SECOND
FIVE-YEAR REVIEW REPORT FOR
ATLAS TACK SUPERFUND SITE
BRISTOL COUNTY, MASSACHUSETTS

Prepared by

U.S. Environmental Protection Agency
Region 1
BOSTON, MA

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09/22/15

Date

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EXECUTIVE SUMMARY

This is the Second Five-Year Review (FYR) for the Atlas Tack Superfund (Site) located at 83 Pleasant Street in Fairhaven, Bristol 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 9/23/2010.

The Site is approximately 48 acres and is located about 0.5 mile from Fairhaven Center **(Figure 1)** in a predominantly residential area. It is bounded by a bicycle path, residences and a few commercial/light industrial businesses to the north, a tidal marsh to the east and south, a former elementary school about 200 feet to the northwest and residences immediately to the south. The Site includes the entire Atlas Tack Corp. (Atlas Tack) property, adjacent property to the owned by Hathaway-Braley Wharf Company, Inc., and portions of Boys Creek and the adjacent saltwater tidal marsh extending to Buzzards Bay. A hurricane dike (also referred to as "barrier"), built in the early 1960s, runs northeasterly through the marsh area of the Site.

The Atlas Tack facility was built in 1901 and manufactured cut and wire tacks, steel nails, and similar items until 1985. From the 1940s until the late 1970s or 1980s, wastes containing cyanide and heavy metals were discharged into an unlined acid neutralizing lagoon located approximately 200 feet east of the manufacturing building and adjacent to a saltwater tidal marsh in Buzzards Bay Estuary. Process wastes containing acids, metals such as copper and nickel and solvents were discharged into drains in the floor of the main building. Some of these chemicals have permeated the floors and timbers of the building and have migrated to adjacent soils and groundwater. Other contaminated areas at the site included a filled wetland, a former dump, and other chemical spills.

The remedy for the Site included demolition of former manufacturing facility buildings, excavation and off- site disposal of approximately 55,000 cubic yards of contaminated soil and sediment, monitored natural attenuation of groundwater, long term (30 years) monitoring of soil, sediment, surface water and vegetation, site restoration, and establishment of institutional controls. All components of the remedy were performed in accordance with the plans and specifications approved by EPA. The Massachusetts Department of Environmental Protection (MassDEP) is currently working with the property owner to close an existing 100,000-gallon No. 6 petroleum fuel oil underground storage tank. Closure of this tank is excluded from CERCLA and is not a part of the selected remedy for the Site.

The assessment of this FYR found that the remedy was constructed in accordance with the requirements of the Record of Decision and Explanation of Significant Difference (ESD) for the Site. The remedy is functioning as designed. It is expected to be protective of both human health and the environment when groundwater cleanup goals are achieved through monitored natural attenuation.

In order for the remedy to be protective in the long-term, institutional controls are required.

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LIST OF ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
AWQC	Ambient Water Quality Criteria
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COCs	Contaminants of Concern
CWA	Clean Water Act
CY	Cubic yards
DOD	Department of Defense
DOJ	Department of Justice
ELAP	Environmental Laboratory Accredited Program
EPA	United States Environmental Protection Agency
ER-M Q	Effect Range-Median Quotients
ERE	[Grant of] Environmental Restriction and Easement
ESD	Explanation of Significant Difference
FS	Feasibility Study
FYR	Five-Year Review
IC	Institutional Control
IGCL	Interim groundwater clean-up levels
LTGM	Long-Term Groundwater Monitoring
LTRA	Long-Term Response Action
MA UCL	Massachusetts Contingency Plan Upper Concentration Limit
MassDEP	Massachusetts Department of Environmental Protection
MCL	Maximum Contaminant Level
MCP	Massachusetts Contingency Plan
mg/kg	milligrams per kilogram
MNA	Monitored Natural Attenuation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NOB	North of Hurricane Barrier
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
NRPL	Notice of Responsibility and Potential Liability
NRWQC	National Recommended Water Quality Criteria
O&M	Operation and Maintenance
PAH	Polycyclic Aromatic Hydrocarbon
PQL	Practical Quantitation Limits
PRPs	Potentially Responsible Parties
RA	Remedial Action
RAO	Remedial Action Objective
RD	Remedial Design
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose (non-cancer)
RGP	Remediation General Permit
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SOB	South of Hurricane Barrier

SWDA	Solid Waste Debris Area
SVOC	Semi-Volatile Organic Compound
TBC	To be considered
UAO	Unilateral Administrative Order
µg/L (ug/L)	micrograms per liter
USACE	United States Army Corps of Engineers
VI	Vapor Intrusion
VOC	Volatile Organic Compound

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Atlas Tack Corporation Superfund Site		
EPA ID: MAD001026319		
Region: 1	**State:** MA	**City/County:** Fairhaven, Bristol County

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA
Author name (Federal or State Project Manager): Kimberly White
Author affiliation: USEPA, Region 1
Review period: 5/1/2010 - 4/30/2015
Date of site inspection: 10/23/201
Type of review: Statutory
Review number: 2
Triggering action date: 9/23/2010
Due date *(five years after triggering action date)*: 9/23/2015

Five-Year Review Summary Form (continued)

Issues and Recommendations Identified in the Five-Year Review:

OU(s): *Sitewide*	**Issue Category: Institutional Controls**			
	Issue: Institutional Controls have not been implemented			
	Recommendation: Continue to work with PRP to complete implementation of institutional controls.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	5/30/2016

Sitewide Protectiveness Statement

Protectiveness Determination: Short-term Protective

Addendum Due Date (if applicable):

The remedy at the Site is currently protects human health and the environment because soil and sediment at the Site no longer present an unacceptable risk to environmental receptors via ingestion of contaminated vegetation or biota, or incidental ingestion of contaminated soil and sediment. Additionally, court ordered restrictions limit the current Site property owners' uses of the property to those that are consistent with the risk assessment, and specifically prohibit withdrawal, consumption, exposure or utilization of groundwater for any purpose and cultivation of plants or crops for human consumption. Similarly, activities such as excavation and drilling that might disturb the soil are limited by the order. In order for the remedy to be protective in the long-term, institutional controls enforceable against all future Site property owners must be put in place to restrict certain land and groundwater uses

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 Atlas Tack Corporation Superfund Site in Fairhaven, Bristol County, Massachusetts. EPA is the lead agency for developing and implementing the remedy for the Site. Massachusetts Department of Environmental Protection (MassDEP), as the support agency representing the State of Massachusetts, has reviewed all supporting documentation and provided input to EPA during the FYR process.

This is the second FYR for the Atlas Tack Corporation 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 one Operable Unit, which is addressed in this FYR. The remedy was completed in accordance with the requirements of the March 2000 Record of Decision for the Site, as modified by the September 2009 Explanation of Significant Difference (ESD).

The major contaminants of concern (COC) at the Site include cyanide and toluene in groundwater and volatile organic compounds (VOCs), including toluene and ethyl benzene; heavy metals, including chromium, cadmium, lead, zinc and nickel; pesticides; polychlorinated biphenyls (PCBs); and polycyclic aromatic hydrocarbons (PAHs) in Site soils and sediments.

The major components of the selected remedy included:

- Excavation, treatment, and off-site disposal of contaminated soil, debris and sediment;
- Demolition of contaminated buildings;
- Marsh mitigation, and restoration of the affected areas; and
- Implementation of institutional controls.

In addition, the long-term components of the remedy include:

- Monitoring of the Site groundwater and surface waters; and
- Monitoring of the wetland development.

Further information about the site history can be found in Appendix A.

Operation and Maintenance and Long Term Remedial Action (LTRA)

The primary cleanup of the Site took place during the construction phase of the RA (i.e., excavation and off-site disposal of contaminated soil and sediment). As the source of groundwater contamination in soil and sediment has been removed, the other remaining component of the cleanup is monitored natural attenuation (MNA) for groundwater. Following the completion of construction in September 2007, operation and maintenance activities were performed by EPA until the remedy was determined to be Operational and Functional (O&F) and the MassDEP assumed responsibility for O&M for the source control component of the remedy (monitoring of restoration areas) in September 2008. Long-Term Remedial Action includes groundwater monitoring, which will be conducted by EPA until 2018. Following that, the Massachusetts Department of Environmental Protection will assume responsibility for groundwater monitoring also.

The primary O&M activities include:

- Groundwater monitoring.
- Surface water and sediment sampling to monitor the effectiveness of the source removal remedy, and in conjunction with the results of the groundwater monitoring program to assess the effectiveness of the natural attenuation remedy. Future sampling will occur every five years for a period of thirty years.
- Periodic inspections of the perimeter fence and gates for integrity, and of ditches, swales, dikes, spillways, slopes and banks for hydrologic conditions, erosion and sedimentation.
- An “adaptive management program,” including qualitative assessments during the growing season, quantitative vegetative monitoring, and invasive species control.

As previously noted, final restoration and planting of restored wetlands and adjacent areas was completed at the end of September 2007. The O&M plan describes an “adaptive management program,” which includes monthly assessments/monitoring of vegetation, invasive species, wildlife use, photo documentation, and inspection of the perimeter fence and gates.

II. PROGRESS SINCE THE LAST REVIEW

This section presents the protectiveness finding from the last five year review, follow-up requirements on the issues found in the 2010 FYR and the remedy implementation activities that have taken place from 2010 – 2014, including institutional control measures and operation and maintenance activities. **Table 1** presents the 2010 protectiveness determination, **Table 2** presents the recommendations and follow-up actions, and **Table 3** presents a summary of the institutional controls.

TABLE 1: PROTECTIVENESS DETERMINATIONS/STATEMENTS FROM THE 2010 FYR

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Short-term Protective	The remedy at the Site is expected to be protective of human health and the environment upon completion of the monitored natural attenuation of the groundwater. In the interim, soil and sediment at the Site no longer present an unacceptable risk to environmental receptors via ingestion of contaminated vegetation or biota, or incidental ingestion of contaminated soil and sediment. In addition, the soil will no longer act as a source of surface water and sediment contamination in Boys Creek, thereby providing suitable habitat for environmental receptors. Also, as the contaminated soil and sediment in the Commercial Area and Boys Creek have been remediated, they no longer present an unacceptable risk to human health. Additionally, court ordered restrictions limit the current Site property owners' uses of the property to those that are consistent with the risk assessment, and specifically prohibit withdrawal, consumption, exposure or utilization of groundwater for any purpose and cultivation of plants or crops for human consumption. Similarly, activities such as excavation and drilling that might disturb the soil are limited by the order. In order for the remedy to be protective in the long-term, certain follow-up actions need to be completed. Institutional Controls enforceable against all future Site property owners must be put in place to restrict certain land and groundwater uses. EPA must also evaluate potential adjustments to the surface water monitoring program, complete post-remediation toxicity testing, and perform additional evaluation of any potential vapor intrusion risks to future site users.

TABLE 2: STATUS OF RECOMMENDATIONS FROM THE 2010 FYR

OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Over sight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
Site wide	1. Permanent institutional controls are not in place.	Establish benchmark schedule (non-public enforcement document) for implementations of proposed grant of easement.	EPA/State	EPA	4/30/2011	Ongoing	2/12/2015
Site wide	2. Characterization of VOCs in groundwater is not sufficient to rule out the possibility of future vapor intrusion.	Sample and analyze for total VOCs in groundwater Fall 2010 and Spring 2011.	EPA	EPA	9/30/2011	Completed	4/3/2014
Site wide	3. Some analytical methods for surface water sampling are not sufficiently sensitive to achieve NRWQC levels.	Investigate practicability and cost efficiency of alternative analytical methods for cyanide and nine pesticides.	EPA/State	EPA	9/30/2011	Completed	5/4/2012
Site wide	4. Post-remediation toxicity testing has not been conducted.	Conduct post-remediation toxicity testing.	EPA	EPA	4/30/2011	Completed	10/26/2011

Actions taken address the issues identified in Table 2 are summarized below:

Findings on Issue #1: In consultation with counsel from the Department of Justice, EPA developed a benchmark schedule for the implementation of the institutional controls at two properties within the site one owned by Atlas Tack Corporation (Atlas Tack) and the other owned by the Hathaway-Braley Wharf Company, Inc. (Hathaway-Braley or H-B). Currently, the instrument by which an access easement and environmental restrictions will be placed on the Site will be a Grant of Environmental Restriction and Easement (ERE). The Hathaway-Braley ERE is currently pending final approval by MassDEP. ICs for both properties are expected to be completed and recorded as soon as possible, and in any event before the end of 2016. If steady progress toward IC implementation is not achieved, relative to the benchmark schedule, EPA will evaluate available enforcement options/authorities to obtain compliance with the IC implementation provisions of the operative Consent Decrees.

Findings on Issue #2: In order to complete the vapor intrusion (VI) screening for the site, additional VOC data was collected in order to have a minimum of three years of useful data and ensure that the detection limits were significantly low enough to complete the evaluation. During the April 2011 sampling event groundwater samples were analyzed for a full list of VOCs by Method 8260 and SVOCs by Method 8011 and in October 2011, in addition to these parameter, SVOCs by Method 8270 SIM was also analyzed. In April 2012 and October 2012, only VOCs by Method 8260 were analyzed. VOC data previously collected from 2007 through 2010 but not reported was also provided by the EPA contractor. **Appendix B** shows the VOC sampling results used for the VI analysis along with an explanatory memorandum. The VI screening supports a determination that the vapor intrusion pathway is unlikely to pose an unacceptable risk and that VI is not a pathway of concern at this time.

Findings on Issue #3: An investigation was performed to determine if there are EPA accepted aqueous analytical methods that are both practicable and cost efficient for cyanide and a select list of nine specific pesticides (4,4-DDT, Chlordane, Dieldrin, Endosulfan I, Endosulfan II, Endrin, Heptachlor, Heptachlor Epoxide, and Toxapheneto) that support the surface water monitoring program because current aqueous practical quantitation limits (PQL) of the analytical methods selected were higher than the established monitoring criteria, freshwater and saltwater chronic National Recommended Water Quality Criteria (NRWQC). Based on the investigation completed in May 2012 by the USACE contractor, Weston Solutions, it was determined that although a lower detection limit could be achieved, it would not be cost effective and would also not be practicable because the services were provided by a laboratory not certified Department of Defense (DoD) Environmental Laboratory Accredited Program (ELAP). The results of the investigation are presented in the **Appendix B**. At this time, no further action is needed on this issue.

Findings on Issue #4: Post remediation toxicity testing was conducted in April and October 2011. Samples were collected from sediments in Boys Creek, marsh locations and in the freshwater wetlands. Sediment analytical monitoring results indicated that no site COCs were detected at concentrations in excess of sediment monitoring criteria at any of the sampling locations. In addition, no sediment samples indicate toxicity based on the fact that all calculated ER-MQ values were below 1. Sediment monitoring locations and analytical results along with calculated ER-MQ values are presented in **Figures 2-1 through 2-4 in Appendix B**. Although no sediment samples indicated toxicity based upon the calculated ER-MQ values being less than 1.0, freshwater and saltwater sediment samples were analyzed for toxicity during the April and October 2011 monitoring event. The freshwater monitoring sediment samples were analyzed for 10-day survival and growth of *Hyalella azteca* and *Chironomus dilutus*, by Method 100.1 and 100.2, respectively. The saltwater monitoring sediment samples were analyzed for 10-day survival of *Leptocheirus plumulosus* by Method LP-10. **Table 4-6 and Table 4-7 in Appendix B** provide a summary of the sediment toxicity results in 2011. Greater than 90% of each species tested, survived and corroborates the ER-MQ values calculated to be less than 1.0 indicating no toxicity in the sediments that were analyzed. Additional information on the sampling event can be found in the *Final Long-Term Groundwater Monitoring, 2011 Annual Summary Report* (Weston, 2012b).

Remedy Implementation Activities

As part of the selected remedy, institutional controls are required to limit uses of the Site properties by all future owners to those uses that are consistent with the risk assessment for properties on the site; below is a summary of the planned ICs.

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 to be Implemented
Groundwater and soils	Yes	Yes	Atlas Tack property	Prohibit withdrawal, consumption, exposure or utilization of groundwater for any purpose and cultivation of plants or crops for human consumption. Restrictions on activities such as excavation and drilling that might disturb the soil	To be determined - planned completion: August 2016
Groundwater and soils	Yes	Yes	Hathaway-Braley property	Prohibit withdrawal, consumption, exposure or utilization of groundwater for any purpose and cultivation of plants or crops for human consumption. Restrictions on activities such as excavation and drilling that might disturb the soil	Grant of Environmental Restriction and Easement (ERE) - planned completion: December 2015

Operation and Maintenance Activities

Since the completion of the last five-year review in September 2010, EPA continues to conduct Long-Term Groundwater Monitoring (LTGM) associated with monitored natural attenuation portion of the remedy. LTGM was initiated in 2008 and samples were initially collected on a quarterly basis at 15 monitoring well locations shown on **Figure 2 in Appendix C** and then continued semi-annually from 2009 through 2012. In 2013, as required by the operation and maintenance plans for the Site, the monitoring frequency was reduced to annually and samples were collected in the spring or fall months. Groundwater sampling results are compared to interim groundwater cleanup levels (IGCLs) established in the ROD, which are ecologically based.

In addition, the ROD requires that surface water be monitored and for the results to be compared to the NRWQCs. In cases where NRWQC guidance was not available for a constituent, the following published criteria were evaluated as potential Monitoring Criteria (presented below in hierarchical order):

- Remediation General Permit (RGP) Appendix III Effluent Limitations
- RGP Appendix VI Minimum Levels and Test Methods
- MassDEP Surface Water Environmental Toxicity Values (Chronic) found in 310 Code of Massachusetts Regulations 40.1516(1)
- MCP Method 1 GW-3 Groundwater Standards

Although these are not performance standards, comparison of monitoring results to these criteria enables progress of the natural attenuation process to be evaluated and measured against a standard reference. In 2011, the responsibility for surface water monitoring was transferred from EPA to the state, MassDEP. As part of the operation and maintenance plan, MassDEP also collects sediment samples during the surface water sampling events, once every five years. Surface water and sediment monitoring will be completed by MassDEP during Years 5 (2012), 10 (2017), 15 (2022), 20 (2027), 25 (2032), and 30 (2037) as depicted on **Figure 3 in Appendix C**.

MassDEP also continued to conduct qualitative and quantitative monitoring of the freshwater wetland and the salt water marsh. The qualitative assessments were conducted during the growing season (May through August) to assess the restoration area (overall site conditions, plant condition and survival, cover, potential animal grazing, photographic documentation) and the need for additional controls (e.g., management of invasive species), if necessary. The quantitative assessments were conducted during or soon after the peak growing season (late July - early September) at wetland monitoring stations established in each restored habitat type and reference tidal marsh areas located in undisturbed areas of Boys Creek South of the Barrier (SOB). Combined, these monitoring efforts help identify any potential problems so that adaptive measures can be implemented to improve restoration performance in subsequent years.

MassDEP O&M costs range between thirty- and forty- thousand dollars per year since 2010. The average cost for the groundwater O&M from 2010 to 2013 was approximately seventy-thousand dollars per year, but in 2013 and subsequent years cost were approximately forty-five thousand dollars per year.

III. FIVE-YEAR REVIEW PROCESS

Administrative Components

The PRP was notified of the initiation of the five-year review on 1/20/2015. The Atlas Tack Corporation Superfund Site Five-Year Review was led by Kimberly White of the U.S. EPA, Remedial Project Manager for the Site and Kelsey O'Neil, the Community Involvement Coordinator (CIC). Joseph Coyne of MassDEP, assisted in the review as the representative for the support agency.

The review, which began on 1/13/2015, 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 in January 2015 between the RPM and CIC for the Site. A press release was issued and a notice was published on the U.S. EPA Region 1 website at: www.epa.gov/region1/superfund/sites/atlas , on 1/5/2015, stating that there was a five-year review and inviting the public to submit any comments to the U.S. EPA.

The results of the review and the report will be made available on the EPA website at http://www.epa.gov/region1/superfund/sites/atlas and at the Site information repositories located at:

Fairhaven Public Library Center Street, Fairhaven, MA 02719	and	U.S. EPA, 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 O&M records and monitoring data. Applicable groundwater cleanup standards, as listed in the March 2000 Record of Decision, were also reviewed.

Data Review

Groundwater Monitoring

From 2010 to 2012 groundwater samples were collected on a semi-annually basis and then annually in 2013 and 2014. Monitoring at the Site complies with the conditions set forth in the Final Sampling and Analysis Plan (H&S, 2014) and generally consist of inspecting the integrity of the well, measuring groundwater elevations, recording water quality data using low-flow sampling techniques with dedicated tubing, and collecting groundwater samples for analysis of groundwater COCs at 15 well locations. Groundwater samples are submitted to Accutest Laboratories of New England, Inc. for laboratory analysis of metals (total and dissolved: zinc, nickel and copper), VOCs, cyanide and other parameters (pH, chloride, total dissolved solids and total suspended solids). Samples were collected using low flow methods to monitor groundwater quality conditions for MNA; a summary of the groundwater quality conditions (pH, specific conductivity, dissolved oxygen, oxidation-reduction potential and turbidity) at the sample locations during the 2014 sampling event (H&S, 2015) are provided in **Table 1 in Appendix C**. Groundwater purged from the wells not submitted for analysis is containerized and temporarily staged then infiltrated back onsite once sample results confirm that COC concentrations are below the federal and MassDEP primary maximum contaminant levels (MCLs). Below is a summary of the findings since the last five-year review.

Groundwater elevation contour maps representing the overburden flow regime have been similar for the last 5 years of monitoring. **Figure 4 in Appendix C** shows the Groundwater Contour Map from June 2014.) Groundwater flows from the western portion of the Site toward the northeast before discharging to the surface water in Boys Creek. Groundwater elevations vary, but some wells, MW-7 and Well #519 have been intermittently dry during sampling events (**Table 2 in Appendix C**). Since groundwater elevations may be tidally influenced, recommendations were made in 2014 to sample the wells during high tide to improve the likelihood of encountering water in the wells. In addition, recommendations were made to redevelop wells MW-7, Well #519, along with MW-4R, MW-15, MW-16, and AT-5, which have also been found to be dry on occasion. Redevelopment of the wells is necessary to improve the performance of the wells. This is not an issue affecting protectiveness, but will be considered in connection with ongoing O&M and possible in future FYRs.

Generally, groundwater concentrations of site COCs remain above the interim groundwater cleanup levels (also referred to as Project Action Limits [PALs]), but are decreasing with a few exceptions. From 2010 to 2014, five of the 15 monitoring wells sampled in the LTGM network, AT-8, MW-3, MW-12, MW-13 and MW-14, yielded detections of one or more COCs above their respective cleanup level (see **Table 3 in Appendix C**). **Figures 5a – 5d in Appendix C** shows the concentrations at each sample location for each COC.

Zinc was the most commonly detected contaminant during the 2010 -2014 groundwater monitoring events. In the 2014 sampling event, it was detected in all the sampled monitoring wells, with two wells (MW-7 and AT-8) yielding detections in excess of the IGCL of 810 µg/L more often than not (**see Table 4**

of Appendix C). 2014 sampling data indicate concentrations at AT-8 were above the October 2013 sampling result of 572 µg/L but less than the maximum concentration observed at this location (2,020 µg/L in April 2010). MW-7 was not sampled in 2014 or 2013 but when it was last sampled in both the spring and fall of 2012 sample results (819 µg/L and 846 µg/L , respectively) were below the historic maximum at this location (6540 µg/L in December 2007). A qualitative analysis of the trend graphs for Zinc at each sampling location, provided as **Figures 6a -6o in Appendix C**, indicate that concentrations have fluctuated but are generally declining across the Site.

Nickel was also frequently detected, with two wells (AT-8 and MW-3) yielding detections in excess of the IGCL of 82 µg/L. In 2014, concentrations AT-8 (100 µg/L) were above 2013 results (80.2 µg/L) but about half the maximum concentrations (211 µg/L) at this location. Concentration in 2014 at MW-3 (131 µg/L) were above the 2013 result of 96 µg/L but slightly less than the maximum concentration observed at this location (133 µg/L in April 2012). In most all the wells across the Site, there is an overall fluctuating but decreasing trend in nickel concentrations except at MW-3. Nickel concentrations in MW-3 exhibit an increasing trend as indicated in **Figures 6a-6o provided in Appendix C**.

Copper was detected in more than half the sampled monitoring wells, with two wells, MW-7 and AT-8, yielding detections in excess of the IGCL of 31 µg/L, when sampled. In 2014, MW-7 was dry and was not sampled, but concentrations have been consistently above the IGCLs and with last sample results in October 2012 at 278 µg/L. Copper was detected at AT-8 in 2014 (188 µg/L) was above the concentration detected at AT-8 in October 2013 (147 µg/L), but below the maximum detected concentration of 462 µg/L in April 2010. Copper concentrations have displayed a generally decreasing trend in all monitoring wells but remained above the IGCLs at MW-7**.**

Cyanide has only been detected in three monitoring wells (MW-12, MW-13, and MW-14) over the last five years; concentrations in those wells have been above the IGCL of 10 µg/L. In 2014, concentrations MW-12, MW-13 and MW-14 were 13 µg/L, 11 J µg/L, and 22 J µg/L, respectively. At the respective well locations, the concentration at MW-12 and MW-13 are below both the historical averages and the historical maximums. At MW-14 the concentration in 2014 exceeded the average concentration at this location but remained below the historic maximums.

There were no detections of toluene observed during sampling events over the last five years and there was only one estimated result of 0.6 µg/L at monitoring well AT-8 during the October 2012 event (see **Table 4 of Appendix C**). No results exceeded the IGCL of 100,000 µg/L.

Of the 12 monitoring wells consistently sampled in the last five years, wells MW-2, MW-4R, MW-9, MW-10, MW-11, MW-15, MW-16, and AT-5 had no detected concentration of any site COC that exceeded the Site IGCLs. Site COC concentrations are declining except in the case of nickel at MW-3 and cyanide at MW-14 where concentration remain below historical maximum concentrations. In general, the annual sampling frequency is appropriate and will continue until 2037 (year 30) or until it is shown that contaminant levels in the groundwater either meet or approach the IGCL.

Sediment and Surface Water Monitoring

In June 2012 and October 2012 surface water samples were collected from six locations at the Site for chemical analysis. Sediment samples were also collected from 13 locations at the Site for chemical analysis and toxicity testing. Surface water and sediment sampling locations are shown on **Figures 7a and 7b of Appendix C** for areas to the North of the Barrier and the South of the Barrier, respectively. In accordance with the O&M plan samples were collected during low tide to maximize the potential groundwater influence on surface water. Although there is some area of fresh water wetland, the ultimate receiving water body is a marine coastal salt marsh, which was the principle focus of the remediation. Surface water and sediment analytical samples were sent to ESS Laboratories in Cranston, Rhode Island. Surface water samples were analyzed for: cyanide; total cadmium, chromium, nickel, and zinc; total lead; and total copper. Sediment samples were analyzed for: cyanide and total metals. Sediment toxicity samples were also collected for: 10-day survival and growth of *Hyallela azteca* and *Chironomus dilutus* organisms for freshwater sediment samples and10-day survival only of *Leptocheirus plumulosis* organisms for saltwater sediment samples and sent to Aqua Survey, Inc. located in Flemington, New Jersey. The toxicity samples were not analyzed since the chemical analysis of the site contaminants were not detected above the salt water chronic criteria. Effects Range Median – Quotient (ERM-Q) values calculated for each of the sampling location were also below 1 therefore indicating no toxicity of sediment collected during both monitoring events in 2012. Analytical results for the June 2012 and October 2012 sampling events are provided in **Tables 5a- 5c and Tables 6a – 6c of Appendix C**, respectively.

Soil, Sediment and Vegetative Restoration Monitoring in the freshwater wetland and salt water marsh

During the last five years, MassDEP's contractors AMEC Environment & Infrastructure, Inc. (AMEC) (formerly MACTEC Engineering and Consulting, Inc. (MACTEC)) and New England Environmental, Inc. (NEE) conducted inspections of the restored salt water and fresh water marsh areas. In general the inspections consisted of qualitative evaluations for the following characteristics consistent with the operation and maintenance goals established in the ROD:

- Stability of Soil and Sediments – observations of erosion, scouring, slumping channel banks and muskrat burrowing
- Vegetative Assessment – observation of percent cover, plant health and invasive species presence
- Other Qualitative Observations – observations of hydrologic conditions, wildlife use, and wetland functional attributes
- General Site Conditions – observations of Site perimeter fencing, gates and security.

South of the Barrier (SOB), tidal marsh has not shown signs of erosion, and the soil throughout the area appeared stable over the last 5 years. The vegetative cover in the area is generally over the goal of 85% of the pre-1901 site characteristics (as established in the ROD) except in areas to the east of Boys Creek that were unplanted. The unplanted area has had an increase in the vegetative cover from 55% in 2012 to 70% in 2014. **Figure 8a in Appendix C** shows the extent of vegetation in the restored areas south of the barrier, and **Figures 8b in Appendix C** shows the vegetative percent cover for the tidal marsh SOB. Although invasive species were not observed in the tidal marsh SOB, common reed has been noted as approaching the area, therefore recommendations were made for annual herbicide application until vegetation has matured.

North of the Barrier (NOB), soil in the wetland/upland transition zone has been stabilized. Planted trees and shrubs have had an approximate 85% survival rate. There are still some areas of sparse vegetative cover, particularly in the northwestern and eastern sides of the tidal marsh. Common reed has been observed scattered in the tidal marsh, and other exotic invasive species were observed in the wetland/upland areas. The invasive species have been treated with herbicide annually over the past 5 years. The tidal marsh has had an increase in vegetative cover over the last several years and is currently at approximately a 60% vegetative cover (see **Figure 8c and 8d in Appendix C)**. Recommendations were made to reseed or replant in areas void of vegetation and as a result replanting efforts were implemented in April 2011. Two salt pannes were also constructed to promote vegetative growth, as an alternative to replanting, in November 2011 in areas NOB. The replanting effort in April 2011 consisted of sporadically filling in some bare spots in the salt marsh area NOB with established plants from the high salt marsh area SOB. The salt pannes constructed in November 2011 were created to promote low marsh growth by creating small creeks, sloped 25 – 30% from the confluence with the unnamed stream and Boys Creek to salt pannes. The salt pannes are approximately 4 feet in diameter with a depth of approximately 1- 1.5 feet (see pictures in **Appendix D)**; vegetation from the existing streams were removed and replanted along these salt pannes and the connected creeks. In general, it is expected that the vegetative cover will continue to increase as a result of these efforts and the 85% cover will be achieved on or around 2023.

The freshwater wetland consists of berms, spillways and vegetated islands. Soils on the berm located on the perimeter of freshwater wetland were evaluated as they are critical to allow plantings to become established by maintaining water levels at a constant throughout the wetland and by preventing high tides in the saltwater marsh from saturating the freshwater wetland. Specifically, the berms are evaluated to determine if deterioration or compromise has occurred from digging by muskrats, invasive species growth or any other potential problems. Burrowed areas were observed on the top of the berm and also along the edge of the freshwater emergent wetland. Many of these burrows did not appear to be fresh or active areas and are suspected to be from digging by both rabbits and muskrats. In general the berm is not compromised but muskrats will always be a potential problem for the berm and this area will continue to be monitored. Soils in the spillways located in the northeast and southeast corners of the freshwater wetland were also evaluated as they prevent the accumulation of stagnant water, ensuring that the wetland is naturally flushed on a regular basis. The spillways, which had been reported as eroding in previous assessments, are generally stable with growth of smooth cordgrass (*Spartina alterniflora*) in the most recent inspections. The vegetation on the islands in the freshwater wetland are generally growing well, and all of the islands are well vegetated, although there is evidence of animal use on some of the islands. In June 2012, it was noted that Island 2 had much less area above the water than observed in the past, likely due to erosion. Islands 8 and 10 also had large areas of bare ground or trampled vegetation. These emergent wetlands were originally protected with fencing, but more than 75% of the fencing that was originally installed has been removed in order to protect the bird population from becoming entangled in the fencing. Throughout the last few years adult mute swans, cygnets, belted kingfisher, muskrats, rabbits and other wildlife have been observed within the freshwater wetlands. These areas will continue to be monitored, but no additional planting or fencing is necessary, as the goal of 85% cover has been met and the expectation is that the area will be self-sustaining.

Site Inspection

The inspection of the Site was conducted on 1/20/2015. In attendance were Kimberly White, Ronald Gonzalez, Richard Sugatt, and Bart Hoskins of the U.S. EPA and Joe Coyne of the MassDEP. The purpose of the inspection was to assess the protectiveness of the remedy. During the inspection the former

source areas, fencing, and on-site building and groundwater monitoring wells were visually inspected. The on-site building had several open windows, and it appeared that some areas could be accessible. In addition, the roof of the building appeared to be collapsed. A pile of rubble was noticed in an area near the building. Should there be a need in the future to address the deteriorating condition of the remaining office building (technically part of the Site, but not subject to the cleanup activity or to institutional controls), consideration should be given as to whether the northern long-eared bat (*Myotis septentrionalis*) might be present in the building. The U.S. Fish and Wildlife Service has determined threatened species status under the Endangered Species Act of 1973 for this species of bat, which lives in forests and roosts in trees and, less often, in buildings. An interim rule issued April 2015 (see http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/FRnlebFinalListing02April2015.pdf) provides for conservation for the northern long-eared bat, and should be considered, assuming the species was thought to be present, in the event of future construction activity.

Also, the on-site underground storage tank (UST) was marked off; this is likely related to work associated with the removal of the UST. As noted during the 2014 long-term monitoring report, some monitoring wells were observed to be in need of repair due to the corrosion of the well casings. The upland areas generally appeared to be in good condition, and wetland and marsh area seemed to have grass cover in most all areas. Some netting was noted on one of the freshwater wetlands islands. At the time if the inspection, it was unclear what the netting was, but as noted in the interview with a community stakeholder, Carolyn Longworth [see **Appendix D**], the netting seemed to be associated with a soccer goal post. In addition, a shopping cart was observed in the on-site stream.

A second inspection was conducted on May 20, 2015; this is inspection was an opportunity to observe the site at the beginning of the growing season. Growth in the salt marsh areas was also observed, particularly in the salt pannes that were installed in 2011. The site was also inspected for issues noted in the interview responses regarding a hole in the fencing, which were not observed in the January 2015 site inspection. The opening in the Egypt Lane fence was noted in May, and photographs are provided in **Appendix D**. Based on the inspection, additional measures should be taken to ensure the security of the site.

Interviews

During the FYR process, interviews were conducted with parties impacted by the Site, including the community stakeholders, the Town of Fairhaven, MassDEP and contractors involved in Site activities or aware of the Site. The purpose of the interviews was to document any perceived problems or successes with the remedy that has been implemented to date. Interviews are summarized below and complete interviews are included in **Appendix D**.

The following persons were contacted for interviews:

- Joseph Coyne, MassDEP Project Manager,
- Patrick Schauble, O&M Contractor with H&S Environmental
- Mr. Jeffrey Osuch, Town of Fairhaven Executive Secretary
- Mr. Bob Espindola, Town Fairhaven, Board of Selectman
- Patricia Fowle, Town of Fairhaven, Department of Public Health
- Carolyn Longworth, Community Stakeholder
- Paul Lekhim, Atlas Tack (contacted, but no interview granted and no comments were provided)

The overall sentiment of those responding was that they are pleased with the resurgence of the wildlife and the value of the scenery, as summarized by Ms. Longworth. Although there have been some concerns about the O&M activities relating to the management of the mute swan, which prevented the growth of the freshwater wetland, as of 2011 the mute swans are no longer being eradicated. MassDEP indicated that the growth of the marsh and wetlands continues to flourish, but at a slower rate than projected; the mute swans, specifically, are no longer considered a significant impedance. O&M activities related to groundwater monitoring continue to be conducted on an annual basis, but the need for routine well maintenance was noted by the O&M contractor. In addition, several concerns were expressed by the town and community representatives about the Site security due to observed openings in the fence and graffiti in the Site building. Potential trespassers could damage the wetland and marsh areas or cause harm to themselves from access to the poor conditions of the building. No formal complaints or notices of incidents have been reported to the Town.

IV. TECHNICAL ASSESSMENT

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

Yes. The review of the documents, ARARs, risk assumptions and results of the Site inspection indicates that the remedy is functioning as intended by the ROD, as modified by the ESD.

The vegetation in the freshwater wetland and salt marsh south of the barrier appears to be developing well, but more slowly in the salt marsh north of the barrier. Nonetheless the remedy is functioning as intended, and these ecological concerns are not likely to affect the current or future protectiveness of the remedy.

Groundwater contaminants are generally decreasing and given that there are no known consumers of the groundwater for drinking, the cleanup goals for groundwater remain reasonable. It is expected that the clean-up levels may not be achieved within the time frame initially anticipated; therefore further evaluation may be warranted to update original estimates.

Institutional controls (ICs) are required on the Atlas Tack property and the Hathaway-Braley property. These will be required to limit uses of the Site property by all future owners to those uses that are consistent with the risk assessment. It is expected that these ICs will be in place by 2016. Openings in the fencing around the Site should be repaired to deter trespassers from entry to most of the upland area of the Site.

With respect to ecological risk, the data reviewed since the last Five-Year Review in 2010 indicate that the remedy is functioning as intended by the ROD and as modified by the ESD.

Eight years has elapsed since the monitored natural attenuation groundwater plan was implemented at this Site. The overall trend of COC concentrations in groundwater has either shown a decline or the concentrations have been below historical maxima. Even though COC concentrations still exceed their PALs those concentrations appear to be declining over time. Copper, nickel, zinc, and tetrachloroethene (PCE) exceeded their PALs but only at 1 well location out of the 12 wells sampled, (copper and zinc at AT-8, nickel at MW-3, and PCE at MW-2). Cyanide also exceeded its PAL at sampling wells MW-12, MW-13, and MW-14. The ROD estimated that it would take about 10 years for groundwater to meet the cleanup goals, with monitoring to continue for a total of 30 years.

Sediment sampling was conducted as part of the 2011 groundwater monitoring. All analytical results were well below the sediment criteria. Sediment toxicity testing was also performed in 2011. No toxicity was identified from any samples tested and all samples resulted in 90% survival or greater.

A presidential action was recently issued and is noted for further consideration as potentially applicable to any future Site activities. Executive Order (E.O.) 13690 (January 30, 2015) concerning floodplains establishes a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input (see https://federalregister.gov/a/2015-02379). The E.O. is relevant for remedy decisions and remedial actions going forward to construction, and these would be required to meet protectiveness standards and be designed and implemented to protect floodplain resources in the event of a 500-year flood event or a flood that is three feet above the 100-year flood elevation. It was determined at the time of the remedy design that the performance of the selected remedy would not result in any discharge that will cause or contribute to exceedances of state water quality standards or toxic effluent standards or to degradation of water quality; this is not expected to change within the 500-year floodplain since the area was restored to elevations and conditions consistent with the surrounding salt marsh; and therefore flood storage capacity was restored to the likely original pre-fill conditions. There are no site wells or structures associated with the site within the existing 100-year floodplain (now 500-year), south of the hurricane barrier, and therefore no further action is required at this time. This 500-year floodplain designation should be considered for any future activities.

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?

Yes. With respect to human health risk, while there have been changes to exposure assumptions and toxicity data, the changes do not impact the protectiveness of the remedy. The human health RAOs have been achieved, namely prevention of contact with contaminated soil and groundwater, determination that vapor intrusion is not a potential exposure pathway, and elimination of shellfish risk by excavation of contaminated sediment. 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.

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

Changes in Standards and TBCs

A review was conducted to consider changes in standards that were identified as Applicable or Relevant and Appropriate Requirements (ARARs) in the ROD, newly promulgated standards for chemicals of potential concern, and other policies, criteria and guidance "to be considered" (TBCs) to the extent these bear on the protectiveness of the remedy. A listing of the ARARs and TBC identified in the ROD are attached in **Appendix E**. As the remedial construction work has been completed, location- and action-specific ARARs have been met.

As listed in Appendix E, the Clean Water Act, Ambient Water Quality Criteria (now known as National Recommended Water Quality Criteria (NRWQCs)) were used to derive soil and sediment cleanup levels in habitat areas. This ARAR is no longer applicable because the remedial construction work has been completed and the clean-up levels have been attained. With the exception of changes with respect to the TBCs for cancer slope factors and reference doses, which will be addressed below, there are no changes in the chemical-specific ARARs and TBCs listed in Appendix E.

Human Health Risk Assessment

Changes in Exposure Pathways

The two exposure scenarios used to develop the Human Health Risk Assessment included (1) the future maintenance worker in the Commercial Area and (2) the adult trespasser. For the maintenance worker, the exposure pathways evaluated were ingestion and dermal contact with commercial area soils. For the adult trespasser, the evaluated exposure pathways were (1) ingestion and dermal contact with commercial area soils; (2) ingestion and dermal contact with Boys' Creek sediments; and (3) ingestion of hard-shelled clams. Since residential development of the Site was not planned, residential exposure scenarios, initially considered in 1995, were not updated in the April 23, 1998, "Update of Baseline Human Health Risk Assessment and Development of Risk-Based Cleanup Levels" (Weston, 1998).

In the RI/FS, the potential for migration of toluene in the groundwater to indoor air was also evaluated. Although an interim groundwater cleanup level (IGCL) for toluene was included in the Proposed Plan, upon further examination of this exposure point, EPA determined (as documented in the 2000 ROD) that toluene did not represent a potential future threat to human health. EPA vapor intrusion guidance, OSWER "Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air", June 2015 recommends that reevaluation of a screened-out site be carried out if site conditions or building/facility uses change in a way that might change the screening-out decision or other new information suggests greater conservatism is warranted in assessing this exposure pathway. While there are no active buildings onsite, there are residential buildings located adjacent to the Site, primarily to the south and north. Accordingly, this issue was considered as part of the last and current five-year review.
There was insufficient groundwater VOC data (with the exception of toluene), to conduct an appropriate screening of future risks from the vapor intrusion pathway for the VOCs at the Site, during the last five year review. A recommendation was made to modify the groundwater sampling program so as to analyze samples collected from the Site wells using the SW-846 Method 8260B until sufficient data are obtained to complete a proper screening of the vapor intrusion exposure pathway. In 2014 the VI screening was completed utilizing groundwater data from 2010 through 2013. As presented in **Appendix B**, the results of the screening indicated that due to the conservative nature of the screening it is unlikely that the vapor intrusion pathway poses an unacceptable risk and is not a pathway of concern for the residential and commercial/ industrial scenarios.

As part of this five-year review, more recent 2014 data were used to supplement and complete the VI screening conducted in 2014. The vapor intrusion screen was done using data from the only well with VOC detections in 2014, well MW-2, see Table 4 in Appendix C. Only three VOCs were detected in groundwater at MW-2; tetrachloroethene (PCE) at 9.2 ug/L, cis-1,2-dichloroethene (cis-1,2-DCE) at 1.6 ug/L, and trichloroethene (TCE) at 1.2 ug/L, as reported in the 2014 LTGM report. Using EPA's Vapor

Intrusion Screening Level (VISL) calculator, the target groundwater concentrations for 1 x 10^{-6} cancer risk or HQ = 1 are 15 ug/L for PCE and 1.2 ug/L for TCE. A VISL value was not available for cis-1,2-DCE. The results indicate that neither PCE nor TCE exceeded the screening level. TCE was equal to the screening level, but vapor intrusion is unlikely in the downgradient residential area because the groundwater near MW-2 is flowing predominantly toward Boy's Creek, rather than towards the residential area. Monitoring should continue to ensure that the concentrations of VOCs do not exceed VISL values and to ensure that groundwater flow direction does not change.

Changes in Toxicity and Other Contaminant Characteristics

The changes in toxicity values of the chemicals of concern in the 2000 ROD are presented in **Table A of Appendix E.** Since 2010, toxicity values are new or changed for 1, 4-dioxane, pentachlorophenol (PCP), cis-1, 2-dichloroethene (cis-1,2-DCE*)*, methylene chloride, trichloroethene (TCE), and tetrachloroethene (PCE), as discussed below.

- *2010 1,4-dioxane* non-cancer toxicity value and 2013 cancer toxicity values
  In 2010 and 2013, EPA finalized the toxicity assessment for 1,4-dioxane. The new values indicate that 1,4-dioxane is more toxic from both cancer and non-cancer health effects. These toxicity changes would result in increased non-cancer hazard and cancer risk from exposure to 1,4-dioxane.

- *2010 Pentachlorophenol* cancer and non-cancer toxicity values
  On September 30, 2010, EPA finalized the toxicity assessment for pentachlorophenol (PCP). The new values indicate that PCP is more toxic from both cancer and non-cancer health effects. These toxicity changes would result in increased non-cancer hazard and cancer risk from exposure to PCP.

- *2010 cis-1,2-DCE* non-cancer toxicity values
  In January 2010, EPA revised the non-cancer toxicity value for cis-1,2-DCE and determined that there are currently no available cancer value and no inhalation values. It is now not possible to quantify cancer risk and inhalation risk from exposure to cis-1,2-DCE.

- *2011 Methylene Chloride* cancer and non-cancer toxicity values
  On November 18, 2011, EPA finalized the toxicity assessment for methylene chloride. The new values indicate that methylene chloride is more toxic from non-cancer health effects but less toxic from cancer health effects. These toxicity changes would result in an increased non-cancer hazard and a decreased cancer risk.

- *2011 TCE* cancer and non-cancer toxicity values
  On September 28, 2011, EPA finalized the December 2009 revised toxicity values for TCE. The new values indicate that TCE is more toxic from both cancer and non-cancer health effects. These toxicity changes would result in increased non-cancer hazard and cancer risk.

- *2012 PCE* cancer and non-cancer toxicity values
  On February 10, 2012, EPA finalized the cancer and non-cancer toxicity values for PCE. These new values indicate that PCE is now more toxic from cancer health effects but less toxic from non-cancer hazard effects. These toxicity changes would result in an increased cancer risk and a decreased non-cancer hazard.

Of the chemicals listed above, only pentachlorophenol and methylene chloride are chemicals of concern in the 2000 ROD. In addition, cis-1, 2-dichloroethene, trichloroethene, and tetrachloroethene were detected in groundwater in the 2014 monitoring. 1, 4-dioxane was last sampled in groundwater in 1991, during the remedial investigation phase, but it was not detected above the detection limit of 50 ug/l and therefore was not considered a chemical of concern in the 2000 ROD. Due to the 50 ug/l detection limit, there is uncertainty whether 1, 4-dioxane is present in groundwater at concentrations higher than the current EPA Regional Screening Level for tapwater (0.46 ug/l for 1 x 10^{-6} cancer risk). This is not considered a data gap because groundwater at the site is not a drinking water source due to salinity; therefore the exposure pathway is incomplete, and there is no risk.

As shown in **Table A in Appendix E**, the only carcinogenic chemicals of concern in the ROD with a more stringent oral slope factor are pentachlorophenol and hexavalent chromium. Hexavalent chromium did not have an oral slope factor in 2000. Using conservative assumptions, the 2010 Five Year Review calculated a cancer risk of hexavalent chromium in commercial soil to be within EPA's acceptable risk range. Pentachlorophenol was a chemical of concern in clam tissue, which would have a 3-fold increase in cancer risk; however, the sediment from this area has been excavated. Changes in toxicity factors were also evaluated using contaminant concentrations measured prior to remediation to determine whether the risk estimates for ingestion of clams by a Site trespasser at the Site would change significantly (see **Appendix E,** *Update of clam ingestion risk for trespassers at Atlas Tack Superfund Site*). The results of this evaluation indicate that the unacceptable clam ingestion risk calculated in 1998 would likely have been acceptable, or very close to acceptable, if calculated using 2015 updated toxicity factors and a more realistic percentage of inorganic arsenic in clam tissue.

About half of the 63 non-carcinogenic chemicals of concern in the ROD have had their oral reference dose (RfD) changed, of which 14 have become more stringent and 16 have had their oral reference dose withdrawn. Of note is the two order of magnitude decrease of the oral Reference Dose (RfD) for cyanide from 2 x 10^{-2} to 6 x 10^{-4} mg/kg-day, resulting in a two order of magnitude higher non-cancer toxicity.

Changes in Risk Assessment Methods

New guidance and risk assessment methods include:

- *2014 OSWER Directive Determining Groundwater Exposure Point Concentrations, Supplemental Guidance*
  In 2014, EPA finalized a Directive to determine groundwater exposure point concentrations (EPCs): http://www.epa.gov/oswer/riskassessment/pdf/superfund-hh-exposure/OSWER-Directive-9283-1-42-GWEPC-2014.pdf. This Directive provides recommendations to develop groundwater EPCs. The recommendations to calculate the 95% UCL of the arithmetic mean concentration for each contaminant from wells within the core/center of the plume, using the statistical software ProUCL could result in lower groundwater EPCs than the maximum concentrations routinely used for EPCs as past practice in risk assessment, leading to changes in groundwater risk screening and evaluation. In general this approach could result in slightly lower risk or lower screening levels. (Reference: USEPA. 2014. Determining Groundwater Exposure Point Concentrations. OSWER Directive 9283.1-42. February 2014.)

- *2014 OSWER Directive on the Update of Standard Default Exposure Factors*
  In 2014, EPA finalized a Directive to update standard default exposure factors and frequently asked questions associated with these updates: http://www.epa.gov/oswer/riskassessment/superfund_hh_exposure.htm (items # 22 and #23 of this web link). Many of these exposure factors differ from those used in the risk assessment(s) supporting the

ROD(s). These changes in general would result in a slight decrease of the risk estimates for most chemicals. (Reference: USEPA. 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February 6, 2014.)

- *2012 OSWER Directive on Recommendations for Default Value for Relative Bioavailability of Arsenic in Soil*
  Based on a compilation and review of data on relative bioavailability of arsenic in soil in 2012, arsenic was found to be less bioavailable via soil ingestion relative to other analytes. A default value of relative bioavailability (RBA) of 60% is now applied during soil/sediment ingestion calculations of risk/cleanup levels. This default RBA value reduces arsenic contribution to risk and/or increases arsenic cleanup levels. (Reference: USEPA. 2012. Compilation and Review of Data on Relative Bioavailability of Arsenic in Soil and Recommendations for Default Value for Relative Bioavailability of Arsenic in Soil Documents. OSWER Directive 9200.1-113. December 31, 2012.)

- Most current RSLs tables – Updated twice/year. Most up-to-date tables as available at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/

- Most current VISLs tables- Updated periodically. Most up-to-date tables as available at: http://www.epa.gov/oswer/vaporintrusion/guidance.html#Item6

In order to evaluate the potential risk implications of these changes, a screening risk evaluation was conducted for a worker scenario using updated EPA Regional Screening Levels (RSLs) for industrial soil and the 95% Upper Confidence Limit concentration of chemicals of concern in the commercial soil area (0-2 ft below ground surface) from the April 1998 "Update of Baseline Human Health Risk Assessment and Development of Risk-Based Cleanup Levels Atlas Tack Corporation Fairhaven, Massachusetts" (1998 Baseline HHRA) (Weston, 1998). This risk screening assumes that the concentrations in soil are the same as in the 1998 risk assessment, i.e., prior to remedial activities. The soil concentrations were taken from Table 2-2 of the 1998 Baseline HHRA. The cancer risk, expressed as a probability of getting cancer, was calculated by dividing the soil concentration by the cancer-based RSL (for an Incremental Lifetime Cancer Risk (ILCR) of 1×10^{-6}) and then multiplying by 1×10^{-6}. The non-cancer risk was calculated by dividing the soil concentration by the non-cancer based RSL (for a Hazard Quotient of 1). As shown in **Table B in Appendix E**, only benzo(a)pyrene had an ILCR higher than EPA's acceptable cancer risk range of 1×10^{-6} to 1×10^{-4}. The total ILCR for multiple chemicals was 3×10^{-4}, driven primarily by PAHs, Aroclor 1260, and hexavalent chromium, all of which had ILCR values in the 10^{-5} range. The only chemical that had a HQ greater than 1 was cyanide, which had a HQ of 180, higher than EPA's risk limit of HQ=1. Also, the 95% UCL concentration of lead was 1280 mg/kg, which is higher than the EPA recommended concentration of 800 mg/kg for non-residential areas (http://www.epa.gov/superfund/lead/almfaq.htm#worker).

Due to the extensive removal of soil and cover with clean fill, the remaining concentrations of PAHs, PCBs, chromium, cyanide, and lead are much lower than prior to remediation. The remedy is currently protective because exposure of workers and trespassers to soil at the Site is currently prevented by consent agreements and fencing so the remedy is protective in the short term.

Ecological Risk Assessment

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.

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

No, no other information come to light that could call into question the protectiveness of the remedy.

Technical Assessment Summary

According to the data reviewed, the Site inspection, and the interviews, the remedy is functioning as intended by the ROD, as modified by the ESD. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. The soil contamination cleanup standards cited in the ROD have been met. The changes to toxicity factors for COCs that were used in the baseline risk assessment have been evaluated, as have been changes in the standardized risk assessment methodology, and these are not considered to affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

V. ISSUES/RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Table 4: Issues and Recommendations/Follow-up Actions

OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
						Current	Future
Sitewide	Institutional Controls have not been implemented	Continue to work with PRP to implement institutional controls	EPA/ MassDEP/ PRP	EPA	5/30/2016	No	Yes

In addition, the following are recommendations that improve effectiveness of remedy, and management of O&M, but do not affect current protectiveness, were identified during the Five-Year Review:

- *Unauthorized persons have accessed the site, additional measures should be taken to ensure the security of the site.*
- *Well maintenance is necessary due to corrosion of some wells and the frequent dry conditions of a few wells.*
- *The time frame to achieve the groundwater cleanup goals should be updated, current groundwater COC levels are decreasing but have not achieved IGCLs.*
- *Vapor Intrusion Screening results indicate that TCE was equal to but does not exceeded the screening level. Monitoring should continue to ensure that the concentrations of VOCs do not exceed vapor intrusion screening values.*

VI. PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement	
Protectiveness Determination: Short-term Protective	*Addendum Due Date (if applicable):*
The remedy at the Site currently protects human health and the environment because soil and sediment at the Site no longer present an unacceptable risk to environmental receptors via ingestion of contaminated vegetation or biota, or incidental ingestion of contaminated soil and sediment. Additionally, court ordered restrictions limit the current Site property owners' uses of the property to those that are consistent with the risk assessment, and specifically prohibit withdrawal, consumption, exposure or utilization of groundwater for any purpose and cultivation of plants or crops for human consumption. Similarly, activities such as excavation and drilling that might disturb the soil are limited by the order. In order for the remedy to be protective in the long-term, institutional controls enforceable against all future Site property owners must be put in place to restrict certain land and groundwater uses.	

VII. NEXT REVIEW

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

VIII. REFERENCES AND DOCUMENTS REVIEWED

AMEC. 2012. *September 2011 Qualitative Assessment Report.* Atlas Tack Corporation Superfund Site, Fairhaven, Massachusetts.

AMEC. 2012b. *June 2012 Qualitative Assessment Report.* Atlas Tack Corporation Superfund Site, Fairhaven, Massachusetts.

AMEC. 2012c. *May 2012 Qualitative Assessment Report.* Atlas Tack Corporation Superfund Site, Fairhaven, Massachusetts.

AMEC. 2012d. *September 2011 Qualitative Assessment Report.* Atlas Tack Corporation Superfund Site, Fairhaven, Massachusetts.

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APPENDIX A

EXISTING SITE INFORMATION

A. SITE CHRONOLOGY

B. BACKGROUND

C. REMEDIAL ACTIONS

A. SITE CHRONOLOGY

A chronology of all significant Site events is included in the table below.

Table: Site Chronology

Event	Date
Atlas Tack ceased manufacturing operations onsite.	June 1985
Commonwealth of Massachusetts completed partial removal of unlined wastewater lagoon.	October 1985
Site proposed for inclusion on EPA's NPL.	June 1988
Site placed on NPL.	February 1990
EPA issued a UAO to Atlas Tack requiring installation of a fence to limit site access.	1992
Remedial Investigation completed by EPA.	May 1995
Feasibility Study completed by EPA.	July 1998
Proposed Plan for the selected remedy issued by EPA.	December 1998
Atlas Tack demolishes the middle section of the main building.	Fall 1998 to January 1999
EPA conducts a Removal Action to remove asbestos from the buildings.	September 28, 1999 through February 9, 2000
Record of Decision (ROD) issued by EPA.	March 10, 2000
EPA conducts the RD for the first two phases of the RA with CERCLA funds.	January 2001
EPA completes the Phase III RD.	September 2004
Phase I Commercial Area demolition & excavation/disposal initiated.	June 2005
RA Phase I completed.	March 2006
RA Phase II Solid Waste & Debris Area excavation initiated.	March 2006
RA Phase III Boys Creek Marsh and Boys Creek excavation/disposal & Site restoration initiated.	January 2007
RA Phase III completed, Construction Completion for the Site.	September 2007
EPA determines that the remedy is Operational & Functional (O&F).	September 2008
Massachusetts Department of Environmental Protection assumes responsibility for O&M of the source control. EPA begins LTRA for the groundwater remedy.	September 2008
Explanation of Significant Differences issued by EPA.	September 16, 2009

B. BACKGROUND

Physical Characteristics

The roughly 48-acre Site is located at 83 Pleasant Street in Fairhaven, Massachusetts, which is approximately one-half mile from Fairhaven Center. The Site is within the Boys Creek watershed and Boys Creek flows through the eastern portion of the site from north to south. Boys Creek discharges into Buzzards Bay via Priest Cove. Site surface drainage discharges into Boys Creek and indirectly into the adjoining marsh. Immediately to the north, the Site is bounded by a bike path, residences, and a few commercial/light industrial businesses. To the south and east, there is a tidal marsh, and there are residences to the south. About 200 feet to the northwest there is an elementary school. A hurricane dike (also referred to as "barrier" in this report), built in the early 1960s, runs northeasterly through the marsh area of the Site.

The Site includes property owned by the Atlas Tack Corporation (Atlas Tack), unimproved property adjacent to the Atlas Tack facility owned by the Hathaway-Braley Wharf Company (Hathaway-Braley), and portions of Boys Creek and the adjacent saltwater tidal marsh extending to Buzzards Bay. The marsh and creek parcels located south of the dike are owned by Atlas Tack, the Town of Fairhaven, and the Commonwealth Electric Company. For the purposes of previous investigation and remedy selection, the site was divided into the Commercial Area; the Solid Waste and Debris Area (SWDA), which includes the former lagoon and fills areas; the Marsh and Creek Bed Areas, and the Groundwater.

Hydrology

In general, the geologic profile of the site consists of a surficial stratum which may be industrial fill, granular fill, organic rich soil, or sand (depending upon the area of the site) overlying a moderately dense glacial till, which overlies a gneissic bedrock. The bedrock surface is found at a depth of 5 to 21 feet below ground surface. The buried bedrock surface dips to the northeast over the western portion of the site and slopes more sharply to the east (towards Boys Creek) along the eastern portion of the site.

The site is located in a coastal sub-basin of the Acushnet River, with the majority of surface drainage being collected by Boys Creek, which drains directly into Buzzards Bay.

The predominant groundwater flow vector for the site is to the northeast, in both overburden and bedrock; however, there are some minor exceptions to this flow field. Along the western edge of the site the flow is more northerly and along the eastern side of the site the flow is more easterly. Groundwater flow gradients are low, typically less than 0.02. Low hydraulic conductivities were also measured for on-site granular deposits ranging from less than 1 foot per day to 26 feet per day.

The groundwater flow directions observed at the site are believed to be limited to within close proximity to the site. Area and regional groundwater flow is expected to be southward, towards Buzzards Bay.

Groundwater levels in both overburden and bedrock are affected by tidal fluctuation, generally following the expected pattern of decreasing amplitude of tidal fluctuation as distance from the coast increases. Vertical hydraulic gradients measured between overburden and bedrock well pairs indicate a general trend of downward vertical gradients over the western portion of the site, with upward vertical

gradients measured in two well pairs along the eastern edge of the site (adjacent to Boys Creek Marsh).

Land and Resource Use

The historic use of Atlas Tack property was the manufacture of a variety of metal products including wire tacks, steel nails, rivets, bolts, shoe eyelets. Wastes from these operations (solid and liquid) were disposed of at the Site, as discussed in greater detail below. The Hathaway-Braley property was undeveloped land that was utilized for storage of commercial fishing equipment and waste disposal.

The current land use for the area surrounding the Site is residential, industrial and commercial. The Atlas Tack property is currently zoned industrial, but remains vacant. A dilapidated two-story brick building currently remains on the western portion of the property. A small metal shed is located along the southern boundary of the Commercial Area. Cleanup goals at the Site are based on the expectation that the future use of the Site would be industrial/commercial.

The Hathaway-Braley property is currently zoned for residential use, but the property is predominantly wetland. Accordingly, EPA did not consider there to be any possibility of residential development on this property. Further, in a settlement with the Natural Resource Damage Trustees, Hathaway-Braley has agreed to keep the property undeveloped by means of a Conservation Restriction (easement) to maintain the property in its "natural, scenic, and open condition; to protect and conserve wetland and upland areas of the Property; and to preserve the Property as habitat for those species known to occur in such ecosystems in Bristol County, Massachusetts, in perpetuity."

Boys Creek and the associated wetlands and the salt water marsh are habitats for plants, fish, and wildlife. The area is mapped as rare species and habitat by the Massachusetts National Heritage Program.

The groundwater underlying the Site is not currently used as a drinking water source. As documented in a March 1998 Memorandum of Agreement between EPA and the Commonwealth, the Groundwater Use and Value Determination for the Site is deemed "low."

History of Contamination

The Atlas Tack facility operated from approximately 1901 until 1985. In the course of operation, process wastes containing acids, cyanide, metals such as copper and nickel, and solvents were discharged into drains in the floor of the main factory building. As a result, contaminants permeated the floors and timbers of the building and migrated to the soils below and adjacent to the manufacturing buildings, and ultimately to the groundwater. Hazardous liquid waste and sludge from the manufacturing processes were also discharged directly to an unlined lagoon on the site. Also, industrial fill was deposited into wetlands to the east of facility. A 3.2-acre portion of the Hathaway-Braley property also received waste from a number of sources. Soil, surface water, sediment, and groundwater at the Site have been contaminated. The major contaminants of concern at the Site include heavy metals, including arsenic, antimony, lead, copper, chromium, zinc, nickel, and cadmium; practical quantitation limits (PQL mainly polycyclic aromatic hydrocarbons (PAHs); and polychlorinated biphenyls (PCBs); cyanide; and pesticides.

Initial Response

In 1985, the Massachusetts Department of Environmental Quality Engineering ("DEQE" and now known as the Massachusetts Department of Environmental Protection) supervised the removal of drums of hazardous waste from the facility (which was by that time inactive). Subsequently, DEQE supervised the partial excavation of the on-site lagoon. Containerized chemicals remaining at the facility were removed in November 1986. In January 1987, DEQE placed the Site on the Massachusetts Hazardous Waste Site List.

In 1988, the Site was proposed for inclusion on EPA's National Priorities List (NPL) and it was place on the NPL in February 1990. In 1992, EPA issued an order to erect a fence around the Site. The Remedial Investigation (RI) and Feasibility Study (FS) were completed in 1995 and 1998, respectively. From September1999 to February 2000, EPA conducted a removal action at the Site to remove asbestos-containing materials from the dilapidated, inactive facility buildings. The Record of Decision (ROD) was signed on March 10, 2000.

Basis for Taking Action

The baseline human health risk assessment (as updated in 1998) identified the following chemicals, which posed an unacceptable risk in soils and sediments in the Commercial Area and Boys Creek:

- Arsenic
- Benzo(a)pyrene
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Dibenzo(a,h)anthracene
- Indeno(1,2,3-cd)pyrene
- 3,3-dichloribenzidene
- Polychlorinated biphenyls (Aroclor 1260)
- Lead

The ecological risk characterization concluded contaminant levels detected in soils and sediments in Boys Creek and the surrounding marsh and upland area posed a substantial risk to invertebrates, fish, and wildlife:

- Copper
- Lead
- Mercury
- Nickel
- Silver
- Zinc
- Cyanide

In addition, the following chemicals posed the greatest risk to the survival, reproduction and growth of the benthic community:

- Endosulfan sulfate
- Anthracene
- DDT (total)
- Cadmium
- Copper
- Cyanide
- Lead
- Zinc

In summary, contaminant levels in soils and sediments throughout Boys Creek and the surrounding marsh area (including the tidal creek proper and the tidal marsh surface) and adjacent upland areas were sufficiently elevated to pose a substantial risk to invertebrates, fish and wildlife through direct contact and dietary exposure to a variety of organic chemicals and metals.

C. REMEDIAL ACTIONS

Remedy Selection

The ROD for the Site was signed on March 10, 2000. Remedial Action Objectives (RAOs) were developed as a result of data collected during the RI to aid in the development and screening of remedial alternatives to be considered for the ROD. They are:

1. Attain Commercial Area surface (0 to 2 feet) soil/sludge contaminant concentrations which are protective of human health, assuming commercial exposure for human receptors.

2. Attain Solid Waste and Debris Area surface (0 to 2 feet) soil and sediment contaminant concentrations which are protective of aquatic and terrestrial organisms.

3. Attain Marsh and Creek Bed Area surface (0 to 2 feet) soil and sediment contaminant concentrations which are protective of human health (shellfish ingestion) and aquatic and terrestrial organisms.

4. Attain surface water contaminant concentrations which are protective of human health and aquatic and terrestrial receptors.

5. Protect surface water and sediments from contaminant migration from Commercial Area, SWD Area, and Marsh and Creek Bed Area soils and sediments.

6. Prevent unacceptable risk to humans due to exposure to contaminants that may migrate from the groundwater via vapor intrusion into buildings.

7. Protect the surface water in Boys Creek and its tributaries from contaminant migration from groundwater.

8. Comply with applicable chemical-, location-, and action-specific ARARs.

The major components of the selected remedy included the excavation, treatment, and off-site disposal of contaminated soil, debris and sediment, demolition of contaminated buildings, marsh mitigation, and restoration of the affected areas. Monitored natural attenuation (MNA), with phytoremediation (planting of specific types of trees to lower the level of residually contaminated groundwater) as an enhancement component, was chosen to address the groundwater beneath the Site.

The Interim Groundwater Cleanup Levels (IGCLs) established in the ROD are ecologically based, four out of the five IGCL parameters (copper, nickel, zinc, and cyanide) are based on the Ambient Water Quality Criteria [now the National Recommended Water Quality Criteria (NRWQC)] subject to a dilution factor. There is no NRWQC standard for toluene. Therefore, the Massachusetts Contingency Plan (MCP), Upper Concentration Limit (UCL) for toluene was used.

Interim Groundwater Cleanup Levels

COC	Protective level (ug/L)
Copper	31
Nickel	82
Zinc	810
Cyanide	10
Toluene	100,000

The ROD required that a more extensive bioavailability study be performed to determine the extent of sediment removal in the marsh area. Cleanup levels were developed based on the correlation between the level of contamination (principally metals) and associated toxicity data for each sampling location (USEPA, 2009).

An ESD was issued on September 16, 2009. The primary remedy changes are:

1. Rather than restore the freshwater wetland and salt water marsh areas to the precise contours that existed in 1901, the area of saltwater marsh north of the hurricane dike was designed with a smaller footprint because the maximum tidal flow through the dike was believed to be insufficient to sustain a larger area of saltwater marsh.

2. Elimination of the phytoremediation component of the remedy because EPA determined that lowering the groundwater table would not allow for enough groundwater flow into the freshwater wetland area, which would substantially frustrate a key feature in the design of the wetland, i.e., sustaining sufficient standing water to minimize the growth of the common reed (Phragmites australis or Phragmites a.), an invasive species.

Institutional controls (ICs) are required on the Atlas Tack property north of the hurricane dike and on the Hathaway-Braley property. These will be required to limit uses of the Site property by all future owners to those uses that are consistent with the risk assessment. Specifically the ICs will prohibit withdrawal, consumption, exposure or utilization of groundwater for any purpose and cultivation of plan+ts or crops for human consumption. Restrictions on activities such as excavation and drilling that might disturb the soil would also be required.

Remedy Implementation

A three-phase cleanup approach was planned and executed.

Phase I, the Commercial Area Remediation, included: demolition of the three-story manufacturing building, the power plant building and smokestack; demolition and excavation of the concrete slabs remaining from the previously demolished, former one-story building, and from other buildings demolished in this phase; and excavation and off-site disposal of contaminated soil, sludge and debris. 5,480 cy of contaminated soil and 775 cy of plating sludge (RCRA listed waste F009) were excavated and disposed of at appropriate off-site licensed landfills in Phase I. Following demolition and excavation, the area was backfilled and graded to facilitate proper site drainage.

Phase II, the Solid Waste and Debris Area Remediation, involved excavation and off-site disposal of 36,600 cy of contaminated soil and debris from the solid waste disposal (fill) areas on the Atlas Tack property and the Former Lagoon Area (east of the Commercial Area), and the Commercial and Industrial Debris Area located on the Hathaway-Braley property . Most of the fill areas remediated in this phase were originally wetland. As the remedy called for these areas to be restored as wetland, restoration of this area, including final grading, occurred in conjunction with the marsh restoration activities during Phase III.

Phase III, the Boys Creek Marsh and Boys Creek Remediation and Site Restoration, entailed excavation of contaminated marsh sediment and creek bed sediment and restoration of the site. 36,430 cy marsh and creek bed sediment was removed. Site restoration activities included: installation of a security fence and boulder barricade; regrading, placement of loam, and seeding with a wildflower seed mix; planting of salt marsh vegetation; installation of coir fiber logs and biodegradable erosion control blankets along Boys Creek to prevent erosion; Phragmites a., also known as common reed, growing near the restored area was controlled with herbicide to deter it from spreading into the restored area; and adjacent upland areas were planted with trees and shrubs, and were seeded with native plant seed mixes. Temporary fencing was installed to deter grazing on herbaceous plantings by waterfowl.

During the remedial action, fencing around the Site served to control access. At the start of Phase II, some of the existing chain link fence was replaced along the toe of the hurricane barrier.

The Site achieved construction completion status when the Preliminary Close Out Report was signed on September 28, 2007.

The ROD states EPA’s expectation that groundwater clean up levels will be attained in approximately ten years, and that monitoring will continue for 30 years. The groundwater monitoring will be conducted by EPA until 2018, when the Massachusetts Department of Environmental Protection will assume that responsibility.

APPENDIX B

FINDINGS ON ISSUES FROM LAST (2010) REVIEW

- Finding for Issues 2 and 3 of the 2010 FYR addressed in the following Memorandums:
    - Screening Risk Assessment for Vapor Intrusion at Atlas Tack Corporation Superfund Site
    - Memorandum of Findings: Analytical Practicability Analysis for Pesticides and Cyanide

- Finding for Issue 4 of the 2010 FYR are presented in
  Post Remedial Toxicity Testing Tables 4-6 and 4-7 and Figures 2-1 through 2-4.

Memorandum

Date: April 3, 2014

From: Claire Willscher, Human Health Risk Assessor, Technical Support & Site Assessment

To: Kimberly White, RPM

Subj: Screening Risk Assessment for Vapor Intrusion at Atlas Tack Corporation Superfund Site

In response to your request, I have reviewed the groundwater data from 2010 through 2013 for the Atlas Tack Corporation Superfund Site ("Site"). I have also performed a risk screening for the vapor intrusion pathway for both the residential and industrial/commercial exposure scenarios potentially resulting from groundwater contamination at the Site. This risk screening was performed on the semi-annual data collected between April 2010 and October 2012 and the October 2013 data for wells: AT-GW-0519; AT-GW-AT05; AT-GW-AT08; AT-GW-MW02; AT-GW-MW03; AT-GW-MW4R; AT-GW-MW07; AT-GW-MW09; AT-GW-MW10; AT-GW-MW11; AT-GW-MW12; AT-GW-MW13; AT-GW-MW14; AT-GW-MW15; AT-GW-MW16. I understand that all samples from all of the identified wells were collected from a depth that is representative of groundwater that has the potential to influence the vapor intrusion pathway.

The groundwater contour map included as Figure 1-3 in the October 2012 Long-Term Groundwater Monitoring Report ("2012 Monitoring Report"), prepared by Weston shows that the groundwater flows in a northerly (spanning northwest to northeast) direction from the location of the former Atlas Tack Corporation Main Building toward the bike path. I understand that groundwater does not flow to the south toward the Hathaway-Brawley property and Church Street; Figure 1-3 does not show any groundwater monitoring wells in this direction. The text of the December 2012 Long-Term Groundwater Monitoring Annual Summary Report (Weston, 2012) ("2012 Annual Monitoring Report") identifies that, "the site's surrounding area is predominantly residential. It is bounded by a bike path, residences, and a few commercial/light industrial businesses to the north, a tidal march to the east and south, an elementary school about 200 feet to the northwest, and residences immediately to the south." Figure 1-3 from the 2012 Monitoring Report also shows the location of the groundwater monitoring wells.

The 2010 Five-Year Review (USEPA, 2010) ("FYR") identifies that institutional controls are not currently in place at the Site or the Hathaway-Brawley property. The FYR identifies that ICs will prohibit withdrawal, consumption, exposure or utilization of groundwater for any purpose and cultivation of plants or crops for human consumption. Restrictions on activities such as excavation and drilling that might disturb the soil would also be required.

The data was analyzed for both the residential and industrial / commercial exposure scenarios base on the description of the surrounding area included in the 2012 Annual Monitoring Report (an analysis of the residential exposure is more conservative than an analysis of exposures at an elementary school) and the fact that there are presently no ICs in place at the Site. The analysis includes a comparison of contaminant concentrations to the corresponding

residential and industrial / commercial vapor intrusion screening levels based on the more stringent concentration associated with a 10^{-6} excess cancer risk and HI=0.1, assuming an average groundwater temperature of 25°C. The screening levels were calculated by EPA's Vapor Intrusion Screening Level Calculator (http://www.epa.gov/oswer/vaporintrusion/guidance.html#Item6) which incorporated contaminant toxicity data provided in the November 2013 Regional Screening Level Tables.

Please note that the vapor intrusion screening levels are based on toxicity data which may be updated in the future. Therefore, it is recommended that this pathway be reevaluated as new data become available.

Residential Screening

Four VOCs (benzene, chloroform, trichloroethylene, and tetrachloroethylene) were detected in excess of the residential vapor intrusion screening levels in the above referenced wells between 2010 and 2013. Below is a summary of the detected concentrations in excess of the corresponding residential vapor intrusion screening levels:

- The residential vapor intrusion screening level for benzene is 1.38 ug/L, corresponding to a 10^{-6} cancer risk. Benzene was detected in well AT-GW-MW4R at a concentration of 1.7 ug/L during the April 2010 sampling round.

- The residential vapor intrusion screening level for chloroform is 0.71 ug/L, corresponding to a 10^{-6} cancer risk. Chloroform was detected in well AT-GW-AT05 at a concentration of 1.4 ug/L during the October 2010 sampling round.

- The residential vapor intrusion screening level for tetrachloroethylene (PCE) is 5.77 ug/L, corresponding to a hazard index of 0.1. PCE was detected in well AT-GW-MW02 at a concentration of 13.6 ug/L in April 2010; 8.0 ug/L in April 2011; 8.7 ug/L in October 2011; and 8.8 ug/L in April 2012. PCE was also detected in well AT-GW- MW15 at a concentration of 6 ug/L in April 2012.

- The residential vapor intrusion screening level for trichloroethylene (TCE) is 0.52 ug/L, corresponding to a hazard index of 0.1. TCE was detected in well AT-GW-MW02 at a concentration of 1.2 ug/L in April 2010; 2.3 ug/L in October 2010; 1.0 ug/L in April 2011; 1.1 ug/L in October 2011; 1.7 ug/L in April 2012; 0.9 ug/L in October 2012; and 1.2 ug/L in October 2013.

It is important to note that the detection limits for several contaminants included in the data set were not consistently appropriate to detect concentrations equal to, or below, their respective residential vapor intrusion screening levels. These contaminants include: 1,1,2-trichloroethane; 1,2-dibromo-3-chloropropane; chloroform; bromomethane; carbon tetrachloride; dichlorodifluoromethane; ethylene dibromide; TCE, vinyl chloride and bromodichloromethane. Therefore it is uncertain whether the appropriate residential vapor intrusion screening levels, corresponding to the more stringent concentration associated with

a 10^{-6} excess cancer risk and HI=0.1, are achieved. Below is a summary of the data set for each of these analytes in relation to their corresponding residential vapor intrusion screening levels:

- The residential vapor intrusion screening level for 1,1,2-trichloroethane is 0.62 ug/L, corresponding to a hazard index of 0.1. All wells were non-detect with a detection limit of 1 ug/L between 2010 and 2013.

- The residential vapor intrusion screening level for 1,2-dibromo-3-chloropropane is 0.03 ug/L, corresponding to a 10^{-6} cancer risk. The detection limit for data collected in 2010 was 5 ug/L, for data collected in 2011 and 2012 was 2 ug/L, and for data collected in 2013 was 5 ug/L. All wells were non-detect between 2010 and 2012. During the April 2011 sampling round a second analysis with a detection limit of 0.015 ug/ L (which is appropriate to detect concentrations equal to, or below, the residential vapor intrusion screening level) was performed for each well; all wells were non-detect for 1,2-dibromo-3-chloropropane using this analysis.

- The residential vapor intrusion screening level for chloroform is 0.71 ug/L, corresponding to a 10^{-6} cancer risk. The detection limit for data collected during 2010 was 1 ug/L, for data collected during 2011 and 2012 was 0.5 ug/L (which is appropriate to detect concentrations equal to, or below, the residential vapor intrusion screening level), and for data collected in 2013 was 1 ug/L. With the exception of well AT-GW-AT05 during the October 2010 sampling round, as described above, all wells were non-detect between 2010 and 2013.

- The residential vapor intrusion screening level for bromomethane is 1.74 ug/L, corresponding to a hazard index of 0.1. The detection limit for data collected during 2010 was 2 ug/L, for data collected during 2011 and 2012 was 1 ug/L (which is appropriate to detect concentrations equal to, or below, the residential vapor intrusion screening level), and for data collected in 2013 was 2 ug/L. The data show that bromomethane was not detected in any of the wells between 2010 and 2013.

- The residential vapor intrusion screening level for carbon tetrachloride is 0.36 ug/L, corresponding to a 10^{-6} cancer risk. The detection limit for data collected during 2010 was 1 ug/L, for data collected during 2011 and 2012 was 0.2 ug/L (which is appropriate to detect concentrations equal to, or below, the residential vapor intrusion screening level), and for data collected in 2013 was 1 ug/L. The data show that carbon tetrachloride was not detected in any of the wells between 2010 and 2013.

- The residential vapor intrusion screening level for dichlorodifluoromethane is 0.74 ug/L, corresponding to a hazard index of 0.1. The detection limit for data collected during 2010 was 2 ug/L, for data collected during 2011 and 2012 was 1 ug/L, and for data collected in 2013 was 2 ug/L. The data show that dichlorodifluoromethane was not detected in any of the wells between 2010 and 2013.

- The residential vapor intrusion screening level for ethylene dibromide (CASRN 106-93-4, 1,2-Dibromoethane) is 0.15 ug/L, corresponding to a 10^{-6} cancer risk. The detection limit for data collected in 2010 and 2012 was 1 ug/L, and for data collected in 2011 and 2013 was 0.015 ug/L (which is appropriate to detect concentrations equal to, or below, the residential vapor intrusion screening level). The data show that ethylene dibromide was not detected in any of the wells between 2010 and 2013.

- The residential vapor intrusion screening level for TCE is 0.52 ug/L, corresponding to a hazard index of 0.1. The detection limit for data collected between 2010 and 2013 was 1 ug/L. With the exception of detections at well AT-GW-MW02, as described above, all wells were non-detect between 2010 and 2013.

- The residential vapor intrusion screening level for vinyl chloride is 0.14 ug/L, corresponding to a 10^{-6} cancer risk. The detection limit for data collected in 2010 was 1 ug/L, for data collected in 2011 and 2012 was 0.1 ug/L (which is appropriate to detect concentrations equal to, or below, the residential vapor intrusion screening level), and for data collected in 2013 was 1 ug/L. The data show that vinyl chloride was not detected in any of the wells between 2010 and 2013.

- The residential vapor intrusion screening level for bromodichloromethane is 0.76 ug/L, corresponding to a 10^{-6} cancer risk. The detection limit for data collected in 2010 through 2012 was 0.6 ug/L (which is appropriate to detect concentrations equal to, or below, the residential vapor intrusion screening level), and for data collected in 2013 was 1 ug/L. The data show that bromodichloromethane was not detected in any of the wells between 2010 and 2013.

I preformed a screening risk assessment for the residential vapor intrusion pathway based on the data between 2010 and 2013. The assessment identified the "Concentration for Screening" as the maximum detected concentration of those contaminants detected in the any of the wells identified above, and the lowest detection limit for those contaminants whose detection limit exceeded the corresponding residential vapor intrusion screening level for at least 2 of the most recent 3 years (i.e., bromomethane, carbon tetrachloride, vinyl chloride and bromodichloromethane were omitted because the detection limits for these contaminants in the 2011 and 2012 sampling rounds were appropriate to detect concentrations equal to, or below, the corresponding residential vapor intrusion screening level. However, 1,2-dibromo-3-chloropropane and ethylene dibromide were retained because detection limits appropriate to detect concentrations equal to, or below, the corresponding residential vapor intrusion screening level were used for only 1 and 2 rounds of sampling, respectively). Those contaminants with detects below the corresponding screening level, and contaminants with all non-detects and appropriate detection limits were excluded from the analysis. For each contaminant included in the assessment, the ratio of the "Concentration for Screening" to the concentration associated with a residential 10^{-6} excess cancer risk or HI=0.1 was calculated. For non-carcinogens, the ratio was multiplied by 0.1 to yield the hazard index corresponding with the "Concentration for Screening". For carcinogens, the ratio was multiplied by 10^{-6} to yield the excess cancer risk associated with the "Concentration for Screening". Table 1

summarizes the hazard index and excess cancer risk associated with the residential exposure scenario for each contaminant included in the screening risk assessment.

This conservative screening risk assessment, specific to the residential vapor intrusion pathway, identifies that the excess cancer risk associated with either the maximum detected concentration, or the detection limit, for each contaminant is no greater than 6.67×10^{-5}; and, the combined cancer risk for all carcinogenic contaminants is 7.99×10^{-5}. The HI associated with the maximum detected concentration, or the detection limit, for each non-carcinogen is no greater than 0.44; and, the combined hazard index for all contaminants with non-cancer adverse health effects is 1.05. Due to the conservative nature of this screening it is unlikely that the vapor intrusion pathway poses an unacceptable risk and is not a pathway of concern at this time.

Industrial / Commercial Screening

Trichloroethylene was detected in excess of the industrial / commercial vapor intrusion screening level in the above referenced wells between 2010 and 2013. Below is a summary of the detected concentration that is in excess of the corresponding industrial / commercial vapor intrusion screening level:

- The industrial / commercial screening level for trichloroethylene (TCE) is 2.18 ug/L, corresponding to a hazard index of 0.1. TCE was detected in well AT-GW-MW02 at a concentration of 2.3 ug/L during the October 2010 sampling round.

It is important to note that the detection limits for 1,2-dibromo-3-chloropropane and ethylene dibromide were not consistently appropriate to detect concentrations equal to, or below, their respective industrial / commercial vapor intrusion screening levels. Therefore it is uncertain whether the appropriate industrial / commercial vapor intrusion screening levels, corresponding to the more stringent concentration associated with a 10^{-6} excess cancer risk and HI=0.1, are achieved. Below is a summary of the data set for these analytes in relation to their corresponding industrial / commercial vapor intrusion screening levels:

- The industrial / commercial screening level for 1,2-dibromo-3-chloropropane is 0.34 ug/L, corresponding to a 10^{-6} cancer risk. The detection limit for data collected in 2010 was 5 ug/L, for data collected in 2011 and 2012 was 2 ug/L, and for data collected in 2013 was 5 ug/L. All wells were non-detect between 2010 and 2013. During the April 2011 sampling round a second analysis with a detection limit of 0.015 ug/L (which is appropriate to detect concentrations equal to, or below, the industrial / commercial vapor intrusion screening level) was performed for each well; all wells were non-detect for 1,2-dibromo-3-chloropropane using this analysis.

- The industrial / commercial screening level for ethylene dibromide (CASRN 106-93-4, 1,2-Dibromoethane) is 0.77 ug/L, corresponding to a 10^{-6} cancer risk. The detection limit for data collected in 2010 and 2012 was 1 ug/L, and for data collected

in 2011 was 0.015 ug/L (which is appropriate to detect concentrations equal to, or below, the industrial / commercial vapor intrusion screening level). The data show that ethylene dibromide was not detected in any of the wells between 2010 and 2012.

I preformed a screening risk assessment for the industrial / commercial vapor intrusion pathway based on the data between 2010 and 2013. The assessment identified the "Concentration for Screening" as the concentration of TCE detected in well AT-GW-MW02 as identified above, and the lowest detection limit for both 1,2-dibromo-3-chloropropane and ethylene dibromide, whose detection limits exceeded the corresponding risk-based vapor intrusion screening concentration for at least 2 of the 3 years (1,2-dibromo-3-chloropropane and ethylene dibromide each had only one and two sampling rounds, respectively, with a detection limit appropriate to detect concentrations equal to, or below, the corresponding industrial / commercial vapor intrusion screening level). Those contaminants with detected concentrations below the corresponding screening level, and contaminants with all non-detects and appropriate detection limits were excluded from the analysis. For the three contaminants identified above, the ratio of the "Concentration for Screening" to the concentration associated with an industrial / commercial 10^{-6} excess cancer risk and HI=0.1 was calculated. For non-carcinogens, the ratio was multiplied by 0.1 to yield the hazard index corresponding with the "Concentration for Screening". For carcinogens, the ratio was multiplied by 10^{-6} to yield the excess cancer risk associated with the "Concentration for Screening". Table 2 summarizes the hazard index and excess cancer risk associated with the industrial / commercial exposure scenario for each contaminant included in the screening risk assessment.

This screening risk assessment, specific to the industrial / commercial vapor intrusion pathway, identifies that the excess cancer risk associated with either the maximum detected concentration, or the detection limit, for each contaminant is no greater than 5.88×10^{-6}; and, the combined cancer risk for all carcinogenic contaminants is 7.49×10^{-6}. The HI associated with the maximum detected concentration, or the detection limit, for each non-carcinogen is no greater than 0.11; and, the combined hazard index for all contaminants with non-cancer adverse health effects is 0.12. Due to the conservative nature of this screening it is unlikely that the vapor intrusion pathway poses an unacceptable risk and is not a pathway of concern at this time.

I hope you find this analysis helpful as you decide how to proceed on any further evaluations of the vapor intrusion exposure pathway at the Atlas Tack Corporation Superfund Site.

Table 1
Residential Exposure Scenario
Vapor Intrusion Pathway
Atlas Tack Corporation Superfund Site

1. The excess cancer risk and hazard index associated with the "Concentration for Screening Value" is based on the lowest detection limit for those contaminants whose

Contaminant	CASRN	Concentration for Screening (ug/L)	Detect / Detection Limit	Well/ Date of Detect	Concentration corresponding to 10^{-6} Risk for Vapor Intrusion	Concentration corresponding HI=0.1 for Vapor Intrusion	Excess Cancer Risk Associated with Concentration for Screening Value	Hazard Index Associated with Concentration for Screening Value
Benzene	71-43-2	1.7	Detect	AT-GW-MW4R/ April 2010	**1.38**	14	1.23E-06	0.01
Chloroform	67-66-3	1.4	Detect	AT-GW-AT05/ October 2010	**0.71**	68	1.97E-06	0.00
Tetrachloroethylene	127-18-4	13.6	Detect	AT-GW-MW02/ April 2010	13	**5.77**	1.05E-06	0.24
Trichloroethylene	79-01-6	2.3	Detect	AT-GW-MW02/ October 2010	1.1	**0.52**	2.09E-06	0.44
1,1,2-Trichloroethane[1]	79-00-5	1	Detection Limit	All wells	4.5	**0.62**	2.22E-07	0.16
1,2-Dibromo-3-Chloropropane[1,2]	96-12-8	2	Detection Limit	All wells	**0.03**	3.5	6.67E-05	0.06
Dichlorodifluoromethane[1]	75-71-8	1	Detection Limit	All wells	NA	**0.74**	NA	0.14
Ethylene Dibromide[1]	106-93-4	1	Detection Limit	All wells	**0.15**	35	6.67E-06	0.00
						Cumulative Risk / Hazard Index	**7.99E-05**	**1.05**

detection limit exceeded the corresponding residential vapor intrusion screening level for at least 2 of the most recent 3 years. Therefore the calculated cancer risk and hazard index are conservative estimates.

2. During the April 2011 sampling round a second analysis with a detection limit of 0.015 ug/L (which is appropriate to detect concentrations equal to, or below, the residential vapor intrusion screening level) was performed for each well, and all wells were non-detect using this analysis.

Table 2
Industrial / Commercial Exposure Scenario
Vapor Intrusion Pathway
Atlas Tack Corporation Superfund Site

Contaminant	CASRN	Concentration for Screening (ug/L)	Detect / Detection Limit	Well/ Date of Detect	Concentration corresponding to 10^{-6} Risk for Vapor Intrusion	Concentration corresponding HI=0.1 for Vapor Intrusion	Excess Cancer Risk Associated with Concentration for Screening Value	Hazard Index Associated with Concentration for Screening Value
Trichloroethylene	79-01-6	2.3	Detect	AT-GW-MW02/ October 2010	7.4	**2.18**	3.11E-07	0.11
1,2-Dibromo-3-Chloropropane[1,2]	96-12-8	2	Detection Limit	All wells	**0.34**	15	5.88E-06	0.01
Ethylene Dibromide[1]	106-93-4	1	Detection Limit	All wells	**0.77**	150	1.30E-06	0.00
						Cumulative Risk / Hazard Index	**7.49E-06**	**0.12**

1. The excess cancer risk and hazard index associated with the "Concentration for Screening Value" is based on the lowest detection limit for those contaminants whose detection limit exceeded the corresponding residential vapor intrusion screening level for at least 2 of the most recent 3 years. Therefore the calculated cancer risk and hazard index are conservative estimates.
2. During the April 2011 sampling round a second analysis with a detection limit of 0.015 ug/L (which is appropriate to detect concentrations equal to, or below, the residential vapor intrusion screening level) was performed for each well, and all wells were non-detect using this analysis.

Atlas Tack Corporation Superfund Site

Memorandum of Findings: Analytical Practicability Analysis for Pesticides and Cyanide

4 May 2012

This memorandum was prepared in response to the recommendation in the 2010 Five Year review for the Atlas Tack Superfund Site to further investigate whether there are EPA accepted analytical methods that would report results for the analysis of cyanide and pesticides in surface water below the established monitoring criteria and still be cost effective and practicable.

The established criteria for surface water monitoring at the Site included in this analysis are based on the freshwater and saltwater chronic National Recommended Water Quality Criteria (NRWQC). Although this set of criteria is not a performance standard established in the Record of Decision (ROD), comparison of monitoring results to these criteria allows for the evaluation of the progress of the natural attenuation process and measurement against a standard reference. For cyanide and nine pesticides, however, the practical quantitation limit (PQL) of the analytical methods selected were higher than the NRWQC established for surface water. This included 6 pesticide compounds for freshwater monitoring and 9 pesticide compounds for saltwater monitoring, where the 6 pesticides for freshwater monitoring are included in the 9 pesticide compounds for saltwater monitoring. This investigation includes the review of PQLs for cyanide and the following 9 pesticides:

- 4,4-DDT
- Chlordane
- Dieldrin
- Endosulfan I
- Endosulfan II
- Endrin
- Heptachlor
- Heptachlor Epoxide
- Toxaphene

To begin the analytical practicability analysis for the list of pesticides provided, WESTON first contacted ESS Laboratory of Rhode Island, the currently contracted analytical laboratory for the project. WESTON requested that they review their procedures to determine if they could improve upon their PQLs and reduce them so that they are equal to or less than the current established surface water monitoring criteria. ESS reported that their current method detection limits (MDLs) and PQLs could not be lowered to meet the current established surface water monitoring criteria. ESS recommended that WESTON contact Lancaster Laboratory of Lancaster, Pennsylvania to determine if they have a method that can achieve lower PQLs. Lancaster Laboratory was then contacted and upon inquiry they indicated they could achieve some lower PQLs. However, the only established surface water monitoring criteria that

could be achieved (of the nine listed above) was Endrin in freshwater. In addition, Lancaster Laboratory is not Department of Defense (DoD) Environmental Laboratory Accredited Program (ELAP) certified, which is required to perform this work. Upon reviewing this information, WESTON contacted Analytics Environmental Laboratory (AEL) of Portsmouth, NH. AEL is a DoD ELAP certified laboratory, however, they could not provide PQLs low enough to meet the current established surface water monitoring criteria. They could however, provide slightly more accurate and precise data at an additional cost of $18 per sample. The attached table, entitled *Table 1 Laboratory Method Detection Limits and Reporting Limits for Pesticides in Surface Water* details the Data Quality Objectives (DQOs) provided by AEL and ESS (Lancaster Labs did not provide DQOs) as compared to the current established surface water monitoring criteria and the cost per analysis. It should be noted that Toxephene is not included in Final SAP Addendum Number 006, Surface Water and Sediment Monitoring; however, ESS reported this compound during each surface water sampling event.

WESTON also began the analytical practicability analysis for total cyanide by contacting ESS Laboratory of Rhode Island. WESTON requested that they review their method 9014 (low level cyanide) procedures to determine if they could improve upon their PQLs and reduce them so that they are equal to or less than the current established surface water monitoring criteria for total cyanide. ESS reported that their current method 9014 (low level cyanide) method detection limits MDLs and PQLs could not be lowered to meet the current established surface water monitoring criteria for total cyanide. WESTON then contacted Eastern Analytical, Inc. (EAI) of Concord, NH. EAI is not a DoD ELAP certified laboratory, however, they provided a PQL low enough to meet the current established surface water monitoring criterion of 1 µg/L for saltwater. The attached table, entitled *Table 2 Laboratory Method Detection Limits and Reporting Limits for Total Cyanide in Surface Water* details the DQOs provided by EAI and ESS as compared to the current established surface water monitoring criteria for total cyanide and the cost per analysis.

Based upon the information gathered, WESTON has concluded that ESS Laboratory still provides the most practicable detection limits for the dollar to conduct both pesticide and cyanide surface water analyses. ESS may not provide the absolute lowest detection limits but their data and data quality still allows for a useful comparison against the established criteria. Since the data collected is for monitoring purposes only and not for compliance with Record or Decision (ROD) specified criteria, the reported concentrations from ESS can still be considered to be valuable for monitoring the effectiveness of the remedy. When monitoring the overall effectiveness of the remedy, groundwater, sediment analytical chemistry and sediment toxicity testing results should be considered in conjunction with results obtained from surface water sampling, as is established in project planning documents.

Table 1

Laborotory Method Detection Limits and Reporting Limits for Pesticides in Surface Water
Atlas Tack Corporation Superfund Site
Fairhaven, Massachusetts

				Lacaster Labs Acheivable Laboratory Limits		AEL Acheivable Laboratory Limits		ESS Acheivable Laboratory Limits							
			Price:	$179.00		$108.00		$90.00		ESS DQOs			AEL DQOs		
Analytes of Concernand Methods	CAS Number	Units	Initial Plan Monitoring Criteria	PQL	MDL	PQL	MDL	PQL	MDL	Accuracy (%R)	Precision (%RPD)	Completeness (% valid Data)	Accuracy (%R)	Precision (%RPD)	Completeness (% valid Data)
Surface Water Samples (Freshwater)[1]															
Pesticides Waters 3510C/8081A															
Aldrin	309-00-2	µg/L	20	0.010	0.0020	0.15	0.006	0.05	0.015	25 - 140	30	95	60-124	25	
alpha-BHC	319-84-6	µg/L	N/A	0.010	0.0032	0.2	0.009	0.05	0.015	60 - 130	30	95	60-130	25	
beta-BHC	319-85-7	µg/L	N/A	0.010	0.0049	0.05	0.008	0.05	0.015	65 - 125	30	95	65-125	25	
gamma-BHC	58-89-9	µg/L	N/A	0.010	0.0025	0.15	0.005	0.05	0.015	25 - 135	30	95	65-135	25	
delta-BHC	319-86-8	µg/L	N/A	0.010	0.0038	0.05	0.005	0.05	0.015	45 - 135	30	95	60-135	25	
Chlorodane (nos), multicomponent mixture	57-74-9	µg/L	0.0043	N/A	N/A	0.1	0.09	0.5	0.15	N/A	N/A	95	60-140	30	
alpha-chlordane	5103-71-9	µg/L	N/A	0.010	0.0025	0.05	0.003	0.05	0.015	65 - 125	30	95	65-125	25	
gamma-chlordane	5103-74-2	µg/L	N/A	0.010	0.0042	0.05	0.025	0.05	0.05	60 - 125	30	95	61-125	25	
4,4'-DDD	72-54-8	µg/L	50	0.020	0.0010*	0.05	0.004	0.05	0.015	25 - 150	30	95	70-122	25	
4,4'-DDE	72-55-9	µg/L	400	0.020	0.0010*	0.05	0.008	0.05	0.015	35 - 140	30	95	53-122	25	
4,4'-DDT	50-29-3	µg/L	0.001	0.020	0.0010*	0.05	0.008	0.05	0.015	45 - 140	30	95	54-132	25	
Dieldrin	60-57-1	µg/L	0.056	0.020	0.0051	0.05	0.011	0.05	0.015	60 - 130	30	95	67-130	25	
Endosulfan I	959-98-8	µg/L	0.056	0.010	0.0051	0.05	0.003	0.05	0.015	50 - 110	30	95	67-110	25	
Endosufan II	33213-65-9	µg/L	0.056	0.020	0.011	0.05	0.006	0.05	0.015	30 - 130	30	95	66-130	25	
Endosulfan Sulfate	1031-07-8	µg/L	N/A	0.020	0.0050	0.1	0.006	0.05	0.015	55 - 135	30	95	56-135	25	
Endrin	72-20-8	µg/L	0.036	0.020	0.0070	0.05	0.006	0.05	0.015	55 - 135	30	95	75-132	25	
Endrin Ketone	53494-70-5	µg/L	N/A	0.020	0.0050	0.05	0.010	0.05	0.015	75 - 125	30	95	75-125	25	
Heptachlor	76-44-8	µg/L	0.0038	0.010	0.0026	0.15	0.005	0.05	0.015	40 - 130	30	95	57-128	25	
Heptachlor epoxide	1024-57-3	µg/L	0.0038	0.010	0.0026	0.1	0.007	0.05	0.015	60 - 130	30	95	66-130	25	
Hexachlorobenzene	118-74-1	µg/L	3.68	0.010	0.0030	0.05	0.006	0.05	0.0160	50 - 130	30	95	60-140	25	
Methoxychlor	72-43-5	µg/L	0.03	0.10	0.030	0.05	0.032	0.05	0.015	55 - 150	30	95	59-140	25	
Toxaphene	8001-35-2	µg/L	N/A	3.0	1.0	1	0.21	N/A	N/A				60-140	30	
Surface Water Samples (Saltwater)[1]															
Pesticides Waters 3510C/8081A															
Aldrin	309-00-2	µg/L	20	0.010	0.0020	0.15	0.006	0.05	0.015	25 - 140	30	95	60-124	25	
alpha-BHC	319-84-6	µg/L	N/A	0.010	0.0032	0.2	0.009	0.05	0.015	60 - 130	30	95	60-130	25	
beta-BHC	319-85-7	µg/L	N/A	0.010	0.0049	0.05	0.008	0.05	0.015	65 - 125	30	95	65-125	25	
gamma-BHC	58-89-9	µg/L	N/A	0.010	0.0025	0.15	0.005	0.05	0.015	25 - 135	30	95	65-135	25	
delta-BHC	319-86-8	µg/L	N/A	0.010	0.0038	0.05	0.005	0.05	0.015	45 - 135	30	95	60-135	25	
Chlorodane (nos), multicomponent mixture	57-74-9	µg/L	0.0043	N/A	N/A	0.1	0.09	0.5	0.15	N/A	N/A	95	60-140	30	
alpha-chlordane	5103-71-9	µg/L	N/A	0.010	0.0025	0.05	0.003	0.05	0.015	65 - 125	30	95	65-125	25	
gamma-chlordane	5103-74-2	µg/L	N/A	0.010	0.0042	0.05	0.025	0.05	0.05	60 - 125	30	95	61-125	25	
4,4'-DDD	72-54-8	µg/L	50	0.020	0.0050	0.05	0.004	0.05	0.015	25 - 150	30	95	70-122	25	
4,4'-DDE	72-55-9	µg/L	400	0.020	0.0050	0.05	0.008	0.05	0.015	35 - 140	30	95	53-122	25	
4,4'-DDT	50-29-3	µg/L	0.001	0.020	0.0050	0.05	0.008	0.05	0.015	45 - 140	30	95	54-132	25	
Dieldrin	60-57-1	µg/L	0.0019	0.020	0.0051	0.05	0.011	0.05	0.015	60 - 130	30	95	67-130	25	
Endosulfan I	959-98-8	µg/L	0.0087	0.010	0.0051	0.05	0.003	0.05	0.015	50 - 110	30	95	67-110	25	
Endosufan II	33213-65-9	µg/L	0.0087	0.020	0.011	0.05	0.006	0.05	0.015	30 - 130	30	95	66-130	25	
Endosulfan Sulfate	1031-07-8	µg/L	N/A	0.020	0.0050	0.1	0.006	0.05	0.015	55 - 135	30	95	56-135	25	
Endrin	72-20-8	µg/L	0.0023	0.020	0.0070	0.05	0.006	0.05	0.015	55 - 135	30	95	75-132	25	
Endrin Ketone	53494-70-5	µg/L	N/A	0.020	0.0050	0.05	0.010	0.05	0.015	75 - 125	30	95	75-125	25	
Heptachlor	76-44-8	µg/L	0.0036	0.010	0.0026	0.15	0.005	0.05	0.015	40 - 130	30	95	57-128	25	
Heptachlor epoxide	1024-57-3	µg/L	0.0036	0.010	0.0026	0.1	0.007	0.05	0.015	60 - 130	30	95	66-130	25	
Hexachlorobenzene	118-74-1	µg/L	6000	0.010	0.0030	0.05	0.006	0.05	0.0160	50 - 130	30	95	60-140	25	
Methoxychlor	72-43-5	µg/L	0.03	0.10	0.030	0.05	0.032	0.05	0.015	55 - 150	30	95	59-140	25	
Toxaphene	8001-35-2	µg/L	N/A	3.0	1.0	1	0.21	N/A	N/A				60-140	30	

Notes:

Monitoring Criteria are provided for monitoring purposes only and are not to be considered Project Action Limits (PAL)

Yellow highlighted compounds and monitoring criteria are primary compounds for data practicability analysis. Yellow highlighted PQLs are currently equal to or greater than Monitoring Criteria

Red highlighted proposed PQLs are equal to or greater than Monitoring Criteria

[1] Monitoring Criteria for surface water based on hierarchy established in Table 1-1 of *Final Sampling and Analysis Plan, Addendum No. 006*

PQL = practical quantitation limit

MDL = method detection limit

%R = relative percent

DQO = data quality objective

%RPD = relative percent difference

µg/L = micrograms per liter

N/A = not available or not applicable

*Need special extract dilution to meet limit

Blank indicates information not provided

Table 2

Laborotory Method Detection Limits and Reporting Limits for Total Cyanide in Surface Water
Atlas Tack Corporation Superfund Site
Fairhaven, Massachusetts

				EAI Acheivable Laboratory Limits [1]		ESS Acheivable Laboratory Limits							
			Price:	$120.00		$28.00		ESS DQOs			EAI DQOs		
Analytes of Concern and Methods	CAS Number	Units	Initial Plan Monitoring Criteria	PQL	MDL	PQL	MDL	Accuracy (%R)	Precision (%RPD)	Completeness (% valid Data)	Accuracy (%R)	Precision (%RPD)	Completeness (% valid Data)
Surface Water Monitoring (saltwater)													
Total Cyanide - 9014 (low-level)	57125	µg/L	1	1	1	5	2	75-125	20	95	70 -130	20	90
Surface Water Monitoring (freshwater)													
Total Cyanide - 9014 (low-level)	57125	µg/L	5.2	1	1	5	2	75-125	20	95	70 - 130	20	90

Notes:
Monitoring Criteria are provided for monitoring purposes only and are not to be considered Project Action Limits (PAL)
Red highlighted PQLs are equal to or greater than Monitoring Criteria
Monitoring Criteria for surface water based on hierarchy established in Table 1-1 of *Final Sampling and Analysis Plan, Addendum No. 006*
DQO = Data Quality Objectives
PQL = Practical Quantitation Limit
MDL = Method Detection Limit
µg/L = micrograms per liter
%RPD = relative percent difference
%R = relative percent
EAI = Eastern Analytical Inc.
[1] = Low Level Cyanide Method 4500CN-E; valid results are within 30% of LCS

April 2011 & October 2011 Post Remediation Toxicity Testing Results

Finding for Issue 4 of the 2010 FYR presented in Post Remedial Toxicity Testing Tables 4-6 and 4-7. Sediment monitoring locations and analytical results along with calculated ER-MQ values are presented in Figures 2-1 through 2-4. (Weston, 2012)

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Table 4-6

Sediment Toxicity Summary of Results
Long-Term Groundwater Monitoring
Atlas Tack Superfund Site
April 14, 2011

Sample ID	Analysis	Method	Mean % Survival	Mean Growth Weight (mg) [1]
AT-PM-FW-05-004-Y	Hyalella azteca	EPA/600/R-99/064, Method 100.1	100	0.145
	Chironomus tentans	EPA/600/R-99/064, Method 100.2	95	1.110
AT-PM-FW-06-004-Y	Hyalella azteca	EPA/600/R-99/064, Method 100.1	100	0.154
	Chironomus tentans	EPA/600/R-99/064, Method 100.2	92.5	1.030
Ha Ct Control	Hyalella azteca	EPA/600/R-99/064, Method 100.1	98.8	0.150
	Chironomus tentans	EPA/600/R-99/064, Method 100.2	93.8	1.330
AT-PM-BC-01-004-Y	Leptocheirus plumulosus	EPA/600/R-94/025[2]	98	NA
AT-PM-BC-04-004-Y	Leptocheirus plumulosus	EPA/600/R-94/025[2]	94	NA
AT-PM-BC-08-001-Y	Leptocheirus plumulosus	EPA/600/R-94/025[2]	95	NA
AT-PM-BC-10-001-Y	Leptocheirus plumulosus	EPA/600/R-94/025[2]	100	NA
Lp Control	Leptocheirus plumulosus	EPA/600/R-94/025[2]	100	NA

Notes:

[1] Mean Ash-free Weight by Method 100.2

[2] Regional guidance for dredged material testing is outlined in USACE Regional Implementation Manual, April 2004.

USACE = United States (U.S.) Army Corp. of Engineers

mg = milligrams

NA = Not Applicable

EPA = United States Environmental Protection Agency

EPA/600/R-94/025 = Method for Assessing the Toxicity of Sediment-associated Contaminants with Esuarine and Marine Amphipods

EPA/600/R-99/064 = Methods for Assessing the Toxicity of and Bioccumulation of Sediment-associated Contaminants with Freshwater Invertebrates

Table 4-7

Sediment Toxicity Summary of Results
Long-Term Groundwater Monitoring
Atlas Tack Superfund Site
October 26, 2011

Sample ID	Analysis	Method	Mean % Survival	Mean Growth Weight (mg) [1]
AT-PM-BC-01-005-Y	Leptocheirus plumulosus	EPA/600/R-94/025[2]	97	NA
AT-PM-BC-04-005-Y	Leptocheirus plumulosus	EPA/600/R-94/025[2]	95	NA
AT-PM-MH-09-002-Y	Leptocheirus plumulosus	EPA/600/R-94/025[2]	98	NA
Lp Control	Leptocheirus plumulosus	EPA/600/R-94/025[2]	99	NA

Notes:

[1] Mean Ash-free Weight by Method 100.2

[2] Regional guidance for dredged material testing is outlined in USACE Regional Implementation Manual, April 2004.

USACE = United States (U.S.) Army Corp. of Engineers

mg = milligrams

NA = Not Applicable

EPA = United States Environmental Protection Agency

EPA/600/R-94/025 = Method for Assessing the Toxicity of Sediment-associated Contaminants with Esuarine and Marine Amphipods

SAMPLE	ANALYTE	SEDIMENT CRITERIA	4/14/11 RESULT
AT-PM-BC-03-004-Y	CYANIDE (TOTAL)	34	1.19 U
	CADMIUM	9.6	0.4 U
	CHROMIUM	370	4.3
	COPPER	270	7.8
	LEAD	218	12.1
	NICKEL	52	2.6
	ZINC	410	22.1
	ER-MQ	–	0.04

SAMPLE	ANALYTE	SEDIMENT CRITERIA	4/14/11 RESULT
AT-PM-BC-04-004-Y	CYANIDE (TOTAL)	34	1.24 U
	CADMIUM	9.6	0.2 J
	CHROMIUM	370	15
	COPPER	270	47.5
	LEAD	218	18.4
	NICKEL	52	16.1
	ZINC	410	77
	ER-MQ	–	0.14

SAMPLE	ANALYTE	SEDIMENT CRITERIA	4/14/11 RESULT
AT-PM-BC-13-001-Y	CYANIDE (TOTAL)	34	1.09 U
	CADMIUM	9.6	0.4 U
	CHROMIUM	370	1.8
	COPPER	270	3.4
	LEAD	218	2.4 J
	NICKEL	52	1.4 J
	ZINC	410	14.8
	ER-MQ	–	0.02

SAMPLE	ANALYTE	SEDIMENT CRITERIA	4/14/11 RESULT
AT-PM-FW-05-004-Y	CYANIDE (TOTAL)	34	1.16 U
	CADMIUM	9.6	0.4 U
	CHROMIUM	370	4.9
	COPPER	270	9.2
	LEAD	218	5.7
	NICKEL	52	2.9
	ZINC	410	15.6
	ER-MQ	–	0.04

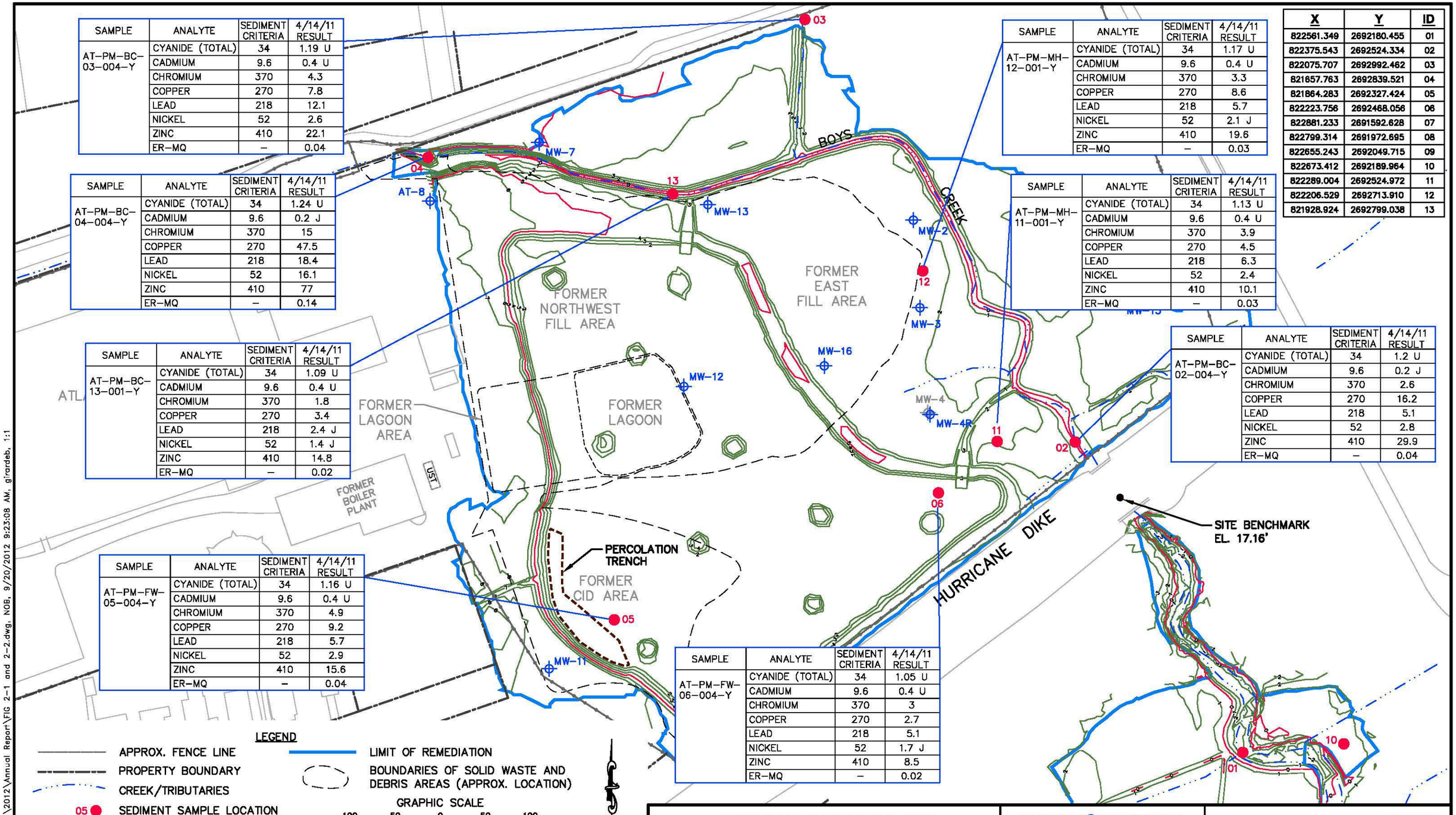
SAMPLE	ANALYTE	SEDIMENT CRITERIA	4/14/11 RESULT
AT-PM-MH-12-001-Y	CYANIDE (TOTAL)	34	1.17 U
	CADMIUM	9.6	0.4 U
	CHROMIUM	370	3.3
	COPPER	270	8.6
	LEAD	218	5.7
	NICKEL	52	2.1 J
	ZINC	410	19.6
	ER-MQ	–	0.03

SAMPLE	ANALYTE	SEDIMENT CRITERIA	4/14/11 RESULT
AT-PM-MH-11-001-Y	CYANIDE (TOTAL)	34	1.13 U
	CADMIUM	9.6	0.4 U
	CHROMIUM	370	3.9
	COPPER	270	4.5
	LEAD	218	6.3
	NICKEL	52	2.4
	ZINC	410	10.1
	ER-MQ	–	0.03

SAMPLE	ANALYTE	SEDIMENT CRITERIA	4/14/11 RESULT
AT-PM-BC-02-004-Y	CYANIDE (TOTAL)	34	1.2 U
	CADMIUM	9.6	0.2 J
	CHROMIUM	370	2.6
	COPPER	270	16.2
	LEAD	218	5.1
	NICKEL	52	2.8
	ZINC	410	29.9
	ER-MQ	–	0.04

SAMPLE	ANALYTE	SEDIMENT CRITERIA	4/14/11 RESULT
AT-PM-FW-06-004-Y	CYANIDE (TOTAL)	34	1.05 U
	CADMIUM	9.6	0.4 U
	CHROMIUM	370	3
	COPPER	270	2.7
	LEAD	218	5.1
	NICKEL	52	1.7 J
	ZINC	410	8.5
	ER-MQ	–	0.02

X	Y	ID
822561.349	2692180.455	01
822375.543	2692524.334	02
822075.707	2692992.462	03
821657.763	2692839.521	04
821864.283	2692327.424	05
822223.756	2692468.056	06
822881.233	2691592.628	07
822799.314	2691972.695	08
822655.243	2692049.715	09
822673.412	2692189.964	10
822289.004	2692524.972	11
822206.529	2692713.910	12
821928.924	2692799.038	13



LEGEND

- APPROX. FENCE LINE
- PROPERTY BOUNDARY
- CREEK/TRIBUTARIES
- 05 SEDIMENT SAMPLE LOCATION
- LIMIT OF REMEDIATION
- BOUNDARIES OF SOLID WASTE AND DEBRIS AREAS (APPROX. LOCATION)

GRAPHIC SCALE

100 50 0 50 100

APPROXIMATE SCALE IN FEET

NOTES:
1) ALL RESULTS REPORTED IN MG/KG
2) U = NOT DETECTED
3) J = ESTIMATE RESULTS SINCE RESULTS ARE BETWEEN THE MAXIMUM DETECTION LIMIT AND REPORTING LIMIT
4) J^{9}= ESTIMATE RESULTS SINCE FIELD DUPLICATE CRITERIA WAS NOT MET
5) CID – COMMERCIAL INDUSTRIAL DEBRIS
6) HORIZONTAL CONTROL: MASSACHUSETTS STATE PLANE, NORTH AMERICAN DATUM 1983 – NAD83 (1996), FEET
VERTICAL CONTROL: NORTH AMERICAN VERTICAL DATUM 1988 – NAVD88, FEET
SITE BENCHMARK IS SET ABOVE CULVERT ON TOP OF DIKE, IT IS A 3"X3" SQUARE WITH DRILLED HOLE AT IT'S CENTER, CUT INTO THE CONCRETE STRUCTURE (NORTHING–2692462.83, EASTING–822425.27, ELEVATION–17.16)

SEDIMENT MONITORING MAP NORTH OF BARRIER APRIL 14, 2011

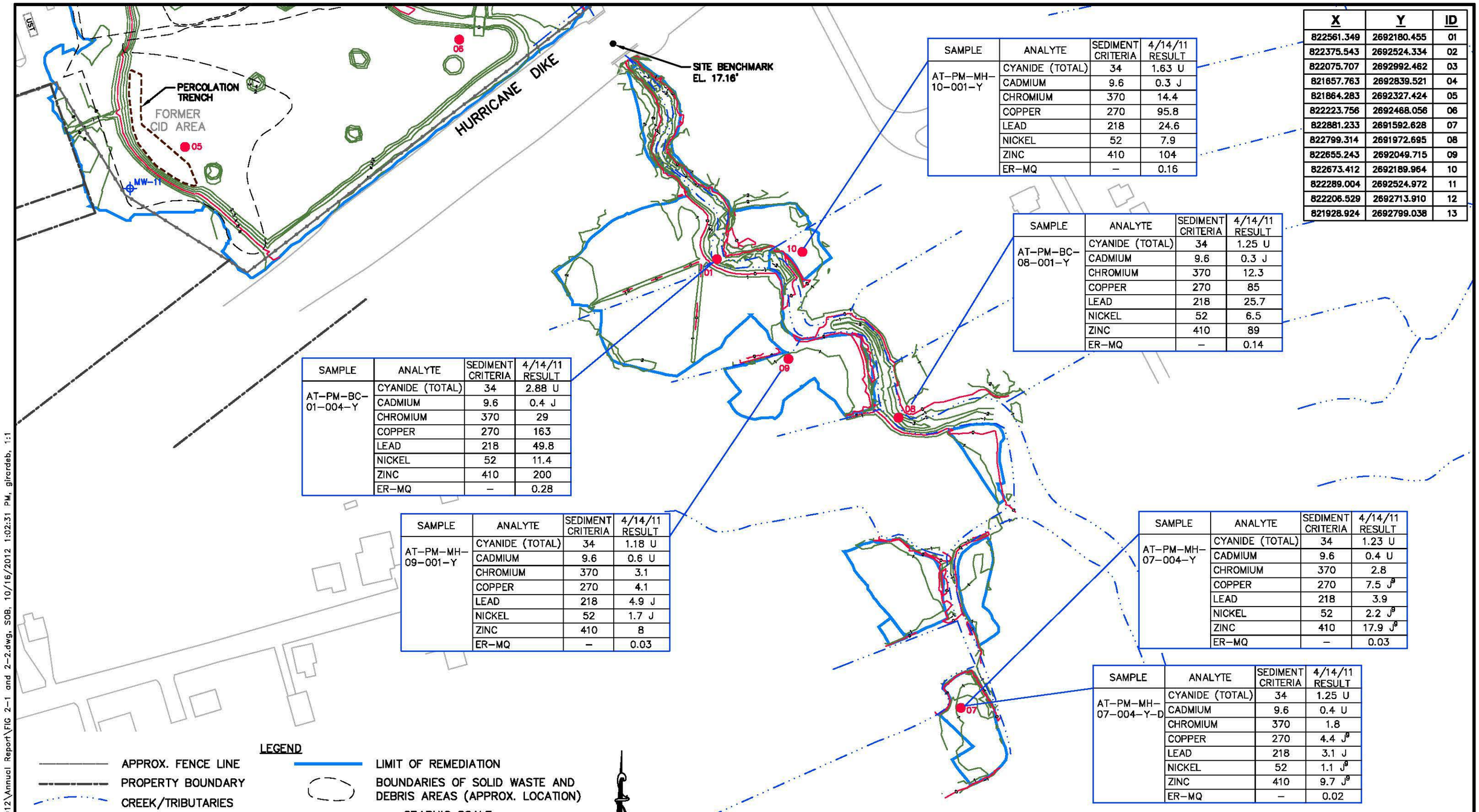
LONG-TERM GROUNDWATER MONITORING
ATLAS TACK SUPERFUND SITE
FAIRHAVEN, MASSACHUSETTS

WESTON SOLUTIONS
MANCHESTER NEW HAMPSHIRE

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT
CORPS OF ENGINEERS
CONCORD, MASSACHUSETTS

DRAWN	DATE	DES. ENG.	DATE	W.O. NO.
BEG	SEP 2012			20173.009.403
CHECKED	DATE	SCALE	REVISION	FIGURE NO.
		AS SHOWN		2-1

M:\Design\DWG\ATLAS\2012\Annual Report\FIG 2-1 and 2-2.dwg, NOB, 9/20/2012 9:23:08 AM, gfrardeb, 1:1



SAMPLE	ANALYTE	SEDIMENT CRITERIA	4/14/11 RESULT
AT-PM-MH-10-001-Y	CYANIDE (TOTAL)	34	1.63 U
	CADMIUM	9.6	0.3 J
	CHROMIUM	370	14.4
	COPPER	270	95.8
	LEAD	218	24.6
	NICKEL	52	7.9
	ZINC	410	104
	ER-MQ	–	0.16

X	Y	ID
822561.349	2692180.455	01
822375.543	2692524.334	02
822075.707	2692992.462	03
821657.763	2692839.521	04
821864.283	2692327.424	05
822223.756	2692468.056	06
822881.233	2691592.628	07
822799.314	2691972.695	08
822655.243	2692049.715	09
822673.412	2692189.964	10
822289.004	2692524.972	11
822206.529	2692713.910	12
821928.924	2692799.038	13

SAMPLE	ANALYTE	SEDIMENT CRITERIA	4/14/11 RESULT
AT-PM-BC-08-001-Y	CYANIDE (TOTAL)	34	1.25 U
	CADMIUM	9.6	0.3 J
	CHROMIUM	370	12.3
	COPPER	270	85
	LEAD	218	25.7
	NICKEL	52	6.5
	ZINC	410	89
	ER-MQ	–	0.14

SAMPLE	ANALYTE	SEDIMENT CRITERIA	4/14/11 RESULT
AT-PM-BC-01-004-Y	CYANIDE (TOTAL)	34	2.88 U
	CADMIUM	9.6	0.4 J
	CHROMIUM	370	29
	COPPER	270	163
	LEAD	218	49.8
	NICKEL	52	11.4
	ZINC	410	200
	ER-MQ	–	0.28

SAMPLE	ANALYTE	SEDIMENT CRITERIA	4/14/11 RESULT
AT-PM-MH-09-001-Y	CYANIDE (TOTAL)	34	1.18 U
	CADMIUM	9.6	0.6 U
	CHROMIUM	370	3.1
	COPPER	270	4.1
	LEAD	218	4.9 J
	NICKEL	52	1.7 J
	ZINC	410	8
	ER-MQ	–	0.03

SAMPLE	ANALYTE	SEDIMENT CRITERIA	4/14/11 RESULT
AT-PM-MH-07-004-Y	CYANIDE (TOTAL)	34	1.23 U
	CADMIUM	9.6	0.4 U
	CHROMIUM	370	2.8
	COPPER	270	7.5 J^9
	LEAD	218	3.9
	NICKEL	52	2.2 J^9
	ZINC	410	17.9 J^9
	ER-MQ	–	0.03

SAMPLE	ANALYTE	SEDIMENT CRITERIA	4/14/11 RESULT
AT-PM-MH-07-004-Y-D	CYANIDE (TOTAL)	34	1.25 U
	CADMIUM	9.6	0.4 U
	CHROMIUM	370	1.8
	COPPER	270	4.4 J^9
	LEAD	218	3.1 J
	NICKEL	52	1.1 J^9
	ZINC	410	9.7 J^9
	ER-MQ	–	0.02

LEGEND

- APPROX. FENCE LINE
- PROPERTY BOUNDARY
- CREEK/TRIBUTARIES
- 05 SEDIMENT SAMPLE LOCATION
- LIMIT OF REMEDIATION
- BOUNDARIES OF SOLID WASTE AND DEBRIS AREAS (APPROX. LOCATION)

GRAPHIC SCALE

100 50 0 50 100

APPROXIMATE SCALE IN FEET

NOTES:
1) ALL RESULTS REPORTED IN MG/KG
2) U = NOT DETECTED
3) J_9 = ESTIMATE RESULTS SINCE RESULTS ARE BETWEEN THE MAXIMUM DETECTION LIMIT AND REPORTING LIMIT
4) J^9 = ESTIMATE RESULTS SINCE FIELD DUPLICATE CRITERIA WAS NOT MET
5) CID – COMMERCIAL INDUSTRIAL DEBRIS
6) HORIZONTAL CONTROL: MASSACHUSETTS STATE PLANE, NORTH AMERICAN DATUM 1983 – NAD83 (1996), FEET
VERTICAL CONTROL: NORTH AMERICAN VERTICAL DATUM 1988 – NAVD88, FEET
SITE BENCHMARK IS SET ABOVE CULVERT ON TOP OF DIKE, IT IS A 3"X3" SQUARE WITH DRILLED HOLE AT IT'S CENTER, CUT INTO THE CONCRETE STRUCTURE (NORTHING–2692462.83, EASTING–822425.27, ELEVATION–17.16)

SEDIMENT MONITORING MAP SOUTH OF BARRIER APRIL 14, 2011

LONG-TERM GROUNDWATER MONITORING
ATLAS TACK SUPERFUND SITE
FAIRHAVEN, MASSACHUSETTS

WESTON SOLUTIONS
MANCHESTER NEW HAMPSHIRE

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT
CORPS OF ENGINEERS
CONCORD, MASSACHUSETTS

DRAWN	DATE	DES. ENG.	DATE	W.O. NO.
BEG	SEP 2012			20173.009.403
CHECKED	DATE	SCALE	REVISION	FIGURE NO.
		AS SHOWN		2-2

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SAMPLE	ANALYTE	SEDIMENT CRITERIA	10/26/11 RESULT
AT-PM-BC-03-005-Y	CYANIDE (TOTAL)	34	1.15 U
	CADMIUM	9.6	0.1 J
	CHROMIUM	370	4.1 J[1,2]
	COPPER	270	7.5 J[1,2]
	LEAD	218	13.7
	NICKEL	52	2.1
	ZINC	410	23.5 J[1,2]
	ER-MQ	–	0.03

SAMPLE	ANALYTE	SEDIMENT CRITERIA	10/26/11 RESULT
AT-PM-BC-04-005-Y	CYANIDE (TOTAL)	34	3.53 R[4]
	CADMIUM	9.6	0.6 J
	CHROMIUM	370	24.8 J[1,2,19]
	COPPER	270	143 J[1,2,19]
	LEAD	218	207
	NICKEL	52	11.6
	ZINC	410	274 J[1,2,19]
	ER-MQ	–	0.42

SAMPLE	ANALYTE	SEDIMENT CRITERIA	10/26/11 RESULT
AT-PM-BC-13-002-Y	CYANIDE (TOTAL)	34	1.13 U
	CADMIUM	9.6	0.3 U
	CHROMIUM	370	1 J[1,2]
	COPPER	270	2.3 J[1,2]
	LEAD	218	2.5 J
	NICKEL	52	0.9 J
	ZINC	410	13.1 J[1,2]
	ER-MQ	–	0.02

SAMPLE	ANALYTE	SEDIMENT CRITERIA	10/26/11 RESULT
AT-PM-FW-05-005-Y	CYANIDE (TOTAL)	34	1.29 U
	CADMIUM	9.6	0.07 J
	CHROMIUM	370	3.6 J[1,2]
	COPPER	270	14.6 J[1,2]
	LEAD	218	10.2
	NICKEL	52	1.7 J
	ZINC	410	23.8 J[1,2]
	ER-MQ	–	0.03

SAMPLE	ANALYTE	SEDIMENT CRITERIA	10/26/11 RESULT
AT-PM-MH-12-002-Y	CYANIDE (TOTAL)	34	1.21 U
	CADMIUM	9.6	0.4 U
	CHROMIUM	370	2.8 J[1,2]
	COPPER	270	4.5 J[1,2]
	LEAD	218	5.7
	NICKEL	52	1.2 J
	ZINC	410	10.4 J[1,2]
	ER-MQ	–	0.02

SAMPLE	ANALYTE	SEDIMENT CRITERIA	10/26/11 RESULT
AT-PM-MH-11-002-Y	CYANIDE (TOTAL)	34	1.2 U
	CADMIUM	9.6	0.4 U
	CHROMIUM	370	2.7 J[1,2]
	COPPER	270	3.6 J[1,2]
	LEAD	218	6.3
	NICKEL	52	1.0 J
	ZINC	410	8.4 J[1,2]
	ER-MQ	–	0.02

SAMPLE	ANALYTE	SEDIMENT CRITERIA	10/26/11 RESULT
AT-PM-BC-02-005-Y	CYANIDE (TOTAL)	34	1.01 J
	CADMIUM	9.6	0.4 J
	CHROMIUM	370	4.8 J[1,2]
	COPPER	270	32.9 J[1,2]
	LEAD	218	9.1
	NICKEL	52	6.3
	ZINC	410	58.1 J[1,2]
	ER-MQ	–	0.08

SAMPLE	ANALYTE	SEDIMENT CRITERIA	10/26/11 RESULT
AT-PM-FW-06-005-Y	CYANIDE (TOTAL)	34	1.04 U
	CADMIUM	9.6	0.3 U
	CHROMIUM	370	2.7 J[1,2]
	COPPER	270	2.2 J[1,2]
	LEAD	218	5.1
	NICKEL	52	1.3 J
	ZINC	410	7.3 J[1,2]
	ER-MQ	–	0.02

X	Y	ID
822561.349	2692180.455	01
822375.543	2692524.334	02
822075.707	2692992.462	03
821657.763	2692839.521	04
821864.283	2692327.424	05
822223.756	2692468.056	06
822881.233	2691592.628	07
822799.314	2691972.695	08
822655.243	2692049.715	09
822673.412	2692189.964	10
822289.004	2692524.972	11
822206.529	2692713.910	12
821928.924	2692799.038	13

BOYS CREEK

HURRICANE DIKE

FORMER NORTHWEST FILL AREA

FORMER EAST FILL AREA

FORMER LAGOON AREA

FORMER LAGOON

FORMER BOILER PLANT

UST

PERCOLATION TRENCH

FORMER CID AREA

MW-2, MW-3, MW-4, MW-4R, MW-7, MW-11, MW-12, MW-13, MW-16, AT-8

SITE BENCHMARK EL. 17.16'

LEGEND

- APPROX. FENCE LINE
- PROPERTY BOUNDARY
- CREEK/TRIBUTARIES
- LIMIT OF REMEDIATION
- BOUNDARIES OF SOLID WASTE AND DEBRIS AREAS (APPROX. LOCATION)
- 05 SEDIMENT SAMPLE LOCATION

GRAPHIC SCALE

100 50 0 50 100

APPROXIMATE SCALE IN FEET

NOTES:
1) ALL RESULTS REPORTED IN MG/KG
2) U = NOT DETECTED
3) J = ESTIMATE RESULTS SINCE RESULTS ARE BETWEEN THE METHOD DETECTION LIMIT AND REPORTING LIMIT
4) J[1] = ESTIMATE RESULTS SINCE LAB DUPLICATE DID NOT MEET CRITERIA
5) J[2] = ESTIMATE RESULTS SINCE SPIKE RECOVERIES WERE LESS THAN QC CRITERIA. RESULTS MAY BE BIASED LOW.
6) J[19] = ESTIMATE POSITIVE RESULTS DUE TO PERCENT SOLIDS LESS THAN 30%.
7) R[4] = REJECT NON-DETECT RESULTS DUE TO PERCENT SOLIDS LESS THAN 30%.
8) CID – COMMERCIAL INDUSTRIAL DEBRIS
9) HORIZONTAL CONTROL: MASSACHUSETTS STATE PLANE, NORTH AMERICAN DATUM 1983 – NAD83 (1996), FEET
VERTICAL CONTROL: NORTH AMERICAN VERTICAL DATUM 1988 – NAVD88, FEET
SITE BENCHMARK IS SET ABOVE CULVERT ON TOP OF DIKE, IT IS A 3"X3" SQUARE WITH DRILLED HOLE AT IT'S CENTER, CUT INTO THE CONCRETE STRUCTURE (NORTHING-2692462.83, EASTING-822425.27, ELEVATION-17.16)

SEDIMENT MONITORING MAP NORTH OF BARRIER OCTOBER 26, 2011

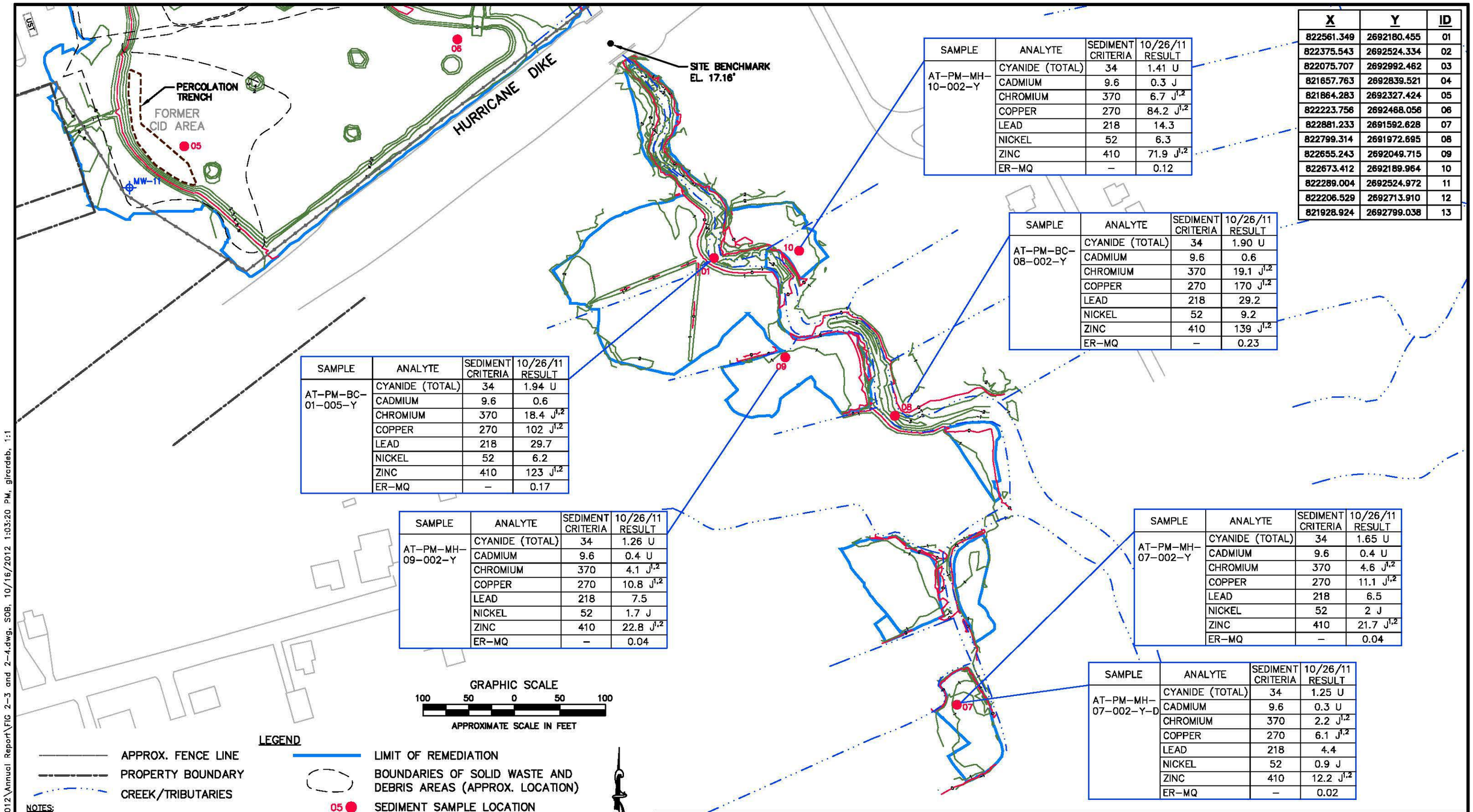
LONG-TERM GROUNDWATER MONITORING
ATLAS TACK SUPERFUND SITE
FAIRHAVEN, MASSACHUSETTS

WESTON SOLUTIONS
MANCHESTER NEW HAMPSHIRE

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT
CORPS OF ENGINEERS
CONCORD, MASSACHUSETTS

DRAWN	DATE	DES. ENG.	DATE	W.O. NO.
BEG	SEP 2012			20173.009.403
CHECKED	DATE	SCALE	REVISION	FIGURE NO.
		AS SHOWN		2-3

M:\Design\DWG\ATLAS\2012\Annual Report\FIG 2-3 and 2-4.dwg, NOB, 9/21/2012 9:19:29 AM, gfrardeb, 1:1



SAMPLE	ANALYTE	SEDIMENT CRITERIA	10/26/11 RESULT
AT-PM-MH-10-002-Y	CYANIDE (TOTAL)	34	1.41 U
	CADMIUM	9.6	0.3 J
	CHROMIUM	370	6.7 $J^{1,2}$
	COPPER	270	84.2 $J^{1,2}$
	LEAD	218	14.3
	NICKEL	52	6.3
	ZINC	410	71.9 $J^{1,2}$
	ER-MQ	–	0.12

X	Y	ID
822561.349	2692180.455	01
822375.543	2692524.334	02
822075.707	2692992.462	03
821657.763	2692839.521	04
821864.283	2692327.424	05
822223.756	2692468.056	06
822881.233	2691592.628	07
822799.314	2691972.695	08
822655.243	2692049.715	09
822673.412	2692189.964	10
822289.004	2692524.972	11
822206.529	2692713.910	12
821928.924	2692799.038	13

SAMPLE	ANALYTE	SEDIMENT CRITERIA	10/26/11 RESULT
AT-PM-BC-08-002-Y	CYANIDE (TOTAL)	34	1.90 U
	CADMIUM	9.6	0.6
	CHROMIUM	370	19.1 $J^{1,2}$
	COPPER	270	170 $J^{1,2}$
	LEAD	218	29.2
	NICKEL	52	9.2
	ZINC	410	139 $J^{1,2}$
	ER-MQ	–	0.23

SAMPLE	ANALYTE	SEDIMENT CRITERIA	10/26/11 RESULT
AT-PM-BC-01-005-Y	CYANIDE (TOTAL)	34	1.94 U
	CADMIUM	9.6	0.6
	CHROMIUM	370	18.4 $J^{1,2}$
	COPPER	270	102 $J^{1,2}$
	LEAD	218	29.7
	NICKEL	52	6.2
	ZINC	410	123 $J^{1,2}$
	ER-MQ	–	0.17

SAMPLE	ANALYTE	SEDIMENT CRITERIA	10/26/11 RESULT
AT-PM-MH-09-002-Y	CYANIDE (TOTAL)	34	1.26 U
	CADMIUM	9.6	0.4 U
	CHROMIUM	370	4.1 $J^{1,2}$
	COPPER	270	10.8 $J^{1,2}$
	LEAD	218	7.5
	NICKEL	52	1.7 J
	ZINC	410	22.8 $J^{1,2}$
	ER-MQ	–	0.04

SAMPLE	ANALYTE	SEDIMENT CRITERIA	10/26/11 RESULT
AT-PM-MH-07-002-Y	CYANIDE (TOTAL)	34	1.65 U
	CADMIUM	9.6	0.4 U
	CHROMIUM	370	4.6 $J^{1,2}$
	COPPER	270	11.1 $J^{1,2}$
	LEAD	218	6.5
	NICKEL	52	2 J
	ZINC	410	21.7 $J^{1,2}$
	ER-MQ	–	0.04

SAMPLE	ANALYTE	SEDIMENT CRITERIA	10/26/11 RESULT
AT-PM-MH-07-002-Y-D	CYANIDE (TOTAL)	34	1.25 U
	CADMIUM	9.6	0.3 U
	CHROMIUM	370	2.2 $J^{1,2}$
	COPPER	270	6.1 $J^{1,2}$
	LEAD	218	4.4
	NICKEL	52	0.9 J
	ZINC	410	12.2 $J^{1,2}$
	ER-MQ	–	0.02

GRAPHIC SCALE

100 50 0 50 100

APPROXIMATE SCALE IN FEET

LEGEND

- APPROX. FENCE LINE
- PROPERTY BOUNDARY
- CREEK/TRIBUTARIES
- LIMIT OF REMEDIATION
- BOUNDARIES OF SOLID WASTE AND DEBRIS AREAS (APPROX. LOCATION)
- 05 SEDIMENT SAMPLE LOCATION

NOTES:
1) ALL RESULTS REPORTED IN MG/KG
2) U = NOT DETECTED
3) J = ESTIMATE RESULTS SINCE RESULTS ARE BETWEEN THE METHOD DETECTION LIMIT AND REPORTING LIMIT
4) J^1 = ESTIMATE RESULTS SINCE LAB DUPLICATE DID NOT MEET CRITERIA
5) J^2 = ESTIMATE RESULTS SINCE SPIKE RECOVERIES WERE LESS THAN QC CRITERIA. RESULTS MAY BE BIASED LOW.
6) J^{19} = ESTIMATE POSITIVE RESULTS DUE TO PERCENT SOLIDS LESS THAN 30%.
7) R^4 = REJECT NON-DETECT RESULTS DUE TO PERCENT SOLIDS LESS THAN 30%.
8) CID - COMMERCIAL INDUSTRIAL DEBRIS
9) HORIZONTAL CONTROL: MASSACHUSETTS STATE PLANE, NORTH AMERICAN DATUM 1983 - NAD83 (1996), FEET
VERTICAL CONTROL: NORTH AMERICAN VERTICAL DATUM 1988 - NAVD88, FEET
SITE BENCHMARK IS SET ABOVE CULVERT ON TOP OF DIKE, IT IS A 3"X3" SQUARE WITH DRILLED HOLE AT IT'S CENTER, CUT INTO THE CONCRETE STRUCTURE (NORTHING-2692462.83, EASTING-822425.27, ELEVATION-17.16)

SEDIMENT MONITORING MAP
SOUTH OF BARRIER
OCTOBER 26, 2011

LONG-TERM GROUNDWATER MONITORING
ATLAS TACK SUPERFUND SITE
FAIRHAVEN, MASSACHUSETTS

WESTON SOLUTIONS
MANCHESTER NEW HAMPSHIRE

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT
CORPS OF ENGINEERS
CONCORD, MASSACHUSETTS

DRAWN	DATE	DES. ENG.	DATE	W.O. NO.
BEG	SEP 2012			20173.009.403
CHECKED	DATE	SCALE	REVISION	FIGURE NO.
		AS SHOWN		2-4

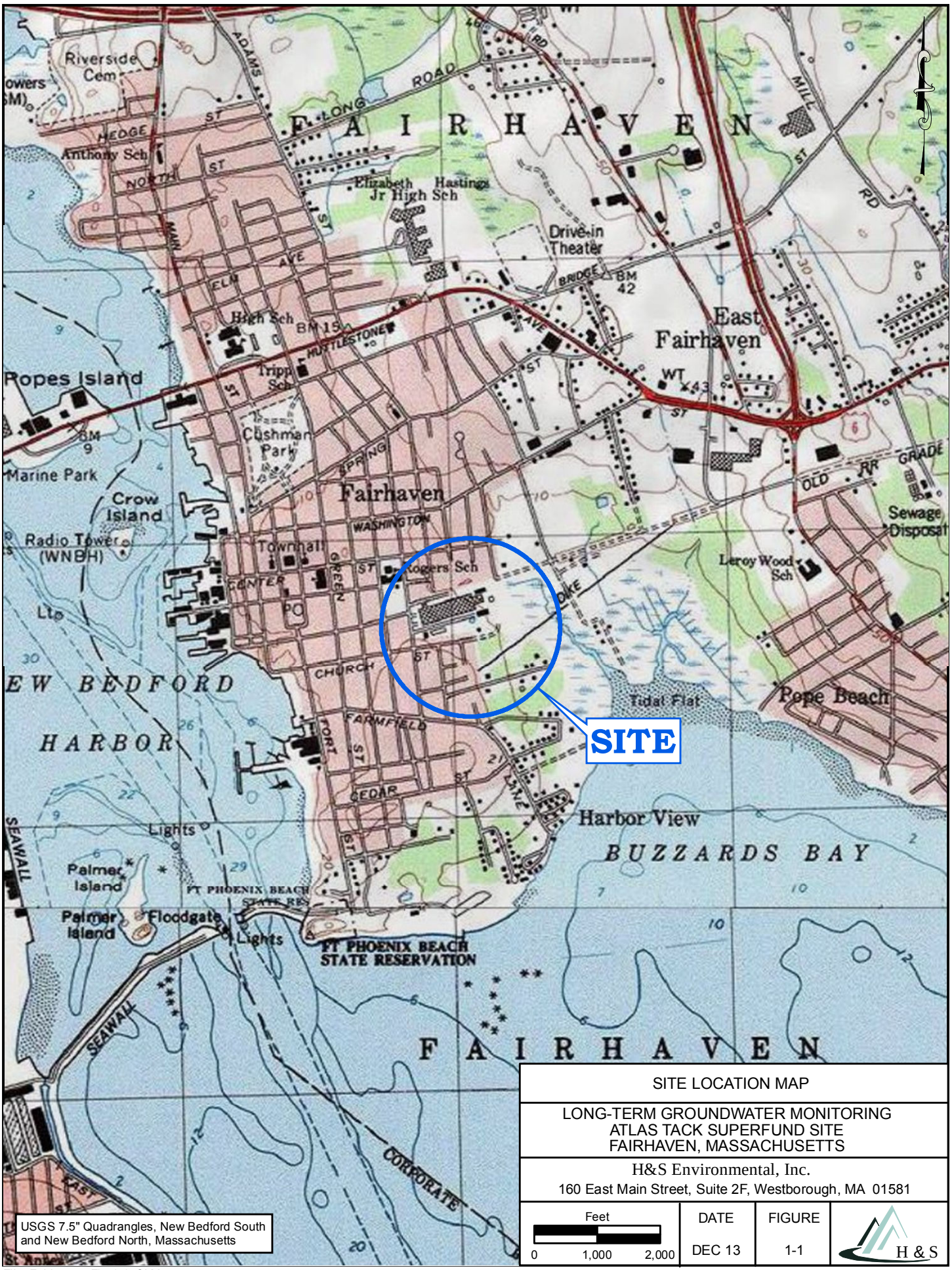
M:\Design\DWG\ATLAS\2012\Annual Report\FIG 2-3 and 2-4.dwg, SOB, 10/16/2012 1:03:20 PM, girardeb, 1:1

APPENDIX C

FIGURES & TABLES

LIST OF FIGURES

LIST OF TABLES



USGS 7.5" Quadrangles, New Bedford South and New Bedford North, Massachusetts

SITE LOCATION MAP

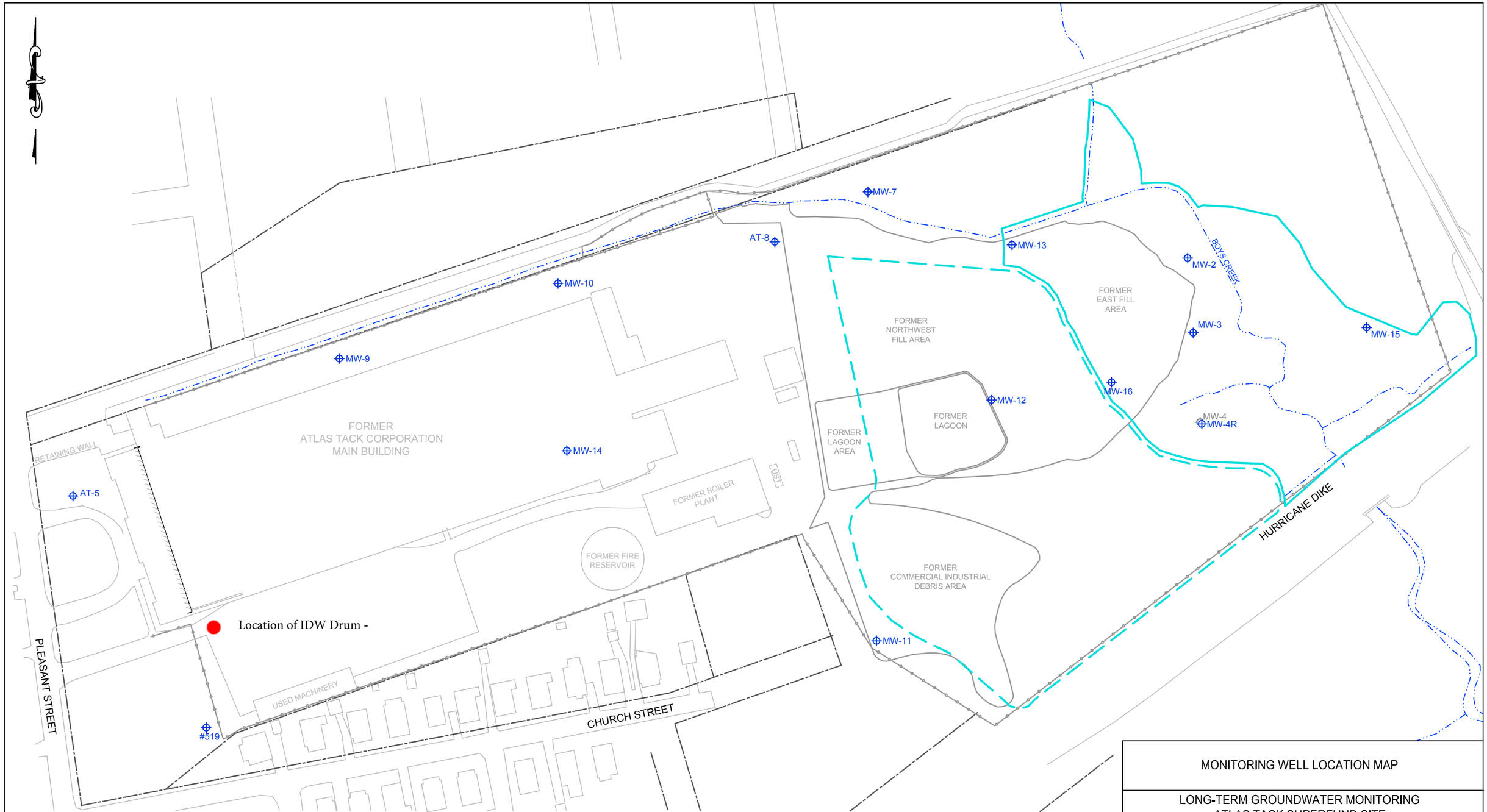
LONG-TERM GROUNDWATER MONITORING
ATLAS TACK SUPERFUND SITE
FAIRHAVEN, MASSACHUSETTS

H&S Environmental, Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

Feet	DATE	FIGURE
0 1,000 2,000	DEC 13	1-1

H & S

File: Fairhaven_Fig-1-1_SLM



LEGEND

- EXISTING OVERBURDEN MONITORING WELL
- ABANDONED OVERBURDEN MONITORING WELL
- EXTENT OF RESTORED SALTWATER WETLAND
- EXTENT OF RESTORED FRESHWATER WETLAND
- PROPERTY BOUNDARY
- CREEK / TRIBUTARIES

MONITORING WELL LOCATION MAP

LONG-TERM GROUNDWATER MONITORING
ATLAS TACK SUPERFUND SITE
FAIRHAVEN, MASSACHUSETTS

H&S Environmental, Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

SCALE IN FEET	DATE	FIGURE
0 — 120	DEC 13	2

File name: Fairhaven_Fig.dwg

Year		Groundwater	Surface Water Sediment
Year 1	2008	EPA - Quarterly	EPA – 1 Event
Year 2*	2009	EPA - Semiannually	EPA – 2 Event
Year 3	2010	EPA - Semiannually	
Year 4	2011	EPA - Semiannually	
Year 5	2012	EPA - Semiannually	MassDEP – 2 Events
Year 6**	2013	EPA - Annually	
Year 7	2014	EPA - Annually	
Year 8	2015	EPA - Annually	
Year 9	2016	EPA - Annually	
Year 10	2017	EPA - Annually	MassDEP – 2 Events
Year 11	2018	EPA - Annually	
Year 12	2019	MassDEP - Annually	
Year 13	2020	MassDEP - Annually	
Year 14	2021	MassDEP - Annually	
Year 15***	2022	MassDEP - Annually	MassDEP – 2 Events
Year 16	2023	MassDEP - Annually	
Year 17	2024	MassDEP - Annually	
Year 18	2025	MassDEP - Annually	
Year 19	2026	MassDEP - Annually	
Year 20	2027	MassDEP - Annually	MassDEP – 2 Events
Year 21	2028	MassDEP - Annually	
Year 22	2029	MassDEP - Annually	
Year 23	2030	MassDEP - Annually	
Year 24	2031	MassDEP - Annually	
Year 25	2032	MassDEP - Annually	MassDEP – 2 Events
Year 26	2033	MassDEP - Annually	
Year 27	2034	MassDEP - Annually	
Year 28	2035	MassDEP - Annually	
Year 29	2036	MassDEP - Annually	
Year 30	2037	MassDEP - Annually	MassDEP – 2 Events

Figure 3
Atlas Tack Corporation Superfund Site

Operation and Maintenance
Remedial Action Monitoring Activities By Year

Massachusetts Department of Environmental Protection

Notes:

* Annual groundwater monitoring events to be completed in April and October.

** Annual groundwater monitoring events will either take place during the months of April or October. The decision on when to complete the annual monitoring event should be based on data trend monitored over the first 5 years of the monitoring events. The month that exhibits the highest concentrations of contaminants of concern should be selected for when to perform the annual monitoring event.

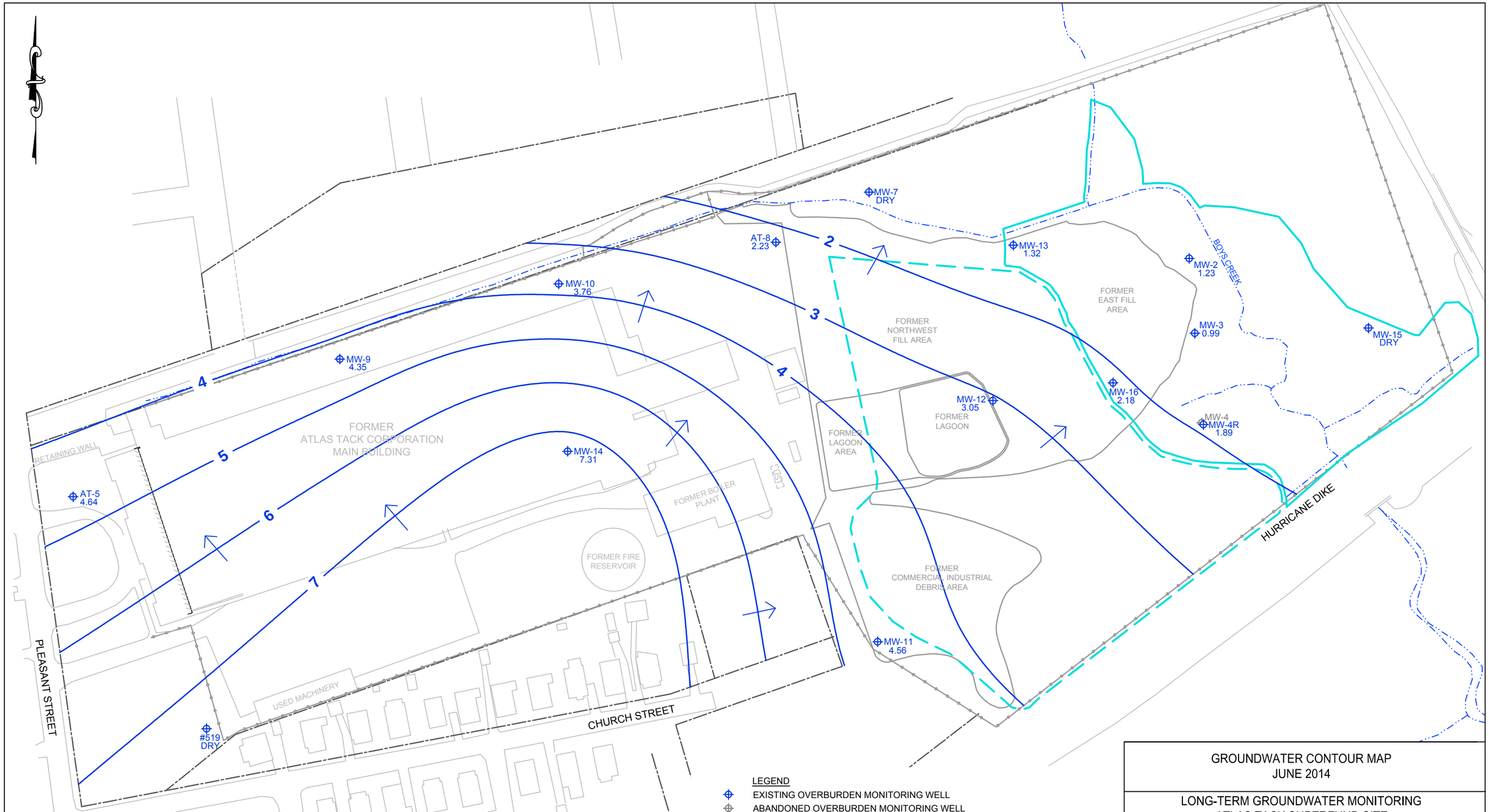
*** At a minimum, monitoring wells must be redeveloped on Year 15.

~ Groundwater water quality parameters to be collected concurrently with each groundwater monitoring event.

~ Groundwater sampling and surface water/sediment monitoring is to be done concurrently whenever possible.

WESTON SOLUTIONS

US Army Corps of Engineers®



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- EXISTING OVERBURDEN MONITORING WELL
- ABANDONED OVERBURDEN MONITORING WELL
- EXTENT OF RESTORED SALTWATER WETLAND
- EXTENT OF RESTORED FRESHWATER WETLAND
- PROPERTY BOUNDARY
- CREEK / TRIBUTARIES
- 3.05 GROUNDWATER ELEVATION
- 3 GROUNDWATER CONTOUR WITH ELEVATION
- GROUNDWATER FLOW ARROW

GROUNDWATER CONTOUR MAP
JUNE 2014

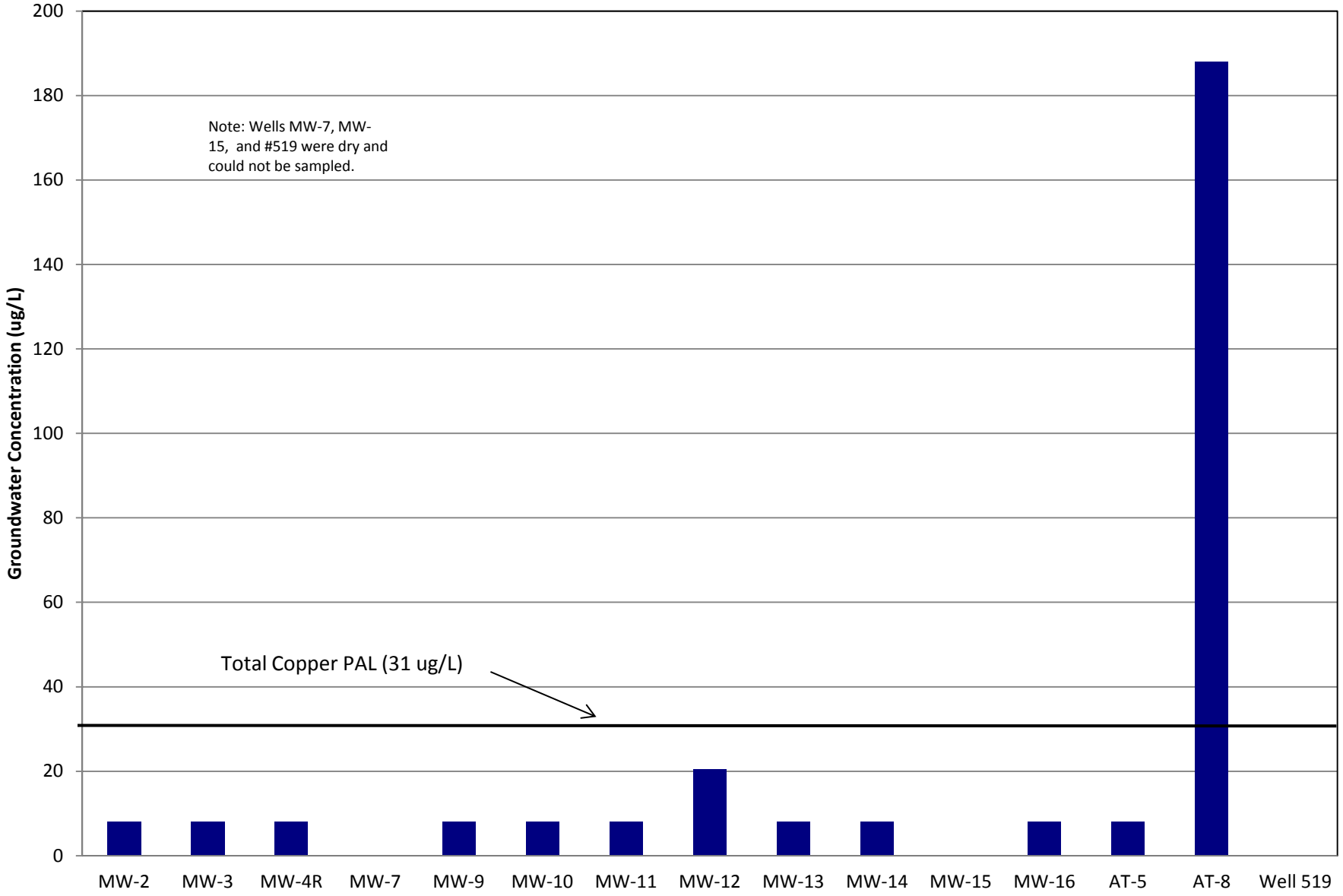
LONG-TERM GROUNDWATER MONITORING
ATLAS TACK SUPERFUND SITE
FAIRHAVEN, MASSACHUSETTS

H&S Environmental, Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

SCALE IN FEET	DATE	FIGURE
0 — 120	OCT 14	4

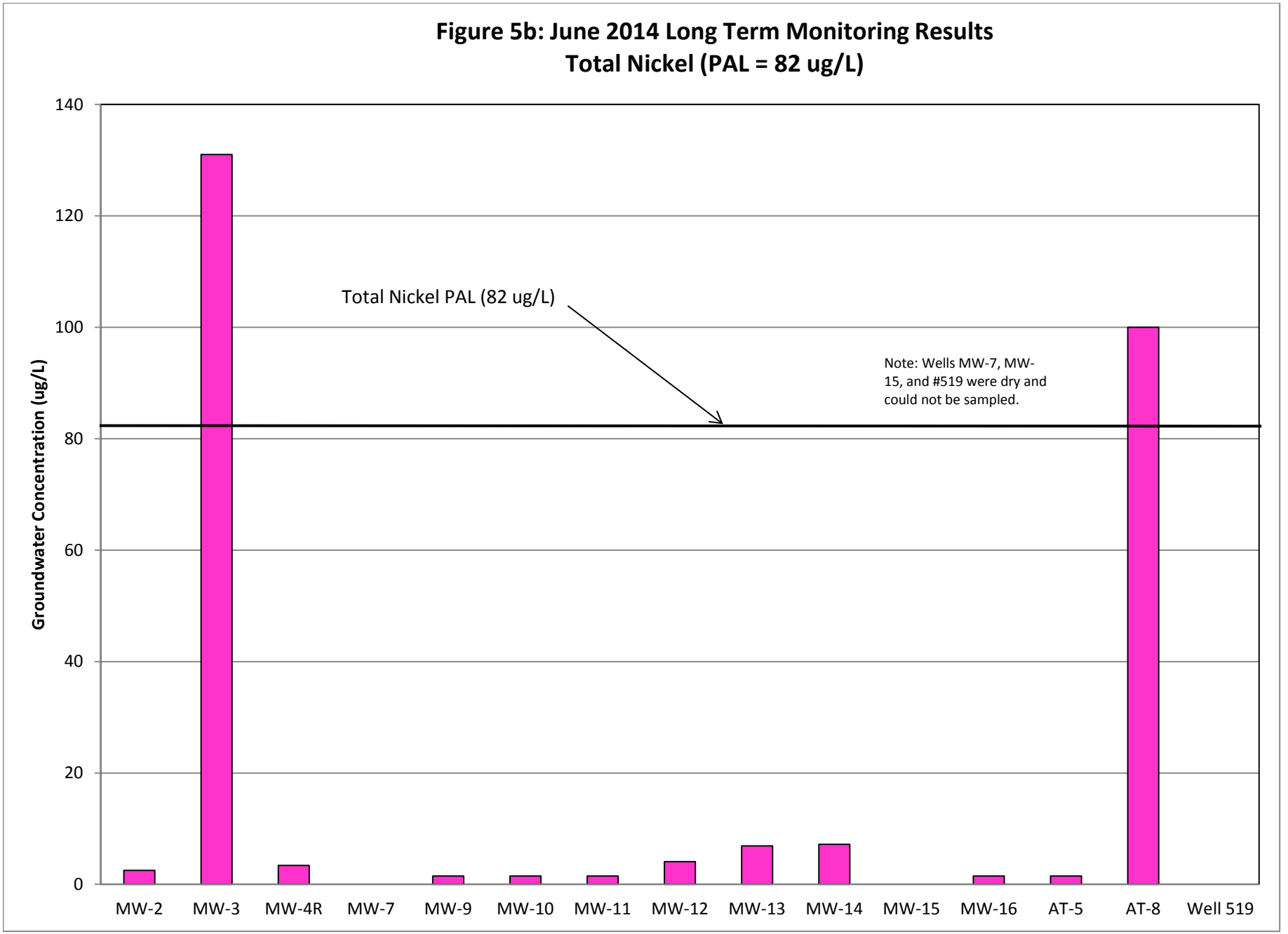
File name: Fairhaven_Fig.dwg Date: 10/20/2014

Figure 5a: June 2014 Long Term Monitoring Results
Total Copper (PAL = 31ug/L)



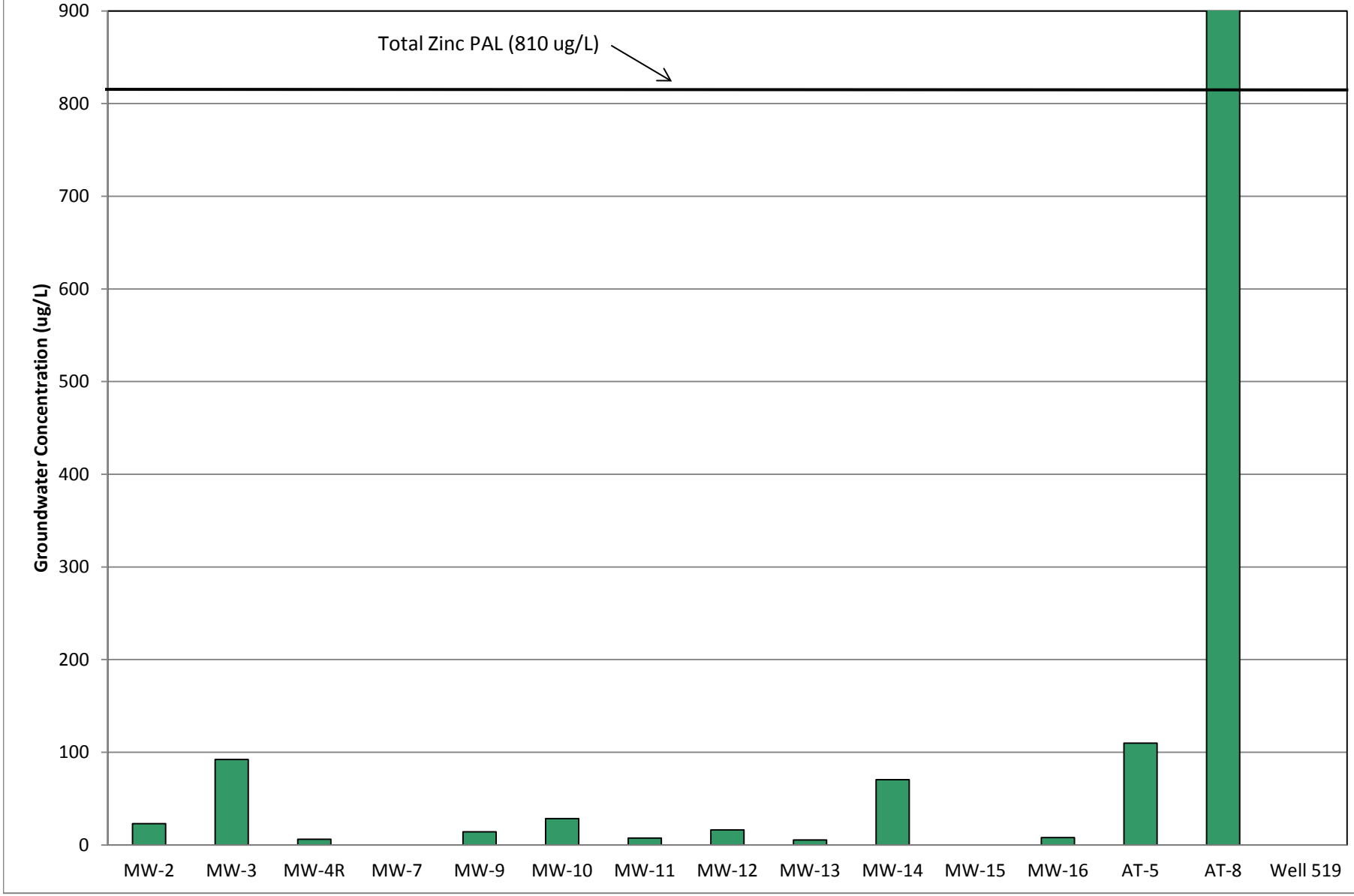
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 5b: June 2014 Long Term Monitoring Results
Total Nickel (PAL = 82 ug/L)



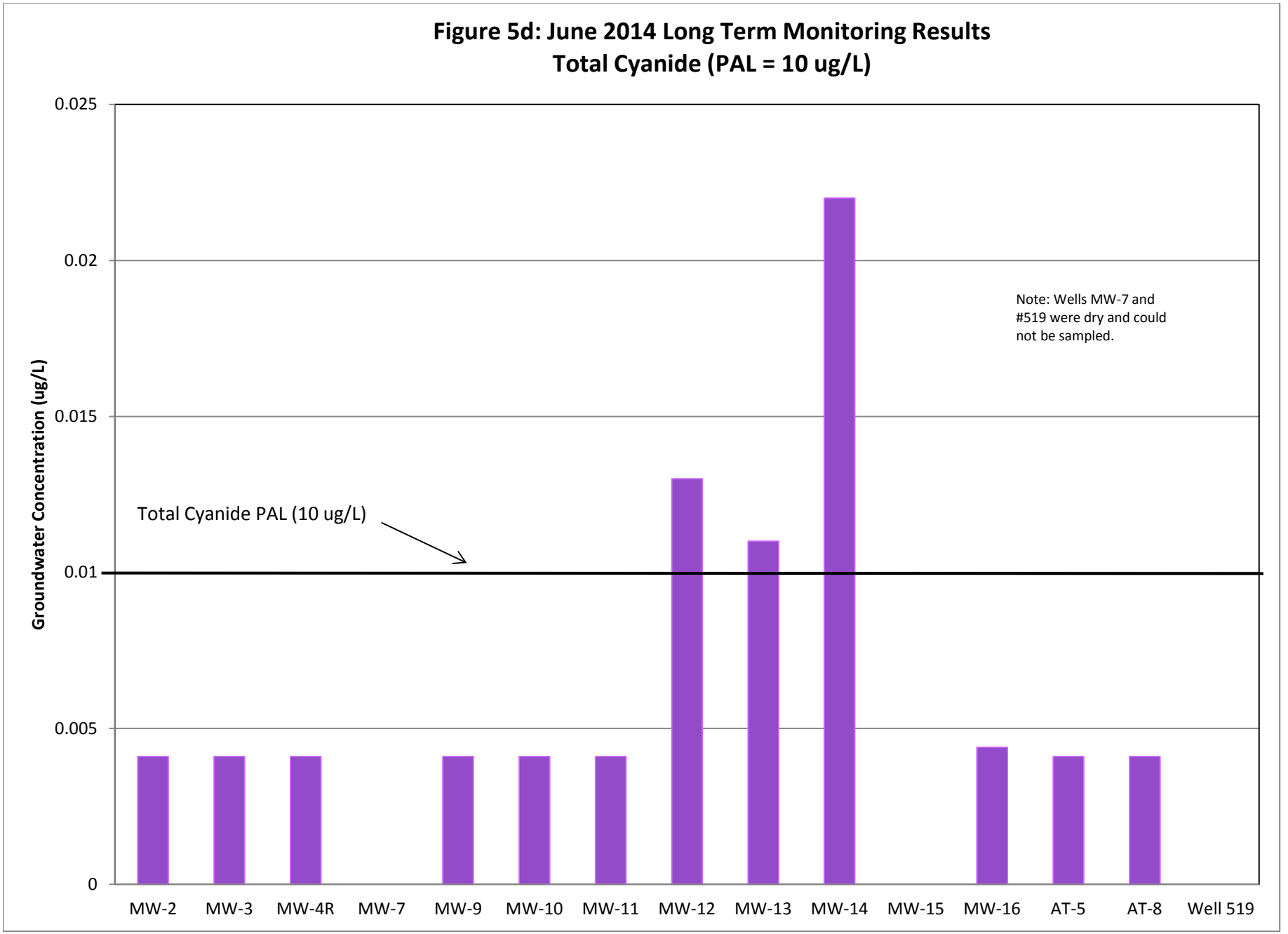
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 5c: June 2014 Long Term Monitoring Results
Total Zinc (PAL = 810 ug/L)



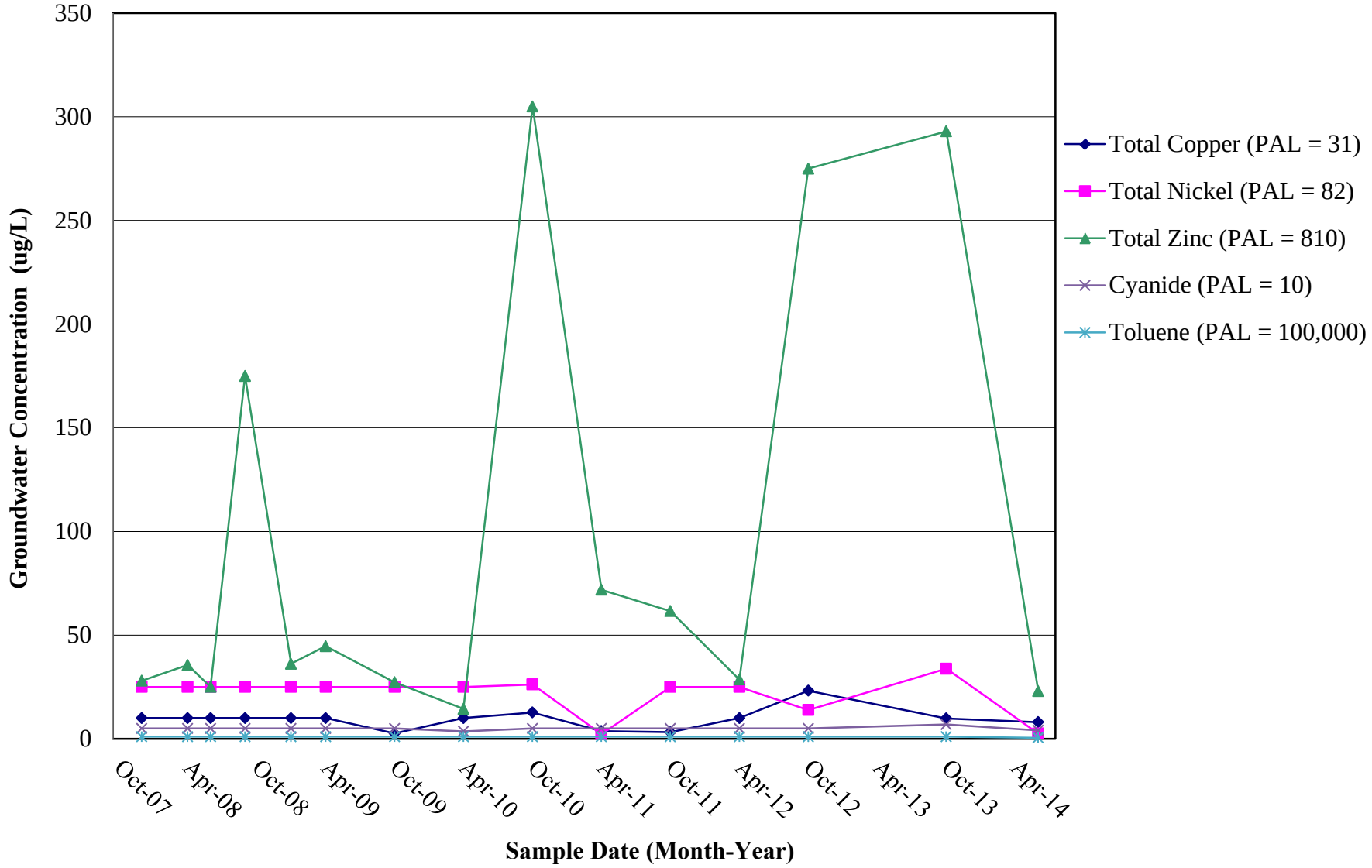
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 5d: June 2014 Long Term Monitoring Results
Total Cyanide (PAL = 10 ug/L)



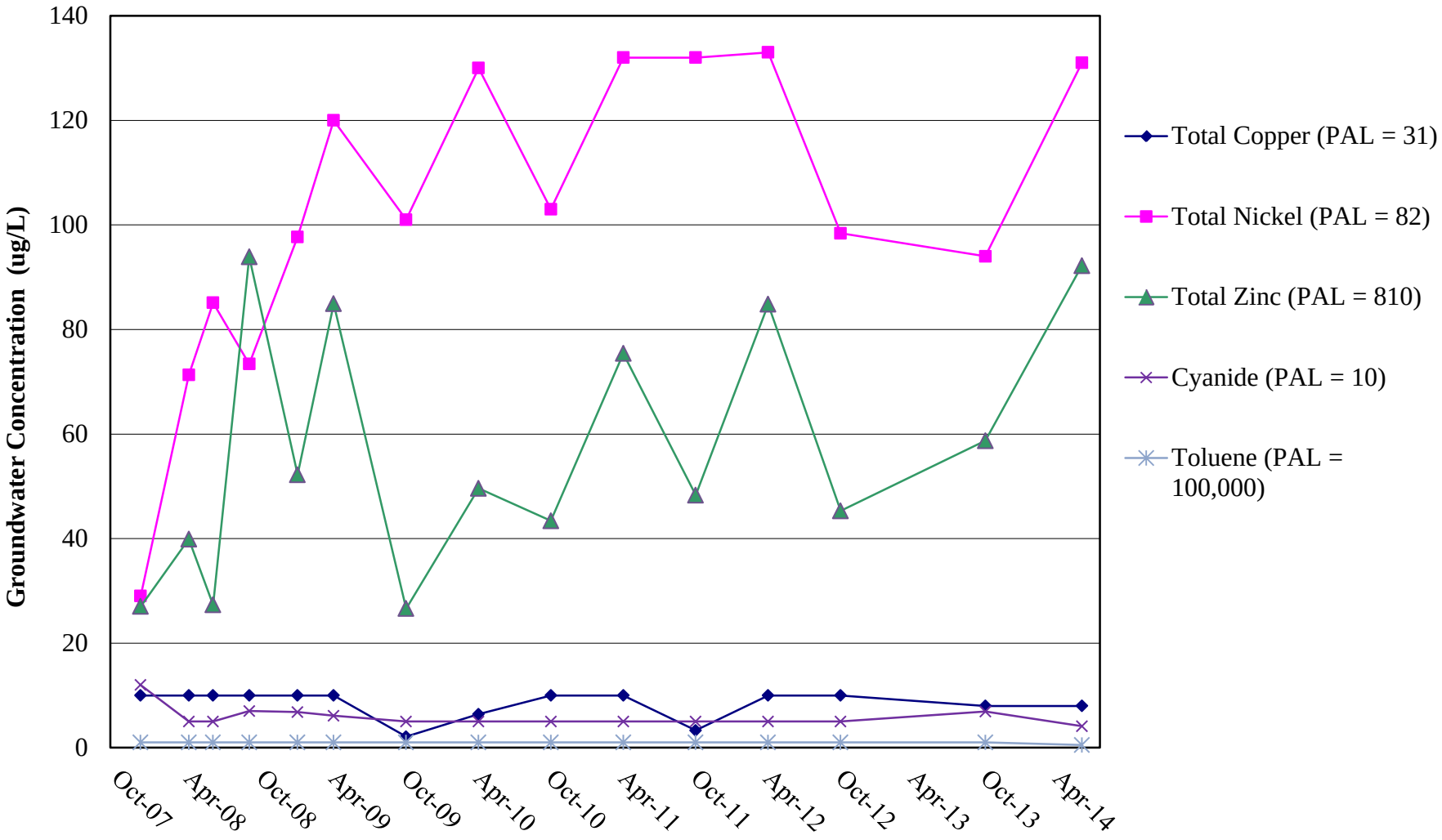
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 6a: MW-2 Contaminant Concentrations vs Time



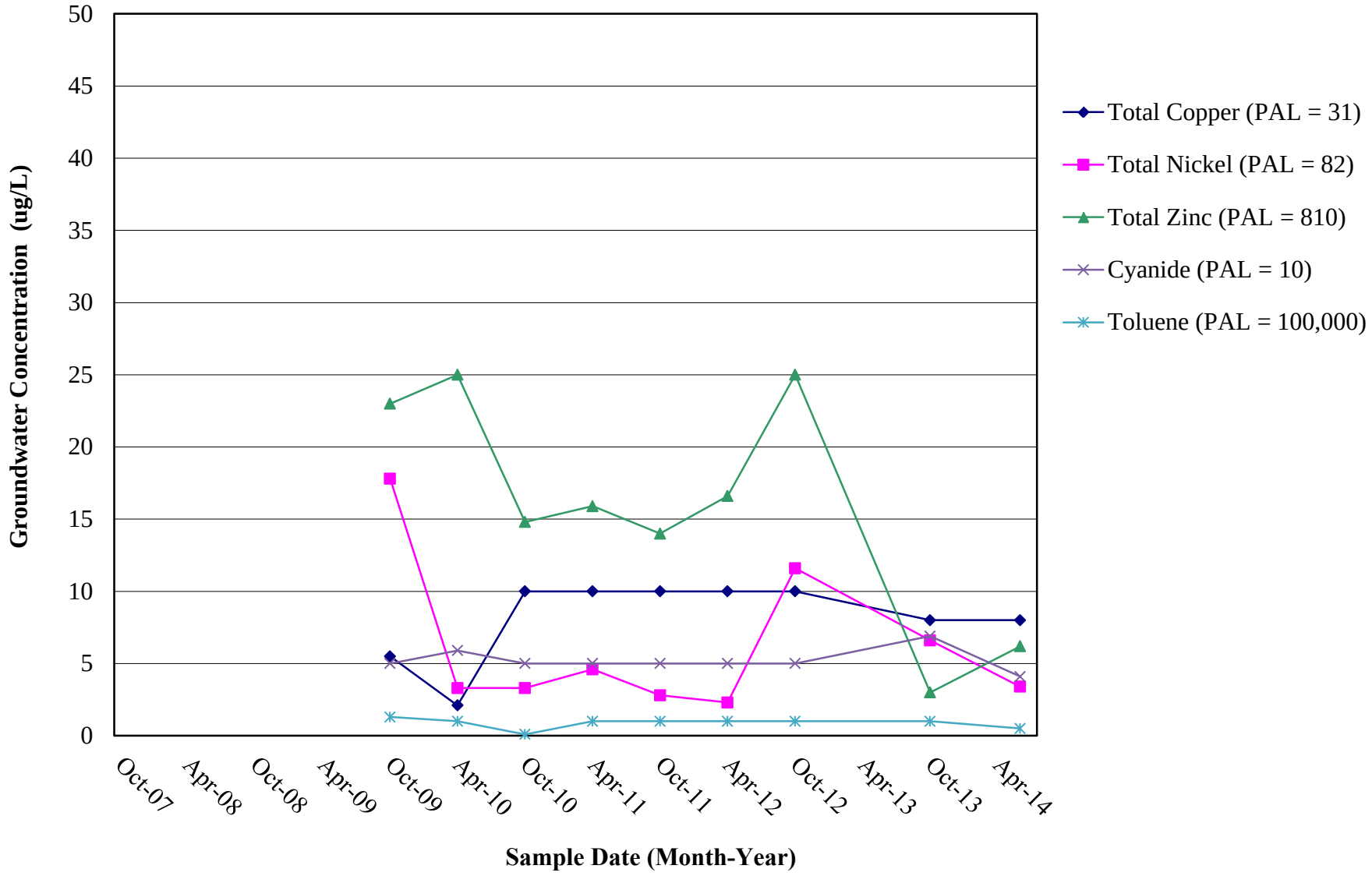
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 6b: MW-3 Contaminant Concentrations vs Time



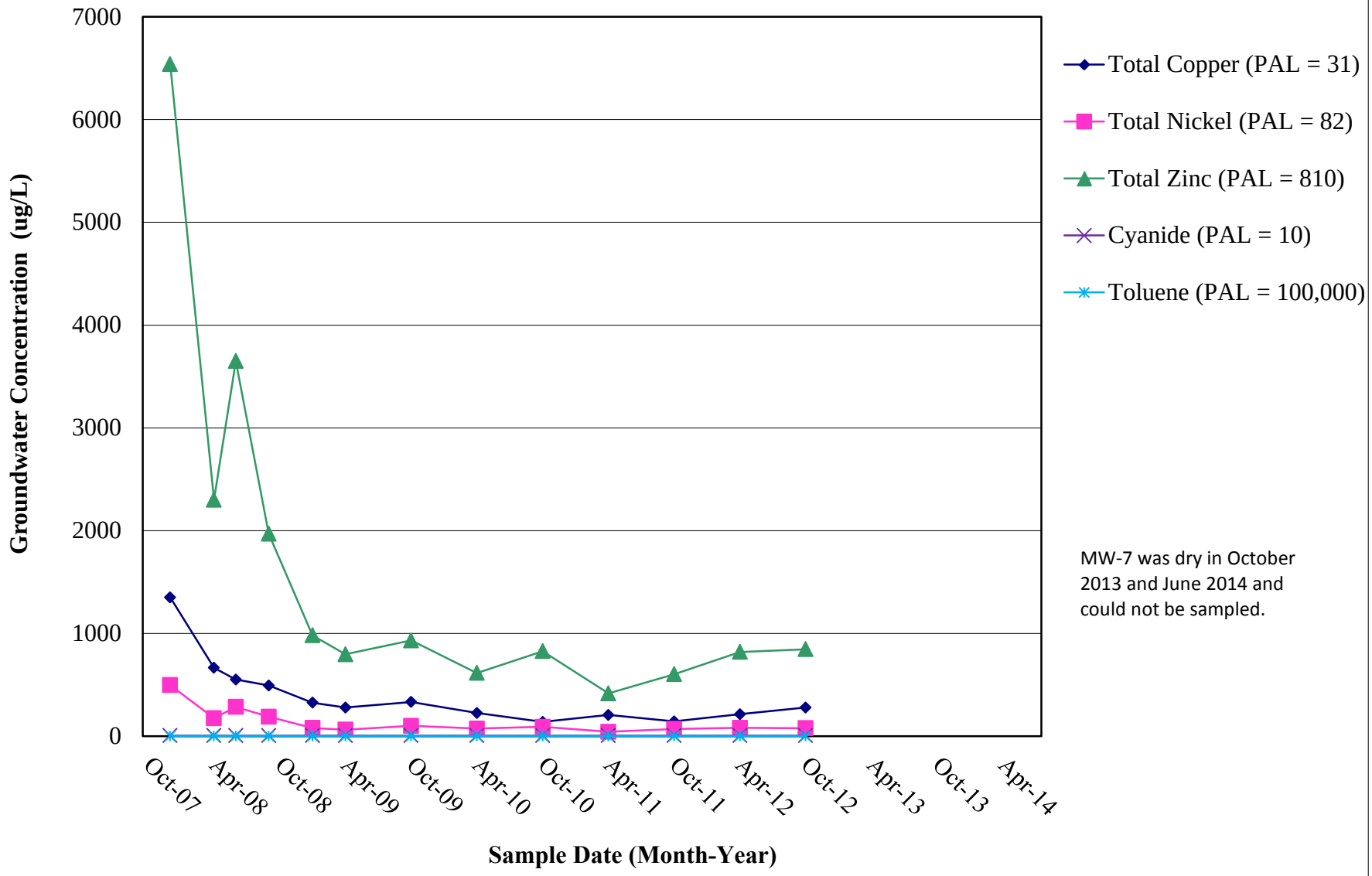
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 6c: MW-4R Contaminant Concentrations vs Time



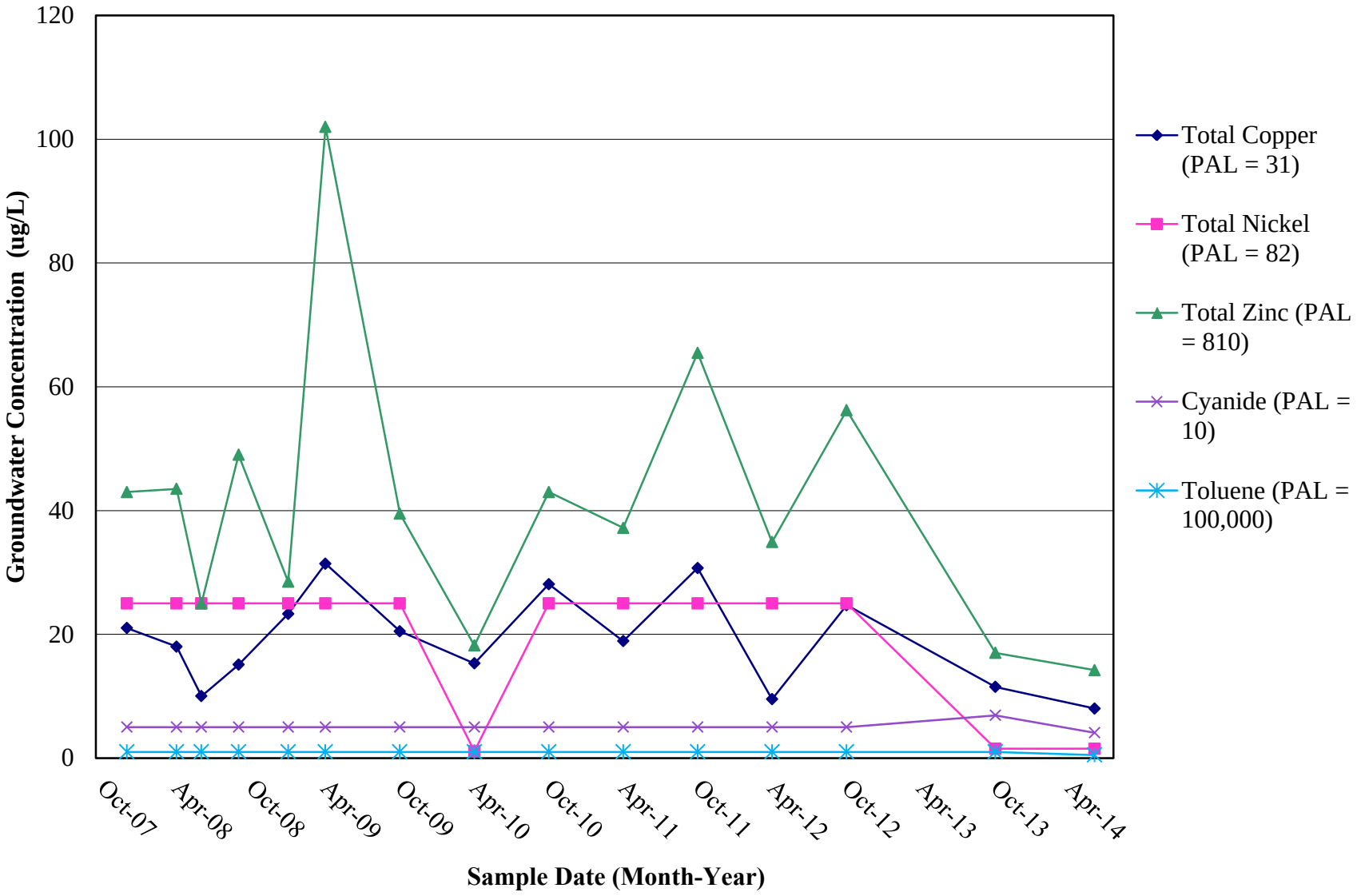
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 6d: MW-7 Contaminant Concentrations vs Time



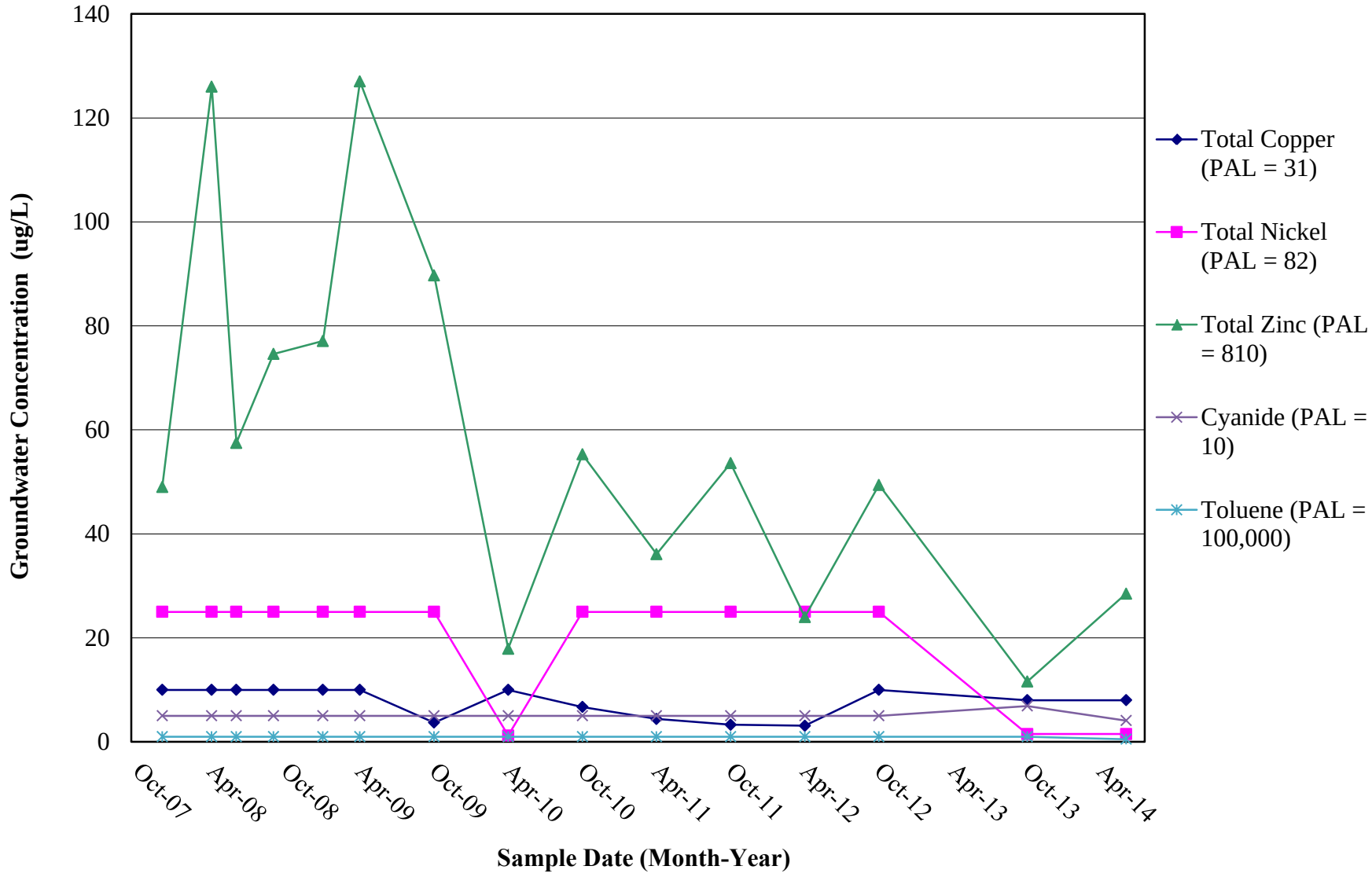
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 6e: MW-9 Contaminant Concentrations vs Time



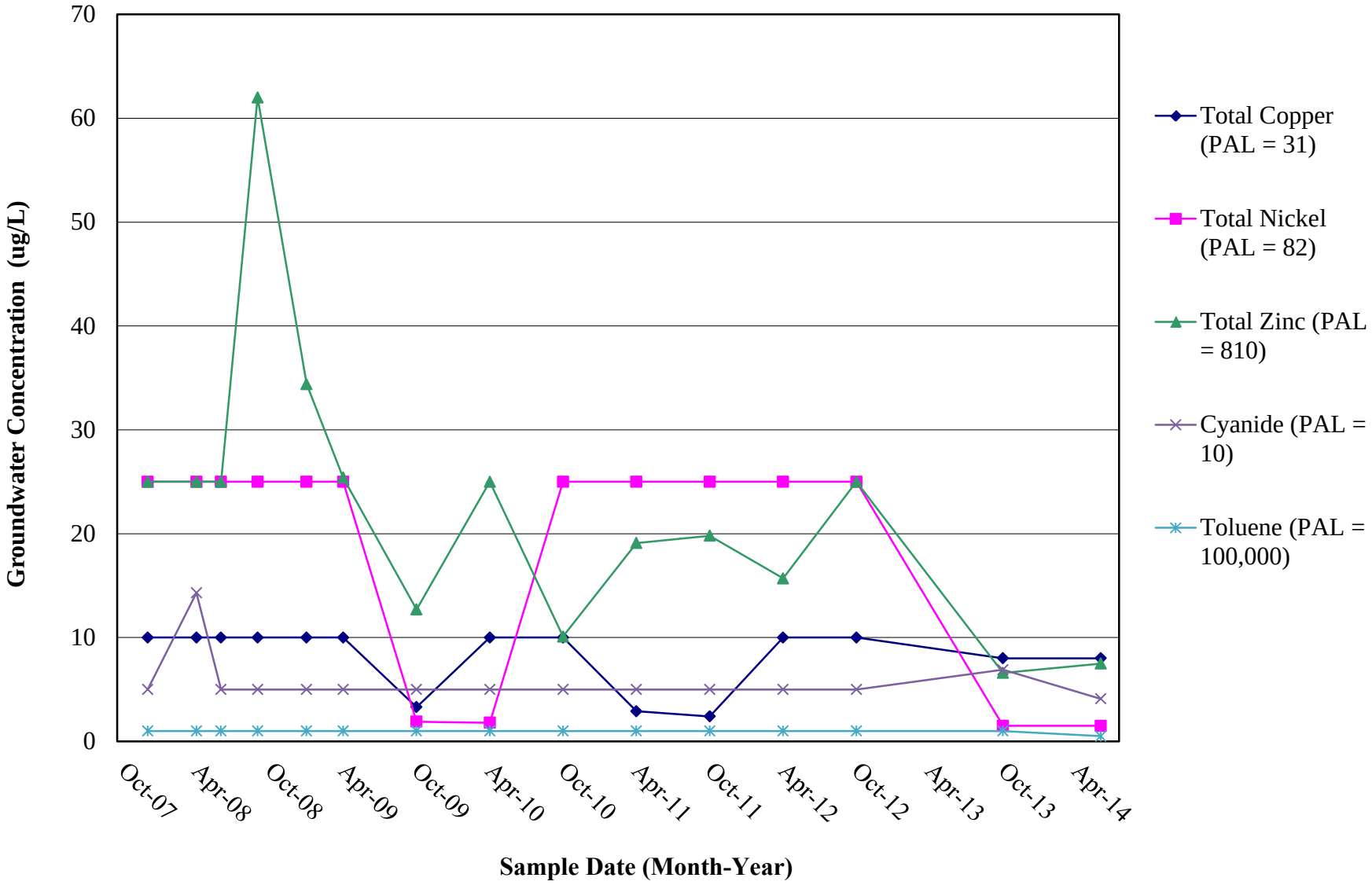
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 6f: MW-10 Contaminant Concentrations vs Time



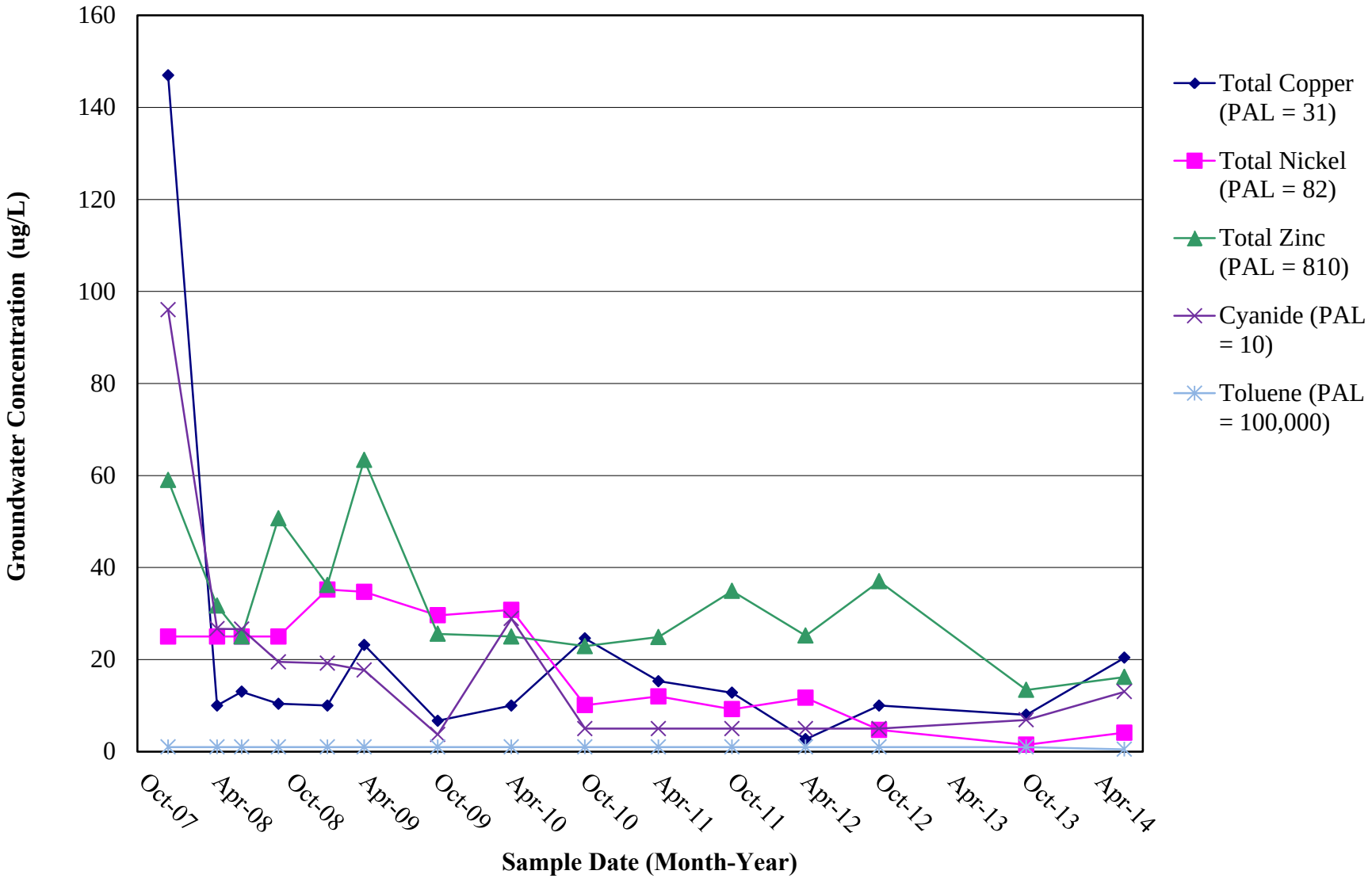
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 6g: MW-11 Contaminant Concentrations vs Time



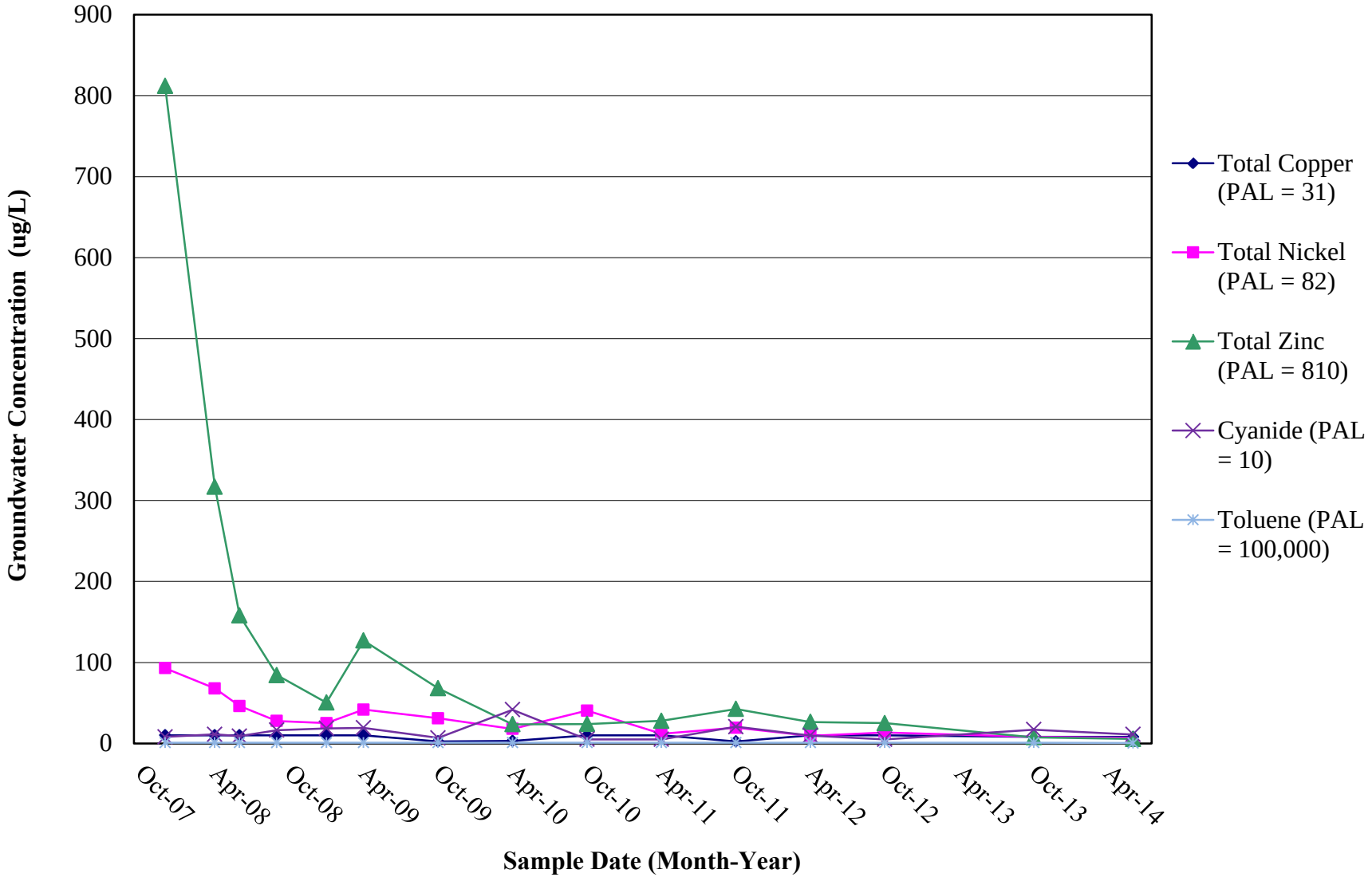
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 6h: MW-12 Contaminant Concentrations vs Time



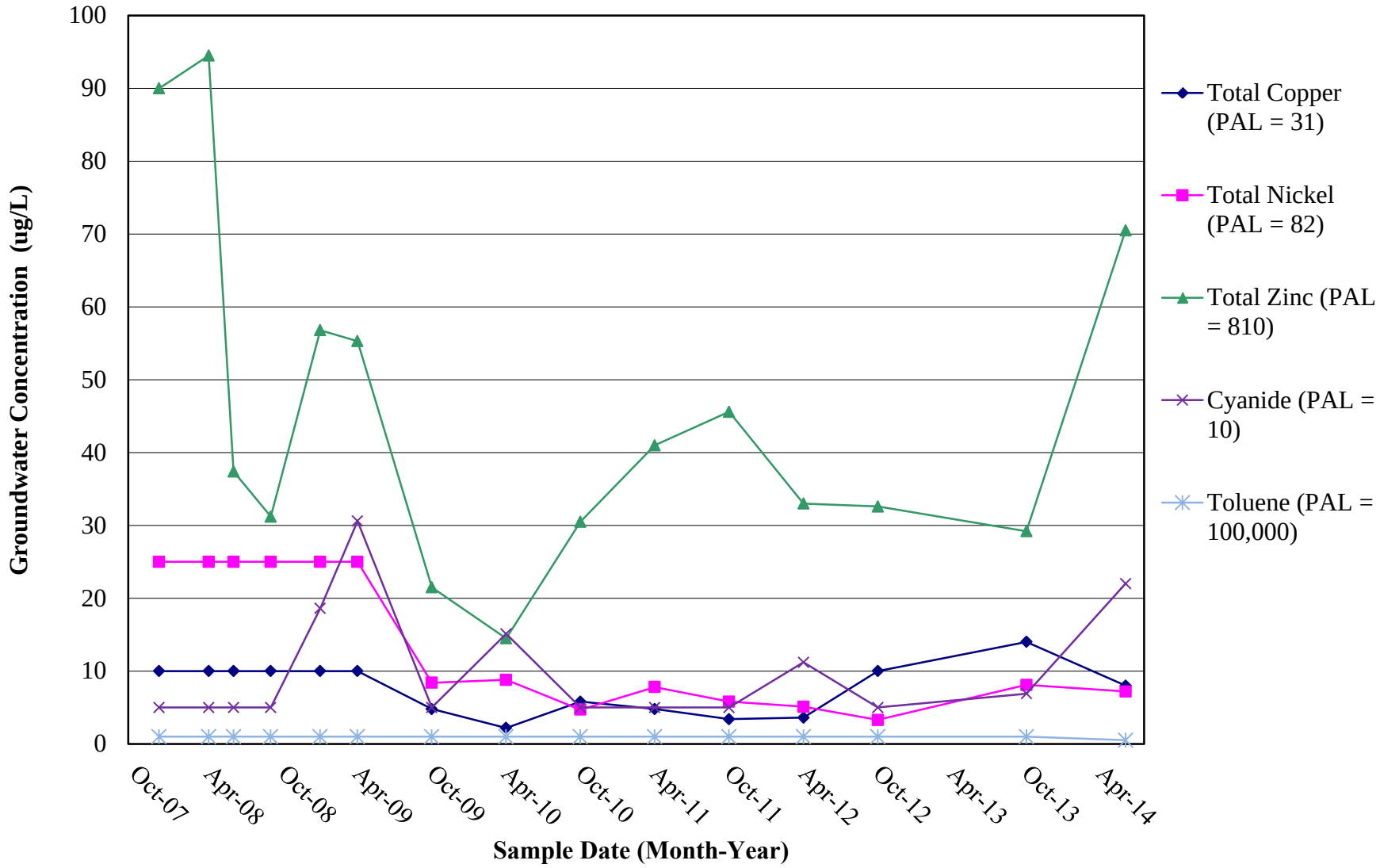
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 6i: MW-13 Contaminant Concentrations vs Time



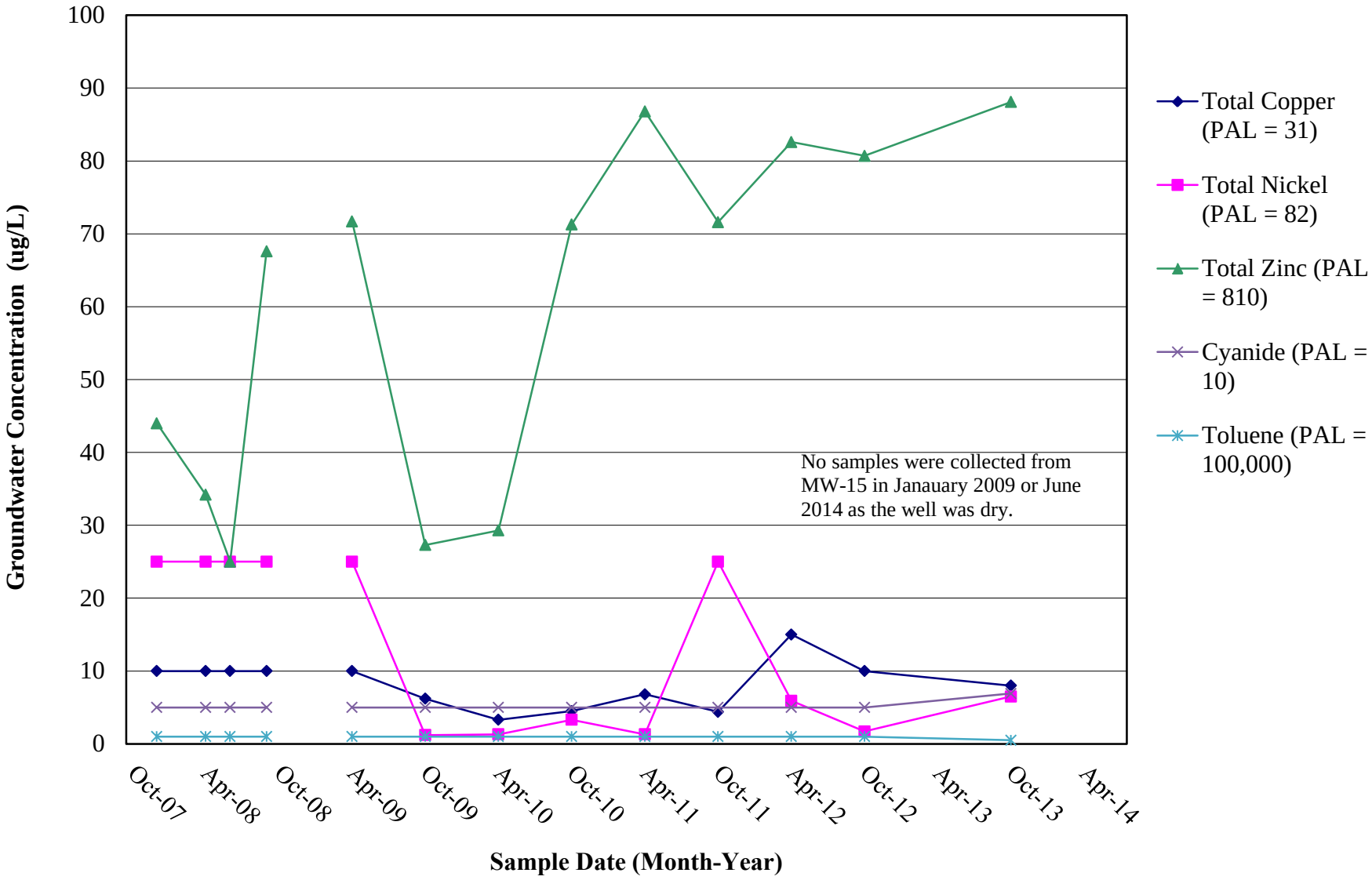
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 6j: MW-14 Contaminant Concentrations vs Time



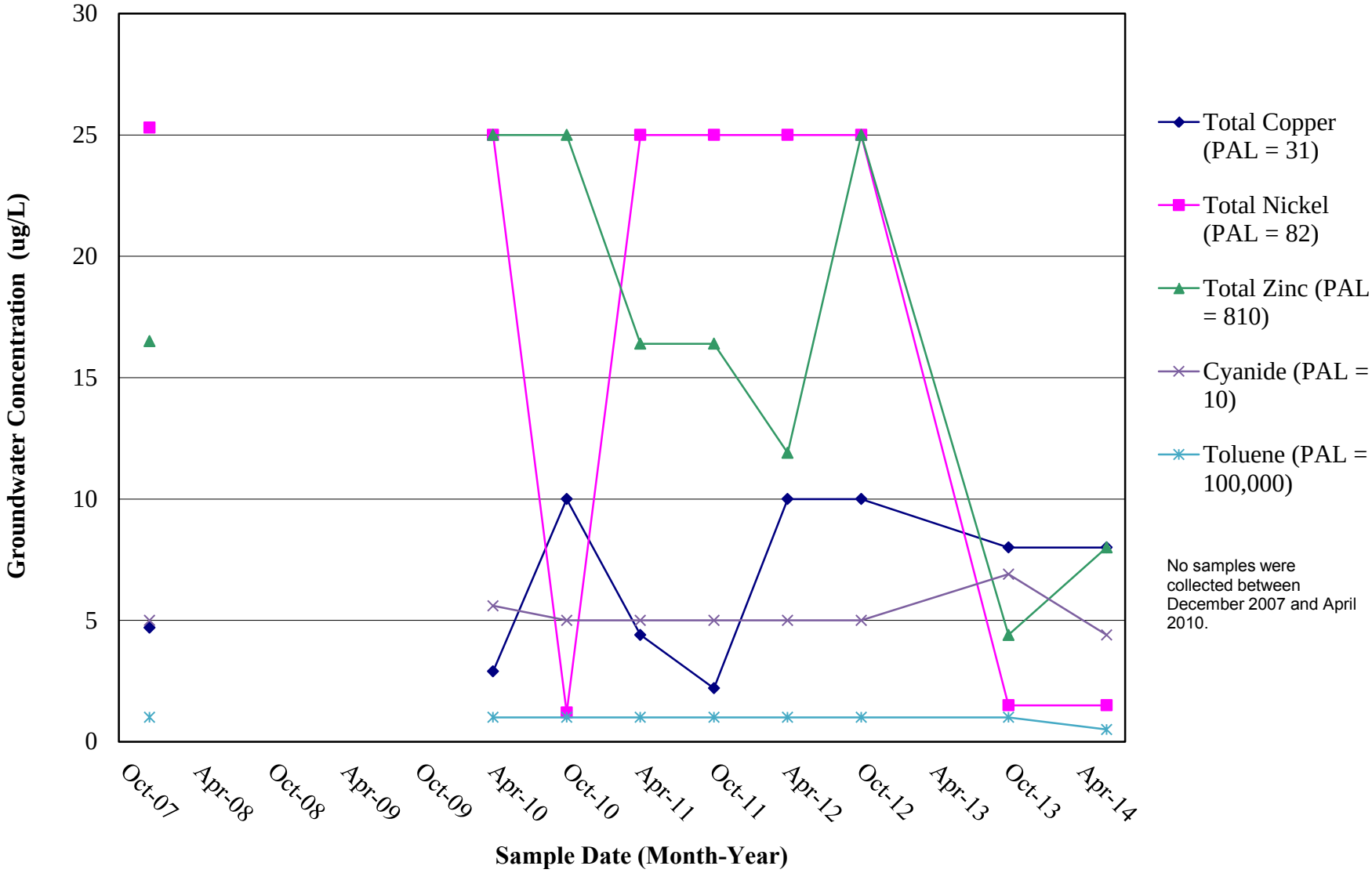
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 6k: MW-15 Contaminant Concentrations vs Time



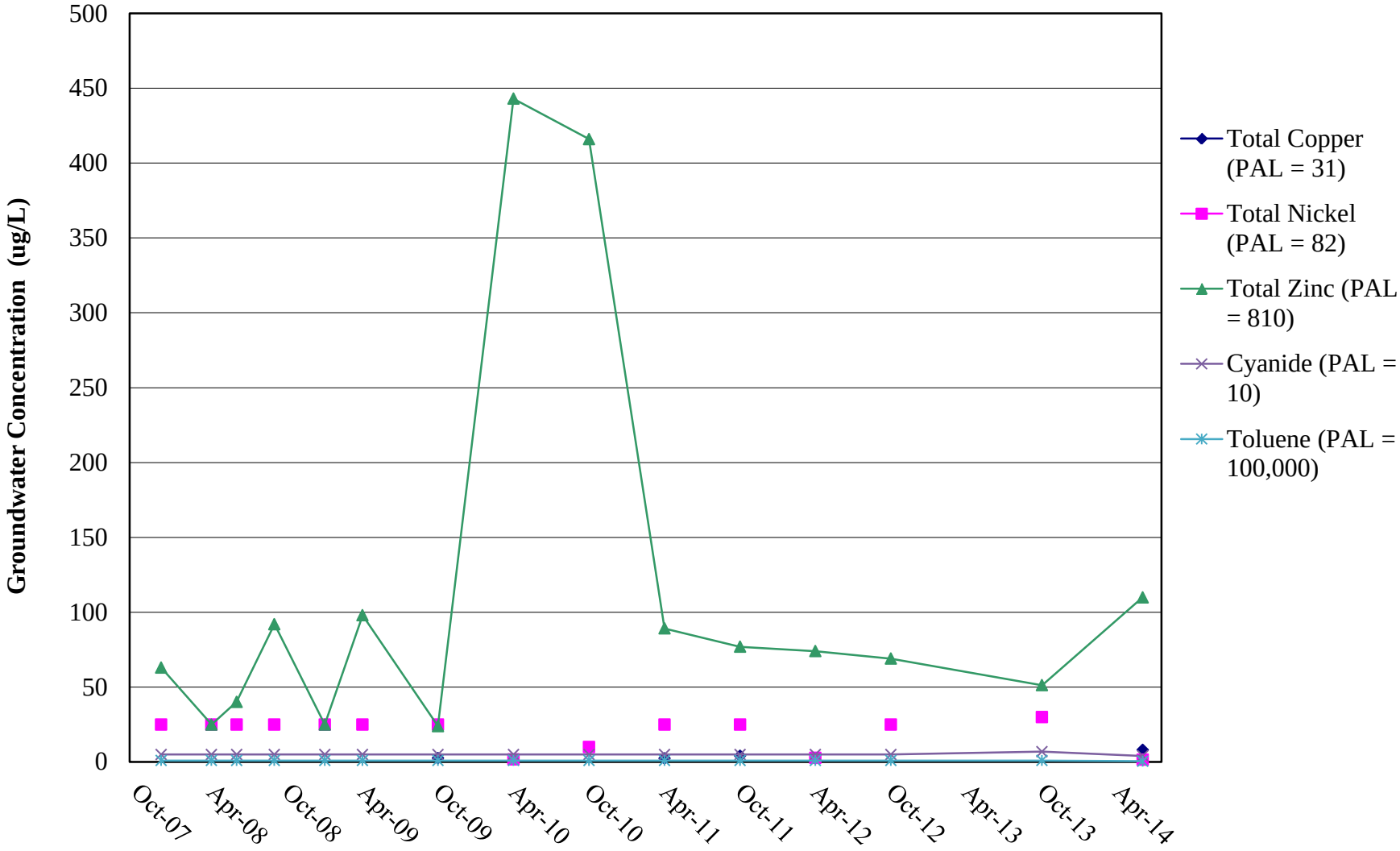
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 6l: MW-16 Contaminant Concentrations vs Time



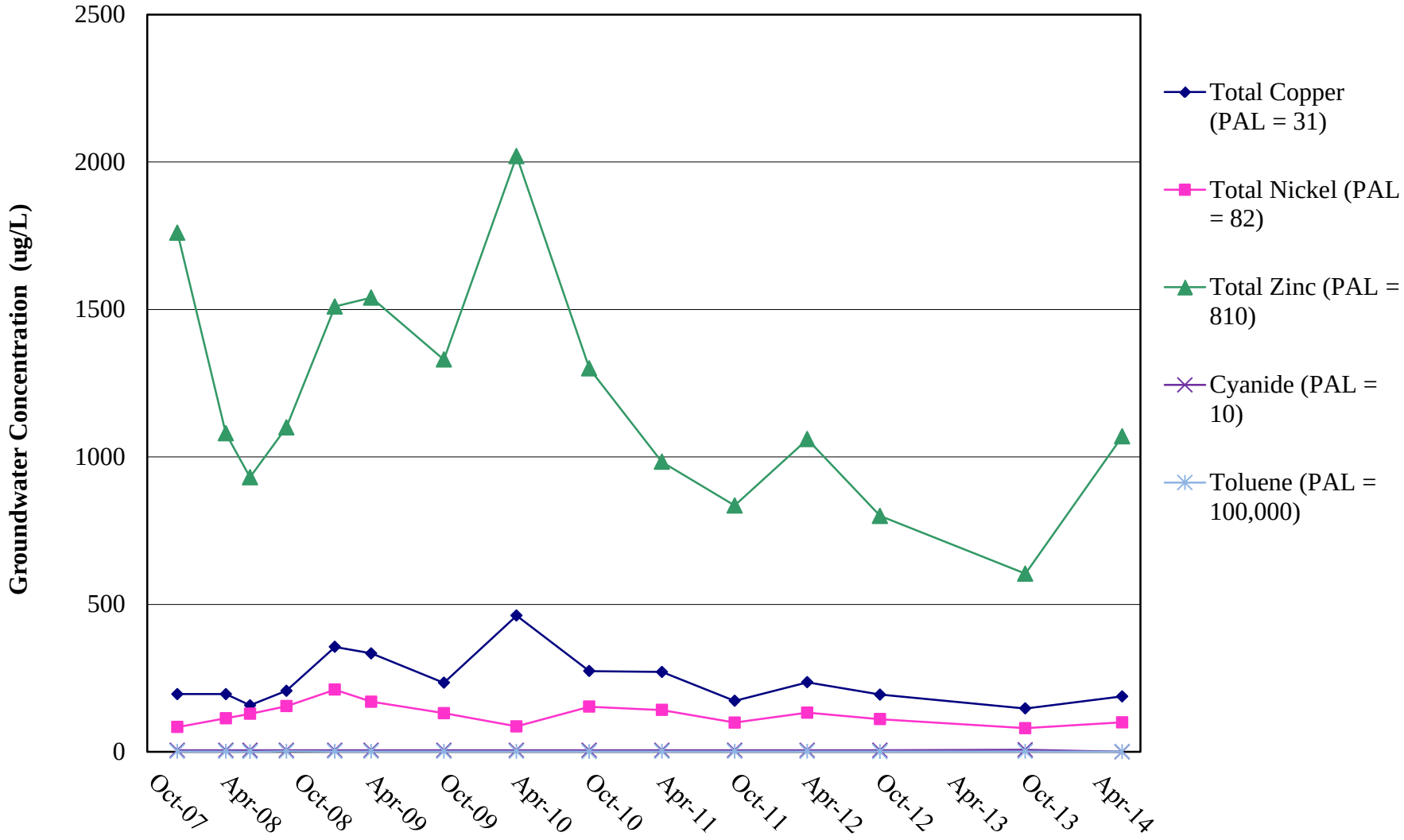
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 6m: AT-5 Contaminant Concentrations vs Time



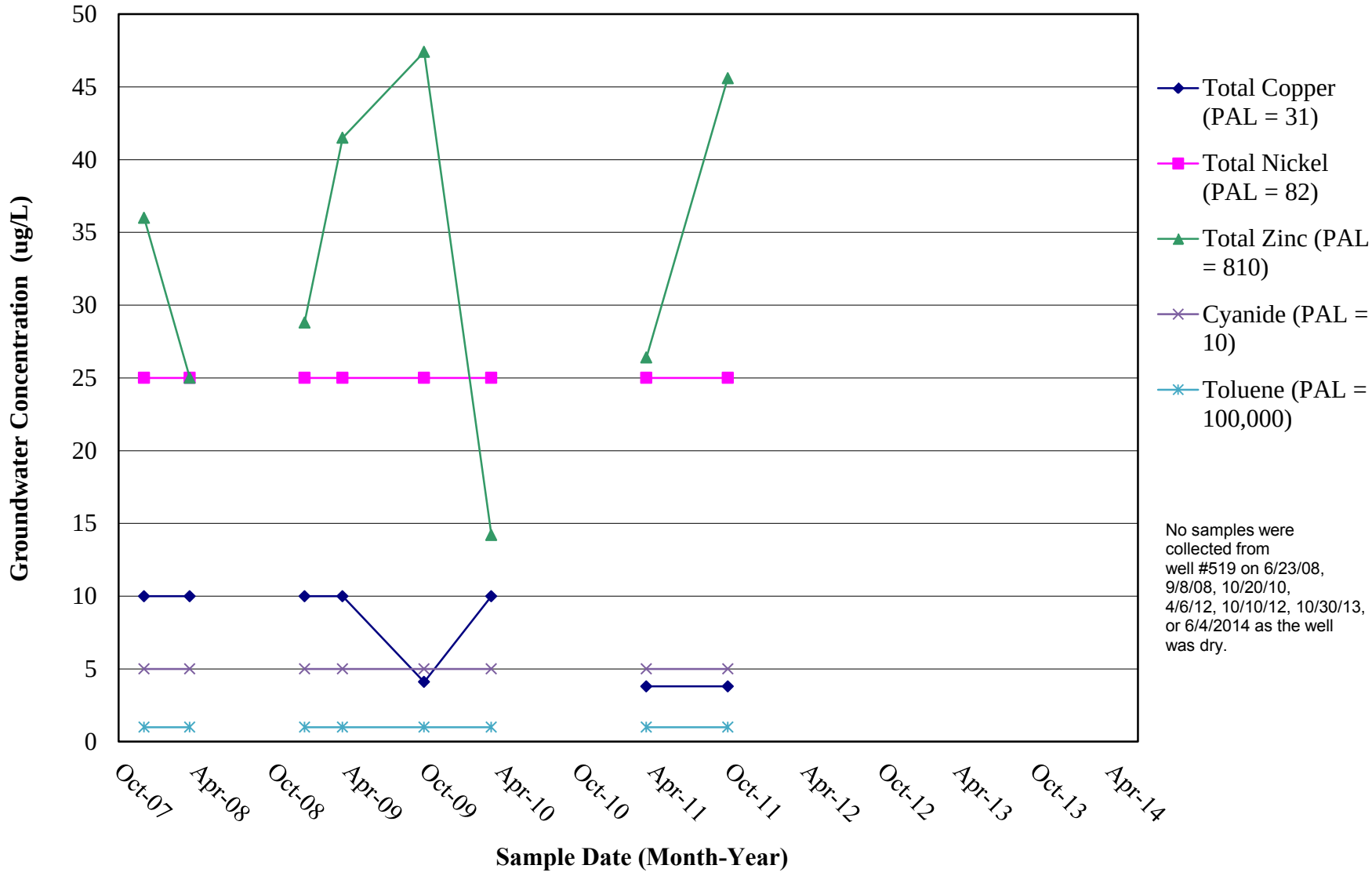
*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 6n: AT-8 Contaminant Concentrations vs Time

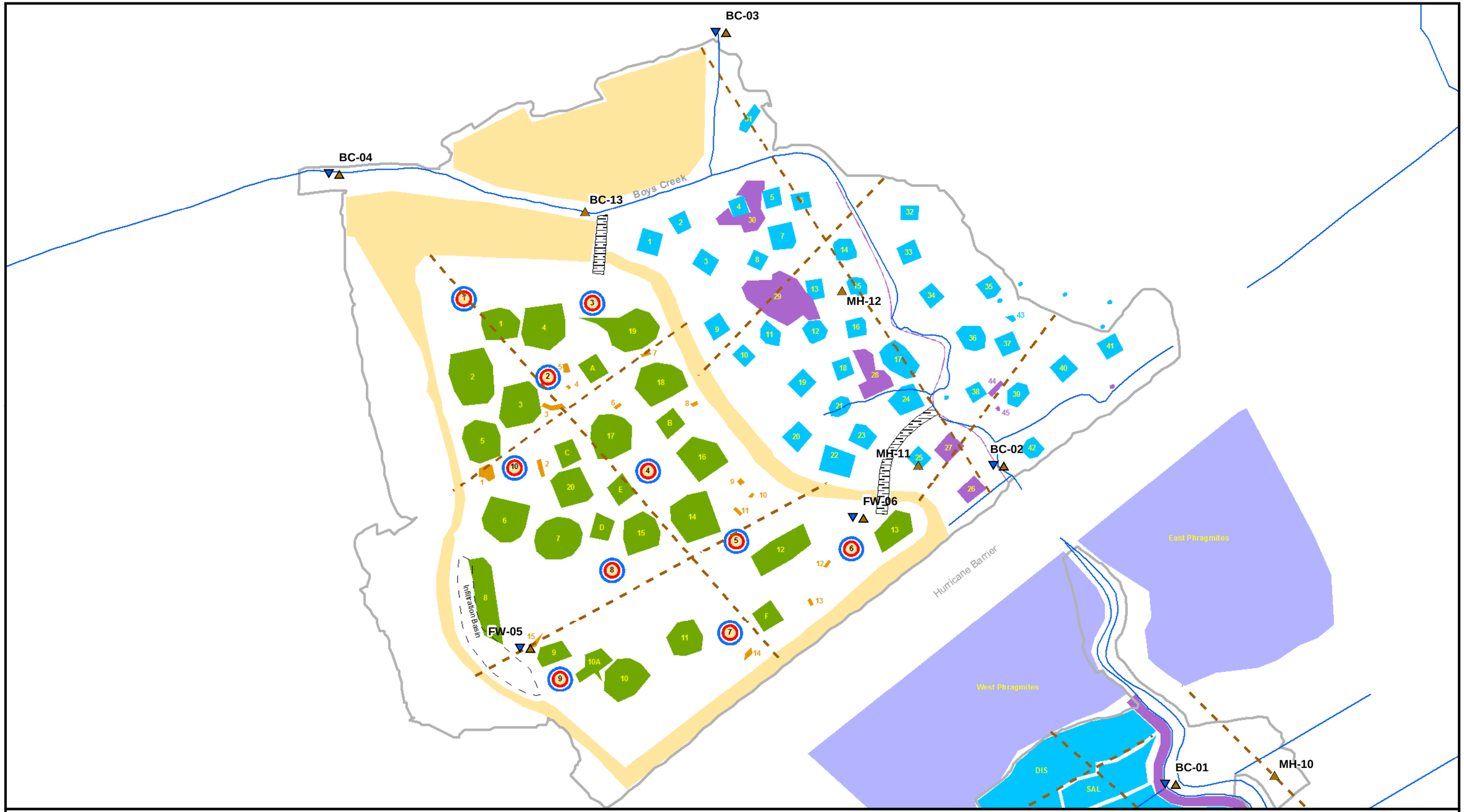


*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -

Figure 6o: #519 Contaminant Concentrations vs Time



*PAL = Project Action Limits also referred to as interim groundwater cleanup levels (IGCLs) -



Notes:
1. Basemap obtained from Weston Solutions.
2. Horizontal Control: Massachusetts State Plane NAD83, Feet

Legend

- Surface Water and Sediment Sampling Location
- Sediment Sampling Location
- Creek/Tributaries
- Approximate Vegetation Monitoring Transect
- Island
- Limit of Excavation
- Spillway
- Low Marsh Planting
- High Marsh Planting

N

0 50 100 Feet

Figure 7a
Surface Water and Sediment Sampling Locations - NOB
Atlas Tack Superfund Site
Fairhaven, Massachusetts

amec foster wheeler
AMEC Foster Wheeler
Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

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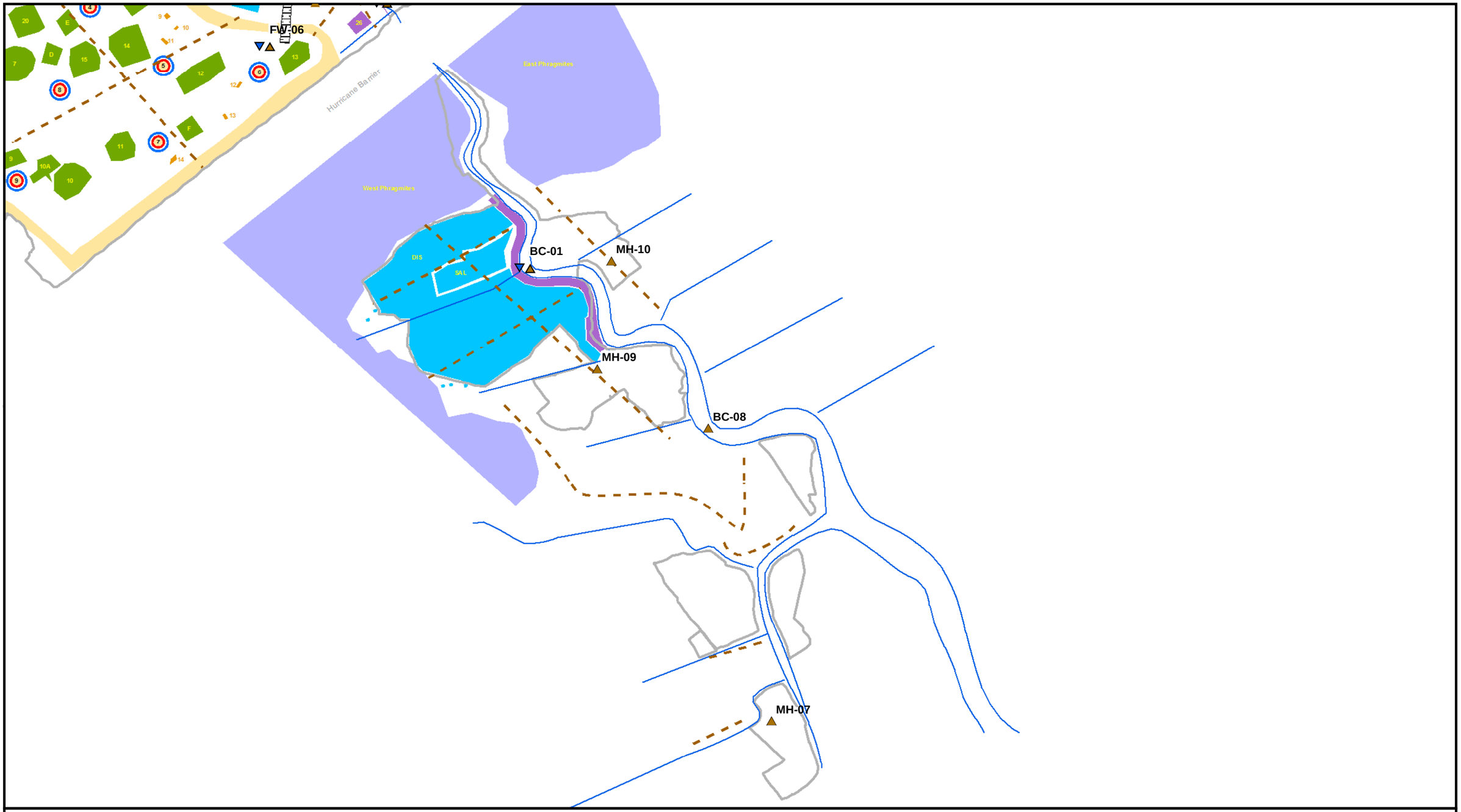

Notes:
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Legend

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- Sediment Sampling Location
- Creek/Tributaries
- Approximate Vegetation Monitoring Transect
- Island
- Limit of Excavation
- Spillway
- Low Marsh Planting
- High Marsh Planting

N

0 60 120 Feet

Figure 7b
Surface Water and Sediment Sampling Locations - SOB
Atlas Tack Superfund Site
Fairhaven, Massachusetts

amec foster wheeler
AMEC Foster Wheeler
Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

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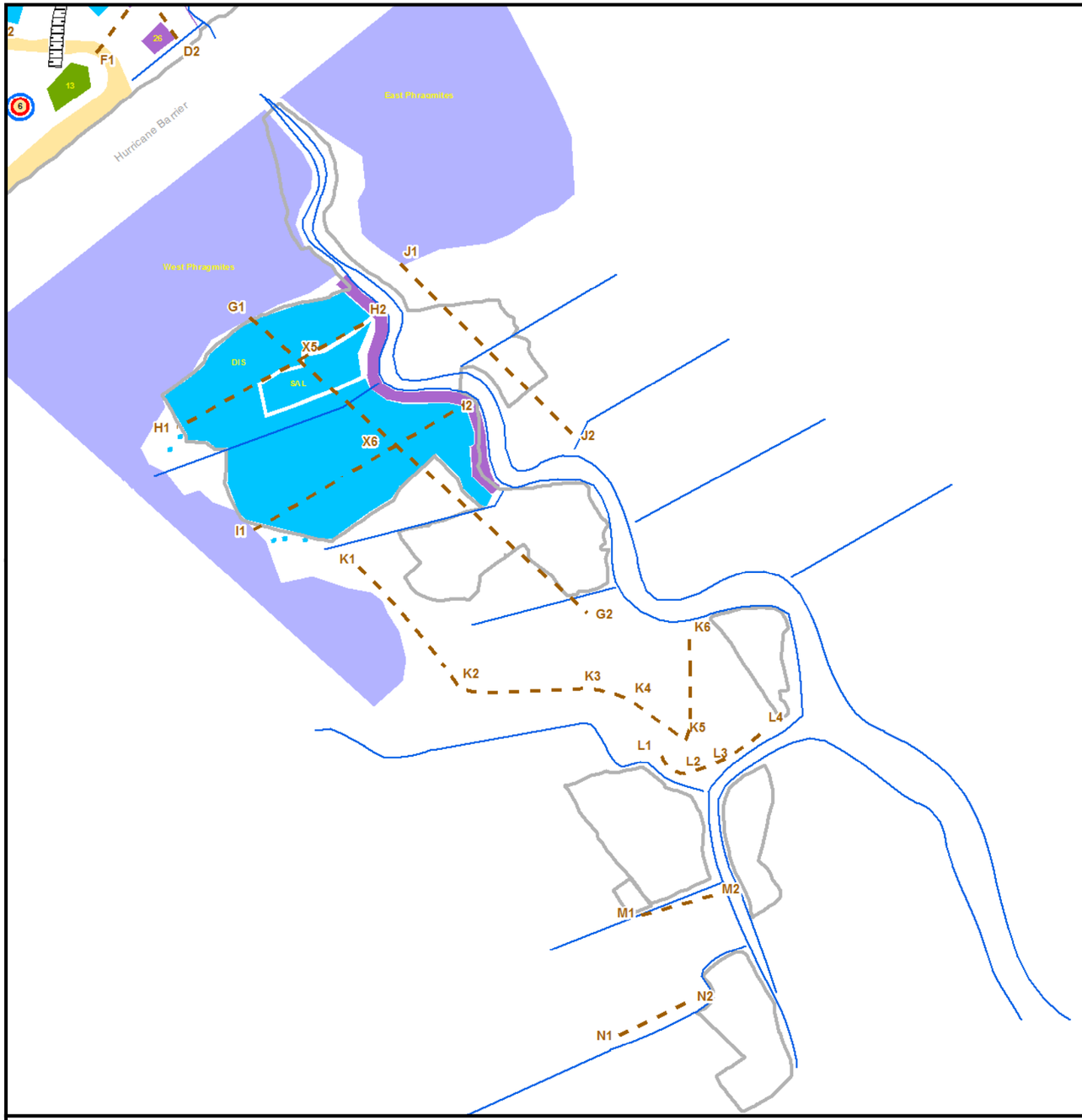

PLANTED VEGETATION AREAS			
	VEGETATION TYPE	LOCATION ID	SPECIES
	ZONE A	DEEPWATER PLOTS (1-20,A-F), FRESHWATER WETLAND FLOOR	SCIRPUS ACUTUS POLYGONUM AMPHIBIUM PONTEDARIA CORDATA NUPHAR ADVENA SAGITTARIA RIGIDA
	ZONE B	LOWER BANKS OF ISLAND (10) AND N,S,E,W FRESHWATER WETLAND BANKS	PELTANDRA VIRGINICA SCIRPUS VALIDUS SPARGANIUM EURYCARPUM SAGITTARIA LATIFOLIA
	ZONE C	UPPER BANKS AND TOPS OF ISLANDS (10)	CAREX CRINITA CAREX LURIDA CAREX STRICTA GLYCERIA STRIATA JUNCUS EFFUSUS LEERSIA ORYZOIDES SCIRPUS CYPERINUS
	CATTAIL STANDS	C1-C15	TYPHA SP.
	WOODY SPECIES	UPLAND AREAS NORTH OF BOYS CREEK, TOP OF ISLANDS (10), TRANSITIONAL WETLAND/UPLAND LOCATIONS ALONG THE FRESHWATER WETLAND BERM, E,N,S BOUNDARIES OF FRESHWATER WETLAND	CLETHRA ALNIFOLIA ILEX GLABRA SAMBUCUS CANADENSIS ACER RUBRUM LIQUIDAMBAR STYRACIFLUA NYSSA SYLVATICA QUERCUS SP. CEPHALANTHUS OCCIDENTALIS ILEX VERTICILLATA IVA FRUTESCENS MYRICA PENNSYLVANICA QUERCUS BICOLOR SALIX NIGRA
	HIGH MARSH	PLANTED PLOTS 1-25 & 31-43	DISTICHLIS SPICATA (DIS) JUNCUS GERARDII (JUN) SPARTINA PATENS (PAT) SALICORNIA VIRGINICA (SAL)
	LOW MARCH	PLANTED PLOTS 26-30 & 44-45	SPARTINA ALTERNIFLORA (SPA)

Notes:
1. Basemap obtained from Weston Solutions.
2. Horizontal Control: Massachusetts State Plane NAD83, Feet

N
0 60 120
Feet

Legend

- Creek/Tributaries
- Approximate Vegetation Monitoring Transect
- Limit of Excavation
- Spillway
- 1 Island

Figure 8a: Extent of Vegetation in Restored Areas South of Barrier

Source: Figure 3 of October 2014 Qualitative Report by AMEC

Atlas Tack Superfund Site
Fairhaven, Massachusetts

amec foster wheeler
AMEC Foster Wheeler
Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

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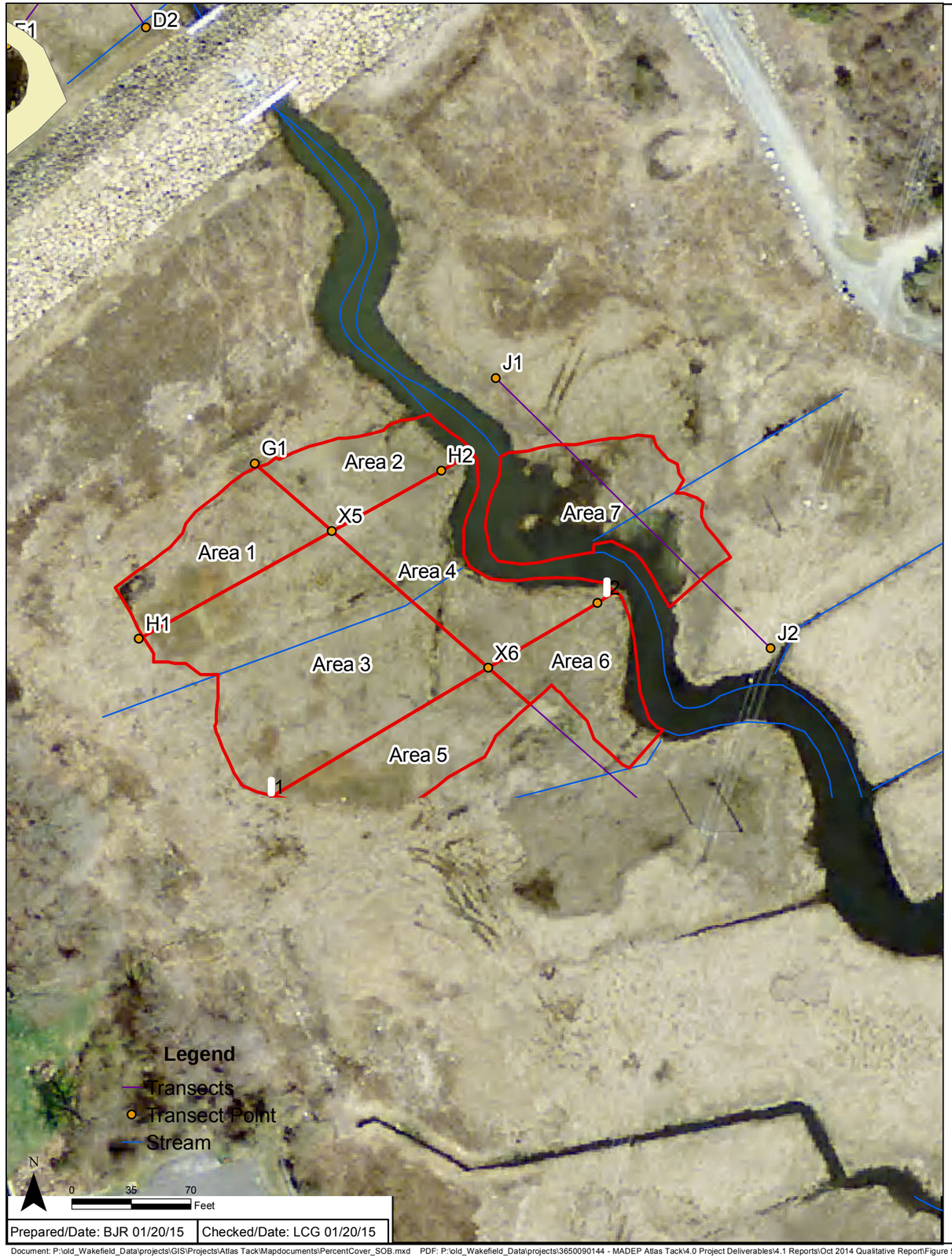

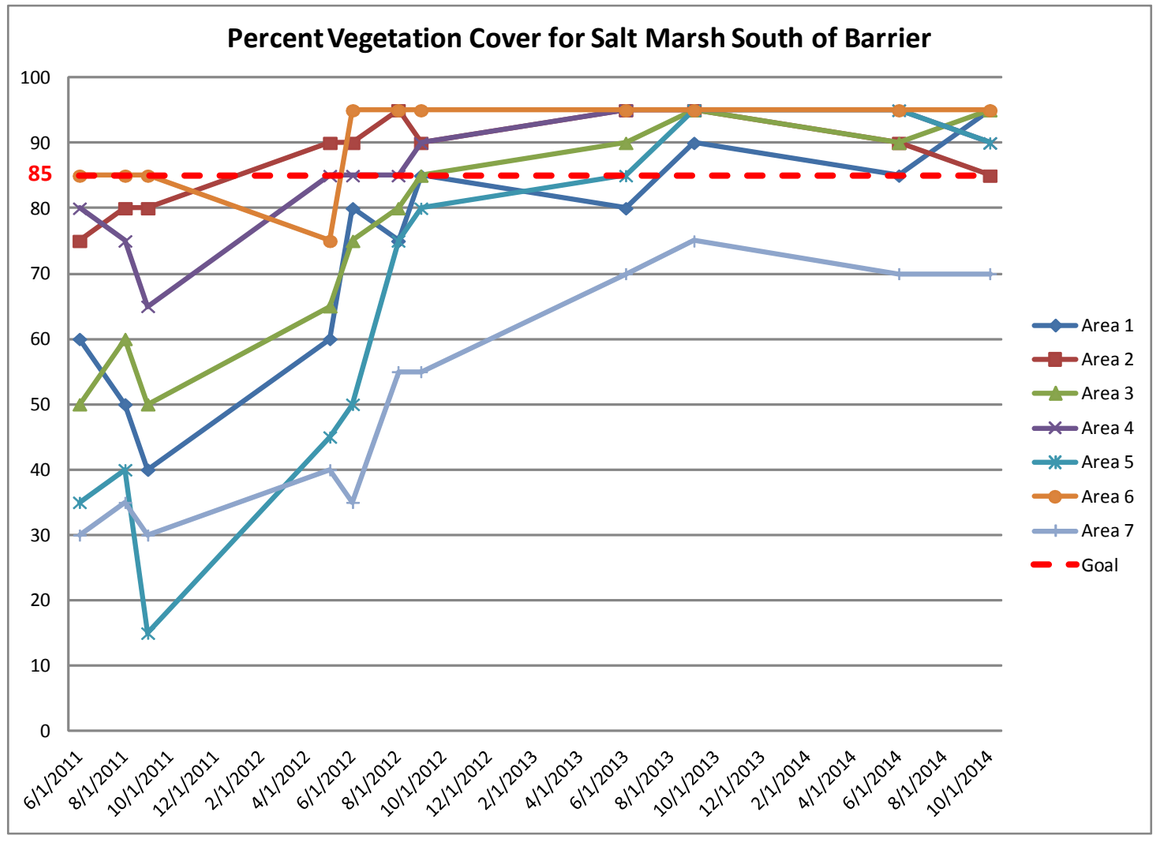

Figure 8b: Percent Vegetative Cover for Salt Marsh South of the Barrier

Source: Figure 5 of October 2014 Qualitative Report by AMEC

Atlas Tack Superfund Site
Fairhaven, Massachusetts

amec foster wheeler
AMEC Foster Wheeler
Environment & Infrastructure, Inc.
271 Mill Road
Chelmsford, MA 01824

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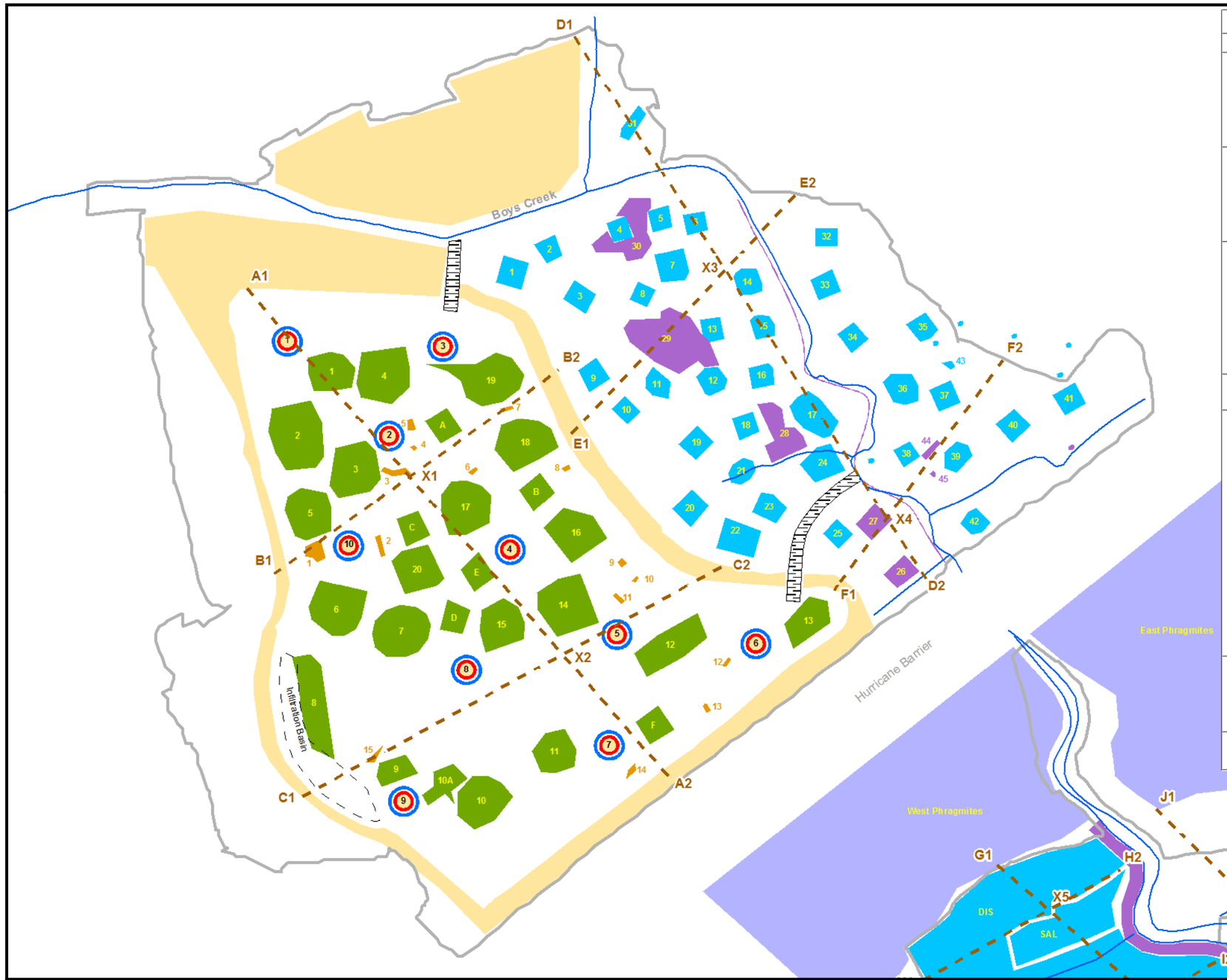

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	ZONE B	LOWER BANKS OF ISLAND (10) AND N,S,E,W FRESHWATER WETLAND BANKS	PELTANDRA VIRGINICA SCIRPUS VALIDUS SPARGANIUM EURYCARPUM SAGITTARIA LATIFOLIA
	ZONE C	UPPER BANKS AND TOPS OF ISLANDS (10)	CAREX CRINITA CAREX LURIDA CAREX STRICTA GLYCERIA STRIATA JUNCUS EFFUSUS LEERSIA ORYZOIDES SCIRPUS CYPERINUS
	CATTAIL STANDS	C1-C15	TYPHA SP.
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	HIGH MARSH	PLANTED PLOTS 1-25 & 31-43	DISTICHLIS SPICATA (DIS) JUNCUS GERARDII (JUN) SPARTINA PATENS (PAT) SALICORNIA VIRGINICA (SAL)
	LOW MARCH	PLANTED PLOTS 26-30 & 44-45	SPARTINA ALTERNIFLORA (SPA)

Notes:
1. Basemap obtained from Weston Solutions.
2. Horizontal Control: Massachusetts State Plane NAD83, Feet

Legend

- Creek/Tributaries
- Approximate Vegetation Monitoring Transect
- Limit of Excavation
- Spillway
- Island

N

0 50 100 Feet

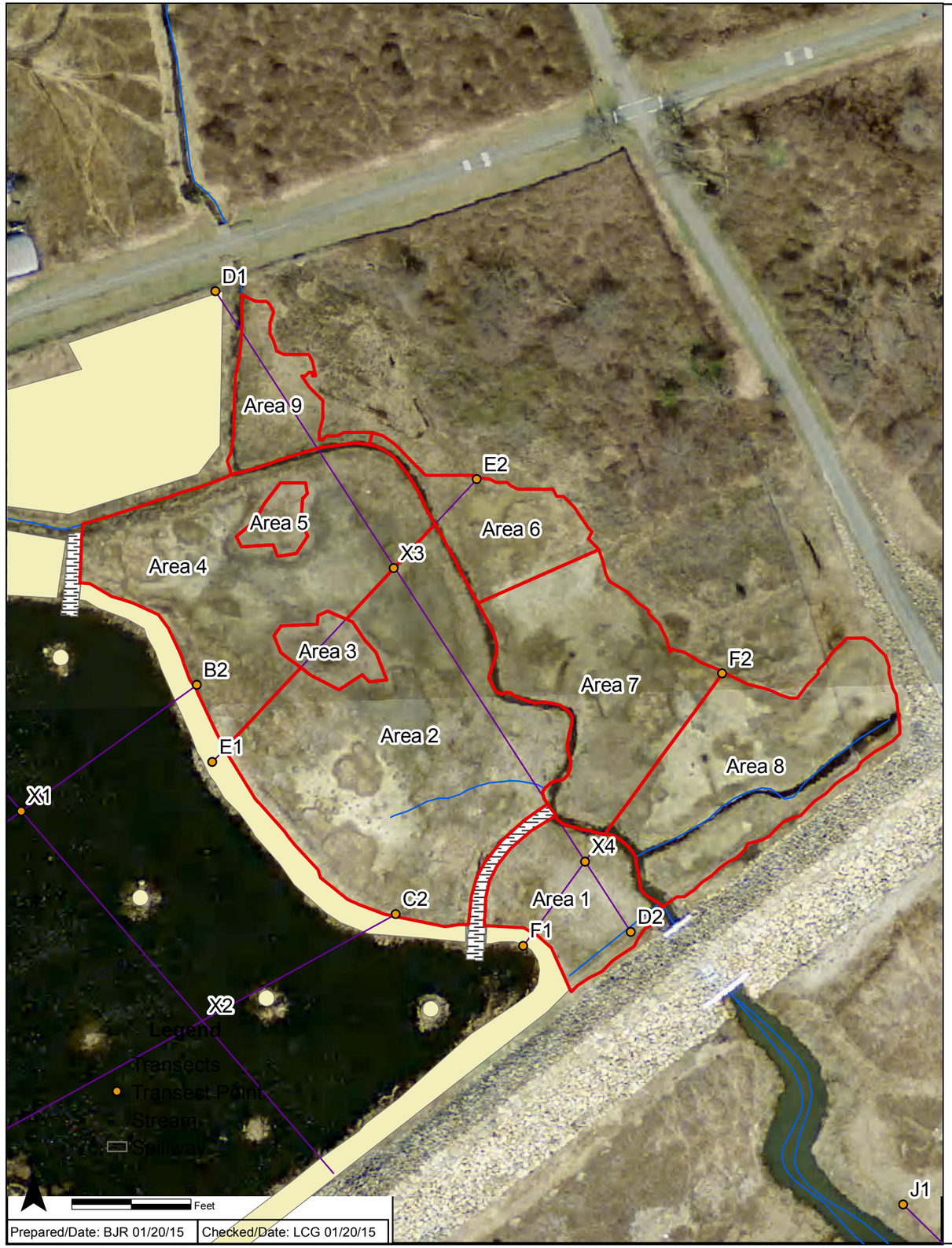
Figure 8c: Extent of Vegetation in Restored Areas North of Barrier

Source: Figure 2 of October 2014 Qualitative Report by AMEC

Atlas Tack Superfund Site
Fairhaven, Massachusetts

amec foster wheeler
AMEC Foster Wheeler
Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

Document: P:\GIS\Projects\Atlas Tack\Mapdocuments\Atlas Tack NOB_11X17LS.mxd PDF: P:\old_Wakefield_Data\projects\3650090144 - MADEP Atlas Tack\4.0 Project Deliverables\4.1 Reports\June 2012 Qualitative Report\Figure 2 - NOB.pdf 11/12/2012 11:06 AM brian.roden



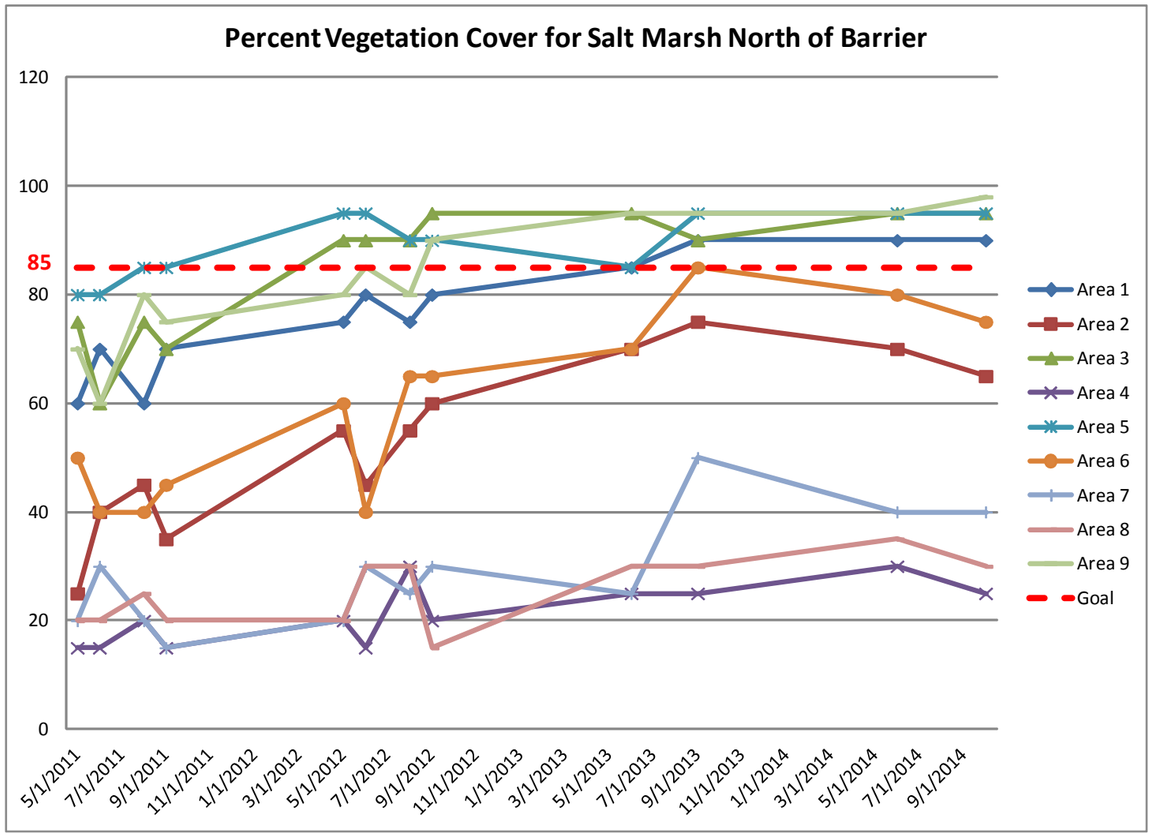


Figure 8d: Percent Vegetative Cover for Salt Marsh North of the Barrier

Source: Figure 4 of October 2014 Qualitative Report by AMEC

Atlas Tack Superfund Site
Fairhaven, Massachusetts

amec foster wheeler
AMEC Foster Wheeler
Environment & Infrastructure, Inc.
271 Mill Road
Chelmsford, MA 01824

Document: P:\old_Wakefield_Data\projects\GIS\Projects\Atlas Tack\Mapdocuments\PercentCover_NOB.mxd PDF: P:\old_Wakefield_Data\projects\3650090144 - MADEP Atlas Tack\4.0 Project Deliverables\4.1 Reports\Oct 2014 Qualitative Report\Figure 4 - Percent Cover NOB.pdf 1/20/2015 2:14 PM brian.roden

Table 1
2014 Field Groundwater Quality Parameters
Long-Term Groundwater Monitoring Atlas
Tack Superfund Site
June 2014

	Units	MW-2 AT-GW-MW-2-06042014-1 MC31057-8/F 6/4/2014 Accutest Original data Low-Flow	MW-2 AT-GW-MW-2-06042014-D MC31057-9/F 6/4/2014 Accutest Field Duplicate Low-Flow	MW-3 AT-GW-MW-3-06042014-1 MC31057-10/F 6/4/2014 Accutest Original data Low-Flow	MW-4R AT-GW-MW-4R-06052014-1 MC31095-1/F 6/5/2014 Accutest Original data Low-Flow	MW-9 AT-GW-MW-9-06032014-1 MC31057-4/F 6/3/2014 Accutest Original data Low-Flow	MW-10 AT-GW-MW-10-06032014-1 MC31057-1/F 6/3/2014 Accutest Original data Low-Flow	MW-11 AT-GW-MW-11-06042014-1 MC31057-7/F 6/4/2014 Accutest Original data Low-Flow
Low Flow Monitoring Field Parameters								
Temperature	°C	12.88	12.88	14.08	15.62	14.50	13.78	12.52
pH	SU	5.77	5.77	5.71	6.52	6.64	6.85	6.53
Specific Conductivity	µS/cm	3151	3151	2798	6189	339	391	412
Dissolved Oxygen	mg/L	0.23	0.23	0.84	5.96	0.66	0.24	0.57
ORP	mv	172.1	172.1	39.2	-55.9	75.7	-59.2	-72.9
Turbidity	NTU	1.03	1.03	36.20	24.90	2.17	0.55	12.10

	Units	MW-12 AT-GW-MW-12-06052014-1 MC31095-2/F 6/5/2014 Accutest Original data Low-Flow	MW-13 AT-GW-MW-13-06042014-1 MC31057-6/F 6/4/2014 Accutest Original data Low-Flow	MW-14 AT-GW-MW-14-06032014-1 MC31057-3/F 6/3/2014 Accutest Original data Low-Flow	MW-16 AT-GW-MW-16-06042014-1 MC31057-11/F 6/4/2014 Accutest Original data Low-Flow	AT-5 AT-GW-AT-5-06032014-1 MC31057-2/F 6/3/2014 Accutest Original data Low-Flow	AT-8 AT-GW-AT-8-06052014-1 MC31095-4/F 6/5/2014 Accutest Original data Low-Flow
Low Flow Monitoring Field Parameters							
Temperature	°C	17.51	12.30	12.01	15.70	11.97	12.01
pH	SU	6.54	6.58	6.01	6.64	6.79	5.28
Specific Conductivity	µS/cm	540	880	706	1667	194	789
Dissolved Oxygen	mg/L	0.24	0.15	0.19	0.73	8.19	1.87
ORP	mv	-107.6	-80.8	70.4	-56.0	282.3	171.3
Turbidity	NTU	28.30	2.16	10.47	5.03	4.19	22.60

Notes:

--- = Not Applicable.
NA = Not Available.
ORP = Oxidation-Reduction Potential

Table 2
2007-2014 Groundwater Elevation Summary Table
Long-Term Groundwater Monitoring
Atlas Tack Superfund Site

Well Designation	12/27/2007	4/14/2008	6/23/2008	9/8/2008	1/14/2009	4/15/2009	10/26/2009	4/6/2010	10/20/2010	4/12/2011	10/24/2011	4/5/2012	10/10/2012	10/28/2013	6/3/2014
MW-2	2.79	1.47	1.08	1.18	1.86	1.86	1.98	1.41	1.89	1.24	2.12	1.70	1.46	1.05	1.23
MW-3	2.65	1.44	1.07	1.12	1.85	1.23	1.70	0.97	1.75	1.16	2.02	1.75	1.55	0.98	0.99
MW-4R	--	--	--	--	--	--	1.84	1.74	1.85	2.08	2.38	2.32	2.23	1.68	1.89
MW-7	3.06	2.86	1.68	1.68	2.68	2.39	3.34	2.91	2.65	3.10	3.17	2.42	1.93	Dry	Dry
MW-9	7.70	6.60	3.48	3.01	7.80	7.43	7.92	7.29	5.58	6.28	7.49	4.95	4.33	2.44	4.35
MW-10	6.28	5.72	3.39	3.26	6.42	6.17	6.84	6.12	5.12	5.57	6.34	4.51	4.19	2.49	3.76
MW-11	5.11	5.25	4.11	3.65	4.86	4.75	4.98	4.76	4.71	4.82	4.97	4.84	4.70	3.20	4.56
MW-12	3.53	3.50	2.90	2.63	3.62	3.43	3.74	3.44	3.19	3.20	3.35	3.29	3.02	2.38	3.05
MW-12 (SW)	3.52	3.47	2.82	2.81		3.39	3.58	3.37	3.21	3.41	3.45	3.42	3.21	--	--
MW-13	2.60	1.60	1.33	1.41	1.89	1.59	1.94	1.49	2.04	1.34	2.19	1.71	1.66	1.29	1.32
MW-14	9.91	9.95	6.55	6.16	10.35	9.66	10.29	9.71	8.96	9.25	9.97	8.31	8.19	5.27	7.31
MW-15	2.57	1.27	0.92	0.94		1.12	1.72	1.18	1.63	1.01	2.06	2.21	1.53	2.16	Dry
MW-16	--	--	--	--	--	--	2.67	2.43	2.46	2.51	2.84	2.79	2.69	2.16	2.18
#519	14.66	14.90	--	--	14.50	15.24	15.49	15.19	--	15.55	14.80	--	--	Dry	Dry
AT-8	3.33	2.79	2.13	1.98	2.78	2.74	3.32	2.75	2.64	2.46	3.23	2.63	2.23	1.83	2.23
AT-5	11.80	7.63	3.79	2.51	8.44	8.68	7.80	9.79	3.92	6.93	7.72	4.81	3.29	2.09	4.64

NOTES:

Groundwater elevations presented in NAVD 1988 Feet.
-- Groundwater elevation measurement was not collected.
Elevation data collected at MW-12 (SW) was collected in the freshwater wetland and represents a surface water elevation.

Table 3
2007 - 2014 Contaminants of Concern Laboratory Analytical Summary
Long-Term Groundwater Monitoring
Atlas Tack Superfund Site
June 2014

	Analyte:	Copper, total		Nickel, total		Zinc, total		Cyanide		Toluene	
	IGCL:	31 µg/L		82 µg/L		810 µg/L		10 µg/L		100,000 µg/L	
	Date										
MW-2	12/27/2007	10	U	25	U	28		5	U	1	U
	4/14/2008	10	U	25	U	35.6		5	U	1	U
	6/23/2008	10	U	25	U	25	UJ	5	U	1	U
	9/8/2008	10	U	25	U	175		5	U	1	U
	1/14/2009	10	U	25	U	36.2		5	U	1	U
	4/15/2009	10	U	25	U	44.7		5	U	1	U
	10/27/2009	2.6	J	25	U	27.3		5	U	1	U
	4/6/2010	10	U	25	U	14.4	J	3.6	J	1	U
	10/20/2010	12.7		26.2		305		5	U	1	U
	4/12/2011	3.7	J	2.3	J	71.9		5	UJ	1	U
	10/24/2011	3.2		25	U	61.6		5	UJ	1	U
	4/5/2012	10	U	25	U	28.6	J	5	U	1	U
	10/10/2012	23.2		13.9	J	275		5	U	1	U
	10/30/2013	9.8	J	33.8	J	293		6.9	U	1.0	U
	6/4/2014	8.0	U	2.5	J	23.0		4.1	UJ	0.5	U
MW-3	12/27/2007	10	U	29		27		**12**		1	U
	4/14/2008	10	U	71.3		39.9		5	U	1	U
	6/23/2008	10	U	**85.1**		27.3	J	5	U	1	U
	9/8/2008	10	U	73.4		93.9		7		1	U
	1/14/2009	10	U	**97.7**		52.2		6.8		1	U
	4/15/2009	10	U	**120**		84.9		6.1		1	U
	10/27/2009	2.1	J	**101**		26.6		5	U	1	U
	4/6/2010	6.4	J	**130**		49.6		5	U	1	U
	10/20/2010	10	U	**103**		43.4		5	U	1	U
	4/12/2011	10	U	**132**		75.4		5	UJ	1	U
	10/24/2011	3.3	J	**132**		48.3		5	UJ	1	U
	4/5/2012	10	U	**133**		84.8	J	5	U	1	U
	10/10/2012	10	U	**98.4**		45.3	U	5	U	1	U
	10/30/2013	8.0	U	**94.0**		58.7		6.9	U	1.0	U
	6/4/2014	8.0	U	**131.0**		92.2		4.1	UJ	0.5	U
MW-4R	10/27/2009	5.5	J	17.8		23		5	U	1.3	
	4/6/2010	2.1	J	3.3	J	25	U	5.9		1	J
	10/20/2010	10	U	3.3	J	14.8	J	5	U	0.1	J
	4/12/2011	10	U	4.6	J	15.9	J	5	UJ	1	U
	10/24/2011	10	U	2.8	J	14	J	5	UJ	1	U
	4/5/2012	10	U	2.3	J	16.6	J	5	U	1	U
	10/10/2012	10	U	11.6	J	25	U	5	U	1	U
	10/30/2013	8.0	U	6.6	J	3.0	J	6.9	U	1.0	U
	6/4/2014	8.0	U	3.4	J	6.2	J	4.1	U	0.5	U

Notes:
Bold text indicates Interim Groundwater Cleanup Level (IGCL) exceedance.
All results and IGCL's reported in micrograms per liter (µg/L).
U = Analyte not detected above the Limit of Detection.
J = Analyte detected above the Limit of Detection but below the Limit of Quantitation.
Data prior to 2013 from Weston Solutions, Inc.

Table 3 (cont'd)
2007 - 2014 Contaminants of Concern Laboratory Analytical Summary
Long-Term Groundwater Monitoring
Atlas Tack Superfund Site
June 2014

	Analyte:	Copper, total		Nickel, total		Zinc, total		Cyanide		Toluene	
	IGCL:	31 µg/L		82 µg/L		810 µg/L		10 µg/L		100,000 µg/L	
	Date										
MW-7	12/27/2007	**1350**		**496**		**6540**		5	U	1	U
	4/14/2008	**665**		**175**		**2300**		5	U	1	U
	6/23/2008	**551**		**284**		**3650**	J	5	U	1	U
	9/8/2008	**493**		**189**		**1970**		5	U	1	U
	1/14/2009	**326**		80.2		**981**		5	U	1	U
	4/15/2009	**278**		62.3		796		5	UJ	1	U
	10/27/2009	**333**		**100**		**932**		5	U	1	U
	4/6/2010	**225**		74.1		614		5	U	1	U
	10/20/2010	**139**		**90.7**		**826**		5	U	1	U
	4/12/2011	**206**		41.8		416	J	5	UJ	1	U
	10/24/2011	**143**		70.5		603		5	UJ	1	U
	4/5/2012	**214**		81.5		**819**		5	U	1	U
	10/10/2012	**278**		77.1		**846**		5	U	1	U
MW-9	12/27/2007	21		25	U	43		5	U	1	U
	4/14/2008	18		25	U	43.5		5	U	1	U
	6/23/2008	10	U	25	U	25	UJ	5	U	1	U
	9/8/2008	15.1		25	U	49		5	U	1	U
	1/14/2009	23.3		25	U	28.5		5	U	1	U
	4/15/2009	**31.4**		25	U	102		5	U	1	U
	10/27/2009	20.5		25		39.5		5	U	1	U
	4/6/2010	15.3		1.1	J	18.2	J	5	U	1	U
	10/20/2010	28.1		25	U	43		5	U	1	U
	4/12/2011	18.9		25	U	37.2		5	UJ	1	U
	10/24/2011	30.7		25	U	65.5		5	UJ	1	U
	4/5/2012	9.5	J	25	U	34.9	J	5	U	1	U
	10/10/2012	24.7		25	U	56.2		5	U	1	U
	10/29/2013	11.5	J	1.5	U	17.0	J	6.9	U	1.0	U
	6/3/2014	8.0	U	1.5		14.2	J	4.1	UJ	0.5	U
MW-10	12/27/2007	10	U	25	U	49		5	U	1	U
	4/14/2008	10	U	25	U	126		5	U	1	U
	6/23/2008	10	U	25	U	57.5	J	5	U	1	U
	9/8/2008	10	U	25	U	74.6		5	U	1	U
	1/14/2009	10	U	25	U	77.1		5	U	1	U
	4/15/2009	10	U	25	U	127		5	UJ	1	U
	10/27/2009	3.7	J	25	U	89.7		5	U	1	U
	4/6/2010	10	U	1.2	J	17.9	J	5		1	U
	10/20/2010	6.7	J	25	U	55.3		5	U	1	U
	4/12/2011	4.4	J	25	U	36.1		5	UJ	1	U
	10/24/2011	3.3	J	25	U	53.6		5	UJ	1	U
	4/5/2012	3.1	J	25	U	24	J	5	U	1	U
	10/10/2012	10	U	25	U	49.4	U	5	U	1	U
	10/28/2013	8.0	U	1.5	U	11.8	J	6.9	U	1.0	U
	6/3/2014	8.0	U	1.5	U	28.5		4.1	UJ	0.5	U

Notes:
Bold text indicates Interim Groundwater Cleanup Level (IGCL) exceedance.
All results and IGCL's reported in micrograms per liter (µg/L).
U = Analyte not detected above the Limit of Detection.
J = Analyte detected above the Limit of Detection but below the Limit of Quantitation.
Data prior to 2013 from Weston Solutions, Inc.

Table 3 (cont'd)
2007 - 2014 Contaminants of Concern Laboratory Analytical Summary
Long-Term Groundwater Monitoring
Atlas Tack Superfund Site
June 2014

	Analyte:	Copper, total		Nickel, total		Zinc, total		Cyanide		Toluene	
	IGCL:	31 µg/L		82 µg/L		810 µg/L		10 µg/L		100,000 µg/L	
	Date										
MW-11	12/27/2007	10	U	25	U	25	U	5	U	1	U
	4/14/2008	10	U	25	U	25	U	**14.3**		1	U
	6/23/2008	10	U	25	U	25	UJ	5	U	1	U
	9/8/2008	10	U	25	U	62		5	U	1	U
	1/14/2009	10	U	25	U	34.4		5	U	1	U
	4/15/2009	10	U	25	U	25.4		5	UJ	1	U
	10/27/2009	3.3	J	1.9	J	12.7	J	5	U	1	U
	4/6/2010	10	U	1.8	J	25	U	5	U	1	U
	10/20/2010	10	U	25	U	10.1	J	5	U	1	U
	4/12/2011	2.9	J	25	U	19.1	J	5	UJ	1	U
	10/24/2011	2.4	J	25	U	19.8	J	5	UJ	1	U
	4/5/2012	10	U	25	U	15.7	J	5	U	1	U
	10/10/2012	10	U	25	U	25	U	5	U	1	U
	10/29/2013	8.0	U	1.5	U	6.6	J	6.9	U	1.0	U
	6/4/2014	8.0	U	1.5	U	7.5	J	4.1	UJ	0.5	U
MW-12	12/27/2007	**147**		25	U	59		**96**		1	U
	4/14/2008	10	U	25	U	31.7		**26.7**		1	U
	6/23/2008	13		25	U	25	UJ	**26.6**		1	J
	9/8/2008	10.4		25	U	50.7		**19.5**		1	U
	1/14/2009	10	U	35.2		36.2		**19.2**		1	U
	4/15/2009	23.2		34.7		63.4		**17.7**		1	U
	10/27/2009	6.7	J	29.6		25.6		3.7	J	1	U
	4/6/2010	10	U	30.8		25	U	**28.9**		1	U
	10/20/2010	24.6		10.1	J	22.9	J	5	U	1	U
	4/12/2011	15.3		12	J	24.9	J	5	UJ	1	U
	10/24/2011	12.8		9.2	J	34.9		5	UJ	1	U
	4/5/2012	2.7	UJ	11.7	J	25.2		5	U	1	U
	10/10/2012	10	U	4.7	J	37	U	5	U	1	U
	10/29/2013	8.0	U	1.5	U	13.4	J	6.9	U	1.0	U
	6/5/2014	20.4	J	4.1	J	16.2	J	**13**		0.5	U
MW-13	12/27/2007	10	U	**93**		**812**		8		1	U
	4/14/2008	10	U	67.9		317		**11.1**		1	U
	6/23/2008	10	U	46.2		158	J	8.9		1	U
	9/8/2008	10	U	27.7		84.3		**16.3**		1	U
	1/14/2009	10	U	25	U	50.4		**18.6**		1	U
	4/15/2009	10	U	41.7		127		**19.2**		1	U
	10/27/2009	2.5	J	31		68.1		6.7		1	U
	4/6/2010	3.2	J	18	J	23.7	J	**41.6**		1	U
	10/20/2010	10	U	40.5		24	J	5	U	1	U
	4/12/2011	10	UJ	11.9	J	27.9	J	5	UJ	1	U
	10/24/2011	2.5	J	19.4	J	42.6		**20.7**	J	1	U
	4/5/2012	10	U	9.4	J	26.4		9.8		1	U
	10/10/2012	10	U	13.3	J	25	U	5	U	1	U
	10/30/2013	8.0	U	8.1	J	7.5	J	**17.0**		1.0	U
	6/4/2014	8.0	U	6.9	J	5.5	J	**11.0**	J	0.5	U

Notes:
Bold text indicates Interim Groundwater Cleanup Level (IGCL) exceedance.
All results and IGCL's reported in micrograms per liter (µg/L).
U = Analyte not detected above the Limit of Detection.
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Table 3 (cont'd)
2007 - 2014 Contaminants of Concern Laboratory Analytical Summary
Long-Term Groundwater Monitoring
Atlas Tack Superfund Site
June 2014

	Analyte:	Copper, total		Nickel, total		Zinc, total		Cyanide		Toluene	
	IGCL:	31 µg/L		82 µg/L		810 µg/L		10 µg/L		100,000 µg/L	
	Date										
MW-14	12/27/2007	10	U	25	U	90		5	U	1	U
	4/14/2008	10	U	25	U	94.5		5	U	1	U
	6/23/2008	10	U	25	U	37.4	J	5	U	1	U
	9/8/2008	10	U	25	U	31.2		5	U	1	U
	1/14/2009	10	U	25	U	56.8		**18.6**		1	U
	4/15/2009	10	U	25	U	55.3		**30.6**		1	U
	10/27/2009	4.8	J	8.4	J	21.5	J	5	U	1	U
	4/6/2010	2.2	J	8.8	J	14.5	J	**15.1**		1	U
	10/20/2010	5.8	J	4.7	J	30.5		5	U	1	U
	4/12/2011	4.8	J	7.8	J	41		5	UJ	1	U
	10/24/2011	3.4	J	5.8	J	45.6		5	UJ	1	U
	4/5/2012	3.6	J	5.1	J	33	J	**11.2**		1	U
	10/10/2012	10	U	3.3	J	32.6	U	5	U	1	U
	10/29/2013	14.0	J	8.1	J	29.2		9.5	J	1.0	U
	6/3/2014	8.0	U	7.2	J	70.5		**22**	**J**	0.5	U
MW-15	12/27/2007	10	U	25	U	44		5	U	1	U
	4/14/2008	10	U	25	U	34.2		5	U	1	U
	6/23/2008	10	U	25	U	25	UJ	5	U	1	U
	9/8/2008	10	U	25	U	67.6		5	U	1	U
	4/15/2009	10	U	25	U	71.7		5	U	1	U
	10/27/2009	6.2	J	1.2	J	27.3		5	U	1	U
	4/6/2010	3.3	J	1.3	J	29.3		5	U	1	U
	10/20/2010	4.5	J	3.3	J	71.3		5	U	1	U
	4/12/2011	6.8	J	1.3	J	86.8		5	UJ	1	U
	10/24/2011	4.4	J	25	U	71.6		5	UJ	1	U
	4/5/2012	15		5.9	J	82.6	J	5	U	1	U
	10/10/2012	10	U	1.7	J	80.7		5	U	1	U
	10/29/2013	8.0	U	6.5	J	88.1		6.9	U	1.0	U
MW-16	12/27/2007	4.7	J	25.3		16.5	J	5	U	1	U
	4/6/2010	2.9	J	25	U	25	U	5.6		1	U
	10/20/2010	10	U	1.2	J	25	U	5	U	1	U
	4/12/2011	4.4	J	25	U	16.4	J	5	UJ	1	U
	10/24/2011	2.2	J	25	U	16.4	J	5	UJ	1	U
	4/5/2012	10	U	25	U	11.9	J	5	U	1	U
	10/10/2012	10	U	25	U	25	U	5	U	1	U
	10/30/2013	8.0	U	1.5	U	4.4	J	6.9	U	1.0	U
	6/4/2014	8.0	U	1.5	U	8.0	J	4.4	J	0.5	U

Notes:
Bold text indicates Interim Groundwater Cleanup Level (IGCL) exceedance.
All results and IGCL's reported in micrograms per liter (µg/L).
U = Analyte not detected above the Limit of Detection.
J = Analyte detected above the Limit of Detection but below the Limit of Quantitation.
Data prior to 2013 from Weston Solutions, Inc.

Table 3 (cont'd)
2007 - 2014 Contaminants of Concern Laboratory Analytical Summary
Long-Term Groundwater Monitoring
Atlas Tack Superfund Site
June 2014

	Analyte:	Copper, total		Nickel, total		Zinc, total		Cyanide		Toluene	
	IGCL:	31 µg/L		82 µg/L		810 µg/L		10 µg/L		100,000 µg/L	
	Date										
AT-5	12/27/2007	10	U	25	U	63		5	U	1	U
	4/14/2008	10	U	25	U	25	U	5	U	1	U
	6/23/2008	10	U	25	U	40.2	J	5	U	1	U
	9/8/2008	10	U	25	U	92		5	U	1	U
	1/14/2009	10	U	25	U	25	U	5	U	1	U
	4/15/2009	10	U	25	U	98		5	UJ	1	U
	10/27/2009	2.5	J	25	U	24	J	5	U	1	U
	4/6/2010	10	U	1.7	J	443		5	U	1	U
	10/20/2010	21.8		10	J	416		5	U	1	U
	4/12/2011	2.4	J	25	U	89.2	J	5	UJ	1	U
	10/24/2011	4.1	J	25	U	77		5	UJ	1	U
	4/5/2012	3.7	J	2.8	J	74	J	5	U	1	U
	10/10/2012	10	U	25	U	69		5	U	1	U
	10/28/2013	8.0	U	30	J	51.3		6.9	U	1.0	U
	6/3/2014	8.0	U	1.5	U	110		4.1	UJ	0.5	U
AT-8	12/27/2007	**196**		**84**		**1760**		5	U	1	U
	4/14/2008	**196**		**114**		**1080**		5	U	1	U
	6/23/2008	**158**		**129**		**931**	J	5	U	0.5	J
	9/8/2008	**207**		**155**		**1100**		5	U	1.8	
	1/14/2009	**356**		**211**		**1510**		5	U	1	U
	4/15/2009	**334**		**170**		**1540**		5	U	1	U
	10/27/2009	**234**		**131**		**1330**		5	U	1	U
	4/6/2010	**462**		**86**		**2020**		5	U	1	U
	10/20/2010	**274**		**153**		**1300**		5	U	0.6	J
	4/12/2011	**271**		**142**		**983**		5	UJ	1	U
	10/24/2011	**173**		**99**		**835**		5	UJ	1	U
	4/5/2012	**236**		**133**		**1060**	J	5	U	1	U
	10/10/2012	**194**		**111**		800		5	U	0.6	J
	10/28/2013	**147**		80.2		604		6.9	U	1.0	U
	6/3/2014	**188**		**100**		**1070**		4.1	U	0.5	U
#519	12/27/2007	10	U	25	U	36	J	5	U	1	U
	4/14/2008	10	U	25	U	25	U	5	U	1	U
	1/14/2009	10	U	25	U	28.8		5	U	1	U
	4/15/2009	10	U	25	U	41.5		5	UJ	1	U
	10/27/2009	4.1	J	25	U	47.4		5	U	1	U
	4/6/2010	10	U	25	U	14.2	J	5	U	1	U
	4/12/2011	3.8	J	25	U	26.4	J	5	UJ	1	U
	10/24/2011	3.8	J	25	U	45.6		5	UJ	1	U

Notes:
Bold text indicates Interim Groundwater Cleanup Level (IGCL) exceedance.
All results and IGCL's reported in micrograms per liter (µg/L).
U = Analyte not detected above the Limit of Detection.
J = Analyte detected above the Limit of Detection but below the Limit of Quantitation.
Data prior to 2013 from Weston Solutions, Inc.

Table 4
2014 Laboratory Analytical Data Summary
Long-Term Groundwater Monitoring Atlas
Tack Superfund Site
JUNE 2014

			Well ID:	MW-2	MW-2	MW-3	MW-4R	MW-9	MW-10	MW-11
			Field Sample ID:	AT-GW-MW-2-06042014-1	AT-GW-MW-2-06042014-D	AT-GW-MW-3-06042014-1	AT-GW-MW-4R-06052014-1	AT-GW-MW-9-06032014-1	AT-GW-MW-10-06032014-1	AT-GW-MW-11-06042014-1
			Lab Sample ID:	MC31057-8/F	MC31057-9/F	MC31057-10/F	MC31095-1/F	MC31057-4/F	MC31057-1/F	MC31057-7/F
			Sample Date:	6/4/2014	6/4/2014	6/4/2014	6/5/2014	6/3/2014	6/3/2014	6/4/2014
			Lab Name:	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest
			Field QC:	Original data	Field Duplicate	Original data	Original data	Original data	Original data	Original data
			Sampling Method:	Low-Flow	Low-Flow	Low-Flow	Low-Flow	Low-Flow	Low-Flow	Low-Flow
	Units	**PAL (IGCL)**								
VOCs by 8260C										
1,2,4-Trimethylbenzene	ug/l	2.4		1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Acetone	ug/l	22,000		10 UJ	10 UJ	10 UJ	10 U	10 UJ	10 UJ	10 UJ
Benzene	ug/l	1.36		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	ug/l	2.1		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Carbon disulfide	ug/l	560		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	ug/l	0.71		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	ug/l	210		**1.6**	**1.6**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	ug/l	3.04		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Isoproplybenzene	ug/l	NA		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl Tert Butyl Ether	ug/l	12,000		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	ug/l	580		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	ug/l	26		2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
sec-Butylbenzene	ug/l	25		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/l	0.55		**9.4**	**9.3**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	ug/l	2.89		**1.2**	**1.2**	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	ug/l	150		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Metals (total)										
Copper	ug/l	31		8.0 U	8.0 U	8.0 U	8.0 U	8.0 U	8.0 U	8.0 U
Nickel	ug/l	82		**2.5** J	**2.5** J	**131**	**3.4** J	1.5 U	1.5 U	1.5 U
Zinc	ug/l	810		**22.2**	**23.0**	**92.2**	**6.2** J	**14.2** J	**28.5**	**7.5** J
Metals (dissolved)										
Copper	ug/l	31		8.0 U	8.0 U	8.0 U	8.0 U	8.0 U	8.0 U	8.0 U
Nickel	ug/l	82		**2.8** J	**2.8** J	**130**	**4.0** J	1.5 U	1.5 U	**2.0** J
Zinc	ug/l	810		**26.6**	**24.5**	**88.6**	**5.8** J	**13.6** J	**7.0** J	**8.4** J
Other Parameters										
Chloride	mg/l	---		**915**	**910**	**380**	**3300**	**6.0**	**5.5**	**24.0**
Cyanide	mg/l	0.01		0.0041 UJ	0.0041 UJ	0.0041 UJ	0.0041 U	0.0041 UJ	0.0041 UJ	0.0041 UJ
pH	SU	---		**5.9**	**5.9**	**5.8**	**6.3**	**6.7**	**6.7**	**6.3**
TDS	mg/l	---		**2120**	**2110**	**2020**	**3210**	**215**	**214**	**219**
TSS	mg/l	---		3.1 U	3.1 U	3.1 U	**138**	3.1 U	3.1 U	3.1 U

Notes:

(1) The PAL for hexachlorobenzene could not be achieved by Accutest using Method 8270C-SIM.

Only contaminants of concern are listed on this summary table.

Bold values indicate a detection and shaded values indicate an exceedence of PAL or IGCL.

U = Analyte not detected above Limit of Detection.

J = Analyte detected above the Limit of Detection but below the Limit of Quantitation.

R =Data rejected due to a quality control issue.

IGCL = Interim Groundwater Cleanup Level

PAL = Project Action Limit

--- = Not Applicable.

NA = Not Available.

Table 4 (cnt'd)
Laboratory Analytical Data Summary
Long-Term Groundwater Monitoring
Atlas Tack Superfund Site
JUNE 2014

	Well ID:		MW-12	MW-13	MW-14	MW-16	AT-5	AT-8
	Field Sample ID:		AT-GW-MW-12-06052014-1	AT-GW-MW-13-06042014-1	AT-GW-MW-14-06032014-1	AT-GW-MW-16-06042014-1	AT-GW-AT-5-06032014-1	AT-GW-AT-8-06052014-1
	Lab Sample ID:		MC31095-2/F	MC31057-6/F	MC31057-3/F	MC31057-11/F	MC31057-2/F	MC31095-4/F
	Sample Date:		6/5/2014	6/4/2014	6/3/2014	6/4/2014	6/3/2014	6/5/2014
	Lab Name:		Accutest	Accutest	Accutest	Accutest	Accutest	Accutest
	Field QC:		Original data	Original data	Original data	Original data	Original data	Original data
	Sampling Method:		Low-Flow	Low-Flow	Low-Flow	Low-Flow	Low-Flow	Low-Flow
	Units	**PAL (IGCL)**						
VOCs								
1,2,4-Trimethylbenzene	ug/l	2.4	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Acetone	ug/l	22,000	10 U	10 UJ	10 UJ	10 UJ	10 UJ	10 U
Benzene	ug/l	1.36	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	ug/l	2.1	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Carbon disulfide	ug/l	560	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	ug/l	0.71	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	ug/l	210	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	ug/l	3.04	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Isoproplybenzene	ug/l	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl Tert Butyl Ether	ug/l	12,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	ug/l	580	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	ug/l	26	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
sec-Butylbenzene	ug/l	25	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/l	0.55	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	ug/l	2.89	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	ug/l	150	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Metals (total)								
Copper	ug/l	31	**20.4** J	8.0 U	8.0 U	8.0 U	8.0 U	**188**
Nickel	ug/l	82	**4.1** J	**6.9** J	**7.2** J	1.5 U	1.5 U	**100**
Zinc	ug/l	810	**16.2** J	**5.5** J	**70.5**	**8.0** J	**110**	**1070**
Metals (dissolved)								
Copper	ug/l	31	8.0 U	8.0 U	8.0 U	8.0 U	8.0 U	**173**
Nickel	ug/l	82	**2.1** J	**6.6** J	**7.2** J	**2.7** J	**4.0** J	**101**
Zinc	ug/l	810	**6.3** J	5.0 U	**70.8**	**5.8** J	**102**	**983**
Other Parameters								
Chloride	mg/l	---	**24.0**	**155**	**81.0**	**360**	**16.5**	**130**
Cyanide	mg/l	0.01	**0.013**	**0.011** J	**0.022** J	**0.0044** J	0.0041 UJ	0.0041 U
pH	SU	---	**6.5**	**6.4**	**6.0**	**6.4**	**7.1** J	**5.0**
TDS	mg/l	---	**319**	**466**	**439**	**784**	**93**	**750**
TSS	mg/l	---	**88.0**	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U

Notes:

(1) The PAL for hexachlorobenzene could not be achieved by Accutest using Method 8270C-SIM.

Only contaminants of concern are listed on this summary table.

Bold values indicate a detection and shaded values indicate an exceedence of PAL or IGCL.

U = Analyte not detected above Limit of Detection.

J = Analyte detected above the Limit of Detection but below the Limit of Quantitation.

IGCL = Interim Groundwater Cleanup Level

PAL = Project Action Limit

--- = Not Applicable.

NA = Not Available.

Table 5a
Saltwater Surface Water Sample Results - June 2012
Atlas Tack Superfund Site
Fairhaven, Massachusetts

Parameter	Criteria (1)	BC-01 AT-SW-01-062912-001 6/29/2012	BC-02 AT-SW-02-062912-002 6/29/2012	BC-03 AT-SW-03-062912-003 6/29/2012	BC-04 AT-SW-04-062912-004 6/29/2012	BC-04 AT-SW-04-062912-004-D 6/29/2012
Metals, Total (mg/L)						
Cadmium	0.0088	0.0125 U	0.0025 U	0.0005 J	0.0025 U	0.0025 U
Chromium	0.05	0.05 U	0.01 U	0.0015 J	0.0018 J	0.01 U
Copper	0.0031	0.0037	0.0017	0.0046	0.008 J	0.0118 J
Lead	0.0081	0.0189	0.0025 U	0.0032	0.0026	0.0044
Nickel	0.0082	0.03 U	0.006 U	0.006 U	0.0018 J	0.0024 J
Zinc	0.081	0.0308 J	0.0292	0.0441	0.0865	0.104
Inorganics (mg/L)						
Cyanide, Total	0.001	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U

1 - Saltwater monitoring criteria from Final Sampling and Analysis Plan Addendum No. 006 Surface Water and Sediment Monitoring April 2009.
Shaded results exceed saltwater monitoring criteria.
mg/L - milligrams per liter
U - Not detected, value is detection limit
J - Value is estimated

Prepared by: BJR 7/9/12
Checked by: SFR 7/9/12

Table 5b
Freshwater Surface Water Sample Results - June 2012
Atlas Tack Superfund Site
Fairhaven, Massachusetts

Parameter	Criteria (1)	FW-05 AT-SW-05-062912-001 6/29/2012	FW-06 AT-SW-06-062912-002 6/29/2012
Metals, Total (mg/L)			
Cadmium	0.00025	0.0025 U	0.0025 U
Chromium	0.011	0.01 U	0.01 U
Copper	0.009	0.0007 J	0.0026
Lead	0.0025	0.0025 U	0.0025 U
Nickel	0.052	0.006 U	0.006 U
Zinc	0.12	0.0142 J	0.0203 J
Inorganics (mg/L)			
Cyanide, Total	0.0052	0.005 U	0.005 U

1 - Freshwater monitoring criteria from Final Sampling and Analysis Plan Addendum No. 006 Surface Water and Sediment Monitoring April 2009.
Shaded results exceed saltwater monitoring criteria.
mg/L - milligrams per liter
U - Not detected, value is detection limit
J - Value is estimated

Prepared by: BJR 7/9/12
Checked by: SFR 7/9/12

Table 5c
Sediment Sample
ER-MQ Calculations
June 2012
Atlas Tack Superfund Site
Fairhaven, Massachusetts

Location 01
AT-PM-BC-01-006-Y
6/29/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.06	0.01	
Chromium	370	4.5	0.01	
Copper	270	17.5	0.06	
Lead	218	6.4	0.03	
Nickel	52	2.1	0.04	
Zinc	410	27.4	0.07	
		ERM-Q:	0.04	< 1.0
		Total Cyanide:	1.27 U	< 34 mg/kg

Location 02
AT-PM-BC-02-006-Y
6/29/2012

	ER-M	Results	Quotient	
Cadmium	9.6	1.1	0.11	
Chromium	370	11.7	0.03	
Copper	270	83.2	0.31	
Lead	218	17	0.08	
Nickel	52	16.2	0.31	
Zinc	410	139	0.34	
		ERM-Q:	0.20	< 1.0
		Total Cyanide:	1.44 U	< 34 mg/kg

Location 03
AT-PM-BC-03-006-Y
6/29/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.06	0.01	
Chromium	370	4.3	0.01	
Copper	270	14.1	0.05	
Lead	218	14.8	0.07	
Nickel	52	3.5	0.07	
Zinc	410	27.6	0.07	
		ERM-Q:	0.05	< 1.0
		Total Cyanide:	1.27 U	< 34 mg/kg

Location 04
AT-PM-BC-04-006-Y
6/29/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.2	0.02	
Chromium	370	5.6	0.02	
Copper	270	32.3	0.12	
Lead	218	15.8	0.07	
Nickel	52	10.9	0.21	
Zinc	410	131	0.32	
		ERM-Q:	0.13	< 1.0
		Total Cyanide:	1.22 U	< 34 mg/kg

Notes:
Non-detect results included in ERM-Q calculations at their respective reporting limit.
U = Non-detect Total Cyanide results presented at the reporting limit.
All results reported as mg/kg (ppm).

Table 5c (cont'd)
Sediment Sample
ER-MQ Calculations
June 2012
Atlas Tack Superfund Site
Fairhaven, Massachusetts

Location 05
AT-PM-FW-05-005-Y6
6/29/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.08	0.01	
Chromium	370	5.3	0.01	
Copper	270	52.8	0.20	
Lead	218	14.3	0.07	
Nickel	52	3.3	0.06	
Zinc	410	51.5	0.13	
		ERM-Q:	0.08	< 1.0
		Total Cyanide:	1.37 U	< 34 mg/kg

Location 06
AT-PM-FW-06-006-Y
6/29/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.4	0.04	
Chromium	370	3.3	0.01	
Copper	270	3	0.01	
Lead	218	4.5	0.02	
Nickel	52	1.5	0.03	
Zinc	410	8.8	0.02	
		ERM-Q:	0.02	< 1.0
		Total Cyanide:	1.13 U	< 34 mg/kg

Location 07
AT-PM-MH-07-002-Y
6/29/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.7	0.07	
Chromium	370	8.8	0.02	
Copper	270	25	0.09	
Lead	218	12.5	0.06	
Nickel	52	3.4	0.07	
Zinc	410	33.7	0.08	
		ERM-Q:	0.07	< 1.0
		Total Cyanide:	2.16 U	< 34 mg/kg

Location 08
AT-PM-BC-08-002-Y
6/29/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.5	0.05	
Chromium	370	22.8	0.06	
Copper	270	124	0.46	
Lead	218	30.1	0.14	
Nickel	52	9.5	0.18	
Zinc	410	139	0.34	
		ERM-Q:	0.21	< 1.0
		Total Cyanide:	0.44	< 34 mg/kg

Notes:
Non-detect results included in ERM-Q calculations at their respective reporting limit.
U = Non-detect Total Cyanide results presented at the reporting limit.
All results reported as mg/kg (ppm).

Table 5c (cont'd)
Sediment Sample
ER-MQ Calculations
June 2012
Atlas Tack Superfund Site
Fairhaven, Massachusetts

Location 09
AT-PM-MH-09-002-Y
6/29/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.4	0.04	
Chromium	370	4.3	0.01	
Copper	270	6.9	0.03	
Lead	218	6.3	0.03	
Nickel	52	2	0.04	
Zinc	410	11.2	0.03	
		ERM-Q:	0.03	< 1.0
		Total Cyanide:	1.32 U	< 34 mg/kg

Location 10
AT-PM-MH-10-002-Y
6/29/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.4	0.04	
Chromium	370	10.9	0.03	
Copper	270	80.4	0.30	
Lead	218	20.7	0.09	
Nickel	52	8.8	0.17	
Zinc	410	89.1	0.22	
		ERM-Q:	0.14	< 1.0
		Total Cyanide:	4.34	< 34 mg/kg

Location 11
AT-PM-MH-11-002-Y
6/29/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.4	0.04	
Chromium	370	3.9	0.01	
Copper	270	5.6	0.02	
Lead	218	6.1	0.03	
Nickel	52	2.2	0.04	
Zinc	410	12	0.03	
		ERM-Q:	0.03	< 1.0
		Total Cyanide:	1.14 U	< 34 mg/kg

Location 12
AT-PM-MH-12-002-Y
6/29/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.4	0.04	
Chromium	370	5.7	0.02	
Copper	270	14.2	0.05	
Lead	218	6.5	0.03	
Nickel	52	4	0.08	
Zinc	410	16.1	0.04	
		ERM-Q:	0.04	< 1.0
		Total Cyanide:	1.14 U	< 34 mg/kg

Notes:
Non-detect results included in ERM-Q calculations at their respective reporting limit.
U = Non-detect Total Cyanide results presented at the reporting limit.
All results reported as mg/kg (ppm).

Table 5c (cont'd)
Sediment Sample
ER-MQ Calculations
June 2012
Atlas Tack Superfund Site
Fairhaven, Massachusetts

Location 13

AT-PM-BC-13-002-Y
6/29/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.4	0.04	
Chromium	370	2.4	0.01	
Copper	270	6.6	0.02	
Lead	218	7.3	0.03	
Nickel	52	1.9	0.04	
Zinc	410	28.4	0.07	
		ERM-Q:	0.04	< 1.0
		Total Cyanide:	1.09 U	< 34 mg/kg

Prepared by: BJR 7/9/12
Checked by: SFR 7/9/12

Notes:
Non-detect results included in ERM-Q calculations at their respective reporting limit.
U = Non-detect Total Cyanide results presented at the reporting limit.
All results reported as mg/kg (ppm).

Table 6a
Saltwater Surface Water Sample Results - October 2012
Atlas Tack Superfund Site
Fairhaven, Massachusetts

Parameter	Criteria (1)	BC-01 AT-SW-01-102512-003 10/25/2012	BC-02 AT-SW-02-102512-004 10/25/2012	BC-03 AT-SW-03-102512-005 10/25/2012	BC-04 AT-SW-04-102512-006 10/25/2012	BC-04 AT-SW-04-102512-006-DUP 10/25/2012
Metals, Total (mg/L)						
Cadmium	0.0088	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U
Chromium	0.05	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Copper	0.0031	0.0032 U	0.002 U	0.0016 U	0.0026 U	0.0025 U
Lead	0.0081	0.005 U	0.0025 U	0.0025 U	0.0025 UJ	0.0025 UJ
Nickel	0.0082	0.006 U	0.006 U	0.006 U	0.0029 J	0.0023 J
Zinc	0.081	0.0598	0.0544	0.0504	0.0568	0.0517
Inorganics (mg/L)						
Cyanide, Total	0.001	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U

1 - Saltwater monitoring criteria from Final Sampling and Analysis Plan Addendum No. 006 Surface Water and Sediment Monitoring April 2009.
Shaded results exceed saltwater monitoring criteria.
mg/L - milligrams per liter
U - Not detected, value is detection limit
J - Value is estimated

Prepared by: BJR 11/8/2012
Checked by: SFR 11/8/2012

Table 6b
Freshwater Surface Water Sample Results - October 2012
Atlas Tack Superfund Site
Fairhaven, Massachusetts

Parameter	Criteria (1)	FW-05 AT-SW-05-102512-001 10/25/2012	FW-06 AT-SW-06-102512-002 10/25/2012
Metals, Total (mg/L)			
Cadmium	0.00025	0.0025 U	0.0025 U
Chromium	0.011	0.01 U	0.01 U
Copper	0.009	0.0038	0.0015 U
Lead	0.0025	0.002 J	0.0025 U
Nickel	0.052	0.006 U	0.006 U
Zinc	0.12	0.0493	0.0338
Inorganics (mg/L)			
Cyanide, Total	0.0052	0.005 U	0.005 U

1 - Freshwater monitoring criteria from Final Sampling and Analysis Plan Addendum No. 006 Surface Water and Sediment Monitoring April 2009.
Shaded results exceed saltwater monitoring criteria.
mg/L - milligrams per liter
U - Not detected, value is detection limit
J - Value is estimated

Prepared by: BJR 11/8/2012
Checked by: SFR 11/8/2012

Table 6c
Sediment Sample
ER-MQ Calculations
October 2012
Atlas Tack Superfund Site
Fairhaven, Massachusetts

Location 01
AT-PM-BC-01-007-Y
10/25/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.2	0.021	
Chromium	370	6.1	0.016	
Copper	270	26.4	0.098	
Lead	218	10.0	0.046	
Nickel	51.6	2.3	0.045	
Zinc	410	35.3	0.086	
		ERM-Q:	0.052	< 1.0
		Total Cyanide:	1.41 U	< 34 mg/kg

Location 02
AT-PM-BC-02-007-Y
10/25/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.3	0.031	
Chromium	370	1.8	0.0049	
Copper	270	3.2	0.012	
Lead	218	2.5	0.011	
Nickel	51.6	1.3	0.025	
Zinc	410	8.4	0.020	
		ERM-Q:	0.018	< 1.0
		Total Cyanide:	1.14 U	< 34 mg/kg

Location 03
AT-PM-BC-03-007-Y
10/25/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.09	0.0094	
Chromium	370	3.7	0.010	
Copper	270	6.9	0.026	
Lead	218	10.6	0.049	
Nickel	51.6	2.5	0.048	
Zinc	410	21	0.051	
		ERM-Q:	0.032	< 1.0
		Total Cyanide:	1.26 U	< 34 mg/kg

Location 04
AT-PM-BC-04-007-Y
10/25/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.3	0.031	
Chromium	370	5.7	0.015	
Copper	270	64.4	0.24	
Lead	218	36.5	0.17	
Nickel	51.6	4.8	0.093	
Zinc	410	62.7	0.15	
		ERM-Q:	0.12	< 1.0
		Total Cyanide:	1.22 U	< 34 mg/kg

Notes:
Non-detect results included in ERM-Q calculations at their respective reporting limit.
U = Non-detect Total Cyanide results presented at the reporting limit.
All results reported as mg/kg (ppm).

Table 6c (cont'd)
Sediment Sample
ER-MQ Calculations
October 2012
Atlas Tack Superfund Site
Fairhaven, Massachusetts

Location 05
AT-PM-FW-05-007-Y
10/25/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.1	0.010	
Chromium	370	4.5	0.012	
Copper	270	16.3	0.060	
Lead	218	10.4	0.048	
Nickel	51.6	2.5	0.048	
Zinc	410	28.6	0.070	
		ERM-Q:	0.041	< 1.0
		Total Cyanide:	1.19 U	< 34 mg/kg

Location 06
AT-PM-FW-06-007-Y
10/25/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.07	0.0073	
Chromium	370	4.1	0.011	
Copper	270	3.8	0.014	
Lead	218	7	0.032	
Nickel	51.6	1.8	0.035	
Zinc	410	10.5	0.026	
		ERM-Q:	0.021	< 1.0
		Total Cyanide:	1.12 U	< 34 mg/kg

Location 07
AT-PM-MH-07-004-Y
10/25/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.1	0.010	
Chromium	370	4.1	0.011	
Copper	270	11.6	0.043	
Lead	218	6.5	0.030	
Nickel	51.6	1.8	0.035	
Zinc	410	20.9	0.051	
		ERM-Q:	0.03	< 1.0
		Total Cyanide:	1.36 U	< 34 mg/kg

Location 08
AT-PM-BC-08-004-Y
10/25/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.4	0.042	
Chromium	370	12.9	0.035	
Copper	270	57.5	0.21	
Lead	218	17.9	0.082	
Nickel	51.6	5.1	0.099	
Zinc	410	60.5	0.15	
		ERM-Q:	0.10	< 1.0
		Total Cyanide:	1.83 U	< 34 mg/kg

Notes:
Non-detect results included in ERM-Q calculations at their respective reporting limit.
U = Non-detect Total Cyanide results presented at the reporting limit.
All results reported as mg/kg (ppm).

Table 6c (cont'd)
Sediment Sample
ER-MQ Calculations
October 2012
Atlas Tack Superfund Site
Fairhaven, Massachusetts

Location 09
AT-PM-MH-09-004-Y
10/25/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.2	0.021	
Chromium	370	6.9	0.019	
Copper	270	19.8	0.073	
Lead	218	10.7	0.049	
Nickel	52	2.4	0.046	
Zinc	410	32.4	0.079	
		ERM-Q:	0.048	< 1.0
		Total Cyanide:	1.32 U	< 34 mg/kg

Location 10
AT-PM-MH-10-004-Y
10/25/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.7	0.073	
Chromium	370	23.1	0.062	
Copper	270	104	0.39	
Lead	218	30.3	0.14	
Nickel	51.6	8.2	0.16	
Zinc	410	146	0.36	
		ERM-Q:	0.20	< 1.0
		Total Cyanide:	1.59	< 34 mg/kg

Location 11
AT-PM-MH-11-004-Y
10/25/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.06	0.0063	
Chromium	370	4.1	0.011	
Copper	270	6.3	0.023	
Lead	218	6.5	0.030	
Nickel	51.6	1.9	0.037	
Zinc	410	14.8	0.036	
		ERM-Q:	0.02	< 1.0
		Total Cyanide:	1.11 U	< 34 mg/kg

Location 12
AT-PM-MH-12-004-Y
10/25/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.05	0.0052	
Chromium	370	3.6	0.0097	
Copper	270	4.6	0.017	
Lead	218	6.2	0.028	
Nickel	51.6	1.8	0.035	
Zinc	410	15.1	0.037	
		ERM-Q:	0.02	< 1.0
		Total Cyanide:	1.15 U	< 34 mg/kg

Notes:
Non-detect results included in ERM-Q calculations at their respective reporting limit.
U = Non-detect Total Cyanide results presented at the reporting limit.
All results reported as mg/kg (ppm).

Table 6c (cont'd)
Sediment Sample
ER-MQ Calculations
October 2012
Atlas Tack Superfund Site
Fairhaven, Massachusetts

Location 13

AT-PM-BC-13-004-Y
10/25/2012

	ER-M	Results	Quotient	
Cadmium	9.6	0.08	0.0083	
Chromium	370	2.5	0.0068	
Copper	270	8.7	0.032	
Lead	218	8.1	0.037	
Nickel	51.6	1.8	0.035	
Zinc	410	32.4	0.079	
		ERM-Q:	0.033	< 1.0
		Total Cyanide:	1.23 U	< 34 mg/kg

Prepared by: SFR 11/8/2012
Checked by: BJR 11/8/2012

Notes:
Non-detect results included in ERM-Q calculations at their respective reporting limit.
U = Non-detect Total Cyanide results presented at the reporting limit.
All results reported as mg/kg (ppm).

APPENDIX D

SITE INSPECTION, PICTURES, AND INTERVIEWS

- Five Year Review Checklist
- Photographs from Site Inspection
- Interview Records

Five-Year Review
Site Inspection Checklist

Atlas Tack Corp.

I. SITE INFORMATION

Site Name: Atlas Tack Corp.

Location and Region: Fairhaven, Massachusetts EPA ID:

Date of Inspection: 1/20/15 & 5/20/2015 Weather/temperature: Clear

Agency, office, or company leading the 5-year review: USEPA

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☐ Surface water collection and treatment
- ☒ Other: Wetland Restoration

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS

1. **O&M Site Manager** _____ _____ _____
   Name Title Date

   Interviewed ☐ at site ☐ at office ☐ by phone Phone no.

   Problems, suggestions; Report attached see attached report

2. **O&M Staff** _____ _____ _____
   Name Title Date

   Interviewed ☐ at site ☐ at office ☐ by phone Phone no.

   Problems, suggestions; Report attached see attached report

Site: Atlas Tack Corp. Superfund Site

5-year Review Inspection Conducted on: 1/20/15 & 5/20/15

II. INTERVIEWS (CONT'D)

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Town of Fairhaven

Contact _____ _____ _____ _____

Name Title Date Phone no.

Problems, suggestions; Report attached see atached report

_____

Agency Town of Fairhaven

Contact _____ _____ _____ _____

Name Title Date Phone no.

Problems, suggestions; Report attached see atached report

_____

Agency _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Problems, suggestions; Report attached _____

_____

Agency _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Problems, suggestions; Report attached _____

_____

4. **Other interviews** (optional) ☒ Reports attached.

Name of Personnel Title

Site: Atlas Tack Corp. Superfund Site

5-year Review Inspection Conducted on: 1/20/15 & 5/20/15

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (CHECK ALL THAT APPLY)

1. **O&M Documents**

☒	O&M manual:	☐ Readily available	☒ Up to date	☐ N/A
☒	As-built drawings:	☐ Readily available	☒ Up to date	☐ N/A
☒	Maintenance logs:	☐ Readily available	☒ Up to date	☐ N/A

Remarks

2. **Site-Specific Plans**

☒	Health and Safety Plan	☐ Readily available	☒ Up to date	☐ N/A
☐	Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
☐	Other:	☐ Readily available	☐ Up to date	☐ N/A

Remarks

3. **Training Records**

☒	O&M	☐ Readily available	☒ Up to date	☒ N/A
☒	OSHA	☐ Readily available	☒ Up to date	☒ N/A
☐	Other:	☐ Readily available	☐ Up to date	☐ N/A

Remarks

4. **Permits and Service Agreements**

☐	Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐	Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐	Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐	Dumpster for the City	☐ Readily available	☐ Up to date	☒ N/A
☐	Other:	☐ Readily available	☐ Up to date	☐ N/A

Remarks

5. **Gas Generation Records**

☐ Readily available	☐ Up to date	☒ N/A

Remarks

Site: Atlas Tack Corp. Superfund Site

5-year Review Inspection Conducted on: 1/20/15 & 5/20/15

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (CONT'D)

6. **Settlement Monument Records**

☒ Readily available ☐ Up to date ☐ N/A

Remarks _____

7. **Groundwater Monitoring Records**

☒ Readily available ☐ Up to date ☐ N/A

Remarks _____

8. **Leachate Extraction Records**

☐ Readily available ☐ Up to date ☒ N/A

Remarks _____

9. **Discharge Compliance Records**

☐ Air ☐ Readily available ☐ Up to date ☒ N/A

☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A

Remarks _____

10. **Daily Access/Security Logs**

☐ Readily available ☐ Up to date ☒ N/A

Remarks _____

Site: Atlas Tack Corp. Superfund Site

5-year Review Inspection Conducted on: 1/20/15 & 5/20/15

IV. OPERATION & MAINTENANCE COSTS

1. **O&M Organization**

☐ State in-house	☒ Contractor for State	☐ N/A
☐ PRP in-house	☐ Contractor for PRP	☐ N/A
☐ Federal Facility in-house	☐ Contractor for Federal Facility	☐ N/A

Other: _____

2. **O&M Cost Records**

☐ Readily available ☒ Up to date ☐ N/A

☐ Funding mechanism/agreement in place

☐ Original O&M cost estimate _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From	2010 (Date)	to	2014 (Date)	30,000 - 40,000/ yr (Total Cost)	☐ Breakdown attached
From	_____ (Date)	to	_____ (Date)	_____ (Total Cost)	☐ Breakdown attached
From	_____ (Date)	to	_____ (Date)	_____ (Total Cost)	☐ Breakdown attached
From	_____ (Date)	to	_____ (Date)	_____ (Total Cost)	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

Site: Atlas Tack Corp. Superfund Site

5-year Review Inspection Conducted on: 1/20/15 & 5/20/15

V. ACCESS AND INSTITUTIONAL CONTROLS

☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged**

☒ Location shown on site map ☒ Gates secured ☐ N/A

Remarks _____

B. Other Access Restrictions

1. **Signs and other security measures**

☐ Location shown on site map ☐ N/A

Remarks _____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	☐ Yes	☒ No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☒ No	☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____

Frequency _____

Responsible party/agency _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up-to-date	☐ Yes	☐ No	☒ N/A
Reports are verified by the lead agency	☐ Yes	☐ No	☒ N/A
Specific requirements in deed or decision documents have been met	☐ Yes	☒ No	☐ N/A
Violations have been reported	☐ Yes	☒ No	☐ N/A

Other problems or suggestions: ☐ Report attached _____

Site: Atlas Tack Corp. Superfund Site

5-year Review Inspection Conducted on: 1/20/15 & 5/20/15

V. ACCESS AND INSTITUTIONAL CONTROLS (CONT'D)

2. **Adequacy**

☐ ICs are adequate ☒ ICs are inadequate ☐ N/A

Remarks

D. General

1. **Vandalism/trespassing**

☒ Location shown on site map ☐ No vandalism evident

Remarks

2. **Land use changes on site**

☐ Redevelopment ☒ N/A

Remarks

3. **Land use changes off site**

☐ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

B. Other Site Conditions

Remarks see 5YR report

VII. LANDFILL COVERS

☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS

☐ Applicable ☒ N/A

Site: Atlas Tack Corp. Superfund Site

5-year Review Inspection Conducted on: 1/20/15 & 5/20/15

IX. GROUNDWATER/SURFACE WATER REMEDIES

☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☒ Applicable ☒ N/A

D. Monitoring Data

1. Monitoring Data
   ☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:
   ☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☐ Good condition
   ☒ All required wells located ☒ Needs Maintenance ☐ N/A

   Remarks

X. OTHER REMEDIES

Wetland Restoration.

Observations of the restoration are discussed in the 5YR

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

see 5YR review

Site: Atlas Tack Corp. Superfund Site

5-year Review Inspection Conducted on: 1/20/15 & 5/20/15

XI. OVERALL OBSERVATIONS (CONT'D)

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

see 5YR review

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

There are no current indicators of potential remedy problems.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Through the adaptive management program established in the O&M plan the frequency of monitoring at the site has been reduced.

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ATLAS TACK CORP. SUPERFUND SITE

JANUARY 20, 2015 and MAY 20, 2015- SITE INSPECTION PHOTOGRAPHS

Photo 1: Fence at front of building with signage.

Photo 2: Opening in fence along Egypt Lane

Photo 3: Open window in the front of the building

Photo 4: Pile of Rubble to the right of building entrance and in front of the back entrance of building

Photo 5: Exposed Roof and graffiti on building

Photo 6: Collapsed roof and broken windows of the on-site building

Photo 7: Upland areas behind the building in January 2015

Photo 8: Upland areas behind the building in May 2015

Photo 9: Underground Storage Tank Area

Photo 10: Shopping cart in stream near Tripp street entrance

Photo 11: Fresh water marsh area, January 2015

Photo 12: Fresh water marsh area, May 2015

Photo 13: Soccer Goal post observed on island in freshwater wetland

Photo 14: Wildlife observed in freshwater wetland, May 2015

Photo 15:Monitoring Well on-site

Photo 16: Hurricane Barrier

Photo 17: Saltwater Marsh north of the barrier, January 2015

Photo 18: Saltwater Marsh north of the barrier, May 2015

Photo 19: Saltwater pannes in areas north of barrier in January 2015

Photo 20: Saltwater pannes in areas north of barrier in May 2015

Photo 21: Saltwater Marsh South of Barrier, January 2015

Photo 21: Saltwater Marsh South of Barrier, May 2015

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INTERVIEW RECORD

Site Name: Atlas Tack Superfund Site	**EPA ID No.:** MA001026319	
Subject: 2015 Five Year Review	**Time:** 12:51	**Date:** 04/16/2015
Type: ☐ Telephone ☒ E-mail ☐ Other	☐ Incoming ☒ Outgoing	
☐ Visit **Location of Visit:**		

Contact Made By:

Name: Kimberly White	**Title:** Project Manager	**Organization:** USEPA

Individual Contacted:

Name: Joseph Coyne	**Title:** Project Manager	**Organization:** MassDEP
Telephone No: **617 348-4066**	**Street Address:** One Winter Street,	
Fax No:	**City, State, Zip:** Boston, Ma 02108	
E-Mail Address: Joseph.Coyne@state.ma.us		

Summary of Conversation

1. **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.**

There were originally 4 site inspections conducted annually on the property during the first 5 years of Operatons and Management and during the past two years these inspections have been reduced to twice annually. The purpose of these inspection were to monitor the growth rates of plants in the freshwater and saltwater wetlands as well as to ensure the site was in general good condition.

2. Are there any proposed changes to the monitoring activities?

Due to the consistent yet slow growth in the salt water wetlands the site inspections were extended beyond the original 5 years as outlined in the O&M plan but the number of annual inspections were reduced from four to two.

3. How much has been spent annually on operation and maintenance?

The costs of the site inspections have been between 30,000 and 40,000 annually. Recently those cost have come down due to the reductions in annual inspections.

4. Do you have specific concerns about the ecological restoration? If so, what are they?

No, the growth rate of the salt marsh was originally concerning but appears that it is just occuring slower than had originally been anticipated in the O&M.

5. Aside from the ecological restoration, have any problems or difficulties been encountered which have impacted the implementability of the remedy?

No

Summary of Conversation

6. Are there any issues with the UST program response which affect the remedy?

I do not believe the UST issue that is being handled by the Mass DEP office in Lakeville is negatively affecting the remedy. Currently the DEP is beginning enforcement actions against the owner to jumpstart the UST removal.

7. 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.

No

8. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

No

9. General Comments:

The growth of the salt water and freshwater wetlands have been an effective yet slow process.

INTERVIEW RECORD

Site Name: Atlas Tack Superfund Site	**EPA ID No.:** MA001026319	
Subject: 2015 Five Year Review	**Time:** 2:00pm	**Date:** 04/06/2015
Type: ☒ Telephone ☐ E-mail ☐ Other ☐ Visit **Location of Visit:**	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Kimberly White Kelsey O'Neil	**Title:** Project Manager Community Involvement	**Organization:** USEPA

Individual Contacted:

Name: Jeffrey Osuch Bob Espindola	**Title:** Executive Secetary Chairman, Board of Selectmen	**Organization:** Town of Fairhaven

Telephone No: 508-979-4023	**Street Address:** 40 Center Street
Fax No: 508-979-4079	**City, State, Zip:** Fairhaven, MA 02719

E-Mail Address: josuch@fairhaven-ma.gov; selectmanbobespindola@gmail.com

Summary of Conversation

1. Are you aware of any community concerns or articles regarding the site or its operation and administration? If so, please give details.

In April 2014, an email was submitted by a community activist, Karen Vilandry, requesting information about the status of the Atlas Tack site; this information was forwarded to the town by Ms. Vilandry for consideration in regards to the the sale of the now closed Rogers school near the site. [The issues raised in the email were primarily to about the remediation of the site but there was no specific correlation to the school].

At this time, there has been one interested buyer in the school but because of the low offer it is possible additional actions may be taken to identify other buyers.

2. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

The site building has several broken windows and graffiti on both the inside and outside of the building. There is great concern that the building can be accessed by teen or others on the bike path which could result in an accident and major liability. No emergency incidents or other response actions by local emergency response autorities have been necessary.

3. Do you know of any activities near the site that may impact the protectiveness of the completed remedy?

No. The area surrounding the site is mostly residential, but no new activities have been reported to the town, besides the potential of redevlopment of the school building.

Summary of Conversation

4. Has land use changed or is it anticipated to change (e.g., housing developments, either constructed or planned, exist in the area)?

No.

5. Have you had any interested parties approach you about the site's future reuse? If so, please give details.

No, not directly, but the town is interested in reusing the site. There have been discussions as to whether there is the potential of the site being used as a state park or staging area for Wind Farm development. At this time the town has not had any offers under consideration for the development of the site for any of those uses.

6. If the property owners have contacted your office, what were there concerns? Has the Town or property owners taken any action that we should be aware of?

No.

7. Does the town have an tracking system or other applicable database (e.g., GIS maps) to keep information about land use restriction (institutional controls) ?

The planning department maintains records of land use restrictions.

8. Has the town had to close the hurricane barrier's gate valve in the last Five years?

The gates controlled by the town are periodically closed when there is a threat of a hurricane or when the pump station is shut down.

9. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

The town would like to see EPA encourage the sale or reuse of the Atlas Tack property.

10. General Comments:

The town would like to see a 1-page summary of the site status.

INTERVIEW RECORD

Site Name: Atlas Tack Superfund Site	**EPA ID No.:** MA001026319	
Subject: 2015 Five Year Review	**Time:** 11:30	**Date:** 04/01/2015
Type: ☐ Telephone ☒ E-mail ☐ Other	☐ Incoming ☒ Outgoing	
☐ Visit **Location of Visit:**		

Contact Made By:

Name: Kimberly White	**Title:** Project Manager	**Organization:** USEPA

Individual Contacted:

Name: Patricia Fowle, RS, CHO	**Title:** Board of Health Agent	**Organization:** Town of Fairhaven

Telephone No: 508-979-4022	**Street Address:** 40 Center Street
Fax No: 508-979-4079	**City, State, Zip:** Fairhaven, MA 02719

E-Mail Address: boh@fairhaven-ma.gov

Summary of Conversation

1. **Are you aware of any community concerns or articles regarding the site or its operation and administration? If so, please give details.**

There have been none the BOH is aware of.

2. **Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.**

There have been none that the BOH office is aware of.

3. **Do you know of any activities near the site that may impact the protectiveness of the completed remedy?**

The site is well maintained.

4. **Do you have any comments, suggestions, or recommendations regarding the site's management or operation?**

I would say the site is well maintaned.

5. **Do you have specific concerns about the ecological restoration? If so, what are they?**

The ecological system appears to be working well with plantings and wildlife doing well.

6. **Does the town have an tracking system or other applicable database (e.g., GIS maps) to keep information about land use restriction (institutional controls) ?**

Planning Department and Board of Public Works.

Summary of Conversation

7. Do you have any comments, suggestions, or recommendations regarding the project

I think from where this site once was to its present day existence is quite remarkably good. I would love to see the existing structure on site either demolished or renovated as it is always a concern for fire and safety.

8. General Comments:

INTERVIEW RECORD			
Site Name: Atlas Tack Superfund Site		**EPA ID No.:** MA001026319	
Subject: 2015 Five Year Review		**Time:**	**Date:** 5/7/15
Type: ☐ Telephone ☒ E-mail ☐ Other ☐ Visit **Location of Visit:**		☐ Incoming ☒ Outgoing	
Contact Made By:			
Name: Kelsey O'Neil	**Title:** Community Involvement Coordinator	**Organization:** USEPA	
Individual Contacted:			
Name: Carolyn Longworth	**Title:** Director	**Organization:** The Millicent Library	
Telephone No: 508-992-5342		**Street Address:** 45 Center St.	
Fax No: 508-993-7288		**City, State, Zip:** 02719	
E-Mail Address: clongworth@sailsinc.org			

Summary of Conversation

1. What effects have site operations had on the surrounding community?

I have not heard from people there what effect the actual operation has, except when a pair of Mute Swans were shot. I hear only good things from people who live near there about the actual cleanup, the resurgence of wildlife and the value of pleasant scenery.

2. Are you aware of any community concerns or articles regarding the site or its operation and administration? If so, please give details.

Can't think of any. One man, who thought I was someone working in the marsh told me years ago that he worried about mosquitoes, but I told him the water was not stagnant there.

3. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

The kids in the area have been vandalizing the area near the site a bit, mostly to do with their ATV and dirt bike riding but hadn't gotten into the fenced area till this winter. Currently there is a large hole cut in the fence near Egypt Lane and a hockey goal net on one of the islands. I guess they were there when there were not the usual walkers and birders to see them because of the snow.

On the bay side of the hurricane dike, people living nearby, moor their motor boats and also run jet skis in the canal of the marsh which I believe is part of the project.

4. Are you concerned about the site's future reuse? If so, please give details.

As someone interested in nature, I would hope that the marshes continue to be protected with fencing. The wildlife it has attracted has made it an official "Birding Hotspot" on Cornell's Ornithology site. Beyond the marsh I would hope there would be nothing built that would compromise the area with runoff. I believe there were Wood Ducks nesting in the woods near the site. First record of Gadwall nesting in Bristol County (rare in other parts of the state), possible endangered Pied-billed Grebe nesting in marsh.

Summary of Conversation
5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation? Everyone seems very responsive to concerns. **6. General Comments:** The marshes have attracted birds (to nest and as a general habitat) that have not been known to nest in the county. People like walking along the top of the dike and seeing an idyllic landscape that used to be a poisonous eyesore.

INTERVIEW RECORD

Site Name: Atlas Tack Superfund Site	**EPA ID No.:** MA001026319	
Subject: 2015 Five Year Review	**Time:** 1100	**Date:** 04/17/2015
Type: ☐ Telephone ☒ E-mail ☐ Other	☐ Incoming ☐ Outgoing	
☐ Visit **Location of Visit:**		

Contact Made By:

Name: Heather Sullivan	**Title:** Project Manager	**Organization:** USACE

Individual Contacted:

Name: Patrick Schauble	**Title:** Project Manager	**Organization:** H&S Environmental

Telephone No: 484.880.1869	**Street Address:** 160 E. Main Street
Fax No:	**City, State, Zip:** Westborough, MA 01581
E-Mail Address: pschauble@hsenv.com	

Summary of Conversation

1. **What is the current status of operations at the site (e.g., budget and schedule)?**

H&S peforms annual groundwater monitoring and reporting. Work has been peformed within budget and on schedule.

2. **Have any problems been encountered which required, or will require, changes to the operation and maintenance activities?**

Routine well repairs and maintenance is required.

3. **Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.**

During a recent site visit on 3/25/15, all three access gates were locked and appeared secure. Some debris on site (shopping cart, etc) suggest unauthorized access has occurred. Drums from the June 2014 sampling event were damaged apparently by heavy equipment as noted in the 2014 Annual Long Term Groundwater Monitoring Report.

4. **Do you have any comments, suggestions, or recommendations regarding the site's management or operation?**

Site security should continue to be managed.

5. **Have any problems or difficulties been encountered which have impacted the implementability of the remedy?**

No

Summary of Conversation

6. Do you have any comments, suggestions, or recommendations regarding the project (i.e., design, construction documents, constructability, management, regulatory agencies, etc.)?

No

7. General Comments:

None

APPENDIX E

SUPPORTING DOCUMENTS FOR TECHNICAL ASSESSMENT

- ARARS and TBC from ROD
- Update of clam ingestion risk for trespassers at Atlas Tack Superfund Site Memo
- Table A. Toxicity Values for Chemicals of Concern in the 2000 ROD Compared with 2015 Toxicity Values

- Table B. EPA Calculation of Risks of Chemicals of Concern from the 1998 Updated Risk Assessment

CHEMICAL-SPECIFIC ARARs and TBCs

Requirement	Requirement Synopsis	Actions to be Taken to Attain Requirement
Clean Water Act, Ambient Water Quality Criteria, 33 USC 1313, 1314; 64 Fed. Reg. 19781	Establishes national recommended surface water quality criteria for the protection of human health and aquatic life for approximately 150 pollutants, and requires state water quality standards for the same protective purposes. These criteria have been incorporated into the Massachusetts Surface Water Quality Standards.	The Ambient Water Quality Criteria (AWQC) were used to establish interim groundwater cleanup levels and soil and sediment cleanup levels. Contaminated soils and sediments will be excavated (and disposed of off-site) and the contaminants in the groundwater will naturally attenuate (with the assistance of phytoremediation) to attain these ARARs.
Cancer Slope Factors (CSFs)	These are guidance values used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	Cleanup action will minimize exposure to potential receptors
Reference Doses (RfDs)	These are guidance values used to evaluate the potential non-carcinogenic hazard caused by exposure to contaminants.	Cleanup action will minimize exposure to potential receptors
The Potential of Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program, NOAA Technical Memorandum NOS OMA 52 (Long & Morgan, 1990) and Incidence of Adverse Biological Effects Within Range of Chemical Concentrations in Marine and Estuarine Sediments (Long, et al., 1995)	These reports identify contaminant concentrations in sediments associated with deleterious effects on fish and invertebrates in estuarine and marine environments.	This TBC was used to establish the cleanup levels for sediments. The selected remedy's excavation of sediments (0-2 feet deep) within Boys Creek and adjacent marsh will be consistent with this TBC.
Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil (EPA, December 1996)	This report describes a methodology for assessing risks associated with non-residential adult exposures to lead in soil. This methodology focuses on estimating fetal blood lead concentrations in women exposed to lead contaminated soils.	The soil cleanup level for lead in the Commercial Area was established based upon this TBC.

LOCATION-SPECIFIC ARARs and TBCs

Media	Requirement	Requirement Synopsis	Actions to be Taken to Attain Requirement
Wetlands	Clean Water Act § 404 (40 CFR 230)	No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the discharge which would have a less adverse impact to the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. Discharge cannot cause or contribute to violations of any state water quality standard or toxic effluent standard or jeopardize threatened or endangered species. Discharge cannot cause or contribute to significant degradation of the waters of U.S. Appropriate and practicable steps must be taken which will minimize the potential adverse impacts of the discharge of the dredged material on the aquatic ecosystem.	These requirements will be attained because there is no practicable alternative with less adverse impact and all practicable measure will be taken to minimize and mitigate any adverse impacts. Excavated materials will be dewatered or solidified/stabilized. Dredged material s will not be discharged to the aquatic system. Excavated areas will be filled with clean materials from off-site, in accordance with 40 CFR 230. The performance of the selected remedy will not result in any discharge that will cause or contribute to exceedances of state water quality standards or toxic effluent standards or to degradation of water quality.
Wetlands Floodplains	Procedures on Floodplain Management and Wetlands Protection (40 CFR 6, App. A)	Federal agencies shall avoid, whenever possible, the long and short term impacts associated with the destruction of wetlands and the occupancy and modifications of floodplains and wetlands development wherever there is a practicable alternative in accordance with Executive Orders 11990 and 11988. The agency shall promote the preservation and restoration of floodplains so that their natural and beneficial values can be realized. Any plans for actions in wetlands or floodplains must be submitted for public review.	These requirements will be attained because there is no practicable alternative with less adverse impact to work in the wetlands and floodplains with less adverse impact, and all practicable measure will be taken to minimize and mitigate any adverse impacts. Wetlands and floodplains disturbed by excavation will be restored to their original conditions. Temporary fill placed in wetlands for access roads and staging area will not have a significant impact on the extent of flooding.
Wetlands	Fish and Wildlife Coordination Act, 16 USC 661 et. seq. (50 CFR Part 81, 225, 402, 226, and 227)	Requires federal agencies to take into consideration the effect that water-related projects will have on fish and wildlife. Requires consultation with the Fish and Wildlife Service and the state to develop measures to prevent, mitigate, or compensate for project-related losses to fish and wildlife.	Consultation with the Fish and Wildlife Services to develop plan to controlling affects on wildlife during remediation activities. This plan will include sampling and analysis of the creek water to ensure minimal impact.
Wetlands	Massachusetts Wetlands Protection Act (310 CMR 10.00)	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling, altering, or polluting of wetlands. Work within 100 feet of a wetland is regulated under this requirement. The requirement also defines wetlands based on vegetation type and requires that efforts on wetlands be mitigated. These regulations also contain wildlife habitat evaluation provisions.	If the remedial action activities involve removing, filling, dredging, or altering a DEP defined wetland, or conducting work within 100 feet of a wetland, these regulations will be met. Whenever possible, remedial actions will be conducted so that impacts to wetlands and habitats will be minimized or mitigated.

Location-Specific ARARs and TBCs (Continued)

Media	Requirement	Requirement Synopsis	Actions to be Taken to Attain Requirement
Wetlands	River Protection Act Amendments to the Massachusetts Wetlands Protection Act (310 CMR 10.58)	These requirements added a new resource area and accompanying performance standards to the Wetlands Protection Act. The resource area is called the "riverfront area," which extends 200 feet (25 feet in municipalities with large populations and in densely developed areas) on each side of perennial rivers and streams. Projects must not have significant adverse impacts on the riverfront area, in order to protect public and private water supplies, wildlife habitat, fisheries, shellfish, groundwater, and to prevent flooding, storm damage and pollution. It must also be demonstrated that there are no practicable and substantially equivalent economic alternatives to the proposal work with less adverse effects on these public interests.	Work at the Site will be within 25 feet of the edge of Boys Creek. The project will have no long-term significant adverse impact; instead, the removal of contaminated sediments and soils will have a significant positive impact. Also, these requirements will be attained because there are no practicable and substantially equivalent economic alternatives to the proposed work with less adverse effects.
Dredged Materials	Massachusetts Clean Waters Act Water Quality Certification for Discharge of Dredged or Fill Material, Dredging, and Dredged Material Disposal in Waters of the United States within the Commonwealth (314 CMR 9.00)	The substantive portions of these regulations establish criteria and standards for the dredging, handling and disposal of fill material and dredged material.	Excavation and filling, operations will meet substantive criteria and standards in these regulations. The remedial alternative will be designed to ensure the maintenance or attainment of the MA Water Quality Standards in the affected water and to minimize the impact on the environment.
Coastal Zone	Coastal Zone Management Act, 16 USC 1451, et. seq., as implemented by 15 CFR 930, Federal Consistency With Approved Coastal Management Programs	The general provisions of 15 CFR 930 are intended to insure that all federally conducted or supported activities including development projects, directly affecting the coastal zone are undertaken in a manner consistent to the maximum extent practicable with approved State coastal location of the Site makes this act, and related state coastal zone policies, applicable to potential remedial actions at the Site.	All practicable measure will be taken to ensure compliance with substantive requirements of the State coastal management programs.
Coastal Zone	Commonwealth of MA - Coastal Zone Management (CZM) Water Quality Policy 1 and Water Quality Policy 3	Requires federal agencies to ensure that point-source discharges in or affecting the coastal zone are consistent with federally approved state effluent limitations and water quality standards. Requires that activities in or affecting the coastal zone conform to applicable state and federal requirements governing surface water discharges.	The selected remedy will not result in any discharge; but, if there is a point source discharge, it will meet AWQC for protection of marine aquatic life from chronic effects.

Location-Specific ARARs and TBCs (Continued)

Media	Requirement	Requirement Synopsis	Actions to be Taken to Attain Requirement
Coastal Zone	Commonwealth of MA - CZM Water Quality Policy 2	Requires protection of coastal resource areas including salt marshes, shellfish beds, dunes, beaches, barrier beaches, salt ponds, eelgrass beds, and freshwater wetlands for their important role as natural habitats.	Erosion controls will be implemented as necessary to prevent runoff of surface water containing soils or site contaminants. Implemented through Waterways and Wetland Protection Regulations.
Coastal Zone	Commonwealth of MA - CZM Habitat Policy 1	Requires protection of coastal resource areas including salt marshes, shellfish beds, dunes, beaches, barrier beaches, salt ponds, eelgrass beds, and freshwater wetlands for their important role as natural habitats.	All practicable measures will be taken to ensure the coastal resource areas adjacent to the Atlas Tack site will be protected during remediation activities. Disturbed wetlands will be restored as part of the site activities.
Coastal Zone	Commonwealth of MA - CZM Habitat Policy 2	Requires restoration of degraded or former wetland resources in coastal areas and ensure that activities in coastal areas do not further wetland degradation but instead take advantage of opportunities to engage in wetland restoration.	Areas disturbed by excavation will be restored. This will include construction of ditches to promote flooding by tides to promote the establishment of high marsh plant species where appropriate.
Coastal Zone	Commonwealth of MA - CZM Coastal Hazard Policy 1	Preserve, protect, restore and enhance the beneficial functions of storm damage prevention and flood control provided by natural coastal landforms such as dunes, beaches, barrier beaches, coastal banks, land subject to coastal storm flowage, salt marshes, and land under the ocean.	Adjacent marshes and wetlands will be restored if disturbed during remedial site activities. If creek flow is diverted during site activities, care will be taken to protect downstream coastal resources.
Coastal Zone	Commonwealth of MA - CZM Coastal Hazard Policy 2	Ensure construction in water bodies and contiguous land areas will minimize interference with water circulation and sediment transport. Approve flood or erosion control projects only when it has been determined that there will be no significant adverse effects on the project site or adjacent or downcoast areas.	Assure the excavation procedures, flood control, and erosion control will protect downstream and adjacent wetlands and coastal resources.
Rare Species	Massachusetts Wetlands Protection Program Policy 90-2; Standards and Procedures for Determining Adverse Impacts to Rare Species	This policy clarifies the rules regarding rare species habitat contained at 310 CMR 10.37 and 10.59.	Habitats of rare species as determined by the Massachusetts Natural Heritage Program will be considered in the mitigation plans.

ACTION-SPECIFIC ARARs and TBCs

Media	Requirement	Requirement Synopsis	Actions to be Taken to Attain Requirement
Dewatering Water	Massachusetts Ground Water Discharge Permit Program 314 CMR 5.00	Any discharge shall not result in a violation of Massachusetts Surface Water Quality Standards (314 CMR 4.00) or Massachusetts Ground Water Quality Standards (314 CMR 6.00).	Water from dewatering excavated soils and sediments may be discharged onto the land surface within the wetland buffer. The discharge shall not result in a violation of these requirements.
Surface Water	Clean Water Act National Pollution Discharge Elimination System (NPDES) 40 CFR Part 122	Regulates the discharge of water into public surface waters. Among other things, major requirements are: • Use of best available technology (BAT) economically achievable is required to control toxic and non-conventional pollutants. Use of best conventional pollutant control technology (BCT) is required to control conventional pollutants. Technology-based limitations may be determined on a case-by-case basis. • Applicable Federally approved State water quality standards must be complied with. These standards may be in addition to or more stringent than other Federal standards under the CWA.	Any point source discharge will comply with all substantive NPDES requirements.
Surface Water	Massachusetts Surface Water Quality Standards 314 CMR 4.00	These standards designate the most sensitive uses which the various waters of the Commonwealth shall enhanced, maintained and protected. Minimum quality criteria required to sustain the designated are established. Massachusetts surface water quality standards incorporate federal AWQC as standards the surface waters of the State. Any on-site water treatment and discharge is subject to these	Any point source discharge will comply with these requirements.
Hazardous Waste	RCRA Hazardous Waste Regulations (Identification and Listing of Hazardous Wastes) 40 CFR Part 261	These regulations define wastes that are subject to regulation as hazardous wastes.	Wastes and contaminated media (debris, soils and sediments) excavated at the Site will be analyzed to determine if they are listed hazardous waste, “contain” listed hazardous waste or exhibit a characteristic of hazardous waste, in compliance with these regulations.

Action-Specific ARARs and TBCs (Continued)

Media	Requirement	Requirement Synopsis	Actions to be Taken to Attain Requirement
Hazardous Waste	RCRA Hazardous Waste Regulations (Storage of Hazardous Waste) 40 CFR Part 264, Subparts I, J & L 40 CFR 262.34(a)	Subparts I, J and L of Part 264 identify design, operating, monitoring, closure, and post-closure care requirements for long-term storage of RCRA hazardous waste in containers, tanks and waste piles, respectively. However, 262.34(a) allows accumulation of RCRA hazardous wastes for up to 90 days in or on containers, tanks or drip pads, provided that the generator complies with Part 265.	During remediation, remediation wastes will be stored in containers, tanks and/or waste piles (or on drip pads) in compliance with these requirements
Excavated/Dredged Materials, Treatment Residuals	TSCA, Subpart D (Storage and Decontamination) 40 CFR 761.65 & 761.79	These regulations establish requirements for the storage for disposal of PCBs and PCB Items with concentrations of 50 ppm or greater. These various requirements include requirements for roof, flooring, curbing, and location outside 100-year floodplain. They also establish decontamination standards and procedures for removing PCBs from non-porous surfaces.	Storage of PCB materials will be conducted in compliance with these requirements. Solid debris, excluding trees and bushes, which have been contaminated with regulated PCB materials will be decontaminated prior to off-site transport and disposal i accordance with these requirements; in addition, equipment will be cleaned in accordance with these regulations.
Ambient Air	Massachusetts Ambient Air Quality Standards and Massachusetts Air Pollution Control	The applicable portions of these regulations prohibit burning or emissions that cause or contribute to a condition of air pollution, including dust from excavation activities.	Control measures will be implemented to ensure compliance with state regulations.
Wastewater	Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities 314 CMR 8.00	Water treatment units which are exempted from M.G.L.a.21C and which treat, store, or dispose of hazardous wastes generated at the same site are regulated to ensure that such activities are conducted in a manner which protects public health and safety and the environment.	If on-site treatment of wastewater is performed, all processes will comply with all substantive Massachusetts requirements regarding location, technical standards, closure and post-closure, and management standards.
Soil/Sediment	A Guide on Remedial Actions at Superfund Sites With PCB Contamination (EPA, August 1990)	Describes various scenarios and considerations pertinent to determining the appropriate level of PCBs that can be left in each contaminated media to achieve protection of human health and the environment.	This guidance was considered in determining the appropriate level of PCBs that will be left in the soils. Management of PCB-contaminated residuals will be designed in accordance with the guidance.

Technical Memorandum

To: Kimberly White
From: Richard Sugatt
Date: July 30, 2015
RE: Update of clam ingestion risk for trespassers at Atlas Tack Superfund Site

The purpose of this technical memorandum is to evaluate whether changes in toxicity factors since the original risk assessment in 1998 (Weston, 1998) would result in significantly changed risk estimates for ingestion of clams by a Site trespasser at the Atlas Tack Superfund Site, assuming no change in contaminant concentrations that were measured prior to remediation. Another purpose is to evaluate the impact on the risk estimates if it is assumed that the percent inorganic arsenic compared to organic arsenic is less than 100%. The 1998 risk assessment assumed that all of the arsenic in clams was inorganic arsenic, which is more toxic than organic arsenic, which has been found to predominate in marine fish and shellfish.

According to Table 2-20 of the 1998 "Update of Baseline Human Health Risk Assessment and Development of Risk-Based Cleanup Goals-Atlas Tack Corporation, Fairhaven, Massachusetts" (Roy F. Weston, 1998), the total shellfish cancer risk for an adult trespasser was 7.4×10^{-4}, of which arsenic contributed a cancer risk of 6.2×10^{-4}, or about 84 % of total cancer risk. Shellfish non-cancer risk was a Hazard Index (HI) of 4.0, of which arsenic contributed a HI of 3.2, or about 80% of total non-cancer risk.

In order to evaluate whether changes in toxicity factors since 1998 would result in significantly changed risk estimates, the current (June, 2015) and 1998 oral slope factors (SF) and oral reference doses (RfD) were compiled, and risks were re-calculated, as shown in Table 1. The updated toxicity factors were taken from the June, 2015 EPA Regional Screening Level (RSL) tables (http://www.epa.gov/region9/superfund/prg/). The updated cancer risks were calculated by dividing the 2015 SF by the 1998 SF and then dividing by the 1998 cancer risk (Incremental Lifetime Cancer Risk, or ILCR). The updated non-cancer risks were calculated by dividing the 1998 RfD by the 2015 RfD and then dividing by the 1998 non-cancer risk (expressed as a Hazard Quotient, or HQ). As shown in Table 1, for cancer risk there were small changes in the SF for 2, 4-dinitrotoluene and pentachlorophenol, resulting in a small increase of total ILCR from 7.3×10^{-4} to 7.4×10^{-4}. For non-cancer risk, there were small changes in the RfD for hexavalent chromium and copper, resulting in a small increase of total Hazard Index from 3.6 to 3.7. By themselves, these changes in toxicity factors did not change the conclusion that the cancer and non-cancer risks were higher than EPA maximum risk criteria.

The 1998 risk assessment assumed that 100% of the arsenic in shellfish was in inorganic form because the toxicity factors were based on inorganic arsenic. In its literature review of arsenic bioaccumulation in aquatic organisms, EPA (2003) confirms the general assertion that from 85% to >90% of arsenic found in edible portions of marine fish and shellfish is organic arsenic, primarily arsenobetaine. Since organic arsenic has much lower cancer and non-cancer toxicity than inorganic arsenic, the actual risk at the Site was probably much lower. To evaluate the impact of this finding, the updated 2015 cancer and non-cancer risks of arsenic were multiplied by 0.01 or 0.15, to reflect the risks for the likely range of percent inorganic arsenic in marine shellfish (1% to 15% of total arsenic). The results, shown in Table 2, indicate that the cancer risk of arsenic would be 6.2×10^{-6} for 1 % inorganic arsenic to 9.3×10^{-5} for 15% inorganic arsenic, as compared to 6.2×10^{-4}, assuming 100% inorganic arsenic. Similarly, the non-cancer

risk of arsenic would be HQ = 0.032 for 1% inorganic arsenic to HQ = 0.48 for 15% inorganic arsenic, as compared to HQ = 3.2 assuming 100% inorganic arsenic.
Table 2 also shows the total risk of arsenic and other chemicals of concern under the assumption of 1% to 15% inorganic arsenic. The total cancer risk would be 1.2×10^{-4} at 1% inorganic arsenic to 2.1×10^{-4} at 15% inorganic arsenic, as compared with 7.4×10^{-4} assuming 100% inorganic arsenic. The total HI would be HI = 0.5 for 1% inorganic arsenic to HI = 0.9 for 15% arsenic, as compared to HI= 3.7 assuming 100% inorganic arsenic. These results show that the total non-cancer risk would be acceptable (i.e. HI $\leq$ 1) at 1% to 15% inorganic arsenic, and that total cancer risk would be acceptable (i.e. ILCR $\leq 1 \times 10^{-4}$) at 1% inorganic arsenic but unacceptable at 15% inorganic arsenic.

These results indicate that the unacceptable clam ingestion risk calculated in 1998 would likely have been acceptable, or very close to acceptable, if calculated using 2015 updated toxicity factors and a more realistic percentage of inorganic arsenic in clam tissue. The 1998 risk assessment concluded in Section 2.6 indicated that the sediment cleanup based on the combined risk to the trespasser of soil in the un-remediated commercial area and sediment associated with clam ingestion was needed only at the location of the hard-shell clam beds (sediment sample location SS-812). Although extensive excavation and re-grading with clean fill occurred south of the hurricane barrier during the remediation and marsh restoration, it could not be determined from the final interim remedial action report (USACOE-NED, 2008) whether the area of hard shell clam beds was remediated.

It is concluded that the current risk of clam ingestion is probably acceptable because the risk of arsenic is much lower than estimated previously based on the likely percentage of inorganic arsenic and the likelihood that the clam beds were remediated as part of the extensive excavation, re-grading with clean fill, and marsh restoration efforts.

References

Roy F. Weston, Inc. 1998. Update of Baseline Human Health Risk Assessment and Development of Risk-Based Cleanup Goals-Atlas Tack Corporation, Fairhaven, Massachusetts. April 23, 1998.

U. S. Army Corps of Engineers-New England District. 2008. Atlas Tack Corporation Superfund Site. Volume II Final Interim Remedial Action Report (O & F) Completion Report) for Phases II and III. September, 2008.

U. S. EPA. 2003. Technical Summary of Information Available on the Bioaccumulation of Arsenic in Aquatic Organisms. December, 2003. EPA-822-R-03-032.

Table 1. EPA Updated Toxicity Factors and Shellfish Risks-Atlas Tack Superfund Site

Cancer Risk				
	SF ((mg/kg-day)$^{-1}$)		ILCR	
Chemical of Concern	1998	2015	1998	2015
Arsenic	1.5	1.5	6.2E-04	6.2E-04
3,3'-Dichlorobenzidine	0.45	0.45	5.4E-05	5.4E-05
Benzo(a)pyrene	7.3	7.3	4.4E-05	4.4E-05
Benzo(a)anthracene	0.73	0.73	5.3E-06	5.3E-06
Benzo(k)fluoranthene	0.073	0.073	2.8E-06	2.8E-06
Bis(2-ethylhexyl)phthalate	0.014	0.014	2.0E-06	2.0E-06
2,4-Dinitrotoluene	0.68	0.31	4.5E-06	2.1E-06
Pentachlorophenol	0.12	0.4	1.6E-06	5.3E-06
		Total ILCR:	7.3E-04	7.4E-04

SF = oral Slope Factor
RfD = oral Reference Dose
ILCR = Incremental Lifetime Cancer Risk
1998 risks are from Table 2-20 (Weston, 1998)
1998 toxicity factors are from Table 2-15 (Weston, 1998)
2015 ILCR = (2015 SF/1998 SF)/(1998 ILCR)

Non-Cancer Risk				
	RfD (mg/kg-day)		HQ	
Chemical of Concern	1998	2015	1998	2015
Arsenic	3.0E-04	3.0E-04	3.2	3.2
Mercury	3.0E-04	3.0E-04	0.2	0.2
Chromium VI	5.0E-03	3.0E-03	0.1	0.17
Copper	3.7E-02	4.0E-02	0.1	0.09
		Total HI:	3.6	3.7

RfD = oral Reference Dose
HQ = Hazard Quotient
HI = Hazard Index
1998 risks are from Table2-20 (Weston, 1998)
1998 toxicity factors are from Table 2-16 (Weston, 1998)
2015 HQ = (1998 RfD/2015 RfD)/(1998 HQ)

Roy F. Weston. 1998. "Update of Baseline Human Health Risk Assessment and Development of Risk-Based Cleanup Levels Atlas Tack Corporation, Fairhaven, Massachusetts". 23 April, 1998.

Table 2. EPA Updated Toxicity Factors and Shellfish Risks-Atlas Tack Superfund Site
(Assuming 1% to 15% inorganic arsenic (As) in marine shellfish, per EPA, 2003)

Cancer Risk						
	SF ((mg/kg-day)$^{-1}$)		ILCR			
Chemical of Concern	1998	2015	1998	2015	15 % inorganic As	1% inorganic As
Arsenic	1.5	1.5	6.2E-04	6.2E-04	9.3E-05	6.2E-06
3,3'-Dichlorobenzidine	0.45	0.45	5.4E-05	5.4E-05	5.4E-05	5.4E-05
Benzo(a)pyrene	7.3	7.3	4.4E-05	4.4E-05	4.4E-05	4.4E-05
Benzo(a)anthracene	0.73	0.73	5.3E-06	5.3E-06	5.3E-06	5.3E-06
Benzo(k)fluoranthene	0.073	0.073	2.8E-06	2.8E-06	2.8E-06	2.8E-06
Bis(2-ethylhexyl)phthalate	0.014	0.014	2.0E-06	2.0E-06	2.0E-06	2.0E-06
2,4-Dinitrotoluene	0.68	0.31	4.5E-06	2.1E-06	2.1E-06	2.1E-06
Pentachlorophenol	0.12	0.4	1.6E-06	5.3E-06	5.3E-06	5.3E-06
		Total ILCR:	7.3E-04	7.4E-04	2.1E-04	1.2E-04

SF = oral Slope Factor
RfD = oral Reference Dose
ILCR = Incremental Lifetime Cancer Risk
1998 risks are from Table 2-20 (Weston, 1998)
1998 toxicity factors are from Table 2-15 (Weston, 1998)
2015 ILCR = (2015 SF/1998 SF)/(1998 ILCR)

Non-Cancer Risk						
	RfD (mg/kg-day)		HQ			
Chemical of Concern	1998	2015	1998	2015	15% inorganic As	1% inorganic As
Arsenic	3.0E-04	3.0E-04	3.2	3.2	0.48	0.032
Mercury	3.0E-04	3.0E-04	0.2	0.2	0.2	0.2
Chromium VI	5.0E-03	3.0E-03	0.1	0.17	0.17	0.17
Copper	3.7E-02	4.0E-02	0.1	0.09	0.09	0.09
		Total HI:	3.6	3.7	0.9	0.5

HI = Hazard Index
RfD = oral Reference Dose
HQ = Hazard Quotient
HI = Hazard Index
1998 risks are from Table2-20 (Weston, 1998)
1998 toxicity factors are from Table 2-16 (Weston, 1998)
2015 HQ = (1998 RfD/2015 RfD)/(1998 HQ)

Roy F. Weston. 1998. "Update of Baseline Human Health Risk Assessment and Development of Risk-Based Cleanup Levels Atlas Tack Corporation, Fairhaven, Massachusetts". 23 April, 1998.

U. S. EPA. 2003 Technical Summary of Information Available on the Bioaccumulation of Arsenic in Aquatic Organisms. December, 2003. EPA-822-R-03-032.

Table A. Toxicity Values for Chemicals of Concern in the 2000 ROD Compared with 2015 Toxicity Values

		Toxicity Factor			
	Media/	Oral SF (per mg/kg-d)		Oral RfD (mg/kg-d)	
Chemical of Concern	Receptor	2000 [e]	2015 [f]	2000 [g]	2015 [h]
Methylene chloride	a	7.5E-03	2.0E-03	6.0E-02	6.0E-03
Acenaphthene	d		NTV	6.0E-02	6.0E-02
Acenaphthylene	a,d		NTV	3.0E-03	NTV
Anthracene	d		NTV	3.0E-01	3.0E-01
Benzo(a)anthracene	a,b,c,d	7.3E-01	7.3E-01	3.0E-02	NTV
Benzo(a)pyrene	abcd	7.3E+00	7.3E+00	3.0E-02	NTV
Benzoic acid	d			4.0E+00	4.0E+00
Benzo(b)fluoranthene	abcd	7.3E-01	7.3E-01	3.0E-02	NTV
Benzo(g, h, i)perylene	a		NTV	3.0E-03	NTV
Benzo(k)fluoranthene	abcd	7.3E-02	7.3E-02	3.0E-02	NTV
Benzyl alcohol	d			3.0E-01	1.0E-01
bis (2-Chloroisopropyl)ether	d			4.0E-02	NTV
bis (2-ethylhexyl)phthalate	abd	1.4E-02	1.4E-02	2.0E-02	2.0E-02
Butyl benzyl phthalate	ad	NTV	NTV	2.0E-01	NTV
2-Chloronaththalene	d			8.0E-02	NTV
2-Chlorophenol	d			5.0E-03	5.0E-03
Chrysene	abcd	7.3E-03	7.3E-03	3.0E-02	NTV
Dibenz(a, h)anthracene	abc	7.3E+00	7.3E+00	3.0E-02	NTV
Dibenzofuran	ab			4.0E-03	NTV
1, 3-Dichlorobenzene	d			NTV	4.0E-04
1, 4-Dichlorobenzene	d	2.4E-02	5.4E-03	NTV	7.0E-02
3, 3'-Dichlorobenzidene	d	4.5E-01	4.5E-01	NTV	NTV
Diethyl phthalate	d		NTV	8.0E-01	8.0E-01
Dimethyl phthalate	d		NTV	NTV	NTV
di-n-Butyl phthalate	d		NTV	1.0E-01	1.0E-01
2, 4-Dinitrotoluene	d	6.8E-01	3.1E-01	2.0E-02	2.0E-03
di-n-Octyl phthalate	d	NP	NTV	2.0E-02	1.0E-02
Hexachlorobutadiene	d	7.8E-02	7.8E-02	2.0E-04	1.0E-03
Isophorone	d	9.5E-04	9.5E-04	2.0E-01	2.0E-01
Indeno(1, 2, 3-cd)pyrene	abc	7.3E-01	7.3E-01	3.0E-02	NTV
2-Methylnaphthalene	ad		NTV	4.0E-02	4.0E-03
2-Methylphenol	abd		NTV	5.0E-02	NTV
Naphthalene	ad		NTV	3.0E-02	2.0E-02
2-Nitrophenol	d		NTV	NTV	NTV
4-Nitrophenol	d		NTV	8.0E-03	NTV
Pentachlorophenol	d	1.2E-01	4.0E-01	3.0E-02	5.0E-03

Phenanthrene	ad		NTV	3.0E-02	NTV
Pyrene	ad		NTV	3.0E-02	3.0E-02
Aldrin	b	1.7E+01	1.7E+01	3.0E-05	3.0E-05
Aroclor 1260	ab	2.0E+00	2.0E+00	NTV	NTV
Beta-BHC	a	1.8E+00	1.8E+00	NTV	NTV
Gamma-BHC (Lindane)	b	1.3E+00	1.1E+00	3.0E-04	3.0E-04
4, 4'-DDD	bc	2.4E-01	2.4E-01	NTV	NTV
4, 4'-DDE	bc	3.4E-01	3.4E-01	NTV	NTV
4,4'-DDT	ac	3.4E-01	3.4E-01	5.0E-04	5.0E-04
Dieldrin	b	1.6E+01	1.6E+01	5.0E-05	5.0E-05
Aluminum	abcd		NTV	1.0E+00	1.0E+00
Antimony	abc		NTV	4.0E-04	4.0E-04
Arsenic	abcd	1.5E+00	1.5E+00	3.0E-04	3.0E-04
Barium	cd		NTV	7.0E-02	2.0E-01
Berylium	abc	NTV	NTV	5.0E-03	2.0E-03
Cadmium	abc	NTV	NTV	1.0E-03	1.0E-03
Chromium (hexavalent)	abcd	NTV	5.0E-01	5.0E-03	3.0E-03
Cobalt	ab		NTV	6.0E-02	3.0E-04
Copper	abcd		NTV	3.7E-02	4.0E-02
Lead	abc	NTV	NTV	NTV	NTV
Manganese	abcd		NTV	2.4E-02	2.4E-02
Mercury (inorganic)	abcd		NTV	3.0E-04	3.0E-04
Nickel	abcd	NTV	NTV	2.0E-02	2.0E-02
Silver	d		NTV	5.0E-03	5.0E-03
Vanadium	abc		NTV	7.0E-03	5.0E-03
Zinc	abcd		NTV	3.0E-01	3.0E-01
Cyanide	abcd		NTV	2.0E-02	6.0E-04

Underlined values are more stringent in 2015 than in 2010.

[a] Chemicals of Concern for Commercial Soils (Future Maintenance Worker), From Table 1, 2000 Record of Decision

[b] Chemicals of Concern for Commercial Soil (Future Adult Trespasser), From Table 2, 2000 Record of Decisio

[c] Chemicals of Concern for Sediment (Future Adult Trespasser), From Table 4, 2000 Record of Decision

[d] Chemicals of Concern for Clams (Future Adult Trespasser), from Table 5, 2000 Record of Decision

[e] Oral Cancer Slope Factor, from Table 7, 2000 Record of Decision

[f] Oral Cancer Slope Factor, from EPA Regional Screening Levels, January, 2015

[g] Oral Reference Dose, from Table 8, 2000 Record of Decision

[h] Oral Reference Dose, from EPA Regional Screening Levels, January, 2015

[I] Data from Table 2-1 and 2-2 from 1998 "Update of Baseline Human Health Risk Assessment and Developmer of Risk-Based Cleanup Levels Atlas Tack Corporation Fairhaven, Massachusetts"

NTV = No Toxicity Value, NR = Not Reported

Table B. EPA Calculation of Risks of Chemicals of Concern from the 1998 Updated Risk Assessment

	Conc. (mg/kg)	Industrial RSL (mg/kg)		95%UCL Risk	
Chemical of Concern	95% UCL	ILCR = 1E-06	HQ = 1	ILCR	HQ
Methylene chloride	0.0144	1020	3160	1.4E-11	4.6E-06
Acenaphthene	NR		45200		
Acenaphthylene	1.27	NR	NR		
Anthracene	NR		226000		
Benzo(a)anthracene	60.3	2.87		2.1E-05	
Benzo(a)pyrene	54.8	0.289		**1.9E-04**	
Benzoic acid	NR				
Benzo(b)fluoranthene	43.3	2.89		1.5E-05	
Benzo(g, h, i)perylene	27				
Benzo(k)fluoranthene	54.6	28.9		1.9E-06	
Benzyl alcohol	NR				
bis (2-Chloroisopropyl)ether	NR				
bis (2-ethylhexyl)phthalate	15.2	164	16400	9.3E-08	9.3E-04
Butyl benzyl phthalate	1.56	1210	164000	1.3E-09	9.5E-06
2-Chloronaththalene	NR				
2-Chlorophenol	NR				
Chrysene	66	289		2.3E-07	
Dibenz(a, h)anthracene	4.58	0.289		1.6E-05	
Dibenzofuran	24.3		1040		2.3E-02
1, 3-Dichlorobenzene	NR				
1, 4-Dichlorobenzene	NR				
3, 3'-Dichlorobenzidene	NR				
Diethyl phthalate	NR				
Dimethyl phthalate	NR				
di-n-Butyl phthalate	NR				
2, 4-Dinitrotoluene	NR				
di-n-Octyl phthalate	NR				
Hexachlorobutadiene	NR				
Isophorone	NR				
Indeno(1, 2, 3-cd)pyrene	34.7	2.89		1.2E-05	
2-Methylnaphthalene	6.2	NR	3010		2.1E-03
2-Methylphenol	1.42				
Naphthalene	34.5	16.7	585	2.1E-06	5.9E-02
2-Nitrophenol	NR				
4-Nitrophenol	NR				
Pentachlorophenol	NR				
Phenanthrene	123				
Pyrene	109		22600		4.8E-03
Aldrin	NR				

Aroclor 1260	18.9	0.991	15	1.9E-05	1.3E+00
Beta-BHC	0.012	0.070		1.7E-07	
Gamma-BHC (Lindane)	NR				
4, 4'-DDD	NR				
4, 4'-DDE	NR				
4,4'-DDT	0.0098	8.53	518	1.1E-09	1.9E-05
Dieldrin	NR				
Aluminum	14600		1120000		1.3E-02
Antimony	30.7		467		6.6E-02
Arsenic	18.7	3	479	6.2E-06	3.9E-02
Barium	NR				
Berylium	0.558	6950	2290	8.0E-11	2.4E-04
Cadmium	215	9260	982	2.3E-08	2.2E-01
Chromium (hexavalent)	311	6.33	3480	4.9E-05	8.9E-02
Cobalt	68.9	1850	347	3.7E-08	2.0E-01
Copper	6090		46700		1.3E-01
Lead	1280				
Manganese	565				
Mercury (inorganic)	0.435		350		1.2E-03
Nickel	294	64100	22400	4.6E-09	1.3E-02
Silver	NR				
Vanadium	59.2	NR	5830		1.0E-02
Zinc	38000		350000		1.1E-01
Cyanide	2190	NR	12		**1.8E+02**
			Totals:	**3.3E-04**	**1.8E+02**

Risks in bold exceed EPA risk limits (HQ ≤ 1; ILCR ≤ 1E-04).

[I] Data from Table 2-1 and 2-2 from 1998 "Update of Baseline Human Health Risk Assessment and Development of Risk-Based Cleanup Levels Atlas Tack Corporation Fairhaven, Massachusetts"

NR = Not Reported

RSL = EPA Regional Screening Level for Industrial Soil (June, 2015)

HQ = Hazard Quotient

ILCR = Incremental Lifetime Cancer Risk

ILCR = (RSL for 1E-06 cancer risk/soil concentration)*1E-06

HQ = RSL for HQ =1/soil concentration

UCL = Upper Confidence Level