FIVE-YEAR REVIEW REPORT FOR WELLS G&H SUPERFUND SITE MIDDLESEX COUNTY, MASSACHUSETTS

Prepared by

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LIST OF ACRONYMS

ADAF	Age-Dependent Adjustment Factor
AOC	Administrative Order on Consent
AMSL	Above Mean Sea Level
ARAR	Applicable or Relevant and Appropriate Requirements
AS	Air Sparging
AWQC	Ambient Water Quality Criteria
Beatrice	Beatrice Corporation
B&M	Boston and Maine
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
CIC	Community Involvement Coordinator
COC	Contaminant of Concern
COPC	Contaminants of Potential Concern
cPAH	Carcinogenic PAHs
CWA	Clean Water Act
1,1-DCE	1,1-Dichloroethene
1,2-DCA	1,2-Dichloroethane
1,2-DCE	1,2-Dichloroethene
DEQE	Department of Environmental Quality Engineering (now the MassDEP)
DNAPL	Dense Non-Aqueous Phase Liquid
ESD	Explanation of Significant Difference
EPA	United States Environmental Protection Agency
FID	Flame Ionization Detector
FDDA	Former Drum Disposal Area
FS	Feasibility Study
ftbgs	Feet Below Ground Surface
FYR	Five-Year Review
GAC	Granular Activated Carbon
GeoTrans	GeoTrans, Inc. (consultant to Grace)
GES	Groundwater & Environmental Services, Incorporated
gpm	gallons per minute
Grace	W.R. Grace & Co. – Conn
HRS	Hazard Ranking System
IC	Institutional Control

IEUBK	Integrated Exposure Uptake Biokinetic Model
IRIS	Integrated Risk Information System
ISCO	In-Situ Chemical Oxidation
ISV	In-situ Volatilization
lb/yr	Pounds per Year
LNAPL	Light Non-Aqueous Phase Liquid
LTM	Long Term Monitoring
MassDEP	Massachusetts Department of Environmental Protection
MBTA	Massachusetts Bay Transportation Authority
MCL	Maximum Contaminant Level
MCP	Massachusetts Contingency Plan
MDC	Metropolitan District Commission
M&E	Metcalf & Eddy, Inc.
µg/dL	Microgram per Deciliter
µg/kg	Microgram per Kilogram
µg/L	Micrograms per Liter
MSGRP	Multiple Source Groundwater Response Plan
MSR	Management System Review
MWRA	Massachusetts Water Resources Authority
NAPL	Non-Aqueous Phase Liquid
NCP	National Contingency Plan
NEP	New England Plastics Corporation
NGVD	National Geodetic Vertical Datum
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRWQC	National Recommended Water Quality Criteria
Olympia	Olympia Nominee Trust
O&M	Operation and Maintenance
OU	Operable Unit
OU-1	Operable Unit 1 – Wells G&H Source Area Properties
OU-2	Operable Unit 2 – Central Area
OU-3	Operable Unit 3 – Aberjona River Study
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
PID	Photoionization Detector
ppb	parts per billion
ppmv	parts per million by volume
PRP	Potentially Responsible Party
PVC	Polyvinyl Chloride

QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objectives
RETEC	The RETEC Group (former consultant to Beatrice at Wildwood since acquired by AECOM)
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Levels
scfm	standard cubic feet per minute
SDWA	Safe Drinking Water Act
SVE	Soil Vapor Extraction
SVM	Soil Vapor Monitoring
TBC	To Be Considered
TCE	Trichloroethene
1,1,1-TCA	1,1,1-Trichloroethane
TRC	TRC Environmental Corporation
TSDF	Treatment, Storage and Disposal Facility
TTNUS	TetraTech NUS, Inc.
UniFirst	UniFirst Corporation
UV/Ox	Ultraviolet/chemical oxidation
VOC	Volatile Organic Compound
VI	Vapor Intrusion
VISL	Vapor Intrusion Screening Level
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WRA	Woburn Redevelopment Authority

EXECUTIVE SUMMARY

This is the fourth (4th) Five-Year Review (FYR) for the Wells G&H Superfund (Site) located in Woburn, Middlesex 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 9/24/2009.

The Wells G&H Superfund Site (the Site) is approximately 330-acres in size and includes the aquifer and land located within the zone of contribution of two former municipal drinking water wells known as Wells G and H, which are located adjacent to the Aberjona River (see Figures 1 and 2). The boundaries of the Site are Route 128 (Interstate 95) to the north, Route 93 to the east, the Boston and Maine (B&M) Railroad to the west, and Salem and Cedar Streets to the south (see Figure 1).

The Site was originally segregated into three operable units, the Source Area (Operable Unit [OU]-1) properties, the Central Area (OU-2), and the Aberjona River Study (OU-3). However, in the Spring of 2002, the Environmental Protection Agency (EPA) merged the study of Wells G&H OU-3 (the Aberjona River Study) with Industri-Plex OU-2, and subsequently issued a Record of Decision (ROD) in January 2006 that addresses OU-3. Thus, further evaluation of OU-3, including FYRs, will be conducted as part of the Industri-Plex Site.

The OU-1 Source Area properties consist of the W.R. Grace Property (Grace property) , UniFirst Property (UniFirst property), New England Plastics Property (NEP property), Wildwood Property (Wildwood property) , and Olympia Property (Olympia property), the locations of which are depicted on Figure 2. Currently, no remedy decision has been selected for OU-2 (Central Area), which is under investigation. Thus, OU-2 is not evaluated as part of this FYR.

The selected remedy identified in the 1989 ROD for the Source Area (OU-1) properties included the following:

- Treatment of contaminated soil using in-situ volatilization at Wildwood property;
- Excavation and on-site incineration of contaminated soils at Wildwood, Olympia, NEP, and UniFirst properties;
- Treatment and/or disposal of sludge and debris found at Wildwood property in a manner to be determined during the design phase of the clean-up; and
- Extraction and treatment of contaminated groundwater separately at the five Source Area properties using pre-treatment for metals and an air stripper to remove volatile organic contaminants, or an equally or more effective technology approved by EPA. The extraction systems were to be designed to address the specific bedrock and/or overburden contamination at each Source Area property.

EPA's April 25, 1991 Explanation of Significant Differences (ESD) described three significant changes and one non-significant change from the remedial action to be undertaken at the OU-1 Source Area properties as set forth in the ROD. Those changes were as follows:

Significant Changes

- On-site incineration of soils at Wildwood, NEP, and Olympia properties was changed to off-site incineration;
- In-situ volatilization would be used on UniFirst property, rather than incineration; and
- A typographical error was corrected resulting in more stringent target action levels for groundwater.

Other Non-Significant Change

- Groundwater extraction systems could be combined for UniFirst and Grace properties.

The 1991 ESD provided for certain changes to the soil and groundwater remedy, but the overall remedy remained fundamentally the same: incineration and in-situ volatilization of contaminated soils, removal of sludge and debris, and extraction and treatment of groundwater at the Source Area properties.

As required by a Consent Decree entered by the court in 1991, a group of Potentially Responsible Parties (PRPs) agreed to conduct the Remedial Investigation/Feasibility Study (RI/FS) for OU-2. A remedy has not yet been selected for OU-2. OU-3 was combined with Industri-Plex OU-2. Going forward, response actions for Wells G&H OU-3 will be managed as part of the Industri-Plex Site. A ROD for Industri-Plex OU-2 that includes Wells G&H OU-3 was issued on January 31, 2006. The FYR for the Industri-Plex Site will determine the protectiveness of the Industri-Plex OU-2 remedy, including Wells G&H OU-3.

This is the fourth FYR for the Wells G&H Site. The previous three FYRs were completed in August 1999, September 2004 and September 2009, respectively. In addition, as a protectiveness statement could not be made at the time of the third FYR, additional data was collected to evaluate the potential for impacts to indoor air quality associated with shallow groundwater conditions were included in an Addendum to Third Five-Year Review, dated April 2012. The FYR is required because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

This FYR concludes that the remedy at the Source Area properties is currently protective of human health and the environment because active remedial actions, including groundwater pump and treatment (Grace, UniFirst and Wildwood properties), in-situ chemical oxidation (ISCO; Olympia property), air sparging/soil vapor extraction (AS/SVE) source control (NEP property – shutdown in 2000, and Wildwood property) and SVE source control (UniFirst property), have been or continue to be implemented in conjunction with routine operation and maintenance (O&M) and monitoring. The current assessment of the vapor intrusion pathway at both on-property and downgradient of/near property locations also supports our conclusion that the OU-1 remedy is currently protective. However, in order for the remedy to be protective in the long-term, the following actions are recommended: continued implementation of soil remedy (SVE) at UniFirst property; continued monitoring by both Grace and UniFirst properties; worker contact with groundwater should be performed under property-specific Health & Safety Plan/controls until remedy is complete; groundwater capture and treatment system assessment/enhancements at the Wildwood property; additional groundwater data collection and assessment including deep bedrock conditions and, as determined necessary, groundwater treatment at NEP property; assessment of soil and groundwater cleanup levels from ISCO treatment at Olympia property;

assessment of groundwater conditions relative to arsenic and manganese at Grace, UniFirst, Wildwood and/or Olympia properties; evaluation of vapor intrusion pathway if Grace, Wildwood and/or Olympia properties are developed/redeveloped with occupied buildings, and, where appropriate, implementation of vapor intrusion mitigation measures during development.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Wells G&H Superfund Site		
EPA ID: MAD980732168		
Region: 1	**State:** MA	**City/County:** Woburn, Middlesex County

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

REVIEW STATUS
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:**
Author name (Federal or State Project Manager): Joseph F. LeMay, PE
Author affiliation: U.S. EPA Region 1
Review period: 10/1/2009 - 9/30/2014
Date of site inspection: August 2014
Type of review: Statutory
Review number: 4
Triggering action date: 9/24/2009
Due date *(five years after triggering action date)*: 9/30/2014

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): *OU-1*	**Issue Category: Remedy Performance**			
	Issue: Extraction systems performance (possible insufficient capture of groundwater contamination) at Wildwood property.			
	Recommendation: Additional data collection and/or analysis to determine whether or not sufficient capture has been achieved at the Wildwood property, and, where appropriate, take corrective actions to ensure sufficient capture in the future.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	2016
OU(s): *OU-1*	**Issue Category: Remedy Performance**			
	Issue: No groundwater pump and treatment system implemented at NEP property following AS/SVE shutdown.			
	Recommendation: Assess groundwater conditions on NEP property since AS/SVE shutdown, and evaluate the need for further groundwater treatment.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	2016
OU(s): *OU-1*	**Issue Category: Remedy Performance**			
	Issue: No recent data regarding groundwater contaminant concentrations in deep bedrock at NEP property.			
	Recommendation: Additional data collection to evaluate deep bedrock groundwater conditions on the NEP property, and, where appropriate, evaluate groundwater treatment.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	2016
OU(s): *OU-1*	**Issue Category: Remedy Performance**			
	Issue: Area south of treatment system at Wildwood property may have groundwater contamination in excess of ROD cleanup goals not receiving treatment.			
	Recommendation: Assess groundwater conditions south of treatment system at Wildwood, evaluate the need for further groundwater treatment, and consider other treatment enhancements/optimizations as appropriate.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP & EPA	EPA	2016
OU(s): *OU-1*	**Issue Category: Remedy Performance**			
	Issue: No groundwater pump and treatment remedy implemented at Olympia property.			
	Recommendation: Evaluate progress of Olympia's soil clean up (In-situ Chemical Oxidation [ISCO]) to achieve ROD groundwater and soil cleanup standards. Assess need			

Issues and Recommendations Identified in the Five-Year Review:				
	for groundwater cleanup at the conclusion of the removal action.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	2018
OU(s): *OU-1*	**Issue Category: Institutional Controls**			
	Issue: The 1988 Endangerment Assessment did not comprehensively evaluate non-ingestion uses of groundwater such as dermal contact during industrial groundwater usage or direct contact during trench excavation under certain current (commercial worker) and future (commercial worker, residential) scenarios at Source Area properties.			
	Recommendation: Because of persistent groundwater contamination at each Source Area property, worker contact with groundwater should be performed under property-specific Health & Safety Plan/controls until the remedy is complete.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	2016
OU(s): *OU-1*	**Issue Category: Remedy Performance**			
	Issue: Arsenic MCL changed from 50 µg/L to 10 µg/L. Arsenic was not previously targeted for cleanup based on prior MCL. Historical arsenic concentrations were either above 10 µg/L, or detection limits exceeded 10 µg/L. In addition, manganese was not identified as a COC in OU-1 groundwater under the 1988 Endangerment Assessment. Manganese toxicity values have been reduced by a factor of 10 since the 1988 assessment. Future exposures to manganese in groundwater may exceed EPA's Lifetime Health Advisory.			
	Recommendation: Assess current groundwater conditions relative to arsenic and manganese at UniFirst, Grace, Wildwood and Olympia properties, and, where appropriate, revise cleanup goals through a remedy decision document.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP (date) & EPA (revise limits)	EPA	2016
OU(s): *OU-1*	**Issue Category: Remedy Performance**			
	Issue: An evaluation of the groundwater to indoor air pathway indicates that potential future risks at the Grace property (residential, commercial), Olympia property (commercial, residential) and Wildwood property (residential) might exceed EPA risk management guidelines should development/redevelopment occur.			
	Recommendation: Evaluate risk from exposure to indoor air at the Grace, Wildwood and Olympia properties based on up-to-date data if any of the properties are developed/redeveloped with occupied buildings. Grace property exceeds EPA groundwater VISL and development/redevelopment should incorporate engineered vapor intrusion mitigation measures into development plans, unless otherwise demonstrated satisfactorily to EPA that vapor intrusion will not pose a potential threat to future occupants. If Wildwood and Olympia properties were proposed for development, then evaluate risk from exposure to indoor air in accordance with issue.			
Affect Current	**Affect Future**	**Party**	**Oversight**	**Milestone Date**

Issues and Recommendations Identified in the Five-Year Review:				
Protectiveness	**Protectiveness**	**Responsible**	**Party**	
No	Yes	PRP (data) & EPA (risk)	EPA	Upon Development / Redevelopment

Protectiveness Statement(s)		
Operable Unit: OU-1	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):* Not Applicable
Protectiveness Statement: The remedy at the Source Area (OU-1) properties currently protects human health and the environment because active remedial actions, including groundwater pump and treatment (Grace, UniFirst and Wildwood properties), ISCO (Olympia property), AS/SVE source control (NEP property – shutdown in 2000, and Wildwood property) and SVE source control (UniFirst property) have been or continue to be implemented in conjunction with routine O&M and monitoring. The current assessment of the vapor intrusion pathway at both on-property and downgradient of/near property locations also supports our conclusion that the OU-1 remedy is currently protective. However, in order for the remedy to be protective in the long-term, the following actions are recommended: continued implementation of soil remedy (SVE) at UniFirst property; continued monitoring by both Grace and UniFirst properties; worker contact with groundwater should be performed under property-specific Health & Safety Plan/controls until remedy is complete; groundwater capture and treatment system assessment/enhancements at the Wildwood property; additional groundwater data collection and assessment including deep bedrock conditions and, as determined necessary, groundwater treatment at NEP property; assessment of soil and groundwater cleanup levels from ISCO treatment at Olympia property; assessment of groundwater conditions relative to arsenic and manganese at Grace, UniFirst, Wildwood and/or Olympia properties; evaluation of vapor intrusion pathway if Grace, Wildwood and/or Olympia properties are developed/redeveloped with occupied buildings, and, where appropriate, implementation of vapor intrusion mitigation measures during development.		

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 FYR 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 Wells G&H Superfund Site in Woburn, Middlesex County, Massachusetts. EPA is the lead agency for developing and implementing the remedy for the Site. The Massachusetts Department of Environmental Protection (MassDEP), as the support agency representing the Commonwealth of Massachusetts, has reviewed all supporting documentation and provided input to EPA during the FYR process.

This is the fourth FYR for the Wells G&H Superfund Site. The triggering action for this statutory review is the completion date of the previous FYR. An Addendum to Third FYR was completed in April 2012. The Addendum was necessary because a protectiveness statement could not be made at the time of the third FYR. Additional data was collected to evaluate the potential for impacts to indoor air quality associated with shallow groundwater conditions and this data is discussed in the Addendum to Third FYR, and the protectiveness statement was revised at that time. This fourth 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 currently consists of two Operable Units (OU), one of which (OU-1) is addressed in this FYR.

II. PROGRESS SINCE THE LAST REVIEW

Table 1: Protectiveness Determinations/Statements from the 2009 FYR as Amended (April 2012)		
OU #	**Protectiveness Determination**	**Protectiveness Statement**
1	Short-term Protective	The remedy for OU-1 is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

Table 2: Status of Recommendations from the 2009 FYR and Addendum to Third FYR (April 2012)							
OU	**Issue**	**Recommendations/ Follow-up Actions**	**Party Responsible**	**Oversight Party**	**Original Milestone Date**	**Current Status**	**Completion Date (if applicable)**
1	Potential current indoor air risks above EPA's risk management guidelines based upon an evaluation of the soil gas to indoor air and soil to indoor air pathways for the existing commercial building at UniFirst property	#1) Additional data collection at UniFirst property to assess vapor intrusion, and evaluate and implement technical solutions as appropriate.	PRP & EPA	EPA	2010	Completed	N/A
1 *	Potential future indoor air risks above EPA's risk management guidelines based upon the risk evaluation of complete VI pathway at existing commercial building 260207 on the UniFirst Source Area property should the building be used for residential purposes in the future. In addition, potential future VI could occur at existing commercial building 260207 on the UniFirst Source Area property if building conditions (e.g., further cracks	#2) Design and Implement In Situ Volatilization (ISV) soil remedy in accordance with the Consent Decree. EPA anticipates ISV implementation should sufficiently mitigate the future indoor air risk associated with the VI pathway. In addition, annual groundwater monitoring of wells exceeding federal drinking water standards (e.g., PCE at 5 µg/L) to monitor groundwater conditions on the UniFirst Source Area property starting in 2012, and, upon ISV completion, annual VOC subslab soil gas	PRP	EPA	2012	Completed	August 2014 (SVE mobilization)

Table 2: Status of Recommendations from the 2009 FYR and Addendum to Third FYR (April 2012)							
OU	**Issue**	**Recommendations/ Follow-up Actions**	**Party Responsible**	**Oversight Party**	**Original Milestone Date**	**Current Status**	**Completion Date (if applicable)**
	in foundation, etc.) were to change due to the presence of elevated concentrations of PCE and TCE in subslab soil gas beneath the building.	and indoor air monitoring of the existing building 260207 on the UniFirst Source Area property to monitor the performance of the ISV soil remedy to mitigate future indoor air risks associated with the VI pathway. See Attachment A Table 2 and Figure 2 of this Addendum.					
1 *	Potential future VI could occur at existing commercial building 260206 downgradient of/near the UniFirst Source Area property if building conditions (e.g. further cracks in foundation, etc.) were to change due to the presence of elevated concentrations of PCE in subslab soil gas beneath the building.	#3) Annual VOC subslab soil gas and indoor air monitoring of existing building 260206 downgradient of/near the UniFirst Source Area property to monitor the VI pathway and building conditions starting in 2012. In addition, annual groundwater monitoring of wells exceeding federal drinking water standards (e.g., PCE at 5 µg/L) by the UniFirst Source Area property to monitor VOC conditions downgradient of/ near the UniFirst Source Area property. See Attachment A Table 2 and Figure 2 of this Addendum.	PRP	EPA	2012	Ongoing	2014 (monitoring incorporate into annual monitoring)
1	Uncertain water quality conditions downgradient of the UniFirst, Grace and NEP properties which may contribute to a potential vapor intrusion pathway.	#4) Install additional monitoring wells and collect additional groundwater data downgradient from/ near UniFirst Grace and NEP properties to assess potential vapor intrusion pathway. Collect any further data, and evaluate and	PRP & EPA	EPA	2010	Completed	N/A

Table 2: Status of Recommendations from the 2009 FYR and Addendum to Third FYR (April 2012)							
OU	**Issue**	**Recommendations/ Follow-up Actions**	**Party Responsible**	**Oversight Party**	**Original Milestone Date**	**Current Status**	**Completion Date (if applicable)**
		implement technical solutions as appropriate.					
1 *	Water quality conditions in groundwater downgradient of/near UniFirst and Grace Source Area properties exceed federal drinking water standards.	#5) Annual groundwater monitoring of wells exceeding federal drinking water standards (e.g., PCE at 5 µg/L) by the UniFirst and Grace Source Area properties to monitor VOC conditions downgradient of/ near the UniFirst and Grace Source Area properties.	PRP	EPA	2012	Completed	N/A
1	No soil remedy has been implemented at UniFirst (SVE).	#6) Review soil contamination issues at UniFirst, collect additional data, and evaluate and implement technical solutions.	PRP & EPA	EPA	2011	Completed	2014 (SVE mobilizatio n)
1	No property-specific institutional controls implemented at the Source Area properties to prevent public contact with contaminated groundwater and soil above action levels	#7) Property-specific institutional controls should be established at each source area property to prevent potential exposures to the public, until the source control remedy has been completed.	PRP, EPA, State and City	EPA	2011	Ongoing	N/A
1	Persistent groundwater contaminant concentrations at all Source Area Properties.	#8) Additional data collection and/or analysis to diagnose the limited VOC reductions at all Source Area properties, and improve system performance and pace of Site cleanup.	PRP	EPA	2014	Completed	N/A
1	Extraction systems performance (possible insufficient capture of groundwater	#9) Additional data collection and/or analysis to determine whether or not sufficient capture has	PRP	EPA	2011	Ongoing	2016

Table 2: Status of Recommendations from the 2009 FYR and Addendum to Third FYR (April 2012)							
OU	**Issue**	**Recommendations/ Follow-up Actions**	**Party Responsible**	**Oversight Party**	**Original Milestone Date**	**Current Status**	**Completion Date (if applicable)**
	contamination) at UniFirst, W.R. Grace and Wildwood properties.	been achieved at UniFirst, Grace and Wildwood properties, and, where appropriate take corrective actions to ensure sufficient capture in the future.					
1	No groundwater pump and treatment system implemented at NEP following AS/SVE shutdown.	#10) Assess groundwater conditions on NEP property since AS/SVE shutdown, evaluate the need for further groundwater treatment, and where appropriate consider other treatment technologies.	PRP	EPA	2012	Ongoing	2016
1	No recent data regarding groundwater contaminant concentrations in deep bedrock at NEP	#11) Additional data collection to evaluate deep bedrock groundwater conditions on the NEP property, and where appropriate evaluate groundwater remedial technologies.	PRP	EPA	2010	Ongoing	2016
1	Area south of Wildwood treatment system may have groundwater contamination in excess of ROD cleanup goals not receiving treatment.	#12) Assess groundwater conditions south of Wildwood treatment system, evaluate the need for further groundwater and soil treatment, and consider other treatment technologies as appropriate.	PRP & EPA	EPA	2011	Ongoing	2016
1	No groundwater pump and treatment remedy implemented at Olympia.	#13) Evaluate progress of Olympia's in-situ chemical oxidation (ISCO) to achieve ROD groundwater and soil cleanup standards. Assess need for groundwater cleanup at the conclusion of the removal action.	PRP	EPA	2014	Ongoing	2018
1	Soil contaminant concentrations at	#14) Assess extent of soil contamination	PRP	EPA	2010	Completed	N/A

Table 2: Status of Recommendations from the 2009 FYR and Addendum to Third FYR (April 2012)							
OU	**Issue**	**Recommendations/ Follow-up Actions**	**Party Responsible**	**Oversight Party**	**Original Milestone Date**	**Current Status**	**Completion Date (if applicable)**
	Grace property exceed ROD Action Levels.	exceeding ROD Action Levels. Evaluate and implement response actions as appropriate.					
1	The 1988 Endangerment Assessment did not comprehensively evaluate non-ingestion uses of groundwater such as dermal contact during industrial groundwater usage or direct contact during trench excavation under certain current (commercial worker) and future (commercial worker, residential) scenarios at Source Area properties.	#15) Because of persistent groundwater contamination at each Source Area property, non-ingestion groundwater exposures should be prevented through the implementation of property-specific controls until the remedy is complete.	PRP (data) & EPA (risk)	EPA	2011	Ongoing	2016
1	Arsenic MCL recently changed from 50 µg/L to 10 µg/L. Arsenic was not previously targeted for cleanup based on prior MCL. Historical arsenic concentrations were either above 10 µg/L, or detection limits exceeded 10 µg/L. In addition, manganese was not identified as a COC in OU-1 groundwater under the 1988 Endangerment Assessment. Manganese toxicity values have been reduced by a factor of 10 since the assessment. Future	#16) Assess current groundwater conditions relative to arsenic and manganese at UniFirst, Grace, Wildwood and Olympia properties, and where appropriate revise cleanup goals.	PRP (data) & EPA (revise limits)	EPA	2011	Ongoing	2016

Table 2: Status of Recommendations from the 2009 FYR and Addendum to Third FYR (April 2012)							
OU	**Issue**	**Recommendations/ Follow-up Actions**	**Party Responsible**	**Oversight Party**	**Original Milestone Date**	**Current Status**	**Completion Date (if applicable)**
	exposures to manganese in groundwater may exceed EPA's Lifetime Health Advisory.						
1	An evaluation of the groundwater to indoor air pathway indicates that potential future risks at the Olympia property (commercial, residential) and Wildwood property (residential) might exceed EPA risk management guidelines should re-development occur. Newly discovered soil contamination on Grace property, if encountered, may also present vapor intrusion issue should redevelopment occur. Re-development at any of the Source Area properties may present a vapor intrusion risk.	#17) Evaluate risk from exposure to indoor air at the Source Area properties based on up-to-date data if any of the properties are developed/ redeveloped.	PRP (data) & EPA (risk)	EPA	2014	Ongoing	2016
1	AWQCs associated with aquatic life have decreased since the ROD. AWQCs were used to establish effluent limits for remedial system discharges at the UniFirst and Grace properties.	#18) Assess NPDES equivalent discharge standards based upon current AWQCs, and revise discharge limits at UniFirst and Grace properties as appropriate.	PRP & EPA	EPA	2011	Completed	N/A

Notes:
***** These issues were included in Table 6 of the *Addendum To Third Five-Year Review* dated April 2012. Table 6 of the Addendum supplemented the original Table 6 from Section 9.0 of the FYR Report dated September 24, 2009 and provides a listing of additional recommendations and follow-up issues.

The following provides brief elaboration, as appropriate, regarding the recommendations and current status to ensure adequate discussion of items in the table above.

Recommendation 1

As documented in the Addendum to Third FYR, additional data collection has been conducted and EPA concluded that the VI pathway was not likely to pose unacceptable current indoor air risk at UniFirst property. As a result, further response to Recommendation #1 is not currently required and no revised completion date is cited.

Recommendation 2

A soil vapor extraction (SVE) pilot test was completed at UniFirst property in 2012. Based on the results of the pilot test, UniFirst submitted an SVE System Design Report in May 2014 describing the engineering design of a proposed SVE system. On June 10, 2014, EPA approved the SVE System Design Report. On August 14, 2014, UniFirst mobilized and began implementation of the SVE System Design on the property. EPA anticipates the SVE system will be constructed and fully operational by the end of 2014. EPA considers Recommendation # 2 complete.

Recommendation 3

Annual monitoring (sub-slab soil gas, indoor air and groundwater) has been conducted pursuant to the Addendum to Third FYR. Concentrations of tetrachloroethene (PCE) in the 2013 and 2014 samples were generally consistent with or less than those detected in 2011 confirming that the VI pathway is unlikely to pose a risk to current building occupants. UniFirst has incorporated the monitoring into their annual monitoring environmental program. This monitoring program will continue to evolve and incorporate the SVE monitoring and any optimizations/enhancements on the property. EPA considers Recommendation #3 complete.

Recommendation 4

Annual groundwater monitoring continues to be routinely performed. EPA considers Recommendation # 4 complete.

Recommendation 5

Annual groundwater monitoring continues to be routinely performed. EPA considers Recommendation # 5 complete.

Recommendation 6

An SVE pilot test was completed at UniFirst property in 2012. On June 10, 2014, EPA approved the SVE System Design Report. On August 14, 2014, UniFirst mobilized and began implementation of the SVE System Design on the property.

Recommendation 7

As outlined in the ROD, "once cleanup goals have been satisfied, the extraction wells will be shut down and a monitoring program will be implemented. This program will consist of a minimum of three years of quarterly monitoring of ground water quality. If the monitoring data during this period shows an increase in contaminant levels over time, such that cleanup goals are not maintained, active groundwater remediation will be resumed. The results of this monitoring program will be reviewed by EPA in order to evaluate the success of the remedy, the maintenance of cleanup goals, the need for any additional site work including the resumption of the remedy or the implementation of institutional controls, and to provide information for site delisting." At the appropriate time, EPA will review the "monitoring program" and will consider resumption of work, additional work or institutional controls, as necessary.

Recommendation 8

To varying degrees, additional data collection and/or analysis to diagnose the limited volatile organic compound (VOC) reductions and improve system performance and pace of Site cleanup, have been conducted at the Source Areas. EPA continues to encourage source area properties to explore optimization/enhancement techniques to accelerate progress toward the achievement of cleanup goals at the Site, as appropriate.

Recommendation 9

Additional data collection and/or analysis have been conducted at Grace and UniFirst properties to assess the groundwater recovery system's capture of contaminated groundwater within their properties. UniFirst has agreed to enhance its capture at the southwest corner of their property and submitted an additional extraction well installation work plan in May 2014. EPA approved the work plan in June 2014, and UniFirst mobilized to initiate extraction well(s) installation on the property in July 2014. Additional investigation and corrective actions, as needed, are required at Wildwood property.

Recommendation 10

Annual monitoring continues to occur at NEP property; however, additional data collection to evaluate groundwater conditions on NEP property, including (where appropriate) an evaluation of the need for further groundwater treatment, continues to be required.

Recommendation 11

Annual monitoring continues to occur at NEP property; however additional data collection to evaluate deep bedrock groundwater conditions on NEP property, including (where appropriate) an evaluation of groundwater treatment, is required.

Recommendation 12

Beatrice installed additional monitoring wells along its eastern and southeastern boundaries of the Wildwood property and periodically collected water quality and level measurements on the property between 2011 and 2013. In May 2014, Beatrice submitted Hydraulic Capture Zone Evaluation, which continues to demonstrate limited capture on the Wildwood property. In May 2014, Beatrice also submitted a Technical Memorandum in response to EPA's 2009 comments regarding potential optimization/enhancements to existing treatment systems at the Wildwood property. These May 2014 submissions are under review by EPA.

Recommendation 13

The remedial action continues to be implemented at Olympia property, including ongoing evaluation of the progress of ISCO treatment to achieve ROD groundwater and soil cleanup standards. An assessment of the need for groundwater cleanup at the conclusion of the soil removal action will be required.

Recommendation 15

Under this review, the issue has been modified as follows: "Because of persistent groundwater contamination at each Source Area property, worker contact with groundwater should be performed under property-specific Health & Safety Plan/controls until the remedy is complete."

Recommendation 18

An assessment of National Pollutant Discharge Elimination System (NPDES) equivalent discharge standards based upon current Ambient Water Quality Criteria (AWQC), and revised discharge limits have been completed by Grace and UniFirst, as documented in their separate 2009 annual monitoring reports.

Remedy Implementation Activities

The following information summarizes remedy implementation activities conducted by each Source Area Defendant and Source Area property during the previous five years.

Note that additional well installation and shallow groundwater monitoring was conducted in 2011 to evaluate groundwater conditions and potential vapor intrusion; however no remedial implementation activities, including institutional controls (ICs), have occurred at NEP property since the previous FYR and the property is therefore excluded from the following discussion. Additional remedial implementation activities are discussed in Appendix A.

Grace Property

Groundwater Remedy

Grace submitted an Areas 2, 3 & 4 Enhancement Work Plan in May 2010 to address EPA comments on the Grace Remedial Action Report, dated May 14, 2009, and recommendations

actions #5 and #6 in the Wells G&H Superfund Site third FYR (page ES-6 of the report), regarding treatment system performance and capture. Grace property well locations are included in Figure 3. The proposed Work Plan activities that were implemented by Grace following EPA approval include:

- Deepening recovery well RW22;
- Installation of three, two-level monitoring well clusters (G37 through G39);
- Collection of groundwater samples from newly installed well clusters; and
- Conducting a 14-day pumping test of the reconfigured RW22 recovery well.

More specifically, in August 2010, recovery well RW22 was deepened by approximately 50 feet (from 20 feet below ground surface [ftbgs] to 79 ftbgs) to 25 feet below the top of bedrock using air-rotary techniques (Tetra Tech & JG, 2011). Following installation, the recovery well was developed. In July 2010, three two-well monitoring well clusters were also installed including: G37S and G37D (near RW22), G38S and G38D (southwestern corner of the Grace property and G39S and G39D (south of the Grace property). The shallow ("S") wells were installed within the unconsolidated deposits and the deeper ("D") wells were installed within the shallow bedrock (Tetra Tech & JG, 2011). Each 2-inch diameter polyvinyl chloride (PVC) well was developed following installation.

Groundwater samples were collected from each of new monitoring well clusters in October 2010, consistent with annual groundwater sampling procedures at Grace property, using diffusion bags to evaluate capture of the recovery system. Trichloroethene (TCE) was detected in excess of the Record of Decision (ROD) action level (5 µg/L) in wells G37S and G37D at concentrations of 11 µg/L and 54 µg/L, respectively (Tetra Tech & JG, 2011). PCE was detected in excess of the ROD action level (5 µg/L) in wells G38S, G38D and G39S at concentrations ranging from 27 µg/L to 44 µg/L (Tetra Tech & JG, 2011).

Beginning in August 2010, a 14-day pumping test was run on the reconfigured RW22 recovery well to evaluate the capture zone of the well. In addition to pressure transducer data logging and manual water level measurements, groundwater samples were collected during (first, fourth and fourteen day) and following (approximately three months after completion) the pump test (Tetra Tech & JG, 2011). An increased flow rate was observed at the reconfigured RW22 recovery well and, when combined with the water quality data collected from the recovery well, indicated increased VOC mass removal (Tetra Tech & JG, 2011). Increased vertical and horizontal capture in groundwater were also reported.

Noting significant progress toward achievement of Site closure at Grace property, including the achievement of shutdown criteria in four of the Area 2 northern extraction wells (i.e., RW7, RW8, RW11 and RW12), EPA raised several concerns in its October 10, 2012 letter to Grace regarding the Grace property recovery system including:

- Installation of additional monitoring wells / piezometers and collection of additional water quality data to resolve technical concerns regarding capture;

- Installation and sampling of monitoring wells to assess potential off-property migration of impacted groundwater;
- Plan for identifying potential off-property influences (e.g., off-property PCE source); and
- Identifying and implementing steps to enhance remedy performance toward complete attainment of cleanup criteria.

To address concerns regarding capture and off-property migration, Grace submitted a Work Plan for Area 2 & 3 on April 12, 2013 (Tetra Tech, 2013). The work plan included installation of four paired piezometer clusters to evaluate hydraulic capture at the southwest corner of the Grace property, installation of one paired piezometer cluster and one paired monitoring well cluster to evaluate capture along the southern property boundary, and the installation of two paired monitoring well clusters to evaluate the potential for an on-site source of PCE to be impacting the Area 3 recovery wells (see Figure 3).

Additional well installation and monitoring activities were completed by Grace between June 2013 and December 2013, as described in the *Area 2 & 3 Evaluation Report* dated March 31, 2014 (Tetra Tech, 2014). The March 2014 report also proposed and provided the rationale for the shutdown of the Area 2 and 3 recovery wells.

TCE in excess of Maximum Contaminant Levels (MCLs) continues to be present in monitoring wells G24D, G40S and G40D near the southern property boundary, as well as G13D, G16S and G16D further to the north. EPA is reviewing Grace's *Area 2 & 3 Evaluation Report*, and will prepare a response later in 2014.

Soil Remedy

EPA's September 14, 1989 ROD described the remedy for the Source Area (OU-1) properties. The remedial action objectives for contaminated soil were:

- Prevent public contact with contaminated soil above action levels;
- Stop the leaching of soil contaminants to groundwater; and
- Protect natural resources at the Site from further degradation.

EPA identified site-wide clean-up goals for each of the chemicals of concern in soil that satisfy the above objectives. The soil clean-up goals represent the concentrations that can remain in soil and still be considered protective of human health. EPA identified seven locations on the Grace property with soil contaminant concentrations in excess of ROD action levels in a letter providing comments on the Grace Remedial Action Report dated May 14, 2009. Due to concentrations of VOCs (TCE and/or PCE), polychlorinated biphenyls (PCBs) and carcinogenic polycyclic aromatic hydrocarbons (cPAHs), further investigation was warranted and a 2010 milestone was set in the third FYR.

In a PRP memorandum dated October 10, 2010, historic sampling results were summarized and recommended actions for delineation were outlined (GeoTrans, 2010b). Additional soil investigation activities were implemented between November 2011 and December 2011 in

accordance with the *Soil Management Work Plan (Revision 1)* dated October 18, 2011 (TetraTech, 2011). The investigation focused on the following areas (see Figure 4):

- Passivating Area Drain Line;
- North Side of 1966 Building Addition;
- South Side of 1966 Building Addition;
- Between Former Warehouse and 1974 Building Addition; and
- South Drainage Ditch.

The results of the supplemental soil investigation were summarized in the *Soil Management Evaluation and Response Plan, Revision 1* dated June 19, 2012. The June 2012 report also proposed soil excavation and off-site disposal of impact soil material from the vicinity of the Passivating Area drain line, between the Former Warehouse and 1974 Building Addition and South Drainage Ditch. These areas were targeted for limited soil excavation and disposal due to the presence of PCBs and cPAHs in excess of ROD action levels.

Following EPA approval, remedial activities were implemented under EPA oversight between August 2012 and September 2012. ENPRO Services, Incorporated was contracted by the PRP to excavate and facilitate off-site disposal of soil material exceeding ROD action levels. Impacted soil material was excavated and temporarily stockpiled on-site pending transportation off-site for disposal. The following table summarizes the removal actions:

Table 3: Summary of Grace Soil Removal Activities (2012)

Targeted Area	Targeted Soil Sample Locations	Contaminants Exceeding ROD Action Levels	Approximate Removal by Weight
Passivating Area Drain Line	SS-14 and SS-17	PCBs	32.4 tons
North Side of 1966 Building Addition	RW22-B2-16	TCE	No Action (1)
South Side of 1966 Building Addition	ECS-8	PCE and TCE	No Action (2)
Between Former Warehouse & 1974 Building Addition	ECS-13	PCBs	104.27 tons
South Drainage Ditch	ECS-SS-1 & ECS-SS-2	cPAHs	757.34 tons

Notes:

(1) No delineation conducted as TCE exceedance in RW22-B2-16 detected below the water table and reanalysis and duplicate analysis exhibited non-detect concentrations of TCE.

(2) No VOCs were detected during the 2011 delineation investigation, potentially as a result of volatilization following removal of the floor slab/building foundation; therefore a removal action was deemed unnecessary.

Following removal, confirmatory soil samples were collected from the excavated areas and submitted for laboratory analysis of VOCs, PCBs or cPAHs. Once confirmatory sampling indicated that the excavation limits had been reached (i.e., soil material exceeding ROD actions levels had been removed), the excavation areas were backfilled with documented clean soil material (Tetra Tech & JG, 2013a). The south drainage ditch was reconstructed with geotextile fabric and rip-rap to accommodate drain line discharge to the swale. Portions of the south drainage ditch disturbed during the removal action, but not covered with rip-rap, were seeded, fertilized and mulched (Tetra Tech & JG, 2013a). Excavated soil material was accepted for

disposal at the Waste Management facility in Rochester, New Hampshire.

Following off-site disposal and based on the results of the confirmatory sampling, the excavation activities completed at Grace property in 2012 successfully removed soil exhibiting contaminant concentrations in excess of ROD action levels and no further action to address on-property soils is currently required. Grace documented their work in their *Soil Response Action Completion Report, Revision 1* (Tetra Tech & JG, 2013a), which was accepted by EPA on June 5, 2013.

UniFirst Property

Groundwater Remedy

Based on discussions with EPA and in response to follow-up actions raised in the third FYR regarding groundwater capture, UniFirst submitted an Extraction Well Installation Work Plan in May 2014 (The Johnson Co., 2014a). The work plan described the rationale, objectives and implementation procedures for the installation and testing of one new extraction well, three piezometer clusters and associated hydraulic testing (slug and pump testing) (The Johnson Co., 2014a). The primary objective of the supplemental extraction well installation activities is to collect the necessary data and supplement the exiting treatment system to ensure groundwater capture at the southwest corner of the UniFirst property. Existing well locations at UniFirst property, as well as the proposed locations noted above, are depicted on Figure 5. On June 10, 2014, EPA approved the Extraction Well Installation Work Plan. In July 2014, UniFirst mobilized and began implementation of the work plan on the property with periodic field oversight by EPA.

The Operation and Maintenance (O&M) Plan will also be modified to describe incorporation of the new extraction well in the existing treatment system. The modified O&M Plan will be submitted to EPA following completion of the activities described in the approved work plan.

Soil Vapor Extraction

The UniFirst property remedy set forth in the ROD and modified in the Explanation of Significant Difference (ESD) included SVE treatment of contaminated soil. UniFirst submitted a revised Vapor Extraction Pilot Test Work Plan and Quality Assurance Project Plan (QAPP) and subsequent Addendum to the Pilot Test Work Plan in July 2012 and September 2012, respectively (The Johnson Co., 2012a, 2012b and 2012c). The work plan describes the pilot test program, which includes installation of SVE and soil vapor monitoring (SVM) points, and both step and constant rate testing of installed SVE points.

SVE pilot testing was conducted between October 2012 and November 2012 , with EPA oversight, for the following purposes: estimating radius of influence at extraction points and flow velocities at various vacuum levels; identifying potential interferences; assessing possible anisotropy; evaluating potential localized groundwater mounding; estimating anticipated extracted VOC concentrations; estimating VOC mass removal; and determining appropriate technologies for full-scale design (The Johnson Co., 2013a). The completed pilot testing activities included:

- Pre-testing;
- SVE and SVM point installation;
- Soil sampling, laboratory analysis and field hydrophobic dye testing for the presence of non-aqueous phase liquid (NAPL);
- Step and constant rate testing; and
- Extracted vapor treatment and monitoring.

A total of four SVE test points and 33 SVM observation points were installed during the pilot test program (The Johnson Co., 2013a). SVE, SVM and soil boring locations are depicted in Figure 6. SVE points were successfully installed near the northeast corner of the UniFirst building (i.e., "waste-oil contamination area"), near the former loading dock area in Building B (an area with NAPL present), near the former "gutter" in Building B, and west of the original exterior perimeter footing of Building B (The Johnson Co., 2013a). Attempts to install a fifth SVE point (SVE-5) outside of Building B were unsuccessful due to concrete and/or bedrock encountered at shallow depths. Concentrations of VOCs detected in soil samples collected during the pilot test program were consistent with previously identified areas of VOC-impacted soil material (The Johnson Co., 2013a).

Based on the results of the pilot test, UniFirst submitted a Soil Vapor Extraction System Design Report in May 2014 (The Johnson Co., 2014) containing a summary of the engineering design for the proposed SVE system. On June 10, 2014, EPA approved the SVE design. In August 2014, UniFirst mobilized and began implementation of the SVE design on the property with periodic field oversight by EPA.

Wildwood Property

Groundwater & Soil Remedies

In accordance with the approved design, Beatrice continues to operate its pump & treatment system coupled with their SVE and Air Sparging treatment system at the Wildwood property. A site and well location map for the Wildwood property is included as Figure 7. In November 2013, Beatrice submitted their "Work Plan to Expand Air Sparge System in Area of Well BSW-1." EPA approved this work plan in December 2013 and Beatrice mobilized to install and monitor the enhancements in June 2014. Beatrice installed additional monitoring wells along its eastern and southeastern boundaries of the Wildwood property and periodically collected water quality and level measurements on the property between 2011 and 2013. In May 2014, Beatrice submitted a Hydraulic Capture Zone Evaluation, which continues to demonstrate limited capture on the property. In May 2014, Beatrice also submitted a Technical Memorandum in response to EPA's 2009 comments regarding potential optimization/enhancements to existing treatment systems. These May 2014 submittals are in the process of being reviewed by EPA.

At the Wildwood property, Beatrice has submitted the following documents over the past five years:

- Focused Data Gap Investigation (2010)
- Expand Air Sparge System in Area of Well BSW-1 (2013)
- Installation of River Monitoring Wells and Geophysical Investigation (2011)
- Monitoring Well Installation and MNA Groundwater Sampling
- Hydraulic Capture Zone Evaluation (2014)
- Tech. Memo. – In-Situ Remediation Alternative Evaluation (2014)

Olympia Property

Olympia is currently treating the TCE release at the Olympia property using ISCO via sodium permanganate ($NaMnO_4$) injection inside an approximately 180 feet long by 100 feet wide sheet pile enclosure in the Former Drum Disposal Area (FDDA). Additional on-site groundwater monitoring wells were installed and the groundwater continues to be routinely monitored to determine the effectiveness of this ongoing remedial action. Monitoring well locations are included in Figure 8.

The following summarizes PRP activities that have taken place during the evaluation period of the fourth FYR (GeoInsight, 2014):

- Focused $NaMnO_4$ Injection Events
    - 16th Injection (November, 2009)
    - 17th Injection (June, 2010)
    - 18th Injection (November, 2010)
    - 19th Injection (June, 2011)
    - 20th Injection (November, 2011)
    - 21st Injection (June, 2012)
    - 22nd Injection (November, 2012)
    - 23rd Injection (November, 2013)
    - 24th Injection (July, 2014)

- Groundwater Monitoring
    - Focused sampling event (March, 2009)
    - Focused sampling event (April, 2009)
    - Focused sampling event (May, 2009)
    - Focused sampling event (November, 2009)
    - Focused sampling event (February, 2010)
    - Focused sampling event (September, 2010)
    - Focused sampling event (March, 2011)
    - Focused sampling event (October, 2011)
    - Focused sampling event (November, 2011)
    - Focused sampling event (April, 2012)

    - Focused sampling event (August, 2012)
    - Focused sampling event (March, 2013)
    - Focused sampling event (July, 2013)
    - Focused sampling event (March, 2014)

- Additional Assessment Activities
    - Subsurface investigation activities (SB-800 series soil borings) (June 2010)
    - Subsurface investigation activities (SB-900 series soil borings) (November 2010)

System Operation/Operation and Maintenance Activities

Descriptions of O&M activities conducted during the previous five years are provided below for UniFirst, Grace, Wildwood and Olympia properties. NEP has provided the results of groundwater monitoring activities; however no O&M activities have occurred at NEP property since the shutdown of their AS/SVE system in 2000. Additional descriptions of previous O&M activities are provided in Appendix A.

Grace Property

From September 1992 to May 2002, the Grace property treatment system consisted of both particulate filtration and ultraviolet/chemical oxidation (UV/Ox). The UV/Ox component was reliable and effective; however, to simplify the treatment system operation and lower operating costs, additional technologies were evaluated in 2002 (Tetra Tech & JG, 2013b). Grace selected liquid phase granular activated carbon (GAC) to replace the UV/Ox technology and, following EPA approval, began operation of the combined filtration and GAC system in May 2002.

During the previous five years, the system has operated with limited downtime. System downtime was generally a result of the following:

- Power outages;
- Carbon change-out;
- System alarms (e.g., air pressure alarm, low pressure alarm, high water level alarm, sump alarm, compressor alarm, etc.);
- High equalization tank level;
- Compressor replacement;
- Cracked bag filter housing unit;
- Transfer pump malfunction; and
- Utility work.

Maintenance activities conducted during the previous five years primarily included:

- Cleaning air regulators;

- Cleaning/replacing flow meters;
- Air compressor maintenance;
- Compressor maintenance;
- Well, transfer and sump pump cleaning, repair and/or replacement;
- Installation of replacement fire alarm panel;
- Telecommunication line repairs;
- Sewer line and sewer ejector repairs; and
- Exhaust fan repairs.

As previously described, the most significant modification to the Grace property treatment system during the previous five years was the deepening and redevelopment of recovery well RW22 in an effort to increase the flow rate and zone of influence.

The O&M for the Grace property includes monthly sampling of the treatment system at the first (primary unit) and second (secondary) GAC vessel effluent, monthly influent sampling, and annual sampling of 10 monitoring wells, 6 recovery wells and Snyder Creek (discharge point) (Tetra Tech & JG, 2013b).[1] During the previous five years, additional monitoring wells have been included in the annual sampling events for various reasons including:

- Recovery Well RW22 shutdown evaluation (2009 through 2013 sampling events);
- Area 2 & 3 shutdown evaluation (2011 through 2013 sampling events);
- Area 2 & 3 enhancement activities (2011 through 2013 sampling events);
- Obtaining additional water quality information (2011 through 2013 sampling events); and
- Supporting assessment of vapor intrusion (2011 through 2013 sampling events).

Annual groundwater monitoring continues to be used to evaluate residual VOC concentrations in groundwater. Overall, monitoring activities continue to show reductions in the concentrations of VOCs below ROD action levels at many well locations. However, one Area 1 monitoring well (G16S), located upgradient of the Area 2 and 3 recovery system, has shown a slight upward trend in TCE concentrations (increasing from non-detect in March 1989 to 68 µg/L in May 2013), in excess of the ROD action level of 5 µg/L.

To date, the system has treated over 79 million gallons of water, with the volume removed remaining relatively consistent since initiation of groundwater treatment in 1992 (Tetra Tech & JG, 2013b). The estimated VOC mass removal has also been relatively stable during the previous five years, ranging from approximately 1.0 pound (0.09 gallons) to 1.61 pounds (0.14 gallons) over that time period.

[1] Two of the 12 monitoring wells designated for annual monitoring were abandoned in 2006. As a result, the long-term monitoring plan was revised to include ten monitoring wells in the annual sampling program.

UniFirst Property

UniFirst's deep bedrock groundwater extraction and treatment system continues to operate. Bi-monthly samples are taken from the treatment system influent and monthly samples are taken from the treatment system effluent. Routine O&M includes weekly system inspections, quarterly sensor checks, and annual inspection and maintenance (UniFirst, 2013).

At the time of the second FYR Site Inspection, the groundwater extraction well pump had undergone replacement due to recent failure. The replacement pump was not capable of lowering the groundwater table to the design elevation of 15 feet above mean sea level (AMSL) (Cosgrave, 2004). However, subsequent documentation indicated that the design elevation was eventually attained following system adjustments (HPS, 2004).

During the previous five years the system has operated with limited downtime. The system was reportedly online between 93 and greater than 99-percent of the time (HPS, 2009 and 2010; UniFirst, 2011, 2012 and 2013). System downtime was generally a result of the following:

- Power outages (includes significant outage due to Hurricane Sandy);
- Piping failures;
- Fitting failures (e.g., split sample port fitting);
- Valve leaks;
- Pump issues/failures (includes clamp failure, motor failure and downtime in association with UC22 restart evaluation in May 2012); and
- Response to alarms (e.g., high level alarm).

Non-routine maintenance activities conducted during the previous five years included:

- Reattachment of pump to discharge line with threaded fitting (February 2010);
- Replacement of Tank #4 (April 2010);
- Replacement / repair of well covers, road boxes and pads (June 2010);
- Well pump replacement (September 2010);
- Well pump replacement (February 2011);
- Well pump replacement (April 2012);
- Replacement of some electrical components following Hurricane Sandy (November 2012);
- Datalogger replacement (February 2013); and
- Removal of accumulated material (265 gallons of water and solids) from the backwash settling tank (January 2014).

The following system modifications were reported by the PRP during the previous five years:

- Removal of valves B5 and B12, as well as the diaphragm check valve between B3 and B12. These items were reportedly installed to protect the former UV/Ox unit from undue pressure. The O&M manual was updated accordingly (HPS, 2009).
- In April 2010, Carbon Tank #4 was found to have a damaged polyethylene liner. As a result, a replacement tank was manufactured and installed and each carbon tank was modified to accommodate relief valves to mitigate potential excessive vacuum in the future (HPS, 2010).

No additional system modifications were reported between 2011 and 2013.

To date, the system has treated over 439 million gallons of water (UniFirst, 2013). As previously described, additional extraction well installation and testing activities are currently underway at the UniFirst property. Ultimately, the additional extraction well will be incorporated into the existing treatment system. The O&M Plan will also be modified to describe incorporation of the new extraction well. The modified O&M Plan will be submitted to EPA following completion of the activities described in the approved work plan.

Wildwood Property

The Wildwood property AS/SVE and bedrock groundwater extraction and treatment system continued to operate during the previous five years. Monitoring activities at Wildwood property include analysis of process water, process vapor and groundwater. Monthly process monitoring activities are conducted for the treatment system. Monthly monitoring activities include:

- Groundwater extraction/treatment system
    - Pressure readings
    - Influent and effluent sampling
- Air sparging system
    - Flow readings
    - Pressure readings
- Vapor extraction/treatment system
    - Vacuum readings
    - Flow readings
    - Analytical sampling of air from influent, lead carbon effluent, total effluent
    - PID readings of ambient air

Groundwater monitoring well sampling is conducted quarterly for a select number of wells and annually for a larger selection of wells.

Olympia Property

As previously noted, the PRP for Olympia property is treating TCE-contaminated soil using ISCO via permanganate injection inside an approximately 180 feet long by 100 feet wide sheet

pile enclosure in the FDDA. Additional on-site groundwater monitoring wells were installed and the groundwater continues to be routinely monitored to determine the effectiveness of this ongoing remedial action. Monitoring well locations are included in Figure 8.

III. FIVE-YEAR REVIEW PROCESS

This section describes the activities performed during the FYR process and provides a summary of findings.

Administrative Components

The Wells G&H Superfund Site FYR was led by Joseph F. LeMay of the EPA, RPM for the Site. Jennifer McWeeney, of the MassDEP, assisted in the review as the representative for the support agency.

The review, which began on 6/26/2014, consisted of the following components:

- Community Involvement;
- Review of Site-Related Documents;
- Review of Site Monitoring Data;
- Review of Applicable or Relevant and Appropriate Requirements (ARARs) and Other Standards;
- Inspection of the Site and Management System Review (MSR);
- Interviews with Key Stakeholders; and
- FYR Report Development and Review.

Community Notification and Involvement

A notice was published in the local newspaper, the "The Boston Globe", on 2/13/2014, stating that there was a FYR and inviting the public to submit any comments to the EPA.

Over the last five years, community interest in the Site has been relatively low, with interest centered on evaluation of the potential for vapor intrusion and potential reuse of the Grace property. Public involvement/interest in progress of the OU-1 remedies has been limited. Interviews for this FYR with various members of the local government and community were conducted throughout the month of August 2014. The results of the interviews are described further below. Since the last FYR, EPA has issued several fact sheets and press releases regarding site progress.

The results of the review and the report will be made available at the Site information repository located at the Woburn Public Library, 45 Pleasant Street, Woburn, Massachusetts 01801 and the OSRR Records and Information Center, 1st Floor, 5 Post Office Square, Suite 100 (HSC), Boston, Massachusetts 02109-3912.

Review of Site-Related Documents

This FYR included a review of documents relevant to the history and status of the Site. The document review included the following documents:

- Endangerment Assessment for the Wells G&H Site, Woburn, Massachusetts. Prepared for EBASCO Services, Incorporated, Lyndhurst, New Jersey. Prepared by: Clement Associates, Fairfax, Virginia. December 1988.
- Record of Decision (September 14, 1989)
- Consent Decree, Civil Action No. 91-11807MA and RD/RA SOW (1991)
- Explanation of Significant Difference (April 25, 1991)
- Five-Year Review Report, Wells G&H Superfund Site (September 24, 2009)
- Addendum to Third Five-Year Review, Wells G&H Superfund Site (April 2012; EPA 2012a)
- Latest Annual Performance Evaluation and Source Control Reports for the Source Area (OU-1) properties:
    - W.R. Grace Remedial Action, Annual Report, November 15, 2013
    - RD/RA Year 21 Annual Report for the UniFirst property, November 15, 2013
    - Annual Report – Year 10 through Year 14, RD/RA for Wildwood Property, April 23, 2014
    - Groundwater Monitoring Report, New England Plastics Corporation, September 2013
- Human Health Risk Assessment Report for Vapor Intrusion Pathway (April 2012)
- Assessment of Coordinated Groundwater Remedies Operable Unit One – Northeast Quadrant (December 17, 2010)
- Areas 2, 3 & 4 Enhancement Evaluation Report, W.R. Grace & Co.-Conn. Property (March 8, 2011)
- Soil Response Action Completion Report, Revision 1, W.R. Grace & Co.-Conn. Property (July 3, 2013)
- Vapor Extraction Pilot Test Summary Report, UniFirst Property (February 22, 2013)
- Vapor Intrusion Monitoring Results, Commercial Property 260206 (May 15, 2013 and April 28, 2014)
- Soil Vapor Extraction System Design Report, UniFirst Property (May 2, 2014)
- Extraction Well Installation Work Plan, UniFirst Property (May 20, 2014)

Additional documents and information sources used in the preparation of this report are listed in Appendix B. Applicable soil and groundwater cleanup standards, as listed in the ROD dated September 14, 1989, were also reviewed.

Review of Site Monitoring Data

Groundwater monitoring has been performed for a number of years at each of the Source Areas. Specific dates when sampling was initiated and conducted varies for each of these properties. The following table provides a summary of current maximum detections of contaminants in excess of ROD action levels by Source Area:

Table 4: Current Maximum Groundwater Contaminant Concentrations Above ROD Action Levels by Property

Source Area Property	Contaminant	ROD Action Level	Well Location (Maximum Detection) (1)	Date of Current Maximum Detected Concentration	Current Maximum Detected Concentrations
		µg/L			µg/L
Grace	cis-1,2-DCE	70	RW22RE	5/9/2013	150
	PCE	5	RW20	5/9/2013	15 (2)
	TCE	5	G16S	4/20/2012	68 (3)
	Vinyl Chloride	2	RW22RE	5/9/2013	ND (<4.0) (4)
UniFirst	cis-1,2-DCE	70	UC11-2	4/24/2013	370
	PCE	5	UC5	4/30/2013	2,900
	TCE	5	UC7-2	4/30/2013	380
NEP	PCE	5	NEP-101	7/30/2013	15
Wildwood	TCE	5	BW18RD(LO)	10/21/2013	11,200
Olympia	cis-1,2-DCE	70	MW-207S	3/21/2014	1,100
	PCE	5	MW-208D	3/21/2014	210
	TCE	5	MW-208D	3/21/2014	8,200
	Vinyl Chloride	2	MW-207S	3/21/2014	74

Notes:
(1) On-property well.
(2) RW20 is an Area 3 recovery well. Maximum detection for a monitoring well(s) was 10 µg/L in monitoring wells G38S and G38D on May 8, 2013. Detections of PCE along the southern Area 3 boundary are reportedly associated with an off-site contaminant source.
(3) The maximum detected TCE concentration for wells sampled in 2012 was 150 µg/L at G19M; however this well was not sampled in 2013.
(4) Vinyl chloride was not reported above the ROD action level in 2013; however some elevated detection limits continue to be reported. The highest detection limit is listed for reference as vinyl chloride could be present above the ROD action level at these locations.

The discussions below provide further detail and summarizes the results of groundwater monitoring by Source Area property. The evaluations of the groundwater monitoring database for each property takes into consideration the overall concentration trends of the contaminants of concern (COCs) since initiation of remedial activities, as well as current trends in concentrations over the last five years.

Grace Property

Grace property well locations are included in Figure 3. For soil, Grace conducted contaminant delineation activities in 2011 and response actions in 2012. Soil excavation and off-site disposal activities implemented at Grace property subsequent to the third FYR are discussed in Section II and presented in Figure 4. Soil with contaminant concentrations in excess of ROD action levels

was removed and no further response actions for soil are currently required at the Grace property.

The groundwater monitoring program formerly included annual sampling and analysis of groundwater from 10 monitoring wells and eight pumping wells (GeoTrans, 2002). Subsequent to EPA approval of a revised Long Term Monitoring (LTM) Plan on April 11, 2004, the groundwater monitoring program was modified to include annual sampling and chemical analysis of groundwater from a total of 12 monitoring wells and six pumping wells. Two of the twelve monitoring wells designated for annual monitoring were abandoned in 2006. As a result, the LTM Plan was revised to include 10 monitoring wells and six pumping wells in the annual sampling program.

During the previous five years, additional monitoring wells have been installed and additional existing monitoring wells have been included in the annual sampling events. The additional well installation and sampling activities support various activities and evaluations at Grace property, including additional data collection in response to EPA review regarding the extent of groundwater capture. Expanded groundwater monitoring has been conducted during this FYR period in association with the following general activities:

- Recovery Well RW22 shutdown evaluation (2009 through 2013 sampling events);
- Area 2 & 3 shutdown evaluation (2011 through 2013 sampling events);
- Area 2 & 3 enhancement activities (2011 through 2013 sampling events);
- Obtaining additional water quality information (2011 through 2013 sampling events); and
- Supporting assessment of vapor intrusion (2011 through 2013 sampling events).

The available database shows that overall concentrations of VOCs in groundwater appear to be decreasing at Grace property. Of the 10 monitoring wells currently included in the sampling program (G11S, G11D, G12S, G12D, G23S, G23D, G36D, G36DBR, G36DB2 and G36S), VOC concentrations have dropped significantly since the initiation of groundwater extraction in 1992. Nonetheless, since the third FYR in 2009, groundwater contaminant concentrations equal to or in excess of ROD action levels have been observed in three of the 10 wells currently being monitored (G23D, G36DBR and G36DB2).[2]

In general, on-property monitoring wells in which contaminant concentrations in excess of ROD action levels have been detected over this FYR period, both routinely monitored and other, include: G1DB, G1DB3, G13D, G16S, G16D, G19M , G19D, G20S, G20M, G20D, G23D, G24S, G24D, G28D, G29S, G36DBR, G36DB2, G37S, G37D, G38S and G38D.[3] Three monitoring wells (G11D, G22D and G28S) exhibiting exceedances prior to the issuance of the third FYR have not exceeded ROD actions levels during this FYR period. One monitoring well (G16S), not cited in the third FYR, has shown an increasing trend in TCE concentrations

[2] With the exception of the 2011 annual sampling event, monitoring wells G11S and G23S were dry at the time of LTM Plan sampling activities during the previous five years. Both wells were non-detect for VOCs in 2011.
[3] Six monitoring wells (G3D, G3DB, G4D, G15D, G34D and G35DB) noting as exhibiting exceedances of ROD action levels during the third FYR were not sampled during this FYR period.

(increasing from non-detect in March 1989 to 68 µg/L in May 2013) in excess of the ROD action level of 5 µg/L. Sampling of monitoring wells G37S, G37D, G38S and G38D was initiated in 2010.

Since the third FYR in 2009, TCE was detected in each of 18 on-property monitoring wells at concentrations above the TCE action levels of 5 µg/L. Detected maximum concentrations of TCE during this review period vary over time and from monitoring well to monitoring well, and range from approximately 6.1 µg/L (G23D) to 300 µg/L (G19D). Consistent with the third FYR, monitoring well G19D continues to exhibit the highest concentrations of TCE, although concentrations have shown a decreasing trend following a high of 530 µg/L in June 2008. These data also show that PCE has been detected above or equal to its respective ROD action level of 5 µg/L in two on-property monitoring wells over the reporting period at concentrations of 30 µg/L (G38D) and 31 µg/L (G38S). In addition, cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride have been detected in excess of ROD action levels at maximum concentrations ranging from 100 µg/L to 350 µg/L and 4.8 µg/L to 18 µg/L, respectively. The ROD specified action levels for cis-1,2-DCE and vinyl chloride are 70 µg/L and 2 µg/L, respectively.[4]

Groundwater from the six routinely monitored pumping wells at Grace property (RW-10, RW-12, RW-13, RW-17, RW-20, and RW-22RE) has been found to contain TCE (2 out of 6 wells) and PCE (4 out of 6 wells) above ROD action levels. Maximum concentrations of TCE and PCE in the routinely monitored recovery wells ranged from 9.4 µg/L (RW-17) to 220 µg/L (RW-22RE) and 9.0 µg/L (RW-10) to 21 µg/L (RW-13), respectively. The highest VOC concentrations detected at Grace property have been encountered in groundwater from pumping well RW-22RE. Detections of 1,2-DCE and vinyl chloride have also been encountered in RW-22RE groundwater during this FYR period at maximum concentrations of 500 µg/L and 27 µg/L, respectively.

During this review period, the PRP sampled additional pumping wells, including RW-7, RW-8, RW-9, RW-11, RW-14, RW-15, RW-16, RW-18, RW-19 and RW-21. TCE was not detected in these recovery wells over the ROD action level of 5 µg/L during this FYR period. PCE was detected above the ROD action level of 5 µg/L in recovery wells RW-14, RW-15 and RW-19 at concentrations ranging from 7.3 µg/L (RW-19) to 19 µg/L (RW-14).

Samples collected from the shallower monitoring wells (overburden and shallow bedrock) at Grace property have primarily been found to be non-detect for the COCs or have had concentrations below ROD action levels. The exceptions include the G13, G16 and G24 well clusters, which continue to exhibit ROD action level exceedances for TCE. . Deeper contaminated groundwater emanating from Grace property is reported to be captured by the deeper groundwater recovery system operated at UniFirst property.

The arsenic MCL changed from 50 µg/L to 10 µg/L prior to the third FYR. Arsenic was not previously targeted for cleanup based on the prior MCL. In addition, manganese was not identified as a COC in OU-1 groundwater under the 1988 Endangerment Assessment (Ebasco,

[4] Instances of reported detection limits for vinyl chloride in excess of the ROD action level have occurred during the previous five years; however elevated detection limits have only been reported for wells that have historically and continue to exhibit exceedances of ROD-specified action levels for vinyl chloride or other VOCs.

1988). Manganese toxicity values have been reduced by a factor of 10 since the assessment. Future exposures to manganese in groundwater may exceed EPA's Lifetime Health Advisory.

In response to EPA's May 14, 2009 letter and the Third FYR, Grace discussed the results of the 2006 groundwater sampling for arsenic and manganese in its 2009 Annual Monitoring Report. Prior to abandonment, groundwater samples were collected form thirteen monitoring wells. The MCL for arsenic was exceeded in only two of the 13 monitoring wells sampled for metals at the Grace property in 2006 (i.e., G15D at 0.0161 mg/L and G15S at 0.0136 mg/L. The EPA health advisory of 0.3 mg/L was exceeded in three of the 13 wells sampled in 2006 for metals (i.e., G25S, G15S, and G15D) at concentrations ranging from 0.745 mg/L to 1.301 mg/L. No groundwater samples were collected and analyzed for arsenic and manganese at the Grace property during this FYR period.

Tetra Tech & JG Environmental (2013b) calculated the mass of VOCs removed from the subsurface for September 4, 2012 through September 3, 2013. The calculated total mass removed in that period was 1.38 pounds. The calculation was based on influent concentrations of detected VOCs and the total volume of groundwater treated (approximately 4,015,314 gallons) during that period. Values reported as below the detection limit were assumed to be zero in all calculations consistent with prior similar calculations for the Grace property.

As deeper contaminated groundwater emanating from the Grace property is reported to be captured by the deeper groundwater recovery system operated at UniFirst property, an estimated mass flux of VOCs in the deeper bedrock groundwater of 0.4 pounds per year (lb/yr) was calculated for the 2013 annual reporting period (Tetra Tech & JG, 2013b). This is significantly less than the calculated pre-remedy off-property mass flux of VOCs for the unconsolidated and bedrock deposits was estimated to be 15.3 lb/yr in 1985 (GeoTrans, 1987) and 10.7 lb/yr in 1991 (EPC, 1991).

The recovery wells average flow rates ranged from approximately 7.4 gallons per minute (gpm) to 9.9 gpm during this FYR period. Total gallons pumped over the 5-year period is 21.3 million gallons and total mass of VOC removed during the 5-year period is approximately 6.7 lbs. The estimated total mass of VOCs that was removed from groundwater beneath Grace property during the 21 years of operation is 89.0 pounds (7.7 gallons).

UniFirst Property

Soil Vapor Extraction

UniFirst submitted a Soil Vapor Extraction System Design Report in May 2014 containing a summary of the engineering design of a proposed SVE system, including a draft Operation, Maintenance and Monitoring Plan. On June 10, 2014, EPA approved the SVE design. In August 2014, UniFirst mobilized and began implementation of the SVE design on the property, with periodic field oversight by EPA. EPA anticipates the SVE system will be constructed and fully operational by the end of 2014.

Groundwater Monitoring

The groundwater monitoring program at UniFirst property currently includes sampling of 37 monitoring wells and subsequent chemical analysis for VOCs.[5] UniFirst property well locations are depicted on Figure 5. Over the years since active groundwater pumping has been conducted, variations to the list of wells included in the sampling program have been implemented. Most recently, wells were added to the LTM program at the request of EPA in 2011 and in support of VI assessment as documented in the Addendum to Third FYR dated April 2012.

Currently, there is only one groundwater extraction well operated on UniFirst property (UC22), which is pumping at a rate of approximately 39.8 gpm (UniFirst, 2013). Based on discussions with EPA and in response to follow-up actions raised in the third FYR regarding system performance claims and groundwater capture, UniFirst submitted an Extraction Well Installation Work Plan in May 2014 (The Johnson Co., 2014a). The work plan described the rationale, objectives and implementation procedures for the installation and testing of one new extraction well, three piezometer clusters and associated hydraulic testing (slug and pump testing) (The Johnson Co., 2014a). The primary objective of the supplemental extraction well installation activities is to collect the necessary data and supplement the exiting treatment system to ensure groundwater capture at the southwest corner of the UniFirst property. On June 10, 2014, EPA approved the Extraction Well Installation Work Plan. In July 2014, UniFirst mobilized and began implementation of the work plan on the property with periodic field oversight by EPA.

A review of the data available prior to and since startup of active groundwater pumping shows that contaminant concentrations have not changed significantly in some of the routinely monitored wells. Examples include wells UC7-1 and UC7-2, which had PCE concentrations of approximately 2,800 µg/L and 2,900 µg/L, respectively, in 1991 and PCE concentrations of 2,100 µg/L and 2,000 µg/L, respectively in 2013. Other on-property wells which do not appear to show a significant decrease in concentrations or have shown concentration increases for one or more COC include, UC5, UC7-3 through UC7-5, UC10-1 through UC10-5, UC29D and UG10. In locations where decreasing contaminant concentrations have been encountered, concentrations generally remain above ROD action levels.

A total of 33 of the 37 monitoring wells (both on- and off-property) currently included in the LTM program were successfully sampled during the April 2013 monitoring event. Of those 33 wells, nine wells (including both on- and off-property wells) exhibited VOC concentrations below ROD action levels during this FYR period including: UC4, UC10S, UC10M, UC10D, UC19, UC19M, UG14, S70S and S70D. The remaining wells have exhibited concentrations of total 1,2-DCE (primarily cis-1,2-DCE), PCE and/or TCE in excess of ROD action levels during one or more sampling events during this FYR period. Over the last five years, maximum concentrations of cis-1,2-DCE, PCE and TCE in on-property monitoring wells have ranged from 96 µg/L (UC10-4) to 540 µg/L (UC10-1), 5.2 µg/L (UC30) to 2,500 µg/L (UC7-1) and 16 µg/L (UC6 and UC26D) to 450 µg/L (UC7-2), respectively.

[5] As noted in the RD/RA Year 21 Annual Report for the UniFirst Site dated November 15, 2013, select monitoring wells included in the LTM program may not be sampled as the monitoring well was dry (e.g., UC34, UC35 and UC36) and/or an inability to sample the well (e.g., UG1-4).

Shallow groundwater within the unconsolidated deposits appears to contain lower concentrations of the COCs than deeper groundwater located within the bedrock. For example, as noted above, shallow wells UC10S, UC10M, UC10D, UC19M and S70S have had concentrations of the COCs repeatedly below ROD action levels for several rounds of sampling. It should be noted that three of these five wells (UC10S, UC10M and S70S) exhibited non-detectable concentrations of VOCs during their respective earliest sampling events.

No groundwater samples were collected and analyzed for arsenic and manganese at UniFirst property during this FYR, although changes to the MCL for arsenic and toxicity values for manganese were noted in the third FYR.

During the 2013 annual sampling event, 16 on-property monitoring wells were assessed for the presence of dense non-aqueous phase liquid (DNAPL) (UniFirst, 2013). In addition, sumps in two SVM points (SVM-12 and SVM-13) were also assessed (UniFirst, 2013). DNAPL was not present in any of these wells; however free product has been observed in monitoring well UC8 and groundwater concentrations in monitoring well UC7 suggest the presence of DNAPL (UniFirst, 2013).

Vapor Intrusion Pathway

The Addendum to Third FYR concluded that the VI pathway is not likely to pose unacceptable current indoor air risk at and downgradient of/near UniFirst property, including all downgradient residential buildings. It also concluded that the VI pathway is unlikely to pose an unacceptable future risk at buildings downgradient of/near UniFirst property, including all downgradient residential buildings. However, subslab soil gas concentrations of PCE beneath commercial buildings 260207 and 260206 were determined to be high compared to soil gas VI screening levels. In addition, subslab soil gas concentrations of TCE beneath commercial building 260207 were determined to be high compared to soil gas VI screening levels. While not a current exposure risk, the presence of elevated concentrations of PCE and TCE in subslab soil gas beneath commercial building 260207, and elevated concentrations of PCE in subslab soil gas beneath commercial building 260206, indicated a potential for a future VI pathway to the indoor air if buildings conditions were to change (e.g., future cracks could form in the foundation/subslab such that soil gas could more easily travel into the building, etc.). As a result, annual monitoring of the subslab and indoor air at Building 260206 was included in the Addendum to Third FYR. Annual subslab soil gas and indoor air monitoring of the existing building 260207 should commence following completion of the in-situ volatilization remedy at UniFirst property, in accordance with the recommendations of the Addendum to Third FYR and as described herein.

Two annual subslab soil gas and indoor air sampling events have been conducted at existing commercial building 260206 since issuance of the Addendum to Third FYR in April 2012. During the sampling events in March 2013 and February 2014, three indoor air samples, one to two ambient air samples and three subslab soil gas samples were collected for laboratory VOC analysis. Consistent with the vapor intrusion assessment applied in the FYR Addendum, the 2013 and 2014 indoor air samples were evaluated and determined to be within acceptable human health risk ranges. For example, indoor air PCE results have remained relatively consistent at

1.23 µg/m^3 in 2011 and 1.57 µg/m^3 in 2014. In addition, subslab soil gas PCE concentrations have decreases from 5,730 µg/m3 in 2011 to 2,830 µg/m3 in 2014 at the building immediately west/downgradient/near the UniFirst property. As a result, the VI pathway is unlikely to pose unacceptable current risk.

As previously noted, UniFirst has continued monitoring off-property groundwater, as well as subslab soil gas and indoor air, to confirm that there are no potential VI pathways. In the future, EPA anticipates off-property groundwater, subslab soil gas and indoor air monitoring will continue annually and be reported in UniFirst's annual monitoring reports.

Treatment System Mass Removal

UniFirst calculated the total mass of contaminant removed using the average of the influent concentrations of the contaminants and monthly flows from extraction well UC-22. Approximately 33.1 pounds of PCE and 1.7 pounds of TCE were removed during the twenty-first operational year (UniFirst, 2013). Approximately 0.2 pounds of 1,1,1-trichloroethane (1,1,1-TCA), 0.3 pounds of 1,2-DCE, and 0.2 pounds of 1,1-dichloroethene (1,1-DCE) were removed from the subsurface by the extraction and treatment system during the twenty-first year of operation (UniFirst, 2013). During the twenty-first operational year, approximately 20.9 million gallons of groundwater were extracted from UC-22 (UniFirst, 2013). The total gallons pumped over the review period is approximately 110.25 million gallons. During the 21 years of UniFirst property groundwater treatment system operations (which includes capturing deep bedrock contamination from the Grace property), approximately 2,203 pounds of PCE and 108 pounds of TCE have been removed.

NEP Property

NEP operated the AS/SVE source control remedy from February 2, 1998 to March 7, 2000. Since the shutdown of the remedial system at NEP property, ongoing groundwater monitoring is being performed to evaluate trends in contaminant concentrations. Well locations at NEP property are depicted on Figure 9. Operation of the AS/SVE system reduced concentrations of the COCs detected in groundwater beneath the NEP property significantly, with maximum concentrations of total chlorinated VOCs detected in overburden well NEP-101 being reduced from 10,908 µg/L in April 1995 (pre-purge) to a range of 15 µg/L to 68 µg/L during this FYR period (Woodard & Curran, 2013). Concentration reductions have also been noted in groundwater within the PRP's routinely monitored bedrock well network. For example, total VOC concentrations in bedrock well NEP-101B have reduced from 544 µg/L in August 1996 to 2.9 µg/L in July 2013 (Woodard & Curran, 2013).

Although significant reductions of groundwater contaminant concentrations have been achieved, exceedances of ROD action levels remain in the current monitoring network at NEP property. The predominant chlorinated VOC in groundwater at NEP property is PCE (ROD action level of 5 µg/L). During this FYR period, detections of PCE have exceeded the ROD action level in unconsolidated monitoring wells EW-1 and NEP-101 and bedrock monitoring wells NEP-101B,

NEP-104B and NEP-106B (Woodard & Curran, 2010, 2011 and 2013).[6] TCE was not detected above the ROD action level of 5 µg/L during this FYR period. In the most recent round of groundwater monitoring in July 2013, PCE was detected in excess of the ROD action level in EW-1 (6.3 µg/L), NEP-101 (15 µg/L) and NEP-104B (8.0 µg/L). No significant increasing trend is noted to have occurred since turning off the AS/SVE system in March 2000.

Groundwater samples were previously collected and analyzed for arsenic and manganese at NEP property. Based upon the review of these data, EPA has concluded that there is not an exceedance of the arsenic MCL or the manganese health advisory at NEP property.

As documented in the Addendum to Third FYR, in September 2010, NEP installed two new shallow groundwater monitoring wells on nearby residential properties located downgradient of the NEP property. In October 2010, NEP collected groundwater samples from these two new monitoring wells and from 17 existing monitoring wells located within the NEP property. In April 2011, NEP collected a second round of groundwater samples from the two new monitoring wells and one monitoring well located within the NEP property. All of the groundwater samples were analyzed at a laboratory for VOCs. Because no VOCs were detected above EPA's groundwater VI screening levels at the two new monitoring wells, no further investigation was performed downgradient of/near NEP property.

Contaminant mass removal estimates are not included in NEP property annual reporting since active remedial systems are currently shut down.

Wildwood Property

The Wildwood property remediation system uses a combination of AS/SVE and groundwater extraction. The AS/SVE currently operates in three cycles during a 24 hour period. The first cycle operates only the southern-half of the AS/SVE system (8 hours/day); the second cycle operates only the northern-half of the AS/SVE system (8 hours/day); and during the third cycle, the AS/SVE is shut down/not operating (8 hours/day). During operations, the vapor stream enters the treatment facility where moisture is removed at the air water separator and the liquid directed to the influent equalization tank. Additional vapor from the tray air stripper is added to the vapor stream. The vapor stream continues to two 1,500-pound vapor-phase GAC treatment vessels (in series) and then released to the atmosphere. The vapor-phase GAC vessels are changed approximately once per year.

Groundwater is extracted from various recovery wells and combined within the treatment system at an equalization tank. The water stream continues to a tray air stripper, where stripped VOCs are directed to the vapor stream treatment train. The water stream continues through a sand filter and 2,800-pound GAC vessels. Treated water is discharged to a Massachusetts Water Resources Authority (MWRA) sewer line situated within Salem Street.

With an active AS/SVE system on-site, ongoing environmental monitoring at the Wildwood property includes both the groundwater and activities to evaluate potential vapor migration

[6] Groundwater monitoring was not conducted in 2009 or 2012 at NEP.

outside of the treatment area on-site. Groundwater quality is monitored in the overburden to evaluate the effectiveness of the treatment zone created by the AS/SVE system, as well as from the shallow and deeper bedrock to evaluate the impacts of groundwater extraction activities. The potential for vapor migration beyond the engineered cover and SVE systems is performed at specified points over the treatment zone created by the AS/SVE system.

A site and well location map for the Wildwood property is included as Figure 7. Groundwater monitoring activities include quarterly sampling and analysis from 13 wells and annual sampling and analysis from 23 wells. Well locations monitored include extraction wells and monitoring wells located both within the AS/SVE treatment zone and outside of the treatment zone. No groundwater samples were collected and analyzed for arsenic and manganese at the Wildwood property.

Contaminant concentrations in excess of ROD action levels for groundwater persists at most monitoring well locations and within the different aquifer zones (i.e., shallow and intermediate overburden, till, shallow bedrock and deeper bedrock). The overall predominant contaminant detected in overburden groundwater is TCE. While the deeper bedrock zone contains the highest concentrations of contaminants, only two wells screened within the deep bedrock are included in the monitoring program, one of which is an extraction well.

The most recent annual report for Wildwood property prepared by AECOM (2014) documents performance of the remedy through Year 14. This 2014 report concludes that the quantity of total VOCs removed from the groundwater and vapor extraction systems is based on totalized volumes for the vapor and liquid process streams and contaminant concentrations for these streams. The air injection rates from Year 10 to Year 14 ranged between 86–124 standard cubic feet per minute (scfm), while the air extraction rates ranged between 189–193 scfm.

The treatment system influent includes groundwater pumped from the five bedrock extraction wells and periodic batch flows of water collected in the two air-water separators on the SVE system. The total annual volume of water treated from Year 10 to Year 14 ranged between 12.4 to 14.1 million gallons.

Water run through the treatment system is composed of the influent from the subsurface treatment system and water generated by plant operations, sampling, and routine maintenance. Both streams are run through the air stripper prior to discharge. The operation sources include backwash water from the sand filter and the two carbon vessels, and water from the acid-gas scrubber (when the catalytic oxidation unit was in operation). Water generated from general decontamination operations is also collected by the floor drains and transferred into the system for treatment.

AECOM (2014) calculations used to estimate mass removal for the groundwater treatment system assume that the total VOCs are comprised entirely of TCE. Mass removal estimates for groundwater are based on laboratory data combined with the totalized influent flow reading collected at the treatment building. The total calculated mass of VOCs removed from groundwater during Year fourteen operations was 11 pounds of VOCs.

Mass removal estimates for the SVE system are based on laboratory analytical sampling to determine influent and effluent air concentrations converted to parts per million by volume (ppm(v)) for comparison purposes assuming all detected VOCs comprised of TCE. The total mass removed from Year 10 through Year 14 is approximately 86 pounds of VOCs from groundwater and 102 pounds from vapor. The total mass removed at Wildwood property through the end of Year 14 is approximately 279 pounds of VOCs from groundwater and 2,302 pounds from vapor.

Olympia Property

In Spring 2003, EPA reached an agreement with Olympia through an Administrative Order on Consent (AOC) to clean up contaminated soils on the Olympia property. Under the AOC, Olympia excavated and disposed of 56 cubic yards of PCB-contaminated surface soils, and approximately 5 cubic yards of PAH-contaminated soil (called for in the ROD), evaluated various options for addressing the TCE-contaminated soils, and prepared a detailed work plan for cleaning up the TCE by way of in-situ sodium permanganate injection treatment. In June 2004, EPA approved the TCE Work Plan and reached an agreement in a second AOC with Olympia to implement the work.

The major components of the Olympia ISCO removal action include:

- A sheet pile wall installed to a depth of approximately 15 feet around the perimeter of the FDDA (an area approximately 180 feet long and 100 feet wide used to contain impacted groundwater, thereby limiting continued impacts to the Wells G&H aquifer, and to help ensure that oxidant is retained within the area of remedial focus);
- Delivery of sodium permanganate to the silt unit via a multi-depth injection network;
- Multiple applications of oxidant via gravity drainage; and
- Monitoring of groundwater conditions within the FDDA via a network of nested monitoring wells and discrete Geoprobe® water samples.

Cleanup of the TCE contaminated soils is currently underway and is closely monitored by EPA. In 2008, the oxidant delivery approach was enhanced with Geoprobe® (direct push technology) to improve oxidant distribution. Since Fall 2008, the monitoring and injection approach for the FDDA includes 3 month cycles where injections occur from October – December and April – June, while monitoring/evaluation occur from January- March and July-September. This approach is consistent with the revised work plan dated October 2008.

The effectiveness of the cleanup within the FDDA is evaluated by monitoring groundwater quality. Groundwater samples are collected from new and existing monitoring wells and by direct, depth-discrete groundwater sampling using a Geoprobe®. The sampling program includes groundwater samples collected from multiple locations and depths that are representative of the different stratigraphic units within the FDDA monitored over multiple events and time periods.

Well locations at Olympia property are depicted on Figure 8. Of the 68 wells sampled as part of the April 2005 baseline monitoring performed by the PRP prior to initiation of ISCO treatment,

38 had concentrations of PCE and/or TCE, and some cases associated daughter products, in excess of ROD action levels for groundwater. Based on the most recent rounds of groundwater monitoring available for those wells (GeoInsight, 2014), 20 of the 68 wells monitored as part of the April 2005 baseline have PCE/TCE related contaminant concentrations detected in excess of ROD action levels.[7] Three of these wells (i.e., MW-206D, MW-215M and MW-217M) did not exhibit ROD action level exceedances in April 2005, but currently have concentrations of cis-1,2-DCE, TCE and/or vinyl chloride above the ROD action levels. Six wells have shown increases in contaminant concentrations (i.e., cis-1,2-DCE, TCE and/or vinyl chloride) since injections were initiated. Oxidant delivery and monitoring will continue until the cleanup objectives are achieved.

No groundwater samples were collected and analyzed for arsenic and manganese at UniFirst property in association with changes to the MCL for arsenic and toxicity values for manganese identified in the third FYR.

Data Review Summary

Remedial or removal actions have been conducted on the five Source Area Properties. Based on a review of the analytical groundwater data generated to date, COCs persist in groundwater at the Source Area properties at concentrations exceeding ROD action levels. Areas where there may be insufficient capture have been or are actively being address at the UniFirst and Grace properties. In the future, arsenic and manganese groundwater data need to be collected from UniFirst, Grace, Wildwood and Olympia properties to address concerns raised by EPA in the Addendum to the Third FYR.

Potential VI pathways downgradient/near the UniFirst property (i.e., existing commercial building 260206) are currently being addressed with ongoing monitoring pursuant to the Addendum to Third FYR dated April 2012. Based on data collected in 2010 and 2011, the Addendum to the Third FYR concludes that the VI pathway was not likely to pose unacceptable current or future risk downgradient of/near Grace property. No further investigation was performed downgradient of/near NEP property because no VOCs were detected above EPA's groundwater VI screening levels following additional monitoring well installation and sampling in 2010/2011.

Following soil removal activities and based on the results of the associated confirmatory sampling, the excavation activities completed at the Grace property in 2012 successfully removed soil exhibiting contaminant concentrations in excess of ROD action level and no further action to address on-property soils is currently required. UniFirst submitted a Soil Vapor Extraction System Design Report in May 2014 containing a summary of the engineering design of a proposed SVE system, including a draft Operation, Maintenance and Monitoring Plan to address soil impacts. The Design Report is currently under review.

[7] An additional 10 of the 68 monitoring wells reported non-detect concentrations with elevated detection limits in excess of one or more applicable ROD action levels. The majority (8 of 10 occurrences) of the elevated detection limits were reported for wells inside the treatment cell.

Review of ARARs

This FYR includes a review of ARARs to check the impact on the remedy due to changes in standards that were identified as ARARs in the ROD, newly promulgated standards for contaminants of potential concern (COPCs) and TBCs (to be considered) that may affect the protectiveness of the remedy. The tables in Appendix C provide a review of the location, chemical and action-specific ARARs and TBCs. The review is summarized below.

The tables in Appendix C provide an evaluation of ARARs using the regulations and requirement synopses listed in the ROD as a basis. The evaluation includes a determination of whether the regulation is currently an ARAR or TBC and whether the requirements have been met. Most of the listed ARARs remain applicable or relevant and appropriate to the Site and are being complied with. As indicated in the attached tables, some ARARs no longer apply, such as the requirements that applied to the on-site incineration component of the remedy as identified in the ROD. The on-site incineration component was eliminated by the April 1991 ESD.

Since the third FYR, there have been no significant changes to the ARARs that impact the remedy for OU-1; however changes have been made to ARARs since the development of the ROD. The changes are summarized in Appendix C. Regulatory changes that are currently applicable to or have a potential impact on future OU-1 activities include the following:

- The MCL for arsenic in drinking water has decreased since the 1988 Endangerment Assessment. Manganese was not originally identified as a COC in groundwater, but concentrations have historically exceeded the secondary MCL. Arsenic and manganese in OU-1 should be further evaluated to determine if the concentrations are currently associated with a risk above regulatory guidelines. Groundwater is not being used at OU-1; nonetheless, these requirements remain relevant and appropriate.
- The AWQC have been updated since the 1989 ROD (EPA-822-R-02-047 in November 2002, EPA-822-F-03-012 in December 2003 and again in 2009).[8] These criteria, developed under the Clean Water Act (CWA) as guidelines from which states develop water quality standards, remain relevant and appropriate.
- The Massachusetts Wetlands Protection Act (310 CMR 10.00) was most recently amended in July 2009. Although no PRP facility is currently proposing work in a wetland, the regulations remain relevant and appropriate.
- The Massachusetts Groundwater Quality Standards (314 CMR 6.00) regulation has been rescinded as revisions to the Groundwater Discharge Permit Program (314 CMR 5.00), promulgated in March 2009, eliminated the need for this regulation. Therefore, requirements to comply with 314 CMR 5.00 are no longer applicable as the Groundwater Discharge Permit Program regulations are currently relevant.
- The Operation and Maintenance and Pretreatment Standards for Waste Water Treatment Works and Indirect Discharges (314 CMR 12.00) were recently amended in April 2014.

[8] Draft updated National Recommended Water Quality Criteria (NRWQC) are currently under review and are anticipated to be finalized prior to the next FYR.

The Grace, UniFirst and Wildwood properties should continue to conduct proper O&M, sampling and discharge procedures in accordance with this regulation.

No ARAR evaluations were conducted for OU-2 since this OU does not have a signed ROD. Future FYRs for the Industri-Plex Site will perform the ARARs review for the Industri-Plex OU-2 remedy, including Wells G&H OU-3.

Inspection of the Site

The inspection of the Site was conducted on August 12, 2014 (Grace, UniFirst and Olympia properties) and August 22, 2014 (NEP property). In attendance on behalf of Joseph F. LeMay, RPM for EPA, were representatives from TRC including Michael Plumb, P.E. and Jeffrey Hansen, P.H. The following Source Area properties representatives participated during their respective site inspections:

- **Clayton Smith**, Project Coordinator with de Maximis, Incorporated, **Van Sawyer**, Technical Services Manager with Groundwater & Environmental Services, Incorporated (GES), and **Michael Decoteau**, Project Engineer with GES, were present during the site inspection at Grace property on August 12, 2014.
- **Timothy Cosgrave**, Operations and Maintenance Manager with UniFirst property, was present during the site inspection conducted on August 12, 2014;
- **Michael Webster**, Senior Project Manager with GeoInsight, Incorporated, and **Kristen Sarson**, project Scientist with GeoInsight, Inc., were present during the site inspection at Olympia property on August 12, 2014;
- **Jeffrey Hamel**, Project Manager with Woodard & Curran, Incorporated, was present during the site inspection at NEP property on August 22, 2014; and

The purpose of the inspection was to assess the protectiveness of the remedy. Site inspection checklists and associated photographs are included in Appendix D. The inspections included visual inspection of each Source Area property with documentation, as appropriate, of general site information, site access, onsite record keeping and groundwater remedy implementation and monitoring activities.

Overall, the site inspections indicated that remedies at the Source Area properties are being effectively implemented. Pertinent findings are summarized below by Source Area property:

- **Grace Property** – Based on the site inspection and onsite interviews with Clayton Smith (de Maximis), Van Sawyer (GES) and Michael Decoteau (GES), the groundwater treatment system and extraction well pumps are operational. No observations were made during the inspection that call into question the effectiveness or function of the remedy. O&M staff visit the property on a weekly basis and perform monthly recovery well water levels to check that they are operating properly. No unexpected changes in cost or scope of O&M or frequent repairs were reported and no optimization opportunities specific to the site inspection were identified.

Perimeter fencing was observed to be in good shape. Although no fencing is present at the rear of the property, adjacent to Snyder Creek, accessing the property from the east is difficult and unlikely given the wet conditions.

The concrete pads and valve box covers for wells G16S and G16D remain dislodged as previously noted in the Third FYR. In addition, several monitoring wells were observed to be unsecured.

- **UniFirst property** – The existing groundwater treatment system infrastructure was observed to be in good condition; however it should be noted that an aquifer test was being conducted at the time of the inspection for the purposes of providing design information to support design and construction of additional groundwater extraction to enhance capture. In addition, UniFirst is in the process of constructing an SVE system to address VOC soil contaminants on the property. Also, following SVE, UniFirst has agreed to prepare a work plan to perform ISCO treatment to address residual DNAPL beneath the east side of the UniFirst Building near monitoring well UC-8.

  The perimeter chain-link fence was in good condition and signage (authorized access only) is posted on the door to the treatment facility. O&M staff visit the site on a weekly basis and no concerns were raised that call into question the current protectiveness of the remedy. No groundwater treatment system unexpected changes in cost or scope of O&M or frequent repairs were reported and no optimization opportunities specific to the site inspection were identified.

  Road box covers at certain wells, including UC-5, UC-16, UC-17, UC-19, UC-20 and UC-24 cluster, were not bolted and should be secured.[9] Well covers at UC-15S (stick up) and UC-31 cluster (flush mount) at the southwest corner of the building were broken and need to be replaced. Monitoring wells UC-16 and UC-20 need to be equipped with expansion plugs to prevent runoff from entering these wells. The gate box at UC-17 is filled with sediment, which needs to be removed.

- **NEP Property** – The remedy for NEP property included AS/SVE which was effective in meeting ROD cleanup levels in unsaturated soils and significantly reducing groundwater concentrations of TCE and PCE. This system has been shutdown since 2000. Groundwater is currently being monitored bi-annually and generally shows downward trends with some exceedances of the ROD cleanup levels remaining in groundwater. No unexpected changes in cost or scope of O&M or frequent repairs were reported and no optimization opportunities specific to the site inspection were identified.

  Certain monitoring well locations were observed to be unlocked. These wells should be properly secured. In addition, the NEP-103 well pair could not be located and assessed due to heavy vegetation.

[9] An off-property well, located across the street from UniFirst, was also not secure. In particular, the cover was not bolted and the expansion plug in the well was not locked. OU-2 parties should perform an inspection of the well network and perform repairs/maintenance, as needed, to secure the wells.

- **Olympia Property** – No onsite system is currently active at Olympia, therefore O&M consists of groundwater sampling and oxidant injection (i.e., ISCO) activities to destroy organic contamination in groundwater and sorbed to shallow soils. Monitoring data shows some contaminant concentration reduction has been achieved since injections began. Injections were performed in July 2014 and included monitoring well location MW-217M where increasing concentrations of VOCs were observed.

  Portions of the perimeter fence have been damaged, including a downed section of fence located adjacent to the B&M Railroad tracks. Liter was observed within the limits of the fence, suggesting trespassers have been present near the edge of the injection area; however no indication of trespassing within the injection area was observed.

  Monitoring wells located inside the fenced area were observed to be unlocked. Monitoring wells outside the fenced area were locked; however tubing protruding from beneath the well cover could be pulled by hand. All wells should be properly secured.

Any concerns raised during the site inspections, as well as concerns raised during interviews with key stakeholders, that do not relate to the protectiveness of the remedy (e.g., O&M of the source area treatment facilities), will not be reported as issues under this FYR. Instead, EPA will identify all potential concerns raised relative to OU-2 to the PRPs, and request that these concerns be adequately addressed. Any concerns raised relative to OU-3 will be evaluated and addressed as part of the five year review cycle for the Industri-Plex Superfund Site.

Interviews with Key Stakeholders

During the FYR process, interviews were conducted with representatives of the Source Area properties as well as parties impacted by the Site, including members of the Woburn, Massachusetts City government and groups aware of the Site. The individuals interviewed, their affiliation, date of interviews, and interview types (i.e., in person, telephone, during site visit) are summarized in Table 5.

Table 5: Summary of Interviewees, Affiliations and Interview Dates and Types

Interviewee	Affiliation	Interview Date	Interview Type
Clayton Smith	de Maximis, Inc. – Grace Contractor	September 19, 2014	Telephone (1)
Jack Guswa	JG Environmental, Inc. – Grace Contractor	September 19, 2014	Telephone (1)
Timothy Cosgrave	Senior Manager – UniFirst Corporation	September 18, 2014	Telephone
Christene A. Binger	GeoInsight – Olympia Contractor	September 19, 2014	Telephone
Jennifer McWeeney	Massachusetts Department of Environmental Protection	September 23, 2014	Email
Linda Raymond	Aberjona River Study Coalition, Inc.	August 31, 2014	Email

(1) Interview conducted with both parties during single conference call.

Attempts were made to reach out to other interested parties (e.g., representatives from the City of Woburn); however efforts to document additional interviews within the timeframe of this FYR were unsuccessful.

The purpose of the interviews was to document any perceived problems or successes with the remedy that has been implemented to date. Interviews were conducted between August 31, 2014 and September 23, 2014. Interviews were conducted via telephone to the extent practicable. Representatives of TRC conducted all interviews on behalf of EPA. Interviews are summarized below and complete interviews are included in Appendix E.

The following summarizes key information obtained during the interviews. The summaries are grouped by PRP Representatives/Consultants and State Government and Community, respectively. The summary does not provide a complete recitation of the interviews. For a detailed accounting of the interviews with each individual or group, refer to the interview records provided in Appendix E.

State Government and Community

The overall opinion expressed by the government officials and community representatives interviewed was that the cleanup is moving too slowly and at an uneven pace, though MassDEP feels that issues are being investigated and addressed. The community representatives do not believe that public perception of the Site is changing at all. The community is concerned that the Site will never be cleaned up.

The government officials felt that they were well informed and had good access to information on the project. The community representatives felt that, though the flow of information has improved over the last five years, more information should be made available to the public and that updates should occur more frequently. It was suggested that EPA reach out to community schools to educate children concerning Woburn's history and future related to the Site.

The government officials expressed concern about persistent groundwater contamination at the Source Area properties, particularly UniFirst, Olympia and Wildwood properties, and the adequacy of remedial efforts. In addition, government officials expressed concern for the potential for future risk via the indoor air pathways at the UniFirst building and suggested that the building be periodically inspected for new cracks in the foundation that could have the potential to affect indoor air quality.

PRP Representatives / Consultants

The PRP or their representatives reported that the systems are functioning as they are required to by the ROD and positive progress is being made toward achieving ROD-specified cleanup levels.

The PRPs or their representatives reported that there have been no changes to the remedial systems and no significant O&M difficulties within the last five years. In addition, there have not been any O&M optimization requirements within the last five years, other than a decrease in oxidant injection frequency and a change in the oxidant injection method at the Olympia property. Both of these changes are viewed as resulting in increased remedial efficiency by Olympia representatives. Grace representatives stated that there have been additional monitoring

wells added to their monitoring program to support EPA's vapor intrusion evaluation and to characterize a potential upgradient PCE source.

The PRPs or their representatives reported that there is continuing progress in the cleanup process. NAPL has not been observed in any of the monitor wells, except for DNAPL in one UniFirst monitoring well, UC8, as stated by the UniFirst representative. No reports of complaints were identified by the PRPs or their representatives except for one complaint received by EPA during a recent aquifer test at the UniFirst property. Upon investigation of the complaint, nothing was found to suggest that the issue was related to the testing.

The PRPs or their representatives reported no impact from off-site contaminants or pumping except for where it is specifically designed. The UniFirst pumping well (UC22) helps contain contaminants in the deep aquifer for Grace. The Grace representatives indicated that the continued pumping of Area 2 and Area 3 monitoring wells could draw PCE onto the Grace property from an upgradient source. Grace representatives stated that they recommend that EPA approve their proposed shutdown of Area 2 and Area 3 pumping wells and proposed monitoring plan.

The PRPs or their representatives reported there were no changes in ownership for the Source Area properties within the last five years. In addition, there were no institutional controls enacted at the Site within the last five years.

IV. TECHNICAL ASSESSMENT

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

Yes. The review of documents, ARARs, and the results of the site inspections indicate that remedial actions are being implemented as intended by the ROD and ESD. The OU-1 remedy is expected to be protective of human health and the environment upon completion. The following provides a summary of recent progress related to implementation of remedial actions, system operation and maintenance activities and potential optimization opportunities.

Remedial Actions

Groundwater

As described in the third FYR, potential limitations were identified with respect to the documentation of an adequate degree of hydraulic control and groundwater contamination capture being achieved at some of the Source Area properties. Actions have been taken and/or are underway to evaluate and address concerns regarding capture. In addition, while some persistent groundwater contamination remains beneath all Source Area properties, groundwater contaminant levels have been substantially reduced, particularly at Grace and NEP properties, and active remediation continues to occur at several of the Source Area properties.

During this FYR period, additional monitoring wells were installed and additional existing monitoring wells were included in the annual sampling events at Grace property. The additional

well installation and sampling supported various activities, including supplemental data collection requested by EPA to further demonstrate groundwater capture. The additional investigation and data collection activities, including Work Plan for Area 2 & 3 (Tetra Tech, 2013) and Area 2 & 3 Evaluation Report (Tetra Tech, 2014) under review by EPA, have significantly enhanced the understanding of groundwater conditions beneath the Grace property; however, groundwater remains on the property above the ROD cleanup levels. Monitoring wells G-24S, G24D and G-40D continue to exhibit TCE above the ROD action level. Monitoring wells G13D and G16D further to the north of Area 3 also continue to sample positively for TCE above ROD action levels, and monitoring well G16S has shown an increasing trend in the level of TCE concentration (increasing from non-detect in March 1989 to 68 µg/L in May 2013). EPA will continue its review of the Area 2 & 3 Evaluation Report and provide a response in 2014.

Based on discussions with EPA and in response to follow-up actions raised in the third FYR regarding system performance and groundwater capture, UniFirst submitted an Extraction Well Installation Work Plan in May 2014 describing the rationale, objectives and implementation procedures for the installation and testing of one new extraction well, three piezometer clusters and associated hydraulic testing (The Johnson Co., 2014a). The primary objective of the supplemental extraction well installation activities is to collect the additional evaluative data and to supplement the exiting treatment system to enhance groundwater capture at the southwest corner of the UniFirst property. This work plan was approved by EPA, and UniFirst mobilized and began implementation of the work plan in July 2014.

Although significant reductions of groundwater contaminant concentrations have been achieved, exceedances of ROD action levels for some contaminants remain in the current monitoring network at NEP property. Further evaluation of NEP property groundwater, including in the deep bedrock, is necessary to fully characterize this source area and ensure remedy effectiveness.

Results of groundwater sampling at the Wildwood property showed reductions in many contaminant concentrations; however, the data also continue to confirm exceedances of ROD action levels for some of the contaminants (e.g. TCE).As a result, additional monitoring wells were also installed at the Wildwood property and all wells were sampled in 2013. Also, groundwater contamination remains outside the capture zone and above the ROD action levels at Wildwood property, including in the southern portion of the property where the highest PCE concentration of 325 parts per billion (ppb) was observed at new well WW-101SR (sampled 8/2/2013).

At Olympia property, a groundwater pump and treat system has not yet been implemented. However, significant cleanup work is being conducted under a separate Administrative Order on Consent with EPA to address soil and groundwater contamination.

Concerns regarding changes to the MCL for arsenic and manganese toxicity values still need to be addressed at the Grace, UniFirst, Wildwood and Olympia properties. No groundwater samples were collected and analyzed for arsenic and manganese at these properties during this FYR period.

<u>Soil</u>

Soil excavation and off-site disposal activities implemented at Grace property subsequent to the third FYR are discussed in Section II. Soil material with contaminant concentrations in excess of ROD action levels was removed and no further response action with regard to soil is currently required at the Grace property.

Soil contamination has not yet been fully addressed at UniFirst property, as required in the ROD and modified in the ESD. However, UniFirst has submitted a Soil Vapor Extraction System Design Report in May 2014 (The Johnson Co., 2014b) including a draft Operation, Maintenance and Monitoring Plan. The work plan was approved by EPA, and UniFirst began implementation of the work plan on the property in August 2014.

Soil remediation activities implemented at NEP and Wildwood properties have been described in the previous FYR report and no additional soil remediation was conducted during this FYR period.

In Spring 2003, EPA entered into an Administrative Order on Consent (AOC) with Olympia to address the cleanup of contaminated soils on the Olympia property. Under the AOC, Olympia excavated and disposed of 56 cubic yards of PCB-contaminated surface soils, and approximately 5 cubic yards of PAH-contaminated soil (called for in the ROD), evaluated various options for addressing the TCE-contaminated soils, and prepared a detailed work plan for cleaning up the TCE by way of in-situ sodium permanganate injection treatment. As described in Section III, cleanup of the TCE contaminated soils is currently underway with EPA oversight.

Institutional Controls

As stated in the ROD (p.34-35), "Once cleanup goals have been satisfied, the extraction wells will be shut down and a monitoring program will be implemented. This program will consist of a minimum of three years of quarterly monitoring of ground water quality. If the monitoring data during this period shows an increase in contaminant levels over time, such that cleanup goals are not maintained, active groundwater remediation will be resumed. The results of this monitoring program will be reviewed by EPA in order to evaluate the success of the remedy, the maintenance of cleanup goals, the need for any additional site work including the resumption of the remedy or the implementation of institutional controls, and to provide information for site delisting. … EPA recommends that the State and the City of Woburn implement controls, such as regulations, ordinances, deed and land restrictions, or other effective forms of land use control to prevent the use of the aquifer in the vicinity of the Site. Groundwater use should be restricted until it is determined conclusively that cleanup goals have been met." At the appropriate time, EPA will review the "monitoring program" and will consider resumption of work, additional work or institutional controls, as necessary.

System Operation & Maintenance

Descriptions of the O&M activities conducted during the previous five years are provided in Section II for UniFirst, Grace, Wildwood and Olympia properties. No O&M activities have occurred at NEP property since the third FYR.

Based on the review of the Source Area properties' O&M documentation and the results of the FYR site inspection activities, the current operating procedures maintain the effectiveness of remedy implementation at the Source Area properties.

Opportunities for Optimization

The Source Area property groundwater treatment systems, and associated monitoring programs, are the only components of the remedy that currently offer the possibility for optimization/enhancements. Progress continues towards the remedy cleanup goals since the third FYR. Optimizations/enhancement opportunities remain at the Wildwood property for capture and groundwater contaminant reductions. EPA continues to encourage the source area properties to explore optimization/enhancement techniques to accelerate progress toward the achievement of cleanup goals at the Site.

Early Indicators of Potential Issues

As discussed in Section II, treatment systems at the Source Area properties continue to operate with limited downtime, primarily related to fixing/replacing system components and incidents, such as power outages, that are beyond control. No apparent frequent and persistent equipment breakdowns, that could potentially affect protectiveness, are currently evident.

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?

No. Although there have been changes in toxicity values, exposure assumptions and risk assessment methods since the risk assessment for the Site was completed in 1988, the changes do not affect remedy protectiveness as long as groundwater is not used as a source of household water, worker protective measures are implemented for excavations where shallow groundwater may be encountered, land use at the Source Area properties is not changed without further consideration and possible evaluation of the subsurface vapor intrusion pathway, and ongoing monitoring and evaluation of groundwater and air contaminant concentrations continue.

Question B is addressed by reviewing the risk assessment that formed the basis for the selected remedies, describing any significant differences as compared to current risk assessment practice, and qualitatively evaluating the impact of any such differences on remedy protectiveness.

Review of Risk Assessments and Toxicity Factors Serving as the Basis for the Remedy

Risk Assessment Review

The Endangerment Assessment (Ebasco, 1988) evaluated potential impacts to human health and the environment in the absence of remedial action under both current and potential future use scenarios. The site was divided into six areas that were treated individually. The six areas included the five Source Area properties and the Central Area, defined as the area surrounding Wells G and H, the Aberjona River, and the wetlands (i.e., the non-Source Areas). Human

exposures were considered at all six areas; ecological exposures were only evaluated for the Central Area.

For the human health Source Area evaluation, groundwater and soil exposures at the five Source Area properties were examined. Future residential groundwater use was evaluated for each area and included the ingestion of drinking water and inhalation of volatiles while showering. Because groundwater was originally used as process water at the NEP facility, groundwater was also evaluated for the inhalation of volatiles released to indoor air during commercial groundwater use for the NEP property. Current soil exposures at NEP and Olympia properties were evaluated for adolescent trespasser and commercial worker exposures via ingestion, dermal contact, and inhalation. Current trespasser exposures only were evaluated for Wildwood property. Due to the presence of paving at UniFirst property, the current soil exposure pathway was considered incomplete. NEP, Olympia, Wildwood, and UniFirst properties were also evaluated for future residential soil exposures via ingestion and dermal contact. In 1988, no soil COPCs were identified for the Grace property; therefore, no soil evaluation was conducted at this property.

The evaluation of future domestic use of groundwater at all five Source Areas resulted in estimated risks above a level of concern. Significant groundwater risk and hazard contributors included arsenic, chloroform, 1,1-dichloroethane, 1,1-dichloroethene, 1,2-dichloroethene, 1,1,1-trichloroethane, PCE, TCE, and vinyl chloride. Current risks and hazards were noted at Wildwood property based on adolescent trespasser soil exposures. In addition, soil exposures based on future residential assumptions resulted in risks and hazards above a level of concern for NEP and Wildwood properties. Significant risk contributors for Wildwood property included chlordane, 4,4'-DDT, PCBs, PAHs, and lead. Phthalates and PCE were the primary risk contributors in soils at NEP property.

In 2012, EPA prepared a human health risk assessment report for the VI pathway to evaluate the potential for impacts to indoor air quality associated with current groundwater conditions downgradient of/near Grace, UniFirst and NEP properties. Based upon shallow groundwater, subslab soil gas and indoor air data collected at seven residential and commercial buildings downgradient of/near Grace and UniFirst properties, current cancer risks estimated are less than $1x10^{-4}$ and current non-carcinogenic hazards estimated are less than 1. In addition, for most of the properties evaluated (including all residential properties), future cancer risks estimated are less than $1x10^{-4}$ and future non-carcinogenic hazards are less than 1. However, if the commercial building on the UniFirst property is converted to residential use in the future, there is the potential for unacceptable cancer risk and non-carcinogenic hazard associated with the VI pathway, due to the presence of PCE. As a precaution, annual monitoring of subslab soil gas and indoor air VOC concentrations are occurring at the commercial building immediately west/ downgradient of UniFirst property. Though two monitoring wells were installed to evaluate the impact of shallow groundwater on indoor air quality downgradient of/near NEP property, no further investigation was performed downgradient of/near NEP property because no VOCs were detected above EPA's groundwater VI screening levels.

In this fourth FYR, the toxicity values that served as the basis for the action levels, as contained in the ROD, have been re-evaluated to determine whether any changes in toxicity impact the

protectiveness of the remedy. Any changes in current or potential future exposure pathways or exposure assumptions that may impact remedy protectiveness are also noted. In addition, environmental data, available since the last FYR, have been evaluated to determine whether exposure levels existing at the Site present a risk to current human receptors.

Changes in Toxicity Values

No inhalation toxicity values have changed for volatile compounds of concern evaluated in EPA's 2012 human health risk assessment for the vapor intrusion pathway.

Table 1 in Appendix F presents the changes in toxicity values (oral reference doses [RfD] and oral cancer slope factors) for compounds selected as compounds of potential concern in the 1988 Endangerment Assessment. Updated toxicity information was obtained from the *Integrated Risk Information System* (IRIS; EPA, 2014c) and other peer reviewed sources. In general, minor changes (i.e., slight increases or decreases) in toxicity values have occurred for most COPCs. However, the safe level of exposure to manganese (i.e., manganese toxicity value) has been reduced by a factor of 10 since 1988 rendering the compound more toxic than had previously been believed. Therefore, manganese in OU-1 groundwater may require further investigation at UniFirst, Grace, Wildwood and Olympia properties to determine if concentrations exceed risk levels based upon the current toxicity estimates. Data more recently collected using up-to-date groundwater sampling protocols do not indicate health-based exceedances of manganese at NEP property.

A re-evaluation of the toxicity of PCE and TCE was completed by EPA since the third FYR. For both compounds, the revised non-carcinogenic and/or carcinogenic toxicity values (i.e., oral RfD or oral slope factor) indicate that these compounds are generally more toxic than once believed. Though toxicity values have in general become more stringent for PCE and TCE, these changes do not affect remedy protectiveness since groundwater is not currently being used as drinking water and a risk assessment will be performed to demonstrate that the risk is below EPA risk management guidelines, once the remedy is complete. The most recent toxicity values for PCE and TCE were used in EPA's 2012 human health risk assessment for the VI pathway.

Cleanup standards for groundwater were established as MCLs, which is consistent with the current selection of groundwater clean-up standards in areas that may serve as a potential source of drinking water. All compounds of concern in groundwater, based on the results of the 1988 Endangerment Assessment, were targeted for clean-up with the exception of arsenic since groundwater arsenic concentrations at the Source Area properties were not above the 1988 MCL of 50 µg/L. However, the MCL for arsenic has been reduced to 10 µg/L since 1988. Therefore, arsenic in OU-1 groundwater may require further investigation at UniFirst, Grace, Wildwood and Olympia properties to determine if concentrations exceed risk levels based upon current toxicity estimates. Data more recently collected using up-to-date groundwater sampling protocols do not indicate an exceedance of the arsenic MCL at NEP property.

Soil contaminants requiring cleanup were based on the contaminants identified as presenting a direct-contact hazard by the 1988 Endangerment Assessment (PCE, lead, chlordane, 4,4'-DDT, PAHs, and PCBs). VOCs selected as groundwater contaminants of concern (PCE, TCE,

chloroform, trans-1,2-dichloroethene and 1,1,1-trichloroethane) were also targeted for cleanup in soil based on their potential to serve as a source of contamination to groundwater. To assure that the ROD action levels for soil do not present a direct contact risk using current toxicity information, a comparison of the leaching-based and direct-contact based soil cleanup levels to EPA RSLs (EPA, 2014b) for residential soil has been performed and is presented in Table 6. RSLs are developed based on current toxicity information and correspond to the lower of a carcinogenic risk of $1x10^{-6}$ and a noncarcinogenic hazard of 1. This comparison indicates that the ROD soil action levels based on leaching to groundwater are adequately protective for a residential exposure scenario. ROD action levels for non-volatile contaminants (chlordane, 4,4'-DDT, PAHs, and PCBs), based on direct contact, are also adequately protective with respect to human health. Even though the action levels for chlordane, 4,4'-DDT, benzo(a)pyrene and PCBs exceed screening levels set at a cancer risk of $1x10^{-6}$, the cumulative risk for all carcinogenic compounds combined would be within EPA's acceptable risk range (see Table 6).

The ROD soil action level for lead was calculated by using the *Integrated Exposure Uptake Biokinetic* (IEUBK; EPA, 2002b) model and an acceptable blood lead level of 10 micrograms per deciliter (µg/dL). This model continues to be used to evaluate acceptable levels in soil, though the specific assumptions incorporated into the model have changed. The ROD action level for lead for residential land use (640 mg/kg) is slightly higher than what would be used today based on the current IEUBK model (400 mg/kg), though less than what would be used for commercial settings (800 mg/kg).

Table 6: Comparison of ROD Soil Action Levels to Risk-Based Screening Levels

Pollutant	ROD Soil Action Level (µg/kg)	EPA Screening Level (µg/kg)	Target Cancer Risk Associated with Action Level
Chloroform	62.5	320	2E-07
Tetrachloroethene	36.7	24,000	2E-09
Trichloroethene	12.7	940	1E-08
trans-1,2-Dichloroethene	83.2	1,600,000	NA
1,1,1-Trichloroethane	613	8,100,000	NA
Chlordane	6,140	1,800	3E-06
4,4'-DDT	23,500	1,900	1E-05
cPAHs (1)	694	15	5E-05
PCBs	1,040	240	4E-06
Lead	640,000	400,000	NA

NA – Not applicable since compound not considered carcinogenic

(1) Based on benzo(a)pyrene.

Confirmation sampling performed as part of the soil excavation remedy for VOCs, PCBs and PAHs (based on benzo(a)pyrene equivalents) at Grace property in 2012 demonstrated that ROD action levels had been achieved. Therefore, because the ROD soil action levels continue to be protective of human health, the soil remedy implemented at Grace property is also protective of human health.

Changes in Exposure Pathways/Assumptions

There have been no changes in land use since the last FYR. Redevelopment of the Grace property for non-residential use is under discussion. Groundwater is not currently used as a source of drinking water by the community.

The 1988 Endangerment Assessment did not evaluate direct contact exposures associated with excavation into the water table by workers. Because of persistent groundwater contamination at each Source Area property in combination with uncertainty regarding the location and magnitude of potential exposures, worker contact with groundwater should be performed under property-specific Health & Safety Plan/controls until the remedy is complete.

A new method to evaluate compounds with mutagenic modes of action is now recommended by EPA. The currently recommended method was not used in the 1988 Endangerment Assessment since the EPA carcinogen risk assessment guidance was published subsequent to the completion of the risk assessment. The current methodology calls for the use of age-dependent adjustment factors (ADAFs) to account for an increased sensitivity during early life for compounds with mutagenic modes of action including TCE and carcinogenic PAHs detected at the Site. The 2012 vapor intrusion risk assessment included the early-life calculation, as applicable, since guidance was available at that time. Comparison of ROD actions to RSLs (Table 6), developed using ADAFs as applicable, confirms that the soil action levels continue to be protective. Though ADAFs were not used for the groundwater risk evaluation performed in 1988, this change does not affect remedy protectiveness since groundwater is not currently being used as drinking water and a risk assessment will be used to demonstrate that the risk is below EPA risk management guidelines, once the remedy is complete.

In February 2014, EPA published updated default exposure assumptions for Superfund Sites, based on exposure studies considered and evaluated in the 2011 Exposure Factors Handbook. Some of the recommended exposure assumptions are more conservative than those used previously, while some are less conservative. However, overall, use of the 2014 recommended exposure assumptions results in an increase in acceptable risk-based environmental levels, indicating continued remedy protectiveness. This conclusion takes into consideration the intent to re-evaluate groundwater risk once cleanup levels are achieved, as well as the continued evaluation of ROD action levels and environmental data against RSLs and other screening levels that incorporate the newly released updated exposure factors.

The subsurface vapor intrusion pathway from groundwater to indoor was not evaluated in the 1988 Endangerment Assessment. However, Grace, Wildwood and Olympia properties are undeveloped, meaning that the subsurface vapor intrusion pathway is currently incomplete. Evaluation of shallow groundwater concentrations at NEP property in the second and third FYR reports suggested that the likelihood of vapor intrusion into the NEP building was low. EPA's 2012 human health risk assessment for the vapor intrusion pathway evaluated the commercial building on the UniFirst property as well as select residential and commercial buildings downgradient of/near UniFirst, Grace and NEP properties. Though the risk assessment concluded there was no current threat to the occupied buildings evaluated, precautionary monitoring of the building immediately west/ downgradient of UniFirst property is being conducted annually to monitor subslab soil gas and indoor air conditions, and ensure that

conditions do not change and become a health concern. In this FYR, the vapor intrusion pathway has been re-evaluated due to the February 2014 update in the standard default exposure factor assumptions and recent updates to toxicity values. The VI screening evaluation for NEP and UniFirst properties, as well as the buildings downgradient of/near UniFirst and Grace properties is presented in the following section (Evaluation of Recent Sampling Data). A VI screening for the Grace property has also been included in the following section since discussions concerning redevelopment of this property are ongoing and redevelopment is likely to occur in the near future.

Evaluation of Recent Sampling Data

Shallow Groundwater

To determine whether the conclusions concerning the vapor intrusion pathway for NEP and UniFirst properties as presented in the third FYR Report and 2012 human health risk assessment for the vapor intrusion pathway, respectively, require modification, current (i.e., 2013) shallow groundwater (i.e., less than 30 feet in depth) contaminant concentration data have been compared to groundwater vapor intrusion screening levels (VISL). In addition, 2013 groundwater data from the residential and commercial areas immediately downgradient of/near UniFirst and Grace properties have been compared to groundwater VISLs to determine whether the conclusions of the 2012 vapor intrusion risk assessment remain valid. A comparison of shallow groundwater concentrations to VISLs has also been performed since redevelopment of this property is anticipated to occur in the near future. The monitoring wells used in this evaluation for NEP, UniFirst, Grace properties and the downgradient area are listed in Appendix F, Table 2. Though Wildwood and Olympia properties have not been included in this evaluation because no occupied buildings are present on the properties and redevelopment is not currently being considered, concentrations of TCE, PCE, vinyl chloride and/or other VOCs in excess of MCLs remain on these properties, signifying that a vapor intrusion evaluation is recommended if these properties are redeveloped in the future.

This VI screening evaluation includes comparison of maximum detected groundwater VOC concentrations for NEP, UniFirst, Grace properties and downgradient properties, to groundwater VISLs protective of groundwater, and to indoor air impacts. Consistent with current land use, residential VISLs are used for the downgradient area and commercial VISLs are used for NEP and UniFirst properties. Both residential and commercial VISLs are used for Grace property since mixed use redevelopment of the property is under discussion. VISLs were calculated from formulas obtained from EPA's 2014 VISL calculator (version 3.2.1) and EPA's May 2014 residential and commercial indoor air RSLs, as presented in Appendix F, Table 3. The VISLs correspond to a cancer risk of $1x10^{-6}$ for carcinogens or a hazard quotient of 1 for noncarcinogens.

Table 7 provides a comparison of maximum detected shallow groundwater VOC concentrations to groundwater VISLs based on residential or commercial land use assumptions, as applicable, for developed areas of the Site.

Table 7: Comparison of Maximum Detected Shallow Groundwater VOC Concentrations to Screening Levels		
Detected Analyte	**Maximum Groundwater Concentration (µg/L)**	**Vapor Intrusion Screening Level (µg/L)**
UniFirst (2013) compared to Commercial Screening Levels		
1,1,1-Trichloroethane	1.3	31,000
cis-1,2-Dichloroethene	16	NA
Tetrachloroethene	2,900	65
Trichloroethene	18	7.4
NEP (2013) compared to Commercial Screening Levels		
Tetrachloroethene	15	65
Downgradient of/Near UniFirst and Grace Properties (2013) compared to Residential Screening Levels		
Tetrachloroethene	22	15
Trichloroethene	0.82	1.2
Grace (2012/2013) compared to Residential Screening Levels		
cis-1,2-Dichloroethene	150	NA
trans-1,2-Dichloroethene	0.83	NA
Tetrachloroethene	15	15
Trichloroethene	68	1.2
Grace (2012/2013) compared to Commercial Screening Levels		
cis-1,2-Dichloroethene	150	NA
trans-1,2-Dichloroethene	0.83	NA
Tetrachloroethene	15	65
Trichloroethene	68	7.4

Notes:

(a) Values taken from Appendix F, Table 3. The screening concentrations corresponding to a cancer risk of $1x10^{-6}$ and noncancer hazard of 1.

NA – Not available.

The maximum PCE concentrations at NEP property, the only VOC detected in 2013, is below its commercial VISL confirming that the vapor intrusion pathway does not pose a risk at this property. The maximum detected PCE groundwater concentration at the area downgradient of/near Grace and UniFirst properties slightly exceeds the residential VISL. However, the 2013 maximum concentration (22 µg/L) is less than the maximum groundwater concentration detected in 2010 (78 µg/L) when the subslab soil gas and indoor air sampling was conducting. Because groundwater concentrations in the downgradient area have declined since 2010, the conclusions of the 2012 human health risk assessment for the downgradient area remain valid. Commercial VISLs for PCE and TCE are exceeded at UniFirst property, but only the maximum PCE concentration exceeds detected concentrations at the time of the sampling conducted to support the 2012 human health risk assessment. The maximum PCE was detected in monitoring well UC5, located near the far eastern end of the building where free product was discovered during supplemental explorations to support the pending soil remedy. Only the office area of the

building is considered occupied space. The office area of the building is located in the central portion of the building, and not in the vicinity of monitoring well UC5. Elevated concentrations of VOCs in the UC5 area will be addressed during the to-be-conducted soil remedial actions. For Grace property, the maximum detected shallow groundwater concentration for TCE exceeds its VISL for both commercial and residential land uses. Therefore, as a precaution, vapor intrusion mitigation measures should be incorporated into future building design at Grace property to ensure that the remedy remains protective. However, the potential for VI should decrease, overall on the property, as soil and groundwater cleanup progresses.

Indoor Air

Subslab soil gas and indoor air sampling was conducted in 2013 and 2014 at the building immediately west/downgradient of UniFirst property. Though EPA's 2012 human health risk assessment concluded that there was currently no unacceptable risk associated with the vapor intrusion pathway at this building, annual monitoring was required due to elevated concentrations of PCE in the subsurface beneath this building. Concentrations of PCE in the 2013 and 2014 samples were generally consistent with or less than those detected in 2011 confirming that the vapor intrusion pathway is unlikely to pose a risk to current building occupants. Table 8 presents the indoor air and subslab soil gas concentrations of PCE in 2011, 2013 and 2014. The potential risk to the downgradient building will continue to decrease as response actions continue at the UniFirst property.

Table 8: Maximum Detected Concentrations of Tetrachloroethene (µg/m^3) at Building Immediately West/Downgradient of the UniFirst Property

Medium	2011	2013	2014
Subslab Soil Gas	5730	3390	2830
Indoor Air	1.23	1.02	1.57

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

No. There is no other information, including newly identified ecological risks and natural disasters, which call into question the current protectiveness of the Source Area (OU-1) remedy.

Technical Assessment Summary

The review of documents, ARARs, and the results of the Site inspection indicate that OU-1 remedy activities are being implemented and the treatment systems are functioning as intended by the ROD and ESD. The OU-1 remedy is expected to be protective of human health and the environment upon completion.

Actions have been taken and/or are underway to evaluate and address previously identified potential limitations with respect to the documentation of an adequate degree of hydraulic control and groundwater contamination capture being achieved at some of the Source Area properties. Groundwater contamination remains outside the capture zone above the ROD action level at Wildwood property, including the southern portion of the property. In addition, while

persistent groundwater contamination remains beneath all Source Area properties, groundwater contaminant levels have been substantially reduced, particularly at Grace and NEP properties, and active remediation continues to occur at several of the Source Area properties.

Soil remediation activities have been implemented (at Grace and NEP properties), and are ongoing at the Wildwood property (SVE), Olympia property (TCE in soils), and UniFirst property (SVE mobilization) properties.

Toxicity values, exposure assumptions and risk assessment methods were addressed by reviewing the human health and ecological risk assessments that formed the basis for the selected remedies, describing any significant differences as compared to current risk assessment practice, and qualitatively evaluating the impact of any such differences on remedy protectiveness.

There have been no changes in land use since the last FYR. Though there have been changes in toxicity values, exposure assumptions and risk assessment methods since the risk assessment for the Site was completed in 1988, the changes do not affect remedy protectiveness as long as: groundwater is not used as a source of household water; worker protective measures are implemented for excavations where shallow groundwater may be encountered; land use at the Source Area properties is not changed without further consideration and possible evaluation of the subsurface vapor intrusion pathway; and ongoing monitoring and evaluation of groundwater and air contaminant concentrations continue to occur.

The subsurface vapor intrusion pathway from groundwater to indoor was not evaluated in the 1988 Endangerment Assessment. However, Wildwood and Olympia properties are undeveloped and redevelopment is not currently being considered, meaning that the subsurface vapor intrusion pathway is currently incomplete. If the use of these properties changes and they are redeveloped to include occupied buildings, a VI evaluation should be performed due to exceedances of MCLs in groundwater.

Evaluation of shallow groundwater concentrations at NEP property in the second and third FYR reports suggested that the threat to the NEP building was low. Re-evaluation using current shallow groundwater results indicated that the maximum PCE concentrations at NEP property, the only VOC detected in 2013, is below its commercial VISL, confirming that the vapor intrusion pathway does not pose a risk at this property.

EPA's 2012 human health risk assessment for the vapor intrusion pathway evaluated the commercial building at UniFirst property, as well as select residential and commercial buildings downgradient of/near UniFirst, Grace and NEP property. Though the maximum detected PCE groundwater concentration at the area downgradient of/near Grace and UniFirst properties slightly exceeds the residential VISL, the 2013 maximum concentration is less than the maximum groundwater concentration detected in 2010. Because groundwater concentrations in the downgradient area have declined since 2010, the conclusions of the 2012 human health risk assessment for the downgradient area remain valid. Though monitoring wells were installed to evaluate the impact of shallow groundwater on indoor air quality downgradient of/near NEP property, no further investigation was performed downgradient of/near NEP property because no VOCs were detected above EPA's groundwater VISLs.

Commercial VISLs for PCE and TCE are exceeded at UniFirst property, but only the maximum PCE concentration exceeds detected concentrations at the time of the sampling conducted to support the 2012 human health risk assessment. The maximum PCE was detected in monitoring well UC5, located near the far eastern end of the building where free product was discovered during supplemental explorations to support the pending soil remedy. This pathway may require further consideration as methods used to evaluate this complex pathway evolve; however, the potential for VI should decrease as soil and groundwater cleanup progresses.

For Grace property, a VI screening was performed since discussions concerning redevelopment of this property are ongoing and redevelopment, to include occupied buildings, is likely to occur in the near future. Because the maximum detected shallow groundwater concentration for TCE exceeds its VISL for both commercial and residential land uses, as a precaution, vapor intrusion mitigation measures should be incorporated into future buildings design at Grace property.

Though the 2012 risk assessment concluded that there was no current threat to the occupied buildings evaluated, monitoring of the building immediately west/ downgradient of UniFirst property has been conducted annually for potential indoor air impacts associated with shallow groundwater VOC concentrations. Concentrations of PCE in the 2013 and 2014 samples were generally consistent with or less than those detected in 2011, confirming that the vapor intrusion pathway is unlikely to pose a risk to current building occupants.

There is no other information, including newly identified ecological risks and natural disasters, which call into question the current protectiveness of the Source Area (OU-1) remedy.

V. ISSUES AND RECOMMENDATIONS/ FOLLOW-UP ACTIONS

Table 9: Issues and Recommendations/Follow-up Actions

OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
						Current	Future
1	Extraction systems performance (possible insufficient capture of groundwater contamination) at Wildwood property.	Additional data collection and/or analysis to determine whether or not sufficient capture has been achieved at the Wildwood property, and, where appropriate, take corrective actions to ensure sufficient capture in the future.	PRP	EPA	2016	N	Y
1	No groundwater pump and treatment system implemented at NEP property following	Assess groundwater conditions on NEP property since AS/SVE shutdown, and evaluate	PRP	EPA	2016	N	Y

Table 9: Issues and Recommendations/Follow-up Actions							
OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
						Current	Future
	AS/SVE shutdown.	the need for further groundwater treatment.					
1	No recent data regarding groundwater contaminant concentrations in deep bedrock at NEP property.	Additional data collection to evaluate deep bedrock groundwater conditions on the NEP property, and, where appropriate, evaluate groundwater treatment.	PRP	EPA	2016	N	Y
1	Area south of treatment system at Wildwood property may have groundwater contamination in excess of ROD cleanup goals not receiving treatment.	Assess groundwater conditions south of treatment system at Wildwood property, evaluate the need for further groundwater treatment, and consider other treatment enhancements/optimizati ons as appropriate.	PRP & EPA	EPA	2016	N	Y
1	No groundwater pump and treatment remedy implemented at Olympia property.	Evaluate progress of Olympia's ISCO soil clean up to achieve ROD groundwater and soil cleanup standards. Assess need for groundwater cleanup at the conclusion of the removal action.	PRP	EPA	2018	N	Y
1	The 1988 Endangerment Assessment did not comprehensively evaluate non-ingestion uses of groundwater such as dermal contact during industrial groundwater usage or direct contact during trench excavation under certain current (commercial worker) and future (commercial worker, residential) scenarios at Source Area properties.	Because of persistent groundwater contamination at each Source Area property, worker contact with groundwater should be performed under property-specific Health & Safety Plan/controls until the remedy is complete.	PRP (data) & EPA (risk)	EPA	2016	N	Y

Table 9: Issues and Recommendations/Follow-up Actions							
OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
						Current	Future
1	Arsenic MCL changed from 50 µg/L to 10 µg/L. Arsenic was not previously targeted for cleanup based on prior MCL. Historical arsenic concentrations were either above 10 µg/L, or detection limits exceeded 10 µg/L. In addition, manganese was not identified as a COC in OU-1 groundwater under the 1988 Endangerment Assessment. Manganese toxicity values have been reduced by a factor of 10 since the 1988 assessment. Future exposures to manganese in groundwater may exceed EPA's Lifetime Health Advisory.	Assess current groundwater conditions relative to arsenic and manganese at UniFirst, Grace, Wildwood and, Olympia properties, and, where appropriate, revise cleanup goals through a remedy decision document.	PRP (data) & EPA (revise limits)	EPA	2016	N	Y
1	An evaluation of the groundwater to indoor air pathway indicates that potential future risks at the Grace property (residential, commercial), Olympia property (commercial, residential) and Wildwood property (residential) might exceed EPA risk management guidelines should re-development occur.	Evaluate risk from exposure to indoor air at the Grace, Wildwood, and/or Olympia properties based on up-to-date data if any of the properties are developed/ redeveloped with occupied buildings. Grace exceeds EPA groundwater VISL, and development/redevelopment should incorporate engineered vapor intrusion mitigation measures into development plans, unless otherwise demonstrated satisfactorily to EPA that vapor intrusion will not pose a potential threat to	PRP (data) & EPA (risk)	EPA	Upon Development / Redevelopment	N	Y

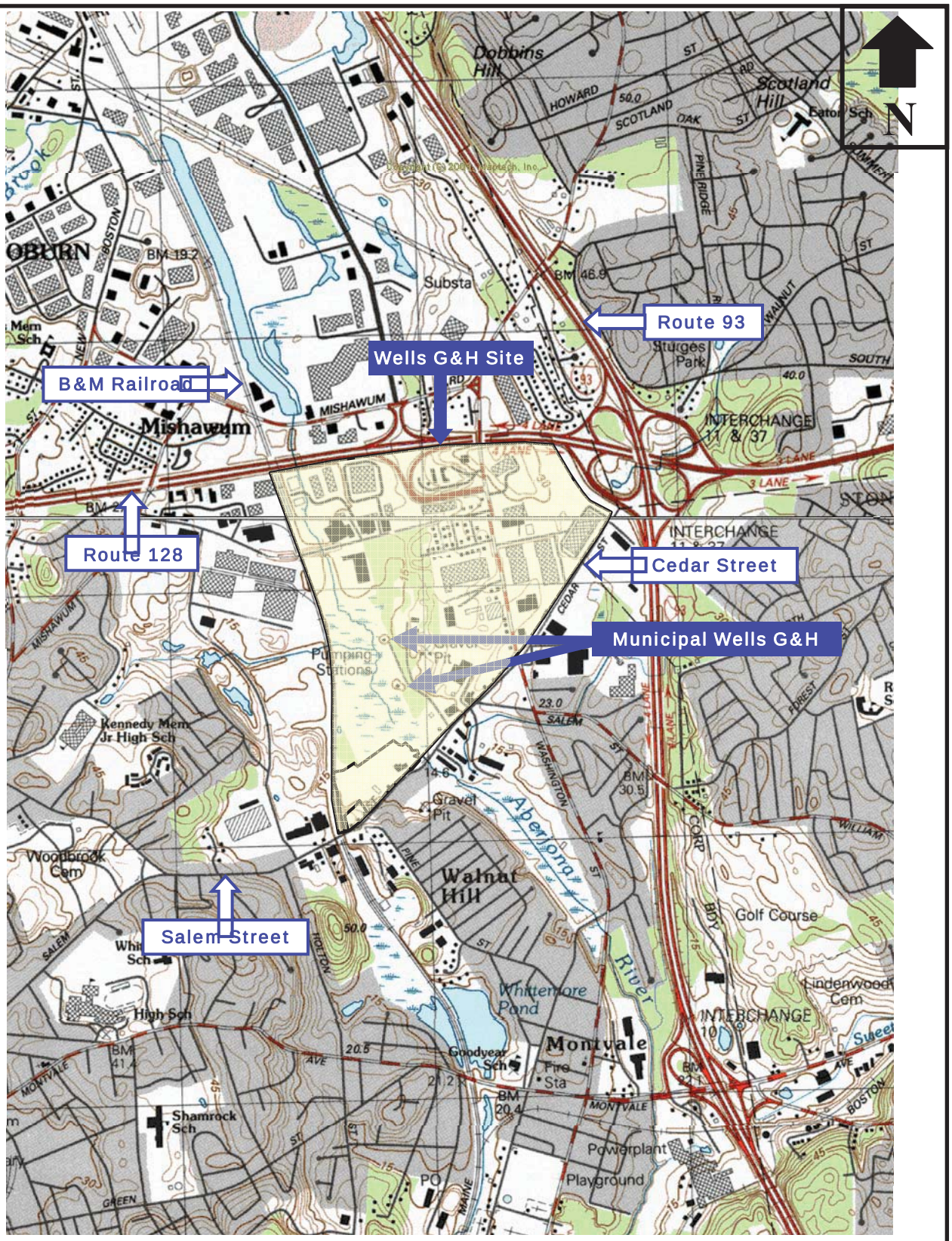
Table 9: Issues and Recommendations/Follow-up Actions							
OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
						Current	Future
		future occupants. If Wildwood and Olympia properties were proposed for development, then evaluate risk from exposure to indoor air in accordance with issue.					

VI. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)		
Operable Unit: OU-1	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):* Not Applicable
Protectiveness Statement: The remedy at the Source Area (OU-1) properties currently protects human health and the environment because active remedial actions, including groundwater pump and treatment (Grace, UniFirst and Wildwood properties), ISCO (Olympia property), AS/SVE source control (NEP property – shutdown in 2000, and Wildwood property) and SVE source control (UniFirst property), have been or continue to be implemented in conjunction with routine O&M and monitoring. The current assessment of the vapor intrusion pathway at both on-property and downgradient of/near property locations also supports our conclusion that the OU-1 remedy is currently protective. However, in order for the remedy to be protective in the long-term, the following actions are recommended: continued implementation of soil remedy (SVE) at UniFirst property; continued monitoring by both Grace and UniFirst properties; worker contact with groundwater should be performed under property-specific Health & Safety Plan/controls until remedy is complete; groundwater capture and treatment system assessment/enhancements at the Wildwood property; additional groundwater data collection and assessment including deep bedrock conditions and, as determined necessary, groundwater treatment at NEP property; assessment of soil and groundwater action levels from ISCO treatment at Olympia property; assessment of groundwater conditions relative to arsenic and manganese Grace, UniFirst, Wildwood and Olympia properties; evaluation of vapor intrusion pathway if Grace, Wildwood and/or Olympia properties are developed/redeveloped with occupied buildings, and, where appropriate, implementation of vapor intrusion mitigation measures during development.		

VII. NEXT REVIEW

The next FYR report for the Wells G&H Superfund Site is required five years from the completion date of this review. Therefore, the next FYR should be completed by September 30, 2019.



BASE MAP IS A PORTION OF THE FOLLOWING 7.5' USGS TOPOGRAPHIC QUADRANGLE: BOSTON NORTH, 1985

0 1000 2000 3000

scale in feet

FIGURE 1
LOCATION MAP

WELLS G&H
SUPERFUND SITE
WOBURN, MASSACHUSETTS

AECOM

TRC

Wannalancit Mills
650 Suffolk Street
Lowell, MA 01852
978-970-5600

QUADRANGLE LOCATION

MASS

TRC PROJ. NO.: 104161

EPA CONTRACT NO.: EP-S1-06-01

SUBCONTRACT NO.: 3493

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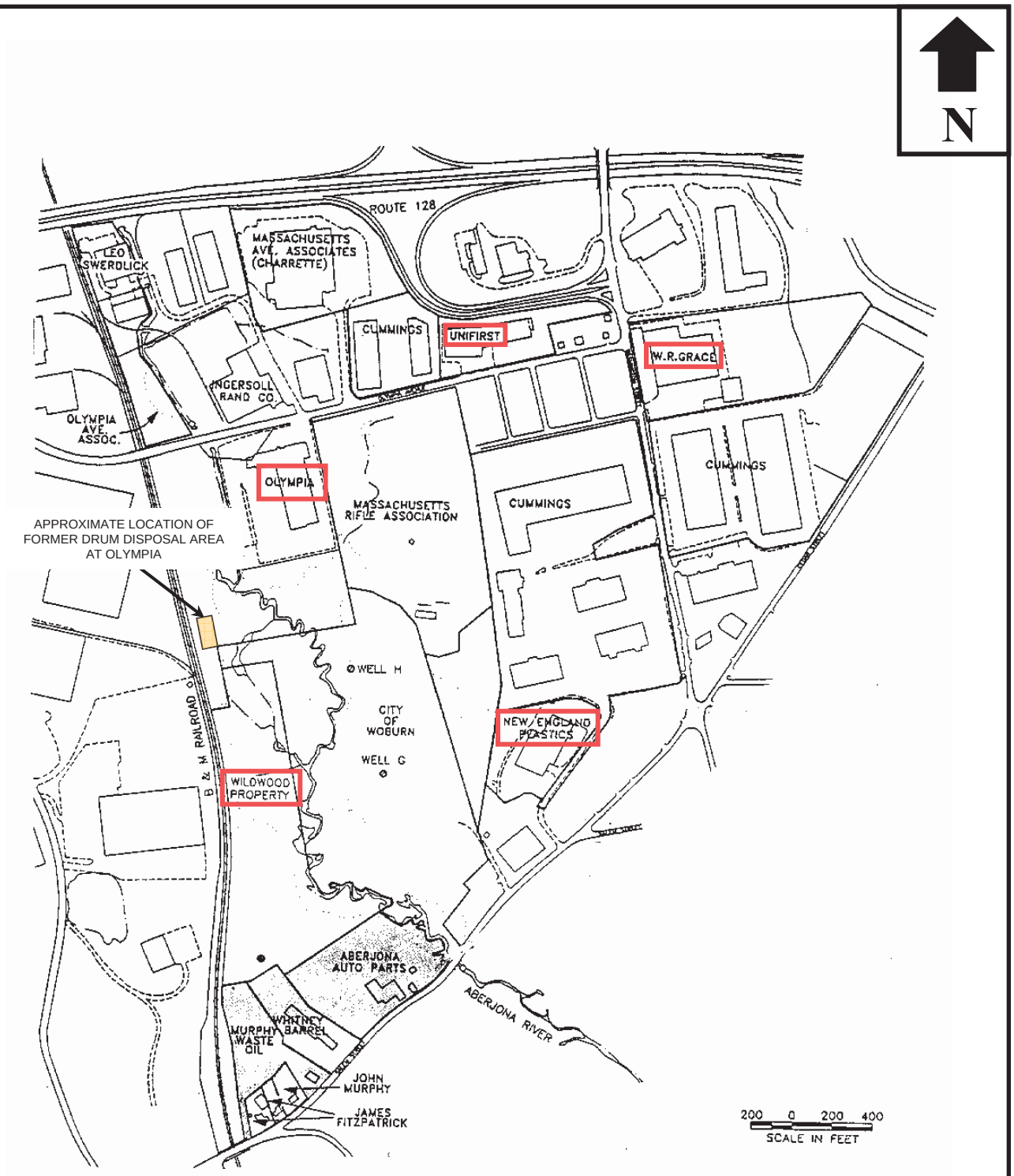

LEGEND

Wells G&H Source Area Properties

FIGURE 2
SOURCE AREA PROPERTY LOCATIONS
WELLS G&H
SUPERFUND SITE
WOBURN, MASSACHUSETTS

AECOM

TRC

Wannalancit Mills
650 Suffolk Street
Lowell, MA 01852
978-970-5600

QUADRANGLE LOCATION

MASS

TRC PROJ. NO.: 104161

EPA CONTRACT NO.: EP-S1-06-01

SUBCONTRACT NO.: 3493

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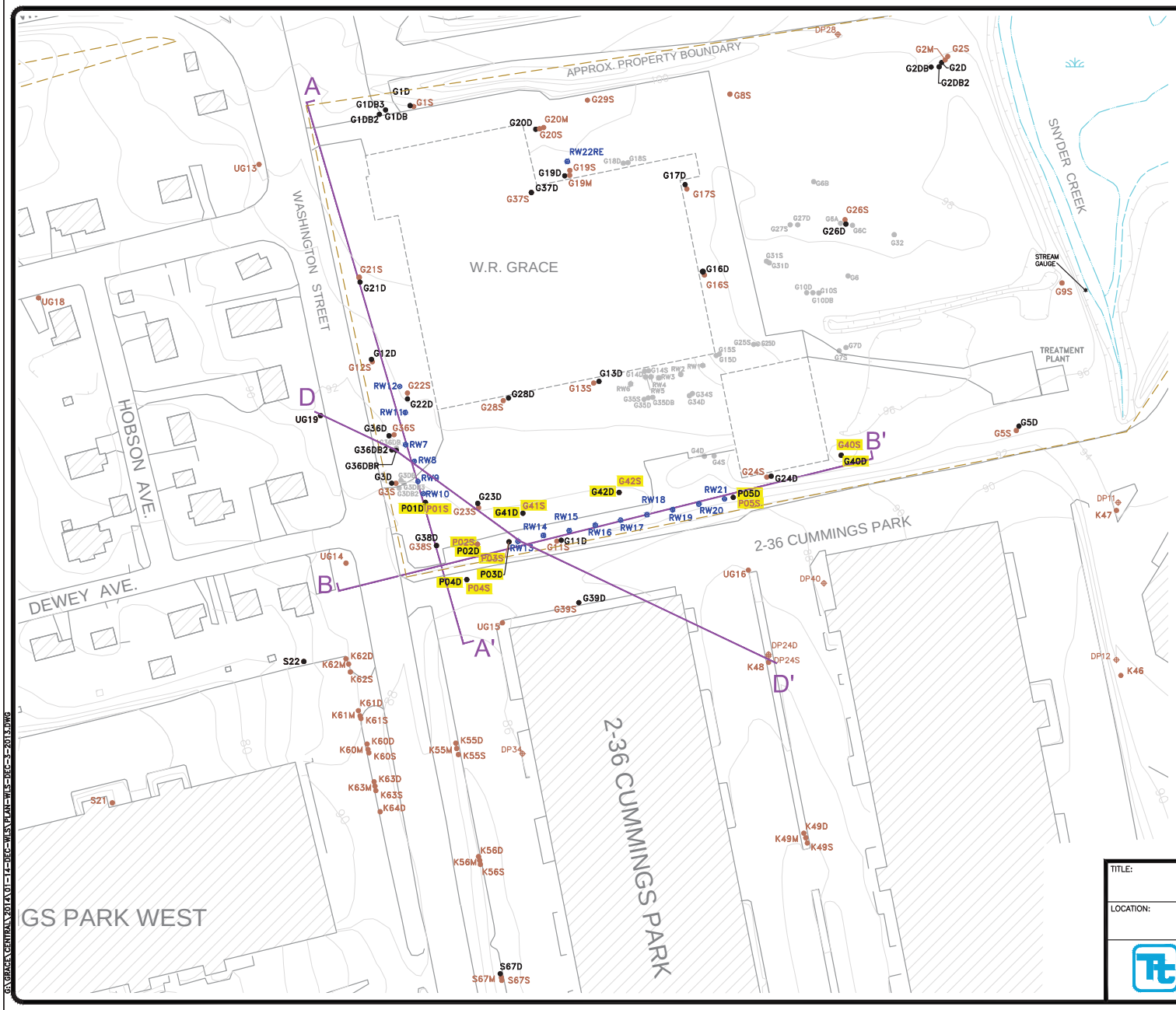

TITLE:

LOCATION:

APPROVED	ABS	FIGURE
DRAFTED	RMK	
PROJECT#	117-3008	
DATE	FEB 2014	

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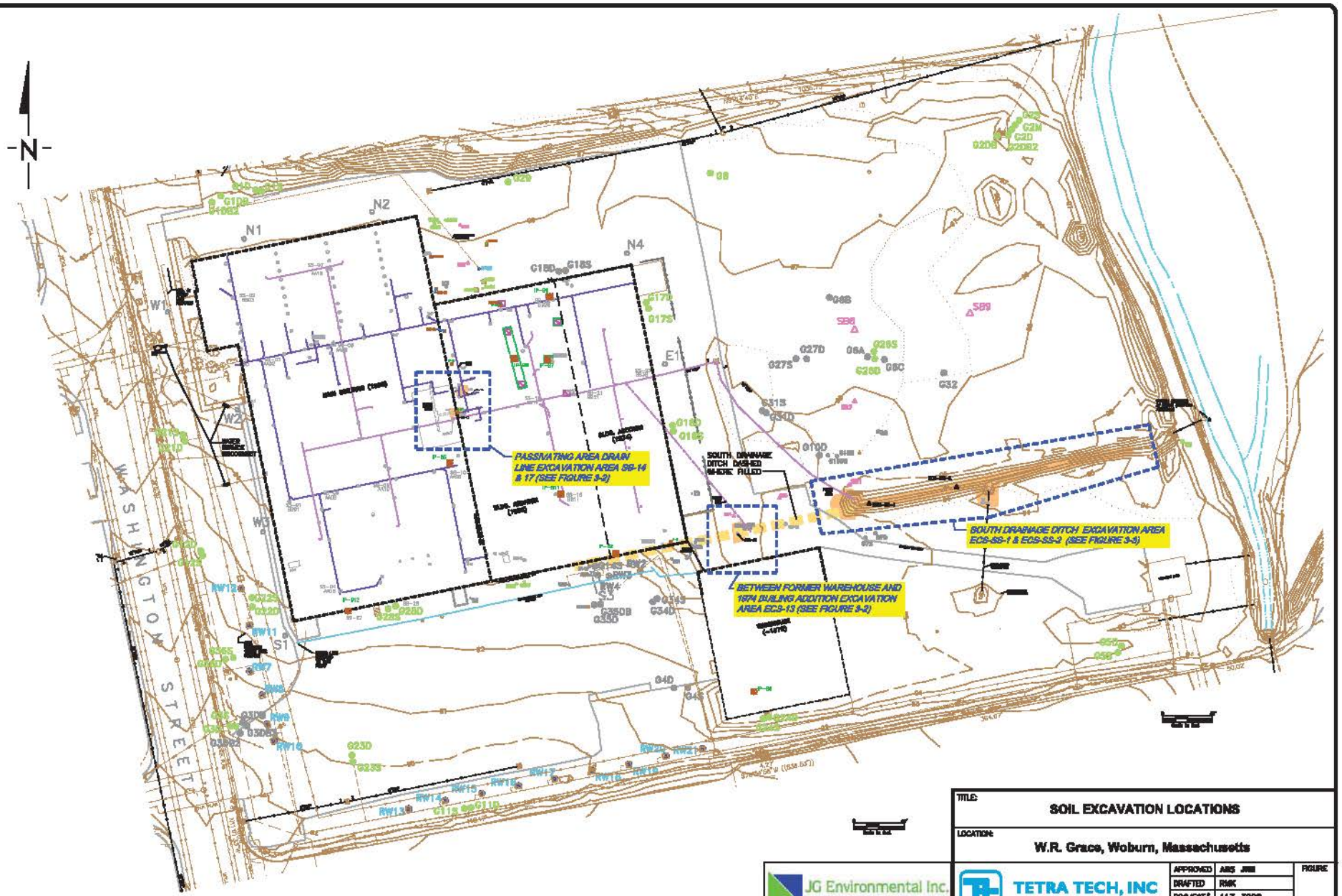


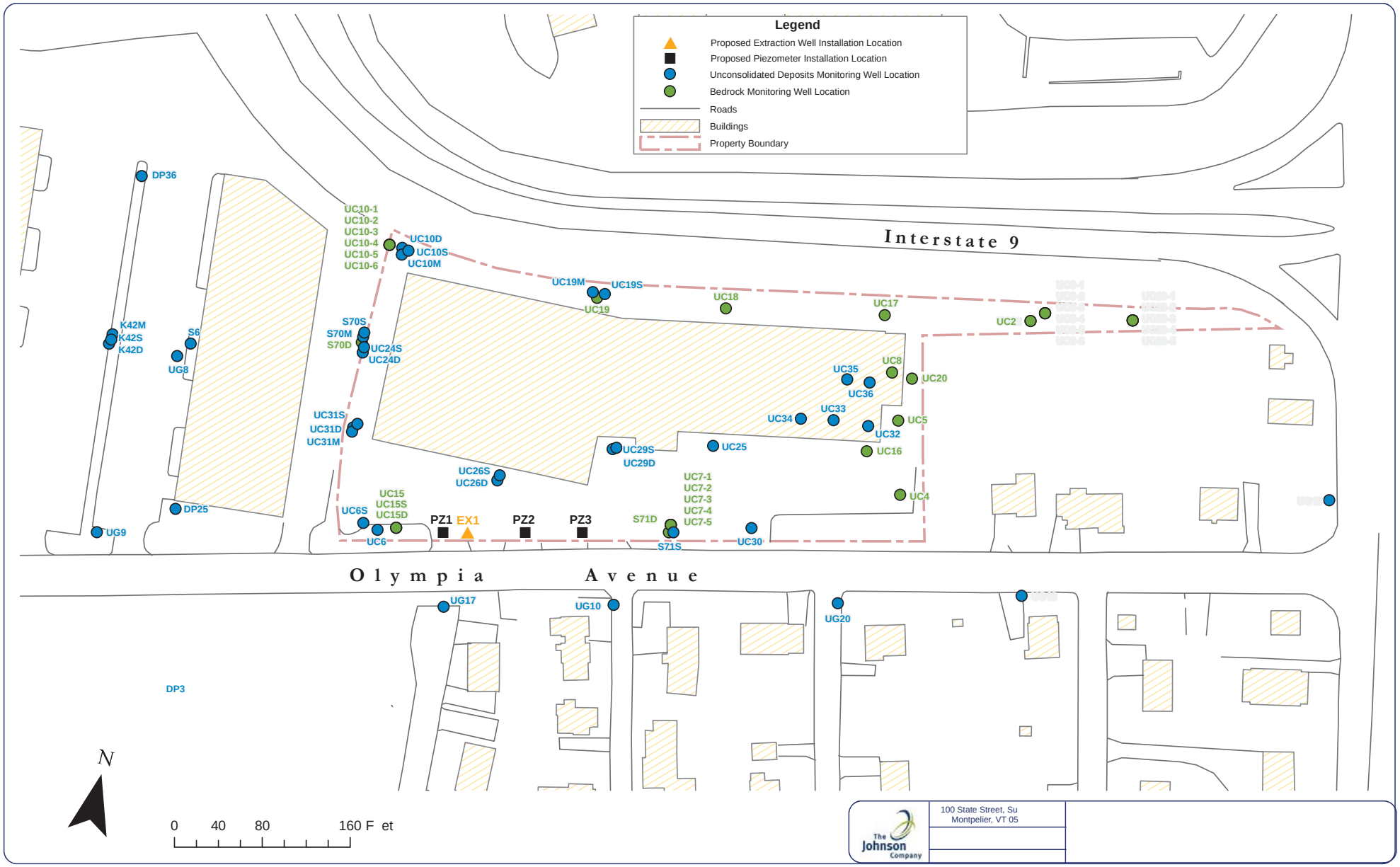
TITLE: SOIL EXCAVATION LOCATIONS

LOCATION: W.R. Grace, Woburn, Massachusetts

JG Environmental Inc. WATER RESOURCES CONSULTING

TETRA TECH, INC

APPROVED	ARS JMB	FIGURE
DRAFTED	RMK	
PROJECT#	117-3008	
DATE	JAN 2013	


Legend
Proposed Extraction Well Installation Location
Proposed Piezometer Installation Location
Unconsolidated Deposits Monitoring Well Location
Bedrock Monitoring Well Location
Roads
Buildings
Property Boundary
Interstate 9
Olympia Avenue
DP36
K42M
K42S
K42D
S6
UG8
UG9
DP25
DP3
UC10-1
UC10-2
UC10-3
UC10-4
UC10-5
UC10-6
UC10D
UC10S
UC10M
S70S
S70M
S70D
UC24S
UC24D
UC31S
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UC31M
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UC19S
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UC18
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UC2
UC35
UC36
UC8
UC20
UC34
UC33
UC32
UC5
UC16
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UC25
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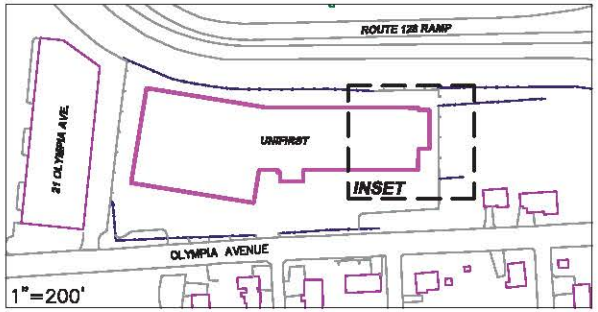
UC7-3
UC7-4
UC7-5
UC4
UC15
UC15S
UC15D
UC6S
UC6
PZ1
EX1
PZ2
PZ3
S71D
S71S
UC30
UG17
UG10
UG20
N
0
40
80
160 F et
The Johnson Company
100 State Street, Su
Montpelier, VT 05

Legend

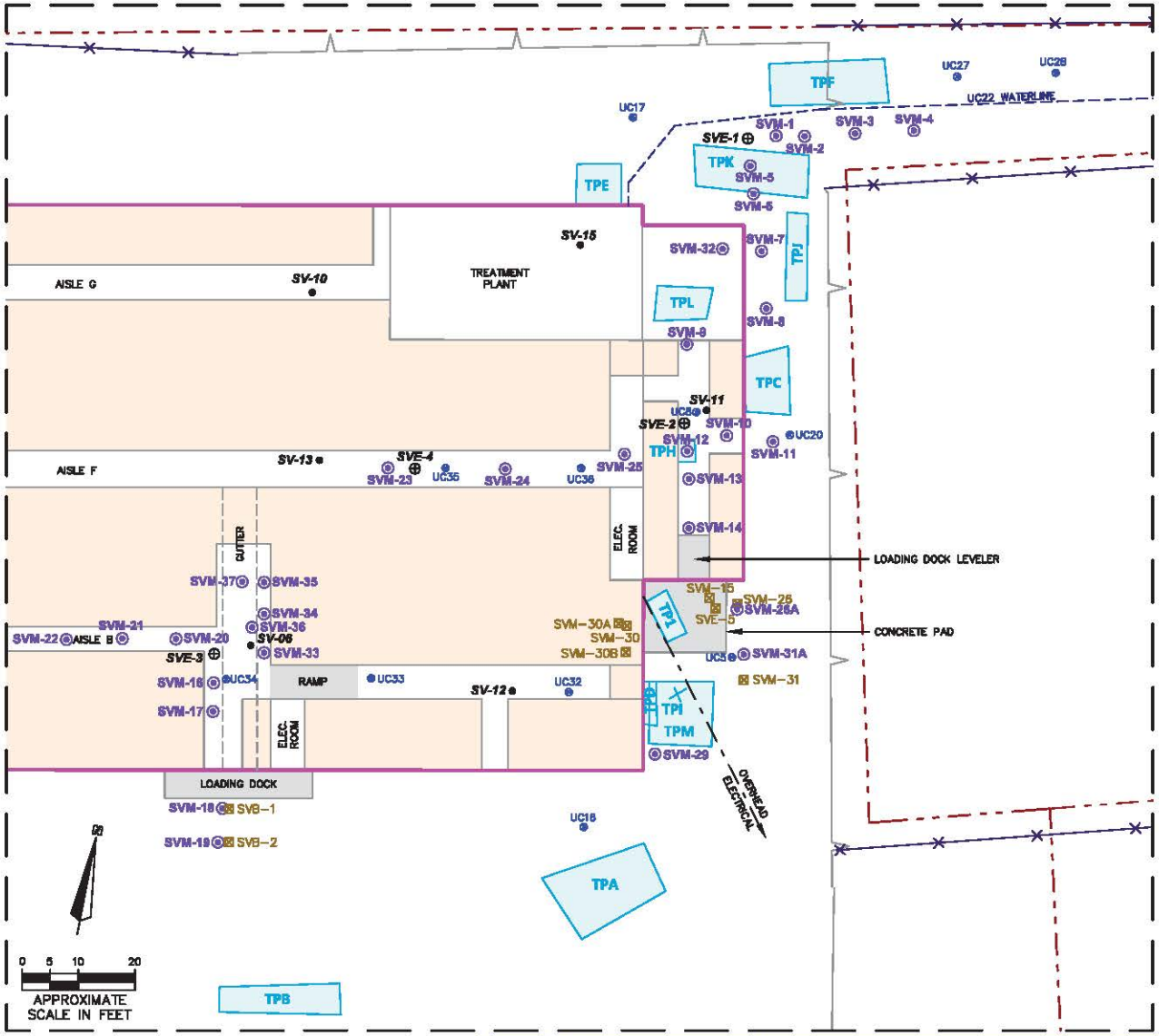
- Property Line
- Building Footprint
- Fenceline
- Retaining Wall
- Approximate Storage Area Footprint
- Approximate Test Pit Location Identified in 1994 ENSR Figure Titled "Location of Features of Interest, East End of UniFirst Property"
- UC7A — Groundwater Monitoring Well Loction
- SV-01 — Previous Sub-Slab Soil Vapor Sampling Location
- SVE-1 — 2012 Pilot Test Soil Vapor Extraction (SVE) Point Location
- SVM-1 — 2012 Pilot Test Soil Vapor Monitoring (SVM) Point Location
- SVM-30A — 2012 Pilot Test Soil Boring or Shallow Refusal Location

Key Map



Notes:

1. Base Map from an undated Layout Drawing of the Extra Space Storage Operation provided to UniFirst Corp.
2. Pilot Test point locations based on a field survey by The Johnson Company in October 2012.
3. All locations are approximate.



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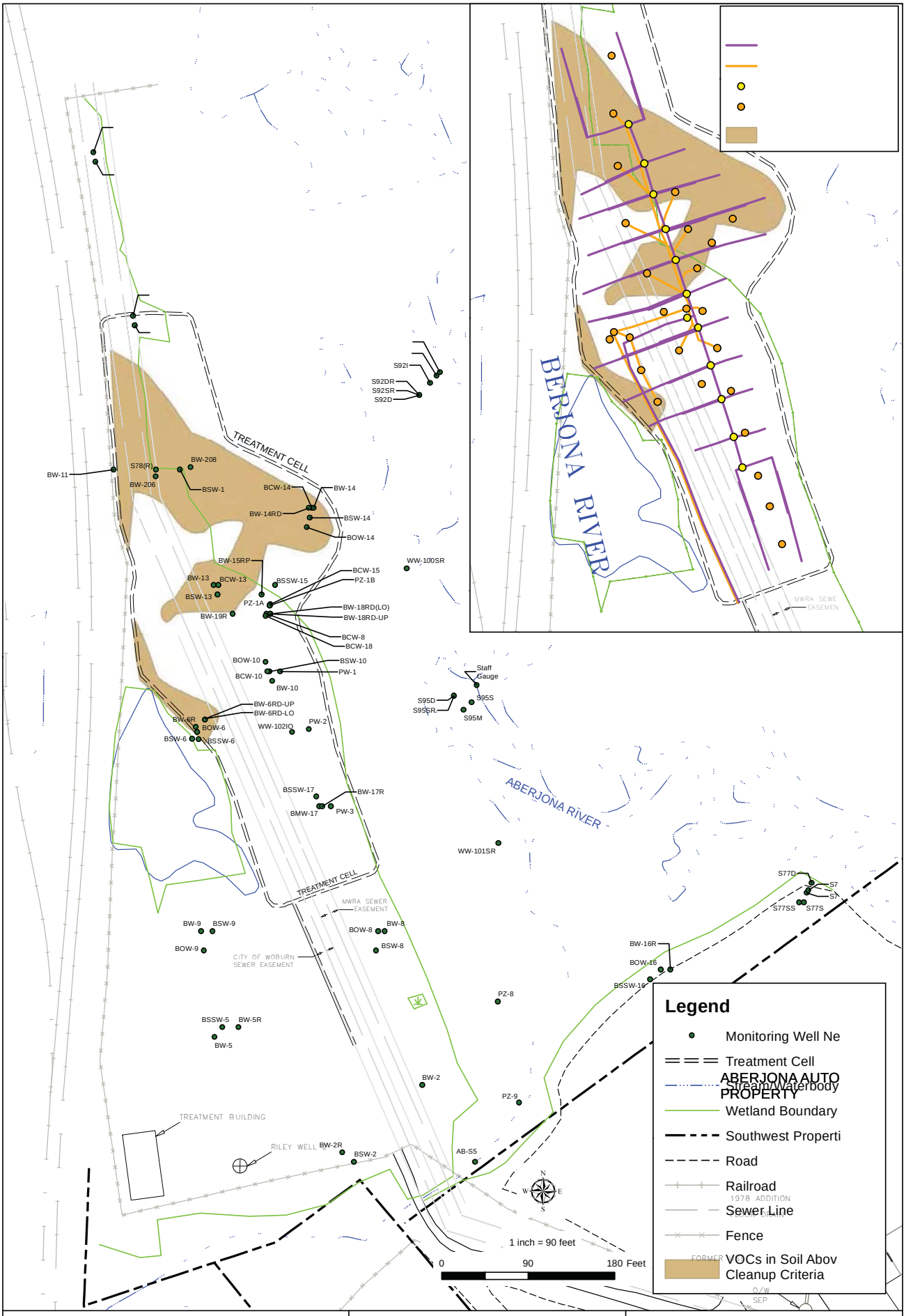
The Johnson Company
100 State Street, Suite 600
Montpelier, VT 05602
(802) 229-4600
Drawn by: TJK Date: 01/16/13
Chk'd by: BLL Date: 02/08/13
Scale: As Shown Project: 1-2114-2


BERJONA RIVER
ABERJONA RIVER
TREATMENT CELL
TREATMENT CELL
MWRA SEWER EASEMENT
CITY OF WOBURN SEWER EASEMENT
TREATMENT BUILDING
RILEY WELL
S92I
S92DR
S92SR
S92D
BW-11
S78(R)
BW-206
BW-208
BSW-1
BCW-14
BW-14
BW-14RD
BSW-14
BOW-14
BW-15RP
BW-13
BCW-13
BSW-13
BSSW-15
PZ-1A
BW-19R
BCW-15
PZ-1B
BW-18RD(LO)
BW-18RD-UP
BCW-8
BCW-18
WW-100SR
BOW-10
BSW-10
BCW-10
PW-1
BW-10
BW-6RD-UP
BW-6RD-LO
BW-6R
BOW-6
BSW-6
BSSW-6
WW-102IO
PW-2
Staff Gauge
S95D
S95SR
S95S
S95M
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BW-17R
BMW-17
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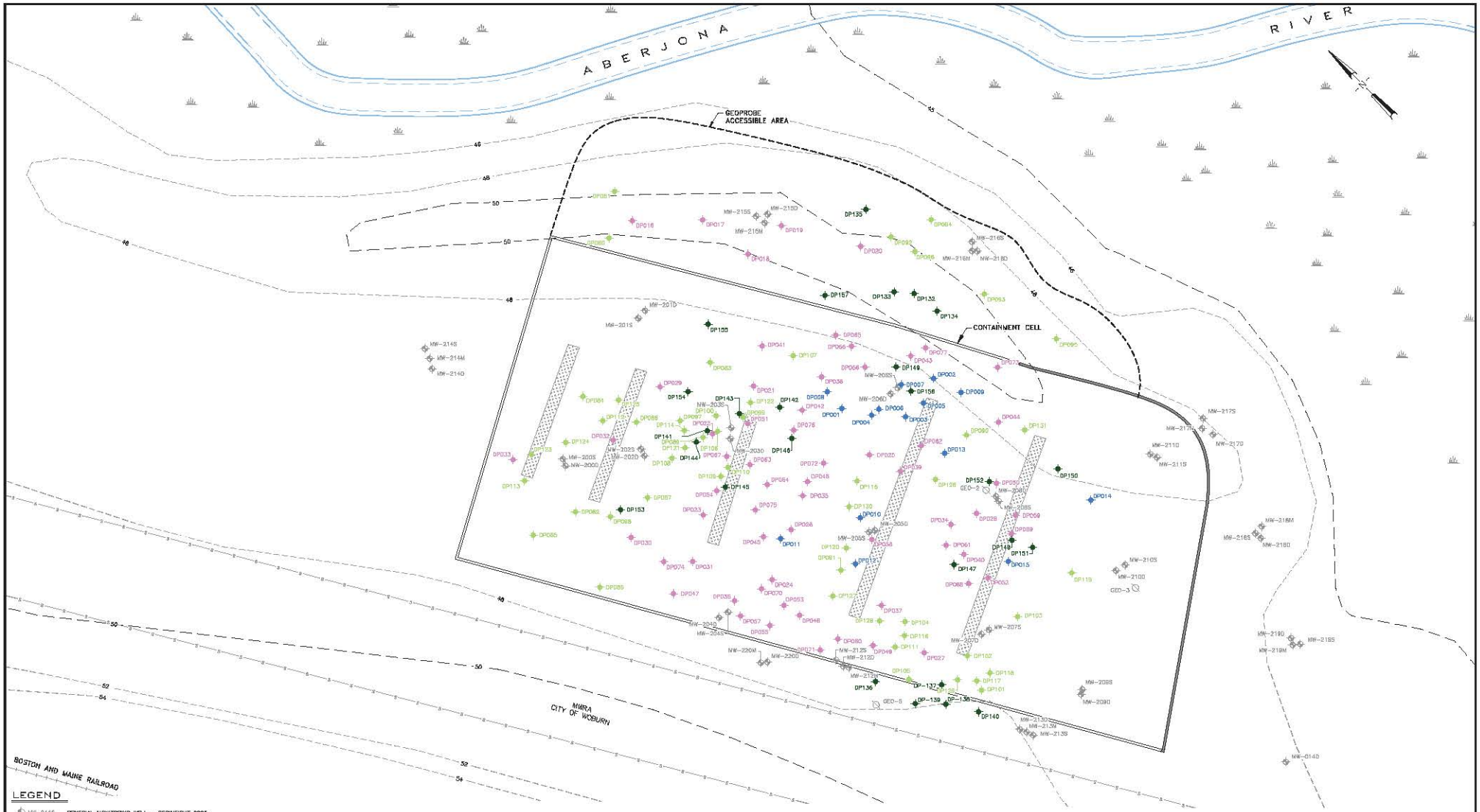
S77SS
S77S
BW-9
BSW-9
BOW-9
BOW-8
BW-8
BSW-8
BW-16R
BOW-16
BSSW-16
PZ-8
BSSW-5
BW-5R
BW-5
BW-2
PZ-9
BW-2R
BSW-2
AB-S5
N
W
E
S
1 inch = 90 feet
0
90
180 Feet
Legend
Monitoring Well Ne
Treatment Cell
ABERJONA AUTO PROPERTY
Stream/Waterbody
Wetland Boundary
Southwest Properti
Road
Railroad
Sewer Line
Fence
VOCs in Soil Abov Cleanup Criteria

AECOM



LEGEND

- MW-2165 — REMEDIAL MONITORING WELL – GEOINSIGHT 2005
- DP001 — DIRECT PUSH INJECTION LOCATIONS SPRING 2008 (MAY 2008)
- DP016 — DIRECT PUSH INJECTION LOCATIONS FALL 2008 (OCT, NOV, AND DEC 2008) (DP016–DP077)
- DP080 — DIRECT PUSH INJECTION LOCATIONS SPRING 2009 (APRIL AND MAY 2009) (DP080–DP131)
- DP132 — DIRECT PUSH INJECTION LOCATIONS FALL 2009 (NOVEMBER, 2009) (DP132–DP157)
- SUBSURFACE SEWER LINES
- APPROXIMATE LOCATION OF WETLAND AREA
- 54 — GROUND SURFACE ELEVATION CONTOUR IN FEET
- SHEETPILE WALL – 20 FEET DEEP
- SHEETPILE WALL – 25 FEET DEEP

DRAFT

NOTES:

1. BEARINGS ARE REFERENCED TO THE MASSACHUSETTS MAINLAND COORDINATE SYSTEM (NAD 27) HOLDING COASTAL GEODETIC SURVEY (CGS) MONUMENTS 414 AND 11085. THE COORDINATES WERE DERIVED UTILIZING THE GLOBAL POSITIONING SYSTEM (GPS) FAST STATIC SURVEY METHODS.

2. ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988, HOLDING CGS MONUMENT U33.

3. BASE MAPPING IS COMPILED FROM CITY OF WOBURN TOPOGRAPHIC MAPPING. FIELD TOPOGRAPHY WAS PERFORMED ON APRIL 22, 2002.

4. REFERENCE IS MADE TO THE FOLLOWING MAPS:

A. "RIGHT-OF-WAY AND TRACK MAP, BOSTON AND LOWELL R.R. CORP., OPERATED BY THE BOSTON AND MAINE R.R., STATION 546+31 TO STATION 601+11," SCALE 1" = 100', DATED JUNE 30, 1914. VALUATION 13.1/9.

B. "PLAN OF LAND, WOBURN, MASS. BELONGING TO DANIEL J. QUINN," SCALE 1" = 40', DATED FEBRUARY 1946, PREPARED BY GEO. W. OLSON, MAP ON FILE IN THE MIDDLESEX REGISTRY OF DEEDS AS PLAN #297.

C. "PLAN OF LAND IN WOBURN, MASS.," SCALE 1" = 40', DATED JUNE 6, 1963, PREPARED BY SCHOFIELD BROTHERS.

D. "SUBDIVISION PLAN OF LAND IN WOBURN, H. KINGMAN ABBOTT, SURVEYOR," SEPTEMBER 20, 1958, LAND COURT DOCUMENT 35070.

E. "SUBDIVISION PLAN OF LAND IN WOBURN," HAYES ENGINEERING, INC., SURVEYORS, DATED JANUARY 14, 1983, LAND COURT DOCUMENT 35070.

F. "PLAN OF LAND IN WOBURN," H. KINGMAN ABBOTT, SURVEYOR, JANUARY 8, 1982, NOVEMBER 1988, LAND COURT DOCUMENT 32181A.

0 10 20
APPROX. SCALE IN FEET

CLIENT: OLYMPIA NOMINEE TRUST			
PROJECT: 60 OLYMPIA AVENUE			
TITLE:			
DESIGNED: RSE	DRAWN: NMT	CHECKED: CAB	APPROVED: MJW
SCALE: 1" = 10'	DATE: 03/15/10	FILE NO.: 24910122	PROJECT NO.: 2491

FIGURE NO.:

gend

Monitoring Wells

f-Property Shallow Overburden Well Location

ormer Bedrock Production Wells

Deep Bedrock Wells

VOCS (VOCs) IN GROUNDWATER

190	--- 1987 concentration, ug/L
158	--- 1988 concentration, ug/L
52	--- 1989 concentration, ug/L
63	--- 1990 concentration, ug/L
72	--- 1992 concentration, ug/L
68	--- 1996 concentration, ug/L
29	--- 1998 concentration, ug/L
15	--- 1999 concentration, ug/L
	--- 2000 concentration, ug/L
	--- 2001 concentration, ug/L
	--- 2002 concentration, ug/L
nd	--- 2003 concentration, ug/L
	--- 2004 concentration, ug/L
nd	--- 2005 concentration, ug/L
nd	--- 2006 concentration, ug/L
nd	--- 2007 concentration, ug/L
nd	--- 2008 concentration, ug/L
U	--- 2010 concentration, ug/L
7	--- 2011 concentration, ug/L
2	--- 2013 concentration, ug/L

-- Indicates not sampled
nd Indicates not detected
U Non-Detect at reported concentration based on data quality assessment (2010 only)

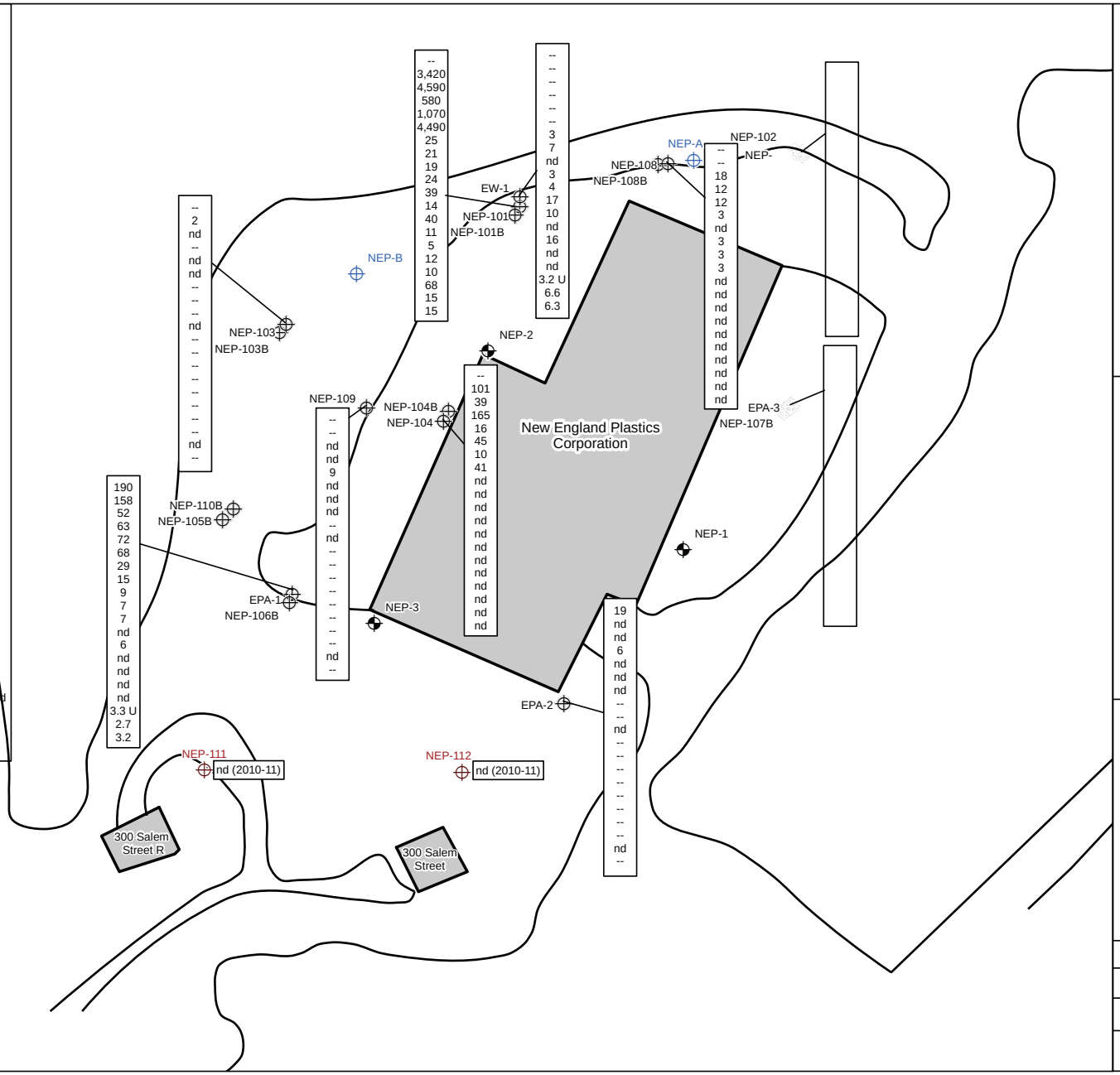
-101 was also sampled in 1994. Total CVOC concentrations d at 5,406 ug/l.

was paved over in 1996.

ations of VOCs in new off-property overburden wells (NEP-111 and talled in September 2010 and sampled in October 2010 were

2011, concentrations of methyl tert-butyl ether (MTBE; a non-chlorinated lso detected in overburden well EPA-3 at 93 ug/l.

nferred from MassGIS Orthophotography, 2008.



APPENDIX A – EXISTING SITE INFORMATION

A. SITE CHRONOLOGY

The chronology of all significant Site events and dates is included in Table A-1.

Table A-1
Site Chronology

Event	Date
"Riley Well 2" began operation on Wildwood Conservation Corporation (Wildwood) property.	1958
Municipal water Well G developed.	1964
Municipal water Well H developed.	1967
Woburn police find abandoned drums at Massachusetts Bay Transportation Authority (MBTA) property on Mishawum Road.	1979
The Massachusetts Department of Environmental Protection (MassDEP) finds contamination in the City of Woburn water wells G and H. The wells are subsequently closed.	1979
The United States EPA investigates groundwater contamination.	1981
The Wells G&H Site is proposed for the National Priorities List (NPL).	December 1982
The Wells G&H Site is listed on the NPL.	September 1983
Three Potentially Responsible Parties (PRPs) are ordered by EPA to study groundwater and soil contamination. The PRPs complying with the order are Grace and Co.–Conn (Grace), UniFirst Corporation (UniFirst), and Beatrice Corporation (Beatrice).	1983
EPA begins investigation of the entire 330-acre Wells G&H Site.	1985
Under EPA order, Olympia Nominee Trust (Olympia) removes 12 55-gallon drums from southwest corner of property on west side of Aberjona River in area known as the Former Drum Disposal Area (FDDA).	1986
The United States Geological Survey (USGS) conducts 30-day aquifer test at Wells G&H under agreement with EPA.	1987
Under EPA order, Olympia removes an additional 5 55-gallon drums from southwest corner of property on west side of Aberjona River in FDDA.	1987
EPA issues an Administrative Order to UniFirst to install monitoring wells and remove contaminants.	1987
EPA finishes soil and groundwater studies and completes the Supplemental Remedial Investigation (RI).	September 1988
The "Riley Well 2" production well on the Wildwood property ceases operation.	1989
EPA issues the Wells G&H Record of Decision (ROD), which presents the long-term clean-up approach.	September 14, 1989
Consent Decree (CD) is signed.	September 1990
EPA issues Explanation of Significant Difference (ESD)	April 25, 1991
PRPs begin design of long-term clean-up. Combined Grace-UniFirst groundwater treatment pilot study conducted.	1991
Two of five PRPs begin long-term groundwater clean-up and two others begin soil excavation.	September 1992
Combined Grace-UniFirst groundwater recovery and treatment system commences operation.	September 1992

Table A-1 Site Chronology	
Event	**Date**
PRPs (Beatrice, UniFirst, and Grace) issue Phase IA Wells G&H Site Central Area Investigation Report for the Central Area Operable Unit 2 (OU-2).	February 1994
Beatrice issues Draft Remedial Investigation Report for Southwest Properties.	February 1994
Clean Harbors issues Hydrogeologic Characterization Report for Murphy Waste Oil (1 of 3 properties of the OU-2 Southwest Properties).	February 1994
Remediation of sludge, debris and mixed contaminant soil completed at Wildwood.	1994
EPA and U.S. Fish and Wildlife Service (USFWS) conduct investigations in support of the Aberjona River Study (OU-3).	1995
Clean Harbors issues Addendum I to Hydrogeologic Characterization Report for Murphy Waste Oil Site.	January 1995
Clean Harbors issues Corrective Action Investigation Report Part I and II for Murphy Waste Oil Site.	1996 and 1997
Clean Harbors issues Focused Human Health Imminent Hazard Evaluation and Evaluation of Imminent Hazard to Environmental Receptors for Murphy Waste Oil Site.	October 1996
Second round of Aberjona River Study sampling conducted by EPA and Metcalf & Eddy, Inc. (M&E).	1997
EPA investigates Romicon facility as part of OU-2.	Summer 1997
Grace reduced number of pumping wells from the original 22 to current 16 wells.	1997
New England Plastics (NEP) initiates Source Control Remedy (air sparging with soil vapor extraction).	February 2, 1998
EPA conducts Phase I Pre-Design Investigation of FDDA at the Olympia Site.	March 1998
Wildwood soil and groundwater remediation system startup.	May 6, 1998
Clean Harbors issues Addendum to Corrective Action Report (Part II) for Murphy Waste Oil Site.	December 1998
First Five-Year Review report issued.	August 4, 1999
NEP discontinues soil remediation.	March 7, 2000
Wildwood replaces catalytic oxidation unit with activated carbon filtration unit.	June 2000
EPA, TetraTech NUS, Inc. (TTNUS), and M&E conduct supplemental field activities in support of Aberjona River Study (OU-3).	2000-2002
EPA combines the study of Wells G&H OU-3 (the Aberjona River Study) with Industri-Plex OU-2	Spring 2002
Grace replaces ultraviolet/chemical oxidation (UV/Ox) system with two granular activated carbon filters operating in series.	2002
EPA/TRC prepares and issues Olympia Data Summary Report.	December 2002
Olympia enters into first Administrative Order on Consent (AOC) with EPA Removal Program to conduct contaminated soil removal activities.	March 12, 2003
EPA issues Draft Baseline Human Health and Ecological Risk Assessment Report for Aberjona River Study (OU-3).	May 2003
EPA issues Draft Preliminary Multiple Source Groundwater Response Plan (MSGRP) Report - Southern Area as part of Industri-Plex/Aberjona River Study that evaluates potential contaminant sources in the Aberjona Watershed south of Route 128.	June 2003
Contaminated surface soil and polychlorinated biphenyl (PCB) material at Olympia property excavated and disposed offsite by PRP.	June – August 2003

Table A-1 Site Chronology	
Event	**Date**
Beatrice undertakes Supplemental RI of Southwest Properties and issues Draft Supplemental RI Report.	August 2003
UniFirst replaces UV/Ox system with two carbon adsorption units operating in series.	October 2003
EPA issues Baseline Human Health and Ecological Risk Assessment for the Southwest Properties.	March 2004
Olympia enters into second AOC with EPA Removal Program to address trichloroethene (TCE) impacted soils associated with the FDDA at the Olympia Site.	June 9, 2004
EPA issues second Five-Year Review report for the Wells G&H Site.	September 2004
Olympia initiates In-situ Chemical Oxidation (ISCO) treatment system to address TCE contamination in soil and groundwater at the FDDA.	September 2005
EPA issues ROD for Industri-Plex OU-2 (including Wells G&H OU-3).	January 31, 2006
EPA Removal Program enters into AOC with abutting property owner to address chromium waste along drainage swale at the neighboring former J. J. Riley property.	June 2006
Grace demolishes Site buildings in anticipation of potential redevelopment.	August/September 2006
EPA Removal Program performs removal actions to address PCB contaminated soils at the neighboring former waste oil facility on Salem Street.	June 2007
EPA conducts review of PRP soil and soil gas data at UniFirst property	February 2008
Owner of former Aberjona Auto Parts property (within Southwest Properties) constructs public ice rink facility.	September 2008
EPA enters into Consent Decree settlement with Bayer CropScience, Inc., and Pharmacia Corporation for cleanup of Industri-Plex OU-2 (including Wells G&H OU-3) consistent with January 2006 ROD.	November 2008
Massachusetts Contingency Plan (MCP) Phase II and Phase III Report submitted for the Organix, LLC (former location of J.J. Riley tannery) property describing the Comprehensive Site Assessment and evaluation of Remedial Action Alternatives.	March 15, 2009
EPA issues draft comment letters for Wells G&H OU-1 and OU-2.	May 2009
EPA issues third Five-Year Review report for Wells G&H Site.	September 2009
EPA provides notice of well installation in Dewey and Olympia Avenue neighborhood to evaluate groundwater contribution to VOCs in indoor air.	April 24, 2010
NEP submits Off-Property Groundwater Investigation Work Plan.	July 14, 2010
Completion of modifications to deepen recovery well RW22 at Grace property.	August 19, 2010
Remedial Action Plan under the MCP implemented at the Organix, LLC (former location of J.J. Riley tannery) including clearing of work areas, excavation and offsite disposal.	July – September 2010
UniFirst and Grace submit Assessment of Coordinated Groundwater Remedies Operable Unit One – Northeast Quadrant of Wells G&H Superfund Site report.	December 17, 2010
EPA presents the results of groundwater sampling and outlines next steps (e.g., collection of subslab soil gas and indoor air samples, data evaluation and communication of results) related to Dewey and Olympia Avenue neighborhood Vapor Intrusion investigation.	January 26, 2011
EPA issues Addendum to Third Five-Year Review report for Wells G&H Site, including a Human Health Risk Assessment for the Vapor Intrusion Pathway for additional data collection at the UniFirst property and downgradient of the UniFirst, Grace and NEP properties.	April 2012
Grace submits Soil Management Evaluation and Response Plan (Revision 1)	June 19, 2012

Table A-1 Site Chronology	
Event	**Date**
describing November-December 2011 soil investigation activities and proposed response actions.	
UC22 Restart Monitoring results submitted by UniFirst.	June 20, 2012
UniFirst submits Revised Vapor Extraction Pilot Test Work Plan and Quality Assurance Project Plan	July 31, 2012
UniFirst submits Addendum to Revised Vapor Extraction Pilot Test Work Plan in response to EPA comments.	September 28, 2012
Source Area Defendants (Beatrice, Grace, NEP and UniFirst) submit responses to EPA Comments at June 12, 2012 Meeting regarding OU-2 and completion of a Phase 1B Work Plan.	October 1, 2012
Vapor extraction pilot test conducted at the UniFirst property.	October/November 2012
UniFirst submits Vapor Extraction Pilot Test Summary Report.	February 22, 2013
Grace submits work plan for installation of additional piezometers and monitoring wells in the vicinity of Area 2 & 3 recovery wells.	April 12, 2013
Grace implements soil removal activities.	August – October 2013
Grace submits Soil Response Action Completion Report (Revision 1) summarizing soil excavation and disposal activities.	July 3, 2013
Grace submits Area 2 & 3 Evaluation Report summarizing the results of the June through December 2013 well installation and monitoring activities.	March 31, 2014
UniFirst submits Soil Vapor Extraction System Design Report.	May 2, 2014
UniFirst submits Extraction Well Installation Work Plan for installation and testing of a supplemental extraction well.	May 20, 2014
UniFirst conducts supplemental well installation, development, slug testing and pump testing.	July/August 2014

B. BACKGROUND

Physical Characteristics / Land and Resource Use

The Wells G&H Superfund Site covers approximately 330 acres in east Woburn, Middlesex County, Massachusetts (see Figure 1). The Site includes the aquifer and land located within the zone of contribution of two former municipal drinking water wells known as Wells G and H, which are located adjacent to the Aberjona River. The boundaries of the Site are Route 128 (Interstate 95) to the north, Route 93 to the east, the Boston and Maine (B&M) Railroad to the west, and Salem and Cedar Streets to the south (see Figure 1). Wells G and H are located in the sand and gravel aquifer of the Aberjona River basin within the Mystic River watershed.

The Site is currently a mixed use area consisting of light industry, commercial businesses, office and industrial parks, residences, and recreational property. Predominantly residential property is located to the south of the Site. Former land uses in this area consisted of traditional industries such as manufacturing, warehousing, and distribution (GeoTrans, 1994) as well as agricultural uses such as piggeries and flower nurseries (TRC, 2002).

The Site is divided into three operable units, the Source Area (OU-1) properties, the Central Area (OU-2) and the Aberjona River Study (OU-3), which are briefly described below. Note that in the Spring of 2002, EPA combined the study of Wells G&H OU-3 (the Aberjona River Study) with Industri-Plex OU-2. In January 2006, EPA issued a ROD for Industri-Plex OU-2 (including Wells G&H OU-3). In November 2008, EPA entered into a Consent Decree with Bayer CropScience Incorporated and Pharmacia Corporation for the implementation of the Industri-Plex OU-2 (including Wells G&H OU-3) remedy consistent with the January 2006 ROD.

Operable Unit 1 – Source Area Properties

The OU-1 Source Area properties consist of the W.R. Grace Property (Grace property) , UniFirst Property (UniFirst property), New England Plastics Property (NEP property), Wildwood Property (Wildwood property) , and Olympia Property (Olympia property), the locations of which are depicted on Figure 2. The Grace property is approximately 13 acres and is located at 369 Washington Street on the northeastern portion of the Site. The UniFirst property is located at 15 Olympia Avenue. NEP property is approximately 2 acres located at 310 Salem Street. The NEP office and plant are on the south side of Cummings Office Park and west of Washington Street. The Wildwood property is approximately 15 acres located at 278 Rear Salem Street. The Olympia property is approximately 23.1 acres located at 60 Olympia Avenue on the western boundary of the Site.

The UniFirst facility was a uniform service facility with an in-house dry cleaning operation. In 1965, the site was developed and the facility eventually included office space, processing and storage of industrial uniforms, dry cleaning, and a truck storage garage (PRC, 1986). The property is currently used for storage by another company (Extra Space Storage, Incorporated). Downgradient of the UniFirst property are residential and commercial properties, as well as wetlands connected to the Aberjona River.

Grace purchased the 369 Washington Street facility in 1960 and fabricated food wrapping/packaging equipment (PRC, 1986). The Grace property is currently vacant and was historically under consideration by the Woburn Redevelopment Authority (WRA) for development opportunities. Potential uses reviewed by the WRA include office space, research and development, hotel, retail/business services, and light manufacturing (WRA, 2002a). In August and September 2006, Grace demolished all site buildings, except the treatment building, in anticipation of potential redevelopment of the property. Additional redevelopment opportunities, including hotel and/or restaurant space, are currently being evaluated. Downgradient of the Grace property are residential and commercial properties.

NEP began operations in 1965 and manufactures vinyl siding and custom molded plastic items. Prospect Tool and Die Company rented space from NEP beginning in 1967 and began operations as a machine shop (Ebasco, 1989; CEI, 1992). NEP continues to operate a plastics manufacturing facility. On-site contamination at NEP property has been attributed in the past to NEP and their former tenant, Prospect Tool and Die Company. A residence is located immediately downgradient of the NEP property and downgradient of groundwater monitoring well 106B (Hamel, 2004).

The Wildwood property is 15 acres of woodland and open space adjacent to the Aberjona River on the western floodplain. The Wildwood property was formerly owned by the J. J. Riley Tannery, which was purchased in 1979 by Beatrice Foods. The only land use of the Wildwood property was the construction and use of a production well (Riley Well 2) in 1958 for the former J. J. Riley Tannery, which was located west of the Wildwood property across the B&M Railroad. The operation of Riley Well 2 was discontinued in 1989. The only structures currently on-site are the Riley Well 2 well house and a building housing the groundwater treatment system. Downgradient of the Wildwood property are wetlands and the Aberjona River. The projected land use shows Wildwood remaining undeveloped, with a nature area/walking trails located on City property east and across the river (WRA, 2002b).

The 23.1-acre Olympia property is located on Olympia Avenue and is split by the Aberjona River. The eastern portion of the property was developed as a trucking terminal in 1963 and is presently used as such. The western portion of the Olympia property is the site of a FDDA, and is the source of groundwater contamination associated with the Olympia property and addressed in the ROD.

A truck terminal currently occupies approximately eight acres of the northeast corner of the Olympia property on the east side of the Aberjona River and includes a one-story terminal building and associated paved parking areas on all sides of the terminal building. Downgradient of the Olympia property are wetlands and the Aberjona River.

The mechanism of release at the FDDA appears to have been leaking drums. The drums were discovered in 1979/1980 by representatives of MassDEP (then the Department of Environmental Quality Engineering [DEQE]). The drums were removed in 1986 and 1987 by Olympia under EPA orders. EPA conducted extensive sampling and analysis of soil and groundwater in 2002 and delineated soil and groundwater contamination at the FDDA. Surface soils were contaminated with PCBs, and subsurface soils and groundwater were primarily contaminated with TCE. EPA believes that this area serves as an ongoing source of TCE contamination to the groundwater and to the Aberjona River that flows through the property. Pursuant to a June 2004 AOC, a PRP-lead removal action is underway at this portion of the site.

Operable Unit 2 – Central Area

The Central Area (OU-2) consists of all groundwater and land within the area defined as the Wells G&H Superfund Site, excluding the areas defined for Source Area (OU-1) properties and the Aberjona River Study (OU-3; merged with Industri-Plex OU-2).

The groundwater aquifer underlying the Site is not currently used as a municipal drinking water source. The remedial action objectives listed in the Site ROD included restoring the aquifer to drinking water standards. The community has consistently stated that it is opposed to utilizing Wells G and H as a drinking water supply, although the City of Woburn has expressed interest in having the source available for the future (MassDEP, 2004). MassDEP's Groundwater Use and Value Determination assigned a "medium" use and value for the Site aquifer, based on a balanced consideration of several factors. The Groundwater Use and Value Determination concludes that the aquifer may be used in the future for domestic and industrial purposes

(MassDEP, 2004).

The portion of the Central Area (OU-2) known as the Southwest Properties includes the Aberjona Auto Parts, Whitney Barrel, and Murphy Waste Oil properties. Aberjona Auto Parts began operations in the mid-1950s for the sale and reconditioning of used and wrecked automobiles, and was also a gasoline service station (NUS, 1986). The Aberjona Auto Parts business is no longer in operation. The current owner has cleared the property of debris. The property is currently occupied by an automotive repair shop, a landscaper, a residence, and a newly constructed ice rink.

The Whitney Barrel Company located on Salem Street commenced operations in 1949, and reconditioned drums, boilers, tanks and machinery (NUS, 1986). The Whitney Barrel property is currently occupied by several commercial businesses such as landscapers and automotive glass repair.

The Murphy Waste Oil property is a Resource Conservation and Recovery Act (RCRA)-permitted Treatment, Storage and Disposal Facility (TSDF) operated by Clean Harbors Environmental Services, Incorporated. The property lies to the west of the Whitney Barrel property and to the east of the B&M Railroad. It is predominantly covered by fill. North and east of the fence that surrounds the waste oil facility is a wetland area referred to as the "Murphy Wetland" which is connected to the Aberjona River.

Operable Unit 3 – Aberjona River Study

The Aberjona River Study (OU-3) area consists of the Aberjona River and its tributaries, sediments, and associated 38-acre wetland area that lie within the 330-acres of the Site. The Aberjona River begins in Reading, Massachusetts, and flows through the Industri-Plex Superfund Site to the north of Route 128 before flowing through the Site, and eventually reaches the Mystic Lakes in Winchester.

Historically, the Aberjona River watershed contained numerous industrial facilities. The types of manufacturing in the Aberjona River watershed included leather processing, tanning factories, shoe and boot factories, machine shops, and chemical manufacturing. The watershed also includes the Industri-Plex Superfund Site, which is located approximately 1.5 miles upstream from municipal Wells G and H. The land within the watershed is highly developed, but with a higher percentage of office and commercial business space than the industrial and manufacturing land uses seen in the past. In Spring 2002, OU-3 was combined with Industri-Plex OU-2. EPA entered into a Consent Decree with Bayer CropScience, Incorporated, and Pharmacia Corporation for cleanup of Industri-Plex OU-2 (including Wells G&H OU-3) consistent with the January 2006 ROD.

The protectiveness of the remedy selected for Industri-Plex OU-2 (including Wells G&H OU-3) will be evaluated during the FYR for the Industri-Plex Site.

Geology and Hydrogeology

The following provides a brief description of the geologic and hydrogeologic conditions in the vicinity of the Wells G&H Superfund Site.

Geology

The unconsolidated deposits at the edges of the Aberjona River Valley are primarily ground moraine deposits. Within the Eastern Uplands, two varieties of till have been identified, a lodgment till and an ablation till. The lodgment till lies directly on the bedrock surface and is as much as 30 feet thick. The lodgment till was deposited at the base of the glacial ice, is very densely packed, generally has low permeability, and does not easily yield water to wells. Overlying the lodgment till is a thin layer of ablation till. The ablation till has a more sandy texture and is less densely packed than the lodgment till. In the Eastern Uplands, the ablation till generally exists above the water table (GeoTrans, 1994).

The low lying western portion of the Central Area aquifer is comprised of stratified outwash deposits. Geologic logs of wells and borings indicate that within the buried bedrock valley, the outwash deposits generally overlie the bedrock surface directly. In some areas, there is a thin layer of lodgment till between the outwash deposits and bedrock surface (GeoTrans, 1994).

The swamp deposits consist of decayed vegetal matter, silt, sand, and possibly clay. These deposits generally lie at the surface, except where covered by artificial fill, and are found within the wetlands that border the Aberjona River and its tributaries. Based on geologic logs from wells drilled through the swamp deposits, the thickness, which varies considerably and is probably a result of the surface topography of the outwash deposits, is generally less than 5 feet (GeoTrans, 1994).

The stratified drift deposits fill the Aberjona River Valley, make up the Central Area Aquifer, and are up to 130 feet thick. The stratified drift deposits are well sorted and possess much higher hydraulic conductivity than the till, ranging from 0.1 feet per day in the finer grained deposits to 350 feet per day in the gravelly layers (Myette et al., 1987). City of Woburn public water supply Wells G and H and the J. J. Riley supply wells were constructed in the stratified drift because the high hydraulic conductivity of these deposits and proximity to the Aberjona River allowed large well yields (GeoTrans, 1994). Several other industrial supply wells were operated in the stratified drift deposits north of the Wells G&H Superfund Site (Delaney and Gay, 1980).

The bedrock underlying the Wells G&H Site has been mapped as Salem Granodiorite, Dedham Granite, and undifferential metavolcanics (Barosh et al., 1977). The underlying bedrock surface rises steeply from an elevation less than –100 feet National Geodetic Vertical Datum (NGVD) along the buried valley axis, to an elevation greater than 100 feet NGVD near the intersection of Washington Street and Route 128. In general, available data indicate the bedrock is generally competent and is not extensively fractured, but contains localized fracture zones capable of yielding water to wells (GeoTrans, 1994).

The hydraulic conductivity of the bedrock is generally low and, in general, potential well yields would be low. Localized areas within the Wells G&H Superfund Site, however, have been

discovered where water yields have been sufficient for well installation such as Johnson Brothers greenhouses and New England Plastics (GeoTrans, 1987 and 1994; HMM, 1990).

Hydrogeology

The Aberjona River, which has its headwaters in the Town of Reading and empties into the Mystic Lakes in the Town of Winchester, flows north to south through the Site. Relatively small amounts of groundwater enter the Aberjona River Valley from upgradient areas north of Interstate 95 (Route 128), and exit the narrow southern end of the valley south of Salem Street. A 38-acre wetland area exists along both sides of the Aberjona River that is located within the 100-year floodplain of the Aberjona River (EPA, 1989). The drainage basin area of the Aberjona River upstream of the Salem Street Bridge, which marks the downstream end of the Wells G&H Superfund Site, is approximately seven square miles (GeoTrans, 1994).

The USGS maintains a surface water gauging station in Winchester, Massachusetts, located about four miles downstream of the Salem Street Bridge. According to the USGS Water Data Report for 2011 for the Aberjona River at Winchester, gauging data have been collected at this station since 1939 (USGS, 2011). The annual mean river discharge between 1939 and 2011 was 31.7 cubic feet per second (cfs). Extreme flows at Winchester during the period of record range from the lowest daily mean of 0.25 cfs on October 10, 1950, to the highest daily mean of 1,420 cfs on May 15, 2006 and March 15, 2010 (USGS, 2011). Since the early 1940s, the trend shows an increase in both the frequency and magnitude of high flow events (USGS, 2011).

Under non-pumping conditions, groundwater within the boundaries of the Wells G&H Site generally flows laterally in the unconsolidated deposits and bedrock from the edges of the valley toward the center of the valley. In the center of the valley and near the Aberjona River, groundwater which originated in the upland areas converges with groundwater flowing from north of Route 128 and generally assumes a more southerly flow direction approximately parallel to the course of the Aberjona River (GeoTrans, 1994).

In 1987, the USGS completed a hydrogeologic investigation of the central Aberjona River valley and evaluated the area of influence and zone of contribution to City of Woburn municipal Wells G&H. According to the USGS, groundwater in the Aberjona River valley in the vicinity of Wells G and H is present mainly in a 0.5-1.0-mile wide stratified drift aquifer that fills a deep, narrow bedrock channel. The USGS developed a generalized stratigraphy for the central Aberjona River valley that included four stratigraphic layers (with the upper three layers considered the local aquifer). The uppermost stratigraphic layer consists of sand, silt, clay, and deposits of peat, and has a thickness of 0 to 30 feet. It is underlain by an intermediate layer of fine-to-coarse sand that has a thickness of 10 to 50 feet.

Groundwater in the stratified drift is unconfined, and water levels fluctuate continuously in response to recharge and discharge. The water table is generally at or near the ground surface in most of the low-lying areas. The direction of groundwater flow is typically inward toward the central axis of the river. Under non-pumping conditions, groundwater discharges to the river and adjacent wetlands. Appreciable vertical hydraulic gradients were generally only observed near the outer river valley walls (downward) or directly adjacent to the river channel (upward).

Groundwater flow elsewhere was primarily horizontal (GeoInsight, 2000). The lowermost aquifer layer, where Wells G and H were screened, consists of 20 to 50 feet of course sand and gravel. A layer of fine grained sand and silt (up to 40 feet thick) occupies the deepest portions of the river valley and is situated directly on top of bedrock (GeoInsight, 2000).

History of Contamination

On May 4, 1979, 184 55-gallon drums containing polyurethane and toluene diisocyanate were found on Mishawum Road on a vacant lot owned by the MBTA. The drum discovery prompted DEQE to sample the nearest downgradient public water supply, Wells G and H (NUS, 1986).

Several chlorinated VOCs were detected in water from Wells G and H at concentrations ranging from 1 to 400 ppb and, as a result, Wells G and H were shut down on May 21, 1979. Since then, the Metropolitan District Commission (MDC) (now the Massachusetts Water Resources Authority or MWRA) supplements the City of Woburn's water supply.

EPA and various property owners have conducted numerous studies to determine the nature and extent of contamination at the Site. The following five facilities have been identified as sources of contamination – Grace, UniFirst, NEP, Wildwood, and Olympia properties. Wells G&H Superfund Site was listed as a Superfund Site on the NPL on September 8, 1983.

Initial Response

EPA evaluated the hydrogeology and groundwater quality of a 10 square-mile area east and north of Woburn in 1981 to determine the extent of contamination and identify sources. In May 1983, three administrative orders pursuant to Section 3013 of RCRA were issued to Grace, UniFirst and Beatrice. The administrative orders required proposals from each company for sampling, analysis, monitoring and reporting to address possible groundwater contamination on or emanating from their properties. Groundwater monitoring programs were subsequently initiated by the companies at their respective properties (NUS, 1986).

In 1986 and 1987, EPA issued orders pursuant to Section 106 of CERCLA to Olympia who subsequently removed approximately 17 55-gallon drums and debris from the western portion of their property in the area known as the FDDA (EPA, 1989; TRC, 2002).

EPA's 1987/1988 Supplemental Remedial Investigation/Feasibility Study (RI/FS) for the Site included soil and groundwater sampling from potential groundwater contaminant source properties including Grace, UniFirst, NEP, Wildwood and Olympia properties. EPA also collected surface water and sediment samples from the Aberjona River to support the Endangerment Assessment.

The Supplemental RI/FS identified the Grace, UniFirst, NEP, Wildwood and Olympia properties as the likely sources of groundwater contamination in the vicinity of Wells G and H. EPA also identified soil contamination above target levels on the UniFirst, NEP, Wildwood and Olympia properties. Specifically, EPA found the following: VOCs at UniFirst; VOCs at NEP property; a mixture of VOCs, pesticides, PCBs, PAHs and lead at Wildwood property; and VOCs and PAHs

at Olympia property. Aberjona River and wetland sediment samples contained PAHs and metals such as arsenic, mercury and chromium. Finally, sludge and debris were identified at Wildwood property.

EPA issued a ROD for the Site in September 1989. The ROD required soil and groundwater contamination be addressed at the Source Area properties. EPA issued an ESD for the Site in April 1991.

A CD was signed by EPA and several PRPs, including Grace, UniFirst, Beatrice and NEP, in 1990 and entered by the Court in 1991 (EPA, 1991). Olympia did not sign the 1991 Consent Decree.

Basis for Taking Action

The following briefly summarizes the contaminants detected at the Site as identified in the ROD.

Groundwater

Chlorinated VOCs were the primary groundwater contaminants. Groundwater contamination has been found in overburden and bedrock aquifers at the Grace, UniFirst, NEP and Wildwood properties as well as the Central Area (OU-2) of the Site. Groundwater contamination was also found in the overburden aquifer at the Olympia FDDA.

The Grace property contamination consisted primarily of chlorinated solvents characterized by a high percentage of TCE and 1,2- DCE. Other contaminants include PCE and vinyl chloride. The UniFirst property contamination was predominantly PCE; secondary constituents were 1,1,1-TCA, and smaller amounts of TCE and 1,2-DCE. At NEP property, PCE, TCE, 1,1,1-TCA and 1,2-DCE were found in bedrock and overburden wells. The Wildwood property contamination consisted primarily of TCE detected at a number of wells, with 1,1,1-TCA, DCE, and PCE detected at a few locations. At Olympia property, TCE and xylene were detected in the overburden.

Soil

Chlorinated VOCs are the primary contaminants in soil and were found at various levels on the Grace, UniFirst, NEP, Wildwood and Olympia properties. Some chlorinated VOC soil contamination was also found in a wetland area at Wildwood property.

Other soil contaminants include PCBs, chlordane, phthalates, and PAHs, which were found dispersed throughout the Wildwood property. PAHs were found in one location at Olympia property. Phthalates were found in a small area at NEP property. Assorted debris and sludge contaminated with lead, VOCs, PAHs, and pesticides were also found at Wildwood property.

Air

Air monitoring, conducted during all site investigations, did not reveal any VOC readings above

background at the breathing zone.

Potential health risks identified at the Site include residential ingestion of groundwater, dermal contact with groundwater, and inhalation of volatiles while showering, or trespasser and residential incidental ingestion of surface soils (EPA, 1989).

C. REMEDIAL ACTIONS

Remedy Selection

The following discusses the remedy selected for the Source Area (OU-1) properties and the approaches to selecting a remedy for the Central Area (OU-2) and the Aberjona River Study (OU-3).

Operable Unit 1 – Source Area Properties

EPA's September 14, 1989 ROD described the remedy for the Source Area (OU-1) properties as follows:

- Treatment of contaminated soil using in-situ volatilization at Wildwood property;
- Excavation and on-site incineration of contaminated soils at Wildwood, Olympia, NEP, and UniFirst properties;
- Treatment and/or disposal of sludge and debris found at Wildwood property in a manner to be determined during the design phase of the clean-up; and
- Extraction and treatment of contaminated groundwater separately at the five Source Area properties using pre-treatment for metals and an air stripper to remove volatile organic contaminants, or an equally or more effective technology approved by EPA. The extraction systems were to be designed to address the specific bedrock and/or overburden contamination at each Source Area property.

The selected Source Area (OU-1) remedy was developed to satisfy the following remedial objectives that guide remedy design and measure success.

<u>Remedial Action Objectives for Soil</u>

The remedial objectives for contaminated soil were:

- Prevent public contact with contaminated soil above action levels;
- Stop the leaching of soil contaminants to groundwater; and
- Protect natural resources at the Site from further degradation.

EPA identified site-wide clean-up goals for each of the chemicals of concern in soil that satisfy the above objectives. The soil clean-up goals represent the concentrations that can remain in soil and still be considered protective of human health. The soil action levels selected, as identified in

the ROD, are summarized in Table A-2:

Table A-2 ROD-Specified Soil Action Levels	
Contaminant of Concern	**Target Soil Concentration**
	(µg/kg)
Chloroform	62.5
Tetrachloroethene	36.7
Trichloroethene	12.7
Trans-1,2-Dichloroethene	83.2
1,1,1-Trichloroethane	613
Chlordane	6,140
4,4-Dichlorodipheynyltrichloroethane (4,4,-DDT)	23,500
Carcinogenic Polycyclic Aromatic Hydrocarbons	694
Polychlorinated Biphenyls	1040
Lead	640,000

µg/kg – micrograms per kilogram

Remedial Action Objectives for Groundwater

The remedial objectives for contaminated groundwater were:

- Prevent the further introduction of contaminated groundwater from the Source Areas to the Central Area;
- Limit the further migration of contaminated groundwater off-site from the Source Areas;
- Restore the bedrock and overburden aquifers in the vicinity of the Source Areas to drinking water quality; and
- Prevent public contact with contaminated groundwater above the action levels.

The target groundwater action levels are based upon the classification of the groundwater at the Site as a potential source of drinking water. EPA identified MCLs promulgated under the Safe Drinking Water Act (SDWA) as the clean-up goals for Site groundwater. These goals satisfy the above objectives and are protective of human health.

EPA's April 25, 1991 ESD described three significant changes and one non-significant change from the remedial actions to be undertaken at the Source Areas (OU-1) as set forth in the ROD. Those changes were as follows:

Significant Changes

- On-site incineration of soils at the Wildwood, NEP, and Olympia properties was changed to off-site incineration;

- In-situ volatilization would be used on the UniFirst property rather than incineration; and
- A typographical error was corrected resulting in more stringent target action levels for groundwater.

Other Non-Significant Change

- Groundwater extraction systems could be combined for the UniFirst and Grace properties.

The 1991 ESD provided for certain changes to the soil and groundwater remedy, but the overall remedy remained fundamentally the same: incineration and in-situ volatilization of contaminated soils, removal of sludge and debris, and extraction and treatment of groundwater at the Source Areas.

The groundwater action levels selected, as identified in the ROD, are summarized in Table A-3.

Table A-3
ROD-Specified Groundwater Action Levels

Contaminant of Concern	Target Groundwater Concentration	Basis for Criteria
	(µg/l)	
Chloroform	100	MCL
1,1-Dichloroethane	5	MCL (1)
1,2-Dichloroethane	5	MCL
1,1-Dichloroethene	7	MCL
Tetrachloroethene	5	MCL (2)
Trans-1,2-Dichloroethene	70	MCLG
1,1,1-Trichloroethane	200	MCL
Trichloroethene	5	MCL
Vinyl Chloride	2	MCL

µg/l – micrograms per liter
MCL – Maximum Contaminant Level
MCLG – Maximum Contaminant Level Goal
(1) – MCL for 1,2-Dichloroethane
(2) – MCL for Trichloroethene

Operable Unit 2 – Central Area

The ROD called for a study of the Central Area Aquifer to determine the most effective way of addressing contamination in the Central Area.

The objectives of the Central Area Study, as identified in the ROD, included:

- Define the nature and extent of contamination in the Aberjona River.
- Define the upgradient introduction of contaminants to the Aberjona River.

- Refine the present understanding of the interaction of the Aberjona River and the aquifer systems on the Site.
- Evaluate the effectiveness of pump and treat as a remedial alternative for the clean-up of contaminated groundwater in the Central Area.
- Evaluate the impact of pumping the Central Area aquifer on the Aberjona River and associated wetlands.
- Identify and evaluate innovative remedial technologies for aquifer restoration (e.g., in-situ bioremediation).
- Evaluate the mobility of contaminants including semi-volatile organics and metals under ambient and pumping conditions.

Three industrial properties located within the Central Area (Southwest Properties [Murphy Waste Oil, Whitney Barrel, and Aberjona Auto Parts]) were also included as part of the OU-2 RI/FS.

A remedial decision has not yet been reached for the Central Area (OU-2). Thus, it is not evaluated as part of this FYR.

Operable Unit 3 – Aberjona River Study

In the Spring of 2002, EPA merged the study of Wells G&H OU-3 (the Aberjona River Study) with Industri-Plex OU-2, and subsequently issued a ROD in January 2006 that addressed OU-3. Thus, further evaluation of OU-3, including the protectiveness of the selected remedy selected, will be evaluated during the FYR for the Industri-Plex Site.

Remedy Implementation

The history and status of remedy implementation at the Wells G&H site is discussed below by operable unit.

Operable Unit 1 – Source Area Properties

This history and status of remedial actions at the Source Area (OU-1) properties is discussed below by property.

<u>UniFirst and Grace Properties</u>

The groundwater extraction and treatment systems for both properties began operation in September 1992 and consisted of two extraction and treatment systems. The UniFirst property has one pumping well (UC-22) which is designed to capture contaminants in the unconsolidated deposits, shallow bedrock, and deep bedrock at the UniFirst property, as well as capture contaminants in deep bedrock at the Grace property. The Grace property currently has 16 operating recovery wells which are designed to capture contaminants in the unconsolidated deposits and shallow bedrock (UniFirst, 2013; Tetra Tech & JG, 2013b). The remedial systems are currently in the 21st year of operation.

UniFirst's treatment system for groundwater originally included UV/Ox followed by two carbon adsorption units operating in series. Due to decreased contaminant levels, the UV/Ox system was no longer required and the system was modified in October 2003 (HPS, 2003). The UV/Ox system was replaced with GAC filters. Treated groundwater is discharged to a storm sewer (HPS et al, 2008), which flows and discharges to the Aberjona River by Olympia Avenue. Some on-site monitoring wells have achieved the ROD action levels, while over the last 5 years the remaining wells monitored at the Site have primarily remained consistent or shown minor decreases in contaminant concentrations (Tetra Tech & JG, 2013b). Exceptions include concentrations of PCE in UC6 and UC29D (unconsolidated deposits) and PCE and TCE concentrations in UC5 (shallow bedrock). Wells UC5 and UC29D were added to the long-term monitoring program in 2012, while UC6 has been included in the long-term monitoring program since 1996 (Tetra Tech & JG, 2013b).

The UniFirst remedy set forth in the ROD also included SVE treatment of contaminated soil. UniFirst submitted a revised Vapor Extraction Pilot Test Work Plan and Quality Assurance Project Plan (QAPP) and subsequent Addendum to the Pilot Test Work Plan in July 2012 and September 2012, respectively. The work plan documents detailed a pilot test program including installation of SVE and SVM points and step and constant rate testing of installed SVE points. Based on the results of the pilot test, UniFirst submitted a Soil Vapor Extraction System Design Report in May 2014 containing a summary of the engineering design of a proposed SVE system. The design report is currently under review by EPA.

The Grace property groundwater treatment system initially included particulate filtration and UV/Ox treatment. Treated groundwater is discharged to Snyder Creek. System modifications in 1997 included the reduction in pumping wells from the original 22 to the current 16 wells. In 2002, the use of the UV/Ox reactor was discontinued and replaced with two GAC filters in series (Tetra Tech & JG, 2013b). The remedial system is designed to capture groundwater in the unconsolidated deposits and shallow bedrock before traveling offsite (Tetra Tech & JG, 2013b). The remaining groundwater contamination emanating from Grace property is, by design, allowed to migrate towards the UniFirst property and is reportedly captured by the UniFirst extraction well (UC-22).

NEP Property

The remedial design for NEP property from the CD included the removal of approximately 10 cubic yards of soil for off-site incineration, delineating the nature and extent of groundwater contamination and development of a groundwater pump and treat system (CEI, 1992).

Ultimately, the source control remedy for NEP property included air sparging with soil vapor extraction (AS/SVE). This system ran from February 1998 to March 2000. At the time of system shut down, ROD clean-up concentrations in unsaturated soils had been achieved and significant reductions in VOCs in groundwater were realized. TCE and PCE levels in site groundwater decreased significantly in the Source Area and downgradient overburden and shallow bedrock groundwater. However, TCE and PCE contamination remains present in groundwater above ROD action levels and there are no recent data regarding groundwater contaminant

concentrations in deep bedrock.

Annual groundwater monitoring is conducted by the PRP to identify contaminant trends. Nine wells in the plume area are currently sampled annually (Woodard & Curran, 2013); sampling of other wells was discontinued in 2001 (Hamel, 2004). Statistical trend analysis continues to indicate that some wells in the PRP's routine monitoring network have a decreasing concentration trend for PCE and TCE at a 95-percent or greater confidence level, with some wells indicating neither an increasing or decreasing trend for PCE (Woodard & Curran, 2013). However, PCE groundwater contamination is still present above the ROD action level in shallow overburden monitoring wells EW-1 and NEP-101 and shallow bedrock well NEP-104B based on the 2013 annual sampling event. The concentration of PCE detected in monitoring well NEP-101 in 2010 (68 µg/L) represents the maximum detected concentration since the shutdown of the AS/SVE system in March 2000 (Woodward & Curran, 2013). TCE was detected in two shallow bedrock monitoring wells (NEP-104B and NEP-106B) at concentrations of 2.0 µg/L and 1.2 µg/L, respectively (below the ROD action level of 5 µg/L) in 2013 (Woodard & Curran, 2013). In addition, as noted previously, there are no recent data regarding groundwater contaminant concentrations at depth in bedrock.

Wildwood Property

A review of the remedial system trends indicates decreased or stabilized concentrations of influent vapor-phase VOCs, dissolved-phase VOCs in groundwater, and VOCs in overburden and bedrock aquifers (AECOM, 2014). However, TCE groundwater contamination concentrations remain in many monitoring wells above the ROD action level. Additional monitoring wells were also installed at the Wildwood property and sampled along with existing monitoring wells in 2013. Groundwater contamination remains outside the capture zone above the ROD action level at Wildwood property, including the southern portion of the property where the highest PCE concentration of 325 ppb was observed at new well WW-101SR (sampled 8/2/2013). Also, since the startup of the treatment, increased TCE concentrations have been observed at monitoring well BSW 1 (32,000 ppb 4/20/2010). Treatment system operations are ongoing.

Olympia Property

EPA reached an agreement with Olympia in Spring 2003 to continue the clean-up of contaminated soils on the Olympia property. Under an AOC, Olympia excavated and disposed of 56 cubic yards of PCB-contaminated surface soils, and approximately 5 cubic yards of PAH-contaminated soil, evaluated various options for addressing the TCE-contaminated soils, and prepared a detailed work plan for cleaning up the TCE by way of in-situ sodium permanganate injection treatment (a form of in-situ chemical oxidation). In March 2004, EPA granted conditional approval of the TCE Work Plan (EPA, 2004a). In June 2004, EPA entered into a second AOC with Olympia to implement the approved TCE Work Plan. EPA continues to oversee the work outlined in the second AOC. Under the second AOC, Olympia undertook the following work to address subsurface TCE contamination (EPA, 2004b):

- Define the extent of subsurface contamination (as needed), monitor progress of treatment, and document successful clean-up (when attained);
- Treat (oxidize) TCE-contaminated subsurface soils in-situ by sodium permanganate injection;
- Re-vegetate and grade the site; and
- Conduct post-cleanup groundwater quarterly monitoring for three years.

The in-situ chemical oxidation (via permanganate) cleanup action was initiated by the PRP for the FDDA portion of the Olympia property in the Fall 2005. The major components of the removal action include:

- A sheet pile wall installed to a depth of approximately 15 feet around the perimeter of the FDDA (an area approximately 180 feet long and 100 feet wide);
- Delivery of permanganate to the silt unit via a multi-depth injection network;
- Multiple applications of oxidant via gravity drainage; and
- Monitoring of groundwater conditions within the FDDA via a network of nested monitoring wells and discrete Geoprobe® water samples.

The sheet pile wall is used to help focus oxidant delivery within the area of highest contaminant concentrations, as well as limiting continued impacts to the Wells G&H aquifer. Focused oxidant injections are also targeted on areas with contamination outside the sheet piling. EPA will evaluate TCE cleanup and groundwater monitoring data, and, as necessary, consider the need for further groundwater treatment. Since Fall 2008, the monitoring and injection approach for the FDDA includes 3 month cycles where injections occur from October – December and April – June, while monitoring and evaluations occur in the January-March and July-September timeframes. This approach is consistent with the revised work plan dated October 2008.

Contaminant concentration trends over the last five years indicate that focused oxidant injection activities have successfully reduced concentrations of TCE in some locations. Concentrations of TCE in monitoring wells MW-215S and MW-216M appear to have decreased and remained low (below laboratory detection limits).[10] However, some monitoring wells (MW-216S) indicate fluctuating concentrations of TCE due to rebound following injection activities or apparent increasing TCE trends (MW-215M). Injection and monitoring activities are ongoing.

Soil and groundwater clean-up goals are as set forth in the ROD. Recent groundwater data collected by the PRP through March 2014 indicate that groundwater contaminant concentrations continue to exceed ROD cleanup criteria.

Operable Unit 2 – Central Area

A remedy has not been selected for the Central Area (OU-2). Thus, it is not evaluated as part of

[10] Elevated detection limits (i.e., in excess of ROD action levels) are reportedly a result of the continued presence of oxidant in the subsurface; however remedial actions are ongoing and the site is not currently near closure.

this FYR.

Operable Unit 3 – Aberjona River Study

The protectiveness of the Industri-Plex OU-2 (including Wells G&H OU-3) remedy will be evaluated during the FYR for the Industri-Plex Site.

System Operation / Operation and Maintenance

O&M descriptions are provided below for each Source Area property (UniFirst, Grace, NEP, Wildwood and Olympia properties). However, the remedial actions underway at these properties are implemented by various responsible parties and O&M costs are only included where applicable and available as of the submittal of this FYR.

UniFirst Property

UniFirst's deep bedrock groundwater extraction and treatment system has been in operation for approximately 21 years. Bi-monthly samples are taken from the treatment system influent and monthly samples are taken from the treatment system effluent. Routine O&M includes weekly system inspections, quarterly sensor checks, and annual inspection and maintenance (UniFirst, 2013).

At the time of the second FYR Site Inspection, the groundwater extraction well pump had undergone replacement due to recent failure. The replacement pump was not capable of lowering the groundwater table to the design elevation of 15 feet AMSL (Cosgrave, 2004). However, subsequent documentation indicated that the design elevation was eventually attained following system adjustments (HPS, 2004).

The following system modifications were reported by the PRP during the previous five years:

- Removal of valves B5 and B12, as well as the diaphragm check valve between B3 and B12. These items were reportedly installed to protect the former UV/Ox unit from undue pressure. The O&M manual was updated accordingly (HPS, 2009).
- In April 2010, Carbon Tank #4 was found to have a damaged polyethylene liner. As a result, a replacement tank was manufactured and installed and each carbon tank was modified to accommodate relief valves to mitigate potential excessive vacuum in the future (HPS, 2010).

No additional system modifications were reported between 2011 and 2013.

The original annual estimated O&M costs for the UniFirst treatment system, including power, routine maintenance and emergency response was $50,100 (EPC, 1991). No current O&M costs were available at the time of this FYR.

Grace Property

The Grace property overburden and shallow bedrock groundwater extraction and treatment system has been in operation for approximately 21 years. The O&M for the Grace property includes monthly sampling of the treatment system at the first (primary unit) and second (secondary) GAC vessel effluent, monthly influent sampling, and annual sampling of 10 monitoring wells, six recovery wells and Snyder Creek (discharge point) (Tetra Tech & JG, 2013b).[11] During the previous five years additional monitoring wells have been included in the annual sampling events for various reasons including:

- Recovery Well RW22 shutdown evaluation (2009 through 2013 sampling events);
- Area 2 & 3 shutdown evaluation (2011 through 2013 sampling events);
- Area 2 & 3 enhancement activities (2011 through 2013 sampling events);
- Obtaining additional water quality information (2011 through 2013 sampling events); and
- Supporting assessment of vapor intrusion (2011 through 2013 sampling events).

Annual groundwater monitoring continues to evaluate residual VOC concentrations in groundwater.

The original annual estimated O&M costs for management of migration at the Source Area properties, including individual groundwater pump and treat systems, was approximately $124,000 (Ebasco, 1989). The annual O&M costs for Grace reportedly ranged from $125,000 to $175,000 during the first 14 years of operation, but have increased to $189,000 to $275,000 during the last seven years due to costs associated with work plan implementation, rising and O&M costs and reduction in the rate of VOC removal (Tetra Tech & JG, 2013b).

NEP Property

NEP implemented an AS/SVE treatment system that was operational for approximately 2 years between 1998 and 2000. This system was intended to clean up contaminated soil. Operation of the remediation system (AS/SVE) was discontinued in March 2000; therefore, there are no O&M activities conducted at this property. Post-shutdown monitoring of overburden and shallow bedrock groundwater is ongoing.

Wildwood Property

The Wildwood property AS/SVE and bedrock groundwater extraction and treatment system has been in operation for approximately 15 years (documentation available up through year 14 in AECOM, 2014). Monitoring activities at Wildwood property include analysis of process water, process vapor and groundwater. Monthly process monitoring activities are conducted for the treatment system. Monthly monitoring activities include:

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[11] Two of the 12 monitoring wells designated for annual monitoring were abandoned in 2006. As a result, the long-term monitoring plan was revised to include 10 monitoring wells in the annual sampling program.

- Groundwater extraction/treatment system
    - Pressure readings
    - Influent and effluent sampling
- Air sparging system
    - Flow readings
    - Pressure readings
- Vapor extraction/treatment system
    - Vacuum readings
    - Flow readings
    - Analytical sampling of air from influent, lead carbon effluent, total effluent
    - PID readings of ambient air

Groundwater monitoring well sampling is conducted quarterly for a select number of wells and annually for a larger selection of wells.

Olympia Property

The PRP for the Olympia property is treating TCE contaminated soil in-situ using chemical oxidation (ISCO) via permanganate injection inside an approximately 180 feet long by 100 feet wide sheet pile enclosure in the FDDA. Additional on-site groundwater monitoring wells were installed and the groundwater is monitored to determine the effectiveness of this on-going remedial action.

The following summary expands on details provided in the previous FYR to include PRP activities that have taken place during the evaluation period of the fourth FYR (GeoInsight, 2014):

- Focused NaMnO4 Injection Events
    - 16th Injection (November, 2009)
    - 17th Injection (June, 2010)
    - 18th Injection (November, 2010)
    - 19th Injection (June, 2011)
    - 20th Injection (November, 2011)
    - 21st Injection (June, 2012)
    - 22nd Injection (November, 2012)
    - 23rd Injection (November, 2013)
    - 24th Injection (July, 2014)
- Groundwater Monitoring
    - Focused sampling event (March, 2009)
    - Focused sampling event (April, 2009)
    - Focused sampling event (May, 2009)
    - Focused sampling event (November, 2009)

    - Focused sampling event (February, 2010)
    - Focused sampling event (September, 2010)
    - Focused sampling event (March, 2011)
    - Focused sampling event (October, 2011)
    - Focused sampling event (November, 2011)
    - Focused sampling event (April, 2012)
    - Focused sampling event (August, 2012)
    - Focused sampling event (March, 2013)
    - Focused sampling event (July, 2013)
    - Focused sampling event (March, 2014)
- Additional Assessment Activities
    - Subsurface investigation activities (SB-800 series soil borings) (June 2010)
    - Subsurface investigation activities (SB-900 series soil borings) (November 2010)

APPENDIX B – LIST OF DOCUMENTS REVIEWED

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TABLE C1 - LOCATION-SPECIFIC ARARS WELLS G&H SITE - OU-1				
FEDERAL OR STATE ARAR	**REQUIREMENTS**	**ORIGINAL (ROD) STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**FOURTH FIVE-YEAR REVIEW**
Federal Regulatory Requirements	RCRA - Location Standards (40 CFR 264.18). Alternatives SC-10 and MOM-2	Relevant and Appropriate	This regulation outlines the requirements for constructing a RCRA facility on a 100-year floodplain. A facility located on a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood, unless waste may be removed safely before floodwater can reach the facility, or no adverse effects on human health and the environment would result if washout occurred.	These requirements remain applicable. The ROD assumed that remediation facilities would be located outside the floodplain or designed to allow quick mobilization out of the area and to prevent damage by initial floodwaters. The management of RCRA regulated wastes takes place outside the floodplain.
Federal Regulatory Requirements	CWA - Section 404 Dredge and Fill Requirements (Guidelines at 40 CFR 230). Alternatives SC-10 and MOM-2	Applicable	For activities under Section 404 jurisdiction, the governing regulations favor practicable alternatives that have less impact on wetlands. If no mitigated practicable alternative exists, impacts must be mitigated.	Activities at the Source Areas governed by this requirement are complete. No PRP facility is currently proposing to conduct dredge and fill operations, therefore the requirements are no longer applicable.
Federal Regulatory Requirements	Wetlands Executive Order (EO 11990). Alternatives SC-10 and MOM-2	Applicable	Under this Executive Order, federal agencies are required to select alternatives that minimize the destruction, loss or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If no practicable alternative exists impacts must be mitigated	Activities at the Source Areas governed by this requirement are complete. No PRP facility is currently proposing work in a wetland, therefore the requirements are no longer applicable.
Federal Regulatory Requirements	Floodplains Executive Order (EO 11988). Alternatives SC-10 and MOM-2	Applicable	Federal agencies are required to reduce the risk of flood loss, to minimize impact of floods, and to restore and preserve the natural and beneficial value of floodplains. In addition, practicable alternatives must be selected that have less impact on wetlands.	Activities at the Source Areas governed by this requirement are completed. No PRP facility is proposing further work in the floodplain.

TABLE C1 - LOCATION-SPECIFIC ARARS WELLS G&H SITE - OU-1				
FEDERAL OR STATE ARAR	**REQUIREMENTS**	**ORIGINAL (ROD) STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**FOURTH FIVE-YEAR REVIEW**
Federal Regulatory Requirements	Protection of Archaeological Resources (32 CFR 229). Alternative SC-10	Status not provided in ROD	These regulations develop procedures for the protection of archaeological resources.	Archeological resources were not discovered during response actions and are not expected to be in the future.
State Regulatory Requirements	Massachusetts Wetlands Protection Requirements (310 CMR 10.00). Alternatives SC-10 and MOM-2	Applicable	These requirements control regulated activities in freshwater wetlands, 100 year floodplains, and 100 foot buffer zones beyond these areas. Regulated activities include virtually any construction or excavation activity. Performance standards are provided for evaluation of the acceptability of various activities. The Wetland Protection Act was most recently amended in July 2009.	Activities at the Source Areas governed by this requirement are complete. No PRP facility is proposing work in a wetland.
State Regulatory Requirements	Massachusetts Waterways Licenses (310 CMR 9.00). Alternative MOM-2	Applicable	Controls dredging, filling, and other work in water of the Commonwealth. These regulations were most recently amended in May 2014.	The centralized treatment facility for the Wells G&H Source Areas is not currently a component of the remedy; therefore, these requirements are not applicable to OU-1.
State Regulatory Requirements	Massachusetts Certification for Dredging and Filling (314 CMR 9.00). Alternative MOM-2	Applicable	Establishes water quality-based standards for filling activities (CWA Section 401). These regulations were most recently amended in July 2009.	Source area pumping and central area treatment require placement of pipes under and across the Aberjona River. Proper measures were taken to avoid contravention of water quality standards (i.e., turbidity) during installation of pipes, thereby complying with the ARAR.
State Regulatory Requirements	Inland Wetland Orders (302 CMR 6.00), currently regulated under the Adopting Inland Wetland Orders (310 CMR 13.00). Alternative MOM-2	Relevant and Appropriate	Defines wetland areas, establishes encroachment lines along waterways or floodplain areas, and regulates activities in these areas.	The centralized treatment facility is no longer a component of the remedy; therefore, these requirements are not relevant and appropriate.

TABLE C1 - LOCATION-SPECIFIC ARARS WELLS G&H SITE - OU-1				
FEDERAL OR STATE ARAR	**REQUIREMENTS**	**ORIGINAL (ROD) STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**FOURTH FIVE-YEAR REVIEW**
State Regulatory Requirements	Operation and Maintenance and Pretreatment Standards for Waste Water Treatment Works and Indirect Discharges (314 CMR 12.00). Alternative MOM-2	Relevant and Appropriate	Insures the proper operation and maintenance of waste water treatment facilities including operation and maintenance, sampling, and discharges.	These requirements remain relevant and appropriate. Proper operation, maintenance, sampling and discharge procedures are being complied with at the UniFirst, Grace and Wildwood facilities. These regulations were amended in April 2014.
Federal Regulatory Requirements	EPA Groundwater Protection Strategy. Alternative MOM-2	TBC	EPA classifies groundwater into three categories depending on current, past or potential use to serve as a guide for protection of the resource.	The Wells G&H aquifer is a Class IIB aquifer (potentially usable aquifer). The requirement for Class IIB standards to be attained following remediation.

TABLE C2 - CHEMICAL-SPECIFIC ARARs AND TBCs WELLS G&H SITE - OU-1				
FEDERAL OR STATE ARAR	**REQUIREMENTS**	**ORIGINAL (ROD) STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**FOURTH FIVE-YEAR REVIEW**
Federal Regulatory Requirements	SDWA - Maximum Contaminant Levels (MCLs) (40 CFR 141.11 - 141.16)	Relevant and Appropriate	MCLs have been promulgated for a number of common organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered relevant and appropriate for groundwater aquifers potentially used for drinking water.	The MCL for arsenic in drinking water has decreased since the 1988 Endangerment Assessment. Arsenic concentrations in OU-1 should be further evaluated to determine if currently associated with a risk above regulatory guidelines. Groundwater is not being used at OU-1; nonetheless, these requirements remain relevant and appropriate.
Federal Regulatory Requirements	RCRA - Maximum Concentration Limits (MCLs) (40 CFR 264.94)	Relevant and Appropriate	RCRA MCLs provide groundwater protection standards for 14 common contaminants. All are equal to the SDWA MCLs for those contaminants.	The MCL for arsenic in drinking water has decreased since the 1988 Endangerment Assessment. Arsenic concentrations in OU-1 should be further evaluated to determine if currently associated with a risk above regulatory guidelines. Groundwater is not being used at OU-1; nonetheless, these requirements remain relevant and appropriate.
Federal Regulatory Requirements	CWA - Ambient Water Quality Criteria (AWQC) - Protection of Freshwater Aquatic Life, Human Health - Fish Consumption	Relevant and Appropriate	AWQC are developed under the Clean Water Act (CWA) as guidelines from which states develop water quality standards. A more stringent AWQC for aquatic life may be found relevant and appropriate rather than an MCL, when protection of aquatic organisms is being considered at a site.	AWQCs have been updated since the 1989 ROD (EPA-822-R-02-047, November 2002, EPA-822-F-03-012, December 2003 and revised National Recommended Water Quality Criteria (NRWQC) were issued in 2009). These criteria remain relevant and appropriate.

TABLE C2 - CHEMICAL-SPECIFIC ARARs AND TBCs WELLS G&H SITE - OU-1				
FEDERAL OR STATE ARAR	**REQUIREMENTS**	**ORIGINAL (ROD) STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**FOURTH FIVE-YEAR REVIEW**
State Regulatory Requirements	Massachusetts Drinking Water Regulations Maximum Contaminant Levels (MCLs) (310 CMR 22.00)	Relevant and Appropriate	Massachusetts MCLs establish levels of contaminants allowable in public water supplies. The Massachusetts MCLs, listed in 310 CMR 22.00, consist of promulgated EPA MCLs which have become effective, as well as Massachusetts-specific MCLs. The regulations were last promulgated on December 25, 2009.	The MCL for arsenic in drinking water has decreased since the 1988 Endangerment Assessment. Arsenic concentrations in OU-1 should be further evaluated to determine if currently associated with a risk above regulatory guidelines. Groundwater is not being used at OU-1; nonetheless, these requirements remain relevant and appropriate.
State Regulatory Requirements	Massachusetts Groundwater Quality Standards (314 CMR 6.00)	Relevant and Appropriate	These standards consist of groundwater classifications which designate and assign the uses of Commonwealth groundwaters, and water quality criteria necessary to sustain these uses. There is a presumption that all groundwaters are Class I.	This regulation has been rescinded as revisions to 314 CMR 5.00, promulgated in March 2009, eliminated the need for this regulation. These requirements are no longer applicable.
Federal Criteria, Guidance, Advisories to be Considered	EPA Risk Reference Doses (RfDs)	TBC	RfDs are dose levels developed by the EPA for noncarcinogenic effects. Changes in toxicity values, including PCE and TCE, have occurred since the third FYR. Other toxicity values have also changed as described in the text and associated appendices.	The toxicity values for manganese in drinking water have decreased since the 1988 Endangerment Assessment. Manganese concentrations in OU-1 should be further evaluated to determine if associated with a risk above regulatory guidelines. While groundwater is not being used at OU-1, these requirements remain TBCs.

TABLE C2 - CHEMICAL-SPECIFIC ARARs AND TBCs WELLS G&H SITE - OU-1				
FEDERAL OR STATE ARAR	**REQUIREMENTS**	**ORIGINAL (ROD) STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**FOURTH FIVE-YEAR REVIEW**
Federal Criteria, Guidance, Advisories to be Considered	EPA Carcinogen Assessment Group Potency Factors	TBC	Potency Factors are developed by the EPA from Health Assessments or evaluation by the Carcinogen Efforts Assessment Group. Note that potency factors have changed since the Endangerment Assessment. See text for additional information.	These requirements remain TBCs.
State Criteria, Guidance, Advisories to be Considered	Massachusetts Drinking Water Guidelines	TBC	MassDEP Drinking Water Guidelines provide health-based values for chemicals other than those with established MCLs.	These guidelines continue to be periodically updated and remain TBCs.

TABLE C3 - ACTION-SPECIFIC ARARS AND TBCs WELLS G&H SITE - OU-1				
FEDERAL OR STATE ARAR	**REQUIREMENTS**	**ORIGINAL (ROD) STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**FOURTH FIVE-YEAR REVIEW**
Federal Regulatory Requirements	RCRA - General Facility Requirements (40 CFR 264.10 to 264.18). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	General facility requirements outline general waste security measures, inspections, and training requirements.	These requirements remain relevant and appropriate and have been complied with.
Federal Regulatory Requirements	RCRA - Incineration Requirements (40 CFR 264 Subpart 0). Alternative SC-10.	Relevant and Appropriate	Principal Organic Hazardous Constituents (POHC) are to be destroyed to 99.99 percent destruction and removal efficiency, stringent particulate and HCL limits are imposed.	The Explanation of Significant Differences (ESD) eliminated on-site incineration component required by the ROD in favor of off-site incineration and disposal of soil from Wildwood, NEP and Olympia. In-situ volatilization of soil would be used on the UniFirst property. Therefore, these requirements are no longer relevant and appropriate.
Federal Regulatory Requirements	RCRA - Land Disposal Restrictions (40 CFR 268). Alternatives SC-10 and MOM-2	Relevant and Appropriate	Provides treatment standards and schedules governing land disposal of RCRA wastes and of materials contaminated with or derived from RCRA wastes.	The ESD eliminated on-site incineration component required by the ROD in favor of off-site incineration and disposal of soil from Wildwood, NEP and Olympia. In-situ volatilization of soil would be used on the UniFirst property. Therefore, these requirements are no longer relevant and appropriate.
Federal Regulatory Requirements	TSCA - PCB Incineration Requirements (40 CFR 761.70(a)(2) (b). Alternative SC-10.	Applicable	Contaminated soil in excess of 50 ppm PCB concentration must be incinerated to a 99.9999 percent destruction efficiency.	The ESD eliminated on-site incineration component required by the ROD in favor of off-site incineration and disposal of soil from Wildwood, NEP and Olympia. Therefore, these requirements are no longer applicable.

TABLE C3 - ACTION-SPECIFIC ARARS AND TBCs WELLS G&H SITE - OU-1				
FEDERAL OR STATE ARAR	**REQUIREMENTS**	**ORIGINAL (ROD) STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**FOURTH FIVE-YEAR REVIEW**
Federal Regulatory Requirements	RCRA - Generator and Transporter Responsibilities (40 CFR 262 and 263). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	Provides standards for packing and accumulating hazardous waste prior to off site disposal.	These requirements remain relevant and appropriate.
Federal Regulatory Requirements	RCRA - Container Requirements (40 CFR 264 Subpart I). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	This regulation sets forth RCRA requirements for use and management of containers at RCRA facilities.	These requirements remain relevant and appropriate and have been complied with. On-site treatment systems continue to generate RCRA regulated waste materials and must comply with container requirements.
Federal Regulatory Requirements	DOT - Transportation of Hazardous Waste Requirements (49 CFR 171 to 179). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	These regulations set forth DOT requirements for transportation of hazardous waste. These are generally identical to RCRA requirements at 40 CFR 263.	These requirements are off-site requirements and are not ARARs per se. All applicable requirements will be met.
Federal Regulatory Requirements	RCRA - Tank Requirements (40 CFR 264 Subpart J). Alternative SC-10.	Relevant and Appropriate	Provides design and operating requirements for RCRA waste treatment facilities utilizing tanks.	These requirements remain relevant and appropriate. Note that none of the PRP sites maintain hazardous waste tanks at this time.
Federal Regulatory Requirements	RCRA - Preparedness and Prevention (40 CFR 264.30 to 264.31). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	This regulation outlines requirements for safety equipment and spill control.	These requirements remain relevant and appropriate and have been complied with.
Federal Regulatory Requirements	RCRA - Contingency Plan and Emergency Procedures (40 CFR 264.50 to 264.56). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	This regulation outlines the requirements for emergency procedures to be used following explosions, fires, etc.	These requirements remain relevant and appropriate and have been complied with.
Federal Regulatory Requirements	RCRA - Manifesting, Recordkeeping, and Reporting (40 CFR 264.70 to 264.77). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	This regulation specifies the recordkeeping and reporting requirements for RCRA facilities.	These requirements remain relevant and appropriate and have been complied with.
Federal Regulatory Requirements	RCRA - Closure and Post Closure (40 CFR 264 Subpart G). Alternative SC-10.	Relevant and Appropriate	This regulation details the specific requirements for closure and post-closure care of hazardous waste facilities.	Closure requirements may be relevant and appropriate to soil clean ups.

TABLE C3 - ACTION-SPECIFIC ARARS AND TBCs WELLS G&H SITE - OU-1				
FEDERAL OR STATE ARAR	**REQUIREMENTS**	**ORIGINAL (ROD) STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**FOURTH FIVE-YEAR REVIEW**
Federal Regulatory Requirements	OSHA - General Industry Standards (29 CFR 1910). Alternatives SC-10 and MOM-2.	Applicable	This regulation specifies the 8 hour, time - weighted average concentration for various organic compounds and two PCB compounds; site control procedures; training; and protective clothing requirements for worker protection at site remediation projects.	These requirements are not environmental standards and therefore, are not ARARs. However, they are health and safety requirements that are required to be met.
Federal Regulatory Requirements	OSHA - Safety and Health Standards (29 CFR 1926). Alternatives SC-10 and MOM-2.	Applicable	This regulation specifies the type of safety equipment and procedures to be followed during construction and excavation activities.	These requirements are not environmental standards and therefore are not ARARs. However, they are health and safety requirements that are required to be met.
Federal Regulatory Requirements	OSHA - Recordkeeping, Reporting and Related Regulations (29 CFR 1904). Alternatives SC-10 and MOM-2.	Applicable	The regulation outlines the recordkeeping and reporting requirements for an employer under OSHA.	These requirements are not environmental standards and therefore are not ARARs. However, they are health and safety requirements that are required to be met.
Federal Regulatory Requirements	TSCA - Marking of PCBs and PCB Items (40 CFR 761.40 to 761.79). Alternative SC-10.	Applicable	50 ppm PCB storage areas, storage items, and transport equipment must be marked with the HL mark.	These requirements have been complied with.
Federal Regulatory Requirements	TSCA - Storage and Disposal (40 CFR 761.60 to 761.79). Alternative SC-10.	Applicable	This requirement specifies the requirements for storage and disposal/destruction of PCBs in excess of 50 ppm. These PCB-contaminated soils would have to be disposed of or treated in a facility permitted for PCBs, in compliance with TSCA regulations. Treatment must be performed using incineration or some other method with equivalent destruction efficiencies.	The storage requirements were complied with during soil excavation. Disposal requirements were not applicable since soil was shipped off-site.
Federal Regulatory Requirements	TSCA - Records and Reports (40 CFR 761.18 to 761.185). Alternative SC-10.	Applicable	This regulation outlines the requirements for recordkeeping for storage and disposal of >50 ppm PCBs.	These requirements were complied with.

TABLE C3 - ACTION-SPECIFIC ARARS AND TBCs WELLS G&H SITE - OU-1				
FEDERAL OR STATE ARAR	**REQUIREMENTS**	**ORIGINAL (ROD) STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**FOURTH FIVE-YEAR REVIEW**
Federal Regulatory Requirements	CAA - National Air Quality Standards for Total Suspended Particulates (40 CFR 129.105, 750). Alternatives SC-10 and MOM-2.	Applicable	This regulation specifies maximum primary and secondary 24 hour concentrations for particulate matter.	These requirements are not ARARs, but rather the regulations promulgated by states. Compliance with this regulation, including potential fugitive dust levels, is applicable.
Federal Criteria Guidance Advisories to be Considered	RCRA - Proposed Air Emission Standards for Treatment Facilities (52 FR 3748, February 5, 1987). Alternatives SC-10 and MOM-2.	TBC	This proposal would set performance standards for RCRA treatment facility air emissions. The final rule (55 FR 25454) is dated June 21, 1990.	These requirements are for the Wildwood vapor collection system and are being complied with. These requirements would apply to the UniFirst extraction system upon completion.
Federal Criteria Guidance Advisories to be Considered	EPA Groundwater Protection Strategy. Alternative MOM-2.	TBC	EPA Classifies groundwater into three categories depending on current, past or potential use. This serves as a guide for protection of the resource.	The Wells G&H aquifer is a Class IIB aquifer (potentially usable aquifer). The requirement for Class IIB standards to be attained following remediation.
Federal Criteria Guidance Advisories to be Considered	USEPA office of Solid Waste and Emergency Response, Directive 9355.0-28; Air Stripper Control Guidance. Alternative MOM-2.	TBC	Establishes guidance on the control of air emissions from air strippers used at Superfund sites for groundwater treatment.	These requirements are TBC for the Wildwood vapor collection system and are being complied with. These requirements would apply to the UniFirst extraction system upon completion.
State Regulatory Requirements	Massachusetts Wetlands Protection Requirements (310 CMR 10.00). Alternatives SC-10 and MOM-2	Applicable	These requirements control regulated activities in freshwater wetlands, 100 year floodplains, and 100 foot buffer zones beyond these areas. Regulated activities include virtually any construction or excavation activity. Performance standards are provided for evaluation of the acceptability of various activities. The Wetland Protection Act was most recently amended in July 2009.	Activities at the Source Areas governed by this requirement are complete. No PRP facility is proposing work in a wetland.

TABLE C3 - ACTION-SPECIFIC ARARS AND TBCs WELLS G&H SITE - OU-1				
FEDERAL OR STATE ARAR	**REQUIREMENTS**	**ORIGINAL (ROD) STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**FOURTH FIVE-YEAR REVIEW**
State Regulatory Requirements	Massachusetts Waterways Licenses (310 CMR 9.00). Alternative MOM-2	Applicable	Controls dredging, filling, and other work in water of the Commonwealth. These regulations were most recently amended in May 2014.	The centralized treatment facility for the Wells G&H Source Areas is no longer a component of the remedy; therefore, these requirements are not applicable to OU-1.
State Regulatory Requirements	Massachusetts Certification for Dredging and Filling (314 CMR 9.00). Alternative MOM-2.	Applicable	Establishes water quality-based standards for filling activities (CWA Section 401). These regulations were most recently amended in July 2009.	Source area pumping and central area treatment require placement of pipes under and across the Aberjona River. Proper measures were taken to avoid contravention of water quality standards (i.e., turbidity) during installation of pipes, thereby complying with the ARAR. The Central Area treatment facility is no longer a component of the remedy; therefore these requirements are not applicable.
State Regulatory Requirements	Surface Water Discharge Permit Program Requirements (314 CMR 3.00). Alternative MOM-2.	Applicable	Provides permitting process for surface water body point discharges. This requirement is generally identical to CWA NPDES.	Water discharges to the Aberjona River (e.g., UniFirst system discharges) are treated to ensure that violations of the MassDEP water quality standards for that water body do not occur. These regulations have not been amended since 2007 (prior to submittal of the third FYR).These requirements remain applicable and have been complied with.

TABLE C3 - ACTION-SPECIFIC ARARS AND TBCs WELLS G&H SITE - OU-1				
FEDERAL OR STATE ARAR	**REQUIREMENTS**	**ORIGINAL (ROD) STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**FOURTH FIVE-YEAR REVIEW**
State Regulatory Requirements	Surface Water Quality Standards (314 CMR 4.00) Alternative MOM-2.	Applicable	This regulation consists of surface water classifications which designate and assign uses and water quality criteria necessary to sustain the designated uses. These regulations were amended in December 2013.	Water discharges to the Aberjona River (e.g., UniFirst system discharges) are treated to ensure that violations of the MassDEP water quality standards for that water body do not occur. The Aberjona River continues to be designated a Class B water body. These requirements remain applicable and have been complied with.
State Regulatory Requirements	Groundwater Discharge Permit Program (314 CMR 5.00). Alternative MOM-2.	Applicable	This regulation consists of groundwater classifications which designate and assign uses, and water quality criteria necessary to sustain the designated uses.	Class I groundwater quality criteria will be achieved at the end of the remediation process in compliance with the ARARs.
State Regulatory Requirements	Groundwater Quality Standards (314 CMR 6.00). Alternative MOM-2.	Applicable	This regulation consists of groundwater classifications which designate and assign uses, and water quality criteria necessary to sustain the designated uses.	This regulation has been rescinded as revisions to 314 CMR 5.00 (see above), promulgated in March 2009, eliminated the need for this regulation. These requirements are no longer applicable.
State Regulatory Requirements	Air Emission Limitations for Unspecified Sources of Volatile Organic Compounds (310 CMR 7.18(17)) Alternative MOM-2.	Relevant and Appropriate	Unspecified source with the potential to emit 100 tons/year of VOCs must install "Reasonably Available Control Technology (RACT)"	Treatment of VOC air emissions from pretreatment units to 99.99 percent combustion efficiency in vapor phase carbon adsorption. These requirements remain applicable.
State Regulatory Requirements	Hazardous Waste Management Requirements (310 CMR 30.00). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	These regulations provide comprehensive monitoring, storing, recordkeeping, etc. programs at hazardous waste sites. These regulations were amended in December 2013.	The requirements remain relevant and appropriate. Since the OU-1 treatment systems continues to generate RCRA regulated wastes.

TABLE C3 - ACTION-SPECIFIC ARARS AND TBCs WELLS G&H SITE - OU-1				
FEDERAL OR STATE ARAR	**REQUIREMENTS**	**ORIGINAL (ROD) STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**FOURTH FIVE-YEAR REVIEW**
State Regulatory Requirements	Hazardous Waste Incinerator Air Emission Requirements 310 CMR 7.08(4). Alternative SC-10.	Relevant and Appropriate	Provides air emission requirements for hazardous waste incinerators. Principal Organic Hazardous Constituents (POHCS) destroyed to 99.99 percent, PCBs to 99.9999 percent. Particulate, HCL and CO emissions also controlled.	The ESD eliminated on-site incineration component required by the ROD in favor of off-site incineration and disposal of soil from Wildwood, NEP and Olympia. Therefore, these requirements are no longer relevant.
State Regulatory Requirements	Ambient Air Quality Standards for the Commonwealth of Massachusetts (310 CMR 6.00). Alternatives SC-10 and MOM-2.	Applicable	This regulation specifies dust, odor, and noise emissions from construction activities.	These requirements remain applicable and have been complied with. Contaminated soils may still require removal and hence, these requirements would be applicable.
State Regulatory Requirements	Air Pollution Control Regulations (310 CMR 7.00). Alternatives SC-10 and MOM-2.	Applicable	Regulates new sources of air pollution to prevent air quality degradation. Requires the use of "Best Available Control Technology" (BACT) on all new sources. These regulations were amended in June 2014 (Asbestos Regulatory Reform) and additional amendments have been proposed by MassDEP.	These requirements are applicable for the Wildwood vapor collection system and are being complied with. These requirements would apply to the UniFirst extraction system upon completion.
State Regulatory Requirements	Prevention & Abatement of Air Pollution Episodes & Emergencies (310 CMR 8.00)	Applicable	Regulation to prevent ambient air concentrations from reaching levels which would constitute significant harm, or imminent and substantial endangerment to the health of persons.	These requirements remain applicable and have been complied with.
State Regulatory Requirements	Employee and Community Right-to-Know Requirements (310 CMR 33.00). Alternatives SC-10 and MOM-2.	Applicable	Establishes rules for the dissemination of information related to toxic and hazardous substances to the public.	These requirements remain applicable and have been complied with.

TABLE C3 - ACTION-SPECIFIC ARARS AND TBCs WELLS G&H SITE - OU-1				
FEDERAL OR STATE ARAR	**REQUIREMENTS**	**ORIGINAL (ROD) STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**FOURTH FIVE-YEAR REVIEW**
Federal Regulatory Requirements	CWA National Pollutant Discharge Elimination System (NPDES) (40 CFR 122 to 125). Alternatives MOM-2.	Applicable	Provides permitting process for surface water body point source discharges. The NPDES permit program is administered by authorized states (Massachusetts is not currently authorized).	Treated water is discharged to a storm sewer at UniFirst. Compliance monitoring is conducted monthly. At Grace, treated water is discharged to Snyder Creek. Compliance monitoring is conducted monthly. Treated water at Wildwood is discharged to the Aberjona River. Compliance monitoring is conducted monthly. These requirements remain applicable and are being complied with.

Appendix D

Site Inspection Checklists & Photographs

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: W. R. Grace	**Date of inspection:** August 12, 2014
Location and Region: Woburn USEPA Region 1	**EPA ID:** Wells G&H MAD980732168
Agency, office, or company leading the five-year review: TRC / AECOM.	**Weather/temperature:** Sunny, 70's

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☐ Institutional controls
- ■ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other_____
- ☐ Monitored natural attenuation
- ■ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ■ Inspection team roster attached Table 1 ■ Site map attached Figure 1

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Clayton Smith, Project Coordinator, de Maximis, Inc.
   Name Title
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached_____

2. **O&M staff** Van Sawyer Technical Services Manager, Groundwater & Environmental Services, Inc.
   Name Title
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. 978-392-0090
   Problems, suggestions; ☐ Report attached _____

Team members on attached Table 1

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 _____
   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) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ■ O&M manual Dated 10/4/02 ■ 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 As-built drawings for current system layout are kept off-site. Maintenance logs are kept in file cabinet in treatment plant and were current through 8/5/14. Additional details written in onsite O&M journal

2. **Site-Specific Health and Safety Plan** ■ Readily available ■ Up to date ☐ N/A
   - ■ Contingency plan/emergency response plan ■ Readily available ■ Up to date ☐ N/A

   Remarks Two HASPs onsite – TetraTech, dated April 1, 2013 and GES dated 2/7/12. Both HASPs include Contingency/Emergency Response Plans

3. **O&M and OSHA Training Records** ☐ Readily available ■ Up to date ☐ N/A

   Remarks Van Sawyer (GES) keeps OSHA training certification cards in his wallet. None are maintained on-site.

4. **Permits and Service Agreements**
   - ☐ Air discharge permit None ☐ Readily available ☐ Up to date ☐ N/A
   - ☐ Effluent discharge None ☐ Readily available ☐ Up to date ☐ N/A
   - ☐ Waste disposal, POTW None ☐ Readily available ☐ Up to date ☐ N/A
   - ☐ Other permits None ☐ Readily available ☐ Up to date ☐ N/A

   Remarks: There is an Order of Conditions from the Woburn Conservation Commission (ConCom). Grace has asked the ConCom to allow the surface water sampling to be discontinued.

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ■ N/A

   Remarks_____

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ■ N/A

   Remarks_____

7. **Groundwater Monitoring Records** ☐ Readily available ■ Up to date ☐ N/A

   Remarks Maintained off-site at the office. Submitted in Annual Reports.

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 Maintained off-site at the office. Submitted in Annual Reports

10. **Daily Access/Security Logs** ■ Readily available ■ Up to date ☐ N/A

    Remarks Current access logs are on-site.

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ■ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other At the time of the Site visit, Grace contracted with GES for routine O&M.

2. **O&M Cost Records**
■ Readily available In Annual Reports ■ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate _____ ☐ Breakdown attached

About $189,000-$270,000 per year over the past 5 years.

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: No

V. ACCESS AND INSTITUTIONAL CONTROLS ■ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ■ Gates secured ☐ N/A
Remarks Fence in good shape. No fencing present in back of property near Snyder Creek

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
Remarks No security system alarm or signage observed.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐ Yes ☐ No ■ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ■ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency_____
Contact _____ _____ _____ _____
Name Title Date
Phone no.

Reporting is up-to-date ☐ Yes ☐ No ■ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ■ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ■ N/A
Violations have been reported ☐ Yes ☐ No ■ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☐ ICs are adequate* ☐ ICs are inadequate ■ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ■ No vandalism evident
Remarks None

2. **Land use changes on site** ☐ N/A
Remarks No land use change since last 5-YR review. Land use may change in future if property is sold and developed.

3. **Land use changes off site** ☐ N/A
Remarks None

VI. GENERAL SITE CONDITIONS

A. Roads ■ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ■ Roads adequate ☐ N/A
Remarks Access to treatment plant is drivable. There are cracks and weeds growing through pavement. Roads appear adequate for current site uses.

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☐ Applicable ■ N/A

A. Landfill Surface ☐ Applicable ■ N/A

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
Areal extent_____ Depth_____
Remarks

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____
_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
Remarks_____
_____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
Areal extent_____ Height_____
Remarks_____
_____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____
_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____
_____

B. Benches ☐ Applicable ■ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

C. Letdown Channels ☐ Applicable ■ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____
_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____
_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____
_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____
_____

D. Cover Penetrations ☐ Applicable ■ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____
_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____
_____

E. Gas Collection and Treatment ☐ Applicable ■ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs Maintenance
Remarks_____
_____

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks_____

_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

F. Cover Drainage Layer ☐ Applicable ■ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks_____
_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks_____
_____

G. Detention/Sedimentation Ponds ☐ Applicable ■ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
☐ Siltation not evident
Remarks_____
_____

2. **Erosion** Areal extent_____ Depth_____
☐ Erosion not evident
Remarks_____
_____

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks_____
_____

4. **Dam** ☐ Functioning ☐ N/A
Remarks_____
_____

H. Retaining Walls ☐ Applicable ■ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____
_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks_____
_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ■ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent_____ Depth_____
Remarks_____
_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____

Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ■ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ■ Applicable ☐ N/A

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

1. **Pumps, Wellhead Plumbing, and Electrical**
■ Good condition ■ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
■ Good condition ☐ Needs Maintenance
Remarks _____

3. **Spare Parts and Equipment**
■ Readily available ■ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks Extra pumps are available on site

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

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____

C. Treatment System ■ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ■ Carbon adsorbers
Filters Bag
☐ Additive (*e.g.*, chelation agent, flocculent) None
☐ Others _____
■ Good condition ☐ Needs Maintenance

■ Sampling ports properly marked and functional Yes
■ Sampling/maintenance log displayed and up to date Log available.
☐ Equipment properly identified
■ Quantity of groundwater treated annually Totalizer readings. Volume provided in Annual Reports as cumulative value.
☐ Quantity of surface water treated annually None
Remarks Groundwater logs and separate monthly sampling log.

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ■ Good condition ☐ Needs Maintenance
Remarks_____

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ■ Good condition ☐ Proper secondary containment ■ Needs Maintenance
Remarks_

4. **Discharge Structure and Appurtenances**
☐ N/A ■ Good condition ☐ Needs Maintenance
Remarks Discharge is to wetland at edge of Snyder Creek above water surface

5. **Treatment Building(s)**
☐ N/A ■ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ■ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ■ Needs Maintenance ☐ N/A
Remarks The concrete pads and valve box covers for wells G16S and G16D remain dislodged from the pavement since last 5-YR inspection. A number of monitoring wells were found to be unsecured – See Figure 2.

D. Monitoring Data

Monitoring Data
■ Is routinely submitted on time ■ Is of acceptable quality

Monitoring data suggests: * de Maximis, Inc.
☐ Groundwater plume is effectively contained* ■ Contaminant concentrations are declining

D. Monitored Natural Attenuation

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

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. None

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

The remedy is groundwater containment for the shallow aquifer with the UniFirst extraction well supplying deep aquifer containment (the systems are designed to work in concert). Based on the site inspection and interview with Clayton Smith (de Maximis), Van Sawyer (GES), and Michael Decoteau, P.E. (GES), the groundwater treatment system and extraction well pumps are operational. No observations were made during the inspection that call into question the effectiveness or function of the remedy. EPA is currently evaluating the need for additional capture east of the Area 3 recovery wells. Repairs are needed to a couple of monitoring well pads and all monitoring wells need to be secured.

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.

O&M staff visit the site on a weekly basis and perform monthly recovery well water levels to check that they are operating properly. Based on observations during the site inspection, there were no concerns that call into question the protectiveness of the remedy. EPA is currently evaluating the need for additional capture east of the Area 3 recovery wells. See also comments above in "A".

C. Early Indicators of Potential Remedy Problems

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

No unexpected changes in cost or scope of O&M or frequent repairs were reported by Clayton Smith.

D. Opportunities for Optimization

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

None based on the site inspection alone. EPA has agreed to shutdown of certain ground water extraction wells. This proposed action is still under consideration by Grace.

Table 1. W. R. Grace Inspection Team Roster

5-Year Inspection Team Members	**Company**
Michael Plumb, PE, LSRP	TRC
Jeffrey Hansen, PH	TRC
Interviewed PRP Staff	
Clayton Smith	de Maximis, Inc.
Van Sawyer	Groundwater & Environmental Services, Inc. (GES)
Michael Decoteau, PE	Groundwater & Environmental Services, Inc. (GES)

GROUND WATER WELL INSPECTION
WELLS G & H FIVE YEAR REVIEW
W. R. GRACE SOURCE AREA PROPERTY
WOBURN, MASSACHUSETTS

Well Designation	Noted Issues
RW-13	Missing bolt on cover
G-36D	Roadbox cover had no bolts
G-36DB2	Roadbox cover off, no bolts
G-36DBR	Roadbox cover had no bolts
G28D	Cover not bolted or otherwise insecure
G-21D	Cover off, only had 1 bolt
G1DB1	Roadbox had no bolts
G20S	Cover is not locked/secured
G19M	Cover not bolted or otherwise insecure
G19D	Cover not bolted or otherwise insecure
G24D	Cover not bolted or otherwise insecure
G2M	Cover missing
G16S	Cover only had 1 bolt, pad raised up from pavement
G16D	Cover only had 1 bolt, pad raised up from pavement

Five Year Review Site Inspection Photographs
W.R. Grace
August 12, 2014

Carbon Contactors – Grace Treatment System

Grace Treatment System – Equalization Tank

Grace Treatment System – Bag Filter Unit and Well Feed to System

Five Year Review Site Inspection Photographs
W.R. Grace
August 12, 2014

Grace Treatment System Control Panel

Grace Treatment System Outfall to Snyder Brook

Five Year Review Site Inspection Photographs
W.R. Grace
August 12, 2014

W.R. Grace Monitoring Well G-24D – Bolts Missing from Well Cover (similar conditions at other wells)

W.R. Grace Recovery Well RW-21 Vault

W.R. Grace Recovery Well RW-20 Vault

Five Year Review Site Inspection Photographs
W.R. Grace
August 12, 2014

W.R. Grace Monitoring Well G-2M – Missing Cover

W.R. Grace Well G-16S – Raised Pad

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: UniFirst	**Date of inspection:** August 12, 2014
Location and Region: Woburn USEPA Region 1	**EPA ID:** Wells G&H MAD980732168
Agency, office, or company leading the five-year review: TRC / AECOM.	**Weather/temperature:** Sunny, 70's

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☐ Institutional controls
- ■ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other_____
- ☐ Monitored natural attenuation
- ■ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ■ Inspection team roster attached Table 1 ■ Site map attached Figure 1

II. INTERVIEWS (Check all that apply)

1. **O&M Site Manager** Timothy M. Cosgrave O&M Manager, Unifirst August 12, 2014
   Name Title Date
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. 978-658-8888 x4332
   Problems, suggestions; ☐ Report attached_____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

Team members: on attached Table 1

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 _____
   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) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

■ O&M manual HPS, December 2008	■ 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 Maintenance records are maintained in an Access database and hardcopies are kept off-site. O&M manual was on-site (December 2008). Electronic versions of documents accessible from onsite via internet

2. **Site-Specific Health and Safety Plan** ■ Readily available ■ Up to date ☐ N/A
■ Contingency plan/emergency response plan ■ Readily available ■ Up to date ☐ N/A
Remarks HASP was on-site (6/5/2009).

3. **O&M and OSHA Training Records** ■ Readily available ■ Up to date ☐ N/A
Remarks _____

4. **Permits and Service Agreements**

☐ Air discharge permit	None	☐ Readily available	☐ Up to date	■ N/A
☐ Effluent discharge	None	☐ Readily available	☐ Up to date	■ N/A
☐ Waste disposal, POTW	None	☐ Readily available	☐ Up to date	■ N/A
☐ Other permits	None	☐ Readily available	☐ Up to date	■ N/A

Remarks _____

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ■ N/A
Remarks _____

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ■ N/A
Remarks _____

7. **Groundwater Monitoring Records** ■ Readily available ☐ Up to date ☐ N/A
Remarks Groundwater monitoring records are kept off-site.

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 Discharge compliance records are kept off-site.

10. **Daily Access/Security Logs** ■ Readily available ■ Up to date ☐ N/A
Remarks A site visitor log is maintained on-site. Older copies stored offsite.

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
■ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other

2. **O&M Cost Records**
☐ Readily available (see remarks below) ■ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate not sure ☐ Breakdown attached

Total annual cost by year for review period if available

Costs provided via email subsequent to site visit and are approximately $88,000, 61,000 and $80,000 per year over the last 3 years. Other data not available. These costs do not include Unifirst labor.

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons None.

V. ACCESS AND INSTITUTIONAL CONTROLS ■ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ■ Gates secured ☐ N/A
Remarks Fencing OK; chain link.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
Remarks Authorized access sign on door to treatment facility.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐ Yes ☐ No ■ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ■ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency_____
Contact _____ _____ _____ _____
Name Title Date Phone no.

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

_____
_____
_____
_____

2. **Adequacy** ☐ ICs are adequate* ☐ ICs are inadequate ■ N/A
Remarks_____
_____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ■ No vandalism evident
Remarks None

2. **Land use changes on site** ☐ N/A
Remarks None

3. **Land use changes off site** ☐ N/A
Remarks None

VI. GENERAL SITE CONDITIONS

A. Roads ■ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A
Remarks Site area surrounding building is paved. South side of site is parking area. Paved access along north, east and west side of building. Pavement condition OK

B. Other Site Conditions

Remarks_____
_____
_____
_____
_____

VII. LANDFILL COVERS ☐ Applicable ■ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____

Remarks_____
_____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____
_____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
Areal extent_____ Depth_____
Remarks_____
_____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____
_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
Remarks_____
_____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
Areal extent_____ Height_____
Remarks_____
_____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____
_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____
_____

B. Benches ☐ Applicable ☐ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)
Remarks_____
_____

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

C. Letdown Channels ☐ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)
Remarks_____
_____

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____
_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____
_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____
_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____
_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____
_____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs Maintenance
Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks_____

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ■☐ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
☐ Siltation not evident
Remarks_____
_____

2. **Erosion** Areal extent_____ Depth_____
☐ Erosion not evident
Remarks_____
_____

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks_____
_____

4. **Dam** ☐ Functioning ☐ N/A
Remarks_____
_____

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____
_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks_____
_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent_____ Depth_____
Remarks_____
_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____
_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks_____
_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ■ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____

Remarks_____
_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____
_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ■ Applicable ☐ N/A

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

1. **Pumps, Wellhead Plumbing, and Electrical**
■ Good condition ■ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks _____
_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
■ Good condition ☐ Needs Maintenance
Remarks Maintained and replaced as needed. Some piping and flow switches in plant replaced last year.
_____

3. **Spare Parts and Equipment**
■ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks Spare well pump maintained onsite.
_____

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

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks_____
_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks_____
_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____
_____

C. Treatment System ■ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal None ☐ Oil/water separation None ☐ Bioremediation None
☐ Air stripping ■ Carbon adsorbers
Filters Multimedia_____
☐ Additive (*e.g.*, chelation agent, flocculent) None_____
☐ Others _____
■ Good condition ☐ Needs Maintenance
■ Sampling ports properly marked and functional Yes

☐ Sampling/maintenance log displayed and up to date On computer
■ Equipment properly identified Yes
☐ Quantity of groundwater treated annually Varies – provided in annual O&M reports
☐ Quantity of surface water treated annually N/A
Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ■ Good condition ☐ Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ■ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks Actual tie-in to storm sewer has not been observed. Effluent piping runs underground beneath Olympia Ave.

5. **Treatment Building(s)**
☐ N/A ■ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/~~locked~~ ☐ Functioning ■ Routinely sampled (annually)

☐ Good condition ■ All required wells located ■ Needs Maintenance ☐ N/A
Remarks Road boxes covers at certain wells were not bolted including UC-5, UC-16, UC-17, UC-19, UC-20, and UC-24. These wells need to be secured. Well covers at UC-15S (stick up) and UC-31 (flush mount) at the southwest corner of the building were broken and need to be replaced. UC-16 and UC-20 need to be equipped with expansion plugs to prevent runoff from entering these wells. The gatebox at UC-17 is filled with sediment, which needs to be removed. Note that an off-site Grace/Unifirst well across the street from Unifirst was also not secure. In particular, the cover was not bolted and the expansion plug in the well was not locked. OU2 parties should perform an inspection of the off-site well network and perform repairs/maintenance as needed to secure the wells.

D. Monitoring Data

Monitoring Data
■ Is routinely submitted on time ■ Is of acceptable quality

Monitoring data suggests: *According to Harvard Project Services
■ Groundwater plume is effectively contained * ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

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

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. None

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

The goal of the groundwater treatment system is to contain contaminated groundwater. An aquifer test was being conducted at the time of the inspection for the purposes of providing design information to support design and construction of additional ground water extraction to enhance capture. An SVE system is in the process of being constructed to address soil impacts beneath the Unifirst Building. Unifirst has agreed to prepare a work plan to perform in-situ chemical oxidation to address residual DNAPL beneath the east side of the Unifirst Building

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.

O&M staff visit the site on a weekly basis. With the upcoming implementation of the SVE system and additional groundwater recovery at the southwest corner of the property, there were no concerns that call into question the protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

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

No unexpected changes in cost or scope of O&M of the existing pump and treat system were reported by Tim Cosgrave. Tim also indicated that the system has had minimal downtime over the past 5 years.

D. Opportunities for Optimization

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

None based on site inspection alone. However, it is expected that planned implementation of the SVE System, additional groundwater extraction wells at the southwest corner of the property, and In-situ remediation of DNAPL beneath the eastern part of the building will help to reduce the overall remedial timeframe.

Table 1. UniFirst Inspection Team Roster

5-Year Inspection Team Members	**Company**
Michael Plumb, PE, LSRP	TRC
Jeffrey Hansen, PH	TRC
Interviewed PRP Staff	
Timothy M. Cosgrave	Unifirst

GROUND WATER WELL INSPECTION
WELLS G & H FIVE YEAR REVIEW
UNIFIRST SOURCE AREA PROPERTY
WOBURN, MASSACHUSETTS

Well Designation	Noted Issues
UC-16	Cover not bolted, no expansion plug. Vulnerable to runoff intrusion.
UC-20	Cover not bolted, no expansion plug. Vulnerable to runoff intrusion.
UC-17	Cover not bolted. Sediment accumulated in roadbox burying well head. Has plug. Sediment needs to be removed.
UC-5	Cover not bolted. Expansion plug not locked. Well not secure.
UC-24	Cover not bolted. Expansion plug not locked. Well not secure.
UC-19 cluster	Two wells in cluster - Cover not bolted. Expansion plug not locked. Well not secure.
UC-31	Cover broken
UC-15S	Cover broken
UC-10	Cover not bolted. Expansion plug not locked. Well not secure.

Five Year Review Inspection Photographs
UniFirst
August 12, 2014

Unifirst Pumping Well – UC-22 Well Head

Unifirst Monitoring Well UC-16 – No Plug and Not Secure – Potential Sample Integrity Concerns (Note Downspout from Roof

Unifirst Monitoring Well UC-17 – Well Not Secure and Roadbox Not Water Tight – Note Sediment Accumulation Around Well

Five Year Review Inspection Photographs
UniFirst
August 12, 2014

Unifirst Monitoring Well UC-24 – Plug does not lock and Irregular PVC Riser Does Not Permit Plug to Seal Well

Unifirst – Drum Label for Soil From Southwest Corner Piezometer and Pumping Well Installation

Unifirst – Drums Containing Soil from Southwest Corner Piezometer/Well Installation

Five Year Review Inspection Photographs
UniFirst
August 12, 2014

Unifirst – Broken Cap for Monitoring Well UC-15S

Unifirst – Broken Cover for Monitoring Well at SW Corner of Building

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: New England Plastics (NEP)	**Date of inspection:** August 22, 2014
Location and Region: Woburn USEPA Region 1	**EPA ID:** Wells G&H MAD980732168
Agency, office, or company leading the five-year review: TRC / AECOM	**Weather/temperature:** Cloudy, 70s

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☐ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls
■ Other Groundwater monitoring only. Air sparging/soil vapor extraction (AS/SVE) system shut off in March 2000.

Attachments: ■ Inspection team roster attached Table 1 ■ Site map attached Figure 1

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Jeffrey A. Hamel, LSP (Name) Vice President, Woodard & Curran, Inc. (Title) 8/22/14 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone no. 978-317-3635
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** See Note 1 (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone no. _____
   Problems, suggestions; ☐ Report attached Note 1: AS/SVE system shut off in March 2000

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 _____
   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) ☐ Report attached.

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 At W&C Office	☐ Readily available	☐ Up to date	☐ N/A

Remarks Sept 1997 monitoring plan and groundwater sampling checklist are kept on-site.

2. **Site-Specific Health and Safety Plan** ■ Readily available ■ Up to date ☐ N/A

■ Contingency plan/emergency response plan	■ Readily available	■ Up to date	☐ N/A

Remarks Woodward & Curran (7/17/2013).

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A

Remarks Not available on-site, but all O&M staff are OSHA 40-hr trained

4. **Permits and Service Agreements**

☐ Air discharge permit	None	☐ Readily available	☐ Up to date	■ N/A
☐ Effluent discharge	None	☐ Readily available	☐ Up to date	■ N/A
☐ Waste disposal, POTW	None	☐ Readily available	☐ Up to date	■ N/A
☐ Other permits	None	☐ Readily available	☐ Up to date	■ N/A

Remarks

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ■ N/A

Remarks

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ■ N/A

Remarks

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☐ N/A

Remarks Maintained off-site.

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 No visitors other than for annual sampling. O&M staff do sign in at NEP's office.

IV. O&M COSTS

1. **O&M Organization**
   ☐ State in-house ☐ Contractor for State
   ☐ PRP in-house ■ Contractor for PRP
   ☐ Federal Facility in-house ☐ Contractor for Federal Facility
   ☐ Other Woodward & Curran is a direct contractor to NEP.

2. **O&M Cost Records**
   ☐ Readily available No ☐ Up to date
   ☐ Funding mechanism/agreement in place
   Original O&M cost estimate _____ ☐ Breakdown attached

   Approx. $10,000 per year for years when GW sampling performed

   Total annual cost by year for review period if available

   From_____ To_____ _____ ☐ Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ ☐ Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ ☐ Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ ☐ Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ ☐ Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: None

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ■ N/A
   Remarks Vehicle access to back of property is gated. No fencing present.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks Gates are locked at night when NEP workers are not present. No signs or security systems are used. Trailer is locked

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs not properly implemented ☐ Yes ☐ No ■ N/A
   Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ■ N/A

   Type of monitoring (*e.g.*, self-reporting, drive by) _____
   Frequency _____
   Responsible party/agency_____
   Contact _____ _____ _____ _____
   Name Title Date Phone no.

   Reporting is up-to-date ☐ Yes ☐ No ■ N/A
   Reports are verified by the lead agency ☐ Yes ☐ No ■ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ■ N/A
Violations have been reported ☐ Yes ☐ No ■ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☐ ICs are adequate* ☐ ICs are inadequate ■ N/A
Remarks None

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ■ No vandalism evident
Remarks None

2. **Land use changes on site** ☐ N/A
Remarks None

3. **Land use changes off site** ☐ N/A
Remarks None

VI. GENERAL SITE CONDITIONS

A. Roads ■ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ■ Roads adequate ☐ N/A
Remarks Paved parking lot present in northern and western portions of site

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☐ Applicable ■ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks

4. **Holes** ☐ Location shown on site map ☐ Holes not evident

Areal extent_____ Depth_____
Remarks_____
_____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____
_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
Remarks_____
_____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
Areal extent_____ Height_____
Remarks_____
_____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____
_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____
_____

B. Benches ☐ Applicable ■ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

C. Letdown Channels ☐ Applicable ■ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____
_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____
_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____
_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____
_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____
_____

D. Cover Penetrations ☐ Applicable ■ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____
_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____
_____

E. Gas Collection and Treatment ☐ Applicable ■ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs Maintenance

Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks_____

F. Cover Drainage Layer ☐ Applicable ■ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ■ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
☐ Siltation not evident
Remarks_____

2. **Erosion** Areal extent_____ Depth_____
☐ Erosion not evident
Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
Remarks_____

H. Retaining Walls ☐ Applicable ■ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ■ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____
_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks_____
_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ■ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____
_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____
_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ■ N/A

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

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ■ N/A
Remarks Everything from old system is currently mothballed.
_____
_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks_____
_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____
_____
_____

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

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks_____
_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks_____
_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____

C. Treatment System ■ Applicable (but not in use) ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ■ Carbon adsorbers
Filters _____
☐ Additive (*e.g.*, chelation agent, flocculent) _____
☐ Others _____
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually
☐ Quantity of surface water treated annually
Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
■ N/A ☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Tanks, Vaults, Storage Vessels**
■ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks_____

4. **Discharge Structure and Appurtenances**
■ N/A ☐ Good condition ☐ Needs Maintenance
Remarks_____

5. **Treatment Building(s)**
■ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks Trailer for mothballed system appears in good condition.

6. **Monitoring Wells** (pump and treatment remedy)
■ Properly secured/locked ■ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks Certain wells noted not to be locked (see table). Did not find NEP-103 well pair (too heavily vegetated).

D. Monitoring Data

Monitoring Data
■ Is routinely submitted on time ■ Is of acceptable quality

Monitoring data suggests:
☐ Groundwater plume is effectively contained ■ Contaminant concentrations are declining

D. Monitored Natural Attenuation

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

Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

The remedy for NEP included air sparging with soil vapor extraction which was effective in meeting ROD cleanup levels in unsaturated soils and significantly reducing groundwater concentration of TCE and PCE. This system has been shut down since 2000. Groundwater is currently being monitored bi-annually and generally shows downward trends with some exceedances of the ROD cleanup levels remaining in groundwater.

B. Adequacy of O&M

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

No issues were identified as part of the site inspection that call into question the protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

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

No unexpected changes in cost or scope of O&M or frequent repairs were reported by Jeffrey Hamel.

D. Opportunities for Optimization

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

None identified based on the site inspection alone.

Table 1. NEP Inspection Team Rooster

5-Year Inspection Team Members	**Company**
Michael Plumb, PE, LSRP	TRC
Interviewed PRP Staff	
Jeffrey Hamel, LSP, Vice President	Woodard & Curran, Inc.

Five Year Review Inspection Photographs
NEP
August 22, 2014

New England Plastics SVE System (Inactive)

SVE Extraction Well

Five Year Review Inspection Photographs
NEP
August 22, 2014

SVE Extraction Well

SVE Extraction Well

Five Year Review Inspection Photographs
NEP
August 22, 2014

Area of Former Extraction Well NEP-2 (Well is paved over)

Area of NEP 109B (under pallets)

Five Year Review Inspection Photographs
NEP
August 22, 2014

Former Extraction Well NEP 3

Former Extraction Well NEP 1 Vault

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Olympia	**Date of inspection:** August 12, 2014
Location and Region: Woburn, MA (EPA Region 1)	**EPA ID:** MAD980732168
Agency, office, or company leading the five-year review: TRC/AECOM	**Weather/temperature:** Sunny, 70's

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☐ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls
■ Other___In Situ Chemical Oxidation (ISCO). Last targeted amendment injections July 11 and 15, 2014. Next injections scheduled for Fall 2014 (maybe November).

Attachments: ■ Inspection team roster attached ■ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** __Michael Webster_____
   Name Title
   Interviewed ☐ at site ☐ at office ☐ by phone Phone No. _____
   Problems, suggestions; ☐ Report attached_____

2. **O&M staff** __Kristen Sarson_____Project Scientist_____
   Name Title
   Interviewed ■at site ☐ at office ☐ by phone Phone No. 781-219-8317
   Problems, suggestions; ☐ Report attached ___None_____
   _____

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 _____
   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) ☐ Report attached.

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 As-built diagram for wells/trenches and injection information provided in reports.

2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☐ N/A
   ☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A
   Remarks Available at GeoInsight Office

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A
   Remarks Available at GeoInsight Office

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	■N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	■ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	■ N/A
☐ Other permits	☐ Readily available	☐ Up to date	☐ N/A

Remarks None

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ■ N/A
   Remarks

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ■ N/A
   Remarks

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☐ N/A
   Remarks Available at GeoInsight Office

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 _Available at GeoInsight Office_____

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ■ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other _____

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate _____ ☐ Breakdown attached

_____

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: ___None_____

V. ACCESS AND INSTITUTIONAL CONTROLS ■ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ■ Location shown on site map ■ Gates secured ☐ N/A
   Remarks Areas where fence damage noted are shown on Figure 1.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks On gate at Site entrance

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs not properly implemented ☐ Yes ☐ No ■ N/A
   Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ■ N/A

   Type of monitoring (*e.g.*, self-reporting, drive by) _____
   Frequency _____
   Responsible party/agency_____
   Contact _____ _____ _____ _____
   Name Title Date
   Phone no.

   Reporting is up-to-date ☐ Yes ☐ No ■ N/A
   Reports are verified by the lead agency ☐ Yes ☐ No ■ N/A
   Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ■ N/A
   Violations have been reported ☐ Yes ☐ No ■ N/A
   Other problems or suggestions: ☐ Report attached
   _____
   _____
   _____
   _____

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ■ N/A
   Remarks_____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ■ No vandalism evident
   Remarks Part of fence is down adjacent to railroad tracks and litter inside fence suggests that trespassers use trails at edge of injection area. No indication of trespassing into injection area.

2. **Land use changes on site** ☐ N/A
   Remarks None

3. **Land use changes off site** ☐ N/A
   Remarks None

VI. GENERAL SITE CONDITIONS

A. Roads ■ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ■ Roads adequate ☐ N/A
   Remarks _____

B. Other Site Conditions

Remarks_____
_____
_____

_____
_____

VII. LANDFILL COVERS ☐ Applicable ■ N/A

A. Landfill Surface ☐ Applicable ☐ N/A

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____
_____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____
_____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
Areal extent_____ Depth_____
Remarks_____
_____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____
_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
Remarks_____
_____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
Areal extent_____ Height_____
Remarks_____
_____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____
_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____
_____

B. Benches ☐ Applicable ☐ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

C. Letdown Channels ☐ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____
_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____
_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____
_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____
_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____
_____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____
_____

2. **Gas Monitoring Probes**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs Maintenance
Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks_____

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
☐ Siltation not evident
Remarks_____

2. **Erosion** Areal extent_____ Depth_____
☐ Erosion not evident
Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A

Remarks_____
_____

4. **Dam** ☐ Functioning ☐ N/A
Remarks_____
_____

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____
_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks_____
_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent_____ Depth_____
Remarks_____
_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____
_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks_____
_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ■ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____
_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____
_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☐ N/A

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

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks_____

_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks _____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks _____

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

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks_____
_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks_____
_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____
_____

C. Treatment System ☐ Applicable ■ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon Adsorbers
Filters _____
☐ Additive (*e.g.*, chelation agent, flocculent) _____
☐ Others _____
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually
☐ Quantity of surface water treated annually
Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
■ N/A ☐ Good condition ☐ Needs Maintenance
Remarks_____
_____

3. **Tanks, Vaults, Storage Vessels**
■ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks_____
_____

4. **Discharge Structure and Appurtenances**
■ N/A ☐ Good condition ☐ Needs Maintenance
Remarks _____

5. **Treatment Building(s)**
■ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ■Functioning ☐ Routinely sampled ☐ Good condition
■ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks Wells inside the fenced area were not locked. Wells outside the fenced area were locked but tubing protruded out from beneath the cover which could be pulled out by hand. All wells should be secured.

D. Monitoring Data

Monitoring Data
■ Is routinely submitted on time ■ Is of acceptable quality

Monitoring data suggests:
☐ Groundwater plume is effectively contained ■ Contaminant concentrations are declining

D. Monitored Natural Attenuation

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

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

The remedy consists of injection of chemical oxidant (ISCO) to destroy organic contamination in groundwater and sorbed to shallow soils. Monitoring data shows some contaminant concentration reduction has been achieved since injections began. Injections were performed in July 2014 and included monitoring well location MW-217M where increasing concentration of VOCs observed.

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.

With no active system onsite, onsite O&M consists of groundwater sampling and oxidant injection.

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, which suggest that the protectiveness of the remedy may be compromised in the future.

None

D. Opportunities for Optimization

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

None, based on site inspection alone.

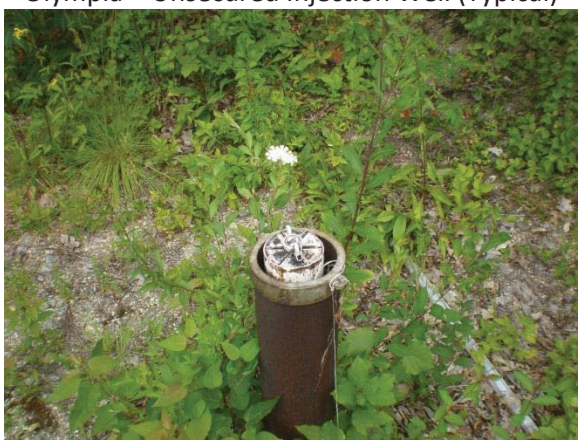
Table 1 - Inspection Team Roster

5-Year Inspection Team Members	**Company**
Michael Plumb, PE, LSRP	TRC
Jeffrey Hansen, PH	TRC
Interviewed Staff	**Company**
Kristen Sarson	GeoInsight, Inc.

Five Year Review Inspection Photographs
Olympia
August 12, 2014

Olympia Injection Wellfield

Olympia – Unsecured Injection Well (Typical)



Olympia – Unsecured Monitoring Well Inside Fenceline (Typical)

Five Year Review Inspection Photographs
Olympia
August 12, 2014

Olympia – Damaged Fence Near Commuter Rail Line – Evidence of Trespassers

Appendix E

Interview Records

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	**EPA ID No.:** MAD980732168
Subject: Five Year Review	**Time:** 13:00 **Date:** 9/19/2014
Type: ■ Telephone ☐ Visit ☐ Other **Location of Visit:**	☐ Incoming ☐ Outgoing N/A

Contact Made By:

Name: Michael Plumb	**Title:** Project Engineer	**Organization:** TRC

Individuals Contacted:

Name: Clayton Smith	**Title:** Project Coordinator	**Organization:** de maximis, Inc.
Telephone No.: 781-642-8775 **Fax No.:** 781-642-1078 **E-mail Address:** csmith@demaximis.com	**Street Address** 135 Beaver Street Waltham, MA	

Name: -Jack Guswa, Ph.D., LSP	**Title:** President / Principal Hydrogeologist	**Organization:** **JG Environmental, Incorporated**
Telephone No.: 978-266-2992 **Fax No.:** 978-263-0696 **E-mail Address:** jguswa@jgenvironmental.com	**Street Address** 1740 Massachusetts Avenue Boxborough, Massachusetts 01719-2209	

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

Mr. Guswa feels they are pretty much at the end of the project and that great progress has been made

2.A. Is the remedy functioning as expected? How well is the remedy performing?

Yes. The remedy is performing well.

3.A. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

Mr. Guswa said the data shows continuing decreasing trends. Concentrations at many wells are at or below ROD-required cleanup levels.

4.A. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

O&M personnel are at the site weekly for system inspections, monthly for water level measurements and system water quality sampling. Onsite O&M staff varies from 1 to 2 people at a time, depending on the task.

5.A. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

There have been no operational changes over the last five years. There have been changes in the monitoring wells sampled to resolve EPA's potential issues over time, such as vapor intrusion and the offsite PCE source.

6.A. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

No.

7.A. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

In the past, changing to sampling the monitoring wells using PDBs has reduced costs. In the last five years, no.

8.A. Do you have any comments, suggestions, or recommendations regarding the project?

Mr. Guswa recommends EPA approve the proposed shut down of Area 2 and 3 pumping wells and the proposed monitoring program.

SUPPLEMENTAL QUESTIONS

Groundwater Cleanup

1.B. Are certain wells continuing to have high detections while others are dropping? What explains these results?

No. Data from all wells show decreasing trends. In the area of RW-22, concentrations are higher, but are dropping.

2.B. Has the mix of contaminants changed in the monitoring or treatment system? What accounts for these changes?

The mix has been the same over the last five years. There were higher PCE concentrations initially, however the overall mix is the same.

3.B. Is there an indication that DNAPL or LNAPL is present? How have you checked or verified?

There are no indications currently. Historically, during the initial releases, there may have been some DNAPL.

4.B. Discuss how the treatment processes changed or have been adjusted over time.

No changes over the last five years. The process hasn't changed since the UVOX system was shutdown, prior to this 5-year review period.

5.B. How have pumping rates changed over time and why have they changed?

The pumping rates have not changed much at all. With the deepening of RW-22, years back, the overall system flow may have increased ½ to 1 gallon per minute. The overall system flow rate remains around 7 to 8 gallons per minute.

6.B. What are your most recent projections for achieving cleanup overall or in subportions of the site?

Mr. Guswa stated the ROD requirement of no offsite migration has been achieved for the overburden and shallow bedrock. Deeper ground water contamination is captured by pumping at the Unifirst Site – by design. Some interior wells remain above ROD-required levels. They have not made any projections.

7.B. What changes do you anticipate will be made in the operation of the system as subportions of the site are cleaned-up?

Mr. Guswa stated they anticipate the shutdown of Area 2 and 3 wells.

8.B. Do you expect cleanup to be achieved below regulatory prescribed levels or do you envision that a constant/asymptotic level of contamination will remain above numerical cleanup criteria?

Mr. Guswa expects cleanup to ROD-required levels to be achieved, including near well RW-22.

9.B. Are you considering pulsing the pumping operation in a different manner than in the past? Has pulsing helped?

No. A pulsed pumping study was performed and determined pulsed pumping would not be helpful.

Potential Local Contaminant/Hydraulic Impacts/Effects

10.B. What upgradient sites are believed to be impacting site cleanup and to what degree? Are there any suggested steps that could be taken to deal with impacts?

Mr. Guswa stated that under pumping conditions there is an upgradient PCE source. Recommend approval of the Area 2 and 3 shutdown to prevent drawing the PCE towards the site. Also he believes the Central Area investigation includes efforts to identify this source.

11.B. Are you noticing the impact of offsite entities on the aquifer in terms of offsite pumping or other hydraulic impacts that may be impacting the local water table?

By design, UC-22 produces significant drawdown in the deeper bedrock.

12.B. How has the natural gradient changed and are seasonal gradients present that vary from the average yearly gradient? Does the system function best at low water table or high water table or somewhere in between?

No changes in the last five years. The system works well during high and low water table conditions.

Nature and Extent

13.B. What is the integrity of the facility sewers? Is it possible that there are continuing sources of release at the site from buried pipelines and tanks?

Onsite sewers were removed in 2006.

14.B. Is there any known surficial soil contamination remaining at the property?

No.

Reporting

15.B. What site investigation and remediation reports have been generated in the past 5 years? In addition to monthly and annual reports from 2009 to 2014 in chronological order:

1) Kueper, B. H. and J. H. Guswa, 2010. Assessment of Coordinated Groundwater Remedies, Operable Unit One – Northeast Quadrant, Wells G & H Superfund Site, Woburn, MA, December 17, 2010.

2) Tetra Tech GEO and JG Environmental, 2011. Areas 2, 3 & 4 Enhancement Evaluation Report, March 8, 2011.

3) Tetra Tech and JG Environmental, 2013. Soil Response Action Completion Report (Rev 1). July 3, 2013.

4) Tetra Tech and JG Environmental, 2014. Areas 2 & 3 Evaluation Report, March 31, 2014.

16.B. Provide a summary of the types of problems or errors that have been made in the prior 5 years.

None.

17.B. Have you conducted a regulatory compliance audit (internal or external) and is a report available describing any deficiencies identified?

No.

18.B. Have there been any health and safety issues on-site?

No reportable incidents.

Land Use

19.B. Has site ownership changed?

Not at this time.

20.B. Has site occupancy changed? Are there any occupancy changes in the foreseeable future? If so, please describe.

No.

21.B. What is the zoning of the property? Are there any institutional controls/deed restrictions in place?

Not sure regarding the zoning. There are no deed restrictions.

22.B. Are there new industrial processes occurring at the site or has there been a change in chemicals used at the site?

No.

23.B. What are the current uses of the property (indoor and outdoor [landscaping])?

The only current onsite use is the treatment system.

24.B. How frequently are authorized individuals present at the property (days/week)?

One day per week.

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

A concept development plan has been submitted which includes restaurants, a hotel and parking.

26.B. Is groundwater currently used (e.g., as process water) on the property?

No.

27.B. Are there plans to use groundwater on-site in the future?

No.

Exposure Information

28.B. What measures have been taken to secure the site and the contaminated areas (e.g., fencing, locks, etc.)? How successful have these measures been?

No.

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

No.

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

No.

31.B. Have there been any unusual or unexpected activities or events at the site (e.g., flooding)?

No.

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

No.

Wrap-Up

33.B. Do you have any recommendations for reducing or increasing activities at the site?

Mr. Guswa stated they recommend the shutdown of Area 2 and 3 wells and the proposed monitoring plan.

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

Mr. Smith stated they would like a response to the shutdown proposal to help them identify requirements going forward relative to site development. They propose to abandon wells which are currently only used to measure water levels or where water quality sampling has shown concentrations less than Rod-required levels for years.

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	**EPA ID No.:** MAD980732168	
Subject: Five Year Review	**Time:** 10:00	**Date:** 9/18/2014
Type: ■ Telephone ☐ Visit ☐ Other **Location of Visit:**	☐ Incoming ☐ Outgoing N/A	

Contact Made By:

Name: Michael Plumb	**Title:** Project Engineer	**Organization:** TRC

Individual Contacted:

Name: Timothy M. Cosgrave	**Title:** Senior Manager, EH&S	**Organization:** UniFirst Corporation
Telephone No: 978-658-8888 ext 4332 **Fax No:** **E-Mail Address:** Timothy_Cosgrave@unifirst.com	**Street Address:** 68 Janspin Road Wilmington, MA	

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

Mr. Cosgrave stated Unifirst feels that the system is operating as required by the ROD. Unifirst felt capture discussions with EPA were not progressing and therefore decided to enhance the system to continue to work with the EPA.

2.A. Is the remedy functioning as expected? How well is the remedy performing?

Mr. Cosgrave feels the remedy is functioning fine considering this is a DNAPL site. The remedy is performing as it was designed.

3.A. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

For monitoring wells on the Unifirst site, the data are presented in the annual reports. Recent data suggests there are wells in the Central Area of the Wells G&H site that have concentrations less than ROD requirements.

4.A. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

Mr. Cosgrave stated that there are weekly visits, a dial in data logger to conduct remote checks and the data logger will dial him if there are any problems. Weekly visits include inspection of gauges and system operations and preventative inspections/actions as appropriate. Occasionally, there are other activities such as carbon change outs (a few times per year).

5.A. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

No. Unifirst is planning on performing updates/upgrades to their system controls. EPA will receive information on this soon.

6.A. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

No.

7.A. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

Mr. Cosgrave stated that in the Year 17 Annual Report Unifirst requested to stop sampling for lead and proposed the annual expanded sampling event be reduced. Unifirst has not heard back from EPA on this.

8.A. Do you have any comments, suggestions, or recommendations regarding the project?

Not at this time.

SUPPLEMENTAL QUESTIONS

Groundwater Cleanup

1.B. Are certain wells continuing to have high detections while others are dropping?

What explains these results?

Mr. Cosgrave stated that he believes the information presented in the annual reports shows some ground water contaminant concentrations remain high while other have not. He stated this is typical for a DNAPL site.

2.B. Has the mix of contaminants changed in the monitoring or treatment system? What accounts for these changes?

No.

3.B. Is there an indication that DNAPL or LNAPL is present? How have you checked or verified?

Yes. DNAPL checks are made periodically. UC-8 remains the only well where DNAPL has been directly observed.

4.B. Discuss how the treatment processes changed or have been adjusted over time.

No changes over the last 5 years.

5.B. How have pumping rates changed over time and why have they changed?

Within the context of maintaining the set water level, there have been minor flow rate changes. None of these are considered significant.

6.B. What are your most recent projections for achieving cleanup overall or in subportions of the site?

There are currently no such projections.

7.B. What changes do you anticipate will be made in the operation of the system as subportions of the site are cleaned-up?

No changes anticipated beyond the enhancements currently underway – SVE and additional ground water extraction capacity.

8.B. Do you expect cleanup to be achieved below regulatory prescribed levels or do you envision that a constant/asymptotic level of contamination will remain above numerical cleanup criteria?

Mr. Cosgrave stated he believes some portions of the site have cleaned up while others

you can't predict.

9.B. Are you considering pulsing the pumping operation in a different manner than in the past? Has pulsing helped?

No.

Potential Local Contaminant/Hydraulic Impacts/Effects

10.B. What upgradient sites are believed to be impacting site cleanup and to what degree? Are there any suggested steps that could be taken to deal with impacts?

By design the Unifirst ground water extraction system captures the deeper portions of the ground water contamination from the W.R. Grace site.

11.B. Are you noticing the impact of offsite entities on the aquifer in terms of offsite pumping or other hydraulic impacts that may be impacting the local water table?

No.

12.B. How has the natural gradient changed and are seasonal gradients present that vary from the average yearly gradient? Does the system function best at low water table or high water table or somewhere in between?

Any changes are not expected to be significant. Mr. Cosgrave believes UC-22 is capable of providing the required capture. Water levels are measured annually during the expected high water table conditions and he believes the resulting data continues to show capture.

Nature and Extent

13.B. What is the integrity of the facility sewers? Is it possible that there are continuing sources of release at the site from buried pipelines and tanks?

Mr. Cosgrave stated the sewers are not a continuing source of site COCs. He does not see this as a concern.

14.B. Is there any known surficial soil contamination remaining at the property?

Yes, the SVE system being installed is designed to address this.

Reporting

15.B. What site investigation and remediation reports have been generated in the past 5 years?

- Assessment of Coordinated Groundwater Remedies Report, dated December 17, 2010
- Vapor Extraction Pilot Test Summary Report, dated February 22, 2013

16.B. Provide a summary of the types of problems or errors that have been made in the prior 5 years.

None significant.

17.B. Have you conducted a regulatory compliance audit (internal or external) and is a report available describing any deficiencies identified?

No.

18.B. Have there been any health and safety issues on-site?

No.

Land Use

19.B. Has site ownership changed?

No.

20.B. Has site occupancy changed? Are there any occupancy changes in the foreseeable future? If so, please describe.

No.

21.B. What is the zoning of the property? Are there any institutional controls/deed restrictions in place?

No.

22.B. Are there new industrial processes occurring at the site or has there been a change in chemicals used at the site?

No.

23.B. What are the current uses of the property (indoor and outdoor [landscaping])?

Office space, storage building and parking lot

24.B. How frequently are authorized individuals present at the property (days/week)?

Individuals working on the system are present 1 day/week.

Persons using the storage space can be present during normal working hours 8:00 am to 5:30 pm Monday through Saturday. 10 am until 2 pm on Sundays.

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

No different uses currently planned.

26.B. Is groundwater currently used (e.g., as process water) on the property?

No.

27.B. Are there plans to use groundwater on-site in the future?

No.

Exposure Information

28.B. What measures have been taken to secure the site and the contaminated areas (e.g., fencing, locks, etc.)? How successful have these measures been?

The site is fenced with a lockable gate.

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

No.

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

No.

31.B. Have there been any unusual or unexpected activities or events at the site (e.g., flooding)?

No.

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

One complaint was received by EPA during the recent aquifer test. Follow-up evaluations were made and nothing was found to suggest the issue was site-related.

Wrap-Up

33.B. Do you have any recommendations for reducing or increasing activities at the site?

No.

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

No.

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	**EPA ID No.:** MAD980732168	
Subject: Five Year Review	**Time:** 1:00 PM	**Date:** 9/9/2014
Type: ■ Telephone ☐ Visit ☐ Other **Location of Visit:**	☐ Incoming ☐ Outgoing N/A	

Contact Made By:

Name: Michael Plumb	**Title:** Project Engineer	**Organization:** TRC

Individuals Contacted:

Name: Christene A. Binger	**Title:** Office Manager/Senior Hydrogeologist	**Organization:** GeoInsight, Inc.
Telephone No.: (978) 679-1600 ext. 415 **Fax No.:** (978) 679-1601 **E-Mail Address:** CABinger@geoinc.com	**Street Address:** 5 One Monarch Drive, Suite 201 Littleton, MA 01460	
Name:	**Title:**	**Organization:**
Telephone No.: **Fax No.:** **E-Mail Address:**	**Street Address:**	

Preface:

The system at this Site has been shut down since 2000. There are no O&M activities related to the operation of the system.

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

Ms. Binger stated she feels the remedy is making satisfactory progress moving towards ground water cleanup.

2.A. Is the remedy functioning as expected? How well is the remedy performing?

Yes. The system is performing well.

3.A. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

The data shows decreasing trends compared to initial conditions in a majority of the monitoring locations.

4.A. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

No.

5.A. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

The frequency of injections has changed from twice per year to once per year. Ms. Binger does not believe this change has affected the protectiveness of effectiveness of the remedy. They have been iteratively focusing resources as they implement the remedy.

6.A. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

No.

7.A. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

The injection method has changed from gravity feed to direct push. Ms. Binger feels this has increased the injection efficiency.

8.A. Do you have any comments, suggestions, or recommendations regarding the project?

Time is needed to allow the reagent to work its way into the formation, perform continued monitoring and iteratively focus the remedial efforts.

SUPPLEMENTAL QUESTIONS

Groundwater Cleanup

1.B. Are certain wells continuing to have high detections while others are dropping? What explains these results?

No. Data from all wells has generally decreased.

2.B. Has the mix of contaminants changed in the monitoring or treatment system? What accounts for these changes?

No.

3.B. Is there an indication that DNAPL or LNAPL is present? How have you checked or verified?

DNAPL initially observed using a tape. DNAPL has not been observed more recently during monitoring events using an interface probe.

4.B. Discuss how the treatment processes changed or have been adjusted over time.

The reagent delivery method has changed from gravity feed to direct push. The injection frequency has changed from a high intensity to periodic injections.

5.B. How have pumping rates changed over time and why have they changed?

N/A.

6.B. What are your most recent projections for achieving cleanup overall or in subportions of the site?

No current projections are available.

7.B. What changes do you anticipate will be made in the operation of the system as subportions of the site are cleaned-up?

The injection frequency, reagent volume injected and the scope of the injections would be expected to change as subportions of the site are cleaned up.

8.B. Do you expect cleanup to be achieved below regulatory prescribed levels or do you envision that a constant/asymptotic level of contamination will remain above numerical cleanup criteria?

Ms. Binger stated the objective is to cleanup to ROD-specified requirements. Currently concentrations seem to be approaching asymptotic levels. Ms. Binger stated believes ROD-required cleanup levels will be achieved.

9.B. Are you considering pulsing the pumping operation in a different manner than in the past? Has pulsing helped?

N/A

Potential Local Contaminant/Hydraulic Impacts/Effects

10.B. What upgradient sites are believed to be impacting site cleanup and to what degree? Are there any suggested steps that could be taken to deal with impacts?

No.

11.B. Are you noticing the impact of offsite entities on the aquifer in terms of offsite pumping or other hydraulic impacts that may be impacting the local water table?

No.

12.B. How has the natural gradient changed and are seasonal gradients present that vary from the average yearly gradient? Does the system function best at low water table or high water table or somewhere in between?

No change in gradients has been noted.

Nature and Extent

13.B. What is the integrity of the facility sewers? Is it possible that there are continuing sources of release at the site from buried pipelines and tanks?

N/A

14.B. Is there any known surficial soil contamination remaining at the property?

None known.

Reporting

15.B. What site investigation and remediation reports have been generated in the past 5 years?

Periodic Progress Reports

16.B. Provide a summary of the types of problems or errors that have been made in the prior 5 years.

No significant errors or problems have been noted.

17.B. Have you conducted a regulatory compliance audit (internal or external) and is a report available describing any deficiencies identified?

No.

18.B. Have there been any health and safety issues on-site?

No.

Land Use

19.B. Has site ownership changed?

No.

20.B. Has site occupancy changed? Are there any occupancy changes in the foreseeable future? If so, please describe.

No.

21.B. What is the zoning of the property? Are there any institutional controls/deed restrictions in place?

Ms. Binger is not sure – either commercial or industrial.

22.B. Are there new industrial processes occurring at the site or has there been a change in chemicals used at the site?

No.

23.B. What are the current uses of the property (indoor and outdoor [landscaping])?

The containment cell portion of the property is not used/vacant land.

24.B. How frequently are authorized individuals present at the property (days/week)?

A minimum of 4 to 6 times per year.

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

Same as current use – vacant land. (containment cell)

26.B. Is groundwater currently used (e.g., as process water) on the property?

No.

27.B. Are there plans to use groundwater on-site in the future?

No.

Exposure Information

28.B. What measures have been taken to secure the site and the contaminated areas (e.g., fencing, locks, etc.)? How successful have these measures been?

Containment cell is fenced with padlocked gates.

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

No.

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

No.

31.B. Have there been any unusual or unexpected activities or events at the site (e.g., flooding)?

No.

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

No.

Wrap-Up

33.B. Do you have any recommendations for reducing or increasing activities at the site?

No.

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

No.

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	**EPA ID No.:** MAD980732168	
Subject: Five Year Review	**Time:**	**Date:** 9/23/2014
Type: ☐ Telephone ☐ Visit ■ Other **Location of Visit:** Email Response	☐ Incoming ☐ Outgoing N/A	

Contact Made By:

Name: David Sullivan	**Title:** Project Manager	**Organization:** TRC

Individual Contacted:

Name: Jen McWeeney	**Title:** Project Manager	**Organization:** MassDEP
Telephone: (617) 654-6560 **Fax No.** **E-mail Address:** jennifer.mcweeney@state.ma.us	**Street Address:** One Winter Street 6th Floor Boston, MA 02108	

Preface:

5-YEAR REVIEW QUESTIONS FOR STATE/LOCAL OFFICIALS

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

MassDEP believes the site is being managed in a comprehensive manner. From a technical standpoint, there are virtually no issues that are not investigated and addressed. However, similar to other CERCLA sites, progress can be slow and the pace uneven. This may be, in part, because of the complexity of the site (multiple source area properties and PRPs) and also because it is a PRP funded site.

2.A. Have there been routine communication or activities (site visits, inspections) involving your office regarding the site? If so, please give purpose and results.

MassDEP is copied on emails and participates in conference calls and meetings regarding the site. Over the past five years, MassDEP has also participated in site visits and public meetings.

3.A. 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 response.

No, not regarding Wells G&H OU1.

4.A. Do you feel well informed about the site's activities and progress?

Yes, MassDEP feels well informed.

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

Please continue to copy MassDEP on emails and invite MassDEP to participate in meetings, conference calls and also site visits regarding this site.

SUPPLEMENTAL QUESTIONS

1.B. What concerns do you have about the site?

MassDEP continues to be concerned about persistent groundwater contamination at all source area properties and also the adequacy of remedial efforts at source area properties (particularly Unifirst, Olympia and Wildwood).

MassDEP continues to be concerned about potential future risk to human health via the indoor air pathway at Unifirst (should the building develop cracks allowing a complete exposure pathway from the underlying contaminated groundwater to indoor air).

2.B. Are you aware of any community concerns regarding the site? Provide details.

No, not currently.

3.B. Have the activities to date at the site helped the neighborhood and/or community?

Yes, in 2012 EPA conducted a human health risk assessment to investigate whether groundwater contamination affiliated with the Unifirst property was impacting indoor air quality in nearby residences. EPA concluded that there were no significant health risks (either current or future) for people living in residences downgradient of the Unifirst property.

4.B. Are you aware of any events of vandalism or trespassing at the site?

No.

5.B. Are you aware of any changes in projected land use at or near the site?

Yes, the Grace property is proposed to be developed into a commercial property that includes 3 restaurants and one hotel.

6.B. We understand that groundwater from that site may be used in the distant future. Are there plans for use of groundwater at the site in the near term?

No.

7.B. Are there any pending changes in laws or regulations that may impact the site?

No.

8.B. Do you have any suggestions or recommendations regarding the project?

MassDEP suggests that the Unifirst building be routinely inspected for new building cracks that could impact indoor air quality and pose a health risk to workers.

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

No.

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	**EPA ID No.:** MAD980732168	
Subject: Five Year Review	**Time:**	**Date:** 8/31/14
Type: ☐ Telephone ☐ Visit ■ Other **Location of Visit:** Email Response	☐ Incoming ☐ Outgoing	

Contact Made By:

Name: Diane Silverman	**Title:** Risk Assessor	**Organization:** TRC

Individual Contacted:

Name: Linda Raymond	**Title:** Environmental Activist	**Organization:** Aberjona Study Coalition, Inc.
Telephone No.: **Fax No.:** **E-Mail Address:** fitwalker1@aol.com	**Street Address:**	

Preface:

I was present at the Woburn City Council public hearing when EPA project Manager, Joe LeMay presented his 2-14 update overview of Wells G & H site and the Industri-plex site. I found his presentation informative. I want to also make note that more periodic updates need to be shared with the community.

5-YEAR REVIEW QUESTIONS FOR COMMUNITY

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

It is taking too long for the clean-up process to begin. Same sentiments as the previous 5 year reviews.

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

Little or none.

3.A. Are you aware of any community concerns regarding the site's operation and administration? If so, please give details.

One main concern that both sites will never be cleaned up.

4.A. Are you aware of any events, incidents, or activities at the site (such as emergency responses)? If so, please give details.

No.

5.A. Do you feel well informed about the site's activities and progress?

Information sharing about this site's activities and progress has improved. The Aberjona Study Coalition, Inc. is a conduit for information to the Communities. ASC represents over 225,000 people residing along the Aberjona River.

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

The Aberjona Study Coalition, Inc. (ASC) hopes that the EPA continues to work with the DEP and Community Groups. The sharing of information is vital not only for the clean-up of these sites but also for the well-being of those who reside in our communities. A band-aid approach is not acceptable.

SUPPLEMENTAL QUESTIONS FOR COMMUNITY GROUPS

1.B. What concerns do you have about the site?

Wells G & H should remain closed for perpetuity.

2.B. Are you aware of any other community concerns regarding the site? Provide details.

It is unacceptable that the clean-up has still not begun.

3.B. Have the activities to date at the site helped the neighborhood and/or community?

EPA has provided the community and ASC with updates. Have they helped? More information, more paper to be placed on file. The community needs to see clean-up action.

4.B. Are you aware of any events of vandalism or trespassing at the site?

No

5.B. Are you aware of any other activities at the site that might be of importance (e.g., flooding)?

No

6.B. Are you aware of any changes in projected land use at or near the site?

No

7.B. Is there any sentiment from the community about the future use of groundwater from the site?

Yes, there will always be the fear of contamination. Contamination knows no boundary.

8.B. Do you have any suggestions or recommendations regarding the project?

Yes, educate our children. As I stated in the last 5 year review and will again state the following: The EPA should reach out to local schools in the community by speaking to students on the wrongs of Woburn's past "Woburn's History and Future" it is a lesson that must be taught to students so that future generations will not make the same mistakes.

Also, the EPA needs to take a closer look on the results of pets roaming on the site and then tracking sediments to homes. Not all pets are kept on leashes.

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

Yes, the information that I would like to share is that I have reviewed the last (2) 5-year reviews and noticed that some of the comments of concern made then still apply today.

Appendix F

Current Toxicity Criteria and Vapor Intrusion Screening Levels for Groundwater

Table 1 - Comparison of 1988 and 2014 Oral Reference Doses and Oral Cancer Slope Factors for Compounds of Potential Concern
Wells G&H Superfund Site

Compound of Potential Concern	Oral Reference Dose (RfD) (mg/kg-day)			Oral Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$	
	1988	2014		1988	2014
1,1-Dichloroethane	0.12	0.2		0.091	0.0057
1,1-Dichloroethene	0.009	0.05		0.6	N/A
1,1,1-Trichloroethane	0.09	2		N/A	N/A
1,2-Dichlorobenzene	0.09	0.09		N/A	N/A
1,2-Dichloroethane	N/A	0.006		0.091	0.091
Acetone	0.1	0.9		N/A	N/A
Chloroform	0.01	0.01		0.081	0.031
Methylene Chloride	0.06	0.006		0.0075	0.002
Tetrachloroethene	0.02	0.006		0.051	0.0021
trans-1,2-Dichloroethene	0.01	0.02		N/A	N/A
Toluene	0.3	0.08		N/A	N/A
Trichloroethene	N/A	0.0005		0.011	0.046
Vinyl Chloride	N/A	0.003		2.3	0.72
Xylenes	2	0.2		N/A	N/A
bis(2-Ethylhexyl)phthalate	0.02	0.02		0.0084	0.014
PAHs	0.41	0.02		11.5	7.3
Pentachlorophenol	0.03	0.005		N/A	0.4
Phenol	0.04	0.3		N/A	N/A
4,4'DDT	0.0005	0.0005		0.34	0.34
Aldrin	0.00003	0.00003		17	17
Chlordane	0.00005	0.0005		1.3	0.35
PCBs	N/A	0.00002		7.7	2
Antimony	0.0004	0.0004		N/A	N/A
Arsenic	N/A	0.0003		1.5	1.5
Barium	0.05	0.2		N/A	N/A
Cadmium (water)	0.0005	0.0005		N/A	N/A
Chromium VI	0.005	0.003		N/A	0.5
Copper	0.037	0.04		N/A	N/A
Iron	1	0.7		N/A	N/A
Lead	0.0006	N/A		N/A	N/A
Manganese (non-diet)	0.22	0.024		N/A	N/A
Mercury (inorganic)	0.0014	0.0003		N/A	N/A
Mercury (organic)	0.0014	0.0001		N/A	N/A
Nickel	0.02	0.02		N/A	N/A
Zinc	0.21	0.3		N/A	N/A

N/A = Not applicable or not available

1. Naphthalene used for RfD; benzo(a)pyrene used for slope factor. The slope factor is then adjusted for relative potency of other carcinogenic PAHs. No adjustment for relative potency was made in 1988.
2. 1988 value for slope factor used Aroclor 1260; 2014 RfD assumes Aroclor 1254.
3. Lead currently evaluated throught the use of lead exposure models for children and adults.

Table 2

Wells Used for Groundwater Vapor Intrusion Screening

Area	Well Identifier	Date of Most Recent Sampling
NEP Property	EW-1	July 2013
	EPA-1	July 2013
	NEP-101	July 2013
	NEP-104	July 2013
	NEP-108	July 2013
UniFirst Property	S71S	April 2013
	UC10S	April 2013
	UC18	April 2013
	UC25	April 2013
	UC29S	April 2013
	UC30	April 2013
	UC33	April 2013
	UC4	April 2013
	UC5	April 2013
	UC6S	April 2013
Downgradient Area	UG9	April 2013
	UG10	April 2013
	UG17	April 2013
	UG15	May 2103
	UG16	May 2013
Grace Property	G12S	May 2103
	G13S	May 2103
	G16S	May 2103
	G20S	April 2012
	G22S	April 2012
	G24S	May 2103
	G28S	May 2103
	G29S	May 2103
	G37S	April 2012
	G38S	May 2103
	G39S	May 2103
	RW7	May 2103
	RW8	May 2103
	RW9	May 2103
	RW10	May 2103
	RW11	May 2103
	RW12	May 2103
	RW13	May 2103
	RW14	May 2103
	RW15	May 2103
	RW16	May 2103
	RW17	May 2103
	RW18	May 2103
	RW19	May 2103
	RW20	May 2103
	RW21	May 2103
	RW22RE	May 2103

Table 3

Vapor Intrusion Screening Levels for Groundwater[1]

					Commercial Target Indoor Air Concentration (ILCR=1E-06)	Commercial Target Indoor Air Concentration (HQ=1)		Target Groundwater Concentration (ILCR=1E-06)	Target Groundwater Concentration (HI=1)
Chemical	Basis of Target Concentration C=Cancer Risk; N/C=Non cancer Risk	InhalationUnit Risk $(\mu g/m^3)^{-1}$		Reference Concentration $(\mu g/m^3)$	$\mu g/m^3$	$\mu g/m^3$	Dimensionless Henry's Law Constant (unitless)	µg/L	µg/L
1,1,1-Trichloroethane	NC	NA		5.0E+03	I	NA	2.2E+04	7.03E-01	NA	3.1E+04
Tetrachloroethene	C	2.6E-07	I	4.0E+01	I	4.7E+01	1.8E+02	7.24E-01	6.5E+01	2.5E+02
Trichloroethene	C	4.1E-06	I	2.0E+00	I	3.0E+00	8.8E+00	4.03E-01	7.4E+00	2.2E+01
trans-1,2-Dichloroethene	NA	NA		NA		NA	NA	1.67E-01	NA	NA
cis-1,2-Dichloroethene	NA	NA		NA		NA	NA	1.67E-01	NA	NA

					Residential Target Indoor Air Concentration (ILCR=1E-06)	Residential Target Indoor Air Concentration (HQ=1)		Target Groundwater Concentration (ILCR=1E-06)	Target Groundwater Concentration (HI=1)
Chemical	Basis of Target Concentration C=Cancer Risk; N/C=Non cancer Risk	InhalationUnit Risk $(\mu g/m^3)^{-1}$		Reference Concentration $(\mu g/m^3)$	$\mu g/m^3$	$\mu g/m^3$	Dimensionless Henry's Law Constant (unitless)	µg/L	µg/L
Tetrachloroethene	C	2.6E-07	I	4.0E+01	I	1.1E+01	4.2E+01	7.24E-01	1.5E+01	5.8E+01
Trichloroethene	C	4.1E-06	I	2.0E+00	I	4.8E-01	2.1E+00	4.03E-01	1.2E+00	5.2E+00
trans-1,2-Dichloroethene	NA	NA		NA		NA	NA	1.67E-01	NA	NA
cis-1,2-Dichloroethene	NA	NA		NA		NA	NA	1.67E-01	NA	NA

[1] Table Footnotes:

Toxicity Values used as basis of Target Indoor Air and Groundwater Concentrations are available on the Regional Screening Levels Table at http://www.epa.gov/reg3hwmd/risk/human/index.htm (May 2014)
NA - Not Available.

Toxicity Value References: I = IRIS

Henry's Law Constants from Regional Screening Levels Table (May 2014)

Screening value is based on $1x10^6$ cancer risk or HI = 1.

Residential and Commercial Target Indoor Air values are found in Regional Screening Levels table (http://www.epa.gov/reg3hwmd/risk/human/index.htm).

The equation for the target groundwater concentration (Cgw) is:

$$Cgw = \frac{Cia,target}{AFgw \times (1000\ L/m^3) \times HLC}$$

where Cia is the target indoor air concentration, AFgw is the generic attenuation factor for groundwater (default value = 0.001) and HLC is Henry's Law Constant.

The lower of the target groundwater concentration based on an ILCR of 1E-06 or a HQ=1 is selected as the groundwater Vapor Intrusion Screening Level (VISL).