UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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September 27, 2012

Donald C. Morris, P.E.
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Hanscom Air Force Base
66 ABG/CEA
Hanscom AFB, MA 01731

Re: ***Five-Year Review (2008-2012), Hanscom Air Force Base, Bedford, Concord, Lexington, and Lincoln, Massachusetts***

Dear Mr. Morris:

This office is in receipt of the Air Force's *Five-Year Review Report, Hanscom Air Force Base* dated September 2012. Upon review of this report, EPA concurs with the findings that all remedies which have been implemented are currently protective of human health and the environment. EPA looks forward to working with the Air Force to address future Site 6 and 21 initiatives including establishing a groundwater compliance boundary, confirming the lack of vapor intrusion pathway exposure, and evaluating the expansion of the active recovery network. These initiatives, combined with ongoing optimization efforts, will continue to ensure successful remedies at HAFB.

This fourth five-year review was triggered by the third 5-year review completed in 2007. Consistent with Section 121(c) of CERCLA and EPA's *Comprehensive Five-Year Review Guidance (OSWER Directive 9355.7-03B-P)*, the next statutorily required five-year review must be finalized by September 27, 2017.

Sincerely,

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

cc. Mary Sanderson/EPA
Bryan Olson/EPA
Matthew Audet/EPA
Dave Gallagher/MassDEP

SDMS Doc ID 522266

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 66TH AIR BASE GROUP
HANSCOM AIR FORCE BASE MASSACHUSETTS

Five-Year Review Report

Fourth Five-Year Review Report

for

Hanscom Field/Hanscom Air Force Base Superfund Site

Bedford, Concord, Lexington, Lincoln

Middlesex County, Massachusetts

August 2012

PREPARED BY:

66th Air Base Group/Civil Engineering
Hanscom Air Force Base, Massachusetts

Approved by: **Date:**

26 SEP 12

LESTER A. WEILACHER
Colonel, USAF
Commander

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Five-Year Review Report

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List of Acronyms

1,2-DCE	1,2-dichloroethene
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
ARAR	Applicable or Relevant and Appropriate Requirement
BIW	Boundary Interceptor Well
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
cis	cis-1,2-dichloroethene
CoC	Contaminant of Concern
CoE	U.S. Army Corps of Engineers
DEA	Debris Excavation Area
DD	Decision Document
DNAPL	Dense Non-Aqueous Phase Liquid
DoD	Department of Defense
ESC	Electronic Systems Center
EWRA	East Wetland Remediation Area
FS	Feasibility Study
GAC	Granular Activated Carbon
GC	Gas Chromatograph
gpm	gallons per minute
H&A	Haley & Aldrich, Inc.
HI	Hazard Index
IC	Institutional Controls
IROD	Interim Record of Decision
IRP	Installation Restoration Program
IW	Interceptor Well
LNAPL	Light Non-Aqueous Phase Liquid
LTM	Long Term Management
LUC	Land Use Controls
MassDEP	Massachusetts Department of Environmental Protection
Massport	Massachusetts Port Authority
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goals
MCP	Massachusetts Contingency Plan
MSL	mean sea level
NCP	National Oil and Hazardous Substances Contingency Plan
NFRAP	No Further Response Action Planned
NPL	National Priorities List
O&M	Operation and Maintenance
OM&M	Operation, Maintenance and Monitoring
ORC	Oxygen Release Compound
OU	Operable Unit
OW	Observation Well
PAH	Polynuclear Aromatic Hydrocarbon

List of Acronyms – Continued

ppb	Parts per billion
ppm	Parts per million
PSG	Professional Services Group, Inc.
RA	Remedial Action
RAB	Restoration Advisory Board
RBRGs	Risk Base Remediation Goals
RAO	Remedial Action Objectives
RAO (MCP)	Response Action Outcome
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SCADA	Supervisory control and data acquisition system
SVE	Soil Vapor Extraction
SVOC	Semi-volatile organic compound
TCE	Trichloroethene
TPH	Total Petroleum Hydrocarbon
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VER	Vapor Enhanced Recovery
VOC	Volatile organic compound
WWRA	West Wetland Remediation Area

Executive Summary

This is the Fourth Five-Year Review for the Hanscom Field/Hanscom AFB Superfund Site. A review of in-place remedial actions is required by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) every five years as long as hazardous substances, pollutants, or contaminants remain on site above levels that allow for unlimited use and unrestricted exposure. The triggering action for this review is the date of the Third Five-Year Review Report as shown in EPA's WasteLAN database: September 30, 2007.

The Department of Defense (DoD) initiated its Installation Restoration Program (IRP) concurrently with CERCLA with the overall goal of cleaning up contamination on DoD installations. The USAF began implementing the IRP at Hanscom AFB during the early 1980s with records reviews, interviews and field investigations to identify potentially contaminated sites. Subsequently Hanscom AFB, including Hanscom Field, was listed on the USEPA National Priorities List (NPL) in 1994. Of the 22 individual Hanscom AFB IRP sites with known or suspected contamination, 6 with on-going remedial actions have been designated as CERCLA sites and fall under jurisdiction of the United States Environmental Protection Agency (USEPA) and are the subject of this review. These CERCLA sites were grouped into the following three Operable Units (OUs):

Operable Unit 1

IRP Site 1	Fire Training Area II
IRP Site 2	Paint Waste Disposal Area
IRP Site 3	Jet Fuel Residue/Tank Sludge Disposal Area

Operable Unit 2

IRP Site 4	Sanitary Landfill

Operable Unit 3

IRP Site 6	Landfill/Former Filter Beds
IRP Site 21	Unit 1 Petroleum Release Site

Pre-NPL Remedial Action Plans for Hanscom Field Sites (IRP Sites 1, 2, 3/5 and 4): In 1985 Haley & Aldrich, Inc. (H&A) was retained to conduct investigations and prepare Remedial Action Plans for IRP Sites 1 through 5 on Hanscom Field. Field investigation of the sites was conducted by H&A in 1985 and 1986. The results of this field work were documented in Appendix F of the report entitled *Installation Restoration Program, Phase IV-A, Hanscom AFB Area I*. Based on the results of the field investigation H&A prepared a "Remedial Action Plan" for each site. Following public review of the plans, Hanscom AFB documented selection of each site's Remedial Action Plan in a *Decision Paper, Area 1 (Sites 1-5)* dated April 6, 1988. This Decision Paper was approved by the Base Commander on April 20, 1988. Please note that the Remedial Action Plan entitled IRP Sites 3/5 noted that "… field investigations have failed to indicate that fire training activities or any contamination associated with those activities can be attributed to Site 5." Subsequently a Decision *Document for Close-Out* for Site 5 was signed by the Base Commander on 27 September 1991. This Decision Document included the determination "… that there is no basis for the existence of this site" and included the declaration

that "… the selected remedy is no action and the site is hereby closed-out." Regulatory confirmation of the close out of IRP Site 5 was later documented in the *Interim Record of Decision, Operable Unit 1* dated November 2000.

The Remedial Action Plans for IRP Sites 1, 2 and 3 included the removal of drums and/or visibly contaminated soil in 1988; construction of a groundwater collection, treatment and recharge system which commenced operation in 1991; and a long term groundwater and surface water monitoring program. The groundwater collection system included collection trenches at each of the three sites and four (4) boundary interceptor wells along the Hanscom Field/Hanscom AFB northern property boundary with the Town of Bedford's property. The purpose of these wells is to intercept any contamination migrating off the airfield complex through the lower/glacial till and/or bedrock aquifers.

The Remedial Action Plan for IRP Site 4, the former Hanscom AFB municipal landfill, included a low permeable cap, drainage measures and a compensatory wetland, Construction of this remedy was completed in 1988 and long-term monitoring program conducted between December 1989 and September 1992.

Post-NPL Actions

OU-1/IRP Sites 1, 2 & 3: Following designation of Hanscom Field/Hanscom AFB as a NPL site, USEPA became the lead regulatory agency and IRP Sites 1, 2 and 3 which are located on Hanscom Field were grouped into Operable Unit 1 to facilitate further response actions. These three sites are confirmed groundwater contamination source areas. Contaminants of Concern (CoCs) at OU-1 consist of chlorinated and aromatic volatile organic compounds (VOCs) and the VOCs with the highest concentrations are trichloroethene (TCE), 1,2-dichlorothene (1,2-DCE) and vinyl chloride. Dense non-aqueous phase liquid (DNAPL) is known to be present at Site 1 and is suspected to be present in other areas within OU-1. While the extent of the DNAPL is not fully known it is believe to be fully contained and within the capture zone of the existing collection system. This conclusion is supported by long-term monitoring data which has not found dissolved-phase contaminant concentrations in groundwater which are indicative of nearby DNAPL in monitoring wells down-gradient of the existing collection system.

> **IRP Site 1**: This site is located at the north end of the airfield was reportedly used from the late 1960s through 1973 for fire training exercises. It is situated in the town of Bedford. Two (2) burn pits were used at this site. Waste oils, solvents, paint thinners, and degreasers were collected from around the base, dumped into pits, ignited, and then extinguished. Occasionally, aircraft wrecks and fuselages were burned in the pits. The size of each of the two pits was estimated to be 15 feet by 20 feet. There is no information indicating that a liner or containment was used at these pits.
>
> **IRP Site 2**: This site located in the northeast portion of the airfield, was used for disposing of waste solvents and paint from 1966 to 1972. It is situated in the town of Bedford. Metal plating wastes may also have been disposed in this area from the early 1960s through 1972. During the 1988 removal action four (4) drum burial pits of various sizes were found and excavated. There is no information indicating whether any type of

liner or containment was used at these pits.

IRP Site 3: This site located in a triangular area in the western portion of the airfield bounded by Taxiway "Whiskey" to the north, Taxiway "Mike" to the southwest and Runway 5-23 to the southeast. It is situated in the town of Concord. According to the IRP Phase I Records Search, several hundred drums of waste oils and paint wastes were buried at the Jet Fuel Residue Area during the period of 1959 to 1969. Disposal at the Tank Sludge Area, which is located within the same triangular area and to the northwest of the Jet Fuel Residue Area, reportedly occurred during the early 1960's. Because of the close proximity of this site to the Jet Fuel Residue Area, they were discussed and evaluated as one site. During the 1988 removal action ten (10) drum burial pits of various sizes were found and excavated. There is no information indicating whether any type of liner or containment was used at these pits.

As stated above, Remedial Action Plans for IRP Sites 1, 2 and 3 were developed and implemented prior to the NPL designation. Subsequently, in 1995, USEPA advised that additional studies were necessary to ensure that these earlier actions fully addressed CERCLA requirements. Using the results of all previous investigations a *Final Ecological Risk Assessment, OU1* (dated January 1999) and a *Focused Feasibility Study, OU1* (dated May 2000) were completed. This effort included groundwater flow and solute transport models, and an evaluation of the soil-to-groundwater contaminant transport pathway for human health risk assessment. Based on these reports and the presence of DNAPL in the bedrock fractures, the Project Team concluded that it was not prudent to select a final remedy at that time since there was a moderate to high degree of uncertainty regarding attainment of Applicable or Relevant and Appropriate Requirements (ARARs) within all of the OU-1 area. At that time it was determined that an Interim Record of Decision (IROD) would be appropriate and an *Interim Proposed Plan for Hanscom AFB Operable Unit 1* (dated June 2000) was prepared. The public review of this plan, to include a Public Information Meeting and Public Hearing on June 28, 2000, was completed in July 2000 without comment.

Subsequently an Interim Record of Decision, dated November 2000, selecting an interim remedy for OU1 was signed by the Air Force on January 24, 2001 and by USEPA on February 6, 2001. The Commonwealth of Massachusetts formally concurred with this IROD by letter dated December 27, 2000. The selected interim remedial action for cleaning up OU-1/IRP Sites 1, 2 and 3 included continued operation of the existing dynamic groundwater remediation system, implementation of institutional controls, and monitoring of groundwater and surface water. This course of action was selected to provide time to collect additional information to support a final remedy.

By 2006 progress had been made (since the IROD was issued in 2000) towards the cleanup of OU-1 and additional information that was gathered which supported the selection of a final remedy. Therefore, in 2007, a Focused Groundwater Flow and Transport Model (May 2007), a Revised Focused Feasibility Study of OU-1 (May 2007), and a Proposed Plan (May 2007) were prepared to support a Final Record of Decision (ROD) for OU-1. The public comment period for the OU-1 Proposed Plan was from June 8, 2007 to July 9, 2007. In addition, a public meeting and a public hearing were conducted on June 20, 2007 in Bedford, MA to discuss the OU-1

Proposed Plan and to accept oral comments. No written comments were received during the comment period, including the public hearing. During the public hearing on June 20, 2007 oral comments were accepted from the public. Comments received during the hearing were positive and no required no changes to the Proposed Plan. Based on the above a ROD selecting the final remedy for OU-1 was signed by the Air Force on September 14, 2007 and by USEPA on September 28, 2007. The Commonwealth of Massachusetts formally concurred with this ROD by letter dated September 28, 2007. The final remedy selected by the 2007 ROD was the Continued Operation of the Existing Dynamic Groundwater Remediation System, Land Use Controls and Monitoring.

According to the data review, site inspections, and interviews conducted in the summer of 2012 the remedy is functioning as intended by the ROD and there have been no changes in the physical conditions of the site that could affect the protectiveness of the remedy. All threats at the site have been addressed through physical measures and land use controls and there is no other information that calls into question the protectiveness of the remedy. The OU-1 RA has been, and continues to be, successful in containing/capturing the groundwater contamination at the Hanscom Field boundary with the Hartwell Town Forest and the Jordan Recreation Area and in cleaning up both the on-site and off-site surface water and groundwater. Current data also indicates that contaminant concentrations in the source areas (Site 1 and Site 2), the on-site plumes, and the off-site plume are declining. As a result the assessment of this, the Fourth, Five-Year Review, finds that the **remedy** for OU-1/IRP Sites 1, 2 and 3 **is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.**

OU-2/IRP Site 4: IRP Site 4 was used as the Hanscom AFB municipal waste landfill from December 1964 until December 1974. The site covers 10.5 acres and is located approximately 1,800 feet southeast of the approach end of Runway 5-23 on Hanscom Field. The landfill is situated predominantly in the town of Lincoln, with a small portion protruding into the bordering town of Concord. Pre-1964 topographic maps of the area indicate that the site was a wetland area associated with Elm Brook. During its active life, the landfill was intended to be primarily for the disposal of solid waste. However, the IRP Phase I – Records Search report states that interviews with Base personnel confirmed that dumpsters containing waste from all shops and research laboratories were emptied into the landfill during its 10-year operation. No attempt was made to segregate hazardous materials from non-hazardous materials. The landfill ranges from 10 to 15 feet deep and is estimated to have a volume of 210,000 cubic yards. As discussed above the remedial action constructed in 1988 placed an impervious cap over the area. The area is also bermed with drainage ditches to channel runoff from the capped area to the wetlands. Today the area is grassed open space with a softball field in the southern half.

Following the listing of Hanscom Field/Hanscom AFB on the NPL, USEPA requested that CERCLA Human Health and Ecological Risk Assessments, to include Supplemental Sampling and Analysis, be completed for IRP Site 4. The site was also designated Operable Unit 2 at this time. The additional monitoring was conducted and the CERCLA risk assessments were completed. Subsequently USEPA determined that the Remedial Action completed in 1988 was acceptable as a final remedial action. The Project Team (Remedial Project Managers for Hanscom AFB, USEPA & MassDEP) concluded that additional long-term groundwater

monitoring data was not required but, since the landfill waste remains on-site, Five-Year Reviews of the remedial action were appropriate.

USEPA and Hanscom AFB completed a site inspection in May 1997 and USEPA issued *Five-Year Review Report #1, Hanscom Air Force Base Superfund Site, Middlesex County, Massachusetts* dated September 1997. This review concluded "based on the field inspection, and human health and ecological risk assessment, protectiveness of the landfill cap at Site 4 has been demonstrated" however, the review did identify a requirement to remove scrub brush growing in the drainage ditches and on sections of the cap and berms and for a long-term inspection/ maintenance program to be instituted. The field work to remove the scrub brush was completed in the spring of 1998 and a long-term inspection and maintenance program was instituted and continues to the present.

According to the data review to include quarterly inspection reports, site inspections, and interviews conducted in the summer of 2012 the remedy continues to function as intended by the 1988 Remedial Action Plan and there have been no changes in the physical conditions of the site that could affect the protectiveness of the remedy. A long-term inspection and maintenance program is in place to ensure continued protectiveness of the remedy and all threats at the site have been addressed through physical measures and land use controls. There is no other information that calls into question the protectiveness of the remedy. Therefore the assessment of this, the Fourth, Five-Year Review, finds that the **remedy** for OU-2/IRP Site 4 **continues to be protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.**

OU-3/IRP Site 6: OU-3/IRP Site 6 is approximately 15 acres in area and is located in the northeast portion of Hanscom AFB. It is situated in both the town of Bedford and the town of Lexington. The site is bounded to the north by a former railroad spur, to the northeast by a wetland area and small pond, to the east by a commercial industrial park, to the south by a service road (Hunter Street), and to the west by IRP Site 21 (the former aviation fuel facility). IRP Site 6 consists of three distinct areas: the former filter beds (including the former sludge beds) and two (2) hillside landfill areas; the south landfill (including a suspected ash disposal area and Building 1855 Underground Storage Tank (UST) site); and the west landfill. The former filter bed area is higher than the wetlands to the north and was the location of the original sanitary waste treatment system (used from 1947 until the mid 1950's) for Hanscom AFB. This system, which was abandoned in place when the Base connected to a municipal sanitary waste system, consisted of an Immoff Tank, Dosing Tank, Filter Beds (six (6) sand filled cells with a concrete berm surrounding each cell) and two (2) sludge beds. Following the abandonment of the treatment system, this area became a disposal site for municipal wastes, construction debris, and clean fill. As a result the filter beds were overlain by approximately 5 to 15 feet of solid waste material. Immediately adjacent to, and to the south of the filter bed area are two (2) hillside landfill areas (south and west). Disposal in these two areas was mainly clean fill and/or construction debris. The south landfill was originally graded into terraces, however, these were obliterated by dumping of clean fill from a building foundation excavation and construction debris in the late 80's/early 90's. The southernmost portion of the south landfill includes a suspected ash disposal area and the former location of a 1,000-gallon No. 2 fuel oil UST on the west side of Building 1855. When the UST tank was removed in 1990, evidence of a petroleum

release was found. Building 1855 formerly housed an incinerator and is currently a licensed solid waste transfer station for Hanscom AFB.

The Remedial Investigation (RI) of the site was completed in 1998 and Human Health and Ecological Risk Assessments were completed in 1999. The human health risk assessment identified that future industrial site workers could potentially be exposed to CoCs in surface soil. Also, the hypothetical scenario identified that future hypothetical residential groundwater users living in houses built on OU-1 may be exposed to an unacceptable human health risk that exceeds 10-4 (carcinogenic) and HI>1 (noncarcinogenic). Although this is not a likely scenario, it must be considered under the CERCLA regulation, the NCP. In addition, the ecological risk assessment identified an unacceptable risk to soil invertebrates and animals feeding 100% of the time at the landfill areas (especially the suspected Ash Disposal Area), to benthic and water column organisms in the wetlands, and to the black-crowned night heron from DDT in the wetlands. Based on the RI and risk assessments a *Focused Feasibility Study, Operable Unit 3, Site 6 – Landfill* and a *Proposed Plan for Hanscom AFB Operable Unit 3/Site 6* were prepared. The public review of the Proposed Plan, to include an Information Meeting and Public Hearing on June 20, 2000, was completed in July 2000 without comment. Subsequently, a Record of Decision, dated September 2000, selecting the final remedy for OU3/IRP Site 6 was signed by the Air Force on November 14, 2000 and by USEPA on December 5, 2000. The Commonwealth of Massachusetts formally concurred with this Record of Decision (ROD) by letter dated October 16, 2000.

The construction of the final remedy in accordance with the IRP Site 6 ROD was substantially completed in September 2001 and review of the *Remedial Action Report* confirmed that the remedy was constructed in accordance with the Remedial Design. The remedial action for cleaning up OU-3/IRP Site 6 included containment/pervious capping of three landfill areas, removal of contaminated sediments and landfill debris from adjacent private property and placing of this material within the capped landfill area, long-term monitoring, and institutional controls. In addition, the remedy included establishment of a Groundwater Compliance Boundary and a Contingency Groundwater Remedy in the event monitoring results show that the remedy is not effective in maintaining groundwater quality outside the compliance boundary. Immediately following construction of the remedy a long-term inspection, maintenance and monitoring program commenced to ensure the continued protectiveness of the remedy.

A Five/Thirty Year Monitoring Plan was specified by the Remedial Design for the wetland areas remediated during the construction phase of the Site 6 Remedial Action. The initial 5-year wetland mitigation monitoring program was successfully completed in 2006 and the Wetland Mitigation Monitoring Reports for this monitoring indicated that the wetlands had exceeded the design goal for vegetative cover, and provided ample evidence that wildlife habitat has been restored. The Remedial Design also specified that the initial Five-Year Monitoring should be followed by a Long-Term Monitoring Plan for the continuing evaluation of the restoration every 5 years for thirty years. In compliance with this RD requirement a wetland mitigation and ecosystem evaluation event was successfully completed in 2011. The 2011 report confirmed that the wetlands had been successfully re-established but that they were maturing somewhat different than expected. It was noted that the water levels in the EWRA and WWRA did not appear to vary more than a few inches year around which is not quite the case in a typical

herbaceous wetland in Massachusetts and it was concluded that the groundwater table in the wetland system is just a few inches too high to the wetland maturation to proceed toward the typical herbaceous wetland in Massachusetts. There is nothing wrong with this condition, it is just that bulrushes, sweet flag, cattails and common reed because of their tolerance to saturation throughout the growing season, are dominating the site and not proceeding toward the anticipated tussock sledge stage. Because of the importance of groundwater levels to the success of these wetlands it was recommended that the groundwater elevation in 2 existing piezometers (PZ-E and PZ-W) be collected during each future Long-Term Monitoring event in order to get a more complete understanding of the dynamics of this system in the next/2016 wetland mitigation and ecosystem evaluation of the restoration areas.

The long-term monitoring data continues to indicate that the surface water quality in the adjacent wetlands and the Shawsheen River are not being threatened and that natural flushing and natural attenuation are reducing the size and strength of residual on-site and off-site groundwater contamination. Current monitoring data also indicate that groundwater outside the groundwater compliance boundary (which was revised (expanded further to the north) in 2006 meets the MCLs at times but there continues to be periodic spike-ups above the MCL for dissolved arsenic in some of the wells defining the Compliance Boundary. It is concluded that additional data/time is required to confirm that the Site 6 Groundwater Compliance Boundary adequately defines where the dissolved arsenic concentrations are less that the arsenic 10 ug/L MCL. If it is subsequently concluded in the next 3 to 5 years that the current boundary is inadequate then the boundary will be revised again or a ROD Amendment or ESD will be prepared to address the dissolved arsenic non-compliance.

According to the data review, site inspections, and interviews conducted in the summer of 2012 the remedy continues to function as intended by the ROD for OU-3/IRP Site 6 and there have been no changes in the physical conditions of the site that could affect the protectiveness of the remedy. A long-term inspection and maintenance program is in place to ensure continued protectiveness of the remedy and all threats at the site to include the periodic exceedances of the arsenic MCL/MCP GW-1 Standard at the Groundwater Compliance Boundary have been addressed through physical measures and land use controls. There is no other information that calls into question the protectiveness of the remedy. Therefore the assessment of this, the Fourth, Five-Year Review finds that the **remedy** for OU-3/IRP Site 6 **is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.**

OU-3/IRP Site 21: IRP Site 21 is an area with groundwater contamination and three separate areas of petroleum products floating on the water table were identified by the Remedial Investigation. These areas are technically referred to as light non-aqueous phase liquid (LNAPL) pools. The site is approximately 5 acres in area, situated in the town of Bedford in the northeast portion of Hanscom AFB and adjacent to IRP Site 6. IRP Site 21 is the area of a former aviation fueling facility that was used for storage, off-loading, and dispensing of jet fuel and aviation gasoline from at least 1945 through 1973, and to store and distribute No. 2 fuel oil during the early 1970s. Fuel was stored in aboveground and underground storage tanks, which had associated pump houses and a network of underground piping. This area was also used for the storage of cleaning solvents and other petroleum products (oils and lubricants) associated with aircraft and vehicle maintenance.

Following the discovery of IRP Site 21 in 1990 several interim remedial actions were conducted prior to 2001, to include a RI and risk assessments which were completed in July 2000. Based on these documents and data gathered during the interim remedial actions, a *Feasibility Study, Operable Unit 3/ Site 21* dated June 2001 and a *Proposed Plan for Hanscom AFB Operable Unit 3/Site 21* dated July 2001 were prepared. The public review of the Proposed Plan, to include a Public Information Meeting and Public Hearing on August 1, 2001, was completed in August 2001 without comment. Subsequently, a Record of Decision, dated October 2001 selecting the remedy for OU3/IRP Site 21 was signed by the Air Force on August 20, 2002 and by the USEPA on August 29, 2002. The Commonwealth of Massachusetts formally concurred with this ROD by letter dated January 22, 2002.

The construction of the final remedy in accordance with the IRP Site 21 ROD commenced in June 2003 and was substantially completed in September 2003. The selected remedial action for cleaning up OU-3/IRP Site 21 includes interceptor trenches with passive recovery wells; removal and disposal of petroleum saturated soil encountered during trench construction; enhancement of biodegradation of groundwater contamination by ORC® application in all trenches; a network of ten active recovery wells connected to an existing treatment system; monitoring; land use controls/institutional controls; and groundwater containment/treatment and vacuum enhanced recovery (VER) contingencies. Following construction there was a 6-month shakedown/ assessment period for the 10-well LNALP/groundwater recovery and treatment system which commenced 15-September 2003. Review of the Remedial Action Report confirmed that the remedy was constructed in accordance with the Environmental Cleanup Plan and is being operated in accordance with the Operation and Maintenance Plan.

Immediately following the shakedown/assessment period the Remedial Action-Operation (RA-O) phase commenced. This includes operation and maintenance of a small scale (less than 1 gpm) LNALP/groundwater recovery and treatment system and a long-term LNAPL and groundwater/surface water monitoring program. The post-RA monitoring of the site commenced with a baseline monitoring round in October 2003 to document post-RA LNAPL, to identify contaminants of concern in the groundwater water and surface water, and to provide a baseline to monitor changes over time in the contaminant concentration levels. The RA-O phase also includes the monitoring and enforcing of the LUCs/ICs specified in the ROD.

According to the data review, site inspections, and interviews conducted in the summer of 2012 the remedy continues to function as intended by the ROD and there have been no changes in the physical conditions of the site that could affect the protectiveness of the remedy. All threats at the site have been addressed through physical measures and land use controls and there is no other information that calls into question the protectiveness of the remedy. Review of the monthly Remedial Action Reports and Long-Term Monitoring Reports completed to date confirms that progress towards attainment of RAOs is being made, that there is natural containment of the on-site LNAPL and natural containment/natural attenuation of the on-site groundwater contamination and that water quality of the adjacent Shawsheen River is not being threatened. As a result the assessment of this, the Fourth, Five-Year Review finds that the **remedy** for OU-3/IRP Site 21 **is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.**

Third (2007) Five-Year Review Issues – There were no issues related to current site operations, conditions, or activities that affect current and/or future protectiveness of any of the Hanscom Field/Hanscom AFB remedies.

Third (2007) Five-Year Review Recommendations and Follow-up Actions

Recommendation: Continue to implement Remedial Process Optimization initiatives for the OU-1 Dynamic Groundwater Remediation System as suggested by operational experience, monitoring and the evolution of new applicable remediation technologies to complete the cleanup in the most cost effective and timely manner possible.

Progress:

- Aug 07 to date– various adjustments to the Remediation Systems Monitoring and to both the Phase 1 (via laboratory) and the Phase 2 (via on-site GC) of the Long-Term Monitoring Programs (see pages 13 to 15 in **Attachment C-1)**
- Aug 07 – Commenced another VER phase following a permanganate injection remediation period
- Sep 07 – Revised VER system to include extraction from converted monitoring well RAP1-3R.
- Jul 09 – Installed hydrant stub-up tapped off the Site 2 recharge piping to provide an alternate or additional recharge capability at Site 2, however, has yet to be used
- Sep 09 – Installed hydrant stub-up tapped off the Site 3 recharge piping to provide a recharge capability at Site 1 and the diversion of treated groundwater to discharge on the surface of the Site 1 source areas is expected to commence later this summer (2012).
- The OU-1 ROD required the Air Force, in consultation with the EPA and Mass DEP, to establish restrictions prohibiting the construction of wells and the use of groundwater in any documented or anticipated area of groundwater contamination. These restrictions shall be in place within 1 year of the ROD's 2007 signature. In retrospect these restrictions were already in place, specifically Section 8 of the Bedford Board of Health Code of Health Regulations requires that any landowner obtain a permit for the installation of wells anywhere in the Town of Bedford. While this does not specifically "prohibit" wells in the Jordan Conservation Area and Hartwell Town Forest it does ensure that the Board of Health would be involved in the decision. See **Attachment J-3**

Recommendation: Determine whether or not dissolved thallium is a contaminant of concern in the on-site groundwater at OU-3/IRP Site 6.

Progress: Commencing with the October 2008 Long-Term Monitoring event for IRP Site 6 the analysis method for thallium was changed from Method 6010 to the more definitive Methods 7841 or 6020. As shown in **Attachment G-4** there has been no exceedances of the Thallium MCL when analysis was by Methods 7841 or 6020. It is concluded that Dissolved Thallium in groundwater is not a Contaminant of Concern at OU3/IRP Site 6

Recommendation: Determine whether or not the groundwater compliance boundary is adequately defined by the current network of monitoring wells.

Progress:

- In 2008 completed installation of an additional surface aquifer monitoring well (MW6-125U) to better define the groundwater compliance boundary as revised in 2006 and completed installation of two (2) additional surface aquifer monitoring wells (MW6-123U & MW6-124U) to evaluate the north/northwest side of the Shawsheen River down gradient of IRP Site 6 (see **Figure 23**).
- In 2008 expanded the surface water monitoring program from one sampling point in the wetlands by including a sampling point in the pond north of the former railroad spur and two points in the Shawsheen River (one upstream of IRP Site 6 and one near the northern most point of the groundwater compliance boundary (see **Figure 24**).
- In 2010 received Massport's permission to sample and analyze for dissolved arsenic six (6) monitoring wells installed by Massport to provide data for a Hanscom Field **Storm Water** Model. These wells are on the north/northwest side of the Shawsheen River down gradient of IRP Site 6 (see **Figure 15**). Subsequently have continued to include 2 of the 6 wells in the Long-Term Monitoring Program for Site 6.
- Dissolved arsenic continues to be periodically detected in the Groundwater Compliance Boundary's surface aquifer at levels above the MCL. Dissolved arsenic concentrations at levels above the MCL have also been found in 5 of the 6 Massport Storm Water Model wells on the far side (north/west) of the Shawsheen

In summary progress has been made but not definitive enough to satisfactorily address this recommendation. Thus it will be carried over as a recommendation of the Review.

Additional Progress Since the 2007 Five-Year Review

Superfund Site

- **Preliminary Close Out Report** for the Hanscom Field/Hanscom AFB NPL Site issued by the Environmental Protection Agency (September 2007)
- **Federal Facility Agreement** established (signed by the Air Force on 10 September 2009 and the Environmental Protection Agency on 18 September 2009)
- **Modified Comprehensive Site Evaluation Phase 1, Military Munitions Response Program (MMRP)**, Hanscom AFB, MA completed by the Air Force (April 2010)
- **Appendix F (Initial Site Management Plan) to the Federal Facility Agreement** issued by Hanscom AFB (April 2010)

OU-1/IRP Sites 1, 2 and 3

- **Record of Decision** issued - (signed by the Air Force on 14 September 2007 and the Environmental Protection Agency on 28 September 2007
- **Continued Remedial Action – Operation:** Operation, maintenance and monitoring of the dynamic groundwater remediation system and monitoring and enforcing LUCs.
    - Continued monitoring Site 3 for rebound of contaminant concentrations (the collection and treatment of groundwater from Site 3 was stopped in August 2001 because the TCE and cis-1,2-DCE concentrations had declined to near drinking

water standards.

OU-2/IRP Site 4

- **Continued Long-Term Maintenance:** Inspection and maintenance of landfill cap and monitoring and enforcing voluntary LUCs.

OU-3/IRP Site 6

- **Continued Remedial Action – Operation:** Inspection, maintenance and monitoring of capped landfill and restored wetland areas and monitoring and enforcing LUCs.
- In 2011 completed a Wetland Mitigation Monitoring & Ecosystem Evaluation as required by the Monitoring Plan included in the Remedial Design for the wetland areas remediated during the construction phase of the Site 6 Remedial Action. Follow-on events are required every five years commencing until 2031.

OU-3/IRP Site 21

- **Continued Remedial Action – Operation:** Operation, maintenance and monitoring of the LNAPL/groundwater recovery and treatment system and monitoring and enforcing LUC
- In 2010 installed an additional active Recovery Well, RW-11A, to address developing petroleum hotspot in the vicinity of monitoring well ECS-31
- in 2011 booster injection of ORC® into Former LNAPL Pool A was completed

Fourth (2012) Five-Year Review Issues – There are no issues related to current site operations, conditions, or activities that affect current and/or future protectiveness of any of the Hanscom Field/Hanscom AFB remedies.

Fourth (2012) Five-Year Review Recommendations and Follow-up Actions

Recommendations and Follow-up Actions: The following are required and suggested improvements to current site operations, activities, remedies, or conditions. Hanscom AFB is responsible for their implementation with regulatory oversight by USEPA Region I and/or MassDEP.

OU-1/IRP Sites 1, 2 and 3

- Continue to implement Remedial Process Optimization initiatives as suggested by operational experience, monitoring and the evolution of new applicable remediation technologies to complete the cleanup in the most cost effective and timely manner possible, and
- Re-survey the IRZ Area monitoring wells and re-validate or revise the Conceptual Site Model for this area to more fully evaluate the impact of the change of the surface water elevation since the beaver dam was breeched by Massport in 2010. This should be accomplished as soon as possible and an analysis of the current vertical hydraulic gradients should be included in the 2012 Annual Long-Term Monitoring Report,
- Surface recharge for 3 to 6 months in the area of Burn Pit #1 and the Burn Pit #1 Runoff Area and then re-assess the necessity and/or cost effectiveness of continuing VER at these Site 1 source areas,
- Suspend operation of BIW-2 for 12 – 18 months and evaluate the impact of this suspension and the necessity for continued operation in the 2012 and/or 2013 Annual Long-Term Monitoring Reports, and
- Re-initiate groundwater collection and recharging at Site 3 for 3 – 6 months to confirm that no further active cleanup is required for the IRP Site 3 source areas.

OU-2/IRP Site 4 - none

OU-3/IRP Site 6

- Determine whether or not the groundwater compliance boundary is adequately defined by the current network of monitoring wells and provide a satisfactory/acceptable explanation for the dissolved arsenic that has been found on Hanscom Field. If this is not accomplished in the next 3-5 years then a ROD Amendment or Explanation of Significant Difference will be required to address the Groundwater Compliance Boundary component of the ROD.

OU-3/IRP Site 21

- Continue to implement Remedial Process Optimization initiatives as suggested by operational experience, monitoring and the evolution of new applicable remediation technologies to complete the cleanup in the most cost effective and timely manner possible, and

- Install additional monitoring wells in Zone 2 of Site 21 to evaluate whether or not expansion of the active recovery network to cover more of this Zone would be beneficial in expediting the cleanup of Zone's 2 groundwater.

- Since Buildings 1823, 1833 and 1834 are either on or adjacent to OU-3/IRP Site 21 and VOC contamination occurs in the unsaturated zone and/or the uppermost saturated zone at this site, the subsurface vapor intrusion to indoor air pathway exposure pathway needs to be evaluated in accordance with EPA's 2002 draft guidance. This evaluation should be completed within 6 months using the Long-Term Monitoring data scheduled to be collected in the fall of 2012.

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Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Hanscom Field/Hanscom AFB		
EPA ID: MA 8570024424		
Region: 1	**State:** MA	**City/County:** Bedford-Concord-Lexington-Lincoln/Middlesex County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: Other Federal Agency **If "Other Federal Agency" was selected above, enter Agency name:** U.S. Air Force
Author name (Federal or State Project Manager): Thomas W. Best
Author affiliation: Portage, Inc. – Installation Restoration Program Consultant (Former Hanscom AFB Installation Restoration Program Manager)
Review period: 16 February 2012 - 1 August 2012
Date of site inspection: 19 July 2012, The purpose of this inspection was to confirm current land use and to assess the protectiveness of the remedies for OU-1/IRP Sites 1, 2 and 3, OU2/IRP Site 4, OU3/IRP Site 6, and OU3/IRP Site 21. No significant issues were identified and no activities were observed that would indicate that areas with subsurface soil contamination had been excavated or that the groundwater was being used for potable/non-potable purposes.
Type of review: Statutory
Review number: 4
Triggering action date: 09/30/2007
Due date *(five years after triggering action date)*: 09/30/2012

Five-Year Review Summary Form (continued)

The table below is for the purpose of the summary form and associated data entry and does not replace the two tables required in Section VIII and IX by the FYR guidance. Instead, data entry in this section should match information in Section VII and IX of the FYR report.

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU-2/IRP Site 4

Issues and Recommendations Identified in the Five-Year Review:

OU(s): OU-1	**Issue Category: Operations and Maintenance**			
	Issue: None			
	Recommendation: Continue to implement Remedial Process Optimization initiatives as suggested by operational experience, monitoring and the evolution of new applicable remediation technologies to complete the cleanup in the most cost effective and timely manner possible. **Recommendation:** Surface recharge for 3 to 6 months in the areas of the Burn Pits and the Burn Pit #1 Runoff Area and evaluate the effect of recharging on remedy. Also re-evaluate cost effectiveness of continuing VER at Site 1. **Recommendation:** Suspend operation of BIW-2 for 12 – 18 months and evaluate the impact of this suspension and the necessity for continued operation in the 2012 and/or 2013 Annual Long-Term Monitoring Reports. **Recommendation:** Re-initiate groundwater collection and recharging at Site 3 for 3 – 6 months to confirm that no further active cleanup is required for the IRP Site 3 source areas.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Federal Facility	EPA/State	09/30/2017
OU(s): OU-1	**Issue Category: Monitoring**			
	Issue: None			
	Recommendation: Re-survey the IRZ Area monitoring wells and re-validate or revise the Conceptual Site Model for this area to more fully evaluate the impact of the change of the surface water elevation since the beaver dam was breeched by Massport in 2010. This should be accomplished as soon as possible and an analysis of the current vertical hydraulic gradients should be included in the 2012 Annual Long-Term Monitoring Report.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Federal Facility	EPA/State	09/30/2017
OU(s): OU-3/IRP Site 6	**Issue Category: Monitoring**			
	Issue: None			

	Recommendation: Determine whether or not the groundwater compliance boundary is adequately defined by the current network of monitoring wells and provide a satisfactory/acceptable explanation for the dissolved arsenic that has been found on Hanscom Field. If this is not accomplished in the next 3-5 years then a ROD Amendment or Explanation of Significant Difference will be required to address the Groundwater Compliance Boundary component of the ROD.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Federal Facility	EPA/State	09/30/2017
OU(s): OU-3/IRP Site 21	**Issue Category: Institutional Controls**			
	Issue: None			
	Recommendation: Since Buildings 1823, 1833 and 1834 are either on or adjacent to OU-3/IRP Site 21 and VOC contamination occurs in the unsaturated zone and/or the uppermost saturated zone at this site, the subsurface vapor intrusion to indoor air pathway exposure pathway needs to be evaluated in accordance with EPA's 2002 draft guidance. This evaluation should be completed within 6 months using the Long-Term Monitoring data scheduled to be collected in the fall of 2012.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Federal Facility	EPA/State	03/31/2017
OU(s): OU-3/IRP Site 21	**Issue Category: Operations and Maintenance**			
	Issue: None			
	Recommendation: Continue to implement Remedial Process Optimization initiatives as suggested by operational experience, monitoring and the evolution of new applicable remediation technologies to complete the cleanup in the most cost effective and timely manner possible.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Federal Facility	EPA/State	09/30/2017
OU(s): OU-3/IRP Site 21	**Issue Category: Monitoring**			
	Issue: None			
	Recommendation: Install additional monitoring wells in Zone 2 of Site 21 to evaluate whether or not expansion of the active recovery network to cover more of this Zone would be beneficial in expediting the cleanup of Zone's 2 groundwater.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Federal Facility	EPA/State	09/30/2017

Protectiveness Statement(s)
Include each individual OU protectiveness determination and statement. If you need to add more protectiveness determinations and statements for additional OUs, copy and paste the table below as many times as necessary to complete for each OU evaluated in the FYR report.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU-1	Short-term Protective	Click here to enter date.
Protectiveness Statement: The remedy at OU-1 is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.		
Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU-2/IRP Site 4	Short-term Protective	Click here to enter date.
Protectiveness Statement: The remedy at OU-2/IRP Site 4 is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.		
Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU-3/IRP Site 6	Short-term Protective	Click here to enter date.
Protectiveness Statement: The remedy at OU-3/IRP Site 6 is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.		

Operable Unit: OU-3/IRP Site 21	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: The remedy at OU-3/IRP Site 21 is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.		
Sitewide Protectiveness Statement (if applicable)		
For sites that have achieved construction completion, enter a sitewide protectiveness determination and statement.		
Protectiveness Determination: Short-term Protective		*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: The remedies in-place at the Hanscom Field/Hanscom AFB Superfund Site are protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.		

Five-Year Review Report

I. Introduction

The United States Air Force has conducted a five-year review of the remedial actions implemented at the Hanscom Field/Hanscom AFB Superfund Site in Bedford, Concord, Lexington and Lincoln, Massachusetts. This is the Fourth Five-Year Review for the Hanscom Field/Hanscom AFB Superfund Site. The triggering action for this review is the date of the Third Five-Year Review Report, as shown in USEPA's WasteLAN database: September 30, 2007. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants are or will be left on site above levels that allow for unlimited use and unrestricted exposure.

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

The United States Air Force is preparing this five-year review pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The United States Air Force interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR §300.430(f) (4) (ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

II. Site Chronology

Table 1: Chronology of Site Events

Event	Date
Initial discovery of problem or contamination	
– IRP Sites 4 & 6	5 June 1981
– IRP Site 2 & 3	25 June 1982
– IRP Site 1	April 1983
– IRP Site 21	14 June 1990
Pre-NPL responses	
– Hydrogeologic Investigation of Hanscom Field	June 1982 – September 1984
– Remedial Action Plans for IRP Sites 1 thru 5	September 1985 – May 1988
– Design of IRP Site 1 Soil Removal	December 1986 – August 1987
– Design of IRP Sites 2 & 3 Drum Removal	December 1986 – August 1987
– Design of IRP Site 4 Soil Cap Old Landfill	December 1986 – August 1987
– IRP Phase II-Confirmation/Quantification-Stage 1 for IRP Sites 6 through 13	November 1986 – August 1988
– Design of pump & treat system for Sites 1, 2 & 3	February 1987 – May 1988
– IRP Site 1 Soil Removal	September 1987 – August 1988
– IRP Sites 2 & 3 Soil & Drum Removal	September 1987 – June 1988
– Construction of IRP Site 4 Soil Cap	September 1987 – September 1988
– RI/FS for IRP Sites 6, 8 & 13	September 1987 – June 1992
– Construction of groundwater collection, treatment and recharge system for IRP Sites 1, 2 & 3	September 1988 – January 1991
– Long-term Monitoring of IRP Site 4 (7 Rounds)	November 1989 –November 1992
– Long-term Monitoring of IRP Sites 1, 2 and 3/5	November 1990; February – March 1991; August 1991
– IRP Site 21 Pilot Product Recovery	December 1990 – February 1991
– Operation of groundwater collection, treatment and recharge system for IRP Sites 1, 2 & 3	23 April 1991 - present
– Preliminary RI, IRP Site 21	October 1992 – March 1994
– IRP Site 21 SVE & Groundwater/Product Recovery	March 1993 – December 1993
NPL listing	31 May 1994
Removal Actions - OU-3/IRP Site 21	September 1995 - September 2003
Remedial Investigation/Feasibility Study completed	
- OU-2/IRP Site 4 Supplemental Sampling	February 1996
- OU-2/IRP Site 4 Risk Assessments	April 1997
- OU-3/IRP Site 6 Supplemental RI	July 1998
- OU-1 Ecological Risk Assessment	January 1999
- OU-3/IRP Site 21 Remedial Investigation	April 1999
- OU-3/IRP Site 6 Risk Assessments	July 1999
- OU-3/IRP Site 6 Focused Feasibility Study	May 2000
- OU-3/IRP Site 6 Proposed Plan	May 2000
- OU-1 Focused Feasibility Study	May 2000
- OU-1 Interim Proposed Plan	June 2000
- OU-3/IRP Site 21 Supp. RI & Risk Assessments	July 2000
- OU-3/IRP Site 21 Feasibility Study	June 2001

Table 1: Chronology of Site Events

Event	Date
- OU-3/IRP Site 21 Proposed Plan - OU-1 Revised Focused Feasibility Study - OU-1 Proposed Plan	July 2001 May 2007 May 2007
ROD signature - OU-3/IRP Site 6 ROD dated September 2000 - OU-1 IROD dated November 2000 - OU-3/IRP Site 21 ROD dated October 2001 - OU-1 ROD dated September 2007	 Air Force - 14 November 2000 EPA - 5 December 2000 Air Force - 24 January 2001 EPA - 6 February 2001 Air Force - 20 August 2002 EPA - 29 August 2002 Air Force – 14 September 2007 EPA – 28 September 2007
ROD Amendments or ESDs	None
Enforcement documents (CD, AOC, Unilateral AO)	None
Remedial design start – OU-1/IRP Sites 1, 2 & 3 & OU-2/IRP Site 4 – OU-3/IRP Site 6 – OU-3/IRP Site 21	 Pre-NPL 27 September 1999 3 December 2002
Remedial design complete – OU-1/IRP Sites 1, 2 & 3 – OU-2/IRP Site 4 – OU-3/IRP Site 6 – OU-3/IRP Site 21	 Pre-NPL Pre-NPL 13 April 2001 10 June 2003
Superfund Federal Facility Agreement	Air Force – 14 September 2007 EPA – 28 September 2007
Construction dates (start, finish) – OU-1/IRP Sites 1, 2 & 3 & O(U-2/IRP Site 4 – OU-3/IRP Site 6 – OU-3/IRP Site 21	 Pre-NPL 29 March 2001 - 17 September 2001 2 June 2003 – 15 September 2003
Construction completion date	28 September 2007
Actual remedial action start – OU-1/IRP Sites 1, 2 & 3 – OU-2/IRP Site 4 – OU-3/IRP Site 6 – OU-3/IRP Site 21	 Pre-NPL Pre-NPL 18 September 2001 15 September 2003
Final Close-out Report	n/a
Deletion from NPL	n/a
Previous five-year reviews	September 1997, September 2002, September 2007

III. Background

Physical Characteristics

Hanscom Field/Hanscom AFB is located in the central part of Middlesex County, Massachusetts, approximately 14 miles northwest of downtown Boston and 11.5 miles south of downtown Lowell, Massachusetts. The complex occupies land in the towns of Bedford, Concord, Lexington, and Lincoln (**Figure 1**). Topographically the Hanscom Field/Hanscom AFB area is located in a low-lying basin surrounded by hills. The relatively flat runway portion of Hanscom Field lies in the ancient lake bed of glacial Lake Concord. The ground surface elevation on this former lake bed ranges from 120 to 130 feet above mean sea level (MSL). The hills south of the air base, and Pine Hill to the west, rise to more than 200 feet MSL. Hills north of the airfield area are more subdued, but still rise above 150 feet MSL. Former glacial Lake Concord and Hanscom AFB on its southern edge, drain to the Shawsheen River, which flows north-northeast from the site to join the Merrimack River approximately 15 miles downstream. The topography and surficial geology of the Hanscom Field/Hanscom AFB area is illustrated in **Figure 2**.

The Department of Defense (DoD) initiated its Installation Restoration Program (IRP) concurrently with CERCLA with the overall goal of cleaning up contamination on DoD installations. The USAF began implementing the IRP at Hanscom AFB during the early 1980s with records reviews, interviews and field investigations to identify potentially contaminated sites. Subsequently Hanscom AFB, including Hanscom Field, was listed on the USEPA National Priorities List (NPL) in 1994. Of the 22 individual Hanscom AFB IRP sites with known or suspected contamination, 6 with on-going remedial actions have been designated as CERCLA sites and fall under jurisdiction of the USEPA and are the subject of this review. These CERCLA sites were grouped into the following three Operable Units OUs):

Operable Unit 1(OU-1)

- IRP Site 1 Fire Training Area II
- IRP Site 2 Paint Waste Disposal Area
- IRP Site 3 Jet Fuel Residue/Tank Sludge Disposal Area

Operable Unit 2 (OU-2)

- IRP Site 4 Sanitary Landfill

Operable Unit 3 (OU-3)

- IRP Site 6 Landfill/Former Filter Beds
- IRP Site 21 Unit 1 Petroleum Release Site

The location of these three Operable Units is shown in **Figure 1**.

Upon the designation of Hanscom Field/Hanscom AFB as a NPL Site in 1994 USEPA reviewed the listing of all of the IRP sites to identify those not subject to CERCLA because of the CERCLA petroleum exclusion clause. IRP sites identified at this time as non-CERCLA sites included IRP Sites 9, 11, 12, 14, 15, 16, 17, and 18. Subsequently, following additional review of site investigation data, IRP Sites 13 and 22 were also determined to be non-CERCLA sites. Please note that non-CERCLA/petroleum sites are regulated by the Massachusetts Contingency Plan (MCP) with regulatory oversight by the Massachusetts Department of Environmental Protection (MassDEP).

There are 16 IRP Sites not covered by this Five-Year Review because they have either been closed-out with regulatory concurrence or are non-CERCLA sites being regulated by the MCP. The status of these 16 sites is as follows:

IRP Site	Name	Status	Date	Document
5	Fire Training Area I	Closed-out	9/27/1991	AF DD (note 1)
7	Industrial Wastewater Treatment System	Closed-out	1/22/1991	AF DD (note 2)
8	Scott Circle landfill	Closed-out	12/23/1991	AF DD (note 3)
9	Administration Building Jet Fuel Spill	Closed-out	1/22/1991	AF DD
10	Mercury Spill at Building 1128	Closed-out	12/19/1989	AF DD (note 2)
11	Various Fuel Spills on Runways & Taxiways	Closed-out	1/22/1991	AF DD
12	AAFES Service Station Gasoline Leak	Closed-out	1/22/1991	AF DD
13	Motor Pool Gasoline Leak	MCP Long-Term Monitoring	1/19/1999	Class C RAO
14	Multi-site UST Investigation	Closed-out	10/19/2000	AF DD
15	Multi-site UST Removal	Closed-out	10/19/2000	AF DD
16	Contamination at Building T-860	Closed-out	9/30/1994	AF DD
17	Contamination at Building 1103	Closed-out	9/30/1993	AF DD
18	Contamination at Building 1102-C	Closed-out	9/30/1993	AF DD
19	Suspected Dump Site	Closed-out	9/30/1994	AF DD (note 2)
20	Suspected Fire Training Area	Closed-out	2/6/2001	OU-1 IROD
22	AAFES Service Station Petroleum Leaks	MCP Long-Term Monitoring	8/26/1997	Class C RAO

Note 1 - Closed-out reconfirmed by OU-1 IROD dated November 2002
Note 2 - Closed-out reconfirmed by USEPA letter dated July 5, 2000
Note 3 - Closed-out reconfirmed by USEPA letter dated September 28, 2001

Land and Resource Use

Hanscom AFB is an active base owned and operated by the Federal government through the Department of the USAF. Hanscom AFB is home to the Electronic Systems Center (ESC), a dynamic organization with the important mission of providing the latest in command and control and information systems for the Air Force, the Department of Defense and our allies. ESC currently manages approximately 200 programs and has an annual budget of more than $5 billion. Many systems represent America's most valuable defense assets, such as the **E-3 AWACS** and the **E-8 Joint STARS**.

Hanscom Field, located adjacent to, and north of the Base, is a full-service General Aviation airport owned by the Commonwealth of Massachusetts and operated by the Massachusetts Port Authority (Massport) and the Federal Aviation Administration. However, prior to 1973, the USAF leased the runways and flight line (that are now part of Hanscom Field) from the Commonwealth and the primary mission of Hanscom AFB was the operational maintenance of fighter aircraft and research and development support.

Massport's 2005 L.G. Hanscom Field Environmental Status and Planning Report (ESPR) and the most recent (November 2003) Hanscom AFB General Plan Update (master plan) indicate that there are currently no plans to change the existing land use of Hanscom Field/Hanscom AFB in the future. These documents also state that potable water for Hanscom Field and Hanscom AFB is obtained from local municipal suppliers (Bedford, Concord and Lexington).

Groundwater beneath Hanscom Field/Hanscom AFB is not currently used as a drinking water supply, and it is not expected to be so used in the future.

However, MassDEP also has classified groundwater in Hanscom Field/Hanscom AFB as Class I "high use and value" and the groundwater in the Town of Bedford has been designated as GW-1 (i.e., as a potential future drinking water supply) under state law by means of a Town of Bedford Aquifer Protection District by-law that was enacted through a process authorized by MCP and implemented through the state regulations. (Bedford's Aquifer Protection Districts are shown on **Figure 3**.) In addition MassDEP has classified sections of the area as a Non-Potential Drinking Water Source (Medium Yield). The MCP defines "Non-Potential Drinking Water Source" as, "Those portions of high and medium yield aquifers which may not be considered as areas of groundwater conducive to the locations of public water supplies." The MassDEP groundwater classification maps for each of the source (IRP Site) areas are included as **Figures 4 through 8**.

A well inventory was conducted for Hanscom AFB by M&E as part of the Remedial Investigation of IRP Site 6. The objective of the well inventory was to identify and locate all public water supply wells, private drinking water wells, and industrial, irrigation, and monitoring wells within a three-mile radius of Hanscom AFB. Subsequently, in October 2000, officials from Hanscom AFB met with the Director of the Board of Health in the Town of Bedford to review the location of any wells installed after the M&E survey. These surveys revealed that there are five private wells located within 1.4 miles of the northeastern corner of Hanscom AFB,

in Bedford. The two nearest private wells are located 1.2 miles north-northeast, and 1.3 miles northeast of the northeastern corner of Hanscom AFB, respectively. The closest active public wells are the Town of Bedford Shawsheen Road Wellfield located approximately 2.3 miles northeast of the northeastern corner of Hanscom AFB. The MassDEP map showing Public Water Supply Wells in the vicinity of Hanscom Field/Hanscom AFB is included as **Figure 10**. Please note Bedford's inactive Hartwell Road well field is also shown.

OU-1/IRP Sites 1, 2 & 3: OU-1 is an area with groundwater contamination that includes three distinct areas of concern, known as IRP Sites 1, 2, and 3, which are all located on Hanscom Field. OU-1 includes parts of Hanscom Field and the wetland areas/former beaver ponded area to the north/northeast of the airfield known as the Jordan Conservation Area and the Hartwell Town Forest which are owned by the Town of Bedford. There are deed restrictions on the Bedford property which limit use to passive and/or active recreation use. There is also a small section of OU-1 which is leased from the Commonwealth by Hanscom AFB and used as a campground and as the site of the central groundwater treatment facility for OU-1. The November 2003 Hanscom AFB Base General Plan Update (master plan) identifies the campground area as "Outdoor Recreation" and the treatment facility area as "Industrial" in both the existing and future Land Use Plans. The General Plan Update also shows each of these airfield sites with "Environmental Constraints" (because of IRP Site status) and with "Operational Constraints" (due to location on Hanscom Field).

Potable water for the campground and treatment facility is provided by the Town of Bedford public water distribution system. The wetland area to the north/northeast of the airfield was delineated and named Wetland B during the Air Force Comprehensive Ecological Analysis by LEC in 1992-1995 (LEC, 1997). Wetland B is a mature forested swamp associated with a tributary of the Shawsheen River. Subsequent to the LEC investigations, beavers dammed the drainage channel resulting in a significant portion of the former wetland becoming inundated killing off most of the tress. Therefore, the nomenclature of Wetland B/beaver pond has been adopted to represent this mixed habitat in documents issued prior to 2011. However, in May 2011 Massport removed 10 beavers from his area, installed a beaver deceiver in the stream and breeched the beaver dam at end of Runway 23-5. Since then water levels have been significantly lower in the drainage ditch that receives the groundwater treatment system's discharge and most of the ponded water has disappeared.

> **IRP Site 1**, situated in the town of Bedford, is a former Air Force fire training area located on a relatively flat plateau on the southeast side of Hartwell Hill and northwest of Hanscom Field Runway 5-23. The area is slightly higher than the runways and the wetlands to the northeast. This area was reportedly used for fire training from the late 1960s through 1973. Today the area is fenced open space.

IRP Site 2, situated in the town of Bedford, is the site of drum burial pits located on Hanscom Field north of Runway 11-29 and east of Runway 5-23 which were used for disposing of waste solvents and paint from 1966 to 1972. The area is the same elevation as the runways and is slightly higher than the wetlands to the north. Prior to the remedial activities discussed below the site was devoid of most vegetation, possibly because of the sand cap placed over the site following the burial of the drums. Today the area is grassed open space cover by a groundwater recharge system within the security fence perimeter of Hanscom Field.

IRP Site 3, situated in the town of Concord, is the site of drum burial pits located on Hanscom Field in a triangular area bounded by Taxiway "Whiskey" to the north, Taxiway "Mike" to southwest and Runway 5-23 to the southeast. The area is the same elevation as the runways. Today the area is grassed open space cover by a groundwater recharge system within the security fence perimeter of Hanscom Field.

OU-2/IRP Site 4: IRP Site 4 is a municipal waste landfill which covers 10.5 acres and is located approximately 1,800 feet southeast of the approach end of Runway 5-23 on Hanscom Field. Pre-1964 topographic maps of the area indicate that the site was a wetland area associated with Elm Brook. As discussed below the Remedial Action constructed in 1988 placed an impervious cap over the area. The area is also bermed with drainage ditches to channel runoff from the capped area to the wetlands. Today the area is grassed open space with a softball field in the southern half. The landfill is situated predominantly in the town of Lincoln, with a small portion protruding into the bordering town of Concord. The November 2003 Hanscom AFB Base General Plan Update (master plan) identifies this airfield site as one with “Environmental Constraints” (because of IRP Site status) and with “Operational Constraints” (due to location on Hanscom Field).

OU-3/IRP Site 6: OU-3/IRP Site 6 is approximately 15 acres in area and is located in the northeast portion of Hanscom AFB and is situated in both the town of Bedford and the town of Lexington. The site is bounded to the north by a former railroad spur, to the northeast by a wetland area and small pond, to the east by a commercial industrial park, to the south by a service road (Hunter Street), and to the west by IRP Site 21, the former aviation storage facility. IRP Site 6 consists of three distinct areas: the former filter beds (including the former sludge beds) and two (2) hillside landfill areas (south and west). The former filter bed area is higher than the wetlands to the north. As discussed below the Remedial Action constructed in 2001 re-graded and placed a pervious cap over the three landfill areas of the site.

IRP Site 6 was classified in the 1998 Hanscom Air Force Base General Plan (master plan) as industrial in both the existing and future Land Use Plans. Based upon this designation there was a potential for future industrial use of the site. However, the 2003 General Plan Update includes the following as a change from the 1998 Plan: “Most of the area designated Industrial at IRP Site 6 in the Building 1800 series area was changed to Open Space since Land Use Controls associated with the ongoing remedial action constrain development.”

Today IRP Site 6 is a grassed area which is fenced and locked with "No Digging, No Dumping" signs posted. The site is periodically used by Air Force personnel for readiness training that does not require digging. The November 2003 General Plan Update identifies the Site 6 area as "Open Space" in both the Existing and Future Land Use Plans. The General Plan Update also shows the site with "Environmental Constraints" (because of IRP Site status and proximity to wetlands and the Shawsheen River) and with "Operational Constraints" (due to proximity to Hanscom Field). Through these measures the use of the site is well controlled and managed. There are currently no plans to change the existing use of IRP Site 6 in the future.

An area adjacent to the southeast portion of the site is used as a municipal waste transfer station for all municipal waste produced at Hanscom AFB and a sand and salt storage dome is located adjacent to the southwest corner of the site. Land use in adjacent and surrounding areas in close proximity to the site currently includes an occupied industrial park located east of the site, unoccupied wetland areas just north and northeast of the filter bed area, a former railroad spur to the north of the site, and an industrial area of the base to the west of the site.

OU-3/IRP Site 21: OU-3/IRP Site 21 is approximately 5 acres in area, situated in the town of Bedford, in the northeast portion of Hanscom AFB and adjacent to IRP Site 6. The Shawsheen River bounds the site to the north. IRP Site 21 is the area of a former aviation fueling facility that was used for storage, off-loading, and dispensing of jet fuel and aviation gasoline from at least 1945 through 1973, and to store and distribute No. 2 fuel oil during the early 1970s. Fuel was stored in aboveground and underground storage tanks, which had associated pump houses and a network of underground piping. This area was also used for the storage of cleaning solvents and other petroleum products (oils and lubricants) associated with aircraft and vehicle maintenance.

Today the northern half of the site is a controlled/fenced parking area for privately owned recreational vehicles. The southern half of the site includes Building 1823, which is currently used as the base entomology facility; the former aboveground storage tank (AST) area which is currently used by the Base roads and grounds maintenance organization for equipment and materials storage, wood/brush chipping, and composting; and Buildings 1833 and 1834 used for the base's maintenance material receiving and storage.

The area of IRP Site 21 is classified in the Hanscom Air Force Base General Plan (master plan) as either "Outdoor Recreational" or "Industrial" in both the Current Land and Future Land Use Plans. The General Plan Update also shows the site with "Environmental Constraints" (because of IRP Site status and proximity to Shawsheen River) and with "Operational Constraints" (due to proximity to Hanscom Field). There are currently no plans to change the existing use of IRP Site 21 in the future.

History of Contamination

Hanscom AFB's initial action in implementing CERCLA was the submission of Notification of Hazardous Waste Site forms to USEPA on 5 June 1981, which identified IRP Sites 4 and 6 as land filled areas where hazardous waste may have been disposed. Following discussions with long-time employees, this initial notification was amended with the submission of additional Notification of Hazardous Waste Site forms to USEPA on 25 June 1982, which identified IRP Sites 2 and 3 as areas sites where hazardous waste may have been disposed. Also, in 1982 IRP actions at Hanscom Field/Hanscom AFB commenced with the conduct of a preliminary investigation of IRP Site 3. Subsequently Roy F. Weston, Inc. was retained by Hanscom AFB to conduct a hydrogeologic investigation at Hanscom Field to assess the potential for past waste disposal activities at Hanscom field to impact the water quality at the Town of Bedford's Hartwell Road wellfield. This investigation confirmed the existence of contamination at IRP Sites 2 and 3 and also identified contamination in the area designated as IRP Site 1.

In 1984, JRB Associates, Inc. was retained by Hanscom AFB to complete an Installation Assessment/Records Search. The purpose of this investigation was to identify the potential for environmental contamination from past waste management practices, evaluate the probability of contaminant migration, and assess the potential hazard posed by past disposal activities. 5 of the 6 specific sites covered by this Five-Year Review (IRP Sites 1, 2, 3, 4, & 6) were documented in this report.

In June 1990, petroleum product identified as jet fuel (JP-4) was found in a foundation investigation boring for an addition to Building 1823 and in September 1990, during the cleaning of the abandon fuel transfer pipeline, No. 2 fuel oil was released from the end of the former rail tank car unloading header. Also, in December 1990 during the removal of abandoned underground storage tanks (USTs) connected to the floor drains of out of commission pump houses (Buildings 1818 and 1828), LNAPL was found in both of the UST excavations. Subsequently, the former fuels area was designated IRP Site 21.

OU-1/IRP Sites 1, 2 & 3: OU-1 is an area with groundwater contamination that includes three distinct areas of concern, known as IRP Sites 1, 2, and 3, which are all located on Hanscom Field. These three sites are confirmed groundwater contamination source areas. Contaminants of Concern (CoCs) at OU-1 consist of chlorinated and aromatic volatile organic compounds (VOCs) and the VOCs with the highest concentrations being trichloroethene (TCE), 1,2-dichlorothene (1,2-DCE) and vinyl chloride. Dense non-aqueous phase liquid (DNAPL) is known to have been present at Site 1 and is suspected to have been present in other areas within OU-1; however, monitoring date in recent years suggests that most of the DNAPL has been remediated. While the extent of any residual DNAPL is not fully known it is believe to be fully contained and within the capture zone of the existing collection system. This conclusion is supported by long-term monitoring data which has not found dissolved-phase contaminant concentrations in groundwater which are indicative of nearby DNAPL in monitoring wells down-gradient of the existing collection system.

IRP Site 1, located at the north end of the airfield was reportedly used from the late 1960s through 1973 for fire training exercises. Two (2) burn pits were used at this site. There is also any area designated as Burn Pit #1 Runoff Area adjacent to Burn Pit #1 where visible contaminant staining was noted in the RI. Waste oils, solvents, paint thinners, and degreasers were collected from around the base, dumped into pits, ignited, and then extinguished. Occasionally, aircraft wrecks and fuselages were burned in the pits. The size of the pits was estimated to be 15 feet by 20 feet each (**Figure 11**). There is no information indicating that a liner or containment was used at these pits.

IRP Site 2, located in the northeast portion of the airfield, was used for disposing of waste solvents and paint from 1966 to 1972. Metal plating wastes may also have been disposed in this area from the early 1960s through 1972. During the 1988 removal action four (4) drum burial pits of various sizes were found and excavated (**Figure 12**). There is no information indicating whether any type of liner or containment was used at these pits.

IRP Site 3, located in a triangular area in the western portion of the airfield bounded by Taxiway "Whiskey" to the north, Taxiway "Mike" to the southwest and Runway 5-23 to the southeast. According to the Phase I Records Search several hundred drums of waste oils and paint wastes were buried at the Jet Fuel Residue Area during the period of 1959 to 1969. Disposal at the Tank Sludge Area, which is located within the same triangular area and to the northwest of the Jet Fuel Residue Area, reportedly occurred during the early 1960's. Because of the close proximity of this site to the Jet Fuel Residue Area, both areas were discussed and evaluated as one site (**Figure 13**). During the 1988 removal action ten (10) drum burial pits of various sizes were found and excavated. There is no information indicating whether any type of liner or containment was used at these pits.

OU-2/IRP Site 4: IRP Site 4, located on the southwestern corner of Hanscom Field, was used as the Hanscom AFB municipal waste landfill from December 1964 until December 1974 (**Figure 14**). During its active life, the landfill was intended to be used primarily for the disposal of solid waste, however, the IRP Phase I – Records Search report states that interviews with Base personnel confirmed that dumpsters containing waste from all shops and research laboratories were emptied into the landfill during its 10-year operation. No attempt was made to segregate hazardous materials from non-hazardous materials. A review of the 1980 chemical inventory and waste management practices of Hanscom AFB revealed that the following types of compounds and associated empty containers were routinely discarded into dumpsters and disposed of in the landfill: battery acid; bonding compounds; fuels; medical wastes; inks and paints; mercury; photographic chemicals (developers, fixers, toners); spent acids (HF, H2SO4, HCl, HNO3); and trichloroethene (TCE) and other cleaning solvents. The landfill ranges from 10 to 15 feet deep and is estimated to have a volume of 210,000 cubic yards.

OU-3/IRP Site 6: IRP Site 6, located on the northeastern corner of Hanscom AFB, consists of three distinct areas: the former filter beds (including the former sludge beds); the south landfill

Fourth (2012) Five-Year Review Issues – There are no issues related to current site operations, conditions, or activities that affect current and/or future protectiveness of any of the Hanscom Field/Hanscom AFB remedies.

Fourth (2012) Five-Year Review Recommendations and Follow-up Actions

Recommendations and Follow-up Actions: The following are required and suggested improvements to current site operations, activities, remedies, or conditions. Hanscom AFB is responsible for their implementation with regulatory oversight by USEPA Region I and/or MassDEP.

OU-1/IRP Sites 1, 2 and 3

- Continue to implement Remedial Process Optimization initiatives as suggested by operational experience, monitoring and the evolution of new applicable remediation technologies to complete the cleanup in the most cost effective and timely manner possible, and
- Re-survey the IRZ Area monitoring wells and re-validate or revise the Conceptual Site Model for this area to more fully evaluate the impact of the change of the surface water elevation since the beaver dam was breeched by Massport in 2010. This should be accomplished as soon as possible and an analysis of the current vertical hydraulic gradients should be included in the 2012 Annual Long-Term Monitoring Report,
- Surface recharge for 3 to 6 months in the areas of the Burn Pits and the Burn Pit #1 Runoff Area and evaluate the effect of recharging on remedy. Also re-evaluate cost effectiveness of continuing VER at Site 1.
- Suspend operation of BIW-2 for 12 – 18 months and evaluate the impact of this suspension and the necessity for continued operation in the 2012 and/or 2013 Annual Long-Term Monitoring Reports, and
- Re-initiate groundwater collection and recharging at Site 3 for 3 – 6 months to confirm that no further active cleanup is required for the IRP Site 3 source areas.

OU-2/IRP Site 4 - none

OU-3/IRP Site 6

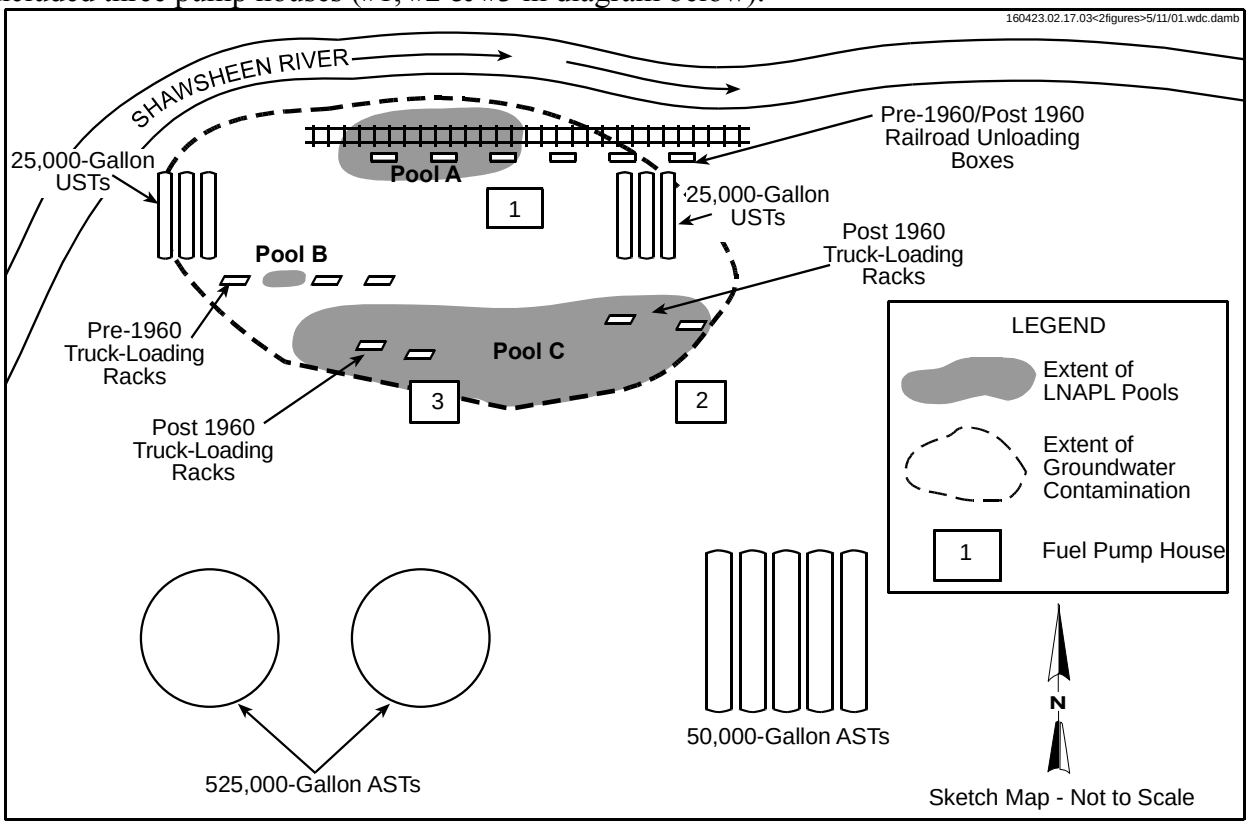
- Determine whether or not the groundwater compliance boundary is adequately defined by the current network of monitoring wells and provide a satisfactory/acceptable explanation for the dissolved arsenic that has been found on Hanscom Field. If this is not accomplished in the next 3-5 years then a ROD Amendment or Explanation of Significant Difference will be required to address the Groundwater Compliance Boundary component of the ROD.

OU-3/IRP Site 21

- Continue to implement Remedial Process Optimization initiatives as suggested by operational experience, monitoring and the evolution of new applicable remediation technologies to complete the cleanup in the most cost effective and timely manner possible, and

biodegradation of the contaminants. In addition, the vertical migration of the dissolved-phase contamination is confined by a lacustrine layer that underlies the upper (fill/sand and gravel) water table aquifer.

Today's (post-RA) layout of the area is shown on **Figure 16** and the sketch on the following page shows the historical layout of the area. Prior to 1960 the fuel distribution and storage system at IRP Site 21 consisted of a railroad tank car siding where the fuel was unloaded, six 25,000-gallon USTs
, and truck loading/unloading stations located on the northern portion of the site. Post-1960 the USTs and the truck loading/unloading stations were replaced by two 525,000-gallon jet fuel and five 50,000-gallon aviation gasoline above-ground storage tanks (ASTs) and new truck loading/unloading stations located on the south side of the site. This post-1960 system also included three pump houses (#1, #2 & #3 in diagram below).



Initial Response

All of the following actions were conducted under the Air Force initiated CERCLA based IRP with the MassDEP as the lead regulatory agency.

Remedial Action Plans for Hanscom Field Area 1 (IRP Sites 1, 2, 3/5 and 4): In 1985 Haley & Aldrich, Inc. (H&A) was retained to conduct investigations and prepare Remedial Action Plans for Area 1 on Hanscom Field which included IRP Sites 1 through 5 (**Figure 17**). Field investigation of the sites was conducted by H&A in 1985 and 1986. The results of this field work are included in Appendix F of the report entitled *Installation Restoration Program, Phase IV-A, Hanscom AFB Area I.* Based on the results of the field investigation H&A prepared a Remedial Action Plan for each site. Following public review of these plans, Hanscom AFB documented selection of each site's Remedial Action Plan in a *Decision Paper, Area 1 (Sites 1-5)* dated April 6, 1988. This Decision Paper was approved by the Base Commander on April 20, 1988. Please note that the Remedial Action Plan entitled IRP Sites 3/5 noted that "… field investigations have failed to indicate that fire training activities or any contamination associated with those activities can be attributed to Site 5." Thus this Remedial Action Plan did not address Site 5 and a *Decision Document for Close-Out* for Site 5, was signed by the Base Commander on 27 September 1991. This Decision Document included the determination "… that there is no basis for the existence of this site." and the declaration that "… the selected remedy is no action and the site is hereby closed-out." Regulatory confirmation of the close out of IRP Site 5 was also subsequently documented in the OU-1 Interim Record of Decision (IROD).

Remedial Action Plans for IRP Sites 1, 2 and 3: The remedy for these sites included the removal of drums and/or visibly contaminated soil; construction of a groundwater collection, treatment and recharge system; and a long term monitoring program. Also included were four (4) Boundary Interceptor Wells along the Hanscom AFB/Massport northern property boundary with the Town of Bedford's property. The purpose of these wells is to intercept any contamination migrating off the airfield complex through the lower/glacial till and/or bedrock aquifers.

Remedial Action Plan for IRP Site 4: The remedy for this former Hanscom AFB municipal landfill included a low permeable cap, drainage measures, a compensatory wetland and long-term monitoring.

Remedial Action Design for Hanscom Field Area 1 (IRP Sites 1, 2, 3/5 and 4): H&A was also retained to design the remedial actions for IRP Sites 1, 2, 3/5 and 4. This effort commenced in December 1986 and was completed in August 1987.

Remedial Action Construction - IRP Site 1: In September 1987 Enroserv Inc. was awarded a contract for Soil Removal and Site Improvements at IRP Site 1. Field work commenced in the spring of 1988 and was completed in August 1988. There were three areas where visibly contaminated soils were excavated: Burn Pit #1, Burn Pit #1 Runoff Area, and Burn Pit #2 (**Figure 11**). A total of 2,160 tons of visibly contaminated soil was removed and transported to

disposal facilities. Post-excavation survey data indicate that excavation depths averaged three to four feet in the two Burn Pits, and one to two feet in the Burn Pit #1 Runoff Area. These areas were backfilled with clean fill material.

Remedial Action Construction - IRP Sites 2 and 3: In September 1987 Hydro-dredge Corporation was awarded a contract for Drum Removal at IRP Sites 2 and 3. Field work commenced in October 1987 and was completed in June 1988. Buried drums were excavated from Sites 2 and 3 in January and February, 1988. The majority of the drums were empty and only 660 gallons of liquids were recovered. Site 2 contained 4 drum excavation pits (**Figure 12**) and Site 3 contained 10 drum excavation pits (**Figure 13**). A total of 1,896 tons of visibly contaminated soil was removed from the pits along with the drums and transported to licensed off-site disposal facilities. The pits were backfilled with the remaining excavated soil and 1,617 tons of clean fill with the intent that any residual contamination would be captured by the groundwater collection trench installed around the perimeter of the site.

Remedial Action Construction - IRP Site 4: In September 1987 WES Construction Corporation was awarded a contract for Soil Cap Old Landfill which included a low permeable cap, drainage measures, and a compensatory wetland. Field work commenced in April 1988 and was completed in September 1988 (**Figure 14**).

Remedial Action Construction – Groundwater Collection, Treatment and Recharge System for IRP Sites 1, 2 and 3: In September 1988 R. Zoppo Co., Inc. was awarded a contract to construct a groundwater collection, treatment and recharge system for IRP Sites 1, 2 and 3. Components of the system (see **Figure 18**) included:

- Central groundwater treatment facility
- Underground piping and electrical to and from the treatment facility and remote groundwater collection points
- Upper (surface/unconfined) aquifer groundwater collection trenches with pump station at each site
- Groundwater recharge basins at IRP Sites 2 and 3
- Four boundary interceptor wells (BIWs) aligned along the Hanscom AFB/Massport northern property boundary with the Town of Bedford's property. These wells are constructed to collect groundwater from both the lower and bedrock aquifers.

The contractor received a Notice to Proceed in December 1988 and startup testing of the completed project was conducted between November 1990 and April 1991.

Long-Term Monitoring of IRP Site 4: In 1989 Environmental Resources Management, Inc. was awarded a contract to conduct long-term monitoring of groundwater and surface water at IRP Site 4. A total of seven rounds of sampling were completed between December 1989 and September 1992. Environmental Resources Management's final report for this long-term monitoring was issued in November 1992.

Technical Document to Support No Further Action Planned, IRP Site 4: This document, which was signed by the Electronic System Center Commander on 30 September 1993, states that "A permanent response action solution has been achieved (landfill cap). Groundwater and surface water monitoring has determined that a condition of no significant risk of harm to health, safety, public welfare and the environment foreseeable future exists at the site. ……. thus the selected remedy is the No further Action alternative and the site is hereby closed-out."

Remedial Action Operation – Groundwater Collection, Treatment and Recharge System for IRP Sites 1, 2 and 3: In January 1991 Metcalf & Eddy Services was awarded a contract for the operation and maintenance of the Groundwater Collection, Treatment and Recharge System for IRP Sites 1, 2 and 3. The locations of the components the Groundwater Collection, Treatment and Recharge System for IRP Sites 1, 2 and 3 are shown in **Figure 18.** Regular/daily operation of the system was started on 23 April 1991 and on 6 May 1991 the system went to around-the-clock operation (and has continued around-the clock ever since). The maximum flow capacity of the treatment facility is approximately 320 gallons per minute (gpm). **Attachment C-1** provides a summary listing of OU-1 Groundwater Collection, Treatment and Recharge System Key Dates/Milestones. Initially groundwater was collected via the collection trenches at IRP Sites 1, 2 and 3 and from the four boundary interceptor wells (BIW-1, BIW-2, BIW-3 & BIW-4) and pumped to the central treatment facility. The collected groundwater is pumped to a 40,000-gallon equalization tank at the treatment facility and then from the equalization tank it is pumped through two air stripping towers connected in series to remove the contaminants of concern (VOCs). The water cascades downward through materials (similar to whiffle balls) within the towers while air is blown upward. Contaminants are removed from the groundwater in this process and go into a gaseous phase. The water that leaves the towers, called effluent, is sampled and analyzed to ensure that it meets regulatory discharge parameters. The treated effluent can be pumped to, and recharged (returned to the groundwater) at, Sites 1, 2 and/or 3 and/or discharged to a drainage channel between the treatment plant and the northeast-southwest runway of Hanscom Field. This drainage channel flows to the Wetland B/beaver pond north of Hanscom Field. The treatment facility also has an off-gas treatment system consisting of 2 granular activated carbon units connected in series which removes the VOCs from the air from the stripping towers before the air is discharged into the atmosphere.

IRP Site 1, 2 & 3 Decision Document No Further Response Action Planned: This document, which was signed by the Base Commander on 9 April 1992, states that "…… This determination is protective of human health and the environment, and attains Federal and State requirements that are applicable or relevant and appropriate, and cost effective. This declaration is to continue operation of a pump and treat system until the groundwater meets acceptable levels."

Long-Term Monitoring of IRP Sites 1, 2 and 3: H&A was also retained to conduct the long term monitoring of IRP Sites 1, 2 and 3. Between January 1986 and October 1988 H&A completed 3 rounds of groundwater monitoring in OU-1. Round 1 (January & March 1986),

Round 2 (September-October 1987) and Round 3 (September-October 1988) were associated with the development of the Remedial Action Plans, the design of the Remedial Actions and to establish a baseline prior to commencement of groundwater treatment. Round 4 (November 1990), Round 5 (February-March 1991) and Round 6 (August 1991) were designed to provide long term monitoring information on the performance of the groundwater treatment facility and the potential off-site migration of groundwater contaminants from Hanscom field. Upon review of the Round 6 data MassDEP requested that the monitoring network be expanded to better access the effectiveness of the pump & treat system. 30 additional monitoring wells were installed prior to further sampling. Subsequently Round 7 (June-July 1994) and Round 8 (November 1994) were completed.

OU-3/IRP Site 21: The initial response actions conducted at IRP Site 21 are summarized **Table 2** below.

Table 2: IRP Site 21 Remedial Actions

Date	Authority	Action	Results
1990-1991	MCP Interim Measure/DEP Case No. 3-3315	Passive Recovery System (1 recovery well) for 8 weeks in the vicinity of Building 1823. Contractor: GZA Remediation, Inc.	25 gallons of jet fuel recovered
1993	MCP Interim Measure/ DEP Case No. 3-3315	200 Linear Feet of Horizontal Recovery Trench. Operation of Soil Vapor Extraction (SVE) system for 4 months, and Groundwater Recovery/Treatment System for 8 months. Contractor: Zenone, Inc.	1,400 tons of petroleum contaminated soil removed 226,420 gallons of groundwater recovered/treated 62 gallons of petroleum product recovered 185 gallons of SVE solvent recovered
1995 thru Oct 1998	CERCLA Removal Action	9 to 13 Recovery Wells & Zenone's Recovery Trenches. Operation of Soil Vapor Extraction (SVE) and Groundwater Recovery/Treatment System Sep 95 thru Oct 98. Contractor: Kestrel Drilling and Remediation, Inc.	3,191,356 gallons of groundwater recovered/treated 1,451 gallons of petroleum product recovered 1,679 gallons of SVE solvent recovered
1999-2000	CERCLA Removal Action	3 Recovery Wells. Operation Vacuum Enhanced Recovery (VER) System Sep 99 thru Jul 00 Contractor: Arcadis Geraghty & Miller, Inc.	67,730 gallons of groundwater recovered/treated
2000-2003	CERCLA Removal Action	Continued Operation of Vacuum Enhanced Recovery (VER) System and groundwater monitoring Contractor: IT Corp	231,408 gallons of groundwater recovered/treated

Long-Term Monitoring of IRP Sites 21: A component of the Removal Action which commenced in September 1995 was the long-term monitoring of groundwater contaminant concentrations and the thickness of the LNAPL in selected IRP Site 21 monitoring and recovery wells. Long-term groundwater sampling rounds were conducted in April 1996, June 1996, December 1996, March 1997, June 1997, December 1997, April 1998, June 1998, September 1998, April 1999, July 1999, May 2000, October 2000, January 2001, May 2001, October 2001, May 2002 and October 2002.

Basis for Taking Action

OU-1/IRP Sites 1, 2 and 3 Groundwater Contamination: CoC concentrations in OU-1 groundwater exceed federal drinking water standards (i.e., MCLs and non-zero MCLGs), state drinking water standards (i.e., MCLs) and state groundwater risk characterization standards (i.e., MCP Method 1 GW-1 standards) at many locations. As a result there is an unacceptable risk to human health from the ingestion of this groundwater. The nature and extent of groundwater contamination in the three aquifers in the OU-1 area (upper, lower, and bedrock) have been evaluated in detail through the OU-1 Long-Term Monitoring Program. Following Hanscom's designation as a NPL site in 1994, USEPA reviewed H&A's Long-term Monitoring Rounds 7 and 8 data and requested that the monitoring network be expanded again to better access the effectiveness of the pump & treat system and to better define the nature and extent of contamination from the airfield (OU-1) sites. 22 additional monitoring wells were installed prior to further sampling.

Subsequently Round 9 (June-July 1996) and Round 10 (May 1997) were completed. During this period CH2M Hill was retained to complete CERCLA Risk Assessments, a Focus Feasibility Study and an Interim Record of Decision (IROD) for OU1. As part of this effort groundwater flow and solute transport models were developed. These indicated a need for an additional cluster (3) monitoring wells in the Bedford forest northeast of the boundary interceptor wells to confirm the models' projection of the off-site contaminated groundwater plume. The additional well cluster was installed prior to H&A's Round 11 (May 1998). The Round 11 (and subsequent monitoring) results for the additional cluster are consistent with what was projected by the model. The results of Sampling Round 11 and a summary of all earlier H&A sampling rounds are presented in the Round 11 Sampling Report (H&A, 1998). Following H&A's Round 11 the focus of the Long-Term Monitoring Program changed to the monitoring of the effectiveness of the on-going remedial actions and progress towards attainment of RAOs and the complete cleanup of OU-1. In 1999 Hanscom AFB issued a long-term monitoring plan for OU-1 which reflected the changed focus. Also at this time the responsibility for the long-term monitoring of OU-1 (in accordance with the Long-Term Monitoring Program) was shifted to the contractor responsible for the operation and maintenance (O&M) of the OU-1 remedial actions. Also, since 1999, the Long-Term Monitoring Program has been subject to the Remedial Process Optimization (RPO) process in that sampling points and frequency are re-evaluated after each round for changes necessary to more effectively accomplish the objectives of the Long-Term Monitoring Program. Twenty-five (25) major/formal rounds of sampling and analysis in OU-1 have been performed to date, at the times listed in Table 3 on the following page.

Table 3: Schedule of Past Long-Term Monitoring Rounds

Round No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Date (Mo/Yr)	2/86	10/87	9/88	11/90	2/91	8/91	6/94	11/94	7/96	5/97	5/98	5/99	11/99

Round No.	14	15	16	17	18	19	20	21	22	23	24	25	
Date (Mo/Yr	11/00	11/01	11/02	11/03	11/05	11/05	11/06	11/07	11/08	11/09	11/10	11/11	

Long-Term Monitoring Reports have been issued for each OU-1 major/formal round of sampling and analysis. Based on the historical Long-Term Monitoring data, CoCs at OU-1 consist of chlorinated and aromatic VOCs, with the compounds with highest concentrations being trichloroethene (TCE), cis-1,2-dichlorothene (cis-1,2-DCE) and vinyl chloride. The table **at Attachment D** provides a summary of the OU-1 Long-Term Monitoring analytical data (laboratory VOC analysis) collected to date.

OU-2/IRP Site 4: As stated above, a *Technical Document to Support No Further Action Planned* for Site 4 was signed by the Commander on 30 September 1993. MassDEP subsequently requested that a risk assessment be completed in order to close-out the site. O'Brien & Gere was retained to complete a MCP Risk Assessment which included supplemental sampling and analysis at IRP Site 4. However, prior to completion of this effort, Hanscom Field/Hanscom AFB was added to the NPL and USEPA requested that CERCLA Human Health and Ecological Risk Assessments be completed instead of the MCP Risk Assessment. The site was also designated Operable Unit 2 (OU-2) at this time. O'Brien & Gere's scope of work was then modified to only include sampling and analysis. Field work was conducted by O'Brien & Gere between December 1994 and April 1995. The results of this field work are included in O'Brien & Gere's Report entitled *Supplemental Sampling and Environmental Update, Site 4 – Sanitary Landfill* dated February 1996.

CH2M Hill was retained to complete the CERCLA Human Health and Ecological Risk Assessments. In the process it was determined that some data gaps existed and CH2M Hill conducted additional sampling and analysis. This field work was completed in 1996 and the results provided in CH2M Hill's *Operable Unit 2 Sampling Report* dated August 1996. The CERCLA risk assessments were then completed and are found in CH2M Hill's *Baseline Human Health Risk Assessment for Operable Unit 2 (Site 4)* and *Baseline Ecological Risk Assessment for Operable Unit 2 (Site 4)*, both dated April 1997. Upon review of the Risk Assessments USEPA determined that the Remedial Action completed in 1988 was acceptable as a final remedial action. The Project Team (Remedial Project Managers for Hanscom AFB, USEPA & Mass DEP) concluded that additional long-term groundwater monitoring data was not required but, since the landfill waste remains on-site, Five-Year Reviews of the remedial action were appropriate.

USEPA and Hanscom AFB completed a site inspection in May 1997 and USEPA issued the *Five-Year Review Report #1, Hanscom Air Force Base Superfund Site, Middlesex County, Massachusetts* dated September 1997. This review concluded "based on the field inspection, and human health and ecological risk assessment, protectiveness of the landfill cap at Site 4 has been demonstrated" however, the review did identify a requirement to remove scrub brush growing in the drainage ditches and on sections of the cap and berms and for a long-term inspection/maintenance program to be instituted. The field work to remove the scrub brush was completed in the spring of 1998 and a long-term inspection and maintenance program instituted.

OU-3/IRP Site 6: The baseline human health risk assessment revealed that future industrial site workers potentially exposed to compounds of concern in surface soil, and future residential groundwater users may be exposed to an unacceptable human health risk that exceeds 10-4 (carcinogenic) and HI>1 (noncarcinogenic). In addition, the ecological risk assessment revealed an unacceptable risk to soil invertebrates and animals feeding 100% of the time at the landfill areas (especially the suspected Ash Disposal Area), to benthic and water column organisms in the Wetland Z area, and to the black-crowned night heron from DDT in wetland Z. The media that were sampled during field investigations include subsurface soil, surface soil, sediments (wetland and stream), surface water, and groundwater and the following **Table 4** summarizes the results of these investigations.

Table 4: OU-3/IRP Site 6 RI Results

Contaminant Type	Medium Affected	Concentration Range	Approximate Areal Extent	Suspected Source
VOCs*	Groundwater – Upper aquifer Groundwater – Lower aquifer	3.0 - 100 ug/L 0.5 – 130 ug/L	Former Filter Beds	Flushing of landfill areas
Pesticides**	Wetland sediment	0.01 – 920 ug/kg	Wetland Z sediment/north of Former Filter Beds	Landfill surface soil erosion, surface water draining from the landfill areas
SVOCs** (including PAHs)	Wetland sediment	10 - 55,000 ug/kg	Wetland Z sediment/north of Former Filter Beds	Landfill surface soil erosion, surface water draining from the landfill areas
SVOCs** (including PAHs)	Groundwater – Upper aquifer	0.27 – 180 ug/L	Former Filter Beds	Flushing of landfill areas
SVOCs** (including PAHs)	Surface soil	0.0035 – 330 mg/kg	Suspected Ash Disposal Area	Landfill debris (source area)
SVOCs** (including PAHs)	Subsurface soil	0.00084 – 12 mg/kg	South Landfill	Landfill debris (source area)
Metals*	Groundwater – Upper aquifer Groundwater – Lower aquifer	14.3 – 117,000 ug/L 22 – 14,400 ug/L	Former Filter Beds	Flushing of landfill areas
Metals*	Surface water	ND – 0.11mg/L	Ponded wetland areas	Flushing of landfill areas, surface water draining from the landfill areas

Notes:
*Human Health Risk Assessment (CH2M HILL, 1999a) exposure concentration data was used for concentration ranges.
**Ecological Risk Assessment (CH2M HILL, 1999b) exposure concentration data was used for concentration ranges.
ND – Non Detect

OU-3/IRP Site 21: CoC concentrations in OU-3/IRP Site 21 groundwater exceed federal drinking water standards (i.e., MCLs and non-zero MCLGs), state drinking water standards (i.e., MCLs) and state groundwater risk characterization standards (i.e., MCP Method 1 GW-1 standards), and the human health risk assessment revealed that future construction workers potentially exposed to LNAPL and contaminated groundwater, and future residential groundwater users may be exposed to an unacceptable human health risk that exceeds 10-4 (carcinogenic) and HI>1 (noncarcinogenic). Contaminants detected above MCLs in groundwater during the 1999 Supplemental RI are presented by sample location, i.e., beneath LNAPL Pools A, B or C or from the dissolved-phase plume; in the following **Table 5**.

Table 5: Contaminants of Concern in Groundwater – OU-3/IRP Site 21

Contaminant (exceeding MCL)	Sample Id/ Location	Maximum Concentration	MCL (Drinking Water Standard)
Source Area (LNAPL Pool A)			
Benzene	MW-10	150 ug/L	5 ug/L
Toluene	MW-10	1,800 ug/L	1,000 ug/L
Naphthalene	MW-10	170 ug/L	20 ug/L[1]
Source Area (LNAPL Pool B)			
Naphthalene	ECS-33	73 ug/L	20 ug/L[1]
Source Area (LNAPL Pool C)			
Naphthalene	MWZ-20	120 ug/L	20 ug/L[1]
Groundwater Plume			
1,4-Dichlorobenzene	CH-102	390 ug/L	75 ug/L
1,2-Dichlorobenzene	CH-102	1,400 ug/L	600 ug/L
1,2,4-Trichlorobenzene	ECS-31	84 ug/L	70 ug/L
vinyl chloride	ECS-28	37 ug/L	2 ug/L
cis-1,2-Dichloroethene	ECS-28	100 ug/L	70 ug/L
Trichloroethylene	MWZ-7	6 ug/L	5 ug/L
Naphthalene	MWZ-23	33 ug/L	20 ug/L[1]
Benzene	ECS-14R	73 ug/L	5 ug/L
TPH	CH-102	2,900 ug/L	200 ug/L[1]

Notes:
[1] MCP Method 1 GW-1 standard used because no MCL exists.

The ecological risk assessment revealed that, although a risk could not be ruled out for the Shawsheen River, the contamination detected in the river (non site-related concentrations of PAHs in the sediments and metals in the surface water) was most likely from surface water runoff from the paved areas of Hanscom Field and/or Hanscom AFB and not related to the releases regulated under CERCLA. Therefore actions to address this contamination detected in the river were not included in the Remedial Action; however, actions to ensure that the site's contaminants are not impacting the Shawsheen River are subject to CERCLA and are included in the remedial action. Also, it should also be noted, that the headwaters of the Shawsheen River, which includes Hanscom AFB and Hanscom Field, are the subject of intensive study through the Massachusetts Watershed Initiative established to ensure Clean Water Act compliance.

IV. Remedial Actions

Remedy Selection - OU-1/IRP Sites 1, 2 and 3

As stated above, Remedial Action Plans for IRP Sites 1, 2 and 3 were developed and implemented prior to the NPL designation. Subsequently, in 1995, USEPA advised that additional studies were necessary to ensure that these earlier actions fully addressed CERCLA requirements. Using the results of all previous investigations CH2M Hill completed a *Final Ecological Risk Assessment, OU-1* (dated January 1999) and a *Focused Feasibility Study, OU-1* (dated May 2000). This effort included groundwater flow and solute transport models (based on 1996 and 1997 Long-Term Monitoring results), and an evaluation of the soil-to-groundwater contaminant transport pathway for human health risk assessment. Based on these reports and the apparent presence of DNAPL in the bedrock fractures the Project Team concluded that it was not prudent to select a final remedy at this time (2000) since compliance with ARARs would not be attained in the existing groundwater contaminant plume in the short-term. It was determined that an Interim Remedial Action should be selected/implemented. Subsequently CH2M Hill prepared an *Interim Proposed Plan for Hanscom AFB Operable Unit 1*, dated June 2000. The public review of this plan, to include a Public Information Meeting and Public Hearing on June 28, 2000, was completed in July 2000 without comment. Following the public review/comment period an Interim Record of Decision, dated November 2000, (also prepared by CH2M Hill) selecting the remedy for OU-1 was signed by the Air Force on January 24, 2001 and by USEPA on February 6, 2001. The Commonwealth of Massachusetts formally concurred with this IROD by letter dated December 27, 2000.

Charts of all actual Long-Term Monitoring results to date were presented in the 2002 Five-Year Review Report which indicated that both the contaminant mass at the Site 1 and Site 2 source areas and the contaminant concentrations in the plumes flowing from these source areas was being reduced at a rate much faster than predicted by the solute transport model. These Long-Term Monitoring charts have been updated annually since then and the trends seen in 2002 and 2007 have continued. Updated charts with Long-Term Monitoring data through 2011/12 will be presented/discussed in the Data Review section of this document.

Long-Term Monitoring results since the initiation of active groundwater remediation in 1991 have demonstrated that the groundwater remediation system is effective at removing contaminant mass at the source areas and within the contaminant plumes. In addition, the water quality and groundwater flow data collected at the boundary wells and wells in the both the on-site plumes and the off-site plumes (Town of Bedford conservation lands) indicate that the remedial system is effective in both containing contaminant migration in each of the surface, lower and bedrock aquifers and in pulling back the plumes towards their source areas. Long-Term Monitoring results since 1997 also appear to not support assumptions used in CH2M Hill's solute transport model that was constructed using 1996 and 1997 Long-Term Monitoring results. That model could not predict when, if ever, RAOs would be achieved and resulted in the selection of an interim action to provided time to gather additional data.

In 2006 the Project Team concluded that the existing system appeared to be a feasible technology to achieve RAOs in a reasonable period of time and that Hanscom AFB should start the process of converting the 2000 IROD to a final ROD. Because of the apparent reduction of CVOC contaminant concentrations in site ground water that was observed in the Long-Term Monitoring data set, in 2006 EPA Region I and Hanscom AFB partnered in preparing a "focused" solute transport model based on the Long-Term Monitoring results and the adjusted ground water extractions rates through 2005. During a January 2007 Project Team meeting the draft model which had been prepared by EPA's consultant, CDW Consultants, Inc. was reviewed and evaluated. The focused solute transport model conservatively indicated that the existing interim remedy (dynamic groundwater remediation system) could achieve RAOs within a reasonable (30-50 years) time frame. It was concurred that the "focused" model more likely reflected actual solute transport conditions for the area modeled and those results should be incorporated into a revised focused feasibility study. The final report for the Focused Groundwater Flow and Transport Model was issued in May 2007 and a Revised Focused Feasibility Study for OU-1, prepared by Hanscom AFB, was also issued in May 2007.

Subsequently Hanscom AFB prepared a *Proposed Plan for Hanscom AFB Operable Unit 1*, dated May 2007. The public review of this plan, to include a Public Information Meeting and Public Hearing on June 20, 2007, was completed in July 2007 without comment. Following the public review/comment period a Record of Decision (ROD), dated September 2007 was prepared by Hanscom AFB. This ROD was signed by the Air Force on September 14, 2007 and by USEPA on September 28, 2007. The Commonwealth of Massachusetts formally concurred with this ROD by letter dated September 28,, 2007.

The remedy for OU-1 selected by the ROD is basically the same as that selected by the 2000 IROD. This 2007 ROD sets forth the final remedy for OU-1 at the Hanscom Field/Hanscom AFB NPL Site as the continued operation of the existing dynamic groundwater remediation system, land use controls including institutional controls, and the monitoring of groundwater and surface water. This remedy is expected to remove/destroy the sources of groundwater contamination, effectively contain the migration of groundwater contaminants and is expected to reduce the overall extent of the groundwater plume via a reduction in contaminant mass. The following are the major components of the selected remedy:

- Continuing to operate the existing dynamic groundwater remediation system (groundwater collection, treatment and recharge system; vacuum enhanced recovery (VER) system; molasses and/or permanganate injections).
- Continuing to maintain and enforced Land Used Controls (LUCs), including Institutional Controls (ICs), to prevent exposure to hazardous substances above permissible levels.
- Continuing an environmental sampling program (including groundwater and surface water) to monitor the performance of the groundwater remediation system and to monitor progress towards achievement of the Remedial Action Objectives (RAOs).
- Conducting Five-Year Reviews as long as any hazardous substances, pollutants or

contaminants remain at the site above levels that allow for unrestricted exposure and unlimited use to assure that the cleanup remedy continues to protect human health and the environment.

The primary objectives of the remedial measures are to:

- Prevent exposure (via ingestion, inhalation and/or dermal contact) to groundwater containing CoC concentrations that exceed federal drinking water standards (i.e., MCLs and non-zero MCLGs, state drinking water standards (i.e., MCLs), and state groundwater risk characterization standards (i.e., MCP Method 1 GW-1 standards);
- Prevent further migration of dissolved-phase CoCs in groundwater;
- Prevent discharge to surface-water bodies and wetlands of groundwater containing CoC concentrations that exceed federal drinking water standards, state drinking water standards, and state groundwater risk characterization standards; and
- Within an acceptable time period (<30 - 50 years), return groundwaters to federal drinking water standards, state drinking water standards, and state groundwater risk characterization standards.

Secondary objectives are to ensure that excavation at the three source areas (IRP Sites 1, 2 and 3) is controlled to prevent exposure to any residual contamination in the subsurface soil and to prevent exposure to vapors that could accumulate in buildings affected by the contaminated groundwater plume.

Remedy Selection - OU-2/IRP Site 4

A discussed above a remedy for OU-2/IRP Site 4 was selected prior to the listing of Hanscom Field/Hanscom AFB on the NPL with the MassDEP as the lead regulatory agency. The selected remedy (impermeable cap) was documented in the Remedial Action Plan for the former Hanscom AFB municipal landfill.

Remedy Selection - OU-3/IRP Site 6

Using the results of all previous investigations CH2M Hill completed a *Human Health Risk Assessment, Site 6 of OU3* and the *Ecological Risk Assessment, Site 6 of OU3* both dated July 1999. In addition to finalizing the risk assessments CH2M Hill also prepared a *Focused Feasibility Study, Operable Unit 3, Site 6 – Landfill* and *Proposed Plan for Hanscom AFB Operable Unit 3/Site 6* both dated May 2000. The public review of Proposed Plan, to include a Public Information Meeting and Public Hearing on June 20, 2000, was completed in July 2000 without comment.

A Record of Decision dated September 2000 (also prepared by CH2M Hill) selecting the remedy for OU3/IRP Site 6 was signed by the Air Force on November 14, 2000 and by USEPA on December 5, 2000. The Commonwealth of Massachusetts formally concurred with this ROD by

letter dated October 16, 2000.

Remedial action objectives (RAOs) based on the types of contaminants, environmental media of concern, and potential exposure pathways, were developed to aid in the development and screening of alternatives. These RAOs were developed to mitigate, restore and/or prevent existing and future potential threats to human health and the environment. The RAOs for the selected remedy for OU-3/ Site 6 are:

- Prevent exposure to groundwater above health-based criteria (via ingestion, inhalation, and dermal contact) within the landfill and filter bed area.
- Reduce exposure of ecological receptors to Wetland Z sediment contamination.
- Reduce potential exposure of ecological receptors to contaminated surface soils in the landfill/former filter bed area, south landfill, and west landfill.
- Prevent direct contact to surface soils within the landfill source areas (former filter bed area, south landfill, former ash disposal area, and west landfill).
- Minimize erosion of potentially contaminated soil from the former filter bed area into the adjacent pond and wetlands.

The RAOs are meant to reduce the potential exposure of future industrial site workers to PAHs in surface soil at the landfill areas via dermal contact, ingestion, and inhalation that may present a human health risk in excess of 10-4 (carcinogenic) and HI >1 (noncarcinogenic) such that the risk attributable to this medium is below 10-4 to 10-6 (carcinogenic) and has a HI which does not exceed one (noncarcinogenic) and complies with ARARs for the protection of human health and the environment. In addition, the RAOs are meant to reduce the potential exposure of children and adults to VOCs and inorganics in groundwater via ingestion, dermal contact, and inhalation that may present a human health risk in excess of 10-4 (carcinogenic) and HI >1 (noncarcinogenic) such that the risk attributable to this medium is below 10-4 to 10-6 (carcinogenic) and has a HI which does not exceed one (noncarcinogenic) and complies with ARARs for the protection of human health and the environment.

The RAOs are also meant to reduce the potential exposure of soil invertebrates and higher trophic level omnivorous animals to PAHs and inorganics in the landfill soil that are present in concentrations that may result in adverse effects for these receptors. In addition, the RAOs are meant to reduce the potential exposure of benthic organisms and the black-crowned night heron to pesticides in the wetland sediments.

The selected remedy for OU-3/IRP Site 6 consists of:

- Containment(permeable caps) of three landfill areas,
- Removal of contaminated sediments and landfill debris and placing of this material within the capped landfill area,
- Long-term monitoring, and
- Institutional controls.

In addition, the remedy includes establishment of a groundwater compliance boundary and a Contingency Groundwater Remedy in the event monitoring results show that the remedy is not effective in maintaining groundwater quality outside the compliance boundary. A full range of options from extending the boundary, to more sampling, to active remedial measures may be considered depending on the site conditions at the time.

An expected outcome of the selected remedy is that the landfill soils and wetland sediments will no longer present an unacceptable risk to future industrial site workers and ecological receptors via dermal contact, ingestion, and inhalation. In combination with natural flushing and natural attenuation, this alternative can be expected to achieve a reduction in the size and strength of the contaminant plume within the compliance boundary. The selected remedy will also provide environmental and ecological benefits such as restoration of the wetlands areas where contaminated sediments are removed.

Remedy Selection - OU-3/IRP Site 21

Using the results of all previous investigations CH2M Hill prepared a *Feasibility Study, Operable Unit 3/ Site 21* dated June 2001 and *Proposed Plan for Hanscom AFB Operable Unit 3/Site 21* dated July 2001. The public review of Proposed Plan, to include a Public Information Meeting and Public Hearing on August 1, 2001, was completed in August 2001 without comment. A Record of Decision, dated October 2001 (also prepared by CH2M Hill) selecting the remedy for OU3/IRP Site 21, was signed by the Air Force on August 20, 2002 and by the USEPA on August 29, 2002. The Commonwealth of Massachusetts formally concurred with this ROD by letter dated January 22, 2002.

Remedial action objectives (RAOs) based on the types of contaminants, environmental media of concern, and potential exposure pathways, were developed to aid in the development and screening of alternatives. These RAOs were developed to mitigate, restore and/or prevent existing and future potential threats to human health and the environment. The RAOs for the selected remedy for OU-3/ Site 21 are:

- Prevent exposure (via ingestion, inhalation and/or dermal contact) to groundwater containing CoC concentrations that exceed federal drinking water standards (i.e., MCLs and non-zero MCLGs), state drinking water standards (i.e., MCLs) and state groundwater risk characterization standards (i.e., MCP Method 1 GW-1 standards);
- Prevent discharge to the Shawsheen River of groundwater containing CoC concentrations that exceed federal drinking water standards, state drinking water standards and state groundwater risk characterization standards;
- Prevent or minimize further migration of the contaminant plume (dissolved-phase CoCs);
- Prevent or minimize further migration of contaminants from source materials (VOCs/LNAPL) to groundwater; and

- Within an acceptable time period (< 100 years), return groundwaters to federal drinking water standards (i.e., MCLs and non-zero MCL goals (MCLGs)), state drinking water standards (i.e., MCLs) and state groundwater risk characterization standards (i.e., MCP Method 1 GW-1 standards).

The physical details of the selected remedial action for cleaning up OU-3/IRP Site 21 are graphically shown on **Figure 19** and the principal components of the include:

- Three (3) interceptor trenches with passive recovery wells, one main trench covering LNAPL Pools A and B near northern boundary of the site and two smaller trenches at hotspot areas within LNAPL Pool C;
- Network of active recovery wells in non-hotspot areas of LNAPL Pool C;
- Enhancement of biodegradation of dissolved-phased contaminants (VOCs and fuel compounds) by ORC® application in all trenches;
- Monitoring;
- Land Use Controls/Institutional Controls; and
- Groundwater Containment/Treatment and VER Contingencies.
- Five-year Reviews

The primary expected outcome of the selected remedy is that the human health risks associated with the contaminated groundwater and LNAPL will be eliminated through the implementation of the selected remedy described above. Petroleum saturated soils will be removed during the installation of the trenches. Residual LNAPL not removed during construction will be contained, captured and removed through a network of active and passive recovery wells. Short term exposure to contaminants will be controlled through the use of the land use controls (LUCs)/Institutional Controls (ICs). Groundwater monitoring will confirm the effectiveness of the remedy in containing the LNAPL pools and dissolved-phase (VOCs/fuel compounds) groundwater contaminated plume from migrating to the Shawsheen River.

Remedy Implementation - OU-1/IRP Sites 1, 2 and 3

Remedial Action-Operation/Continued Operation of the Existing Dynamic Groundwater Remediation System: As discussed earlier in this document the remedy for OU-1/IRP Sites 1, 2 and 3 was constructed/implemented (**Figure 18**) prior to the listing of Hanscom Field/Hanscom AFB on the NPL and appropriateness of the remedy was re-confirmed by the 2000 OU-1 IROD and 2007 OU-1 ROD. The term "dynamic" was included in the remedy designation and in the 2007 ROD to include the Remedial Process Optimization (RPO) as a component of the selected Remedy. This process has been on-going since the initial Groundwater Collection, Treatment and Recharge system was placed in operation in April 1991. A listing of key dates/milestones for the OU-1 Remedy is included as **Attachment C-1**. Significant RPO changes in this listing include:

- In 1996 the system was automated which allowed for the reduction in operating staff/unmanned operation and the pump stations at IRP Sites 1, 2 and 3 were upgraded with larger pumps. Subsequently in 1997 variable speed drives were added to these pumps.
- In 1997 an experimental vacuum enhanced recovery (VER) system consisting of four recovery wells was placed in operation in the immediate vicinity of Burn Pit #1 and Burn Pit #1 Runoff Area at Site 1 (**Figure 20**) to accelerate the removal of contaminant mass from the bedrock aquifer at Site 1. Following a successful Demonstration Project, this system was incorporated in the OU-1 remedy.
- In 1997 two additional conventional interceptor wells were placed in operation, one downgradient (southeast) of Site 1(IW-6) and the other downgradient (north) of Site 2 (IW-5). Also the pump in BIW #1 was replaced with a larger pump.
- In 1999 an additional conventional interceptor well was installed at Site 1 (IW-10) in the center of Burn Pit #2 and the VER system at Site 1 was augmented by the conversion of 3 monitoring wells in the immediate area to conventional interceptor wells (IW-7, IW-8 & IW-9). The groundwater collected by these wells is pumped to the central treatment facility.
- In 2000 an Environmental Security Technology Certification Program (ESTCP) project entitled: In-situ Substrate Addition to Create Reactive Zones for Treatment of Chlorinated Aliphatic Hydrocarbons: Hanscom Air Force Base commenced in the vicinity of the RAP1-6 monitoring well cluster which is considered to be in the heart of the on-site plume emanating from Site 1 (**Figure 21**). This project involved multiple injections of a substrate (molasses) into the lower aquifer slightly upgradient of the existing RAP1-6 monitoring well cluster. A total of forty-seven injections were made between October 2000 and October 2002. Over this time 1,250 gallons of raw blackstrap molasses was injected (average of 139 lbs molasses/week).
- In 2001 the pumps in BIW #3 and BIW #4 were replaced with larger pumps to take advantage of available well yield to increase the amount of contaminant mass being recovered and to enhance the BIWs capability to contain the plume on-site and also to

draw it back from off-site..

- In June 2001 a permanganate injection pilot study commenced in the vicinity of existing monitoring wells RAP1-3S and RAP1-3R which is also the area being remediated by the Site 1 VER system. VER system operation and recovery from IW-7, IW-8 and IW-9 were suspended for the duration of pilot study.
- In August 2001 because the TCE and cis-1,2-DCE concentrations had declined to near drinking water standards the collection and treatment of groundwater from Site 3 was suspended.
- In October 2002 the VER system was restarted following conclusion of permanganate injection pilot study. However, due to iron fouling of well, pumps and discharge line IW-7, IW-8 and IW-9 were not re-activated.
- In 2003 the pump in BIW #1 was replaced with a larger pump to take advantage of available well yield to increase the amount of contaminant mass being recovered.
- In June 2006 an existing monitoring well (IRZ-2) located in the on-site plume emanating from Site 1 and downgradient of the molasses injection well was converted to a conventional interceptor well (IW-11) (**Figure 22**).
- In August 2006 the operation of the Site 1 VER system was again suspended for the duration of a permanganate treatment of the Site 1 source area in the vicinity of existing monitoring wells RAP1-3S and RAP1-3R.
- In August 2006 fouled/nearly worn out pumps in BIW No. 2 and IW No. 5 were replaced for with larger size pumps.
- In August 2007 restarted VER system (shut down 31 Jul 06 for permanganate injection).
- In September 2007 converted monitoring well RAP1-3R to a vacuum enhanced extraction well and included it in the operational scheme for the IRP Site 1 VER System.
- In July 2009 installed a hydrant stub-up tapped off the Site 2 recharge piping to provide an alternate or additional recharge capability at Site 2.
- In September 2009 installed a hydrant stub-up tapped off the Site 3 recharge piping to provide a recharge capability at Site 1.

Monitoring of Groundwater and Surface Water: As discussed above the Long-Term Monitoring of OU-1 has been on-going since the RI commenced in 1986 and an extensive network (see **Figure 23**) of interceptor, recovery and monitoring wells and surface water monitoring points has been developed over time to monitor contaminant levels/trends in the surface water and groundwater in each of the 3 aquifers of concern within OU-1. The implemented remedy includes the continuation of groundwater and surface water monitoring at OU-1 which initially commenced 1986. Long-Term Monitoring events are conducted in accordance with the *Basewide Quality Assurance Project Plan for Long Term Monitoring at NPL Operable Unit 1, NPL Operable Unit 3/IRP Site 6, NPL Operable Unit 3/IRP Site 21and MCP Sites (IRP Sites 13 & 22, and the FAFSUST Site)*. The post-1998 Long-Term Monitoring for OU-1 has been 2-phased; (1) the annual sampling of selected monitoring wells and a surface water sampling point for analysis of VOCs by an off-site commercial laboratory, and (2) the monthly/quarterly/semi-annually/annually sampling of collection points, selected monitoring and the surface water sampling point for analysis by the O&M staff using an on-site gas

chromatograph (GC). Please note the analysis with the on-site GC only quantifies the two principal contaminants of concern, TCE and cis-1,2-DCE. The Long-Term Monitoring Program has also been subject to the RPO process in that sampling points and frequency are re-evaluated after each round for changes necessary to more effectively accomplish the objectives of the Long-Term Monitoring Program.

The monitoring component of the 2007 ROD remedy continues the two-phase approach. Phase 1 is the annual sampling of selected wells to confirm established Long-Term Monitoring trends within the OU-1 source areas and plumes and to monitor progress towards achievement of RAOs. Analysis of these samples is for VOCs by an off-site commercial laboratory. The Phase 1 sampling and analysis is documented in a formal Long-Term Monitoring Report. The second phase of the Long-Term Monitoring Program is the sampling of collection sources and monitoring wells for screening by the operations and maintenance (O&M) staff using an on-site GC. The purpose of this sampling and analysis is for system optimization (RPO) and to identify any changes in the established Long-Term Monitoring TCE and cis-1,2-DCE trends. Results of the Long-Term Monitoring Program Phase 2 sampling and analysis is documented in the Monthly OU-1 Remedial Action Report which is submitted to USEPA Region I, MassDEP and stakeholders.

Land Use Controls: Due to the nature and extent of the contaminants, the current and future land use, and since OU-1/IRP Sites 1, 2 & 3 are on an active/full-service General Aviation airport; LUCs/ICs which include non-engineered instruments such as legal and/or administrative controls, will prevent exposure to, and use of, contaminated groundwater; ensure that excavation at the three source areas (IRP Sites 1, 2 and 3) is controlled to prevent exposure to any residual contamination in the subsurface soil; and prevent exposure to vapors that could accumulate in buildings effected by the contaminated groundwater plume. ICs are considered acceptable measures to be used as part of a balanced cleanup when treatment is also being used to address principle waste threats. LUCs/ICs that are being maintained, monitored and enforced under this remedy to control access to the three source areas on Hanscom Field and to ensure that the OU-1 groundwater is not used for drinking water purposed include:

- Since the early 80's Massport has granted the Air Force access to Hanscom Field for activities associated with the Hanscom AFB IRP. This access is formalized by License Agreements with the current license scheduled for renewal in December 2012.
- Massport is kept up-to-date on the status of the Hanscom AFB IRP. Both the Airport Director and Massport's Environmental Unit are on the distribution list for IRP Reports concerning OU-1 (and other IRP Reports concerning/affecting Hanscom Field). Also Massport is a chartered member of the Hanscom AFB Restoration Advisory Board (RAB).
- To alert Massport's operational personnel, planners, and decision makers of their presence, OU-1 and the locations of IRP Sites 1, 2 and 3 are noted on Figure 9-4 of Massport's 2005 L.G. Hanscom Field Environmental Status and Planning Report (ESPR) and Chapter 9 of the document includes a discussion of the Hanscom AFB IRP.

- Massport's 2005 ESPR included forecasts for 2010 and 2020 scenarios which indicate that Hanscom Field will continue to be a full-service General Aviation airport for the foreseeable future.
- Hanscom Field has a perimeter fence and all areas of Hanscom Field are patrolled by security forces. Access to the field is controlled and restricted to authorized personnel. In addition IRP Site 1 is separately fenced.
- Construction of the OU-1 recharge basins placed 6-8 feet of clean soil over the original ground surface of the waste burial pits at IRP Sites 2 and 3. Also all visually contaminated soil at IRP sites 1, 2 and 3 was removed by the 1988 removal actions and replaced by clean backfill. Thus access to any residual subsurface soil contamination is physically restricted.
- Massport's 2005 ESPR states "The ESPR does not replace the MEPA review of projects at the site which exceed regulatory thresholds."
- IRP Sites 1, 2 and 3 are immediately adjacent to the runways, within the restrictive airfield area, and the only potential construction would be for utility services. Further, in place remedial system piping and recharge basins at Site 2 and 3 would necessitate routing of new utility services around the area with any residual subsurface soil contamination. If construction activities are planned for the airfield area in the future, appropriate health and safety procedures will be followed, including the preparation of a site specific health and safety plan, in accordance with OSHA (29 CFR 1910.120) and all other applicable federal, state, and local requirements.
- Groundwater beneath Hanscom Field/OU-1 is not used, not expected to ever be used, as a public water supply. The Public water supply for Hanscom Field is provided by Lexington (served by MWRA) and Bedford (served by MWRA and wells). Figure 9-2 of Massport's 2005 ESPR shows all public water supply facilities within Bedford, Concord, Lexington and Lincoln. Table 9-4 shows the approximate distance of each from Hanscom Field which vary from 0.9 to 7.3 miles.
- Figure 9-2 of Massport's 2005 ESPR delineates an approved Zone II Wellhead Protection Area that overlaps Hanscom Field and includes IRP Site 3. These areas are approved under the MassDEP's Drinking Water Program to protect the recharge area around public water supply groundwater sources.

In addition to the Hanscom Field area OU-1 contaminated groundwater also flows through a section of an active Air Force Installation (Hanscom AFB's Family Campground) and into conservation lands owned by the Town of Bedford. The below listed LUCs/ICs are already in-placed/instituted for that the portion of OU-1 which the Air Force leases from the Commonwealth of Massachusetts for the Hanscom AFB Family Campground and central groundwater treatment system.

Hanscom AFB LUCs/ICs are primarily documented in the November 2003 Hanscom AFB General Plan Update (master plan). Section 2.7 Responsibilities of this document states:

> The following are general responsibilities identified throughout the General Plan Update

document. These are significant responsibilities that need to be brought to the attention of the Commander and users of the Plan to provide that they are implemented.

Ground Disturbance
Since the 1998 General Plan, several Installation Restoration Program (IRP) (now called Environmental Restoration Program, ERP) sites have been remediated (see section 4.3.3.) Any ground disturbance on the remediated sites still must be reviewed and approved by the Hanscom AFB Environmental Office before any digging begins to provide that adequate precautions are taken to mitigate risks.

Land Use Changes at ERP Sites
No changes in the current land use of the (ERP) site can be made without the written approval of the USAF government oversight Environmental Office. Also EPA and MassDEP are to be notified for consultation 45 days in advance of proposed land use changes, which are inconsistent with the land use assumptions or land uses described in the remedy selection document.

In both the Existing and Future Land Use Plans presented in the General Plan Update the OU-1 area leased by the Air Force is identified as "Outdoor Recreation" (campground area) and as "Industrial" (the treatment facility area). The General Plan Update also shows the location of each of the 3 airfield source areas (IRP Sites 1, 2 and 3) and the 3 sites and the area leased by Hanscom AFB are identified as having "Environmental Constraints" and "Operational Constraints".

The General Plan Update includes specific environmental constraints that apply to IRP Sites with Land Use Controls and/or Institutional Controls as a component of the selected remedy. The Update also includes constraints in regards to closed IRP Sites. Specific LUCs that apply to all Hanscom AFB IRP Sites include:

- No drinking water wells are allowed on the site and untreated contaminated groundwater recovered from the site cannot be used for any purpose.
- Any digging, excavation, or groundwater use on the site must be approved by the Base Environmental Office in writing and, once approved, be conducted in accordance with a site-specific health and safety plan.

A summary of all IRP Land Use Controls/Institutional Controls included in the November 2003 Hanscom AFB General Plan Update is included as **Attachment J-1** of this Fourth Five-Year Review Report.

Hanscom AFB operating procedures as defined by Air Force Instructions (AFIs) requires that project planning documents (for both new construction and repair projects) be coordinated with the environmental office. Also Hanscom AFB contractors performing IRP work are required by OSHA to have Site Specific Health and Safety Plans and properly trained workers.

For those portions of OU-1 located on conservation lands owned by the Town of Bedford a legal mechanism is in place (deed restrictions on these lands) which limit use to passive and/or active recreation use. This area of OU-1 includes undeveloped wetlands, beaver ponded and forest areas known as the Jordan Conservation Area and Hartwell Town Forest. A letter to the Hanscom AFB RPM from the Town of Bedford Conservation Commission which summarizes the management and land use status of these areas is included as **Attachment J-2** of this Fourth Five-Year Review Report. Additional administrative mechanisms to ensure that the groundwater under this off-site area is not used for drinking water purposes include:

- Town of Bedford officials are kept up-to-date on the status of the Hanscom AFB IRP and levels of contaminants in the groundwater beneath the town owned land. The Board of Health is furnished a copy of all OU-1 Long-Term Monitoring Reports and both the Board of Health and Conservation Commission are on the distribution list for the monthly Remedial Action Report. Also the Board of Health Director is a chartered member of the Hanscom AFB Restoration Advisory Board (RAB) and the Chair/CoChair of the Board of Health usually attends RAB meetings.

- Also, the OU-1 ROD required the Air Force, in consultation with the EPA and Mass DEP, to establish restrictions prohibiting the construction of wells and the use of groundwater in any documented or anticipated area of groundwater contamination. These restrictions shall be in place within 1 year of the ROD's signature. In retrospect these restrictions were already in place, specifically Section 8 of the Bedford Board of Health Code of Health Regulations requires that any landowner obtain a permit for the installation of wells anywhere in the Town of Bedford. While this does not specifically "prohibit" wells in the Jordan Conservation Area and Hartwell Town Forest it does ensure that the Board of Health would be involved in the decision.

A 4 September 2008 Memorandum from to the Hanscom AFB Environmental Office to the USEPA, Region I which summarizes the implantation of LUCs/ICs for OU-1 is included as **Attachment J-3** of this Fourth Five-Year Review Report. An **enclosure to Attachment J-3** is a copy of the 24 July 2008 letter to the Hanscom AFB Environmental Director from the Bedford Town Manager which discusses restrictions on the land use and the use of groundwater by the Town of Bedford in off-base areas of contamination.

The on- and off-site LUCs will be maintained until the concentrations of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and unlimited exposure. The Air Force is responsible for ensuring that the LUCs described above, as components of the selected remedy, continue to be in place, are reported on, and enforced to ensure that the LUCs and are effective and protective of human health and the environment. In this regards, the Hanscom AFB environmental office formally monitors and documents the results in normal operations, maintenance, and/or monitoring reports for the remedial action. This monitoring is accomplished by:

- Frequent inspections (almost daily) of the OU-1 area by the Hanscom AFB's remedial action-operations contractor's on-site staff in the course of their OU-1 system operation, maintenance and monitoring duties, and
- Discussions at least annually, or more often if warranted between Massport and Bedford officials by the Hanscom AFB IRP Manager to verify that untreated groundwater within OU-1 is not being used for any purpose and that there is no unauthorized digging at IRP Sites 1, 2 and 3.

The LUC monitoring results will be included in a separate annual report or as a section of another annual environmental report, if appropriate, and provided to the EPA and the Commonwealth. The LUC monitoring reports will be used in preparation of the Five Year Reviews to evaluate the effectiveness of the OU-1 remedy.

Should the Air Force plan on transferring or leasing any property affected by OU-1, whether or not as a result of base closure, the Air Force will consult with USEPA and MassDEP on the specific wording on groundwater and land use restrictions to be included in the documents evidencing the transfer or lease. If the property is transferred, or the lease allows capital improvements, a technical evaluation of the continued effectiveness and appropriateness of the remedy will be undertaken considering long-term monitoring results to date, the proposed land use, and the fact that the Air Force may no longer actively own or operate the property.

Remedy Implementation - OU-2/IRP Site 4

As discussed earlier in this document the remedy for OU-2/IRP 4, was constructed/ implemented prior (1988) to the listing of Hanscom Field/Hanscom AFB on the NPL and the protectiveness of the remedy documented in the 1st Five-Year Review Report and the Site entered the Long-Term Management Phase on 16 September 1997.

Land Use Controls (LUCs): LUCs to ensure that future land use and/or groundwater use does not increase the risk of exposure to the waste/contaminated soils and groundwater remaining on the site were **not** specified in the 1988 Remedial Action Plan for Site 4. However, inspections are made by both the Hanscom AFB IRP Manager and by Hanscom AFB's remedial action-operations contractor's on-site staff in the course of their IRP Site 4 maintenance duties to verify the integrity of the cap and to ensure that drinking water wells are not being installed and that there is no unauthorized digging at the site. Site 4 is also on Hanscom Field within the area formally designated as a buffer area (Runway 5 Approach Area) and most of the discussion of Hanscom Field's LUCs/ICs above in the OU-1 section also applies to Site 4. Vehicle access to the Runway 5 Approach Area is restricted by a locked gate. As with OU-1, access by Air Force personnel/contractors to Hanscom Field conduct IRP activities is formalized by License Agreements with the current license scheduled for renewal in December 2012. In addition Table ES-3 (Current Hanscom Field Planning Initiatives and Projects, and Potential Planning Concepts under 2010 and 2020 scenarios) in Massport's 2005 ESPR reflects that nothing is/ will be

planned for Runway 5 Approach Area.

Remedy Implementation - OU-3/IRP Site 6

Remedial Design/Remedial Construction: The Remedial Design (RD) in conformance with the ROD is dated April 2001. This RD was prepared for Hanscom AFB by CH2M Hill. Construction of the remedy was completed via an Air Force Center for Environmental Excellence (AFCEE) contract with IT Corporation. IT Corporation mobilized on-site on 29 May 2001 and field work was substantially complete on September 17, 2001. The *Remedial Action Report for Landfill Capping Project at Operable Unit 3-Site 6*; prepared by IT Corporation, April 2002, describes the construction of the RA.

The major components of IT's scope of work included:

- Conducting a property line survey to verify the location of the Base property line to the north and east of the Former Filter Bed Area,
- Excavation of the contaminated sediments from two wetland hotspot areas and the placement of this material under the Former Filter Bed Area cap,
- Excavation of the debris extending off the Base property and the placement of this material under the Former Filter Bed Area cap,
- Constructing a permeable cap at the Former Filter Bed Area, South Landfill, and West Landfill,
- Restoring the wetlands in the wetland remediation areas,
- Re-establishment of perimeter and security fencing with signs on each gate, and
- As-built surveys and drawings.

The installation of three monitoring well couplets down gradient from Site 6 on adjacent landowner's property to help define a groundwater compliance boundary was also included in the scope of the construction contract. Delays in negotiating a Right-of-Entry for the Kiln Brook Spur property precluded installation of the wells during the major construction period in 2001. The Right-of-Entry was subsequently established and the wells installed in September 2002. The *Site 6 Compliance Boundary Monitoring Well Installation Report*; prepared by IT Corporation and dated January 2003 describes the installation of the wells.

Quarterly inspections and annual maintenance of the capped areas commenced in 2002.

Wetland Mitigation Monitoring: The Remedial Design included a 30-year post-RA Monitoring Plan for the wetland areas remediated during the construction phase of the Site 6 Remedial Action. The "baseline" vegetative monitoring event for the wetland restoration areas (East Wetland Remediation Area (EWRA) and West Wetland Remediation Area (WWRA)) was included in the construction contract scope/costs and was accomplished by IT Corporation in September 2001. The baseline vegetative monitoring was performed by a qualified wetlands

scientist and included the establishment of a transect line through each wetland remediation area, the placement of a 1 m x 1 m quadrant at a reproducible location, an ocular estimation of the ratio of growth to area, photographs of the wetland remediation areas from a reproducible location, and the assessment of the remedial progress. This vegetative monitoring (which established the baseline conditions for future inspections and assessments) was documented in the *Remedial Action Report for Landfill Capping Project at Operable Unit 3-Site 6*; prepared by IT Corporation, April 2002. Subsequently the initial Five-Year Monitoring Plan included in the Remedial Design for the wetland areas remediated was completed in the fall of 2006 with follow-up wetland mitigation monitoring and ecosystem evaluation required every five years thereafter.

Monitoring of Groundwater and Surface Water: An extensive network of groundwater monitoring wells and surface water monitoring points (see **Figure 15**) has been developed over time to monitor contaminant levels/trends in the surface water and groundwater in each of the 2 aquifers of concern within IRP Site 6. The monitoring of the IRP Site 6 remedy commenced in 2001 with a "baseline" groundwater and surface water sampling and analysis event that was included in the construction contract scope/costs. The purpose of this initial post-RA monitoring of the site was to identify contaminants of concern in the groundwater water and surface water and to provide a baseline to monitor changes over time in the contaminant concentration levels. It was accomplished by IT Corporation in December 2001and documented in the *Baseline Groundwater Monitoring Report for Post-RA Monitoring of Operable Unit 3 Site 6 (December 2001 Samples);* prepared by IT Corporation, May 2002. Subsequent post-RA Long-Term Monitoring events have been conducted at least annually. Also seasonal dissolved arsenic analysis of groundwater from selected wells commenced July 2005.

Groundwater Compliance Boundary: Figure 7.0 of the Site 6 ROD shows the Groundwater Compliance Boundary and associated monitoring wells to include 3 additional well couplets (surface and lower aquifers). The initial sampling and analysis of groundwater at the existing monitoring wells was included in the 2001 baseline Long-Term Monitoring event. However, as stated above, the installation of three additional monitoring well couplets down gradient from Site 6 (and on an adjacent Massport or privately owned property) to better define the groundwater compliance boundary was delayed and not completed until September 2002. The initial sampling and analysis of groundwater from these wells was included in the October 2002 Long-Term Monitoring event for Site 6. Also, as noted in the 2007 Five-Year Review additional monitoring wells were installed and the initial boundary was revised in 2006. The revised Groundwater Compliance Boundary and additional wells are shown on the current Site Plan (**Figure 15**)

Land Use Controls (LUCs)/Institutional Controls (ICs): LUCs/ICs instituted to ensure that future land use and/or /groundwater use does not increase the risk of exposure to the waste/contaminated soils and groundwater remaining on the site are listed below. LUCs/ICs are formally monitored and results documented by the base environmental office in the recurring Remedial Action Reports issued for this site.

- Fencing with locked gates
- Signs at each of the 2 vehicle access gates stating:
  IRP Site 6
  No Digging, No Dumping
  Per Order of the Installation Commander
  For Additional Information Contact the Environmental Office
  781-377-4495/8207/4667
- Inspections are conducted by both the Hanscom AFB IRP Manager and by Hanscom AFB's remedial action-operations contractor's on-site staff in the course of their IRP Site 6 maintenance and monitoring duties to verify the integrity of the cap and to ensure that there is no unauthorized digging at the site and that drinking water wells are not being installed at the site or in adjacent Massport and privately property (Debris Excavation Area 1, the off-site wetlands, and the former railroad spur to Hanscom AFB) which may have groundwater with dissolved arsenic levels above the arsenic MCL.
- Much of the off-base area downgradient from Site 6 is on Hanscom Field within the Runway 29 approach area and most of the discussion of Hanscom Field's LUCs/ICs above in the OU-1 section also applies to this section of Hanscom Field which may contain groundwater with dissolved arsenic levels above the arsenic MCL. As with OU-1 and OU-2, access to Hanscom Field by Air Force personnel/contractors to conduct IRP activities is formalized by License Agreements. Massport is also on the distribution list for Long-Term Monitoring Reports concerning OU-3/IRP Site 6.
- Rights-of-Entry are formalized with the private property owners (Debris Excavation Area 1, the off-site wetlands, and the former railroad spur to Hanscom AFB) which may contain groundwater with dissolved arsenic levels above the arsenic MCL. Each owner is formally provided with the analytical results of groundwater and surface water samples collected at these off-base locations.
- IRP Site 6 was classified in the 1998 Hanscom Air Force Base General Plan (master plan) as "industrial" in both the existing and future Land Use Plans, however, the actual land use was "open space". With an "industrial" designation there was a potential for future industrial use of the site. Subsequently the actual "open space" land use classification was made official by the November 2003 General Plan Update which identifies the Site 6 area as "Open Space" in both the Existing and Future Land Use Plans. The General Plan Update also shows the site with "Environmental Constraints" (because of IRP Site status and proximity to wetlands and the Shawsheen River) and with "Operational Constraints" (due to proximity to Hanscom Field). Also base operating procedures (as established by Air Force Instructions) requires that project planning documents (for both new construction and repair projects) be coordinated with the environmental office. Through these measures the use of the site is well controlled and managed. There are currently no plans to change the existing use of IRP Site 6 in the future.
- The 2003 General Plan Update includes the specific environmental constraints that apply to IRP Sites with Land Use Controls and/or Institutional Controls as a component of the

selected remedy. The Update also includes constraints in regards to closed IRP Sites. **Attachment J-1** provides a summary of the specific IRP Land Use Controls/Institutional Controls included in the November 2003 Hanscom AFB Base General Plan Update.

Contingency Groundwater Remedy: Not required at this time

Remedy Implementation - OU-3/IRP Site 21

Remedial Design/Remedial Construction: The design and construction of the selected Remedial Action for IRP Site 21 was completed via an Air Force Center for Environmental Excellence (AFCEE) contract with Shaw Environmental, Inc. (formerly IT Corporation). The remedial design for the selected remedy was included in the *Environmental Cleanup Plan, Remedial Action at Operable Unit 3- Site 21, Hanscom AFB, MA*; prepared by Shaw Environmental, Inc. and dated May 2003. Shaw mobilized on-site on June 2, 2003 and field work was substantially complete in September 2003 and the LNAPL recovery/groundwater treatment system officially commenced around-the-clock operation on September 15, 2003. The *Final Remedial Action Report for the Remedial Action at Operable Unit 3- Site 21, Hanscom AFB, MA;* prepared by Shaw Environmental, Inc. and dated March 2004 describes the construction of the RA.

The major construction components of the RA for this Site were:

- Removal of petroleum contaminated soils from various hotspot locations – a total of 2,763 tons of contaminated soil was sent transported to Eastern Soil Management Inc. for thermal treatment and reuse;
- Construction of four trenches with passive recovery wells – one main trench covering LNAPL Pool A with three passive wells, one trench covering LNAPL Pool B with two passive wells, and two smaller trenches at hotspot areas within LNAPL Pool C, each with a passive well;
- Application of ORC® in each trench to enhance the biodegradation of dissolved-phased contaminants (VOCs and fuel compounds) - a total of 1,170 pounds was applied during construction;
- Installation of a network of ten active recovery wells in non-hotspot areas within LNAPL Pool C connected to a retrofitted LNAPL recovery and treatment system that had been used at the site for previous removal actions;
- Installation of provisions to implement groundwater containment/treatment and/or enhanced vapor recovery contingencies in the future;
- Surveying and as-built drawings;
- A six-month start-up and prove-out period for the LNAPL/groundwater recovery and treatment system. This O&M period was included in the construction contract scope/costs. The construction contract also included preparation of the *Operation and Maintenance Plan, Remedial Action at Operable Unit 3 - IRP Site 21* which was prepared by Shaw Environmental, Inc. in 2003. Upon completion of the start-up and prove-out period the responsibility for the operation, maintenance, and monitoring of the Site 21

remedy in accordance with the O&M Plan was transferred to the Basewide Remedial Action-Operation (RA-O)/Long-Term Management (LTM) contractor.

Monitoring of LNAPL, Groundwater and Surface Water: An extensive network of groundwater monitoring wells and surface water monitoring points (see **Figure 16**) has been developed over time to monitor LNAPL levels and contaminant levels/trends in the surface water and groundwater in each of the 2 aquifers of concern within IRP Site 21. The monitoring of the IRP Site 21 remedy commenced in 2003 with a "baseline" groundwater and surface water sampling and analysis event was included in the construction contract scope/costs. This event also included the measurement of LNAPL thickness in monitoring and recovery wells at Site 21 which had discernable LNAPL a pre-RA monitoring events. The purposed of this initial post-RA monitoring of the site was to document the residual LNAPL; to identify contaminants of concern in the groundwater water and surface water; and to provide a baseline to monitor changes over time in the contaminant concentration levels. It was accomplished by Shaw Environmental, Inc. in October 2003 and documented in the *October 2003 Stage 2 Post-RA Baseline Long Term Monitoring Report for Operable Unit 3 – IRP Site 21*; prepared by Shaw Environmental, Inc. and dated March 2004. Subsequent post-RA Long-Term Monitoring events have been conducted semi-annually.

Land Use Controls (LUCs)/Institutional Controls (ICs): LUCs/ICs instituted to ensure that future land use or groundwater use does not increase the risk of exposure to the waste/ contaminated soils and groundwater remaining on the site are listed below. LUCs/ICs are formally monitored and results documented by the base environmental office in the recurring Remedial Action Reports issued for this site.

- Frequent inspections (almost daily) by the Hanscom AFB IRP Manager and Hanscom AFB's remedial action-operations contractor's on-site staff in the course of their OU-1 system operation, maintenance and monitoring duties are conducted to verify that untreated groundwater within OU-3/IRP Site 21 is not being used for any purpose and that there is no unauthorized digging at the site.
- The area of IRP Site 21 is classified in the Hanscom Air Force Base November 2003 General Plan (master plan) Update as either "Outdoor Recreational" or "Industrial" in both the Current Land and Future Land Use Plans. The General Plan Update also shows the site with "Environmental Constraints" (because of IRP Site status and proximity to Shawsheen River) and with "Operational Constraints" (due to proximity to Hanscom Field). There are currently no plans to change the existing use of IRP Site 21 in the future.
- The 2003 General Plan Update includes the specific environmental constraints that apply to IRP Sites with Land Use Controls and/or Institutional Controls as a component of the selected remedy. The Update also includes constraints in regards to closed IRP Sites. **Attachment J-1** provides a summary of the specific IRP Land Use Controls/Institutional Controls included in the November 2003 Hanscom AFB Base General Plan Update.

Groundwater Containment/Treatment and VER Contingencies: Not envisioned at this time

Remedy Implementation Summary

OU-1/IRP Sites 1, 2 & 3:

- Continued operation of the existing dynamic groundwater collection and treatment system – implemented
- Monitoring of groundwater and surface water – implemented
- Land Use Controls/Institutional controls – implemented

OU-4/IRP Site 4

- Inspection and Maintenance of cap – implemented
- Monitoring of groundwater and surface water – no longer required
- Land Use Controls/Institutional controls – Not formally included in the 1988 RAP, however, they have been implemented

OU-3/IRP Site 6

- Containment of three landfill areas - completed
- Removal of contaminated sediments and landfill debris and placing of this material within the capped landfill area - completed
- Inspection and Maintenance of capped areas – implemented
- Wetland mitigation monitoring – implemented
- Monitoring of groundwater and surface water – implemented
- Groundwater compliance boundary – implemented
- Land Use Controls/Institutional controls - implemented
- Contingency Groundwater Remedy – not envisioned at this time

OU-3/IRP Site 21

- Construction of interceptor trenches with passive recovery wells and removal of petroleum contaminated soils - completed
- Application of ORC® in interceptor trenches – completed
- Installation of LNAPL/groundwater recovery and treatment system – completed
- Operation of LNAPL/groundwater recovery and treatment system - implemented
- Monitoring of groundwater and surface water – implemented
- Land Use Controls/Institutional controls - implemented
- Groundwater Containment/Treatment and VER Contingencies – not envisioned at this time

Remedial Action – Operation/Long-Term Management

Since 1999 the RA-O & LTM phase of the Hanscom Field/Hanscom AFB Superfund remedies has been the responsibility of a single contractor as follows:

- January 1999 to January 2003 – International Technology (IT) Corporation via an AFCEE RAC Delivery Order (OU-1 & OU-2/IRP Site 4+ OU-3/IRP Site 6 commencing 2002)
- January 2003 to January 2008 – MaraTech Engineering Services, Inc. subcontractor for Del-Jen, Inc. via an Hanscom AFB A-76 (Contracting Out) Contract (OU-1, OU-2/IRP Site 4 & OU-3/IRP Site 6 + OU-3/IRP Site 21 commencing 2004)
- January 2008 to January 2009 – Metcalf & Eddy, Inc. via an AFCEE 4PAE Task Order (OU-1, OU-2/IRP Site 4, OU-3/IRP Site 6 & OU-3/IRP Site 21)
- January 2009 to January 2010 – Environmental Quality Management, Inc. via an AFCEE ECOS Task Order (OU-1, OU-2/IRP Site 4, OU-3/IRP Site 6 & OU-3/IRP Site 21)
- April 2010 to August 2012 – Advent Environmental, Inc. via an AFCEE issued GSA Task Order & AFCEE ECOS Task Orders (OU-1, OU-2/IRP Site 4, OU-3/IRP Site 6 & OU-3/IRP Site 21)

Please note that the On-site Manager for each of the above Basewide RA-O contractors was/is Mr. Richard Landry. In fact Mr. Landry accepted the keys from the OU-1 Remediation System's construction contractor in 1991 and has served as the On-site Manager for each support contractor thereafter. Also note there was a break in service of the Basewide RA-O contracts between January and April 2010. During this period all RA-O requirements continued to be met by the Hanscom AFB Environmental Office in-house staff with Mr. Landry serving as a consultant via a separate support contract.

OU-1/IRP Sites 1, 2 and 3 Remedial Action – Operation

Metcalf & Eddy Services, Inc. (subsequently acquired by Professional Services Group (PSG)) was contracted via a Corps of Engineers (CoE) service contract to operate and maintain the OU-1/IRP Sites 1, 2 and 3 groundwater collection, treatment and recharge system after it was constructed. Operation of the system commenced in April 1991. At the end of May 1996, the original service contract ended, however, PSG was awarded a CoE construction contract to upgrade and automate the collection, treatment and recharge system. PSG continued normal operations of the system during the course of the construction contract which ended in December 1998. Commencing in January 1999 the RA-O/LTM phase of the Hanscom Field/Hanscom AFB Superfund remedies has been the responsibility of a single contractor as noted above.

Remediation System Operations, Maintenance and Monitoring (OM&M):

Monitoring of the remediation systems is conducted in accordance with the *Basewide Quality Assurance Project Plan for Long Term Monitoring at NPL Operable Unit 1, NPL Operable Unit 3/IRP Site 6, NPL Operable Unit 3/IRP Site 21and MCP Sites (IRP Sites 13 & 22, and the FAFSUST Site)*. Operation and maintenance (O&M) of the original Groundwater Collection, Treatment and Recharge System is conducted in accordance with the O&M Manual entitled

Recovered Groundwater Treatment System O&M Manual. The O&M Manual was initially prepared by Engineer-Science, Inc., a subcontractor to H&A, in 1991. In 1998 the manual was revised by IT Corp, a subcontractor to PSG Inc., following completion of the system automation and upgrade contract. Under this contract a supervisory control and data acquisition (SCADA) system was installed to control and monitor system operation. The SCADA system includes remote terminal units at the pump stations at IRP Sites 1, 2 and 3 for two-way radio communication with the central control unit at the central treatment facility. Also includes an auto-dialer to notify the operating contractor of major failures during non-duty hours/periods of unattended operation.

Operation and maintenance (O&M) of the VER System is based on Standard Operating Procedures established since the VER Demonstration Project commenced in 1997.

The primary activities associated with OM&M of the OU-1 Groundwater Collection, Treatment and Recharge System include the following:

- Visual checks of doors, gates, and system components to include remote sites for signs of vandalism and/or other unauthorized activity.
- Visual and computer checks of all operational equipment to include remote collection points (VER system, pump stations and interceptor wells). Repairs as necessary for proper operation.
- Adjustment of controls and computer set points necessary for efficient system operation.
- On-site and off-site commercial laboratory analysis of treatment systems (central & Site 1 VER) water quality and air quality parameters to ensure compliance with discharge standards.
- Response to major alarms during non-duty/unattended operation period. Major alarms include steam boiler failure, security alert, process down, high equalization tank level, or fire alarm.
- Scheduled/routine maintenance of equipment.
- On-site re-generation of central system's granular activated carbon units when continuous monitoring device indicates need for such.
- Major maintenance tasks as needed for efficient system operation. Includes replacement of failed pumps, replacement of "consumed" activated carbon in Site 1 VER system and in the central system (when it can no longer be regenerated on-site), pigging of collection system piping, acid cleaning of stripping towers, and cleaning/repacking of stripping towers.
- Disposal of recovered solvent, spent activated carbon from the Site 1 VER system and other generated hazardous waste at a licensed off-site disposal facility.
- Monthly Remedial Action Report

As noted above the Air Force's RPO process has been on-going since the initial Groundwater Collection, Treatment and Recharge system was placed in operation in April 1991. A listing of key dates/milestones for the OU-1 Remedy is included as **Attachment C-1**.

Groundwater and Surface Water Monitoring: Long-Term Monitoring events are conducted in accordance with the *Basewide Quality Assurance Project Plan for Long Term Monitoring at NPL Operable Unit 1, NPL Operable Unit 3/IRP Site 6, NPL Operable Unit 3/IRP Site 21 and MCP Sites (IRP Sites 13 & 22, and the FAFSUST Site)*. Long-Term Monitoring Reports are issued for each formal/annual event and the results for the on-site GC analysis are reported in the Remedial Action Reports submitted monthly for OU-1. The primary activities associated with OU-1's Long-Term Monitoring include the following:

- Annual sampling of selected monitoring wells and one surface water sampling point with analysis for VOCs by an off-site commercial laboratory to confirm the containment and possible reduction of the OU-1 plumes. Also includes 3 wells at the Bedford Community Gardens being monitored by Hanscom for the Town of Bedford and regulators.
- Piezometric levels to monitor changes in groundwater elevations.
- Monthly and/or quarterly sampling of collection points and selected monitoring wells for screening by the operations and maintenance (O&M) staff using an onsite gas chromatograph (GC). The purpose of this sampling and analysis is for remedial system optimization and to identify trends in VOC levels at groundwater collection points and within the OU-1 plumes. This GC analysis only quantifies the two principal contaminants of concern, TCE and cis-1,2-DCE. The RPO process documented as a component of the selected Remedy in the 2007 ROD is applicable to both the Dynamic Groundwater Remediation System and the Long-Term Monitoring Program. A listing of key dates/milestones for the OU-1 Treatment System Monitoring is on Page 13 of **Attachment C-1** and a listing of key dates/milestones for the OU-1 Long-Term Monitoring Program. Key begins on Page 14 of **Attachment C-1**

The following is a listing of OU-1 Long-Term Monitoring Reports that have been issued since the 2007 Five-Year Review:

- *Long-Term Monitoring Report for Operable Unit 1 - November 2007 Samples;* prepared by Shaw Environmental, Inc. for Maratech Engineering Services, Inc., May 2008
- *Long-Term Monitoring Report for Operable Unit 1 - November 2008 Samples;* prepared by Metca**lf & Eddy, Inc**., January 2009
- *Long-Term Monitoring Report for Operable Unit 1 - November 2009 Samples;* prepared by Environmental Quality Management, Inc., January 2010
- *Long-Term Monitoring Report for Operable Unit 1 - November 2010 Samples;* prepared by Shaw Environmental, Inc., March 2011
- *Long-Term Monitoring Report for Operable Unit 1 - November 2011 Samples;* prepared by Shaw Environmental, Inc., May 2012

Remedial Action-Operation Costs: Actual operation, maintenance and monitoring costs for OU-1/IRP Sites 1, 2, & 3 that have been incurred since the remedial action-operation phase commenced in 1991 are summarized in the following **Table 6**.

Table 6: Annual OU-1 Remedial Action-Operation Costs

Start Date	End Date	Basic O&M Cost	Long-Term Monitoring Cost	One-time O&M/ Alterations	Remarks
April 1991	March 1992	$551,670		$10,414	Propane & solvent disposal
April 1992	March 1993	$485,270			
April 1993	March 1994	$509,534		$63,475	Acid wash towers; solvent disposal; booster pumps,
April 1994	March 1995	$535,010		$137,243	Pigging system; iron bacteria pilot studies
April 1995	March 1996	$561,760		$25,599	Solvent & carbon disposal; Clean Site 2 Recharge Pipes, pave around plant
April 1996	December 1996	$403,425		$689,844	Automation & upgrades; Drill IWs 5 & 6
January 1997	December 1997	$342,009		$164,036	Acid Wash towers; replace BIW-1 power & pump; VFDs for pump stations; IWs 5 & 6 power& pumps; BIW & IW flow meters
January 1998	December 1998	$281,904		$58,734	Repack Towers
January 1999	December 1999	$315,347	$15,170	$73,984	Drill IW-10; power/pumps,IWs 7,8, 9 & 10; Y2K upgrades; VER carbon
January 2000	December 2000	$299,145	$20,253	$60,507	Acid wash towers; 2-Bedford Community Garden monitoring wells; VER carbon;
January 2001	December 2001	$316,080	$16,238	$31,987	Permanganate Pilot Study; VER Carbon;
January 2002	February 2003	$380,601	$23,667	$37,833	14 Months O,M&M, VER carbon
February 2003	January 2004	$321,663	In O&M	$0	11 Months O,M&M
February 2004	January 2005	$367,261	In O&M	$0	
February 2005	January 2006	$355,817	In O&M	$26,473	IW-11
February 2006	January 2007	$369,476	In O&M	$0	Permanganate Treatment
February 2007	January 2008	$379,730	In O&M	$0	
February 2008	January 2009	$348,123	In O&M	$61,007	Clean & repack AS #1; replace controls mounting boards at PS 1, 2 & 3
February 2009	January 2010	$294,688	In O&M	$8,942	Sites 1 & 2 recharge hydrants; repair underground pressure lines

Start Date	End Date	Basic O&M Cost	Long-Term Monitoring Cost	One-time O&M/ Alterations	Remarks
February 2010	August 2011	$417,240	In O&M	$32,526	17 months OM&M; paint EQ Tank; Retrofit BIW-4
August 2011	August 2012	$318,914	In O&M	$0	

Please note the above excludes government-furnished electricity and propane costs. These utility costs For FY2007 through FY2012 are as follows:

Dates		Electricity	Propane
From	To		
October 2006	September 2007	$66,000 est	$36,898
October 2007	September 2008	$66,000 est	$66,634
October 2008	September 2009	$106,000	$36,899
October 2009	September 2010	$100,512	$33,757
October 2010	September 2011	$97,951	$49,910
October 2011	September 2012	$86,000 est	$52,000 est

OU-2/IRP Site 4 Long-Term Management

The RA-O phase ended with the 1st Five-Year Review which documented that the Long-Term Monitoring of the Sites ground water and surface water was no longer necessary to confirm the protectiveness of the remedy. However, the 1st Five-Year Review identified a requirement to remove scrub brush growing in the drainage ditches and on sections of the cap and berms and recommended that a long-term inspection/maintenance program be instituted. The initial field work to remove the scrub brush was completed was completed in the spring of 1998 by PSG, Inc., via a modification to the contract providing operation, maintenance and monitoring support for the on-going OU-1 remedial action. Subsequently, since 1999, the recurring inspection and maintenance of IRP Site 4 has been included in the scope of the Basewide RA-O/LTM contract. OU-2/IRP Site 4 LTM requirements include:

Inspection and Maintenance: Recurring requirements include:

- Periodic (usually quarterly) inspections to verify integrity of the cap and to monitor for settlement and slope instability
- Fill and/or seed low and bare areas of landfill cap
- Fill animal burrows on landfill cap

- Annually cut grass and brush on the capped area and berms to include the capped northwest lobe outside the bermed f landfill capped (main) area Remove debris from drainage swales
- Monitoring of LUCs

Note: The grass on the main cap is cut periodically by Massport and a softball league at no cost to Hanscom AFB.

Annual Remedial Action Report: The following is a listing of OU-2/IRP Site 4 Annual Remedial Action Reports that have been issued since the 2007 Five-Year Review. . Each report includes a summary of CY activities and the quarterly inspection reports with photo documentation

- *Calendar Year 2007Remedial Action Report for NPL OU-2/IRP Site 4;* prepared by MaraTech Engineering Services
- *Calendar Year 2008 Remedial Action Report for NPL OU-2/IRP Site 4;* prepared by Metcalf & Eddy, Inc.
- *Calendar Year 2009 Remedial Action Report for NPL OU-2/IRP Site 4*; prepared by Environmental Quality Management, Inc.
- *Calendar Year 2010 Remedial Action Report for NPL OU-2/IRP Site 4*; prepared by Advent Environmental, Inc.
- *Calendar Year 2011 Remedial Action Report for NPL OU-2/IRP Site 4*; prepared by Advent Environmental, Inc.

Long-Term Management Costs: Actual Long-Term Management costs for OU-2/IRP Site 4 that have been incurred since the 1st Five-Year Review are summarized in the following **Table 7**. Please note that, though the remedy was put in place in 1988, the recurring inspections and maintenance of the site did not commence until after the 1st Five-Year Review in 1997. The below costs do not include Long-Term Monitoring costs since, following completion of the Human Health and Ecological Risk Assessments and the 1st Five-Year Review, the Project Team (Hanscom AFB, USEPA & MassDEP Remedial Project Managers) concluded that additional long-term monitoring data was not required.

Table 7: Annual OU-2/IRP Site 4 Long-Term Management Costs

Dates		Total Cost
From	To	
October 1997	December 1998	$5,454
January 1999	December 1999	$2,933
January 2000	December 2000	$5,696
January 2001	December 2001	$4,752

Dates		Total Cost
From	To	
January 2002	February 2003	$5,000
February 2003	January 2004	$4,549
February 2004	January 2005	$4,615
February 2005	January 2006	$2,933
February 2006	January 2007	$5,000
February 2007	January 2008	$5,965
February 2008	January 2009	$5,086
February 2009	January 2010	$6,000
February 2010	August 2011	$6,000
August 2011	August 2012	$6,066

OU-3/IRP Site 6 Remedial Action-Operation

The RA-O phase commenced in September 2001 following completion of the Remedial Action-Construction phase. OU-3/IRP Site 6 RA-O requirements include:

Inspection and Maintenance: Recurring requirements include:

- Periodic (usually quarterly) inspections of fences, gates, signs and permanent survey benchmarks for integrity.
- Periodic (usually quarterly) inspections to verify integrity of the cap and to monitor for settlement, erosion and slope instability
- Mowing of grassed areas of the landfill caps at least once per year prior to the fall inspection.
- Fertilizing, seeding, and mulching as required to establish and maintain grass cover.
- Periodic inspections groundwater monitoring wells for proper functioning.
- Repairs as necessary if an inspection of the site indicates that corrective action is needed to repair or restore a component of the remedy.
- Monitoring of LUCs

Annual Remedial Action Report: The following is a listing of OU-3/IRP Site 6 Annual Remedial Action Reports that have been issued since the 2007 Five-Year Review. Each report includes a summary of CY activities and the quarterly inspection reports with photo documentation.

- *Calendar Year 2007 Remedial Action Report for NPL OU-3/IRP Site 6;* prepared by

MaraTech Engineering Services

- *Calendar Year 2008 Remedial Action Report for NPL OU-3/IRP Site 6;* prepared by Metcalf & Eddy, Inc.
- *Calendar Year 2009 Remedial Action Report for NPL OU-3/IRP Site 6*; prepared by Environmental Quality Management, Inc.
- *Calendar Year 2010 Remedial Action Report for NPL OU-3/IRP Site 6*; prepared by Advent Environmental, Inc.
- *Calendar Year 2011 Remedial Action Report for NPL OU-3/IRP Site 6*; prepared by Advent Environmental, Inc.

Wetland Mitigation Monitoring: Per the Remedial Design Wetland Mitigation Monitoring & Ecosystem Evaluation is required every five years commencing 2011 until 2031. The following is a listing of OU-3/IRP Site 6 Wetland Mitigation Monitoring Reports that have been issued since the 2007 Five-Year Review.

- *2011 Wetland Mitigation Monitoring & Ecosystem Evaluation Report, Hanscom AFB, OU-3/Site 6;* prepared by Shaw Environmental, Inc., November 2011

Note: The semi-annual and/or annual monitoring of wetland ecosystem development in the West and East Wetland Restoration Areas, supervised by a Wetlands Scientist, at the beginning (May) and/or end (September) of the growing season for five years was completed in 2006.

Groundwater/Surface Water Monitoring to include Groundwater Compliance Boundary Monitoring: Long-Term Monitoring events are conducted in accordance with the *Basewide Quality Assurance Project Plan for Long Term Monitoring at NPL Operable Unit 1, NPL Operable Unit 3/IRP Site 6, NPL Operable Unit 3/IRP Site 21and MCP Sites (IRP Sites 13 & 22, and the FAFSUST Site)*. The results of the Quarterly/ Seasonal Long-Term Monitoring events at IRP Site 6 are documented in formal Annual Long-Term Monitoring Reports.

Sampling and analysis of groundwater and surface water are required as part of the remedy selected in the Record of Decision (ROD) for OU-3/IRP Site 6. The primary objective of this effort is to monitor the compliance boundary and the continued natural flushing of residual contaminants in the land filled areas in order to assess the effectiveness of the RA. The primary activities associated with OU-3/IRP Site 6's Long-Term Monitoring Program include the following:

- Annual sampling of selected monitoring wells and surface water sampling points with analysis for CoCs by an off-site commercial laboratory. Also includes the sampling and analysis for dissolved arsenic of 2 Massport storm water wells on Hanscom Field.
- Piezometric levels to monitor changes in groundwater elevations.

As noted above the "baseline" groundwater and surface water sampling and analysis was conducted in December 2001 to identify contaminants of concern (CoCs) in the groundwater

water and surface water and to provide a baseline to monitor changes over time in the contaminant concentration levels. Since then the OU-3/IRP Site 6's Long-Term Monitoring Program has been subjected to the Air Force's Remedial Process Optimization (RPO) which has included the installation of additional monitoring wells and inclusion of additional surface water sampling points to better define the groundwater compliance boundary, refinement of CoCs, changes in the frequency of events, and the refinement of monitoring points based on the analysis of each year's results. A summary listing of the OU-3/IRP Site 6' Long-Term Monitoring Program activities is included as **Attachment G-1**.

The initial sampling and analysis of groundwater at existing monitoring wells selected to help define the groundwater compliance boundary was included in the 2001 baseline monitoring event. The wells selected to help define the compliance boundary have also been included in the post-RA Long-Term Monitoring events that have been conducted at least annually. However, as stated above, the installation of three additional monitoring well couplets down gradient from Site 6 (and on an adjacent Massport or privately owned property) to better define the groundwater compliance boundary was delayed and not completed until September 2002. The initial sampling and analysis of groundwater from these wells was included in the October 2002 Long-Term Monitoring event for Site 6.

Based on the Long-Term Monitoring results through 2005 it was concluded that there was dissolved arsenic in the surface aquifer further downgradient of the site than anticipated and that the compliance boundary should be moved further to the north, near the Shawsheen River. Three additional surface aquifer monitoring wells, all on Massport property north of the site, were installed in 2006 to better define a revised/expanded compliance boundary. These additional wells were initially sampled in July 2006 and since then have been included in the seasonal (quarterly or spring, summer & fall) Long-Term Monitoring events which are being conducted to evaluate seasonal changes/impacts in the off-site dissolved arsenic plume.

At a 2006 Project Team meeting the RPMs from USEPA and MassDEP recommended that the Air Force sample the groundwater in the former off-base Debris Excavation Area 1 east of the site to confirm that the groundwater in this area (which is side gradient to the normal groundwater flow and also on privately owned property) is not being impacted by Site 6. A three well cluster (surface aquifer/lacustrine layer/lower aquifer) was installed in 2006 and the wells were initially sampled in July 2006 and again in the annual Long-Term Monitoring event in October 2006). Analysis of the samples was for all of Site 6's CoCs (VOCs, SVOCs, pesticides, PCBs, and dissolved metals). With the exception of one questionable estimated result for thallium (a metal) the initial sampling and analysis did not identify any CoC in the former Debris Excavation Area (DEA) No. 1. In regard to the thallium analysis it was determined that EPA Method (6010B), the method used by the laboratory for the initial metal analysis) was not the best method to quantify low levels of thallium since false positive results are sometimes reported. Since the 2006 DEA No. 1 Baseline Monitoring the Long-Term Monitoring analysis of DEA No.1's groundwater has been limited to SVOCs and dissolved arsenic which are the principal CoCs for Site 6 plus some additional analysis via Method 7841 or 6020 to confirm that

thallium is not a CoC.

The installation of the additional monitoring wells installed in 2006 is documented in the *Monitoring Well Installation Report for Additional Compliance Boundary Monitoring Wells*; prepared by Shaw Environmental, Inc., July 2006. This report also included a revised site map (**Figure 24**) which shows the relationship of the new wells to the revised compliance boundary.

Three (3) additional wells were installed in October 2008 on the downgradient side of the compliance boundary. Two of these were on the west side of the Shawsheen River and the 3rd was on the north side of the Shawsheen River. The purpose of these wells is to further define and/or revise the current Groundwater compliance boundary for the Site. These well installations were documented in a letter report dated January 2009. This report also included a revised site map (**Figure 25**) which shows the relationship of the new wells to the revised compliance boundary.

Also in 2008 the Long-Term Monitoring Program was revised to include three additional surface water sampling points. These points and the initial surface water monitoring points are shown on the sketch included as **Figure 26**.

The following is a listing of OU-3/IRP Site 6 Long-Term Monitoring Reports that have been issued since the 2007 Five-Year Review:

- *Groundwater Monitoring Report for Post-RA Monitoring of Operable Unit 3 Site 6 (January, April, August and October 2007 Samples)*; prepared by Shaw Environmental, Inc. for Maratech Engineering Services, Inc., February 2008
- *Groundwater Monitoring Report for Post-RA Monitoring of Operable Unit 3 Site 6 (April, July and October 2008 Samples)*; prepared by Metcalf & Eddy, Inc., January 2009
- *2009 Long-Term Monitoring Report, NPL Operable Unit 3, IRP Site 6 (April, July and November 2009 Samples)*; prepared by Environmental Quality Management, Inc., January 2010
- *2010 Annual Long-Term Monitoring Report, NPL Operable Unit 3, IRP Site 6 (April, July and November 2010 Samples)*; prepared by Shaw Environmental, Inc., February 2008
- *2011 Annual Long-Term Monitoring Report, NPL Operable Unit 3, IRP Site 6 (April, July and November 2010 Samples)*; prepared Shaw Environmental, Inc., March 2012

Remedial Action-Operation Costs: Actual inspection, maintenance and monitoring costs for IRP Site 6 that have been incurred since the remedial action was constructed in 2001 are summarized in the following **Table 8**.

Table 8: Annual OU-3/IRP Site 6 Remedial Action-Operation Costs

Dates		Total Cost
From	To	
January 2002	February 2003	$58,890
February 2003	January 2004	$46,801
February 2004	January 2005	$62,538
February 2005	January 2006	$87,525 note 1
February 2006	January 2007	$59,946
February 2007	January 2008	$58,370
February 2008	January 2009	$55,997 note 2
February 2009	January 2010	$31,000
February 2010	August 2011	$60,000
August 2011	August 2012	$41,000

Note 1: Includes non-recurring costs for 6 additional monitoring wells to better define the groundwater compliance boundary.
Note 2: Includes non-recurring costs for 3 additional monitoring wells to better define the groundwater compliance boundary.

Remedial Action-Operation OU-3/IRP Site 21

Remedial Action-Operation: The RA-O phase at IRP Site 21 commenced on September 15, 2003 following the completion of the Remedial Action-Construction phase. OU-3/IRP Site 21 RA-O requirements include:

Remediation System Operations, Maintenance and Monitoring (OM&M): Operation and maintenance (O&M) is conducted in accordance with the *Operation and Maintenance Plan, Remedial Action at Operable Unit 3- IRP Site 21*, prepared by Shaw Environmental, Inc. in December 2003. Monitoring of the remediation system is conducted in accordance with the *Basewide Quality Assurance Project Plan for Long Term Monitoring at NPL Operable Unit 1, NPL Operable Unit 3/IRP Site 6, NPL Operable Unit 3/IRP Site 21and MCP Sites (IRP Sites 13 & 22, and the FAFSUST Site)*.

The primary activities associated with OM&M of the OU-3/IRP Site 21 LNAPL/Groundwater Recovery and Treatment System include the following:

- Periodic (at least weekly) visual checks of all operational equipment associated with the LNAPL/groundwater recovery and treatment system and adjustment of controls as

necessary for efficient system operation.

- Visual checks of doors and system components for signs of vandalism and/or other unauthorized activity.
- Periodic (normally monthly) off-site commercial analysis of the groundwater treatment system water quality parameters to ensure compliance with discharge standards.
- Backwashing of the groundwater treatment system GAC units and/or the sand filter when operational pressures dictate such.
- Routine maintenance and/or repair of equipment. Includes removing sludge and biomass from the oil-water separator, transfer tank, and backwash water recovery tank.
- Major maintenance tasks as needed for efficient system operation. Includes replacement of failed pumps; replacement of "consumed" activated carbon in groundwater treatment system; replacement of sand filter media; and
- Disposal of recovered LNAPL, spent carbon and other generated wastes.
- Monthly Remedial Action Report

The Air Force's RPO process has been on-going since the initial LNAPL/Groundwater Recovery and Treatment system was placed in operation in December 2003. A listing of key dates/milestones for the OU-3/IRP Site 21 Remedy is included as **Attachment H-1**.

Groundwater and Surface Water Monitoring: Semi-Annual Long-Term Monitoring events are conducted in accordance with the *Basewide Quality Assurance Project Plan for Long Term Monitoring at NPL Operable Unit 1, NPL Operable Unit 3/IRP Site 6, NPL Operable Unit 3/IRP Site 21 and MCP Sites (IRP Sites 13 & 22, and the FAFSUST Site)*. The results of these Long-Term Monitoring events at IRP Site 21 are documented in formal Annual Long-Term Monitoring Reports.

The primary objective of the Site 21 Long-Term Monitoring Program is to monitor the natural attenuation and/or the natural containment of the dissolved-phase contaminant plumes and to monitor progress towards achievement of Remedial Action Objectives (RAOs) in order to assess the effectiveness of the RA. The primary activities associated with OU-3/IRP Site 21's Long-Term Monitoring Program include the following:

- Semi-Annual (spring & fall) sampling of selected monitoring wells and surface water sampling points with analysis for VOCs by an off-site commercial laboratory. Also includes the sampling and analysis for SVOCs and/or TPH (DRO) if determined to be necessary.
- Piezometric levels to monitor changes in groundwater elevations.

As noted above the "baseline" groundwater and surface water sampling and analysis was conducted in October 2003 to document the post-RA extent of the LNAPL Pools and dissolved phase VOCs. Since then the OU-3/IRP Site21's Long-Term Monitoring Program has been subjected to the Air Force's RPO process in that the frequency of monitoring specific wells is adjusted and the monitoring points for each event are refined based on the analysis of each year's results. A summary listing of the OU-3/IRP Site 21' Long-Term Monitoring Program activities

is included on Page 3 of **Attachment H-1**.

The following is a listing of OU-3/IRP Site 21 Long-Term Monitoring Reports that have been issued since the 2002 five-year review:

- *May and October 2007 Post-RA Long Term Monitoring Report for Operable Unit 3 – IRP Site 21*; prepared by Shaw Environmental, Inc. for Maratech Engineering Services, Inc., April 2008
- *Annual Long-Term Monitoring Report for NPL Operable Unit 3/IRP Site 21, April and October 2008 Post RA*; prepared by Metcalf & Eddy, Inc., January 2009
- *2009 Long-Term Monitoring Report, NPL Operable Unit 3, IRP Site 21 (April and November 2009 Samples)*; prepared by Environmental Quality Management, Inc., January 2010
- *2010 Post RA Long-Term Monitoring Report for Operable Unit 3- Site 21 (April and November 2010 Samples)*; prepared by Shaw Environmental, Inc., February 2011
- *2011 Post RA Long-Term Monitoring Report for Operable Unit 3- Site 21 (April and November 2011 Samples)*; prepared by Shaw Environmental, Inc., April 2012

LNAPL Monitoring: LNAPL monitoring is a component of Long-Term Monitoring Program for OU-3/IRP Site 21. The site's recovery (active and passive) and groundwater monitoring wells with a post-RA history of LNAPL are periodically (some monthly) checked for the presence of LNAPL with an oil-water interface probe. Also the site's recovery and monitoring wells are checked for LNAPL during their sampling in the Semi-Annual (spring and fall) Long-Term Monitoring events. The results of the LNAPL monitoring are reported in the monthly RA Report or the Long-Term Monitoring Report issued for the Long-Term Monitoring event.

Remedial Action-Operation Costs: Actual operation, maintenance and monitoring costs for IRP Site 21 that have been incurred since the remedial action-operation phase commenced in 2003 are summarized in the following Table 9.

Table 9: Annual OU-3/IRP Site 21 Remedial Action-Operation Costs

Dates		Total Cost
From	To	
September 2003	January 2004	$1,198 note 1
February 2004	January 2005	$40,385 note 1
February 2005	January 2006	$43,011
February 2006	January 2007	$30,000
February 2007	January 2008	$29,770

Dates		Total Cost
From	To	
February 2008	January 2009	$25,430
February 2009	January 2010	$30,000
February 2010	August 2011	$30,000 note 2
August 2011	August 2012	$23,000

Note: 1 The costs for the six-month start-up and prove-out O&M period that ended in March 2004 and a post-RA "baseline" groundwater and surface water monitoring event in October 2003 were included in construction contract.
Note 2: Includes non-recurring costs for one (1) additional recovery well, booster ORC injection and replacement of recovery well road vaults

V. Progress Since the Last Five-Year Review

Third (2007) Five-Year Review Issues – There were no issues related to current site operations, conditions, or activities that affect current and/or future protectiveness of any of the Hanscom Field/Hanscom AFB remedies.

Third (2007Five-Year Review Recommendations and Follow-up Actions

Recommendation: Continue to implement Remedial Process Optimization initiatives for the OU-1 Dynamic Groundwater Remediation System as suggested by operational experience, monitoring and the evolution of new applicable remediation technologies to complete the cleanup in the most cost effective and timely manner possible.

Progress:

- Aug 07 to date– various adjustments to the Remediation Systems Monitoring and to both the Phase 1 (via laboratory) and the Phase 2 (via on-site GC) of the Long-Term Monitoring Program (see pages 13 to 15 in **Attachment C-1)**
- Aug 07 – Commenced another VER phase following a permanganate injection remediation period
- Sep 07 – Revised VER system to include extraction from converted monitoring well RAP1-3R.
- Jul 09 – Installed hydrant stub-up tapped off the Site 2 recharge piping to provide an alternate or additional recharge capability at Site 2, however, has yet to be used
- Sep 09 – Installed hydrant stub-up tapped off the Site 3 recharge piping to provide a recharge capability at Site 1 and the diversion of treated groundwater to discharge on the surface of the Site 1 source areas is expected to commence later this summer (2012).
- The OU-1 ROD required the Air Force, in consultation with the EPA and Mass DEP, to establish restrictions prohibiting the construction of wells and the use of groundwater in any documented or anticipated area of groundwater contamination. These restrictions shall be in place within 1 year of the ROD's 2007 signature. In retrospect these restrictions were already in place, specifically Section 8 of the Bedford Board of Health Code of Health Regulations requires that any landowner obtain a permit for the installation of wells anywhere in the Town of Bedford. While this does not specifically "prohibit" wells in the Jordan Conservation Area and Hartwell Town Forest it does ensure that the Board of Health would be involved in the decision. See **Attachment J-3**

Recommendation: Determine whether or not dissolved thallium is a contaminant of concern in the on-site groundwater at OU-3/IRP Site 6.

Progress: Commencing with the October 2008 Long-Term Monitoring event for IRP Site 6 the analysis method for thallium was changed from Method 6010 to the more definitive Methods 7841 or 6020. As shown in **Attachment G-4** there has been no exceedances of the Thallium MCL when analysis was by Methods 7841 or 6020. It is concluded that Dissolved

Thallium in groundwater is not a Contaminant of Concern at OU3/IRP Site 6

Recommendation: Determine whether or not the groundwater compliance boundary is adequately defined by the current network of monitoring wells.

Progress:

- In 2008 completed installation of an additional surface aquifer monitoring well (MW6-125U) to better define the groundwater compliance boundary as revised in 2006 and completed installation of two (2) additional surface aquifer monitoring wells (MW6-123U & MW6-124U) to evaluate the north/northwest side of the Shawsheen River down gradient of IRP Site 6 (see **Figure 23**).
- In 2008 expanded the surface water monitoring program from one sampling point in the wetlands by including a sampling point in the pond north of the former railroad spur and two points in the Shawsheen River (one upstream of IRP Site 6 and one near the northern most point of the groundwater compliance boundary (see **Figure 24**).
- In 2010 received Massport's permission to sample and analyze for dissolved arsenic six (6) monitoring wells installed by Massport to provide data for a Hanscom Field **Storm Water** Model. These wells are on the north/northwest side of the Shawsheen River down gradient of IRP Site 6 (see **Figure 15**). Subsequently have continued to include 2 of the 6 wells in the Long-Term Monitoring Program for Site 6.
- Dissolved arsenic continues to be periodically detected in the Groundwater Compliance Boundary's surface aquifer at levels above the MCL. Dissolved arsenic concentrations at levels above the MCL have also been found in 5 of the 6 Massport Storm Water Model wells on the far side (north/west) of the Shawsheen

In summary progress has been made but not definitive enough to satisfactorily address this recommendation. Thus it will be carried over as a recommendation of this Review.

Additional Progress

Superfund Site

- **Preliminary Close Out Report** for the Hanscom Field/Hanscom AFB NPL Site issued by the Environmental Protection Agency (September 2007)
- **Federal Facility Agreement** established (signed by the Air Force on 10 September 2009 and the Environmental Protection Agency on 18 September 2009)
- **Modified Comprehensive Site Evaluation Phase 1, Military Munitions Response Program (MMRP)**, Hanscom AFB, MA completed by the Air Force (April 2010)
- **Appendix F (Initial Site Management Plan) to the Federal Facility Agreement** issued by Hanscom AFB (April 2010)

OU-1/IRP Sites 1, 2 and 3

- **Record of Decision** issued - (signed by the Air Force on 14 September 2007 and the Environmental Protection Agency on 28 September 2007
- **Continued Remedial Action – Operation:** Operation, maintenance and monitoring of the dynamic groundwater remediation system and monitoring and enforcing LUCs.
    - Continued monitoring Site 3 for rebound of contaminant concentrations (the collection and treatment of groundwater from Site 3 was stopped in August 2001 because the TCE and cis-1,2-DCE concentrations had declined to near drinking water standards.

OU-2/IRP Site 4

- **Continued Long-Term Maintenance:** Inspection and maintenance of landfill cap and monitoring and enforcing voluntary LUCs.

OU-3/IRP Site 6

- **Continued Remedial Action – Operation:** Inspection, maintenance and monitoring of capped landfill and restored wetland areas and monitoring and enforcing LUCs.
- In 2011 completed a Wetland Mitigation Monitoring & Ecosystem Evaluation as required by the Monitoring Plan included in the Remedial Design for the wetland areas remediated during the construction phase of the Site 6 Remedial Action. Follow-on events are required every five years commencing until 2031.

OU-3/IRP Site 21

- **Continued Remedial Action – Operation:** Operation, maintenance and monitoring of the LNAPL/groundwater recovery and treatment system and monitoring and enforcing LUC
- In 2010 installed an additional active Recovery Well, RW-11A, to address developing petroleum hotspot in the vicinity of monitoring well ECS-31
- in 2011 booster injection of ORC® into Former LNAPL Pool A was completed

VI. Five-Year Review Process

Administrative Components

The Fourth Five-Year Review of Hanscom Field/Hanscom AFB Superfund Site kicked off on 16 February 2012 at a Project Team/Five-Year Review Scoping meeting at Hanscom AFB. Attendees included:

Matthew Audet, US EPA Region 1 RPM;
David Gallagher, MassDEP RPM;
Catherine Foster, Hanscom AFB Restoration Program Manager, and
Thomas Best, IRP Consultant, Portage, Inc.

The Air Forces' plan was to complete the review "in-house" relying on Mr. Best (Hanscom AFB Restoration Program Manager 1994 until retirement June 2011) The Project Team agreed that Hanscom should target to have the "draft" report submitted for comment by the beginning of July to ensure finalization in September.

Community Involvement

The Hanscom AFB Restoration Advisory Board (RAB) has been kept up-to-date as to the status of all of Hanscom AFB's on-going remedial actions. Also Minutes of meetings are sent to all RAB members and others on the RAB mailing list who did not attend the meeting. Meetings since the 2007 Five-Year review to present IRP status updates were held on:

10 June 2008
24 June 2008
28 September 2010, and
20 September 2011

Also at the 20 September 2011 meeting the RAB was notified of the pending/2012 Five-Year Review and that the IRP Update presented at the meeting was a preliminary presentation of the Five-Year Review and that the RAB would be kept apprised of progress towards the finalization of the report.

Community Relations activities in regards to this Fourth Five-Year Review include:

- Memorandum dated 20 August 2012 with a copy of the Executive Summary from the Draft Report was sent to the RAB mailing list and to officials of the 4 surrounding communities.
- The Final Report will be placed in the Bedford Town Library and a notice placed in the local papers announcing that the document is available to the public

Document Review

This five-year review consisted of a review of relevant documents including OM&M records (see **Attachment A - List of Documents Reviewed**). In addition applicable groundwater cleanup standards, as listed in the RODs for OU-1, OU-3/IRP Site 6, and OU-3/IRP Site 21 and the ROD for OU-1, were reviewed (see **Attachment B**).

Data Review

OU-1/IRP Sites 1, 2 and 3 - Operational Data for the "dynamic" Groundwater Remediation System.

General: See **Figure 18** for the locations of the components of OU-1 Groundwater Remediation System and **Attachment C-1** for a summary listing of OU-1 Groundwater Remediation System's Key Dates/Milestones since the 1991 startup. Pages 1 through 11 of this Attachment details operational data, pages 11 and 12 details the development of the monitoring, interceptor and recovery well network, page 13 details changes to the treatment system compliance monitoring and pages 14 and 15 details the long-term monitoring program since 1997 when on-site GC analysis was fully incorporated into OU-1's Long-Term Monitoring Program. The on-site GCs TCE and cis-1,2-DCE results for the groundwater treatment and collection systems samples during this reporting period are documented in the Table/**Attachment C-2.**

The 2nd and 3rd Five-Year Reviews presented a detailed summary of the operational records from system startup in 1991 through the end of calendar year 2006. This, the Fourth, Five-Year Review primarily addresses the data that has been generated since the start of 2007. Operational data is reported in the monthly NPL OU-1 Remedial Action Report which is submitted to stakeholders. See **Attachment C-3** for the Hanscom AFB NPL OU-1 Remedial Action Report for December 2011. Note page 2 of the report which normally includes operational data by month for the current and previous calendar years has not been included. Instead a summary of the monthly operational data for 2007 through May 2012 is presented in Tables/**Attachment C-4** and an annual summary for this period is presented in **Table 10** below. Of special note is the durability/dependability of the system as evidenced by the time-operating percentages. Normally there are only minor/short interruptions of operation for maintenance, minor repairs or equipment swaps and the majority of significant down time periods is weather related, i.e., power outages due to downed trees.

Also please note that all gpm data is based on continuous around-the-clock operation without regard to inoperable periods, e.g., a pump's operating rate is 10 gpm but the pump only operates 50% of the possible minutes thus its average gpm is reported as 5.

Table 10 – OU-1 Groundwater Remediation System Operational Data

	2007	2008	2009	2010	2011	2012 *
Million Gallons Processed	66.4	73.5	70.7	68.8	69.1	29.8
Average gpm	126.4	139.5	134.1	131.0	131.5	136.0
VER Contribution - gpm	0.2	0.3	0.5	0.3	0.2	0.1
On-site Recharge - gpm	2.8	3.5	3.3	4.1	3.7	4.6
GWT Sys Time Operating	96.8%	97.1%	97.4%	98.9%	95.7%	99.97%
Average VOCs - ug/L (off-site lab data)	268.0	240.6	231.5	234.5	180.5	199.1
Effluent VOCs - ug/L	bdl	bdl	bdl	bdl	bdl	bdl

Note VOC data is the average of all monthly samples. bdl = below detection levels
* 2012 is through May

Treatment System: Air stripping towers are very effective at removing VOCs from groundwater and the effectiveness of the OU-1 groundwater treatment system was documented and discussed extensively in the Second (2002) Five-Year Review. The OU-1 system has 2 air stripping towers in series with tower #1 always the lead tower. Treatment system monitoring is a component of OU-1 the Long-Term Monitoring Program, primarily to document compliance with discharge standards but also accomplished for optimization. In this regard from startup to 1999 weekly samples of the central groundwater treatment system's influent, mid-fluent and effluent were analyzed by a commercial laboratory for VOCs and designated metals to monitor the influent's makeup and concentration trends; to assess tower #1's effectiveness and/or identify tower maintenance requirements; and to ensure the continued compliance with discharge ARARs. In addition, commencing in August 1996, duplicates of the weekly samples were analyzed for VOCs by the O&M staff using the on-site GC to be compared to the laboratory result and to validate the on-site GC results.

In 1999 the frequency of laboratory analysis of the influent, mid-fluent and effluent was changed to once a month and, in May 2006, the laboratory analysis of the mid-fluent was suspended. In June 2011 the on-site GC analysis of the mid-fluent was suspended and subsequently, starting January 2012, an RPO initiative to conserve diminishing GC resources changed the frequency of the influent analysis by the on-site GC to monthly and suspended the on-site GC analysis of the effluent. Thus the current system monitoring is monthly laboratory analysis of the influent and effluent and monthly on-site GC analysis of duplicate influent samples. Please note the monitoring of the mid-fluent will be resumed if significant VOC detections start showing up in the effluent. Also see page 13 of Attachment C-1 for a summary of changes to the system's monitoring program.

From startup through the most recent samples the **effluent has met and continues to meet** the discharge ARARs/drinking water standards, almost always with no detections of any VOC.

Also the lead tower (#1) consistently removes all incoming VOCs unless its efficiency is

degraded by the buildup of silt and iron bacteria. Since the 1991 startup air stripping towers #1 and #2 were cleaned and repacked in July 1998 and tower #1 was cleaned and repacked again in November 2008. These events proved to be very effective but they are also a very costly activity. Acid cleaning of the towers to restore the flow capacity lost due to fouling has also been tried in the past, both before and after the 1998 repacking event, but this method was not very effective and it was also almost as costly as cleaning and repacking.

The capacity of the treatment system also has varied due to the normal wear and tear loss of efficiency and iron bacteria and silt fouling of the stripping towers. This can show up in the system's operating factors (differential pressure between a tower air inlet and outlet and the air blower amperage) which indicate that the towers are becoming fouled. Consequently the quantity of influent has had to be periodically restricted/reduced to preclude operational and/or mechanical damage to equipment until the fouling is addressed.

The fact that all of the system's influent VOCs are usually removed by tower #1 is not surprising since the system is significantly over-designed, especially for today's contaminant levels discussed above (and even for the initial/1991 levels which had a high of 5,300 ug/L for TCE). The OU-1 groundwater treatment system was designed for the following influent concentrations:

TCE	=	45,000 ug/L
Trans-1,2-DCE	=	7,500 ug/L
1,2-DCA	=	820 ug/L
Vinyl Chloride	=	35 ug/L

Collection System: The OU-1 groundwater treatment system has processed between 100 to 320 gallons per minute since it became operational and, as of 31 December 2011, a total of 2.037 billion gallons of groundwater has been collected/treated. Chart/**Attachment C-5** graphically shows the gallons treated annually since the 1991 startup and **Table 11** below breaks out the gallons collected and treated annually since 2006 from the individual collection points.

Though the system is designed for 320 gpm, the actual quantity processed as shown above has varied due to operational and other factors. Shortly after the 1991 startup flow from the collection sources became restricted by the growth in the pipes from the pump stations at Sites 1, 2 and 3 to the treatment facility of naturally occurring bacteria that thrives on the iron rich groundwater. This problem was initially overcome by booster pumps and the "pigging" (mechanical cleaning) of the lines. Then, in 1996/7, a construction project)which made major system alterations) upgraded the 3 pump stations' pumps to provide the capability to overcome the pipe fouling and **pump more from the pump stations than the treatment facility can process.** This situation continues to the present.

Table 11 – OU-1 Groundwater Remediation System Collection System Data

		Average gpm				
Collection Source	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Site 1 Trench	13.0	12.6	12.1	8.8	6.4	6.3
Site 1 VER System	0.2	0.3	0.5	0.3	0.2	0.1
Site 2 Trench	70.1	71.2	59.3	64.5	64.1	53.8
Site 3 Trench	0	0	0	0	0	0
BIW #1	13.3	16.4	15.6	15.4	16.8	16.1
BIW #2	6.7	4.7	4.7	5.0	4.8	5.0
BIW #3	14.7	13.4	13.2	13.9	13.5	13.9
BIW #4	3.6	11.7	16.1	12.2	19.7	34.8
IW-5 (Site 2)	2.7	7.7	10.6	8.5	4.5	5.0
IW-6 (Site 1)	1.7	1.0	1.2	2.0	1.0	0.8
IW-7-8-9 (Site 1)	0	0	0	0	0	0
IW-10 (Site 1)	0.1	0.2	0.4	0.1	0.2	0.1
IW-11 (Site 1)	0.3	0.3	0.3	0.2	0.2	0.2
Total	126.4	139.5	134.1	131.0	131.5	136.0

* 2012 is through May

While getting groundwater from the sources to the treatment facility is no longer a problem, collecting the groundwater (getting it out of the ground) is constrained by the design and efficiency of the collection system, and by the weather; e.g., drought conditions result in lower groundwater elevations/reduced amount of groundwater available. As noted earlier the initial (1991) collection system has been augmented by additional interceptor wells (IW-5 thru IW-11) and the Site 1 source area VER system. Also the original Boundary Interceptor Wells' pumps have been upgraded to capture all that the wells will yield. On the operational side O&M shutdowns, pump/motor and power failures and control problems have a short term negative impact on the amount that can be extracted from the ground. Operational issues are eventually resolved, however, an interceptor well's yield as well as the well pump's efficiency can slowly decrease over time due to normal wear and tear, the silting up of the well, and the same iron bacteria fouling that's affecting the piping to the treatment facility. In recent years the quantity of groundwater that can be extracted by the BIWs/IWs has been relatively stable except BIW #4 has been increasing. See Charts/**Attachment C-6 & C-7** for graphs of the yearly average pumping rates for the BIW/IWs. BIW #4's increase in flow rates between 2007 and 2011 is primarily attributed fewer outages due to pump and/or motor failures. The significant increase in BIW #4's pumping rate in 2011 is attributed to the retrofit of BIW #4 in June/July 2011 necessitated by the failure of the direct burial cable that provided power to the pump. Since then the pump has had no operational problems. The current pumping scheme and pumping rates are considered adequate to maintain the effectiveness of the remedial action. Eventually, if/when a well yield reduces to the point that the effectiveness of the remedial action is threatened, an

attempt to rehabilitate the low yielding well(s) will be necessary. If this rehabilitation effort is not successful then new/additional interceptor wells may have to be installed.

Collection System Discharge/Treatment System Influent: The total quantity collected for treatment is only part of the assessment of the effectiveness of the collection system. Just as important is the level of contamination being captured. Subsequent sections of this document include a presentation and discussion of levels of contamination being captured at each distinct collection source while this section addresses the levels and trends of VOCs in the treatment system's influent. The groundwater collected from each source is pumped through the collection system and discharged into an equalization tank at the treatment facility prior to being treated. This process results in the treatment system's influent being a composite sample.

Chart/**Attachment C-8** graphically documents the influent's trichloroethene (TCE) concentrations from the 1991 startup through the end of May 2012. This chart is formatted to show the range of TCE collected in a calendar year with a line from the last analysis of the year connected to the first analysis in the following year. Please note TCE has been the predominant VOC in OU-1's groundwater and, under suitable natural conditions, it eventually biodegrades; initially into cis-1,2-dichloroethene (cis-1,2-DCE), then to vinyl chloride, and finally to ethylene. Ethylene is a harmless compound; however, the complete TCE biodegradation process can take years/decades depending on the natural conditions. In the meantime the other compounds are not harmless and are the target of the OU-1 remedial action.

As seen in **Attachment C-8** there were wide swings in the TCE concentrations through 1998. This is not unexpected as slugs of contamination are collected and processed. Also obvious is a decreasing trend punctuated by a significant jump up in 1997. The decreasing trend is also not unexpected as the initial pool of dissolved-phase contamination within the collection system's zone of influence is readily collected. This is replaced by "cleaner" groundwater moving into the zone which picks up additional contamination dissolving from that absorbed onto the soil and, over time, the amount absorbed onto the soil decreases resulting in lower and lower concentrations entering the collection system. The decreasing trend is evidence of progress towards cleanup but also reflects a decreasing trend in the cost effectiveness of the remedial action.

The 1997 and subsequent jump ups in concentrations reflects the Remedial Process Optimization (RPO) process begun in 1996 to increase both the cleanup effectiveness and the cost effectiveness of the remedial action. At that time the following collection system priorities were established to operate the treatment facility as close to the system's treatment capacity as possible while maximizing influent contaminant concentrations:

Priority 1 - Site 1 Collection Trench, Site 1 VER System, 4 BIWs and IWs
Priority 2 - Site 2 Collection Trench
Priority 3 - Site 3 Collection Trench

Prior to 1997 Site 3, per the original design of the collection system, made up the majority of the treatment system's influent since the Site 3 collection trench physically "yields" more than the other collection points. However, by 1997, Site 3 was the least contaminated of the sources and groundwater collected from Site 3 was in essence diluting the composite influent. Also slightly evident on Chart/**Attachment C-8** is a minor jump up of TCE concentrations at the end of 2001/start of 2002 which reflects the cessation of collection from Site 3 in August 2001. On this chart it is evident that the concentrations are slowly declining as more and more "clean" must be processed to capture the residual groundwater contamination. This asymptotic condition is not uncommon for mature pump & treat systems. Also, as noted above for the past, any future RPO changes to minimize the amount of cleaned groundwater being captured and treated should increase the influent concentrations. However, this is not expected to increase the cost effectiveness of the remedial action as operation of the current treatment system is relatively a fixed cost.

While **Attachment C-8** presents the big picture much of the detail in post-97 years is lost due to the scale. See **Attachment C-9** for a Table of the annual average concentrations of the different VOCs found in the influent from 2007 through the May 2012 analysis. **Attachment C-9** also includes a chart of the average annual "total" VOCs for this period. An analysis of this influent analytical data finds that TCE and the initial breakdown compound, cis-1,2-DCE, account for ~ 91% of the VOCs being removed.

On-Site Recharge/Off-site Discharge - As discussed earlier in this document recharge basins were constructed at Site 2 and Site 3 to re-inject the treated groundwater with the objective of augmenting/increasing the natural soil flushing action that removes contaminants absorbed onto the soil in the vadose zone/above the groundwater level. The original design was to recharge 250 gpm with the remainder of the treatment system's capacity (70 gpm) being discharge to surface waters leaving the site (discharge point is Hanscom Field storm water discharge ditch flowing into Wetland B/beaver pond north of Hanscom field). However, as with the collection and treatment systems, iron bacteria growth in the recharge pipes restricted flow from the recharge pipes and recharging was stopped at Site 2 in January 1992 and at Site 3 in March 1992. Since 1992 there has been periodic recharging at both Site 2 and 3, however, commencing in July 2001 the maximum rate possible has been recharged at Site 2 in an effort to flush out any residual contamination in the soil above the water table. As noted above in **Table 10** the recharge rate at Site 2 has ranged from 2.8 to 4.6 gpm since 2007. In addition, as noted in **Attachment C-1,** a hydrant stub up tapped off the Site 2 recharge piping was installed in 2009 to provide an alternate or additional recharge capability at Site 2 by discharging on the surface of the recharge basis. Another 2009 RPO Initiative was to tap off the recharge piping to Site 3 and install a hydrant stub up in the vicinity of the Site 1 gate to VER area and burn pits to provide the capability to discharge on the surface at Site 1. This was completed in September 2009, however, as of May 2012, neither the Site 1 nor the Site 2 surface recharge hydrants have been used.

Source Areas Contaminant Concentrations: As stated earlier in this document, data initially collected for the OU-1 remedial action concerned the groundwater treatment facility's operation and compliance with discharge standards and did not include monitoring the contaminant concentration at individual collection sources. In 1997 it was realized that source data was needed to better optimize the OU-1 remedial system and a portable GC provided in the original construction contract as a support item was available to do on-site analysis for a minor cost. The O&M program was revised to include the analysis of both the treatment systems' samples and samples collected from the Site 1 VER area, each of the 3 pump stations, and from each BIW/IW. This analysis is performed by the O&M staff using an on-site gas chromatograph (GC). Note that only the 2 principal contaminants of concern (TCE and cis-1,2-DCE) are quantified during this on-site analysis (see Attachment C-2 for the results of the on-site GC analysis during this Review period). A discussion of the Collection System Point Source data follows. Also note Site 3 has been omitted from this section of the report because there has been no collection at this site since August 2001.

Site 1 Source Area Vacuum Enhanced Recovery (VER) System: The VER system was initially installed and operated by Arcadis Geraghty & Miller as an AFCEE Technology Demonstration Project conducted in 2 phases; between December 1997 and June 1998 and between October 1998 and April 1999. **Figure 20** is a layout of the site and the components of the system include 4 recovery wells and a trailer outfitted with a 15 HP liquid ring vacuum pump to extract vapor and liquid (groundwater and/or DNAPL) from the recovery wells, a vapor/liquid phase separator, 2 granular activated carbon (GAC) units in series to treat the recovered vapor, and a pump with flow meter to transfer the recovered liquid to the Site 1 pump station for subsequent treatment by the central groundwater treatment facility. The 4 recovery wells are installed at the corners of a 40-ft square with RAP1-3R in the center of the square. Each well was installed to specifically recover vapor and liquid from the bedrock fractures.

During the demonstration phases a total of 707,522 gallons of contaminated groundwater was recovered and processed by the central groundwater treatment facility. It was estimated that this system recovered an average of 2.4 pounds of VOCs per day that it operated, 1.4 via the vapor phase and 1.0 via the liquid phase. Due to the success of the demonstration the VER system was restarted on 28 April 1999 as a component of the OU-1 remedial action. The VER system subsequently operated continuously until 18 June 2001 (except for the period between 29 June 1999 and 22 October 1999 when high humidity made it impracticable to meet vapor phase discharge standards). During this period of operation a total of 1,323,232 gallons of contaminated groundwater was recovered.

At the time of the Second (2002) Five-Year Review the operation of the VER system had been suspended (on 18-June 2001) for the duration of a permanganate pilot study in the same area. The objective of this pilot study was to determine if permanganate injection/in-situ oxidation would be more effective than the VER system as a technology to use to clean up this source area. The field phase of the pilot study was completed in the fall of 2002 and a new phase of VER commenced on 10-October 2002. It was concluded that both technologies were effective but that

VER has a short-term advantage due to its ability to actively draw the contamination to the recovery wells and the fact that the system was already in-place. It was also concluded that periodic permanganate injections should also be incorporated in the remediation strategy. Subsequently, around-the clock VER continued until 31-July 2006 except for maintenance and repair periods. Between 31-July 2006 and August 2007 VER was again suspended for the duration of a permanganate treatment of the same area.

A new VER phase commenced 9 August 2007, however, operational and maintenance issues have limited operation to 32.7% of the time between 18 June 2007 & 31 Dec 2011. The most recent shutdown lasted from August 2011 until the system was repaired and placed in operation on 30 April 2012. **Attachment C-10** provides the operational data for this period and includes the results of both the on-site and off-site laboratory analysis of the vapor stream as it flows through the treatment system. Chart/**Attachment C-11** graphically depicts the system's liquid effluent (gallons transferred to the Site 1 Pump station) and periods of shutdown since the start of the VER demonstration project in 1997. When operating the system's vapor is analyzed on-site using a flame ionization detector (FID) and by an off-site laboratory using a method developed by Microseeps. While vapor data is collected to ensure that the treatment system complies with the vapor discharge criteria (at least 95% of the VOCs entering are removed before being discharge to the atmosphere) it also reflects the amount of total VOCs being extracted from the subsurface in the vapor phase. In addition the on-site GC analysis program also includes the VER system's liquid effluent and the effluent's TCE and cis-1,2-DCE concentrations are documented on Page 8 of **Attachment C-2**.

A summary of key 2007-2012 operational data is presented in **Table 12** below.

Table 12 – Site 1 VER System Operational Data

	2007	2008	2009	2010	2011	2012
Gallons Processed	84,660	169,271	285,948	161,970	114,300	22,430#
Average gpm	0.2	0.3	0.5	0.3	0.2	
VER Sys Time Operating	19.8%	24.6%	46.0%	33.5%	23.8%	55.9% #
Vapor Influent* – Ave VOCs - ppmv	15.9	15.4	10.7	7.8	7.8	7.0
Liquid Effluent* – Ave TCE - ug/L	69	54	94	47	58	31#
Liquid Effluent* – Ave cis-1,2-DCE - ug/L	65	48	139	59	59	65.5#

- May 2012 data * - Analytical via on-site GC and FID

Also note a RPO initiative in 2007 before restarting the system was the addition of a runtime (hour) meter to better access performance.

Chart/**Attachment C-12** graphically depicts the annual average of the total VOC concentrations in the VER system's vapor phase influent for 2000 through 2011. Calendar year 2000 has been selected as the starting point for this chart as it was the last full year of operation before the permanganate pilot study (June 2001 through December 2002). This chart shows relatively

constant levels in 2000 and 2001 prior to the shutdown. When the system was re-started following the permanganate injection phase the concentrations being recovered in the vapor phase were significantly reduced (~63%) and continued to slowly decline until the 31 July 2006 shutdown for another permanganate injection period. When the system was re-started in 2007 (following the permanganate injection phase) the concentrations being recovered in the vapor phase were again significantly reduced (~56.5%) and continued to slowly decline through the August 2011 shutdown due to operational problems (see Chart/**Attachment C-13** which graphically depicts the ups and downs and periods of no operation during the current VER phase). It is noted that the low concentrations of VOCs currently being recovered calls to question the cost effectiveness of continuing VER.

Please note that, the VER system is dual phase and contaminants are extracted from the subsurface in both a vapor phase and a liquid phase. However, the VER process transfers a significant amount of the recovered VOCs from the liquid phase to the vapor phase, thus the VER system's liquid effluent concentrations do not completely reflect the level of contamination being recovered in the liquid phase. Chart/**Attachment C-14** graphically depicts the annual average TCE and cis-1,2-DCE concentrations (determined by the on-site GC analysis) in the liquid effluent from the recovery system from 2000 through 2011. As shown in Chart/**Attachment C-14** the liquid effluent's VOC concentrations have mimicked the vapor VOC concentrations shown in **Attachment C-12**.

Attachments C-10 thru **C-14** appear to support a conclusion that the combination of VER and permanganate injections have removed and destroyed a significant amount of the contaminants in the bedrock aquifer at the Site 1 Burn Pit #1 and Burn Pit #1 Runoff Area. To better assess the residual level of contamination in the site's groundwater the VER system is periodically shut down for a short period of time to recharge and sample the 4 recovery wells (VER RWs 1, 2, 3 & 4). These samples are analyzed for TCE and cis-1,2-DCE concentrations with the on-site GC (see **Attachment C-15** for results). As discussed earlier in this document these recovery wells are located in a confirmed DNAPL area. The wells are constructed to principally recover contamination from the bedrock fractures by using a very high vacuum to dewater the wells and volatilize the DNAPL. The results of this sampling and analysis show that there are wide fluctuations within each well and identification of trends is difficult.

It is interesting to note that the Long-Term Monitoring results for monitoring well RAP1-3R in the center of the box (with the VER RWs at the corners) prior to 2007 did not appear to be following the same decreasing trend found in the VER system's vapor and liquid effluent. Long-Term Monitoring results for RAP1-3R are discussed in a later section and are graphically depicted on Chart/**Attachment F-2**. **Attachment F-2** shows that the TCE concentrations over time (analysis via off-site laboratory analysis) have range from a high of 1,100,000 ug/L in June 1996 (a concentration indicative of DNAPL), 152,600 ug/L in September 2001 and 142,000 ug/L in November 2006. While the pre-2001 reduction is significant (most likely due to the operation of the Site 1 VER system and/or permanganate injections) the relatively constant levels between 2001 and 2007 were indicative of a nearby DNAPL source which was not in the VER system's

primary area of influence. Based on this observation what may be the **most important RPO initiative during this reporting** period was accomplished in September 2007. This was the conversion of monitoring well RAP1-3R to a VER well to augment the existing 4-well system and VER from RAP1-3R commenced on 13 Sep 2007. Since then a downtrend commenced and by November 2011 the TCE concentration was down to 3,300 ug/L. Charts/**Attachment C-16** through **C-20** graphically depicts the TCE and cis-1,2-DCE concentrations found in the VER system's 5 recovery wells between July or September 2006 and May 2012 (analysis via on-site GC analysis). These charts also show that even with the operational problems the current VER phase appears to be successfully reducing the mass of contaminants at the Site 1 Burn Pit #1 and Burn Pit #1 Runoff Area. However, since concentrations in the parts per million ranged continued to be found in the groundwater there is still a significant contaminant mass remaining in this area. It is planned to start using the on-site surface recharge capability put in place in 2009 in an attempt to flush more of the residual DNAPL and/or dissolved phase into the VER system's and IW-10's area of influence. It is planned to surface recharge for 3 to 6 months and then evaluate it's effect and also evaluate the cost effectiveness of continuing VER at Site 1.

Site 1 Pump Station (see Chart/**Attachment C-21**). This pump station's effluent is a composite of the discharge from the Site 1 collection trench, BIW-1, BIW-2, IW-6, IW-10, and the Site 1 VER system. IW-7/8/9 also discharge into this pump station, however, these wells have not been operated since April 2007. These collection system point sources, other than the collection trench, are also discussed separately. Between 1997 (the time on-site GC analysis began) through 2012 the Site 1 pump station's effluent TCE and cis-1,2-DCE concentrations initially had a significant decreasing trend which gradually became asymptotic and a relatively flat line condition continued throughout this reporting period as shown on Chart/**Attachment C-21**. Also, the TCE-cis ratio remained constant over this period at 4.0 +/-. Base on this data (in conjunction with the other Site 1 data) is concluded that there remains a continuing DNAPL source. Long-Term Monitoring data discussed in a later section shows that the cleanup of the surface aquifer almost complete, however, the continued operation of the pump station is required to transfer the contaminant mass recovered from other than the collection trench to the central treatment system.

Site 2 Pump Station (see Chart/**Attachment C-22**): This pump station's effluent is a composite of the discharge from the Site 2 collection trench, BIW #3, BIW #4, and IW-5. These sources, other than the collection trench, are also analyzed separately. The Site 2 Pump Station's effluent TCE and cis-1,2-DCE concentrations initially had a significant decreasing trend which were gradually approaching the asymptotic condition by the time of the 2007 Five-Year Review. During this reporting period these concentrations have decreased slightly. Also, the TCE-cis ratio which was 0.9 in 1998 has remained constant over this period at 0.3 +/-. Base on this data (in conjunction with the other Site 2 data) is concluded that there is very little contaminant mass remaining at Site 2 and, as with the Site 1 Pump Station, the continued operation of the Site 2 Pump Station is required to transfer the contaminant mass recovered from other than the collection trench to the central treatment system. It is also noted that biodegradation is a contributor to the cleanup of the groundwater in the Site 2 area.

Site 3 Pump Station – as noted above active recovery from Site 3 was suspended on 22 August 2001 therefore there is no pump station data for this review period.

Boundary Interceptor Well Number 1 (BIW-1) (see Chart/**Attachment C-23**). This well is constructed to recover groundwater from the lower (glacial till) and bedrock aquifers. It has a 60' screen set in the bottom 8' of the glacial till the remaining 52' set in the bedrock. At the time of the 2007 Five-Year Review the TCE concentration being recovered had appeared to be at a plateau just under 100 ug/L and that the cis-1,2-DCE concentrations were either below detection levels or at low levels which indicates that biodegradation is not a significant contributor to the cleanup in this part of OU-1. This situation has changed during since then with concentrations gradually increasing. Also cis-1,2-DCE ratio is now relatively constant at 5.0+/- as opposed to 20 +/- in 1997. However, the hypothesis discussed in the 2007 Five-Year Review in not completely invalidated by the 2007-2011 results. It is still considered that. The groundwater contamination being recovered BIW-1 is the "dissolved" phase from a DNAPL source outside the well's area of influence. However, the change in the TCE-cis ratio indicates that biodegradation is becoming evident and the fact that the TCE concentration has increased can be attributed to more effective recovery due to a change in pump size in May 2007 (the average pump rate for the 2002-2006 period was 14.9-gpm and the rate for 2008 -2011 was higher at 16.1-gpm). Note, in May 2007 the 33-gpm pump failed and was replaced by a 25-gpm pump providing a longer run time before the well shutdown because it was pumped "dry". Due to its location and the fact that nearby bedrock well RAP1-1R screened in the top 24' of bedrock is "cleaned" whereas BIW-1 is screened 52' into the bedrock it has been concluded that the contamination being captured by BIW-1 is being pulled from a distance source through a deep bedrock fracture. Also note that in 1998 the TCE concentration being captured averaged 829 ug/L. Thus BIW- 1 has made some progress to the cleanup of its area of influence and continued operation of BIW #1 is warranted.

Boundary Interceptor Well Number 2 (BIW-2) (see Chart/**Attachment C-24**). This well is constructed to recover groundwater from the lower (glacial till) and bedrock aquifers. It has a 60' screen set in the bottom 6' of the glacial till the remaining 54' set in the bedrock. As noted in the 2002 Five-Year Review both the TCE and cis-1,2-DCE concentrations were on a downward trend and were very close to drinking water standard at that time. Since then the trends continued until 2008 when both TCE and cis-1,2-DCE reached the below detection levels (bdl). Also it should be noted that, prior to reaching the current state, the TCE-cis ratio had consistently been in the 0.2-0.4+/- range which indicated that biodegradation had been a contributor to the cleanup of the groundwater being captured by this well. Based on these observations it appears that operation of BIW-2 may no longer be necessary. However, since BIW-2 does contributes to the boundary's containment/capture zone the necessity for continued operation needs to be evaluated by suspending its operation until results for the 2012 and 2013 Annual Long-Term Monitoring events are available and evaluated. Of concern would be the reversal of the down trends now existing in upgradient monitoring wells B126 (lower), B-242 (lower), and B243 (bedrock) and downgradient/off-site wells B-245 (lower) and B244A

(bedrock).

Boundary Interceptor Well Number 3 (BIW-3) (see Chart/**Attachment C-25**). This well is constructed to recover groundwater from the lower (glacial till) and bedrock aquifers. It has a 60' screen set in the bottom 5' of the glacial till the remaining 55' set in the bedrock. As noted in the 2007 Five-Year Review the TCE concentration being captured by BIW-3 had declined to the point that it was approaching its MCL and the cis-1,2-DCE concentration was relatively stable below its MCL at ~ 40+/- ug/L. Since then further declines have been noted and, in 2008, TCE reached the bdl and the cis-1,2-DCE has ranged from bdl to 9 ug/L. While, BIW-3 is no longer capturing significant levels of contamination it does contributes to the boundary's containment/capture zone and continued operation is warranted as long as contaminant concentrations in downgradient/boundary monitoring well RAP2-3T (lower aquifer) exceed MCLs. Recent Long-Term Monitoring data for RAP3-1T appears to indicate that a pocket of contamination (primarily cis-1,2-DCE is being pulled back from off-site into the RAP2-3R area.

Boundary Interceptor Well Number 4 (BIW-4) (see Chart/**Attachment C-26**). This well is constructed to recover groundwater from the lower (glacial till) and bedrock aquifers. It has a 60' screen set in the bottom 5' of the glacial till the remaining 55' set in the bedrock. As noted in the 2002 Five-Year Review both the TCE and cis-1,2-DCE concentrations had peaked, and were on a significant downward trend. Since then the decreasing trends have continued though the TCE concentration appears to have leveled off at a level slightly above its MCL. The TCE-cis ratio has declined from > 2.0 in 1997 to < 0.1 in 2007where it remains to the present. This is an indicator that biodegradation may be a significant contributor to the cleanup of the groundwater being captured by this well. Operational problems have plagued BIW-4's for many years as shown on the graph of its long-term pumping rates (see Chart/**Attachment C-27**). As noted earlier the increase in flow rates between 2007 and 2011 is primarily attributed fewer outages due to pump and/or motor failures. However, the failure of the direct burial cable powering the pump necessitated a complete retrofit of this BIW. Power is now obtained from a 230V source as opposed to 480V and new controls and new 18-gpm pump were installed. Since then the pump has had no operational problems and the around-the-clock pumping rate for 2012 through May is 34.8-gpm. BIW- 4 has made significant progress in the cleanup of its area of influence and continued operation of BIW-4 is warranted.

Interceptor Well Number 5 (IW-5) (see Charts/**Attachments C-28 & C-29**). This well, constructed to intercept/recover groundwater contamination in the lower (glacial till) aquifer in the immediate vicinity of the Site 2 source area, was added to the collection system in August 1997. It has a 5' screen in a thin glacial till layer (reported by the driller to be very dense grey medium sand with rock fragments and trace of silt) under the lacustrine layer. Its primary purpose is to "contain & capture "the lower aquifer contamination originating in the Site 2 source areas (drum burial pits) and not allow it to be pulled to the boundary by BIW-3 and BIW-4. Chart/**Attachment C-28** shows that for the current reporting period the contaminant concentrations being captured by IW-5 have leveled off but remain well above MCLs in the part per million range. Chart/**Attachment C-29** presents the long-term (since analysis began in

1997) results. As noted in the 2002 Five-Year Review both the TCE and cis-1,2-DCE concentrations rapidly declined following startup to a plateau at 500+/- ug/L each, However, between 2001 and the latter part of 2003, concentrations were in an up-trend peaking in 2003. At this time both the TCE and cis-1,2-DCE concentrations began trending down through the end of 2006 when another significant 2-year up-trend commenced. A third up-trend which commenced in the fall of 2008 is now underway but this time it is only cis-1,2-DCE that is participating. Also of note is that the TCE-cis ratio declined from the +1.0 range at the start of analysis to an average of 0.1+/- in 2006 and has remained at this ratio to this date. The IW-5 data shows that pockets of significant contaminants are being pulled in and captured and that biodegradation is under way at the Site 2 source area. It is also concluded that IW-5 is achieving its objectives and that continued operation of IW-5 is warranted as it is a significant contributor to the cleanup of the Site 2 groundwater. However, as noted in Table 11 in the Collection System subparagraph, IW-5's yield has varied from a low of 2.7-gpm to a high of 10.6-gpm with recovery limited by the fact that it has only a 5' screen set in a thin layer of glacial till. Measures to enhance the yield of IW-5 are limited to ensuring its around-the-clock operational status or installing additional IWs in the Site 2 area to expedite the cleanup.

Interceptor Well Number 6 (IW-6) (see Charts/**Attachments C-30 & C-31**). This well, constructed to intercept/recover groundwater contamination in the bedrock aquifer near the Site 1 source area, was added to the collection system in August 1997. It is an open core well drilled 60' into the bedrock. Its primary purpose is to "contain & capture "the bedrock aquifer contamination originating in the Site 1 source areas (Burn Pits 1 and 2 and Burn Pit #1 Runoff area) and not allow it to be pulled to the boundary by BIW-2, BIW-3 and BIW-4. Chart/**Attachment C-30** shows that for the current reporting period the contaminant concentrations being captured by IW-6 have slowly trended down but remain well above MCLs in the part per million range. Chart/**Attachment C-31** presents the long-term (since analysis began in 1997) results. As noted above for IW-5 the concentrations being captured by IW-6 have gone through down and up-trend cycles since it is startup in 1997. Also the TCE-cis ratio has consistently been in the 4.0+/- range during the reporting period. Normally a ratio in this range is considered an indication that biodegradation is not a significant contributor to cleanup, however, the level of cis-1,2-DCE being recovered by IW-6 does indicate that biodegradation is on-going in this part of OU-1. It is also concluded that IW-6 is achieving its objectives and that continued operation of IW-6 is warranted as it is making a significant contribution to the cleanup of the Site 1 groundwater. However, as noted in Table 11 in the Collection System subparagraph, IW-6 is a very low yielding well with recovery limited by the absence of fractures in the bedrock (only 1 notable fracture 23' into the bedrock) was reported by the driller. Measures to enhance the yield of IW-6 are limited to ensuring its around-the-clock operational status or installing additional IWs in the Site 1 area to expedite the cleanup.

Interceptor Wells Numbers 7, 8 & 9 (IWs-7, 8 & 9) (see Charts/**Attachments C-32, C-33 & C-34**). These 3 wells were originally installed as bedrock aquifer monitoring wells associated with the VER demonstration project and are shown on **Figure 19** as GM-97-M2, GM-97-M3 and GM-97-M4 respectively. They were converted to interceptor wells in April 1999 but, as earlier

discussed; these wells were not operated after the 2001 permanganate injections in the VER area until late 2006 when they ran for about 6-months. Since April 2007 they have only been used as monitoring wells. However, IWs-7 & 9 were used as permanganate injection wells in 2001 though IW-7 accepted very little. The following **Table 13** was included in the 2007 Five-Year Review. It shows that, following startup of the VER system and pumping from these wells, concentrations of both the TCE and cis-1,2-DCE in these wells were initially very high and declined rapidly to relatively low levels by 2006.

Table 13 – Site 1 VER Area - Average Annual Concentrations in IWs #7, 8 & 9

	IW #7		IW #8		IW #9	
	TCE	**cis-1,2-DCE**	**TCE**	**cis-1,2-DCE**	**TCE**	**cis-1,2-DCE**
1998	7,562	2,291	96,000	bdl (<1,000)	43,740	bdl (<1,000)
1999	117,102	5,651	73,207	2,837	6,427	1,057
2000	19,955	2,383	6,495	2,098	4,354	1,432
2001	3,067	1,658	911	1,016	3,886	1,619
2002	3,136	1,855	1,594	1,233	119	61
2003	700	602	117	398	38	125
2004	616	321	126	386	19	87
2005	685	961	102	273	14	54
2006	134	119	529	518	15	49
Pre 31-Jul-06	68	38	8	143	15	67
Aug-Dec-06	244	249	1,398	1,143	15	19

Note: This is the same Table as that included in the 2007 Five-Year Review

Since the 2007 Review concentrations in these wells have been up and down, often times at very low/bdl levels. Charts/**Attachments C-32, C-33 and C-34** show the results of the individual sampling events during this reporting period. These results are an indication that slugs of contamination are periodically passing through the area. Operation of the VER system and/or significant rainfall most likely reasons for the movement of pockets of contamination from an upgradient source. Also of note is that there are orders of magnitude differences between these 3 wells as can be seen by the scale used for each chart. Highs for IW-7 are in the multi ppm range, IW-8 gets up to 1 ppm and IW-9 gets up to 100 ug/L (ppb). As noted above operation of the VER system has been sporadic but also beneficial and as noted in the 2007 Five-Year Review the periodic permanganate injections have also been beneficial. The re-activation of recovery by these 3 IWs should be re-evaluated following completion of the current VER phase.

Interceptor Well Number 10 (IW-10) (see Chart/**Attachment C-35**). This well was added to the collection system in July 1999 and was constructed to intercept/recover groundwater contamination in the overburden and the top two (2) feet of the weathered bedrock surface. It is located near the center of the Site 1 Burn Pit #2 (see **Figures 11 and 18**) and is considered to be outside the VER system's area of influence. Its primary purpose is to "contain & capture" any residual overburden/bedrock surface contamination in the Burn Pit #2. However, since September 2005 the pump has only been operated during non-freezing weather. This is because

the in-ground pump discharge line to the Site 1 pump became clogged and it was not considered cost effective to replace it. Instead an inexpensive surface laid discharge line is used during non-freezing weather. The make-up of the overburden at Burn Pit #2 (clean fill (sand) on top of glacial till which is primarily clay limits the effectiveness of IW-10. Its yield is minor (see Table 11 in the Collection System subparagraph) except when the surface sand becomes saturated. Chart/**Attachment C-35** shows that the TCE concentrations have relatively stable in recent years and also shows that the cis-1,2-DCE concentrations at this well are usually below detection levels which is an indication that there is little to no biodegradation underway. In conjunction with the Long-Term Monitoring data for monitoring well V-1 it does appear that a significant TCE source remains at this burn pit area. Unfortunately, under current conditions completing the removal of the residual source at Burn Pit #2 may take an extremely long time. Recharging of treated water on the surface of this area and other measures to enhance the yield of IW-10 and/or expedite the elimination of this source will be evaluated in the future.

Interceptor Well Number 11 (IW-11) (see Chart/**Attachment C36**). This well is believed to be located near the center of the Site 1 on-site plume and is shown on **Figure 18** and **21** as IW-11 (IRZ-2). It was originally installed as a 4' lower/glacial till aquifer monitoring well IRZ-2 associated with the 2000-2002 demonstration project to create an in-situ reactive zone (IRZ) by the periodic injections of the molasses (see **Figure 20** for the IRZ Project's a site layout plan). In June 2006, following the conclusion of an extended post-molasses injection monitoring period, the monitoring well was converted to an interceptor well with the purpose to intercept/ recover residual groundwater contamination and complete the cleanup of the IRZ area. However, as noted in Table 11 in the Collection System subparagraph it is a very low yielding well with recovery limited by its 4' diameter and the location of its 10' screen in tightly packed very poorly sorted layers of sand and grey silt (glacial till). At the time of the 2007 Five-Year Review the analytical results were insufficient to determine if any trends were in place at IW-11. But, as seen in Chart/**Attachment C-35,** it now appears that the amount of TCE being captured is remaining relatively constant whereas the cis-1,2-DCE appears to be decreasing. Please note the IW-11's TCE and cis-1,2-DCE concentrations could be coming from the bedrock aquifer and by-passing most of the IRZ which is in the lower aquifer. Specifically, Long-Term Monitoring data for bedrock aquifer monitoring well RAP1-6R (upgradient of IW-11 but downgradient of the molasses injection point) shows that significant TCE and cis-1,2-DCE within the IRZ but in the bedrock aquifer. A more detailed discussion of the IRZ will be presented in the Long-Term Monitoring section which follows. It is also concluded that IW-11 is achieving its objectives and that continued operation of IW-11 is warranted as it is a significant contributor to the cleanup of the on-site plume which originates at the Site 1 source areas. Unfortunately, as with IW-10, under current conditions completing the cleanup of the IRZ area may take an extremely long time. Measures to enhance the yield of IW-11 and/or expedite the degradation/destruction of the residual contaminants in the IRZ area will be evaluated in the future.

Data Review - OU-1 Long-Term Monitoring Data

As discussed in earlier sections of this report the long-term monitoring of OU-1 was initiated in January 1986 and an extensive network of monitoring wells has been established to assess groundwater quality in each of the 3 aquifers of concern within OU-1. The OU-1 monitoring points are shown in **Figure 22**. The current Long-Term Monitoring Program is 2-phased; (1) the annual sampling of selected monitoring wells and a surface water sampling point for analysis of VOCs by an off-site commercial laboratory, and (2) the monthly/quarterly/semi-annually/ annually sampling of selected monitoring and, until January 2012, the surface water sampling point for analysis of TCE and cis-1,2-DCE by the O&M staff using an on-site GC. Table/ **Attachment D** summarizes the laboratory VOC analysis of Long-Term Monitoring samples since the initial monitoring in 1986. This table includes analytical data for the monitoring wells and surface water monitoring point in Phase 1 of the current Long-Term Monitoring Program. Additional data is available in the Annual Long-Term Monitoring Reports for OU-1. Table/ **Attachment E-1** summarizes the 2007-2012 on-site GC results for Long-Term Monitoring Phase 2 samples. The GC results are also included as an attachment to the monthly OU-1 Remedial Action Report as soon as they are available. Charts showing the long-term trends in the VOCs and/or cis-1,2-DCE and/or TCE concentrations at OU-1 monitoring points are at **Attachment F**. Phase 1 Long-Term Monitoring data (laboratory results) are presented if available and Phase 2 (on-site GC) results are presented for wells not currently in the Phase 1 program.

Due to the complexity of the OU-1 groundwater and surface water contamination the analysis of results is best presented by the following sections of OU-1:

- Surface Water
- Site 1 Source Areas
- On-site Plume to include the Hanscom AFB Family Campground (Famcamp) area
- Site 2 Source Areas
- Boundary of Hanscom Field/Hanscom AFB with Town of Bedford Conservation Lands
- Off-site/ Town of Bedford Conservation Lands
- Site 3 Source Areas
- Site 3 Down/side gradient Surface Aquifer Hotspots
- Northwest Area

Surface Water: The Long-Term Monitoring surface water monitoring point (RAP1-4SW on **Figure 23**) is in the Hanscom Field storm water discharge ditch between Sites 1 and 2 which empties into Wetland B/beaver pond north of Hanscom field. This ditch also receives the groundwater treatment effluent that is not recharged on-site. Note the surface water monitoring point is located downstream of the treated effluent discharge point. As graphically depicted in **Attachment F-1,** the TCE concentration in at this monitoring point was 91 ug/L in 1991 just prior to the startup of the groundwater collection, treatment and recharge system. Subsequently, by the June 1996 Long-Term Monitoring event, it had fallen below the TCE MCL and has

remained below it ever since. This is also the case for all other VOCs. These reductions can be attributed to the following: (1) the Site 1 collection trench is successfully containing any residual surface aquifer contamination at the source area precluding its migration to this downgradient location; (2) prior to the operation of the BIW's the drainage ditch received both surface runoff and the discharge from the surface aquifer because the natural vertical gradient was up (from the bedrock, lower and surface aquifers to the surface water). (3) Beaver activity in the area which resulted in a significant rise in the elevation of the surface water which may have changed the vertical gradients. Consequently, the operation of the BIWs and IWs and/or the change in the surface water elevation reversed the natural (up) vertical hydraulic gradients to the point that the surface water was recharging the surface aquifer with uncontaminated water.

As noted in the 2002 Five-Year Review the TCE concentration had declined by 1999 to below 1.0 ug/L and, until the most recent (2011) analysis, was consistently qualified as estimated concentrations because they were below the Reporting Level. However, as shown in **Attachment F-2,** the November 2011 surface water sample's TCE concentration spiked up to 1.5 ug/L. It remains to be determined whether or not this is a reversal of trend. But, as noted in **Attachment C-1**, (OU-1 Key Milestones/Date) in May 2011 Massport removed 10 beavers, installed a beaver deceiver in stream and breeched beaver dam at end of Runway 23-5. As a result of this action the surface water levels in drainage ditch dropped significantly. Unfortunately, the elevations of the RAP1-6 monitoring well cluster have been lost due to a recent Massport Runway Safety Improvement Project which necessitated adjustment of the well heights but did not re-survey the wells to re-establish a measuring point to be used to determine the groundwater elevations in the 3 aquifers for comparison to the surface water elevation. This re-survey will be scheduled to be completed before the 2012 Annual Long-Term Monitoring event and an analysis of the current vertical hydraulic gradients will be included in the 2012 Annual Long-Term Monitoring Report for 2012.

This data review confirms that the Remedial Action Objective (RAO) to "Prevent discharge to surface-water bodies and wetlands of groundwater containing CoC concentrations that exceed federal drinking water standards, state drinking water standards, and state groundwater risk characterization standards" continues to be **met**. However, following completion of all active remedial efforts, a period of Long-Term Monitoring will be required with the hydraulic gradients back to normal in order to confirm the cleanup of the OU-1 surface water.

Site 1 Source Areas: The Site 1 source areas are Burn Pit #1 (with an associated runoff area) and Burn Pit #2. These areas are located on a plateau on the southeast side of Hartwells Hill and are shown on **Figure 11**. Burn Pit #1 is considered the major source of the contaminated groundwater plume migrating away from the site. There is no lacustrine layer at this location and it appears that the waste liquids poured into the pit, or flowing onto the runoff area, were able to make their way through the surficial glacial till and into the bedrock fractures underlying the site.

RAP1-3R (Attachments F-2 & F-3): Bedrock aquifer monitoring well RAP1-3R, at

the downgradient edge of the runoff area and in the center of the VER area, is used to monitor progress towards elimination of this bedrock source. The historical TCE concentrations in this well are graphed in **Attachment F-2**. This chart indicates that, while significant progress towards eliminating the Site 1 contaminant source has been made, a significant amount remains as graphically depicted in **Attachment F-3**. As discussed in the VER and IW-7/8/9 sections earlier in the data review section, the reduction in TCE is most likely due to the combination of extraction by the Site 1 VER system; the in-situ destruction by permanganate; some (limited) removal by IWs-7, 8 and 9; and some biodegradation. At the time of the 2007 Five-Year Review the TCE concentration had plateaued in the 100,000+/- ug/L range but a new downtrend commenced in 2007 and, by November 2011, the TCE concentration was down to 3,300 ug/L. This significant change is attributed to the fact that a new VER phase commenced 9 August 2007 and a RPO initiative converted RAP1-3R to a VER well.

GM MW-1: Bedrock aquifer monitoring well GM MW-1 is located at the Burn Pit #1 boundary with the Burn Pit #1 Runoff Area. A chart of contaminant trends is not included for GM MW-1 as there was only 1 detection of TCE via GC analysis (9 ug/L in June 2007) in this reporting period. All other TCE results were bdl. Also the cis-1,2-DCE concentrations ranged from 86 ug/L in June 2007 to 16 ug/L in September 2011 with several bdls in between.

RAP1-3S (Attachment F-4): RAP1-3S is adjacent to RAP1-3R in VER area and is used to evaluate the presence of a residual source in the surficial groundwater in this source area. As shown in **Attachment F- 4** TCE has only periodically been detected in RAP1-3S and the cis-1,2-DCE concentrations fluctuate above and below its MCL. It is concluded that there is not a significant residual source in the surficial aquifer. This should be confirmed by the plan noted in the VER subparagraph earlier in this report to start surface recharging to see if residual DNAPL and/or dissolved phase can be flushed into the VER system's area of influence. While the objective of recharging is to assess its impact on the bedrock aquifer it will also help to confirm that the surface aquifer is not a significant concern. Also of note that indication that biodegradation is underway as the TCE-cis ratio during this period was 0.2 or less.

V-1 (Attachment F-5): IW-10 is located in the center of this burn pit (see IW-10 subparagraph above) and monitoring well V-1, which is near the center of the pit is used to determine if there is any significant source remaining. Burn Pit #2, while on the same Hartwell Hill plateau as Burn Pit #1, is outside the VER system's area of influence. Also, the 38' of overburden (clean fill (sand) on top of glacial till which is primarily clay) at Burn Pit #2 is somewhat different from that found in the VER area. RAP1-3S has 18' of glacial till which is primarily Brown medium fine sand and gravel. As shown in **Attachment F-5** significant/ fluctuating but somewhat declining levels of TCE have been found in V-1. This chart also shows that the cis-1,2-DCE concentrations at this well are frequently bdl and when present the TCE-cis ratio is > 1, e.g., in November 2011 the ratio is 21.0, an indication that there is no significant biodegradation underway. When viewed in conjunction with IW-10 (which is adjacent to V-1) it does appear that a significant TCE source remains at this burn pit area but that under the current conditions it may take a very long time to achieve RAOs.

Site 1 On-site Plume: The Site 1 plume originally was cigar-shaped (or snake like), extending in a southeasterly direction from the source areas (burn pits) on Hanscom Field to the vicinity of BIW-3 and BIW-4 in the Hanscom AFB Campground area. The Site 1 plume also co-mingles with the Site 2 plume in the Campground area and changes direction to flow northeast into the off-site Hartwell Town Forest. It is believed that the Site 1 plume generally follows a natural trough in the bedrock surface. It is believed that it is following a natural trough in the bedrock surface. Groundwater flow in this area also follows a similar path as documented in the remedial investigation (RI) of OU-1 which included modeling which predicts that the groundwater exits the OU-1 area via discharge to the surface water which flows into the Shawsheen River.

Contamination had been found in all three aquifers of interest (surface, lower/glacial till and bedrock) with the greatest concentrations being in the bedrock. Also as noted in previous Five-Year Reviews, the Site 1 collection trench augmented by IW-6 in 1997 has been effective in capturing/containing the plume (surface, lower/glacial till and bedrock aquifers) flowing away from the source areas towards BIW-3 and BIW-4. It appears that this continues to be the case as the on-site GC results (see Attachment E-1) during this reporting period have been relatively benign (low to bdl levels) for most of the surface and lower aquifers monitoring wells between the source areas and Runway 5-23. Consequently trend charts are not being presented for the following wells (with aquifer monitored noted): B103 (L), B238 (S), B239 (L), CW-4 (L), PO1-4SA (S/L), PT1- SA (S/L), RAP1-2R (BR), and RAP1-5S (S). As discussed below the on-going remedial action is also having a positive impact in the bedrock aquifer on the Site 1 side of Runway 5-23 and its paved approach/overrun areas.

RAP1-5R (**Attachment F-6**): This well is located adjacent to the west end of the surface aquifer collection trench. The intent of the design was that recovery via the trench would capture contaminants from all 3 aquifers of concern due to the hydraulic up gradient. This does appear to have been the as the levels in the bedrock dropped significantly after active recovery commence in 1991 and, by May 1997, the TCE concentration was down to 1,500 ug/L. Subsequently, recovery from the bedrock aquifer by IW-6 began in Aug 1997 and, as shown in **Attachment F-6,** by May 1998 TCE appeared to be at a steady state under 50 ug/L with cis-1,2-DEC at bdls. However, starting in August 03 concentrations jumped up 1-2 orders of magnitude before falling back to bdls via the GC in September 2011. This pattern is considered indicative of a pocket/slug of groundwater with higher contaminant levels passing (or being pulled) through the area. Please note RAP1-5 has been changed to a Phase 1 well in OU-1's Long-Term Monitoring Program and laboratory analysis of a November 2011 sample found TCE at 9.4 ug/L and cis-1,2-DCE at 1.6 ug/L.

B-237 (**Attachment F-7**): This well is located southwest of the collection and believed to be side gradient of the Site 1 source areas but it may be downgradient of the Navy's Southern Flight Test Area. It was initially sampled and analyzed by the off-site laboratory in June 1996 and the results were an unexpected 8,600 ug/L for TCE and 960 ug/L for cis-1,2-DCE. As noted above IW-6 began recovery from the bedrock aquifer in 1997 and its impact was immediately

seen in B-237 samples and by the 2007 Five-Year Review the GC results were down to bdls. The results of monitoring during this reporting period are shown in **Attachment F-7** and it appears that a pocket/slug of groundwater with higher contaminant levels passed (or was pulled) through the area in 2007/8 but bdls have been consistently reported since June 2009. The cleanup of the B-237 area is considered a testament to the effectiveness of IW-6 making a significant contribution to the attainment of RAOs.

B-240 (**Attachment F-8**): This well is located southwest of the collection trench and is between IW-6 and the Runway 5-23 approach/overrun paved area. As shown in **Attachment F-7** concentrations of both TCE and cis-1,2-DCE declined significantly following the 1997 startup of IW-6 and, prior to September 2006, had over a 4-year run when the cis-1,2-DCE was usually bdl and the TCE fluctuating between bdl and 50 ug/L. This was considered an indication that B240 is within the capture zone of IW-6. The results of monitoring during this reporting period are shown in **Attachment F-8** and it now appears that in 2006 pocket(s)/slug(s) of groundwater with higher contaminant levels began passing (or being pulled) through the area. Most likely the source of the current contamination is being pulled back to IW-6 from under the pavement.

IRZ AREA (Figures 20 & 21): As noted in previous reviews the OU-1 remedial action had been less effective in cleaning up the cigar shaped plume in the lower/glacial till and bedrock aquifers in the downgradient area between Runway 5-23 and the Famcamp area. In fact there had been an adverse impact in that BIW-2, BIW-3 and BIW-4 were "pulling" the plume from the source towards the boundary. Once this was recognized RPO initiatives were put in place to counteract this BIW impact. Specifically, in 2000, an ESTCP project commenced to establish an In-situ Reactive Zone (IRZ) in the lower aquifer in the vicinity existing monitoring well cluster RAP1-6S, RAP1-6T & RAP1-6R and the drainage ditch discussed in the Surface Water subparagraph above. This area was considered to be in the heart of the on-site plume emanating from Site 1. A molasses injection well (**IRZ-Inj**) was installed slightly upgradient of the existing well cluster and 5 additional monitoring wells were installed in the area **(IRZ-1 through IRZ-5**). The active injection phase lasted 2-years and the demonstration was considered a success. Subsequently, Long-Term Monitoring data indicates that significant progress has been/is being made to clean-up the lower aquifer in the IRZ area. A positive impact was also noted in the bedrock aquifer (RAP1-6R). Passive monitoring of the IRZ continued until June 2006 when another RPO initiative converted IRZ-2 to an interceptor well (IW-11) to accelerate flow through the IRZ, to contain contaminants in the IRZ, and pull back from the downgradient area.

Long-Term Monitoring trend charts found in **Attachment F** for the IRZ area are as follows:

IRZ-Inj (**Attachment F-9**) – Lower aquifer – June 2000 through 2011
IRZ-1 (**Attachment F-10**) – Lower aquifer – June 2000 through 2011
IRZ-2 – see IW-11 (**Attachment C-32**) – Lower aquifer – November 2007 through November 2011

IRZ-3 (**Attachment F-11**) – Lower aquifer – June 2000 through May 2012
IRZ-4 (**Attachment F-12**) – Lower aquifer – June 2000 through May 2012
IRZ-5 (**Attachment F-13**) – Lower aquifer – June 2000 through May 2012
RAP1-6S (**Attachment F-14**) – Surface aquifer – February 1986 through 2011
RAP1-6S (**Attachment F-15**) – Surface aquifer – November 2007 through November 2011
RAP1-6T (**Attachment F-16**) – Lower aquifer – February 1986 through 2011
RAP1-6T (**Attachment F-17**) – Lower aquifer – November 2007 through November 2011
RAP1-6R (**Attachment F-18**) – Bedrock aquifer – February 1986 through 2011
RAP1-6R (**Attachment F-19**) – Bedrock aquifer – – November 2007 through November 2011

Observations noted for these attachments include:

- TCE in the IRZ-Inj, IRZ-1 & RAP1-6T and RAP1-6R degraded rapidly following the commencement of the molasses injections to the point that TCE is no longer detected in IRZ-Inj and IRZ-1. The fact that there has been no TCE rebound in these wells may indicate that the source of the TCE in this area has been completely eliminated or, if TCE is continuing to migrate or being pulled into the IRZ the effectiveness of the IRZ is resulting in its immediate degradation. The former is believed to be the actual situation considering that upgradient measures (VER, Site 1 Collection Trench and IW-6) are apparently capturing and/or containing any residual the TCE source.

- Cis-1,2-DCE is also being degraded as evidenced by declining trends and the emergence of Vinyl Chloride as a significant CoC.

- Operation of IW-11 is contributing to the cleanup of the IRZ area

- Massport's 2011 removal of the beavers and dam may be resulting in a significant change to the conceptual site model for this area. As noted in the Surface Water subparagraph above the wells in the IRZ area will be scheduled to be re-surveyed before the 2012 Annual Long-Term Monitoring event and an analysis of the current vertical hydraulic gradients should be included in the 2012 Annual Long-Term Monitoring Report for 2012.

Between IRZ AREA and BIW-2: As noted above operation of BIW-2 is "pulling" in some of the plume from the IRZ. Monitoring wells in this area include the 3 aquifer cluster (B-241/2/3).
Long-Term Monitoring trend charts found in **Attachment F** for the area between the IRZ and BIW-2 are as follows:

B242 (**Attachment F-20**) – Lower aquifer – November 2007 through November 2011
B243 (**Attachment F-21**) – Bedrock aquifer – November 2007 through November 2011

A trend chart is not presented for B241 because the surface aquifer in this area was cleaned up (bdls) by 1998. As graphically depicted in **Attachments F-20 and F-21** progress towards attainment of RAOs, albeit slow, continues to be made in the lower and bedrock aquifers in this section of the on-site plume. Also, as noted in the BIW-2 subparagraph above the operation of BIW-2 will be suspended in the summer of 2012 until the necessity for continued operation can be evaluated in the 2012 and 2013 Annual Long-Term Monitoring Reports. Also of note is that the TCE-cis ratio for B242 and B243 is in the 0.3 to 0.5 range and the presence of vinyl chloride are indicators that biodegradation may be a significant contributor to the cleanup of the groundwater in this part of OU-1.

Between IRZ AREA and BIW-3 & BIW-4: As noted above operation of BIW-3 & BIw-4 are "pulling" the plume towards the boundary. Monitoring wells between the IRZ and BIW-3 is the 2-well cluster B107 (Surface)/B113 (Lower) and between the IRZ and BIW-4 is the 3 aquifer cluster (RAP2-2S, RAP2-2T/RAP2-2R). Also 2-well cluster B101 (Surface)/B108 (Lower) is in the area between BIW-3 and BIW-4.

Long-Term Monitoring trend charts found in **Attachment F** for the area between the IRZ and BIW-3 and BIW-4 are as follows:

B113 (**Attachment F-22**) – Lower aquifer – November 2007 through November 2011
RAP2-2T (**Attachment F-23**) – Lower aquifer – February 1986 through 2011
RAP2-2T (**Attachment F-24**) – Lower aquifer – November 2007 through November 2011
RAP2-2R (**Attachment F-25**) – Bedrock aquifer – February 1986 through 2011
RAP2-2R (**Attachment F-26**) – Bedrock aquifer – November 2007 through November 2011
B108 (**Attachment F-27**) – Lower aquifer – June 1994 through 2011
B108 (**Attachment F-28**) – Lower aquifer – November 2007 through November 2011

Trend charts are not presented for B101, B107 and RAP2-2S because the surface aquifer in this area was cleaned up (bdls) by 1998. As graphically depicted in **Attachments F-22 through F-27** progress towards attainment of RAOs, albeit slow, continues to be made in the lower and bedrock aquifers in this section of the on-site plume. Also of note is that the TCE-cis ratio for all wells is in the 0.2 and lower range and the presence of vinyl chloride are indicators that biodegradation may be a significant contributor to the cleanup of the groundwater in this part of OU-1.

In summary the Long-Term Monitoring results for this reporting period show that the RPO initiatives have been effective in counter-acting the adverse impact of the BIWs pulling the on-site plume towards the boundary. However, while the levels of contaminants in the Site 1 on-site plume are now declining, pockets of relatively high levels still remain. It is anticipated that continued operation of the dynamic groundwater remedial system will result in the continued

reduction in contaminant levels and ultimately eliminate the on-site plume attributed to the Site 1 source areas.

Site 2 Source Areas: The Site 2 Source Areas are drum burial pits within the area defined by the rectangular surface aquifer collection trench. These features and the layout of the recharge basin constructed above the pits are shown on **Figure 12**. There is a lacustrine layer at this location and it appears that the waste liquids escaping from the buried containers were initially constrained by the lacustrine layer and were not able to readily make their way into the glacial till and bedrock fractures underlying the site. Contaminant levels in the surface aquifer are monitored by a line of monitoring wells installed diagonally across the source areas (**OW2-1 through OW2-7** from the northwest to the southeast and wells surrounding the collection trench. Contaminant levels in the lower aquifer are monitored at **B115**, located in the center of the site, and B114 installed in the vicinity of the collection trench and IW-5. Please see **Figure 23** for the OU-1 monitoring wells network.

Also as noted in previous Five-Year Reviews, the Site 2 collection trench augmented by IW-5 in 1997 has been effective in capturing/containing the plume (surface and lower/glacial till aquifers) flowing away from the source areas towards BIW-3 and BIW-4. It appears that this continues to be the case as the on-site GC results (see Attachment E-1) during this reporting period have been relatively benign (low to bdls) for several of the surface and lower aquifers monitoring wells at the Site 2 Source Areas. Consequently trend charts are not being presented for the following wells (with aquifer monitored noted):

Surface Aquifer: OW2-1, OW2-2, OW2-7, OW2-8, B105, & B106
Lower Aquifer: B109

Also note several upgradient and side gradient wells in all three aquifers were documented as cleaned in previous Five-Year Reviews and are no longer being monitored.

Long-Term Monitoring trend charts found in **Attachment F** for the Site 2 source area are as follows:

OW2-3 (**Attachment F-29**) – Surface aquifer – March 2007 through February 2012
OW2-4 (**Attachment F-30**) – Surface aquifer – June 1994 through 2011
OW2-5 (**Attachment F-31**) – Surface aquifer – March 2007 through September 2011
OW2-6 (**Attachment F-32**) – Surface aquifer – September 1998 through February 2012
RFW-11 (**Attachment F-33**) – Surface aquifer – February 1986 through 2011
RFW-11 (**Attachment F-34**) – Surface aquifer – March 2007 through February 2012
PO2-1S (**Attachment F-35**) – Surface aquifer – March 2007 through February 2012
B115 (**Attachment F-36**) – Lower aquifer – June 1994 through 2011
B115 (**Attachment F-37**) – Lower aquifer – November 2007 through November 2011
B114 (**Attachment F-38**) – Lower aquifer – November 2007 through November 2011

Since the 2007 review contaminant levels have remained relatively benign at all except **OW2-3, OW2-5** and **OW2-6**. As shown in the **Attachments** during this reporting periods pockets of contaminated groundwater **have** continued to be found which are apparently moving towards the collection trench. These are most likely new pockets being generated by the flushing of residual soil contaminants by both rainfall and the limited recharging that has been ongoing during this reporting period. At **OW2-3** it now appears that the most recent pocket of contaminated groundwater has passed through the area as GC analysis of samples in December 2011 and February 2012 were bdls (**Attachment F-29**). At **OW2-5** the most recent pocket of contaminated groundwater passed through in 2008 as GC analysis of samples from December 2008 through September 2011were bdls (**Attachment F-31**). The only significant residual surface aquifer contamination within the perimeter of the collection trench is located at **OW2-6** which is 10' from the collection trench on the upgradient side. As shown in **Attachment F-31** pockets of groundwater are continuing to pass through the area as has been the case since the commencement of monitoring in 1998.

As reported in previous Five-Year Reviews the most significant historical surface aquifer contamination within the perimeter of the collection trench had been found in the center of the site at **OW2-4** and, as shown by **Attachment F-30,** there have been 2 distinct periods of significant contamination since monitoring began. Between 1994 and 1998 and again between 2001 and 2005 concentrations up-ticked, peaked and then dropped back to below MCLs. This pattern is indicative of "pockets" passing/being pulled through the area on their way to the perimeter collection trench. This movement had also been confirmed by the 2006 on-site GC results for the other source areas surface aquifer wells (**OW2-3 & OW2-5**) which had significant spike-ups in 2006 (after the 2003 peak at OW2-4), especially for cis-1,2-DCE. However, during this reporting period TCE and cis-1,2-DCE concentrations at OW2-4 have consistently been bdl except for one cis-**1**,2-DCE detection at 92 ug/L in March 2008.

Two additional pockets of contaminated groundwater (primarily TCE) in the surface aquifer have historically been found adjacent to, but on the downgradient side of the collection trench. The collection trench has been very effective in capturing the RI identified pocket at **RFW-11** as graphically depicted in **Attachment F-33**. Also as shown by Attachment F-34 during this reporting the TCE concentration has finally dropped below its MCL in the 20111 Long-Term Monitoring Event. Also of note cis-1,2-DCE has been well below its MCL since 1994 and vinyl chloride has never been detection. A little further (65') downgradient is **PO2-1S.** TCE was initially detected at this location in 1998 and since has fluctuated without a discernible trend. This situation has continued during this reporting period as graphically depicted in **Attachment F-35** and, similar to RFW-11, cis-1,2-DCE has never been detected by on-site GC analysis.

Initially it was assumed that the hazardous wastes released in the surface aquifer would readily make their way into the glacial till because of the lacustrine layer underlying the Site 2 source areas. Based on this the original groundwater remediation system did not address lower aquifer contamination at Site 2. While not impermeable the lacustrine layer does act as an aquitard. However, overtime there has been a "bleed" through of contaminants as shown by **Attachments**

F-36 & F37 which graphically depicts the historical analytical results for lower aquifer monitoring well **B115** (located in the center of the Site 2 Source Areas) and **Attachment F-38** which shows the same for **B-114 (** located adjacent to both the collection trench and **IW-5)**. Note a chart is note included for **B109** which, like **B114, is** in the immediate vicinity of the north side of the collection trench. GC analysis during this reporting has consistently been bdl. Two factors contribute to the bleed through: (1) TCE is a sinker, i.e., heavier than water and (2) a reversal from a natural hydraulic up gradient to a down gradient caused by recovery from the lower/bedrock aquifers by the **BIW=3, BIW-4 and IW-5**. Unfortunately pre and early RA analytical results are not available for this area as the analysis of groundwater from **B114** and **B115** did not commence until 1994. Over the years the concentrations of TCE and cis-1,2-DCE in both wells have declined and, during this reporting, are shown to be below or approaching MCLs. Please note that these concentrations of TCE and cis-1,2-DCE do not account for the levels being captured by **IW-5** (see **Attachment C-24**) which could mean that IW-5 is pulling back lower aquifer contamination from the Famcamp area.

In hindsight contaminants had been making their way into the lower aquifer from the surface aquifer source areas and it is now assumed that a significant plume developed in the lower aquifer which, prior to the 1997 activation of IW-5, was flowing towards/being pulled to the north/northeast (and boundary) by the natural flow gradient accentuated by the operation of BIW-3 and BIW-4. As a result it is believed that this lower aquifer Site 2 plume co-mingled with the Site 1 plume in the Famcamp area. The contamination in 2 lower aquifer monitoring wells north/downgradient of the Site 2 source areas **(B108 & B113)** in the Famcamp may be co-mingled. **B108 (Attachments F-27 & F-28)** and **B113 (Attachment FC-22)** have been discussed above in the **Site 1 On-site Plume** subparagraph. Base on the current concentrations being found in the lower aquifer monitoring wells it is concluded that the majority of the concentrations being captured by IW-5 are coming from the area between IW-5 and B108 and B113.

Also of note the TCE-cis ratio for most wells in the Site 2 Source Area has consistently been <1 with cis-1,2-DCE being the predominant contaminant which is an indicator that biodegradation is on-going in the Site 2 Source Areas.

Boundary:

The boundary is defined by the four BIWs augmented by monitoring wells located along the boundary of Hanscom Field/Famcamp area and the Town of Bedford's conservation lands. The lower aquifer and bedrock aquifer boundary monitoring wells, listed below in order from the northwest to southeast, are:

RAP1-1T (lower)/RAP1-1R (bedrock),
BIW-1(lower & bedrock),
PT1-RA (bedrock), PO1-2R (bedrock),
RAP1-4RA, BIW-2 (lower & bedrock),

B126 (lower),
PO2-1T (lower)/PO2-1RA (bedrock),
BIW-4 (lower & bedrock),
PO2-2T (lower)/PO2-2R (bedrock),
RAP2-1T (lower)/RAP2-1R (bedrock),
RAP2-3T (lower)/RAP2-3R (bedrock) &
BIW-3 (lower & bedrock)

Long-Term Monitoring trend charts found in **Attachment F** for wells along the boundary are as follows:

BIW-1 (**Attachment C-19) -** – November 2007 through November 2011
PT1-RA (**Attachment F-39)** – November 2007 through November 2011
PO1-2R (**Attachment F-40)** – November 2007 through November 2011
BIW-2 (**Attachment C-20)** – November 2007 through November 2011
B126 (**Attachment F-41)** – June 1994 through 2011
B126 (**Attachment F-42)** – November 2007 through November 2011
PO2-1T (**Attachment F-43**) – November 2007 through November 2011
PO2-1RA (**Attachment F-44)** – November 2007 through November 2011
BIW-4 (**Attachment C-22)** – November 2007 through November 2011
PO2-2T (**Attachment F-45)** – November 2007 through November 2011
PO2-2R (**Attachment F-46)** – November 2007 through November 2011
RAP2-1T (**Attachment F-47)** – February 1986 through 2011
RAP2-1T (**Attachment F-48)** – November 2007 through November 2011
RAP2-1R (**Attachment F-49)** – February 1986 through 2011
RAP2-1R (**Attachment F-50)** – November 2007 through November 2011
RAP2-3T (**Attachment F-51)** – January 1986 through 2011
RAP2-3T (**Attachment F-52)** – November 2007 through November 2011
BIW-3 (A**ttachment C-21)** – November 2007 through November 2011

This discussion excludes the surface aquifer wells along the boundary since, as noted in the 2002 Review, the surface aquifer was considered cleaned up/no longer a concern and the S&A of the surface aquifer wells along the boundary is no longer conducted. Also Long-Term Monitoring data documents that the groundwater in RAP1-1T, RAP1-1R, PT-1RA (**Attachment F-39),** PO1-2R (**Attachment F-40),** RAP1-4RA, PO2-1RA (**Attachment F-44)** and RAP2-3R meets the RAOs.

Also, as noted in earlier Reviews and the BIWs subparagraphs in this report, the Long-Term Monitoring results for the BIWs and lower and bedrock aquifer monitoring wells along the boundary document the effectiveness of the four boundary interceptor wells in containing/ capturing lower and bedrock aquifer contamination at the boundary while also pulling back from the off-site area of concern. The earlier discussed initial adverse impact of the BIWs pulling contaminants towards the boundary is graphically depicted in **Attachments F-47, F49 and F-51.**

The following **Table 14** summarizes the residual concentrations found in November 2011 in the boundary wells which continue to exceed the MCL for TCE and/or cis-1,2-DCE.

Table 14 – OU-1 Long-Term Monitoring Data for the Hanscom Field/Off-site Boundary

	TCE - ug/L	cis-1,2-DCE - ug/L	TCE-cis Ratio
B126 (lower)	**7.9**	4.1	1.9
PO2-1T (lower) *	bdl	**78**	n/a
PO2-2T (lower) *	**36**	**308**	0.12
RAP2-1T (lower)	1.6	**77**	0.02
RAP2-3T (lower)	**6.7**	**230**	0.03
PO2-1RA (bedrock) *	bdl	19	n/a
PO2-2R (bedrock) *	**135**	**167**	0.81
RAP2-1R (bedrock)	**75**	**130**	0.58

Note: Bolded results exceed the MCL and * is on-site GC data

The above table show that the most significant remaining contamination is in the vicinity of BIW-4. The above also reflects that cis-1,2-DCE has become more predominate than TCE which is an indication that biodegradation is on-going in the groundwater being pulled towards BIW-4. Please note that in relationship to BIW-4 the location of PO2-1T/PO2-2RA are west, RAP2-1T/RAP2-1R are east, and PO2-2T/PO2-2R are south.

Off-site Plume/Town of Bedford Conservation Lands: The off-site plume in the Hartwell Town Forest is monitored by four (4) monitoring well clusters (surface, lower & bedrock aquifers). Also an on-site/boundary well couplet (lower & surface) is included in this grouping as it is downgradient of BIW-4.

As noted in previous Five-Year Reviews the surface aquifer in the off-site/Bedford Conservation Lands had met drinking water standards (MCLs) and they are no longer in the Long-Term Monitoring Program. The surface aquifer wells are B127, B246, B247, B250 & B253

Also, as of the 2007 Five-Year Review, off-site laboratory analysis had documented that three of the 4 bedrock aquifer wells (B249, B252 & B255) were cleaned and on-site GC analysis of samples from these wells during 2007 to 2011 were all bdls. Thus trend graphs are not being included for the surface aquifer and cleaned bedrock aquifer wells.

Wells with residual contamination in 2007 and their respective Long-Term Monitoring chart/Attachment F document number are as follows:

B111 (lower)-approximately 250' north of BIW-4 - **Attachments F-53 & F-54**

B245 (lower) – south/west flank of plume, approximately 550' northeast of BIW #2 -- **Attachment F-55**

B244A (bedrock – south/west flank of plume, approximately 550' northeast of BIW #2 -- **Attachments F-56 & F-57**

B251 (lower) – south/east flank of plume, approximately 450' east of BIW #4 - **Attachment F-58**

B248 (lower) – near the center of plume, approximately 900' north of BIW #4 – **Attachments F-59 & F-60**

B254 (lower) – near the leading edge of plume, approximately 2,000' north of BIW #4 -- **Attachments F-61 & F-62**

During the 2006-2011 period progress continued to be made in reducing the overall strength of the off-site plume as shown on the above referenced charts and as documented in **Table 15** below. This progress can be attributed to the containment/capture zone at the boundary resulting from the operation of the BIWs which both precludes the further feeding of the off-site plume while also pulling some of it back to the capture zone. This allows for the natural attenuation of the remainder of the plume and biodegradation does appear to be on-going as evidenced by the TCE-cis-1,2-DCE ratio data. Please note the spike-ups in cis-1,2-DCE at B-111 (**Attachment F-53**) and the significant downtrend (especially in the TCE concentrations) at B248 (**Attachment F-59**) in the center of the off-site plume. These results are a good confirmation that the BIW's are also pulling back some of the off-site contamination.

Table 15 – OU-1 Long-Term Monitoring Data for Off-site Wells (LaboratoryAnalysis)

	TCE - ug/L		**cis-1,2-DCE- ug/L**		**TCE-CIS Ratio**	
	2006	**2011**	**2006**	**2011**	**2006**	**2011**
B111 (lower)	**7.4**	3.9	**102**	**80**	0.07	0.05
B245 (lower)	4.6	1.7	35.1	23	0.13	0.07
B248 (lower)	**15.2**	**7.9**	**120**	**100**	0.13	0.08
B251 (lower)	1.7	1.4	4.6	1.7	0.37	0.82
B254 (lower)	**8.9**	2.5	25.3	26	0.35	0.10
B244A (bedrock)	**16.4**	**14**	50.2	59	0.33	0.24

Note: Bolded results exceed the MCL

The Long-Term Monitoring results for the off-site area in conjunction with the Long-Term Monitoring results for the boundary interceptor and monitoring wells indicates that the OU-1 RA has been, and continues to be successful in containing/capturing lower and bedrock aquifer contamination at the boundary while also reducing the strength of the off-site plume.

Site 3 Source Areas: The Site 3 Source Areas are drum burial pits within the area defined by the rectangular surface aquifer collection trench. These features and the layout of the recharge basin constructed above the pits are shown on **Figure 13**. There is a lacustrine layer at this location. As with Site 2 it was initially assumed that the hazardous wastes released in the surface aquifer would not readily make their way into the glacial till because of the lacustrine layer underlying the Site 3 source areas. Based on this the original groundwater remediation system did not address lower aquifer contamination at Site 3. While not impermeable the lacustrine layer does act as an aquitard. and the Long-Term Monitoring data documents that this was a valid assumption, i.e., the waste liquids that had escaped from the buried containers have been constrained by the lacustrine layer and were not able to make their way into the glacial till and bedrock fractures underlying the site.

Contaminant levels in the surface aquifer are monitored by 2 lines of monitoring wells installed from west to east across the source areas. **OW3-1 through B118** cover the southern half of the Source Areas and **OW3-8 through OW3-14** cover the northern half. Also OW3-7 (surface) and B125 (lower) are installed in the center of this area. In addition there are several wells surrounding the collection trench to monitor up/side and downgradient areas. Please see **Figure 23** for the OU-1 monitoring wells network.

As noted in the 2002 review the groundwater in the lower and bedrock aquifers at Site 3 consistently met drinking water standards and, at those lower and bedrock aquifer monitoring wells that had positive minor detections of TCE and/or cis-1,2-DCE, the trend in concentrations was down. This situation continued throughout the 2002-2011 period and the lower and bedrock aquifers at Site 3 are no longer considered to be a concern. In regards to the surface aquifer (and as discussed previously) Long-Term Monitoring data presented in the 2002 review showed that the remedial action has been very successful in cleaning up the surface aquifer and that the collection, treatment and recharge of groundwater at IRP Site 3 had been **stopped in August 2001**. However, prior to decommissioning the Site 3 remedial infrastructure, is planned to re-commence the collection, treatment and recharge of groundwater at Site 3 for a short (~3-month) period to confirm that active remediation is no longer needed at Site 3.

Long-Term Monitoring trend charts found in **Attachment F** for the Site 3 Source Areas are as follows:

OW3-14 (**Attachment F-63**) – Surface aquifer–November 2007 through November 2011
B118 (**Attachment F-64**) – Surface aquifer – June 1994 through 2011
B125 (**Attachment F-65**) – Lower aquifer – June 1994 through 2011
B117 (**Attachment F-6)** – Surface aquifer – November 2007 through November 2011
B122 (**Attachment F-67**) – Lower aquifer – June 1994 through 2011

Monitoring during the 2002-2011 period has been directed at documenting that the groundwater at the Site 3 Source Areas within the capture zone of the collection trench continues to meet the MCLs/drinking water standards. Please note that charts of on-site GC data have not been

presented since almost all results during this reporting period have been bdl. Wells in this category include the **OWs except OW3-14**, **B116, B121, B231** and **B232**. However, both the off-site laboratory and the on-site GC data for **OW3-14** document that a pocket of cis-1,2-DCE and vinyl chloride that exceeds their MCLs moved into this area of the site in 2008 as graphically depicted in **Attachment F-63. OW3-14** is located just outside (10') of the collection trench in the northern half of the Site 3 Source Areas and it is evident that natural attenuation is well underway in this groundwater

The impact/continued effectiveness of the active phase of the remedial action is shown in **Attachment F-64** for the surface aquifer monitoring well **B118** which is located just outside (10') of the collection trench in the southern half of the Site 3 Source Areas. The groundwater contamination at B118 dropped below the MCLs in 2002 and has remained at very low levels ever since. **Attachment F-65** shows that the lower aquifer in the center of the Site 3 Source Areas has not had any significant contaminant concentrations since the monitoring of this well commenced in 1994 and **Attachments F-66** and **F-67** show that this has been the case for both the surface and lower aquifers downgradient of the collection trench.

Site 3 Down/side gradient Surface Aquifer Hotspots: In addition to the Site 3 Source Areas within the capture zone of the collection trench, there are 2 additional areas in the Site 3 area that have had significant surface aquifer contamination in previous Reviews. One is the location of surface aquifer monitoring well **RAP3-3S**. This well is downgradient of historical drum burial pit 3J which is not within the perimeter of the Site 3 collection trench. It is approximately 250 feet to the east and is considered to be outside of the collection trench's capture zone. The second area of concern is the location of surface aquifer monitoring well **RAP3-4S**. It appears to be side gradient of the Site 3 Source Areas and a source of the groundwater contamination is this area has never been found/identified. Also, as at RAP3-3S, this area is considered to be outside the collection trench's capture zone.

Long-Term Monitoring trend charts found in **Attachment F** for the Site 3 down/side gradient areas of concern as follows:

> **RAP3-3S** (**Attachment F-68**) – Surface aquifer – March 1986 through 2011
> **RAP3-3S** (**Attachment F-69**) – Surface aquifer – November 2007 through November 2011
> **RAP3-4S** (**Attachment F-70**) – Surface aquifer – March 1986 through 2011
> **RAP3-4S** (**Attachment F-71**) – Surface aquifer – November 2007 through November 2011

Long-Term Monitoring data for **RAP3-3S** is shown in **Attachments F-68 and F-69**. While this graph shows some fluctuations the overall TCE concentration in recent years has been trending lower but remains above its MCL. However, the TCE-cis ratio continues to be much greater than 1.0 (>6 for November 2011) which is an indication that biodegradation is not significant at this location. The second area of concern is the location of surface aquifer monitoring well

RAP3-4S which is east of Runway 5-23 and not downgradient of the Site 2 Source Areas. A source of the groundwater contamination is this area has never been found and, as at RAP3-3S, this area is considered to be outside the collection trench's capture zone. As shown in the charts/ **Attachments F-70 and F-71** the TCE concentrations in RAP3-4S peaked in 1990/1991 and then, by November 1999, declined to below the MCLs. This was followed by increasing concentrations until the cis-1,2-DCE peaked again in November 2007. Subsequently, during this reporting period concentrations dropped below the MCLs in November 2008 and continued to decline through the most recent (2011) Long-Term Monitoring event. Unlike the RAP3-3S area there appears to be significant biodegradation at the RAP3-4S location as evidence by the TCE-cis Ratio which has been <0.1 throughout this reporting period. Also, if the current trend continues through 2012 then the data will be sufficient enough to document that the RAP3-4S area is no longer an area of concern.

Northwest Area: Please note that this area was included in the Haley & Aldrich's investigation of Hanscom Field Area to confirm whether or not groundwater contamination was migrating from Hanscom Field towards Elm Brook on the north side of Hartwell Hill. The investigation concluded that it was not and Long-Term Monitoring data at the time of the 2nd Five-Year Review confirmed that groundwater throughout the Northwest area met drinking water standards and that no further action in regards to the Northwest area was warranted.

Data Review OU-2/IRP Site 4

Since the first Five-Year Review conducted in 1997, OU2/IRP Site 4 has been in the Long-Term Management phase with no requirement for groundwater or surface water monitoring. The first Five-Year Review did identify a requirement for recurring maintenance of the site to remove scrub brush growing in the drainage ditches and on sections of the cap. This maintenance was initiated in the spring of 1998. Subsequently, since 1999, quarterly inspections have been routinely performed and maintenance/repairs identified in the inspection have been completed. Review of the quarterly inspection reports for the current reporting period confirms that the integrity of the cap is being maintained and that there are no physical changes at the site.

Data Review OU-3/IRP Site 6

General: See **Figure 15** for the Site Map showing the locations of Site 6's monitoring points and groundwater compliance boundary and **Attachment G-1** for a listing of OU-3/IRP Site 6 Key Dates/Milestones since the 2001 Remedial Action construction phase.

Long-term Maintenance and Inspection: As a result of the RA construction activities the RAOs for this site have been substantially achieved and in September 2001 the Site entered the RA-O (long-term maintenance and monitoring) phase. Review of the quarterly inspection reports for the current reporting period confirms that the integrity of the cap is being maintained and that there are no physical changes at the site.

Wetland Mitigation Monitoring: As noted earlier the initial Five-Year Wetland Mitigation Monitoring for the wetland areas remediated during the construction phase of the Site 6 Remedial Action concluded in 2006 and the Wetland Mitigation Monitoring Reports for this monitoring indicated that the wetlands had exceeded the design goal for vegetative cover, and provided ample evidence that wildlife habitat has been restored. The Remedial Design also specified that the initial Five-Year Monitoring should be followed by a Long-Term Monitoring Plan for continuing evaluation of the restoration every 5 years for thirty years. The first follow-up wetland mitigation and ecosystem evaluation event was completed in 2011 by a qualified wetlands scientist and documented in the *OU-3/Site 6, 2011 Wetland Mitigation Monitoring & Ecosystem Evaluation Report,* prepared by Shaw Environmental, Inc., November 2011. This report also confirms that the wetlands have been successfully re-established but maturing somewhat different than expected. It was noted that the water levels in the EWRA and WWRA did not appear to vary more than a few inches year around which is not quite the case in a typical herbaceous wetland in Massachusetts and it was concluded that the groundwater table in the wetland system is just a few inches too high to proceed toward the typical herbaceous wetland in Massachusetts. There is nothing wrong with this condition, it is just that bulrushes, sweet flag, cattails and common reed because of their tolerance to saturation throughout the growing season, are dominating the site and not proceeding toward the anticipated tussock sledge stage. Because of the importance of groundwater levels to the success of these wetlands it was recommended that the groundwater elevation in 2 existing piezometers (PZ-E and PZ-W) be collected during each future Long-Term Monitoring event in order to get a more complete understanding of the dynamics of this system in the next/2016 wetland mitigation and ecosystem evaluation of the restoration areas.

Groundwater/Surface Water and Compliance Boundary Monitoring: Please note that the "on-site" and "off-site" designations have been **inconsistently** applied in previous discussions and/or reports. For the purpose of this Review "on-site" is intended to refer to the Hanscom AFB property owned by the U.S. and "off-site" is intended to refer to the Hanscom Field/ Commonwealth owned property and the privately owned property (DEA #1, wetlands and Kiln Brook (former railroad) Spur) which abuts the Site 6 area of Hanscom AFB.

The long-term monitoring of OU-3/IRP Site 6 commenced with a "baseline" event on December 2001 following completion of construction activities. The purpose of this "baseline" event sampling was document post-RA groundwater conditions at the site. Since 2001 an annual long-term monitoring event has been conducted each fall with the most recent in October 2011. Also, commencing in July 2005, seasonal, "mini" events, limited to the analysis of selected monitoring well and surface water samples for dissolved arsenic have been conducted.

A network of monitoring points (which has been developed over time) as shown in **Figure 15** is used to assess Site 6's surface water and groundwater and the analytical results of the analysis of the Long-Term Monitoring groundwater and surface water samples are formally documented in Annual Long-Term Monitoring Reports. Updated tables containing all of the analytical results

for CoCs since the 2001 Baseline event are included in each Annual Long-Term Monitoring Report and are presented in **Attachment G-2** - Summary of Long-Term Monitoring Program's Groundwater and Surface Water Samples Results for Dissolved Arsenic - 2001 through 2012 and **Attachment G-3 -** Summary of Long-Term Monitoring Program's Groundwater and Surface Water Samples Results for Contaminants of Concern Less Arsenic - 2001 through 2011.

Since the landfill waste has been left in place is not expected that the groundwater under the wastes would meet drinking water standards and the primary objectives of the monitoring component of the RA are:

- to identify the on and off site's post-RA CoCs,
- to monitor changes in on-site contaminant concentrations over time, , i.e., monitor the "flushing" of CoCs from the landfilled areas,
- to monitor concentrations of CoCs in surface water flowing from the site, and
- to monitor concentrations of CoCs at the site's groundwater compliance boundary.

The Long-Term Monitoring data collected to date confirms that, while there are on-site wells which have a CoC that exceeds its MCL and/or MCP GW-1 Standard, **dissolved arsenic is the most significant CoC** in both the on-site and off-site groundwater.

CoCs other than Dissolved Arsenic: In addition to dissolved arsenic the other CoCs identified in the 2001 Baseline and/or subsequent monitoring events include:

Dissolved Metals: Antimony, Barium, Cadmium, Nickel, Lead, Thallium & Vanadium
PCBs: Aroclor 1016, 1232, 1242, or 1248
Pesticides: 4-4'-DDD, Dieldrin, & Heptachlor epoxide
SVOCs: 1,4-Dichlorobenzene, 2,4-Dichlorophenol, 2,4,5-Trichlorophenol, bis (2-Ethylhexyl) phthalate, Naphthalene, Pentachlorophenol (PCP)
VOCs: Benzene & Trichloroethene

However, by 2007 the initial CoCs listed below had sufficient Long-Term Monitoring data to conclude that they should no longer be considered a Site 6 CoC.

Dissolved Metals: Antimony & Vanadium
Pesticides: Dieldrin, & Heptachlor epoxide
VOCs: Benzene & Trichloroethene

As noted in ***Section V, Progress Since the Last Five-Year Review***, the recommendation in the 2007 Five-Year Review to determine whether or not dissolved thallium is a contaminant of concern in the on-site groundwater at OU-3/IRP Site 6 has been implemented. Specifically, commencing with the October 2008 Long-Term Monitoring event for IRP Site 6 the analysis method for thallium was changed from Method 6010 to the more definitive Methods 7841 or 6020. As shown in **Attachment G-4** there has been no exceedances of the Thallium MCL when

analysis was by Methods 7841 or 6020. It is concluded that Dissolved Thallium in groundwater **is not a CoC** at OU3/IRP Site 6.

Long-Term Monitoring trend charts found in **Attachment G-5** for the Site 6 CoCs less dissolved arsenic for this reporting period are as follows:

Attachment G-5 Chart 1 – Barium - MW6-110U (surface aquifer) & MW6-112U (surface aquifer)
Attachment G-5 Chart 2 – Cadmium - MW6-110U (surface aquifer), MW6-113U (surface aquifer) & MW6-113T (lower aquifer)
Attachment G-5 Chart 3 – Lead - MW6-110U (surface aquifer)
Attachment G-5 Chart 4 – Nickel - MW6-110U (surface aquifer), MW6-113U (surface aquifer) & MW6-113T (lower aquifer)
Attachment G-5 Chart 5 – PCBs (Aroclor 1016, 1232, 1242 or1248) - MW6-110U (surface aquifer)
Attachment G-5 Chart 6 – Pesticides (4-4'-DDD) - MW6-114T (lower aquifer)
Attachment G-5 Chart 7 – SVOCs (1,4-Dichlorobenzene) – MW6-106 (surface aquifer), MW6-110U (surface aquifer), MW6-110T (lower aquifer), MW6-112U (surface aquifer) & MW6-B07 (lower aquifer)
Attachment G-5 Chart 8 – SVOCs (2,4-Dichlorophenol) – MW6-106 (surface aquifer)
Attachment G-5 Chart 9 – SVOCs (2,4,5-Trichlorophenol) – MW6-106 (surface aquifer)
Attachment G-5 Chart 10 – SVOCs (Pentachlorophenol (PCP)) – MW6-106 (surface aquifer)
Attachment G-5 Chart 11 – SVOCs (bis (2-Ethylhexyl) phthalate) - MW6-110U (surface aquifer) and MW6-117U (surface aquifer)
Attachment G-5 Chart 12 – SVOCs (Naphthalene) – MW6-106 (surface aquifer), MW6-110U (surface aquifer) and MW6-112U (surface aquifer)

The above charts consistently indicate that "flushing" of CoCs from the landfill waste to the groundwater is on-going. Also evident is that the 2001 RA activities of pulling back waste from the off-site properties and the removal of wetland sediments from the EWRA and WWRA and incorporating these materials in the existing landfill waste on top of the former filter bed area before grading and capping the site stirred up CoCs. In most cases the CoC high was found in the 2001 baseline event or they trended up until peaking in a later annual event before beginning a down trend.

Barium: MCL exceedances were initially found in MW6-110U and MW6-112U but, as seen in **Chart 1**, it is no longer a CoC in MW6-110U and has been below the MCL in 2010 and 2011 in MW60112U.

Cadmium: MCL exceedances were initially found in MW6-110U, MW6-113U and MW6-113T but, as seen in **Chart 2**, it is no longer a CoC in any of the 3 wells.

Lead: MCL exceedances were initially found in MW6-110U but, as seen in **Chart 3**, it is no longer a CoC in this well.

Nickel: MCL exceedances were initially found in MW6-110U, MW6-113U and MW6-113T but, as seen in **Chart 4**, it is no longer a CoC in MW6-113U and MW6-113T and it is well below its peak in MW6-110U.

PCBs (Aroclor 1232, 1242 or1016): MCL exceedances have only been found in MW6-110U and, as seen in **Chart 5**, it continues to downtrend from its 2005 peak.

Pesticides (4-4'-DDD): MCL exceedances have only been found in MW6-114T and, as seen in **Chart 6**, it continues to fluctuate at levels below its 2006 peak.

SVOCs (1,4-Dichlorobenzene): MCL exceedances have been found in MW6-106, MW6-110U, MW6-110T, MW6-112U and MW6-B07 but, as seen in **Chart 7**, levels are below the MCL at all wells as of the 2011 monitoring event except MW6-112U.

SVOCs (2,4-Dichlorophenol, 2,4,5-Trichlorophenol & Pentachlorophenol (PCP)): MCL exceedances for these 3 SVOS have been found in MW6-106 but, as seen in **Charts 8, 9 & 10**, the concentration of each was below their MCL in the 2011 monitoring event. As noted on **Chart 10** PCP MCL exceedances were also found at MW6-110U (2.7 F ug/L) in October 2004 and at MW6-112U (1.06 F ug/L) in October 2006. These results were both "F" qualified and all other analyses at these 2 wells before and after the date listed have been non-detect for PCP.

SVOCs (bis (2-Ethylhexyl) phthalate): MCL exceedances were initially found in MW6-110U and MW6-117U but, as seen in **Chart 11**, it is no longer a CoC in either well.

SVOCs (Naphthalene): MCL exceedances were initially found in MW6-106 (surface aquifer), MW6-110U (surface aquifer) and MW6-112U (surface aquifer). Please note that at the time of the Site 6 ROD the MCP GW-1 Standard for Naphthalene was 20 ug/L and it was subsequently increased to 140 ug/L. Thus Naphthalene is no longer a CoC for MW6-106 and MW6-110U. Also, as seen in **Chart 12**, it has been below the 140 UG/L GW-1 Standard in MW6-112U ever since the 2001 baseline event except for a MJ qualified result in October 2008. Thus it is now no longer considered a Site 6 CoC.

In summary, other than dissolved arsenic, the only residual CoCs for Site 6 going forward are:

Barium in MW6-112U
Nickel in MW6-110U
PCBs (Aroclor 1232, 1242 or1016) in MW6-110U
Pesticides (4-4'-DDD) in MW6-114T
SVOCs (1,4-Dichlorobenzene) in MW6-106 and MW6-112U
SVOCs (2,4-Dichlorophenol, 2,4,5-Trichlorophenol & Pentachlorophenol (PCP)) in MW6-106

Please note a July 2006 sample from MW6-B07 analyzed for SVOCs had "F" qualified results for the following compounds which exceeded their respective MCL: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Hexachlorobenzene and Indeno(1,2,3-cd)pyrene. Because the October 2008 results were "F" qualified it was concluded that an additional confirmatory analysis was needed to rule out that they are CoCs. Subsequently, these SVOCs were all non-detect in an October 2011 sample from MW6-B07 and, based on this analysis they are not considered CoCs for Site 6.

Dissolved Arsenic: As noted above the Long-Term Monitoring Program's Results for Dissolved Arsenic from 2001 through 2012 are presented in **Attachment G-2** and **Table 16** on the following pages **s**ummarize these by on and off-site location and by aquifer.

While dissolved arsenic is the predominant COC found in the on and off site groundwater and surface water it has been either **non-detect or below the 10 ug/L MCL/MCP GW-1 Standard** in all analyses of the groundwater or surface water from the following sampling points:

On-site
MW6-106 – Surface Aquifer (max detected = 0.63 F ug/L)
MW6-110U – Surface Aquifer (max detected = 2.7 ug/L)
MW6-112U – Surface Aquifer (all non-detect)

MW6-113T – Lower Aquifer (max detected = 2 F ug/L)
MW6-114T – Lower Aquifer (all non-detect)
MW6-115T – Lower Aquifer (all non-detect)

Off-site Wells
MW6-117T – Lower Aquifer (max detected = 8.1 ug/L)

Compliance Boundary Wells
MW6-116U – Surface Aquifer (max detected =1.5 F ug/L)
MW6-122U – Surface Aquifer (max detected = 0.46 F ug/L)

MW6-122L – Lacustrine Aquifer (max detected = 0.74 F ug/L)

MW6-14 – Lower Aquifer (all non-detect)
MW6-116T – Lower Aquifer (max detected = 3.8 F ug/L)
MW6-118T – Lower Aquifer (max detected = 0.22 F ug/L)
MW6-122T – Lower Aquifer (max detected = 2.9 F ug/L – also note there was a non-filtered sample in November 2009 with a "total" concentration = 27 ug/L)

Hanscom Field Wells
MP MW-301 – Surface Aquifer (max detected =5.1 ug/L)

Table 16 Long-Term Monitoring Program Results for Dissolved Arsenic - 2001 through 2012
OU-1/IRP Site 6, Hanscom AFB, MA

On-site Surface Aquifer Wells

	MW6-16	MW6-17	MW6-23	MW6-103	MW6-104	MW6-105	MW6-106	MW6-110U	MW6-112U	MW6-113U	PZ-E	PZ-W
Dec-01	<2.7	6 F	62	Dry	Dry	Dry	Dry	<2.7	<2.7	Dry		
Oct-02	<1.6	60	11 F	Dry	Dry	27 F	<1.6		<1.6	Dry		
Apr-03				6 F	14 F			<1.6	<1.6	11 F		
Sep-03	66	122	15 F			12 F	<2.9	<2.9	<2.9	9 F		
Oct-04	18 F	105	8 F	13 F	Dry	30	<2.5	<2.5	<2.5	3 F		
Apr-05	<2.5				18							
Jul-05	<2.5	72									16	19
Oct-05	2.4 F	35	10	27		37	<1.86	2.7	<1.86	2.41 F	59.4	20.7
Jan-06	<1.9	6.6									7.5	22
Apr-06	<1.9	22									7.2	9.8
Jul-06							<1.2				19.1	
Oct-06	<4	86	6.6			10	<4	<4	<4	<20	47.2	13.3
Jan-07	<4	4.6		9.7	6.9		<4			4.7	32	6.3
Apr-07	<4	37		5.2	7.2	<4					15	9.1
Aug-07	<4	35		<4		8.7						
Oct-07	<4	37	4.2	Dry	Dry	6.2	Dry	<4	<4	Dry		
Apr-08	0.3 F	7.6		20	7.4	8.9					4.9	7.2
Jul-08	0.98 F	32		9.4	Dry	4.2 F					15	35
Oct-08	0.69 F	41	5.4	5.8	2.5 F	2.8 F	0.63 F				3.1 F	36
Apr-09	<4.4	27 F		<4.4	<4.4	<4.4					13 F	14 F
Jul-09	<4.4	43			8.2 F	8.6 F	<4.4				14	17
Nov-09	<4.4	18	<4.4			<4.4					26*	14*
Apr-10	<4.4	21		9.8		<4.4					<4.4	<4.4
Jul-10	0.45 F	38		2.3 F							Dry	Dry
Nov-10	0.48 F	20									3.8 F	1.3 F
Apr-11				40							15	2.6 F
Jul-11				18							Dry	Dry
Oct-11	0.28 F	32		2.9 F							1.3 F	25
Apr-12				1.9 F							1.6 F	7.0

On-site Lower Aquifer Wells

	MW6-B07	MW6-B09	MW6-B10	MW6-11	MW6-13	MW6-110T	MW6-111T	MW6-113T	MW6-114T	MW6-115T
Dec-01	48	26 F	21 F	45.0	12 F	22 F	<2.7	<2.7	<2.7	
Oct-02		15 F	40	50.0		23 F		<1.6	<1.6	<1.6
Apr-03	46	42			20 F			2 F		
Sep-03	50	36	43	<2.9	<2.9	23 F		<2.9	<2.9	<2.9
Oct-04	45	46	51	<2.5	23 F	10 F	25 F	<2.5		<2.5
Apr-05		54								
Jul-05		51	51							
Oct-05	43	34	48	<1.86	9.6	22	72	<1.86		
Jan-06		52	52							
Apr-06		50	55							
Jul-06	63.4									
Oct-06	55	52	55	<4	7.4	18	76	<20		
Jan-07	61	54	62					<4		
Apr-07	89	46	54			18	64			
Aug-07	55	40	52			11				
Oct-07	53	40	66	<4	<4	11	66	<4		
Apr-08	78	42	59			13	57			
Jul-08	64	39	63			12	61			
Oct-08	66	46	77			12	74			
Apr-09	78	42	58			9.2F/11F	46			
Jul-09	76	40	39			17	66			
Nov-09	48	38	56			16	64			
Apr-10	77	36	54			6.2	40			
Jul-10	65	44	56			15/15	52			
Nov-10	58	31/29	53			16	18			
Oct-11	61	43	51			14	49			

Notes: Shaded results exceed the 10 ug/L MCL for arsenic
* November 2009 sample not filtered, thus result is "Total" Arsenic

Table 16 Long-Term Monitoring Program Results for Dissolved Arsenic - 2001 through 2012
OU-1/IRP Site 6, Hanscom AFB, MA

	Off-site Surface Aquifer Wells										Surface Water Monitoring Points			
	MW6-21U	MW6-116U	MW6-117U	MW6-118U	MW6-119U	MW6-120U	MW6-121U	MW6-122U	MW6-122L	MW6-125U	SWW6-05	SWW6-06	SWR6-02	SWR-SG #3
Dec-01	6 F										< 2.7			
Oct-02	32	<1.6	5 F	24 F							<1.6			
Apr-03	<1.6	<1.6	4 F	23 F							<1.6			
Sep-03	5 F	<2.9	6 F	108							<2.9/<2.9			
Oct-04	35	<2.5	8 F	179										
Apr-05	<2.5		3 F	20							<2.5			
Jul-05	80		3	90							<2.5			
Oct-05	170	<1.9	16	39							<1.9			
Jan-06	2.8 F		<1.9	2.8							<1.9			
Apr-06	<1.9		3.5 F	28							<1.9			
Jul-06	35	<1.2	3.0 F	48	8	11	<1.2	<1.2	<1.2		<1.2			
Oct-06	99	<4	9.9	200	33	9	6.7	<4	<4		<4			
Jan-07	7.1		<4	28	<4	<4	<4							
Apr-07	<4		<4	32	<4	<4	<4							
Aug-07	100		10		44	12	<4							
Oct-07	150	<4	30		76	7.2	15	Dry	<4					
Apr-08	2.4 F		0.93 F	18	0.22 F	0.33 F	2.0 F				0.67 F	0.59 F	3.2 F	3.4 F
Jul-08	48		12	150	34	0.9 F	8.1				1.5 F	1.6 F	2.8 F	3.0 F
Oct-08	91	1.5 F	4.0 F	130	6.9 F	4.0 F	9.1	0.46 F	0.74 F	20	1.0 F	0.65 F	3.1 F	3.8 F
Apr-09	<4.4		<4.4	23 F	<4.4	<4.4	<4.4			16 F	<4.4	<4.4	<4.4<4.4	<4.4
Jul-09	33		<4.4	17	4.7 F	<4.4	15			35	<4.4	<4.4	4.9 F	5.8 F
Nov-09	11	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4
Apr-10	<4.4		4.6	<4.4	<4.4	<4.4	<4.4			18	<4.4	<4.4	<4.4	<4.4
Jul-10	28		17	17	39	3.9 F	1.8 F			20/19	**DRY**	**DRY**	1.4 F	2.2 F
Nov-10	3.1 F	<0.21	2.5 F	11	31	1.8 F	.88F/3.3F			16	0.97 F	1.5 F	2.0 F	2.3 F
Apr-11	1.0 F		0.51 F	.29F/.31F	0.36 F	0.62 F	0.95 F			11	0.60 F	0.72 F	3.1 F	2.9 F
Jul-11	14		.77F/.89F	16	35	0.66 F	18			13	**DRY**	1.3 F	1.5 F	2.1 F
Oct-11	24/24	0.27 F	.48F/.48F	39	3.3 F	3.4 F	1.1 F			14	1.5 F	1.2 F	3.7 F	3.6 F
Apr-12	4.8 F		0.51 F	6.4/4.1 F	11	4.9 F	0.70 F			8.8	0.92 F	0.52 F	3.5 F	3.0 F

	Off-site Lower Aquifer Wells						Hanscom Field Surface Aquifer Wells							
	MW6-14	MW6-15	MW6-116T	MW6-117T	MW6-118T	MW6-122T	MP MW - 301	MP MW-302	MP MW-303	MP MW-304	MP MW-305	MP MW-306	MW6-123U	MW6-124U
Dec-01		<2.7												
Oct-02	<1.6	18 F	<1.6	<1.6	<1.6									
Apr-03		<1.6	<1.6	<1.6	<1.6									
Sep-03	<2.9	<2.9	<2.9	<2.9	<2.9									
Oct-04	<2.5	4 F	<2.5	<2.5	<2.5									
Apr-05		<2.5												
Jul-05		<2.5												
Oct-05		<1.9	<1.9	<1.9	<1.9									
Jan-06		<1.9												
Apr-06		<1.9												
Jul-06						<1.2								
Oct-06		<4	<4	<4	<4	<4								
Jan-07		<4												
Apr-07		<4		<4	<4									
Aug-07		<4		<4										
Oct-07		<4	<4	<4		<4								
Apr-08		1.0 F		<0.021										
Jul-08		0.83 F		8.1										
Oct-08		10	<0.42	2.1 F	<0.42	1.1 F							4.4 F	38
Apr-09		<4.4		<4.4									<4.4	19 F
Jul-09		7.1 F		<4.4									17	34/43
Nov-09		<4.4	<4.4	4.7 F	<4.4	27 *							5.7 F	<4.4
Apr-10		<4.4											<4.4	<4.4
Jul-10		2.5 F		<0.21			2.6 F	24	11	32	72	17	14	39/35
Nov-10		2.5 F	3.8 F	<0.21	0.22 F		2.6 F	48	10	40	110	18	8	11/8.2
Apr-11				<0.21			3.5 F				78		5.2	.45F/.58F
Jul-11				<0.21			5.1				90		7.1	40/41
Oct-11		1.7 F	<0.21	<0.21	<0.21	2.9 FQ	3.7 F				82		2.3F/2.3F	051 F
Apr-12							2.8 F				74		19	11

Notes: Shaded results exceed the 10 ug/L MCL for arsenic
122L listed with the surface aquifer wells is screened in the lacustrine layer
* November 2009 sample not filtered, thus result is "Total" Arsenic

Off-site Surface Water
SG #3 – Shawsheen River up gradient vic IRP Site 21 (max detected =5.8 F ug/L)
SWR6-02 – Shawsheen River (max detected =3.7 F ug/L)
SWW6-05 – wetlands (max detected =1.5 F ug/L)
SWW6-06 – wetlands (max detected =1.5 F ug/L)

Long-Term Monitoring trend charts found in **Attachment G-6** for the Site 6 sampling points which have had exceedances of the dissolved arsenic MCL/MCP GW-1 Standard are as follows:

On-site Wells - Aquifer
Chart 1 - MW6-16 – Surface Aquifer – Dissolved Arsenic, 2001-2011
Chart 2 - MW6-17 – Surface Aquifer – Dissolved Arsenic, 2001-2011
Chart 3 - MW6-23 – Lacustrine/Lower Aquifer – Dissolved Arsenic, 2001-2009
Chart 4 - MW6-103 – Surface/Lacustrine Aquifer – Dissolved Arsenic, 2003-2012
Chart 5 - MW6-104 – Surface/Lacustrine/Lower Aquifer–Dissolved Arsenic, 2003-2009
Chart 6 - MW6-105 – Surface/Lacustrine Aquifer – Dissolved Arsenic, 2002-2010
Chart 7 - MW6-113U – Surface Aquifer – Dissolved Arsenic, 2003-2007
Chart 8 - MW6-B07 — Lower Aquifer Dissolved Arsenic, 2001-2011
Chart 9 - MW6-B09 – Lower Aquifer – Dissolved Arsenic, 2001-2011
Chart 10 - MW6-B10 – Lower Aquifer – Dissolved Arsenic, 2001-2011
Chart 11 - MW6-11 – Lacustrine/Lower Aquifer – Dissolved Arsenic, 2001-2007
Chart 12 - MW6-13 – Lower Aquifer – Dissolved Arsenic, 2001-2007
Chart 13 - MW6-110T – Lower Aquifer – Dissolved Arsenic, 2001-2011
Chart 14 - MW6-111T – Lower Aquifer – Dissolved Arsenic, 2004-2011

Off-site Wells - Aquifer
Chart 15 - MW6-118U – Surface Aquifer – Dissolved Arsenic, 2002-2012
Chart 16 - PZ-E – Surface Aquifer – Dissolved Arsenic, 2005-2012
Chart 17 - PZ-W – Surface Aquifer – Dissolved Arsenic, 2005-2012

Compliance Boundary Wells - Aquifer
Chart 18 - MW6-21 – Surface Aquifer – Dissolved Arsenic, 2007-2012
Chart 19 - MW6-117U – Surface Aquifer – Dissolved Arsenic, 2002-2012
Chart 20 - MW6-119U – Surface Aquifer – Dissolved Arsenic, 2006-2012
Chart 21 - MW6-120U – Surface Aquifer – Dissolved Arsenic, 2006-2012
Chart 22 - MW6-121U – Surface Aquifer – Dissolved Arsenic, 2006-2012
Chart 23 - MW6-125U – Surface Aquifer – Dissolved Arsenic, 2008-2012
Chart 24 - MW6-15 – Lower Aquifer – Dissolved Arsenic, 2001-2011

Hanscom Field Wells - Aquifer
Chart 25 - MW6-123U – Surface Aquifer – Dissolved Arsenic, 2008-2012
Chart 26 - MW6-124U – Surface Aquifer – Dissolved Arsenic, 2008-2012
Chart 27 - MP MW-301 & MP MW-305 – Surface Aquifer–Dissolved Arsenic, 2010-12

As noted for the "Other" CoCs the above charts consistently indicate that "flushing" of CoCs from the landfill waste to the groundwater is on-going. Also evident is that the 2001 RA activities of pulling back waste from the off-site properties and the removal of wetland sediments from the EWRA and WWRA and incorporating these materials in the existing landfill waste on top of the former filter bed area before grading and capping the site stirred up CoCs. These observations apply to almost all of the dissolved arsenic "charted" monitoring wells. In most cases the CoC high was either found in the 2001 baseline event or they trended up until peaking in a later Long-Term Monitoring event before beginning a down trend. In many cases they have been below the Standards for several monitoring events.

On-site Wells

MW6-16 2001-2011 – peaked in September 2003 and below standards since April 2005

MW6-17 2001-2011 – peaked in September 2003 and periodically drops below standards but has been relatively constant during 2007-2011

MW6-23 2001-2009 peaked in September 2003 and at or below standards since October 2004

MW6-103 2003-2012 – peaked in October 2005 and below standards since January 2007 except for 2 spring spike-ups to above standards (20 ug/L in April 2008 & 20 ug/L in April 2011)

MW6-104 2003-2009 – peaked in April 2005 and below standards since January 2007

MW6-105 2002-2010 – peaked in October 2005 and at or below standards since October 2006

MW6-113U 2003-2007 - peaked in April 2003 and below standards since September 2003

MW6-B07 2007-2011 – peaked in April 2007 and relatively constant since then

MW6-B09 2007-2011 – peaked in April 2005/January 2007 and relatively constant since then

MW6-B10 2007-2011 – peaked in October 2008 and relatively constant since then

MW6-11 2001-2007 - peaked in October 2002 and non-detect since September 2003

MW6-13 2001-2007 – peaked in October 2004 and below standards since October 2005

MW6-110T 2001-2011 - peaked in October 2002/September 2003 and trending down ever since

MW6-111T 2004-2011 - peaked in October 2006 and trending down since October 2008

The Long-Term Monitoring data for the on-site surface aquifer wells indicates that the dissolved arsenic has almost completely been flushed out or attenuated to below the standards. The only surface aquifer well with residual concentrations consistently above the standards is MW6-17. The lower aquifer also appear to be following the same pattern, i.e., attenuating but there are 3 (MW6-B07, MW6-B09 & MW6-B10) were the concentrations have been relatively stable since their peaks.

Off-site Wells

MW6-118U 2002-2012 - peaked in October 2006 and trending down ever since
PZ-E 2005-2012 - peaked in October 2005 and trending down ever since
PZ-W 2005-2012 - peaked in October 2005 and trending down ever since

As with the on-site surface aquifer wells the Long-Term Monitoring data for these off-site surface aquifer wells indicates that the dissolved arsenic is fluctuating but attenuating/trending down over time.

Compliance Boundary Wells

MW6-21 – Surface Aquifer 2007-2012 - peaked in October 2005 and trending down ever since and it is expected that it will attenuate to be consistently below standards in a few more years

MW6-117U – Surface Aquifer 2002-2012 - peaked in October 2007 and trending down ever since and has been below standards since November 2010. While there may be a seasonal spike-up or 2 to above standards in the future it is expected that it will attenuate to be consistently below standards in a few more years.

MW6-119U – Surface Aquifer 2006-2012 - peaked in October 2007 and trending down ever since and it is expected that it will attenuate to be consistently below standards in a few more years.

MW6-120U – Surface Aquifer 2006-2012 - peaked a little over the standard at 12 ug/L in August 2007 and has been consistently below standard ever since.

MW6-121U – Surface Aquifer 2006-2012 – 3 separate peaks (15 ug/L in October 2007, 15 ug/L in July 2009 & 18 ug/L in October 2011) and below standard in 16 of the 19 separate analysis over time. Also the MW6-121U peaks (15-18 ug/L) are well below highs seen elsewhere. It is expected that concentrations in MW6-121U will attenuate to be consistently below standards in a few more years.

MW6-125U – Surface Aquifer 2008-2012 – relatively new well which had a peak of 35 ug/L in July 2009 and has been trending down ever and was below the standard in April 2012. It is expected that concentrations in MW6-125U will attenuate to be consistently below standards in a few more years.

MW6-15 – Lower Aquifer 2001-2011 - separate peaks (18 ug/L in October 2002 & 10 ug/L in October 2008) and has been at or below standard in 24 of the 25 separate analyses since 2001. It is concluded that the MW6-15 data documents that the lower aquifer at this well is in compliance.

Hanscom Field Wells

MW6-123U& MW6-124U – Surface Aquifer 2008-2012 – relatively new wells installed

by Hanscom AFB in 2008 with the intent of documenting that the surface aquifer on the far side of the Shawsheen River (in relation to Site 6) did not have dissolved arsenic. Unfortunately, this has not been the case as shown on Charts 25 and 26. Since 2008 both wells have fluctuated above and below the MCL and both wells are following the same pattern with no apparent trend.

MP MW-301 and MP MW-305 – Surface Aquifer 2010-2012 – relatively new wells installed in 2010 by Massport to support a Storm Water Model. As shown on Chart 27 disssolved arsenic concentrations have been found below the MCL in MP MW-301 and above the MCL in MP MW-305 and the concentrations in both have been relatively constant over the short monitoring period. However, the monitoring period is not considered long enough to define trends.

Data Review OU-3/IRP Site 21

OU-3/IRP Site 21 LNAPL/ Groundwater Collection and Treatment System Operational Data

General: At the time of the 2nd Five-Year Review in 2002 IRP Site 21 had an on-going Removal Action which was being incorporated into the selected final Remedial Action. Also at that time planning for the implementation of the 2001 ROD was underway. Subsequently, the Remedial Design and remedy construction were completed and the Site entered the RA-O (long-term operation, maintenance and monitoring) phase in September 2003. As noted in the Third Five-Year Review the March 2004 *Remedial Action Report* confirmed that the remedy was constructed in accordance with the ROD/Remedial Design.

See **Figure 18** for the layout of Site 21 to include recovery and monitoring wells, locations of the former (pre-RA) LNAPL Pools, and RI Zone designations and **Attachment H-1** for a summary listing of the Site 21 Groundwater Remediation System's Key Activities/Milestones since the 2003 RA. Pages 1 and 2 of this Attachment details operational data and pages 3 and 4 details the long-term monitoring program since the 2003 Baseline monitoring event.

The 3rd Five-Year Review presented a detailed summary of the operational records from system startup in 1991 through the end of calendar year 2006. This reviewed confirmed that the remedy was operating as expected and that the treatment system was very effective. However, the post-RA data documented that the "small scale" enhanced product recovery system within Former LNAPL Pool C was **not** recovering LNAPL and, as noted in the 2007 Five-Year Review, the objective of the active recovery system was revised to remediate the localized trichloroethene (TCE) hotspot centered on RW-6A and RW-7A. Additionally, with the installation and activation of RW-11A in October 2010 the objective was expanded to remediate a developing petroleum contaminated groundwater hotspot in the vicinity of monitoring well ECS-31.

This, the Fourth, Five-Year Review primarily addresses the data that has been generated since

the start of 2007. Operational data is reported in the monthly NPL OU-1 Remedial Action Report which is submitted to stakeholders. See **Attachment H-2** for the Hanscom AFB NPL OU-3/IRP Site 21 Remedial Action Report for December 2011. Note, the listed attachments to the monthly report are presented as separate attachments (see below). Annual operational data is presented in **Tables 16 and 17** below. Of special note is the durability/dependability of the system as evidenced by the time-operating percentages. Normally there are only minor/short interruptions of operations for maintenance, minor repairs or deliberate shut downs in advanced of groundwater sampling events. Also individual recovery wells or the entire collection system are shutdown during periods of very heavy rain (to preclude overwhelming the oil-water separator).

Table 17 – LNAPL/ Groundwater Collection and Treatment System Operational Data

Annual Summary

	Gallons/Year	Gallons/Day	% Operating
2003	37,335	349	96.3
2004	152,657	417	96.7
2005	148,734	545	98.1
2006	143,122	392	97.1
2007	68,198	187	96.1
2008	97,950	268	98.7
2009	89,838	246	93.2
2010	43,191	118	96.4
2011	81,413	301	93.3
Since Startup	862,438	294	95.8

Table 18 – Collection and Treatment System Off-site Laboratory Analytical Data

	2007	2008	2009	2010	2011
Influent TPH - mg/L	0.48	0.78	0.39	0.85	2.98
Influent TCE - ug/L	33.0	31.5	27.8	27.0	unk
Influent 1,4-DCB -ug/L	nil	bdl	nil	nr	747
Effluent TPH - mg/L	bdl	nil	nil	nil	nil
Effluent TCE - ug/L	bdl	bdl	bdl	bdl	bdl
Effluent MTBE - ug/L	1.0	1.1	4.5	5.5	5.8

Notes: data is the average of monthly samples.
Unk = Commencing in 2011 TCE concentration is masked by laboratory dilution due to high concentrations of chlorobenzene. 1,2-DCB & 1,4-DCB
bdl = below detection levels nr = not reported nil = random low level detections

Collection System: The Site 21 collection system initially consisted of 10 recovery wells (RW-1A through RW-10A) located in the former LNAPL Pool C area of the site. RW-11A was added to the system in October 2010 to address a developing chlorobenzene hotspot identified by the Long-Term Monitoring Program. During the 2003 construction phase provisions were also

provided to convert passive recovery wells to active recovery wells, however, monitoring to date has not indicated that implementation of this contingency is necessary. From the September 2003 startup through March 2005 all 10 of the recovery wells were usually in operation. Commencing in March 2005 RW-3A and RW-4A were only operated sporadically, mainly as an optimization measure supported by the fact that the groundwater being captured was well below MCLs and that no LNAPL was being recovered. Subsequently, starting in June 2006 additional RWs were turned off/only been operated sporadically, also for optimization. As of the end of 2006 four (4) of the initial ten (10) RWs were in normal around the clock operation. These were RW-1A, RW-5A, RW-6A and RW-7A. All others were in a stand-by mode.

The gallons (per day) of groundwater collected and treated is not a significant factor as the recovery wells were constructed to collect specifically from the lacustrine layer and the yield from this zone is generally not affected by the weather, i.e., rainfall. As noted the maximum collection occurred in 2005 when 545-gpd were collected which also is 22.7-gph or 0.38-gpm and the corresponding data for the most recent year (2011) is 301-gpd, 12.5-gph or 0.21-gpm.

The immediate increase in the yield of some of the recovery wells (specifically RW-5A, RW-7A and RW-10A) was discussed in the 2007 Review. This increase is primary groundwater (usually "clean") from the area above the lacustrine layer and it appears to flow directly into the wells during inclement weather, almost as if the wells are connected to the storm drainage system. As shown in **Chart/Attachment H-3** the water table has significant seasonal swings (as much as a 7' differential) and the most effective recovery comes when the water table is in the lacustrine layer. As LNAPL monitoring has found more evidence of LNAPL traces when the water table is low.

As previously reported the activation of the RA's LNAPL and Groundwater Recovery System in 2003 resulted in the discovery of a TCE hotspot which had not been identified during the investigative phase. As noted in the OU-1 section of this document the O&M staff has been able to use an on-site GC to provide screening/trend analysis specifically for TCE and cis-1,2-DCE. Through trial and error it was determined that the on-site GC can also provide screening/trend analysis for TCE and cis-1,2-DCE in Site 21 RW samples which contain little to no other VOC compounds, which is situation for RW-2A through 7A. Subsequently the on-site GC analysis of some RW samples (target of monthly analysis) has been included in the Long-Term Monitoring Program for Site 21 until suspended (to conserve dwindling GC resources) in April 2012. The results from the on-site GC analysis for RW-6A and RW-7A are presented in the **Table/ Attachment H-4** and a trend chart of these results from the start of on-site GC analysis in 2004 is **Chart/Attachment H-5** (note these 2 attachments are usually included in the monthly RA Reports). Going forward RW-6A and RW-7A have been added to the Semi-Annual Long-Term Monitoring Program with the most recent laboratory analysis conducted in April 2012. The GC chart shows that there are seasonal ups and down but that there is no apparent trend which may be an indicator of a nearby DNAPL source.

In order to assess the contribution of the active recovery well these wells have been included in

the annual Long-Term Monitoring events conducted since the 2003 Baseline event. **Charts/Attachment H-6** has the following Long-Term Monitoring trend charts for RW-1A and RW-11A which (other than RW-6A and RW-7A) are the only recovery wells that capture any CoC:

Chart 1 – RW-1A
Chart 2 – RW-11A

CoCs for **RW-1A** are the four (4) VOC compounds (alkyl benzenes) which have neither a MCL nor a MCP GW Standard but do have Risk Based Remediation Goals (RBRGs) listed in the ROD. These compounds are 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene and n-propylbenzene and sec-butylbenzene. At the 2007 Review a downtrend appear to be in place but during this Review period they have rebounded and no trend is evident.

CoCs for **RW-11A** are Chlorobenze and its degradation products 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene and 1,2,4-Trichlorobenzene. The data for this well only spans the 18-months since it was activated in October 2010 and during this time it has been capturing significant levels of the COCs without any trend evident.

In summary the amount of LNAPL being recovered (nil) and the levels of BTEX in the groundwater within the former LNAPL Pool C area (very low) do not warrant continuation of the RA's active recovery well component. However, there are is a benefit from continuing the operation of RW-1A, RW-6A, RW-7A and RW-11A to expedite the cleanup the CoCs within their capture zone. Thus continued operation of the system is warranted. Also some additional investigation (15' geoprobe wells) is warranted in Zone 2 within the area bounded by monitoring wells ECS-14R, RW-6A, RW-7A, ECS-35, ECS-31 and CH102 to determine whether or not further expansion of the active recovery system would be beneficial.

Treatment System: **Table/Attachment H-7** summarizes the laboratory analysis of the influent and effluent during this Review period. This table reflects that the effluent is consistently below both the NPDES discharge standards and the MCLs/GW-1 Standards/RBRGs. There have been only periodic minor TPH (DRO) detections and consistent low levels of MTBE (note the GAC used in the system had previously been used at another site and the MTBE is considered to be from that site and is now off-gassing from the carbon). Thus it can be concluded that the Site 21 groundwater treatment system is effective. This table also shows that the influent reflects the CoCs being capture by RW-1A, RW-6A, RW-7A and RW-11A) and that the composition changed significantly in 2011 following the October 2010 activation of RW-11A. The following influent trend charts are in **Attachment H-8.**

Chart 1 – Influent TPH concentrations, Sep 2003 – May 2012
Chart 2 - Influent TCE concentrations, Jan 2007 – Apr 2011
Chart 3 - Influent Chlorobenzene et al concentrations, Jan 2011 – May 2012

Prior to RW-11A replacing RW-5A in the operational scheme it is believed that most, if not all, of the TPH being recovered was coming from RW-1A as the monitoring results for RW-5A, RW-6A and RW-7A reflected very little petroleum contamination. TPH concentrations had been down trending following a January 2008 uptick and at times dropped below the GW-1 Standard of 0.2 ug/L which may be an indication that the cleanup of the RW-1 source was almost complete. This all changed in November 2010 and the change in TPH that is graphically shown on Chart 1 is drastic. Since then the TPH has been fluctuation without a discernible trend.

OU-3/IRP Site 21 Long-Term Monitoring Data

Monitoring is a component of the selected remedy with the objectives of monitoring progress towards achievement of Remedial Action Objectives (RAOs) and monitoring the reduction in the volume of LNAPL and the natural attenuation/natural containment of the LNAPL and dissolved-phase contaminant plumes (including the former tetrachloroethene (PCE) hot spot). The Long-Term Monitoring Program for Site 21 is documented in the Hanscom AFB *Basewide Quality Assurance Project Plan (QAPP) for Long-Term Monitoring at NPL Operable Unit 1, NPL Operable Unit 3/IRP Site 6, NPL Operable Unit 3/IRP Site 21, and MCP Sites (IRP Sites 13 & 22 and the FAFSUST Site)*. The Long-Term Monitoring Program for Site 21 initially included 2-stages. Stage 1 was the pre-remedial action monitoring and Stage 2 is the post-RA monitoring which commenced on 15 September 2003. Stage 2 currently includes the following:

- October 2003 Post-RA Baseline sampling of selected wells.
- Semi-annual/annual sampling of selected monitoring wells and the Shawsheen River for laboratory analysis to confirm the containment and anticipated reduction and degradation of the dissolved-phase plumes (e.g., former PCE hot spot).
- Periodic measurement of LNAPL levels using an oil/water interface probe to monitor effectiveness of the remedial action and/or natural attenuation.
- Treatment system monitoring.

The analytical results from the treatment system monitoring and the periodic measurement of LNAPL levels are reported separately in Monthly Remedial Action Reports for Hanscom AFB Site 21. The data presented in this section covers the post-RA Long-Term Monitoring events at Site 21 from 2007 through April 2012. These events are documented in Annual Long-Term Monitoring Reports.

Note: The semi-annual collection of piezometric levels throughout the Site to assess the effectiveness of the enhanced product recovery system within Former LNAPL Pool C and to confirm the site's groundwater flow direction has been dropped as an Long-Term Monitoring Program objective because earlier post-RA piezometric data confirmed that the Remedial Action did not impact the site's groundwater flow direction as documented during the RI. However, LNAPL and groundwater levels are collected from any wells being sampled as part of the semi-annual Long-Term Monitoring Program to document that groundwater elevations are consistent with historical groundwater elevations.

As discussed above in earlier sections of this review the long-term monitoring of OU-3/IRP Site 21 commenced in 1992 and an extensive network of monitoring and recovery wells has been established to monitor LNAPL and to assess the site's groundwater. This network of monitoring points at IRP Site 21 is shown in **Figure 9**. The Basewide Quality Assurance Project Plan for Long Term Monitoring reflects 2 stages for the Site 21 Long-Term Monitoring Program, Stage 1 was the pre-RA stage and the on-going Stage 2 is the post-RA stage which commenced with a "baseline" event on October 2003. The results of this baseline event are presented in the *October 2003 Stage 2 Post-RA Baseline Long-Term Monitoring Report for Operable Unit 3 – IRP Site21,* dated March 2002, which was prepared by Shaw Environmental, Inc. Subsequently samples are collected from selected monitoring points on a semi-annual or annual basis and analyzed for VOCs or SVOCs to monitor progress towards achievement of the RAOs. These semi-annual/annual monitoring events are documented in Long-Term Monitoring Reports with the most recent being the April and October 2006 *Long-Term Monitoring Report for Operable Unit 3 – IRP Site21,* dated March 2002, which was prepared by Shaw Environmental, Inc. A Table is included in each Long-Term Monitoring Report which summarizes all Long-Term Monitoring exceedances of a standard (surface water and groundwater/MCLs, MCP GW-1 & 2 and RBRGs).

Table/Attachment H-9 summarizes the IRP Site 21 Long-Term Monitoring Plan for 2012. This table has been extracted from the 2011 Annual Long-Term Monitoring Report. In addition to the wells to be sampled there is a listing of wells for which sampling and analysis is currently suspended and a listing of wells for which no further sampling and analysis is planned.

Table/Attachment H-10 provides a summary of all post-RA results (to include the baseline sampling conducted in October 2003) for the monitoring wells, recovery wells, and Shawsheen River sampling point included in the Long-Term Monitoring Program from 2007 through April 2012. Compounds that exceed an EPA MCL, MCP GW-1 Standard, or RBRG are shaded in **Attachment H-10**. (A similar Table is included in each of the Annual Long-Term Monitoring Reports).

Due to the complexity of the OU-3/IRP Site 21 groundwater and surface water contamination the analysis of results is best presented by using the RI's subdivision of the Site into the following areas:

- Former Above Ground Storage Tank Area
- Former Railroad Tracks Right of Way
- Zone 1 (Jet Fuel Loading and Unloading Area)
- Zone 2 (Aviation Fuel Loading and Unloading Area, also gasoline and diesel service station setup for Civil Engineering Vehicles)
- Zone 3 (Eastern Half of Railroad Fuel Delivery Siding with Underground Unloading Header)
- Zone 4 (Western Half of Railroad Fuel Delivery Siding with Underground Unloading Header)

- Zone 5 (Buffer/Sentry Area between Site and the Shawsheen River) and the
- Shawsheen River

These areas can best be seen on **Figure 26** which also delineates the separate areas of LNAPL (Pool A, Pool B and Pool C) found in the RI. Note **Figure 26** is slightly different than the Site Plan (**Figure 16)** introduced earlier in this report as it does not show the location of RW-11A but it more clearly shows the above areas.

Please note that **Charts** showing the long-term trends in the VOCs concentrations at OU-3/IRP Site 21 monitoring points are in **Attachment I**.

Former Above Ground Storage Tank Area: The RI did not identify any residual contamination in the area, thus there has been no Post-RA Long-Term Monitoring of this area. Note as listed in **Attachment H-9** no further sampling and analysis is planned for ECS-26, ECS-27, ECS-45 and ESC-46 which are in the Former Above Ground Storage Tank Area.

Former Railroad Tracks Right of Way: The investigation phase did not identify any residual surface aquifer contamination in the western half of this area which was confirmed by Post-RA Baseline monitoring event. Note as listed in **Attachment H-9** no further sampling and analysis is planned for CH-104 & OW-2 which are in the western half of the Former Railroad Tracks Right of Way. Long-Term Monitoring trend charts found in **Attachment I** for the Former Railroad Tracks Right of Way Monitoring wells which have had Post-RA exceedances of a CoCs MCL/MCP GW-1 Standard and/or RBRGs are as follows

Chart 1 – CH-102 (lower aquifer) 1,4-DCB Compounds Oct 1999 – Apr 2012
Chart 2 – ECS-30L (lower aquifer) 1,4-DCB Compounds Oct 1997 – Nov 11
Chart 3 – ECS-34 (surface aquifer) TCE Oct 1997 – Apr 2012

CH-102 – In the 2003 baseline event 1,4-dichlorobenze (1,4-DCB) was found at a concentration of 28.76 ug/L in this **lower aquifer** monitoring well which is under the MCL (75 ug/L) but exceeded the GW-1 Standard of 5 ug/L. This was significantly lower than that found in the 1999 SRI (390 ug/L). Subsequently this well (CH-102) was buried under a stockpile of earth and not accessible for sampling until April 2012. In April 2012 the 1,4-DCB concentration was 82 ug/L which, while higher than in 2003, is still well below the 1999 concentration.

ECS-30L – 1,4-DCB was identified as a CoC in this **lower aquifer** monitoring well in the 1997 RI, however, by the 1999 SRI its concentration had attenuated to just above the MCP GW-1 Standard of 5 ug/L. Since 1999 the 1,4-DCB has almost flat lined while fluctuating above and below the MCP GW-1 Standard. Note that in **surface aquifer** well **ECS-30U** at the same location 1,4-DCB is below its laboratory detection level and no other CoCs have been identified at this location. Thus a Trend Chart is not included for ECS-30U.

ECS-34 – TCE was identified as a CoC in this **surface aquifer** monitoring well in the

1997 RI, however, by the 1999 SRI its concentration had attenuated to below the MCL and has remained below the MCL (5 ug/L) through April 2012 except for a one-rime April 2008 spike-up to 15 ug/L. There also been a one-time Post-RA detection (160 ug/L) in October 2005 of MTBE which was above the MCP GW-1 Standard of 70 ug/L. Subsequently the MTBE was 0.4 F ug/L the following year and has been bdl ever since and a trend chart for MTBE is not meaningful/presented.

Zone 1 (Jet Fuel Loading and Unloading Area/Former LNAPL Pool C): In this area LNAPL continues be periodically found in some of the monitoring wells (see later LNAPL monitoring discussion) and the principal CoCs are the 4 compounds with RBRGs. Long-Term Monitoring trend charts found in **Attachment I** for the Zone 1 monitoring wells which have had Post-RA exceedances of a CoC's MCL/MCP GW-1 Standard and/or RBRG are as follows

Chart 4 – ECS-29 (lower aquifer) RBRGs Compounds Apr 2006 – Apr 2012
Chart 5 – ECS-35 (surface aquifer) TCE Oct 2003 – Nov 2011
Chart 6 – MWZ-13 (surface aquifer) RBRGs Compounds Oct 2006 – Nov 2011
Chart 7 – MWZ-13 (surface aquifer) Naphthalene Oct 2006 – Nov 2011
Chart 8 – MWZ-15 (surface aquifer) RBRGs Compounds Oct 2006 – Nov 2011
Chart 9 – MWZ-17 (surface aquifer) RBRGs Compounds Oct 2006 – Nov 2011
Chart 10 – MWZ-20 (surface aquifer) RBRGs Compounds Oct 2006 – Nov 2011
Chart 11 – MWZ-22 (surface aquifer) RBRGs Compounds Oct 2006 – Apr 2012

Note as listed in **Attachment H-9** monitoring of the following Zone 1 wells has been suspended because their Long-Term Monitoring results had consistently been below the Standards: **MWZ-23, PW-1, PW-2, RT-S2, RT-S3, RW-2A, RW-3A, RW-4A, RW-5A, RW-8A, RW-9A** and **RW-10A**. Since these wells are all within or downgradient from the former LNAPL Pool C area a final confirmatory sampling and analysis is planned once the data indicates that RAOs have been achieved in the other wells in this area and the operation of the small scale LNAPL/Groundwater Recovery System is no longer warranted. Also as listed in **Attachment H-9** no further sampling and analysis is planned for MWZ-19, MWZ-24, MWZ-25, ECS-37 and RW-2 which are in Zone 1.

ECS-29 Apr 2006–Apr 2012– CoCs = compounds with RBRGs – concentrations peaked in October 2007 and dropped below RBRGs in October 2008 and are now almost all bdls.

ECS-35 Oct 2003 – Nov 2011– CoCs = TCE – The TCE concentration increased significantly following the startup of active recovery in 2003 and, while some fluctuation is noted, the concentration has been relatively constant or slightly trending up since 2008. Also see discussion for RW-6A and RW-7A in the Collection System subparagraph. Also, in retrospect, the RW-6A, RW-7A and ECS-35 area probably should been designated as in Zone 2 and also not reflected as in Former LNAPL Pool C.

MWZ-13 Oct 2006 – Nov 2011– CoCs = compounds with RBRGs + naphthalene –

RBRGs compounds appear to be trending lower but still have exceedances (concentrations lower in October 2011 than in 2006). Naphthalene spiked above the GW-1 Standard in November 2010 but dropped back below in October 2011

MWZ-15 Oct 2006 – Nov 2011– CoCs = compounds with RBRGs – RBRGs compounds trending lower and were below RBRGs in 2011

MWZ-17 Oct 2006 – Nov 2011– CoCs = compounds with RBRGs – RBRGs compounds trending lower and were below RBRGs in 2011

MWZ-20 Oct 2006 – Nov 2011– CoCs = compounds with RBRGs – RBRGs compounds trending lower and all except n-propylbenzene were below RBRGs in 2011

MWZ-22 Oct 2006 – Apr 2012– CoCs = compounds with RBRGs – RBRGs compounds trending lower and all were below RBRGs in 2012

Zone 2 (Aviation Fuel Loading and Unloading Area, also Gasoline and Diesel Service Station Setup for Civil Engineering Vehicles): A Pre-RI (November 1992) investigation found significant BTEX in monitoring well MWZ-14 with a benzene concentration of 599 ug/L. Subsequently, MWZ-14 was destroyed and was replaced by ECS-14R in the October 1997 RI at which time the BTEX had dropped significantly with a benzene concentration of 9.9 ug/L. The MWZ-14/ECS-14R location is downgradient from the five former above ground 50,000-gallon aviation gas storage tanks and is in the immediate vicinity of the former truck loading/unloading facilities. Thus it is concluded that there had been a historic release of aviation gas in this area prior to 1972 when the Air Force flying activities at Hanscom AFB were terminated.

Note as listed in **Attachment H-9** no further sampling and analysis is planned for CH-101 and ECS-43 which are in Zone 2.

In this area benzene and its degradation compound, 1,4-dichlorobenze, are the principal CoCs. Long-Term Monitoring trend charts found in **Attachment I** for the Zone 2 Monitoring wells which have had Post-RA exceedances of a CoC's MCL/MCP GW-1 Standard and/or RBRGs are as follows:

Chart 12 – ECS-14R (surface aquifer) Benzene Oct 1997 – Nov 2011
Chart 13 – ECS-31 (surface aquifer) 1,4-DCB et al Oct 1997 – Apr 2012
Chart 14 – RW-1 (former surface aquifer recovery well now inactive/used as a monitoring well) Benzene & 1,4-DCB Oct 2005 – Nov 2011

ECS-14R Oct 1997 – Nov 2011 – CoC = Benzene – A 1992 Pre-RI monitoring found the benzene concentration to be 599 ug/L and by the 2003 Baseline event the benzene had attenuated down to 25.3 ug/L (note SRI 9.9 ug/L concentration is suspect). Since 2003 the benzene has fluctuated between 25 ug/L and the MCL (5 ug/L) and no trend is apparent.

ECS-31 Oct 1997 – Apr 2012 – CoC = 1,4-DCB – Between the 1997 RI and the 2003 Baseline monitoring event the concentration of 1,4-DCB remained relatively stable at levels above its GW-1 Standard. This well was not monitored in 2004 or 2005 but in the 2006 Annual Long-Term Monitoring event the concentrations of chlorobenzene, 1,2-DCB and 1,4-DCB had increased and this uptrend continued until peaking in November 2009. Since then they have been trending down significantly with chlorobenzene and 1,2-DCB now back below their standards. As noted earlier in this review it was the Long-Term Monitoring Program results that led to the installation and activation of RW-11A in October 2010.

RW-1 Oct 2005 – Nov 2011 – CoCs = Benzene & 1,4-DCB – The initial post-RA monitoring of this former recovery well left over from the 1995 Removal Action was in the 2005 Annual Long-Term Monitoring event. At this time 1,4-DCB exceeded bot the MCL (75 ug/L) and MCP GW-1 Standard (5 ug/L). Since then it has attenuated to the point that, in November 2011, the 1,4-DCB concentration was under both the MCL and the GW-1 Standard. Also between October 2005 and November 2011 the benzene concentration fluctuated with a high slightly above its MCL a couple of times but was bdl in November 2011.

CH-102 (lower aquifer) and ECS-30L (lower aquifer) discussed in the Former Railroad Tracks Right of Way subparagraph above are located downgradient from Zone 2 and are believed to be associated with the aviation gasoline release discussed above. The fact that 1,2-DCB is in the lower aquifer can be accounted for by the re-working/grading of the Site 21 area when Hanscom AFB was constructed in the 1940's and the development of the jet fuel facilities in the 1960s. The lacustrine layer thins out in this area and it is assumed that a pathway into the lower aquifer was created by this earth moving in Zone 2 and/or the Former Above Ground Storage Tank Area. In any case attenuation is underway in the lower aquifer.

Zone 3 (Eastern Half of Railroad Fuel Delivery Siding with Underground Unloading Header): There was a documented release of Number 2 Heating Oil from the western end of the underground fuel unloading header in the early 1990s. At that time the pipe was being cleaned out, unfortunately pressure instead of a vacuum was applied to the pipe and the oil inside the pipe blew out of the end cap. This release (which was in the immediate vicinity of MW-12) was immediately cleaned up but it now appears they did not get it all.

Note as listed in **Attachment H-9** no further sampling and analysis is planned for MWZ-6, MWZ-7, RW-3, RW-4A and RW-5 which are in Zone 3. Long-Term Monitoring trend charts found in **Attachment I** for the Zone 3 monitoring wells which have had Post-RA exceedances of a CoC's MCL/MCP GW-1 Standard and/or RBRGs are as follows:

Chart 15 – ECS-28 (surface aquifer) Vinyl Chloride Oct 2003 – Nov 2011
Chart 16 – ECS-28 (surface aquifer) MTBE 2003 – Nov 2011
Chart 17 – MWZ-11 (surface aquifer) n-propylbenzene (RBRGs Compound) Oct 2003 – Nov 2011
Chart 18 – MWZ-12 (surface aquifer) RBRGs Compounds Oct 2006 – Nov 2011

ECS-28 Oct 2003 – Nov 2011– CoC = Vinyl Chloride – Pre-RA monitoring data documented that a undocumented PCE/TCE release had naturally attenuated to the point the only vinyl chloride remained at concentrations above a MCL/MCP GW-1 Standard at the time of the 2003 baseline monitoring event. Since then the vinyl chloride concentration has trended lower but continues to fluctuate above and below the 2 ug/L MCL.

ECS-28 Oct 2003 – Nov 2011– CoC = MTBE – Unfortunately the laboratory did not report an MTBE result for the 2003 Baseline Monitoring event so the MTBE data begins with the November 2004 analysis which found MTBE above the MCP GW-1 Standard (70 ug/L) at 334.2 ug/L. Since then it decreased rapidly, falling below the standard in April 2006 and was bld in November 2011. MTBE is no longer considered a CoC for ECS-28. Also the source of this MTBE has never been identified/found.

MWZ-11 Oct 2003 – Nov 2011– CoC = n-propylbenzene – The other three alkyl benzenes have consistently been below their RBRG and they are not CoCs for MW-11 and not included on Chart 17. The 4th, n-propylbenzene, has been up-trending since the 2003 Baseline monitoring event and additional monitoring is needed to fully assess the impact of this trend. This well is downgradient from MWZ-12 and there made be a migration of CoCs from MWZ-12 which would be consistent with the groundwater flow directions documented in the RI and confirmed by the Long-Term Monitoring Program to date.

MWZ-12 Oct 2003 – Nov 2011 – CoC = RBRGs Compounds – CoCs concentrations peaked in October 2006 and have trended lower since then, but all 4 currently remain above their RBRG.

Zone 4 (Western Half of Railroad Fuel Delivery Siding with Underground Unloading Header/Former LNAPL Pools A & B): LNAPL Pool A was the most significant pre-RA CoC and, as discussed earlier in this Review, the LNAPL was effectively eliminated by the removal of the petroleum contaminated soil in order to construct the RA's east-west interceptor trench. LNAPL Pool B was not as significant as POOL A or Pool C, however, as with LNAPL Pool A the construction of the RA's northeast-southwest interceptor trench effectively eliminated the LNAPL. Post-RA COCs within the former LNAPL Pool A and Pool B areas include the 4 VOC compounds with RBRGs and Benzene. Also of concern in Zone 4 was the dissolved phase plume emanating from the LNAPL.

Long-Term Monitoring trend charts found in **Attachment I** for the Zone 4 monitoring wells which have had Post-RA exceedances of a CoC's MCL/MCP GW-1 Standard and/or RBRGs are as follows

Chart 19 – MWZ-3 (surface aquifer) Benzene Oct 2003 – Apr 2012
Chart 20 – MWZ-3 (surface aquifer) RBRGs Compounds Oct 2003 – Apr 2012
Chart 21– PW-3 (surface aquifer) RBRGs Compounds Oct 2003 – Nov 2011
Chart 22 – PW-4 (surface aquifer) Benzene Oct 2003 – Nov 2011

Chart 23 – PW-4 (surface aquifer) RBRGs Compounds Oct 2003 – Nov 2011
Chart 24 – PW-5 (surface aquifer) RBRGs Compounds Oct 2003 – Nov 2011

MWZ-3 Oct 2003 – Apr 2012 – CoC = Benzene – concentrations peaked in March 2004 and have trended lower since then and dropped below the MCL for good in April 2005. Benzene is no longer considered a CoC for MWZ-3.

MWZ-3 Oct 2003 – Apr 2012 – CoC = RBRGs Compounds – CoCs concentrations had fluctuated without a discernible trend until November 2009 when all except n-propylbenzene began to decrease. n-propylbenzene continues to flat line around 20 ug/L and 1,3,5-trimethylbenzene and sec-butylbenzene dropped below their RBRGs in November 2010 and continue to be under their RBRGs through April 2012. 1,2,4-trimethylbenzene dropped below its RBRG in the semi-annual events in 2011 but rebounded back above in April 2012.

PW-3 Oct 2003 – Nov 2011 – CoC = RBRGs Compounds except sec-butylbenzene – CoCs concentrations have fluctuated throughout the period with a slow down trend. 1,3,5-trimethylbenzene and sec-butylbenzene were just above their RBRGs in October 2011 while 1,2,4-trimethylbenzene's concentration of 43 ug/L is 50%+ lower than it was in October 2003.

PW-4 Oct 2003 – Nov 2011 – CoC = Benzene – concentrations had fluctuated above and below the MCL until peaking in October 2008. In April 2009 they dropped back below and have remained under the MCL through October 2011.

PW-4 Oct 2003 – Nov 2011 – CoC = RBRGs Compounds– CoCs concentrations initially increased, peaked and then began trending down. All dropped significantly between April 2011 and October 2011 when all were under their RBRGs.

PW-54 Oct 2003 – Nov 2011 – CoC = RBRGs Compounds– CoCs concentrations were trending down since October 2003, then spiked in November 2009 and for 2010 and 2011 were less than their RBRGs.

Note as listed in **Attachment H-9** monitoring of the following Zone 4 wells has been suspended because their Long-Term Monitoring results had consistently been less than the Standards: **MWS-108, PW-6, PW-7** and **RW-8.** Since these wells are all within or downgradient from the former LNAPL Pool A or Pool B areas a final confirmatory sampling and analysis is planned once the data indicates that RAOs have been achieved in the other wells in Zone 4. Also as listed in **Attachment H-9** no further sampling and analysis is planned for Ch-105, ECS-32, MWZ-4, and MWZ-5.

Zone 5 (Buffer/Sentry Area between Site and the Shawsheen River): Of primary concern in the post-RA Long-Term Monitoring Program is confirmation that there is a natural containment of the LNAPL and a natural containment and/or natural attenuation of the dissolved-phase plume. In this regards six monitoring wells are located in Zone 5 downgradient from the Former

LNAPL Pools and the dissolved phase plumes. These sentry wells are CH-103, ESC-38, ECS-39, ECS-40, ECS-41 and ECS-42. Two of these wells (ECS-38 and ECS-39) had pre-RA exceedances of some standards, whereas the other four have consistently been near or below the laboratory detection levels for all VOCs. In the 2007 Five-Year Review it was noted that the post-RA results for ECS-39 consistently met all standards with only low to below the laboratory detection levels for all VOCs. With this documented post-RA cleanup of the groundwater in ECS-39 the only sentry monitoring well to have any post-RA exceedances of a standard (1,4-dichlorobenzene) during this Review period is ECS-38). Note as listed in **Attachment H-9** no further sampling and analysis is planned for Ch-103, ECS-32, ECS-39, ECS-40, ECS-41 and ECS-42.

Chart 25 – MWZ-38 (surface aquifer) 1,4-DCB Oct 2003 – Apr 2012

ECS-38 Oct 2003 – Nov 2011– CoC = 1,4-DCB - The only historical and/or current CoC in the groundwater sampled from ECS-38 and the post-RA is 1,4-DCB. As graphically shown the 1,4,-DCB concentrations are still above the MCP GW-1 standard of 5 ug/L and there has been a slight up-trend during this Review period. Also of note is that the post-RA 1,4-DCBconcentrations have been and continue to be less than USEPA's MCL of 75 ug/L.

Shawsheen River: Also of primary concern in the post-RA Long-Term Monitoring Program is confirmation of that water quality of the adjacent Shawsheen River is not being threatened by the LNAPL and/or groundwater contamination at Site 21**. Page 15** of **Attachment H-10** summarizes the results of the post-RA sampling of the Shawsheen River at the stream gauging station immediately downgradient of the site. While there have been sporadic detections of the Site 21 VOC CoCs these detections have always been well below drinking water standards. Based on the low levels being detected it is concluded that neither the LNAPL nor the dissolved-phase plume is adversely impacting the water quality of the Shawsheen River. Also note that the contaminants detected in the river could actually be from the surface water runoff from the paved areas of Hanscom AFB and Hanscom Field which make up the majority of the flow in the river at this monitoring point.

OU-3/IRP Site 21 LNAPL Monitoring/Passive LNAPL Collection

A component of the Site 21 Remedial Action is a monitoring program to track levels of residual LNAPL floating on the surface aquifer groundwater. This monitoring was initiated following the 2003 RA construction activities (removal of petroleum contaminated soil, construction of interceptor trenches, and installation of active and passive recovery wells) at the site. Initially all wells with a historical LNAPL presence and those within the perimeter of the former LNAPL Pools (A, B & C) where monitored monthly. Subsequently, after the November 2004 LNAPL monitoring event, the frequency for those wells with more than one year of no LNAPL detections was changed to semi-annually. Also any site well sampled as part of the Long-Term Monitoring Program is also checked for the presence of LNAPL. The results of the LNAPL monitoring are reported in the monthly Remedial Action Reports. LNAPL monitoring to date

has found that LNAPL has not returned to the areas of former LNAPL Pools A and B and has also not returned to the interceptor trenches in the area of former LNAPL C. However, traces to minor thicknesses of LNAPL continue to be periodically found in existing monitoring wells outside the limits of the Pool C trenches but within the perimeter of former LNAPL Pool C. The table in **Attachment H-11** documents the LNAPL monitoring results during this review period. Only wells which have had a post-RA detection of LNAPL are included in this table. These include monitoring wells ECS-29, ECS-31, ECS-35, MWZ-13, MWZ-15, MWZ-17, MWZ-20 and MWZ-22. It should be noted that a measurable thickness is seldom found because the fuel is so weathered it does not react to the with the ORS probe but traces are found on the napkin used to wipe off the probe when it is removed from a well and it can be visibly noted whether or not the trace is light or heavy. Also, absorbent socks are used periodically to clean out these wells whenever a heavy trace or measurable thicknesses of LNAPL is found. Two observations can be drawn from **Attachment H-11:** 1) LNAPL lens thickness appears to be greater at lower elevations and 2) the thickness of the lens and frequency of LNAPL detections have decrease over time.

In summary the post-RA LNAPL monitoring to date indicates that the 2003 RA's removal and disposal of petroleum contaminated soil effectively removed most of the residual LNAPL, especially in the former LNAPL Pool A and Pool B areas of the site.

Site Inspection

An inspection of the Site was conducted on 19 July 2012 by Thomas W. Best, Portage, Inc. – IRP Consultant (Former Hanscom AFB IRP Manager). Mr. Best was accompanied by:

Matthew Audet and David E. Gallagher, USEPA and MassDEP Remedial Project Managers for the Hanscom Field/Hanscom AFB NPL Site

Stephanie Pilkington, Hanscom AFB Environmental Engineer, and

Richard Landry, Advent Environmental, Inc. 's On-site Manger for the Basewide Remedial Action-Operations Contract.

The purpose of this inspection was to confirm current land use and to assess the protectiveness of the remedies for OU-1/IRP Sites 1, 2 and 3, OU2/IRP Site 4, OU3/IRP Site 6, and OU3/IRP Site 21. No significant issues were identified and no activities were observed that would indicate that areas with subsurface soil contamination had been excavated or that the groundwater was being used for potable/non-potable purposes.

OU-1/IRP Sites 1, 2 and 3: All 3 sites are within the restricted/fenced perimeter of Hanscom Field which is patrolled by Massport operational and security personnel. IRP Site 1 with the VER system is also fenced to segregate the area from the active airfield and adjacent US Navy property. At IRP Sites 2 and 3 recharge basins are constructed over the drum burial pits which precludes access to any residual subsurface soil contamination. The central treatment facility is fenced with access to it controlled by the Hanscom AFB's remedial action contractor's on-site staff. The storm drainage ditch where the effluent from the treatment system is discharged was checked and no evidence of an adverse impact of the discharge was observed. However, it was noted that the water level is significantly lower due to Massport's breeching of the beaver dam.

OU-2/IRP Site 4: This site is part of Hanscom Field in the Runway 5 Approach but is outside the perimeter fencing of the active part of the airfield. Vehicle access to this area is restricted by locked gates and physical barriers; however, the area is accessible on foot. The capped areas, berms, side slopes, drainage structures were observed in good condition and as constructed in 1988.

OU-3/IRP Site 6: This site is on Hanscom AFB and access to the base is restricted to authorized personnel. The site is also separately fenced with signs advising that it is an IRP site and that digging and dumping are not authorized. The Site is being utilized by active Air Force personnel for readiness training, however, all activities are in keeping with the open space land use. The capped areas, side slopes/toe drains and drainage structures were observed in excellent condition and as constructed in 2001. Also the remediated wetland areas appeared to be healthy and fully restored.

OU-3/IRP Site 21: As with IRP Site 6 this site is on Hanscom AFB and access to the base is restricted to authorized personnel. The active LNAPL/groundwater recovery and treatment system was in operation and "industrial" land use of the Site 21 area was observed to be un-changed.

Interviews

Interviews were conducted with various parties connected to the site. During the 19 July 2012 Site Inspection, the USEPA and MassDEP RPMs were interviewed by Mr. Best. Both reconfirmed the necessity to finalize the OU-3/IRP Site 6 Groundwater Compliance Boundary or to issue a ROD Amendment /ESD addressing the dissolved arsenic in the off-site downgradient area to include Hanscom Field on the north/west side of the Shawsheen River. Neither identified any other concerns regarding the Hanscom Field/Hanscom AFB NPL Site.

Ms Barbara Patzner (Airport Director, Hanscom Field) and Mr. Keith Leonhardt (Operations Manager, Hanscom Field) were interviewed on 30 July 2012 and Ms Heidi Porter (Director of Public Health, Bedford) was interviewed on 1 August 2012 by Ms Catherine Foster (Hanscom AFB's IRP RPM) and MR. Best. During these interviews the Land Use Controls for the Remedial Actions were discussed and all parties agreed that communication between parties was adequate.

Mr. Rich Landry, the Hanscom AFB RA-Os contractor's field/on-site manager was interviewed on 19 July 2012 by Mr. Best and expressed concern that the Programmable Logic Computers (PLCs), SCADA System and the system's computer (all associated with the automation of the groundwater remediation system) were last updated for Y2K and that failure of any could result in a fairly long shutdown until repaired or replaced. However, Mr. Landry did not identify any issues/concerns with the current operation, maintenance and monitoring (to include Land Use Controls) associated with the on-going remedial actions.

VII. Technical Assessment

OU-1/IRP Sites 1, 2 and 3

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

Remedial Action Performance: The review of documents, ARARs, risk assumptions, and the results of the site inspection indicates that the remedy is functioning as intended by the ROD. Surface water and groundwater sampling as part of the Long-Term Monitoring Program confirms that operation of the remediation system has achieved continues to achieve the remedial objectives (RAOs) to prevent exposure (via ingestion, inhalation and/or dermal contact) to groundwater containing CoC concentrations that exceed federal drinking water standards (i.e., MCLs and non-zero MCLGs), state drinking water standards (i.e., MCLs), and state groundwater risk characterization standards (i.e., MCP Method 1 GW-1 standards); to prevent further migration of dissolved phase CoCs in groundwater; and to prevent discharge to surface water bodies and wetlands of groundwater containing CoC concentrations that exceed federal drinking water standards, state drinking water standards, and state groundwater risk characterization standards. This monitoring also confirms that the ROD's secondary objectives (ensue that excavation at the three source areas (IRP Sites 1, 2 and 3) is controlled to prevent exposure to any residual contamination in the subsurface soil and to prevent exposure to vapors that could accumulate in buildings affected by the contaminated groundwater plume) are being met by the monitoring and enforcements of LUCs/ICs. Also an IROD secondary objective to decrease contaminants near the source area and to reduce the size of the off-site dissolved phase plume, i.e., draw back the plume toward the source areas is being met.

In August 2001 groundwater recovery, treatment and recharge was suspended at IRP Site 3 and monitoring since then indicates that active remediation of the IRP Site 3 source areas may no longer be necessary. This suspension continues to be considered an interim action. In the future groundwater collection and recharging will be reinitiated to conduct an additional rebound test to confirm that no further active cleanup is required for the IRP Site 3 source areas.

In 2008 both TCE and cis-1,2-DCE in BIW-2 reached the below detection levels (bdl) via the on-site GC analysis. Also it should be noted that, prior to reaching the current state, the TCE-cis ratio had consistently been in the 0.2-0.4+/- range which indicated that biodegradation had been a contributor to the cleanup of the groundwater being captured by this well. Based on these observations it appears that operation of BIW-2 may no longer be necessary. However, since BIW-2 does contributes to the boundary's containment/capture zone the necessity for continued operation needs to be evaluated by suspending its operation now for 12 – 18 month and evaluating the impact of this suspension in the 2012 and 2013 Annual Long-Term Monitoring Reports.

What may be the most important RPO initiative during this reporting period was accomplished in September 2007. This was the conversion of monitoring well RAP1-3R to a VER well to

augment the existing 4-well system and VER from RAP1-3R commenced on 13 Sep 2007. Since then a downtrend commenced and by November 2011 the TCE concentration was down to 3,300 ug/L. Charts/**Attachment C-16** through **C-20** graphically depicts the TCE and cis-1,2-DCE concentrations found in the VER system's 5 recovery wells between July or September 2006 and May 2012 (analysis via on-site GC analysis). These charts also show that even with the operational problems the current VER phase appears to be successfully reducing the mass of contaminants at the Site 1 Burn Pit #1 and Burn Pit #1 Runoff Area. However, since concentrations in the parts per million ranged continued to be found in the groundwater there is still a significant contaminant mass remaining in this area. It is planned to start using the on-site surface recharge capability put in place in 2009 in an attempt to flush more of the residual DNAPL and/or dissolved phase into the VER system's area of influence. After 3 to 6 months the effect of this recharging on the remedy and the necessity and/or cost effectiveness of continuing VER will be evaluated.

System Operations/O&M: Operation and maintenance of the groundwater collection, treatment and recharge system has, on the whole, been extremely effective. The system operates continuously around-the-clock with periodic scheduled/unscheduled shutdowns for maintenance or repairs. The system has operated between 95.7% and 98.9% of possible hours for each year of this Review period.

Opportunities for Optimization: Starting in 1996 there have been several changes in the system with the objective of optimization and, as indicated above, in keeping with the ROD's selected Remedial Action which involves "the continued operation of the existing dynamic groundwater remediation system ..." additional opportunities have been and will continue to be investigated. Optimization actions since the 2007 review are listed in Section V. Also the Long-Term Monitoring Program is adjusted between events and wells are added or removed from the sampling plan to optimize the monitoring plan.

Early Indicators of Potential Issues: With the exception of the VER system there have been no frequent equipment breakdowns or changes in operation, maintenance and monitoring data that indicate a potential/developing issue.

However, as discussed in the OU-1 Long-Term Monitoring Data Review paragraphs and as shown in **Attachment F-2,** the TCE and cis-1,2-DCE concentration in the surface water samples from the drainage ditch in the IRZ Area have been increasing since November 2009. It remains to be determined whether or not this is a reversal of trend. But, as noted in **Attachment C-1**, (OU-1 Key Milestones/Date) in May 2011 Massport removed 10 beavers, installed a beaver deceiver in stream and breeched beaver dam at end of Runway 23-5. As a result of this action the surface water levels in drainage ditch dropped significantly. Unfortunately, the elevations of the RAP1-6 monitoring well cluster and IZR monitoring wells have been lost due to a recent Massport Runway Safety Improvement Project which necessitated adjustment of the well heights but did not re-survey the wells to re-establish a measuring point to be used to determine the groundwater elevations in the 3 aquifers for comparison to the surface water elevation. The IRZ

Area monitoring wells need to be re-surveyed and the Conceptual Site Model for this area re-validated or revised to more fully evaluate the impact of the change of the surface water elevation. This should be accomplished as soon as possible and an analysis of the current vertical hydraulic gradients should be included in the 2012 Annual Long-Term Monitoring Report. There are no other known issues or problems associated with the OU-1 Remedial Action that could place protectiveness at risk.

Implementation of Land Use Controls/Institutional Controls and Other Measures: The LUCs/IC's including in the ROD have been fully implemented, monitored and enforced. Also, Massport incorporated additional/updated information on the Hanscom AFB IRP (includes Sites 1, 2 and 3) in their 2005 L.G. Hanscom Field Environmental Status and Planning Report (ESPR).

Question B: *Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?*

Changes in Standards and To Be Considered: The ARARs listed in the OU-1 ROD that must be met and that have been evaluated are included in Attachment B-1. These include federal drinking water standards (i.e., MCLs and non-zero MCLGs), state drinking water standards (i.e., MCLs) and state groundwater risk characterization standards (i.e., MCP Method 1 GW-1 standards); ARARs related to the site's location (surface water and wetlands); and ARARs related to groundwater and treatment systems' monitoring. There are no known changes in these ARARs and no new standards or TBCs identified that affect the protectiveness of the OU-1 remedy.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics: One pathway of potential concern that was not evaluated in the previous risk evaluations because they pre-dated EPA 2002 draft guidance is the subsurface vapor intrusion to indoor air pathway. This pathway may be of concern at sites where soil and/or groundwater contaminated with VOCs exist in close proximity to occupied buildings or locations where buildings may be constructed in the future. Per EPA guidance, the indoor air pathway should be evaluated at buildings that are within approximately 100 feet laterally or vertically of known or interpolated soil gas or groundwater contaminants, and, where the contamination occurs in the unsaturated zone and/or the uppermost saturated zone. A qualitative screening of the maximum concentrations for groundwater contaminants to EPA risk-based groundwater screening levels for vapor intrusion for target risk of 1E-06 shows that contaminant levels in groundwater exceed risk-based levels within OU-1. The vapor intrusion screening levels can be obtained from EPA's OSWER vapor intrusion screening level website at
http://www.epa.gov/oswer/vaporintrusion/guidance.html#Item6

Since there is contamination of VOCs, especially TCE, cis-1,2-dichloroethene, vinyl chloride in OU-1's groundwater, this exposure pathway was addressed in paragraph 2.7.1.3 of the September 2007 ROD. Key points include in paragraph 2.7.1.3 of the ROD were:

EPA's draft guidance issued to help determine if the vapor intrusion exposure pathway poses a significant risk to human health has been reviewed and determined not to be applicable to OU-1 at this time because of the following:

- There are no permanent residential settings within the footprint of the OU-1 groundwater that has VOC contamination in any of the three aquifers of concern.

- Receptors in sections of OU-1 where vapor intrusion could pose a risk are primarily limited to site workers (the remedial action contractor's on-site operation, maintenance, and monitoring staff) and periodic/short-term official visitors.

- The exposure pathway to potential receptors in the Hanscom AFB Campground area and conservation lands owned by the Town of Bedford is not complete; i.e., LTMP data confirms that, with the exception of immediate vicinity of the Site 1 and Site 2 source areas which are limited/restricted in extent, the surficial aquifer has been cleaned up and VOC contaminated groundwater is confined in to the lower and bedrock aquifers by the overlying lacustrine layer and surface aquifer.

Due to the groundwater contamination, should future development occur within OU-1, the vapor intrusion assessment may need to be re-evaluated because of changes in site conditions, such as land use, source remediation, or plume migration or a mitigation system can be installed at the time of development to prevent the vapor intrusion pathway from occurring.

During the last five years, several changes have occurred to some of the EPA toxicity values maintained on the Integrated Risk Information System (IRIS) for the COCs identified in the ROD. Most notably, on September 28, 2011, EPA released the TCE assessment with new cancer and non-cancer toxicity values. EPA now formally characterizes TCE as carcinogenic to humans by all routes of exposure and a non-carcinogenic health hazard. Although these toxicity values are more stringent than those used in the human health risk assessment conducted for the Site and would result in higher TCE risks from exposure to TCE at the Site, this would not affect the remedy selected for the Site because there is no change to the TCE MCL, which was selected for groundwater cleanup level.

In 2010, EPA released the toxicity assessment for cis-1,2-dichloroethene with a non-cancer reference dose toxicity value less stringent than the value used in the ROD which may result in lower risks from exposure to cis-1,2-dichloroethene at the Site. However, this would not affect the remedy selected for the Site because there is no change to the cis-1,2-dichloroethene MCL, which was selected for groundwater cleanup level.

Physical site conditions or the understanding of these conditions have not changed in a way that could affect the protectiveness of the remedy. The land use on or near the site remains un-changed and there are no newly identified contaminants or contaminant sources. Human health

or ecological routes of exposure or receptors have not been newly identified or changed in a way that could affect the protectiveness of the remedy. There are no unanticipated toxic byproducts of the remedy not previously addressed by the decision documents.

Changes in Risk Assessment Methods: Standardized risk assessment methodologies have not changed in a way that could affect the protectiveness of the remedy.

Expected Progress Towards Meeting RAOs: The remedy is progressing as expected.

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

No newly identified human health or ecological risks been found and no weather-related events have affected the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

Technical Assessment Summary: According to the data reviewed, site inspections, and interviews, the remedy is functioning as intended by the ROD and there have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

OU-2/IRP Site 4

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

Remedial Action Performance: The review of documents, ARARs, risk assumptions, and the results of the site inspection indicates that the remedy is functioning as intended by the 1988 Remedial Action Plan. Since the 3rd Five-Year Review, the physical site conditions or the understanding of these conditions have not changed in a way that could affect the protectiveness of the remedy. The protectiveness the landfill cap had previously been confirmed by the long-term monitoring conducted between December 1989 and September 1992, Supplemental Sampling and Analysis conducted in 1995 and 1996, the Human Health and Ecological Risk Assessments completed in 1997, and Five-Year Reviews conducted in 1997, 2002 and 2007. The assessment of this Five-Year Review finds that the recommendations of the 1st Five-Year Review continue to be implemented and that a long-term inspection and maintenance program is in place to ensure continued protectiveness of the remedy. Quarterly inspections confirm that there have been no changes of any kind since the 3rd Five-Year Review that could affect the protectiveness of the remedy.

Implementation of Land Use Controls/Institutional Controls and Other Measures: While LUCs/IC's were not specifically included in the 1988 Remedial Action Plan they have been voluntarily implemented, monitored and enforced. Also, Massport incorporated additional/updated information on the Hanscom AFB IRP (includes Site 4) in their 2005 L.G.

Hanscom Field Environmental Status and Planning Report (ESPR).

Question B: *Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?*

The Human Health Risk Assessment concluded that "there are no unacceptable risks associated with exposure to Site 4 media" and the Ecological Risk Assessment concluded that "there are no significant ecological risks associated with Site 4." There are no known changes to standardized risk assessment methodologies, exposure assumptions, or toxicity data which would affect these risk assessments.

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

No newly identified human health or ecological risks been found and no weather-related events have affected the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

Technical Assessment Summary: According to the data reviewed, site inspections, and interviews, the remedy is functioning as intended by the 1988 Remedial Action Plan and there have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

OU-3/IRP Site 6

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

Remedial Action Performance: The review of documents, ARARs, risk assumptions, and the results of the site inspection indicates that the remedy is to be functioning as intended by the ROD. The capping of contaminated soils and removal of contaminated wetland soil has achieved the Remedial Action Objectives to prevent direct contact with contaminants in surface soils, to reduce exposure of ecological receptors to contamination, and to minimize erosion of contaminants from the site to the adjacent wetlands and pond. A formal inspection and maintenance program is in place to ensure that the physical site conditions or the understanding of these conditions have not changed in a way that could affect the protectiveness of the remedy. Quarterly inspections confirm that there have been no changes of any kind since the 3rd Five-Year Review that could affect the protectiveness of the remedy. Long-Term Monitoring data confirms that the Site 6 CoCs are not leaving the site via the surface water flowing from the wetlands and surface water and groundwater sampling as part of the Long-Term Monitoring Program confirms that natural flushing and natural attenuation are reducing the size and strength of the on-site contaminants to include dissolved arsenic.

The Long-Term Monitoring data for the Groundwater Compliance Boundary wells indicates that the dissolved arsenic has almost completely been flushed out or attenuated to below the standards. In April 2012 the only surface aquifer well with a concentration above the 10 ug/L MCL was MW6-119U which had a concentration of 11 F ug/L. The data also documents that the lower aquifer wells have consistently been at or below 10 ug/L with the only exception being the October 2002 sample from MW6-15 which had a concentration of 18 F ug/L. While these results in conjunction with the surface water results are quite promising it is recognized that the surface aquifer wells have fluctuated above and below the arsenic MCL during this review time and the fact that dissolved arsenic at concentrations above the MCL are being found in the monitoring wells on the far (north-west) side of the Shawsheen River on Hanscom Field clouds the issue. The trends noted in the Data Review section for the Compliance Boundary wells have to continue for some time and an adequate explanation for the Hanscom Field dissolved arsenic must be found to fully document a "satisfactory/acceptable" Groundwater Compliance Boundary for OU-3/IRP Site 6. If this does not happen in the next 3-5 years then a ROD Amendment or Explanation of Significant Difference will be require to address the Groundwater Compliance Boundary component of the ROD.

Implementation of Land Use Controls/Institutional Controls and Other Measures: The LUCs/IC's including in the ROD have been fully implemented, monitored and enforced. Also, Massport incorporated additional/updated information on the Hanscom AFB IRP (includes Site 6) in their 2005 L.G. Hanscom Field Environmental Status and Planning Report (ESPR).

Question B: Are *the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?*

Changes in Standards and To Be Considered: The ARARs listed in the ROD that must be met and that have been evaluated are included in Attachment B-3. The These include federal drinking water standards (i.e., MCLs and non-zero MCLGs), state drinking water standards (i.e., MCLs) and state groundwater risk characterization standards (i.e., MCP Method 1 GW-1 standards) and ARARs related to the site's location (surface water and wetlands). There are no known changes in these ARARs and no new standards or TBCs identified that affect the protectiveness of the OU-3/IRP Site 6 remedy. However, as noted in previous reviews the Safe Drinking Water Act (SDWA) was changed in 2001 to lower the arsenic standard from 50 ug/L to 10 ug/L. Since, as discussed earlier in this report, dissolved arsenic is the principal contaminant of concern in the on and off- site groundwater and this change may necessitate further adjustment of the groundwater compliance boundary or the preparation of a ROD Amendment or Explanation of Significant Difference. Also implementation of the ROD's contingency groundwater remedy is not envisioned.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics: One pathway of potential concern that was not evaluated in the previous risk evaluations because they pre-dated EPA 2002 draft guidance is the subsurface vapor intrusion to indoor air pathway. This pathway may be of concern at sites where soil and/or groundwater contaminated with VOCs exist in close proximity to occupied buildings or locations where buildings may be constructed in the future. Per EPA guidance, the indoor air pathway should be evaluated at buildings that are within approximately 100 feet laterally or vertically of known or interpolated soil gas or groundwater contaminants, and, where the contamination occurs in the unsaturated zone and/or the uppermost saturated zone. Since there are no buildings within or near the footprint of the OU-3/IRP Site 6 groundwater that has VOC contamination this exposure pathway does not need to be evaluated at this time. Due to the groundwater contamination, should future development occurs at this site, the vapor intrusion assessment may need to be re-evaluated because of changes in site conditions, such as land use, source remediation, or plume migration or a mitigation system can be installed at the time of development to prevent the vapor intrusion pathway from occurring.

During the last five years, several changes have occurred to some of the EPA toxicity values maintained on the Integrated Risk Information System (IRIS) for the COCs identified in the ROD. Most notably, on September 28, 2011, EPA released the TCE assessment with new cancer and non-cancer toxicity values. EPA now formally characterizes TCE as carcinogenic to humans by all routes of exposure and a non-carcinogenic health hazard. Although these toxicity values are more stringent than those used in the human health risk assessment conducted for the Site and would result in higher TCE risks from exposure to TCE at the Site, this would not affect the remedy selected for the Site because there is no change to the TCE MCL, which was selected for groundwater cleanup level.

In 2010, EPA released the toxicity assessment for cis-1,2-dichloroethene with a non-cancer reference dose toxicity value less stringent than the value used in the ROD which may result in lower risks from exposure to cis-1,2-dichloroethene at the Site. However, this would not affect the remedy selected for the Site because there is no change to the cis-1,2-dichloroethene MCL, which was selected for groundwater cleanup level.

Physical site conditions or the understanding of these conditions have not changed in a way that could affect the protectiveness of the remedy. The land use on or near the site remains un-changed and there are no newly identified contaminants or contaminant sources. Human health or ecological routes of exposure or receptors have not been newly identified or changed in a way that could affect the protectiveness of the remedy. There are no unanticipated toxic byproducts of the remedy not previously addressed by the decision documents.

Changes in Risk Assessment Methods: Standardized risk assessment methodologies have not changed in a way that could affect the protectiveness of the remedy.

Expected Progress Towards Meeting RAOs: The remedy is progressing as expected.

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

No newly identified human health or ecological risks been found and no weather-related events have affected the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

Technical Assessment Summary: According to the data reviewed, site inspections, and interviews, the remedy is functioning as intended by the ROD for OU-3/IRP Site 6, however, additional data/time is required to confirm that the Groundwater Compliance Boundary as revised in 2006 adequately defines where the dissolved arsenic plume coming from the Site 6 landfilled areas ends. It is noted that there have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. Also there are no known changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessments, and there have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

OU-3/IRP Site 21

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

Remedial Action Performance: The review of documents, ARARs, risk assumptions, and the results of the site inspection indicates that the remedy is functioning as intended by the ROD. Surface water and groundwater sampling and analysis as part of the Long-Term Monitoring Program confirms that construction of the interceptor trenches and operation of the LNAPL/ groundwater recovery (and treatment) system has achieved the remedial objectives to prevent or minimize further migration of the contaminant plume (dissolved-phase CoCs) and of contaminants from source materials (VOCs/LNAPL) to groundwater. This monitoring confirms that groundwater containing CoC concentrations that exceed standards is not discharging into the Shawsheen River and that the RAO to return groundwaters to federal and state drinking water standards and state groundwater risk characterization standards should be met within an acceptable time period (< 100 years).

The RAO to prevent exposure (via ingestion, inhalation and/or dermal contact) to groundwater containing CoC concentrations that exceed federal drinking water standards (i.e., MCLs and non-zero MCLGs), state drinking water standards (i.e., MCLs) and state groundwater risk characterization standards (i.e., MCP Method 1 GW-1 standards) are being met by the monitoring and enforcement of LUCs/ICs.

System Operations/O&M: Operation and maintenance of the LNAPL/groundwater recovery and treatment system has, on the whole, been effective. The fact that there has been no measurable amount of LNAPL recovered is considered to be due the fact that little to no residual

LNAPL remained on-site after the construction of the interceptor trenches (which removed a significant amount of petroleum contaminated from the site) in 2003. The small scale LNAPL/Groundwater Recovery and Treatment System operates continuously around-the-clock with only periodic scheduled/unscheduled shutdowns for maintenance or repairs or because of adverse weather. The system has consistently operated for greater than 95.8% of possible hours since its 2003 startup.

Opportunities for Optimization: The operational scheme of the small scale LNAPL/ Groundwater Recovery System has already been optimized based on Long-Term Monitoring data. One new well was installed and added to the system in 2010 and the current scheme is that 4 of the 11 active recovery wells are on-line with the remainder in standby. Also the Long-Term Monitoring Program is adjusted between events and wells are added or removed from the sampling plan to optimize the monitoring plan. In addition it is being recommended that additional monitoring wells be installed in the Zone 2 section of Site 21 to evaluated whether or not expansion of the active recovery network to cover more of this Zone would be beneficial in expediting the cleanup of Zone's 2 groundwater. Additional optimization opportunities will continue to be investigated.

Early Indicators of Potential Issues: There have been no frequent equipment breakdowns or changes in operation, maintenance and monitoring data that indicate a potential/developing issue. There are no known issues or problems associated with the OU-3/IRP Site 21 Remedial Action that could place protectiveness at risk.

Implementation of Land Use Controls/Institutional Controls and Other Measures: The LUCs/IC's including in the ROD have been fully implemented, monitored and enforced.

Question B: *Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?*

Changes in Standards and To Be Considered: The ARARs listed in the ROD that must be met and that have been evaluated are included in Attachment B-3. These include federal drinking water standards (i.e., MCLs and non-zero MCLGs), state drinking water standards (i.e., MCLs) and state groundwater risk characterization standards (i.e., MCP Method 1 GW-1 standards); ARARs related to the site's location (Shawsheen River); and ARARs related to groundwater and treatment system monitoring. There have been no changes in these ARARs or TBCs identified that affect the protectiveness of the OU-3/IRP Site 21 remedy. However, in April 2006 the MCP Method 1 standards were revised for all classes (GW-1/2/3) which did impact potential contaminants of concern. Most notably the increase of the GW-1 standard for naphthalene from 20 ug/L to 140 ug/L all but removed this compound from the list of contaminants of concern in the groundwater at Site 21.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics: One pathway of potential concern that was not evaluated in the previous risk evaluations because they pre-dated EPA 2002 draft guidance is the subsurface vapor intrusion to indoor air pathway. This pathway may be of concern at sites where soil and/or groundwater contaminated with VOCs exist in close proximity to occupied buildings or locations where buildings may be constructed in the future. Per EPA guidance, the indoor air pathway should be evaluated at buildings that are within approximately 100 feet laterally or vertically of known or interpolated soil gas or groundwater contaminants, and, where the contamination occurs in the unsaturated zone and/or the uppermost saturated zone. Since there are buildings (1823, 1833 & 1835) on or adjacent to and contamination of VOCs, especially TCE, vinyl chloride**,** and chlorobenzene ant its degradation compounds in groundwater at OU-3/IRP Site 21, this exposure pathway needs to be evaluated. A qualitative screening of the maximum concentrations for groundwater contaminants to EPA risk-based groundwater screening levels for vapor intrusion for target risk of 1E-06 is required to determine if the contaminant levels in groundwater exceed risk-based levels at OU-3/IRP Site 21. The vapor intrusion screening levels can be obtained from EPA's OSWER vapor intrusion screening level website at http://www.epa.gov/oswer/vaporintrusion/guidance.html#Item6 Due to the groundwater contamination, should future development occurs at this site, the vapor intrusion assessment may need to be re-evaluated because of changes in site conditions, such as land use, source remediation, or plume migration or a mitigation system can be installed at the time of development to prevent the vapor intrusion pathway from occurring.

During the last five years, several changes have occurred to some of the EPA toxicity values maintained on the Integrated Risk Information System (IRIS) for the COCs identified in the ROD. Most notably, on September 28, 2011, EPA released the TCE assessment with new cancer and non-cancer toxicity values. EPA now formally characterizes TCE as carcinogenic to humans by all routes of exposure and a non-carcinogenic health hazard. Although these toxicity values are more stringent than those used in the human health risk assessment conducted for the Site and would result in higher TCE risks from exposure to TCE at the Site, this would not affect the remedy selected for the Site because there is no change to the TCE MCL, which was selected for groundwater cleanup level.

In 2010, EPA released the toxicity assessment for cis-1,2-dichloroethene with a non-cancer reference dose toxicity value less stringent than the value used in the ROD which may result in lower risks from exposure to cis-1,2-dichloroethene at the Site. However, this would not affect the remedy selected for the Site because there is no change to the cis-1,2-dichloroethene MCL, which was selected for groundwater cleanup level.

Physical site conditions or the understanding of these conditions have not changed in a way that could affect the protectiveness of the remedy. The land use on or near the site remains un-changed and there are no newly identified contaminants or contaminant sources. Human health or ecological routes of exposure or receptors have not been newly identified or changed in a way that could affect the protectiveness of the remedy. There are no unanticipated toxic byproducts

of the remedy not previously addressed by the decision documents.

Changes in Risk Assessment Methods: Standardized risk assessment methodologies have not changed in a way that could affect the protectiveness of the remedy.

Expected Progress Towards Meeting RAOs: The remedy is progressing as expected.

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

No newly identified human health or ecological risks been found and no weather-related events have affected the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

Technical Assessment Summary: According to the data reviewed, site inspections, and interviews, the remedy is functioning as intended by the ROD and there have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. There are no known changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment and there have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

VIII. Issues Identified During the Technical Assessment

There are no issues related to current site operations, conditions, or activities that affect current and/or future protectiveness of any of the Hanscom Field/Hanscom AFB remedies.

IX. Recommendations and Follow-up Actions

The following are required and suggested improvements to current site operations, activities, remedies, or conditions. Hanscom AFB is responsible for their implementation with regulatory oversight by USEPA Region I and/or MassDEP.

OU-1/IRP Sites 1, 2 and 3

- Continue to implement Remedial Process Optimization initiatives as suggested by operational experience, monitoring and the evolution of new applicable remediation technologies to complete the cleanup in the most cost effective and timely manner possible, and
- Re-survey the IRZ Area monitoring wells and re-validate or revise the Conceptual Site Model for this area to more fully evaluate the impact of the change of the surface water elevation since the beaver dam was breeched by Massport in 2010. This should be accomplished as soon as possible and an analysis of the current vertical hydraulic gradients should be included in the 2012 Annual Long-Term Monitoring Report,
- Surface recharge for 3 to 6 months in the areas of the Burn Pits and the Burn Pit #1 Runoff Area and evaluate the effect of recharging on remedy. Also re-evaluate cost effectiveness of continuing VER at Site 1,
- Suspend operation of BIW-2 for 12 – 18 months and evaluate the impact of this suspension and the necessity for continued operation in the 2012 and/or 2013 Annual Long-Term Monitoring Reports, and
- Re-initiate groundwater collection and recharging at Site 3 for 3 – 6 months to confirm that no further active cleanup is required for the IRP Site 3 source areas.

OU-2/IRP Site 4 - none

OU-3/IRP Site 6

- Determine whether or not the groundwater compliance boundary is adequately defined by the current network of monitoring wells and provide a satisfactory/acceptable explanation for the dissolved arsenic that has been found on Hanscom Field. If this is not accomplished in the next 3-5 years then a ROD Amendment or Explanation of Significant Difference will be required to address the Groundwater Compliance Boundary component of the ROD.

OU-3/IRP Site 21

- Continue to implement Remedial Process Optimization initiatives as suggested by operational experience, monitoring and the evolution of new applicable remediation technologies to complete the cleanup in the most cost effective and timely manner possible, and

- Install additional monitoring wells in Zone 2 of Site 21 to evaluate whether or not expansion of the active recovery network to cover more of this Zone would be beneficial in expediting the cleanup of Zone's 2 groundwater.

- Since Buildings 1823, 1833 and 1834 are either on or adjacent to OU-3/IRP Site 21 and VOC contamination occurs in the unsaturated zone and/or the uppermost saturated zone at this site, the subsurface vapor intrusion to indoor air pathway exposure pathway needs to be evaluated in accordance with EPA's 2002 draft guidance. This evaluation should be completed within 6 months using the Long-Term Monitoring data scheduled to be collected in the fall of 2012.

X. Protectiveness Statement(s)

OU-1/IRP Sites 1, 2 & 3

- The remedy at OU-1 is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

Current data indicates that residual contaminant sources are being removed/destroyed, that the dissolved-phase plume is contained, and that groundwater containing CoC concentrations exceeding ARARs is not discharging into the surface water/wetlands of OU-1. Continued operation of the dynamic groundwater remediation system will, over time, permanently eliminate the plumes of contaminated groundwater and the source of groundwater contamination. Also, based on the CDW model, there is now a reasonably estimated 30-50 year time frame to complete the cleanup. LUCs/ICs (whilst the remedy operates to meet the cleanup goals) prevent exposure to and use of contaminated groundwater; ensures that excavation at the three source areas (IRP Sites 1, 2 and 3) is controlled to prevent exposure to any residual contamination in the subsurface soil; and prevent exposure to vapors that could accumulate in buildings effected by the contaminated groundwater plume.

OU-2/IRP Site 4

- The remedy at OU-2 continues to be protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

The protectiveness the landfill cap at IRP Site 4 been documented in the 1st, 2nd and 3rd Five-Year Reviews and there have been no changes of any kind since 1997 that could affect the protectiveness of the remedy. A long-term inspection and maintenance program is in place to ensure continued protectiveness of the remedy.

OU-3/IRP Site 6

- The remedy at OU-3/IRP Site 6 is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

Construction of the remedy was completed in 2001 and a long-term inspection, maintenance and monitoring program is in place to ensure that the remedy remains in place as constructed. Current data indicates that natural flushing and natural attenuation are slowly reducing the size and strength of the contaminant plume within the compliance boundary and that groundwater quality is at times being met outside the compliance boundary. However, additional data/time is required to confirm that the revised/expanded Groundwater Compliance Boundary adequately defines where the dissolved arsenic is less than the 10 ug/L MCL. LUCs/ICs (whilst the remedy

operates to meet the cleanup goals) prevent exposure to and use of contaminated groundwater and ensure that excavation at the three capped landfilled areas is controlled to prevent exposure to any residual contamination in the subsurface soil.

OU-3/IRP Site 21

- The remedy at OU-3/IRP Site 21 is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

Construction of the remedy was completed in 2003 and a long-term operation, maintenance and monitoring program is in place to ensure that the remedy remains in place as constructed. Current data indicates that the majority of the LNAPL was removed during the construction phase and that the residual contaminants at the site (dissolved-phase plume and LNAPL) are contained and are slowly decreasing due to natural attenuation, ORC® applications, and operation of the small scale LNAPL/groundwater recovery system. Current data also indicates that that groundwater containing CoC concentrations exceeding ARARs is not discharging into the Shawsheen River. LUCs/ICs (whilst the remedy operates to meet the cleanup goals) prevent exposure to and use of contaminated groundwater; ensures that excavation at the Site is controlled to prevent exposure to any residual contamination in the subsurface soil or groundwater; and that future land use does not increase the risk of exposure to contaminants remaining on site.

XI. Next Review

The next five-year review for the Hanscom Field/Hanscom AFB Superfund Site should be completed no later than five years following the signature date of this Five-Year Review Report which is anticipated to occur on or before September 30, 2017.

Figures

Figure 1 – Site Location Map with Operable Unit Locations

Figure 2 – Topography and Surficial Geology

Figure 3 – Town of Bedford Aquifer Protection Districts

Figure 4 - MassDEP – Bureau of Waste Site Cleanup Groundwater Classification Map for IRP Site 1

Figure 5 - MassDEP – Bureau of Waste Site Cleanup Groundwater Classification Map for IRP Site 2

Figure 6 - MassDEP – Bureau of Waste Site Cleanup Groundwater Classification Map for IRP Site 3

Figure 7 - MassDEP – Bureau of Waste Site Cleanup Groundwater Classification Map for IRP Site 6

Figure 8 - MassDEP – Bureau of Waste Site Cleanup Groundwater Classification Map for IRP Site 21

Figure 9 - Not Used

Figure 10 - MassDEP – Bureau of Waste Site Cleanup Groundwater Classification Map showing Public Water Supply Wells in Bedford

Figure 11 – IRP Site 1 Plan

Figure 12 – IRP Site 2 Plan

Figure 13 – IRP Site 3 Plan

Figure 14 – IRP Site 4 Plan

Figure 15 – IRP Site 6 Plan (includes Locations of the Long-Term Monitoring Sampling Points)

Figure 16 – IRP Site 21 Plan (includes Locations of the Long-Term Monitoring Sampling Points)

Figure 17 – Hanscom Field Area 1 Project Locus Plan

Figure 18 – OU-1 Plan of the Components of the Groundwater Remediation System

Figure 19 – OU-3/IRP Site 21 Plan of the Physical Components of the Selected Remedial Action

Figure 20 – OU-1/IRP Site 1 VER Demonstration Layout Plan

Figure 21 – OU-1/IRP Site 1 IRZ Project (Molasses Injections) Layout Plan

Figure 22 – OU-1/IRP Site 1 IW-11 Layout Plan

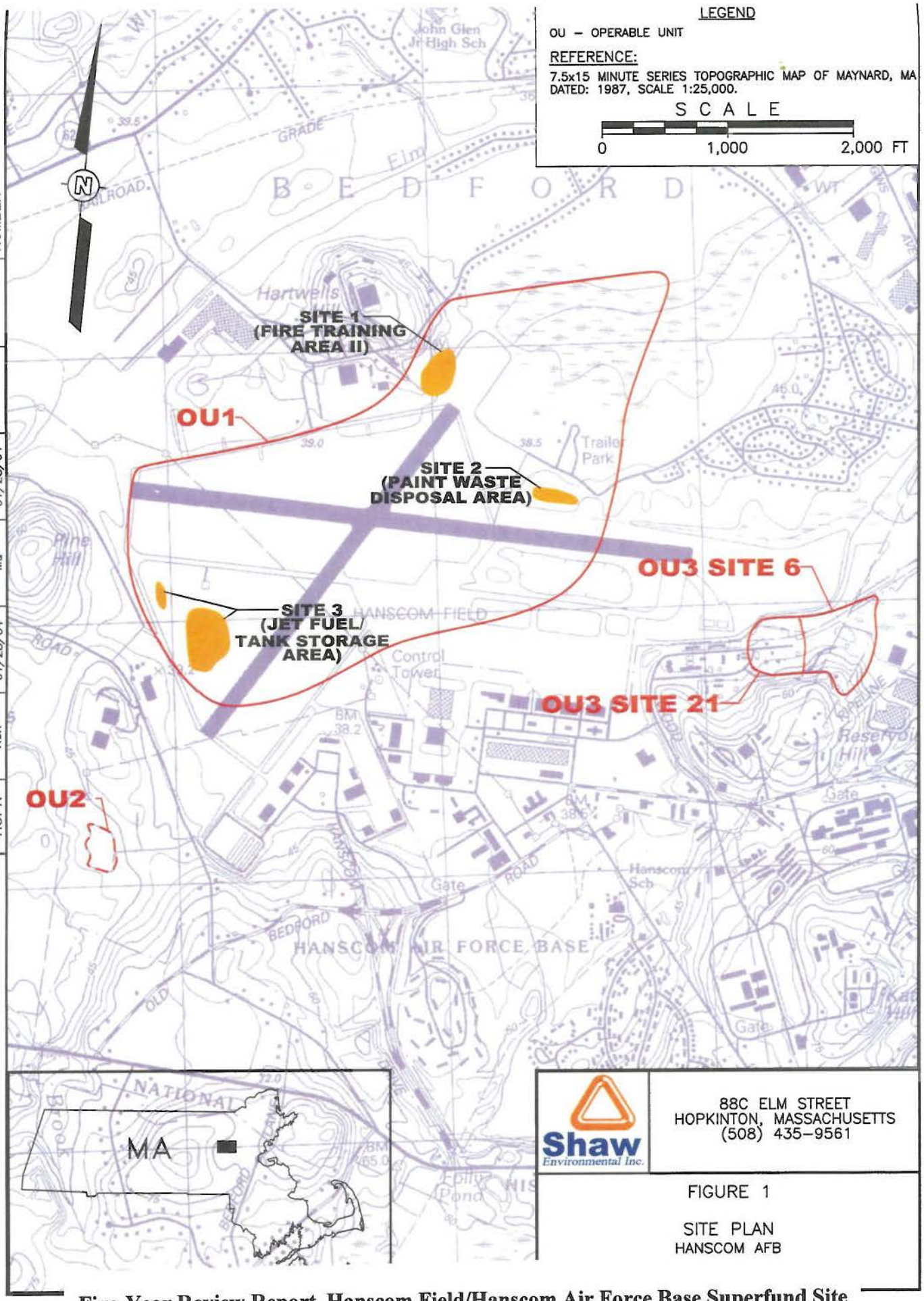
Figure 23 – OU-1 Site Plan Showing Locations of the Long-Term Monitoring Sampling Points

Figure 24 – Ou-3/IRP Site 6 Plan Showing 6 New Groundwater Monitoring Wells Installed in 2006 and the Groundwater Compliance Boundary as revised in 2006

Figure 25 – Ou-3/IRP Site 6 Plan Showing Locations 3 Additional Surface Water Monitoring Points and 3 New Groundwater Monitoring Wells Installed in October 2008

Figure 26 – Sketch Showing the Four Surface Water Monitoring Points

Figure 27 – IRP Site 21 Plan (includes RI Area Designations and Locations of the Former LNAPL Pools



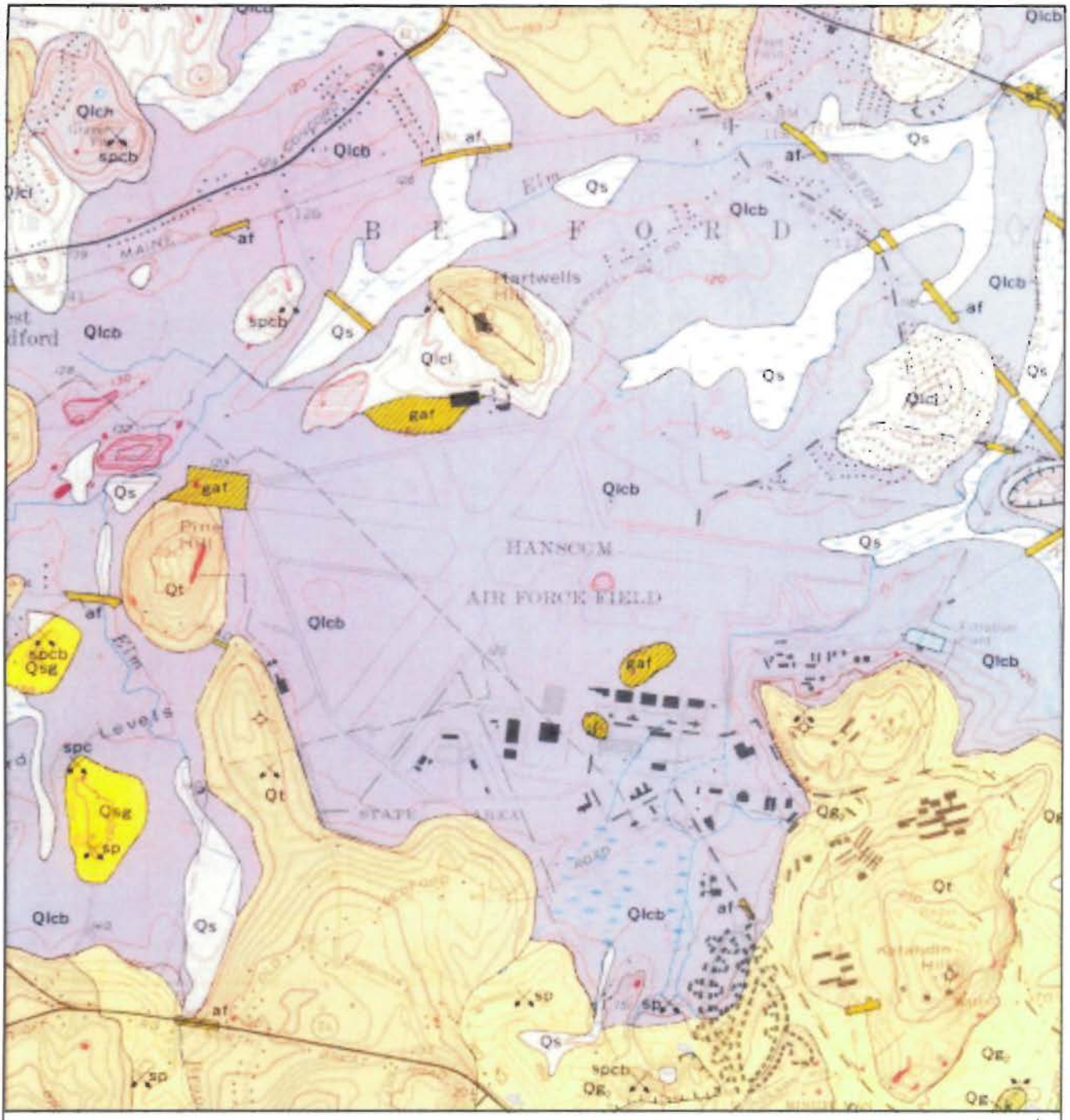
OFFICE	DRAWN BY		CHECKED BY		APPROVED BY	DRAWING NUMBER
HOPK	KCK	01/28/04	MO	01/28/04		SITE9-2.dwg

File: N:\MISC\Hanscom AFB\2004\OU1\SITE 9-3jb.dwg Layout: O.U. LOC FIG 1-1 User: chris.desiata Jun 14, 2007 – 4:30pm
XREF Files: Topo-2 IMAGE Files: maynard.tif

Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

FIGURE 1

138808.FS.ZZ<Surfic>cac.wdc.04/00



0 1 Mile

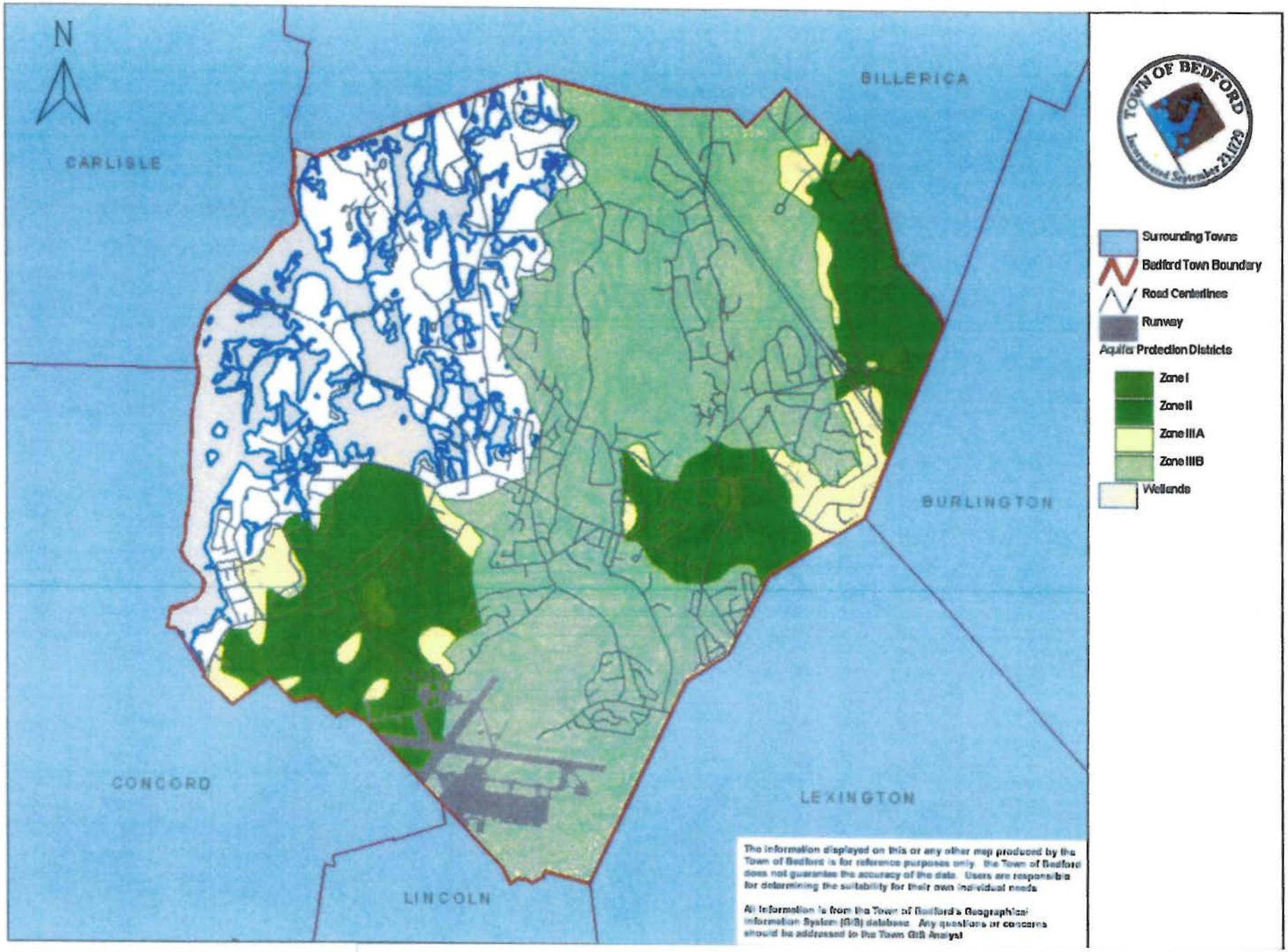
N

LEGEND

gaf	graded and filled	Qlcl	low stage lake deposits
Qg_2	sand, gravel, and silt	Qs	swamp deposits
Qlcb	lake bottom deposits	Qsg	sand and gravel
Qlch	high stage lake deposits	Qt	till

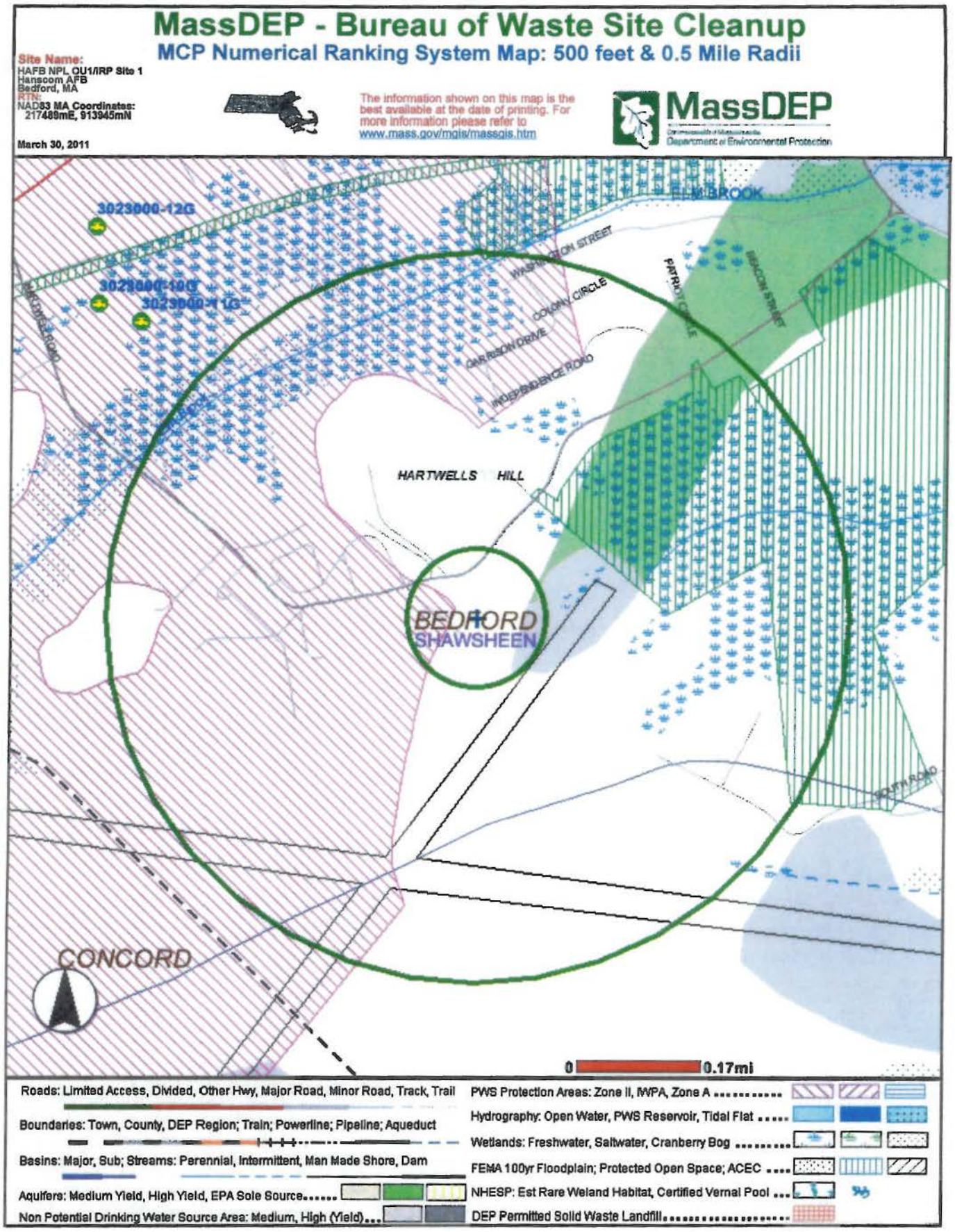
Source: U.S. Geological Survey Map GQ-331. Surficial Geology of the Concord Quadrangle. Carl Koteff, 1964.

Figure 8
SURFICAL GEOLOGY OF THE MODELED AREA
Hanscom Air Force Base
Operable Unit 1



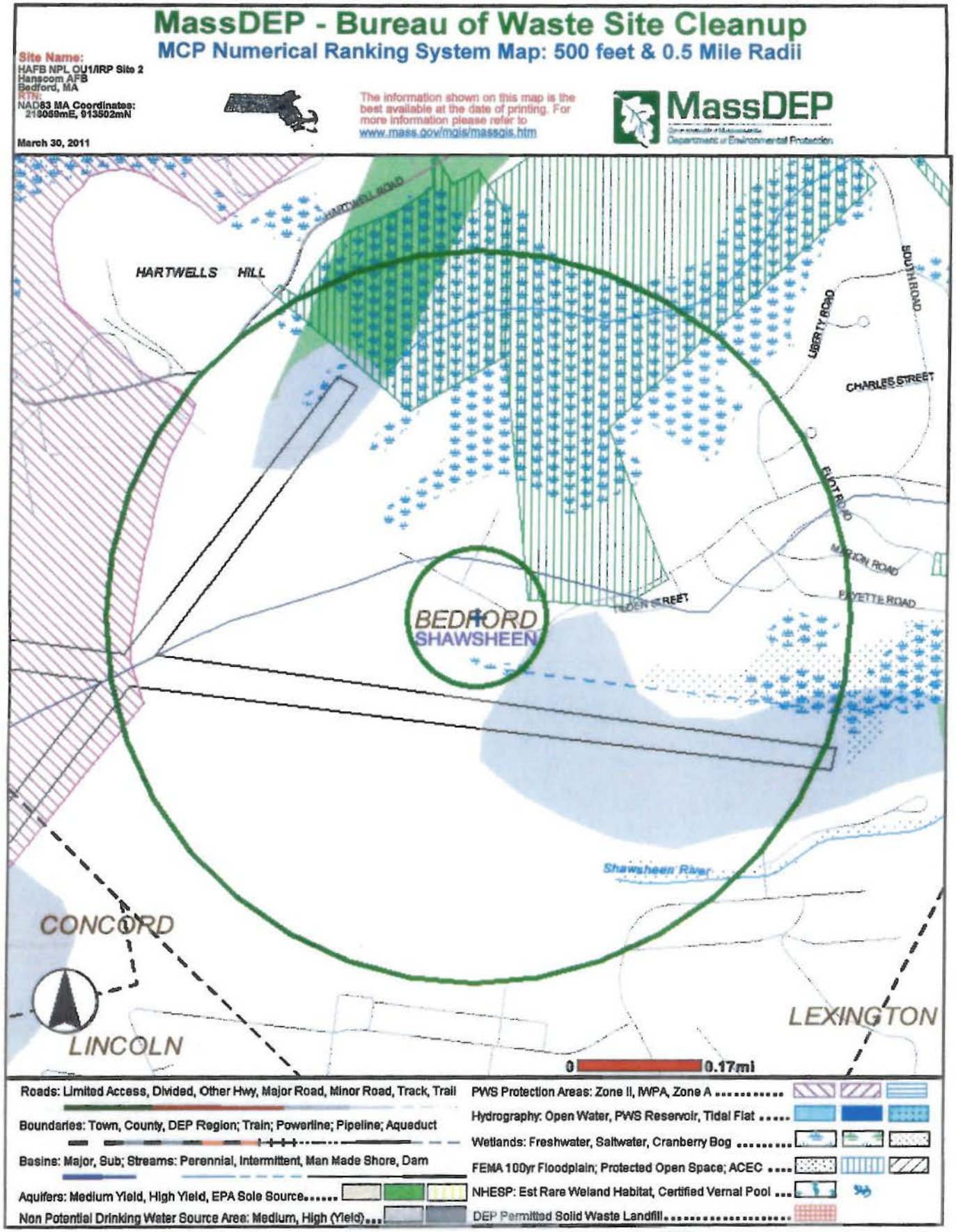
Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

FIGURE 3



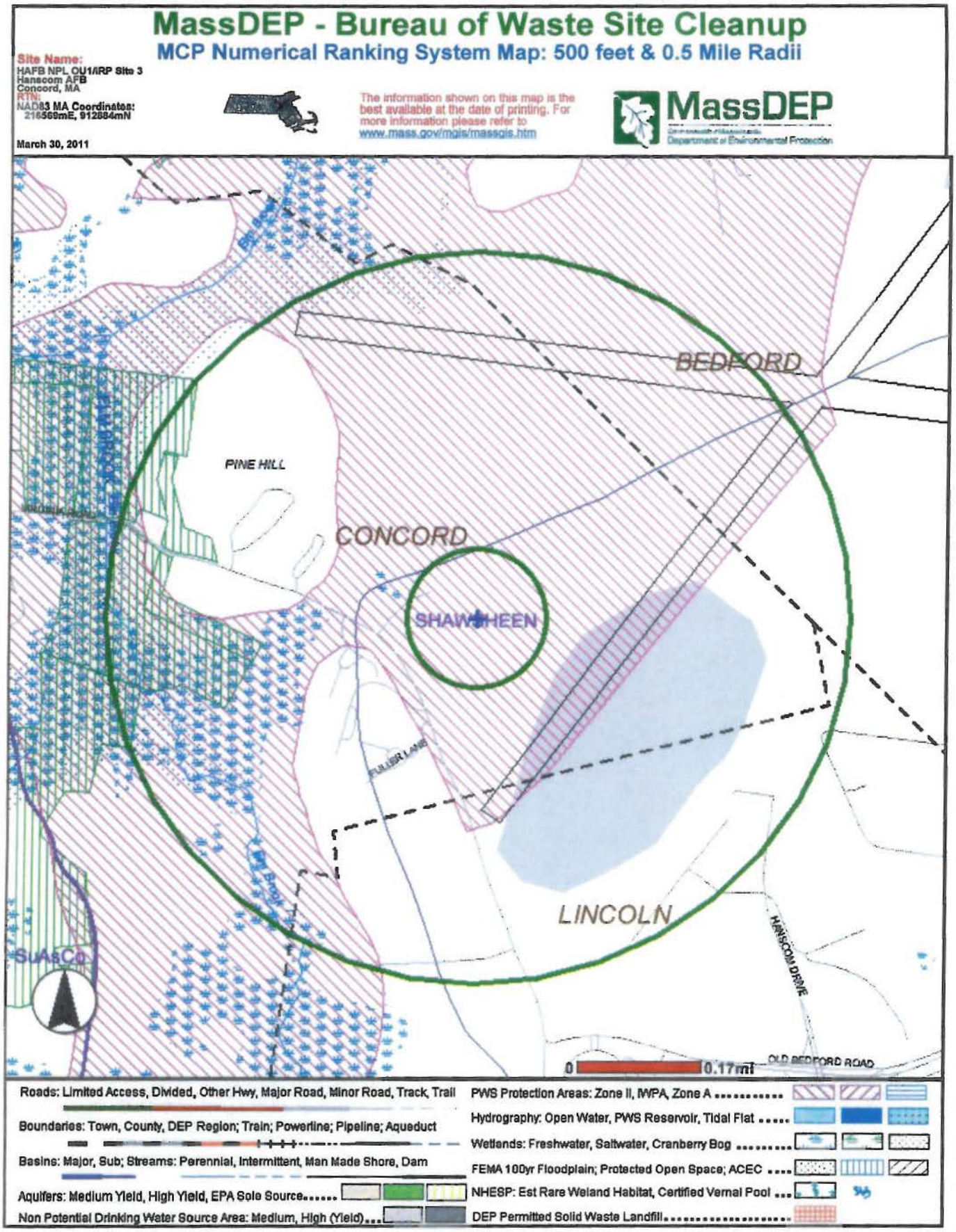
Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

FIGURE 4



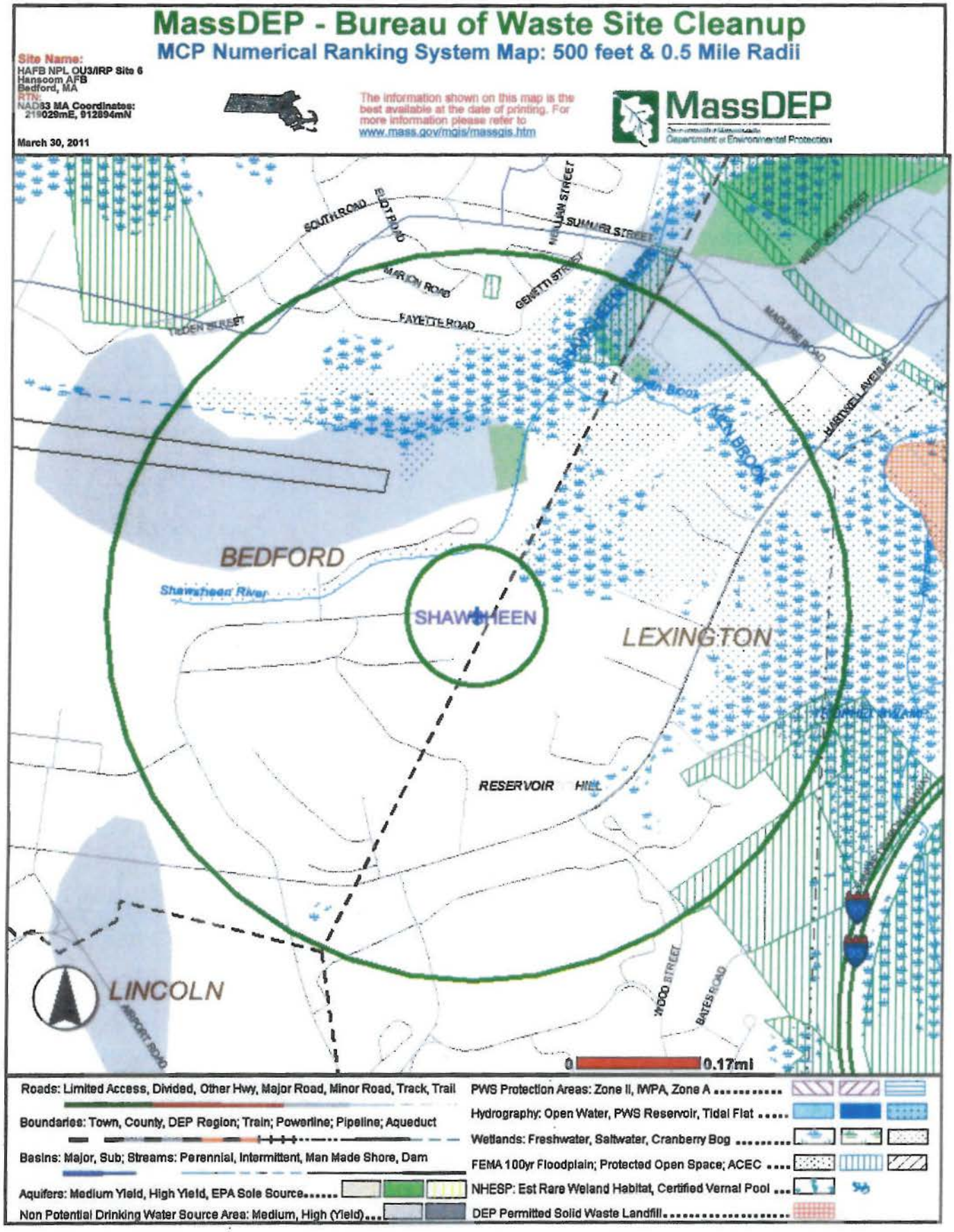
Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

FIGURE 5



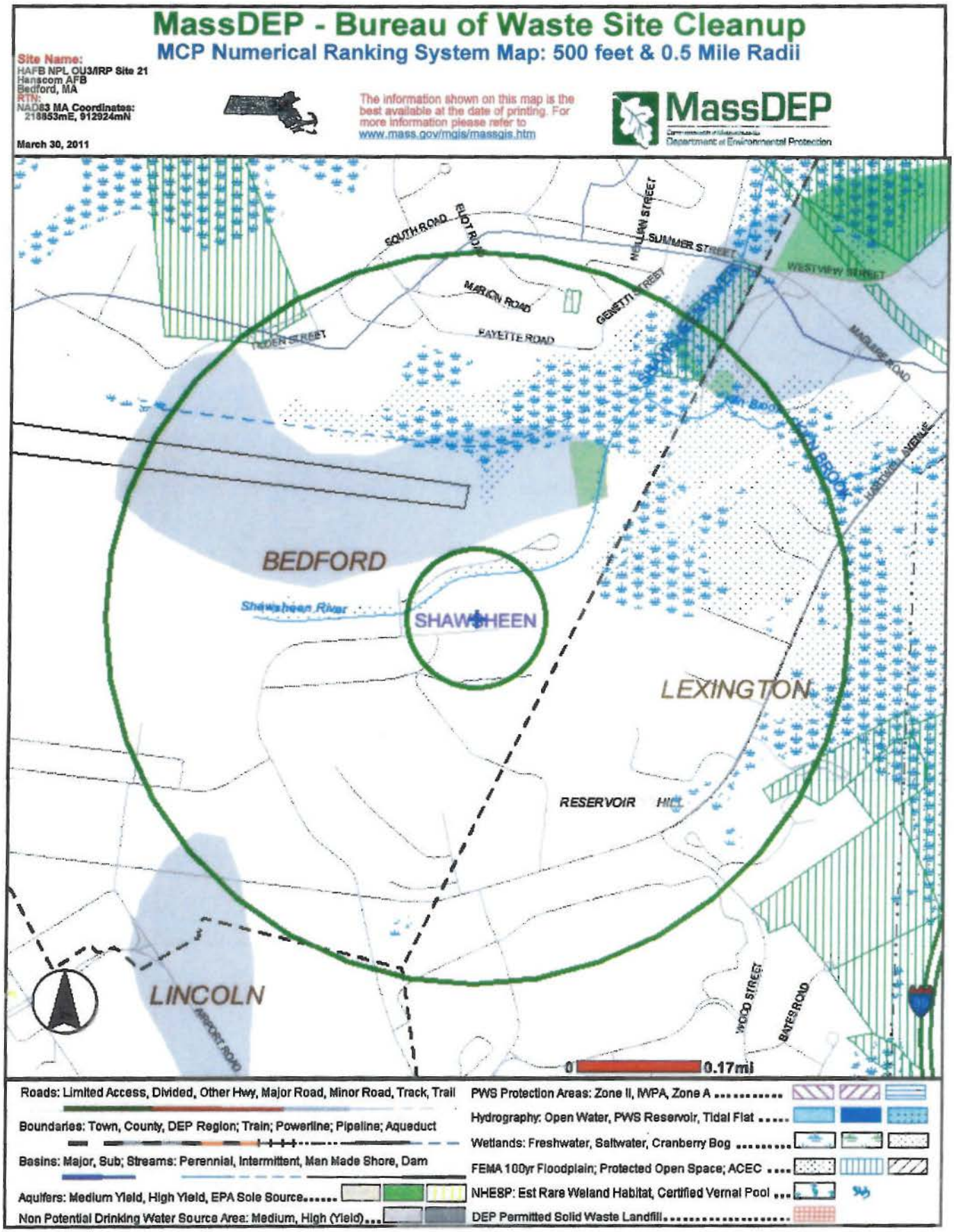
Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

FIGURE 6



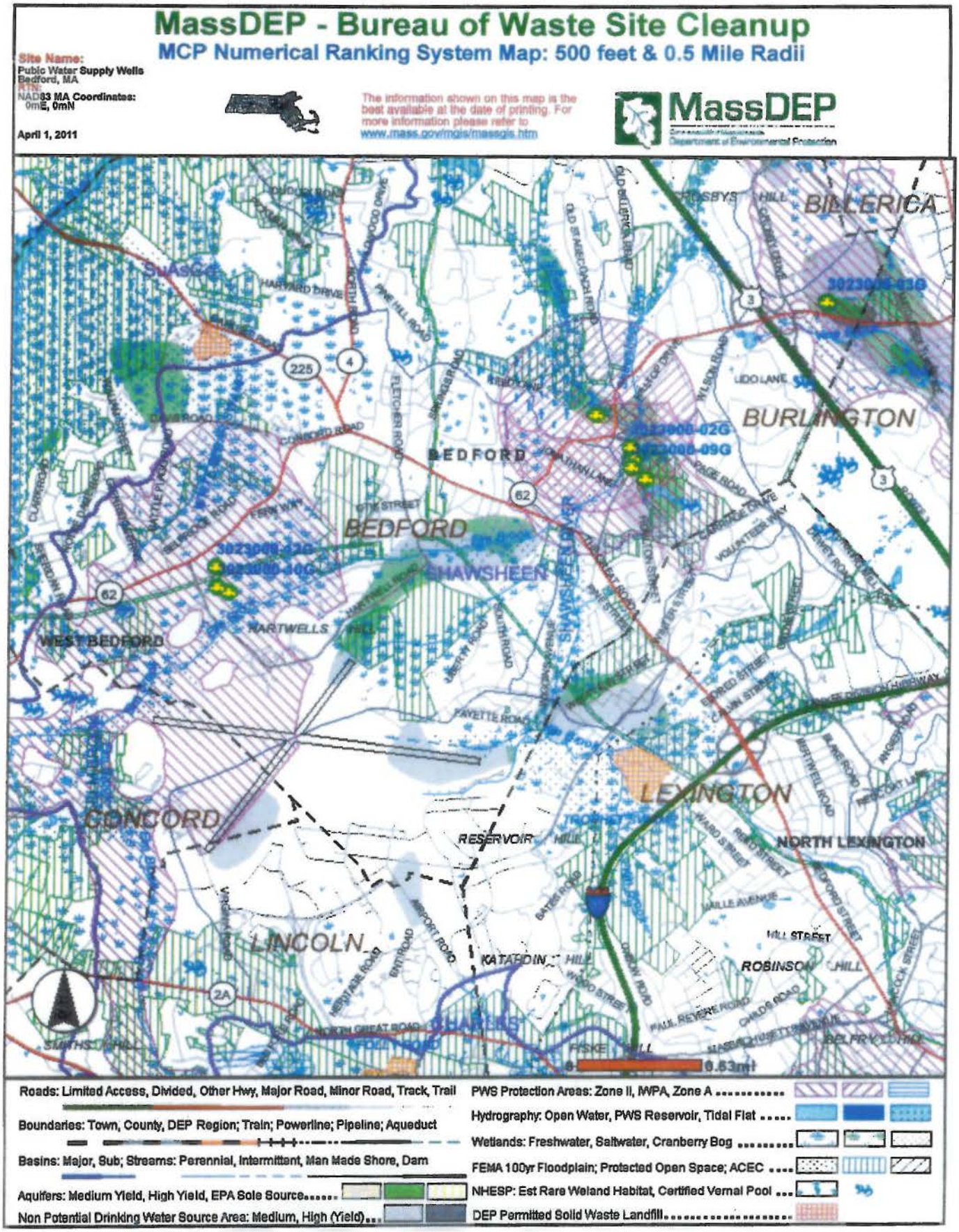
Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

FIGURE 7



Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

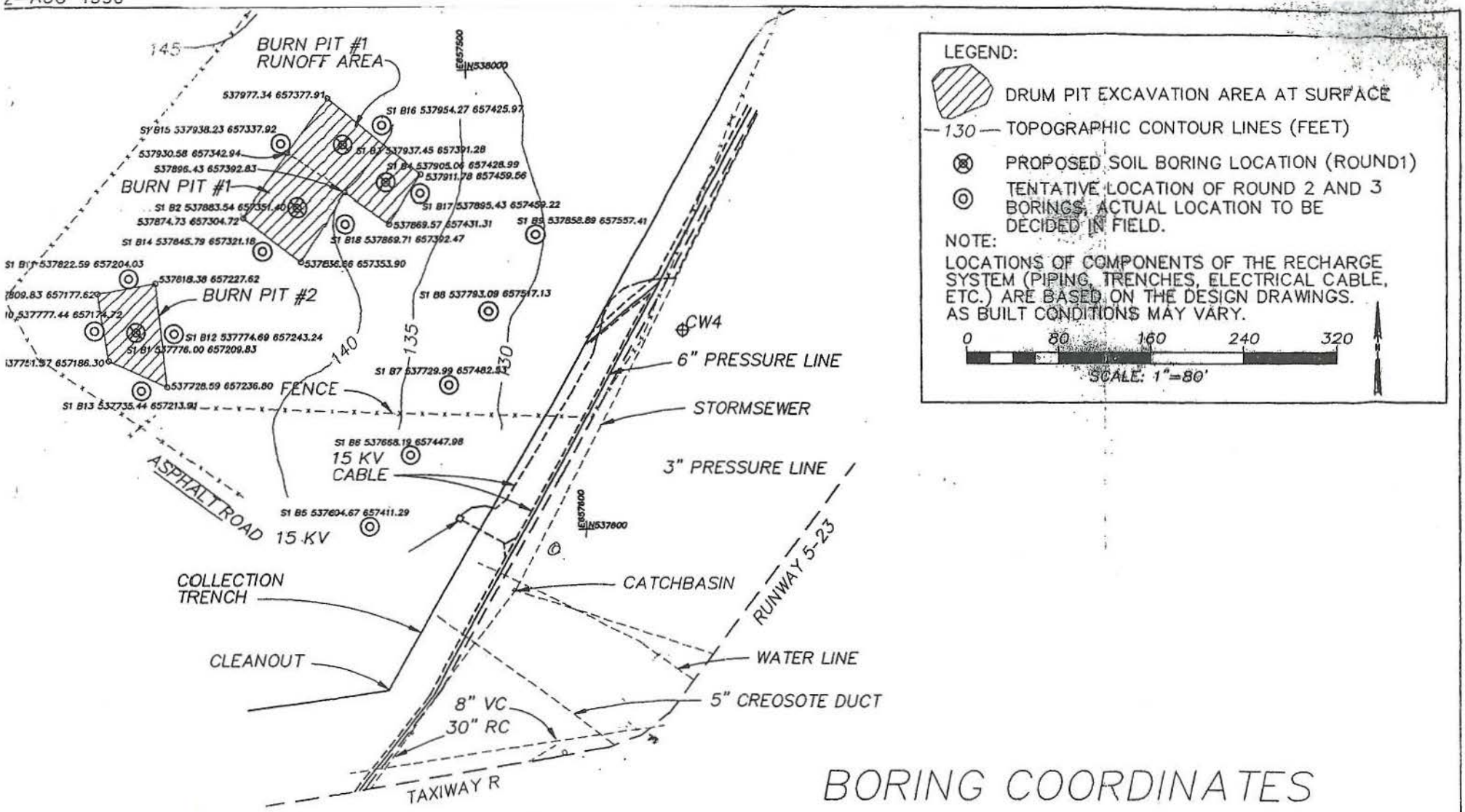
FIGURE 8



Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

FIGURE 10

FIGURE 11



BORING COORDINATES ARE DISPLAYED FOR INTERNAL USE ONLY

SOURCE:
DRUM PIT LOCATIONS TAKEN FROM HALEY AND ALDRICH DRAWING ENTITLED:
"INSTALLATION RESTORATION PROGRAM HANSCOM AIR FORCE BASE, MASSACHUSETTS
SITE 1 - EXISTING CONTOUR & DRUM PIT LOCATIONS"
RECHARGE SYSTEM LOCATIONS TAKEN FROM HALEY AND ALDRICH DRAWING ENTITLED:
"INSTALLATION AND RESTORATION PROGRAM HANSCOM AIR FORCE BASE, MASSACHUSETTS
STAGE II GROUND WATER TREATMENT PRESSURE LINE ALIGNMENT PLAN/SITE 1 COLLECTION TRENCH

Figure 2:
SOIL BORING LOCATIONS
SITE 1
HANSCOM AFB

CH2MHILL

TE3TP.DWG

FIGURE 12

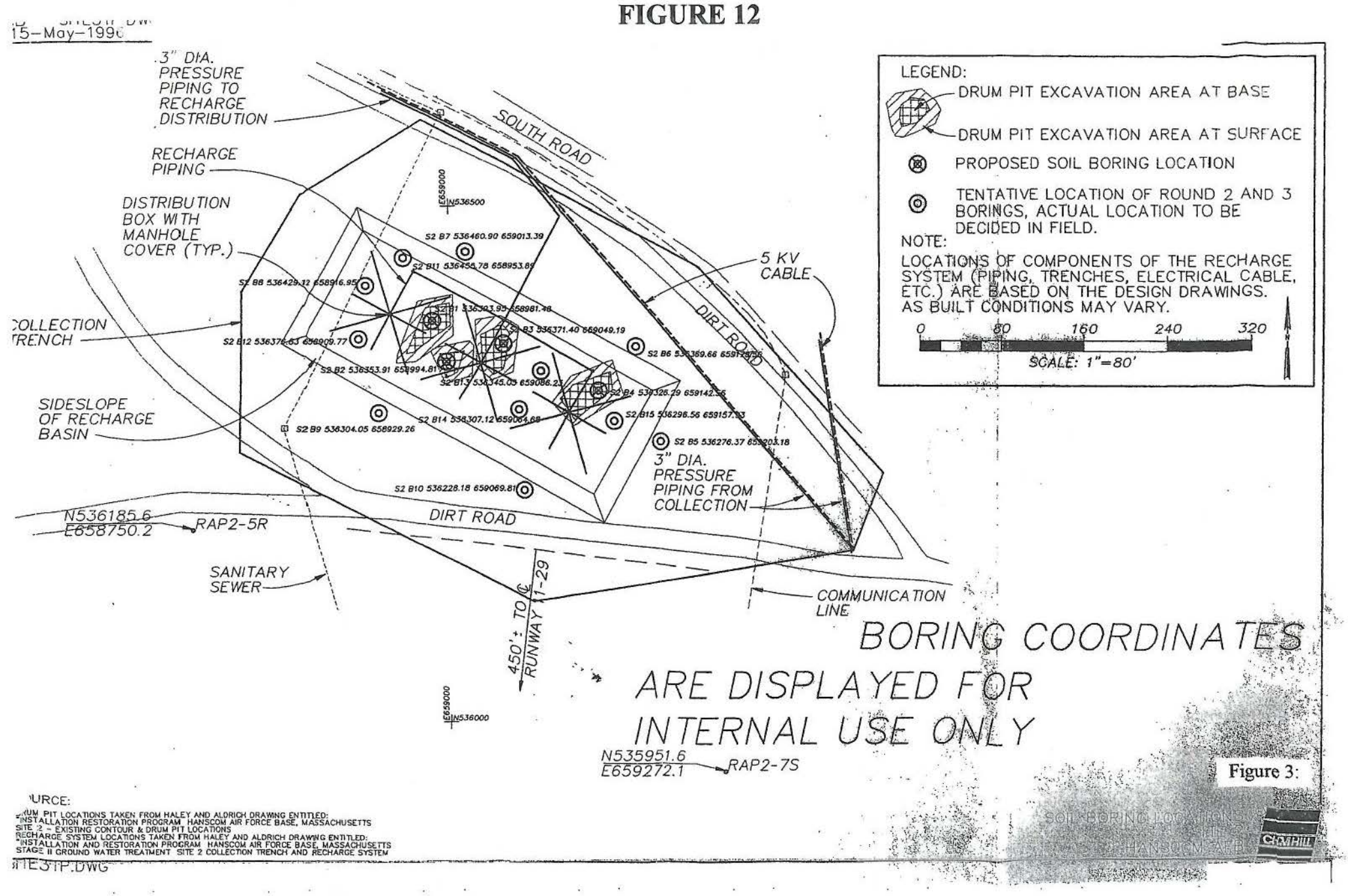

15-May-1996
3" DIA. PRESSURE PIPING TO RECHARGE DISTRIBUTION
RECHARGE PIPING
DISTRIBUTION BOX WITH MANHOLE COVER (TYP.)
COLLECTION TRENCH
SIDESLOPE OF RECHARGE BASIN
SOUTH ROAD
DIRT ROAD
5 KV CABLE
3" DIA. PRESSURE PIPING FROM COLLECTION
N536185.6
E658750.2
RAP2-5R
SANITARY SEWER
450'± TO ℄ RUNWAY 11-29
COMMUNICATION LINE
N535951.6
E659272.1
RAP2-7S
E659000
N536500
N536000
S2 B7 536460.90 659013.39
S2 B11 536456.78 658953.89
S2 B8 536429.12 658916.95
S2 B12 536376.63 658909.77
S2 B2 536353.91 658994.81
S2 B13 536345.03 659056.23
S2 B3 536371.40 659049.19
S2 B6 536369.66 659128.56
S2 B4 536328.29 659142.56
S2 B15 536296.56 659157.93
S2 B5 536276.37 659203.18
S2 B9 536304.05 658929.26
S2 B14 536307.12 659064.68
S2 B10 536228.18 659069.81
LEGEND:
DRUM PIT EXCAVATION AREA AT BASE
DRUM PIT EXCAVATION AREA AT SURFACE
PROPOSED SOIL BORING LOCATION
TENTATIVE LOCATION OF ROUND 2 AND 3 BORINGS, ACTUAL LOCATION TO BE DECIDED IN FIELD.
NOTE:
LOCATIONS OF COMPONENTS OF THE RECHARGE SYSTEM (PIPING, TRENCHES, ELECTRICAL CABLE, ETC.) ARE BASED ON THE DESIGN DRAWINGS. AS BUILT CONDITIONS MAY VARY.
0 80 160 240 320
SCALE: 1"=80'
BORING COORDINATES ARE DISPLAYED FOR INTERNAL USE ONLY
Figure 3:
SOIL BORING LOCATIONS
HANSCOM AFB
CH2MHILL
SOURCE:
DRUM PIT LOCATIONS TAKEN FROM HALEY AND ALDRICH DRAWING ENTITLED:
INSTALLATION RESTORATION PROGRAM HANSCOM AIR FORCE BASE, MASSACHUSETTS
SITE 2 - EXISTING CONTOUR & DRUM PIT LOCATIONS
RECHARGE SYSTEM LOCATIONS TAKEN FROM HALEY AND ALDRICH DRAWING ENTITLED:
INSTALLATION AND RESTORATION PROGRAM HANSCOM AIR FORCE BASE, MASSACHUSETTS
STAGE II GROUND WATER TREATMENT SITE 2 COLLECTION TRENCH AND RECHARGE SYSTEM
SITESTP.DWG

FIGURE 13

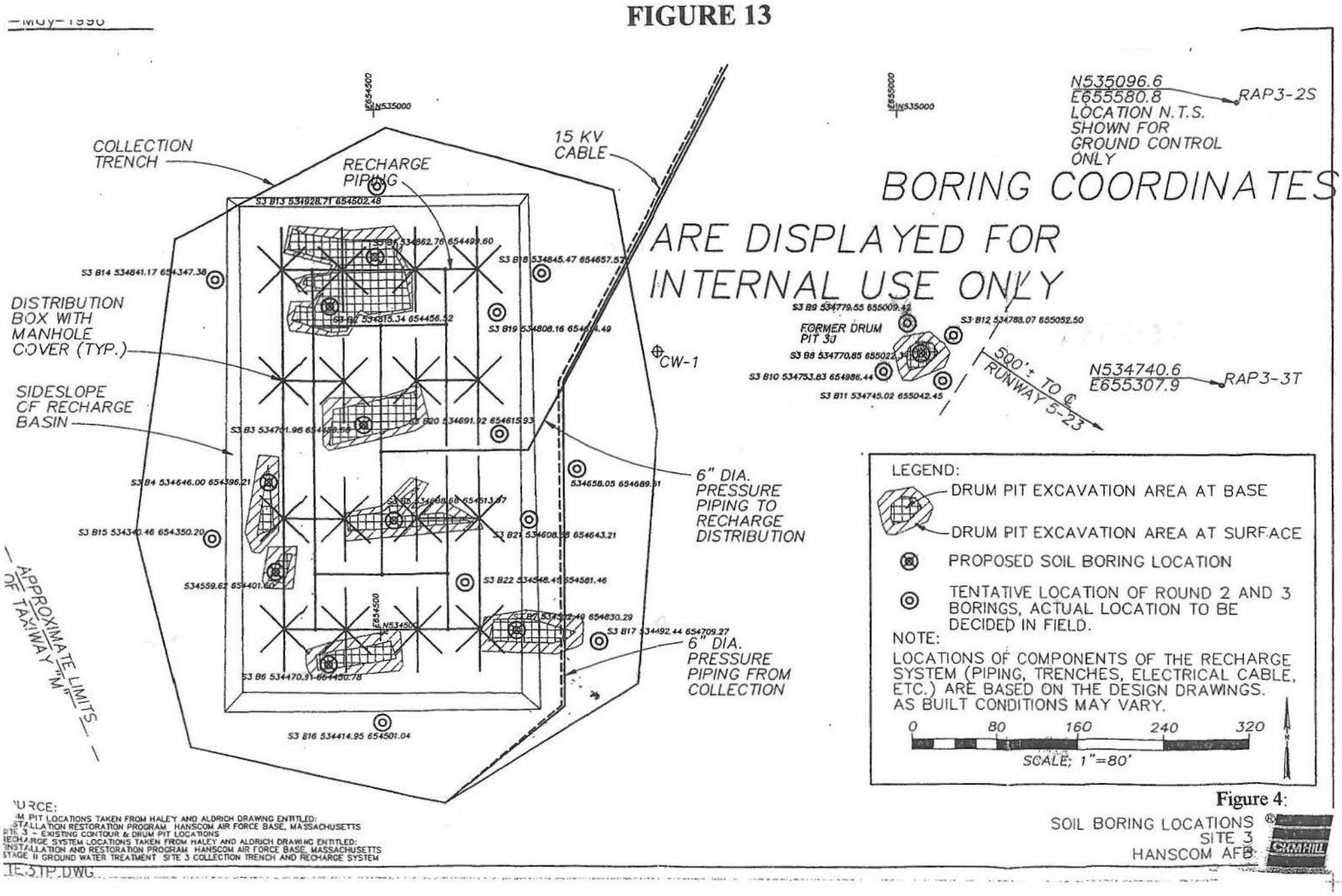


Figure 4:
SOIL BORING LOCATIONS
SITE 3
HANSCOM AFB

SOURCE:
DRUM PIT LOCATIONS TAKEN FROM HALEY AND ALDRICH DRAWING ENTITLED:
INSTALLATION RESTORATION PROGRAM HANSCOM AIR FORCE BASE, MASSACHUSETTS
SITE 3 - EXISTING CONTOUR & DRUM PIT LOCATIONS
RECHARGE SYSTEM LOCATIONS TAKEN FROM HALEY AND ALDRICH DRAWING ENTITLED:
INSTALLATION AND RESTORATION PROGRAM HANSCOM AIR FORCE BASE, MASSACHUSETTS
STAGE II GROUND WATER TREATMENT SITE 3 COLLECTION TRENCH AND RECHARGE SYSTEM

TE.STP.DWG

FIGURE 14

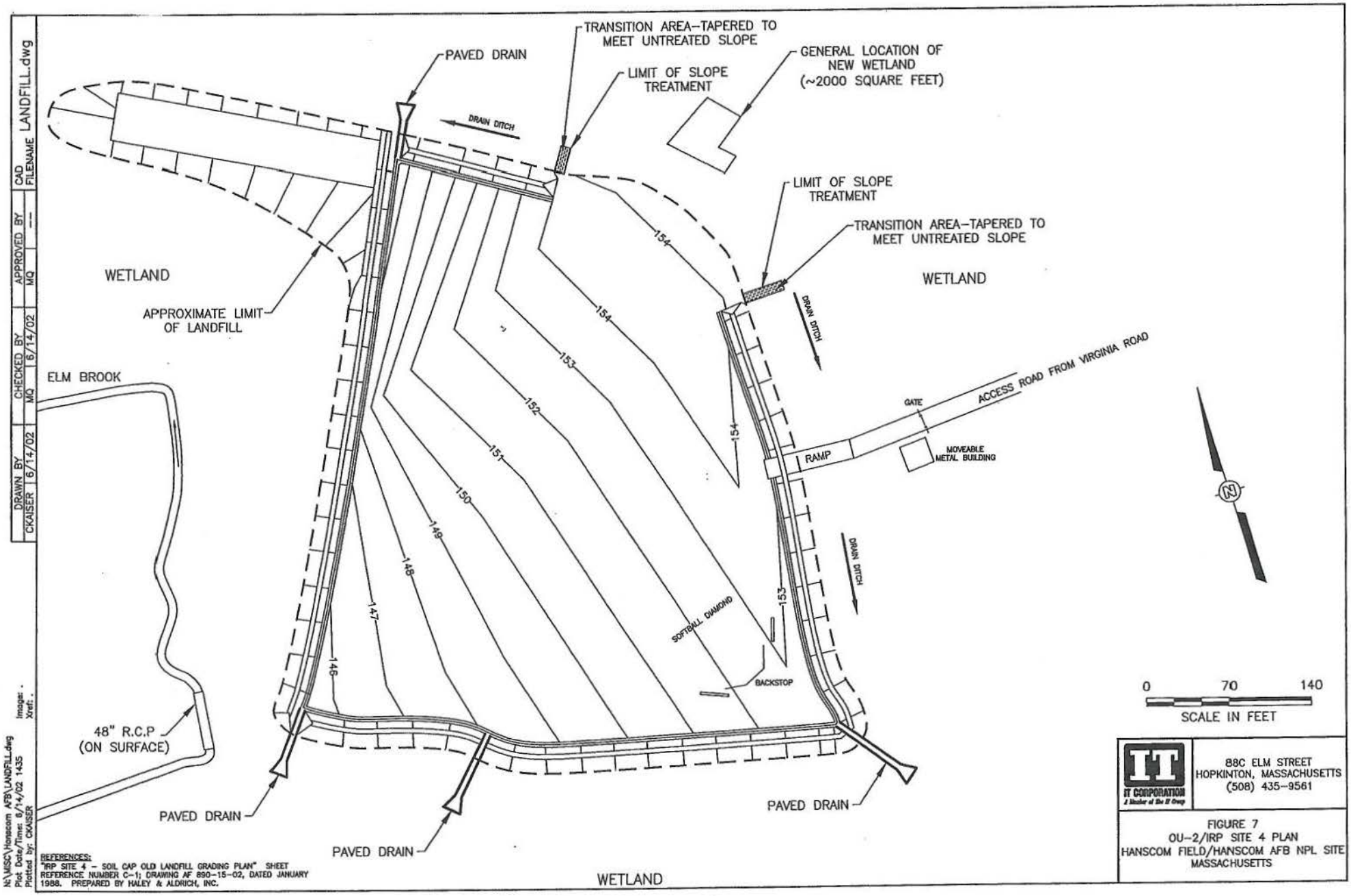

TRANSITION AREA–TAPERED TO MEET UNTREATED SLOPE
PAVED DRAIN
GENERAL LOCATION OF NEW WETLAND (~2000 SQUARE FEET)
LIMIT OF SLOPE TREATMENT
DRAIN DITCH
LIMIT OF SLOPE TREATMENT
TRANSITION AREA–TAPERED TO MEET UNTREATED SLOPE
WETLAND
WETLAND
APPROXIMATE LIMIT OF LANDFILL
DRAIN DITCH
ELM BROOK
ACCESS ROAD FROM VIRGINIA ROAD
GATE
RAMP
MOVEABLE METAL BUILDING
154
153
152
151
150
149
148
147
146
SOFTBALL DIAMOND
BACKSTOP
DRAIN DITCH
48" R.C.P (ON SURFACE)
PAVED DRAIN
PAVED DRAIN
PAVED DRAIN
WETLAND
0 70 140
SCALE IN FEET
IT CORPORATION
88C ELM STREET
HOPKINTON, MASSACHUSETTS
(508) 435–9561
FIGURE 7
OU–2/IRP SITE 4 PLAN
HANSCOM FIELD/HANSCOM AFB NPL SITE
MASSACHUSETTS
REFERENCES:
"IRP SITE 4 – SOIL CAP OLD LANDFILL GRADING PLAN" SHEET REFERENCE NUMBER C–1; DRAWING AF 890–15–02, DATED JANUARY 1988. PREPARED BY HALEY & ALDRICH, INC.
DRAWN BY CKAISER 6/14/02
CHECKED BY MQ 6/14/02
APPROVED BY MQ
CAD FILENAME LANDFILL.dwg
N:\MISC\Hanscom AFB\LANDFILL.dwg
Plot Date/Time: 6/14/02 1435
Plotted by: CKAISER
Image: -
Xref: -

FIGURE 15

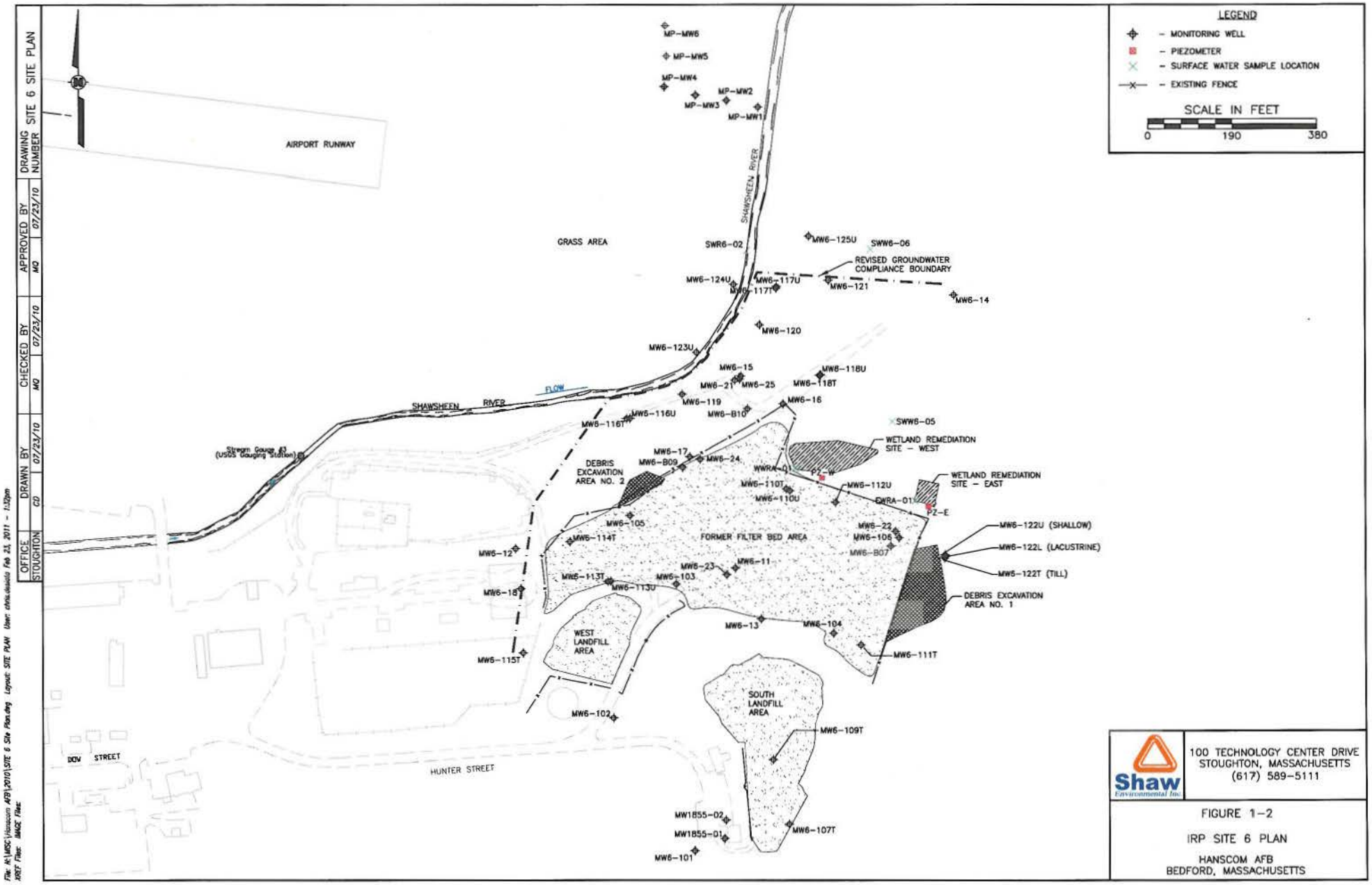
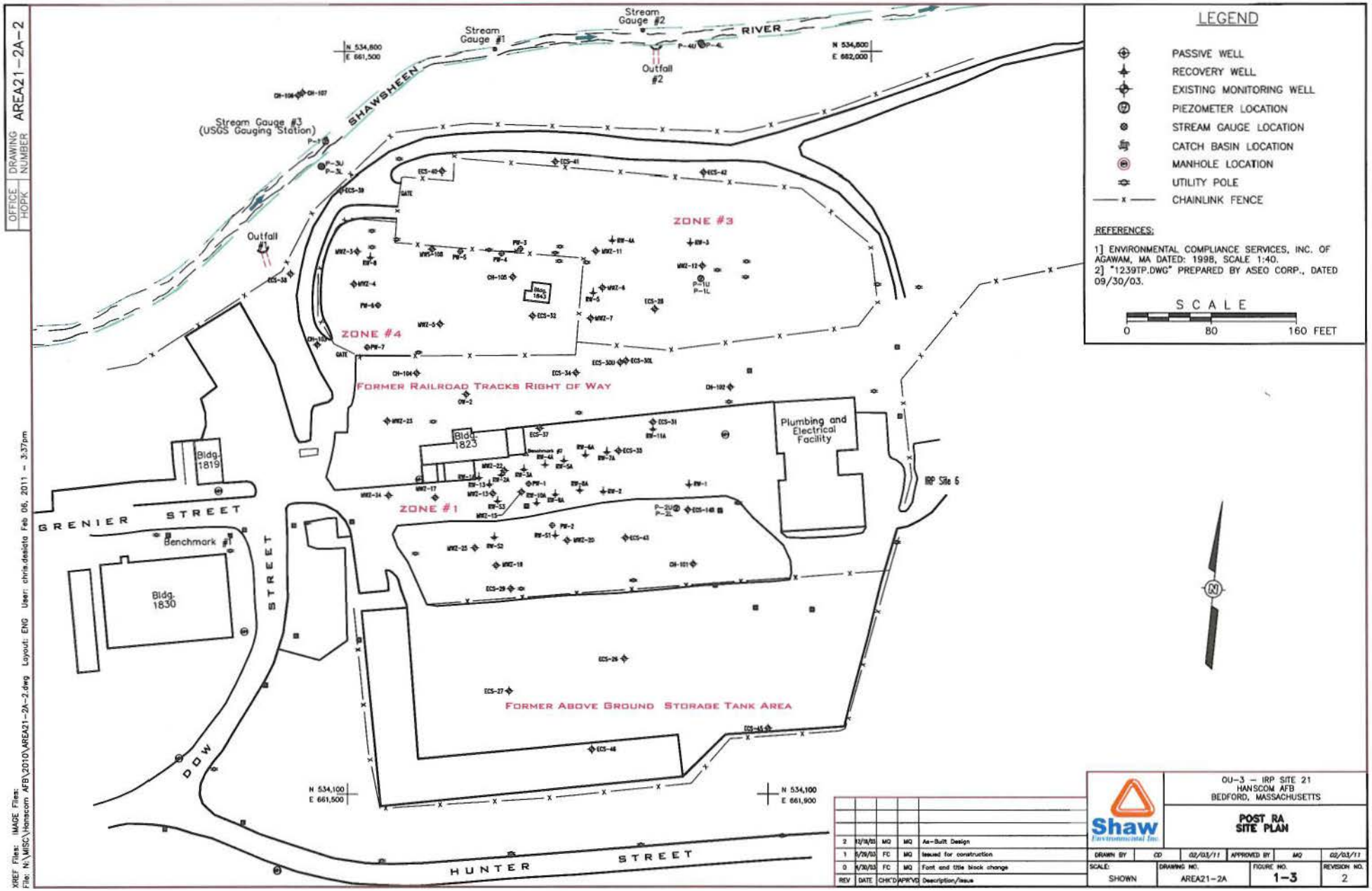

LEGEND
- MONITORING WELL
- PIEZOMETER
- SURFACE WATER SAMPLE LOCATION
- EXISTING FENCE
SCALE IN FEET
0
190
380
AIRPORT RUNWAY
GRASS AREA
SHAWSHEEN RIVER
FLOW
REVISED GROUNDWATER COMPLIANCE BOUNDARY
WETLAND REMEDIATION SITE - WEST
WETLAND REMEDIATION SITE - EAST
DEBRIS EXCAVATION AREA NO. 2
FORMER FILTER BED AREA
DEBRIS EXCAVATION AREA NO. 1
WEST LANDFILL AREA
SOUTH LANDFILL AREA
HUNTER STREET
DOV STREET
Stream Gauge #3 (USGS Gauging Station)
MW6-122U (SHALLOW)
MW6-122L (LACUSTRINE)
MW6-122T (TILL)
Shaw Environmental Inc.
100 TECHNOLOGY CENTER DRIVE
STOUGHTON, MASSACHUSETTS
(617) 589-5111
FIGURE 1-2
IRP SITE 6 PLAN
HANSCOM AFB
BEDFORD, MASSACHUSETTS
SITE 6 SITE PLAN
DRAWING NUMBER
APPROVED BY
CHECKED BY
DRAWN BY
OFFICE
STOUGHTON

FIGURE 16


LEGEND
PASSIVE WELL
RECOVERY WELL
EXISTING MONITORING WELL
PIEZOMETER LOCATION
STREAM GAUGE LOCATION
CATCH BASIN LOCATION
MANHOLE LOCATION
UTILITY POLE
CHAINLINK FENCE
REFERENCES:
1] ENVIRONMENTAL COMPLIANCE SERVICES, INC. OF AGAWAM, MA DATED: 1998, SCALE 1:40.
2] "1239TP.DWG" PREPARED BY ASEO CORP., DATED 09/30/03.
SCALE
0 80 160 FEET
Stream Gauge #1
Stream Gauge #2
Stream Gauge #3 (USGS Gauging Station)
SHAWSHEEN RIVER
Outfall #1
Outfall #2
N 534,600 E 661,500
N 534,600 E 662,000
N 534,100 E 661,500
N 534,100 E 661,900
ZONE #1
ZONE #3
ZONE #4
FORMER RAILROAD TRACKS RIGHT OF WAY
FORMER ABOVE GROUND STORAGE TANK AREA
Bldg. 1819
Bldg. 1823
Bldg. 1830
Plumbing and Electrical Facility
IRP Site 6
GRENIER STREET
DOW STREET
HUNTER STREET
Benchmark #1
OU-3 – IRP SITE 21
HANSCOM AFB
BEDFORD, MASSACHUSETTS
POST RA SITE PLAN
Shaw Environmental Inc.
DRAWING BY CD 02/03/11
APPROVED BY MQ 02/03/11
SCALE: SHOWN
DRAWING NO. AREA21-2A
FIGURE NO. 1-3
REVISION NO. 2
REV DATE CHK'D APR'VD Description/Issue
2 12/13/03 MQ MQ As-Built Design
1 6/29/03 FC MQ Issued for construction
0 4/30/03 FC MQ Font and title block change
OFFICE HOPK
DRAWING NUMBER AREA21-2A-2
XREF Files: IMAGE Files:
File: N:\MISC\Hanscom AFB\2010\AREA21-2A-2.dwg Layout: ENG User: chris.desiata Feb 08, 2011 - 3:37pm

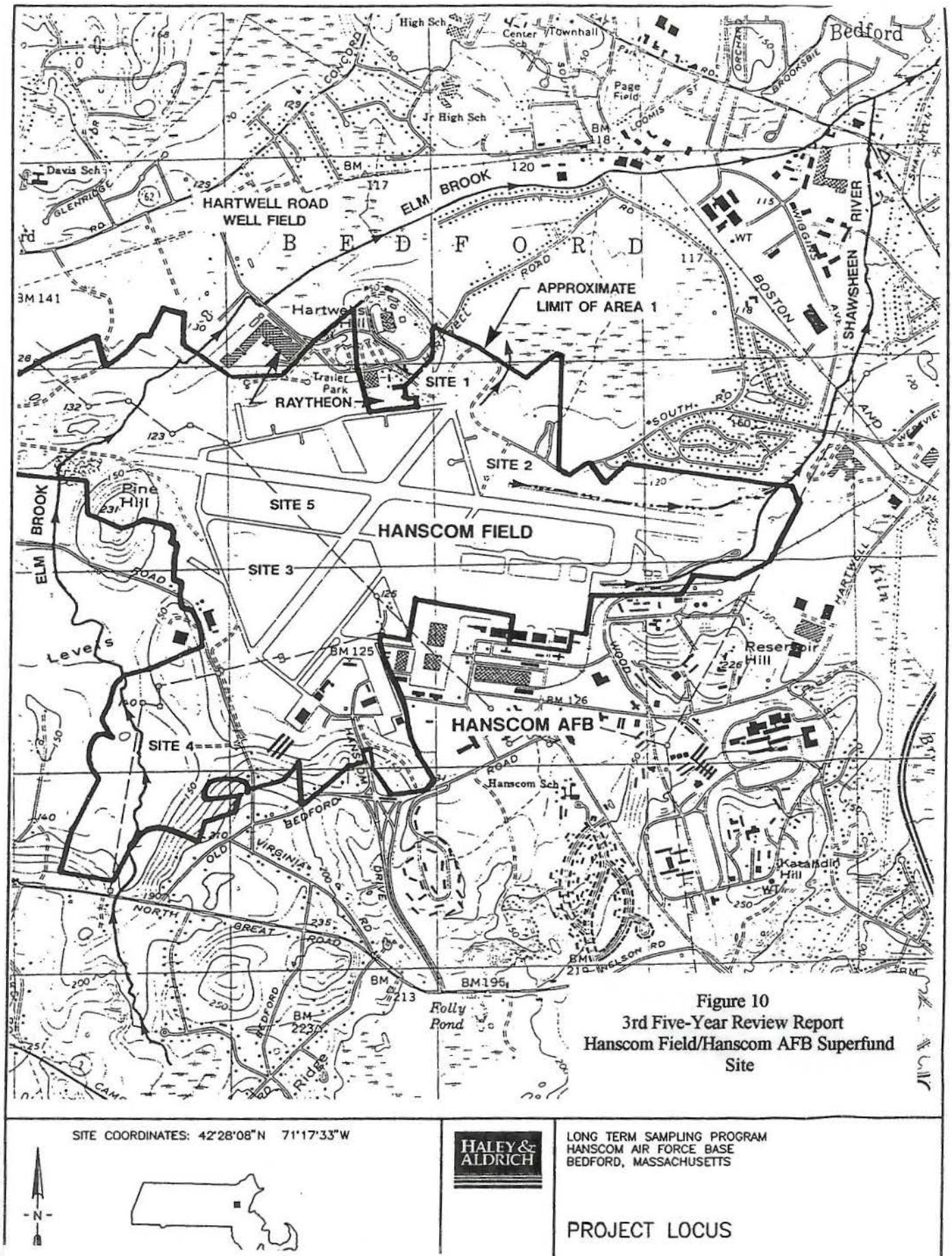


Figure 10
3rd Five-Year Review Report
Hanscom Field/Hanscom AFB Superfund Site

SITE COORDINATES: 42°28'08"N 71°17'33"W

HALEY & ALDRICH

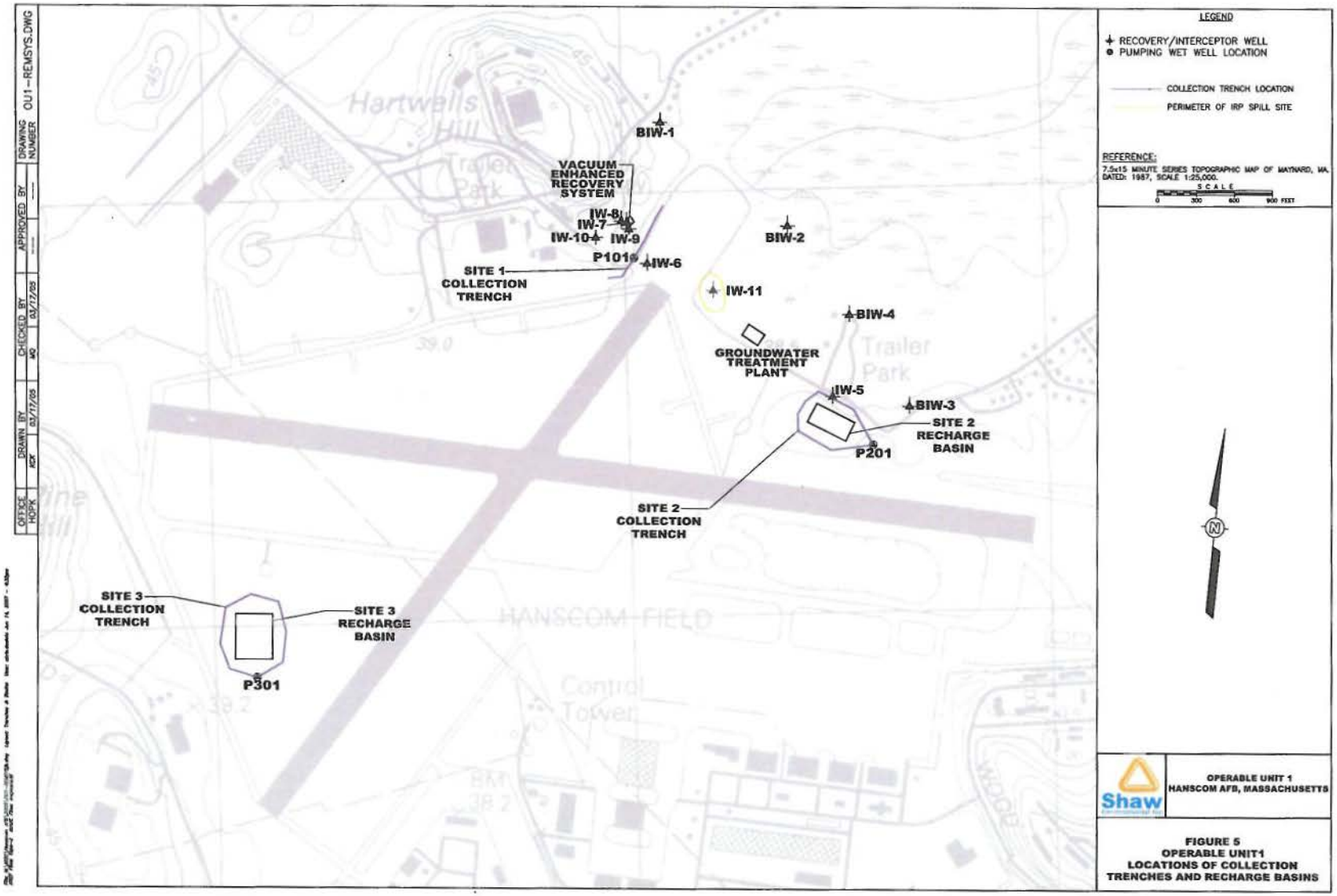
LONG TERM SAMPLING PROGRAM
HANSCOM AIR FORCE BASE
BEDFORD, MASSACHUSETTS

PROJECT LOCUS

05833-065 A161

Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

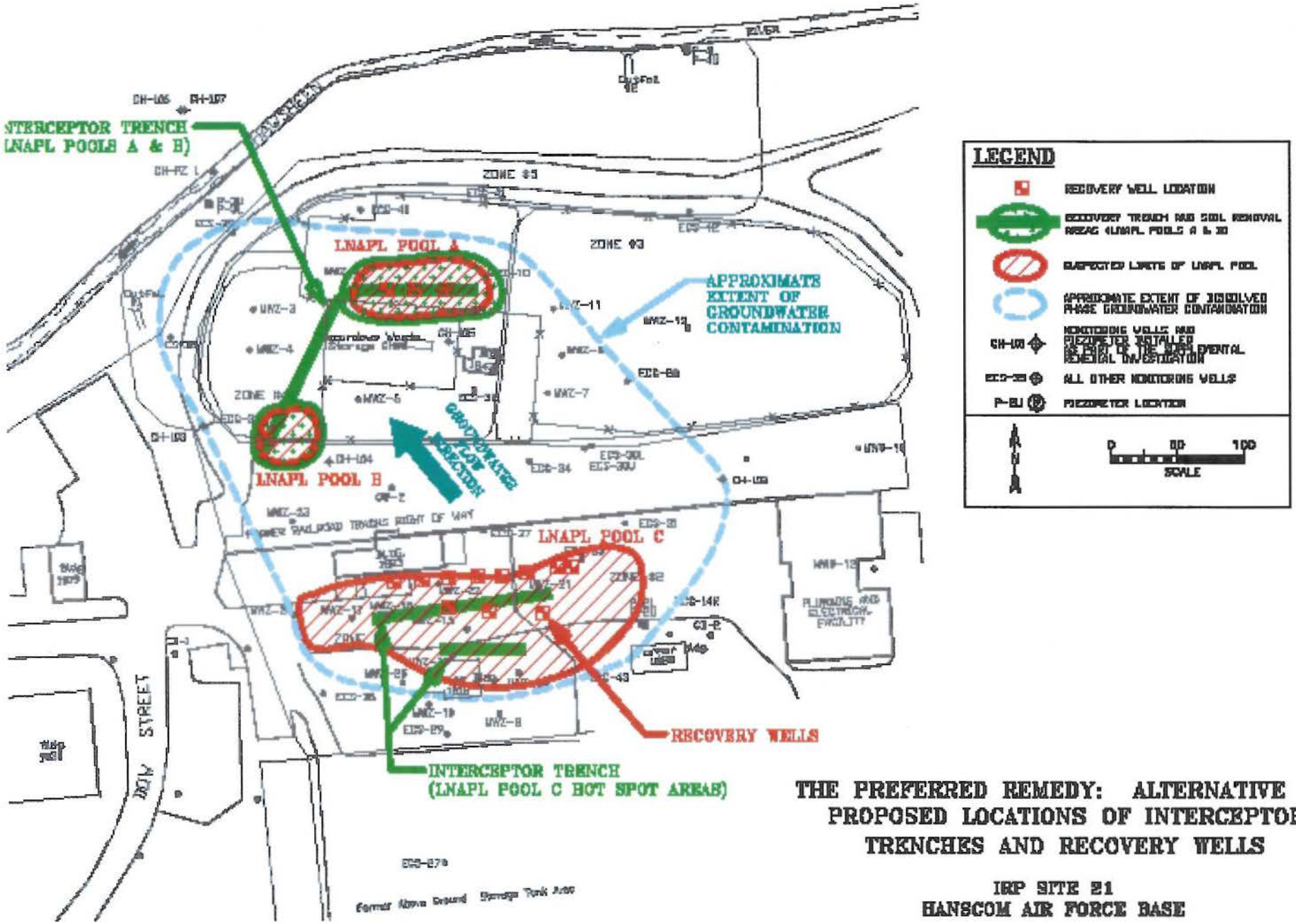
FIGURE 17



Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

FIGURE 18

FIGURE 19



THE PREFERRED REMEDY: ALTERNATIVE 12.
PROPOSED LOCATIONS OF INTERCEPTOR TRENCHES AND RECOVERY WELLS

IRP SITE 21
HANSCOM AIR FORCE BASE

FIGURE 20

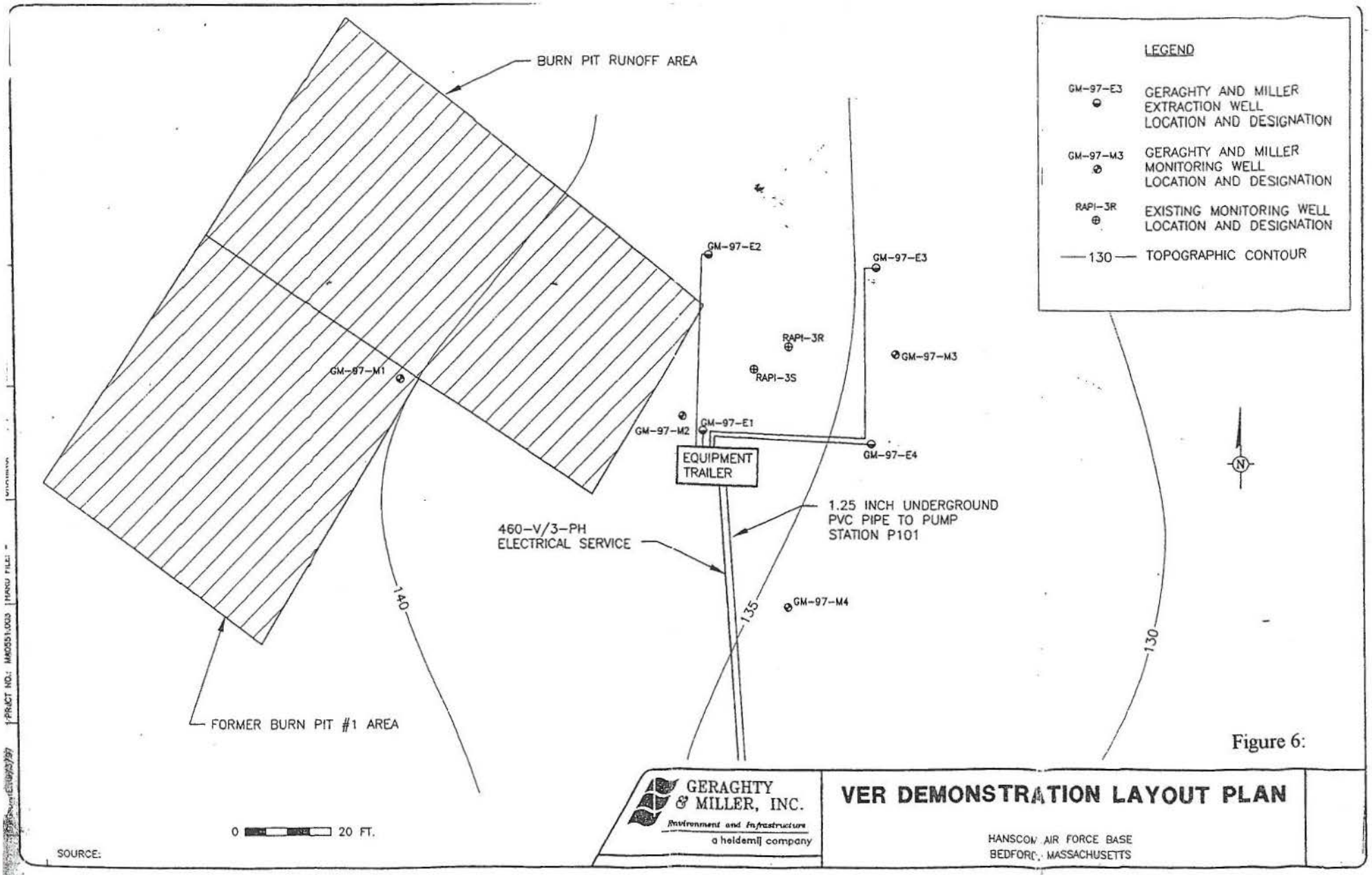
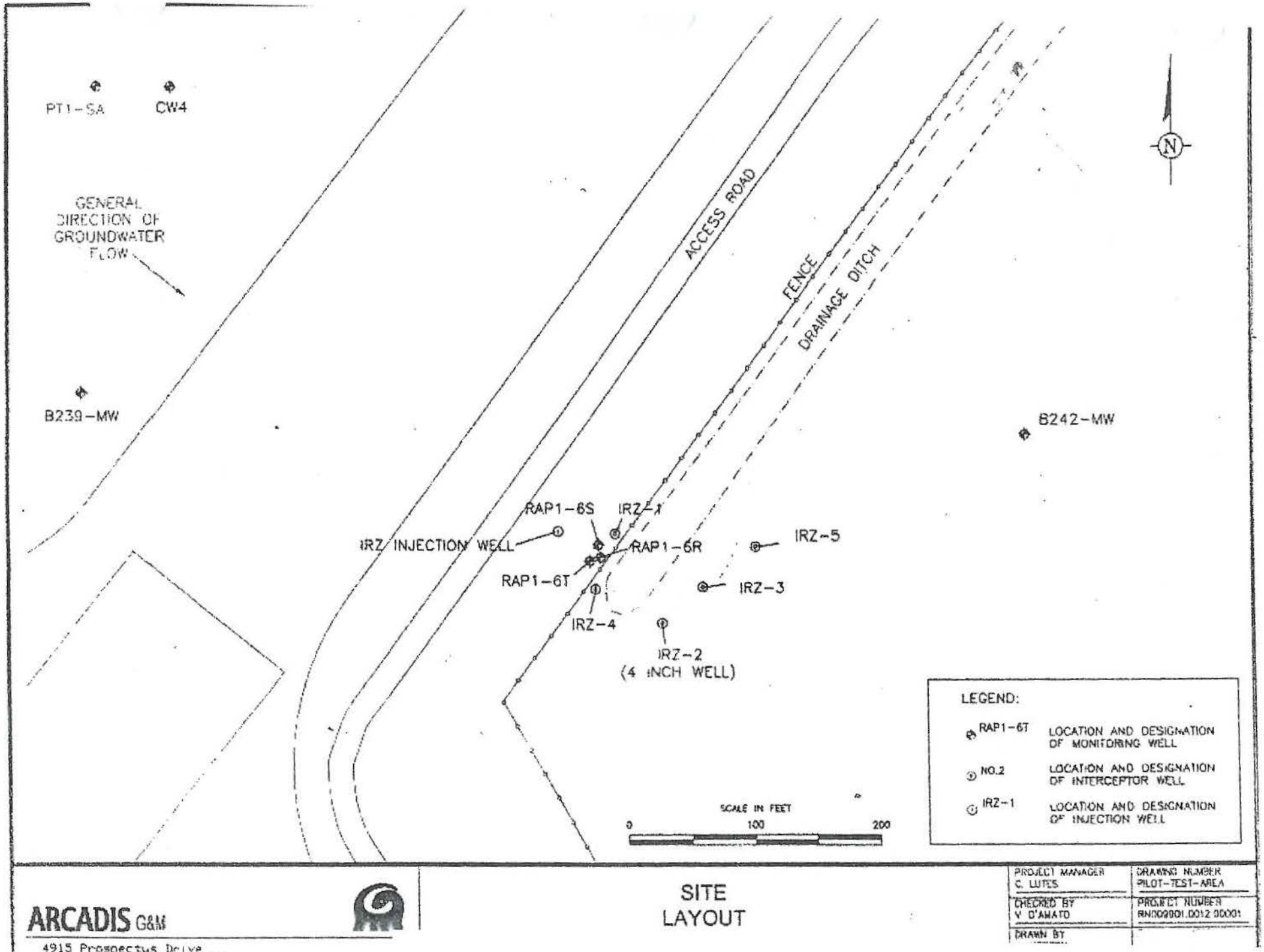
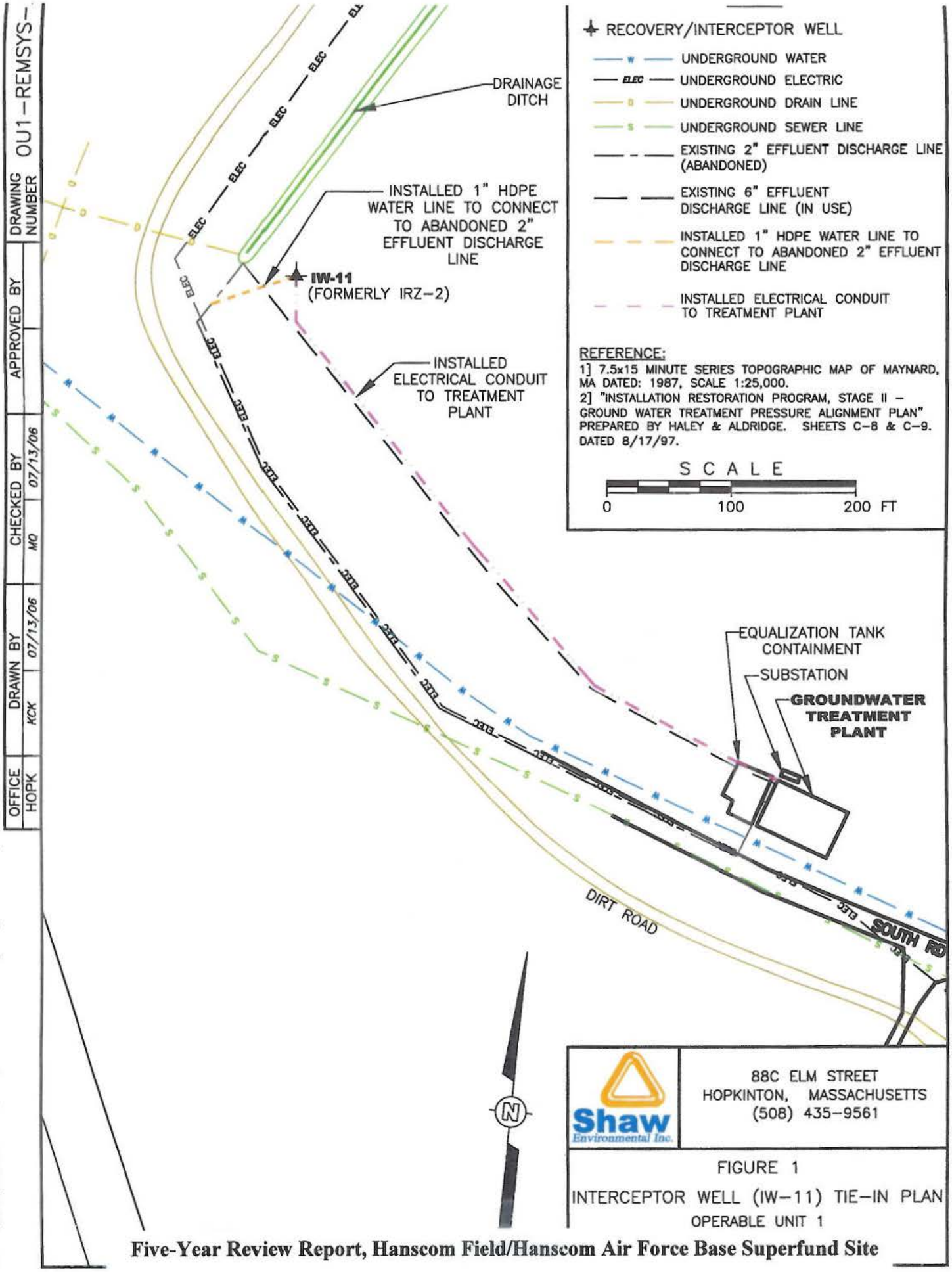


Figure 6:



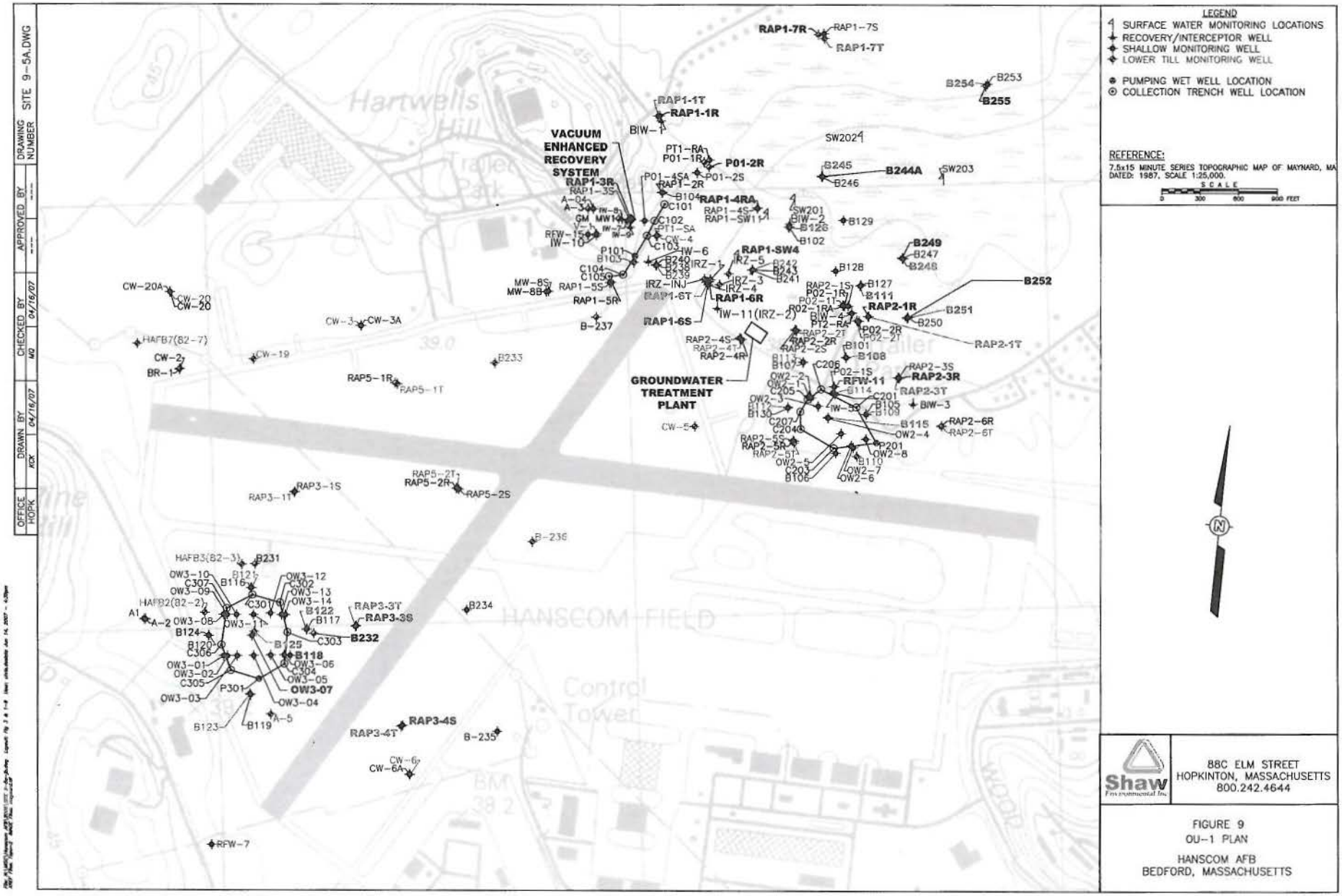
Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

FIGURE 21



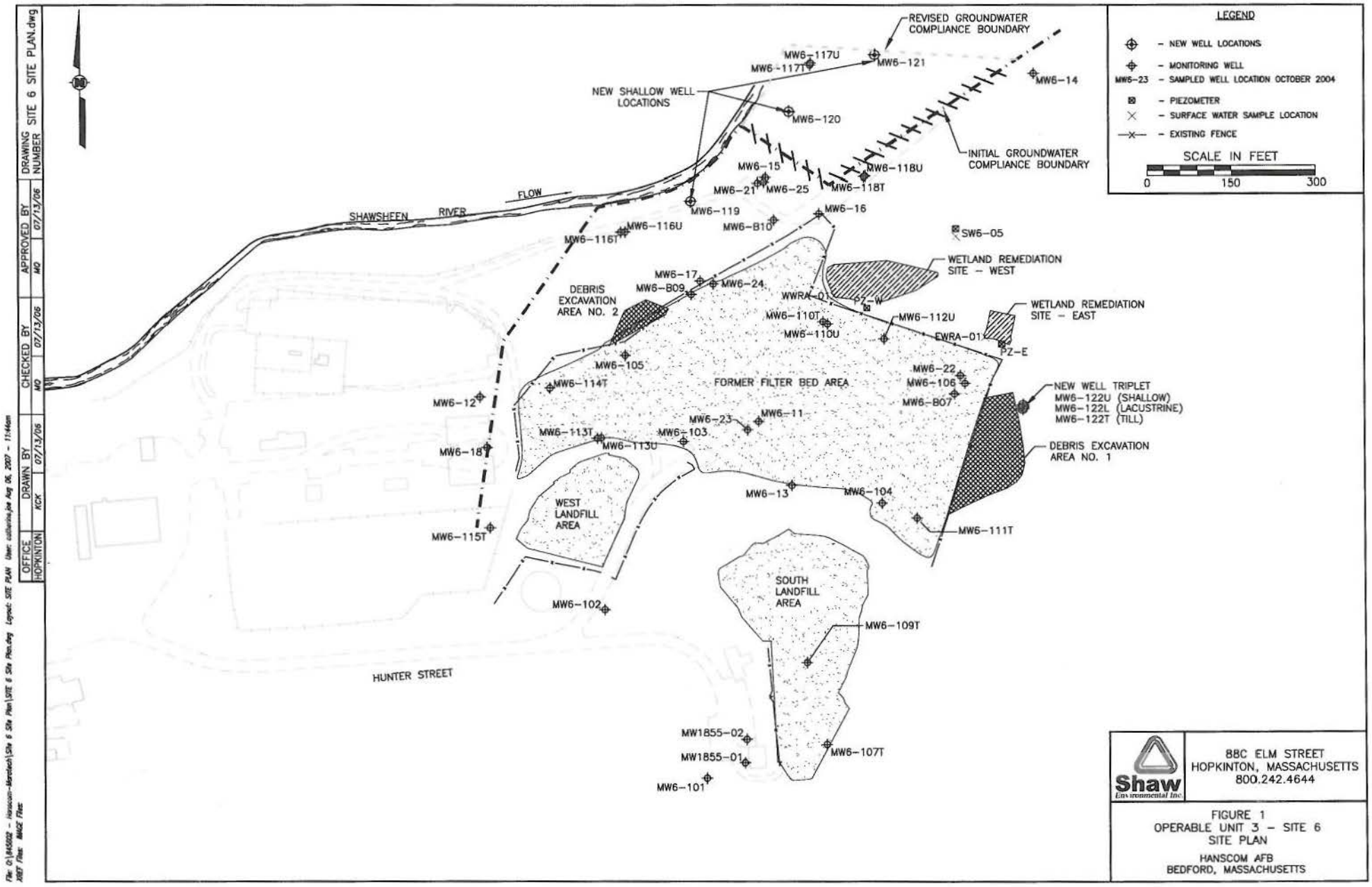
Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

FIGURE 22



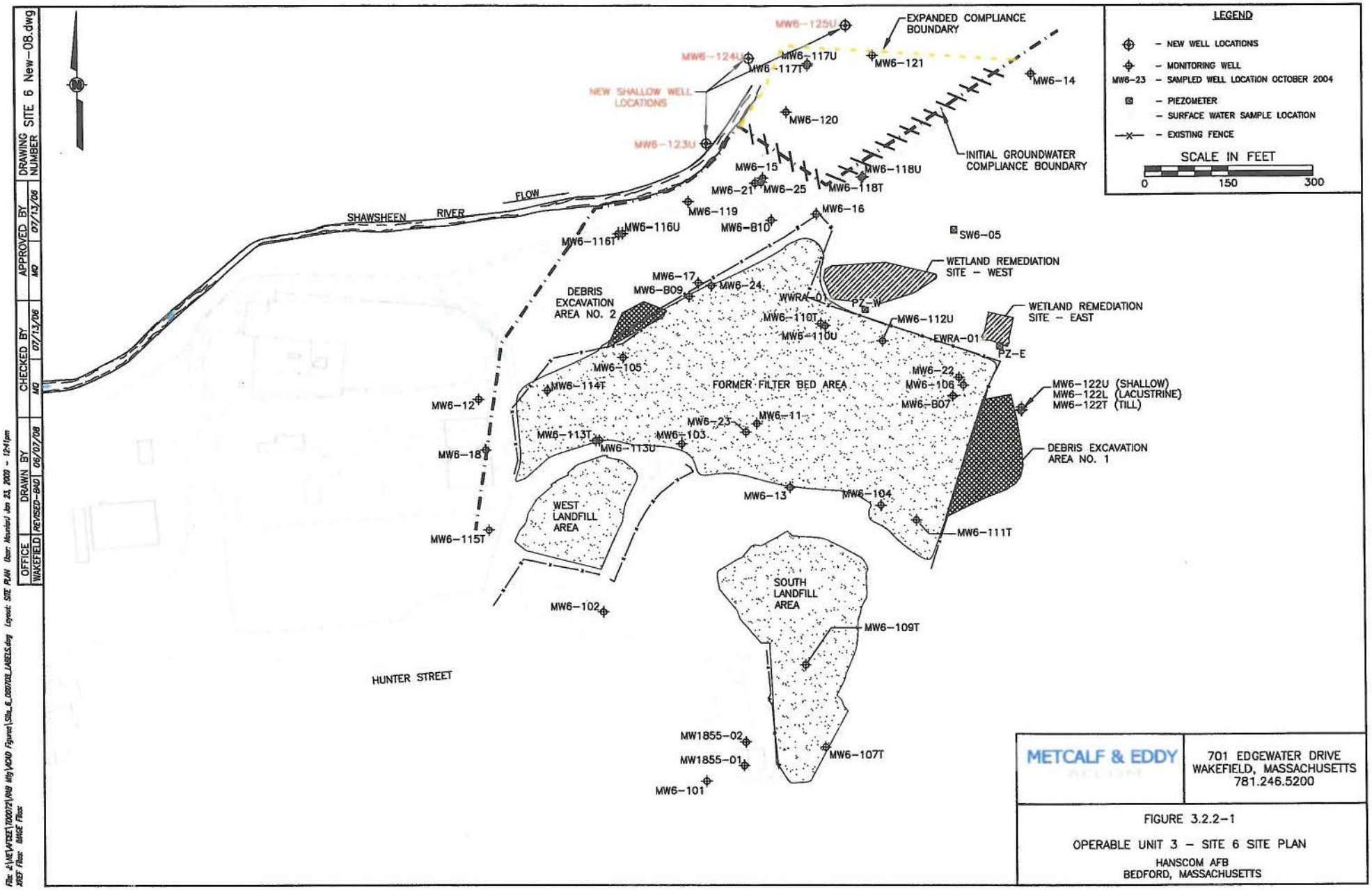
Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

FIGURE 23



Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

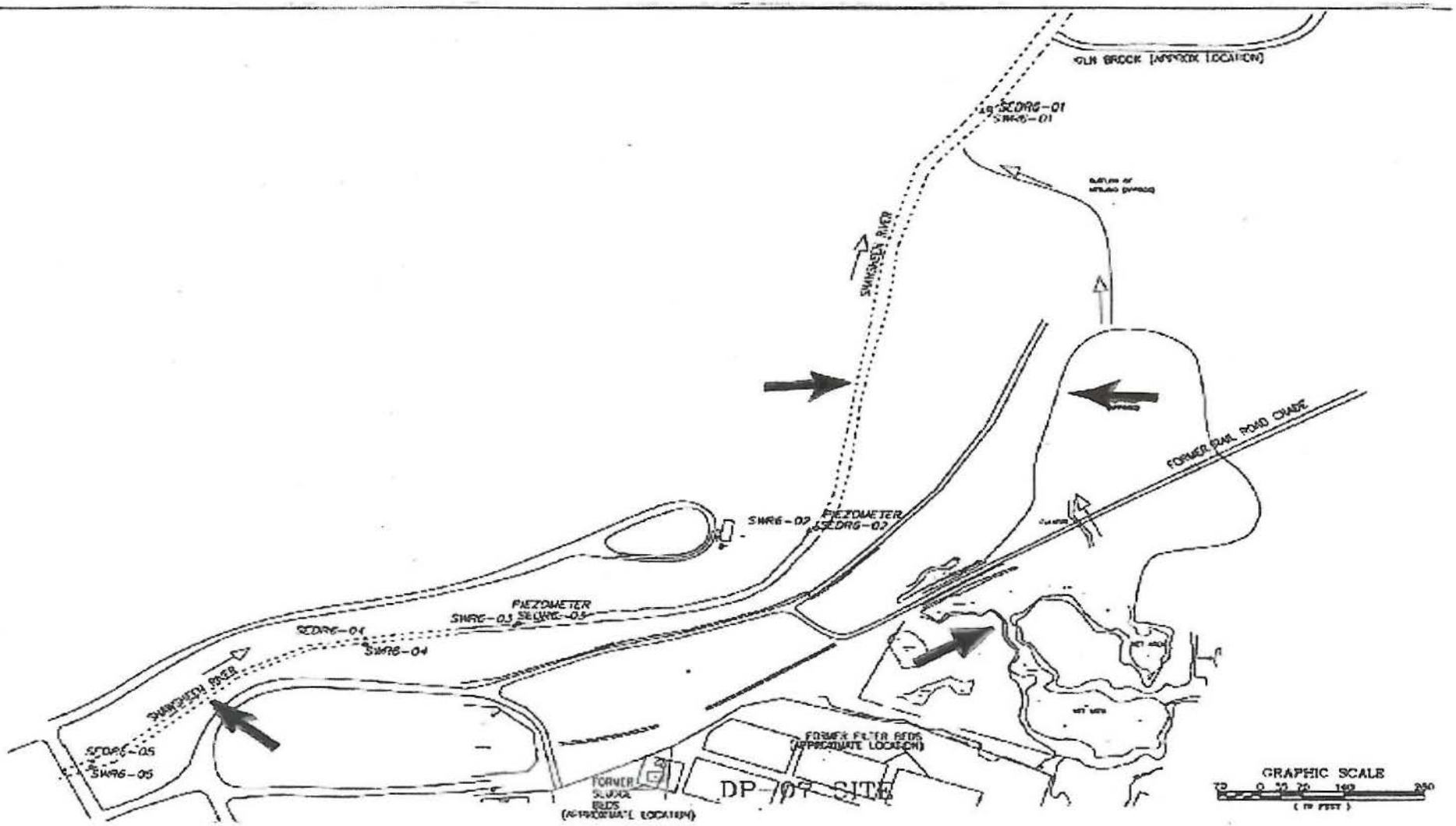
FIGURE 24



Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

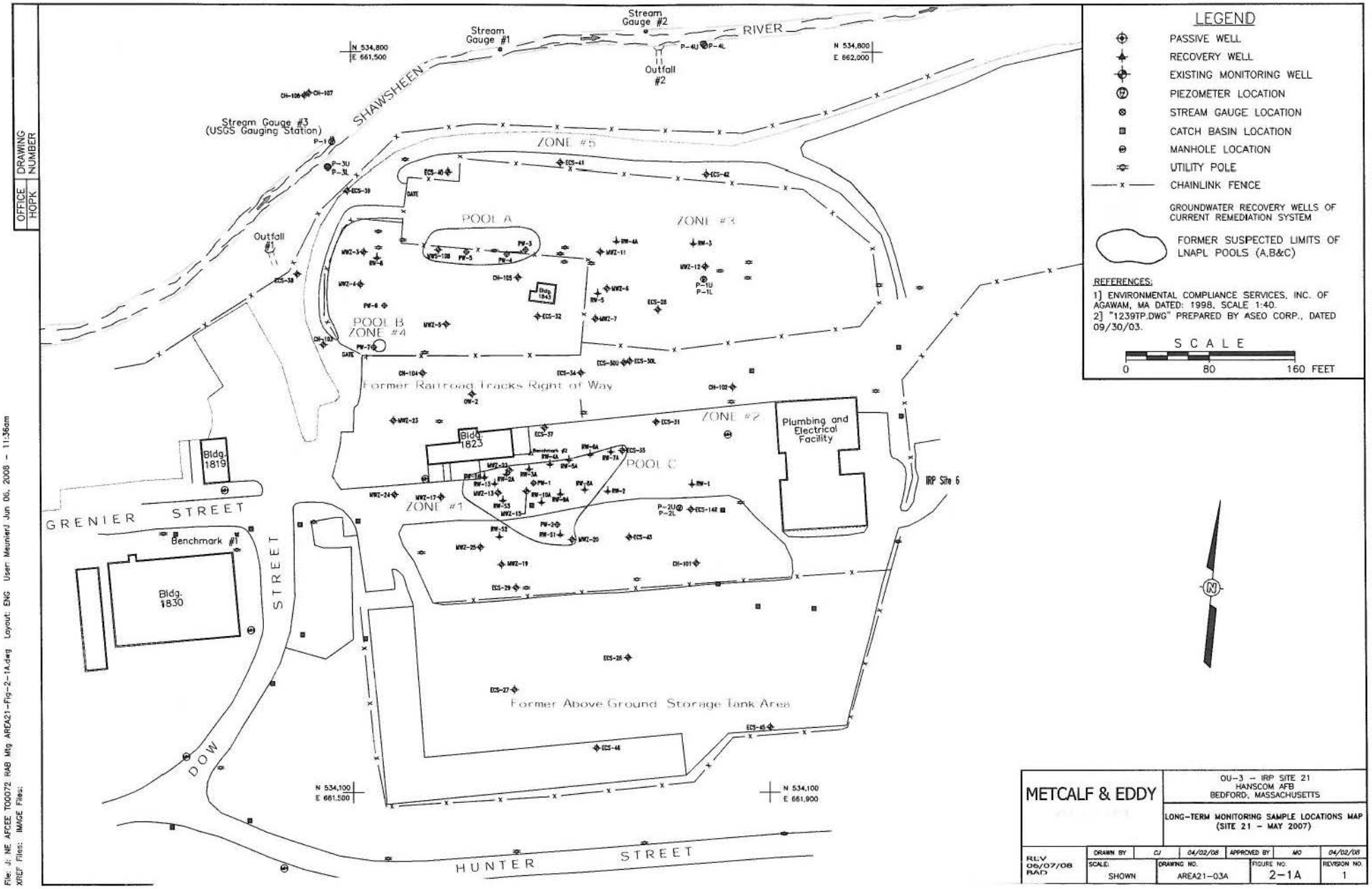
FIGURE 25

SITE 6 SURFACE WATER SAMPLING POINTS



Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

FIGURE 26



Five-Year Review Report, Hanscom Field/Hanscom Air Force Base Superfund Site

FIGURE 27

Attachments

A - List of Documents Reviewed

B – Applicable or Relevant and Appropriate Requirements (ARARs)

C – OU-1 System Operational Data

D – Summary of OU-1 Long-Term Monitoring Analytical Data

E – Summary of OU-1 On-Site GC Analytical Data (Phase 2 of the Long-Term Monitoring Program)

F – OU-1 Long-Term Monitoring Program Charts Showing Trends

G – Site 6 Data – Includes Long-Term Monitoring Program Charts Showing Trends

H – Site 21 System Operation, Maintenance & Monitoring Data and Long-Term Monitoring Analytical Data

I – Site 21 Charts Showing Long-Term Monitoring Trends

J – Land Use Controls/Institutional Controls (LUCs/ICs) Documentation

Hanscom Field/Hanscom AFB NPL Site – 4th Five-Year Review

Attachment A – List of Documents Reviewed

GENERAL:

General Plan Update (replaces Base Comprehensive Plan); prepared by Parsons Brinckerhoff Quade & Douglas, Inc., November 2003 (Basewide).

Public Health Assessment for Hanscom Field/Hanscom Air Force Base, Bedford, Middlesex County, Massachusetts, EPA Facility ID: MA8570024424; prepared by Agency for Toxic Substances and Disease Registry, April 2004

Draft 2005 L.G. Hanscom Field Environmental Status & Planning Report, Bedford, Massachusetts; submitted by: Massachusetts Port Authority, November 2006

Preliminary Close Out Report for the Hanscom Field/Hanscom AFB NPL Site; prepared by U.S. Environmental Protection Agency, Region I, September 2007

Federal Facilities Agreement under CERCLA Section 120 for the Hanscom Field/Hanscom AFB NPL Site; prepared by U.S. Environmental Protection Agency, Region I and the U.S. Air Force, September 2009

Appendix F, Initial site Management Plan dated April 2010 to the *Federal Facilities Agreement under CERCLA Section 120 for the Hanscom Field/Hanscom AFB NPL Site;* prepared by Environmental Office, Hanscom AFB

Final-Modified Comprehensive Site Evaluation Phase I Report, Military Munitions Response Program (MMRP), Hanscom AFB, MA; prepared by US Army Corps of Engineers, Omaha District for the U.S. Air Force, April 2010

Five-Year Review Reports

Five-Year Review Report #1, Hanscom AFB Superfund Site (OU2-Site 4); prepared by the US Environmental Protection Agency, September 1997 (IRP Site 4).

Second Five-Year Review Report for Hanscom Field/Hanscom Air Force Base Superfund Site, Bedford, Concord, Lexington, Lincoln, Middlesex County, Massachusetts; prepared by Hanscom AFB, August 2002

Third Five-Year Review Report for Hanscom Field/Hanscom Air Force Base Superfund Site, Bedford, Concord, Lexington, Lincoln, Middlesex County, Massachusetts; prepared by Hanscom AFB, August 2007

OU-1/IRP Sites 1, 2 and 3:

Records of Decision/Decision Document

Final Record of Decision (ROD) for National Priorities List (NPL) Operable Unit 1 at Hanscom Field/Hanscom Air Force Base; prepared by 66 MSG/CEGV, Hanscom AFB, September 2007

Hanscom AFB Environmental Office's Memorandum to the to the USEPA, Region I which summarizes the implantation of LUCs/ICs for OU-1, September 4, 2008

Operable Unit 1 Remedial Action Reports:

Monthly Remedial Action Reports, 2007 through May 2012; prepared by Hanscom AFB

OU-1 Long-Term Monitoring Documents:

Long-Term Monitoring Report for Operable Unit 1 - November 2007 Samples; prepared by Shaw Environmental, Inc. for Maratech Engineering Services, Inc., May 2008

Long-Term Monitoring Report for Operable Unit 1 - November 2008 Samples; prepared by Metcalf & Eddy, Inc., January 2009

Long-Term Monitoring Report for Operable Unit 1 - November 2009 Samples; prepared by Environmental Quality Management, Inc., January 2010

Attachment A – List of Documents Reviewed

Long-Term Monitoring Report for Operable Unit 1 - November 2010 Samples; prepared by Shaw Environmental, Inc., March 2011

Long-Term Monitoring Report for NPL Operable Unit 1 - November 2011 Samples; prepared by Shaw Environmental, Inc., May 2012

OU-2/IRP Site 4:

OU-2/IRP Site 4 Long-Term Maintenance Documents:
Calendar Year 2007Remedial Action Report for NPL OU-2/IRP Site 4; prepared by MaraTech Engineering Services

Calendar Year 2008 Remedial Action Report for NPL OU-2/IRP Site 4; prepared by Metcalf & Eddy, Inc.

Calendar Year 2009 Remedial Action Report for NPL OU-2/IRP Site 4; prepared by Environmental Quality Management, Inc.

Calendar Year 2010 Remedial Action Report for NPL OU-2/IRP Site 4; prepared by Advent Environmental, Inc.

Calendar Year 2011 Remedial Action Report for NPL OU-2/IRP Site 4; prepared by Advent Environmental, Inc.

OU-3/IRP Site 6:

Records Of Decision/Decision Documents
Record of Decision, OU-3/Site 6 Landfill; prepared by CH2M Hill, September 2000

OU-3/IRP Site 6 Remedial Action Design and Construction Documents:
Environmental Cleanup Plan Addendum #3– Monitoring Well Installations, Operable Unit 3/IRP Site 6; prepared by Metcalf & Eddy, Inc., July 2008

Memorandum, Installation of Monitoring Wells at Operable Unit 3 Site 6; prepared by Metcalf & Eddy, Inc., January 2009

OU-3/IRP Site 6 Wetland Mitigation Monitoring Documents:
OU-3/Site 6, 2011 Wetland Mitigation Monitoring & Ecosystem Evaluation Report, prepared by Shaw Environmental, Inc., November 2011

OU-3/IRP Site 6 Long-Term Maintenance Documents:
Calendar Year 2007 Remedial Action Report for NPL OU-3/IRP Site 6; prepared by MaraTech Engineering Services

Calendar Year 2008 Remedial Action Report for NPL OU-3/IRP Site 6; prepared by Metcalf & Eddy, Inc.

Calendar Year 2009 Remedial Action Report for NPL OU-3/IRP Site 6; prepared by Environmental Quality Management, Inc.

Calendar Year 2010 Remedial Action Report for NPL OU-3/IRP Site 6; prepared by Advent Environmental, Inc.

Calendar Year 2011 Remedial Action Report for NPL OU-3/IRP Site 6; prepared by Advent Environmental, Inc.

OU-3/IRP Site 6 Long-Term Monitoring Documents:
Groundwater Monitoring Report for Post-RA Monitoring of Operable Unit 3 Site 6 (January, April, August and October 2007 Samples); prepared by Shaw Environmental, Inc. for Maratech Engineering Services, Inc., February 2008

Attachment A – List of Documents Reviewed

Groundwater Monitoring Report for Post-RA Monitoring of Operable Unit 3 Site 6 (April, July and October 2008 Samples); prepared by Metcalf & Eddy, Inc., January 2009

2009 Long-Term Monitoring Report, NPL Operable Unit 3, IRP Site 6 (April, July and November 2009 Samples); prepared by Environmental Quality Management, Inc., January 2010

2010 Annual Long-Term Monitoring Report, NPL Operable Unit 3, IRP Site 6 (April, July and November 2010 Samples); prepared by Shaw Environmental, Inc., February 2008

2011 Annual Long-Term Monitoring Report, NPL Operable Unit 3, IRP Site 6 (April, July and November 2010 Samples); prepared Shaw Environmental, Inc., March 2012

OU-3/IRP Site 21:

Records Of Decision/Decision Document
Record of Decision, OU-3/IRP Site 21; prepared by CH2M Hill, October 2001

OU-3/IRP Site 21 Remedial Action Design and Construction Documents:
Addendum #1 (RW-11A Installation and Tie-in) to the Environmental Cleanup Plan for the Remedial Action at OU-3/IRP Site 21, prepared by Advent Environmental, Inc., September 2010

Addendum (RE-11A Installation & Tie-in) to the Remedial Action Report for the RA at OU-3/IRP Site 21; prepared by Advent Environmental, Inc., February 2011

OU-3/IRP Site 21 Remedial Action Reports:
Monthly Remedial Action Reports, 2007 through February 2012; prepared by Hanscom AFB

OU-3/IRP Site 21 Long-Term Monitoring Documents:
May and October 2007 Post-RA Long Term Monitoring Report for Operable Unit 3 – IRP Site 21; prepared by Shaw Environmental, Inc. for Maratech Engineering Services, Inc., April 2008

Annual Long-Term Monitoring Report for NPL Operable Unit 3/IRP Site 21, April and October 2008 Post RA; prepared by Metcalf & Eddy, Inc., January 2009

2009 Long-Term Monitoring Report, NPL Operable Unit 3, IRP Site 21 (April and November 2009 Samples); prepared by Environmental Quality Management, Inc., January 2010

2010 Post RA Long-Term Monitoring Report for Operable Unit 3- Site 21 (April and November 2010 Samples); prepared by Shaw Environmental, Inc., February 2011

2011 Post RA Long-Term Monitoring Report for Operable Unit 3- Site 21 (April and November 2011 Samples); prepared by Shaw Environmental, Inc., April 2012

Attachment B – Applicable or Relevant and Appropriate Requirements (ARARs)

B1 - OU1/IRP Sites 1, 2 and 3 ARARs

B2 – OU3/IRP Site 6 ARARs

B3 – OU3/ IRP Site 21 ARARs

ARARs Table Hanscom AFB OU-1 - Selected Remedy

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirement	Status
Chemical Specific ARARs				
Groundwater	***Federal***			
	Federal Safe Drinking Water Act Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.16)	MCLs are enforceable standards that regulate the concentration of specific organic and inorganic contaminants that have been determined to adversely affect human health in public drinking water supplies. They also may be considered relevant and appropriate for groundwater aquifers potentially used for drinking water. Primary threat COCs in groundwater are VOCs.	Alternative G-3's groundwater remediation system will treat extracted groundwater to attain MCLs before discharging the treated groundwater to the recharge basins and/or drainage ditch. The standards will not be attained in groundwater at the source ares or within the contaminated plumes in the short-term, however, all RAOs are expected to be achieved in a reasonable (<50-years) period of time. In the interim LUCs will serve to control the potential access and exposure to contaminated media within the OU-1.The selected remedy also includes annual groundwater and surface water monitoring in order to track changes in contaminant concentrations over time. MCLs are listed in Table 2-1 for compounds of concern at OU-1.	Relevant and Appropriate
	Federal Safe Drinking Water Act Maximum Contaminant Level Goals (MCLGs) (40 CFR 141.50-141.51)	Non-zero MCLGs are nonenforceable health goals for public water systems. MCLGs are set at levels that would result in no known or expected adverse health effects with an adequate margin of safety. Non-zero MCLGs are to be used as goals when MCLs have not been established for a particular compound of concern.	Alternative G-3's groundwater remediation system will treat extracted groundwater to attain MCLs before discharging the treated groundwater to the recharge basins and/or drainage ditch. The standards will not be attained in groundwater at the source ares or within the contaminated plumes in the short-term, however, all RAOs are expected to be achieved in a reasonable (<50-years) period of time. In the interim LUCs will serve to control the potential access and exposure to contaminated media within the OU-1.The selected remedy also includes annual groundwater and surface water monitoring in order to track changes in contaminant concentrations over time. MCLs are listed in Table 2-1 for compounds of concern at OU-1.	Relevant and Appropriate
	USEPA Risk Reference Doses (RfDs)	RfDs are considered the levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.	USEPA RfDs will be used to calculate risk-based groundwater cleanup levels for non-carcinogens when no federal or state MCL or non-zero MCLG or state GWQS is available.	To Be Considered
	USEPA Carcinogen Assessment Group Cancer Slope Factors (CSFs)	CSFs represent the most-up-to-date information on cancer risk from USEPA Carcinogen Assessment Group.	USEPA RCSFs will be used to calculate risk-based groundwater cleanup levels for non-carcinogens when no federal or state MCL or non-zero MCLG or state GWQS is available.	To Be Considered
	USEPA Guidelines for Carcinogen Risk Assessment	These guidelines provide a framework for assessing cancer risks from exposure to pollutants or other agents in the environment	USEPA Guidelines will be used to assess risk posed by the site contaminants.	To Be Considered
	USEPA Supplemental Guidance for Assessing Susceptibility from Early Life Exposure to Carcinogens	These guidelines provide a framework for assessing cancer risks from exposure to pollutants or other agents in the environment	USEPA Guidelines will be used to assess risk posed by the site contaminants.	To Be Considered
	State			
	Massachusetts Drinking Water Standards (310 CMR 22.00)	These standards establish State MCLs for organic and inorganic contaminants that have been determined to adversely affect human health in public drinking water systems. They are to be used where they are more stringent than Federal MCLs.	Alternative G-3's groundwater remediation system will treat extracted groundwater to attain MCLs before discharging the treated groundwater to the recharge basins and/or drainage ditch. The standards will not be attained at the source ares or within the contaminated plumes in the short-term, however, all RAOs are expected to be achieved in a reasonable (<50-years) period of time. In the interim LUCs will serve to control the potential access and exposure to contaminated media within the OU-1.The selected remedy also includes annual groundwater and surface water monitoring in order to track changes in contaminant concentrations over time. MCLs are listed in Table 2-1 for compounds of concern at OU-1.	Relevant and Appropriate
	Massachusetts Contingency Plan (MCP) Method 1 GW-1 and GW-2 Standards (310 CMR 40.0974)	These are promulgated standards for characterizing the risk posed by COCs in groundwater under the MCP. The MCP Method 1 GW-1 and GW-2 standards will only apply for compounds where the standard is more restrictive than the federal MCL or MCLG, or for which no MCL or MCLG currently exists. Primary threat COCs in groundwater are VOCs.	Alternative G-3's groundwater remediation system will treat extracted groundwater to attain MCLs before discharging the treated groundwater to the recharge basins and/or drainage ditch. The standards will not be attained in groundwater at the source ares or within the contaminated plumes in the short-term, however, all RAOs are expected to be achieved in a reasonable (<50-years) period of time. In the interim LUCs will serve to control the potential access and exposure to contaminated media within the OU-1.The selected remedy also includes annual groundwater and surface water monitoring in order to track changes in contaminant concentrations over time. MCLs are listed in Table 2-1 for compounds of concern at OU-1.	Relevant and Appropriate

ARARs Table Hanscom AFB OU-1 - Selected Remedy

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirement	Status
	Massachusetts Groundwater Quality Standards (314 CMR 6.00)	These standards limit the concentration of certain materials allowed in classified Massachusetts water. The groundwater at the site has been designated as GW-1 (i.e., as a potential future drinking water supply) under state law by means of a Town of Bedford Aquifer Protection District by-law that was enacted through a process authorized by and implementing the MCP. In addition, MADEP has classified the eastern side of OU-1, east of Runway 5-23, as an approved Zone II; under the state drinking water regulations (310 CMR 22.02), a Zone II is "that area of an aquifer which contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated." Further in addition, the northeastern portion of the site at the northern end of Runway 5-23 is classified as a Potentially Productive Aquifer; the MCP defines "Potentially Productive Aquifer" in part as "all aquifers delineated by the U.S. Geological Survey (USGS) as a high or medium yield aquifer."	Alternative G-3's groundwater remediation system will treat extracted groundwater to attain GW-1 standards unless a more restrictive state standard has been promulagated in which case the more stringent state standard will be met. GW-1 standards will not be attained in groundwater at the source ares or within the contaminated plumes in the short-term, however, all RAOs are expected to be achieved in a reasonable (<50-years) period of time. In the interim LUCs will serve to control the potential access and exposure to contaminated media within the OU-1.The selected remedy also includes annual groundwater and surface water monitoring in order to track changes in contaminant concentrations over time. GW-1 standards are listed in Table 2-1 for compounds of concern at OU-1.	Applicable
Location Specific ARARs				
Surface water and wetlands	***Federal***			
	Fish and Wildlife Coordination Act (16 USC 661 et seq.)	This act requires consultation with the Fish and Wildlife Service and the state wildlife resource agency if alteration of a body of water, including discharge of pollutants into a wetland, will occur as a result of off-site remedial activities. Consultation is strongly recommended for on-site actions. This provides protection for actions that would affect streams, wetlands, other water bodies or protected habitats. Any action taken should protect fish or wildlife, and include measures developed to prevent, mitigate, or compensate for project-related losses to fish and wildlife.	Alternative G-3 includes continued operation and optimization of the groundwater remediation system which discharges treated groundwation into a drainage ditch which emptys into in the Wetland B/Beaver Pond Area surface water. The selected remedy includes monitoring of the treatment system effluent and the long-term monitoring of groundwater and surface water. Precautions will be taken to minimize the potential effect on fish and wildlife during these activities and any future remediation system alterations.	Relevant and Appropriate
Wetland sediment and surface water	***Federal***			
	Protection of Wetlands - Executive Order 11990 (40 CFR 6, Appendix A)	Appendix A of 40 CFR 6 sets forth policy for carrying out provisions of the Protection of Wetlands Executive Order. Under this order, federal agencies are required to minimize the degradation, loss, or destruction of wetlands, and to preserve the natural and beneficial values of wetlands. Appendix A requires that no remedial alternatives adversely affect a wetland if another practicable alternative is available. If no alternative is available, effects from implementing the chosen alternative must be mitigated.	Alternative G-3 includes continued operation and optimization of the groundwater remediation system and the long-term monitoring of groundwater and surface water. No additional actions, other than monitoring, are proposed in the wetlands until RAOs are achieved and existing wells in the Wetland B/Beaver Pond Area are decommissioned. There is no practicable alternative these remedy components located in or near the Wetland B/Beaver Pond Area. Precautions will be taken to minimize the potential effect on wetlands during these activities.	Applicable
	State			
	Massachusetts Wetlands Regulations (310 CMR 10.51-10.60, MGL c. 131, Section 40: Wetlands Protection Act)	These regulations protect inland wetlands such as those found at the site from activities that may alter the resource area by establishing buffer zone areas. The loss may be permitted with replication of the lost area within two growing seasons.	Alternative G-3 includes continued operation and optimization of the groundwater remediation system and the long-term monitoring of groundwater and surface water. No additional actions, other than monitoring, are proposed in the wetlands until RAOs are achieved and existing wells in the Wetland B/Beaver Pond Area are decommissioned. There is no practicable alternative these remedy components located in or near to the Wetland B/Beaver Pond Area. Activities at the site will be performed in compliance with the buffer zone requirements for these resource areas. Under CERCLA, only the substantive requirements of these regulations would apply to this alternative.	Applicable
Other Natural Resources	***Federal***			
	Protection of Floodplains, Executive Order 11988 (40 CFR 6, Appendix A)	Appendix A of 40 CFR 6 sets forth policy for carrying out provisions of the Protection of Floodplains Executive Order. Under this order, federal agencies are required to avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values of the floodplain.	According to the Comprehensive Ecological Analysis (LEC, August 1997), portions of OU-1 are located within a 100-year floodplain. Alternative G-3 includes continued operation and optimization of the existing groundwater remediation system, and the long-term monitoring of groundwater and surface water. No practicable alternative to these remedy components exists. The floodplain storage capacity and hydraulics will not be changed by this remedy.	Applicable

ARARs Table Hanscom AFB OU-1 - Selected Remedy

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirement	Status
Action Specific ARARs				
Surface water	***Federal***			
	Clean Water Act National Pollutant Discharge Elimination System (NPDES) Regulations (40 CFR 122-125 and 131)	These regulations establish discharge limitations, monitoring requirements and best management practices for any direct discharge from a point source into surface water.	Alternative G-3 includes continued operation and optimization of the groundwater remediation system, which includes the discharge of effluent from the treatment plant to a drainage channel which emptys into in the Wetland B/Beaver Pond Area surface water.. The effluent will be sampled and analyzed to ensure compliance with regulatory discharge parameters.	Applicable
	State			
	Clean Waters Act - Surface Water Discharge Permit Program (314 CMR 3.00; MGL c. 21 Sections 26-53)	This act and program establish the requirements intended to maintain the quality of surface waters by controlling the direct discharge of pollutants to surface waters. Direct discharges of wastewater to surface waters must meet effluent discharge limits established by this program.	Alternative G-3 includes continued operation and optimization of the groundwater remediation system, which includes the discharge of effluent from the treatment plant to a drainage channel which emptys into in the Wetland B/Beaver Pond Area surface water.. The effluent will be sampled and analyzed to ensure compliance with regulatory discharge parameters. Under CERCLA, only the substantive requirements of these regulations would apply to this alternative.	Applicable
Groundwater	***Federal***			
	Resource Conservation and Recovery Act (RCRA) 40 CFR Part 264, Subpart F-Releases from Solid Waste Management Units (40 CFR 264.90-264.101 and 265.90-265.94)	General facilities requirements for groundwater monitoring at affected facilities and general requirements for corrective action programs, if required, at the affected facilities.	This program has been delegated to the state. Groundwater monitoring will be conducted in accordance with Massachusetts requirements.	Applicable
	Underground Injection Control Program (UIC) (40 CFR 141 148)	These regulations outline minimum program and performance standards for underground injection wells and prohibit any injection that may cause a violation of any primary drinking water regulation in the aquifer.	This program has been delegated to the state and takes effect through the State requirements listed below.	Applicable
	State			
	MA Hazardous Waste Management Rules (HWMR) Groundwater Protection (310 CMR 30.660-30.679)	These regulations require groundwater monitoring at specified regulated units that treat, store or dipose of hazardous waste. Maximum concentration limits for the hazardous constituents are specified in 310 CMR 30.668.	Groundwater monitoring under Alternative G-3 will be conducted in accordance with these requirements.	Applicable
	MA Standards for Analytical Data for Remedial Response Action, Bureau of Waste Site Cleanup Policy 300-89.	This policy decribes the minimum standards for analytical data submitted to the MADEP.	All sampling plans for Alternative G-3 will be designed with consideration of the analytical methods provided in this policy.	To Be Considered
	Massachusetts Groundwater Discharge Permit Program (314 CMR 5.00; MGL c.21 Sections 26-53; 310 CMR 27.01 - 27.11)	This program is designed to protect state groundwaters for their highest potential use by regulating discharges of pollutants to state groundwaters and requiring the MADEP to regulate the outlets for groundwater discharges and associated treatment works. These regulations set effluent limits for the discharge of pollutants to groundwater. Recharge wells used exclusively to replenish an aquifer with uncontaminated water are exempt from this requirement. Uncontaminated water is water which upon discharge could not cause a violation of applicable water quality standards.	Alternative G-3 includes continued operation and optimization of the groundwater remediation system, which includes the option to discharge of treated water to the ground via recharge basins. The treatment system's effluent will be sampled and analyzed to ensure the discharge of treated water to groundwater would comply with the substantive requirements of these regulations. Under CERCLA, only the substantive requirements of these regulations would apply to this alternative.	Applicable
	MA Underground Injection Control (UIC) Program (310 CMR 23.01-23.11)	These regulations require acquiring a permit in order to inject wastes, chemicals or other substances into the subsurface.	Alternative G-3 includes continued operation and optimization of the groundwater remediation system, which may include the injection of permanganate, molasses or other substances for in-situ remediation of on-site groundwater contaminants. To ensure that these injections complies with the substantive requirements of these regulations the proposed quantities to be injected will be included in the work plan/design that will be submitted to EPA and MA DEP for comment and concurrence prior to an injection and injections will only be considered for on-site locations that are upgradient of the boundary interceptor wells. Also the groundwater monitoring program will reviewed/revised to ensure adequacy for the assessment of the impact of any injections. Under CERCLA, only the substantive requirements of these regulations would apply to this alternative.	Applicable

ARARs Table Hanscom AFB OU-1 - Selected Remedy

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirement	Status
Miscellaneous Actions	***State***			
	Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas (May 2003)	Provides guidance and best management practices regarding erosion and sediment control.	Construction of any new wells (if needed) will be performed in accordance with this guidance as appropriate.	To Be Considered
	Massachusetts Well Decommissioning Requirements (313 CMR 3.03)	These regulations provide for certain notification requirements upon well abandonment.	The decommissioning or abandonment of wells (when no longer needed) will be performed in accordance with these requirements.	Applicable
Waste	***Federal***			
	RCRA Identification and Listing of Hazardous Wastes (40 CFR 261.24)	These requirements establish the maximum concentrations of contaminants for which the waste would be a RCRA-characteristic hazardous waste for toxicity.	Alternative G-3 ncludes continued operation and optimization of the groundwater remediation system, which includes the potential generation of wastes which may be classified as hazardous. These materials include the recovered solvent from the groundwater treatment system, the activated carbon from the air/vapor treatments systems associated with the groundwater treatment and vacuum enhanced recovery systems, groundwater samples, and soil borings that may result from the installation of new wells. Under CERCLA, only the substantive requirements of these regulations would apply to this alternative.	Applicable
	RCRA Standards Applicable to Generators of Hazardous Waste (40 CFR Part 262)	Massachusetts has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations.	Alternative G-3 ncludes continued operation and optimization of the groundwater remediation system, which includes the potential generation of wastes which may be classified as hazardous. These materials include the recovered solvent from the groundwater treatment system, the activated carbon from the air/vapor treatments systems associated with the groundwater treatment and vacuum enhanced recovery systems, groundwater samples, and soil borings that may result from the installation of new wells. Under CERCLA, only the substantive requirements of these regulations would apply to this alternative.	Applicable
	State			
	MA HWMR, Use and Management of Containers, 310 CMR 30.689; Storage and Treatment in Tanks, 310 CMR 30.699	These regulations set forth requirements for use and management of containers and tanks at hazardous waste facilities.	Alternative G-3 includes continued operation and optimization of the groundwater remediation system, which includes the potential generation of wastes which may be classified as hazardous. Under CERCLA, only the substantive requirements of these regulations would apply to this alternative.	Applicable
	Massachusetts Hazardous Waste Management Rules (HWMR), 310 CMR 30.300-30.371, Requirements for Generators	Establishes requirements and standards for generators of hazardous waste that address general waste management measures, including the accumulation of hazardous waste prior to off-site disposal, preparing the hazardous wastes for shipment, and preparing appropriate waste manifests.	Alternative G-3 includes continued operation and optimization of the groundwater remediation system, which includes the potential generation of wastes which may be classified as hazardous. Under CERCLA, only the substantive requirements of these regulations would apply to this alternative.	Applicable
Air	***Federal***			
	RCRA - Air Emission Standards for Process Vents, 40 CFR Part 264, Subpart AA	These regulations establish requirements for controlling emmisions from process vents associated with treatment processes that manage hazardous wastes with organic concentrations of 10 ppm or more.	If operation of the groundwater remediation system under Alternative G-3 involves management of hazardous waste with organic concentrations of at least 10 ppm, equipment used in remedial activies will meet the requirements and be monitored for compliance.	Relevant and Appropriate
	RCRA, Air Emission Standards for Equipment Leaks 40 CFR 264, Subpart BB	Contains air pollutant emission standards for equipment leaks at hazardous waste TSD facilities. Contains design specifications and requirements for monitoring for leak detection. It is applicable to equipment that contains or contacts hazardous wastes with organic concentrations of at least 10% by weight.	If operation of the groundwater remediation system under Alternative G-3 involves management of hazardous waste with organics of at least 10 ppm, equipment will meet the design specifications, and will be monitored for leaks.	Relevant and Appropriate

ARARs Table Hanscom AFB OU-1 - Selected Remedy

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirement	Status
	RCRA, Air Emission Standards for Tanks, Surface Impoundments and Containers (40 CFR 264, Subpart CC	Contains air pollutant emission standards for owners and operators of TSD facilities using tanks, surface impoundments, and containers to manage hazardous waste. Specific organic emissions controls have to be installed if the average volatile organic concentantions are equal or greater than 100 ppmw.	If operation of the groundwater remediation system under Alternative G-3 involves management of hazardous waste with organics of at least 10 ppm, equipment used in in remediation activities will meet the requirement to be monitored for compliance.	Relevant and Appropriate
	USEPA Policy on Control of Air Emissions from Superfund Air Strippers at Superfund Groundwater Sites, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.0-28	Provides guidance on the control of air emissions from air strippers used at Superfund sites and distinguishes between requirements for attainment and nonattainment areas for ozone.	Alternative G-3 includes continued operation and optimization of the groundwater remediation system, which includes an off-gas treatment system for the air strippers. This off-gas treatment system will be monitored and maintained to ensure air emissions meet discharge standards.	To Be Considered
	USEPA New England Region Memorandum, 12 July 1989 from Louis Gitto to Merril S. Hohman	States that Superfund air strippers in ozone nonattainment areas generally merit controls on all VOC emissions.	Alternative G-3 includes continued operation and optimization of the groundwater remediation system, which already includes an off-gas treatment system for the air strippers.	To Be Considered
	State			
	MADEP Off-Gas Treatment of Point Source Remedial Air Emissions (Policy No. WSC-94-150)	This policy establishes permitting requirements for air stripper installations.	Alternative G-3 includes continued operation and optimization of the groundwater remediation system, which already includes off-gas treatment systems for the air strippers and the vacuum enhanced recovery system that were designed to meet air discharge standards. These off-gas treatment systems are/will be monitored and maintained to ensure air emissions continue meet discharge standards. Under CERCLA, only the substantive requirements of these regulations would apply to this alternative.	To Be Considered
	Massachusetts Air Pollution Control Regulations (310 CMR 7.18)	These regulations establish the standards and requirements for air pollution control in the Commonwealth. Section 7.18 details requirements for air pollution controls for volatile organic compounds.	Alternative G-3 includes continued operation and optimization of the groundwater remediation system, which already includes off-gas treatment systems for the air strippers and the vacuum enhanced recovery system that were designed to meet air discharge standards. These off-gas treatment systems are/will be monitored and maintained to ensure air emissions continue meet discharge standards. Under CERCLA, only the substantive requirements of these regulations would apply to this alternative.	Applicable
	Massachusetts Rules for Remedial Air Emissions (310 CMR 40.0049)	The Massachusetts rules set forth standards for emissions from remedial activities, including a general requirement for 95% control over emissions from the remedial system.	Alternative G-3 includes continued operation and optimization of the groundwater remediation system, which already includes off-gas treatment systems for the air strippers and the vacuum enhanced recovery system that were designed to meet air discharge standards. These off-gas treatment systems are/will be monitored and maintained to ensure air emissions continue meet discharge standards. Under CERCLA, only the substantive requirements of these regulations would apply to this alternative.	Relevant and Appropriate
	Massachusetts Threshold Exposure Limits (TELs) and Allowable Ambient Limits (AALs) for Ambient Air	The Massachusetts Department of Environmental Protection has issued guidance setting out permissible concentations of air toxics in ambient air. The TELs and AALs are used to guide permitting decisions for sources of air toxics.	Remedial activities under Alternative G-3 will be monitored to ensure remedial air emissions do not cause any exceedances of TELs and AALs. Under CERCLA, only the substantive requirements of these regulations would apply to this alternative.	To Be Considered

AALs - Allowable Ambient Limits
ARARs - Applicable or relevant and appropriate requirements.
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act.
CFR - Code of Federal Regulations.
CMR - Code of Massachusetts Regulations
COCs - Contaminants of Concern
CSFs - Cancer Slope Factors
CWA- Clean Water Act.
EPA - Environmental Protection Agency.
GAC - Granular Activated Carbon
GWQS - Groundwater Quality Standards
LUCs - Land Use Controls
MGL - Massachusetts General Laws
NPDES-National Pollutant discharge elimination system.
ppm - parts per million
ppmv - parts per million by wieght
RCRA - Resource Conservation and Recovery Act.
RfDs - Risk Reference Doses
SDWA - Safe Drinking Water Act.
TELs - Threshold Exposure Limits
TSD - Treatment, Storage and Disposal
USC - United States Code.
VOC - Volatile Organic Compounds

Attachment B – Applicable or Relevant and Appropriate Requirements (ARARs)

B2 – OU3/IRP Site 6 ARARs

ARARs Table Hanscom AFB OU-3/IRP Site 6 - Selected Remedy

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirement	Status
Chemical Specific ARARs				
Surface Soil	***Site Specific***			
	Federal-EPA Risk Reference Doses (RfDs)[a]	RfDs are dose levels developed based on noncarcinogenic effects and are used to develop Hazard Indices. A Hazard Index of less than or equal to 0.1 is considered acceptable. Primary COCs for surface soil include PAHs and inorganics.	This alternative includes installation of permeable caps over the landfill areas, implementation of institutional controls controlling future land use, and excavation of contaminated wetland sediments to prevent exposure to contaminated soils.	To Be Considered
	Federal-EPA Human Health Assessment Group Cancer Slope Factors[a]	Cancer slope factors are developed by the EPA from Health Effects Assessments and are used to develop excess cancer risks. The only COCs for the surface soil were carcinogens, a carcinogenic risk of less than or equal to $1x10^{-6}$ is acceptable. Primary COCs for surface soil include PAHs and inorganics.	This alternative includes installation of permeable caps over the landfill areas, implementation of institutional controls controlling future land use, and excavation of contaminated wetland sediments to prevent exposure to contaminated soils.	To Be Considered
Groundwater	***Federal***			
	Federal Safe Drinking Water Act MCLs (40 CFR 141.11-141-16)	This act consists of promulgated standards or levels (concentrations) for a broad range of contaminants of concern (COCs) in public drinking water supplies. It may be considered relevant and appropriate for groundwater aquifers used for drinking water. The site groundwater is not currently being used and will not be used in the future. The applicability of the ARARs will be at the compliance boundary. Primary threat COCs include VOCs, PAHs, and arsenic.	This alternative includes annual groundwater monitoring in order to track changes in contaminant concentrations over time as natural flushing continues to occur.	Relevant & Appropriate
	State			
	Massachusetts Contingency Plan GW-1 Standards (310 CMR 40.0974)	This act consists of promulgated standards or levels (concentrations) for COCs in groundwater under Massachusetts DEP Method 1 standards. The MCP GW-1 standards will only apply for compounds where the state standard is more restrictive than the federal MCL and/or MCLGs or for which no MCL and/or MCLG currently exists. The site groundwater is not currently being used and will not be used in the future. The applicability of the ARARs will be at the compliance boundary. Primary threat COCs include VOCs, PAHs, and arsenic.	This alternative includes annual groundwater monitoring in order to track changes in contaminant concentrations over time as natural flushing continues to occur.	Applicable
	Site Specific			
	Federal-EPA Risk Reference Doses (RfDs)[a]	RfDs are dose levels developed based on noncarcinogenic effects and are used to develop Hazard Indices. A Hazard Index of less than or equal to 0.1 is considered acceptable. Primary threat COCs include VOCs, PAHs, and arsenic.	This alternative includes annual groundwater monitoring in order to track changes in contaminant concentrations over time as natural flushing continues to occur.	To Be Considered
	Federal-EPA Human Health Assessment Group Cancer Slope Factors[a]	Cancer slope factors are developed by the EPA from Health Effects Assessments and are used to develop excess cancer risks. A carcinogenic risk of less than or equal to $1x10^{-6}$ is acceptable. Primary threat COCs include VOCs, PAHs, and arsenic.	This alternative includes annual groundwater monitoring in order to track changes in contaminant concentrations over time as natural flushing continues to occur.	To Be Considered
Location Specific ARARs				
Wetlands Surface water	***Federal***			
	Fish and Wildlife Coordination Act (16 USC 661et seq.)	These acts provide protection and consultation with the US Fish and Wildlife Service and State counterpart for actions that would affect streams, wetlands, other water bodies or protected habitats. Any action taken should protect fish or wildlife, and measures developed to prevent, mitigate, or compensate for project-related losses to fish and wildlife.	Alternative #3 - *Permeable Cap* includes excavation of contaminated wetland sediments, placement of clean sediment that will support the existing ecological wetlands system, followed by the planting of submerged and bordering species as appropriate. Standard good engineering practices and precautions will be taken to minimize or eliminate the potential effects of these actions on fish and wildlife, and efforts will be made to enhance the overall condition of the wetlands through replication. Consultation with Natural Resource agencies will be performed.	Applicable

ARARs Table Hanscom AFB OU-3/IRP Site 6 - Selected Remedy

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirement	Status
Wetland soil and surface water	*Federal*			
	Protection of Wetlands - Executive Order 11990 (40 CFR 6, Appendix A)	Appendix A of 40 CFR 6 sets forth policy for carrying out provisions of the Protection of Wetlands Executive Order. Under this order, federal agencies are required to minimize the degradation, loss, or destruction of wetlands, and to preserve the natural and beneficial values of wetlands. Appendix A requires that no remedial alternatives adversely affect a wetland if another practicable alternative is available. If no alternative is available, effects from implementing the chosen alternative must be mitigated. Public notice and review of activities involving wetlands is required.	COCs have been detected in wetland soils at the site, therefore, those areas have already been impacted. Alternative #3 - *Permeable Cap* includes excavation and removal of contaminated wetland sediments, followed by the placement of clean sediment and planting of submerged and bordering plant species that will support the existing ecological wetlands system in the excavated areas. The permeable cap over the Former Filter Bed Area will prevent soil erosion that might transport contaminated soil into the wetland areas. During cap construction and wetland sediment excavation, drainage controls will be constructed and standard engineering practices will be implemented to minimize or eliminate the potential effects of these actions on the surrounding wetlands. There is no practical alternative to this action and it is the least invasive protective action. Public review will be accomplished through the Proposed Plan.	Applicable
	Clean Water Act, (Section 404 (b)(1), 40 CFR 230) Guidelines for Specification of Disposal Sites for Dredged or Fill Material	The purpose of this act is to restore and maintain the chemical, physical, and biological integrity of waters of the United States through the control of discharges of dredged or fill material. Dredged or fill material should not be discharged into the aquatic ecosystem unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern. Public notice is required.	Alternative #3 - *Permeable Cap* includes excavation of contaminated wetland sediments, placement of clean sediment that will support the existing ecological wetlands system, followed by the planting of submerged and bordering species as appropriate. Standard engineering practices and precautions will be taken to minimize the potential effect on surface waters through erosion and drainage controls, and efforts will be made to enhance the overall condition of the wetlands through the replication. There is no practical alternative to this action and it is the least invasive protective action. Public review will be accomplished through the Proposed Plan.	Applicable
	State			
	Massachusetts Wetlands Regulations (310 CMR 10.51-10.60, MGL c. 131, Section 40: Wetlands Protection Act)	These regulations protect inland wetlands such as those found at the site from activities that may alter the resource area. The loss may be permitted with replication of the lost area within two growing seasons.	Alternative #3 - *Permeable Cap* includes excavation and replication of contaminated wetland sediments. Clean sediment that will support the existing ecological wetlands system will be placed in the excavated areas, followed by the planting of submerged and bordering species as appropriate. Activities at the site will be performed in compliance with the performance standards of these regulations.	Applicable
All forms of media at the site	*Federal*			
	Migratory Bird Treaty Act of 1972, (16 USC Section 703)	This act protects almost all species of native birds in the U.S. from unregulated "taking" which can include poisoning at contaminated or hazardous waste sites.	According to the Comprehensive Ecological Analysis (LEC, August 1997), migratory birds have been observed in Wetland Z. Alternative #3 - *Permeable Cap* includes the removal of contaminated sediments and the enhanced replication of the wetland. Standard engineering practices and precautions will be taken to minimize the potential effect on migratory birds, and efforts will be made to enhance the overall condition of the wetlands through the replication.	Applicable
	Protection of Floodplains, Executive Order 11988 (40 CFR 6, Appendix A)	Appendix A of 40 CFR 6 sets forth policy for carrying out provisions of the Protection of Floodplains Executive Order. Under this order, federal agencies are required to avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values of the floodplain. Agencies are also required to circulate a notice explaining why action within the floodplain is proposed.	According to the Comprehensive Ecological Analysis (LEC, August 1997), wetland Z is located within a 100-year floodplain. Alternative #3 - *Permeable Cap* includes the removal of contaminated sediments, followed by the planting of submerged and bordering plant species and the enhanced replication of the wetland. Efforts will be made to conduct the work during the dry season to avoid potenial flooding. The floodplain storage capacity and hydraulics will not be changed significantly by this alternative. There is no practical alternative to this action and it is the least invasive protective action. Public notice and review of proposed activities will be accomplished through the Proposed Plan.	Applicable
	State			
	Massachusetts Endangered Species Act, 321 CMR 10.00, (MGL c. 131A)	The Commonwealth of Massachusetts has authority to research, list, and protect any species deemed endangered, threatened, or of other special concern. These species are listed as either endangered, threatened, or species of special concern in the regulations. Actions must be conducted in a manner that minimizes the effect on Massachusetts-listed endangered species and species listed by the Massachusetts Natural Heritage Program.	According to the Comprehensive Ecological Analysis (LEC, August 1997), the spotted turtle (a species of Special Concern, as listed by Massachusetts), has been observed in Wetland Z. Alternative #3-*Permeable Cap* includes excavation and replication of contaminated wetland sediments. These activities will be designed to mimize the potential effect on this species and to enhance the overall status of the wetlands.	Applicable

ARARs Table Hanscom AFB OU-3/IRP Site 6 - Selected Remedy

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirement	Status
Action Specific ARARs				
Surface water	***Federal***			
	National Pollutant Discharge Elimination System (NPDES) (40 CFR 122-125 and 131), Clean Water Act	Establishes discharge limitations, monitoring requirements and best management practices for any direct discharge from a point source into surface water.	Under Alternative #3 - *Permeable Cap*, during cap construction drainage controls will be constructed and standard engineering precautions will be taken to minimize/eliminate potential effects of these activities.	Applicable
	State			
	Clean Waters Act - Surface Water Discharge Permit Program (314 CMR 3.00; MGL c. 21 Sections 26-53)	This act and program regulate the requirements intended to maintain the quality of surface waters by controlling the direct discharge of pollutants to surface waters. Direct discharges of wastewater to surface waters must meet effluent discharge limits established by this section. These limits are established on a case-by-case basis.	Under Alternative #3-*Permeable Cap* construction of the cap will prevent the erosion of contaminated soil into surface waters. During cap construction drainage controls will be constructed and standard engineering precautions will be taken to minimize/eliminate potential effects of the action.	Applicable
	Massachusetts Surface Water Quality Standards (314 CMR 4.05(3)(b)5-8; MGL c.21 Sections 26-53)	These regulations limit or prohibit discharges of pollutants to surface waters to assure that surface water quality standards of the receiving waters are protected and maintained or attained. Discharges may be limited or prohibited to protect existing uses and not interfere with the attainment of designated uses in downstream and adjacent segments. This may pertain to both discharges to surface water as a result of remediation and any onsite surface waters affected by site conditions.	Under Alternative #3-*Permeable Cap*, during cap construction (and after if permanent point drainage structures are constructed) drainage controls will be constructed and standard engineering precautions will be taken to minimize/eliminate potential effects of the action.	Applicable
Waste	***State***			
	Solid Waste Disposal Laws (MGL c. 21H, MGL c. 111, 150A-150A 1/2) 310 CMR 19.100-151	These regulations specify general design and performance standards for the South and West landfill cover systems, potential gas control, storm water control, closure, monitoring, corrective action, and post-closure care. These regulations apply to all solid waste management activities and facilities including landfills and dumping grounds.	Under alternative 3 - *Permeable Cap*, the action includes the excavation of waste material from the area east of the former filter bed area and removal of contaminated wetlands sediment. These materials will be placed within the OU3/Site 6 filter bed area prior to installation of the permeable cap. The alternative will address the relevant and appropriate performance requirements of these regulations for the South and West landfills. A monitoring program will be developed to monitor and maintain the South and West landfill areas after construction.	Relevant & Appropriate
	Hazardous Waste disposal Laws (MGL c.21C), 310 CMR 30.001-009, 30.590-593, 30.633, 30.660-666.	These regulations specify general design and performance standards for the filter bed cover system, potential gas control, storm water control, closure, monitoring, corrective action, and post-closure care. These regulations apply to all hazardous waste management facilities.	Under alternative 3 - *Permeable Cap*, the action includes the excavation of waste material from the area east of the former filter bed area and removal of contaminated wetlands sediment. These materials will be placed within the OU3/Site 6 filter bed area prior to installation of the permeable cap. The alternative will address the relevant and appropriate performance requirements of these regulations for the former filter bed area. A monitoring program will be developed to monitor and maintain the filter bed area after construction.	Relevant & Appropriate
Air	***State***			
	Massachusetts Air Pollution Control Regulations (310 CMR 7.09)	These regulations establish the standards and requirements for air pollution control in the Commonwealth. Section 7.09 details requirements for ambient air quality standards (dust, odor) during construction and demolition activities.	Under Alternative #3-*Permeable Cap*, excavation and material handling operations associated with capping activities could generate ambient air quality issues. Remedial actions will be conducted with air monitoring equipment, and engineering controls will be implemented during construction, as required, to meet the regulations.	Applicable

ARARs - Applicable or relevant and appropriate requirements.
RCRA - Resource Conservation and Recovery Act.
CFR - Code of Federal Regulations.
CWA- Clean Water Act.
EO - Executive Order.
EPA - Environmental Protection Agency.
FR - Federal Register.
USC - United States Code.

NPDES-National Pollutant discharge elimination system.
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act.
SDWA - Safe Drinking Water Act.
[a] Toxicity information obtained from U.S. Environmental Protection Agency (EPA) Integrated Risk Information System (IRIS) 1999, and Health Effects Assessment Summary Tables (HEAST) FY1998

Attachment B – Applicable or Relevant and Appropriate Requirements (ARARs)

B3 – OU3/ IRP Site 21 ARARs

ARARS Table Hanscom AFB OU-3/IRP Site 21 Selected Remedy

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirement	Status
Chemical Specific ARARs				
Groundwater			***Federal***	
	Federal Safe Drinking Water Act Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.16)	MCLs are enforceable standards that regulate the concentration of specific organic and inorganic contaminants that have been determined to adversely affect human health in public drinking water supplies. They also may be considered relevant and appropriate for groundwater aquifers potentially used for drinking water. Primary threat COCs in groundwater are VOCs.	Alternative 12 includes excavation of petroleum-saturated soil from LNAPL Pools A and B and "hot spots" in LNAPL Pool C and decreases in the dissolved concentrations of both the LNAPL associated contaminants and the chlorinated VOCs through natural attenuation. Following removal of the contaminant source ORC will be added to the excavation for an initial treatment of groundwater. Following the initial ORC treatment the dissolved-phase contaminant concentrations will continue to decrease through natural attenuation. Alternative 12 also includes contingencies for pumping and/or treating the groundwater in order to contain migration and/or reduce dissolved-phase concentrations. This alternative includes annual groundwater monitoring in order to track decreases in LNAPL volume and dissolved-phase contaminant concentrations over time. MCLs are listed in Table 2-15 for compounds of concern at OU-3/ IRP Site 21.	Relevant and Appropriate
	Federal Safe Drinking Water Act Maximum Contaminant Level Goals (MCLGs) (40 CFR 141.50-141.51)	Non-zero MCLGs are nonenforceable health goals for public water systems. MCLGs are set at levels that would result in no known or expected adverse health effects with an adequate margin of safety. Non-zero MCLGs are to be used as goals when MCLs have not been established for a particular compound of concern.	Alternative 12 includes excavation of petroleum-saturated soil from LNAPL Pools A and B and "hot spots" in LNAPL Pool C and decreases in the dissolved concentrations of both the LNAPL associated contaminants and the chlorinated VOCs through natural attenuation. Following removal of the contaminant source ORC will be added to the excavation for an initial treatment of groundwater. Following the initial ORC treatment the dissolved-phase contaminant concentrations will continue to decrease through natural attenuation. Alternative 12 also includes contingencies for pumping and/or treating the groundwater in order to contain migration and/or reduce dissolved-phase concentrations. This alternative includes annual groundwater monitoring in order to track decreases in LNAPL volume and dissolved-phase contaminant concentrations over time.	Relevant and Appropriate
			State	
	Massachusetts Drinking Water Standards (310 CMR 22.00)	These standards establish State MCLs for organic and inorganic contaminants that have been determined to adversely affect human health in public drinking water systems. They are to be used where they are more stringent than Federal MCLs.	Alternative 12 includes excavation of petroleum-saturated soil from LNAPL Pools A and B and "hot spots" in LNAPL Pool C and decreases in the dissolved concentrations of both the LNAPL associated contaminants and the chlorinated VOCs through natural attenuation. Following removal of the contaminant source ORC will be added to the excavation for an initial treatment of groundwater. Following the initial ORC treatment the dissolved-phase contaminant concentrations will continue to decrease through natural attenuation. Alternative 12 also includes contingencies for pumping and/or treating the groundwater in order to contain migration and/or reduce dissolved-phase concentrations. This alternative includes annual groundwater monitoring in order to track decreases in LNAPL volume and dissolved-phase contaminant concentrations over time.	Relevant and Appropriate
	Massachusetts Contingency Plan Method 1 GW-1 Standards (310 CMR 40.0974)	These are promulgated standards for characterizing the risk posed by COCs in groundwater under MCP. The MCP Method 1 GW-1 standards will only apply for compounds where the state standard is more restrictive than the federal MCL or MCLG, or for which no MCL or MCLG currently exists. Primary threat COCs in groundwater are VOCs.	Alternative 12 includes excavation of petroleum-saturated soil from LNAPL Pools A and B and "hot spots" in LNAPL Pool C and decreases in the dissolved concentrations of both the LNAPL associated contaminants and the chlorinated VOCs through natural attenuation. Following removal of the contaminant source ORC will be added to the excavation for an initial treatment of groundwater. Following the initial ORC treatment the dissolved-phase contaminant concentrations will continue to decrease through natural attenuation. Alternative 12 also includes contingencies for pumping and/or treating the groundwater in order to contain migration and/or reduce dissolved-phase concentrations. This alternative includes annual groundwater monitoring in order to track decreases in LNAPL volume and dissolved-phase contaminant concentrations over time. MCP Method 1 GW-1, GW-2 and GW-3 standards are listed in Table 2-15 for compounds of concern at OU-3/ IRP Site 21.	Relevant and Appropriate

ARARS Table Hanscom AFB OU-3/IRP Site 21 Selected Remedy

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirement	Status
Location Specific ARARs				
Surface water and wetlands			***Federal***	
	Fish and Wildlife Coordination Act (16 USC 661 et seq.)	This act requires consultation with the Fish and Wildlife Service and the state wildlife resource agency if alteration of a body of water, including discharge of pollutants into a wetland, will occur as a result of off-site remedial activities. Consultation is strongly recommended for on-site actions. This provides protection for actions that would affect streams, wetlands, other water bodies or protected habitats. Any action taken should protect fish or wildlife, and include measures developed to prevent, mitigate, or compensate for project-related losses to fish and wildlife.	According to the Comprehensive Ecological Analysis (LEC, August 1997), the Shawsheen River and it's banks are part of the Wetland Z System, however, Alternative 12 does not alter the river or discharge pollutants into a wetland. Since Alternative 12 includes excavating a trench approximately 120 to 200 feet south of the Shawsheen River and the discharge of treated groundwater into the base storm drainage system which discharges into the river, precautions will be taken to ensure that this alternative does not alter the river or discharge pollutants into a wetland. These include the installation of hay bales and/or silt fencing between the site and the river to ensure that surface runoff from the open excavation area does not transport silt into the the river and/or wetland. Also the the effluent from the groundwater treatment system will be sampled and analyzed to ensure compliance with regulatory discharge parameters.	Applicable
Other Natural Resources			***Federal***	
	Protection of Floodplains, Executive Order 11988 (40 CFR 6, Appendix A)	Appendix A of 40 CFR 6 sets forth policy for carrying out provisions of the Protection of Floodplains Executive Order. Under this order, federal agencies are required to avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values of the floodplain.	According to the Comprehensive Ecological Analysis (LEC, August 1997), the Shawsheen River and it's banks (Zone 5) are located within a 100-year floodplain, however, Alternative 12 does not include any activities within the 100-year floodplain. Also the floodplain storage capacity and hydraulics will not be changed by this alternative. Since Alternative 12 includes excavating a trench approximately 120 to 200 feet south of the Shawsheen River, precautions will be taken to ensure that this alternative has no effect on the natural and beneficial values of the floodplain. These include the installation of hay bales and/or silt fencing between the site and the 100-year floodplain to ensure that surface runoff from the open excavation area does not transport silt into the floodplain.	Applicable
			State	
	Massachusetts Endangered Species Act, 321 CMR 10.00, (MGL c. 131A)	The Commonwealth of Massachusetts has authority to research, list, and protect any species deemed endangered, threatened, or of other special concern. These species are listed as either endangered, threatened, or species of special concern in the regulations. Actions must be conducted in a manner that minimizes the effect on Massachusetts-listed endangered species and species listed by the Massachusetts Natural Heritage Program.	According to the Comprehensive Ecological Analysis (LEC, August 1997), the spotted turtle (a species of Special Concern, as listed by Massachusetts), has been observed in the Wetland Z System, however, Alternative 12 does not include any activities within the wetland. Since Alternative 12 includes excavating a trench approximately 120 to 200 feet south of the Shawsheen River and long-term monitoring of groundwater including some wells adjacent to the river, precautions will be taken to minimize the potential effect on endangered species. These include the briefing of site workers that if the spotted turtle is observed in the area of site work then actions (stop work or relocate turtle out of danger) are to be taken to preclude threatening or endangering the turtle. The requirement for this briefing will be included in the construction work plan and operation, maintenance, and monitoring plan.	Applicable

ARARS Table Hanscom AFB OU-3/IRP Site 21 Selected Remedy

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirement	Status
Action Specific ARARs				
Surface water			***Federal***	
	Clean Water Act National Pollutant Discharge Elimination System (NPDES) Regulations (40 CFR 122-125 and 131)	These regulations establish discharge limitations, monitoring requirements and best management practices for any direct discharge from a point source into surface water.	Alternative 12 includes recovery, treatment, and discharge of groundwater to the base storm drainage system which has outfalls in the Shawsheen River. The effluent from the groundwater treatment system will be sampled and analyzed to ensure compliance with regulatory discharge parameters.	Relevant and Appropriate
	Federal Ambient Water Quality Criteria (AWQC), 33 U.S.C 1314(a): (40 CFR Part 122.44)	Federal AWQC include (1) criteria for protection of human health from toxic properties of contaminants ingested through drinking water and aquatic organisms, and (2) criteria for protection of aquatic life.	Contaminant concentrations in monitoring wells adjacent to the Shawsheen River will continue to be monitored to determine whether river water quality is being impacted by contaminated groundwater, and to assure that AWQC are being met.	Relevant and Appropriate
			State	
	Clean Waters Act - Surface Water Discharge Permit Program (314 CMR 3.00; MGL c. 21 Sections 26-53)	This act and program establish the requirements intended to maintain the quality of surface waters by controlling the direct discharge of pollutants to surface waters. Direct discharges of wastewater to surface waters must meet effluent discharge limits established by this program.	Alternative 12 includes recovery, treatment, and discharge of groundwater to the base storm drainage system which has outfalls in the Shawsheen River. The effluent from the groundwater treatment system will be sampled and analyzed to ensure compliance with regulatory discharge parameters.	Relevant and Appropriate
	Massachusetts Surface Water Quality Standards (314 CMR 4.05(3)(b)5-8; MGL c.21 Sections 26-53)	These regulations limit or prohibit discharges of pollutants to surface waters to assure that surface water quality standards of the receiving waters are protected and maintained or attained. Discharges may be limited or prohibited to protect existing uses and not interfere with the attainment of designated uses in downstream and adjacent segments. This may pertain to both discharges to surface water as a result of remediation and any onsite surface waters affected by site conditions.	Contaminant concentrations in monitoring wells adjacent to the Shawsheen River will continue to be monitored to determine whether river water quality is being impacted by contaminated groundwater, and to assure that MA standards are being met.	Relevant and Appropriate
Groundwater	***Federal***			
	RCRA 40 CFR Part 264, Subpart F-Releases from Solid Waste Management Units (40 CFR 264.90-264.101 and 265.90-265.94)	General facilities requirements for groundwater monitoring at affected facilities and general requirements for corrective action programs, if required, at the affected facilities.	Groundwater monitoring will be conducted in accordance with these requirements.	Relevant and Appropriate
	Federal Safe Drinking Water Act Underground Injection Control Program (UIC) Subparts C,D and E (40 CFR 144.21-144.55)	These regulations require acquiring a permit in order to inject wastes, chemicals or other substances into the subsurface.	Alternative 12 includes injection of ORC into the groundwater. To ensure that the ORC injection complies with the substantive requirements of these regulations the proposed quantities to be injected will be included in the design and submitted to EPA and MA DEP for comment and concurrence and the groundwater monitoring program will assess the impact of the ORC. Also the contigency for groudnwater recovery from the trenches receiving the ORC can be implemented to remove the ORC if determined to be necessary.	Relevant and Appropriate
	State			
	MA HWMR Groundwater Protection (310 CMR 30.660-30.679)	These regulations require groundwater monitoring at specified regulated units that treat, store or dipose of hazardous waste. Maximum concentration limits for the hazardous constituents are specified in 310 CMR 30.668.	Groundwater monitoring will be conducted in accordance with these requirements.	Relevant and Appropriate
	Massachusetts Groundwater Discharge Permit Program (314 CMR 5.00; MGL c.21 Sections 26-53)	This program is designed to protect state groundwaters for their highest potential use by regulating discharges of pollutants to state groundwater and requiring the MADEP to regulate the outlets for groundwater discharges and associated treatment works. These regulations set effluent limits for the discharge of pollutants to groundwater. Recharge wells used exclusively to replenish an aquifer with uncontaminated water are exempt from this requirement. Uncontaminated water is water which upon discharge could not cause a violation of applicable water quality standards.	Alternation 12 does not include any discharge to groundwater. However, Alternative 12 does includes injection of ORC into the groundwater. To ensure that the ORC injection complies with the substantive requirements of these regulations the proposed quantities to be injected will be included in the design and submitted to EPA and MA DEP for comment and concurrence and the groundwater monitoring program will assess the impact of the ORC. Also the contigency for groudwater recovery from the trenches receiving the ORC can be implemented to remove the ORC if determined to be necessary.	Relevant and Appropriate
	MA Application of Remedial Additives (310 CMR 40.0046)	These regulations consist of requirements for the application of remedial additives to the subsurface.	Alternative 12 includes injection of ORC into the groundwater. To ensure that the ORC injection complies with the substantive requirements of these regulations the proposed quantities to be injected will be included in the design and submitted to EPA and MA DEP for comment and concurrence and the groundwater monitoring program will assess the impact of the ORC. Also the contingency for groundwater recovery from the trenches receiving the ORC can be implemented to remove the ORC if determined to be necessary.	Relevant and Appropriate
	MA Standards for Analytical Data for Remedial Response Action, Bureau of Waste Site Cleanup Policy 300-89.	This policy decribes the minimum standards for analytical data submitted to the MADEP.	All sampling plans will be designed with consideration of the analytical methods provided in this policy.	To Be Considered
	MA Underground Injection Control (UIC) Program (310 CMR 23.01-23.11)	These regulations require acquiring a permit in order to inject wastes, chemicals or other substances into the subsurface.	Alternative 12 includes injection of ORC into the groundwater. To ensure that the ORC injection complies with the substantive requirements of these regulations the proposed quantities to be injected will be included in the design and submitted to EPA and MA DEP for comment and concurrence and the groundwater monitoring program will assess the impact of the ORC. Also the contingency for groundwater recovery from the trenches receiving the ORC can be implemented to remove the ORC if determined to be necessary.	Relevant and Appropriate

ARARS Table Hanscom AFB OU-3/IRP Site 21 Selected Remedy

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirement	Status
Action Specific ARARs				
Waste	***Federal***			
	Resource Conservation and Recovery Act (RCRA) Identification and Listing of Hazardous Wastes (40 CFR 261.24)	These requirements establish the maximum concentrations of contaminants for which the waste would be a RCRA-characteristic hazardous waste for toxicity.	Alternative 12 includes the disposal of recovered petroleum product and petroleum-saturated soil which may be classified as hazardous. Also this alternative includes groundwater treatment. The treatment method would have the potential to generate hazardous wastes such as activated carbon used to treat groundwater. Disposal of these wastes will comply with the substantive requirements of these regulations.	Applicable
	RCRA Standards Applicable to Generators of Hazardous Waste (40 CFR Part 262)	Massachusetts has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations.	Alternative 12 includes the disposal of recovered petroleum product and petroleum-saturated soil which may be classified as hazardous. Also this alternative includes groundwater treatment. The treatment method would have the potential to generate hazardous wastes such as activated carbon used to treat groundwater. Disposal of these wastes will comply with the substantive requirements of these regulations.	Applicable
	State			
	MA HWMR, Use and Management of Containers, 310 CMR 30.689; Storage and Treatment in Tanks, 310 CMR 30.699	These regulations set forth requirements for use and management of containers and tanks at hazardous waste facilities.	Packing and accumulation of recovered product, treatment sludges, and other material will adhere to these standards.	Relevant and Appropriate
	Massachusetts Hazardous Waste Management Rules (HWMR), 310 CMR 30.300-30.371, Requirements for Generators	Establishes requirements and standards for generators of hazardous waste that address general waste management measures, including the accumulation of hazardous waste prior to off-site disposal, preparing the hazardous wastes for shipment, and preparing appropriate waste manifests.	Alternative 12 includes the disposal of recovered petroleum product and petroleum-saturated soil which may be classified as hazardous. Also this alternative includes groundwater treatment. The treatment method would have the potential to generate hazardous wastes such as activated carbon used to treat groundwater. Disposal of these wastes will comply with the substantive requirements of these regulations.	Applicable
	Solid Waste Disposal Laws (MGL c. 21H, MGL c. 111, Sections 150A-150A 1/2) 310 CMR 19.100-151	These regulations govern the disposal of solid waste in Massachusetts	Disposal of solid waste resulting from remedial activities associated with this alternative will have to be disposed of properly in accordance with these laws.	Relevant and Appropriate
Air	***Federal***			
	RCRA, - Air Emission Standards for Equipment Leaks (42 USC 6924, 40 CFR 264, Subpart BB	Contains air pollutant emission standards for equipment leaks at hazardous waste TSD facilities. Contains design specifications and requirements for monitoring for leak detection. It is applicable to equipment that contains or contacts hazardous wastes with organic concentrations of at least 10% by weight.	If petroleum product recovery or groundwater treatment involves management of hazardous waste with organics of at least 10 ppm, equipment will meet the design specifications, and will be monitored for leaks.	Relevant and Appropriate
	State			
	Massachusetts Air Pollution Control Regulations (MGL c.111 Sections 142A-142M, 310 CMR 7.09 and 7.18)	These regulations establish the standards and requirements for air pollution control in the Commonwealth. Section 7.09 details requirements for ambient air quality standards (dust, odor) during construction and demolition activities. Section 7.18 details requirements for air pollution controls for volatile organic compounds.	Alternative 12 includes excavation of petroleum-saturated soils and the excavation and material handling operations could generate ambient air quality issues. Air monitoring will be conducted during excavation and soil management activities such as the potential use of landfarming to treat petroleum contaminated soil on-site. Remedial actions will be conducted with air monitoring equipment, and engineering controls will be implemented as required to meet the regulations. Under CERCLA, only the substantive requirements of these regulations would apply to this alternative.	Applicable

ARARs - Applicable or relevant and appropriate requirements.
RCRA - Resource Conservation and Recovery Act.
CFR - Code of Federal Regulations.
CMR - Code of Massachusetts Regulations
CWA- Clean Water Act
EPA - Environmental Protection Agency.
MGL - Massachusetts General Laws
USC - United States Code.

NPDES-National Pollutant discharge elimination system.
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
SDWA - Safe Drinking Water Act.
GAC - Granular Activated Carbon
VOC - Volatile Organic Compounds

Attachment C – OU-1 System Operational Data .....

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NPL OU-1/IRP Sites 1, 2 & 3 Groundwater Remediation System

1989-1990 - Construction - Note there was significant dewatering associated with the construction of the collection trenches. Volume pumped exceeded capacity of temporary/ construction stripper and the majority of the water was transferred to holding basins and eventually soaked back into the ground.

Fall 1990 thru March 1991 - startup testing - 1st gallon of contaminated water on 13 Nov 90. Facility operated sporadically through April 91.

23 April 1991 - **O&M contractor starts operations,** however it appears that the BIW's where not turned on until much later. Records are sketchy but first notes indicate that sporadic operation of BIW's commenced in Jul 93. However, due to insufficient pumping capacity from the Site 1 pump station, operation of BIW's #1 & 2 was minimal until 25 April 95 when the Site 1 pump was replaced by a temporary Flygt pump. Also all treated water was recharged at Sites 2 & 3 until 29 May 91.

7 May 91 - Commenced 24 hour operations - Initially at 238 gpm but immediately started decreasing to a level of 100+/- gpm by the end of Dec 91 where it stabilized. Plant operated at 100+/- gpm thru 11 Feb 1993.

6 Jan 92 - Recharge to Site 2 stopped due to loss of recharge capacity/iron bacteria fouling of recharge piping

19 Feb 92 - Test pit at Site 2 Recharge Basin confirmed iron bacteria fouling of recharge piping and found evidence of it in the sand & gravel bedding

4 Mar 92 - Stopped recharging to Site 3 due to loss of recharge capacity/iron bacteria fouling of recharge piping - Commenced discharging everything to drainage ditch.

Feb 93 - Installed booster pumps at 3 pump stations in effort to overcome iron bacteria fouling of the piping between collection trenches and treatment plant. Collecting system pumping capacity increased to 290+/- gpm by 31 May 93 (as adjustments were made), however, following the initial increase, the gpm decreased to a level of 200 +/- gpm as the iron bacteria built backup in the piping from pump stations to the plant.

Apr 93 - Field test of pigging at Site 2

12-17 Oct 93 - System down for the **acid cleaning of the stripping towers** by Dow-Schlumberge

7 Jun 94 - Periodic pigging of piping between collection trenches and treatment plant begins and gpm increases to 270+/-

25 Apr 95 - Installed Flygt pump at Site 1 pump station to increase pumping rate to 110+/- gpm which allowed for pumping from BIW #1 & #2. Note, prior to this date, BIW #1 & #2 were only operated intermittently for fear of flooding the pump station. Pump test indicate that Site 3 pumps 140 gpm with Site 1 off but with Site 1 also pumping into the same line to the plant the combined total of Site 1 & 3 = 238 gpm. Site 2 can pump 150+/- gpm when functioning properly.

6 Sep 95 - Pressured cleaned Site 2 recharge piping followed by 2-week recharge test

27 Mar 96 - BIW #1 failure

20 May 96 – BIW #1 pump replaced

16 Jul 96 – Preconstruction meeting on contract to automate the facility and upgrade pump stations

2-21 Oct 96 – Recharged at Sites 2 & 3

8 Oct 96 thru 26 Jan 97 – Replaced pumps in all three pump stations with bigger pumps. Facility kept partially operational during period with temporary pumps. Operation of pumps staggered manually as capacity of new pumps exceeds the plant's processing capacity.

9 Dec 96 thru 31 Jan 97 - Recharged at Site 3

13 Dec 96 – **SCADA system operational and system operated automatically (unmanned for evening & night shifts and on weekends/holidays)**

13-17 Apr 97 - System down for the **acid cleaning of the stripping towers** by AEE.

25 Apr 97 – BIW #1 failure

21 May 97 – BIW #1 pump replaced.

12 Aug 97 – **Commenced pumping from IW #6** which is screened in the bedrock aquifer downgradient from the Site 1 pump station.

13 Aug 97 – **Commenced pumping from IW #5** which is screened in the lower aquifer downgradient from the Site 2 collection trench.

27 Aug 97 – BIW #1 fails again. Determined that the direct burial electrical service from Site 1 transformer had gone bad.

24/25 Sep 97 – Installed flow meters at BIW's

21 Oct thru 8 Nov 97 – Installed variable speed drives at each pump station to provide the capability to operate all 3 pump stations simultaneously. However, minimum setting at Site 3 is 100 gpm, which is greater than desired. Therefore, Site 3 is operated cyclically to maximize recovery from pump stations at Site 1 & Site 2.

29 Oct 97 – **Startup of AFCEE Demonstration Project for Vacuum Enhanced Recovery @** Site 1 in vicinity of monitoring well RAP1-3R.

30 Oct 97 – New electrical service & bigger pump installed at BIW #1

30 Nov 97 – Revised monthly report format to include collection and VER systems' operational data and on-site GC analytical data.

8 Dec 97 – 20 Jun 98 – VER @ Site 1 operational.

29 Jun 98 thru 10 Jul 98 – System down for the **cleaning and repacking of the stripping towers** by IT Corp.

23 – 27 Jul 98 – System down due to lightning damage.

1 Sep - 12 Nov 98 – Recharging at Site 2.

1 Oct - 12 Nov 98 – Recharging at Site 3.

13 Oct 98 – Restarted VER @ Site 1, operated thru 6 April 99 when Demonstration Project concluded.

9 Apr 99 – **Commenced pumping from IW #7, IW #-8 & IW #9** (converted VER monitoring wells GM MW-2, GM MW-3 & GM MW-4)

28 Apr 99 - **Restarted VER @ Site 1 as component of the OU1 remedial system.**

29 Jun 99 – VER shutdown due to ineffective carbon/high humidity.

21 Jul 99 – **Commenced pumping from IW #10** which was installed in the center of the western most Site 1 fire training pit.

22 Oct 99 – Restarted VER @ Site 1.

26 Oct - 3 Nov 99 – Replace operating computer/system upgrade for Y2K compliance.

8 Feb 00 – Shutdown and remove pump at IW #5 as on-off controls were not functioning.

15 Mar 00 – Cleaned pump intake screen at Sites 1, 2 & 3.

14 Apr 00 – Re-installed IW #5 pump after cleaning.

3 – 17 May 00 – G&M drilling wells for an Environmental Security Technology Certification Program (ESTCP) project entitled: *In-situ Substrate Addition to Create Reactive Zones for Treatment of Chlorinated Aliphatic Hydrocarbons: Hanscom Air Force Base.* Wells labeled IRZ-Injection and IRZ-1 through 4 were installed in the vicinity if existing Site 1 monitoring well cluster labeled RAP1-6S, RAP1-6T, and RAP1-6R.

29 May 00 – Shutdown and removed IW #5, controls malfunctioning again.

20 Aug 00 – BIW #3 failed.

30 Aug 00 – Re-installed IW #5 pump after cleaning.

25 Sep – 3 Oct 00 – Clean Harbors **acid cleaned towers**/partial startup 29 Sep – returned to full operation 3 Oct.

29 Sep 00 – Commenced recharging at Site 3.

3 Oct 00 – Commenced recharging at Site 2.

11 Oct 00 – **G&M commenced substrate (molasses) injections** for ESTCP project.

21 Nov 00 – Electrical service for BIW #3 replaced and pump back on line.

3 Jan 01 – Recharging at Site 2 stopped (commenced 3 Oct 00) due to fouling of distribution pipes/clogging of beds.

23 Mar 01 – Replaced propane vaporizer.

3 Apr 01 – Shutdown and removed pump at IW #5, controls malfunctioning again.

27 Apr 01 – BIW #3 failed.

7 May 01 – Re-installed IW #5 pump after cleaning.

7 June 01 – BIW #10 failed.

11 June 01 – Replaced BIW #3 with bigger pump.

18 June 01 – **Commenced permanganate injection pilot study** in the vicinity of existing monitoring wells RAP1-3S and RAP1-3R which is also the area being remediated by the Site 1 VER system. **Suspended VER system operation and recovery from IW-7, IW-8 and IW-9 for duration of study.** Baseline groundwater samples collected from the area's monitoring and recovery wells.

19 & 21 June injected permanganate into VER RW-2. On 20 June attempted to inject into VER RW-1 and IW-7 but both wells would only accept a small amount.

20 – 23 June 01 - System down due to lightning damage.

6 Jul 01 – Recharging at Site 3 stopped (commenced 29 Sep 00) in preparation for the suspension of recovery from site due to low concentrations.

6 Jul 01 – Commenced recharging at Site 2.

13 July 01 – Replaced BIW #10 pump.

6/7 Aug 01 – 2nd permanganate injection. Entire batch injected into RAP1-3S.

22 Aug 01 – **Suspended recovery at Site 3 due to low concentrations.**

18 Sep 01 – Replaced pumps at the Site 1 and Site 2.

18 Sep 01 – Replaced BIW #4 with bigger pump.

25/26 Oct 01 – 3rd permanganate injection. Split batch between RAP1-3R and IW-9.

26 Dec 01 – Recharging at Site 2 stopped (commenced 6 Jul 01) due to cold weather and fouling of distribution pipes/clogging of beds.

21 Jan 02 – Re-commenced recharging at Site 2 but at low (5-10 gpm) rate.

10 Jul 02 – Power failure and subsequent surges burned out VFDs and other controls at Site 2 and Site 3

12 Jul 02 – Installed Flygt pump at Site 2 as interim measure to allow for semi-normal operations with plant total of 100 gpm.

18 Jul 02 – Installed larger Flygt pump at Site 2 to increase plant total rate to 165 gpm (from 100 gpm).

9 Oct 02 – **G&M makes final substrate (molasses) injection** for ESTCP project. To be followed by post-demonstration monitoring.

10 Oct 02 – **VER system restarted (part-time operation only) following conclusion of permanganate injection pilot study.** However, due to iron fouling of well, pumps and discharge line IW-7, IW-8 and IW-9 were not re-activated.

24 Dec 02 – VER system on around-the-clock.

28 May 03 – VER system's vacuum pump failed.

29 Jul 03 – Removed pump from IW-10 to trouble shoot pump and/or flow meter problems. Sporadic operation of pump and flow meter initially noted in May 03.

16 through 28 Oct 03 – Groundwater collection, treatment and recharge system in-operative. Lightening and/or power outage/surge damaged pump stations VFD and some of the treatment system equipment/electronics. Following repairs the system was returned normal around-the-clock operation in the automatic mode on 28 October.

1 Nov 03 – Pump for BIW No. 1 failed. Pump started erratic operation o/a 6 October, i.e., periodic failure to cycle on after programmed recharge/off periodic following a well dry/cycle-off condition.

5 Nov 03 – VER vacuum pump repaired and system returned to service/normal around-the-clock operation.

25 Nov 03 through 6 Jan 04 – VER system operated sporadically due to several minor problems.

25 Nov 03 – Re-installed cleaned IW No. 10.

26 Nov 03 – Replaced pump (25-gpm) for BIW No. 1 with larger size (33-gpm) pump.

1 Dec 03 – Pump for BIW No. 4 failed.

19 Dec 03 – Replaced pump (25-gpm) for BIW No. 4 with same size pump.

28 Apr 04 – Site 2 pump station pump motor and VFD failed shutting down Site 2 collection trench, BIW No. 2, BIW No. 4 & IW No. 5.

30 Apr 04 – Temporary pump installed in Site 2 pump station which can only be operated in a manual (non-automatic) mode. This arrangement allowed for resumption of normal operation of BIW No. 2, BIW No. 4 & IW No. 5 but with reduced amount recovered via the collection trench.

19 May 04 – New motor & VFD installed at the Site 2 pump station and system returned to normal operation in the automatic mode.

6 Oct 04 - Site 1 pump station pump and motor failed shutting down the Site 1 collection trench, BIW No. 1, and BIW No. 2.

29 Oct 04 – New motor & VFD installed at the Site 1 pump station and system returned to normal operation in the automatic mode.

Jan 05 through 11 Feb 05 – VER system operated sporadically due to several minor problems
11 Feb 05 – VER system's liquid ring/vacuum pump failed.

25 Jul 05 – VER system restarted with repaired vacuum pump.

25 Jul 05 through 8 Nov – VER system operated sporadically due to several minor problems.

Apr to Sep 05 – IW No. 10 Pump and discharge line fouled with little output.

13 Sep 05 – Replaced in-operative flow meter for BIW No. 3.

21 Sep 05 – Replaced pump for IW No. 10 with same size pump and **installed alternate/above ground discharge line.**

8 Nov 05 – VER operational problems resolved and system dependably operates continuously.

5 Dec 05 through 14 Mar 06 – IW No. 10 off for winter/freezing weather

21-24 Jan 06 – system off due to storm related electrical problems. Site 2 VFD destroyed, however, was able to by-pass and run pump station in the manual (non-automatic) mode.

17 Mar 06 – New VFD installed for Site 2 pump station and system returned to full automatic mode.

12-17 Apr 06 – Cleaned fouled pump for BIW No. 6. Flow meter which had not been accurately registering flow replaced with different type and now appears to be accurately registering the flow from the cleaned-up pump.

12 Jun 06 –Around the clock **operation commenced at interceptor well IW No. 11** (formerly 4" IRZ project monitoring well IRZ-2).

16 Jun 06 – Recharging at Site 2 suspended due to high groundwater levels threatening to flood pump station.

21 Jun 06 – Replaced fouled/nearly worn out pump for BIW No. 4 with same size pump.

31 Jul 06 – **Operation of VER system suspended for duration of permanganate treatment of VER area.**

31 Jul, 1 & 4 Aug 06 – Permanganate injected into VER recovery well (G&M VER RW-2)

17 Aug 06 - Replaced fouled/nearly worn out pump for IW No. 5 with larger size pump. Flow meter which had not been registering flow in recent months was replaced and now does registers flow from the new/larger pump.

30 Aug 06 - Replaced fouled/nearly worn out pump for BIW No. 2 with larger size pump. Flow meter (which had not been registering flow in recent months) properly functioned with the larger pump.

31 Aug – 1 Sep 06 – Changed potable water source from Lexington to Bedford – used section of the NWIRP abandoned supply pipe (from Lexington) from Famcamp meter pit to water treatment plant. Note: The abandoned NWIRP supply pipe was not capped on the NWIRP side (should be done sometime in future); however, it was cut & capped at the Famcamp meter pit.

30 Nov 06 – 24 Apr 07 – Shutdown IW-10 for winter/freezing months (operated 13-18 Dec during a warm spell).

27 Jan 07 - Site 2 pump station pump motor failed shutting down Site 2 collection trench, BIW No. 2, BIW No. 4 & IW No. 5. Temporary pump which can only be operated in a manual (non-automatic) mode was installed in Site 2 pump station. This arrangement allowed for resumption of normal operation of BIW No. 3, BIW No. 4 & IW No. 5 but with reduced amount recovered via the collection trench.

9-12 & 16-23 Feb 07 – Remediation system off line due to gasket leak at the top of air stripping. tower #2. Repairs made and system back on line on 23 Feb.

14 Mar 07 – New pump & motor installed at the Site 2 pump station and system returned to normal operation in the automatic mode. Note kept old (but good) motor as spare.

15 May 07 - Pump motor for BIW No. 1 failed.

18 May 07 (estimated) – Pump/motor for IW No. 10 failed.

25 May 07 – At BIW No. 1 installed new motor and replaced pump (33-gpm) with 25-gpm pump.

29 May 07 – **Installed a run-hour meter on VER system.**

29 May 07 – Replaced VFDs & float controls at IW-5 & IW-6 with Coyote controls.

14-21 Jun 07 – At IW-10 installed new pump & motor (same size/13-gpm) but did not function as should until control problems rectified on 21 Jun.

18 Jun 07 – Attempted to restart VER system (shut down 31 Jul 06 for permanganate injection) but did not function as should due to control float problems. (Rectified on 9 Aug 07)

31 Jul 07 - Pump motor for BIW No. 2 failed.

9 Aug 07 – **Restarted VER system** (shut down 31 Jul 06 for permanganate injection).

13 Aug 07 – Restarted BIW No.2 after cleaning pump and replacing motor.

13 Sep 07 – **Began VER extraction from converted monitoring well RAP1-3R.**

21 – 26 Sep 07 – VER system down for carbon change and maintenance.

30 Oct 07 - VER system's vacuum pump and/or motor failed.

30 Nov 07 – 30 Apr 08 – Shutdown IW-10 for winter/freezing months.

31 Mar 08 – IW-6 controls failed (only sporadic operation last part of March).

29 May 08 – IW-5 failed.

30 May 08 - Site 1 pump station pump and/or motor failed shutting down Site 1 collection trench, BIW No. 1, BIW No. 2 & IW No. 10.

6 Jun 08 - Temporary pump installed in Site 1 pump station which can only be operated in a manual (non-automatic) mode. This arrangement allowed for resumption of normal operation of BIW No. 1, BIW No. 2 & IW No. 10 but with reduced amount recovered via the collection trench.

9 Jun 08 – IW-6 controls replaced and pump back in operation.

18 – 24 Jun 08 – New controls installed at IW-5 but operated only sporadically until all bugs worked out on 24 Jun.

15 Sep 08 – Found IW-10 failed.

12 Sep 08 – Refurbished pump and new motor installed at the VER system, however, upon startup a clogged liquid discharge line was evident and system shut down on a high level alarm.

16 Sep 08 - Shutdown all power to Site 3 (pump station) to replace controls' mounting board.

23 Sep 08 – Shutdown all power to Site 2 (pump station, BIWs-3 & 4 and IW-6 to replace controls' mounting board. In less than 1 hour the system (except for IWs-6 and 11) system had to be shutdown due to low EQ tank. Mounting board replaced and all restarted at 3 pm.

24-25 Sep 08 – Excavated to find and remove VER discharge line check valve and ream out line. Flow through line improved but not great.

2 Oct 08 – Restarted VER system

7 Oct 08 – Shutdown all power to Site 1 (pump station, BIWs-1 & 2, IWs 6-10, and VER system to replace controls' mounting board.

9 Oct 08 – VER system restarted

10 Oct 08 - New pump & motor installed at the Site 1 pump station and system returned to normal operation in the automatic mode. Note temporary pump back on shelf as a spare.

27 Oct 08 - New pump, motor & controls installed at IW-10 and pump back in operation.

28 Oct 08 - New pump (10-gpm replacing failed 16-gpm), motor, sample line & check valve installed at BIW-2 and pump back in operation. Also reduced pipe drop from 82' to 73'.

28 Oct 08 - New sample line installed at BIW-3

3 to 10 Nov-08 – System down for the **cleaning and repacking of air stripping tower #1**

10 Nov 08 to 21 May 10 – IW No. 10 off for winter/freezing weather

18 Feb 09 - BIW-4 failed

10 Mar 09 - New pump (assume same size) & motor installed at BIW-4 and pump back in operation

11 Mar 09 - VER system's vacuum pump and/or motor failed

9 Apr 09 – Determined that recharge water line from plant to Site had a break/significant in ground leak. Recharging at Site 2 suspended pending repair of line.

30 Apr 09 – Replaced clogged up IW-11 pump (Grunfos 5 SQE (1.5-7.5-gpm)) with a Grunfos 10 SQE (3-15-gpm)

19 Jun 09 - Repaired vacuum pump & motor installed; on startup a clogged discharge line shut noted & system shut down.

23 Jun 09 - System started up @ 13:30 following installation of surface laid discharge line - only ran 17 hours before shutdown due to low water

1-2 Jul 09 – Excavated and repaired break in the Site 2 recharge pipe.

6 Jul 09 – Hydrant stub up tapped off the Site 2 recharge piping installed to provide an alternate or additional recharge capability at Site 2.

19 Aug 09 – Excavated and repaired leak in the BIW #4 discharge pipe (leak found on 18 Aug 09). Leak was the result of an inadequate attempt to fix an earlier break in the line caused by CE contractor digging in Famcamp area.

21 Aug 09 – Site 2 pump station pump and/or motor failed shutting down Site 2 collection trench, BIW No. 3, BIW No. 4 & IW No. 5. Temporary pump installed which can only be operated in a

manual (non-automatic) mode. This arrangement allowed for resumption of normal operation of BIW No. 3, BIW No. 4 & IW No. 5 but with reduced amount recovered via the collection trench.

1-3 Sep 09 – Process shutdown for 2+ days so that a hydrant stub up could be tapped off the recharge piping to Site 3 in the vicinity of the Site 1 gate to VER area and burn pits to provide a recharge capability at Site 1 also. Restarted process at 12:00 am 3 Sep.

4 Sep 09 - All work completed and hydrant stub up available to divert recharge water to the Site 1 burn pits.

6 Oct 09 - New pump & motor installed at the Site 2 pump station and system returned to normal operation in the automatic mode. Note temporary pump back on shelf as a spare.

8 Oct 09 – Pigged the Site 2 pump station discharge pipe line to the EQ Tank.

24 Feb 10 - BIW-4 failed

26 Apr 10 - BIW-4 returned to service

11 Jun 10 - BIW-4 failed

10 Aug 10 - BIW-4 returned to service with new GS25 pump & motor

13 Aug 10 – BIW-4 failed – determine cause to be break in direct burial power supply cable

29 Sep 10 – Break in the direct burial power feed for BIW #4 was found and repaired; BIW-4 returned to service

Nov 10 – On-site GC inoperative

23 Nov 08 – BIW-4 failed.

26 Nov 10 – On-site GC inoperative – Photovac no longer manufactures or support this GC (Photo 10S50)

9 Dec 10 - VER system off due to frozen surface laid discharge line to Site 1 pump station – restarted 13 Dec but found off 14 Dec due low vacuum, left for winter months because alternate/above ground discharge line freezes.

7 Apr 11 – Was able to get Photovac to repair GC by using parts cannibalized from a similar unit bought on e-Bay.

12 Apr 11 – BIW-4 returned to service with new GS18 pump & 1.5 hp motor

22 Apr 11 – Removed carbon from 1 (lead) of the 2 1,000-gal GAC vessels. While empty found clogged vapor inlet diffuser (located in bottom of vessel) which was creating high back pressure. Did not fill vessel with new carbon – VER system remains off.

May 11 – Massport removed 10 beavers, installed a beaver deceiver in stream and breeched beaver dam at end of Runway 23-5. Beaver ponded area extended into Bedford's Jordan conservation Area and the Hartwell Town Forest. Water levels significantly lower in drainage ditch that receives the groundwater treatment system's discharge as a result of this work.

2 May 11 – VER system restarted with only 1 carbon vessel + tertiary drum of carbon.

2 May 11 – Found IW-10 failed.

3 May 11 – Replaced 5S-08 pump in IW-6 with a 5S-11 model

4 May 11 – Direct burial power feed to BIW #4 failed at 23:00

26 May 11 – IW-10 returned to service with new (10E14) pump

9 – 13 Jun 11 – Retrofitted BIW-4 – Replaced 480 V motor with new 230 V/1 P motor (kept same GS18 pump; raised pump intake by removing 10' section of in-well hard pipe well, leaving 4 ea 21' sections; replaced Coyote controls with a Motor Saver unit similar to those in use at Site 21; and installed an alternate/new underground (in conduit) power feed, also installed an electric meter to document/record usage. Power now comes from a panel box in the Famcamp as opposed to the Site 2 Pump Station transformer.

13 Jun 11 - BIW-4 returned to service, however, upon startup determined that the model of the Motor Saver control being used at Site 21 (a low range unit) did not properly function as it continually goes out on over current but it resets automatically. Order a high range Motor Saver but left the low range on line to get intermittent pump operation until the high range unit is received.

14 Jul 11 – New vapor inlet diffuser (was installed in the off-line & empty 1,000-gal carbon vessel, vessel then filled with fresh carbon and added as the lag vessel in the operating system.

15 Jul 11 – Replaced the low range Motor Saver at BIW-4 with a high range unit which returned BIW-4 to full/normal operation. Note the 1st high range unit received earlier in June from the manufacturer was defective/failed immediately. It was returned and the intermittent pump operation until a good high range unit was received and installed on 13 July.

23 to 26 & 31 Aug to 6 Sep 11 – System down for the **repainting of the 40,000-gallon Equalization Tank**

24 Aug 11 – Found hole (from rusting) in VER phase separator tank bottom – shutdown system until tank can be repaired or replaced.

1 Dec 11 – IW No. 10 off for winter/freezing weather

6 Feb 12 – Replaced IW-5's pump with used, but cleaned, GS13 pump

15 Mar 12 - IW No. 10 will not operate, subsequently determined that transformer (3.0 KVA 480 x 240 x 120) failed.

30 Apr 12 – **VER** system's phase separator repaired and **resumed around-the-clock VER operations** (had been off-line since 24-Aug)

18 May 12 - Restarted IW-10 with new pump & motor (same size/13-gpm) and new transformer.

OU-1 Monitoring, Interceptor & Recovery Wells

Aug 82 – Installed 7 surface aquifer monitoring wells (HAFB/HF 82-1 thru 7) - Initial field investigation of Hanscom Field (IRP Site 3 & NW areas)

Dec 82 - Installed 14 surface & lower aquifer monitoring wells (CW & RFW series) – Hydrogeologic Investigation of Hanscom Field

Nov-Dec 83 - Installed 13 surface & lower aquifer & 1 bedrock aquifer monitoring wells (BR, CW & RFW series) – Supplemental Hydrogeologic Investigation of Hanscom Field

Nov-Dec 85 & Feb 86 – Installed 52 surface, lower & bedrock aquifer monitoring wells (RAP series) – H&A RAP Investigation of Hanscom Field

Jul – Nov 87 – Installed 17 surface, lower & bedrock aquifer monitoring & pump test wells (PT & PO series) – H&A RAP Design

Nov 89 – Installed 24 surface & 2 bedrock aquifer monitoring wells (A & OW series) – Construction of RAP's groundwater collection, treatment & recharge system on Hanscom Field.

Oct 89-Mar 90 – Installed 3 lower/bedrock aquifer boundary interceptor wells (BIW series) – Construction of RAP's groundwater collection, treatment & recharge system on Hanscom Field.

Sep 92 - Installed 2 surface aquifer monitoring wells (B series (101 & 102)) – H&A's initial expansion of MW network

May-Jun 94 - Installed 28 surface, lower & bedrock aquifer monitoring wells (B series (103 thru 130)) - H&A's expansion of MW network

May 96 - Installed 22 surface, lower & bedrock aquifer monitoring wells (B series (231 thru 252)) - H&A's further expansion of MW network on Hanscom Field **and into Hartwell Town Forest.**

Dec 96 – Installed Lower aquifer (IW-5) and bedrock aquifer (IW-6) interceptor wells

Aug-Sep 97 - Installed 8 lower/bedrock aquifer monitoring/VER wells (G&M series) – Construction of VER system at IRP Site 1

Sep 97 – Installed surface aquifer monitoring well OW2-8

Mar 98 – Installed 9 surface, lower & bedrock aquifer monitoring wells (B series (252 thru 255)) – CH2M Hill's expansion of MW network in Hartwell Town Forest to confirm leading edge of the modeled plume

Apr 99 – Converted G&M MW-2, 3 & 4 to IW-7, IW-8 & IW-9

Jul 99 – Installed lower/bedrock aquifer interceptor well (IW-10)

May 00 – Installed lower aquifer injection and monitoring wells IRZ-Injection and IRZ-1 through 4

Aug 00 – Installed 2 lower & bedrock aquifer monitoring wells (RAP1-7S & RAP1-7T) - HAFB RPO initiative to define vertical extent in the Bedford Community Gardens.

May 01 – Installed monitoring well IRZ #5.

Sep 05 – Replaced pump for IW No. 10 with same size pump and **installed alternate/above ground discharge line.**

Jun 06 – Converted IRZ-2 to IW-11

Sep 07 – Converted RAP1-3R to a VER well and commenced extraction from this monitoring well

OU-1 Treatment System Monitoring

1991 – Weekly laboratory analysis of GWT system's influent, mid-fluent & effluent (VOCs, pH & selected metals (iron, manganese & sodium), quarterly toxicity analysis (2 species) of the system's effluent

24 Aug 1996 – Commenced on-site GC analysis of duplicate samples of the GWT system's influent, mid-fluent and effluent

27 Mar 97 - Commenced on-site GC analysis of samples of effluent from Pump Stations, BIW's & IWs

Jan 99 – Decreased frequency of laboratory analysis of GWT system's influent, mid-fluent & effluent from weekly to monthly

Dec 02 – Changed GWT system's effluent toxicity analysis from 2 species quarterly to only 1 species quarterly. Subsequently dropped to 3 events in 2003 and 1 event in 2004. Following the Aug 2004 event all toxicity analysis was suspended.

May 06 – ceased laboratory VOC analysis of GWT mid-fluent

Jun 06 – ceased laboratory pH analysis of GWT effluent

Feb 09 – commenced laboratory VOC analysis of system's influent & effluent via Method 8260B in lieu of Methods 601/601/624

Jun 11 – ceased on-site GC TCE & cis-1,2-DCE analysis of GWT mid-fluent

Jan 12 – ceased on-site GC TCE & cis-1,2-DCE analysis of GWT effluent; changed frequency of on-site GC TCE & cis-1,2-DCE analysis of GWT influent from weekly to monthly; ceased on-site GC TCE & cis-1,2-DCE analysis of BIW #2 & BIW #3, also changed frequency of on-site GC TCE & cis-1,2-DCE analysis of the other collection system samples from monthly to quarterly

OU-1 Long-Term Monitoring

12 May 97 - Commenced on-site GC analysis of monitoring well samples.

May 98 – H&A's Round 11 – laboratory analysis of 118 VOC samples

Oct, Nov & Dec 99 – Annual LTM Round – laboratory analysis of 49 VOC samples (included ecological S&A and some passive bags demonstration project samples)

Mar 00 – LTM Plan officially revised to reflect the 2-phase approached (added on-site GC analysis & reduced off-site laboratory analysis) implemented in 1999 – concept also documented in 2000 IROD

Apr, Jun, Sep & Nov 00 – Annual LTM Round – laboratory analysis of 52 VOC samples (included ecological S&A per IROD)

Jan, Sep & Nov 01 – Annual LTM Round – laboratory analysis of 39 VOC samples (included ecological S&A per IROD)

Apr, Sep & Nov 02 – Annual LTM Round – laboratory analysis of 44 VOC samples

Jan 03 – Revised LTM Plan based on 2002 Five-Year Review - Suspended all S&A of 56 monitoring wells & 4 surface water sampling points - also reduced (dropped 9 monitoring well samples) the off-site laboratory analysis list

Nov 03– Annual LTM Round – laboratory analysis of 36 VOC samples (includes RAP1-1T)

Nov 04– Annual LTM Round – laboratory analysis of 38 VOC samples (added RAP1-3R &, by mistake, RAP1-7S)

Nov 05 – Annual LTM Round – laboratory analysis of 37 VOC samples (no RAP1-7S)

Dec 05 – Resumed S&A of 2 monitoring wells (B101 & B107) suspended in Jan 03

Nov 06 – Annual LTM Round – laboratory analysis of 37 VOC samples

Sep 07 – Revised LTM Plan documented in 2007 ROD and 2007 Five-Year Review - Suspended all S&A of 9 additional monitoring wells - also reduced (dropped 10 and added 7) the off-site laboratory analysis list

Aug 08 - laboratory analysis of B101 sample – all VOCs bdl

Nov 07 – Annual LTM Round – laboratory analysis of 34 VOC samples

Nov 08 – Annual LTM Round – laboratory analysis of 34 VOC samples

Nov 09 – Annual LTM Round – laboratory analysis of 34 VOC samples

Nov 10 – Annual LTM Round – laboratory analysis of 34 VOC samples

Nov 11 – Annual LTM Round – laboratory analysis of 35 VOC samples - dropped 4 and added 5 to the off-site laboratory analysis list; also laboratory analysis of 9 samples for Natural Attenuation Parameters

Jan 12 - Revised_Phase II of LTMP (on-site GC TCE & cis-1,2-DCE analysis) to suspend analysis of samples from monitoring wells with a history of below detection levels and/or results in vicinity of the GC's Method Detection Levels (TCE =7.3 ug/L, cis-1,2-DCE = 10.3 ug/L)

Nov 12 – Annual LTM Round – **planned** laboratory analysis of 37 VOC samples - dropped 5 and added 7 to the off-site laboratory analysis list

OU 1 Groundwater Treatment Facility
On-Site GC and Off-Site Lab TCE and cis-1,2-DCE Concentrations - 2007-present

2007 - 2011+ INFLUENT							MIDPOINT		EFFLUENT			
SAMPLE DATE	GC TCE ppb	Lab TCE ppb	Relative % Difference RPD	GC CIS-1,2 ppb	Lab CIS-1,2 ppb	Relative % Difference RPD	GC TCE ppb	GC CIS-1,2 ppb	GC TCE ppb	Lab TCE ppb	GC CIS-1,2 ppb	Lab CIS-1,2 ppb
5-Jan-07	112/110	120	-7.8%	124/148	130	4.5%	bdl	bdl	bdl	bdl	bdl	bdl
7-Feb-07	139/122	120	8.4%	172/152	140	14.6%	bdl	bdl	bdl	bdl	bdl	bdl
7-Mar-07	108/90	130	-27.1%	148/101	160	-25.0%	bdl	bdl	bdl	bdl	bdl	bdl
4-Apr-07	135/155	120	18.9%	162/172	130	24.9%	bdl	bdl	bdl	bdl	bdl	bdl
2-May-07	100/126	98	14.2%	110/132	100	19.0%	bdl	bdl	bdl	bdl	bdl	bdl
6-Jun-07	122/125	75	48.9%	167/161	84	64.5%	bdl	bdl	bdl	bdl	bdl	bdl
5-Jul-07	116/112	100	13.1%	103/118	100	10.0%	bdl	bdl	bdl	bdl	bdl	bdl
8-Aug-07	127/132	120	7.6%	116/101	110	-1.4%	bdl	bdl	bdl	bdl	bdl	bdl
5-Sep-07	127/131	140	-8.2%	138/145	140	1.1%	bdl	bdl	bdl	bdl	bdl	bdl
3-Oct-07	131/179	150	3.3%	157/183	150	12.5%	bdl	bdl	bdl	bdl	bdl	bdl
31-Oct-07	127/133	140	-7.4%	128/137	150	-12.4%	bdl	bdl	bdl		bdl	
5-Dec-07	134/164	200	-29.2%	99/123	120	-7.8%	bdl	bdl	bdl	bdl	bdl	bdl
9-Jan-08	126/118	140	-13.7%	129/132	130	0.4%	bdl	bdl	bdl	bdl	bdl	bdl
12-Feb-08	78/85	82	-0.6%	126/156	120	16.1%	bdl	bdl	bdl	bdl	bdl	bdl
4-Mar-08	47/43	51	-12.5%	88/67	81	-4.4%	bdl	bdl	bdl	bdl	bdl	bdl
2-Apr-08	47/46	39	17.5%	82/81	60	30.4%	bdl	bdl	bdl	bdl	bdl	bdl
7-May-08	53/51	63	-19.1%	102/108	110	-5.7%	bdl	bdl	bdl	bdl	bdl	bdl
4-Jun-08	72/48	51	16.2%	130/136	82	47.4%	bdl	bdl	bdl	bdl	bdl	bdl
1-Jul-08	75/70	130	-56.8%	110/107	210	**-63.7%**	bdl	bdl	bdl	bdl	bdl	bdl
6-Aug-08	98/114	85	22.0%	200/215	180	14.2%	bdl	bdl	bdl	bdl	bdl	0.37 F
3-Sep-08	81/91	110 R	unk	153/163	160 R	unk	bdl	bdl	bdl		bdl	
1-Oct-08	117/99	120	-10.5%	183/139	160	0.6%	bdl	bdl	bdl	bdl	bdl	bdl
3-Nov-08	103/100	98	3.5%	166/130	140	5.6%	bdl	bdl	bdl	bdl	bdl	bdl
3-Dec-08	66/100	85	-2.4%	123/178	120	22.6%	bdl	bdl	bdl	bdl	bdl	bdl
7-Jan-09	99/97	80	20.2%	170/175	110	44.2%	bdl	bdl	bdl	bdl	bdl	bdl
11-Feb-09	51/69	92	-41.1%	91/123	120	-11.5%	bdl	bdl	bdl	bdl	bdl	bdl
5-Mar-09	93/104	96	2.6%	94/122	95	12.8%	bdl	bdl	bdl	bdl	bdl	bdl
1-Apr-09	85/93	81	9.4%	95/102	74	28.4%	bdl	bdl	bdl	bdl	bdl	bdl
5-May-09	74/84	94	-17.3%	85/97	100	-9.4%	bdl	bdl	bdl	bdl	bdl	bdl
5-Jun-09	85/95	91	-1.1%	189/221	120	**52.3%**	bdl	bdl	bdl	bdl	bdl	bdl
7-Jul-09	98/94	110	-13.6%	145/120	120	9.9%	bdl	bdl	bdl	bdl	bdl	bdl
4-Aug-09	88/84	91	-5.6%	154/126	110	24.0%	bdl	bdl	bdl	bdl	bdl	bdl
31-Aug-09	117/92	120	-13.8%	123/107	140	-19.6%	bdl	bdl	bdl	bdl	bdl	bdl
5-Oct-09	114/123	120	-1.3%	116/121	130	-9.3%	bdl	bdl	bdl	bdl	bdl	bdl
3-Nov-09	102/102	90	12.5%	97/122	110	-0.5%	bdl	bdl	bdl	bdl	bdl	bdl
1-Dec-09	94.4/90.5	79	15.7%	93.6/94.4	110	-15.7%	bdl	bdl	bdl	bdl	bdl	bdl
5-Jan-10	112/110	90	20.9%	107/101	120	-14.3%	bdl	bdl	bdl	bdl	bdl	bdl
3-Feb-10	80/84	na		62/67	na		bdl	bdl	bdl	na	bdl	na
3-Mar-10	89/102	na		85/97	na		bdl	bdl	bdl	na	bdl	na
12-Apr-10	91/83	68	24.5%	97/75	66	26.3%	bdl	bdl	bdl	bdl	bdl	bdl
3-May-10	70/66	75	-9.8%	82/75	89	-12.5%	bdl	bdl	bdl	bdl	bdl	bdl
1-Jun-10	85/77	91	-11.6%	131/117	110	12.0%	bdl	bdl	bdl	bdl	bdl	bdl
6-Jul-10	96/113	120	-13.8%	92/111	110	-8.0%	bdl	bdl	bdl	bdl	bdl	bdl
2-Aug-10	109/101	120	-13.3%	112/104	100	7.7%	bdl	bdl	bdl	bdl	bdl	bdl
7-Sep-10	98/96	110	-12.6%	108/109	120	-10.1%	bdl	bdl	bdl	bdl	bdl	bdl
5-Oct-10	105/67R	120	-13.3%	170/122R	160	6.1%	bdl	bdl	bdl	bdl	bdl	bdl
1-Nov-10	76/76	110	-36.6%	136/127	140	-6.3%	bdl	bdl	bdl	bdl	bdl	bdl
7-Dec-10	na	110		na	120		na	na	na	bdl	na	bdl
4-Jan-11	na	100		na	64		na	na	na	bdl	na	bdl
1-Feb-11	na	110		na	85		na	na	na	bdl	na	bdl
1-Mar-11	na	93		na	76		na	na	na	bdl	na	bdl
4-Apr-11	85/88	72	18.3%	106/98	75	30.5%	bdl	bdl	bdl	bdl	bdl	bdl
2-May-11	85/85	64	28.2%	104/95	96	3.6%	bdl	bdl	bdl		bdl	
6-Jun-11	87/109	96	2.1%	92/85	87	1.7%			bdl	bdl	bdl	bdl
5-Jul-11	97/110	94	9.6%	85/107	97	-1.0%			bdl	bdl	bdl	bdl
2-Aug-11	116/137	110	14.0%	110/143	140	-10.1%			bdl	bdl	bdl	bdl
6-Sep-11	80/72R	54	38.8%	31/19R	36	-14.9%			bdl	bdl	bdl	bdl
3-Oct-11	91/99	73	26.2%	115/122	99	17.9%			bdl	bdl	bdl	bdl
7-Nov-11	46/51 R	62	-29.6%	83/57 R	77	7.5%			bdl		bdl	
5-Dec-11	86/78	70	15.8%	64/54	51	14.5%			bdl	bdl	bdl	bdl
3-Jan-12	70/78	70	5.6%	42/44	60	-33.0%				bdl		bdl
7-Feb-12	95/99	71	31.0%	58/62	59	1.7%				bdl		bdl
5-Mar-12	51/48	90	-58.1%	82/95	120	-30.2%				bdl		bdl
2-Apr-12	78/83	87	-7.8%	77/79	110	-34.0%				bdl		bdl
1-May-12	81/77	99	-22.5%	121/128	130	-4.3%				R		R
Jan-07-present	Mean RPD	TCE	-0.8%		CIS-1-2	3.9%						

GC-Lab Dups: RPD <50% between 100 ug/L & 5 ppm; <100% between RL & 100 ug/L & >5 ppm
RPD < 35% for results above laboratory RL or on-site GC MDL (TCE =7.3 ug/L, cis-1,2-DCE = 10.3 ug/L)

Note: GC results prior to 2007 omitted/on file

CIS-1,2 = cis-1,2-Dichloroethene; bdl = Below detection level

OU 1 Groundwater Collection Points
CY 2007-present TCE and cis-1,2-DCE Concentrations

SAMPLE DATE	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	REMARKS
SITE 1 PS Includes coll. trench, IW #1, 2, 6-10 & VER				
2-Jan-07 No sample				
1-Feb-07	330	102	3.2	
1-Mar-07	267	91	2.9	
2-Apr-07	353	116	3.0	
1-May-07	340	68	5.0	
1-Jun-07	325	80	4.1	
2-Jul-07	222	68	3.3	
1-Aug-07	60 J	bdl J	unk	**suspect**
4-Sep-07	239	81	3.0	
1-Oct-07	475	161	3.0	
1-Nov-07	284	86	3.3	
3-Dec-07	202	79	2.6	
31-Dec-07	222	69	3.2	
1-Feb-08	192	43	4.5	
3-Mar-08	106	3	35.3	
1-Apr-08	98	bdl	unk	
14-May-08	76	bdl	unk	
10-Jun-08	214	51	4.2	
1-Jul-08	202	79	2.6	
1-Aug-08	159	15	10.6	
2-Sep-08	318	99	3.2	**rerun 321 - 107**
1-Oct-08	212	39	5.4	
31-Oct-08	76	bdl	unk	
1-Dec-08	249	46	5.4	
2-Jan-09	195	14	13.9	
2-Feb-09	188	52	3.6	
27-Feb-09	183	29	6.3	
1-Apr-09	248	58	4.3	
1-May-09	301	85	3.5	
1-Jun-09	113	72	1.6	
1-Jul-09	70	13	5.4	**Bad septum**
3-Aug-09	166	57	2.9	
11-Sep-09	173	71	2.4	
1-Oct-09	324	69	4.7	
2-Nov-09	340	73	4.7	
1-Dec-09	246	53	4.6	
31-Dec-09	229	36	6.4	
1-Mar-10	259	66	3.9	
1-Apr-10	113	18	6.3	
3-May-10	240	67	3.6	
1-Jun-10	252	85	3.0	
1-Jul-10	292	84	3.5	
2-Aug-10	199	59	3.4	
1-Sep-10	199	62	3.2	
1-Oct-10	292	79	3.7	
1-Nov-10	211	48	4.4	
2-May-11	252	49	5.1	
1-Jun-11	214	65	3.3	
1-Jul-11	396	72	5.5	
1-Aug-11	270	82	3.3	
29-Sep-11	278	52	5.3	
14-Oct-11	389	78	5.0	
21-Nov-11			ukn	
1-Dec-11	167	30	5.6	**61.14**
3-Jan-12	140	28	5.0	
1-Feb-12	266/244	56/85	4.8/2.9	RPD 8.6%/**-41.1%**
1-Mar-12	150	33	4.5	
2-Apr-12	329/247	78/67	4.2/3.7	RPD 28.5%/15.2%
1-May-12	312/303	77/73	4.1/4.2	RPD 2.9%/5.3%

SAMPLE DATE	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	REMARKS
SITE 2 PS Includes collection trench, IW #3, 4 & 5				
2-Jan-07	26/15	105/60	0.2/0.3	**RPD 53.7%/54.5%**
1-Feb-07	26.8/17.9	44.5/42.7	0.6/0.4	RPD 39.8%/4.1%
1-Mar-07	19/45	156/186	0.1/0.2	**RPD -81.3%/**-17.8%
2-Apr-07	29/28	162/170	0.2/0.2	RPD 3.5%/-4.8%
1-May-07	23/28	175/164	0.1/0.2	RPD -19.6%/6.5%
1-Jun-07	33/38	139/132	0.2/0.3	RPD -14.1%/5.2%
2-Jul-07	63/59	102/84	0.6/0.7	RPD 6.6%/19.4%
1-Aug-07	65 J/46 J	18 JR/45 JR	3.6/1.0	RPD 34.2%/**-85.7%**
4-Sep-07	71/75	134/134	0.5/0.6	RPD -5.8%/-0.2%
1-Oct-07	72/80	99/92	0.7/0.9	RPD -10.5%/7.3%
1-Nov-07	76/85	178/162	0.4/0.5	RPD -11.2%/9.4%
30-Nov-07	35/44	98/113	0.4/0.4	RPD -22.8%/-14.2%
2-Jan-08	45/46	109/124	0.4/0.4	RPD -2.2%/-12.9%
1-Feb-08	42/42	91/84	0.5/0.5	RPD 0.0%/8.0%
3-Mar-08	9/9	52/39	0.2/0.2	RPD 0.0%/28.6%
1-Apr-08	9/17	51/53	0.2/0.3	RPD **-61.5%/**-3.8%
14-May-08	26/19	87/71	0.3/0.3	RPD 31.1/20.3%
2-Jun-08	18/29	39/69	0.5/0.4	RPD -46.8%/**-55.6%**
1-Jul-08	35.81/33.68	115.9/101.1	0.3/0.3	RPD 6.1/13.6%
1-Aug-08	23/20	150/129	0.2/0.2	RPD 14.0%/15.1%
2-Sep-08	16/17	128/154	0.1/0.1	RPD -6.1/-18.4%
1-Oct-08	23/16	188/123	0.1/0.1	RPD 35.9/41.8%
31-Oct-08	bdl/bdl	12/10	unk	RPD unk/18.2%
1-Dec-08	24/21	152/136	0.2/0.2	RPD 13.3%/11.1%
2-Jan-09	14/14	133/176	0.1/0.1	RPD 0.0%/-27.8%
2-Feb-09	7/15	94/145	0.1/0.1	RPD **-72.7%/**-42.7%
27-Feb-09	10/15	65/77	0.2/0.2	RPD -40.0/-16.9%
1-Apr-09	15/17	116/92	0.1/0.2	RPD -12.5/22.0%
1-May-09	19.23/19.23	139.6/146.3	0.1/0.1	RPD 0.0%/-4.7%
1-Jun-09	17/22	160/190	0.1/0.1	RPD -25.6/-17.1%
1-Jul-09	27/21	152/137	0.2/0.2	RPD 25.0%/10.4%
3-Aug-09	14/12	89/97	0.2/0.1	RPD 15.4%/-8.6%
11-Sep-09	11/15	69/110	0.2/0.1	RPD -30.8%/**-45.8%**
1-Oct-09	14/12	102/103	0.1/0.1	RPD 15.4%/-1.0%
2-Nov-09	19/27	47/90	0.4/0.3	RPD -34.8%/**-62.8%**
1-Dec-09	18/19	48/52	0.4/0.4	RPD -5.4/-8.0%
31-Dec-09	24/26	39/46	0.6/0.6	RPD -8.0/-16.5%
1-Mar-10	16/19	69/80	0.2/0.2	RPD -17.1/-14.8%
1-Apr-10	bdl/bdl	32/45	unk	RPD 0/-33.8%
3-May-10	34/33	108/99	0.3/0.3	RPD 3.0/8.7%
1-Jun-10	35.74/36.56	141/138	0.3/0.3	RPD -2.3/2.2%
1-Jul-10	39/35	90/81	0.4/0.4	RPD 10.8/10.5%
2-Aug-10	36.65/37.07	89/95	0.4/0.4	RPD -1.1/-6.5%
1-Sep-10	15 R/35	51 R/110	0.3R/0.3	R=Syringe Clogged
1-Oct-10	47/34	152/128	0.3R/0.3	RPD 32.1/17.1%
1-Nov-10	31/31	141/128	0.2/0.2	RPD 0.0/9.7%
2-May-11	24/34	80/99	0.3/0.3	RPD -34.5/-21.2%
1-Jun-11	31/39	85/100	0.4/0.4	RPD -22.9/-16.2%
1-Jul-11	47/55	85 R/133	0.6/0.4	RPD -15.7/**-44.0%**
1-Aug-11	23 R/37	115 R/171	0.2/0.2	**RPD -46.7%/-39.2%**
29-Sep-11	8 R/19	96 R/78	0.1/0.2	RPD **-81.5%/**-20.7%
14-Oct-11	38/35	146/121	0.3/0.3	RPD 8.2/18.7%
21-Nov-11	22/26	84/95	0.3/0.3	RPD -16.7/-12.3%
1-Dec-11	bdl R/29	55 R/100	0.3	RPD UNK/**-58.1%**
3-Jan-12	bdl/bdl	33/40	0.0/0.0	RPD UNK/-19.2%
1-Feb-12	5/8	18/17	0.3/0.5	Reject-syringe clogged
1-Feb-12	23	47	0.5	Re-run
1-Mar-12	26/18R	81/55R	0.3/0.3	**RPD 36.4%/38.2%**
2-Apr-12	4R/14	46R/57	0.1/0.3	**RPD -111.1%/**-21.4%
1-May-12	34	118		

Note: GC results prior to 2007 omitted/on file

PS = pump station, CIS-1,2 / CIS = cis-1,2-Dichloroethene; bdl = Below detection level

OU 1 Groundwater Collection Points
CY 2007-present - TCE and cis-1,2-DCE Concentrations

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

SAMPLE DATE	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	REMARKS
IW #1				
2-Jan-07	132	bdl	unk	
1-Feb-07	76	bdl	unk	
9-Mar-07	177	bdl	unk	
30-Mar-07	187	bdl	unk	
1-May-07	206	bdl	unk	33=gpm pump failed o/a 15 May
1-Jun-07	196	26	7.5	5/25 new motor & 25-gpm pump
2-Jul-07	150	bdl	unk	
10-Aug-07	110	bdl	unk	
4-Sep-07	114	bdl	unk	
2-Oct-07	150	bdl	unk	
1-Nov-07	136	bdl	unk	
13-Dec-07	133	27	4.9	
23-Jan-08	92	bdl	unk	
19-Feb-08	146	bdl	unk	
3-Mar-08	174	18	9.7	
1-Apr-08	103	bdl	unk	
15-May-08	129	bdl	unk	
10-Jun-08	204	67	3.0	
1-Jul-08	89	bdl	unk	
1-Aug-08	241	59	4.1	
17-Sep-08	206	71	2.9	
1-Oct-08	194	39	5.0	
31-Oct-08	55	bdl	unk	
1-Dec-08	119	bdl	unk	
2-Jan-09	233	81	2.9	
2-Feb-09	157	17	9.2	
27-Feb-09	223	53	4.2	
1-Apr-09	124	bdl	unk	
1-May-09	222	66	3.4	
1-Jun-09	178	67	2.7	
15-Jul-09	211	79	2.7	
3-Aug-09	206	86	2.4	
14-Sep-09	135	14	9.6	
1-Oct-09	194	33	5.9	
2-Nov-09	146	21	7.0	
1-Dec-09	156	24	6.5	
25-Jan-10	180	23	7.8	
1-Mar-10	263	75	3.5	
1-Apr-10	131	30	4.4	
3-May-10	286	98	2.9	
1-Jun-10	206	77	2.7	
1-Jul-10	261	80	3.3	
2-Aug-10	156	41	3.8	
1-Sep-10	162	49	3.3	
1-Oct-10	248	68	3.6	
1-Nov-10	208	39	5.3	
2-May-11	287	90	3.2	
1-Jun-11	259	117	2.2	
13-Jul-11	256	63	4.1	
1-Aug-11	218	20	10.9	
15-Sep-11	185	20	9.3	
12-Oct-11	250	50	5.0	
1-Dec-11	200	16	12.5	
3-Jan-12	106	38	2.8	
1-Feb-12	158	46	3.4	

SAMPLE DATE	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	REMARKS
IW #2				
29-Dec-06	3	bdl	unk	
1-Feb-07	bdl	bdl	unk	
1-Mar-07	23	bdl	unk	
12-Apr-07	bdl	bdl	unk	
1-May-07	bdl	67	unk	
1-Jun-07	3	14	unk	
2-Jul-07	bdl	bdl	unk	
31-Jul-07	Motor failed-13 August cleaned pump & new motor installed			
4-Sep-07	45	bdl	unk	
2-Oct-07				sample tap inoperative
1-Nov-07				sample tap inoperative
13-Dec-07				sample tap inoperative
23-Jan-08				sample tap inoperative
19-Feb-08				sample tap inoperative
3-Mar-08				sample tap inoperative
1-Apr-08				sample tap inoperative
14-May-08				sample tap inoperative
10-Jun-08				sample tap inoperative
1-Jul-08				sample tap inoperative
26-Aug-08	bdl	bdl	unk	sample suspect/tap issues
28-Oct-08	New 10-gpm pump (replaces 16-gpm) & new motor installed			
31-Oct-08	bdl	bdl	unk	
20-Nov-08	bdl	bdl	unk	
1-Dec-08	bdl	bdl	unk	
2-Jan-09				sample tap frozen
2-Feb-09				sample tap frozen
27-Feb-09	bdl	bdl	unk	
1-Apr-09	bdl	bdl	unk	
19-Jun-09	bdl	bdl	unk	
15-Jul-09	bdl	bdl	unk	
12-Aug-09	bdl	bdl	unk	
14-Sep-09	bdl	bdl	unk	
1-Oct-09	bdl	bdl	unk	
2-Nov-09	bdl	bdl	unk	
1-Dec-09	bdl	bdl	unk	
25-Jan-10	bdl	bdl	unk	
1-Mar-10	bdl	bdl	unk	
1-Apr-10	bdl	bdl	unk	
3-May-10	bdl	bdl	unk	
1-Jun-10	bdl	bdl	unk	
1-Jul-10	bdl	bdl	unk	
2-Aug-10	bdl	bdl	unk	
1-Sep-10	bdl	bdl	unk	
1-Oct-10	bdl	bdl	unk	
1-Nov-10	bdl	bdl	unk	
30-Jun-11	bdl	bdl	unk	
5-Jul-11	bdl	bdl	unk	
29-Sep-11	bdl	bdl	unk	
14-Oct-11	bdl	bdl	unk	
1-Dec-11				GC Suspended

GC results prior to 2007 omitted/on file

CIS-1,2 / CIS = cis-1,2-Dichloroethene; bdl = Below detection level

OU 1 Groundwater Collection Points
CY 2007-present - TCE and cis-1,2-DCE Concentrations

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

SAMPLE DATE	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	REMARKS
IW #3				
1-Feb-07	21	34	0.6	
1-Mar-07	8	64	0.1	
2-Apr-07	bdl	21	unk	
1-May-07	bdl	bdl	unk	
1-Jun-07	20	bdl	unk	
2-Jul-07	7	74	0.1	
1-Aug-07	46 J	bdl J	unk	Holding time exceeded
4-Sep-07	bdl	9	unk	
1-Oct-07	51	37	1.4	
1-Nov-07	bdl	15	unk	
13-Dec-07				sample tap inoperative
23-Jan-08				sample tap inoperative
19-Feb-08				sample tap inoperative
3-Mar-08				sample tap inoperative
1-Apr-08				sample tap inoperative
15-May-08	bdl	24	unk	
2-Jun-08	bdl	35	unk	
1-Jul-08	bdl	10	unk	Suspect/septum bulged
1-Aug-08	bdl	bdl	unk	
2-Sep-08	bdl	bdl	unk	rerun bdl - bdl
1-Oct-08	bdl	bdl	unk	
31-Oct-08	bdl	bdl	unk	
1-Dec-08	bdl	bdl	unk	
2-Jan-09				sample tap frozen
2-Feb-09	bdl	bdl	unk	
27-Feb-09	bdl	bdl	unk	
1-Apr-09	bdl	bdl	unk	
1-May-09	bdl	bdl	unk	
1-Jun-09	bdl	13	unk	rerun bdl - bdl
1-Jul-09	bdl	bdl	unk	
3-Aug-09	bdl	9	unk	
14-Sep-09	bdl	bdl	unk	
1-Oct-09	bdl	bdl	unk	
2-Nov-09	bdl	bdl	unk	
1-Dec-09	bdl	bdl	unk	
25-Jan-10	bdl	bdl	unk	
1-Mar-10	bdl	bdl	unk	
1-Apr-10	bdl	bdl	unk	
3-May-10	bdl	bdl	unk	
1-Jun-10	bdl	bdl	unk	
1-Jul-10	bdl	bdl	unk	
2-Aug-10	bdl	bdl	unk	
1-Sep-10	bdl	bdl	unk	
1-Oct-10	bdl	bdl	unk	
1-Nov-10	bdl	bdl	unk	
Dec-10				GC Inoperative
Mar-11				GC Inoperative
2-May-11	bdl	bdl	unk	**GC-LAB RPD Cannot calcul**
2-May-11	**Lab 2.2**	**Lab 16**	**0.14**	**No other VOCs**
1-Jun-11	bdl	bdl	unk	
1-Jul-11	bdl	bdl	unk	
1-Aug-11	bdl	49	unk	
15-Sep-11	bdl	bdl	unk	
14-Oct-11	bdl	bdl	unk	
22-Nov-11	bdl	bdl	unk	
1-Dec-11				GC Suspended

SAMPLE DATE	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	REMARKS
IW #4				
1-Feb-07	56	502	0.11	
1-Mar-07	25	359	0.07	
2-Apr-07	48	471	0.10	
1-May-07	41	610	0.07	
12-Jun-07	30	643	0.05	early peaks
2-Jul-07	17	267	0.06	
10-Aug-07	11	283	0.04	
10-Sep-07	26	568	0.05	
2-Oct-07	19	397	0.05	
27-Nov-07	29	320	0.09	
13-Dec-07	11	255	0.04	
2-Jan-08	15	319	0.05	
19-Feb-08	14	411	0.03	
3-Mar-08	bdl	292	unk	
1-Apr-08	4	308	0.01	
14-May-08	4	272	0.01	
2-Jun-08	bdl	255	unk	
1-Jul-08	4	212	0.02	
1-Aug-08	bdl	185	unk	
2-Sep-08	11	405	0.03	
1-Oct-08	bdl	159	unk	
31-Oct-08	bdl	134	unk	
1-Dec-08	bdl	186	unk	
2-Jan-09				sample tap frozen
2-Feb-09	bdl	220	unk	
18-Feb-09	pump failed - repaired & returned to service 10 Mar			
12-Mar-09	14	234	0.06	
1-Apr-09	2	347	0.01	
1-May-09	15	505	0.03	
1-Jun-09	10	426	0.02	
15-Jul-09	13	524	0.02	
3-Aug-09	9	474	0.02	
14-Sep-09	bdl	141	unk	
1-Oct-09	11	197	0.06	rerun=13/238
2-Nov-09	20	253	0.08	
1-Dec-09	12	205	0.06	early peak
25-Jan-10	12	190	0.06	
pump power failed o/a 24 Feb - repaired & returned to service 26-Apr				
26-Apr-10	3	11	0.27	Just after start up
3-May-10	15	347	0.04	
1-Jun-10	16	359	0.04	early peak
pump failed o/a 11 Jun, damaged pitless O-ring delayed operation until 10-Aug				
11-Aug-10	8	172	0.05	
13-Aug-10	direct buried power cable failed - repaired 29 Sep			
1-Oct-10	19	352	0.05	
1-Nov-10	11	185	0.06	
25-gpm pump & motor failed o/a 23 Nov 10; new 18-gpm pump & motor 12-Apr-11				
12-Apr-11	23	203	0.11	Just after start up
20-Apr-11	16	277	0.06	early peak
2-May-11	20	236	0.08	GC-LAB RPD=33.3%/7.0%
2-May-11	**Lab 28**	**Lab 220**	0.13	VC=34, 1,1-DCA=15; trans=14
pump failed 4 May-11-new power feed, controls & 18-gpm pump installed 13 June				
14-Jun-11	4	204	0.02	
1-Jul-11	22	382	0.06	early peak
1-Aug-11	20	282	0.07	early peak
15-Sep-11	28	308	0.09	
14-Oct-11	30	300	0.10	
21-Nov-11	23	227	0.10	early peak
1-Dec-11	19	200	0.10	
3-Jan-12	17	150	0.11	early peak
1-Feb-12	31	292	0.11	early peak

GC results prior to 2007 omitted/on file

CIS-1,2 / CIS = cis-1,2-Dichloroethene; bdl = Below detection level

OU 1 Groundwater Collection Points
CY 2007-present - TCE and cis-1,2-DCE Concentrations

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

SAMPLE DATE	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	REMARKS
IW #5				
2-Jan-07	253	1,776	0.14	
1-Feb-07	251	1,815	0.14	
1-Mar-07	215	2,036	0.11	
2-Apr-07	245	2,154	0.11	
1-May-07	336	3,147	0.11	
12-Jun-07	130	1,326	0.10	
2-Jul-07	68	444	0.15	
1-Aug-07	118 J	789 J	0.15	Holding time exceeded
10-Sep-07	316	2,680	0.12	
1-Oct-07	250	4,089	0.06	sample suspect
18-Oct-07	208	2,277	0.09	
1-Nov-07	310	3,002	0.10	
30-Nov-07	159	1,717	0.09	
4-Jan-08	167	1,655	0.10	
27-Feb-08	187	2,201	0.08	
3-Mar-08	177	2,317	0.1/0.1	RPD = -3.3/10.6%
1-Apr-08	161/148	1,874/1,714	0.1/0.1	RPD = 8.4/8.9%
14-May-08	198/298	1,814/2,553	0.1/0.1	**RPD = -40.3/-33.8%**
5/29/2008		Controls failed - replaced & pump back on 24 Jun		
19-Jun-08	519/460	5,274/5,051	0.1/0.1	RPD= 12.1/4.3%
27-Jun-08	261	2,540	0.10	
1-Jul-08	81	768	0.11	
1-Aug-08	82	712	0.12	
2-Sep-08	57	532	0.11	
1-Oct-08	59	469	0.13	
31-Oct-08	98/116	900/1,012	0.1/0.1	RPD = -16.8/-11.7%
1-Dec-08	67	652	0.10	
2-Jan-09	81	812	0.10	
2-Feb-09	57	571	0.10	
27-Feb-09	30	394	0.08	
1-Apr-09	95	1,247	0.08	
1-May-09	106	1,244	0.09	
1-Jun-09	87	1,275	0.07	
1-Jul-09	87	1,321	0.07	
3-Aug-09	78	1,247	0.06	
11-Sep-09	81	679	0.12	
1-Oct-09	84	786	0.11	
2-Nov-09	76	643	0.12	
1-Dec-09	67	772	0.09	
31-Dec-09	90/91	857/843	0.1/0.1	RPD= -1.1/1.6%
1-Mar-10	95	1,394	0.07	
1-Apr-10	51/50	877/723	0.06/0.07	RPD= 2.0/19.3%
3-May-10	87	1,062	0.08	
1-Jun-10	78	1,077	0.07	
1-Jul-10	84	1,173	0.07	
2-Aug-10	45	635	0.07	
1-Sep-10	86	1,220	0.07	
1-Oct-10	90	1,968	0.05	
1-Nov-10	83/95	777/822	0.1/0.1	Rerun-RPD= -12.4%/-5.6%
4-Apr-11	65	1,073	0.06	GC-LAB RPD=3.1%-49.1%
4-Apr-11	**Lab 63**	**Lab 650**	0.10	VC = 21
2-May-11	70/61	907/939	0.1/0.1	RPD= 13.7/-3.5%
1-Jun-11	57/54	1197/992	0.05/0.05	RPD= 5.4/18.7%
1-Jul-11	134/123	1201/1351	0.11/0.09	RPD= 8.6/-11.8%
1-Aug-11	107	924	0.12	
29-Sep-11	84	1,081	0.08	
14-Oct-11	87	1,064	0.08	
21-Nov-11	107	1,032	0.10	
1-Dec-11	100	911	0.11	
3-Jan-12	76	1,481	0.05	
1-Feb-12	89	1,957	0.05	
6-Feb-12				Replace pump with cleaned used one

SAMPLE DATE	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	REMARKS
IW #6				
2-Jan-07	4126/4118	1136/1129	3.6/3.6	RPD=0.2%/0.6%
1-Feb-07	3242/3844	1038/1203	3.1/3.2	RPD= -17.0/-14.7%
1-Mar-07	3063/3629	1023/1203	3.0/3.0	RPD= -16.9%/-16.2%
2-Apr-07	4004/5044	1266/1567	3.2/3.2	RPD= -23.0/-21.2%
1-May-07	6219/6848	2226/2259	2.8/3.0	RPD= -9.6/-1.5%
1-Jun-07	7125/7196	2019/2164	3.6/3.3	RPD= -0.3/-6.9%
2-Jul-07	5078/3278	1511/796	3.4/4.1	**RPD= 43.1/62.0%**
1-Aug-07	512J/5356J	175J/1584J	3.8/3.4	RPD= -17.1/-29.6%
4-Sep-07	5702/6809	1571/2251	3.6/3.0	RPD= -17.7/-35.6%
1-Oct-07	4,839	1,475	3.3	sample suspect
18-Oct-07	5341/6225	1634/1844	3.3/3.4	RPD= -15.3/-12.1%
1-Nov-07	5039/4995	1772/1510	2.8/3.3	RPD= 0.9/16.0%
3-Dec-07	3856/3766	1012/1075	3.8/3.5	RPD= 2.4/-6.0%
31-Dec-07	3088/4582	1251/1156	3.8/3.5	RPD= 2.4/-6.0%
6-Feb-08	4931/6136	1402/2139	2.9/3.5	**RPD= -21.8/-41.6%**
3-Mar-08	4,292	1,211	3.5	
31-Mar-08				Pump controls failed
9-Jun-08				Controls replaced & pump restarted
10-Jun-08	4365/3943	1433/1141	3.0/3.5	RPD= 10.2/22.7%
1-Jul-08	3250/3167	776/893	4.2/3.5	RPD= 2.6/-14.0%
1-Aug-08	3041/3911	656/887	4.4/4.6	RPD= -25.0/-29.9%
15-Sep-08	3062/2359	695/462	4.4/5.1	**RPD= 25.9/40.3%**
1-Oct-08	3246/3384	729/817	4.5/4.1	RPD= -4.2/-11.4%
31-Oct-08	4440/4218	1198/1145	3.7/3.7	RPD= 5.1/4.5%
1-Dec-08	3710/3924	949/1010	3.9/3.9	RPD= -5.6/-6.2%
2-Jan-09	4939/4998	1721/1650	2.9/3.0	RPD= -1.2/4.2%
2-Feb-09	4654/4336	1542/1207	3.0/3.6	RPD= 7.1/24.4%
27-Feb-09	5059/3534	1645/1020	3.1/3.5	**RPD= 35.5/46.9%**
1-Apr-09	4427/4667	1353/1502		RPD= -5.3/-10.4%
1-May-09	4910/5358	1436/1671	3.2/3.4	RPD= -8.7/-15.1%
1-Jun-09	5013/5009	1513/1615	3.3/3.2	RPD= 0.1/-6.5%
1-Jul-09	5510/5721	2216/2092	2.5/2.7	RPD= -3.8/5.8%
3-Aug-09	4319/4965	1562/1715	2.8/2.9	RPD= -13.9/-9.3%
11-Sep-09	3660/3790	596/702	6.1/5.4	RPD= -3.5/-16.3%
1-Oct-09	3393/3744	566/629	6.0/6.0	RPD= -9.8/-10.5%
2-Nov-09	3937/4071	625/673	6.3/6.0	RPD= -3.3/-7.4%
1-Dec-09	3808/4466	627/844	6.1/5.3	RPD= -15.9/-29.5%
31-Dec-09	4593/4427	830/837	5.5/5.3	RPD= 3.7/-18.9%
1-Mar-10	4089/4378	1120/1227	3.6/3.6	RPD= -6.8/-8.3%
1-Apr-10	4,167	1,154	3.6	
3-May-10	3573/3715	1070/1091	3.3/3.4	RPD= -3.9/-1.9%
1-Jun-10	3375/3692	1111/1102	3.0/3.4	RPD= -9.0/+0.8%
1-Jul-10	4138/3879	1207/1215	3.4/3.2	RPD= 6.5/-0.7%
2-Aug-10	2643/2851	679/833	3.9/3.4	RPD= -7.6/-20.4%
1-Sep-10	4009/3035	1106/761	3.6/3.8	**RPD= 27.7/37.0%**
1-Oct-10	3253/3727	891/1080	3.7/3.5	RPD= -13.6/-19.2%
1-Nov-10	2464/3017	577/750	4.3/4.0	RPD= -20.2/-26.1%
4-Apr-11	2,520	677	3.7	GC-LAB RPD=0.8%-18.9%
4-Apr-11	**Lab 2500**	**Lab 560**	**4.5**	**No other VOCs**
2-May-11	3,087	771	4.0	
3-May-11	3010/2947	828/860	3.6/3.4	RPD= 2.1/-3.8%
3-May-11	Replaced worn out 5S-08 pump with a 5S-13 model			
1-Jun-11	2,502	765	3.3	
5-Jul-11	5,685	1,066	5.3	
1-Aug-11	3560/nr	1160/917	3.1/?	RPD= ?/23.4%
29-Sep-11	5126/5056	1042/963	4.9/5.3	RPD = 1.4%/7.9%
14-Oct-11	4528/4175	873/797	5.2/5.2	RPD = 8.1%/9.1%
21-Nov-11	ns	ns	unk	
1-Dec-11	1948/1413R	445/282 R	4.4/5.0	**RPD=31.8%/44.8% R**
3-Jan-12	1247/1173R	509/326 R	2.4/3.6	**RPD = 6.1%/43.8%**
1-Feb-12	2,056	500	4.1	

GC results prior to 2007 omitted/on file

CIS-1,2 / CIS = cis-1,2-Dichloroethene; bdl = Below detection level

OU 1 Groundwater Collection Points
CY 2007-present - TCE and cis-1,2-DCE Concentrations

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

SAMPLE DATE	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	REMARKS	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	REMARKS	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	REMARKS
G&M MW #2 = IW #7					G&M MW #3 = IW #8					G&M MW #4 = IW #9				
31-Jul-06	**VER Suspended for Duration of Permanganate Treatment - Permanganate Injected in VER RW #2 31-July, 1 August & 4 August**													
2-Jan-07	8,205	14,240	0.58											
24-Apr-07	9,625	9,994	0.96		24-Apr-07	35	270	0.13		24-Apr-07	bdl	72	unk	
15-Jun-07	160	bdl	unk		15-Jun-07	19	255	0.07		15-Jun-07	bdl	104	unk	
26-Jun-07	62	156												
9-Aug-07	9,659	13,430	0.72		9-Aug-07	44	68	0.65		9-Aug-07	31	bdl	unk	
9-Aug-07	**Resumed VER**													
25-Sep-07	14,850	17,590	0.84		25-Sep-07	305	909	0.34		25-Sep-07	41	bdl	unk	
30-Oct-07	**VER Failure**													
24-Mar-08	66	45	1.47		24-Mar-08	15	75	0.20		24-Mar-08	bdl	51	unk	
15-Sep-08	77	174	0.44	small early peak						15-Sep-08	bdl	bdl	unk	
2-Oct-08	**Resumed VER**													
13-Mar-09	**VER Failure**													
21-May-09	20	bdl	unk		21-May-09	11	255	0.04		21-May-09	bdl	39	unk	
15-Jun-09	15	bdl	unk		15-Jun-09	bdl	81	unk		15-Jun-09	bdl	bdl	unk	
26-Jun-09	**Resumed VER**													
31-Aug-09	**Suspended VER operations @ 15:00 for planned power outage & to allow for rebound**													
11-Sep-09	23	11	2.09		11-Sep-09	117	bdl	unk		11-Sep-09	bdl	bdl	unk	
24-Sep-09	**VER system Restarted @ 11:15 pm**													
1-Oct-09	**Found VER system down - estimate shutdown @ 11:00 am on 30-Sep**													
23-Oct-09	19	57	0.33		23-Oct-09	bdl	43	unk		23-Oct-09	3	bdl	unk	
Oct-09	**Sporardic VER operation in October due to an undiagnosed problem - only operated 133.2-hours/5.55-days in October (17.9%)**													
Nov-09	**Continued VER operational problems in November - operated 440.8-hours/18+ days in November (60.7%)**													
4-Dec-09	66	88	0.75		4-Dec-09	bdl	168	unk		4-Dec-09	7	bdl	unk	
Dec-09	**Continued VER operational problems in December - operated 92.2-hours/3.84-days in December (12.4%) - Pipes frozen - Left off for winter months**													
13-May-10	9	136	0.07		13-May-10	bdl	93	unk		13-May-10	bdl	25	unk	
10-Jun-10	4	bdl	unk	pump sample	10-Jun-10	bdl	176	unk		10-Jun-10	bdl	bdl	unk	GC Rerun = bdl & bdl
14-Jun-10	**Resumed sporadic around-the-clock operations @ 1:45 PM-continued operational problems-operated 127.6 hrs/5.3+ days in June (17.7%)**													
Jul-10	**Continued VER operational problems in July - only operated 300.3-hours/12.5 days (40.4%)**													
16-Aug-10	bdl	12	unk		16-Aug-10	377	431	0.87		16-Aug-10	bdl	12	unk	
Aug-10	**Continued VER operational problems in August- only operated 438.6-hours/18.275 days (59.0%)**													
27-Sep-10	6,357	5,157	1.23		27-Sep-10	2	32	0.06		27-Sep-10	72	bdl	unk	
Sep-10	**Most operational problems resolved - operated 588.8 hours/24.5 days (81.8%) in September**													
21-Oct-10	4,732	2907	1.63		21-Oct-10	bdl	12	unk		21-Oct-10	13	bdl	unk	
Oct-10	**Operated 605.3 hours/25.2 days (81.3%) in October**													
18-Nov-10	1,794	499	3.60		18-Nov-10	bdl	8	unk		18-Nov-10	bdl	2	unk	
Nov-10	**Operated 658.7 hours/27.4 days (91.5%) in November**													
14-Dec-10	**Shut down because of low vacuum; subsequently pipes froze/off for winter months**													
Dec-10	**Operated 214.9 hours/9.0 days (28.9%) in December**													
28-Apr-11	267	7	38.14		18-Nov-10	bdl	56	unk		18-Nov-10	bdl	9	unk	
2-May-11	**Resumed sporadic around-the-clock operations @ 1:45 PM-operated 543.2 hrs/22.6 days (73.0%) in May**													
27-Jun-11	6	bdl	unk		27-Jun-11	bdl	32	unk		27-Jun-11	bdl	bdl	unk	rerun = bdl/bdl
30-Jun-11	**Somewhat sporadic around-the-clock operations-operated 621.1 hrs/25.9 days (86.3%) in June**													
31-Jul-11	**Somewhat sporadic around-the-clock operations-operated 603.7 hrs/25.2 days (81.1%) in July**													
9-Aug-11	1,207	90	13.41		9-Aug-11	bdl	17	unk		9-Aug-11	4	bdl	unk	
31-Aug-11	**Operated 316.5 hours/13.2 days (42.5%) in August - Shut down 24 Aug to repair/replace leaking phase separator tank**													
22-Sep-11	131	9	14.56		22-Sep-11	15	234	0.06		22-Sep-11	13	bdl	unk	
21-Nov-11	1,271	51	24.92		21-Nov-11	bdl	274	unk		21-Nov-11	bdl	15	unk	
01-Dec-11	18	bdl	unk		1-Dec-11	bdl	182	unk		1-Dec-11	bdl	52	unk	
20-Feb-12	229	38	6.03		20-Feb-12	bdl	68	unk		20-Feb-12	bdl	16	unk	
28-Mar-12	259	9	28.78		28-Mar-12	bdl	26	unk		28-Mar-12	bdl/bdl	bdl/bdl	unk	
30-Apr-12	8 R/2 R	66 R/43 R	unk		30-Apr-12	bdl R	49 R	unk		30-Apr-12	bdl R	bdl R	unk	
30-Apr-12	**Phase separator repaired and resumed around-the-clock operations @ 2:00 PM - had been off-line since 24 Aug 2011**													

GC results prior to 2007 omitted/on file

CIS-1,2 / CIS = cis-1,2-Dichloroethene; bdl = Below detection level

OU-1 Groundwater Collection Points
CY 2007-present - TCE and cis-1,2-DCE Concentrations

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

SAMPLE DATE	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	REMARKS
IW #10				
1-Nov-06	32	bdl	unk	**Shutdown 11/30 for winter**
13-Dec-06	29	bdl	unk	Tannin color-operated 13-18 Dec
24-Apr-07				Restarted 24 April
24-Apr-07	bdl	bdl	unk	2nd pump cycle
1-May-07	456	bdl	unk	
18 May 07 (est) Pump/motor failed. 14 Jun 07 New pump & motor (same size/13-gpm) but did not function as should until control problems rectified on 21 Jun.				
2-Jul-07	576	bdl	unk	Noisy, small peaks
17-Aug-07	3	bdl	unk	
6-Sep-07	23	bdl	unk	1st cycle after off 3-days
12-Oct-07	350.9	bdl	unk	Rerun 355.8 & bdl
28-Nov-07	17	bdl	unk	early in pump cycle
30-Nov-07				Pump shutdown for the winter months
24-Mar-08	bdl/bdl	bdl/bdl	unk	Ran just for S&A
30-Apr-08				Restarted after winter shutdown
14-May-08	1,021	bdl	unk	
10-Jun-08	775	23	33.7	
1-Jul-08	146	bdl	unk	early peak
1-Aug-08	547	bdl	unk	
2-Sep-08	85	bdl	unk	
15 Sep 08 Pump/motor failed. 27 Oct 08 New pump & motor (same size/13-gpm)				
29-Oct-08	139	bdl	unk	
10-Nov-08				Pump shutdown for the winter months
21-May-09	14	12	1.2	Restarted-1st pump cycle
1-Jun-09	639	bdl	unk	
11-Jun-09	597	bdl	unk	
1-Jul-09	513	bdl	unk	
12-Aug-09	523	bdl	unk	
11-Sep-09	335	bdl	unk	
6-Oct-09	77	bdl	unk	
26-Oct-09	248	bdl	unk	
2-Nov-09	126	bdl	unk	
1-Dec-09	164	16	10.3	
4-Dec-09				Pump shutdown for the winter months
20-Apr-10				Restarted after winter shutdown
20-Apr-10	bdl	bdl	unk	soon after startup
13-May-10	768	bdl	unk	serveral oher peaks
1-Jun-10	301	bdl	unk	
10-Jun-10	560	68	8.2	
1-Jul-10	341	bdl	unk	
2-Aug-10	bdl	bdl	unk	gw levels low; rerun same
7-Oct-10	bdl	bdl	unk	1st pump cycle in 3-4 days
21-Oct-10	580	bdl	unk	
11-Nov-10	bdl	bdl	unk	
22-Nov-10	79	bdl	unk	GC accuracy suspect
6-Dec-10	Pump shutdown for the winter months - Restarted 6 Apr 11			
2-May-11	Pump/motor failed - 26 May 11 New pump & motor (same size/13-gpm)			
8-Jun-11	740	98	7.6	
5-Jul-11	100	bdl	unk	
1-Aug-11	95	bdl	unk	
22-Sep-11	779	bdl	unk	Noisy, lots of peaks
14-Oct-11	ns	ns	unk	
16-Nov-11	ns	ns	unk	
1-Dec-11	bdl	bdl	unk	pump found off, left off for winter
15-Mar-12	Tried to restart-failed - Restarted 18 May w/new pump & motor (same size/13-gpm)+ new transformer			
21-May-12	337	8	42.1	Noisy, lots of peaks

SAMPLE DATE	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	REMARKS
IW #11 (Converted MW IRZ-2)				**12-Jun-06 commenced pumping**
1-Feb-07	122	2,259	0.05	
1-Mar-07	111	1,902	0.06	
30-Apr-07	413	3,236	0.13	
1-May-07	390	3,535	0.11	
1-Jun-07	450	4,214	0.11	early peaks
12-Jul-07	55	359	0.15	results suspect
9-Aug-07	198	2,179	0.09	
5-Sep-07	193	2,689	0.07	
5-Oct-07	351	5,444	0.06	
6-Nov-07	173	2,364	0.07	
12-Dec-07	195	3,077	0.06	
23-Jan-08	244	4,145	0.06	
14-Feb-08	217	3,934	0.06	
12-Mar-08	194	2,753	0.07	
1-Apr-08	213	3,307	0.06	
21-May-08	58	601	0.10	
10-Jun-08	257	3,276	0.08	early peaks
9-Jul-08	148	2,465	0.06	
5-Aug-08	181	2,382	0.08	
2-Sep-08	151	2,437	0.06	
1-Oct-08	31	1,151	0.03	
1-Dec-08	322	2,067	0.16	
20-Jan-09	269	3,160	0.09	
5-Feb-09	210	2,756	0.08	
5-Mar-09	94	1,324	0.07	
7-Apr-09	159	3,166	0.05	
30-Apr-09	Replaced worned out 1.5-7.5-gpm pump with a 3-15-gpm pump			
27-May-09	336	3,217	0.10	
1-Jun-09	266	2,736	0.10	
1-Jul-09	306	3,041	0.10	
3-Aug-09	257	2,796	0.09	
17-Sep-09	299	1,467	0.20	
7-Oct-09	280	1,406	0.20	
2-Nov-09	347	1,681	0.21	
1-Dec-09	218	1,096	0.20	
8-Jan-10	342	1,522	0.22	
1-Mar-10	327	2,405	0.14	
3-May-10	238	1,926	0.12	
1-Jun-10	226	1,922	0.12	
1-Jul-10	266	2,129	0.12	
19-Aug-10	299	2,533	0.12	
1-Sep-10	274	2,006	0.14	
1-Oct-10	330	2,689	0.12	early peak
1-Nov-10	270	1,289	0.21	
4-Apr-11	**280**	**1,300**	**0.22**	**LAB VC=250 et al**
6-Apr-11	297	1,954	0.15	
6-May-11	329	2,316	0.14	
1-Jun-11	228	1,847	0.12	
5-Jul-11	355	2,330	0.15	
1-Aug-11	221	2,018	0.11	
15-Sep-11	440	1,799	0.24	early peak
14-Oct-11	445	1,505	0.30	
16-Nov-11	253	1,027	0.25	early peak
1-Dec-11	284	1,149	0.25	
	253.1	2,326.2	0.12	Average since 2007

GC results prior to 2007 omitted/on file

CIS-1,2 / CIS = cis-1,2-Dichloroethene; bdl = Below detection level

OU-1/Site 1 VER System
Liquid Effluent TCE and cis-1,2-DCE Concentrations via on-site GC

SAMPLE DATE	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	REMARKS
VER EFFLUENT				
31-Jul-06	**VER Suspended for Permanganate Treatment/Injection**			
9-Aug-07	**Commenced full time operation**			
13-Aug-07	58	60	1.0	
31-Aug-07	105	82	1.3	
6-Sep-07	138	69	2.0	
13-Sep-07	**RAP1-3R Converted to Extraction Well**			
13-Sep-07	31	bdl	unk	After extraction from RAP1-3R commenced = 86 - bdl
12-Oct-07	54	70	0.8	
19-Oct-07	38	bdl	unk	
25-Oct-07	57	43	1.3	
29-Oct-07	**VER Suspended @ 11:00 am for Groundwater Sampling in Area**			
30-Oct-07	**System Restarted @ 1:20 pm**			
30-Oct-07	**System Down (after 3.4 hours) - Suspect Vacuum Pump Failure**			
2-Oct-08	**System Repaired & Resumed Around-the-Clock Operations @ 11 am**			
9-Oct-08	90	113	0.8	
23-Oct-08	15	bdl	unk	
29-Oct-08	23	bdl	unk	
31-Oct-08	13	bdl	unk	
1-Dec-08	31	bdl	unk	Rerun 39 & bdl
15-Dec-08	154	175	0.9	
2-Jan-09	72	62	1.2	
9-Jan-09	60	50	1.2	
2-Feb-09	77	98	0.8	Rerun 70 & 87
13-Mar-09	**System Down - Suspect Vacuum Pump Failure**			
23-Jun-09	**System Repaired/failed startup after 17-hours**			
23-Jun-09	35	146	0.2	
26-Jun-09	**Resumed Around-the-Clock Operations @ 10:45**			
1-Jul-09	51	56	0.9	
16-Jul-09	96	128	0.8	
3-Aug-09	94	107	0.9	
31-Aug-09	**System shut down due to power outage - Left off for rebound evaluation**			
24-Sep-09	**Resumed Around-the-Clock Operations @ 11:15**			
1-Oct-09	**Found system down - estimate shutdown @ 11:00 am on 30-Sep**			
Sporardic operation in October due to an undiagnosed problem-only operated 133.2-hrs				
6-Oct-09	156	289	0.5	Just after a restart; sporadic VER operation in October
23-Oct-09	42	80	0.5	sporadic VER operation in October (17.9%)
2-Nov-09	292	486	0.6	
25-Nov-09	55	27	2.0	continued sporadic VER operation in November (60.7%)
11-Dec-09	**Found system off-estimate shutdown @ 16:00 pm on 7-Dec-Left Off for winter**			
14-Jun-10	**Resumed Sporadic Around-the-Clock Operations @ 1:45 PM**			
22-Jun-10	28	59	0.5	
1-Jul-10	44	57	0.8	
30-Jul-10	55	55	1.0	
16-Aug-10	78	164	0.5	
1-Sep-10	33	22	1.5	
1-Oct-10	43	19	2.3	
7-Oct-10	44	25	1.8	
21-Oct-10	48	42	1.1	
1-Nov-10	23	bdl	unk	
11-Nov-10	74	85	0.9	
14-Dec-10	**Found off on 14-Dec - left off until spring**			
2-May-11	25	148	0.2	**Resumed somewhat sporadic operations @ 2:00 PM**
19-May-11	128	96	1.3	
1-Jun-11	40	18	2.2	
14-Jun-11	29	7	4.1	
1-Jul-11	87	37	2.4	
5-Jul-11	31	30	1.0	
1-Aug-11	67	74	0.9	
30-Apr-12	na	na		VER System Resumed operations - off since 24-August
1-May-12	34	84	0.4	
21-May-12	28	47	0.6	

GC results prior to 2006 omitted/on file

HANSCOM AFB NPL OU 1 REMEDIAL ACTION REPORT

Report Period: **December 2011**

I COLLECTION	GALLONS		AVE GPM See Note 1	% of TOTAL	TCE ppb	CIS 1,2-DCE ppb	TCE-CIS RATIO
SITE 1 PUMP STATION							
SITE 1 COLLECTION TRENCH	147,985	#	3.3	2.1%	ns/na	ns/na	na
VER Liquid Effluent - see Note 4	-	##	-	0.0%	ns/na	ns/na	na
INTERCEPTOR WELLs NO. 7, 8 & 9	-	##	-	0.0%	see breakout by well		
INTERCEPTOR WELL NO. 10- see Note 5	-	##	-	0.0%	bdl	bdl	unk
INTERCEPTOR WELL NO. 1	1,005,879		22.5	14.6%	200	16	12.5
INTERCEPTOR WELL NO. 2	223,200	e	5.0	3.2%	ns/na	ns/na	na
INTERCEPTOR WELL NO. 6	50,344		1.1	0.7%	1,948	445	4.38
TOTAL/COMPOSITE	1,427,408		32.0	20.7%	167	30	5.6
SITE 2 PUMP STATION							
SITE 2 COLLECTION TRENCH	2,927,081	#	65.6	42.4%	ns/na	ns/na	na
INTERCEPTOR WELL NO. 3	654,298		14.7	9.5%	ns/na	ns/na	na
INTERCEPTOR WELL NO. 4	1,663,200	e	37.3	24.1%	19	200	0.10
INTERCEPTOR WELL NO. 5	223,200	e	5.0	3.2%	100	911	0.11
TOTAL/COMPOSITE	5,467,779		122.5	79.2%	29	100	0.29
SITE 3 PUMP STATION - see Note 2							
SITE 3 COLLECTION TRENCH-TOTAL	0		0	0%	ns/na	ns/na	na
INTERCEPTOR WELL NO. 11	9,595		0.2	0.1%	284	1,149	0.25

II TREATMENT	GALLONS	AVE GPM
INFLUENT	6,904,782	154.7
YEAR TO DATE	69,229,436	
TOTAL SINCE 1991 STARTUP	2,036,585,789	

VOC's - See Note 3	*Off-site Lab 5-Dec-11*	On-site GC 5-Dec-11	On-site GC 14-Dec-11	On-site GC 21-Dec-11	On-site GC 28-Dec-11
TRICHLOROETHENE - ug/L (ppb)	*70*	82.0	71	68	85
cis-1,2-DICHLOROETHENE - ug/L (ppb)	*51*	59.0	42	70	67
TOTAL - ug/L (ppb)	*121*	82.0	113	138	152
ALL OTHER VOCs - ug/L (ppb)	*21.2*				
AVE OF ALL GC - TCE ug/L (ppb)	76.5				
- CIS ug/L (ppb)	59.5				

III RECHARGE/OFF-SITE DISCHARGE	GALLONS	AVE GPM	% of Total
SITE 2	243,476	5.45	3.5%
SITE 3	-	0.0	0.0%
OFF-SITE	6,661,306	149.2	96.5%
TOTAL	6,904,782	154.7	

VOC's - See Note 3	*Off-site Lab 5-Dec-11*	On-site GC 5-Dec-11	On-site GC 14-Dec-11	On-site GC 21-Dec-11	On-site GC 28-Dec-11
MID-POINT - ug/L (ppb)	*na*	*na*	*na*	*na*	*na*
EFFLUENT - ug/L (ppb)	*brl (<1.0 ug/L)*	bdl	bdl	*na*	*na*

IV OTHER DATA	UNIT	INFLUENT	EFFLUENT
pH - Min - Max	pH Units	6.15-6.34	7.43-7.68
SODIUM	mg/l	18.000	18.000
IRON	mg/l	0.700	0.550
MANGANESE	mg/l	0.160	nd <0.010

V VER VAPOR DATA - see Note 4	INFLUENT	MID-POINT	EFFLUENT

ATTACHMENTS

1. On-site GC/Lab results for collection & treatment systems' samples
2. On-site GC results for surface water and/or groundwater samples
3. 2011 On-site GC & FID Quality Contol Data
4. Chart - Monitowing Well RAP1-3R Annual LTM (Lab) TCE concentrations 2006 - 2011
5 & 6. Charts - CY average of on-site GC results for BIW-4 and IW-11 Effluent

NOTES:

1. Average GPM based on round-the-clock operation for the reporting period even if system/pumps did not operate 100% of time.
2. Groundwater collection at Site 3 suspended August 2001.
3. Air stripper influent-effluent results from off-site lab, TestAmerica Laboratories Inc., were analyzed by EPA Method 8260 for VOCs and 200.7 for metals.
4. VER system off-line since 24 August 2011 awaiting repair or replacement of phase separator (knock out tank).
5. IW-10 deactivated 1 Dec-11 for winter months.

* = Results are average of sample and field duplicate.
e = estimated - flow meter in-operative
# = No flow meter/pumping rate and quantity estimated based on pump station total less measured other sources.
= VER and IW-7, 8, 9 & 10 off all month.

bdl = below detection limits na = not applicable nr = not reported ns/na = not sampled/not analyzed
brl = below reporting limits

HANSCOM AFB NPL OU1 REMEDIAL ACTION REPORT
YTD SUMMARY

2012

COLLECTION SYSTEM - Gallons	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	2012Total	Ave GPM	% of Total
SITE 1 COLLECTION TRENCH	394,645	306,410	234,170	230,615	208,536								1,374,376	6.3	4.6%
VER Liquid Effluent (RW-1 thru RW-4)	-	-	-	-	20,370								20,370	0.1	0.1%
INTERCEPTOR WELLs NO. 7, 8 & 9	-	-	-	-									-	0.0	0.0%
INTERCEPTOR WELL NO. 10	-	-	-	-	12,849								12,849	0.1	0.0%
INTERCEPTOR WELL NO. 1	718,555	704,010	746,846	635,418	712,239								3,517,068	16.1	11.8%
INTERCEPTOR WELL NO. 2	223,200	208,800	223,200	215,700	221,040								1,091,940	5.0	3.7%
INTERCEPTOR WELL NO. 6	41,565	39,187	42,237	36,419	19,531								178,939	0.8	0.6%
SITE 1 PUMP STATION TOTAL	1,377,965	1,258,407	1,246,453	1,118,152	1,194,565								**6,195,542**	**28.3**	**20.8%**
SITE 2 COLLECTION TRENCH	3,054,771	2,597,230	2,322,903	2,064,612	1,747,110								11,786,626	53.8	39.6%
INTERCEPTOR WELL NO. 3	585,230	589,991	647,505	588,229	623,134								3,034,089	13.9	10.2%
INTERCEPTOR WELL NO. 4	1,497,955	1,470,820	1,622,170	1,477,009	1,555,121								7,623,075	34.8	25.6%
INTERCEPTOR WELL NO. 5	223,200	208,800	223,200	215,700	223,200								1,094,100	5.0	3.7%
SITE 2 PUMP STATION TOTAL	5,361,156	4,866,841	4,815,778	4,345,550	4,148,565								**23,537,890**	**107.5**	**79.1%**
SITE 3 PUMP STATION/COL. TRENCH	0	0	0	0	0								-	**0.0**	**0.0%**
INTERCEPTOR WELL NO. 11	8,069	8,391	8,917	7,487	7,270								**40,134**	**0.2**	**0.1%**
PLANT INFLUENT	6,747,190	6,133,639	6,071,148	5,471,189	5,350,400								**29,773,566**	**136.0**	100.0%
GPM	151.1	146.9	136.0	126.6	119.9										
% of time operating	100.00%	100.00%	100.00%	99.86%	100%								**99.97% ave time operating**		
TOTAL VOC's - ug/L via off-site lab	152.4	149.2	229.0	216.3	248.5								**199.1 ave of VOC's-ppb**		

DISCHARGE SYSTEM - Gallons	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	2012Total	Ave GPM	% of Total
SITE 2 Recharge Basin	223,872	208,360	207,403	188,061	183,243								**1,010,939**	**4.6**	**3.4%**
SITE 3 Recharge Basin	-	-											-	**0.0**	**0.0%**
Storm Drainage Ditch/Beaver Pond	6,523,318	5,925,279	5,863,745	5,283,128	5,167,156								**28,762,626**	**131.4**	**96.6%**
TOTAL	6,747,190	6,133,639	6,071,148	5,471,189	5,350,399								**29,773,565**	**136.0**	100%

2011

COLLECTION SYSTEM - Gallons	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	2011 Total	Ave GPM	% of Total
SITE 1 COLLECTION TRENCH	218,261	175,052	832,153	581,187	431,901	246,377	168,830	115,951	133,260	191,520	146,625	147,985	3,389,102	6.4	4.9%
VER Liquid Effluent (RW-1 thru RW-4)	-	-	-	-	43,816	31,124	33,230	6,130	-	-	-	-	114,300	0.2	0.2%
INTERCEPTOR WELLs NO. 7, 8 & 9	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0%
INTERCEPTOR WELL NO. 10	-	-	-	16,548	5,197	25,511	20,294	8,608	23,997	25,225	-	-	125,380	0.2	0.2%
INTERCEPTOR WELL NO. 1	568,950	539,550	1,020,300	879,259	768,451	663,695	654,624	531,233	579,931	713,437	892,363	1,005,879	8,817,672	16.8	12.8%
INTERCEPTOR WELL NO. 2	214,680	201,600	223,200	215,130	223,200	213,870	222,450	188,730	176,160	205,080	210,660	223,200	2,517,960	4.8	3.6%
INTERCEPTOR WELL NO. 6	66,417	64,063	44,640	43,200	44,640	42,248	31,848	35,158	28,782	43,790	43,374	50,344	538,504	1.0	0.8%
SITE 1 PUMP STATION	1,068,308	980,265	2,120,293	1,735,324	1,517,205	1,222,825	1,131,276	885,810	942,130	1,179,052	1,293,022	1,427,408	**15,502,918**	**29.5**	**22.4%**
SITE 2 COLLECTION TRENCH	2,147,714	1,846,398	4,643,132	3,686,596	3,896,726	3,066,809	1,904,121	1,358,890	2,122,286	2,976,089	3,104,966	2,927,081	33,680,808	64.1	48.7%
INTERCEPTOR WELL NO. 3	644,040	666,960	687,050	550,164	661,977	615,115	571,873	476,264	450,741	540,339	590,927	654,298	7,109,748	13.5	10.3%
INTERCEPTOR WELL NO. 4	-	-	-	1,074,021	234,028	250,897	1,329,210	1,550,659	1,590,859	1,311,724	1,343,338	1,663,200	10,347,936	19.7	15.0%
INTERCEPTOR WELL NO. 5	173,513	154,912	142,460	176,825	321,435	208,281	223,200	175,792	175,500	205,140	210,390	223,200	2,390,648	4.5	3.5%
SITE 2 PUMP STATION	2,965,267	2,668,270	5,472,642	5,487,606	5,114,166	4,141,102	4,028,404	3,561,605	4,339,386	5,033,292	5,249,621	5,467,779	**53,529,140**	**101.8**	**77.4%**
SITE 3 PUMP STATION/COL. TRENCH	0	0	0	0	0	0	0	0	0	0	0	0	-	**0.0**	**0.0%**
INTERCEPTOR WELL NO. 11	8,508	11,520	10,671	9,631	9,122	8,771	7,911	6,974	6,839	8,097	8,739	9,595	**106,378**	**0.2**	**0.2%**
PLANT INFLUENT	4,042,083	3,660,055	7,603,606	7,232,561	6,640,493	5,372,698	5,167,591	4,454,389	5,288,355	6,220,441	6,551,382	6,904,782	**69,138,436**	**131.5**	100.0%
GPM	90.5	90.8	170.3	167.4	148.8	124.4	115.8	99.8	122.4	139.3	151.7	154.7			
% of time operating	96.18%	100%	100%	99.07%	100%	99.04%	99.80%	83.95%	81.28%	91.91%	97.43%	100.00%	**95.70% ave time operating**		
TOTAL VOC's - ug/L via off-site lab	176.4	207.4	181.2	158.5	180.5	196.9	207.7	278.1	101.2	189.1	146.9	142.2	**180.5 ave of VOC's-ppb**		

DISCHARGE SYSTEM - Gallons	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	2011 Total	Ave GPM	% of Total
SITE 2 Recharge Basin	62,414	24,684	319,410	225,992	161,854	119,733	94,314	54,191	188,000	210,972	241,894	243,476	**1,946,934**	**3.7**	**2.8%**
SITE 3 Recharge Basin	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.0**	**0.0%**
Storm Drainage Ditch/Beaver Pond	3,979,669	3,635,371	7,284,196	7,006,569	6,478,639	5,252,965	5,073,277	4,400,198	5,100,355	6,009,469	6,309,488	6,661,306	**67,191,502**	**127.8**	**97.2%**
TOTAL	4,042,083	3,660,055	7,603,606	7,232,561	6,640,493	5,372,698	5,167,591	4,454,389	5,288,355	6,220,441	6,551,382	6,904,782	**69,138,436**	**131.5**	100%

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2010

COLLECTION SYSTEM - Gallons	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	2010 Total	Ave GPM	% of Total
SITE 1 COLLECTION TRENCH	496,958	374,052	1,014,550	1,138,256	430,882	261,465	275,286	100,723	109,485	96,188	134,229	217,297	4,649,371	8.8	6.8%
VER Liquid Effluent (RW-1 thru RW-4)	-	-	-	-	-	5,820	17,750	22,240	30,220	31,840	41,360	12,740	161,970	0.3	0.2%
INTERCEPTOR WELLs NO. 7, 8 & 9	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0%
INTERCEPTOR WELL NO. 10	-	-	-	-	27,066	15,668	3,654	1,298	1,199	2,177	7,025	1,395	59,482	0.1	0.1%
INTERCEPTOR WELL NO. 1	851,506	767,892	1,072,739	881,322	686,425	592,695	521,040	574,400	510,030	524,760	535,436	566,377	8,084,622	15.4	11.7%
INTERCEPTOR WELL NO. 2	223,200	201,600	221,400	214,560	216,270	213,030	222,780	220,920	216,000	219,030	212,550	223,110	2,604,450	5.0	3.8%
INTERCEPTOR WELL NO. 6	95,558	94,654	96,936	84,582	103,813	107,595	87,695	92,928	70,627	77,195	74,605	65,360	1,051,548	2.0	1.5%
SITE 1 PUMP STATION	1,667,222	1,438,198	2,405,625	2,318,720	1,464,456	1,196,273	1,128,205	1,012,509	937,561	951,190	1,005,205	1,086,279	**16,611,443**	**31.6**	**24.1%**
SITE 2 COLLECTION TRENCH	3,451,947	2,998,237	4,764,351	5,170,007	3,457,630	2,863,353	2,849,555	2,346,048	1,827,339	976,958	985,433	2,215,589	33,906,447	64.5	49.2%
INTERCEPTOR WELL NO. 3	580,768	540,281	671,873	629,728	545,652	606,080	635,515	714,323	651,980	525,484	557,091	672,910	7,331,685	13.9	10.6%
INTERCEPTOR WELL NO. 4	1,054,912	821,382	-	156,440	1,308,697	440,681	46	120,748	89,843	1,299,075	1,113,617	-	6,405,441	12.2	9.3%
INTERCEPTOR WELL NO. 5	467,808	432,021	489,629	470,570	501,107	502,289	437,416	137,000	311,406	334,800	324,000	61,458	4,469,504	8.5	6.5%
SITE 2 PUMP STATION	5,555,435	4,791,921	5,925,853	6,426,745	5,813,086	4,412,403	3,922,532	3,318,119	2,880,568	3,136,317	2,980,141	2,949,957	**52,113,077**	**99.1**	**75.7%**
SITE 3 PUMP STATION/COL. TRENCH	0	0	0	0	0	0	0	0	0	0	0	0	-	**0.0**	**0.0%**
INTERCEPTOR WELL NO. 11	13,723	12,307	13,487	12,148	11,071	6,438	8,983	8,775	9,008	9,367	9,614	10,192	**125,113**	**0.2**	**0.2%**
PLANT INFLUENT	7,236,380	6,242,426	8,344,965	8,757,613	7,288,613	5,615,114	5,059,720	4,339,403	3,827,137	4,096,874	3,994,960	4,046,428	**68,849,633**	**131.0**	100.0%
GPM	162.1	154.8	186.9	202.7	163.3	130.0	113.3	97.2	88.6	91.8	92.5	90.6			
% of time operating	100.00%	100.00%	99.49%	100.00%	96.92%	95.33%	99.81%	98.98%	100.00%	98.16%	98.40%	99.97%	**98.92% ave time operating**		
TOTAL VOC's - ug/L via off-site lab	228.3	na	na	159.4	183.2	221.2	242.6	233.5	244.9	310.6	275.8	245.3	**234.5 ave of VOC's-ppb**		

DISCHARGE SYSTEM - Gallons	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	2010 Total	Ave GPM	% of Total
SITE 2 Recharge Basin	304,077	247,111	444,284	544,246	297,771	132,211	47,988	15,443	3,800	41,067	45,362	35,577	**2,158,937**	**4.1**	**3.1%**
SITE 3 Recharge Basin	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.0**	**0.0%**
Storm Drainage Ditch/Beaver Pond	6,932,303	5,995,315	7,900,681	8,213,367	6,990,842	5,482,903	5,011,732	4,323,960	3,823,337	4,055,807	3,949,598	4,010,851	**66,690,696**	**126.9**	**96.9%**
TOTAL	7,236,380	6,242,426	8,344,965	8,757,613	7,288,613	5,615,114	5,059,720	4,339,403	3,827,137	4,096,874	3,994,960	4,046,428	**68,849,633**	**131.0**	100%

2009

COLLECTION-Gallons	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	2009 Total	Ave GPM	% of Total
SITE 1 COLLECTION TRENCH	833,651	498,632	529,700	533,897	768,776	582,615	500,569	639,641	442,315	293,103	269,672	479,740	6,372,311	12.1	9.0%
VER Liquid Effluent (RW-1 thru RW-4)	65,722	64,441	17,126	-	-	8,416	55,954	43,758	2,582	5,168	18,263	4,517	285,947	0.5	0.4%
INTERCEPTOR WELLs NO. 7, 8 & 9	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0%
INTERCEPTOR WELL NO. 10	-	-	-	-	9,094	28,072	58,004	56,681	21,155	18,517	39,540	5,574	236,637	0.4	0.3%
INTERCEPTOR WELL NO. 1	850,438	657,129	817,363	743,994	633,888	521,856	656,496	588,528	565,473	594,688	673,041	905,026	8,207,920	15.6	11.6%
INTERCEPTOR WELL NO. 2	221,730	197,820	219,900	210,540	197,370	199,650	212,820	195,420	162,420	203,910	214,710	223,200	2,459,490	4.7	3.5%
INTERCEPTOR WELL NO. 6	31,425	29,955	31,248	43,171	49,534	37,440	63,018	66,425	61,178	72,739	80,893	89,844	656,870	1.2	0.9%
SITE 1 PUMP STATION	2,002,966	1,447,977	1,615,337	1,531,602	1,658,662	1,378,049	1,546,861	1,590,453	1,255,123	1,188,125	1,296,119	1,707,901	**18,219,175**	**34.6**	**25.8%**
SITE 2 COLLECTION TRENCH	3,051,079	2,626,331	2,538,301	2,401,941	2,825,757	2,560,962	2,819,072	2,390,021	838,934	2,416,981	2,944,872	3,833,793	31,248,043	59.3	44.2%
INTERCEPTOR WELL NO. 3	579,685	602,963	644,691	641,234	613,649	589,513	583,763	527,020	499,033	523,953	558,820	590,404	6,954,728	13.2	9.8%
INTERCEPTOR WELL NO. 4	848,503	490,980	374,040	189,270	372,420	548,640	678,793	945,961	1,021,865	1,039,664	987,135	977,431	8,474,702	16.1	12.0%
INTERCEPTOR WELL NO. 5	499,057	471,275	508,839	474,743	478,459	475,200	485,518	468,398	414,201	476,603	382,595	466,618	5,601,506	10.6	7.9%
SITE 2 PUMP STATION	4,978,324	4,191,549	4,065,871	3,707,188	4,290,285	4,174,315	4,567,146	4,331,400	2,774,033	4,457,201	4,873,422	5,868,246	**52,278,979**	**99.2**	**74.0%**
SITE 3 PUMP STATION/COL. TRENCH	0	0	0	0	0	0	0	0	0	0	0	0	-	**0.0**	**0.0%**
INTERCEPTOR WELL NO. 11	12,613	7,951	7,583	5,917	17,599	17,521	16,261	15,292	13,040	12,720	12,349	13,147	**151,993**	**0.3**	**0.2%**
PLANT INFLUENT	6,993,903	5,647,477	5,688,791	5,244,707	5,966,546	5,569,884	6,130,268	5,937,145	4,042,196	5,658,046	6,181,890	7,589,294	**70,650,147**	**134.1**	100.0%
GPM	156.7	140.1	127.4	121.4	133.7	128.9	137.3	133.0	93.6	126.7	143.1	170.0			
% of time operating	99.73%	100.00%	100.00%	99.86%	99.52%	98.44%	96.03%	95.64%	91.94%	91.13%	99.40%	100.00%	**97.36% ave time operating**		
TOTAL VOC's - ug/L via off-site lab	209.0	267.61	215.5	173.6	215	237	251	223	291	274.8	216	205.2	**231.5 ave of VOC's-ppb**		

DISCHARGE-Gallons	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	2009 Total	Ave GPM	% of Total
SITE 2 Recharge Basin	332,974	206,374	221,051	53,672	-	58,501	120	-	28,147	281,913	218,927	363,901	**1,765,579**	**3.3**	**2.5%**
SITE 3 Recharge Basin	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.0**	**0.0%**
Storm Drainage Ditch/Beaver Pond	6,660,929	5,441,103	5,467,740	5,191,035	5,966,546	5,511,383	6,130,148	5,937,145	4,014,049	5,376,133	5,962,962	7,225,393	**68,884,566**	**130.7**	**97.5%**
TOTAL	6,993,903	5,647,477	5,688,791	5,244,707	5,966,546	5,569,884	6,130,268	5,937,145	4,042,196	5,658,046	6,181,889	7,589,294	**70,650,146**	**134.1**	100%

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2008

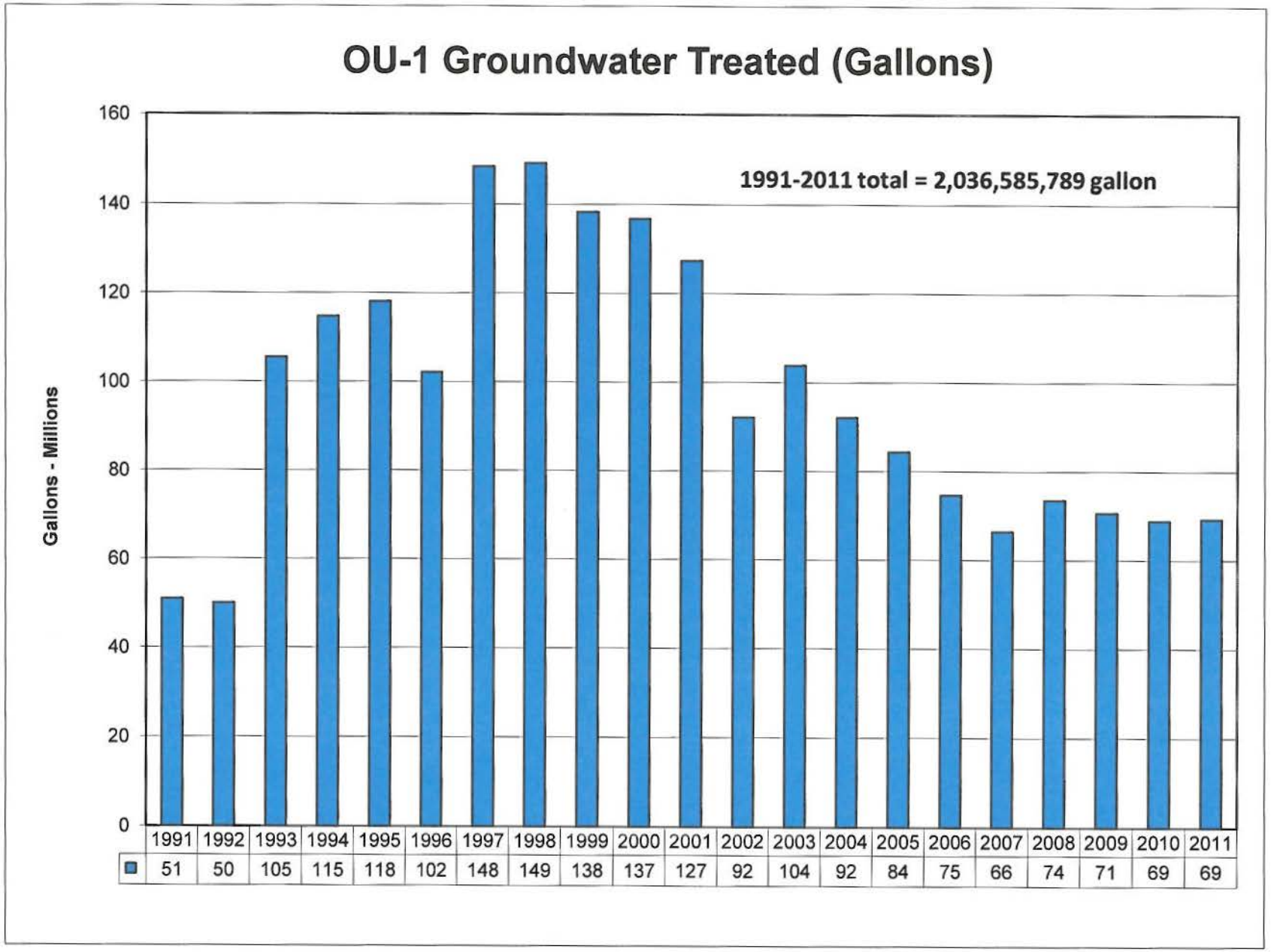
COLLECTION-Gallons	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	2008 Total	Ave GPM	% of Total
SITE 1 COLLECTION TRENCH	518,167	374,883	492,718	681,539	634,717	532,849	518,818	556,602	633,677	540,392	457,690	688,696	6,630,748	12.6	9.0%
VER Liquid Effluent (RW-1 thru RW-4)	-	-	-	-	-	-	-	-	-	55,887	48,028	65,356	169,271	0.3	0.2%
INTERCEPTOR WELLs NO. 7, 8 & 9	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0%
INTERCEPTOR WELL NO. 10	-	-	-	1,827	28,735	17,327	16,408	8,040	1,893	5,016	2,979	-	82,225	0.2	0.1%
INTERCEPTOR WELL NO. 1	622,485	927,761	1,017,689	786,947	668,023	514,184	626,664	722,752	632,753	703,031	466,642	966,161	8,655,092	16.4	11.8%
INTERCEPTOR WELL NO. 2	223,200	208,800	209,880	215,000	202,620	176,280	215,820	223,200	214,020	221,610	163,620	221,730	2,495,780	4.7	3.4%
INTERCEPTOR WELL NO. 6	78,566	73,498	50,000	-	-	24,324	47,164	55,982	41,775	56,163	52,819	61,098	541,389	1.0	0.7%
SITE 1 PUMP STATION	1,442,418	1,584,942	1,770,287	1,685,313	1,534,095	1,264,964	1,424,874	1,566,576	1,524,118	1,582,099	1,191,778	2,003,041	**18,574,505**	**35.2**	**25.3%**
SITE 2 COLLECTION TRENCH	2,591,161	3,160,047	3,795,898	3,807,289	3,713,991	3,577,248	3,056,123	3,196,294	2,941,766	2,702,897	2,089,430	2,891,527	37,523,671	71.2	51.0%
INTERCEPTOR WELL NO. 3	677,121	637,946	660,510	624,432	587,502	579,156	587,678	601,410	525,507	594,065	394,499	588,398	7,058,224	13.4	9.6%
INTERCEPTOR WELL NO. 4	181,268	203,400	273,221	283,990	314,657	372,653	548,383	667,743	759,299	1,063,490	618,119	877,600	6,163,823	11.7	8.4%
INTERCEPTOR WELL NO. 5	108,922	83,500	175,093	35,803	36,728	133,399	609,667	623,843	550,087	618,806	515,378	559,082	4,050,308	7.7	5.5%
SITE 2 PUMP STATION	3,558,472	4,084,893	4,904,722	4,751,514	4,652,878	4,662,456	4,801,851	5,089,290	4,776,659	4,979,258	3,617,426	4,916,607	**54,796,026**	**104.0**	**74.6%**
SITE 3 PUMP STATION/COL. TRENCH	0	0	0	0	0	0	0	0	0	0	0	0	-	**0.0**	**0.0%**
INTERCEPTOR WELL NO. 11	15,686	14,781	16,093	14,915	15,189	14,652	15,164	14,849	9,251	4,417	6,008	13,712	**154,717**	**0.3**	**0.2%**
PLANT INFLUENT	5,016,576	5,684,616	6,691,102	6,451,742	6,202,162	5,942,072	6,241,889	6,670,715	6,310,028	6,565,774	4,815,212	6,933,360	**73,525,248**	**139.5**	100.0%
GPM	112.4	136.1	149.9	149.3	138.9	137.5	139.8	149.4	146.1	147.1	111.5	155.3			
% of time operating	100.00%	99.91%	100.00%	99.54%	94.95%	100.00%	95.69%	100.00%	98.86%	99.96%	75.75%	99.96%	**97.07%**	**ave time operating**	
TOTAL VOC's - ug/L via off-site lab	275.0	368.0	132.0	101	202	144	346	288	244	294	267	225.1	**240.6**	**ave of VOC's-ppb**	

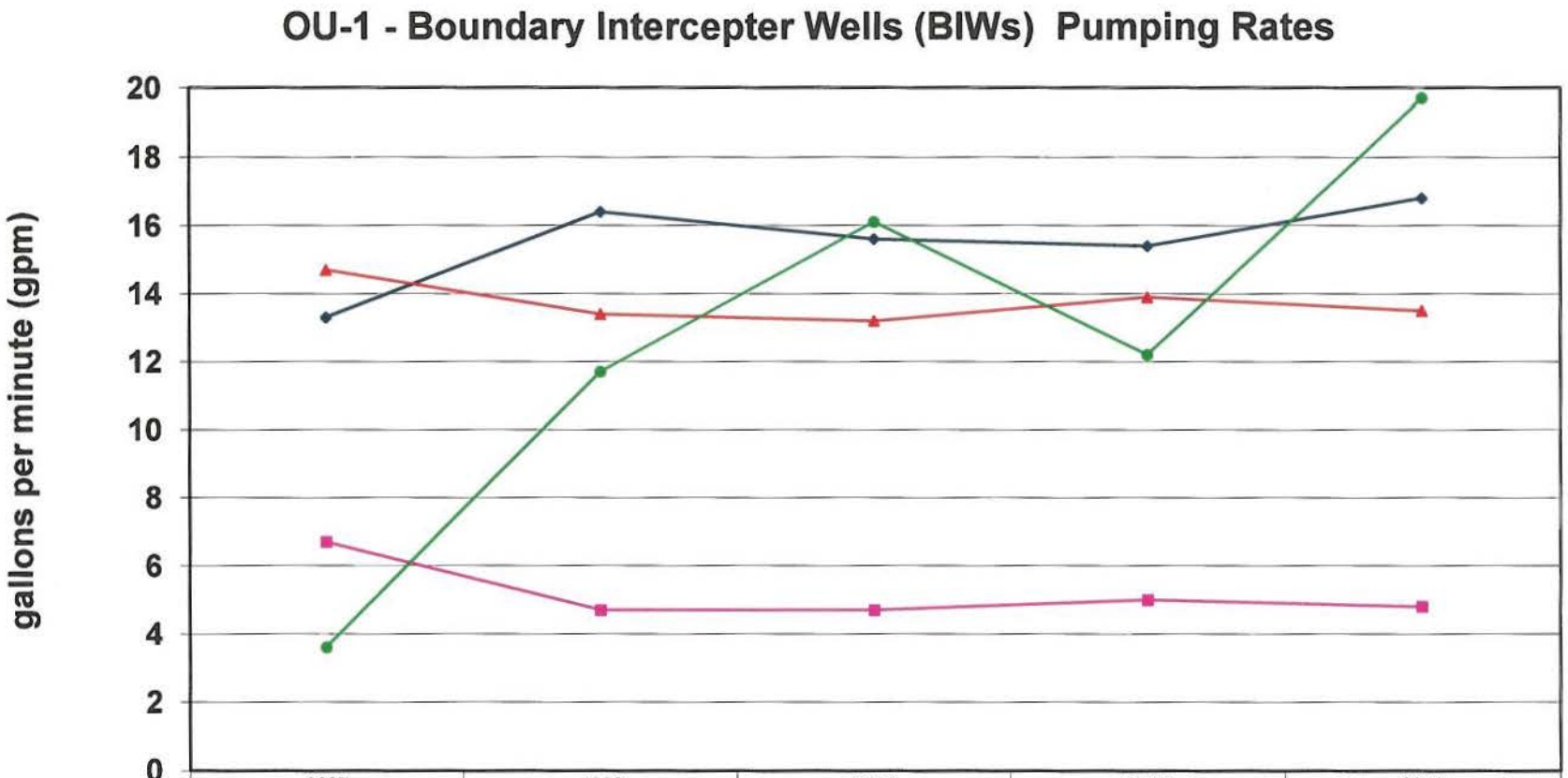
DISCHARGE-Gallons	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	2008 Total	Ave GPM	% of Total
SITE 2 Recharge Basin	219,080	113,470	-	-	-	104,951	293,362	326,974	290,105	303,695	217,998	352,868	**2,222,503**	**4.2**	**3.0%**
SITE 3 Recharge Basin	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.0**	**0.0%**
Storm Drainage Ditch/Beaver Pond	4,797,496	5,571,146	6,691,102	6,451,742	6,202,162	5,837,121	5,948,527	6,343,741	6,019,923	6,262,079	4,597,214	6,580,492	**71,302,745**	**135.3**	**97.0%**
TOTAL	5,016,576	5,684,616	6,691,102	6,451,742	6,202,162	5,942,072	6,241,889	6,670,715	6,310,028	6,565,774	4,815,212	6,933,360	**73,525,248**	**139.5**	100%

2007

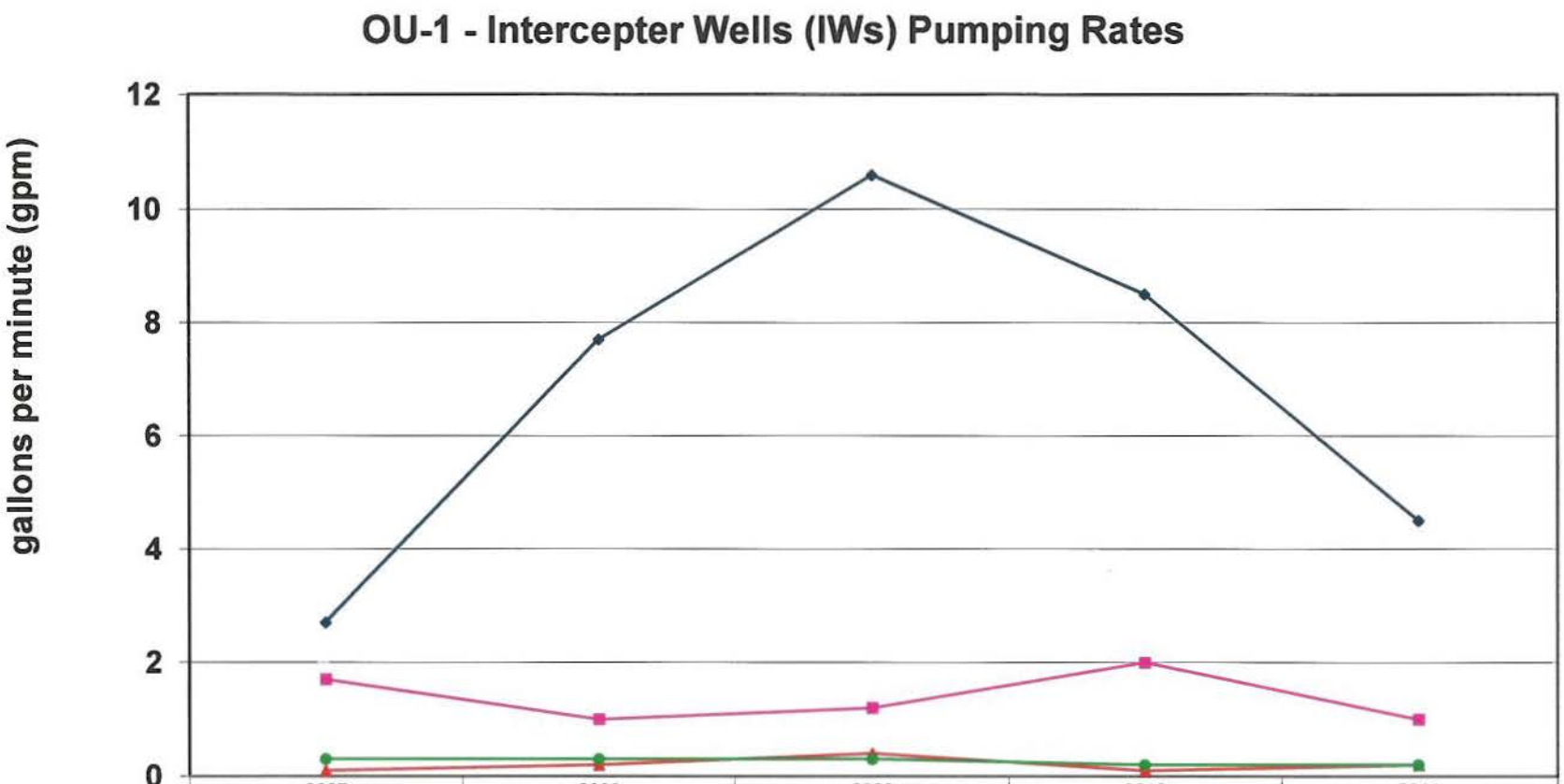
COLLECTION-Gallons	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07	2007 Total	Ave GPM	% of Total
SITE 1 COLLECTION TRENCH	584,000	236,862	462,190	555,151	826,678	636,858	760,604	639,958	641,533	643,000	416,255	410,198	6,813,287	13.0	10.3%
VER Liquid Effluent (RW-1 thru RW-4)						240	-	31,993	30,199	22,228	-	-	84,660	0.2	0.1%
INTERCEPTOR WELLs NO. 7, 8 & 9	10,662	6,116	4,120	61	-	-	-	-	-	-	-	-	20,959	0.0	0.0%
INTERCEPTOR WELL NO. 10	-	-	-	8,071	16,102	8,611	11,113	-	990	931	1,262	-	47,080	0.1	0.1%
INTERCEPTOR WELL NO. 1	698,752	319,590	833,320	971,790	563,793	629,418	521,092	478,584	437,850	453,900	533,180	561,118	7,002,387	13.3	10.5%
INTERCEPTOR WELL NO. 2	460,616	215,684	517,099	310,358	400,155	443,021	152,009	133,290	215,730	222,690	215,730	222,270	3,508,652	6.7	5.3%
INTERCEPTOR WELL NO. 6	87,894	84,535	93,994	96,617	78,944	35,320	64,839	88,367	80,977	69,205	79,920	58,478	919,090	1.7	1.4%
SITE 1 PUMP STATION	1,831,262	856,671	1,906,603	1,941,987	1,885,672	1,753,468	1,509,657	1,372,192	1,407,279	1,411,954	1,246,347	1,252,064	**18,375,156**	**35.0**	**27.7%**
SITE 2 COLLECTION TRENCH	3,470,783	1,112,518	2,963,536	4,095,882	4,826,117	4,613,211	4,061,919	3,088,612	2,433,576	2,205,742	1,948,024	2,013,853	36,833,773	70.1	55.4%
INTERCEPTOR WELL NO. 3	867,794	377,122	739,821	494,634	626,133	662,649	677,173	677,173	647,089	668,222	633,920	666,161	7,737,891	14.7	11.6%
INTERCEPTOR WELL NO. 4	204,812	91,530	215,623	182,764	182,795	139,827	151,135	151,135	126,862	146,248	147,518	165,666	1,905,915	3.6	2.9%
INTERCEPTOR WELL NO. 5	130,787	131,135	156,794	138,811	125,945	109,315	110,387	110,387	117,072	101,533	92,448	88,986	1,413,600	2.7	2.1%
SITE 2 PUMP STATION	4,674,176	1,712,305	4,075,774	4,912,091	5,760,990	5,525,002	5,000,614	4,027,307	3,324,599	3,121,745	2,821,910	2,934,666	**47,891,179**	**91.1**	**72.1%**
SITE 3 PUMP STATION/COL. TRENCH	0	0	0	0	0	0	0	0	0	0	0	0	-	**0.0**	**0.0%**
INTERCEPTOR WELL NO. 11	18,505	11,542	14,275	6,211	13,076	11,501	12,851	15,355	14,429	14,994	15,100	15,351	**163,190**	**0.3**	**0.2%**
PLANT INFLUENT	6,523,943	2,580,518	5,996,652	6,860,289	7,659,738	7,289,971	6,523,122	5,414,854	4,746,307	4,548,693	4,083,357	4,202,081	**66,429,525**	**126.4**	100.0%
GPM	146.1	64.0	134.3	158.8	171.6	168.7	146.1	121.3	109.9	101.9	94.5	94.1			
% of time operating	99.22%	63.90%	99.91%	97.10%	98.71%	100.00%	99.95%	99.91%	99.88%	99.98%	100.00%	100.00%	**96.79%**	**ave time operating**	
TOTAL VOC's - ug/L via off-site lab	271.3	272.0	314.7	263	209	176	206	245	298	320	296	344.9	**268.0**	**ave of VOC's-ppb**	

DISCHARGE-Gallons	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07	2007 Total	Ave GPM	% of Total
SITE 2 Recharge Basin	211,077	45,145	115,567	111,150	21,075	26,119	123,858	155,612	111,496	161,750	188,357	216,799	**1,488,005**	**2.8**	**2.2%**
SITE 3 Recharge Basin	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.0**	**0.0%**
Storm Drainage Ditch/Beaver Pond	6,312,866	2,535,373	5,881,085	6,749,139	7,638,663	7,263,852	6,399,264	5,259,242	4,634,811	4,386,943	3,895,000	3,985,282	**64,941,520**	**123.6**	**97.8%**
TOTAL	6,523,943	2,580,518	5,996,652	6,860,289	7,659,738	7,289,971	6,523,122	5,414,854	4,746,307	4,548,693	4,083,357	4,202,081	**66,429,525**	**126.4**	100%

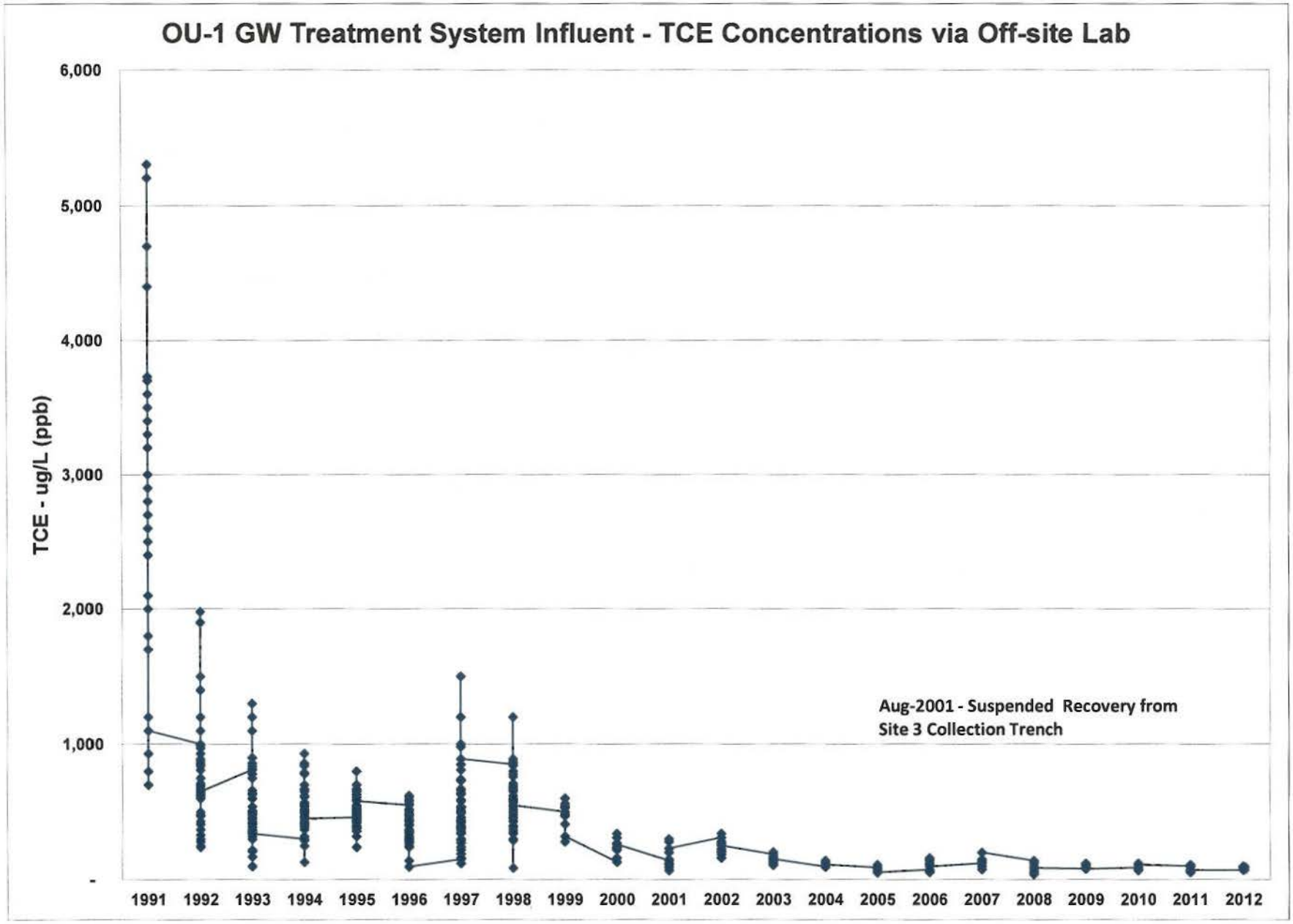

OU-1 Groundwater Treated (Gallons)
1991-2011 total = 2,036,585,789 gallon
Gallons - Millions
160
140
120
100
80
60
40
20
0
1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
51 50 105 115 118 102 148 149 138 137 127 92 104 92 84 75 66 74 71 69 69



	2007	2008	2009	2010	2011
BIW-1	13.3	16.4	15.6	15.4	16.8
BIW-2	6.7	4.7	4.7	5.0	4.8
BIW-3	14.7	13.4	13.2	13.9	13.5
BIW-4	3.6	11.7	16.1	12.2	19.7

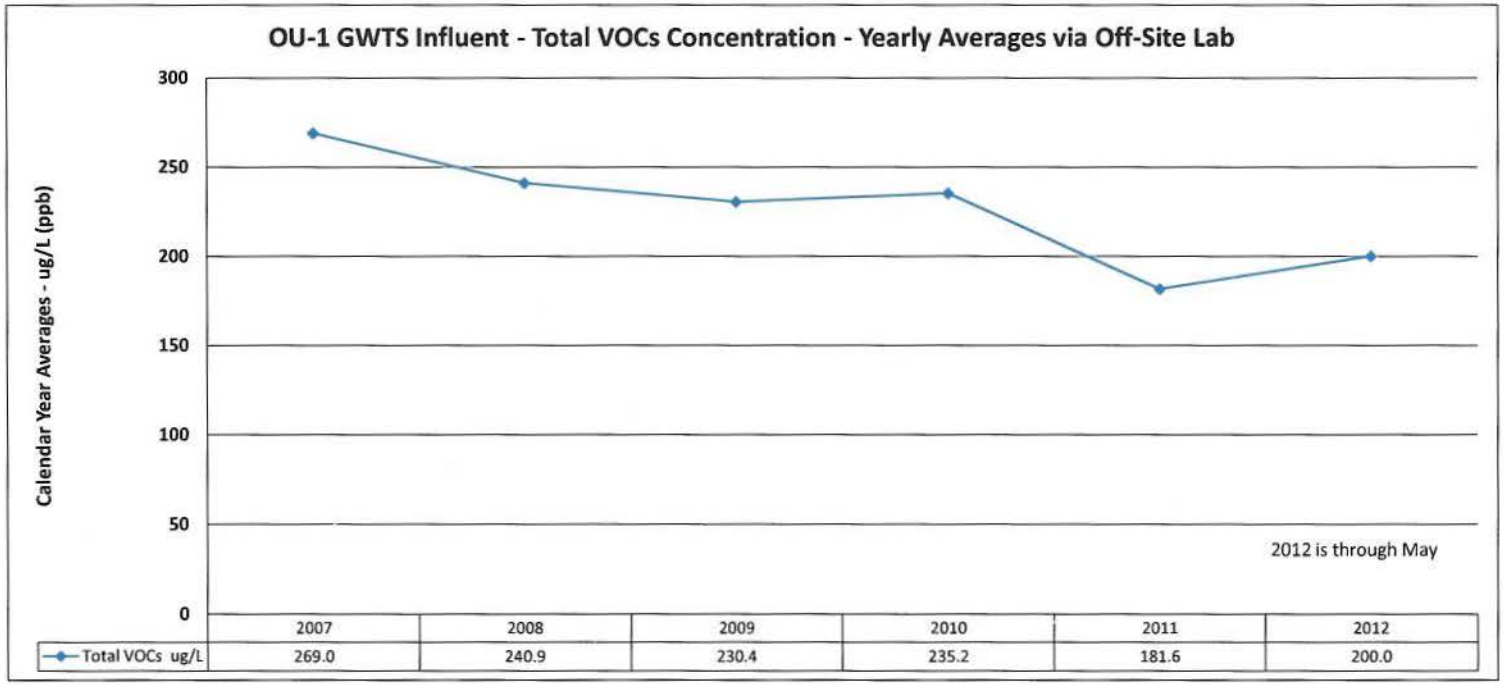


	2007	2008	2009	2010	2011
IW-5	2.7	7.7	10.6	8.5	4.5
IW-6	1.7	1.0	1.2	2.0	1.0
IW-10	0.1	0.2	0.4	0.1	0.2
IW-11	0.3	0.3	0.3	0.2	0.2


OU-1 GW Treatment System Influent - TCE Concentrations via Off-site Lab
TCE - ug/L (ppb)
6,000
5,000
4,000
3,000
2,000
1,000
-
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Aug-2001 - Suspended Recovery from
Site 3 Collection Trench

HANSCOM AFB NPL OU-1 REMEDIAL ACTION REPORT
GW Treatment System VOCs via OFF-SITE LAB

	Influent				OTHER VOCs									Mid-fluent	Effluent
Sample Date	Total VOCs ug/L	TCE ug/L	cis-1,2-DCE ug/L	TCE-cis Ratio	1,1,1-TCA ug/L	1,1-DCA ug/L	1,1-DCE ug/L	VC ug/L	trans-1,2-DCE ug/L	PCE ug/L	BTEX et al ug/L	Total Other ug/L	SAMPLE DATE	All ug/L	All ug/L
2007	269.0	126.1	126.2	1.00	6.8	2.5	4.2	0.7	0.3	bdl	na	15.7	2007	na	bdl
2008	240.9	85.8	126.6	0.68	3.4	4.1	3.4	1.7	1.1	bdl	na	27.8	2008	na	3 detects
2009	230.4	95.3	111.6	0.85	6.1	6.0	2.9	3.8	1.9	0.1	1.8	22.6	2009	na	bdl
2010	235.2	101.4	113.5	0.89	5.8	4.6	2.1	3.8	1.5	<1.0	1.6	19.4	2010	na	bdl
2011	181.6	83.2	81.9	1.02	4.7	4.4	1.8	3.2	1.1	<1.0	0.2	15.4	2011	na	bdl
2012	200.0	83.4	95.8	0.87	5.2	5.4	2.2	4.5	2.0	<1.0	0.6	19.9	2012	na	bdl



OU-1/Site 1 VER System Operating Data

Note: Dec 97-Jun 98 & Oct 98-Apr 99 were demonstration periods - On 28 Apr 99, following completion of the demonstration project, the system was incorporated into the OU-1 Remedial Action.

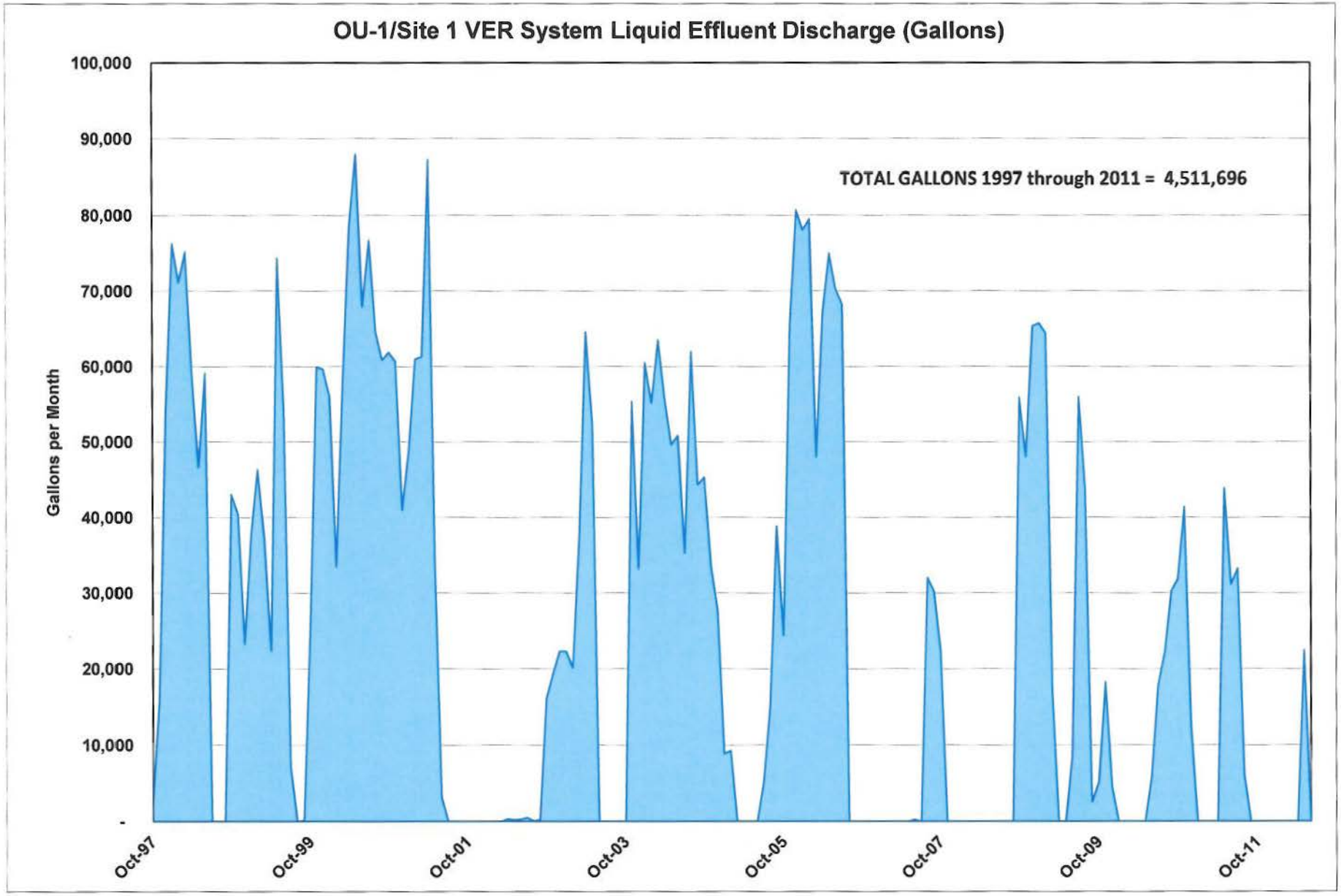
DATE	INLET VACUUM	AIR FLOW	AIR STREAM - ppmv On-site via FID/Off-site via Microseeps INFLUENT	MIDPOINT	EFFLUENT	WELLHEAD VACUUM in. w.c RW-1	RAP1-3R	RW-2	RW-3	RW-4	LRP METER hours	GW METER gallons
31-Jul-06	Shutdown @ 11 am for permanganate injection/treatment											1,037,750
2-May-07	Replaced carbon in one GAC unit in preparation for system startup - also installed LRP run-hour meter											1,037,750
18-Jun-07	Initial attempt to restart operation										22.1	
9-Aug-07	System restarted @ 11 am									on 8-13	97.6	
31-Aug-07	20.5"-.5psi	12-15	43.06-36.3	33.65-65.03	29.55-14.79	Retest of Influent = 86.07					529.3	1,069,150
6-Sep-07	20.5"-.5psi		33.05-8.84	26.55-9.27	20.95-9.36	Duplicate Influent = 32.92-8.01						1,076,890
6-Sep-07	MICROSEEPS		17.2050	10.7331	7.8090							
13-Sep-07	17.5"-1psi	12-18	18.26-5.17	18.83-5.39	20.13-5.69	8.0		3.5	12.5	9.3		1,085,130
13-Sep-07			65.73-na			7.0	8.0	Converted RAP1-3R to VER				
19-Sep-07	19"-.8psi	12-18	25.45-5.45	21.89-6.32	18.02-6.52	12.0	11.5	3.5	14.5	10.0		1,092,170
21-Sep-07	Shutdown @ 8:30 am to replace carbon & make minor repairs-Restarted @ 10:45 am on 26th										1,031.8	1,094,320
12-Oct-07	15.5"-1.2psi		15.25-2.61	16.56-2.88	4.24-3.17	6.5	6.8	2.5	11.0	8.0	1,415.7	1,112,020
12-Oct-07	MICROSEEPS		9.412	12.078	0.1740	Duplicate Influent via FID = 15.75 - 2.63						
19-Oct-07	16"-1.2psi		20.71-4.01	21.07-4.40	4.85-3.52	6.5	8.0	1.5	11.5	9.5		1,117,110
25-Oct-07	-1.3psi		22.86-5.30	18.98-6.07	6.30-5.35	8.5	8.0	2.5	11.5	8.8	1,728.1	1,120,340
29-Oct-07	Shutdown @ 11:00 am to sample wells										1,824.2	1,122,210
30-Oct-07	Restarted @ 1:20 pm - System down after 3.7 run hours - pump may be siezed										1,827.9	1,122,260
	Average of Microseeps Samples between 18-Jun-07 and 30-Oct-07		13.309	11.406	3.992						Hrs Operated-Gal recovered since 18 Jun -07 1,805.85	84,510
12-Sep-08	Refurbished vacuum pump & new motor installed-on startup a clogged discharge line shut system down on hi level alarm in KO tank											
2-Oct-08	System started up following reaming of discharge line and removal of check valve.										1,827.9	1,122,260
7-Oct-08	Power/system shutdown @ 8:30 am for repairs of the Site 1 controls monuting board										1,946.0	1,133,020
9-Oct-08	Power restored and system restarted @ 11:00 am											
21-Oct-08											2,332.9	1,156,250
23-Oct-08	17-18"	~ 15	19.99-1.91	14.50-2.26	3.74-2.43							1,158,170
29-Oct-08	18"		17.81-2.01	14.3-2.27	3.71-2.11						2,426.9	1,170,350
12-Nov-08	19"		19.47-2.45	16.13-2.62	3.23-2.51						2,760.8	1,194,800
4-Dec-08	16"	~ 15-18	12.19-1.04	2.19-1.06	2.01-1.05	Tertiary drum on line					3,295.7	1,232,700
4-Dec-08	MICROSEEPS		3.8870	0.3581	0.0743	Tertiary drum on line						
9-Dec-08	Replaced carbon in lead without shutting down system										3,415.7	
15-Dec-08	18"		21.20-2.82	5.12-4.21	5.51-4.68							
30-Dec-08	18"		13.96-1.93	4.08-2.49	3.59-2.89						3,918.0	1,288,330
9-Jan-09	17.5"/0.5psi		11.15-0.77	3.10-0.87	1.60-0.96	Duplicate Influent = 11.50-0.73					4,156.4	1,312,670
9-Jan-09	MICROSEEPS		9.8270	1.6657	0.0547							
22-Jan-09	18"/1.0psi		14.52-3.09	4.50-2.98	4.37-3.17						4,470.2	1,341,020
18-Feb-09	17"/4.0psi		10.34-0.97	3.30-1.10	1.99-1.46	Duplicate Influent = 10.21-0.89					5,118.2	1,394,320
18-Feb-09	MICROSEEPS		9.5070	1.5230	0.0540							
25-Feb-09	18"/3.5psi		9.52-0.95	2.56-0.96	1.75-1.15						5,286.1	1,409,260
6-Mar-09	16-17"		9.32-0.74	3.60-0.97	1.67-1.09	Duplicate Influent = 9.97-0.89					5,502.9	1,430,350
6-Mar-09	MICROSEEPS		9.8260	1.9710	0.0451							
13-Mar-09	Found system down - estimate shutdown @ 5 pm on March 11th - could not be restarted										5,624.5	1,438,820
	Average of Microseeps Samples between 2-Oct-08 and 13-Mar-09		8.262	1.380	0.057						Hrs Operated-Gal recovered since 2-Oct-08 restart 3,796.60	316,560
19-Jun-09	Repaired vacuum pump & motor installed-on startup a clogged discharge line shut noted & system shut down											
23-Jun-09	System started up @ 13:30 following installation of surface laid discharge line										5,625.2	1,438,830
25-Jun-09	Found system down - estimate shutdown @ 6:30 am on June 24th - did not restart due to low water in tank										5,642.2	1,439,350
26-Jun-09	System started up @ 10:45 following filling of tank (5 straws on)										5,642.2	1,439,350
16-Jul-09	21.5"	15-18	22.15-2.20	4.02-2.56	3.99-2.61	Duplicate Influent = 21.81-2.31					6,120.6	1,472,350
16-Jul-09	MICROSEEPS		17.8616	0.25490	0.3263							
22-Jul-09	22.5"/0.5psi		12.01-1.20	6.21-1.26	4.59-1.81						6,270.7	1,484,380
12-Aug-09	19.0"/3.5psi	15	12.59-1.69	9.07-1.87	3.01-1.97						6,771.7	1,524,030
12-Aug-09	MICROSEEPS		10.6214	7.0902	0.6949							
27-Aug-09	19.0"/3psi		8.57-0.70	11.47-1.03	2.83-2.04	Tertiary drum on line					7,132.0	1,543,700
31-Aug-09	Power/system shutdown @ 3:00 pm to excavate in vicinity of direct burial high-voltage cable.										7,230.5	1,547,400
24-Sep-09	System started up @ 11:15 following rebound period											
1-Oct-09	Found system down - estimate shutdown @ 10:45 am on 29-Sep - restarted on 6-Oct @ 14:15										7,349.8	1,549,530
Sep-09	Only operated 119.3-hours/4.97-days in September											
9-Oct-09	@ 3pm		11.44-1.79	6.13-1.89	2.47-2.19						7,422.5	1,553,210
15-Oct-09	Found system down - estimate shutdown @ 0145 am on 10-Ocr-operated 10.8-hrs-restarted on 23-Oct @ 10:30										7,433.3	1,553,250
23-Oct-09	15" - Just after a restart											
30-Oct-09	Found system down - estimate shutdown @ 13:00 am on 25-Oct - not retarted at that time										7,483.0	1,554,698
Oct-09	Sporardic operation in October due to an undiagnosed problem - only operated 133.2-hours/5.55-days in October											
2-Nov-09	System started up @ 12:00 - Installed new flow meter										7,483.0	147,250
17-Nov-09	Restarted after finding off - estimate shutdown @ 8:00 am on 7-Nov										7,599.0	151,630
25-Nov-09	15.5"/2.0psi	12-18	11.97-1.61	8.27-1.8	2.65-1.89						7,788.4	162,830
Nov-09	Continued operational problems in November-operated 437.3-hours/18.22 days in November											
1-Dec-09	System shutdown @ 11:00 am during O&M check - not retarted at that time										7,934.8	166,000
4-Dec-09	Restart system @ 11:00										7,934.8	166,000
11-Dec-09	Found system off. System went off 12/7@16:00										8,012.5	170,030
15-Dec-09	Attempted restart. Unable to operate due to frozen discharge line										8,012.5	170,030
Dec-09	Continued operational problems in December-operated 92.2-hours/3.84+ days in December-Frozen pipes/Left off for winter months											

OU-1/Site 1 VER System Operating Data

Note: Dec 97-Jun 98 & Oct 98-Apr 99 were demonstration periods - On 28 Apr 99, following completion of the demonstration project, the system was incorporated into the OU-1 Remedial Action.

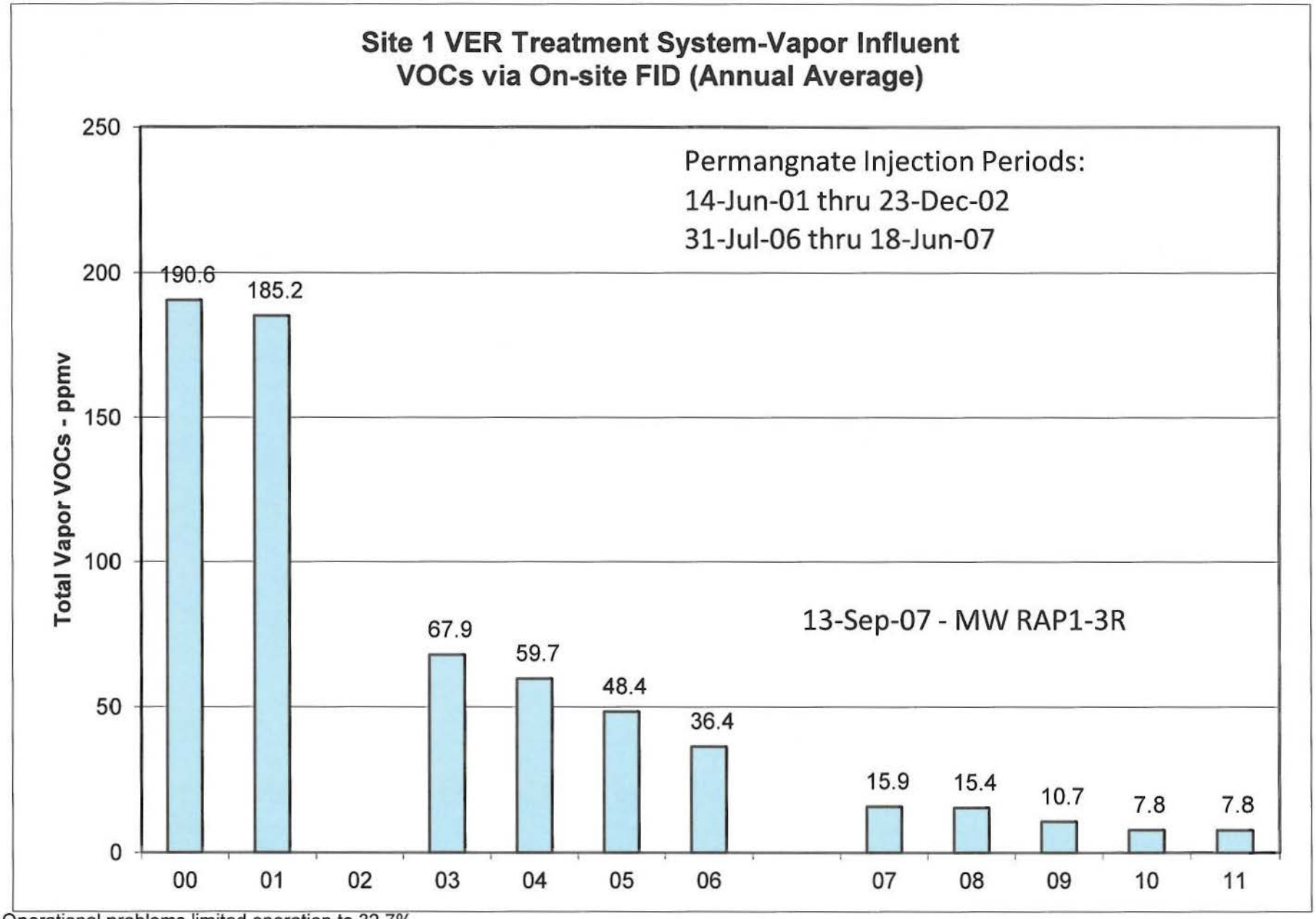
DATE	INLET VACUUM	AIR FLOW	AIR STREAM - ppmv On-site via FID/Off-site via Microseeps INFLUENT	MIDPOINT	EFFLUENT	WELLHEAD VACUUM in. w.c RW-1	RAP1-3R	RW-2	RW-3	RW-4	LRP METER hours	GW METER gallons
14-Jun-10	Resumed very sporardic around-the-clock operations @ 1:45 PM											
Jun-10	Continued operational problems in June - only operated 127.6 hours/5.3+ days										8,140.1	175,850
8-Jul-10	Replaced carbon in lead - system had shutdown @ 10:20 1 July - restarted @11:20 12 July										8,140.3	175,900
Jul-10	Continued operational problems in July - only operated 300.3 hours/12.5 days (40.4%)										8,440.4	193,600
Aug-10	Continued operational problems in August - only operated 438.6 hours/18.3 days (59.0%)										8,879.0	215,840
2-Sep-10	Found system off - est @ ~8:00 on 2nd - repaired check valve in liquid transfer piping - restarted @ 10:40										8,899.4	216,950
9-Sep-10	16.0"/1.3psi		9.77-0.95	6.56-1.04	2.51-1.31	Duplicate Influent = 10.34-0.80					9,068.9	226,210
9-Sep-10	MICROSEEPS		7.5440	2.90600	0.0520							
23-Sep-10	Found system off - est @ 11:00on 22nd - Restarted 11:50 on 27th										9,384.0	239,820
30-Sep-10	17.0"/1.4psi		8.01-2.17	6.86-2.32	3.75-2.29						9,457.8	245,000
Sep-10	Most operational problems resolved - operated 588.8 hours/24.5 days (81.8%) in September										9,467.8	245,560
7-Oct-10	17.0"/2psi					Duplicate Influent = 10.34-0.80					9,622.6	253,860
14-Oct-10	17.0"		15.83-4.52	9.07-5.1	9.37-5.9	Duplicate Influent = 15.37-4.58					9,792.8	261,630
14-Oct-10	MICROSEEPS		6.4630	1.77600	0.0246							
Oct-10	Operated 605.3 hours/25.2 days (81.3%) in October										605.3	245,580
22-Nov-10			8.51-0.69	3.57-0.56	2.43-0.53	Duplicate Influent = 8.70-0.78					10,523.4	304,830
22-Nov-10	MICROSEEPS		4.7950	2.02800	0.5300							
Nov-10	Operated 658.7 hours/27.4 days (91.5%) in November										658.7	41,360
14-Dec-10	12.0		5.27-0.21	4.10-0.20	1.56-0.29	Duplicate Influent = 4.99-.21					10,948.0	332,000
14-Dec-10	MICROSEEPS		4.4730	4.89800	1.2350							
14-Dec-10	Shut down because of low vacuum; subsequently pipes froze & system was off unti May 2011											
Dec-10	Operated 214.9 hours/9.0 days (28.9%) in December										214.9	12,740
22-Apr-11	Removed carbon from lead unit, found vapor diffuser clogged & creating high back pressures, left off-line awaiting repairs											
02-May-11	Resumed around-the-clock operations @ 1:45 PM with only 1 GAC unit on-line - somewhat sporadic thru out month										10,948.0	332,000
19-May-11	Found system off - est @ 10:15 on 16th - Restarted 13:15 on 19th										11,281.5	358,610
23-May-11	Found system off - est @ 20:15 on 21st - Restarted @ 13:30 on 25th										11,336.7	363,250
26-May-11	17.5"/0.8 psi		11.08-1.33	12.52-1.25	not sampled							
May-11	Operated 543.2 hours/22.6 days (73.0%) in May										543.2	43,816
07-Jun-11	15.7"/0.8psi		8.47-1.27	14.52-1.35	na	tertiary drum on-inlet 1.5 psi					11,648.4	386,330
14-Jun-11	17.0"/1.1psi		8.61-0.7	8.06-1.12	8.55-1.26	inf dup = 7.83-0.81 - added 2nd tertiary drum					11,815.4	395,690
14-Jun-11	MICROSEEPS		7.4221	7.27880	6.2778							
27-Jun-11	Found system off - Restarted @ 10:45 - inlet 17.0"/1.0 psi										12,045.0	403,030
Jun-11	Operated 621.1 hours/25.9 days (86.3%) in June - 4 shutdowns due low water or power outages										621.1	31,124
14-Jul-11	Repaired (new vapor diffuser) GAC unit & refilled with new carbon and added as lag unit										12433.6+	423070+
25-Jul-11	1.1 psi		6.92-.72	8.48-.73	1.25-.72	inf dup = 7.46-0.71					12,654.5	436,560
25-Jul-11	MICROSEEPS		*6.3330*	*5.6750*	*0.0970*							
Jul-11	Operated 603.7 hours/25.2 days (81.1%) in July - 2 shutdowns due low water in transfer tank										603.7	33,230
01-Aug-11	Found system off - Restarted @ 13:02										12,716.0	440,170
24-Aug-11	Shutdown to repair/replace phase separator - Intermittant operations since 8/1										13,032.5	446,300
Aug-11	Operated 316.5 hours/13.2 days (42.5%) in August - several shutdowns due low water in leaking transfer tank										316.5	6,130
2011	System operated a total of 2,084.5 of the possible hours during CY 2011 (23.8% of CY)											
30-Apr-12	Phase separator repaired and resumed around-the-clock operations @ 2:00 PM-had been off-line since 24-Aug-11										13,032.5	446,300
21-May-12	15.0"/1.0psi		8.86-1.86	6.15-1.89	3.66-1.71	inf dup = 9.12-1.88					13,292.1	461,700
21-May-12	MICROSEEPS		8.5090	4.36270	1.6310							
May-12	System operated a total of 426.2 of the possible hours 30-Apr - 1 Jun (55.9%)										426.2	22,430
REMARKS:	1st FID number = total VOCs, 2nd = methane component											

OU-1/Site 1 VER System Operating Data

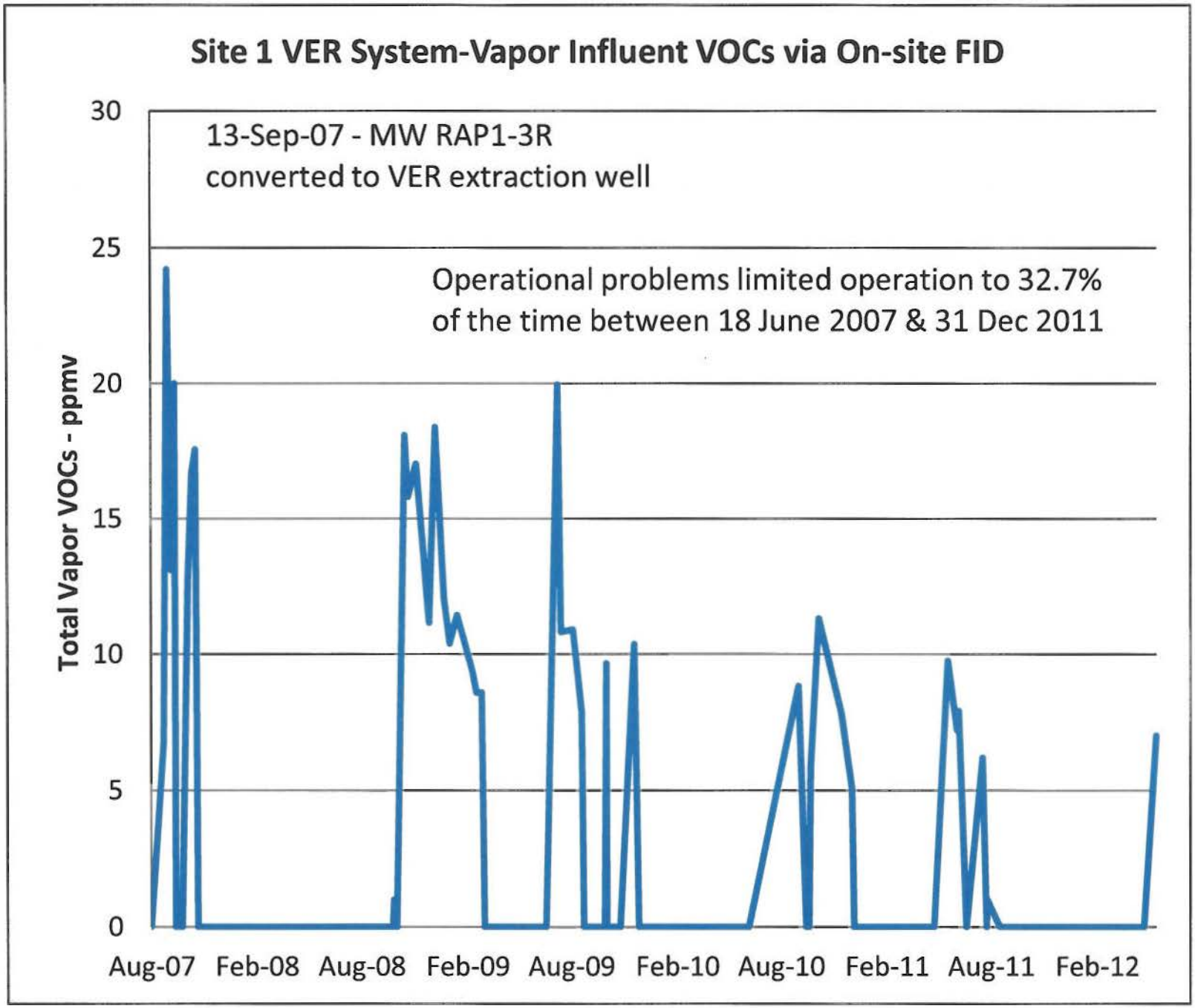


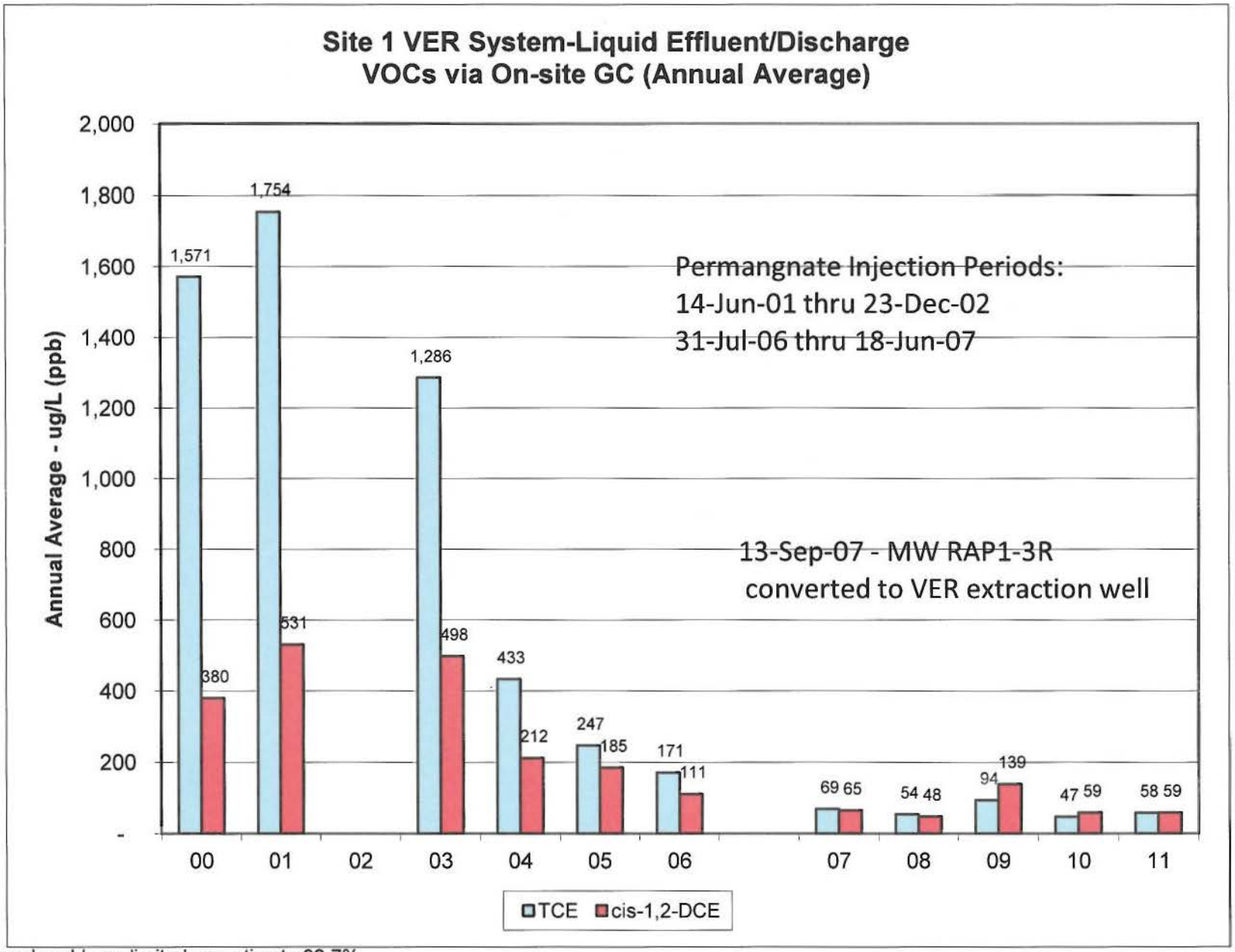
Operational problems limited operation to 32.7%
of the time between 18 June 2007 31 Dec 2011

C-11 Chart OU-1 VER Liquid Effluent 1997-2012



Operational problems limited operation to 32.7%
of the time between 18 June 2007 31 Dec 2011


Site 1 VER System-Vapor Influent VOCs via On-site FID
13-Sep-07 - MW RAP1-3R
converted to VER extraction well
Operational problems limited operation to 32.7%
of the time between 18 June 2007 & 31 Dec 2011
Total Vapor VOCs - ppmv
30
25
20
15
10
5
0
Aug-07
Feb-08
Aug-08
Feb-09
Aug-09
Feb-10
Aug-10
Feb-11
Aug-11
Feb-12



Operational problems limited operation to 32.7%
of the time between 18 June 2007 31 Dec 2011

OU-1/Site 1 VER System
Extraction Wells TCE and cis-1,2-DCE Concentrations via on-site GC

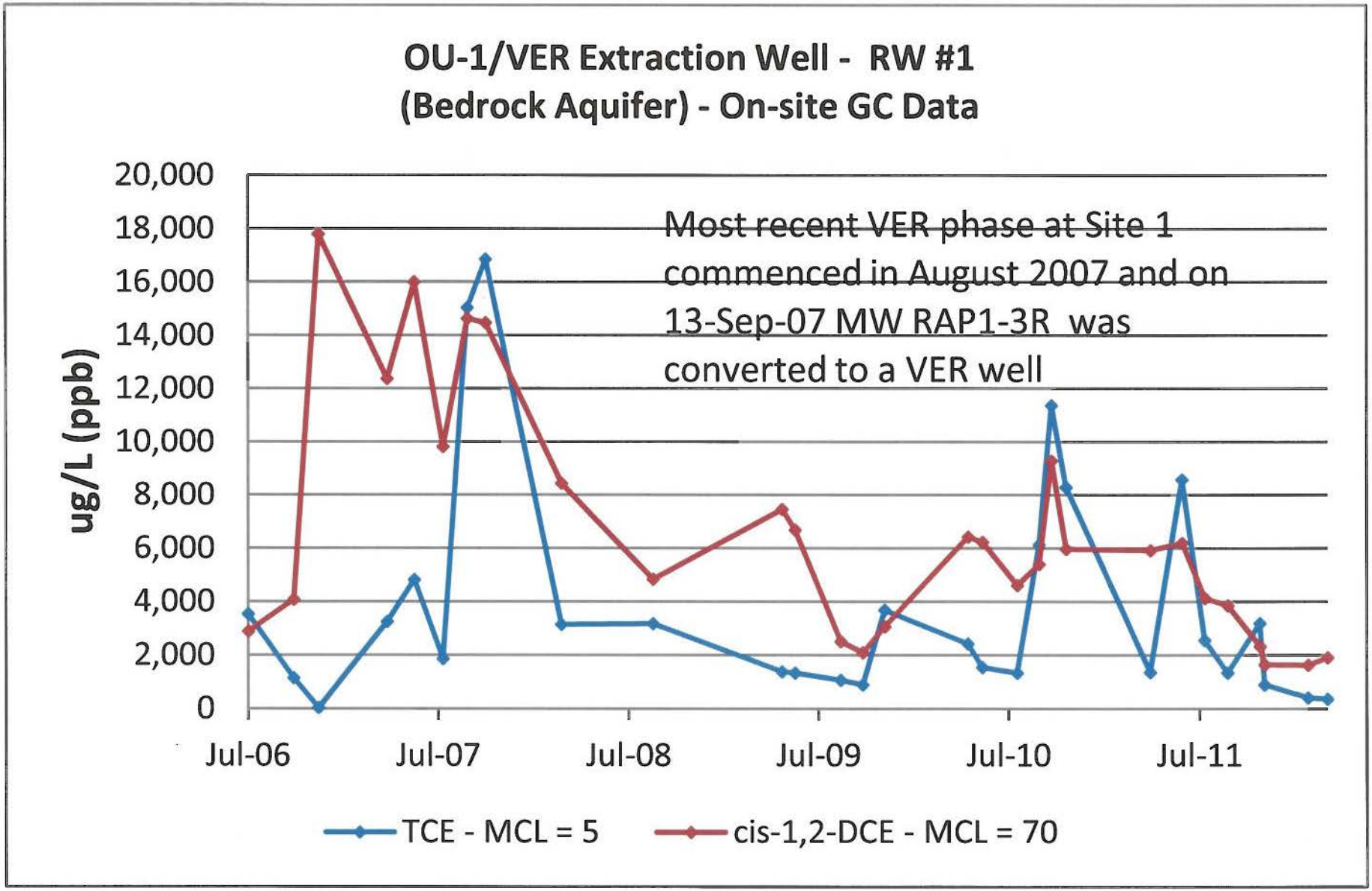
	G&M VER RW #1			G&M VER RW #2			G&M VER RW #3			G&M VER RW #4			RAP1-3R		
SAMPLE DATE	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO	TCE ppb	CIS-1-2 ppb	TCE-CIS RATIO
Jan & Feb-06 not sampled, system operating around the clock															
8-Mar-06	3,637	6,946	0.5	3,233	2,590	1.2	2,045	953	2.1	8,571	8,840	1.0			
31-Jul-06 VER Suspended for Duration of Permanganate Treatment															
31-Jul-06	3,526	2,883	1.2	point of injection			3,601	1,490	2.4	5,343	5,925	0.9			
14-Sep-06	not sampled			not sampled			707	214	3.3	not sampled					
27-Oct-06	1,142	4,076	0.28	554	713	0.8	94	229	0.4	263	1,467	0.2			
13-Dec-06	33	17,796	0.002	26	bdl	unk	43	495	0.1	465	2,963	0.2			
24-Apr-07	3,238	12,370	0.3	66	594	0.1	138	524	0.3	375	2,733	0.1			
15-Jun-07	4,808	16,001	0.3	96	132	0.7	83	712	0.1	835	6,910	0.1			
9-Aug-07	1,853	9,813	0.2	45	18	2.5	44	198	0.2	1,335	8,385	0.2			
9-Aug-07 COMMENCED FULL-TIME OPERATION (FOLLOWING CARBON CHANGE (1 UNIT) & REPAIR OF CONTROLS)															
13-Sep-07 RAP1-3R Converted to Extraction Well															
25-Sep-07	15,030	14,630	1.0	7,803	1,898	4.1	3,642	2,142	1.7	8,622	10,090	0.9	98,060	43,280	2.3
29-Oct-07 VER Suspended @ 11:00 am for Groundwater Sampling in Area															
30-Oct-07	16,850	14,470	1.2	6,530	3,293	2.0	4,250	2,412	1.8	8,558	10,570	0.8	135,100	73,370	1.8
30-Oct-07 System Restarted @ 1:20 pm															
30-Oct-07 System Down (after 3.4 hours) - Vacumm Pump Failure															
24-Mar-08	3,140	8,436	0.4	89	523	0.2	159	452	0.4	1,334	5,895	0.23	52,810	41,850	1.3
12-Sep-08 Refurbished Pump/New Moror Installed but Clogged Discharge Line Precluded Resumption of Operations															
15-Sep-08	3,167	4,838	0.7	3	bdl	unk	89	31	2.9	1,219	3,243	0.4	44,610	45,240	1.0
24/25 Sep-08 - Excavated to Remove Check Valve in Discharge Line and Ream Out Line															
2-Oct-08 COMMENCED FULL-TIME OPERATION @ 11 am															
13-Mar-09 Found system down - estimate shutdown @ 5 pm on March 11th - could not be restarted															
21-May-09	1,377	7,458	0.2	13	81	0.2	68	326	0.2	1,530	4,552	0.3	29,100	38,150	0.8
15-Jun-09	1,329	6,684	0.2	186	244	0.8	3	94	0.0	407	1,700	0.2	36,110	52,670	0.7
26-Jun-09 COMMENCED FULL-TIME OPERATION (FOLLOWING REPAIR OF PUMP & INSTALLATION OF SURFACE DISCHARGE LINE)															
31-Aug-09 Suspended Operations @ 15:00 for Planned Power Outage & to Allow for Rebound															
11-Sep-09	1,064	2,514	0.4	796	476	1.7	559	307	1.8	1,196	980	1.2	9,187	12,590	0.7
24-Sep-09 System Restarted @ 11:15 am													13,560	22,100	0.6
1-Oct-09 Found system down - estimate shutdown @ 11:00 am on 30-Sep															
Oct-09 Sporardic operation in October due to an undiagnosed problem - only operated 133.2-hours/5.55-days in October (17.9%)															
6-Oct-09													25,730	29,400	0.9
23-Oct-09	890	2,100	0.4	730	819	0.9	201	112	1.8	5,053	4,635	1.1	13,060	30,630	0.4
Nov-09 Continued operational problems in November - operated 440.8-hours/18+ days in November (60.7%)															
4-Dec-09	3,678	3,066	1.2	276	109	2.5	696	284	2.5	8,307	6,631	1.3	23,640	13,880	1.7
Dec-09 Operational problems continued-operated 92.2-hours/3.84+ days in December-Frozen pipes/Left off for winter months															
3-May-10													11,170	40,760	0.3
13-May-10	2,424	6,425	0.4	45	42	1.1	39	197	0.2	478	3,325	0.1			
10-Jun-10	1,542	6,232	0.2	67	51	1.3	24	166	0.1	445	4,019	0.1	9,364	39,980	0.2
30-Jun-10													10,260	25,860	0.4
14-Jun-10 Resumed sporadic around-the-clock operations @ 1:45 PM-Continued operational problems-operated 127.6 hrs/5.3+ days in June															
Jul-10 Continued operational problems in July - only operated 300.3 hours/12.5 days (40.4%)															
16-Aug-10	1,332	4,613	0.3	461	523	0.9	365	153	2.4	3,626	5,372	0.7	3,610	11,370	0.3
Aug-10 Continued operational problems in August - only operated 438.6 hours/18.275 days (59.0%)															
27-Sep-10	6,123	5,401	1.1	1,014	920	1.1	1,404	1,143	1.2	4,672	6,006	0.8	6,634	16,940	0.4
Sep-10 Most operational problems resolved - operated 588.8 hours/24.5 days (81.8%) in September															
21-Oct-10	11,360	9,285	1.2	456	544	0.8	1,602	1,268	1.3	5,330	7,295	0.7	5,109	8,720	0.6
Oct-10 Operated 605.3 hours/25.2 days (81.3%) in October															
18-Nov-10	8,286	5,972	1.4	1,124	910	1.2	910	789	1.2	4,966	6,084	0.8	5,479	6,756	0.8
Nov-10 Operated 658.7 hours/27.4 days (91.5%) in November															
14-Dec-10 Shut down because of low vacuum; subsequently pipes froze/off for winter months															
Dec-10 Operated 214.9 hours/9.0 days (28.9%) in December										-		-			
28-Apr-11	1,357	5,923	0.2	29	33	0.9	11	100	0.1	257	1,581	0.2	3,314	4,496	0.7
2-May-11 Resumed sporadic around-the-clock operations @ 1:45 PM-perated 543.2 hrs/22.6 days (73.0%) in May															
27-Jun-11	8,567	6,194	1.4	1,221	1,270	1.0	1,048	1,032	1.0	4,890	3,925	1.2	14,432	8,222	1.8
Jun-11 Operated 621.1 hours/25.9 days (86.3%) in June															
Jul-11 Operated 603.7 hours/25.2 days (81.1%) in July															
9-Aug-11	2,550	4,128	0.6	334	430	0.8	762	771	1.0	3,470	3,343	1.0	3,261	6,376	0.5
Aug-11 Operated 316.5 hours/13.2 days (42.5%) in August - Shut down 24 Aug to repair/replace leaking phase separator tank															
22-Sep-11	1,337	3,849	0.3	122	83	1.5	202	31	6.5	1,086	1,395	0.8	5,343	8,634	0.6
22-Nov-11	3,183	2,329	1.4	16	8	2.0	52	65	0.8	243	426	0.6	4,496	7,103	0.6
01-Dec-11	892	1,644	0.5	101	93	1.1	17	42	0.4	164	442	0.4	2,594	5,023	0.5
Dec-11 VER System off-line all of September, October, November & December															
2011 System operated a total of 2,084.5 of the possible hours during CY 2011 (23.8% of CY)															
20-Feb-12	408	1,633	0.2	46	14	3.3	104	bdl	NA	645	1,271	0.5	812	2,140	0.4
28-Mar-12	360	1,912	0.2	24	19	1.3	41	61	0.7	181	424	0.4	1,349	3,394	0.4
30-Apr-12 Phase separator repaired and resumed around-the-clock operations @ 2:00 PM - had been off-line since 24 Aug 2011															
30-Apr-12	867	4,456	0.2	78	81		15/15	19/23		244	1,302		969	3,010	0.3

NOTE: Operational problems limited operation to 32.7% of the time between 18 June 2007 & 31 Dec 2011

Note: Prior to Oct-10 RAP1-3R samples were diluted (10) - since then RAP1-3R not diluted

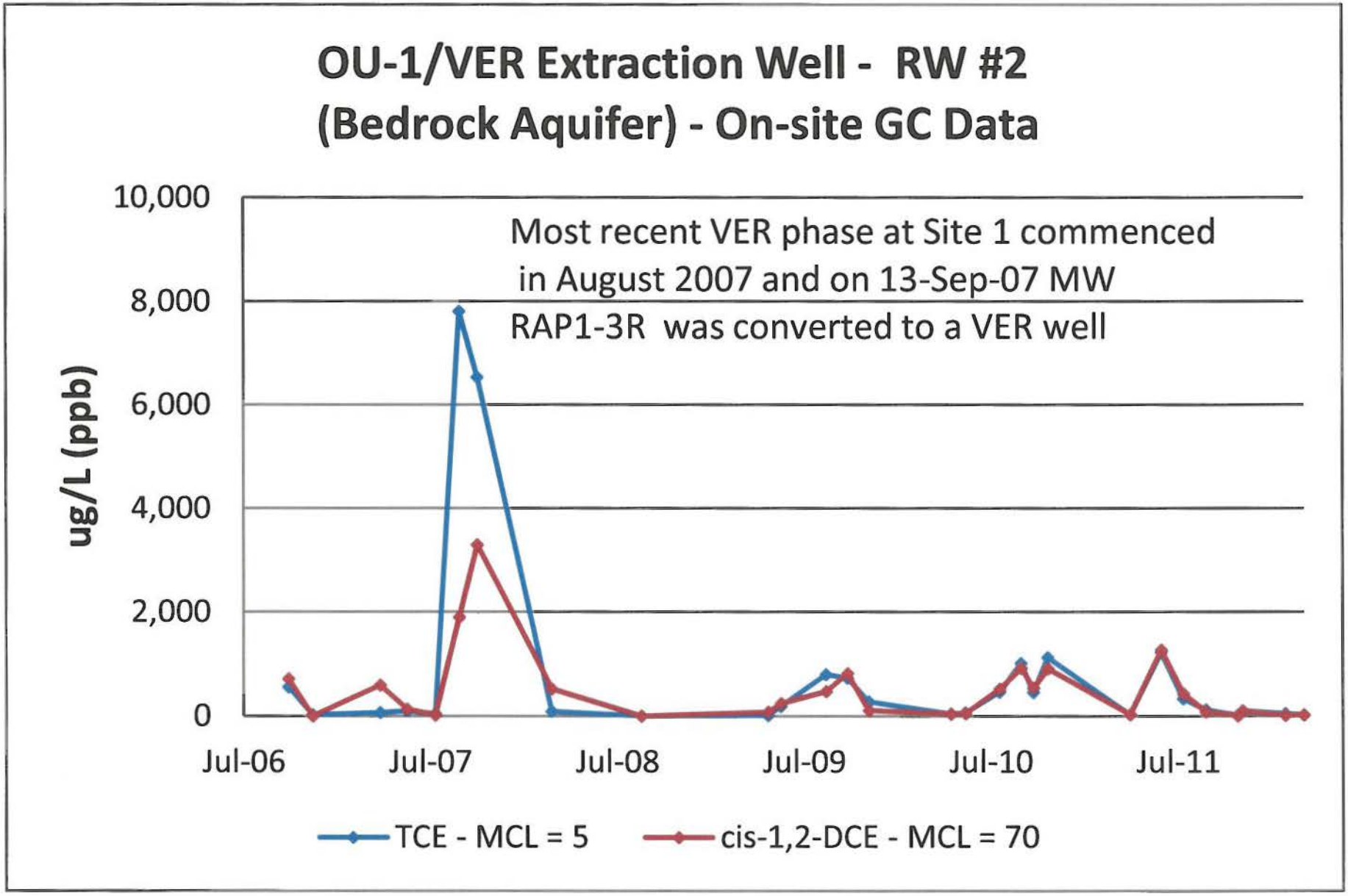
GC results prior to 2006 omitted/on file

OU-1 Site 1 VER System Extraction Wells - 2006 to present - TCE and cis-1,2-DCE Concentrations via On-site GC



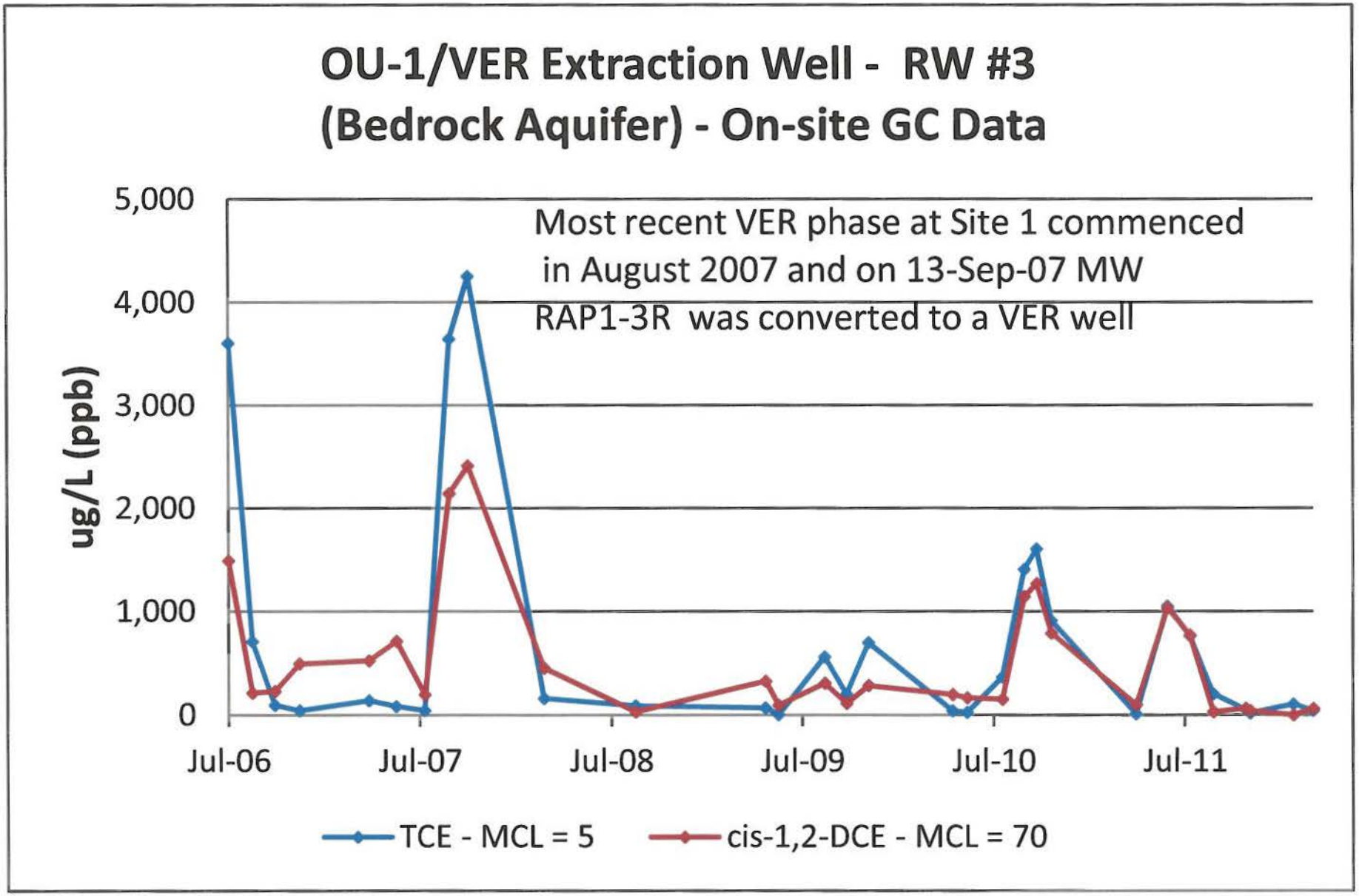
Operational problems limited operation to 32.7%
of the time between 18 June 2007 31 Dec 2011

OU-1 Site 1 VER System Extraction Wells - Jul-2006 to present - TCE and cis-1,2-DCE Concentrations via On-site GC



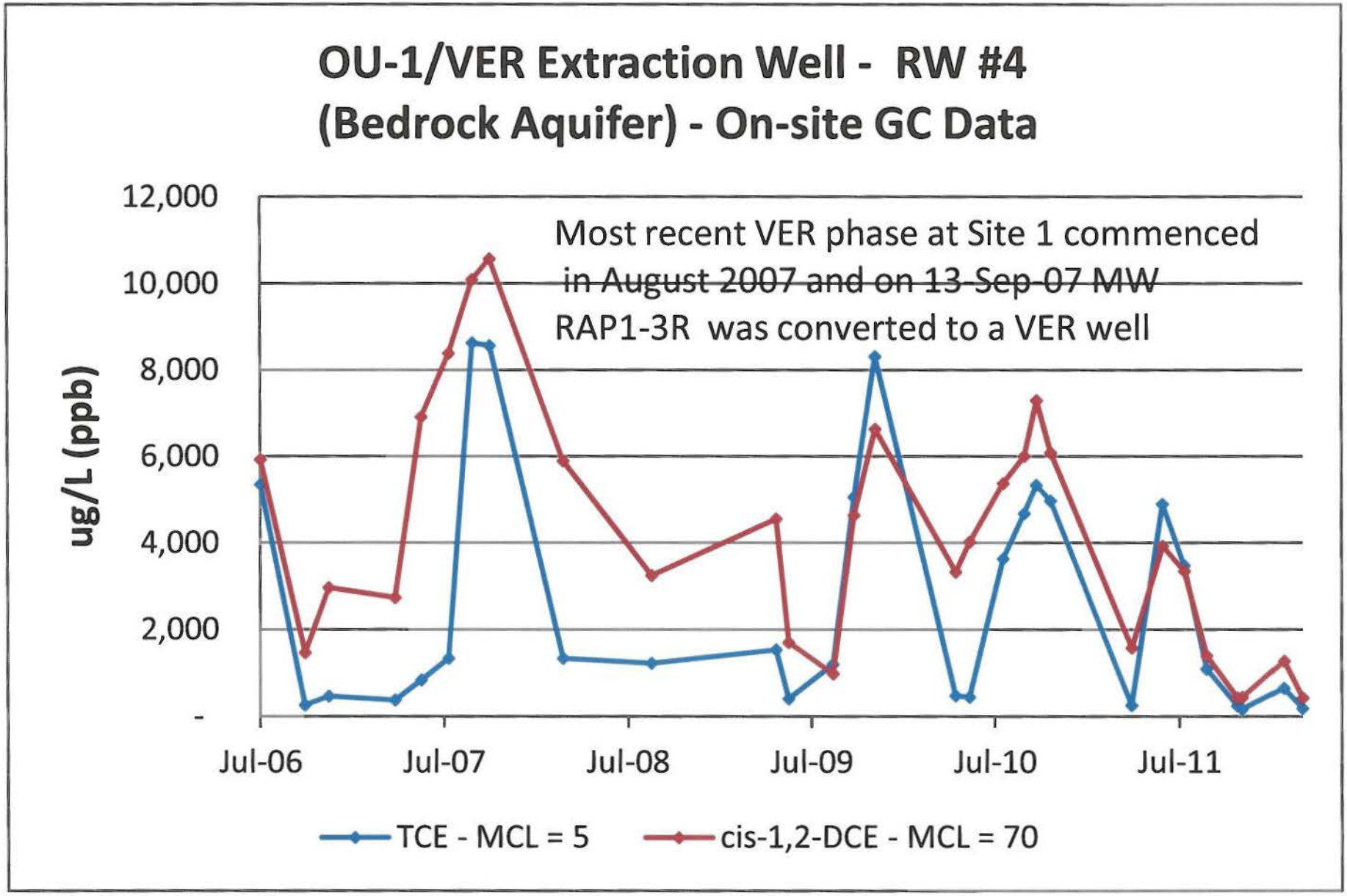
Operational problems limited operation to 32.7% of the time between 18 June 2007 31 Dec 2011

OU-1 Site 1 VER System Extraction Wells - Jul-2006 to present - TCE and cis-1,2-DCE Concentrations via On-site GC



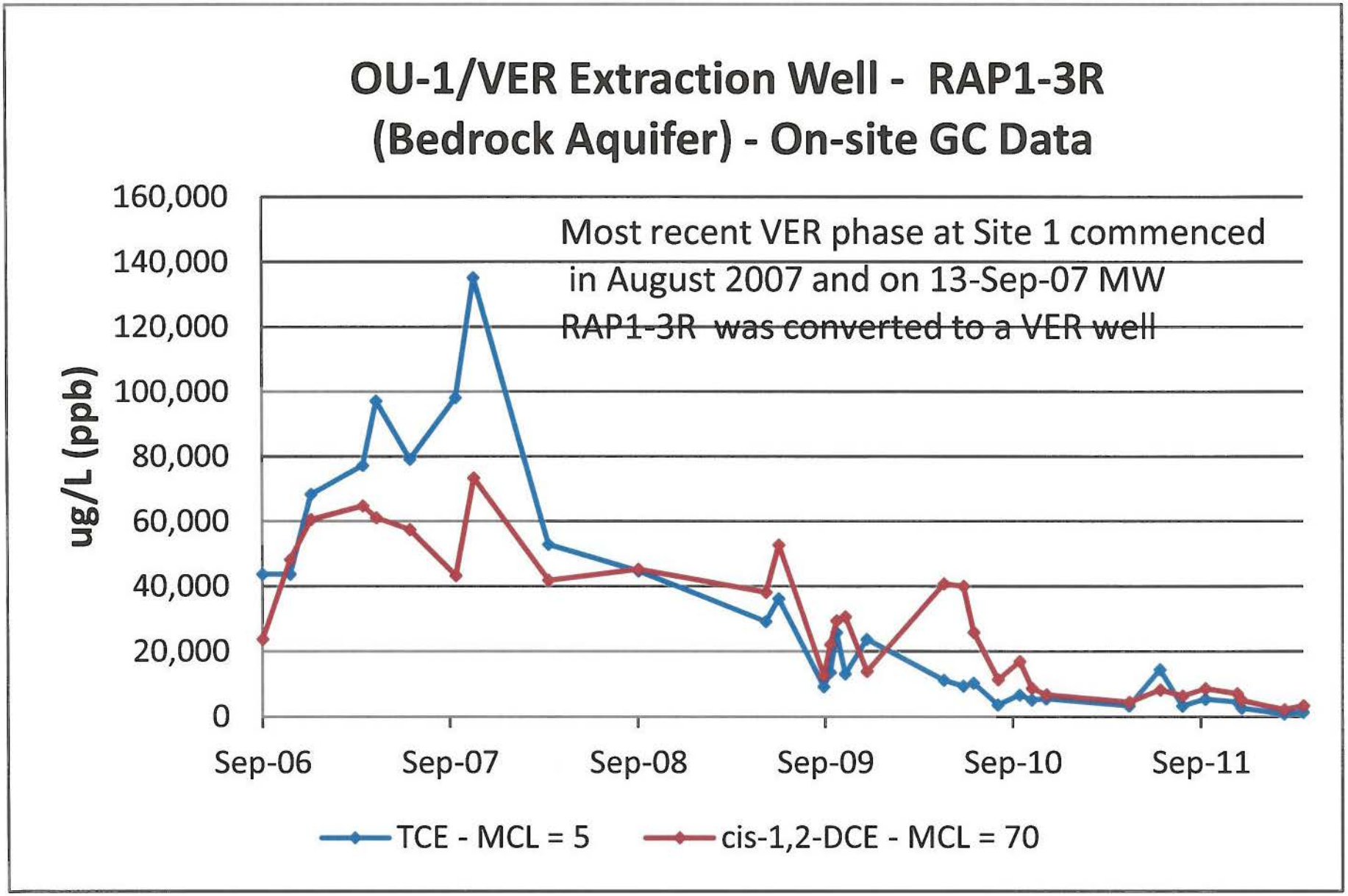
Operational problems limited operation to 32.7% of the time between 18 June 2007 31 Dec 2011

OU-1 Site 1 VER System Extraction Wells - Jul-2006 to present - TCE and cis-1,2-DCE Concentrations via On-site GC



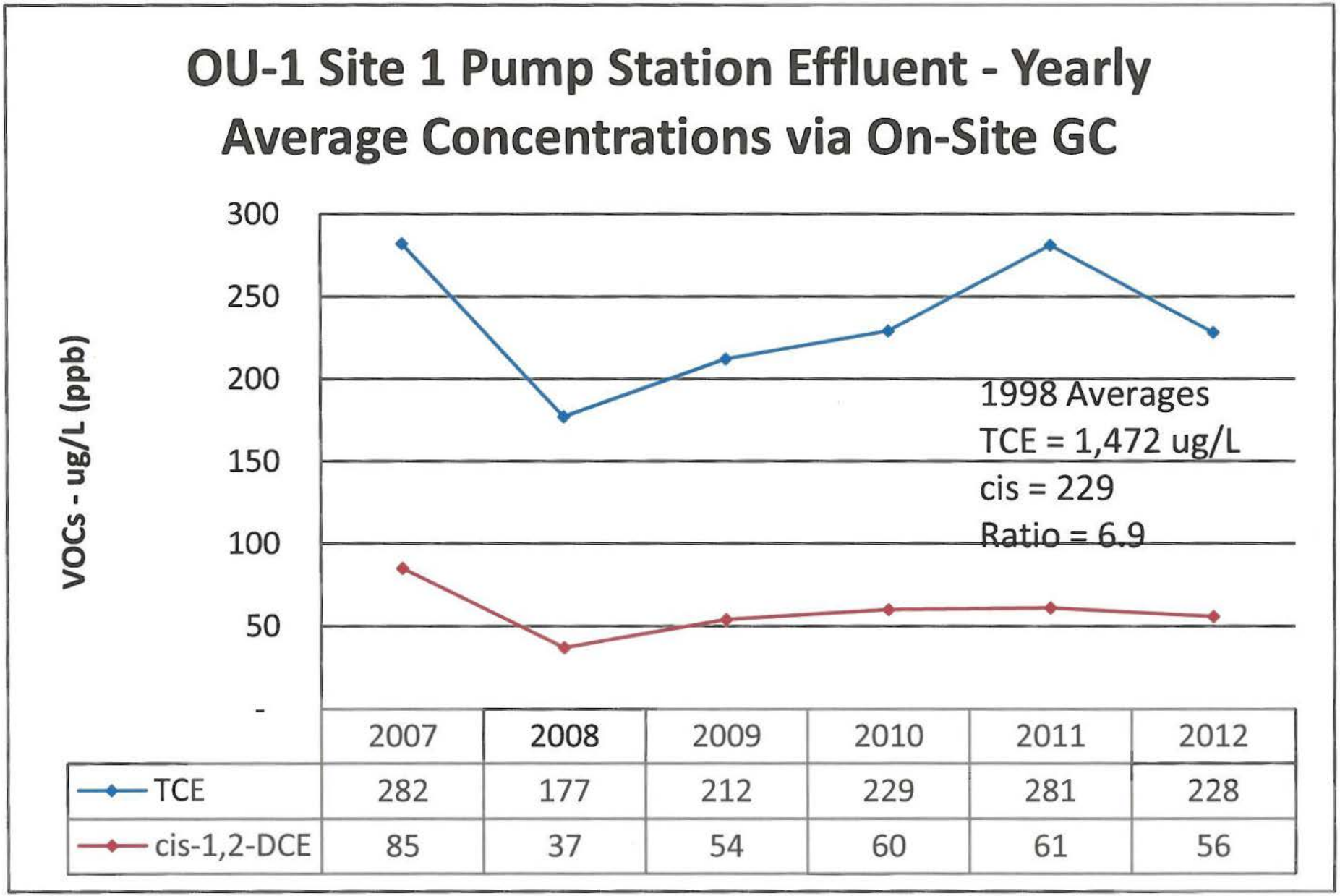
Operational problems limited operation to 32.7%
of the time between 18 June 2007 31 Dec 2011

OU-1 Site 1 VER System Extraction Wells - Sep-2006 to present - TCE and cis-1,2-DCE Concentrations via On-site GC



Operational problems limited operation to 32.7%
of the time between 18 June 2007 31 Dec 2011

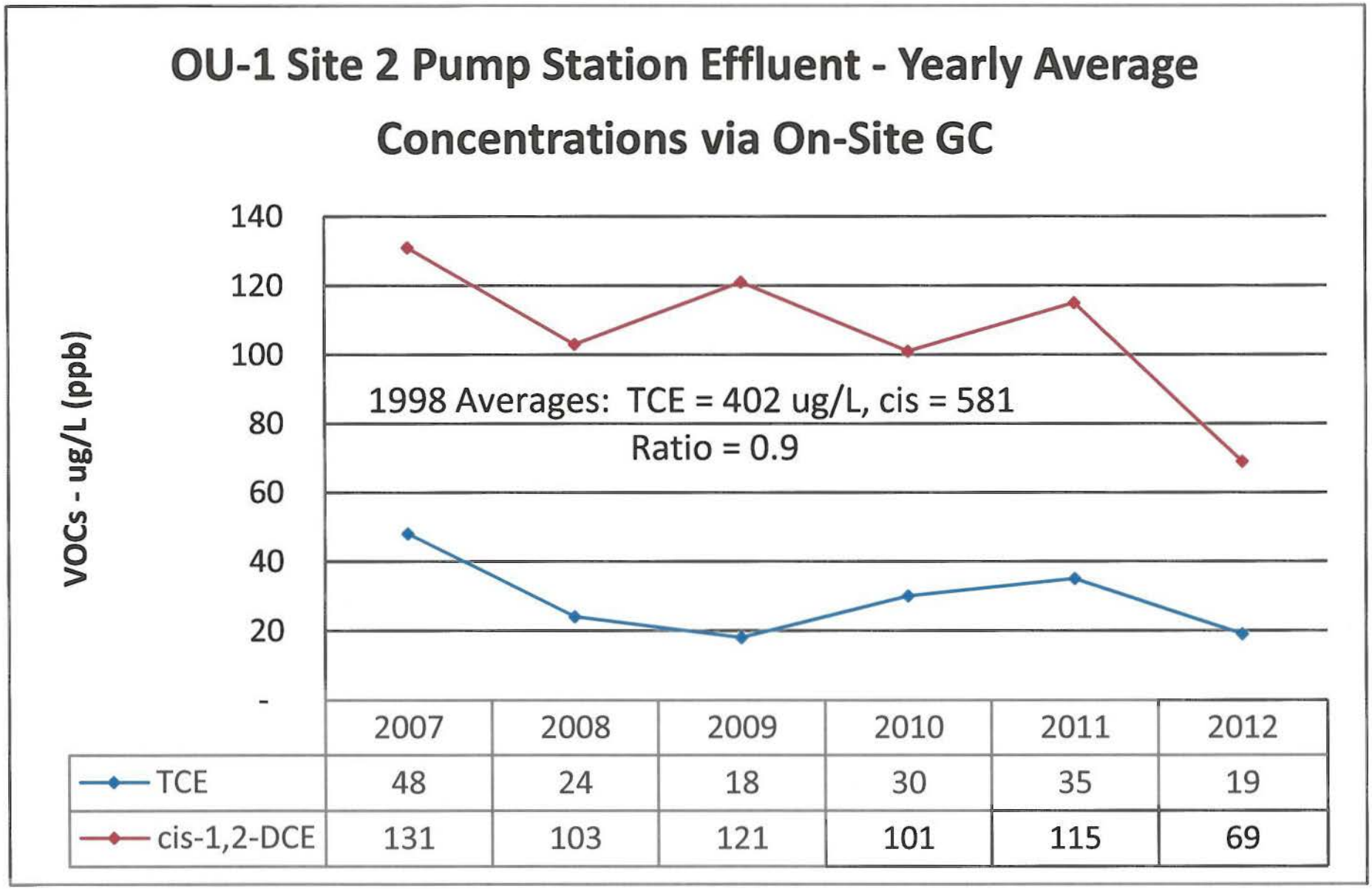
OU-1 Groundwater Collection Points CY 2007-2011 TCE and cis-1,2-DCE Concentrations via On-site GC



	2007	2008	2009	2010	2011	2012
TCE	282	177	212	229	281	228
cis-1,2-DCE	85	37	54	60	61	56

TCE - MCL = 5 ug/L; cis-1,2-DCE - MCL = 70 ug/L

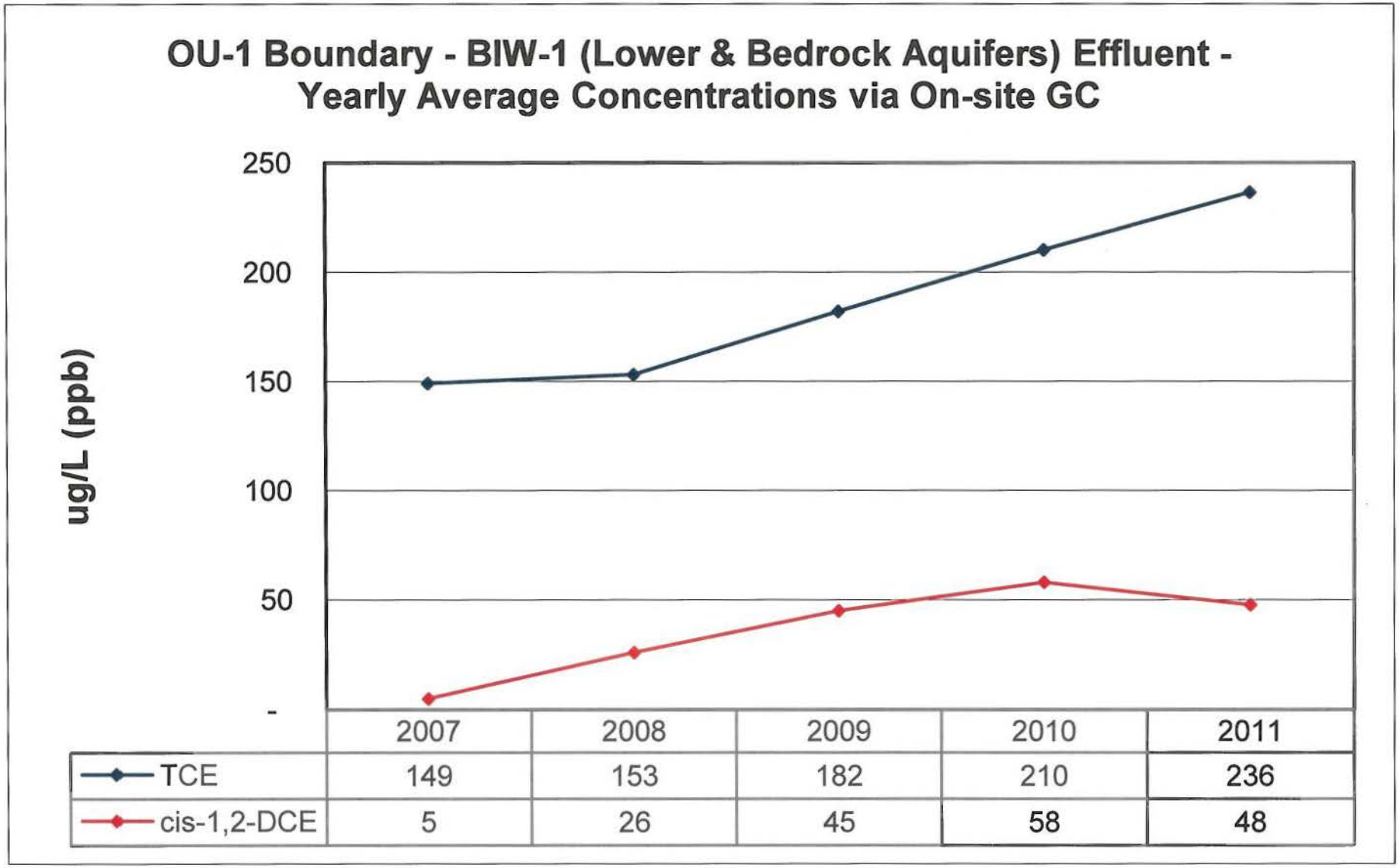
OU-1 Groundwater Collection Points CY 2007-2011 TCE and cis-1,2-DCE Concentrations via On-site GC



	2007	2008	2009	2010	2011	2012
TCE	48	24	18	30	35	19
cis-1,2-DCE	131	103	121	101	115	69

TCE - MCL = 5 ug/L; cis-1,2-DCE - MCL = 70 ug/L

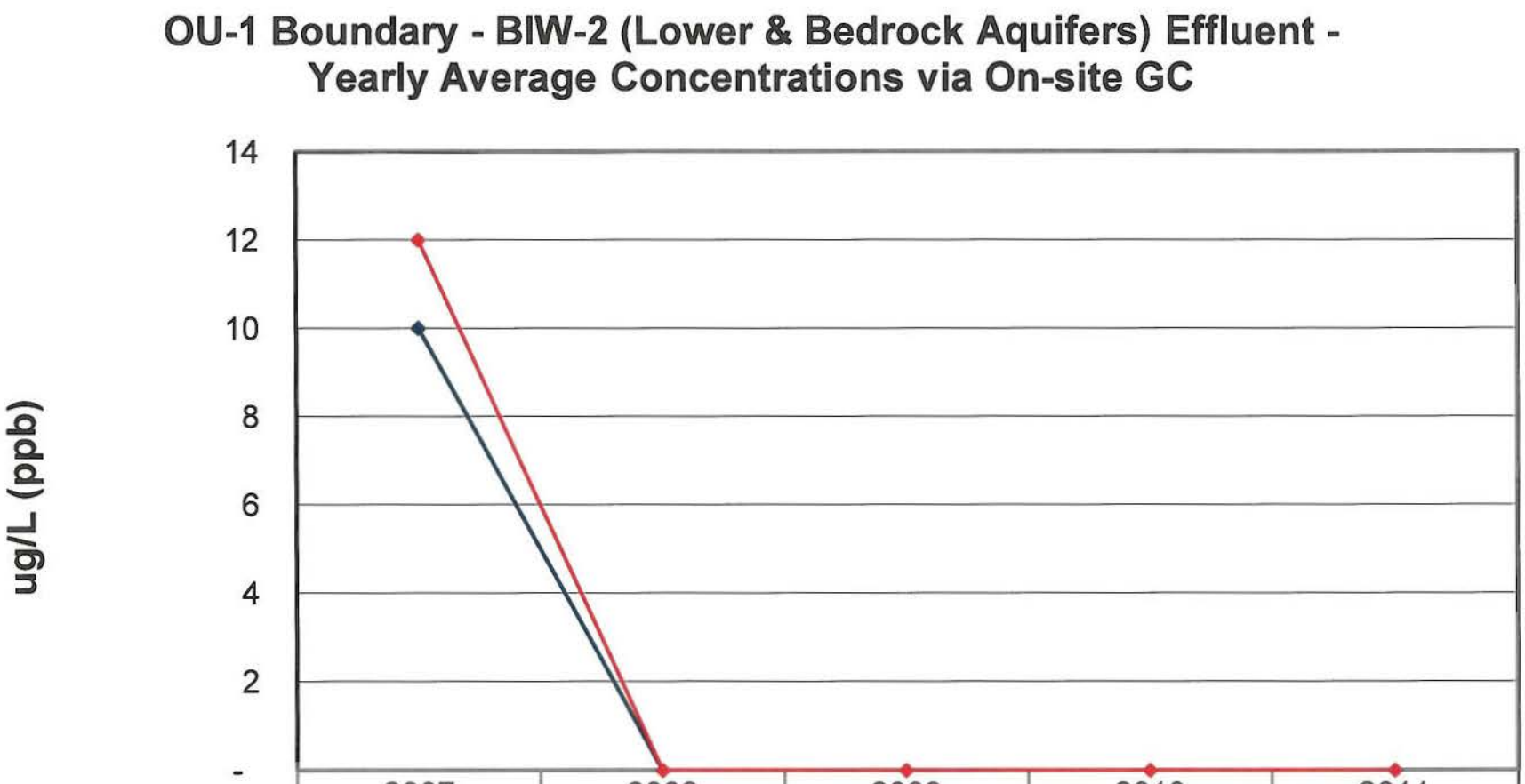
OU-1 Groundwater Collection Points CY 2007-2011 TCE and cis-1,2-DCE Concentrations via On-site GC



	2007	2008	2009	2010	2011
TCE	149	153	182	210	236
cis-1,2-DCE	5	26	45	58	48

TCE MCL = 5 ug/L; cis-1,2-DCE MCL = 70 ug/L

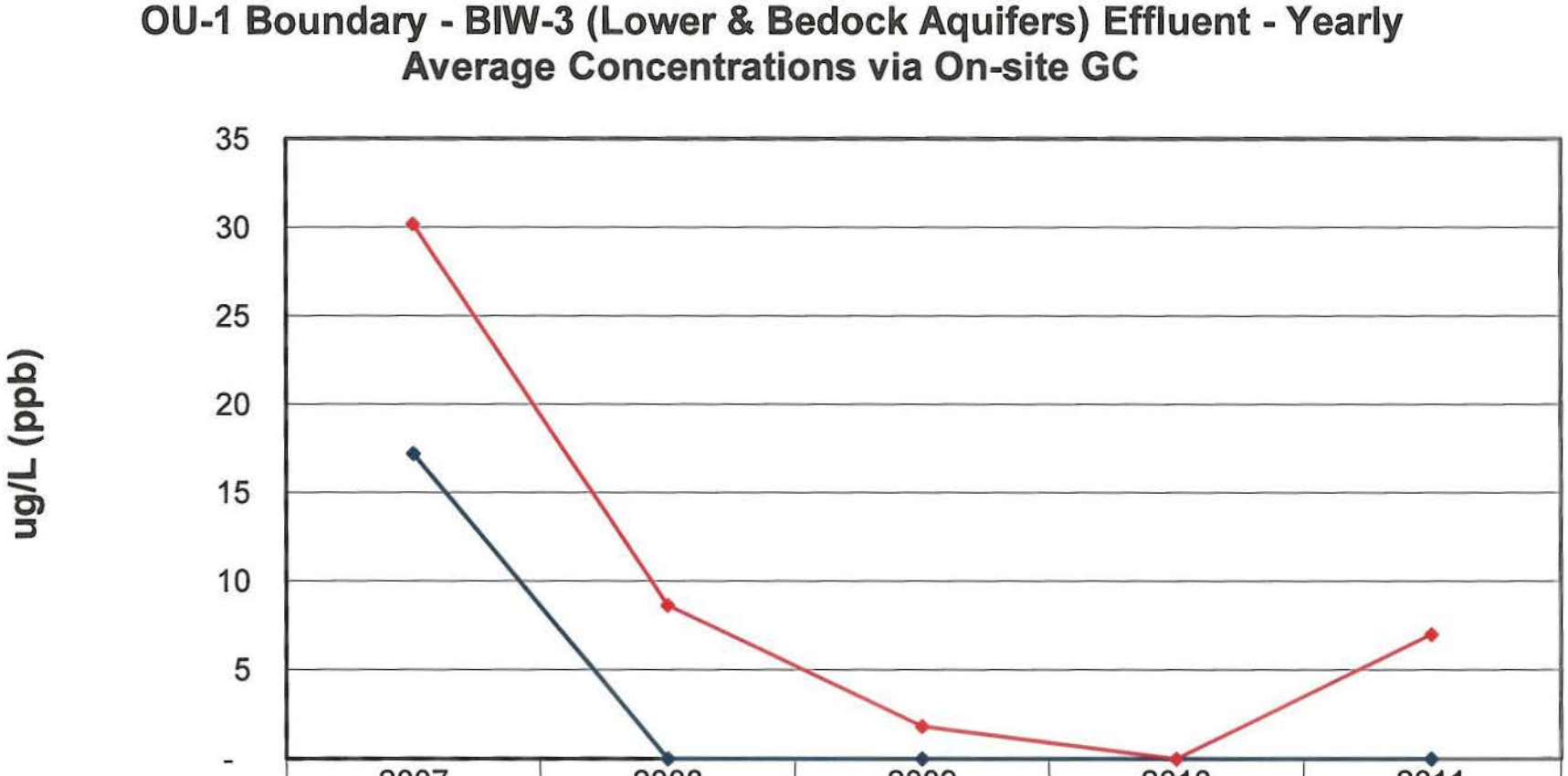
OU-1 Groundwater Collection Points CY 2007-2011 TCE and cis-1,2-DCE Concentrations via On-site GC



	2007	2008	2009	2010	2011
TCE	10	0	0	0	0
cis-1,2-DCE	12	0	0	0	0

TCE MCL = 5 ug/L; cis-1,2-DCE MCL = 70 ug/L

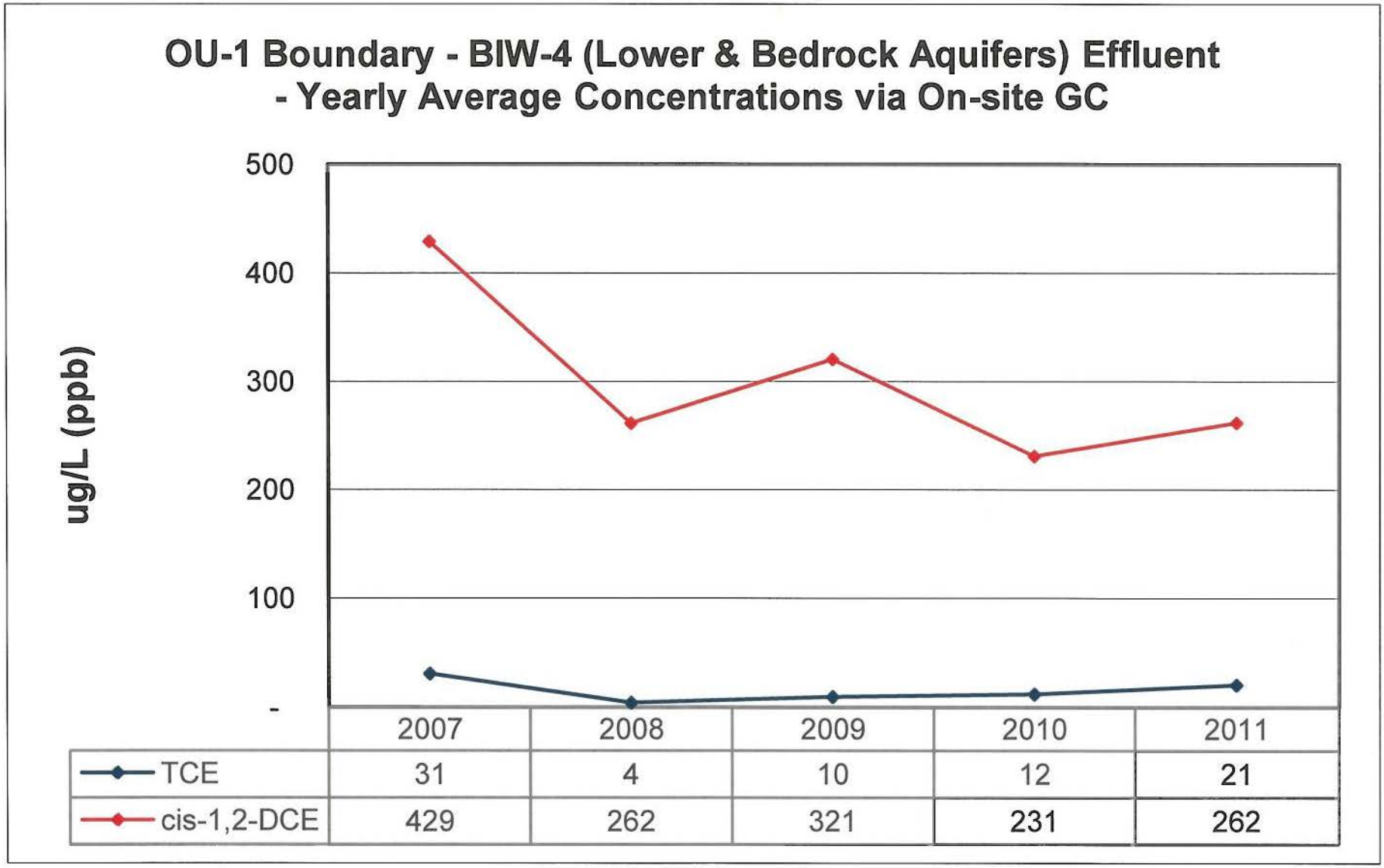
OU-1 Groundwater Collection Points CY 2007-2011 TCE and cis-1,2-DCE Concentrations via On-site GC



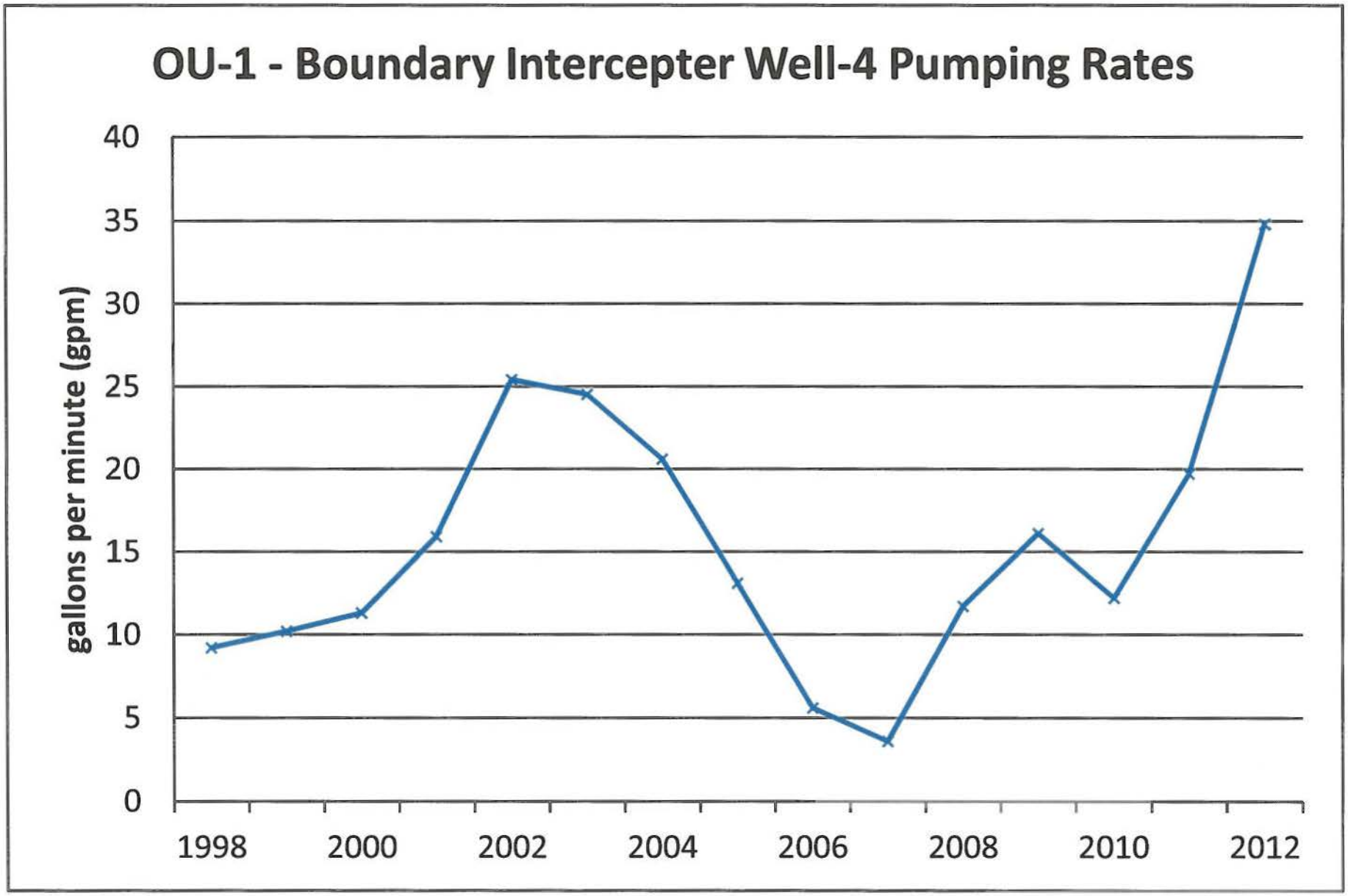
	2007	2008	2009	2010	2011
TCE	17	-	-	-	-
cis-1,2-DCE	30	9	2	-	7

TCE MCL = 5 ug/L; cis-1,2-DCE MCL = 70 ug/L

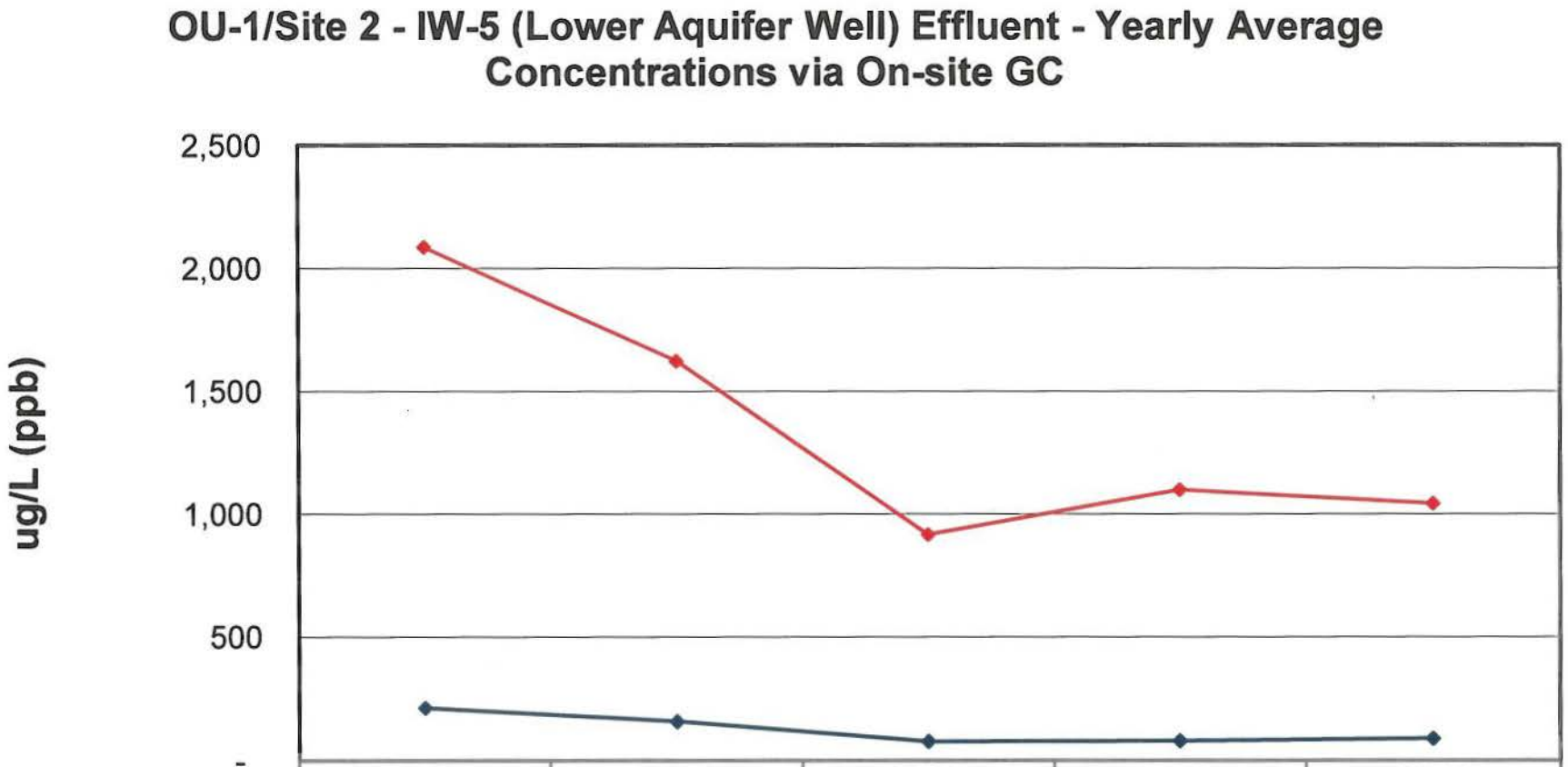
OU-1 Groundwater Collection Points CY 2007-2011 TCE and cis-1,2-DCE Concentrations via On-site GC



TCE MCL = 5 ug/L; cis-1,2-DCE MCL = 70 ug/L

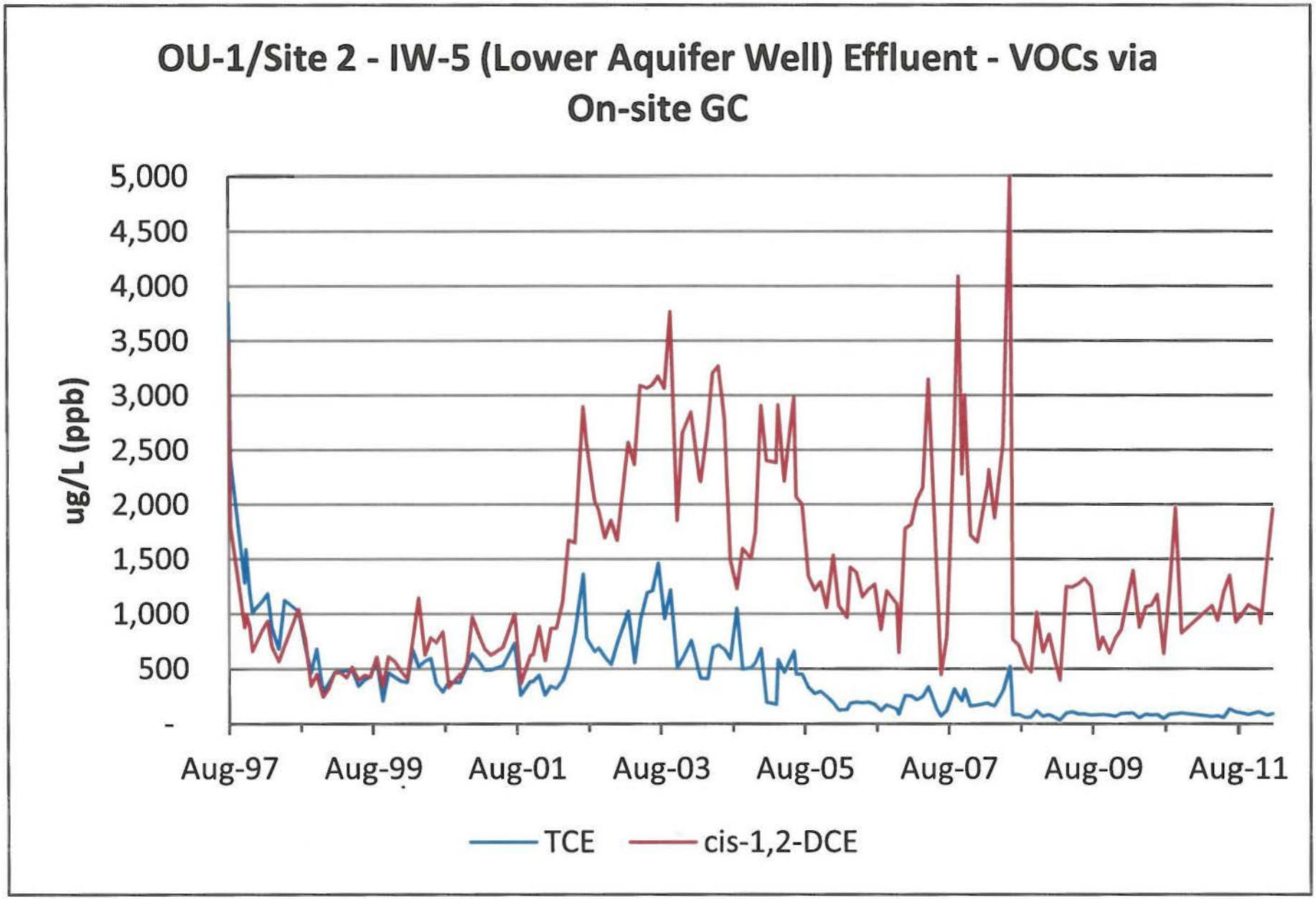

OU-1 - Boundary Intercepter Well-4 Pumping Rates
gallons per minute (gpm)
40
35
30
25
20
15
10
5
0
1998
2000
2002
2004
2006
2008
2010
2012

OU-1 Groundwater Collection Points CY 2007-2011 TCE and cis-1,2-DCE Concentrations via On-site GC

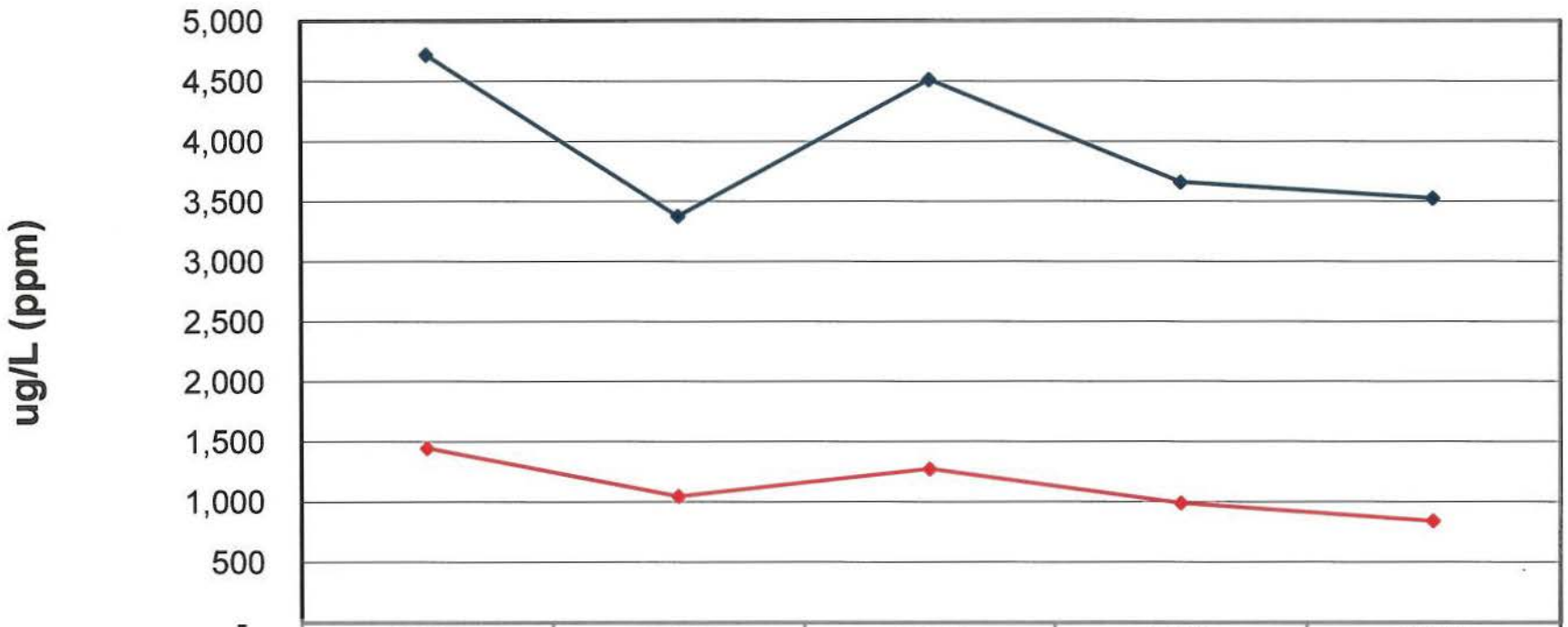


	2007	2008	2009	2010	2011
TCE	213	158	77	80	89
cis-1,2-DCE	2,087	1,623	916	1,098	1,042

TCE MCL = 5 ug/L; cis-1,2-DCE MCL = 70 ug/L


OU-1/Site 2 - IW-5 (Lower Aquifer Well) Effluent - VOCs via On-site GC
ug/L (ppb)
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
-
Aug-97
Aug-99
Aug-01
Aug-03
Aug-05
Aug-07
Aug-09
Aug-11
TCE
cis-1,2-DCE

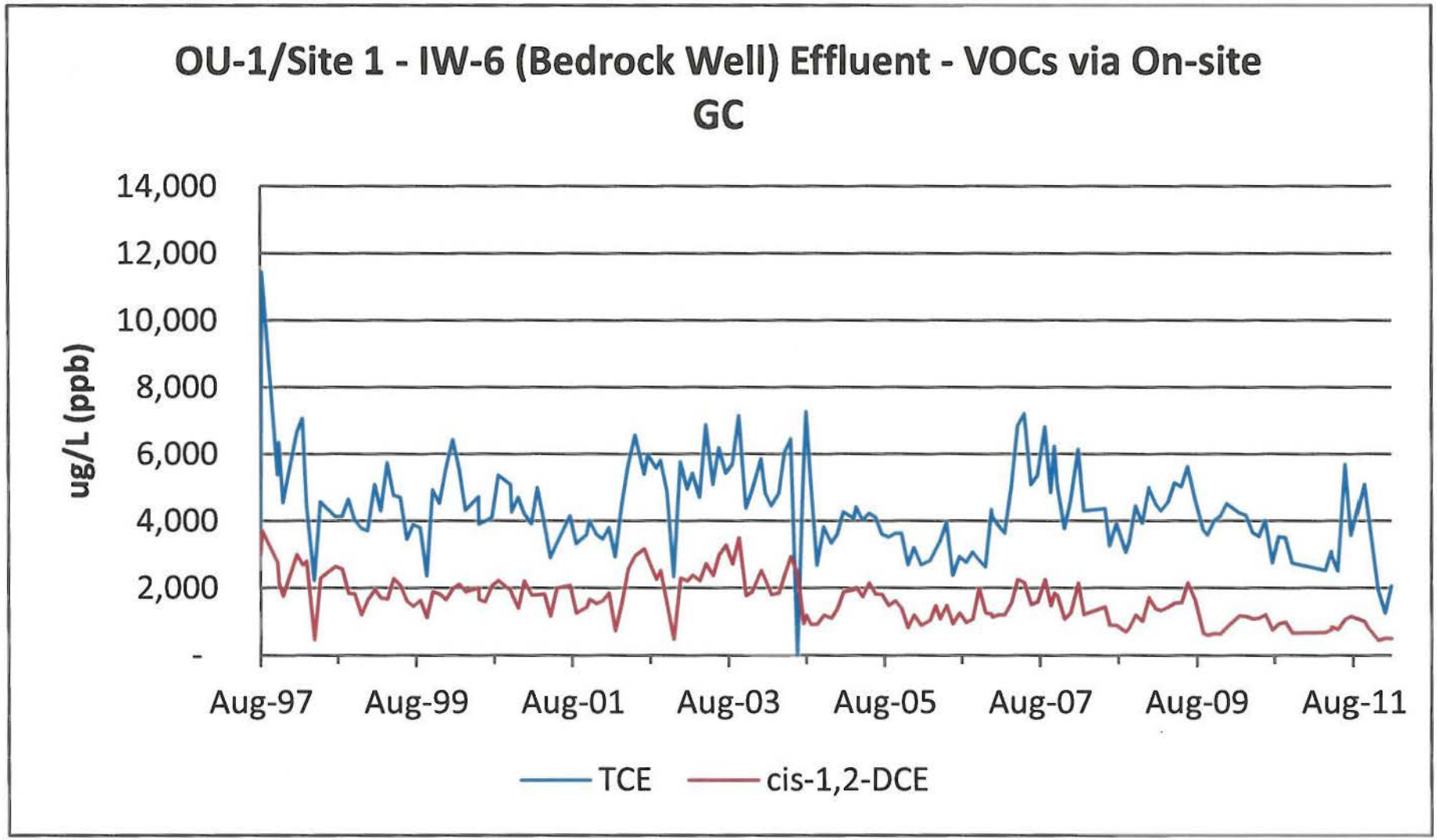
OU-1 Groundwater Collection Points CY 2007-2011 TCE and cis-1,2-DCE Concentrations via On-site GC



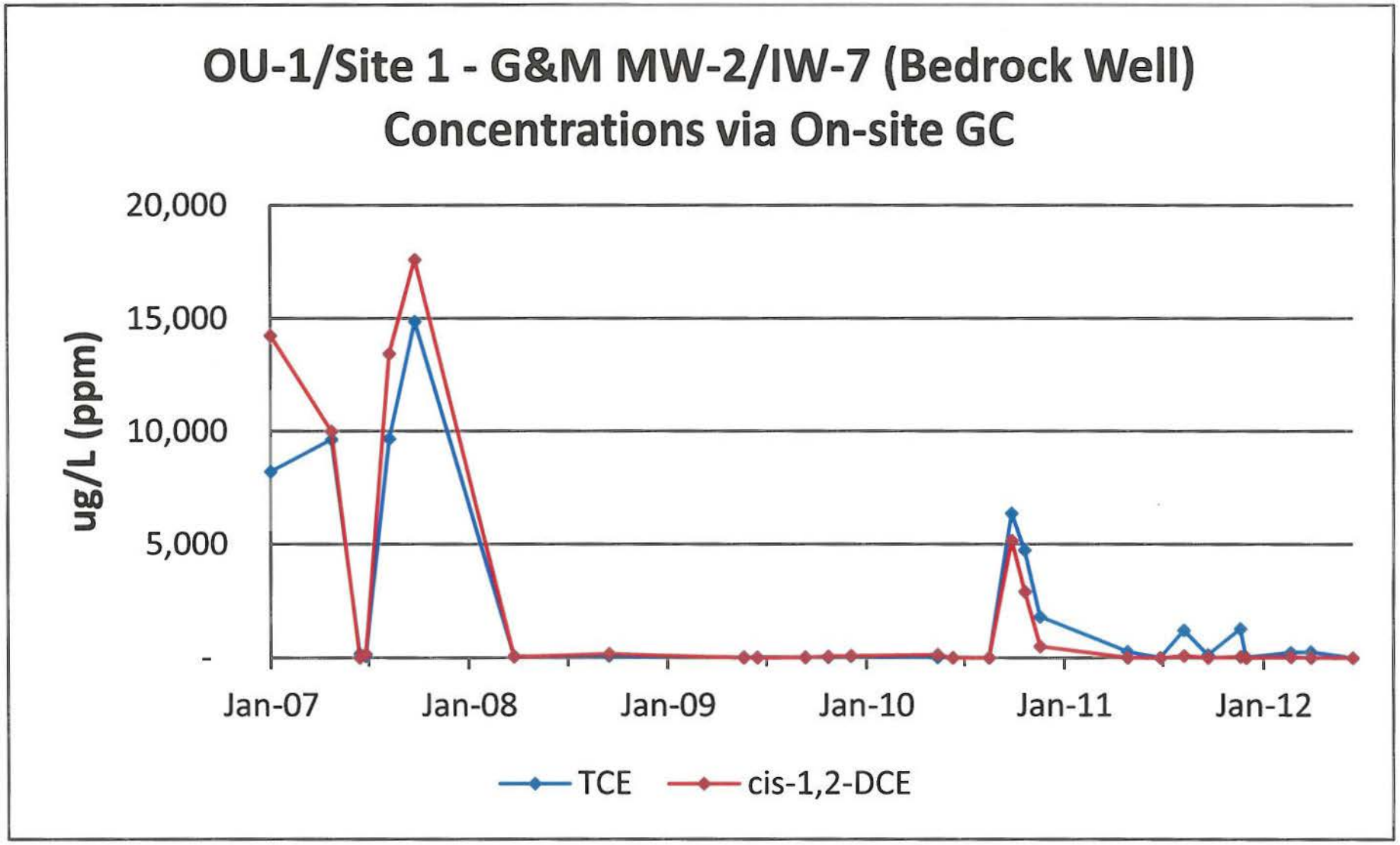
	2007	2008	2009	2010	2011
TCE	4,718	3,376	4,512	3,660	3,525
cis-1,2-DCE	1,446	1,046	1,272	990	841

TCE MCL = 5 ug/L; cis-1,2-DCE MCL = 70 ug/L

OU-1 Groundwater Collection Points CY 1997-2012 TCE and cis-1,2-DCE Concentrations via On-site GC

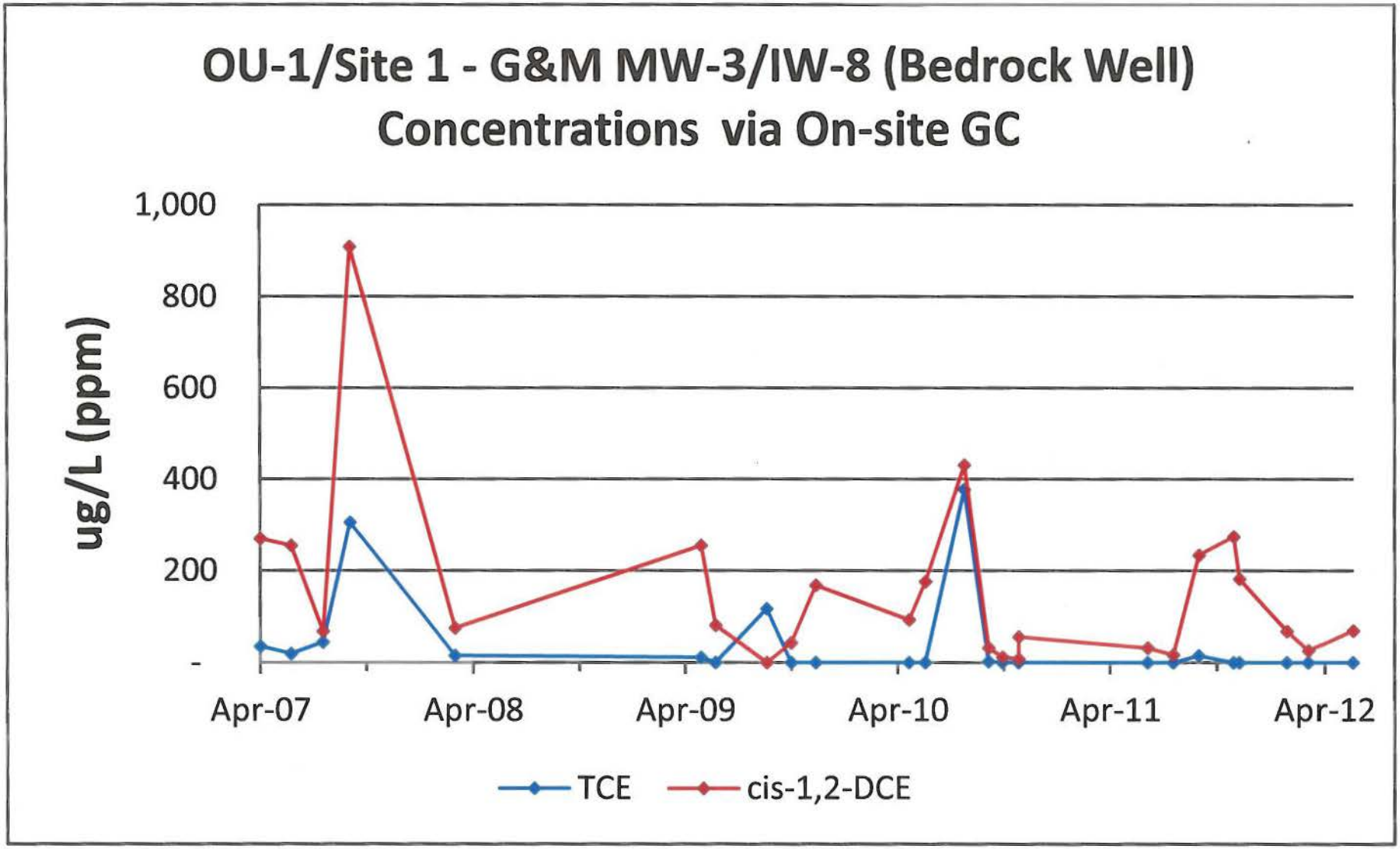


OU-1 Groundwater Collection Points CY 2007-2012 TCE and cis-1,2-DCE Concentrations via On-site GC



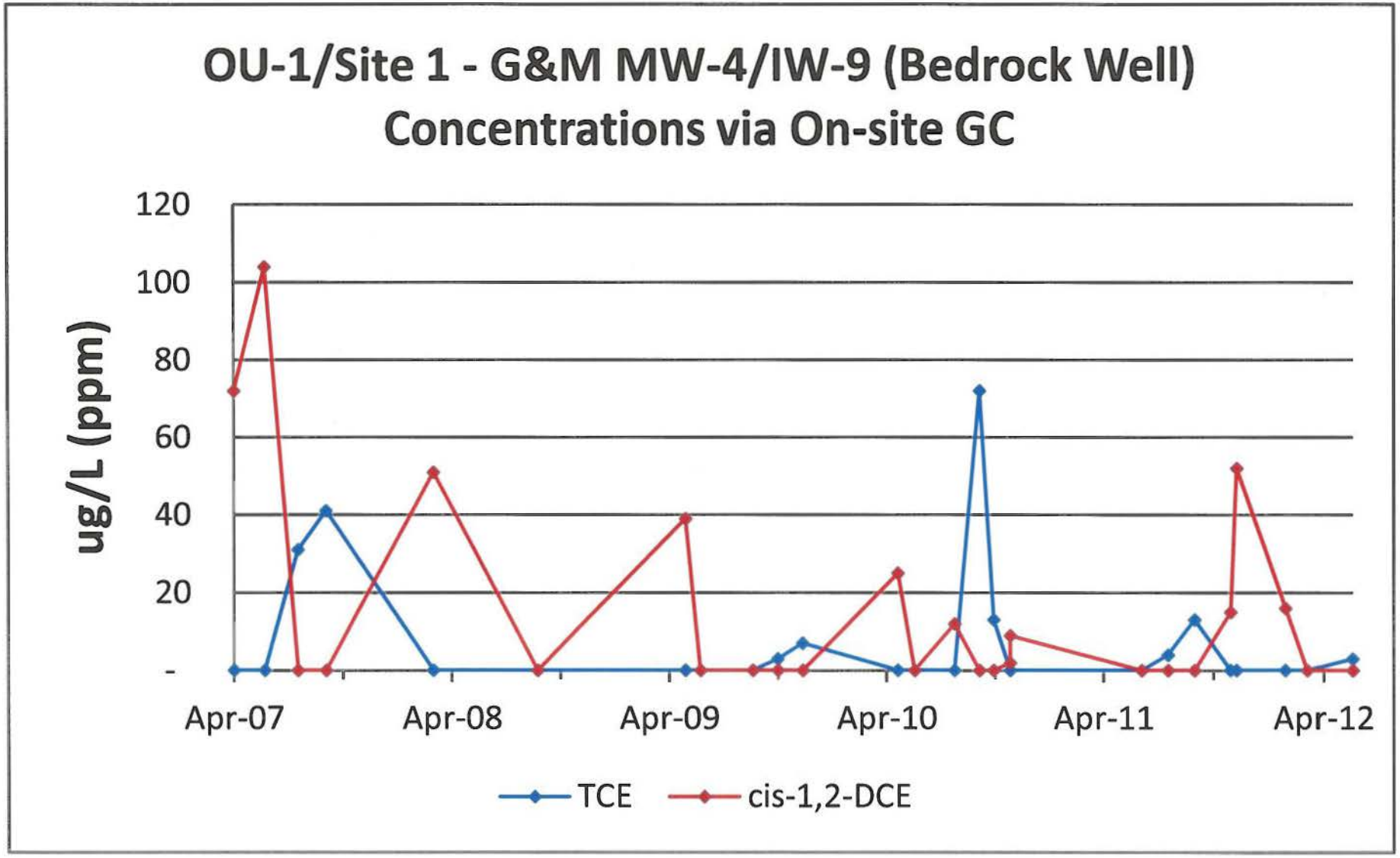
TCE MCL = 5 ug/L; cis-1,2-DCE MCL = 70 ug/L

OU-1 Groundwater Collection Points CY 2007-2012 TCE and cis-1,2-DCE Concentrations via On-site GC



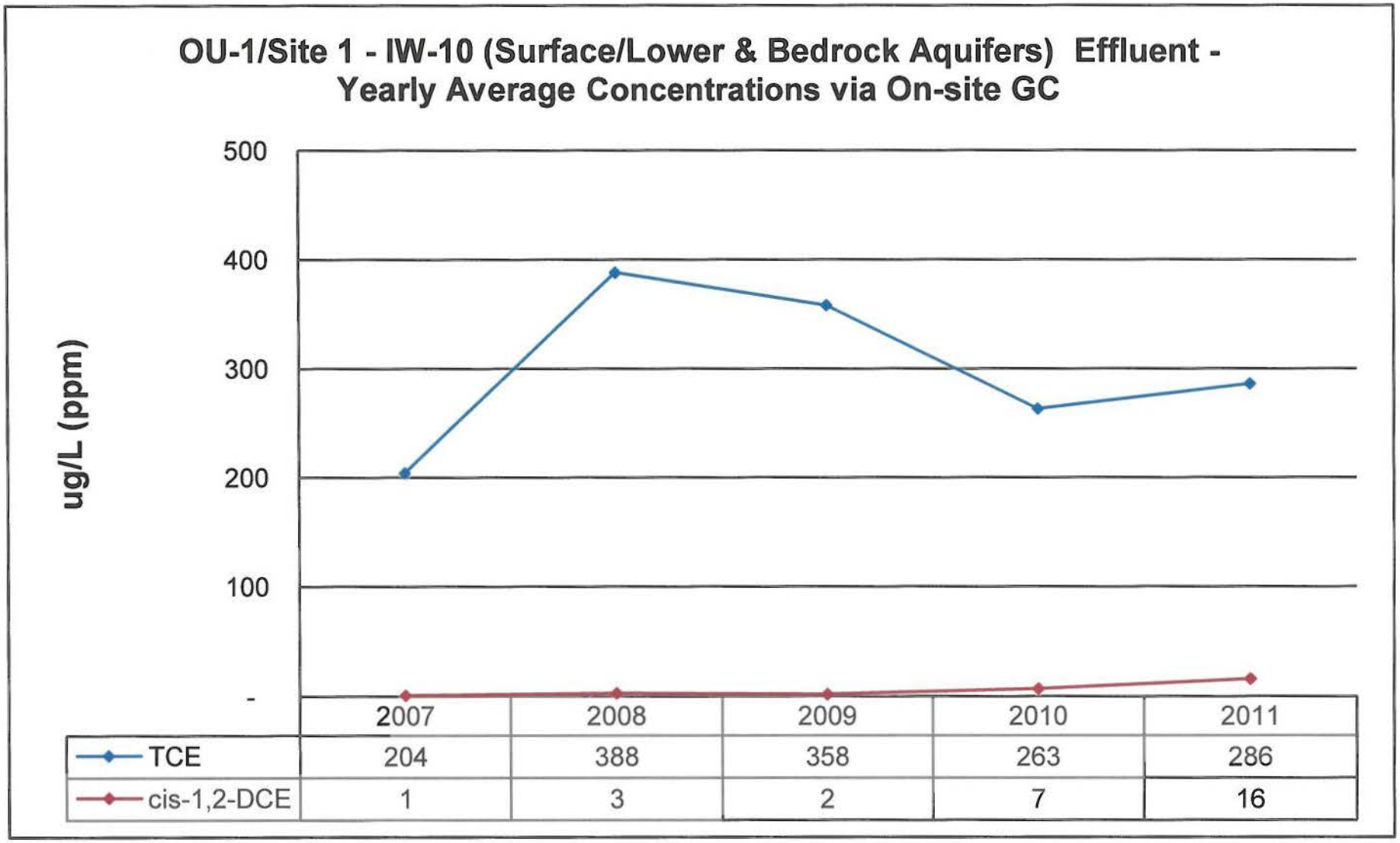
TCE MCL = 5 ug/L; cis-1,2-DCE MCL = 70 ug/L

OU-1 Groundwater Collection Points CY 2007-2012 TCE and cis-1,2-DCE Concentrations via On-site GC



TCE MCL = 5 ug/L; cis-1,2-DCE MCL = 70 ug/L

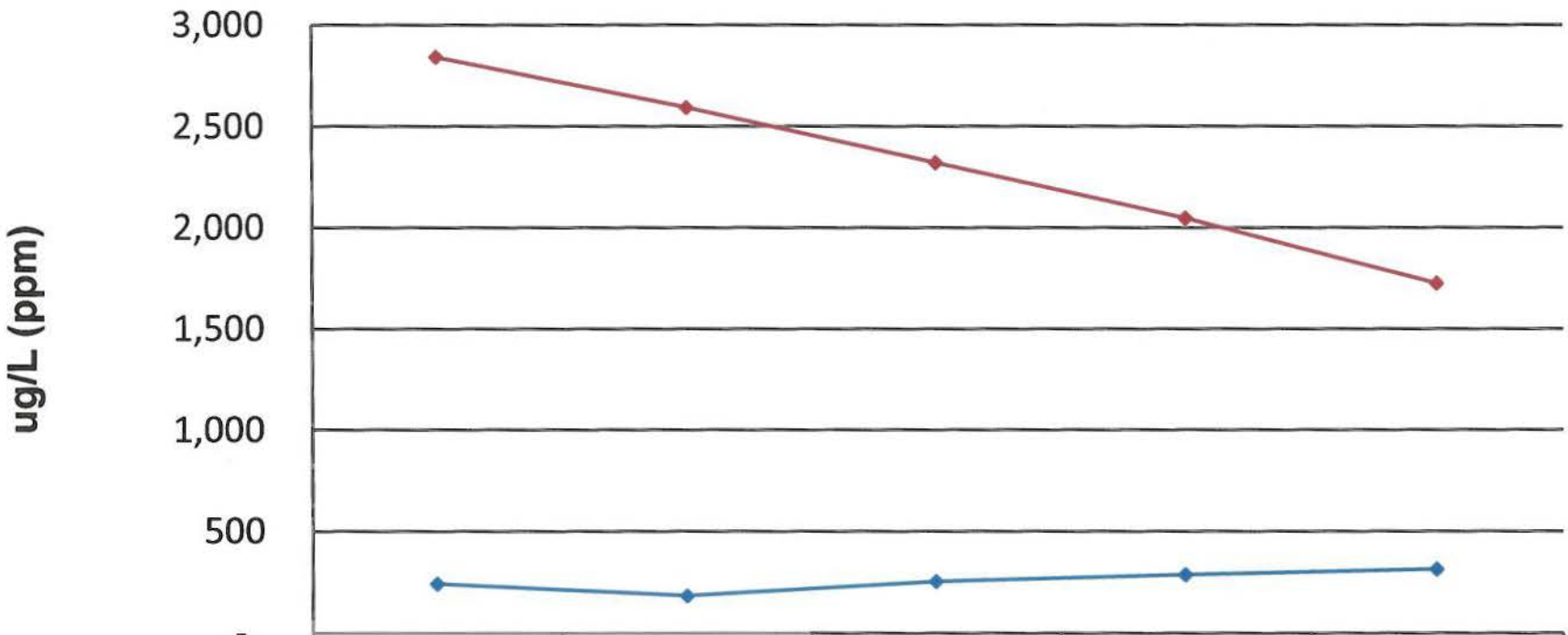
OU-1 Groundwater Collection Points CY 2007-2011 TCE and cis-1,2-DCE Concentrations via On-site GC



	2007	2008	2009	2010	2011
TCE	204	388	358	263	286
cis-1,2-DCE	1	3	2	7	16

TCE MCL = 5 ug/L; cis-1,2-DCE MCL = 70 ug/L

OU-1 Groundwater Collection Points CY 2007-2011 TCE and cis-1,2-DCE Concentrations via On-site GC



	2007	2008	2009	2010	2011
TCE	241	183	253	286	313
cis-1,2-DCE	2,842	2,593	2,321	2,047	1,725

TCE MCL = 5 ug/L; cis-1,2-DCE MCL = 70 ug/L

Attachment D – OU-1 LTMP Historical Summary of Chemical Analytical Data

Well	Location/Aquifer	Page
B108	Site 1 and/or Site 2 Plume Lower Aquifer	D–1
B111	Off-Site (Bedford Forest) Lower Aquifer	D–2
B113	Site 1 and/or Site 2 Plume - Lower Aquifer	D–2
B115	Site 2 Source Areas Lower Aquifer	D–3
B117	Site 3 Lower Aquifer	D–3
B118	Site 3 Collection Trench Surface Aquifer	D–4
B122	Site 3 Lower Aquifer	D–5
B125	Site 3 Source Areas Lower Aquifer	D–5
B126	Boundary Lower Aquifer	D–6
B128	Off-Site (Bedford Forest) Surface Aquifer	D–6
B129	Off-Site (Bedford Forest) Surface Aquifer	D–7
B232	Site 3 Lower Aquifer	D–7
B242	Site 1 Plume - Lower Aquifer	D–8
B243	Site 1 Plume - Bedrock Aquifer	D–8
B244A	Off-Site (Bedford Forest) Bedrock Aquifer - South/West Flank	D–8 & 9
B245	Off-Site (Bedford Forest) Lower Aquifer - South/West Flank	D–9
B246	Off-Site (Bedford Forest) Surface Aquifer - South/West Flank	D–10
B247	Off-Site (Bedford Forest) Surface Aquifer - Center of Plume	D–10
B248	Off-Site (Bedford Forest) Lower Aquifer - Center of Plume	D–10 & 11
B249	Off-Site (Bedford Forest) Bedrock Aquifer - Center of Plume	D–11 & 12
B250	Off-Site (Bedford Forest) Surface Aquifer - South/East Flank	D–12
B251	Off-Site (Bedford Forest) Lower Aquifer - South/East Flank	D–12
B252	Off-Site (Bedford Forest) Bedrock Aquifer - South/East Flank	D–13
B253	Off-Site (Bedford Forest) Surface Aquifer - Northeast/Leading Edge	D–13
B254	Off-Site (Bedford Forest) Lower Aquifer - Northeast/Leading Edge	D–13
B255	Off-Site (Bedford Forest) Bedrock Aquifer - Northeast/Leading Edge	D–14
OW2-6	Site 2 Collection Trench Surface Aquifer	D–14
OW3-7	Site 3 Source Areas Surface Aquifer	D–15
OW3-14	Site 3 Collection Trench Surface Aquifer	D–15
PO1-2R	Boundary - Bedrock Aquifer	D–15 & 16
PO2-1RA	Boundary - Lower Aquifer	D–16
PT1-RA	Boundary - Lower Aquifer	D–16
RAP1-1T	Boundary - Lower Aquifer	D–17
RAP1-1R	Boundary - Bedrock Aquifer	D–17 & 18
RAP1-3R	Site 1 Source Area - Bedrock Aquifer	D–18 & 19
RAP1-3S	Site 1 Source Area – Surface/Till Aquifer	D–19
RAP1-4RA	Boundary - Bedrock Aquifer	D–20
RAP1-5R	Site 1 Collection Trench Area - Bedrock Aquifer	D–20
RAP1-6 S	Site 1 Plume - Surface Aquifer	D–21
RAP1-6 T	Site 1 Plume - Lower Aquifer	D–22 & 23
RAP1-6 R	Site 1 Plume - Bedrock Aquifer	D–23 & 24
RAP1-7 S	Bedford Community Gardens - Surface Aquifer	D–25
RAP1-7 T	Bedford Community Gardens - Lower Aquifer	D–25
RAP1-7 R	Bedford Community Gardens - Bedrock Aquifer	D–25 & 26

RAP1-SW4 - Surface Water Monitoring Point ..... D–26 & 27

RAP2-1T – Boundary - Lower Aquifer D–28
RAP2-1R – Boundary - Bedrock Aquifer D–29
RAP2-2T – Site 1 and/or Site 2Plume - Lower Aquifer D–30
RAP2-2R – Site 1 and/or Site 2 Plume - Bedrock Aquifer D–30
RAP2-3T – Boundary - Lower Aquifer D–31
RAP2-3R – Boundary - Bedrock Aquifer D–31
RAP3-3S – Site 3 Surface Aquifer D–32
RAP3-3T – Site 3 Lower Aquifer D–33
RAP3-4S – Site 3 Surface Aquifer ..... D–33 & 34
RAP3-4T – Site 3 Lower Aquifer D–35
RFW-11 – Site 2 Surface Aquifer D–36

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	B-108		LOWER AQUIFER								
SAMPLING ROUND	Round 7	Round 8	Round 9	Round 10	Round 11	Round 12	Round 12	Round 12	Round 12	Round 13	LTSP 2000
SAMPLING DATE	28-Jun-94	7-Nov-94	2-Jul-96	6-May-97	8-May-98	12-May-99 Pbag - A	12-May-99 Pbag - B	12-May-99 Pbag - C	13-May-99 Low-f	6-Oct-99 P pump	22-Sep-00
1,1-Dichlorethane			0.55j								0.24M
1,1-Dichlorethylene											0.16M
1,2-Dichlorethene (total)	8.8	9.5	37	28	210	22	25	26	7.4		
Acetone						3.3BL	3.1BL	3.5BL	7.7BL		
Carbon disulfide											0.1B
Chloroform				0.48j							
Chloromethane				0.6							0.25M
cis-1,2-Dichlorethene										19	35.92M
Dichloromethane/Methylene Chloride											0.4B
trans-1,2-Dichlorethene											0.32M
Trichloroethene	12	12	20	15	470	21	12	14	16	14	18.1M
TOTAL VOCs	20.8	21.5	57.6	44.1	680	43	37	40	23.4	33	55.5

MONITORING WELL:	B-108		LOWER AQUIFER								
SAMPLING ROUND	LTSP 2001	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	5-Sep-01	26-Sep-02	18-Nov-03	18-Nov-04	16-Nov-05	9-Nov-06	7-Nov-07	November-08	25-Nov-09	23-Nov-10	21-Nov-11
1,1-Dichloroethane	0.62	1.31	1.76	3.23	5.55	4.82	0.84F	0.36 F	0.31 F	1.1	0.87F
1,1-Dichloroethene	0.41F	0.68F	0.72F	1.35F	1.92F	1.55F	0.32F	0.23 F	0.20 F	0.25 F	0.26F
1,2-Dichloroethane				0.23F							
1,2,4-Trichlorobenzene									0.14 F		
Acetone							1.87F				
Benzene	0.27F			0.22F				0.17 FJ	0.16 F		
Chloromethane	0.25F									0.27 F	
cis-1,2-Dichloroethene	78.68	90.69M	96.35M	128.4M	141	101M	37.20	35 J	31	35	29
Dichlorodifluoromethane	0.3F										
Dichloromethane/Methylene Chloride	0.6J				1.72F		0.11F		0.46 FB		0.73F
Naphthalene				0.38F							
trans-1,2-Dichloroethene	0.11F		0.56F	0.45F	0.625F	0.525F	0.23F	0.22 FJ	0.10 F	0.13 F	0.097F
Trichloroethene	37.1	32.7	29.5	22.28	23.40	18.5J	10.3	6.4	5.4	4.5	3.8
Vinyl chloride	0.45F	1.48F	2.18F	4.73	9.38	11.30	1.62	0.46 F	0.60 F	1.7	0.22F
TOTAL VOCs	118.8	126.9	131.1	161.3	183.6	137.7	52.5	42.8	37.7	42.95	34.98

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	B-111		LOWER AQUIFER								
SAMPLING ROUND	Round 7	Round 8	Round 9	Round 10	Round 11	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999
SAMPLING DATE	1-Jul-94	7-Nov-94	28-Jun-96	20-May-97	11-May-98	10-May-99	10-May-99	10-May-99	10-May-99	12-May-99	15-Nov-99
						Pbag - A	Pbag - B	Pb-B Dup	Pbag - C	Low-f	Pbag - B
1,1-Dichloroethane	1	1.2	1	0.89j							1.0L
1,1-Dichloroethene				0.63j							
1,2-Dichloroethene (total)	8.8	13	9.2	7.9	5.6	7.8	8.2	8.9	9.1	5.9	30
2-Butanone (MEK)						7.1L					
Acetone						14B	8.1BL	5.7BL	19B		
methyl-t-butyl ether (MTBE)											3.2L
Trichloroethene	6.1	8.6	7.8	5.9	16	65	85	84	77	47	*100
TOTAL VOCs	15.9	22.8	18.0	15.32	21.6	79.9	101.3	98.6	105.1	52.9	134

MONITORING WELL:	B-111		LOWER AQUIFER								
SAMPLING ROUND	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2001	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2008
SAMPLING DATE	15-Nov-99	27-Nov-00	26-Nov-01	26-Nov-01	19-Nov-02	18-Nov-03	17-Nov-04	16-Nov-05	9-Nov-06	7-Nov-07	November-08
	P pump			Duplicate							
1,1-Dichloroethane		1.77	0.85	0.84	1.26	1.71F	2.06F	3.21	2.47	1.28F	1.4
1,1-Dichloroethene		1.42M	0.31F	0.34F	0.87M	0.6F	0.8F	1.12	0.97F	0.38F	0.54 F
1,2-Dichloroethane								0.31F			
Benzene		1.33									
Carbon Disulfide		1.19F									
cis-1,2-Dichloroethene	18	132.16M	29.31	28.61	36.18	55.01M	78.08M	234	102M	56.5R	54 J
Dichloromethane/Methylene Chloride	1.6b	1F					1.29F	0.41F			
trans-1,2-Dichloroethene		2.6M						0.26F	0.35F	0.5F	0.13 FJ
Trichloroethene	72	104.6M	9.3	9.1	10.4	9.7	9.3	10.4	7.42J	5.94	4.5
Vinyl chloride			0.27F	0.28F	0.66F	0.92F	1.13F	1.66	2.28	1.9F	0.91 F
TOTAL VOCs	92	246.1	40	39.2	49.4	67.9	92.7	251.4	115.5	66.5	57

MONITORING WELL:	B-111		LOWER AQUIFER
SAMPLING ROUND	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	Dec-09	22-Nov-10	21-Nov-11
1,1-Dichloroethane	1.5	1.8	1.8
1,1-Dichloroethene	0.49 F	0.56 F	0.64F
cis-1,2-Dichloroethene	60	75	80
Dichloromethane/Methylene Chloride	0.21 FB		0.74F
trans-1,2-Dichloroethene	0.23 F	0.19 F	0.3F
Trichloroethene	4	4.1	3.9
Vinyl chloride	1.2	1.1	1
TOTAL VOCs	67.6	82.75	88.38

MONITORING WELL:	B-113	LOWER AQUIFER
SAMPLING ROUND	LTSP 2011	
SAMPLING DATE	29-Nov-11	
1,1-Dichloroethane	8.3	
1,1-Dichloroethene	2	
1,2-Dichloroethane	0.49F	
Acetone	5.1F	
Benzene	0.19F	
cis-1,2-Dichloroethene	100	
Dichloromethane/Methylene Chloride	0.43F	
Toluene	0.094F	
trans-1,2-Dichloroethene	1.7	
Trichloroethene	19	
Vinyl chloride	39	
TOTAL VOCs	176.3	

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	B-115		LOWER AQUIFER								
SAMPLING ROUND	Round 7	Round 8	Round 9	Round 10	Round 11	Round 13	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2002	LTSP 2003
SAMPLING DATE	22-Jun-94	11-Nov-94	9-Jul-96	12-May-97	18-May-98	6-Oct-99	22-Sep-00	5-Sep-01	26-Sep-02	26-Sep-02 Duplicate	17-Nov-03
1,1-Dichloroethane			44j				1.98M	2.89F	4.34	4.48	
1,1-Dichloroethene			28j				1.02M	3.15F	1.92F	3.01F	
1,2-Dichloroethane							0.13F				
1,2-Dichloroethene (total)	4,800	2,800	3,100	1,800	380				630.60F	792.10F	
Acetone						50	8.2R				
Benzene							1.34	2.33F	1.52F	1.62F	
chloromethane							0.22M				
cis-1,2-Dichloroethene						190	382.21	985.34	627.31M	789.02M	367.9M
Dichloromethane/Methylene Chloride						22b	0.2B		1.1F	1.7F	3F
Toluene							2.61	2.62F	491.43	406.43	7.24F
trans-1,2-Dichloroethene							8.5M	2.82F	3.29F	3.08F	2.92F
Trichloroethene	7,500	2,800	1,200	6,000	960	270	29.4M	379.4	14.3J	24.7J	460.1
Vinyl Chloride						16	33.66M	40.46M	49.38J	36.11J	18.06F
TOTAL VOCs	12,300	5,600	4,372	7,800	1,340	548	461.3	1,419	1,194.6	1,270.2	859.2

MONITORING WELL:	B-115		LOWER AQUIFER								
SAMPLING ROUND	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2006	LTSP 2007	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	17-Nov-04	16-Nov-05	9-Nov-06	9-Nov-06 Duplicate	5-Nov-07	5-Nov-07 Duplicate	Nov-08	Nov-09	Nov-09 Duplicate	18-Nov-10	29-Nov-11
1,1-Dichloroethane								0.28 F	0.28 F	0.81 F	0.15F
1,1-Dichloroethene								1.6	1.6	5.7	0.81F
Acetone											23
Benzene				3.25F			0.23	0.27 F	0.28 F	1	0.16F
cis-1,2-Dichloroethene	822.29M	446.00	1,100M	1,300M	637		66 J	58	59	260	27
Dichloromethane/Methylene Chloride	5.6F	25.8F						0.41 FB	0.43 FB		0.48F
Toluene	23.52F	183	58	39.2				0.41 F	0.40 F	0.26 F	110
trans-1,2-Dichloroethene	3.61F			5F			0.4 FJ	0.42 F	0.40 F	1.9	0.18F
Trichloroethene	244.93	134		4.75F	31F		48	26	29	80	9.6
Vinyl Chloride	23.14F	16F	110	74.8	80		1.1	4.8	4.6	16	5.1
TOTAL VOCs	1,123.1	804.8	1,268	1,427	748	792	117.3	91.8	95.6	365.67	176.48

MONITORING WELL:	B-117		SURFACE AQUIFER								
SAMPLING ROUND	Round 7	Round 8	Round 9	Round 10	Round 11	LTSP 2002	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	20-Jun-94	3-Nov-94	17-Jun-96	16-May-97	26-May-97	18-Apr-02	5-Nov-07	Nov-08	2-Dec-09	19-Nov-10	17-Nov-11
1,2-Dichloroethene (total)	11	3.9	1.7								
Chloromethane			1.5								
cis-1,2-Dichloroethene						4.2	1.77	1.9 J	0.40 F	3.1	0.16F
Dichloromethane/Methylene Chloride									0.29 FB		
Trichloroethene	16	3.7	1.1	2.8	2	3.6	1.11	0.51 F	0.29 F	0.29F	0.52F
Vinyl chloride						0.52F					
TOTAL VOCs	27	7.6	4.3	2.8	2	8.3 F	2.9	2.4	1	3.39	0.68

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	B-118		SURFACE AQUIFER								
SAMPLING ROUND	Round 7	Round 9	Round 10	Round 11	Round 13	LTSP 2000	LTSP 2002	LTSP 2002	LTSP 2002	LTSP 2003	LTSP 2004
SAMPLING DATE	20-Jun-94	17-Jun-96	16-May-97	26-May-97	10-Nov-99 P pump	29-Nov-00	18-Apr-02	18-Dec-02	18-Dec-02 Duplicate	17-Nov-03	16-Nov-04
1,1-Dichloroethane		1.2	0.52j			2.27F					0.16F
1,1-Dichloroethene		0.64j									
1,1,1-Trichloroethane											0.23F
1,2-Dichloroethene (total)	71	0.62j	58	66							
Benzene		0.98j									
cis-1,2-Dichloroethene					100	380.36M	12.32	2.94	3.03	1.23M	1.44M
Ethylbenzene		0.63j									
Tetrachloroethene	3.1	1.2	0.57j	1.1			0.38F	0.15F	0.14F	0.13F	0.13F
Toluene		0.52j								10.74	0.14F
trans-1,2-Dichloroethene						3.35M	0.53F				
Trichloroethene	47	20	5.1	34	4.2J	26.7B	0.4F	1F	1	0.3F	0.94F
Vinyl Chloride											0.13F
TOTAL VOCs	121.1	25.8	64.2	101.1	104.2	412.7	13.6	4.1	4.2	12.4	3.2

MONITORING WELL:	B-118		SURFACE AQUIFER					
SAMPLING ROUND	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	16-Nov-04 Duplicate	14-Nov-05	10-Nov-06	5-Nov-07	Nov-08	2-Dec-09	19-Nov-10	17-Nov-11
1,1-Dichloroethane	0.19F	0.16F				0.58 F		
1,1,1-Trichloroethane	0.28F							
1,4-Dichlorobenzene							0.22 F	
Acetone				1.43 F				
Chloromethane							0.16F	
Dichloromethane/Methylene Chloride						0.25 FB		
cis-1,2-Dichloroethene	2.06M	1.56	2.57M	1.65	1.7 J	0.27 F	1.2	2.7
Tetrachloroethene	0.19F							
Toluene	0.25F			8.76	0.09 F			
trans-1,2-Dichloroethene								
Trichloroethene	1.15	0.37F	0.48F	0.26 F	0.3 F	0.17 F	0.23 F	0.62F
Vinyl Chloride	0.23F	0.14F						
TOTAL VOCs	4.4	2.2	3.1	12.1	2.1	1	1.81	3.32

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	B-122		LOWER AQUIFER								
SAMPLING ROUND	Round 7	Round 8	Round 9	Round 10	Round 11	Round 11	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2002	LTSP 2003
SAMPLING DATE	21-Jun-94	4-Nov-94	17-Jun-96	16-May-97	26-May-97	26-May-97 Duplicate	17-Apr-00 Mod-LF	18-Jan-01	18-Apr-02	18-Dec-02	17-Nov-03
1,1-Dichloroethane	9.9	11	12	11	9.6	9.2	6.26	7.42	4.84	4.63	3.77
1,1-Dichloroethene		1.2	1.6	1.4			0.41F	0.4F	0.44F	0.4F	0.27F
1,2-Dichloroethane							0.2F	0.24F		0.13F	0.1F
1,2-Dichloroethene (total)	14	15	19	17	14	14					
1,4-dichlorobenzene								0.17F			
Benzene							0.22F	0.28F	0.15F	0.13F	0.13F
cis-1,2-Dichloroethene							8.37	9.96	7.82	6.88	5.54M
trans-1,2-Dichloroethene							0.71	0.97			
Trichloroethene	1.8		3	2.4	2.6	2.3	1.1M	1.2	1	1	0.9F
TOTAL VOCs	25.7	27.2	35.6	31.8	26.2	25.5	16.6	20.6	14.3	13.2	10.7

MONITORING WELL:	B-122		LOWER AQUIFER				
SAMPLING ROUND	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010
SAMPLING DATE	16-Nov-04	14-Nov-05	10-Nov-06	5-Nov-07	Nov-08	02-Dec-09	19-Nov-10
1,1-Dichloroethane	3.94	3.42	2.49	1.9	1.9	2.1	1.7
1,1-Dichloroethene	0.3F	0.24F	0.17F		0.15 F	0.12 F	0.11 F
1,2-Dichloroethane	0.1F						
Benzene	0.12F						
cis-1,2-Dichloroethene	5.98M	4.68	3.57M	3.22	3 J	3.5	2.8
Dichloromethane/Methylene Chloride		0.17F		0.13F		0.26 FB	
Toluene	0.1F						
Trichloroethene	0.8F	0.78F	0.55F	0.58F	0.54 F	0.42 F	0.44 F
TOTAL VOCs	11.3	9.3	6.8	5.8	5.6	6.1	5.05

MONITORING WELL:	B-125		LOWER AQUIFER								
SAMPLING ROUND	Round 7	Round 8	Round 9	Round 10	Round 11	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2002	LTSP 2003	LTSP 2003
SAMPLING DATE	21-Jun-94	4-Nov-94	18-Jun-96	22-May-97	27-May-98	17-Apr-00 Mod-LF	18-Jan-01	18-Apr-02	18-Dec-02	17-Nov-03	17-Nov-03 Duplicate
1,1-Dichloroethane	4.8	4.5	4.5	4.9	3.9	2.29	1.19	0.80	0.61	0.51	0.52
1,1-Dichloroethene			0.71j	1.1		0.22F	0.1F				
cis-1,2-Dichloroethene						2.65	1.92	1.52	1.14F	1.28M	1.3M
1,2-Dichloroethene (total)	5.5	5.3	6	6.5	5.6						
Tetrachloroethene						0.12F					
Toluene							8.37			6.88	6.08
trans-1,2-Dichloroethene						0.17F					
Trichloroethene	1.4	1.6	1.6	2.2	1.8	0.8M	0.4F	0.5F	0.4F	0.4F	0.4F
Vinyl Chloride										0.1F	
TOTAL VOCs	11.7	11.4	12.8	14.7	11.3	6.3	12.0	2.8	2.2	9.2	8.3

MONITORING WELL:	B-125		LOWER AQUIFER				
SAMPLING ROUND	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP	LTSP	LTSP 2010
SAMPLING DATE	16-Nov-04	14-Nov-05	10-Nov-06	5-Nov-07	Nov-08	02-Dec-09	19-Nov-10
1,1-Dichloroethane	0.56F	0.45F	0.33F	0.23F	0.25 F	0.30 F	0.26 F
Acetone		1.22F	3.33F				
cis-1,2-Dichloroethene	1.14M	0.95F	0.85M	0.7F	0.78 FJ	0.85 F	0.78 F
Dichloromethane/Methylene Chloride		0.12F				0.29 FB	
Trichloroethene	0.5F	0.43F	0.28F	0.3F	0.39 F	0.33 F	0.28 F
TOTAL VOCs	2.2	3.2	4.8	1.2	1.4	1.5	1.32

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	B-126		LOWER AQUIFER								
SAMPLING ROUND	Round 7	Round 8	Round 9	Round 10	Round 11	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999
SAMPLING DATE	1-Jul-94	7-Nov-94	26-Jun-96	8-May-97	13-May-98	10-May-99 Pbag - A	10-May-99 Pbag - B	10-May-99 Pbag - C	12-May-99 Low-f	15-Nov-99 Pbag - A	15-Nov-99 Pbag - B
1,1-Dichloroethane	5.5	6.4	4.1	4.7							
1,1-Dichloroethene	1.6	1.9	1.6	2.3							
1,2-Dichloroethene (total)	170	170	95	100	21	8.4	14	11	11	22	24
Acetone						5.2BL	5.8BL	4.1B	4.9BL		
methyl-t-butyl ether (MTBE)											6.5
Trichloroethene	43	45	39	46	41	15	22	20	19	30	30
Vinyl Chloride	9	13	9.1	13							
TOTAL VOCs	229.1	236.3	148.8	166	62	28.6	42	35	35	52	60.5

MONITORING WELL:	B-126		LOWER AQUIFER								
SAMPLING ROUND	LTSP 1999	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007
SAMPLING DATE	15-Nov-99 Pbag - C	11-Nov-99 P pump	27-Nov-00	27-Nov-01	20-Nov-02	20-Nov-02 Duplicate	17-Nov-03	18-Nov-04	16-Nov-05	7-Nov-06	8-Nov-07
1,1-Dichloroethane			0.66	0.16F	0.75	0.70	0.57	0.88F	1.47	0.23F	0.23R
1,1-Dichloroethene							0.13F	0.18F	0.31F		
1,2-Dichloroethene (total)	26										
Acetone											1.23R
cis-1,2-Dichloroethene		20	17.67M	3.79	5.63	5.59	4.36M	6.12M	8.70	6.21M	8.14R
Dichloromethane/Methylene Chloride											0.15R
p-Isopropyltoluene	2.5L										
trans-1,2-Dichloroethene			1.18M								
Trichloroethene	28	22	17.2M	8.4	11.8	11.3	8.7	9.48	12.6	12.9J	11.3R
Vinyl Chloride			0.32F								0.76R
TOTAL VOCs	56.5	42	37	12.4	18.2	17.6	13.8	16.7	23.1	19.3	21.8 R

MONITORING WELL:	B-126		LOWER AQUIFER	
SAMPLING ROUND	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	Nov-08	02-Dec-09	23-Nov-10	18-Nov-11
1,1-Dichloroethane	0.08 F	0.11F	0.15 F	0.24F
1,1-Dichloroethene				0.096F
cis-1,2-Dichloroethene	2.5 J	2.6	3.3	4.1
Dichloromethane/Methylene Chloride		0.24 FB		0.73F
trans-1,2-Dichloroethene				0.067F
Trichloroethene	6.4	6	6.3	7.9
Vinyl Chloride				0.097F
TOTAL VOCs	9	9	9.75	13.23

MONITORING WELL:	B-128		SURFACE AQUIFER						
SAMPLING ROUND	Round 7	Round 8	Round 9	Round 10	Round 11	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002
SAMPLING DATE	11-Jul-94	14-Nov-94	28-Jun-96	21-May-97	13-May-98	15-Nov-99 P pump	28-Nov-00	27-Nov-01	19-Nov-02
1,2-Dichloroethene (total)				0.52j					
Acetone							11.8F		
Chloromethane				0.57j					
cis-1,2-Dichloroethene									0.36F
Trichloroethene	3.1	2.2	10	18	13	1		0.2F	0.4F
TOTAL VOCs	3.1	2.2	10	19.1 j	13	1	11.8	0.2	0.8

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	B-129		SURFACE AQUIFER						
SAMPLING ROUND	Round 7	Round 8	Round 9	Round 10	Round 11	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002
SAMPLING DATE	11-Jul-94	14-Nov-94	28-Jun-96	21-May-97	13-May-98	15-Nov-99 P pump	28-Nov-00	27-Nov-01	20-Nov-02
1,1-Dichloroethane			1.1	1.3			0.14F	0.16F	
1,1-Dichloroethene				0.53j					
1,2-Dichloroethene (total)	16	24	89	110	24				
Acetone			11j						
Benzene			0.53j	0.64j				0.11F	0.1F
Chloromethane			1.0	1.3					
cis-1,2-Dichloroethene						7.2	3.75M	5.94	3.53
Trichloroethene	1.4	2.9	7.8	5.8					
Vinyl Chloride						0.6J	0.34F	0.75F	0.61F
TOTAL VOCs	17.4	26.9	110.4 j	119.6 j	24	7.8	4.2	7.0	4.2

MONITORING WELL:	B-232		BEDROCK AQUIFER								
SAMPLING ROUND	Round 9	Round 10	Round 11	LTSP 2000	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005
SAMPLING DATE	17-Jun-96	20-May-97	27-May-98	17-Apr-00 Mod-LF	17-Apr-00 Duplicate	18-Jan-01	18-Apr-02	18-Dec-02	17-Nov-03	16-Nov-04	14-Nov-05
Acetone				3.2B	2.5B						1.1F
cis-1,2-Dichloroethene										0.11M	
Tetrachloroethene	0.66j	0.93j		0.18F	0.17F	0.17F	0.17F	0.11F	0.12F		
Toluene	1.2									8.2	2.6
TOTAL VOCs	1.9	0.9	bdl	0.2	0.2	0.2	0.2	0.1	0.1	8.3	3.7

MONITORING WELL:	B-232		BEDROCK AQUIFER		
SAMPLING ROUND	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010
SAMPLING DATE	10-Nov-06	5-Nov-07	Nov-08	02-Dec-09	19-Nov-10
Acetone					2.7 F
Dichloromethane/Methylene Chloride				0.27 FB	
Toluene	0.17F	316	21	4.7	0.29 F
TOTAL VOCs	0.2	316	21	4.7	2.99

MONITORING WELL:	B-240	BEDROCK AQUIFER
SAMPLING ROUND	LTSP 2011	
SAMPLING DATE	18-Nov-11	
1,1,1-Trichloroethane	0.09F	
1,1-Dichloroethane	22	
1,1-Dichloroethene	12	
1,2-Dichlorobenzene	0.18F	
1,2-Dichloroethane	3.8	
Benzene	0.59	
Chloroethane	0.91F	
cis-1,2-Dichloroethene	240	
Dichloromethane	0.6F	
trans-1,2-Dichloroethene	2.9	
Trichloroethene	300	
Vinyl chloride	23	
TOTAL VOCs	606.1	

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	B-242		LOWER AQUIFER								
SAMPLING ROUND	Round 9	Round 9	Round 10	Round 10	Round 11	LTSP 2007	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	27-Jun-96	27-Jun-96 Duplicate	14-May-97	14-May-97 Duplicate	13-May-98	8-Nov-07	8-Nov-07 Duplicate	Nov-08	25-Nov-09	19-Nov-10	28-Nov-11
1,1-Dichloroethane	26	35	38	36		1.31R	1.33R	1.4	1	1	1
1,1-Dichloroethene	13	18	18	17		0.45R	0.47R	0.5 F	0.40 F	0.31 F	0.33F
Acetone						1.21F	1.07F				
1,2-Dichlorethene (total)	540j	700j	730	720	510						
cis-1,2-Dichloroethene						24.9R	24.2R	25 J	19	19	18
Dichloromethane/Methylene Chloride						0.13R	0.13R		0.40 FB		0.43F
trans-1,2-Dichloroethene						0.19R	0.19R	0.18 FJ	0.14 F	0.11 F	0.88F
Trichloroethene	210	280	300	300	220	8.87R	8.65R	9.5	7.9	7.3	7.1
Vinyl chloride	69	96	93	94		2.77	2.7	2.5	1.5	1.1	1.1
TOTAL VOCs	858	1,129	1,179	1,167	730	39.8 R	38.7 R	39.1	30.3	28.82	28.84

MONITORING WELL:	B-243		BEDROCK AQUIFER						
SAMPLING ROUND	Round 9	Round 10	Round 11	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	26-Jun-96	12-May-97	13-May-98	8-Nov-07	Nov-08	25-Nov-09	25-Nov-09 Duplicate	19-Nov-10	22-Nov-11
1,1-Dichloroethane	51	50		9.75R	14	15	13	15	9.5
1,1-Dichloroethene	26	27		1.7R	2.1	1.9	1.7	1.4	0.74F
1,2-Dichloroethane					1.0	0.88		1	0.73
1,2-Dichlorethene (total)	1100j	990	1,000						
Benzene					0.3 FJ	0.34 F	0.30 F	0.31 F	0.23F
Chloroethane						0.77 F	0.61 F	0.44 F	0.5F
cis-1,2-Dichloroethene				93.9R	120 J	110	98	88	48
Dichloromethane/Methylene Chloride						0.45 FB	0.64 F		0.43F
trans-1,2-Dichloroethene				0.9R	0.92 FJ	1.1	1.0	1.1	1.1
Trichloroethene	430	400	400	27.8R	31	34	32	30	25
Vinyl chloride	140	160		21.6	33	36	36	31	23
TOTAL VOCs	1,747	1,627	1,400	155.7	201.3	200.0	183.3	168.3	109.23

MONITORING WELL:	B-244A		BEDROCK AQUIFER								
SAMPLING ROUND	Round 9	Round 10	Round 11	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 2000
SAMPLING DATE	28-Jun-96	21-May-97	14-May-98	11-May-99 Pbag - A	11-May-99 Pbag - B	11-May-99 Pbag - C	11-May-99 Pbag - D	11-May-99 Pbag - E	11-May-99 P Pump	16-Nov-99 P pump	28-Nov-00
1,1-Dichloroethane	1.5	1.8j							1.0L		0.81
1,1-Dichloroethene	0.86j	1.2j									0.31M
1,2-Dichloroethene (total)	32	33	56	63	65	55	61	82	56		
Acetone				15B	11B	15B	11B				
cis-1,2-Dichloroethene										48	37.84M
Dichloromethane/Methylene Chloride										1.3b	
trans-1,2-Dichloroethene											0.85M
Trichloroethene	110	91	46	8.1	5	47	46	19	35	12	29.3M
Vinyl Chloride	1.2	1.2j		1.6L	2.0L	1.2L	1.3L	1.7L	1.3L		4.24
TOTAL VOCs	145.6	128.2	102	72.7	72.0	103.2	108.3	102.7	93.3	61.3	73.4

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	B-244A		BEDROCK AQUIFER								
SAMPLING ROUND	LTSP 2001	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010
SAMPLING DATE	27-Nov-01	20-Nov-02	19-Nov-03	18-Nov-04	18-Nov-04 Duplicate	17-Nov-05	7-Nov-06	8-Nov-07	Nov-08	1-Dec-09	23-Nov-10
1,1-Dichloroethane	1.13	0.92F	1.05F	0.88F	0.89F	1F	0.65F	0.775R	0.89 F	0.88 F	0.98 F
1,1-Dichloroethene	0.74F		0.62F	0.55F	0.55F	0.6F		0.425R	0.62 F	0.57 F	0.61 F
cis-1,2-Dichloroethene	71.95	64.88	77.69M	65.04M	63.69M	64.8	50.2M	63.7R	61 J	66	74
Dichloromethane/Methylene Chloride				0.56F	0.56F	4.65F				0.59 FB	
trans-1,2-Dichloroethene	0.39F		0.51F				1.95F	0.525R	0.29 FJ	0.30 F	0.32 F
Trichloroethene	43.8	23	25.9	14.14	13.61	12.2	16.4J	19.5R	21	18	18
Vinyl Chloride	4.66	3.3F	4.06F	2.13F	2.02F	3.8F	2.7F	3R	2	1.6	1.5
TOTAL VOCs	122.7	92.1	109.8	83.3	81.3	87.1	71.9	87.9	85.8	87.4	95.41

MONITORING WELL:	B-244A	BEDROCK AQUIFER
SAMPLING ROUND	LTSP 2011	
SAMPLING DATE	29-Nov-11	
1,1-Dichloroethane	0.97F	
1,1-Dichloroethene	0.54F	
Acetone	9.8F	
cis-1,2-Dichloroethene	59	
Dichloromethane/Methylene Chloride	0.44F	
trans-1,2-Dichloroethene	0.68F	
Trichloroethene	14	
Vinyl Chloride	2.7	
TOTAL VOCs	88.13	

MONITORING WELL:	B-245		LOWER AQUIFER								
SAMPLING ROUND	Round 9	Round 10	Round 11	Round 12	Round 12	LTSP 1999	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2003
SAMPLING DATE	28-Jun-96	21-May-97	14-May-98	11-May-99 Pbag	11-May-99 Pb Dup	11-May-99 P Pump	16-Nov-99 P pump	28-Nov-00	27-Nov-01	20-Nov-02	19-Nov-03
1,1-Dichloroethane		1.1						0.12F	0.21F	0.13F	0.42F
1,1-Dichloroethene		0.7j							0.14F		0.28F
1,2-Dichloroethene (total)	1.3	19	22	15	15	13					
Acetone				11B	10B	4.7BL					
cis-1,2-Dichloroethene							12	12.8M	23.72	17.79	43.59M
Toluene	0.61j										
trans-1,2-Dichloroethene							0.2J	0.36M	0.18F	0.22F	0.34F
Trichloroethene		58	24	7.4	7.1	7.3	8	5.3B	9.5	6.8	6.6
Vinyl Chloride		.58j							0.18F	0.15F	0.33F
TOTAL VOCs	1.91	79.38	46	22.4	22.1	20.3	20.2	18.6	33.9	25.1	51.6

MONITORING WELL:	B-245		LOWER AQUIFER					
SAMPLING ROUND	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	18-Nov-04	17-Nov-05	7-Nov-06	8-Nov-07	Nov-08	1-Dec-09	23-Nov-10	28-Nov-11
1,1-Dichloroethane	0.44F	0.6F	0.4F	0.35R	0.33 F	0.26 F	0.26 F	0.24F
1,1-Dichloroethene	0.3F	0.375F		0.21R	0.25 F	0.22 F	0.19 F	0.16F
1,2-Dichloroethene (total)								
Acetone				1.07R				
cis-1,2-Dichloroethene	44.72M	48.40	35.1M	34R	33 J	28	30	23
Dichloromethane/Methylene Chloride	0.24F	1.05F				0.59 FB		0.43F
Toluene								
trans-1,2-Dichloroethene	0.3F	0.35F		0.21R	0.19 FJ	0.18 F	0.18 F	0.13F
Trichloroethene	6.23	7.02	4.62J	3.91R	3.3	2.3	2.3	1.7
Vinyl Chloride	0.41F	0.35F			0.21 F	0.38 F	0.17 F	0.14F
TOTAL VOCs	52.6	58.2	40.1	39.8 R	37.3	31.3	33.1	25.8

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	B-246		SURFACE AQUIFER				
SAMPLING ROUND	Round 9	Round 10	Round 11	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002
SAMPLING DATE	28-Jun-96	21-May-97	14-May-98	15-Nov-99 P pump	28-Nov-00	27-Nov-01	20-Nov-02
1,1-Dichloroethane	1.2						
1,2-Dichloroethene (total)	15	1.5					
2-Butanone		5.6j					
Acetone			25R				
Chloromethane		0.94j					
cis-1,2-Dichloroethene						0.34F	
Toluene	0.6j						
Trichloroethene	47	4.3				0.1F	
TOTAL VOCs	63.8j	12.34j	bdl	bdl	bdl	0.44F	bdl

MONITORING WELL:	B-247		SURFACE AQUIFER				
SAMPLING ROUND	Round 9	Round 10	Round 11	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002
SAMPLING DATE	1-Jul-96	7-May-97	11-May-98	15-Nov-99 P pump	28-Nov-00	27-Nov-01	19-Nov-02
2-Butanone		5.7j					
Acetone		6.1j					
Trichloroethene	.88j						
TOTAL VOCs	.88j	11.8j	bdl	bdl	bdl	bdl	bdl

MONITORING WELL:	B-248		LOWER AQUIFER								
SAMPLING ROUND	Round 9	Round 10	Round 11	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 2000	LTSP 2000	LTSP 2001
SAMPLING DATE	1-Jul-96	7-May-97	12-May-98	11-May-99 Pbag	12-May-99 Low-f	15-Nov-99 Pbag	15-Nov-99 P pump	15-Nov-99 P pump Dup	28-Nov-00	28-Nov-00 Duplicate	27-Nov-01
1,1-Dichloroethane	11	9.9j					6J		4.53F	4.73F	2.96
1,1-Dichloroethene	6.1j	5.9j									1.85
1,2-Dichloroethene (total)	110	120	230	170	130	210					
Acetone				180L	26BL						
Benzene	8.8j	8.9j					5.1J		3.44F	3.52F	2.1
Carbon Disulfide										3.55F	
cis-1,2-Dichloroethene							230	230	193.9M	194.65M	148.58
Dichloromethane/Methylene Chloride								10b			
trans-1,2-Dichloroethene											1.11
Trichloroethene	1,300	1,300	1,000	470	260	*560	670	690	471.4M	499.8M	258.2
Vinyl Chloride											0.3F
TOTAL VOCs	1,435.9	1,444.7	1,230	640	390	770	911.1	930	673.27	706.30	415.25

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	B-248		LOWER AQUIFER								
SAMPLING ROUND	LTSP 2001	LTSP 2002	LTSP 2002	LTSP 2003	LTSP2004	LTSP 2005	LTSP 2005	LTSP 2006	LTSP 2006	LTSP 2007	LTSP 2008
SAMPLING DATE	27-Nov-01 Duplicate	19-Nov-02	19-Nov-02 Duplicate	18-Nov-03	17-Nov-04	17-Nov-05	17-Nov-05 Duplicate	9-Nov-06	9-Nov-06 Duplicate	7-Nov-07	Nov-08
1,1-Dichloroethane	3F	1.55F	1.58F	1.52F	1.15F	1.3F	1.35F	1.05F	1.2F	0.6F	1.20
1,1-Dichloroethene	1.73F			0.78F	0.64F	1F	0.9F	0.65F	0.7F		0.85 F
Acetone										2.7F	2.4 F
Benzene	1.91F	0.97F	1.03F	0.68F	0.55F	0.55F	0.6F	0.5F	0.55F	0.34J	0.66 F
cis-1,2-Dichloroethene	153.9	108.2	112.7	119.47M	92.77M	98	117	120M	120M	65.6R	130 J
Dichloromethane/Methylene Chloride				0.5F	1.07F	5.2F	4.25F			0.26F	
trans-1,2-Dichloroethene	1.82F	0.57F	0.74F	1.8F	0.64F			1.05F	1.15F	0.28F	0.58 FJ
Trichloroethene	261.60	75.6	73.3	48.1	26.98	21.1	18.6	12.8J	15.2J	14.10	11
Vinyl Chloride											0.27 F
TOTAL VOCs	424	186.9	189.4	172.9	124.7	127.2	142.7	136.1	138.8	83.9	147

MONITORING WELL:	B-248		LOWER AQUIFER	
SAMPLING ROUND	LTSP 2009	LTSP 2010	LTSP 2010	LTSP 2011
SAMPLING DATE	3-Dec-09	22-Nov-10	22-Nov-10 Duplicate	28-Nov-11
1,1-Dichloroethane	0.85 F	0.9 F	0.85 F	1.0
1,1-Dichloroethene	0.53 F	0.51 F	0.49 F	0.72F
Acetone			2.4 J	
Benzene	0.49	0.49	0.48	0.58
Chloromethane		0.14 F	0.12 F	
cis-1,2-Dichloroethene	92	93	95	100M
Dichloromethane/Methylene Chloride				0.47F
trans-1,2-Dichloroethene	0.27 F	0.31 F	0.28 F	0.31F
Trichloroethene	9.8	9.4	8.8	7.9
Vinyl Chloride	0.18 F	0.15 F	0.14 F	0.2F
TOTAL VOCs	104.1	104.9	108.56	112.18

MONITORING WELL:	B-249		BEDROCK AQUIFER								
SAMPLING ROUND	Round 9	Round 10	Round 11	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002
SAMPLING DATE	1-Jul-96	7-May-97	12-May-98	11-May-99 Pbag	12-May-99 Low-f	15-Nov-99 Pbag	15-Nov-99 Pbag Dup	15-Nov-99 P pump	28-Nov-00	27-Nov-01	19-Nov-02
1,1-Dichloroethane	1.9j										
1,1-Dichloroethene	1.4j										
1,2-Dichloroethene (total)	22	14		2.9L		3.0L	2.8L				
Acetone				10B	16B						
Benzene	1.4								0.17F		
Carbon Disulfide								16			
Chloromethane									0.73F	0.31F	
cis-1,2-Dichloroethene								1.6	2.35M	0.74F	0.43F
Dichloromethane/Methylene Chloride								0.2b			
methyl-t-butyl ether (MTBE)						6.1	5.8				
Toluene	1.1j			1.1L				0.4j	0.67M	0.18F	
Trichloroethene	260	140	50	35	18	26	28	13	18.2M	9.9	5.4
Vinyl chloride									0.17F		
Xylene (total)								0.2j		0.15F	
TOTAL VOCs	287.8	154	50	39	18	35.1	36.6	31.4	22.3	11.3	5.8

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	B-249		BEDROCK AQUIFER	
SAMPLING ROUND	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006
SAMPLING DATE	18-Nov-03	17-Nov-04	17-Nov-05	9-Nov-06
cis-1,2-Dichloroethene	0.21M	0.27M	0.19F	0.2M
Dichloromethane/Methylene Chloride			0.36F	
Trichloroethene	2.6	2.06	1.89	1.43J
TOTAL VOCs	2.8	2.3	2.4	1.6

MONITORING WELL:	B-250		SURFACE AQUIFER				
SAMPLING ROUND	Round 9	Round 10	Round 11	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002
SAMPLING DATE	1-Jul-96	7-May-97	11-May-98	15-Nov-99 P pump	28-Nov-00	27-Nov-01	19-Nov-02
2-Butanone	7.8j	6.3j					
Acetone		6.2j					
Toluene	0.84j						
Trichloroethene	1.5						
TOTAL VOCs	10.1 j	12.5 j	bdl	bdl	bdl	bdl	bdl

MONITORING WELL:	B-251		LOWER AQUIFER								
SAMPLING ROUND	Round 9	Round 10	Round 11	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002
SAMPLING DATE	1-Jul-96	7-May-97	11-May-98	11-May-99 Pbag	12-May-99 Low-f	15-Nov-99 Pbag	15-Nov-99 Pbag Dup	15-Nov-99 P pump	28-Nov-00	27-Nov-01	19-Nov-02
1,1-Dichloroethane		0.72j							0.22F	0.39F	0.35F
1,1-Dichloroethene		0.61j								0.17F	
1,2-Dichloroethene (total)	3.6	11	4.1	1.0L	4.3L	2.0L	2.2L				
Acetone				15B							
Benzene		0.62j								0.16F	0.2F
cis-1,2-Dichloroethene								1.9	7.71M	18.39	25.63
methyl-t-butyl ether (MTBE)						3.1L	3.0L				
trans-1,2-Dichloroethene									0.64M	0.1F	0.17F
Trichloroethene	41	110	56	18	22	20	20	8.2	8.7M	17.5	10.6
TOTAL VOCs	44.6	123	60.1	19	26.3	25.1	25.2	10.1	17.3	36.7	37

MONITORING WELL:	B-251		BEDROCK AQUIFER					
SAMPLING ROUND	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010
SAMPLING DATE	19-Nov-03	17-Nov-04	16-Nov-05	9-Nov-06	7-Nov-07	Nov-08	3-Dec-09	22-Nov-10
1,1-Dichloroethane	0.3F	0.21F	0.19F	0.11F	0.18F	0.1F	0.077 F	0.064 F
1,1-Dichloroethene	0.14F	0.11F						
Acetone					2.57F			
Benzene	0.14F							
cis-1,2-Dichloroethene	24.74M	9.09M	9.25	4.56M	14.20	3.4 J	2.4	1.7
Dichloromethane/Methylene Chloride			0.19F		0.11F			
methyl-t-butyl ether (MTBE)		0.32F	0.4F	0.44F	0.69F	0.48 F	0.52 F	0.54 F
trans-1,2-Dichloroethene	0.13F							
Trichloroethene	5.1	2.66	2.06	1.68J	4.05	1.7	1.6	1.4
TOTAL VOCs	30.6	12.4	12.1	6.8	21.8	5.7	4.6	3.7

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	B-252		BEDROCK AQUIFER								
SAMPLING ROUND	Round 9	Round 10	Round 11	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006
SAMPLING DATE	1-Jul-96	7-May-97	11-May-98	15-Nov-99 P pump	28-Nov-00	27-Nov-01	19-Nov-02	18-Nov-03	17-Nov-04	16-Nov-05	9-Nov-06
1,1-Dichloroethane				1.4	1.54	0.97	0.75	1.59	3.13	8.18	10.5
1,1-Dichloroethene				1.8	1.41M	1.43	1.7M	2.01	2.64	3.49	3.6
1,1,1-Trichloroethane				14	27.09M	16.46	23.62	32.56	45.26	48.9	55.6
2-Butanone		7.0j									
Benzene					0.12F				0.15F	0.19F	0.17F
Chloroethane						0.3F					
Dichloromethane/Methylene Chloride										0.22F	
Toluene	0.85j			0.1J	0.29M	0.14F	0.34F	0.27F	0.7F	0.73F	0.9F
Trichloroethene	1.70	3.50			1B	0.2F	0.1F	0.1F	0.14F	0.12F	
TOTAL VOCs	2.6	10.5	bdl	17.3	31.5	19.5	26.5	36.5	52	61.8	70.8

MONITORING WELL:	B-253		SURFACE AQUIFER		
SAMPLING ROUND	Round 11	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002
SAMPLING DATE	15-May-98	13-Nov-99 P pump	28-Nov-00	27-Nov-01	18-Nov-02
TOTAL VOCs	bdl	bdl	bdl	bdl	bdl

MONITORING WELL:	B-254		LOWER AQUIFER								
SAMPLING ROUND	Round 11	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 2000	LTSP 2000	LTSP 2001	LTSP 2001	LTSP 2002
SAMPLING DATE	15-May-98	10-May-99 Pbag	11-May-99 Low-f	11-May-99 Low-f Dup	11-Nov-99 P pump	11-Nov-99 P pump Dup	28-Nov-00	28-Nov-00 Duplicate	27-Nov-01	27-Nov-01 Duplicate	18-Nov-02
1,1-Dichloroethane							0.2F	0.22F	0.25F	0.24F	0.27F
1,2-Dichloroethene (total)		1.4L									
2-Butanone		6.7L									
Acetone		14B	7.2BL	2.3BL							
Benzene					0.2J	0.2J	0.18F	0.19F	0.2F	0.21F	0.23F
Carbon Disulfide							0.14				
cis-1,2-Dichloroethene					2.7	2.6	2.85M	2.91M	3.95	4.28	4.27
Trichloroethene	11	7.6	2.6L	2.2L	14	13	14.5M	15M	21.8	23.1	25.2
TOTAL VOCs	11	15.7	2.6	2.2	16.9	15.8	17.9	18.3	26.2	27.8	30.0

MONITORING WELL:	B-254		LOWER AQUIFER								
SAMPLING ROUND	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2005	LTSP 2006	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	18-Nov-03	16-Nov-04	15-Nov-05	15-Nov-05 Duplicate	7-Nov-06	7-Nov-06 Duplicate	7-Nov-07	Nov-08	3-Dec-09	22-Nov-10	17-Nov-11
1,1-Dichloroethane	0.26F	0.28F	0.28F	0.27F	0.32F	0.32F	0.24F	0.3 F	0.24 F	0.28 F	0.27F
1,1-Dichloroethene	0.11F	0.17F	0.12F	0.13F	0.16F	0.19F	0.14F	0.22 F	0.17 F	0.14 F	
Acetone							1.38F				
Benzene	0.18F	0.21F	0.18F	0.19F	0.23F	0.22F	0.19F	0.22 FJ	0.19 F	0.22 F	
cis-1,2-Dichloroethene	5.58M	9.99M	14.7	14.3	25.2M	25.3M	22.90	24 J	23	27	26M
Dichloromethane/Methylene Chloride			0.52F	0.43F					0.57 FB		
trans-1,2-Dichloroethene								0.11 FJ	0.06	0.077 F	
Trichloroethene	18.3	16.19	10.8	10.7	8.78J	8.86J	5.01	5	3.5	2.8	2.50
TOTAL VOCs	24.4	26.8	26.6	26.0	34.7	34.9	29.9	29.9	27.2	30.5	28.8

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	B-255		BEDROCK AQUIFER								
SAMPLING ROUND	Round 11	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006
SAMPLING DATE	15-May-98	10-May-99	11-May-99	13-Nov-99	28-Nov-00	27-Nov-01	18-Nov-02	18-Nov-03	16-Nov-04	15-Nov-05	7-Nov-06
		Pbag	Low-f	P pump							
Acetone		4.6BL									
Carbon Disulfide				0.9J	0.27B						
Toluene				0.2J							
Xylene (total)				0.1J							
TOTAL VOCs	bdl	bdl	bdl	1.2J	0.3	bdl	bdl	bdl	bdl	bdl	bdl

MONITORING WELL:	OW2-6		SURFACE AQUIFER
SAMPLING ROUND	O&M 1998	LTSP 2011	
SAMPLING DATE	1-Sep-98	21-Nov-11	
1,1,1-Trichloroethane	250	0.24F	
1,1-Dichloroethane	220	5.1	
1,1-Dichloroethene	230	2.9	
1,2-Dichlorobenzene		5.1	
1,4-Dichlorobenzene		0.9	
Benzene		1.3	
Chloroform		0.14F	
cis-1,2-Dichloroethene	6000	400	
Dichloromethane	160 B	0.67F	
Isopropylbenzene		0.15F	
trans-1,2-Dichloroethene		3.5	
Trichloroethene	310	30	
Vinyl chloride	200	130	
TOTAL VOCs	7,370	580	

MONITORING WELL:	OW3-7		SURFACE AQUIFER								
SAMPLING ROUND	Round 1	Round 2	Round 3	Round 7	Round 8	Round 9	Round 9	Round 10	Round 10	Round 11	Round 11
SAMPLING DATE	Jan-83	Jan-84	Jan-86	21-Jun-94	3-Nov-94	19-Jun-96	19-Jun-96	22-May-97	22-May-97	27-May-98	27-May-98
	CW-1A	CW-1A	CW-1A				Duplicate		Duplicate		Duplicate
1,2-Dichlorobenzene						1.9j	1.8j	4.5	4.4		
1,2-Dichloroethene (total)	71	200	2,200	13	35	1.8	2.3	2.1	2.2		
1,2,4-Trimethylbenzene						62	59	39	40	12	13
1,3,5-Trimethylbenzene						2.6	2.1				
1,4-Dichlorobenzene						1.3j		5.7	5.7		
2-Butanone			190								
4-Methyl-2-Pentanone			700								
Acetone			450								
Benzene	87		110			1.4	1.5	6.3	5.8		
Chloroform	235	15									
Dichloromethane/Methylene Chloride		8.5									
Ethylbenzene	240		110			190	180	400	380	69	73
Isopropylbenzene						9.5	9.3	18	18		
Naphthalene						1.0j					
n-Propylbenzene						12	11	18J	bdl R		
p-Isopropyltoluene						2.8	2.4	2.4j	2.4j		
Tetrachloroethene	78		52								
Toluene	1,700		1,300			5.9	5.6	8.0	7.9	19	18
Trichloroethene	10,950	2,400	6,400		2.8	1.1	1.2				
Vinyl Chloride				65	17	3.8	3.8	15	16		
Xylenes (Total)			420			76	67	61	59	28	29
TOTAL VOCs	13,361	2,624	11,932	78	55	371.2	347	580	541	128	133

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	OW3-7		SURFACE AQUIFER					
SAMPLING ROUND	Round 13	LTSP 2002	LTSP 2002	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006
SAMPLING DATE	11-Nov-99 P pump	29-Nov-00	18-Apr-02	18-Dec-02	17-Nov-03	16-Nov-04	14-Nov-05	10-Nov-06
1,4-Dichlorobenzene			0.11F					
Acetone							2.15F	
cis-1,2-Dichloroethene	1.5	1.17M	1.19F	3.28F	1.91F	1.22M	0.6F	0.82M
Ethylbenzene	0.3J	32.78M						
Tetrachloroethene			0.17F					
Toluene				112.39			0.85F	2.89
trans-1,2-Dichloroethene							0.1F	
Trichloroethene	1.5	2.1B	0.4F	0.7F	0.7F	0.35F	0.47F	0.26F
Vinyl chloride			0.24F	1.83F	0.18F	0.15F	0.49F	
o-Xylene		7.46M						
TOTAL VOCs	3.3	43.5	2.1	118.2	2.8	1.7	4.7	4.0

MONITORING WELL:	OW3-14		SURFACE AQUIFER		
SAMPLING ROUND	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	5-Nov-07	Nov-08	2-Dec-09	19-Nov-10	17-Nov-11
1,1-Dichloroethene		0.51 F	0.65 F	0.18 F	0.44F
Benzene		2.1 J	1.9	0.71	1
Chloromethane				0.16 F	
cis-1,2-Dichloroethene		200 J	240	68	180
Dichloromethane/Methylene Chloride			0.23 FB		
Isopropylbenzene		0.18 F	0.31 F		
Toluene	316	0.28 F	0.93 F	0.14 F	
trans-1,2-Dichloroethene		0.75 FJ	0.88 F	0.37 F	0.81F
Trichloroethene		0.44 F	0.20 F	0.31 F	0.71F
Vinyl chloride		2.2	4.2	0.78 F	4.5
TOTAL VOCs	316	206.5	249.1	70.7	187.5

MONITORING WELL:	P01-2R		BEDROCK AQUIFER								
SAMPLING ROUND	Round 10	Round 11	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007
SAMPLING DATE	12-May-97	20-May-98	11-Nov-99 P pump	27-Nov-00	26-Nov-01	20-Nov-02	17-Nov-03	17-Nov-04	15-Nov-05	7-Nov-06	11/5/2007
1,1-Dichloroethane	0.77j			0.21F	0.47	0.25F	0.26F	0.23F	0.2F	0.15F	0.16F / 0.16F
1,1,1Trichloroethane											0.27F
Acetone									3.64F	2.86F	2.47F
Chloroethane						0.2F	0.3F	0.3F			
cis-1,2-Dichloroethene			3.8	0.8M	2.97	1.37F	1.36M	1.83M	0.86F	0.88M	0.59F
methyl-t-butyl ether (MTBE)								0.1F			
Toluene	3.4		11	3.29M	2.39	1.54	0.93F	5.01	1.53	1.23	0.73F
Trichloroethene	50	12	26	8.1M	19.5	10.9	8.4	9	6.43	5.34J	3.99
Vinyl Chloride	0.76j		1.7J	0.45F	0.89F	0.46F	0.37F	0.62F	0.47F	0.44F	
TOTAL VOCs	68.9	14.7	42.5	12.9	26.2	14.7	11.6	17.1	13.1	10.9	8.4

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	P01-2R		BEDROCK AQUIFER	
SAMPLING ROUND	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	Nov-08	2-Dec-09	18-Nov-10	18-Nov-11
1,1-Dichloroethane	0.16F/0.16F	0.14 F	0.14 F	0.17F
1,1-Dichloroethene	0.08F/0.076F			
1,1,1Trichloroethane	0.05FJ/0.069FJ			
Chloroethane	0.26F / 0.21F			0.2F
Chloroform	0.07FJ/0.055FJ		0.085 F	0.059F
cis-1,2-Dichloroethene	0.65FJ/0.75FJ	0.94 F	0.85 F	1.2
Dichloromethane/Methylene Chloride				0.49F
Toluene	0.74F / 0.71F	0.49 F	0.75 F	0.61F
Trichloroethene	4.3 / 4.3	2.6	3.7	4.2
Vinyl Chloride	0.41F / 0.39 F	0.28 F	0.3F	0.33F
TOTAL VOCs	6.7/6.7	4.50	5.8	7.3

MONITORING WELL:	P02-1RA	BEDROCK AQUIFER
SAMPLING ROUND	LTSP 2011	
SAMPLING DATE	22-Nov-11	
1,1-Dichloroethane	2.7	
1,1-Dichloroethene	0.35F	
1,2-Dichloroethane	0.28F	
Acetone	3.4F	
Chloroform	0.061F	
cis-1,2-Dichloroethene	37	
Dichloromethane	0.42F	
Toluene	0.89F	
trans-1,2-Dichloroethene	6.6	
Trichloroethene	2.2	
Vinyl chloride	2.4	
TOTAL VOCs	56.30	

MONITORING WELL:	PT1-RA		BEDROCK AQUIFER		
SAMPLING ROUND	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	5-Nov-07	Nov-08	2-Dec-09	18-Nov-10	18-Nov-11
1,1-Dichloroethane		0.14 F	0.18 F	0.2 F	0.27F
1,2-Dichloroethane	0.43F	0.57	0.46 F	0.43 F	0.37F
Acetone	1.4F				
Chloroethane		0.43 F	0.42 F		0.21F
cis-1,2-Dichloroethene					0.1F
Dichloromethane/Methylene Chloride			0.25 FB		0.55F
Toluene	0.27F	0.29 F	0.26 F	0.26 F	0.2F
Trichloroethene	0.1F				0.14F
Xylene (total)	0.11F	0.1 F	0.11F	0.12 F	0.12F
TOTAL VOCs	2.3	1.5	1.4	1.01	2

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP1-1T		LOWER AQUIFER								
SAMPLING ROUND	Round 1	Round 1	Round 2	Round 3	Round 7	Round 8	Round 9	Round 10	Round 11	LTSP 2003	LTSP 2004
SAMPLING DATE	19-Feb-86	19-Feb-86 Duplicate	30-Sep-87	22-Sep-88	7-Jul-94	14-Nov-94	27-Jun-96	14-May-97	13-May-98	18-Nov-03	16-Nov-04
Chloroform										0.2F	0.61
Ethylbenzene								0.50j			
Dichloromethane/Methylene Chloride			2.9j	14b							
methyl-t-butyl ether (MTBE)								1.2			
Tetrachloroethene								0.68j			
Trichloroethene					1.0	5.6	1.9j	3	3.2	0.8F	0.35F
Total Xylenes								1.1j			
TOTAL VOCs	bdl	bdl	2.9j	14b	1.0	5.6	1.9j	6.7	3.2	1.0F	0.96

MONITORING WELL:	RAP1-1T		LOWER AQUIFER
SAMPLING ROUND	LTSP 2005	LTSP 2006	
SAMPLING DATE	15-Nov-05	7-Nov-06	
Chloroform	0.18F	0.59	
Dichloromethane/Methylene Chloride	0.21F	0.46F	
methyl-t-butyl ether (MTBE)	0.29F		
TOTAL VOCs	0.7	1.1	

MONITORING WELL:	RAP1-1R		BEDROCK AQUIFER								
SAMPLING ROUND	Round 1	Round 1	Round 2	Round 3	Round 4	Round 4	Round 5	Round 6	Round 7	Round 7	Round 8
SAMPLING DATE	19-Feb-86	19-Feb-86 Duplicate	30-Sep-87	22-Sep-88	6-Nov-90	6-Nov-90 Acid Preserved	26-Feb-91	6-Aug-91	7-Jul-94	7-Jul-94 Duplicate	14-Nov-94
1,1,1-Trichloroethane	8.0	8.2	6.8	3.7j	2.1						
1,2-Dichloroethene (total)	7.6	7.6	12	11	4.2	4.4	1.5	1.2			
Chlorobenzene		2.6j									
Chloroethane								8.9			
Dichloromethane/Methylene Chloride			4.0jbR	9.5bR				7.9bR			
cis-1,2-Dichloroethene											
Trichloroethene	120	120	220	160	54	69	23	30			15
TOTAL VOCs	135.6	138.4	238.8	174.7	60.3	73.4	24.5	40.1	bdl	bdl	15

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP1-1R		BEDROCK AQUIFER								
SAMPLING ROUND	Round 9	Round 9	Round 10	Round 10	Round 11	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2003	LTSP 2004
SAMPLING DATE	27-Jun-96	27-Jun-96 Duplicate	14-May-97	14-May-97 Duplicate	13-May-98	16-Nov-99 P pump	28-Nov-00	27-Nov-01	18-Nov-02	18-Nov-03	16-Nov-04
1,2-Dichloroethene (total)		1.1									
Chloroform									0.2F	1.04	0.29F
Dichlorodifluoromethane				0.62j							
Trichloroethene	8.3	5.5	0.65j	0.85j	2.5	3.4	1.5B	0.2F	1.2	0.3F	0.16F
TOTAL VOCs	8.3	6.6	.65j	1.47j	2.5	3.4	1.5	0.2	1.4	1.3	0.5

MONITORING WELL:	RAP1-1R		BEDROCK AQUIFER
SAMPLING ROUND	LTSP 2005	LTSP 2006	
SAMPLING DATE	15-Nov-05	7-Nov-06	
Chloroform	0.22F		
methyl-t-butyl ether (MTBE)	0.29F		
Trichloroethene	0.2F	0.22F	
TOTAL VOCs	0.7	0.2	

MONITORING WELL:	RAP1-3R		BEDROCK AQUIFER								
SAMPLING ROUND	Round 1	Round 9	Round 10	Round 11		Permanganate Pilot Study			LTSP 2004	LTSP 2005	LTSP 2006
SAMPLING DATE	19-Feb-86	26-Jun-96	13-May-97	20-May-98	18-Jun-01	29-Aug-01	29-Aug-01 Duplicate	22-Apr-03	17-Nov-04	14-Nov-05	7-Nov-06
1,1-Dichlorethane								291.5			
1,1-Dichlorethene		11,000							383.25		
1,1,1-Trichlorethane	110,000	220,000	130,000	112,000	31,124.5	27,853.5	26,431	55,929	40,602.00	24,600	41,600
1,2-Dichlorethane	23,000 e										
1,2-Dichlorethene (total)	25,000	26,000	35,000								
cis-1,2-Dichlorethene					13,199.0	19,182	17,459	4,255.7	18,360.75M	20,000	45,000M
Dichloromethane/Methylene Chloride	8,100 e								458.5F	600F	
Tetrachloroethene					60	848	815	448	437.25F		
Toluene	5,100	23,000	9,200 j		1,569 F	1,619 F	1,609 F	1,021.2	633.25	650F	850F
Trichloroethene	410,000	1,100,000	580,000	477,000	129,172.5	124,464.5	116,998.5	63,527	111,661.00	79,700	142,000J
Vinyl Chloride					70	660.5	70	145			
TOTAL VOCs	581,200	1,380,000	754,200	589,000	175,195	174,628	163,383	125,617	172,536	125,550	229,450

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP1-3R		BEDROCK AQUIFER		
SAMPLING ROUND	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	5-Nov-07	Nov-08	3-Dec-09	18-Nov-10	18-Nov-11
Naphthalene		180 F	160	200	140
1,1-Dichloroethene	760F	500	380	670	27
1,1,1-Trichloroethane	32,400	16,000	8,400	6,000	2,100
1,2-Dichlorobenzene				11 F	10F
1,2,4-Trimethylbenze			22 F	11 F	12F
1,3,5-Trimethylbenze			9.4 F	5.6 FM	2.1F
Chloroform				3.5 F	
cis-1,2-Dichloroethene	25,100	12,000	14,000	12,000	5,800
Ethylbenzene			21 F	15 F	6.8F
Dichloromethane/Methylene Chloride			36 F		12F
Isopropylbenzene					2.7F
Naphthalene					17F
Tetrachloroethene	480R	310	140	91	25
Toluene	800F	470	170	110	12F
trans-1,2-Dichloroethene		92 FJ	85 F	68	33
Trichloroethene	119,000	57,000	20,000	15,000	3,300
Vinyl Chloride		160 F	200	200	190
Total Xylene		56 F	50 F	40 F	20F
TOTAL VOCs	178,540	86,768	43,673	34,425	11,710

MONITORING WELL:	RAP1-3S		SURFACE AQUIFER
SAMPLING ROUND	Permanganate Pilot Study		
SAMPLING DATE	18-Jun-01	22-Apr-03	
1,1,1-Trichloroethane	20.05	10.33	
1,1-Dichloroethane	26.25	16.41	
1,2-Dichloroethane	1.33F		
Chloroethane	1.7F		
cis-1,2-Dichloroethene	300.53	206.89	
Dichloromethane/Methylene Chloride	1.3F		
trans-1,2-Dichloroethene	6.84	5.24F	
Trichloroethene	43.3	34.8	
Vinyl chloride	4.45F	1.61F	
TOTAL VOCs	405.8	275.3	

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP1-4RA		BEDROCK AQUIFER								
SAMPLING ROUND	Round 1	Round 2	Round 3	Round 7	Round 8	Round 9	Round 10	Round 11	LTSP 1999	LTSP 2000	LTSP 2001
SAMPLING DATE	Mar-86	Oct-87	Oct-88	12-Jul-94	11-Nov-94	24-Jun-96	12-May-97	20-May-98	11-Nov-99	27-Nov-00	26-Nov-01
	RAP1-4R	RAP1-4R	RAP1-4R						P pump		
1,1-Dichloroethane		1.9j	3.0j	1.8	2.2	1.1	0.76j				
1,2-Dichloroethene (total)	13	18	23	15	16	7.3	6.8				
2-Butanone							13				
Acetone							35				
Chloromethane						0.93					
cis-1,2-Dichloroethene									2.6	0.75M	0.66F
Dichloromethane/Methylene Chloride		140b	24b								
Trichloroethene	34	27	37	16	15	7.1	4.3		4.2	2.2B	2
TOTAL VOCs	47	46.9	63	32.8	33.2	16.4	59.9	bdl	6.8	3.0	2.7

MONITORING WELL:	RAP1-4RA		BEDROCK AQUIFER		
SAMPLING ROUND	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006
SAMPLING DATE	20-Nov-02	17-Nov-03	Nov-04	15-Nov-05	7-Nov-06
cis-1,2-Dichloroethene	0.53F	0.51M	0.5M	0.64F	0.77M
Trichloroethene	2	1.7	1.45	1.42	1.26J
TOTAL VOCs	2.5	2.2	2.0	2.1	2.0

MONITORING WELL:	RAP1-5R	BEDROCK AQUIFER
SAMPLING ROUND	LTSP 2011	
SAMPLING DATE	18-Nov-11	
1,1-Dichlorethane	1.2	
1,1-Dichlorethene	0.23F	
1,2-Dichlorethane	0.32F	
1.4-Dichlorobenzzene	0.23F	
1,1,1-Trichlorethane	0.16F	
cis-1,2-Dichloroethene	1.6	
Dichloromethane/Methylene Chloride	0.36F	
trans-1,2-dichloroethene	0.13F	
Trichloroethene	9.4	
Vinyl Chloride	0.34F	
TOTAL VOCs	14.0	

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP1-6S		SURFACE AQUIFER								
SAMPLING ROUND	Round 1	Round 2	Round 3	Round 4	Round 4	Round 5	Round 5	Round 6	Round 6	Round 7	Round 8
SAMPLING DATE	13-Feb-86	1-Oct-87	23-Sep-88	7-Nov-90	7-Nov-90 Duplicate	26-Feb-91	26-Feb-91 Duplicate	6-Aug-91	6-Aug-91 Duplicate	1-Jul-94	15-Nov-94
1,1-Dichlorethane	90	78	120j	97	100	100	110J	89	86		
1,1-Dichlorethene	48	36		50	53	43J	62J	46	44		
1,2-Dichlorethane		9.7		12	10	21J	26J				
1,2-Dichlorethene (total)	*3100		3800	3200	3100	1000J	380J	840	830	2100J	690
1,1,1-Trichlorethane					4.1J		1.4J				
2-Hexanone		2.8j									
Benzene	1.2j	1.9j		2.4	2.2						
Dichloromethane/Methylene Chloride		3.4jR	1600R					72bR	67bR		
Tetrachloroethene	4.9j			4.0	3.7	3.8J	4.9J				
Toluene			110j								
Trichloroethene	*850		*1100	850	760	730J	650J	590	580	590J	180
Vinyl Chloride	70	59	140j	200	230	130J	140J	85	85	170J	
TOTAL VOCs	4164.1	187.4	5,270	4,415.4	4263.0	2027.8	1,374	1,650	1,625	2,860	870

MONITORING WELL:	RAP1-6S		SURFACE AQUIFER								
SAMPLING ROUND	Round 8	Round 9	Round 10	Round 11	Round 11	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 2000	LTSP 2001
SAMPLING DATE	15-Nov-94 Duplicate	26-Jun-96	8-May-97	19-May-98	19-May-98 Duplicate	10-May-99 Pbag - A	10-May-99 Pbag - B	10-May-99 Low-f	6-Oct-99 P pump	22-Sep-00	5-Sep-01
1,1-Dichlorethane		2									0.73
1,1-Dichlorethene		1.1	1.1								0.35F
1,2-Dichlorethene (total)	680	70j	83	21	21	37	59	12			
Acetone						11B	6.0B	3.9BL			
Chloromethane						2.6L					0.17F
cis-1,2-Dichlorethene									8.1	2.24M	39.72
Dichloromethane/Methylene Chloride										0.2B	
trans-1,2-Dichloroethene											0.33F
Trichloroethene	180	18	21	5.7	5.7	9.2	16	2.8L	2.5	1.2M	2.5
Vinyl Chloride		7.6	5.4				3.9L		0.5J	0.11M	3.51
TOTAL VOCs	860	98.7	110.5	26.7	26.7	48.8	78.9	14.8	11.1	3.75	47.31

MONITORING WELL:	RAP1-6S		SURFACE AQUIFER							
SAMPLING ROUND	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	26-Sep-02	17-Nov-03	17-Nov-04	16-Nov-05	7-Nov-06	5-Nov-07	Nov-08	2-Dec-09	18-Nov-10	18-Nov-11
1,1-Dichlorethane				0.18M	0.46F		0.44 F	0.30 F	0.33 F	5.7
1,1-Dichlorethene	0.14F		0.13F	0.38M						1.6
1,1,1-Trichloroethane							0.09 FJ			
1,2-Dichloroethane										0.69
1,2-Dichlorethene (total)	7.26MF									
2-butanone			22.2	56.9						
Benzene										0.16F
Acetone			7.7M	17.9						
cis-1,2-Dichlorethene	7.15M	2.68M	8.08M	23.8	9.91M	2.56	6.6 J	3.1	2.8	180
Dichloromethane/Methylene Chloride				0.29M				0.26 FB		0.48F
Toluene		0.35F	1.56	9.42	0.56F					0.077F
trans-1,2-Dichloroethene	0.11F			0.16F	0.16F		0.14 FJ	0.086 F	0.077 F	1
Trichloroethene	1.5	0.3F	0.46F	0.58M	0.32F	0.26F	0.67 F	0.14 F		1.1
Vinyl Chloride	0.64F	0.21F	0.7F	2.38M	4.17		2.7	1.1	1.1	38
TOTAL VOCs	9.5	3.5	40.8	112.0	15.6	2.8	10.6	4.7	4.3	228.8

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP1-6T		LOWER AQUIFER								
SAMPLING ROUND	Round 1	Round 1	Round 1	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 8
SAMPLING DATE	13-Feb-86	13-Feb-86 Duplicate	5-Mar-86	5-Mar-86 Duplicate	1-Oct-87	22-Sep-88	7-Nov-90	26-Feb-91	6-Sep-91	1-Jul-94	15-Nov-94
1,1-Dichlorethane	190	200	160	170j	110	98j	120	130J	220		270
1,1-Dichlorethene	96	100	84		42		61	68J	140		
1,1,1-Trichlorethane	300	300	290	330j	130	120j	130	160J	62		
1,1,2,2-Tetrachlorethene	6.6	7.4	7.1								
1,2-Dichlorethane	17	17	18				9.7	58J	11		
1,2-Dichlorethene (total)	5,000*	5,000*	1,900R	6,000	3,200	3,000	2,700	1,000J	2,900*	4,200J	5,000
Acetone					790						
Benzene	2.9j	2.1j	2.6j								
Dichloromethane/Methylene Chloride					330b	610R			59bR		
Tetrachloroethene							3.8		13		
Toluene						100j					
Trichloroethene	650*	590*	550	720	340	430	450	600J	1,400	1,800J	2,500
Vinyl Chloride	780	790	760	800j	510	560	570	660J	1,200*	950J	1,200
TOTAL VOCs	7,042.5	7,006.5	1,871.7	8,020.0	5,452.0	4,308.0	4,045.0	2,676.0	5,946.0	6,950	8,970

MONITORING WELL:	RAP1-6T		LOWER AQUIFER								
SAMPLING ROUND	Round 8	Round 9	Round 10	Round 11	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999
SAMPLING DATE	15-Nov-94 Duplicate	26-Jun-96	8-May-97	19-May-98	13-May-99 P bag - A	13-May-99 P bag - B	13-May-99 P bag - C	13-May-99 P bag - D	13-May-99 P bag - E	14-May-99 Low-f	6-Oct-99 P pump
1,1-Dichloroethane	270	350	350		82L	280	250	270	200L	250	270
1,1-Dichloroethene		210	220			140L	140L	140L	110L		160J
1,1,1-Trichloroethane		30j			410						
1,2-Dichloroethene (total)	4900	6200j	6600	3800	2,400	6,800	6,800E	6,600E	6,200E	6,200E	
Acetone							330BL	230BL			
cis-1,2-Dichloroethene											5,100
Dichloromethane/Methylene Chloride											560b
Trichloroethene	2500	2200	2000	1600		1,600	1,600	1,800	1,600	1,500	1,400
Vinyl Chloride	1,200	1,600	1,600		180L	1,600	1,300	1,300	1,200	1,300	1,000
TOTAL VOCs	8,870	10,590	10,828	5,400	3,072.00	10,420	10,090	10,110	9,310	9,250	7,930

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP1-6T		LOWER AQUIFER								
SAMPLING ROUND	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010
SAMPLING DATE	22-Sep-00	5-Sep-01	26-Sep-02	17-Nov-03	17-Nov-04	16-Nov-05	7-Nov-06	5-Nov-07	Nov-08	2-Dec-09	18-Nov-10
1,1-Dichloroethane	199.93	78.6	104.07	13.83	19.46	18M	11.7	55.8	15	12	18
1,1-Dichloroethene	96.55M	40.8F	38.8		0.15F	0.23M		19.5F	0.84 F	0.13 F	1.4
1,1,1-Trichloroethane	0.17F		1.02F		0.48F				0.22 FJ	0.40 F	0.34 F
1,1,2-Trichloroethane	0.1F										
1,2-Dichlorobenzene				0.42	0.21F	0.25F	0.1F		0.11 F		0.2 F
1,2-Dichloroethane	16.24	8.17F	7.15	1.57	0.94	0.76	0.35F		0.51		
1,4-Dichlorobenzene				0.26F	0.16F	0.16F					
2-Butanone						2.94F					
Acetone						2.18F					
Benzene	4.88		2.56F	0.64	0.3F	0.33F	0.14F		0.16 FJ		0.2 F
Chlorobenzene	0.33F			0.15F							
Chloroethane	0.4M	6.6F	3.9F	12.90	2.25	3.13	0.69M			0.38 F	
Chloroform		16.75									
cis-1,2-Dichloroethene	4,881.65	1,869.75	1,763.1M	2.89M	10.57M	10.6	2.72M	898	33 J	5.3	61
Dichloromethane/Methylene Chloride	0.7B		1.6F			0.36M					
Tetrachloroethene	5.57										
Toluene	0.83F										
trans-1,2-Dichloroethene	294.96J	16.91F	18.98	3.04	1.74	3.27	0.95F	17.2F	1.5 J	0.80 F	3.6
Trichloroethene	1,265.5	67.8	77.6	0.5F	1.94	2.41M	1.44J	206	10	2.1	21
Vinyl Chloride	608.95	655.68M	501.27	6.28	11.09	6.2M	5.83	312	31	8.9	50
TOTAL VOCs	7,376.8	2,761.1	2,520.1	42.5	49.3	50.8	23.9	1,508.5	92.3	30.0	155.7

MONITORING WELL:	RAP1-6T	LOWER AQUIFER
SAMPLING ROUND	LTSP 2011	
SAMPLING DATE	18-Nov-11	
1,1-Dichloroethane	11	
1,1-Dichloroethene	0.089F	
1,1,1-Trichloroethane	0.25F	
1,2-Dichloroethane	0.21F	
cis-1,2-Dichloroethene	2.5	
Dichloromethane/Methylene Chloride	0.65F	
trans-1,2-Dichloroethene	0.57F	
Trichloroethene	1.1	
Vinyl Chloride	8.4	
TOTAL VOCs	24.8	

MONITORING WELL:	RAP1-6R		BEDROCK AQUIFER								
SAMPLING ROUND	Round 1	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 8	Round 9	Round 10
SAMPLING DATE	13-Feb-86	13-Feb-86 Duplicate	1-Oct-87	23-Sep-88	7-Nov-90	27-Feb-91	7-Aug-91	5-Jul-94	15-Nov-94	26-Jun-96	8-May-97
1,1-Dichloroethane	60	64	77	140j	84	*140	*130	130	190	240	230
1,1-Dichloroethene	48	51	42j	60j	37	64	95	69	110	130	130
1,1,1-Trichloroethane	70	71	36j		22	50	32				
1,2-Dichloroethane	8.50	9.40			14	36	10				
1,2-Dichloroethene (total)	*2600	*1900	2,900	5,000	2,600	*680	*1,800	3,500	3,700	4,932	4,800
Trichloroethene	*820	*640	730	1,400	570	*670	*760	1,100	1,400	1,800	1,600
Benzene					2.4						
Dichloromethane/Methylene Chloride			71j	590bR							
Tetrachloroethene	11	11			5.4	9.6	14				
Toluene				57j							
Vinyl Chloride	67	72	220	340j	170	*460	*300	600	710	990	850
TOTAL VOCs	3,685	2,818	4,076	6,997	3,505	2,110	3,004	5,399	6,110	8,092	7,610

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP1-6R		BEDROCK AQUIFER								
SAMPLING ROUND	Round 11	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999
SAMPLING DATE	19-May-98	7-May-99	13-May-99	13-May-99	13-May-99	13-May-99	13-May-99	13-May-99	14-May-99	14-May-99	6-Oct-99
		P pump	P bag - A	P bag - B	P bag - C	Pb-C Dup	P bag - D	P bag - E	Low-f	Low-f Dup	P pump
1,1-Dichloroethane		270	200L	200L	230L	200L	220L	200L	230L	230L	220
1,1-Dichloroethene		180		110L	110L	110L			100L	120L	120J
1,2-Dichloroethene (total)	4,800		5,100E	5,400E	6,400E	6,100E	6,300E	5,400	6,400E	5,700E	
Acetone				180BL		210BL					970
cis-1,2-Dichloroethene		4,800									4,100
Dichloromethane/Methylene Chloride											290b
Trans-1,2-Dichloroethene											58J
Trichloroethene	1,800	1,300	1,000	1,100	1,400	1,200	1,300	1,100	1,200	1,300	1,200
Vinyl Chloride	1,300	590	940	930	1,100	1,200	1,300	930	810	810	700
TOTAL VOCs	7,900	7,140	7,240	7,740	9,240	8,810	9,120	7,630	8,740	8,160	7,368

MONITORING WELL:	RAP1-6R		BEDROCK AQUIFER							
SAMPLING ROUND	LTSP 2000	LTSP 2000	LTSP 2001	LTSP 2001	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2004	LTSP 2005	LTSP 2005
SAMPLING DATE	22-Sep-00	22-Sep-00	5-Sep-01	5-Sep-01	26-Sep-02	17-Nov-03	29-Nov-04	29-Nov-04	16-Nov-05	16-Nov-05
		Duplicate		Duplicate				Duplicate		Duplicate
1,1-Dichloroethane	164.25	171.22	200.84	204.76	159.66	106.84	76.07	78.22	93.4M	76.6M
1,1-Dichloroethene	85.98M	98.12M	110.62F	157.96F	91.25F	23.63F	6.08F	7.7F	13.5M	3.1M
1,1,1-Trichloroethane	2.72	2.61								
1,2-Dichloroethane	15.09	15.05	26.02F	29.88F	12.99F	10.65F	7.68F	8.08F	7.5	6.9
1,2-Dichlorobenzene									0.4F	
Acetone									7.85F	
Benzene	4.39	4.23							1.98	1.6F
Chlorobenzene	0.18F	0.24F								
Chloroethane	0.2M	0.2M					4.99F	4.3F	3.55	4.6F
cis-1,2-Dichloroethene	4,086.40	4,274.48	4,536.96	4,439.12	3827.6M	1192.8M	356.97M	449.19M	634	198
Dichloromethane/Methylene Chloride	0.3B	0.4B			30.4F				1.5M	2M
Tetrachloroethene	6.56	6.31							0.35F	
Toluene	0.36F	0.38F								
trans-1,2-Dichloroethene	69.85J	93.01J	25.54F	23.2F	22.25F	12.54F	9.42F	9.41F	10.8	8.8F
Trichloroethene	1,148.1	1,219	904.1	1,038.5	692.1	179.5	48.86	68.81	86.5M	27.3M
Vinyl Chloride	445.9	465.76	738.78M	1083.64M	487.06	250.70	140.23	162.28	87.5M	69.4M
TOTAL VOCs	6,030	6,351	6,543	6,977	5,323	1,777	640.9	788.0	949.2	398.3

MONITORING WELL:	RAP1-6R		BEDROCK AQUIFER						
SAMPLING ROUND	LTSP 2006	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2010	LTSP 2011	LTSP 2011
SAMPLING DATE	7-Nov-06	7-Nov-06	5-Nov-07	Nov-08	2-Dec-09	18-Nov-10	18-Nov-10	18-Nov-11	18-Nov-11
		Duplicate					Duplicate		Duplicate
1,1-Dichloroethane	56.7	82.2	84.2	86	120	120	120	120	110
1,1-Dichloroethene	0.8 F	7.4 F	5.4 F	12	27	37	38	21	23
1,1,1-Trichloroethane				0.38 FJ		0.66 F	0.68 F	0.36F	0.42F
1,2-Dichlorobenzene								0.75F	<0.56
1,2-Dichloroethane	4.85	5.8 F		5.7	5.9			5.5	5.5
Benzene	0.7 F			1.5 FJ	2.5	2.9 F	2.8 F	2.9	2.8
cis-1,2-Dichloroethene	71 M	479 M	520	750 J	1,200	2100	2300	1100	1200
Dichloromethane/Methylene Chloride					1.3 FB			4.1F	4.5F
trans-1,2-Dichloroethene	6.25	8.6 F	9.8 F	7.2 J	7.8	11	11	19	14
Trichloroethene	19.3 J	71.8 J	26.2	16	170	360	400	140	160
Vinyl Chloride	85	184	160	440	810	380	350	590	560
TOTAL VOCs	244.6	838.8	805.6	1,318.78	2,344.5	3011.6	3222.5	2003.6	2080.2

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP1-7S		SURFACE AQUIFER		
SAMPLING ROUND	LTSP 2000	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2004
SAMPLING DATE	22-Sep-00	27-Nov-00	27-Nov-01	18-Nov-02	16-Nov-04
Acetone					1.1M
Dichloromethane/Methylene Chloride	0.1B				
Toluene					0.12F
Trichloroethene					0.35F
TOTAL VOCs	0.1B	bdl	bdl	bdl	1.57

MONITORING WELL:	RAP1-7T		LOWER AQUIFER								
SAMPLING ROUND	LTSP 2000	LTSP 2000	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007
SAMPLING DATE	22-Sep-00	27-Nov-00	27-Nov-00 Duplicate	27-Nov-01	18-Nov-02	18-Nov-02 Duplicate	18-Nov-03	16-Nov-04	15-Nov-05	7-Nov-06	7-Nov-07
1,1-Dichloroethane	0.15M										
1,1-Dichloroethene								0.11F	0.12F		
Acetone	3R	0.7F	0.4F						1.17F		
cis-1,2-Dichloroethene	2.55M	1.64M	1.82M	2.48	1.82	1.82	1.3M	3.09M	2.28	1.78M	3.15
Dichloromethane/Methylene Chloride	0.1B										
Methyl-tert-butyl-ether								0.2F	0.1F		
Trichloroethene	29.4M	18.6B	20.8B	26.8	25.4	25	13.9	17.84	18.60	12.6J	12.3
TOTAL VOCs	32.2	20.9	23.0	29.3	27.2	26.8	15.2	21.2	22.3	14.4	15.5

MONITORING WELL:	RAP1-7T		LOWER AQUIFER	
SAMPLING ROUND	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	Nov-08	30-Nov-09	22-Nov-10	17-Nov-11
1,1-Dichloroethene	0.12 F	0.19 F	0.13F	
Acetone				3.4F
cis-1,2-Dichloroethene	3.8 J	4.1	3.9	3.5
Dichloromethane/Methylene Chloride		0.31 FB		
Toluene			0.088F	
Trichloroethene	22	26 M	22	12
TOTAL VOCs	25.9	30.6	26.1	18.9

MONITORING WELL:	RAP1-7R		BEDROCK AQUIFER								
SAMPLING ROUND	Round 1	Round 2	Round 3	Round 4	Round 4	Round 5	Round 6	Round 7	Round 8	Round 9	Round 10
SAMPLING DATE	25-Feb-86	2-Oct-87	25-Sep-88	6-Nov-90	6-Nov-90 Acid Preserved	26-Feb-91	6-Aug-91	7-Jul-94	15-Nov-94	25-Jun-96	19-May-97
1,1-Dichloroethene										1.0j	1.7j
1,2-Dichloroethene (total)	1.8j	3.0	4.4j	9.6	10	5.4	4.7	10	10	12	15
Acetone	8.4										
Chloroform	2.1j										
Dichloromethane/Methylene Chloride	3.6j	9.5R	23bR				7.0bR				
Toluene			1.1j								
Trichloroethene	35	69	88	140	150	96	*150	180	150	76j	200
TOTAL VOCs	50.9	81.5	116.5	149.6	160	101	161.7	190	160	89	216.7

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP1-7R		BEDROCK AQUIFER								
SAMPLING ROUND	Round 11	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 2000
SAMPLING DATE	13-May-98	10-May-99	10-May-99	10-May-99	10-May-99	10-May-99	11-May-99	11-Nov-99	13-Nov-99	13-Nov-99	22-Sep-00
		Pbag -A	Pbag -B	Pbag -C	Pbag -D	Pbag -E	Low-f	P pump	Pbag -C	Pbag -E	
1,2-Dichloroethene (total)	12	5.1				9.7L	8.2L				
2-Butanone (MEK)		8.1L									
Acetone		15B	75BL	70BL		25BL	37BL				
cis-1,2-Dichloroethene								18	21	22	12.49
Dichloromethane/Methylene Chloride											1.3B
Trichloroethene	200	56	280	180	220	190	180	230	300	330	243.4
TOTAL VOCs	212	84.2	355	250	220	199.7	225.2	248	321	352	257.2

MONITORING WELL:	RAP1-7R (RAP1-7)		BEDROCK AQUIFER								
SAMPLING ROUND	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010
SAMPLING DATE	27-Nov-00	27-Nov-01	18-Nov-02	18-Nov-03	16-Nov-04	14-Nov-05	7-Nov-06	7-Nov-07	Nov-08	30-Nov-09	22-Nov-10
1,1-Dichloroethane									0.37 F	0.33 F	0.37 F
1,1-Dichloroethene						1F	1.6F		1.1	1.4	1.5
1,1,1-Trichloroethane									0.14 FJ	0.13 F	0.15 F
Carbon Disulfide	1.2F										
Chloroform										0.056 F	0.068 F
cis-1,2-Dichloroethene	10.34M	14.62	11.01F	12.77M	12.61M	12.5	17.3M	12.6R	15 J	15	17
Dichloromethane/Methylene Chloride					1.85F	1.2F				0.77 FB	
Tetrachloroethene									0.34 F	0.31 F	0.33 F
trans-1,2-Dichloroethene									0.58 FJ	0.11 F	0.092 F
Trichloroethene	195.7B	217	189.2	197.8	154.82	188	256J	189R	230	250	230
TOTAL VOCs	207.2	231.6	200.2	210.6	169.3	202.7	274.9	201.6	247.5	267.3	249.5

MONITORING WELL:	RAP1-7R (RAP1-7)		BEDROCK AQUIFER
SAMPLING ROUND	LTSP 2011	LTSP 2011	
SAMPLING DATE	17-Nov-11	17-Nov-11 Duplicate	
1,1-Dichloroethane	0.32F	0.32F	
1,1-Dichloroethene	1.3	1.2	
Acetone	1.9F	2.4F	
cis-1,2-Dichloroethene	14	15	
Tetrachloroethene	0.29F	<0.14	
Trichloroethene	190	220	
TOTAL VOCs	207.8	238.9	

SURFACE WATER MONITORING POINT:			RAP1-SW4								
SAMPLING ROUND	Round 1	Round 1	Round 2	Round 3	Round 4	Round 4	Round 5	Round 5	Round 6	Round 6	Round 7
SAMPLING DATE	4-Mar-86	4-Mar-86 Duplicate	5-Oct-87	26-Sep-88	8-Nov-90	8-Nov-90 Duplicate	27-Feb-91	27-Feb-91 Duplicate	7-Aug-91	7-Aug-91 Duplicate	12-Jul-94
1,1-Dichloroethane	5.7	5.3		3.9j			4.5J		2.5	2.5	
1,1-Dichloroethene	4.3j	3.8j		4.0			1.9J	4.9J	1.2	1.1	
1,1,1-Trichloroethane	4.9j	4.4j	3.3j	1.8j	2.6	3.2	6.5	6.5	1.1J	1.5J	
1,2-Dichloroethane			4.9j								
1,2-Dichloroethene (total)	130	120	100	87	44	50	35	31	24	29	15
Acetone	6.0b	4.0b									
Benzene				1.5j							
Chlorobenzene				1.2j							
Toluene				2.3j							
Trichloroethene	100	92		54	49	57	93	88	35	33	20
Vinyl Chloride	19	16	13	4.9j			5.1J	7.1J	1.6	1.5	1.2
TOTAL VOCs	269.9	245.5	121.2	159.5	95.6	110.2	146.0	137.5	65.4	68.6	36.2

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

SURFACE WATER MONITORING POINT:	RAP1-SW4										
SAMPLING ROUND	Round 7	Round 8	Round 8	Round 9	Round 9	Round 10	Round 10	Round 11	Round 11	1999 LTSP	1999 LTSP
SAMPLING DATE	12-Jul-94 Duplicate	17-Nov-94	17-Nov-94 Duplicate	27-Jun-96	27-Jun-96 Duplicate	14-May-97	14-May-97 Duplicate	29-May-98	29-May-98 Duplicate	6-Oct-99	21-Dec-99
1,2-Dichloroethene (total)	13	6.4	5.8	3.8	2.8	3.1	2.3				
Chlorobenzene						0.53j					
Chloromethane						0.55j					
cis-1,2-Dichloroethene										0.7j	0.6j
Ethylbenzene						0.77j					
Tetrachloroethene						0.98j					
Toluene				0.58j	0.54j						
Trichloroethene	19	8.6	7.4	4.0	4.7	2.4	1.8	3.8	3.8	0.6j	0.4j
Vinyl Chloride	1.1										
Xylenes (Total)						2.3j					
TOTAL VOCs	33.1	15	13.2	8.4	8	10.6	4.1	3.8	3.8	1.3	1

SURFACE WATER MONITORING POINT:	RAP1-SW4										
SAMPLING ROUND	LTSP 2000	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009
SAMPLING DATE	22-Jun-00	22-Sep-00	5-Sep-01	26-Sep-02	17-Nov-03	18-Nov-04	17-Nov-05	10-Nov-06	8-Nov-07	Nov-08	3-Dec-09
Acetone		1.5F				3.1M	2.65F	2.73 F	2.28 R	4.1 F	2.3 F
Chloromethane			0.21F								
cis-1,2-Dichloroethene	0.7F	0.27M	0.82F	0.42M	0.68M	0.89M	0.64F	2.03	0.92 R	1.1 J	0.16 F
Dichloromethane/Methylene Chloride		0.2B	0.1J						0.12 R		0.22 FB
Methyl-tert-butyl-ether						0.11F					
Trichloroethene	0.6F	0.2M	0.4F	0.3F	0.5F	0.49F	0.32M	0.64 F	0.34 R	0.43 F	
TOTAL VOCs	1.3	2.2	1.5	0.7	1.2	4.6	3.6	5.4	3.7	5.6	2.5

SURFACE WATER MONITORING POINT:	RAP1-SW4	
SAMPLING ROUND	LTSP 2010	LTSP 2011
SAMPLING DATE	19-Nov-10	18-Nov-11
1,1-Dichloroethane	0.1F	0.19F
1,1-Dichloroethene		0.12F
Acetone	8.8 F	26
Chloromethane		0.13F
cis-1,2-Dichloroethene	2.3	3.8
Dichloromethane/Methylene Chloride		0.76F
trans-1,2-dichloroethene		0.061F
Trichloroethene	0.23 F	1.5
Vinyl Chloride		0.17F
TOTAL VOCs	11.43	32.7

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP2-1T		LOWER AQUIFER								
SAMPLING ROUND	Round 1	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 8	Round 9	Round 10
SAMPLING DATE	29-Jan-86	29-Jan-86 Duplicate	Not Sampled	Not Sampled	8-Nov-90	28-Feb-91	8-Sep-91	29-Jun-94	11-Nov-94	1-Jul-96	6-May-97
1,1-Dichloroethane							2.4		20	22	20
1,1-Dichloroethene						1.9	1.3		21	17	16j
1,2-Dichloroethene (total)	1.6j	2j			17	9.9	40.0	500	650	470	450
Acetone	38b	38b								62j	
Chloroethane											13j
Chloromethane										7.3j	
Dichloromethane/Methylene Chloride							6.0bR				
Benzene										15	15j
Ethylbenzene										7.4j	
Tetrachloroethene										12	
Trichloroethene	17	17			42	61	130	880	1,800	2,100	2,100
Xylenes (Total)										27j	
TOTAL VOCs	56.6	57			59	72.8	173.7	1,380	2,491	2,740	2,614

MONITORING WELL:	RAP2-1T		LOWER AQUIFER								
SAMPLING ROUND	Round 11	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002
SAMPLING DATE	8-May-98	12-May-99 Pbag - A	12-May-99 Pbag - B	12-May-99 Pbag - C	12-May-99 Pbag - D	12-May-99 Pbag - E	13-May-99 Low-f Dup	11-Nov-99 P pump	27-Nov-00	26-Nov-01	19-Nov-02
1,1-Dichloroethane					3.8L				1.38F	0.32F	1.86
1,1-Dichloroethene									1.44M		1.93
1,2-Dichloroethene (total)	220		15L	95	82	97					
Acetone		21BL	24BL		31B						
cis-1,2-Dichloroethene								240	124.78M	33.53	253.39
Benzene				4.4L		5.0			1.06F	0.12F	1.8
trans-1,2-Dichloroethene									2.24M		1.56
Trichloroethene	2,400	55	230	*900	*1,300	*990	880	850	107.1M	5.1	44.4
Vinyl Chloride											0.16F
TOTAL VOCs	2,620	76	269	999	1,417	1,092	880	1,090	238.0	39.1	305.1

MONITORING WELL:	RAP2-1T		LOWER AQUIFER						
SAMPLING ROUND	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	19-Nov-03	17-Nov-04	16-Nov-05	9-Nov-06	8-Nov-07	Nov-08	3-Dec-09	22-Nov-10	29-Nov-11
1,1-Dichloroethane	2.46F	2.14F	3.9M	2.3F	1.4R	1.1	0.74 F	0.64 F	0.54F
1,1-Dichloroethene	2.09F	1.78F	2.3M	1.4F	1.1R	0.87 F	0.54 F	0.51 F	0.42F
Acetone									11
Benzene	1.7F	1.57F	1.1F	1F	1	0.75 J	0.52	0.4	0.35F
cis-1,2-Dichloroethene	349.58M	291.65M	263	257M	234R	160 J	100	85	77
Dichloromethane/Methylene Chloride		1.23F	4.2M						0.40F
Naphthalene		2.86F							
trans-1,2-Dichloroethene	3F	1.55F	1.5F	2F	2.2R	0.81 FJ	0.92 F	0.44 F	0.34F
Trichloroethene	16	3.53F	8.8M	3.9F	3.8R	2.6	2	1.8	1.6
Vinyl chloride			5.9M	3.6F		0.15 F			
TOTAL VOCs	374.8	306.3	290.7	271.2	243.5	166.3	104.7	88.8	91.7

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP2-1R		BEDROCK AQUIFER								
SAMPLING ROUND	Round 1	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 8	Round 9	Round 10
SAMPLING DATE	12-Feb-86	12-Feb-86 Duplicate	7-Oct-87	27-Sep-88	8-Nov-90	28-Feb-91	8-Sep-91	29-Jun-94	11-Nov-94	2-Jul-96	6-May-97
1,1-Dichloroethane										1.8j	4.6j
1,1-Dichloroethene										1.6j	4.0j
1,2-Dichloroethene (total)								2.5	14	48	140
Benzene										1.0j	3.6j
Chloromethane										6.6	
Dichloromethane/Methylene Chloride		6.1		7.8R			11bR				
Trichloroethene								18	78	270	640
TOTAL VOCs	bdl	6.1	bdl	bdl	bdl	bdl	bdl	20.5	92	329	792.2

MONITORING WELL:	RAP2-1R		BEDROCK AQUIFER								
SAMPLING ROUND	Round 11	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 2000	LTSP 2001
SAMPLING DATE	8-May-98	12-May-99 Pbag - A	12-May-99 Pbag - B	12-May-99 Pbag - C	12-May-99 Pb-C Dup	12-May-99 Pbag - D	12-May-99 Pbag - E	13-May-99 Low-f	11-Nov-99 P pump	27-Nov-00	26-Nov-01
1,1-Dichloroethane		5.2L	7.8L	5.9L	4.4L	5.9L	4.8L			7.76F	3.32F
1,1-Dichloroethene									11J	5.72M	1.68F
1,2-Dichloroethene (total)	130	340	300	270	250	280	260	470			
Acetone			40BL	26BL	23BL	21BL	49BL				
Benzene										5.61F	1.24F
cis-1,2-Dichloroethene									1,100	778.99	278.09
Dichloromethane/Methylene Chloride										2.3F	
trans-1,2-Dichloroethene										16.81M	2.71F
Trichloroethene	500	*840	*890	*780	*790	*540	490	*750	880	628.3M	264.6
TOTAL VOCs	630	1,185.2	1,197.8	1,055.9	1,044.4	825.9	754.8	1,220	1,991	1,445.5	551.7

MONITORING WELL:	RAP2-1R		BEDROCK AQUIFER								
SAMPLING ROUND	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011	LTSP 2011
SAMPLING DATE	19-Nov-02	19-Nov-03	17-Nov-04	16-Nov-05	9-Nov-06	8-Nov-07	Nov-08	3-Dec-09	22-Nov-10	22-Nov-11	22-Nov-11
1,1-Dichloroethane	2.03F	1.88F	1.33F	2M	1.4F		1.1	1.1	0.84 F	1.1	1.1
1,1-Dichloroethene		1.57F	1.55F	1.7M	1.3F		1.1	1	0.77 F	1.1	1
Dichloromethane/Methylene Chloride			1.19F	12.5M							
Benzene	1.59F	1.28F		1.3F	1.1F		0.84 J	0.84	0.68	0.93	0.88
cis-1,2-Dichloroethene	119.97	139.4M	98.61M	162	160M	260R	180 J	160	140	130	130
Dichloromethane/Methylene Chloride										0.42F	0.43F
trans-1,2-Dichloroethene		2.02F			1.5F		0.63 FJ	0.62 F	0.92 FM	0.35F	0.36F
Trichloroethene	306	217.8	155.41	161M	130J	98.6R	44	55	33 M	75	75
Vinyl Chloride							0.21 F	0.21 F	0.12 FM	0.17F	0.15F
TOTAL VOCs	429.6	364.0	258.1	340.5	295.3	358.6	227.9	218.8	176.3	209.1	208.9

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP2-2T		BEDROCK AQUIFER			
SAMPLING ROUND	Round 11	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	11-May-98	7-Nov-07	Nov-08	25-Nov-09	18-Nov-10	28-Nov-11
1,1-Dichloroethane		70.5R	80	71	74	73
1,1-Dichloroethene		10.5R	8.8	7.6	5.7	6.9
1,2-Dichlorobenzene			0.27 F	0.33 F		0.34F
1,2-Dichloroethane			5	4.3	4.9	4.4
1,2-Dichlorethene (total)	1,100					
Benzene			1.5 J	1.5	1.5	1.4
cis-1,2-Dichloroethene		744R	540 J	500	440	440
Chloromethane					0.57 F	
Dichloromethane/Methylene Chloride				1.2 FB		0.98F
Toluene			0.19 F		0.28 F	0.16F
trans-1,2-Dichloroethene		10.5R	17 J	22	27	34
Trichloroethene	330	44R	39	35	27	29
Vinyl chloride		212R	220	190	140	170
o-Xylene			0.64 FM	0.57 F	0.51 F	0.6F
TOTAL VOCs	1,430	1,091.5	912.4	832.3	721.5	760.8

MONITORING WELL:	RAP2-2R		BEDROCK AQUIFER								
SAMPLING ROUND	Round 1	Round 1	Round 7	Round 8	Round 9	Round 10	Round 11				
SAMPLING DATE	29-Jan-86	29-Jan-86 Duplicate	30-Jun-94	14-Nov-94	2-Jul-96	14-May-97	12-May-98	12-May-99 Pbag - A	12-May-99 Pbag - B	12-May-99 Pbag - C	12-May-99 Pbag - D
Vinyl Chloride					12	120		120	160	140	140
1,1-Dichlorethane					8.5	57		54	57	51	57
1,1-Dichlorethene					3.8	32		30	34	29	37
1,2-Dichlorethene (total)			6.6	8.1	200 j	1,400	1,400	*1,400	*1,800	*1,800	*1,800
Chloroform					0.70 j						
Trichloroethene	5.3	4.9 j	bdl	1.2	51	330	400	320	300	280	270
Tetrachloroethene		3.8 j			75						
Acetone								26 B	36 BL	33 B	28 BL
TOTAL VOCs	5.3	8.7 j	6.6	9.3	276.0j	1,939	1,800	1,924	2,351	2,300	2,304

MONITORING WELL:	RAP2-2R		BEDROCK AQUIFER				
SAMPLING ROUND			LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	12-May-99 Pbag - E	14-May-99 Low-f	7-Nov-07	Nov-08	25-Nov-09	18-Nov-10	22-Nov-11
1,1-Dichloroethane	61		30R	20	21	36	79.0
1,1-Dichloroethene	37		6R	3.9	3.8	4.1	9.5
1,2-Dichloroethane				1.2			5.2
1,2-Dichlorethene (total)	*1,900	2,200					
1,2-Dichlorobenzene							0.25F
Acetone	43 BL	230 BL					
Benzene				0.41 FJ	0.53 F	0.74 F	1.8
Chloroethane				2.9	2.9	1.2 F	
cis-1,2-Dichloroethene			601R	520 J	550	560	540
Dichloromethane/Methylene Chloride					1.3 FB		1.5F
Toluene						0.16 F	0.29F
trans-1,2-Dichloroethene				1 FJ	0.70 F	8.8	35
Trichloroethene	350	190 L	45R	25	27	23	38
Vinyl chloride	150	150 L	51R	18	12	43	130
Xylenes (total)							0.59F
TOTAL VOCs	2,541	2,770	733 R	592.4	617.9	677.0	841.1

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP2-3T		LOWER AQUIFER								
SAMPLING ROUND	Round 1	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 8	Round 9	Round 10
SAMPLING DATE	29-Jan-86	29-Jan-86 Duplicate	Not Sampled	Not Sampled	8-Nov-90	28-Feb-91	Not Sampled	29-Jun-94	8-Nov-94	8-Jul-96	6-May-97
1,1-Dichloroethane										11	22
1,1-Dichloroethene										11	23
1,2-Dichloroethene (total)	16	17			35	11		1,600	870	290	1,300
Acetone										58j	
Benzene										11	21
Toluene		1.7j									
Trichloroethene	150	180			180	99		5,600	3,900	1,600	4,400
TOTAL VOCs	166	198.7			215	110		7,200	4,770	1,981	5,766

MONITORING WELL:	RAP2-3T		LOWER AQUIFER								
SAMPLING ROUND	Round 11	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002
SAMPLING DATE	7-May-98	12-May-99 P bag - A	12-May-99 P bag - B	12-May-99 P bag - C	12-May-99 P bag - D	12-May-99 P bag - E	13-May-99 Low-f	11-Nov-99 P pump	27-Nov-00	26-Nov-01	18-Nov-02
1,1-Dichloroethane									4.68	0.62F	
1,1-Dichloroethene									5.67M	0.84F	
1,2-Dichloroethene (total)	110	170	14L	35	28	13L	77				
Acetone		21BL									
Benzene								1.3J	4.09	0.55F	
cis-1,2-Dichloroethene								62	691.5M	86.12	60.82
Dichloromethane/Methylene Chloride								2.2b			
Ethylbenzene								0.6J			
Styrene								0.7J			
trans-1,2-Dichloroethene									3.32M		
Trichloroethene	440	160	86	200	160	71	170	240	1776.6M	91.6	19.8
Xylene (total)								1J			
TOTAL VOCs	550	330	100	235	188	84	247	307.8	2,485.9	179.7	80.6

MONITORING WELL:	RAP2-3T		LOWER AQUIFER							
SAMPLING ROUND	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP2011
SAMPLING DATE	18-Nov-03	18-Nov-04	16-Nov-05	9-Nov-06	7-Nov-07	7-Nov-07 Duplicate	Nov-08	3-Dec-09	23-Nov-10	29-Nov-11
1,1-Dichloroethane	0.7F	0.58F	0.65M	0.21F	0.4F	0.34F	1.6 / 1.5	0.18 F	0.52 F	0.91F
1,1-Dichloroethene	0.57F			0.18F	0.22F		1.7 / 1.9	0.19 F	0.53 F	0.94F
Acetone										8.4F
Benzene				0.12F	0.22F	0.22F	1.2 J / 1.1 J	0.16 F	0.4	0.69
Chloromethane								0.19 F		
cis-1,2-Dichloroethene	90.46M	68.47M	78.6	35.7M	58.6	55.6	360 J/ 350 J	43	130	230
Dichlorodifluoromethane							0.15F / 0.14F			
Dichloromethane/Methylene Chloride		0.64F	6.1M							0.39F
trans-1,2-Dichloroethene	0.53F			0.27F	0.34F	0.38F	1.4 J / 1.5 J	0.28 F	0.51 F	0.76F
Trichloroethene	5.2	3.99F	2.25M	1.88J	1.56F	1.38F	11 / 10	1.3	2.3	6.7
Vinyl Chloride							0.26F / 0.25F			0.20F
TOTAL VOCs	97.5	73,68	87.6	38.4	61.3	57.9	377.3/366.4	45.3	134.3	249.0

MONITORING WELL:	RAP2-3R		BEDROCK AQUIFER								
SAMPLING ROUND	Round 1	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 8	Round 9	Round 10
SAMPLING DATE	7-Feb-86	7-Feb-86 Duplicate	8-Oct-87	28-Sep-88	9-Nov-90	28-Feb-91	9-Aug-91	29-Jun-94	8-Nov-94	8-Jul-96	6-May-97
Chloromethane											0.53j
Dichloromethane/Methylene Chloride			4.7j	12R							
Trichloroethene			4.3j	1.63	1.9j	1.4	1.8			0.95j	0.50j
TOTAL VOCs	bdl	bdl	9	1.6	1.9	1.4	1.8	bdl	bdl	0.95	1

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP2-3R		BEDROCK AQUIFER						
SAMPLING ROUND	Round 11	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006
SAMPLING DATE	7-May-98	11-Nov-99 P pump	27-Nov-00	26-Nov-01	18-Nov-02	18-Nov-03	18-Nov-04	16-Nov-05	9-Nov-06
Dichloromethane/Methylene Chloride								0.31M	
Naphthalene							0.55F		
TOTAL VOCs	bdl	bdl	bdl	bdl	bdl	bdl	0.6	0.3	bdl

MONITORING WELL:	RAP3-3S		SURFACE AQUIFER								
SAMPLING ROUND	Round 1	Round 2	Round 3	Round 4	Round 4	Round 5	Round 5	Round 6	Round 6	Round 7	Round 7
SAMPLING DATE	10-Mar-86	14-Oct-87	30-Sep-88	13-Nov-90	13-Nov-90 Duplicate	4-Mar-91	4-Mar-91 Duplicate	13-Sep-91	13-Sep-91 Duplicate	23-Jun-94	23-Jun-94 Duplicate
1,2-Dichloroethene (total)	4.2j	23		17	17	50	43J	53	54	4.7	5.1
Acetone			10								
Carbon Disulfide			14								
Dichloromethane/Methylene Chloride		33b	6.5R								
Trichloroethene	200	150	180	200	210	34	32J	89	91	100J	110J
TOTAL VOCs	204.2	206	204	217	227	84	75	142	145	104.7	115.1

MONITORING WELL:	RAP3-3S		SURFACE AQUIFER								
SAMPLING ROUND	Round 8	Round 8	Round 9	Round 10	Round 11	1999-IT	2000-IT	LTSP 2000	LTSP 2002	LTSP 2002	LTSP 2002
SAMPLING DATE	10-Nov-94	10-Nov-94 Duplicate	18-Jun-96	5/22/977	27-May-98	10-Nov-99 Mod-LF	17-Apr-00 Mod-LF	29-Nov-00	18-Apr-02	18-Apr-02 Duplicate	18-Dec-02
1,2-Dichloroethene (total)	4.1	3.9	3.4	2.3							
cis-1,2-Dichloroethene						11J	2.4	4.12M	3.53	3.51	9.8
Dichloromethane/Methylene Chloride									0.2F	0.2F	
Tetrachloroethene							0.17F				0.13F
Trichloroethene	100J	73J	84	68	20	270	113.3M	167.4M	42.6	41.8	20.9
TOTAL VOCs	104.1	76.9	87.4	70.3	20	281	115.9	161.5	46.3	45.5	30.8

MONITORING WELL:	RAP3-3S		SURFACE AQUIFER								
SAMPLING ROUND	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2009	LTSP 2010	LTSP 2010
SAMPLING DATE	17-Nov-03	16-Nov-04	14-Nov-05	14-Nov-05 Duplicate	10-Nov-06	5-Nov-07	Nov-08	2-Dec-09	2-Dec-09 Duplicate	19-Nov-10	19-Nov-10 Duplicate
cis-1,2-Dichloroethene	7.34M	6.07M	4.85F	4.8F	7.85M	8.6	4 J / 4.6 J	3.4	3.2	4.5	4.4
Dichloromethane/Methylene Chloride			0.65F	0.6F				0.30 FB	0.29 FB		
trans-1,2-Dichloroethene											0.058 J
Trichloroethene	93.80	92.99	50	49.6	62.6J	68.6	40 / 48	29	28	37	35
TOTAL VOCs	101.1	99.1	55.5	55.0	70.5	77.2	44 / 52.6	32.4	31.2	41.5	39.5

MONITORING WELL:	RAP3-3S	SURFACE AQUIFER
SAMPLING ROUND	LTSP 2011	
SAMPLING DATE	28-Nov-11	
cis-1,2-Dichloroethene	3.7	
Dichloromethane/Methylene Chloride	0.39F	
Trichloroethene	23	
TOTAL VOCs	27.1	

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP3-3T		LOWER AQUIFER								
SAMPLING ROUND	Round 1	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 8	Round 9	Round 9
SAMPLING DATE	10-Mar-86	10-Mar-86 Duplicate	14-Oct-87	30-Sep-88	13-Nov-90	4-Mar-91	13-Aug-91	22-Jun-94	10-Nov-94	19-Jun-96	19-Jun-96 Duplicate
1,1-Dichloroethane	8.8	7.8	8.6	8.4	9.7	14	12	9.7	8.9	10	10
1,1-Dichloroethene										0.84j	0.84j
1,2-Dichloroethene (total)	28	26	23	23	22	16	19	18	16	19	19
1,2-Dichloroethane		1.1j									
Acetone	17b										
Benzene											0.59j
Dichloromethane/Methylene Chloride	1.6b		14b	5.8R		6.0bR					
Ethylbenzene											1.7
Trichloroethene		2.4j			1.5j	2.1	7	1.4	1.6	1.6	1.4
TOTAL VOCs	55.4	37.3	45.6	31.4	33.2	32.1	38	29.1	26.5	31.4	33.5

MONITORING WELL:	RAP3-3T		LOWER AQUIFER								
SAMPLING ROUND	Round 10	Round 10	Round 11	Round 11	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005
SAMPLING DATE	22-May-97	22-May-97 Duplicate	27-May-98	27-May-98 Duplicate	17-Apr-00 Mod-LF	18-Jan-01	18-Apr-02	18-Dec-02	17-Nov-03	16-Nov-04	14-Nov-05
1,1-Dichloroethane	11	11	8.9	9.3	6.43	6.69	5.48	5.27	5.36	5.31	4.61
1,1-Dichloroethene	0.79jJ	1.2J			0.42F	0.46	0.41F	0.47F	0.47F	0.5F	0.44F
1,2-Dichloroethane					0.23F	0.28F	0.15F	0.18F	0.19F	0.21F	0.16F
1,2-Dichloroethene (total)	20	21	16	16							
Benzene	0.63j	0.65j			0.27F	0.3F	0.2F	0.21F	0.2F	0.19F	0.16F
cis-1,2-Dichloroethene					11.62	12.31	11.85	11.78	11.9M	11.8M	10.4
trans-1,2-Dichloroethene					0.34F	0.53F					
Trichloroethene	1.7	1.6	1.5	1.6	0.9M	1F	1F	1.2	1.1	1.16	1
Vinyl Chloride					0.11F						
TOTAL VOCs	34.1	35.5	26.4	26.9	20.3	21.6	19.1	19.1	19.2	19.2	16.8

MONITORING WELL:	RAP3-3T	LOWER AQUIFER
SAMPLING ROUND	LTSP 2006	
SAMPLING DATE	10-Nov-06	
1,1-Dichloroethane	4.13	
1,1-Dichloroethene	0.43F	
Benzene	0.13F	
cis-1,2-Dichloroethene	9.91M	
Trichloroethene	0.86F	
TOTAL VOCs	15.5	

MONITORING WELL:	RAP3-4S		SURFACE AQUIFER								
SAMPLING ROUND	Round 1	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 7	Round 8	Round 9
SAMPLING DATE	14-Mar-86	14-Mar-86 Duplicate	9-Oct-87	29-Sep-88	12-Nov-90	4-Mar-91	12-Aug-91	23-Jun-94	23-Jun-94 Duplicate	4-Nov-94	18-Jun-96
1,1-Dichloroethane					5.8	7.3	6.0	1.3	1.2	1.1	1.4
1,1-Dichloroethene					1.8j						
1,1,1-Trichloroethane				1.7j	13	5.9	6.1				
1,2-Dichloroethane						4.7					
1,2-Dichloroethene (total)	1.8j			7.8	150	77	160	30	28	27	24
Chloromethane				14							
Dichloromethane/Methylene Chloride			5.1	7.6bR							
Tetrachloroethene				1.8j	23	32	27	3.8	3.4	3.4	
Trichloroethene	10	8.7	5.7	56	450	*430J	410	65	60	54	42
Vinyl Chloride						1.2	1.5				
TOTAL VOCs	11.8	8.7	10.8	81.3	643.6	558.1	610.6	100.1	92.6	85.5	67.4

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RAP3-4S		SURFACE AQUIFER								
SAMPLING ROUND	Round 10	Round 11	Round 11	Round 13	LTSP 2000	LTSP 2002	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006
SAMPLING DATE	19-May-97	28-May-98	28-May-98 Duplicate	10-Nov-99 P pump	29-Nov-00	18-Apr-02	18-Dec-02	17-Nov-03	16-Nov-04	14-Nov-05	10-Nov-06
1,1-Dichloroethane	1					0.21F	0.39F	1.67	2.15	1.38F	2
1,1-Dichloroethene								0.38F	0.49F	0.26F	0.42F
1,1,1-Trichloroethene										0.2F	
1,2-Dichloroethane								0.32F	0.38F		
1,2-Dichloroethene (total)	16	4.4	3.5								
Acetone										2.1F	
cis-1,2-Dichloroethene				1	0.26M	5.7	15.35	61.42M	86.48M	59.2	106M
Dichloromethane/Methylene Chloride								0.2F			
trans-1,2-Dichloroethene								0.49F	0.77F	0.6F	1.32F
Tetrachloroethene	2	0.74j	0.63j	0.3J		0.29F	0.33F	0.54F	0.44F		
Trichloroethene	32	10	9.5	2.8	1.5B	5.8	5.3	9.8	8.22	4.36	3.86J
Vinyl Chloride								0.8F	0.7F	0.42F	0.92F
TOTAL VOCs	51	15.1	13.6	4.1	1.8	12	21.4	75.6	99.6	68.8	114.5

MONITORING WELL:	RAP3-4S		SURFACE AQUIFER		
SAMPLING ROUND	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	5-Nov-07	Nov-08	2-Dec-09	19-Nov-10	17-Nov-11
1,1-Dichloroethane	2.5F	1.2	1.2	1.1	0.45F
1,1-Dichloroethene		0.31 F	0.24 F	0.32 F	
1,1,1-Trichloroethane		0.11 FJ			
Acetone		7.6 F			
Benzene		0.14 FJ		0.19 F	
cis-1,2-Dichloroethene	134.0	63 J	62	65	21
Dichloromethane/Methylene Chloride			0.29 FB		
Tetrachloroethene		0.24 F	0.16 F		
trans-1,2-Dichloroethene	1.9F	0.81 FJ	1.3	1.1	0.41F
Trichloroethene	5.3F	3.4	2.3	1.7	1.1
Vinyl Chloride		0.54 F	0.33 F	0.27 F	
TOTAL VOCs	143.7	77.4	67.5	69.7	23.0

MONITORING WELL:	RAP3-4T		LOWER AQUIFER								
SAMPLING ROUND	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 8	Round 9	Round 10	Round 11
SAMPLING DATE	10-Mar-86	9-Oct-87	29-Sep-88	12-Nov-90	4-Mar-91	12-Aug-91	23-Jun-94	4-Nov-94	18-Jun-96	19-May-97	5-May-98
1,2-Dichloroethene (total)										0.92j	
Acetone	9.6b										
Dichloromethane/Methylene Chloride	2.1b	5.7	4.9jR								
Trichloroethene									1.7j		
TOTAL VOCs	11.7b	5.7	R	bdl	bdl	bdl	bdl	bdl	1.7j	0.92j	bdl

MONITORING WELL:	RAP3-4T		LOWER AQUIFER					
SAMPLING ROUND	LTSP 2000	LTSP 2001	LTSP 2002	LTSP 2002	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006
SAMPLING DATE	17-Apr-00 Mod-LF	18-Jan-01	18-Apr-02	18-Dec-02	17-Nov-03	16-Nov-04	14-Nov-05	10-Nov-06
1,1-Dichloroethane		0.12F						
cis-1,2-Dichloroethene	0.31F	0.44F	0.28F	0.32F		0.25M		
TOTAL VOCs	0.3	0.6	0.3	0.3	bdl	0.3	bdl	bdl

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

MONITORING WELL:	RFW-11		SURFACE AQUIFER								
SAMPLING ROUND	Round 1	Round 2	Round 3	Round 4	Round 4	Round 5	Round 5	Round 6	Round 6	Round 7	Round 7
SAMPLING DATE	12-Feb-86	5-Oct-87	26-Sep-88	9-Nov-90	9-Nov-90 Duplicate	4-Mar-91	4-Mar-91 Duplicate	12-Sep-91	12-Sep-91 Duplicate	30-Jun-94	30-Jun-94 Duplicate
1,1-Dichloroethane				9.1	8.6	42J	53J				
1,1-Dichloroethene				18	15	11	13				
1,1,1-Trichloroethane			100J	160	170	*260J	*330J	170	150		
1,2-Dichloroethene (total)	6,100	15,000	8,400	*3,800	*3,300	*1,700J	*2,000J	1,600	1,700	17	17
4-Methyl-2-Pentanone			620								
Benzene				9.0	3.2						
Chloroform				3.9J	2.7J	*220J	*270J			32	31
Dichloromethane/Methylene Chloride		1,900	300R			8.9bR	11bR	150J			
Ethylbenzene			69j								
Freon 113				180j	150j						
Tetrachloroethene						2.5J	3.2J				
Toluene	170j	430j	1,500								
Trichloroethene	9,300	36,000	7,000	*3,900J	*2,500J	*2,500J	*2,700J	1,400	1,700	57	54
Xylenes (Total)			330	2.0J							
TOTAL VOCs	15,570	53,330	18,019	8081.9	6149.7	4735.5	5369.2	3,320	3,550	106	102

MONITORING WELL:	RFW-11		SURFACE AQUIFER								
SAMPLING ROUND	Round 8	Round 8	Round 9	Round 9	Round 10	Round 10	Round 11	LTSP 1999	LTSP 2000	LTSP 2001	LTSP 2002
SAMPLING DATE	10-Nov-94	10-Nov-94 Duplicate	3-Jul-96	3-Jul-96 Duplicate	14-May-97	14-May-97 Duplicate	15-May-98	6-Oct-99	22-Sep-00	5-Sep-01	26-Sep-02
1,1-Dichloroethane									0.33M		
1,1-Dichloroethene									0.43M		
1,1,1-Trichloroethane									0.42F		
1,2-Dichloroethene (total)	22	23	2.9	5.2	4.8	4.7					
Acetone								220			
Chlorobenzene			0.93j								
Chloroform	32	33					6		2.92	0.99	1.41
Chloromethane			1.2							0.2F	
cis-1,2-Dichloroethene								88	34.97	1.41	5.66M
Dichloromethane/Methylene Chloride								57b	0.2B		
Ethylbenzene			1.3								
trans-1,2-Dichloroethene									0.13M		
Tetrachloroethene			1.8								
Toluene			0.79j		0.75j						
Trichloroethene	50	51	9.5	18	19J	29J	15	470	230.5	12	84.4
Xylenes (Total)			4.3								
TOTAL VOCs	104	107	22.7	23.2	24.6	33.7	21	778	269.7	14.6	91.5

MONITORING WELL:	RFW-11		SURFACE AQUIFER						
SAMPLING ROUND	LTSP 2003	LTSP 2004	LTSP 2005	LTSP 2006	LTSP 2007	LTSP 2008	LTSP 2009	LTSP 2010	LTSP 2011
SAMPLING DATE	17-Nov-03	17-Nov-04	16-Nov-05	9-Nov-06	7-Nov-07	Nov-08	2-Dec-09	18-Nov-10	21-Nov-11
1,1-Dichloroethene							0.10 F		
1,2,3-Trichlorobenze							0.16 F		
1,2,4-Trichlorobenze							0.16 F		
Bromodichloromethane					0.21M				
Chloroform	0.66	0.33F		0.66	1.02	0.29 FJ	0.32	0.52	0.29F
cis-1,2-Dichloroethene	1.53M	0.88M	1.03	0.6M	2.29	1.1 J	1.9	0.78 F	0.28F
Dichloromethane/Methylene Chloride			0.44F				0.44 FB		0.75F
Methyl-tert-butyl-ether						32			0.53F
n-butylbenzene							0.12 F		
Trichloroethene	17.7	10.31	7.99	6.3J	24	10	25	10	2.7
TOTAL VOCs	19.9	11.5	9.5	7.6	27.5	43.4	27.8	11.3	4.6

TABLE 4-1
SUMMARY OF LONG-TERM MONITORING PROGRAM RESULTS
NPL OPERABLE UNIT 1
HANSCOM AFB, MA

NOTES:

All concentrations are micrograms per liter.

Summary tables only include compounds with concentrations above the approximate sample quantification or detection limit.

VOCs: Volatile organic compounds

bdl: Below the approximate sample quantification or detection limit

1,2-Dichloroethene (total) includes both cis-1,2-dichloroethene and trans-1,2-dichloroethene

Rounds 1 through 11 were completed as part of the Remedial Action Program (RAPs) developed in 1987 for Sites 1, 2 & 3, followed by the RAPs implementation and long-term monitoring. Monitoring subsequent to Round 11 has been completed as part of the on-going operation, maintenance and monitoring of the Interim Remedial Action for Operable Unit 1.

For clarity, data qualifiers have not been applied to total VOC results unless all detected VOCs were similarly qualified.

Data Qualifiers

b or B: Compound was detected in an associate laboratory and/or field blank. Reported concentration not substantially above level reported in laboratory or field blanks and may be due to laboratory contamination

E: Estimated value exceeds the calibration range

F: Result between method detection limit (MDL) and recovery limit (RL)

j: Reported concentration estimated due to: 1) tentatively identified compound where 1:1 response is assumed, or 2) due to a positively identified compound detected at concentration less than detection limit, or 3) out of tolerance recoveries in laboratory QC analysis

J: Reported concentration estimated based on consultant's evaluation of QA/QC data

L: Estimated value is below the calibration range

R: Reported concentration rejected based on consultant's evaluation of QA/QC data

*: Sample was analyzed at two dilution factors. Concentrations determined at lower dilution are listed without notation. Concentrations detected at higher dilution are identified by an *

M: A matrix effect is present

Attachment E – Summary of OU-1 On-Site GC Analytical Data (Phase 2 of the Long-Term Monitoring Program)

Attachment E-1 – Comparison of On-site GC to Off-site Laboratory TCE and cis-1,2-DCE Results, OU-1 2011 Long-Term Monitoring Event, November 2011

Attachment E-2 – OU-1 On-Site GC Analytical Results – 2007 to May 2012

OU-1 Fall 2011 LTM Event - Comparison of on-site GC to laboratory TCE cis-1,2-DCE results

	SAMPLE DATE	GC TCE ppb	LAB TCE ppb	Relative % Difference RPD
PT1-RA	18-Nov-11	NS	0.14 F	NA
B117	17-Nov-11	NS	0.52 F	NA
B118	17-Nov-11	NS	0.62 F	NA
OW 3-14	17-Nov-11	bdl	0.71 F	CBC
RAP 1-6S	18-Nov-11	NS	1.1	NA
RAP 1-6T	18-Nov-11	NS	1.1	NA
RAP 3-4S	17-Nov-11	bdl	1.1	CBC
RAP1-SW4	18-Nov-11	NS	1.5	NA
RAP2-1T	29-Nov-11	bdl	1.6	CBC
B245 (L)	28-Nov-11	NS	1.7	NA
PO2-1RA	22-Nov-11	NS	2.2	NA
B254 (L)	17-Nov-11	bdl	2.5	CBC
B254 (L) dup	17-Nov-11	bdl	2.5	CBC
RFW-11 (S)	21-Nov-11	NS	2.7	NA
B108 (L)	21-Nov-11	NS	3.8	NA
B111 (L)	21-Nov-11	bdl	3.9	CBC
PO1-2R	18-Nov-11	NS	4.2	NA
RAP2-3T	29-Nov-11	bdl	6.7	CBC
B242 (L)	28-Nov-11	NS	7.1	NA
B126 (L)	18-Nov-11	NS	7.9	NA
B248 (L)	28-Nov-11	bdl	7.9	CBC
B248 (L) dup	28-Nov-11	bdl	7.9	CBC
RAP1-5R	18-Nov-11	NS	9.4	NA
B115 (L)	29-Nov-11	bdl	9.6	CBC
B115 (L) dup	29-Nov-11	bdl	9.6	CBC
RAP1-7 (T)	17-Nov-11	NS	12	NA
B244A (R)	29-Nov-11	8	14	-54.5%
B113	29-Nov-11	7	19	-92.3%
RAP 3-3S	28-Nov-11	16	23	-35.9%
B243 (R)	22-Nov-11	16	25	-43.9%
RAP 2-2T	28-Nov-11	13	29	-76.2%
OW 2-6	21-Nov-11	29	30	-3.4%
RAP 2-2R	22-Nov-11	6	38	**-145.5%**
RAP2-1R	22-Nov-11	60	75	-22.2%
RAP1-6R	18-Nov-11	156	**150.0**	3.9%
RAP1-6R dup	18-Nov-11	160	**150.0**	6.5%
RAP1-7 (R)	17-Nov-11	258	**205.0**	22.9%
B240	18-Nov-11	286	300	-4.8%
RAP 1-3R	18-Nov-11	4,496	3,300	30.7%
			RPD Ave	-31.9%

	SAMPLE DATE	GC CIS-1-2 ppb	LAB CIS-1-2 ppb	Relative % Difference RPD
PT1-RA	18-Nov-11	NS	0.10 F	NA
B117	17-Nov-11	NS	0.16 F	NA
RFW-11 (S)	21-Nov-11	NS	0.28 F	NA
RAP1-5R	18-Nov-11	NS	1.6	NA
RAP 1-6T	18-Nov-11	NS	2.5	NA
B118	17-Nov-11	NS	2.7	NA
RAP1-7 (T)	17-Nov-11	NS	3.5	NA
RAP 3-3S	28-Nov-11	bdl	3.7	CBC
RAP1-SW4	18-Nov-11	NS	3.8	NA
B126 (L)	18-Nov-11	NS	4.1	NA
PO1-2R	18-Nov-11	NS	4.2	NA
RAP1-7 (R)	17-Nov-11	bdl	**14.5**	CBC
B242 (L)	28-Nov-11	NS	18	NA
RAP 3-4S	17-Nov-11	9	21	-80.0%
B245 (L)	28-Nov-11	NS	23	NA
B254 (L)	17-Nov-11	8	26	**-105.9%**
B254 (L) dup	17-Nov-11	20	26	-26.1%
B115 (L) dup	29-Nov-11	11	27	-84.2%
B115 (L)	29-Nov-11	12	27	-76.9%
B108 (L)	21-Nov-11	NS	29	NA
PO2-1RA	22-Nov-11	NS	37	NA
B243 (R)	22-Nov-11	27	48	-56.0%
B244A (R)	29-Nov-11	63	59	6.6%
RAP2-1T	29-Nov-11	71	77	-8.1%
B111 (L)	21-Nov-11	48	80	-50.0%
B113	29-Nov-11	34	100	-98.5%
B248 (L) dup	28-Nov-11	85	100	-16.2%
B248 (L)	28-Nov-11	94	100	-6.2%
RAP2-1R	22-Nov-11	108	130	-18.5%
OW 3-14	17-Nov-11	196	180	8.5%
RAP 1-6S	18-Nov-11	NS	180	NA
RAP2-3T	29-Nov-11	255	230	10.3%
B240	18-Nov-11	231	240	-3.8%
OW 2-6	21-Nov-11	409	400	2.2%
RAP 2-2T	28-Nov-11	455	440	3.4%
RAP 2-2R	22-Nov-11	680	540	23.0%
RAP1-6R	18-Nov-11	1,493	**1,150.0**	26.0%
RAP1-6R dup	18-Nov-11	1,402	**1,150.0**	19.7%
RAP 1-3R	18-Nov-11	7,103	5,800	20.2%
			RPD Ave	-23.2%

Measurement Performance Criteria for Comparability:

RPD < 100% for results between RL and 100 ppb or > 5,000 ppb;

On-site GC MDL (TCE =7.3 ug/L, cis-1,2-DCE = 10.3 ug/L)

RPD < 50% for results between 100 ppb and 5,000 ppb.

Median RPD (of GC results ≥ detection level & lab results ≥ RL) between –50% and +50% for all measurements.

Shaded = excluded from average RPD calculation

CBC = Cannot Be Calculated

bdl = below detection level

Bolded Results = average of Primary & Duplicate

Bolded RPD = exceedance of criteria

NA = not applicable

Attachment E-2 – OU-1 On-Site GC Analytical Results – 2007 to May 2012 .....

Well	Page	Well	Page	Well	Page	Well	Page
B101	19	B103	3	B105	13	B106	14
B107	20	B108	21	B109	18	B111	34
B113	21	B114	18	B115	19	B116	23
B117	23	B118	24	B121	25	B122	25
B125	26	B126	26	B231	26	B232	26
B237	4	B238	4	B239	5	B240	5
B241	6	B242	6	B243	7	B244A	36
B245	34	B248	35	B249	37	B251	35
B252	37	B254	36	B255	37	CW-4	3
GM MW-1	1	IRZ-INJ	7	IRZ-1	8	IRZ-2	8
IRZ-3	8	IRZ-4	9	IRZ-5	9	OW2-1	14
OW2-2	14	OW2-3	15	OW2-4	15	OW2-5	15
OW2-6	16	OW2-7	16	OW2-8	16	OW3-3	23
OW3-4	23	OW3-5	23	OW3-6	23	OW3-7	24
OW3-10	24	OW3-11	24	OW3-12	24	OW3-13	24
OW3-14	25	PO1-2R	30	PO1-4SA	3	PO2-1RA	31
PO2-1S	17	PO2-1T	28	PO2-2R	31	PO2-2T	29
PT1-RA	31	PT1-SA	3	PT2-RA	32	RAP1-1R	32
RAP1-1T	29	RAP1-2R	3	RAP1-3R	2	RAP1-3S	1
RAP1-5R	4	RAP1-5S	4	RAP1-6R	12	RAP1-6S	10
RAP1-6T	11	RAP1-7R	39	RAP1-7S	8	RAP1-7T	38
RAP2-1R	33	RAP2-1T	29	RAP2-2R	22	RAP2-2S	20
RAP2-2T	22	RAP2-3R	33	RAP2-3T	30	RAP3-3S	27
RAP3-3T	28	RAP3-4S	27	RFW-11	17	V-1	3

Surface Water Monitoring Point	Page
RAP1-SW4	13

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

SITE 1 - PIT #1/RUNOFF AREA	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
GM MW #1	29-Mar-07	bdl	bdl	
	28-Jun-07	9	86	
	18-Sep-07	bdl	bdl	Small early peak
	24-Mar-08	bdl	bdl	
	18-Jun-08	bdl	86	
	29-Sep-08	bdl	bdl	
	15-Dec-08	bdl	bdl	
	25-Mar-09	bdl	bdl	
	26-Jun-09	bdl	21	
	29-Sep-09	bdl	bdl	
	3-May-10	bdl	bdl	
	29-Jun-10	bdl	35	
	20-Sep-10	bdl	19	
	8-Jun-11	bdl	34	
	29-Sep-11	bdl	16	
	NF GC Analysis		**Need Lab Confirmatory when think VER Area cleaned-up**	
RAP 1-3S	**20-May-98**	**150**	**550**	**Off-site-H&A Round 11**
	18-Jun-01	**43.3**	**300.53**	**via off-site lab diluted @ 10; trans-1,2-DCE, 1,1,1-TCA, VC et al**
	22-Apr-03	**34.8**	**206.89**	**via off-site lab diluted @ 10**
	29-Mar-07	45	216	
	24-Apr-07	15	167	
	28-Jun-07	16	183	
	24-Sep-07	bdl	bdl	
	24-Mar-08	17	58	
	18-Jun-08	bdl	14	
	15-Dec-08	9	525	
	25-Mar-09	10	253	
	21-May-09	bdl	107	Re-run bdl & 153
	15-Jun-09	bdl	139	
	11-Sep-09	13	133	
	29-Sep-09	5	65	
	23-Oct-09	bdl	51	
	4-Dec-09	bdl	147	
	3-May-10	11	118	
	10-Jun-10	bdl	83	
	30-Jun-10	bdl	bdl	sporadic VER operation commenced 14-June
	20-Sep-10	ns	ns	well dry
	28-Apr-11	bdl	59	
	20-Jun-11	2	38	
	12-Sep-11	13	170	
	21-Nov-11	bdl	241	
	20-Dec-11	bdl	102	
	20-Feb-12	bdl	42	
	28-Mar-12	bdl	59	
	30-Apr-12	bdl	54	
	NF GC Analysis			**Annual (Nov) Off-Site**

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
RAP 1-3R	**20-May-98**	**477,000**	**bdl**	**Off-site-H&A Round 11**
	18-Jun-01	**129,172.5**	**13,199.0**	**via off-site lab diluted @ 5000; toluene & 1,1,1-TCA**
	29-Aug-01	**124,464.5**	**19,182**	**via off-site lab**
	22-Apr-03	**63,527.8**	**4,255.75**	**via off-site lab diluted @ 2500;**
	17-Nov-04	**111,661**	**18,467**	**via off-site lab diluted @ 5000; Methylene chloride=458.5F et al**
	14-Nov-05	**79,700**	**20,000**	**via off-site lab diluted @ 5000; 1,1,1-TCA = 24,600 et al**
	7-Nov-06	**142,000**	**45,000**	**via off-site lab diluted @ 5000; 1,1,1-TCA = 41,600 et al**
	29-Mar-07	77,180	64,770	DL=10
	24-Apr-07	97,100	61,120	DL=10
	28-Jun-07	79,080	57,440	DL=10
	25-Sep-07	98,060	43,280	DL=10 - Commence VER extraction from well
	30-Oct-07	135,100	73,370	DL=10 - VER System Off/Pump Failure
	5-Nov-07	87,750 j	56,690j	DL=10; VER remains off; j = 1 day over holding time
	5-Nov-07	**119,000**	**25,100**	**via off-site lab diluted @ 4000; 1,1,1-TCA = 32,400 et al**
	24-Mar-08	52,810	41,850	DL=10; VER remains off
	24-Jun-08	57,060	62,580	DL=10; VER remains off
	15-Sep-08	44,610	45,240	DL=10; VER remains off - early peak
	18-Nov-08	51,670	14,400	DL=10; VER on 2-Oct-08; rerun = 58,570 & 18,660
	18-Nov-08	**57,000**	**12,000 J**	**via off-site lab diluted @ 2000; 1,1,1-TCA = 16,000 J et al**
	25-Mar-09	25120/27850	36380/38670	DL=10; VER off 13 Mar
	21-May-09	29,100	38,150	DL=10; VER remains off
	15-Jun-09	36,110	52,670	DL=10; VER remains off
	11-Sep-09	9,187	12,590	DL=10; VER on 26 June thru 31-Aug; off 8/31 - 9/24
	24-Sep-09	13,560	22,100	DL=10; VER on after S&A
	6-Oct-09	25,730	29,400	DL=10; sporadic VER operation in October
	23-Oct-09	13,060	30,630	DL=10; Rerun = 14,700 & 35,570; sporadic VER operation in October
	3-Dec-09	23,640	13,880	DL=10; sporadic VER operation in November
	3-Dec-09	**20,000**	**14,000**	**via off-site lab diluted @ 1000; 1,1,1-TCA = 8,400 et al**
	3-May-10	11,170	40,760	DL=10; VER off since Dec 7, 2009
	10-Jun-10	9,364	39,980	DL=10; VER remains off
	30-Jun-10	10,260	25,860	DL=10; sporadic VER operation commenced 14-June
	16-Aug-10	3,610	11,370	DL=10; sporadic VER operation commenced 14-June
	27-Sep-10	6,634	16,940	DL=10; sporadic VER operation commenced 14-June
	18-Nov-10	5,479	6,756	GC accuracy suspect-not diluted-VER operating
	18-Nov-10	**15,000**	**12,000**	**via off-site lab diluted @ 1000; 1,1,1-TCA = 6,000 et al**
	14-Dec-10			VER off for winter
	28-Apr-11	3,314	4,496	VER remains off
	27-Jun-11	14,432	8,222	no dilution; VER on 2 May - sporadic operation in May & June
	22-Sep-11	5,343	8,634	no dilution; VER off 24 August
	18-Nov-11	4,496	7,103	no dilution; VER remains off
	18-Nov-11	**3,300**	**5,800**	**via off-site lab diluted @ 20; VC=190; 1,1,1-TCA = 2,100 et al**
	1-Dec-11	2,594	5,023	no dilution; VER remains off
	20-Dec-11	1,069	2,419	no dilution; VER remains off
	20-Feb-12	812	2,140	
	28-Mar-12	1,349	3,394	
	30-Apr-12	969	3,010	VER restarted 30 April
	17-May-12	3,688	3,600	
	Quarterly GC			**Annual (Nov) Off-Site**

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
SITE 1 - PIT #2				
V-1 (S)	29-Mar-07	1,723	bdl	
	28-Jun-07	5,165	bdl	
	25-Mar-08	929	511	
	18-Jun-08	7,222	bdl	
	29-Sep-08	513	15	Many un-identified peaks
	15-Dec-08	792	bdl	
	25-Mar-09	1,317	bdl	
	26-Jun-09	3,013	8.1	Many un-identified peaks
	29-Sep-09	113	6	GC rerun = 109 & 6
	6-May-10	1,525	67	Many un-identified peaks
	29-Jun-10	1,248	bdl	
	14-Jun-11	3,066	28	Many un-identified peaks
	12-Sep-11	768	bdl	
	20-Dec-11	1,239	59	
	20-Feb-12	758	82	
	17-May-12	190	bdl	IW-10 restarted 18 May-12
	Quarterly GC		**Need Lab Confirmatory when think Pit 2 cleaned-up**	
SITE 1 - COLLECTION TRENCH AREA				
B103 (L)	**21-May-98**	**16/17**	**32/35**	**Off-site-Haley & Aldrich Round 11 with duplicate**
	25-Jun-07	bdl	bdl	
	8-Jul-08	bdl	bdl	
	25-Jun-09	bdl	bdl	
	24-Jun-10	bdl	bdl	
	6-Jun-11	bdl	bdl	
	NF GC Analysis		**Need Lab Confirmatory when think Site 1 is cleaned-up**	
CW-4 (L)	**20-May-98**	**89/89**	**100/rejected**	**Off-site-Haley & Aldrich Round 11 with duplicate**
	26-Jun-07	3	bdl	
	18-Jun-08	bdl	bdl	
	29-Jun-09	bdl	96	
	29-Jun-10	bdl	46	
	8-Jun-11	bdl	40	
	NF GC Analysis		**Need Lab Confirmatory when think Site 1 is cleaned-up**	
PO1-4SA (S/L)	**20-May-98**	**3.2**	**3.8**	**Off-site-Haley & Aldrich Round 11**
	26-Jun-07	17	17	
	18-Jun-08	4	bdl	
	29-Jun-09	bdl	bdl	
	29-Jun-10	bdl	7	
	8-Jun-11	bdl	bdl	
	NF GC Analysis		**Need Lab Confirmatory when think Site 1 is cleaned-up**	
PT1-SA (S/L)	**25-Jun-96**	**140 j**	**130**	**Off-site-Haley & Aldrich Round 9; VC = 29**
	13-May-97	**190**	**150**	**Off-site-Haley & Aldrich Round 10; VC = 17**
	20-May-98	**200**	**210**	**Off-site-Haley & Aldrich Round 11; VC = bdl; 1,1,1-TCA = 40**
	26-Jun-07	bdl	bdl	
	18-Jun-08	bdl	bdl	
	29-Jun-09	bdl	15	
	29-Jun-10	bdl	bdl	
	6-Jun-11	bdl	bdl	
	NF GC Analysis		**Need Lab Confirmatory when think Site 1 is cleaned-up**	
RAP1-2R	**20-May-98**	**bdl/bdl**	**bdl/bdl**	**Off-site-Haley & Aldrich Round 11 with duplicate**
	26-Jun-07	bdl	bdl	
	18-Jun-08	bdl	bdl	
	29-Jun-09	bdl	bdl	
	29-Jun-10	bdl	bdl	
	8-Jun-11	bdl	bdl	
	NFA			

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
RAP1-5S	**20-May-98**	**bdl**	**bdl**	**Off-site-Haley & Aldrich Round 11**
	26-Jun-07	bdl	bdl	
	24-Mar-08	bdl	bdl	
	20-Jun-08	bdl	bdl	
	30-Jun-09	bdl	bdl	
	24-Jun-10	ns	ns	Well dry
	5-Jul-11	bdl	bdl	Well dry in June 2011
	NFA			
RAP1-5R	13-Aug-97	**IW-6 Commenced Pumping**		
	20-May-98	**65/70**	**bdl/bdl**	**Off-site-Haley & Aldrich Round 11 with duplicate**
	29-Mar-07	106	bdl	
	26-Jun-07	137	80	Early peak
	18-Sep-07	22	bdl	Early peak
	24-Mar-08	151	9	
	20-Jun-08	305	59	
	29-Sep-08	bdl	bdl	Early peak
	15-Dec-08	8	bdl	Early peak
	25-Mar-09	68	35	Early peak
	30-Jun-09	136	122	Early peak
	29-Sep-09	bdl	bdl	Early peak
	6-May-10	27	122	Early peak
	24-Jun-10	11	bdl	
	20-Sep-10	bdl	bdl	
	8-Jun-11	bdl	19	Early peak
	12-Sep-11	bdl	bdl	
	18-Nov-11	**9.4**	**1.6**	**via off-site lab; VC = 0.34 F**
	NF GC Analysis			**Annual (Nov) Off-Site**
SITE 1 - SIDE-GRADIENT AREA				
B237 (R)	**20-Jun-96**	**8,600**	**960**	**Off-site-Haley & Aldrich Round 9-significant other VOCs**
	15-May-97	**7,900**	**1,200**	**Off-site-Haley & Aldrich Round 10-less significant other VOCs**
	13-Aug-97	**IW-6 Commenced Pumping**		
	22-May-98	**2,600**	**1,500**	**Off-site-Haley & Aldrich Round 11-bdl for other VOCs**
	21-Jun-00	**22**	**84**	**via off-site lab**
	29-Mar-07	bdl	bdl	Early peak
	26-Jun-07	bdl	bdl	Early peak
	18-Sep-07	519	116	Resampled 1-Oct = 585 & 126
	24-Mar-08	35	bdl	
	24-Jun-08	6	bdl	Early peak
	29-Sep-08	25	bdl	Early peak - Rerun = 22 & bdl
	15-Dec-08	16	bdl	
	25-Mar-09	3	bdl	
	30-Jun-09	bdl	bdl	
	1-Oct-09	bdl	bdl	Early peak
	6-May-10	bdl	bdl	Early peak
	24-Jun-10	bdl	bdl	Early peak
	23-Sep-10	bdl	bdl	Early peak
	14-Jun-11	bdl	bdl	
	29-Sep-11	bdl	bdl	Early peak
	NF GC Analysis		**Need Lab Confirmatory when think Site 1 is cleaned-up**	
SITE 1 - DOWN-GRADIENT AREA				
B238 (S)	**21-May-98**	**bdl**	**bdl**	**Off-site-Haley & Aldrich Round 11**
	13-Aug-97	**IW-6 Commenced Pumping**		
	25-Jun-07	bdl	bdl	
	20-Jun-08	bdl	bdl	
	30-Jun-09	bdl	bdl	
	24-Jun-10	bdl	bdl	
	14-Jun-11	bdl	bdl	
	NFA			

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
B239 (L)	**27-Jun-96**	**680/630**	**1200/1100**	**Off-site-H&A Round 9 with dupl-significant other VOCs**
	14-May-97	**440/490**	**940/1000**	**Off-site-H&A Round 10 with dupl-less significant other VOCs**
	13-Aug-97	**IW-6 Commenced Pumping**		
	21-May-98	**300/12**	**520/24**	**Off-site-H&A Round 11 with dupl-less significant other VOCs**
	14-Jun-00	**29**	**70**	**Collected by G&M for IRZ Project - via off-site lab**
	3-May-01	**22**	**54**	**Collected by G&M for IRZ Project - via off-site lab**
	14-Oct-02	**39**	**88**	**Collected by G&M for IRZ Project - via off-site lab**
	20-May-03	**55**	**190**	**Collected by G&M for IRZ Project - via off-site lab**
	29-Mar-07	bdl	bdl	
	25-Jun-07	bdl	bdl	
	18-Sep-07	bdl	bdl	
	24-Mar-08	bdl	bdl	
	20-Jun-08	bdl	bdl	
	29-Sep-08	bdl	bdl	
	15-Dec-08	bdl	bdl	
	25-Mar-09	bdl	bdl	
	30-Jun-09	bdl	bdl	
	1-Oct-09	bdl	bdl	
	26-Apr-10	bdl	bdl	
	24-Jun-10	bdl	bdl	
	23-Sep-10	bdl	bdl	
	14-Jun-11	bdl	bdl	
	29-Sep-11	bdl	bdl	
	NF GC Analysis		**Need Lab Confirmatory when think Site 1 is cleaned-up**	
B240 (R)	**20-Jun-96**	**32,000**	**3,800**	**Off-site-H&A Round 9 with dupl-significant other VOCs**
	13-May-97	**28,000**	**3,800**	**Off-site-H&A Round 10 with dupl-less significant other VOCs**
	13-Aug-97	**IW-6 Commenced Pumping**		
	21-May-98	**9,400**	**2,800**	**Off-site-Haley & Aldrich Round 11 - bdl for other VOCs**
	13-May-99	**2,000**	**1,500**	**via off-site lab**
	13-May-99	**4,633**	**2,400**	**via EPA lab - average of 3 USGS passive bags**
	14-May-99	**4900/4800**	**2600/2600**	**via EPA lab - low-flow sample w/dupl**
	21-Jun-00	**829**	**345**	**via off-site lab**
	29-Mar-07	138	37	
	25-Jun-07	668	636	
	18-Sep-07	1,326	1,336	
	24-Mar-08	14	bdl	
	20-Jun-08	12	bdl	
	29-Sep-08	18	bdl	
	15-Dec-08	788	917	
	25-Mar-09	53	1,787	
	30-Jun-09	1,176	1,582	Early peak
	1-Oct-09	883	539	Early peak
	6-May-10	74	235	
	24-Jun-10	149	656	Early peak
	23-Sep-10	360	744	
	14-Jun-11	433	434	
	29-Sep-11	344	203	
	18-Nov-11	286	231	
	18-Nov-11	**300**	**240**	**dupl via off-site lab; VC = 23**
	21-Dec-11	242	169	
	22-Feb-12	131	338	
	21-May-12	247	1,225	
	Quarterly GC less Nov			**Annual (Nov) Off-Site**

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BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
B241 (S)	**20-Jun-96**	**25**	**13**	**Off-site-Haley & Aldrich Round 9**
	12-May-97	**10**	**7.1**	**Off-site-Haley & Aldrich Round 10**
	14-May-98	**bdl**	**bdl**	**Off-site-Haley & Aldrich Round 11**
	22-Jun-07	3	bdl	
	27-Jun-08	bdl	bdl	
	23-Jun-09	bdl	bdl	
	1-Jul-10	bdl	bdl	
	6-Jun-11	bdl	bdl	
	NFA		**Need Lab Confirmatory when think boundary is cleaned-up**	
B242 (L)	**27-Jun-96**	**210/280**	**540j/700j**	**Off-site-Haley & Aldrich Round 9**
	14-May-97	**300/300**	**730/720**	**Off-site-Haley & Aldrich Round 10**
	13-May-98	**220**	**510**	**Off-site-Haley & Aldrich Round 11**
	6-Apr-07	bdl	bdl	
	22-Jun-07	bdl	bdl	
	20-Sep-07	bdl	bdl	
	8-Nov-07	bdl/bdl	bdl/bdl	
	8-Nov-07	**8.87 J/8.65 J**	**24.9 J/24.2 J**	**dupl via off-site lab; VC = 2.77/2.70, J = over holding time**
	24-Mar-08	bdl	18	
	27-Jun-08	bdl	bdl	
	23-Sep-08	bdl	bdl	
	20-Nov-08	bdl	bdl	
	20-Nov-08	**9.5**	**25 J**	**dupl via off-site lab; VC = 2.5**
	4-Dec-08	bdl	bdl	
	26-Mar-09	bdl	bdl	Rerun = bdl - bdl
	23-Jun-09	bdl	7	
	24-Sep-09	bdl	bdl	
	25-Nov-09	bdl	bdl	
	25-Nov-09	**7.9**	**19**	**dupl via off-site lab; VC = 1.5**
	26-Apr-10	bdl	bdl	
	1-Jul-10	bdl	bdl	
	23-Sep-10	bdl	bdl	
	19-Nov-10	bdl	bdl	GC accuracy suspect
	19-Nov-10	**7.3**	**19**	**dupl via off-site lab; VC = 1.1**
	6-Jun-11	bdl	bdl	
	13-Sep-11	bdl	6	
	28-Nov-11	**7.1**	**18**	**dupl via off-site lab; VC = 1.1**
	12-Dec-11	bdl	bdl	
	NF GC Analysis			**Annual (Nov) Off-Site**

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
B243 (R)	**26-Jun-96**	**430**	**1,100j**	**Off-site-Haley & Aldrich Round 9**
	12-May-97	**400**	**990**	**Off-site-Haley & Aldrich Round 10**
	13-May-98	**400**	**1,000**	**Off-site-Haley & Aldrich Round 11**
	2-Apr-07	35	194	
	22-Jun-07	26/22	130/85	RPD 16.7%/41.9%
	20-Sep-07	38	216	Early peak
	8-Nov-07	20	47	
	8-Nov-07	**27.8 J**	**93.9 J**	**dupl via off-site lab; VC = 21.6; J = over holding time**
	24-Mar-08	8/12	45/55	
	27-Jun-08	9	73	
	23-Sep-08	4	12	Small early peak
	20-Nov-08	14	75	
	20-Nov-08	**31**	**120 J**	**dupl via off-site lab; VC = 33**
	4-Dec-08	38	261	
	26-Mar-09	41	239	
	23-Jun-09	30/27	209/187	RPD 10.5%/11.1%
	24-Sep-09	21	89	
	25-Nov-09	27/17R	86/44R	Early peak - RPD -45.5%/-64.6% **Rejected dupl.**
	25-Nov-09	**34**	**110**	**dupl via off-site lab; VC = 36**
	26-Apr-10	25	79	
	1-Jul-10	26/29	145/171	RPD -10.9%/-16.5%
	23-Sep-10	27	110	
	19-Nov-10	18	68	GC accuracy suspect
	19-Nov-10	**30**	**88**	**dupl via off-site lab; VC = 31**
	6-Jun-11	38/30	86/91	RPD 23.5%/-5.6%
	13-Sep-11	24	63	mid sized un'id peak
	22-Nov-11	16	27	
	22-Nov-11	**25**	**48**	**dupl via off-site lab; VC = 23**
	12-Dec-11	bdl	14	
	10-Feb-12	12	27	Early peak
	10-May-12	14	29	
	Quarterly GC less Nov			**Annual (Nov) Off-Site**
IRZ-INJ	13-Jun-00	417	1,900	**New well** installed by G&M for IRZ Project
	16-Jun-00	**560/530**	**1600/1600**	**Collected by G&M w/dupl - via off-site lab**
	18-Oct-00	299	1,697	Collected by G&M for IRZ Project - **1st Injection 11-Oct-00**
	8-May-01	**15**	**640**	**Collected by G&M for IRZ Project - via off-site lab**
	28-Mar-02	bdl	117	Collected by G&M for IRZ Project - **last Injection 9-Oct-02**
	14-Oct-02	**bdl**	**110**	**Collected by G&M for IRZ Project - via off-site lab**
	20-May-03	**10**	**1,700**	**Collected by G&M for IRZ Project - via off-site lab**
	12-Jun-06	**IW-11 Commenced Pumping**		
	6-Apr-07	bdl	896	early peak
	27-Jun-07	bdl	738	early peak
	24-Sep-07	2	608	early peak
	25-Mar-08	bdl	238	early peak- sample dark brown color
	30-Jun-08	bdl	392	early peak
	18-Sep-08	bdl	158	early peak
	2-Dec-08	bdl	204	sample dark brown color
	27-Mar-09	bdl	517	
	25-Jun-09	bdl	379	early peak
	29-Sep-09	bdl	113	early peak
	3-May-10	bdl	141	early peak
	29-Jun-10	bdl	125	early peak
	20-Sep-10	bdl	68	
	3-Jun-11	bdl	140	early peak
	13-Sep-11	bdl	bdl	no peaks
	12-Dec-11	bdl	bdl	early peak
	NF GC Analysis		**Need Lab Confirmatory when think IRZ cleaned-up**	

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BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
IRZ-1	**16-Jun-00**	**1,100**	**3,500**	**Collected by G&M for IRZ Project - via off-site lab**
	8-May-01	**0.7**	**3,600**	**Collected by G&M for IRZ Project - via off-site lab**
	14-Oct-02	**68**	**980**	**Collected by G&M for IRZ Project - via off-site lab**
	19-May-03	**1.2**	**19**	**Collected by G&M for IRZ Project - via off-site lab**
	12-Jun-06	**IW-11 Commenced Pumping**		
	6-Apr-07	bdl	bdl	1 early peak
	27-Jun-07	bdl	bdl	early peak
	24-Sep-07	4	bdl	early peak
	25-Mar-08	bdl	bdl	early peak- sample light molasses color
	30-Jun-08	bdl/bdl	bdl/bdl	early peak
	18-Sep-08	bdl	bdl	early peak
	2-Dec-08	bdl	bdl	early peak
	27-Mar-09	bdl	bdl	
	25-Jun-09	bdl	bdl	early peak
	29-Sep-09	bdl	bdl	early peak
	3-May-10	bdl	bdl	early peak
	29-Jun-10	bdl	bdl	early peak
	20-Sep-10	bdl	bdl	Small early peak
	3-Jun-11	bdl	bdl	early peak
	13-Sep-11	bdl	bdl	early peak
	12-Dec-11	bdl	bdl	
	NF GC Analysis		**Need Lab Confirmatory when think IRZ cleaned-up**	
IRZ-2	**16-Jun-00**	**1,900**	**5,300**	**Collected by G&M for IRZ Project - via off-site lab**
	8-May-01	**1,300**	**5,700**	**Collected by G&M for IRZ Project - via off-site lab**
	14-Oct-02	**1,800**	**5,100**	**Collected by G&M for IRZ Project - via off-site lab**
	28-Mar-06	321/323	1,824/1,816	Field Dupl - RPD = -0.6% TCE & 0.4% Cis
IRZ-2 Converted to IW-11				**Installed pump-commenced pumping 12-June 2006**
IRZ-3	**16-Jun-00**	**1,300**	**4,400**	**Collected by G&M for IRZ Project - via off-site lab**
	8-May-01	**320**	**5,000**	**Collected by G&M for IRZ Project - via off-site lab**
	14-Oct-02	**1,400**	**4,800**	**Collected by G&M for IRZ Project - via off-site lab**
	12-Jun-06	**IW-11 Commenced Pumping**		
	6-Apr-07	106	528	Early peak
	27-Jun-07	82	448	Early peak
	21-Sep-07	315	1,781	Early peak
	24-Mar-08	219	1,270	Early peak
	26-Jun-08	123	679	
	22-Sep-08	45/39	281/247	Small early peak; RPD 14.3%/12.9%
	3-Dec-08	113	700	
	26-Mar-09	149	1,007	Early peak
	23-Jun-09	69	554	
	24-Sep-09	36	161	
	26-Apr-10	31	183	
	1-Jul-10	33	182	
	16-Sep-10	69/56	429/382	RPD 20.8%/11.6%
	3-Jun-11	53	309	
	13-Sep-11	62	248	
	12-Dec-11	15	74	
	10-Feb-12	19	66	Early peak
	10-May-12	23	123	
	Quarterly GC		**Need Lab Confirmatory when think IRZ cleaned-up**	

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BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
IRZ-4	**16-Jun-00**	**1,500**	**5,300**	**Collected by G&M for IRZ Project - via off-site lab**
	8-May-01	**1,200**	**4,900**	**Collected by G&M for IRZ Project - via off-site lab**
	16-Oct-02	**1,400**	**5,000**	**Collected by G&M for IRZ Project - via off-site lab**
	12-Jun-06	**IW-11 Commenced Pumping**		
	6-Apr-07	340	1,781	Early peak
	27-Jun-07	351	2,061	early peak
	21-Sep-07	452	2,802	Early peak
	24-Mar-08	288	1,391	Early peak
	27-Jun-08	461	2,243	
	22-Sep-08	bdl	bdl	Small early peak
	4-Dec-08	168	984	
	26-Mar-09	319	1,868	Early peak
	25-Jun-09	239	1,437	
	29-Sep-09	296/288	820/974	RPD 2.7%/-17.2%
	3-May-10	184	1,140	
	1-Jul-10	144	798	early peak
	16-Sep-10	150	1,006	
	3-Jun-11	189	3,077	
	12-Sep-11	175	784	early mid sized unidentified peak
	12-Dec-11	99	406	
	14-Feb-12	108	623	Early peak
	10-May-12	76	533	
	Quarterly GC		**Need Lab Confirmatory when think IRZ cleaned-up**	
IRZ-5	**8-May-01**	**1,200**	**4,600**	**Collected by G&M for IRZ Project - via off-site lab**
	16-Oct-02	**1,100**	**4,400**	**Collected by G&M for IRZ Project - via off-site lab**
	20-May-03	**380**	**3,000**	**Collected by G&M for IRZ Project - via off-site lab**
	12-Jun-06	**IW-11 Commenced Pumping**		
	6-Apr-07	79	2,100	Early peak
	27-Jun-07	196	3,335	early peak
	21-Sep-07	242	2,800	Early peak
	24-Mar-08	163	2,379	Early peak
	26-Jun-08	78	2,798	
	22-Sep-08	19	335	Small early peak
	3-Dec-08	135	1,689	
	26-Mar-09	180	2,480	Early peak
	25-Jun-09	25	527	
	24-Sep-09	14	210	
	26-Apr-10	154	1,756	Early peak
	1-Jul-10	66	896	
	16-Sep-10	58	902	
	3-Jun-11	155	1,874	Early peak
	13-Sep-11	290	2,154	
	12-Dec-11	157	1,100	Early peak
	10-Feb-12	119	1,257	Early peak
	10-May-12	61	879	Early peak
	Quarterly GC		**Need Lab Confirmatory when think IRZ cleaned-up**	

TCE - MCL = 5 ug/L; cis-1,2-DCE - MCL = 70 ug/L

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BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
RAP 1-6S	19-May-98	5.7/5.7	21/21	Off-site-Haley & Aldrich Round 11 with duplicate
(in IRZ Area)	10-May-99	13	48	via EPA lab - average of 2 USGS passive bags
	10-May-99	2.8	21	via EPA lab - low-flow sample
	6-Oct-99	2.5	8.1	via off-site lab; VC = 0.5j
	16-Jun-00	1.4	3.8	Collected by G&M for IRZ Project - via off-site lab
	22-Sep-00	1.2	2.2	via off-site lab; VC = 0.11 F
	8-May-01	1.7/1.7	6.4/6.4	Collected by G&M for IRZ Project w/dupl - via off-site lab
	5-Sep-01	2.5	39.7	via off-site lab; VC=3.51
	26-Sep-02	1.5	7.15	via off-site lab - Last IRZ Injection - 9-Oct-02
	16-Oct-02	0.4	1.6	Collected by G&M for IRZ Project - via off-site lab
	19-May-03	0.93 j	9.1	Collected by G&M for IRZ Project - via off-site lab
	17-Nov-03	0.3 F	2.68	via off-site lab; VC = 0.21 F; toluene = 0.35 F
	17-Nov-04	0.46 F	8.08	via off-site lab; VC =0.7 F; toluene = 1.56; 2-butanone = 22.2
	16-Nov-05	0.58 F	23.8	dupl via off-site lab; VC = 2.38; toluene=9.42; 2-butanone=56.9
	12-Jun-06	IW-11 Commenced Pumping		
	7-Nov-06	0.32 F	9.91	dupl via off-site lab; VC = 4.17
	6-Apr-07	bdl	bdl	1 early peak
	27-Jun-07	bdl	bdl	1 early peak
	5-Nov-07	bdl j	bdl j	1 early peak; j=1day over holding time
	5-Nov-07	0.260 F	2.56	dupl via off-site lab; VC = <0.038U
	24-Mar-08	bdl	bdl	Early peak
	20-Jun-08	bdl	bdl	Early peak
	18-Sep-08	bdl	bdl	
	18-Nov-08	bdl	bdl	Small early peak
	18-Nov-08	0.67 F	6.6 J	dupl via off-site lab; VC = 2.7
	4-Dec-08	bdl	bdl	
	25-Mar-09	bdl	bdl	
	25-Jun-09	bdl/bdl	bdl/bdl	
	29-Sep-09	bdl	bdl	
	2-Dec-09	bdl	bdl	
	2-Dec-09	0.14 F	3.10	dupl via off-site lab; VC = 1.1
	3-May-10	bdl	37	Early peak
	29-Jun-10	bdl	49	Early peak
	15-Sep-10	bdl	bdl	Small early peak
	18-Nov-10	bdl	bdl	GC accuracy suspect
	18-Nov-10	bdl	2.8	dupl via off-site lab; VC = 1.1
	3-Jun-11	bdl	157	Early peak - results suspect
	12-Sep-11	bdl	6	
	18-Nov-11	1.1	180	via off-site lab; VC = 38
	12-Dec-11	bdl	22	
	14-Feb-12	bdl	175	Early peak
	10-May-12	bdl	405	Early peak
	Quarterly GC less Nov			Annual (Nov) Off-Site

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BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
RAP 1-6T (in IRZ Area)	**19-May-98**	**1,600**	**3,800**	**Off-site-Haley & Aldrich Round 11**
	13-May-99	**1,402**	**5,760**	**via EPA lab - average of 5 USGS passive bags**
	14-May-99	**1,500**	**6,200**	**via EPA lab - low-flow sample**
	6-Oct-99	**1,400**	**5,100**	**via off-site lab diluted @ 200; VC = 1000**
	16-Jun-00	**810**	**2,100**	**Collected by G&M for IRZ Project - via off-site lab**
	22-Sep-00	**1,266**	**4,882**	**via off-site lab; VC = 609**
	8-May-01	**4.7**	**3,000**	**Collected by G&M for IRZ Project - via off-site lab**
	5-Sep-01	**68**	**1,870**	**via off-site lab; VC = 655.68**
	26-Sep-02	**70**	**1,763**	**via off-site lab diluted @ 100; VC = 501**
	14-Oct-02	**510/530**	**3300/3300**	**G&M sample w/dup via off-site lab - Last IRZ Injection 9-Oct-02**
	20-May-03	**8.1**	**140**	**Collected by G&M for IRZ Project - via off-site lab**
	17-Nov-03	**0.5F**	**2.89**	**via off-site lab; VC = 6.28 F**
	17-Nov-04	**1.94**	**10.57**	**via off-site lab; VC = 11.09**
	16-Nov-05	**2.41**	**10.6**	**dupl via off-site lab; VC = 6.2**
	12-Jun-06	**IW-11 Commenced Pumping**		
	6-Apr-07	bdl	bdl	1 early peak
	27-Jun-07	bdl	bdl	1 early peak
	21-Sep-07	248	1,728	Resampled 1-Oct = 264 & 1,823
	5-Nov-07	166 j	1,088 j	j=1day over holding time
	5-Nov-07	**206**	**898**	**dupl via off-site lab; VC = 312**
	24-Mar-08	bdl	bdl	
	24-Jun-08	bdl	bdl	
	18-Sep-08	bdl	bdl	Small early peak
	18-Nov-08	bdl	bdl	Small early peak
	18-Nov-08	**10**	**33 J**	**dupl via off-site lab; VC = 31**
	4-Dec-08	bdl	bdl	
	25-Mar-09	bdl	bdl	Septum questionable
	25-Jun-09	bdl	bdl	
	29-Sep-09	10	27	Early peak
	2-Dec-09	bdl	bdl	Early peak
	2-Dec-09	**2.10**	**5.30**	**dupl via off-site lab; VC = 8.9**
	3-May-10	bdl	bdl	Early peak
	29-Jun-10	bdl	bdl	Early peak
	15-Sep-10	133	714	
	18-Nov-10	bdl	10	GC accuracy suspect
	18-Nov-10	**21**	**61 M**	**dupl via off-site lab; VC = 50 M**
	3-Jun-11	bdl	bdl	Early peak - results suspect
	12-Sep-11	bdl	bdl	early unidentified peak
	18-Nov-11	**1.1**	**2.5**	**dupl via off-site lab; VC = 8.4**
	12-Dec-11	bdl	bdl	
	NF GC Analysis			**Annual (Nov) Off-Site**

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
RAP 1-6R	19-May-98	1,800	4,800	Off-site-Haley & Aldrich Round 11
(in IRZ Area)	7-May-99	1,300	4,800	via off-site lab
	13-May-99	1,180	5,720	via EPA lab - average of 5 USGS passive bags
	14-May-99	1200/1300	6400/5700	via EPA lab - low-flow sample w/dupl
	6-Oct-99	1,200	4,100	via off-site lab - diluted @ 200; VC = 700
	16-Jun-00	1,400	4,300	Collected by G&M for IRZ Project - via off-site lab
	22-Sep-00	1,148/1,219	4,086/4274	via off-site lab w/dupl; VC = 446
	8-May-01	1,300	4,600	Collected by G&M for IRZ Project - via off-site lab
	5-Sep-01	904.1	4,536.96	via off-site lab; VC = 738.78
	5-Sep-01	1,039.5	4,439.12	via off-site lab; VC = 1003.64
	26-Sep-02	692	3,828	via off-site lab - diluted @ 200; VC = 487
	14-Oct-02	1,400	4,900	G&M sample via off-site lab - Last IRZ Injection 9-Oct-02
	17-Nov-03	179.5	1,192.8	via off-site lab; VC = 250.7
	17-Nov-04	3.03R/41.31	223.07R/346.16	via off-site lab w/dupl; RPD = Reject; VC = 68.16/89.33
	29-Nov-04	48.86/68.61	356.97/449.19	via off-site lab w/dupl; RPD = -33.6%/-22.9%; VC = 140.23/162.28
	16-Nov-05	86.5M/27.3	634M/198	dupl via off-site lab w/dupl; RPD=>100%/<100%; VC = 87.5M/69.4
	12-Jun-06	IW-11 Commenced Pumping		
	7-Nov-06	19.3/71.8*	71/479*	dupl via off-site lab w/dupl; RPD = -115%/-148%; VC = 85/184
	6-Apr-07	137/216	1266/1947	RPD of sample & dup = -44.8% TCE & -42.4% Cis
	27-Jun-07	245/388	2765/4087	RPD of sample & dup = -45.2% TCE & -38.6% Cis
	24-Sep-07	153/187	2139/2387	RPD of sample & dup = -20.0% TCE & -11.0% Cis
	5-Nov-07	23 j/32 j	759 j/1159 j	RPD of sample & dup = -32.7% & -41.7%; j=1day over holding time
	5-Nov-07	26.2	520	dupl via off-site lab; VC = 160
	24-Mar-08	66/55	1067/1032	RPD of sample & dup = -20.0% TCE & -11.0% Cis
	20-Jun-08	22/23	843/871	RPD of sample & dup = 18.2% TCE & 3.3% Cis
	18-Sep-08	108/136	1527/1921	Early peak - RPD of sample & dup = -23.0% TCE & -22.9% Cis
	18-Nov-08	bdl	990.5	Early peak - 2 reruns = 1,031 & bdl and 1,034 & bdl
	18-Nov-08	16	750 J	dupl via off-site lab; VC = 440
	4-Dec-08	110	2,407	
	25-Mar-09	10/20	802/856	Early peaks - RPD of sample & dup = -66.7% TCE & -6.5% Cis
	25-Jun-09	262	3,418	Early peak
	29-Sep-09	266/164	1767/1197	Early peaks - RPD of sample & dup = 47.4% TCE & 38.5% Cis
	2-Dec-09	134/158	1021/1068	RPD of sample & dup = -16.4% TCE & -4.5% Cis
	2-Dec-09	170	1,200	dupl via off-site lab; VC = 810
	3-May-10	181/165	1749/1730	RPD of sample & dup = 9.2% TCE & 1.1% Cis
	29-Jun-10	61/81	716/1070	Early peak - RPD of sample & dup = -28.2% TCE & -39.6% Cis
	15-Sep-10	206/408	1812/3310	Early peak - RPD of sample & dup = -65.8% TCE & -58.5% Cis
	18-Nov-10	173	1,457	GC accuracy suspect
	18-Nov-10	360/400	2,100/2,300	dupl w/dupl via off-site lab; VC = 380/380
	8-Jun-11	223/335	2,252/3,254	Early peak - RPD of sample & dup = -40.1% TCE & -36.4% Cis
	12-Sep-11	315/387	2034/2982	RPD of sample & dup = -20.5% TCE & -37.8% Cis
	18-Nov-11	156/160	1493/1402	RPD of sample & dup = -2.5% TCE & 6.3% Cis
	18-Nov-11	140/160	1,100/1,200	dupl w/dupl via off-site lab; VC = 590/560
	12-Dec-11	139/144	1024/980	RPD of sample & dup = -3.5% TCE & 4.4% Cis
	14-Feb-12	161	1,691	Early peak
	10-May-12	199	2,052	Early peak
	Quarterly GC less Nov			Annual (Nov) Off-Site

TCE - MCL = 5 ug/L; cis-1,2-DCE - MCL = 70 ug/L

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
Surface Water	**29-May-98**	**3.8/3.8**	**bdl/bdl**	**Off-site-Haley & Aldrich Round 11 with duplicate**
RAP1-SW4	**6-Oct-99**	**0.6 j**	**0.7 j**	**via off-site lab**
(in IRZ Area)	**21-Jun-00**	**0.6 F**	**.7F**	**via off-site lab**
	22-Sep-00	**.2F**	**.27F**	**via off-site lab**
	5-Sep-01	**0.4F/0.5F**	**0.82F/0.78F**	**via off-site lab**
	26-Sep-02	**0.3**	**0.42**	**via off-site lab**
	17-Nov-03	**0.5F**	**0.68F**	**via off-site lab**
	18-Nov-04	**0.49F**	**0.89F**	**via off-site lab**
	17-Nov-05	**0.32F**	**0.64F**	**dupl via off-site lab**
	12-Jun-06	**IW-11 Commenced Pumping**		
	10-Nov-06	**0.64 F**	**2.03**	**dupl via off-site lab**
	6-Apr-07	bdl	bdl	
	27-Jun-07	bdl	bdl	
	21-Sep-07	bdl	bdl	
	8-Nov-07	20	bdl	Results suspect-to be resampled asap
	8-Nov-07	**0.34 FJ**	**0.920 FJ**	**dupl via off-site lab; J = over holding time**
	27-Nov-07	bdl	bdl	
	24-Mar-08	bdl	bdl	
	26-Jun-08	bdl	bdl	
	22-Sep-08	bdl	bdl	
	20-Nov-08	bdl	bdl	
	20-Nov-08	**0.43 F**	**1.1 J**	**dupl via off-site lab; VC = 0.078 U**
	3-Dec-08	bdl	bdl	
	27-Mar-09	bdl	bdl	
	25-Jun-09	bdl	bdl	
	1-Oct-09	bdl	bdl	
	3-Dec-09	bdl	bdl	
	3-Dec-09	**bdl**	**0.16 F**	**dupl via off-site lab; VC = bdl**
	26-Apr-10	bdl	bdl	
	1-Jul-10	bdl	bdl	
	17-Sep-10	bdl	bdl	
	19-Nov-10	bdl	bdl	GC accuracy suspect
	19-Nov-10	**.73 F**	**2.3**	**dupl via off-site lab; VC = bdl**
	2-Jun-11	bdl	bdl	
	29-Sep-11	bdl	bdl	
	18-Nov-11	**1.5**	**3.8**	**via off-site lab; VC = 0.17 F**
	NF GC Analysis			**Annual (Nov) Off-Site**
SITE 2 - RECHARGE/COLLECTION TRENCH AREA - SURFACE AQUIFER				
B105 (S)	**15-May-98**	**2.5**	**2.5**	**Off-site-Haley & Aldrich Round 11**
	28-Mar-07	bdl	bdl	
	13-Jun-07	bdl	bdl	
	12-Sep-07	bdl	bdl	
	18-Mar-08	bdl	bdl	
	25-Jun-08	bdl	bdl	
	18-Sep-08	bdl	bdl	
	2-Dec-08	bdl	bdl	
	27-Mar-09	bdl	bdl	
	16-Jun-09	bdl	bdl	
	14-Sep-09	bdl	bdl	
	20-Apr-10	bdl	bdl	
	28-Jun-10	bdl	bdl	
	8-Sep-10	bdl	bdl	
	14-Apr-11	bdl	bdl	
	2-Jun-11	bdl	bdl	
	19-Sep-11	bdl	bdl	
	14-Dec-11	bdl	bdl	
	NFA			

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
B106 (S)	13-Jun-07	bdl	bdl	
	25-Jun-08	bdl	bdl	
	22-Jun-09	bdl	bdl	
	28-Jun-10	bdl	bdl	
	20-Jun-11	bdl	bdl	
	NFA			
C-201 (S)	24-Sep-09	58	62	1st time S&A
	30-Oct-09	26	31	
C-203 (S)	24-Sep-09	bdl	bdl	1st time S&A
	30-Oct-09	bdl	bdl	
C-206 (S)	30-Oct-09	bdl	bdl	1st time S&A
OW 2-1	**18-May-98**	**bdl**	**5**	**Off-site-Haley & Aldrich Round 11**
	28-Mar-07	bdl	bdl	
	12-Jun-07	9	bdl	
	14-Sep-07	bdl	bdl	
	18-Mar-08	bdl	bdl	
	25-Jun-08	bdl	bdl	
	17-Sep-08	bdl	bdl	
	2-Dec-08	bdl	bdl	
	25-Mar-09	bdl	bdl	
	18-Jun-09	bdl	bdl	
	16-Sep-09	bdl	bdl	
	19-Apr-10	bdl	bdl	
	28-Jun-10	bdl	bdl	
	15-Sep-10	bdl	bdl	
	16-Jun-11	bdl	bdl	
	19-Sep-11	bdl	bdl	
	14-Dec-11	bdl	bdl	
	NFA			
OW 2-2	**1-Sep-98**	**bdl (<500)**	**23,000**	**via off-site lab; VC = 5,000**
	26-Mar-07	bdl	bdl	
	12-Jun-07	bdl	bdl	
	14-Sep-07	bdl	bdl	
	18-Mar-08	bdl	bdl	
	25-Jun-08	bdl	bdl	
	17-Sep-08	bdl	bdl	
	2-Dec-08	bdl	bdl	
	25-Mar-09	bdl	bdl	
	18-Jun-09	bdl	bdl	
	16-Sep-09	bdl	bdl	
	19-Apr-10	bdl	bdl	
	28-Jun-10	bdl	bdl	
	15-Sep-10	bdl	bdl	
	16-Jun-11	bdl	bdl	
	19-Sep-11	bdl	bdl	
	14-Dec-11	bdl	bdl	
	NF GC Analysis		**Need Lab Confirmatory when think Site 2 is cleaned-up**	

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
OW 2-3	28-Mar-07	bdl	261	
	12-Jun-07	bdl	bdl	
	14-Sep-07	bdl	126	
	18-Mar-08	bdl	bdl	
	24-Jun-08	bdl	47	
	17-Sep-08	bdl	67	
	2-Dec-08	bdl	bdl	
	25-Mar-09	bdl	bdl	
	18-Jun-09	bdl	316	Small early peak
	16-Sep-09	5	107	
	19-Apr-10	bdl	bdl	
	28-Jun-10	bdl	bdl	
	13-Sep-10	bdl	15	
	16-Jun-11	bdl	bdl	
	19-Sep-11	bdl	656	
	21-Dec-11	bdl	bdl	
	14-Feb-12	bdl	bdl	
	10-May-12	bdl	40	
	Quarterly GC less Nov			**Annual (Nov) Off-Site**
OW 2-4	**22-Jun-94**	**48**	**1,000**	**Off-site-Haley & Aldrich Round 7**
	11-Nov-94	**bdl**	**64,000**	**Off-site-Haley & Aldrich Round 8**
	9-Jul-96	**130**	**19,000**	**Off-site-Haley & Aldrich Round 9**
	12-May-97	**3.9**	**74**	**Off-site-Haley & Aldrich Round 10**
	18-May-98	**1.3**	**3.2**	**Off-site-Haley & Aldrich Round 11**
	26-Mar-07	4	bdl	
	12-Jun-07	bdl	bdl	
	14-Sep-07	bdl	bdl	
	18-Mar-08	bdl	92	
	24-Jun-08	bdl	bdl	
	17-Sep-08	bdl	bdl	
	2-Dec-08	bdl	bdl	
	25-Mar-09	bdl	bdl	
	18-Jun-09	bdl	bdl	
	16-Sep-09	bdl	bdl	
	19-Apr-10	bdl	bdl	
	28-Jun-10	bdl	bdl	
	13-Sep-10	bdl	bdl	1 small peak
	16-Jun-11	bdl	bdl	
	19-Sep-11	bdl	bdl	
	14-Dec-11	bdl	bdl	
	NF GC Analysis		**Need Lab Confirmatory when think Site 2 is cleaned-up**	
OW 2-5	28-Mar-07	13	bdl	
	12-Jun-07	bdl	bdl	
	17-Sep-07	2	bdl	
	18-Mar-08	bdl	bdl	
	24-Jun-08	bdl	865	1 early peak
	17-Sep-08	bdl	46	
	2-Dec-08	bdl	bdl	
	25-Mar-09	bdl	bdl	
	22-Jun-09	bdl	bdl	
	16-Sep-09	bdl	bdl	small, early peak
	19-Apr-10	bdl	bdl	
	28-Jun-10	bdl	bdl	2 early peaks
	28-Sep-10	2	bdl	
	20-Jun-11	4	bdl	
	20-Sep-11	4	bdl	
	NF GC Analysis		**Need Lab Confirmatory when think Site 2 is cleaned-up**	

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
OW 2-6	26-Mar-07	240	675	
	13-Jun-07	69	426	
	17-Sep-07	14	bdl	
	18-Mar-08	94	431	
	24-Jun-08	82	bdl	
	17-Sep-08	4	300	early peak
	2-Dec-08	19	618	
	25-Mar-09	991	834	
	22-Jun-09	49	998	
	16-Sep-09	22	151	early peak
	19-Apr-10	47	614	
	28-Jun-10	10	290	
	8-Sep-10	4	147	early peak
	14-Apr-11	61	515	
	20-Jun-11	8	367	early peak
	27-Sep-11	47	557	early peak
	21-Nov-11	29	409	early peak
	21-Nov-11	**30**	**400**	**dupl via off-site lab; VC = 130**
	19-Dec-11	9	229	early peak
	14-Feb-12	29	455	early peak
	10-May-12	14	201	
	Quarterly GC less Nov			**Annual (Nov) Off-Site**
OW 2-7	**8-Nov-94**	**2,700**	**650**	**Off-site-Haley & Aldrich Round 8; VC = 57**
	8-Jul-96	**1,800**	**190**	**Off-site-Haley & Aldrich Round 9; VC = 13 j**
	18-May-98	**130**	**bdl**	**Off-site-Haley & Aldrich Round 11; VC = bdl**
	28-Mar-07	bdl	bdl	
	13-Jun-07	bdl	bdl	
	17-Sep-07	bdl	bdl	
	18-Mar-08	bdl	bdl	
	25-Jun-08	bdl	bdl	
	17-Sep-08	bdl	bdl	
	2-Dec-08	bdl	bdl	
	25-Mar-09	bdl	bdl	
	22-Jun-09	bdl	bdl	
	16-Sep-09	bdl	bdl	
	19-Apr-10	bdl	bdl	
	28-Jun-10	bdl	bdl	
	8-Sep-10	bdl	bdl	
	14-Apr-11	bdl	bdl	
	20-Jun-11	bdl	bdl	
	29-Sep-11	bdl	bdl	
	NF GC Analysis		**Need Lab Confirmatory when think Site 2 is cleaned-up**	
OW 2-8	**18-May-98**	**8.7**	**70**	**Off-site-Haley & Aldrich Round 11**
	26-Mar-07	7	bdl	
	13-Jun-07	bdl	bdl	
	17-Sep-07	bdl	bdl	
	18-Mar-08	bdl	bdl	
	25-Jun-08	bdl	bdl	
	17-Sep-08	bdl	bdl	
	2-Dec-08	bdl	bdl	
	27-Mar-09	bdl	bdl	
	22-Jun-09	bdl	bdl	
	16-Sep-09	bdl	bdl	
	19-Apr-10	bdl	bdl	
	28-Jun-10	bdl	bdl	
	8-Sep-10	10	bdl	
	14-Apr-11	bdl	bdl	
	20-Jun-11	bdl	bdl	
	27-Sep-11	bdl	bdl	
	NF GC Analysis		**Need Lab Confirmatory when think Site 2 is cleaned-up**	

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
PO2-1S	**20-May-98**	**2.7**	**bdl**	**Off-site-Haley & Aldrich Round 11**
	28-Mar-07	26	bdl	
	20-Jun-07	55	bdl	
	12-Sep-07	26	bdl	
	25-Mar-08	23	bdl	
	26-Jun-08	ns	ns	Unable to locate/buried under layer of gravel
	13-Nov-08	15 j	bdl j	Analysis exceeded holding time
	3-Dec-08	bdl	bdl	
	26-Mar-09	23	bdl	
	30-Jun-09	24	bdl	
	10-Sep-09	29	bdl	
	20-Apr-10	67	bdl	
	22-Jun-10	21	bdl	
	17-Sep-10	bdl	bdl	
	16-Jun-11	42	bdl	
	29-Sep-11	31	bdl	
	13-Dec-11	70	bdl	
	14-Feb-12	8	bdl	
	17-May-12	bdl	bdl	
	Quarterly GC less Nov			**Annual (Nov) Off-Site**
RFW-11 (S)	**29-Apr-98**	**30**	**9**	**via off-site lab**
	15-May-98	**15**	**bdl**	**Off-site-Haley & Aldrich Round 11**
	6-Oct-99	**470**	**88**	**via off-site lab**
	22-Sep-00	**231**	**35**	**via off-site lab**
	5-Sep-01	**12**	**1.41**	**via off-site lab**
	26-Sep-02	**84**	**5.66**	**via off-site lab**
	17-Nov-03	**18**	**1.53**	**via off-site lab**
	17-Nov-04	**10**	**0.88 F**	**via off-site lab**
	16-Nov-05	**7.99**	**1.03**	**dupl via off-site lab**
	9-Nov-06	**6.30**	**0.60 F**	**dupl via off-site lab**
	26-Mar-07	bdl	bdl	
	13-Jun-07	34	bdl	
	12-Sep-07	bdl	bdl	
	7-Nov-07	17	bdl	
	7-Nov-07	**24**	**2.29**	**dupl via off-site lab**
	18-Mar-08	bdl	bdl	
	26-Jun-08	bdl	bdl	
	23-Sep-08	bdl	bdl	
	19-Nov-08	bdl	bdl	
	19-Nov-08	**10**	**1.1 J**	**dupl via off-site lab; VC = 0.078 U**
	3-Dec-08	bdl	bdl	
	27-Mar-09	bdl	bdl	
	16-Jun-09	bdl	bdl	
	14-Sep-09	bdl	bdl	
	25-Nov-09	19	bdl	
	25-Nov-09	**25**	**1.9**	**dupl via off-site lab; VC = bdl**
	20-Apr-10	bdl	bdl	
	28-Jun-10	bdl	bdl	
	13-Sep-10	bdl	bdl	
	18-Nov-10	bdl	bdl	GC accuracy suspect
	18-Nov-10	**10**	**0.78 F**	**dupl via off-site lab; VC = bdl**
	2-Jun-11	bdl	bdl	
	19-Sep-11	bdl	bdl	
	21-Nov-11	**2.7**	**0.28 F**	**via off-site lab; VC = bdl**
	14-Dec-11	bdl	bdl	
	NF GC Analysis			**Annual (Nov) Off-Site**

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
SITE 2 - RECHARGE/COLLECTION TRENCH AREA - LOWER AQUIFER				
B109 (L)	**15-May-98**	**18**	**8.2**	**Off-site-Haley & Aldrich Round 11**
	26-Mar-07	bdl	bdl	
	13-Jun-07	bdl	bdl	
	12-Sep-07	bdl	bdl	
	18-Mar-08	bdl	bdl	
	25-Jun-08	bdl	bdl	
	18-Sep-08	bdl	bdl	
	2-Dec-08	bdl	bdl	
	27-Mar-09	bdl	bdl	
	16-Jun-09	bdl	bdl	
	14-Sep-09	bdl	bdl	
	20-Apr-10	bdl	bdl	
	28-Jun-10	bdl	bdl	
	8-Sep-10	bdl	bdl	
	14-Apr-11	bdl	bdl	
	2-Jun-11	bdl	bdl	
	19-Sep-11	bdl	bdl	
	13-Dec-11	bdl	bdl	
	NF GC Analysis		**Need Lab Confirmatory when think Site 2 is cleaned-up**	
B114 (L)	**15-May-98**	**1,000**	**310**	**Off-site-Haley & Aldrich Round 11**
	13-Jun-07	bdl/bdl	2,712/2,936	RPD unk & -7.9%
	26-Jun-08	54/41	2,283/1,903	RPD 27.4% & 18.2%
	16-Jun-09	bdl/bdl	129/107	RPD unk & 18.6%
	28-Jun-10	bdl/bdl	91/106	RPD unk & -15.2%
	2-Jun-11	bdl/bdl	120/98	RPD unk & 20.2%
	NF GC Analysis			**Annual (Nov) Off-Site - Well adjacent to IW-5**

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
B115 (L)	**29-Apr-98**	**570**	**390**	**via off-site lab**
	18-May-98	**960**	**380**	**Off-site-Haley & Aldrich Round 11**
	6-Oct-99	**270**	**190**	**via off-site lab; VC = 16**
	22-Sep-00	**29.4**	**382**	**via off-site lab; VC = 33.66**
	5-Sep-01	**379.4**	**985.34**	**via off-site lab; VC = 40.46**
	26-Sep-02	**21.1/31.4**	**627/789**	**via off-site lab; toluene = 491/406 (diluted @ 25)**
	17-Nov-03	**460.1**	**367.9**	**via off-site lab; VC = 18.06 F; toluene =7.24 F**
	17-Nov-04	**244.93**	**822.29**	**via off-site lab; VC = 23.14 F; toluene=23.52 F**
	16-Nov-05	**134**	**446**	**dupl via off-site lab; VC =16 F; toluene = 183**
	9-Nov-06	**<1.35/4.75 F**	**1100 M/1300**	**dupl via off-site lab; VC = 110/74.8, toluene=58/39.2**
	26-Mar-07	7/bdl	64/47	RPD n/a & -30.6%, rerun dup bdl-54 RPD n/a & -13.9%; early peak
	12-Jun-07	bdl/bdl	44/47	RPD n/a & -6.6%, early peak
	14-Sep-07	bdl/bdl	bdl/bdl	RPD n/a & n/a - early peak
	5-Nov-07	21j/26j	922j/929j	j = 1 day over holding time - RPD -21.3%/-0.8%
	5-Nov-07	**31.0F/35.5F**	**637/688**	**dupl via off-site lab w/dupl; VC = 80.0/68.5**
	18-Mar-08	70/77	55/62	RPD -9.5% & -12.0%
	24-Jun-08	101/113	130/145	RPD -11.2% & -10.9%
	17-Sep-08	39/10	bdl/bdl	RPD **118.4%** & unk%
	19-Nov-08	10	bdl	
	19-Nov-08	**48**	**66 J**	**dupl via off-site lab w/dupl; VC = 1.1**
	2-Dec-08	21	bdl	
	25-Mar-09	53/32	bdl/bdl	RPD 49.4% & unk%
	18-Jun-09	260/273	219/245	RPD -4.9% & -11.2%
	14-Sep-09	44/50	35/45	RPD -12.8% & -25.0%
	25-Nov-09	11	16	
	25-Nov-09	**26/29**	**58/59**	**dupl w/dupl via off-site lab; VC = 4.8/4.6**
	19-Apr-10	97/96	215/183	RPD 1.0% & 16.1%
	28-Jun-10	77/104	201/256	RPD -29.8% & -24.1%
	13-Sep-10	196/262	567/798	RPD -28.8% & -33.8%
	18-Nov-10	50/63	205/235	GC accuracy suspect - RPD -23.0% & -13.6%
	18-Nov-10	**80**	**260**	**dupl w/dupl via off-site lab; VC = 16**
	16-Jun-11	16/4	143/146	RPD **120.0** & -2.1%
	19-Sep-11	bdl/bdl	bdl/bdl	RPD n/a & n/a - early peak
	29-Nov-11	bdl/bdl	12/11	RPD unk% & 8.7%
	29-Nov-11	**9.6**	**27**	**dupl via off-site lab; VC = 5.1**
	14-Dec-11	bdl/bdl	bdl/bdl	
	Quarterly GC less Nov			**Annual (Nov) Off-Site**
SITE 1 and/or SITE 2 PLUME - FAMCAMP/DOWNGRADIENT AREA - SURFACE AQUIFER				
B101 (S)	27-Mar-07	bdl	bdl	
	22-Jun-07	28 R	bdl	Results suspect - to be re-sampled asap
	8-Aug-07	bdl	bdl	
	8-Aug-07	**bdl**	**bdl**	**dupl via off-site lab - all VOCs bdl**
	12-Sep-07	bdl	bdl	
	24-Mar-08	bdl	bdl	
	26-Jun-08	bdl	bdl	
	23-Sep-08	bdl	bdl	
	3-Dec-08	bdl	bdl	
	17-Mar-09	bdl	bdl	
	16-Jun-09	bdl	bdl	
	10-Sep-09	bdl	bdl	
	20-Apr-10	bdl	bdl	
	22-Jun-10	bdl	bdl	
	2-Sep-10	bdl	bdl	
	2-Jun-11	bdl	bdl	
	27-Sep-11	bdl	bdl	
	13-Dec-11	bdl	bdl	
	NFA			

TCE - MCL = 5 ug/L; cis-1,2-DCE - MCL = 70 ug/L

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
B107 (S)	**11-May-98**	**2.8**	**bdl**	**Off-site-Haley & Aldrich Round 11**
	10-May-99	**bdl**	**bdl**	**via EPA lab - USGS sample - passive bag**
	10-May-99	**bdl**	**bdl**	**via EPA lab - low-flow sample**
	27-Mar-07	bdl	bdl	
	20-Jun-07	23 R	bdl	Results suspect - to be re-sampled asap
	12-Sep-07	bdl	bdl	
	25-Mar-08	bdl	bdl	
	25-Jun-08	bdl	bdl	
	22-Sep-08	bdl	bdl	
	3-Dec-08	bdl	bdl	
	17-Mar-09	bdl	bdl	
	16-Jun-09	bdl	bdl	
	10-Sep-09	bdl	bdl	
	20-Apr-10	bdl	bdl	
	22-Jun-10	bdl	bdl	
	2-Sep-10	bdl	bdl	
	16-Jun-11	bdl	bdl	
	27-Sep-11	bdl	bdl	
	13-Dec-11	bdl	bdl	
	NFA			
RAP2-2S	28-Mar-07	bdl	bdl	
	22-Jun-07	26	bdl	Results suspect - to be re-sampled asap
	20-Sep-07	bdl	bdl	
	25-Mar-08	bdl	bdl	
	27-Jun-08	bdl	bdl	
	22-Sep-08	bdl	bdl	
	3-Dec-08	bdl	bdl	
	26-Mar-09	bdl	bdl	
	23-Jun-09	bdl	bdl	
	10-Sep-09	bdl	bdl	
	20-Apr-10	bdl	bdl	
	22-Jun-10	bdl	bdl	
	23-Sep-10	bdl	bdl	
	2-Jun-11	bdl	bdl	
	27-Sep-11	bdl	bdl	
	13-Dec-11	bdl	bdl	
	NFA			

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
SITE 1 and/or SITE 2 PLUME - FAMCAMP/DOWNGRADIENT AREA - LOWER AQUIFER				
B108 (L)	**8-May-98**	**470**	**210**	**Off-site-Haley & Aldrich Round 11-Results suspect**
	11-May-99	**16**	**24**	**via EPA lab - USGS samples - ave of 3 passive bags**
	12-May-99	**16**	**7.4**	**via EPA lab - low-flow sample**
	6-Oct-99	**14**	**19**	**via off-site lab**
	22-Sep-00	**18**	**36**	**via off-site lab**
	5-Sep-01	**39**	**79**	**via off-site lab**
	26-Sep-02	**33**	**91**	**via off-site lab**
	18-Nov-03	**30**	**96**	**via off-site lab; VC = 2.18 F**
	18-Nov-04	**22**	**128**	**via off-site lab; VC = 4.73**
	16-Nov-05	**23**	**141**	**dupl via off-site lab; VC = 9.38**
	9-Nov-06	**19**	**101**	**dupl via off-site lab; VC = 11.3**
	27-Mar-07	bdl	bdl	
	22-Jun-07	36	17	
	12-Sep-07	8	bdl	
	7-Nov-07	bdl	bdl	
	7-Nov-07	**10.3**	**37**	**dupl via off-site lab; VC = 1.62**
	25-Mar-08	bdl	bdl	
	26-Jun-08	bdl	bdl	
	23-Sep-08	bdl	bdl	
	19-Nov-08	bdl	bdl	
	19-Nov-08	**6.4**	**35 J**	**dupl via off-site lab; VC = 0.46 F**
	3-Dec-08	bdl	bdl	early peak
	17-Mar-09	bdl	bdl	
	16-Jun-09	bdl	16	
	10-Sep-09	bdl	9	
	25-Nov-09	bdl	bdl	
	25-Nov-09	**5.4**	**31**	**dupl via off-site lab; VC = 0.60 F**
	20-Apr-10	bdl	54	
	22-Jun-10	bdl	8	
	2-Sep-10	bdl	52	
	23-Nov-10	bdl	bdl	GC accuracy suspect
	23-Nov-10	**4.5**	**35**	**dupl via off-site lab; VC = 1.7**
	2-Jun-11	bdl	47	
	27-Sep-11	bdl	bdl	
	21-Nov-11	**3.8**	**29**	**via off-site lab; VC = 0.22 F**
	13-Dec-11	bdl	bdl	
	NF GC Analysis			**Annual (Nov) Off-Site**
B113 (L)	**11-May-98**	**44**	**120**	**Off-site-Haley & Aldrich Round 11**
	11-May-99	**32.0**	**99.0**	**via EPA lab - USGS samples - ave of 3 passive bags**
	11-May-99	**30/32**	**100/92**	**via EPA lab - middle P. bag sample w/dupl**
	12-May-99	**11**	**51**	**via EPA lab - low-flow sample**
	26-Mar-07	21	234	
	20-Jun-07	30	354	
	12-Sep-07	11	176	
	25-Mar-08	bdl	160	
	25-Jun-08	7	153	
	22-Sep-08	bdl	37	
	3-Dec-08	8	234	
	17-Mar-09	bdl	61	
	16-Jun-09	11	224	
	10-Sep-09	12	99	
	20-Apr-10	9	116	
	22-Jun-10	10	107	
	2-Sep-10	7	81	
	16-Jun-11	3	134	
	27-Sep-11	6	126	
	29-Nov-11	7	34	
	29-Nov-11	**19**	**100**	**dupl via off-site lab; VC = 39**
	13-Dec-11	bdl	45	
	NF GC Analysis			**Annual (Nov) Off-Site**

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BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
RAP 2-2T	**11-May-98**	**330**	**1,100**	**Off-site-Haley & Aldrich Round 11**
	22-Jun-07	61	993	
	20-Sep-07	28	1,036	Early peak
	7-Nov-07	46	864	
	7-Nov-07	**44.0 J**	**744 J**	**dupl via off-site lab; VC = 212 J; J = over holding time**
	25-Mar-08	22	638	Early peak
	27-Jun-08	13	440	Early peak
	22-Sep-08	bdl	190	Early peak
	19-Nov-08	19	573	Early peak
	19-Nov-08	**39**	**540 J**	**dupl via off-site lab; VC = 220**
	3-Dec-08	14	618	
	26-Mar-09	48	1,391	Early peak
	23-Jun-09	40	1,395	Early peak
	10-Sep-09	30	482	
	25-Nov-09	18	356	
	25-Nov-09	**35**	**500**	**dupl via off-site lab; VC = 190**
	20-Apr-10	26	812	Early peak
	22-Jun-10	33	775	Early peak
	23-Sep-10	35	803	Early peak
	18-Nov-10	15	581	GC accuracy suspect
	18-Nov-10	**27**	**440**	**dupl via off-site lab; VC = 140**
	2-Jun-11	16	644	Early peak
	27-Sep-11	5	456	Early peak
	28-Nov-11	13	455	Early peak
	28-Nov-11	**29**	**440**	**dupl via off-site lab; VC = 170**
	13-Dec-11	10	264	Early peak
	10-Feb-12	19	396	Early peak
	17-May-12	8	444	Early peak
	Quarterly GC less Nov			**Annual (Nov) Off-Site**
SITE 1 and/or SITE 2 PLUME - FAMCAMP/DOWNGRADIENT AREA - BEDROCK AQUIFER				
RAP 2-2R	**12-May-98**	**400**	**1,400**	**Off-site-Haley & Aldrich Round 11**
	12-May-99	**304.0**	**1,740.0**	**via EPA lab - USGS samples - ave of 5 passive bags**
	14-May-99	**190**	**2,200**	**via EPA lab - low-flow sample**
	28-Mar-07	54	1,389	Early peak
	20-Sep-07	64	1,341	
	7-Nov-07	29	725	
	7-Nov-07	**45.0 J**	**601 J**	**dupl via off-site lab; VC = 51.0 J; J = over holding time**
	25-Mar-08	53	1,260	
	27-Jun-08	bdl	627	
	22-Sep-08	bdl	211	
	19-Nov-08	7	615	
	19-Nov-08	**25**	**520 J**	**dupl via off-site lab; VC = 18**
	3-Dec-08	10	613	
	26-Mar-09	21	1,095	Early peak
	23-Jun-09	21	1,274	
	10-Sep-09	21	490	
	25-Nov-09	3	301	
	25-Nov-09	**27**	**550**	**dupl via off-site lab; VC = 12**
	20-Apr-10	16	932	Early peak
	22-Jun-10	16	799	
	23-Sep-10	12	733	
	18-Nov-10	bdl	203	GC accuracy suspect
	18-Nov-10	**23**	**560**	**dupl via off-site lab; VC = 43**
	2-Jun-11	15	1,073	
	27-Sep-11	18	672	Early peak
	22-Nov-11	6	680	Early peak
	22-Nov-11	**38**	**540**	**dupl via off-site lab; VC = 130**
	13-Dec-11	bdl	292	Early peak
	10-Feb-12	17	459	Early peak
	17-May-12	16	647	Early peak
	Quarterly GC less Nov			**Annual (Nov) Off-Site**

TCE - MCL = 5 ug/L; cis-1,2-DCE - MCL = 70 ug/L

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
SITE 3 - RECHARGE/COLLECTION TRENCH AREA - SURFACE AQUIFER				
B116	**18-Jun-96**	**bdl**	**bdl**	**Off-site-Haley & Aldrich Round 9**
	18-Apr-02	**bdl**	**bdl**	**via off-site lab - Recovery from Site 3 suspended 22 Aug 01**
	15-Oct-09	bdl	bdl	
	25-Oct-10	bdl	bdl	
	NFA			
B117	**26-May-98**	**2**	**bdl**	**Off-site-Haley & Aldrich Round 11**
	18-Apr-02	**3.6**	**4.2**	**via off-site lab - Recovery from Site 3 suspended 22 Aug 01**
	25-Apr-07	bdl	bdl	
	5-Nov-07	bdl j	bdl j	j = 1 day over holding time
	5-Nov-07	**1.11**	**1.77**	**dupl via off-site lab**
	3-Apr-08	bdl	bdl	
	7-Jul-08	bdl	bdl	
	17-Nov-08	bdl j	bdl j	j = 1 day over holding time
	17-Nov-08	**0.51 F**	**1.9 J**	**dupl via off-site lab**
	20-Jul-09	bdl	bdl	
	22-Oct-09	bdl	bdl	
	2-Dec-09	bdl	bdl	
	2-Dec-09	**0.29 F**	**0.40 F**	**dupl via off-site lab**
	19-Jul-10	bdl	bdl	
	18-Oct-10	bdl	bdl	
	19-Nov-10	bdl	bdl	GC accuracy suspect
	19-Nov-10	**0.29 F**	**3.1**	**dupl via off-site lab**
	4-Aug-11	bdl	bdl	
	17-Nov-11	**0.52 F**	**0.16 F**	**via off-site lab**
	NFA			
OW 3-3	19-Nov-07	bdl	bdl	Recovery from Site 3 suspended 22 Aug 01
	22-Oct-09	bdl	bdl	
	18-Oct-10	bdl	bdl	
	NFA			
OW 3-4	19-Nov-07	bdl	bdl	Recovery from Site 3 suspended 22 Aug 01
	15-Oct-09	bdl	bdl	
	18-Oct-10	bdl	bdl	
	NFA			
OW 3-5	19-Nov-07	bdl	bdl	Recovery from Site 3 suspended 22 Aug 01
	22-Oct-09	bdl	bdl	
	18-Oct-10	bdl	bdl	
	NFA			
OW 3-6	19-Nov-07	bdl	bdl	Recovery from Site 3 suspended 22 Aug 01
	22-Oct-09	bdl	bdl	
	18-Oct-10	bdl	bdl	
	NFA			

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BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
B118	26-May-98	34	66	Off-site-H&A Round 11
Replaces OW	10-Nov-99	4.2J	100	via off-site lab
	29-Nov-00	26.7	380.36	via off-site lab
	18-Apr-02	0.4F	12.3	via off-site lab - Recovery from Site 3 suspended 22 Aug 01
	18-Dec-02	1.0F/1.0F	2.94/3.03	via off-site lab
	17-Nov-03	0.3F	1.23	via off-site lab; toluene = 10.74
	16-Nov-04	0.94 F/1.15	1.44/2.06	via off-site lab w/dupl
	14-Nov-05	0.37 F	1.56	dupl via off-site lab
	10-Nov-06	0.48 F	2.57	dupl via off-site lab
	25-Apr-07	bdl	bdl	
	5-Nov-07	bdl j	bdl j	j = 1 day over holding time
	5-Nov-07	0.260 F	1.65	dupl via off-site lab; toluene = 8.76
	3-Apr-08	bdl	bdl	
	7-Jul-08	bdl	bdl	
	17-Nov-08	bdl j	bdl j	j = 1 day over holding time
	17-Nov-08	0.30 F	1.7 J	dupl via off-site lab; toluene = 0.088 F
	20-Jul-09	bdl	bdl	
	22-Oct-09	bdl	bdl	
	2-Dec-09	bdl	bdl	
	2-Dec-09	0.17 F	0.27 F	dupl via off-site lab
	19-Jul-10	bdl	bdl	
	18-Oct-10	bdl	bdl	
	19-Nov-10	bdl	bdl	GC accuracy suspect
	19-Nov-10	0.23 F	1.2	dupl via off-site lab
	4-Aug-11	bdl	bdl	
	17-Nov-11	0.62 F	2.7	via off-site lab
	NFA			
OW 3-7	27-May-98	bdl/bdl	bdl/bdl	Off-site-H&A Round 11, BTEX = 130 ppb
	10-Nov-99	1.50	1.50	via off-site lab
	29-Nov-00	2.1	1.17F	via off-site lab; Ethylbenzene=32.78, Xylene=7.46
	18-Apr-02	0.4F	1.2	via off-site lab - Recovery from Site 3 suspended 22 Aug 01
	18-Dec-02	0.7F	3.28F	via off-site lab; toluene=112.39
	17-Nov-03	0.7F	1.91	via off-site lab
	16-Nov-04	0.35 F	1.22	via off-site lab
	14-Nov-05	0.47 F	0.60 F	dupl via off-site lab
	10-Nov-06	0.26 F	0.82 F	dupl via off-site lab; toluene = 2.89
	19-Nov-07	bdl	bdl	
	15-Oct-09	bdl	bdl	
	18-Oct-10	bdl	bdl	
	NFA			
OW 3-10	19-Nov-07	bdl	bdl	Fouled w/organics; Recovery from Site 3 suspended 22 Aug 01
	22-Oct-09	bdl	bdl	
	21-Oct-10	bdl	bdl	
	NFA			
OW 3-11	19-Nov-07	bdl	bdl	Recovery from Site 3 suspended 22 Aug 01
	15-Oct-09	3	bdl	
	21-Oct-10	bdl	bdl	
	NFA			
OW 3-12	19-Nov-07	bdl	bdl	Recovery from Site 3 suspended 22 Aug 01
	15-Oct-09	bdl	bdl	
	21-Oct-10	bdl	bdl	
	NFA			
OW 3-13	19-Nov-07	bdl	bdl	Recovery from Site 3 suspended 22 Aug 01
	15-Oct-09	bdl	bdl	
	21-Oct-10	bdl	bdl	
	NFA			

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BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
OW 3-14	25-Apr-07	bdl	bdl	Recovery from Site 3 suspended 22 Aug 01
	5-Nov-07	bdl j	bdl j	j = 1 day over holding time
	5-Nov-07	bdl	bdl	**dupl via off-site lab; toluene = 316**
	3-Apr-08	bdl	bdl	
	8-Jul-08	bdl	bdl	
	17-Nov-08	18 j	bdl j	Rerun 44 j & bdl j; j = 1 day over holding time
	17-Nov-08	**0.44 F**	**200 J**	**dupl via off-site lab; Benzene = 2.1 J; VC = 2.2**
	20-Jul-09	bdl	247	Rerun bdl & 296
	15-Oct-09	bdl	134	
	2-Dec-09	bdl	188	
	2-Dec-09	**0.20 F**	**240**	**dupl via off-site lab; VC = 4.2**
	23-Sep-10	bdl	bdl	
	21-Oct-10	bdl	bdl	
	19-Nov-10	bdl	33	GC accuracy suspect
	19-Nov-10	**0.31 F**	**68**	**dupl via off-site lab; VC = 4.2**
	4-Aug-11	bdl	52	
	17-Nov-11	bdl	196	
	17-Nov-11	**0.71 F**	**180**	**dupl via off-site lab; VC = 4.5**
	22-Feb-12	bdl	67	
	21-May-12	bdl	14	
	Quarterly GC less Nov			**Annual (Nov) Off-Site**
SITE 3 - RECHARGE/COLLECTION TRENCH AREA - LOWER AQUIFER				
B121	**26-May-98**	**2**	**5.6**	**Off-site-Haley & Aldrich Round 11**
	23-Nov-07	bdl	bdl	Recovery from Site 3 suspended 22 Aug 01
	15-Oct-09	bdl	bdl	
	25-Oct-10	bdl	bdl	
	NFA			
B122	**26-May-98**	**2.6/2.3**	**14/14**	**Off-site-Haley & Aldrich Round 11-9.6/9.2 1,1-DCA**
	17-Apr-00	**1.1M**	**8.37**	**off-site lab; 1,1-DCA = 6.26**
	18-Jan-01	**1.2**	**9.96**	**off-site lab; 1,1-DCA = 7.42**
	18-Apr-02	**1.0**	**7.8**	**Lab; 1,1-DCA =4.84; Recovery from Site 3 suspended 22 Aug 01**
	18-Dec-02	**1**	**6.88**	**off-site lab; 1,1-DCA = 4.63**
	17-Nov-03	**0.9F**	**5.44**	**off-site lab; 1,1-DCA = 3.77**
	16-Nov-04	**0.8 F**	**5.98**	**off-site lab; 1,1-DCA = 3.94**
	14-Nov-05	**0.78 F**	**4.68**	**dupl via off-site lab; 1,1-DCA = 3.42**
	10-Nov-06	**0.55 F**	**3.57**	**dupl via off-site lab; 1,1-DCA = 2.49**
	25-Apr-07	bdl	bdl	
	5-Nov-07	bdl j	bdl j	j = 1 day over holding time
	5-Nov-07	**0.580 F**	**3.22**	**dupl via off-site lab; 1,1-DCA = 1.90**
	3-Apr-08	bdl	bdl	
	7-Jul-08	bdl	bdl	
	17-Nov-08	bdl j	bdl j	j = 1 day over holding time
	17-Nov-08	**0.54 F**	**3.0 J**	**dupl via off-site lab; 1,1-DCA = 1.9**
	20-Jul-09	bdl	bdl	
	22-Oct-09	bdl	bdl	
	2-Dec-09	bdl	bdl	
	2-Dec-09	**0.42 F**	**3.5**	**dupl via off-site lab; 1,1-DCA = 2.1**
	19-Jul-10	bdl	bdl	
	18-Oct-10	bdl	bdl	
	19-Nov-10	bdl	bdl	GC accuracy suspect
	19-Nov-10	**0.44 F**	**2.8**	**dupl via off-site lab; 1,1-DCA = 1.7**
	4-Aug-11	bdl	bdl	
	NFA			

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
B-125	**27-May-98**	**1.8**	**5.6**	**Off-site-Haley & Aldrich Round 11**
	17-Apr-00	**0.8M**	**2.65**	**via off-site lab; 1,1-DCA = 2.29**
	18-Jan-01	**0.4F**	**1.92**	**via off-site lab; 1,1-DCA = 8.37, toluene = 1.19**
	18-Apr-02	**0.5F**	**1.5**	**Lab; 1,1-DCA = 0.8; Recovery from Site 3 suspended 22 Aug 01**
	18-Dec-02	**0.4F**	**1.14**	**via off-site lab; 1,1-DCA = 0.61**
	17-Nov-03	**0.4F/0.4F**	**1.28/1.3**	**via off-site lab w/dupl; toluene 6.88/6.08**
	16-Nov-04	**0.5 F**	**1.14**	**via off-site lab**
	14-Nov-05	**0.43 F**	**0.95 F**	**dupl via off-site lab**
	10-Nov-06	**0.28 F**	**0.85 F**	**dupl via off-site lab**
	25-Apr-07	bdl	bdl	
	5-Nov-07	10 j	bdl j	j = 1 day over holding time; TCE result suspect to be resampled asap
	5-Nov-07	**0.300 F**	**0.700 F**	**dupl via off-site lab**
	23-Nov-07	bdl	bdl	
	3-Apr-08	bdl	bdl	
	7-Jul-08	bdl	bdl	
	17-Nov-08	bdl j	bdl j	j = 1 day over holding time
	17-Nov-08	**0.39 F**	**0.78 FJ**	**dupl via off-site lab**
	20-Jul-09	bdl	bdl	
	15-Oct-09	bdl	bdl	
	2-Dec-09	bdl	bdl	
	2-Dec-09	**0.33 F**	**0.85 F**	**dupl via off-site lab**
	23-Sep-10	bdl	bdl	
	21-Oct-10	bdl	bdl	
	19-Nov-10	bdl	bdl	GC accuracy suspect
	19-Nov-10	**0.28 F**	**0.78 F**	**dupl via off-site lab; 1,1-DCA = 0.26F**
	4-Aug-11	bdl	bdl	
	NFA			
SITE 3 - RECHARGE/COLLECTION TRENCH AREA - BEDROCK AQUIFER				
B-231	**26-May-98**	**bdl**	**bdl**	**Off-site-Haley & Aldrich Round 11**
	23-Nov-07	bdl	bdl	Recovery from Site 3 suspended 22 Aug 01
	15-Oct-09	bdl	bdl	
	25-Oct-10	bdl	bdl	
	NFA			
B-232	**27-May-98**	**bdl**	**bdl**	**Off-site-Haley & Aldrich Round 11**
	17-Apr-00	**bdl/bdl**	**bdl/bdl**	**via off-site lab w/dupl**
	18-Jan-01	**bdl**	**bdl**	**via off-site lab**
	18-Apr-02	**bdl**	**bdl**	**via off-site lab - Recovery from Site 3 suspended 22 Aug 01**
	18-Dec-02	**bdl**	**bdl**	**via off-site lab**
	17-Nov-03	**bdl**	**bdl**	**via off-site lab**
	16-Nov-04	**bdl**	**0.11 F**	**via off-site lab; toluene = 8.16**
	14-Nov-05	**bdl**	**bdl**	**dupl via off-site lab; toluene = 2.59**
	10-Nov-06	**<0.027**	**<0.032**	**dupl via off-site lab; toluene = 0.17 F**
	25-Apr-07	bdl	bdl	early peak
	5-Nov-07	bdl j	bdl j	j = 1 day over holding time; earlypeak
	5-Nov-07	**<0.027**	**<0.032**	**dupl via off-site lab; toluene = 316**
	3-Apr-08	bdl	bdl	early peak
	7-Jul-08	bdl	bdl	early peak
	17-Nov-08	bdl j	bdl j	j = 1 day over holding time
	17-Nov-08	**bdl**	**bdl**	**dupl via off-site lab; toluene = 21**
	20-Jul-09	bdl	bdl	early peak
	22-Oct-09	bdl	bdl	early peak
	2-Dec-09	bdl	bdl	early peak
	2-Dec-09	**bdl**	**bdl**	**dupl via off-site lab; toluene = 4.7**
	19-Jul-10	bdl	bdl	early peak
	25-Oct-10	bdl	bdl	early peak
	19-Nov-10	bdl	bdl	GC accuracy suspect
	19-Nov-10	**bdl**	**bdl**	**dupl via off-site lab; toluene = 0.29 F**
	4-Aug-11	bdl	bdl	early peak
	NFA			

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
SITE 3 - DOWNGRADIENT - SURFACE AQUIFER				
RAP 3-3S	27-May-98	20	-	Off-site-Haley & Aldrich Round 11
	10-Nov-99	270	11 J	via off-site lab
	17-Apr-00	113.3	2.4	via off-site lab
	29-Nov-00	157.4	4.12F	via off-site lab
	18-Apr-02	42.6/41.8	3.53/3.51	Lab w/dupl - Recovery from Site 3 suspended 22 Aug 01
	18-Dec-02	20.9	9.8	via off-site lab
	17-Nov-03	93.8	7.34	via off-site lab
	16-Nov-04	93.0	6.07	via off-site lab
	14-Nov-05	50/49.6	4.85 F/4.80 F	dupl via off-site lab w/dupl
	10-Nov-06	62.6	7.85	dupl via off-site lab
	25-Apr-07	31/19	bdl/bdl	Field duplicate - RPD = 48.0% & 0%
	5-Nov-07	55 j	bdl j	j = 1 day over holding time
	5-Nov-07	68.6	8.60	dupl via off-site lab
	3-Apr-08	16/9	bdl/bdl	Field duplicate - RPD = 56.0% & 0%
	7-Jul-08	29/22	bdl/bdl	Field duplicate - RPD = 27.5% & 0%
	17-Nov-08	7.2 j/6.6 j	bdl j /bdl j	j = 1 day over holding time
	17-Nov-08	40/48	4.0 J/4.6 J	dupl via off-site lab w/dupl
	20-Jul-09	40	bdl	
	26-Oct-09	45/38	bdl/bdl	Field duplicate - RPD = 16.9% & 0%
	2-Dec-09	13.49/12.87	bdl/bdl	Field duplicate - RPD = 14.7% & 0%
	2-Dec-09	29/28	3.4/3.2	dupl via off-site lab w/dupl
	19-Jul-10	30	bdl	
	25-Oct-10	29	bdl	
	19-Nov-10	18/17	bdl/bdl	GC accuracy suspect-Field duplicate - RPD = 5.7% & 0%
	19-Nov-10	37/35	4.5/4.4	dupl via off-site lab w/dupl
	4-Aug-11	65	bdl	
	28-Nov-11	16	bdl	
	28-Nov-11	23	3.7	dupl via off-site lab
	22-Feb-12	bdl	bdl	
	21-May-12	39	bdl	
	Quarterly GC less Nov			Annual (Nov) Off-Site
RAP 3-4S	28-May-98	10/9.5	4.4/3.5	Off-site-Haley & Aldrich Round 11
	10-Nov-99	3	1	via off-site lab
	29-Nov-00	1.5	.26F	via off-site lab
	18-Apr-02	5.8	5.70	via off-site lab - Recovery from Site 3 suspended 22 Aug 01
	18-Dec-02	5.3	15.4	via off-site lab
	17-Nov-03	9.8	61.42	via off-site lab; 1,1-DCA = 1.67
	16-Nov-04	8.22	86.48	via off-site lab; 1,1-DCA = 2.15
	14-Nov-05	4.36	59.2	dupl via off-site lab; 1,1-DCA = 1.38 F
	10-Nov-06	3.86	106	dupl via off-site lab; 1,1-DCA = 2.0
	25-Apr-07	bdl	bdl	
	5-Nov-07	bdl j	151 j	j = 1 day over holding time; GC rerun = bdl/164
	5-Nov-07	5.30	134	dupl via off-site lab; 1,1-DCA = 2.50 F
	3-Apr-08	bdl/bdl	bdl/bdl	Field duplicate - RPD =0% & 0%
	8-Jul-08	bdl/bdl	9.53/9.00	Field duplicate - RPD =0% & 5.7%
	17-Nov-08	bdl j	bdl j	Rerun = bdl j & bdl j; j = 1 day over holding time
	17-Nov-08	3.40	63 J	dupl via off-site lab; 1,1-DCA = 1.2 et al
	20-Jul-09	bdl	bdl	
	26-Oct-09	bdl/bdl	56/51	Field duplicate - RPD = 0% & 9.3%
	2-Dec-09	bdl/bdl	28/41	Field duplicate - RPD = 0% & -37.3%
	2-Dec-09	2.3	62	dupl via off-site lab; 1,1-DCA = 1.2 et al
	23-Sep-10	bdl	43	
	25-Oct-10	bdl	28	
	19-Nov-10	bdl/bdl	39/35	GC accuracy suspect-Field duplicate - RPD = 0% & 10.8%
	19-Nov-10	1.7	65 M	dupl via off-site lab; 1,1-DCA = 1.1 et al
	4-Aug-11	bdl	9	
	17-Nov-11	1.1	21	dupl via off-site lab; 1,1-DCA = 0.45 F; trans-1,2-DCE=0.41 F
	NF GC Analysis			Annual (Nov) Off-Site

TCE - MCL = 5 ug/L; cis-1,2-DCE - MCL = 70 ug/L

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
SITE 3 - DOWNGRADIENT - LOWER AQUIFER				
RAP 3-3T	**27-May-98**	**1.5/1.6**	**16/16**	**Off-site-Haley & Aldrich Round 11/Duplicate**
	17-Apr-00	**0.9M**	**11.6**	**via off-site lab; 1,1-DCA = 6.43**
	18-Jan-01	**1F**	**12.31**	**via off-site lab; 1,1-DCA = 6.69**
	18-Apr-02	**1F**	**11.85**	**Lab; 1,1-DCA = 5.48; Recovery from Site 3 suspended 22 Aug 01**
	18-Dec-02	**1**	**11.78**	**via off-site lab; 1,1-DCA = 5.27**
	17-Nov-03	**1.1**	**11.9**	**via off-site lab; 1,1-DCA = 5.36**
	16-Nov-04	**1.16**	**11.8**	**via off-site lab; 1,1-DCA = 5.31**
	14-Nov-05	**1.00**	**10.4**	**dupl via off-site lab; 1,1-DCA = 4.61**
	10-Nov-06	**0.86 F**	**9.91**	**dupl via off-site lab; 1,1-DCA = 4.13**
	23-Nov-07	bdl	bdl	
	26-Oct-09	bdl	bdl	
	25-Oct-10	bdl	bdl	
	NF GC Analysis		**Need Lab Confirmatory when think Site 3 is cleaned-up**	
BOUNDARY - LOWER AQUIFER				
B126 (L)	**13-May-98**	**41**	**21**	**Off-site-Haley & Aldrich Round 11**
	10-May-99	**19**	**11**	**via EPA lab - USGS samples - ave of 3 passive bags**
	11-May-99	**19**	**11**	**via EPA lab - low-flow sample**
	11-Nov-99	**22**	**20**	**via off-site lab**
	15-Nov-99	**30**	**22**	**via EPA lab - USGS samples - ave of 3 passive bags**
	27-Nov-00	**17**	**18**	**via off-site lab**
	27-Nov-01	**8.4**	**3.79**	**via off-site lab**
	20-Nov-02	**11.8/11.3**	**5.63/5.59**	**via off-site lab**
	17-Nov-03	**8.7**	**4.36**	**via off-site lab**
	18-Nov-04	**9.48**	**6.12**	**via off-site lab**
	17-Nov-05	**12.6**	**8.70**	**dupl via off-site lab**
	7-Nov-06	**12.9**	**6.21**	**dupl via off-site lab**
	31-May-07	12	bdl	
	8-Nov-07	bdl	bdl	
	8-Nov-07	**11.3 J**	**8.14 J**	**dupl via off-site lab; J = over holding time**
	23-May-08	2	bdl	
	20-Nov-08	bdl	bdl	
	20-Nov-08	**6.4**	**2.5 J**	**dupl via off-site lab**
	26-May-09	bdl	bdl	
	3-Dec-09	bdl	bdl	
	3-Dec-09	**6.0**	**2.6**	**dupl via off-site lab**
	17-May-10	bdl	bdl	
	23-Nov-10	bdl	bdl	GC accuracy suspect
	23-Nov-10	**6.3**	**3**	**dupl via off-site lab**
	16-May-11	bdl	bdl	
	18-Nov-11	**7.9**	**4.1**	**via off-site lab; VC = 0.097 F**
	NF GC Analysis			**Annual (Nov) Off-Site**
PO2-1T	**8-May-98**	**330**	**1,700**	**Off-site-Haley & Aldrich Round 11**
	16-May-07	bdl	267	
	9-Nov-07	bdl	144	
	28-May-08	bdl	151	
	13-Nov-08	bdl j	bdl j	Analysis exceeded holding time
	12-May-09	bdl	210	
	7-Dec-09	bdl	148	
	18-May-10	bdl	146	
	10-May-11	bdl	98	
	22-Nov-11	bdl	78	
	NF GC Analysis			**Annual (Nov) Off-Site**

TCE - MCL = 5 ug/L; cis-1,2-DCE - MCL = 70 ug/L

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
PO2-2T	**8-May-98**	**2,800**	**1,000**	**Off-site-Haley & Aldrich Round 11**
	16-May-07	147/144	766/730	Field duplicate; RPD = 2.1/4.8%
	9-Nov-07	85	498	
	27-May-08	48/38	671/631	Field duplicate; RPD = 23.3/6.1%
	13-Nov-08	bdl j	87 j	Analysis exceeded holding time
	7-May-09	4/12	604/660	
	7-Dec-09	17/19	346/401	Field duplicate; RPD = -11.1/-14.7%
	18-May-10	25/18	753/522	Field duplicate; RPD = 32.6/36.2%
	10-May-11	13/13	719/711	Field duplicate; RPD = 0.0/1.1%
	22-Nov-11	36	308	
	3-May-12	bdl R	33 R	GC operating parameters not correct
	May GC			**Annual (Nov) Off-Site**
RAP1-1T	**13-May-98**	**3.2**	**bdl**	**Off-site-Haley & Aldrich Round 11**
	18-Nov-03	**0.8 F**	**bdl**	**via off-site lab**
	16-Nov-04	**0.35 F**	**bdl**	**via off-site lab**
	15-Nov-05	**0.21 F**	**bdl**	**dupl via off-site lab**
	7-Nov-06	**0.46 F**	**bdl**	**dupl via off-site lab**
	29-May-07	bdl	bdl	
	14-Nov-07	bdl	bdl	
	22-May-08	bdl	bdl	
	26-Nov-08	bdl	bdl	
	28-May-09	bdl	bdl	
	8-Dec-09	bdl	bdl	
	18-May-10	bdl	bdl	
	23-May-11	bdl	bdl	
	NFA			
RAP2-1T	**8-May-98**	**2,400**	**220**	**Off-site-Haley & Aldrich Round 11**
	12-May-99	**695**	**58**	**via EPA lab - average of 5 USGS passive bags**
	13-May-99	**880**	**bdl**	**via EPA lab - low-flow sample**
	11-Nov-99	**850**	**240**	**via off-site lab**
	27-Nov-00	**107**	**125**	**via off-site lab**
	26-Nov-01	**5**	**34**	**via off-site lab**
	19-Nov-02	**44**	**253**	**via off-site lab**
	19-Nov-03	**16**	**346**	**via off-site lab**
	17-Nov-04	**3.53 F**	**292**	**via off-site lab**
	16-Nov-05	**8.80 F**	**263**	**dupl via off-site lab; VC = 5.9 F**
	9-Nov-06	**3.90 F**	**257**	**dupl via off-site lab; VC = 3.6 F**
	16-May-07	bdl	632	
	8-Nov-07	bdl	244	
	8-Nov-07	**3.80 J**	**234 J**	**dupl via off-site lab; VC = <0.38; J = over holding time**
	27-May-08	bdl	263	
	19-Nov-08	bdl	101	
	19-Nov-08	**2.6**	**160 J**	**dupl via off-site lab; VC = 0.15 F**
	7-May-09	bdl	142	
	3-Dec-09	bdl	71	
	3-Dec-09	**2.0**	**100**	**dupl via off-site lab; VC = bdl**
	24-May-10	bdl	147	
	23-Nov-10	bdl	14	GC accuracy suspect
	23-Nov-10	**1.8**	**85**	**dupl via off-site lab; VC = bdl**
	5-May-11	bdl	116	
	29-Nov-11	bdl	71	
	29-Nov-11	**1.6**	**77**	**dupl via off-site lab; VC = bdl**
	3-May-12	bdl R	5 R	GC operating parameters not correct
	May GC			**Annual (Nov) Off-Site**

TCE - MCL = 5 ug/L; cis-1,2-DCE - MCL = 70 ug/L

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BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
RAP2-3T	7-May-98	440	110	Off-site-Haley & Aldrich Round 11
	12-May-99	135	52	via EPA lab - average of 5 USGS passive bags
	13-May-99	170	77	via EPA lab - low-flow sample
	11-Nov-99	240	62	via off-site lab
	27-Nov-00	1,777	692	via off-site lab
	26-Nov-01	92	86	via off-site lab
	18-Nov-02	20	61	via off-site lab
	18-Nov-03	5.2/5.2	90.46/92.44	via off-site lab
	18-Nov-04	3.99	68	via off-site lab
	16-Nov-05	2.25	79	dupl via off-site lab
	9-Nov-06	1.88	36	dupl via off-site lab
	16-May-07	bdl	146	
	7-Nov-07	bdl/3	41/15	
	7-Nov-07	1.56 F/1.38 F	58.6/55.6	dup w/dup via off-site lab
	21-May-08	bdl	46	
	19-Nov-08	bdl	335	
	19-Nov-08	11/10	360 J/350 J	dup w/dup via off-site lab; VC = 0.26 F/0.25 F
	26-May-09	bdl	151	
	3-Dec-09	bdl	bdl	
	3-Dec-09	1.3	43	dupl via off-site lab; VC = bdl
	18-May-10	bdl	242	
	23-Nov-10	bdl	107	GC accuracy suspect
	23-Nov-10	2.3	130	dupl via off-site lab; VC = bdl
	5-May-11	bdl	206	
	29-Nov-11	bdl	255	
	29-Nov-11	6.7	230	dupl via off-site lab; VC = bdl
	3-May-12	bdl R	109 R	GC operating parameters not correct
	May GC			Annual (Nov) Off-Site
BOUNDARY - BEDROCK AQUIFER				
PO1-2R	20-May-98	12	2.7	Off-site-Haley & Aldrich Round 11
	11-Nov-99	26	3.8	via off-site Lab; VC = 1.7 J, toluene = 11
	27-Nov-00	8.1	0.80	via off-site lab
	26-Nov-01	20	0.47	via off-site lab
	20-Nov-02	11	1.37	via off-site lab
	17-Nov-03	8.4	1.36	via off-site lab; VC = 0.37 F; toluene = 0.93 F
	17-Nov-04	9	1.83	via off-site lab; VC = 0.62 F; toluene = 5.01
	15-Nov-05	6.43	0.86 F	dupl via off-site lab; VC = 0.47 F; toluene = 1.53
	7-Nov-06	5.34	0.88 F	dupl via off-site lab; VC = 0.44 F; toluene = 1.23
	29-May-07	bdl	bdl	
	5-Nov-07	bdl j	bdl j	j = 1 day over holding time
	5-Nov-07	3.99	0.590 F	dupl via off-site lab; toluene = 0.730 F
	23-May-08	bdl/bdl	bdl/bdl	
	18-Nov-08	bdl/bdl	bdl/bdl	
	18-Nov-08	4.3/4.3	0.65 FJ/0.75 FJ	dup w/dup via off-site lab; toluene = 0.74 F/0.71 F
	26-May-09	bdl	bdl	
	2-Dec-09	bdl	bdl	
	2-Dec-09	2.6	0.94 F	dupl via off-site lab; VC = 0.28 F; toluene = 0.49 F
	17-May-10	bdl	bdl	
	18-Nov-10	bdl	bdl	GC accuracy suspect
	18-Nov-10	3.7	0.85 F	dupl via off-site lab; VC = 0.30 F; toluene = 0.75 F
	23-May-11	bdl	bdl	
	18-Nov-11	4.2	1.2	dupl via off-site lab; VC = 0.33 F; toluene = 0.61 F
	NF GC Analysis		Annual (Nov) Off-Site	

TCE - MCL = 5 ug/L; cis-1,2-DCE - MCL = 70 ug/L

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
PO2-1RA	16-May-07	bdl	bdl	
	9-Nov-07	bdl	bdl	
	28-May-08	bdl	bdl	
	13-Nov-08	bdl j	bdl j	Analysis exceeded holding time
	12-May-09	bdl	56	
	7-Dec-09	bdl	32	
	18-May-10	bdl	40	
	10-May-11	bdl	19	
	22-Nov-11	**2.2**	**37**	**via off-site lab; VC = 2.4; 1,1-DCA=2.7; trans-1,2-DCE= 6.6**
	NF GC Analysis		**Need Lab Confirmatory when think BIW-4 Area is cleaned-up**	
PO2-2R	**8-May-98**	**130**	**45**	**Off-site-Haley & Aldrich Round 11**
	12-May-99	**163**	**64**	**via EPA lab - average of 5 passive bags**
	13-May-99	**66**	**25**	**via EPA lab - low-flow sample**
	2007	ns	ns	well damaged by snow plow - subsequently repaired in 2008
	28-May-08	92	343	
	13-Nov-08	16 j	10 j	Rerun = 16 j & 12 j; Analysis exceeded holding time
	7-May-09	95	209	
	7-Dec-09	199	231	
	18-May-10	95	174	
	10-May-11	65	140	
	22-Nov-11	135	167	
	3-May-12	43 R	112 R	GC operating parameters not correct
	May GC			**Annual (Nov) Off-Site**
PT1-RA	**20-May-98**	**7.8**	**bdl**	**Off-site-Haley & Aldrich Round 11**
	29-May-07	bdl	bdl	Large/early peak
	5-Nov-07	bdl j	bdl j	j = 1 day over holding time; early peak
	5-Nov-07	**0.100 F**	**<0.032**	**dupl via off-site lab**
	23-May-08	bdl	bdl	Early peak
	18-Nov-08	bdl	bdl	Early peak
	18-Nov-08	**<0.10**	**<0.098 J**	**dupl via off-site lab**
	26-May-09	bdl	bdl	Early peak
	2-Dec-09	bdl	bdl	Early peak
	2-Dec-09	**bdl**	**bdl**	**dupl via off-site lab**
	17-May-10	bdl	bdl	Early peak
	18-Nov-10	bdl	bdl	GC accuracy suspect
	18-Nov-10	**bdl**	**bdl**	**dupl via off-site lab**
	23-May-11	bdl	bdl	
	18-Nov-11	**0.14 F**	**0.10 F**	**dupl via off-site lab**
	NFA			

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
PT2-RA	16-May-07	19	655	Early peaks
Integrity	9-Nov-07	14	406	
Suspect.	28-May-08	35	371	
Replaced by	13-Nov-08	bdl j	14 j	Analysis exceeded holding time
BIW #4	7-May-09	bdl j	274	Early peak
	7-Dec-09	9	157	Early peak
	24-May-10	bdl	213	Early peak
	10-May-11	bdl	87	
	NF GC Analysis		Need Lab Confirmatory when think BIW-4 Area is cleaned-up	
RAP1-1R	**13-May-98**	**2.5**	**bdl**	**Off-site-Haley & Aldrich Round 11**
	16-Nov-99	**3.4**	**bdl**	**via off-site lab**
	28-Nov-00	**1.5**	**bdl**	**via off-site lab**
	27-Nov-01	**0.2 F**	**bdl**	**via off-site lab**
	18-Nov-02	**1.2**	**bdl**	**via off-site lab**
	18-Nov-03	**0.3 F**	**1.04**	**via off-site lab**
	16-Nov-04	**0.16 F**	**bdl**	**via off-site lab**
	15-Nov-05	**0.20 F**	**bdl**	**dupl via off-site lab**
	7-Nov-06	**0.22 F**	**bdl**	**dupl via off-site lab**
	29-May-07	bdl	bdl	
	14-Nov-07	bdl	bdl	
	22-May-08	bdl	bdl	
	26-Nov-08	bdl	bdl	
	28-May-09	bdl	bdl	
	8-Dec-09	bdl	bdl	
	18-May-10	bdl	bdl	
	23-May-11	bdl	bdl	
	NFA			
RAP1-4RA	**20-May-98**	**bdl**	**bdl**	**Off-site-Haley & Aldrich Round 11**
	11-Nov-99	**bdl/4.2**	**bdl/2.6**	**via off-site lab w/dupl**
	27-Nov-00	**bdl/2.2**	**bdl/0.75**	**via off-site lab w/dupl**
	26-Nov-01	**bdl/2.0**	**bdl/.66F**	**via off-site lab w/dupl**
	18-Nov-02	**2.0**	**0.53**	**via off-site lab**
	17-Nov-03	**1.7**	**0.51F**	**via off-site lab**
	17-Nov-04	**1.45**	**0.5F**	**via off-site lab**
	15-Nov-05	**1.42**	**0.64 F**	**dupl via off-site lab**
	7-Nov-06	**1.26**	**0.77 F**	**dupl via off-site lab**
	29-May-07	bdl	bdl	
	14-Nov-07	bdl	bdl	
	22-May-08	bdl	bdl	
	26-Nov-08	bdl	bdl	
	26-May-09	bdl	bdl	
	7-Dec-09	bdl	bdl	
	17-May-10	bdl	bdl	
	10-May-11	bdl	bdl	
	NF GC Analysis		Need Lab Confirmatory when think Boundary is cleaned-up	

TCE - MCL = 5 ug/L; cis-1,2-DCE - MCL = 70 ug/L

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
RAP2-1R	**8-May-98**	**500**	**130**	**Off-site-Haley & Aldrich Round 11**
	12-May-99	**708**	**290**	**via EPA lab - average of 5 passive bags**
	13-May-99	**750**	**470**	**via EPA lab - low-flow sample**
	11-Nov-99	**880**	**1,100**	**via off-site lab**
	27-Nov-00	**628**	**779**	**via off-site lab**
	26-Nov-01	**265**	**278**	**via off-site lab**
	19-Nov-02	**306**	**120**	**via off-site lab**
	19-Nov-03	**218**	**139**	**via off-site lab**
	17-Nov-04	**155**	**99**	**via off-site lab**
	16-Nov-05	**161**	**162**	**dupl via off-site lab**
	9-Nov-06	**130**	**160**	**dupl via off-site lab**
	16-May-07	172	321	
	8-Nov-07	69	315	
	8-Nov-07	**98.6 J**	**260 J**	**dupl via off-site lab; J = over holding time**
	27-May-08	55	444	
	19-Nov-08	34	227	
	19-Nov-08	**44**	**180 J**	**dupl via off-site lab; VC = 0.21 F**
	7-May-09	6	160	
	3-Dec-09	46	117	
	3-Dec-09	**55**	**160**	**dupl via off-site lab; VC = 0.21 F**
	24-May-10	43	217	
	22-Nov-10	15	98	GC accuracy suspect
	22-Nov-10	**33**	**140**	**dupl via off-site lab; VC = 0.12 FM**
	5-May-11	40	65	
	22-Nov-11	60	108	
	22-Nov-11	**75/75**	**130/130**	**dupl via off-site lab; VC = 0.17 F/0.15 F**
	3-May-12	5 R	194 R	GC operating parameters not correct
	May GC			**Annual (Nov) Off-Site**
RAP2-3R	**12-May-98**	**bdl**	**bdl**	**Off-site-Haley & Aldrich Round 11**
	11-Nov-99	**bdl/bdl**	**bdl/bdl**	**via off-site lab w/dupl**
	27-Nov-00	**bdl/bdl**	**bdl/bdl**	**via off-site lab w/dupl**
	26-Nov-01	**bdl/bdl**	**bdl/bdl**	**via off-site lab w/dupl**
	18-Nov-02	**bdl**	**bdl**	**via off-site lab**
	18-Nov-03	**bdl**	**bdl**	**via off-site lab**
	18-Nov-04	**bdl**	**bdl**	**via off-site Lab**
	16-Nov-05	**bdl**	**bdl**	**dupl via off-site lab**
	16-Nov-05	**bdl**	**bdl**	**dupl via off-site lab**
	16-May-07	bdl	bdl	No peaks
	9-Nov-07	bdl	bdl	
	21-May-08	bdl	bdl	
	13-Nov-08	bdl j	bdl j	Analysis exceeded holding time
	26-May-09	bdl	bdl	
	3-Dec-09	bdl	bdl	
	17-May-10	bdl	bdl	
	23-Nov-10	bdl	bdl	GC accuracy suspect
	5-May-11	bdl	bdl	
	NFA			

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BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
OFF-SITE BEDFORD CONSERVATION AREAS + B111 - LOWER AQUIFER				
B111 (L)	11-May-98	16	5.6	Off-site-Haley & Aldrich Round 11
	10-May-99	76	8.4	via EPA lab - USGS samples - ave of 3 passive bags
	10-May-99	85/84	8.2/8.9	via EPA lab - middle passive bag sample w/dupl
	11-May-99	47	5.9	via EPA lab - low-flow sample
	15-Nov-99	100	30	via EPA Lab - USGS passive bag @ midpoint of screen
	15-Nov-99	72	18	via off-site lab
	27-Nov-00	86	132.16	via off-site lab
	26-Nov-01	9.3/9.1	29.31/28.61	via off-site lab w/dupl
	19-Nov-02	3.0	23	
	19-Nov-02	10	36	via off-site lab
	18-Nov-03	9.7	55	via off-site lab; VC = 0.92 F
	17-Nov-04	9.3	78	via off-site lab; VC = 1.13 F
	16-Nov-05	10.4	234	dupl via off-site lab; VC = 1.66 F
	9-Nov-06	7.4	102	dupl via off-site lab; VC = 2.28
	31-May-07	bdl	162	
	7-Nov-07	19	12	
	7-Nov-07	5.94	57	dupl via off-site lab; VC = 1.90
	27-May-08	bdl	11	
	19-Nov-08	bdl	bdl	
	19-Nov-08	4.5	54 J	dupl via off-site lab; VC = 0.91 F
	12-May-09	bdl	90	
	3-Dec-09	bdl	37	
	3-Dec-09	4.0	60	dupl via off-site lab; VC = 1.2
	17-May-10	bdl	65	
	22-Nov-10	bdl	57	GC accuracy suspect
	22-Nov-10	4.1	75	dupl via off-site lab; VC = 1.1
	16-May-11	bdl	59	
	21-Nov-11	bdl	48	
	21-Nov-11	3.9	80	dupl via off-site lab; VC = 1.0
	NF GC Analysis			Annual (Nov) Off-Site
B245 (L)	14-May-98	24	22	Off-site-Haley & Aldrich Round 11
	11-May-99	7.3	13	via EPA lab
	11-May-99	7.4/7.1	15/15	via EPA lab - USGSpassive bag @ midp. of screen w/dupl
	16-Nov-99	8	12	via off-site lab
	28-Nov-00	5.3	13	via off-site lab
	27-Nov-01	9.5	24	via off-site lab
	20-Nov-02	6.8	18	via off-site lab
	19-Nov-03	6.6	44	via off-site lab; VC = 0.33 F
	18-Nov-04	6.23	45	via off-site lab; VC = 0.41 F
	17-Nov-05	7.02	48	dupl via off-site lab; VC = 0.35 F
	7-Nov-06	4.62	35.1	dupl via off-site lab; VC = <0.095
	31-May-07	bdl	50	
	8-Nov-07	bdl	bdl	
	8-Nov-07	3.91 J	34.0 J	dupl via off-site lab; VC = <0.038 J; J = over holding time
	23-May-08	bdl	10	
	20-Nov-08	bdl	bdl	
	20-Nov-08	3.3	33 J	dupl via off-site lab; VC = 0.21 F
	28-May-09	bdl	bdl	
	2-Dec-09	bdl	bdl	
	1-Dec-09	2.3	28	dupl via off-site lab; VC = 0.38 F
	1-Jun-10	bdl	31	
	23-Nov-10	bdl	bdl	GC accuracy suspect
	23-Nov-10	2.3	30	dupl via off-site lab; VC = 0.17 F
	25-May-11	bdl	bdl	
	28-Nov-11	1.7	23	via off-site lab; VC = 0.14 F
	NF GC Analysis		Need Lab Confirmatory when think Forest is cleaned-up	

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BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
B248 (L)	12-May-98	1,000	230	Off-site-Haley & Aldrich Round 11
	11-May-99	470	170	via EPA lab - USGS passive bag sample
	12-May-99	260	130	via EPA lab - low-flow sample
	15-Nov-99	560	210	via EPA lab - USGS passive bag sample @ midp. of screen
	15-Nov-99	670/690	230/230	via off-site lab w/dupl
	28-Nov-00	471.4/499.8	193.9/194.65	via off-site lab w/dupl
	27-Nov-01	258.2/261.6	148.58/153.9	via off-site lab w/dupl
	19-Nov-02	75.6/73.3	108.15/112.69	via off-site lab w/dupl
	18-Nov-03	48	119	via off-site lab
	17-Nov-04	27	93	via off-site lab
	17-Nov-05	21.1/18.6	98.0/117	dupl via off-site lab w/dupl
	9-Nov-06	12.8/15.2	120/120	dupl via off-site lab w/dupl
	30-May-07	7/9	244/230	Field duplicate; RPD = -25.0/+5.9%
	7-Nov-07	17	bdl	
	7-Nov-07	14.1	65.6	dupl via off-site lab
	21-May-08	bdl	43	
	19-Nov-08	bdl	87	
	19-Nov-08	11	130 J	dupl via off-site lab; VC = 0.27 F
	12-May-09	bdl/bdl	86.3/81.3	
	3-Dec-09	bdl/bdl	72/70	Field duplicate; RPD = unk/+2.8%
	3-Dec-09	9.8	92	dupl via off-site lab; VC = 0.18 F
	24-May-10	bdl	139	
	22-Nov-10	bdl/bdl	57/59	GC accuracy suspect RPD = unk%/-3.4%
	22-Nov-10	9.4/8.8	93/95	dupl via off-site lab; VC = 0.15 F/0.14 F
	25-May-11	bdl/bdl	151/252	Field duplicate; RPD = unk%/-50.1%
	28-Nov-11	bdl/bdl	94/85	Field duplicate; RPD = unk%/10.1%
	28-Nov-11	7.9	100	dupl via off-site lab; VC = 0.20 F
	11-Jun-12	bdl	81	
	May GC			Annual (Nov) Off-Site
B251 (L)	11-May-98	56	4.1	Off-site-Haley & Aldrich Round 11
	11-May-99	18	1.0	via EPA lab - USGS passive bag sample
	11-May-99	22	4.3	via EPA lab - low-flow sample
	15-Nov-99	20/20	2.0/2.2	via EPA lab - USGS passive bag sample @ midp. of screen
	15-Nov-99	8.2	1.9	via off-site lab
	28-Nov-00	8.7	7.7	via off-site lab
	27-Nov-01	18	18.4	via off-site lab
	19-Nov-02	11	25.6	via off-site lab
	19-Nov-03	5.1	24.7	via off-site lab
	17-Nov-04	2.7	9.1	via off-site lab
	16-Nov-05	2.06	9.25	dupl via off-site lab
	9-Nov-06	1.68	4.56	dupl via off-site lab
	30-May-07	bdl	bdl	
	7-Nov-07	bdl	bdl	
	7-Nov-07	4.05	14.2	dupl via off-site lab
	21-May-08	bdl	bdl	
	19-Nov-08	bdl	bdl	
	19-Nov-08	1.7	3.4 J	dupl via off-site lab
	12-May-09	bdl	bdl	
	3-Dec-09	bdl	bdl	
	3-Dec-09	1.6	2.4	dupl via off-site lab; VC = bdl
	24-May-10	bdl	bdl	
	22-Nov-10	bdl	bdl	GC accuracy suspect
	22-Nov-10	1.4	1.7	dupl via off-site lab; VC = bdl
	10-May-11	bdl	bdl	
	NF GC Analysis		Need Lab Confirmatory when think Forest is cleaned-up	

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
B254 (L)	15-May-98	11	bdl	Off-site-Haley & Aldrich Round 11
	10-May-99	7.6	1.4	via EPA lab - USGS passive bag sample
	11-May-99	2.6/2.2	bdl/bdl	via EPA lab - low-flow sample w/dupl
	11-Nov-99	14/13	2.7/2.6	via off-site lab w/dupl
	28-Nov-00	14.5/15	2.85/2.91	via off-site lab w/dupl
	27-Nov-01	21.8/23.1	3.95/4.28	via off-site lab w/dupl
	18-Nov-02	25.2	4.27	via off-site lab
	18-Nov-03	18.3	5.58	via off-site lab
	18-Nov-04	16.2	9.99	via off-site lab
	15-Nov-05	10.8/10.7	14.7/14.3	dupl via off-site lab
	7-Nov-06	8.78/8.86	25.2/25.3	dupl via off-site lab
	30-May-07	bdl/bdl	bdl/bdl	no peaks-Field duplicate; RPD = unk%/unk%
	7-Nov-07	bdl	bdl	
	7-Nov-07	5.01	22.9	dupl via off-site lab
	22-May-08	bdl	bdl	
	18-Nov-08	bdl	bdl	
	18-Nov-08	5	24 J	dupl via off-site lab
	28-May-09	bdl/bdl	bdl/13	RPD = unk%/unk%
	30-Nov-09	bdl/bdl	bdl/bdl	RPD = unk%/unk%
	30-Nov-09	3.5	23	dupl via off-site lab; VC = bdl
	24-May-10	bdl/bdl	bdl/bdl	RPD = unk%/unk%
	22-Nov-10	bdl/bdl	bdl/bdl	GC accuracy suspect RPD = unk%/unk%
	22-Nov-10	2.8	27	dupl via off-site lab; VC = bdl
	25-May-11	bdl/bdl	bdl/bdl	RPD = unk%/unk%
	17-Nov-11	bdl/bdl	8/20	RPD = unk%/-85.7%
	17-Nov-11	2.5	26	dupl via off-site lab; VC = bdl
	NF GC Analysis			Annual (Nov) Off-Site
OFF-SITE BEDFORD CONSERVATION AREAS - BEDROCK AQUIFER				
B244A (R)	14-May-98	46	56	Off-site-Haley & Aldrich Round 11
	11-May-99	35	56	via EPA lab
	11-May-99	25	65	via EPA lab - average of 5 USGA passive bags
	16-Nov-99	12	48	via off-site lab
	28-Nov-00	29	38	via off-site lab
	27-Nov-01	44	72	via off-site Lab; VC = 4.29
	20-Nov-02	23	65	via off-site lab
	19-Nov-03	26	78	via off-site lab; VC = 4.06 F
	18-Nov-04	14.14/13.61	65.04/63.69	via off-site lab w/dupl; VC = 2.13 F/2.02 F
	17-Nov-05	12	65	dupl via off-site lab; VC = 2.70 F
	7-Nov-06	16	50	dupl via off-site lab; VC = 3.8 F
	31-May-07	3	81	
	8-Nov-07	8	17	
	8-Nov-07	19.5 J	63.7 J	dupl via off-site lab; VC = 3.00 J; J = over holding time
	23-May-08	5	55	
	20-Nov-08	bdl	bdl	
	20-Nov-08	21	61 J	dupl via off-site lab; VC = 2.0
	28-May-09	3	78	
	2-Dec-09	13	41	
	1-Dec-09	18	66	dupl via off-site lab; VC = 1.6
	1-Jun-10	8	112	
	23-Nov-10	bdl	30	GC accuracy suspect
	23-Nov-10	18	74	dupl via off-site lab; VC = 1.5
	25-May-11	bdl	76	
	28-Nov-11	9/4	62/63	Field duplicate; RPD = 76.9/-1.6%
	29-Nov-11	8	63	
	29-Nov-11	14	59	dupl via off-site lab; VC = 2.7
	11-Jun-12	9.0	111	
	May GC			Annual (Nov) Off-Site

TCE - MCL = 5 ug/L; cis-1,2-DCE - MCL = 70 ug/L

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BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
B249 (R)	12-May-98	50	bdl	Off-site-Haley & Aldrich Round 11
	11-May-99	35	2.9	via EPA lab - USGS passive bag sample
	12-May-99	18	bdl	via EPA lab - low-flow sample
	15-Nov-99	26/28	3.0/2.8	via EPA lab - passive bag sample w/dupl @ midp of screen
	15-Nov-99	13	1.6	via off-site lab
	28-Nov-00	18.2	2.35	via off-site lab
	27-Nov-01	9.9	0.74	via off-site lab
	19-Nov-02	5.4	0.43	via off-site lab
	18-Nov-03	2.6	0.21F	via off-site lab
	17-Nov-04	2.06	0.27F	via off-site lab
	17-Nov-05	1.89	0.19 F	dupl via off-site lab
	9-Nov-06	1.43	0.20 F	dupl via off-site lab
	30-May-07	bdl	bdl	
	7-Nov-07	bdl	bdl	
	21-May-08	bdl	bdl	
	26-Nov-08	bdl	bdl	
	12-May-09	bdl	bdl	
	3-Dec-09	bdl	bdl	
	24-May-10	bdl/bdl	bdl/bdl	RPD = unk%/unk%
	22-Nov-10	bdl	bdl	GC accuracy suspect
	25-May-11	bdl	bdl	
	NF GC Analysis		Need Lab Confirmatory when think Forest is cleaned-up	
B252 (R)	12-May-98	bdl	bdl	Off-site-Haley & Aldrich Round 11
	15-Nov-99	bdl	1.8	Lab; 1,1-DCE = 1.8; 1,1-DCA = 1.4; 1,1,1-TCA = 14
	28-Nov-00	1.0	bdl	Lab; 1,1-DCE = 1.41; 1,1-DCA = 1.54; 1,1,1-TCA = 27.09
	27-Nov-01	0.2F	bdl	Lab; 1,1-DCE = 1.43; 1,1-DCA = 0.97; 1,1,1-TCA = 16.46
	19-Nov-02	0.1F	bdl	Lab; 1,1-DCE = 1.7M; 1,1-DCA = 0.75; 1,1,1-TCA = 23.62
	18-Nov-03	0.1F	bdl	Lab; 1,1-DCE = 2.01; 1,1-DCA = 1.59; 1,1,1-TCA = 32.56
	17-Nov-04	0.14 F	bdl	Lab; 1,1-DCE = 2.64; 1,1-DCA = 3.13; 1,1,1-TCA = 45.26
	15-Nov-05	0.12 F	bdl	Lab; 1,1-DCE = 3.49; 1,1-DCA = 8.18; 1,1,1-TCA = 48.9
	9-Nov-06	<0.027	<0.032	Lab; 1,1-DCE = 3.60; 1,1-DCA = 10.5; 1,1,1-TCA =55.6
	30-May-07	bdl	bdl	Early small peak
	7-Nov-07	bdl	bdl	
	21-May-08	bdl	bdl	
	13-Nov-08	bdl j	bdl j	Analysis exceeded holding time
	12-May-09	bdl	bdl	
	3-Dec-09	bdl	bdl	
	24-May-10	bdl	bdl	
	22-Nov-10	bdl	bdl	GC accuracy suspect
	10-May-11	bdl	bdl	
	NFA			
B255 (R)	15-May-98	bdl	bdl	Off-site-Haley & Aldrich Round 11
	10-May-99	bdl	bdl	via EPA Lab - 1 USGS passive bag sample
	11-May-99	bdl	bdl	via EPA Lab - low-flow sample
	11-Nov-99	bdl	bdl	via off-site lab
	28-Nov-00	bdl	bdl	via off-site lab
	27-Nov-01	bdl	bdl	via off-site lab
	18-Nov-02	bdl	bdl	via off-site lab
	18-Nov-03	bdl	bdl	via off-site lab
	16-Nov-04	bdl	bdl	via off-site lab
	15-Nov-05	bdl	bdl	dupl via off-site lab
	7-Nov-06	bdl	bdl	dupl via off-site lab
	30-May-07	bdl	bdl	
	7-Nov-07	bdl	bdl	
	22-May-08	bdl	bdl	
	18-Nov-08	bdl	bdl	
	28-May-09	bdl	bdl	
	30-Nov-09	bdl	bdl	
	24-May-10	bdl	bdl	
	22-Nov-10	bdl	bdl	GC accuracy suspect
	25-May-11	bdl	bdl	
	NFA			

TCE - MCL = 5 ug/L; cis-1,2-DCE - MCL = 70 ug/L

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
BEDFORD COMMUNITY GARDENS AREA				
RAP1-7 (S)	**22-Sep-00**	**bdl**	**bdl**	**via off-site lab**
	27-Nov-00	**bdl**	**bdl**	**via off-site lab**
	27-Nov-01	**bdl**	**bdl**	**via off-site lab**
	18-Nov-02	**bdl**	**bdl**	**via off-site lab**
	16-Nov-04	**0.35 F**	**bdl**	**via off-site lab**
	30-May-07	bdl	bdl	
	7-Nov-07	bdl	bdl	Tannin color
	22-May-08	bdl	bdl	
	18-Nov-08	bdl	bdl	
	28-May-09	bdl	bdl	
	30-Nov-09	bdl	bdl	
	18-May-10	bdl	bdl	
	22-Nov-10	bdl	bdl	GC accuracy suspect
	23-May-11	bdl	bdl	
	NFA			
RAP1-7 (T)	**22-Sep-00**	**29.4**	**2.55**	**via off-site lab**
	27-Nov-00	**18.6/20.8**	**1.64/1.82**	**via off-site lab**
	27-Nov-01	**26.8**	**2.48**	**via off-site lab**
	18-Nov-02	**25.4/25.0**	**1.82/1.82**	**via off-site lab**
	18-Nov-03	**13.9**	**1.3**	**via off-site lab**
	16-Nov-04	**17.84**	**3.09**	**via off-site lab**
	15-Nov-05	**18.6**	**2.28**	**dupl via off-site lab**
	7-Nov-06	**12.6**	**1.8**	**dupl via off-site lab**
	30-May-07	6	bdl	
	7-Nov-07	bdl	bdl	
	7-Nov-07	**12.3**	**3.15**	**dupl via off-site lab**
	22-May-08	2	bdl	
	18-Nov-08	bdl	bdl	
	18-Nov-08	**22**	**3.8 J**	**dupl via off-site lab**
	28-May-09	bdl	bdl	
	30-Nov-09	15	bdl	
	30-Nov-09	**26 M**	**4**	**dupl via off-site lab**
	18-May-10	bdl	bdl	
	22-Nov-10	5	bdl	GC accuracy suspect
	22-Nov-10	**22**	**3.9**	**dupl via off-site lab**
	23-May-11	bdl	bdl	
	17-Nov-11	**12**	**3.5**	**dupl via off-site lab**
	NF GC Analysis			**Annual (Nov) Off-Site**

TCE - MCL = 5 ug/L; cis-1,2-DCE - MCL = 70 ug/L

OU-1 Surface Water and Groundwater Monitoring Points TCE and cis-1,2-DCE Concentrations via On-site GC 2007 to present + post-1998 Lab Results

BOLDED RESULTS FROM OFF-SITE LAB - OTHERS ARE ON-SITE GC RESULTS

	SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
RAP1-7 (R)	**13-May-98**	**200**	**12**	**Off-site-Haley & Aldrich Round 11**
	10-May-99	**185.2**	**3.0**	**via EPA lab - average of 5 passive bags**
	11-May-99	**180.0**	**8.2**	**via EPA lab - low-flow sample**
	11-Nov-99	**315**	**21.5**	**via off-site Lab - average of 2 passive bags**
	11-Nov-99	**230**	**18**	**via off-site lab**
	22-Sep-00	**243**	**12.5**	**via off-site lab**
	27-Nov-00	**195.7**	**10.34**	**via off-site lab**
	27-Nov-01	**217**	**14.62**	**via off-site lab**
	18-Nov-02	**189.2**	**11.01**	**via off-site lab**
	18-Nov-03	**197.8**	**12.77**	**via off-site lab**
	16-Nov-04	**154.8**	**12.61**	**via off-site lab**
	16-Nov-05	**188**	**12.5**	**dupl via off-site lab**
	7-Nov-06	**256**	**17.3**	**dupl via off-site lab**
	30-May-07	317	bdl	
	7-Nov-07	158	bdl	
	7-Nov-07	**189 J**	**12.6 J**	**dupl via off-site lab; J = over holding time**
	27-May-08	156	bdl	
	18-Nov-08	40	bdl	
	18-Nov-08	**230**	**15 J**	**dupl via off-site lab**
	28-May-09	257	bdl	
	30-Nov-09	215	bdl	
	30-Nov-09	**250**	**15**	**dupl via off-site lab; VC = 0.25 F**
	18-May-10	197	bdl	
	22-Nov-10	178	bdl	GC accuracy suspect
	22-Nov-10	**230**	**17**	**dupl via off-site lab**
	23-May-11	194	bdl	
	17-Nov-11	258	bdl	
	24-May-12	175	bdl	
	May GC			**Annual (Nov) Off-Site**

TCE - MCL = 5 ug/L; cis-1,2-DCE - MCL = 70 ug/L

ATTACHMENT F INDEX

Attachment F – OU-1 Long-Term Monitoring Program Charts Showing Trends .....

F –1 RAP1-SW4 - Surface Water Monitoring Point .....
F –2 RAP1-3R – Site 1 Source Area, Bedrock Aquifer (1986-2011) .....
F –3 RAP1-3R – Site 1 Source Area, Bedrock Aquifer (2007-2011) .....
F –4 RAP1-3S – Site 1 Source Area, Surface Aquifer (2007-2011) .....
F –5 V-1 – Site 1 Source Area (Burn Pit #2), Surface to Bedrock Aquifers (1997-2011) .....
F –6 RAP1-5R – Site 1 Collection Trench Area, Bedrock Aquifer (1998-2011).....
F –7 B237 – Site 1 On-site Plume, Bedrock Aquifer (2007-2011) .....
F –8 B240 – Site 1 On-site Plume, Bedrock Aquifer (1998-2011) .....
F –9 IRZ-Inj – Site 1 On-site Plume, Molasses Injection Well, Lower Aquifer (2000-11) .....
F –10 IRZ-1 – Site 1 On-site Plume, Molasses Injection Area, Lower Aquifer (2000-11).....
F –11 IRZ-3 – Site 1 On-site Plume, Molasses Injection Area, Lower Aquifer (2007-11).....
F –12 IRZ-4 – Site 1 On-site Plume, Molasses Injection Area, Lower Aquifer (2007-11).....
F –13 IRZ-5 – Site 1 On-site Plume, Molasses Injection Area, Lower Aquifer (2007-11).....
F –14 RAP1-6S – Site 1 On-site Plume, Surface Aquifer (1986-2011) .....
F –15 RAP1-6S – Site 1 On-site Plume, Surface Aquifer (2007-2011) .....
F –16 RAP1-6T – Site 1 On-site Plume, Lower Aquifer (1986-2011).....
F –17 RAP1-6T – Site 1 On-site Plume, Lower Aquifer (2007-2011).....
F –18 RAP1-6R – Site 1 On-site Plume, Bedrock Aquifer (1986-2011) .....
F –19 RAP1-6R – Site 1 On-site Plume, Bedrock Aquifer (2007-2011) .....
F –20 B242 – Site 1 On-site Plume Approaching BIW-2, Lower Aquifer (2007-2011).....
F –21 B243 – Site 1 On-site Plume Approaching BIW-2, Bedrock Aquifer (2007-2011) .....
F –22 B113 – Site 1 and/or 2 On-site Plume, Famcamp Area, Lower Aquifer (2007-11).....
F –23 RAP2-2T – Site 1 and/or 2 On-site Plume Approaching BIW-4, Lower Aquifer (1986-2011).....
F –24 RAP2-2T – Site 1 and/or 2 On-site Plume Approaching BIW-4, Lower Aquifer (2007-2011).....
F –25 RAP2-2R – Site 1 and/or 2 On-site Plume Approaching BIW-4, Bedrock Aquifer (1986-2011).....
F –26 RAP2-2R – Site 1 and/or 2 On-site Plume Approaching BIW-4, Bedrock Aquifer (2007-2011).....
F –27 B108 – Site 1 and/or 2 On-site Plume, Famcamp Area, Bedrock Aquifer (1986-2011) .....
F –28 B108 – Site 1 and/or 2 On-site Plume, Famcamp Area, BIW-4, Bedrock Aquifer (2007-2011).....
F –29 OW2-3 – Site 2 Source Area, Surface Aquifer (2007-2011).....
F –30 OW2-4 – Site 2 Source Area, Surface Aquifer (1994-2011).....
F –31 OW2-5 – Site 2 Source Area, Surface Aquifer (2007-2011).....
F –32 OW2-6 – Site 2 Source Area, Surface Aquifer (1998-2011).....
F –33 RFW-11 – Site 2 Source Area vic Collection Trench, Surface aquifer (1986-2011)..... through 2011
F –34 RFW-11 – Site 2 Source Area vic Collection Trench, Surface aquifer (2007-2011).....
F –35 PO2-1S - Site 2 Source Area vic Collection Trench, Surface aquifer (2007-2011)
F –36 B115 – Site 2 Source Area, Lower Aquifer (1994-2011).....

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F –37 B115 – Site 2 Source Area, Lower Aquifer (2007-2011).....
F –38 B114 – Site 2 Source Area vic Collection Trench, Surface aquifer (2007-2011).....
F –39 PT1-RA – Hanscom Field-Hartwell Forest Boundary between BIW-1 & BIW-2, Bedrock Aquifer (2007-2011).....
F –40 PO1-2R – Hanscom Field-Hartwell Forest Boundary between BIW-1 & BIW-2, Bedrock Aquifer (2007-2011).....
F –41 B126 – Hanscom Field-Hartwell Forest Boundary vic BIW-2, Lower Aquifer (1994-2011).....
F –42 B126 – Hanscom Field-Hartwell Forest Boundary vic BIW-2, Lower Aquifer (2007-2011).....
F –43 PO2-1T – Hanscom Field-Hartwell Forest Boundary vic/west of BIW-4, Lower Aquifer (2007-2011).....
F –44 PO2-1RA – Hanscom Field-Hartwell Forest Boundary vic/west of BIW-4, Bedrock Aquifer (2007-2011).....
F –45 PO2-2T – Hanscom Field-Hartwell Forest Boundary vic/south of BIW-4, Lower Aquifer (2007-2011).....
F –46 PO2-2R – Hanscom Field-Hartwell Forest Boundary vic/south of BIW-4, Bedrock Aquifer (2007-2011).....
F –47 RAP2-1T – Hanscom Field-Hartwell Forest Boundary vic/east of BIW-4, Lower Aquifer (1986-2011).....
F –48 RAP2-1T – Hanscom Field-Hartwell Forest Boundary vic/east of BIW-4, Lower Aquifer (2007-2011).....
F –49 RAP2-1R – Hanscom Field-Hartwell Forest Boundary vic/east of BIW-4, Bedrock Aquifer (1986-2011).....
F –50 RAP2-1R – Hanscom Field-Hartwell Forest Boundary vic/east of BIW-4, Bedrock Aquifer (2007-2011).....
F –51 RAP2-3T – Hanscom Field-Hartwell Forest Boundary between BIW-4 & BIW-3, Lower Aquifer (1986-2011).....
F –52 RAP2-3T – Hanscom Field-Hartwell Forest Boundary between BIW-4 & BIW-3, Lower Aquifer (2007-2011).....
F –53 B111 – Hanscom Field-Hartwell Forest Boundary vic/north of BIW-4, Lower Aquifer (1994-2011).....
F –54 B111 – Hanscom Field-Hartwell Forest Boundary vic/north of BIW-4, Lower Aquifer (2007-2011).....
F –55 B245 – Off-site (Hartwell Forest) Plume, Southwest Flank, Lower Aquifer (2007-2011).....
F –56 B244A – Off-site (Hartwell Forest) Plume, Southwest Flank, Bedrock Aquifer (1996-2011).....
F –57 B244A – Off-site (Hartwell Forest) Plume, Southwest Flank, Bedrock Aquifer (2007-2011).....
F –58 B251 – Off-site (Hartwell Forest) Plume, Southeast Flank, Lower Aquifer (2007-2011).....
F –59 B248 – Off-site (Hartwell Forest) Plume, vic Plume center, Lower Aquifer (1996-2011).....
F –60 B248 – Off-site (Hartwell Forest) Plume, vic Plume center, Lower Aquifer (2007-2011).....

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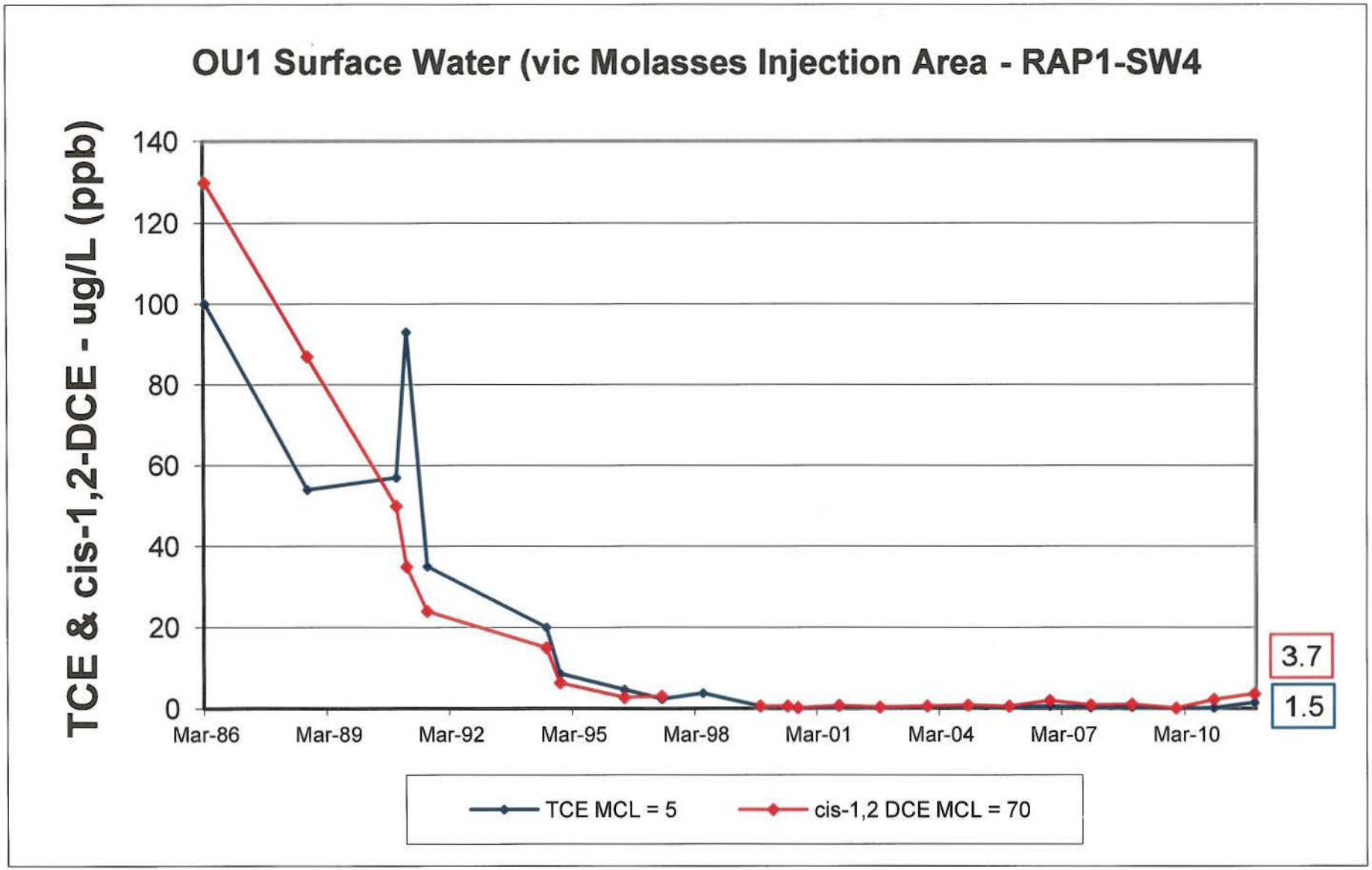
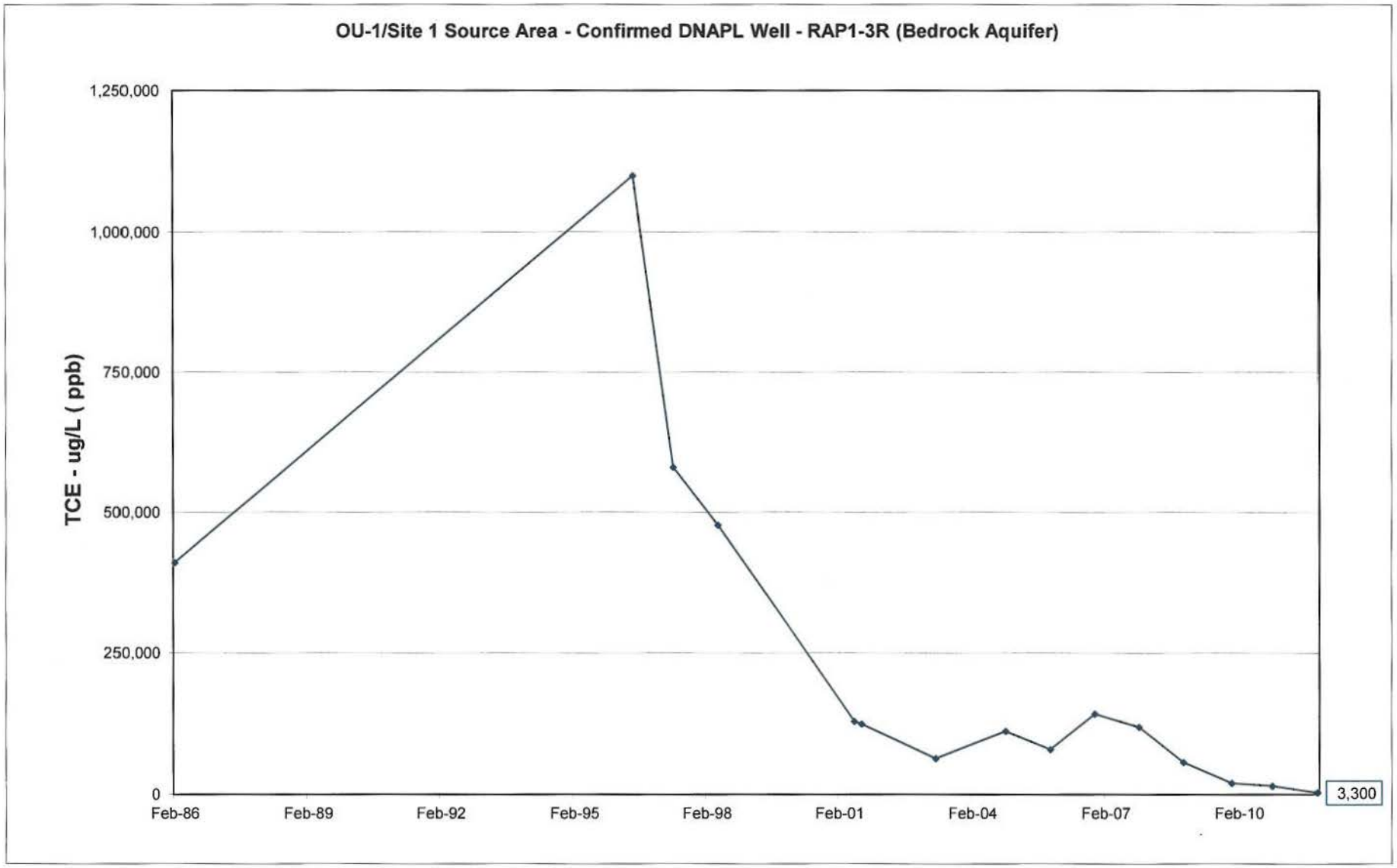
F –61 B254 – Off-site (Hartwell Forest) Plume, Near Leading Edge, Lower Aquifer (1998-2011).....
F –62 B254 – Off-site (Hartwell Forest) Plume, Near Leading Edge, Lower Aquifer (2007-2011).....
F –63 OW3-14 – Site 3 Source Area vic Collection Trench, Surface aquifer (2007-2011)
F –64 B118 – Site 3 Source Area vic Collection Trench, Surface aquifer (1994-2011)
F –65 B125 – Site 2 Source Area, Lower Aquifer (1994-2011).....
F –66 B117 – Site 3 Downgradient of Collection Trench, Surface aquifer (2007-2011)
F –67 B122 – Site 3 Downgradient of Collection Trench, Lower aquifer (1994-2011)
F –68 RAP3-3S – Site 3 Area of Concern vic Burial Pit 3J, Surface aquifer (1986-2011)
F –69 RAP3-3S – Site 3 Area of Concern vic Burial Pit 3J, Surface aquifer (2007-2011)
F –70 RAP3-4S – Site 3 Area of Concern east of RW 5-23, Surface aquifer (1986-2011)
F –71 RAP3-4S – Site 3 Area of Concern east of RW 5-23, Surface aquifer (2007-2011)

OU1 Historical LTM Results via Off-site Laboratory

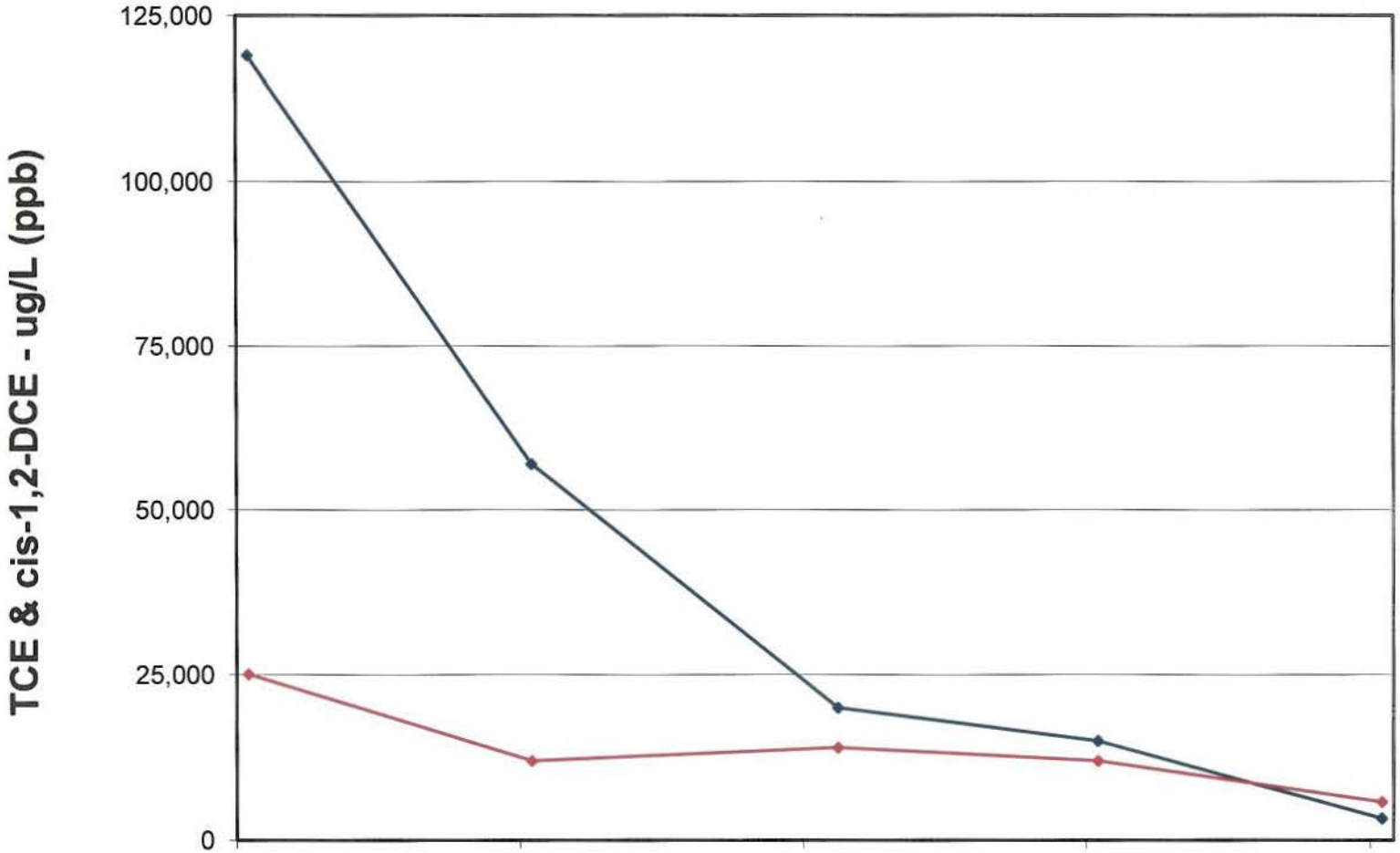


OU-1 Historical LTM Results via Off-site Laboratory



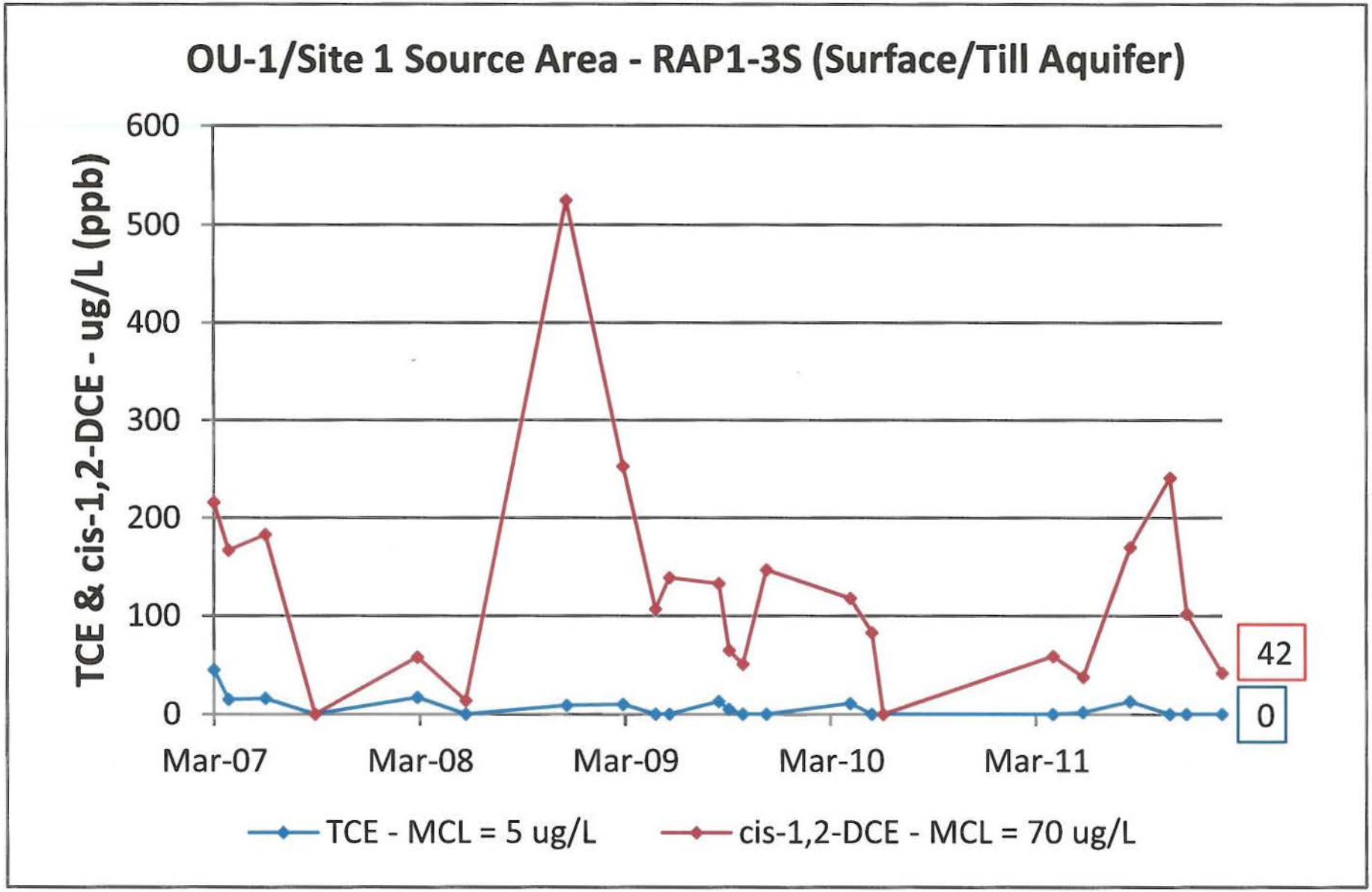
OU1 Historical LTM Results via Off-site Laboratory

OU-1/Site 1 Source Area - Confirmed DNAPL Well - RAP1-3R (Bedrock Aquifer)



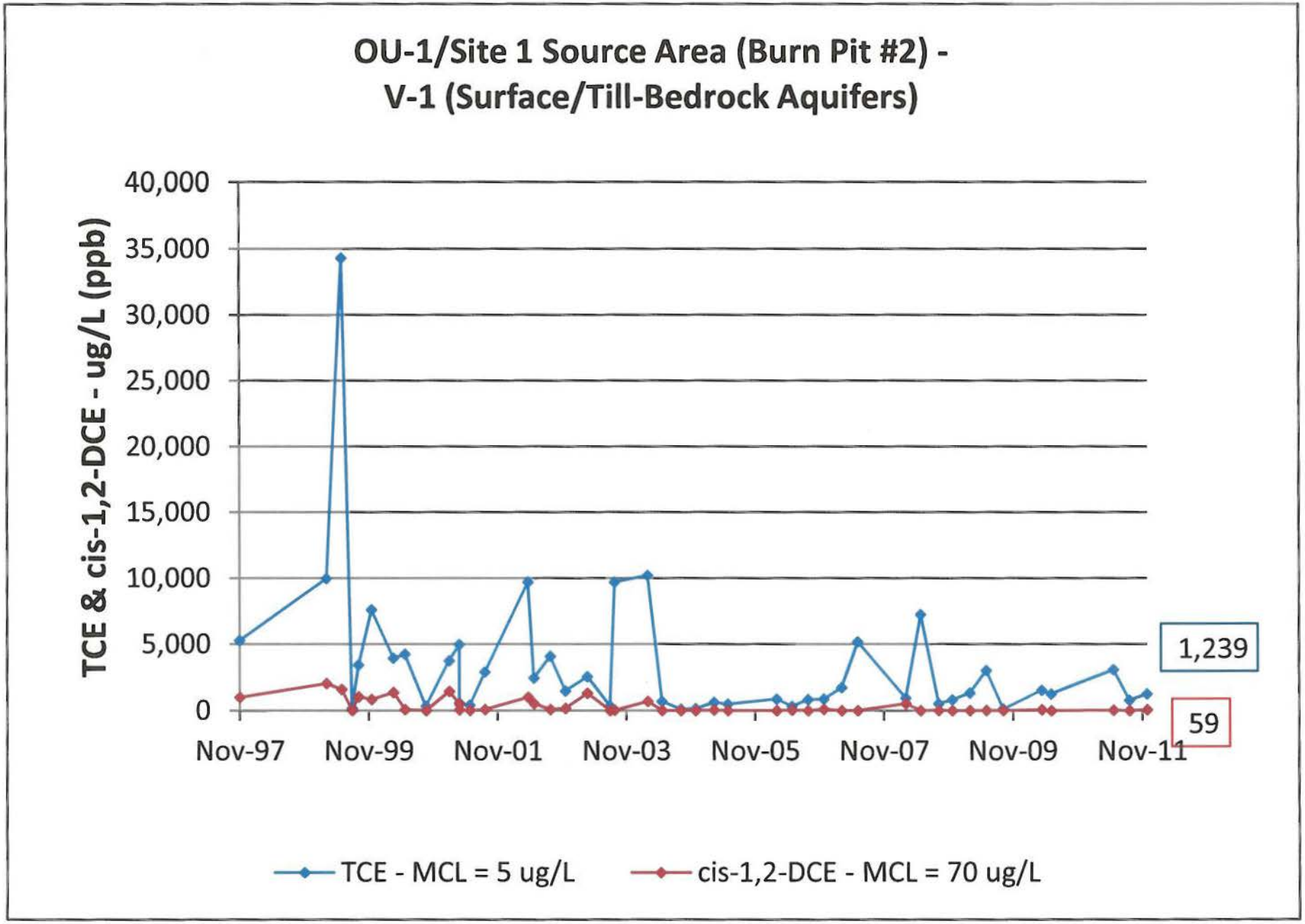
	Nov-07	Nov-08	Dec-09	Nov-10	Nov-11
TCE - MCL = 5	119,000	57,000	20,000	15,000	3,300
cis-1,2 DCE - MCL = 70	25,100	12,000	14,000	12,000	5,800

OU-1 Historical LTM Results via On-site GC Analysis



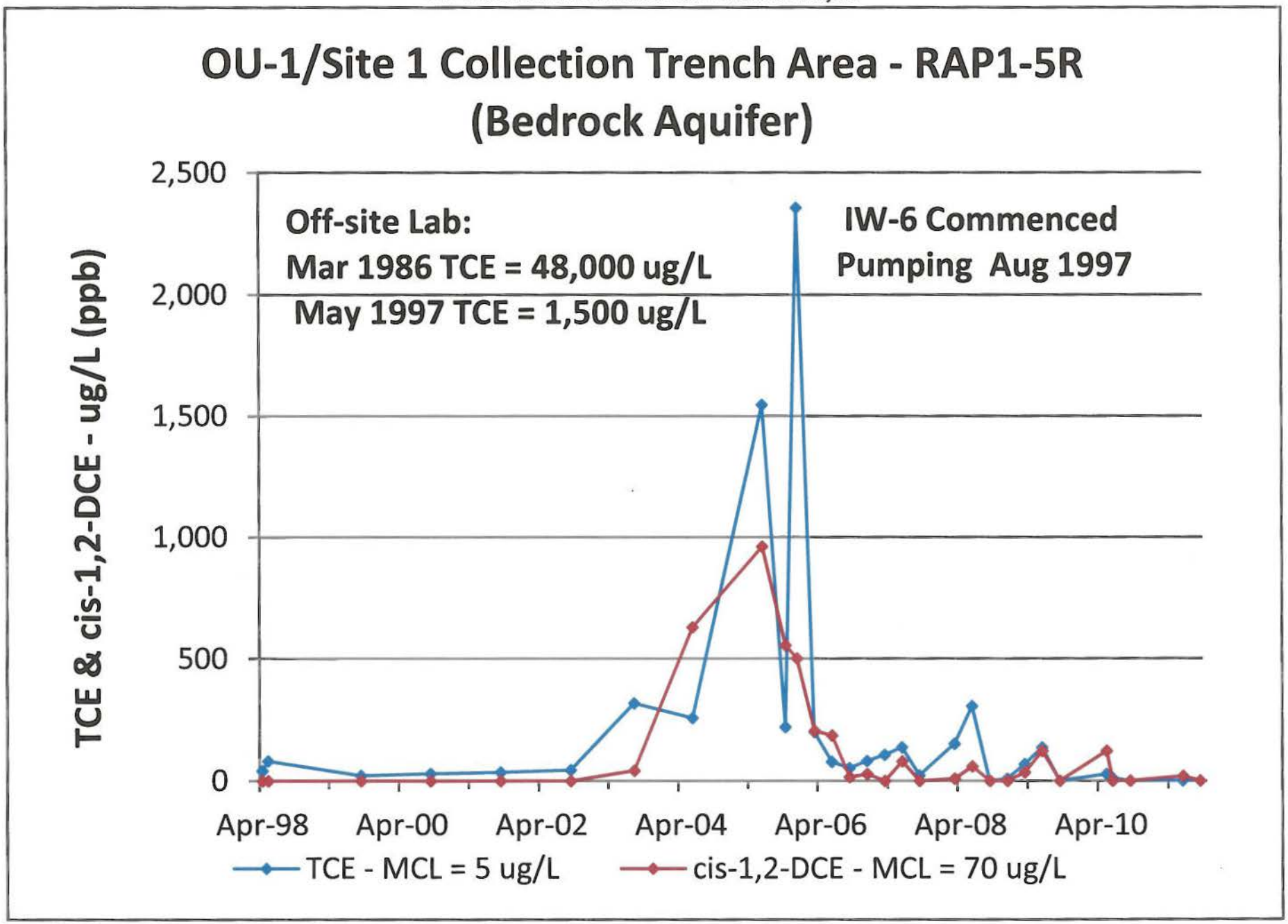
This chart based on on-site GC results

OU-1 Historical LTM Results via On-site GC Analysis



This chart based on on-site GC results

OU-1 Historical LTM Results via On-site GC Analysis



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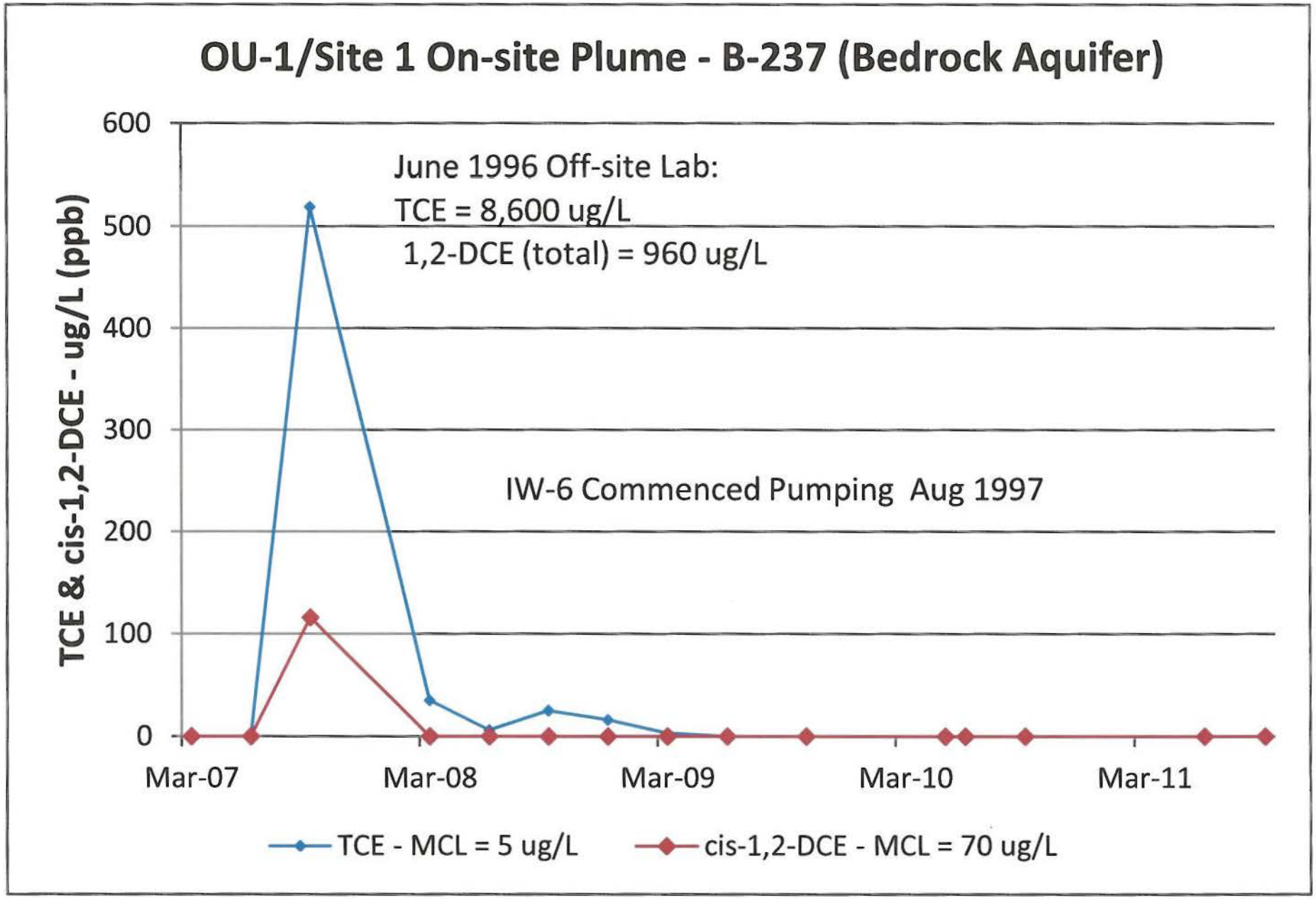
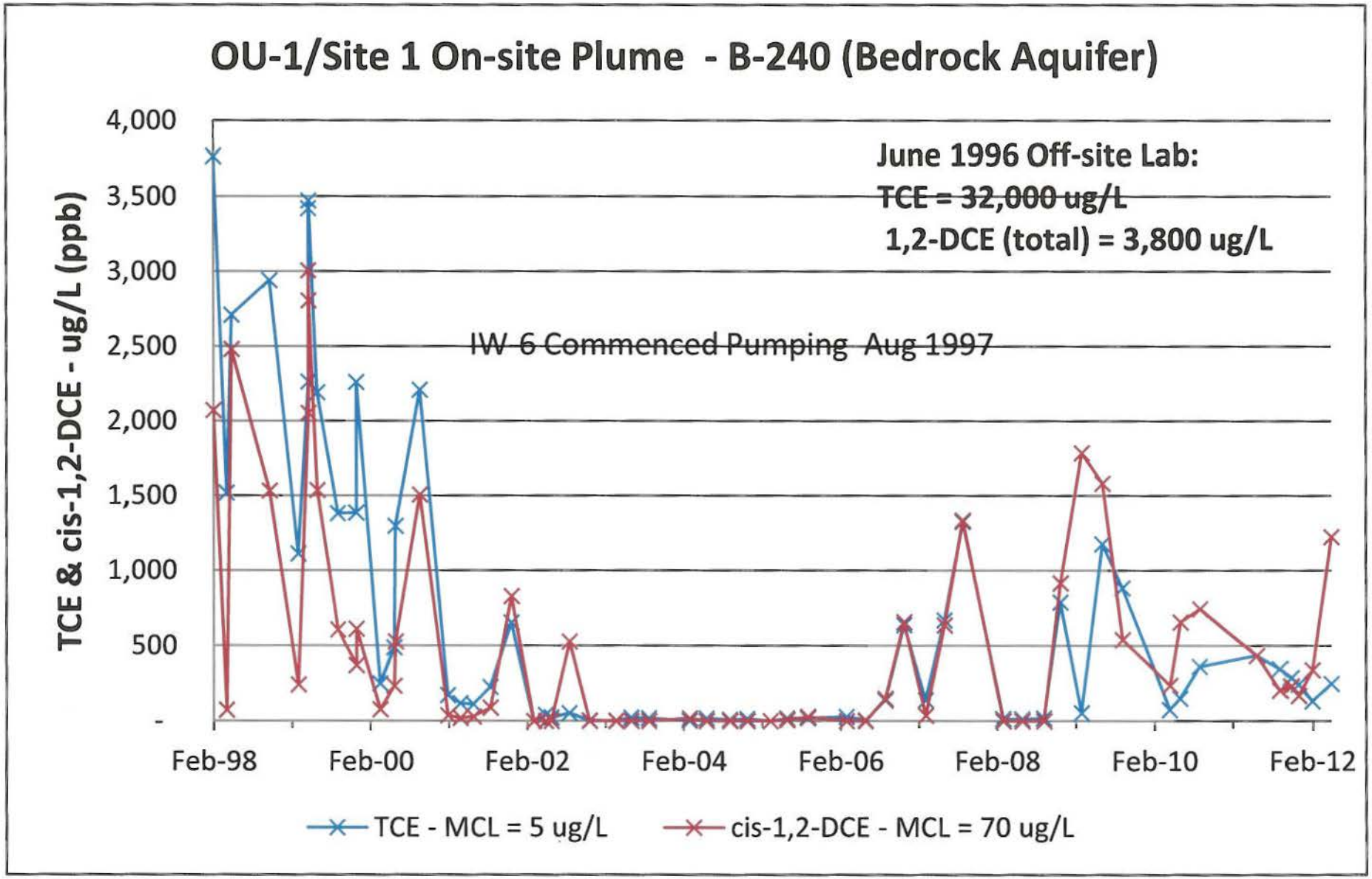


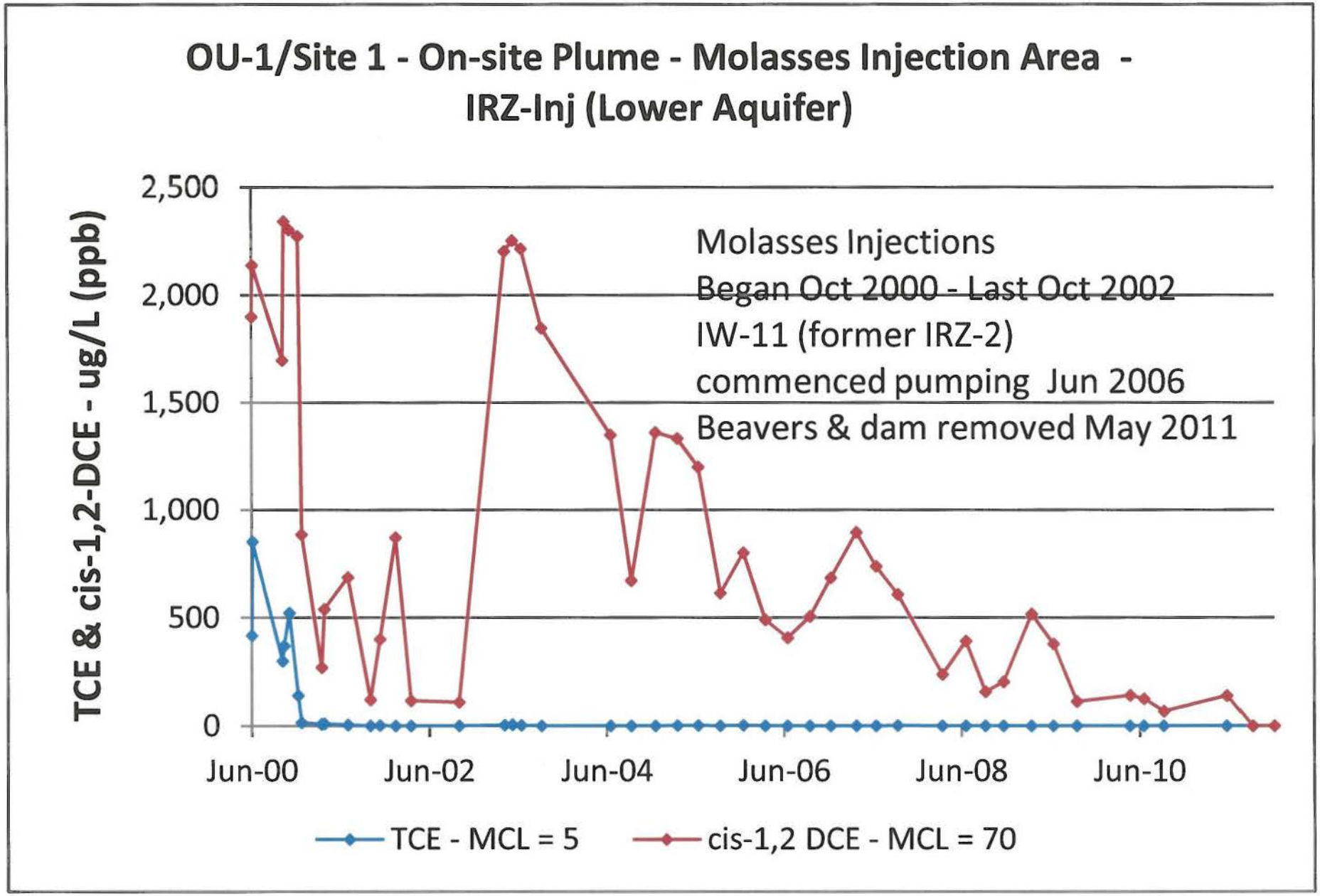
This chart based on on-site GC results

OU-1 Historical LTM Results via On-site GC Analysis



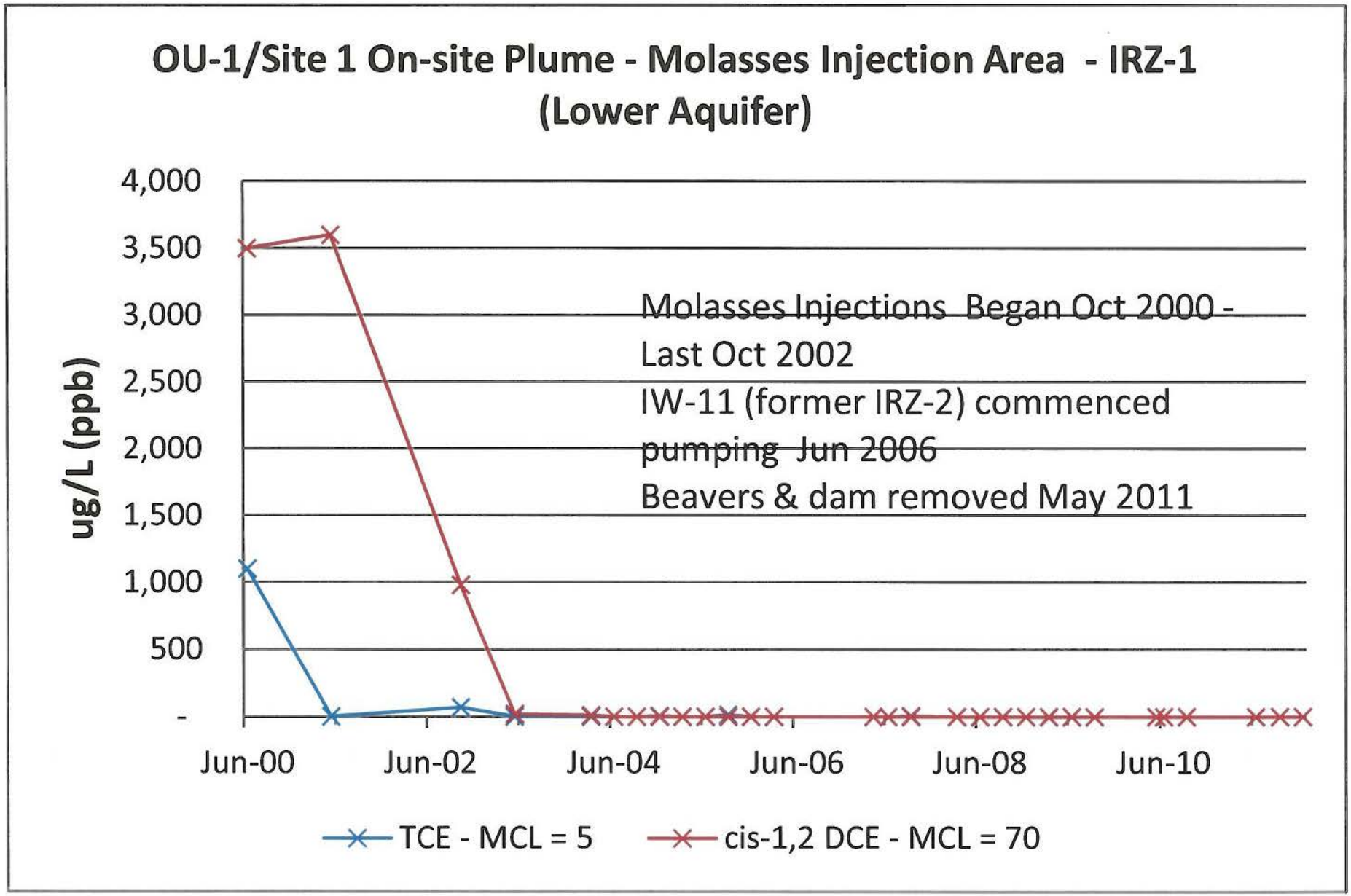
This chart based on on-site GC results

OU-1 Historical LTM Results via On-site GC Analysis



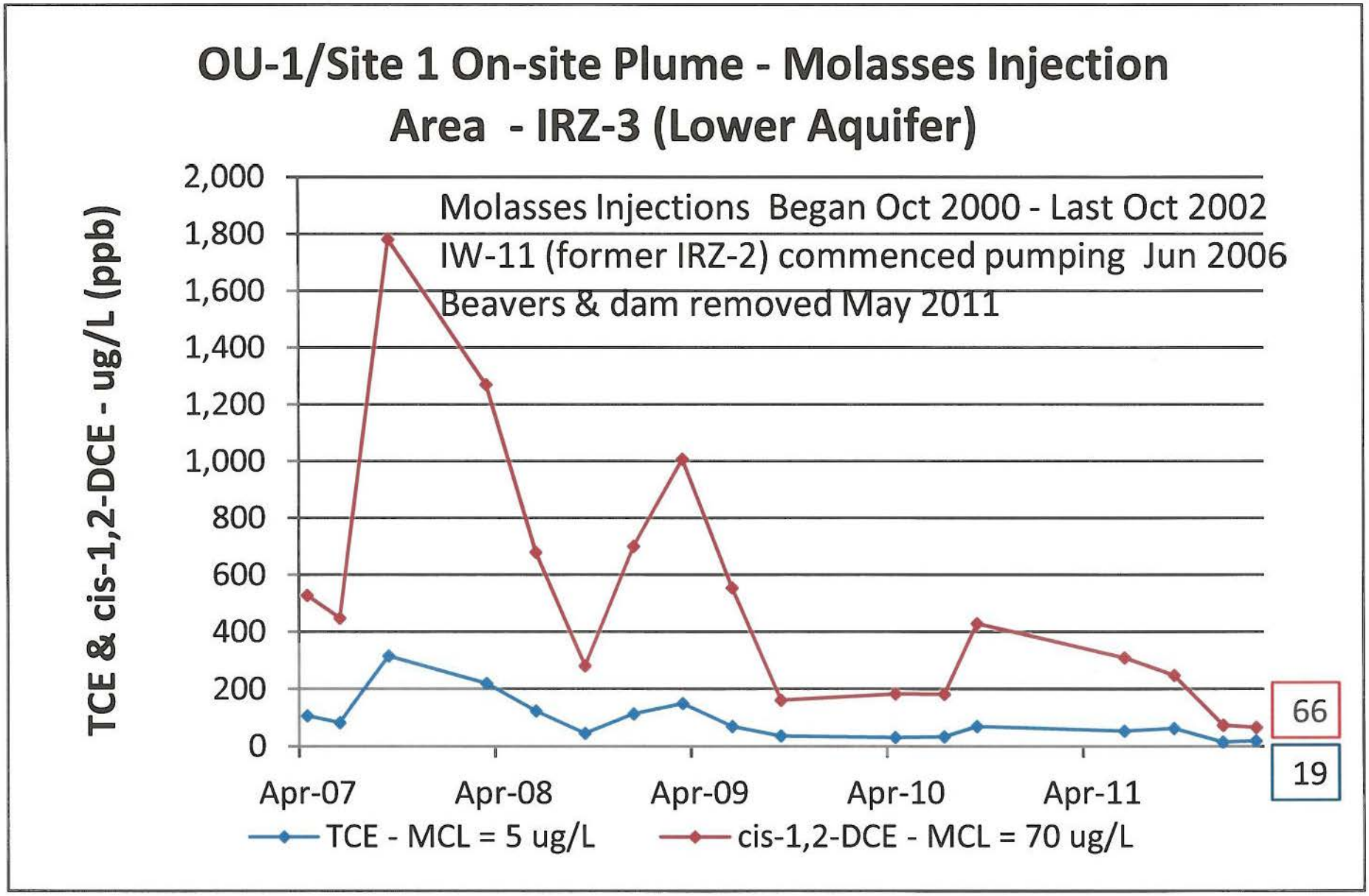
This chart based on on-site GC results

OU-1 Historical LTM Results via both ON Off-site Laboratory



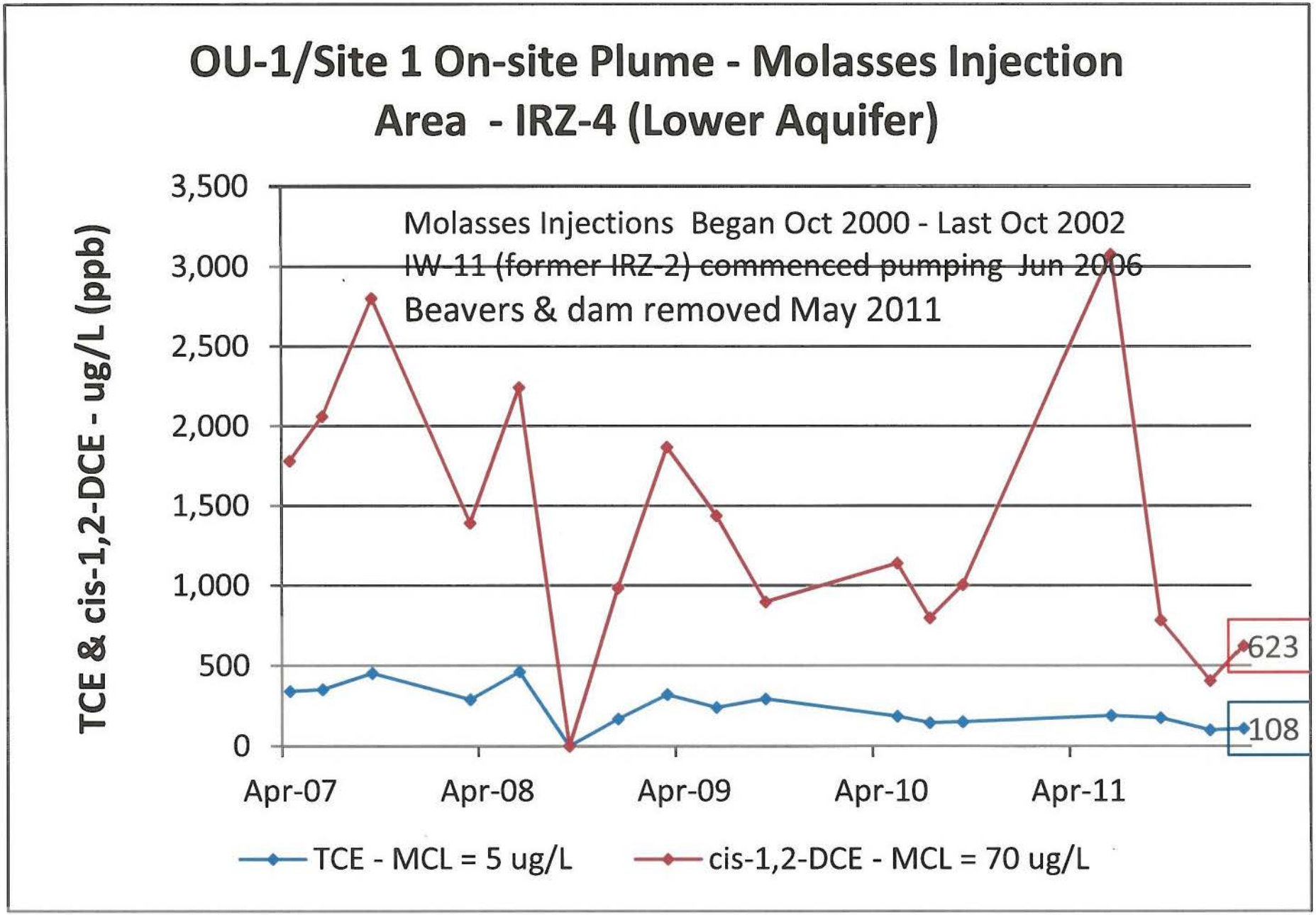
Lab results through 2003, on on-site GC results 2004 on

OU-1 Historical LTM Results via On-site GC Analysis



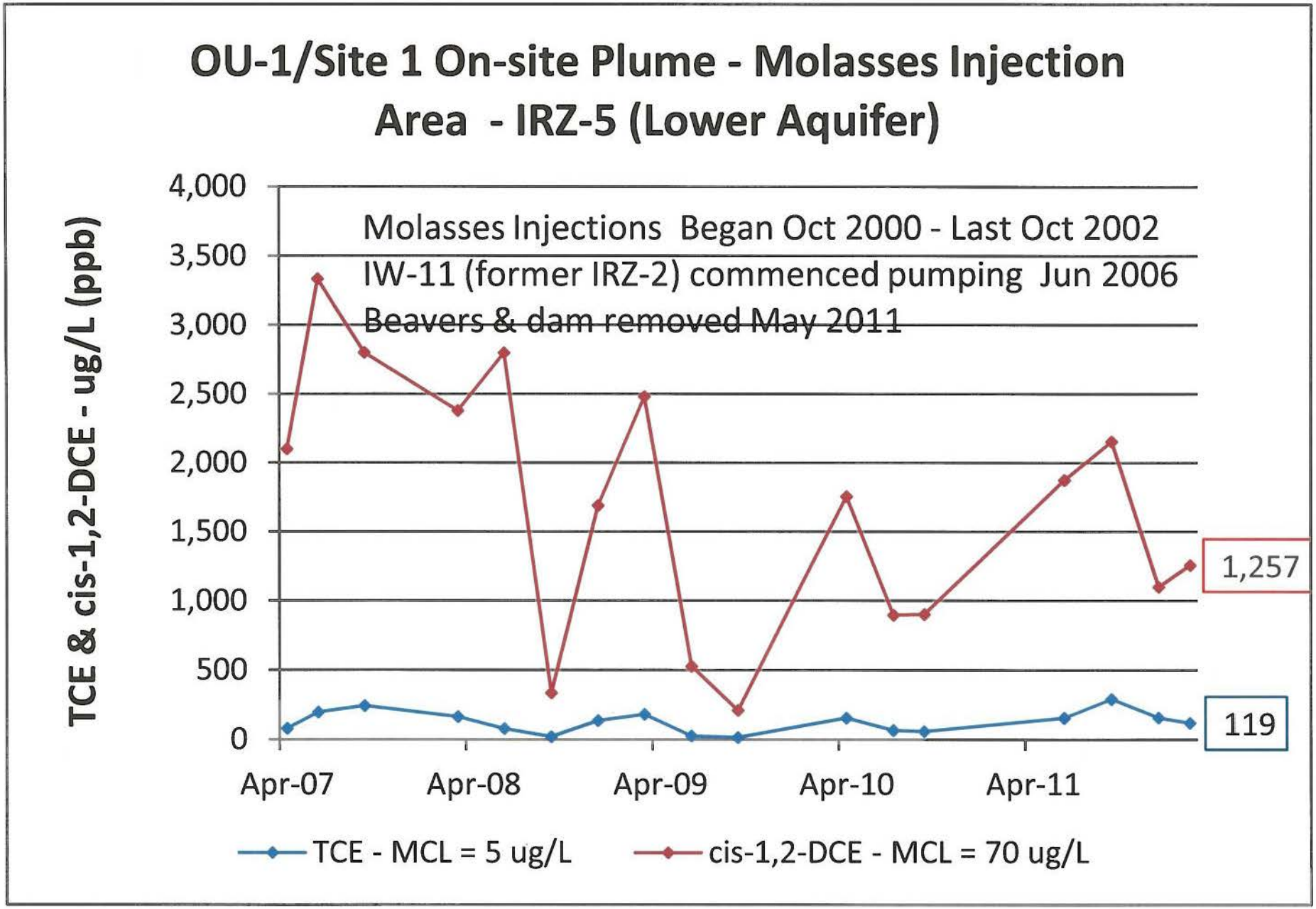
This chart based on on-site GC results

OU-1 Historical LTM Results via On-site GC Analysis



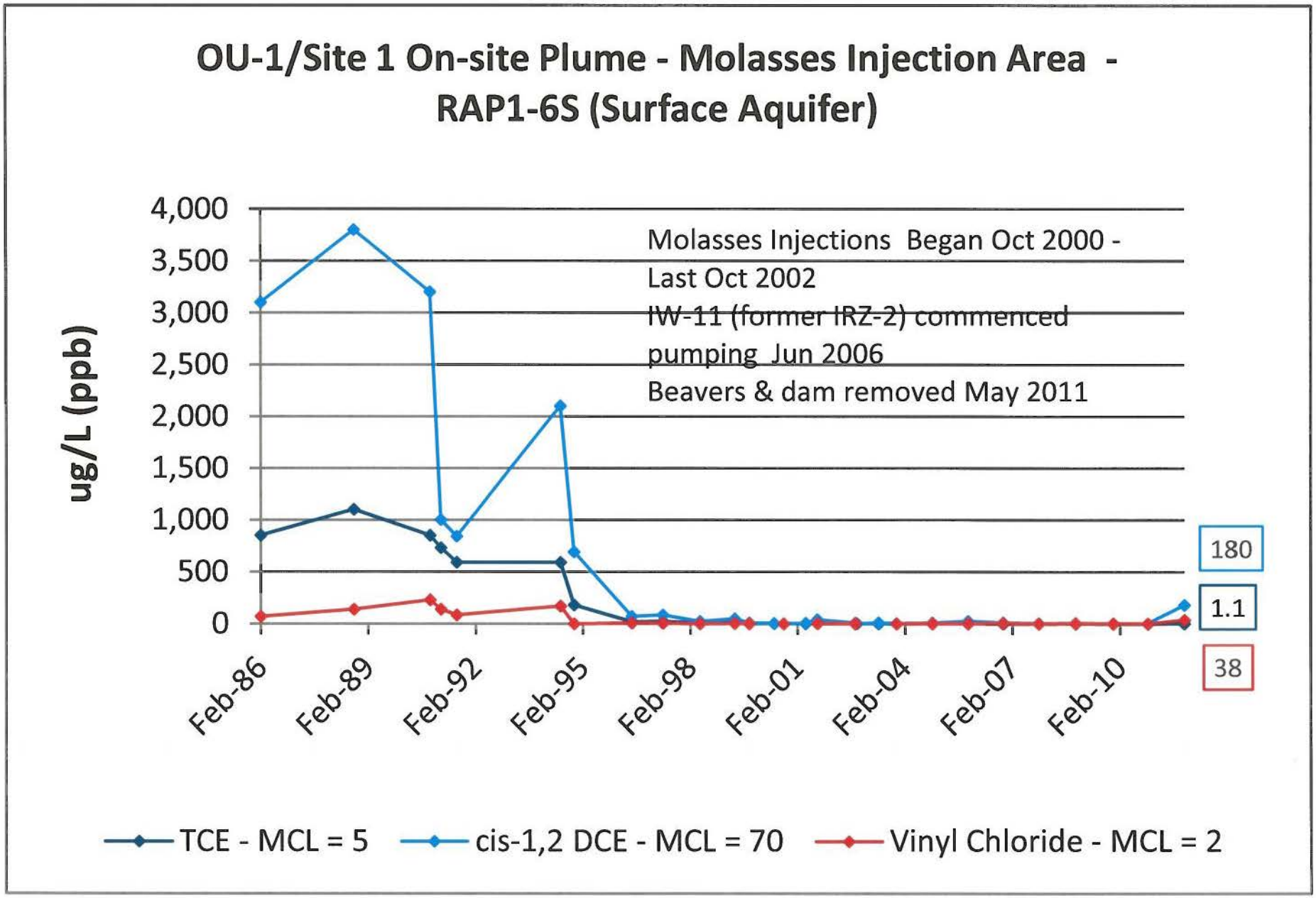
This chart based on on-site GC results

OU-1 Historical LTM Results via On-site GC Analysis



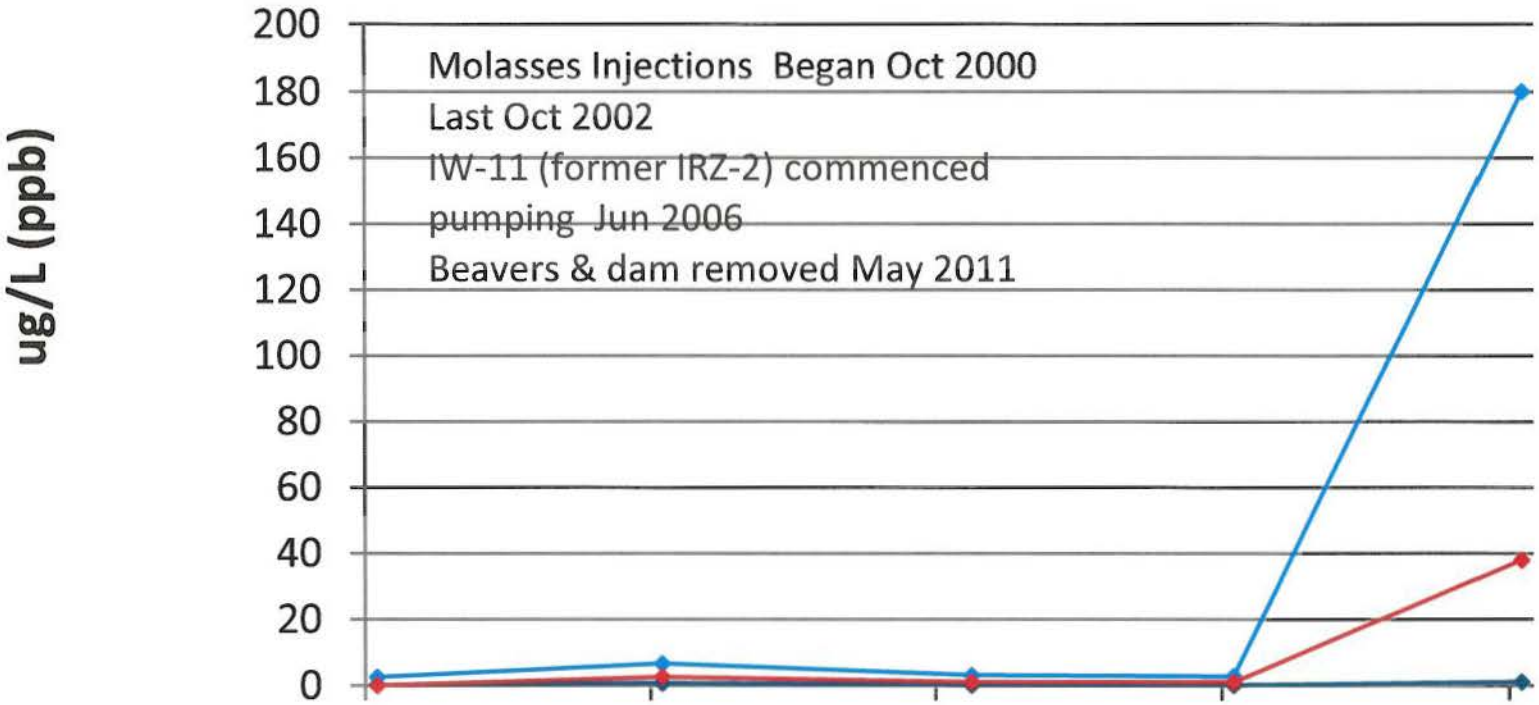
This chart based on on-site GC results

OU-1 Historical LTM Results via Off-site Laboratory



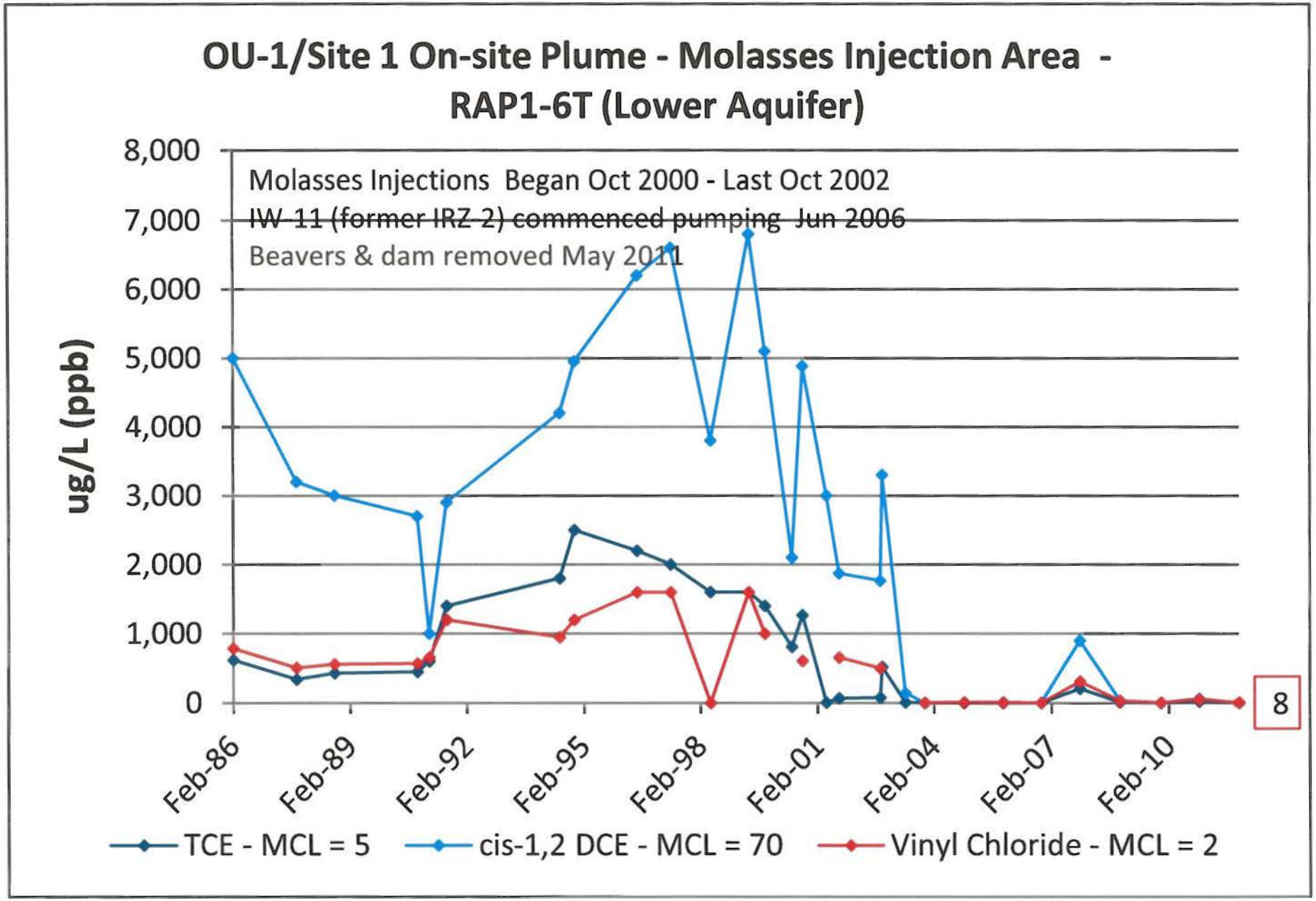
OU-1 Historical LTM Results via Off-site Laboratory

OU-1/Site 1 On-site Plume - Molasses Injection Area - RAP1-6S (Surface Aquifer)



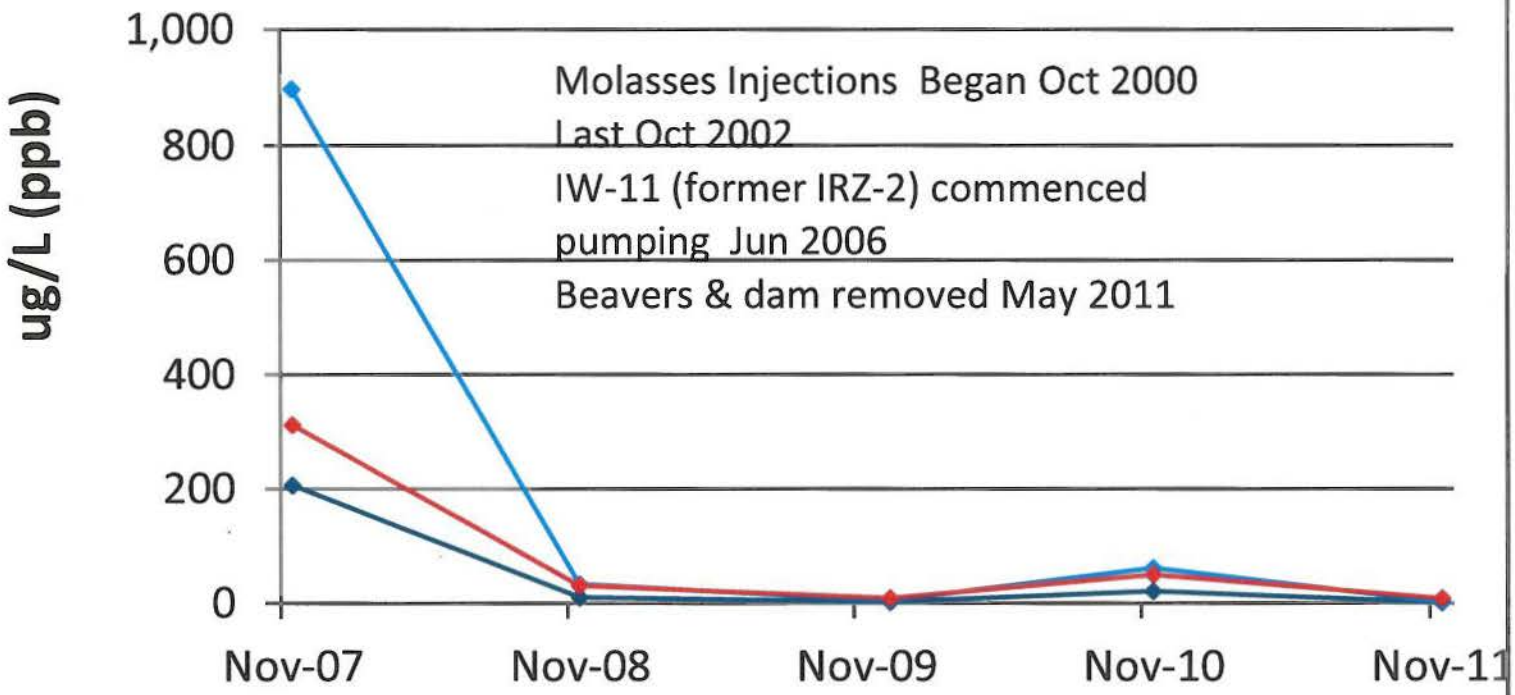
	Nov-07	Nov-08	Dec-09	Nov-10	Nov-11
TCE - MCL = 5	0.26	0.67	0.14	0.1	1.1
cis-1,2 DCE - MCL = 70	2.56	6.6	3.1	2.8	180
Vinyl Chloride - MCL = 2	0.1	2.7	1.1	1.1	38

OU-1 Historical LTM Results via Off-site Laboratory



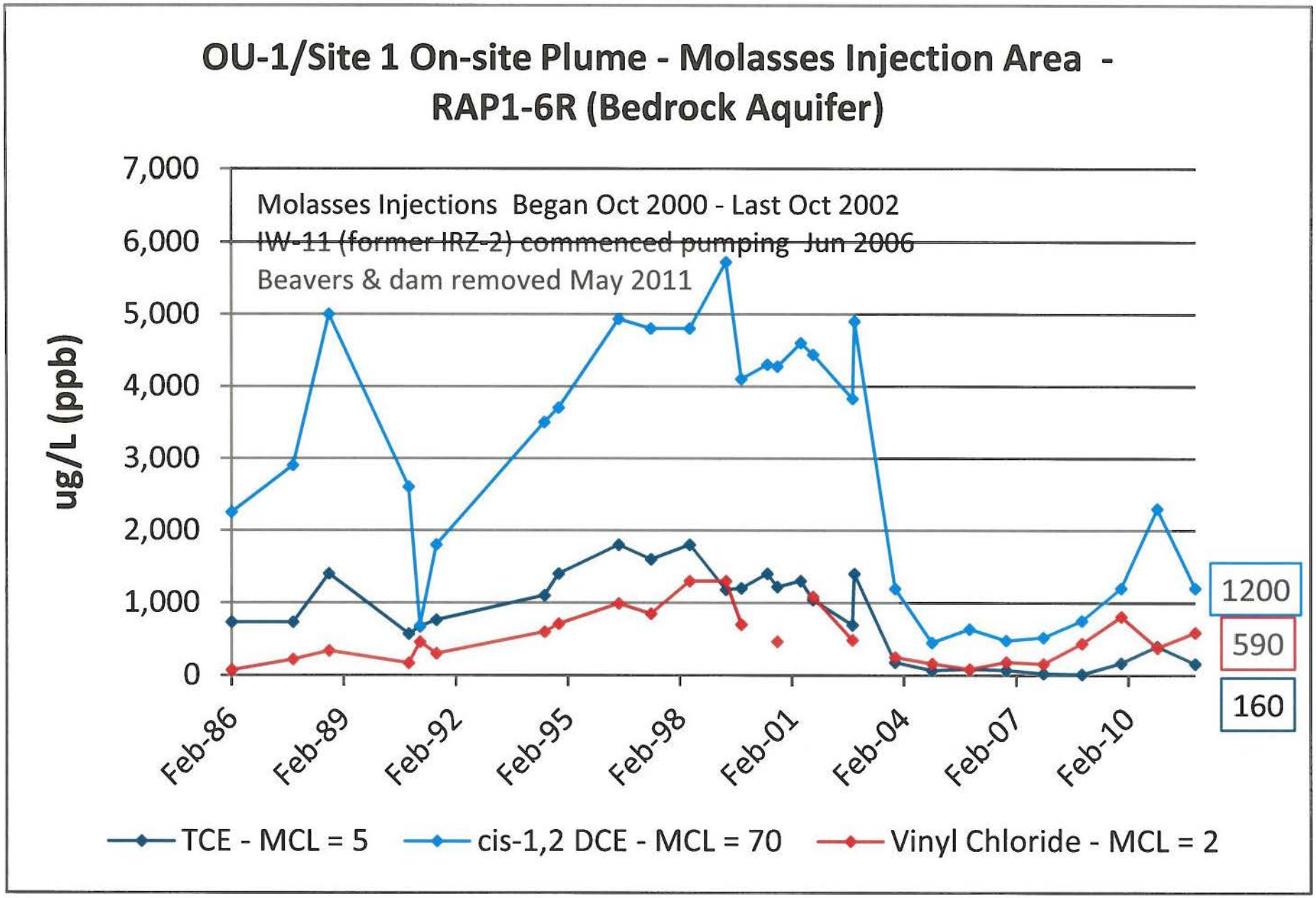
OU-1 Historical LTM Results via Off-site Laboratory

OU-1/Site 1 On-site Plume - Molasses Injection Area - RAP1-6T (Lower Aquifer)



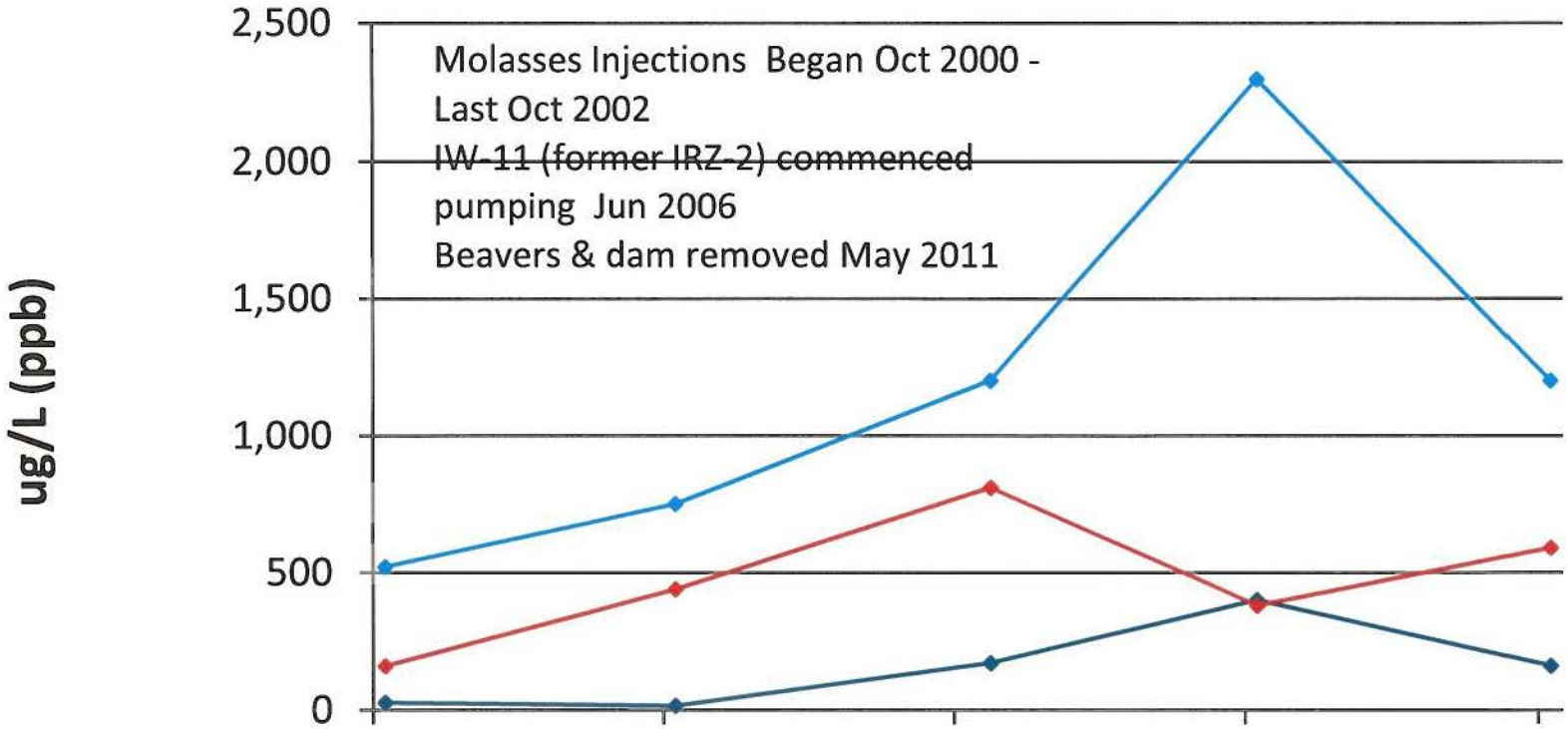
	5-Nov-07	15-Nov-08	2-Dec-09	18-Nov-10	18-Nov-11
TCE mcl = 5	206	10	2.1	21	1.1
cis-1,2 DCE mcl = 70	898	33	5.3	61	2.5
Vinyl Chloride mcl = 2	312	31	8.9	50	8

OU-1 Historical LTM Results via Off-site Laboratory



OU-1 Historical LTM Results via Off-site Laboratory

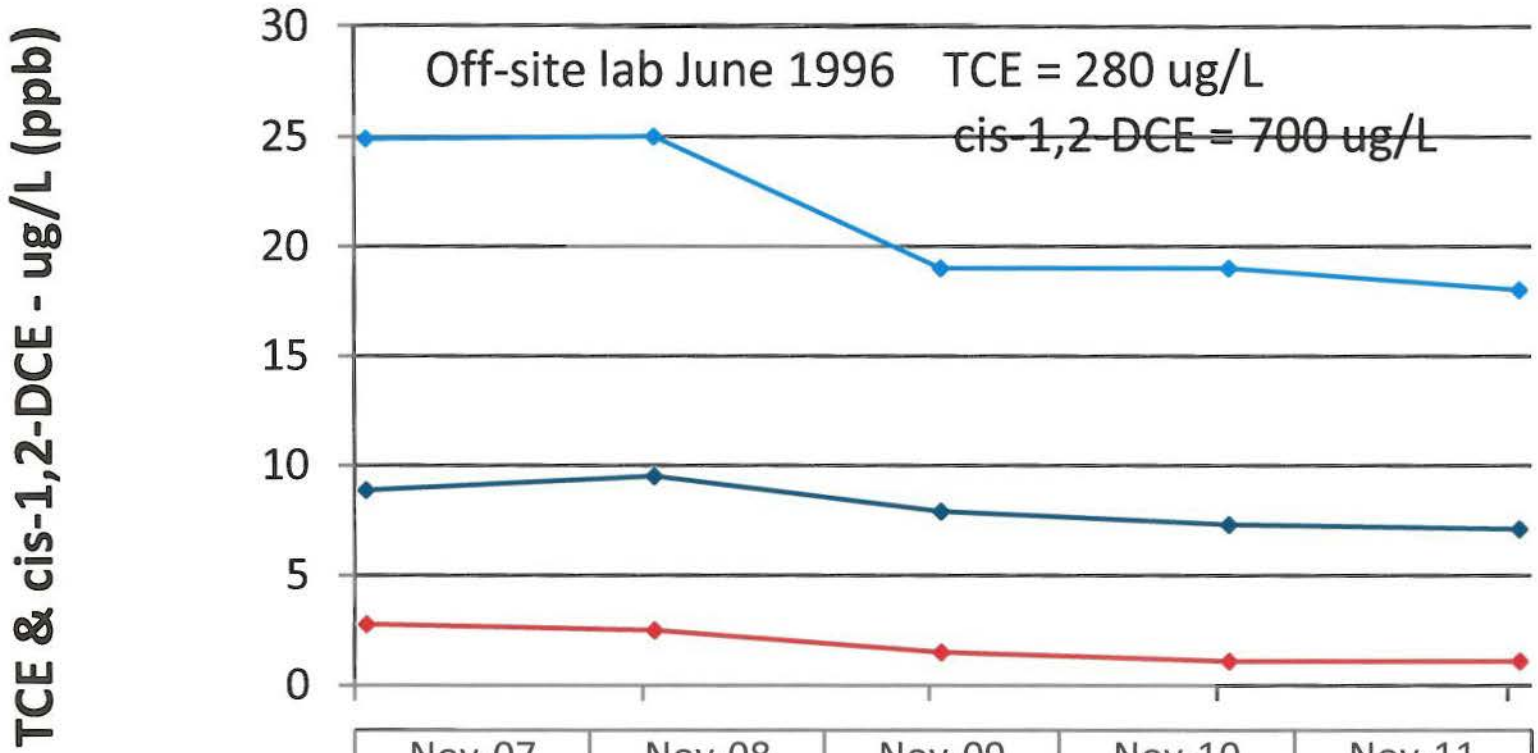
OU-1/Site 1 On-site Plume - Molasses Injection Area - RAP1-6R (Bedrock Aquifer)



	Nov-07	Nov-08	Dec-09	Nov-10	Nov-11
TCE - MCL = 5	26.2	16	170	400	160
cis-1,2 DCE - MCL = 70	520	750	1200	2300	1200
Vinyl Chloride - MCL = 2	160	440	810	380	590

OU-1 Historical LTM Results via Off-site Laboratory

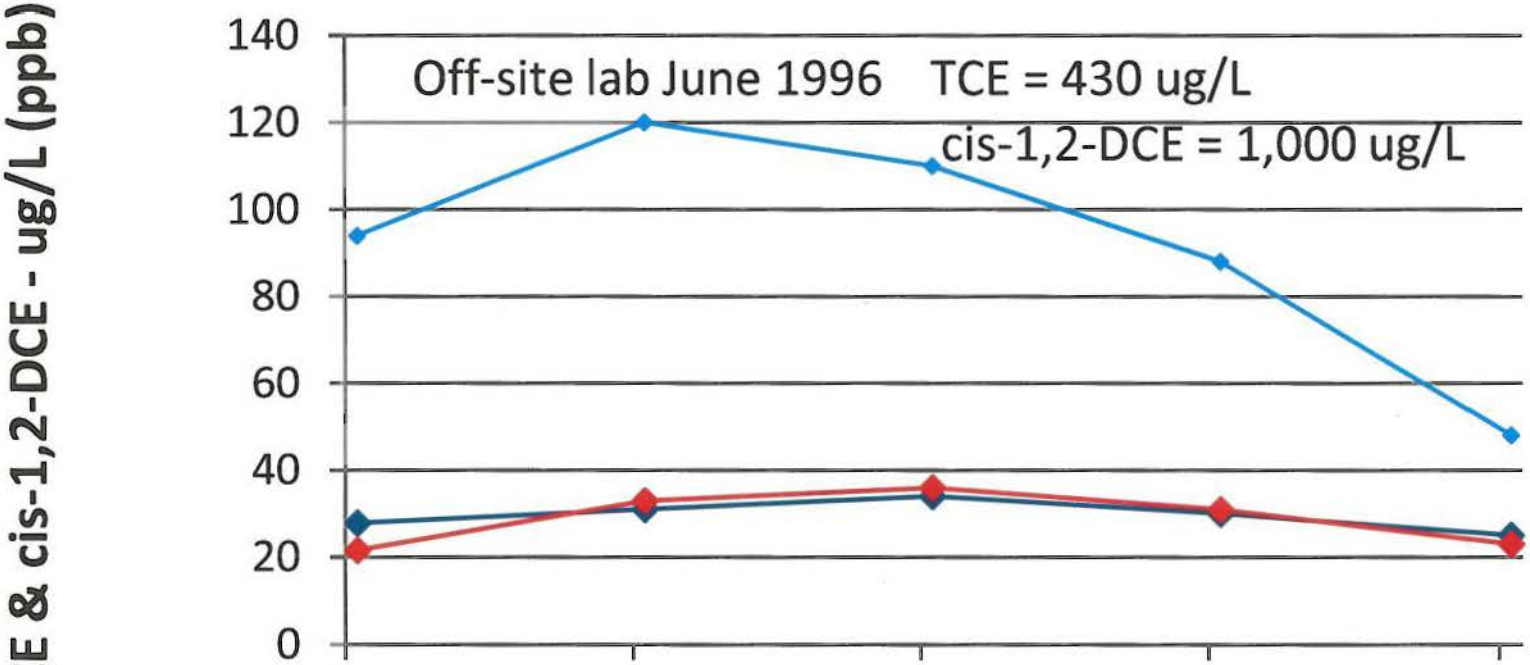
OU-1/Site 1 On-site Plume Approaching BIW #2 B242 (Lower Aquifer)



	Nov-07	Nov-08	Nov-09	Nov-10	Nov-11
TCE - MCL = 5	8.87	9.5	7.9	7.3	7.1
cis-1,2 DCE - MCL = 70	24.9	25	19	19	18
Vinyl Chloride - MCL = 2	2.77	2.5	1.5	1.1	1.1

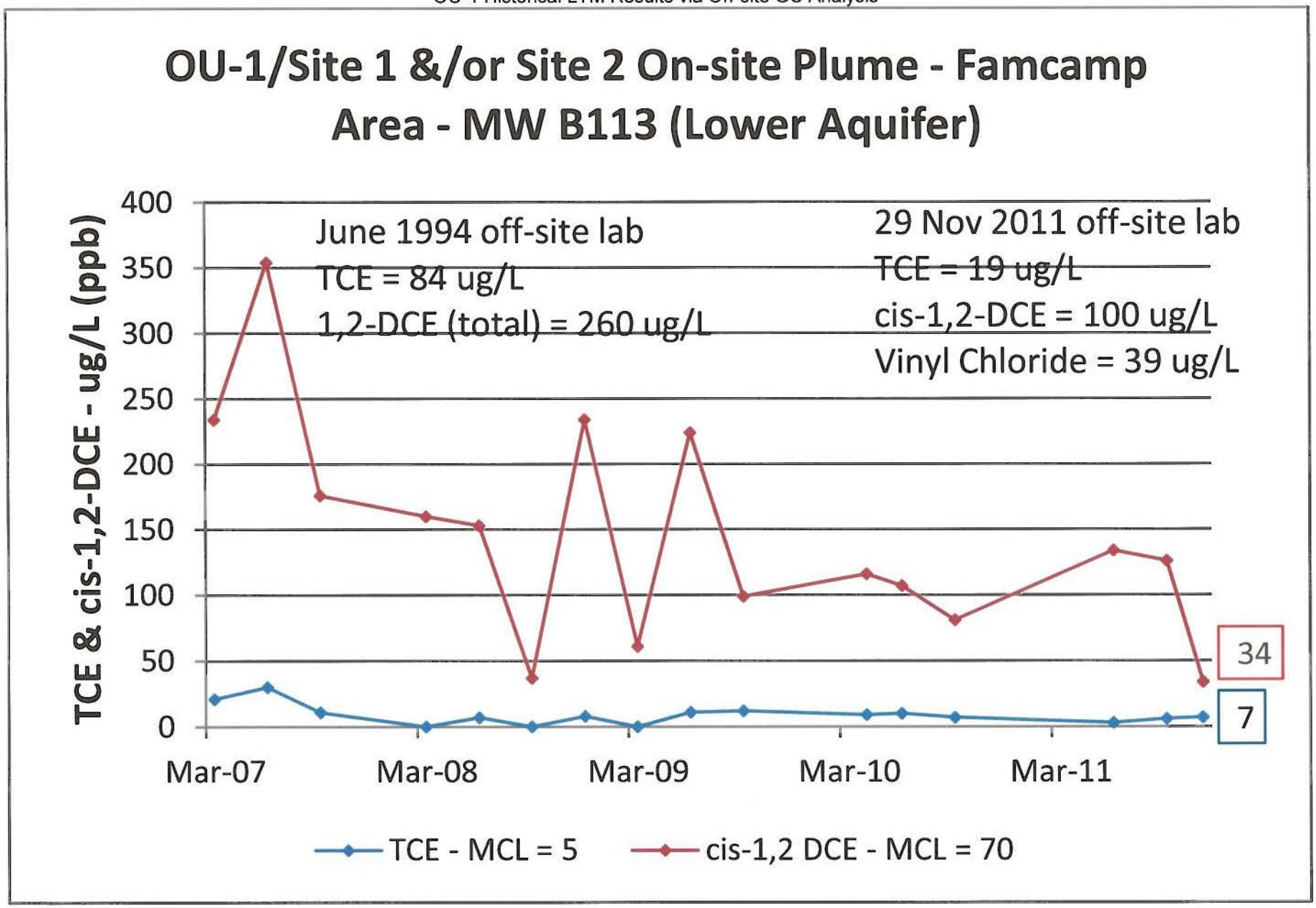
OU-1 Historical LTM Results via Off-site Laboratory

Site 1 On-site Plume Approaching BIW #2
B243 (Bedrock Aquifer)



	Nov-07	Nov-08	Nov-09	Nov-10	Nov-11
TCE - MCL = 5	27.8	31	34	30	25
cis-1,2 DCE - MCL = 70	93.9	120	110	88	48
Vinyl Chloride - MCL = 2	21.6	33	36	31	23

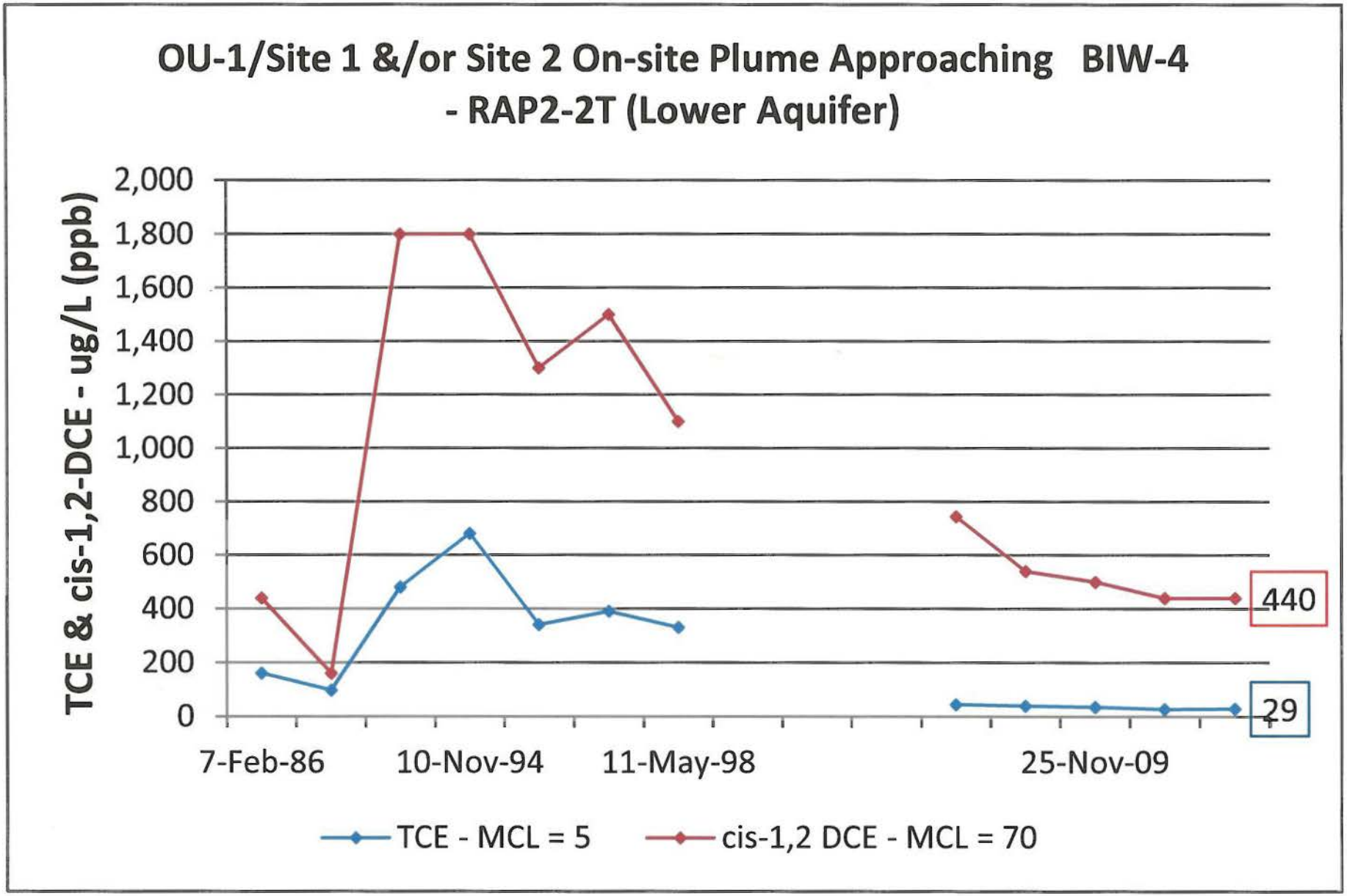
OU-1 Historical LTM Results via On-site GC Analysis



This chart based on on-site GC results

S2-Boundary 2010 - Apr 2012

OU-1 Historical LTM Results via Off-site Laboratory

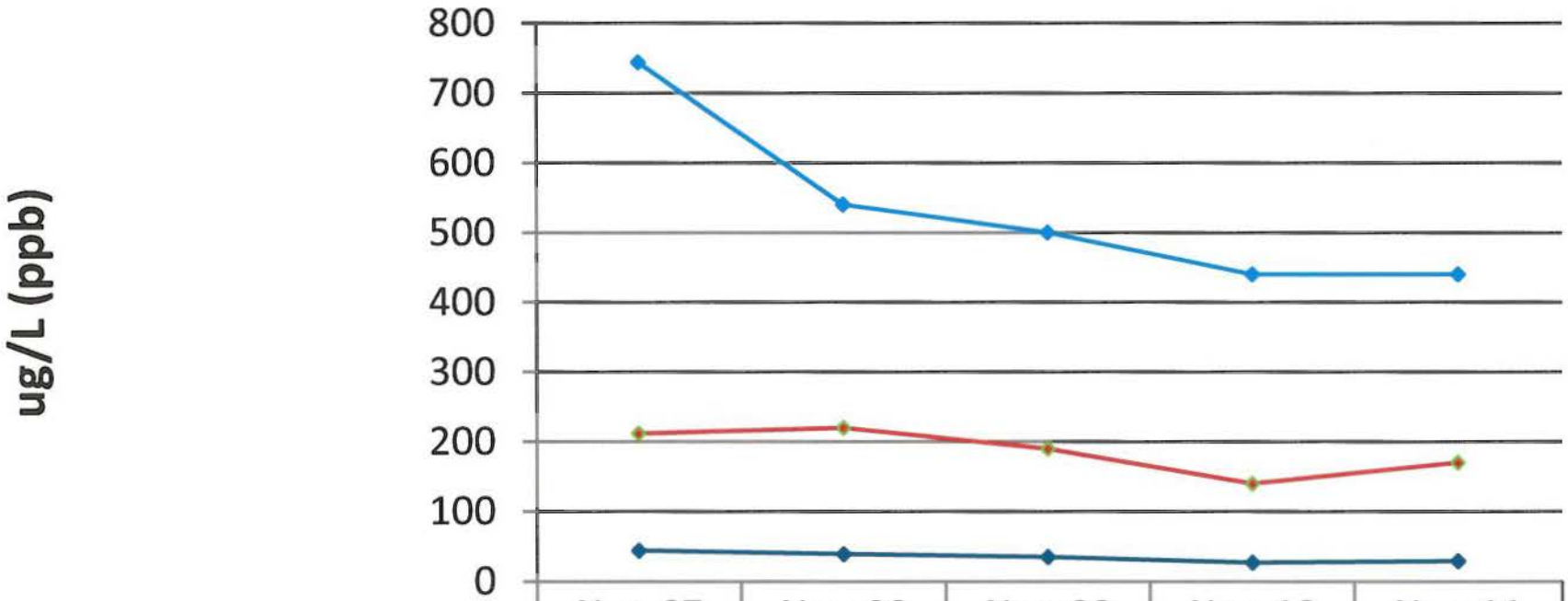


On-site GC analysis only 1999-2006

S2-Boundary 2010 - Apr 2012

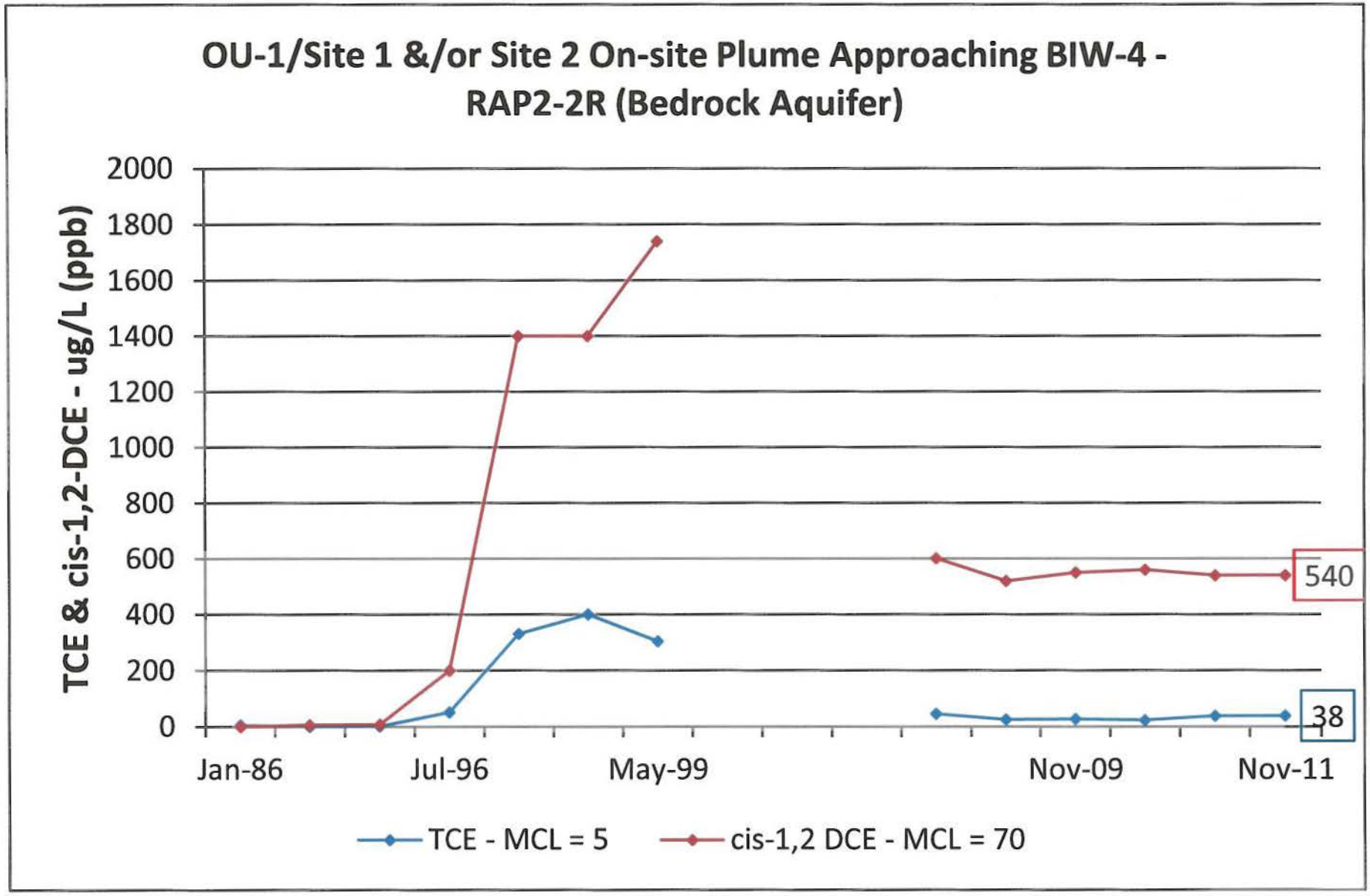
OU-1 Historical LTM Results via Off-site Laboratory

OU-1/Site 1 &/or Site 2 On-site Plume Approaching BIW-4 - RAP2-2T (Lower Aquifer)



	Nov-07	Nov-08	Nov-09	Nov-10	Nov-11
TCE - MCL = 5	44	39	35	27	29
cis-1,2 DCE - MCL = 70	744	540	500	440	440
Vinyl Chloride MCL = 2	212	220	190	140	170

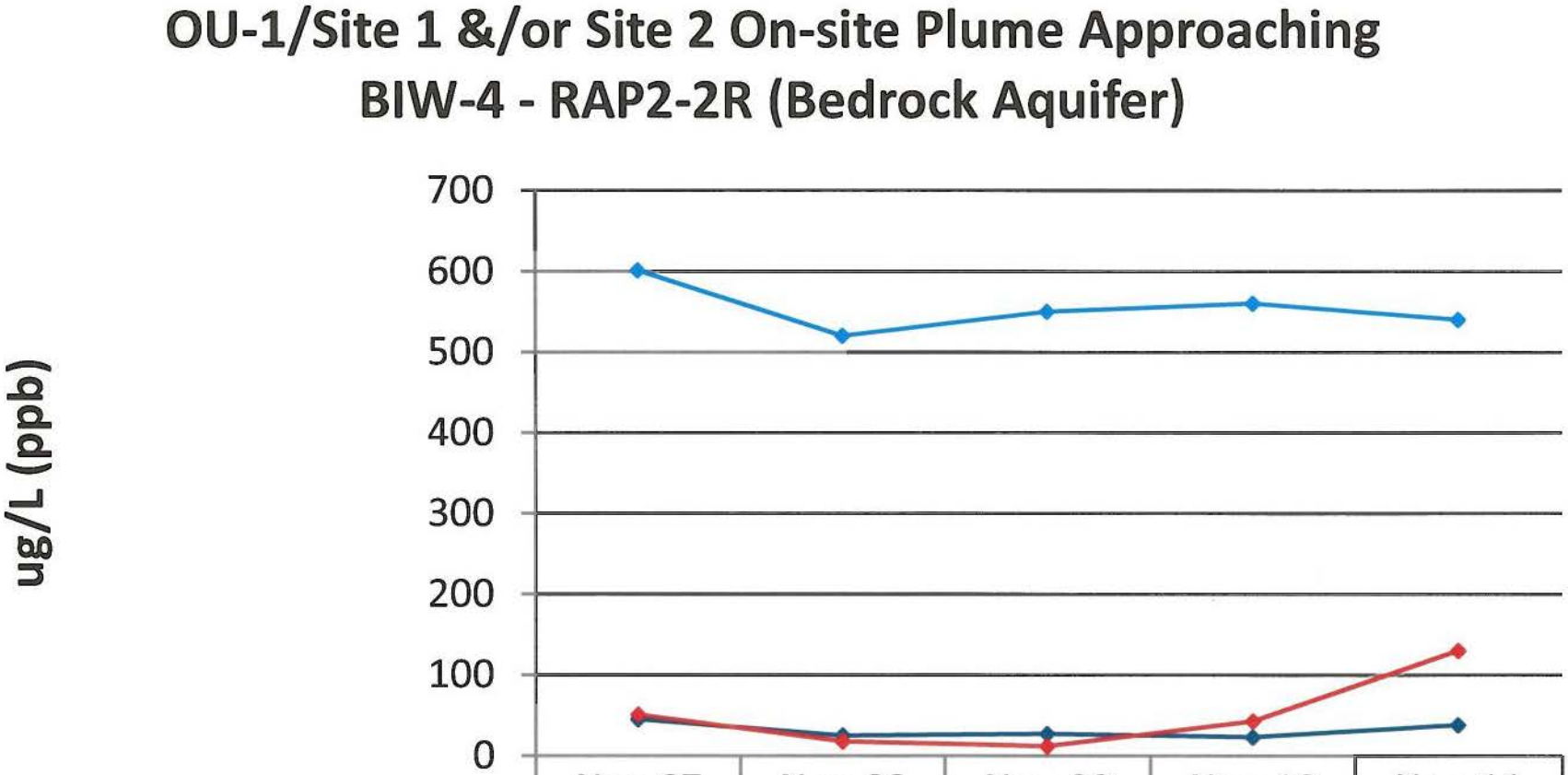
OU-1 Historical LTM Results via Off-site Laboratory



On-site GC analysis only 2000-2006

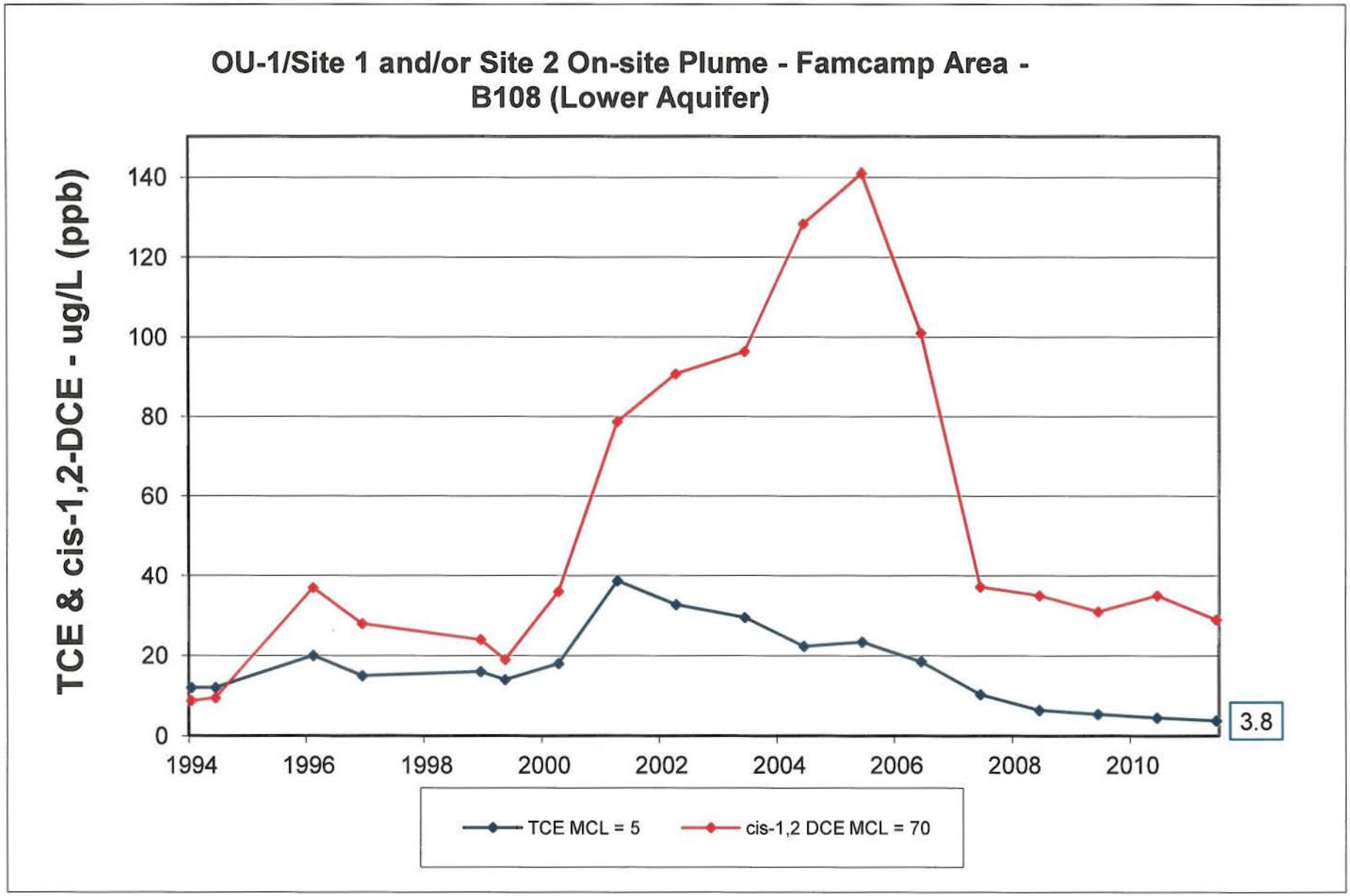
S2-Boundary 2010 - Apr 2012

OU-1 Historical LTM Results via Off-site Laboratory



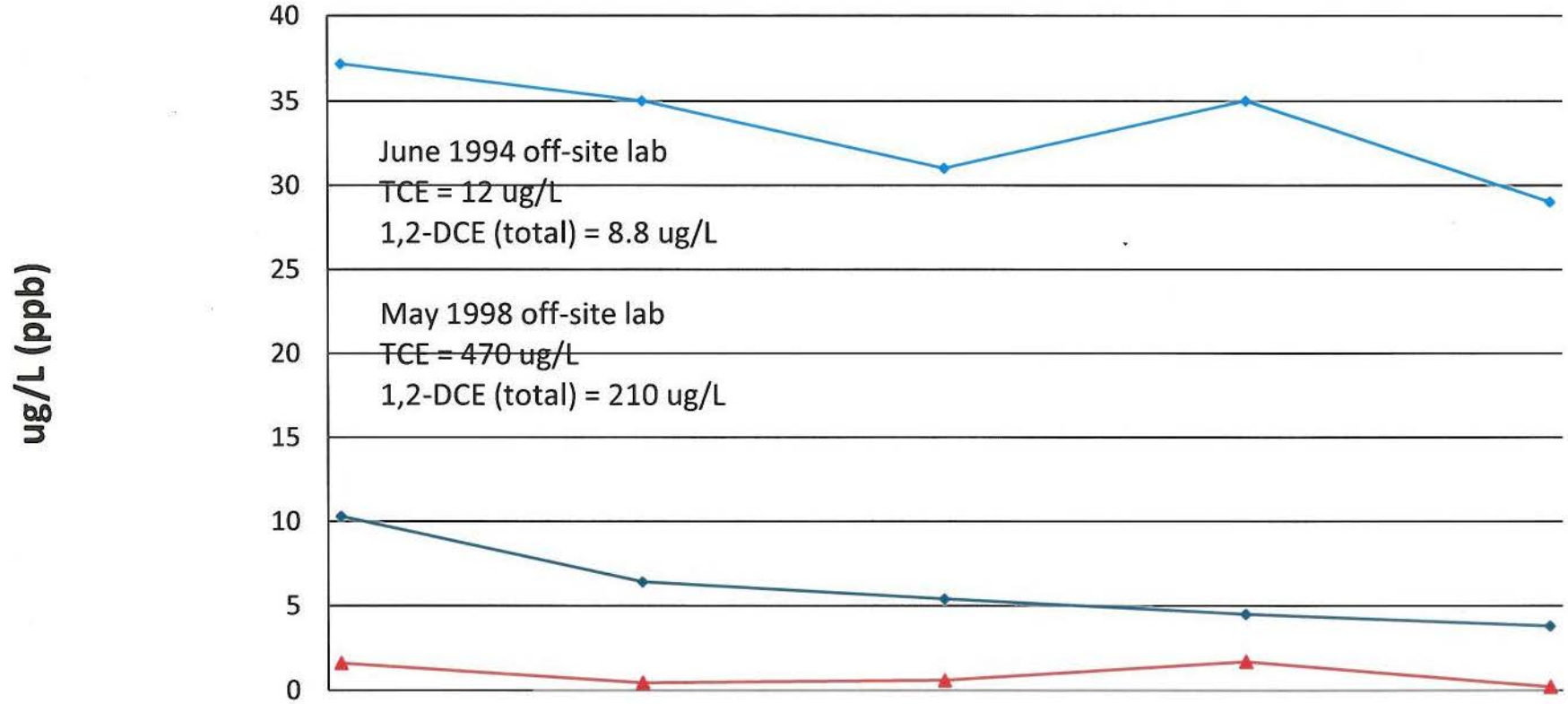
	Nov-07	Nov-08	Nov-09	Nov-10	Nov-11
TCE - MCL = 5	45	25	27	23	38
cis-1,2 DCE - MCL = 70	601	520	550	560	540
Vinyl Chloride MCL = 2	51	18	12	43	130

OU1 Historical LTM Results via Off-site Laboratory



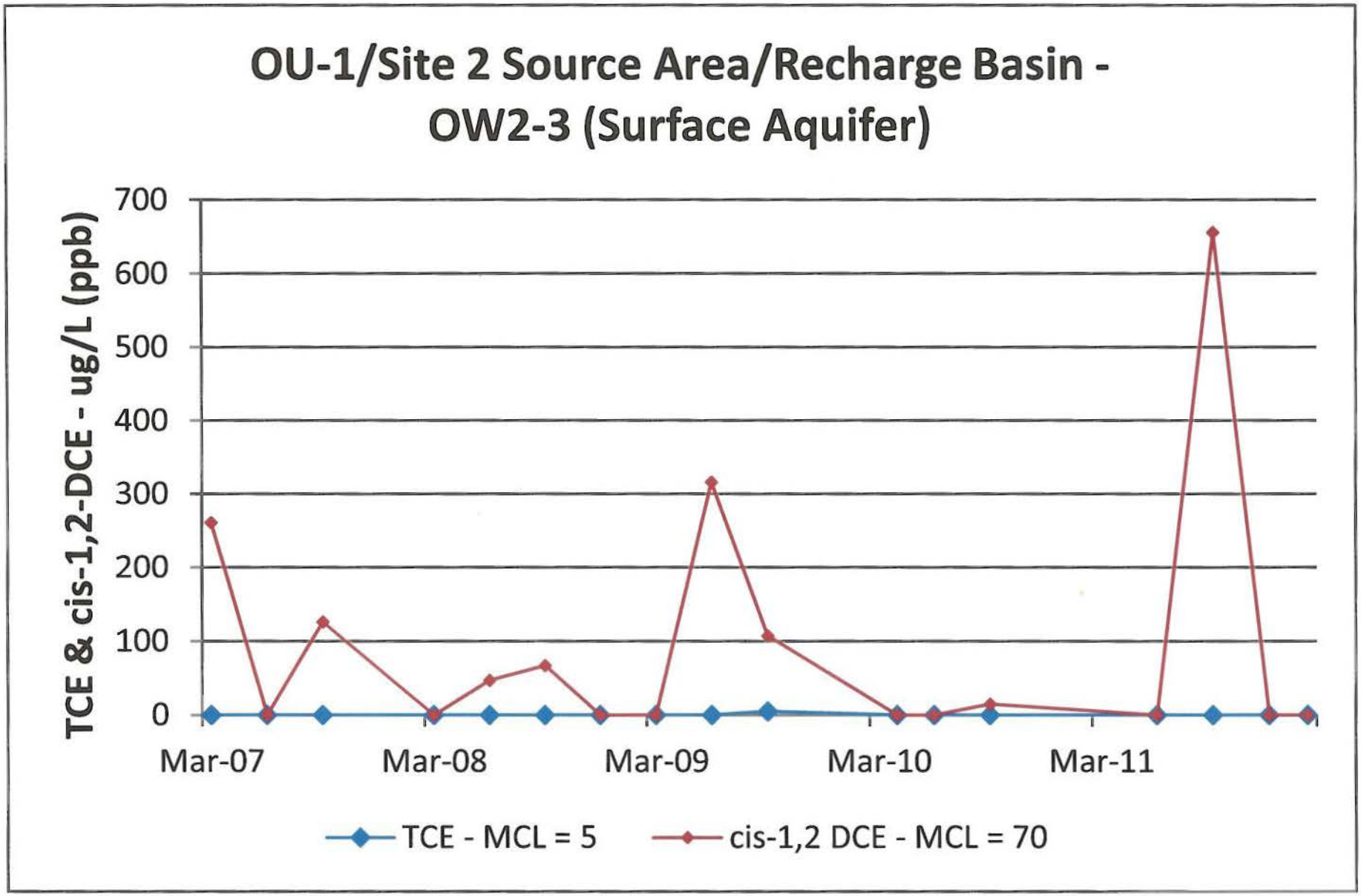
OU-1 Historical LTM Results via Off-site Laboratory

OU-1/Site 1 and/or Site 2 On-site Plume - Famcamp Area - B108 (Lower Aquifer)



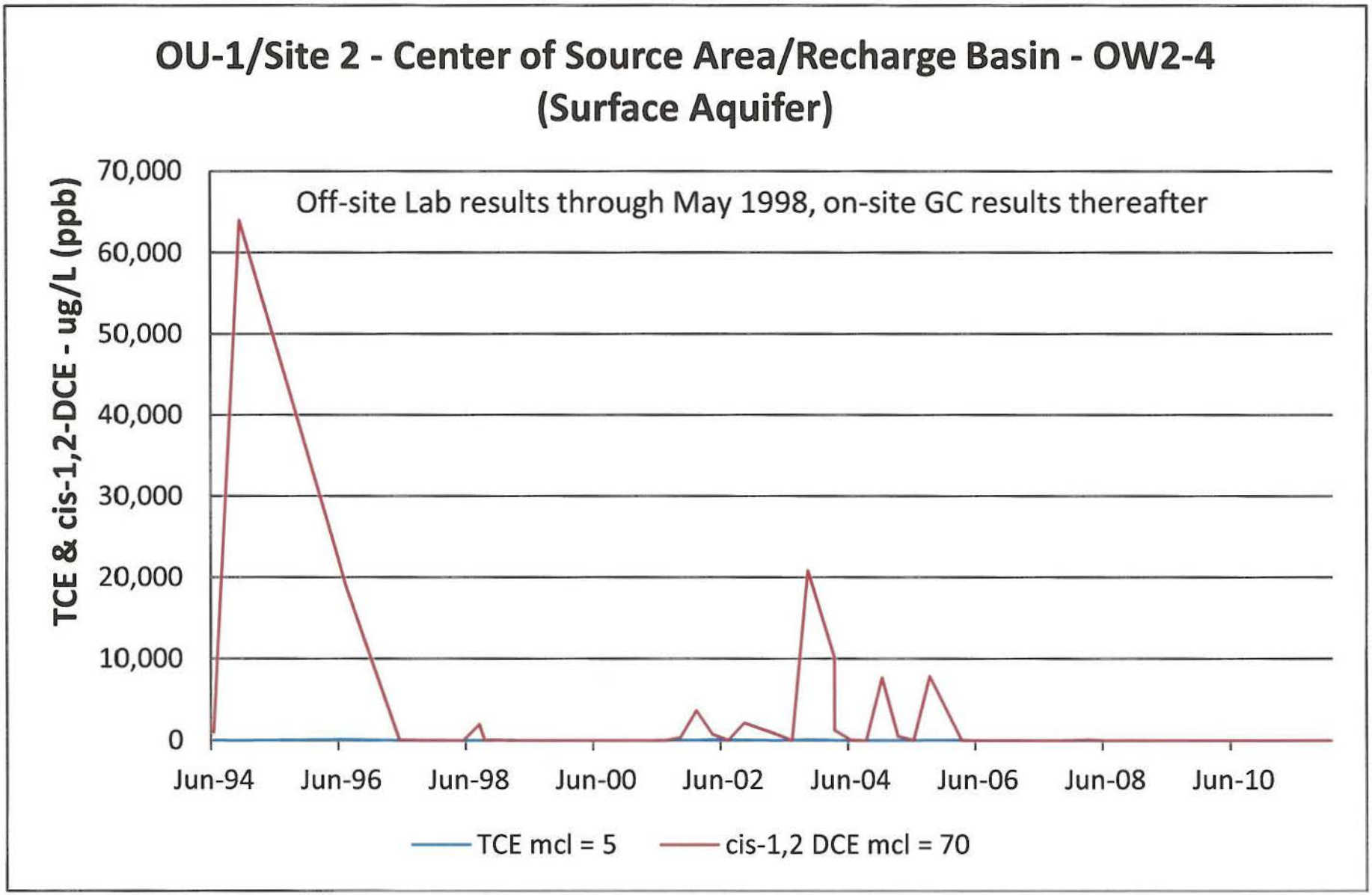
	Nov-07	Nov-08	Nov-09	Nov-10	Nov-11
TCE MCL = 5	10.3	6.4	5.4	4.5	3.8
cis-1,2 DCE MCL = 70	37	35	31	35	29
Vinyl Chloride MCL = 2	1.6	0.5	0.6	1.7	0.2

OU-1 Historical LTM Results via On-site GC Analysis

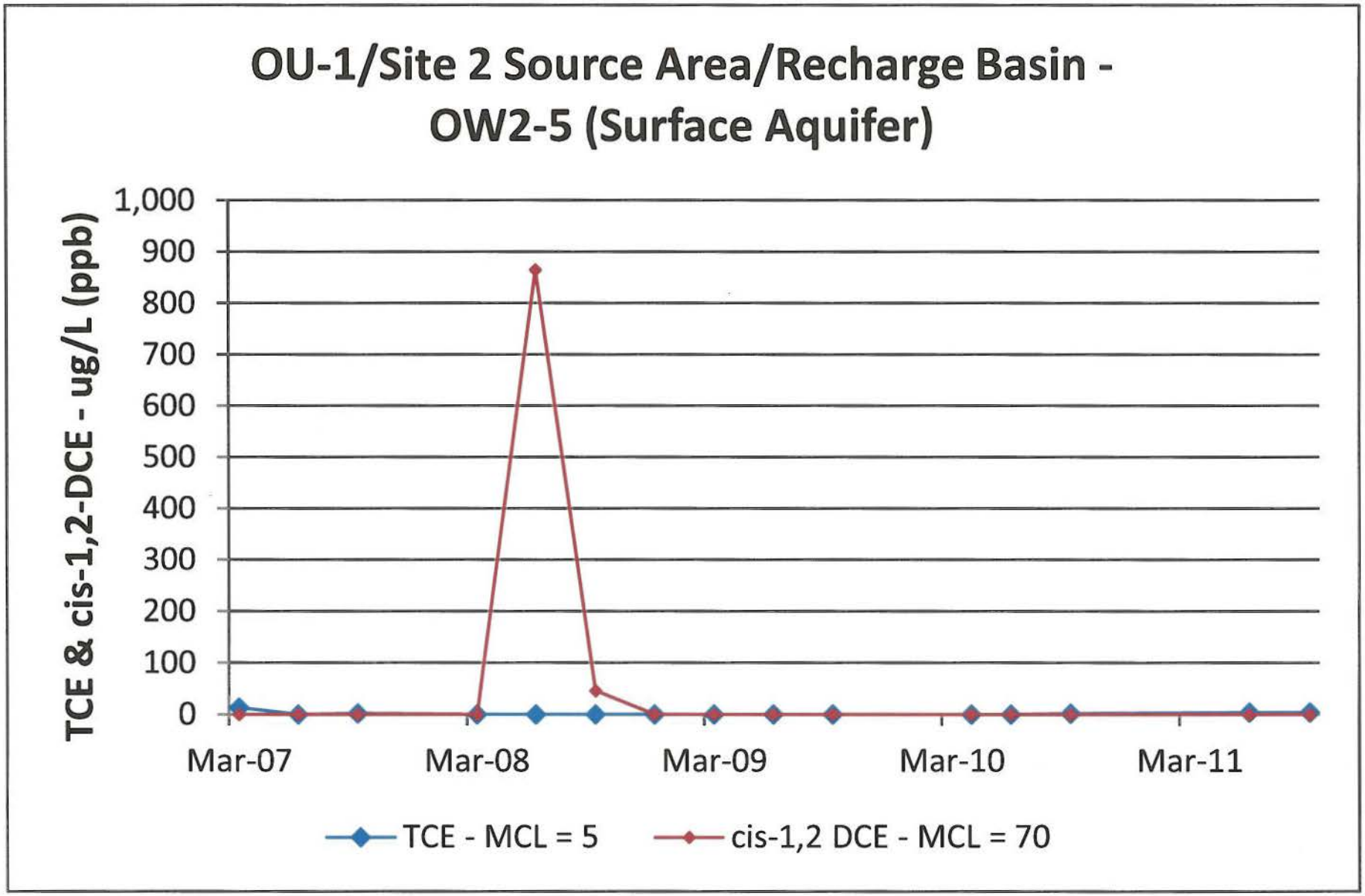


This chart based on on-site GC results

OU-1 Historical LTM Results via both Off-site Laboratory On-site GC

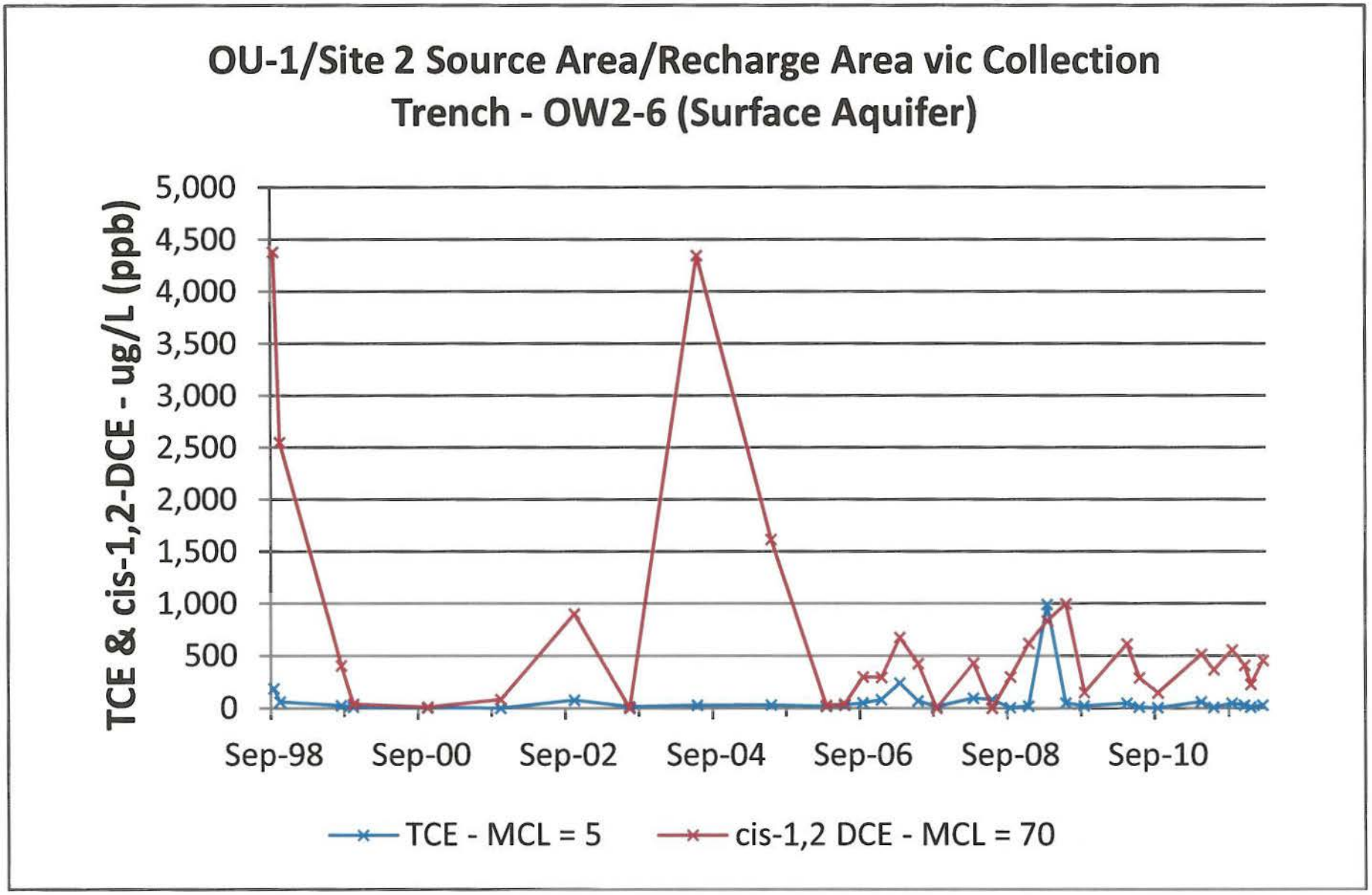


OU-1 Historical LTM Results via On-site GC Analysis



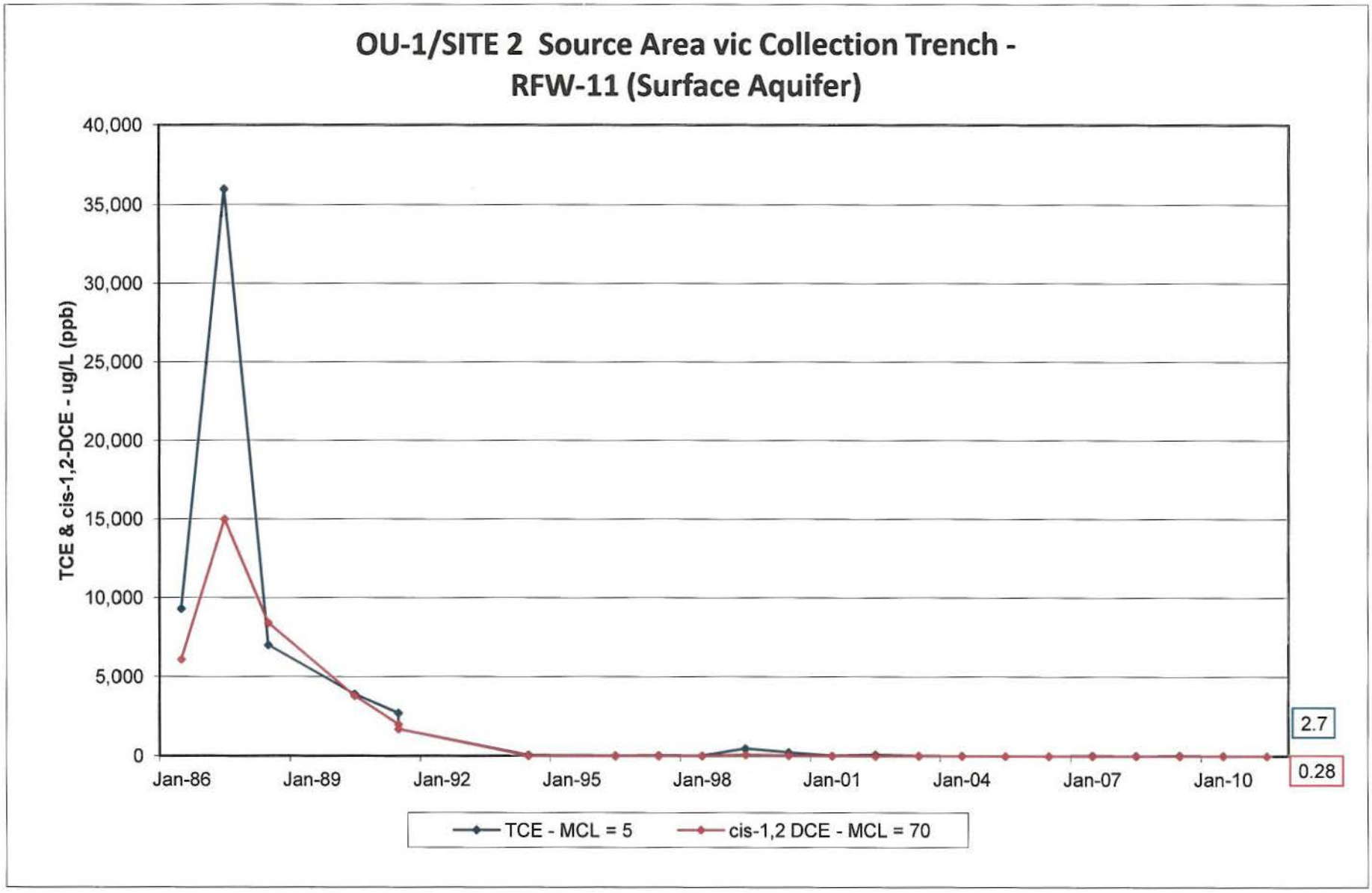
This chart based on on-site GC results

OU-1 Historical LTM Results via On-site GC Analysis

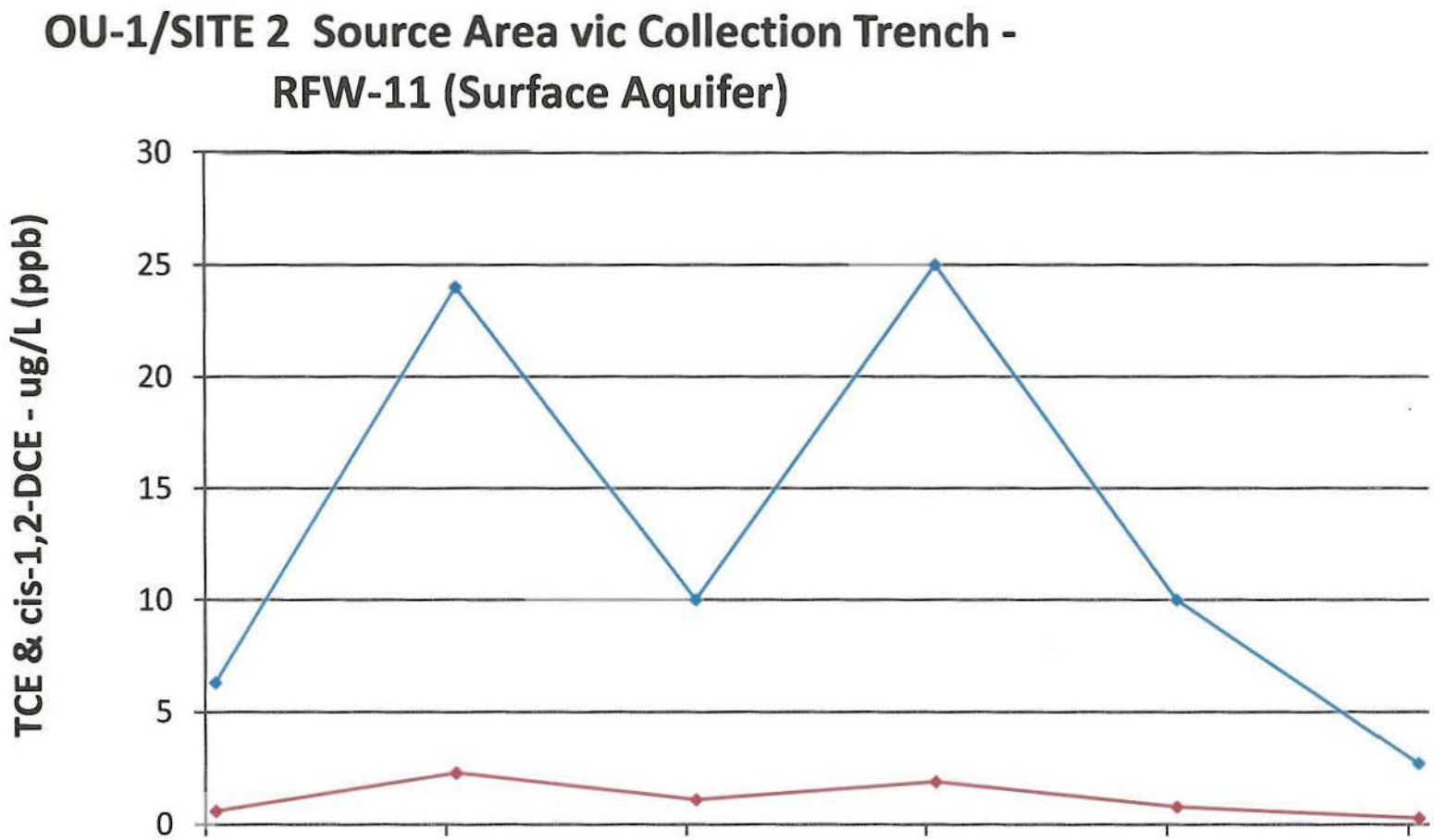


This chart based on on-site GC results

OU-1 Historical LTM Results via Off-site Laboratory

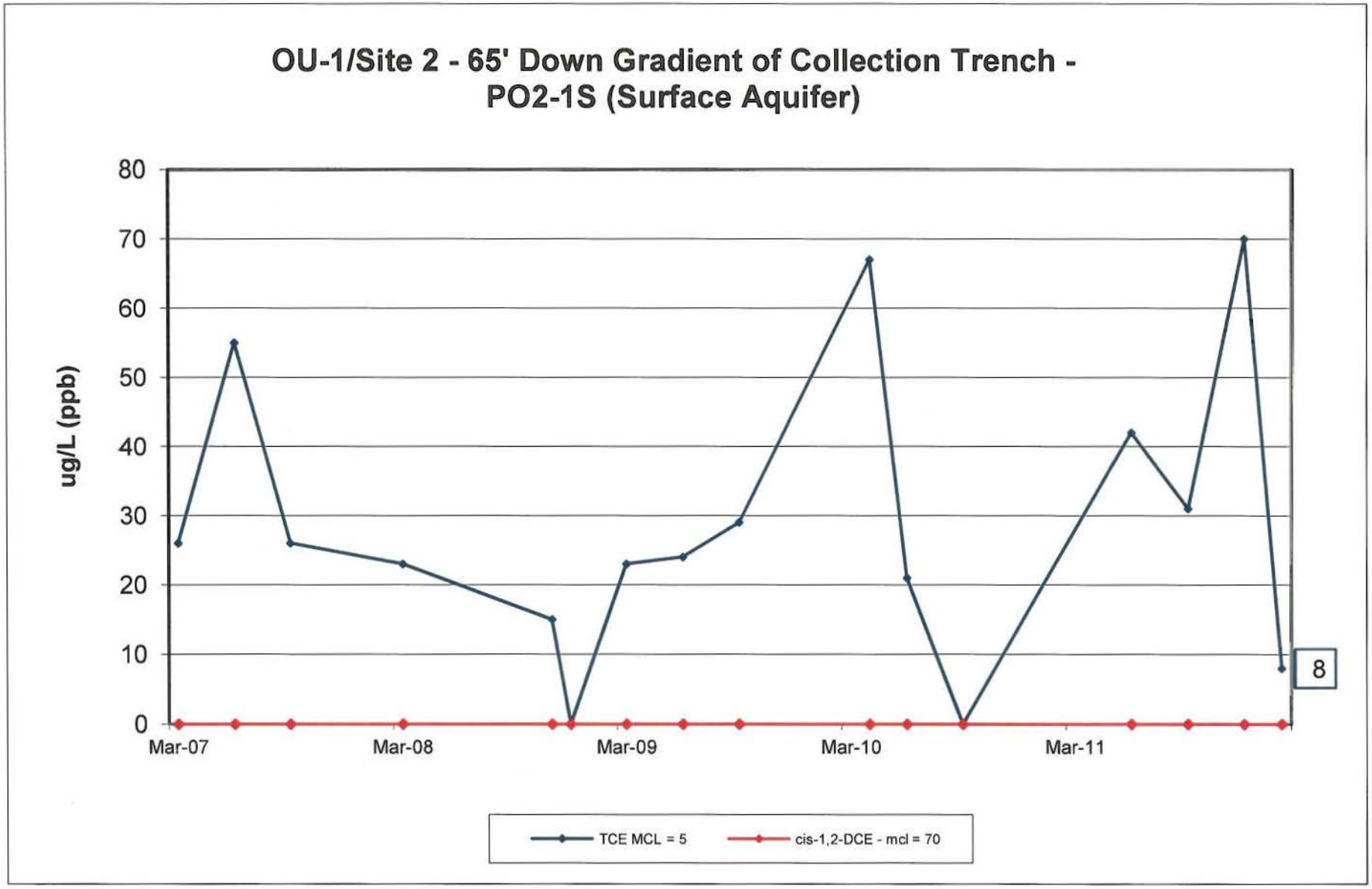


OU-1 Historical LTM Results via Off-site Laboratory



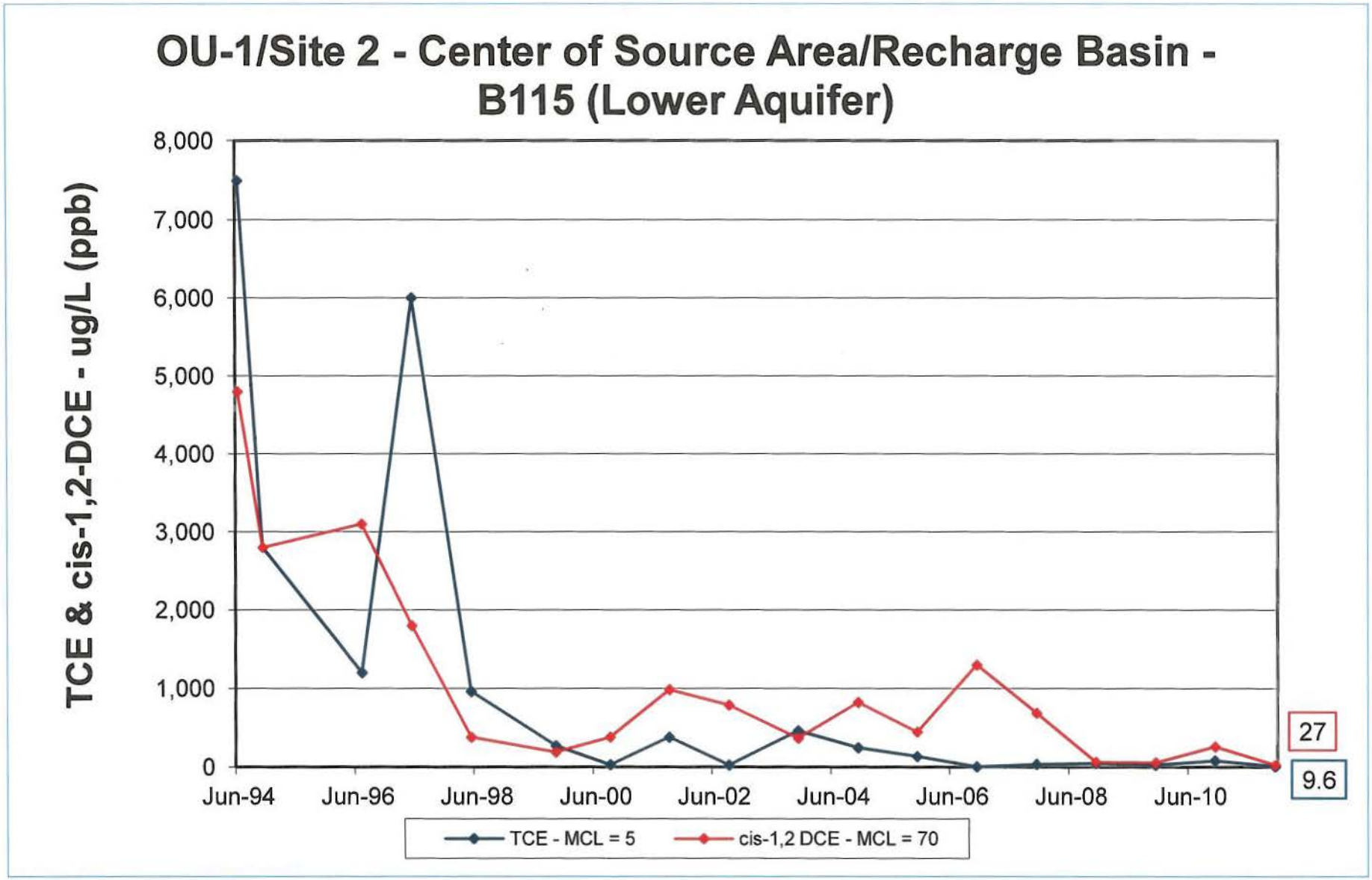
	Nov-06	Nov-07	Nov-08	Nov-09	Nov-10	Nov-11
TCE - MCL = 5	6.3	24	10	25	10	2.7
cis-1,2 DCE - MCL = 70	0.6	2.3	1.1	1.9	0.8	0.3

OU-1 Historical LTM Results via On-site GC Analysis



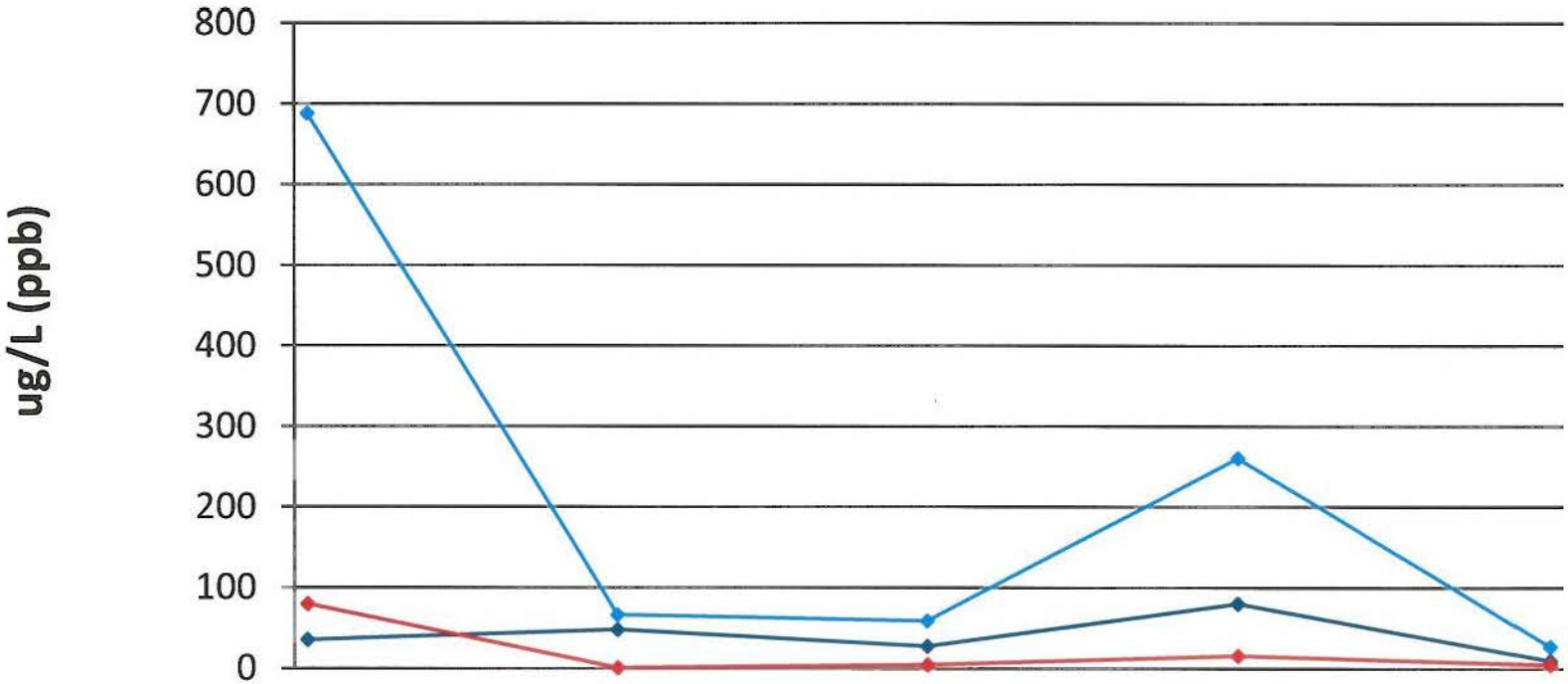
This chart based on on-site GC results

OU-1 Historical LTM Results via Off-site Laboratory



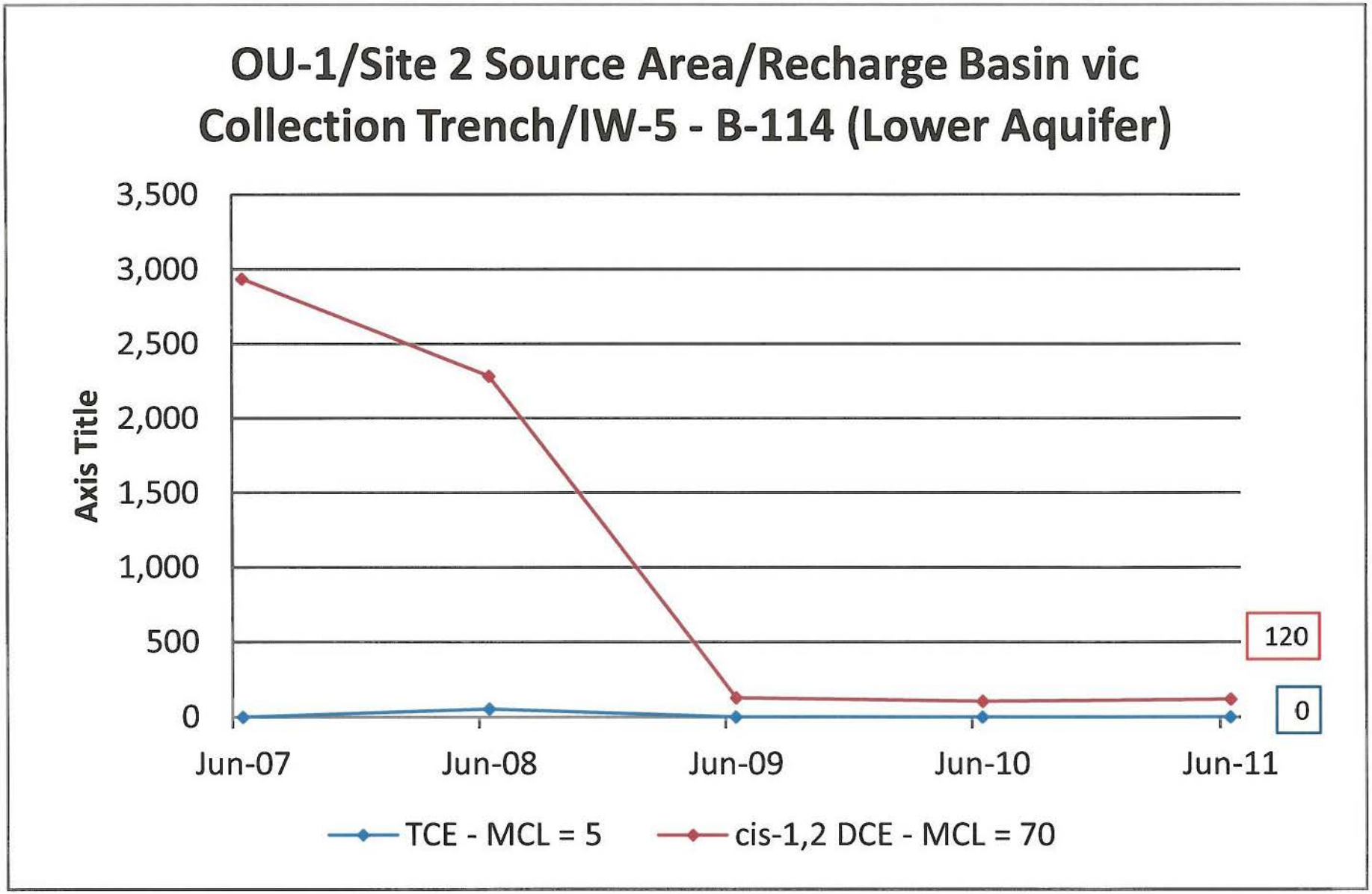
OU-1 Historical LTM Results via Off-site Laboratory

OU-1/Site 2 - Center of Source Area/Recharge Basin - B115 (Lower Aquifer)



	Nov-07	Nov-08	Nov-09	Nov-10	Nov-11
TCE MCL = 5	36	48	28	80	9.6
cis-1,2 DCE MCL = 70	688	66	59	260	27
Vinyl Chloride MCL = 2	80	1.1	4.8	16	5.1

OU-1 Historical LTM Results via On-site GC Analysis

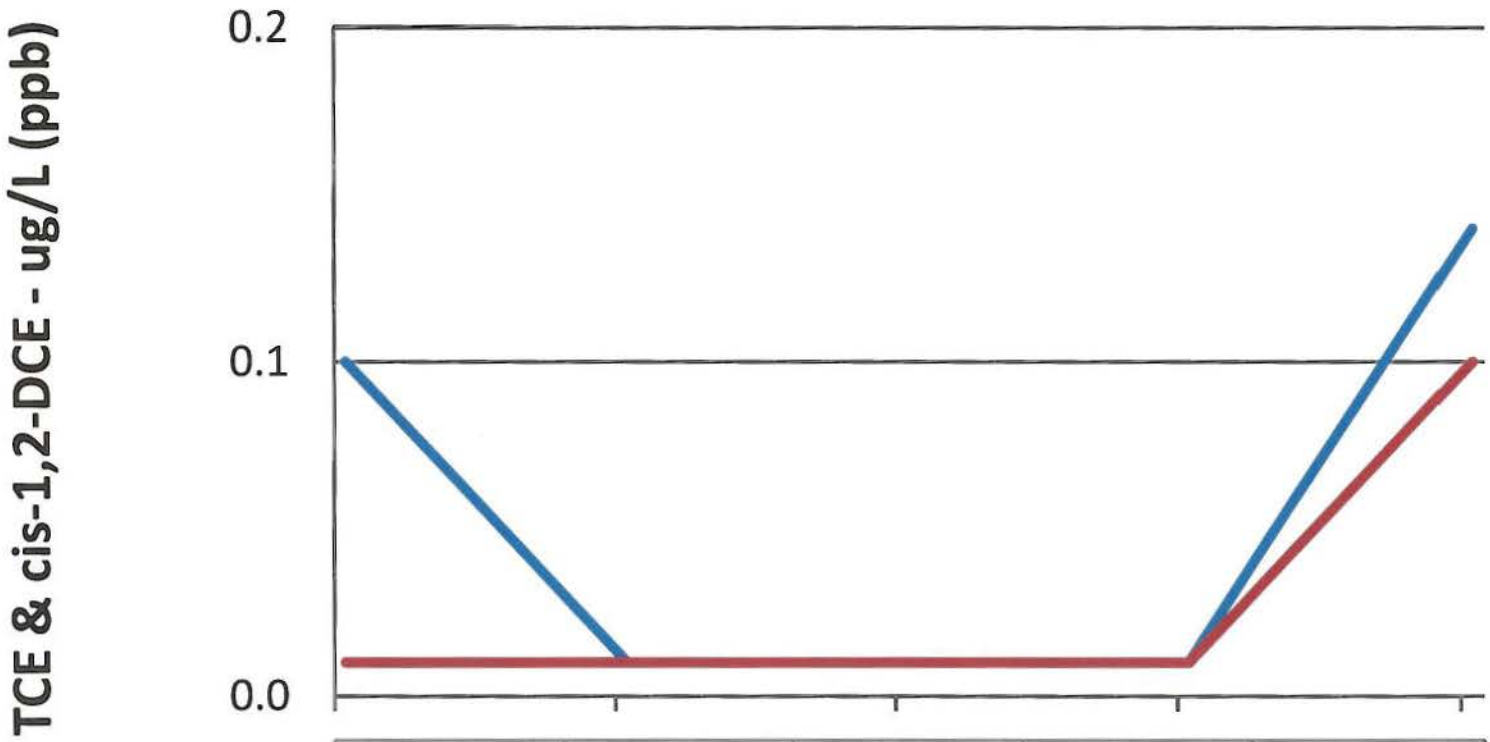


This chart based on on-site GC results

S2-Boundary 2010 - Apr 2012

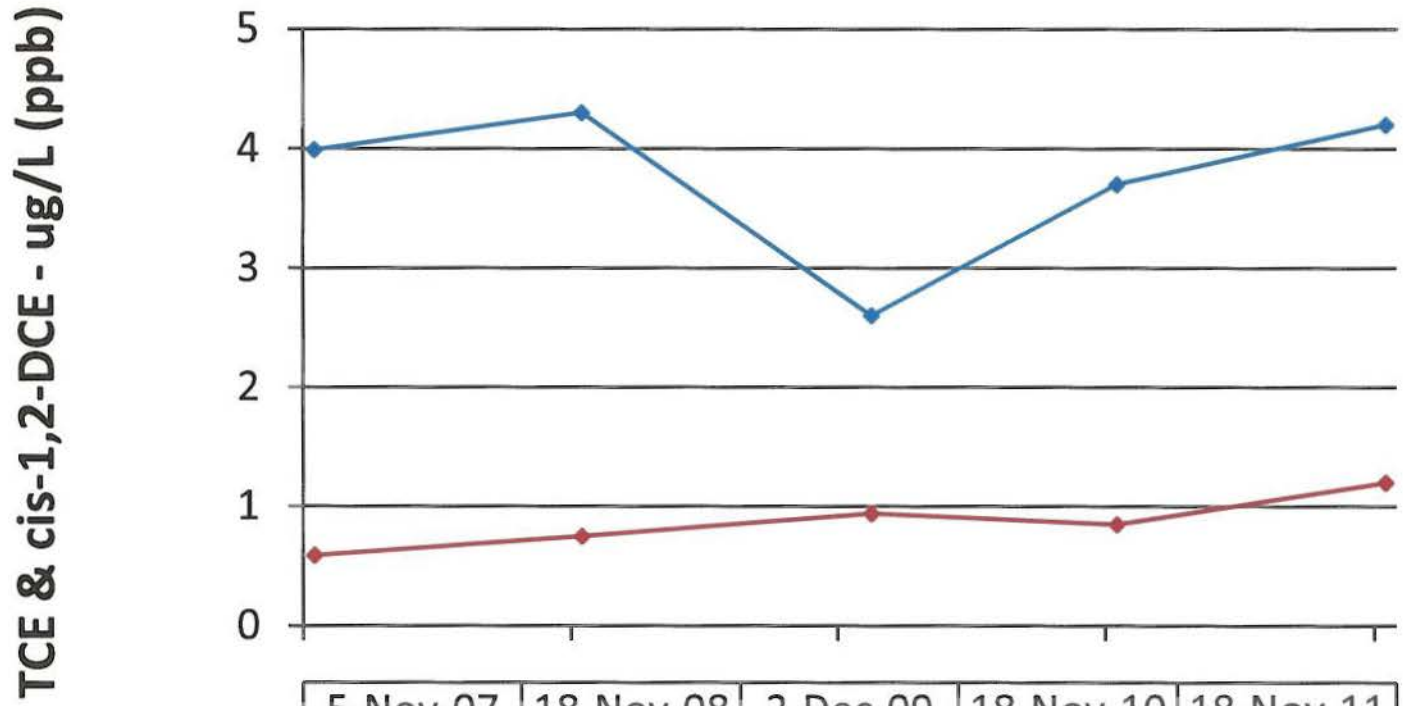
OU-1 Historical LTM Results via Off-site Laboratory

OU-1 Hanscom Field-Hartwell Forest Boundary - PT-1RA between BIW-1 & BIW-2 (Bedrock Aquifer)



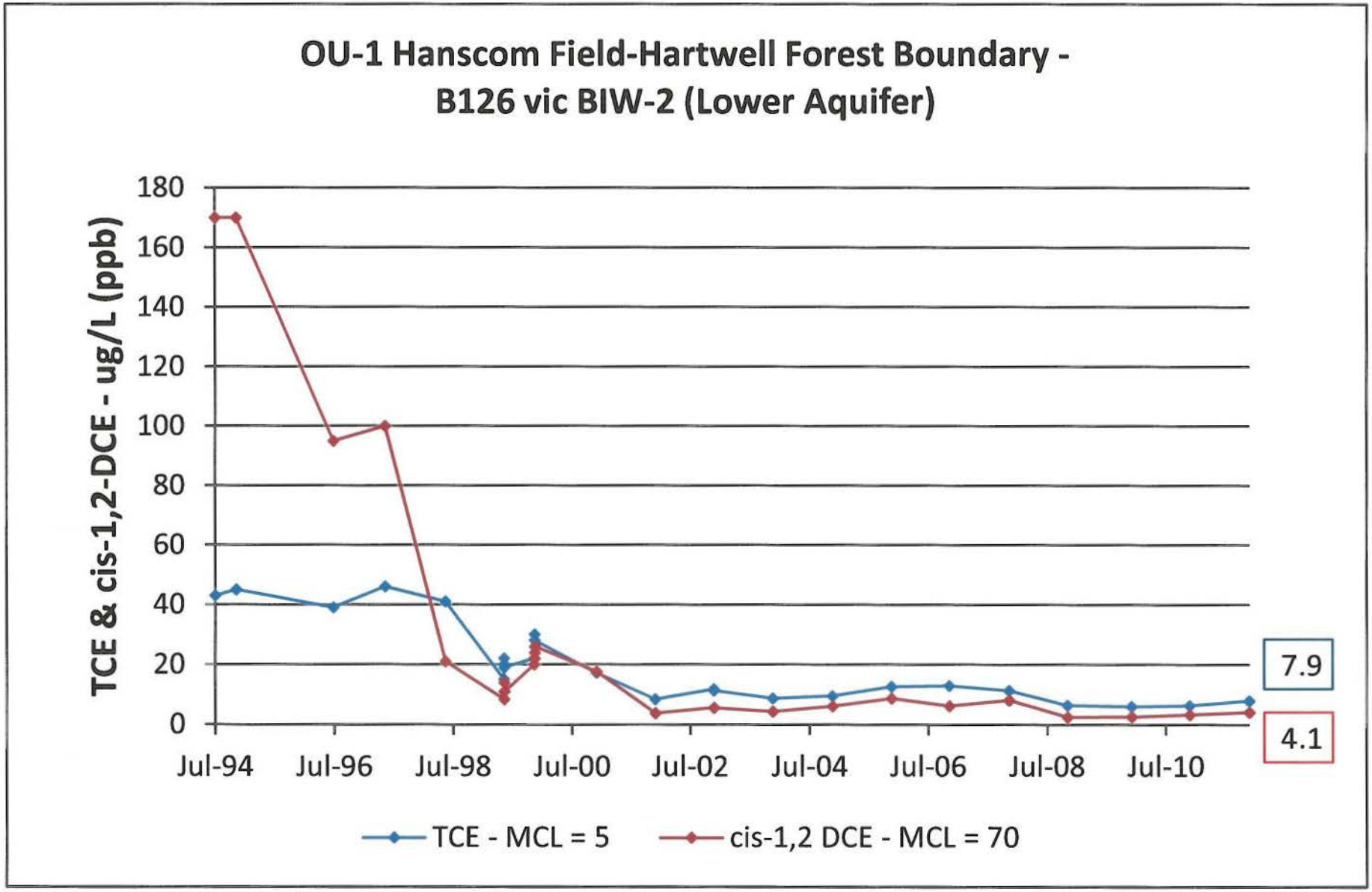
	Nov-07	Nov-08	Dec-09	Nov-10	Nov-11
TCE - MCL = 5	0.10	0	0	0	0.14
cis-1,2 DCE - MCL = 70	0	0	0	0	0.10

OU-1 Historical LTM Results via Off-site Laboratory

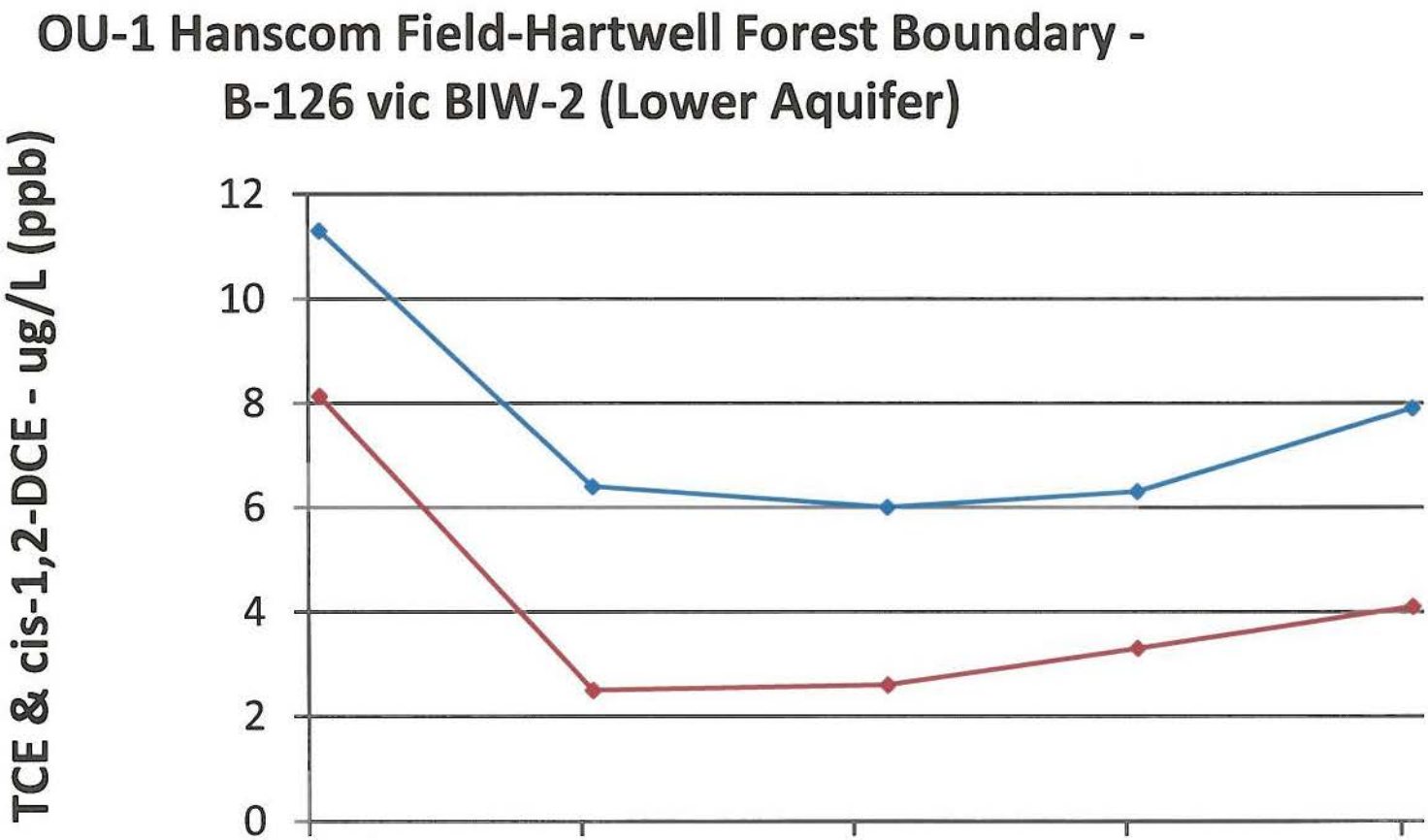


	5-Nov-07	18-Nov-08	2-Dec-09	18-Nov-10	18-Nov-11
TCE - MCL = 5	4.0	4.3	2.6	3.7	4.2
cis-1,2 DCE - MCL = 70	0.6	0.8	0.9	0.9	1.2

OU-1 Historical LTM Results via Off-site Laboratory

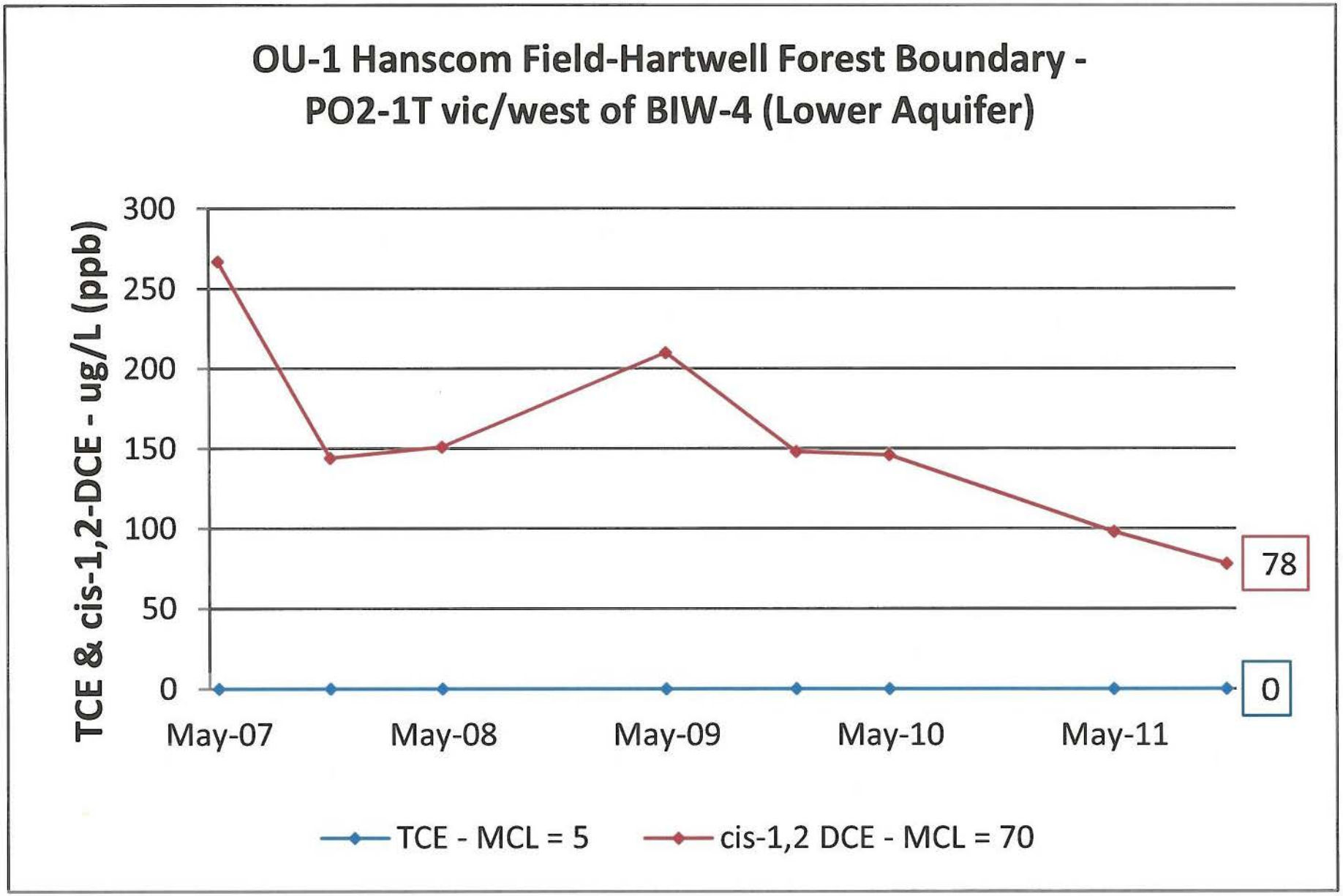


OU-1 Historical LTM Results via Off-site Laboratory



	Nov-07	Nov-08	Dec-09	Nov-10	Nov-11
TCE - MCL = 5	11.3	6.4	6.0	6.3	7.9
cis-1,2 DCE - MCL = 70	8.1	2.5	2.6	3.3	4.1

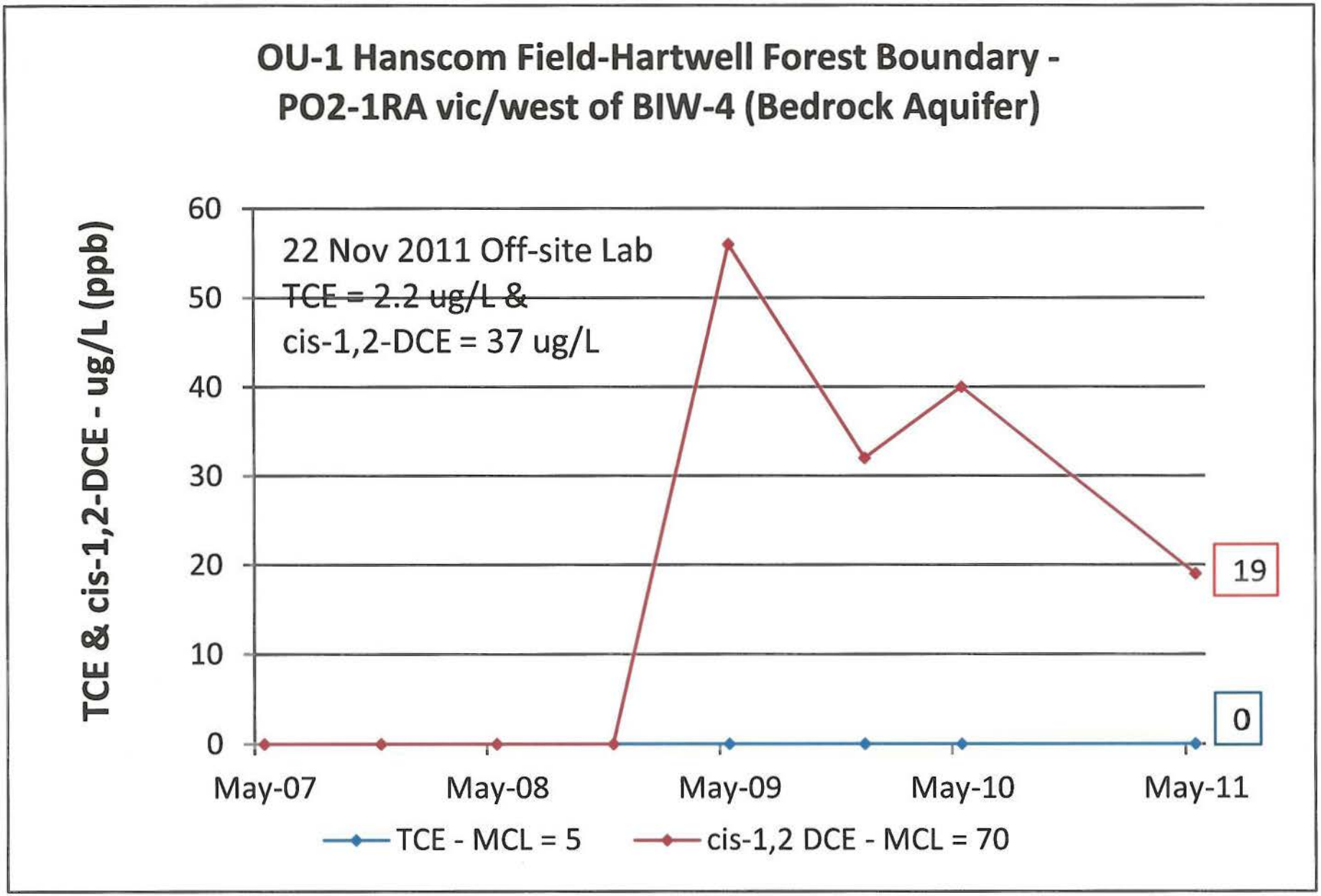
OU-1 Historical LTM Results via On-site GC Analysis



This chart based on on-site GC results

S2-Boundary 2010 - Apr 2012

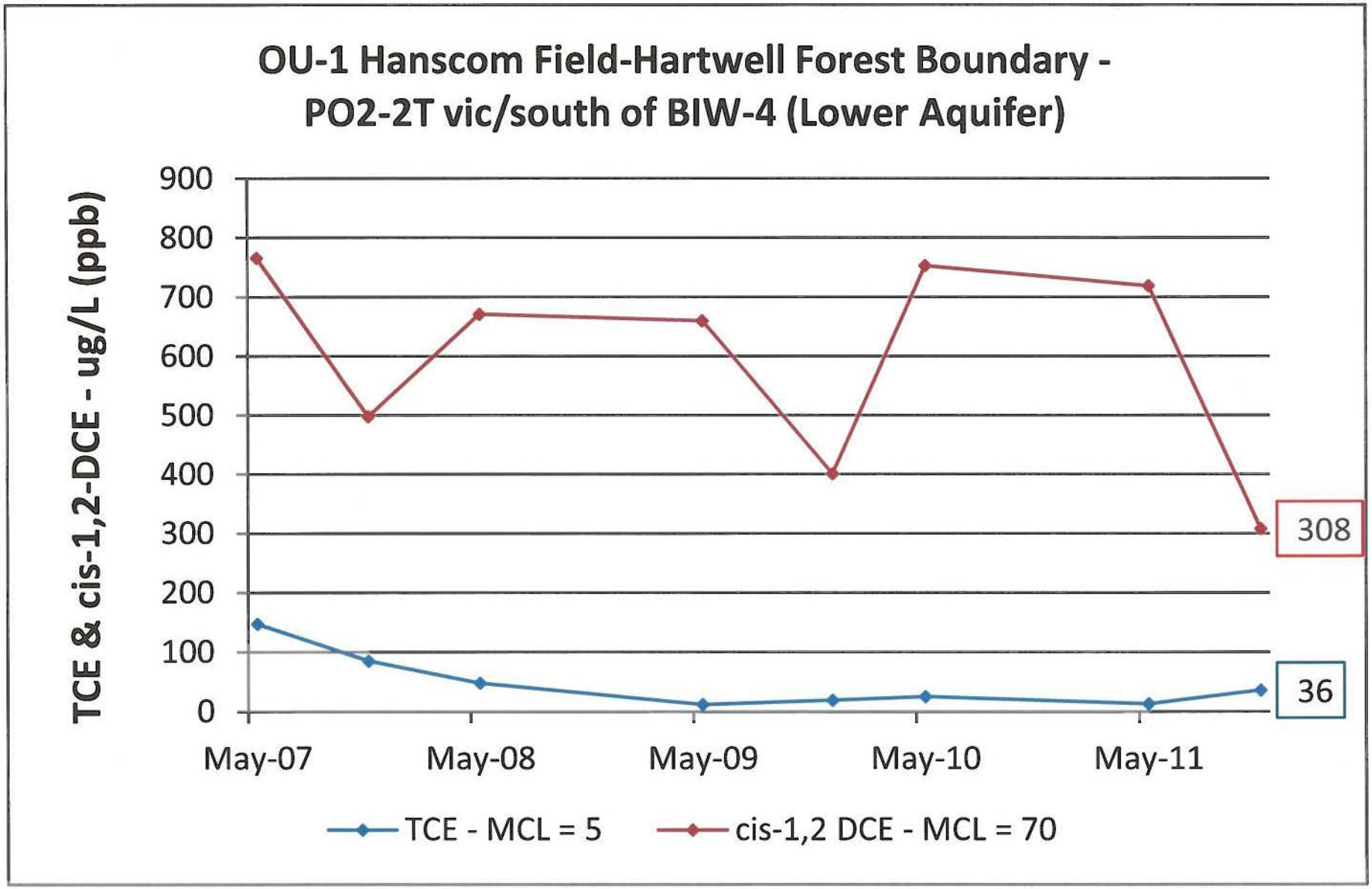
OU-1 Historical LTM Results via On-site GC Analysis



This chart based on on-site GC results

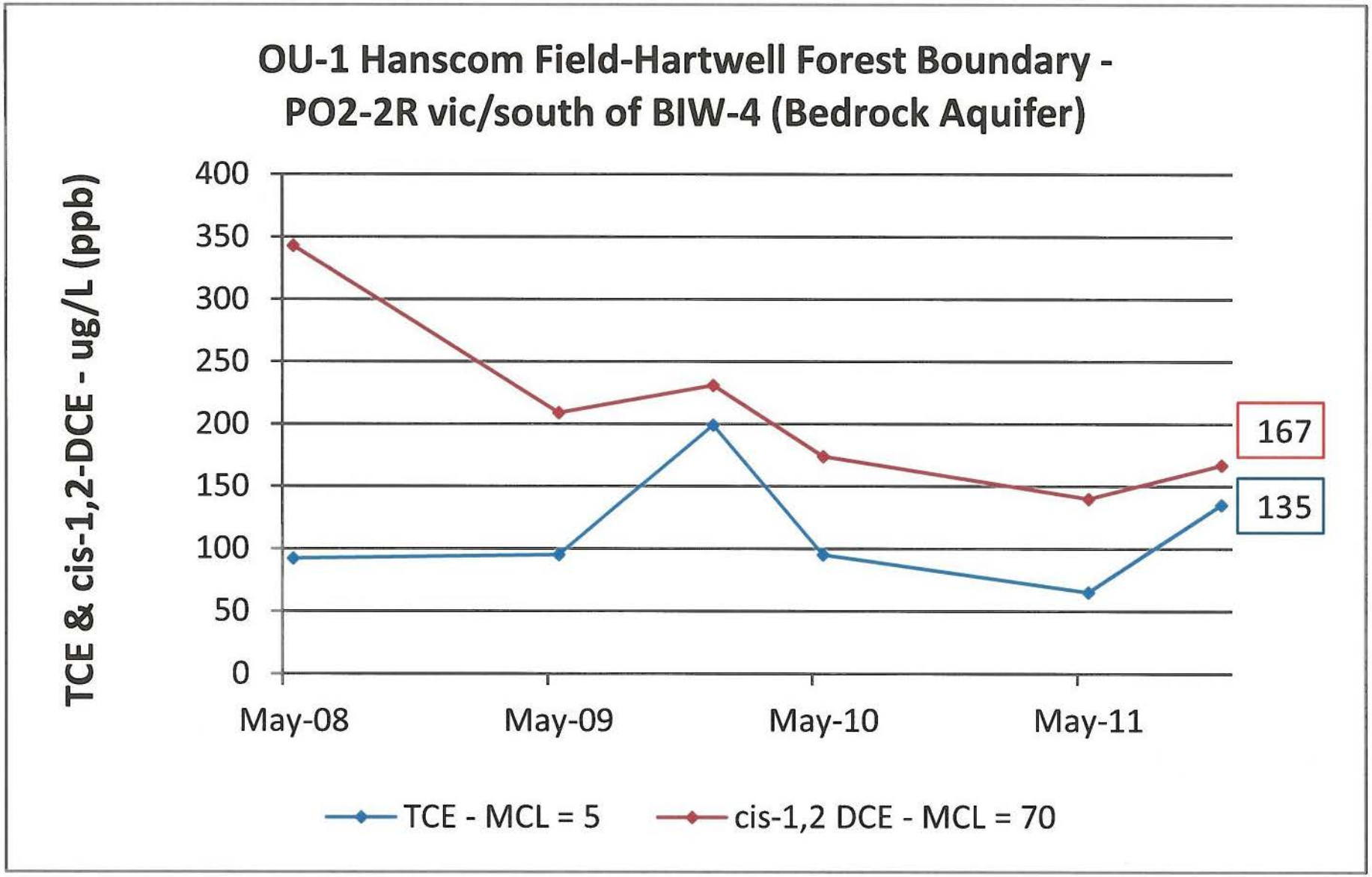
S2-Boundary 2010 - Apr 2012

OU-1 Historical LTM Results via On-site GC Analysis



This chart based on on-site GC results

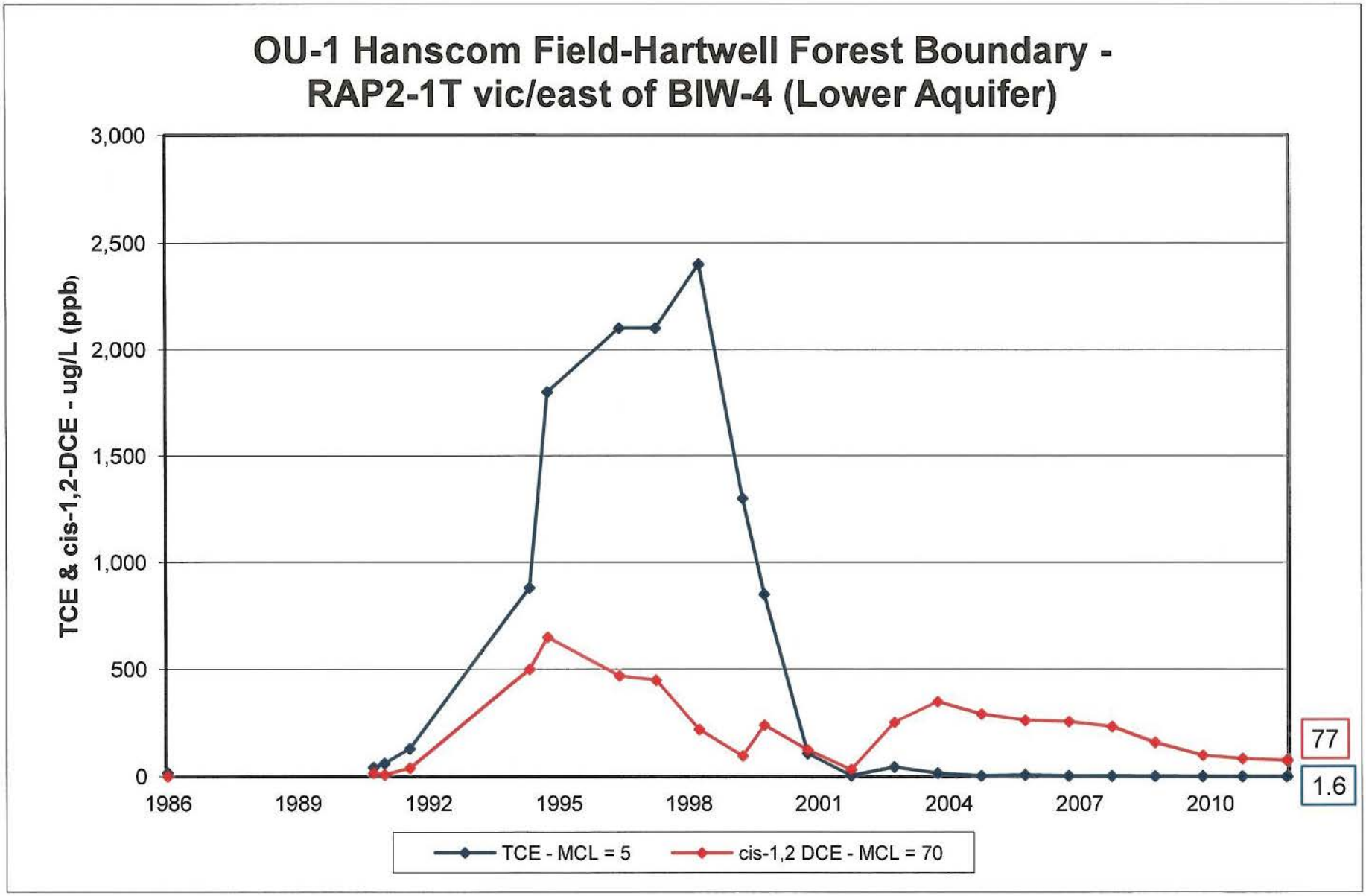
OU-1 Historical LTM Results via On-site GC Analysis



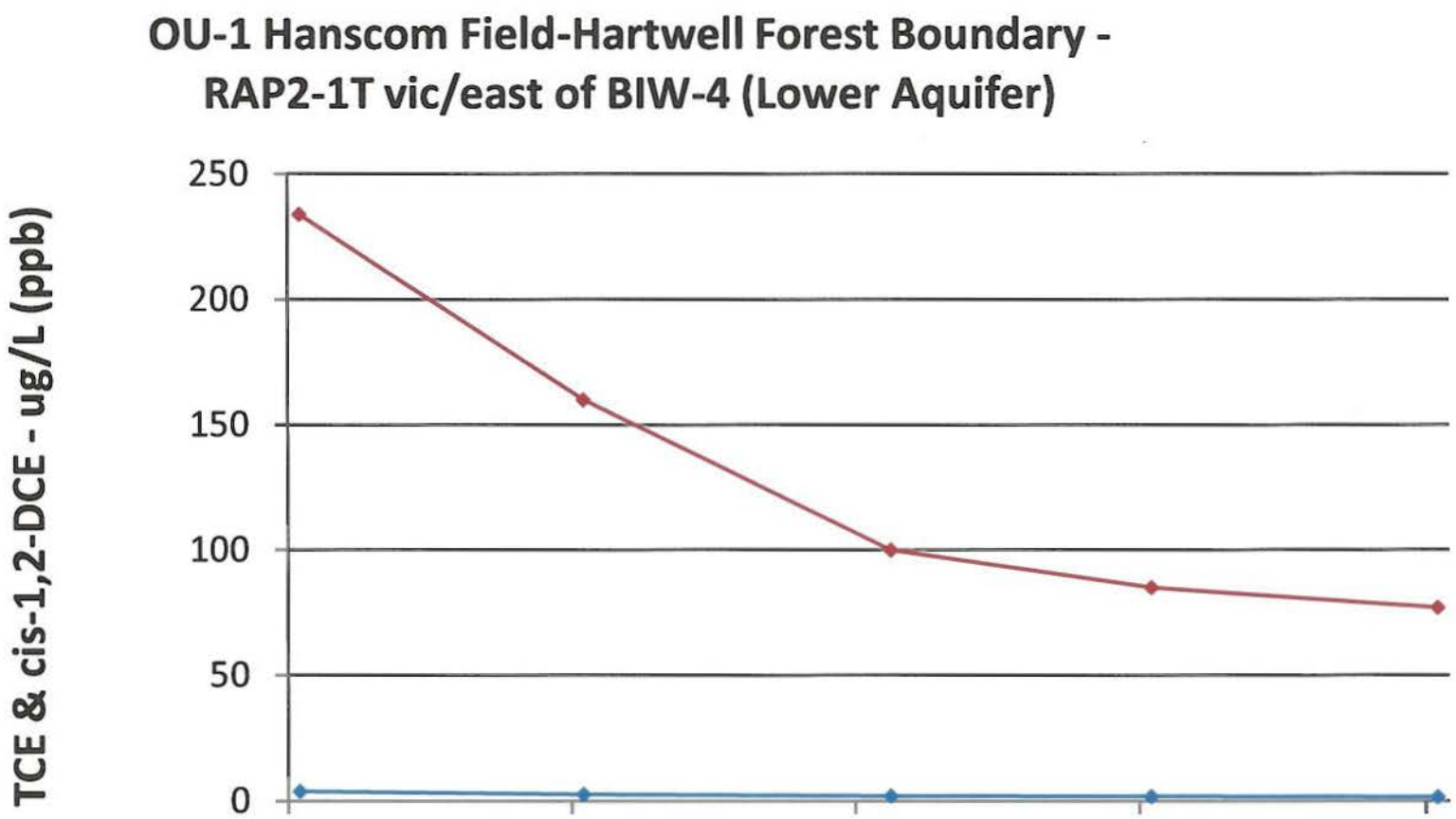
This chart based on on-site GC results

S2-Boundary 2010 - Apr 2012

OU-1 Historical LTM Results via Off-site Laboratory

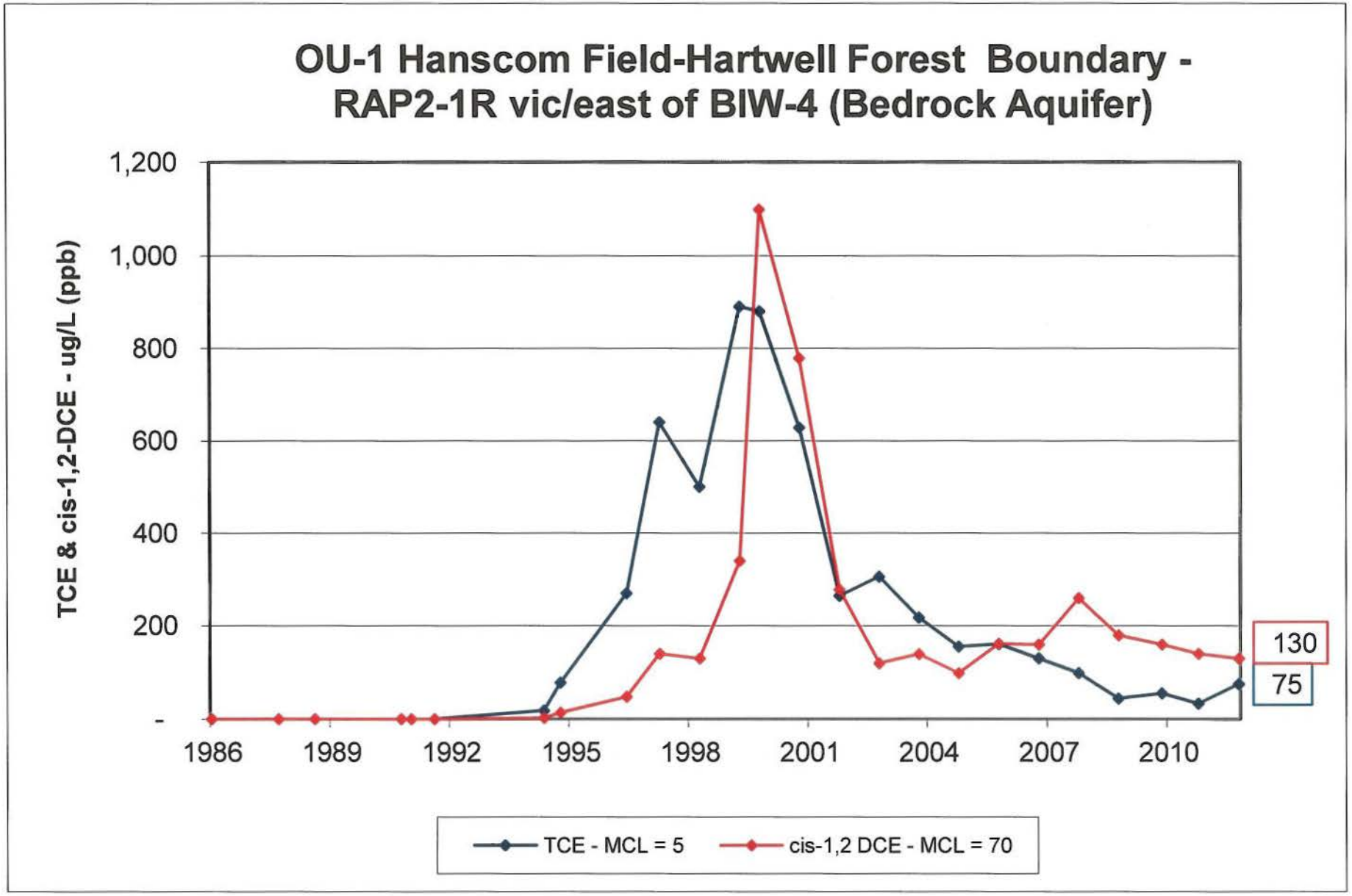


OU-1 Historical LTM Results via Off-site Laboratory

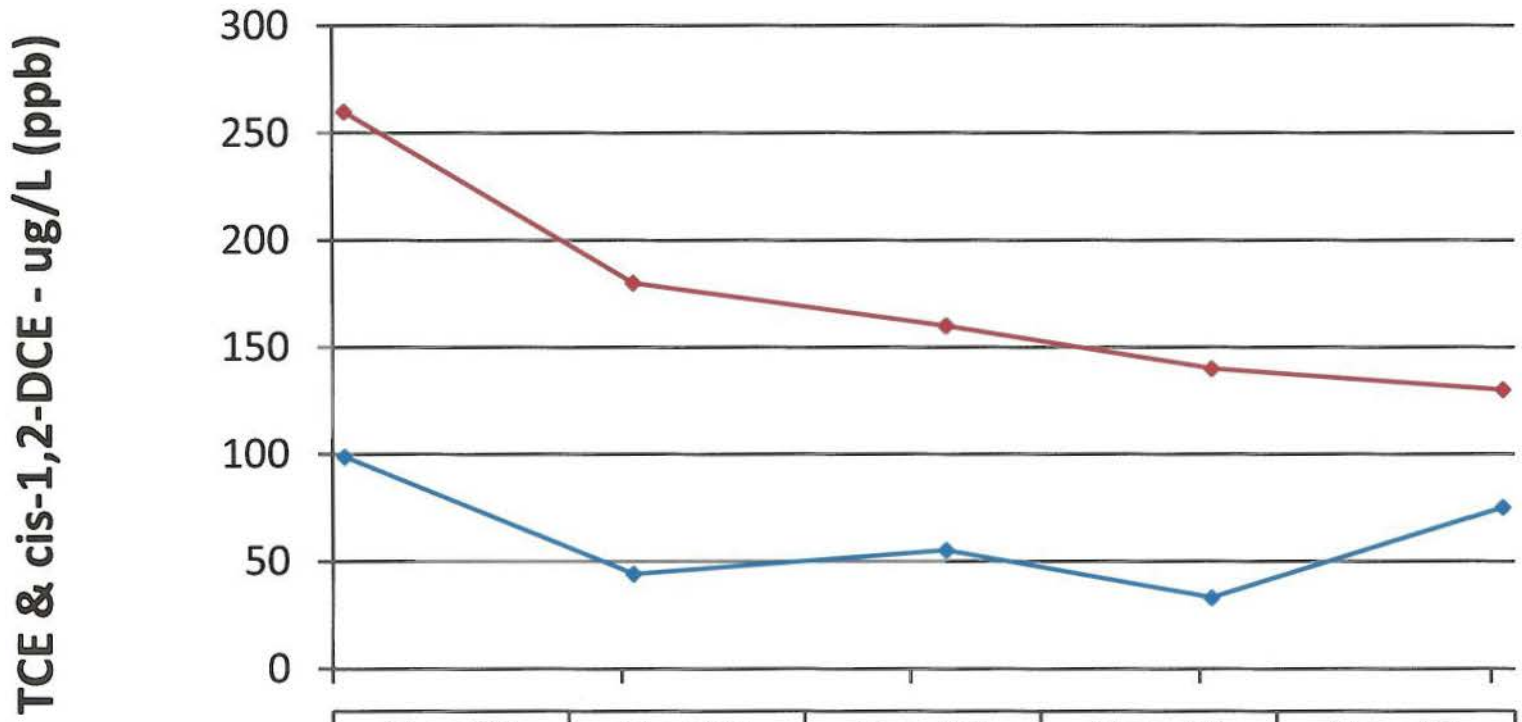


	Nov-07	Nov-08	Dec-09	Nov-10	Nov-11
TCE - MCL = 5	3.8	2.6	2	1.8	1.6
cis-1,2 DCE - MCL = 70	234	160	100	85	77

OU-1 Historical LTM Results via Off-site Laboratory

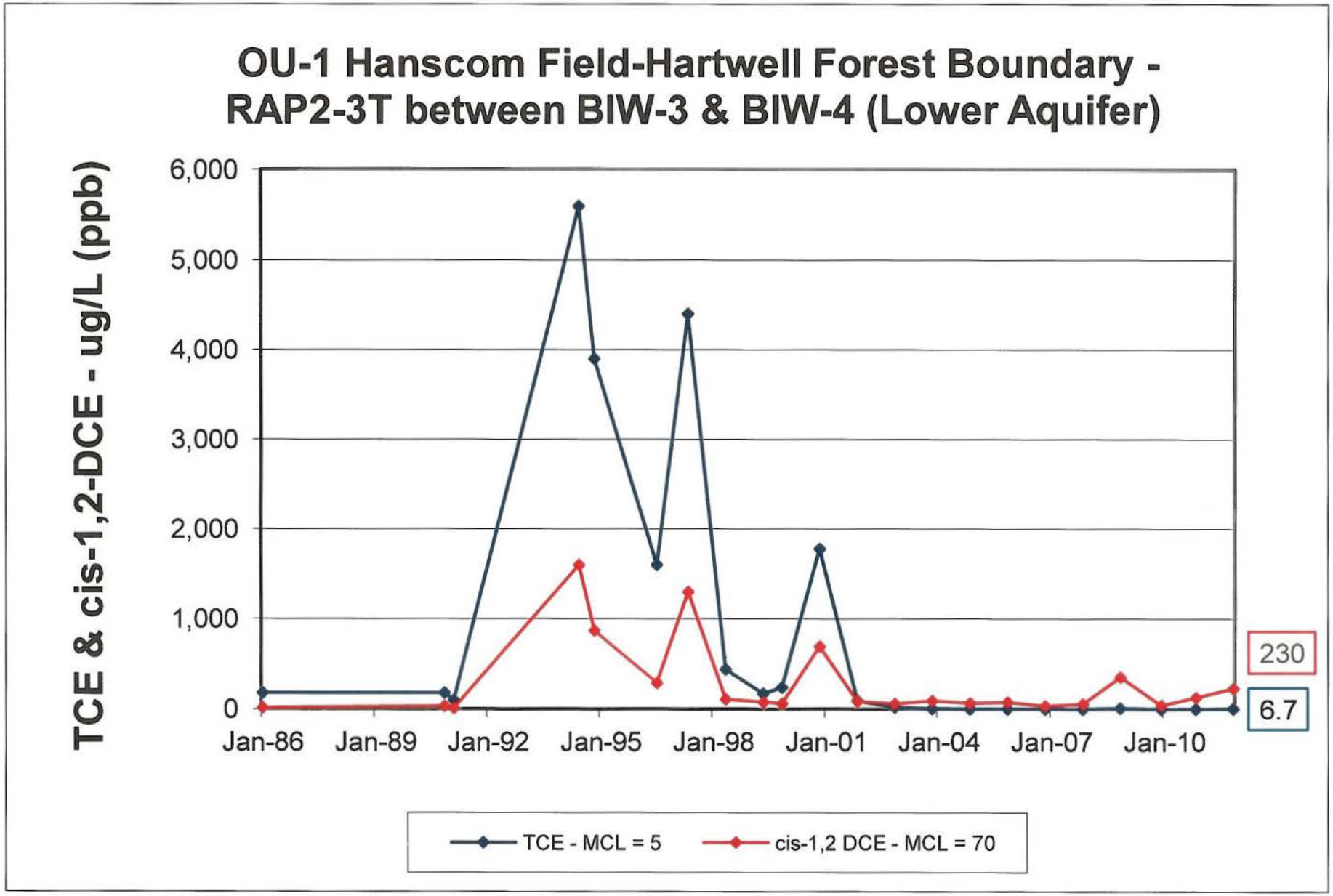


OU-1 Historical LTM Results via Off-site Laboratory

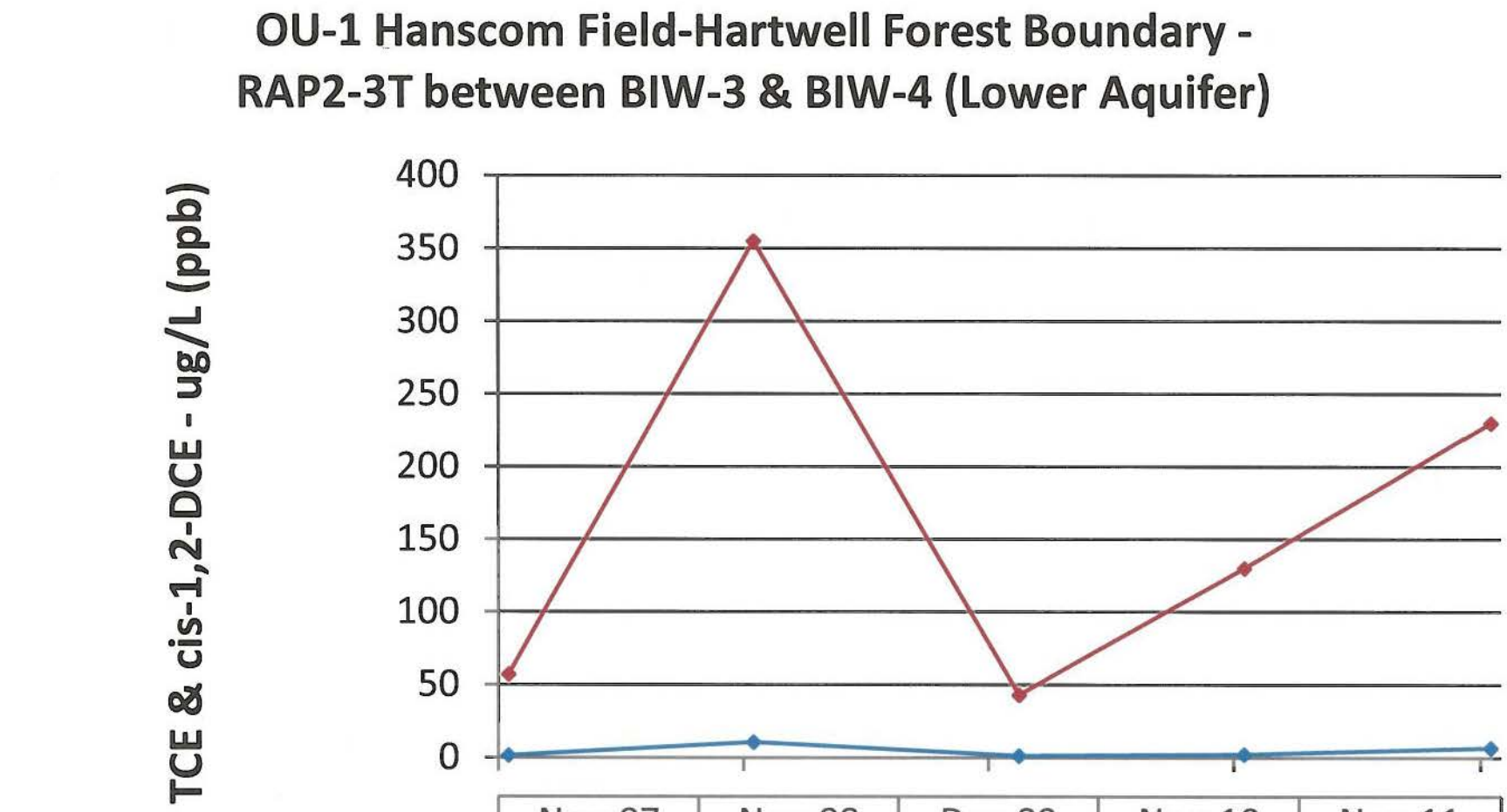


	Nov-07	Nov-08	Dec-09	Nov-10	Nov-11
TCE - MCL = 5	99	44	55	33	75
cis-1,2 DCE - MCL = 70	260	180	160	140	130

OU-1 Historical LTM Results via Off-site Laboratory

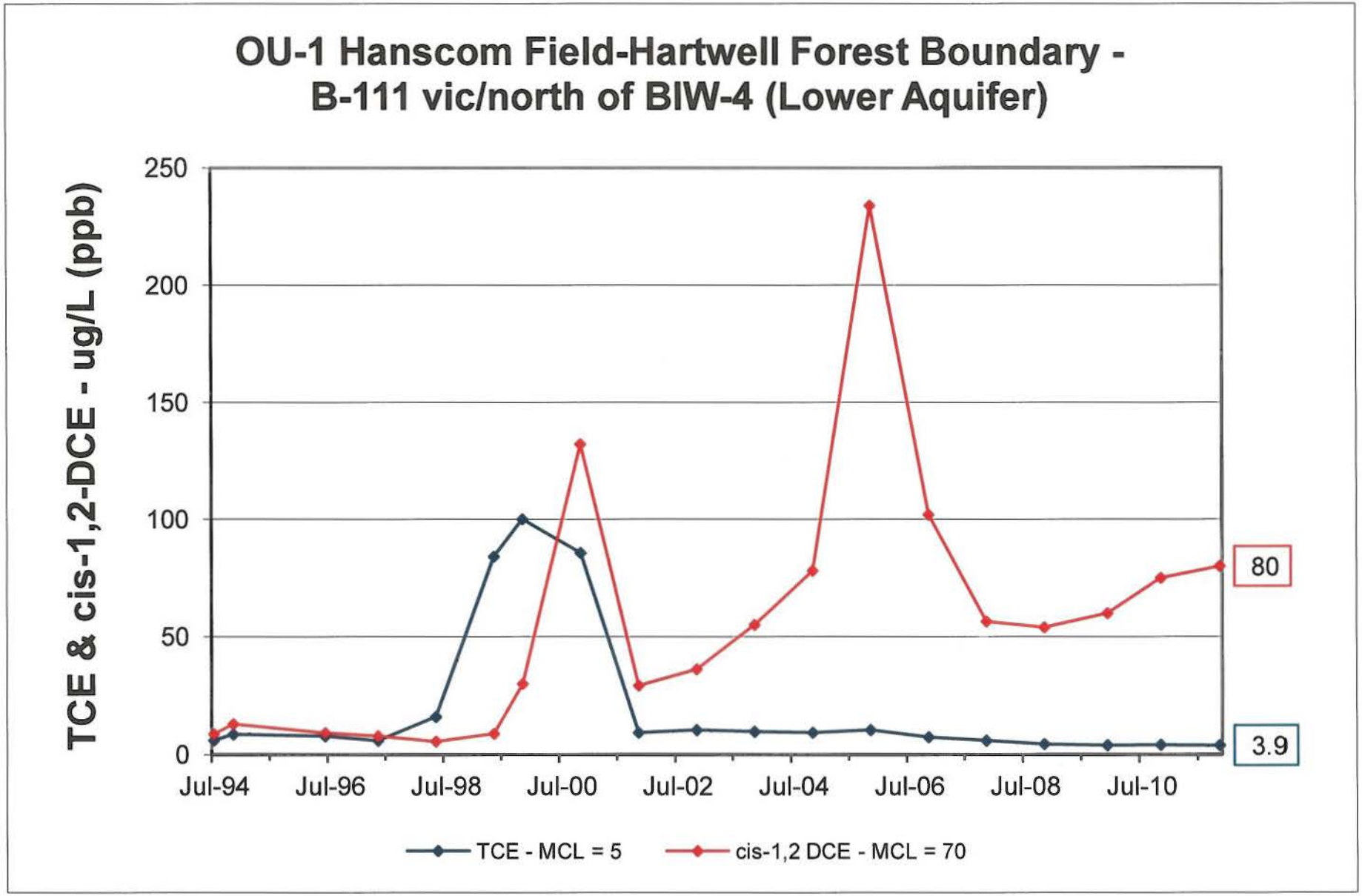


OU-1 Historical LTM Results via Off-site Laboratory

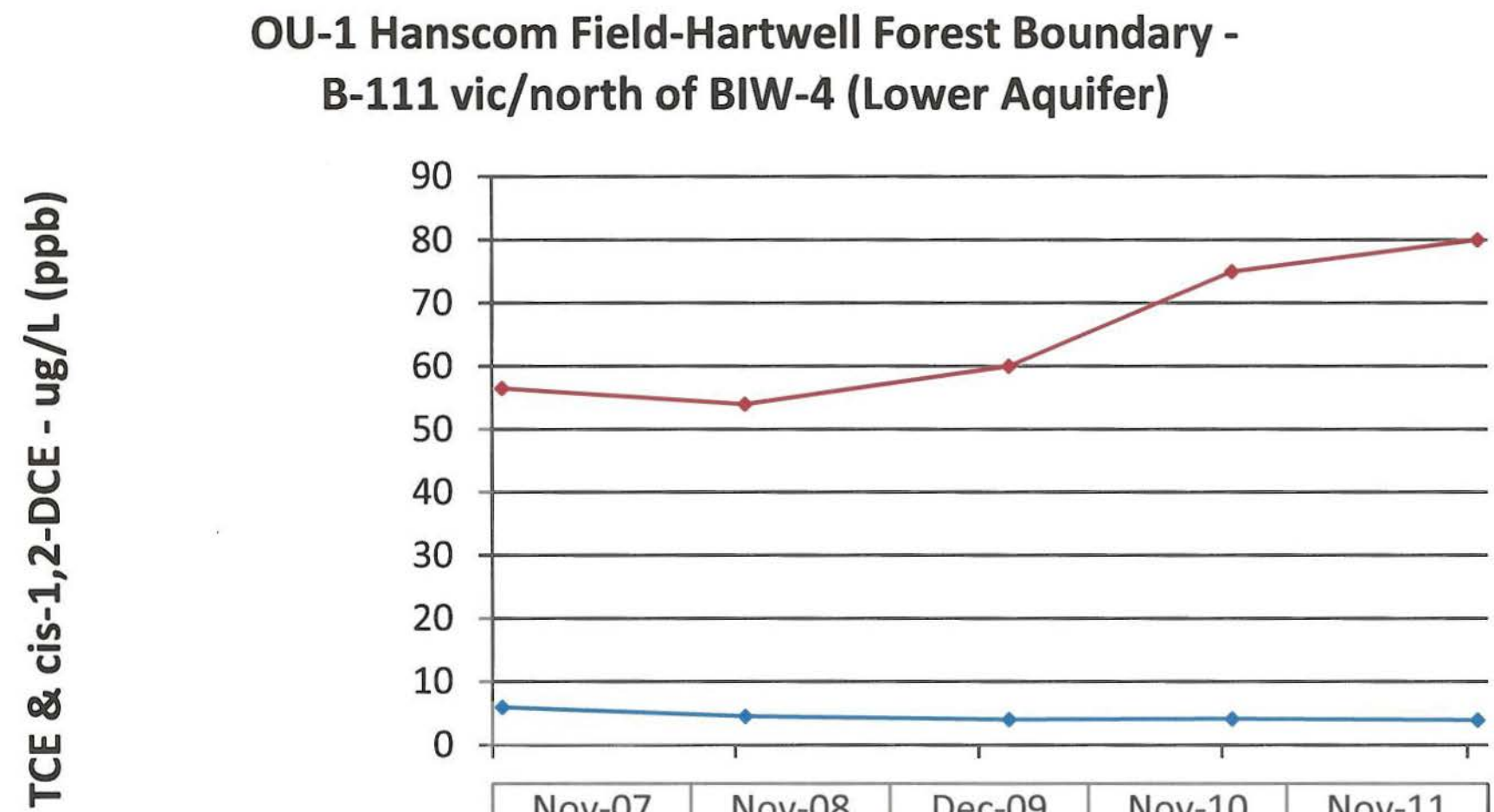


	Nov-07	Nov-08	Dec-09	Nov-10	Nov-11
TCE - MCL = 5	1.6	10.5	1.3	2.3	6.7
cis-1,2 DCE - MCL = 70	57	355	43	130	230

OU1 Historical LTM Results via Off-site Laboratory

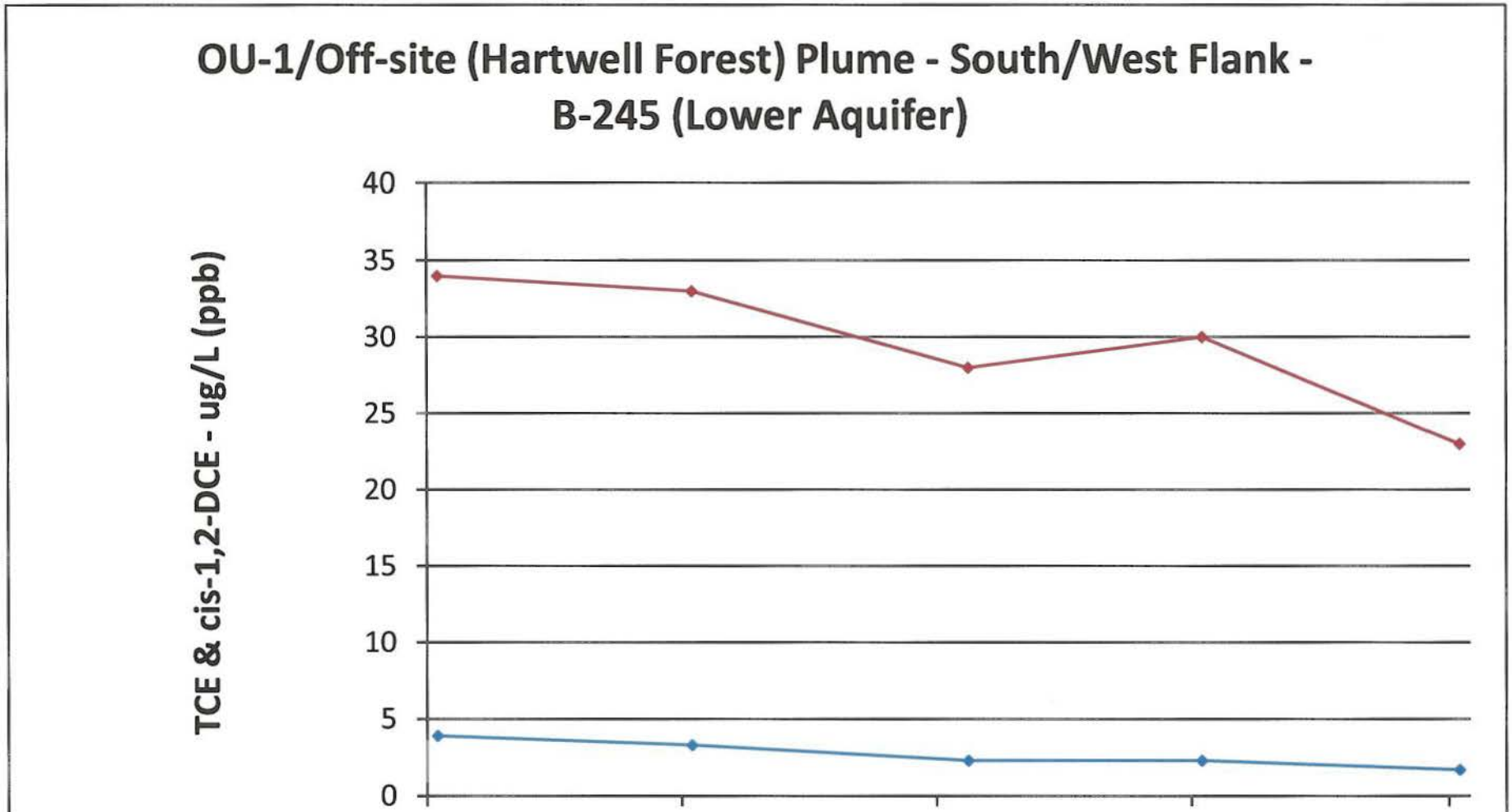


OU-1 Historical LTM Results via Off-site Laboratory



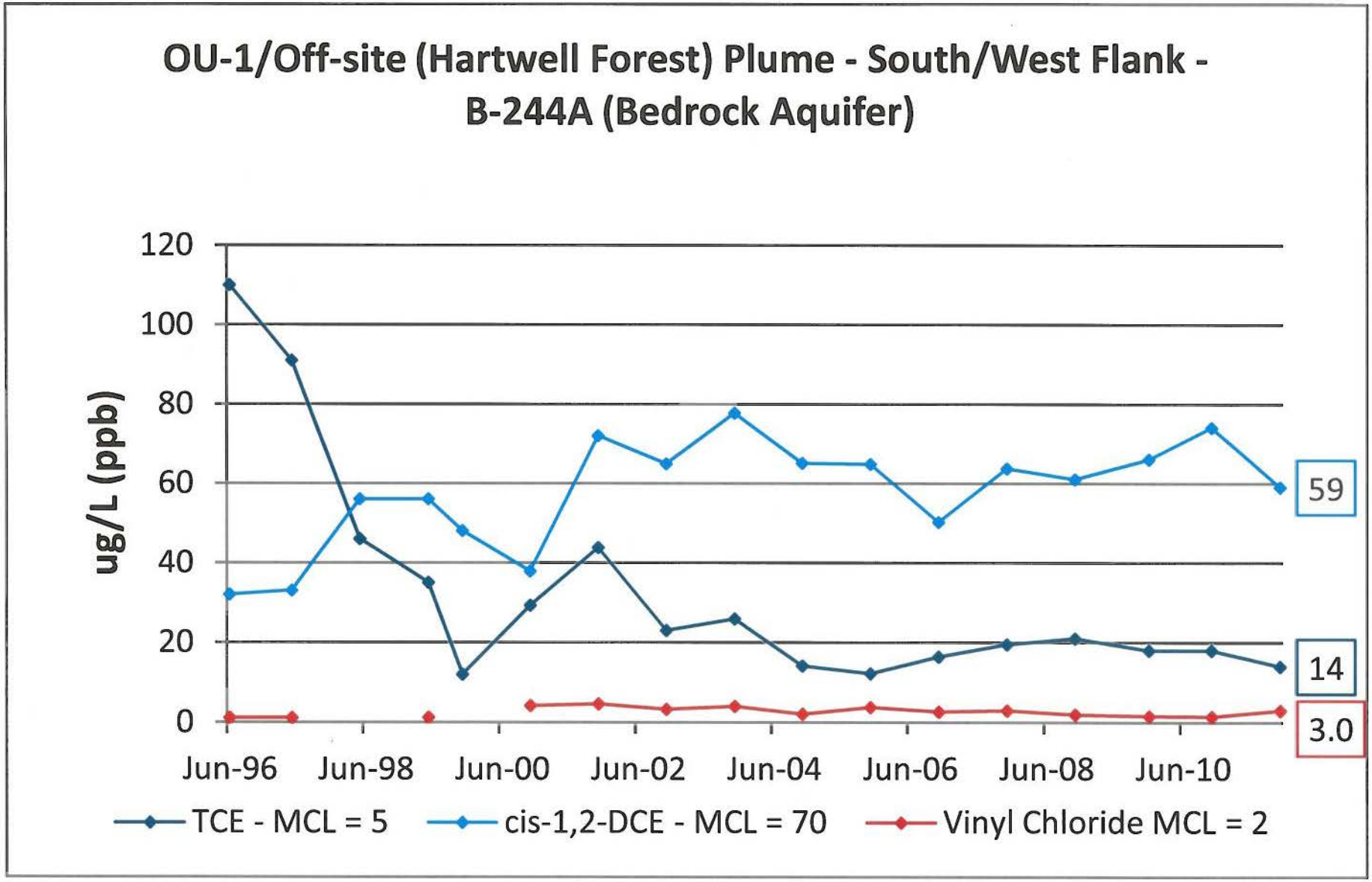
	Nov-07	Nov-08	Dec-09	Nov-10	Nov-11
TCE - MCL = 5	5.9	4.5	4	4.1	3.9
cis-1,2 DCE - MCL = 70	57	54	60	75	80

OU-1 Historical LTM Results via Off-site Laboratory

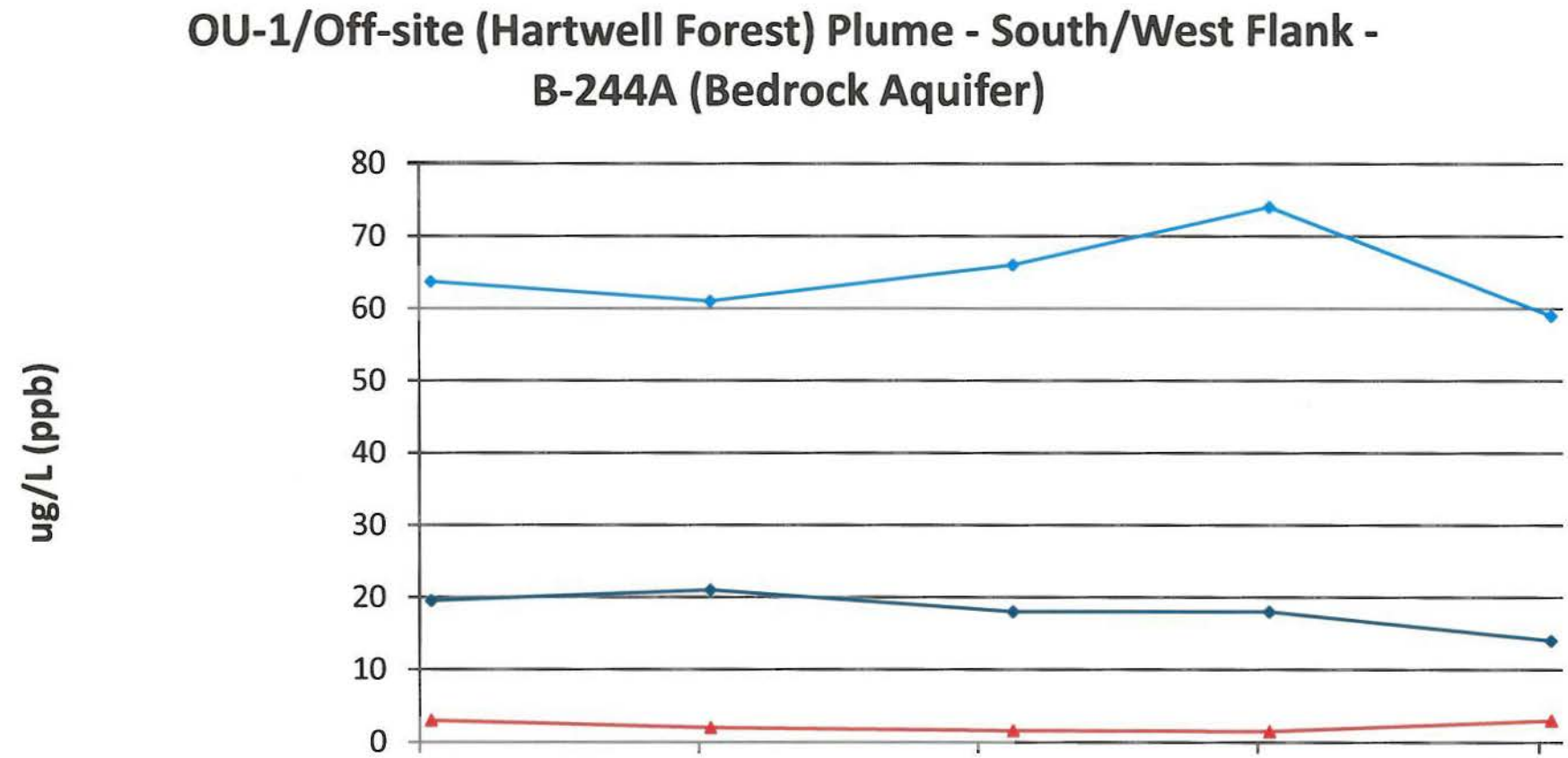


	Nov-07	Nov-08	Dec-09	Nov-10	Nov-11
TCE - MCL = 5	3.9	3.3	2.3	2.3	1.7
cis-1,2 DCE - MCL = 70	34	33	28	30	23

OU-1 Historical LTM Results via Off-site Laboratory

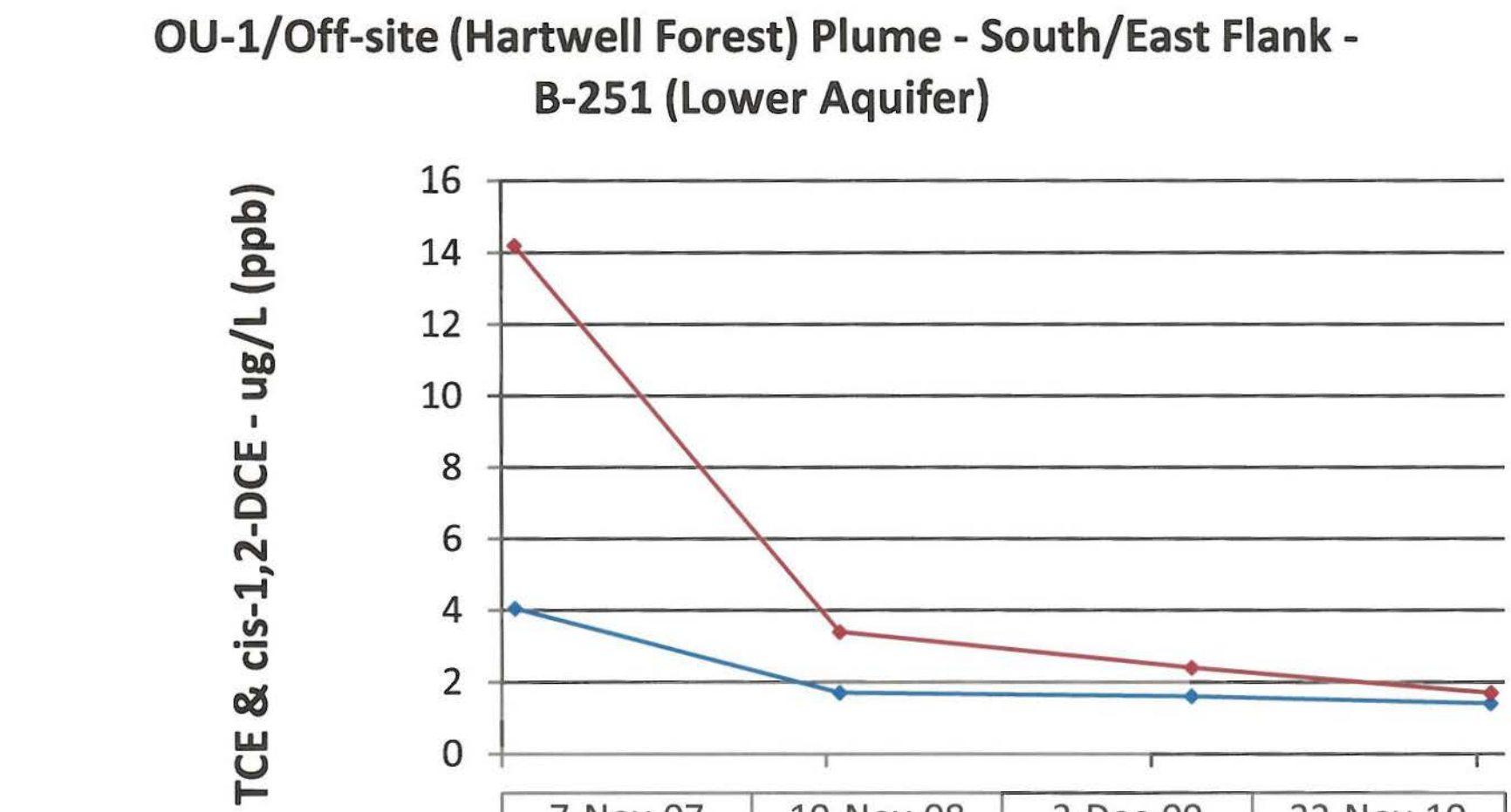


OU-1 Historical LTM Results via Off-site Laboratory



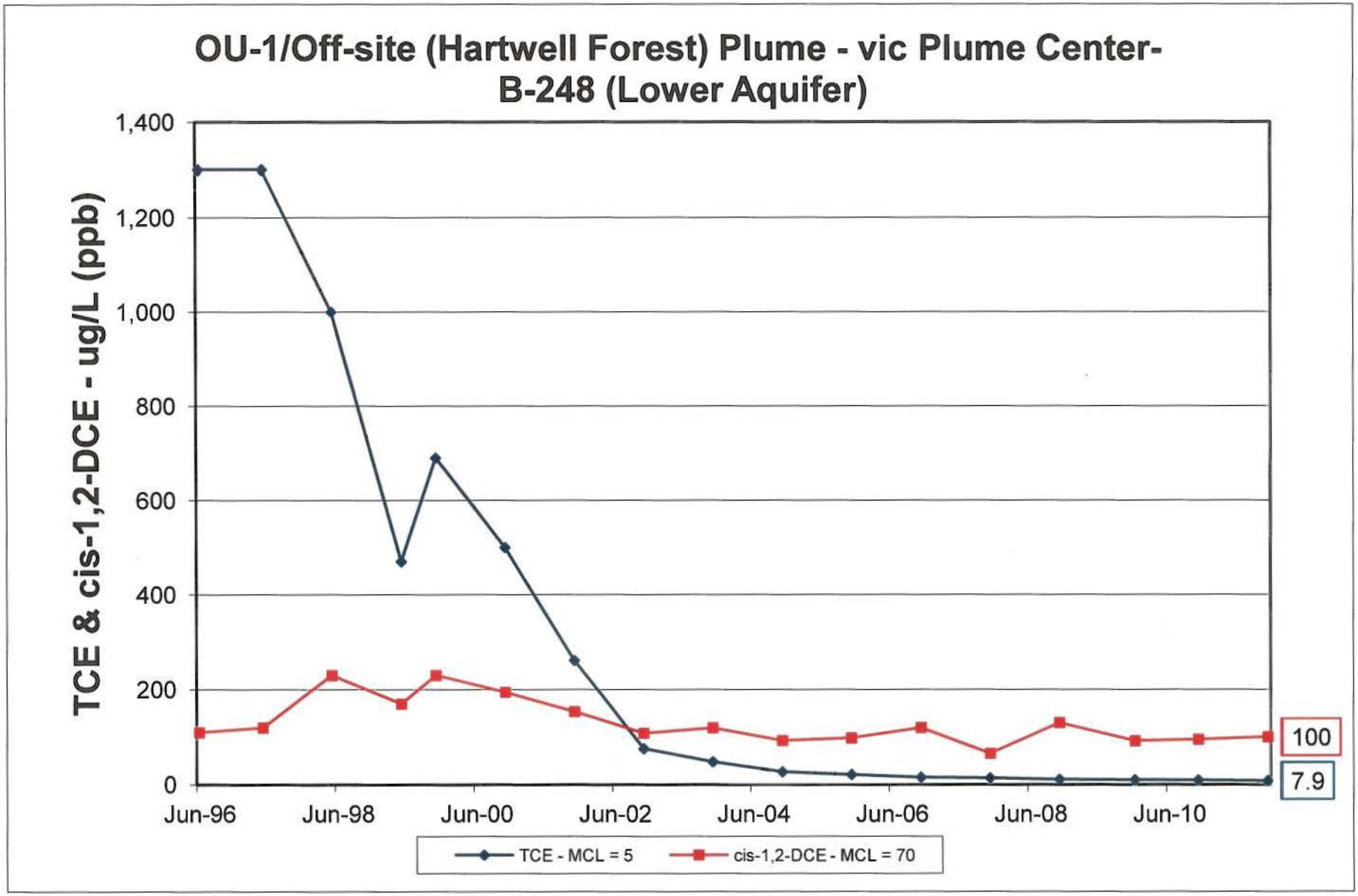
	Nov-07	Nov-08	Dec-09	Nov-10	Nov-11
TCE - MCL = 5	20	21	18	18	14
cis-1,2 DCE - MCL = 70	63.7	61	66	74	59
Vinyl Chloride MCL = 2	3.0	2.0	1.6	1.5	3.0

OU-1 Historical LTM Results via Off-site Laboratory

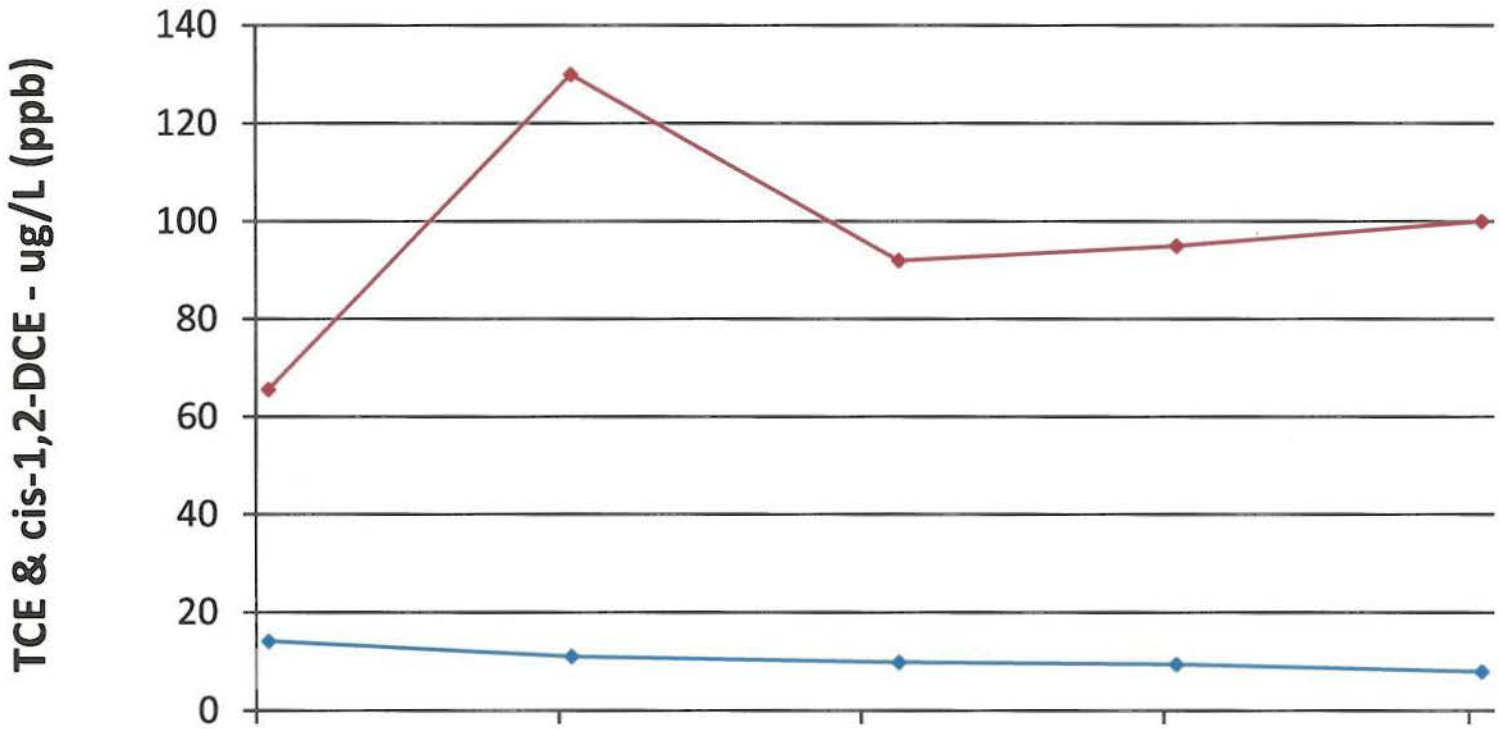


	7-Nov-07	19-Nov-08	3-Dec-09	22-Nov-10
TCE - MCL = 5	4.1	1.7	1.6	1.4
cis-1,2 DCE - MCL = 70	14	3.4	2.4	1.7

OU1 Historical LTM Results via Off-site Laboratory

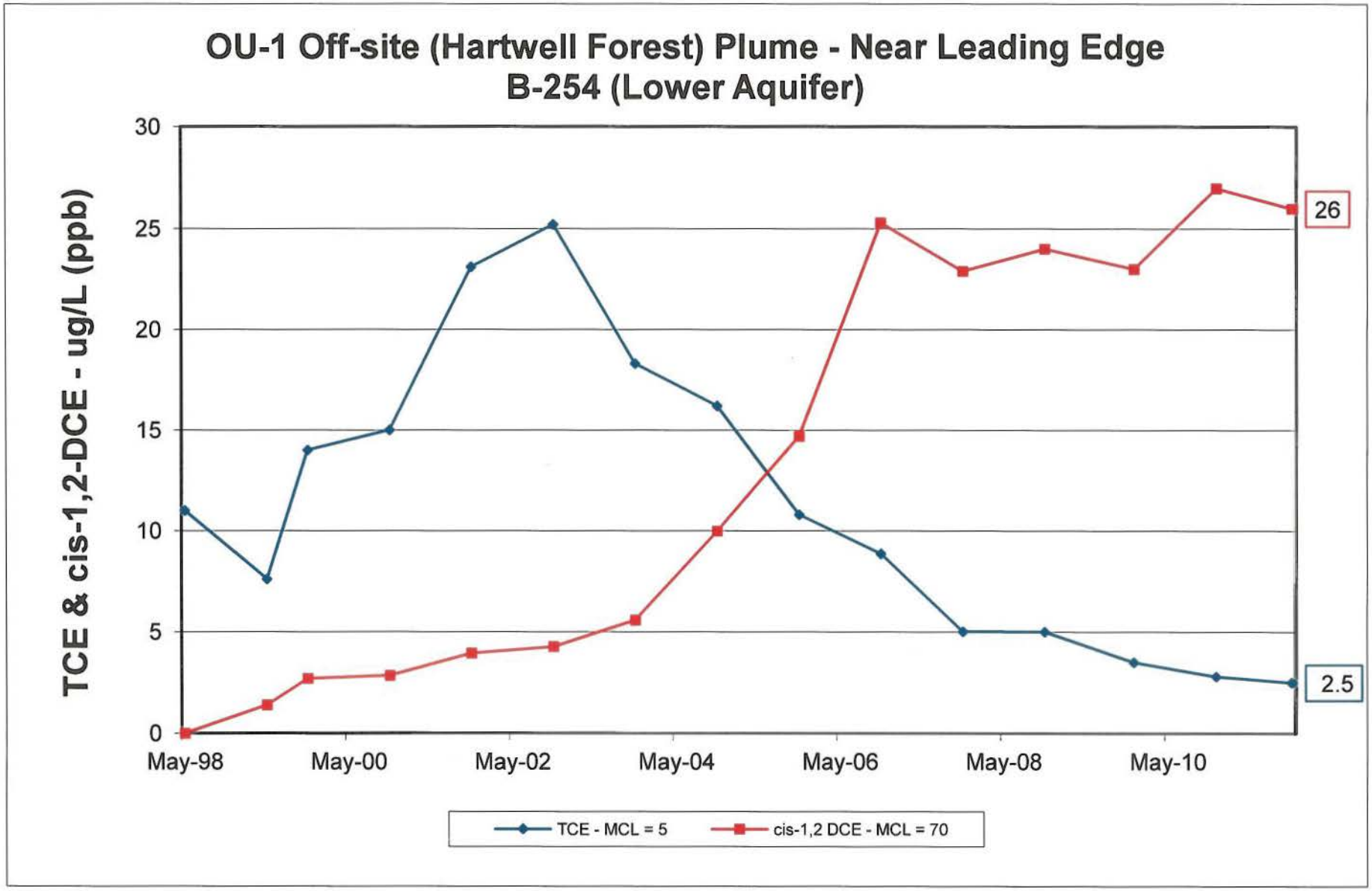


OU-1 Historical LTM Results via Off-site Laboratory



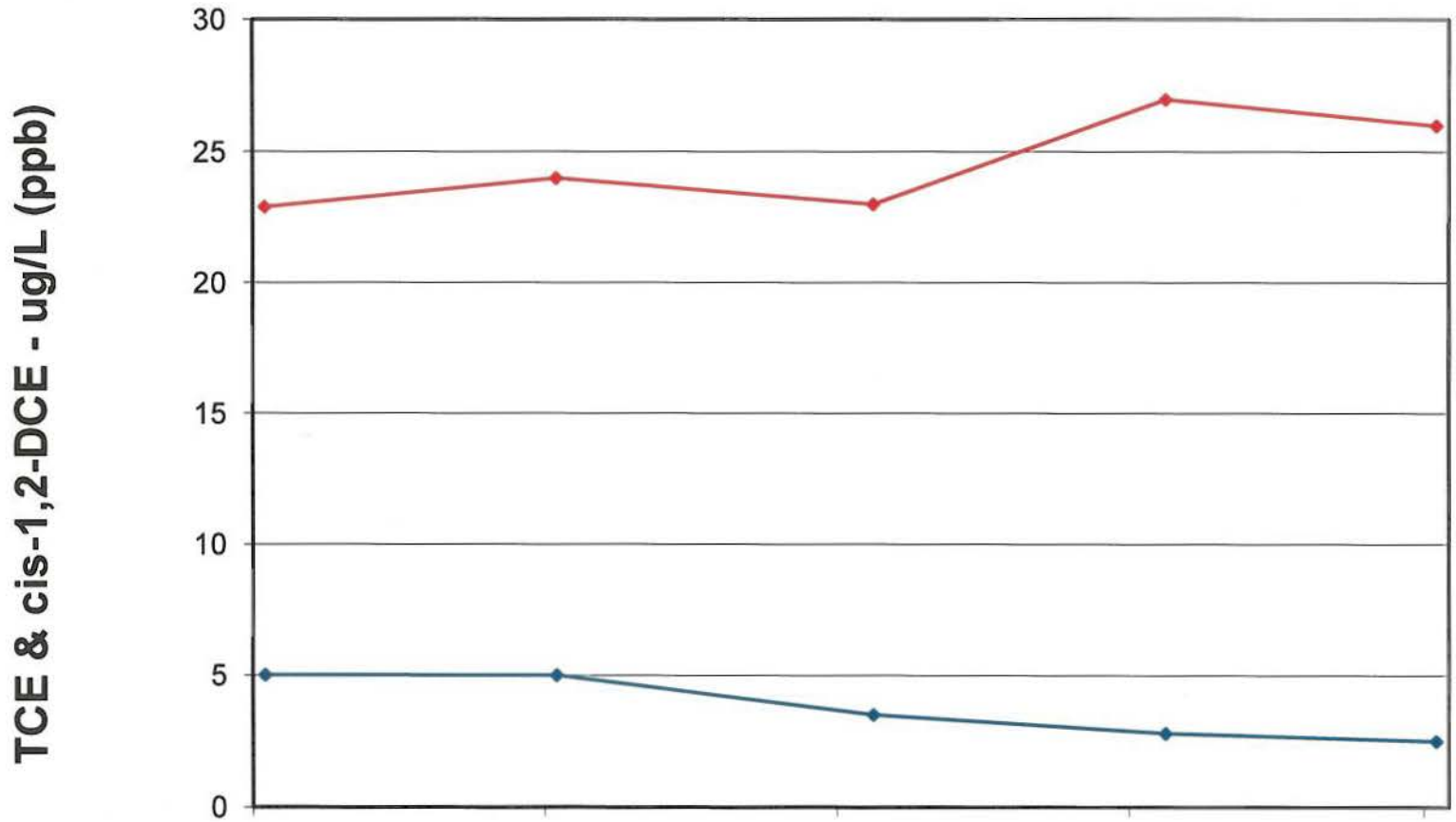
	8-Nov-07	1-Nov-08	1-Dec-09	22-Nov-10	28-Nov-11
TCE - MCL = 5	14	11	9.8	9.4	7.9
cis-1,2-DCE - MCL = 70	66	130	92	95	100

OU1 Historical LTM Results via Off-site Laboratory



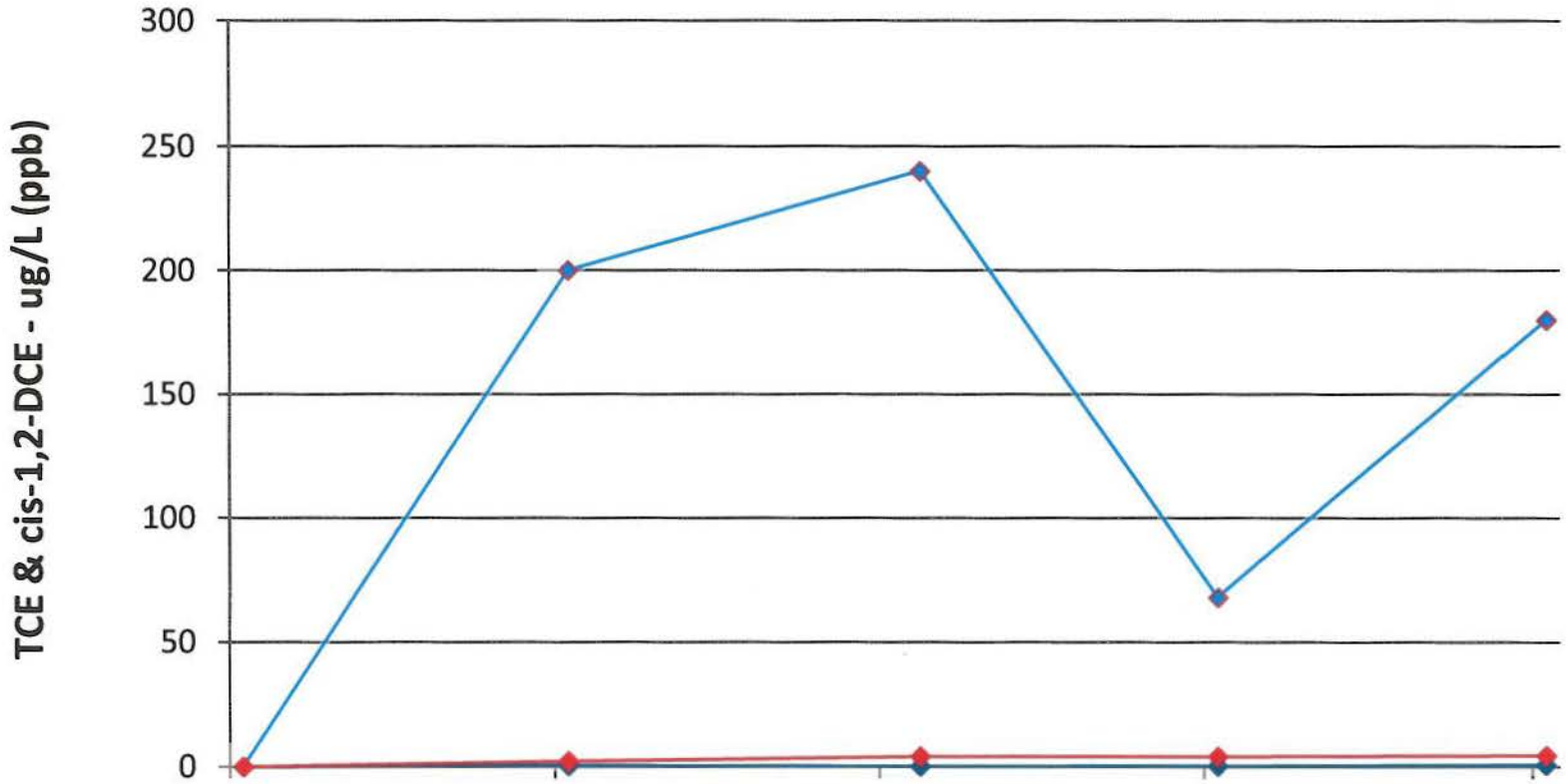
OU-1 Historical LTM Results via Off-site Laboratory

OU-1 Off-site (Hartwell Forest) Plume - Near Leading Edge B-254 (Lower Aquifer)



	Nov-07	Nov-08	Dec-09	Dec-10	Nov-11
TCE - MCL = 5	5.0	5.0	3.5	2.8	2.5
CIS-1,2-DCE - MCL = 70	23	24	23	27	26

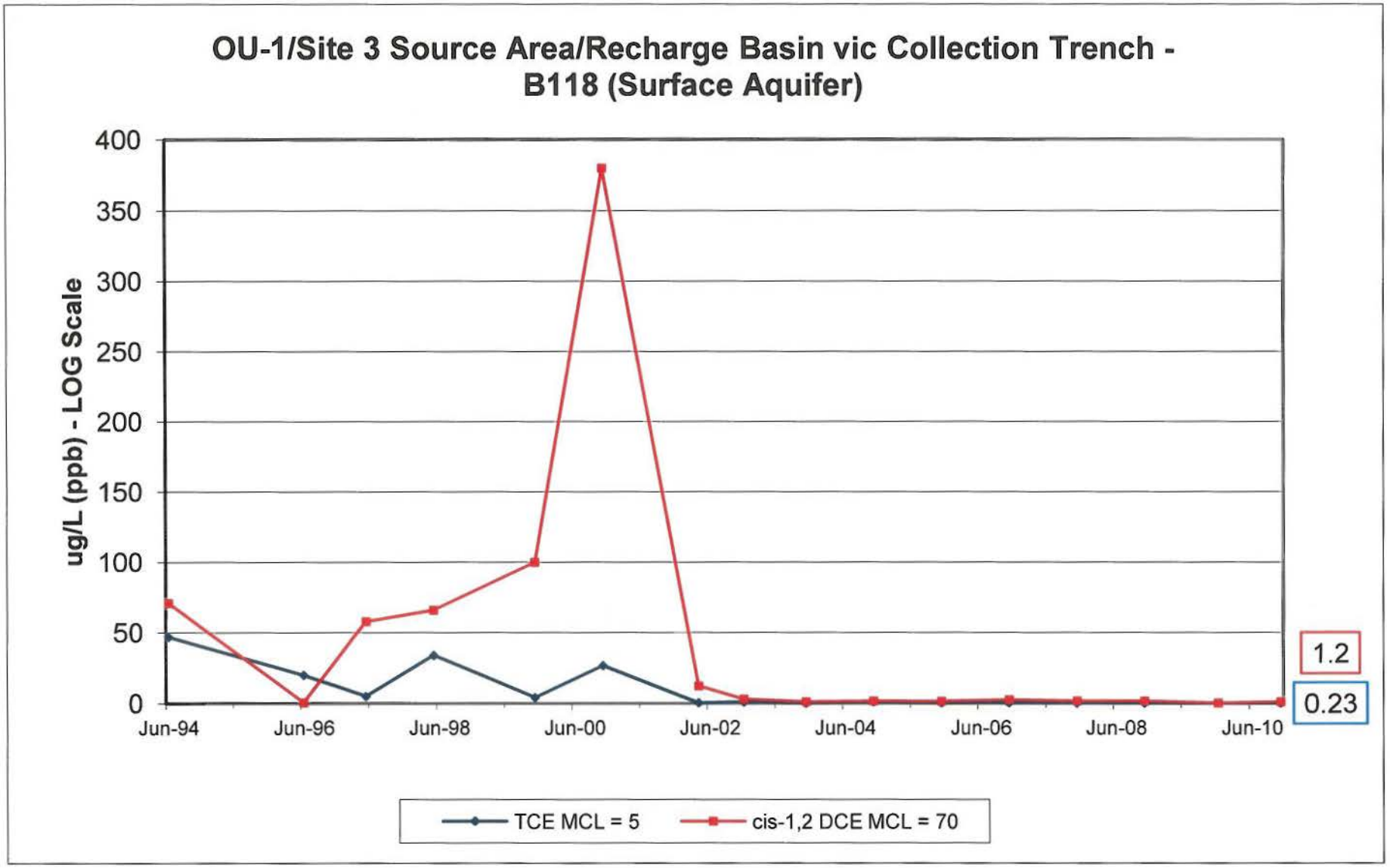
OU-1 Historical LTM Results via Off-site Laboratory



	Nov-07	Nov-08	Dec-09	Nov-10	Nov-11
TCE MCL = 5	0.0	0.44	0.20	0.31	0.71
cis-1,2 DCE MCL = 70	0.0	200	240	68	180
Vinyl Chloride MCL = 2	0.0	2.20	4.20	4.20	4.50

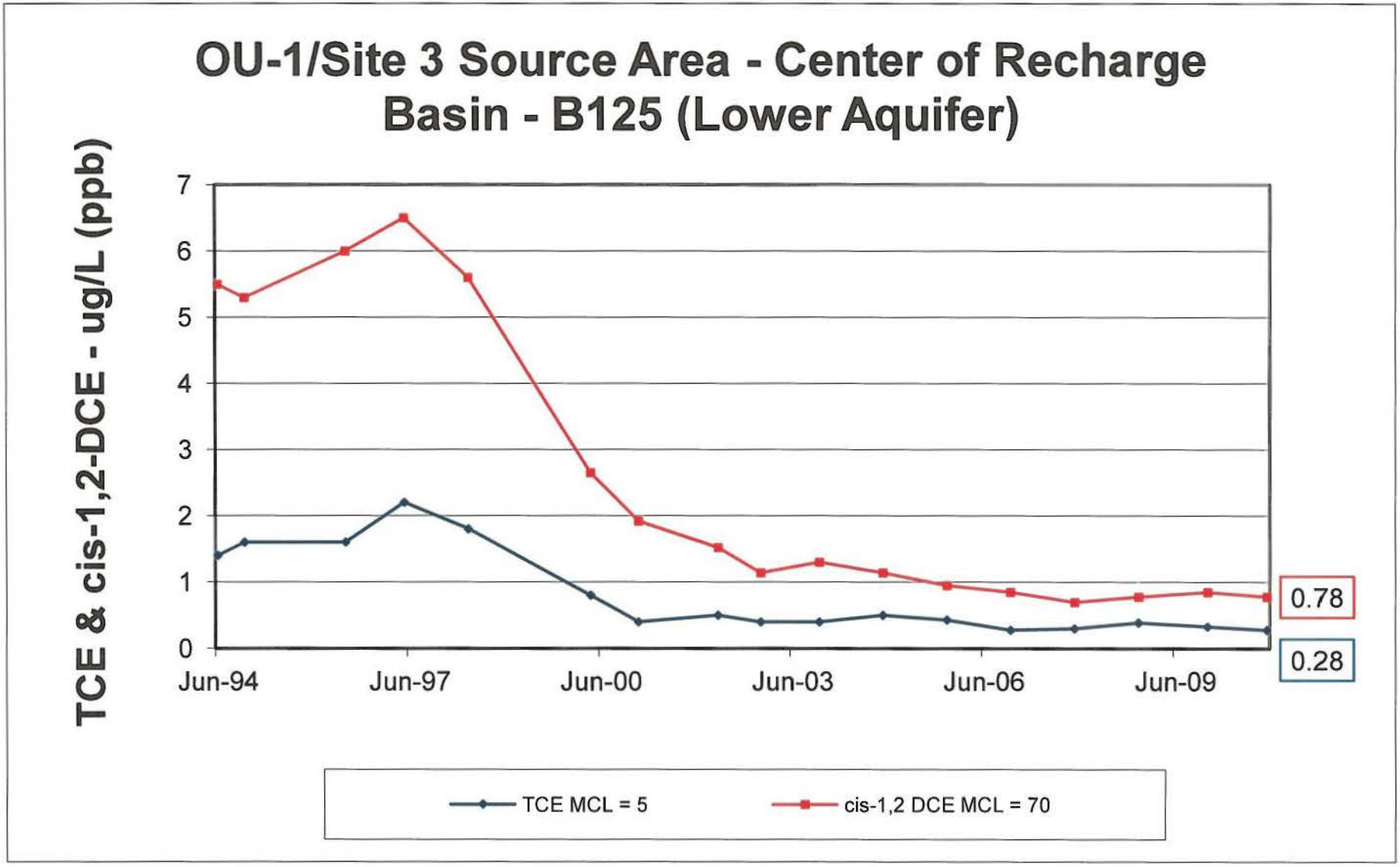
Recovery from Site 3 suspended 22 Aug 01

OU1 Historical LTM Results via Off-site Laboratory



Recovery from Site 3 suspended 22 Aug 01

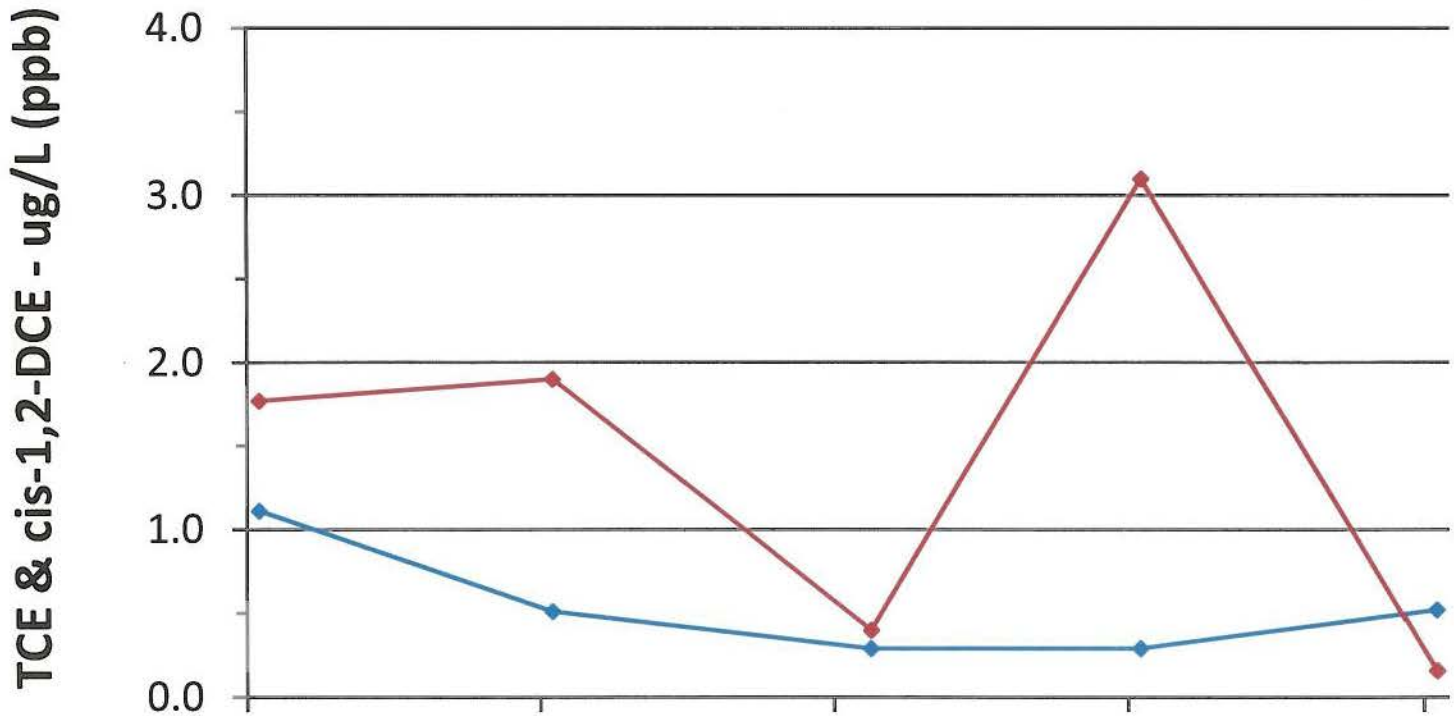
OU-1 Historical LTM Results via Off-site Laboratory



Recovery from Site 3 suspended 22 Aug 01

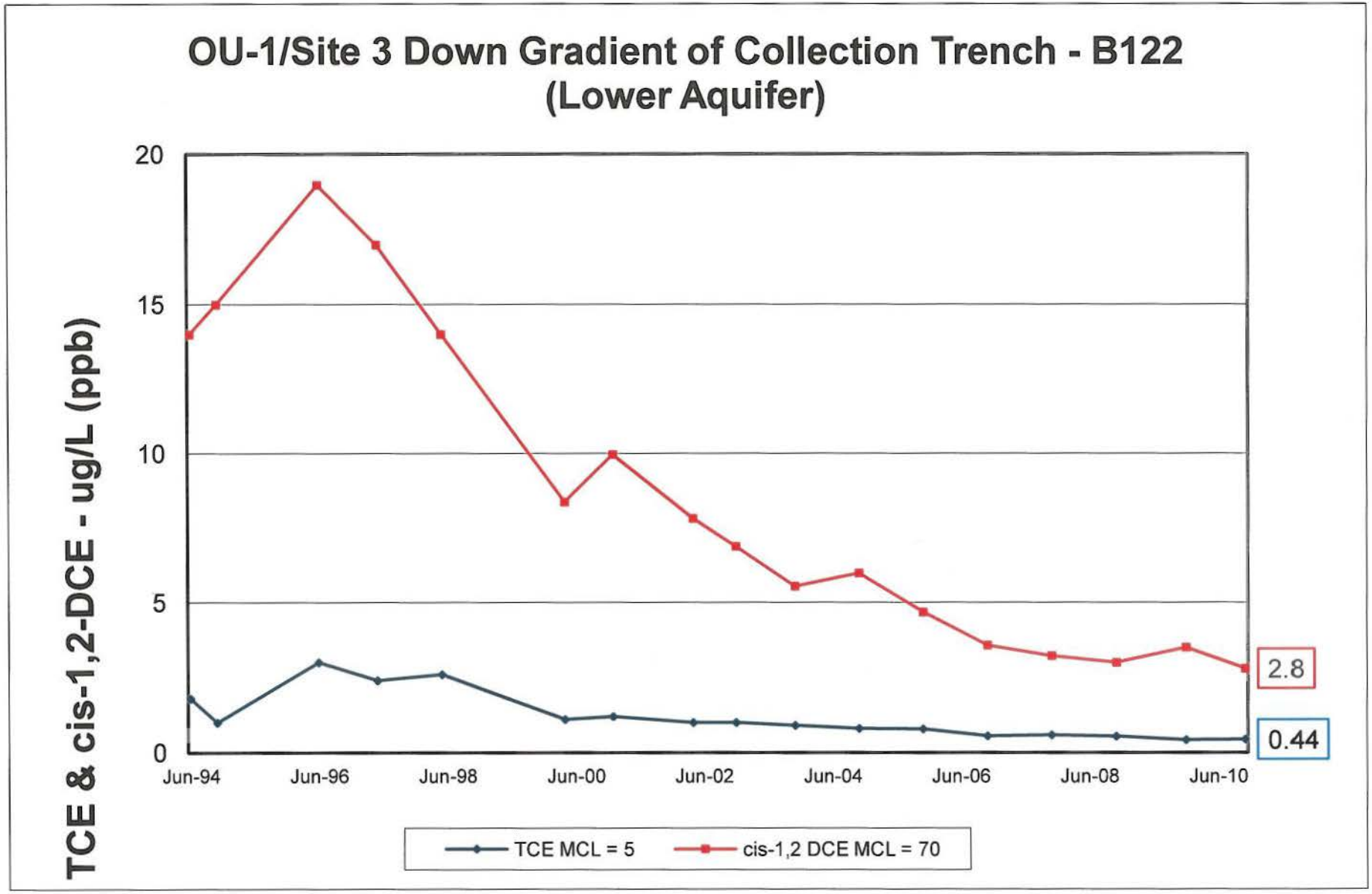
OU-1 Historical LTM Results via Off-site Laboratory

OU-1/Site 3 Down Gradient of Collection Trench - B117 (Surface Aquifer)



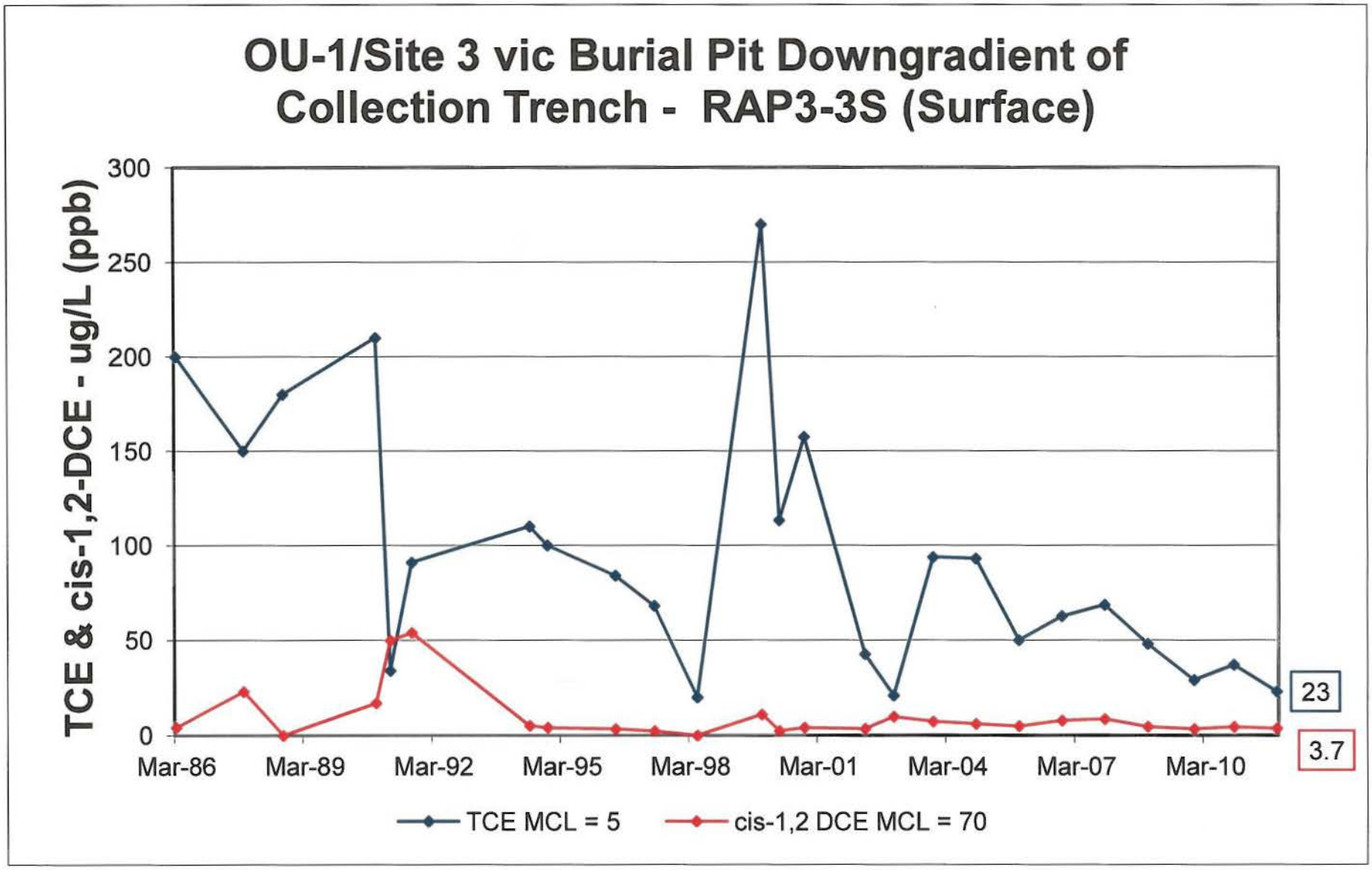
	Nov-07	Nov-08	Dec-09	Nov-10	Nov-11
TCE MCL = 5	1.1	0.5	0.3	0.3	0.5
cis-1,2 DCE MCL = 70	1.8	1.9	0.4	3.1	0.2

OU-1 Historical LTM Results via Off-site Laboratory



Recovery from Site 3 suspended 22 Aug 01

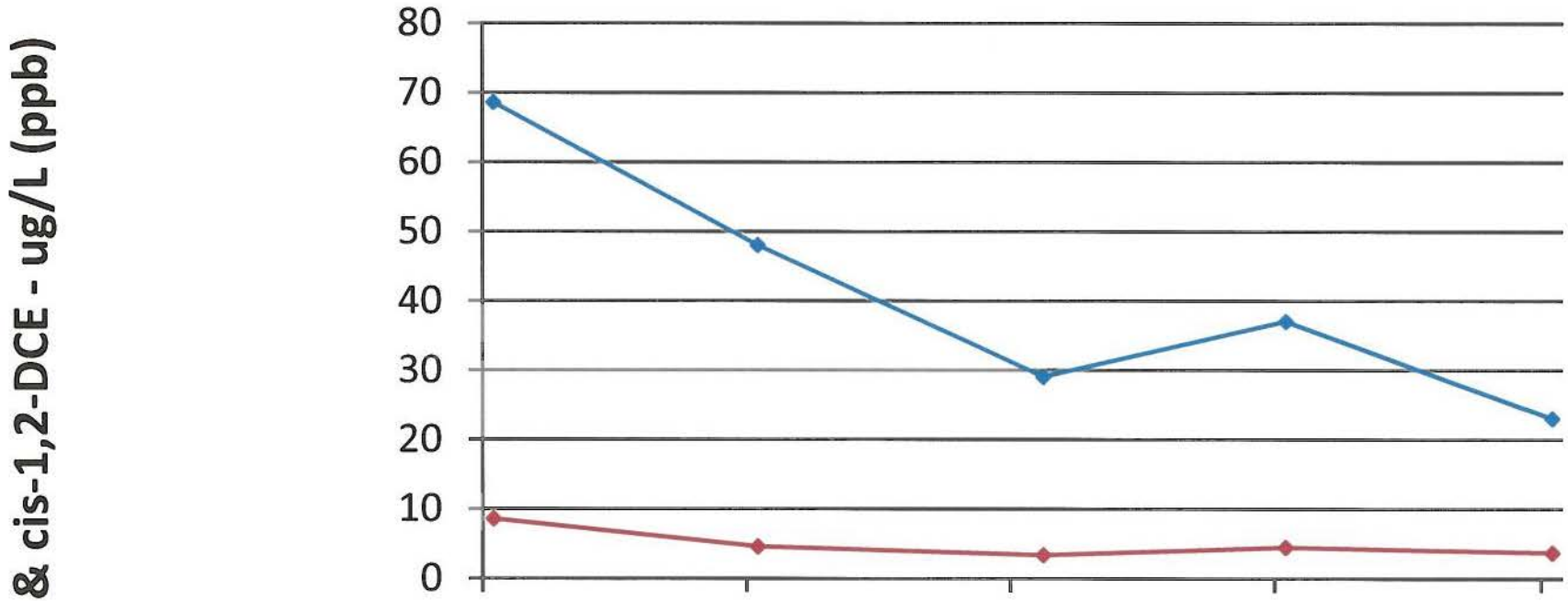
OU1 Historical LTM Results via Off-site Laboratory



Recovery from Site 3 suspended 22 Aug 01

OU-1 Historical LTM Results via Off-site Laboratory

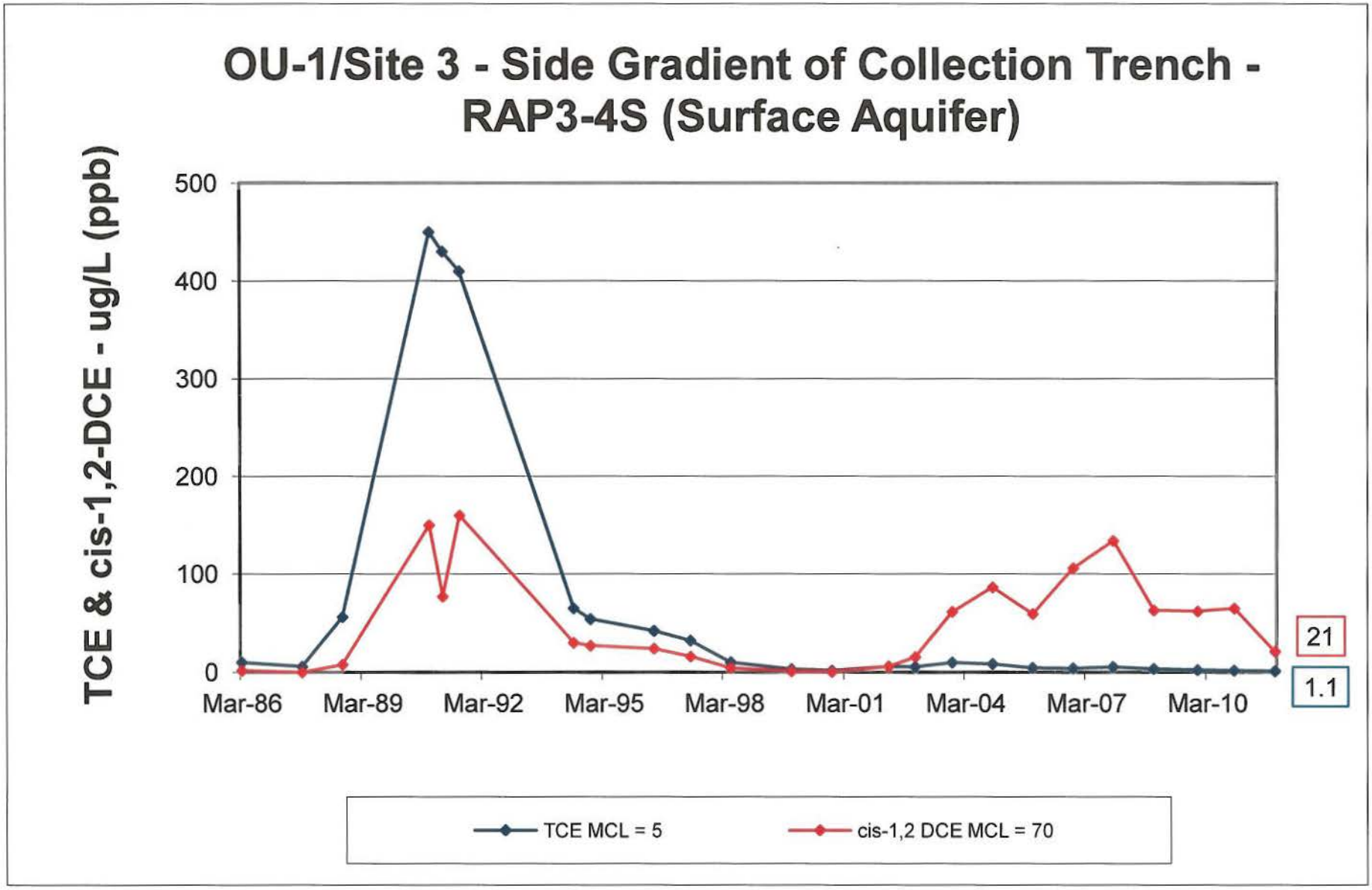
OU-1/Site 3 vic Burial Pit Downgradient of Collection Trench - RAP3-3S (Surface)



	Nov-07	Nov-08	Dec-09	Nov-10	Nov-11
TCE MCL = 5	69	48	29	37	23
cis-1,2 DCE MCL = 70	8.6	4.6	3.4	4.5	3.7

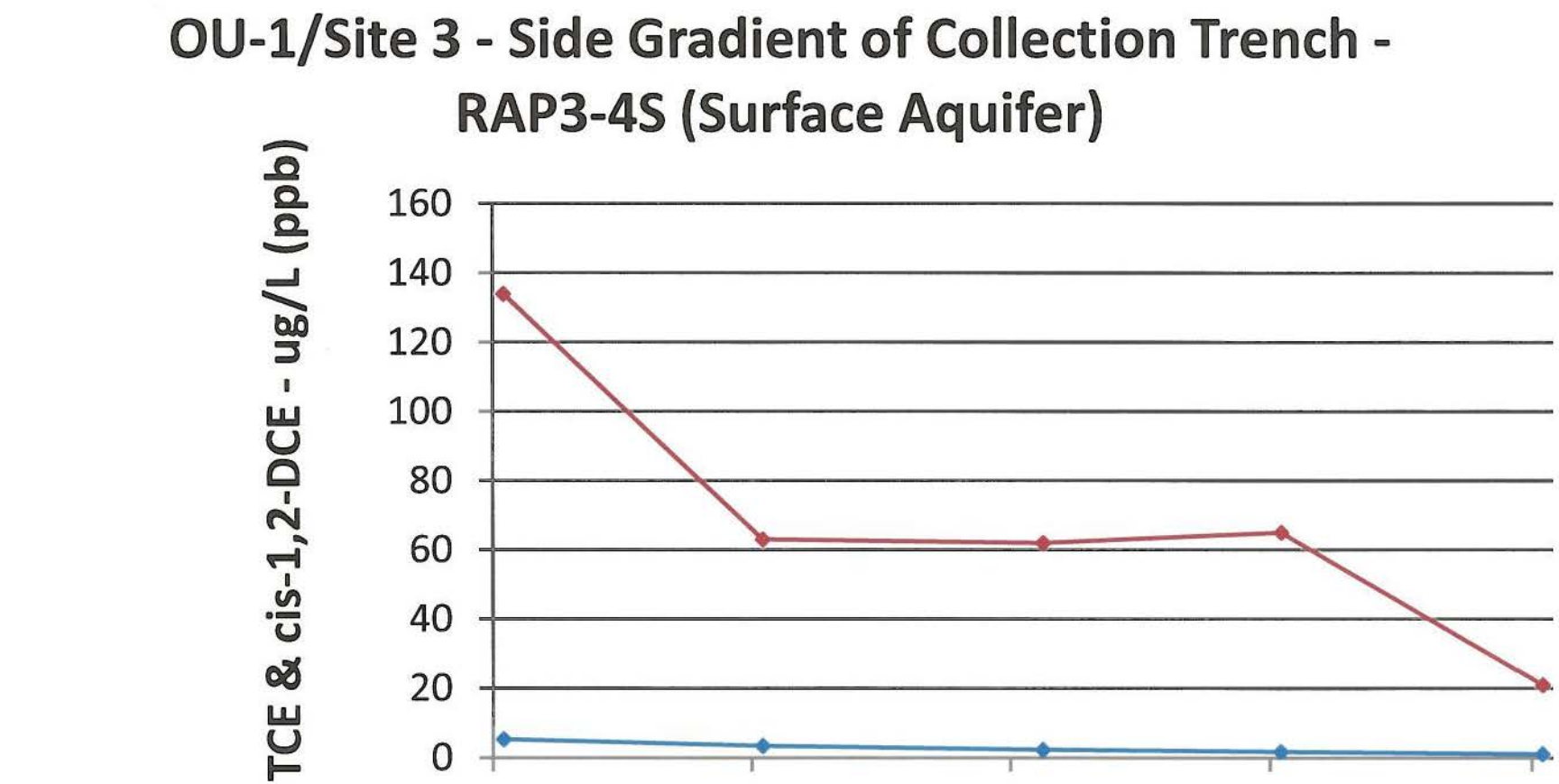
Recovery from Site 3 suspended 22 Aug 01

OU1 Historical LTM Results via Off-site Laboratory



Recovery from Site 3 suspended 22 Aug 01

OU-1 Historical LTM Results via Off-site Laboratory



	Nov-07	Nov-08	Dec-09	Nov-10	Nov-11
TCE MCL = 5	5.3	3.4	2.3	1.7	1.1
cis-1,2 DCE MCL = 70	134	63	62	65	21

Attachment G – OU-3/IRP Site 6 Data

G-1 - Remedial Action-Operation - Key Dates/Milestones

G-2 - Table 3-7 from 2011 Annual Long-Term Monitoring Report for NPL OU-3/IRP Site 6 - Summary of LTMP Groundwater and Surface Water Samples Results for Dissolved Arsenic - 2001 through 2011

G-3 - Table 3-8 from 2011 Annual Long-Term Monitoring Report for NPL OU-3/IRP Site 6 - Summary of LTMP Groundwater and Surface Water Samples Results for Contaminants of Concern Less Arsenic - 2001 through 2011

G-4 – Summary of Analytical Results for Dissolved Thallium in Groundwater - 2001 through 2011

G-5 – Long-Term Monitoring Program Trend Charts for CoCs (except Dissolved Arsenic) - 2001 through 2011

G-6 – Long-Term Monitoring Program Trend Charts for Dissolved Arsenic - 2001 through 2011

NPL OU-3/IRP Site 6 Monitoring Wells & Long-Term Monitoring

Dec 01 – Remedial Action Baseline Long-Term Monitoring Event – 16 MWs and 1 SW analyzed for VOCs, SVOCs, Pesticides, PCBs, and Total and Dissolved Metals – also 3 MWs for analyzed for Total and Dissolved Arsenic only

Sep 02 - 3 new surface & lower aquifer monitoring well couplets (MW6-116U & T, MW6-117U & T & MW6-118U & T) installed to help define compliance boundary

Oct 02 – Annual Long-Term Monitoring Round - 21 MWs and 1 SW analyzed for VOCs, SVOCs, Pesticides, PCBs, and Total and Dissolved Metals & 1 MW analyzed for VOCs, Pesticides, PCBs, and Total and Dissolved Metals – also 3 MWs analyzed for Total and Dissolved Arsenic only

Apr 03 – Supplemental Long-Term Monitoring event (included wells dry in 01 & 02 fall events & verification of some earlier results) – 11 VOC, SVOC & Pesticide samples; 9 PBC samples; 9 Total and Dissolved Metals; and 1 Total Metals – also 10 MWs for analyzed for Total and Dissolved Arsenic only

Oct 03 – Annual Long-Term Monitoring event – 21 MWs and 3 SW analyzed for VOCs, SVOCs, Pesticides, PCBs, and Total and Dissolved Metals – also 6 MWs for analyzed for Total and Dissolved Arsenic & 2 of these MWs were analyzed for cadmium and nickel

Oct 04 – Ceased analysis for "total" metals

Oct 04 – Annual Long-Term Monitoring event –16 VOCs, 15 SVOCs, 15 Pesticides, 15 PCBs, and 15 Dissolved Metals – also 15 Dissolved Arsenic only

Apr 05 – Commenced more frequent (target quarterly) S&A for dissolved arsenic only

Apr 05 – Quarterly Long-Term Monitoring event – 11 Dissolved Arsenic only, also 2 VOCs and 1 SVOCs for MWs always dry in fall

Jul 05 – Quarterly Long-Term Monitoring event – 13 Dissolved Arsenic only

Oct 05 – Annual Long-Term Monitoring event –7 VOCs, 6 SVOCs, 4 Pesticides, 3 PCBs, and 6 Dissolved Metals – also 23 Dissolved Arsenic only

Jan 06 – Quarterly Long-Term Monitoring event – 12 Dissolved Arsenic only

Apr 06 – Quarterly Long-Term Monitoring event – 13 Dissolved Arsenic only

May 06 - 3 new surface aquifer monitoring wells (MW6-119U, MW6-120U & MW6-121U and a surface, lacustrine, and lower aquifer well cluster (MW6-122U, L & T) installed to help define compliance boundary

Jul 06 – Quarterly Long-Term Monitoring event – 8 Dissolved Arsenic only – also baseline S&A for new 3-well cluster (VOCs/SVOCs/Pesticides/PCBs/Dissolved Metals) + 3 SVOCs & 4 Dissolved Metals

Oct 06 – Annual Long-Term Monitoring event –9 SVOCs, 2 Pesticides, 1 PCBs, and 8 Dissolved Metals – also 26 Dissolved Arsenic only

Jan 07 – Quarterly Long-Term Monitoring event – 20 Dissolved Arsenic only

Apr 07 – Quarterly Long-Term Monitoring event – 22 Dissolved Arsenic only - also 2 VOCs and 1 SVOCs for MWs always dry in fall

Aug 07 – Quarterly Long-Term Monitoring event – 16 Dissolved Arsenic only

Oct 07 – Annual Long-Term Monitoring event –4 SVOCs, 1 Pesticides, 1 PCBs, and 3 Dissolved Metals – also 23 Dissolved Arsenic only – 1 additional sample was analyzed for dissolved thallium by method 7841.

Jan 08 – Dropped the January/winter Long-Term Monitoring event

Apr 08 – Seasonal Long-Term Monitoring event – 24 Dissolved Arsenic only

Jul 08 – Seasonal Long-Term Monitoring event – 23 Dissolved Arsenic only

Oct 08 - 3 new surface aquifer monitoring wells (MW6-123U, MW6-124U & MW6-125U) installed to help define compliance boundary

Oct 08 – Annual Long-Term Monitoring event – 8 SVOCs, 1 Pesticides, 1 PCBs, 1 Dissolved Metals and 35 Dissolved Arsenic only – additionally samples were analyzed for individual dissolved metals (1 barium, 2 cadmium, 1 lead, 2 nickel & 4 thallium)

Apr 09 – Seasonal Long-Term Monitoring event – 27 Dissolved Arsenic only

Jul 09 – Seasonal Long-Term Monitoring event – 27 Dissolved Arsenic only

Nov 09 – Annual Long-Term Monitoring event – 2 SVOCs, 1 Pesticides, 1 PCBs, and 32 Dissolved Arsenic only – additionally samples were analyzed for individual dissolved metals (1 barium, 1 cadmium, 1 lead, 2 nickel & 6 thallium (by Method 6020))

Apr 10 – Seasonal Long-Term Monitoring event – 25 Dissolved Arsenic only

Jul 10 – Seasonal Long-Term Monitoring event – 25 Dissolved Arsenic only - also 6 Dissolved Arsenic only from Massport monitoring wells installed in 2010 on the north/northwest side of the Shawsheen River and downgradient of Site 6 to provide data for a Massport storm water model.

Nov 10 – Annual Long-Term Monitoring event – 2 SVOCs, 1 Pesticides, 1 PCB, and 27 Dissolved Arsenic only – additionally samples were analyzed for individual dissolved metals (1 barium, 1 cadmium, 1 lead, 1 nickel & 5 thallium (by Method 6020)) - also 6 Dissolved Arsenic only from Massport monitoring wells

Apr 11 – Seasonal Long-Term Monitoring event – 17 Dissolved Arsenic only - also 2 Dissolved Arsenic only from Massport monitoring wells

Jul 10 – Seasonal Long-Term Monitoring event – 14 Dissolved Arsenic only – also 2 Dissolved Arsenic only from Massport monitoring wells

Oct 11 – Annual Long-Term Monitoring event – 5 SVOCs, 1 Pesticides, 1 PCB, and 29 Dissolved Arsenic only – additionally samples were analyzed for individual dissolved metals (1 barium, 1 cadmium, 2 nickel & 1 thallium (by Method 6020)) - also 2 Dissolved Arsenic only from Massport monitoring wells

Apr 12 – Seasonal Long-Term Monitoring event – 17 Dissolved Arsenic only - also 2 Dissolved Arsenic only from Massport monitoring wells

Jul 12 – Planned Seasonal Long-Term Monitoring event – 14 Dissolved Arsenic only – also 2 Dissolved Arsenic only from Massport monitoring wells

Oct 12 – Planned Annual Long-Term Monitoring event – 3 SVOCs, 1 Pesticides, 1 PCB, and 29 Dissolved Arsenic only – additionally samples were analyzed for individual dissolved metals (1 barium, 1 cadmium & 2 nickel) - also 2 Dissolved Arsenic only from Massport monitoring wells

Table 3-7 2011 Long-Term Monitoring Report for OU-3/IRP Site 6

Dissolved Arsenic Results - 2001 through 2011

Location ID	MW6-B07	MW6-B09	MW6-B10	MW6-11	MW6-12	MW6-13	MW6-14	MW6-15	MW6-16	MW6-17	MW6-18	MW6-21
Aquifer	Till	Till	Till	Till	Till	Till	Till	Till	Surface	Surface	Lacust.	Surface
Dec-01		26 F	21 F	45	< 2.7/< 2.7	12 F		< 2.7	< 2.7	6 F	< 2.7	6 F
Oct-02		15 F	40/35	50			<1.6	18 F	<1.6	60	3 F	32
Apr-03		42				20 F		<1.6				<1.6
Sep-03		36	43	< 2.9		<2.9	<2.9	<2.9	66	122		5 F
Oct-04		46	51	<2.5		23 F	<2.5	4 F	18 F	105		35
Apr-05		54						<2.5	<2.5			<2.5
Jul-05		51	51					<2.5	<2.5/<2.5	72		80
Oct-05		34	48	<1.9		9.6		<1.9	2.0 F/2.4 F	35/19		170
Jan-06		52	52					<1.9	<1.9	6.6		2.8 F
Apr-06		50	55					<1.9	<1.9	22		<1.9
Jul-06	63.4											35
Oct-06	55	52	55	<4		7.4		<4	<4	86		99
Jan-07	61/61	54	62					<4	<4	4.6		7.1
Apr-07	89	46	54					<4	<4	37		<4
Aug-07	54/55	40	52					<4	<4	35		100
Oct-07	53	40/40	66	<4		<4		<4	<4	37		150
Apr-08	78	42	59					1.0 F	0.30 F	7.6		2.4 F/2.2 F
Jul-08	64	39	63					0.83 F	0.98 F	32		48
Oct-08	66	46	77					10	0.69 F	41		91
Apr-09	78	42	58					<4.4	<4.4	27		<4.4
Jul-09	76	40	69					7.1 F	<4.4	43		33
Nov-09	48	38	56					<4.4	<4.4	18		11
Apr-10	77	36	54					<4.4	<4.4	21 F		<4.4
Jul-10	65	44	56					2.5 F	0.45 F	38		28
Nov-10	58	31/29	53					2.5 F	0.48 F	20		3.1/3.3 F
Apr-11												1 F
Jul-11												14
Oct/Nov-11	61	43	51					1.7 F	0.28F	32		24/24

All results are in ug/L (ppb).
Exceeds MCL of 10-ug/L (ppb)
< less than method detection limit
F - Between method detection limit & the reporting limit
* - MW6-122T, PZ-E & PZ-W Nov-09 samples were not filtered thus results are total arsenic

Blank - Not Sampled
Primary/Duplicate

Table 3-7 2011 Long-Term Monitoring Report for OU-3/IRP Site 6

Dissolved Arsenic Results - 2001 through 2011

Location ID	MW6-22	MW6-23	MW6-25	MW6-103	MW6-104	MW6-105	MW6-106	MW6-110T	MW6-110U	MW6-111T	MW6-112U	MW6-113T
Aquifer	Lacust.	Lacust.	Lacust.	Sur/Lac	Sur/Lac/Till	Sur/Lac	Surface	Till	Surface	Till	Surface	Till
Dec-01	48	62	123/90	Dry	Dry	Dry	Dry	22 F	< 2.7	< 2.7	< 2.7	< 2.7
Oct-02		11 F	<1.6	Dry	Dry	27 F	<1.6	23 F			<1.6	<1.6
Apr-03	46		2 F	6 F	10 F/14 F				<1.6		<1.6	2 F
Sep-03	50	15 F	4 F			12 F	< 2.9	21 F/23 F	<2.9		<2.9	<2.9
Oct-04	44/45	8 F	20 F	13 F	Dry	30/30	<2.5	10 F	<2.5	25 F	<2.5	<2.5
Apr-05			3 F									
Jul-05			<2.5									
Oct-05	43/43	10	3.4 F	27	18	37	<1.9	22	2.74	72	<1.86/<1.86	<1.86
Jan-06			<1.9									
Apr-06			<1.9									
Jul-06	5.67						<1.2/<1.2					
Oct-06		6.6	<4			10	<4	18/18	<4	76	<4	<20/<20
Jan-07			<4	9.7	6.9		<4					<4
Apr-07			<4	5.2	7.2	<4		17/18		64		
Aug-07			<4	<4		8.7		11				
Oct-07		4.2	<4	Dry	Dry	6.2	Dry	11	<4	66	<4	<4
Apr-08				20	7.0/7.4	8.9		13		57		
Jul-08				9.4	Dry	4.2 F		12		61		
Oct-08		5.4		5.8	2.5 F	2.6 F/2.8 F	0.55F/0.63F	12		74		
Apr-09				<4.4	<4.4	<4.4		9.2 F/11		46		
Jul-09				<4.4	8.2 F	8.6 F	<4.4	17		66		
Nov-09		<4.4				<4.4		16/14		64		
Apr-10				9.8 F				6.2 F		40		
Jul-10				2.3 F				15/15		52		
Nov-10				Dry				16		18		
Apr-11				40								
Jul-11				18								
Oct/Nov-11				2.9 F				14		49		

All results are in ug/L (ppb).
Exceeds MCL of 10-ug/L (ppb)
< less than method detection limit
F - Between method detection limit & the reporting limit
* - MW6-122T, PZ-E & PZ-W Nov-09 samples were not filtered thus results are total arsenic

Blank - Not Sampled
Primary/Duplicate

Table 3-7 2011 Long-Term Monitoring Report for OU-3/IRP Site 6

Dissolved Arsenic Results - 2001 through 2011

Location ID	MW6-113U	MW6-114T	MW6-115T	MW6-116T	MW6-116U	MW6-117T	MW6-117U	MW6-118T	MW6-118U	MW6-119U	MW6-120U	MW6-121U
Aquifer	Surface	Till	Till	Till	Surface	Till	Surface	Till	Surface	Surface	Surface	Surface
Dec-01	Dry	< 2.7										
Oct-02	Dry	<1.6	<1.6	<1.6	<1.6	<1.6	5 F	<1.6	24 F			
Apr-03	11 F			<1.6	<1.6	<1.6	4 F	<1.6	23 F			
Sep-03	9 F	<2.9	<2.9	<2.9	<2.9	<2.9	6 F	<2.9/<2.9	108			
Oct-04	3 F		<2.5	<2.5	<2.5	<2.5	8 F	<2.5	179			
Apr-05							3 F		14/20			
Jul-05							3.0		90			
Oct-05	2.41 F			<1.9	<1.9	<1.9	16	<1.9	39			
Jan-06							<1.9/<1.9		2.8 F/<1.9			
Apr-06							3.5 F/2.5 F		28			
Jul-06					<1.2		3.0 F		48	8	11/11	<1.2
Oct-06	<20			<4/<4	<4	<4	9.9	<4	200/200	33	9	6.7
Jan-07	4.7						<4		28	<4/<4	<4	<4
Apr-07						<4	<4	<4	32	<4	<4/<4	<4
Aug-07						<4	10/9.7			44	12	<4
Oct-07	Dry			<4	<4	<4/<4	30			76	7.2	15
Apr-08						<0.021	0.93 F		18	0.22 F	0.33 F	2.0 F
Jul-08						8.1	12		150/150	34/38	0.90 F	8.1
Oct-08				<0.42	1.5 F	2.1 F	4.0 F	<0.42/<0.42	130	6.9 F	4.0 F	9.1/9.1
Apr-09						<4.4	<4.4		23	<4.4	<4.4	<4.4
Jul-09						<4.4/<4.4	<4.4		17	4.7 F	<4.4	15
Nov-09				<4.4	<4.4	4.7 F	<4.4	<4.4/<4.4	<4.4	<4.4	<4.4	<4.4/<4.4
Apr-10						<4.4	4.6 F		<4.4/<4.4	<4.4	<4.4	<4.4
Jul-10						<0.21	17		17	39	3.9 F	1.8 F
Nov-10	Dry			3.8 F	<0.21	<0.21	2.5 F	0.22 F	11.0	31.0	1.8 F	0.88 F
Apr-11						<0.21	0.51 F		0.29F/0.31F	0.36 F	0.62 F	0.95 F
Jul-11						<0.21	0.77F/0.89F		16.0	35.0	0.66 F	18.0
Oct/Nov-11				<0.21	0.27 F	<0.21	0.48F/0.48F	<0.21	39.0	3.3 F	3.4 F	1.1 F

All results are in ug/L (ppb).
Exceeds MCL of 10-ug/L (ppb)
< less than method detection limit
F - Between method detection limit & the reporting limit
* - MW6-122T, PZ-E & PZ-W Nov-09 samples were not filtered thus results are total arsenic

Blank - Not Sampled
Primary/Duplicate

Table 3-7 2011 Long-Term Monitoring Report for OU-3/IRP Site 6

Dissolved Arsenic Results - 2001 through 2011

Location ID	MW6-122L	MW6-122T	MW6-122U	MW6-123U	MW6-124U	MW6-125U	PZ-E	PZ-W	SWR6-02	SWW6-05	SWW6-06	SG #3
Aquifer	Lacust.	Till	Surface	Surface	Surface	Surface	Surface	Surface	Surface H2O			
Dec-01										< 2.7		
Oct-02										<1.6		
Apr-03										<1.6		
Sep-03										<2.9/<2.9		
Oct-04												
Apr-05										<2.5		
Jul-05							16	19		<2.5		
Oct-05							59.4	20.7		<1.9		
Jan-06							7.5	22		<1.9		
Apr-06							7.2	9.8		<1.9		
Jul-06	<1.2	<1.2	<1.2				19.1			<1.2		
Oct-06	<4	<4	<4				47.2	13.3		<4		
Jan-07							32	6.3				
Apr-07							15	9.1				
Aug-07												
Oct-07	<4	<4	Dry									
Apr-08							4.9	7.2	3.2 F	0.67 F	0.59 F	3.4 F
Jul-08							15	35	2.8 F	1.5 F	1.6 F	3.0 F
Oct-08	0.74 F	1.1 F	0.46 F	4.4 F	38	20	3.1 F	36	3.1 F	1.0 F	0.65 F	3.8 F
Apr-09				<4.4	19	16	13	14	<4.4/<4.4	<4.4	<4.4	<4.4
Jul-09				17	34/43	35	14	17	4.9 F	<4.4	<4.4	5.8 F
Nov-09	<4.4	27 *	<4.4	5.7 F	<4.4	<4.4	26 *	14 *	<4.4	<4.4	<4.4	<4.4
Apr-10				<4.4	<4.4/<4.4	18 F	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4
Jul-10				14	39/35	20/19	Dry	Dry	1.4 F	Dry	Dry	2.2 F
Nov-10		R-O-E exp		8	11/8.2	16.0	3.8 F	1.3 F	2 F	0.97 F	1.5 F	2.3 F
Apr-11				5.2	0.45F/0.58F	11.0	15	2.6 F	3.1 F	0.6 F	0.72 F	2.9 F
Jul-11				7.1	40/41	13.0			1.5 F		1.3 F	2.1 F
Oct/Nov-11		2.9 F		2.3F/2.3F	0.51 F	14.0	1.3 F	25	3.7 F	1.5 F	1.2 F	3.6 F

All results are in ug/L (ppb).
Exceeds MCL of 10-ug/L (ppb)
< less than method detection limit
F - Between method detection limit & the reporting limit
* - MW6-122T, PZ-E & PZ-W Nov-09 samples were not filtered thus results are total arsenic

Blank - Not Sampled
Primary/Duplicate

Table 3-7 2011 Long-Term Monitoring Report for OU-3/IRP Site 6

Dissolved Arsenic Results - 2001 through 2011

Location ID	MP-MW-1	MP-MW-2	MP-MW-3	MP-MW-4	MP-MW-5	MP-MW-6
Aquifer	Surface	Surface	Surface	Surface	Surface	Surface
Dec-01						
Oct-02						
Apr-03						
Sep-03						
Oct-04						
Apr-05						
Jul-05						
Oct-05						
Jan-06						
Apr-06						
Jul-06						
Oct-06						
Jan-07						
Apr-07						
Aug-07						
Oct-07						
Apr-08						
Jul-08						
Oct-08						
Apr-09						
Jul-09						
Nov-09						
Apr-10						
Jul-10	2.6 F	24	11	32	72	17
Nov-10	3.6 F	48	10	40	110	18
Apr-11	3.5 F				78	
Jul-11	5.1				90	
Oct/Nov-11	3.7 F				82	

All results are in ug/L (ppb).
Exceeds MCL of 10-ug/L (ppb)
< less than method detection limit
F - Between method detection limit & the reporting limit
* - MW6-122T, PZ-E & PZ-W Nov-09 samples were not filtered thus results are total arsenic

Blank - Not Sampled
Primary/Duplicate

ATTACHMENT G-3, Hanscom Field/Hanscom AFB 4th Five-Year Review Report

Table 3-8 2011 Annual Long-Term Monitoring Report OU-3/IRP Site 6, Hanscom AFB

Results for CoCs Less Arsenic - 2001 through 2011

The following is a summary of analysis (less arsenic-see separate table) that have had an exceedence of an MCL in one or more Post-RA LTM Rounds - All results are in ug/L (ppb)

VOCs-SVOCs	MCL (ppb)	Dec-01	Oct-02	Apr-03	Sep-03	Oct-04	Oct-05	Jul-06	Oct-06	Oct-07	Oct-08	Nov-09	Nov-10	Oct-11
MW6-104 (Surf/Lac/Till)														
Benzene	5	Dry	Dry	2.97/5.79	Dry	Dry	<0.5 U Apr-05		Dry	<0.01 U Apr-07				
MW6-23 (Lacustrine)														
Trichloroethene	5	6.1	<0.04 U		0.2 F		<0.031 U							
MW6-110U														
1,4-Dichlorobenzene voc-svoc	5*	6.98-3.3 F		4.9-4.1 F	4.41-4.7 F	6.61-5.1 F	7.6 - 6.69 F		4.40 F/4.22 F	3.32 F/2.94 F	0.57FJ/0.46FJ			
Benzene	5	6.34		1.49	3.34	4.6	3.86							
bis (2-Ethylhexyl) phthalate	6	<2.09 U		<3.05 U	6.6 F	1.2 F	1.30 F		1.12 F/1.21 F	0.920M/0.730J	1.37/0.96F			
Naphthalene - voc-svoc	140*-was 20*	25.3-15.3		3.6-3.2 F	8.7-8.7 F	8.96-8.4 M	10.4 - 11.8		9.27 F/9.74 F	11.7/8.91 F	7.3FMJ/5.9MJ			
Pentachlorophenol (PCP)	1	<0.73 U		<0.59 U	<0.31 U	2.7 F	<6.29 U		<0.23/<0.23	<1.2 U/<1.2 U	<20 U/<20 U			
MW6-110T														
1,4-Dichlorobenzene voc-svoc	5*	6.01-4.5 F	2.48 F-2.5 F		1.5-1.2F/1.41-1.3F	1.42								
MW6-112U														
1,4-Dichlorobenzene voc-svoc	5*	17.1-11.4	15.9-9.5 F	14.65-11.4	16.29-15.6	23.69-19.5	22.1 - 18.3		17.5	12.3	13 J	12	12	13
Benzene	5	6.24	5.55	1.12	3.65	4.43	3.22							
Naphthalene - voc-svoc	140*-was 20*	155-151	22.6-35.1	11.5-7 F	30.7-38.6	45.12-43.8 M	64.1 - 83.6		57	49.3	150 MJ	69	47	58
Pentachlorophenol (PCP)	1								1.06 F	<1.20	<20 U	<19 UM		<19
MW6-106 (Surface)										Dry				
1,4-Dichlorobenzene voc-svoc	5*		14.1-9.7 F	10.99-8.1 F	10.29-7.8 F	13.83-8.9 F	9.1 -7.24F/7.15F	8.47 F/8.54 F	10.6		7.8 FJ	6.0 F/6.2 F	4.1 F/4.5 F	<0.30/<0.31
Benzene	5		5.17	1.5	3.6	2.89	1.18							
2,4-Dichlorophenol	10*		58	21.7	24.1	20.4	21.8/21.6	16/17.1	25.1		25	NR		<0.61/<0.61
2,4,5-Trichlorophenol	200 *		1,681.6	1,576.8 F	918.4 F	616.6 F	368 M/304 F	526 F/550	530 F		460	370 M//410 M	400 F/530 F	<0.43/<0.43
Naphthalene - voc-svoc	140*-was 20*		16.6-15.7	12.4-10.5	24.1 - <0.08	15.86-11.4 M	4.3- 5.32F/5.28F	8.02 F/8.49 F	<0.6 U		5.3 FJ	2.9 F/3.2 F	3.6 F/4 F	<0.28/<0.28
Pentachlorophenol (PCP)	1		4,507.9	6,025.7	3,105.3	2320.9 F	1,200M/1,040	2,720/2,980	3,980		1,900 J	1,600 M/1,700 M	1,600/2,000	<19/<19
MW6-B07 (Till)														
1,4-Dichlorobenzene voc-svoc	5*	5.41-5 F		5.36-3.7 F	4.39	4.44/4.48	4.55/4.71	3.87 F						2.6 F
Benzo(a)anthracene	1*							1.31 F						<0.33
Benzo(a)pyrene	0.2 *							1.15 F						<0.29
Benzo(b)fluoranthene	1*							1.21 F						<0.50
Benzo(k)fluoranthene	1*							1.14 F						<0.44
Dibenzo(a,h)anthracene	0.5*							1.02 F						<0.48
Hexachlorobenzene	1							1.03 F						<0.63
Indeno(1,2,3-cd)pyrene	0.5*							1.10 F						<0.62
PZ-W										R-o-E Expired				
1,4-Dichlorobenzene voc-svoc	5*						5.9 - 4.2 F		3.5 F		3.2 FJ			2.2 F
MW6-117U														
bis (2-Ethylhexyl) phthalate	6		<3.05 R		14.9	1.9 F	3.78 F		0.650 F					

* - GW-1 (no MCL) | < less than listed detection limit | J - Estimated | NA - Not analyzed | U - Not detected
B - Detected in blank | F - Between MDL and RL | M - May be biased high or low | NR - Not reported | * - Nov-09 samples not filtered
= Exceeds MCL or MCP-GW-1

Table 3-8 2011 Annual Long-Term Monitoring Report OU-3/IRP Site 6, Hanscom AFB

Results for CoCs Less Arsenic - 2001 through 2011

Pesticides	MCL (ppb)	Dec-01	Oct-02	Apr-03	Sep-03	Oct-04	Oct-05	Jul-06	Oct-06	Oct-07	Oct-08	Nov-09	Nov-10	Oct-11
MW6-114T														
4-4'-DDD	0.2*	0.277 F	0.563	0.467 F	0.498 F	0.8 J	0.94		0.95 R	0.64 (0.44)	<0.0077 U	<0.0077 U	0.73	0.48
Dieldrin	0.1*	<0.0099 U	<0.0073 U	0.105 F	<0.0084 U	<0.002 U	<0.0094 U		<0.0092 U		<0.0063 U	<0.0063 U		
MW6-105 (Surf/Lac/Till)														
Dieldrin	0.1*	NA -dry	<0.0073 U	0.418 F	0.058 F	0.01 F/0.01 F	<.0094U/.0094U		<.0094U/.0094U					
Heptachlor epoxide	0.2	NA -dry	0.819	<0.01 U	<0.01 U	<.0067U/<.0067U	<.014 U/<.014 U		<.014 U/<.014 U					
MW6-106 (Surface)									Dilution = 50					
4-4'-DDD	0.1*	NA	0.166 R	NA	<0.066 UR	0.03 J			<0.46 R		0.0077 U			

PCBs	MCL (ppb)	Dec-01	Oct-02	Apr-03	Sep-03	Oct-04	Oct-05	Jul-06	Oct-06	Oct-07	Oct-08	Nov-09	Nov-10	Oct-11
MW6-110U														
Aroclor 1016	(total)0.5												0.56 J	
Aroclor 1232	(total)0.5													0.54 J
Aroclor 1242	(total)0.5	<0.0531 J	NA	0.73 F	0.61 F		0.984/1.05		0.411 J	0.686	0.10 UJ	0.50 UJ		
Aroclor 1248	(total)0.5					0.59 J								

Metals - Dissolved	MCL (ppb)	Dec-01	Oct-02	Apr-03	Sep-03	Oct-04	Oct-05	Jul-06	Oct-06	Oct-07	Oct-08	Nov-09	Nov-10	Oct/Nov-11
MW6-110U														
Barium - Filtered	2,000	1,142.8		2,983.3	2,262.5	2,105	1,680		1610 M	1,450				
Cadmium - Filtered	5	<0.33 U		5.6 F	<0.25 U	<0.17 U	<0.27 U		4.22 F	3.20 F				
Nickel - Filtered	100*	30.7		1,055.9	177.2	292	257		108	192	180 J	150 *	430	190
Lead	15	1.2 F		9.9 F	<0.7 U	1.7 F	2.55 F		4.17 F	23 F	<0.36 U	4.7 *	11	
Thallium - Filtered	2	<0.76 UM		<0.63 U	<0.63 UM	<0.63 U	6.15 F		<5.87 U	<0.83 U		0.030 F *		
Vanadium - Filtered	50*	3.0 F		55.0	29	30	19.4		27.1	21.6				
MW6-112U														
Antimony - Filtered	6	2.0 F	2.0 F	22 F	6.0 F	3.0 F	3.93 F/3.65F		<1.52 U	<1.52 U				
Barium - Filtered	2,000	2,028.7	321.6	1,416.6	1,839.7	3,154.6	2,750 M/2,770		3,500 M	2,520	2,500	2,200 *	1,200	1,900
Nickel - Filtered	100*	74.7	162.7	85.3	31.2	36	55.2/54.6		40.4	84.7				
Thallium - Filtered	2	<0.76 UM	<0.63 U	<0.63 U	<0.63 UM	<0.63 U	<4.63 U/<4.63 U		<5.87 U	<5.87 U		0.025 F *	0.03 F	
MW6-113U										Dry			Dry	
Cadmium - Filtered	5			5.6 F	7.5		<0.27 U		3.16 F		0.16 FJ			
Nickel - Filtered	100*			120.4	77.9		20.9		158		17	20 *		4
MW6-113T														
Cadmium - Filtered	5	18.1	9.3	15.7	11.6		3.86 F		9.18 F/9.57 F	2.74 F	1.5 F	8.6 *	0.31 F	0.31 F
Thallium - Filtered	2	<0.76 UM	<0.63 U	<0.63 U			<4.63 U		<29.4 U/<29.4U	19.7 F	1.2	1.4 *	0.4	
Nickel - Filtered	100*	135.7	57.6	125.2	80.5				47.7/50.9	18.3 F				
MW6-122T													R-o-E Expired	
Thallium	2							6.5 F	NA	<0.83 U	0.14 F	0.17 F *	NA	0.12 F
PZ-E										R-o-E Expired				
Thallium	2						8.36 F	<5.87 U	<5.87 U	NA	<0.02 U	0.053 F *	<0.02 U	
PZ-W										R-o-E Expired				
Thallium	2						5.43 F		<5.87 U	NA	<0.04 U	<0.020 U *	0.029 F	

* - GW-1 (no MCL) | < less than listed detection limit | J - Estimated | NA - Not analyzed | U - Not detected

B - Detected in blank | F - Between MDL and RL | M - May be biased high or low | NR - Not reported | * - Nov-09 samples not filtered

= Exceeds MCL or MCP-GW-1 | ** - MW6-122T sample collected Nov-2011 due to receipt of R-o-E

ATTACHMENT G-4, Hanscom Field/Hanscom AFB NPL Site 4th Five-Year Review Report

Extract from OU3/IRP Site's 2011 Long-Term Monitoring Report's Table 3-8

Summary of Analytical Results for Dissolved Thallium in Groundwater - 2001 through 2011

	Groundwater Monitoring Wells					
Date	MW6-110U	MW6-112U	MW6-113T	MW6-122T	PZ-E	PZ-W
Dec-01	<0.76 UM	<0.76 UM	<0.76 UM			
Oct-02	NA	<0.63 U	<0.63 U			
Apr-03	<0.63 U	<0.63 U	<0.63 U			
Sep-03	<0.63 UM	<0.63 UM	NA			
Oct-04	<0.63 U	<0.63 U	NA			
Oct-05	6.15 F	<4.63 U/<4.63 U	<4.63 U		8.36 F	5.43 F
Jul-06	NA	NA		6.5 F	<5.87 U	NA
Oct-06	<5.87 U	<5.87 U	<29.4 U/<29.4U	NA	<5.87 U	<5.87 U
Oct-07	<0.83 U	<5.87 U	19.7 F	<0.83 U	NA	NA
Oct-08	NA	NA	1.2	0.14 F	<0.02 U	<0.04 U
Nov-09	0.030 F #	0.025 F #	1.4 #	0.17 F #	0.053 F #	<0.020 U #
Nov-10	<0.020 U	0.030 F	0.41	NA	<0.020 UQ	0.029 F
Oct-11	NA	NA	NA	0.12 F	NA	NA

Notes:

Only monitoring wells with thallium detections exceeding MCL via Method 6010 listed above

Exceeds MCL of 2 ug/L (ppb)

< less than listed detection limit

F - Between MDL and RL

M - May be biased high or low

NA - Not analyzed

U - Not detected

 # - Nov-09 samples not filtered

Attachment G-5 – Long-Term Monitoring Program Trend Charts for CoCs (except Dissolved Arsenic) - 2001 through 2011

Chart 1 – Barium - MW6-110U (surface aquifer) & MW6-112U (surface aquifer)

Chart 2 – Cadmium - MW6-110U (surface aquifer), MW6-113U (surface aquifer) & MW6-113T (lower aquifer)

Chart 3 – Lead - MW6-110U (surface aquifer)

Chart 4 – Nickel - MW6-110U (surface aquifer), MW6-113U (surface aquifer) & MW6-113T (lower aquifer)

Chart 5 – PCBs (Aroclor 1232, 1242 or1016) - MW6-110U (surface aquifer)

Chart 6 – Pesticides (4-4'-DDD) - MW6-114T (lower aquifer)

Chart 7 – SVOCs (1,4-Dichlorobenzene) – MW6-106 (surface aquifer), MW6-110U (surface aquifer), MW6-110T (lower aquifer), MW6-112U (surface aquifer) & MW6-B07 (lower aquifer)

Chart 8 – SVOCs (2,4-Dichlorophenol) – MW6-106 (surface aquifer)

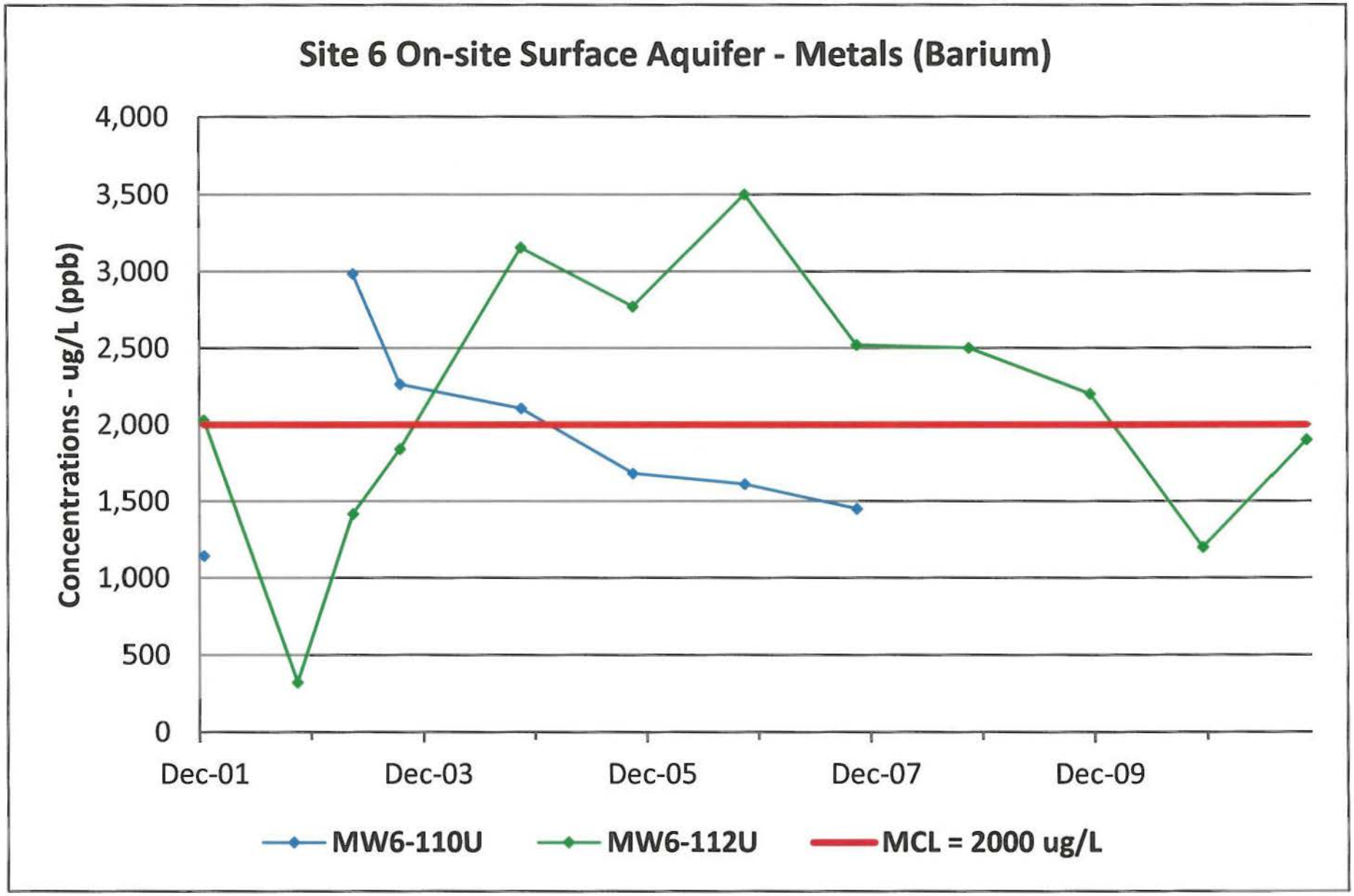
Chart 9 – SVOCs (2,4,5-Trichlorophenol) – MW6-106 (surface aquifer)

Chart 10 – SVOCs (Pentachlorophenol (PCP)) – MW6-106 (surface aquifer)

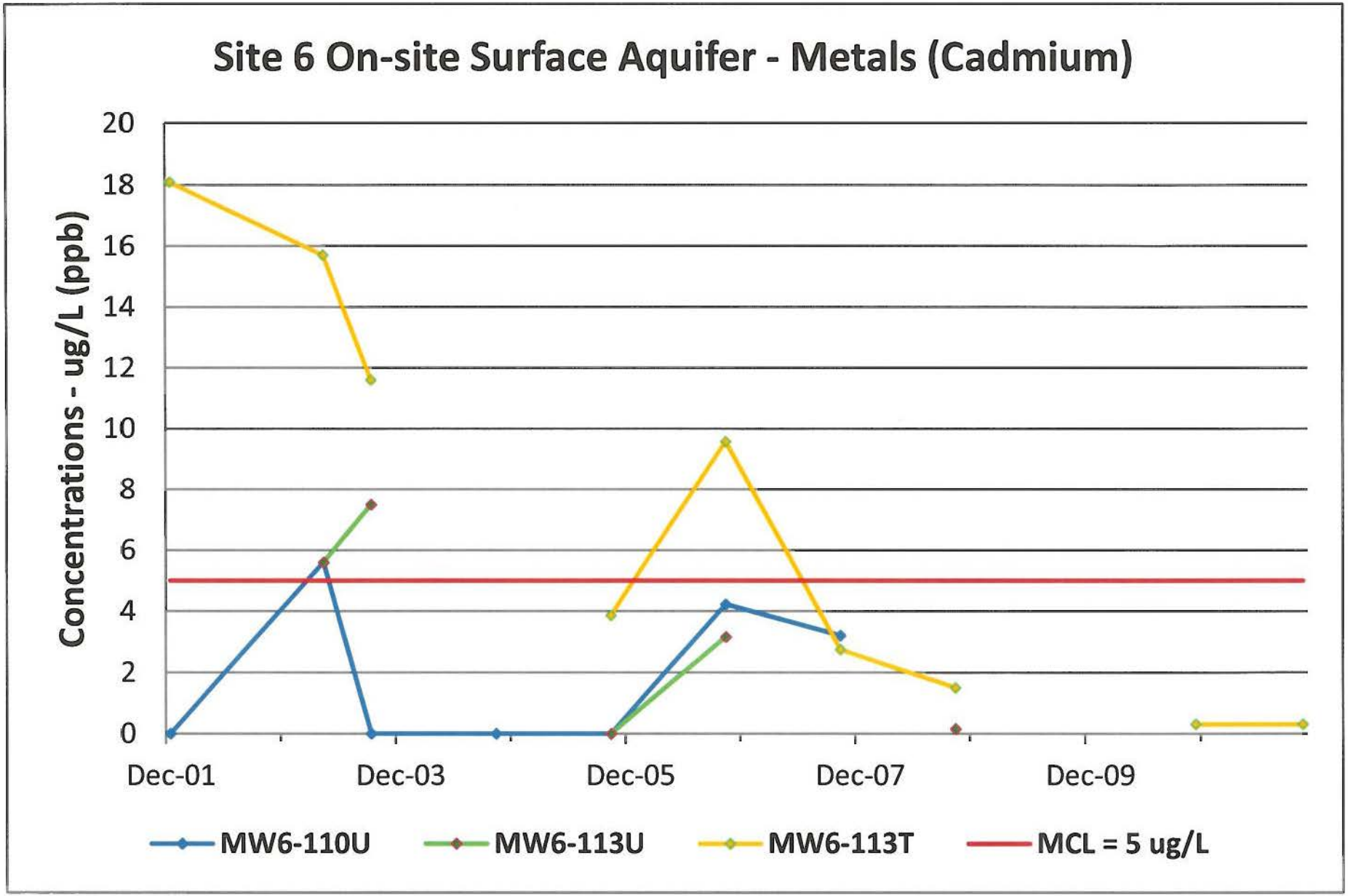
Chart 11 – SVOCs (bis (2-Ethylhexyl) phthalate) - MW6-110U (surface aquifer) and MW6-117U (surface aquifer)

Chart 12 – SVOCs (Naphthalene) – MW6-106 (surface aquifer), MW6-110U (surface aquifer) and MW6-112U (surface aquifer)

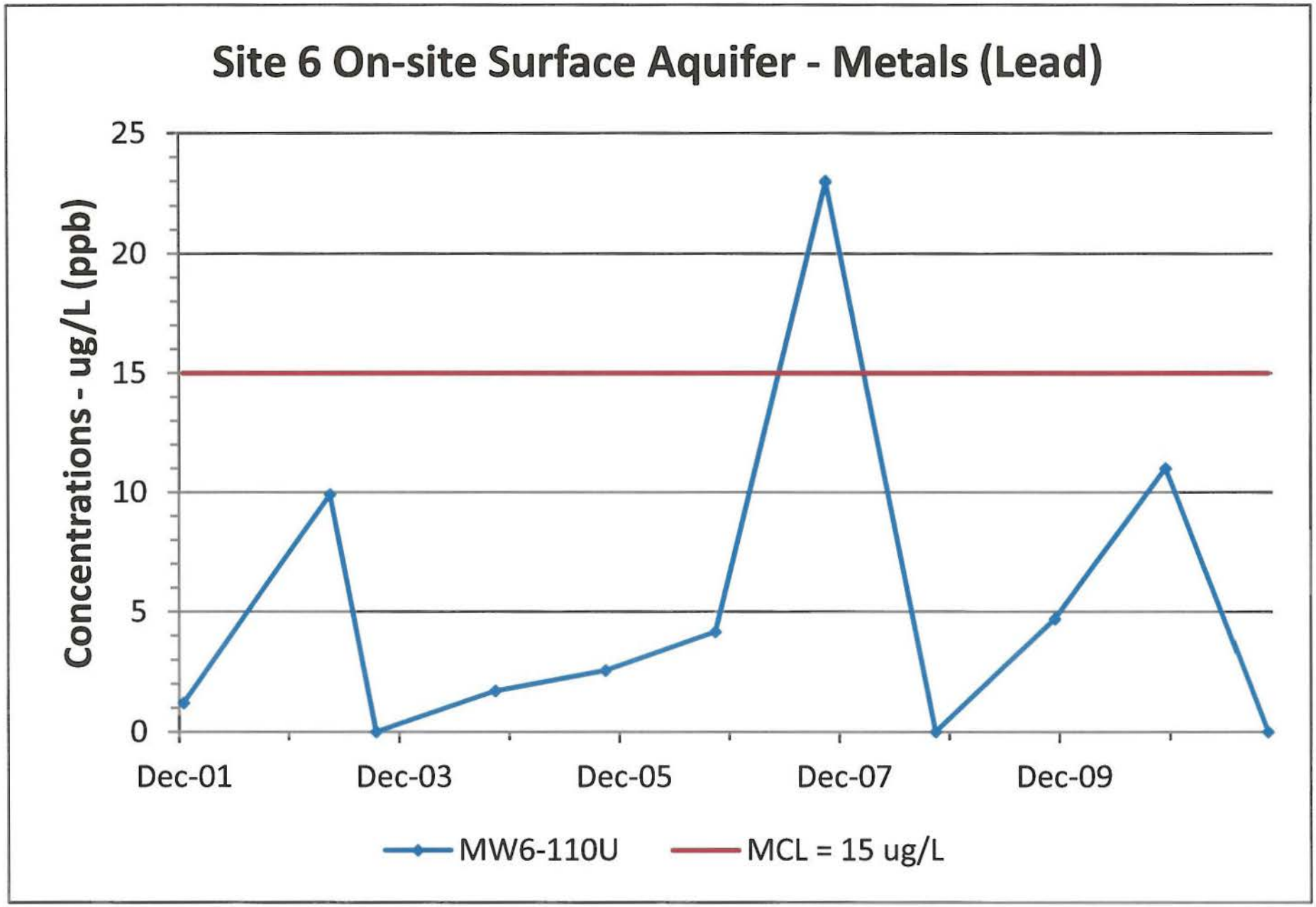
OU-3/IRP Site 6 Historical LTM Results via Off-site Laboratory



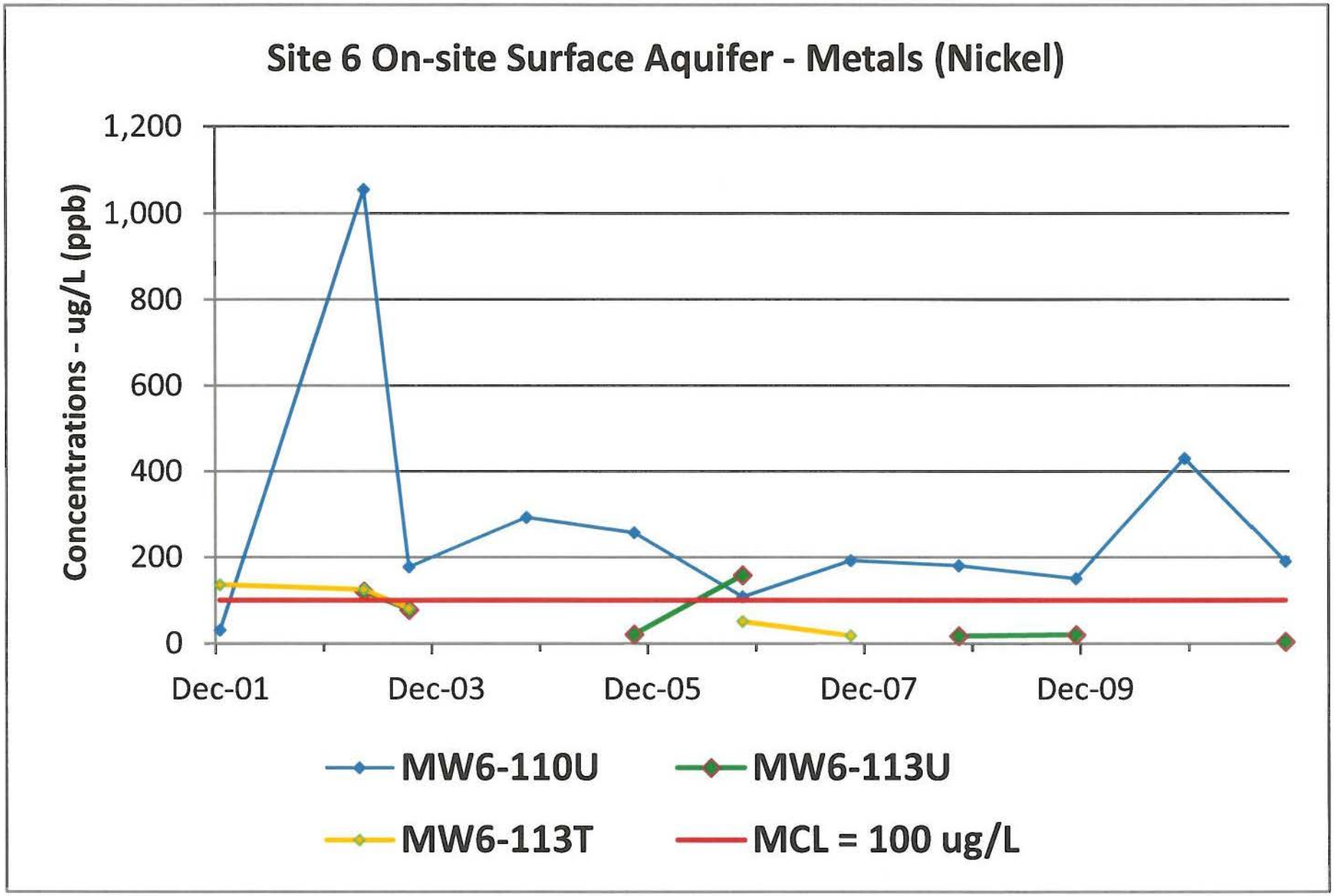
OU-3/IRP Site 6 Historical LTM Results via Off-site Laboratory



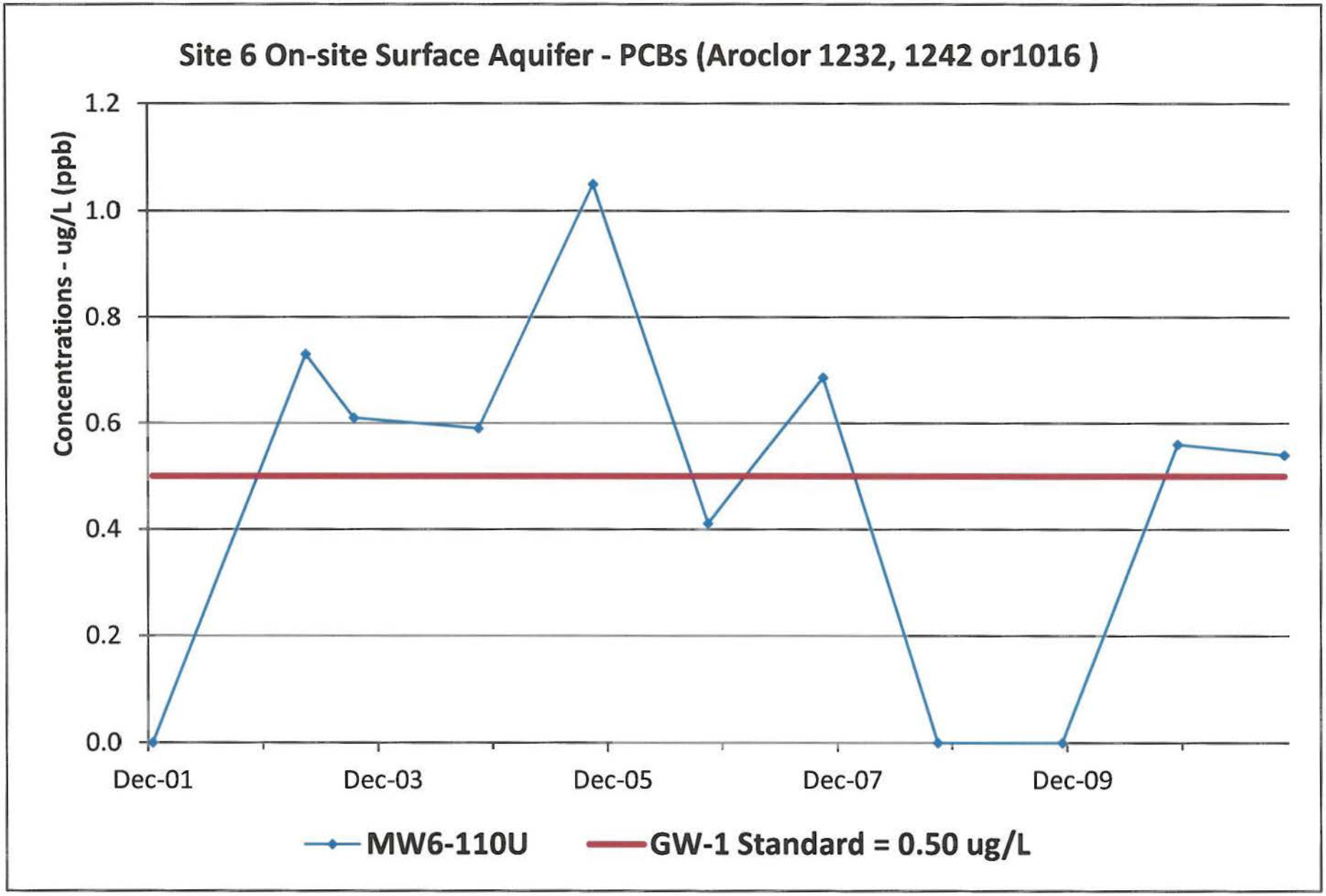
OU-3/IRP Site 6 Historical LTM Results via Off-site Laboratory



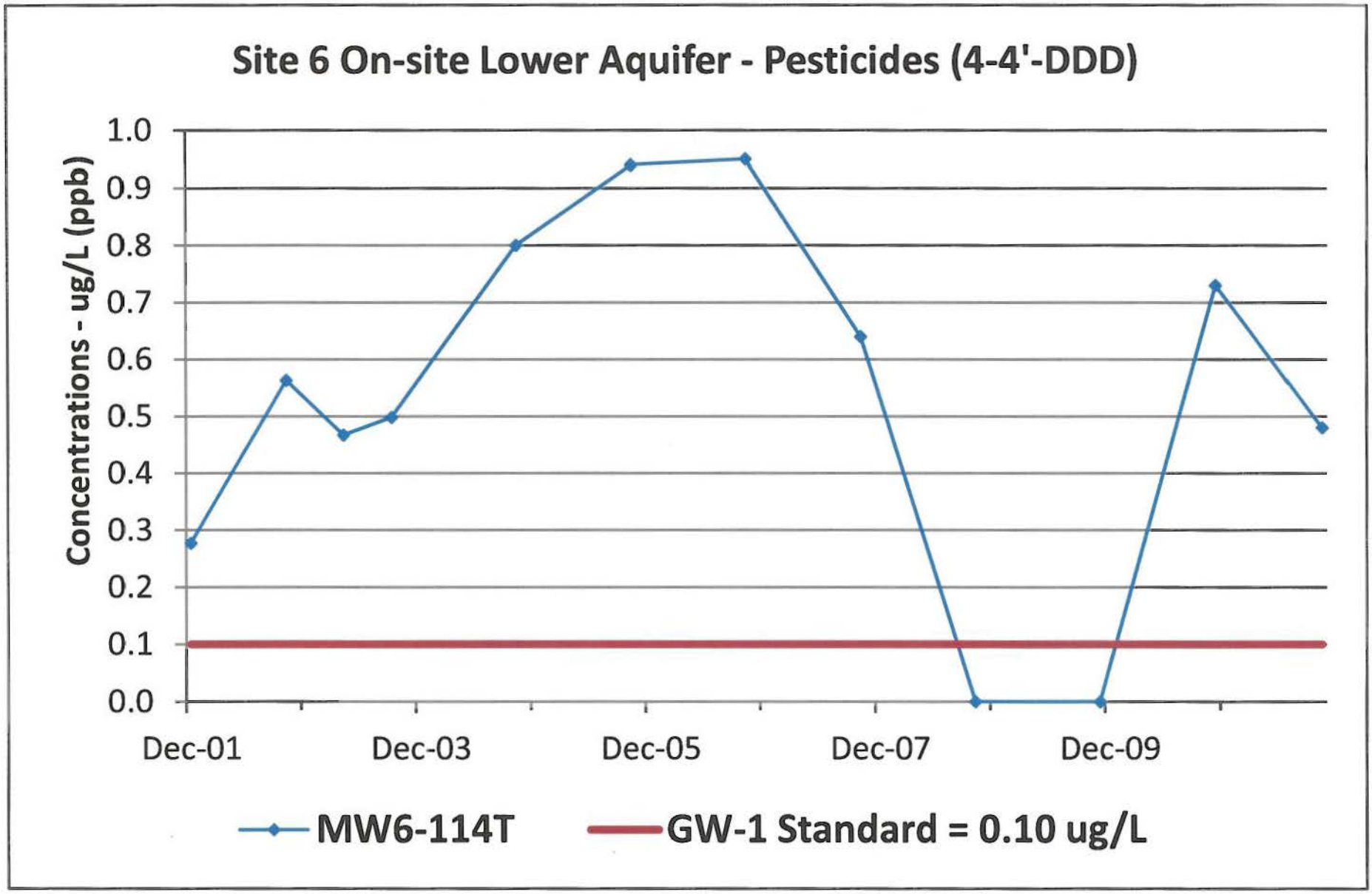
OU-3/IRP Site 6 Historical LTM Results via Off-site Laboratory



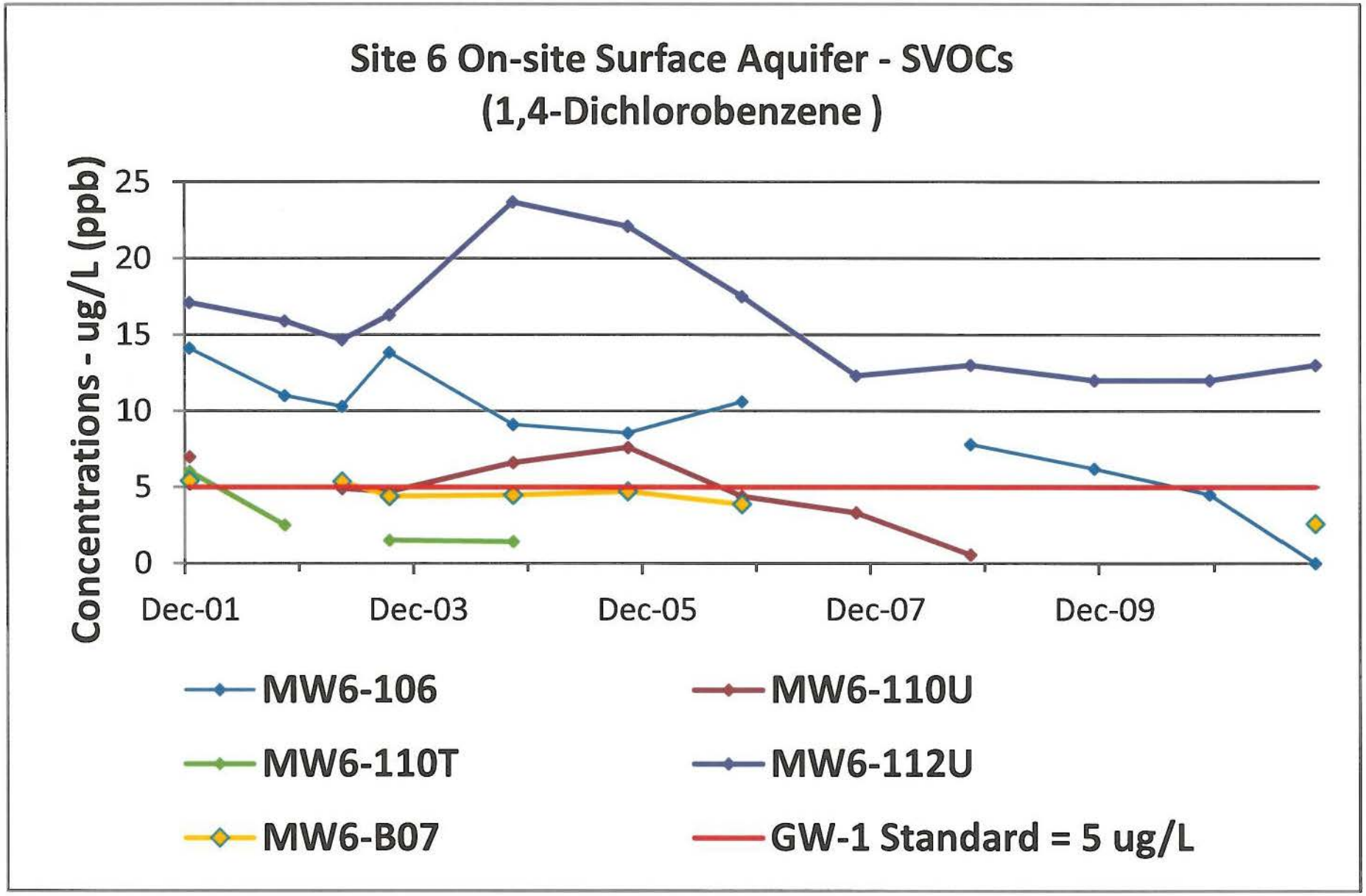
OU-3/IRP Site 6 Historical LTM Results via Off-site Laboratory



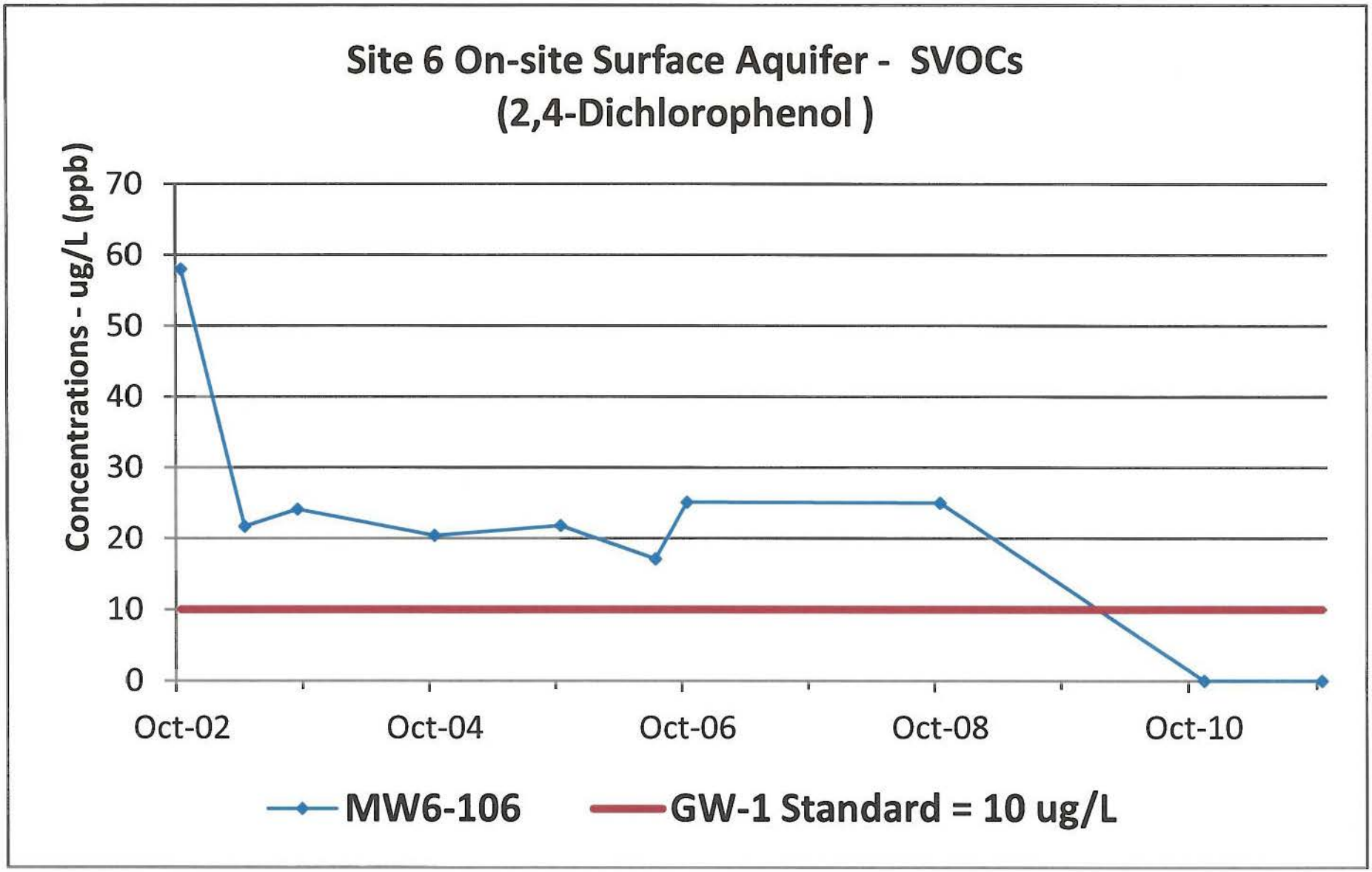
OU-3/IRP Site 6 Historical LTM Results via Off-site Laboratory



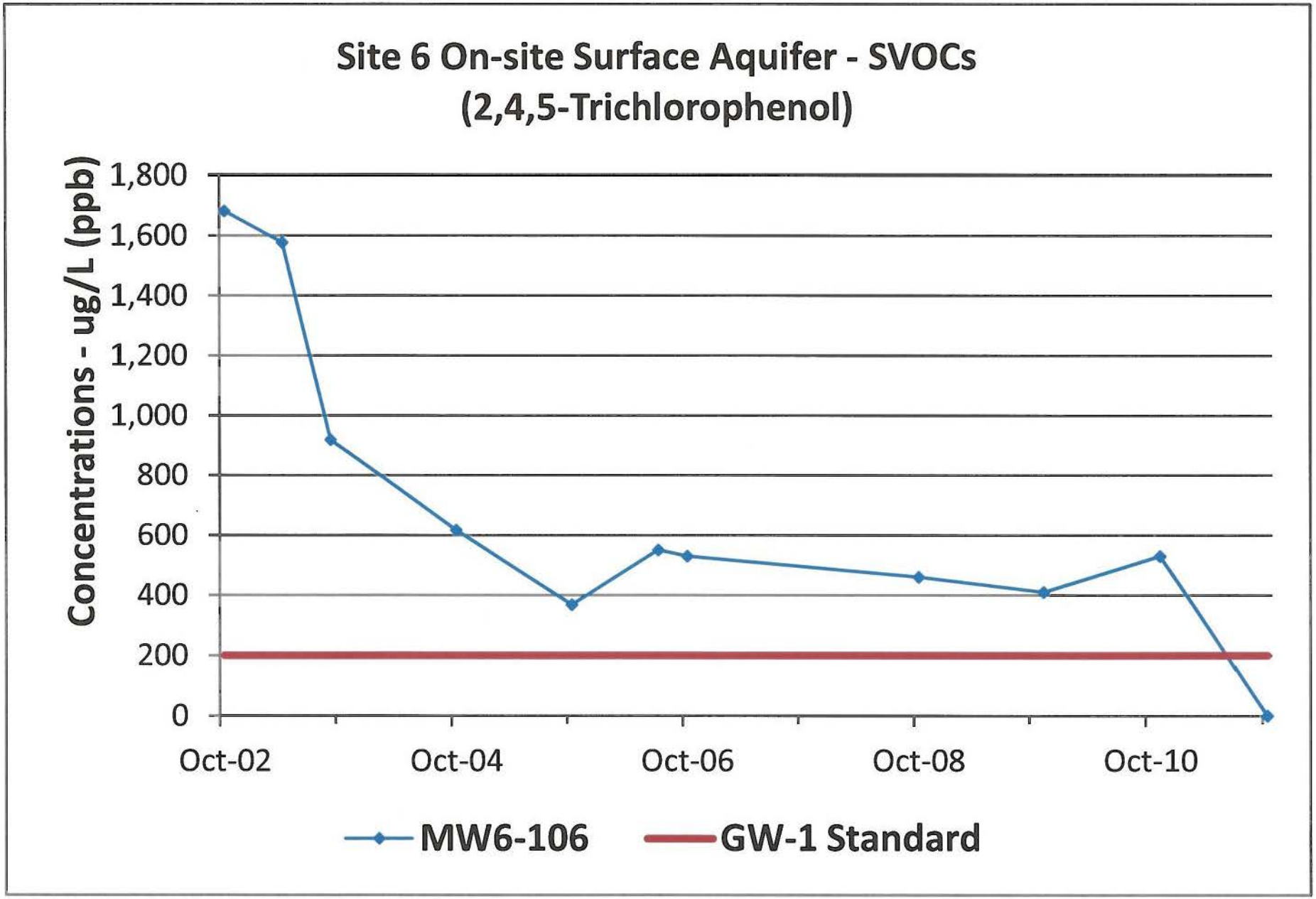
OU-3/IRP Site 6 Historical LTM Results via Off-site Laboratory



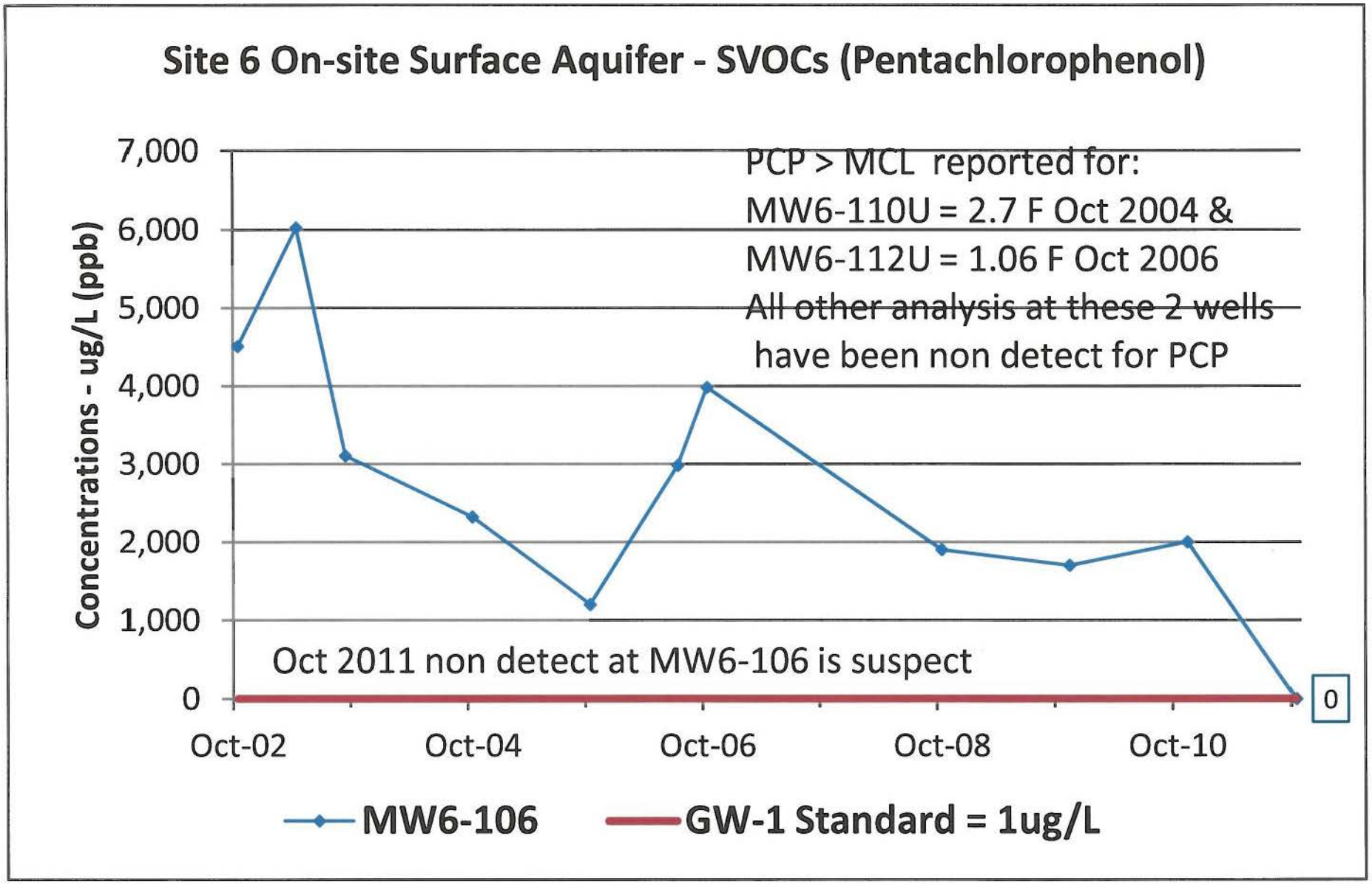
OU-3/IRP Site 6 Historical LTM Results via Off-site Laboratory



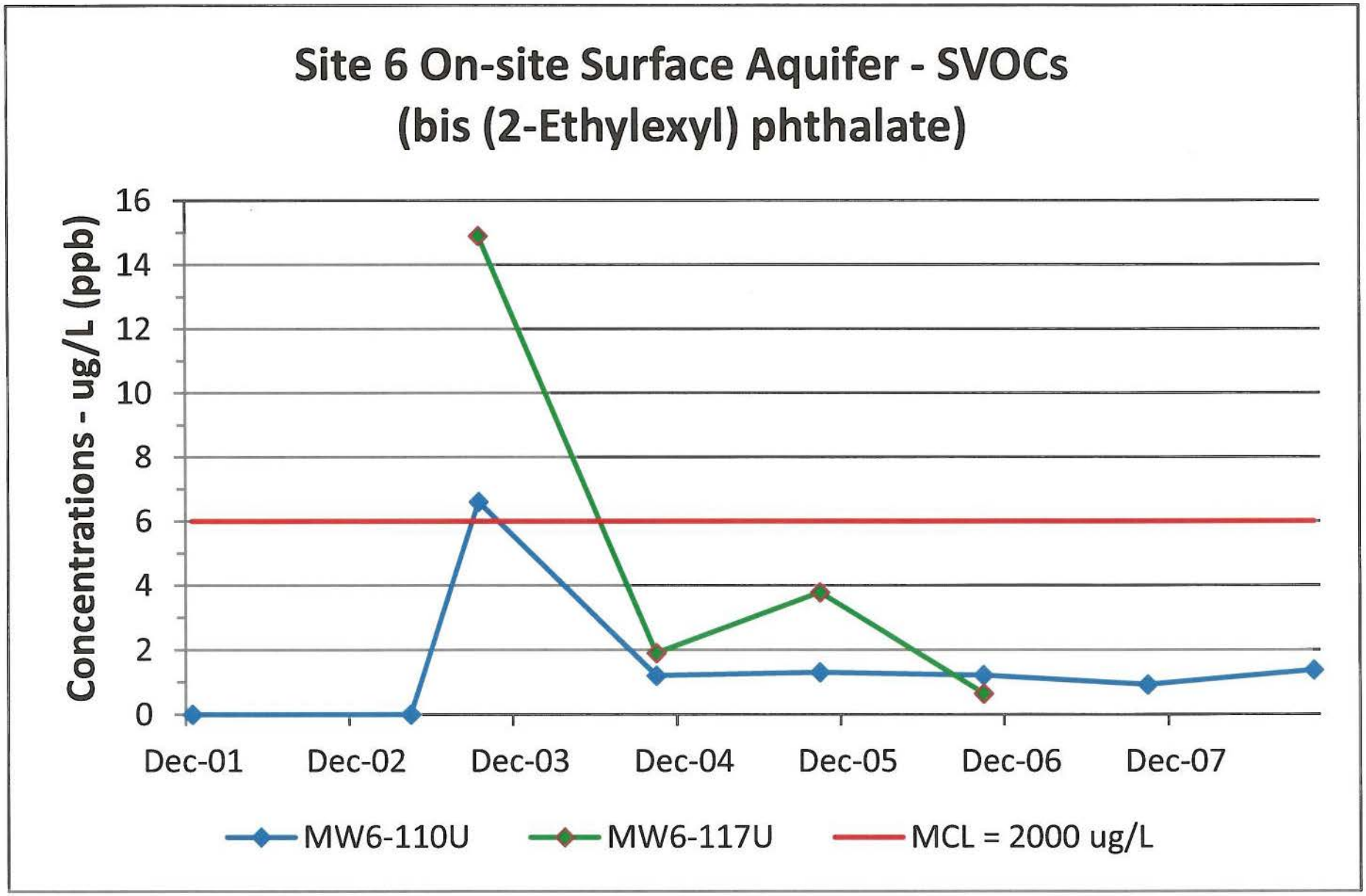
OU-3/IRP Site 6 Historical LTM Results via Off-site Laboratory



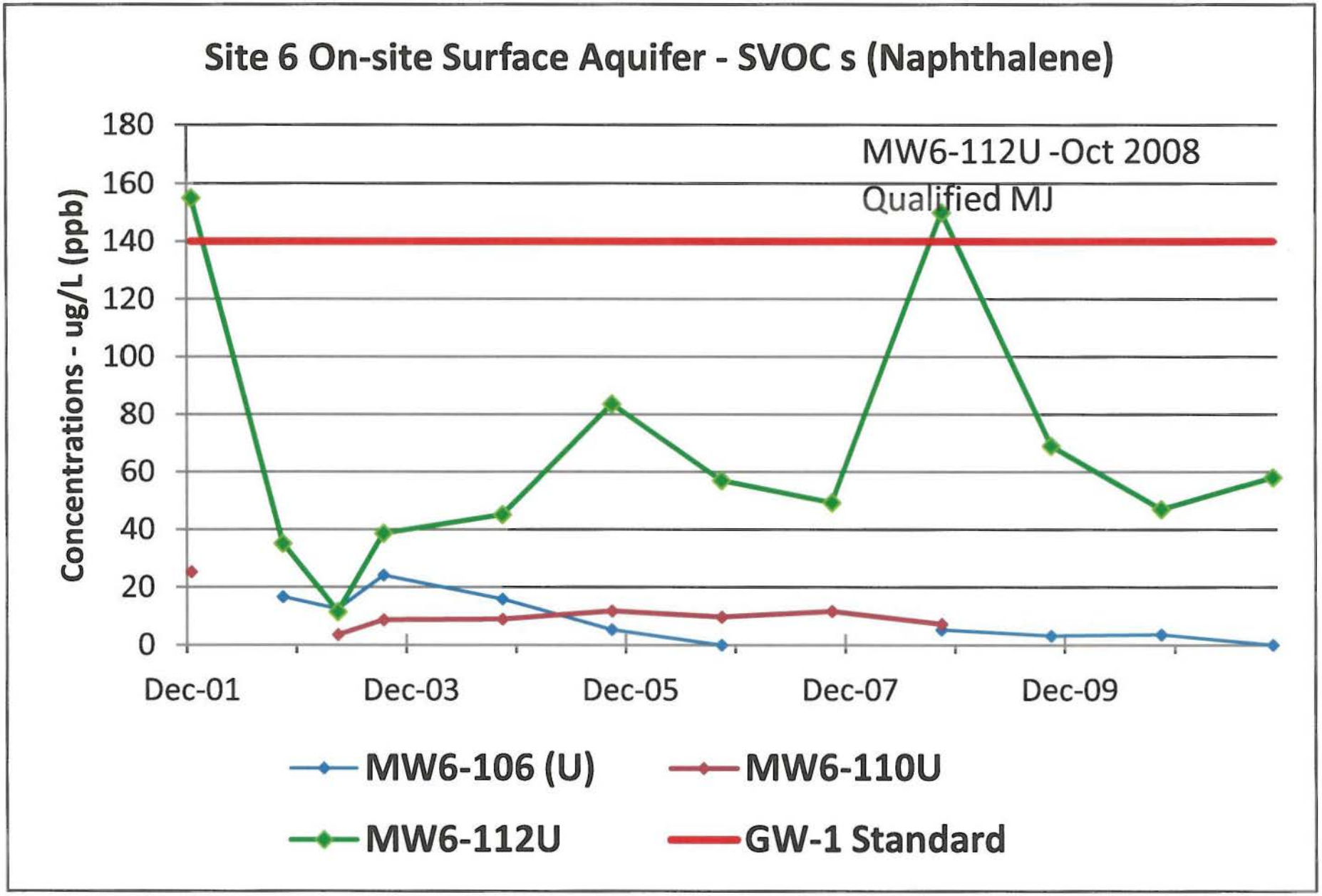
OU-3/IRP Site 6 Historical LTM Results via Off-site Laboratory



OU-3/IRP Site 6 Historical LTM Results via Off-site Laboratory



OU-3/IRP Site 6 Historical LTM Results via Off-site Laboratory



Attachment G-6 – OU-3/IRP Site 6 Long-Term Monitoring Charts Showing Trends

On-site Wells - Aquifer

Chart 1 - MW6-16 – Surface Aquifer – Dissolved Arsenic, 2001-2011
Chart 2 - MW6-17 – Surface Aquifer – Dissolved Arsenic, 2001-2011
Chart 3 - MW6-23 – Lacustrine/Lower Aquifer – Dissolved Arsenic, 2001-2009
Chart 4 - MW6-103 – Surface/Lacustrine Aquifer – Dissolved Arsenic, 2003-2012
Chart 5 - MW6-104 – Surface/Lacustrine/Lower Aquifer–Dissolved Arsenic, 2003-2009
Chart 6 - MW6-105 – Surface/Lacustrine Aquifer – Dissolved Arsenic, 2002-2010
Chart 7 - MW6-113U – Surface Aquifer – Dissolved Arsenic, 2003-2007

Chart 8 - MW6-B07 — Lower Aquifer Dissolved Arsenic, 2001-2011
Chart 9 - MW6-B09 – Lower Aquifer – Dissolved Arsenic, 2001-2011
Chart 10 - MW6-B10 – Lower Aquifer – Dissolved Arsenic, 2001-2011
Chart 11 - MW6-11 – Lower Aquifer – Dissolved Arsenic, 2001-2007
Chart 12 - MW6-13 – Lower Aquifer – Dissolved Arsenic, 2001-2007
Chart 13 - MW6-110T – Lower Aquifer – Dissolved Arsenic, 2001-2011
Chart 14 - MW6-111T – Lower Aquifer – Dissolved Arsenic, 2004-2011

Off-site Wells - Aquifer

Chart 15 - MW6-118U – Surface Aquifer – Dissolved Arsenic, 2002-2012
Chart 16 - PZ-E – Surface Aquifer – Dissolved Arsenic, 2007-2012
Chart 17 - PZ-W – Surface Aquifer – Dissolved Arsenic, 2007-2012

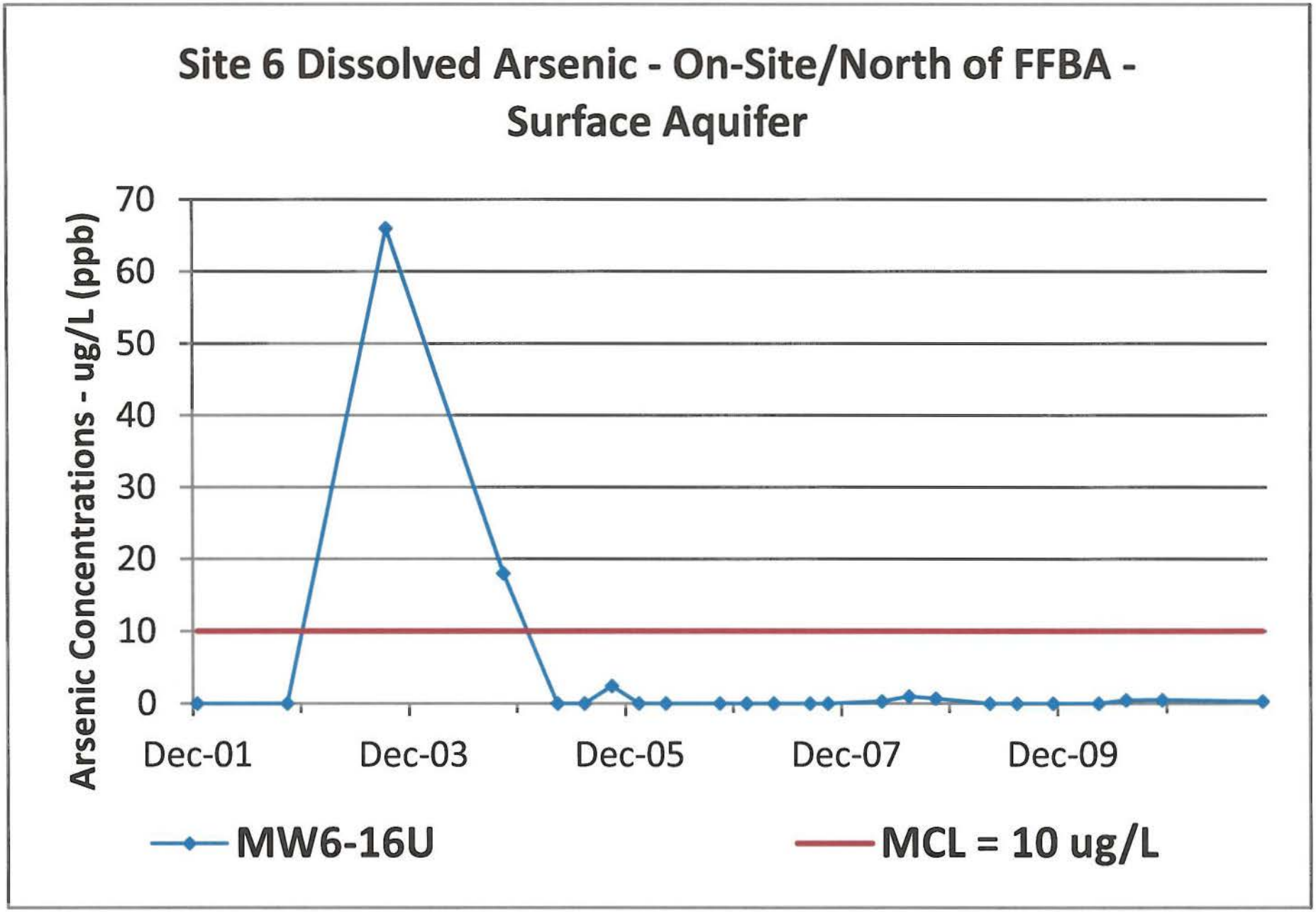
Compliance Boundary Wells - Aquifer

Chart 18 - MW6-21 – Surface Aquifer – Dissolved Arsenic, 2001-2012
Chart 19 - MW6-117U – Surface Aquifer – Dissolved Arsenic, 2002-2012
Chart 20 - MW6-119U – Surface Aquifer – Dissolved Arsenic, 2006-2012
Chart 21 - MW6-120U – Surface Aquifer – Dissolved Arsenic, 2006-2012
Chart 22 - MW6-121U – Surface Aquifer – Dissolved Arsenic, 2006-2012
Chart 23 - MW6-125U – Surface Aquifer – Dissolved Arsenic, 2008-2012
Chart 24 - MW6-15 – Lower Aquifer – Dissolved Arsenic, 2001-2011

Hanscom Field Wells - Aquifer

Chart 25 - MW6-123U – Surface Aquifer – Dissolved Arsenic, 2008-2012
Chart 26 - MW6-124U – Surface Aquifer – Dissolved Arsenic, 2008-2012
Chart 27 - MP MW-301 & MP MW-305 – Surface Aquifer–Dissolved Arsenic, 2010-12

OU-3/IRP Site 6 Historical LTM Results via Off-site Laboratory



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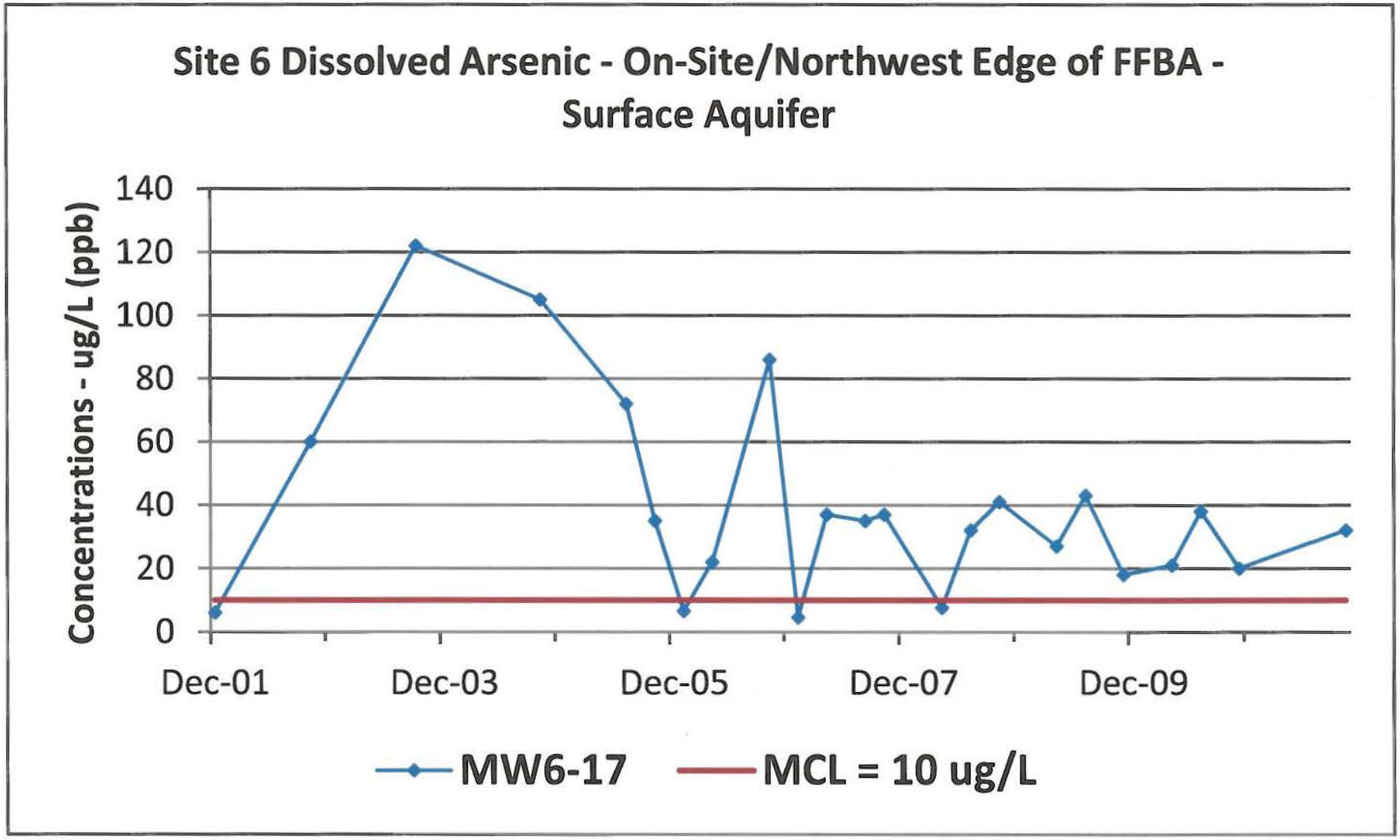

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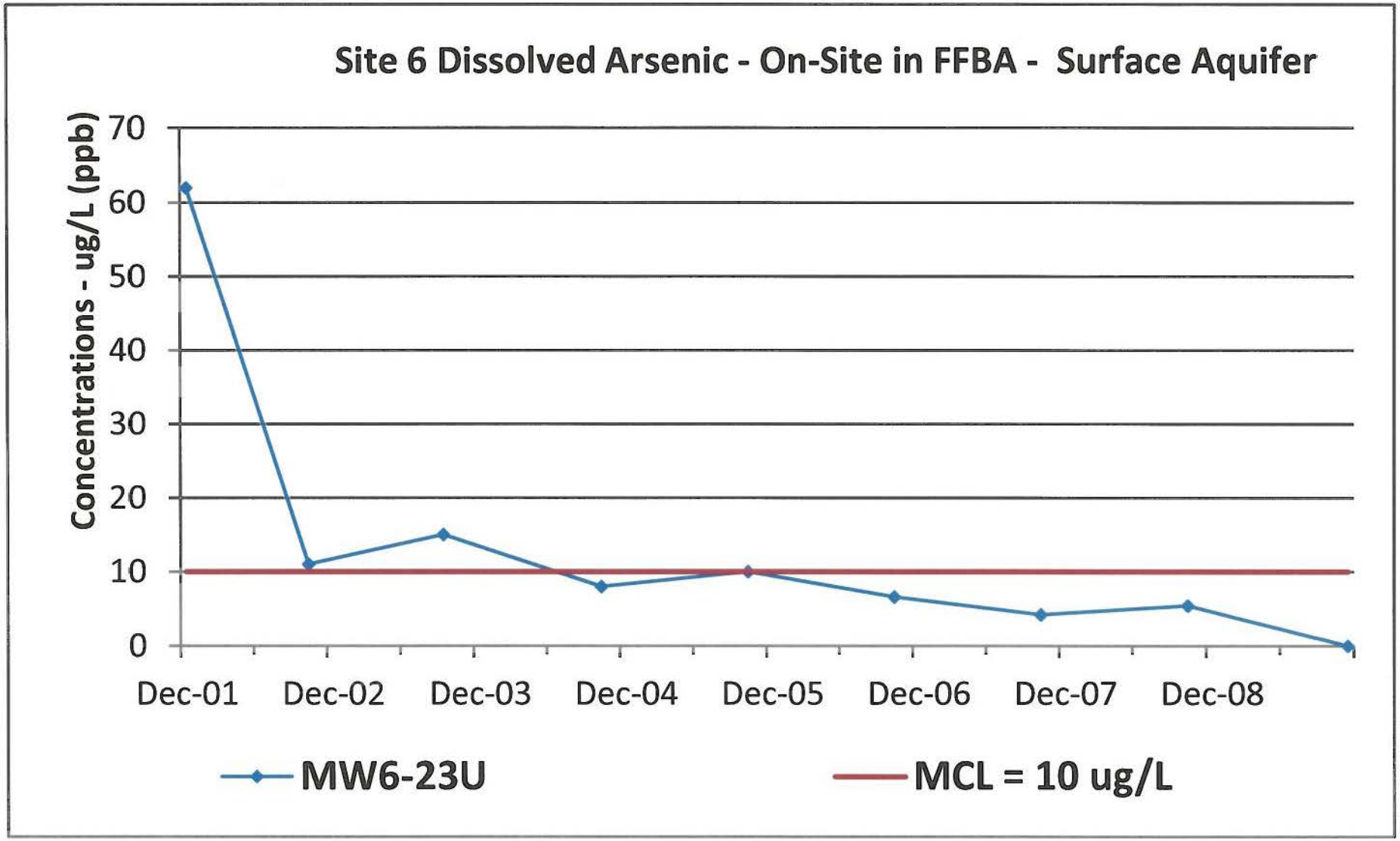

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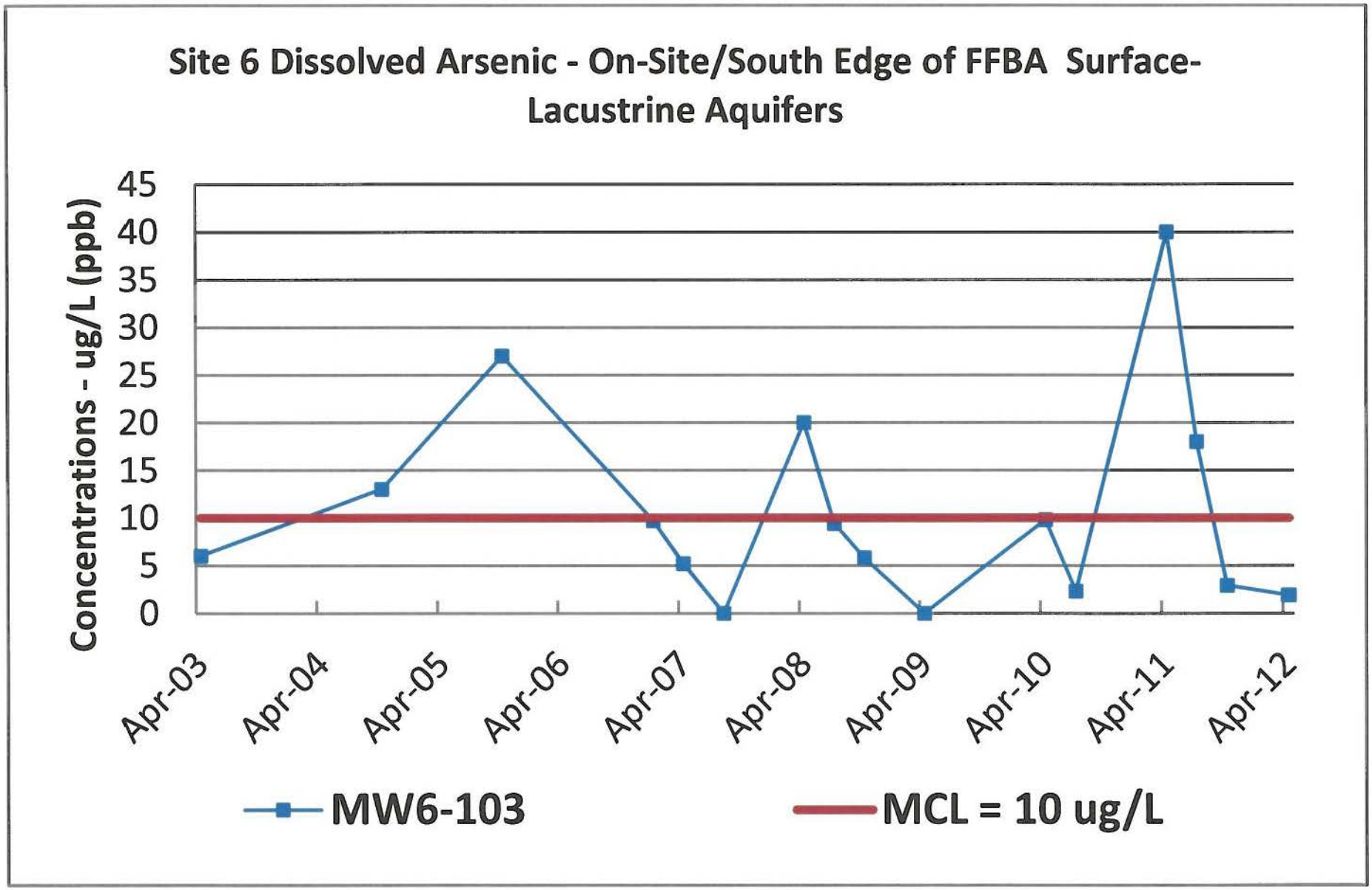
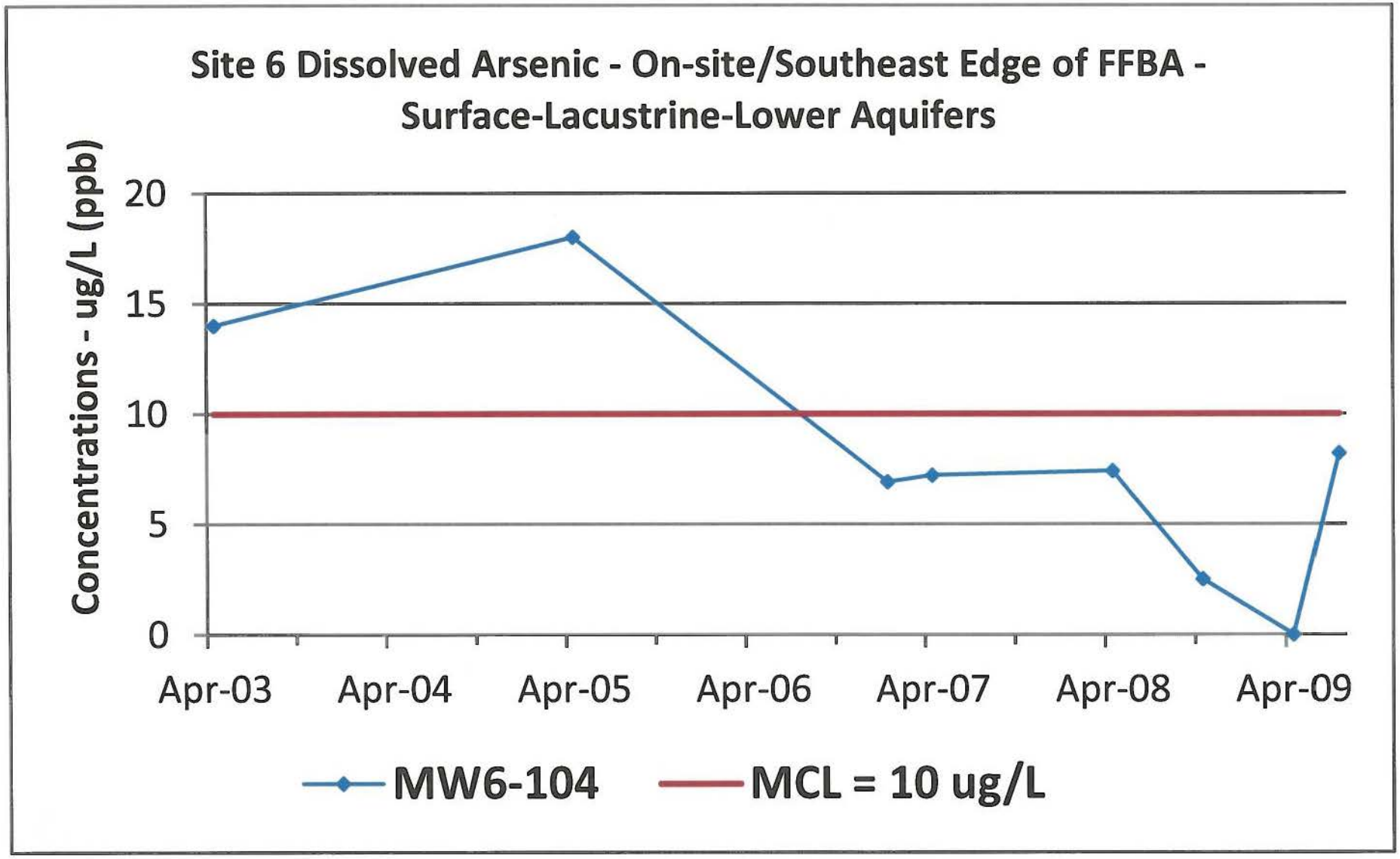


OU-3/IRP Site 6 Historical LTM Results via Off-site Laboratory



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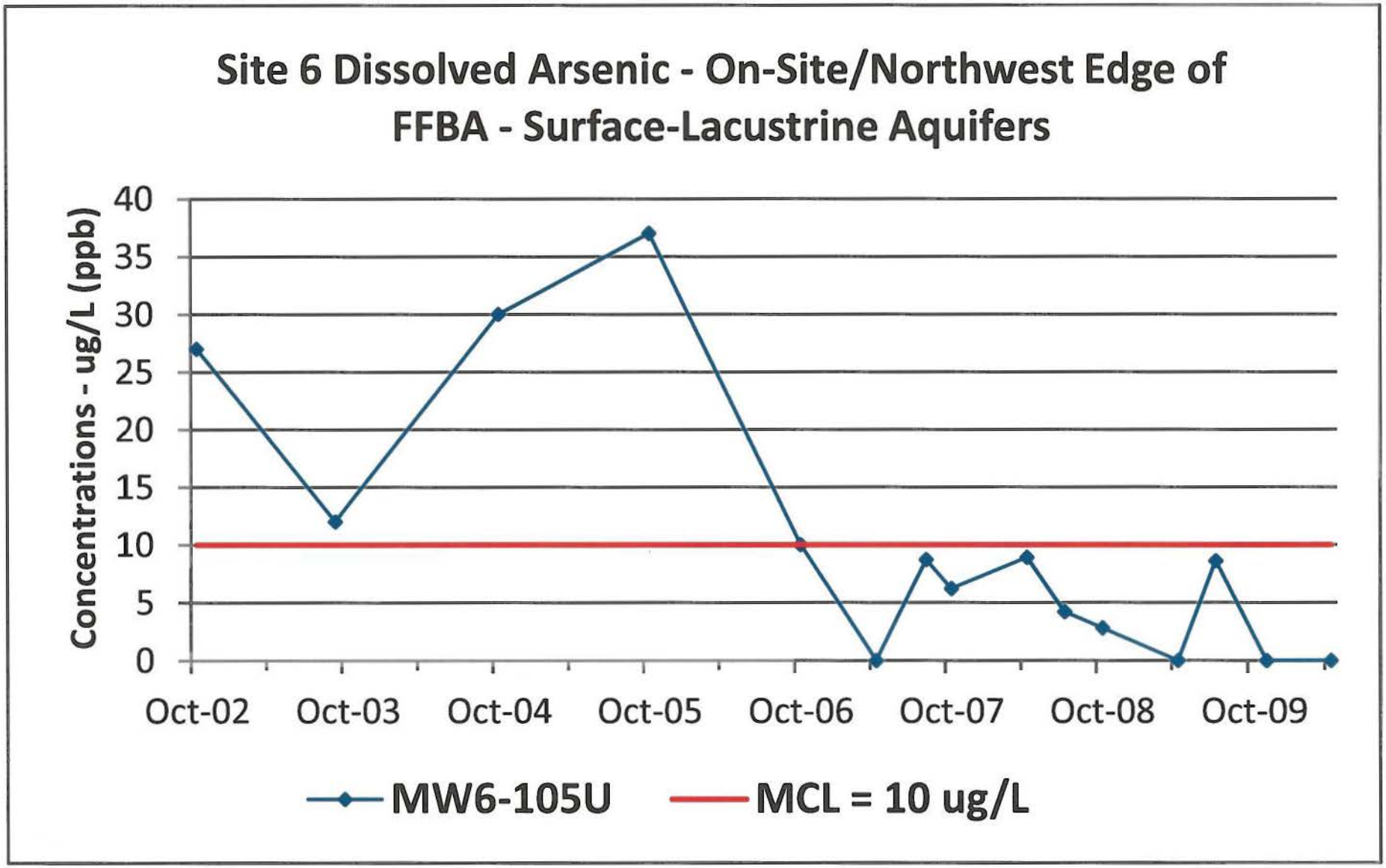

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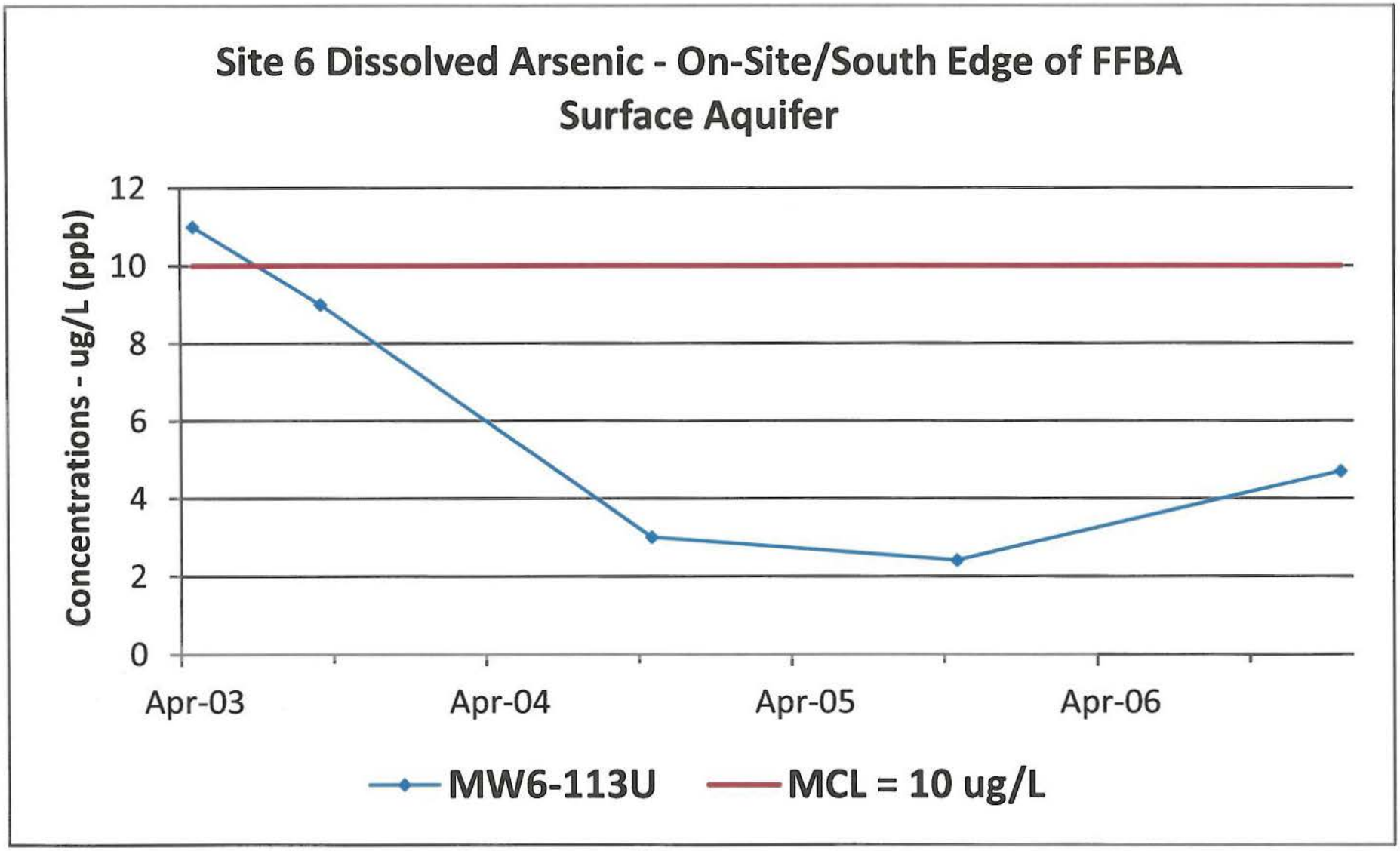

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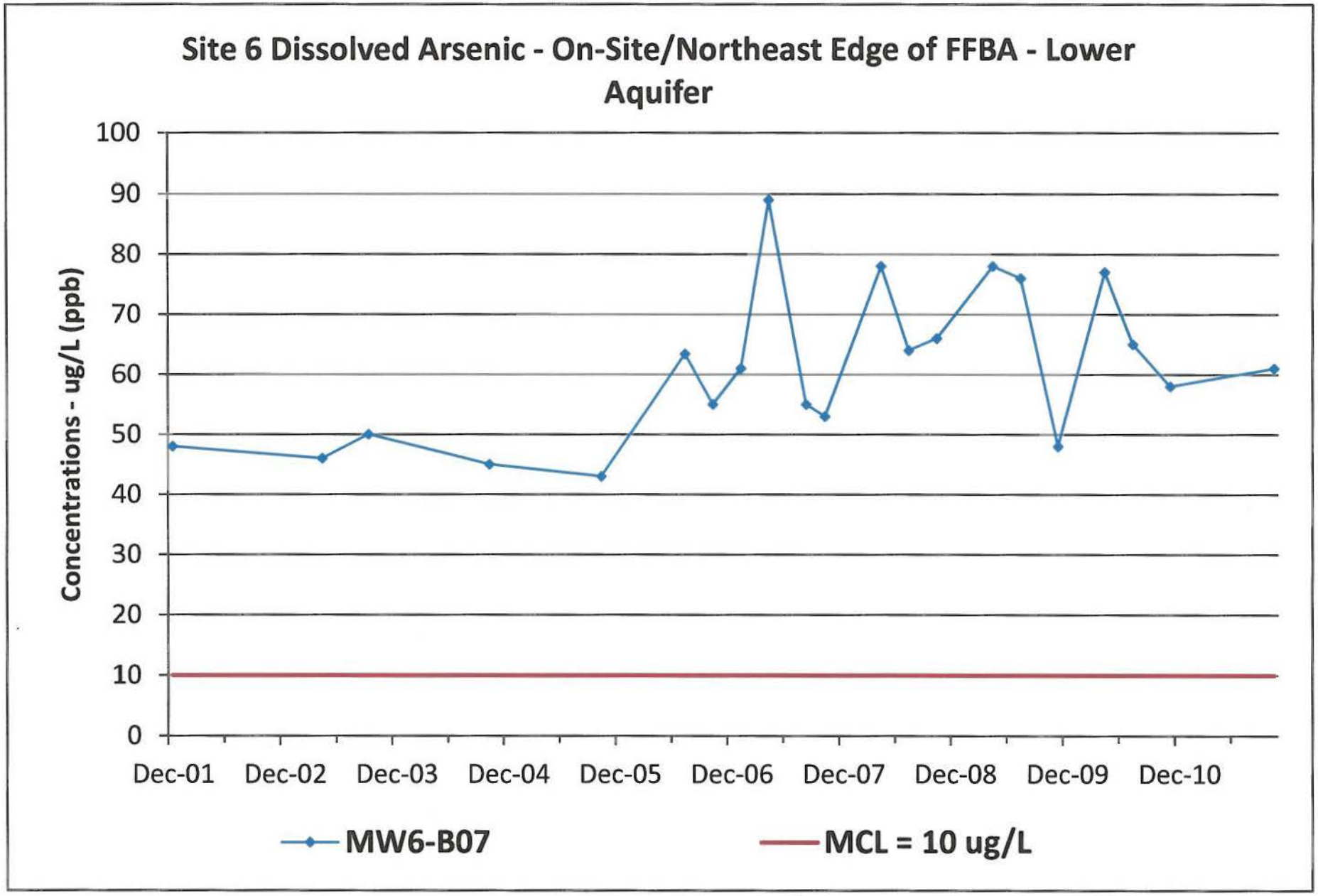

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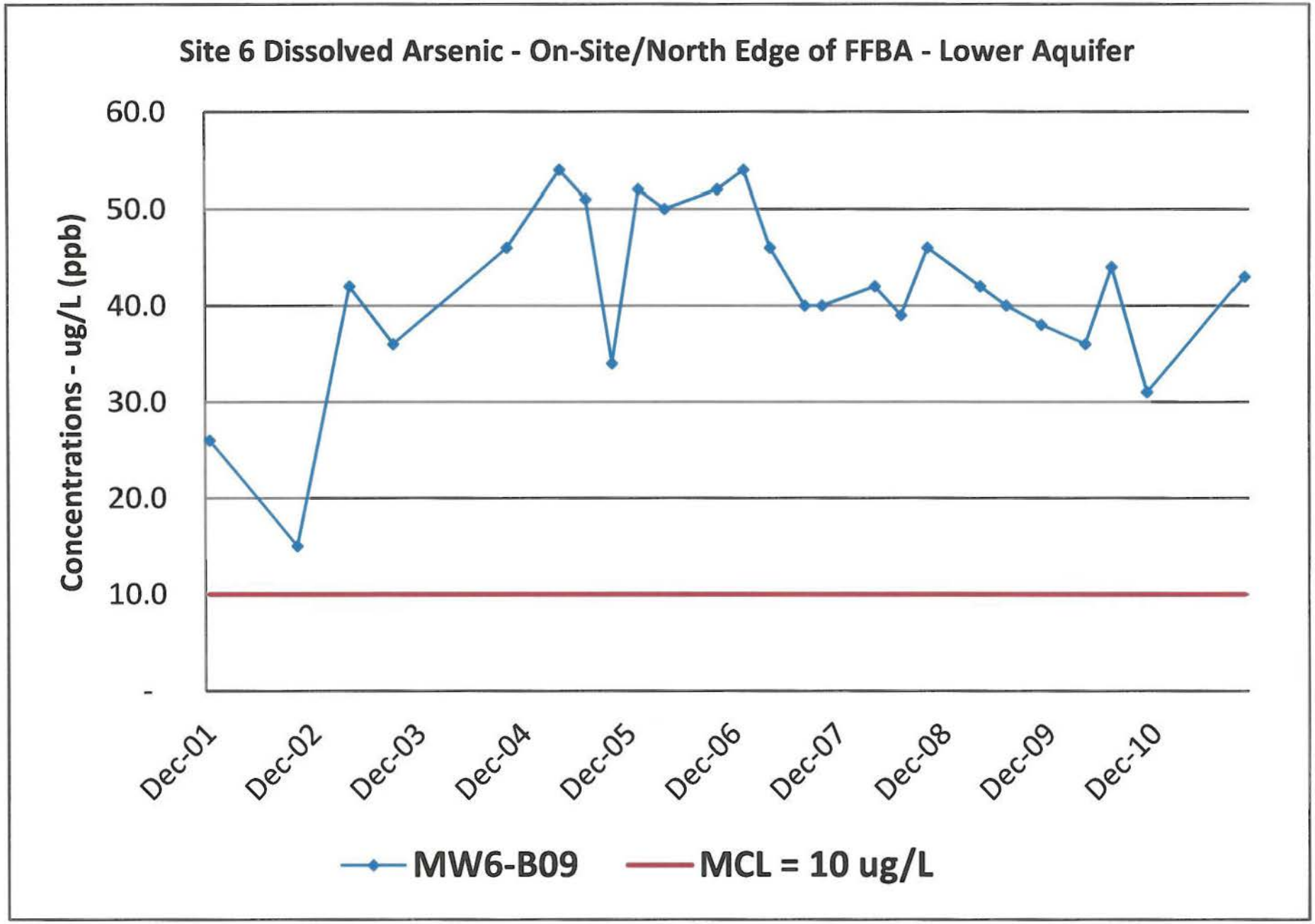

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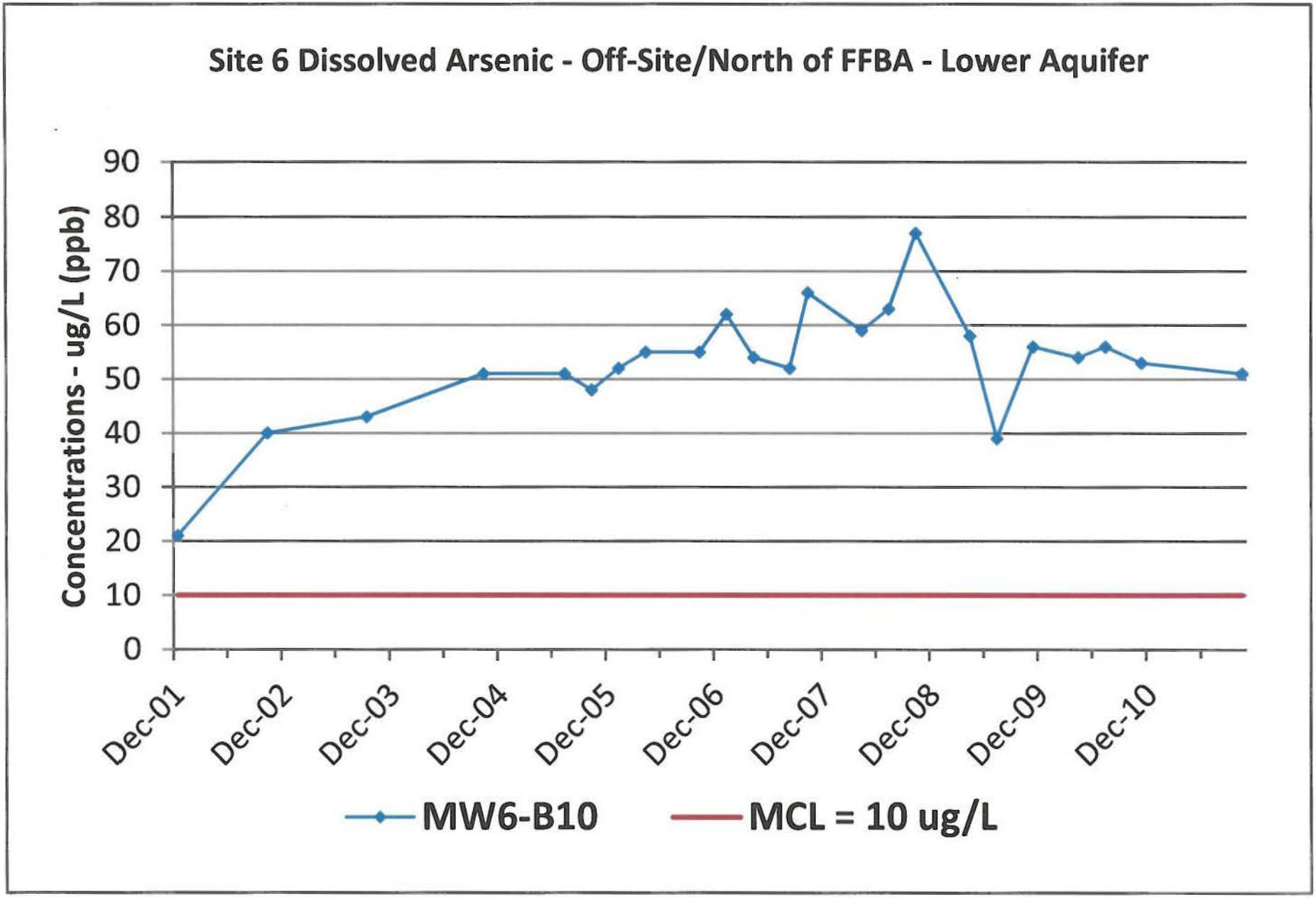

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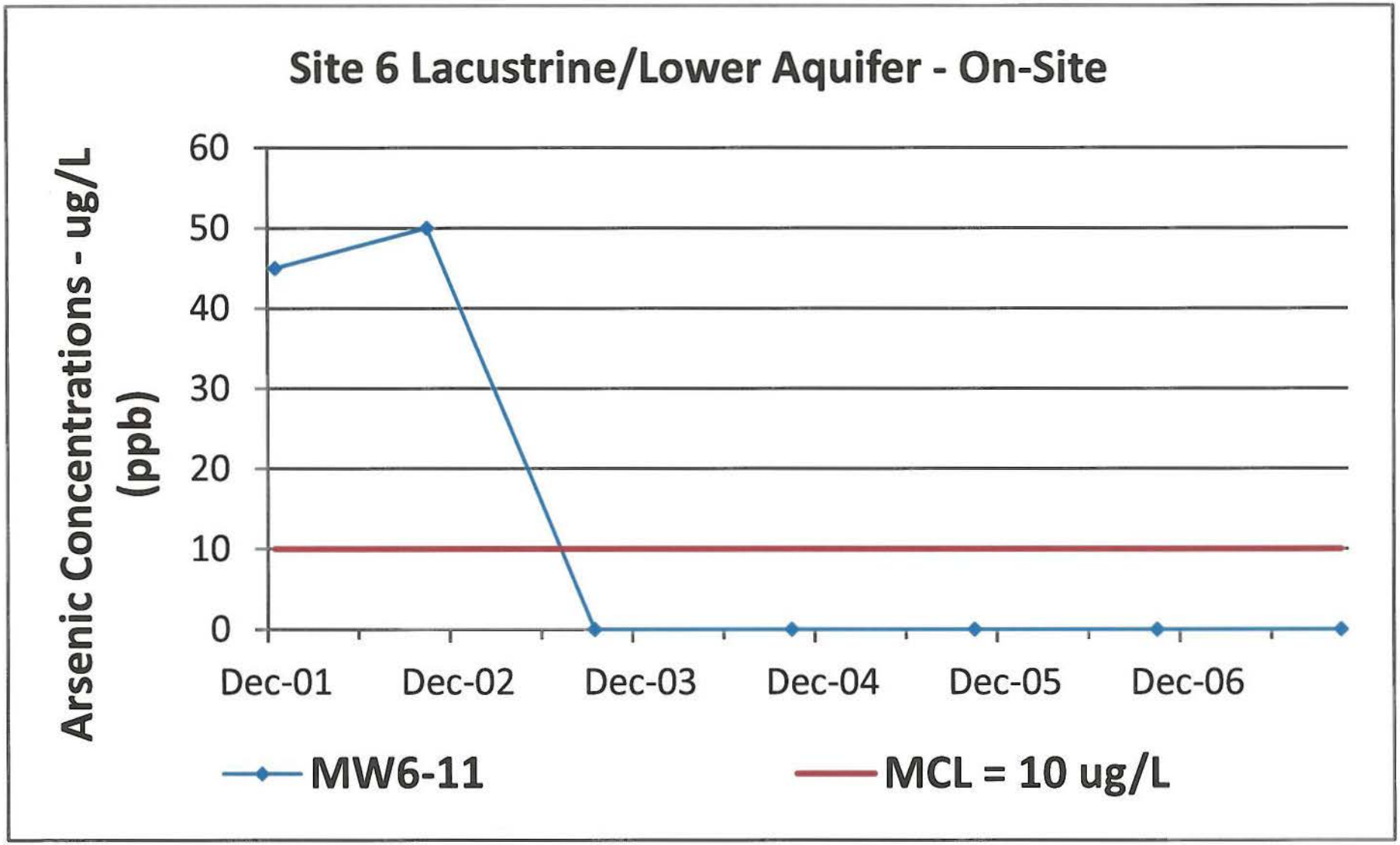

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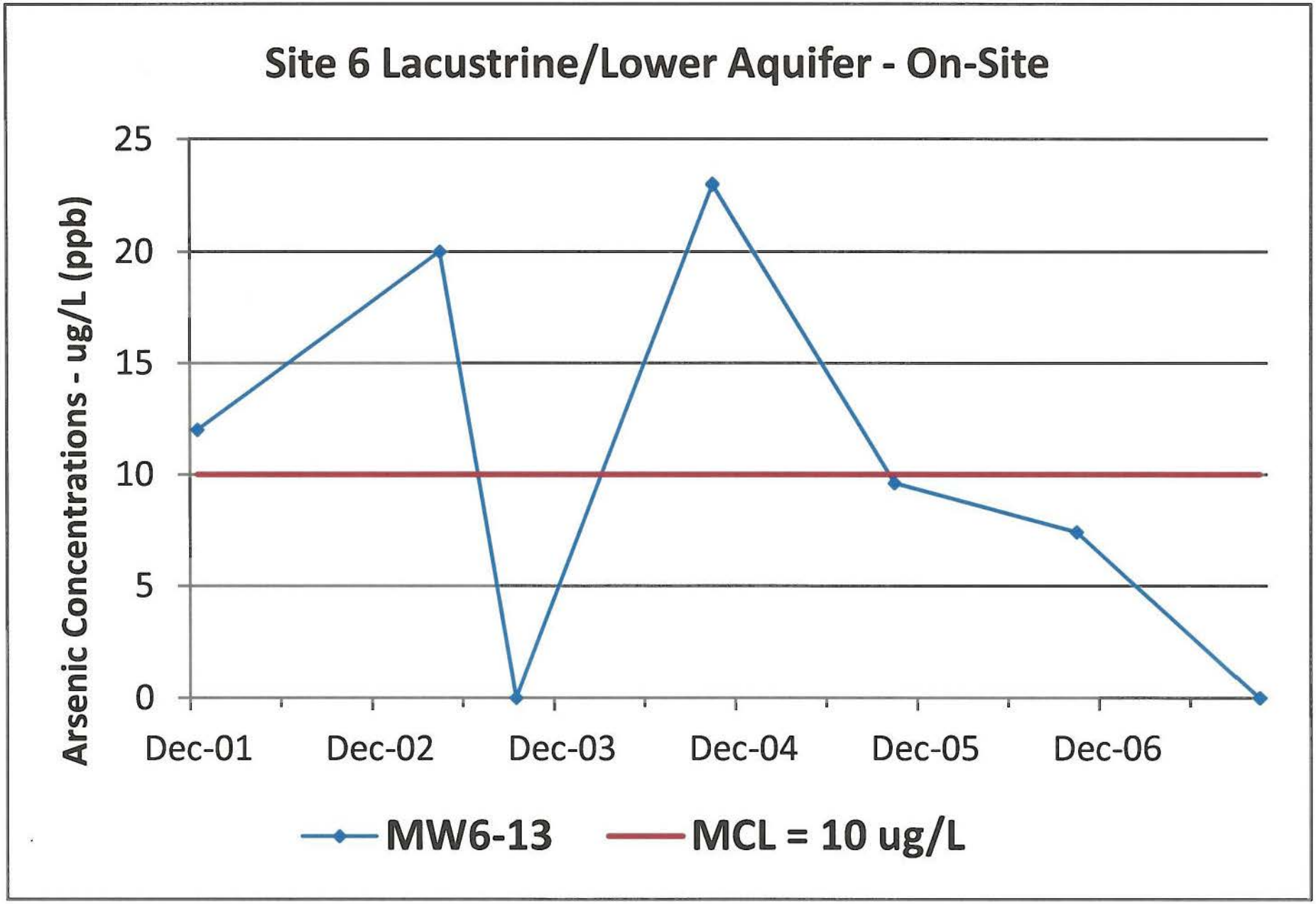

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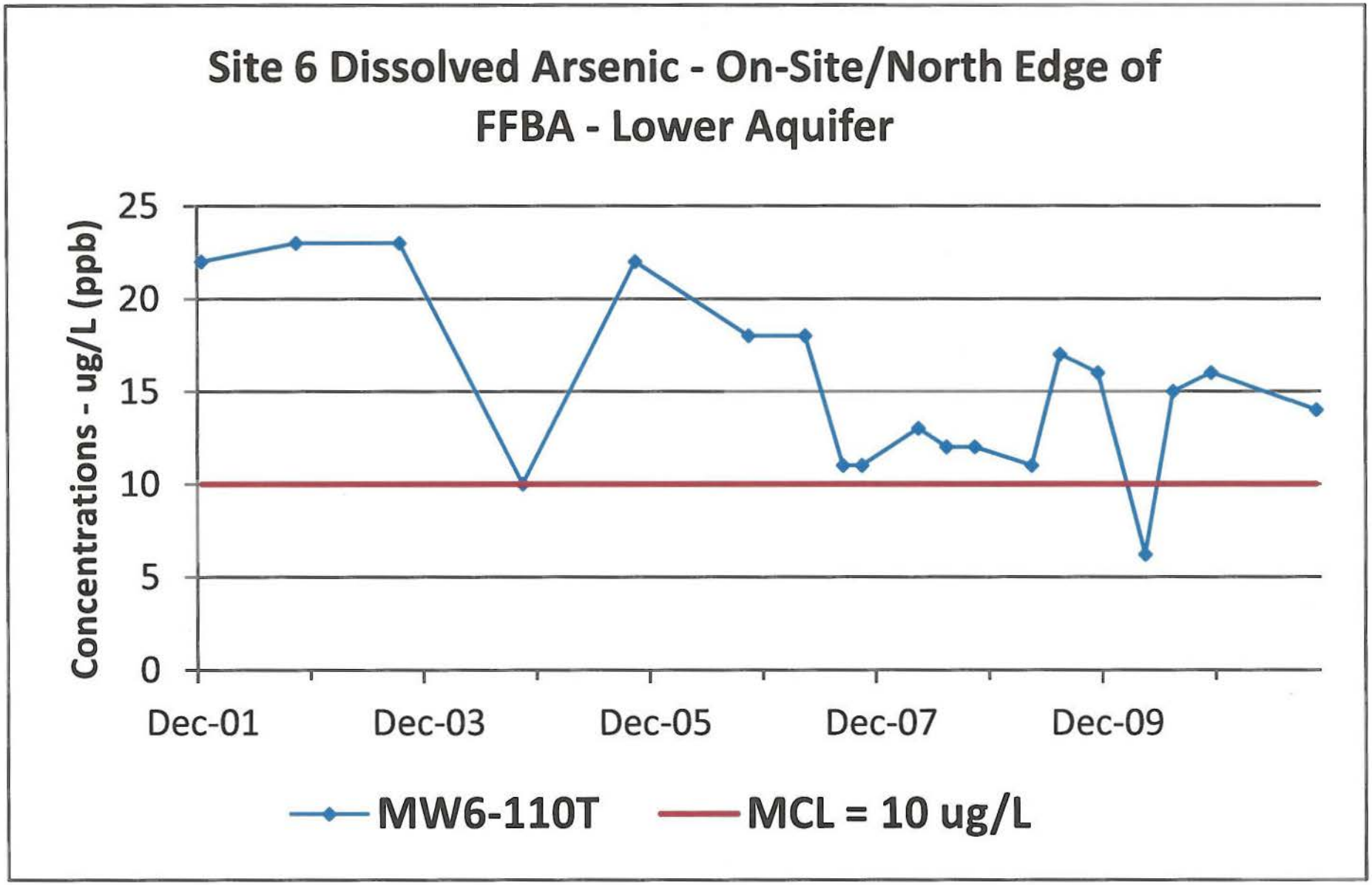

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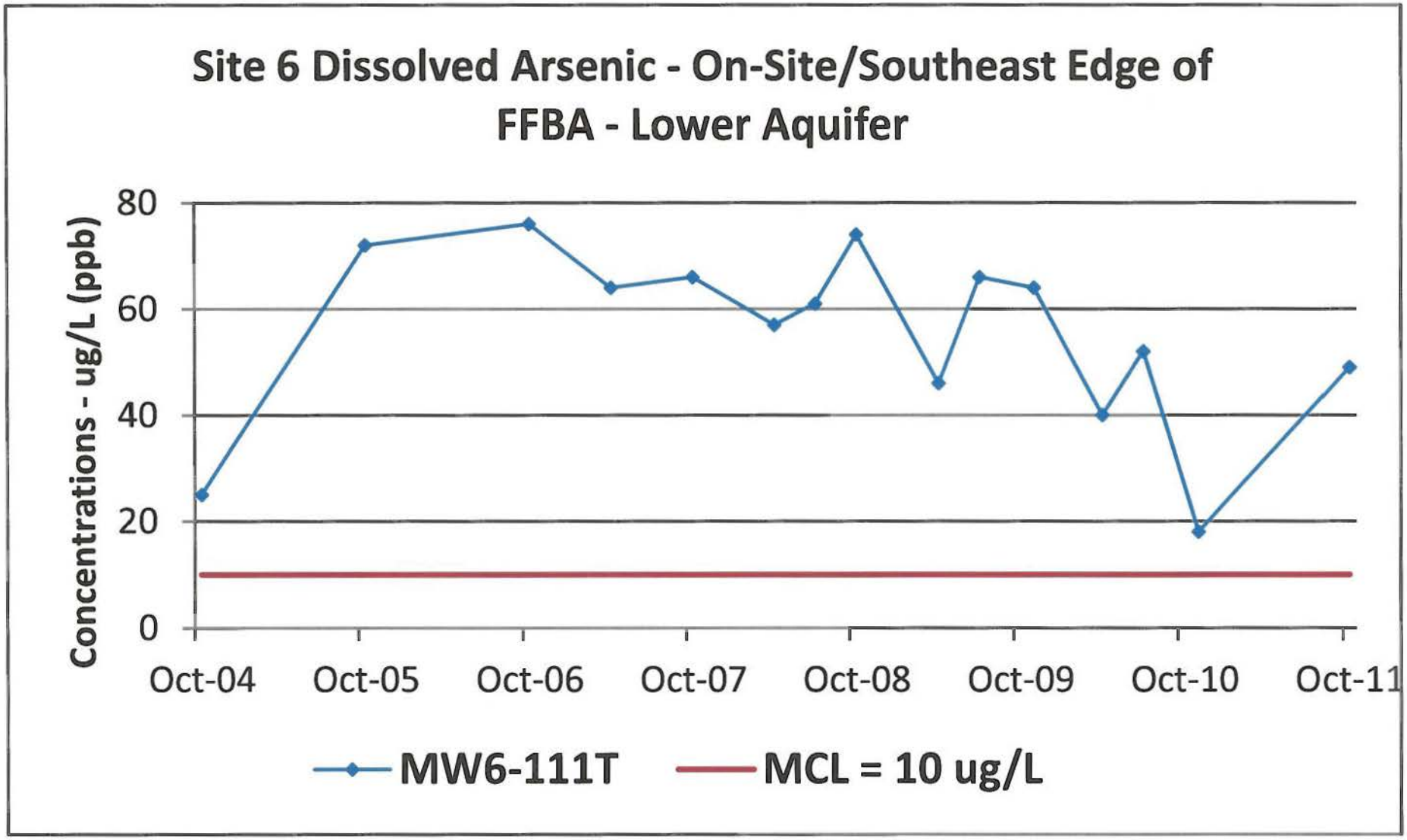

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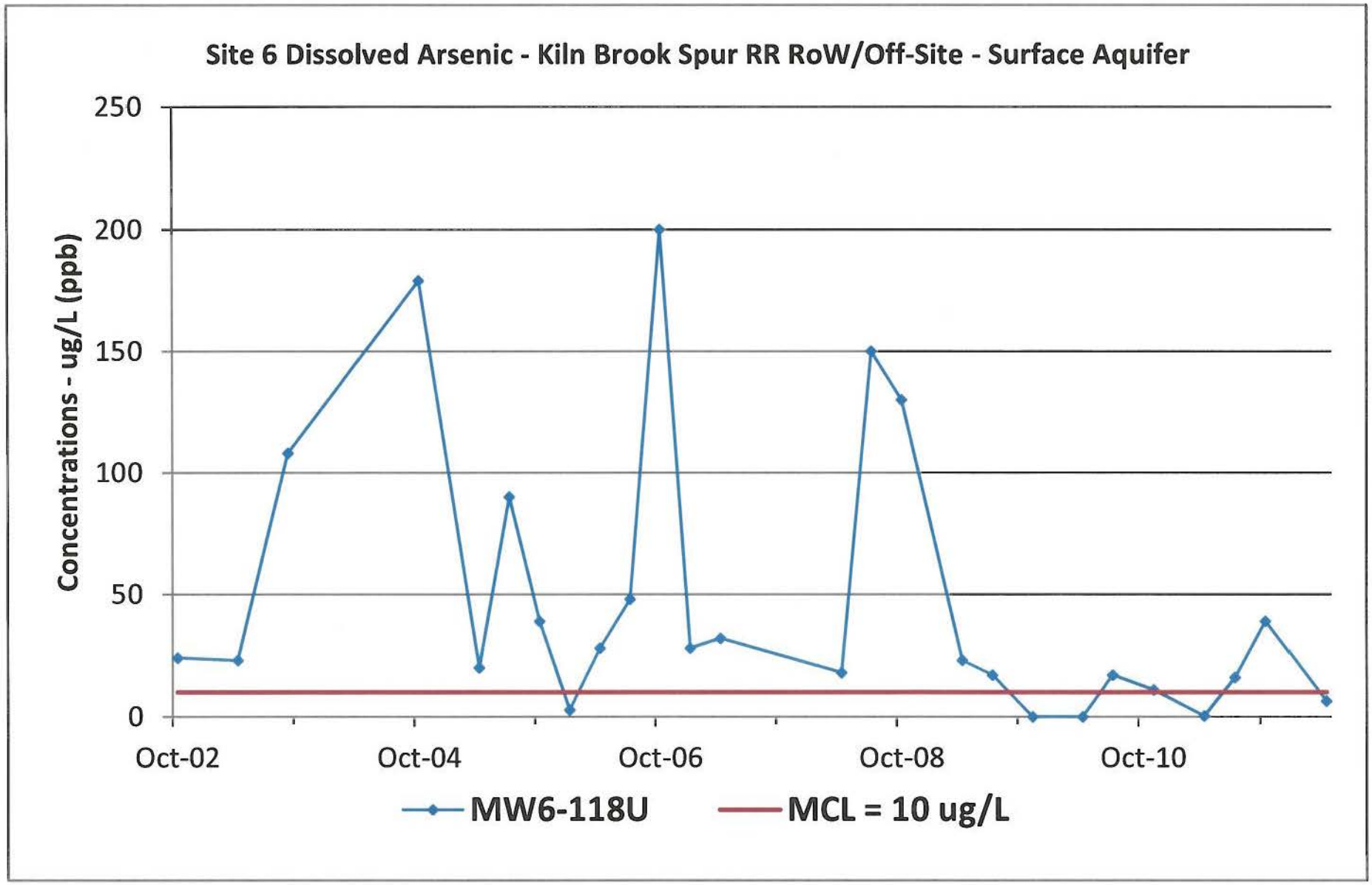

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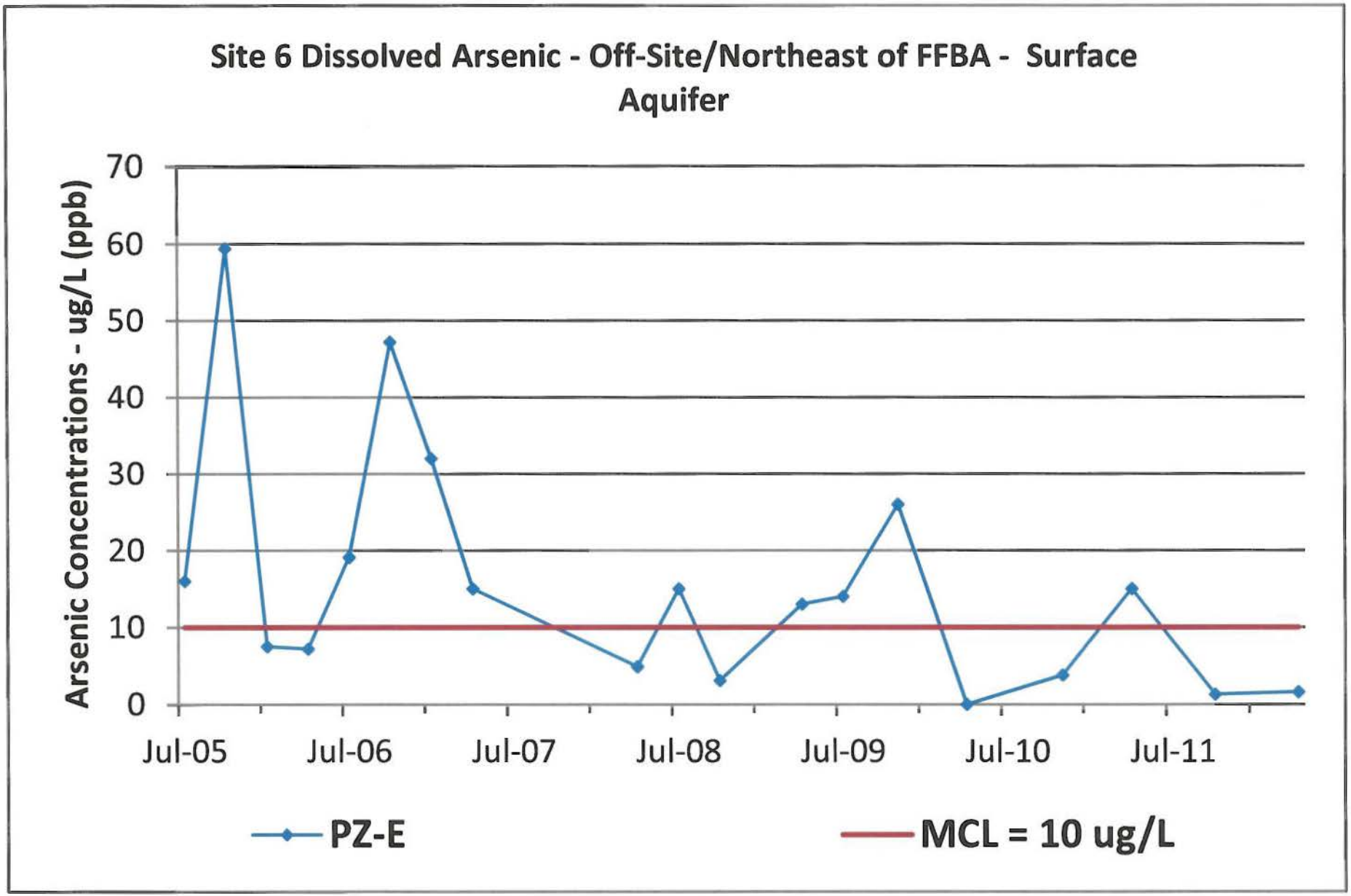

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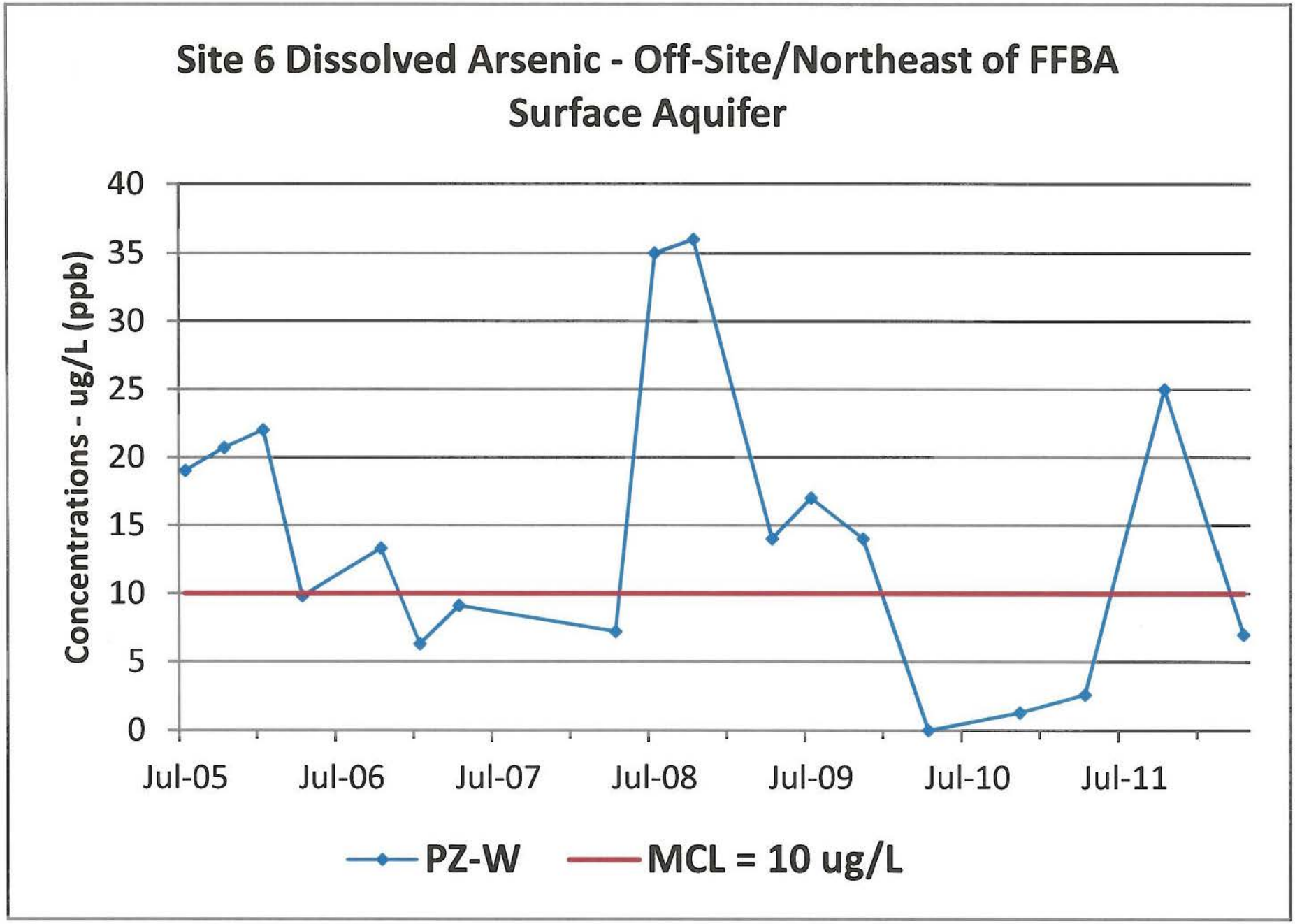

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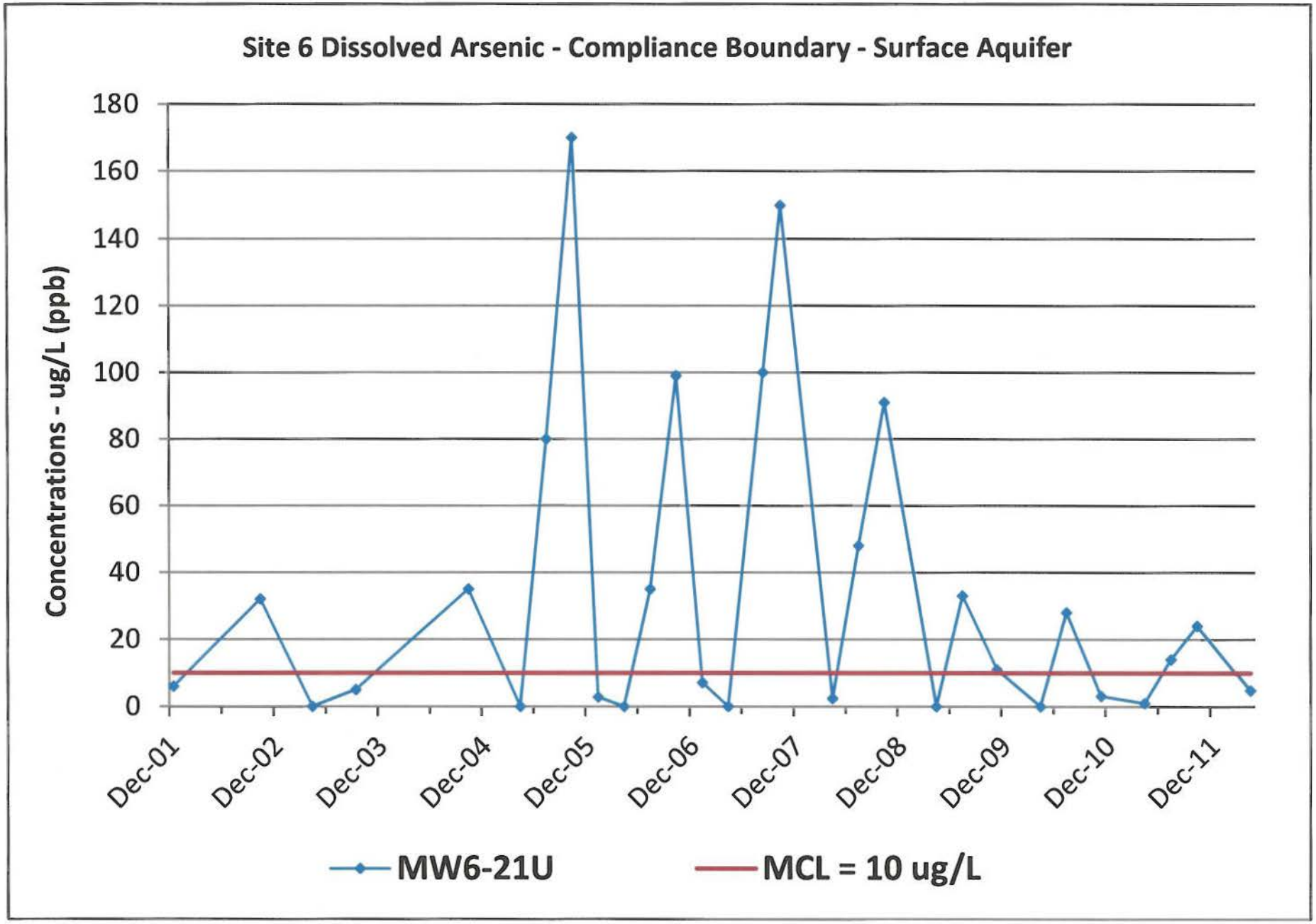

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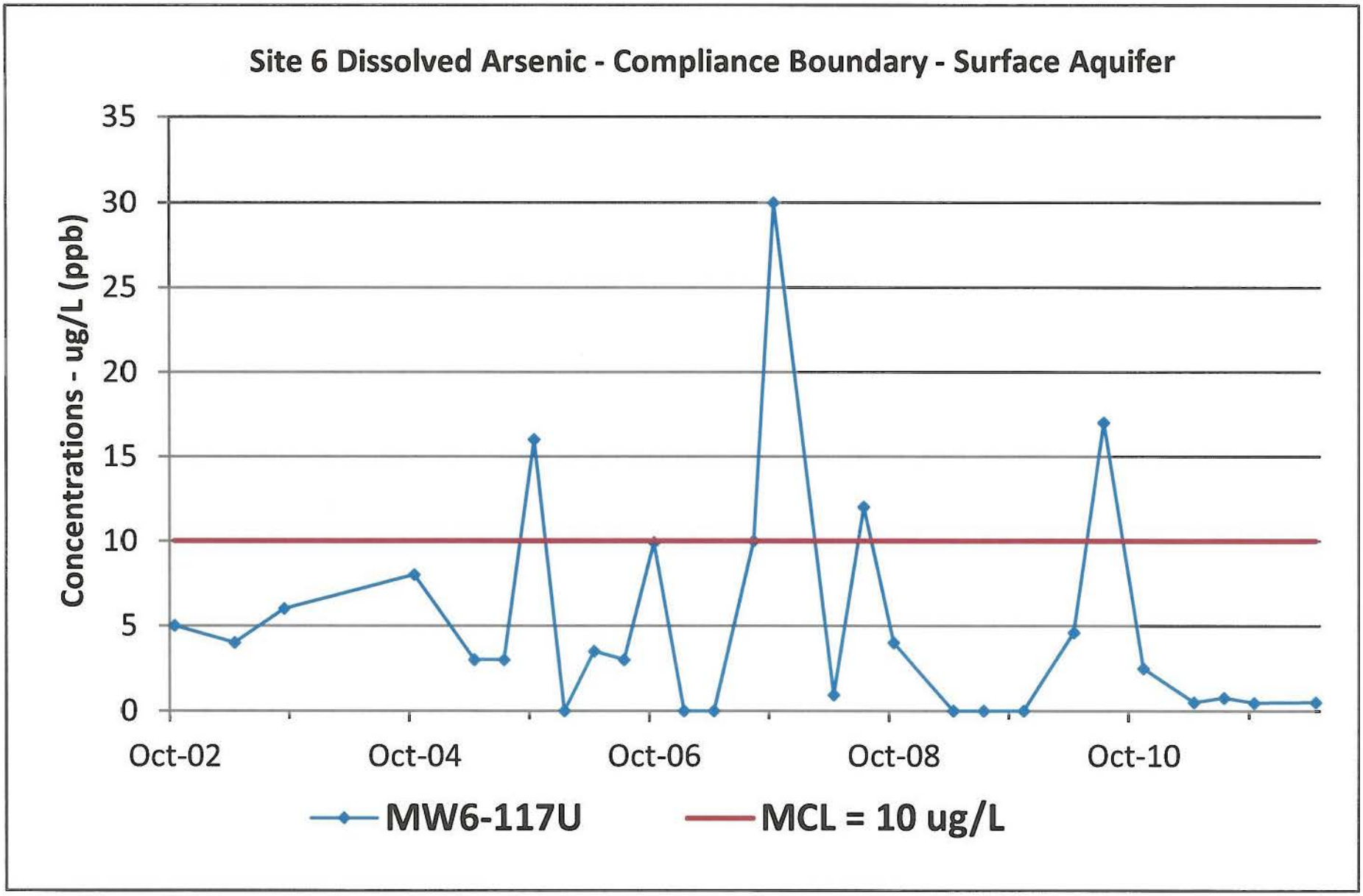

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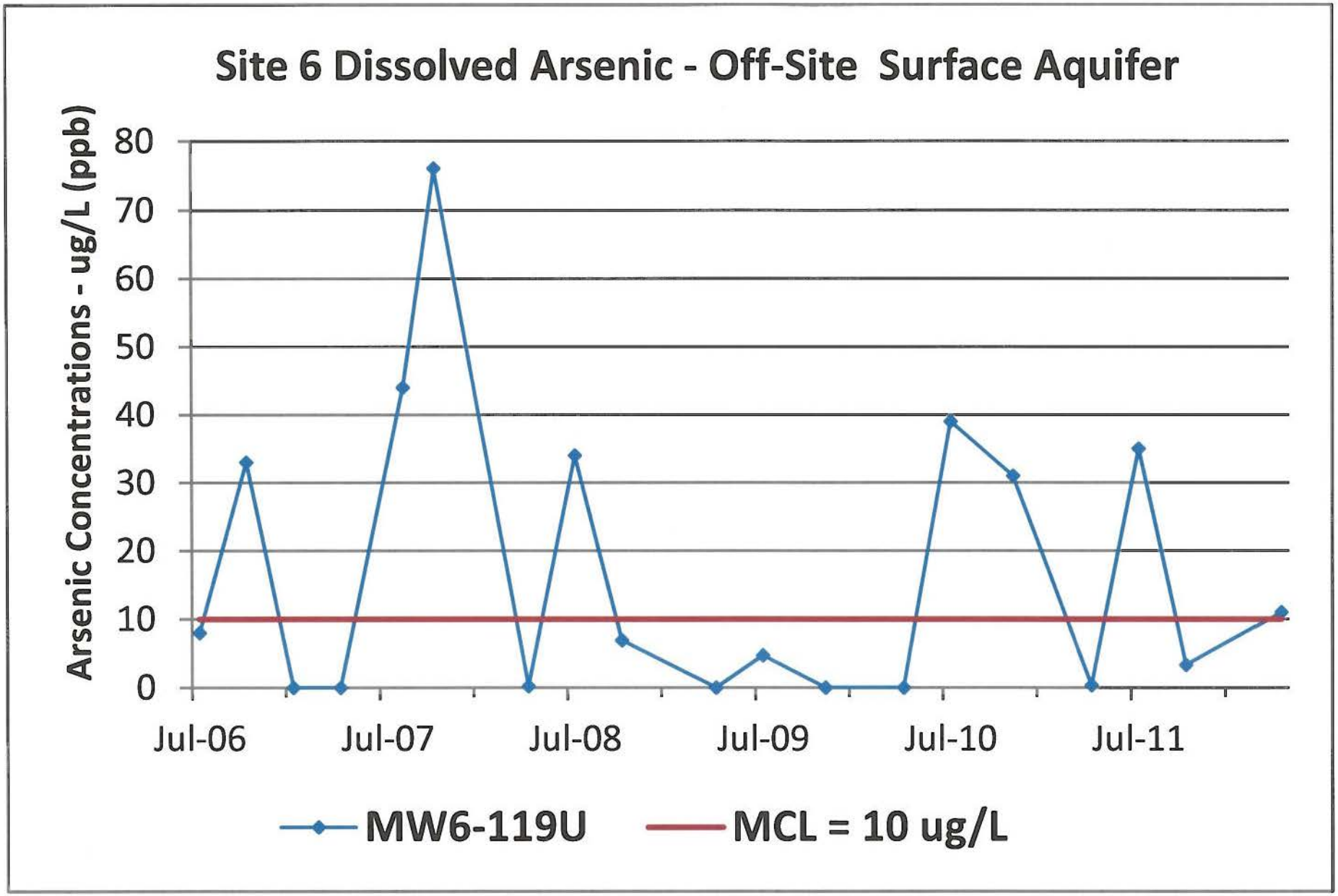

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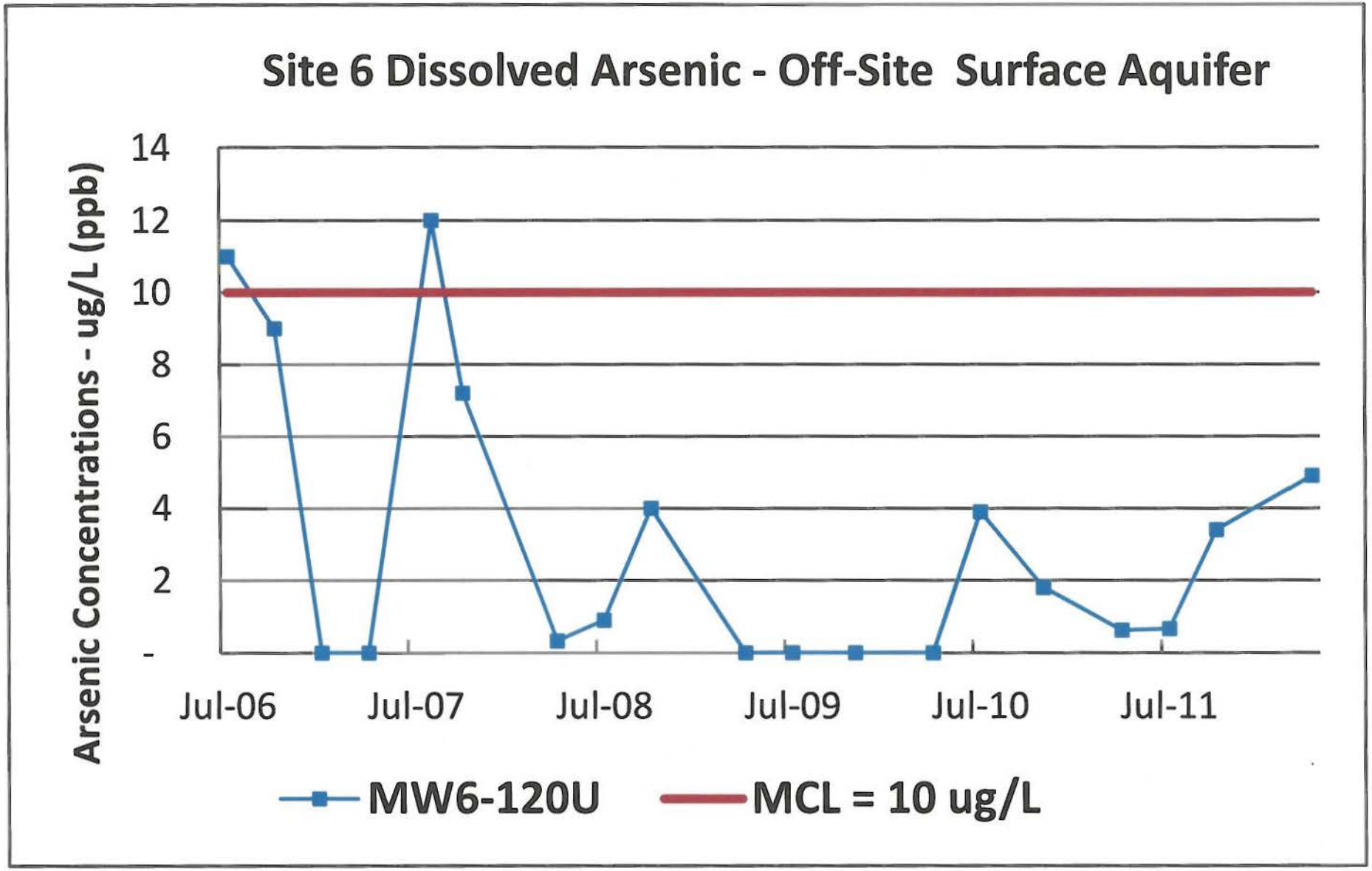

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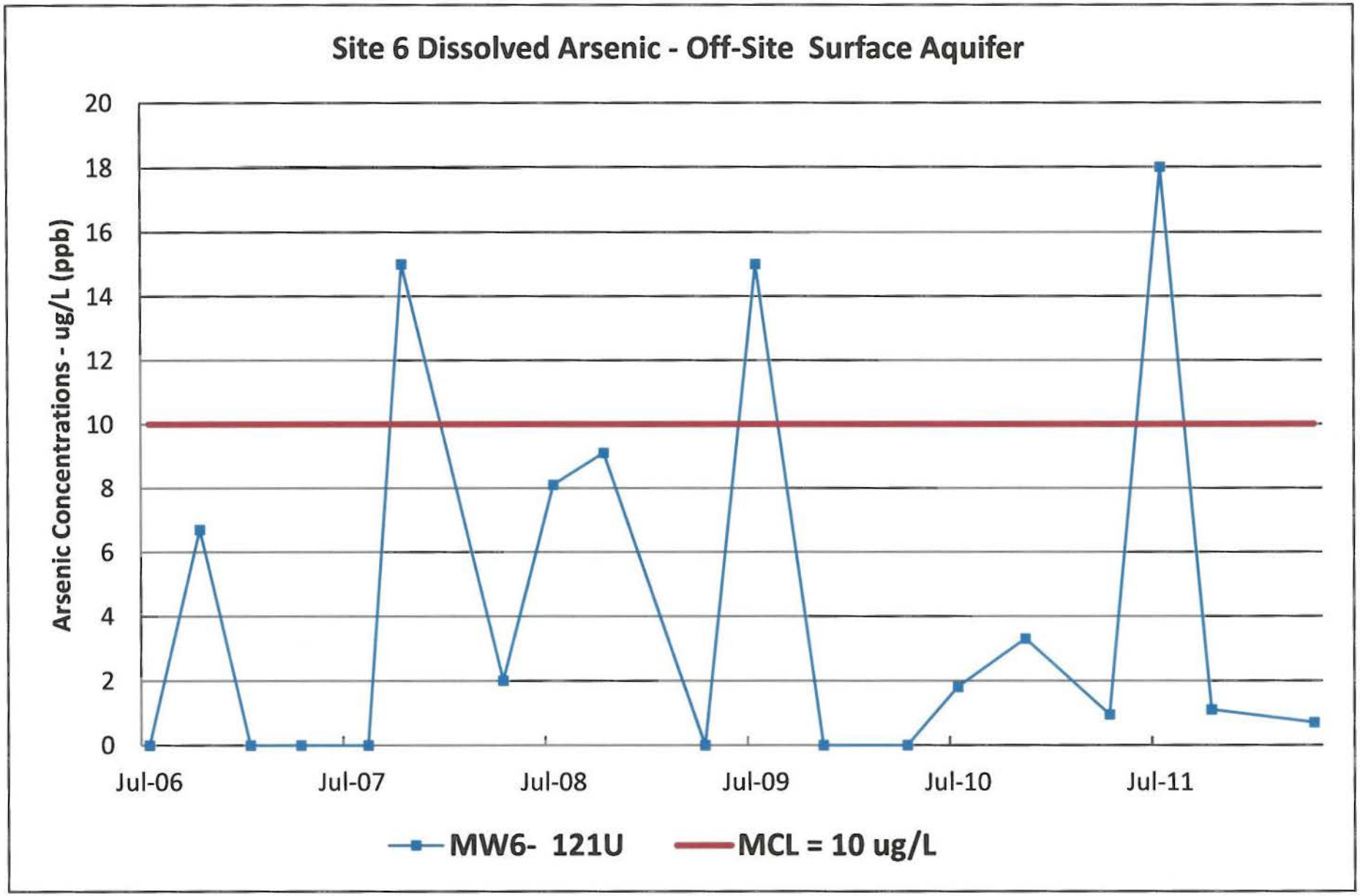

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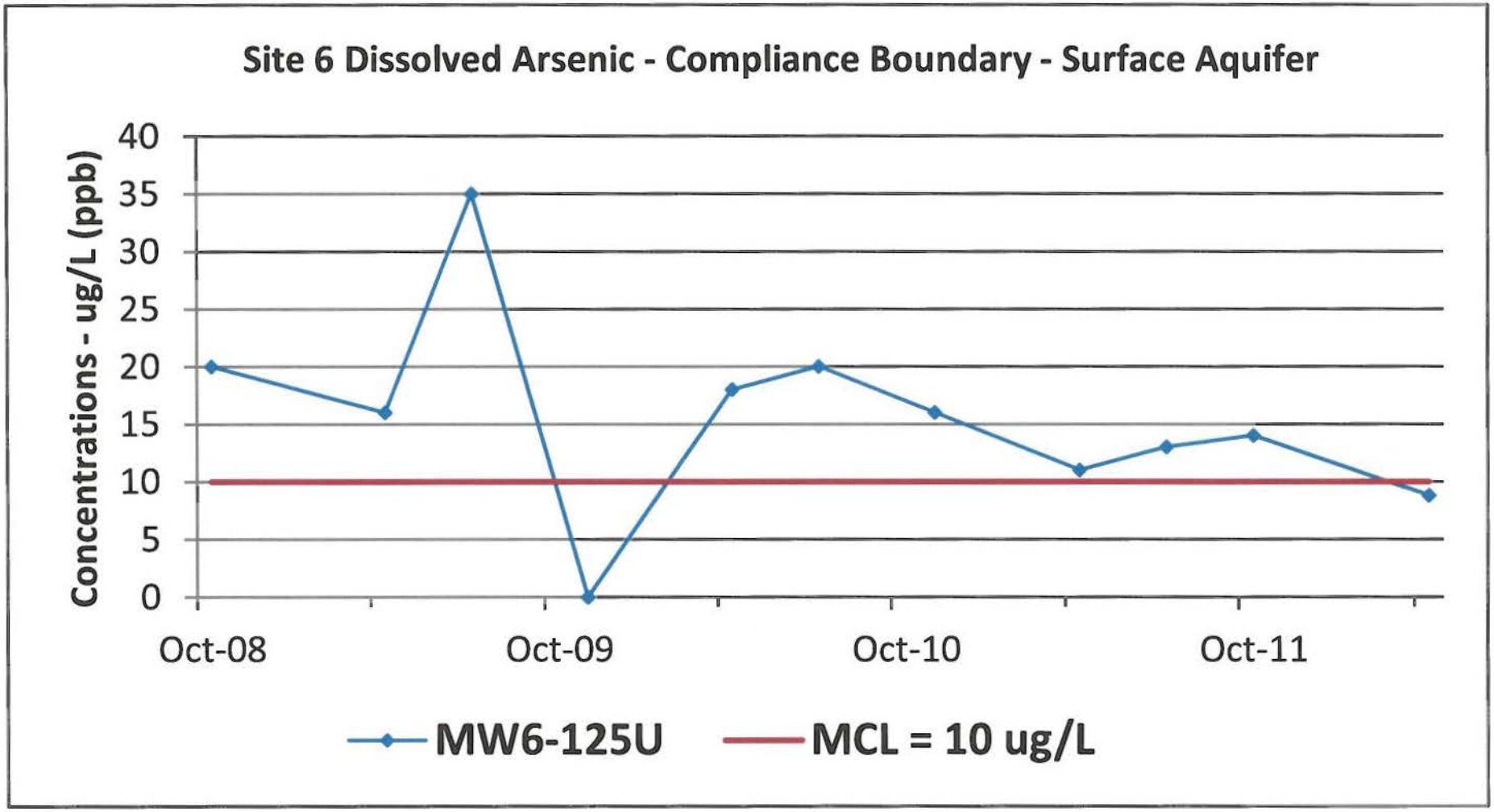

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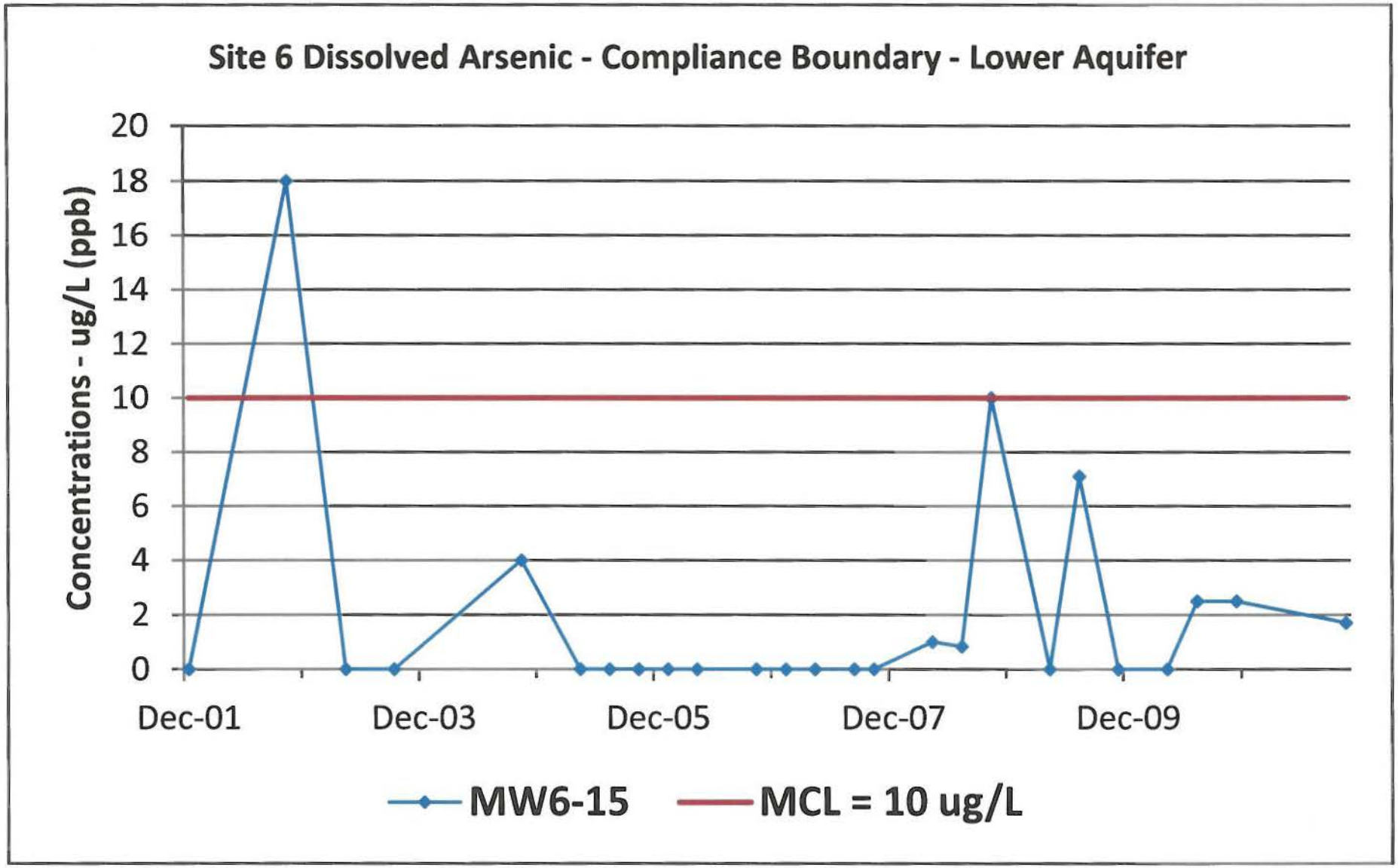

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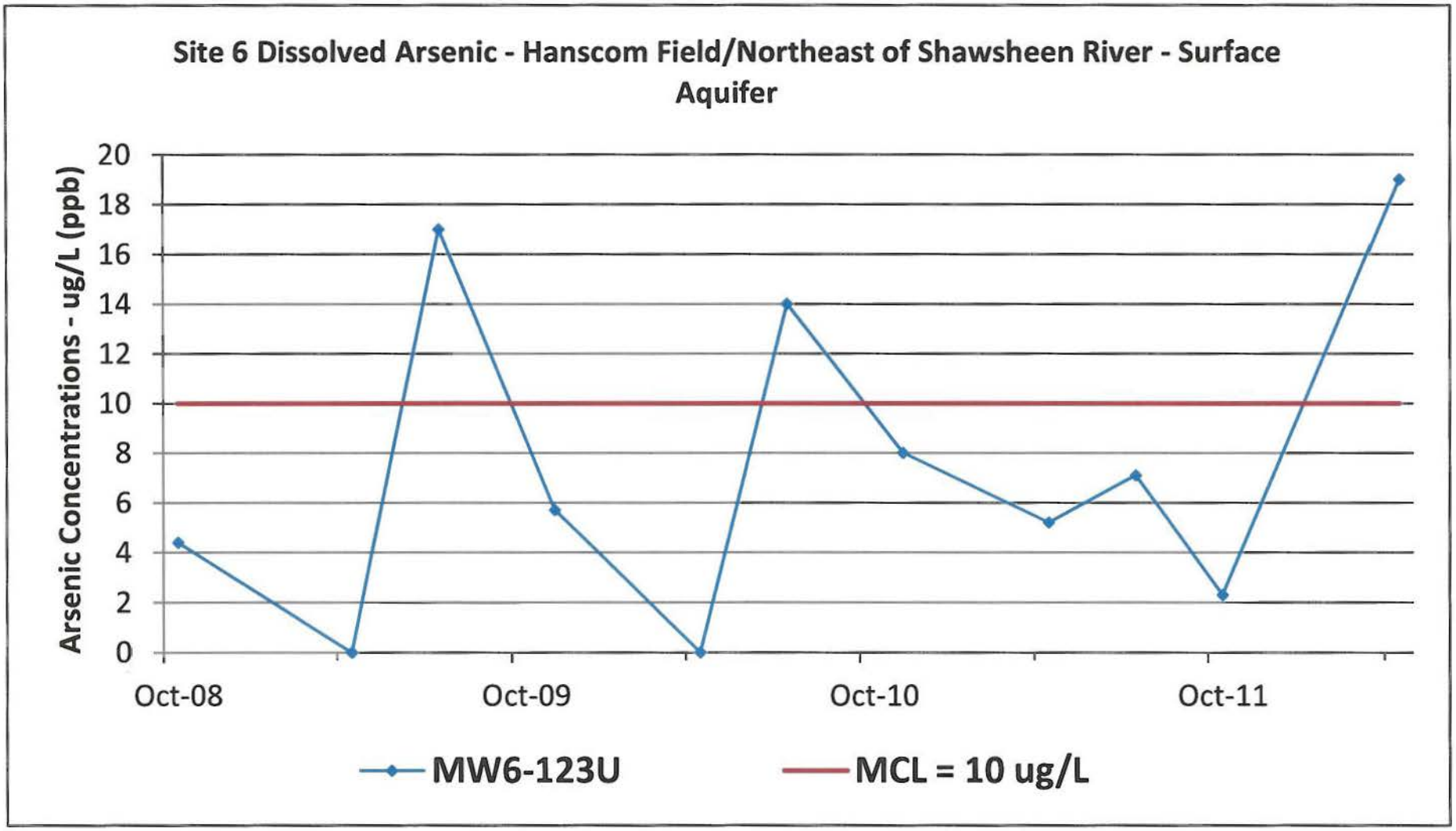

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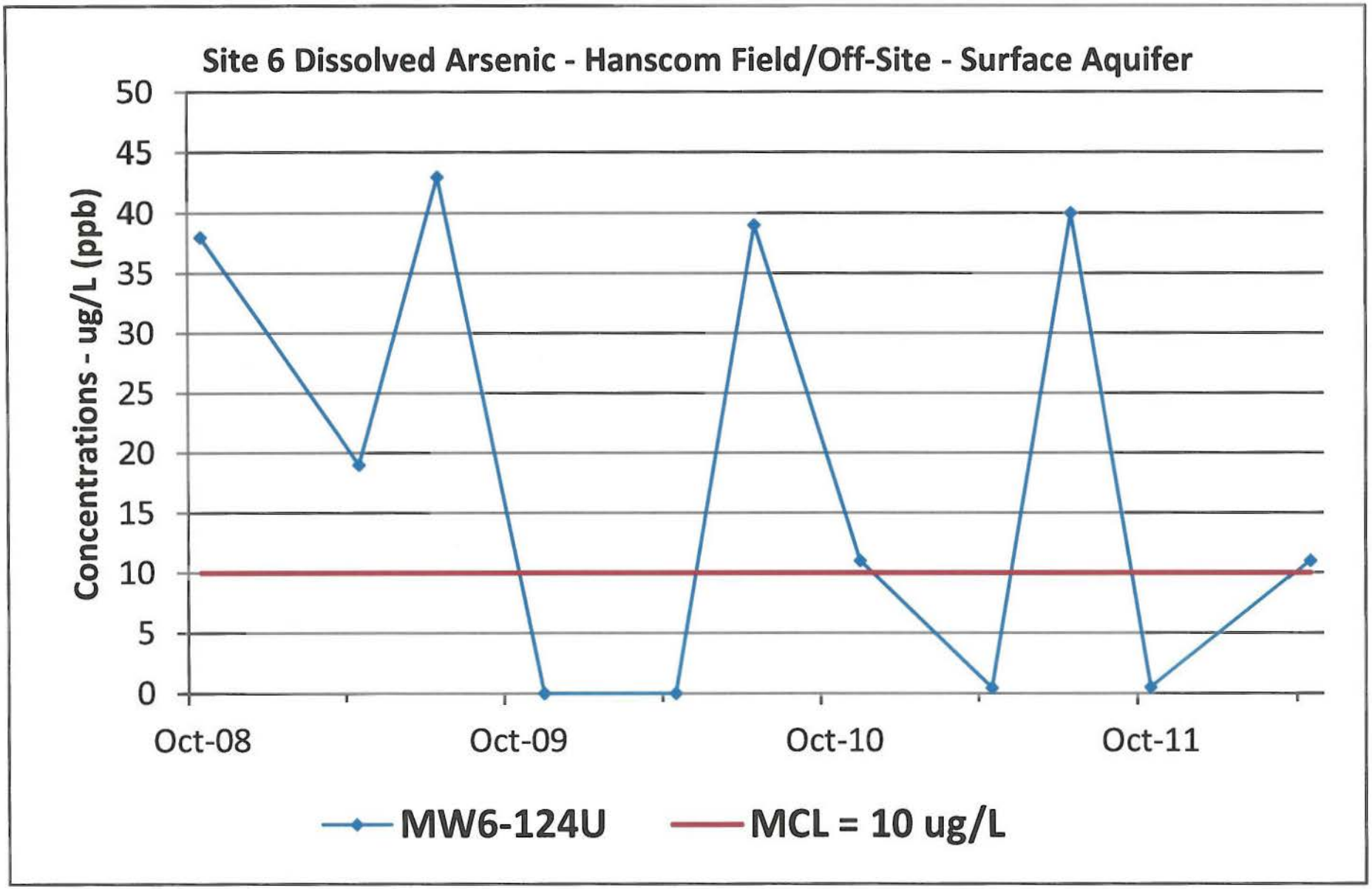

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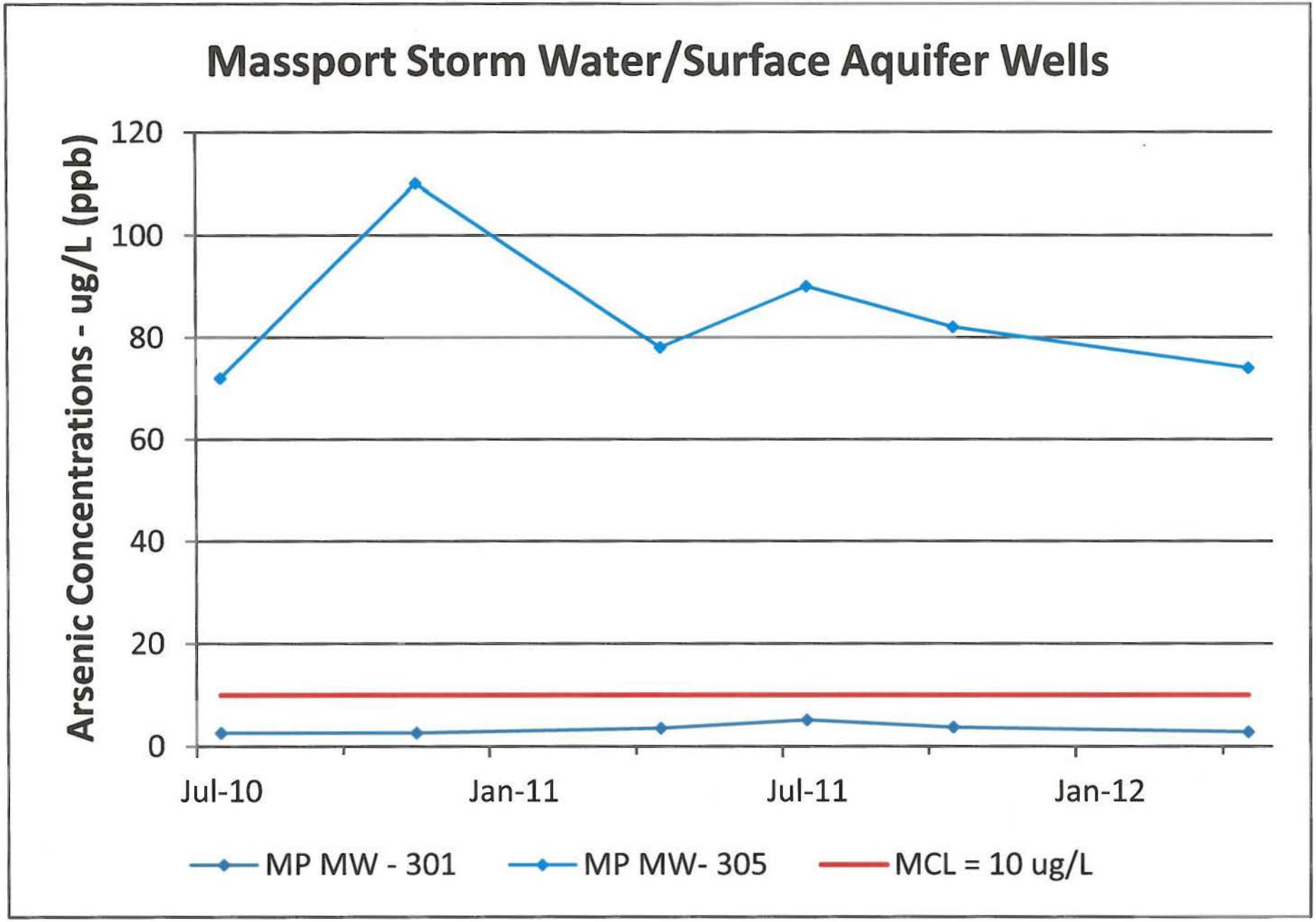

Attachment H – OU-3/IRP Site 21 Operation, Maintenance and Monitoring Data .....

H-1 - Key Activities/Milestones Table

H-2 - NPL OU-3/IRP Site 21 Remedial Action Report for December 2011

H-3 – Chart, MWZ-13 Groundwater Elevations - 2007-2012

H-4 – Table, GC analysis of RW-6A and RW-7A – 2007-2012

H-5 – Chart, GC analysis of RW-6A and RW-7A – 2005-2012

H-6 - Long-Term Monitoring Trend Charts
- **Chart 1** – RW-1A
- **Chart 2** – RW-11A

H-7 – Table, Laboratory Analysis of the Influent and Effluent - 2007-2012

H-8 - Long-Term Monitoring Trend Charts
- **Chart 1** – Influent TPH concentrations, Sep 2003 – May 2012
- **Chart 2** – Influent TCE concentrations, Jan 2007 – Apr 2011
- **Chart 3** – Influent Chlorobenzene et al concentrations, Jan 2011 – May

H-9 – Table, IRP Site 21 Long-Term Monitoring Plan for 2012.Table

H-10 – Table, Post-RA Long-Term Monitoring Program Laboratory Analytical Results – 2003-2012

H-11 – Table, - IRP Site 21 LNAPL Monitoring, 2007-2012

Attachment H-1 Remedial Action-Operation - Key Activities/Milestones

Site 21 LNAPL/Groundwater Recovery and Treatment System

15 Sep 03 – Startup of "low-yield" 10 well LNAPL/groundwater recovery system

15 Sep 03 thru 16 Feb 04 – Shakedown period (O&M) covered by construction contract

16 Feb 04 to present – Monthly laboratory analysis of treatment system's influent and effluent for Total (C9-C36) Diesel Range Organics (DRO) via method 8015B

16 Feb 04 thru Jan 09 – Monthly laboratory analysis of treatment system's influent and effluent for VOCs via Method 601/602 or semi-annual analysis via Method 624

Jan 04 to present – Petrobailers (passive LNAPL collectors) or absorbent socks used in monitoring wells with a measurable LNAPL lens - less than 1-gallon total collected through Jan 12

Jul 04 – Commenced monthly on-site GC analysis of TCE in active recovery wells RW-6A and RW-7A (TCE hotspot not found in RI)

1 Aug -1 Dec 05 – Active LNAPL/groundwater recovery system shutdown to assess rebound of LNAPL and/or dissolved phase.

Aug 05 – Expanded monthly on-site GC analysis of TCE in active recovery wells to include RW-3A, RW-4A & RW-5A in addition to RW-6A and RW-7A

Aug 05 - Laboratory VOC analysis via Method 601/602 and Total (C9-C36) Diesel Range Organics (DRO) analysis via method 8015B of 2 recovery wells (RW-5A & RW-8A)

Sep 05 - Laboratory VOC analysis via Method 601/602 and Total (C9-C36) Diesel Range Organics (DRO) analysis via method 8015B of 2 recovery wells (RW-3A & RW-4A)

Oct 05 - Laboratory Total (C9-C36) Diesel Range Organics (DRO) analysis via method 8015B of 5 RWs (1A, 6A, 7A, 9A &10A)

Nov 05 - Laboratory VOC analysis via Method 601/602 and Total (C9-C36) Diesel Range Organics (DRO) analysis via method 8015B of 1 recovery well (RW-2A)

Sep 06 – Suspended on-site GC analysis of TCE in active recovery wells RW-3A & RW-4A. Continued analysis of RW-5A, RW-6A and RW-7A

Jun - Dec-06 – Optimizing pumping scheme and ended year operating only 4 (RW-1A, RW-5A, RW-6A & RW-7A) of the 10 recovery wells

Feb 09 to present – Monthly laboratory analysis of treatment system's influent and effluent for VOCs changed to via Method 8260

27 Jul 10 – additional recovery well (RW-11A) installed to address developing petroleum contaminated groundwater hotspot in the vicinity of monitoring well ECS-31

5-11 Oct 10 - Active LNAPL/groundwater recovery system shutdown in order to replace failing well vaults in Grenier Street (RW-1A thru 10A, PW-1 & RW-1) and to tie-in RW-11A to the active recovery well network.

19 Oct 10 - RW-11A added to operational scheme and RW-5A removed. Optimizing pumping scheme now includes 4 (RW-1A, RW-6A, RW-7A & RW-11A) of the 11 recovery wells

4 May 11 – Booster injection of 250 lbs of ORC into the former LNAPL Pool A area

Apr 11 – Laboratory begins to report both Total Petroleum Hydrocarbons (C9-C36) and Diesel Range Organics (C10-C28) for the monthly laboratory analysis of treatment system's influent and effluent.

Mar 12 – Excavated inside RW-6A's vault and found and repaired a break in discharge pipe near the pitless adaptor.

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NPL OU-3/IRP Site 21 Monitoring Wells & Long-Term Monitoring

Oct 03 - RA Baseline Event – 44 MWs and 1 SW analyzed for VOCs - also 10 of the MWs were analyzed for natural attenuation parameters

Feb 04 – Laboratory VOC analysis of 4 monitoring wells

Mar 04 – Laboratory VOC analysis of 3 monitoring wells

Apr 04 – Semi-annual LTM Round - laboratory VOC analysis of 8 monitoring wells and 1 surface water samples

Nov 04 - Annual LTM Round - laboratory VOC analysis of 13 monitoring wells, 10 active recovery wells and 1 surface water samples - also 5 MWs were analyzed for natural attenuation parameters and TPH (DRO)

Apr 05 – Semi-annual LTM Round - laboratory VOC analysis of 8 monitoring wells and 1 surface water samples

Oct 05 - Annual LTM Round - laboratory VOC analysis of 25 monitoring wells, 5 active recovery wells and 1 surface water samples

Apr 06 – Semi-annual LTM Round - laboratory VOC analysis of 5 monitoring wells and 1 surface water samples

Oct 06 - Annual LTM Round - laboratory VOC analysis of 35 monitoring wells, 10 active recovery wells and 1 surface water samples – also 4 additional MWs were analyzed for SVOCs and TPH (DRO)

May 07 – Semi-annual LTM Round - laboratory VOC analysis of 6 monitoring wells and 1 surface water samples

Oct 07 - Annual LTM Round - laboratory VOC analysis of 25 monitoring wells, 6 active recovery wells and 1 surface water samples

Apr 08 – Semi-annual LTM Round - laboratory VOC analysis of 6 monitoring wells and 1 surface water samples

Oct 08 - Annual LTM Round – laboratory VOC analysis of 21 monitoring wells, 4 active recovery wells and 1 surface water samples

Apr 09 – Semi-annual LTM Round - laboratory VOC analysis of 6 monitoring wells and 1 surface water samples

Oct 09 - Annual LTM Round – laboratory VOC analysis of 20 monitoring wells, 1 active recovery wells and 1 surface water samples

Apr 10 – Semi-annual LTM Round - laboratory VOC analysis of 6 monitoring wells, 1 active recovery well and 1 surface water samples

Oct 10 - Annual LTM Round – laboratory VOC analysis of 20 monitoring wells, 2 active recovery wells and 1 surface water samples

Apr 11 – Semi-annual LTM Round - laboratory VOC analysis of 4 monitoring wells, 2 active recovery wells and 1 surface water samples

Oct 11 - Annual LTM Round – laboratory VOC analysis of 17 monitoring wells, 3 active recovery wells and 1 surface water samples

Apr 12 – Semi-annual LTM Round - laboratory VOC analysis of 7 monitoring wells, 3 active recovery wells and 1 surface water samples

Oct 12 - Annual LTM Round – Planned laboratory VOC analysis of 20 monitoring wells, 4 active recovery wells and 1 surface water samples

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ATTACHMENT H-2, Hanscom Field/Hanscom AFB 4th Five-Year Review Report

Hanscom AFB NPL OU-3/IRP Site 21 Remedial Action Report

General
Report Period: December 2011

Remedial Action: LNAPL Recovery/Groundwater Pump & Treat
Remedial Action in Place/System Startup: 15-Sep-03
Remedial Action System Shutdown for Rebound Monitoring: 1-Aug-05 through 30-Nov-05
O&M Contractor: as of 5 April 2010 Advent Environmental, Inc.

Operational Data:

Active Recovery Wells:	4	wells	(See notes)
Groundwater treated - current month:	9,340	gallons	
Year-to-date (2011):	81,413	gallons	
Since 15-Sep-03 Startup:	862,438	gallons	
LNAPL Removed:	nil	gallons	(See notes)
Days of possible operation	31	days	
Avg. GW Treated for Month:	301.3	GPD	
% of Month Operating:	100.0%		(See notes)

Groundwater Treatment System Sampling and Analysis: See notes

	Influent (Lead GAC) 6-Dec-2011	Effluent (Lag GAC) 6-Dec-2011
TPH - C9-C36 (mg/L)	3.4	<0.094
DRO - C10-28 (mg/L)	2.8	<0.094
benzene (ug/L)	<50	<1.0
ethylbenzene (ug/L)	<50	<1.0
toluene (ug/L)	<50	<1.0
xylenes (ug/L)	<100	<2.0
MTBE (ug/L)	<50	5.9
1,2-dichlorobenzene	2600	<1.0
1,3-dichlorobenzene	<50	<1.0
1,4-dichlorobenzene	810	<1.0
Chlorobenzene	92	<1.0
Chloroform	<50	<1.0
TCE (ug/L)	<50	<1.0
Cis-1,2-DCE (ug/L)	<50	<1.0

Recovery Well Sampling/On-Site GC Analysis: see notes

	RW-6A	RW-7A
TCE (ug/L)	NS	NS
Cis-1,2-DCE (ug/L)	NS	NS

LNAPL Monitoring: See notes

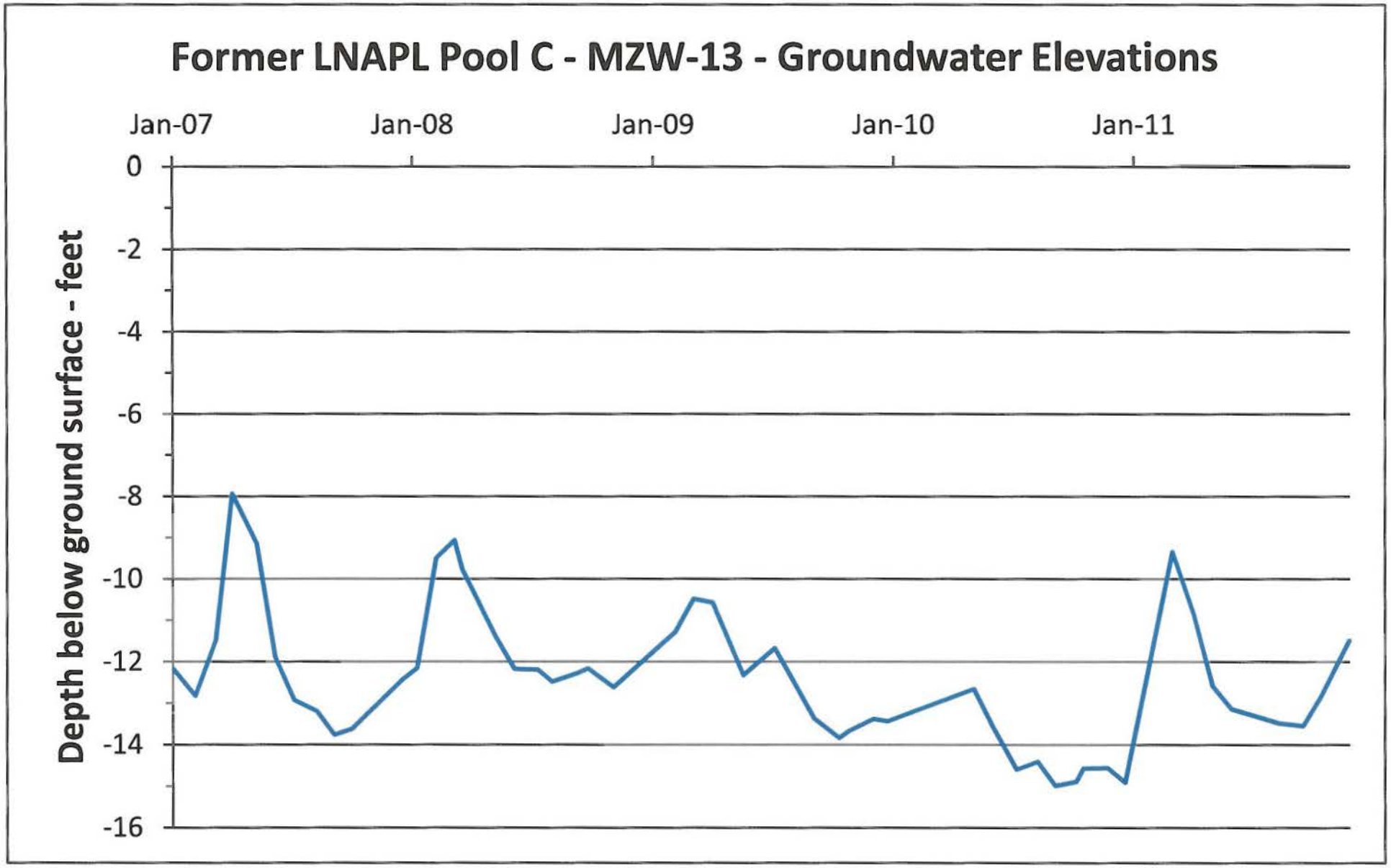
ECS-29	ECS-35	MZW-13	MZW-15	MZW-17	MZW-20	MZW-22
15-Dec-2011	15-Dec-2011	15-Dec-2011	15-Dec-2011	15-Dec-2011	15-Dec-2011	15-Dec-2011
no product	no product	trace	flooded	no product	no product	no product

Notes:

1) The current operating configuation is RW-1A, 6A, 7A & 11A with the remaining 7 RWs in standby & being monitored for LNAPL and/or rebound in dissolved phase. Also RW-7A is cycled on/off as necessary to preclude exceeding system's capacity during periods of heavy rainwater inflow.
2) There was no LNAPL recovered this month.
3) Treatment system samples analysis by TestAmerica, Laboratories Inc. using EPA Method 8015B (M) for TPH & DRO and EPA Method 8260B for VOCs.
4) Monthly LNAPL Monitoring 28 October - December 31, 2011; * = absorbent sock in MWZ-22 just prior to & returned after monitoring;
5) Recovery Wells not Sampled

Attachment:
Chart - TCE Hotspot @ RW-6A & RW-7A

OU-3/IRP Site 21 Groudwater Elevation 2007 - 2011



Site 21 LNAPL Monitoring 2007-present

IRP Site 21 - On-site GC Analysis for TCE and Cis-1,2-DCE in RW-6A and RW-7A

All results in ug/L (ppb)

SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
RW #6-A			
1-Dec-03	**50**	**1**	
3-Nov-04	**65.5**	**1.93**	**GC TCE RPD = -48.3%**
20-Oct-05	**48**	**2.6**	other VOC detects
10-Oct-06	**100**	**5.22**	**dup/minor other detects**
12-Jan-07	221	bdl	Just 1 peak-rerun=248/bdl
1-Mar-07	211	bdl	Just 1 peak
4-Apr-07	336	bdl	Just 1 peak
15-May-07	846	bdl	
6-Jun-07	501	bdl	
27-Jul-07	166	bdl	
24-Aug-07	146	bdl	Just 1 peak
14-Sep-07	143	bdl	
11-Oct-07	178	bdl	
31-Oct-07	191	bdl	
28-Nov-07	103	bdl	Just 1 peak
10-Dec-07	128	bdl	
9-Jan-08	164	9	
11-Feb-08	202	bdl	
6-Mar-08	138	bdl	
28-Mar-08	104	bdl	
2-Apr-08	102	bdl	
7-May-08	190	83	GC chart noisy-results suspect
3-Jun-08	167	14	
1-Jul-08	105	bdl	
6-Aug-08	55	bdl	
3-Sep-08	111	bdl	
1-Oct-08	94	7	
6-Oct-08	95	7	
5-Nov-08	89	bdl	
3-Dec-08	109	bdl	
7-Jan-09	289	bdl	
11-Feb-09	130	bdl	
5-Mar-09	516	49	
8-Apr-09	143	bdl	
5-May-09	439	bdl	
5-Jun-09	269	bdl	
7-Jul-09	143	bdl	
4-Aug-09	310	bdl	
31-Aug-09	73	bdl	
5-Oct-09	154	bdl	
2-Nov-09	145	bdl	
1-Dec-09	116	bdl	
13-Jan-10	100	bdl	
3-Feb-10	139	bdl	
8-Mar-10	336	bdl	
12-Apr-10	183	bdl	
22-Apr-10	**76 J**	**9.4**	**J=holding time exceeded**
3-May-10	162	bdl	
1-Jun-10	173	bdl	
16-Jul-10	72	bdl	
3-Aug-10	114	bdl	
2-Sep-10	76	bdl	
14-Oct-10	103	bdl	
2-Nov-10	124	bdl	
1-Dec-10			GC Inoperative-Repaired Apr-11
4-Apr-11	259	bdl	
2-May-11	211	bdl	
6-Jun-11	279	bdl	
5-Jul-11	212	bdl	
1-Aug-11			
23-Aug-11	90	bdl	
6-Sep-11	166	bdl	
3-Oct-11	NS	NS	
7-Nov-11	123	bdl	
13-Dec-11	NS	NS	
3-Jan-12	100	bdl	
7-Feb-12	550R	150R	Very noisy, lots of peaks- BTEX?
14-Mar-12	183	bdl	
2-Apr-12	133	bdl	
17-Apr-12	464R	22R	Very noisy, lots of peaks- BTEX?
17-Apr-12	**142**	**15**	**Semi-Annual LTM Event**

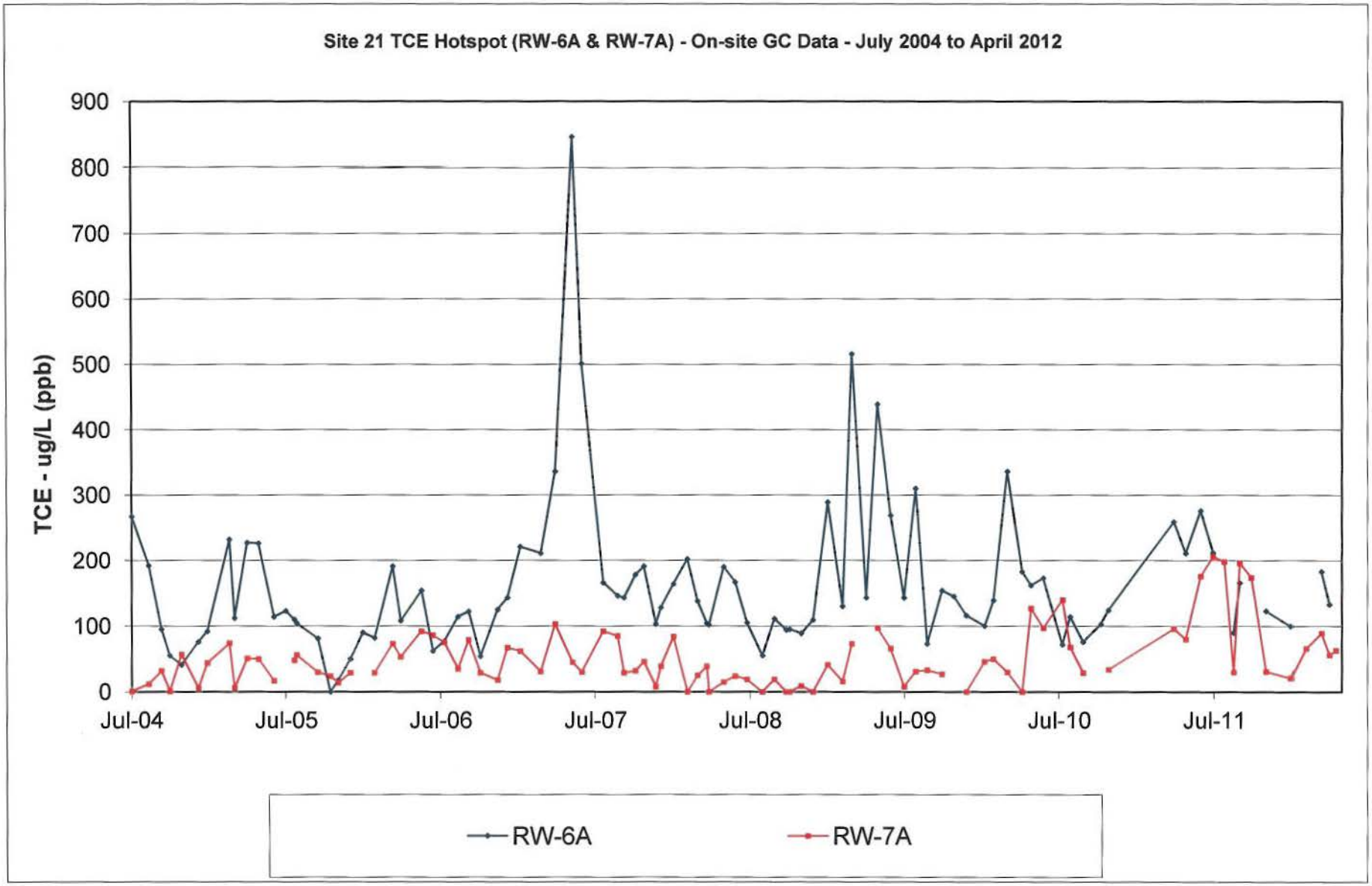
SAMPLE DATE	TCE ppb	CIS-1-2 ppb	REMARKS
RW #7-A			
1-Dec-03	**20**	**1**	
3-Nov-04	**50.46**	**2.74**	**GC TCE RPD = -5.0%**
20-Oct-05	**45**	**2.1**	other VOC detects
10-Oct-06	**76.6**	**4.02**	**dup/minor other detects**
12-Jan-07	62	bdl	Just 1 peak
1-Mar-07	31	bdl	Just 1 peak
4-Apr-07	103	bdl	Just 1 peak
15-May-07	45	bdl	
6-Jun-07	30	bdl	Just 1 peak
27-Jul-07	92	bdl	Just 1 peak
30-Aug-07	85	bdl	Just 1 peak
14-Sep-07	29	bdl	
11-Oct-07	32	bdl	
31-Oct-07	46	bdl	
28-Nov-07	8	bdl	Just 1 peak
5-Dec-07	39	bdl	
9-Jan-08	84	bdl	
11-Feb-08	bdl	bdl	No peaks/diluted by rain??
6-Mar-08	25	bdl	Just 1 peak
28-Mar-08	39	bdl	
2-Apr-08	bdl	bdl	GC re-run = bdl/bdl
7-May-08	15	bdl	Just 1 peak
3-Jun-08	24	bdl	
1-Jul-08	19	bdl	
27-Aug-08	bdl	bdl	
3-Sep-08	19	bdl	
1-Oct-08	bdl	bdl	
9-Oct-08	bdl	bdl	
5-Nov-08	9	bdl	
13-Dec-08	bdl	bdl	
7-Jan-09	41	bdl	
11-Feb-09	16	bdl	
5-Mar-09	73	bdl	
8-Apr-09			Sample bottle broke
5-May-09	97	bdl	
5-Jun-09	66	bdl	
7-Jul-09	8	bdl	
4-Aug-09	31	bdl	
31-Aug-09	33	bdl	
5-Oct-09	27	bdl	
2-Nov-09			Sample bottle broke
1-Dec-09	bdl	bdl	
5-Jan-10	46	bdl	
3-Feb-10	50	bdl	
8-Mar-10	30	bdl	
12-Apr-10	bdl	bdl	
22-Apr-10			not sampled
3-May-10	127	bdl	
1-Jun-10	97	bdl	
6-Jul-10	140	bdl	
3-Aug-10	68	bdl	
2-Sep-10	29	bdl	
14-Oct-10			not sampled
2-Nov-10	34	bdl	
1-Dec-10			GC Inoperative-Repaired Apr-11
4-Apr-11	96	bdl	
2-May-11	80	bdl	
6-Jun-11	176	bdl	
5-Jul-11	206	bdl	
1-Aug-11	198	bdl	
23-Aug-11	30	bdl	
6-Sep-11	196	bdl	
3-Oct-11	174	bdl	
7-Nov-11	31	bdl	
13-Dec-11	NS	NS	
3-Jan-12	21	bdl	
7-Feb-12	66	bdl	
14-Mar-12	89	bdl	
2-Apr-12	59	bdl	
17-Apr-12	63	bdl	
17-Apr-12	**120**	**6.6**	**Semi-Annual LTM Event**

Bold is off-site lab results, all others are on-site GC results. Also lab results may include other minor VOC detects.

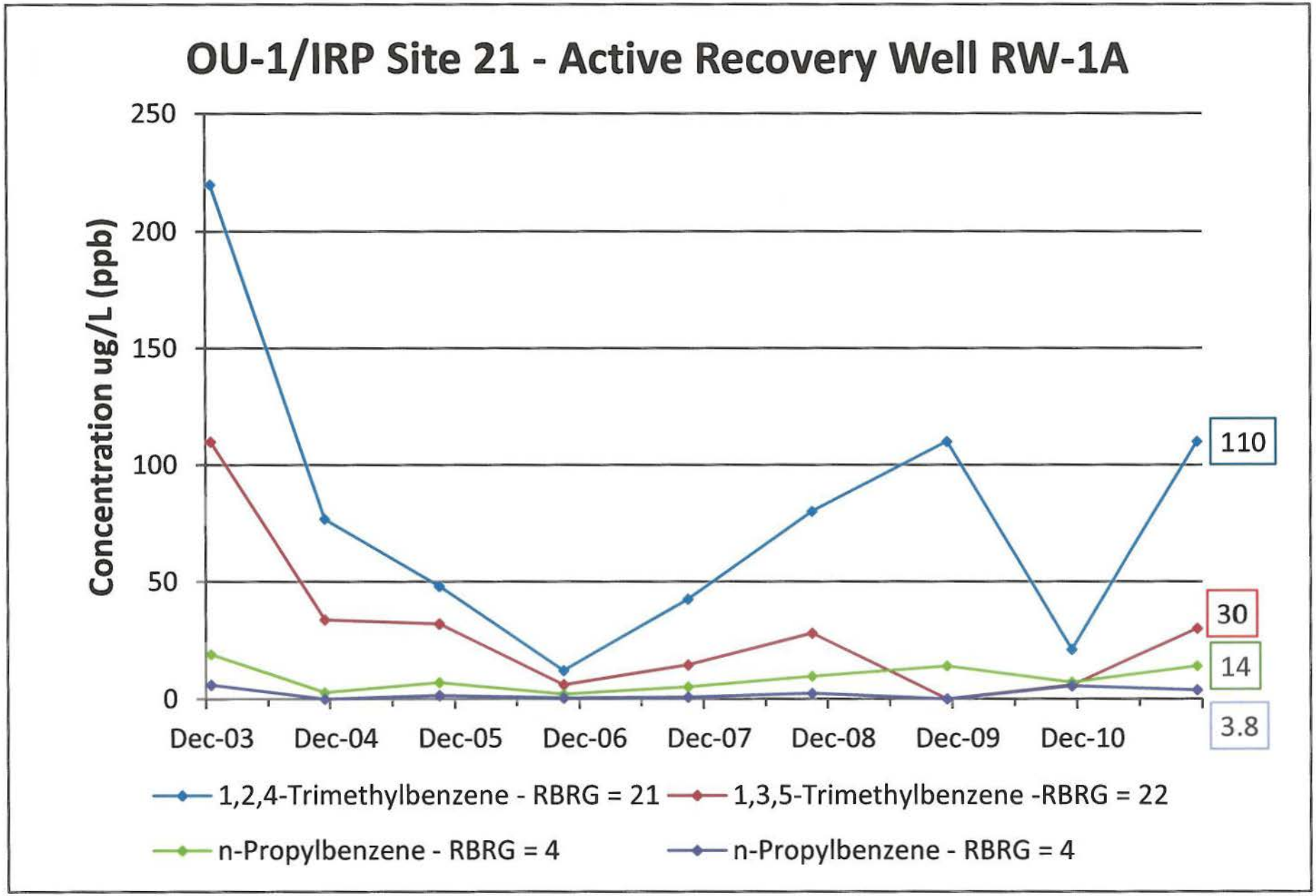
GC samples collected from operating pump sample tap unless otherwise noted.

On-site GC results for 2004 through 2006 omitted/on file.

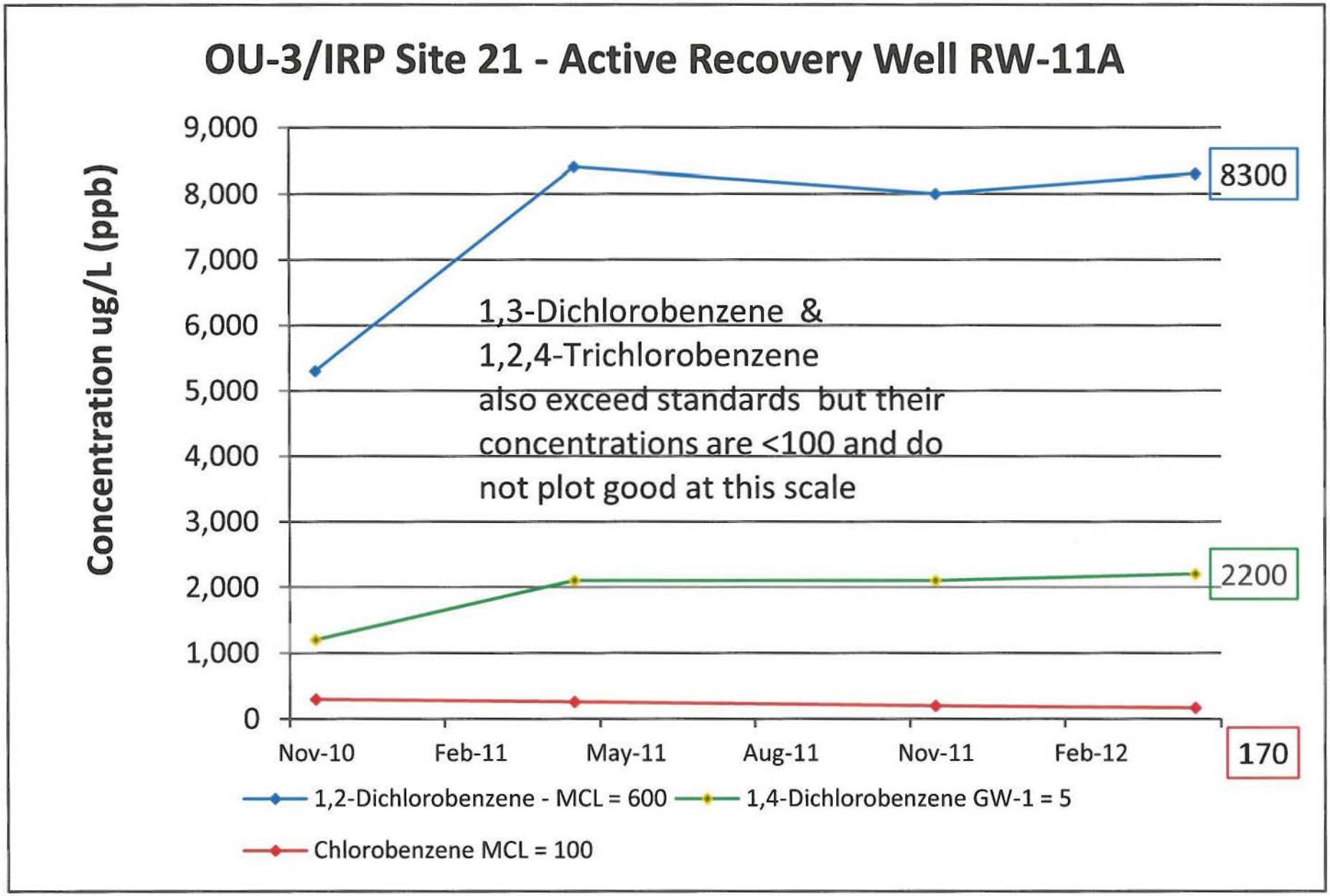
HANSCOM AFB NPL OU-3/IRP Site 21 REMEDIAL ACTION Data



OU-3/IRP Site 21 Active Recovery Well CoCs Concentrations via Off-site Laboratory



OU-3/IRP Site 21 Historical Active Recovery Well Effluent Concentrations via Off-site Laboratory



RW-11A activated 19 Oct 2010

Site 21 GWT System Analytical Data - Historical Summary Table

	Influent (Lead GAC)												Effluent (Lag GAC)	
Sample Date	TPH (C9-C36) mg/L	benzene ug/L	ethyl-benzene ug/L	toluene ug/L	xylenes ug/L	MTBE ug/L	Chloro-benzene ug/L	1,2-DCB ug/L	1,3-DCB ug/L	1,4-DCB ug/L	TCE ug/L	cis-1,2-DCE ug/L	TPH (C9-C36) mg/L	MTBE ug/L
5-Jan-07	0.59	ND (1)	ND (1)	ND (1)	5.7	ND (1)	ND (1)	1.3	ND (1)	ND (1)	41	5.0	ND (0.1)	2.6
7-Feb-07	0.73	ND (1)	ND (1)	ND (1)	9.5	ND (1)	ND (1)	2.5	ND (1)	ND (1)	42	4.6	ND (0.1)	ND (1.0)
7-Mar-07	0.74	ND (1)	ND (1)	ND (1)	5.9	ND (1)	ND (1)	1.9	ND (1)	ND (1)	36	4.7	ND (0.1)	3.3
4-Apr-07	0.82	ND (1)	2.1	ND (1)	30	ND (1)	ND (1)	4.8	ND (1)	1.1	39	5.4	ND (0.1)	ND (1.0)
2-May-07	0.61	ND (1)	5.3	ND (1)	79	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	25	NR	ND (0.1)	ND (1.0)
6-Jun-07	0.62	<1.6	<1.6	<1.6	NR	NR	<1.7	<1.4	<1.5	<1.5	24	4.5	ND (0.1)	NR
5-Jul-07	0.15	ND (1)	ND (1)	ND (1)	4.6	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	30	2.8	ND (0.1)	3.9
8-Aug-07	0.42	ND (1)	ND (1)	ND (1)	2.3	ND (1)	ND (1)	2.5	ND (1)	ND (1)	38	6.2	ND (0.1)	ND (1.0)
5-Sep-07	0.36	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	27	4.8	ND (0.1)	ND (1.0)
3-Oct-07	0.12	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	32	5.6	ND (0.1)	2.7
31-Oct-07	0.27	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	31	2.8	ND (0.1)	4
5-Dec-07	0.36	ND (2)	ND (2)	ND (2)	NR	NR	ND (2)	ND (2)	ND (2)	ND (2)	31	4.7	ND (0.2)	NR
2007 Average	0.48	bdl	0.6	bdl	19.6	bdl	bdl	1.1	bdl	0.1	33.0	4.6	bdl	1.0
9-Jan-08	1.7	1.3	ND (1)	1.8	8.6	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	43	4.4	0.18	3.8
12-Feb-08	0.84	ND (1)	ND (1)	ND (1)	18	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	41	6.3	ND (0.1)	3.1
4-Mar-08	0.99	ND (1)	1.7	ND (1)	58	ND (1)	ND (1)	5.5	ND (1)	ND (1)	31	5.8	0.14	3.3
2-Apr-08	1.20	ND (1)	3.9	ND (1)	49	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	20	2.4	0.28	ND (1.0)
7-May-08	0.90	ND (1)	4.3	ND (1)	57	ND (1)	ND (1)	3.9	ND (1)	ND (1)	33	4.7	ND (0.1)	ND (1.0)
4-Jun-08	0.69	ND (1)	ND (1)	ND (1)	11	ND (1)	ND (1)	2.8	ND (1)	ND (1)	31	3.9	ND (0.1)	ND (1.0)
1-Jul-08	0.37	ND (1)	ND (1)	ND (1)	2	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	27	4.2	ND (0.1)	ND (1.0)
6-Aug-08	0.81	ND (1)	ND (1)	ND (1)	NR	NR	ND (1)	1.0	ND (1)	ND (1)	30	4.9	ND (0.1)	NR
3-Sep-08	0.31	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected
1-Oct-08	0.49	ND (1)	ND (1)	ND (1)	3.6	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	35	5.9	ND (0.1)	ND (1.0)
5-Nov-08	0.55	ND (1)	ND (1)	ND (1)	1.5	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	31	4.7	ND (0.1)	ND (1.0)
3-Dec-08	0.5	ND (2)	ND (2)	ND (2)	NR	NR	ND (2)	ND (2)	ND (2)	ND (2)	25	4.7	ND (0.2)	NR
2008 Average	0.78	0.1	0.9	0.2	23.2	bdl	bdl	1.2	bdl	bdl	31.5	4.7	0.1	1.1
7-Jan-09	1.1	ND (1)	ND (1)	ND (1)	37	ND (1)	1.4	ND (1)	ND (1)	ND (1)	26	2.5	ND (0.1)	ND (1.0)
11-Feb-09	0.38	ND (1)	0.31 J	ND (1)	12.3	0.40 J	ND (1)	2.9	ND (1)	0.67 J	30	3.9	ND (0.095)	4.3
5-Mar-09	0.37	ND (1)	0.31 J	ND (1)	9.1	ND (1)	ND (1)	2.5	ND (1)	0.76 J	31	3.6	ND (0.095)	4.0
8-Apr-09	0.38	ND (1)	ND (1)	ND (1)	14	ND (1)	NR	NR	NR	NR	13	1.4	ND (0.1)	4.5
5-May-09	0.43	ND (1)	ND (1)	ND (1)	8.5	ND (1)	NR	NR	NR	NR	35	3.2	ND (0.1)	3.6
5-Jun-09	0.21	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	NR	NR	NR	NR	30	3.1	ND (0.1)	4.7
7-Jul-09	0.29	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	NR	NR	NR	NR	19	1.2	ND (0.1)	5.1
4-Aug-09	0.32	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	NR	NR	NR	NR	25	2.6	ND (0.1)	6.1
31-Aug-09	0.30	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	NR	NR	NR	NR	30	3.5	ND (0.1)	6.0
5-Oct-09	0.18	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	NR	NR	NR	NR	37	3.1	ND (0.1)	4.2
2-Nov-09	0.28	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	NR	NR	NR	NR	29	1.8	ND (0.1)	5.2
1-Dec-09	0.45	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	NR	NR	NR	NR	28	1.7	0.17	5.2
2009 Average	0.39	ND (1)	nil	ND (1)	16.2 then ni	nil					27.8	2.6	nil	4.5

Site 21 GWT System Analytical Data - Historical Summary Table

	Influent (Lead GAC)												Effluent (Lag GAC)	
Sample Date	TPH (C9-C36) mg/L	benzene ug/L	ethyl-benzene ug/L	toluene ug/L	xylenes ug/L	MTBE ug/L	Chloro-benzene ug/L	1,2-DCB ug/L	1,3-DCB ug/L	1,4-DCB ug/L	TCE ug/L	cis-1,2-DCE ug/L	TPH (C9-C36) mg/L	MTBE ug/L
5-Jan-10	0.44	ND (1)	ND (1)	ND (1)	ND (2)	4.8	NR	NR	NR	NR	ND (2)	ND (2)	ND (0.92)	4.9
1-Feb-10	**No Sample Analysis this month**													
1-Mar-10	**No Sample Analysis this month**													
13-Apr-10	0.65	ND (1)	6.9	ND (1)	281	ND (1)	NR	NR	NR	NR	23	2.3	ND (0.091)	4.1
3-May-10	0.32	ND (1)	1.6	ND (1)	21.6	ND (1)	NR	NR	NR	NR	32	2.5	ND (0.092)	4.7
1-Jun-10	0.41	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	NR	NR	NR	NR	31	2.8	ND (0.091)	5.5
6-Jul-10	0.27	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	NR	NR	NR	NR	33	3.9	ND (0.091)	6.6
2-Aug-10	0.11	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	NR	NR	NR	NR	25	5.1	ND (0.091)	6.2
2-Sep-10	0.026	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	NR	NR	NR	NR	22	2.2	ND (0.01)	6.9
5-Oct-10	0.21	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	NR	NR	NR	NR	25	1.9	ND (0.01)	5.1
1-Nov-10	2.7	ND (1)	5.1	1.9	7.5	ND (1)	NR	NR	NR	NR	25	2.5	0.14	5.9
7-Dec-10	3.4	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	NR	NR	NR	NR	ND (100)	ND (100)	ND (0.091)	4.3
2010 Average	0.85	n/a	n/a	n/a	n/a	n/a					27.0	2.9	nil	5.5
4-Jan-11	3.1	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	150	3,000	ND (100)	880	ND (100)	ND (100)	ND <0.091	4.7
1-Feb-11	2.9	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	NR	2,100	ND (100)	NR	20 J	ND (100)	ND <0.10	5.5
1-Mar-11	4.5	ND (5)	8.6	ND (5)	19	ND (5)	120	2,500	27	780	30	ND (5)	ND <0.091	5.5
4-Apr-11	2.9 (2.7 DRO) J	ND (5)	9.5	8.9	88	ND (5)	68	2,100	22	650	21	ND (5)	0.10 (<0.091 DRO) J	4.8
2-May-11	2.3 (2.0 DRO)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	97	1,800	ND (50)	680	ND (50)	ND (50)	<0.094 - both	5.5
6-Jun-11	3.4 (2.6 DRO)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	92	1,800	ND (50)	580	ND (50)	ND (50)	<0.091 - both	5.0
5-Jul-11	2.0 B (1.7 DRO)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	88	1,800	ND (50)	550	ND (50)	ND (50)	<0.091 - both	8.4
1-Aug-11	2.9 (2.7 DRO)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	140	2,700	ND (100)	800	ND (100)	ND (100)	0.092 (<0.091 DRO)	7.6
6-Sep-11	3.6 (3.0 DRO)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	120	2,800	ND (50)	840	ND (50)	ND (50)	0.094 (<0.093 DRO)	6.7
3-Oct-11	2.2 (2.2 DRO)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	120	2,900	ND (50)	880	ND (50)	ND (50)	0.098 (<0.093 DRO)	6.0
7-Nov-11	2.6 (2.4 DRO)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	88	2,700	ND (50)	770	ND (50)	ND (50)	<0.094 - both	4.4
6-Dec-11	3.4 (2.8 DRO)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	92	2,600	ND (50)	810	ND (50)	ND (50)	<0.094 - both	5.9
2011 Average	2.98 TPH	unk	unk	unk	unk	unk	107	2,400	unk	747	unk	unk	nil	5.8
3-Jan-12	3.4 (3.0 DRO)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	91	2,500	ND (50)	800	ND (50)	ND (50)	0.27 (0.16 DRO)	5.5
7-Feb-12	4.7B (3.4B DRO)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	89	2,700	ND (50)	840	ND (50)	ND (50)	<0.094 J - both	5.2
5-Mar-12	4.7 (3.9 DRO)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	120	3,300	ND (50)	990	ND (50)	ND (50)	<0.094 - both	6.0
2-Apr-12	4.0B (3.2 DRO)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	95	2,400	ND (50)	730	ND (50)	ND (50)	<0.095 J - both	7.0
1-May-12	2.4 (1.9 DRO)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	2,200	ND (50)	690	ND (50)	ND (50)	<0.095 J - both	7.0
2012 Average		unk	unk	unk	unk	unk	99	2,620	unk	810	unk	unk	nil	6.1

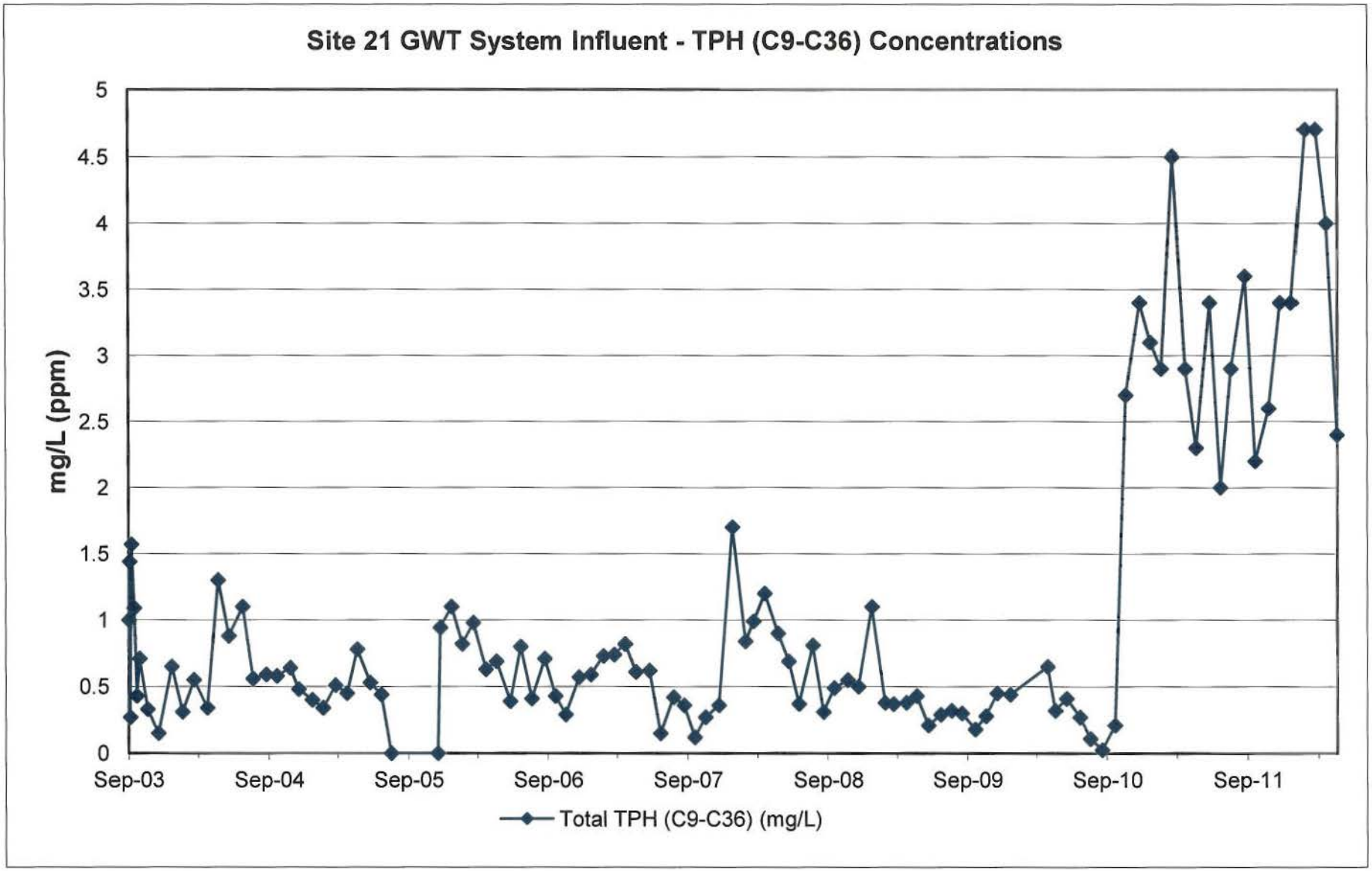
Notes: a. Highlighted = exceeds a standard; d

b. Effluent has consistently been below detection levels for all TPH & VOC analysis except for minor detections of MTBE and periodic/random detections of TPH.

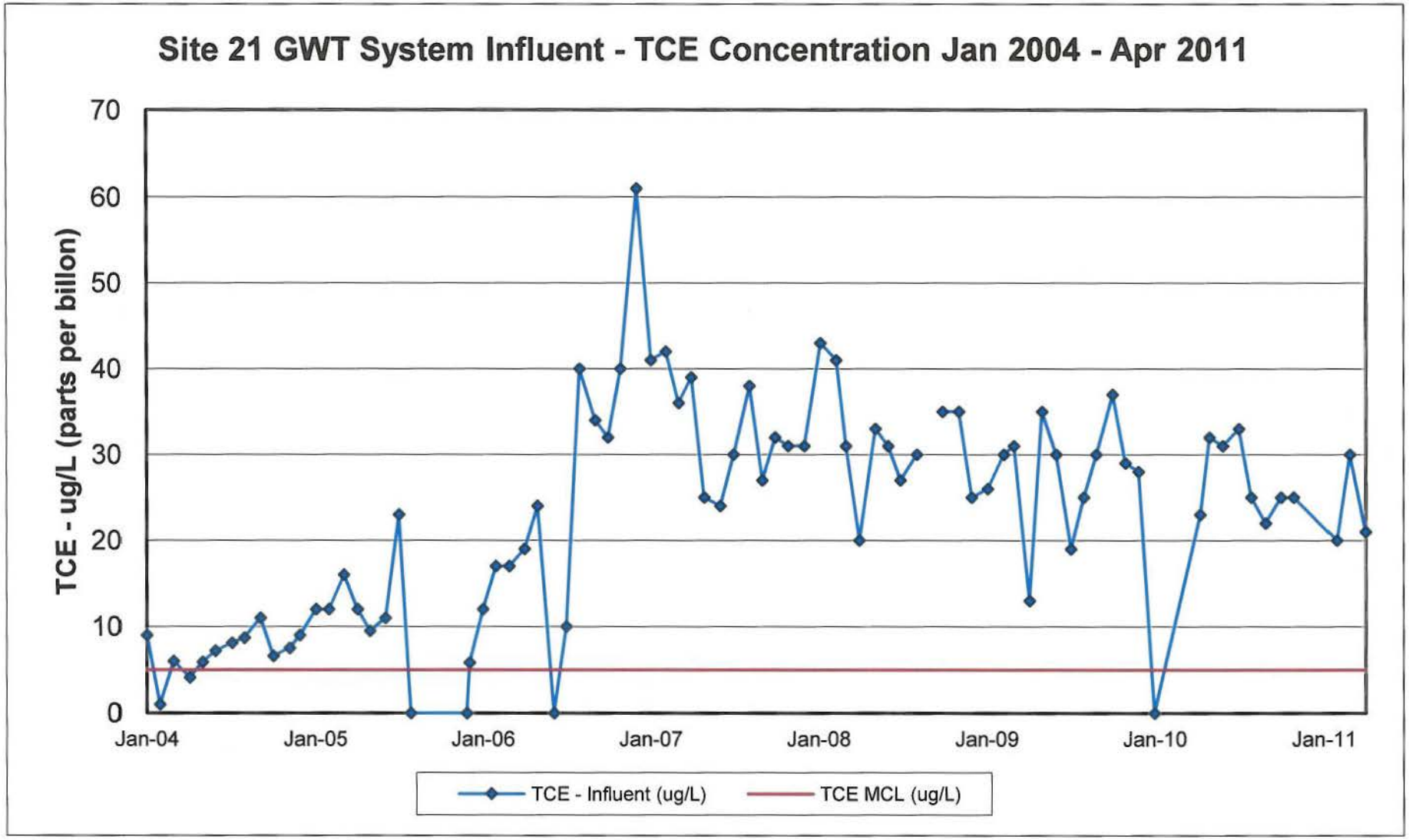
c. ND or < = not detected above level indicated; na = not analyze; bdl = below detection level; BRL = below reporting level; NR = not reported;

d. Apr 2011-Laboratory begins to report both Total Petroleum Hydrocarbons (C9-C36) and Diesel Range Organics (C10-C28) for the monthly laboratory analysis of treatment system's influent and effluent

OU-3/IRP Site 21 Historical GWT System Influent Results via Off-site Laboratory

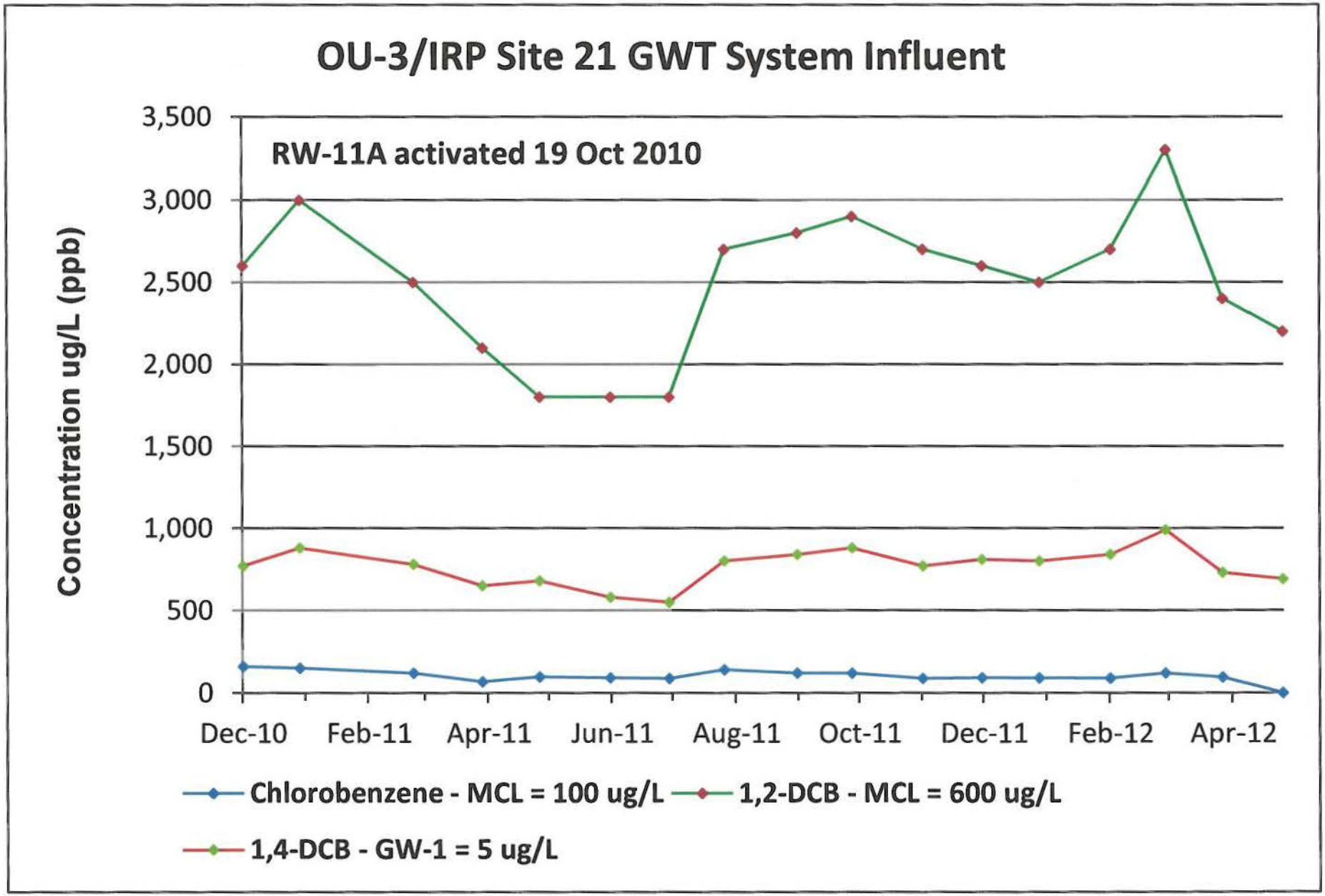


OU-3/IRP Site 21 Historical GWT System Influent Results via Off-site Laboratory



Note: Since April 2011 the laboratory's dilution due to other CoCs masks the TCE

OU-3/IRP Site 21 Historical GWT System Influent Results via Off-site Laboratory



OU-3/Site 21 Long-Term Monitoring Plan for 2012

OU-3/IRP Site 21 Wells Included in Long-Term Monitoring Plan for 2012

	Baseline Event	LNAPL Monthly	Semi-A Spring	Annual Fall	Remarks
CH102	13-Oct-03		VOC	VOC	**COC = 1,4-DCB** (2003 BL - 28.8 ug/L)
ECS-14R	13-Oct-03			VOC	**COC = Benzene** (Nov-10 5.1 ug/L)
ECS-28	16-Oct-03			VOC	**COC = Vinyl Chloride** (Nov-10 3.7 ug/L)
ECS-29	11-Oct-06	LNAPL-M	VOC-suspended after 2010		< MCLs & RB stds Oct-08, Nov-09 & Nov-10
ECS-30U	14-Oct-03		VOC	VOC	Below MCLs - RI, SRI, RA-C BL, Oct-06 & Oct-07
ECS-30L	14-Oct-03			VOC	**COC = 1,4-DCB** (Nov-09 & Nov-10 below standards)
ECS-31	13-Oct-03	LNAPL-M	VOC	VOC	**COC = 1,2 & 1,4-DCB, Chlorobenzene & Vinyl Chloride**
ECS-34	15-Oct-03		VOC	VOC	< MCLs & RB stds Oct-08, Apr & Nov-09 & Apr & Nov-10
ECS-35	13-Oct-03	LNAPL-M		VOC	**COC = TCE** (Nov-10 17 ug/L)
ECS-38	14-Oct-03		VOC	VOC	**COC = 1,4-DCB** (Nov-10 12 ug/L)
MWZ-3	15-Oct-03		VOC	VOC	**COC = RB VOCs**
MWZ-11	15-Oct-03			VOC	**COC = RB VOCs (< RBRGs Nov-09 & Nov-10)**
MWZ-12	15-Oct-03			VOC	**COC = RB VOCs**
MWZ-13	10-Oct-06	LNAPL-M		VOC	**COC = RB VOCs**
MWZ-15	10-Oct-06	LNAPL-M		VOC	**COC = RB VOCs**
MWZ-17	13-Oct-03			VOC	**COC = RB VOCs**
MWZ-20	11-Oct-06	LNAPL-M		VOC	**COC = RB VOCs**
MWZ-22	10-Oct-06	LNAPL-M	VOC-suspended after 2010		**COC = RB VOCs (< RBRGs Oct-08, Nov-09 & Nov-10)**
PW-3	15-Oct-03			VOC	**COC = RB VOCs**
PW-4	14-Oct-03		VOC	VOC	**COC = RB VOCs**
PW-5	14-Oct-03			VOC	**COC = RB VOCs**
RW-1	20-Oct-05			VOC	**COC = Benzene** (Nov-10 7.7 ug/L) **& 1,4-DCB** (Nov-10 65 ug/L)
RW-1A	1-Dec-03	**Pumping**		VOC	**COC =RB VOCs**
RW-6A	1-Dec-03	**Pumping**	VOC *	VOC	**COC = TCE**
RW-7A	1-Dec-03	**Pumping**	VOC *	VOC	**COC = TCE**
RW-11A	8-Nov-10	**Pumping**	VOC	VOC	**COC = 1,2 & 1,4-DCB, Chlorobenzene & Vinyl Chloride**
SG #3	16-Oct-03		VOC	VOC	< MCLs/RB stds-continue monitoring Shawsheen for migration
Totals		7	11	25	

Notes: 1. LNAPL & groundwater levels will be collected semi-annually from all above except pumping recovery wells
2. VOC * = Lab & on-site GC analysis. GC analysis will be suspend after Apr-2012 S&A (lab only after then)
3. S&A of ECS-30U & ESC-34 is being reinstitued to access migration from petroleum hot spot at ECS-31

Site 21 Wells Temporarily Excluded from LTMP

MWS-108	14-Oct-03	**VOC-suspended**	< MCLs & RB stds Oct-05, Oct-06 & Oct-07
MWZ-23	14-Oct-03	**VOC-suspended**	< MCLs & RB stds Apr & Nov-04, Apr & Oct-05 & Oct-07
PW-1	13-Oct-03	**VOC-suspended**	< MCLs RA-C BL, Nov-04, Oct-05 & Oct-06
PW-2	13-Oct-03	**VOC-suspended**	< MCLs RA-C BL, Nov-04, Oct-05 & Oct-06
PW-6	21-Apr-04	**VOC-suspended**	< MCLs & RB stds Apr-06, Oct-06, Oct-07 & Oct-08
PW-7	14-Oct-03	**VOC-suspended**	< MCLs & RB stds Oct-05, Oct-06 & Oct-07
RT-S2	14-Oct-03	**VOC-suspended**	< MCLs Jun-97, Oct-03 Baseline & Oct-06
RT-S3	14-Oct-03	**VOC-suspended**	< MCLs Jun-97, Oct-03 Baseline & Oct-06
RW-8	12-Oct-06	**VOC-suspended**	vic MWZ-3 - < MCLs Oct-06 Baseline
RW-2A	1-Dec-03	**VOC-suspended**	< MCLs & RB stds Nov-04/Nov-05/Oct-06
RW-3A	1-Dec-03	**VOC-suspended**	< MCLs & RB stds Oct-06/Oct-07/Oct-08
RW-5A	1-Dec-03	**VOC-suspended**	< MCLs & RB stds Dec-03/Nov-04/Oct-05
RW-4A	1-Dec-03	**VOC-suspended**	< MCLs & RB stds Oct-06/Oct-07/Oct-08
RW-8A	1-Dec-03	**VOC-suspended**	< MCLs & RB stds Nov-04/Nov-05/Oct-06/Oct-07
RW-9A	1-Dec-03	**VOC-suspended**	< MCLs & RB stds Oct-06/Oct-07/Oct-08
RW-10A	1-Dec-03	**VOC-suspended**	< MCLs & RB stds Nov-05/Oct-06/Oct-07

OU-3/Site 21 Long-Term Monitoring Plan for 2012

Site 21 Wells Excluded from Future Sampling and Analysis		
	Baseline	**Remarks**
CH101	13-Oct-03	Below MCLs - SRI & RA-C BL
CH103	14-Oct-03	Below MCLs 1999 SRI, RA-C BL Oct-03, Jan-04, & Oct-06
CH104	14-Oct-03	Below MCLs - SRI & RA-C BL
CH105	16-Oct-03	Below MCLs RA-C BL Oct-03 & Oct-06
CH106	16-Oct-03	Below MCLs - SRI & RA-C BL
CH107	16-Oct-03	Below MCLs - SRI & RA-C BL
ECS-32	14-Oct-03	Below MCLs - RI, SRI & RA-C BL
ECS-37	13-Oct-03	Below MCLs - RI, SRI, RA-C BL & Oct-05
ECS-39	14-Oct-03	VOCs below MCLs May-02 thru Oct-05; also Oct-06 SVOCs < MCLs
ECS-40	15-Oct-03	Below MCL since Sep-95 thru Oct-05
ECS-41	14-Oct-03	Below MCL since Sep-95 thru Oct-05
ECS-42	14-Oct-03	Below MCLs - RI, SRI, RA-C BL & Oct-05
ECS-43	13-Oct-03	Below MCLs - RI, SRI, RA-C BL & Oct-05
MWZ-4	15-Oct-03	Below MCLs Dec-02, RA-C BL Oct-03 & Oct-06
MWZ-5	14-Oct-03	Below MCLs - 1992, RI, SRI & RA-C BL
MWZ-6	15-Oct-03	Below MCLs - RA-C BL, Oct-05 & Oct-06
MWZ-7	15-Oct-03	Below MCLs - RA-C BL, Oct-05 & Oct-06
MWZ-19	11-Oct-06	Below MCLs Oct-06 Baseline
MWZ-24	14-Oct-03	Below MCLs - 1993, RI, SRI & RA-C BL
MWZ-25	15-Oct-03	Below MCLs 1997 RI, RA-C BL Oct-03 & Oct-06
OW-2	14-Oct-03	Below MCLs - RI, SRI & RA-C BL
RW-2	14-Oct-03	Below MCLs Jun-97, RA-C BL Oct-03, Oct-05 & Oct-06
Upgradient and destroyed wells, wells near another and wells removed/destroyed and replaced by another		
ECS-26	Not Sampled	upgradient/below MCLs-RI/may be destroyed
ECS-27	Not Sampled	upgradient/may be destroyed/below MCLs-RI
ECS-33	No well	removed during RA/replaced by PW-7
ECS-36	No well	destroyed before RA, below MCLs - RI & SRI
ECS-44	No well	Never installed-replaced by CH-101
ECS-45	Not Sampled	upgradient/below MCLs - RI
ECS-46	Not Sampled	upgradient/below MCLs - RI
MWZ-1	No well	pre-RA destroyed/replaced by ECS-27
MWZ-2	No well	pre-RA destroyed/replaced by ECS-26
MWZ-8	No well	pre-RA destroyed
MWZ-9	No well	removed during RA/replaced by MWS-108
MWZ-10	No well	removed during RA/replaced by PW-3
MWZ-14	No well	pre-RA destroyed/replaced by ECS-14R
MWZ-16	No well	removed during/replaced by PW-1
MWZ-18	No well	removed during/replaced by PW-2
MWZ-21	No well	removed during RA/replaced by PW-1
RT-S1	Not Sampled	buried during RA/vic PW-2
RW-3	Not Sampled	redundant vic MWZ-12
RW-4A	Not Sampled	Pre-RA RW - redundant vic MWZ-11
RW-5	Not Sampled	redundant vic MWZ-6
RW-6	No well	removed during RA
RW-7	No well	removed during RA
RW-9	No well	removed during RA
RW-10	No well	removed during RA
RW-11	No well	removed during RA
RW-12	No well	removed during RA
RW-13	Not Sampled	vic RW-1A & RW-2A
VER-1	No well	removed during RA
VER-2	No well	removed during RA
VER-3	No well	removed during RA

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

All results are ug/L (ppb) except TPH are mg/L

CH-102	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 16-Oct-03	16-Apr-12
Total BTEX					ND	ND
1,2-Dichlorobenzene	600	600	2,000		122.27	83
1,3-Dichlorobenzene	ns	40	2,000		1.67F	2.9
1,4-Dichlorobenzene	75	5	200		28.76	82
Chlorobenzene	100	100	200			7.2
Trichloroethene	5	5	30		0.7 F	0.80 F

ECS-14R Replaced MWZ-14	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 13-Oct-03	10-Oct-06	23-Oct-07	15-Oct-08	16-Nov-09	8-Nov-10	2-Nov-11
Total BTEX					82.34F	64	72.66	126.1	33.24	16.56F	73.3
Benzene	5	5	2,000		25.36	4.83	11.1 J	25	7.4	5.1	15
Toluene	1,000	1,000	50,000		0.99F	<0.018	<0.036R	1.1	0.19 F	0.27 F	1.3
Ethylbenzene	700	700	20,000		52.87	52.8	60.6	56	25	11	45
Xylenes	10,000	10,000	9,000		3.12F	6.8M	0.96J	44M	0.65 F	0.19 F	12
1,2,4-Trimethylbenzene				21	6.31	7.21	2.68	5.6M	0.81 F	0.17 F	3.1
1,3,5-Trimethylbenzene				22	0.55F	0.5F	<0.026	1.5	<0.083M	0.15 F	0.21 F
Isopropylbenzene					2.8	1.67	1J	1.4	0.59 F	0.59 F	0.86 F
Naphthalene		140	1,000		9.2	16.7	12.2	20	6.3	1.2	18
n-Propylbenzene				4	2.73	2.08	1.1F	1.6	<0.13	0.53 F	0.97 F

Monitoring Well ECS-28	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 16-Oct-03	4-Nov-04	26-Apr-05	19-Oct-05	21-Apr-06	12-Oct-06	14-May-07	22-Oct-07
Total BTEX					0.76 F	1.6 M	1.29 F	2.49 F	21 / 22 F	2.1 / 1.8	3.32 F	1.75 / 1.6
Benzene	5	5	2,000		0.28 F	0.35 F	1.29 F	2.3	20.6 / 21.4	1.85 / 1.48	2.36	1.75 / 1.6
Toluene	1,000	1,000	50,000									
Xylenes	10,000	10,000	6,000		0.33 F	1.0 M	<0.41	0.19F		<0.07/<0.07	0.76 F	
1,2,4-Trimethylbenzene				21								
Acetone		6,300	50,000		na	2.3 F	<2.3	3.9 M	5.08 F/<2.06	<2.06/<2.06	<0.823	
Chloroethane					1	1.01 F	<0.83					
cis-1,2-Dichloroethene	70	70	100		2.57	1.12 F	<0.39	8.7	0.3F / 0.325F	0.9F/0.775F	0.37 F	
Methyl-tert-butylether		70	50,000		na	334.2	260.28	130	40.2/42.8	47.6/47	4.8 F	16.7 / 15
sec-Butylbenzene				4	1.24 F	2.61	1.12 F	1.5	0.725 F/0.8 F	1.72F/1.82F	2.05	1.2 F/1.18 F
tert-Butylbenzene					2.41	3.16	1.55 F	1.7	1.75 F/1.85 F	1.88 F/2 F	1.74	1.3 F/1.23 F
Vinyl Chloride	2	2	2		12.75	16.69	1.59F	18	6.85 / 7.33	5.72/4.45	1.32	7.75 / 7.4

					9-Apr-08	14-Oct-08	16-Apr-09	17-Nov-09	22-Apr-10	10-Nov-10	28-Oct-11
Total BTEX					0.76/0.88	3.0	2.5	0.13 F/0.12 F	0.63F/0.36F	0.87	0.57
Benzene	5	5	2,000		0.76/0.88	2.2	2.5/2.6	<0.13/<0.13	0.35F/0.36F	0.79	0.57
Toluene	1,000	1,000	50,000							0.08 F	
Xylenes	10,000	10,000	9,000						0.28J/<0.087UJ		
1,2,4-Trimethylbenzene				21					0.57F/0.2F	0.14 F	0.43 F
Acetone		6,300	50,000							4.6 F	
cis-1,2-Dichloroethene	70	70	100						0.28F/0.25F	8.7	0.22 F
Dichloromethane/Methylene Chloride	5	5	10,000							1.2 F	
Isopropylbenzene									0.24J/<0.12UJ	0.18 F	1.4
Methyl tert-butyl ether		70	50,000		1.8 / 2	1.9 F	1.0 F/1.1 F	0.50 F/0.57 F	0.18F/0.18F	2.4 F	
Naphthalene		140	1,000								0.69 F
n-Butylbenzene					<0.12		<.25M/<.25M	<0.12/<0.12			0.36 F
n-Propylbenzene				4					0.18J/<0.13UJ		0.28 F
sec-Butylbenzene				4	0.76 F/0.81 F	1.7	.76FM/.74FM	<0.18/0.21 F	0.67F/0.58F	0.58 F	5.3
tert-Butylbenzene					0.62 F/0.66 F	1.8	.75 F/.72 F	.28 FM/.32 FM	0.63F/0.53F	1.2	3.6
trans-1,2-Dichloroethene	100	100	90							0.11 F	0.06 F
Trichloroethene	5	5	30						<0.1/0.13F	2.7	
Vinyl chloride	2	2	2		0.66 F/0.7 F	6.2	.86 F/.96 F	.63 F/.72 F	1J/0.85J	3.7	4.5

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

Monitoring Well ECS-29	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 14-Oct-03	21-Apr-06	23-Oct-07	15-Oct-08	16-Nov-09	8-Nov-10	17-Apr-12
Total BTEX					LNAPL	**3.4**	**4.2**	**0.44**	**0.42 FM**	**ND**	**0.68**
Ethylbenzene	700	700	20,000			0.67 M	1.2	0.44 F	0.42 FM		0.68 F
Xylenes	10,000	10,000	9,000			2.7	3	<0.187 M	<0.187		
1,2,4-Trimethylbenzene				21		35.1	59J	8.1 M	0.75 FM	0.34 F	0.24 F
1,3,5-Trimethylbenzene				22		20.6	22.2	9.7	0.49 FM		
Dichloromethane/Methylene Chloride	5	5	10,000							0.35 F	0.58 F
Isopropylbenzene						3.16	6.01 J	2	1.4 M	0.21 F	1.1
Naphthalene		140	1,000			2.99	3.7	2.2	2 M		0.61 F
n-Butylbenzene						0.21 F	2.16	<0.12	<0.12 M		
n-Propylbenzene				4		2.97	5.2	1.4	1.0	0.18 F	0.48 F
p-Isopropyltoluene						5.85	4.28 J	9.4	4.7	0.62 F	
sec-Butylbenzene				4		1.36	1.52	0.34 F	0.24 FM		

Monitoring Well ECS-30L	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 14-Oct-03	16-Oct-05	11-Oct-06	23-Oct-07	15-Oct-08	16-Nov-09	9-Nov-10	2-Nov-11
Total BTEX					**0.13 F**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**0.39 J**
Benzene												0.27 J
Xylenes												0.12 J
1,2-Dichlorobenzene	600	600	2,000		13.54	45	30.6	14.7	34 M	18	18	37 J
1,3-Dichlorobenzene												0.43 J
1,4-Dichlorobenzene	75	5	200		4.28	13	11.4	5.44	8.6	4.5	4.4	11 J
Acetone		6,300	50,000		na	<0.63M	1.17 M	1.95 F	<1.6	<1.6 M	3.6 F	
Chlorobenzene	100	100	200		2.55	6.3	3.99	1.67	3.7	1.2	1.7	5.3 J
Chloroform		70	50									0.073 J
Chloromethane											0.65 F	
cis-1,2-Dichloroethene	70	70	100								0.24 F	0.5 J
Trichloroethene	5	5	30								0.12 F	0.3 J
Vinyl Chloride	2	2	2									0.19 J

Monitoring Well ECS-30U	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 14-Oct-03	11-Oct-06	23-Oct-07	16-Apr-12
Total BTEX					**0.21 F**	**0.2 F**	**ND**	**ND**
Benzene	5	5	2,000		0.11 F	0.2 F	<0.01	
Toluene	1,000	1,000	50,000		0.1 F	<0.018	<0.018	
1,2-Dichlorobenzene	600	600	2,000			0.14 F	<0.019	
Acetone		6,300	50,000			1.34 M	1.21 F	5.4 F
Isopropylbenzene						0.11 F	<0.021	
Dichloromethane/Methylene Chloride	5	5	10,000		0.2 F	0.2 F	<0.034	0.60 F
Methyl tert-butyl ether		70	50,000			13.6	10.2	9.5
Trichloroethene	5	5	30					0.17 F

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

Monitoring Well ECS-31	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 16-Oct-03	10-Oct-06	14-May-07	23-Oct-07	9-Apr-08	16-Oct-08	16-Apr-09
Total BTEX					**1.19 F**	**23 FM**	**40.25 F**	**22 F**	**29.8**	**21.6**	**14.05**
Benzene	5	5	2,000		<.032	<0.25	<0.25	<0.25	<0.66	<0.66	<0.26
Toluene	1,000	1,000	50,000		0.24 F	3 F	<0.45	<0.45	1.5 F	1.1 F	0.49 F
Ethylbenzene	700	700	20,000		0.57 F	11 F	7.25 F	9 F	13	11	7.3
Xylenes	10,000	10,000	9,000		0.38 F	9.3 M	33 F	13 F	15.3 F	9.5 FM	6.26
1,2-Dichlorobenzene	600	600	2,000		38.71	872	792M	958	1200	1200 M	710 *
1,2,4-Trichlorobenzene	70	70	2,000		19.57	13.2 F	27	20 F	22	21	20
1,2,4-Trimethylbenzene				21	0.22 F	<0.3	2.75 F	<0.3	7.1	5.4 M	3.4
1,3-Dichlorobenzene		40	2,000		1.1 F	9 F	<0.5	11.2 F	13	11	7.3
1,3,5-Trimethylbenzene				22						4.2 F	2.4
1,4-Dichlorobenzene	75	5	200		17.72	276	259	358	370	320	200 *
Chlorobenzene	100	100	200		21.8	55.5	80	79	79 M	120	130 *
cis-1,2-Dichloroethene	70	70	100		0.37 F	<0.8	<0.8	<0.8	0.89 F	1.6 F	2.2
					0.2 F	<0.525	2.75 F	<0.525	5.4	4.3 F	3.3
Tetrachloroethene	5	5	50		0.96 F	<0.75	3.25F	<0.75	2.7 F	2.3 F	2.1

					16-Nov-09	22-Apr-10	9-Nov-10	25-Apr-11	2-Nov-11	16-Apr-12
Total BTEX					**121.45**	**54.99 F**	**31.5 F**	**5.93 F**	**6.09 F**	**2.78 F**
Benzene	5	5	2,000		0.45	0.29F				
Toluene	1,000	1,000	50,000		17	2.7	1.5 F	0.53 F	0.29 F	0.18 F
Ethylbenzene	700	700	20,000		39	19	10	2.2 F	2.5 F	1.2
Xylenes	10,000	10,000	9,000		65	33	20	3.2 F	3.3 F	1.4 F
1,2-Dichlorobenzene	600	600	2,000		3200	1800J	1700	650	800	310
1,2,3-Trichlorobenzene					1.5	0.83F				0.36 F
1,2,4-Trichlorobenzene	70	70	2,000		28	26	41	18	21	9.2
1,2,4-Trimethylbenzene				21	11	10	12	1.9 F	0.94 F	0.23 F
1,3-Dichlorobenzene		40	2,000		24	19	19	6	9.2	3.7
1,3,5-Trimethylbenzene				22	7.2	6.6	10	1.8 F	0.4 F	0.088 F
1,4-Dichlorobenzene	75	5	200		740	490J	490	200	240	100
Acetone		6,300	50,000			68	75 F			
Chlorobenzene	100	100	200		290	210J	210	120	63	52
Chloroform		70	50		2.3	0.66		0.82 F	1.2	0.34
cis-1,2-Dichloroethene	70	70	100		3.8	3.4	3.1 F	2.2 F	1.9 F	2.1
Isopropylbenzene					6.8	5.6	3.5 F	1 F	0.77 F	
Naphthalene		140	1,000		5.3	3.3				0.33 F
n-Propylbenzene				4	2.1	2.2		0.58 F		0.18 F
Tetrachloroethene	5	5	50		2.3	1.7			0.69 F	0.52 F
Trichloroethene	5	5	30		1.5	1	1.4 F	1.6 F	0.71 F	0.69 F
Vinyl Chloride	2	2	2		2.3	2.1	1.5 F	1.4 F		1.6

Monitoring Well ECS-34	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 15-Oct-03	19-Oct-05	11-Oct-06	14-May-07	23-Oct-07	9-Apr-08	15-Oct-08	16-Apr-09
Total BTEX					**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
1,2-Dichlorobenzene	600	600	2,000			0.57F	<0.019	0.98 M	<0.019	2.6 J	<0.11 M	<0.11
1,4-Dichlorobenzene	75	5	200					0.28 F	<0.017	0.91 J	<0.12	<0.12
Dichloromethane/Methylene Chloride	5	5	10,000		0.1F	0.6F	<0.034	<0.034	<0.034	0.35 F	<0.21	<0.21
Methyl-tert-butyl-ether		70	50,000			160	0.4F	<0.025	0.11F	<0.18	<0.18	<0.18 M
Trichloroethene	5	5	30		2.1	0.43F	2.1	0.45F	0.9 R	15	1.1	0.14 F

					16-Nov-09	22-Apr-10	9-Nov-10	16-Apr-12
Total BTEX					**0.073 F**	**ND**	**ND**	**ND**
1,2-Dichlorobenzene	600	600	2,000		<0.11		0.12 F	
1,4-Dichlorobenzene	75	5	200		<0.12			
cis-1,2-Dichloroethene	70	70	100					0.12F/0.13F
Chlorobenzene	100	100	200			0.51		
Dichloromethane/Methylene Chloride	5	5	10,000		0.40 FB			0.36F/0.69F
Trichloroethene	5	5	30		0.92 F	0.4F	0.23 F	0.91F/0.52F

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

Monitoring Well ECS-35	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 13-Oct-03	10-Oct-06	23-Oct-07	15-Oct-08	16-Nov-09	9-Nov-10	2-Nov-11
Total BTEX					**0.21F**	**0.17 F**	**ND**	**ND**	**ND**	**ND**	**0.23J**
Ethylbenzene	700	700	20,000								0.12 J
Xylenes	10,000	10,000	9,000								0.11 J
1,1-Dichloroethane		70	1,000							0.11 F	
1,1-Dichloroethene	7	7	80							0.13 F	0.1 J
1,2-Dichlorobenzene	600	600	2,000		0.39	0.51 F	0.94 F	2.1 M/ 2.2 M	1.5/1.4	1.6	0.59 J
1,3-Dichlorobenzene		40	2,000		0.22 F	<0.02	<0.02	1.1 /<0.14	<0.14/<0.14		
1,4-Dichlorobenzene	75	5	200		0.47	0.41 F	0.67	0.84/0.83	0.52/0.51	0.6	0.34 J
cis-1,2-Dichloroethene	70	70	100		0.31F	1.2	12.6	0.61F / 0.68F	0.89F/0.92F	1.8	1.3 J
Chloroform	100	70	50							0.39	
Isopropylbenzene					0.82	0.49 F	0.23 F	.31 F/.32 F	.30FM/.29FM	0.3 F	
n-Propylbenzene				4	1.27	0.51 F	0.29 F	.31 F/.31 F	<0.13/0.27 F	0.21 F	
Naphthalene		140	1,000							1.2	1.4 J
p-Isopropyltoluene					1.95	0.63 F	1.35	.57 F/.58 F	<0.1/<0.1		
sec-Butylbenzene				4	4.54	1.65	1.76	1.5/1.4	1.9 M/1.8 M	2.2	1.2 J
tert-Butylbenzene										0.18 F	
Trichloroethene	5	5	30		3.7	18.8	5.78 R	13/13	14/13	17	16 J

Monitoring Well ECS-38	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 14-Oct-03	5-Jan-04	21-Apr-04	3-Nov-04	26-Apr-05	19-Oct-05	21-Apr-06	14-May-07
Total BTEX					**ND**	**ND**	**ND**	**0.34 F**	**0.56**	**.34 F / .27 F**	**0.275 F**	**1.96 F / 0.78 F**
1,2-Dichlorobenzene	600	600	2,000		188.76	170	77.75	112.16	2.21	53 / 55	48	27.9 M / 29.5 M
1,4-Dichlorobenzene	75	5	200		48.9	52	22.34	31.92	2.05	13 / 13	12.9	10.7 / 11.2
Chlorobenzene	100	100	1,000		5.80	6 J	1.89	4.44	0.3 F	2.2 / 2.3	1.92	1.77 / 1.79
					22-Oct-07	9-Apr-08	14-Oct-08	16-Apr-09	17-Nov-09	22-Apr-10	10-Nov-10	25-Apr-11
Total BTEX					**ND**	**0.48**	**0.27 F**	**0.27 F**	**0.228 F**	**ND**	**ND**	**0.15 F**
1,2-Dichlorobenzene	600	600	2,000		14 R	24	35	32	130	45	54	24
1,4-Dichlorobenzene	75	5	200		5.56R	6.1	6.7	7.9	26	11	12	6.2
Chlorobenzene	100	100	200		2.27R	<0.08	1.5	<0.076	5.1	1.5	2.9	1.1
cis-1,2-Dichloroethene	70	70	100							0.11F	0.24 F	0.35 F
Trichloroethene	5	5	30									0.11 F
					28-Oct-11	16-Apr-12						
Total BTEX					**ND**	**ND**						
1,2-Dichlorobenzene	600	600	2,000		57	68						
1,4-Dichlorobenzene	75	5	200		14	19						
Chlorobenzene	100	100	200		2.3	3.60						
cis-1,2-Dichloroethene	70	70	100		0.1 F	0.31 F						
Trichloroethene	5	5	30									

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

ECS-39	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	14-Oct-03 RA-C BL	21-Apr-04	3-Nov-04	26-Apr-05	19-Oct-05	11-Oct-06
Total BTEX					0.31 F	**ND**	**ND**	**ND**	**ND**	**SVOCs**
1,2-Dichlorobenzene	600	600	1,000		16.14	0.23F	<0.04	<0.067	0.23F	2.84 F
1,3-Dichlorobenzene	none	600	10,000		0.16 F		<0.02	<0.021	<0.26	<0.06
1,4-Dichlorobenzene	75	5	30,000		4.43	0.15 F	<0.025	<0.039	0.28F	0.840 F
Chlorobenzene	100	100	1,000		1.94		<0.033	<0.017	<0.15	
Chloroform	100	5	4,000						1.2	
cis 1,2-Dichloroethene	70	70	30,000		1.04 F		<0.021	<0.039	<0.2	
sec-Butylbenzene	none			4	0.45 F		<0.017	<0.019	<0.22	
tert-Butylbenzene	none				0.37 F		<0.02	<0.046	<0.2	
Tetrachloroethene	5	5	3,000		0.16 F		<0.033	<0.046	<0.17	
Trichloroethene	5	5	300		0.9 F		<0.029	<0.031	<0.16	
Vinyl Chloride	2	2	2		0.79 F		<0.023	<0.031	<0.21	

ECS-40	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	15-Oct-03 RA-C BL	24-Apr-04	26-Apr-05	26-Apr-05	19-Oct-05
Total BTEX					**ND**	**ND**	**ND**	**ND**	**ND**
Methylene Chloride					0.4 F	<0.55	<0.55	<0.089	0.36 FB
Methyl tert-butyl ether		70	50,000			<0.019	<0.019	0.24 F	<0.42

ECS-41	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	14-Oct-03 RA-C BL	19-Oct-05
Methylene Chloride					0.3 F	0.31 F
Trichlorofluoromethane	none					0.15 F

ECS-42	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	14-Oct-03 RA-C BL	19-Oct-05
Total BTEX					**ND**	**ND**
1,2,4-Trimethylbenzene	none				0.39 F	<0.18
cis 1,2-Dichloroethene	70	70	30,000		0.29 F	<0.2
Isopropylbenzene	none				2.06	<0.2
Dichloromethane/Methylene Chloride	5	5	10,000		0.4 F	0.37 F
n-Propylbenzene	none			4	1.95	<0.21
p-Isopropyltoluene	none				0.24 F	<0.2
sec-Butylbenzene	none			4	1.6	<0.22
tert-Butylbenzene	none				0.17 F	<0.2

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

MWS-108	EPA MCL	MCP GW-1	MCP GW-2	RBRG	14-Oct-03 RA-C BL	21-Apr-04	4-Nov-04	27-Apr-05	19-Oct-05	12-Oct-06
Total BTEX					42.36	13.52	5.86	88.98	2.11/2.32	0.530 F
Benzene	5	5	2,000		9.72	3.58	4.74	4.66	1.9/2.1	0.400 F
Toluene	1,000	1,000	6,000		<.07	<0.038	<0.038	<0.038	<0.17/<0.17	<0.018
Ethylbenzene	700	700	30,000		30.35	4.32	1.12	82.14	0.21F/0.22F	0.130 F
Xylenes	10,000	#####	6,000		2.29 F	5.62	<0.046	2.18	<0.14/<0.14	<0.028
1,2,4-Trimethylbenzene		#####	######	21	3.12	3.03	0.28 F	12.38	0.44F/0.48F	<0.012
1,3,5-Trimethylbenzene		none	none	22	1.11	<0.03	<0.03	<0.032	<0.19/<0.19	<0.013
Acetone	none	3,000	50,000			2.1 FB	<0.17	<0.23	<0.63/<0.63	<0.823
Chloroform	100	5	400		<0.03	<0.015	<0.015	0.99	<0.15/<0.15	<0.029
Isopropylbenzene	none	none	none		12.22	1.28	6.24	21.80	1.1/1.3	0.600 F
Methylene Chloride	5	5	50,000		1.7 F	<0.055	<0.055	<0.089	<0.17/0.49 F	<0.034
n-Butylbenzene	none	none	none		0.51 F	<0.019	<0.019	0.11 F	<0.22/<0.22	<0.013
n-Propylbenzene		none	none	4	11.63	1.04	1.79	16.84	0.40F/0.43F	0.170 F
Naphthalene	none	20	6,000		6.30	2.97	0.8 F	19.50	<0.23/<0.23	0.300 F
p-Isopropyltoluene	none	none	none		6.98	0.77F	2.41	<0.022	<0.20/<0.20	<0.014
sec-Butylbenzene	RB 4	none	none	4	4.28	1.93	1.04	2.80	1.4/1.5	1.78
tert-Butylbenzene	none	1,000	10,000		1.08 F	0.66F	0.45 F	0.82 F	0.54F/0.65F	0.670 F

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

Monitoring Well MWZ-3	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 15-Oct-03	1-Dec-03	5-Jan-04	2-Feb-04	3-Mar-04	21-Apr-04	4-Nov-04	26-Apr-05
Total BTEX					**591.04 F**	**511 J**	**391 J**	**236 J**	**236 J**	**10.45**	**170M**	**39.97F**
Benzene	5	5	2,000		6.08 F	8 J	9 J	8 J	9.1 J	0.57F	5.42	1.73F
Toluene	1,000	1,000	50,000		<.95	<10	<10	<10	<10	<0.095	<0.38	
Ethylbenzene	700	700	20,000		25.54	27	36	33	31	3.16	20.99	22.49
Xylenes	10,000	10,000	9,000		559.42 F	476 J	346 J	195 J	130	6.72	140.88M	15.75
1,1,1-Trichloroethane	200	200	4,000		<0.525			20	<10	<0.053		
1,2-Dichlorobenzene	600	600	2,000		<1					5.64	1.95F	3.92F
1,2,4-Trimethylbenzene				21	148.48	170	180	150	170	56.24	217.29	51.97
1,3,5-Trimethylbenzene				22	47.63	44	32	15	<10	0.83F	7.74F	0.93F
1,4-Dichlorobenzene	75	5	200		<.625					1.54		1.27F
Dichloromethane/Methylene Chloride	5	5	10,000		14.9 F	<20	<20	<20				
Isopropylbenzene					20.28	31	32	28	27	11.34	31.38	21.77
Naphthalene		140	1,000		26.5	27 J	39 J	39 J	38 J	8.37	53.1	9.83
n-Propylbenzene				4	15.47	21	24	19	21	9.71	24.43	17.04
p-Isopropyltoluene					3.75 F	6 J	7 J	6 J	<10	4.17	7.52F	4.57F
Tetrachloroethene	5	5	3,000		<0.825			13	<10			
Trichloroethene	5	5	30		<0.73			97	<10	0.27F		
					19-Oct-05	21-Apr-06	12-Oct-06	14-May-07	22-Oct-07	9-Apr-08	14-Oct-08	16-Apr-09
Total BTEX					**73.70**	**606.2**	**150**	**156F**	**131.1F**	**95.6**	**65.8F**	**40.79**
Benzene	5	5	2,000		2.4	<0.25	1.8F	1.2F	1.1F	0.97	1.2	0.85
Toluene	1,000	1,000	50,000			<0.45	<0.09			0.44F	0.47F	0.24 F
Ethylbenzene	700	700	20,000		9.30	36.2	4.55F	14.8		13	0.87F	4.5
Xylenes	10,000	10,000	9,000		62	570	140	140	130	81.2	63.3	35.2
1,2-Dichlorobenzene	600	600	2,000		2.1	4.5F	2.3F	13.3M	1.1F	1.4	1.2	1.2
1,2,4-Trimethylbenzene				21	150	259	234	171	195	140	220	170 *
1,3,5-Trimethylbenzene				22	22	56.5	42.3	35.4	28.4	39	19	25
1,4-Dichlorobenzene	75	5	200		0.45F	<0.425		4.3F		0.6	0.58	0.59
Chlorobenzene	100	100	200		0.33F	<0.275			2F		0.6	
Isopropylbenzene					25	29.2	30.6	22.9	27.6	26	28	27
Naphthalene		140	1,000		33	72.5	58.8	29.1	46	28	36	21
n-Propylbenzene				4	17	20.8F	26.7	19.9	22.2	18	21	20
p-Isopropyltoluene					6.1	<0.35	5.8	7.4F	7.2F	6.2	5.9	6.0
sec-Butylbenzene				4	2.9	<0.425		3.2F	1.9F	2.8		3.3
tert-Butylbenzene					15	<0.4	1F	3.8F				
					17-Nov-09	22-Apr-10	10-Nov-10	25-Apr-11	28-Oct-11	16-Apr-12		
Total BTEX					**53.31**	**28.42F**	**2.7 F**	**4.62 F**	**1.36 F**	**3.76 F**		
Benzene	5	5	2,000		1.0	1.1	0.54	0.82	1.1			
Toluene	1,000	1,000	50,000		0.20 F	0.42F	0.14 F	0.2 F	0.073 F	0.45 F		
Ethylbenzene	700	700	20,000		0.71 F	4.9	0.22 F	1.1 F	0.19 F	0.31 F		
Xylenes	10,000	10,000	9,000		51.4	22	1.8 F	2.5 F		3.0		
1,2-Dichlorobenzene	600	600	2,000		0.61 F	6.60	1.1	0.25 F	0.37 F	0.31 F		
1,2,4-Trimethylbenzene				21	250	220	54	18	4.2	56		
1,3,5-Trimethylbenzene				22	53	23	2.1	3.2				
1,4-Dichlorobenzene	75	5	200		0.33 F	2.0	0.5	0.24 F				
Chlorobenzene	100	100	200			0.77F	1.2	0.16 F		0.12 F		
Isopropylbenzene					29	37.0	19	17	24	26		
Naphthalene		140	1,000		32	19.0	3	3.1	2.4	11		
n-Propylbenzene				4	22	30.0	14	14	20	20		
p-Isopropyltoluene					5.5	7.7	3.1	2.4	1.3	1.3		
sec-Butylbenzene				4		4.5	2.2	1.6 F	3.1	2.1		

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

Monitoring Well MWZ-11	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 15-Oct-03	19-Oct-05	12-Oct-06	22-Oct-07	14-Oct-08	17-Nov-09	10-Nov-10	28-Oct-11
Total BTEX					**0.93F**	**1.18**	**1.7F**	**ND**	**0.21 F**	**ND**	**ND**	**0.71 F / 0.70 F**
Benzene	5	5	2,000		0.5	0.32F	0.25F	<0.01				0.19 F / 0.19 F
Toluene	1,000	1,000	50,000		<.04	<0.17	<0.018	<0.018				
Ethylbenzene	700	700	20,000		0.28F	0.17F	0.71F	<0.024	0.21F			0.52 F / 0.51 F
Xylenes	10,000	10,000	9,000		0.15F	0.69F	0.76F	<0.028				
1,2,4-Trimethylbenzene				21	0.12F	3.2	3.05	<0.012	0.58F		0.23 F	2.9 / 3.2
1,3,5-Trimethylbenzene				22			0.51F	<0.013				
Acetone		6,300	50,000				1.62F	1.73F				
cis-1,2-Dichloroethene	70	70	100		0.13F	<0.2	<0.032	<0.032	0.15F	0.13 F		
Dichloromethane/Methylene Chloride	5	5	10,000		0.2F	0.31F	<0.034	0.38F		0.48 FB	1.5 F	
Isopropylbenzene					3.65	4.2	5.56	0.88F	4.8	2.4	0.16 F	11 / 11
Methyl-tert-butyl-ether		70	50,000				0.29F	0.85F				
Naphthalene		140	1,000				1.01	0.19F	1.4	0.48 FB		1.8 / 1.5
n-Butylbenzene					0.19F	<0.22	0.25F	0.15F				0.52 F / 0.52 F
n-Propylbenzene				4	1.8	2.7	5.11	0.86F	5.6	2.8		12 / 11
p-Isopropyltoluene							0.15F	0.32F	1.5			3.7 / 3.7
sec-Butylbenzene				4	1.72	1.2	1.43	0.67F	2.2	1.7	0.22 F	2.9 / 2.9
tert-Butylbenzene					0.49F	0.81F	0.25F	0.18F	0.3 F	0.27 F		
Trichloroethene	5	5	30		<.03	<0.16	<0.027	0.1F				

Monitoring Well MWZ-12	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 15-Oct-03	19-Oct-05	12-Oct-06	22-Oct-07	14-Oct-08	17-Nov-09	10-Nov-10	28-Oct-11
Total BTEX					**9.90F**	**1.03F**	**11F**	**4.2F**	**3.63F**	**1.604 F**	**0.79 F**	**2.19 F**
Benzene	5	5	2,000		<.32	<0.15	<0.1					
Toluene	1,000	1,000	50,000		<.38	<0.17	<0.18			0.24 F		0.085 F
Ethylbenzene	700	700	20,000		3.42F	0.52F	3.5F	1.2F	1.2	1.1	0.28 F	0.6 F
Xylenes	10,000	10,000	9,000		6.48F	0.51F	7.2F	3.0F	2.43F	0.264 F	0.51 F	1.5 F
1,2,4-Trimethylbenzene				21	195	40	339	124	150	200	37	63
1,3,5-Trimethylbenzene				22	66.55	4.2	130	24	73	130	18	56
Dichloromethane/Methylene Chloride	5	5	10,000			0.53F	<0.34					
Isopropylbenzene					28.43	8.4	50.8	17.6	21	25	6.3	15
Methyl-tert-butyl-ether		70	50,000			0.52F	<0.25					
Naphthalene		140	1,000		11.2	<0.23	2.6F	1.9F	1.1	1.5	0.84 F	1.7
n-Butylbenzene					2.62F	<0.22	2.8F	1.7F		3.5	1.3	3.8
n-Propylbenzene				4	36.49	11	74.2	25.5	38	46	14	34
p-Isopropyltoluene					8.44F	2.4	7.1F	4.4F	15	17	12	13
sec-Butylbenzene				4	4.88F	2.6	6.9F	2.6F	6.6	7.6	3.8	9.9

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

Monitoring Well MWZ-13	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 15-Oct-03	10-Oct-06	23-Oct-07	15-Oct-08	16-Nov-09	9-Nov-10	2-Nov-11
Total BTEX					LNAPL	**1,400FM**	**1,482**	**849 F**	**956 F**	**706**	**303.37 F**
Benzene	5	5	2,000			<0.05	<0.2R	0.40 F		0.49	
Toluene	1,000	1,000	50,000			2.1F	<0.36R	0.23 F	0.25 F	5.5	0.37 F
Ethylbenzene	700	700	20,000			248	282	160	180	110	53
Xylenes	10,000	10,000	9,000			1100M	1200	688	776	590	250
2-Butanone (MEK)		4000	50,000			5.6F	<13R				
1,2,4-Trimethylbenzene				21		295	353	250	290	260	86
1,2-Dichlorobenzene	600	600	2,000							0.16 F	
1,3,5-Trimethylbenzene				22		114	133	140	170	200	55
Chloromethane										0.26 F	
Isopropylbenzene						34.1	34.4J	27	31	25	9.6
n-Butylbenzene						5.5	13.8F			8.8	4.4
n-Propylbenzene				4		39.1	39	29	30	20	9.2
p-Isopropyltoluene						9.3	10J	23	21	28	11
sec-Butylbenzene				4		6.75	6.4F	9.1		9.3	3.2
tert-Butylbenzene						1.5F	<0.32				
Naphthalene		140	1,000			100	125	110	100	160	59
Tetrachloroethene	5	5	50							0.85 F	0.41 F

Monitoring Well MWZ-15	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 15-Oct-03	10-Oct-06	23-Oct-07	16-Oct-08	16-Nov-09	9-Nov-10	2-Nov-11
Total BTEX					LNAPL	**150M/140M**	**126**	**12.7F / 13.1F**	**16.1**	**20.35 F**	**1.25F/1.33F**
Benzene	5	5	2,000			<0.01/<0.025	<0.025R			0.15 F	
Toluene	1,000	1,000	50,000			<0.018/<0.045	<0.045R	0.074F/0.11F	<0.068/0.12 F		0.27F/0.29F
Ethylbenzene	700	700	20,000			16.4/16.2	16	2.9 / 2.9	2.7/2.4	3.2	0.42F/0.47F
Xylenes	10,000	10,000	9,000			130M/120M	110	9.7 / 10.1	13.4/12.2	17	0.56F/0.57F
2-Butanone (MEK)		4000	50,000			3.77F/<1.62	<13R				
1,2,4-Trimethylbenzene				21		59.6/58	69.4	24 / 25	38/38	52	3.2 / 3.2
1,3,5-Trimethylbenzene				22		39.2/38.8	38.6	17 / 17	37/36	51	2 / 2
1,2-Dichlorobenzene	600	600	2,000								0.53F/0.52F
1,4-Dichlorobenzene	75	5	200								0.27F/0.26F
Chloromethane										0.25 F	
Isopropylbenzene						5.81/5.85	7J	2.6 / 2.6	3.4/3.2	4.4	0.7F/0.74F
n-Butylbenzene						1.73/1.6F	5.52		1.1/ND	1.2	
n-Propylbenzene				4		5.62/5.58	7.45	2.1 / 2.1	2.6/2.4	3.8	0.45F/0.4F
sec-Butylbenzene				4		2.68/2.68	2.52	1.2 / 1.3	2.7/2.4	2.9	0.46F/0.46F
tert-Butylbenzene						1.13/1.1F	<0.04				0.23F/0.26F
4-Isopropyltoluene						5.8/5.45	4.65J	12 / 10	9.8/8.5	9.4	0.78F/0.7F
Naphthalene		140	1,000			23.1/19.9	19.2	9.1 / 9.7	4.0/4.8	5.7	<0.25UJ/1.5J

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

Monitoring Well MWZ-17	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 13-Oct-03	21-Apr-04	24-Oct-07	15-Oct-08	16-Nov-09	9-Nov-10	2-Nov-11
Total BTEX					**7.99F**	**4.68M**	**1.6F**	**1.8 F**	**0.24 F**	**1.2 F**	**0.12 F**
Benzene	5	5	2,000		<.032		<0.01				
Toluene	1,000	1,000	6,000		0.71F		<0.018	0.16F	0.12 F		
Ethylbenzene	700	700	30,000		1.52	0.77M	0.3F	0.35F		0.28 F	
Xylenes	10,000	10,000	6,000		5.76F	3.91	1.3F	1.29F	0.12 F	0.92 F	0.12 F
1,2-Dichlorobenzene	600	600	10,000		<.04		<0.019				1.4
1,2,4-Trimethylbenzene				21	37.23	29.06M	16	23	14	34	13
1,3,5-Trimethylbenzene				22	12.51	15.6	8	15	5.7	14	5
1,4-Dichlorobenzene	75	5	200								0.99
Acetone		6,300	50,000			1.9F	7.67F				
Chloroethane					<.04		<0.116				
Chloromethane					<.036		<0.126				
cis-1,2-Dichloroethene	70	70	100						0.11 F		
Dichloromethane/Methylene Chloride	5	5	10,000				0.18F		0.52 FB		
Isopropylbenzene					8.58	2.43M	1.69	2.5	1.4	3.7	1.5
Methyl-tert-butyl-ether		70	50,000			4.9F	<0.025			0.51 F	
Naphthalene		20	6,000		1.1		0.55F			0.82 F	
n-Butylbenzene					1.13	2.67	1.41		0.86 F	1.5	2.3
n-Propylbenzene				4	7.34	2.86	1.98	2.6	1.5	3.7	1.7
p-Isopropyltoluene					3.38	6.2	1.73	7.7	5.8	9	8.8
sec-Butylbenzene				4	2.83	2.53	1.18	1.7	1.5	2.8	3.3
tert-Butylbenzene					0.84F	0.9F	<0.016				

Monitoring Well MWZ-20	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 15-Oct-03	11-Oct-06	23-Oct-07	15-Oct-08	16-Nov-09	8-Nov-10	2-Nov-11
Total BTEX					**LNAPL**	**140M/140M**	**151.55J /181.55J**	**107.1**	**129.5**	**169**	**55.13 J**
Benzene	5	5	2,000			1.08/1.08	0.55J / 0.55J	0.27F			
Toluene	1,000	1,000	50,000			<0.036/<0.036	<0.09R / <0.09R	0.18F			0.13 J
Ethylbenzene	700	700	20,000			106M/103M	134 / 157	92	110	140	43 J
Xylenes	10,000	10,000	9,000			32/34	17 / 24	14.6	19.5	29	12 J
1,2,4-Trichlorobenzene	70	70	2,000								0.95 J
1,2,4-Trimethylbenzene				21		56.1/63.8	26 / 47	24	23	45	16 J
1,3,5-Trimethylbenzene				22		35.1/43.8	7.45 / 23	13	13	37	10 J
1,2-Dichlorobenzene	600	600	2,000								4.2 J
1,4-Dichlorobenzene	75	5	200								1.4 J
Acetone		6,300	50,000							110	
Dichloromethane/Methylene Chloride	5	5	10,000							1.2 F	
Isopropylbenzene						13.2/13.5	12.9J / 14.8J	9.6	14	22	9.1 J
Naphthalene		140	1,000			37/38.2	32.8 / 38.1	27	35	49	28 J
n-Butylbenzene						1.16F/1.22F	3.8F / 7.8			4.2 F	1.4 J
n-Propylbenzene				4		9.76/9.96	8.35 / 9.5	6.7	8.5	12	5.5 J
p-Isopropyltoluene						8.46/9.2	7.85J / 10.8J	1.3	12	23	5.9 JM
sec-Butylbenzene				4		2.06/2.14	1.8F / 2.5F	1.3	1.4	3.2 F	1.5 J
tert-Butylbenzene						1.14F/1.16F	<0.08 / <0.08				

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

Monitoring Well MWZ-22	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 15-Oct-03	10-Oct-06	23-Oct-07	15-Oct-08	16-Nov-09	9-Nov-10	17-Apr-12
Total BTEX					LNAPL	**24M**	**7.05F**	**2.16F**	**0.22 F**	**28.15 F**	**5.4**
Benzene	5	5	2,000			<0.05	<0.05R				
Toluene	1,000	1,000	50,000			<0.09	<0.09R			0.35 F	
Ethylbenzene	700	700	20,000			7.5	2.15F	0.48F		5.8	1.5
Xylenes	10,000	10,000	9,000			16M	4.9F	1.68F	0.22 F	22	3.9
1,2,4-Trimethylbenzene				21		63.4	31.1	15	3.3	17	7.9
1,2-Dichlorobenzene	600	600	2,000							0.56 F	
1,3,5-Trimethylbenzene				22		45.7	24.2	14	5.0	15	2.3
1,4-Dichlorobenzene	75	5	200							0.12 F	
Chloromethane										0.33F	
Isopropylbenzene						13	5.9J	2.7	0.32 F	2.7	1.3
Naphthalene		140	1,000			9.5	3.55F	2.6		3.5	1.1
n-Butylbenzene						2.8F	4.65F		1.5		
n-Propylbenzene				4		14.8	6	3.1	0.48 F	3.1	1.3
p-Isopropyltoluene						10.9	6.2J	13	9.2	11	2.8
sec-Butylbenzene				4		5.35	2.35F	1.9	0.41 F	2.1	1.0
Tetrachloroethene	5	5	50							0.45 F	
tert-Butylbenzene						1.5F	<0.08		0.94 F		0.25 F

PW-1	EPA MCL	MCP GW-1	MCP GW-2	RBRG	13-Oct-03 RA-C BL	4-Nov-04	20-Oct-05
Total BTEX					**ND**	**ND**	**ND**
Acetone	none	3,000	50,000		na	3.2 F	<0.63
Chloroform	100	5	4,000		0.30	<0.015	<0.15
Methylene Chloride	5	5	50,000		0.6 F/B	<0.055	0.33 FB

PW-2	EPA MCL	MCP GW-1	MCP GW-2	RBRG	13-Oct-03 RA-C BL	4-Nov-04	19-Oct-05
Total BTEX					**1.06**	**0.16 F**	**ND**
Benzene	5	5	2,000		<.032	<0.032	<0.15
Toluene	1,000	1,000	6,000		<.038	0.16 F	<0.17
Ethylbenzene	700	700	30,000		0.80	<0.02	<0.16
Xylenes	10,000	#####	6,000		0.26 F	<0.046	<0.14
1,2,4-Trimethylbenzene	none			21	0.65 F	0.24 F	<0.18
Acetone	none	3,000	50,000		na	1.7 F	<0.63
Chloroform	100	5	4,000		0.37	<0.015	<0.15
Isopropylbenzene	none				1.60	0.18 F	<0.20
Methylene Chloride	5	5	50,000		0.6 F/B	<0.055	0.44 FB
Naphthalene	none	20	6,000		0.2 F	0.23 F	<0.21
n-Propylbenzene	none			4	0.39 F	0.11 F	<0.23
sec-Butylbenzene	none			4	0.66 F	0.25 F	<0.22
tert-Butylbenzene	none				0.18 F	<0.02	<0.20

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

PW-3	EPA MCL	^{X}MCP GW-1	^{X}MCP GW-2	RBRG	RA-C BL 15-Oct-03	4-Nov-04	19-Oct-05	12-Oct-06	22-Oct-07	14-Oct-08	17-Nov-09	10-Nov-10
Total BTEX					**602.84F**	**250**	**296.7**	**120**	**175.2F**	**145.1**	**42.7**	**103.26**
Benzene	5	5	2,000		3.37F	1.39	2.7	1.3F	1.95F	2.8	0.21 F	0.96
Toluene	1,000	1,000	50,000		9.75F	5.64	11	2.65F	5.65	9.3	0.39 F	1.3
Ethylbenzene	700	700	20,000		110.37	56.9	23	13.2	27.6	49	4.1	21
Xylenes	10,000	10,000	9,000		479.35	188.08M	260	100	140	84	38	80
1,2,4-Trimethylbenzene				21	89.84	51.43	94	76.3	57.8	98	30	49
1,3,5-Trimethylbenzene				22	34.34	17.03	30	18.2	23.7	49	18	29
Isopropylbenzene					10.88	6.98	8.8	10.1	8.55	17	2.0	12.0
Methyl-tert-butyl-ether		70	50,000									0.47 F
Naphthalene		140	1,000		27.8	17.16	16	15.3	16.4	29	7.4	22
n-Butylbenzene					1.63F	1.18	<0.22	0.85F	1.8F			
n-Propylbenzene				4	9.68	6.2	7.2	8.3	7.25	13	1.2	8.5
p-Isopropyltoluene					7.86F	3.4	6.5	2.55F	2.5F	7	2.9	4.1 M
sec-Butylbenzene				4	2.95F	1.88	2.6	1.8F	1.4F	3.9		2.1
Tetrachloroethene	5	5	50									1.3
					28-Oct-11							
Total BTEX					**70.62 F**							
Benzene	5	5	2,000		0.74							
Toluene	1,000	1,000	50,000		0.88 F							
Ethylbenzene	700	700	20,000		16							
Xylenes	10,000	10,000	9,000		53							
1,2,4-Trimethylbenzene				21	43							
1,3,5-Trimethylbenzene				22	22							
Isopropylbenzene					8.9							
Methyl-tert-butyl-ether		70	50,000									
Naphthalene		140	1,000		19							
n-Butylbenzene					1.4							
n-Propylbenzene				4	6.7							
p-Isopropyltoluene												
sec-Butylbenzene				4	1.9							
Tetrachloroethene	5	5	50		0.46 F							
Trichloroethene	5	5	30		0.14 F							

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

PW-4	EPA MCL	[X]MCP GW-1	[X]MCP GW-2	RBRG	RA-C BL 14-Oct-03	4-Nov-04	19-Oct-05	21-Apr-06	12-Oct-06	14-May-07	22-Oct-07	9-Apr-08
Total BTEX					**328.11F**	**690**	**435.1**	**844.3**	**700**	**190**	**42.1JF**	**99.5F**
Benzene	5	5	2,000		2.97	5.19	2.1	7.5F	7.25F	4F	2.3J	3.8
Toluene	1,000	1,000	50,000		0.83F	3.95	23	3.75F	<0.45	<0.45	<0.18R	0.74F
Ethylbenzene	700	700	20,000		162.76	235.86	130	243	158	113	12.8	67
Xylenes	10,000	10,000	9,000		161.55	446.96M	280	590	530	73F	27F	28
1,2-Dichlorobenzene	600	600	2,000							3.25F	<0.19	<0.11
1,2,4-Trimethylbenzene				21	93.41	134.83	180	244	233	203	130	150
1,3,5-Trimethylbenzene				22	19.27	25.28	39	42	39.2	5F	3.7F	1.5
2-Butanone (MEK)		4000	50,000			1.5F	<0.9		<3.24	<16.2R	<6.49R	<1.2
Dichloromethane/Methylene Chloride	5	5	10,000		3.9F	<0.055	1.9F		<0.85	4.5F	<0.34	<0.21
Isopropylbenzene					17.99	30.17	27	32.2	37	28.3	25.7J	37
Naphthalene		140	1,000		43.4	73.06	40	65.8	56.2	36.2	15	30
n-Butylbenzene					0.83F	1.84	<0.22		<0.325	5.25F	1.7F	1.6
n-Propylbenzene				4	13.47	25.27	18	26.2	33.5	23.5F	22	31
p-Isopropyltoluene					3.61F	4.9	10		3.5F	15.8F	4.8J	8.8
sec-Butylbenzene				4	1.93F	4.02	5		5.5F	7.5F	3.8F	7.1
tert-Butylbenzene					0.76F	1	<0.2		<0.4	<0.4	<0.16	<0.099
					14-Oct-08	16-Apr-09	17-Nov-09	22-Apr-10	10-Nov-10	25-Apr-11	28-Oct-11	16-Apr-12
Total BTEX					**262.3**	**76.0**	**2.96**	**90F**	**27.65 F**	**126.9 / 127.9**	**2.29 F**	**0.72**
Benzene	5	5	2,000		11	4.1	0.67	0.61	1.1	2 / 2	0.32 F	0.72
Toluene	1,000	1,000	50,000		1.9	4.5	0.14 F	0.35F	0.25 F	1.9 / 1.9		
Ethylbenzene	700	700	20,000		54	36	0.32 F	33	5.3	80 / 78	0.87 F	
Xylenes	10,000	10,000	9,000		195.4	31.4	1.83 F	56	21	43 / 46	1.1 F	
1,2-Dichlorobenzene	600	600	2,000			0.12 F		0.15F		0.18 J / <0.11UJ		
1,2,4-Trimethylbenzene				21	180	150	130	57	59	100 / 99	8.7 M	0.55 F
1,3,5-Trimethylbenzene				22	45	9.1	1.9		9.3	5.5 / 5.9	1.2	
Isopropylbenzene					38	37	20	23	18	24 / 23	1.1	4.5
Naphthalene		140	1,000		49	25	25	4.5	14	24 / 27	2.2	0.32 F
n-Butylbenzene						1.4	0.98 F	0.77F	0.86 F	1 / 0.96 F		
n-Propylbenzene				4	29	28	18	18	14	18 / 17	0.43 F	0.96 F
p-Isopropyltoluene					9.7	4.9	3.0	3.5	3.9	3.1 / 2.9		
sec-Butylbenzene				4	7.9	6.7	5.5	4.5	4.4	4.3 / 4	0.24 F	0.88 F

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

PW-5	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 14-Oct-03	4-Nov-04	19-Oct-05	12-Oct-06	22-Oct-07	14-Oct-08	17-Nov-09	10-Nov-10
Total BTEX					**125.43F**	**76M**	**14.9**	**11**	**1.34F**			**0.5**
Benzene	5	5	2,000		0.41F	3.07	4.6	4.27	0.38F	0.91		0.5
Toluene	1,000	1,000	50,000		0.6F	<0.076	<0.17	<0.018	<0.018			
Ethylbenzene	700	700	20,000		15.85	60.65	6.5	2.2	<0.024			
Xylenes	10,000	10,000	9,000		108.57	11.87M	3.8	4.7	0.96F	0.39F		
1,2,4-Trimethylbenzene				21	51.3	7.95	11	3.05	1.75	1.2	38	0.36 F
1,3,5-Trimethylbenzene				22	27.07	2.98	2	0.83F	0.61F	0.54F		
Dichloromethane/Methylene Chloride	5	5	10,000				4.5B	<0.034	<0.034			
Isopropylbenzene					5.41	15.64	26	11.7	2.05	17	22	3.6
Naphthalene		140	1,000		8.4	12.52	4.8	1.75	0.54F	1.2	7.6	0.92 F
n-Butylbenzene					2.44F	0.49F	<0.22	0.38F	0.63F			
n-Propylbenzene				4	6.16	9.68	19	6.94	0.85F	0.41F	9.3	
p-Isopropyltoluene					4.34	0.72F	7.3	0.34F	0.29F		0.50 F	
sec-Butylbenzene				4	3.05F	2.01	4.7	3.73	2.55	4.2	4.2	1.5
tert-Butylbenzene					0.6F	0.52F	<0.2	0.87F	0.89F	0.87F		0.44 F
					28-Oct-11							
Total BTEX					**0.67**							
Benzene	5	5	2,000		0.67							
Toluene	1,000	1,000	50,000									
Ethylbenzene	700	700	20,000									
Xylenes	10,000	10,000	9,000									
1,2,4-Trimethylbenzene				21	0.38 F							
1,3,5-Trimethylbenzene				22								
Dichloromethane/Methylene Chloride	5	5	10,000									
Isopropylbenzene					2.4							
Naphthalene		140	1,000		0.75 F							
n-Butylbenzene												
n-Propylbenzene				4	0.21 F							
p-Isopropyltoluene												
sec-Butylbenzene				4	1.6							
tert-Butylbenzene					0.24 F							

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

PW-6	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	14-Oct-03 RA-C BL	21-Apr-04	27-Apr-05	21-Apr-06	12-Oct-06	22-Oct-07	14-Oct-08
Total BTEX					Dry	20.71/27.20	53.56/53.42	ND	0.20 F/0.14 F	ND	1.7F
Benzene	5	5	2,000			3.8/5.08	5.92/5.83	<0.01	0.20 F/0.14 F	<0.010	1.1
Toluene	1,000	1,000	50,000			0.39F/0.46F	1.23/1.23	<0.018	<0.018/<0.018	<0.018	0.075F
Ethylbenzene	700	700	20,000			11.56/15.5	25.64/25.48	<0.024	<0.024/<0.024	<0.024	0.38F
Xylenes	10,000	10,000	9,000			4.96/6.16	20.77/20.88	<0.028	<0.028/<0.028	<0.028	0.19F
1,2,4-Trimethylbenzene				21		7.47/10.96	41.47/42.79	<0.012	<0.012/<0.012	<0.012	0.32F
1,3,5-Trimethylbenzene				22		0.52F/.63F	0.64F/0.65F	<0.013	<0.013/<0.013	<0.013	bdl
Acetone		6,300	50,000			<.17/1.3FB	<0.23/<0.23	1.36 F	1.28FB/1.25FB	<0.823	bdl
Isopropylbenzene						2.53/3.67	12.44/12.46	<0.021	0.41 F/0.31 F	<0.021	5.0
Naphthalene		140	1,000			4.24/5.6	11.46/11.55	<0.024	0.30 F/0.21 F	<0.024	1.1
n-Butylbenzene						<.019/<.019	0.62F/0.61F	<0.013	<0.013/<0.013	<0.013	bdl
n-Propylbenzene				4		1.47/2.16	9.58/9.59	<0.009	0.21 F/0.15 F	<0.009	1.7
p-Isopropyltoluene						<.014/.56F	<.022/<.022	<0.014	<0.014/<0.014	<0.014	0.70F
sec-Butylbenzene				4		0.64F/.87F	4.71/4.62	<0.017	0.34 F/0.30 F	<0.017	3.2
tert-Butylbenzene						0.46F/.51F	1.18/1.18	<0.016	0.110 F/<0.016	<0.016	0.90F
Trichloroethene	5	5	30							0.12 FB	bdl

PW-7	EPA MCL	MCP GW-1	MCP GW-2	RBRG	14-Oct-03 RA-C BL	4-Nov-04	19-Oct-05	12-Oct-06	22-Oct-07	Re-run 22-Oct-07
Total BTEX					47.6	5.28	ND	ND	ND	ND
Benzene	5	5	2,000		<.032	<0.032	<0.15	<0.15	<0.15	<0.15
Toluene	1,000	1,000	6,000		<.038	0.11 F	<0.17	<0.018	<0.018	<0.018
Ethylbenzene	700	700	30,000		19.91	5.17	<0.16	<0.024	<0.024	<0.024
Xylenes	10,000	10,000	6,000		27.73	11.99 M	<0.14	<0.028	<0.028	<0.028
1,2-Dichlorobenzene	600	600	1,000		0.77	1.18	<0.15	0.110 F	<0.019	<0.019
1,2,4-Trimethylbenzene	none			21	48.77	29.88	0.23 F	0.380 F	<0.012	<0.012
1,3,5-Trimethylbenzene	none			22	14.23	12.82	<0.19	<0.013	<0.013	<0.013
1,4-Dichlorobenzene	75	5	30,000		0.31	<0.025	<0.23	<0.017	<0.017	<0.017
Acetone	none	3,000	50,000		na	1.9 F	8.6 F	5.57 FB	6.21 F	4.62 F
Isopropylbenzene	none				7.9	5.10	0.39 F	0.640 F	0.150 F	0.150 F
Methylene Chloride	5	5	50,000		0.4 F/B	<0.055	1.5 FB	<0.034	0.120 FB	<0.034
Naphthalene	none	20	6,000		7.70	5.80	<0.23	<0.024	<0.024	<0.024
n-Butylbenzene	none				1.48	0.86 F	<0.22	<0.013	<0.013	<0.013
n-Propylbenzene	none			4	8.77	4.92	<0.21	0.210 F	<0.009	<0.009
p-Isopropyltoluene	none				4.57	2.11	0.41 F	<0.014	<0.014	<0.014
sec-Butylbenzene	none			4	2.97	1.87	0.31 F	0.830 F	0.270 F	0.290 F
tert-Butylbenzene	none				0.52 F	0.32 F	<0.20	0.170 F	<0.016	<0.016
Trichloroethene	5	5	30						0.130 FB	<0.027

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

Recovery Trench S-2	EPA MCL	[x]MCP GW-1	[x]MCP GW-2	RBRG	12-Jun-97 O&M	14-Oct-03 RA-C BL	11-Oct-06
Total BTEX					ND	ND	ND
Acetone		6,300	50,000				1.42 FB
Chloroform		70	50			0.17 F	<0.029
Dichloromethane/Methylene Chloride	5	5	10,000			.04 F	<0.034

Recovery Trench S-3	EPA MCL	[x]MCP GW-1	[x]MCP GW-2	RBRG	12-Jun-97 O&M	14-Oct-03 RA-C BL	10-Oct-06 RA-O LTM
Total BTEX					223	3.83 F	0.190 F
Benzene	5	5	2,000		10	0.29 F	<0.010
Ethylbenzene	700	700	20,000		110	1.17	<0.024
Xylenes	10,000	10,000	9,000		103	2.37 F	0.190 F
1,2,4-Trimethylbenzene				21		2.4	0.170 F
1,3,5-Trimethylbenzene				22		0.69	<0.013
Isopropylbenzene						0.72	<0.021
Methyltert-butylether		70	50,000				0.660 F
Naphthalene		140	1,000			1.8	0.500 F
sec-Butylbenzene				4		0.22 F	<0.017
tert-Butylbenzene						0.25 F	0.240 F

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

RW-1	EPA MCL	[X]MCP GW-1	[X]MCP GW-2	RBRG	RA-C BL 14-Oct-03	12-Jun-97	20-Oct-05	10-Oct-06	23-Oct-07	15-Oct-08	16-Nov-09	8-Nov-10
Total BTEX					**Not Sampled**	**ND**	**53.72F**	**190**	**86.1**	**100.6**	**189**	**339.7/339.8**
Benzene	5	5	2,000				1.1	5.11	5.6 J	3		7.7/7.8
Toluene	1,000	1,000	50,000				0.62F	2.38	2.7J	1.4	2	12/12
Ethylbenzene	700	700	20,000				26	124	50.8	77	130	160/160
Xylenes	10,000	10,000	9,000				26	59M	27	19.2	57	160/160
1,2-Dichlorobenzene	600	600	2,000			1100	350	284	85	120	1.0 F	250/250
1,2,4-Trichlorobenzene	70	70	2,000				3.2	2.53	1.7F	2.6	3.9	<1.4/3
1,2,4-Trimethylbenzene				21			3.3	5.54	1.7F	4	12	10/9.4
1,3-Dichlorobenzene		40	2,000				3.7	3.96	1.3F	1.7		3.1F/2.8
1,3,5-Trimethylbenzene				22			2	0.81F	<0.13	1.3	2.9	3.3F/3.1
1,4-Dichlorobenzene	75	5	200			350	110	95.3	32.7	35	99	65/65
Acetone		6,300	50,000				66	<0.823M	17.7F			
Chlorobenzene	100	100	200				0.4F	<0.011	3.1J	0.81	2.3	8.5/11
cis-1,2-Dichloroethene	70	70	100			350	<0.2	<0.032	<0.32			
Chloromethane												2.1J/<0.083UJ
Dichloromethane/Methylene Chloride	5	5	10,000				4F	<0.034	<0.34			
Isopropylbenzene							0.59F	2.03	<0.21R	1.1	3.3	2F/2.1
Naphthalene		140	1,000				4.2	15.9	4F	9.9	18	17/14
p-Isopropyltoluene												<1UJ/0.27J
n-Propylbenzene				4			0.31F	1.2	<0.09	0.76F	2.1	2.1J/1.5J

					2-Nov-11
Total BTEX					**4.02 F**
Benzene	5	5	2,000		
Toluene	1,000	1,000	50,000		0.12 F
Ethylbenzene	700	700	20,000		2.3
Xylenes	10,000	10,000	9,000		1.6 F
1,2-Dichlorobenzene	600	600	2,000		4.1
1,2,4-Trichlorobenzene	70	70	2,000		0.67 F
1,2,4-Trimethylbenzene				21	0.14 F
1,3-Dichlorobenzene		40	2,000		
1,3,5-Trimethylbenzene				22	
1,4-Dichlorobenzene	75	5	200		4.1
Acetone		6,300	50,000		
Chlorobenzene	100	100	200		4.1
cis-1,2-Dichloroethene	70	70	100		
Chloromethane					
Dichloromethane/Methylene Chloride	5	5	10,000		
Isopropylbenzene					
Naphthalene		140	1,000		
p-Isopropyltoluene					
n-Propylbenzene				4	

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

RW-1A	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 14-Oct-03	1-Dec-03	3-Nov-04	20-Oct-05	10-Oct-06	24-Oct-07	16-Oct-08	16-Nov-09
Total BTEX					**Not Sampled**	**1500**	**210**	**172.5**	**21M**	**109.3 / 106.3**	**214.6**	**135.2 FM**
Benzene	5	5	2,000			<10	0.24F	0.6	0.22F	0.3F / 0.32F	0.32 F	0.35 F
Toluene	1,000	1,000	50,000			16	0.76F	4.9	<0.018	<0.036 / <0.036	0.11F	0.11 F
Ethylbenzene	700	700	20,000			260	28.75	57	7.93	29 / 28	45	32 M
Xylenes	10,000	10,000	9,000			1200	182.4	110	13M	80 / 78	169.2	102.7
1,2,4-Trimethylbenzene				21		220	76.78	48	12.1	42.4 / 41.8	80	110
1,3,5-Trimethylbenzene				22		110	33.77	32	6.12	14.5 / 14	28	31 M
2-Butanone (MEK)		4000	50,000			<100	4F	<0.9	<0.649	<1.3 / <1.3		
cis-1,2-Dichloroethene	70	70	100			<10	0.23F	<0.2	<0.032	<0.064 / <0.064		
Dichloromethane/Methylene Chloride	5	5	10,000			<20	<0.55	0.49F	<0.034	0.22F / <0.068		
Isopropylbenzene						26	3.35	8.5	2.63	5.78 / 5.7	10	19 M
Methyl-tert-butyl-ether		70	50,000			<10	<0.019	1.8F	3.39F	<0.05 / <0.05		
Naphthalene		140	1,000			50	30.82	19	6.88	22.2 / 22.9	34	57 M
n-Butylbenzene						<10	0.62F	<0.22	0.16F	1.26F / 1.22F		
n-Propylbenzene				4		19	2.79	7	2.08	5.12 / 5.16	9.6	14
p-Isopropyltoluene						13	5.04	9.6	0.58F	1.14F / 1.04F	4.3	3.9
sec-Butylbenzene				4		6J	<0.017	1.5	0.44F	0.76F / 0.76F	2.4	
tert-Butylbenzene						<10	0.71F	<0.2	0.23F	<0.032 / <0.032		
Trichloroethene	5	5	30			<10	4.37	0.2F	<0.027	<0.054 / <0.054	0.13 F	

					9-Nov-10	2-Nov-11
Total BTEX					**20.6J/20.95J**	**125.27 J**
Benzene	5	5	2,000		<0.53UJ/0.19J	0.15 J
Toluene	1,000	1,000	50,000		<0.27UJ/0.26J	0.12 J
Ethylbenzene	700	700	20,000		3.6F/3.5	31 J
Xylenes	10,000	10,000	9,000		17/17	94 J
1,2,4-Trimethylbenzene				21	21/19	110 J
1,3,5-Trimethylbenzene				22	5.9/5.3	30 J
1,2-Dichlorobenzene	600	600	2,000			0.25 J
2-Butanone (MEK)		4000	50,000			
cis-1,2-Dichloroethene	70	70	100			
Chloromethane					1.2J/<0.083UJ	
Dichloromethane/Methylene Chloride	5	5	10,000			
Isopropylbenzene					11J/7.4J	18 J
Methyl-tert-butyl-ether		70	50,000			
Naphthalene		140	1,000		18J/12J	53 J
n-Butylbenzene					<0.5UJ/1.3J	2.5 J
n-Propylbenzene				4	7.1J/4.7J	14 J
p-Isopropyltoluene					<0.42UJ/4.1J	2.7 J
sec-Butylbenzene				4	5.5J/2.6J	3.8 J
tert-Butylbenzene						
Trichloroethene	5	5	30			0.11 J

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

RW-2A	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	1-Dec-03	4-Nov-04	2-Nov-05	10-Oct-06
Total BTEX					**209**	**18.52**	**ND**	**0.13 F**
Benzene	5	5	2,000		<10	<0.032	<1.0	0.130 F
Ethylbenzene	700	700	20,000		31	3.3	<1.0	<0.024
Xylenes	10,000	10,000	9,000		178	15.22	<1.0	<0.028
1,2,4-Trimethylbenzene				21	76	2.88		0.110 F
1,3,5-Trimethylbenzene				22	73	3.04		<0.013
Acetone		6,300	50,000			<0.17		1.36 F
Chloroform		70	50			0.26 F		<0.029
Dichlordifluoromethane						0.28 F		0.670 F
Isopropylbenzene					5	0.44 F		0.220 F
Naphthalene		140	1,000		<20	2.06		0.160 F
n-Propylbenzene				4	<5	0.23 F		0.100 F
p-Isopropyltoluene					6	0.12 F		<0.014

RW-3A	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	1-Dec-03	4-Nov-04	7-Sep-05	10-Oct-06	24-Oct-07
Total BTEX					**ND**	**0.63**	**ND**	**ND**	**ND**
Ethylbenzene	700	700	20,000		<1	0.42 F	<1	<0.024	<0.024
Xylenes	10,000	10,000	9,000		<1	0.21 F	<1	<0.028	<0.028
1,2-Dichlorobenzene	600	600	2,000		<1	<0.04	2.4	<0.019	<0.019
1,3,5-Trimethylbenzene				22	<1	0.2 F		<0.013	<0.013
Acetone		6,300	50,000			<0.17		1.10 FB	<0.823
Chloroform		70	50			<0.015		0.250 F	<0.029
cis-1,2-Dichloroethene	70	70	100		<1	<0.021	1.3	<0.032	<0.032
Isopropylbenzene					<1	0.82 F		<0.021	<0.021
Naphthalene		140	1,000		<5	0.26 F		<0.024	<0.024
n-Propylbenzene				4	<1	0.85 F		>0.009	<0.009
p-Isopropyltoluene					<1	0.13 F		<0.014	<0.014
sec-Butylbenzene				4	<1	0.35 F		<0.017	<0.017
tert-Butylbenzene					<1	0.1 F		<0.016	<0.016
Trichloroethene	5	5	30		<1	<0.029	34	2.59	0.860 F

RW-4A	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	1-Dec-03	4-Nov-04	7-Sep-05	10-Oct-06	24-Oct-07
Total BTEX					**1.0**	**ND**	**ND**	**ND**	**ND**
Xylenes	10,000	10,000	9,000		1	<0.046	<1	<0.028	<0.028
1,2,4-Trimethylbenzene				21	1	<0.016		<0.012	<0.012
Acetone		6,300	50,000			<0.17		1.45 FB	<0.823
Chloroform		70	50			<0.015		0.230 F	<0.029
cis-1,2-Dichloroethene	70	70	100		<1	0.15 F	<1	0.140 F	<0.032
Dichloromethane/Methylene Chloride	5	5	10,000		<2	<0.055		<0.034	0.150 B
tert-Butylbenzene					<1	0.1 F		<0.016	<0.016
Trichloroethene	5	5	30		2	0.8 F	7.6	3.83	0.610 F

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

RW-5A	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 14-Oct-03	1-Dec-03	3-Nov-04	10-Oct-06
Total BTEX					**Not Sampled**	**ND**	**ND**	**ND**
Acetone		6,300	50,000					1.33M
cis-1,2-Dichloroethene	70	70	100			<1	0.24F	<0.032
Dichloromethane/Methylene Chloride	5	5	10,000			4	<0.055	<0.034
Methyl-tert-butylether		70	50,000			<1	0.11F	<0.025
Trichloroethene	5	5	30			2	3.4	1.23

RW-6A	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 14-Oct-03	1-Dec-03	3-Nov-04	20-Oct-05	10-Oct-06	22-Apr-10	25-Apr-11	2-Nov-11
Total BTEX					**Not Sampled**	**ND**	**ND**	**ND**	**ND**	**ND**	**0.23 F**	**0.15 J**
1,2-Dichlorobenzene	600	600	2,000			<1	5.58	4.8	1.34F	8.1J		0.36 J
1,4-Dichlorobenzene	75	5	200			<1	1.98	1.1	0.98F	2.0J		
Chloroform		70	50			<1	0.22F	0.53	0.58F	0.77		0.79 J
cis-1,2-Dichloroethene	70	70	100			1	1.93	2.6	5.22	9.4		5.3 J
Trichloroethene	**5**	**5**	**30**			50	65.50	48	100	76J	0.23 F	77 J
					17-Apr-12							
Total BTEX					**ND**							
1,2-Dichlorobenzene	600	600	2,000		5.4							
1,4-Dichlorobenzene	75	5	200		2							
Chloroform		70	50		0.69 B							
cis-1,2-Dichloroethene	70	70	100		15							
Trichloroethene	**5**	**5**	**30**		140							

RW-7A	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 14-Oct-03	1-Dec-03	3-Nov-04	20-Oct-05	10-Oct-06	17-Apr-12
Total BTEX					**Not Sampled**	**ND**	**ND**	**ND**	**ND**	**ND**
1,2-Dichlorobenzene	600	600	2,000			1J	2.3	2.2/2.4	0.3F	3.4
1,4-Dichlorobenzene	75	5	200			0.7J	0.32F	0.39F/0.46F	<0.034	0.87
Acetone		6,300	50,000			<50	1.2F	27/26	2.44M	6.3 F
Chloroform	ns	70	50			<1	1.02	0.72/0.7	1.18	1.6 B
cis-1,2-Dichloroethene	70	70	100			1	2.74	2/2.1	4.02	6.6
Trichloroethene	5	5	30			20	50.46	46/45	76.6	120

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

RW-8	EPA MCL	MCP GW-1	MCP GW-2	RBRG	12-Oct-06
Total BTEX					**0.86 F**
Benzene	5	5	2,000		0.75
Xylenes	10,000	#####	6,000		0.110 F
Isopropylbenzene	none	none	none		2.67
n-Butylbenzene	none	none	none		0.140 F
n-Propylbenzene		none	none	4	1.35
p-Isopropyltoluene	none	none	none		0.240 F
sec-Butylbenzene		none	none	4	2.17
tert-Butylbenzene	none	1,000	10,000		1.64

RW-8A	EPA MCL	[x]MCP GW-1	[x]MCP GW-2	RBRG	1-Dec-03	4-Nov-04	3-Aug-05	10-Oct-06	24-Oct-07
Total BTEX					**ND**	**ND**	**ND**	**0.120 F**	**0.200 F**
Toluene	1,000	1,000	50,000		<1	<0.038	<1	<0.018	0.200 F
Ethylbenzene	700	700	20,000		<1	<0.02	<1	0.120 F	<0.024
1,2-Dichlorobenzene	600	600	2,000		3	0.47 F	1	0.490 F	0.200 F
1,2,4-Trimethylbenzene				21	<1	<0.016		<0.012	0.120 F
1,3,5-Trimethylbenzene				22	7	<0.03		<0.013	<0.013
1,4-Dichlorobenzene	75	5	200		2	1.25	1	0.79	0.430 F
2-Butanone (MEK)		4,000	50,000			0.9 F		<0.649	<0.649
Acetone		6,300	50,000			2.2 F		2.64 FB	<0.823
Isopropylbenzene					3	<0.02		<0.021	<0.021
Naphthalene		140	1,000		<5	<0.047		<0.024	0.120 F
n-Propylbenzene				4	2	<0.013		>0.009	<0.009
p-Isopropyltoluene					4	<0.014		<0.014	0.180 F
sec-Butylbenzene				4	3	<0.017		<0.017	<0.017
tert-Butylbenzene					1	0.14 F		<0.016	<0.016

RW-9A	EPA MCL	[x]MCP GW-1	[x]MCP GW-2	RBRG	1-Dec-03	4-Nov-04	20-Oct-05	10-Oct-06	24-Oct-07
Total BTEX					**68**	**46.45**	**32.3**	**29.08 F**	**ND**
Benzene	5	5	2,000		<1	0.35 F	<0.15	0.190 F	<0.010
Toluene	1,000	1,000	50,000		<1	0.51 F	<0.17	<0.018	<0.018
Ethylbenzene	700	700	20,000		14	16.87	4.3	10.10	<0.024
Xylenes	10,000	10,000	9,000		54	28.69	28	18.79	<0.028
1,2-Dichlorobenzene	600	600	2,000		2	0.97 F	0.82 F	1.02	0.150 F
1,2,4-Trimethylbenzene				21	24	16.39	31	17.3	2.7
1,3,5-Trimethylbenzene				22	26	14.06	30	3.84	0.100 F
1,4-Dichlorobenzene	75	5	200		<1	0.5	0.36 F	0.380 F	0.120 F
2-Butanone (MEK)		4,000	50,000			3.3	<0.90	<0.649	<0.649
Acetone		6,300	50,000			5.7 F	<0.63	<0.823	<0.823
Dichloromethane/Methylene Chloride	5	5	10,000		<2	<0.055	<0.17	<0.034	0.150 FB
Isopropylbenzene					5	4.65	2.3	4.38	0.150 F
Naphthalene		140	1,000		7	5.73	3.9	3.61	0.250 F
n-Butylbenzene						0.15 F	<0.22	0.210 F	0.140 F
n-Propylbenzene				4	4	3.16	1.5	3.6	<0.009
p-Isopropyltoluene					2	2.1	5.3	1.08	0.350 F
sec-Butylbenzene				4	1	0.88 F	1.1	1.05	<0.017
tert-Butylbenzene					1	0.51 F	<0.20	0.370 F	<0.016

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

RW-10A	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	1-Dec-03	4-Nov-04	20-Oct-05	10-Oct-06	24-Oct-07
Total BTEX					**ND**	**174.79**	**0.35 F**	**ND**	**0.410 F**
Benzene	5	5	2,000		<1	1.78	0.35 F	<0.050	0.410 F
Toluene	1,000	1,000	50,000		<1	0.34 F	<0.17	<0.090	<0.018
Ethylbenzene	700	700	20,000		<1	25.78	<0.16	<0.120	<0.024
Xylenes	10,000	10,000	9,000		<1	146.87 *	<0.14	<0.028	<0.028
1,2-Dichlorobenzene	600	600	2,000		<1	<0.025	0.20 F	<0.095	<0.019
1,2,4-Trimethylbenzene				21	<1	66.47 *	0.72 F	<0.060	<0.012
1,3,5-Trimethylbenzene				22	<1	14.89	<0.19	<0.065	<0.013
Acetone		6,300	50,000			<0.17	<0.63	5.10 FB	3.35 F
Dichloromethane/Methylene Chloride	5	5	10,000		<2	<0.055	0.48 FB	<0.170	0.390 FB
Isopropylbenzene					<1	3.8	0.25 F	<0.105	0.140 F
Naphthalene		140	1,000		<5	28.19	0.55 F	<0.120	<0.024
n-Butylbenzene						0.37 F	<0.22	<0.065	<0.013
n-Propylbenzene				4	<1	3.18	<0.21	>0.045	<0.009
p-Isopropyltoluene					<1	1.12	<0.20	<0.070	<0.014
tert-Butylbenzene					<1	0.37 F	<0.20	<0.080	<0.016

RW-11A	EPA MCL	XMCP GW-1	XMCP GW-2	RBRG	RA-C BL 14-Oct-03	8-Nov-10	25-Apr-11	2-Nov-11	17-Apr-12
Total BTEX					**Not Sampled**	**102.5 F**	**195**	**152 F**	**151 F**
Benzene	5	5	2,000						
Toluene	1,000	1,000	50,000			7.5 F	40	18 F	14
Ethylbenzene	700	700	20,000			45	56	55	54 F
Xylenes	10,000	10,000	9,000			50 F	99	79 F	83
1,2-Dichlorobenzene	600	600	2,000			**5300**	**8400**	**8000**	**8300**
1,2,3-Trichlorobenzene									2.5
1,2,4-Trichlorobenzene	70	70	2,000			63	**97**	64	97 J
1,2,4-Trimethylbenzene				21		11 F	11 F	12 F	12
1,3-Dichlorobenzene		40	2,000			**42**	**69**	**71**	**94**
1,3,5-Trimethylbenzene				22		9 F	9.1 F	7.6 F	5.7
1,4-Dichlorobenzene	75	5	200			**1200**	**2100**	**2100**	**2200**
Carbon tetrachloride	5	5	2				**14 F**		**1.1**
Chlorobenzene	100	100	200			**300**	**260**	**200**	**170 F**
Chloroethane									**2.4**
Chloroform		70	50			24	47	**63**	**62 FB**
cis-1,2-Dichloroethene	70	70	100						0.96 F
Dichloromethane/Methylene Chloride	5	5	10,000			**12 F**			
Isopropylbenzene						5.5 F	6.8 F	5 F	6
Naphthalene		140	1,000						16
p-Isopropyltoluene									0.23 F
n-Propylbenzene				4					2
Tetrachloroethene	5	5	50						1.4
Trichloroethene	5	5	30						1.9

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

Shawsheen River	EPA	^{X}MCP	^{X}MCP		RA-C BL							
vic. Stream Gage #3	**MCL**	**GW-1**	**GW-2**	**RBRG**	16-Oct-03	5-Jan-04	21-Apr-04	4-Nov-04	26-Apr-05	20-Oct-05	21-Apr-06	11-Oct-06
Total BTEX					**ND**	**ND**	**ND**	**ND**	**0.2 F**	**ND**	**ND**	**ND**
Xylenes	10,000	10,000	9,000						0.2 F			
1,2-Dichlorobenzene	600	600	2,000		<.04	<1	.022 F	0.34 F	<0.067		0.12 F	<0.019
1,4-Dichlorobenzene	75	5	200		<.025	<1	0.13 F	0.14 F				
2-Butanone (MEK)		4000	50,000				0.3 F	5.4 F	6.0 F	2.3 F	<0.649	1.22 F
Acetone		6,300	50,000			<50	8.4 F	9.1 F	10.3	8.7 F	18.3	3.16 M
cis-1,2-Dichloroethene	70	70	100		0.7 F	0.8 J	0.77 F	0.88 F	0.67 F	0.78 F	0.86 F	0.9 F
Dichloromethane/Methylene Chloride	5	5	10,000		0.1 F	<2	<0.055	<0.055	<0.089	0.48 F	<0.034	<0.034
Methyl-tert-butyl-ether		70	50,000		na	1 J	2.11 F	2.28 F	0.7 F	0.62 F	0.58 F	0.76 F
Trichloroethene	5	5	30		0.3 F	<1	0.34 F	0.44 F	0.25 F	0.3 F	0.5 F	0.29 F
					14-May-07	22-Oct-07	9-Apr-08	14-Oct-08	16-Apr-09	17-Nov-09	22-Apr-10	9-Nov-10
Total BTEX					**ND**	**ND**	**ND**	**ND**	**ND**	**0.15 F**	**0.071F**	**0.258 F**
Toluene	1,000	1,000	50,000							0.15 F	0.071F	0.088 F
Xylenes	10,000	10,000	9,000									0.17 F
1,1-Dichloroethene	7	7	1						0.19 F			
1,2-Dichlorobenzene	600	600	2,000		0.1 F	<0.019		0.11 F		0.26 F	0.13F	
1,2,4-Trimethylbenzene				21					0.20 F			0.21 F
2-Butanone (MEK)		4000	50,000		<0.649 R	<0.649	5 F	4.6 F	57			
Acetone		6,300	50,000		4.69 F	3.94F		34	8.7 F		4.2F	5.6 F
Chloromethane												0.13 F
cis-1,2-Dichloroethene	70	70	100		0.8 F	0.73F	0.8F	0.84 F	0.82 F	0.60 F	0.54F	0.18 F
Dichloromethane/Methylene Chloride	5	5	10,000		<0.034	0.22F				0.44 FB		
Methyl-tert-butyl-ether		70	50,000		0.95 F	0.45F	0.27F	0.27 F				
Naphthalene		140	1,000		0.26 F	<0.024						0.78 F
Trichloroethene	5	5	30		0.24 F	0.19R			0.018 F	0.11 F		
					14-May-07	25-Apr-11	2-Nov-11	16-Apr-12				
Total BTEX					**ND**	**0.35 F**	**0.39 F**	**0.32 F**				
Toluene	1,000	1,000	50,000			0.19 F	0.26 F	0.18 F				
Xylenes	10,000	10,000	9,000			0.16 F	0.13 F	0.14 F				
1,2-Dichlorobenzene	600	600	2,000		0.1 F		0.16 F					
1,2,4-Trimethylbenzene				21		0.16 F		0.13 F				
2-Butanone (MEK)		4000	50,000		<0.649 R			2.6 F				
Acetone		6,300	50,000		4.69 F		5.1 F	8.9 F				
cis-1,2-Dichloroethene	70	70	100		0.8 F	0.75 F	0.46 F	0.55 F				
Dichloromethane/Methylene Chloride	5	5	10,000		<0.034			0.32 F				
Methyl-tert-butyl-ether		70	50,000		0.95 F							
Naphthalene		140	1,000		0.26 F	1.4						
Trichloroethene	5	5	30		0.24 F	0.28 F						

Table 4-1 Historical Summary of VOC Analytical Data OU-3, Site 21, Hanscom AFB, MA

NOTES:

1. Summary tables only include compounds with concentrations above the approximate sample quantification or detection limit.
2. Shaded results indicate an exceedence of one or more of the groundwater standards.
3. If no result shown then either below detection level or not analyzed.
4. Blanks in standards columns indicate that a standard has not been identified
5. Since 2000 groundwater samples have been collected using a modified low-flow sampling method with a peristaltic pump. Post 1999 analytical results reported above should be considered "minimum" concentrations and non-detect data considered "estimated".
6. For samples where a field duplicate was analyzed, both detected values are shown separated with a slash

[X*] MCP Method 1 Standards revised February 2008.

DATA QUALIFIERS

b or B: Compound was detected in an associate laboratory and/or field blank. Reported concentration not substantially above level reported in laboratory or field blanks and may be due to laboratory contamination

E: Estimated (value exceeds the calibration range)

F: Result between method detection limit (MDL) and recovery limit (RL)

j: Reported concentration estimated due to: 1) tentatively identified compound where 1:1 response is assumed, or 2) due to a positively indentified compound detected at concentration less than detection limit, or 3) out of tolerance recoveries in laboratory QC analysis

J: Reported concentration estimated based on consultant's evaluation of QA/QC data

L: Estimated value is below the calibration range

M: A matrix effect is present

R: Reported concentration rejected based on consultant's evaluation of QA/QC data

ACRONYMS/ABBREVIATIONS

BTEX = Combined total of benzene, toluene, ethylbenzene and xylenes.
EPA = United States Environmental Protection Agency
GW-1 / GW-2 = Massachusetts Contingency Plan Groundwater Classifications
RBRG = Risk Based Remediation Goals based on the Record of Decision (October, 2001)
IRA = Interim Remedial Action
LNAPL = Light Non-Aqueous Phase Liquid
LTM / LTMP = Long-term Monitoring / Long-term Monitoring Plan
MCP = Massachusetts Contingency Plan
MCL = Maximum Contaminant Level
na = not analyzed
ND = not detected
ns = no regulatory standard
O&M = Operation and Maintenance
RA-C BL = Remedial Action-Construction Baseline Sampling Event
RI / SRI = Remedial Investigation / Supplemental Remedial Investigation
vic. = vicinity
VOC = Volatile Organic Compounds
< = Compound is not detected at specified limit.

Historical Summary of Site 21 LNAPL Thicknesses

LNAPL Pool C - MWZ-13

PVC Elevation 129.29	Depth (ft) to Groundwater	Depth (ft) to LNAPL	Thickness (ft)
Well installed during 1992 Preliminary RI			
Remedial Action Performed - Summer 2003			
Jan-07	-12.18	-12.18	Trace
Feb-07	-12.83	-12.83	Trace
Mar-07	-11.49	-11.49	Trace
Apr-07	-7.94	-7.94	Trace
May-07	-9.15	-9.14	0.01
Jun-07	-11.89	-11.88	0.01
Jul-07	-12.93	-12.93	Trace
Aug-07	-13.20	-13.19	0.01
Sep-07	-13.77	-13.64	0.13
Oct-07	-13.63	-13.63	Trace *
Jan-08	-12.43	-12.43	Trace *
Jan-08	-12.16	-12.16	Trace
Feb-08	-9.50	-9.50	Trace
Mar-08	-9.07	-9.065	0.005
Apr-08	-9.78	-9.77	0.01
May-08	-11.40	-11.40	Trace *
Jun-08	-12.18	np	0.00 *
Jul-08	-12.20	np	0.00 *
Aug-08	-12.49	-12.49	Trace
Sep-08	-12.28	np	0 w/odor *
Oct-08	-12.17	-12.17	Trace
Nov-08	-12.62	-12.62	Trace *
		nm	Has sock
Feb-09	-11.29	-11.29	Trace
Mar-09	-10.49	nm	Has sock
Apr-09	-10.58	np	0.00
Jun-09	-12.33	np	0.00 *
Jul-09	-11.68	np	0.00
Aug-09	-12.49	np	0.00
Sep-09	-13.37	np	0.00
Nov-09	-13.84	np	0 w/odor
Nov-09	-13.68	-13.68	Hvy Trace
Dec-09	-13.38	np	0.00
Jan-10	-13.44	np	0.00
		Not accessible - cover stuck	
May-10	-12.66	-12.65	0.01
Jun-10	-13.58	np	0.00 *
Jul-10	-14.60	-14.56	0.04
Aug-10	-14.41	np	0.00 *
Sep-10	-14.99	-14.99	Trace
Oct-10	-14.89	np	0.00 *
Nov-10	-14.57	-14.58	Slight Trace
Dec-10	-14.56	-14.56	Slight Trace
Jan-11	-14.91	Not accessible - iced up	
		np	0.00
Mar-11	-9.35	-9.35	Trace
Apr-11	-10.86	np	0.00 *
May-11	-12.59	np - odor	0.00 *
Jun-11	-13.14	-13.14	Slight Trace
Sep-11	-13.49	np	0.00
Oct-11	-13.55	-13.55	Trace
Nov-11	-12.85	-12.85	Trace
Dec-11	-11.49	-11.49	Trace
Jan-12	-12.34	np	0 w/odor

* Oil absorbant sock in well most of month

LNAPL Pool C - MWZ-15

PVC Elevation 129.1	Depth (ft) to Groundwater	Depth (ft) to LNAPL	Thickness (ft)
Well installed during 1992 Preliminary RI			
Remedial Action Performed - Summer 2003			
24-Jan-07	-11.01	np	0.00
7-Feb-07	-11.83	-11.83	Trace
30-Mar-07	-10.27	np	0.00
24-Apr-07	-6.42	np	0.00
31-May-07	-9.17	-9.17	Trace
28-Jun-07	-10.69	-10.69	Trace
27-Jul-07	-12.25	np	Oder only
30-Aug-07	-12.65	-12.65	SlightTrace/oder
26-Sep-07	-13.17	-13.17	Trace
22-Oct-07	-13.33	-13.33	Trace
8-Jan-08	-11.49	np	0.00 *
30-Jan-08	Not accessible - well flooded/underwater		
28-Feb-08	-8.32	np	0.00
27-Mar-08	-7.85	np	0.00
8-Apr-08	-8.17	np	0.00
29-May-08	-10.22	np	0.00
26-Jun-08	-10.67	np	0.00
31-Jul-08 - Not accessible - well flooded/underwater			
22-Aug-08	-10.86	np	0.00
30-Sep-08	-10.57	np	0.00
16-Oct-08	-10.63	np	0.00
24-Nov-08	-11.60	np	Oder only
29-Dec-08 - Not accessible - well flooded/underwater			
26-Feb-09	-9.63	np	0.00
26-Mar-09	-8.84	np	0.00
24-Apr-09	-8.78	np	0.00
9-Jun-09	-10.91	np	0.00
27-Jul-09	Not accessible - well flooded/underwater		
25-Aug-09	-10.53	-10.53	Trace
25-Sep-09	-12.44	np	0.00
2-Nov-09	Not accessible - well flooded/underwater		
16-Nov-09	-12.68	np	0.00
24-Dec-09	-11.74	np	0.00
15-Jan-10	-12.60	np	0.00
22-Apr-10	-7.19	np	0.00
26-May-10	-10.34	np	0.00
21-Jun-10	-12.27	np	0.00
30-Jul-10	-13.80	-13.78	0.02
31-Aug-10	-13.70	np	0.00 *
27-Sep-10	-14.17	-14.17	Trace
29-Oct-10	-13.94	np	0.00 *
9-Nov-10	-13.68	np	0.00
16-Dec-10	-13.78	-13.78	Heavy Trace
11-Jan-11	-14.18	np	0.00 *
17-Feb-11	Not accessible - iced up		
23-Mar-11	-6.79	np	0.00 *
25-Apr-11	-8.60	np	0.00
24-May-11	Not accessible - well flooded/underwater		
21-Jun-11	-10.29	np	0.00
1-Sep-11	-12.29	np	0.00
6-Oct-11	-12.18	-12.18	Slight Trace
2-Nov-11	-9.31	np	Odor
15-Dec-11	Not accessible - well flooded/underwater		
9-Jan-12	-10.17	np	0.00

* Oil absorbant sock in well most of month

LNAPL Pool C - MWZ-17

PVC Elevation 129.17	Depth (ft) to Groundwater	Depth (ft) to LNAPL	Thickness (ft)
Well installed during 1992 Preliminary RI			
Remedial Action Performed - Summer 2003			
24-Jan-07	-12.47	np	0.00
22-Oct-07	-13.95	np	0.00
16-Oct-08	-12.40	np	0.00
16-Nov-09	-14.30	np	0.00
16-Nov-09	-14.30	np	0.00
22-Apr-10	-10.02	np	0.00
9-Nov-10	-13.25	np	0.00
25-Apr-11	-11.87	-11.87	Trace
24-May-11	-13.22	np - odor	0.00 *
21-Jun-11	-13.91	-13.91	trace *
1-Sep-11	-14.15	np	0.00 *
6-Oct-11	-14.20	-14.20	Slight Trace
2-Nov-11	-13.34	np	Odor
15-Dec-11	-11.97	np	0.00*
9-Jan-12	-12.97	np	0.00

* Oil absorbant sock in well most of month

Notes: nm = not measured; np = not present
Results prior to 1 Jan-05 ommitted/on file

Historical Summary of Site 21 LNAPL Thicknesses

LNAPL Pool C - MWZ-20

PVC Elevation 134.8	Depth (ft) to Groundwater	Depth (ft) to LNAPL	Thickness (ft)
Well installed during 1992 Preliminary RI			
Remedial Action Performed - Summer 2003			
24-Jan-07	-13.65	np	0.00
27-Feb-07	-15.52	-15.52	Slight Trace
30-Mar-07	-12.43	np	0.00
24-Apr-07	-9.53	np	0.00
31-May-07	-11.08	np	0.00
28-Jun-07	-13.54	np	0.00
27-Jul-07	-15.61	np	0.00
30-Aug-07	-16.73	-16.73	Slight Trace
26-Sep-07	-17.61	-17.59	0.02
22-Oct-07	-17.92	-17.92	Slight Trace *
8-Jan-08	-15.20	np	0.00 *
30-Jan-08	-13.85	np	0.00
28-Feb-08	-10.37	np	0.00
27-Mar-08	-10.14	np	0.00
8-Apr-08	-10.25	np	0.00
29-May-08	-13.28	np	0.00
26-Jun-08	-14.44	np	0.00
31-Jul-08	-13.75	np	0.00
22-Aug-08	-14.47	np	0.00
30-Sep-08	-13.22	np	0.00
16-Oct-08	-14.52	np	0.00
24-Nov-08	-15.59	np	0.00
29-Dec-08	-9.87	np	0.00
26-Feb-09	-12.66	np	0.00
26-Mar-09	-11.37	np	0.00
24-Apr-09	-11.03	np	0.00
9-Jun-09	-14.29	np	0.00
27-Jul-09	-12.57	np	0.00
25-Aug-09	-14.89	np	0.00
25-Sep-09	-16.14	np	0.00
2-Nov-09	-15.83	np	0.00
16-Nov-09	-15.19	np	0.00
24-Dec-09	-14.87	np	0.00
15-Jan-10	-15.17	np	0.00
22-Apr-10	-10.90	np	0.00
26-May-10	-14.20	np	0.00
21-Jun-10	-16.90	np	0.00
30-Jul-10	-17.78	-17.78	Heavy Trace
31-Aug-10	-17.73	np	0.00 *
27-Sep-10	-19.02	-19.02	Trace
29-Oct-10	-18.21	-18.21	Slight Trace *
9-Nov-10	-18.30	-18.30	Heavy Trace
16-Dec-10	-17.03	-17.03	Slight Trace
11-Jan-11	-18.24	-18.24	Trace
17-Feb-11		Not accessible - snow	
23-Mar-11	-11.08	np	0.00 *
25-Apr-11	-12.53	np	0.00
24-May-11	-14.03	np	0.00
21-Jun-11	-13.86	np	0.00
1-Sep-11	-14.93	np	0.00
6-Oct-11	-14.95	np	0.00
2-Nov-11	-13.17	-13.17	Trace
15-Dec-11	-11.87	np	0.00
9-Jan-12	-13.90	np	0.00

* oil absorbant sock in well most of month

LNAPL Pool C - MWZ-22

PVC Elevation 129.67	Depth (ft) to Groundwater	Depth (ft) to LNAPL	Thickness (ft)
Well installed during 1992 Preliminary RI			
Remedial Action Performed - Summer 2003			
24-Jan-07	-11.28	-11.28	Trace
27-Feb-07	-12.37		Smell only *
30-Mar-07	-9.44	-9.44	Trace
24-Apr-07	-6.86	-6.86	Trace
31-May-07	-11.16	-11.16	Trace
28-Jun-07	-11.08	-11.08	Trace
27-Jul-07	-12.56	-12.56	Trace
30-Aug-07	-13.09	-13.09	Trace
26-Sep-07	-13.56	-13.55	0.01
22-Oct-07	-13.52	-13.52	Slight Trace *
8-Jan-08	-11.48	-11.48	Trace *
30-Jan-08	-11.92	np	0.00
28-Feb-08	-7.91	np	0.00
27-Mar-08	-7.87	np	0.00
8-Apr-08	-7.91	np	0.00
29-May-08	-10.43	np	0.00
26-Jun-08	-11.15	np	0.00
31-Jul-08	-10.13	-10.13	Trace
22-Aug-08	-10.94	-10.94	Trace
30-Sep-08	-9.96	np	0.00
16-Oct-08	-11.05	np	0.00
24-Nov-08	-11.92	-11.92	Trace
29-Dec-08	-7.56	np	0.00
26-Feb-09	-9.09	np	0.00
26-Mar-09	-9.22	np	0.00
24-Apr-09	-8.19	np	0.00
9-Jun-09	-11.44	np	0.00
27-Jul-09	-8.59	np	0.00
25-Aug-09	-11.36	np	0.00
25-Sep-09	-12.64	-12.64	Heavy Trace
2-Nov-09	-13.09	np	0.00 *
16-Nov-09	-11.67	-11.67	Trace
24-Dec-09	-11.81	np	0.00
15-Jan-10	-12.58	12.58	Trace
22-Apr-10		Not accessible - cover stuck	
26-May-10	-11.25	np	0.00 *
24-Jun-10	-12.64	np	0.00 *
30-Jul-10	-14.10	-14.10	Slight Trace
31-Aug-10	-13.64	-13.64	Heavy Trace*
27-Sep-10	-14.57	-14.56	0.01
29-Oct-10	-14.07	-14.07	Slight Trace *
9-Nov-10	-13.57	-13.57	Slight Trace
16-Dec-10	-13.53	-13.53	Heavy Trace
11-Jan-11	-14.18	np	0.00 *
17-Feb-11	-14.28	-14.28	Slight Trace *
23-Mar-11	-7.54	np	0.00 *
25-Apr-11	-8.65	np	0.00
24-May-11	-10.67	-10.67	Slight Trace
21-Jun-11	-11.82	np	odor
1-Sep-11	-11.55	-11.55	Heavy Trace
6-Oct-11	-12.23	-12.23	Trace *
2-Nov-11	-9.02	np	
15-Dec-11	-9.31	np	
9-Jan-12	-11.04	-11.04	Slight Trace

* oil absorbant sock in well most of month

LNAPL Pool C - ECS-29

TOC Elevation 138.94	Depth (ft) to Groundwater	Depth (ft) to LNAPL	Thickness (ft)
Well installed during 1997 RI			
Remedial Action Performed - Summer 2003			
24-Jan-07	-20.67	np	0.00
27-Feb-07	-21.64	-21.64	Slight Trace
30-Mar-07	-19.86	np	0.00
24-Apr-07	-15.91	np	0.00
31-May-07	-18.53	np	0.00
28-Jun-07	-20.55	-20.55	Slight Trace
27-Jul-07	-21.74	np	Oder only
30-Aug-07	-22.24	-22.24	SlightTrace/oder
26-Sep-07	-22.84	-22.84	Heavy Trace
22-Oct-07	-23.06	-23.06	Slight Trace*
8-Jan-08	-21.69	np	0.00 *
30-Jan-08	-21.3	np	0.00
28-Feb-08	-18.04	np	0.00
27-Mar-08	-17.44	np	0.00
8-Apr-08	-18.31	np	0.00
29-May-08	-20.05	np	0.00
26-Jun-08	-20.92	np	0.00
31-Jul-08	-21.04	np	0.00
22-Aug-08	-21.48	np	0.00
30-Sep-08	-21.05	np	0.00
16-Oct-08	-21.11	np	0.00
24-Nov-08	-21.61	np	0.00
29-Dec-08	-18.28	np	0.00
26-Feb-09	-19.90	np	0.00
26-Mar-09	-18.82	np	0.00
24-Apr-09	-18.82	np	0.00
9-Jun-09	-21.12	np	0.00
27-Jul-09	-20.36	np	0.00
25-Aug-09	-21.28	np	0.00
25-Sep-09	-22.40	np	0.00
2-Nov-09	-23.20	np	0.00
16-Nov-09	-22.97	np	0.00
24-Dec-09	-22.38	np	0.00
15-Jan-10	-22.02	np	0.00
22-Apr-10	-17.97	np	0.00
26-May-10	-21.29	np	0.00
21-Jun-10	-22.53	np	0.00
30-Jul-10	-23.71	np	0.00
31-Aug-10	-23.86	np	0.00
27-Sep-10	-24.23	np	0.00
29-Oct-10	-24.25	np	0.00
9-Nov-10	-4.31 ?	np	0.00
16-Dec-10	-23.92	np	0.00
11-Jan-11	-24.25	np	0.00
17-Feb-11		Not accessible - iced up	
23-Mar-11	-17.67	np	0.00
25-Apr-11	-19.46	np	0.00
24-May-11	-20.89	np	0.00
21-Jun-11	-21.87	np	0.00
1-Sep-11	-22.54	np	0.00
6-Oct-11	-22.55	-22.55	Slight Trace
2-Nov-11	-21.59	np	0.00
15-Dec-11	-19.72	np	0.00
9-Jan-12	-20.80	np	0.00

**oil absorbant sock in well most of month

Notes: nm = not measured; np = not present
Results prior to 1 Jan-05 ommitted/on file

Historical Summary of Site 21 LNAPL Thicknesses

LNAPL Pool C - ECS-31

PVC Elevation	Depth (ft) to Groundwater	Depth (ft) to LNAPL	Thickness (ft)
Well installed during 1997 RI			
Remedial Action Performed - Summer 2003			
16-Apr-09	-5.25	np	0.00
16-Nov-09	-7.82	-7.82	Heavy Trace
24-Dec-09	-7.39	-7.11	0.28
15-Jan-10	-7.40	-7.40	Trace *
22-Apr-10	-5.02	np	0.00
26-May-10	-6.34	-6.34	Trace *
24-Jun-10	-7.45	-7.45	Trace *
29-Jul-10	-9.05	np	0.00 *
2-Sep-10	-9.40	-9.40	Trace *
27-Sep-10	-10.19	-10.15	0.04 *
29-Oct-10	-10.88	-10.88	Heavy Trace *
9-Nov-10	-10.47	np	0.00 *
16-Dec-10	-10.43	-10.43	Heavy Trace
11-Jan-11		Not accessible - flooded	
17-Feb-11		Not accessible - flooded	
23-Mar-11	-7.36	np	0.00 *
25-Apr-11	-8.75	np	0.00
24-May-11	-8.54	np	0.00
21-Jun-11	-6.96	np	0.00
1-Sep-11	-8.88	np	0.00
6-Oct-11	-9.15	np	0.00
2-Nov-11	-6.72	np	0.00
15-Dec-11	-7.84	np	0.00
9-Jan-12	-8.60	np	0.00

* Oil absorbant sock in well most of month

LNAPL Pool C - ECS-35

PVC Elevation 129.7	Depth (ft) to Groundwater	Depth (ft) to LNAPL	Thickness (ft)
Well installed during 1997 RI			
Remedial Action Performed - Summer 2003			
24-Jan-07	-8.14	np	0.00
27-Feb-07	-9.65	np	0.00
30-Mar-07	-7.08	np	0.00
24-Apr-07	-5.62	np	0.00
31-May-07	-6.77	np	0.00
28-Jun-07	-7.85	np	0.00
27-Jul-07	-8.95	np	0.00
30-Aug-07	-10.14	np	Oder only
26-Sep-07	-10.71	-10.71	Slight Trace
22-Oct-07	-10.80	-10.80	Slight Trace*
22-Oct-07	-8.73	np	0.00 *
30-Jan-08	-8.24	np	0.00
28-Feb-08	-5.71	np	0.00
27-Mar-08	-6.19	np	0.00
9-Apr-08	-6.39	np	0.00
29-May-08	-7.44	np	0.00
26-Jun-08	-7.42	np	0.00
31-Jul-08	-8.06	np	0.00
22-Aug-08	-7.53	np	0.00
30-Sep-08	-7.35	np	0.00
16-Oct-08	-7.56	np	0.00
24-Nov-08	-8.85	np	Oder only
29-Dec-08	-6.06	np	0.00
26-Feb-09	-6.85	np	0.00
26-Mar-09	-6.87	np	0.00
24-Apr-09	-6.08	np	0.00
9-Jun-09	-7.70	np	0.00
27-Jul-09	-7.56	np	0.00
25-Aug-09	-8.12	np	0.00
25-Sep-09	-8.21	np	0.00
2-Nov-09	-6.67	np	0.00
16-Nov-09	-8.09	np	0.00
24-Dec-09	-8.53	np	0.00
15-Jan-10	-8.76	-8.76	Trace
22-Apr-10	-6.06	np	0.00
26-May-10	-7.64	np	0.00
21-Jun-10	-7.78	np	0.00
30-Jul-10	-10.12	-10.12	Heavy Trace
31-Aug-10	-9.77	np	0.00 *
27-Sep-10	-10.07	np	0.00
29-Oct-10	-10.07	np	0.00
9-Nov-10	-10.57	-10.570	Heavy Trace
16-Dec-10	-9.56	np	0.00
11-Jan-11	-10.36	np	0.00
17-Feb-11	-10.19	np	0.00
23-Mar-11	-6.30	np	0.00
25-Apr-11	-7.42	np	0.00
24-May-11	-7.22	np	0.00
21-Jun-11	-7.57	np	0.00
1-Sep-11	-8.10	-8.10	Trace
6-Oct-11	-8.35	np	0.00
2-Nov-11	-6.95	np	0.00
15-Dec-11	-7.14	np	0.00
9-Jan-12	-7.96	np	0.00

* Oil absorbant sock in well most of month

LNAPL Pool C - RW-11A

PVC Elevation	Depth (ft) to Groundwater	Depth (ft) to LNAPL	Thickness (ft)
Well installed 27-July-2010			
Remedial Action Performed - Summer 2003			
30-Jul-10	-9.10	np	0.00 w/order
5-Aug-10	-9.36	np	0.00
9-Aug-10	-9.65	np	0.00
13-Aug-10	-9.87	-9.87	Trace
31-Aug-10	-9.26	np	0.00
2-Sep-10	-9.33	np	0.00
7-Sep-10	-9.40	-9.40	Trace
27-Sep-10	-14.25	-9.40	trace *
19-Oct-10	RW-11A placed in operation		
29-Oct-10	-12.47	-12.47	slight trace *
9-Nov-10	-11.30	np	
16-Dec-10	pump on		
11-Jan-11	pump on		
17-Feb-11	pump on		
23-Mar-11	pump on		
25-Apr-11	-9.93	np	
24-May-11	pump on		
21-Jun-11	pump on		
1-Sep-11	pump on		
6-Oct-11	pump on		
2-Nov-11	-6.97	np	
15-Dec-11	pump on		
9-Jan-12	pump on		

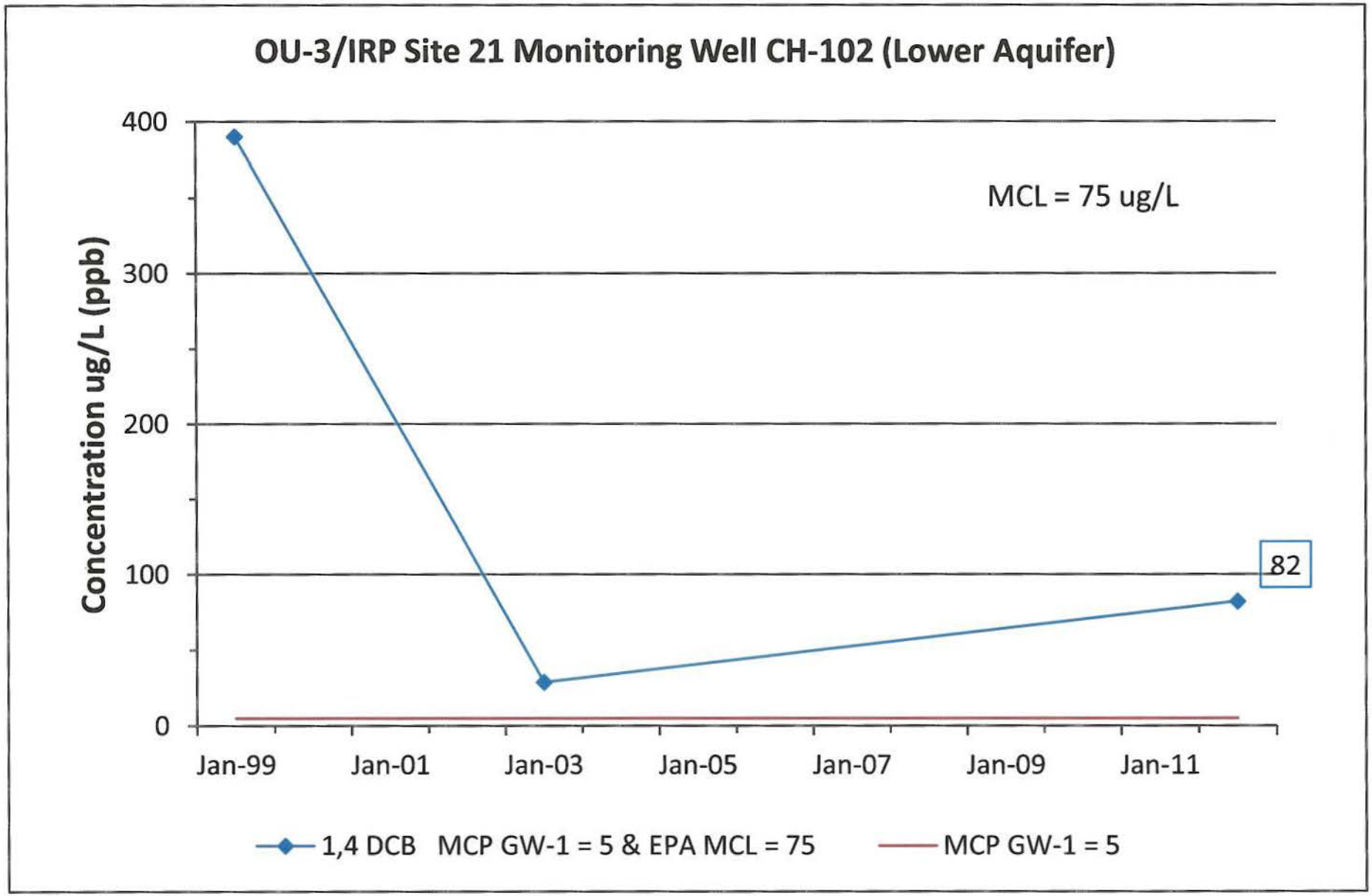
* Oil absorbant sock in well most of month

Notes: nm = not measured; np = not present
Results prior to 1 Jan-05 ommitted/on file

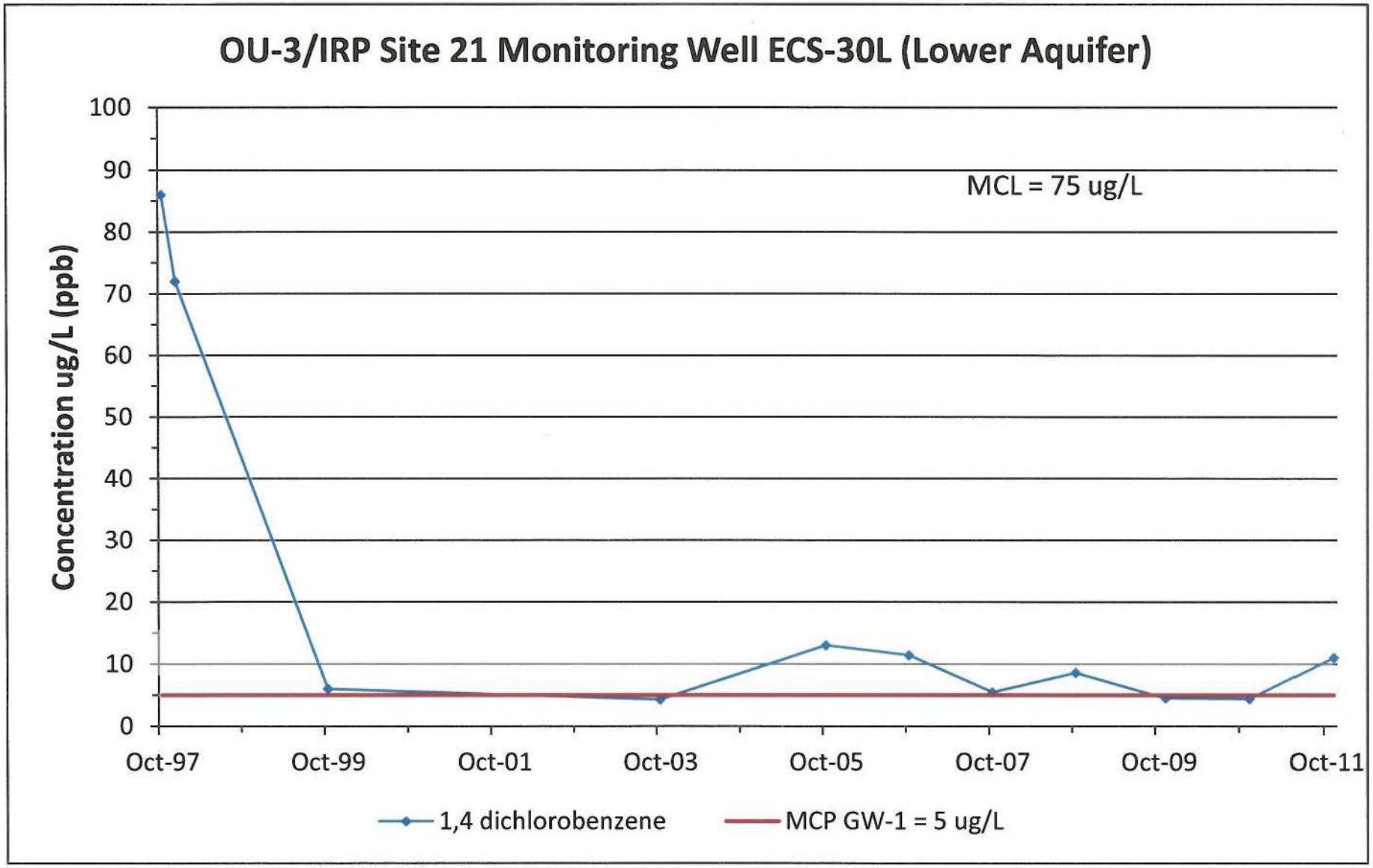
Attachment I – OU-3/IRP Site 21 Long-Term Monitoring Charts Showing Trends .....

Chart 1 – CH-102 (lower aquifer) 1,4-DCB Compounds Oct 1999 – Apr 2012
Chart 2 – ECS-30L (lower aquifer) 1,4-DCB Compounds Oct 1997 – Nov 11
Chart 3 – ECS-34 (surface aquifer) TCE Oct 1997 – Apr 2012
Chart 4 – ECS-29 (lower aquifer) RBRGs Compounds Apr 2006 – Apr 2012
Chart 5 – ECS-35 (surface aquifer) TCE Oct 2003 – Nov 2011
Chart 6 – MWZ-13 (surface aquifer) RBRGs Compounds Oct 2006 – Nov 2011
Chart 7 – MWZ-13 (surface aquifer) Naphthalene Oct 2006 – Nov 2011
Chart 8 – MWZ-15 (surface aquifer) RBRGs Compounds Oct 2006 – Nov 2011
Chart 9 – MWZ-17 (surface aquifer) RBRGs Compounds Oct 2006 – Nov 2011
Chart 10 – MWZ-20 (surface aquifer) RBRGs Compounds Oct 2006 – Nov 2011
Chart 11 – MWZ-22 (surface aquifer) RBRGs Compounds Oct 2006 – Apr 2012
Chart 12 – ECS-14R (surface aquifer) Benzene Oct 1997 – Nov 2011
Chart 13 – ECS-31 (surface aquifer) 1,4-DCB et al Oct 1997 – Apr 2012
Chart 14 – RW-1 (former surface aquifer recovery well now inactive/used as a monitoring well) Benzene & 1,4-DCB - Oct 2005 – Nov 2011
Chart 15 – ECS-28 (surface aquifer) Vinyl Chloride Oct 2003 – Nov 2011
Chart 16 – ECS-28 (surface aquifer) MTBE 2003 – Nov 2011
Chart 17 – MWZ-11 (surface aquifer) n-propylbenzene (RBRGs Compound) Oct 2003 – Nov 2011
Chart 18 – MWZ-12 (surface aquifer) RBRGs Compounds Oct 2006 – Nov 2011
Chart 19 – MWZ-3 (surface aquifer) Benzene Oct 2003 – Apr 2012
Chart 20 – MWZ-3 (surface aquifer) RBRGs Compounds Oct 2003 – Apr 2012
Chart 21– PW-3 (surface aquifer) RBRGs Compounds Oct 2006 – Nov 2011
Chart 22 – PW-4 (surface aquifer) Benzene Oct 2006 – Nov 2011
Chart 23 – PW-4 (surface aquifer) RBRGs Compounds Oct 2006 – Nov 2011
Chart 24 – PW-5 (surface aquifer) RBRGs Compounds Oct 2006 – Nov 2011
Chart 25 – MWZ-38 (surface aquifer) 1,4-DCB Oct 2003 – Apr 2012

OU-3/IRP Site 21 Historical LTM Results via Off-site Laboratory



OU-3/IRP Site 21 Historical LTM Results via Off-site Laboratory



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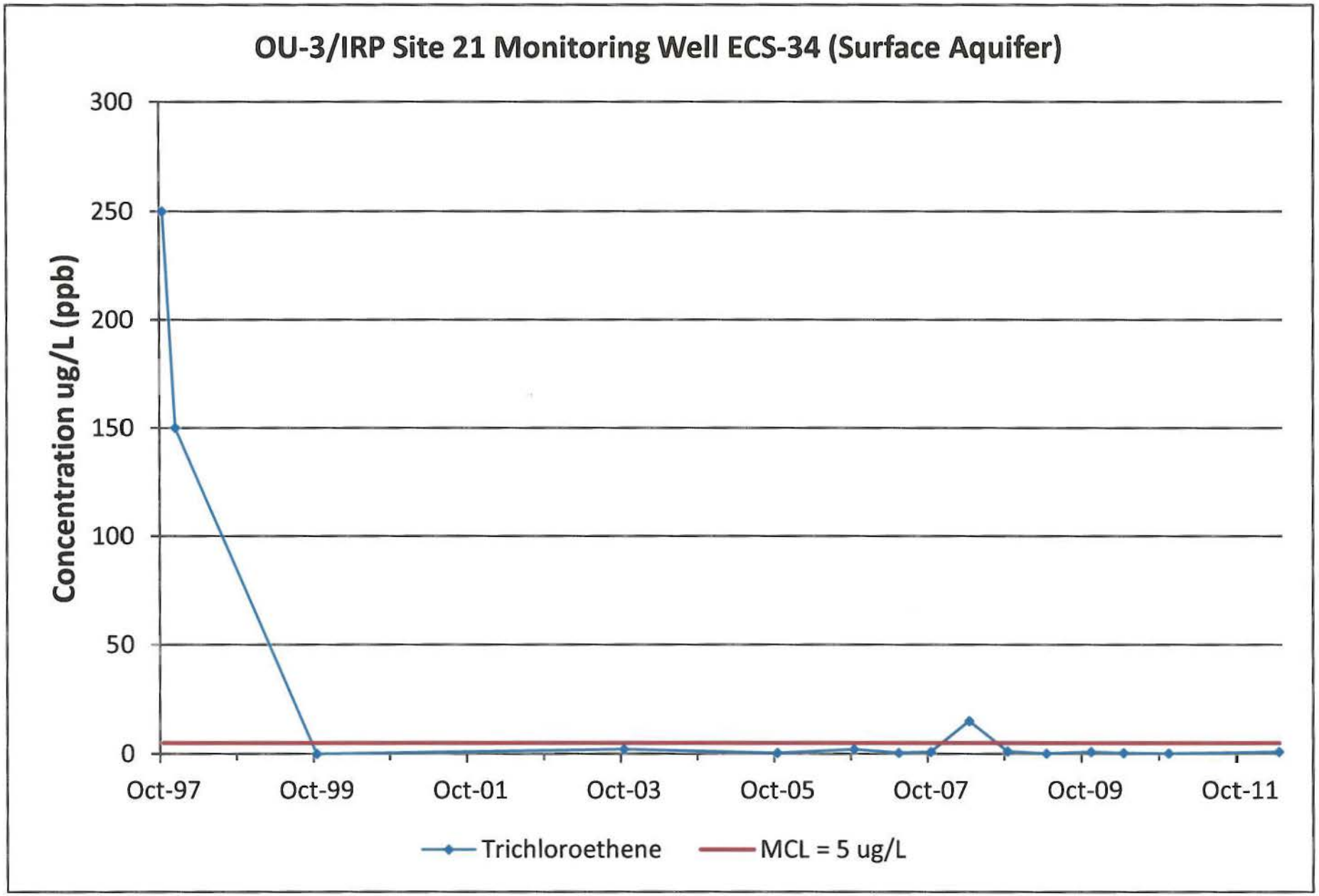

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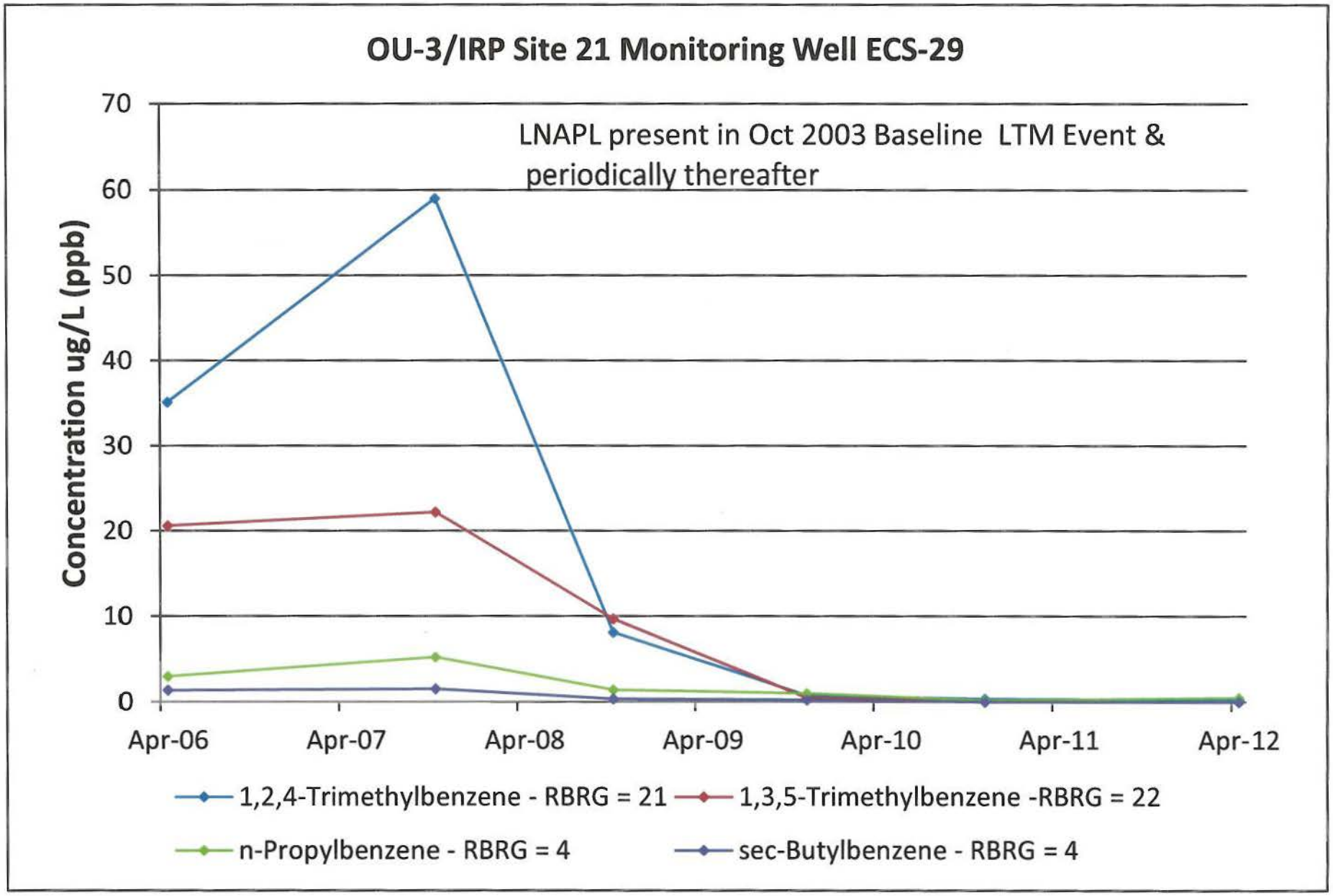

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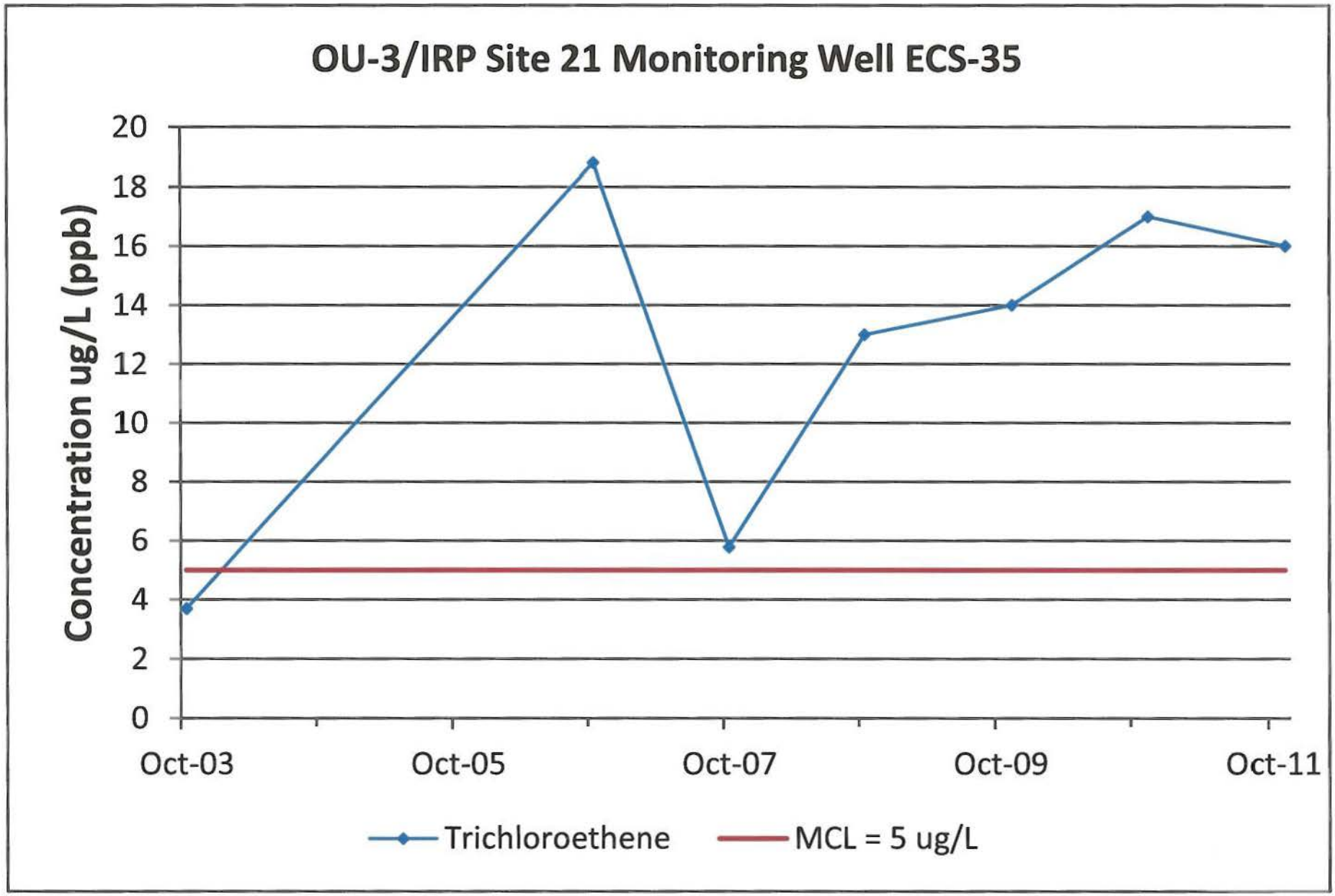

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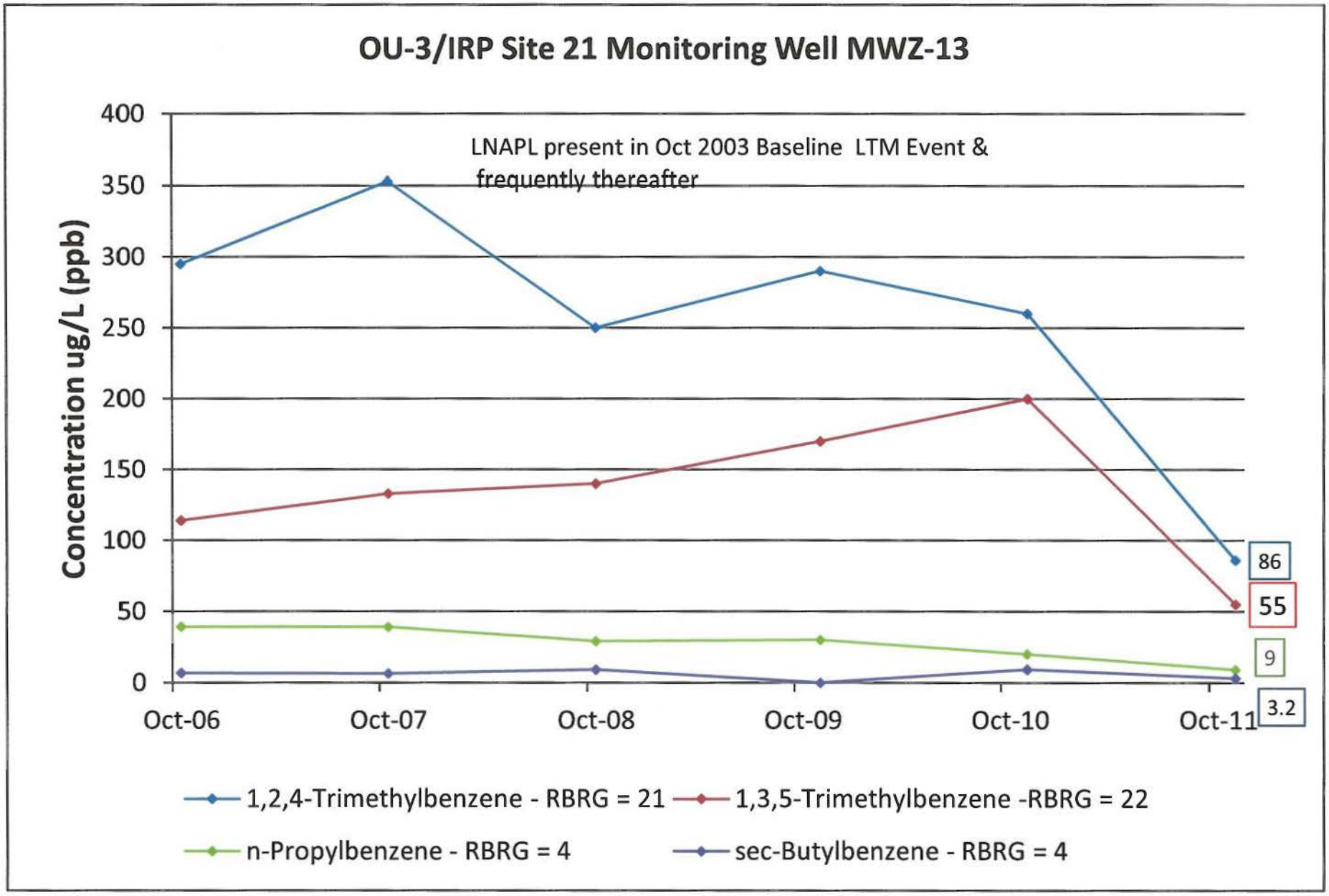

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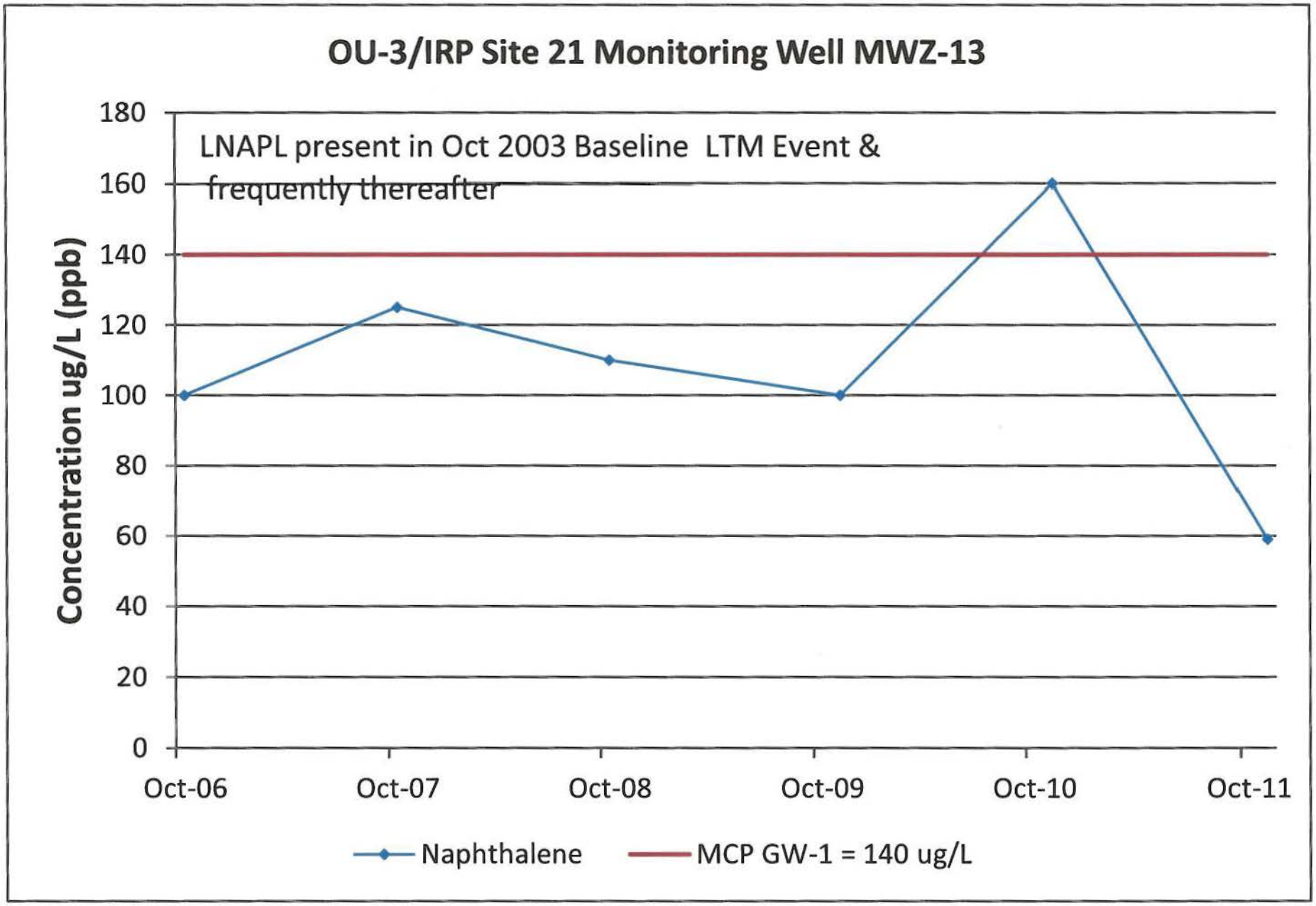

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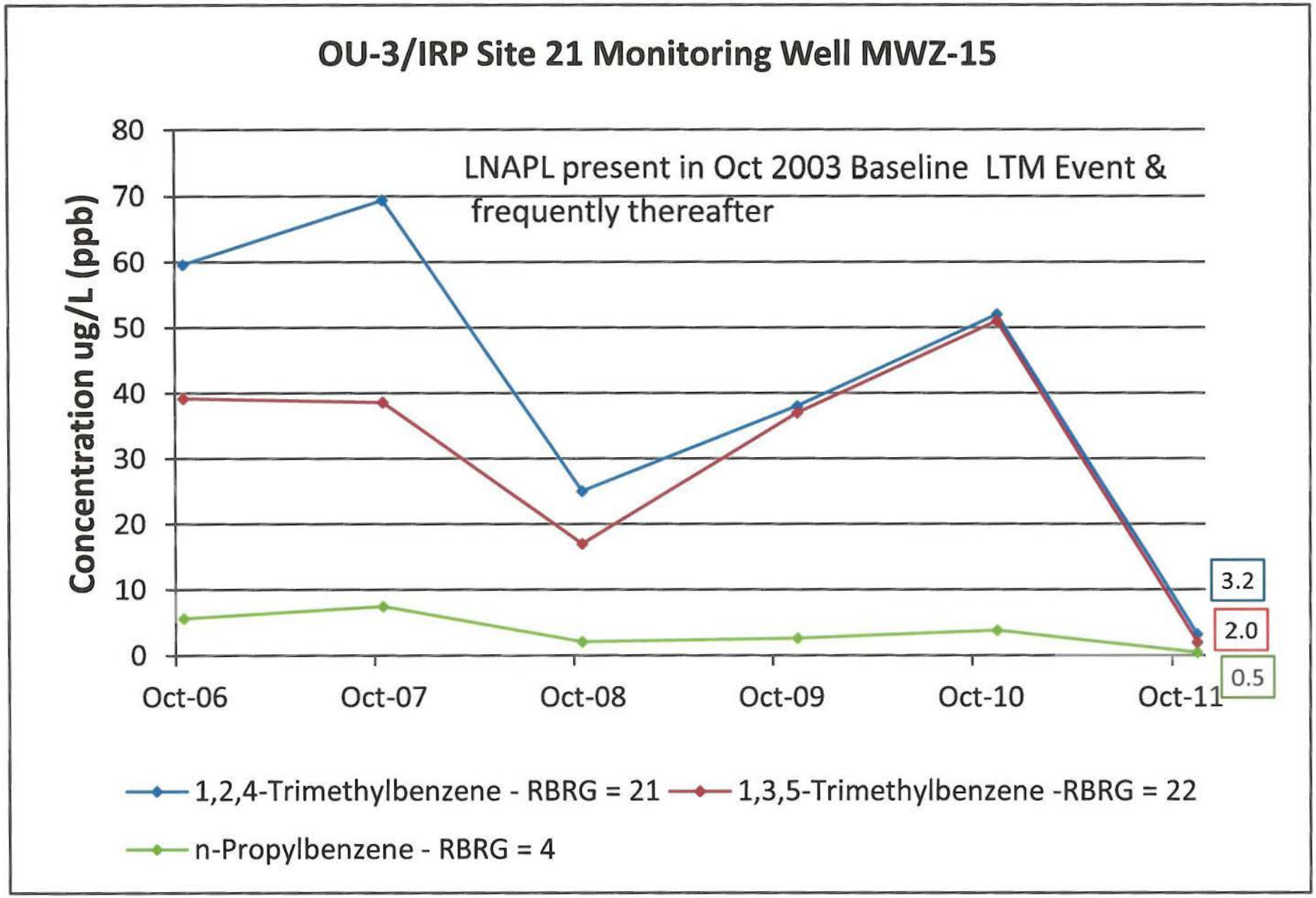

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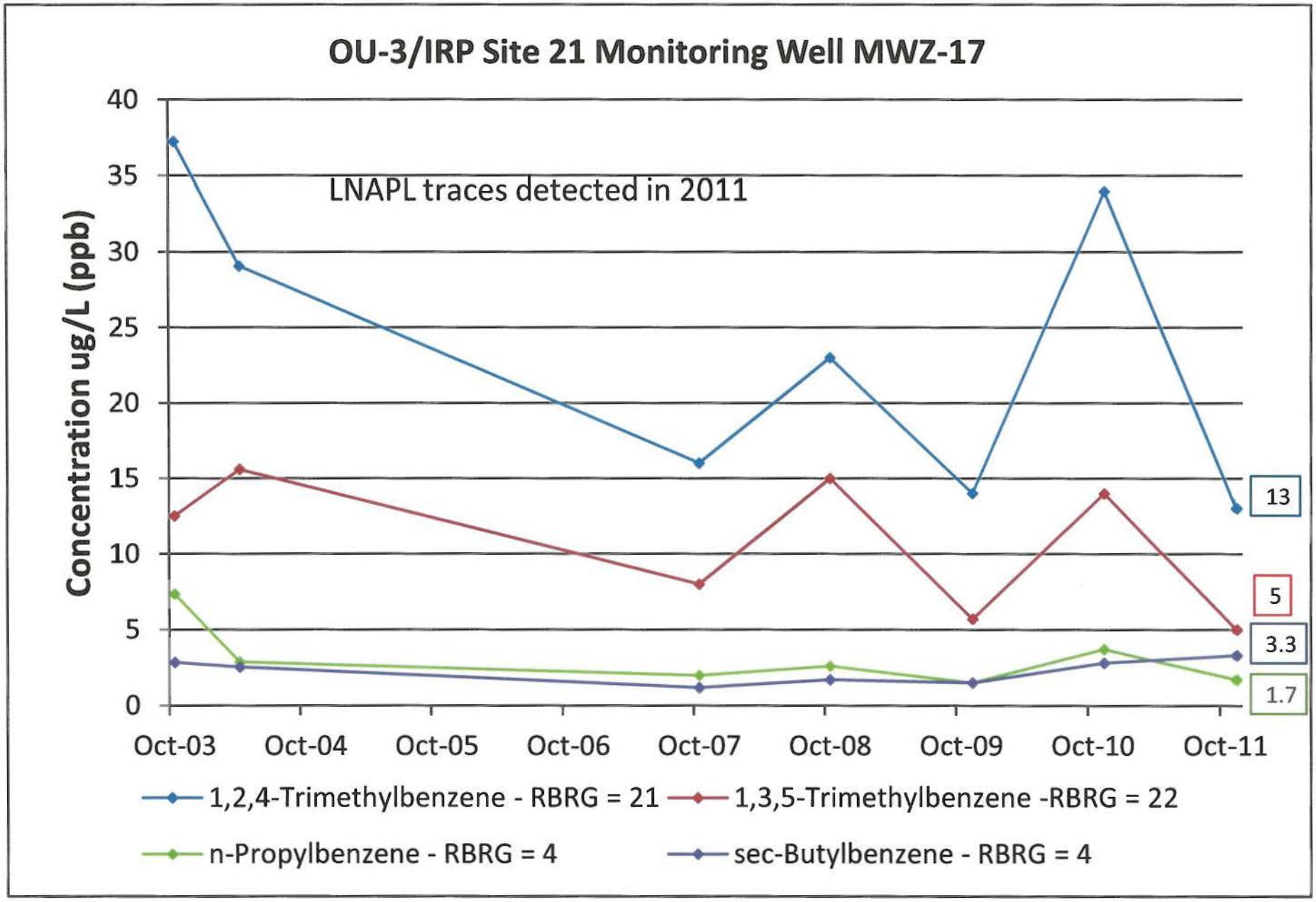

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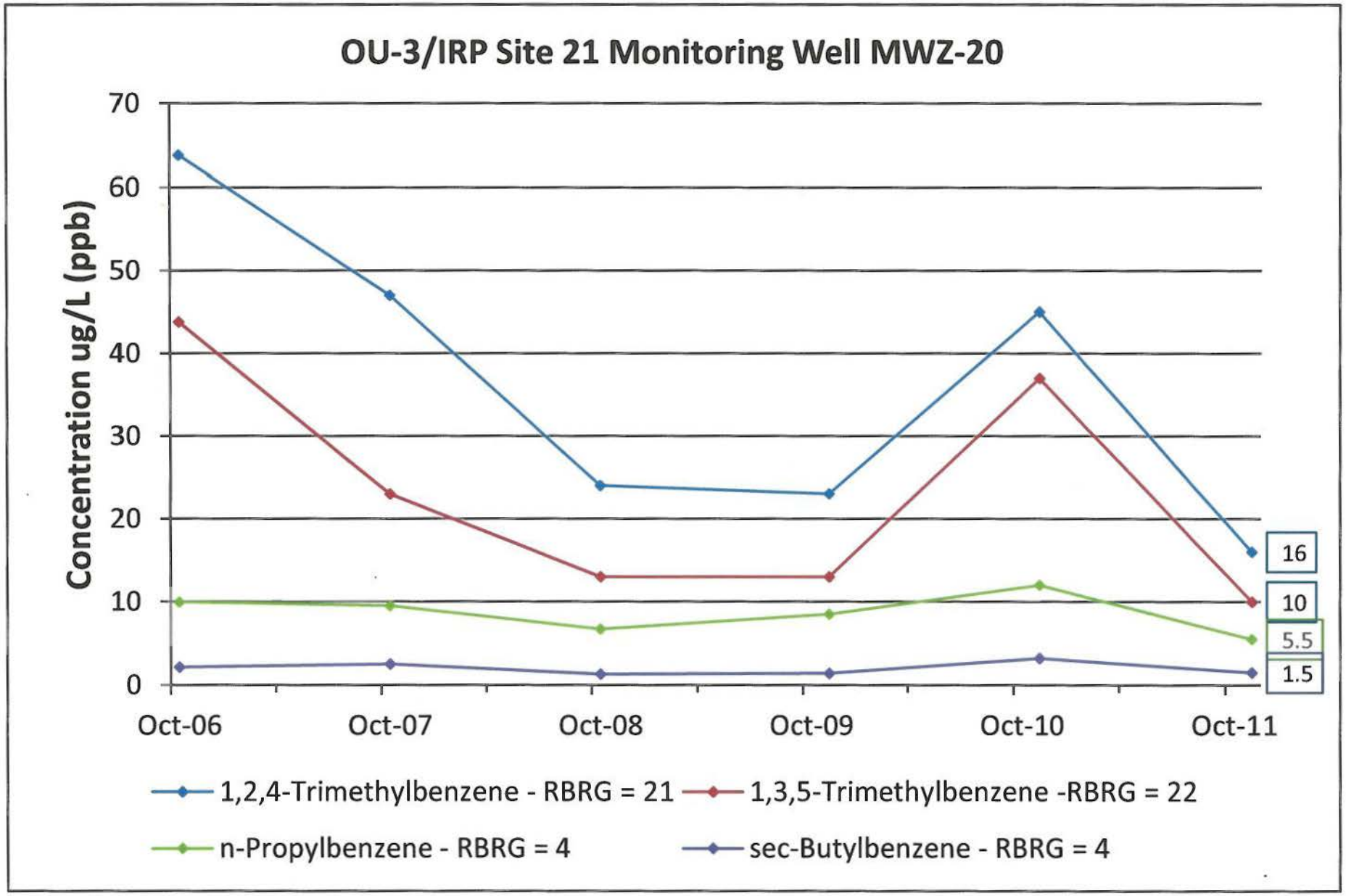

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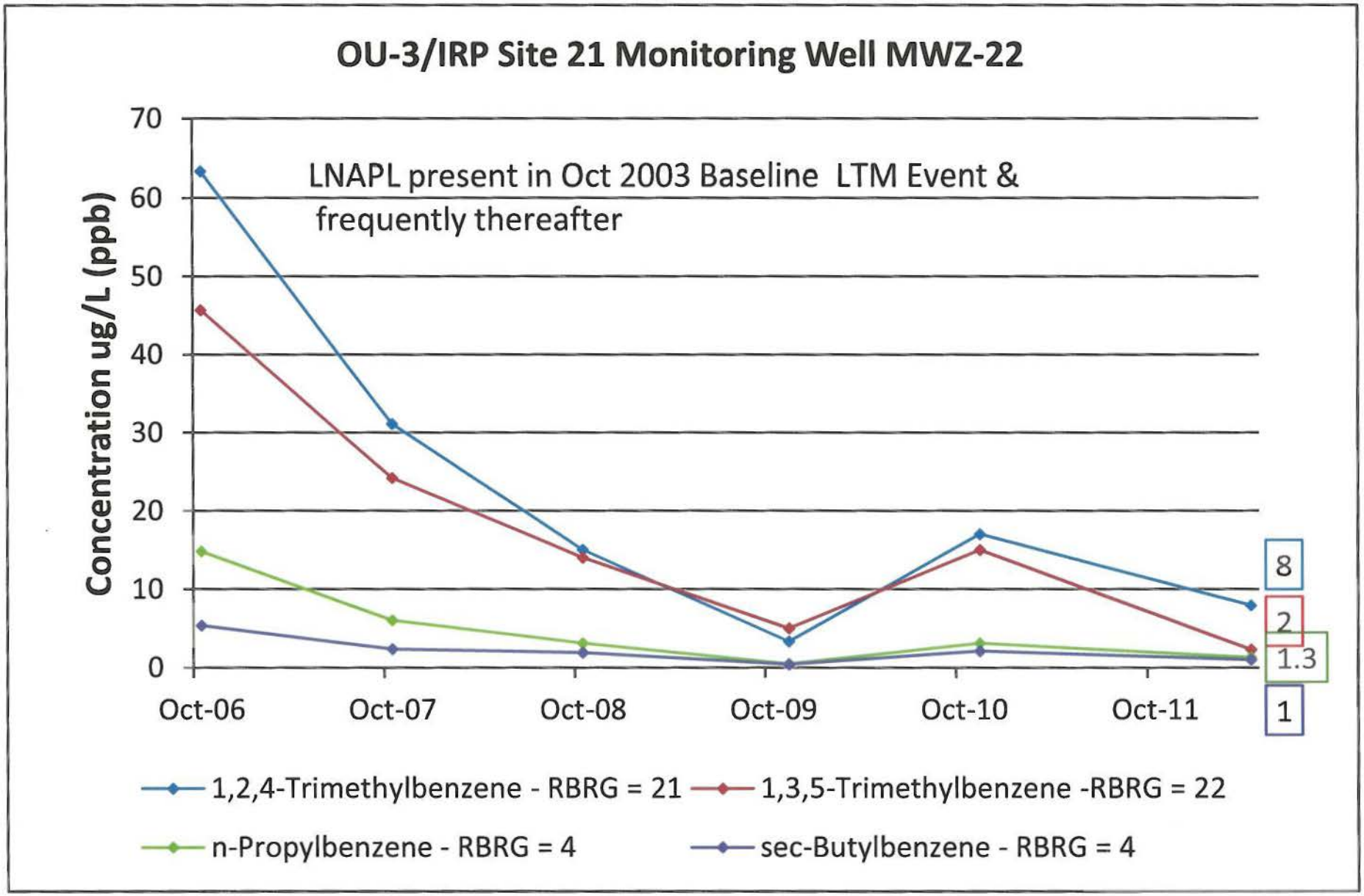

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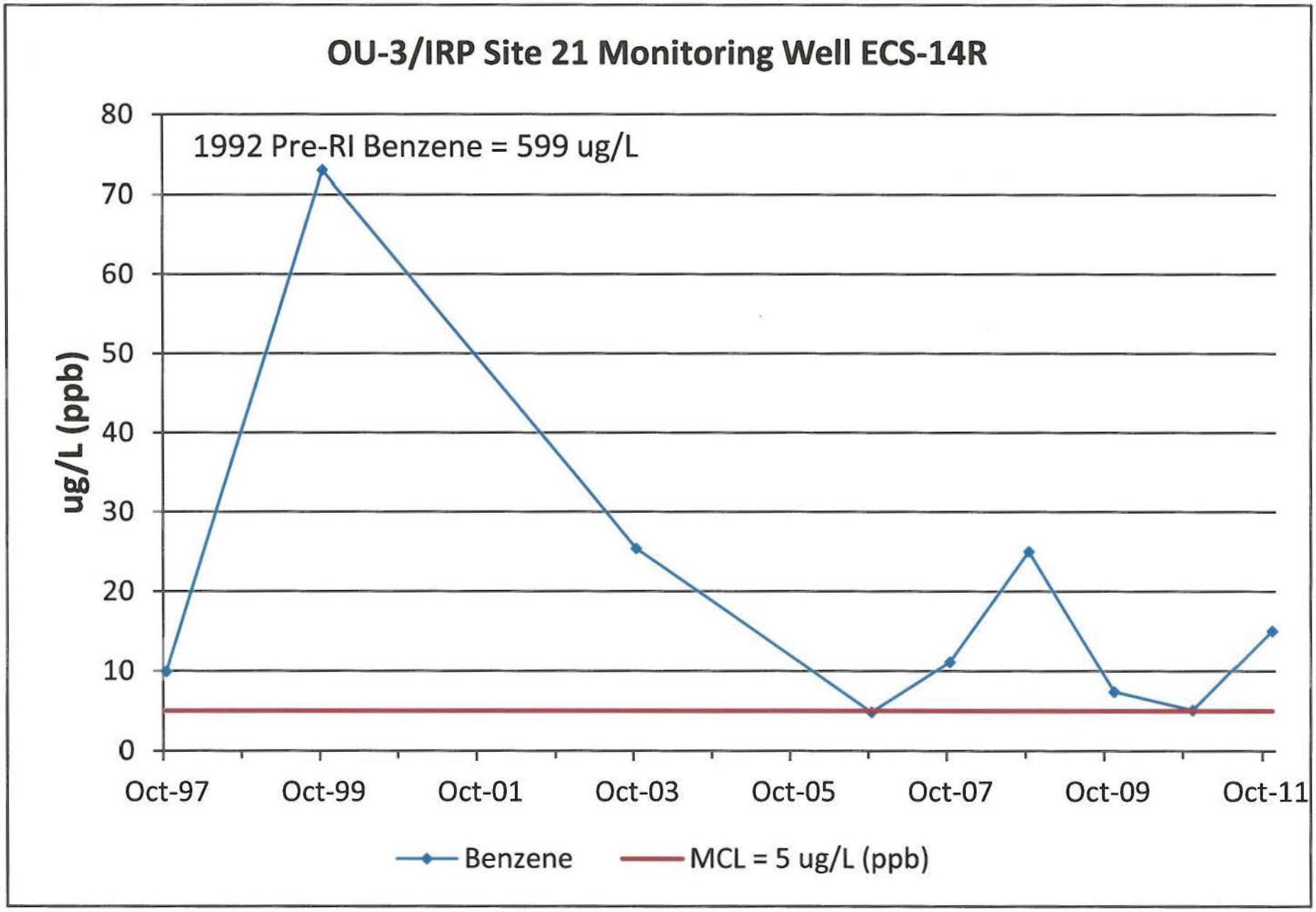

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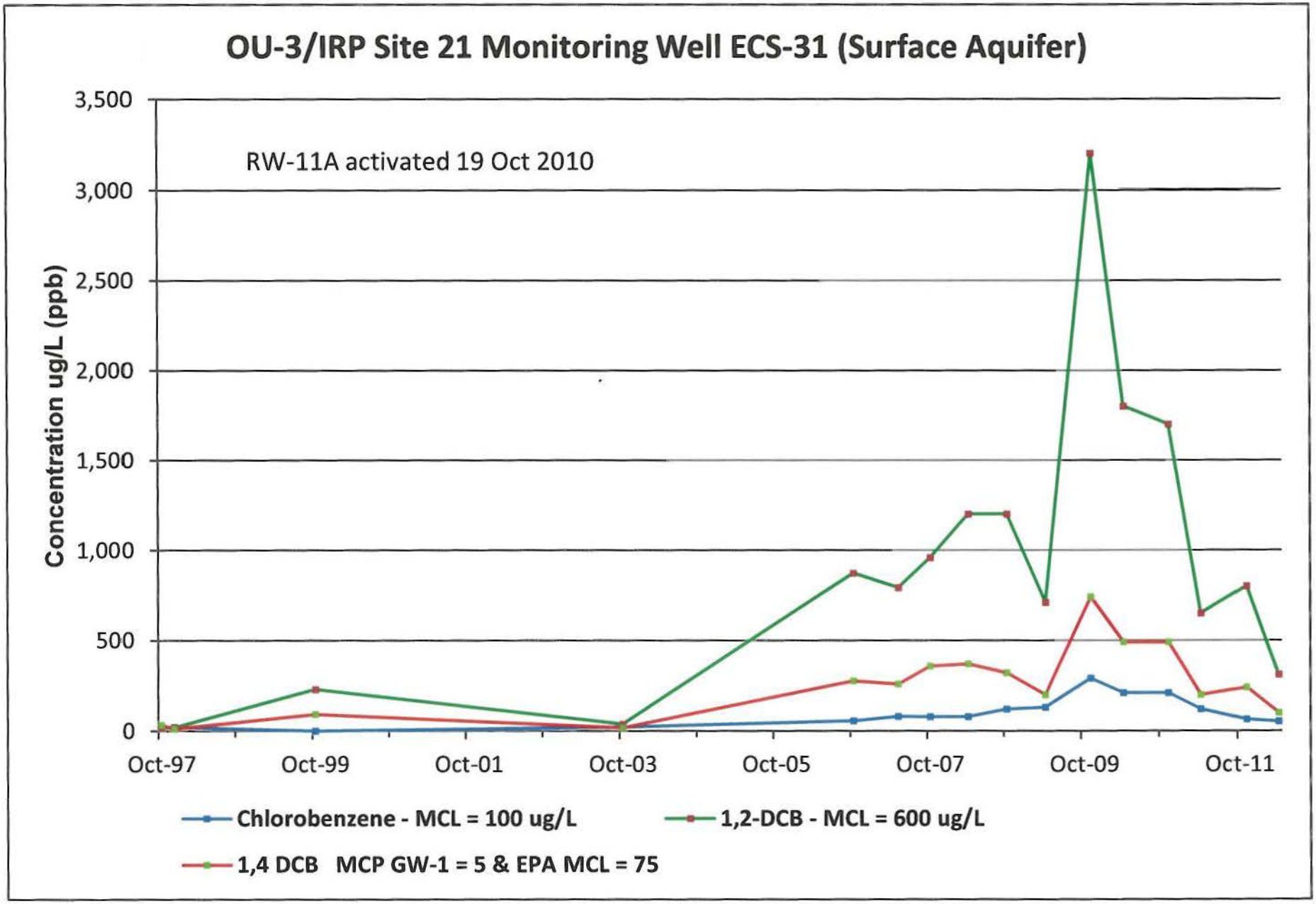

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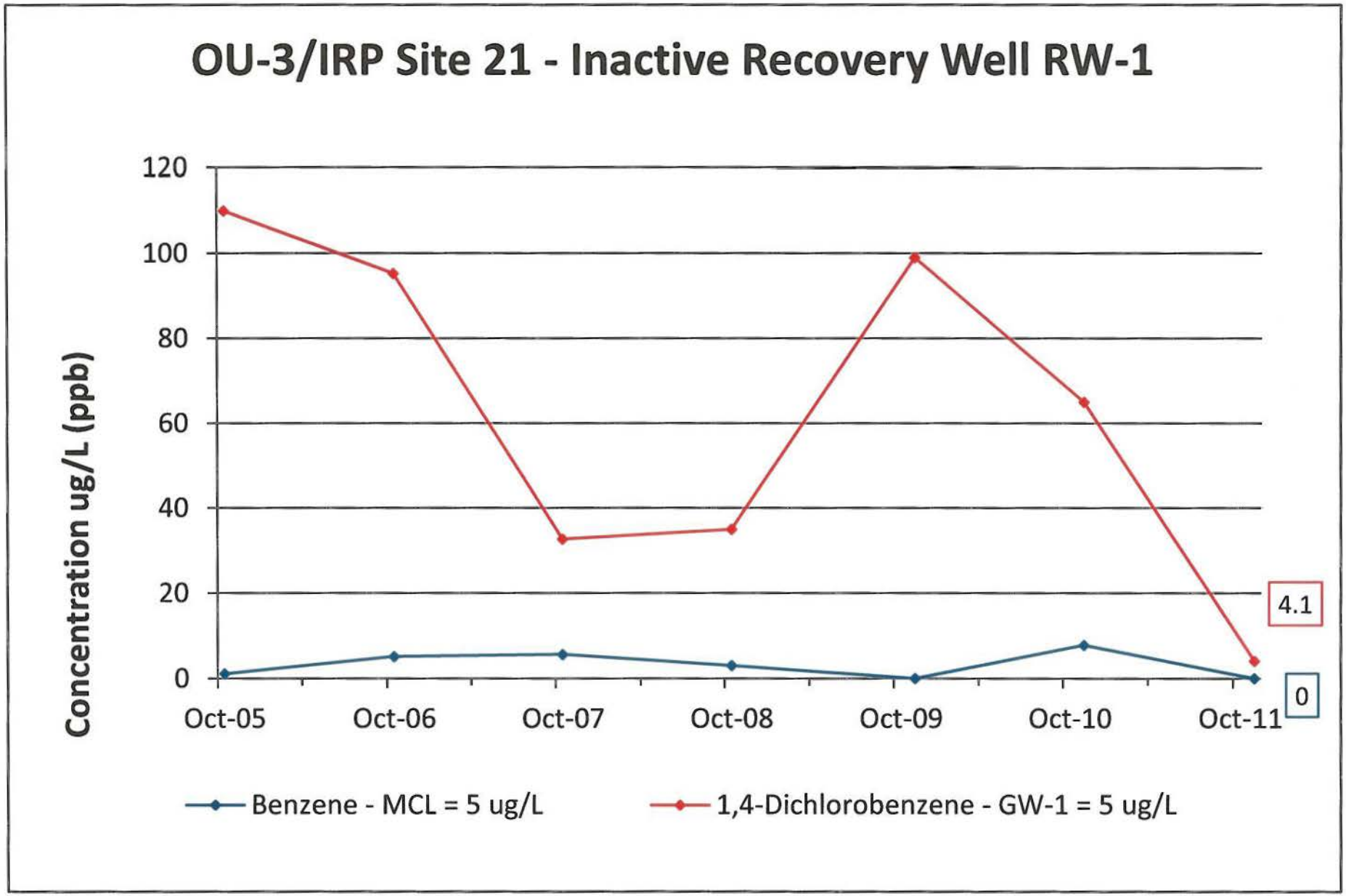

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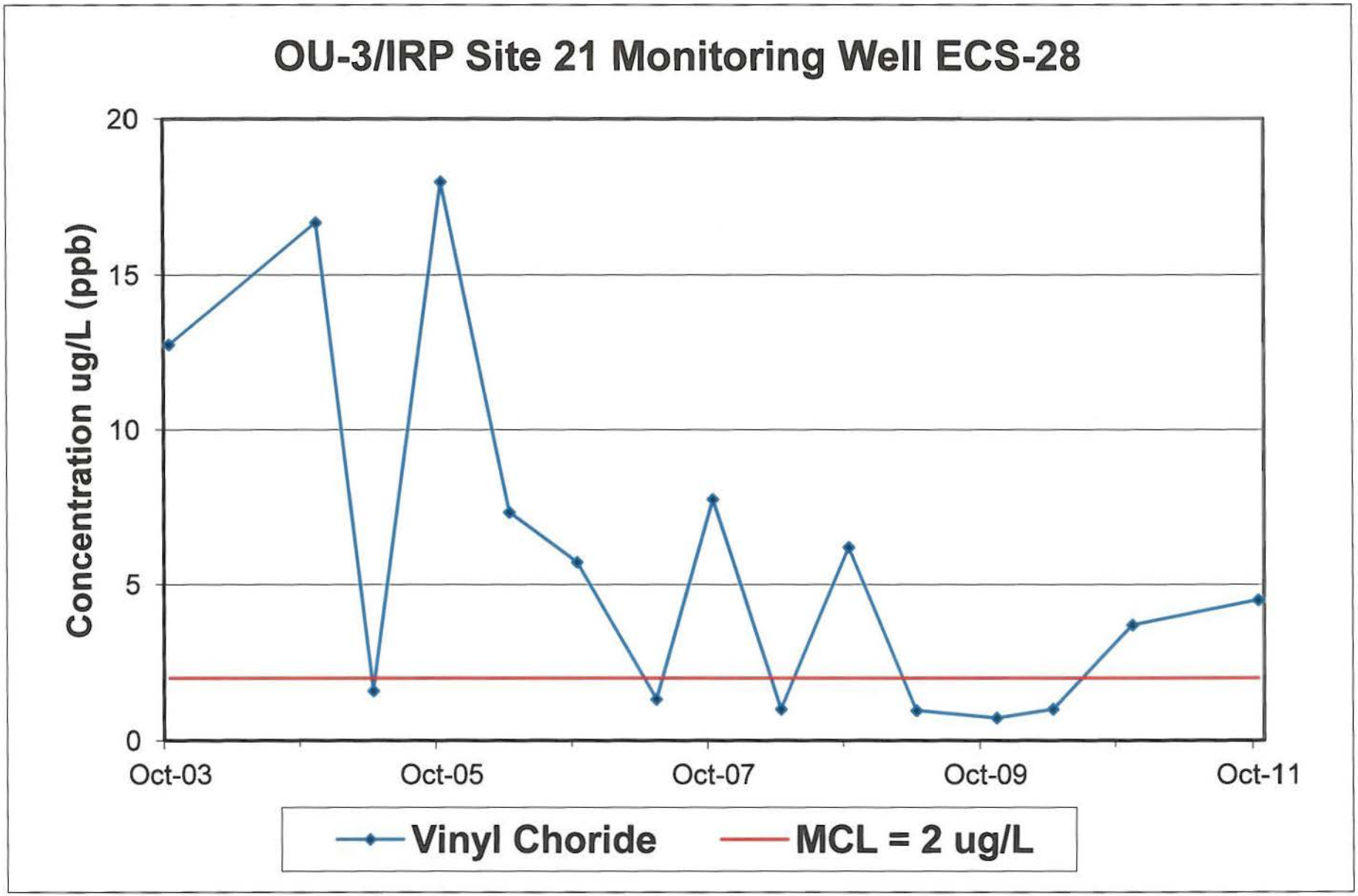

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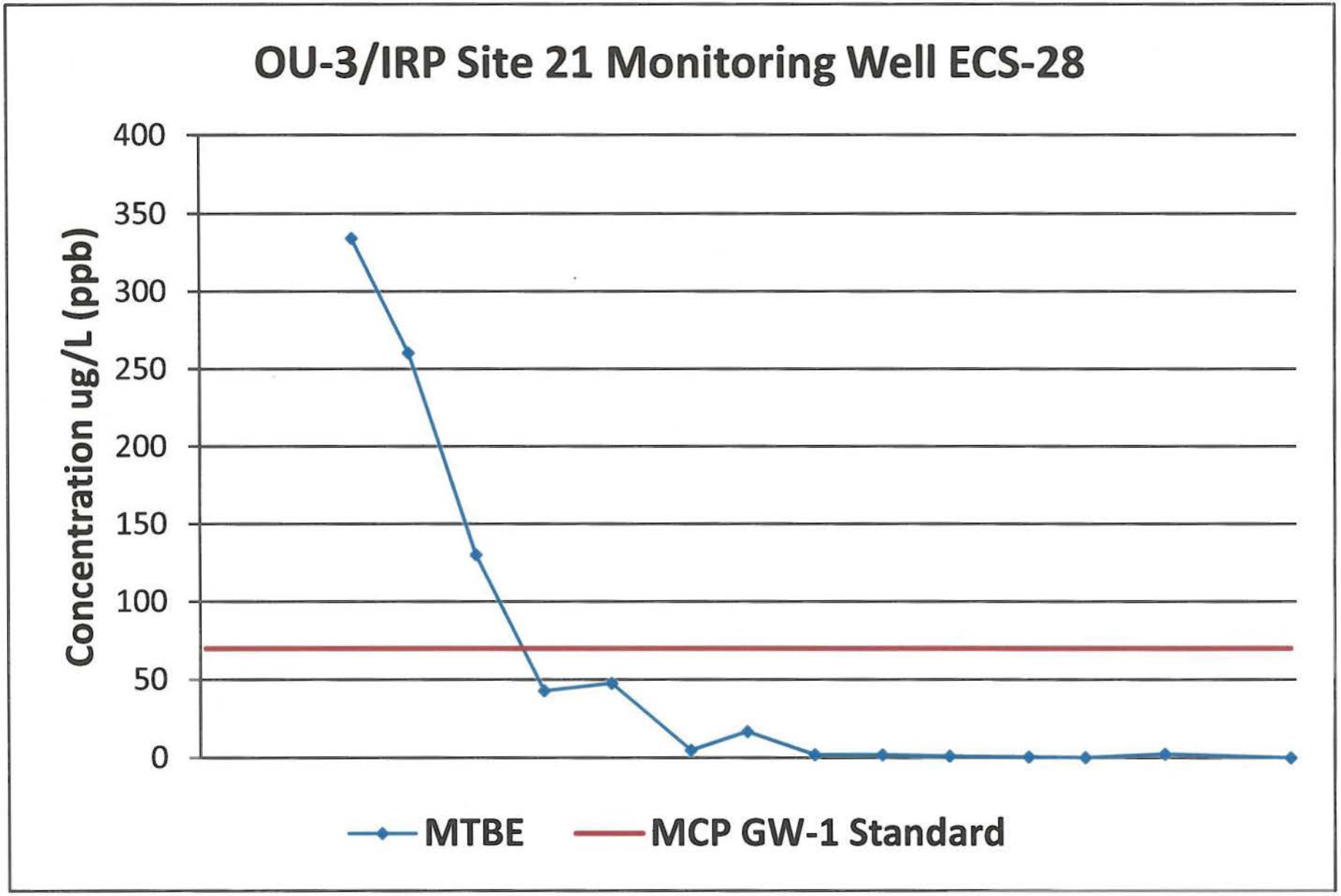

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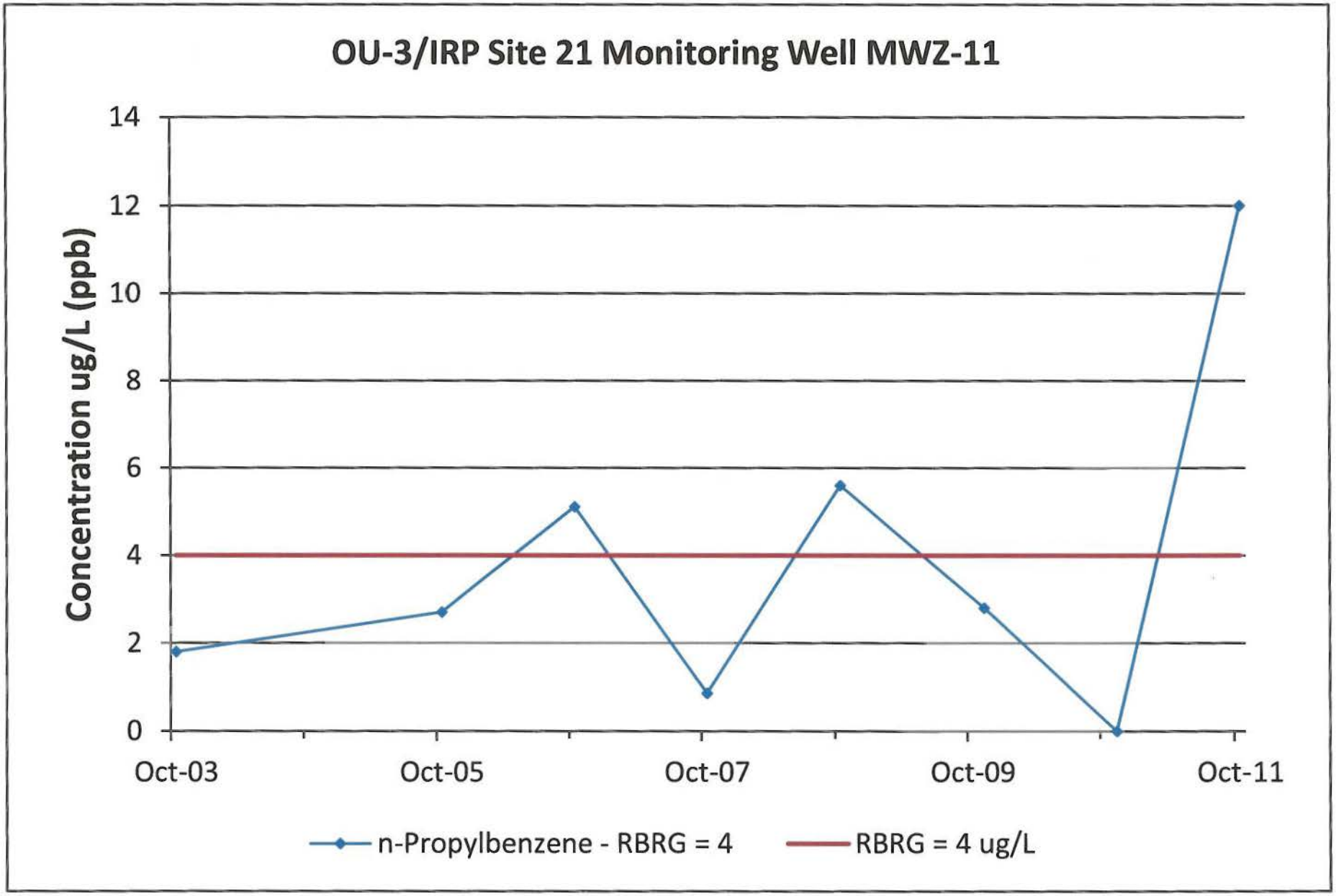

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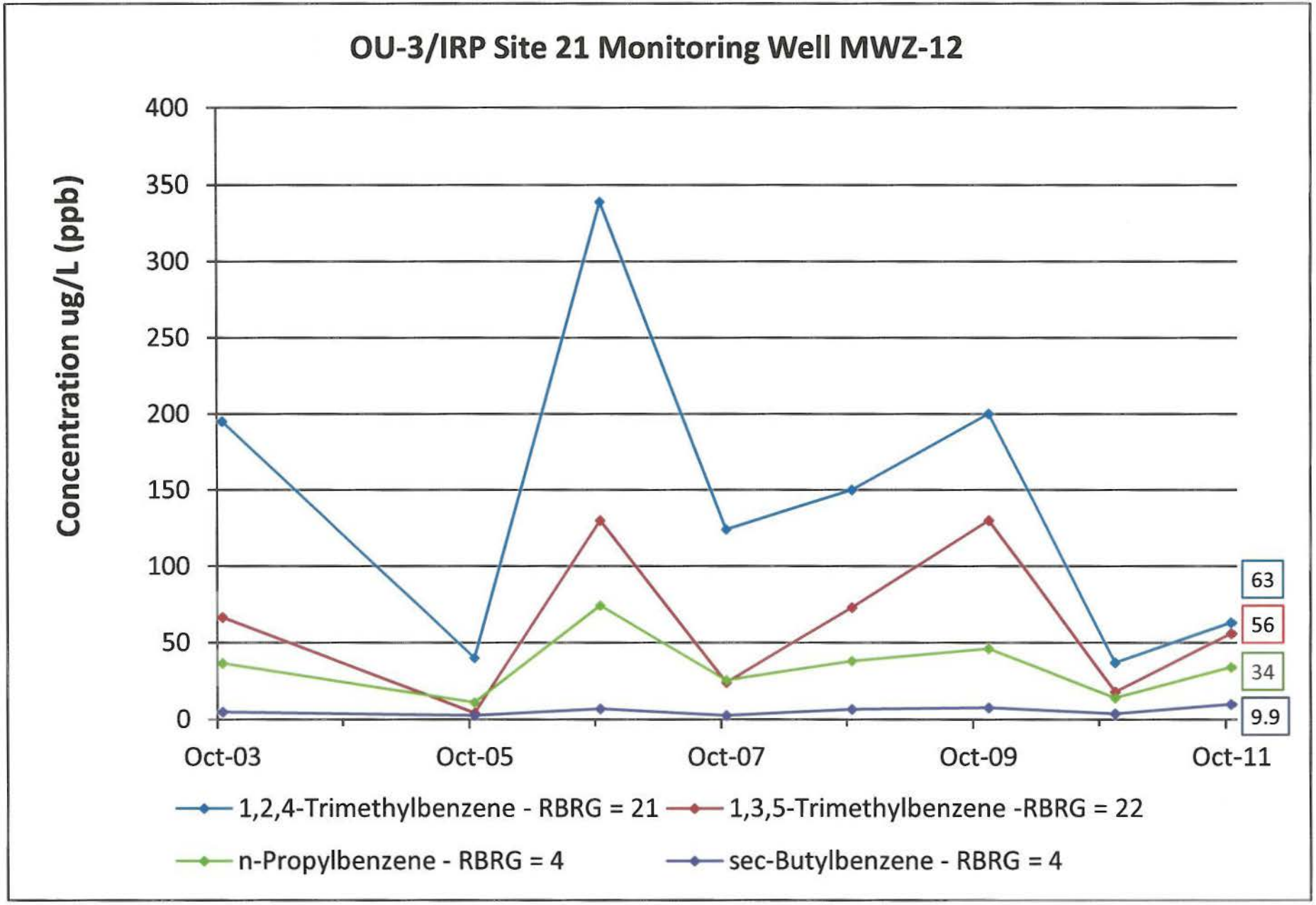

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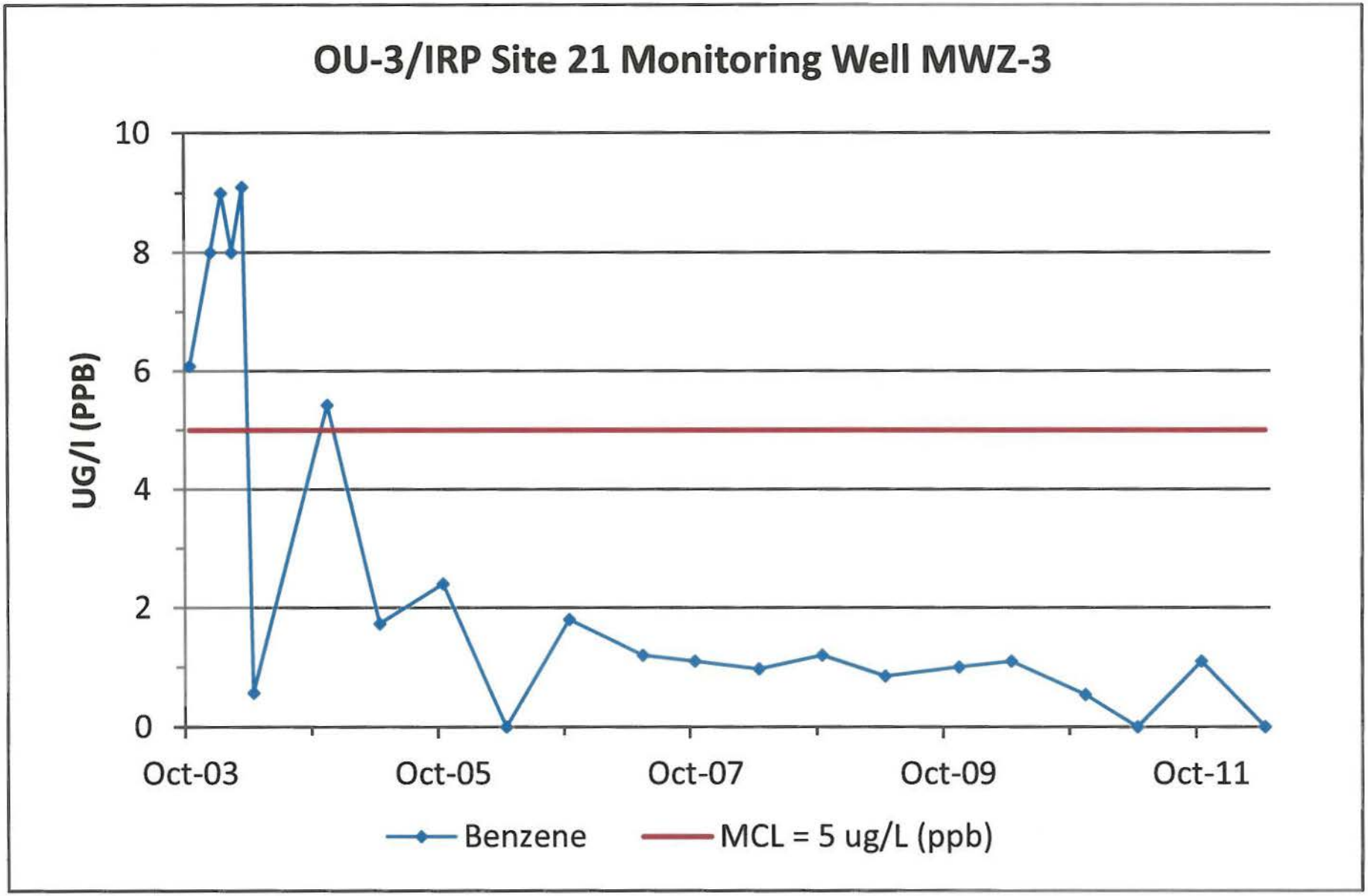

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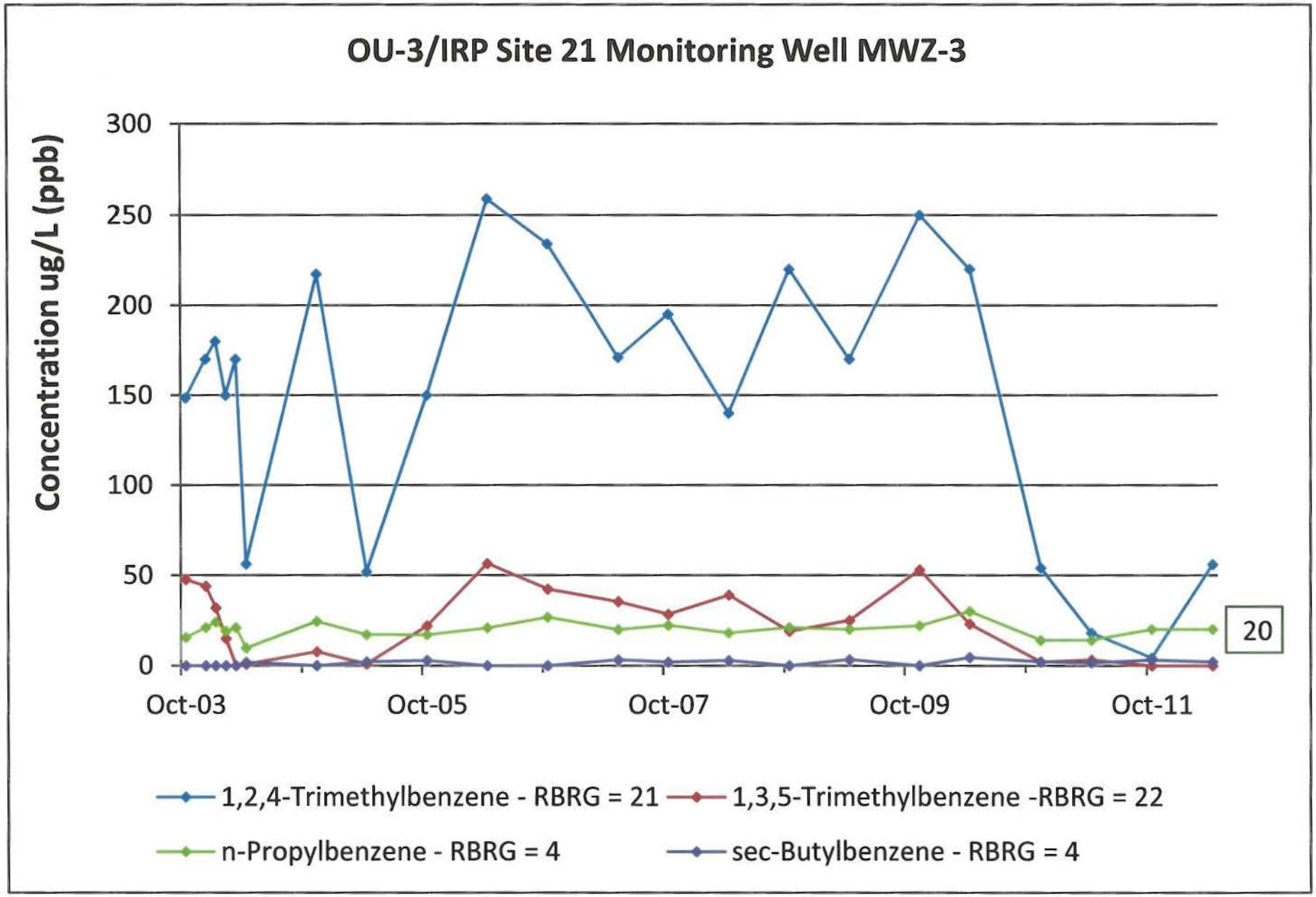

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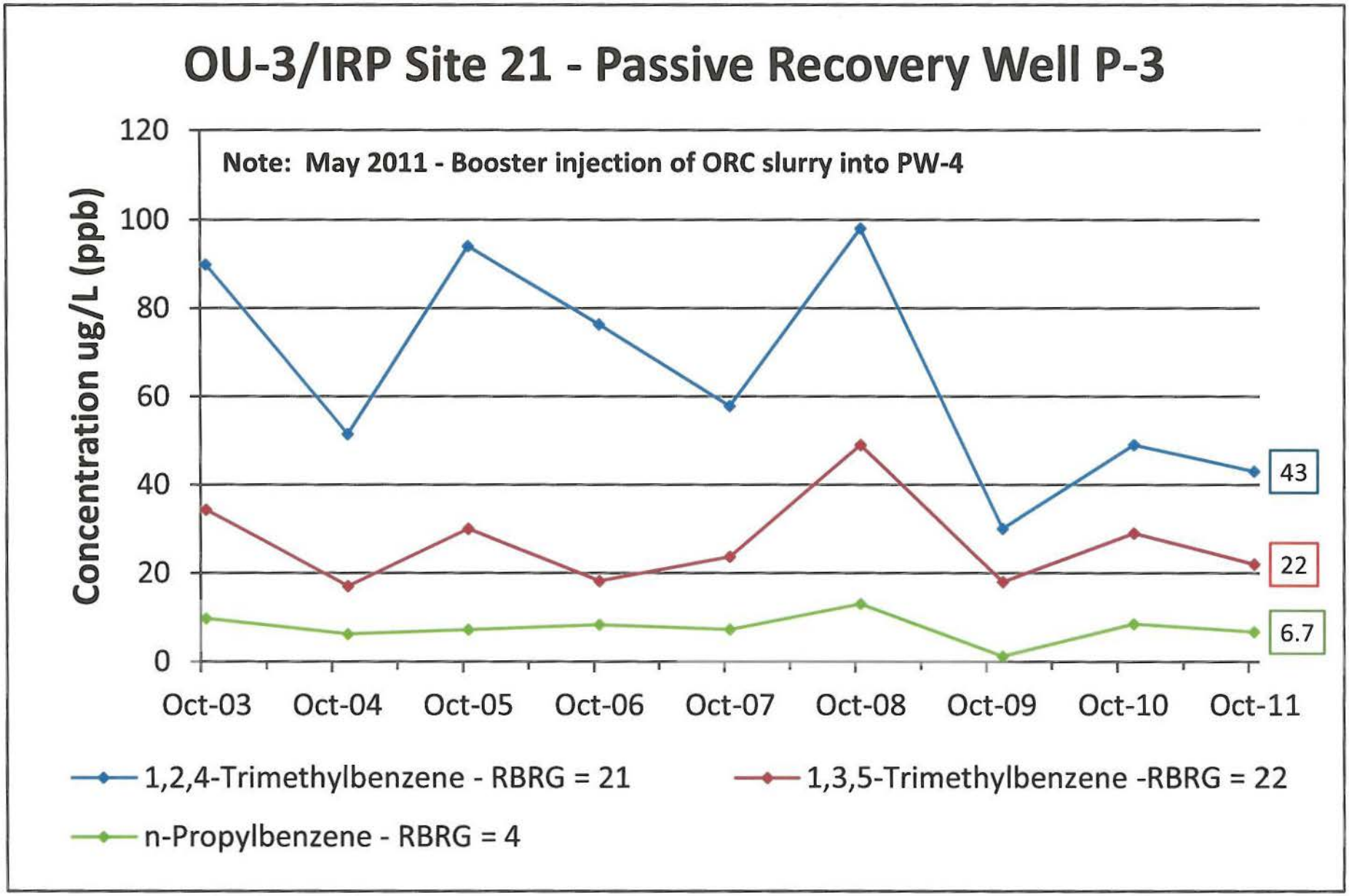

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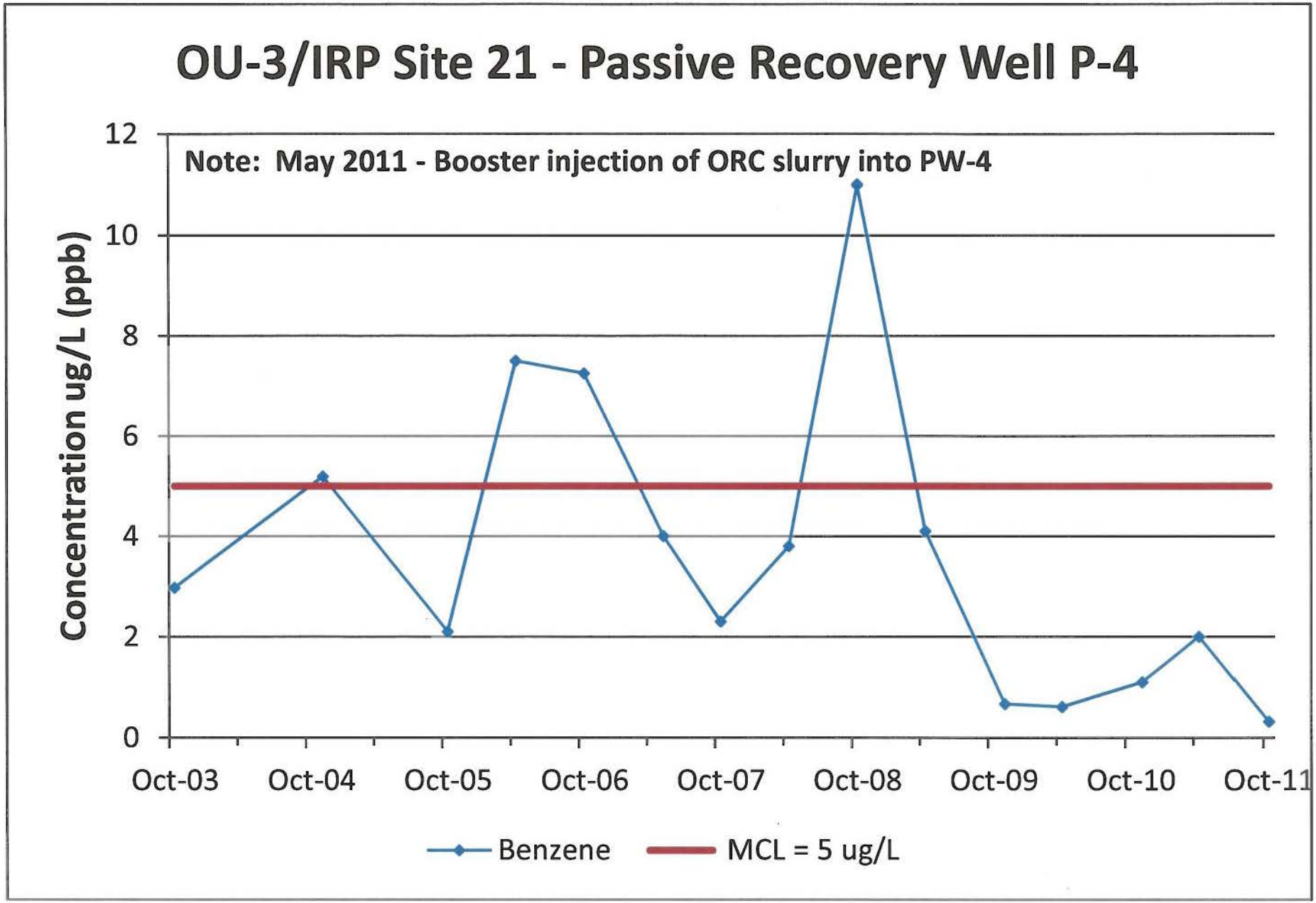

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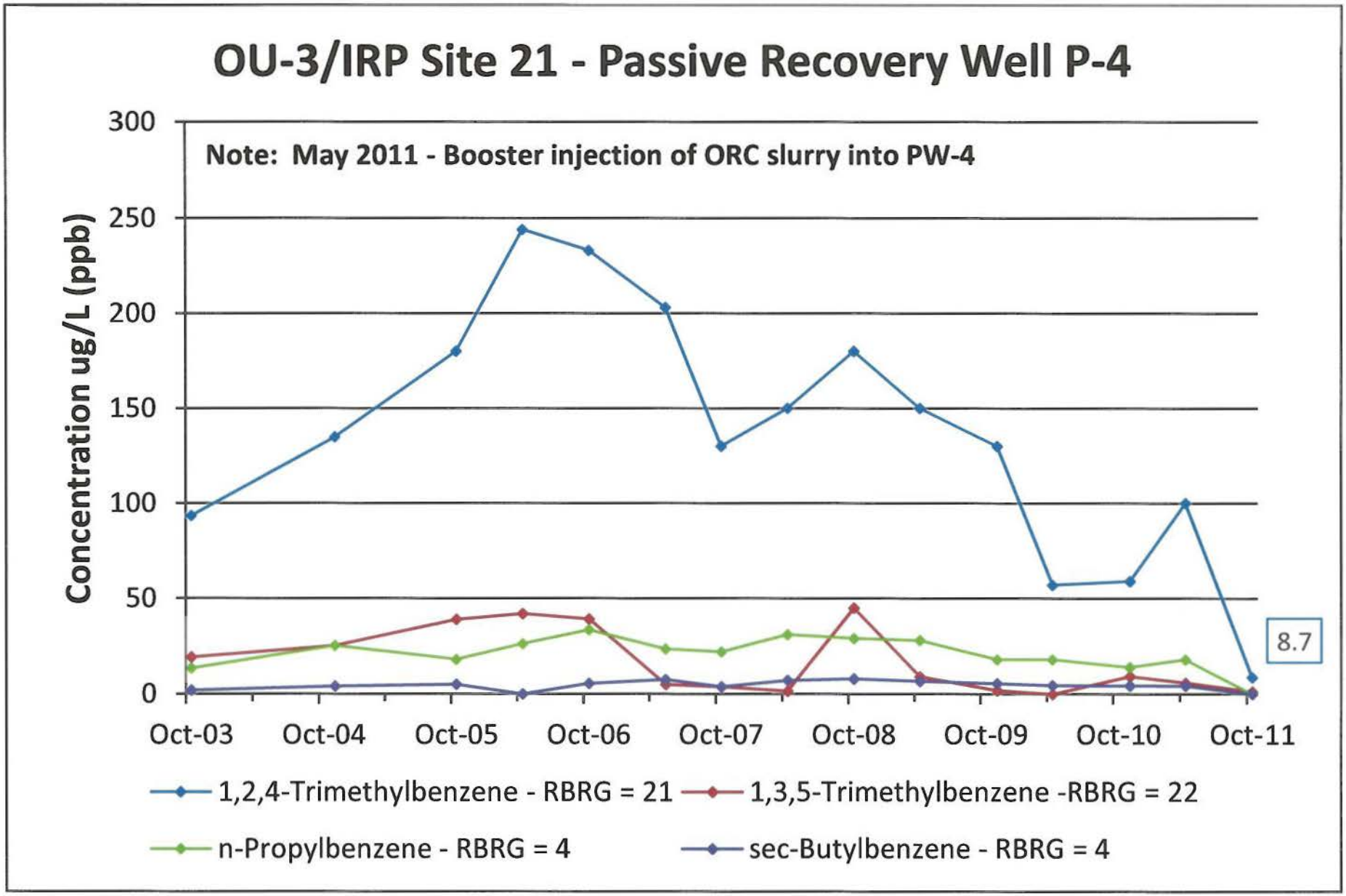

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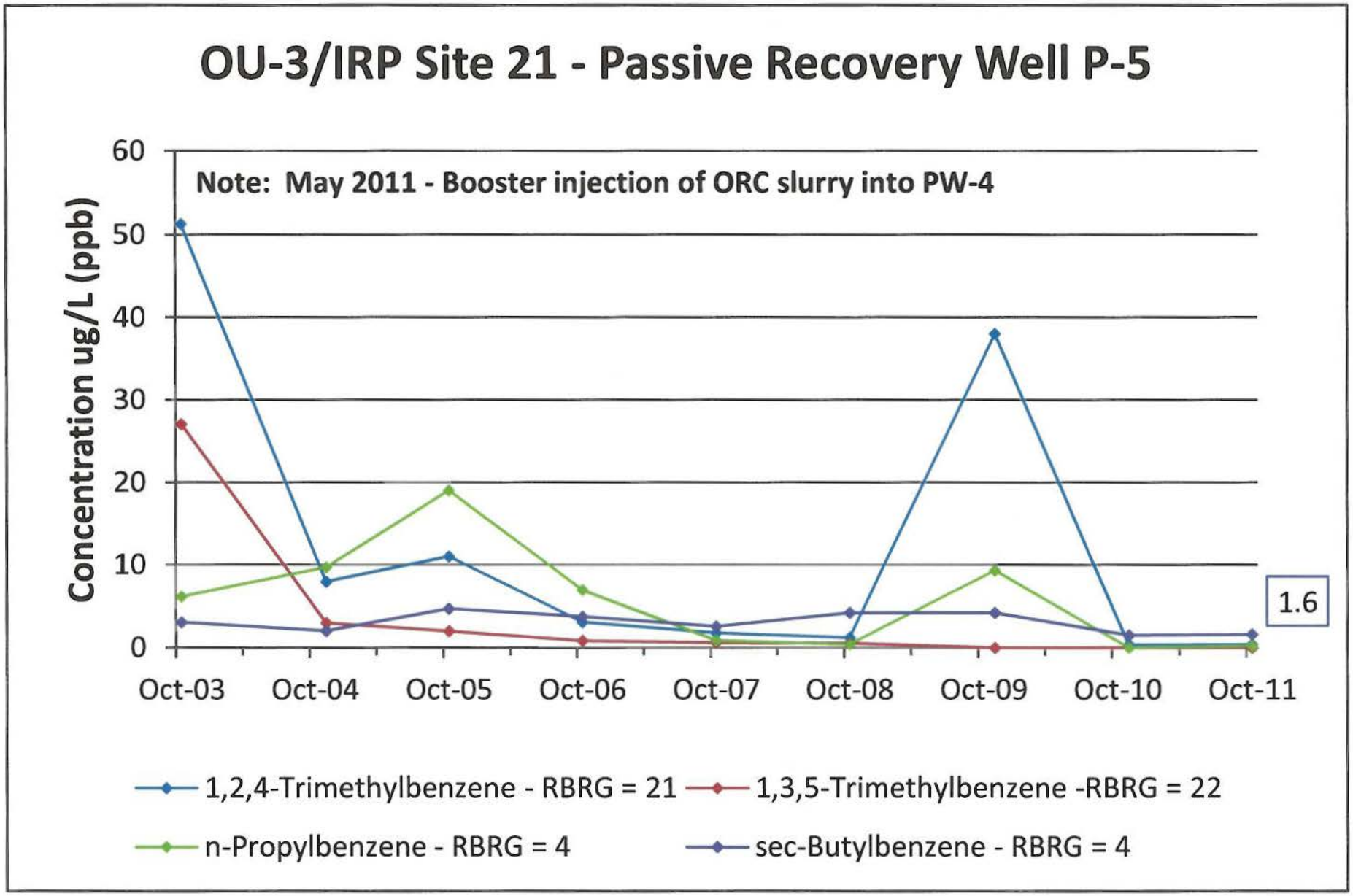

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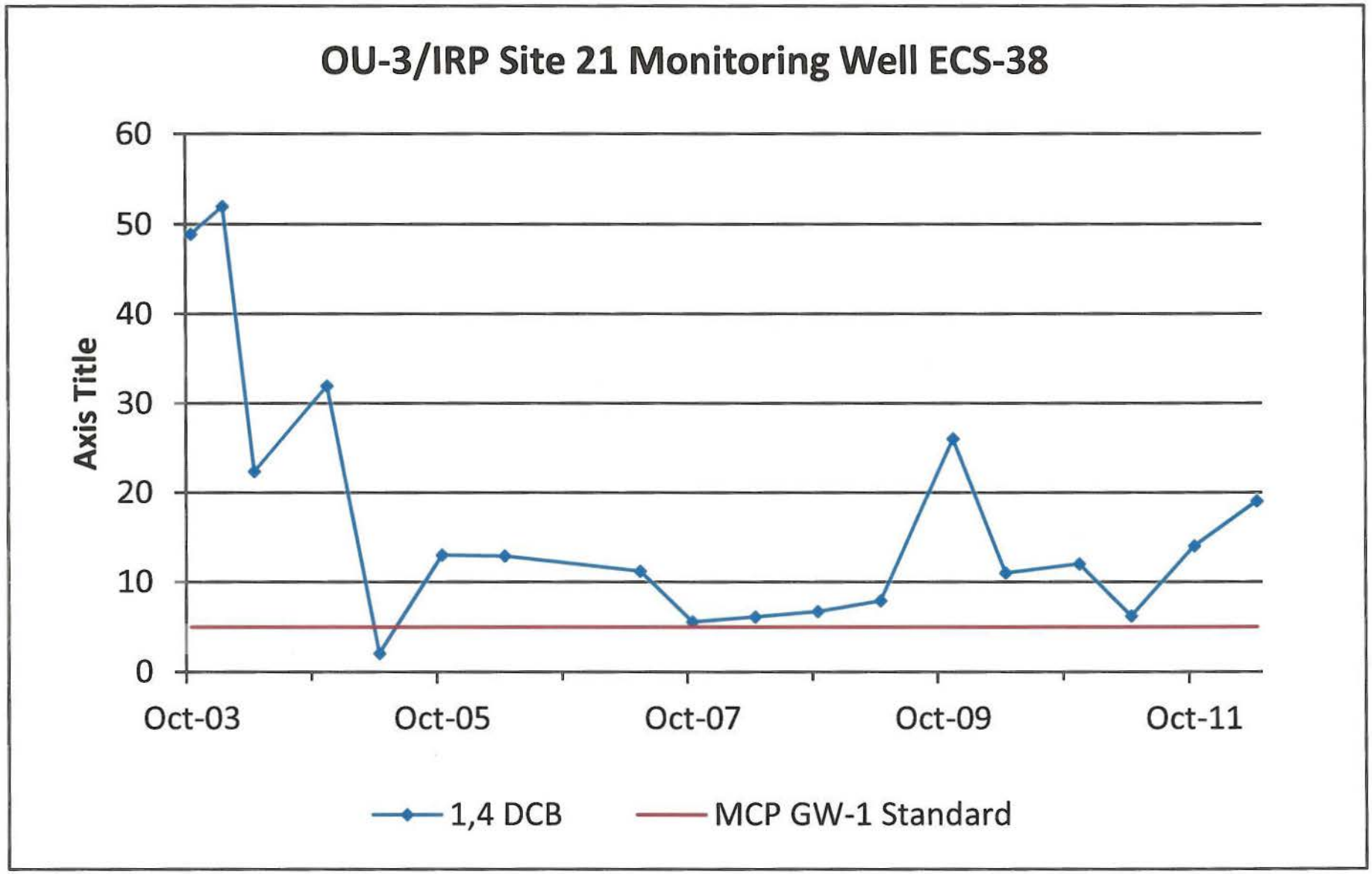

Attachment J – Land Use Controls/Institutional Controls (LUCs/ICs) Documentation

J-1 - Summary of LUCs/ICs included in the November 2003 Hanscom AFB General Plan Update

J-2 - Town of Bedford Conservation Commission's letter to the Hanscom AFB IRP Manager dated July 27, 2007, Subject: Hartwell Town Forest and Jordan Conservation Area

J-3 - Hanscom AFB Environmental Office Memorandum to the USEPA, Region I dated 4 September 2008, Subject: Land Use Controls including Institution Controls (LUCs/ICs) for Operable Unit 1 (OU-1) at the Hanscom Field/Hanscom AFB NPL Site

J-3-1 - Enclosure to Attachment J-3 - Bedford Town Manage letter to the Hanscom AFB Environmental Director dated 24 July 2008 which discusses restrictions on the land use and the use of groundwater by the Town of Bedford in off-base areas of contamination

1.2 Goals and Objectives

Goal 2: Protect the natural and man-made resources of the area.

Objective: Continue to implement and monitor the *Environmental (formerly "Installation")* Restoration Program *(ERP)*.

2.5 Constraints

Since the 1998 General Plan, several Installation Restoration Program (IRP) (now called Environmental Restoration Program, ERP) sites have been remediated (see section 4.3.3.) Any ground disturbance on the remediated sites still must be reviewed by the Hanscom AFB Environmental Manager before any digging begins.

2.7 Responsibilities

The following are general responsibilities identified throughout the General Plan Update document. These are significant responsibilities that need to be brought to the attention of the Commander and users of the Plan to provide that they are implemented.

Ground Disturbance

Since the 1998 General Plan, several Installation Restoration Program (IRP) (now called Environmental Restoration Program, ERP) sites have been remediated (see section 4.3.3.) Any ground disturbance on the remediated sites still must be reviewed and approved by the Hanscom AFB Environmental Office before any digging begins to provide that adequate precautions are taken to mitigate risks.

Land Use Changes at ERP Sites

No changes in the current land use of the (ERP) site can be made without the written approval of the USAF government oversight Environmental Office. Also EPA and MA DEP are to be notified for consultation 45 days in advance of proposed land use changes, which are inconsistent with the land use assumptions or land uses described in the remedy selection document.

Component Plan A-Composite Constraints and Opportunities

4.3 Natural, Cultural, and Environmental Constraints

Ground disturbing activities must be coordinated through and approved by the Base Environmental Manager. Construction projects, including roads and utilities work, and landscaping activities, can seriously impact the integrity of identified sites or create environmental hazards. Developable space at Hanscom AFB is extremely limited. A map depicting the environmental constraints is provided on page 4-3. Environmental constraints have been established to protect human health and the environment. In addition, current cultural and natural resource management requirements may affect project scopes, schedules and other Base programs, especially those involving ground disturbing activities or renovation of facilities.

4.3.1 Natural and Cultural Resources

4.3.1.5 Groundwater

Currently, groundwater within the Base is not used. At many places the groundwater contains naturally occurring dissolved iron and manganese concentrations that exceed the respective 0.3 mg/liter and 0.05 mg/liter limits for drinking water. In addition, the Environmental Restoration Program (ERP) studies have identified several areas on the Base and adjacent Hanscom Field where the groundwater has become contaminated by previous Air Force activities. The goal of the ERP is to clean up these sites and restore the groundwater to drinking water standards.

Many areas of the Base also are subject to high ground water conditions. This condition is typically found in or near wetlands and in the lower elevations of the Base. Groundwater is commonly encountered from three to seven feet below the surface. As a precaution, it is recommended that all subsurface excavations include provisions for de-watering operations, if needed. Also, for some de-watering operations a National Pollution Discharge Elimination System (NPDES) permit must be obtained.

4.3.1.6 Soils

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Some soils have severe limitations for dwellings and small commercial buildings without basements, and may not be suitable for economic construction. As a result, these areas pose a severe constraint to development. As is the case with groundwater ERP studies have identified several areas on the Base and adjacent Hanscom Field where the soil has become contaminated by historic Air Force activities. The goal of the ERP is to clean up these sites to eliminate risks to human health and the environment posed by contamination in the soil. As stated above, all ground disturbing activities must be coordinated through and approved by the Base Environmental Manager to provide that adequate precautions are taken to mitigate risks.

4.3.3 Environmental Restoration Program

Historical Air Force operations at Hanscom AFB and L.G. Hanscom Field involved generation, use, and disposal of numerous hazardous substances. As a result of past waste and resource management practices the groundwater and soil in areas of the Base and L.G. Hanscom Field became contaminated. In response DOD established an Installation Restoration Program (IRP) (now called Environmental Restoration Program, ERP) with the goal of "cleanup of the past". In addition to the restoration efforts, ongoing compliance, conservation, and pollution prevention efforts ensure that present waste and resource management practices are carried out in a manner that protects human health and the environment and are in compliance with applicable laws and regulations.

The ERP is a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-based Environmental Restoration Program. Both CERCLA (42 USC § 9620)

and the Defense Environmental Restoration Program (DERP, 10 USC § 2701) require that response actions be conducted in accordance with CERCLA and EPA implementing guidelines, rules, regulations, and criteria. Response actions at Hanscom AFB must fully comply with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP at 40 CFR Part 300). The ERP process is also used to integrate and accommodate RCRA corrective action and other environmental response requirements and processes under other applicable federal and state statutes where necessary and appropriate, i.e., the Massachusetts Contingency Plan (MCP) is the principal ERP response process at CERCLA petroleum exclusion sites.

ERP activities commenced in 1982 with regulatory oversight by the Massachusetts DEP. In 1994, Hanscom AFB/Hanscom Field was placed on the National Priorities List (NPL) and the U.S. EPA became the lead regulatory agency for the ERP sites covered by the NPL designation. The Base has identified a total of 22 ERP Sites and 1 ERP Area of Concern on both the Base and the adjacent Hanscom Field (Massport property which the Air Force used from 1942 until September 1973).

4.3.3.1 Closed-out ERP Sites/Areas of Concern

Investigations and appropriate response actions have been completed at the 14 ERP Sites and 1 ERP Area of Concern listed below. The determination that no further response action is required at these ERP Sites is in Decision Documents and the appropriate regulatory agencies have concurred with this determination.

Site 5 - Fire Training Area I
Site 7 - Industrial Wastewater Treatment System
Site 8 - Scott Circle Landfill
Site 9 - Administration Building Jet Fuel Spill
Site 10 - Mercury Spill at Building 1128
Site 11 - Various Fuel Spills on Runways and Taxiways
Site 12 - AAFES Service Station Gasoline Leak
Site 14 - Multi-site Underground Storage Tank Investigations
Site 15 - Multi-site Underground Storage Tank Removal
Site 16 – UST at Building T-860
Site 17 – UST at Building 1103
Site 18 – UST at Building 1102-C
Site 19 - Suspected Dump Site
Site 20 - Suspected Fire Training Area
ERP Area of Concern No. 1 – New Commissary Site

4.3.3.2 Sites with Remedial Actions in Place

ERP investigations and appropriate response actions are in place for the eight ERP Sites listed below. The selection of the specific remedy for these ERP Sites is documented in the NPL Records of Decisions, Remedial Action Plans and Air Force Decision Documents and the appropriate regulatory agencies have concurred with the remedies.

Specific IRP Land Use Controls/Institutional Controls

Remedial Actions at these sites will continue until the Remedial Action Objectives specified in the decision document are met and regulatory concurrence with the decision to terminate the response action is received. Also, to assure that human health and the environment are being protected by the remedial action being implemented, Five-Year Reviews are required to be conducted as long as hazardous substances, pollutants, or contaminants are or will be left on site above levels that allow for unlimited use and unrestricted exposure.

- **NPL Operable Unit 1** (Hanscom Field)
  Site 1 - Fire Training Area II
  Site 2 - Paint Waste Disposal Area
  Site 3 - Jet Fuel Residue Area /Tank Sludge Area
  Remedial Action - Groundwater Treatment and Monitoring

- **NPL Operable Unit 2** (Hanscom Field)
  Site 4 - Sanitary Landfill
  Remedial Action - Cap Inspection and Maintenance

- **NPL Operable Unit 3**
  Site 6 - Former Filter Bed Area/Landfilled Areas
  Remedial Action - Cap Inspection and Maintenance and Surface Water and Groundwater Monitoring
  Site 21 - Unit 1 Petroleum Releases
  Remedial Action - Product Removal, Groundwater Treatment and Monitoring

- **MCP Sites**
  Site 13 - Motor Pool Petroleum Releases
  Remedial Action - Monitored Natural Attenuation of Groundwater Contamination
  Site 22 - AAFES Base Service Station Petroleum Releases
  Remedial Action - Enhanced Monitored Natural Attenuation of Groundwater Contamination

4.3.3.3 Land Use Controls/Institutional Controls

No changes in the current land use of the site can be made without the written approval of the USAF government oversight Environmental Office. Also EPA and MA DEP are to be notified for consultation 45 days in advance of proposed land use changes, which are inconsistent with the land use assumptions or land uses described in the remedy selection document.

Land use controls (LUCs) include any type of physical, legal, or administrative mechanism that restricts the use of, or limits access to, real property to prevent or reduce risks to human health and the environment. Institutional Controls (ICs) as discussed in the NCP are a subset of LUCs, and are primarily legal mechanisms to ensure the continued effectiveness of land use restrictions as part of a remedial decision. The objective of LUCs is to provide that future land use remains compatible with the land use that was the basis

for evaluation, selection, and implementation of the response action. LUCs are a common component of any response action that does not allow for unrestricted land use following the completion of the response action or when the response action allows for unrestricted use, but there is a need to protect the integrity of the remedy. Specific LUCs that apply to Hanscom AFB ERP Sites include:

- No drinking water wells are allowed on the site and untreated contaminated groundwater recovered from the site cannot be used for any purpose.
- Any digging, excavation, or groundwater use on the site must be approved by the Base Environmental Office in writing and, once approved, be conducted in accordance with a site-specific health and safety plan.

4.4 Operational and Built Constraints

This section describes the operational and built constraints at Hanscom AFB. Some of these constraints are related to facilities and operations at Massport's adjacent L.G. Hanscom Field. A map depicting the operational constraints is provided on page 4-23.

4.4.1 Airfield Clearance

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Restrictions

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The Building Restriction Line (B.R.L.) is another restriction associated with the airport that affects Hanscom AFB property. This crosses the extreme northeast corner of the Base. No development is allowed north of that building restriction line. This area covers four acres of the Base.

4.6 Summary of Composite Constraints, Opportunities

There are many issues that constitute potential constraints to future development on the Base. However, the issues identified as constraints do not typically represent "fatal flaws." Constraints often do not mean that development in the area is precluded. Instead, knowledge of constraints should be used during decision making, recognizing that constraints will present challenges to development. The Composite Constraints Map, provided on page 4-29, depicts the environmental and operational constraints located on the Base and includes:

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Environmental Restoration Program Sites

As a result of past waste and resource management practices the groundwater and soil in areas some areas of the Base and Hanscom Field have become contaminated by various toxic and/or hazardous compounds. Land Use Controls have been established for the ERP Sites to provide that future land use remains compatible with the land use that was the basis for evaluation, selection, and implementation of the response action. Therefore,

ERP sites constitute constraints to future development. Even cleaned up sites pose development constraints and any proposed projects must be reviewed and approved by the Environmental Flight.

Airfield Clearance

The Base is affected by the FAA building restrictions related to the safe operation of the airport. The airport's Building Restriction Line (B.R.L.) crosses the extreme northeast corner of the Base. No Base development is allowed north of that line. Runway approach and transition surfaces are also determined by the FAA and restrict the height of development south of the B.R.L., with height allowances increasing as the distance from the B.R.L. increases. New construction or alterations at Hanscom AFB require filing a notice of proposed construction or alteration (FAA Form 7460-1) with the FAA to determine height allowances in the general vicinity of the airport. Most structures on the Base are limited to a total height of 283 feet above Mean Sea Level (MSL).

Component Plan C-Land Use

4.13 Land Use

The following discussions update Chapter 4, Component Plan C, Land Use in the 1998 General Plan for Hanscom AFB. Since the land use changes are largely minor, the entire chapter is not reissued, only changes are noted here. In effect, the land use recommendations in the 1998 Plan have been implemented by 2003. Therefore, the existing land use pattern at the Base is now essentially the same as the Future Land Use Plan in the 1998 document.

4.14 Existing Land Use

The existing pattern of land uses at the Base as of February 2003 has changed reflecting implementation of recommendations in the 1998 General Plan to improve the functional relationships of the different land uses. The two major land use changes made consolidated Acquisition Management uses into the Electronic Systems Center (ESC) campus and consolidated Community Commercial uses along Barksdale Street, in effect, the Base's "Main Street". The following changes were made to the Existing Land Use Map in the 1998 Plan to reflect changes since then (see map on page 4-36).

4.14.1 Installation Land Use

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- Most of the area designated Industrial at ERP S 6 in the Building 1800 series area was changed to Open Space since Land Use Controls associated with the ongoing remedial action constrain development.

4.15 Future Land Use

4.15.1 Installation

The future land use pattern at Hanscom AFB is not likely to be substantially different than the existing land use pattern in 2003. As mentioned earlier, the Existing Land Use map and the Future Land Use plan in this General Plan Update are virtually the same. This is because the Future Land Use Plan in the 1998 General Plan has largely been implemented by 2003. The following differences are shown on the Future Land Use Plan (page 4-42):

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-
-

The area of ERP Site 6 has been changed to Open Space from Industrial.

Attachment J – Land Use Controls/Institutional Controls (LUCs/ICs) Documentation

J-2 - Town of Bedford Conservation Commission's letter to the Hanscom AFB IRP Manager dated July 27, 2007, Subject: Hartwell Town Forest and Jordan Conservation Area

TOWN OF BEDFORD

BEDFORD, MASSACHUSETTS 01730

TTD/TTY: 781-687-6124

CONSERVATION COMMISSION

Robert Kenyon
Chair
Elizabeth Bagdonas
Conservation Administrator

Town Hall
10 Mudge Way
Bedford, MA 01730-2144
Phone 781-275-6211
Fax 781-275-1334
Email elizabeth@town.bedford.ma.us

July 27, 2007

Mr. Thomas Best, IRP Manager
66 MSG/CEG, 120 Grenier Street
Hanscom Air Force Base, MA 01731

Re: Hartwell Town Forest and Jordan Conservation Area

Dear Mr. Best:

The attached correspondence from Joseph O'Keefe requests information on the management and land use status of two Bedford conservation areas, the Hartwell Town Forest and George Jordan Conservation Area.

In 1940, the Hartwell Town Forest was accepted by the Town as a gift, "to be placed under the Town Forest Act". *[Reference: History of Hartwell Town Forest]*

The 1957 Conservation Commission Act (Massachusetts General Laws Chapter 40 section 8C) authorized the establishment of a locally appointed municipal agency (the Commission), whose role was to protect natural resources, acquire important land and water areas, and manage these properties for conservation and passive recreation. *[Reference: MACC Environmental Handbook, p. 1]*

At the 1977 Annual Town Meeting, the Town voted to assign jurisdiction over Hartwell Town Forest to the Conservation Commission. According to a 1997 opinion from Town Counsel, a town forest is part of the "public domain" under section 19 of C. 45 of the General Laws. Section 19 says in relevant part that "such public domain shall be devoted to the culture of forest trees, or to the preservation of the water supply of such city or town…"

TOWN OF BEDFORD
BEDFORD, MASSACHUSETTS 01730

TTD/TTY: 781-687-6124

Chapter 40, section 15A requires the Conservation Commission to approve change in use and/or transfer of control, but this law does not entirely override the forest's public trust status since it was a gift to the town. For that matter, town meeting must also agree to a change in both use and control. The potential change in use and the nature of the change in legal or physical control would also need to be analyzed in light of Article 97 which protects the public right to freedom from excessive and unnecessary noise, among others. Article 49 of the Articles of Amendment to the Massachusetts Constitution (inserted in its present form by the 97th Article of Amendment in 1972) says in relevant part:

> "The people shall have the right to clean air and water, freedom from excessive and unnecessary noise, and the natural, scenic, historic, and aesthetic qualities of their environment; and the protection of the people in their right to the conservation, development and utilization of the agricultural, mineral, forest, water, air and other natural resources is hereby declared to be a public purpose." *[Reference: 1997 Town Counsel Report]*

The George Jordan Conservation Area was conveyed to the Town in 1971 "through its Conservation Commission, for administration, control and maintenance", under the provisions of Massachusetts General Laws, Chapter 40, section 8C – the "Conservation Commission Act". The option to purchase, further states that the land shall be "managed and controlled by the Conservation Commission of the Town of Bedford for the promotion and development of the natural resources and for the protection of the watershed resources of said Town."

Please do not hesitate to contact the Commission if you would like more information on the Hartwell or Jordan conservation areas.

Sincerely,

Elizabeth J. Bagdonas

Elizabeth J. Bagdonas
Conservation Administrator

Attachment J – Land Use Controls/Institutional Controls (LUCs/ICs) Documentation

J-3 - Hanscom AFB Environmental Office Memorandum to the USEPA, Region I dated 4 September 2008, Subject: Land Use Controls including Institution Controls (LUCs/ICs) for Operable Unit 1 (OU-1) at the Hanscom Field/Hanscom AFB NPL Site

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 66th MISSION SUPPORT GROUP (AFMC)
HANSCOM AIR FORCE BASE MASSACHUSETTS

U.S. AIR. FORCE

4 September 2008

MEMORANDUM FOR: Mr. Matthew Audet
U.S. Environmental Protection Agency, Region I
1 Congress St., Suite 1100 (HBT)
Boston, MA 02114-2023

FROM: 66 MSG/CEV, 120 Grenier Street, Hanscom AFB, MA 01731-1910

SUBJECT: Land Use Controls including Institution Controls (LUCs/ICs) for Operable Unit 1 (OU-1) at the Hanscom Field/Hanscom AFB NPL Site

Reference: July 24, 2008 letter to the undersigned from the Bedford Town Manager, Mr. Richard T. Reed, concerning restrictions on land use and the use of groundwater in Bedford's Jordan Conservation Area and the Hartwell Town Forest.

1. LUCs/ICs are components of the remedy selected by the 2007 Record of Decision (ROD) for OU-1. The LUCs/ICs that are being maintained, monitored and enforced to control access to the three source areas on Hanscom Field and OU-1 contaminated groundwater are documented in Section 2.13.3, Description of Remedial Action of the ROD. These LUCs/ICs were also discussed in the OU-1 Remedy Implementation paragraphs in Section IV of the 2007 Third Five-Year Review Report for the Hanscom Field/Hanscom AFB Superfund Site.

2. The subject letter was requested by this office to fulfill the specific requirement listed in Section 2.13.3 of the ROD concerning the town establishing restrictions prohibiting the construction of wells and the use of groundwater in any documented or anticipated area of groundwater contamination. As noted in the reference letter the town already has a previously unreported/undocumented IC in place concerning the installation of wells. Specifically Section 8 of Bedford Board of Health Code of Health Regulations requires that any landowner obtain a permit for the installation of wells anywhere in the Town of Bedford. While this does not specifically "prohibit" wells in the referenced conservation lands it does ensure that the Board of Health would be involved in the decision. This permit requirement in conjunction with the Land Use restrictions documented both in the ROD and in the referenced letter and with the Board of Health's knowledge of the groundwater contamination in the reference conservation lands should ensure that wells are not installed in any documented or anticipated area of groundwater contamination.

3. As stated in the ROD the Air Force is responsible for ensuring that the LUCs /ICs described in the ROD continue to be in place, are reported on, and enforced to ensure that the LUCs are effective and protective of human health and the environment. In this regard, the Hanscom AFB environmental office has been monitoring activities on Hanscom Field and in the Bedford

conservation lands for several years to ensure that these activities did not impact the on-going remedial action or threaten human health or the environment. The formal reporting of this monitoring was initiated in June 2002 by including the statement in the monthly OU-1 Remedial Action Report that "there continues to be no evidence of unauthorized activities at Sites 1, 2 and 3 and no evidence that the OU-1 groundwater is being used for drinking water purposes". Please note that this statement is based both on observations by this office and on observations by our remedial action-operations contractor's on-site staff in the course of their OU-1 system operation, maintenance and monitoring duties.

4. This office also maintains a good working relationship with key Hanscom Field and Town of Bedford personnel in regards to activities on Hanscom Field and Hanscom AFB that could impact Bedford, Massport and/or the Air Force. This relationship includes written communications/reports and periodic discussions meetings concerning operational, safety and environmental compliance requirement in addition to Hanscom AFB remedial actions. Hanscom AFB has been furnished the opportunity to review and comment on Massport's L.G. Hanscom Field Environmental Status and Planning Report (ESPR) which is issued every five years. Massport also includes Hanscom AFB in the planning stages of their activities which have an environmental impact, e.g., in 2007 Massport coordinated with this office during the planning stage for new storm water detention/infiltration facilities and also on the design of a Runway Safety Area (RSA) project.

5. In the OU-1 ROD Hanscom AFB committed to have "discussions at least annually, or more often if warranted between Massport and Bedford officials and the Hanscom AFB IRP Manager to verify that untreated groundwater within OU-1 is not being used for any purpose, and that there is no unauthorized digging at IRP Sites 1, 2 and 3". As noted in paragraph 4 above there have been periodic discussions/meetings over the years. In 2008 both the undersigned and our IRP Manager, Mr. Thomas Best have had several discussions and/or meetings with Ms Elizabeth Bagdonas, Bedford's Conservation Administrator, Mr. David Black, Bedford's Director of Public Health, Mr. James Mathieu, Hanscom Field Manager of Operations and Mr. Erik Bankey, Massport's Environmental Unit in which the Hanscom AFB IRP has been the central issue. Mr. Best also coordinated with Mr. Don Corey, former Bedford Selectman/member of both the Hanscom AFB and NWIRP RABs, to obtain the referenced letter from Mr. Reed.

6. In view of the information contained in this Memorandum and the OU-1 ROD Hanscom AFB is of the opinion that the selected remedy is fully in-place. We will continue to formally report on the status of the remedial action to include LUCs/ICs via the monthly Remedial Action Report and annual LTM Report. Also this office and our environmental support contractor will continue to be ever vigilant in monitoring activities on Hanscom Field and in the Bedford

conservation lands to ensure that these activities did not impact the on-going remedial action or threaten human health or the environment.

DONALD C. MORRIS, P.E.
Environmental Director, Civil Engineering

Attachment: Referenced letter from the Bedford Town Manager

CF: Ms Jennifer Roberge, Remedial Project Manager, MADEP
Ms Elizabeth Bagdonas, Bedford Conservation Administrator
Mr. David Black, Bedford Director of Public Health
Mr. Donald Corey, Hanscom AFB RAB Member
Mr. James Mathieu, Operations Manager, L.G. Hanscom Field
Mr. Mark Pearson, Community Co-Chair, Hanscom AFB RAB
Mr. Ed Conroy, Environmental Services Project Manager, Metcalf & Eddy, Inc.

Attachment J – Land Use Controls/Institutional Controls (LUCs/ICs) Documentation

J-3-1 - Enclosure **to Attachment J-3** - Bedford Town Manage letter to the Hanscom AFB Environmental Director dated 24 July 2008 which discusses restrictions on the land use and the use of groundwater by the Town of Bedford in off-base areas of contamination

TOWN OF BEDFORD

BEDFORD, MASSACHUSETTS 01730

TTD/TTY: 781-687-6124

Richard T. Reed, *Town Manager*

Town Hall
Bedford, MA 01730
781-275-1111

July 24, 2008

Mr. Donald C. Morris, P.E,
Environmental Director, Civil Engineering
66th MSG/CEGV
120 Grenier Street
Hanscom AFB, MA 01731

Dear Mr. Morris:

The purpose of this letter is to address concerns of the US EPA and Mass DEP regarding restrictions on land use and the use of groundwater by the Town of Bedford in off-base areas of contamination.

Please be advised of the following:

1. Representatives of the Town of Bedford were given the opportunity to review and comment on Hanscom AFB's 2007 Record of Decision (ROD) for NPL Operable Unit 1 at Hanscom Field/Hanscom AFB, MA. While no formal comments were offered by my office, we noted that this ROD continues the commitment that Hanscom AFB made in the mid-1980's to fast track the investigation and cleanup of the groundwater contamination which was originating from three (3) source areas on Hanscom Field for which the Air Force accepted responsibility.

The Town of Bedford has been kept informed as to each step in the CERCLA process to reach the current on-going remedial action stage. The Monthly Remedial Actions Reports provided to the Conservation Administrator and Director of Public Health, together with the Long-Term Monitoring Reports provided to the Director of Public Health, document the continued progress towards complete aquifer restoration. Also, key members of the Town are kept up-to-date as to the status of the remedial action by periodic meetings with representatives of the Hanscom AFB Environmental Office and by attending the Hanscom AFB Restoration Advisory Board (RAB) meetings or by review of minutes and handouts from the RAB meetings.

2. In regards to the Town's conservation lands known as the Hartwell Town Forest and the Jordan Conservation Area (where Community Gardens are located), we have been asked by your office to outline the current use restrictions and the basis for those restrictions. The management and land use for these areas are outlined in the Conservation Commission's July 27, 2007, letter, which has been incorporated as Appendix G to the September 2007 ROD for NPL Operable Unit 1 at Hanscom Field/Hanscom AFB, MA. As noted in that letter, the bases for the restrictions of these lands are the Massachusetts General Laws and the Massachusetts Constitution. While it may be possible to change the land use, it would be a difficult process that would require public and regulatory involvement.

When the Town was accepted in MWRA's Water Division, one of the mandatory requirements was that Bedford would maintain its currently active municipal drinking water wells and would attempt to reactivate other wells that were shut down due to contamination whenever public health considerations

permit and/or economic feasibility allows. This would include the Hartwell Road Wellfield, although the Hartwell Town Forest and Jordan Conservation Area are too far downgradient to impact those wells.

The Town has also adopted an Aquifer Protection District Bylaw, found at Section 13 of the Bedford Zoning Bylaws. It was developed based on DEP's model ordinance and has rigorous use regulations for properties located within any Aquifer Protection District. The Aquifer Protection Districts are delineated on a map entitled "Hydrogeologic Zones for Bedford Water Supply Wells", which was developed by the town's consultant and is a part of the Zoning Bylaw. All of Hanscom AFB's and Mass. Port Authority's land located in Bedford is either in the Hartwell Road Wellfield Zone II or the currently operational Shawsheen Road Wellfield Zone III. Both Hartwell Town Forest and Jordan Conservation Area, which are drained to the Shawsheen River via Hartwell Brook, are also in the Shawsheen Road Wellfield Zone III. No evidence of contamination has been found in the groundwater from the Shawsheen Wells, and the Town would not consider changes in its upgradient land or groundwater usage that might compromise those wells.

Additional institutional controls that are in-place include the requirement for any landowner to obtain a permit from the Board of Health to install wells anywhere in the Town of Bedford. This requirement is documented within Section 8 of Bedford Board of Health Code of Health Regulations (Private Wells) adopted under authority of Chapter 111, Section 31 of Massachusetts General Laws. Please note that to the best of our knowledge the Board of Health has never issued a drinking water well permit in the immediate vicinity of the Hartwell Town Forest or the Jordan Conservation Area. Also both the Conservation Administrator and representatives of the Hanscom AFB Environmental Office frequently visit these areas and have never reported an unauthorized well in these areas.

3. At this time we cannot envision a scenario that would require the Town to attempt changes in the land use of the Hartwell Town Forest and/or the Jordan Conservation Area. Any proposed change in land use or use of the groundwater as a drinking water source would also initially have to be reviewed and approved by the Conservation Commission, which, as noted above, is well aware of the potential for groundwater contamination in these areas. However, by a copy of this letter, I am requesting that both the Board of Health and the Conservation Commission ensure that the Hanscom AFB Environmental Office is immediately notified in case any changes are proposed in the land and/or groundwater use in the Hartwell Town Forest and/or the Jordan Conservation Area.

Finally, please continue to use our Director of Public Health, Mr. David Black, and our Conservation Administrator, Ms Elizabeth Bagdonas, as the points of contact for matters concerning the groundwater contamination within the Hartwell Town Forest and/or the Jordan Conservation Area.

Very truly yours,

Richard T. Reed

Richard T. Reed
Town Manager

cc: Matthew Audet, Remedial Project Manager, EPA
Jennifer Roberge, Remedial Project Manager, EPA
Tom Best, Project Manager, HAFB
Mark Pearson, HAFB-RAB Community Co-Chair
Donald Corey
Richard Warrington, DPW Director
David Black, Health Director
Elizabeth Bagdonas, Conservation Administrator