FIVE-YEAR REVIEW REPORT FOR BAIRD & MCGUIRE SUPERFUND SITE NORFOLK COUNTY, MASSACHUSETTS

Prepared by

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9/30/14
Date

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LIST OF ACRONYMS

AAL	Acceptable Ambient Air Level
ARAR	Applicable or Relevant and Appropriate Requirement
AUL	Activity and Use Limitation
AWQC	Ambient Water Quality Criteria
BOH	Board of Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act, 42 USC § 9601 et seq.
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COC	Contaminant of Concern
COD	Chemical Oxygen Demand
COPC	Contaminant of Potential Concern
CWA	Clean Water Act
DEM	Department of Environmental Management
DEQE	Massachusetts Department of Environmental Quality Engineering
DOT	Department of Transportation
EO	Executive Order
EPA	Environmental Protection Agency (U.S. EPA - Region 1)
ERA	Ecological Risk Assessment
ERED	Environmental Residue Effects Database
ESD	Explanation of Significant Differences
EW	Extraction Well
FDA	U.S. Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act of 1947
FS	Feasibility Study
GAC	Granular Activated Carbon
FYR	Five Year Review
GWTF	Groundwater Treatment Facility
HQ	Hazard Quotient
ICs	Institutional Controls
IS	Incineration and Stabilization
LNAPL	Light Non-Aqueous Phase Liquid
LOAEL	Lowest Observed Adverse Effects Level
LTRA	Long-term Response Action
M&E	Metcalf & Eddy
MassDEP	Massachusetts Department of Environmental Protection
MCLs	Maximum Contaminant Levels

MEPA	Massachusetts Environmental Policy Act
MGD	Million Gallons Per Day
MNA	Monitored Natural Attenuation
NCP	National Contingency Plan, 40 CFR Part 300
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Adverse Effects Levels
NPL	National Priority List
O&M	Operation and Maintenance
OMEE	Ontario Ministry of Environment and Energy
ORP	Oxidation-Reduction Potential
OU-1	Operable Unit 1
OU-2	Operable Unit 2
OU-3	Operable Unit 3
OU-4	Operable Unit 4
PAHs	Polycyclic Aromatic Hydrocarbons
PLC	Programmable Logic Controller
PRP	potentially responsible party
RAC	Response Action Contract
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act, 42 U.S.C. '' 6901 *et seq.*
RfD	Reference Dose
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
RSE	Remedial System Evaluation
SCADA	Supervisory Control and Data Acquisition
SDWA	Safe Drinking Water Act
SF	Slope Factor
SQC	Sediment Quality Criteria
SVOCs	Semivolatile Organic Compounds
TBC	To Be Considered
TPH	Total Petroleum Hydrocarbon
TLV	Threshold Limit Value
TRV	Toxicity Reference Value
UCL	Upper Concentration Limit
USACE	United States Army Corps of Engineers
VFD	Variable Frequency Drive
VOCs	Volatile Organic Compounds

EXECUTIVE SUMMARY

This is the fourth Five-Year Review (FYR) for the Baird & McGuire Superfund Site located in Holbrook, Norfolk County, Massachusetts. The purpose of this FYR is to review information to determine if the remedy is and will continue to be protective of human health and the environment. The triggering action for this statutory FYR was the signing of the previous FYR on 9/29/2009.

The Baird & McGuire Superfund Site is located on South Street in Holbrook, MA (Figure 1 in Appendix B). The Site boundary and coincident fence line are shown on Figure 2, based on a Site survey conducted in May 1988. The Site designated on Figure 2 has been determined to consist of approximately 32.5 acres. As illustrated on Figure 2, the Site is not limited to land within the former Baird & McGuire properties. Historically, Lots 130, 130-1 and 130-2 have had Baird & McGuire ownership. These lots consist of 9.33 acres, of which approximately 8 acres are within the Site boundaries. The remaining 24.5 acres of the Site consist of portions of five privately owned lots and two lots jointly owned by the towns of Holbrook and Randolph. In addition, four privately owned lots located east of the Cochato River (Lots 6, 12-2 and 12-3, as shown on Figure 2 in Appendix B) have restricted access to the river due to the presence of the security fence.

At the time of the RODs, the Baird & McGuire Site was used for commercial and industrial purposes. Currently, the Site is occupied by the Groundwater Treatment Facility (GWTF). Current and planned uses are still commercial/industrial in nature.

Site contamination occurred during the operations of a chemical manufacturing company (Baird & McGuire) from 1912 to 1983, that produced herbicides, pesticides, disinfectants, soaps, floor waxes and solvents. Waste disposal methods at the site included direct discharge into the soil, a nearby brook and wetlands, a former gravel pit in the eastern portion of the site, and underground disposal systems. Volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), pesticides, and heavy metals including lead and arsenic are the contaminants of concern in site soils, sediment, and groundwater. Additionally, a light non-aqueous phase liquid (LNAPL) plume has been determined to be the primary source of contamination in groundwater.

EPA issued three RODs for the Site, defining four operable units and describing selected remedial alternatives. The first ROD, issued in September 1986, specified groundwater extraction and treatment via an on-site treatment plant (OU-1) and soil excavation and treatment via an on-site incinerator (OU-2). The second ROD, issued in September 1989, addressed contamination in the Cochato River sediments (OU-3). EPA issued the final ROD in 1990, which called for reopening the Donna Road well field to replace the lost supply resulting from contamination of the South Street well field (OU-4).

The construction of the GWTF (OU-1) was completed in 1991. Treatment of contaminated groundwater is ongoing. Treated water is recharged to the groundwater through four infiltration basins. The source control remedy to remove and treat contaminated soils (OU-2) was completed in July 1997. The removal and treatment of contaminated sediments from the Cochato River (OU-3) was completed in June 1995.

In 2000, EPA provided funding to assist the towns of Holbrook and Randolph in expanding the existing water supply capacity at the Upper Reservoir/Great Pond. Two Explanations of Significant Differences (ESD) were issued in August, 2003. An ESD in connection with OU-1 described the expansion of water capacity in the Upper Reservoir/Great Pond. A second ESD in connection with OU-4 determined that the reactivation of the Donna Road well field was no longer necessary due to the expanded water capacity in the Upper Reservoir/Great Pond. Until June 2004, EPA was responsible for GWTF operation and maintenance; groundwater, surface water, sediment, fish and wetland monitoring; and evaluation of long term protectiveness of the remedies and the need for institutional controls (ICs). In June 2004, the Massachusetts Department of Environmental Protection (MassDEP) assumed responsibility for the Site. In 2005, EPA issued an ESD to incorporate comprehensive institutional controls into the OU1 and OU2 remedies.

This is the fourth five-year review for the Site. The first five-year review was completed in September 1999 and subsequent reviews were completed every five years following. The triggering action for this statutory review is the completion date of the previous FYR, which was September 2009. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

This five-year review concluded that the remedy is functioning as designed and continues to be protective of human health and the environment. However, for the remedy to remain protective in the long term, comprehensive institutional controls must be implemented. In addition, interim cleanup levels and recommendations which ensure the remedy is functioning as intended will also be evaluated. Continued monitoring of groundwater, sediment, and fish tissue is also needed to evaluate remedy progress.

SITE IDENTIFICATION		
Site Name: Baird & McGuire		
EPA ID: MAD001041987		
Region: I	**State:** MA	**City/County:** Holbrook/Norfolk

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

REVIEW STATUS
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:**
Author name (Federal or State Project Manager): Kimberly White
Author affiliation: EPA Region I
Review period: 2/6/2014 - 9/30/2014
Date of site inspection: 6/11/2014
Type of review: Statutory
Review number: 4
Triggering action date: 9/29/2009
Due date *(five years after triggering action date)*: 9/29/2014

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU4

Issues and Recommendations Identified in the Five-Year Review:

OU(s): *OU1, OU2, OU3*	**Issue Category: Institutional Controls**			
	Issue: Institutional controls restricting land uses that may impact the protectiveness of the remedy (including preventing the use of groundwater and preventing excavation into areas of the Site with residual soil and/or shallow groundwater) need to be established. The implementation of comprehensive institutional controls is on-going, and when complete, will provide long-term protectiveness for soil and groundwater remedies.			
	Recommendation: EPA, MassDEP, and the property owners should complete development of the ICs and record them by the next five-year review.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA	8/30/2019

Issues and Recommendations Identified in the Five-Year Review:

OU(s): *OU1*	**Issue Category:** Cleanup Levels			
	Issue: The 1986 OU1 ROD states that "after five (5) years of operation, the Agency will determine in a supplemental decision document if the restoration target levels are achievable and if they are adequate to protect public health and environment."			
	Recommendation: Determine whether current interim groundwater cleanup levels are appropriate, and document changes as necessary.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA	12/31/2015

Issues and Recommendations Identified in the Five-Year Review:

OU(s): *OU1*	Issue Category: Operations and Maintenance			
	Issue: Arsenic, benzene, ethylbenzene, lindane, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, mercury, and pentachlorophenol in select monitoring wells continue to exceed MCLs.			
	Recommendation: Evaluate recommendations from the 2013 Optimization Report and implement investigations, as appropriate. In the interim, operation and maintenance of the extraction wells and GWTF should continue to contain the plume, and investigations should continue to determine what improvements, if any, need to be made. Following completion of the investigations, a meeting between EPA and MassDEP is recommended to discuss the results of the investigations. ICs, as noted in a previous recommendation, should also be implemented to ensure that no private wells are installed at or near the site.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA	9/29/2019

Issues and Recommendations Identified in the Five-Year Review:

OU(s): *OU3*	Issue Category: Monitoring			
	Issue: The 2013 sediment data show exceedances of the PAH cleanup level at a sampling location adjacent to the site. The exceedance at the location adjacent to the site does not impact current protectiveness since the area is within the site perimeter fence.			
	Recommendation: Further monitoring should be performed for confirmation of the exceedance.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA	12/31/2018

Issues and Recommendations Identified in the Five-Year Review:

OU(s): *OU3*	**Issue Category**: **Monitoring**			
	Issue: Elevated concentrations of PAHs and pesticides in samples from Ice Pond and Mary Lee Wetlands indicate some uncertainty in the distribution of these contaminants along the banks of the river and wetlands downstream of the site.			
	Recommendation: In order to confirm the protectiveness of the remedy, the soils and sediment downstream of the site should be further sampled and evaluated prior to the next Five Year Review.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA	12/31/2018

Protectiveness Statement(s)

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU1	Short-term Protective	

Protectiveness Statement:

The remedy at OU-1 currently protects human health and the environment because the current pathway for human health exposures has been eliminated as the contaminated aquifer is no longer being used as a drinking water source. The aquifer is being remediated to mitigate a future human health exposure pathway. However, in order for the remedy to be protective in the long-term, groundwater should not be used for any purpose or directly contacted, due to its contamination and to the negative impact pumping could have on the effectiveness of the extraction and treatment system. Comprehensive institutional controls at the site, including OU1, must be implemented to ensure long-term protectiveness in and around the site.

Protectiveness Statement(s)		
Operable Unit: OU2	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):*

Protectiveness Statement:

The remedy at OU2 currently protects human health and the environment. As long as the Site is not used for residential purposes or other purposes where children are present at a high frequency (e.g., day care or parks), human health protectiveness will be within the risk-based concentrations established by EPA. Protectiveness is achieved for future workers in a commercial or industrial use scenario. However, in order for the remedy to be protective in the long-term, comprehensive institutional controls should be implemented or an evaluation should be performed to determine the potential risk to workers prior to initiating intrusive activities as part of site re-development.

Protectiveness Statement(s)		
Operable Unit: OU3	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):*

Protectiveness Statement:

The remedy at OU3 is currently protective of human health and the environment because sediment with high levels of contaminants was excavated and treated, and clean fill was used to replace materials excavated. However, to minimize disruption to wetlands, sediments were not removed from areas of the river where contaminant concentrations were low. Although contaminated sediments remain, it is expected that natural degradative, depositional, and dispersal processes will gradually reduce remaining concentrations in the sediment. In order for the remedy to be protective in the long-term, it is recommended that long-term sediment and fish tissue monitoring continue to evaluate contaminant levels/risks and contaminant behavior over time, and maintain the current fish advisory signage.

Sitewide Protectiveness Statement	
Protectiveness Determination: Short-term Protective	*Addendum Due Date (if applicable):*

Protectiveness Statement:

The remedies for the Site currently protect human health and the environment because current exposure pathways that could result in unacceptable risks are being controlled. All threats at the Site have been or are being addressed through groundwater treatment; removal, incineration, and stabilization of contaminated soil and ash; site fencing; warning signage, and expansion of an alternate water supply.

However, in order for the remedy to be protective in the long-term, comprehensive institutional controls must be implemented to maintain a complete level of protectiveness for

future activities in and around the site. Interim cleanup levels and recommendations which ensure the remedy is functioning as intended will also be evaluated. Continued monitoring of groundwater, sediment, and fish tissue is also needed to evaluate remedy progress.

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue 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, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 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.*"

EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which 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 actions no less often than every five years after the initiation of the selected remedial action*."

EPA conducted a FYR on the remedy implemented at the Baird & McGuire Superfund Site in Holbrook, Norfolk County, Massachusetts. EPA is the lead agency for developing and implementing the remedy for the site. The Massachusetts Department of Environmental Protection (MassDEP), as the support agency representing the Commonwealth of Massachusetts, has reviewed all supporting documentation and provided input to EPA during the FYR process.

This is the fourth FYR for the Baird & McGuire Superfund Site. The triggering action for this statutory review is the completion date of the previous FYR. The FYR is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. The site consists of four Operable Units, all of which are addressed in this FYR. Operable Unit 1 (OU-1) refers to groundwater extraction and treatment. Operable Unit 2 (OU-2) refers to soil excavation and treatment at an on-site incinerator and on-site disposal. Operable Unit 3 (OU-3) was designated to address the contamination in the Cochato River sediments. Operable Unit 4 (OU-4) was designated for reopening the Donna Road well field to replace the lost supply resulting from contamination of

the South Street well field. Figures showing site features are presented in Appendix B.

II. PROGRESS SINCE THE LAST REVIEW

This is the fourth five year review for the Site. This section presents the protectiveness statement, recommendations and follow-up actions identified in the third five year review, followed by a summary of efforts since 2009 to address the recommendations. In addition, this section includes a summary of other site activities and studies that have been conducted since 2009.

Table 1: Protectiveness Determinations/Statements from the 2009 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Short-term Protective	The remedy at OU1 currently protects human health and the environment because the current pathway for human health exposures has been eliminated as the contaminated aquifer is no longer being used as a drinking water source. The aquifer is being remediated to mitigate a future human health exposure pathway, and data indicates that the plume of organic contamination is shrinking. However, in order for the remedy to be protective in the long-term, the groundwater treatment plant, recharge basins, monitoring wells, extraction wells, LNAPL recovery system, and piping network must remain operable and undisturbed. Groundwater should not be used for any purpose or directly contacted, due to its contamination and to the negative impact pumping could have on the effectiveness of the extraction and treatment system. It is important to complete the implementation of comprehensive institutional controls at the site to ensure long-term protectiveness in and around the site.

OU #	Protectiveness Determination	Protectiveness Statement
2	Short-term Protective	The remedy at OU2 currently protects human health and the environment. As long as the site is not used for residential purposes or other purposes where children are present at a high frequency (e.g., day care or parks), human health protectiveness will be within the risk-based concentrations established by EPA. Protectiveness is achieved for future workers in a commercial or industrial use scenario. Contaminants present at depths greater than 15 feet below grade are considered unlikely to be contacted directly by individuals during future site development activities, including construction and utility work. However, in order for the remedy to be protective in the long-term, completion of comprehensive institutional controls is needed.
3	Short-term Protective	The remedy at OU3 currently protects human health and the environment because sediment with high levels of contaminants was excavated and treated, and clean fill was used to replace materials excavated. However, to minimize disruption to wetlands, sediments were not removed from areas of the river where contaminant concentrations were low. Although contaminated sediments remain, it is expected that natural degradative, depositional, and dispersal processes will gradually reduce remaining concentrations in the sediment. In order for the remedy to be protective in the long-term, it is recommended that long-term sediment and fish tissue monitoring continue to evaluate contaminant levels and their behavior over time. However, the State currently has no monitoring plan in place.

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Short-term Protective	Because all remedial actions at all OUs are protective, the site is protective of human health and the environment. The remedy currently protects human health and the environment because current exposure pathways are being controlled. All threats at the Site have been or are being addressed through groundwater treatment; removal, incineration, and stabilization of contaminated soil and ash; site fencing; warning signage; and expansion of an alternate water supply. However, for the Site to be protective in the long-term, it is important to complete the implementation of comprehensive institutional controls at the site to maintain a complete level of protectiveness for future activities in and around the site, and through continued monitoring of groundwater, sediment, and fish tissue. It is essential that monitoring of these media continue in order to ensure that long-term cleanup goals are being met.

Table 2: Status of Recommendations from the 2009 FYR

Recommendation No.	OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
1	1	Groundwater at the site contains contaminants above action limits	Continue operations of GWTF; re-establish MNA monitoring program.	State	EPA/State	1/1/2014	Ongoing	9/29/2019
2	1	Groundwater at the site contains contaminants above action limits	Revisit evaluation of arsenic presence and mobility to determine if conclusions are still valid and develop a plan of action to address high concentrations.	State	EPA/State	1/1/2014	Under Discussion	9/29/2019
3	1	Groundwater at the site contains contaminants above action limits	Optimize extraction system efficiency.	State	EPA/State	1/1/2014	Ongoing	9/29/2019
4	1	Groundwater at the site contains contaminants above action limits	Collect samples for MNA parameters from select monitoring wells.	State	EPA/State	1/1/2014	Considered But Not Implemented	
5	1	Groundwater at the site contains contaminants above action limits	Evaluate the LNAPL collection system to improve LNAPL removal/separation.	State	EPA/State	1/1/2014	Considered But Not Implemented	

Recommendation No.	OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
6	3	During the last five-year review, sediment along the river contained PAHs above action limits and concentrations of metals and pesticides had not decreased significantly since the previous five-year review.	Conduct sediment monitoring; continue operations of the GWTF; maintain site fencing.	State	EPA/State	1/1/2014	Addressed in Next FYR	12/31/2018
7	3	During the last five-year review, fish tissue contained PAHs at concentrations above action limits.	Conduct fish tissue monitoring; maintain warning signs.	State	EPA/State	1/1/2014	Completed	08/28/14
8	1, 2	Institutional controls are not complete.	Complete the implementation of comprehensive institutional controls.	EPA/ State	EPA/State	1/1/2014	Addressed in Next FYR	8/30/2019
9	3	Some areas of replicated wetland are dominated by invasive species, primarily phragmites.	Initiate program to monitor and control invasive species in site wetlands.	State	EPA/State	1/1/2014	Partially Addressed	

Further discussion of recommendations 1, 2, 3, 5, and 9 is provided below.

Recommendation 1

Operation of the GWTF has continued, including implementation of a number of modifications to optimize remedy performance; however, a monitored natural attenuation (MNA) program has not yet been established.

Recommendation 2

Arsenic investigations were conducted by the MassDEP in multiple phases, all of which are summarized in Arsenic Summary Investigation Report – Part II/IIa (CHES, 2014a). Discussion of the findings is included in Section III.

Recommendation 3

In early 2014, MassDEP installed one new extraction well (EW-10) and two new monitoring wells (MW14-01 and MW14-02), conducted a pump test, and integrated EW-10 into the groundwater treatment system.

Recommendation 5

The MassDEP has evaluated LNAPL characteristics and distribution throughout the Site. LNAPL monitoring and recovery is taking place in select monitoring and extraction wells, and LNAPL has been removed and disposed of off-site when sufficient volume is detected.

Recommendation 9

No action was taken on this recommendation; however, control of one invasive plant species, purple loosestrife, has been fairly successful, apparently through introduction of the Galerucella beetle, while several areas of the wetland are still dominated by another invasive species, phragmites. Although control of the phragmites would enhance the wetland, overall it is in good condition, and therefore no further action is recommended.

Since the last five year review, the following investigations have been conducted:

- Fish and Sediment Sampling (ESM, 2014)
- An arsenic investigation (CHES, 2014a)
- Arsenic speciation analyses (data in Appendix d)
- An optimization review (USEPA, 2013)

In addition, the following investigations or studies were initiated during this five year review period:

- A trend analysis to evaluate data trends in groundwater, fish, and sediment data;
- A hydraulic capture analysis to assess plume containment;

- An evaluation of the adequacy of the interim groundwater cleanup levels; and
- An evaluation of the need for additional LNAPL investigations, as necessary to assess future protectiveness of the remedy.

The investigations and the optimization review are discussed further in this section and in Section III.

Remedy Implementation Activities since last Five Year Review

EPA issued three RODs for the Site, defining four operable units and describing selected remedial alternatives. The first ROD, issued in September 1986, specified groundwater extraction and treatment via an on-site treatment plant (OU-1) and soil excavation and treatment via an on-site incinerator (OU-2). The second ROD, issued in September 1989, addressed contamination in the Cochato River sediments (OU-3). EPA issued the final ROD in 1990, which called for reopening the Donna Road well field to replace the lost supply resulting from contamination of the South Street well field (OU-4).

The construction of the GWTF (OU-1) was completed in 1991. Treatment of contaminated groundwater is ongoing. Treated water recharges to the groundwater through four infiltration basins. The source control remedy to remove and treat contaminated soils (OU-2) was completed in July 1997. The removal and treatment of contaminated sediments from the Cochato River (OU-3) was completed in June 1995.

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With the exception of Institutional Controls (ICs), detailed information regarding the implementation of the OU1, OU2, and OU3 remedies is discussed in Appendix A – Existing Site Information.

<u>Institutional Controls</u>

Implementation of Institutional Controls in Massachusetts, namely the recording of Grants of Environmental Restrictions and Easements (GEREs), has been a continued challenge for the

program. The need to complete ICs has often been identified as an issue potentially impacting future protectiveness as part of Five Year Reviews at this and other Massachusetts sites. In an effort to address this issue and improve the process of completing ICs at Massachusetts NPL sites, EPA worked with the MassDEP to develop a new approach using Notices of Activity and Use Limitations (AUL Notices). This process involved first working with MassDEP to update and amend their regulations governing AULs (both Notices and GEREs) embodied in the Massachusetts Contingency Plan (310 CMR 40.0000). The MCP amendments published in May 2014 included new requirements allowing for use of AUL Notices at NPL sites. EPA and MassDEP are currently working on model documents and forms that will be used to implement AUL Notices. Once fully implemented, the overall process for IC implementation will be streamlined as AUL Notices do not require the signature of the MassDEP Commissioner nor do they require Subordination Agreements from those holding prior encumbrances on properties. Both of these requirements served to slow the GERE implementation process at many sites. EPA and MassDEP will work together to determine whether specific circumstances at sites still require GEREs or whether the new AUL Notices can be used instead. This new approach to ICs in Massachusetts should allow EPA to complete these activities more quickly and efficiently and address these Five Year Review recommendations within a reasonable timeframe.

EPA and the MassDEP are in the process of developing ICs for the Baird & McGuire Site. Table 3 presents a tentative list of institutional controls at the Baird & McGuire Site. The location of each of the impacted parcels is shown on Figure 2 in Appendix B. In general, issues to be addressed by the ICs include preventing land uses that could interfere with the remedy; preventing exposure to contaminated media; and securing access for EPA, MassDEP, and their contractors in order to maintain and evaluate the remedy in the future.

Table 3: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
GWTF, extraction wells, piping, monitoring wells	Yes	Yes	Parcels 25-130-00-0, 25-130-01-0, 25-130-02-0, 19-012-00-0	Provide access for EPA and/or MassDEP and their representatives on all parcels where restrictions will be placed until EPA and MassDEP determine that controls are no longer necessary.	If needed

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Multiple Media(e.g., soils, groundwater, sediments)	Yes	Yes	Parcels 25-130-00-0, 25-130-01-0, 25-130-02-0, 25-129-00-0, 25-129-02-0, 25-131-00 -0, 19-003-00-0, 19-012-00-0, 19-012-02-0, 19-012-03-0	Prevent land uses that would cause recontamination of clean soil, interfere with the operation and maintenance of the remedy, or which may result in unacceptable exposures (e.g., prohibition on residential development on some parcels). Prevent the extraction, consumption, or utilization of groundwater or the migration of contaminated groundwater (with the exception of groundwater monitoring and collection of soil samples and sediment samples).	Notice of AUL planned
Sediments	Yes	Yes	19-012-01-0, 19-006-00-0 14-102-00-0,	Prevent land uses that may result in unacceptable exposures to contaminated sediment	Notice of AUL planned

In addition to the tentative institutional controls identified above, fish advisory signs in multiple languages have been installed on the banks of the Cochato River and in downstream Sylvan Lake warning residents of the risks associated with eating the fish. The locations of the signs are shown on Figure 6 in Appendix B.

Groundwater Treatment System Operation/Operation and Maintenance Activities

The majority of O&M activities at the site are related to the operations of the GWTF (OU-1). For OU-1, O&M activities include the operation and maintenance of the GWTF, including the groundwater extraction wells, LNAPL monitoring and collection, and monitoring well sampling and analyses. Currently, the GWTF is staffed by two operators, five days per week for 10 hours per day, plus 4 hours on Saturdays and Sundays to provide routine operation, inspection, and monitoring of the extraction and treatment systems. An operator is also on-call during off-hours to address facility alarms or emergencies. One mechanic is on staff four days per week to handle mechanical maintenance and repairs. Periodic monitoring activities include sample collection from plant monitoring points, monitoring wells, and extraction wells.

More specifically, operating the GWTF includes the addition of treatment chemicals such as polymer and potassium permanganate used for groundwater treatment, change out of filter media such as activated carbon and filter sand, collecting samples from the process for laboratory analyses, disposal of residuals (sludge), and the periodic collection and disposal of LNAPL.

The LNAPL recovery system that was operated historically became inactive in March 2009 due to diminishing recovery of LNAPL. LNAPL has continued to be detected in some wells; however, the specific gravity of the LNAPL appears to be close to water making LNAPL recovery unsuccessful. LNAPL continues to be monitored on a monthly basis at extraction and monitoring wells. The system was not in operation during the beginning of 2010, then was only intermittently turned on when measurable amounts of LNAPL were detected in the wells. Overall, during 2010, only minimal amounts (less than ½ cup of oil) of recoverable LNAPL were generated for disposal during the reporting period (CHES, 2012). During 2011, 2012, and 2013 LNAPL was intermittently removed from EW-6, an extraction well not associated with the LNAPL recovery system (CHES, 2013a).

Other disposal activities include the disposal of sludge from the metals removal process. The sludge is transported off-site in roll-off containers for off-site disposal by Clean Harbors.

Typical routine maintenance items include gear lubrication, seal replacement, and pipe cleaning. Due to the age of the facility, a good amount of non-routine maintenance involving repairing or replacing worn-out or outdated equipment is also required. Other O&M activities include maintaining site security, such as fence repair, and general site maintenance such as mowing and snow removal as needed. Problems associated with the O&M of the site include typical mechanical and process issues that are addressed as needed. Repairs to and replacement of the equipment continues to be a problem, particularly since it is difficult to find replacement and spare parts for some of the equipment due to its age. The O&M of the site is documented in daily

and weekly quality control reports, which are compiled and included in an annual O&M report and in monthly progress summary reports, which are included as an Appendix of the annual Evaluation of Groundwater Remediation Progress Annual Report – OU1 (CHES 2010, 2012, 2013a, and 2013d). The daily and weekly reports include a summary of GWTF status, flow rates and gallons treated and discharged, a description of maintenance and inspections performed, identification of issues and corrective actions, and identification of monitoring performed. The annual O&M reports include information on overall facility performance, plant influent and effluent analytical results, and figures depicting contaminant trends for GWTF influent and effluent data, and plant upgrades and modifications. Elements of the monthly report include a summary of overall facility performance, monitoring information for the extraction wells, treatment process information, problems identified and corrective actions taken, and a summary of analytical data for the process, including contaminant removal efficiency.

Contaminant removal rates for VOCs, SVOCs, metals, and pesticides have continued to exceed 99% removal. GWTF effluent concentrations meet or exceed the discharge criteria for these compounds.

A summary of GWTF O&M costs since the previous five year review is presented in Table 4.

Table 4: Summary of O&M Costs

Total Cost (to the nearest $1000)	
FY 2010	**$901,000**
2011	**$820,000**
2012	**$949,000**
2013	**$815,000**
2014 (est)	**$730,000**

Generally, O&M costs have decreased since the last five year review due to optimization and cost saving measures described in Section IV.

Optimization Review and Other Investigations

In addition to the progress made on the recommendations from the prior five year review, the EPA and the MassDEP conducted a number of investigations and evaluations to assess progress and to identify potential optimization actions that could benefit the remedial action.

The EPA conducted an optimization review in 2012/2013 to identify specific actions that may be taken to potentially improve the effectiveness and cost-efficiency of the remedy. The review focused on remedy performance, protectiveness, cost-effectiveness, technical improvement, and site closure strategy. The recommendations of the optimization review are documented in Optimization Review for the Baird & McGuire Superfund Site, which was finalized in May 2013 (USEPA, 2013).

Since the review was completed, the MassDEP has implemented some of the recommendations of the Optimization Review and has evaluated and attempted others.

Optimization recommendations were divided into three categories: 1) recommendations for refining the conceptual site model; 2) recommendations to be considered if the focus moving forward includes continued operation of the GWTF; and 3) recommendations to be considered if the focus moving forward will be on additional source remediation. The following is a summary of the recommendations of the optimization review and actions taken to date to address the recommendations.

Recommendations and Actions Taken to Refine Conceptual Site Model

Recommendations for refining the conceptual model included: resuming fish sampling and clarifying fish tissue criteria; sampling the Cochato River sediments; conducting a speciation analysis for arsenic in select monitoring wells; adding TPH and TOC analyses to routine groundwater monitoring; performing leaching tests on site soils to better understand if ash is a continuing source of arsenic; and recording and reporting ORP results with groundwater monitoring data. Each of the recommendations and actions taken are discussed below.

- Conduct fish tissue and Cochato River sediment sampling. Fish tissue and sediment sampling were conducted in October 2013. Results are discussed in Section III of this report, and are presented in detail in the Cochato River Sampling Report (ESD, 2013).

- Add TPH and TOC analyses to routine groundwater monitoring and report ORP with monitoring data. The optimization team recommended adding TPH and TOC, and reporting ORP data, in order to assess whether low ORP might be contributing to the mobility of arsenic in site groundwater. The team speculated that the lower ORP contributes to mobilization of arsenic from native soils and or soil remedy ash, potentially resulting in an additional ongoing source of arsenic. To the extent these speculations are correct, as long as sufficient dissolved organic carbon is present in groundwater, widespread continuing sources of arsenic will persist. The MassDEP added these analyses and began reporting the ORP data in their 2012 and 2013 groundwater monitoring events. TPH and TOC were included since VOCs and SVOCs make up only a part of the organic compounds that contribute to low ORP (see additional discussion in Section III).

- Conduct speciation analyses and perform leaching tests for arsenic. The speciation analysis was recommended to determine which species of arsenic exist in the groundwater, and whether arsenic is in organic or inorganic form in the soil, to better evaluate mobility and so that the impact of ORP can be better assessed. Leaching tests were recommended to assess whether leaching of arsenic from site soils/ash is contributing to the arsenic in the groundwater (e.g., whether there is a continuing source

of arsenic from the ash). An arsenic investigation was conducted by MassDEP in 2013/2014 which addressed these recommendations (CHES 2014a). As part of the arsenic investigation conducted by the MassDEP, leaching tests, using the Toxicity Characteristic Leaching Procedure (TCLP) were performed on 7 of 66 samples collected for arsenic analysis. Results were all below detectable levels. An additional focus of the arsenic investigation was to better define the arsenic plume location.

Recommendations and Actions Taken for Continued GWTF Operation

Add New Extraction Wells

Recommendations in the Optimization Review Report included replacing EW-9 and EW-7, plus adding one or more new wells between those wells. Further recommendations made in the Arsenic Investigation Report included the installation of one or two new extraction wells positioned to capture the arsenic plumes prior to reaching the Cochato River, installation of two new monitoring wells within the arsenic plume for future monitoring, and additional investigations for further plume delineation (CHES, 2014a). Installation of one new extraction well (EW-10) and two new monitoring wells (MW14-01 and MW14-02), pump testing, and integration of EW-10 into the groundwater treatment system occurred in February and March 2014 (CHES 2014d).

In addition, the EPA initiated a hydraulic capture analysis to determine whether the extraction system is containing the plume, or whether additional data are needed. Results of the analysis indicate adequate plume capture. A letter report will be prepared prior to the next five year review documenting the results of the hydraulic capture analysis.

Install a New Treatment System for Long-Term Operation

Recommendations in this category included actions or modifications to reduce costs of the existing system. Included were recommendations for reducing treatment plant reporting requirements; recommendations for optimizing the metals removal system; and a recommendation for discontinuing aeration in the activated sludge units.

- Reducing GWTF Reporting Requirements. The optimization team recommended eliminating the daily and weekly reports prepared by the O&M Contractor. This recommendation was considered, but not implemented, since the GWTF staff collects and compiles the information as part of routine O&M, regardless of reporting requirements, so no cost savings would be realized.
- Optimizing metals removal system. Recommendations included replacing the existing system with a new treatment system to streamline operations, if the GWTF is anticipated to continue operation for more than five years. If the existing facility is going to operate for less than five years, the optimization team recommended making modifications to the

chemical feed system, including changing the oxidant used for arsenic removal from potassium permanganate to hydrogen peroxide, changing the ORP set-point, and improving the clarification step. Several of the short-term recommendations were attempted or considered by the MassDEP. Reducing the ORP set-point was attempted but resulted in decreased effluent quality (loss of clarity). Reconfiguration of the clarifiers was considered, but could not be accomplished due to space limitations within the GWTF.

- Discontinue Aeration. A recommendation was made to discontinue aeration in the activated sludge units, which are currently used as air strippers. It was speculated by the optimization team that the units provide little benefit to overall water treatment, and that the aeration is likely contributing to biofouling of the granular activated carbon (GAC) units. MassDEP attempted this modification; however, it was found that eliminating aeration had the opposite effect, and resulted in clogging of downstream filters (GAC and sand filters). Consequently, the aeration units were put back in operation.

In addition to recommendations identified in the optimization review report, the MassDEP has made additional optimization efforts and implemented cost-saving measures. Various upgrades and safety measures have been implemented, including the replacement of high pressure sodium lighting with energy efficient LED lamps; the addition of new variable frequency drives on the aeration tank blowers; replacement of the potassium permanganate tank; replacement of the GAC media with a longer-lasting coarser grade of carbon, and installation of new tank railings and restraints. It was reported that these measures resulted in significant cost savings.

Recommendations and Actions Taken to Determine if Primary Focus Will Be Source Control or Containment

This recommendation and actions that will need to be taken to determine whether source remediation should be the focus going forward are under evaluation.

In support of this evaluation, EPA has initiated an assessment of the interim groundwater cleanup levels and an evaluation of whether additional LNAPL investigations are needed.

Sediment and Fish Tissue Monitoring

In the last five year review, fish tissue and sediment monitoring were recommended. Sediment, bank soil, and fish tissue samples were collected in October 2013 in support of this five-year review (ES&M, 2014). Eleven sediment samples and four soil samples were collected from in and along the Cochato River between October 9 and October 11, 2013 (see Figure 2 in Appendix D). Station progression (upstream to downstream) is A, E (next to site), B, C, and D. Bank soil samples were only collected at stations C and D. Samples were analyzed for TOC, grain size, PAHs, organochlorine pesticides, and arsenic. More discussion is provided in Section III. Analytical results are summarized in Appendix D.

Wetland Inspection

In the last five year review, it was recommended that a program be initiated to monitor and control invasive species in the site wetlands. Wetland inspection and control activities have not been part of the MassDEP monitoring program over the past five years. However, a site inspection to assess the condition of the restored wetland area, as well as the restored upland area, was performed during the five year review process on August 8, 2014. Consistent with observations from the prior five year review in 2009, restored upland portions of the site appeared to be well-vegetated and stabilized. Vegetation in these upland areas are similar to that observed in 2009. Further discussion of the findings is presented in Section III.

III. FIVE-YEAR REVIEW PROCESS

Administrative Components

The Baird & McGuire Superfund Site Five-Year Review was led by Kimberly White of the U.S. EPA, Remedial Project Manager (RPM) for the Site, and Kelsey O'Neil, the Community Involvement Coordinator (CIC). Dorothy Allen, of the MassDEP, assisted in the review as the representative for the support agency.

The review, which began in February 2014 consisted of the following components:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection; and
- Five-Year Review Report Development and Review.

Community Notification and Involvement

Activities to involve the community in the five-year review process were initiated with a meeting on February 6, 2014 between the RPM, Attorney, Risk Assessors and CIC for the Site. On February 13, 2014, EPA issued a press release announcing that EPA was beginning five-year reviews of 27 Superfund sites across New England, including the Baird & McGuire Site. A similar press release will be issued by EPA once the five-year reviews are complete. The results of the review and the report will be made available at the Site information repository located at Holbrook Public Library, 2 Plymouth Street, Holbrook, MA 02343 and at the OSRR Records and Information Center, 1st Floor, 5 Post Office Square, Suite 100 (HSC), Boston, MA 02109-3912.

Document Review

This five-year review consisted of a review of relevant documents including but not limited to O&M records and monitoring data; the Optimization Review Report; and the Arsenic Summary Investigation Report. Applicable cleanup standards/objectives, as listed in the September 1986 ROD (OU-1 groundwater; and OU-2 soil) and September 1989 ROD (OU-3 sediment) were also reviewed. Appendix C lists the documents reviewed for this current FYR as well as other references cited throughout this report.

Data Review

Treatment Plant Effluent Monitoring

The effluent from the groundwater treatment plant is analyzed on a weekly basis for total arsenic, on a monthly basis for VOCs, SVOCs, pesticides, copper, iron, barium, chloride, and sulfate, and on a quarterly basis for total metals and oil and grease. Additionally, daily process control observations made by plant operators include settleability (test used to estimate sludge volume), pH, ORP, turbidity, and temperature.

Exceedances of the discharge criteria occurred on certain occasions within the past 5 years as noted below in Table 5 (note that the most current data is from 2012):

Table 5: Summary of GWTF Discharge Exceedance

Reporting Period	Exceedances
10/1/08 – 9/30/09	- pH exceeded the range of 6.5 to 8.5 pH units on 15 days due to carbon change outs.(8.94 – 9.46) - 2-methylnaphthalene (23 µg/L) exceeded the discharge criteria of 10 µg/L on one occasion. Subsequent sampling did not detect 2-methylnaphthalene. - Turbidity exceeded the discharge criterion of 1 NTU on 22 days.(1)
10/1/09 – 9/30/10	- pH exceeded the acceptable range on 13 days due to carbon change outs (8.69 – 9.57). - Turbidity exceeded the discharge criterion of 1 NTU on 14 days.(2)
10/1/10 – 9/30/11	- pH exceeded the acceptable range on 8 days due to carbon change outs (8.62 – 9.57). - Turbidity exceeded the discharge criterion of 1 NTU on 3 days.(1) - Iron exceeded the discharge criterion of 0.3 mg/l (SMCL) on 2 days (3)
10/1/11 – 9/30/12	- pH exceeded the acceptable range on 3 days due to carbon change outs.

(1) Turbidity exceedances were either due to carbon change outs or to unknown causes.

(2) Turbidity exceedances due to polymer pump malfunction and carbon change outs. Pump malfunction was repaired.

(3) Cause and corrective action not known.

Over the period from October 1, 2008 to September 30, 2012, the final effluent contained no detectable concentrations of pesticides and two detections of one VOC (naphthalene, which has no MCL). SVOCs were detected in the effluent on sporadic occasions over this period and were generally at low concentrations. Overall, VOC, SVOC, and pesticide effluent results indicated greater than 99.99% removal.

Arsenic was not detected above the reporting limit in any effluent samples during the period from October 1, 2008 to September 30, 2012. Iron was detected on several occasions at concentrations below the SMCL (0.3 mg/l); however, there were two occasions in July 2011, as

noted above, where iron concentrations (0.48 and 0.58 mg/l) exceeded the SMCL. Lead was detected on one occasion, copper was detected on 4 occasions, and barium was detected on 4 occasions; all detections were below the respective discharge criteria.

Effluent monitoring data are presented in Evaluation of Groundwater Remediation Progress Annual Reports (CHES, 2010; CHES, 2012; CHES, 2013a; CHES, 2013d).

Groundwater Monitoring

Summary. Groundwater extraction wells at the site are sampled on a quarterly basis. Additionally, annual rounds of groundwater sampling were performed over the past 5 years. The August 2009 and July 2010 annual monitoring events included 21 monitoring wells, the October 2012 annual monitoring event included 23 monitoring wells, and the September 2013 annual monitoring event included 19 monitoring wells. The July 2011 annual monitoring event was a more comprehensive "5-year groundwater sampling round" that included 5 extraction wells and 61 monitoring wells located within and beyond the boundary of the contaminant plumes identified at the site. Groundwater samples over the past five years have been analyzed for arsenic (all wells) and VOCs, SVOCs, and pesticides (all wells in 2011; select wells other years). The 2011 comprehensive monitoring round included a larger number of metals. Additionally, chemical oxygen demand (COD), total petroleum hydrocarbons (TPH), and total organic carbon (TOC) were included in the 2012 and 2013 annual monitoring events at select wells. Arsenic speciation data were collected in 2013 and 2014.

Annual evaluations of extraction system performance in regard to contaminated groundwater remediation and containment have been performed and are included, along with the results of quarterly and annual groundwater sampling for this five year period 2009 to 2013, in Evaluation of Groundwater Remediation Progress Annual Reports (CHES, 2010; CHES, 2012; CHES, 2013a; CHES, 2013d). These reports include discussion of extraction well and monitoring well analytical results, tabular presentation of all data, a figure depicting the approximate extent of arsenic contamination, and an estimate of contaminant mass removal over the reporting period, as well as a discussion of treatment system operation. The annual progress report that will document the September 2013 annual monitoring event has not been completed; however, the groundwater laboratory analytical data has been obtained from MassDEP's contractor and is included in Appendix D.

In order to depict the magnitude and location of remaining contamination, contour maps ("plume maps") for 2011 arsenic, VOC, and SVOC data were developed as part of this five year review. The 2011 data was utilized since this was the most comprehensive sampling round over the past five years and could be compared to previous plume maps included in the previous five year reviews. Copies of the 2011 plume maps are located in Appendix D. As expected, the maximum concentrations in the plumes have reduced over time. The plume extents appear to be similar or reduced from previous plumes. Additional evaluation will be provided in a trend evaluation update report which will be prepared in the near future. Preliminary findings of the trend analysis update are included below.

The following table shows compounds which were detected in the 2011 comprehensive sampling round at concentrations above the MCLs. Exceedances are presented for this sampling round in Table 6 since it was the most comprehensive round of sampling in the past 5 years.

Table 6: Groundwater MCL Exceedances in 2011

Contaminant	SDWA MCL (µg/l)	Location	Concentration (µg/l) in 2011
Benzene	5	MW04-01, MW97-28, and MW98-1	5.77/5.67 (FD) – 10.6
Ethylbenzene	700	MW04-01 and MW97-28	761 – 771/828 (FD)
Lindane (gamma-BHC)	0.2	MW97-1	0.841/0.934 (FD)
Benzo(a)pyrene	0.2	M7-SD and M7-BR	0.271 – 0.483
Bis(2-ethylhexyl)phthalate	6	7 monitoring wells	6.35 – 70
Pentachlorophenol	1	10 monitoring wells and one extraction well	3.13 – 14.0/15.6 (FD)
Mercury	2	BM-7 and MW97-32	3 – 140
Arsenic	10	25 monitoring wells and all extraction wells	11.6 – 1,670

FD - Field duplicate result

In the most recent 2013 annual sampling round, MCLs were exceeded for Lindane (gamma-BHC) (well MW97-23; 0.203 ppb), bis(2-ethylhexyl)phthalate (well MW97-25; 21.8/20.0 [FD] ppb), and for arsenic in a total of 17 monitoring wells at concentrations ranging from 41 ppb to 1,370/1,340 (FD) ppb.

VOCs and SVOCs. Total VOC and SVOC concentrations over time for site groundwater are provided in a table in Appendix D. It should be noted that several site wells were replaced after being destroyed by source control remediation. The original well name and the replacement well name are listed in the table for clarity. The 2004 trend evaluation report concluded that significant decreasing trends in VOC and SVOC concentrations exist for the majority of overburden and bedrock wells monitored at the Site. The data collected since the previous Five-Year Review report and preliminary results of the trend analysis update for the monitoring wells generally support this conclusion for VOCs; however, insufficient monitoring well data is

available to do an extensive trend update for VOCs. For SVOCs, a downward trend was noted in MW-97-32 and BM-2, while no trend was observed in BM-34A, BM-34, M-9T/WB, MW-97-29, and MW-97-31; and an upward trend was noted in well BM-38. More discussion of these observations will be provided in the 2014 Trend Analysis Report. VOC and SVOC concentrations in monitoring wells on the east side of the Cochato River have primarily been non-detect or very low, indicating that continued migration of the plume beneath and beyond the river is not occurring. Plume maps depicting SVOC and VOC contamination based on the 2011 data are included in Appendix D. As shown in the table above, benzene, ethylbenzene, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, and pentachlorophenol (PCP) were detected above current MCLs in overburden groundwater in 2011. Benzo(a)pyrene, PCP, and/or bis(2-ethylhexyl)phthalate were also detected above current MCLs in three bedrock wells in 2011. One of the three bedrock wells, M10-BR, is located on the east side of the Cochato River and contained PCP (3.13 µg/l) over the current MCL (1 µg/l). However, PCP was not detected in well M10-BR the following year in 2012. VOCs and SVOCs detected at the highest concentrations in site groundwater typically included xylenes, naphthalene, 2-methylnaphthalene, and ethylbenzene over the past several years.

Arsenic. Arsenic has generally been detected in the majority of overburden wells within the plume and surrounding areas. A plume map depicting arsenic contamination based on the 2011 data is included in Appendix D. Within the plume area, overburden wells have not exhibited consistent increasing or decreasing trends. This observation is supported by the initial results of the trend analysis update. More discussion of the arsenic groundwater trends since 2004 will be provided in the 2014 Trend Analysis Report. Historical arsenic concentrations are provided in Appendix D. As shown in the table above, arsenic was detected above the current MCL (10 µg/l) in all extraction wells and in 25 other monitoring wells across the site in 2011. In 2013, arsenic was detected above the current MCL in all of the 17 monitoring wells sampled for arsenic across the site. The highest concentrations were detected in overburden monitoring well MW97-28 in 2011 (1670/1630 [FD] ug/l) and overburden monitoring well MW97-21 in 2013 (1370/1340 [FD] ug/l).

In 2009 through 2011, an arsenic investigation was conducted by MassDEP to attempt to identify a source of arsenic in the groundwater, to delineate the extent of arsenic in groundwater, to confirm previous elevated concentrations, and to identify potential locations for additional monitoring wells and extraction wells. The investigations were conducted in multiple phases, all of which are summarized in Arsenic Summary Investigation Report – Part II/IIa (CHES, 2014a). As part of this investigation, soil borings were conducted to evaluate arsenic concentrations in soil and thermally processed soil, and no obvious source area for dissolved arsenic in groundwater was found. The dissolved arsenic at the site was delineated as three plumes, although it is possible that there is a connection between two of the plumes. The highest concentrations of dissolved arsenic were detected in groundwater samples from locations between the former Baird & McGuire buildings and the Cochato River. Based on initial results, a source area for arsenic in groundwater was suspected in the area of a gravel pit, which had been located adjacent to the former Baird & McGuire buildings. Further soil and groundwater investigation occurred in Part II of the investigation and based on those results, the gravel pit was not found to be an obvious arsenic source area (CHES, 2014a).

Arsenic speciation data were also collected in 2013 and 2014. Samples were analyzed for inorganic arsenic (trivalent (III) and pentavalent (V) and organic arsenic (dimethyl arsenic (DMA) and monomethyl arsenic (MMA). Results are provided in Appendix D. It was found that the arsenic in the groundwater at the Baird & McGuire Site is in inorganic form, primarily as the more soluble trivalent arsenic. Trivalent arsenic is normally the predominant species in a reducing aquifer environment.

Pesticides. As noted in the 2011 annual report, the pesticide plume is centered between monitoring wells MW98-1 and MW97-28, with extraction wells EW-4A and EW-6 most appropriately sited to address this plume. The 2004 Trend Evaluation Report (M&E, 2004b) had noted a decrease in the number of locations with detections of pesticides over the period from 2000 to 2003 (41 wells down to 17 wells). During the comprehensive 2011 sampling round, pesticides were detected at 10 wells, indicating a possible further decrease in the size of the plume. The 2004 Trend Evaluation Report had also noted that in 2003, lindane (gamma-BHC) exceeded the MCL at five wells within the plume area, while the 2011 monitoring data indicates exceedances of the MCL for lindane (gamma-BHC) at just one well within the plume area. In general, pesticides have continued to fluctuate over this five-year review period. For example, at well MW97-23, concentrations of total pesticides jumped from 6.72 µg/l in 2011 to 44 µg/l (52.2 µg/l in the field duplicate) in 2012 and then decreased to 1.46 µg/l in 2013. The detections of lindane (gamma-BHC) and heptachlor epoxide both exceeded the current MCLs in 2012, while only lindane (gamma-BHC) exceeded the current MCL in 2013 and heptachlor epoxide was not detected.

LNAPL. An LNAPL recovery system has been in place since March 1999 to remove LNAPL; however, the system became inactive in March 2009 due to diminishing recovery of LNAPL. LNAPL has continued to be detected in some wells; however, the specific gravity of the LNAPL appears to be close to water making LNAPL recovery unsuccessful. The fluid entering the system was found to be in an emulsified state which is not readily separated by the system's oil/water separator (OWS). Historically, the water phase liquid from the LNAPL recovery system was discharged into EW-8; however, a June 2009 sample of the liquid revealed higher concentrations of dissolved phase contaminants than those present in the EW-8 extraction well. For example, 4,4-DDD was close to an order of magnitude greater in the discharge liquid (CHES, 2013).

During the period of October 1, 2011 to October 30, 2012, no LNAPL was observed in the LNAPL system wells (EW-8, MW97-1, and MW98-1), excluding infrequent measurements of 0.01 foot of oil at EW-8 on November 4, 2011 and September 16 and 23, 2012. These infrequent detections are consistent with recent years (CHES, 2013).

During the same reporting period (October 1, 2011 to October 30, 2012), a total of 19 wells at the site were gauged on a monthly basis to evaluate the presence and thickness of LNAPL. During the monthly gauging events, LNAPL was detected in 7 of the 19 wells. Primarily only a trace, non-measureable sheen of LNAPL was observed, except for MW97-24 (contained 0.01 feet in November 2011) and extraction well EW-6, which contained 0.01 feet to 0.89 feet of

LNAPL. LNAPL recovery at EW-6 is initiated after one foot of LNAPL accumulates in the extraction well and occurs via an inertial pumping system. Four attempts were made to recover LNAPL from extraction well EW-6 and a total 28 gallons of LNAPL was removed in total during the reporting period on October 14 and November 22, 2011 and January 19 and April 6, 2012 (CHES, 2013).

As part of the arsenic investigation conducted by MassDEP in 2009 through 2011 and summarized in Arsenic Summary Investigation Report – Part II/IIa (CHES, 2014a), several soil borings were conducted. Three soil borings located within or in close proximity to a former gravel pit (ASB-13, ASB-20, and ASB-20) had evidence of organic vapor or LNAPL with elevated PID responses. Soil borings ASB-20 and ASB-21 encountered the groundwater table at approximately 11 feet below ground surface (bgs) and showed evidence of LNAPL from 11 to 14.5 feet bgs and 11 to 20 feet (bottom of boring), respectively. In soil boring ASB-14, the presence of LNAPL was observed from 16 to 20 feet bgs (bottom of boring). Samples of soil containing LNAPL were collected from each of the three soil borings for SVOC and pesticide laboratory analysis. PAHs were detected above MCP regulatory standards in each soil sample, while only the sample from ASB-21 contained pesticides above MCP regulatory standards. The report concluded that the occurrence of LNAPL within the gravel pit did not appear to correlate with elevated arsenic concentrations in groundwater.

The location of LNAPL is coincident with the hot spot of the organic plume. Therefore, it was concluded that LNAPL is the primary source of the organic contaminants found in the groundwater (CHES, 2014a). The groundwater evaluation reports for the site have concluded that, because a significant amount of pure phase product (LNAPL) still exists in groundwater at the site, biodegradation will have relatively little impact on contaminant destruction. If the LNAPL can be removed such that only the dissolved phase remains, biodegradation could be a significant factor in attaining cleanup goals. Biodegradation may be beneficial at the present time in stabilizing the edges of the plume away from the plume source, such as across the river and to the north of the extraction system. However, hydraulic containment achieved by the groundwater extraction system is likely the primary reason for the stable or shrinking plume size.

Other Parameters. Additional parameters added to the 2012 and 2013 annual monitoring events included COD, TPH, and TOC. These parameters were added in response to recommendations made in EPA's Optimization Review for the Baird & McGuire Superfund Site, which was finalized in May 2013 (USEPA, 2013). The Optimization Review report recommended that laboratory analysis for TPH and TOC be added to the groundwater monitoring program to better correlate residual organic contamination with low oxidation-reduction potential (ORP) and high arsenic concentrations. The report speculated that VOCs and SVOCs are only a part of the organic compounds contributing to low ORP and arsenic mobility in groundwater and that TPH are also a potential source. In 2012, groundwater samples from all monitoring wells sampled, in addition to two well points (ASB-16 and ASB-22), were analyzed for COD, while samples from one monitoring well (MW97-23) and the two well points were analyzed for TPH and TOC. In 2013, groundwater samples from all monitoring wells sampled were analyzed for COD, TPH, and TOC (see Appendix D for the results).

COD is a measure of the oxygen demand of organic compounds in water, and is an indicator of the amount of organic pollutants present. Based on review of the 2013 data which was the largest data set for all three parameters, COD was detected in samples from 3 of 19 wells and TOC was detected in 9 of 19 wells. The three wells with detectable COD were also the three wells with the highest concentrations of TOC (BM-7, MW97-23, and MW97-12); however, the TOC analysis appears to be a more sensitive indicator of the presence of organic pollutants based on the higher number of detections. TPH was detected in groundwater samples from 11 of 19 wells in 2013. The highest concentration of TPH (5.05 mg/l at MW97-23) corresponded to the second highest TOC detection and third highest COD detection. The second highest detection of TPH (1.11 mg/l in MW97-21) corresponded to a lower detection of TOC. All other detections of TPH were less than 0.5 mg/l and only one third of the detections corresponded with detectable TOC.

Cochato River Sediment, Surface Water, and Fish Tissue Monitoring

Long-term monitoring of sediments in the Cochato River was performed on an annual basis from 1996 to 2002. The OU-3 ROD called for long-term monitoring of sediments in portions of the Cochato River downstream of the portion of the Cochato River where sediments were excavated as part of the remedy. Long-term monitoring has also included analysis of fish tissue in order to monitor the impact of the sediments on the fish population. Fish sampling was conducted in 1992, 1996, and annually from 1999 through 2002. Surface water samples were collected from the Cochato River in 2000 in order to establish baseline surface water quality for the project.

Based on data trends identified from samples collected between 2000 and 2002, a sediment and fish tissue sampling frequency of every five years was recommended in the second five-year review (USEPA, 2004). No further surface water sampling was recommended. Sediment, bank soil, and fish tissue samples were collected in October 2013 in support of this five-year review (ES&M, 2014).

Eleven sediment samples and four soil samples were collected from in and along the Cochato River between October 9 and October 11, 2013 (see Figure in Appendix D). Station progression (upstream to downstream) is A, E (next to site), B, C, and D. Bank soil samples were only collected at stations C and D. Samples were analyzed for TOC, grain size, PAHs, organochlorine pesticides, and arsenic. Analytical results are summarized in Appendix D. Line graphs are also included which show the mean concentrations of TOC, PAHs, Arsenic, Total Chlordane, and Total DDT detected in river sediment and bank soil samples collected at each station.

PAHs were detected in all the samples including upstream samples collected from station A. The highest concentrations were detected in the sediment sample collected at station E where naphthalene was detected at 19.5 mg/kg. The highest pesticide concentrations were detected in the sediment sample collected at station D farthest downstream of the site where 4,4'-DDD was detected at a concentration of 13.1mg/kg. Arsenic concentrations above 100 mg/kg were detected in samples collected at stations A, C, and D, with the highest concentration (179 mg/kg)

detected in the sediment sample collected from transect 7 at station A (the upstream location).

Table D-3 in Appendix D compares the 2013 sediment and soil results to historical results and the sediment cleanup levels developed in the 1989 ROD (listed under "Program Action Limit – River" in the table). Values listed as Program Action Limits for bank soils are not established project cleanup levels, but rather concentrations used for evaluation of results in historic trend analysis documents, developed to be protective of humans participating in recreational activities. The results presented show total PAH concentrations which are higher than the previous (2002) monitoring round in all samples. The total PAH concentrations exceed the sediment cleanup level at Stations A (upstream) (29,870 ug/kg) and E (adjacent to site) (76,664 ug/kg). Station D also showed an exceedance of the total DDT sediment cleanup level (19,559 ug/kg). In general, concentrations of detected contaminants were greater than the previous monitoring round.

Table D-4 in Appendix D presents the 2013 fish tissue results compared to historical results. The results presented show that there were no PAHs detected in any of the fish tissue samples in 2013. Total chlordane detections were similar in magnitude to the previous two monitoring rounds (2001 and 2002), except for Station A (upgradient), which showed a high concentration in the American Eel. This high result was based on one eel sample which was much higher in concentration than the other. Similarly, this same eel sample resulted in a high total DDT result at Station A. Other detections of total DDT were similar in magnitude to the previous two monitoring rounds.

Wetland Monitoring

Because on-site wetlands were impacted during implementation of the OU2 remedy, as necessary to remove and remediate contaminated soil, wetland restoration was required. A site inspection to assess the condition of the restored wetland area, as well as the restored upland area, was performed during the five year review process on August 8, 2014.

In general, the wetland vegetation was well-established at all of the wetland areas inspected. Typical wetland vegetation included: soft rush *(Juncus effusus)*, American burr-reed (*Sparganium americanum*), woolgrass *(Scirpus cyperinus)*, dark-green bulrush (*Scirpus atrovirens)*, wide-leaf cattail *(Typha latifolia)*, narrow-leaved cattail *(Typha angustifolia)*, reed canary grass (*Phalaris arundinacea)*, giant goldenrod *(Solidago gigantea)*, lurid sedge (*Carex lurida*), fox sedge *(Carex vulpinoidea)*, water horehound *(Lycopus americanus)*, spotted touch-me-not (*Impatiens capensis*), Canada rush *(Juncus canadensis)*, deer-tongue grass *(Dichanthelium clandestinum)*, rough-stem goldenrod *(Solidago rugosa)*, sensitive fern *(Onoclea sensibilis)*, flat-top goldenrod *(Euthamia graminifolia)*, and poison ivy *(Toxicodendron radicans)*. Silky dogwood *(Cornus amomum)*, Bebb willow (*Salix bebbiana*), elderberry (*Sambucus sp.)*, red maple *(Acer rubrum)*, Northern arrowwood *(Viburnum dentatum)*, green ash *(Fraxinus pennsylvanica)*, cottonwood saplings (*Populus deltoides)*, speckled alder *(Alnus rugosa)*, highbush blueberry *(Vaccinium corymbosum)*, and grey birch (*Betula populifolia*) were observed in the shrub layer of the restored wetland areas at the site.

Consistent with observations from the prior five year review in 2009, restored upland portions of the site appeared to be well-vegetated and stabilized. Vegetation in these upland areas are similar to that observed in 2009. The dominant species consisted of various grasses (Family: Poaceae), black locust trees and saplings (*Robinia pseudoacacia*), various goldenrods (*Solidago* spp.), common blackberry *(Rubus allegheniensis)*, bird's foot trefoil (*Lotus corniculatus*), knapweed (*Centaure*a *stoebe*), white pine *(Pinus strobus)*, milkweed (*Asclepias* spp.) and Quaking aspen *(Populus tremuloides)*. Common tansy (*Tanacetum vulgare*) has become a dominant species over many areas. The white pine and black locust trees have shown significant growth.

Occasional patches of purple loosestrife were observed in the restored wetland areas. In 2009, the field assessment documented that the larvae of the Galerucella beetle were present on site. This beetle, along with other species, has been released in Massachusetts as part of a biological control program for purple loosestrife. Although no beetles were observed in 2014, active herbivory was apparent in the form of damaged leaves, and it appears this activity may be assisting in controlling the purple loosetrife on site and preventing it from becoming more dominant.

Several wetland areas onsite were dominated by phragmites *(Phragmites australis)* and ideally should be controlled by methods compatible with the site. Phragmites was the invasive species which covered the most area at the site. Other invasive species, such as glossy buckthorn *(Rhamnus frangula)* and reed canary grass *(Phalaris arundinacea)* were also observed. The removal or control of these invasive species would enhance the habitat on site. However, the wetland and upland vegetative communities appear to be thriving and stable, and additional habitat enhancement is not required to meet the basic objectives of the remedy.

More detail, along with representative photos of the wetland and upland areas, is provided in Appendix E.

Site Inspection

The inspection of the Site was conducted on 6/11/2014. In attendance were Kimberly White, USEPA; Dorothy Allen and Patrick Hurley (part time) of the MassDEP; Lisa Irwin, John Irwin (part time), Kandi Prentiss and Maggie Legorete of Clean Harbors (the O&M Contractor for the MassDEP); and Cinthia McLane, AECOM (RAC Contractor for EPA). The purpose of the inspection was to assess the protectiveness of the remedy.

The infiltration basins appeared to be in good condition, aside from some overgrowth. The portions of the perimeter fence that could be observed from the site roads were in good condition. An attempt was made to observe a number of the monitoring and extraction wells. Due to heavy overgrowth, not all of the wells could be observed. Six of the eight extraction wells are in service. Extraction wells EW-2 and EW-5 are no longer in service, and O&M Contractor

personnel said that they are experiencing problems with EW-6 that indicate that maintenance may be required soon. O&M personnel stated that EW-9 is in need of a new motor and redevelopment. This well currently produces approximately 1 gpm. A new extraction well, EW-10, was recently installed (work was being done on the well at the time of the site inspection). The location of EW-10 was selected based on results of an arsenic study that was conducted by the MassDEP to better define the location of the arsenic plume.

The Extraction Well Control Building was briefly visited. The variable frequency drives (VFDs) for the wells, located in the building, are no longer used to control flow, but are left open. Total flow to the GWTF is approximately 80 gpm. The LNAPL collection system is no longer in use. Currently, NAPL is collected manually from extraction well EW-6. When collected, the NAPL is allowed to separate over time before being drummed and shipped off-site. Approximately 2.5 gallons of NAPL were last collected in December 2013.

In general, the GWTF continues to meet effluent discharge limits; however, the age of the equipment has resulted in some difficulty for the operators, including difficulty finding spare and replacement parts. Various upgrades and safety measures that have been implemented since the last five year review were noted, including the replacement of high pressure sodium lighting with energy efficient LED lamps; the addition of new variable frequency drives on the aeration tank blowers; replacement of the potassium permanganate tank; replacement of the GAC media with a longer-lasting coarser grade of carbon, and installation of new tank railings and restraints. More detail of the improvements is provided in Section IV.

More detail on the site inspection, including photographs, are included in Appendix E.

Interviews

The MassDEP Project Manager, the O&M Contractor personnel, and the Town Administrator for the Town of Holbrook were interviewed as part of the five year review process. The Holbrook Town Administrator was interviewed by telephone, and the MassDEP Project Manager and the O&M Contractor were interviewed as a group during the site inspection.

In general, the Holbrook Town Administrator was not aware of any problems or complaints related to the Site, and said that he last visited the Site about 3 years ago. The one concern noted by the Town Administrator is the back taxes owed to the town by the property owners.

The overall sentiment of the MassDEP Project Manager is that decisions need to be made at a higher level regarding the source of continuing contamination (particularly arsenic), and an approach to future remediation needs to be developed. She said that she agrees with recommendations in the Optimization Review.

O&M Contractor personnel stated that the GWTF is functioning well, although due to the age of the facility, it has been difficult to find spare and replacement parts. Their main issue is the high arsenic concentration in the groundwater. They have tried to pinpoint the source of the arsenic

and to locate the new extraction well to best capture the arsenic plume. Improvements and modifications to the facility, as well as monitoring frequency and staffing, were discussed. No complaints or intruders were noted, other than kids cutting through the town land on the other side of the fence near the extraction wells. The O&M staff did express concern regarding the impact that proposed redevelopment of a bordering lot of land will have on site operations and access (parcel 19-003-00-0 in Table 3). Part of this property is currently located within the site perimeter fence, however, the developer is proposing to move the fence to the property line as part of the redevelopment.

More detail is provided in Appendix F.

IV. TECHNICAL ASSESSMENT

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

Remedial Action Performance

The review of the documents, ARARs, and risk assumptions indicates that the remedy continues to operate and function as designed and is currently protective; however, the GWTF equipment and most of the extraction wells are very old and require considerable maintenance.

Opportunities for Optimization

As discussed in Section II, the EPA conducted an optimization review in 2012/2013 to identify specific actions that may be taken to potentially improve the effectiveness and cost-efficiency of the remedy. The review focused on remedy performance, protectiveness, cost-effectiveness, technical improvement, and site closure strategy. The recommendations of the optimization review are documented in Optimization Review for the Baird & McGuire Superfund Site, which was finalized in May 2013 (USEPA, 2013). A number of the recommendations have been implemented; others were considered, but not implemented; and others are still being evaluated. See Section II for a detailed discussed on the optimization review and efforts made to implement the recommendations.

Early Indicators of Potential Issues

As noted above, the age of the GWTF equipment and the extraction wells present ongoing maintenance issues.

Implementation of Institutional Controls and Other Measures

Site perimeter fencing has been effective at preventing unauthorized access to the Site, fish advisory signs are being maintained, and the EPA and MassDEP are in the process of developing ICs for the Site.

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

With respect to human health risk, while there have been changes to toxicity values and exposure parameters, the changes do not impact the protectiveness of the remedy. With respect to ecological risk, there are no newly promulgated standards relevant to the site, which bear on the protectiveness of the remedy. There are no major changes in site conditions or exposure assumptions upon which the ecological risk assessment was based that would result in increased exposure or risk. The overall conclusion is that the remedy, as implemented, is protective of human health and the environment.

Review of Human Health Risk Assessment

The risk assessment performed for the 1986 Feasibility Study (FS) report (GHR, 1986a) concluded that there would be significant risk to human health if groundwater from the site containing VOCs, SVOCs, and metals was ingested in the future. The risk assessment further determined that trespasser exposures to site soil containing arsenic, chlordane, and dioxins exceeded EPA risk management guidelines. Direct contact recreational exposures to Cochato River sediments containing elevated levels of arsenic, DDT, PAHs, and chlordane also exceeded regulatory limits. Maximum Contaminant Levels (MCLs) were selected as interim cleanup levels for groundwater. The results of the risk assessment were used to determine the lateral and vertical limits of soil excavation, and to establish cleanup levels for sediment. There was no evaluation of the fish consumption pathway in the risk assessment.

In 1997, a supplemental risk evaluation was performed by Metcalf & Eddy (M&E) as part of the Site Reuse Study (M&E, 1998) to determine the potential risk associated with future commercial/industrial site re-use. Child trespasser risks were also evaluated. Because soils had been excavated, incinerated, and backfilled on-site, the risk evaluation focused on residual risks associated with backfilled ash, contaminated soils remaining below the bottom depth of excavation, and 20 acres of soil remaining outside the limits of excavation. The study concluded that, based on the results of the qualitative risk evaluation, the site could be developed for commercial or industrial use and would not pose harm to children periodically trespassing onto the site.

The toxicity values that served as the basis for the sediment cleanup levels, as contained in the 1989 ROD, have been re-evaluated to determine whether any changes in toxicity impact the protectiveness of the remedy. Changes in toxicity values since the 1997 risk evaluation are also discussed below to determine whether reuse decisions remain valid. Any changes in current or potential future exposure pathways or exposure assumptions that may impact remedy protectiveness are also noted.

Changes in Toxicity. Table 7 presents a summary of the changes in toxicity values (oral reference doses and oral cancer slope factors) for compounds selected as Contaminants of Potential Concern (COPCs) as identified in the 1989 risk assessment. Updated toxicity information was obtained from the Integrated Risk Information System (IRIS; USEPA, 2014a) and other current EPA sources (e.g., the Superfund Health Risk Technical Support Center). Toxicity values for contaminants identified as COPCs during the 1997 risk evaluation, performed as part of the Site Reuse Study, have also been listed. Note that an increase in an oral reference dose will decrease the resulting hazard quotient, while an increase in an oral slope factor will increase the resulting cancer risk.

For most contaminants, changes to toxicity information have been minimal. Changes in toxicity values for groundwater COPCs (e.g., ethylbenzene, trichloroethene, tetrachloroethene, and vinyl chloride) would not affect remedy protectiveness since cleanup levels for groundwater are based on federal MCLs. Until groundwater cleanup levels are achieved and groundwater use is demonstrated to not pose a risk to human health, the installation of private wells and associated

groundwater exposure pathways should be prevented. Though no formal mechanism is yet in place to control groundwater use in the vicinity of the site, a local Board of Health (BOH) ordinance discourages groundwater use by requiring that property owners obtain BOH and Department of Public Works approval prior to installing wells.

A noteworthy change between 1997 and 2014 toxicity values is for chlordane, a significant contaminant in residual soils remaining at the site. The oral slope factor for chlordane has been decreased overall by a factor of approximately three, which results in a decrease in the estimation of cancer risk associated with chlordane in residual soil. Therefore, the conclusions of the 1997 risk evaluation remain valid, based on the toxicity evaluation.

An additional noteworthy change between 1997 and 2014 toxicity values is for dioxin. On February 17, 2012, EPA finalized the non-cancer toxicity assessment for 2,3,7,8 - tetrachlordibenzo-p-dioxin (TCDD), indicating that non-cancer health effects from exposure to dioxin can now be quantified. EPA's dioxin reassessment has been developed and undergone review for many years, with the participation of scientific experts in EPA and other federal agencies, as well as scientific experts in the private sector and academia. The Agency followed current guidelines and incorporated the latest data and physiological/biochemical research into the reassessment. With the release of the final human health non-cancer dioxin reassessment, EPA also published an oral non-caner toxicity value, or reference dose (RfD), of $7x10^{-10}$ mg/kg-day for 2,3,7,8 - TCDD in EPA's Integrated Risk Information System (IRIS). The dioxin cancer reassessment will follow thereafter. The dioxin RfD was approved for immediate use at Superfund sites to ensure protection of human health. While this change increases the hazard quotient for the site, the result is still below 1 when applying the current RfD and the site specific parameters utilized in the 1997 evaluation (see Appendix G). Therefore, the remedy is still considered protective.

In addition, based on a compilation and review of data on relative bioavailability of arsenic in soil (USEPA, 2012), arsenic was found to be less bioavailable via soil ingestion relative to other analytes. A relative bioavailability factor is now applied during soil/sediment ingestion calculations of risk/cleanup levels. This factor reduces arsenic contribution to risk and/or increases cleanup levels. Therefore, the conclusions of the 1997 risk evaluation remain valid, based on the toxicity evaluation.

Table 7: Comparison of 1989 and 2014 Oral Reference Doses and Oral Cancer Slope Factors for Compounds of Potential Concern

Contaminant of Potential Concern	Oral Reference Dose (RfD) (mg/kg-day)			Oral Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$		
	1989	1997 [e]	2014	1989	1997 [e]	2014
1,1-Dichloroethene	N/A		0.05	1.16		N/A
1,2-Dichloroethane	N/A		0.006	0.092		0.091
2,3,7,8-TCDD (Dioxin)	1.00E-09 a		7E-10	1.56E+05		1.3E+05
4,4'-DDD	N/A	N/A	N/A	0.34	0.24	0.24
4,4'-DDE	N/A		N/A	0.34		0.34
4,4'-DDT	N/A		0.0005	0.34		0.34
Aldrin	N/A		0.00003	11.4		17
Arsenic	N/A	0.0003	0.0003	15	1.5	1.5
Benzene	N/A		0.004	0.029		0.055
Benzidene	N/A		0.003	234		230
Benzo(a)pyrene	N/A	N/A	N/A	11.5	7.3	7.3
Beryllium	N/A		0.002	2.6		N/A
alpha-BHC	N/A		0.008	11.1		6.3
beta-BHC	N/A		N/A	1.84		1.8
delta-BHC	N/A		N/A	4.75		N/A
gamma-BHC	N/A		0.0003	1.33		1.1
Cadmium (food)	N/A		0.001	6.1		N/A
Cadmium (water)	N/A		0.0005	6.1		N/A
Chlordane	N/A	0.0005	0.0005	1.61	1.3	0.35
Chloroform	N/A		0.01	0.081		0.031
Dieldrin	N/A	0.00005	0.00005	30.4	16	16
Heptachlor	N/A		0.0005	3.37		4.5
Heptachlor epoxide	N/A		0.000013	3.37		9.1
Nickel	0.01 b		0.02	1.05		N/A
Tetrachloroethene	N/A		0.006	0.051		0.0021
Trichloroethene	N/A		0.0005	0.011		0.046
Vinyl chloride (f)	N/A		0.003	0.0175		0.72
trans-1,2-Dichloroethene	0.01 c		0.02	N/A		N/A
trans-1,3-Dichloropropylene	0.0026 a		0.03	N/A		0.1
2-Butanone	0.024 c		0.6	N/A		N/A
Barium	0.00029 b		0.2	N/A		N/A
Ethylbenzene	0.097 b		0.1	N/A		0.011
Fluoranthene	0.006 a		0.04	N/A		N/A
Lead (d)	0.0014 b		N/A	N/A		N/A
Silver	0.0014 a		0.005	N/A		N/A
Toluene	0.29 b		0.08	N/A		N/A

Contaminant of Potential Concern	Oral Reference Dose (RfD) (mg/kg-day)			Oral Slope Factor (SF) (mg/kg-day)$^{-1}$		
	1989	1997 [e]	2014	1989	1997 [e]	2014
Xylenes	0.01	b	0.2	N/A		N/A
Zinc	0.21	b	0.3	N/A		N/A
Dibenzofuran	N/A		0.001	N/A		N/A
2-Methylnaphthalene	N/A		0.004	N/A		N/A
Acenaphthene	N/A		0.06	N/A		N/A
Acenaphthylene (g)	N/A		0.06	N/A		N/A
Anthracene	N/A		0.3	N/A		N/A
Benzo(a)anthracene	N/A		N/A	N/A		0.73
Benzo(b)fluoranthene	N/A		N/A	N/A		0.73
Benzo(g,h,i)perylene (h)	N/A		0.03	N/A		N/A
Benzo(k)fluoranthene	N/A		N/A	N/A		0.073
Chrysene	N/A		N/A	N/A		0.0073
Dibenz(a,h)anthracene	N/A		N/A	N/A		7.3
Fluorene	N/A		0.04	N/A		N/A
Indeno(1,2,3-cd)pyrene	N/A		N/A	N/A		0.73
Naphthalene	N/A		0.02	N/A		N/A
Phenanthrene (h)	N/A		0.03	N/A		N/A
Pyrene	N/A		0.03	N/A		N/A

N/A = Not Applicable or Not Available
a. Derived from Acceptable Daily Intake (mg/day) divided by assumed body weight of 70 kg.
b. Derived from Acceptable Intake Chronic (mg/day) divided by assumed body weight of 70 kg.
c. Derived from Risk Reference Dose (mg/day) divided by assumed body weight of 70 kg.
d. Lead is currently evaluated through the use of exposure modeling for adults and children.
e. 1997 evaluation only looked at the analytes noted.
f. Vinyl chloride has toxicity values for both adult and child to account for mutagenic mode of action (see discussion below). Toxicity values presented in table are for adult receptors.
g. Acenaphthene used as a surrogate due to structural similarities.
h. Pyrene used as a surrogate due to structural similarities.

Changes in Exposure Pathways/Assumptions. There have been no changes in land use since the last five-year review. Current and future planned uses are still commercial/industrial in nature.

One pathway of potential concern that was not evaluated in the 1989 risk assessment was the vapor intrusion pathway. This pathway may be of concern at sites where soil and shallow groundwater contaminated with VOCs exists in close proximity to occupied buildings. LNAPL has been detected between 11 and 20 feet bgs. Except for the LNAPL Process Building and the Extraction Well Control Building, there are no buildings located above the shallow groundwater VOC plume that contains concentrations of naphthalene, 2-methylnaphthalene, ethylbenzene, toluene, xylene and other VOCs above vapor intrusion groundwater screening values. These two buildings are only visited occasionally (i.e., a few hours per week) to make sure they are secure or to perform periodic maintenance and monitoring of equipment; therefore performance of a

screening evaluation for vapor intrusion is not warranted at this time. However, should shallow groundwater VOC contamination continue to exist coincident with future site development involving the construction of buildings that will be occupied consistently (e.g., office space), the vapor intrusion pathway should be further evaluated to determine the potential risk to on-site workers. Because much of the site is located within wetland areas or the 100-year floodplain, existing zoning by-laws which establish use restrictions in floodplains and wetlands provide a degree of protection in that site re-development will be monitored or discouraged.

Neither the 1986 risk assessment nor the 1997 supplemental risk evaluation specifically assessed the risk to construction or excavation workers exposed to residual soil or shallow groundwater contamination during intrusive activities. Because this receptor population has not been evaluated, institutional controls preventing excavations into areas of the site with residual soil and/or shallow groundwater contamination should be established, or an evaluation should be performed to determine the potential risk to workers prior to initiating intrusive activities as part of site re-development.

Changes in Risk Assessment Methodology/New Guidance. Subsequent to the 1997 supplemental risk evaluation, a new method to evaluate compounds with mutagenic modes of action such as the carcinogenic PAHs is now recommended by EPA. The current methodology calls for the use of age-specific adjustment factors to account for an increased sensitivity during early life. The early-life calculation does not affect the conclusions of the 1997 evaluation for the commercial scenario because workers are assumed to be greater than 16 years of age for which the early-life component is not applicable. The 1997 evaluation showed that the cancer risk for the child trespasser scenario was less than that for the commercial worker scenario. However, the supplemental early-life calculation for child trespassers was not included as part of the 1997 evaluation since the EPA carcinogen risk assessment guidance was published subsequent to the completion of the site-specific risk evaluation. A supplemental calculation that included the early-life component for carcinogens with mutagenic modes of action, performed as part of the previous (2009) five-year review, confirmed the conclusion that child trespasser cancer risk is less than the commercial worker risk. Therefore, the conclusions of the 1997 supplemental risk evaluation continue to be valid. Institutional controls should be implemented to assure that future use of the site is consistent with the commercial land use assumptions used in the Site Reuse Study risk evaluation, and that child exposures of greater frequency and intensity than assumed for trespassing (50 days per year for 10 years) do not occur. The implementation of comprehensive institutional controls is on-going, and when complete, will provide long-term protectiveness for soil and groundwater remedies.

A recent EPA directive (USEPA, 2014b) was published which provides revised default exposure parameter assumptions for various exposure scenarios. Many of these parameters differ from those utilized in the previous risk evaluations. Most are related to residential exposures, which would not impact the protectiveness of the remedy. There are, however, changes to the worker soil adherence factor, skin surface area, and body weight. While not specified in the guidance, similar changes to trespasser exposure parameters would also be appropriate. These changes would generally result in reduced risk/an increase in the risk-based cleanup levels (for all media) providing the same level of risk defined in previous site documents.

Because of the significant changes in risk assessment methods and assumptions since 1986, the previous five-year reviews performed re-evaluations of the sediment cleanup levels to determine whether the changes in risk assessment methods affect remedy protectiveness. The evaluation performed in 2009 concluded that the ROD cleanup levels for sediment (arsenic – 250 mg/kg; PAHs – 22 mg/kg; DDT – 19 mg/kg; and chlordane – 5 mg/kg) were within EPA's target risk range (10^{-6} to 10^{-4}), with arsenic and PAHs (using conservative assumptions) being at the top of the target risk range. The recent directive noted above would lower the overall risk related to the sediment exposures. Furthermore, the reduced bioavailability of arsenic (also noted above in the toxicity changes) would lower the overall risk associated with the ROD cleanup levels.

With respect to these recent exposure assumption changes, the 1997 evaluation of residual soil/ash would show a lowered risk related to the exposures evaluated, thereby maintaining the conclusion of protectiveness.

Fish Tissue. There have been no site-specific cleanup levels associated with the fish tissue ingestion pathway. Previous evaluations and five-year reviews have utilized action limits developed by the Food and Drug Administration (FDA) as guidance values for comparison purposes even though they are not intended for application to recreationally-caught fish. More appropriate comparison methods are now available. The Regional Screening Level (RSL) online calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search) was used to generate screening levels for a range of fish consumption rates (i.e., 50th percentile and 95th percentile) taken from Table 8a of EPA-820-R-14-002 (Estimated Fish Consumption Rates for the U. S. Population and Selected Subpopulations (NHANES 2003-2010 Final Report April 2014) for the inland northeast adult population. These values are 22.1 g/day for the 50th percentile and 76.1 g/day for the 95th percentile). The resulting screening levels are as follows:

Analyte	**Screening Levels (ug/kg)**			
	Ingestion Rate = 76.1 g/day		Ingestion Rate = 22 g/day	
	Risk = 1E-06	HI = 1	Risk = 1E-06	HI = 1
Chlordane	8.43	548	29	1890
DDT	8.68	548	29.9	1890
Benzo(a)pyrene	0.404	NA	1.39	NA

Use of these screening levels for the evaluation of fish ingestion (see below) is more appropriate than use of the FDA values. Note that the RSL calculator does not evaluate total PAHs, so benzo(a)pyrene is used as a surrogate

Evaluation of Recent Sampling Data. As discussed in Section III, arsenic, benzene, ethylbenzene, lindane, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, mercury, and pentachlorophenol in select monitoring wells continue to exceed MCLs. Continued exceedances of MCLs indicate that completion of the drinking water ingestion pathway would present a risk to residents. Since groundwater from the site is not currently used by area residents as a source of potable water, the drinking water exposure pathway is incomplete. Until groundwater concentrations meet interim cleanup levels (MCLs), institutional controls should be implemented

at the site to ensure that no private wells are installed at or near the site.

Surface water monitoring data are no longer collected as the prior two five-year reviews evaluated the most recent data (from 2000) and found results to be well below EPA's target risk range of 10^{-6} to 10^{-4}.

Sediment monitoring data were collected in 2013 (see Section III). While there was one exceedance (Station D, downstream of site) of the DDT cleanup level, as discussed in the third five-year review, the cleanup level was developed at the 1E-06 risk level and, based on changes to toxicity values and exposure parameters, would actually be higher than determined in the ROD. As the exceedance is just above the ROD cleanup level, the resulting risk would be within EPA's target risk range. As discussed earlier, the ROD cleanup level for PAHs is at the top of the target risk range. The 2013 data show exceedances of the PAH cleanup level at Stations E (adjacent to the site) and A (upstream of the project area). The exceedance at Station E is within the range of historic detections (although much higher than the last two monitoring events). Station E is located within the site perimeter fence and therefore there is very limited human exposure potential. The upstream sample (Station A) is at least one order of magnitude above any historic detections in this area. It appears that further monitoring should be performed for confirmation of these exceedances, and that additional upstream characterization may also be needed to determine if there have been any recent upstream releases contributing to the residual contamination in the sediment adjacent to the site.

Fish tissue (fillet) data were collected in 2013. While 2002 fish sampling data indicated a potential issue with PAH detections, there were no PAHs detected in 2013. As discussed in Section III, there have been no site-specific cleanup levels developed for the fish tissue ingestion pathway. However, the screening levels developed above have been used to evaluate risks associated with detected concentrations. Note that EPA has a target cancer risk range of 10^{-6} to 10^{-4} and a target hazard index of 1. The cancer screening levels presented above are for 1×10^{-6}. To establish the approximate upper bound of the target cancer risk range (related to 10^{-4}), the cancer screening levels are multiplied by 100. For chlordane and DDT, the upper bound related to cancer risk is above the screening levels related to a target hazard index of 1, thereby making discussion of hazard index screening levels more significant than the cancer screening levels. Of the DDT and chlordane detections observed, only DDT found in the American eel at Station A (upstream) was high enough to be above EPA's target hazard index of 1 for a higher ingestion rate of 76.1 g/day. Therefore, any potential site-related impacts appear to be within EPA's target risk range.

Review of Ecological Risk Assessment

As summarized in the third FYR, the ecological risk assessment (ERA) performed for the FS Report (GHR, 1986a) was conducted using standard science, methodologies, and professional judgment available at the time.

The media of concern were on-site soils and Cochato River sediments. The ERA concluded that

there would be significant risk to ecological receptors from pesticides, SVOCs, and dioxin, although the ERA did not recommend site specific clean-up levels derived from ecological endpoints (as would be done using current guidelines). The limits of cleanup were based on the nature and extent of soil contamination documented in the RI/FS; the ROD specified the excavation of soil from areas based on contamination profiles developed in the RI Addendum (GHR, 1986b). The limits of excavation were established so that contaminant concentrations outside of the hot areas were one to two orders of magnitude lower than the concentrations inside the hot areas. Excavated soil and sediment were treated by on-site incineration and backfilled in upland areas. Limits of excavation were established to minimize disruption to wetlands.
In 1989, the ROD for the sediment study area (designated as Operable Unit 3 [OU-3]) was signed. This ROD covered the excavation and incineration of sediments from a length of the Cochato River extending from the Baird & McGuire site to the Union Street crossing, placement of clean backfill in excavated areas, and long-term monitoring of downstream portions of the Cochato River beyond the excavated areas. Sediments were dredged to a minimum depth of six inches and a maximum depth of 24 inches along a 2,100-foot reach of the Cochato River. A total of 4,712 cubic yards of sediment was removed. A small portion of the riverbed where contaminated groundwater was suspected to discharge to the river was backfilled with clean organic fill (approximately 438 cubic yards).

Since the ERA was written in 1986, EPA has promulgated guidelines to address screening chemicals, selecting contaminants of concern, and performing risk calculations. Furthermore, many of the tools available today had not yet been created, such as benchmark screening values, toxicity data, or improved laboratory detection levels. In order to address these changes in guidelines and available toxicity reference values, additional evaluations were performed in the second five-year review to assess risk to ecological receptors. These evaluations included modeling of the exposure of a small mammalian receptor exposed to the soils in the remediation area and comparison of fish tissue concentrations to toxicity reference values to assess potential adverse effects on fish exposed to site contaminants in the Cochato River. Since the last five-year review, there are no newly promulgated standards, relevant to the site, which bear on the evaluation of risk or the protectiveness of the remedy. There are no major changes in site conditions or exposure assumptions on which the risk assessment was based that would result in increased exposure or risk.

Soil Excavation. Although the limits of excavation were not determined using ecologically based risk criteria, the remedy likely eliminated risk to ecological receptors from pesticides and other organic contaminants in soil within the excavated area. As part of the second five year review, an evaluation was performed to estimate the exposure of a short-tail shrew as a receptor exposed to the soils in the remediated area. Using the maximum analyte concentrations in quarterly ash samples reported in Table A-1 of the Evaluation of Potential Future Reuse Opportunities of the Baird & McGuire Site report (M&E, 1998), a preliminary model was run to estimate exposure of selected SVOCs and inorganics to a small mammal (shrew) living in the remediated area. Based on this preliminary model, the second five-year review concluded that the remedy implemented for upland soils was protective for ecological receptors, although a more thorough model which uses UCLs and average concentrations, and evaluates risk from all site contaminants would be needed to confirm this conclusion with greater certainty. No

confirmatory samples were collected during soil excavation, nor was additional soil sample data collected for the third five-year review, thus it could not be determined whether or not the limits of excavation were sufficient to remove concentrations of contaminants to levels that are protective to ecological receptors under contemporary ARARs.

As summarized in the Data Review section, soil data were collected in 2013 from two areas (stations C and D) along the riverbank of the Cochato River. The samples were analyzed for PAHs, organochlorine pesticides, and arsenic. Table D-3 in Appendix D compares the 2013 soil data (bank samples) to historical results and to clean-up levels developed in the 1989 ROD. Table D-5 compares these same results to soil screening levels that are used in current-day risk evaluations. The screening values are conservative, but indicate exceedances of screening levels for PAHs, DDT, chlordane and arsenic in both of the soil samples collected in 2013. The levels measured in 2013 in the Mary Lee Wetlands and on the bank locations of Ice Pond were higher than 2002, although only the PAH concentrations in soils of the Mary Lee Wetlands were the highest concentrations observed among all of the historic samples from 1996 to 2002. The soil data show a substantial amount of variation between years, indicating that there may be significant spatial variation in the distribution of contaminants along the banks. The analysis conducted in the second Five Year Review to model potential risk to small mammals from exposure to soils used soil concentrations that were substantially lower than concentrations of PAHs and pesticides measured in bank samples collected in 2013.

River Sediments. Action limits for river sediments and river bank soils were based on human health criteria, thus the top six inches of sediment were removed from the excavation area, and riverbanks were restored with clean material. Because action limits were not based on ecological criteria, it could not be determined with certainty whether or not the action limits were sufficient to remove concentrations of contaminants to levels which are protective of ecological receptors under contemporary ARARs. However, because the zone of biological activity in sediments (i.e., the oxidized zone) typically consists of the top six inches (Rosenberg and Resh, 1993), and because the oxidized zone is where most species concentrate their interaction with their environment (USEPA, 2000), removal of the top six inches of sediment and replacement with clean material likely mitigates the risk of contaminants to benthic and aquatic ecological receptors.

No confirmatory samples were collected during sediment excavation, nor were there additional sediment sample data collected for the previous five-year review. Thus in the previous five-year reviews, it could not be confirmed whether or not the limits of excavation were sufficient to remove concentrations of contaminants to levels which are protective to ecological receptors under contemporary ARARs. However, samples were collected from the Cochato River in 2013 and the results can be compared to contemporary screening values for sediment contaminants. Sediment samples collected in the river at Stations A, E, B, C and D were analyzed for PAHs, arsenic, chlordane, and DDT. Table D-5 compares the sediment results to screening levels that are based on probable effects concentrations (PECs). The results show total PAH concentrations which are higher than the previous (2002) monitoring round in all samples. The total PAH concentrations exceed the sediment screening levels at Stations A (upstream) and E (adjacent to site). In general, pesticide concentrations were above screening levels for most sampling rounds

at all locations except the Station A (upstream). Highest concentrations of both DDT and chlordane were detected in 2013 at stations E (adjacent to site), and all downstream locations in the river sediment. In order to confirm that the higher concentrations of contaminants measured in 2013 in sediments, additional sampling of sediments to determine the extent of the elevated PAHs and pesticides will be conducted so that further risk evaluation can be performed to determine the long-term protectiveness of the remedy prior to the next five year review.

Fish Tissue. The remedy also included conducting long-term fish tissue monitoring in the river. In the second five-year review, maximum fish body burden data collected during the September/October 2002 round of sampling (M&E, 2003) were compared to toxicity reference values (TRVs). TRVs were obtained from the Environmental Residue Effects Database (ERED; USACE, 2004). TRVs were selected from chronic no-observed effects-dose (NOED) studies with reproductive endpoints. The comparison indicated that because fish body burdens are below TRVs, there is negligible risk to fish, thus the remedy is protective of fish. No studies added to the ERED database since the last five-year review would alter the selection of TRVs used. A review of the database in 2014 did not identify any studies providing new TRVs from chronic no-observed effects-dose (NOED) studies with reproductive endpoints for fish species since 2004 for COCs used to evaluate fish tissue in 2004.

Additional fish tissue data were collected for this fourth five-year review. However, the fish tissue was analyzed only for the concentration of selected contaminants in the fillet portions of the fish, which is the portion of the fish used to evaluate risk to human health. Fillet concentrations typically under-represent the whole body burden of contaminants that cause effects on fish. Table D-4 in Appendix D compares the 2013 fish fillet data to historical results for fillet data. The results presented show that there were no PAHs detected in any of the fish fillet tissue samples. Total chlordane detections were similar in magnitude to the previous two monitoring rounds (2001 and 2002), except for Station A (upgradient), which showed a high concentration in the American Eel. This same eel sample resulted in a high total DDT result at Station A. Other detections of total DDT were similar in magnitude to the previous two monitoring rounds.

The TRVs that were used in the second five-year review to compare maximum fish body burdens are not appropriate to evaluate effects on fish using the 2013 fillet-only data. The fillet data under-represent the body burdens and do not provide conclusive comparisons for ecological risk to fish. However, since the majority of the concentrations of contaminants measured in fillet are lower in the 2013 compared to the 2002 fillet-only result, it is likely that the conclusions from the 2002 evaluation are still applicable. The second Five Year Review concluded that since fish body burdens were below TRVs, there is negligible risk to fish, thus the remedy is protective of fish. Since the fillet data indicate that the concentrations in fish have not increased, it is likely that this conclusion is still valid. Prior to the next Five Year Review, another round of fish tissue data should be collected.

Summary and Conclusions Relative to Ecological Risks. In conclusion, since the ERA was prepared in 1986, there are updated soil and sediment screening values not previously used to select COCs potentially posing risk to ecological receptors. There are no newly promulgated

standards, relevant to the site, which bear on the protectiveness of the remedy. There are no major changes in site conditions or exposure assumptions upon which the risk assessment was based that would result in increased exposure or risk. The reference values and exposure assumptions in the ERA were re-evaluated in the second FYR, were found to be generally conservative, and were concluded to be protective. Review of these assumptions and reference values did not result in the identification of standards or reference values that would have significantly changed for the site evaluation since 2004.

Soil, sediment, and fish tissue data collected in 2013 were compared to updated ecological screening values in this Five-Year Review Report. The 2013 data for sediment and soils were generally above ecological screening levels. Elevated concentrations of PAHs and pesticides in samples from Ice Pond and Mary Lee Wetlands indicate some uncertainty in the distribution of these contaminants along the banks of the river and wetlands downstream of the site. Since the arsenic, PAH and pesticide concentrations were not the highest historically observed in these locations, the elevated levels may be a result of substantial spatial variation (e.g., two samples could be collected within one foot of each other and show significant concentration differences). In order to confirm the long-term protectiveness of the remedy, the concentrations of contaminants in soils downstream should be further sampled prior to the next Five Year Review in order to confirm risks to small mammal populations. Similarly, in order to confirm that the higher concentrations of contaminants measured in 2013 in sediments do not represent a risk to aquatic receptors, additional sampling of sediments to determine the extent of the elevated PAHs and pesticides should be conducted so that further risk evaluation can be performed.

Data collected for evaluation of concentrations of contaminants in 2013 were collected for fish fillets, only and not whole body tissue samples. The fillet data indicated that in fillet tissue there were no PAHs detected in any of the fish samples. Total chlordane detections were similar in magnitude to the previous monitoring rounds. Since the majority of the concentrations of contaminants measured in fillet are lower in the 2013 compared to the 2002 fillet results, it is likely that the conclusion from the 2002 evaluation that there is negligible risk to fish population is still applicable.

ARARs Review

A review of Applicable or Relevant and Appropriate Requirements was performed to check the impact on the remedy due to any changes in standards that were identified as ARARs in the three RODs and in the previous five-year review reports, newly promulgated standards for chemicals of potential concern, and TBCs (to be considered) that may affect the protectiveness of the remedy. Tables documenting the review of each ARAR, using the regulations and requirement synopses listed in the ROD as a basis, are provided in Appendix H. The evaluation included a determination of whether the regulation is currently ARAR or TBC and whether the requirements have been met. A discussion of the review is summarized below.

The ARARs identified for the selected remedies include:

Location-Specific:

- Resource Conservation and Recovery Act (RCRA)
- Clean Water Act (CWA)
- Fish and Wildlife Coordination Act (16 U.S.C. 661)
- Wetlands Executive Order (EO 11990)
- Executive Order (EO 11988)
- Massachusetts Wetlands Protection Regulations
- Massachusetts Hazardous Waste Facility Location Regulations
- Massachusetts Environmental Policy Act (MEPA) Regulations
- Massachusetts Certification for Dredging, Dredged Material Disposal and Filling in Waters
- Department of Environmental Management (DEM) Inland Wetland Orders

Chemical-Specific:

- Safe Drinking Water Act (SDWA)
- Resource Conservation and Recovery Act (RCRA)
- Federal Ambient Water Quality Criteria (AWQC)
- EPA Office of Water Guidance - Water-related Fate of 129 Priority Pollutants (1979)
- Threshold Limit Values (TLVs)
- National Oceanic Atmospheric Administration (NOAA)
- Ontario Ministry of Environment and Energy (OMEE)
- Massachusetts Drinking Water Requirements
- Massachusetts Surface Water Quality Standards
- Massachusetts Air Quality/Air Pollution Regulations
- Massachusetts Guidance on Acceptable Ambient Air Levels (AALs)

Action-Specific:

- Resource Conservation and Recovery Act (RCRA)
- Clean Water Act (CWA)
- Clean Air Act (CAA)
- Department of Transportation (DOT) Rules for Transportation of Hazardous Materials
- Massachusetts Hazardous Waste Regulations, Phase I and II
- Massachusetts Solid Waste Management Regulations
- Massachusetts Wetlands Protection Regulations
- Massachusetts Surface Water Discharge Permit Program Regulations
- Massachusetts Certification for Dredging, Dredged Material Disposal, and Filling in Waters
- OSHA General Industry Standards, Recordkeeping and Reporting, and Standards for Hazardous Waste Site Operations

Most of the listed ARARs remain applicable or relevant and appropriate to the site. Some of the listed ARARs were for the soil remediation phase of the remedy, which was completed in 1997,

and hence they are listed as formerly applicable or formerly relevant and appropriate. Those that are still applicable or relevant and appropriate are being complied with.
As discussed above in the Review of Human Health Risk Assessment, the vapor intrusion pathway was not evaluated in the 1989 risk assessment. As discussed above, performance of a screening evaluation for vapor intrusion is not warranted at this time, based on the amount of time the onsite buildings are visited. Should shallow groundwater VOC contamination or LNAPL continue to exist coincident with future site development involving the construction of buildings that will be occupied consistently (e.g., office space), the VI pathway should be re-evaluated based on available guidance at the time, particularly as it relates to institutional controls and future site development.

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

No other information that calls into question the protectiveness of the remedy has been identified during this Five-Year Review process.

Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the RODs, as modified by the two ESD documents. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. Most of the ARARs identified in the RODs remain applicable or relevant and appropriate and either have been met or are being complied with. An optimization review of the remedy was conducted and many of the recommendations have been implemented or attempted, resulting in an overall cost savings.

The toxicity values that served as the basis for the soil, groundwater, and sediment cleanup levels, as contained in the OU-1, OU2, and OU-3 RODs, as well as the toxicity values used for the soil "indicator chemicals" were re-evaluated to determine whether any changes in toxicity impact the protectiveness of the remedy, and no changes affecting protectiveness were noted. There are no major changes in site conditions, risk assessment methods, or exposure assumptions upon which the risk assessment was based that would result in increased exposure risk.

Further monitoring of sediment for PAHs, including upstream sources, is needed to confirm exceedances and to support future risk evaluations.

Long-term protectiveness is dependent upon implementation of institutional controls.

V. ISSUES/RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Table 8: Issues and Recommendations/Follow-up Actions

OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
						Current	Future
1, 2, 3	Institutional controls restricting land uses that may impact the protectiveness of the remedy (including preventing the use of groundwater and preventing excavation into areas of the Site with residual soil and/or shallow groundwater) need to be established. The implementation of comprehensive institutional controls is on-going, and when complete, will provide long-term protectiveness for soil and groundwater remedies.	EPA, MassDEP, and the property owners should complete development of the ICs and record them by the next five-year review.	State	EPA	8/30/2019	No	Yes
1	The 1986 OU1 ROD states that "after five (5) years of operation, the Agency will determine in a supplemental decision document if the restoration target levels are achievable and if they are adequate to protect public health and environment."	Determine whether current interim groundwater cleanup levels are appropriate, and document changes as necessary.	EPA/State	EPA	12/31/2015	No	Yes

OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
						Current	Future
1	Arsenic, benzene, ethylbenzene, lindane, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, mercury, and pentachlorophenol in select monitoring wells continue to exceed MCLs.	Evaluate recommendations from the 2013 Optimization Report and implement investigations, as appropriate. In the interim, operation and maintenance of the extraction wells and GWTF should continue to contain the plume, and investigations should continue to determine what improvements, if any, need to be made. Following completion of the investigations, a meeting between EPA and MassDEP is recommended to discuss the results of the investigations. ICs, as noted in a previous recommendation, should also be implemented to ensure that no private wells are installed at or near the site.	EPA/State	EPA	9/29/2019	No	Yes

OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
						Current	Future
3	The 2013 sediment data show exceedances of the PAH cleanup level at a sampling location adjacent to the site. The exceedance at the location adjacent to the site does not impact current protectiveness since the area is within the site perimeter fence.	Further monitoring should be performed for confirmation of the exceedance.	EPA/State	EPA	12/31/2018	No	Yes
3	Elevated concentrations of PAHs and pesticides in samples from Ice Pond and Mary Lee Wetlands indicate some uncertainty in the distribution of these contaminants along the banks of the river and wetlands downstream of the site.	In order to confirm the protectiveness of the remedy, the soils and sediment downstream of the site should be further sampled and evaluated prior to the next Five Year Review.	State	EPA	12/31/2018	N	Y

VI. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)		
Operable Unit: OU1	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):*

Protectiveness Statement:
The remedy at OU-1 currently protects human health and the environment because the current pathway for human health exposures has been eliminated as the contaminated aquifer is no longer being used as a drinking water source. The aquifer is being remediated to mitigate a future human health exposure pathway However, in order for the remedy to be protective in the long-term, groundwater should not be used for any purpose or directly contacted, due to its contamination and to the negative impact pumping could have on the effectiveness of the extraction and treatment system. Comprehensive institutional controls at the site, including OU1, must be implemented to ensure long-term protectiveness in and around the site.

Protectiveness Statement(s)		
Operable Unit: OU2	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):*

Protectiveness Statement:
The remedy at OU2 currently protects human health and the environment. As long as the Site is not used for residential purposes or other purposes where children are present at a high frequency (e.g., day care or parks), human health protectiveness will be within the risk-based concentrations established by EPA. Protectiveness is achieved for future workers in a commercial or industrial use scenario. However, in order for the remedy to be protective in the long-term, comprehensive institutional controls should be implemented or an evaluation should be performed to determine the potential risk to workers prior to initiating intrusive activities as part of site re-development.

Protectiveness Statement(s)		
Operable Unit: OU3	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):*

Protectiveness Statement:
The remedy at OU3 is currently protective of human health and the environment because sediment with high levels of contaminants was excavated and treated, and clean fill was used to replace materials excavated. However, to minimize disruption to wetlands, sediments were not removed from areas of the river where contaminant concentrations were low. Although contaminated sediments remain, it is expected that natural degradative, depositional, and dispersal processes will gradually reduce remaining concentrations in the sediment. In order for the remedy to be protective in the long-term, it is recommended that long-term sediment and fish tissue monitoring continue to evaluate contaminant levels/risks, and contaminant behavior over time, and maintain the current fish advisory signage.

Sitewide Protectiveness Statement	
Protectiveness Determination: Short-term Protective	*Addendum Due Date (if applicable):*

Protectiveness Statement:
The remedies for the Site currently protects human health and the environment because current exposure pathways that could result in unacceptable risks are being controlled. All threats at the Site have been or are being addressed through groundwater treatment; removal, incineration, and stabilization of contaminated soil and ash; site fencing; warning signage, and expansion of an alternate water supply.

However, in order for the remedy to be protective in the long-term, comprehensive institutional controls must be implemented to maintain a complete level of protectiveness for future activities in and around the site. Interim cleanup levels and recommendations which ensure the remedy is functioning as intended will also be evaluated. Continued monitoring of groundwater, sediment, and fish tissue is also needed to evaluate progress.

VII. NEXT REVIEW

The next five-year review report for the Baird & McGuire Superfund Site is required five years from the completion date of this review.

APPENDIX A – EXISTING SITE INFORMATION

A. SITE CHRONOLOGY

Table A-1: Site Chronology

Event	Date
Baird & McGuire Inc. operated a chemical mixing and batching company.	1912 – 1983
Commonwealth of Massachusetts becomes involved and fines the company at least thirty-five times for violations of the Federal Insecticide, Fungicide and Rodenticide Act of 1947(FIFRA).	1954 – 1977
Massachusetts Department of Environmental Quality Engineering (DEQE) (currently Department of Environmental Protection, or MassDEP) documents a number of questionable disposal practices.	1981 – 1982
Baird & McGuire Inc. carries out a number of voluntary remedial actions.	February - April, 1982
South Street municipal well field shut down.	1982
The Board of Selectmen of Holbrook revoke Baird & McGuire's permit to store chemicals at the Site and order the dismantling of existing storage facilities. As a result operations were terminated.	May 2, 1983
The Site is added to the National Priority List (NPL).	September 8, 1983
EPA begins removal actions including removing 1,000 cubic yards of contaminated soil, the constructing of a clay cap, installing a groundwater interception/recirculation system and erecting some fencing.	1983
EPA constructs a security fence to enclose the site.	July 1985
Remedial Investigation (RI) performed by GHR Engineering Associates.	May 1985
Feasibility Study (FS) performed by GHR Engineering Associates.	1986
EPA issues the first ROD which specifies groundwater extraction and treatment via an on-site treatment plant (OU-1) and soil excavation and treatment via an on-site incinerator (OU-2).	September 30, 1986
EPA issues the second ROD to address contamination in the Cochato River sediments (OU-3).	October 9, 1989
EPA issues the final ROD that calls for reopening the Donna Road well field to replace the lost supply resulting from contamination of the South Street wellfield (OU-4).	September 27, 1990
A groundwater treatment facility (GWTF) and extraction/recharge system is built (OU-1) and treatment of groundwater begins.	1991 to present
Removal of contaminated sediments from the Cochato River by the New England Division of the U.S. Army Corps of Engineers	May 1994 - June 1995

Event	Date
(OU-3).	
Source control remedy to remove and treat contaminated soils (OU-2) and on-site disposal of OU-2 soils and OU-3 sediments.	June 1995 - July 1997
LNAPL recovery system is constructed and becomes operational.	1998
Completion of the first Five-Year Review for the Site	September 1999
A Remedial System Evaluation (RSE) is completed for the GWTF.	January 2002
EPA signed two ESD documents for OU-1 and OU-4, allowing for partial funding of an off-site municipal water supply expansion project.	August 2003
MassDEP assumes site-wide O&M responsibility from EPA.	June 2004
Completion of the second Five-Year Review for the Site	September 2004
EPA issues an ESD for Institutional Controls	April 2005
MassDEP completed contractual agreement with Randolph/Holbrook Water District for alternate water supply capacity	June 2008
Completion of the Third Five-Year Review for the Site	September 2009
EPA conducts an optimization review to identify actions that may be taken to improve the effectiveness and cost-efficiency of the remedy	May 2013
Arsenic Summary Investigation Report produced	February 2014

B. BACKGROUND

Physical Characteristics and Land and Resource Use

The Baird & McGuire Superfund Site is located on South Street in Holbrook, MA (Figure 1 in Appendix B). The 1986 ROD defines the Site as the area within the EPA security fence constructed in July 1985. According to the FS, this fence encompasses all known areas of soil contamination related to Baird & McGuire (GHR, 1986a). The Site boundary and coincident fence line are shown on Figure 2, based on a Site survey conducted in May 1988. The Site designated on Figure 2 has been determined to consist of approximately 32.5 acres. For the purpose of increased security and access control measures during remedial actions, additional fencing was constructed in some areas beyond the Site boundary. This includes fencing around the groundwater treatment plant and recharge basins, and fencing beyond the southern Site boundary.

As illustrated on Figure 2, the Site is not limited to land within the former Baird & McGuire properties. Historically, Lots 130, 130-1 and 130-2 have had Baird & McGuire ownership. These lots consist of 9.33 acres, of which approximately 8 acres are within the Site boundaries. The remaining 24.5 acres of the Site consist of portions of five privately owned lots and two lots jointly owned by the towns of Holbrook and Randolph. In addition, four privately owned lots located west of the Cochato River (Lots 6, 12-2 and 12-3) have restricted access to the river due to the presence of the security fence.

Figure 2 also shows significant ecological Site features, including the Cochato River, the unnamed brook, the 100-year floodplain, and wetland areas. Based on a wetland boundary delineation conducted during RI investigations, wetlands occupied approximately 44 percent of the Site. In addition, 66 percent of the Site was determined to be within the 100-year floodplain (GHR, 1986a).

At the time of the ROD, the Baird & McGuire Site was used for commercial and industrial purposes. Currently, the Site is occupied by the Groundwater Treatment Facility. Current and planned uses are still commercial/industrial in nature.

Hydrology

The onsite geology is representative of processes associated with glaciation. The geologic units include bedrock, till, outwash deposits of stratified sands, gravel and silts, organic soils, and fill materials. Glacial till and bedrock are found in the topographically high areas of the Site. In the topographically lower portions of the Site, fill and stratified sands, gravel, and silt deposits overlie unstratified glacial till. In the wetland areas and topographically low areas of the Site, the stratified deposits are overlain by organic soils. In general, stratified sediments are underlain by till over weathered bedrock. In the eastern portion of the Site, near the Cochato River, the total thickness of stratified material is approximately 50 feet (GHR 1986). The till is underlain by two igneous rock units: granite, apparently part of the Dedham Granodiorite Formation, and Salem Gabbro-Diorite. The bedrock formations are variable in competency between highly weathered and fractured in certain areas of the Site, and competent in other areas. The 1986 *Feasibility Study* (FS) indicated no major faults or other structural features were reported at the Site or the surrounding area (GHR 1986).

Prior studies conducted at the Site reported on the hydrogeologic properties of the subsurface materials underlying the Site. The characteristics of the soil and bedrock at the Site, in terms of hydrogeology, are critical to an understanding of the fate of contaminants that have entered the aquifer at the Site. Based on information in the FS, average values of hydraulic conductivity of the principal overburden units at the Site are 1 x 10-3 cm/sec for silty sands, sand, and silt; 1.6 x 10-2 cm/sec for fine to medium, and fine to coarse-grained sands; and 3.5 x 10-3 cm/sec for glacial till.

A Conceptual Site Model (CSM) was developed by SAIC using previous documents by M&E (M&E 1999, M&E 2001 through 2004), USEPA (USEPA 2004), and GHR (GHR 1986). The CSM was presented in the 2007 Sampling and Analysis Plan (SAIC 2007). In general, the CSM considered the following to be representative of the aquifer at OU-1:

- The saturated zone of the OU-1 aquifer consists of four layers. The upper portion is a zone of relatively permeable stratified clean sand and gravel with a trace of silt to silty sands with little gravel. This stratified sand overlies a zone of unstratified glacial till. Beneath the till and portions of the stratified sand is a deposit of weathered and intact bedrock. In addition, localized deposits of organic, sandy silt are present in the upper layer near the Cochato River (M&E 2001 and GHR 1986).

- The upper aquifer at OU-1 exhibits the characteristics of unconfined groundwater flow.

- Groundwater flow is to the east-northeast across OU-1 in the upper unconfined aquifer and bedrock.

The continuous pumping of the groundwater remedial system appears to have a localized effect on the groundwater flow in the upper unconfined aquifer. Groundwater flow in the bedrock does not appear to be affected by the continuous pumping of the groundwater remedial system. In addition, there are localized areas of groundwater flow to the east toward the Cochato River (U.S. Geological Survey [USGS] 1999).

History of Contamination

Baird & McGuire Inc. operated a chemical mixing and batching facility in northwest Holbrook, Massachusetts from 1912 to 1983. Manufactured products included herbicides, pesticides, disinfectants, soaps, floor waxes and solvents. Waste disposal methods at the site included direct discharge into the soil, a nearby brook and wetlands, and a former gravel pit in the eastern portion of the site. Underground disposal systems were also used.

The state became involved between 1954 and 1977 and fined the company at least thirty-five times for violations of the Federal Insecticide, Fungicide and Rodenticide Act of 1947 (FIFRA). In 1981 and 1982 the Massachusetts Department of Environmental Quality Engineering (DEQE) documented a number of questionable disposal practices. Baird & McGuire Inc. performed voluntary remedial actions from February to April of 1982. In May 1982, the Board of Selectmen of Holbrook revoked Baird & McGuire's permit to store chemicals at the Site and ordered that existing storage facilities be dismantled. As a result, operations were terminated.

Initial Response

A hydrological study was completed by EPA which initiated some removal actions in 1983. These actions included the removal of 1,020 cubic yards of contaminated soil, 1 ton of waste creosote, 25 gallons of waste coal tar, 155 pounds of solid hazardous waste and 47 drums of flammable liquids and solids, and 2 drums of corrosives. EPA also oversaw construction of a clay cap, installation of a groundwater interception-recirculation system, and erection of fencing. The Site was added to the National Priority List (NPL) on September 8, 1983. EPA constructed a security fence in July 1985 to enclose the Site.

An RI/FS (1985/1986a, GHR) identified and described the presence of a groundwater contamination plume, originating from the Baird & McGuire property and extending beyond the Cochato River. EPA issued three RODs for the Site, defining four operable units and describing selected remedial alternatives. The first ROD, issued in September 1986, specified groundwater extraction and treatment at an on-site treatment plant (OU-1) and soil excavation, treatment at an on-site incinerator, and disposal of ash on-site (OU-2). The second ROD, issued in September 1989, addressed contamination in the Cochato River sediments (OU-3). EPA issued the final ROD in 1990, which called for reopening the Donna Road well field to replace the lost supply resulting from contamination of the South Street wellfield (OU-4).

Basis for Taking Action

The following summarizes the contaminants detected at the Site, as identified in the RI and during subsequent investigations.

Soil. Contaminants such as volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), other organic compounds, pesticides, dioxin, and heavy metals such as lead and arsenic have been detected in soils across the site. Dioxin also has been detected in area wetland soils. Although the Site was fenced off, both direct contact and accidental human ingestion of site soils posed an imminent threat to human health due to the high levels of pesticides and dioxin, as identified in the RI.

Groundwater. During the RI, VOCs, SVOCs, PAHs, pesticides, and metals (arsenic and lead) were detected in site groundwater and downgradient of the site, beyond the Cochato River. Direct contact or accidental ingestion of groundwater posed an imminent threat to public health. The contaminated groundwater resulted in the shut down of public wells (South Street well field). In a subsequent investigation, conducted by EPA in 1997, it was confirmed that light non-aqueous phase liquids (LNAPL) exist near the center of the plume. LNAPLs, undissolved chemicals that are less dense than water and thus float on top of the groundwater, have been determined to be a continuing source of

contamination in groundwater at this site. Groundwater monitoring has continued to indicate the presence of VOCs, SVOCs, pesticides, solvents, arsenic and other inorganic chemicals.

Sediments. Contaminants of concern, detected in Cochato River and Unnamed Brook sediments at the site, include VOCs, PAHs, arsenic, and pesticides including DDT and chlordane. The concentrations detected were greatest in the portions of the river on Site and approximately 500 feet downgradient of the existing site fence. These sediments were determined to be acutely toxic to aquatic life (EPA, 1989); and were associated with an excess cancer risk level in excess of 1x10(-6).

These conclusions formed the basis of the selected remedies (past and present) for the Site as outlined in the RODs. See Section C for additional details.

C. REMEDIAL ACTIONS

Remedy Selection

EPA issued three RODs for the Site, defining four operable units and describing selected remedial alternatives. The first ROD, issued in September 1986, specified groundwater extraction and treatment via an on-site treatment plant (OU-1) and soil excavation and treatment via an on-site incinerator (OU-2). The second ROD, issued in September 1989, addressed contamination in the Cochato River sediments (OU-3). EPA issued the final ROD in 1990, which called for reopening the Donna Road well field to replace the lost supply resulting from contamination of the South Street wellfield (OU-4).

The following sections summarize the selected remedies for Operable Units 1, 2, 3, and 4.

Operable Unit 1

The remedial objectives for OU-1 groundwater are:

- Remediate the contaminated aquifer within a reasonable time period to prevent present or future impacts to groundwater drinking supplies;
- Protect surface waters from future contaminant migration; and
- Minimize long-term damage and/or maintenance requirements.

The selected remedial action for OU-1 includes the following components:

- Groundwater Extraction System;
- On-site Groundwater Treatment Facility; and
- Groundwater Recharge System.

The current system consists of eight extraction wells (EW-2, EW-3, EW-4A, EW-5, EW-6, EW-7, EW-8, and EW-9) that pump contaminated groundwater to a groundwater treatment facility, and four recharge basins for discharge of treated groundwater back to the aquifer. Extraction wells EW-1 and EW-4 are currently off-line. The groundwater extraction wells were located to contain the plume.

Operable Unit 2

The remedial objectives for OU-2 soil were:

- Minimize the risk to the human population from direct contact with contaminated soils/sediments;
- Protect surface waters from future contaminant migration; and
- Minimize long-term damage and/or maintenance requirements.

Based on the nature and extent of soil contamination documented in the RI/FS, the 1986 ROD specified the excavation of soil from "hot areas" with subsequent treatment in an on-site incinerator, and on-site disposal of the treated soil (ash). The hot areas were delineated in the ROD based on contamination profiles developed in the RI Addendum (GHR, 1986b). The limits of excavation were established so that contaminant concentrations outside of the hot areas were one to two orders of magnitude lower than the concentrations inside the hot areas. Also considered was the presence of wetlands and the extent of contamination in those wetlands, with the intent of minimizing disruption to wetlands. The ROD notes that although this approach results in residual soil contamination, future health risk for a trespasser scenario would be within an acceptable range.

The selected remedial actions for OU-2 include the following components:

- Excavation with associated dewatering and erosion control;
- Backfilling using treated soil into the excavation area;
- Extraction Well Piping Relocation at the end of the excavation process;
- Temporary relocation of the Unnamed Stream during remediation followed by restoration of its natural course;
- On-Site Incineration and Stabilization (IS) Facility;
- Site Closure upon the completion of soil excavation and treatment;
- Site Restoration;
- Wetlands Restoration; and
- Continued Monitoring.

Operable Unit 3

The remedial objectives for OU-3 (sediment in river) were:

- Reduce human exposure to arsenic, DDT, PAHs, and chlordane in sediment by excavating to an average depth of six (6) inches and by achieving the following levels of contaminants: 250 ppm for arsenic; 19 ppm for DDT; 5 ppm for chlordane; and 22 ppm for total PAHs. These concentrations correspond to a 1×10^{-5} to 1×10^{-6} excess cancer risk level; and
- Reduce environmental exposure to those contaminants of concern to concentrations corresponding to the mean sediment quality criteria (SQC) (EPA, 1989) in the river bed, and to the upper bound SQC in the wetland area north of Ice Pond.

The ROD specified excavation and incineration of approximately 1,500 cubic yards of contaminated sediments for protection of public health and the environment. Sediments were to be excavated to an average depth of six inches from approximately the center of the fenced Site area downstream to Union Street. Sediments were to be transported to the on-site treatment facility, implemented under OU-2, and subsequently placed as backfill on the Site.

The ROD also required erosion control, wetlands restoration, placement of organic fill in the excavated areas of the river in the vicinity of the groundwater plume and long-term monitoring of downstream portions of the river where sediments were not excavated.

To minimize the disruption of wetlands, sediments were not to be removed from areas of the river where contaminant concentrations were low, calculated risks were low, and no impacts were observed. In accordance with the ROD for OU-3, long term monitoring is to be conducted to evaluate remaining contaminant levels and their behavior over time (EPA, 1989).

Operable Unit 4

The remedial objectives for OU-4 were:

- To identify a candidate water source to replace the 0.31 million gallons per day (MGD) lost supply from the closing of the South Street municipal well field in an environmentally sound, cost effective manner without placing additional stress on the Great Pond Reservoir system or existing water treatment facilities.

The selected remedy for OU-4 consisted of the following components:

- Permitting/Pre-design Studies;
- Groundwater Extraction;
- Groundwater Treatment; and
- Delivery to the Distribution System

On August 21, 2003, an Explanation of Significant Differences document (ESD) was issued for the groundwater remedy (OU-1) specified in the 1986 ROD. The ROD was changed to include excavation of soil from the Upper Reservoir/Great Pond located in Braintree and Randolph (approximately 400,000 cubic yards) to provide an additional storage capacity resulting in an estimated additional supply of 0.31 MGD to be used in the interim to supplement the community's drinking water until the groundwater remedial action is complete. On this date, EPA also issued an ESD document for OU-4 stating that no further action will be taken under this ROD.

Remedy Implementation

This section presents summaries of the remedial actions conducted or being conducted at the site in accordance with the RODs' objectives.

OU-1 Remedy Implementation

The groundwater remedy at the Site is ongoing. A groundwater treatment facility (GWTF) and extraction/recharge system were built in 1991 and remain in operation, with modifications.
The three main components of the groundwater remedy are extraction, on-site treatment, and recharge as specified by the 1986 ROD.

Groundwater Extraction. The groundwater extraction system consists of eight extraction wells (EW 2, EW-3, EW-4A, EW-5, EW-6, EW-7, EW-8, and EW-9). Operation of EW-2 was discontinued in 2006. The remaining wells operate at flow rates ranging from less than 1 to 21 gpm (Clean Harbors, 2009). Well EW-9 has not operated properly since installation, producing a very low (<1 gpm) flow rate. The extraction well locations are shown on Figure 3. The system was originally designed to pump at a maximum total rate of 200 gpm. During the period of July 2006 to September 2007, the system pumped an average of 87 gpm. The wells pump the groundwater via separate pipes to an extraction well control building, located south of the extraction system, where the water converges to a single header pipe that conveys the water to the GWTF. All extraction system controls (e.g., valves, flow meters, electrical switches) are housed within the extraction system control building. The wells are operated remotely through use of a programmable logic controller (PLC) located at the GWTF.

Figure 3 also shows the locations of the numerous monitoring wells that exist at the Site. At many of the monitored locations, multiple wells have been constructed. These well clusters allow water levels and water quality to be determined at different depths in the stratified drift deposits, in the till deposits and weathered bedrock zone, and in the underlying fractured bedrock. Data gathered from the monitoring wells are used both to develop groundwater contour maps from which the area of capture of

the extraction well system can be inferred, and to monitor the improvements in water quality resulting from groundwater extraction and treatment.

LNAPL Collection. As an enhancement to the groundwater extraction and treatment systems, LNAPL is pumped directly from 3 wells (EW-8, MW-97-1, and MW-98-1) to a separate collection tank. The recovered LNAPL is disposed off-site. Until June, 2004, the LNAPL was mixed with an absorbent, crushed corncobs, prior to off-site disposal. The State is currently shipping the LNAPL off-site in liquid form. The LNAPL system is currently operated intermittently, when dissolved phase is noted to be presented.

Groundwater Treatment. The Groundwater Treatment Facility (GWTF) is located off South Street as shown on Figure 3. All unit operations are contained in the same building including:

- Metals pretreatment consisting of potassium permanganate to remove heavy metals and arsenic, and the addition of polymer to enhance iron removal;
- Filtration for removing suspended solids carried over from the metals removal process;
- Granular activated carbon (GAC) adsorption for removing organic compounds;
- Sludge dewatering used for decreasing the water content of the metals hydroxide sludge;
- Metals hydroxide sludge disposal in a RCRA hazardous waste landfill; and
- Vapor phase carbon adsorption for treating off-gases from various tanks.

Monitoring points throughout the system allow for in-line instruments to measure flow and indicator parameters, and allow for the collection of samples for off-site laboratory analyses. The GWTF operation is currently staffed 10 hours a day, 7 days per week. Groundwater is treated to meet the SDWA MCLs.

Groundwater Recharge System. Treated water from the GWTF is recharged back to the groundwater through four infiltration basins (each 100 feet by 100 feet). Water is discharged to one basin at a time while the other three basins remain inactive. Discharge is rotated on a weekly basis to other basins to prevent overuse of any one basin and allow maintenance of a particular basin if recharge capacity is diminished.

OU-2 Remedy Implementation

The selected remedy for OU-2 consisted of soil excavation and incineration, erosion control, dewatering, backfilling of incinerated material, relocation of the unnamed stream, site restoration, wetlands restoration and monitoring.

This source control remedy (removal and treatment of contaminated soils) commenced in June 1995 and was completed in July 1997. All soils excavation and treatment facilities have been decommissioned and removed. To summarize, the OU-2 remedial activities consisted of:

- Approximately 248,000 tons of soil and sediment were excavated and treated by on-site incineration. Soils were excavated to approximately one foot below the seasonal low water table within the excavation limits, with excavation depths ranging from approximately 3 to 33 feet below grade;
- Approximately 250,000 tons of the treated soil (i.e., ash) were backfilled into the 12.5-acre excavation area;
- TCLP tests were performed on the ash, and approximately 320 tons of ash which failed the leaching criteria were stabilized with cement prior to backfilling to reduce the potential for leaching of contaminants;

- The incinerator building and equipment were demobilized and removed from the site and the incinerator building foundation was crushed and buried on-site; and
- Approximately 7.4 acres of forested and scrub/shrub floodplain wetlands underwent on-site restoration, including a small peat bog and 1,000 linear feet of the unnamed brook.

EPA and M&E concluded from the site visit conducted for the first five-year review that, although the wetland was not restored with the organic soils recommended in the Final Restoration Plan, the mitigative measures required by EPA and USACE were met. Initially, the wetland was monitored annually in order to assess the success of the wetland restoration effort. During the site visit on June 23, 2009, it appeared that the restored wetland was well established and in good condition.

OU-3 Remedy Implementation

The remedy for OU-3 involved removal of contaminated sediments from the Cochato River. This remedy commenced in May 1994 and was completed in June 1995. Major components of the sediment remedy were site preparation, sediment dredging, placement of organic fill and monitoring.

In preparation for river excavation, the river banks were cleared and grubbed. A detention basin was built in the river just downstream of the Union Street bridge to trap suspended sediments during dredging and was subsequently removed. Temporary haul roads were constructed and then removed after testing showed no residual contamination. Sediments were dredged from a 2,100-foot reach of river extending from the Baird & McGuire Site to the Union Street bridge. Sediments were dredged to a minimum depth of six inches and a maximum depth of 24 inches in some areas. Dredged material was placed in sealable containers and transported to the Baird & McGuire exclusion zone where it was stored for subsequent incineration. A total of 4,712 cubic yards of material were removed from the river. Dredged material was transported to the IS facility, incinerated and placed as backfill within the OU-2 soil excavation area. Wetlands adversely impacted by the dredging and the installation of haul roads were restored under the OU-2 Final Restoration Plan.

The portion of the river where contaminated groundwater underlies the riverbed was backfilled with approximately 438 cubic yards of clean organic fill. This organic fill acts as a filter which will attenuate contaminated groundwater that may discharge into the river.

Following completion of the remedy, EPA implemented a long term monitoring plan of the Cochato River downstream of the dredged area including analyses of sediment and fish. The plan includes collection and analysis of sediment samples annually for the first five years and fish samples every 5 years, followed by a review of the data and trends. Sediment samples were last collected in 2002.

OU-4 Remedy Implementation

The ROD for OU-4 was issued to address alternate water supply/replacement of lost supply that resulted from the contamination and subsequent shutdown of the South Street well field, which was part of the water supply for Holbrook in 1982. The reactivation of the Donna Road well field was selected as the alternate water supply.

In 2001, EPA provided funding to MassDEP through a Cooperative Agreement to assist the towns of Holbrook and Randolph in expanding existing water capacity at the Upper Reservoir/Great Pond. MassDEP actually provided the funding (along with its 10% RA cost share) for the project to the local water board through a contract. This was addressed in an ESD document in August 2003 for the groundwater remedy (OU-1). EPA believes the increase in additional drinking water capacity of the Upper Reservoir/Great Pond as provided by the ESD document for OU-1, should be sufficient to eliminate any interim risk until interim cleanup levels are met for the groundwater remedy. As a result,

the reactivation of the Donna Road wellfield was determined to be not necessary. Thus, an ESD document was issued on August 21, 2003 for OU-4, which states that EPA will not implement the selected OU-4 remedy and no further action will be taken under OU-4.

APPENDIX B

FIGURES

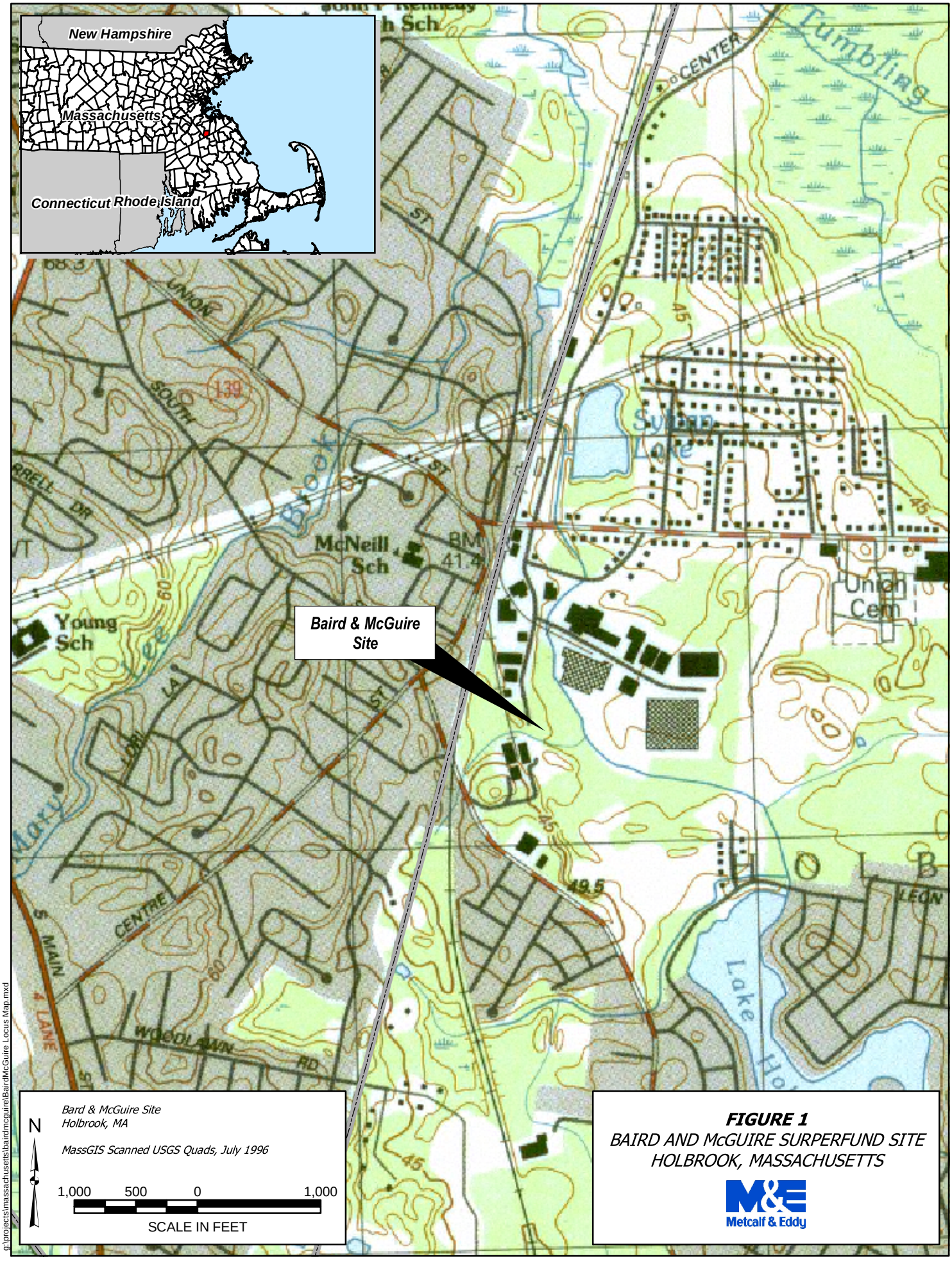
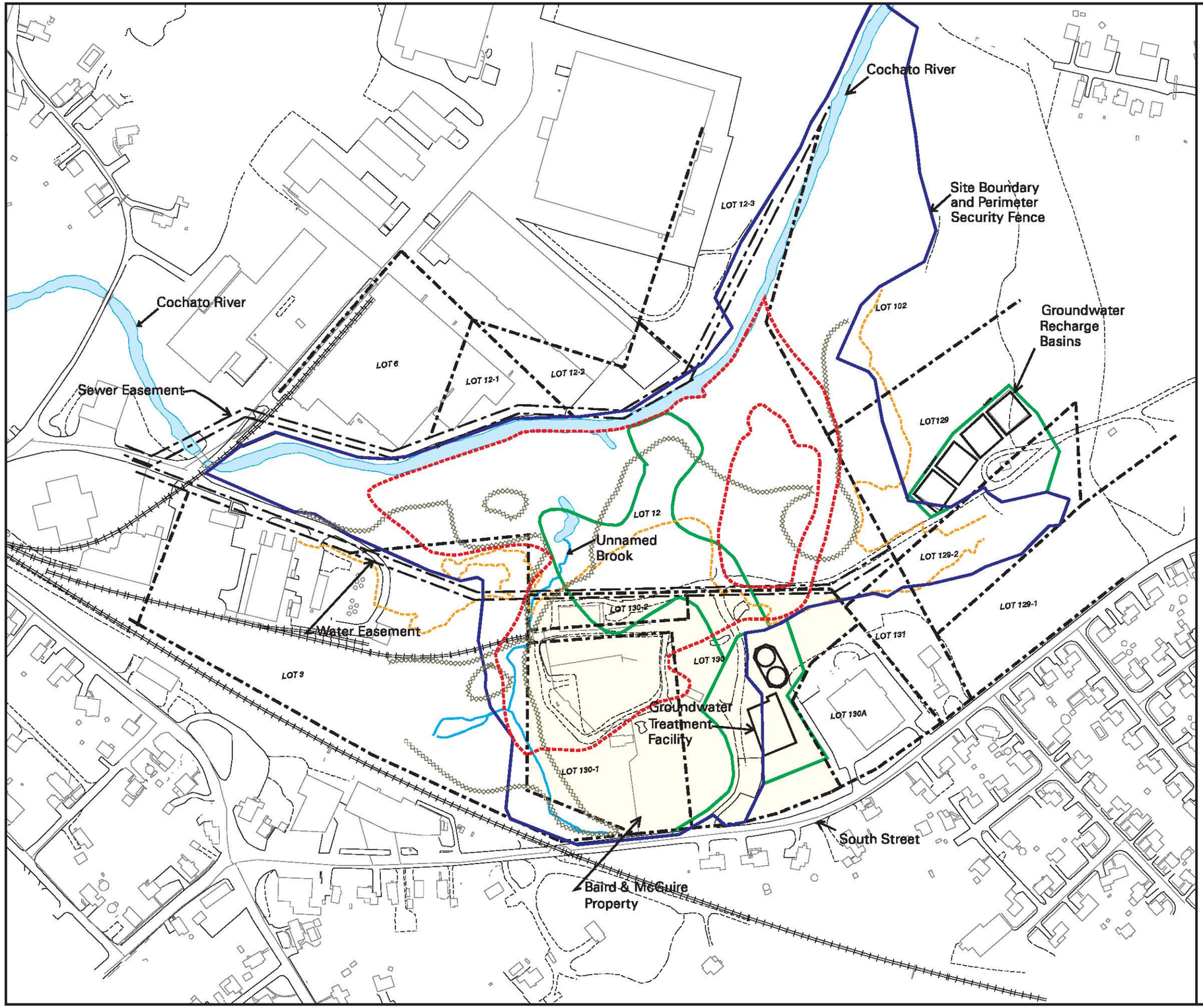


FIGURE 1

BAIRD AND McGUIRE SURPERFUND SITE
HOLBROOK, MASSACHUSETTS

Metcalf & Eddy

g:\projects\massachusetts\bairdmcguire\BairdMcGuire Locus Map.mxd



LEGEND

- Limit of Excavation
- Property Lines
- Easement
- Site Boundary and Perimeter Fenceline
- Additional Fencing
- Roads
- Streams
- Wetland Delineation
- 100 Year Floodplain
- Ponds and Waterbodies
- Baird & McGuire Property

MAP SOURCE:
Base Map is from Eastern Topographics (May 4, 1988).
Site features are compiled from numerous project plans and documents. All locations are approximate.

Metcalf & Eddy

250 0 250

SCALE IN FEET

Figure 2.
BAIRD & McGUIRE
SITE FEATURES.

BAIRD & McGUIRE SUPERFUND SITE
M&E Print Date: September 28, 2004

sitefeat-a

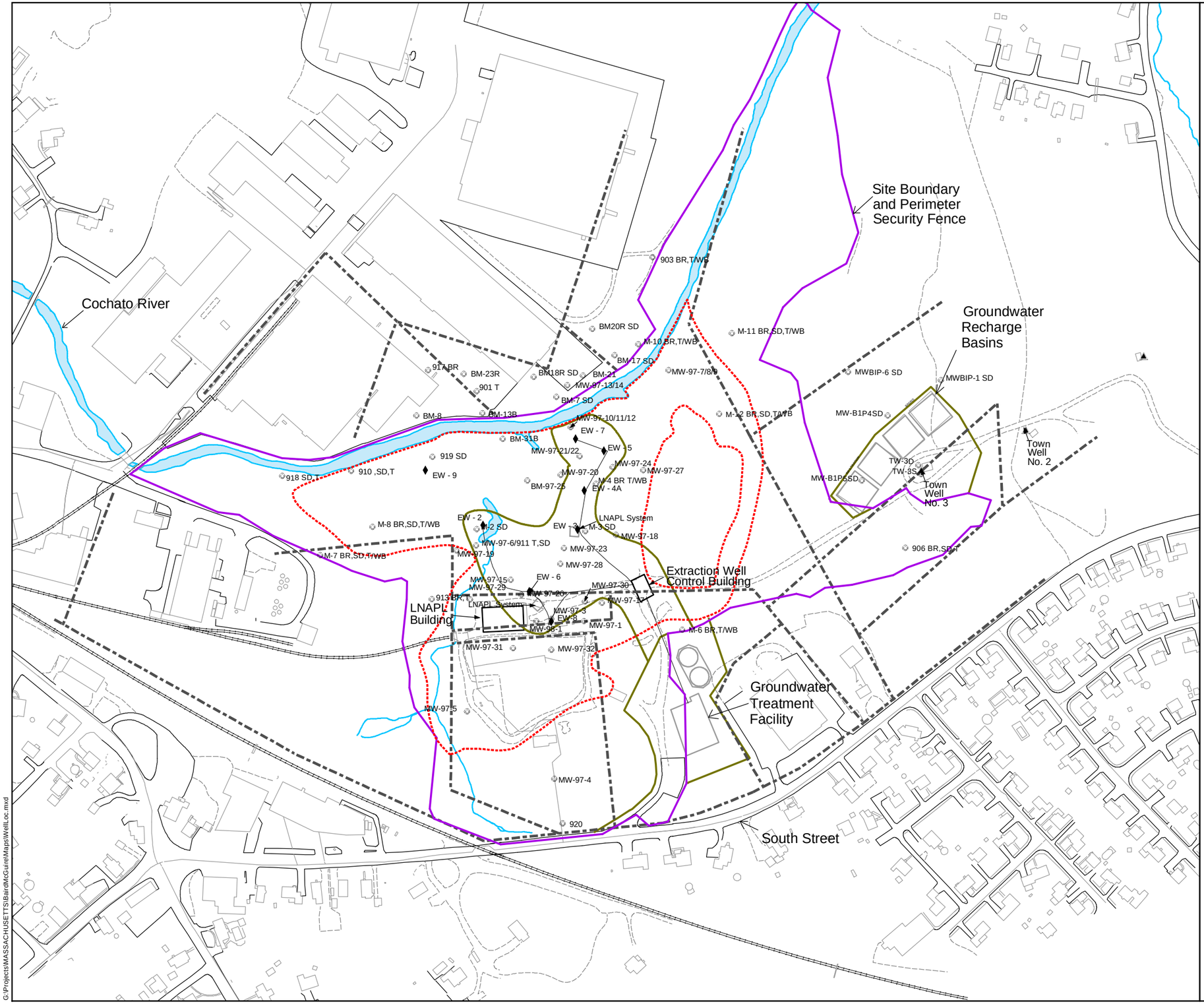

Cochato River
Site Boundary and Perimeter Security Fence
Groundwater Recharge Basins
Extraction Well Control Building
LNAPL Building
Groundwater Treatment Facility
South Street
Town Well No. 2
Town Well No. 3
LNAPL System
903 BR,T/WB
BM20R SD
M-10 BR,T/WB
M-11 BR,SD,T/WB
BM-17 SD
917 BR
BM-23R
BM18R SD
BM-21
901 T
MW-97-7/8/9
MW-97-13/14
BM-7 SD
BM-8
BM-13B
M-12 BR,SD,T/WB
MW-97-10/11/12
EW - 7
BM-31B
MW-97-21/22
EW - 5
919 SD
MW-97-24
MW-97-20
MW-97-27
918 SD,T
910 ,SD,T
EW - 9
BM-97-25
M-1 BR T/WB
EW - 4A
EW - 2
M-2 SD
EW - 3
M-3 SD
MW-97-18
M-8 BR,SD,T/WB
MW-97-6/911 T,SD
MW-97-23
MW-97-19
M-7 BR,SD,T/WB
MW-97-28
MW-97-15
MW-97-29
EW - 6
MW-97-30
MW-97-26
MW-97-17
913 BR,T
MW-97-3
EW-8
MW-97-1
MW-97-31
MW-97-32
M-6 BR,T/WB
MW-97-5
MW-97-4
920
MWBIP-6 SD
MWBIP-1 SD
MW-B1P4SD
MW-B1P5SD
TW-3D
TW-3S
906 BR,SD,T
LEGEND
Limits of Excavation
Property Lines
Site Boundary
Additional Fencing
Roads
Streams
Extraction Piping
EW
Extraction Well
Town Well
MW
Monitoring Well
Ponds and Waterbodies
MAP SOURCE:
Base Map is from Eastern Topographics (May 4, 1988).
Site features are compiled from numerous project plans and documents. All locations are approximate.
Metcalf & Eddy
N
125 62.5 0 125 250 375 500
SCALE IN FEET
Figure 3.
BAIRD & McGUIRE SUPERFUND SITE
SITE PLAN AND
WELL LOCATION PLAN.
HOLBROOK, MASSACHUSETTS
G:\Projects\MASSACHUSETTS\Baird\McGuire\Maps\WellLoc.mxd

FIGURE 4.

BAIRD & MCGUIRE FISH ADVISORY SIGN LOCATIONS

G:\Projects\HAZWASTE\60320585BMC\Maps\Figure4.mxd

APPENDIX C

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APPENDIX D

ANALYTICAL RESULTS

GROUNDWATER ANALYTICAL RESULTS

Table D-1 Summary of September 2013 Groundwater Analytical Data
(obtained from Clean Harbors Environmental Services)

WELL	911A*	BM-7	BM-7 (DUP-1)	BM-8*	BM-13B*	BM-18R	M9-T*	MW04-02	MW97-9	MW97-9	MW97-10*	MW97-12*	MW97-13*	MW97-17
Date Sampled	9/18/2013	9/23/2013	9/30/2013	9/18/2013	9/18/2013	9/18/2013	9/18/2013	9/23/2013	9/19/2013	9/30/2013	9/19/2013	9/19/2013	9/19/2013	9/30/2013
COD (mg/L)														
	<25.0	41.5	63.4	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	28.4	<25.0	<25.0
TPH (mg/L)														
	0.311	<0.163	<0.160	<0.155	0.158	0.156	0.221	<0.161	<0.157	<0.156	0.162	0.291	0.160	0.291
TOC (mg/L)														
	2.50	12.0	12.0	<1.00	<1.00	<1.00	1.10	2.70	<1.00	<1.00	<1.00	3.20	<1.00	<1.00
METALS (mg/L)														
ARSENIC (TOTAL)	0.124	0.0450	---	0.0950	0.101	0.0410	0.159	0.763	---	---	---	0.879	0.281	0.717
MERCURY	---	<0.000200	---	---	---	<0.000200	---	---	---	---	---	---	---	---
Total Metals	*0.124*	*0.0450*	---	*0.0950*	*0.101*	*0.0410*	*0.159*	*0.763*	---	---	---	*0.879*	*0.281*	*0.717*
PESTICIDES (ug/L)														
4 4-DDD	0.362	---	---	---	---	---	---	---	<0.0275	---	---	---	---	<0.0253
4 4-DDE	0.0637	---	---	---	---	---	---	---	<0.0275	---	---	---	---	<0.0253
ALDRIN	<0.0253	---	---	---	---	---	---	---	<0.0275	---	---	---	---	<0.0253
ALPHA-BHC	<0.0253	---	---	---	---	---	---	---	<0.0275	---	---	---	---	0.0750
DELTA-BHC	<0.0253	---	---	---	---	---	---	---	<0.0275	---	---	---	---	<0.0253
DIELDRIN	0.0926	---	---	---	---	---	---	---	<0.0275	---	---	---	---	<0.0253
ENDOSULFAN I	<0.0253	---	---	---	---	---	---	---	<0.0275	---	---	---	---	<0.0253
ENDOSULFAN II	<0.0253	---	---	---	---	---	---	---	<0.0275	---	---	---	---	<0.0253
ENDRIN	<0.0253	---	---	---	---	---	---	---	<0.0275	---	---	---	---	<0.0253
ENDRIN ALDEHYDE	<0.0253	---	---	---	---	---	---	---	<0.0275	---	---	---	---	<0.0253
ENDRIN KETONE	<0.0253	---	---	---	---	---	---	---	<0.0275	---	---	---	---	<0.0253
GAMMA-BHC	<0.0253	---	---	---	---	---	---	---	<0.0275	---	---	---	---	<0.0253
HEPTACHLOR EPOXIDE	<0.0253	---	---	---	---	---	---	---	<0.0275	---	---	---	---	<0.0253
HEXACHLOROBENZENE	<0.0253	---	---	---	---	---	---	---	<0.0275	---	---	---	---	<0.0253
METHOXYCHLOR	<0.0253	---	---	---	---	---	---	---	<0.0275	---	---	---	---	<0.0253
Total Pesticides	0.518	---	---	---	---	---	---	---	*ND*	---	---	---	---	*0.0750*
SEMI VOLATILES (ug/L)								SL			SL			
1,4-DINITROBENZENE	<2.50	---	---	<2.50	---	---	<2.50	<2.63	---	---	<2.63	---	---	<2.63
2,4,5-TRICHLOROPHENOL	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
2,4,6-TRICHLOROPHENOL	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
2,4-DICHLOROPHENOL	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
2,4-DIMETHYLPHENOL	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
2,4-DINITROTOLUENE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
2-METHYLNAPHTHALENE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	5.04
2-METHYLPHENOL	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
3,3'-DICHLOROBENZIDINE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
3-METHYLPHENOL/4-METHYLPHENOL	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
4,6-DINITRO-2-METHYLPHENOL	<5.00	---	---	<5.00	---	---	<5.00	<5.26	---	---	<5.26	---	---	<5.26
4-NITROANILINE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
4-NITROPHENOL	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
ACENAPHTHENE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	15.7
ACENAPHTHYLENE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
ACETOPHENONE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
ANTHRACENE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
BENZO (A) ANTHRACENE	<0.100	---	---	<0.100	---	---	<0.100	<0.105	---	---	<0.105	---	---	<0.105
BENZO (A) PYRENE	<0.100	---	---	<0.100	---	---	<0.100	<0.105	---	---	<0.105	---	---	<0.105
BENZYL ALCOHOL	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
BIS(2-CHLOROETHOXY) METHANE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
BIS(2-CHLOROETHYL) ETHER	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
BIS-(2-CHLOROISOPROPYL) ETHER	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05

Table D-1 Summary of September 2013 Groundwater Analytical Data
(obtained from Clean Harbors Environmental Services)

WELL	911A*	BM-7	BM-7 (DUP-1)	BM-8*	BM-13B*	BM-18R	M9-T*	MW04-02	MW97-9	MW97-9	MW97-10*	MW97-12*	MW97-13*	MW97-17
Date Sampled	9/18/2013	9/23/2013	9/30/2013	9/18/2013	9/18/2013	9/18/2013	9/18/2013	9/23/2013	9/19/2013	9/30/2013	9/19/2013	9/19/2013	9/19/2013	9/30/2013
BIS-(2-ETHYLHEXYL) PHTHALATE	4.56	---	---	3.74	---	---	2.81	<1.05	---	---	<1.05	---	---	1.77
CARBAZOLE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
CHRYSENE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
DIBENZOFURAN	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	4.01
DIETHYLPHTHALATE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
FLUORANTHENE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
FLUORENE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	8.43
INDENO (1,2,3-CD) PYRENE	<0.100	---	---	<0.100	---	---	<0.100	<0.105	---	---	<0.105	---	---	<0.105
NAPHTHALENE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	19.6
NITROBENZENE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
N-NITROSODIPHENYLAMINE	<5.00	---	---	<5.00	---	---	<5.00	<5.26	---	---	<5.26	---	---	<5.26
PENTACHLOROPHENOL	<1.00	---	---	<1.00	---	---	<1.00	<1.00	---	---	<1.00	---	---	<1.00
PHENANTHRENE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	2.34
PHENOL	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
PYRENE	<1.00	---	---	<1.00	---	---	<1.00	<1.05	---	---	<1.05	---	---	<1.05
Total Semi Volatiles	*4.56*	---	---	*3.74*	---	---	*2.81*	*ND*	---	---	*ND*	---	---	*56.9*
VOC (ug/L)														
1,2,4-TRIMETHYLBENZENE	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
1,2-DICHLOROETHANE	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
1,3,5-TRIMETHYLBENZENE	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
2,2-DICHLOROPROPANE	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
BENZENE	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
CHLOROBENZENE	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
ETHYLBENZENE	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
ISOPROPYLBENZENE	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
METHYL TERT-BUTYL ETHER	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
NAPHTHALENE	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
n-BUTYLBENZENE	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
n-PROPLYBENZENE	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
SEC-BUTYLBENZENE	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
TERT-BUTYLBENZENE	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
TETRACHLOROETHENE	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
TOLUENE	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
XYLENES (TOTAL)	---	---	---	---	<2.00	---	---	<2.00	---	---	<2.00	---	---	---
Total Volatiles	---	---	---	---	*ND*	---	---	*ND*	---	---	*ND*	---	---	---

Table D-1 Summary of September 2013 Groundwater Analytical Data
(obtained from Clean Harbors Environmental Services)

WELL	MW97-18*	MW97-21	MW97-21 (DUP-1)	MW97-23	MW97-25	MW97-25 (DUP-2)	MW97-27	MW97-29	MW97-31	Trip Blank
Date Sampled	9/20/2013	9/20/2013	9/20/2013	9/23/2013	9/20/2013	9/20/2013	9/23/2013	9/20/2013	9/20/2013	9/23/2013
COD (mg/L)										
	<25.0	<25.0	---	26.2	<25.0	---	<25.0	<25.0	<25.0	---
TPH (mg/L)										
	<0.155	1.11	---	5.05	<0.167	---	<0.158	<0.158	0.162	---
TOC (mg/L)										
	1.20	1.60	---	5.10	1.00	---	<1.00	<1.00	<1.00	---
METALS (mg/L)										
ARSENIC (TOTAL)	0.264	1.37	1.34	0.376	0.169	0.234	0.224	0.164	0.175	---
MERCURY	---	---	---	---	<0.000200	0.000252	---	---	---	---
Total Metals	*0.264*	*1.37*	*1.34*	*0.376*	*0.169*	*0.234*	*0.224*	*0.164*	*0.175*	---
PESTICIDES (ug/L)				SH						
4 4-DDD	---	---	---	<0.0253	<0.0255	<0.0255	---	0.312	0.0327	---
4 4-DDE	---	---	---	<0.0253	<0.0255	<0.0255	---	<0.0281	<0.0281	---
ALDRIN	---	---	---	0.0411	0.0428	0.0495	---	<0.0281	<0.0281	---
ALPHA-BHC	---	---	---	<0.0253	<0.0255	<0.0255	---	<0.0281	<0.0281	---
DELTA-BHC	---	---	---	<0.0253	<0.0255	<0.0255	---	<0.0281	<0.0281	---
DIELDRIN	---	---	---	0.993	0.0769	0.0775	---	0.237	0.0774	---
ENDOSULFAN I	---	---	---	0.0711	<0.0255	<0.0255	---	<0.0281	<0.0281	---
ENDOSULFAN II	---	---	---	<0.0253	<0.0255	<0.0255	---	<0.0281	<0.0281	---
ENDRIN	---	---	---	<0.0253	<0.0255	<0.0255	---	<0.0281	<0.0281	---
ENDRIN ALDEHYDE	---	---	---	<0.0253	<0.0255	<0.0255	---	0.0871	<0.0281	---
ENDRIN KETONE	---	---	---	0.153	<0.0255	<0.0255	---	<0.0281	<0.0281	---
GAMMA-BHC	---	---	---	0.203	<0.0255	<0.0255	---	<0.0281	<0.0281	---
HEPTACHLOR EPOXIDE	---	---	---	<0.0253	<0.0255	0.0294	---	<0.0281	<0.0281	---
HEXACHLOROBENZENE	---	---	---	<0.0253	<0.0255	<0.0255	---	<0.0281	<0.0281	---
METHOXYCHLOR	---	---	---	<0.0253	<0.0255	<0.0255	---	<0.0281	<0.0281	---
Total Pesticides	---	---	---	*1.461*	*0.1197*	*0.1564*	---	*0.636*	*0.1101*	---
SEMI VOLATILES (ug/L)		SL	SL		SL	SL	SL	SL		
1,4-DINITROBENZENE	<2.55	4.06	<2.50	---	<2.63	<2.66	<2.53	<2.84	<2.58	---
2,4,5-TRICHLOROPHENOL	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
2,4,6-TRICHLOROPHENOL	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
2,4-DICHLOROPHENOL	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
2,4-DIMETHYLPHENOL	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
2,4-DINITROTOLUENE	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
2-METHYLNAPHTHALENE	<1.02	93.2	81.1	---	<1.05	<1.06	<1.01	<1.14	176	---
2-METHYLPHENOL	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
3,3'-DICHLOROBENZIDINE	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
3-METHYLPHENOL/4-METHYLPHENOL	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
4,6-DINITRO-2-METHYLPHENOL	<5.10	<5.00	<5.00	---	<5.26	<5.32	<5.05	<5.68	<5.15	---
4-NITROANILINE	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
4-NITROPHENOL	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
ACENAPHTHENE	<1.02	86.0	87.8	---	<1.05	<1.06	<1.01	<1.14	12.7	---
ACENAPHTHYLENE	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
ACETOPHENONE	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
ANTHRACENE	<1.02	2.54	1.88	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
BENZO (A) ANTHRACENE	<0.102	<0.100	<0.100	---	<0.105	<0.106	<0.101	<0.114	<0.103	---
BENZO (A) PYRENE	<0.102	<0.100	<0.100	---	<0.105	<0.106	<0.101	<0.114	<0.103	---
BENZYL ALCOHOL	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
BIS(2-CHLOROETHOXY) METHANE	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
BIS(2-CHLOROETHYL) ETHER	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
BIS-(2-CHLOROISOPROPYL) ETHER	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---

Table D-1 Summary of September 2013 Groundwater Analytical Data
(obtained from Clean Harbors Environmental Services)

WELL	MW97-18*	MW97-21	MW97-21 (DUP-1)	MW97-23	MW97-25	MW97-25 (DUP-2)	MW97-27	MW97-29	MW97-31	Trip Blank
Date Sampled	9/20/2013	9/20/2013	9/20/2013	9/23/2013	9/20/2013	9/20/2013	9/23/2013	9/20/2013	9/20/2013	9/23/2013
BIS-(2-ETHYLHEXYL) PHTHALATE	1.04	<1.00	<1.00	---	21.8	20.0	<1.01	2.36	1.61	---
CARBAZOLE	<1.02	2.62	2.72	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
CHRYSENE	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
DIBENZOFURAN	<1.02	14.9	13.2	---	<1.05	<1.06	<1.01	<1.14	3.91	---
DIETHYLPHTHALATE	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
FLUORANTHENE	<1.02	1.88	1.80	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
FLUORENE	<1.02	27.4	26.6	---	<1.05	<1.06	<1.01	<1.14	2.42	---
INDENO (1,2,3-CD) PYRENE	<0.102	<0.100	<0.100	---	<0.105	<0.106	<0.101	<0.114	<0.103	---
NAPHTHALENE	<1.02	15.4	11.9	---	<1.05	<1.06	<1.01	<1.14	9.28	---
NITROBENZENE	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
N-NITROSODIPHENYLAMINE	<5.10	<5.00	<5.00	---	<5.26	<5.32	<5.05	<5.68	<5.15	---
PENTACHLOROPHENOL	<1.00	<1.00	<1.00	---	<1.00	<1.00	<1.00	<1.00	<1.00	---
PHENANTHRENE	<1.02	21.3	20.9	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
PHENOL	<1.02	<1.00	<1.00	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
PYRENE	<1.02	1.12	1.20	---	<1.05	<1.06	<1.01	<1.14	<1.03	---
Total Semi Volatiles	*1.04*	*270.4*	*249.1*	---	*21.8*	*20.0*	*ND*	*2.36*	*206*	---
VOC (ug/L)										
1,2,4-TRIMETHYLBENZENE	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
1,2-DICHLOROETHANE	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
1,3,5-TRIMETHYLBENZENE	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
2,2-DICHLOROPROPANE	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
BENZENE	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
CHLOROBENZENE	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
ETHYLBENZENE	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
ISOPROPYLBENZENE	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
METHYL TERT-BUTYL ETHER	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
NAPHTHALENE	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
n-BUTYLBENZENE	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
n-PROPLYBENZENE	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
SEC-BUTYLBENZENE	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
TERT-BUTYLBENZENE	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
TETRACHLOROETHENE	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
TOLUENE	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
XYLENES (TOTAL)	<2.00	---	---	---	<2.00	<2.00	<2.00	---	---	<2.00
Total Volatiles	*ND*	---	---	---	*ND*	*ND*	*ND*	---	---	*ND*

TABLE D-2 HISTORICAL VOC, SVOC, AND ARSENIC CONCENTRATIONS AT SITE WELLS

Overburden Wells	Replacement Well	Well Type	8/88,9/88 Total VOCs (ppb)	4/94 Total VOCs (ppb)	10/94 Total VOCs (ppb)	3/95 Total VOCs (ppb)	4/95 Total VOCs (ppb)	8/97,9/97,10/97 Total VOCs (ppb)	8/98,9/98,10/98 Total VOCs (ppb)	02/00 - 05/00 Total VOCs (ppb)	04/01 - 07/01 Total VOCs (ppb)	04/02 - 07/02 Total VOCs (ppb)	04/03 - 06/03 Total VOCs (ppb)	03/04 - 05/04 Total VOCs (ppb)	06/05 Total VOCs (ppb)	10/06 Total VOCs (ppb)	08/07 - 10/07 Total VOCs (ppb)	07/08 Total VOCs (ppb)	08/09 Total VOCs (ppb)	07/10 Total VOCs (ppb)	07/11 Total VOCs (ppb)	10/12 Total VOCs (ppb)	09/13 Total VOCs (ppb)
Area A (east side of river)																							
BM-7		SD						1.55	ND	0.16	ND	ND	ND								ND		
BM-8		SD	13.7					18	4.1	2.15	0.58	ND	0.71	0.57							ND		
BM-13B		SD	787					44.93	6.7	3.81	5.1	2.85	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BM-17		SD	7420		1224		24.9	28.24	ND	ND	ND	ND	ND								ND		
BM-18R		SD	2293				736	8.66	ND	ND	ND	ND	ND	ND							ND		
BM-20R		SD	1.4	ND			ND	0.057	ND	ND	0.41	ND	ND								ND		
BM-21		SD						10.32	ND	ND	ND	ND	ND										
BM-23R		SD	660				ND	0.87	7.5	4.71	1.46	1.05	0.77								2.77		
901A		SD						7.71	2.51	6	1.73	ND	1.06										
903B		SD	ND				ND	ND	ND	ND			ND								ND		
915A	MW-97-13	T						8.37	3.97	1.17	3.21	1.32	4.42	2.51	ND	5.38	ND	ND	ND	ND	ND		
915B	MW-97-14	SD						759.6	0.61	ND	ND	ND	ND								ND		
M-10T/WB		T/WB						1.07	ND	ND													
Area B (plume wells)																							
BM-2	MW-97-17	SD						655	238		63.3	40.29	69.26	13.9							44.7		
BM-4A		SD	14590																				
BM-10	MW-97-18	SD						ND	ND	ND	ND	ND	ND	ND							ND		ND
BM-30		SD	140.2				11.4																
BM-32B	MW-97-20	SD							0.54	ND	ND	ND	ND								ND		
BM-34A	MW-97-21	SD						3925	2303	1129.2	1014	412.8	208.1	10.32							123.8		
BM-34B	MW-97-22	SD					5630	1476	6.05	2.78	2.58	4.02	ND	3.4							ND		
BM-35	MW-97-23	SD	13490					3317	6470	4894	4770.5	2573	1250								1279		
BM-37	MW-97-24	SD	124.9					0.44	ND	ND	ND	ND	ND								ND		
BM-38	MW-97-25	SD						34	4.52	6.94	4.67	3.69	4.61	1.89					36.0	ND	ND	ND	ND
902A	MW-97-3	SD	11540					10120	4870	2209	1722	531.6	288.8								2268		
902B		SD	7319																				
904B		SD	490																				
914C	MW-97-12	SD	10169				9045	5005	1918	95.06	107.47	111	3.08	4.36							2.74		
914B	MW-97-11	SD	7860				11725	1245	8.15	17.54	5.665	5.3	5.9								2.06		
914A	MW-97-10	T							1938	9.66	8.65	9.17	0.99	9.27	ND	2.6	ND	ND	ND	ND	ND	ND	ND
M-1T/WB	MW-97-15	T/WB					148.6	7.4	9.4	3.03	1.83	ND	0.49								ND		
M-9T/WB	MW-97-16	T						5.65			ND	ND	ND	1.76	ND	ND	ND	ND	ND	ND	9.33		
M-3SD		SD						630.2	935	308.4	569.7	629.8	683.3								81.7		
M-5SD	MW-97-27	SD						ND	ND	ND	ND		ND								ND	ND	ND
MW-97-1		SD								3700	2857	2300	2348								1057		
MW-97-2		SD											2.67								5.27		
MW-97-28		SD								5525	7282	2069	644.9								8509		
MW-97-29		SD									0.83	ND	ND	0.35							ND		
MW-97-30		SD									1364	620.6	269								246		
MW-97-31		SD								0.48	ND	ND	ND	ND							ND		
MW-97-32		SD								62.49	177.8	216.9	26.96	349	672	3556	453	1,295	2.74	1,422	28.5		
MW-98-1		SD								1427.1	1051.2	1886.9	1412.2								4139		
MW-04-01		SD																			6556		
EW-1		T/WB		38	48.9	49.2	27.6																
EW-3		SD		4467	4260	2785	11870	1104	785	521.8	191.6	221	198.4	164.6	1118	850	2012				72.8		
EW-4	EW-4A	T/WB		377	375	229	435	10.97	2.52	0.84	ND	ND		23.55	3249	276.2	1210				482		
EW-5		SD		653	780	575	726.8	19.9	6.34	1.28	1.1	ND	0.29	ND	ND	68.6	ND						
EW-6		SD		2829	4683	2767	3061.5	2254	1956	3484	3024.8	1552.4	1145.8	2384	6728	4474	4194				976		
EW-7		SD							142.7	39.1	23.5	11.89	4.98	0.88	ND	2110	54.1				ND		
EW-8		SD								2668	1637.3	388	329	967.6	6857	4880	25312				2001		
Area C (north of plume)																							
BM-14	MW-97-19	SD	355.9				23.9	12.3	1.93	0.29	0.38	ND	ND								ND		
BM-31B		SD			2.4		1.6	1.81	1.53	ND			11.14	14.18	5.34	12.16	ND	ND					
909A		SD	180	ND			ND																
910A		T		11			18.3		1.1	0.31	0.33	ND	ND								ND		
910B		SD		6			18	15.6	1.36	0.31													
911A		T									ND	ND	0.42	ND							ND		
911B		SD	28				14.9	10.81	2.15	0.29	ND	ND	ND								ND		
912A	MW-97-8	SD	9.4	5	5		2	1.6	ND	ND													

TABLE D-2 HISTORICAL VOC, SVOC, AND ARSENIC CONCENTRATIONS AT SITE WELLS

Overburden Wells	Replacement Well	Well Type	8/88,9/88 Total VOCs (ppb)	4/94 Total VOCs (ppb)	10/94 Total VOCs (ppb)	3/95 Total VOCs (ppb)	4/95 Total VOCs (ppb)	8/97,9/97,10/97 Total VOCs (ppb)	8/98,9/98,10/98 Total VOCs (ppb)	02/00 - 05/00 Total VOCs (ppb)	04/01 - 07/01 Total VOCs (ppb)	04/02 - 07/02 Total VOCs (ppb)	04/03 - 06/03 Total VOCs (ppb)	03/04 - 05/04 Total VOCs (ppb)	06/05 Total VOCs (ppb)	10/06 Total VOCs (ppb)	08/07 - 10/07 Total VOCs (ppb)	07/08 Total VOCs (ppb)	08/09 Total VOCs (ppb)	07/10 Total VOCs (ppb)	07/11 Total VOCs (ppb)	10/12 Total VOCs (ppb)	09/13 Total VOCs (ppb)
913A		SD						9.47	1.79	ND	2.49	ND	ND								ND		
919		SD						9.35	3.8	6.88	6.74	5.25	2.55	ND	ND								
M-2SD		SD						15.04	5.45	0.86													
M-7SD		SD			5.4		11.9	1.79	ND	0.36	0.8	ND	ND								ND		
M-7T/WB		T/WB						3.92	0.76	1.37	2.02	1.78	1.11								ND		
M-8SD		SD		5	5		18.5	11.64	ND	0.39			ND								ND		
M-8T/WB		T/WB						10.4	ND				0.28								ND		
MW-04-02		SD																	ND	ND	ND	ND	ND
EW-2		SD		146	62.5	10	19	21.15	4.32	4.58	2	ND	0.64	0.79	ND								
EW-9		SD														ND	56.4						
Area D (south of plume)																							
BM-15B		T									ND	ND	ND								ND		
912B	MW-97-9	SD	38	ND	1.4		4	1.4	ND	ND	ND	1.87	ND	ND							ND		
M-6T/WB		T/WB						ND	ND		ND	ND	ND								ND		
M-11SD		SD		7	0.8		ND																
M-12SD		SD					ND			ND	ND	ND	ND								ND		
M-12T/WB		T/WB								ND	ND	ND	ND								ND		
Area E (west of plume - upgradient)																							
920		SD								ND	0.85	1.48									ND		
Bedrock Wells	**Replacement Well**																						
Area A (east side of river)																							
901		BR					3.7																
903		BR	0																				
BM-13		BR	198.8				50.7																
M-10BR		BR		ND	2.7		0.8	2.18	0.58	ND	4.95	ND	ND								ND		
Area B (plume wells)																							
902-1		BR	1811																				
902-2		BR	590																				
904		BR	1200																				
M-4BR		BR					25.7			5.71	3.09	2.18	1.72								32.1		
Area C (north of plume)																							
909	MW-97-5	BR	180	ND			ND	ND	ND	ND	ND	ND	ND								ND		
910		BR	24.9	10	10		15.4																
911	MW-97-6	BR	768.2				10.5	2.9	1.2	0.14		ND	ND								ND		
913		BR	25.1				19	14.9	10.28	3.26	2.28	ND	0.78								ND		
M-7BR		BR			5.4		8.3	6.96	7.65	4.96		5.97	3.56								ND		
M-8BR		BR		4	18		16.7	10.1	3.62	2.86	2.57	2.69	2.7								ND		
Area D (south of plume)																							
905		BR	1360				ND																
912	MW-97-7	BR	13.1	ND	3.8		2.5	1.63	1.73	1.33	1.98	ND	1.1								ND		
M-6BR		BR					ND	4.2	ND		ND	ND	ND								ND		
M-12BR		BR			2.7		13.1			0.51	1.52	ND	ND								ND		
Area E (west of plume - upgradient)																							
908	MW-97-4	BR	ND	ND																			
Well Points																							
ASB-16																						ND	
ASB-22																						ND	

Notes

SD: stratified drift

T: till

BR: bedrock

T/WB: till and weathered bedrock

Maximum detected concentration selected for duplicate samples.

ND: non-detect

Blank Space: not sampled

TABLE D-2 HISTORICAL VOC, SVOC, AND ARSENIC CONCENTRATIONS AT SITE WELLS

Overburden Wells	Replacement Well	8/88,9/88 Total SVOCs (ppb)	4/94 Total SVOCs (ppb)	10/94 Total SVOCs (ppb)	3/95 Total SVOCs (ppb)	4/95 Total SVOCs (ppb)	8/97,9/97,10/97 Total SVOCs (ppb)	8/98,9/98,10/98 Total SVOCs (ppb)	02/00 - 05/00 Total SVOCs (ppb)	04/01 - 07/01 Total SVOCs (ppb)	04/02 - 07/02 Total SVOCs (ppb)	04/03 - 06/03 Total SVOCs (ppb)	03/04 - 05/04 Total SVOCs (ppb)	06/05 Total SVOCs (ppb)	10/06 Total SVOCs (ppb)	08/07 - 10/07 Total SVOCs (ppb)	07/08 Total SVOCs (ppb)	08/09 Total SVOCs (ppb)	07/10 Total SVOCs (ppb)	07/11 Total SVOCs (ppb)	10/12 Total SVOCs (ppb)	09/13 Total SVOCs (ppb)
Area A (east side of river)																						
BM-7							16.2	4.3	ND	ND	ND	ND								ND		
BM-8		ND					ND	ND	ND	ND	ND	ND	ND							8.56	5.41	3.74
BM-13B		ND					3	4.2	ND	ND	ND	ND	ND	ND	ND	3.32	ND	3.28	ND	ND		
BM-17		6570		1938		62	31.7	14.6	3.5	14.1	ND	ND								1.49		
BM-18R		840				97	ND	ND	ND	ND	ND	ND	ND							1.36		
BM-20R		13	ND			110	ND	ND	ND	ND	ND	ND								4.23		
BM-21							23.4	2.7	ND	ND	ND	ND										
BM-23R		65				ND	ND	ND	ND	ND	ND	ND								ND		
901A							5.2	ND	ND	ND	ND	ND										
903B		ND				6	ND	ND	ND			ND								ND		
915A	MW-97-13						2.8	3	ND	ND	ND	ND	ND							1.75		
915B	MW-97-14						3115	9.1	2.6	ND	ND	ND								ND		
M-10T/WB							2.7	ND	ND													
Area B (plume wells)																						
BM-2	MW-97-17						6452	2652		957	616	421	323.9	342.8	120.02	2.93	160.1	88.8	77.0	45.41	247	56.9
BM-4A		15440																				
BM-10	MW-97-18						ND	ND	ND	ND	ND	ND	ND	ND	ND	4.54	1.28	ND	ND	ND	9.08	1.04
BM-30		27				ND																
BM-32B	MW-97-20							5.7	ND	ND	ND	ND								2.93		
BM-34A	MW-97-21						7284	6113	4056	2679	1484	285	950	ND	318.7	258.68	ND	330	335	139.7	200.0	259.8
BM-34B	MW-97-22					9098	3482	46.9	4.6	4.2	ND	ND	4.8	1233	2.36	3.86	140.1	ND	243	1.85		
BM-35	MW-97-23	22320					686900	42620	20690	18398	29560	6950								773		
BM-37	MW-97-24	94					573.3	66	38.9	8.9	ND	ND								6.15		
BM-38	MW-97-25						74.6	6.7	ND	ND	ND	ND	ND	ND	ND	1.77	4.85	1.35	8.68	ND	16.8	20.9
902A	MW-97-3	49200					4578	2049	4545000	6239	17740	4520								2113		
902B		8520																				
904B		ND																				
914C	MW-97-12	11500				734	7141	6032	510	834.2	171	70	ND							20.97		
914B	MW-97-11	10440				855	2937	46.7	57.9	3.2	ND	ND								6.06		
914A	MW-97-10							5286	ND	4.3	ND	ND	60.7	ND	ND	3.43	ND	ND	24.1	7.20	11.12	ND
M-1T/WB	MW-97-15					132	ND	ND	ND	ND	ND	ND								ND		
M-9T/WB	MW-97-16						8.3			ND	ND	ND	8.8	ND	ND	7.85	2.26	1.38	1.21	1.10	54.1	2.81
M-3SD							3030	2593	1969	2108.7	922	1060.8								213.9		
M-5SD	MW-97-27						5	10.1	ND	2.3		ND								5.75	4.51	ND
MW-97-1									263600	9350	59470	11850								1727		
MW-97-2												6.1								2.67		
MW-97-28									37750	7725	3254	2931								1485		
MW-97-29										15.5	ND	ND	ND	ND	1.46	8.16	34.8	3.73	ND	1.07	1.28	2.36
MW-97-30										5371	657	972.8								517		
MW-97-31									790	ND	ND	ND	ND	ND		801.21	3.10	48.2	5.33	ND	28.6	206
MW-97-32									2498	3977	1752	1272	3579	805	2663	1626.83	806	211.6	214.2	126.6	1.66	4.56
MW-98-1									9660	3766	9610	7790								1669		
MW-04-01																				3490		
EW-1			78	62	34	46																
EW-3			12127	581	10230	7967	5166	3455	1643	1409.6	637	730	675	1165	822	839				369		
EW-4	EW-4A		1119	1915	681	267	26.4	6.4	ND	ND	ND		198.3	735	197.7	469				711		
EW-5			2516	4884	1859	531	327.6	178.9	85.7	60.7	26.33	30.3	2280	51.1	33	23.6						
EW-6			4073	ND	4400	4511	4800	2885	655.8	3715	3139	2202	ND	4370	2661	1028				509		
EW-7								471.8	120.7	66.7	18	23.1	24	27.8	ND	20.69				22.7		
EW-8									9534	7667	3190	3613	4003	6930	3885.7	5710				5150		
Area C (north of plume)																						
BM-14	MW-97-19	250				ND	ND	ND	ND	ND	ND	ND								1.23		
BM-31B				ND		ND	ND	ND	ND			2.4	ND	ND	ND	9.58	ND					
909A		ND	ND			ND																
910A			ND			ND		ND	ND	ND	ND	ND								4.66		
910B			2			ND	ND	ND	ND													
911A										ND	ND	ND	ND	ND	ND	1.43	ND	1.69	ND	16.6		
911B		34				ND	ND	3.6	ND	ND	ND	ND								17.3		
912A	MW-97-8	27	ND	ND		ND	ND	ND	ND													

TABLE D-2 HISTORICAL VOC, SVOC, AND ARSENIC CONCENTRATIONS AT SITE WELLS

Overburden Wells	Replacement Well	8/88,9/88 Total SVOCs (ppb)	4/94 Total SVOCs (ppb)	10/94 Total SVOCs (ppb)	3/95 Total SVOCs (ppb)	4/95 Total SVOCs (ppb)	8/97,9/97,10/97 Total SVOCs (ppb)	8/98,9/98,10/98 Total SVOCs (ppb)	02/00 - 05/00 Total SVOCs (ppb)	04/01 - 07/01 Total SVOCs (ppb)	04/02 - 07/02 Total SVOCs (ppb)	04/03 - 06/03 Total SVOCs (ppb)	03/04 - 05/04 Total SVOCs (ppb)	06/05 Total SVOCs (ppb)	10/06 Total SVOCs (ppb)	08/07 - 10/07 Total SVOCs (ppb)	07/08 Total SVOCs (ppb)	08/09 Total SVOCs (ppb)	07/10 Total SVOCs (ppb)	07/11 Total SVOCs (ppb)	10/12 Total SVOCs (ppb)	09/13 Total SVOCs (ppb)
913A							ND	ND	ND	ND	ND	ND								ND		
919							ND	ND	ND	ND	ND	ND	ND	ND								
M-2SD							5.4	ND	ND													
M-7SD				ND		ND	ND	ND	ND	ND	ND	ND								4.13		
M-7T/WB							ND	ND	ND	ND	ND	ND								14.0		
M-8SD			4	ND		ND	ND	ND	ND			ND								3.92		
M-8T/WB							ND					ND								6.35		
MW-04-02																		ND	6.87	ND	3.02	ND
EW-2			91	8870	ND	79	76.8	ND	ND	7.5	ND	ND	ND	ND								
EW-9															ND	29.9						
Area D (south of plume)																						
BM-15B											ND	ND								1.07		
912B	MW-97-9	ND	ND	ND		ND	ND	123.1	ND	ND	ND	ND	2.4							1.04		
M-6T/WB							5.5	ND		ND	ND	ND								ND		
M-11SD			7	ND		ND																
M-12SD						ND			ND	ND	ND	ND								ND		
M-12T/WB									ND	ND	ND	ND								ND		
Area E (west of plume - upgra																						
920									ND	ND	ND									ND		
Bedrock Wells	**Replacement Well**																					
Area A (east side of river)																						
901						23																
903		0																				
BM-13		122				9																
M-10BR			1	67		2	ND	ND	ND	ND	ND	ND								3.13	10.1	
Area B (plume wells)																						
902-1		6180																				
902-2		590																				
904		0																				
M-4BR						ND			ND	ND	ND	ND								ND		
Area C (north of plume)																						
909	MW-97-5	ND	3			ND	ND	ND	ND	ND	ND	ND								ND		
910		ND	ND	ND		ND																
911	MW-97-6	159				ND	15	2.8	ND		ND	ND								70.0		
913		75				ND	ND	ND	ND	ND	ND	ND								1.27		
M-7BR				ND		ND	ND	ND	ND		ND	ND								13.7		
M-8BR			ND	2		ND	ND	ND	ND	ND	ND	ND								1.03		
Area D (south of plume)																						
905		33				ND																
912	MW-97-7	32	ND	ND		ND	ND	ND	ND	ND	ND	ND								1.14		
M-6BR						ND	4.2	3.3		ND	ND	ND								ND		
M-12BR				ND		2			ND	ND	ND	ND								1.29		
Area E (west of plume - upgra																						
908	MW-97-4	20	10																			
Well Points																						
ASB-16																						
ASB-22																					ND	

Notes

SD: stratified drift

T: till

BR: bedrock

T/WB: till and weathered bedro

Maximum detected concentratic
selected for duplicate sample

ND: non-detect

Blank Space: not sampled

TABLE D-2 HISTORICAL VOC, SVOC, AND ARSENIC CONCENTRATIONS AT SITE WELLS

Overburden Wells	Replacement Well	Well Type	Arsenic Concentration (mg/L)																												
			1988	Q1/93	Q2/93	Q3/93	Q4/93	Q1/94	Q2/94	Q3/94	Q4/94	Q1/95	Q2/95	Q3/95	Q4/95	8/97 - 10/97	8/98 - 10/98	Q1/00	4/01 - 7/01	4/02 - 7/02	4/03 - 6/03	03/04 - 05/04	06/05	10/06	08/07 - 10/07	07/08	08/09	07/10	07/11	10/12	09/13
Area A (east side of river)																															
BM-7		SD								0.0053						0.012	0.0040	ND	ND	ND	ND								ND	ND	0.0450
BM-8		SD	ND	ND	0.073	ND	0.0040	ND	ND	ND			ND			0.0016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0950
BM-13B		SD		0.0060	0.11	0.017	0.010	0.0023	0.0022	0.0074		0.0055	ND		0.0030	0.0044	0.022	ND	ND	ND	ND	ND	ND	0.006	ND	ND	ND	ND	ND	0.00252	ND	0.101
BM-17		SD	0.019									0.014				0.0085	0.035	0.070	0.10	0.19	0.206								0.118	0.165	
BM-18R		SD	0.0030													0.014	0.013	0.0080	ND	ND	ND	0.074	ND	ND	ND	ND	ND	ND	ND	ND	0.0410
BM-20R		SD	ND	0.0070	0.17	0.011	0.040	0.0056	0.0044			0.0065	ND		0.0056	0.0028	0.0091	0.0090	0.64	ND	ND								ND		
BM-21		SD														0.0060	0.0032	ND	ND	ND	ND										
BM-23R		SD	ND													0.0031	ND	ND	ND	ND	ND								ND		
901A		SD														0.0016	ND	ND	ND	ND	ND										
903B		SD	0.017									0.053			0.28	0.0048	0.090	0.016			0.0043								0.00504		
915A	MW-97-13	T														0.0048	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.281
915B	MW-97-14	SD													0.026	0.074	0.041	0.022	0.010	ND	0.010								0.0138		
M-10T/WB		T/WB		0.0050	0.020	0.020	0.020	0.031	0.012	0.0085		0.0072	ND			0.0016	0.0081	0.011													
Area B (plume wells)																															
BM-2	MW-97-17	SD														0.61	0.82		0.55	0.47	0.451	0.39	0.252	0.408	0.222	0.553	0.292	0.425	0.213	0.379	0.717
BM-4A		SD	2.8																												
BM-10	MW-97-18	SD															0.26	0.46	0.072	0.019	0.0215	0.008	ND	0.006	0.012	0.0350	0.0130	0.0170	0.0118	ND	0.264
BM-30		SD	0.10									0.042			0.059																
BM-32B	MW-97-20	SD															0.36	0.10	0.008	ND	ND						ND	0.0330	0.00176		
BM-34A	MW-97-21	SD														2.6	2.1	1.6	2.1	2.2	1.96	1.31					1.38	1.15	0.988	1.11	1.36
BM-34B	MW-97-22	SD														1.8	0.62	0.40	0.35	0.32	0.224	0.353					0.211	0.234	0.298		
BM-35	MW-97-23	SD														1.1	2.1	1.1	0.96	0.82	0.619						0.264	0.161	0.185	0.334	0.376
BM-37	MW-97-24	SD	ND													2.8	6.8	1.2	0.51	0.53	0.28								0.316		
BM-38	MW-97-25	SD								0.040		0.074				0.014	0.014	0.0070	0.011	ND	0.0056	0.0096					0.0310	0.0370	0.0429	0.0790	0.202
902A	MW-97-3	SD	0.0032														0.37	0.70	0.27	0.25	0.181								0.417		
902B		SD	0.0020																												
904B		SD	ND																												
914C	MW-97-12	SD	0.0039													2.7	1.6	0.60	0.42	0.33	0.365	0.577	0.502	0.521	0.267	0.230	0.271	0.387	1.47	0.888	0.879
914B	MW-97-11	SD	0.0036													1.4	0.54	0.36	0.22	0.17	0.138								0.152		
914A	MW-97-10	T														0.029	1.6	0.0090	0.014	ND	0.0131	0.0132							0.0116		
M-1T/WB	MW-97-15	T/WB														0.032	0.024	0.0060	ND	ND	ND								0.00146		
M-9T/WB	MW-97-16	T								ND		ND	ND			1.4			ND	ND	0.0063	0.004	ND	ND	ND	ND	ND	ND	0.00251	ND	0.159
M-3SD		SD														2.0	1.4	1.0	ND	0.7	0.462								0.365		
M-5SD	MW-97-27	SD														0.56	0.63	0.39	0.41		0.229								0.163	0.143	0.224
MW-97-1		SD																0.36	0.86	0.66	1.18								0.0500		
MW-97-2		SD																			0.255								0.136		
MW-97-28		SD																2.0	0.79	1.50	2.42								1.65		
MW-97-29		SD																	0.061	0.054	0.0467	0.0527	0.0342	0.051	0.0287	0.0450	ND	ND	0.00676	0.0490	0.164
MW-97-30		SD																	0.42	1.20	0.791								0.116		
MW-97-31		SD																0.088	ND	ND	ND	ND	ND	ND	0.0368	0.0110	ND	ND	0.00917	0.0100	0.175
MW-97-32		SD																0.071	0.080	0.028	0.0346	0.115	0.0294	0.136	0.0494	0.0710	0.0130	0.112	0.0264	0.0210	0.124
MW-98-1		SD																0.24	0.27	0.28	0.25								0.0625		
MW-04-01		SD																											1.22		
EW-1		T/WB						0.063		0.061	0.086	0.036	0.046	0.028																	
EW-3		SD						2.4		2.5	1.9	1.8	1.4	1.6	1.6		1.3	1.1	0.94	0.83	0.796	0.754	0.614	0.605	0.549				0.641		
EW-4	EW-4A	T/WB						0.19		0.23	0.27	0.22	0.15	0.19	0.20		0.27	0.19	0.18	0.17		0.541	0.574	0.55	0.493				0.628		
EW-5		SD						1.1		0.97	0.75	0.84	0.67	0.68	0.66		0.60	0.39	0.31	0.29	0.282	0.267	0.228	0.459	0.204						
EW-6		SD						1.1		1.4	0.93	1.4	0.68	0.79	0.31		0.73	0.82	0.65	0.6	0.604	0.575	0.424	0.598	0.393				0.298		
EW-7		SD															1.3	0.76	0.63	0.55	0.458	0.41	0.343	0.465	0.352				0.352		
EW-8		SD																0.79	0.62	0.52	0.488	0.482	0.403	0.433	0.392				0.430		
Area C (north of plume)																															
BM-14	MW-97-19	SD	0.012									0.0060				0.0061	0.0036	ND	ND	ND	ND								ND		
BM-31B		SD								2.0		1.6			1.9		2.0	0.21			1.18	1.99	1.97	2.09	1.76	2.50					
909A		SD	0.0040	0.0060	0.062	0.013	0.0090	0.0025	0.014			ND																			
910A		T		0.010	0.011	0.0050	ND	ND	0.0027	ND		ND	ND		ND		0.021	ND	ND	ND	ND								ND		
910B		SD		0.0060	0.011	0.0080	ND	ND	0.0096	0.0023		ND			ND	0.0071	0.011	ND													
911A		T																	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00120		
911B		SD	0.090													0.46	0.064	0.038	ND	ND	0.0081						0.0220	0.0210	0.00592		
912A	MW-97-8	SD	ND	0.0020	0.0010	ND	ND	ND	ND	ND		ND			ND	0.0031	ND	ND													

TABLE D-2 HISTORICAL VOC, SVOC, AND ARSENIC CONCENTRATIONS AT SITE WELLS

Overburden Wells	Replacement Well	Well Type	Arsenic Concentration (mg/L)																												
			1988	Q1/93	Q2/93	Q3/93	Q4/93	Q1/94	Q2/94	Q3/94	Q4/94	Q1/95	Q2/95	Q3/95	Q4/95	8/97 - 10/97	8/98 - 10/98	Q1/00	4/01 - 7/01	4/02 - 7/02	4/03 - 6/03	03/04 - 05/04	06/05	10/06	08/07 - 10/07	07/08	08/09	07/10	07/11	10/12	09/13
913A		SD	0.0030							0.0044		ND				0.0016	0.0036	ND	ND	ND	ND								0.00269		
919		SD								3.1						3.5	3.8	1.9	1.7	2.5	1.79	ND	1.76								
M-2SD		SD															0.041	0.038													
M-7SD		SD		0.0050	0.028	0.011	0.0050	ND	ND	0.0024		ND	0.0040		0.0038	0.0031	ND	ND	ND	ND	ND	ND								ND		
M-7T/WB		T/WB		0.0040	0.0080	0.0040	ND	ND	ND	0.0028			ND			0.0035	ND	ND	ND	ND	ND	ND								0.00302		
M-8SD		SD		0.0030	0.0010	0.0040	0.0030	ND	ND	0.0034		ND			ND	0.0079	ND	ND			ND									ND		
M-8T/WB		T/WB		ND	0.0080	0.0040	ND	ND	ND	ND			ND			0.0031					ND									ND		
MW-04-02		SD																									0.688	1.13	0.490	0.923	0.763
EW-2		SD						0.062		0.057	0.034	0.039	0.043	0.048	0.070		0.025	0.085	0.042	0.16	0.144	0.0751	0.07									
EW-9		SD																						0.022	0.157						
Area D (south of plume)																															
BM-15B		T																	ND	ND	ND								ND		
912B	MW-97-9	SD	ND	0.0080	0.026	0.035	0.093	0.015	0.021	0.0070		0.0078			2.1	0.0033	0.0034	ND	ND	ND	ND	ND								ND		
M-6T/WB		T/WB														0.0016	ND		ND	ND	ND								ND		
M-11SD		SD																													
M-12SD		SD							0.10									ND	ND	ND	ND								ND		
M-12T/WB		T/WB																ND	ND	ND	ND								ND		
Area E (west of plume - upgradient)																															
920		SD																0.0060	ND	ND									ND		
Bedrock Wells	**Replacement Well**																														
Area A (east side of river)																															
901		BR										0.0061			ND																
903		BR																													
BM-13		BR																													
M-10BR		BR		0.0040	ND	ND	0.0050	ND	ND	ND		ND	ND		ND	0.0016	0.0061	ND	ND	ND	ND								ND	ND	
Area B (plume wells)																															
902-1		BR																													
902-2		BR																													
904		BR	ND																												
M-4BR		BR																ND	ND	ND	ND								ND		
Area C (north of plume)																															
909	MW-97-5	BR	ND	ND	0.0040	0.0050	ND	ND	ND			ND				0.0031	ND	ND	ND	ND	ND								ND		
910		BR	ND	0.0030	0.011	0.0060	ND	ND	0.0036	ND		ND	0.0040		0.0058																
911	MW-97-6	BR														0.0077	0.0076	ND		ND	0.0076								0.00114		
913		BR	0.0070							0.0036		ND		ND		0.0027	ND	ND	ND	ND	ND								0.00114		
M-7BR		BR		0.0030	0.0010	ND	0.0050	ND	ND	ND		ND	ND		ND	0.0031	ND	ND		ND	ND								ND		
M-8BR		BR		0.0010	0.0080	ND	ND		ND	0.0024		ND	ND		ND	0.0031	ND	ND	ND	ND	ND								ND		
Area D (south of plume)																															
905		BR	ND									0.011			0.0053																
912	MW-97-7	BR	ND	ND	0.0010	ND	ND	ND	ND	ND		ND				0.0048	0.0046	ND	ND	ND	ND								0.00311		
M-6BR		BR							0.0023							0.0095			ND	ND	ND								ND		
M-12BR		BR																ND	ND	ND	ND								ND		
Area E (west of plume - upgradient)																															
908	MW-97-4	BR		0.012	0.0010			ND																							
Well Points																															
ASB-16																													0.484		
ASB-22																													0.2115		

Notes

SD: stratified drift

T: till

BR: bedrock

T/WB: till and weathered bedrock

Maximum detected concentration selected for duplicate samples.

ND: non-detect

Blank Space: not sampled

TABLE D-2a
ARSENIC SPECIATION
BAIRD & MCGUIRE SUPERFUND SITE
2012-2013 Evaluation of Groundwater Remediation Progress Annual Report for OU-1

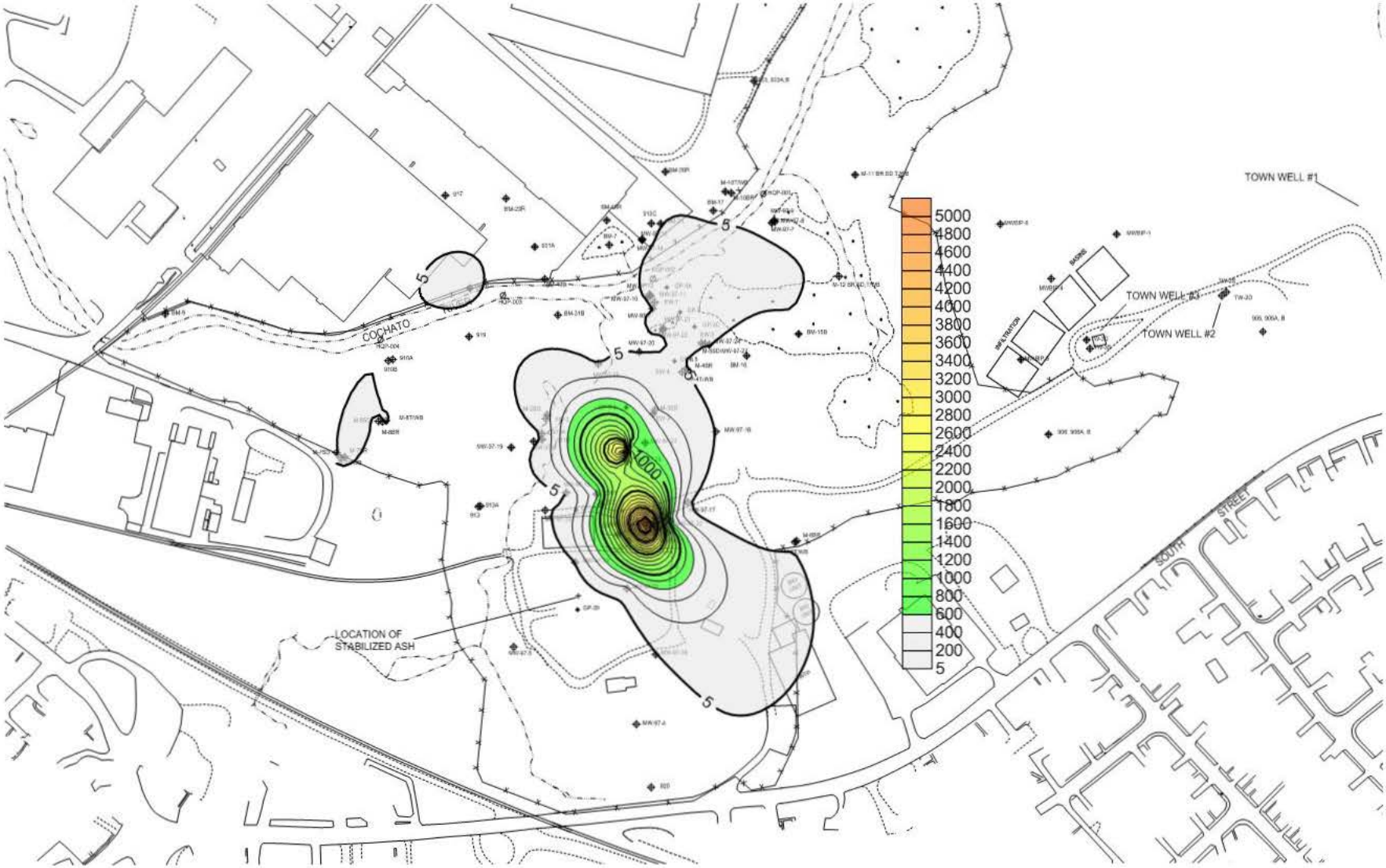
Sample:	MW97-21	MW97-23
Arsenic Speciation		
trivalent arsenic (III)	809	189
inorganic arsenic	928	187
pentavalent arsenic (V)	119	<6.40
dimethyl arsenic (DMA)	<4.8	<14.4
monomethyl arsenic (MMA)	3.46*	<9.60
Additional Analytical		
chemical oxygen demand (COD)	<25,000	26,200
total petroleum hydrocarbon (TPH)	1,110	5,050
total organic carbon (TOC)	1,600	5,100
total arsenic	1,370	376
Monitoring Well Field Screening Parameters		
Oxidation Reduction Potential (millivolts)	-100.9	-61.7
pH (pH units)	7.30	6.86

Notes:
unit of measure is ug/L = microgram per liter or as noted
Samples collected in September 2013
<n - Not detected at laboratory detection limit specified
* - detected by the instrument, the result is > the MDL, but ≤ the MRL. Result is reported and considered an estimate.
Total arsenic (EPA Method 6010C) , COD, TPH, and TOC analyses conducted by Geolabs, Inc.;
arsenic speciation conducted by Brooks Rand Labs (EPA Method 1632)

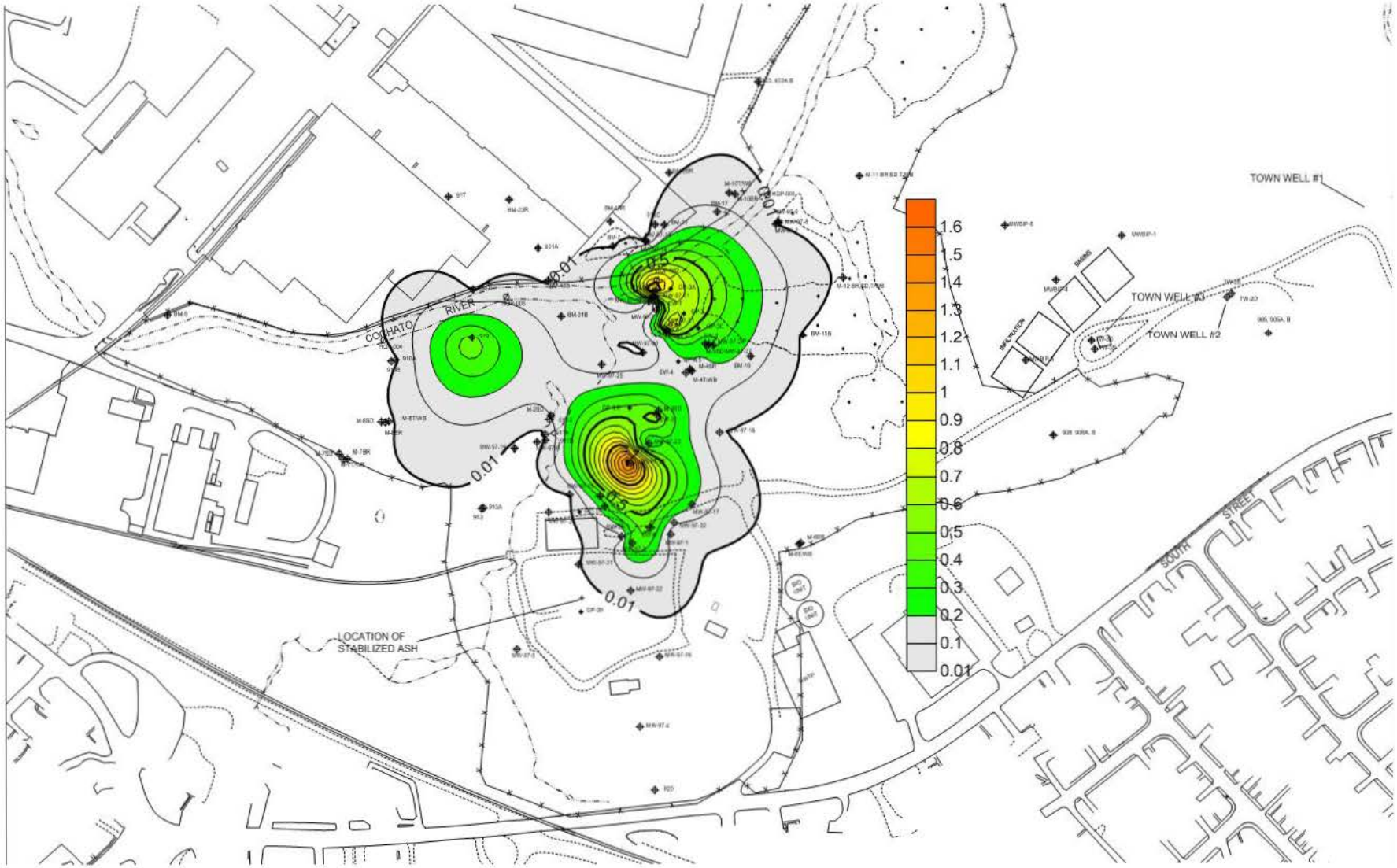
TABLE D-2a (continued)
ARSENIC SPECIATION (EW-10, MW14-01, and MW14-02)
BAIRD & MCGUIRE SUPERFUND SITE

Sample:	EW-10	MW14-01	MW14-02
Arsenic Speciation			
trivalent arsenic (III)	21.3	3.07	812
inorganic arsenic	82.2	3.33	810
pentavalent arsenic (V)	60.9	<0.320	<6.40
dimethyl arsenic (DMA)	<0.480	<0.018	<4.80
monomethyl arsenic (MMA)	<0.373	<0.014	<3.73
Additional Analytical			
chemical oxygen demand (COD)	<25,000	<25,000	32,400
total petroleum hydrocarbon (TPH)	<156	<155	441
total organic carbon (TOC)	1,300	1,000	7,000
total arsenic	34.0	20	884
Monitoring Well Field Screening Parameters			
Oxidation Reduction Potential (millivolts)	84.4	140.3	-36.1
pH (pH units)	6.15	5.51	6.10

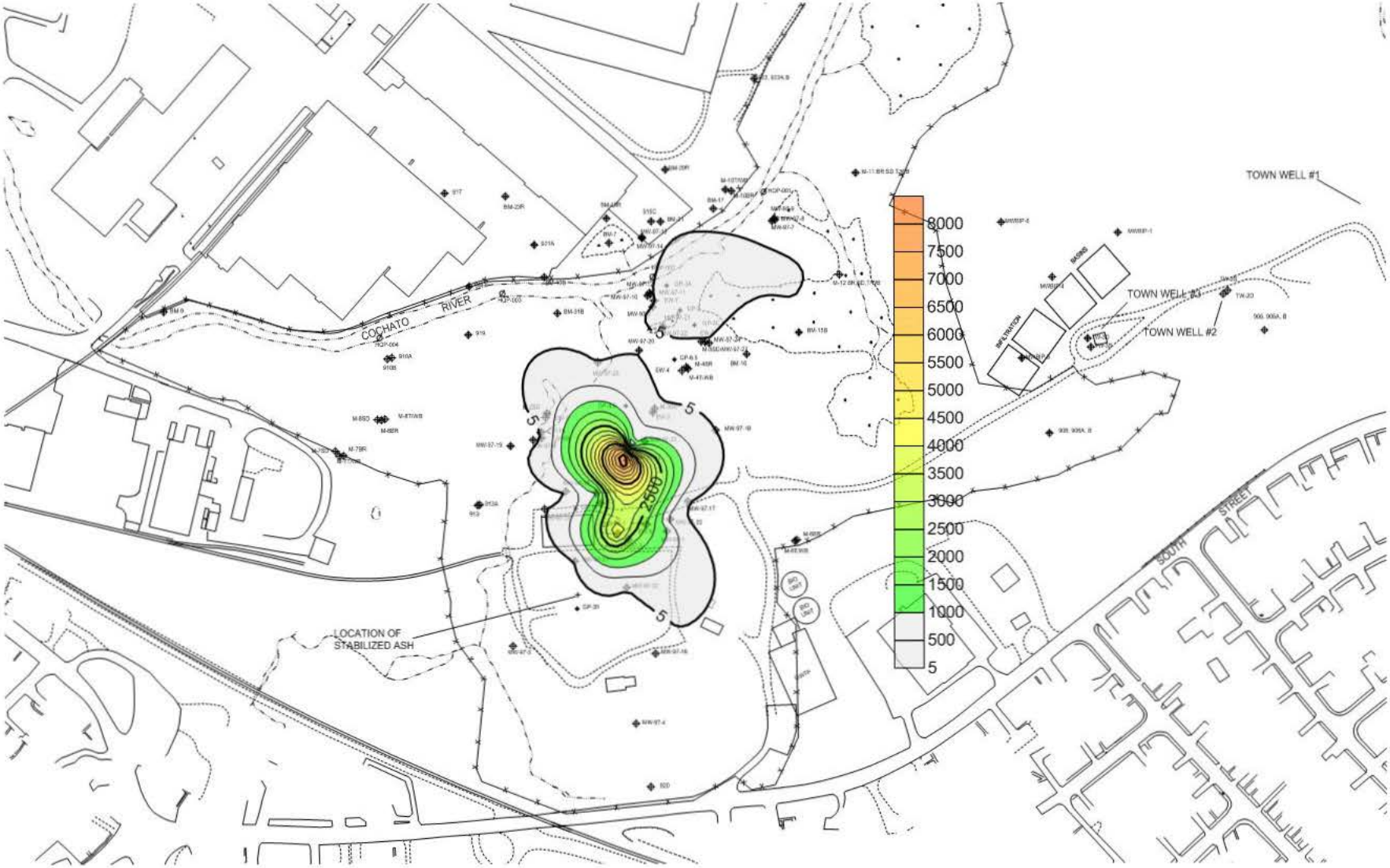
Notes:
unit of measure is ug/L = microgram per liter or as noted
Samples collected in March 2014
<n - Not detected at laboratory detection limit specified
Total arsenic (EPA Method 6010C) , COD, TPH, and TOC submitted to Geolabs, Inc. for analysis
arsenic speciation conducted by Brooks Rand Labs (EPA Method 1632)



SVOCs (concentrations in ppb) – 2011

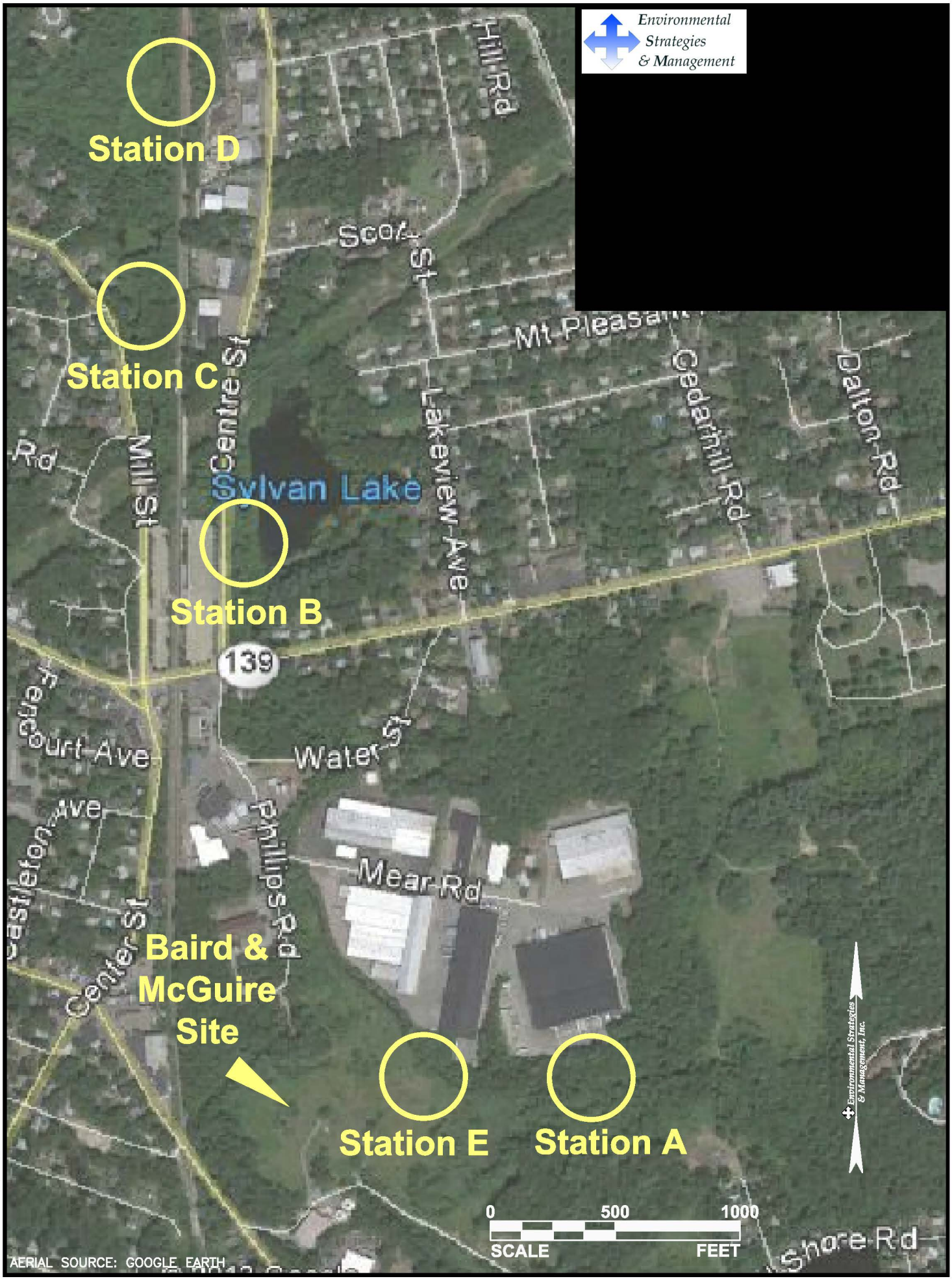


As (concentrations in ppm) – 2011



VOCs (concentrations in ppb) – 2011

SEDIMENT/SOIL AND FISH ANALYTICAL RESULTS



C:\Documents and Settings\JWade\My Documents\ESM\SWRSS Baird McGuire Holbrook\SWRSS Baird McGuire Holbrook Sampling Locations.dwg, Tab: SAMPLE LOCATIONS, Plotted: Feb 20, 2014

Table D-3 Sediment/Soil Results for Common Contaminant Parameters, 1996 - 2013 and Comparison to Project Action Limits

Parameter	Units	1996		1997		1998		1999		2000		2001		2002		2013		Program Action Limit	
		Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	River	Bank
Station A, Upstream of Project Area (control) (n=3 for each station and year)																			
Total PAHs	ng/g, dry	1,770	758	1,540	1,270	357	618	1,940	971	2,549	1,374	2,500	1,500	2,853	2,272	29,870		22,000	33,000
Total DDT	ng/g, dry	36	62.4	33	15.1	43.3	75.1	124	75.7	14.8	5.95	27.4	13.0	11.7	2.9	61.2		19,000	28,500
Total Chlordane	ng/g, dry	23.3	40.4	ND	ND	ND	ND	9	6.98	5.48	3.86	3.76	2.58	2.37	0.32	6.12		5,000	7,500
Arsenic	µg/g, dry	ND	ND	1.5	0.755	1.29	0.873	2.18	0.628	1.33	0.420	1.27	0.70	1.9	0.72	61.3		250	375
Station E, Adjacent to on-site well EW-7 (n=1 for each station and year)[1, 2]																			
Total PAHs	ng/g, dry	--	--	--	--	--	--	1,080	--	122,720	--	4,300	--	7,909	--	76,664		22,000	33,000
Total DDT	ng/g, dry	--	--	--	--	--	--	26	--	1852	--	161	--	820	--	5,961		19,000	28,500
Total Chlordane	ng/g, dry	--	--	--	--	--	--	2.89	--	293	--	19	--	54	--	831		5,000	7,500
Arsenic	µg/g, dry	--	--	--	--	--	--	5.97	--	10.8	--	6.6	--	6.7	--	18.5		250	375
Total VOCs	µg/Kg, dry	--	--	--	--	--	--	--	--	251	--	2,301	--	49	--	--		--	--
Station B, Between Union St., bridge and Center St. (n=3 for each station and year)																			
Total PAHs	ng/g, dry	12,400	776	4,590	2,940	2,960	1,210	3,830	275	11,128	6,781	5,500	4,300	7,119	3,623	9,386		22,000	33,000
Total DDT	ng/g, dry	2,570	42.4	838	1,120	1,010	918	1,070	637	833	1,082	1,190	967	796	238	402		19,000	28,500
Total Chlordane	ng/g, dry	513	168	50	86.6	177	232	385	244	487	614	250	160	133	15	87		5,000	7,500
Arsenic	µg/g, dry	ND	ND	10.2	6.44	11.5	7.52	24.2	15.4	20.2	22.3	12	4.4	10	2.6	7.4		250	375
Station C, Ice Pond (River Locations) (n=3 for each station and year)																			
Total PAHs	ng/g, dry	5,780	4,380	1,690	1,820	3,470	3,840	2,790	1,670	7,335	7,671	4,000	4,400	1,911	1,863	8,441		22,000	33,000
Total DDT	ng/g, dry	1,420	231	955	1,440	1,730	1,590	243	130	653	951	960	845	645	1,003	5,644		19,000	28,500
Total Chlordane	ng/g, dry	381	120	846	1350	373	647	85.7	59.8	236	338	273	232	159	252	1,493		5,000	7,500
Arsenic	µg/g, dry	ND	ND	26.2	24.9	39	20.4	11	6.1	15.3	12.2	15	11	20	14	61		250	375
Station C, Ice Pond (Bank Locations) (n=3 for each station and year)[2]																			
Total PAHs	ng/g, dry	10,100	5,090	8,870	5,910	10,500	5,710	14,100	9,630	28,078	10,266	26,000	22,000	6,618	3,976	20,558		22,000	33,000
Total DDT	ng/g, dry	2,570	1,010	2,230	2,130	2,910	1,920	981	691	2,525	810	1,650	984	1,369	918	1,028		19,000	28,500
Total Chlordane	ng/g, dry	1,250	265	2,310	2,540	947	850	294	232	1,045	170	166	141	320	269	327		5,000	7,500
Arsenic	µg/g, dry	49	43	93	34	34	24	48	36	80	13.7	27	22	95	14	29		250	375
Station D, Mary Lee Wetlands (River Locations) (n=3 for each station and year except 2013, where n=1)																			
Total PAHs	ng/g, dry	5,100	2,150	7,200	7,830	ND	ND	2,250	721	5,567	1,414	10,000	5,900	3140	2,372	12,802		22,000	33,000
Total DDT	ng/g, dry	2,480	996	3,240	1,960	701	691	620	684	1,457	728	7,980	4,890	734	324	19,559		19,000	28,500
Total Chlordane	ng/g, dry	3,330	1,410	2,190	2,250	154	139	198	190	636	347	2,460	1,490	150	50	3,940		5,000	7,500
Arsenic	µg/g, dry	ND	ND	93	47	9	4	45	29	29.9	6.9	80.7	56.1	56	6.9	115		250	375
Station D, Mary Lee Wetlands (Bank Locations) (n=3 for each station and year except 2013, where n=1)																			
Total PAHs	ng/g, dry	995	452	11,900	9,930	20,700	7,900	3,710	2,160	3,628	500	2,030	1,340	900	288	29,886		22,000	33,000
Total DDT	ng/g, dry	72	81	3,920	3,060	2,430	437	455	330	120	23.9	81.6	77.2	76	19	1,286		19,000	28,500
Total Chlordane	ng/g, dry	ND	ND	910	1,370	263	237	124	104	28.2	11.3	18	22	14	4.2	273		5,000	7,500
Arsenic	µg/g, dry	ND	ND	109	82	124	69	25	19	5.9	1.2	5	3	7.4	1.4	64		250	375

[1] Sampling at Station E began in 1999.

[2] Field duplicate samples for 2001and 2002 survey were combined prior to calculation of station averages.

Table D-4 Results for Common Contaminant Parameters Analyzed in Fish Tissue (Fillet) - 1992, 1996, 1999-2002, 2013

Parameter	Units (Wet)	Station and Species																												
		A					B			C						D			E			Sylvan Lake (SL)								
		GS	PS	AE	BB	RP	PS	LMB	BG	GS	RP	PS	LMB	AE	BG	GS	PS	RP	BB	RP	PS	AE	BB	LMB	PS	BG	WP	BC	YP	CP
1992 Fillet Results																														
Lipid Content	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	26.2	8.20	1.53	--	--	--	--	--	--
Total DDT	µg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3,470	1,900	317	--	--	--	--	--	--
Total Chlordane	µg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1,720	2,530	137	--	--	--	--	--	--
Total PAHs	µg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	--	--	--	--	--
Benzo(a)pyrene	µg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	--	--	--	--	--
1996 Fillet Results																														
Lipid Content	%	NR	NR	--	--	--	NR	--	--	NR	--	NR	--	--	--	NR	NR	--	--	--	--	--	--	--	--	--	--	--	--	--
Total DDT	µg/kg	5,200	1,480	--	--	--	10,200	--	--	7,190	--	11,100	--	--	--	14,200	8,540	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Chlordane	µg/kg	670	83	--	--	--	400	--	--	476	--	1,800	--	--	--	1,690	740	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PAHs	µg/kg	ND	ND	--	--	--	ND	--	--	ND	--	ND	--	--	--	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	µg/kg	ND	ND	--	--	--	ND	--	--	ND	--	ND	--	--	--	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--
1999 Fillet (skin-on) Results																														
Lipid Content	%	--	1.15	--	--	1.74	--	--	0.741	--	--	--	--	--	0.775	--	--	1.98	--	--	--	--	1.95	--	--	--	--	--	--	0.665
Total DDT	µg/kg	--	159	--	--	16.4	--	--	167	--	--	--	--	--	88.7	--	--	187	--	--	--	--	279	--	--	--	--	--	--	149
Total Chlordane	µg/kg	--	6.3	--	--	1.85	--	--	5.44	--	--	--	--	--	3.95	--	--	10.8	--	--	--	--	45.4	--	--	--	--	--	--	7.45
Total PAHs	µg/kg	--	12.5	--	--	6.08	--	--	2.37	--	--	--	--	--	2.98	--	--	2.2	--	--	--	--	18.1	--	--	--	--	--	--	3.38
Benzo(a)pyrene	µg/kg	--	0.294	--	--	ND	--	--	ND	--	--	--	--	--	ND	--	--	ND	--	--	--	--	0.415	--	--	--	--	--	--	ND
2000 Fillet Results[3]																														
Lipid Content	%	--	--	5.4	--	--	--	--	--	--	--	--	--	3.17	--	--	--	--	--	--	--	--	2.7	--	--	--	--	--	1.4	--
Total DDT	µg/kg	--	--	420	--	--	--	--	--	--	--	--	--	1.2	--	--	--	--	--	--	--	--	560	--	--	--	--	--	934	--
Total Chlordane	µg/kg	--	--	39	--	--	--	--	--	--	--	--	--	1,578	--	--	--	--	--	--	--	--	37	--	--	--	--	--	50	--
Total PAHs	µg/kg	--	--	9.6	--	--	--	--	--	--	--	--	--	174	--	--	--	--	--	--	--	--	15	--	--	--	--	--	15	--
Benzo(a)pyrene	µg/kg	--	--	NR[1]	--	--	--	--	--	--	--	--	--	NR[1]	--	--	--	--	--	--	--	--	0.1	--	--	--	--	--	ND/ NR[2]	--
2001 Fillet Results																														
Lipid Content	%	--	--	--	--	0.95	--	0.85	0.94	--	1.0	--	--	--	--	--	--	1.0	--	--	--	--	1.6	--	1.0	1.1	--	--	0.78	--
Total DDT	µg/kg	--	--	--	--	7.3	--	167	111	--	163	--	--	--	--	--	--	112	--	--	--	--	645	--	189	157	--	--	245	--
Total Chlordane	µg/kg	--	--	--	--	1.4	--	22	5.3	--	20	--	--	--	--	--	--	26	--	--	--	--	84	--	16	13	--	--	30	--
Total PAHs	µg/kg	--	--	--	--	2.1	--	4.8	5.5	--	10	--	--	--	--	--	--	5.9	--	--	--	--	18	--	12	6.7	--	--	4.9	--
Benzo(a)pyrene	µg/kg	--	--	--	--	ND	--	ND	ND	--	ND	--	--	--	--	--	--	ND	--	--	--	--	ND	--	ND	ND	--	--	ND	--
2002 Fillet Results																														
Lipid Content	%	--	0.17	--	0.32	1.1	0.22	0.39	0.27	--	0.07	0.57	--	--	3.2	--	--	1.1	--	--	--	--	0.44	0.23	4.1	0.20	0.65	0.40	0.30	--
Total DDT	µg/kg	--	9.7	--	74.3	2.1	48.0	42.6	25.9	--	20.8	71.1	--	--	66.6	--	--	20.9	--	--	--	--	181	51.6	26.5	25.5	183	26.4	135	--
Total Chlordane	µg/kg	--	0.96	--	13.7	0.32	4.3	3.4	2.4	--	2.7	7.7	--	--	7.0	--	--	2.7	--	--	--	--	18.5	4.5	0.48	0.26	15.0	1.2	11.3	--
Total PAHs	µg/kg	--	ND	--	ND	ND	ND	1.0	23.1	--	ND	0.48	--	--	ND	--	--	ND	--	--	--	--	ND	14.9	ND	ND	ND	8.4	ND	--
Benzo(a)pyrene	µg/kg	--	ND	--	ND	ND	ND	ND	ND	--		ND	--	--	ND	--	--	ND	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	--
2013 Fillet Results																														
Lipid Content	%	--	0.74	8.56	1.56	--	--	--	--	--	0.78	0.87	0.76	8.08	--	--	--	--	5.11	0.76	1.1	--	2.34	8.36	0.62	0.67	--	0.65	--	--
Total DDT	µg/kg	--	21.7	799	128	--	--	--	--	--	117	31.9	81.0	294	--	--	--	--	122	43.6	27.7	--	155	22.9	45.0	148	--	41.3	--	--
Total Chlordane	µg/kg	--	ND	395	15.3	--	--	--	--	--	8.7	ND	11.5	107	--	--	--	--	19.4	ND	ND	--	17.2	ND	ND	ND	--	ND	--	--
Total PAHs	µg/kg	--	ND	ND	ND	--	--	--	--	--	ND	ND	ND	ND	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	--	ND	--	--
Benzo(a)pyrene	µg/kg	--	ND	ND	ND	--	--	--	--	--	ND	ND	ND	ND	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	--	ND	--	--

N/A - Not applicable/available; ND - Not Detected; NR- Not Reported. AE- American eel; BB- brown bullhead; BC- black crappie; BG - bluegill; CP - chain pickerel; GS - golden shiner; LMB - largemouth bass; PS- pumpkinseed; RP - redfin pickerel; WP- white perch; YP- yellow perch

[1]Result(s) determined to be unusable following data validation.

[2]Non-detect Results and unusable results(determined through data validation) were reported.

[3]Table from September 2001 report presented concentrations as total for all fish in station. Concentrations are now presented as averages where applicable.

Table D-5 Sediment/Soil Screening, 1996 - 2013 Mean Data

Parameter	Units	1996	1997	1998	1999	2000	2001	2002	2013	Screening Value	
		Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Sediment[3]	Soil[4]
Station A, Upstream of Project Area (control) (n=3 for each station and year)											
Total PAHs	ug/kg, dry	1,770	1,540	357	1,940	2,549	2,500	2,853	29,870	22,800[a]	1,100[b]
Total DDT	ug/kg, dry	36	33	43.3	124	14.8	27.4	11.7	61.2	572[a]	21[c]
Total Chlordane	ug/kg, dry	23.3	ND	ND	9	5.48	3.76	2.37	6.12	17.2[a]	224[d]
Arsenic	mg/kg, dry	ND	1.5	1.29	2.18	1.33	1.27	1.9	61.3	33[a]	18[e]
Station E, Adjacent to on-site well EW-7 (n=1 for each station and year)[1, 2]											
Total PAHs	ug/kg, dry	--	--	--	1,080	122,720	4,300	7,909	76,664	22,800[a]	1,100[b]
Total DDT	ug/kg, dry	--	--	--	26	1852	161	820	5,961	572[a]	21[c]
Total Chlordane	ug/kg, dry	--	--	--	2.89	293	19	54	831	17.2[a]	224[d]
Arsenic	mg/kg, dry	--	--	--	5.97	10.8	6.6	6.7	18.5	33[a]	18[e]
Total VOCs	ug/kg, dry	--	--	--	--	251	2,301	49	--	--	--
Station B, Between Union St., bridge and Center St. (n=3 for each station and year)											
Total PAHs	ug/kg, dry	12,400	4,590	2,960	3,830	11,128	5,500	7,119	9,386	22,800[a]	1,100[b]
Total DDT	ug/kg, dry	2,570	838	1,010	1,070	833	1,190	796	402	572[a]	21[c]
Total Chlordane	ug/kg, dry	513	50	177	385	487	250	133	87	17.2[a]	224[d]
Arsenic	mg/kg, dry	ND	10.2	11.5	24.2	20.2	12	10	7.4	33[a]	18[e]
Station C, Ice Pond (River Locations) (n=3 for each station and year)											
Total PAHs	ug/kg, dry	5,780	1,690	3,470	2,790	7,335	4,000	1,911	8,441	22,800[a]	1,100[b]
Total DDT	ug/kg, dry	1,420	955	1,730	243	653	960	645	5,644	572[a]	21[c]
Total Chlordane	ug/kg, dry	381	846	373	85.7	236	273	159	1,493	17.2[a]	224[d]
Arsenic	mg/kg, dry	ND	26.2	39	11	15.3	15	20	61	33[a]	18[e]
Station C, Ice Pond (Bank Locations) (n=3 for each station and year)[2]											
Total PAHs	ug/kg, dry	10,100	8,870	10,500	14,100	28,078	26,000	6,618	20,558	22,800[a]	1,100[b]
Total DDT	ug/kg, dry	2,570	2,230	2,910	981	2,525	1,650	1,369	1,028	572[a]	21[c]
Total Chlordane	ug/kg, dry	1,250	2,310	947	294	1,045	166	320	327	17.2[a]	224[d]
Arsenic	mg/kg, dry	49	93	34	48	80	27	95	29	33[a]	18[e]
Station D, Mary Lee Wetlands (River Locations) (n=3 for each station and year except 2013, where n=1)											
Total PAHs	ug/kg, dry	5,100	7,200	ND	2,250	5,567	10,000	3140	12,802	22,800[a]	1,100[b]
Total DDT	ug/kg, dry	2,480	3,240	701	620	1,457	7,980	734	19,559	572[a]	21[c]
Total Chlordane	ug/kg, dry	3,330	2,190	154	198	636	2,460	150	3,940	17.2[a]	224[d]
Arsenic	mg/kg, dry	ND	93	9	45	29.9	80.7	56	115	33[a]	18[e]
Station D, Mary Lee Wetlands (Bank Locations) (n=3 for each station and year except 2013, where n=1)											
Total PAHs	ug/kg, dry	995	11,900	20,700	3,710	3,628	2,030	900	29,886	22,800[a]	1,100[b]
Total DDT	ug/kg, dry	72	3,920	2,430	455	120	81.6	76	1,286	572[a]	21[c]
Total Chlordane	ug/kg, dry	ND	910	263	124	28.2	18	14	273	17.2[a]	224[d]
Arsenic	mg/kg, dry	ND	109	124	25	5.9	5	7.4	64	33[a]	18[e]

(1) Sampling at Station E began in 1999.

(2) Field duplicate samples for 2001and 2002 survey were combined prior to calculation of station averages.

(3) Sediment screening values apply to river samples only

(4) Soil screening values apply to bank samples only

(a) Probable effects concentration (PEC), MacDonald et al., 2001

(b) EcoSSL (USEPA, 2007) based on High Molecular Weighr (HMW) exposure to mammalian insectivore (shrew)

(c) EcoSSL (USEPA, 2007) based on exposure to mammalian carnivore (weasel)

(d) USEPA, Region 5, Ecological Screening Levles (USEPA, 2003) based on exposure to plants

(e) EcoSSL (USEPA, 2005) based on exposure to plants

Highlighted cells excced corresponding soil or sediment screening values

FIGURE 4
CONCENTRATION DISTRIBUTION GRAPHS
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA

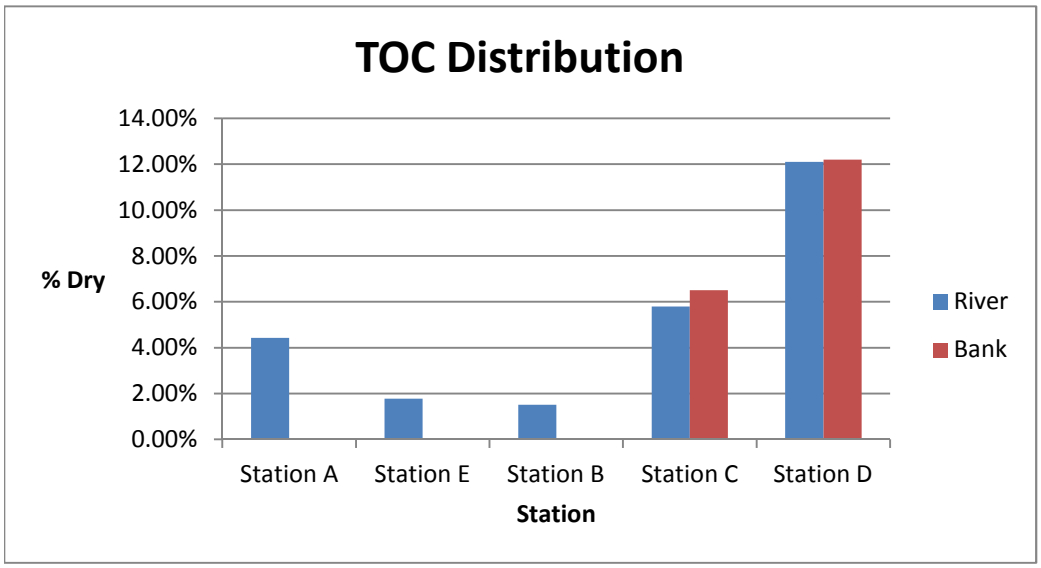


Figure 4.1 - Station Mean Concentrations for TOC in River Sediment and Bank Soil Samples

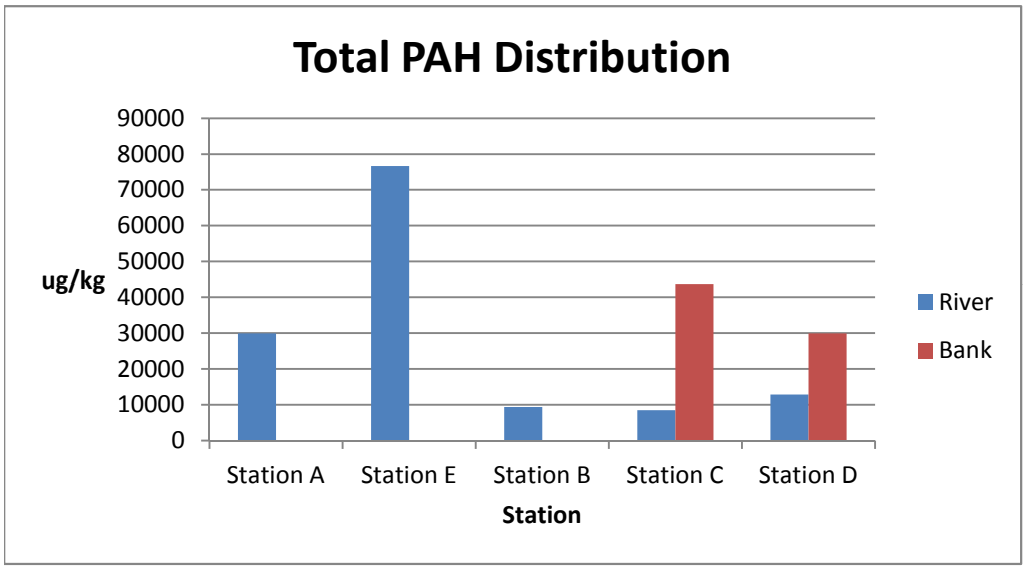


Figure 4.2 - Station Mean Concentrations for Total PAHs in River Sediment and Bank Soil Samples

FIGURE 4
CONCENTRATION DISTRIBUTION GRAPHS
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA

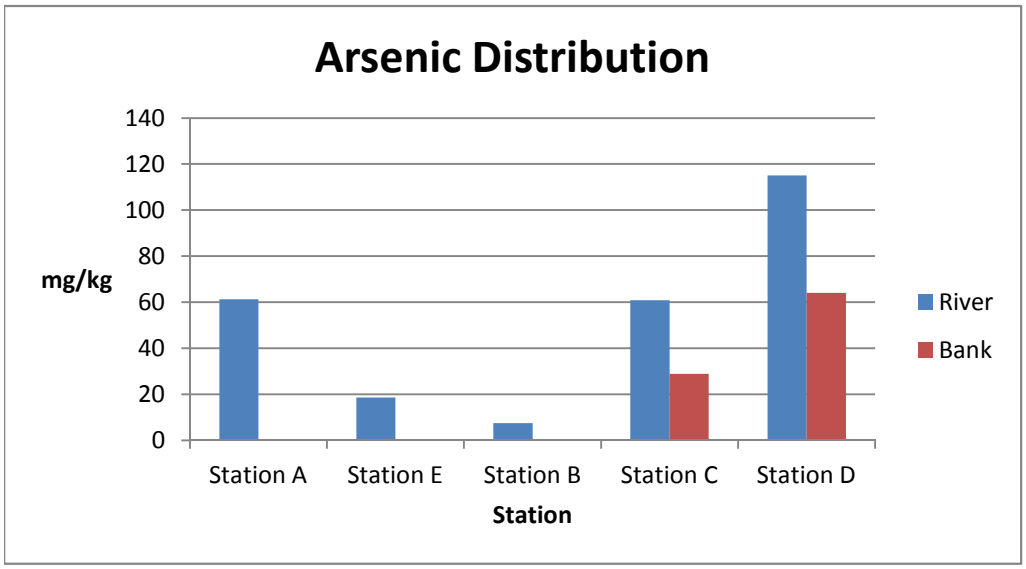


Figure 4.3 - Station Mean Concentrations for Arsenic in River Sediment and Bank Soil Samples

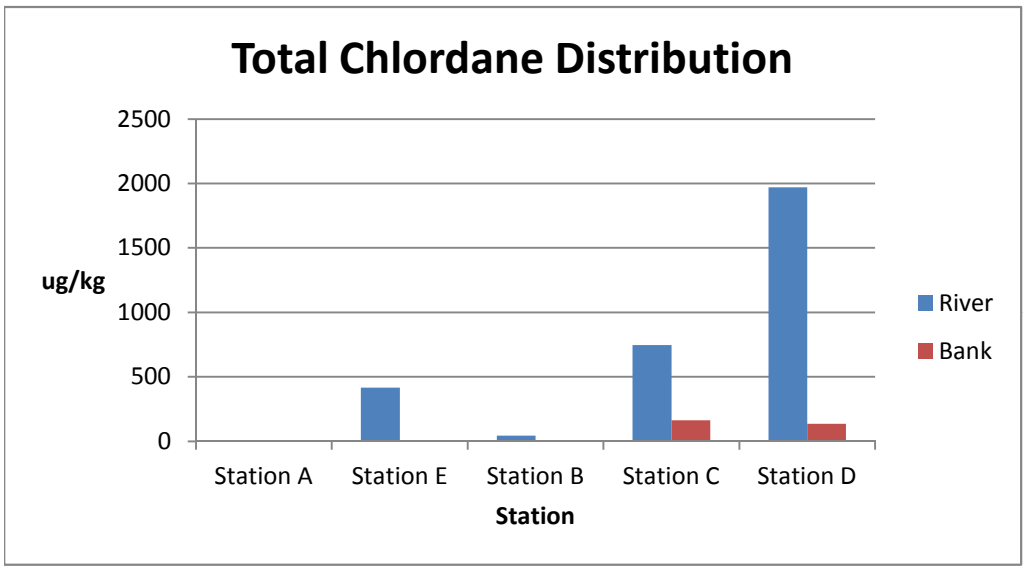


Figure 4.4 - Station Mean Concentrations for Total Chlordane in River Sediment and Bank Soil Samples

FIGURE 4
CONCENTRATION DISTRIBUTION GRAPHS
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA

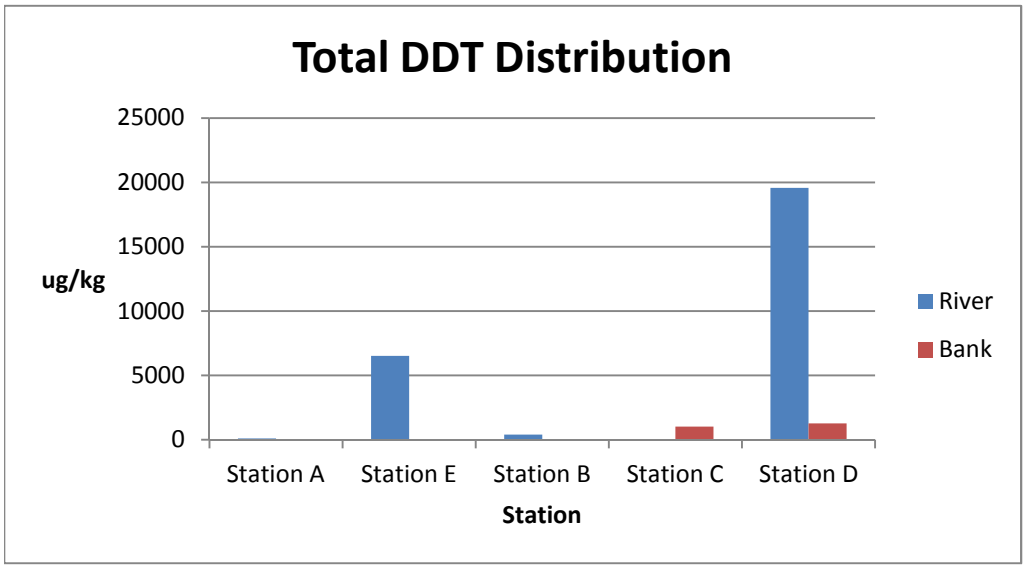


Figure 4.5 - Station Mean Concentrations for Total DDT in River Sediment and Bank Soil Samples

FIGURE 4
CONCENTRATION DISTRIBUTION GRAPHS
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA

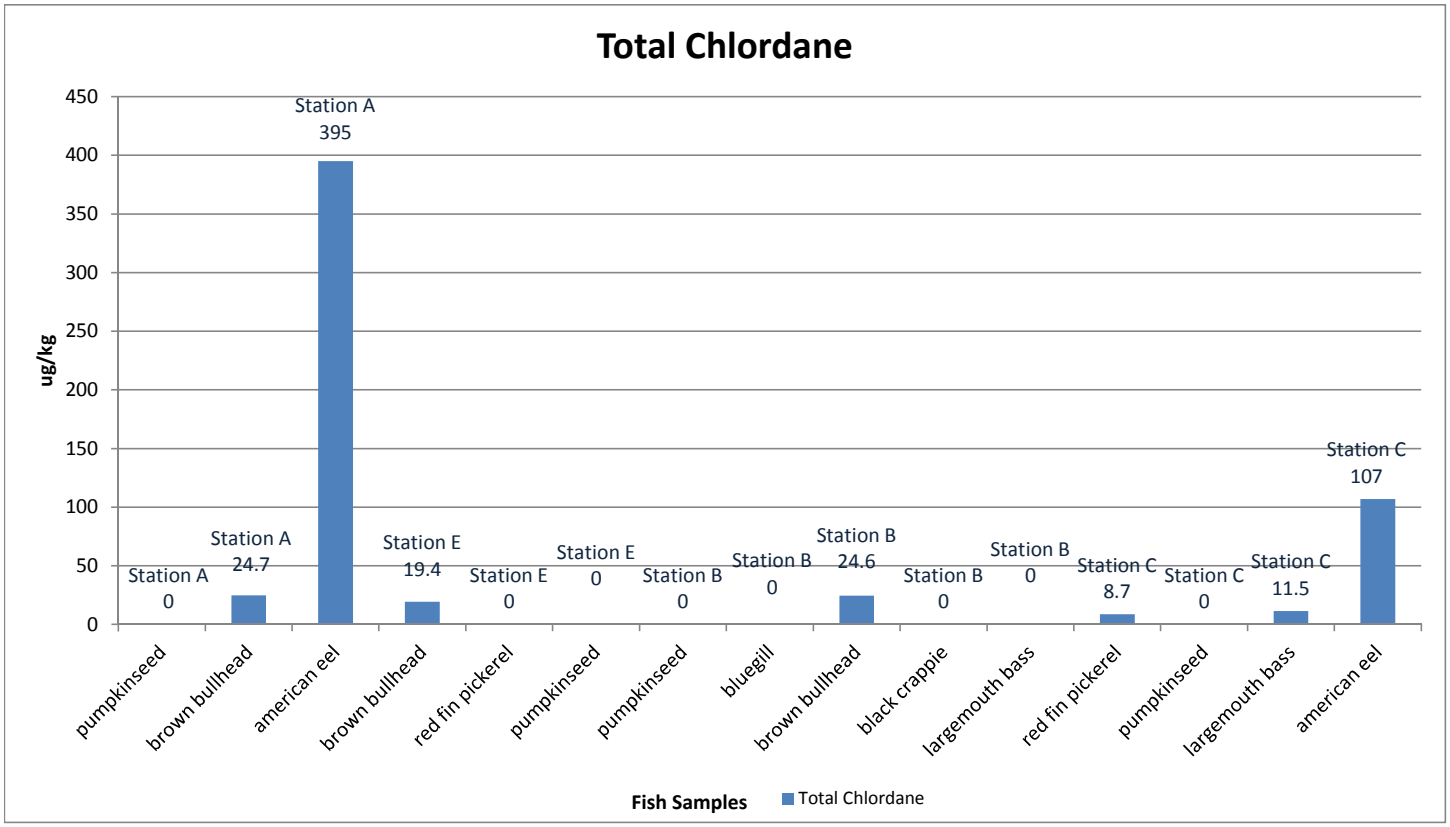


Figure 4.6 - Concentrations of Total Chlordane in Fish Tissue Samples Collected in October 2013

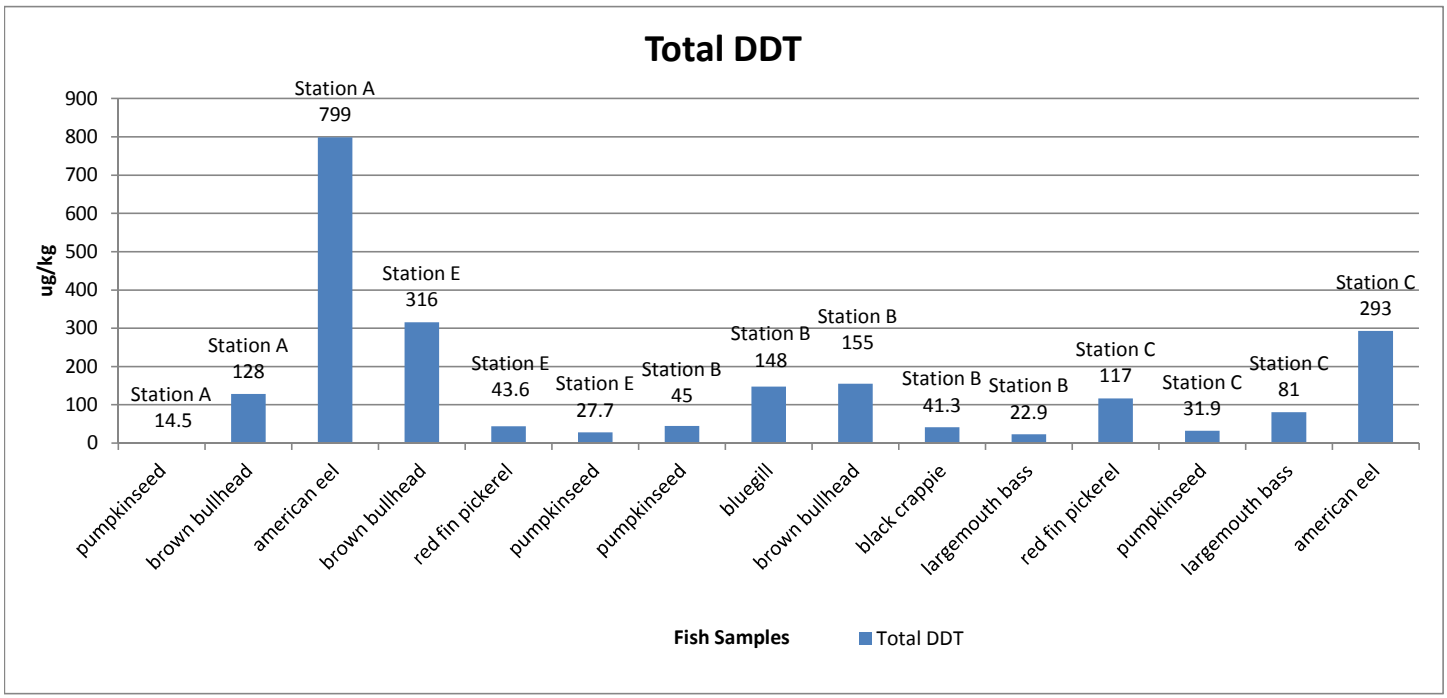


Figure 4.7 - Concentrations of Total DDT in Fish Tissue Samples Collected in October 2013

TABLE 1
SAMPLING LOCATIONS AND ANALYSES

Baird and McGuire Site
Cochato River Investigation

Matrix and Sampling Location	Sample Collection Details	Analytical Parameters
Sediments		
Stations A, B, C, D, and E (Site B is the section of river that runs parallel with Sylvan Lake)	Five stations will be sampled. Three (of nine) transects were used at three stations (A, B, and C) and one transect at stations D and E. One composite sample will be collected per transect.	TOC by EPA Method 9060, PAHs by EPA Method 8270D, Organochlorine Pesticides by EPA Method 8081B, Arsenic by EPA Method 6020A, Grain Size by ASTM D422, and Percent Solids by EPA Method 2540G.
Soils		
Stations C and D	Three transects used at two stations. One composite sample was collected per transect.	TOC by EPA Method 9060, PAHs by EPA Method 8270D, Organochlorine Pesticides by EPA Method 8081B, Arsenic by EPA Method 6020A, Grain Size by ASTM D422, and Percent Solids by EPA Method 2540G.
Fish		
Stations A, B, C, and E (Station B is Sylvan Lake)	At each of four stations (A, B, C, and E), six or more fish were collected to represent several types of fish species – 3 fish each of abundant and predatory were preferred. Fish greater than 60 grams in weight were preferred to provide adequate sample from fillet. Fish smaller than 60 grams were combined with other fish of similar species and size for compositing. Station C was chosen over station D because of access to fishing.	PAHs by EPA 8270D, Organochlorine Pesticides by EPA 8081B, and Percent Lipids by NOAA Methodology. Fish age determination by examining fish scales and pectoral spines (for scale-less fish).

TABLE 2
GPS COORDINATES FOR SAMPLING LOCATIONS

Baird and McGuire Site
Cochato River Investigation
October 2013

Sampling Location	Latitude (North)	Longitude (West)
A1	42°08’58.68820”	71°01’23.79837”
A2	42°08’58.77351”	71°01’24.88997”
A4	42°08’58.91187”	71°01’26.09673”
A5	42°08’59.01855”	71°01’27.02276”
A6	42°08’59.13384”	71°01’28.01546”
A7	42°08’59.39053”	71°01’28.77968”
A8	42°08’59.58336”	71°01’29.38427”
A9	42°09’00.01520”	71°01’29.83190”
B1	42°09’22.79012”	71°01’34.61762”
B2	42°09’23.17730”	71°01’34.35254”
B3	42°09’24.03501”	71°01’34.21767”
B4	42°09’24.33880”	71°01’34.15913”
B5	42°09’24.79483”	71°01’33.98897”
B6	42°09’25.26271”	71°01’33.89832”
B7	42°09’25.83390”	71°01’33.84180”
B8	42°09’26.33466”	71°01’33.76703”
B9	42°09’26.83388”	71°01’33.61347”
C1	42°09’30.57056”	71°01’37.28341”
C2	42°09’31.30673”	71°01’37.28858”
C3	42°09’32.29407”	71°01’37.63201”
C4	42°09’33.30155”	71°01’37.59233”
C5	42°09’34.26767”	71°01’37.11742”
C7	42°09’35.99072”	71°01’36.35008”
C8	42°09’36.87861”	71°01’36.87476”
C9	42°09’37.78651”	71°01’36.71841”
D5	42°09’43.16129”	71°01’32.68422”
E0	42°09’01.08900”	71°01’31.50619”

*Data is in Massachusetts State Plane

TABLE 3
SUMMARY OF
SEDIMENT ANALYTICAL RESULTS
INORGANICS
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(reported on a dry weight basis)

Client ID	Sample Date	Total Organic Carbon (Rep1)	Total Organic Carbon (Rep2)	% Cobbles	% Coarse Gravel	% Fine Gravel	% Total Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Total Fines	Solids, Total
A3 SED	11-Oct-13	1.92%	1.68%	<0.100	<0.100	1.59	1.59	7.91	43.1	40.4	7.00	69.4
A5 SED	11-Oct-13	4.03%	4.08%	<0.100	<0.100	1.68	1.68	3.78	18.2	64.4	11.9	40.0
A7 SED	11-Oct-13	8.03%	6.79%	<0.100	<0.100	0.87	0.87	4.24	26.0	57.1	11.8	25.1
E0 SED	11-Oct-13	1.82%	1.74%	<0.100	<0.100	9.42	9.42	3.84	31.6	43.3	11.9	69.4
B3 SED	09-Oct-13	1.01%	1.22%	<0.100	<0.100	0.66	0.66	2.41	23.4	66.0	7.54	68.4
B5 SED	09-Oct-13	2.35%	2.81%	<0.100	<0.100	0.100	0.100	2.36	47.5	46.5	3.56	57.4
B7 SED	09-Oct-13	0.856%	0.825%	<0.100	<0.100	0.25	0.25	2.31	31.8	61.6	4.06	55.5
C3 SED	10-Oct-13	2.76%	2.29%	<0.100	<0.100	1.73	1.73	6.63	22.7	46.2	22.7	57.8
C5 SED	10-Oct-13	9.87%	7.33%	<0.100	<0.100	1.05	1.05	6.41	30.0	54.9	7.65	40.7
C7 SED	10-Oct-13	5.83%	6.72%	<0.100	<0.100	1.40	1.40	9.94	68.5	18.4	1.67	51.8
D5 SED	11-Oct-13	12.1%	12.1%	<0.100	<0.100	3.25	3.25	11.5	37.8	29.5	18.0	20.2

TABLE 3
SUMMARY OF
SEDIMENT ANALYTICAL RESULTS
PAH
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a dry weight basis in ug/kg)

Client ID	Sample Date	1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene
A3 SED	11-Oct-13	158	206	314	47.4	474	3140	3390	5900	2640
A5 SED	11-Oct-13	90.0	137	74.7	46.3	152	1570	1690	3440	1540
A7 SED	11-Oct-13	226	163	7270	99.2	59.0	439	446	909	384
E0 SED	11-Oct-13	17500	22800	4740	227	671	518	372	612	272
B3 SED	09-Oct-13	24.0	32.9	48.7	63.0	181	793	716	1070	543
B5 SED	09-Oct-13	29.1	44.3	38.9	77.8	125	805	773	1210	648
B7 SED	09-Oct-13	21.3	26.9	18.3	61.4	73.6	570	594	1020	475
C3 SED	10-Oct-13	79.4	122	35.4	190	161	990	761	1330	525
C5 SED	10-Oct-13	129	234	46.8	194	209	591	580	974	518
C7 SED	10-Oct-13	28.6	44.2	12.5	70.7	67.4	589	361	692	226
D5 SED	11-Oct-13	82.6	129	43.8	212	213	920	872	1860	781

TABLE 3
SUMMARY OF
SEDIMENT ANALYTICAL RESULTS
PAH
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a dry weight basis in ug/kg)

Client ID	Sample Date	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
A3 SED	11-Oct-13	2080	3790	881	9550	421	3970	128	4740	6570
A5 SED	11-Oct-13	1150	1870	488	4660	172	2260	83.3	1720	3330
A7 SED	11-Oct-13	350	531	136	1360	1910	583	279	572	1020
E0 SED	11-Oct-13	272	540	72.5	1640	2450	387	19500	2620	1470
B3 SED	09-Oct-13	540	773	174	1620	71.5	787	34.7	849	1370
B5 SED	09-Oct-13	702	906	195	1880	90.3	925	44.7	998	1520
B7 SED	09-Oct-13	397	652	144	1170	37.8	697	20.6	456	1020
C3 SED	10-Oct-13	558	834	193	2010	70.8	758	86.0	684	1640
C5 SED	10-Oct-13	575	655	159	1210	125	724	149	614	1190
C7 SED	10-Oct-13	388	442	79.4	987	32.8	369	53.6	116	860
D5 SED	11-Oct-13	684	1030	259	1910	89.6	1160	110	736	1710

TABLE 3
SUMMARY OF
SEDIMENT ANALYTICAL RESULTS
PESTICIDES
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a dry weight basis in ug/kg)

Client ID	Sample Date	2,4'-DDD	2,4'-DDE	2,4'-DDT	4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	Alpha-BHC	Beta-BHC	Chlordane	cis-Chlordane	cis-Nonachlor	Delta-BHC
A3 SED	11-Oct-13	0.998	< 0.572	< 0.572	3.23	14.5 P	< 0.572	< 0.572	< 0.572	< 13.7	< 28.6	1.65	< 0.572	< 0.572
A5 SED	11-Oct-13	5.18	< 0.982	< 0.982	9.63	19.2 P	< 0.982	< 0.982	< 0.982	< 23.6	< 49.1	3.39	2.99	< 0.982
A7 SED	11-Oct-13	31.4	6.40 P	< 1.53	61.1	26.8	5.15 P	< 1.53	< 1.53	< 36.7	< 76.5	5.64	< 1.53	< 1.53
E0 SED	11-Oct-13	1090	78.7 P	< 2.78	3810 D	544	438	< 2.78	25.8 P	< 66.8	< 139	362	49.2	< 2.78
B3 SED	09-Oct-13	69.1	< 11.7	< 11.7	248	52.9	11.7	< 11.7	< 11.7	< 280	< 584	28.9	< 11.7	< 11.7
B5 SED	09-Oct-13	91.9	< 13.6	< 13.6	317	74.8	< 13.6	< 13.6	< 13.6	< 325	< 678	39.5	< 13.6	< 13.6
B7 SED	09-Oct-13	61.5	< 13.9	< 13.9	210	70.4	< 13.9	< 13.9	< 13.9	< 333	< 694	30.1	< 13.9	< 13.9
C3 SED	10-Oct-13	1170	99.7	< 13.8	4970	644	14.3	< 13.8	< 13.8	< 332	< 691	586	127	< 13.8
C5 SED	10-Oct-13	1620	364 P	< 19.1	5990	1980	27.2	< 19.1	< 19.1	< 459	< 956	916	300	< 19.1
C7 SED	10-Oct-13	10.1	2.14 P	< 0.733	31.8	9.13	< 0.733	< 0.733	< 0.733	< 17.6	< 36.6	6.29	< 0.733	< 0.733
D5 SED	11-Oct-13	3560	323 P	< 38.4	13100	2490	85.7	< 38.4	< 38.4	< 923	< 1920	1630	306	< 38.4

Results reported as <# indicate that compound was not detected above the reporting limit (RL).
Reporting Limit (RL) is the value at which an instrument can accurately measure an analyte at a specific concentration.
The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

Data Qualifiers

P - The RPD between the results for the two columns exceeds the method-specified criteria.
E- Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
I - The lower value for the two columns has been reported due to obvious interference.
D - The concentration of analyte exceeded the range of the calibration curve and/or linear range of the instrument therefore the sample required dilution. The diluted analysis was over the calibration range of the analytical instrument.

TABLE 3
SUMMARY OF
SEDIMENT ANALYTICAL RESULTS
PESTICIDES
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a dry weight basis in ug/kg)

Client ID	Sample Date	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin	Endrin aldehyde	Endrin ketone	gamma-BHC	Heptachlor	Heptachlor epoxide	Hexachloro benzene	Methoxychlor		Mirex
A3 SED	11-Oct-13	< 0.572	< 0.572	< 0.572	< 0.572	< 1.11	< 0.572	< 0.572	< 0.572	< 0.572	< 0.572	< 0.572	6.60	I	< 0.572
A5 SED	11-Oct-13	< 0.982	< 0.982	< 0.982	< 0.982	< 1.92	< 0.982	< 0.982	< 0.982	< 0.982	< 0.982	< 0.982	8.40		< 0.982
A7 SED	11-Oct-13	< 1.53	< 1.53	< 1.53	< 1.53	< 2.98	< 1.53	< 1.53	< 1.53	< 1.53	< 1.53	< 1.53	< 9.18		< 1.53
E0 SED	11-Oct-13	28.1	< 2.78	6.03	4.12	< 5.42	< 2.78	< 2.78	< 2.78	< 2.78	9.55	< 2.78	< 16.7		< 2.78
B3 SED	09-Oct-13	< 11.7	< 11.7	< 11.7	< 11.7	< 22.8	< 11.7	< 11.7	< 11.7	< 11.7	< 11.7	< 11.7	< 70		< 11.7
B5 SED	09-Oct-13	< 13.6	< 13.6	< 13.6	< 13.6	< 26.4	< 13.6	< 13.6	< 13.6	< 13.6	< 13.6	< 13.6	< 81.3		< 13.6
B7 SED	09-Oct-13	< 13.9	< 13.9	< 13.9	< 13.9	< 27.1	< 13.9	< 13.9	< 13.9	< 13.9	< 13.9	< 13.9	< 83.3		< 13.9
C3 SED	10-Oct-13	< 13.8	< 13.8	< 13.8	< 13.8	< 26.9	< 13.8	< 13.8	< 13.8	< 13.8	< 13.8	< 13.8	< 82.9		< 13.8
C5 SED	10-Oct-13	< 19.1	< 19.1	< 19.1	< 19.1	< 37.3	< 19.1	< 19.1	< 19.1	< 19.1	< 19.1	< 19.1	< 115		< 19.1
C7 SED	10-Oct-13	< 0.733	< 0.733	< 0.733	< 0.733	< 1.43	< 0.733	< 0.733	< 0.733	< 0.733	< 0.733	< 0.733	8.54	P	< 0.733
D5 SED	11-Oct-13	< 38.4	< 38.4	< 38.4	< 38.4	< 75	< 38.4	< 38.4	< 38.4	< 38.4	< 38.4	< 38.4	< 231		< 38.4

Results reported as <# indicate that compound was not detected above the reporting limit (RL).
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Data Qualifiers

P - The RPD between the results for the two columns exceeds the method-specified criteria.
E- Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
I - The lower value for the two columns has been reported due to obvious interference.
D - The concentration of analyte exceeded the range of the calibration curve and/or linear range of the instrument therefore the sample required dilution. The diluted analysis was over the calibration range of the analytical instrument.

TABLE 3
SUMMARY OF
SEDIMENT ANALYTICAL RESULTS
PESTICIDES
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a dry weight basis in ug/kg)

Client ID	Sample Date	Oxychlordane	Toxaphene	trans-Chlordane	trans-Nonachlor	
A3 SED	11-Oct-13	< 0.572	< 28.6	1.26	< 0.572	
A5 SED	11-Oct-13	< 0.982	< 49.1	2.51	7.71	P
A7 SED	11-Oct-13	< 1.53	< 76.5	3.90	5.02	P
E0 SED	11-Oct-13	< 2.78	< 139	469	152	
B3 SED	09-Oct-13	< 11.7	< 584	48.1	16.6	
B5 SED	09-Oct-13	< 13.6	< 678	61.3	22.9	
B7 SED	09-Oct-13	< 13.9	< 694	53.5	17.4	P I
C3 SED	10-Oct-13	< 13.8	< 691	824	424	
C5 SED	10-Oct-13	< 19.1	< 956	2140	562	
C7 SED	10-Oct-13	< 0.733	< 36.6	6.20	2.36	
D5 SED	11-Oct-13	< 38.4	< 1920	2310	871	

Results reported as <# indicate that compound was not detected above the reporting limit (RL).
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Data Qualifiers

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D - The concentration of analyte exceeded the range of the calibration curve and/or linear range of the instrument therefore the sample required dilution. The diluted analysis was over the calibration range of the analytical instrument.

TABLE 3
SUMMARY OF
SEDIMENT ANALYTICAL RESULTS
METALS
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a dry weight basis in mg/kg)

Client ID	Sample Date	Arsenic, Total
A3 SED	11-Oct-13	1.45
A5 SED	11-Oct-13	3.59
A7 SED	11-Oct-13	179
E0 SED	11-Oct-13	18.5
B3 SED	09-Oct-13	6.85
B5 SED	09-Oct-13	8.76
B7 SED	09-Oct-13	6.49
C3 SED	10-Oct-13	11.2
C5 SED	10-Oct-13	146
C7 SED	10-Oct-13	25.2
D5 SED	11-Oct-13	115

TABLE 4
SUMMARY OF
SOIL ANALYTICAL RESULTS
INORGANICS
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a dry weight basis)

Client ID	Sample Date	Total Organic Carbon (Rep1)	Total Organic Carbon (Rep2)	% Cobbles	% Coarse Gravel	% Fine Gravel	% Total Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Total Fines	Solids, Total
C3 SOIL	10-Oct-13	5.81%	5.55%	<0.100	<0.100	15.1	15.1	4.45	25.6	47.5	7.32	69.6
C5 SOIL	10-Oct-13	6.88%	0.058	<0.100	<0.100	<0.100	<0.100	0.18	17.9	62.6	19.4	45.3
C7 SOIL	10-Oct-13	7.88%	7.07%	<0.100	<0.100	<0.100	<0.100	0.72	13.3	52.1	33.9	41.5
D5 SOIL	11-Oct-13	12.20%	12.20%	<0.100	<0.100	<0.100	<0.100	3.04	31.9	32.8	32.3	25.0

TABLE 4
SUMMARY OF
SOIL ANALYTICAL RESULTS
PAH
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a dry weight basis in ug/kg)

Client ID	Sample Date	1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene
C3 SOIL	10-Oct-13	41.6	52.7	27.5	123	128	526	554	970
C5 SOIL	10-Oct-13	151	205	125	220	368	1950	1810	3430
C7 SOIL	10-Oct-13	96.1	151	63.1	211	251	1860	2040	4400
D5 SOIL	11-Oct-13	73.4	113	59.6	259	293	1910	2160	5020

TABLE 4
SUMMARY OF
SOIL ANALYTICAL RESULTS
PAH
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a dry weight basis in ug/kg)

Client ID	Sample Date	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
C3 SOIL	10-Oct-13	453	366	643	150	1210	50.6	660	48.5	641	1050
C5 SOIL	10-Oct-13	1640	1440	2100	529	4020	146	2370	157	2190	3460
C7 SOIL	10-Oct-13	1950	1540	2320	638	4120	98.8	2970	119	1600	3240
D5 SOIL	11-Oct-13	2300	1560	2440	683	4420	104	3330	101	1560	3500

TABLE 4
SUMMARY OF
SOIL ANALYTICAL RESULTS
PESTICIDES
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a dry weight basis in ug/kg)

Client ID	Sample Date	2,4'-DDD	2,4'-DDE	2,4'-DDT	4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	Alpha-BHC	Beta-BHC	Chlordane	cis-Chlordane	cis-Nonachlor	Delta-BHC	Dieldrin
C3 SOIL	10-Oct-13	19.0	< 11.4	15.8	64.9	228	139	< 11.4	< 11.4	< 273	< 569	106	39.8	< 11.4	34.9
C5 SOIL	10-Oct-13	270	19.2	< 16.8	876	297	37.0	< 16.8	< 16.8	< 404	< 842	246	69.1	< 16.8	50.9
C7 SOIL	10-Oct-13	216	26.1	< 17.6	543	300	32.1	< 17.6	< 17.6	< 424	< 883	150	51.7	< 17.6	< 17.6
D5 SOIL	11-Oct-13	304	< 30.6	< 30.6	660	290	32.4	< 30.6	< 30.6	< 736	< 1530	109	45.1	< 30.6	< 30.6

Results reported as <# indicate that compound was not detected above the reporting limit (RL).
Reporting Limit (RL) is the value at which an instrument can accurately measure an analyte at a specific concentration.
The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

TABLE 4
SUMMARY OF
SOIL ANALYTICAL RESULTS
PESTICIDES
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a dry weight basis in ug/kg)

Client ID	Sample Date	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin	Endrin aldehyde	Endrin ketone	gamma-BHC	Heptachlor	Heptachlor epoxide	Hexachloro benzene	Methoxychlor	Mirex	Oxychlordane
C3 SOIL	10-Oct-13	< 11.4	< 11.4	< 11.4	< 22.2	< 11.4	< 11.4	< 11.4	< 11.4	< 11.4	< 11.4	< 68.3	< 11.4	26.2
C5 SOIL	10-Oct-13	< 16.8	< 16.8	< 16.8	< 32.8	< 16.8	< 16.8	< 16.8	< 16.8	< 16.8	< 16.8	< 101	< 16.8	< 16.8
C7 SOIL	10-Oct-13	< 17.6	< 17.6	< 17.6	< 34.4	< 17.6	< 17.6	< 17.6	< 17.6	< 17.6	< 17.6	< 106	< 17.6	< 17.6
D5 SOIL	11-Oct-13	< 30.6	< 30.6	< 30.6	< 59.8	< 30.6	< 30.6	< 30.6	< 30.6	< 30.6	< 30.6	< 184	< 30.6	< 30.6

Results reported as <# indicate that compound was not detected above the reporting limit (RL).
Reporting Limit (RL) is the value at which an instrument can accurately measure an analyte at a specific concentration.
The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

TABLE 4
SUMMARY OF
SOIL ANALYTICAL RESULTS
PESTICIDES
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a dry weight basis in ug/kg)

Client ID	Sample Date	Toxaphene	trans-Chlordane	trans-Nonachlor
C3 SOIL	10-Oct-13	< 569	55.8	107
C5 SOIL	10-Oct-13	< 842	249	166
C7 SOIL	10-Oct-13	< 883	173	127
D5 SOIL	11-Oct-13	< 1530	164	80.1

Results reported as <# indicate that compound was not detected above the reporting limit (RL).
Reporting Limit (RL) is the value at which an instrument can accurately measure an analyte at a specific concentration.
The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

TABLE 4
SUMMARY OF
SOIL ANALYTICAL RESULTS
METALS
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a dry weight basis in mg/kg)

Client ID	Sample Date	Arsenic, Total
C3 SOIL	10-Oct-13	19.3
C5 SOIL	10-Oct-13	28.1
C7 SOIL	10-Oct-13	39.4
D5 SOIL	11-Oct-13	64.0

TABLE 5
SUMMARY OF
FISH SAMPLE ANALYTICAL RESULTS
PAH
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a wet weight basis in ug/kg)

LOCATION	Composite	Sampling Date	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene
A1		10/24/2013	< 148	< 148	< 148	< 148	< 148	< 148	< 148	< 148
A2A,A2B	Composite	10/24/2013	< 146	< 146	< 146	< 146	< 146	< 146	< 146	< 146
A3		10/24/2013	< 154	< 154	< 154	< 154	< 154	< 154	< 154	< 154
A4		10/24/2013	< 159	< 159	< 159	< 159	< 159	< 159	< 159	< 159
A5A		10/24/2013	< 149	< 149	< 149	< 149	< 149	< 149	< 149	< 149
A5B		10/24/2013	< 158	< 158	< 158	< 158	< 158	< 158	< 158	< 158
E1		10/22/2013	< 158	< 158	< 158	< 158	< 158	< 158	< 158	< 158
E2		10/22/2013	< 156	< 156	< 156	< 156	< 156	< 156	< 156	< 156
E3A,E3B,E3C	Composite	10/22/2013	< 141	< 141	< 141	< 141	< 141	< 141	< 141	< 141
E4A,E4B,E4C,E4D,E4E,E4F	Composite	10/22/2013	< 154	< 154	< 154	< 154	< 154	< 154	< 154	< 154
B1		10/29/2013	< 157	< 157	< 157	< 157	< 157	< 157	< 157	< 157
B2		10/29/2013	< 160	< 160	< 160	< 160	< 160	< 160	< 160	< 160
B3		10/29/2013	< 152	< 152	< 152	< 152	< 152	< 152	< 152	< 152
B4		10/29/2013	< 156	< 156	< 156	< 156	< 156	< 156	< 156	< 156
B5		10/29/2013	< 140	< 140	< 140	< 140	< 140	< 140	< 140	< 140
B6		10/30/2013	< 154	< 154	< 154	< 154	< 154	< 154	< 154	< 154
B7		10/30/2013	< 156	< 156	< 156	< 156	< 156	< 156	< 156	< 156
C1,C2,C3	Composite	10/17/2013	< 159	< 159	< 159	< 159	< 159	< 159	< 159	< 159
C4,C5,C6A	Composite	10/17/2013	< 157	< 157	< 157	< 157	< 157	< 157	< 157	< 157
C10,C11	Composite	10/18/2013	< 152	< 152	< 152	< 152	< 152	< 152	< 152	< 152
C13		10/18/2013	< 158	< 158	< 158	< 158	< 158	< 158	< 158	< 158
C17,C18	Composite	10/18/2013	< 147	< 147	< 147	< 147	< 147	< 147	< 147	< 147
C19		10/18/2013	< 159	< 159	< 159	< 159	< 159	< 159	< 159	< 159
C20		10/18/2013	< 159	< 159	< 159	< 159	< 159	< 159	< 159	< 159

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TABLE 5
SUMMARY OF
FISH SAMPLE ANALYTICAL RESULTS
PAH
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a wet weight basis in ug/kg)

LOCATION	Composite	Sampling Date	Benz(a) anthracene	Chrysene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Benzo(a) pyrene	Indeno(1,2,3-cd) pyrene	Dibenz(a,h) anthracene	Benzo(g,h,i) perylene
A1		10/24/2013	< 148	< 148	< 148	< 148	< 148	< 148	< 148	< 148
A2A,A2B	Composite	10/24/2013	< 146	< 146	< 146	< 146	< 146	< 146	< 146	< 146
A3		10/24/2013	< 154	< 154	< 154	< 154	< 154	< 154	< 154	< 154
A4		10/24/2013	< 159	< 159	< 159	< 159	< 159	< 159	< 159	< 159
A5A		10/24/2013	< 149	< 149	< 149	< 149	< 149	< 149	< 149	< 149
A5B		10/24/2013	< 158	< 158	< 158	< 158	< 158	< 158	< 158	< 158
E1		10/22/2013	< 158	< 158	< 158	< 158	< 158	< 158	< 158	< 158
E2		10/22/2013	< 156	< 156	< 156	< 156	< 156	< 156	< 156	< 156
E3A,E3B,E3C	Composite	10/22/2013	< 141	< 141	< 141	< 141	< 141	< 141	< 141	< 141
E4A,E4B,E4C,E4D,E4E,E4F	Composite	10/22/2013	< 154	< 154	< 154	< 154	< 154	< 154	< 154	< 154
B1		10/29/2013	< 157	< 157	< 157	< 157	< 157	< 157	< 157	< 157
B2		10/29/2013	< 160	< 160	< 160	< 160	< 160	< 160	< 160	< 160
B3		10/29/2013	< 152	< 152	< 152	< 152	< 152	< 152	< 152	< 152
B4		10/29/2013	< 156	< 156	< 156	< 156	< 156	< 156	< 156	< 156
B5		10/29/2013	< 140	< 140	< 140	< 140	< 140	< 140	< 140	< 140
B6		10/30/2013	< 154	< 154	< 154	< 154	< 154	< 154	< 154	< 154
B7		10/30/2013	< 156	< 156	< 156	< 156	< 156	< 156	< 156	< 156
C1,C2,C3	Composite	10/17/2013	< 159	< 159	< 159	< 159	< 159	< 159	< 159	< 159
C4,C5,C6A	Composite	10/17/2013	< 157	< 157	< 157	< 157	< 157	< 157	< 157	< 157
C10,C11	Composite	10/18/2013	< 152	< 152	< 152	< 152	< 152	< 152	< 152	< 152
C13		10/18/2013	< 158	< 158	< 158	< 158	< 158	< 158	< 158	< 158
C17,C18	Composite	10/18/2013	< 147	< 147	< 147	< 147	< 147	< 147	< 147	< 147
C19		10/18/2013	< 159	< 159	< 159	< 159	< 159	< 159	< 159	< 159
C20		10/18/2013	< 159	< 159	< 159	< 159	< 159	< 159	< 159	< 159

Results reported as <# indicate that compound was not detected above the reporting limit (RL).
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TABLE 5
SUMMARY OF
FISH SAMPLE ANALYTICAL RESULTS
PAH
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a wet weight basis in ug/kg)

LOCATION	Composite	Sampling Date	2-Methylnaphthalene	1-Methylnaphthalene
A1		10/24/2013	< 148	< 148
A2A,A2B	Composite	10/24/2013	< 146	< 146
A3		10/24/2013	< 154	< 154
A4		10/24/2013	< 159	< 159
A5A		10/24/2013	< 149	< 149
A5B		10/24/2013	< 158	< 158
E1		10/22/2013	< 158	< 158
E2		10/22/2013	< 156	< 156
E3A,E3B,E3C	Composite	10/22/2013	< 141	< 141
E4A,E4B,E4C,E4D,E4E,E4F	Composite	10/22/2013	< 154	< 154
B1		10/29/2013	< 157	< 157
B2		10/29/2013	< 160	< 160
B3		10/29/2013	< 152	< 152
B4		10/29/2013	< 156	< 156
B5		10/29/2013	< 140	< 140
B6		10/30/2013	< 154	< 154
B7		10/30/2013	< 156	< 156
C1,C2,C3	Composite	10/17/2013	< 159	< 159
C4,C5,C6A	Composite	10/17/2013	< 157	< 157
C10,C11	Composite	10/18/2013	< 152	< 152
C13		10/18/2013	< 158	< 158
C17,C18	Composite	10/18/2013	< 147	< 147
C19		10/18/2013	< 159	< 159
C20		10/18/2013	< 159	< 159

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TABLE 5
SUMMARY OF
FISH SAMPLE ANALYTICAL RESULTS
PESTICIDES
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a wet weight basis in ug/kg)

LOCATION	Composite	Sampling Date	2,4'-DDD	2,4'-DDE	2,4'-DDT	4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	alpha-BHC	alpha-Chlordane	beta-BHC	cis-nonachlor	delta-BHC
A1		10/24/2013	< 7.30	< 7.30	< 7.30	< 7.30	< 7.30	< 7.30	< 7.30	< 7.30	< 7.30	< 73.0	< 7.30	< 7.30
A2A,A2B	Composite	10/24/2013	< 3.80	< 3.80	< 3.80	11.4	9.59	< 3.80	< 3.80	< 3.80	< 3.80	< 38.0	< 3.80	< 3.80
A3		10/24/2013	< 7.83	< 7.83	< 7.83	11.2	11.2	< 7.83	< 7.83	< 7.83	< 7.83	< 78.3	< 7.83	< 7.83
A4		10/24/2013	6.12	1.29	< 0.391	79.7	38.8	2.29 P	< 0.391	< 0.391	9.46	< 3.91	< 0.391	< 0.391
A5A		10/24/2013	< 0.381	< 0.381	< 0.381	10.5	18.4	3.02 P	< 0.381	< 0.381	2.04	< 3.81	< 0.381	< 0.381
A5B		10/24/2013	177	< 7.89	< 7.89	< 7.89	1210	180	< 7.89	< 7.89	473	< 78.9	103	< 7.89
E1		10/22/2013	9.18 P	2.22 P	< 0.398	82.7	57.2	2.81 P	< 0.398	< 0.398	14.8	< 3.98	4.38	< 0.398
E2		10/22/2013	4.89	1.21	< 0.393	55.9	26.2	1.87 P	< 0.393	< 0.393	9.40	< 3.93	< 0.393	< 0.393
E3A,E3B,E3C	Composite	10/22/2013	7.62 P	< 3.94	< 3.94	17.9	18.1	< 3.94	< 3.94	< 3.94	< 3.94	< 39.4	< 3.94	< 3.94
E4A,E4B,E4C,E4D,E4E,E4	Composite	10/22/2013	< 7.97	< 7.97	< 7.97	17.0	10.7	< 7.97	< 7.97	< 7.97	< 7.97	< 79.7	< 7.97	< 7.97
B1		10/29/2013	< 7.55	< 7.55	< 7.55	13.7	54.3	< 7.55	< 7.55	< 7.55	< 7.55	< 75.5	< 7.55	< 7.55
B2		10/29/2013	< 7.59	< 7.59	< 7.59	10.6	11.3	< 7.59	< 7.59	< 7.59	< 7.59	< 75.9	< 7.59	< 7.59
B3		10/29/2013	< 7.09	< 7.09	< 7.09	19.6	128	< 7.09	< 7.09	< 7.09	< 7.09	< 70.9	< 7.09	< 7.09
B4		10/29/2013	8.99	2.54 P	< 0.386	123	80.3	2.32 P	< 0.386	< 0.386	14.8	< 3.86	4.44	< 0.386
B5		10/29/2013	3.88	< 0.360	< 0.360	50.2	38.9	< 0.360	< 0.360	< 0.360	5.82	< 3.60	< 0.360	< 0.360
B6		10/30/2013	< 3.91	< 3.91	< 3.91	14.6	26.7	< 3.91	< 3.91	< 3.91	< 3.91	< 39.1	< 3.91	< 3.91
B7		10/30/2013	< 3.45	< 3.45	< 3.45	9.85	13	< 3.45	< 3.45	< 3.45	< 3.45	< 34.5	< 3.45	< 3.45
C1,C2,C3	Composite	10/17/2013	14.1 P	< 3.97	< 3.97	41.1	30.9	< 3.97	< 3.97	< 3.97	5.70	< 39.7	< 3.97	< 3.97
C4,C5,C6A	Composite	10/17/2013	< 3.93	< 3.93	< 3.93	32.3	22.5	< 3.93	< 3.93	< 3.93	< 3.93	< 39.3	< 3.93	< 3.93
C10,C11	Composite	10/18/2013	25.6 P	< 3.95	< 3.95	74.0	50.4	< 3.95	< 3.95	< 3.95	11.4	< 39.5	< 3.95	< 3.95
C13		10/18/2013	< 7.77	< 7.77	< 7.77	8.90	< 7.77	< 7.77	< 7.77	< 7.77	< 7.77	< 77.7	< 7.77	< 7.77
C17,C18	Composite	10/18/2013	22.1 P	< 3.98	< 3.98	56.5	37.2	< 3.98	< 3.98	< 3.98	8.96	< 39.8	< 3.98	< 3.98
C19		10/18/2013	15.2	0.722 P I	< 0.389	38.3	25.2	1.58 P	< 0.389	< 0.389	7.56	< 3.89	< 0.389	< 0.389
C20		10/18/2013	15.4	< 7.78	< 7.78	< 7.78	250	28.1	< 7.78	< 7.78	71.2	< 77.8	28.4	< 7.78

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TABLE 5
SUMMARY OF
FISH SAMPLE ANALYTICAL RESULTS
PESTICIDES
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a wet weight basis in ug/kg)

LOCATION	Composite	Sampling Date	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin	Endrin aldehyde	Endrin ketone	gamma-BHC	gamma-Chlordane	Heptachlor
A1		10/24/2013	< 7.30	< 7.30	< 7.30	< 7.30	< 7.30	< 7.30	< 7.30	< 7.30	< 7.30	< 7.30
A2A,A2B	Composite	10/24/2013	< 3.80	< 3.80	< 3.80	< 3.80	< 3.80	< 3.80	< 3.80	< 3.80	< 3.80	< 3.80
A3		10/24/2013	< 7.83	< 7.83	< 7.83	< 7.83	< 7.83	< 7.83	< 7.83	< 7.83	< 7.83	< 7.83
A4		10/24/2013	< 0.391	< 0.391	< 0.391	< 0.391	< 0.391	< 0.391	< 0.391	< 0.391	5.80	< 0.391
A5A		10/24/2013	< 0.381	< 0.381	< 0.381	< 0.381	< 0.381	< 0.381	< 0.381	< 0.381	1.00	< 0.381
A5B		10/24/2013	105	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89	314	< 7.89
E1		10/22/2013	3.28 P	< 0.398	< 0.398	< 0.398	< 0.398	< 0.398	< 0.398	< 0.398	9.34	< 0.398
E2		10/22/2013	0.743	< 0.393	< 0.393	< 0.393	< 0.393	< 0.393	< 0.393	< 0.393	5.35	< 0.393
E3A,E3B,E3C	Composite	10/22/2013	< 3.94	< 3.94	< 3.94	< 3.94	< 3.94	< 3.94	< 3.94	< 3.94	< 3.94	< 3.94
E4A,E4B,E4C,E4D,E4E,E4	Composite	10/22/2013	< 7.97	< 7.97	< 7.97	< 7.97	< 7.97	< 7.97	< 7.97	< 7.97	< 7.97	< 7.97
B1		10/29/2013	< 7.55	< 7.55	< 7.55	< 7.55	< 7.55	< 7.55	< 7.55	< 7.55	< 7.55	< 7.55
B2		10/29/2013	< 7.59	< 7.59	< 7.59	< 7.59	< 7.59	< 7.59	< 7.59	< 7.59	< 7.59	< 7.59
B3		10/29/2013	< 7.09	< 7.09	< 7.09	< 7.09	< 7.09	< 7.09	< 7.09	< 7.09	< 7.09	< 7.09
B4		10/29/2013	1.08	< 0.386	< 0.386	< 0.386	< 0.386	< 0.386	< 0.386	< 0.386	10.4	< 0.386
B5		10/29/2013	< 0.360	< 0.360	< 0.360	< 0.360	< 0.360	< 0.360	< 0.360	< 0.360	3.45 P	< 0.360
B6		10/30/2013	< 3.91	< 3.91	< 3.91	< 3.91	< 3.91	< 3.91	< 3.91	< 3.91	< 3.91	< 3.91
B7		10/30/2013	< 3.45	< 3.45	< 3.45	< 3.45	< 3.45	< 3.45	< 3.45	< 3.45	< 3.45	< 3.45
C1,C2,C3	Composite	10/17/2013	< 3.97	< 3.97	< 3.97	< 3.97	< 3.97	< 3.97	< 3.97	< 3.97	< 3.97	< 3.97
C4,C5,C6A	Composite	10/17/2013	< 3.93	< 3.93	< 3.93	< 3.93	< 3.93	< 3.93	< 3.93	< 3.93	< 3.93	< 3.93
C10,C11	Composite	10/18/2013	< 3.95	< 3.95	< 3.95	< 3.95	< 3.95	< 3.95	< 3.95	< 3.95	< 3.95	< 3.95
C13		10/18/2013	< 7.77	< 7.77	< 7.77	< 7.77	< 7.77	< 7.77	< 7.77	< 7.77	< 7.77	< 7.77
C17,C18	Composite	10/18/2013	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98
C19		10/18/2013	< 0.389 I	< 0.389	< 0.389	< 0.389	< 0.389	< 0.389	< 0.389	< 0.389	3.90	< 0.389
C20		10/18/2013	19.5	< 7.78	< 7.78	< 7.78	< 7.78	< 7.78	< 7.78	< 7.78	35.9	< 7.78

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TABLE 5
SUMMARY OF
FISH SAMPLE ANALYTICAL RESULTS
PESTICIDES
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a wet weight basis in ug/kg)

LOCATION	Composite	Sampling Date	Heptachlor epoxide (B)	Hexachlorobenzene	Methoxychlor	Mirex	Oxychlordane	Technical Chlordane	Toxaphene	trans-Nonachlor
A1		10/24/2013	< 7.30	< 21.9	< 263	< 7.30	< 7.30	< 366	< 366	< 7.30
A2A,A2B	Composite	10/24/2013	< 3.80	< 11.4	< 137	< 3.80	< 3.80	< 191	< 191	< 3.80
A3		10/24/2013	< 7.83	< 23.5	< 282	< 7.83	< 7.83	< 393	< 393	< 7.83
A4		10/24/2013	< 0.391	< 1.17	< 14.1	< 0.391	< 0.391	< 19.6	< 19.6	7.06
A5A		10/24/2013	< 0.381	< 1.14	< 13.7	< 0.381	< 0.381	< 19.1	< 19.1	4.39
A5B		10/24/2013	< 7.89	< 23.7	< 284	< 7.89	< 7.89	< 396	< 396	408
E1		10/22/2013	< 0.398	< 1.20	< 14.3	< 0.398	< 0.398	< 20.0	< 20.0	12.3
E2		10/22/2013	< 0.393	< 1.18	< 14.1	< 0.393	< 0.393	< 19.7	< 19.7	5.78
E3A,E3B,E3C	Composite	10/22/2013	< 3.94	< 11.8	< 142	< 3.94	< 3.94	< 198	< 198	< 3.94
E4A,E4B,E4C,E4D,E4E,E4	Composite	10/22/2013	< 7.97	< 23.9	< 287	< 7.97	< 7.97	< 400	< 400	< 7.97
B1		10/29/2013	< 7.55	< 22.6	< 272	< 7.55	< 7.55	< 379	< 379	8.80
B2		10/29/2013	< 7.59	< 22.8	< 273	< 7.59	< 7.59	< 381	< 381	< 7.59
B3		10/29/2013	< 7.09	< 21.3	< 255	< 7.09	< 7.09	< 356	< 356	14.9
B4		10/29/2013	< 0.386	< 1.16	< 13.9	< 0.386	< 0.386	< 19.4	< 19.4	10.7
B5		10/29/2013	< 0.360	< 1.08	< 12.9	< 0.360	< 0.360	< 18.0	< 18.0	4.35
B6		10/30/2013	< 3.91	< 11.7	< 141	< 3.91	< 3.91	< 196	< 196	< 3.91
B7		10/30/2013	< 3.45	< 10.4	< 124	< 3.45	< 3.45	< 173	< 173	< 3.45
C1,C2,C3	Composite	10/17/2013	< 3.97	< 11.9	< 143	< 3.97	< 3.97	< 199	< 199	5.60
C4,C5,C6A	Composite	10/17/2013	< 3.93	< 11.8	< 141	< 3.93	< 3.93	< 197	< 197	6.24
C10,C11	Composite	10/18/2013	< 3.95	< 11.8	< 142	< 3.95	< 3.95	< 198	< 198	10.8
C13		10/18/2013	< 7.77	< 23.3	< 280	< 7.77	< 7.77	< 390	< 390	< 7.77
C17,C18	Composite	10/18/2013	< 3.98	< 12.0	< 143	< 3.98	< 3.98	< 200	< 200	8.52
C19		10/18/2013	< 0.389	< 1.17	< 14.0	< 0.389	< 0.389	< 19.5	< 19.5	5.69
C20		10/18/2013	< 7.78	< 23.3	< 280	< 7.78	< 7.78	< 391	< 391	101

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TABLE 5
SUMMARY OF
FISH SPECIES AND PERCENT LIPIDS
Baird McGuire Fish Sampling
Cochato River Investigation
Holbrook, MA
(results reported on a wet weight basis)

Sample ID	Composite	Sample Date	Species Name	Percent Lipids
A1		10/24/2013	Pumpkinseed (Lepomis gibbosus)	0.649 %
A2A, A2B	Composite	10/24/2013	Pumpkinseed (Lepomis gibbosus)	0.791 %
A3		10/24/2013	Pumpkinseed (Lepomis gibbosus)	0.771 %
A4		10/24/2013	Brown Bullhead (Ameirus nebulosus)	1.56 %
A5A		10/24/2013	American Eel (Anguilla rostrata)	1.82 %
A5B		10/24/2013	American Eel (Anguilla rostrata)	15.3 %
E1		10/22/2013	Brown Bullhead (Ameirus nebulosus)	8.62 %
E2		10/22/2013	Brown Bullhead (Ameirus nebulosus)	1.59 %
E3A, E3B, E3C	Composite	10/22/2013	RedFin Pickerel (Esox americanus)	0.762 %
E4A, E4B, E4C, E4D, E4E, E4F	Composite	10/22/2013	Pumpkinseed (Lepomis gibbosus)	1.11 %
B1		10/29/2013	Pumpkinseed (Lepomis gibbosus)	0.597 %
B2		10/29/2013	Pumpkinseed (Lepomis gibbosus)	0.639 %
B3		10/29/2013	Bluegill (Lepomis macrochirus)	0.669 %
B4		10/29/2013	Brown Bullhead (Ameirus nebulosus)	3.19 %
B5		10/29/2013	Brown Bullhead (Ameirus nebulosus)	1.48 %
B6		10/30/2013	Black Crappie (Pomoxis nigromaculatus)	0.645 %
B7		10/30/2013	Large Mouth Bass (Micropterus	8.36 %
C1, C2, C3	Composite	10/17/2013	RedFin Pickerel (Esox americanus)	0.892 %
C4, C5, C6A	Composite	10/17/2013	Pumpkinseed (Lepomis gibbosus)	0.882 %
C10, C11	Composite	10/18/2013	RedFin Pickerel (Esox americanus)	0.789 %
C13		10/18/2013	Pumpkinseed (Lepomis gibbosus)	0.855 %
C17, C18	Composite	10/18/2013	RedFin Pickerel (Esox americanus)	0.646 %
C19		10/18/2013	Large Mouth Bass (Micropterus	0.762 %
C20		10/18/2013	American Eel (Anguilla rostrata)	8.08 %

TABLE 6

FISH WEIGHT, LENGTH, AND AGE AT LENGTH
Baird and McGuire Site
Cochato River Investigation
October 2013

Fish ID	Fish Species	Weight at Capture (gr)	Length at Capture (mm)	Fish Age (yrs)	Length at Age			
					Age 1	Age 2	Age 3	Age 4
A1	*Lepomis gibbosus* (pumpkinseed)	160	163	4+	50	80	122	150
A2A	*Lepomis gibbosus* (pumpkinseed)	32	114	3+	49	77	84	
A2B	*Lepomis gibbosus* (pumpkinseed)	28	112	3+	47	82	105	
A3	*Lepomis gibbosus* (pumpkinseed)	77	160	4+	56	90	130	
A4	*Ameiurus nebulosus* (brown bullhead)	60	155	2+				
A5A	*Anguilla rostrata* (american eel)	60	-	-				
A5B	*Anguilla rostrata* (american eel)	43	-	-				
B1	*Lepomis gibbosus* (pumpkinseed)	100	165	4+	53	77	123	147
B2	*Lepomis gibbosus* (pumpkinseed)	77	158	4+	60	88	111	142
B3	*Lepomis macrochirus* (bluegill)	152	180	4+	59	79	122	153
B4	*Ameiurus nebulosus* (brown bullhead)	370	290	4+				
B5	*Ameiurus nebulosus* (brown bullhead)	321	280	4+				
B6	*Pomoxis nigromaculatus* (black crappie)	195	235	4+	92	133	185	209
B7	*Micropterus salmoides* (largemouth bass)	372	300	4+	105	133	219	281
C1	*Esox americanus* (red fin pickerel)	34	171	2+	69	110		
C2	*Esox americanus* (red fin pickerel)	34	165	2+	76	127		
C3	*Esox americanus* (red fin pickerel)	31	161	2+	95	143		
C4	*Lepomis gibbosus* (pumpkinseed)	25	106	3+	41	67	88	
C5	*Lepomis gibbosus* (pumpkinseed)	25	101	3+	48	63	85	
C6A	*Lepomis gibbosus* (pumpkinseed)	18	92	2+	45	68		
C10	*Esox americanus* (red fin pickerel)	37	174	2+	74	132		
C11	*Esox americanus* (red fin pickerel)	37	175	2+	90	141		
C13	*Lepomis gibbosus* (pumpkinseed)	49	137	3+	48	69	100	
C17	*Esox americanus* (red fin pickerel)	35	166	2+	90	146		
C18	*Esox americanus* (pickerel)	32	160	2+	67	115		
C19	*Micropterus salmoides* (largemouth bass)	258	255	4+	89	113	172	239
C20	*Anguilla rostrata* (american eel)	85	-	-				
E1	*Ameiurus nebulosus* (brown bullhead)	60	181	2+				
E2	*Ameiurus nebulosus* (brown bullhead)	68	160	2+				
E3A	*Esox americanus* (red fin pickerel)	27	158	2+	94	139		
E3B	*Esox americanus* (red fin pickerel)	28	155	2+	91	131		
E3C	*Esox americanus* (red fin pickerel)	9	156	3+	61	89	118	
E4A	*Lepomis gibbosus* (pumpkinseed)	6	68	1+	43			
E4B	*Lepomis gibbosus* (pumpkinseed)	11	84	1+	50			
E4C	*Lepomis gibbosus* (pumpkinseed)	6	66	1+	66			
E4D	*Lepomis gibbosus* (pumpkinseed)	5	58	1+	58			
E4E	*Lepomis gibbosus* (pumpkinseed)	6	62	1+	62			
E4F	*Lepomis gibbosus* (pumpkinseed)	5	61	1+	61			

APPENDIX E

SITE INSPECTION

Management System Review Memorandum

Wetland Inspection Memorandum

ROBERTS
Environmental Consulting, Inc.

MEMORANDUM

TO: Cindy McLane DATE: August 15, 2014

FROM: Deborah A. Roberts, Ph.D., PWS

SUBJECT: Baird & McGuire Wetland Restoration Areas Assessment

On August 8, 2014, I conducted a site visit to assess the restored wetland and upland areas at the Baird & McGuire Superfund Site in Holbrook, MA. I met with Clean Harbors employees and conducted an inspection of the restored areas of the site. The former monitoring locations, as documented in the Final (2001) Vegetation Monitoring Report (Prepared by ENSR International, dated December 2002), no longer have existing stakes or markings. Approximate GPS locations, established from drawings in the ENSR, 2001 report were placed on a Google Earth basemap and used to assist in finding the areas where the former vegetation monitoring plots (U-1 to U-10 in the upland areas, and W-1 to W-10 in the wetland areas) were located. These GPS points, along with existing roads and monitoring wells were used to navigate on site and the approximate areas of the former vegetative plots were assessed for the five year review. A map with the approximate GPS points is attached as Figure 1.

In general, the wetland vegetation was well-established at all of the wetland areas inspected. Typical wetland vegetation included: soft rush *(Juncus effusus)*, American burr-reed (*Sparganium americanum*), woolgrass *(Scirpus cyperinus)*, dark-green bulrush (*Scirpus atrovirens)*, wide-leaf cattail *(Typha latifolia)*, narrow-leaved cattail *(Typha angustifolia)*, reed canary grass (*Phalaris arundinacea)*, giant goldenrod *(Solidago gigantea)*, lurid sedge (*Carex lurida*), fox sedge *(Carex vulpinoidea)*, water horehound *(Lycopus americanus)*, spotted touch-me-not (*Impatiens capensis*), Canada rush *(Juncus canadensis)*, deer-tongue grass *(Dichanthelium clandestinum)*, rough-stem goldenrod *(Solidago rugosa)*, sensitive fern *(Onoclea sensibilis)*, flat-top goldenrod *(Euthamia graminifolia)*, and poison ivy *(Toxicodendron radicans)*, among others, were present in the herbaceous layer. Silky dogwood *(Cornus amomum)*, Bebb willow (*Salix bebbiana*), elderberry (*Sambucus sp.)*, red maple *(Acer rubrum)*, Northern arrowwood *(Viburnum dentatum)*, green ash *(Fraxinus pennsylvanica)*, cottonwood saplings (*Populus deltoides)*, speckled alder *(Alnus rugosa)*, highbush blueberry *(Vaccinium corymbosum)*, and grey birch (*Betula populifolia*) were observed in the shrub layer of the restored wetland areas at the site. Representative photos of the wetlands are included as Photos 1 to 5.

Consistent with observations from the prior five year review in 2009, restored upland portions of the site appeared to be well-vegetated and stabilized. Vegetation in these upland areas are similar to that observed in 2009. The dominant species consisted of various grasses (Family: Poaceae), black locust trees and saplings (*Robinia pseudoacacia*), various goldenrods (*Solidago* spp.), common blackberry *(Rubus allegheniensis)*, bird's foot trefoil (*Lotus corniculatus*), knapweed (*Centaure*a *stoebe*), white pine *(Pinus strobus)*, milkweed (*Asclepias* spp.) and Quaking aspen *(Populus tremuloides)*. Common tansy (Tanacetum vulgare) has become a dominant species over many areas. The white pine and black locust trees have shown significant growth.

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A new access road was constructed in the vicinity of sampling plot W-6 to access a new extraction well (EW #10). The vegetation immediately in the vicinity of W-6 was not disturbed (Photo 5). However, a small amount of fill was placed in the wetland to construct the access road (Photo 6).

Occasional patches of purple loosestrife were observed in the restored wetland areas. Photographs included in the ENSR 2001 wetland plots indicated a dominance of purple loosestrife, which is not as apparent under current conditions. In 2009, the field assessment documented that the larvae of the Galerucella beetle were present on site. This beetle, along with other species, has been released in Massachusetts as part of a biological control program for purple loosestrife. Although no beetles were observed in 2014, active herbivory was apparent in the form of damaged leaves, and it appears this activity may be assisting in controlling the purple loosestrife on site from becoming more dominant.

Several wetland areas onsite were dominated by phragmites *(Phragmites australis)* and should be controlled by methods compatible with the site. Phragmites was the invasive species which covered the most area at the site. Other invasive species, such as glossy buckthorn *(Rhamnus frangula)* and reed canary grass *(Phalaris arundinacea)* were also observed. The removal or control of these invasive species would enhance the habitat on site. However, the wetland and upland vegetative communities appear to be thriving and stable, and additional habitat enhancement is not required to meet the basic objectives of the remedy.

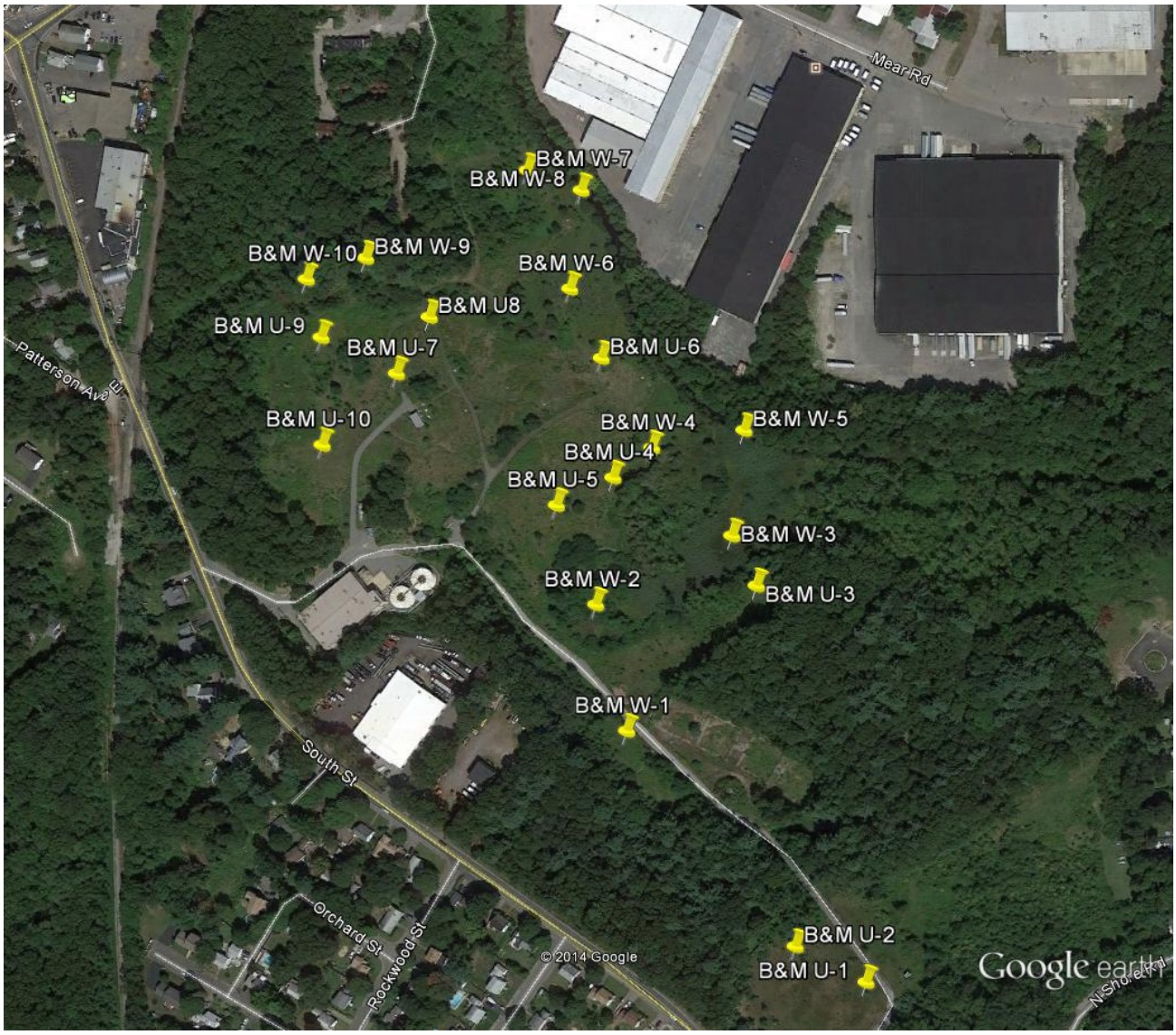

Figure 1. Approximate locations of former vegetation monitoring plots (W-1 to W-10 and U-1 to U-10) at the Baird & McGuire Superfund Site in Holbrook, MA.

Photographs

August 7, 2014

Photo 1. Wetland in the vicinity of W-1.

Photo 2. Wetland in the vicinity of W-9.

Photo 3. Wetland in vicinity of W-8.

Photo 4. Cochato River near W-8.

Photo 5. Wetland in vicinity of W-6, at the base of new extraction well, EW-10.

Photo 6. Access to EW-10.

Photo 7. Upland in the vicinity of U-1.

Photo 8. Upland in the vicinity of U-9.

TECHNICAL MEMORANDUM

MANAGEMENT SYSTEM REVIEW AND TECHNICAL COMPLIANCE EVALUATION

BAIRD AND MCGUIRE SUPERFUND SITE

MANSFIELD, MASSACHUSETTS

JULY 2014

As part of the Five-Year Review for the Baird & McGuire Superfund Site in Holbrook, MA, a Management System Review (MSR) has been performed which includes performance of a site inspection, review of the remedy, and a technical compliance evaluation in order to evaluate whether each element of the remedy is being maintained and operated in accordance with its intended function. This technical memorandum includes a summary of the site inspection performed on June 11, 2014, as well as annotated photographs of various site features taken on that date, and a technical assessment of physical features of the remedy. The portion of the review associated with risk standards was submitted under separate cover on July 21, 2014, in a memorandum entitled Assessment of Changes in Standards Memorandum.

Background

The Baird & McGuire Superfund Site is located on South Street in Holbrook, MA (see Figure 1). The 1986 Record of Decision (ROD) defines the Site as the area within the EPA security fence constructed in July 1985. According to the Feasibility Study FS, this fence encompasses all known areas of soil contamination related to Baird & McGuire (GHR, 1986a). The Site boundary and coincident fence line are shown on Figure 2, based on a Site survey conducted in May 1988. The Site designated on Figure 2 has been determined to consist of approximately 32.5 acres. For the purpose of increased security and access control measures during remedial actions, additional fencing was constructed in some areas beyond the Site boundary. This includes fencing around the groundwater treatment plant and recharge basins, and fencing beyond the southern Site boundary.

As illustrated on Figure 2, the Site is not limited to land within the former Baird & McGuire properties. Historically, Lots 130, 130-1 and 130-2 have had Baird & McGuire ownership. These lots consist of 9.33 acres, of which approximately 8 acres are within the Site boundaries. The remaining 24.5 acres of the Site consist of portions of five privately owned lots and two lots jointly owned by the towns of Holbrook and Randolph. In addition, four privately owned lots located west of the Cochato River (Lots 6, 12-2 and 12-3) access to the river is restricted due to the presence of the security fence.

Figure 2 also shows significant ecological Site features, including the Cochato River, the unnamed brook, the 100-year floodplain, and wetland areas. Based on a wetland boundary delineation conducted during RI investigations, wetlands occupied approximately 44 percent of the Site. In addition, 66 percent of the Site was determined to be within the 100-year floodplain

History of Contamination

Baird & McGuire Inc. operated a chemical mixing and batching facility in northwest Holbrook, Massachusetts from 1912 to 1983. Manufactured products included herbicides, pesticides, disinfectants, soaps, floor waxes and solvents. Waste disposal methods at the site included direct discharge into the soil, a nearby brook and wetlands, and a former gravel pit in the eastern portion of the site. Underground disposal systems were also used.

The state became involved between 1954 and 1977 and fined the company at least thirty-five times for violations of the Federal Insecticide, Fungicide and Rodenticide Act of 1947 (FIFRA). In 1981 and 1982 the Massachusetts Department of Environmental Quality Engineering (DEQE) documented a number of

questionable disposal practices. Baird & McGuire Inc. performed voluntary remedial actions from February to April of 1982. In May 1982, the Board of Selectmen of Holbrook revoked Baird & McGuire's permit to store chemicals at the Site and ordered that existing storage facilities be dismantled. As a result, operations were terminated.

Initial Response

A hydrological study was completed by EPA which initiated some removal actions in 1983. These actions included the removal of 1,020 cubic yards of contaminated soil, 1 ton of waste creosote, 25 gallons of waste coal tar, 155 pounds of solid hazardous waste and 47 drums of flammable liquids and solids, and 2 drums of corrosives. EPA also oversaw construction of a clay cap, installation of a groundwater interception-recirculation system, and erection of fencing. The Site was added to the National Priority List (NPL) on September 8, 1983. EPA constructed a security fence in July 1985 to enclose the Site.

An RI/FS (1985/1986a, GHR) identified and described the presence of a groundwater contamination plume, originating from the Baird & McGuire property and extending beyond the Cochato River. EPA issued three RODs for the Site, defining four operable units and describing selected remedial alternatives. More detail is provided in Appendix A of the Baird & McGuire Five Year Review Report.

At the time of the ROD, the Baird & McGuire Site was used for commercial and industrial purposes. Currently, the Site is occupied by the Groundwater Treatment Facility. Current and planned uses are still commercial/industrial in nature.

REMEDIAL ACTIONS

Remedy Selection

EPA issued three RODs for the Site, defining four operable units and describing selected remedial alternatives. The first ROD, issued in September 1986, specified groundwater extraction and treatment via an on-site treatment plant (OU-1) and soil excavation and treatment via an on-site incinerator (OU-2). The second ROD, issued in September 1989, addressed contamination in the Cochato River sediments (OU-3). EPA issued the final ROD in 1990, which called for reopening the Donna Road well field to replace the lost supply resulting from contamination of the South Street wellfield (OU-4).

The following sections summarize the selected remedies for Operable Units 1, 2, 3, and 4.

Operable Units 1 and 2

The remedial objectives for OU-1 groundwater and OU-2 soil are:

- Minimize the risk for the human population of direct contact with soils/sediments
- Remediate the contaminated aquifer within a reasonable time period to prevent present or future impacts to groundwater drinking supplies;
- Protect surface waters from future contaminant migration; and
- Minimize long-term management and/or maintenance requirements.

The selected remedial action for OU-1 includes the following components:

- Groundwater Extraction System;
- On-site Groundwater Treatment Facility; and
- Groundwater Recharge System.

The extraction system consists of eight extraction wells. Currently, six extraction wells (EW-3, EW-4A, EW-6, EW-7, EW-8, and EW-9) are actively pumping contaminated groundwater to a groundwater treatment facility, and four recharge basins are used to discharge treated groundwater back to the aquifer. Extraction wells EW-1 and EW-4 have been removed from service, and EW-2 and EW-5 are

currently off-line. The groundwater extraction wells were located to contain the plume. A new extraction well, EW-10, was installed in early 2014. The implementation of this system is described in the five year review report.

Based on the nature and extent of soil contamination documented in the RI/FS, the 1986 ROD specified the excavation of soil from "hot areas" with subsequent treatment in an on-site incinerator, and on-site disposal of the treated soil (ash). The hot areas were delineated in the ROD based on contamination profiles developed in the RI Addendum (GHR, 1986b). The limits of excavation were established so that contaminant concentrations outside of the hot areas were one to two orders of magnitude lower than the concentrations inside the hot areas. Also considered were the presence of wetlands and the extent of contamination in those wetlands, with the intent of minimizing disruption to wetlands. The ROD notes that although this approach results in residual soil contamination, future health risk for a trespasser scenario would be within an acceptable range.

The selected remedial actions for OU-2 include the following components:

- Excavation with associated dewatering and erosion control;
- Backfilling using treated soil into the excavation area;
- Extraction Well Piping Relocation at the end of the excavation process;
- Temporary relocation of the Unnamed Stream during remediation followed by restoration of its natural course;
- On-Site Incineration and Stabilization (IS) Facility;
- Site Closure upon the completion of soil excavation and treatment;
- Site Restoration;
- Wetlands Restoration; and
- Continued Monitoring.

Operable Unit 3

The remedial objectives for OU-3 (sediment in river) were:

- Reduce human exposure to arsenic, DDT, PAHs, and chlordane in sediment by excavating to an average depth of six (6) inches and by achieving the following levels of contaminants: 250 ppm for arsenic; 19 ppm for DDT; 5 ppm for chlordane; and 22 ppm for total PAHs. These concentrations correspond to a 1×10^{-5} to 1 x 10-^{6} excess cancer risk level; and

- Reduce environmental exposure to those contaminants of concern to concentrations corresponding to the mean sediment quality criteria (SQC) (EPA, 1989) in the river bed, and to the upper bound SQC in the wetland area north of Ice Pond.

The ROD specified excavation and incineration of approximately 1,500 cubic yards of contaminated sediments for protection of public health and the environment. Sediments were to be excavated to an average depth of six inches from approximately the center of the fenced Site area downstream to Union Street. Sediments were to be transported to the on-site treatment facility, implemented under OU-2, and subsequently placed as backfill on the Site.

The ROD also required erosion control, wetlands restoration, placement of organic fill in the excavated areas of the river in the vicinity of the groundwater plume, and long-term monitoring of downstream portions of the river where sediments were not excavated.

To minimize the disruption of wetlands, sediments were not to be removed from areas of the river where contaminant concentrations were low, calculated risks were low, and no impacts were observed. In accordance with the ROD for OU-3, long term monitoring is to be conducted to evaluate remaining contaminant levels and their trends over time (EPA, 1989).

Operable Unit 4

The remedial objectives for OU-4 were:

- To identify a candidate water source to replace the 0.31 million gallons per day (MGD) lost supply from the closing of the South Street municipal well field in an environmentally sound, cost effective manner without placing additional stress on the Great Pond Reservoir system or existing water treatment facilities.

The selected remedy for OU-4 consisted of the following components:

- Permitting/Pre-design Studies;
- Groundwater Extraction;
- Groundwater Treatment; and
- Delivery to the Distribution System

On August 21, 2003, an Explanation of Significant Differences document (ESD) was issued for the groundwater remedy (OU-1) specified in the 1986 ROD. The ROD was changed to include excavation of soil from the Upper Reservoir/Great Pond located in Braintree and Randolph (approximately 400,000 cubic yards) to provide an additional storage capacity resulting in an estimated additional supply of 0.31 MGD to be used in the interim to supplement the community's drinking water until the groundwater remedial action is complete. On this date, EPA also issued an ESD document for OU-4 stating that no further action will be taken under this ROD.

Site Inspection

On June 11, 2014, Kimberly White of the US EPA and Cinthia McLane of AECOM performed an inspection of the Baird & McGuire site. Also present were Dorothy Allen and Patrick Hurley (part time) of MassDEP; and Lisa Irwin, John Irwin (part time), Kandi Prentiss and Maggie Legorete of Clean Harbors (the O&M Contractor for the MassDEP). The site inspection photos are included as Attachment 1.

The infiltration basins appeared to be in good condition, aside from some overgrowth. Portions of the perimeter fence that could be observed from the site roads were in good condition. An attempt was made to observe a number of the monitoring and extraction wells. Due to heavy overgrowth, not all of the wells could be observed. Six of the eight extraction wells are in service. Extraction wells EW-2 and EW-5 are no longer in service, and personnel from the O&M Contractor Clean Harbors (CH) said that they are experiencing problems with EW-6 that indicate that maintenance may be required soon. CH personnel stated that EW-9 is in need of a new motor and redevelopment. This well currently produces approximately 1 gpm. A new extraction well, EW-10, was recently installed (work was being done on the well at the time of the site inspection). The location of EW-10 was selected based on results of an arsenic study that was conducted by the MassDEP to better define the location of the arsenic plume.

The Extraction Well Control Building was briefly visited. The variable frequency drives (VFDs) for the wells, located in the building, are no longer used to control flow, but are left open. Total flow to the GWTF is approximately 80 gpm. The LNAPL collection system is no longer in use. Currently, NAPL is collected manually from extraction well EW-6. When collected, the NAPL is allowed to separate over time before being drummed and shipped off-site. Approximately 2.5 gallons of NAPL were last collected in December 2013.

Patrick Hurley of the MassDEP led a tour of the GWTF and provided information on improvements that have been made within the past five years, along with maintenance issues resulting from the age of much of the equipment. In general, the GWTF continues to meet effluent discharge limits; however, the age of the equipment has resulted in some difficulty for the operators, including difficulty finding spare and replacement parts. Various upgrades and safety measures have been implemented, including the

replacement of high pressure sodium lighting with energy efficient LED lamps; the addition of new variable frequency drives on the aeration tank blowers; replacement of the potassium permanganate tank; replacement of the GAC media with a longer-lasting coarser grade of carbon, and installation of new tank railings and restraints. More detail of the improvements is provided in the attached Interview Record for the O&M Contractor.

During the site visit and the interviews, effort to implement various recommendations from the 2013 Optimization Review Report (EPA, 2013) was discussed. Some of the recommendations were implemented, such as completion of an arsenic speciation evaluation, installation of a new extraction well, and collection of fish and sediment samples. Other recommendations were attempted or considered but found not to be practical. These included discontinuing aeration in the activated sludge units, which was attempted but resulted in clogging of downstream filters; and optimizing the metals removal system by re-piping the two clarifiers to operate in parallel, which could not be accomplished due to space limitations in the GWTF.

Interviews

The MassDEP Project Manager, the O&M Contractor (CH) personnel, and the Town Administrator for the Town of Holbrook were interviewed as part of the five year review process. The Holbrook Town Administrator was interviewed by telephone, and the MassDEP Project Manager and CH personnel were interviewed as a group during the site inspection. The Attachment 2 includes a detailed summary of the interviews. In general, the Holbrook Town Administrator was not aware of any problems or complaints related to the Site, and said that he last visited the Site about 3 years ago. The one concern noted by the Town Administrator is the back taxes owed to the town by the property owners.

The overall sentiment of the MassDEP Project Manager is that decisions need to be made at a higher level regarding the source of continuing contamination (particularly arsenic) and approach to future remediation developed. She said that she agrees with recommendations in the Optimization Review and referenced a Decision Tree that she had prepared, which she provided by email following the Site Inspection. Details of the interview and a copy of the Decision Tree are included in Attachment 2.

CH personnel stated that the GWTF is functioning well, although due to the age of the facility, it has been difficult to find spare and replacement parts. Their main issue is the high arsenic concentration in the groundwater. They have tried to pinpoint the source of the arsenic and to locate the new extraction well to best capture the arsenic plume. Improvements and modifications to the facility were discussed, as described above. Monitoring frequency and staffing were discussed (see the Interview Record in Attachment 2 for details). No complaints or intruders were noted, other than kids cutting through the town land on the other side of the fence near the extraction wells. The O&M staff did express concern regarding the impact that the proposed redevelopment of Lot 3 will have on site operations and access to the extraction and monitoring wells due to the developer's proposal to move the fence to the property line (the fence currently crosses part of Lot 3 and would be relocated as part of the redevelopment).

Technical Compliance Evaluation of Remedy Components

The technical compliance evaluation is conducted to determine whether the individual components of the remedy are being maintained and operated in accordance with their intended functions.

Evaluation of Intended Function:

OU1 and OU2

- The MassDEP and O&M Contractor Clean Harbors continue to operate and maintain the GWTF. The RAOs of remediating the contaminated aquifer within a reasonable time period is being addressed by the GWTF. Improvements and investigations intended to optimize operations are ongoing.

- The RAO of protecting surface waters from future contaminant migration is being addressed by containment via the groundwater extraction system. Surface water monitoring data are no longer collected as the prior two five-year reviews evaluated the most recent data (from 2000) and found results to be well below EPA's target risk range of 10^{-6} to 10^{-4}.

- The EPA conducted an Optimization Review which considered remedy performance, protectiveness, cost-effectiveness, technical improvement, and site closure strategy. As discussed above, the MassDEP has implemented some of the recommendations of the Optimization Review and has evaluated and attempted others. This effort is ongoing, and addresses the RAO of minimizing long-term management and/or maintenance.

OU3

- The 2013 data show exceedances of the PAH cleanup level at Stations E (adjacent to the site) and A (upstream of the project area). The exceedance at Station E is within the range of historic detections (although much higher than the last two monitoring events), but the upstream sample (Station A) is at least one order of magnitude above any historic detections. It appears that further monitoring should be performed for confirmation of these exceedances, and that additional upstream characterization may also be needed to determine if there have been any recent upstream releases contributing to the residual contamination in the sediment adjacent to the site. More detail is provided in the five year review report.

References

GHR Engineering Associates (GHR). 1986a. *Final Feasibility Study Report, Baird & McGuire Site, Holbrook, MA*. Prepared for NUS Corporation. and U.S. Environmental Protection Agency. July 18, 1986a.

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FIGURES

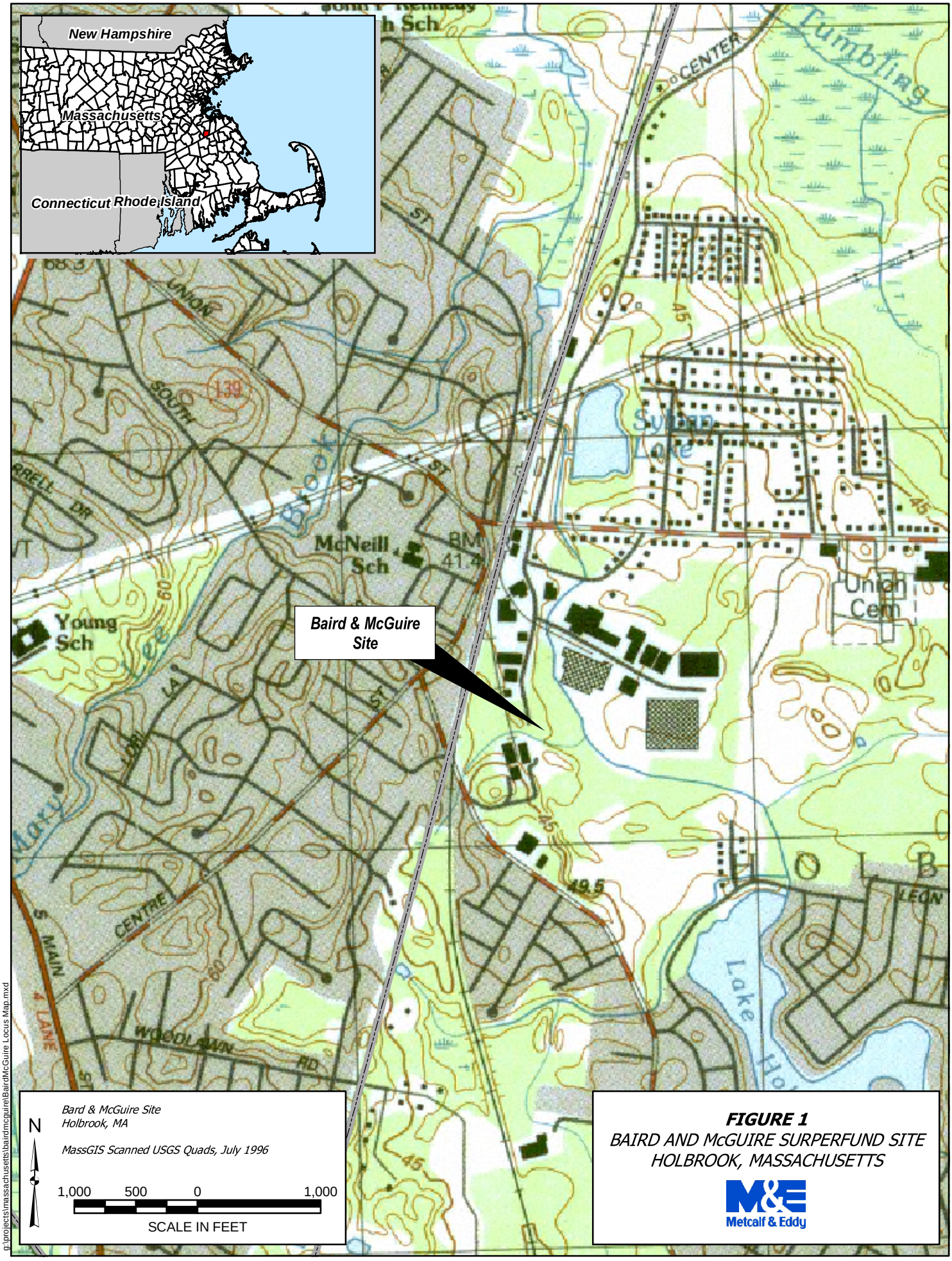
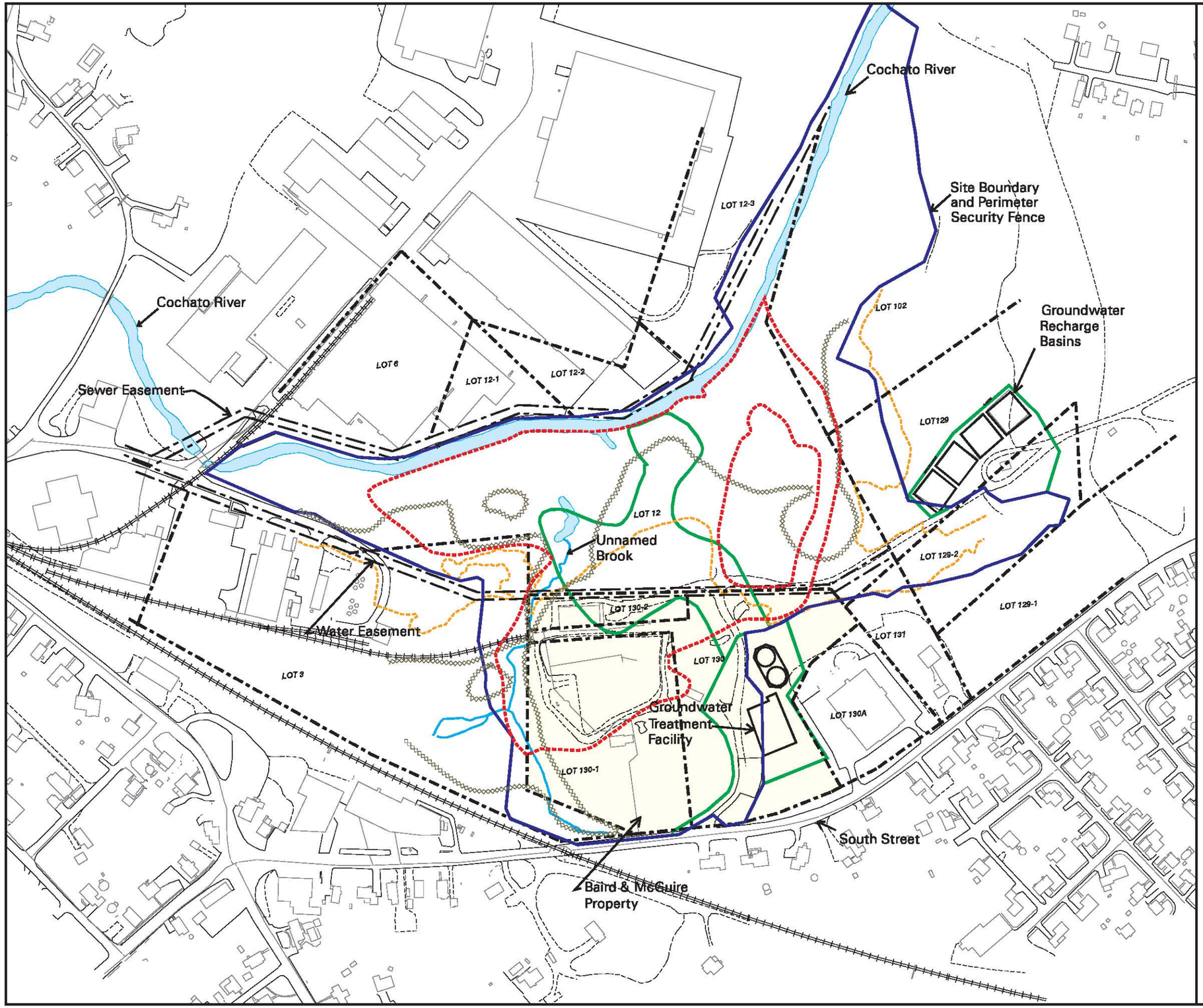


FIGURE 1

BAIRD AND McGUIRE SURPERFUND SITE
HOLBROOK, MASSACHUSETTS

Metcalf & Eddy

g:\projects\massachusetts\bairdmcguire\BairdMcGuire Locus Map.mxd



LEGEND

- Limit of Excavation
- Property Lines
- Easement
- Site Boundary and Perimeter Fenceline
- Additional Fencing
- Roads
- Streams
- Wetland Delineation
- 100 Year Floodplain
- Ponds and Waterbodies
- Baird & McGuire Property

MAP SOURCE:
Base Map is from Eastern Topographics (May 4, 1988).
Site features are compiled from numerous project plans and documents. All locations are approximate.

Metcalf & Eddy

250 0 250

SCALE IN FEET

Figure 2.
BAIRD & McGUIRE
SITE FEATURES.

BAIRD & McGUIRE SUPERFUND SITE
M&E Print Date: September 28, 2004

sitefeat-a

ATTACHMENT 1

SITE PHOTOS

BAIRD & McGUIRE SUPERFUND SITE
June 11, 2014 - SITE INSPECTION PHOTOGRAPHS

Photo #1. Looking northeast across infiltration basins

Photo #2. Looking southeast across infiltration Basin

Photo #3. MW 906

Photo #4. Looking southeast towards the gate on Holbrook Property

Photo #5. Looking southwest towards the Site perimeter fence

Photo #6. Reconstructed Wetlands

Photo #7. Monitoring well along road bordering Lot 3

Photo #8. Looking north towards Lot 3, proposed for redevelopment

Photo #9. Looking north towards MW 913 on Lot 3, proposed for redevelopment

Photo #10. New Extraction well EW-10

Photo #11 Looking north from EW-10 towards new monitoring well MW14-01

Photo #12. Looking east from EW-10 towards new monitoring well MW14-02

Photo #13. Looking southwest on Lot 130-2 towards area of proposed solar panel development

Photo #14. VFD for new EW-10

Photo #15. VFDs located in the Extraction Well Control Building

Photo #16. Aeration Tanks

Photo #17. Fish advisory sign, located on Centre Street in Holbrook near western shore of Sylvan Lake

Photo #18. Fish advisory sign, located on Centre Street in Holbrook near western shore of Sylvan Lake

ATTACHMENT 2

INTERVIEW RECORDS

INTERVIEW RECORD

Site Name: Baird & McGuire Superfund Site (Holbrook, MA)	**EPA ID No.:** MAD001041987	
Subject: Five Year Review	**Time:** 1322	**Date: 7-21-14**
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit:**	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Joel Meunier	**Title:** Project Scientist	**Organization:** AECOM

Individual Contacted:

Name: William J. Phelan	**Title:** Town Administrator	**Organization:** Town of Holbrook
Telephone No: 781-767-4312 **E-Mail:** wphelan@holbrookmassachusetts.us	**Street Address:** Holbrook Town Hall 50 North Franklin Street Holbrook, MA 02343	

1. What is your overall impression of the project? (general sentiment)

Mr. Phelan stated that the Site has almost been forgotten about.

2. Do you feel well informed about site activities and progress?

Not particularly; Mr. Phelan said he has never read or seen a report for the Site (although he was aware that the public library was the repository for said reports)

3. What are the current uses of the property?

Mr. Phelan said that the Site was currently unused.

4. What are the planned future uses of the property (if different from current uses)?

Mr. Phelan stated that he had heard a rumor that someone wanted to place a solar farm on the Site property.

5. Is there evidence or sightings of trespassers on the property? If yes, how often and what type of activities do they engage in?

Mr. Phelan stated that he had not seen or heard of any trespassers on the Site property.

6. Have there been any events of vandalism at the property?

Mr. Phelan stated that he was unaware of any vandalism at the Site property.

7. Have there been any unusual or unexpected activities or events at the site (e.g., flooding)? If so, what if anything was done to address these issues?

Mr. Phelan stated that he was unaware of any unusual or unexpected activities or events at the site.

8. Have any problems been encountered or changes in the site conditions that affect the current operations at the site?

Mr. Phelan stated that he was unaware of any such problems.

9. Has the site been the subject of any community complaints (e.g., odor, noise, health, etc.)?

Mr. Phelan stated that he was not aware of any such complaints.

10. Are you aware of any community concerns regarding the site or remedial actions performed? If so, please provide details.

Mr. Phelan stated that he was not aware of any such concerns.

11. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.

Mr. Phelan and a selectman went to the Site about 3 years ago to visit the site.

12. Do you have any comments, suggestions, or recommendations regarding site management or operation?

Mr. Phelan stated that he had nothing additional to add.

13. Is there any other information that you wish to share that might be of use?

Mr. Phelan stated that back taxes are owed on the property and he would like to see the paid.

INTERVIEW RECORD

Site Name: Baird & McGuire Superfund Site (Holbrook, MA)	**EPA ID No.: MAD001041987**	
Subject: Five Year Review	**Time:**	**Date:** 6/11/14
Type: ☐ Telephone ☒ Visit ☐ Other **Location of Visit:** Baird & McGuire GWTF	☐ Incoming ☐ Outgoing	

Contact Made By:

Name: Cinthia McLane	**Title:** Project Manager	**Organization:** AECOM

Individual Contacted:

Name: Dorothy Allen (with input from Pat Hurley during GWTF inspection/tour)	**Title:** State Remedial Project manager	**Organization:** MassDEP
Telephone No: (617) 292-5795 **E-Mail Address:** dorothy.t.allen@state.ma.us	**Street Address:** 1 Winter Street Boston, MA 02108	

(Note – MassDEP is currently the lead agency for the site and maintains a full-time presence. A group interview was conducted with the MassDEP and the O&M Contractor, Clean Harbors)

1. **What is your overall impression of the project? (general sentiment).** Ms Allen stated that she agrees with the optimization study, and the need to make decisions and follow-up on them.

2. **Is the remedy functioning as expected? How well is the remedy performing?** She questioned whether pumping is cleaning up the groundwater, whether the ash might be a continuing source of arsenic. The new monitoring wells may help supply the missing information. The clean-up levels for organics are being met, but not for arsenic.

3. **Have there been opportunities to optimize O&M or sampling efforts since the last Five Year Review? Please describe changes and resultant or desired cost savings or improved efficiency.** A number of recommendations from the Optimization Review have been implemented. Ms Allen also referenced the attached decision tree.

4. **Have there been any security issues in the last 5 years?** No.

5. **Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.** Periodically, the selectmen have complained about noise, but it was usually related to the transfer facility, rather than the GWTF.

6. **Please describe any community involvement activities.** None recently. There used to be

task force meetings, but few people showed up for them and they were discontinued.

7. **Do you have any comments, suggestions, or recommendations regarding the site's management or operation?** Ms. Allen stated that she would provide a Decision Tree by email following the meeting (attached). Decisions need to be made at the upper management level.

8. **Are you aware of any problems or issues that will affect the progress or implementability of the proposed institutional controls?** Ms. Allen questioned the status of the proposed transfer station [on Lot 3], how to document to the owner what the ICs will be based on, whether soil/ash will be a factor in developing the ICs. Will need to negotiate with the transfer station regarding fence line.

9. **Is there evidence or sightings of trespassers on the property, or evidence of vandalism? If yes, how often and what type of activities do they engage in?**
See interview with Clean Harbors (O&M Contractor).

10. **Have there been any unusual or unexpected activities or events at the site (e.g., flooding)? If so, has this resulted in any damage or had an impact on operations at the site?**
See interview with Clean Harbors (O&M Contractor).

11. **Is there any other information that you wish to share that might be of use?** Ms Allen stated that she does not want to wait for another five year review before moving forward with the decision tree (attached).

INTERVIEW RECORD

Site Name: Baird & McGuire Superfund Site (Holbrook, MA)	**EPA ID No.: MAD001041987**	
Subject: Five Year Review	**Time:**	**Date:**
Type: ☐ Telephone ☒ Visit ☐ Other **Location of Visit:** Baird & McGuire GWTF	☐ Incoming ☐ Outgoing	

Contact Made By:

Name: Cinthia McLane	**Title:** Project Manager	**Organization:** AECOM

Individual Contacted:

Name: Lisa Irwin, John Irwin, Maggie Legorete, Kandi Prentiss (with input from Pat Hurley during GWTF inspection/tour).	**Title:** O&M Contractor Manager/Operator	**Organization:** Clean Harbors
Telephone No: **E-Mail Address:**	**Street Address:** 775 South Street Holbrook, MA 02343	

1. **Is the remedy functioning as expected? How well is the remedy performing?** The GWTF is functioning well. The main issue is arsenic concentration in groundwater, which is up to 2.9 ppm.

2. **What does the monitoring data show? Are there any data trends that appear unusual? What is the current monitoring program for the GWTF and LNAPL systems?** Arsenic, pesticides, VOCs, SVOCs are present in separate areas. CH has tried to pin-point the center of the elevated arsenic to best locate new extraction well EW-10. Arsenic in some wells declined while no trend was noted in others. Organics concentrations decreased.

   All monitoring wells are sampled every five years; 20 wells are sampled annually; extraction wells are sampled quarterly.

3. **Please describe the O&M staff and activities, including frequency of inspections and O&M activities.** The facility is staffed as follows: one mechanic 4 days/week; 2 operators 5 days/week; 1 operator for 4 hours on Saturdays and Sundays; plus an operator on-call during off-hours and all day Saturday and Sunday. O&M activities are described in the O&M reports.

4. **Have there been unexpected O&M difficulties or costs at the site in the last five years? If so, give details.** In general, most of the equipment is so old that finding spare or replacement parts has been difficult. An attempt was made to take the bio tanks off-line, but this resulted in clogging of the GAC units and filters.

5. **Have there been any updates to the O&M manual since the last 5-year review, and are the O&M activities being performed consistently with the approved O&M and monitoring plans?** The O&M manual was revised when O&M of the facility went out to bid last year; however changes were insubstantial. Plant upgrades that have been made over the years haven't required changes to the manual.

   Monitoring is conducted in accordance with the plan.

6. **What are the annual system operation/O&M costs for OU-1 since the previous 5-year review in 2009?** Information provided by Patrick Hurley:

Total Cost	
FY 2010	**900,876.69**
2011	**820,363.05**
2012	**948,887.00**
2013	**814,787.95**
2014 (est)	**730,175.87**

7. **Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.** None noted.

8. **Have there been opportunities to optimize O&M, or sampling efforts since the last five year review? Please describe changes and resultant or desired cost savings or improved efficiency.** High pressure sodium lamps were replaced with LED lighting and new VFDs on the aeration blowers were installed, decreasing electric costs from approximately $550 per month to between $200 to $300 per month.

   An attempt to lower potassium permanganate dosage, but this resulted in a loss of clarity.

   A change to a coarser GAC media was made, which resulted in a significantly longer GAC life. The old type of media had to be replaced every 4 months; the new media lasts up to 14 months.

   New safety features, including new railings on tanks and restraints with hook-ups to prevent falls have been installed in the GWTF.

9. **Have there been any security issues in the last 5 years? Is there evidence or sightings of trespassers on the property, or evidence of vandalism? If yes, how often and what type of activities do they engage in?** Nothing on-site. Kids cut through the town land on the other side of the fence near the extraction wells.

10. **Have there been any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses.** None.

11. **Have there been any unusual or unexpected activities or events at the site (e.g., flooding)? If so, has this resulted in any damage or had an impact on operations at the site?** The river periodically floods. Most of the extraction wells are located above the flood elevation, except EW-2. Flooding has not resulted in a plant shut-down.

12. **Do you have any comments, suggestions, or recommendations regarding the site's management or operation?** None noted (Dorothy Allen of MassDEP responded to this question).

13. **Is there any other information that you wish to share that might be of use?** Concerns were expressed regarding the potential impact that the proposed transfer facility could have on the Site, including concerns with access to the well fields and the on-site roads. MassDEP/EPA and the developers will need to work together on the institutional controls.

Decision Chart for Baird&McGuire Remediation

Containment

Potential Source Remedy

Existing P&T (600K/yr) with Monitoring (100K/yr).

Refine Conceptual Model ($?) of Arsenic contamination using existing and new site data. Collect new data and Perform Arsenic ORP Bench Scale Study (25K). 1 yr

Are low ORP and organic contamination causing high dissolved Arsenic levels in BOTH areas of site?

no

yes

Continue Arsenic treatment via P&T in all areas of the site and remove LNAPL as encountered.

Operate (400K/yr) and Monitor (100K/yr) long term after improvements.

Evaluate Feasibility of Source Remedy for LNAPL ($?) – ISCO or other w/cost estimate. Develop preliminary Performance Standards and Monitoring.* 1 yr

Conduct small scale Characterization (60K) and Pilot Study (300K). Refine cost estimate. 1 yr

Perform Capture Zone Analysis and Install Extraction wells (250K).
Perform Plant Up-grade (1.25 M).
Consider Third Party PV to save 20K/yr on power.

Is Pilot Successful?

no

yes

Is Source Remediation possible w/wo P&T?

no

yes

Perform Full Site Characterization of LNAPL (400K) and Design Full-Scale Source Remediation ($?). Develop Performance Standards, Cleanup Criteria and Monitoring.** 2 yrs

Implement Source Remedy wo P&T (8.2M). Monitoring ($?). 2 yrs

Implement Source Remedy (8.45M) w/existing P&T (700K/yr). Monitoring ($?)

Implement Source Remedy (9.7M) w/up-graded P&T. (500K/yr). Monitoring ($?)

(Costs) Estimates developed for some action items in EPA Optimization Study, May 2013.
* Program decisions required in coordination with EPA.
** EPA ROD changes required.

APPENDIX F

INTERVIEW RECORD FORMS

INTERVIEW RECORD

Site Name: Baird & McGuire Superfund Site (Holbrook, MA)	**EPA ID No.:** MAD001041987	
Subject: Five Year Review	**Time:** 1322	**Date: 7-21-14**
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit:**	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Joel Meunier	**Title:** Project Scientist	**Organization:** AECOM

Individual Contacted:

Name: William J. Phelan	**Title:** Town Administrator	**Organization:** Town of Holbrook
Telephone No: 781-767-4312 **E-Mail:** wphelan@holbrookmassachusetts.us	**Street Address:** Holbrook Town Hall 50 North Franklin Street Holbrook, MA 02343	

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Contact Made By:

Name: Cinthia McLane	**Title:** Project Manager	**Organization:** AECOM

Individual Contacted:

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Contact Made By:

Name: Cinthia McLane	**Title:** Project Manager	**Organization:** AECOM

Individual Contacted:

Name: Dorothy Allen (with input from Pat Hurley during GWTF inspection/tour)	**Title:** State Remedial Project manager	**Organization:** MassDEP
Telephone No: (617) 292-5795 **E-Mail Address:** dorothy.t.allen@state.ma.us	**Street Address:** 1 Winter Street Boston, MA 02108	

(Note – MassDEP is currently the lead agency for the site and maintains a full-time presence. A group interview was conducted with the MassDEP and the O&M Contractor, Clean Harbors)

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9. **Is there evidence or sightings of trespassers on the property, or evidence of vandalism? If yes, how often and what type of activities do they engage in?**
See interview with Clean Harbors (O&M Contractor).

10. **Have there been any unusual or unexpected activities or events at the site (e.g., flooding)? If so, has this resulted in any damage or had an impact on operations at the site?**
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11. **Is there any other information that you wish to share that might be of use?** Ms Allen stated that she does not want to wait for another five year review before moving forward with the decision tree (attached).

Decision Chart for Baird&McGuire Remediation

Containment

Potential Source Remedy

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Are low ORP and organic contamination causing high dissolved Arsenic levels in BOTH areas of site?

no

yes

Continue Arsenic treatment via P&T in all areas of the site and remove LNAPL as encountered.

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Perform Capture Zone Analysis and Install Extraction wells (250K).
Perform Plant Up-grade (1.25 M).
Consider Third Party PV to save 20K/yr on power.

Is Pilot Successful?

no

yes

Is Source Remediation possible w/wo P&T?

no

yes

Perform Full Site Characterization of LNAPL (400K) and Design Full-Scale Source Remediation ($?). Develop Performance Standards, Cleanup Criteria and Monitoring.** 2 yrs

Implement Source Remedy wo P&T (8.2M). Monitoring ($?). 2 yrs

Implement Source Remedy (8.45M) w/existing P&T (700K/yr). Monitoring ($?)

Implement Source Remedy (9.7M) w/up-graded P&T. (500K/yr). Monitoring ($?)

(Costs) Estimates developed for some action items in EPA Optimization Study, May 2013.
* Program decisions required in coordination with EPA.
** EPA ROD changes required.

APPENDIX G

RISK CALCULATIONS

TABLE 4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

BAIRD & MCGUIRE SUPERFUND SITE

Scenario Timeframe: Future
Medium: Ash
Exposure Medium: Ash

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Comm Worker	Adult	Site	CS	Chemical Concentration in Ash		mg/kg		Chronic Daily Intake (CDI) (mg/kg-day) =
				IR	Ingestion Rate of Soil	50	mg/day	USEPA, 1997a	$\frac{CS \times IR \times FI \times EF \times ED \times CF \times RBA}{BW \times AT}$
				FI	Fraction Ingested	1	unitless	Prof. Judgement	
				EF	Exposure Frequency	250	days/year	Prof. Judgement	
				ED	Exposure Duration	25	years	Prof. Judgement	
				BW	Body Weight	80	kg	USEPA, 2014b	
				RBA	Relative Bioavailability	0.6 for Arsenic/1 for all other analytes	- -	USEPA, 2012	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1989	
				CF	Conversion Factor	0.000001	kg/mg	- -	
Ingestion	Trespasser	Adolescent	Site	CS	Chemical Concentration in Ash		mg/kg		Chronic Daily Intake (CDI) (mg/kg-day) =
		(ages 7-17)		IR	Ingestion Rate of Soil	100	mg/day	USEPA, 1997a	$\frac{CS \times IR \times FI \times EF \times ED \times CF \times RBA}{BW \times AT}$
				FI	Fraction Ingested	1	unitless	Prof. Judgement	
				EF	Exposure Frequency	50	days/year	Prof. Judgement	
				ED	Exposure Duration	10	years	Prof. Judgement	
				BW	Body Weight	40	kg	USEPA, 2014b	
				RBA	Relative Bioavailability	0.6 for Arsenic/1 for all other analytes	- -	USEPA, 2012	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	
				CF	Conversion Factor	0.000001	kg/mg	- -	

TABLE 5

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal (2)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Dioxin TEQ	Chronic	7E-10	mg/kg-day	(4)	7E-10	mg/kg-day	Reproductive	30	IRIS	05/29/14
Arsenic	Chronic	3E-04	mg/kg-day	(4)	3E-04	mg/kg-day	Skin	3	IRIS	05/29/14
Dioxin TEQ	Subchronic	7E-10	mg/kg-day	(4)	7E-10	mg/kg-day	Reproductive	30	IRIS	05/29/14
Arsenic	Subchronic	3E-04	mg/kg-day	(4)	3E-04	mg/kg-day	Skin	3	IRIS	05/29/14

(1) Oral absorption efficiencies from RAGS, Part E (USEPA, 2004a).

IRIS = Integrated Risk Information System

N/A = Not Applicable

(2) Calculated as: (oral RfD) x (oral to dermal adjustment factor).

(4) Oral absorption efficiency exceeds 50%. No adjustment of the oral reference dose is necessary.

DAFs from RAGS, Part E (USEPA, 2004a): benzo(a)pyrene = 0.13; pentachlorophenol = 0.25; dioxin and arsenic = 0.03

TABLE 6

CANCER TOXICITY DATA -- ORAL/DERMAL

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units	(1)	Value (2)	Units		Source(s)	Date(s) (MM/DD/YYYY)
Dioxin TEQ	1.30E+05	$(mg/kg\text{-}day)^{-1}$	(1)	1.30E+05	$(mg/kg\text{-}day)^{-1}$	B2	OHEA	1985
Arsenic	1.5E+00	$(mg/kg\text{-}day)^{-1}$	(1)	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	05/29/14

IRIS = Integrated Risk Information System

OHEA = Office of Health and Environmental Assessment

RME = Reasonable Maximum Exposure

CT = Central Tendency

N/A = Not Applicable

(1) Oral absorption efficiency exceeds 50%. Therefore, no adjustment of the oral slope factor is necessary.

(2) Calculated as: (oral slope factor) / (oral to dermal adjustment factor)

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen (by the oral route)

E - Evidence of noncarcinogenicity

TABLE 7.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

BAIRD & MCGUIRE SUPERFUND SITE

Scenario Timeframe: Future
Receptor Population: Comm Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Ash	Ash	Site	Ingestion													
				Dioxin TEQ	1E-03	mg/kg	1.7E-10	mg/kg-day	1.56E+05	(mg/kg-day) $^{-1}$	2.6E-05	4.7E-10	mg/kg-day	7.0E-10	mg/kg-day	6.7E-01
				Arsenic	7E+01	mg/kg	6.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	9.2E-06	1.7E-05	mg/kg-day	3.0E-04	mg/kg-day	5.7E-02
			Exp. Route Total								4E-05					7E-01
		Exposure Point Total									4E-05					7E-01
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	N/A			Total of Receptor Hazards Across All Media		N/A

EPC from 1997 evaluation

TABLE 7.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

BAIRD & MCGUIRE SUPERFUND SITE

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Adolescent (ages 7-17)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Ash	Ash	Site	Ingestion	Dioxin TEQ	1E-03	mg/kg	5.4E-11	mg/kg-day	1.56E+05	(mg/kg-day) $^{-1}$	8.4E-06	3.8E-10	mg/kg-day	7.0E-10	mg/kg-day	5.4E-01
				Arsenic	7E+01	mg/kg	2.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	3.0E-06	1.4E-05	mg/kg-day	3.0E-04	mg/kg-day	4.6E-02
			Exp. Route Total								1E-05					6E-01
		Exposure Point Total									1E-05					6E-01
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	N/A			Total of Receptor Hazards Across All Media		N/A

EPC from 1997 evaluation

APPENDIX H

ARARs REVIEW TABLES

TABLE A7-1. POTENTIAL CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
BAIRD & MCGUIRE SUPERFUND SITE - OPERABLE UNITS 1 AND 2, HOLBROOK, MASSACHUSETTS

Media and Authority	Requirement	ROD Status	ROD requirements synopsis and consideration in RI/FS	Five-Year Review
Groundwater				
Federal Regulatory Requirements	SDWA - Maximum Contaminant Levels (MCLs) (40 CFR 141.11 B 141.16)	Applicable	Maximum Contaminant Levels (MCLs) have been promulgated for a number of common organic and inorganic analytes. These levels regulate the concentration of analytes in public drinking water supplies, but may also be considered relevant and appropriate for groundwater aquifers used for drinking water. The Holbrook Municipal South Street well field was closed due to Baird & McGuire Site contamination. Private drinking water wells exist in the vicinity.	Although the municipal wells have been closed, the Site is located in a state-designated interim wellhead protection area. Drinking water rules are therefore relevant and appropriate. MCLs and non-zero MCLGs have the status of ARARs for areas surrounding the Baird & McGuire Site boundaries. Many of the MCLs and MCLGs have changed since ROD completion. MCLs/MCLGs for OU-1 are provided in Table A7-2. Since the first five-year review in 1999, the MCL for arsenic was lowered from 50 µg/l to 10 µg/l. Constituents in Site groundwater still exceed criteria for arsenic, mercury, lindane (gamma-BHC), VOCs, SVOCs, and the secondary MCL for iron. Groundwater treatment is currently being conducted. The treated groundwater is being discharged back to groundwater and meets the standards for this rule. Groundwater contamination remains, however, and treatment is expected to continue for several years. Groundwater requires continued remediation under this rule.

TABLE A7-1. POTENTIAL CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
BAIRD & MCGUIRE SUPERFUND SITE - OPERABLE UNITS 1 AND 2, HOLBROOK, MASSACHUSETTS

Media and Authority	Requirement	ROD Status	ROD requirements synopsis and consideration in RI/FS	Five-Year Review
	RCRA - Subpart F, Groundwater Protection Standards, Concentration Limits (40 CFR 264.94(a))	Relevant and Appropriate	Standards for 14 toxic compounds have been adopted as part of RCRA groundwater protection standards. These limits were originally set at MCLs. The groundwater protection regulations require the setting of groundwater protection standards which must be protective of the public health and the environment. During the design of the groundwater interception and treatment system, restoration target levels were proposed based on existing data.	RCRA sets the limit for organic constituents at background levels. Constituents in Site groundwater exceed RCRA MCLs for arsenic and mercury and exceed background concentrations for all organic COCs. Groundwater treatment is currently being conducted. The treated groundwater is being discharged back to groundwater and meets the standards for this rule. Groundwater contamination remains, however, and treatment is expected to continue for several years. Groundwater still requires remediation under this rule.
Massachusetts Regulatory Requirements	Massachusetts Drinking Water Requirements (310 CMR 22.05 to 22.09)	Applicable	The Massachusetts Drinking Water Standards and Guidelines list Massachusetts Maximum Contaminant Levels (MMCLs) that apply to water delivered to any user of a public water supply system as defined by the rule.	The Site is located in a designated Mass. Wellhead Protection Area. Drinking water standards are applicable to groundwater supplies surrounding the Baird & McGuire Site. MMCLs for OU-1 are provided in Table A7-2. Constituents in Site groundwater still exceed criteria for arsenic, mercury, lindane (gamma-BHC), VOCs, and SVOCs. Groundwater treatment is currently being conducted. The treated groundwater is being discharged back to groundwater and meets the standards for this rule. Groundwater contamination remains, however, and treatment is expected to continue. Site groundwater requires continued remediation to protect outlying groundwater supplies.
Federal Criteria,	SDWA - Maximum	Relevant and	Maximum contaminant level goals	MCLs and non-zero MCLGs have the status

TABLE A7-1. POTENTIAL CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
BAIRD & MCGUIRE SUPERFUND SITE - OPERABLE UNITS 1 AND 2, HOLBROOK, MASSACHUSETTS

Media and Authority	Requirement	ROD Status	ROD requirements synopsis and consideration in RI/FS	Five-Year Review
Advisories, and Guidance	Contaminant Level Goals (MCLGs)	Appropriate/ To Be Considered	(MCLGs) are health-based criteria that are to be considered for drinking water sources as a result of SARA. These goals are available for a number of organic and inorganic contaminants. Projected groundwater concentrations were compared to their MCLGs in documents supporting the ROD.	of ARARs for areas outside of the Baird & McGuire Site boundaries. Zero MCLGs are criteria to be considered. Many of the MCLs and MCLGs have changed since ROD completion. MCLs/MCLGs for OU-1 are provided in Table A7-2. Groundwater requires continued remediation under this rule to protect outlying resources.
Discharge to Surface Water				
Massachusetts Regulatory Requirements	Massachusetts Surface Water Quality Standards (314 CMR 4.05)	Applicable	DEP Surface Water Quality Standards are given for dissolved oxygen, temperature increase, pH, and total coliform and there is a narrative requirement for toxicants in toxic amounts. In the absence of a state standard for a compound, federal AWQC would be appropriate. Requirements were considered; however, no numerical standards exist for contaminants found in Site groundwater which would be discharged to surface water. Federal AWQC will be used in the absence of narrative standards.	These regulations classify the surface waters of the Commonwealth according to the uses of those waters. The wetland has a Class A waterway classification. Class A waters are designated as habitat for fish, other aquatic and wildlife, and for primary and secondary contact recreation. The state surface water minimum criteria for Class A waters are consistent with federal AWQC. These rules are applicable to the Cochato River and unnamed brook. Discharge is not directly to the Cochato River. This ARAR is more appropriate as an Action-Specific ARAR and, as the groundwater discharge is not directly to a surface water body, should not be an ARAR.
Federal Criteria, Advisories, and Guidance	Federal Ambient Water Quality Criteria (AWQC)	Relevant and Appropriate	Federal AWQC are health-based and ecologically based criteria which have been developed for 95 carcinogenic and non-carcinogenic compounds.	CERCLA Sec. 121 (d)(2)(A) Specifically states that remedial actions shall at least attain federal AWQC established under the Clean Water Act if they are relevant and appropriate.

TABLE A7-1. POTENTIAL CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
BAIRD & MCGUIRE SUPERFUND SITE - OPERABLE UNITS 1 AND 2, HOLBROOK, MASSACHUSETTS

Media and Authority	Requirement	ROD Status	ROD requirements synopsis and consideration in RI/FS	Five-Year Review
			AWQC were considered in characterizing public health risks to aquatic organisms due to contaminant concentrations in surface water at Cochato River. Because this water is not used as a drinking water source, the criteria developed for aquatic organisms protection and ingestion of contaminated aquatic organisms were considered.	AWQC for protection of human health from ingestion of water and aquatic organisms are relevant and appropriate. Current AWQC are listed in Table A7-6. Discharge is not directly to the Cochato River. This ARAR is more appropriate as an Action-Specific ARAR and, as the groundwater discharge is not directly to a surface water body, should not be an ARAR.
Air				
Massachusetts Regulatory Requirements	Massachusetts B Air Quality, Air Pollution (310 CMR 6.00-8.00)	Formerly Applicable now Not ARAR	These standards were primarily developed to regulate stack and automobile emissions.	310 CMR 6.00 provide ambient air quality standards for the Commonwealth, standards for dust are contained in 310 CMR 7.09, and 310 CMR 7.08 provides incinerator standards. These standards were used in establishing discharge limits from the incinerator. The incinerator has been dismantled and these requirements are no longer applicable, relevant or appropriate. Should excavation occur in the future, dust control standards would need to be reconsidered. This ARAR is more appropriate as an Action-Specific ARAR.
Federal Criteria, Advisories, and Guidance	Threshold Limit Values (TLVs)	Formerly To Be Considered now Not ARAR	These standards were issued as consensus standards for controlling air quality in workplace environments. TLVs could be used to assess Site inhalation risks for soil removal operations.	The incinerator has been dismantled and these requirements are no longer applicable, relevant or appropriate. Should excavation be considered in the future, these values would need to be reconsidered. This ARAR is more appropriate as an Action-Specific ARAR.
Massachusetts Criteria, Advisories,	Massachusetts Guidance on Acceptable Ambient	Formerly To Be Considered	AALs were considered when assessing the significance of monitored and modeled residential contamination from air	The incinerator has been dismantled and these requirements are no longer applicable, relevant or appropriate. This ARAR is more

TABLE A7-1. POTENTIAL CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
BAIRD & MCGUIRE SUPERFUND SITE - OPERABLE UNITS 1 AND 2, HOLBROOK, MASSACHUSETTS

Media and Authority	Requirement	ROD Status	ROD requirements synopsis and consideration in RI/FS	Five-Year Review
and Guidance	Air Levels (AALs)	now Not ARAR	emissions.	appropriate as an Action-Specific ARAR.

TABLE A7-2. NUMERICAL STANDARDS FOR BAIRD & MCGUIRE GROUNDWATER

CHEMICAL [1]	SDWA MCL[2] (mg/L)	SDWA MCLG[3] (mg/L)	RCRA MCL[4] (mg/L)	Mass. Drinking Water Stds.[5] (mg/L)
Organics, Pesticides, PCBs				
Acenapthalene*, **	--	--	--	--
Aldrin	--	--	--	--
Benzene*	0.005	0	--	0.005
Benzidine	--	--	--	--
Benzo(a)pyrene	0.0002	0	--	0.0002
Butanone, 2-	--	--	--	--
Chlordane*	0.002	0	--	0.002
Chloroform	--	--	--	--
DDD, 4, 4-	--	--	--	--
DDE, 4, 4-	--	--	--	--
DDT, 4, 4-	--	--	--	--
Dibenzofuran*	--	--	--	--
Dichloroethane, 1, 2-	0.005	0	--	0.005
Dichloroethylene, 1,2-trans*	0.1	0.1	--	0.1
Dichloropropylene, 1,3-trans	--	--	--	--
Dieldrin*	--	--	--	--
Dimethylphenol, 2,4-*	--	--	--	--
Dioxin (2, 3, 7, 8-TCDD)	$3x10^{-8}$	0	--	$3x10^{-8}$
Ethylbenzene*	0.7	0.7	--	0.7
Fluoranthene	--	--	--	--
Fluorene*, **	--	--	--	--
Heptachlor	0.0004	0	--	0.0004
Heptachlor epoxide	0.0002	0	--	0.0002
Lindane (gamma-BHC)	0.0002	0.0002	0.004	0.0002

TABLE A7-2. NUMERICAL STANDARDS FOR BAIRD & MCGUIRE GROUNDWATER

CHEMICAL [1]	SDWA MCL[2] (mg/L)	SDWA MCLG[3] (mg/L)	RCRA MCL[4] (mg/L)	Mass. Drinking Water Stds.[5] (mg/L)
Methylnaphthalene, 2-*, **	--	--	--	--
Methylphenol, 4-*	--	--	--	--
Naphthalene*, **	--	--	--	--
Phenanthrene*, **	--	--	--	--
Total Other PAHs (**)	--	--	--	--
Tetrachloroethylene	0.005	0	--	0.005
Toluene*	1	1	--	1
Trichloroethane, 1,1,1-	0.2	0.20	--	0.2
Trichloroethylene (TCE)	0.005	0	--	0.005
Vinyl chloride	0.002	0	--	0.002
Xylenes (total)*	10	10	--	10
Inorganics				
Antimony	0.006	0.006	--	0.006
Arsenic*	0.010	0	0.05	0.010
Barium	2	2	1.0	2
Beryllium	0.004	0.004	--	0.004
Cadmium	0.005	0.005	0.01	0.005
Iron	--	0.3 (SMCL)	--	0.3 (SMCL)
Lead*	Treatment technique[6]	0	0.05	Treatment technique[6]
Mercury	0.002	0.002	0.002	0.002
Nickel		--	--	--
Silver		0.10 (SMCL)	0.05	0.10 (SMCL)
Zinc		5 (SMCL)	--	5 (SMCL)

TABLE A7-2. NUMERICAL STANDARDS FOR BAIRD & MCGUIRE GROUNDWATER

Notes

1. Chemicals listed in this table include selected critical contaminants identified in Table 1 of the 9/30/86 ROD, indicator compounds as defined in the Site Maintenance Plan (see * below), and other compounds detected at levels exceeding SDWA MCLs during 2003, 2007, or 2011 groundwater monitoring.
2. National Primary Drinking Water Regulations under Safe Drinking Water Act (SDWA), 40 CFR Part 141, Subpart G, Maximum Contaminant Levels (MCLs)
3. National Primary Drinking Water Regulations under Safe Drinking Water Act, 40 CFR Part 141, Subpart F, Maximum Contaminant Level Goals (MCLGs)
4. Federal Resource Conservation and Recovery Act Maximum concentration of Constituents for Groundwater Protection, 40 CFR 264.94, Table 1.
5. Massachusetts Drinking Water Regulations, 310 CMR 22.00
6. The MCL for lead was replaced by an action level of 15 ppb (0.015 mg/L) at the tap, 0.005 mg/L in the system. Public water systems exceeding the action level must for further treatment; b) undertake a public education program to inform consumers about how to reduce exposure to lead in drinking level continues, replace all lead service pipes.

*These compounds are contamination indicator compounds as defined in the Site Maintenance Plan for the Baird & McGuire Groundwater Treatment Plant and Extraction/Recharge System prepared by Metcalf & Eddy, April 25, 1989, for the U.S. Army Engineer District, Omaha.

**PAH compounds listed in Table 2 of 9/30/86 Record of Decision: 2-methylnapthalene, acenapthene, acenapthylene, anthracene, benzo(a)anthracene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluorene, indeno(1, 2, 3-cd)pyrene, napthalene, phenanthrene, and pyrene.

SMCL – Secondary Maximum Contaminant Level

TABLE A7-3. POTENTIAL LOCATION-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
BAIRD & MCGUIRE SITE (ALL OPERABLE UNITS), HOLBROOK, MASSACHUSETTS

SITE FEATURE AND AUTHORITY	REQUIREMENTS	ROD STATUS	REQUIREMENT SYNOPSIS AND CONSIDERATION IN RI/FS	FIVE-YEAR REVIEW
Wetlands				
Federal Regulatory Requirements	Clean Water Act (CWA) Section 404 B (40 CFR Part 230)	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available. Permits are required to be obtained from the US Army Corps of Engineers for dredge and fill activities in off-site wetlands. During identification, screening, and evaluation of alternatives, the effects on wetlands are evaluated. Wetland impacts must be avoided, minimized, mitigated.	To mitigate unavoidable wetland impacts, a Final Site Restoration Plan was developed that requires the restoration of approximately 7.4 acres of forested and scrub/shrub floodplain wetlands, including a small peat bog and 1,000 linear feet of intermittent stream, impacted by the remedial action. The plan required restoring the wetland to the approximate original grades and elevations, backfilling with organic topsoil (at least 20 percent organic matter by weight) and seeding and planting with appropriate herbaceous, shrub, and tree species. The wetland was monitored for four years in order to assess the success of the wetland restoration effort. The final monitoring report was completed in 2002.
	Executive Order, 11990; Wetlands Protection; Clean Water Act (40 CFR 6, Appendix A)	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available. All operable units include wetlands.	To mitigate unavoidable wetland impacts, a Final Site Restoration Plan was developed. The plan required the restoration of forested and scrub/shrub floodplain wetlands, including a small peat bog, and an intermittent stream impacted by the remedial action. The plan also required annual monitoring of the wetlands for at least three years following completion of the restoration efforts. Four years of monitoring data were collected and the final monitoring report was completed in 2002.

TABLE A7-3. POTENTIAL LOCATION-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
BAIRD & MCGUIRE SITE (ALL OPERABLE UNITS), HOLBROOK, MASSACHUSETTS

SITE FEATURE AND AUTHORITY	REQUIREMENTS	ROD STATUS	REQUIREMENT SYNOPSIS AND CONSIDERATION IN RI/FS	FIVE-YEAR REVIEW
	Fish and Wildlife Coordination Act (16 U.S.C. 661)	Applicable	The Fish and Wildlife Coordination Act (16 USC 661 *et. seq*.) requires that, before issuing a federal permit or undertaking any federal action that causes the impoundment (with certain exemptions), diversion, or other control or modification of any body of water, the applicable federal agency must consult with (1) the appropriate state agency exercising jurisdictions over wildlife resources; (2) the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service, within the Department of Interior; and (3) the National Marine Fisheries Service, within the Department of Commerce. The Baird & McGuire Site includes significant wetlands. This requirement is addressed under CWA Section 404.	Consultation occurred as part of the RI/FS process.
State Regulatory Requirements	Massachusetts B Wetlands Protection(310 CMR 10.00)	Applicable	These requirements are promulgated under Wetlands Protection Laws, which regulate dredging, filling, altering, or polluting wetlands. Work within 100 feet of a wetland is also regulated under this requirement. The requirement defines wetlands based on vegetation type and requires that effects on wetlands be mitigated. If alternatives require that work be completed within 100 feet of a defined wetland, these regulations are to be considered. Mitigation of impacts on wetlands is addressed under CWA 404.	To mitigate unavoidable wetland impacts, a Final Site Restoration Plan was developed. The plan required the restoration of forested and scrub/shrub floodplain wetlands, including a small peat bog, and an intermittent stream impacted by the remedial action. The plan also required annual monitoring of the wetlands for at least three years following completion of the restoration efforts. Four years of monitoring data were collected and the final monitoring report was completed in 2002.

TABLE A7-3. POTENTIAL LOCATION-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
BAIRD & MCGUIRE SITE (ALL OPERABLE UNITS), HOLBROOK, MASSACHUSETTS

SITE FEATURE AND AUTHORITY	REQUIREMENTS	ROD STATUS	REQUIREMENT SYNOPSIS AND CONSIDERATION IN RI/FS	FIVE-YEAR REVIEW
	Massachusetts Environmental Policy Act (MEPA) Regulations (301 CMR 11.00)	Formerly Applicable, Now not ARAR	These regulations require that all actions exceeding specified threshold established under MEPA, requiring funding, or requiring a major permit, prepare and file an Environmental Notification Form (ENF). MEPA has determined that the reports generated during Baird & McGuire investigations essentially constitute an Environmental Impact Report. During development of alternatives, impacts to wetlands and floodplains were evaluated.	The CERCLA process generates evaluations and reports that are equivalent to those required by MEPA. To eliminate redundancy, these rules are no longer considered ARAR.
	Department of Environmental Management (DEM) Inland Wetland Orders (302 CMR 6.00)	Applicable	Pursuant to these regulations, DEM has authority to adopt orders restricting activities or uses of inland wetlands in order to preserve and promote public safety, property, wildlife and water resources, and floodplain areas. DEM was apprised of remedial actions which may impact inland wetlands.	To mitigate unavoidable wetland impacts, a Final Site Restoration Plan was developed. The plan required the restoration of forested and scrub/shrub floodplain wetlands, including a small peat bog, and an intermittent stream impacted by the remedial action. The plan also required annual monitoring of the wetlands for at least three years following completion of the restoration efforts. Four years of monitoring data were collected and the final monitoring report was completed in 2002.
Floodplains				
Federal Regulatory Requirements	RCRA Location Standards 40 CFR 264.18(b)	Relevant and Appropriate	RCRA-defined listed or characteristic hazardous waste (40 CFR 261) facility must be designed, constructed, operated, and maintained to prevent washout by 100-year flood.	This ARAR has been met. All hazardous waste facilities are outside of the 100-year flood plain.

TABLE A7-3. POTENTIAL LOCATION-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
BAIRD & MCGUIRE SITE (ALL OPERABLE UNITS), HOLBROOK, MASSACHUSETTS

SITE FEATURE AND AUTHORITY	REQUIREMENTS	ROD STATUS	REQUIREMENT SYNOPSIS AND CONSIDERATION IN RI/FS	FIVE-YEAR REVIEW
	Floodplains Protection Executive Order 11988; Clean Water Act (40 CFR 6.302(b),Appendix A)	Applicable	Federal agencies shall take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values of floodplains. Federal agencies shall also evaluate potential effects of actions in floodplains and ensure consideration of flood hazards and floodplain management. If action is taken in floodplains, alternatives to avoid adverse effects, and minimize potential harm must be taken.	This ARAR has been met. The Site was re-graded according to plan and according to former floodplain delineation.
State Regulatory Requirements	Massachusetts Wetlands Protection (310 CMR 10.57 (2), 10.04)	Applicable	Actions in "bordering land subject to flooding" shall provide compensatory storage for flood storage volume lost as a result of the project, shall not restrict flows so as to cause an increase in flood stage or velocity, and shall not impair its capacity to provide important wildlife habitat functions or alter vernal pool habitat. Actions in "isolated land subject to flooding" shall not result in flood damage because of lateral displacement of water that would otherwise be confined within the area, adverse effects on water supply, adverse effects on the capacity of the area to prevent groundwater pollution, or adverse effects on vernal pool habitat.	This ARAR has been met. The site was re-graded according to plan and according to former floodplain delineation.

TABLE A7-3. POTENTIAL LOCATION-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
BAIRD & MCGUIRE SITE (ALL OPERABLE UNITS), HOLBROOK, MASSACHUSETTS

SITE FEATURE AND AUTHORITY	REQUIREMENTS	ROD STATUS	REQUIREMENT SYNOPSIS AND CONSIDERATION IN RI/FS	FIVE-YEAR REVIEW
	Massachusetts Hazardous Waste Management Rules, Facility Location Regulations (310 CMR 30.700-30.707)	Relevant and Appropriate	No new facility may be located in an area subject to flooding, within the watershed of class A or class SA segment of a surface water body (unless DEP determines these is no feasible alternative), on land overlying an actual planned, or potential public or private drinking water source, or in the flow path of groundwater supplying water to an existing well. Variances and exceptions are noted in the regulations. The impact of the construction and operation of an on-site hazardous waste treatment, storage or disposal facility on the floodplain must be considered during the development of remedial alternatives.	As there was no feasible alternative, the groundwater treatment facility was constructed at this Site. The groundwater treatment facility treats materials that may be classified as RCRA hazardous by toxicity. While these rules may be relevant, they are not appropriate based on the nature of the treatment (remediation).
	Massachusetts Certification for Dredging, Dredged Material Disposal and Filling in Waters (314 CMR 9.00)	Applicable	A water quality certification is required for any activity that involves dredging in a waterway or wetland in Massachusetts that is also subject to a U.S. Army Corps of Engineers CWA Permit, a EPA NPDES permit, or a Massachusetts Wetlands or Waterways Order of Conditions or License. Application must be made to DEP to certify that a proposed project will attain or maintain the Massachusetts Water Quality Standards and minimize adverse impacts to water quality.	To mitigate unavoidable wetland impacts, a Final Site Restoration Plan was developed. The plan required the restoration of forested and scrub/shrub floodplain wetlands, including a small peat bog, and an intermittent stream impacted by the remedial action. The plan also required annual monitoring of the wetlands for at least three years following completion of the restoration efforts. Four years of monitoring data were collected and the final monitoring report was completed in 2002. This work has been completed and substantive requirements have been attained.

TABLE A7-4. POTENTIAL ACTION-SPECIFIC ARARS FOR OPERABLE UNITS 1 AND 2 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	REQUIREMENT SYNOPSIS AND STATUS	ACTION TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
Federal Regulatory Requirements			
RCRA - Generator Standards (40 CFR 261, 265.170 - 265.174, 262.10 - 262.34)	If contaminated substances meet the definition of RCRA-hazardous under 40 CFR 261, RCRA requirements are applicable. If contaminated substances at CERCLA sites are determined to be sufficiently similar to RCRA hazardous wastes, technical aspects of RCRA requirements are considered relevant and appropriate. If removed from their existing locations, hazardous substances should be handled, transported, and treated as RCRA hazardous waste. General generator requirements outline waste characterization, management of containers, packaging, labeling and manifesting. **ROD Status: ARAR** **5-Year Status: Relevant and Appropriate**	Treatment residuals from wastewater treatment will be disposed of according to RCRA. Waste containers will be handled and managed in accordance with RCRA.	These requirements are relevant and appropriate to operations at the groundwater treatment facility. Although the GWTP does not treat RCRA-designated hazardous waste, it does generate a treatment residual that may, at times, meet the definition of a RCRA hazardous waste. Generator requirements are therefore being complied with at the facility.
RCRA - Standards	If a facility operated pursuant to	All facilities on-site will be	These requirements were relevant and appropriate to the

TABLE A7-4. POTENTIAL ACTION-SPECIFIC ARARS FOR OPERABLE UNITS 1 AND 2 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	REQUIREMENT SYNOPSIS AND STATUS	ACTION TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
for Owners and Operators of Permitted Hazardous Waste Facilities (40 CFR 264.10 - 264.18)	RCRA regulations, RCRA requirements are applicable. If contaminated substances at CERCLA sites are determined to be sufficiently similar to RCRA hazardous wastes, technical aspects of RCRA requirements are considered relevant and appropriate. If removed from their existing locations, hazardous substances should be handled, transported, and treated as RCRA hazardous waste. General facility requirements outline general waste analysis, security measures, inspections, and training requirements. **ROD Status: ARAR** **5-Year Status: Not ARAR**	constructed, fenced, posted, and operated in accordance with this requirement. All workers will be properly trained. Process wastes will be evaluated for the characteristics of hazardous wastes to assess further requirements. Treatment residuals from wastewater treatment will be disposed of according to RCRA.	incinerator. The incinerator has been dismantled. The groundwater treatment facility does not treat hazardous waste and does not meet the standards for being sufficiently similar to a hazardous waste treatment facility. These rules are no longer considered applicable, relevant or appropriate.
RCRA - Preparedness and Prevention (40 CFR 265.30-265.37)	This regulation outlines safety equipment and spill control requirements for hazardous waste facilities. Part of the regulation includes a requirement that facilities be designed, maintained, constructed, and operated so that the possibility of an unplanned release which could threaten public health or the environment is minimized. **ROD Status: ARAR** **5-Year Status: Relevant and Appropriate**	Safety and communication equipment will be installed at the Site; local authorities will be familiarized with Site operations.	These requirements are relevant and appropriate to operations at the groundwater treatment facility. Although the GWTP does not treat RCRA-designated hazardous waste, it does generate a treatment residual that may, at times, meet the definition of a RCRA hazardous waste. Generator requirements are therefore being complied with at the facility. Local authorities are familiar with Site operations and safety equipment is in place.

TABLE A7-4. POTENTIAL ACTION-SPECIFIC ARARS FOR OPERABLE UNITS 1 AND 2 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	REQUIREMENT SYNOPSIS AND STATUS	ACTION TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
RCRA - Contingency Plan and Emergency Procedures (40 CFR 265.50-265.56)	This regulation outlines the requirements for emergency procedures to be used following explosions, fires, etc. This regulation also requires that threats to public health and the environment be minimized. **ROD Status: ARAR** **5-Year Status: Relevant and Appropriate**	Plans will be developed and implemented during Site work including installation of monitoring wells, and implementation of Site remedies. Copies of the plans will be kept on-site.	These requirements are relevant and appropriate to operations at the groundwater treatment facility. Although the GWTP does not treat RCRA-designated hazardous waste, it does generate a treatment residual that may, at times, meet the definition of a RCRA hazardous waste. Generator requirements are therefore being complied with at the facility. A contingency plan is available at the Site.
RCRA Subpart F - Groundwater Protection (40 CFR 264.90-264.109)	This regulation details requirements for a groundwater monitoring program to be installed at the Site. **ROD Status: ARAR** **5-Year Status: Relevant and Appropriate**	A groundwater monitoring system must be installed as part of any alternative. During Site characterization, the location and depth of monitoring wells will be evaluated for use in this monitoring program.	Groundwater corrective action rules have changed significantly since the ROD was issued. A groundwater monitoring program has been implemented at the Site. Monthly water level monitoring and quarterly groundwater sampling is performed under this plan. These requirements are relevant and appropriate to the Site due to its former use. Substantive rules are being complied with.
RCRA Subpart G - Closure and Post-Closure (40 CFR 264.110-264.120)	This regulation details specific requirements for closure and post-closure of hazardous waste facilities. **ROD Status: ARAR** **5-Year Status: Not ARAR**	Those parts of the regulations concerned with long-term monitoring and maintenance of the Site will be considered during remedial design. A post-closure plan will be developed.	These requirements were relevant and appropriate to the incinerator. The incinerator has been dismantled. The groundwater treatment facility does not treat hazardous waste and does not meet the standards for being sufficiently similar to a hazardous waste treatment facility. These rules are no longer considered applicable, relevant or appropriate.

TABLE A7-4. POTENTIAL ACTION-SPECIFIC ARARS FOR OPERABLE UNITS 1 AND 2 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	REQUIREMENT SYNOPSIS AND STATUS	ACTION TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
RCRA Subpart K - Surface Impoundments (264.220 - 264.232)	This regulation specifies design, operation and closure requirements for surface impoundments containing hazardous waste. **ROD Status: ARAR** **5-Year Status: Not ARAR**	Design and operating requirements for a liner, leachate collection and removal system and closure are detailed.	There are no waste impoundments on-site. These rules are not applicable, relevant or appropriate.
RCRA Subpart N - Landfills (40 CFR (264.300 - 264.317)	This regulation details design and operating, monitoring, closure and post-closure requirements for hazardous waste landfills. **ROD Status: ARAR** **5-Year Status: Not ARAR**	Landfills must be designed with a liner leachate collection and monitoring, and a specific cap. In addition, long-term monitoring and a post-closure plan must be developed.	As RCRA Subtitle C hazardous wastes were not land disposed on-site, these rules are not applicable, relevant or appropriate.
RCRA Subpart O - Incinerators (40 CFR 264.340 - 264.351)	This regulation details specific requirements for the design, operation and closure of a hazardous waste incinerator. **ROD Status: ARAR** **5-Year Status: Not ARAR**	Performance standards, waste analysis, operating requirements, monitoring, inspection and closure are specified.	These requirements were relevant and appropriate to the incinerator. The incinerator has been dismantled. The groundwater treatment facility does not treat hazardous waste and does not meet the standards for being sufficiently similar to a hazardous waste treatment facility. These rules are no longer considered applicable, relevant or appropriate.

TABLE A7-4. POTENTIAL ACTION-SPECIFIC ARARS FOR OPERABLE UNITS 1 AND 2 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	REQUIREMENT SYNOPSIS AND STATUS	ACTION TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
Clean Water Act - Surface Water Discharges (40 CFR Parts 122, 125)	Any point source discharges must meet NPDES permitting requirements, which include compliance with applicable water quality standards; establishment of a discharge monitoring system; and routine completion of discharge monitoring records. **ROD Status: ARAR** **5-Year Status: Not ARAR**	If groundwater that has been treated by on-site treatment processes is discharged to surface waters on-site, treated groundwater must be in compliance with applicable water quality standards. In addition, a discharge monitoring program must be implemented. Routine discharge monitoring records must be completed.	Treated groundwater is being discharged back to groundwater. No direct, point-source surface water discharge is occurring.
CWA - 40 CFR Part 230	This regulation outlines requirements for discharges of dredged or fill material. Under this requirement no activity that impacts a wetland will be permitted if a practicable alternative that has less impact on the wetland is available. If there is no other practicable alternative, impacts must be mitigated. **ROD Status: ARAR** **5-Year Status: Applicable**	During the identification, screening, and evaluation of alternatives, the effects on wetlands must be evaluated.	A Wetlands Restoration Plan has been implemented at the Site.
CAA - NAAQS for Total Suspended Particulates (40 CFR 129.105, 50)	This regulation specifies maximum primary and secondary 24-hour concentrations for particulate matter. **ROD Status: ARAR** **5-Year Status: Not ARAR**	Fugitive dust emissions from Site excavation activities will be maintained below 260 $\mu g/m^3$ (primary standard) by dust suppressants, if necessary.	These requirements were applicable to the excavation and incineration of debris. These activities are completed. These requirements are only applicable if further land disturbing activities are conducted. None are currently planned.

TABLE A7-4. POTENTIAL ACTION-SPECIFIC ARARS FOR OPERABLE UNITS 1 AND 2 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	REQUIREMENT SYNOPSIS AND STATUS	ACTION TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
DOT Rules for Transportation of Hazardous Materials (49 CFR Parts 107, 171.1-171.5)	This regulation outlines procedures for the packaging, labeling, manifesting, and transportation of hazardous materials. **ROD Status: ARAR** **5-Year Status: Not ARAR**	Contaminated materials shipped off-site will be packaged, manifested, and transported to a licensed off-site disposal facility in compliance with these regulations.	Shipping of hazardous materials has been in compliance. EPA no longer considers DOT rules an ARAR as they are not environmental rules and must always be complied with for all off-site shipments.
State Regulatory Requirements			
Massachusetts Hazardous Waste Regulations (310 CMR 30.000, MGL Ch. 21C)	These regulations provide a comprehensive program for the handling, storage, and recordkeeping at hazardous waste facilities. They implement federal RCRA regulations. **ROD Status: ARAR** **5-Year Status: Relevant and Appropriate**	Because these requirements supplement RCRA hazardous waste regulations, they must also be considered at the Site.	These requirements are relevant and appropriate to operations at the groundwater treatment facility. Although the GWTP does not treat RCRA-designated hazardous waste, it does generate a treatment residual that may, at times, meet the definition of an RCRA hazardous waste. Generator requirements are therefore being complied with at the facility.
Massachusetts Solid Waste Management regulations (310 CMR 19.141)	This regulation requires that notice be recorded in the Registry of Deeds whenever certain types of solid or hazardous waste activity occur on property. **ROD Status: ARAR** **5-Year Status: Applicable**	Notification of remedial actions will be given to the County Registry of Deeds.	This has not been completed to date.

TABLE A7-4. POTENTIAL ACTION-SPECIFIC ARARS FOR OPERABLE UNITS 1 AND 2 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	REQUIREMENT SYNOPSIS AND STATUS	ACTION TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
Massachusetts Wetlands Protection (310 CMR 10.00)	This regulation outlines the requirements necessary to work within 100 feet of a coastal or inland wetland. The act sets forth a public review and decision-making process by which activities affecting waters of the state are to be regulated to contribute to their protection. **ROD Status: ARAR** **5-Year Status: Applicable**	Wetland remediation will comply with the substantive but not the administrative requirements for wetland protection.	To mitigate unavoidable wetland impacts, a Final Site Restoration Plan was developed. The plan required the restoration of forested and scrub/shrub floodplain wetlands, including a small peat bog, and an intermittent stream impacted by the remedial action. The plan also required annual monitoring of the wetlands for at least three years following completion of the restoration efforts. Four years of monitoring data were collected and the final monitoring report was completed in 2002.
Massachusetts Surface Water Discharge Permit Program (314 CMR 2.00-4.00)	This section outlines the requirements for obtaining an NPDES permit in Massachusetts. **ROD Status: ARAR** **5-Year Status: Not ARAR**	Pollutant discharges to surface water must comply with NPDES permit requirements. Permit conditions and standards for different classes of water are specified.	No direct point-source discharges to surface water are occurring.
Certification for Dredging, Dredged Material Disposal, and Filling Waters (314 CMR 9.00, MGL Ch. 21, ss. 26-53)	This regulation is promulgated to establish procedures, criteria, and standards for the water quality certification of dredging and dredged material disposal. **ROD Status: ARAR** **5-Year Status: Applicable**	Applications for proposed dredging/fill work need to be submitted and approved before work commences. Three categories have been established for dredge or fill material based on the chemical constituents. Approved methods for dredging, handling, and disposal options for the three categories must be met.	To mitigate unavoidable wetland impacts, a Final Site Restoration Plan was developed. The plan required the restoration of forested and scrub/shrub floodplain wetlands, including a small peat bog, and an intermittent stream impacted by the remedial action. The plan also required annual monitoring of the wetlands for at least three years following completion of the restoration efforts. Four years of monitoring data were collected and the final monitoring report was completed in 2002.

TABLE A7-5. POTENTIAL CHEMICAL-SPECIFIC CRITERIA, ADVISORIES, AND GUIDANCE FOR OU-3. BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

MEDIA AND AUTHORITY	REQUIREMENT	ROD STATUS	ROD REQUIREMENT SYNOPSIS AND CONSIDERATION IN THE FFS	FIVE-YEAR REVIEW
Surface Water				
Federal Regulatory Requirements	SDWA - MCLs (40 CFR 141.11 - 141.16)	Relevant and Appropriate	Maximum contaminant levels (MCLs) have been promulgated for a number of common organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered relevant and appropriate for surface water bodies used for drinking water. When the risks to public health due to consumption of surface water were assessed, concentrations of contaminants of concern were compared to federal MCLs.	MCLs and non-zero MCLGs have the status of ARARs for surface water downgradient of the Baird & McGuire Site boundaries. Many of the MCLs and MCLGs have changed since ROD completion. MCLs/MCLGs for site contaminants are provided in Table A7-2. Contaminated sediments have been removed and are no longer expected to leach contamination to the Cochato River. This requirement has been attained for OU-3. These criteria are not currently ARAR; however, they may become relevant and appropriate if the Cochato River is considered for a potential public water supply.
	SDWA - MCLGs (40 CFR 141.50 - 141.51)	Relevant and Appropriate	MCLGs are health-based criteria that are used for the protection of drinking water sources as a result of SARA. These unenforceable goals are available for a number of organic and inorganic contaminants. MCLGs will be used when an extraordinary risk is associated with contaminants in the Cochato River surface water and sediment.	MCLs and non-zero MCLGs have the status of ARARs for surface water downgradient of the Baird & McGuire Site boundaries. Zero MCLGs are criteria to be considered. Many of the MCLs and MCLGs have changed since ROD completion. MCLs/MCLGs for site contaminants are provided in Table A7-2. Contaminated sediments have been removed and are no longer expected to leach contamination to the Cochato River. This requirement has been attained for OU-3. It would be relevant and appropriate if the Cochato River is considered for a potential public water supply.

TABLE A7-5. POTENTIAL CHEMICAL-SPECIFIC CRITERIA, ADVISORIES, AND GUIDANCE FOR OU-3. BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

MEDIA AND AUTHORITY	REQUIREMENT	ROD STATUS	ROD REQUIREMENT SYNOPSIS AND CONSIDERATION IN THE FFS	FIVE-YEAR REVIEW
	Federal Ambient Water Quality Criteria (AWQC) under the Clean Water Act	Relevant and Appropriate	Remedial actions involving contaminated surface water or groundwater must consider the uses of the water and the circumstances of the release or threatened release; this determines the relevance and appropriateness. This requirement will be considered when determining clean-up levels or potential discharge limits.	CERCLA Sec. 121 (d)(2)(A) Specifically states that remedial actions shall at least attain federal AWQC established under the Clean Water Act if they are relevant and appropriate. These criteria are not currently ARAR; however, they may become relevant and appropriate if the Cochato River is considered for a potential public water supply. Current AWQC are listed in Table A7-6.
State Regulatory Requirements	Massachusetts Drinking Water Standards (310 CMR 22.00)	Relevant and Appropriate	Massachusetts adopted the federal SDWA Maximum Contaminant Levels (MCLs) as its drinking water standards. MCLs regulate the concentration of contaminants in public drinking water supplies. When risks to public health due to consumption of surface water were assessed, concentrations of contaminants of concern were compared to Massachusetts MCLs.	The Site is located in a designated Mass. Wellhead Protection Area. Drinking water standards are applicable to drinking water sources surrounding the Baird & McGuire Site. MMCLs for site contaminants are provided in Table A7-2. Contaminated sediments have been removed and are no longer expected to leach contamination to the Cochato River. This requirement has been attained for OU-3. It does, however, remain relevant and appropriate.
	Massachusetts Surface Water Quality Standards (314 CMR 4.00)	Applicable	Surface water quality standards are specified for the major surface water bodies of the Commonwealth. Surface waters were classified with respect to designated uses. Each class of surface water has a criteria associated with it (e.g., dissolved oxygen, temperature, pH, total coliform). The Cochato River is designated as a Class B River. Actions will take into account the designated use(s) and will comply with	These regulations classify the surface waters of the Commonwealth according to the uses of those waters. The wetland has a Class A waterway classification. Class A waters are designated as habitat for fish, other aquatic and wildlife, and for primary and secondary contact recreation. The state surface water minimum criteria for Class A waters are consistent with federal AWQC. These rules are applicable to the Cochato River and unnamed brook.

TABLE A7-5. POTENTIAL CHEMICAL-SPECIFIC CRITERIA, ADVISORIES, AND GUIDANCE FOR OU-3. BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

MEDIA AND AUTHORITY	REQUIREMENT	ROD STATUS	ROD REQUIREMENT SYNOPSIS AND CONSIDERATION IN THE FFS	FIVE-YEAR REVIEW
			specified water quality standards.	
Air				
State Regulatory Requirements	Massachusetts Air Pollution Control Regulations (310 CMR 6.04)	Relevant and Appropriate	Massachusetts has promulgated ambient air quality standards for six pollutants (e.g., sulfur oxides, particulate matter, carbon, ozone, nitrogen, and lead). During excavation activities these standards will be complied with.	310 CMR 6.00 provide ambient air quality standards for the Commonwealth, standards for dust are contained in 310 CMR 7.09, and 310 CMR 7.08 provides incinerator standards. These standards were used in establishing discharge limits from the incinerator. The incinerator has been dismantled and these requirements are no longer applicable, relevant or appropriate. Should excavation occur in the future, dust control standards would need to be reconsidered.
Federal Criteria, Advisories, and Guidance	EPA Office of Water Guidance, Water-Related Fate of 129 Priority Pollutants (1979).	To Be Considered	This guidance manual gives transport and fate information for 129 priority pollutants. These criteria were considered during the risk assessment.	There is no change from the ROD presentation for this ARAR.
State Criteria, Advisories and Guidance	Massachusetts Guidance on Allowable Ambient Levels (AALs), cited in Chemical Health Effects Assessment Methodology and Methodology to Derive Allowable Ambient Levels.	To Be Considered	This guidance evaluates acute and chronic toxicity and sets draft AALs for 106 chemicals. Final AALs will be issued in 1989. These levels will be considered when evaluating excavation and treatment technologies that have potential hazardous air emissions.	These requirements are no longer to be considered for this operable unit. The incinerator has been dismantled.

TABLE A7-5. POTENTIAL CHEMICAL-SPECIFIC CRITERIA, ADVISORIES, AND GUIDANCE FOR OU-3. BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

MEDIA AND AUTHORITY	REQUIREMENT	ROD STATUS	ROD REQUIREMENT SYNOPSIS AND CONSIDERATION IN THE FFS	FIVE-YEAR REVIEW
	Draft, DEQE, 1987.			
Soil/Sediment				
Federal Criteria, Advisories and Guidance	EPA Future Interim Sediment Criteria Values for Nonpolar Hydrophobic Organic Contaminants (SCD No. 17; May 1988)	To Be Considered	These criteria have been recently developed by EPA for 16 organic compounds. These criteria represent levels protective of aquatic life. These criteria were used to generate sediment quality criteria values during the risk assessment.	These criteria were never finalized and are no longer used, having been replaced by other, more appropriate criteria such as EPA *Ecotox Thresholds and Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario*. These criteria are no longer to be considered. See Table A7-6 for the replacement criteria which are to be considered during risk evaluation of sediment.
State Regulatory Requirements	Soil Standards for S-3 (310 CMR 40.0975(6)(c)	Applicable	The MCP establishes requirements and procedures for the discovery, notification, assessment of, and responses to, releases and threats of release of oil or hazardous materials. Pursuant to MCL c21E and the MCP, the Commonwealth of Massachusetts publishes a list of confirmed oil or hazardous material to be investigated. Because the Baird & McGuire Site is a confirmed state hazardous material Site and listed on the National Priorities List, joint federal and state jurisdiction exists. Cooperative agreements and contracts with the federal government shall incorporate, to the extent possible, the deadlines and specifications of MCL c21E and the MCP.	The MCP includes a specific reference to remediation at CERCLA sites (40.0111) where it is stated that the MCP does not apply to sites adequately regulated under CERCLA, provided that DEP concurs with the ROD and that CERCLA addresses all contaminants. DEP concurred with the ROD for this site. Therefore, these rules are no longer considered ARAR.

TABLE A7-6. NUMERICAL CHEMICAL-SPECIFIC ARARS CRITERIA, ADVISORIES, AND GUIDANCE FOR CONTAMINANTS OF CONCERN FOR OU-3 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

CHEMICAL OF CONCERN	Surface Water		Sediment	
	Water Quality Guideline (µg/l)	Source[1]	Sediment Quality Guideline (mg/kg)	Source[2]
Organic Compounds:				
Acenaphthalene	--	--	0.044	ER-L
Benzene	46	ET Tier II	0.057	SQB
Chlordane	0.0043	AWQC	0.00324	TEC
DDT (4,4'-)	0.001	AWQC	0.00416	TEC
Di(2-ethylhexyl)phthalate (DEHP)	32	ET Tier II	--	--
Dibenzofuran	20	ET Tier II	2	SQB
Dichloroethylene, 1,2-trans	590	SCV	--	--
Dichloromethane (Methylene chloride)	2200	SCV	--	--
Dieldrin	0.056	AWQC	0.0019	TEC
Dimethylphenol, 2,4-	---	--	--	--
Ethylbenzene	290	ET Tier II	3.6	SQC
Fluorene	3.9	ET Tier II	0.0774	TEC
Methylnaphthalene, 2-	330	Region V	0.070	ER-L
Methylphenol, 4-	--	--	--	--
Monochlorobenzene	130	ET Tier II	0.82	SQB
Naphthalene	24	ET Tier II	0.176	TEC
PAHs[(3)]	--	--	1.61	TEC
Toluene	130	ET Tier II	0.67	SQB
Trichloroethane, 1,1,1-	62	ET Tier II	0.17	SQB
Trichloroethylene (TCE)	350	ET Tier II	1.6	SQB
Xylenes (total)	13	SCV	0.025 [4]	SQB
Inorganics:				
Arsenic	150	AWQC	9.79	TEC
Lead	2.5 [5]	AWQC	35.8	TEC

NOTES:

[1] Current surface water quality guidelines were selected based on the following hierarchy:

1) EPA National Recommended Water Quality Criteria (AWQC) (EPA, 2013)

2) EPA Ecotox Thresholds (ET TIER II) for Surface Water (EPA, 1996)

3) Secondary Chronic Values (SCVs) for aquatic biota developed by Oak Ridge National Laboratory (Suter and Tsao, 1996)

4) Region V screening levels. US EPA Region V Ecological Screening Levels (EPA, 2003) at http://www.epa.gov/reg5rcra/ca/edql.htm

[2] Current sediment quality guidelines were selected based on the following hierarchy:

1) Consensus-based Threshold Effects Concentrations (TEC) for sediments (MacDonald et al., 2000)

2) EPA Ecotox Thresholds for Sediment (EPA, 1996). Citation for both EPA Sediment Quality benchmarks by equilibrium partitioning (SQB) or EPA Sediment Quality Criteria (SQC).

3) National Oceanic and Atmospheric Administration (NOAA) Effects Range -Low (ER-L) for sediments (Long & Morgan, 1990; Long *et al*. 1995; *respectively cited in* Jones, Suter & Hull, 1997)

[3] Polycyclic Aromatic Hydrocarbons. Sediment quality guidelines are for total PAH

[4] Sediment quality criteria for Xylenes is for m-Xylene

[5] Hardness dependent

TABLE A7-7. POTENTIAL ACTION-SPECIFIC ARARs FOR OU-3
BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	ROD REQUIREMENT SYNOPIS AND STATUS	ACTION TO BE TAKEN TO ATTAIN ARAR	FIVE-YEAR REVIEW
Federal Regulatory Requirements			
RCRA - Generator Standards (40 CFR 261, 265.170 - 265.174, 262.10 - 262.34)	If contaminated substances meet the definition of RCRA-hazardous under 40 CFR 261, RCRA requirements are applicable. If contaminated substances at CERCLA sites are determined to be sufficiently similar to RCRA hazardous wastes, technical aspects of RCRA requirements are considered relevant and appropriate. If removed from their existing location, hazardous substances should be handled, transported, and treated as RCRA hazardous waste. General generator requirements outline waste characterization, management of containers, packaging, labeling and manifesting. **ROD Status: Applicable** **5-Year Status: Not ARAR**	Treatment residuals from wastewater treatment will be disposed of according to RCRA. Waste containers will be handled and managed in accordance with RCRA.	These requirements were relevant and appropriate to the incinerator. Sediments have been remediated and may no longer be considered a hazardous material. These rules are no longer considered applicable, relevant or appropriate to OU-3.
RCRA Land Disposal Restrictions (40 CFR 268)	If contaminated substances that meet the definition of RCRA-hazardous, or are sufficiently similar to RCRA hazardous wastes, and are land disposed, RCRA LDR rules are ARAR. **ROD Status: Applicable** **5-Year Status: Not ARAR**	RCRA land disposal requirements, including treatment standards and landfill requirements, must be followed.	No materials meeting the definition of RCRA-hazardous under 40 CFR Part 261 were land disposed on site. These rules are not applicable or appropriate.

TABLE A7-7. POTENTIAL ACTION-SPECIFIC ARARs FOR OU-3
BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	ROD REQUIREMENT SYNOPIS AND STATUS	ACTION TO BE TAKEN TO ATTAIN ARAR	FIVE-YEAR REVIEW
RCRA - Standards for Owners and Operators of Permitted Hazardous Waste Facilities (40 CFR 264.10 - 264.18)	If a facility operated pursuant to RCRA regulations, RCRA requirements are applicable. If contaminated substances at CERCLA sites are determined to be sufficiently similar to RCRA hazardous wastes, technical aspects of RCRA requirements are considered relevant and appropriate. If removed from their existing location, hazardous substances should be handled, transported, and treated as RCRA hazardous waste. General generator requirements outline general waste analysis, security measures, inspections, and training requirements. **ROD Status: Applicable** **5-Year Status: Not ARAR**	All facilities on-site will be constructed, fenced, posted, and operated in accordance with this requirement. All workers will be properly trained. Process wastes will be evaluated for the characteristics of hazardous wastes to assess further requirements. Treatment residuals from wastewater treatment will be disposed of according to RCRA.	These requirements were relevant and appropriate to the incinerator. The incinerator has been dismantled. These rules are no longer considered applicable, relevant or appropriate to OU-3.
Clean Air Act (CAA) Regulations, NAAQs for Particulates (40 CFR 50)	Site remediation activities, including excavation and treatment, must comply with NAAQS. The most relevant pollutant standard at remedial response sites is for particulate matter. **ROD Status: ARAR** **5-Year Status: Not ARAR**	This regulation specifies maximum primary and secondary 24-hour concentrations for fugitive dust. Fugitive dust emissions from Site activities must be maintained below 260 ug/m^3 (primary standard) by dust suppressants if necessary.	These requirements were applicable to excavation and incineration activities, which are now complete. No further land disturbing activities are planned, thus these rules are no longer ARAR.
OSHA General	These standards specify the type of safety	Worker safety rules are to be adhered	OSHA requirements have been followed.

TABLE A7-7. POTENTIAL ACTION-SPECIFIC ARARs FOR OU-3
BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	ROD REQUIREMENT SYNOPIS AND STATUS	ACTION TO BE TAKEN TO ATTAIN ARAR	FIVE-YEAR REVIEW
Industry Standards, Recordkeeping and Reporting, and Standards for Hazardous Waste Site Operations 1926, 1904, 1910 (29 CFR)	equipment and other worker safety procedures to be followed during all remedial activities. **ROD Status: Applicable** **5-Year Status: Not ARAR**	to an all workplace risks are to be communicated to employees.	EPA no longer considers OSHA rules ARAR as they are worker safety rules that must always be complied with.
State Regulatory Requirements			
Massachusetts Hazardous Waste Management Rules (MHWMR) (310 CMR 30.00)	Massachusetts is authorized by EPA to administer substantial portions of the federal RCRA program. If a facility operated pursuant to RCRA regulations, RCRA requirements are applicable. Similar to the RCRA regulations, these rules will be considered relevant and appropriate at CERCLA sites where the hazardous contaminants have been determined to be sufficiently similar to the designated hazardous wastes, and proposed remedial actions are similar to hazardous waste treatment, storage, and/or disposal. **ROD Status: Applicable** **5-Year Status: Not ARAR for OU-3**	Because these regulations supplement RCRA hazardous waste regulations, they must also be considered at the Site.	These requirements are relevant and appropriate to operations at the groundwater treatment facility (OU-1). These rules are no longer considered applicable to OU-3.
Massachusetts Contingency Plan	The MCP establishes requirements and procedures for the discovery, notification,	The revised MCP sets applicable standards in soil. The MCP method 1	The MCP includes a specific reference to remediation at CERCLA sites (40.0111)

TABLE A7-7. POTENTIAL ACTION-SPECIFIC ARARs FOR OU-3
BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	ROD REQUIREMENT SYNOPIS AND STATUS	ACTION TO BE TAKEN TO ATTAIN ARAR	FIVE-YEAR REVIEW
(MCP) (310 CMR 40.0000)	assessment of, and response to, releases and threats of release of oil or hazardous materials. Pursuant to MCL c. 21E and the MCP, the Commonwealth of Massachusetts publishes a list of confirmed oil or hazardous material to be investigated. Because the Baird & McGuire Site is a confirmed state hazardous material Site and listed on the National Priorities List, joint federal and state jurisdiction exists. Cooperative agreements and contracts with the federal government shall incorporate, to the extent possible, the deadlines and specifications of MGL c21E and the MCP. **ROD Status: Applicable** **5-Year Status: Not ARAR**	soil standards consider both the potential risk of harm resulting from direct exposure to the contaminated soil and potential impacts at the Site via leaching. On-site soils are classified according to the frequency and intensity to which human contact may occur.	where it is stated that the MCP does not apply to sites adequately regulated under CERCLA, provided that DEP concurs with the ROD and that CERCLA addresses all contaminants. DEP concurred with the ROD for this site, therefore, these rules are no longer considered ARARs.
Massachusetts Air Pollution Control Regulations (310 CMR 6.00 through 8.00)	These regulations outline the standards and requirements for air pollution control in Massachusetts. Specific regulations generally considered ARARs at CERCLA sites include the particulate matter standard (for excavation and treatment activities), and plan approval and emission limitations (for treatment activities, such as incineration, generating pollutant emissions). **ROD Status: Applicable** **5-Year Status: Not ARAR**	310 CMR 6.00 provide ambient air quality standards for the Commonwealth. 310 CMR 7.09 provides dust standards and 310 CMR 7.08 provides incinerator standards for establishing discharge limits.	These requirements were applicable to the excavation and incineration of debris. These activities are completed, and no further land disturbing activities are planned. There are no air emission sources on site. These rules are no longer ARAR.