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

Prepared by

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Date

TABLE OF CONTENTS

TABLES

APPENDICES

LIST OF ABBREVIATIONS & ACRONYMS

AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
AS	Air-Sparging
As	Arsenic
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cPAH	Carcinogenic Polycyclic Aromatic Hydrocarbon
EPA	United States Environmental Protection Agency
FDDA	Former Drum Disposal Area
ESD	Explanation of Significant Differences
FS	Feasibility Study
FYR	Five-Year Review
GAC	Granular Activated Carbon
GWETS	Groundwater Extraction and Treatment System
HA	Health Advisory
ICs	Institutional Controls
ISCO	In-Situ Chemical Oxidation
MassDEP	Massachusetts Department of Environmental Protection
MCL	Maximum Contaminant Level
mg/kg	milligram per kilogram
Mn	Manganese
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEP	New England Plastics
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PFAS	Per- and Polyfluoroalkyl Substance
PFBS	Perfluorobutane Sulfonate
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SD	Settling Defendant
SVE	Soil Vapor Extraction
SVET	Soil Vapor Extraction and Treatment
TBC	To be considered
TCE	Trichloroethene
UU/UE	Unlimited Use/Unrestricted Exposure
µg/L	microgram per Liter
VI	Vapor Intrusion
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound

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 is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. 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) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fifth FYR for the Wells G&H Superfund Site. The triggering action for this statutory review is the completion date of the previous FYR in September 2014 (EPA, 2014a). The FYR has been prepared because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of three Operable Units (OUs); one OU (OU1) will be addressed in this FYR report. OU1 addresses the five Source Area Properties. The two OUs that are not addressed in this FYR are OU2 (the Central Area), which does not yet have a Record of Decision (ROD) for remedial action, and OU4 (the Southwest Properties; SWP)[1]. A ROD was signed in September 2017 for OU4 (EPA, 2017); negotiations are on-going with the Responsible Parties. Because remedy implementation has not yet begun for OU4, it is not addressed in this FYR. OU3 (the Aberjona River Study) was merged with OU2 of the Industri-Plex Superfund Site in 2002. Further evaluation of OU3, including FYRs, are conducted as part of the Industri-Plex Superfund Site reviews.

The Wells G&H Superfund Site FYR was led by Joseph P. LeMay, P.E., Remedial Project Manager (RPM) for EPA Region 1. Other participants from EPA Region 1 included EPA staff in the roles of hydrologist, risk assessor, attorney, etc. Jennifer McWeeney (Environmental Analyst III) with the Massachusetts Department of Environmental Protection (MassDEP) also participated in this review. The Settling Defendants (SDs) were notified of the initiation of the FYR. The review began on 12/26/2018.

Site Background

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, located adjacent to the Aberjona River (see Figure 1). OU1 consists of the W.R. Grace Property (Grace Property), UniFirst Property, New England Plastics Property (NEP Property), Wildwood Property, and Olympia Nominee Trust Property (Olympia Property) (see Figure 2). The Site is in a highly-developed and populated area which consists of a mix of light industry, commercial businesses, office and industrial parks, residences, and recreational properties. The Aberjona River with its associated wetlands runs through the central portion of the Site.

On May 4, 1979, 184 55-gallon drums containing polyurethane and toluene di-isocyanate were found on a vacant lot located on Mishawum Road, Woburn. This incident prompted the Massachusetts Department of Quality Engineering (DEQE), now known as MassDEP, to sample the nearest downgradient water supply (i.e., Wells G and H). Several chlorinated volatile organic compounds (VOCs) were detected, including tetrachloroethene (PCE) and trichloroethene (TCE), prompting the City of Woburn to shut

[1] The SWP were initially part of OU2, but were separated from OU2 and designated OU4 in 2017.

down the wells on May 21,1979. Subsequent hydrogeologic investigations and groundwater quality evaluations identified the general source areas for the chlorinated VOCs to be within a one square-mile area surrounding the wells. A more thorough discussion of the Site and its history can be found in the 2014 FYR Report (EPA, 2014a).

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		
Author name (Federal or State Project Manager): Joseph F. LeMay, P.E.		
Author affiliation: EPA Region 1		
Review period: 12/26/2018 - 6/30/2019		
Date of site inspection: 2/18&19/2019		
Type of review: Statutory		
Review number: 5		
Triggering action date: 9/30/2014		
Due date *(five years after triggering action date)*: 9/30/2019		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The Supplemental Remedial Investigation (RI), completed by EPA in 1988, identified contaminated soil, sludge, and/or groundwater at five properties within approximately one mile of former municipal Wells G and H (Grace, UniFirst, NEP, Wildwood, and Olympia Properties) as the sources of contamination at the Site. Contamination at the Olympia Property is confined to the Former Drum Disposal Area (FDDA) (Figure 2). Primary contaminants included VOCs, lead, pesticides, polychlorinated biphenyls (PCBs), and carcinogenic polycyclic aromatic hydrocarbons (cPAHs).

Based on the results of sampling conducted as part of the RI, ingestion of groundwater and direct contact with soil/sludge represented the most-significant risks to human health. Chlorinated VOCs were detected

in groundwater at concentrations above levels considered to be protective. Concentrations of pesticides, PCBs, lead, and cPAHs in soil/sludge were present at levels that would endanger public health, if ingested or dermally contacted in a future residential setting.

Response Actions

Analytical data collected by DEQE from former municipal Wells G and H in May 1979 indicated total concentrations of chlorinated VOCs ranging up to 400 micrograms per liter (µg/L). The municipal wells were shut down later that same month. The Site was listed on the National Priority List (NPL) in December 1982.

In May 1983, three administrative orders pursuant to Section 3013 of the Resource Conservation and Recovery Act (RCRA) were issued to W.R. Grace and Co., Inc. Cryovac Division, UniFirst Corporation, and Beatrice Foods, Inc. (Beatrice). These orders required sampling, analysis, monitoring, and reporting that would address the problem of possible groundwater contamination on or emanating from their properties.

The Feasibility Study (FS) was completed in January 1989 (Ebasco, 1989), and in September 1989, EPA issued a ROD for OU1 of the Site. The Remedial Action Objectives (RAOs) identified in the OU1 ROD were:

Groundwater

- 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 cleanup levels.

Soil

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

The approach was to first address contamination at the Source Areas (OU1) to reduce infiltration from source soil/sludge and prevent migration of contamination toward the Central Area aquifer (OU2).

The selected remedy for OU1 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 the Wildwood Property in a manner to be determined during the design phase of the cleanup; and
- Extraction and treatment of contaminated groundwater (bedrock and/or overburden) separately at the five Source Area Properties using pre-treatment for metals and an air stripper to remove VOCs, or an equally or more effective technology approved by EPA.

EPA's April 1991 Explanation of Significant Differences (ESD) described three significant changes and one non-significant change from the remedial action to be undertaken at OU1 as set forth in the ROD. Those changes were as follows:

- On-site incineration of soils at Wildwood, NEP, and Olympia Properties was changed to off-site incineration;
- In-situ volatilization would be used on the UniFirst Property, rather than incineration;
- Groundwater extraction systems could be combined for UniFirst and Grace Properties; and
- A typographical error was corrected resulting in more stringent target cleanup levels for groundwater.

Tables 1a through 1c included in Appendix B present the ROD cleanup levels for leaching of soil contaminants to groundwater, for direct contact with soil, and for groundwater used as drinking water, respectively.

A Consent Decree (CD) was signed by EPA and four of the five SDs in 1991 (Olympia did not sign the CD). The four SDs then began work on their respective areas of the Site. As required by the CD, a group of Potentially Responsible Parties (PRPs) agreed to conduct the RI/FS for OU2, which at the time included the SWP (now OU4). In March 2003, the Olympia SDs entered into an Administrative Order on Consent (AOC) with EPA to conduct removal of contaminated surface soil and PCB material from the FDDA. The Olympia SDs entered into a second AOC in 2004 for the removal of TCE-impacted soils within the FDDA.

Status of Implementation

With the exception of the lack of groundwater pump and treat systems at the Olympia and NEP Properties, all components of the OU1 remedy response actions have been implemented. Minor modifications have been made, where necessary, to optimize the remedial systems as a result of ongoing performance monitoring. The 2014 FYR contains a thorough discussion of implementation activities conducted at the Site. This section briefly describes historic remedy implementation activities for each of the Source Area Properties, but focuses primarily on recent activities occurring at the Site.

Grace Property

In September 1992, Grace began operation of its long-term groundwater cleanup system. In 2002, Grace replaced their existing system with granular activated carbon (GAC) filtration units to address decreased contaminant concentrations. Groundwater sampling continues to be performed at the Grace Property to assess the progress of the remedial actions in achieving cleanup levels.

In 2006, demolition work was performed at the Grace Property in anticipation of potential redevelopment. In 2010, additional work was performed at the Grace Property to enhance groundwater treatment system performance and capture. Additional soil investigation work was performed in 2011, resulting in the excavation of approximately 900 tons of soil exceeding cleanup levels in 2012. To address concerns related to capture and off-property migration, Grace completed additional monitoring well installation and sampling in 2013 and 2014. Between 2014 and the present, the Grace Property has undergone redevelopment into the Woburn Landing commercial space that consists of several restaurants, a hotel, and associated infrastructure, parking and landscaping. Construction has occurred in consultation with EPA, including a 2014 "*Comfort Letter*" providing recommendations for redevelopment consistent with

the ongoing remedy, 2015 "*Final Soil and Groundwater Management Plan*", and has included environmental oversight and monitoring throughout various phases of construction. To date, the redevelopment has resulted in the excavation and off-site disposal of approximately 2,100 cubic yards of soil while maintaining an active recovery well system, groundwater treatment system, and monitoring well network. In addition, vapor mitigation systems have been installed in association with the various occupied structures. Performance of the vapor mitigation systems has been/will be tested and the systems will be subject to ongoing monitoring and optimization.

During the first nine months of this FYR period, Grace operated 16 recovery wells (RW-7 through RW-22RE) in Areas 2, 3, and 4. Recovery well locations are shown on Figure 3. On January 5, 2015, Grace submitted a plan to shut down the six recovery wells in Area 2 (i.e., RW-7 through RW-12 along the western property boundary) and seven of the nine recovery wells (i.e., RW-13 through RW-16, RW-18, RW-19, and RW-21) located in Area 3 along the southern property boundary (TetraTech, 2015a). On May 6, 2015, EPA conditionally approved the 3-year Shutdown Plan which included water level and water quality monitoring to assess potential rebound in contaminant concentrations above cleanup levels, to confirm that operation of the three remaining recovery wells (i.e., RW17, RW20 and RW22RE) provided adequate capture, and confirm that VOC concentrations above cleanup levels did not migrate off-property. The Shutdown Plan, which was completed in May 2018, demonstrated that significant rebound did not occur and that RW17, RW20 and RW22RE were effective in preventing off-property migration of VOCs associated with the historical release(s) on the Grace Property.

UniFirst Property

UniFirst began operation of its long-term groundwater cleanup system in September 1992. In 2003, UniFirst replaced their existing system with GAC filtration units to address decreased contaminant concentrations. Groundwater sampling continues to be performed at the UniFirst Property to assess the progress of the remedial actions in achieving cleanup levels.

Based on the conclusions of EPA's vapor intrusion (VI) risk assessment report (EPA, 2012a) conducted for OU1, monitoring of the VI pathway at the commercial building west/downgradient of the UniFirst Property continues to be performed on an annual basis. In addition, to achieve ROD soil cleanup levels and to address VI concerns at the UniFirst Property identified in the 2012 VI risk assessment, UniFirst installed a Soil Vapor Extraction and Treatment (SVET) System which began operating on November 11, 2014. In addition, to address EPA concerns regarding groundwater capture, UniFirst installed a new overburden extraction well (EX-1), three piezometer clusters, and performed hydraulic testing in 2014. The overburden extraction well was connected to the UniFirst treatment system and began extracting groundwater in May 2016 (UniFirst, 2017).

Wildwood Property

By September 1992, source control activities began at the Wildwood Property. The remediation of sludge, debris, and mixed-contaminated soil was complete in 1994, and the soil and groundwater remediation system startup occurred in 1998. In 2000, Wildwood replaced their existing system with GAC filtration units to address decreased contaminant concentrations. Groundwater sampling continues to be performed at the Wildwood Property to assess the progress of the remedial actions in achieving cleanup levels.

The Wildwood air sparging (AS) system was expanded in 2014 and additional monitoring wells on its eastern and southern boundaries were installed to further assess groundwater capture concerns. Between December 2015 and February 2017, a subsurface investigation was undertaken at the property which included the advancement of direct push points with vertical profiling of VOCs, analysis of chlorinated VOCs in groundwater grab samples from 30 locations, and the installation and sampling of 19 overburden

monitoring wells for VOCs (AECOM, 2016a, 2016b, and 2017a). The purpose of this investigation was to generate data to assess the effectiveness of the AS/SVE remedy and identify areas that require further treatment to achieve ROD cleanup levels in overburden. EPA is working with Wildwood to optimize the performance of the AS/SVE system and groundwater pump and treat system as well as to pilot test remedial enhancements to the existing groundwater remedy.

NEP Property

In 1998, the NEP source control remedy (AS/SVE) was initiated. The NEP soil remediation system was discontinued in 2000 after reaching soil cleanup levels in unsaturated soils. Groundwater sampling continues to be performed at the NEP Property to assess the progress of the remedial actions in achieving cleanup levels.

Olympia Property

Following the removal of contaminated soil from the FDDA at the Olympia Property in 2003, treatment of TCE in soil and groundwater by In-Situ Chemical Oxidation (ISCO) via injection of sodium permanganate was initiated in 2005. Groundwater monitoring at the FDDA commenced following the initiation of TCE treatment. Routine injection of permanganate solution is performed via trenches, injection wells and/or direct-push equipment guided by monitoring data collected to assess the progress of ISCO in reducing TCE and other chlorinated VOCs.

Systems Operations/Operation & Maintenance

Descriptions of Operation & Maintenance (O&M) activities conducted since the last FYR are provided below for UniFirst, Grace, Wildwood and Olympia Properties. NEP has provided the results of on-going groundwater monitoring activities and a deep bedrock investigation; however, no O&M activities have occurred at the NEP Property since the shutdown of their AS/SVE system in 2000.

Grace Property

Extracted groundwater is treated using a particulate filter and two 1000-pound GAC units. Treated water is discharged to Snyder Creek located along the eastern boundary of the property (Figure 3). Influent and effluent concentrations are monitored to assess the need for GAC change-out and to verify compliance with discharge criteria. System O&M activities involving the groundwater extraction and treatment system (GWETS) are performed by Groundwater & Environmental Services (GES) of Westford, Massachusetts. In 2018, Grace transferred groundwater sampling responsibilities from TetraTech to GES.

During the past five years, the system has operated with limited downtime. Downtime was generally a result of power outages, carbon change-outs, system alarms conditions, compressor repairs or maintenance activities. On August 4, 2016, the outer containment pipe for recovery well RW-22RE was damaged during site redevelopment. As a result, RW-22RE was shut down for 4 days while being repaired. Maintenance activities are summarized in Monthly Progress Reports prepared by W.R. Grace's contractor, de maximis, inc., during the period of October 2014 to January 2019 and Annual Reports submitted since the last FYR (Tetra Tech and JG Environmental, Inc., 2015, 2016, and 2017; GES and JG Environmental, Inc., 2018).

UniFirst Property

Soil vapor is extracted by the SVET system using an 8.5 horsepower blower from six SVE wells (SVE-2A, -3A, and -4A within the building footprint and SVE-1, -5, and -6 outside the building footprint)

installed in areas where VOCs in soil were elevated above cleanup levels (Figure 4). Four 55-gallon GAC drums provide treatment of extracted VOCs prior to emission. The SVET system is equipped with an air/water knockout tank, particulate filter, and programmable logic control (PLC).

O&M activities for the SVET system involves routine system monitoring of vacuum at SVE wells and monitoring points (refer to Figure 4), pressure, temperature and soil vapor flow rate measurements, and monthly VOC screening readings using a PID (The Johnson Company, 2015). Sampling of treatment system influent and discharge following the third and the fourth GAC drums prior to emission takes place bimonthly with samples analyzed for target VOCs. Water levels are monitored on a monthly basis in select SVE wells and soil vapor monitoring locations. Routine maintenance conducted during the past five years included change outs of spent GAC units, replacing the particulate filter, and replacing a particulate filter element and site tube on the air/water knock-out tank. No modifications have been made to the SVET system during this FYR period.

During the past five years, the SVET system has reportedly operated greater than 98-percent of the time (UniFirst, 2015, 2016, 2017 and 2018). The treatment system has removed 94-percent or more of VOCs present in the influent during this FYR period.

Groundwater is extracted by UC22 and EX1, shown on Figure 5, and is treated by the GWETS using a filter to remove particulates and three 1,000-pound GAC units to remove VOCs. Treated groundwater is discharged to an on-site sewer. Bimonthly 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, annual inspection of the entire treatment system including tanks, valves, piping, filters, and maintenance (UniFirst, 2018).

During this FYR period, the GWETS has operated with limited downtime as the system was reportedly online between 98 and 99-percent of the time (UniFirst, 2015, 2016, 2017 and 2018). System downtime was a result of power outages, flow meter replacement and maintenance port installation in EX-1, transducer malfunction in UC-22, or reseating a hose on a GAC unit. These activities are described in the Annual Reports (UniFirst, 2015, 2016, 2017 and 2018). Monthly O&M activities are described in monthly operations/progress reports (UniFirst, 2014a, 2015a, 2016a, 2017a,2018a, and 2019a).

The following system modifications were reported during the FYR period: (1) replacement of the original Campbell Data Logger with a new PLC-based system that utilizes new transducers for water level sensing; (2) addition of recovery well EX1 to the existing PLC-based system in May 2016, and; (3) programming upgrades made in 2017 and 2018.

Wildwood Property

The Wildwood Property AS/SVE and bedrock GWETS continued to operate during this FYR period with minimal downtime. Causes of system downtime include, but are not necessarily limited to the following conditions: power outages, non-routine maintenance activities, activation of shutoff switches for the treatment, and weather-related issues (e.g., frozen discharge lines). Routine and non-routine maintenance activities were performed throughout the FYR period and are documented in monthly progress reports submitted to EPA during this FYR period (AECOM, 2016c, 2017b, 2018a and 2019).

Monthly process monitoring activities include pressure readings and influent/effluent sampling of the GWETS, flow and pressure readings of the AS system, and vacuum and flow readings, influent and effluent air sampling, and ambient air PID readings for the SVE system.

In August 17, 2018, EPA granted approval to suspend vapor-phase GAC treatment for the SVE system and the exhaust from the air stripping unit for the groundwater treatment system. EPA's approval was based upon modeling which indicated that concentrations currently present in the SVE system and exhaust from the air stripper (without vapor phase treatment) would not result in exceedances of MassDEP Health Benchmarks for air. Any future modifications to the AS/SVE system and/or the GWETS that could increase VOC concentrations above concentrations used in the model would require GAC treatment to be reinstated.

In November 2017, the SD proposed modifications to the groundwater sampling program including reducing the sampling frequency from quarterly to annually, with a subset of 13 wells to be sampled semi-annually, and changing the set of monitoring wells (total of 41 wells)[2] to be sampled (AECOM, 2017c). In an April 23, 2018 email, EPA requested 26 additional wells be sampled semi-annually and/or annually. Included in the sampling program to provide data to assist with remedial optimization decisions. This modified sampling program was initiated in April 2018. Pending review of these data, EPA will work with the SD to refine the long-term monitoring program for the Wildwood Property. In addition to these 63 wells, samples have been collected from 17 other well locations during various monitoring events over the last five years. Exhibit 1, included in Appendix B, summarizes wells sampled during this FYR period.

Olympia Property

The PRP for Olympia Property is treating TCE-contaminated soil using ISCO via subsurface permanganate delivery[3] inside an approximately 180 feet long by 100 feet wide sheet pile enclosure in the FDDA. Since Fall 2008, the monitoring and delivery approach for the FDDA includes approximately 3-month cycles where permanganate delivery generally occurs from October–December and April–June, while monitoring/evaluation occurs from January-March and July-September. Occasionally, injections are performed at other times based on a review of monitoring data. Groundwater monitoring data is used to guide where remedial injections occur. This approach is consistent with the revised work plan dated October 2004. During the current FYR period, focused injections of sodium permanganate were performed in November 2014, July 2015, November 2015, July 2016, December 2016, April 2017, August 2017, November 2017, and November 2018 to address rebound and lingering concentrations of VOCs exceeding ROD cleanup levels.

The effectiveness of the cleanup within the FDDA is evaluated by monitoring groundwater for the distribution of oxidant and reduction of VOC concentrations after injection. Groundwater samples are collected from monitoring wells and by direct, depth-discrete groundwater sampling using a Geoprobe®. The sampling program includes groundwater samples collected from various locations and depths (depending upon where sodium permanganate is injected) that are representative of the different stratigraphic units within the FDDA. Vertical contaminant profiling using a Membrane Interface Probe (MIP) was also performed in June 2018 at five locations located within and adjacent to the treatment cell as shown on Figure 8. According to GeoInsight, the data were used to focus permanganate injections during November 2018 (GeoInsight, 2019).

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last FYR as well as the recommendations from the last FYR and the current status of those recommendations.

[2] Four new wells were proposed but have not yet been installed.
[3] Depending upon the event and target delivery depth, permanganate delivery to the subsurface occur via injection wells, direct-push injection and/or gravity infiltration through trenches on the land surface (subsurface delivery).

Table 1: Protectiveness Determinations/Statements from the 2014 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Short-term Protective	The remedy at the Source Area (OU1) 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 OU1 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 and soil 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 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.

Table 2: Status of Recommendations from the 2014 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
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.	Ongoing	Between 2015 and 2017, the SD implemented investigations to identify areas of impact not being effectively targeted by the existing AS/SVE System (AECOM, 2016b). In addition, EPA assessed the distribution of VOCs above cleanup levels not captured by the existing groundwater recovery system and clarified its position on the path forward for the Wildwood Property (EPA, 2018a). Work plans were submitted by the SD in October 2018 to perform additional pre-design investigations to expand the AS system in the northern portion of the property (AECOM, 2018b), to refine the extent of soil impact in the southern portion of the property (AECOM, 2018c), and to perform surface geophysics to assist in locating additional bedrock recovery wells (AECOM, 2018d). Work Plans are pending EPA approval.[4]	NA
1	No groundwater pump and treatment system implemented at NEP Property following AS/SVE shutdown.	Assess groundwater conditions on NEP Property since AS/SVE shutdown and evaluate the need for further groundwater treatment.	Ongoing	Based upon the most recent monitoring data (Woodard & Curran, 2017a & 2017b), PCE was detected above cleanup levels in one overburden well and four bedrock monitoring wells (including 3 deep bedrock wells). Additional sampling of other deep bedrock wells on the property (e.g., NEP 1 and 2) will need to be conducted to further assess contamination above the cleanup levels, bedrock conditions, and groundwater treatment in accordance with the previously approved 2016 NEP Work Plan. Additional sampling will occur during the upcoming OU-2 investigation.[5]	NA

[4] This on-going recommendation has been incorporated in Section VI Issues/Recommendation (page 32) under issue "Extraction systems performance (insufficient capture of groundwater contamination) at Wildwood Property.".
[5] This on-going recommendation has been incorporated in Section VI Issues/Recommendation (page 32) under issue, "No groundwater pump and treatment system implemented at NEP Property following AS/SVE shutdown.".

Table 2: Status of Recommendations from the 2014 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
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.	Completed	NEP implemented geophysical logging, transmissivity testing, and sampling at three deep bedrock wells (NEP A, NEP B and NEP-3). Based upon results of the testing (Woodward & Curran, 2017b), PCE and TCE were detected above cleanup levels in discrete fractures in deeper bedrock at all three wells. Additional deeper bedrock data collection will be conducted, as described above (see second Issue in Table 2).	4/20/2017
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, evaluate the need for further groundwater treatment, and consider other treatment enhancements/optimizations as appropriate.	Completed	EPA identified several monitoring wells south of the treatment system with concentrations of TCE above cleanup levels based upon data collected during the past five years (EPA, 2018a). Because this issue is related to insufficient capture, follow-up work proposed in the SD's 2018 Work Plan under EPA review will help address this issue, as described above (see first Issue in Table 2).	7/14/2018
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.	Ongoing	Additional injections of sodium permanganate are performed periodically (most recently in November 2018) to address lingering elevated concentrations of chlorinated VOCs and will continue until cleanup goals for groundwater are attained. EPA will continue to evaluate the progress of ISCO in achieving ROD groundwater and soil cleanup levels based upon post-injection monitoring data and will continue to work with the SD to identify optimization approaches to improve delivery and distribution of oxidant and to more efficiently achieved cleanup goals.[6]	NA

[6] This on-going recommendation has been incorporated in Section VI Issues/Recommendation (page 33) under issue, "No groundwater pump and treatment remedy implemented at Olympia Property."

Table 2: Status of Recommendations from the 2014 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
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.	Completed	Intrusive work at the Grace, UniFirst and Olympia Properties has been performed under property-specific Health & Safety Plans. There are no plans for further intrusive work at this time. This practice of using Health & Safety Plans will continue for intrusive projects, should one be planned at any of the five Source Area Properties in the future.	8/11/2018

Table 2: Status of Recommendations from the 2014 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
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.	Ongoing	Limited sampling was completed for arsenic (As) and manganese (Mn) by NEP in 2005, Olympia between 2005 and 2008, Grace in 2015, and Wildwood in 2017. No metals data has been collected at UniFirst. Some of these limited data exceeded the As MCL or Mn Lifetime Health Advisory (HA). As part of the OU2 investigation, comprehensive sampling for metals, including As and Mn, will be performed in wells from all Source Area Properties.[7]	NA

[7] This on-going recommendation has been incorporated in Section VI Issues/Recommendation (page 33) under issue, "Limited current and historic data for As, Mn, 1,4-dioxane, and PFAS. Detection limits for 1,4-dioxane samples elevated above risk screening levels. These contaminants were not identified as COCs in the ROD but may need to be identified as of possible concern. Where appropriate, revise cleanup goals through a remedy decision document."

Table 2: Status of Recommendations from the 2014 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
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 redevelopment 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 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.	Completed	As part of the Grace Property redevelopment, engineered vapor intrusion mitigation measures have been designed and installed at newly constructed buildings. The Wildwood and Olympia Properties are not proposed for development at this time, and considering the restrictions associated with wetlands and access, it is unlikely that these properties will be developed.	3/1/2019

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

EPA Region 1 issued a press release on 2/21/2019, indicating that it would be reviewing cleanups and remedies at 14 Superfund Sites in Massachusetts, including the Wells G&H Superfund Site (https://www.epa.gov/newsreleases/epa-begins-14-reviews-massachusetts-superfund-site-cleanups-year). In addition to this announcement, an article announcing the commencement of this FYR appeared in the *Daily Times Chronicle* on 2/25/2019. The purpose of the public notices were to inform the community that EPA would be conducting a FYR to ensure that the remedy implemented at the Site remains protective of public health and the environment and is functioning as designed. The results of the review and the report will be made available at the Site information repository (Woburn Public Library located at 45 Pleasant Street, Woburn, MA, and EPA Region 1 – New England's Records Center, 5 Post Office Sq., First Floor, Boston, MA) and on EPA's website at www.epa.gov/superfund/wellsgh.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. Interviews were performed between March 19 and April 8 with officials from Woburn, Massachusetts, community stakeholders, MassDEP, and the PRP site coordinators. The individuals interviewed, their affiliation, date of interviews, and interview types (i.e., in person, telephone, by email) are summarized in Table 3. Results of these interviews are summarized below.

Table 3: Summary of Interviewees, Affiliations and Interview Dates

Interviewee	Affiliation	Interview Date	Interview Type
Clayton Smith	Project Coordinator - de maximis, inc. – Grace Contractor	March 21, 2019	Email
Timothy Cosgrave	Director Environmental Health and Safety – UniFirst Corporation	March 27, 2019	Email
Jeff Hamel, LSP, LEP	Woodard & Curran – New England Plastics Contractor	March 27, 2019	Email
Peter Cox, PG	AECOM – Contractor for Beatrice Foods (Wildwood)	March 27, 2019	Email
Christene A. Binger	GeoInsight – Olympia Contractor	April 1, 2019	Email
Michael L. Raymond	Co-chairman, Aberjona Study Coalition, Inc.	March 19, 2019	Email
Linda A. Raymond	Co-Chairman, Aberjona Study Coalition, Inc.	March 19, 2019	Email
Jennifer McWeeney	Massachusetts Department of Environmental Protection	March 21, 2019	Email
Paul Medeiros	Woburn Resident	March 27, 2019	Email
City Official	City of Woburn	March 26, 2019	Phone
Health Agent	City of Woburn	April 8, 2019	Phone

PRP Representatives / Consultants

The PRPs or their representatives reported that remedial systems (where active) are functioning as required by the ROD and ESD, and that positive progress is being made toward achieving cleanup levels. Peter Cox (Wildwood) acknowledged that optimization efforts are required at Wildwood to improve the removal of VOCs from groundwater, but anticipates that residual VOCs will persist in bedrock above cleanup levels following remedial completion with optimizations.

Representatives of Grace and NEP noted concentrations of VOCs in groundwater have significantly decreased at these properties since the remedy was implemented and that concentrations have been reduced below cleanup levels at many of the monitoring wells. Clayton Smith (Grace) stated that it was Grace's opinion that, based upon existing data, a transition to Monitored Natural Attenuation should be considered. Christene Binger (Olympia) also indicated that significant reductions in VOCs had occurred at the Olympia property, but that some wells completed in silt required a change in the method of oxidant delivery (i.e., direct push) and will take longer to treat. Representatives of UniFirst and Wildwood indicated that while concentrations have decreased (in some cases below cleanup levels) in some wells, VOCs persist above cleanup levels in overburden and bedrock wells in certain portions of these sites.

Other than challenges of operating aging systems and finding spare parts, no significant O&M difficulties within the last five years were identified by the PRPs or their representatives. Representatives of Grace, UniFirst and Wildwood noted several changes to optimize the remedial systems on these properties

including changes in O&M and sampling schedules. Clayton Smith (Grace) mentioned that although optimization of O&M and sampling efforts have occurred, these adjustments have not resulted in a meaningful cost savings.

Except for the addition of EX-1 to UniFirst groundwater extraction system, PRPs or their representatives indicated that no significant changes in overall pumping rates had occurred in the last five years. As per design, the UniFirst pumping well (UC22) helps contain contaminants in the deep aquifer for Grace and captures some contamination from beyond the Unifirst property boundary. One PRP (Grace) reported the potential impact from an off-site contaminant source. Clayton Smith (Grace) stated that PCE continues to be drawn onto the southern portion of the Grace property from an off-site source and was supportive of work completed as part of the Central Area (OU2) investigation to identify the source of the PCE. Jeff Hamel (NEP) noted that toluene and methyl tert-butyl ether (MTBE) are periodically detected in upgradient and cross gradient wells, which Mr. Hamel maintains are not related the release at NEP. Mr. Hamel expressed uncertainty concerning possible upgradient sources of impact to deeper bedrock groundwater in the NEP property or suggested steps that could be taken to address such impacts. The PRPs or their representatives indicated that the mix of contaminants detected in groundwater or soil vapor, where applicable, have remained consistent.

With the exception of Grace, PRPs or their representatives reported there were no changes in ownership or land use for the Source Area Properties within the last five years and no institutional controls have been implemented at the OU1 properties. Clayton Smith indicated that the Grace Property was sold to a local developer in 2014 and that redevelopment of the property with restaurants and a hotel is expected to be complete by the summer of 2019. Vapor barriers have been incorporated beneath all new buildings to prevent potential vapor intrusion.

No land use changes are anticipated by the PRPs or their representatives to occur in the foreseeable future. With the exception of NEP, industrial processes are not being conducted at the OU1 properties and the PRP's representatives are unaware of any changes in chemical use at the properties.

The PRPs or their representatives identified one or more of the following measures were used to prevent unauthorized access to contaminated areas:

- Buildings that house treatment systems are locked and equipped with security systems (Grace, UniFirst, and Wildwood); and
- Fencing and/or gates (UniFirst, Wildwood, NEP and Olympia).

No health and safety issues were identified on-site by the PRPs or their representatives and no incidence of trespassing or vandalism was identified. No unexpected events that could damage remedial components (i.e., fires, floods, etc.) have occurred. In addition, no reports of complaints were reported by the PRPs or their representatives.

With the exception of the representative for Olympia, persons interviewed were aware of the OU4 ROD signed in 2017 and indicated that the PRPs are participating in the on-going OU2 Remedial Investigation/Feasibility Study (RI/FS) process.

Concerns raised by two of the parties related to oversight costs and responsiveness of EPA regarding work plan review and approval. Tim Cosgrave stated that each of the parties has encouraged EPA to undertake its own evaluation of measures it may implement to reduce unnecessary oversight costs. Peter Cox indicated that improved agency turnaround time of various work plans would also reduce project costs.

State and Local Government Officials and Community

The overall opinion expressed by the state/local officials and community representatives/members interviewed is that the Site is being properly managed by EPA and that positive progress is being made, although one community member (Mr. Paul Medeiros) felt that there may not be enough oversight provided by EPA and MassDEP. The MassDEP official and the Woburn Health Agent expressed concern about the pace of the cleanup activities at the Site, noting that OU1 groundwater pumping has been ongoing for a long time.

Those interviewed voiced that the community feels that groundwater from the Site should not be used as a source of potable water, although a representative from the Aberjona Study Coalition indicated that this stigma appears to be lessening with time. The MassDEP representative noted that they are not aware of any plans to use the groundwater and the Woburn Health Agent expressed that the cleanup needed to be completed before there were any discussions concerning groundwater use.

Concerns were expressed relative to redevelopment both at the Site (e.g., the Grace Property) and upstream of the Site (e.g., Industri-Plex and Olin Chemical sites), and the impact of redevelopment on traffic, runoff, contaminant redistribution, and on the watershed overall. The MassDEP official felt cleanup activities to decrease indoor air impacts downgradient of the UniFirst and Grace Properties and the Grace redevelopment project were having a positive impact on the community. The Woburn Health Agent expressed that because EPA had investigated and cleaned up portions of the Wells G&H wetland area, this area could be safely used as walking trails. The City official interviewed also voiced that the newly-completed walking trails have a positive impact on the community.

The Woburn Health Agent indicated that he has not received any complaints or concerns from the community related to the Site over the past five years. He does receive a few calls each year from individuals outside the Woburn area asking questions about the Site.

The state and local government officials felt that they were well informed and had good access to information on the project. The Woburn Health Agent commented that he accesses the EPA webpage for the Site to get current information. However, community representatives felt that more information should be made available to the public and that updates should occur more frequently. Mr. Medeiros noted that questions concerning whether adequate oversight is occurring by EPA and MassDEP are related to the lack of information being transmitted to the community. Mr. Medeiros specifically mentioned that he would like information publicized concerning the result of periodic testing in the neighborhood downgradient of the Grace and UniFirst Properties and EPA oversight activities that occurred as part of the Grace redevelopment project.

All state and local government and community representatives interviewed were aware of the continuing investigation of OU2 and the progress on OU4 of the Site, with a ROD signed for this OU in September 2017. Community member provided additional thoughts related to these two OUs. These community comments have not been summarized at part of this OU1 FYR. However, the comments will be reviewed and considered by EPA as progress continues at the Site.

Data Review

Groundwater monitoring has been performed for a number of years at each of the Source Area Properties on a property-specific schedule. Table 2 in Appendix B provides a summary of current maximum detections of contaminants in excess of ROD cleanup levels by Source Area Property, compared to maximum detected concentrations presented in the 2014 FYR. The discussion below provides further

detail and summarizes the results of groundwater monitoring, as well as monitoring of the SVET at UniFirst, by Source Area Property during this FYR period.

Grace Property

Grace Property well locations are shown in Figure 3. As previously discussed, Grace shut down 13 of the 16 existing recovery wells in 2015 and implemented an EPA-approved post-shutdown monitoring program (EPA, 2015). The shutdown monitoring program involved measuring water levels at between 109 and 115 on- and off-property wells and sampling up to 51 on-property monitoring and recovery wells (depending upon the monitoring event) for chlorinated VOCs. In addition, seven monitoring wells (i.e., G8S, G9S, G17S, G21S, G21D, G28S, and G28D) were sampled prior to abandonment in 2015 to accommodate the ongoing redevelopment of the property with approval from EPA (EPA, 2014b).

On-property monitoring and recovery wells in which contaminant concentrations in excess of ROD cleanup levels have been detected over this FYR period include monitoring wells G1DB3, G13D, G16S, G16D, G19M, G19D, G24S, G24D, G26S, G28D, G36DBR, G37S, G37D, G38S, G38D, and G40D and recovery wells RW-10, RW-17, RW-19, RW-20, RW-21, and RW-22RE. During the most recent monitoring event completed (May 2018), contaminant concentrations had decreased below ROD cleanup levels in ten of these wells (i.e., G16D, G19D, G26S, G36DBR, G37S, G38S, G38D, RW-10, RW-20 and RW-21). Six monitoring wells (G1DB, G20S, G20M, G20D, G23D, and G36DB2) and three recovery wells (RW-14, RW-15, and RW-18) that were at or above cleanup levels during the 2014 FYR period did not exceed ROD cleanup levels during this FYR period.

During this FYR period, TCE was detected in 17 on-property monitoring and recovery wells (i.e., G13D, G16S, G16D, G19M, G19D, G24S, G24D, G26S, G28D, G36DBR, G37S, G37D, G40D, RW-17, RW-19, RW-21, and RW-22RE) at concentrations above its cleanup level. Maximum concentrations of TCE were consistently detected at monitoring well G16S and ranged from 63 µg/L (June 2017) to 140 µg/L (December 2016), with the most recent concentration detected at 91 µg/L (May 2018). The most recent concentrations of TCE at G16D, G19D, G26S, G37S, G36DBR, RW-17 and RW-21 (May 2018) are below the ROD cleanup level (see Exhibit 2 in Appendix B.[8]) TCE concentrations in G19M, G24D, and G37D appear to be decreasing while TCE in wells G24S, G40D, and RW-22RE do not appear to indicate a trend. TCE at RW-19 appears to be increasing (refer to Exhibit 3 in Appendix B). TCE in this well, as well as in wells G19M, G19D, G24S, G24D, G37D, and G40D, appears to be captured by one of the three recovery wells that remain active. Concentrations at G13D and G16S are not increasing and are currently confined on the property.

PCE was detected above its cleanup level in two on-property monitoring wells during this FYR period at maximum concentrations of 9.3 µg/L (G38D) and 11 µg/L (G38S). The PCE in these wells appear to be from an off-property source. Concentrations have decreased below the ROD cleanup level following the partial shutdown of recovery wells and have remained below the cleanup level since 2015. Concentrations of PCE have also been detected above the cleanup level in two active (RW-17 and RW-20) and two inactive (RW-10 and RW-19) recovery wells along the southern boundary of the property (RW-17, RW-19, and RW-20) which appear to be related to the off-property source. The maximum concentration of PCE (19 µg/L) during this FYR period was detected in wells RW-19 and RW-20. Based upon the most recent monitoring event (May 2018), PCE in RW-10 and RW-20 have decreased below the cleanup level (see Exhibit 4 in Appendix B).

[8] The figure shows TCE concentrations in overburden and shallow bedrock monitoring wells. Consequently, results for deeper bedrock monitoring well G36DBR are not shown. The TCE concentration at this well during May 2018 was 1.3 µg/L.

cis-1,2-Dichloroethene (cis-1,2-DCE) was detected above the ROD cleanup level in one well (recovery well RW-22RE) during this FYR period. Concentrations ranged from 180 µg/L during the most recent monitoring event (May 2018) to 270 µg/L in June 2015 and concentrations appear to be decreasing (see Exhibit 5 in Appendix B).

Vinyl chloride was detected in excess of its ROD cleanup level in one well (G1DB3) at a maximum concentration of 2.3 µg/L during this FYR period. The most recent concentration of vinyl chloride in the well was 2.1 µg/L (May 2018). Contaminated groundwater from this well, as well as G36DBR, is reported to be captured by the deeper groundwater recovery system operated at the UniFirst Property.

Limited sampling for total As and Mn was performed by Grace at six monitoring wells (G16S, G16D, G22S, G22D, G23D, and G4S) and two recovery wells (RW-17 and RW-22RE) in 2015. These locations were selected because they currently or historically had detections of VOCs in groundwater and would provide an indication of whether As and/or Mn is present at elevated concentrations in groundwater at the property. Concentrations of As and Mn did not exceed the 10 µg/L MCL for As or the 300 µg/L Lifetime Health Advisory (HA) for Mn.

To date, the system has treated over 92 million gallons of water (GES & JG Environmental, Inc., 2018). Since the partial shutdown of recovery wells, the annual volume of extracted groundwater increased from 2.14 million gallons to 2.7 million gallons. The increase in extracted groundwater was largely attributable to installation of a second pump to maintain drawdown below the bedrock surface in recovery well RW-20, and increased pumping rates in RW-17 during the FYR period which maximizes capture along the southern border of the Grace Property. The contaminant mass removed over this FYR period has been relatively consistent at approximately 1 pound per year with the vast majority of this mass coming from RW-17, RW-20, and RW-22RE. Grace continues to operate these three wells to maintain capture of groundwater exceeding cleanup levels.

UniFirst Property

Soil Vapor Extraction System

Since the SVET system became operational in November 2014, the system is estimated to have removed over 49 pounds of VOCs from the subsurface (see Exhibit 6 in Appendix B). Approximately 39 pounds of this mass was attributable primarily to PCE and to a lesser degree, TCE and 1,1,1-trichloroethane (TCA). Most of the VOC mass was extracted by wells SVE-2A, -3A, and -4A. The levels of VOCs as measured with a PID have decreased since the system began operation (refer to Exhibit 7 in Appendix B). VOCs measured using the PID continue to be detected at all of the SVE wells; however, recent PID readings at the wells show no particular trend over time. Mass removed appears to be declining with time, as expected, with the mass of PCE, TCE, trans-1,2- DCE, TCA and chloroform decreasing from 17.7 pounds per year (lb/yr) during the first year of operation to 13.3 lb/yr and 5.5 lb/yr during the second and third years of operation. The treatment system typically achieves 95 percent or greater reduction in VOCs in accordance with the Code of Massachusetts Regulations (CMR) Section 40.0049 - Remedial Air Emissions.

Groundwater

During this FYR period, UniFirst monitored water levels at between 100 and 107 on- and off-property monitoring wells and the two on-property recovery wells (UC-22 and EX-1), monitored 15 wells for the presence of dense non-aqueous phase liquid (DNAPL), and collected groundwater samples from 33 wells located on the property (i.e., EX-1, S70D, S71S/D, UC4, UC5, UC6, UC6S, UC33, UC7-1 through UC7-5, UC10-1 through UC10-6, UC10S/M/D, UC18, UC19, UC19M, UC25, UC26S/D, UC29S/D, UC30,

UC33) as depicted on Figure 5.[9] Over the FYR period, DNAPL was not present at the monitored locations.

A review of analytical data reveals that contaminant concentrations have not changed significantly in many routinely monitored wells since the previous FYR. For example, concentrations of PCE, TCE and cis-1,2-DCE in UC10-3 ranged from 29 to 140 µg/L, 10 to 46 ug/L, and 86 to 180 ug/L, respectively, during the previous FYR period. During this FYR period, PCE, TCE and cis-1,2-DCE concentrations in this well similarly ranged from 19 to 150 ug/L, 17 to 36 ug/L, and 89 to 270 ug/L, respectively. Similarly, PCE and/or TCE concentrations during this FYR fluctuated over similar ranges observed during the 2014 FYR (above cleanup levels) in S71D, UC6, UC7-1, UC7-2, UC7-3, UC7-4, UC7-5, UC10-1, UC10-2, UC10-4, UC10-5, and UC10-6. At monitoring well UC18, PCE concentrations decreased and remained below the cleanup level for the past three years (see Exhibit 9 in Appendix B). At UC26D, TCE decreased and remained below the cleanup level during this FYR period, and at UC-5, concentrations of PCE were substantially lower (i.e., between 6.4 and 31 µg/L) than concentrations during the previous FYR (which generally ranged between 130 to 2,900 µg/L) and TCE decreased and remained below the cleanup level (see Exhibits 8 and 10 in Appendix B).

Of the 33 on-property wells sampled during the most recent monitoring event, VOCs were not detected or exhibited concentrations below cleanup levels at 13 monitoring wells including: S70D, UC4, UC6S, UC10S/M/D, UC18, UC19, UC19M, UC26S/D, UC30, and UC33. The remaining wells exhibited concentrations of cis-1,2-DCE, PCE and/or TCE in excess of cleanup levels during one or more sampling events during this FYR period. Maximum concentrations of PCE, TCE, and cis-1,2-DCE detected in the wells sampled during the most recent monitoring event are summarized in Table 2. Vinyl chloride, 1,1-dichloroethene, TCA, and/or chloroform were detected below cleanup levels in limited locations (i.e., UC5, UC-7-1, UC7-2, UC-7-3, UC-7-4, UC-7-5, UC10-1, UC10-3, UC29D, and UC33) and samples during this FYR period at levels below the cleanup levels. 1,2-Dichloroethane was not detected at any on-property well during this FYR period. Historically, DNAPL was observed at monitoring well UC8 at the UniFirst Property. In 2012, UniFirst proposed enhancing the remedy with ISCO to reduce persistent PCE in groundwater bedrock in the vicinity of UC8. UniFirst and EPA are monitoring SVET progress, while considering the ISCO work plan schedule for enhancing the remedy.

As of October 2018, the GWETS has treated over 538 million gallons of water and removed approximately 2,460 pounds of PCE and TCE with the mass removed ranging from approximately 23 to 34 pounds per year over this FYR period (UniFirst, 2018).

Vapor Intrusion Pathway

Due to elevated soil gas concentrations of PCE beneath the commercial building immediately west/downgradient of the Unifirst Property, annual monitoring of the subslab and indoor air at the commercial building immediately west/downgradient of the UniFirst Property has been occurring since 2013 and is expected to continue. Annual subslab soil gas and indoor air monitoring of the commercial building at the UniFirst Property will commence following completion of the SVET remedy. The active extraction and treatment of vapors from beneath the building at the UniFirst Property currently protects this building from vapor intrusion.

Seven annual subslab soil gas and indoor air sampling events have been conducted at the commercial building immediately west/downgradient of the UniFirst Property. During each sampling event, three indoor air samples, one to two ambient air samples, and three subslab soil gas samples have been

[9] The long-term monitoring program includes sampling at UC34, UC35, and UC36. However, these wells were dry during each annual monitoring event.

collected for VOC analysis. The data have been evaluated for consistency with VOC concentrations present in 2011, which were determined to be associated with risks within the acceptable human health risk ranges. Subslab soil gas PCE concentrations have decreased from 5,730 µg/m^3 in 2011 to 1,790 µg/m^3 in 2019, while indoor air PCE concentrations have decreased from 1.23 µg/m^3 in 2011 to 0.617 µg/m^3 in 2019[10] (see Table 3 in Appendix B).

UniFirst/Grace has continued monitoring off-property groundwater in downgradient residential/commercial areas to confirm that concentrations are remaining constant or decreasing, indicating that the conclusions of the 2012 VI risk assessment remain valid. Table 4 in Appendix B presents a comparison of the maximum detected VOC concentrations in 2013 to 2018 concentrations in the downgradient areas. The comparison indicates that detected VOC concentrations are remaining stable. These data are discussed relative to Vapor Intrusion Screening Levels (VISLs) in Section V (Technical Assessment – Question B).

Wildwood Property

A site and well location map for the Wildwood Property is included as Figure 6. Exhibit 1, included in Appendix B, summarizes wells sampled at the property during this FYR period. Based upon analytical data collected during this FYR period, VOCs were either not detected or exhibited concentrations below cleanup goals at 25 monitoring wells. The 55 remaining monitoring wells sampled during this FYR period exhibited concentrations of TCE (53 wells), PCE (10 wells), cis-1,2-DCE (11 wells), and/or vinyl chloride (3 wells) above cleanup goals during at least one monitoring event.[11]

Since the groundwater extraction system began operating, concentrations of VOCs have decreased in several wells, many of which are located within or along the edge of the capture zone of shallow bedrock recovery well BW-19R shown on Exhibit 11 in Appendix B. These wells include bedrock monitoring wells BW-6R, BW-6RD(LO), BW-8, BW-15RP, BW-18RD(LO), bedrock extraction well BW-19R, and monitoring well BCW-13 screened in glacial till. Plots showing TCE (the predominant VOC) concentrations over time at these well locations are shown on Exhibits 12 through 18 in Appendix B. While concentrations decreased significantly during the first several years of operation, TCE concentrations have not changed significantly at these well locations during this FYR period and most of the wells continue to exhibit concentrations above the cleanup levels. In 2018, EPA recommended that the SD pilot test ISCO in deeper bedrock in the area of deep bedrock well BW-6RD(LO) as potential remedy enhancement to help reduce elevated and persistent concentrations of VOCs exceeding cleanup levels in conjunction with the bedrock groundwater pump and treat remedy (EPA, 2018a).

During this FYR period, several wells were identified by EPA as located outside the recovery well capture zone and exhibiting concentrations of VOCs above cleanup levels (EPA, 2018a). These wells are shown on Exhibit 11 and include: WW-100SR, WW-101SR, S77D, S77SR, S92SR, S92DR, S95SR, BCW-8, BW-8, and BW-9. In a letter dated July 13, 2018, EPA affirmed its position that additional recovery wells need to be installed between BW-18RD(LO) and S92DR and the area between BW-17R and S77SR to capture and treat impacted groundwater. EPA will continue to work with the SD to locate and install additional recovery wells to achieve capture consistent with the ROD.

[10] These declining PCE indoor air concentrations are below the EPA Regional Screening Levels (RSLs) for industrial air of 18 µg/m^3 and residential air of 4.2 µg/m^3.(EPA 2018b).

[11] Some samples were analyzed at elevated detection limits greater than the cleanup level. Although certain compounds were not detected in the affected samples, one or more of these compounds could potentially have been present above the cleanup level, in the affected samples.

VOCs contained in soil and overburden groundwater are treated using the AS/SVE system. In June 2014, the SD began operating two new AS wells screened near the base of a fine sand unit containing elevated concentrations of VOCs. Operation of these AS wells has significantly reduced (>95% reduction) concentrations of VOCs in nearby monitoring wells BSW-1 and BW-206. Exhibit 19 in Appendix B shows the reduction in PCE and TCE since the new AS wells began operating. The SD subsequently undertook a subsurface investigation during 2015 and 2016 to further assess the presence of residual VOCs in the area of the existing AS system that may require treatment (AECOM, 2016b). Two general areas of residual VOC impacts were identified: one at the northern end of the AS/SVE treatment area and one at the southern end of the treatment area. Exhibit 20 in Appendix B shows the distribution of TCE in overburden within these areas. In its July 13, 2018 letter to representatives for the SD, EPA outlined the path forward for optimizing the AS/SVE system to address residual contamination in these areas including installation and operation of additional AS wells and, as appropriate, additional SVE wells. Work to optimize the AS/SVE system is ongoing.

During this FYR period, the SD conducted As and Mn sampling at five newly installed overburden monitoring wells (i.e., WW-200D, WW-203, WW-206, WW-208S, and WW-211S). Arsenic was detected above the MCL in one well (WW-203) and Mn exceeded the Lifetime HA in all wells except well WW-206.

The GWETS and AS/SVE continue to treat groundwater in bedrock and overburden respectively. The GWETS has recovered and treated over 239,500,000 gallons of contaminated groundwater and the systems are estimated to have removed over 2,763 pounds of VOCs from groundwater. Approximately 20 to 25-percent of the mass of VOCs treated comes from extracted groundwater with the remainder from the AS/SVE system (AECOM, 2016c; 2017d).

NEP Property

Since the shutdown of the remedial system in 2000, ongoing groundwater monitoring is being performed at five overburden wells (EPA-1, EW-1, NEP-101, NEP-104, and NEP-108) and four shallow bedrock wells (NEP-101B, NEP-104B, NEP-106B, and NEP-108B) to evaluate contaminant trends (Figure 7). With the exception of PCE, chlorinated VOCs were not detected above ROD cleanup levels at overburden or shallow bedrock monitoring wells during this FYR period. PCE exceeded the ROD cleanup level at two overburden monitoring wells (EW-1 and NEP-101) and one shallow bedrock well (NEP-104B). The maximum concentration of PCE in these wells was detected in NEP-101 (11 µg/L). Concentrations of PCE in these wells decreased over the FYR period with the most recent concentration at EW-1 (July 2017) below the ROD cleanup level as shown on Mann-Kendall trend plots (Exhibit 21 in Appendix B).

In addition, three deeper bedrock wells (NEP-3, NEP-B, and NEP-A as depicted on Figure 7) were sampled in 2016 in response to EPA's request to assess current concentrations of chlorinated VOCs in deeper bedrock groundwater (EPA, 2009a). Both PCE and TCE were detected above ROD cleanup levels in the three deeper bedrock wells. Concentrations of these two compounds were lower than in samples previously collected from NEP-3 and NEP-B in 1990; however, concentrations were above detection limits in NEP-A. The maximum concentrations of PCE and TCE were detected at NEP-A at concentrations of 12 µg/L and 38 µg/L, respectively.

In addition to chlorinated VOCs, the 2016 samples collected from deeper bedrock wells NEP-3, NEP-A, and NEP-B were analyzed for 1,4-dioxane. Although not detected in NEP-B above the laboratory reporting limit, which varied between 0.144 and 0.153 µg/L, 1,4-dioxane detections exceeded the 0.46 µg/L EPA Regional Screening Level (RSL) in discrete samples collected from fractures in NEP-3 and NEP-A. Concentrations in these wells ranged from 0.482 µg/L in NEP-A to 1.15 µg/L at NEP-3.

Groundwater samples were not analyzed for As or Mn during this FYR. However, groundwater samples were previously collected and analyzed for these metals at the NEP Property in 2008. These data did not reveal an exceedance of the As MCL or the Mn HA at the NEP Property.

Olympia Property

Well locations at the 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 in some cases associated daughter products, in excess of cleanup levels for groundwater. The ISCO injections have significantly reduced concentrations of VOCs at most monitoring locations on the property by one or more orders of magnitude as shown in Exhibit 22. At a few locations, VOCs appear to have decreased below cleanup levels with no apparent rebound over two or more rounds of sampling (e.g., monitoring wells MW208S, MW211S, MW217S, MW218S, and MW219M).

Fifty-four of the 68 wells sampled during the baseline monitoring event were monitored for VOCs during this FYR period as shown on Exhibit 22. Of these 54 wells, 27 wells are located within and 27 wells are located outside of the treatment cell. Concentrations in 23 wells, three located within the treatment cell (i.e., OL-3M, MW-203S, and MW-211S) and 20 located outside the treatment cell (i.e., MW214S/M/D, MW215D, MW216M/D, MW212M/D, MW213D, MW220M/D, MW211S/M, MW217S/D, MW218S/D, and MW219S/M/D), were below cleanup goals during the most recent sampling events completed at these wells during this FYR period. In addition, COCs were not detected in nine wells located within the treatment cell (i.e., MW200S/D, MW202D, MW203D, MW204S/D, MW205D, MW206S, and MW207D) and in two wells outside the treatment cell (i.e., MW215S and MW216S) but at detection limits above cleanup goals. At the vast majority of the remaining wells, concentrations of VOCs continued to decrease or have fluctuated above and below cleanup levels. Three wells (i.e., MW207S, MW211D, and MW217M) have exhibited increases in TCE and/or cis-1,2-DCE concentrations in the last five years. Continued ISCO application, which may include additional optimizations (e.g., improved delivery methods), is anticipated by EPA during the next five years to address areas of persistent contamination and progress toward attainment of cleanup goals.

Site Inspections

The inspection of the five OU1 Source Area Properties was conducted on 2/18/2019 and 2/19/2019. In attendance were David Sullivan, LSP, and Jeffrey Hansen, PH, of TRC, on behalf of the EPA RPM. The purpose of the inspections was to assess the protectiveness of the remedy. A detailed summary of observations made during the inspection of the Source Area Properties is included in Appendix D.

The following individuals attended inspections for the respective SDs:

- **Grace Property:** Clayton Smith, Project Coordinator - de maximis, Inc.; Van Sawyer, Technical Services Manager – GES, and operator of the groundwater extraction and treatment system; and Paul Bucens of W.R. Grace.
- **UniFirst Property:** Tim Cosgrave, Director of EHS for UniFirst and O&M Manager for GWETS.
- **Wildwood Property:** Peter Cox, PG, Project Manager – AECOM and Edward Zygarowski, O&M Manager for GWETS and AS/SVE System, also of AECOM.
- **NEP Property:** Jeff Hamel, LSP and Project Manager – Woodard and Curran, Inc.; and

- **Olympia Property:** Christene Binger, Associate Professional Hydrogeologist - GeoInsight.

The inspections included visual inspection of each Source Area Property for site access, record keeping, and remedy implementation and monitoring activities. Overall, the site inspections indicated that remedies at the Source Area Properties are being effectively implemented. Pertinent findings noted during the inspections are summarized below:

- At the Grace Property, the surfaces around some wells have been temporarily affected by redevelopment. Not all wells could be located or observed due to snow cover or access constraints associated with redevelopment. It is recommended that all monitoring wells be located and assessed when snow cover disappears and the redevelopment has been completed to verify that surfaces surrounding the affected wells has been restored to the satisfaction of EPA and to assess maintenance needs for the monitoring network, if any.
- At the UniFirst Property, not all wells could be located or observed due to snow cover. However, covers for some of the observed flush-mounted wells outside the building were missing bolts and at least one location with a stick up (i.e., PZ1S/D) did not have a lock. The Johnson Company is currently working on a plan to restore wells DP37D, UC31M and UC31D, which were reported to be sand locked in the 25 Year Annual Report (UniFirst, 2017). It is recommended that all wells monitored for water levels/water quality be inspected after snow cover has melted to identify wells that need to be secured and/or require maintenance.
- At the Wildwood Property, not all wells could be located or observed because of snow cover or safety concerns (e.g., icy conditions on wooden boards to wells in the Aberjona wetlands). However, protective covers at several well locations were not locked/secured, reportedly because the property is fenced, with access limited via a locked gate, and O&M personnel are routinely present. It was also noted that at least one well located in an area subject to periodic flooding (BSW-14) did not have an expansion plug to prevent surface water from entering the well. A comprehensive assessment of all wells is recommended once snow cover disappears to identify wells requiring maintenance, if any. In addition, it is recommended that all wells should be locked and secured to limit the potential for tampering by trespassers.
- At the Olympia Property, monitoring wells located inside the fenced area were observed to be unlocked and most did not have covers. Several monitoring wells had sampling tubing protruding from the well and PVC casing was observed to extend above the steel protective casing at several location. Although the property is surrounded by fencing, the fencing is unlikely to deter a determined trespasser. For this reason, it is recommended that all wells should be properly secured between monitoring and injection events.

V. TECHNICAL ASSESSMENT

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

Question A Summary:

Yes – for the Grace, UniFirst, NEP and Olympia Properties. The review of available documents, evaluation of compiled data, and the results of the site inspections indicate that the remedy is functioning as intended in the ROD and ESD. Treatment systems at the Source Area Properties continue to operate with limited downtime and their operation is resulting in decreasing contaminant concentrations in the subsurface. Although lingering VOC contamination is present within the aquifer and further investigation

is required to assess As, Mn and 1,4-dioxane in groundwater at the Source Area Properties[12], the groundwater is not used as a source of drinking water at this time. Vapor mitigation systems have been installed to prevent the VI pathway at buildings constructed as part of Grace redevelopment activities. Monitoring of the subslab and indoor air at the commercial building immediately west/downgradient of the UniFirst Property since 2013 has not indicated a risk to the occupants and annual monitoring of these media is expected to continue. The active extraction and treatment of vapors from beneath the building at the UniFirst Property currently protects this building from vapor intrusion.

For the Wildwood Property, although some contaminated groundwater in bedrock is captured, contaminated groundwater is present outside the capture zone of recovery wells and continues to enter the Central Area. EPA is working with the SD to address this issue.

Remedial Action Performance

While some lingering groundwater contamination remains beneath all Source Area Properties, groundwater contaminant levels have been reduced or controlled and active groundwater remediation continues to occur at the Grace, UniFirst, and Wildwood Properties.

Due to substantial progress at the Grace Property, EPA granted permission for partial shutdown of 13 of the 16 extraction wells at the property. Additional soil excavation and off-site disposal occurred as part of the Grace redevelopment project, along with the installation of vapor mitigation systems in newly-constructed buildings to mitigate a potential VI pathway.

UniFirst installed an additional extraction well to enhance groundwater capture at the southwest corner of the property and began operating the SVET system to address VOC contamination in soil and shallow groundwater. Operation of the SVET system also protects the existing on-property commercial building from vapor migrating into indoor air. UniFirst is monitoring SVET progress, while considering the appropriate time to implement enhancement measures (e.g., ISCO) to address residual DNAPL present in the vicinity of UC8.

Significant reductions of groundwater contaminant concentrations have been achieved at the NEP Property. Exceedances of cleanup levels for PCE remain in overburden and shallow bedrock groundwater at the property, but these exceedances appear to be contained and near cleanup levels. Recent sampling of deeper bedrock groundwater detected concentrations of PCE and TCE at concentrations above cleanup levels and 1,4-dioxane at levels exceeding EPA's tapwater risk-based screening levels. Further evaluation of NEP Property groundwater in the deeper bedrock is necessary to fully characterize the source area and ensure remedy effectiveness.

Results of groundwater sampling at the Wildwood Property initially showed reductions in many contaminant concentrations during the first several years of remedy implementation. Over this FYR period, however, concentrations have not changed significantly and data continue to confirm exceedances of cleanup levels for some contaminants, primarily TCE in overburden groundwater. Groundwater contamination remains outside the capture zone above ROD cleanup levels including in the eastern and southern portion of the property at bedrock well locations S77SR, S92DR, WW100SR and WW101SR where concentrations of TCE ranged from 60 to 130 µg/L during this FYR period. Siting and installation of additional recovery wells is planned in these areas. Additionally, areas of residual VOCs were identified during this FYR period in soil that is not being effectively addressed by the AS/SVE system as currently configured and is contributing to persistent elevated concentrations of VOCs in overburden

[12] To be completed as part of sampling during the OU2 investigation.

groundwater. EPA has recommended enhancement measures including the installation of additional AS wells and, if warranted, SVE wells as to optimize treatment and/or other measures (e.g., ISCO).

At the Olympia Property, a groundwater pump and treat system has not yet been implemented. However, cleanup work continues under an AOC with EPA to address soil and groundwater contamination (i.e., oxidant injection to destroy subsurface VOCs). Although VOCs continue to exceed cleanup levels, ISCO injections have significantly reduced concentrations of VOCs at most monitoring locations on the property by one or more orders of magnitude. Targeted injections continue to be performed, typically twice a year, to address the remaining contamination. Upon ISCO completion, the effectiveness of ISCO will be assessed and EPA will determine the need for implementing the groundwater pump & treatment system identified under OU1 for the Olympia Property.

Concerns resulting from the decreased MCL for As, publication of a lifetime HA for Mn, and assessment for the emerging contaminant 1,4-dioxane are still being addressed at the Source Area Properties. Groundwater samples were collected and analyzed for As and Mn at the Grace and Wildwood Properties during this FYR period, while 1,4-dioxane data were collected at the NEP Property. The groundwater is not used as a source of drinking water at this time.

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 at the Grace, UniFirst, NEP, and Olympia Properties. Progress continues towards the remedy cleanup goals since the fourth FYR. Optimizations/enhancement opportunities remain at the Wildwood Property for capture and groundwater contaminant reductions, as well as the UniFirst Property for groundwater contaminant reductions, as noted previously. 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.

System Operations/O&M

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

Based on the review of the Source Area Properties' O&M documentation and the results of this FYR site inspection activities, the current operating procedures maintain the effectiveness of remedial systems operation at the Source Area Properties.

Implementation of Institutional Controls and Other Measures

As stated in the ROD (p.18 of 52), "Once cleanup goals have been satisfied [Ground Water Extraction and Treatment], 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."

Redevelopment projects have been proposed at various properties within impacted areas of the Site, where the projects may alter existing building conditions, change land uses, potentially cause exposure to contaminated groundwater/soils, etc. Since 2014, the proponents for redevelopment at the Grace Property coordinated with EPA and MassDEP regarding the safe redevelopment of the property, requesting a "*Comfort Letter*" summarizing the status of the cleanup and recommendations for redevelopment. In response to the Comfort Letter, the proponents prepared Groundwater and Soil Management Work Plans and Health & Safety Plans describing how groundwater and soil would be safely managed and workers protected, how the remedy would be maintained, etc. The proponents also prepared vapor mitigation system designs for occupied buildings, and constructed and tested the vapor mitigation systems. EPA approved the work plans and designs, and conducted periodic field oversight of intrusive development activities to ensure the remedy and public health and environment remained protected.

EPA will continue to apply the above redevelopment process at the Site. EPA will also assess the need for ICs to: (1) control use of groundwater until cleanup levels have been met; (2) assure development of plans for controlling soil and/or groundwater exposures/management during intrusive work, as appropriate; (3) require assessment of the VI pathway, as necessary, until groundwater cleanup levels have been met; and (4) maintain operation of vapor mitigation systems until groundwater cleanup levels have been met.

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

Question B Summary:

No. There have been changes to the toxicity values, exposure assumptions, exposure pathways and methods of evaluating risk since the 1989 ROD and 1991 ESD. However, the RAOs selected for the Site are still valid. The drinking water pathway is currently incomplete because municipal drinking water is available and private wells are not present in the area.

The protectiveness of the soil cleanup levels was fully evaluated in the 2014 FYR which concluded that the ROD soil cleanup levels were protective for a residential exposure scenario. Since 2014, the toxicity of cPAHs (i.e., benzo(a)pyrene) and lead have been re-evaluated. However, the revised toxicity estimates do not alter the protectiveness of the remedy.

Although the remedy was not designed to be protective of vapor intrusion, this pathway is incomplete under current land-use conditions at the Wildwood and Olympia Properties, has been evaluated and determined to not pose an unacceptable risk under current land-use conditions at the UniFirst and NEP Properties and downgradient areas, while newly-constructed buildings at the Grace Property have been fitted with engineering controls to mitigate the potential vapor intrusion pathway. Therefore, the changes as described below are not expected to alter the protectiveness of the remedy.

Changes in Standards and TBCs

A review of Applicable or Relevant and Appropriate Requirements (ARARs) was performed to check the impact on the remedy protectiveness due to any changes in standards that were identified in the ROD, new promulgated standards, and/or changes in TBCs (to be considered). Tables documenting the review of each ARAR, using the regulations and requirements synopses listed in the ROD as a basis, are included as Appendix C. The evaluation included a determination of whether the requirement is currently ARAR or TBC and whether the requirements have been met. In general, changes in standards since the 1989 ROD and 1991 ESD do not change the protectiveness of the remedy.

Changes in Toxicity and Other Contaminant Characteristics

Since the time of the original 1988 Endangerment Assessment, EPA has re-examined and updated toxicity factors for each of the contaminants evaluated. Changes in these toxicity factors do not affect the groundwater remedy because of its reliance on the use of municipal water as drinking water until cleanup levels are achieved. ROD groundwater cleanup levels are based on MCLs which have not changed since 1989. With the exception of lead (discussed below), the ROD soil cleanup levels for future residential use continue to be protective, even considering the updated toxicity factors. Even though the ROD cleanup level for lead would no longer be considered protective for residential land use, average lead concentrations on the Source Area Properties do not exceed the current lead screening level (SL). In addition to updated toxicity values, new information has become available on emerging contaminant 1,4-dioxane.

- ***2016 Lead in Soil Cleanups***

  EPA's 2016 OLEM memorandum "Updated Scientific Considerations for Lead in Soil Cleanups" (OLEM Directive 9200.2-167) indicates that adverse health effects are associated with blood lead levels (BLLs) at less than 10 micrograms per deciliter (µg/dL). The memo mentioned that several studies have observed "clear evidence of cognitive function decrements in young children with mean or group BLLs between 2 and 8 µg/dL." Any soil screening, action or cleanup level developed based on the previous target BLL of 10 µg/dL may not be protective.

  EPA's approach to evaluate potential lead risks is to limit exposure to residential and commercial soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% of the population exceeding a 5 µg/dL BLL. This is based on evidence indicating cognitive impacts at BLLs below 10 µg/dL. Additionally, this approach aligns with the Lead Technical Review Workgroup's current support for using a BLL of 5 µg/dL as the level of concern in the Integrated Exposure Uptake Biokinetic Model (IEUBK) and Adult Lead Methodology (ALM). A target BLL of 5 µg/dL reflects current scientific literature on lead toxicology and epidemiology that provides evidence that the adverse health effects of lead exposure do not have a threshold.

  EPA's 2017 OLEM memorandum "Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters" (OLEM Directive 9285.6-56) provides updates on the default baseline blood lead concentration and default geometric standard deviation input parameters for the Adult Lead Methodology. These updates are based on the analysis of the NHANES 2009-2014 data, with recommended updated values for baseline blood lead concentration being 0.6 µg/dL and geometric standard deviation being 1.8.

  Using updated default IEUBK and ALM parameters at a target BLL of 5 µg/dL, site-specific lead soil SLs of 200 mg/kg and 1,000 mg/kg are developed for residential and commercial/industrial exposures, respectively.

  Lead was only identified as a soil contaminant of concern (COC) at the Wildwood Property due to the presence of sludge. Although the lead cleanup level identified in the ROD (640 mg/kg) exceeds the current lead soil SL for residential land use of 200 mg/kg, the Wildwood Property is currently undeveloped and undergoing remedial actions. In addition, based on sampling conducted in 1987 for soil and 1994 post-excavation sampling following sludge removal activities (Table 5 in Appendix B), the average lead concentrations of surface and subsurface soils at this property are less than the residential soil SL.

In 1987, surface and subsurface soil lead data were collected from the Grace, NEP, and Olympia Properties. In addition, 16 surface and subsurface soil samples were collected and analyzed for lead at the Grace Property in 2005. These soil lead data are presented in Appendix B, Table 5. Because the average lead surface soil and subsurface soil concentrations at each of the properties are less than 200 mg/kg, no further remedial work is necessary for lead.[13]

- ***2017 Polycyclic Aromatic Hydrocarbons (PAHs) cancer and non-cancer toxicity values***

On January 19, 2017, EPA issued revised (less carcinogenic) cancer toxicity values and new non-cancer toxicity values for benzo(a)pyrene. Benzo(a)pyrene did not have non-cancer toxicity values prior to January 19, 2017. Benzo(a)pyrene is now considered to be carcinogenic by a mutagenic mode of action; therefore, cancer risks must be evaluated for different human developmental stages using age dependent potency adjustment factors (ADAFs) for different age groups. The cancer potency of other carcinogenic PAHs is adjusted using relative potency factors (RPFs), which are expressed relative to the potency of benzo(a)pyrene. The non-cancer effects of benzo(a)pyrene were not evaluated in the past due to the absence of non-cancer values.

The ROD soil cleanup level for cPAHs (the sum of the benzo(a)pyrene-equivalent concentrations for the cPAHs adjusted for relative toxicity) is 0.694 mg/kg. EPA's residential soil RSL for benzo(a)pyrene based on a cancer risk of $1x10^{-6}$ is 0.11 mg/kg (EPA, 2018). Therefore, the ROD cPAH cleanup level would be associated with approximately a $6x10^{-6}$ cancer risk. Because this is less than the cancer risk estimated in 2014 when the ROD soil cleanup levels were last evaluated for protectiveness, the cumulative risk of the soil cleanup levels would not exceed EPA's risk management range (10^{-6} to 10^{-4}).

- ***2013 1,4-Dioxane cancer and non-cancer toxicity values***

In 2013, EPA revised the toxicity values for 1,4-dioxane. The oral slope factor increased, while the value for inhalation unit risk decreased, which indicates that 1,4-dioxane is more toxic from cancer health effects via the oral pathway, but less toxic from inhalation. Additionally, the non-cancer values for oral reference dose and inhalation reference concentration both decreased, which indicates that 1,4-dioxane is more toxic from non-cancer hazards.

This compound was commonly used as a chlorinated solvent stabilizer to prevent product degradation. It was identified as a COC in OU4 groundwater in the 2017 ROD. Limited sampling in 2011 at the UniFirst (four wells) and Grace (five wells) Properties did not detect this compound at a reporting limit of 2 ug/L. In 2016, three deeper bedrock wells at the NEP Property were sampled and displayed 1,4-dioxane detections above the 0.46 µg/L EPA RSL. The upcoming OU2 sampling event that will include OU1 wells and will include 1,4-dioxane as part of the analytical suite with detection limits which meet tap water RSLs. If it is detected at the Source Area Properties, additional investigation and/or evaluation may be performed to determine if any changes are needed to the remedy. However, if it is detected in OU1 groundwater, it does not pose any additional threat to human health due to the current use of municipal water as the source of drinking water at and in the vicinity of the Site.

- ***2016 PFOA/PFOS[14] non-cancer toxicity values***

[13] The SS-2 location on the Grace Property was excavated in 2012 as part of the Southern Drainage Ditch soil removal action, conducted due to exceedances of the ROD cleanup level for cPAHs. Because no lead post-excavation confirmation sampling was conducted, this data point was retained for the lead evaluation to be health protective.

[14] PFOA and PFOS are Per-and Polyfluoroalkyl Substances (PFAS).

In May 2016, EPA issued final lifetime drinking water health advisories for PFOA and PFOS, which identified a chronic oral reference dose (RfD) of 2E-05 mg/kg-day for PFOA and PFOS (EPA, 2016a and EPA, 2016b). These RfD values should be used when evaluating potential risks from ingestion of contaminated groundwater at Superfund sites where PFOA and PFOS might be present based on site history. Considering the variety of disposal activities at the Site, PFOA and PFOS should be evaluated further at the various Source Area Properties. Potential estimated health risks from PFOA and PFOS, if identified, would likely increase total site risks due to groundwater exposure. Further evaluation of potential risks from exposure to PFOA and PFOS in other media at the Site might be needed based on site conditions and can also affect total site risks.

- ***2014 PFBS[15] non-cancer toxicity value***

PFBS has a chronic oral RfD of 2E-02 mg/kg-day based on an EPA Provisional Peer Reviewed Toxicity Value (PPRTV) (EPA, 2014e). This RfD value should be used when evaluating potential risks from ingestion of contaminated groundwater at Superfund sites where PFBS might be present based on site history. Considering the variety of disposal activities at the Site, PFBS should be evaluated further at the various Source Area Properties. Potential estimated health risks from PFBS, if identified, would likely increase total site risks due to groundwater exposure. Further evaluation of potential risks from exposure to PFBS in other media at the Site might be needed based on site conditions and can also affect total site risks.

Changes in Risk Assessment Methods

The following guidance documents were released by EPA since the last FYR. Although these guidance documents represent a change in risk assessment methodology, the change does not affect remedy protectiveness.

- ***2014 OSWER Directive Determining Groundwater Exposure Point Concentrations, Supplemental Guidance***

In 2014, EPA finalized a Directive to determine groundwater exposure point concentrations (EPCs) (https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=236917). This Directive provides recommendations to develop groundwater EPCs. The recommendations to calculate the 95% UCL of the arithmetic mean concentration for each contaminant from wells within the core/center of the plume, using the statistical software ProUCL, could result in lower groundwater EPCs than the maximum concentrations routinely used for EPCs as past practice in risk assessment, leading to changes in groundwater risk screening and evaluation. In general, this approach could result in slightly lower risk or higher screening levels.

- ***2014 OSWER Directive on the Update of Standard Default Exposure Factors***

In 2014, EPA finalized a Directive to update standard default exposure factors and frequently asked questions associated with these updates. https://www.epa.gov/risk/superfund-risk-assessment-human-health-topics (items # 22 and #23 of this web link under exposure assessment; EPA, 2014d). Many of these exposure factors differ from those used in the risk assessment supporting the 1989 ROD. These changes in general would result in a slight decrease in the risk estimates for most chemicals.

[15] PFBS is a PFAS.

Changes in Exposure Pathways

Exposure pathways considered in the 1988 Endangerment Assessment included: (1) ingestion of groundwater and inhalation of VOCs while showering for future residents; (2) soil ingestion, dermal contact and inhalation exposures by adolescent trespassers and commercial workers; and (3) soil ingestion and dermal contact by future residents. The properties continue to be used commercially (Grace, UniFirst and NEP) or are undeveloped (Wildwood and Olympia). The Grace Property is undergoing redevelopment as a hotel and restaurants. However, because the property was remediated to residential cleanup levels and subslab vapor mitigation systems were installed during construction, the change in land use does not affect remedy protectiveness. Municipal water is available for use at the Site and vicinity which prevents exposure to impacted groundwater until cleanup levels are achieved.

The following guidance was released by EPA since the last FYR. Although this guidance represents a change in the method of evaluating a specific exposure pathway, the changes do not affect remedy protectiveness.

- ***2018 EPA VISL Calculator***

  In February 2018, EPA launched an online VISL calculator which can be used to obtain risk-based screening level concentrations for groundwater, sub-slab soil gas, and indoor air. The VISL calculator uses the same database as the RSLs for toxicity values and physiochemical parameters and is automatically updated during the semi-annual RSL updates. Please see the User's Guide for further details on how to use the VISL calculator. (https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator)

  Consistent with the 2014 FYR, groundwater VISLs have been used to evaluate current shallow groundwater concentrations at the NEP, UniFirst and Grace Properties, and downgradient of the Grace and UniFirst Properties, to confirm that the conclusions of EPA's 2012 VI risk assessment remain valid. In general, shallow groundwater concentrations have remained consistent or have decreased since 2012 (see Table 4 in Appendix B), indicating that the remedy remains protective of the VI pathway. For the Grace Property, subslab vapor mitigation systems were installed in the newly constructed buildings. The operation of the SVET system at UniFirst is protecting the existing commercial building from vapor impacts. In addition, the commercial building west/downgradient of the UniFirst Property is monitored annually for VI concerns. The Wildwood and Olympia Properties have not been evaluated since these properties are currently undeveloped. The VI pathway should be evaluated in the future if these properties are planned for development.

  EPA updates RSL tables twice a year and the most current ones are available at the EPA Regional Screening Levels web page (https://www.epa.gov/risk/regional-screening-levels-rsls).

Expected Progress Towards Meeting RAOs

Soil excavation/off-site disposal and treatment activities, and the operation of soil and groundwater treatment systems have significantly reduced the concentrations of contaminants in soil and groundwater. Concentrations of VOCs in groundwater have diminished since the systems have been operating and continue to capture and reduce the overall mass of VOCs in groundwater at the Source Area Properties. Soil cleanup levels have been achieved at the NEP and Grace Properties. Remedial activities to address subsurface soil and shallow groundwater contamination continue at the UniFirst Property (e.g., SVET system and EX-1) and within the FDDA at the Olympia Property (i.e., ISCO injection). With the exception of the Wildwood Property, groundwater capture has been demonstrated at the Source Area Properties. Although As, Mn and 1,4-dioxane have not been fully investigated as potential groundwater

COCs and lingering VOCs concentrations above cleanup levels remain in groundwater, remedy protectiveness is not affected because groundwater is not a current source of drinking water.

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

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

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1	Issue Category: Remedy Performance			
	Issue: Extraction systems performance (insufficient capture of groundwater contamination) at Wildwood Property.			
	Recommendation: As described in EPA's position on the path forward (EPA, 2018a): 1) Perform surface geophysics to assist in locating additional bedrock recovery wells and install/test additional recovery wells at the northern and southern ends of the property to prevent contaminant migration to the central area; 2) Expand/optimize the AS/SVE system to address areas with elevated concentrations of VOCs in overburden groundwater; and 3) implement pilot of ISCO in the bedrock area of BW-6R as an enhancement to the pump and treat remedy for bedrock groundwater.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	7/1/2021

OU(s): 1	Issue Category: Other Remedy Implementation			
	Issue: No groundwater pump and treatment system implemented at NEP Property following AS/SVE shutdown.			
	Recommendation: Additional sampling of wells on the property (e.g., NEP 1 and 2 deep bedrock production wells) to further assess contamination above the cleanup levels, bedrock conditions, and groundwater treatment during the upcoming OU-2 investigation.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	12/31/2020

OU(s): 1	Issue Category: Other Remedy Implementation			
	Issue: No groundwater pump and treatment remedy implemented at Olympia Property.			
	Recommendation: Continue to evaluate the progress of ISCO in achieving ROD groundwater and soil cleanup levels based upon post-injection monitoring data and the need for groundwater cleanup at the conclusion of the removal action. Upon ISCO completion, the effectiveness of ISCO will be assessed and EPA will determine the need for implementing the groundwater pump & treatment system identified under OU1 for the Olympia Property.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	12/31/2022

OU(s): 1	Issue Category: Other Additional Contaminants of Concern			
	Issue: Limited current and historic data for As, Mn, 1,4-dioxane, and PFAS. Detection limits for 1,4-dioxane samples elevated above risk screening levels. These contaminants were not identified as COCs in the ROD but may need to be identified as of possible concern. Where appropriate, revise cleanup goals through a remedy decision document.			
	Recommendation: Perform comprehensive sampling for As, Mn, 1,4-dioxane, and PFAS at the Source Area Properties to assess whether concentrations are of concern (As, Mn & 1,4-dioxane during OU2 investigation).			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	12/31/2020

Other Findings

In addition, the following are recommendations that were identified during the FYR and may improve performance of the remedy and improve management of O&M, but do not affect current and/or future protectiveness:

- Some groundwater samples on Olympia and Wildwood were analyzed and reported elevated detection limits greater than cleanup levels. Olympia and Wildwood SDs will provide EPA copies of the laboratory data packages and further assess data quality relative to the groundwater cleanup levels; and
- Not all monitoring wells could be located and inspected due to weather conditions (e.g., snow, ice, water level, etc.). The Source Area Properties SDs will re-inspect their monitoring well networks, locate all wells, and assure the wells are operable and secured (e.g., locked), etc. The re-inspection results will be documented in their next annual reports or progress reports.

VII. PROTECTIVNESS STATEMENT

Protectiveness Statement(s)	
Operable Unit:1	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The remedy at the Source Area (OU1) Properties currently protects human health and the environment because exposure pathways that could result in unacceptable risks are being controlled. Active remedial actions have been or continue to be implemented in conjunction with routine O&M and monitoring. The current evaluation of the vapor intrusion pathway at both on-property and downgradient of/near property locations also supports the conclusion that the OU1 remedy is currently protective. However, in order for the remedy to be protective in the long-term, the following actions are recommended: 1) Groundwater capture and treatment system assessment/enhancements at the Wildwood Property actions are required; 2) Deep groundwater assessment, and as required treatment at NEP Property is needed; 3) Assessment of soil and groundwater cleanup levels from additional planned ISCO treatment at Olympia Property to determine if additional groundwater treatment is necessary; and 4) Assessment of groundwater conditions relative to arsenic, manganese, 1,4-dioxane, and PFAS at all Source Area Properties is needed.	

VIII. NEXT REVIEW

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

Appendix A

Reference List

APPENDIX A – REFERENCE LIST

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Appendix B
Additional Data Tables, Figures and Exhibits

Tables

Table 1a : ROD Cleanup Levels for Soil Based on Leaching to Groundwater (µg/kg)

Chloroform	62.5
Tetrachloroethene	36.7
Trichloroethene	12.7
trans-1,2-Dichloroethene	83.2
1,1,1-Trichloroethane	613

Table 1b : ROD Cleanup Levels for Soil Based on Direct Contact (mg/kg)

Chlordane	6.14
4,4'-DDT	235
Carcinogenic PAHs	0.694
PCBs	1.04
Lead	640

Table 1c : ROD Cleanup Levels for Groundwater used as Drinking Water (µg/L)

Chloroform	100
1,1-Dichloroethane	5
1,2-Dichloroethane	5
1,1-Dichloroethene	7
Tetrachloroethene	5
Trichloroethene	5
Vinyl chloride	2
trans-1,2-Dichloroethene	70
1,1,1-Trichloroethane	200

Table 2 : Current Maximum Groundwater Contaminant Concentrations Above ROD Cleanup Levels by Property Since Last 5 Year Review

Source Area Property	Contaminant	ROD Cleanup Level	Well Location (Maximum Detection)[1]	Date of Current Maximum Detected Concentration	Maximum Detected Concentration During 2014 FYR (µg/L)	Current Maximum Detected Concentration (µg/L)[2]
Grace	cis-1,2-DCE	70	RW-22RE	5/23/2018	150	180
	TCE	5	G16S	5/22/2018	68	91
	PCE	5	RW-19	5/22/2018	15	19[4]
	Vinyl Chloride	2	G1DB3	5/22/2018	ND(<4.0)[3]	2.1
UniFirst	cis-1,2-DCE	70	UC10-1	5/30/2018	370	230 J
	TCE	5	UC7-2	5/30/2018	380	440
	PCE	5	UC7-2	5/30/2018	2,900	2,500
NEP	TCE	5	NEP-A	12/19/2016	---	38
	PCE	5	NEP-A	12/19/2016	15[5]	12
Wildwood	cis-1,2-DCE	70	WW203	10/18/2018	---	1,500
	TCE	5	WW207	10/18/2018	11,200	21,000
	PCE	5	WW200D	4/10/2018	---	113
	Vinyl Chloride	2	WW202	4/10/2018	---	364
	TCA	200	WW207	10/18/2018	---	510
Olympia	cis-1,2-DCE	70	MW-211D	3/23/2018	1,100	9,200
	TCE	5	MW-217M	6/22/2018	8,200	5,700
	PCE	5	MW-207S	3/23/2018	210	22
	Vinyl Chloride	2	MW-211D	3/23/2018	74	530
	Chloroform	100	MW-213	10/5/2015	---	120

Notes:

cis-1,2-DCE = cis-1,2-dichloroethene

PCE = Tetrachloroethene

TCE = Trichloroethene

TCA = 1,1,1-Trichloroethane

--- = Not detected above ROD cleanup level during 2014 FYR. Data was not available for deep bedrock groundwater on NEP property.

(1) On-Property well with maximum concentration during most recent monitoring event during this FYR Period.

(2) Based upon the most recent monitoring event. Higher (or lower) concentrations may have been reported earlier during this FYR period.

(3) The highest detection limit is listed as vinyl chloride could potentially have been present at these locations above the ROD cleanup level.

(4) The PCE detected in RW-19 appears to be attributable to the off-site source.

(5) Three deeper bedrock wells exhibited higher concentrations of PCE/TCE than the most recent data from overburden or shallow bedrock wells.

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

Medium	2011	2013	2014	2015	2016	2017	2018	2019
Subslab Soil Gas	5730	3390	2830	2090	2870	1840	2370	1790
Indoor Air	1.23	1.02	1.57	0.841	0.888	0.698	0.665	0.617

Table 4 : Comparison of Maximum Detected Shallow Groundwater VOC Concentrations to Screening Levels

Detected Analyte	Maximum Groundwater Concentration (µg/L) 2012/2013	Maximum Groundwater Concentration (µg/L) 2017/2018	Vapor Intrusion Screening Level (µg/L)
UniFirst Data Compared to Commercial Screening Levels			
1,1,1-Trichloroethane	1.3	6.8	31,100
cis-1,2-Dichloroethene	16	ND (0.5)	NA
Tetrachloroethene	2,900	110	65
Trichloroethene	18	ND (0.5)	7.4
NEP Data Compared to Commercial Screening Levels			
Tetrachloroethene	15	6.8	65
Downgradient of/Near UniFirst and Grace Properties Data Compared to Residential Screening Levels			
Tetrachloroethene	22	22	15
Trichloroethene	0.82	0.84	1.2
Grace Data Compared to Commercial Screening Levels			
Chloroform	ND (3.0)	1.9	4
cis-1,2-Dichloroethene	150	180	NA
trans-1,2-Dichloroethene	0.83	2.2	NA
Tetrachloroethene	15	19	65
Trichloroethene	68	91	7.4

Notes:

(a) Values from EPA's Vapor Intrusion Level Screening Level Calculator (https://epa-visl.ornl.gov/cgi-bin/visl_search).

The screening concentrations corresponding to a cancer risk of $1x10^{-6}$ and noncancer hazard of 1.

NA – Not available.

Table 5
1987, 1994 and 2005 Source Area Property Soil/Sludge* Lead Data

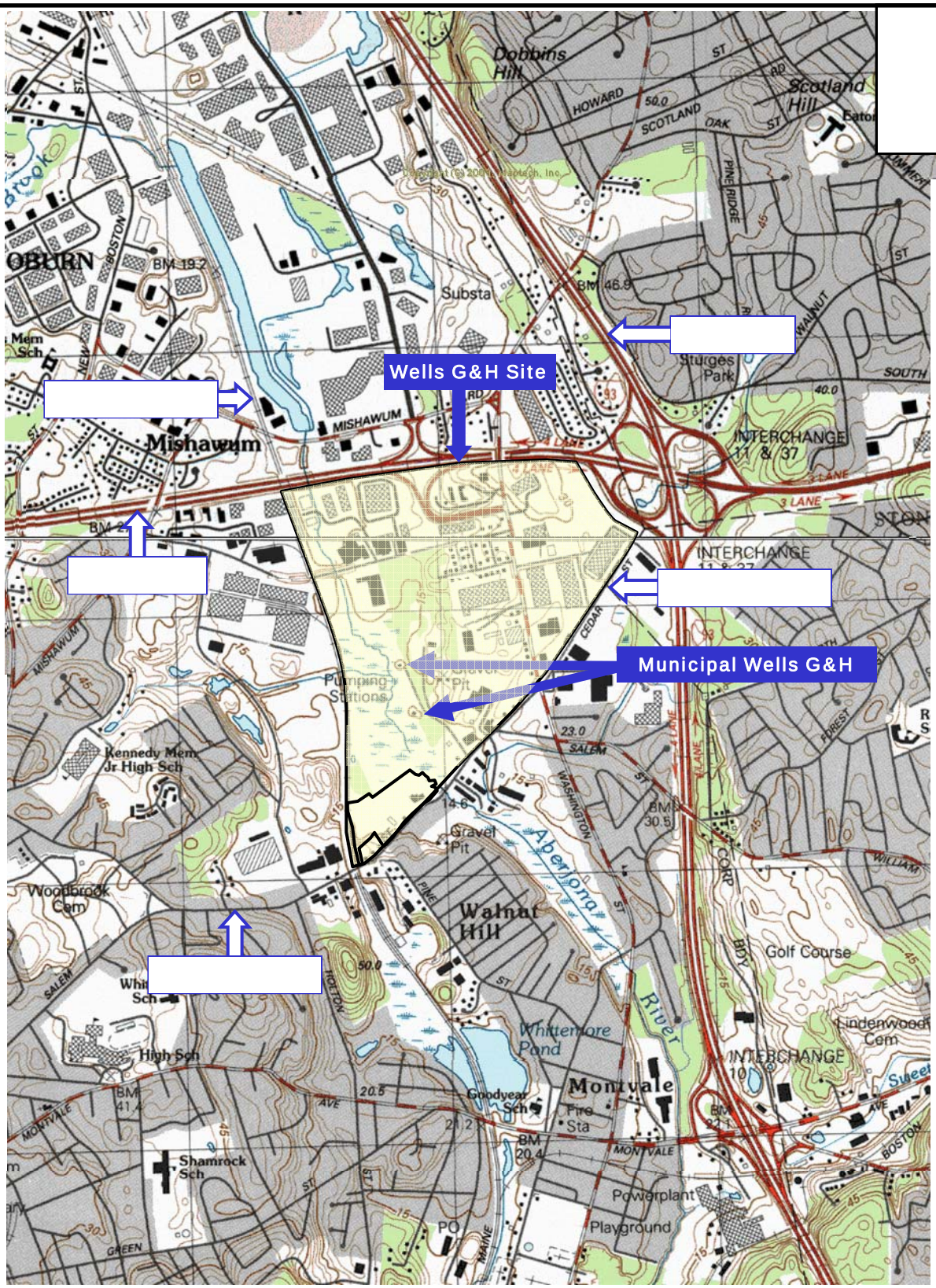
ID	Depth (ft)	Lead (mg/kg)
W.R Grace Property		
SB-9	0-2	37.11
ECS-8	1-3	5.66
ECS-10	1-3	28.9
ECS-10A	1-3	12.3
SS-1	0.5-1	56.5
SS-2	0.5-1	460
	Average	100.1
SB-7	2-4	5.2
ECS-1	10-12	1.48 U
ECS-2	5-7	1.63 U
ECS-3	5-7	1.44 U
ECS-4	20-22	1.45 U
ECS-5	10-12	1.6 U
ECS-6	8-10	6.95
ECS-7	5-7	1.5 U
ECS-9	10-12	1.55 U
ECS-11	5-7	1.56 U
ECS-12	5-7	1.58
ECS-13	5-7	27.9
	Average	39.7
NEP Property		
NE-SS-01	Surface	44
NE-SS-02	Surface	192
NE-SS-03	Surface	48
NE-SS-04	Surface	289
NE-SS-05	Surface	236
NE-SB2-01	Surface	4.6
NE-SB3-01	Surface	8.7
	Average	117.5
NE1-01	Subsurface	4.6
NE1-02	Subsurface	5.2
NE2-01	Subsurface	15
NE2-02	Subsurface	17
NE2-03	Subsurface	17
NE3-01	Subsurface	14
NE3-02	Subsurface	17
NE-SB1-01	Subsurface	3.2
NE-SB3-02	Subsurface	4.7
NE-SB4-01	Subsurface	2.3
NE-SB4-02	Subsurface	4.9
NE-SB5-01	Subsurface	9.8
	Average	9.6

ID	Depth (ft)	Lead (mg/kg)
Olympia Property		
OL-SS01	Surface	39
OL-SS02	Surface	41
OL-SS03	Surface	19
OL-SS04	Surface	36
OL-SS05	Surface	21
SB1	0-2	16.97
SB2	0-2	42
SB3	0-2	2.5
SB4	0-2	14.39
SB5	0-2	18
SB6	0-2	21
SB7	0-2	424
SB8	0-2	3.4
SB9	0-2	35
SB10	0-2	40
	Average	51.6
SB1	2-4	0.25 U
SB2	2-4	2.9
SB2	4-6	4.6
SB3	2-4	1.5
SB4	2-4	21
SB4	4-6	2.5
SB5	2-4	3.1
SB6	2-6	44
SB6	6-8	4.3
SB7	2-6	3.9
SB9	2-4	5.7
OL1-01	Subsurface	122
OL2-01	Subsurface	44
OL2-02	Subsurface	9.8
OL2-03	Subsurface	8.5
OL3-01	Subsurface	40
OL3-02	Subsurface	13
OL3-03	Subsurface	14
OL4-01	Subsurface	18
OL5-01	Subsurface	26
	Average	19.5
UniFirst		
No Data Collected		

ID	Depth (ft)	Lead (mg/kg)
Wildwood Property		
OL-SS06	Surface	27
OL-SS07	Surface	8.6
SB1	0-2	683
SB3	0-2	24.3
SB4	0-2	100
SB5	0-2	51
SB6	0-2	9.59
SB7	0-2	25.4
SB8	0-2	13.5
SB9	0-2	94.58
SB10	0-2	80.4
SB11	0-2	4.2
SB12	0-2	27.9
SB13	0-2	20
SB14	0-2	13.2
SB15	0-2	47.5
	Average	76.9
SB1	2-4	5.5
SB2	2-4	1.2
SB3	2-4	2.2
SB4	2-4	23.7
SB5	2-4	11.5
SB6	2-4	0.25
SB7	2-4	1.9
SB8	2-4	3.1
SB9	2-4	126
SB10	2-4	2.6
SB12	2-4	1.7
SB13	2-4	2.7
SB14	2-4	1.5
SB15	2-4	2.9
	Average	13.3
SL-1	Sludge	19
SL-2	Sludge	9.1
SL-3	Sludge	124.8
SL-4	Sludge	72.7
SL-5	Sludge	14.2
SL-6/7	Sludge	8.7
SL-8	Sludge	51
SL-10/11	Sludge	10.2
SL-12	Sludge	228.5
SL-13	Sludge	66.6
SL-14	Sludge	58.1
SL-15	Sludge	24.2
SL-17/18	Sludge	41.9
SL-19	Sludge	29.5
SL-20	Sludge	41
	Average	53.3

Notes:
mg/kg = milligrams per kilogram.
ft = feet
U - Not detected above listed reporting limit
Full reporting limit used in average calculation
Above 200 mg/kg residential screening level
Italicized sample were analyzed in 2005; none italicized samples were collected in 1987. Sludge samples were collected in 1994.
* - Sludge data presented are confirmation sample results, collected after sludge removal activities were completed.

Figures



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

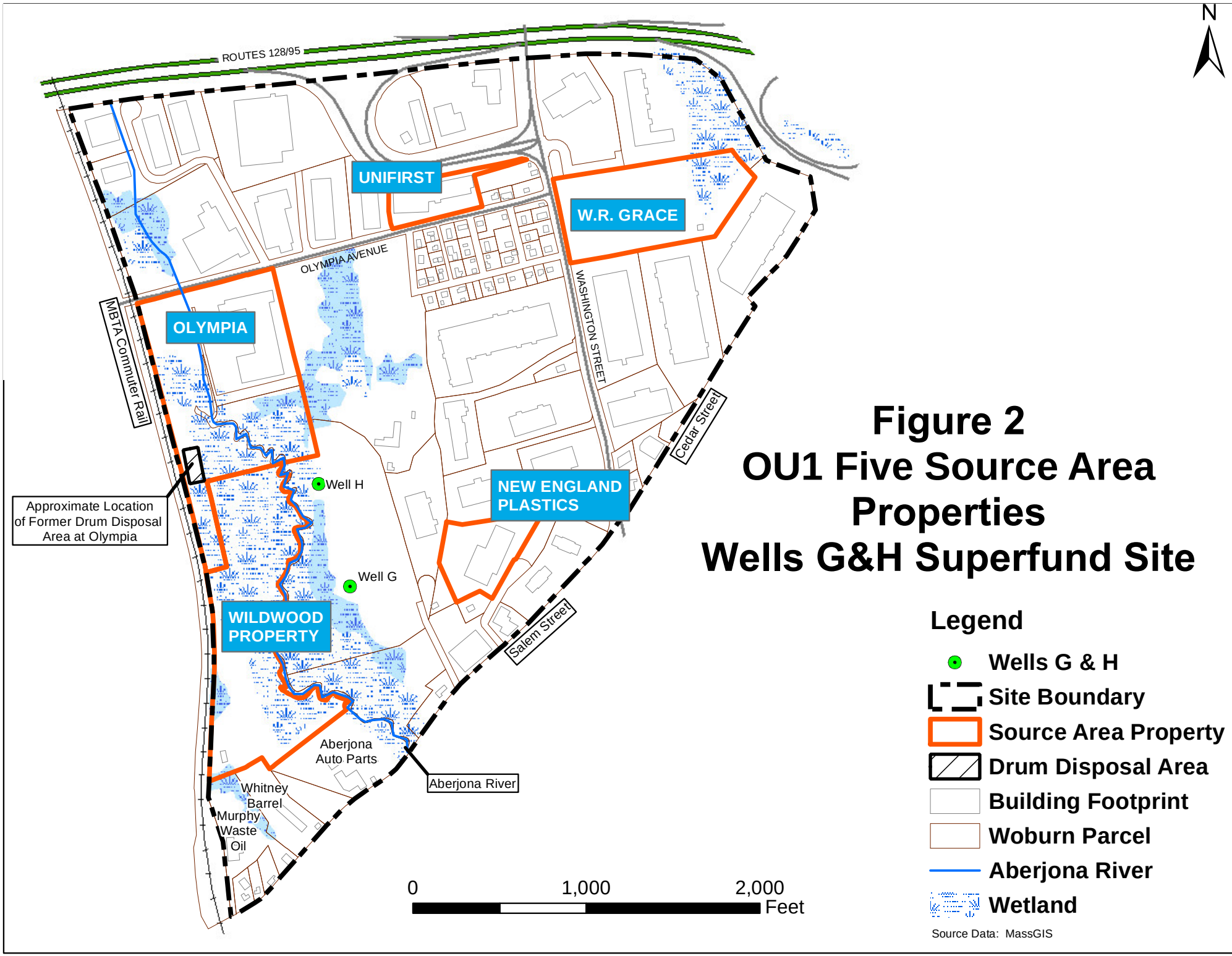
MASS

TRC PROJ. NO.: 104161

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

SUBCONTRACT NO.: 3493

T:\E_CAD\02136\WELLS G&H\JUNE_2009\LOCATION_060409


N
ROUTES 128/95
UNIFIRST
W.R. GRACE
OLYMPIA AVENUE
WASHINGTON STREET
MBTA Commuter Rail
OLYMPIA
Cedar Street
Well H
Approximate Location of Former Drum Disposal Area at Olympia
NEW ENGLAND PLASTICS
Well G
WILDWOOD PROPERTY
Salem Street
Aberjona Auto Parts
Aberjona River
Whitney Barrel
Murphy Waste Oil
0
1,000
2,000
Feet
Figure 2
OU1 Five Source Area Properties
Wells G&H Superfund Site
Legend
Wells G & H
Site Boundary
Source Area Property
Drum Disposal Area
Building Footprint
Woburn Parcel
Aberjona River
Wetland
Source Data: MassGIS

LEGEND

- RW7 • RECOVERY WELL LOCATION
- G36S • MONITORING WELL SCREENED IN THE UNCONSOLIDATED DEPOSITS
- G39D • MONITORING WELL SCREENED IN THE BEDROCK
- UG19 • MONITORING WELL SCREEN IN THE UNCONSOLIDATED DEPOSITS AND BEDROCK
- RW6 G35 ABANDONED MONITORING OR RECOVERY WELL
- A — A' LINE OF CROSS-SECTION
- STREAM
- WETLANDS
- FORMER BUILDING
- APPROX. FORMER W.R. GRACE PROPERTY BOUNDARY

ALL SIX AREA 2 EXTRACTION WELLS (RW7 THROUGH RW12) AND SEVEN AREA 3 EXTRACTION WELLS (RW13 THROUGH RW16, RW18, RW19 AND RW21) WERE SHUT DOWN ON JUNE 2, 2015.

ONLY MONITORING WELLS GAUGED AND/OR SAMPLED UNDER THE CURRENT W.R. GRACE ANNUAL MONITORING PROGRAM ARE DEPICTED ON THE EAST AND WEST CUMMINGS PARK PROPERTIES.

W.R GRACE

2-36 CUMMINGS PARK

200 CUMMINGS PARK WEST

WASHINGTON STREET

HOBSON AVE

WAINWRIGHT AVENUE

MARIETTA STREET

DEWEY AVE

SNYDER CREEK

STREAM GAUGE

GRACE SITE MAP AND WELL LOCATIONS

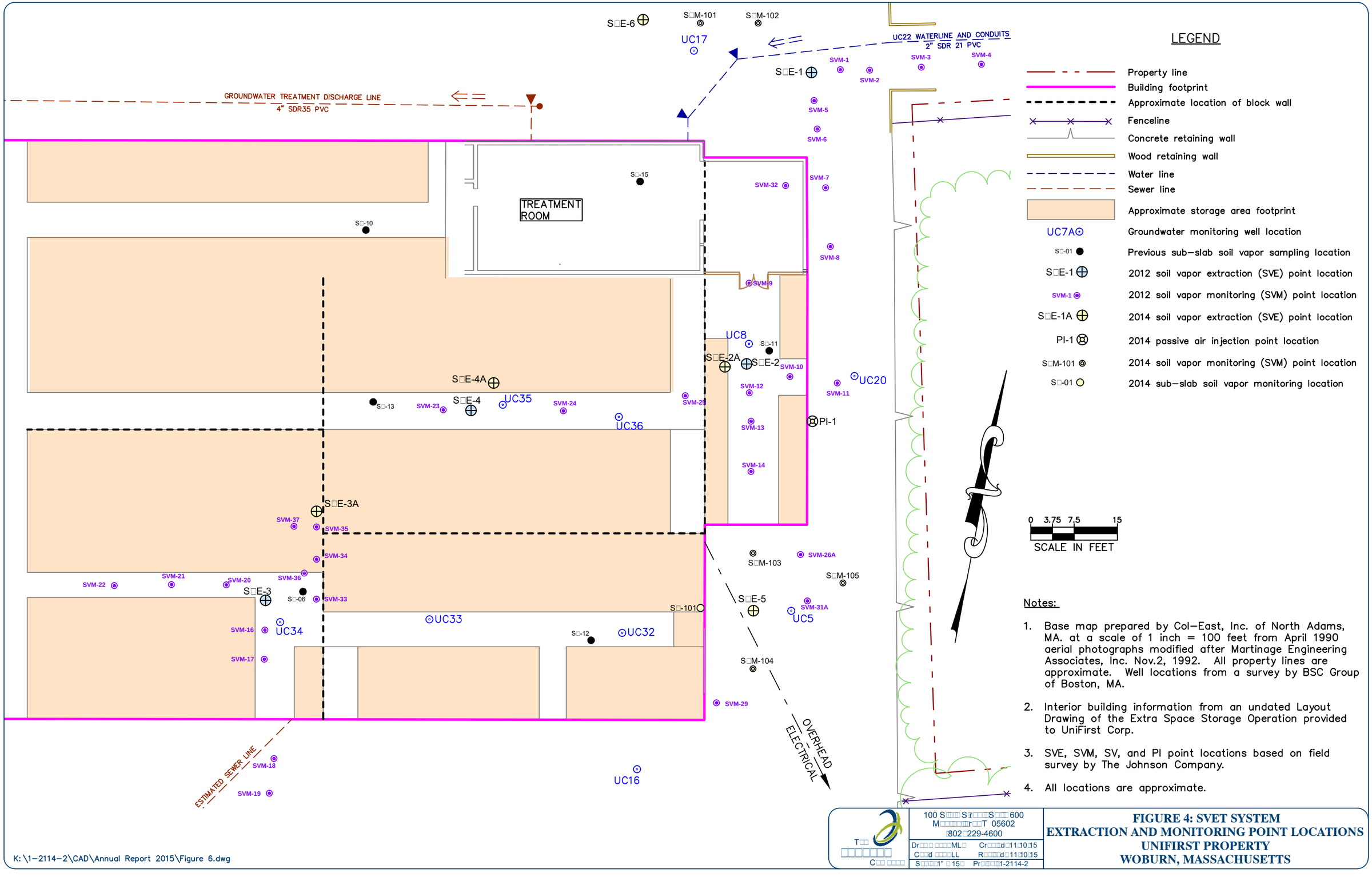
W.R. GRACE
WOBURN, MA

Drawn	J.T.L.
Designed	M.P.
Approved	S.S.
Date	12/13/18
Figure	3

Scale In Feet (Approximate)
0 150

Groundwater & Environmental Services, Inc.

L:\Projects\WR Grace & Co-Conn\Woburn\MA\GIS\WR_Grace_WoburnMA_Groundwater_Sampling_Locations.mxd - Scale 1:1,819 - 11/5/2018 8:59:01 AM - AWiddowson - NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet



LEGEND

- Property line
- Building footprint
- Approximate location of block wall
- Fenceline
- Concrete retaining wall
- Wood retaining wall
- Water line
- Sewer line
- Approximate storage area footprint
- UC7A — Groundwater monitoring well location
- S□-01 — Previous sub-slab soil vapor sampling location
- S□E-1 — 2012 soil vapor extraction (SVE) point location
- SVM-1 — 2012 soil vapor monitoring (SVM) point location
- S□E-1A — 2014 soil vapor extraction (SVE) point location
- PI-1 — 2014 passive air injection point location
- S□M-101 — 2014 soil vapor monitoring (SVM) point location
- S□-01 — 2014 sub-slab soil vapor monitoring location

0 3.75 7.5 15
SCALE IN FEET

Notes:

1. Base map prepared by Col-East, Inc. of North Adams, MA. at a scale of 1 inch = 100 feet from April 1990 aerial photographs modified after Martinage Engineering Associates, Inc. Nov.2, 1992. All property lines are approximate. Well locations from a survey by BSC Group of Boston, MA.
2. Interior building information from an undated Layout Drawing of the Extra Space Storage Operation provided to UniFirst Corp.
3. SVE, SVM, SV, and PI point locations based on field survey by The Johnson Company.
4. All locations are approximate.

100 S□□□ S□r□□□S□□□ 600
M□□□□□r□□T 05602
□802□229-4600

Dr□□ □ □□□□ML□ Cr□□□d□11□10□15
C□□d □□□□LL R□□□□d□11□10□15
S□□□□1" □ 15□ Pr□□□□1-2114-2

FIGURE 4: SVET SYSTEM EXTRACTION AND MONITORING POINT LOCATIONS UNIFIRST PROPERTY WOBURN, MASSACHUSETTS

K:\1-2114-2\CAD\Annual Report 2015\Figure 6.dwg

K:\1-2114-2\CAD\Well Installation Work Plan\Figure 4 - New Well Locations.mxd

Legend

- Proposed Extraction Well Installation Location
- Proposed Piezometer Installation Location
- Unconsolidated Deposits Monitoring Well Location
- Bedrock Monitoring Well Location
- Roads
- Buildings
- Property Boundary

Interstate 95 Off-Ramp

Washington Street

Olympia Avenue

DP36
UC10-1
UC10-2
UC10-3
UC10-4
UC10-5
UC10-6
UC10D
UC10S
UC10M
UC19M
UC19S
UC19
UC18
UC17
UC9-1
UC9-2
UC9-3
UC9-4
UC9-5
UC9-6
UC22
UC23-1
UC23-2
UC23-3
UC23-4
UC23-5
K42M
K42S
K42D
S6
UG8
S70S
S70M
S70D
UC24S
UC24D
UC35
UC8
UC20
UC36
UC31S
UC31D
UC31M
UC34
UC33
UC5
UC32
UC29S
UC29D
UC25
UC16
UC26S
UC26D
UC7-1
UC7-2
UC7-3
UC7-4
UC7-5
UC4
UG13
UC15
UC15S
UC15D
UC6S
DP25
PZ1
EX1
PZ2
PZ3
S71D
UC6
S71S
UC30
UG9
UG17
UG10
UG20
UG18
DP3

N

0 40 80 160 Feet

The Johnson Company

100 State Street, Suite 600
Montpelier, VT 05602

Drawn by: DPB Date: 02/26/13
Revised by: TJK Date: 04/28/14

Scale:1 " = 80 feet Project: 1-2114-2

FIGURE 4: PROPOSED EXTRACTION WELL AND PIEZOMETER INSTALLATION LOCATIONS
WOBURN, MASSACHUSETTS

Figure 5
UniFirst Site Map and Well Locations

Path: J:\Jobs\Rem_Eng\Project Files\Beatrice\Southwest Properties\7.0 Project Documents\7.2 CADD-GIS\GIS\Projects\O&M_Report\Year_15_16_Annual_Report\Figure_1_2_wildwood_property_well_GH_superfund_site.mxd

Legend

- Air Sparge Wells

Formation

- Monitoring Well
- Pumping Well
- VOCs in Soil Above Cleanup Criteria
- Vapor Extraction Well
- Vapor Extraction Network
- Treatment Cell
- Stream/Waterbody
- Southwest Properties
- Road
- Railroad
- Sewer Line
- Fence
- Air Sparge Network
- Cross Section

WILDWOOD PROPERTY

ABERJONA RIVER

ABERJONA AUTO PARTS PROPERTY

BW-7
BSW-7
BW-12
BSW-12
WW-201
WW-202
WW-211D
WW-211S
WW-200D
WW-200S
AS-2013-1
AS-2013-2
WW-210D
WW-210S
WW-213
BW-208
S78(R)
BW-11
BW-206
BSW-1
WW-203
BCW-14
BW-14
BW-14RD
BSW-14
BOW-14
BW-15RP
BSSW-15
BCW-15
BCW-13
BW-13
PZ-1B
PZ-1A
BSW-13
BW-18RD(LO)
BW-18RD-UP
BW-19R
BCW-18
BOW-10
BSW-10
PW-1
BW-6RD-UP
BW-6RD-LO
BCW-10
BW-10
WW-208D
WW-208S
WW-204
BW-6R
BOW-6
PW-2
WW-207
WW-205D
WW-102IO
BSSW-6
BSW-6
WW-209
WW-205S
BSSW-17
BW-17R
WW-206
BMW-17
PW-3
WW-212
WW-100SR
WW-101SR
Staff Gauge
S95D
S95SR
S95S
S95M
S92S
S92M
S92I
S92DR
S92SR
S92D
A
A'
B
B'
MWRA SEWER EASEMENT
CITY OF WOBURN SEWER EASEMENT
BW-9
BSW-9
BOW-9
BW-8
BOW-8
BCW-8
BSW-8
BSSW-5
BW-5R
BW-5
BW-2
PZ-8
PZ-9
AB-S5
BW-2R
BSW-2
TREATMENT BUILDING
RILEY WELL 2
FLOOR DRAIN
S77D
S77SR
S77M
S77SS
S77S
BW-16R
BOW-16
BSSW-16

N
W
E
S

NOTE: THE CROSS-SECTIONS ARE SHOWN ON FIGURES 5-4 AND 5-5.

0 75 150 Feet

AECOM

WILDWOOD PROPERTY
WELL G&H SUPERFUND SITE

FIGURE 6
SITE MAP AND WELL LOCATIONS

DATE: 2/16/2016	DRWN: H.K.M.	PROJECT:		

DRAWING NAME: J:\Projects\104161\cad\ fig6_sitelayout.dwg --- PLOT DATE: February 28, 2019 - 10:54AM --- LAYOUT: 11X17P

Legend

- Monitoring Wells
- Off-Property Shallow Overburden Well Location
- Former Bedrock Production Wells
- Deep Bedrock Wells

TOTAL CHLORINATED VOCS (CVOCs) IN GROUNDWATER

1,260	1988 concentration, ug/L
316	1989 concentration, ug/L
1,020	1990 concentration, ug/L
104	1992 concentration, ug/L
544	1996 concentration, ug/L
209	1998 concentration, ug/L
43	1999 concentration, ug/L
10	2000 concentration, ug/L
11	2001 concentration, ug/L
6	2002 concentration, ug/L
6	2003 concentration, ug/L
6	2004 concentration, ug/L
nd	2005 concentration, ug/L
6	2006 concentration, ug/L
nd	2007 concentration, ug/L
nd	2008 concentration, ug/L
1.8 U	2010 concentration, ug/L
6.5	2011 concentration, ug/L
2.8	2013 concentration, ug/L
2.6	2015 concentration, ug/L
2.8	2017 concentration, ug/L

Operation of AS/SVE Remedy Terminated on March 7, 2000

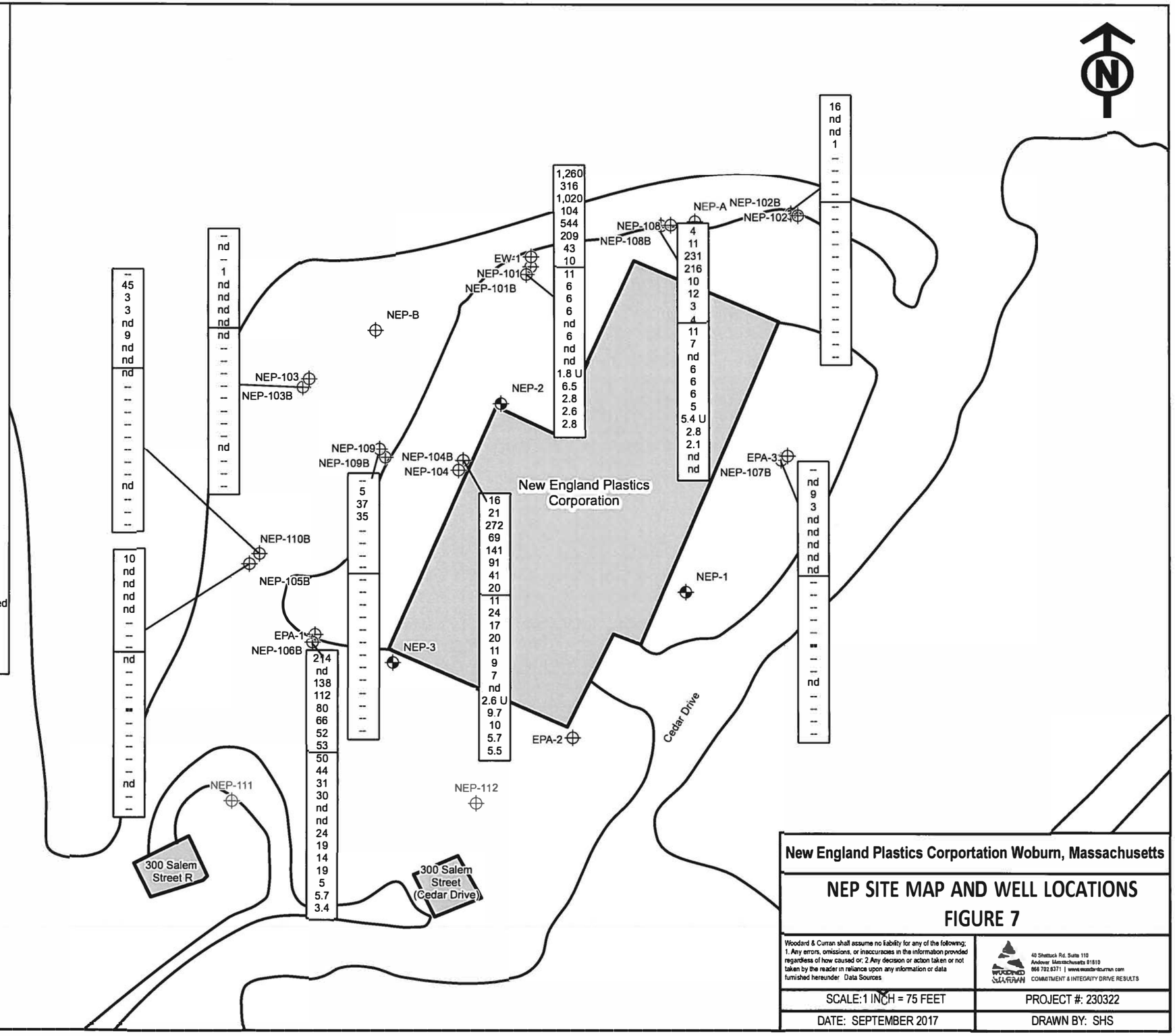
-- Indicates not sampled
nd Indicates not detected
U Non-Detect at reported concentration based on data quality assessment (2010 only)

Notes:

1. Bedrock wells were not sampled prior to 1988. NEP-109B was destroyed in 1993 and decommissioned in 2001. NEP-102B was paved over in 1996.

2. In October 2011, concentrations of methyl tert-butyl ether (MTBE; a non-chlorinated VOC) were also detected in overburden well NEP-107B at 18 ug/l.

3. Basemap inferred from MassGIS Orthophotography, 2008.



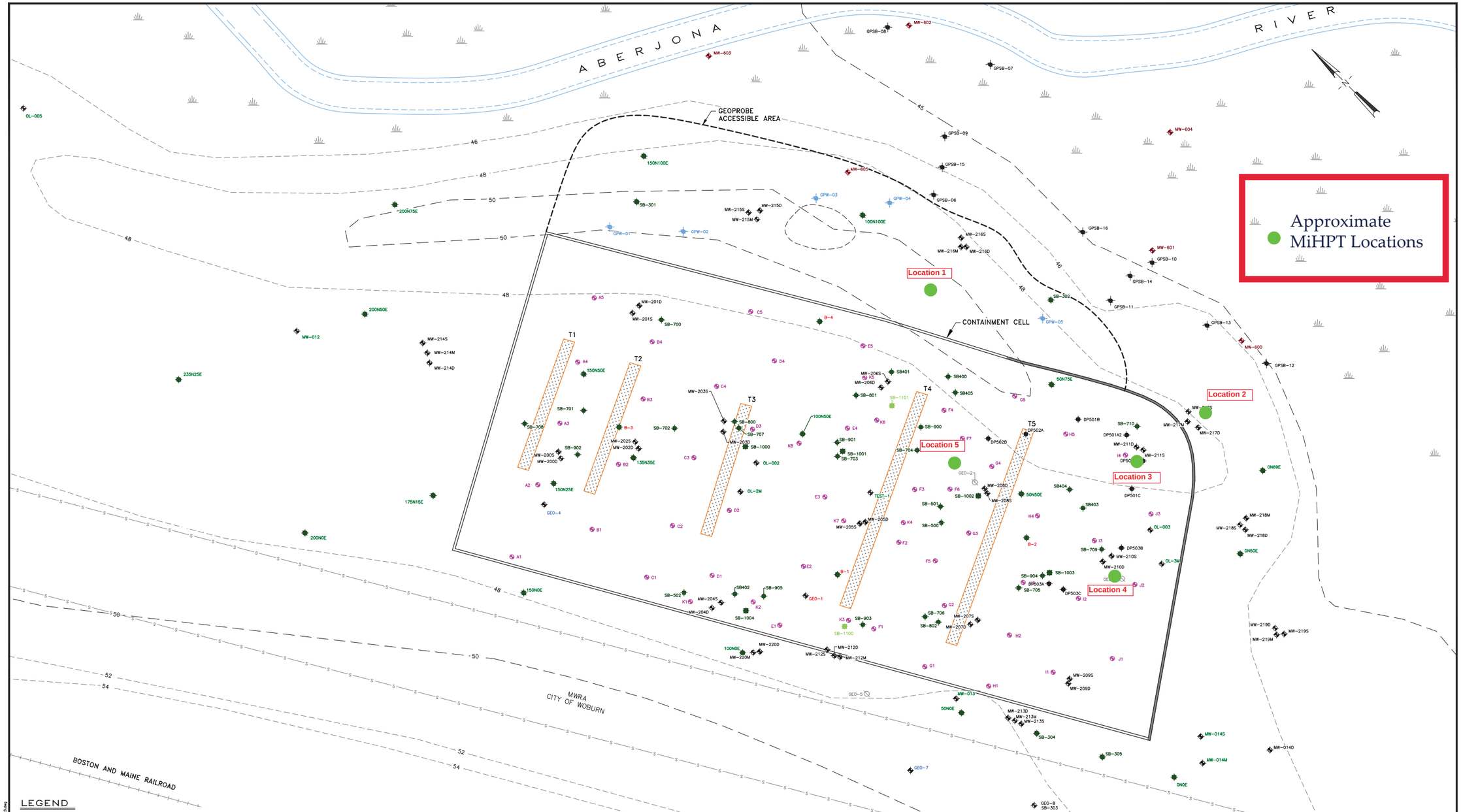
New England Plastics Corportation Woburn, Massachusetts

NEP SITE MAP AND WELL LOCATIONS
FIGURE 7

40 Shattuck Rd. Suite 110
Andover Massachusetts 01810
866 702 8371 | www.woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

SCALE:1 INCH = 75 FEET | PROJECT #: 230322

DATE: SEPTEMBER 2017 | DRAWN BY: SHS



LEGEND

GEO-6	MONITORING WELL–GEOINSIGHT 2003 INVESTIGATION
GEO-1	DEEP OVERBURDEN WELL–GEOINSIGHT 1999 INVESTIGATION
MW-1	MONITORING WELL–PREVIOUS INVESTIGATIONS
GEO-3	MONITORING WELL – DESTROYED
MW-216S	REMEDIAL MONITORING WELL – GEOINSIGHT 2005
MW-600	MONITORING WELL LOCATION AND DESIGNATION
GEO-8/ SB-303	MONITORING WELL/SOIL BORING LOCATION AND DESIGNATION (2007)
SB-1001	SOIL BORING LOCATION AND DESIGNATION SUMMER 2011
SB-1101	SOIL BORING LOCATION AND DESIGNATION FALL 2011
C1	INJECTION WELL LOCATION AND DESIGNATION
SB-304	SOIL BORING LOCATION AND DESIGNATION
GPSB-12	SOIL BORING LOCATION (JUNE 2008)
GPW-05	DISCRETE GROUND WATER SAMPLING POINTS
S S	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
	APPROXIMATE LOCATION OF DEPRESSION OUTSIDE THE FENCE EAST OF THE TREATMENT CELL

NOTES:

1. BEARINGS ARE REFERENCED TO THE MASSACHUSETTS MAINLAND COORDINATE SYSTEM (NAD 27) HOLDING COASTAL GEODETIC SURVEY (CGS) MONUMENTS 414 AND 11095. 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 FORM 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 548+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" = 60', 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 3507C.

E. "SUBDIVISION PLAN OF LAND IN WOBURN," HAYES ENGINEERING, INC., SURVEYORS, DATED JANUARY 14, 1983, LAND COURT DOCUMENT 3507D.

F. "PLAN OF LAND IN WOBURN," H. KINGMAN ABBOTT, SURVEYOR, JANUARY 8, 1962, NOVEMBER 1966, LAND COURT DOCUMENT 32181A.

0 10 20
APPROX. SCALE IN FEET

CLIENT: OLYMPIA NOMINEE TRUST			
PROJECT: 60 OLYMPIA AVENUE			
TITLE: SITE PLAN			
DESIGNED: RSE	DRAWN: DMR	CHECKED: CAB	APPROVED: MJW
SCALE: 1" = 10'	DATE: 05/08/19	FILE NO.: 2491D123	PROJECT NO.: 2491

GeoInsight
Practical in Nature

FIGURE NO.: 8

PLOT DATE: 5-8-19
C:\Users\rsimpson\Documents\Woburn\Local\Temp\AcPublish_8156\PC2491D123.dwg

Exhibits

Exhibit 1

Wells Sampled During FYR Period
Wildwood Property

Shallow Overburden

BSSW-5	**BSSW-6**	BOW-8	BW-208	**BOW-10**
BOW-14	**BSSW-15**	**BSSW-17**	**S77SS**	**S92S**
S95S	**WW-204**	**WW-205S**	**WW-207**	**WW-208S**

Intermediate Overburden

BSW-1	**BW-206**	**BSW-6**	BSW-8	BSW-9
BSW-10	**BSW-12**	**BSW-13**	BSW-14	**BOW-16**
S77S	**S92I**	**S92M**	**S95M**	WW-102IO
WW-200S	**WW-200D**	WW-201	**WW-203**	**WW-205D**
WW-206	**WW-208D**	**WW-209**	**WW-210S**	**WW-211S**
WW-212	**WW-213**			

Deeper Overburden

BW-5	**BCW-8**	**BCW-10**	BW-11	BCW-14
S77M	**S92D**	**WW-202**	**WW-210D**	**WW-211D**

Till

BOW-6	BCW-13	BCW-15	BCW-18	**S77D**
S95D				

Shallow Bedrock

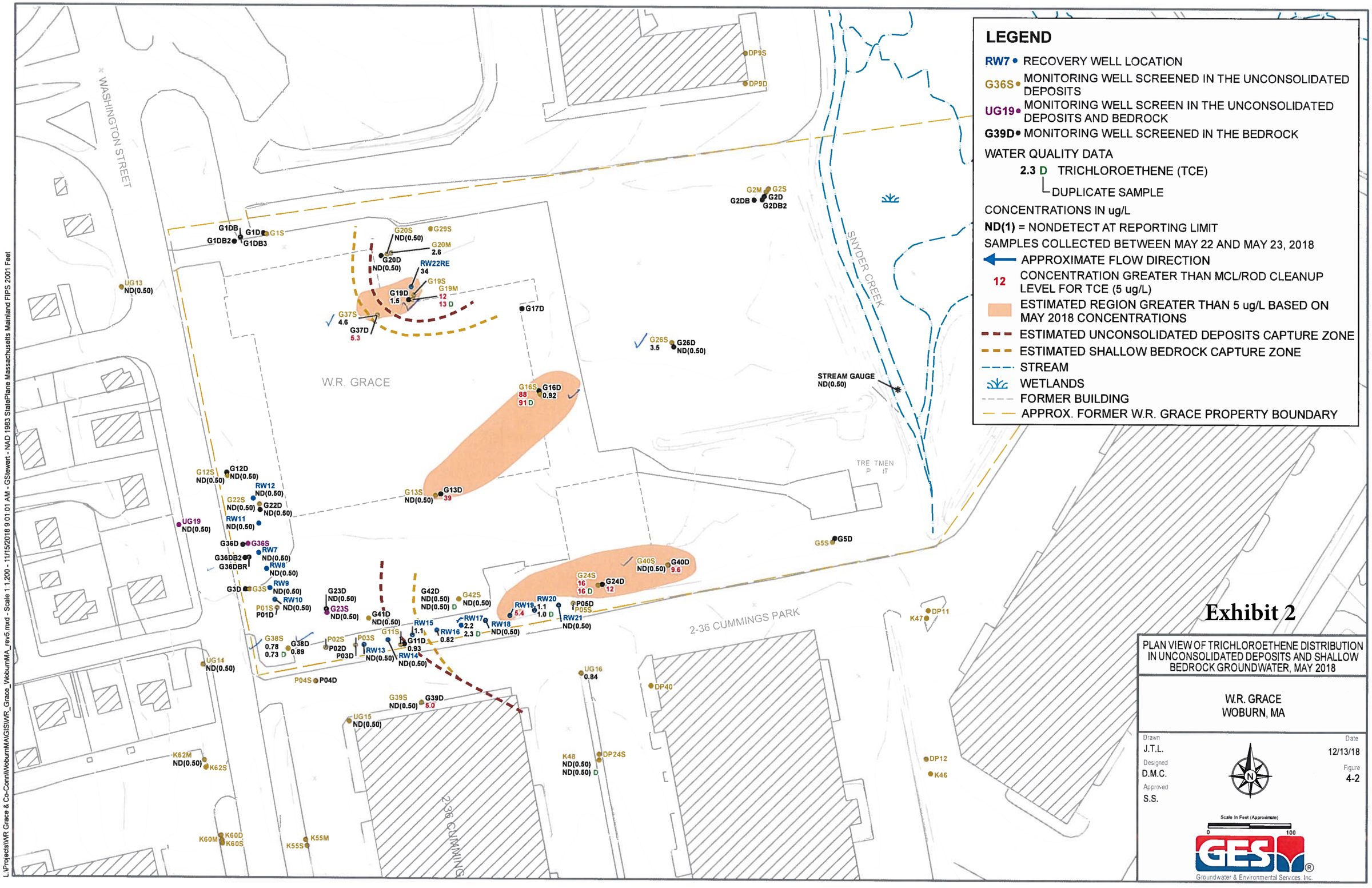
BW-5R	**BW-6R**	**BW-8**	**BW-9**	**BW-10**
BW-13	**BW-14**	BW-15RP	**BW-17R**	**BW-19R (recovery well)**
S77SR	**S92SR**	**S95SR**	**WW100SR**	**WW101SR**
PW-1 (recovery well)	PW-2 (recovery well)	PW-3 (recovery well)		

Deeper Bedrock

BW-6RD(LO)	**BW-14RD**	**BW-18RD(LO) (recovery well)**	**S92DR**	

Note:

Bold indicates well was included in expanded monitoring event completed during 2018.



LEGEND

- RW7 • RECOVERY WELL LOCATION
- G36S • MONITORING WELL SCREENED IN THE UNCONSOLIDATED DEPOSITS
- UG19 • MONITORING WELL SCREEN IN THE UNCONSOLIDATED DEPOSITS AND BEDROCK
- G39D • MONITORING WELL SCREENED IN THE BEDROCK

WATER QUALITY DATA

2.3 D TRICHLOROETHENE (TCE)
└ DUPLICATE SAMPLE

CONCENTRATIONS IN ug/L

ND(1) = NONDETECT AT REPORTING LIMIT

SAMPLES COLLECTED BETWEEN MAY 22 AND MAY 23, 2018

- APPROXIMATE FLOW DIRECTION
- 12 CONCENTRATION GREATER THAN MCL/ROD CLEANUP LEVEL FOR TCE (5 ug/L)
- ESTIMATED REGION GREATER THAN 5 ug/L BASED ON MAY 2018 CONCENTRATIONS
- ESTIMATED UNCONSOLIDATED DEPOSITS CAPTURE ZONE
- ESTIMATED SHALLOW BEDROCK CAPTURE ZONE
- STREAM
- WETLANDS
- FORMER BUILDING
- APPROX. FORMER W.R. GRACE PROPERTY BOUNDARY

Exhibit 2

PLAN VIEW OF TRICHLOROETHENE DISTRIBUTION IN UNCONSOLIDATED DEPOSITS AND SHALLOW BEDROCK GROUNDWATER, MAY 2018

W.R. GRACE
WOBURN, MA

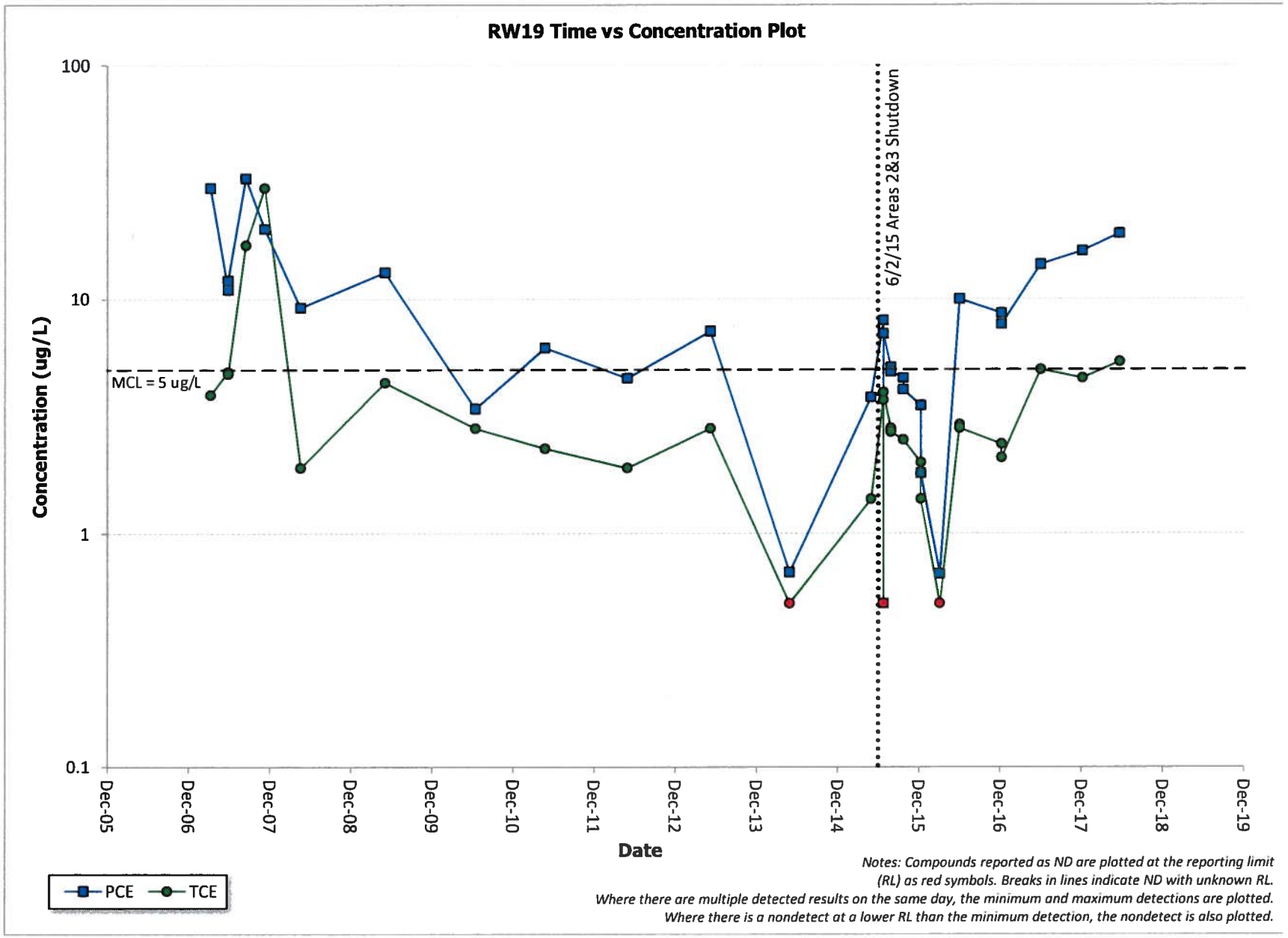
Drawn: J.T.L.
Designed: D.M.C.
Approved: S.S.
Date: 12/13/18
Figure: 4-2

Scale In Feet (Approximate)
0 100

Groundwater & Environmental Services, Inc.

L:\Projects\WR Grace & Co-Conn\Woburn MA\GIS\WR_Grace_WoburnMA_rev5.mxd - Scale 1:1,200 - 11/15/2018 9:01:01 AM - GStewart - NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

Exhibit 3


RW19 Time vs Concentration Plot
100
10
1
0.1
Concentration (ug/L)
MCL = 5 ug/L
6/2/15 Areas 2&3 Shutdown
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Date
PCE
TCE
Notes: Compounds reported as ND are plotted at the reporting limit (RL) as red symbols. Breaks in lines indicate ND with unknown RL.
Where there are multiple detected results on the same day, the minimum and maximum detections are plotted.
Where there is a nondetect at a lower RL than the minimum detection, the nondetect is also plotted.

LEGEND

RW7 • RECOVERY WELL LOCATION

G36S • MONITORING WELL SCREENED IN THE UNCONSOLIDATED DEPOSITS

UG19 • MONITORING WELL SCREEN IN THE UNCONSOLIDATED DEPOSITS AND BEDROCK

G39D • MONITORING WELL SCREENED IN THE BEDROCK

WATER QUALITY DATA

3.2 D TETRACHLOROETHENE (PCE)

└ DUPLICATE SAMPLE

CONCENTRATIONS IN ug/L

ND(1) = NONDETECT AT REPORTING LIMIT

SAMPLES COLLECTED BETWEEN MAY 22 AND MAY 23, 2018

APPROXIMATE FLOW DIRECTION

10 CONCENTRATION GREATER THAN MCL/ROD CLEANUP LEVEL FOR PCE (5 ug/L)

ESTIMATED REGION GREATER THAN 5 ug/L BASED ON MAY 2018 CONCENTRATIONS

ESTIMATED UNCONSOLIDATED DEPOSITS CAPTURE ZONE

ESTIMATED SHALLOW BEDROCK CAPTURE ZONE

STREAM

WETLANDS

FORMER BUILDING

APPROX. FORMER W.R. GRACE PROPERTY BOUNDARY

Exhibit 4

PLAN VIEW OF TETRACHLOROETHENE DISTRIBUTION IN UNCONSOLIDATED DEPOSITS AND SHALLOW BEDROCK GROUNDWATER, MAY 2018

W.R. GRACE
WOBURN, MA

Drawn: J.T.L.
Designed: D.M.C.
Approved: S.S.
Date: 12/13/18
Figure: 4-1

Scale In Feet (Approximate): 0 100

Groundwater & Environmental Services, Inc.

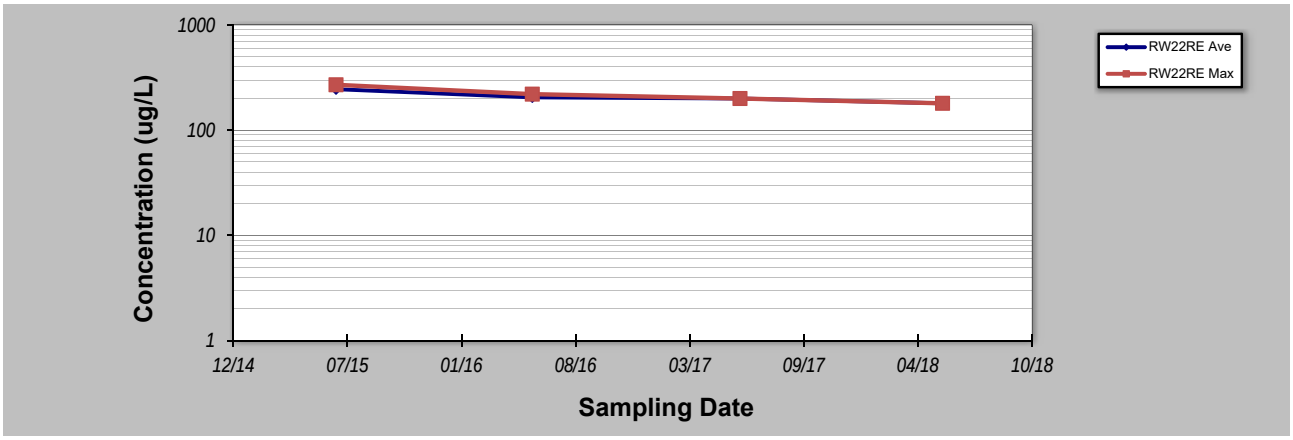
L:\Projects\WR Grace & Co-Conn\Woburn\MA\GIS\WR_Grace_WoburnMA_rev5.mxd - Scale 1:1,200 - 11/15/2018 8:58:24 AM - GStewart - NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

Exhibit 5
Cis-1,2-Dichloroethene Trend
in Recovery Well RW-22RE

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:
Facility Name:
Conducted By:
Job ID:
Constituent:
Concentration Units:

Sampling Point ID:	RW22RE Ave	RW22RE Max					
Sampling Event	Sampling Date	CDCE CONCENTRATION (ug/L)						
1	Jun-15	245	270					
2	3-Jun-16	205	220					
3	2-Jun-17	200	200					
4	23-May-18	180	180					
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.13	0.18					
Mann-Kendall Statistic (S):		-6	-6					
Confidence Factor:		95.8%	95.8%					
Concentration Trend:		Decreasing	Decreasing					



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

Exhibit 6

Figure 9: SVET System - Estimated Cumulative Mass Removal by SVE Points

UniFirst Property
Woburn, Massachusetts

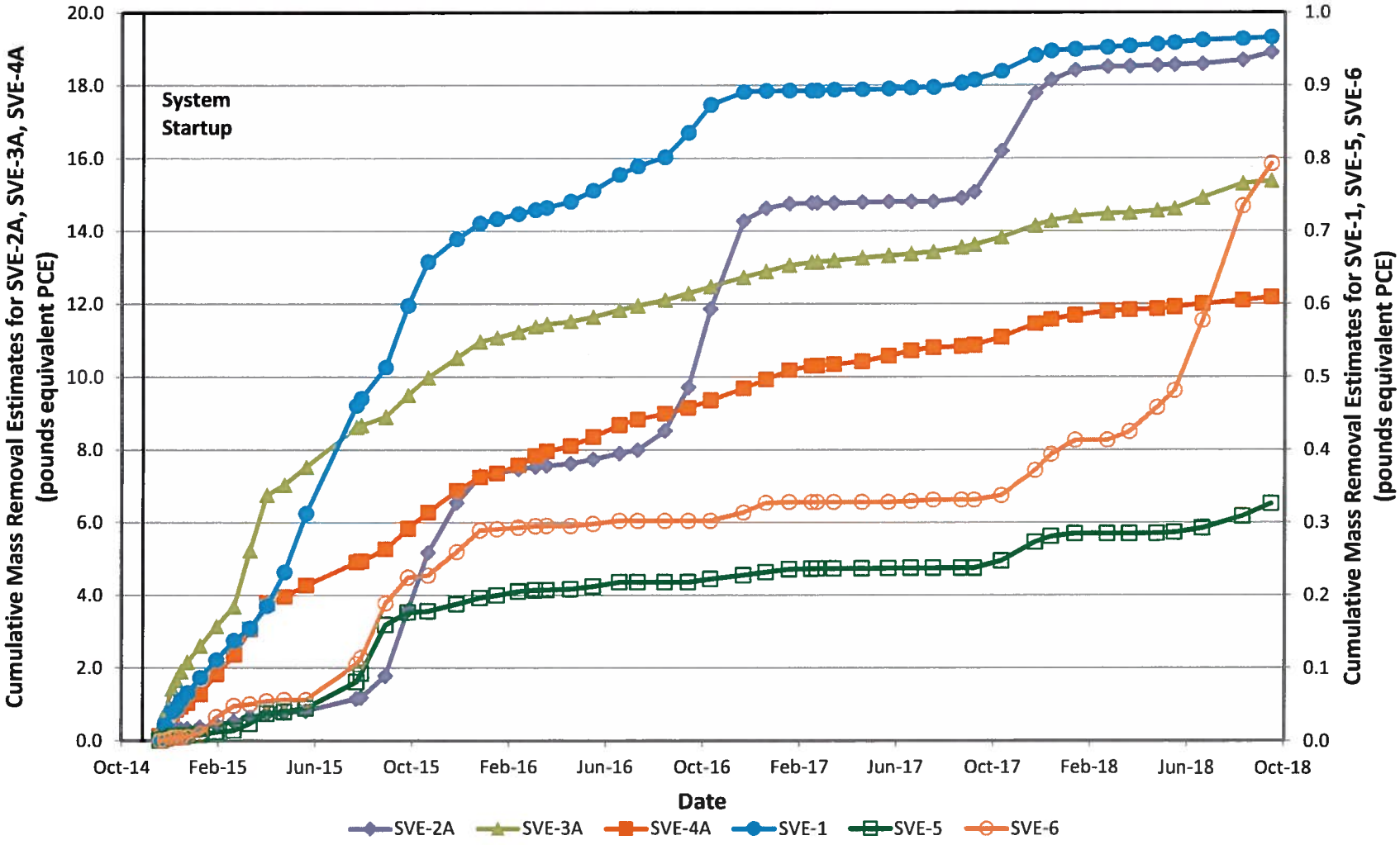


Exhibit 7

Figure 8: SVET System - Total VOC Concentrations at SVE Points

UniFirst Property
Woburn, Massachusetts

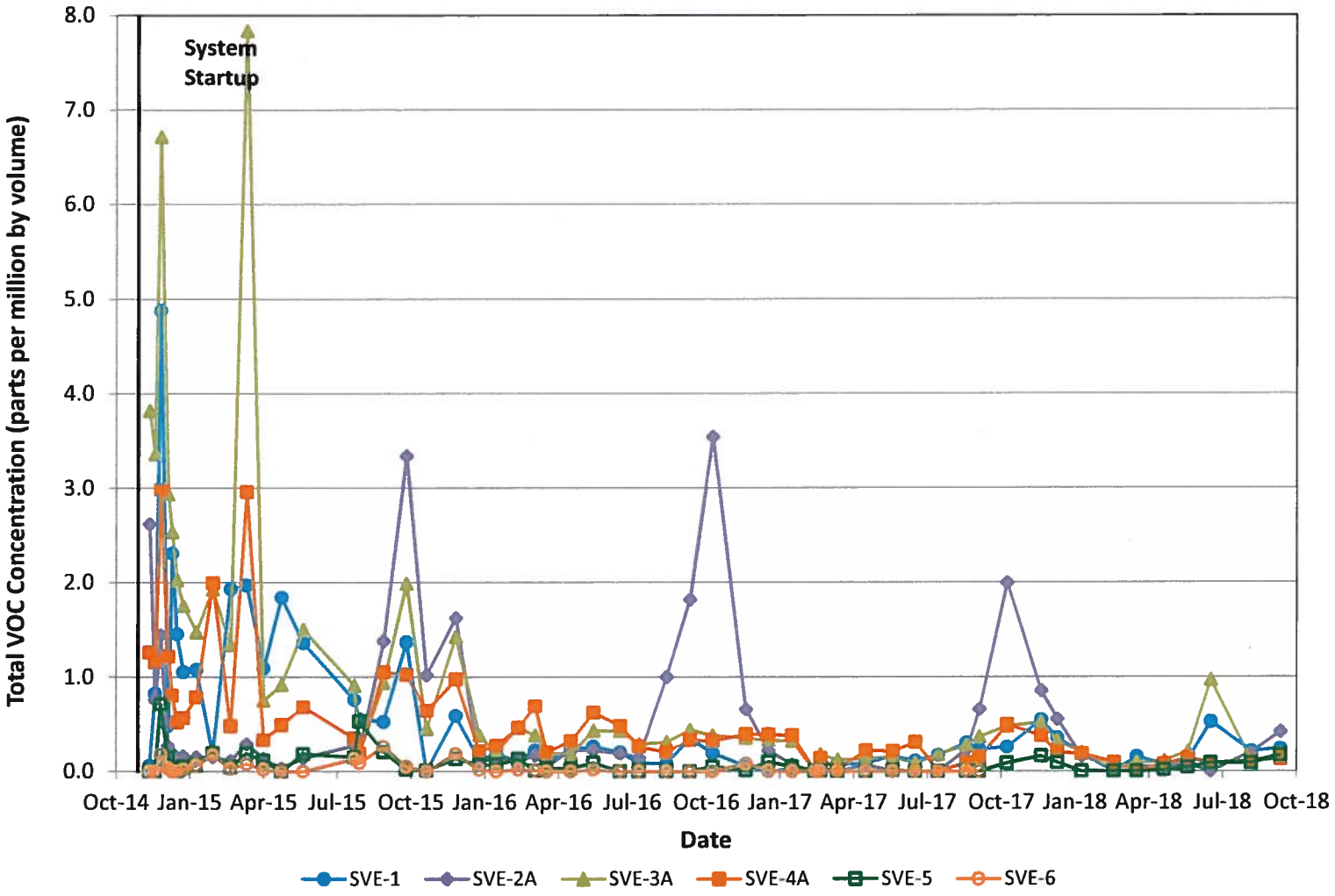


Exhibit 8

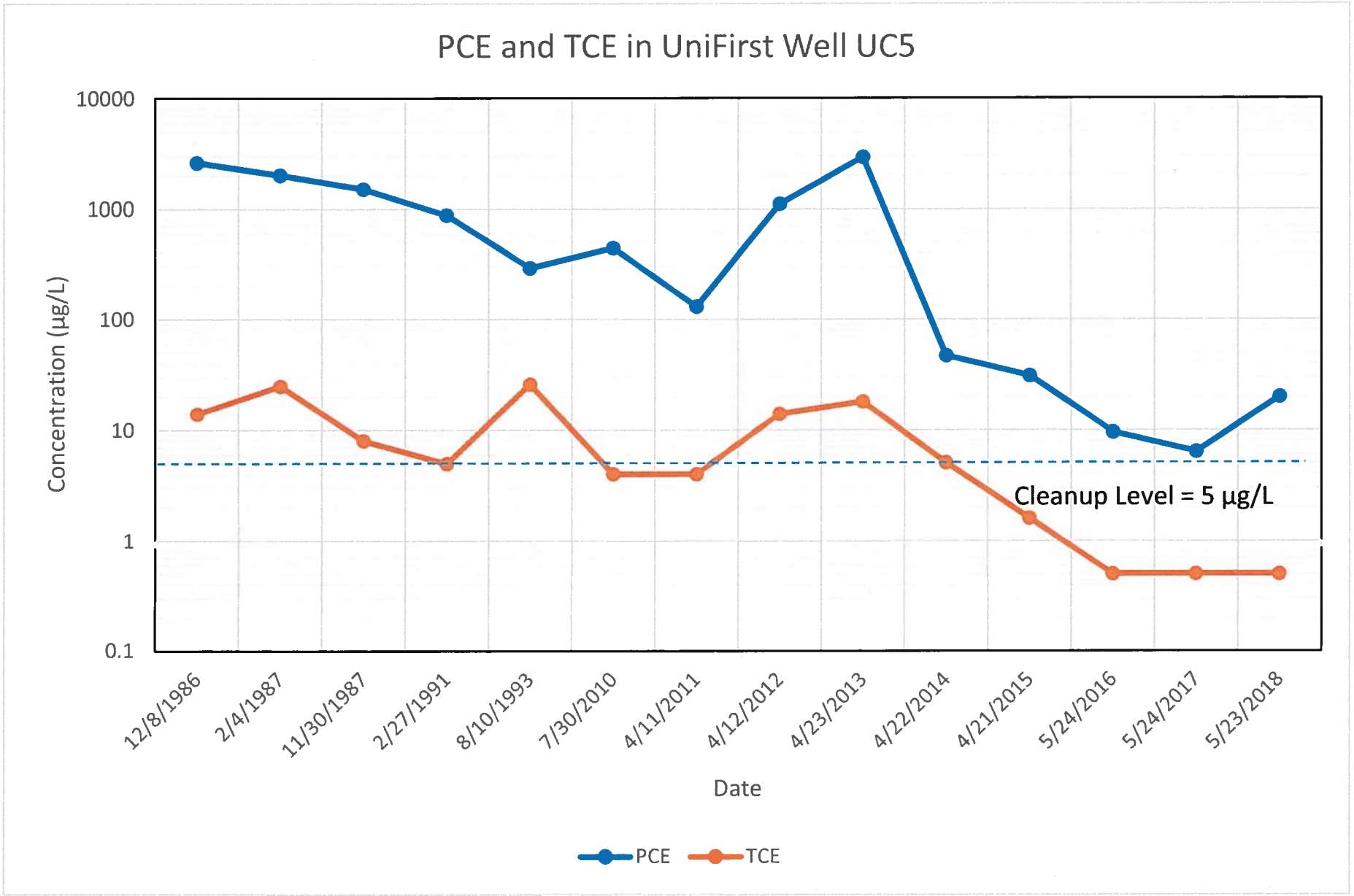

PCE and TCE in UniFirst Well UC5
Concentration (µg/L)
10000
1000
100
10
1
0.1
Cleanup Level = 5 µg/L
12/8/1986
2/4/1987
11/30/1987
2/27/1991
8/10/1993
7/30/2010
4/11/2011
4/12/2012
4/23/2013
4/22/2014
4/21/2015
5/24/2016
5/24/2017
5/23/2018
Date
PCE
TCE

Exhibit 9

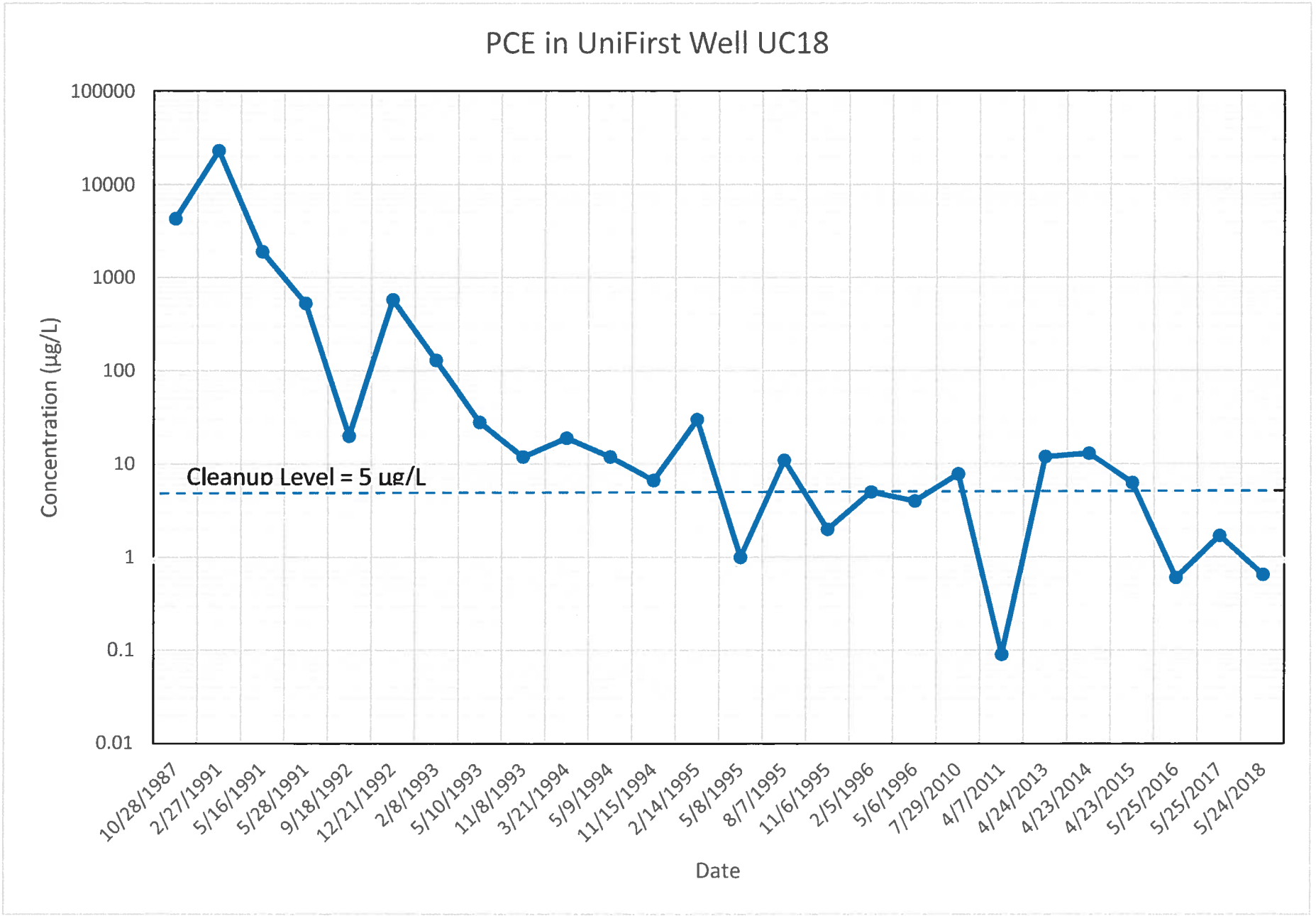
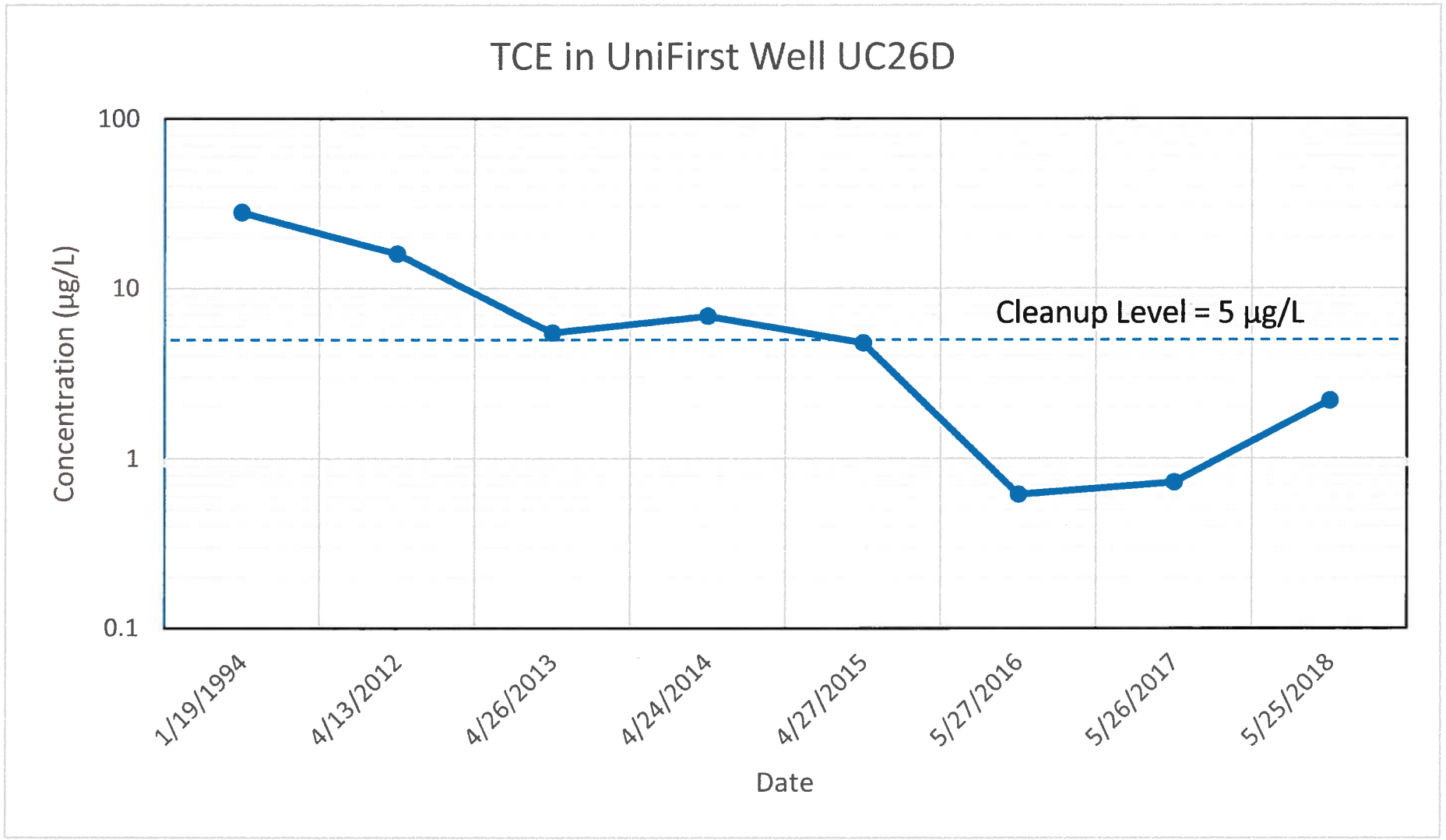

PCE in UniFirst Well UC18
Concentration (µg/L)
100000
10000
1000
100
10
1
0.1
0.01
Cleanup Level = 5 ug/L
10/28/1987
2/27/1991
5/16/1991
5/28/1991
9/18/1992
12/21/1992
2/8/1993
5/10/1993
11/8/1993
3/21/1994
5/9/1994
11/15/1994
2/14/1995
5/8/1995
8/7/1995
11/6/1995
2/5/1996
5/6/1996
7/29/2010
4/7/2011
4/24/2013
4/23/2014
4/23/2015
5/25/2016
5/25/2017
5/24/2018
Date

Exhibit 10


TCE in UniFirst Well UC26D
Concentration (µg/L)
100
10
1
0.1
Cleanup Level = 5 µg/L
1/19/1994
4/13/2012
4/26/2013
4/24/2014
4/27/2015
5/27/2016
5/26/2017
5/25/2018
Date

Path: P:\Jobs\Rem_Eng\Project Files\Beatrice\Southwest Properties\7.0 Project Documents\7.2 CADD-GIS\GIS\Projects\O&M_Report\Year_18_Annual_Report\MXD\Fig_5_1_Low_GW_Elevation_Contours_October_26_2015.mxd

Note: Groundwater elevations at BW-11, BSW-12, BCW-13, PZ-1A/B, BSW-9, and BCW-8 were not used to develop contours based on professional judgement.

Note: Groundwater elevations at BW-6RD-UP and the pumping wells BW-18RD-LO, PW-1, PW-2 and PW-3 were not used to develop contours based on professional judgement.

WILDWOOD PROPERTY

WELL "G"

ABERJONA RIVER

MWRA SEWER EASEMENT

CITY OF WOBURN SEWER EASEMENT

ABERJONA AUTO PARTS PROPERTY

TREATMENT BUILDING

RILEY WELL 2

1978 ADDITION FLOOR DRAIN

OIL/WATER SEPERATOR

FORMER BOILER ROOM CONCRETE SLAB ON GRADE

BSW-7 43.18
BOW-9 44.12
BSSW-5 42.75
BSSW-6 43.03
BW-208 45.18
BOW-14 43.80
BSSW-15 43.35
BOW-10 43.06
BSSW-17 42.90
BOW-8 42.80
BSSW-16 42.45
S92S 42.90
PZ-8 NM
PZ-9 NM
BSW-2 42.89
AB-S5 DRY
STAFF GAUGE 42.28
S95S 42.50
S77SS 42.35
45.0
44.5
44.0
43.5
43.0
42.5

BW-7 43.40
BW-12 43.44
BSW-12 43.85
BW-11 42.67
BW-206 43.17
BSW-13 43.31
BSW-1 43.16
PZ-1B 43.15
BCW-13 42.52
PZ-1A 43.16
BSW-14 43.17
BCW-14 43.15
BCW-15 42.50
BCW-18 39.38
BCW-10 43.07
BSW-10 43.06
BOW-6 42.98
BSW-6 43.02
WW-102IO 42.96
BMW-17 37.96
BSW-9 41.90
BCW-8 41.92
BSW-8 42.66
BW-5 42.14
BW-2 43.21
BOW-16 42.59
S92D 43.08
S92M 43.10
S92I 43.12
S95D 42.80
S95M 42.73
S77D 42.56
S77M 42.62
S77S 42.32
43.4
43.2
43.0
42.8
42.6
42.4
42.2
41.0

S92SR 43.11
S92DR 43.09
S78(R) 43.01
BW-14RD 42.95
BW-14 42.84
WW-100SR 43.33
BW-19R 37.85
BW-13 42.11
BW-15RP 38.42
BW-18RD-UP 44.77
BW-18RD-LO -32.56
PW-1 -5.86
PW-2 -19.61
PW-3 -15.13
BW-6RD-UP 43.27
BW-6R 42.98
BW-6RD-LO 41.60
BW-10 43.07
BW-17R 43.11
WW-101SR 43.24
S95SR 42.98
S77SR 42.60
BW-9 43.14
BW-8 42.89
BW-5R 42.72
BW-16R 42.62
BW-2R 42.87
43.0
42.0
41.0

SHALLOW OVERBURDEN

INTERMEDIATE AND DEEP OVERBURDEN

BEDROCK

Exhibit 11

AECOM

- Monitoring Well with Groundwater Elevation
- Low Groundwater Contour
- Treatment Cell
- Stream/Waterbody
- Interpreted Capture Zone based on October 2015 data
- Southwest Properties
- Road
- NM Not Measured
- Railroad
- Sewer Line
- Fence

N W E S

0 60 120 Feet

WELLS G & H
WILDWOOD PROPERTY
WOBURN, MA

DATE: 7/5/2017 | DRWN: JB | PROJECT 60160533

FIGURE 1
LOW GROUNDWATER CONTOURS
OCTOBER 26, 2015

Exhibit 12

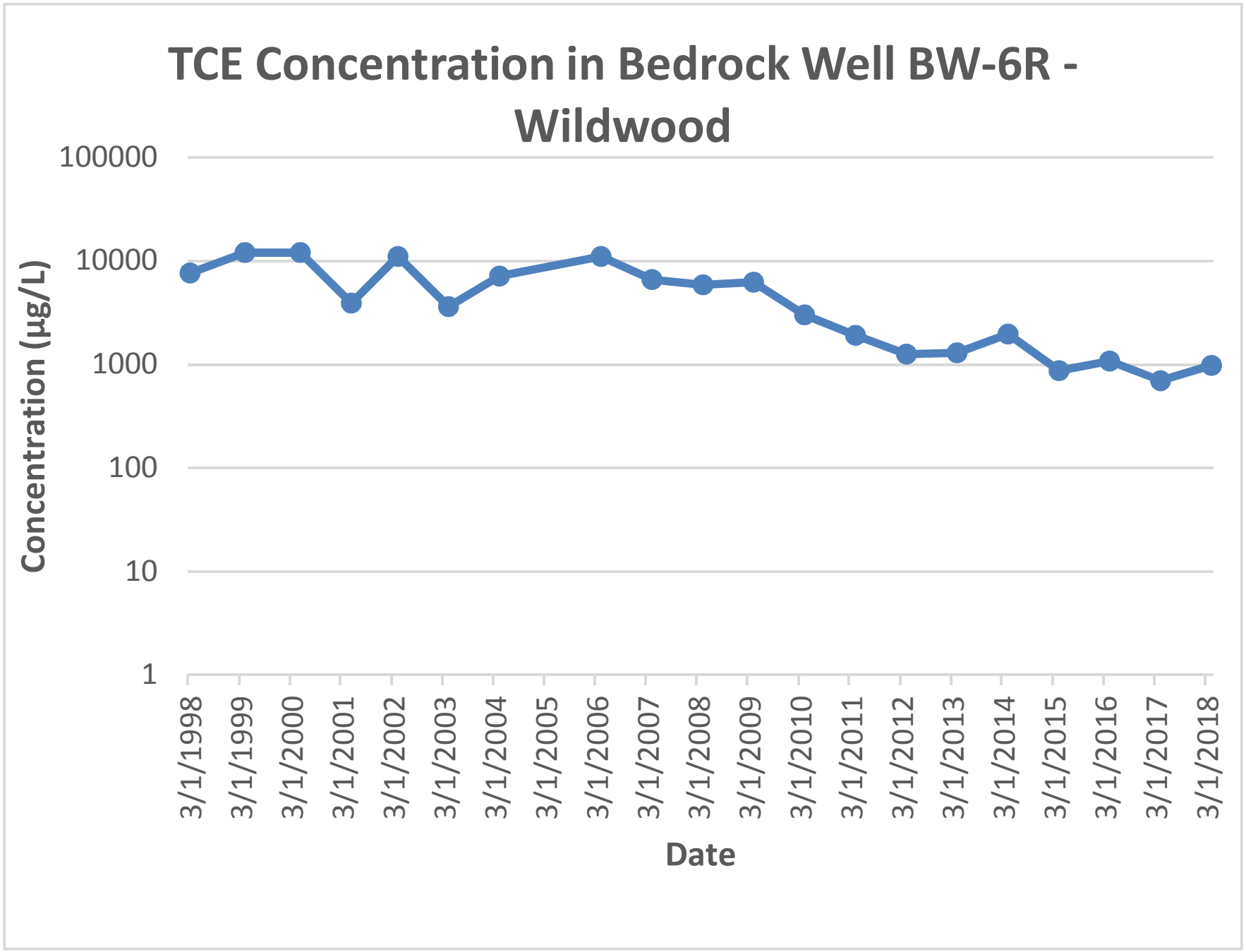

TCE Concentration in Bedrock Well BW-6R - Wildwood
Concentration (µg/L)
100000
10000
1000
100
10
1
3/1/1998
3/1/1999
3/1/2000
3/1/2001
3/1/2002
3/1/2003
3/1/2004
3/1/2005
3/1/2006
3/1/2007
3/1/2008
3/1/2009
3/1/2010
3/1/2011
3/1/2012
3/1/2013
3/1/2014
3/1/2015
3/1/2016
3/1/2017
3/1/2018
Date

Exhibit 13

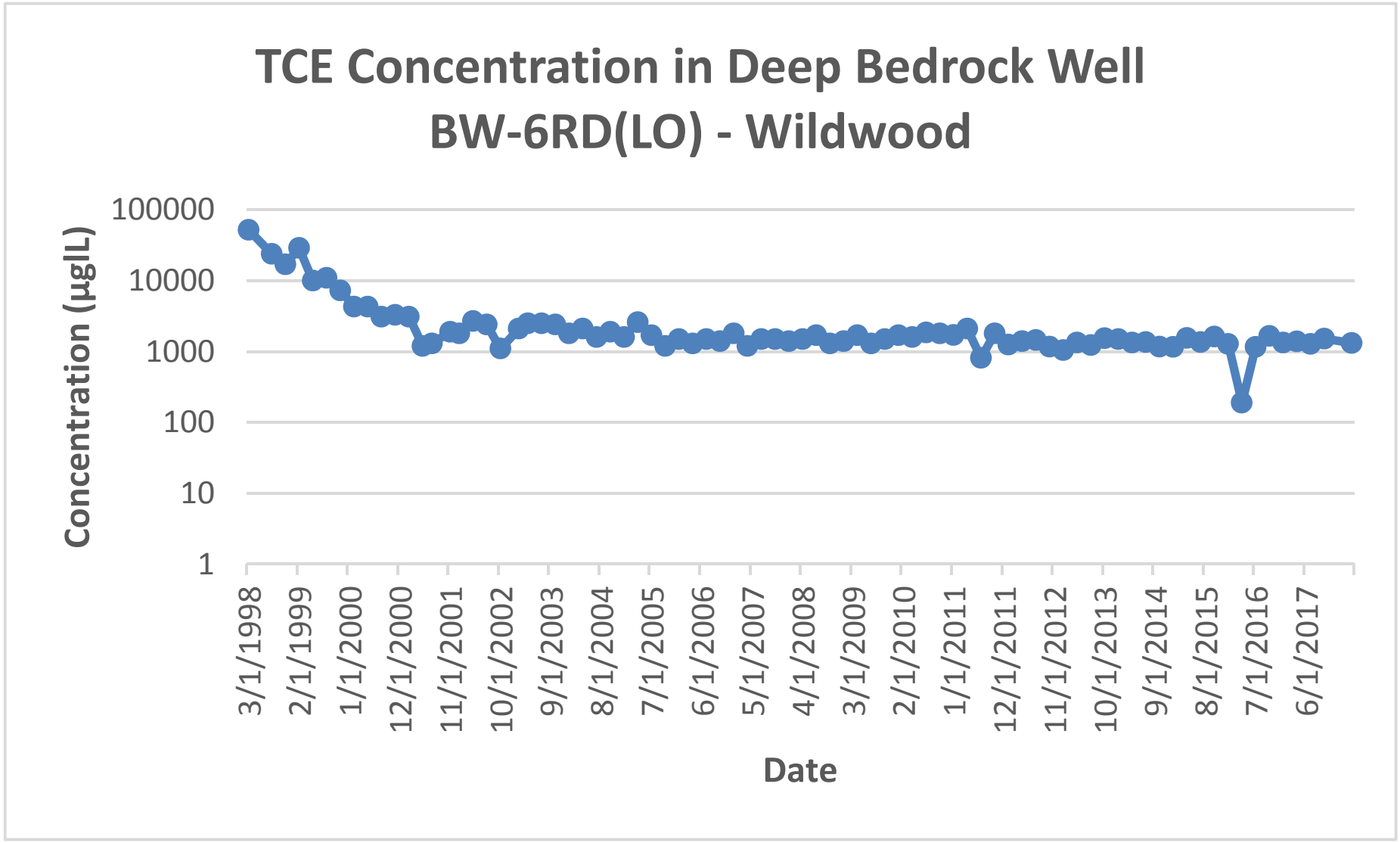

TCE Concentration in Deep Bedrock Well
BW-6RD(LO) - Wildwood
Concentration (µg/L)
100000
10000
1000
100
10
1
3/1/1998
2/1/1999
1/1/2000
12/1/2000
11/1/2001
10/1/2002
9/1/2003
8/1/2004
7/1/2005
6/1/2006
5/1/2007
4/1/2008
3/1/2009
2/1/2010
1/1/2011
12/1/2011
11/1/2012
10/1/2013
9/1/2014
8/1/2015
7/1/2016
6/1/2017
Date

Exhibit 14

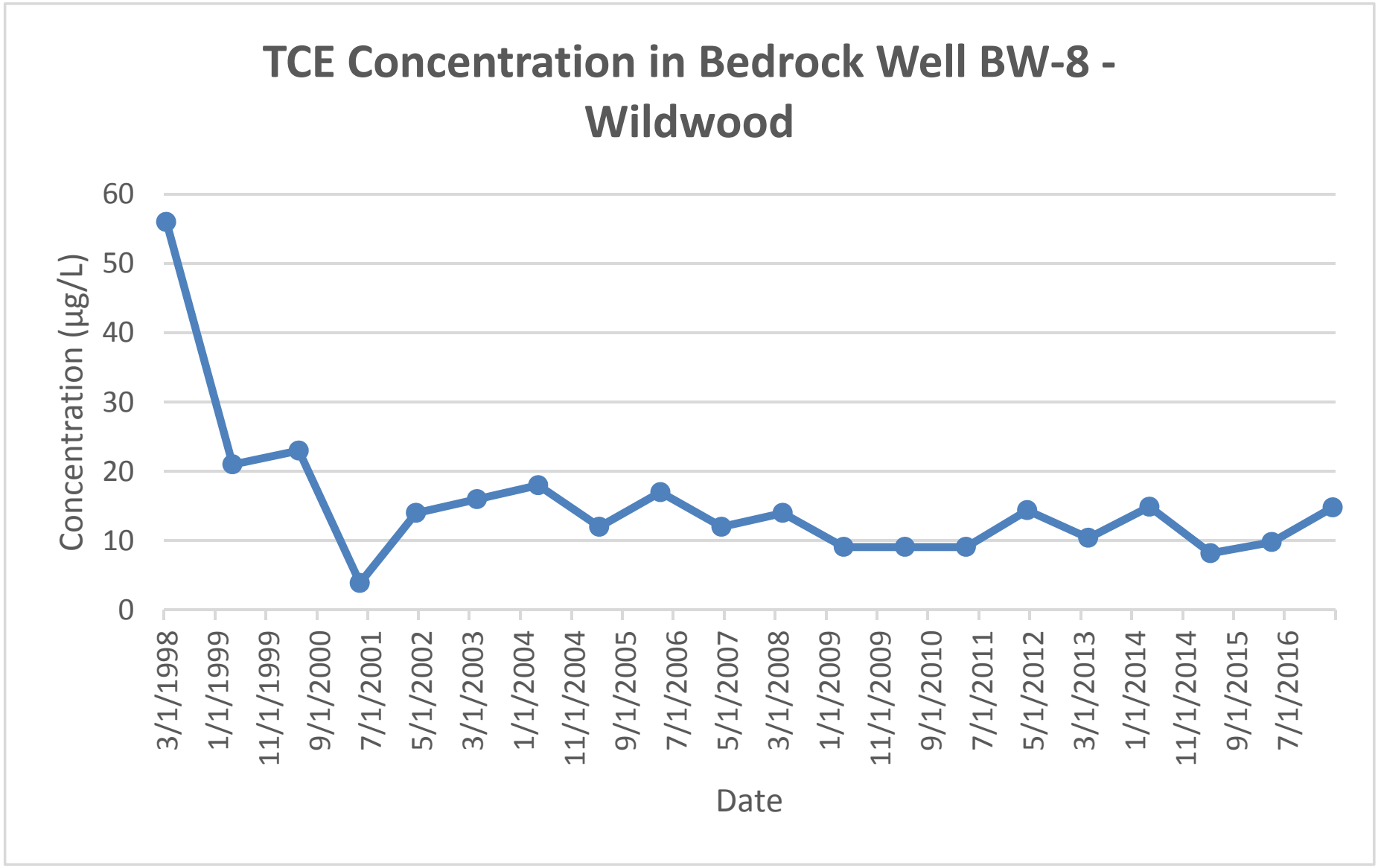

TCE Concentration in Bedrock Well BW-8 - Wildwood
Concentration (µg/L)
60
50
40
30
20
10
0
3/1/1998
1/1/1999
11/1/1999
9/1/2000
7/1/2001
5/1/2002
3/1/2003
1/1/2004
11/1/2004
9/1/2005
7/1/2006
5/1/2007
3/1/2008
1/1/2009
11/1/2009
9/1/2010
7/1/2011
5/1/2012
3/1/2013
1/1/2014
11/1/2014
9/1/2015
7/1/2016
Date

Exhibit 15

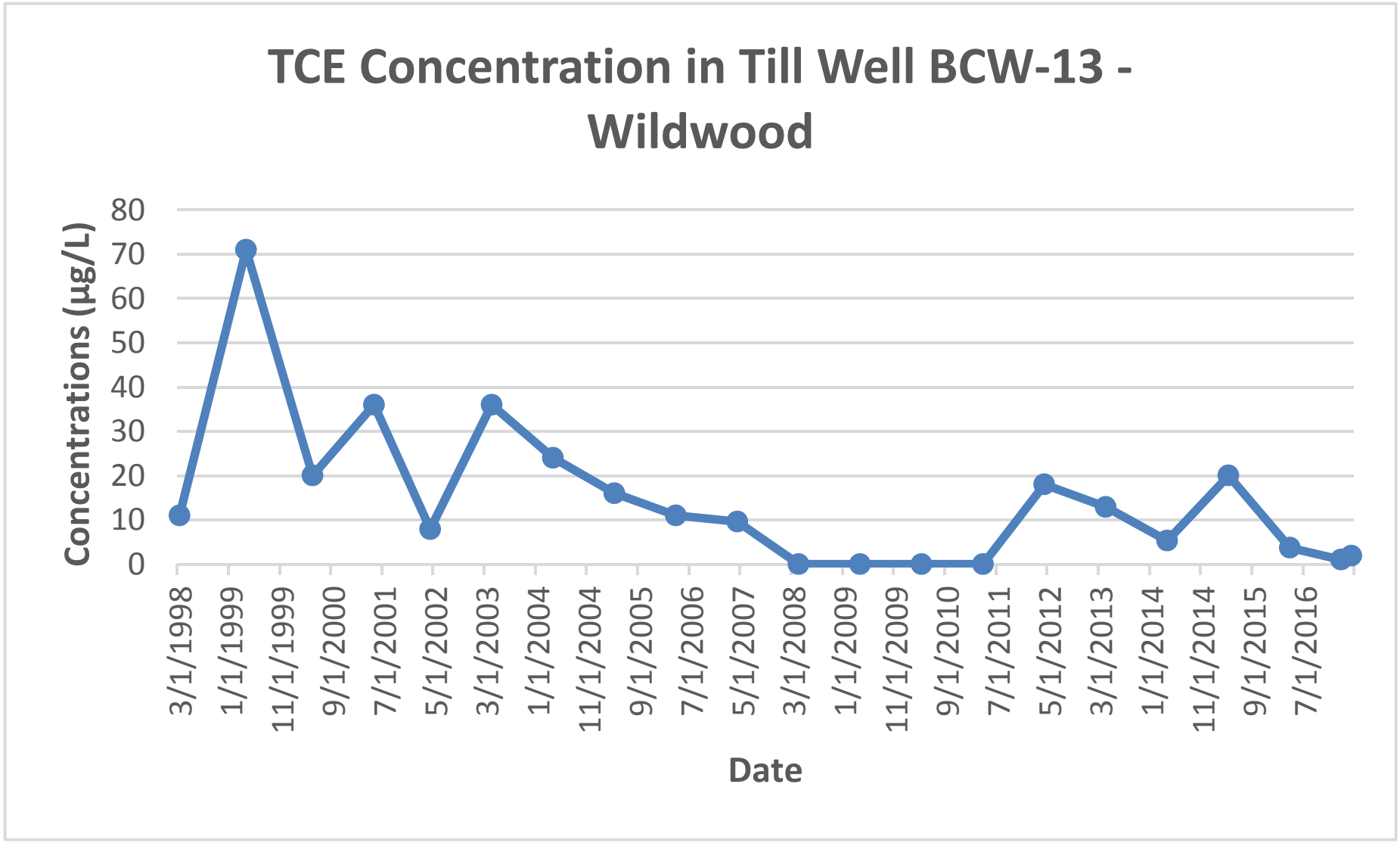

TCE Concentration in Till Well BCW-13 - Wildwood
Concentrations (µg/L)
80
70
60
50
40
30
20
10
0
3/1/1998
1/1/1999
11/1/1999
9/1/2000
7/1/2001
5/1/2002
3/1/2003
1/1/2004
11/1/2004
9/1/2005
7/1/2006
5/1/2007
3/1/2008
1/1/2009
11/1/2009
9/1/2010
7/1/2011
5/1/2012
3/1/2013
1/1/2014
11/1/2014
9/1/2015
7/1/2016
Date

Exhibit 16

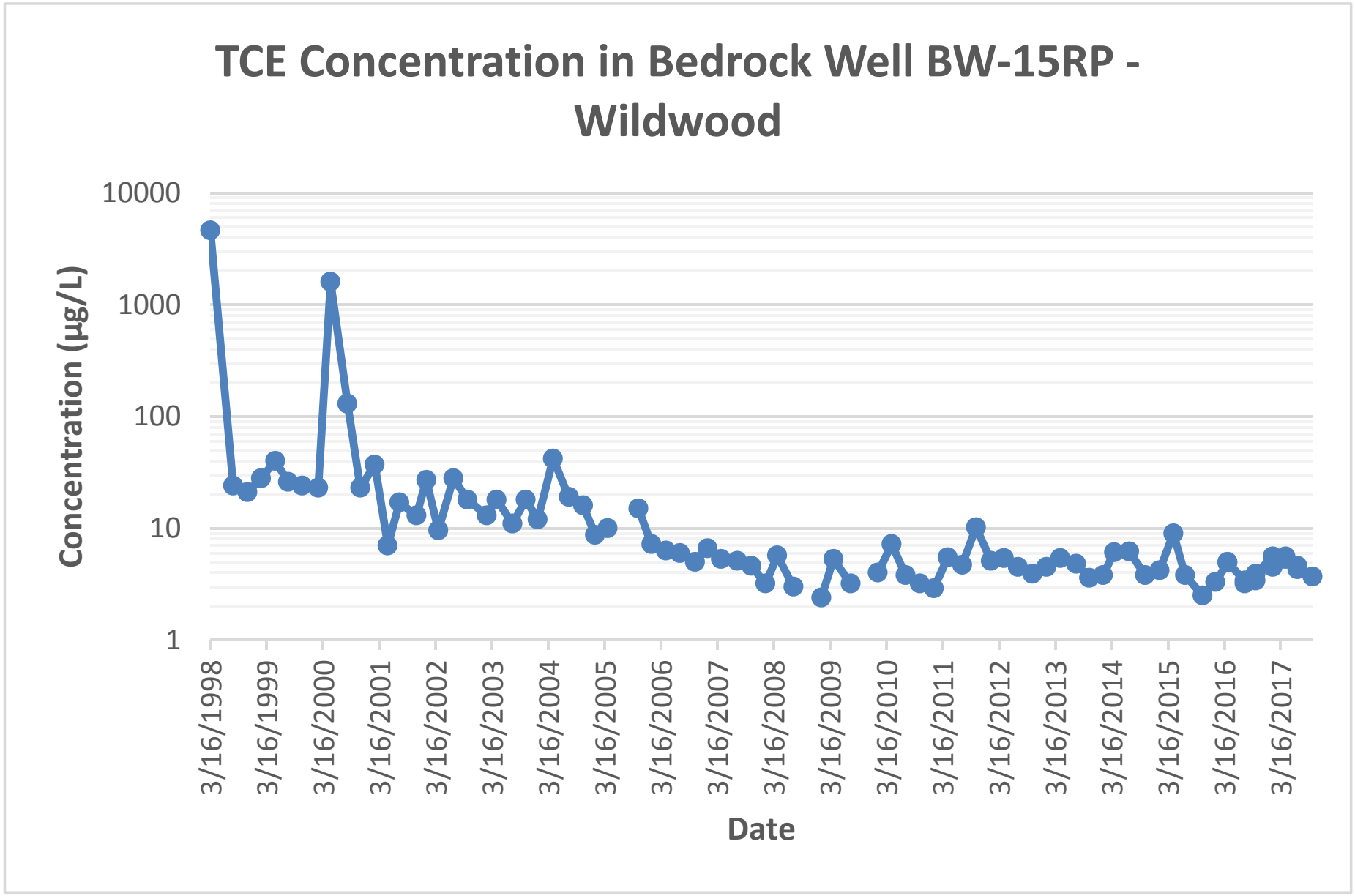

TCE Concentration in Bedrock Well BW-15RP - Wildwood
Concentration (µg/L)
10000
1000
100
10
1
3/16/1998
3/16/1999
3/16/2000
3/16/2001
3/16/2002
3/16/2003
3/16/2004
3/16/2005
3/16/2006
3/16/2007
3/16/2008
3/16/2009
3/16/2010
3/16/2011
3/16/2012
3/16/2013
3/16/2014
3/16/2015
3/16/2016
3/16/2017
Date

Exhibit 17

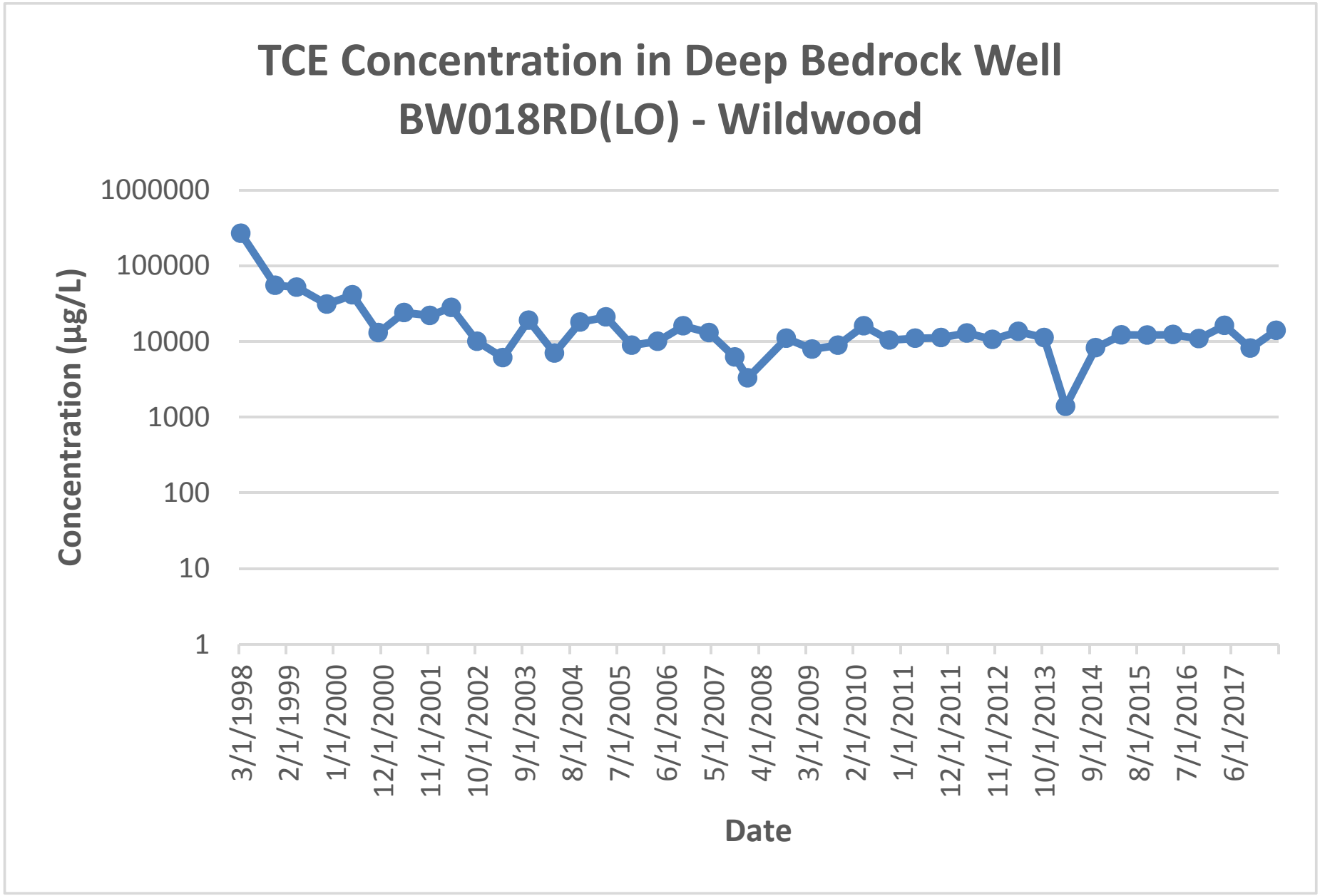

TCE Concentration in Deep Bedrock Well
BW018RD(LO) - Wildwood
Concentration (µg/L)
1000000
100000
10000
1000
100
10
1
3/1/1998
2/1/1999
1/1/2000
12/1/2000
11/1/2001
10/1/2002
9/1/2003
8/1/2004
7/1/2005
6/1/2006
5/1/2007
4/1/2008
3/1/2009
2/1/2010
1/1/2011
12/1/2011
11/1/2012
10/1/2013
9/1/2014
8/1/2015
7/1/2016
6/1/2017
Date

Exhibit 18

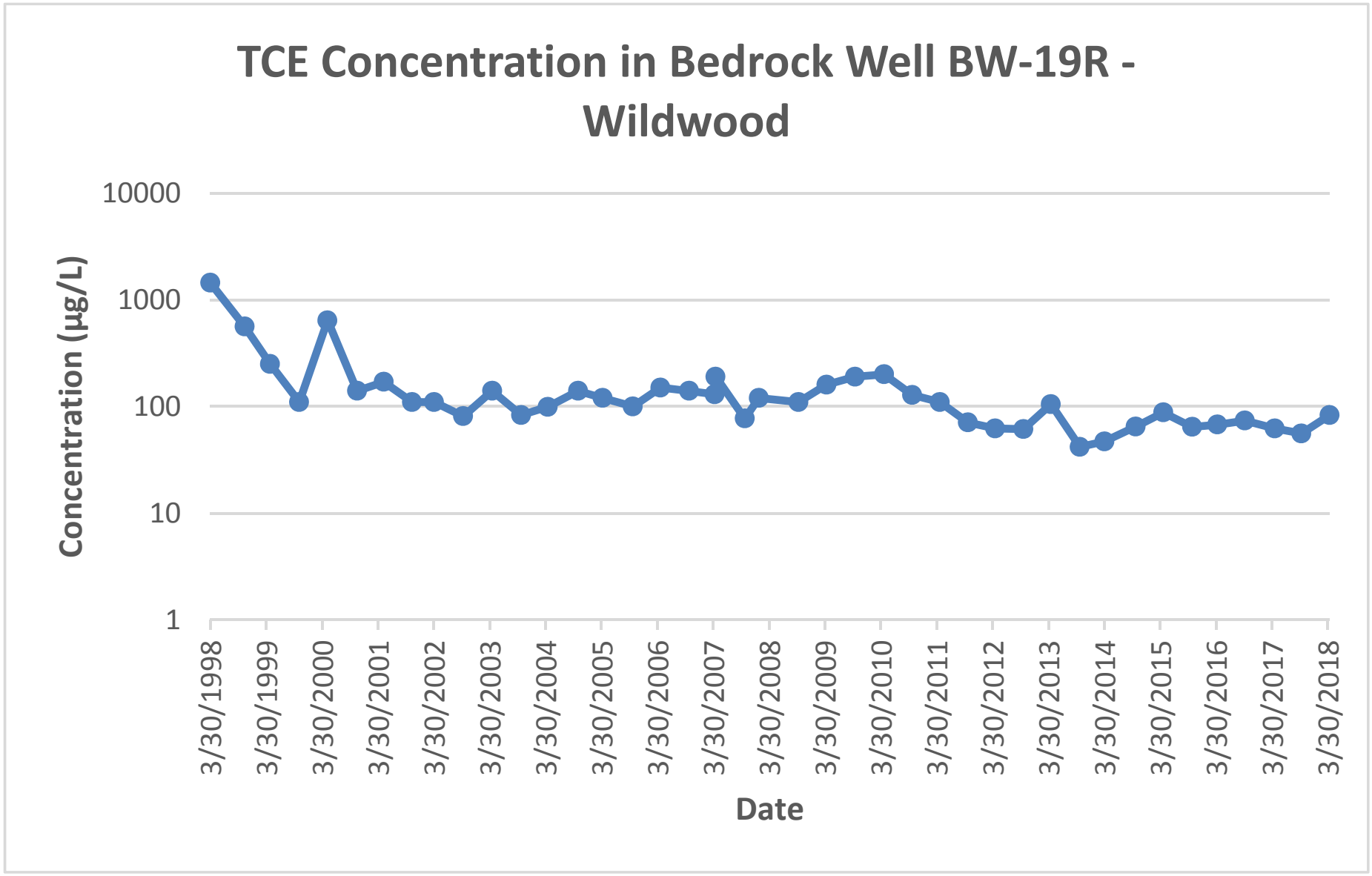
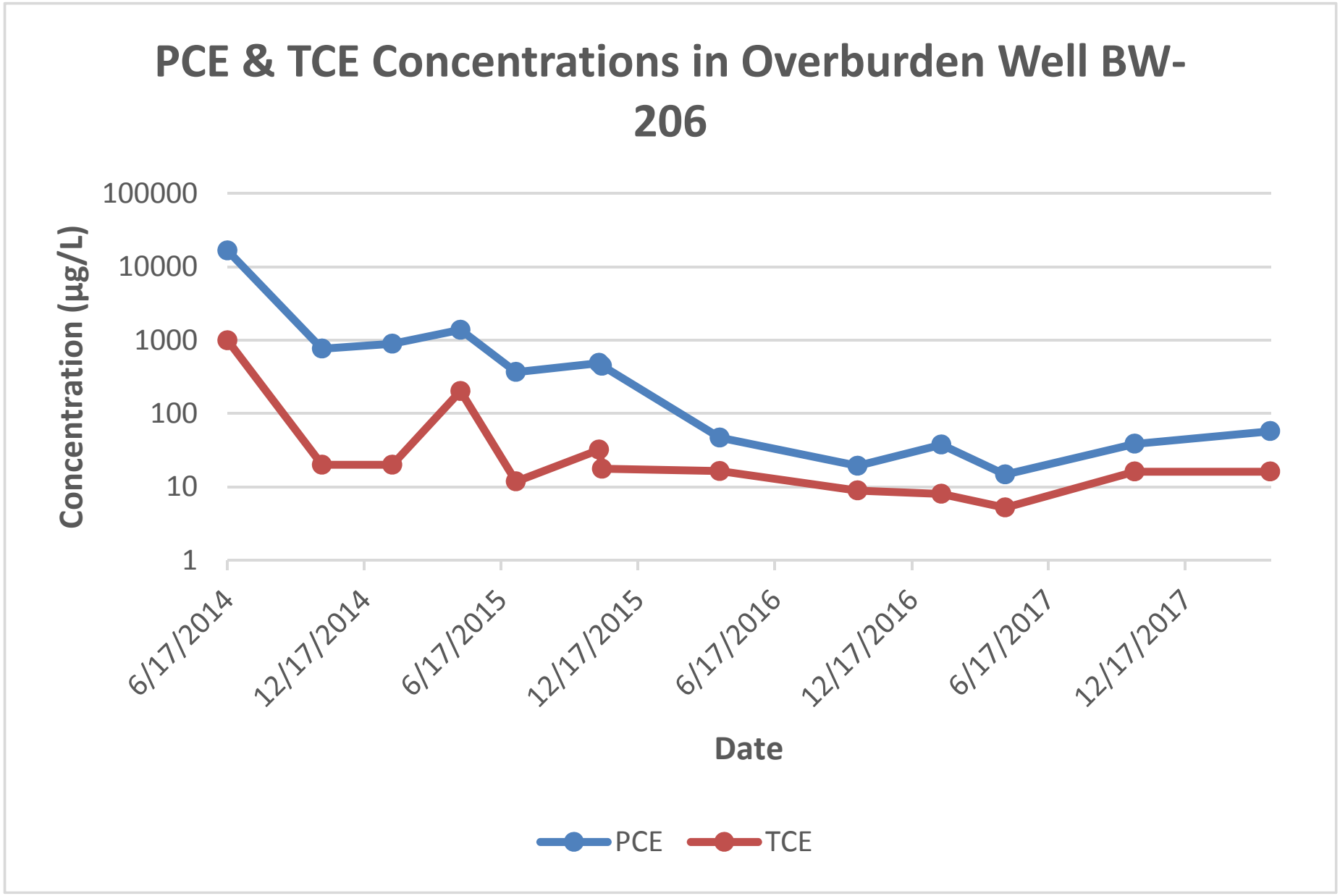

TCE Concentration in Bedrock Well BW-19R - Wildwood
Concentration (µg/L)
10000
1000
100
10
1
3/30/1998
3/30/1999
3/30/2000
3/30/2001
3/30/2002
3/30/2003
3/30/2004
3/30/2005
3/30/2006
3/30/2007
3/30/2008
3/30/2009
3/30/2010
3/30/2011
3/30/2012
3/30/2013
3/30/2014
3/30/2015
3/30/2016
3/30/2017
3/30/2018
Date

Exhibit 19


PCE & TCE Concentrations in Overburden Well BW-206
Concentration (µg/L)
100000
10000
1000
100
10
1
6/17/2014
12/17/2014
6/17/2015
12/17/2015
6/17/2016
12/17/2016
6/17/2017
12/17/2017
Date
PCE
TCE

Path: P:\Jobs\Rem_Eng\Project Files\Beatrice\Southwest Properties\7.0 Project Documents\7.2 CADD-GIS\GIS\Projects\Wildwood_Property\MIP_HPT_Investigation_Summary\MXD\Fig_2_Overburden_MIP_HPT_Investigation_Summary_TCE_Concen.mxd

WILDWOOD PROPERTY

BW-12 <1.0 (75-80)
BSW-12 <1.0 (28.5-33.5)
MHPT-15 2.6 J(26-30)
MHPT-30 < 25.0(22-26) < 20.0(35-39)
<38.0(16-20)
MHPT-4
MHPT-4 84100(43-47)
MHPT-16 <1.9(8-12)
MHPT-29 37.3(4-8)
MHPT-1 9020(33-37)
MHPT-29A 1(30-34)
MHPT-17 25.1(32-36)
MHPT-28 < 100(21-25)
AS-2013-2
AS-2013-1
MHPT-5 43.2(8-12)
S78(R)
BSW-1
BW-208
BW-11
BW-206
MHPT-2 <190(17-21)
MHPT-6 11.2(19-23)
MHPT-6 2.1(36-40)
MHPT-3 155(14-18)
BOW-14
BW-14
BW-14RD
BSW-14
BOW-14
MHPT-25 < 1.0(8-12)
MHPT-7 166(21-25)
MHPT-7 4.6(42-46)
MHPT-27 8.8(6-10) < 1.0(38-42)
MHPT-26 8(18-22)
BCW-13
BW-13
BSW-13
BSSW-15
BW-15RP
MHPT-8 2.8(29-33)
BCW-15
PZ-1B
PZ-1A
BW-19R
BW-18RD-UP
BCW-18
BW-18RD(LO)
MHPT-11 1.2(7-11)
BOW-10
BSW-10
PW-1
BCW-10
BW-10
MHPT-9 <0.4(10-14)
MHPT-12 3.7(12-16)
MHPT-24 2060(10-14)
BW-6RD-LO
BW-6RD-UP
BW-6R
PW-2
BOW-6
WW-102IO
BSW-6
BSSW-6
MHPT-21 44.6(11-15)
MHPT-10 458(13-17)
MHPT-20 255(14-18)
MHPT-23 4.1(12-16) 170(27-31)
MHPT-13 865(32-36)
BSSW-17
BMW-17
PW-3
BW-17R
MHPT-19 450 D(20-24) 1.6(40-44)
MHPT-22 4.2(26-30)
MHPT-14 61.1(14-18)
MHPT-14 329(38-42)
MHPT-18 93.9 D(30-34) 54.9(40-44)
MWRA SEWER EASEMENT
BOW-8 1.9 (3-13)
BW-8
BCW-8
25.7 (52.9-57.9)
BSW-8 <1.0 (17.9-22.9)
BW-9
BSW-9
BOW-9
CITY OF WOBURN SEWER EASEMENT
BSSW-5
BW-5R
BW-5
BW-2
PZ-9
TREATMENT BUILDING
RILEY WELL 2
BW-2R
BSW-2
AB-S5
1978 ADDITION
FLOOR DRAIN
OIL/WATER SEPERATOR
ABERJONA AUTO PROPERTY
S92S
S92M
S92I
S92DR
S92SR
S92D
WW-100SR
Staff Gauge
S95D
S95SR
S95S
S95M
WW-101SR
S77D
S77SR
S77M
S77SS
S77S
BOW-16
BW-16R
BSSW-16
PZ-8
10000
1000
100
10

Legend

TCE (ug/L)
- Non-Detect
- >0 and <=5
- >5 and <=100
- >100 and <=1000
- >1000
- Air Sparge Wells

Formation
- Monitoring Well
- Pumping Well
- VOCs in Soil Above Cleanup Criteria
- Treatment Cell
- Stream/Waterbody
- Southwest Properties
- Road
- Railroad
- Sewer Line
- Fence
- Air Sparge Network

ABERJONA RIVER

N
0 40 80
Scale in Feet

AECOM

WILDWOOD PROPERTY
WELL G&H SUPERFUND SITE

DATE: 12/06/2016 | DRWN: JB | PROJECT:

FIGURE 2
MIP/HPT INVESTIGATION SUMMARY
TCE CONCENTRATIONS

Exhibit 20

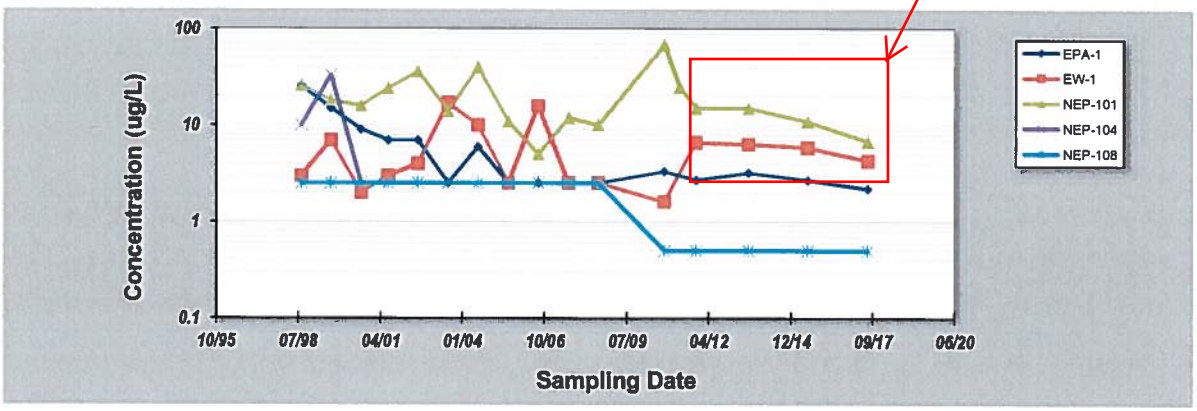
Exhibit 21

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	20-Jul-17	Job ID:	230322
Facility Name:	New England Plastics	Constituent:	PCE (Overburden Wells)
Conducted By:	SHS	Concentration Units:	ug/L

Sampling Point ID:	EPA-1	EW-1	NEP-101	NEP-104	NEP-108
Sampling Event	Sampling Date	PCE (OVERBURDEN WELLS) CONCENTRATION (ug/L)				
1	Aug-98	26.0	3.0	26.0	10.0	2.5
2	Aug-99	15.0	7.0	18.0	33.0	2.5
3	Aug-00	9.0	2.0	16.0	2.5	2.5
4	Jul-01	7.0	3.0	24.0	2.5	2.5
5	Jul-02	7.0	4.0	36.0	2.5	2.5
6	Jul-03	2.5	17.0	14.0	2.5	2.5
7	Jul-04	6.0	10.0	40.0	2.5	2.5
8	Jul-05	2.5	2.5	11.0	2.5	2.5
9	Jul-06	2.5	16.0	5.0	2.5	2.5
10	Jul-07	2.5	2.5	12.0	2.5	2.5
11	Jul-08	2.5	2.5	10.0	2.5	2.5
12	Oct-10	3.3	1.6	68.0	0.5	0.5
13	Apr-11			25.0		
14	Oct-11	2.7	6.6	15.0	0.5	0.5
15	Jul-13	3.2	6.3	15.0	0.5	0.5
16	Jul-15	2.7	5.9	11.0	0.5	0.5
17	Jul-17	2.2	4.3	6.8	0.5	0.5
18						
19						
20						
Coefficient of Variation:		0.57	0.83	0.80	1.88	0.51
Mann-Kendall Statistic (S):		-35	2	-25	-72	-55
Confidence Factor:		96.9%	52.2%	88.0%	100.0%	99.3%
Concentration Trend:		Decreasing	No Trend	Stable	Decreasing	Decreasing

Decreased Concentrations over past 5 years



Notes:

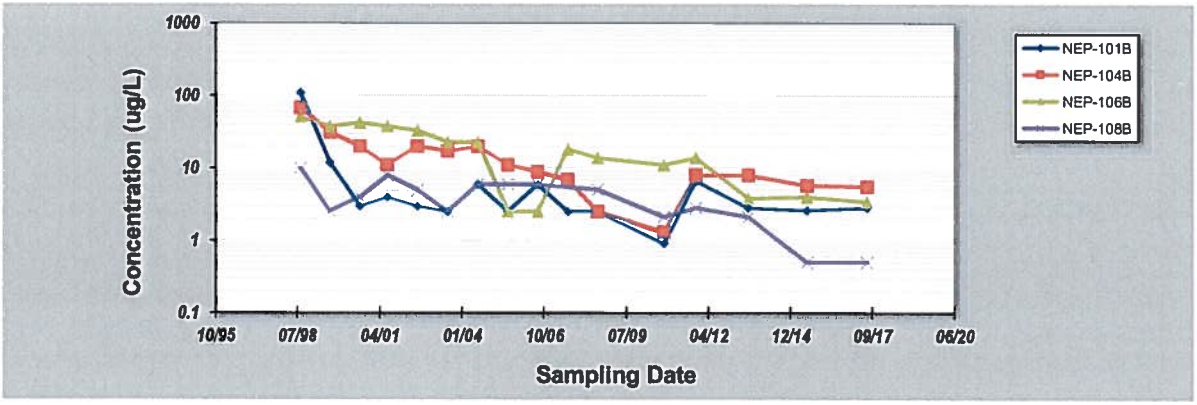
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.
4. For Non-Detect results, half of the detection limit was used for trend calculation.

Exhibit 21 (continued)

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	20-Jul-17	Job ID:	230322
Facility Name:	New England Plastics	Constituent:	PCE (Bedrock Wells)
Conducted By:	SHS	Concentration Units:	ug/L

Sampling Point ID:	NEP-101B	NEP-104B	NEP-106B	NEP-108B			
Sampling Event	Sampling Date	PCE (BEDROCK WELLS) CONCENTRATION (ug/L)						
1	Aug-98	110.0	69.0	51.0	10.0			
2	Aug-99	12.0	31.0	38.0	2.5			
3	Aug-00	3.0	20.0	42.0	4.0			
4	Jul-01	4.0	11.0	38.0	8.0			
5	Jul-02	3.0	20.0	33.0	5.0			
6	Jul-03	2.5	17.0	23.0	2.5			
7	Jul-04	6.0	20.0	23.0	6.0			
8	Jul-05	2.5	11.0	2.5	6.0			
9	Jul-06	6.0	9.0	2.5	6.0			
10	Jul-07	2.5	7.0	18.0				
11	Jul-08	2.5	2.5	14.0	5.0			
12	Oct-10	0.9	1.3	11.0	2.1			
13	Oct-11	6.5	7.9	14.0	2.8			
14	Jul-13	2.8	8.0	3.8	2.1			
15	Jul-15	2.6	5.7	4.0	0.5			
16	Jul-17	2.8	5.5	3.4	0.5			
17								
18								
19								
20								
Coefficient of Variation:		0.48	0.62	0.82	0.60			
Mann-Kendall Statistic (S):		-10	-57	-56	-42			
Confidence Factor:		68.6%	99.9%	99.9%	99.5%			
Concentration Trend:		Stable	Decreasing	Decreasing	Decreasing			



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.
4. For Non-Detect results, half of the detection limit was used for trend calculation.

TABLE 1
SUMMARY OF GROUNDWATER ANALYTICAL DATA - PRIMARY VOCs
60 OLYMPIA AVENUE
WOBURN, MASSACHUSETTS

Location Identification	Sampling Date	Screen Interval (feet)	Color	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl Chloride
				Groundwater Standards			
				5	5	70	2
INSIDE CONTAINMENT CELL							
OL-002	12/15/87	4-9'	---	**41**	**3,100**	---	---
(DUP)	12/15/87		---	**33**	**3,400**	---	---
	09/16/97		---	**8**	**3,700**	**3**	<1
	03/20/02		---	<120	**7,900**	<120	<120
OL-002 (Field Dup D02290)	03/20/02		---	<120	**8,000**	<120	<120
	04/22/03		---	**3**	**91**	**4**	<1
	06/02/03		---	<5	**330**	**17**	<5
	04/14/05		---	<50	**3,200**	**76**	<100
	04/22/08		0	<10	**79**	<10	<10
	04/07/09		1	<3	**41**	<3	<3
OL-2	10/18/11		0	<20	**37**	**22**	<20
	04/17/12		0	<10	**52**	**14**	<10
	03/07/13		0	<2	**22**	**15**	<2
	03/21/14		1	<5	**2.5**	**5.4**	<5
OL-2M	07/09/02	21.5-31.5'	---	<0.1	**5**	<2	<0.1
	06/02/03		---	<0.5	<0.5	<0.5	<0.5
	04/14/05		---	<1	<1	<1	<2
	01/11/06		---	<25	**1,600**	<25	<25
	02/09/06		---	<250	**22,000**	<250	<250
	03/10/06		---	<25	**1,800**	<25	<25
	04/24/06		---	<5	**400**	<5	<5
OL-2M (DUP-3)	04/24/06		---	<5	**430**	<5	<5
	07/19/06		---	**1**	**80**	<0.5	<0.5
	08/31/06		---	<1	**34**	<1	<1
	09/28/06		---	**0.7**	**25**	<0.5	<0.5
	12/14/06		0	**0.8**	**37**	<0.5	<0.5
	03/28/07		0	**6**	**260**	<5	<5
	04/24/07		0	<10	**690**	<10	<10
	04/22/08		0	<0.5	**3**	<0.5	<0.5
	04/07/09		1	**1**	**2**	<0.5	<0.5
	03/07/13		0	<1	**3.8**	<1	<1
	03/21/14		0	<1	**7.1**	<1	<1
	10/05/15		0	<1	**5.3**	<1	<1
	03/23/18		0	<1	**19**	**1.9**	<1
GEO-4	06/24/03	6-16'	---	<5	**340**	<5	<5
	04/14/05		---	<50	**2,500**	<50	<100
	07/19/06		0	<0.5	<0.5	<0.5	<0.5
	04/07/09		2	<25	<25	<25	<25
	03/07/13		2	<20	<20	<20	<20
	03/21/14		3	<10	**36**	<10	<10
TEST-1	07/09/02	1.8-16.8'	---	**14**	**12,000**	**15**	**2**
TEST-1 (Field Dup D02947)	07/09/02		---	**15**	**12,000**	**15**	**2**
	06/02/03		---	**3**	**1,300**	**130**	**3**
	06/24/03		---	<5	**400**	**53**	<5
	04/14/05		---	<50	**3,500**	**390**	<100
TEST-1 (DUP-5)	04/14/05		---	<50	**3,600**	**400**	<100
	04/08/09		1	<0.5	<0.5	<0.5	<0.5
Test 1	04/17/12		2	<1	<1	<1	<1
	03/07/13		2	<1	<1	<1	<1
	03/21/14		2	<1	<1	<1	<1
OL-003	12/15/87	4-9'	---	**45**	**180**	**23**	ND
	09/16/97		---	**5**	**94**	**280**	**95**
	03/18/02		---	**0.508 (J)**	**13**	**57**	**16**
	06/02/03		---	**0.8**	**2**	**11**	**7**
	04/13/05		---	<25	**930**	**480**	**77**
	04/24/08		0	**13**	**370**	**450**	**82**
	04/07/09		3	<25	<25	<25	<25
OL-3	03/07/13		1	<1	**2.4**	**10**	<1
OL-003	03/21/14		0	<1	<1	**1.3**	**2.2**
OL-3M	07/10/02	21.5-31.5'	---	<0.1	**0.191**	<2	<0.1
	06/02/03		---	<0.5	<0.5	<0.5	<0.5
	04/13/05		---	<1	<1	<1	<2
	04/07/09		4	<3	<3	<3	<3
	03/07/13		1	**3.6**	**7.1**	<2	<2
	03/21/14		3	<10	<10	<10	<10
	10/12/18		3	<2	**2.7**	<2	<2
GEO-3	06/24/03	6-16'		<0.5	**4**	**49**	**35**
MW-200S	04/14/05	6.5-9.5'	---	<200	**14,000**	<200	<400
	04/07/09		4	<25	<25	<25	<25
	03/23/11		3	<50	<50	<50	<50
	03/07/13		3	<100	<100	<100	<100
	04/13/16		2	<20	<20	<20	<20
	02/21/17		2	<100	<100	<100	<100
MW-200D	04/14/05	14-17'	---	<25,000	**870,000**	<25,000	<25,000
MW-200D (Dup)	04/14/05		---	<25,000	**770,000**	<25,000	<25,000
	04/07/09		4	<50	<50	<50	<50
	02/15/10		4	<250	<250	<250	<250
	03/23/11		4	<500	<500	<500	<500
	03/07/13		3	<10	<10	<10	<10
	03/21/14		3	<50	<50	<50	<50
	02/21/17		4	<50	<50	<50	<50
MW-201S	04/14/05	6.5-9.5'	---	<5	**330**	<5	<10
	11/05/07		---	<2.5	**4**	<2.5	<2.5
	04/24/08		2	<10	**5**	<10	<10
	03/23/11		0	<0.5	**4**	<0.5	<0.5
	03/07/13		2	<5	<5	<5	<5
	03/21/14		2	<10	**14**	<10	<10
	09/29/14		1	<1	**6.8**	<1	<1
	02/21/17		0	<10	**400**	<10	<10
	05/10/17		1	**2.0**	**95**	<2	<2
	10/26/17		1	<1	**9.5**	**2.3**	<1

Exhibit 22

TABLE 1
SUMMARY OF GROUNDWATER ANALYTICAL DATA - PRIMARY VOCs
60 OLYMPIA AVENUE
WOBURN, MASSACHUSETTS

Location Identification	Sampling Date	Screen Interval (feet)	Color	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl Chloride
				Groundwater Standards			
				5	5	70	2
MW-201D	04/14/05	14-17'	---	<1	**11**	<1	<2
	11/05/07		---	<5	<5	<5	<5
	03/23/11		2	<100	**9,300**	<100	<100
	10/18/11		1	**110**	**18,000**	**120**	<100
	08/24/12		4	**6.8**	**11**	<5	<5
	03/07/13		1	<10	**350**	<10	<10
	07/31/13		1	<50	**4,300**	**50**	<50
	03/21/14		2	<10	**120**	<10	<10
	09/29/14		1	<20	**2,200**	**48**	<20
	05/12/15		2	<10	**35**	<10	<10
	10/05/15		2	<5	**710**	**16**	<5
	10/18/16		0	<1	**7.7**	**1.3**	<1
	02/21/17		0	<20	**2,000**	**23**	<20
	05/10/17		0	<5	**370**	**8.7**	<5
	10/26/17		1	<25	**3,900**	**57**	<25
	03/23/18		1	<1	**26**	<1	<1
MW-202S	04/14/05	6.5-9.5'	---	<100	**6,200**	<100	<200
	04/22/08		3	<25	<25	<25	<25
	03/07/13		0	<20	**770**	<20	<20
	07/31/13		0	<50	**1,600**	<50	<50
	03/21/14		0	<10	**1,300**	<10	<10
	07/15/14		0	<20	**2,300**	<20	<20
	05/12/15		0	<10	**820**	<10	<10
	10/05/15		---	<10	**690**	<10	<10
	04/13/16		---	<10	**290**	<10	<10
	10/18/16		0	<10	**220**	<10	<10
	02/21/17		0	<50	**160**	<50	<50
	10/26/17		---	<1	**49**	<1	<1
MW-202D	04/14/05	14-17'	---	<2,000	**89,000**	<2,000	<4,000
	04/07/09		4	<100	<100	<100	<100
	11/03/09		4	<100	<100	<100	<100
	03/23/11		4	<250	<250	<250	<250
	03/07/13		3	<10	<10	<10	<10
	03/21/14		4	<100	<100	<100	<100
	02/21/17		4	<200	<200	<200	<200
MW-203S	04/14/05	3-6'	---	<10	**500**	<10	<20
	04/25/07		0	<0.5	**3**	**0.7**	<0.5
	11/05/07		---	<0.5	**1**	**0.7**	<0.5
	04/23/08		0	<0.5	**39**	<0.5	<0.5
	04/07/09		0	<0.5	**4**	**0.5**	<0.5
	03/23/11		0	<0.5	**3**	**0.7**	<0.5
	03/07/13		2	<40	**83**	<40	<40
	07/31/13		0	<1	**3.8**	<1	<1
	03/21/14		0	<1	**2.5**	<1	<1
	10/05/15		0	<10	**130**	<10	<10
	04/13/16		---	<1	**2.2**	**2.1**	<1
	02/21/17		0	<1	**1.8**	<1	<1
MW-203D	04/14/05	14-17'	---	<500	**42,000**	<500	<1,000
	08/31/06		1	<250	**24,000**	<250	<250
	12/14/06		2	**120**	<5	<5	<5
	11/05/07		---	<500	**33,000**	<500	<500
	04/24/08		0	<250	**26,000**	<250	<250
	08/06/08		0	<250	**37,000**	<250	<250
	11/13/08		4	<250	**47,000**	<250	<250
	12/11/08		3	<25	<25	<25	<25
	03/09/09		2	**200**	**14,000**	<100	<100
	11/03/09		0	**350**	**45,000**	<250	<250
	02/15/10		3	**30**	<25	<25	<25
	09/01/10		2	<130	<25	<25	<25
	03/23/11		2	**120**	**12,000**	<100	<100
	10/18/11		1	<100	**3,200**	<100	<100
	04/17/12		2	**69**	**6,800**	<25	<25
	08/24/12		4	**18**	**64**	<5	<5
	03/07/13		0	<1	<1	<1	<1
	07/31/13		3	<50	**3,000**	<50	<50
	03/21/14		2	<10	**54**	<10	<10
	09/29/14		1	**26**	**2,000**	<20	<20
	05/12/15		3	<20	<20	<20	<20
	10/05/15		0	<5	<26	**5.7**	<5
	02/21/17		3	<25	<26	<25	<25
MW-204S	04/14/05	7-10'	---	<50	**2,400**	**280**	<100
MW-204S (DUP-8)	04/14/05		---	<50	**2,200**	**250**	<100
	04/23/08		2	<250	<250	<250	<250
	04/07/09		3	<10	<10	<10	<10
	03/23/11		3	<0.5	<0.5	<0.5	<0.5
	03/07/13		2	<50	<50	<50	<50
	03/21/14		2	<10	<10	<10	<10
	02/21/17		1	<20	<20	<20	<20
MW-204D	04/14/05	14-17'	---	<1,000	**60,000**	<1,000	<2,000
	04/25/06		0	<2,500	**190,000**	<2,500	<2,500
	07/19/06		0	<2,500	**160,000**	<2,500	<2,500
	08/31/06		0	<2,500	**220,000**	<2,500	<2,500
	09/28/06		0	<2,500	**210,000**	<2,500	<2,500
	04/25/07		0	<5,000	**260,000**	<5,000	<5,000
	04/24/08		1	<2,500	**460,000**	<2,500	<2,500
	08/06/08		2	<2,500	**190,000**	<2,500	<2,500
	11/13/08		2	<500	**70,000**	<500	<500
	03/09/09		4	<50	<50	<50	<50
	04/08/09		3	<100	<100	<100	<100
	11/03/09		4	<250	<250	<250	<250
	09/01/10		4	<250	<50	<50	<50
	03/23/11		3	**110**	**6,900**	<100	<100
	10/18/11		2	<1000	**4,600**	<1,000	<1,000
	04/17/12		4	<50	<50	<50	<50
	03/07/13		1	<20	<20	<20	<20
	03/21/14		3	<10	**12**	<10	<10
	02/21/17		2	<250	<250	<250	<250

Exhibit 22

TABLE 1
SUMMARY OF GROUNDWATER ANALYTICAL DATA - PRIMARY VOCs
60 OLYMPIA AVENUE
WOBURN, MASSACHUSETTS

Location Identification	Sampling Date	Screen Interval (feet)	Color	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl Chloride
				Groundwater Standards			
				5	5	70	2
MW-205S	04/13/05	4-7'	---	<1	**12**	**4**	<2
	10/30/06		1	<0.5	**2**	**8**	<0.5
	04/23/08		0	<0.5	**5**	**5**	**1**
MW-205S (DUP-3)	04/23/08		0	<0.5	**4**	**4**	**0.9**
	04/07/09		1	<0.5	<0.5	<0.5	<0.5
	03/23/11		0	<0.5	**3**	**5**	**1**
MW-205SX	03/23/11		0	<0.5	**3**	**5**	**1**
	03/07/13		0	<1	<1	**13**	**8.6**
MW-205SX	03/07/13		0	<1	<1	**13**	**8.6**
	03/21/14		0	<1	**1.9**	**7.2**	**2.6**
MW-205SX	03/21/14		0	<1	**1.8**	**7**	**2.4**
	10/05/15		0	<1	**1.6**	**7**	<1
	02/21/17		0	<1	**4.9**	**4.4**	**3**
MW-205D	04/13/05	14-17'	---	<500	**16,000**	<500	<1,000
	04/26/06		0	<1,000	**61,000**	<1,000	<1,000
	07/19/06		0	<2,500	**98,000**	<2,500	<2,500
	08/31/06		0	<2,500	**110,000**	<2,500	<2,500
	09/28/06		0	<2,500	**120,000**	<2,500	<2,500
	10/30/06		0	<1,000	**120,000**	<1,000	<1,000
	04/25/07		0	<2,500	**120,000**	<2,500	<2,500
	04/23/08		1	**340**	**25,000**	<250	<250
	08/06/08		4	<25	<25	<25	<25
	11/13/08		4	<50	<50	<50	<50
	03/09/09		4	<100	<100	<100	<100
	11/03/09		4	<100	<100	<100	<100
	09/01/10		4	<250	<50	<50	<50
	03/23/11		4	<100	<100	<100	<100
MW-205DX	03/23/11		4	<100	<100	<100	<100
	10/18/11		4	<100	<100	<100	<100
MW-205DX	10/18/11		4	<250	<250	<250	<250
	03/07/13		3	<20	<20	<20	<20
MW-205DX	03/07/13		3	<20	<20	<20	<20
	03/21/14		4	<10	<10	<10	<10
MW-205DX	03/21/14		4	<20	<20	<20	<20
	02/21/17		2	<100	<100	<100	<100
MW-206S	04/14/05	4-7'	---	<100	**8,200**	**130**	<200
	04/23/08		1	<5	<5	<5	<5
	03/23/11		3	<0.5	<0.5	<0.5	<0.5
	03/11/13		2	<1	<1	<1	<1
	03/21/14		3	<1	<1	<1	<1
	02/21/17		0	<5	<5	<5	<5
MW-206D	04/14/05	14-17'	---	<25	<25	**70**	<50
	04/26/06		0	<1,000	**81,000**	<1,000	<1,000
	07/19/06		0	<1,000	**73,000**	<1,000	<1,000
	08/31/06		0	<1,000	**78,000**	<1,000	<1,000
	09/28/06		0	<1,000	**87,000**	<1,000	<1,000
	04/25/07		0	<1,000	**83,000**	<1,000	<1,000
	04/23/08		0	**500**	**100,000**	**400**	<50
MW-206D (DUP-2)	04/23/08		0	<1,000	**77,000**	<1,000	<1,000
	08/06/08		2	**320**	**870**	<3	<3
	11/13/08		3	<500	**78,000**	**640**	<500
	12/11/08		3	<25	<25	<25	<25
	03/09/09		2	**200**	<50	<50	<50
	11/03/09		2	**330**	**14,000**	**300**	<100
	02/15/10		2	**260**	**9,200**	**280**	<50
	09/01/10		1	**210**	**34,000**	**2,900**	<3
	03/23/11		1	**150**	**17,000**	**2,400**	<100
	10/18/11		0	<500	**13,000**	**1,900**	<500
	04/17/12		0	**72**	**8,400**	**1,400**	<25
	08/24/12		0	<200	**10,000**	**1,200**	<200
	03/07/13		1	<100	**4,400**	**630**	<100
	07/31/13		1	<100	**5,800**	**630**	<100
	03/21/14		0	**42**	**3,700**	**520**	<40
MW-206D-DUP	03/21/14		0	**45**	**3,600**	**550**	<10
	07/15/14		0	**46**	**4,000**	**520**	<25
	05/12/15		0	<20	**1,700**	**310**	<20
	10/05/15		0	**29**	**2,400**	**300**	<25
	04/13/16		2	<10	**400**	**73**	<10
	10/18/16		1	<20	**1,200**	**150**	<20
	02/21/17		1	<25	**680**	**88**	<25
	05/10/17		1	<10	**200**	**60**	<10
	10/26/17		0	<10	**1,000**	**180**	<10
	03/23/18		0	<10	**530**	**350**	<10
MW-207S	04/13/05	6-9'	---	**110**	**3,700**	**1,700**	**320**
	12/14/06		1	<10	**550**	**150**	<10
	11/05/07		---	<25	**890**	**580**	**54**
	04/22/08		0	**83**	**1,700**	**51**	<10
	08/06/08		2	**62**	**39**	<5	<5
	04/07/09		2	<10	<10	<10	<10
	03/23/11		1	**25**	**930**	**61**	<10
	10/18/11		0	<20	**970**	**390**	<20
	08/24/12		0	<40	**2,000**	**810**	**42**
	03/07/13		1	**11**	**130**	**10**	<4
	07/31/13		1	<10	**160**	**27**	<10
	03/21/14		0	<20	**1,700**	**1,100**	**74**
	07/15/14		0	<10	**550**	**300**	**16**
	05/12/15		0	<20	**1,700**	**100**	<20
	10/05/15		0	<20	**3,200**	**1,300**	**100**
	04/13/16		0	<25	**2,100**	**440**	<25
	10/18/16		0	<50	**2,800**	**3,200**	**330**
	02/21/17		2	**10**	**100**	<10	<10
	10/26/17		0	<20	**2,400**	**820**	**62**
	03/23/18		0	**22**	**2,500**	**560**	**31**
MW-207D	04/14/05	14-17'	---	<100	**7,900**	<100	<200
MW-207D (DUP-7)	04/14/05		---	<100	**8,100**	<100	<200
	04/07/09		4	<50	<50	<50	<50
	03/23/11		4	<100	<100	<100	<100
	03/07/13		4	<10	<10	<10	<10
	03/21/14		0	<10	<10	<10	<10
	02/21/17		2	<50	<50	<50	<50

Exhibit 22

TABLE 1
SUMMARY OF GROUNDWATER ANALYTICAL DATA - PRIMARY VOCs
60 OLYMPIA AVENUE
WOBURN, MASSACHUSETTS

Location Identification	Sampling Date	Screen Interval (feet)	Color	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl Chloride
				Groundwater Standards			
				5	5	70	2
MW-208S	04/14/05	4-7'	---	<25	**1,100**	**1,300**	**95**
	04/22/08		2	<25	<25	<25	<25
	04/07/09		3	<10	<10	<10	<10
	03/23/11		2	<0.5	<0.5	**1**	<0.5
	03/07/13		1	<1	<1	**2.8**	**1.7**
	03/21/14		0	<1	<1	<1	<1
	02/21/17		0	<1	**6.9**	**18**	**9.6**
MW-208D	04/14/05	14-17'	---	<500	**38,000**	<500	<500
	12/14/06		---	<2,500	**170,000**	<2,500	<2,500
	12/11/08		3	<25	<25	<25	<25
	03/09/09		4	<100	<100	<100	<100
	11/03/09		2	**40**	<25	<25	<25
	09/01/10		3	**250**	**73**	<50	<50
MW-208DX	09/01/10		3	<2,500	**91,000**	<500	<500
	03/23/11		3	**500**	**64,000**	<500	<500
	10/18/11		2	**380**	**36,000**	**410**	<100
MW-208 (DUP-1)	10/18/11		2	<500	**38,000**	<500	<500
	04/17/12		3	**300**	**23,000**	**280**	<50
	08/24/12		1	**290**	**22,000**	**270**	<250
	03/07/13		1	<250	**12,000**	**320**	<250
DUP-2	03/07/13		1	<200	**11,000**	**290**	<200
	07/31/13		0	<400	**11,000**	<400	<400
	03/21/14		1	**210**	**8,000**	**590**	<50
MW-208D-DUP	03/21/14		1	**160**	**8,200**	**670**	<50
	07/15/14		0	**230**	**7,400**	**520**	<100
	05/12/15		0	**84**	**2,200**	**690**	<25
	10/05/15		0	**120**	**2,700**	**510**	<25
	04/13/16		0	**50**	**570**	**350**	<10
	10/18/16		0	<100	**880**	**500**	<100
	02/21/17		0	<100	**500**	**380**	<100
	05/10/17		0	**23**	**210**	**210**	<10
	10/26/17		0	**24**	**310**	**240**	<5
	03/23/18		0	**20**	**100**	**94**	<10
MW-209S	04/13/05	7-10'	---	<10	**520**	**1,200**	**270**
	04/22/08		0	<5	**22**	<5	<5
	04/07/09		2	<5	<5	<5	<5
	03/23/11		0	<10	**44**	<10	<10
	10/18/11		0	**1.4**	**34**	**1.00**	<1
	03/07/13		0	<10	<10	<10	<10
	07/31/13		0	<10	<10	<10	<10
	03/21/14		0	<10	**11**	<10	<10
	10/05/15		0	**10**	**130**	<10	<10
	04/13/16		---	<20	**49**	<20	<20
	02/21/17		0	<10	**140**	<10	<10
MW-209D	04/13/05	14-17'	---	<25	**1,600**	<25	<50
	04/08/09		3	<10	<5	<10	<10
	03/23/11		3	<10	<5	<10	<10
	03/21/14		3	<10	**24**	**14**	<10
	02/21/17		0	<5	**49**	**53**	<5
MW-210S	04/13/05	7-10'	---	<50	**730**	**3,500**	**1,100**
	11/05/07		---	<25	**430**	**1,000**	**61**
	04/22/08		0	<25	**2,400**	**2,900**	**290**
	08/06/08		3	<25	<25	<25	<25
	04/07/09		0	**3**	**30**	<0.5	<0.5
	09/01/10		2	<25	<5	<5	<5
	03/23/11		2	<3	**18**	**4**	<3
	10/18/11		3	<5	<5	<5	<5
	03/07/13		1	<1	**14**	**13**	**1.6**
	07/31/13		0	<5	**130**	**210**	**11**
	03/21/14		4	<1	<1	<1	<1
	02/21/17		0	<10	**930**	**1,000**	**200**
	05/10/17		3	<4	<4	**6**	<4
MW-210D	04/14/05	14-17'	---	<25	**650**	**1,900**	<50
	04/07/09		4	<5	<5	<5	<5
	09/01/10		4	<130	<25	<25	<25
	03/23/11		3	<5	<5	<5	<5
	03/07/13		3	<20	<20	<20	<20
	03/21/14		3	<10	<10	<10	<10
	02/21/17		0	<10	<10	**710**	**270**
MW-211S	04/14/05	6.5-9.5'	---	<2	**39**	**140**	**27**
	12/14/06		0	<0.5	**1**	**2**	**0.6**
	04/25/07		0	<0.5	**1**	**0.7**	<0.5
	04/22/08		0	<0.5	**2**	**2**	**0.8**
	09/01/10		0	<3	**0.5**	<0.5	<0.5
	03/23/11		0	<0.5	<0.5	**0.6**	<0.5
	03/07/13		0	<1	<1	**1.2**	<1
	03/21/14		0	<1	<1	<1	<1
	02/21/17		0	<1	<1	<1	<1
MW-211D	04/14/05	14-17'	---	<5	**83**	**150**	<10
	11/05/07		---	<50	**3,300**	**830**	<50
	04/22/08		1	**8**	**69**	<1	<1
	04/08/09		2	<0.5	<0.5	<0.5	<0.5
	03/23/11		2	<25	**380**	**1,600**	<25
	10/18/11		0	<10	**440**	**830**	<10
	04/17/12		2	<1	**10**	**81**	<1
	03/07/13		1	<50	**210**	**1,700**	<50
	07/31/13		0	<100	**690**	**3,900**	<100
	03/21/14		2	<1	**18**	**110**	<1
	09/29/14		0	<40	**110**	**4,800**	<40
	02/21/17		0	<100	**430**	**11,000**	**610**
	10/26/17		0	<100	**580**	**16,000**	**1,000**
	03/23/18		0	<50	**540**	**9,200**	**530**

Exhibit 22

TABLE 1
SUMMARY OF GROUNDWATER ANALYTICAL DATA - PRIMARY VOCs
60 OLYMPIA AVENUE
WOBURN, MASSACHUSETTS

Location Identification	Sampling Date	Screen Interval (feet)	Color	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl Chloride
				Groundwater Standards			
				5	5	70	2
MW-212S	04/14/05	10-13'	---	**450**	**360**	**12**	<20
	04/26/06		0	**1,200**	**2,300**	<25	<25
	08/31/06		0	**1,300**	**2,200**	**39**	<25
	09/28/06		0	**240**	**1,000**	**310**	<25
	10/30/06		0	**1,300**	**1,900**	**42**	<25
	04/26/07		0	**1,200**	**1,800**	**68**	<25
	04/24/08		0	**1,100**	**2,100**	**200**	<25
	04/08/09		3	<25	<25	<25	<25
	03/23/11		0	**1,200**	**1,600**	**21**	<10
	10/18/11		0	**1,300**	**2,500**	<50	<50
	03/07/13		2	**2.4**	**3.0**	<1	<1
	03/21/14		1	<10	**11**	<10	<10
	09/29/14		0	<1	<1	<1	<1
	02/21/17		1	**12**	**410**	<10	<10
	10/26/17		0	**15**	**1,600**	<10	<10
DEEP OVERBURDEN WELLS							
GEO-1	09/21/99	90-100'	---	<1.5	**2.5**	<1	<2
	03/18/02		---	**0.104**	**0.244**	<2	<0.1
	09/13/05		---	<0.5	<0.5	<0.5	<0.5
	01/11/06		---	<0.5	<0.5	<0.5	<0.5
	04/24/06		---	<0.5	<0.5	<0.5	<0.5
	04/24/07		---	<0.5	<0.5	<0.5	<0.5
GEO-2	09/21/99	95-105'	---	<1.5	**1.6**	<1	<2
	03/15/02		---	<0.1	**0.175**	<2	<0.1
OUTSIDE CONTAINMENT CELL UPGRADIENT							
OL-005	12/15/87	3.5-8.5'	---	ND	ND	---	---
	03/19/02		---	<0.1	<1,000	<2	<0.1
	06/02/03		---	<0.5	<0.5	<0.5	<0.5
	04/14/05		---	<1	<1	<1	<2
	04/25/06		0	<0.5	<0.5	<0.5	<0.5
	04/24/07		0	<0.5	<0.5	<0.5	<0.5
MW-12	07/10/02	3.5-13.5'	---	<0.1	<0.1	<2	<0.1
	04/14/05		---	<1	<1	<1	<2
	04/25/06		---	<0.5	<0.5	<0.5	<0.5
	04/24/07		0	<0.5	**32**	**7**	<0.5
	04/24/08		0	<0.5	**13**	**0.5**	<0.5
	04/08/09		0	<0.5	**22**	**4**	<0.5
	03/07/13		0	<1	<1	**4.7**	<1
	03/21/14		0	<1	<1	<1	<1
MW-214S	04/14/05	10-13'	---	<1	**3**	<1	<2
	04/25/06		0	<0.5	**1**	<0.5	<0.5
	04/25/07		0	<0.5	<0.5	<0.5	<0.5
	04/24/08		0	<0.5	<0.5	<0.5	<0.5
	03/07/13		0	<1	<1	<1	<1
	03/21/14		0	<1	<1	<1	<1
	02/21/17		0	<1	<1	<1	<1
MW-214M	04/14/05	20-23'	---	<1	**3**	<1	<2
	04/25/06		0	<0.5	<0.5	<0.5	<0.5
	04/25/07		0	<0.5	<0.5	<0.5	<0.5
	04/24/08		0	<0.5	<0.5	<0.5	<0.5
MW-214D	04/14/05	30-33'	---	<1	<1	<1	<2
	04/25/06		0	<0.5	<0.5	<0.5	<0.5
	04/25/07		0	<0.5	**1**	<0.5	<0.5
	04/24/08		0	<0.5	<0.5	<0.5	<0.5
	03/07/13		0	<1	<1	<1	<1
	03/21/14		0	<1	<1	<1	<1
	02/21/17		0	<1	<1	<1	<1
SIDE GRADIENT EAST (Vicinity of Aberjona River)							
MW-010S	04/22/02	4-14'	---	<0.1	<0.1	<2	<0.1
	04/14/05		---	<1	<1	<1	<2
	04/25/06		0	<0.5	<0.5	**1**	<0.5
	04/23/08		0	<0.5	<0.5	**0.7**	<0.5
	11/16/11		---	<0.5	**0.25 (J)**	**0.45 (J)**	<1
MW-010M	04/25/02	40-50'	---	<0.1	**0.0779 (J)**	<2	<0.1
	04/14/05		---	**2**	**1**	<1	<2
	04/25/06		0	<0.5	<0.5	<0.5	<0.5
	04/23/08		0	<0.5	<0.5	<0.5	<0.5
	11/16/11		---	<0.5	<0.5	<0.5	<1
MW-010D	04/25/02	88.5-98.5'	---	**0.174**	**1.4**	<2	<0.1
	04/25/06		0	<0.5	<0.5	<0.5	<0.5
	11/16/11		---	<0.5	**0.75**	**0.19 (J)**	<1
MW-215S	04/13/05	10-13'	---	**2,300**	**6,200**	**430**	<200
	04/24/06		0	**2,400**	**5,400**	**250**	<100
MW-215S (DUP-1)	04/24/06		0	**2,400**	**5,200**	**260**	<100
	09/28/06		0	**2,900**	**5,400**	**290**	<50
	04/25/07		0	**1,900**	**3,500**	<250	<250
	04/22/08		0	**1,400**	**1,900**	**120**	<10
	11/13/08		3	<50	<50	<50	<50
	12/11/08		2	**360**	<3	<3	<3
	03/09/09		2	**310**	<50	<50	<50
	04/08/09		2	**190**	<50	<50	<50
	11/03/09		3	<50	<50	<50	<50
	02/15/10		2	<50	<50	<50	<50
	03/23/11		3	<5	<50	<5	<5
MW-215SX	03/23/11		3	<25	<25	<25	<25
	10/18/11		3	<10	<10	<10	<10
MW-215SX	10/18/11		3	**62**	**710**	**120**	<20
	11/21/11		---	<10	<10	<10	<10
MW-215SX	11/21/11		---	<10	<10	<10	<10
MW-215S ASCORBIC ACID	04/17/12		3	<1	<1	<1	<1
	04/17/12		3	<10	<10	<10	<10
	03/07/13		2	<10	<10	<10	<10
MW-215SX	03/07/13		2	<10	<10	<10	<10
	03/21/14		3	<1	<1	<1	<1
MW-215SX	03/21/14		3	<20	<20	<20	<20
	02/21/17		2	<10	<10	<10	<10

Exhibit 22

TABLE 1
SUMMARY OF GROUNDWATER ANALYTICAL DATA - PRIMARY VOCs
60 OLYMPIA AVENUE
WOBURN, MASSACHUSETTS

Location Identification	Sampling Date	Screen Interval (feet)	Color	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl Chloride
				Groundwater Standards			
				5	5	70	2
MW-215M	04/13/05	20-23'	---	<1	<1	<1	<2
MW-215M (DUP-2)	04/13/05		---	<1	<1	<1	<2
	04/26/06		0	<0.5	<0.5	<0.5	<0.5
	10/30/06		0	<0.5	**2**	<0.5	<0.5
	04/24/07		0	<0.5	<0.5	<0.5	<0.5
	04/22/08		0	<0.5	<0.5	<0.5	<0.5
	03/23/11		0	<1	**100**	<1	<1
	10/18/11		0	<1	**33**	**1.5**	<1
	08/24/12		0	<1	**53**	<1	<1
	03/07/13		0	<2	**180**	**2.7**	<2
	07/31/13		0	<1	<1	<1	<1
	03/21/14		0	<1	**190**	**51**	<1
	10/05/15		4	<10	<10	<10	<10
	02/21/17		0	<1	**280**	**82**	<1
	10/26/17		0	<2	**200**	**110**	<2
MW-215D	04/13/05	30-33'	---	<1	<1	<1	<2
	09/13/05		0	<0.5	<0.5	<0.5	<0.5
	01/11/06		0	<0.5	**1**	<0.5	<0.5
	04/26/06		0	<0.5	<0.5	<0.5	<0.5
	07/19/06		0	<0.5	<0.5	<0.5	<0.5
	03/28/07		0	<0.5	<0.5	<0.5	<0.5
	04/22/08		0	<0.5	<0.5	<0.5	<0.5
	02/21/17		0	<1	<1	<1	<1
MW-216S	04/13/05	10-13'	---	<500	**20,000**	<500	<1,000
	09/13/05		---	**740**	**32,000**	<500	<500
	04/26/06		0	<1,000	**35,000**	<1,000	<1,000
	09/28/06		0	<1,000	**48,000**	<1,000	<1,000
	04/24/07		0	<1,000	**48,000**	<1,000	<1,000
	04/22/08		0	<1,000	**95,000**	<1,000	<1,000
	12/11/08		0	<500	**98,000**	<500	<500
	03/09/09		0	<500	**40,000**	<500	<500
	05/07/09		2	<250	**26,000**	<250	<250
	11/03/09		0	<500	**120,000**	<500	<500
	02/15/10		0	**180**	**32,000**	<100	<100
MW-216SX	02/15/10		0	<500	**78,000**	<500	<500
	09/01/10		4	<130	<25	<25	<25
MW-216SX	09/01/10		4	<1,300	**56,000**	<250	<250
	03/23/11		0	<1,000	**94,000**	<1,000	<1,000
	10/18/11		0	<1,000	**26,000**	<1,000	<1,000
	04/17/12		0	<50	**17,000**	<50	<50
	08/24/12		0	<250	**20,000**	<250	<250
	03/07/13		2	<10	**600**	<10	<10
	07/31/13		2	<50	**170**	<50	<50
	03/21/14		2	<10	**270**	<10	<10
	05/12/15		1	<10	**82**	<10	<10
	10/05/15		4	<20	<20	<20	<20
	02/21/17		1	<20	<20	<20	<20
MW-216M	04/13/05	20-23'	---	<1	<1	<1	<2
	04/26/06		0	<0.5	**4**	<0.5	<0.5
	04/24/07		0	<0.5	**10**	<0.5	<0.5
	04/23/08		0	<0.5	<0.5	<0.5	<0.5
	03/23/11		0	<0.5	<0.5	<0.5	<0.5
	03/07/13		0	<1	<1	<1	<1
	07/31/13		0	<1	<1	<1	<1
	03/21/14		0	<1	<1	<1	<1
	02/21/17		0	<1	<1	<1	<1
MW-216D	04/13/05	30-33'	---	<1	<1	<1	<2
	09/13/05		---	<0.5	<0.5	<0.5	<0.5
	01/11/06		---	<0.5	<0.5	<0.5	<0.5
	04/26/06		0	<0.5	<0.5	<0.5	<0.5
	07/19/06		0	<0.5	**0.5**	<0.5	<0.5
	12/14/06		0	<0.5	**1**	<0.5	<0.5
	04/24/07		0	<0.5	<0.5	<0.5	<0.5
	04/22/08		0	<0.5	<0.5	<0.5	<0.5
	02/21/17		0	<1	**4.2**	<1	<1
OUTSIDE CONTAINMENT CELL SIDE GRADIENT WEST (Adjacent to Sewer Line Easement)							
GEO-5	06/24/03	2-12'	---	**280**	**3,300**	<50	<50
GEO-6	06/24/03	11-16'	---	<0.5	<0.5	<0.5	<0.5
	04/13/05		---	<1	<1	<1	<2
	04/24/06		0	<0.5	<0.5	<0.5	<0.5
	10/30/06		0	<0.5	**2**	<0.5	<0.5
	04/24/07		0	<0.5	<0.5	<0.5	<0.5
	06/18/07		---	<0.5	<0.5	<0.5	<0.5
GEO-7	06/24/03	6-16'	---	**2**	**8**	<0.5	<0.5
	04/13/05		---	<1	**4**	<1	<2
	04/24/06		0	<0.5	**1**	<0.5	<0.5
	09/28/06		0	<0.5	**2**	<0.5	<0.5
	04/26/07		0	<0.5	<0.5	<0.5	<0.5
	06/18/07		---	<0.5	<0.5	<0.5	<0.5
MW-13	07/09/02	7-17'	---	**410**	**780**	**1,500**	<2
	04/22/03		---	**650**	**280**	**780**	<10
	06/02/03		---	**430**	**250**	**1,300**	<25
	04/14/05		---	**470**	**160**	**340**	<20
	04/26/06		0	**1,500**	**1,400**	**350**	<50
	09/28/06		---	**1,100**	**2,200**	**480**	<25
	04/26/07		---	**1,400**	**4,100**	**380**	<50
	06/18/07		---	**1,100**	**7,100**	**710**	**34**
	11/05/07		---	**560**	**6,400**	**260**	<100
	04/22/08		0	**730**	**6,000**	**420**	<50
	04/07/09		0	**530**	**6,300**	**440**	<50
	02/15/10		3	<10	<10	<10	<10
MW-13X	02/15/10		3	<3	<3	<3	<3
	03/23/11		3	<0.5	<0.5	<0.5	<0.5
MW-13X	03/23/11		3	<25	<25	<25	<25
	10/18/11		3	<12	<12	<12	<12
MW-13X	10/18/11		3	<25	<25	<25	<25
MW-13 ASCORBIC ACID	04/17/12		3	<20	<20	<20	<20
	04/17/12		3	<20	<20	<20	<20
	03/07/13		3	<10	<10	<10	<10
MW-13X	03/07/13		3	<10	<10	<10	<10
	03/21/14		3	<10	<10	<10	<10
MW-13X	03/21/14		3	<10	<10	<10	<10

Exhibit 22

TABLE 1
SUMMARY OF GROUNDWATER ANALYTICAL DATA - PRIMARY VOCs
60 OLYMPIA AVENUE
WOBURN, MASSACHUSETTS

Location Identification	Sampling Date	Screen Interval (feet)	Color	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl Chloride
				Groundwater Standards			
				5	5	70	2
MW-212M	04/14/05	20-23'	---	<1	<1	<1	<2
	04/26/06		0	<0.5	**3**	<0.5	<0.5
	04/25/07		0	<0.5	**7**	**2**	<0.5
	03/07/13		0	<1	<1	<1	<1
	03/21/14		0	<1	<1	<1	<1
	02/21/17		0	<1	<1	<1	<1
MW-212D	04/14/05	30-33'	---	<1	<1	<1	<2
MW-212D (DUP-6)	04/14/05		---	<1	<1	<1	<2
	04/26/06		0	<0.5	<0.5	<0.5	<0.5
	04/26/07		0	<0.5	<0.5	<0.5	<0.5
	04/08/09		0	<0.5	<0.5	<0.5	<0.5
	02/21/17		0	<1	<1	**1**	<1
MW-213S	04/13/05	10-13'	---	**240**	**70**	**140**	<10
MW-213S (DUP-1)	04/13/05		---	**230**	**70**	**140**	<10
	04/24/06		0	**120**	**120**	**47**	<25
	03/28/07		0	**330**	**900**	**150**	<10
	06/18/07		---	**400**	**2,000**	**200**	<10
	04/22/08		0	**280**	**2,100**	**110**	<25
	04/08/09		0	**400**	**6,000**	**81**	<50
	09/01/10		2	**210**	<25	<25	<25
MW-213SX	09/01/10		2	**640**	**13,000**	**120**	<25
	03/23/11		0	**140**	**2,000**	**51**	<25
MW-213S (DUP-1)	03/23/11		0	**140**	**2,000 (D)**	**50**	<10
MW-213SX	03/23/11		0	**150**	**2,200**	**53**	<25
	10/18/11		0	**72**	**620**	**140**	<40
MW-213SX	10/18/11		0	<10	<10	<10	<10
MW-213 ASCORBIC ACID	04/17/12		0	**88**	**470**	**36**	<10
	04/17/12		0	**82**	**500**	**34**	<5
	08/24/12		3	**120**	**1,400**	**36**	<20
MW-213SX	08/24/12		3	<5	<5	<5	<5
	03/07/13		1	**15**	**59**	<10	<10
MW-213SX	03/07/13		1	<10	<10	<10	<10
	07/31/13		2	<20	<20	<20	<20
	03/21/14		0	<10	**18**	<10	<10
MW-213SX	03/21/14		0	<10	**17**	<10	<10
	10/05/15		0	**16**	**47**	**190**	<10
	02/21/17		0	<25	**270**	**98**	<25
	10/26/17		0	<10	**170**	**240**	<10
	03/23/18		0	**9.8**	**260**	<5	<5
MW-213M	04/13/05	20-23'	---	<1	<1	<1	<2
	04/24/06		---	<0.5	<0.5	<0.5	<0.5
	04/24/07		0	<0.5	<0.5	<0.5	<0.5
	06/18/07		0	<0.5	<0.5	<0.5	<0.5
	03/23/11		0	<0.5	**6**	**3**	<0.5
	10/18/11		0	<1	**1.9**	**1.2**	<1
	03/07/13		0	<1	**3.6**	**2.4**	<1
	07/31/13		0	<1	**4.2**	**3.8**	<1
	03/21/14		0	<1	**2.6**	**1.5**	<1
	02/21/17		0	<1	**6.2**	**11**	<1
MW-213D	04/13/05	30-33'	---	<1	<1	<1	<2
	04/24/06		0	<0.5	<0.5	<0.5	<0.5
	03/28/07		0	<0.5	<0.5	<0.5	<0.5
	02/21/17		0	<1	<1	<1	<1
MW-220M	04/14/05	20-23'	---	<1	<1	<1	<2
	04/26/06		0	<1	<1	<1	<1
	04/27/07		0	<0.5	<0.5	<0.5	<0.5
	02/21/17		0	<1	<1	**6.9**	<1
MW-220D	04/13/05	30-33'	---	<1	<1	<1	<2
	04/26/06		0	<0.5	<0.5	<0.5	<0.5
	09/28/06		0	<0.5	<0.5	<0.5	<0.5
	04/26/07		0	<0.5	<0.5	<0.5	<0.5
	02/21/17		0	<1	<1	<1	<1
SIDE GRADIENT WEST (Adjacent to Sewer Line Easement)							
GEO-8 (MW-301)	06/18/07	15-20'	---	<0.5	<0.5	<0.5	<0.5
	04/23/08		0	<0.5	<0.5	<0.5	<0.5
GEO-9 (MW-302)	06/18/07	15-20'	---	<0.5	<0.5	<0.5	<0.5
	04/24/08		0	<0.5	<0.5	<0.5	<0.5
DOWNGRADIENT							
MW-011S	04/26/02	4-14'	---	<0.1	**0.13**	<2	**0.264**
	04/14/05		---	**2**	**5**	**13**	<2
	04/25/06		0	**3**	**8**	**26**	**2**
	04/23/08		0	**0.5**	**2**	**12**	**1**
	11/16/11		---	<0.5	**2.1**	**4.7**	**1.2**
MW-11S	03/23/18		0	<1	**1.4**	**4.4**	<1
MW-011M	04/26/02	40-50'	---	**7**	**120**	**17**	<2
	04/14/05		---	<1	**19**	**2**	<2
	04/25/06		0	<0.5	**4**	**0.8**	<0.5
	04/23/08		0	<0.5	**2**	**0.6**	<0.5
	11/16/11		---	<0.5	**0.80**	**0.30 (J)**	<1
	03/23/18		---	<1	<1	<1	<1
MW-011D	04/26/02	81-91'	---	<0.1	<0.1	<2	<0.1
	04/25/06		0	<0.5	<0.5	<0.5	<0.5
	04/23/08		0	<0.5	<0.5	<0.5	<0.5
	11/16/11		---	<0.5	<0.5	<0.5	<1
MW-014S	07/10/02	5-15'	---	**25**	**180**	**670**	**190**
	04/22/03		---	**1**	**6**	**61**	**19**
	06/02/03		---	**2**	**15**	**62**	**16**
	04/13/05		---	**3**	**6**	**98**	**16**
	09/28/06		1	**120**	**810**	**110**	<10
	04/24/07		0	**39**	**25**	**29**	**6**
	06/18/07		---	**51**	**29**	**33**	**7**
	04/23/08		0	**68**	**180**	**210**	**31**
	04/07/09		0	**11**	**27**	**280**	**30**
	10/18/11		0	**7.5**	**45**	**92**	**3.2**
	03/07/13		1	**4.2**	**13**	**80**	**5.6**
	07/31/13		0	<50	**610**	**2,300**	**79**
	03/21/14		0	**3.3**	**7.7**	**110**	**9.4**
	09/29/14		2	**1.6**	**33**	**160**	<1
	10/05/15		0	<2	**10**	**200**	**15**

Exhibit 22

TABLE 1
SUMMARY OF GROUNDWATER ANALYTICAL DATA - PRIMARY VOCs
60 OLYMPIA AVENUE
WOBURN, MASSACHUSETTS

Location Identification	Sampling Date	Screen Interval (feet)	Color	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl Chloride
				Groundwater Standards			
				5	5	70	2
MW-014M	07/10/02	20-30'	---	<0.1	<0.1	<2	<0.1
	04/13/05		---	<1	<1	<1	<2
	04/24/06		0	<0.5	<0.5	<0.5	<0.5
	10/30/06		0	<0.5	<0.5	<0.5	<0.5
	04/24/07		0	<0.5	<0.5	<0.5	<0.5
	03/07/13		0	<1	<1	<1	<1
	03/21/14		0	<1	<1	<1	<1
MW-014D	04/13/05	37-40'	---	<1	<1	<1	<2
MW-014D (DUP4)	04/13/05		---	<1	<1	<1	<2
	04/25/06		0	<0.5	**0.6**	<0.5	<0.5
	12/14/06		0	<0.5	**0.5**	<0.5	<0.5
	04/24/07		0	<0.5	**2**	<0.5	<0.5
	04/24/08		0	<0.5	<0.5	<0.5	<0.5
	04/07/09		0	<0.5	<0.5	<0.5	<0.5
	03/07/13		0	<1	<1	<1	<1
	03/21/14		0	<1	<1	<1	<1
MW-217S	04/13/05	10-13'	---	<5	**190**	**400**	<10
	04/24/06		0	**7**	**69**	**80**	<5
	04/24/07		0	<0.5	**3**	**2**	<0.5
	04/22/08		0	**12**	**83**	**520**	<5
MW-217S (DUP-1)	04/22/08		0	**12**	**88**	**530**	<5
	04/08/09		0	**5**	**190**	**550**	<5
MW-217S (DUP-1)	04/08/09		0	<5	**170**	**510**	<5
	09/01/10		0	<130	**840**	**2,200**	<25
	03/23/11		0	**0.8**	**31**	**25**	**2**
	10/18/11		0	<1	<1	**5.4**	<1
	03/07/13		0	<1	**1**	**2.4**	<1
	03/21/14		0	<1	<1	<1	<1
	02/21/17		0	<1	<1	<1	<1
MW-217M	04/13/05	25-28'	---	<1	<1	<1	<2
	04/24/06		0	<0.5	<0.5	<0.5	<0.5
	04/24/07		0	<0.5	<0.5	<0.5	<0.5
	04/23/08		2	<25	<25	<25	<25
	04/08/09		2	<0.5	<0.5	<0.5	<0.5
	03/23/11		0	<0.5	**25**	**19**	<0.5
MW-217MX	03/23/11		0	<0.5	**26**	**20**	<0.5
	10/18/11		0	<1	**110**	**100**	**1.7**
MW-217MX	10/18/11		0	<1	**110**	**100**	**1.9**
MW-217M ASCORBIC ACID	04/17/12		---	<5	**420**	**320**	**10**
MW-217M HCL	04/17/12		---	<5	**400**	**320**	**10**
	08/24/12		0	<10	**610**	**500**	**16**
MW-217MX	08/24/12		0	<10	**590**	**470**	**16**
	03/07/13		0	<10	**780**	**670**	**25**
MW-217MX	03/07/13		0	<10	**540**	**440**	**17**
DUP-1	03/07/13		0	<20	**580**	**460**	<20
	07/31/13		0	<20	**1,200**	**690**	**32**
	03/21/14		0	<10	**1,600**	**530**	**34**
MW-217MX	03/21/14		0	<10	**1,500**	**490**	**28**
MW-217M-DUP	03/21/14		0	<10	**1,400**	**490**	**30**
	09/29/14		2	**4.2**	**260**	**23**	<2
	05/12/15		0	<50	**4,000**	**430**	<50
	10/05/15		3	**6.1**	**220**	**7.3**	<2
	04/13/16		---	<100	**4,500**	**380**	<100
	08/10/16		3	**8.4**	**680**	**14**	<2.5
	08/25/16		3	<25	**1,300**	**31**	<25
	10/18/16		0	<20	**1,500**	**98**	<20
	02/21/17		1	<50	**7,800**	**610**	<50
	05/10/17		2	<25	**1,900**	**140**	<25
	06/29/17		1	<2,600	**320,000**	**27,000**	<2,600
	07/27/17		0	**27**	**4,800**	**380**	**28**
	10/26/17		0	<20	**2,700**	**240**	<20
	02/27/18		0	<1	<1	<1	<1
	03/23/18		0	<50	**5,000**	**380**	<50
	06/22/18		0	**57**	**7,700**	**960**	<50
	06/22/18		0	<50	**6,200**	**590**	<50
	06/22/18		0	<50	**5,700**	**580**	<50
MW-217D	04/13/05	37-40'	---	<1	<1	<1	<2
	09/13/05		0	<0.5	<0.5	<0.5	<0.5
	01/11/06		0	<0.5	<0.5	<0.5	<0.5
	04/24/06		0	<0.5	<0.5	<0.5	<0.5
	07/19/06		0	<0.5	<0.5	<0.5	<0.5
	03/28/07		0	<0.5	<0.5	<0.5	<0.5
	03/21/14		0	<1	<1	<1	<1
	02/21/17		0	<1	<1	<1	<1
MW-218S	04/13/05	10-13'	---	<1	**27**	**93**	**5**
	04/25/06		0	<1	**1**	**44**	**6**
MW-218S (DUP-2)	04/25/06		0	<1	**1**	**45**	**6**
	04/25/07		0	<0.5	**3**	**10**	**3**
	04/23/08		0	<0.5	**4**	**9**	**3**
	04/08/09		0	<0.5	**0.5**	**1**	<0.5
	03/21/14		0	<1	<1	**1.6**	<1
	02/21/17		0	<1	<1	**1.2**	<1
MW-218M	04/13/05	25-28'	---	<1	<1	<1	<2
	04/26/06		0	<0.5	**4**	<0.5	<0.5
	04/25/07		0	<0.5	**1**	<0.5	<0.5
	04/23/08		0	<0.5	**0.8**	<0.5	<0.5
	04/08/09		0	<0.5	<0.5	<0.5	<0.5
	03/07/13		0	<1	<1	<1	<1
	03/21/14		0	<1	<1	<1	<1
	02/21/17		0	<1	**1**	<1	<1
	10/12/18		0	<1	**5.4**	**1.4**	<1
MW-218D	04/13/05	37-40'	---	<1	<1	<1	<2
MW-218D (DUP-3)	04/13/05		---	<1	<1	<1	<2
	04/26/06		0	<0.5	**1**	<0.5	<0.5
	12/14/06		0	<0.5	<1	<0.5	<0.5
	04/26/07		1	<0.5	<0.5	<0.5	<0.5
	02/21/17		0	<1	<1	<1	<1

Exhibit 22

TABLE 1
SUMMARY OF GROUNDWATER ANALYTICAL DATA - PRIMARY VOCs
60 OLYMPIA AVENUE
WOBURN, MASSACHUSETTS

Location Identification	Sampling Date	Screen Interval (feet)	Color	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl Chloride
				Groundwater Standards			
				5	5	70	2
MW-219S	04/13/05	10-13'	---	<1	**2**	**33**	**5**
	04/25/06		0	<0.5	<0.5	<0.5	<0.5
	04/25/07		0	<0.5	<0.5	<0.5	<0.5
	04/23/08		0	<0.5	<0.5	<0.5	<0.5
	04/07/09		0	<0.5	<0.5	<0.5	<0.5
	03/07/13		0	<1	<1	<1	<1
	03/21/14		0	<1	<1	<1	<1
	02/21/17		0	<1	**1.6**	**2.8**	<1
MW-219M	04/13/05	25-28'	---	<1	**6**	**63**	**12**
	04/25/06		0	<5	**11**	**210**	**12**
	04/24/07		0	<1	**6**	**56**	**6**
	04/23/08		0	**1**	**4**	**39**	**8**
	04/08/09		0	**0.7**	**2**	**16**	**3**
	03/07/13		0	<1	<1	**7.9**	**1.8**
	03/21/14		0	<1	<1	**9.5**	**2.3**
	02/21/17		0	<1	<1	<1	<1
	10/12/18		0	<1	**1.6**	**3.4**	<1
MW-219D	04/13/05	37-40'	---	<1	<1	<1	<2
	09/13/05		---	<0.5	<0.5	<0.5	<0.5
	01/11/06		0	<0.5	<0.5	<0.5	<0.5
	04/25/06		0	<0.5	<0.5	<0.5	<0.5
	07/19/06		0	<0.5	<0.5	<0.5	<0.5
	03/28/07		0	<0.5	<.5	<0.5	<0.5
	04/24/07		0	<0.5	<0.5	<0.5	<0.5
	02/21/17		0	<1	<1	<1	<1

NOTES:

1. Values in micrograms per liter (µg/L).
2. Bold exceeds laboratory detection limits.
3. Shaded concentrations exceed applicable Groundwater Standard.
4. Groundwater Standards are ROD ICLs or MCP Method 1/GW-1 Risk Standards.
5. (J) = estimated concentration.
6. (UJ) = estimated non-detect.
7. ND = Not Detected: detection limit unknown.
8. --- = Not analyzed
9. Sodium permanganate injected between September 1, 2005 and November 16, 2018.
10. D = listed value obtained from second (diluted) analytical run.
11. e = Concentration exceeded calibration range for the analyte.
12. On March 28, 2007 OL-2M was mislabled as MW-OL-2M on the chain of custody submitted to the lab.

Exhibit 22

Appendix C

ARARs Tables

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**	**FIFTH 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 * Now under Floodplain Management and Protection of Wetlands - 44 CFR. 9	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 * Now under Floodplain Management and Protection of Wetlands - 44 CFR. 9	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**	**FIFTH FIVE-YEAR REVIEW**
Federal Regulatory Requirements	RCRA Floodplain Restrictions for Solid Waste Disposal Facilities and Practices - 40 C.F.R. § 257.3-1	***NEW ADDITION*** Applicable	Solid waste practices must not restrict the flow of a 100-year flood, reduce the temporary water storage capacity of the floodplain or result in washout of solid waste, so as to pose a hazard to human life, wildlife, or land or water resources. Any solid waste generated from the installation and maintenance of monitoring/extraction wells, access ways, and treatment systems will be managed so that it will not impact floodplain resources.	Activities at the Source Areas governed by this requirement are completed. No PRP facility is proposing further work in the floodplain.
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.
Federal Regulatory Requirements	National Historical Preservation Act -16 U.S.C. 469 et seq.; 36 C.F.R. Part 65	***NEW ADDITION*** Relevant and Appropriate	When a federal agency finds, or is notified, that its activities in connection with a federal construction project may cause irreparable loss or destruction of significant scientific, pre-historical, historical, or archeological data, the substantive standards under the Act will be met.	Any undisturbed areas where monitoring/extraction wells, access ways, and treatment systems will be constructed will be assessed to ensure no protected resource areas are present. If present there will be consultation with federal and state preservation officials to address measures to avoid, minimize and/or mitigate any impacts to protected resource areas.
Federal Regulatory Requirements	Fish and Wildlife Coordination Act - 16 U.S.C. §§ 662, 663	***NEW ADDITION*** Relevant and Appropriate	Requires consultation with appropriate agencies to protect fish and wildlife when federal actions may alter waterways. Must develop measures to prevent and mitigate potential loss to the maximum extent possible.	Consultation with appropriate federal agencies will be maintained during planning and implementation of enhancements to the remedy, if any, that may alter protected resource areas

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**	**FIFTH FIVE-YEAR REVIEW**
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 October 2017.	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 March 2017.	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	Relevant and Appropriate	Establishes water quality-based standards for filling activities (CWA Section 401). These regulations were most recently amended in October 2014.	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**	**FIFTH 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.
State Regulatory Requirements	Massachusetts Hazardous Waste Regulations, Location Standards for Land Subject to Flooding - 310 C.M.R. 30.701	***NEW ADDITION*** Relevant and Appropriate	Any new or expanding hazardous waste storage or treatment facility (which only receives hazardous waste from on-site sources), the active portion of which is located within the boundary of land subject to flooding from the statistical 100-year frequency storm, shall be flood-proofed. Flood-proofing shall be designed, constructed, operated and maintained to prevent floodwaters from coming into contact with hazardous waste. Any hazardous waste generated from installation and maintenance of monitoring/extraction wells, access ways, and treatment systems will be managed so that it will not impact floodplain resources.	These regulations are relevant and appropriate.
State Regulatory Requirements	Public Waterfront Act; Waterways regulations - M.G.L. ch. 91; 310 C.M.R. 9.00	***NEW ADDITION*** Relevant and Appropriate	Sets forth criteria for work within waterways, below the high water mark, designated by the State (including the Aberjona River).	If there are no practical alternatives to installation and maintenance of monitoring/extraction wells, access ways, and treatment systems on or adjacent to the river bank, then measures will be taken to meet environmental standards and limit impacts.

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**	**FIFTH FIVE-YEAR REVIEW**
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**	**FIFTH 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	Safe Drinking Water Act; National primary drinking water regulations, Maximum Contaminant Level Goals (MCLGs)	***NEW ADDITION*** Relevant and Appropriate for Non-zero MCLGs only; MCLGs set as zero are To Be Considered.	Establishes MCLGs for public water supplies. MCLGs are health goals for drinking water sources. These unenforceable health goals are available for a number of organic and inorganic compounds.	Considered as part of this FYR.
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.

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**	**FIFTH FIVE-YEAR REVIEW**
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. Incremental updates for parameters, such as PCE and TCE in 2015, are documented at www.epa.gov/wqc.
State Regulatory Requirements	Massachusetts Drinking Water Regulations Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) (310 CMR 22.00)	Relevant and Appropriate	Massachusetts MCLs establish levels of contaminants allowable in public drinking 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 March 11, 2016. Massachusetts Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) are specified for numerous contaminants, including inorganic and organic chemicals. For the most part, the numerical criteria are identical to Federal SDWA MCLs and MCLGs, although there are several additional chemicals that have criteria.	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.

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**	**FIFTH FIVE-YEAR REVIEW**
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 December 2016, 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	Guidance used to compute human health hazard resulting from exposure to non-carcinogens in site media. RfDs are dose levels developed by the EPA for noncarcinogenic effects and are considered to be the levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.. Changes in toxicity values, including benzo(a)pyrene, have occurred since the fourth FYR. Other toxicity values have also changed as described in the text.	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.
Federal Criteria, Guidance, Advisories to be Considered	EPA Carcinogen Assessment Group Potency Factors	TBC	These factors are used to evaluate an acceptable risk from a carcinogen. 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.
Federal Criteria, Guidance, Advisories to be Considered	EPA Health Advisories	***NEW ADDITION*** TBC	EPA publishes contaminant-specific health advisories that indicate the non-carcinogenic risks associated with consuming contaminated drinking water. Used to develop risk-based cleanup standards.	Serves as the risk basis for manganese in OU1 groundwater.

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**	**FIFTH FIVE-YEAR REVIEW**
Federal Criteria, Guidance, Advisories to be Considered	Guidelines for Carcinogenic Risk Assessment - EPA/630/P-03/001F	***NEW ADDITION*** TBC	These guidelines provide guidance on conducting risk assessments involving carcinogens.	Considered as part of this FYR.
Federal Criteria, Guidance, Advisories to be Considered	Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens - EPA/630/R-03/003F	***NEW ADDITION*** TBC	This provides guidance on assessing risk to children from carcinogens.	Considered as part of this FYR.
Federal Criteria, Guidance, Advisories to be Considered	Human Health Assessment Cancer Slope Factors (CSFs)	***NEW ADDITION*** TBC	CSFs are estimates of the upper-bound probability of an individual developing cancer as a result of a lifetime exposure to a particular concentration of a potential carcinogen.	Considered as part of this FYR.
Federal Criteria, Guidance, Advisories to be Considered	Guidance on Remedial Actions for Superfund Sites with PCB Contamination - EPA-540-G-90-007 (August 1990)	***NEW ADDITION*** TBC	EPA Guidance for evaluating risks posed by PCBs at Superfund sites. Used to develop risk-based cleanup standards.	Considered as part of this FYR.
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**	**FIFTH FIVE-YEAR REVIEW**
Federal Regulatory Requirements	Resource Conservation and Recovery Act (RCRA) Subtitle C; Hazardous Waste Identification and Listing Regulations - 42 U.S.C. §6901 et seq.; 40 C.F.R. Parts 260-262 and 264	***NEW ADDITION*** TBC	Federal standards used to identify, manage, and dispose of hazardous waste. Massachusetts has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations. These provisions have been adopted by the State.	Hazardous waste is managed appropriately as part of the remedy.
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 soil vapor extraction (SVE) with activated carbon treatment is now being used on the UniFirst property (in addition to pump and treat as an enhancement). 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. Waste materials potentially impacted by RCRA wastes may still require disposal from time to time and thus this ARAR is relevant and appropriate.

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**	**FIFTH FIVE-YEAR REVIEW**
Federal Regulatory Requirements	Toxic Substances Control Act (TSCA); PCB Remediation Waste - 15 U.S.C. 2601 et seq.; 40 C.F.R. 761.61(c)	***NEW ADDITION*** TBC	This section of the TSCA regulations provides risk-based cleanup and disposal options for PCB remediation waste based on the risks posed by the concentrations at which the PCBs are found. Written approval for the proposed risk-based cleanup must be obtained from the Director, Office of Site Remediation and Restoration, USEPA Region 1.	
Federal Regulatory Requirements	TSCA - PCB Incineration Requirements (40 CFR 761.70(a)(2). 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, as there are no present plans for off-site PCB disposal via incineration.
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 packaging, labeling, marking, placarding, accumulating, and manifesting hazardous waste prior to and for 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.

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**	**FIFTH 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.
Federal Regulatory Requirements	Clean Water Act; Toxic Pollutant Effluent Standards - 40 CFR 129	***NEW ADDITION*** Relevant and Appropriate	Regulates surface water discharges of specific toxic pollutants, specifically certain pesticides and PCBs.	Any water generated from the pump and treat systems and during installation and management of monitoring/extraction wells is/will be treated to meet applicable toxic pollutant discharge standards (if regulated contaminants are present) where the water is to be discharged to surface waters.
Federal Regulatory Requirements	Clean Water Act, National Recommended Water Quality Criteria (NRWQC) - 33 U.S.C. § 1314, 40 CFR Part 131	***NEW ADDITION*** Relevant and Appropriate	NRWQC are provided by EPA for chemicals for both the protection of human health and the protection of aquatic life. They are used to establish monitoring standards for surface waters and sediments, if required for the remedial action.	These requirements remain relevant and appropriate 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**	**FIFTH FIVE-YEAR REVIEW**
Federal Regulatory Requirements	Safe Drinking Water Act; National primary drinking water regulations, Maximum Contaminant Levels 42 U.S.C. § 300f et seq.; 40 C.F.R. 141, Subparts B and G-	***NEW ADDITION*** Relevant and Appropriate	Federal drinking waters standards used as groundwater monitoring standards when contaminated media left in place. The standards arecused as groundwater monitoring standards until groundwater cleanup is achieved.	These requirements remain relevant and appropriate.
Federal Regulatory Requirements	Safe Drinking Water Act; National primary drinking water regulations, Maximum Contaminant Level Goals - 42 U.S.C. § 300f et seq.; 40 C.F.R. 141, Subpart F	***NEW ADDITION*** Relevant and Appropriate for non-zero MCLGs only; MCLGs set as zero are To Be Considered.	Federal drinking waters standards used as groundwater monitoring standards when contaminated media left in place. Standards used as groundwater monitoring standards until groundwater cleanup is achieved.	These requirements remain relevant and appropriate.
Federal Criteria, Guidance, Advisories to be Considered	EPA Health Advisories	***NEW ADDITION*** TBC	Federal risk-based standards for groundwater used as groundwater monitoring standards when contaminated media left in place. Risk-based standards developed using these advisories used as groundwater monitoring standards until groundwater cleanup is achieved.	Serves as the risk basis for manganese in OU1 groundwater.
Federal Criteria, Guidance, Advisories to be Considered	Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration - OSWER Directive 9283.1-33 (June 26, 2009)	***NEW ADDITION*** Relevant and Appropriate	Guidance on developing groundwater remedies at CERCLA sites. Groundwater remediation standards called for in this guidance will be satisfied as long as groundwater cleanup will be achieved through operating the pump and treat systems and ICs are established. that will prevent exposure to contaminated groundwater until cleanup standards are achieved.	These requirements remain relevant and appropriate.

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**	**FIFTH FIVE-YEAR REVIEW**
Federal Criteria, Guidance, Advisories to be Considered	Generation of investigation derived waste - USEPA OSWER Publication 9345.3-03 FS (January 1992)	***NEW ADDITION*** Relevant and Appropriate	Guidance on the management of Investigation-Derived Waste (IDW) in a manner that ensures protection of human health and the environment. IDW generated will be managed based on guidance standards.	These requirements remain relevant and appropriate.
Federal Criteria, Guidance, Advisories to be Considered	OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air - OSWER Publication 9200.2-154 (June 2015)	***NEW ADDITION*** Relevant and Appropriate	EPA guidance for addressing vapor intrusion issues at CERCLA sites.	Applicable to redevelopment activities.
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. Transporters of hazardous waste are subject to both DOT and EPA enforcement of the regulations. Consequently, the DOT and EPA coordinate their efforts to obtain compliance with both the RCRA and Hazardous Materials Transportation Action (HMTA) regulations.	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 use tanks to store or treat hazardous waste 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 requires that facilities be designed, constructed, maintained, and operated to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water which could threaten human health or the environment.	These requirements remain relevant and appropriate 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**	**FIFTH FIVE-YEAR REVIEW**
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 contingency planning and emergency procedures to be used for 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 manifesting, 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 and performance standards for closure and post-closure care of hazardous waste facilities.	Closure requirements may be relevant and appropriate to soil clean ups.
Federal Regulatory Requirements	RCRA, Air Emission Standards for Process Vents - 40 C.F.R. Part 264, Subpart AA	***NEW ADDITION*** TBC	Standards for process vents for air treatment systems for RCRA wastes that have total organic concentrations of 10 ppm or greater. RCRA emissions standards not delegated to the State. Applicable, if VOC emissions over 10 ppm or greater; Relevant and Appropriate, if less than 10 ppm.	If air treatment of VOCs is required, emission standards for any process vents, if present, will be achieved.
Federal Regulatory Requirements	RCRA, Air Emission Standards for Equipment Leaks - 40 C.F.R. Part 264, Subpart BB	***NEW ADDITION*** TBC	Standards for preventing air equipment leaks for systems that treat RCRA wastes that have total organic concentrations of 10 ppm or greater. RCRA emissions standards not delegated to the State.	Standards for preventing air emission leaks from treatment systems for VOCs will be achieved, if applicable.
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 chemicals/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.

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**	**FIFTH FIVE-YEAR REVIEW**
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 occupational injuries and illness 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 761.45). 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, when needed.
Federal Regulatory Requirements	TSCA - Storage and Disposal (40 CFR 761.50 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 applied to, and were complied with, for PCB-impacted soil that was shipped off-site.
Federal Regulatory Requirements	TSCA - Records and Reports (40 CFR 761.180 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**	**FIFTH FIVE-YEAR REVIEW**
Federal Regulatory Requirements	CAA - National Air Quality Standards for Total Suspended Particulates (40 CFR 129.105, 750, now 40 CFR Part 50.6 and 50.7). Alternatives SC-10 and MOM-2.	Applicable	This regulation specifies maximum primary and secondary 24 hour concentrations for particulate matter. When first promulgated, total suspended particulate matter (TSP) was chosen as the size indicator for particulate matter (PM) regulation. Subsequently, PM has been modified to include size specific standards for PM10 (particulate matter 10 micrometers or less in diameter) and PM2.5 (particulate matter 2.5 micrometers or less in diameter), respectively.	Compliance with this regulation, including potential fugitive dust levels, is applicable.
Federal Regulatory Requirements	Clean Air Act (CAA), Hazardous Air Pollutants; National Emission Standards for Hazardous Air Pollutants (NESHAPS) - 42.U.S.C. § 112(b)(1); 40 C.F.R. Part 61	***NEW ADDITION*** Relevant and Appropriate	The regulations establish emissions standards for 189 hazardous air pollutants. Standards set for dust and other release sources.	Remedial activities, including air discharges from the pump and treat system and excavation and management of monitoring/extraction wells, are implemented in accordance with these rules. No air emissions from remedial activities will cause air quality standards to be exceeded. Dust standards will be complied with during excavation and management of materials within the OU.

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**	**FIFTH FIVE-YEAR REVIEW**
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 for VOCs. The final rule (55 FR 25454) is dated June 21, 1990, with typographical errors corrected on April 26, 1991 (56 FR 19514).	Applies to the control of air emissions from hazardous waste treatment, storage, and disposal facilities (TSDF) that are already required to have a RCRA permit to reduce VOC emissions from facilities managing organic hazardous waste through the installation, operation, and maintenance of control equipment, leak detection and repair, and recordkeeping and reporting.
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 have been complied with. At this time, the Unifirst system does not employ air stripping, but rather activated carbon treatment.
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 October 2014.	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**	**FIFTH 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 March 2017.	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 October 2014.	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. These regulations provide that discharges to waters of the Commonwealth shall not result in exceedances of MA Surface Water Quality Standards (MSWQS). This requirement is generally aligned with 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**	**FIFTH 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. Unless the State determines that the groundwater is not an underground source of drinking, all ground waters of the Commonwealth are designated as a source of potable water supply.	This regulation does not apply at this time as there are no discharges to groundwater per the regulation, but would need to be considered if groundwater discharge was selected as a discharge option.
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 December 2016, eliminated the need for this regulation. The requirements of 314 CMR 6.00 are no longer published.

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**	**FIFTH FIVE-YEAR REVIEW**
State Regulatory Requirements	Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities - 314 C.M.R. 8.03	***NEW ADDITION*** Relevant and Appropriate	This regulation outlines the additional requirements that must be satisfied in order for a RCRA facility to comply with the NPDES regulation. Any water generated during operation of the pump and treat system or during extraction/monitoring well drilling or maintenance that meets hazardous waste standards will be treated to meet NPDES standards, if the water is to be discharged to surface waters.	These requirements are relevant and appropriate and have been complied with.
State Regulatory Requirements	Massachusetts Drinking Water Regulations Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) (310 CMR 22.00)	Relevant and Appropriate	Massachusetts MCLs establish levels of contaminants allowable in public drinking 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 March 11, 2016. Massachusetts Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) are specified for numerous contaminants, including inorganic and organic chemicals. For the most part, the numerical criteria are identical to Federal SDWA MCLs and MCLGs, although there are several additional chemicals that have criteria.	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	Air Emission Limitations for Unspecified Sources of Volatile Organic Compounds (310 CMR 7.18(17)) Alternative MOM-2.	Relevant and Appropriate	No person shall cause, suffer, allow or permit emissions from the facility in excess of an emission rate achievable through the implementation of reasonably available control technology (RACT) as required in an emission control plan and regulatory schedule.	The requirements remain relevant and appropriate since the OU-1 treatment systems continue to generate VOC emissions (i.e., Wildwood and Unifirst).

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**	**FIFTH FIVE-YEAR REVIEW**
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 January 2015.	The requirements remain relevant and appropriate. Since the OU-1 treatment systems continues to generate RCRA regulated wastes.
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 since off-site incineration of wastes from OU-1, if utilized, will not take place in Massachusetts.
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 primary and secondary ambient air quality standards to protect public health or welfare from anticipated adverse effects of pollutants such as particular matter, carbon monoxide, ozone, sulfur dioxide, nitrogen dioxide, and lead.	These requirements remain applicable and have been complied with. Contaminated soils may still require removal and hence, the requirements would be applicable (e.g, particulate matter).
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 These requirements apply to the UniFirst soil vapor extraction and treatment (SVET) system and are being complied with.
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.

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**	**FIFTH FIVE-YEAR REVIEW**
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.
State Guidance and Advisories	Massachusetts Standard References for Monitoring Wells - WSC–310-91	***NEW ADDITION*** Applicable	Guidance on locating, drilling, installing, sampling and decommissioning monitoring wells. Monitoring wells will be established, maintained, and decommissioned in accordance with these guidance standards	These requirements are applicable.

Appendix D

Site Inspection Information

Site Inspection Summary

The inspection of the five OU1 Source Area Properties was conducted on 2/18/2019 and 2/19/2019. In attendance were David Sullivan, LSP, and Jeffrey Hansen, PH, of TRC, on behalf of the EPA RPM. The purpose of the inspection was to assess the protectiveness of the remedy.

The following individuals attended inspections for the respective SDs:

- **Grace Property:** Clayton Smith, Project Coordinator - de Maximis, Inc.; Van Sawyer, Technical Services Manager – GES, and operator of the groundwater extraction and treatment system; and Paul Bucens of W.R. Grace.
- **UniFirst Property:** Tim Cosgrave, Director of EHS for UniFirst and O&M Manager for GWETS.
- **Wildwood Property:** Peter Cox, PG, Project Manager – AECOM and Edward Zygarowski, O&M Manager for GWETS and AS/SVE System, also of AECOM.
- **NEP Property:** Jeff Hamel, LSP and Project Manager – Woodard and Curran, Inc.; and
- **Olympia Property:** Christene Binger, Associate Professional Hydrogeologist - GeoInsight.

The inspections included visual inspection of each Source Area Property for site access, record keeping, and 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 (February 18, 2019)

Site Access and Security

At the time of the inspection, the Grace Property was undergoing development resulting in public access to the property. Portions of the property immediately adjacent to Washington Street have been developed as eateries and are currently accessible to the public. The building housing the GWETS is located on the rear half of the property that is currently undergoing development as a hotel and restaurant. The GWETS building is locked when O&M personnel are not on-site and equipped with a security system. There have been no reported incidents of vandalism during the FYR period. A visitors' log is maintained in the treatment building.

GWETS

The groundwater treatment system was observed to be in good condition. At the time of inspection, where appropriate, equipment and sampling points were properly identified and operating, and no leaks were observed. Two of the three active recovery wells (RW-17 and RW-20) were also observed and were appropriately secured. Snow cover and access constraints associated with the property development hindered the observation of the third active recovery well (RW-22RE). The outfall for treated groundwater at Snyder Creek was observed to be unobstructed and in good condition. An O&M log for the system is maintained on-site and was up-to-date. 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. However, Mr. Smith and Mr. Sawyer noted the inherent challenges in operating an aging system.

Monitoring Well Network

Snow cover and ongoing development activities precluded locating and observing all site monitoring wells. However, the following observations were noted:

- Observed wells were found to be locked or secure;
- Some wells in Washington Street need to be raised; and
- Some wells are boxed in base course and will need further adjustment when final asphalt is laid out.

While not directly related to the protectiveness of the remedy, it is recommended that all monitoring wells be located and assessed when snow cover disappears, and the development has been completed to assess maintenance needs for the monitoring network, if any.

UniFirst Property (February 19, 2019)

Site Access and Security

The perimeter chain-link fence controlling access to the property was in good condition and signage (authorized access only) is posted on the door to the treatment facility. Sampling ports for SVE wells are located behind walls and are accessed by a locked door at each SVE well location. No incidents of vandalism were reported during the inspection.

GWETS

The existing groundwater treatment system infrastructure was observed to be in good condition. At the time of inspection, where appropriate, equipment and sampling points were properly identified and operating, and no unusual leaks were observed. O&M staff visit the site on a weekly basis. Maintenance records are maintained off-site at UniFirst's Office in Wilmington; however, recent records were provided for review during the site inspection. No unexpected changes in cost or scope of O&M or frequent repairs to the groundwater treatment system were reported and no immediate optimization opportunities specific to the site inspection were identified.[1] During the inspection, the wellheads for both recovery wells (UC-22 and EX-1) were observed and found to be secure and in good condition. Mr. Cosgrave reported that EX-1 was not pumping at the desired rate to maintain the target water level elevation on the day of the inspection and that trouble-shooting was ongoing to rectify this issue.

SVET System

Mr. Cosgrave reported that the Johnson Company of Montpelier, Vermont provides routine O&M services for the SVET. The infrastructure for the SVET system was observed to be in good condition and operating. Observed SVE wells were secure at the time of inspection. No unexpected changes in cost or scope of O&M or frequent repairs to the SVET system were reported and no optimization opportunities specific to the site inspection were identified.

Monitoring Well Network

Due to snow cover, not all of the flush mounted wells could be located or observed. However, observed wells and monitoring probes located inside the building were found to be properly secured. Covers for

[1] Following SVE, UniFirst agreed during the previous FYR period 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.

some of the observed flush-mounted wells outside the building were missing bolts and at least one location with a stick up (i.e., PZ1S/D) did not have a lock. Flush-mount wells were not opened during inspection as the covers were frozen in place. In the Year 25 Annual Report, DP37D, UC31M and UC31D were found to be sand locked. According to Tim Cosgrave, the Johnson Company is currently working on a plan to restore these wells. Although wells outside the building are within a fenced area, the property is accessible to the public during operating hours and some wells are located outside the fence. All wells monitored for water levels/water quality for the UniFirst remedy should be inspected after snow cover has melted to identify wells that need to be secured and/or require maintenance.

Wildwood Property (February 18, 2019)

Site Access and Security

The north, east and south sides of the Wildwood Property are fenced, and the east side is bordered by the Aberjona River, which discourages trespassing. Fencing observed during the inspection appears to be in good condition. Access to the Wildwood Property is through a gated gravel road off Cedar Street with a warning sign indicated restricted access. The gate is reported to be locked when O&M or sampling personnel are not present on-property. The GWETS building is locked and equipped with a security/alarm system when O&M personnel are not on-property. There have been no reported incidents of vandalism during the FYR period an no evidence of trespassing was observed during the inspection. A site security log for site visitors is maintained in the treatment building.

GWETS

The existing groundwater treatment system infrastructure was observed to be in good condition and maintenance was up-to-date. Where appropriate, equipment and sampling points were properly identified and operating, and no leaks were observed. O&M staff visit the property on a regular basis. Maintenance logs are maintained at the treatment system building. No unexpected changes in cost or scope of O&M were reported and no immediate optimization opportunities specific to the site inspection were identified.[2] Mr. Cox and Mr. Zygarowski noted the inherent challenges in operating an aging system (e.g., difficulty in finding off-the-shelf part; in some cases, parts need to be fabricated). During the inspection, the wellheads for recovery wells BW-18RD(LO)DR and BW-19R were observed. The well heads are below ground in a protective enclosure; however, the recovery well enclosures are not locked.

SVET System

The infrastructure for the SVET system was observed to be in good condition. No unexpected changes in cost or scope of O&M were reported. Optimization of the AS/SVE portion of the remedy is part of an ongoing conversation with EPA and is being completed in a phased manner. A work plan has been submitted by the SD to implement Phase I expansion and radius of influence testing in the northern portion of the treatment cell (AECOM, 2018). Approval of the work plan is pending. Off-gas treatment has been disconnected temporarily with EPA approval. Off-gas treatment will resume, as warranted, pending installation of additional recovery wells and/or air sparge wells that increase VOC concentrations in influent.

[2] EPA is working with the SD to locate and install additional recovery wells to capture and treat contaminated groundwater not currently captured by existing wells. Modifications to the treatment system may be required pending assessment of flow rates and water quality of additional recovery wells. EPA is also engaged in discussions with the SD regarding pilot testing ISCO in deep bedrock in the vicinity of deep bedrock well BW-6RD(LO). These discussions are ongoing.

Monitoring Well Network

Not all wells could be located or observed because of snow cover or safety concerns (e.g., icy conditions on wooden boards to wells in Aberjona wetlands). However, protective covers at several well locations were not locked/secured, reportedly because the property is fenced, access is via a locked gate which limits access, and O&M personnel are routinely present. It was also noted that at least one well located in an area subject to periodic flooding (BSW-14) did not have an expansion plug to prevent surface water from entering the well. A comprehensive assessment of all wells is recommended once snow cover disappears to identify wells requiring maintenance, if any.

NEP Property (February 18, 2019)

NEP currently does not have an active remediation system. The only activities currently ongoing at the property in association with the remedy is groundwater monitoring. 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.[3]

The trailer housing the mothballed AS/SVE system is located behind the NEP building behind a gate that is locked when personnel are not at the facility and the trailer itself is locked. With the exception of NEP-3 which had a PVC expansion plug, wells were observed to be locked during the site inspection.

Olympia Property (February 19, 2019)

No system is currently active at the Olympia Property, therefore O&M consists of groundwater sampling and periodic oxidant injection (i.e., ISCO) activities.

Site Access and Security

The Olympia Property is accessed through the locked gate at the entrance to the Wildwood Property. A chain-link fence surrounds the property and access is controlled by a second locked gate in the chain-link fence. The fence was in generally in good condition at the time of inspection and no indication of trespassing or vandalism was observed.

Monitoring/Injection Well Network

Monitoring wells located inside the fenced area were observed to be unlocked, most without covers. Several monitoring wells had sampling tubing protruding from the well, and PVC casing extends above the steel protective casing at several location. Although the property is surrounded by fencing, the fencing is unlikely to deter a determined trespasser. For this reason, it is recommended that all wells should be properly secured between monitoring and injection events.

[3] In 2016, PCE and TCE were detected in deeper bedrock groundwater above cleanup goals. Further characterization is planned as part of OU2 investigations to further assess the extent of impacts in deeper bedrock groundwater. Decisions concerning active pump and treat of deeper bedrock groundwater will follow.

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: New England Plastics (NEP)	**Date of inspection:** 02.18.2019
Location and Region: Woburn, MA (EPA Region 1)	**EPA ID:** MAD980732168
Agency, office, or company leading the five-year review: EPA	**Weather/temperature:** Cold, cloudy

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 - Soil Vapor Extraction [SVE] and Air Sparging (AS) operated 1998-2000 and was shut down in March 2000. Monitoring of overburden and shallow bedrock groundwater is conducted every other year (i.e., biennially).

Attachments: ■ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Jeff Hamel, Woodard & Curran, LSP Vice President
   Name Title
   Interviewed ■ at site ☐ at office ☐ by phone Phone No. 978-317-3635
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** Assigned as needed by Jeff Hamel (see above)
   Name Title
   Interviewed ☐ at site ☐ at office ☐ by phone Phone No.
   Problems, suggestions; ☐ Report attached _____
   _____

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. *Not applicable.*

   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 Monitoring plan and checklist for SVE/AS system was kept on-site while system was active. System trailer is on-site and documents were maintained in the trailer.

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 kept up to date at office and taken in the field when field work is (i.e., monitoring) Is performed.

3. **O&M and OSHA Training Records** ■ Readily available ■ Up to date ☐ N/A
Remarks According to Mr. Hamel. OSHA training records are maintained at offices of Woodard & Curran.

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	■ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	■ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	■ N/A
☐ Other permits	☐ Readily available	☐ Up to date	■ N/A

Remarks

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

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

7. **Groundwater Monitoring Records** ■ Readily available ■ Up to date ☐ N/A
Remarks Maintained at offices of Woodard & Curran.

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, coordinated in advance with the property owner (NEP).

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 Woodard & Curran is under direct contract to NEP.

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

Approximately $10,000 per groundwater sampling event.

Total annual cost by year for review period if available – (Not 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 noted.

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

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ■ N/A
   Remarks Gated to prevent vehicle access to back of site, otherwise not a fenced site. Gates were open for site inspection but are reportedly secured when no one present and access not needed to back of Site.

B. Other Access Restrictions

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

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ■ No vandalism evident
   Remarks _____

2. **Land use changes on site** ■ N/A
   Remarks _____
   _____

3. **Land use changes off site** ☐ N/A
   Remarks Increased density of development in the general area of Woburn.

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: Monitoring wells were observed to have protective casings and were locked at the time of site inspection.

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: SVE/AS system is 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 ■ 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) _____

☐ 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 Totalizer readings
☐ 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 _____
_____

5. **Treatment Building(s)**
☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks: Other than minor evidence of mice, the trailer for the mothballed SVE/AS system is in reasonably good condition/serviceable.

6. **Monitoring Wells** (pump and treatment remedy)
■ Properly secured/locked ■Functioning ■ Routinely sampled ■ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks: Some wells not visible due to snow cover/private property access issues. Observed monitoring
Were locked at the time of inspection

D. Monitoring Data

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

Monitoring data suggests: For overburden and shallow bedrock, concentrations are declining and the plume appears to be contained to the property. For deeper bedrock, limited data suggests concentrations in two wells have decreased but have increased ant NEP A.

☐ 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 for NEP included AS and SVE, which was intended to reduce concentrations in soil and overburden groundwater to cleanup goals in the Record of Decision (ROD). The SVE/AS System was effective in addressing Record of Decision (ROD) cleanup levels in unsaturated soils and significantly reducing concentrations of trichloroethene (TCE) and tetrachloroethene (PCE) in groundwater. The system has been shut-down since 2000. Overburden and shallow bedrock groundwater is presently monitored every other year (biennially) and shows downward trends. During the most recent monitoring event in 2017, two wells (one in overburden and one in shallow bedrock) had PCE concentrations remaining above ROD cleanup levels and these concentrations were decreasing. In 2016, three deeper bedrock wells were sampled. Concentrations in two of the wells were less than concentrations observed in 1990 but remain above MCLs. In the remaining well, concentrations had increased above MCLs. On-going analysis of deep bedrock groundwater quality by EPA suggests that groundwater extraction and treatment of deeper bedrock groundwater may be necessary to achieve cleanup levels specified by the ROD in deeper bedrock 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 O&M issues were identified as part of the site inspection that call into question the protectiveness of the remedy implemented on behalf of NEP.

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 noted.

D. Opportunities for Optimization

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

None based on the site inspection.

Table 1 - Inspection Team Rooster

5-Year Inspection Team Members	**Company**
Jeffrey S. Hansen, PH	TRC
David M. Sullivan, LSP	TRC
Interviewed Staff	**Company**
Jeff Hamel, VP, LSP, LEP	Woodard & Curran

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: W. R. Grace	**Date of inspection:** February 18, 2019
Location and Region: Woburn USEPA Region 1	**EPA ID:** Wells G&H MAD980732168
Agency, office, or company leading the five-year review: TRC	**Weather/temperature:** Cold, cloudy

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 see Table 1 ☐ Site map attached

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. (781) 929-8427
   Problems, suggestions; ☐ Report attached_____

Note: Meghan Proia is the O&M Manager for this site for GES. Not present for interview. Clayton Smith coordinates on behalf of W.R. Grace.

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 Typical difficulties associated with managing an aging system.

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 on-site and posted on the wall. Maintenance logs are kept in file cabinet in treatment plant and were current. Additional details documented 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:

3. **O&M and OSHA Training Records** ☐ Readily available ■ Up to date ☐ N/A
   Remarks: Van Sawyer (GES) keeps OSHA training certifications back at the GES office in Westford, Massachusetts. 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: Discharge to Snyder Creek is per agreement with the City of Woburn.

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. There is regular annual reporting to EPA, most recently for 2018.

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, most recently for 2018. Tested monthly.

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

Remarks: Current access logs are on-site. The treatment building is also locked and equipped with a security system.

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 $160,000-$275,000 per year over the last 9 to 10 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: Treatment system is steady-state. Recent additional costs are associated with the 3 year extraction well shutdown program. Approximately 2 years ago, had to rebuild compressor for pneumatic pump for recovery wells.

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

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ■ Gates secured ☐ N/A
   Remarks: Fence altered due to construction. No fencing present in back of property near Snyder Creek. Some monitoring wells are outside of fenced property.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks: Treatment building and locked and alarmed.

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: Considerable land-use changes on the site property with a hotel and several restaurants under construction (one restaurant is open for business presently). Vapor mitigation systems in place for new buildings constructed as part of the development.

3. **Land use changes off site** ☐ N/A
   Remarks: Traffic alterations to Washington Street and increased density of commercial development in nearby areas of Woburn.

VI. GENERAL SITE CONDITIONS

A. Roads ■ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ■ Roads adequate ☐ N/A
Remarks: Roadways, access corridors and parking areas are in various stages of completion associated with site re-development.

B. Other Site Conditions

Remarks: Hotel grand opening in August. Other re-development items on individual timelines.

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: Wells are pneumatic, not electrical. Compressors are electrically powered.
_____
_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
■ Good condition ☐ Needs Maintenance
Remarks: Observed two of three active recovery wells (RW-17 and RW-20) – See photos
_

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 filter
☐ Additive (*e.g.*, chelation agent, flocculent) None
■ Others Holding tank
■ 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
☐ 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 (see photo)

5. **Treatment Building(s)**
☐ N/A ■ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks: No chemicals stored on site.

6. **Monitoring Wells** (pump and treatment remedy)
■ Properly secured/locked (see note) ■ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ■ Needs Maintenance ☐ N/A
Remarks: Some wells under Washington Street need to be raised. Three on sidewalk have new road boxes. Observed wells were locked/secure. Some wells were inaccessible due to snow cover and could not be located or observed. A comprehensive inspection of monitoring wells should occur in spring or summer to assess if wells require repair. Some wells are boxed in base course and will need further adjustment when final asphalt is laid out. Stick up wells are in good order.

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 (Overall general, concentrations have declined. At some wells where ROD cleanup goals are exceeded, concentrations do not appear to be 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.

Vapor barrier/passive venting installed for new buildings on site by developers. All are passive systems. Installation based on discussions with EPA for protectiveness of occupants.`

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 by pump and treat to meet ROD cleanup levels 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 Paul Bucens (Grace) 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.

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 regular schedule 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. 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.or Van Sawyer. However, both noted that it is an aging system and challenges inherent with maintaining such systems.

D. Opportunities for Optimization

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

Mr. Smith suggested further reducing the number of operating extraction wells and scaling back on monitoring well network would be desired modifications.

Table 1. W. R. Grace Inspection Team Rooster

5-Year Inspection Team Members	**Company**
Jeffrey S. Hansen, PH	TRC
David M. Sullivan, LSP	TRC
Interviewed PRP Staff	
Clayton Smith	De maximis, Inc.
Van Sawyer	Groundwater & Environmental Services, Inc. (GES)
Paul Bucens	W.R. Grace

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Wildwood	**Date of inspection:** 02.18.2019
Location and Region: Woburn, MA (EPA Region 1)	**EPA ID:** MAD980732168
Agency, office, or company leading the five-year review: TRC	**Weather/temperature:** Light snow, cold

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☐ Institutional controls
■ Groundwater pump and treatment
☐ Surface water collection and treatment
■Other: Soil vapor extraction (SVE) and air sparging (AS).
_____

☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ■ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Pete Cox Project Manager
Name Title
Interviewed ■ at site ☐ at office ☐ by phone Phone No.: 978-764-4257
Problems, suggestions; ☐ Report attached_____

2. **O&M staff** Eddie Zygarowski Plant Operator
Name Title
Interviewed ■at site ☐ at office ☐ by phone Phone No.: 781-935-5523 (site telephone)
Problems, suggestions; ☐ Report attached: Managing an aging system. Parts difficult to come by – in some instances, need to be fabricated.

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. *Not applicable.*

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 Binder on site office shelf ■Readily available ■ Up to date ☐ N/A
   - ■ As-built drawings ■ Readily available ■ Up to date ☐ N/A
   - ■ Maintenance logs Bound log book ■ Readily available ■ Up to date ☐ N/A

   Remarks: Office is neat and well organized. As-Built drawings in office of treatment system building.

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 is from 2017.

3. **O&M and OSHA Training Records** ■ Readily available ■ Up to date ☐ N/A
   Remarks: Copies are kept in on-site file cabinet in the site 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: *Superfund requires only that the substantial requirements of permits are met – no permits are formally issued.*

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 but reported monthly, quarterly and annually to EPA.

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 and information provided in quarterly and annual reports to EPA._____

10. **Daily Access/Security Logs** ■ Readily available ■ Up to date ☐ N/A
Remarks: Sign in sheet is kept in site 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: Approx. $270,000/year ☐ Breakdown attached

Provided in annual reports for Year 17 – May 2014 through April 2015 and Year 18 – May 2015 – May 2016. Not provided in annual reports covering 2017 and 2018.

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: Nothing beyond normal wear and tear. Air compressors are showing their age, for example, and will need servicing or replacement in the near future.

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

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ■ Gates secured ☐ N/A
Remarks: Site is completely fenced except for the Aberjona River shoreline.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
Remarks: Signage on both sets of gates on entrance road from Salem Street. The treatment system building is locked and equipped with a security and alarm system when O&M personnel are not on-site.

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: It's been over a decade since the site experienced vandalism.

2. **Land use changes on site** ■ N/A
Remarks: _____
_____

3. **Land use changes off site** ☐ N/A
Remarks: Increased density of development in the local area.

VI. GENERAL SITE CONDITIONS

A. Roads ■ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ■ Roads adequate ☐ N/A

Remarks Dirt road/gravel entrance and cross-site road.

B. Other Site Conditions

Remarks: Snow covered site due to recent weather. Eddie, the site system operator, flagged all wells used in regular sampling to facilitate locating snow covered wells.

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: Most flow comes from BW-19R (approx. 24 gpm). BW-18RD(LO)DR operated manually on intermittent basis due to low yield (approx. 2000 gal per month). See photos of well heads.

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
■ Good condition ☐ Needs Maintenance
Remarks: Maintenance needs are up to date. No leaks observed.

3. **Spare Parts and Equipment**
■ Readily available ■ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks: Stored inside the treatment building over the roof of the office.
_____

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 and sand filter
☐ 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 – Kept in a bound log.
■ Equipment properly identified
■ Quantity of groundwater treated annually Totalizer readings (see Annual Reports for details).

☐ 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: Up to date and maintained and labeled.

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ■ Good condition ■ Proper secondary containment ☐ Needs Maintenance
Remarks: The treatment building serves as secondary containment. No evidence of leaks observed.

4. **Discharge Structure and Appurtenances**
☐ N/A ■ Good condition ☐ Needs Maintenance
Remarks: Discharge to storm sewer and then to the Aberjona River (manhole/catch basin in Salem Street). In past years, sometimes treated discharge water froze in catch basin. Has not occurred this year.

5. **Treatment Building(s)**
☐ N/A ■ Good condition (esp. roof and doorways) ☐ Needs repair
■ Chemicals and equipment properly stored
Remarks: Cleaning compounds for system stored in "Flammables" cabinet in treatment building.

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ■Functioning ■ Routinely sampled ■ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks: Protective covers were not locked/secured on many of the wells reportedly because the site is fenced and access is via a locked gate. BSW-14 did not have an expansion plug to prevent surface water from entering the wells. Note not all wells could be located or observed because of snow cover or safety concerns (e.g., icy conditions on wooden boards to wells in Aberjona wetlands).

D. Monitoring Data

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

Monitoring data suggests: Containment and effectiveness are part of a wider conversation with EPA.

☐ 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.

Soil vapor extraction / air sparging (SVE/AS) is a major part of the Wildwood remedy. No monitoring issues have been noted. Optimization of the SVE/AS portion of the approved remedy is part of an ongoing conversation with EPA. Off-gas treatment has been disconnected temporarily with EPA approval. Off-gas treatment will resume if warranted pending installation of additional recovery wells and/or air sparge wills

that increase VOC concentrations in influent.

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.).

There are ongoing discussions with EPA regarding remedy optimization alternatives. Implementation of proposed alternatives is pending agreement with EPA as to next steps forward.

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 to suggest a lack of protectiveness. It is an aging system that has O&M challenges that are not atypical of other aging systems. Attentive O&M personnel continue to maintain the system's functionality.

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.

As noted above, it is an aging system. Problematic elements lately include the compressors which will require servicing or replacement to maintain their functionality/performance. However, O&M staff are aware of and are monitoring this issue to assure continued operation of the treatment system.

D. Opportunities for Optimization

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

There has been dialog with EPA on optimization of the remedy operation, including the need for additional air sparging and recovery wells as well as pilot testing of in-situ chemical oxidation as an enhancement to the pump and treat remedy. EPA anticipates that implementation and further assessment of these optimizations will occur over the next five years.

Table 1 - Inspection Team Rooster

5-Year Inspection Team Members	**Company**
Jeffrey S. Hansen, PH	TRC
David M. Sullivan, LSP	TRC
Interviewed Staff	**Company**
Pete Cox	AECOM
Eddie Zygorowski	AECOM

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: UniFirst	**Date of inspection:** 02.19.2019
Location and Region: Woburn USEPA Region 1	**EPA ID:** Wells G&H MAD980732168
Agency, office, or company leading the five-year review: TRC	**Weather/temperature:** Cold, bright, and sunny.

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: Supplemented with soil vapor extraction (SVE)

_____

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

II. INTERVIEWS (Check all that apply)

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

2. **O&M staff** : See above (some O&M, primarily SVE System, subcontracted to the Johnson Company, as well)
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____
   _____

Team members: on attached Table 1 (Johnson Company not in attendance at time of site visit).

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. *Not applicable.*

   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 record hardcopy kept off-site in the UniFirst office in Wilmington (recent files were provided at the site for the inspection). O&M manual was on-site (December 2008 pump and treat/May 2015 SVE). Electronic versions of documents are accessible from onsite via internet.

   * SVE O&M Manual May 2015

   ** Also kept electronically on computer.

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 Health and Safety Plan and Contingency Plan being revised.

3. **O&M and OSHA Training Records** ■ Readily available ■ Up to date ☐ N/A
   Remarks: Kept at UniFirst office in Wilmington, MA

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: Superfund required that substantial requirements that would require a permit are met; however, no formal permits are issued.

5. **Gas Generation Records** ■ Readily available ■ Up to date ☐ N/A
   Remarks: SVE flow rates are kept off-site and reported to EPA annually.

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 and reported to EPA annually.

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. Volatile organic compounds (VOCs) in

treated effluent and discharge volume reported in annual reports to EPA. VOCs in SVE influent, flow rate, and mass removal by treatment reported monthly and annually to EPA.

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 (Johnson Company also assists PRP w/O&M)
☐ 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: not sure ☐ Breakdown attached

Total annual cost by year for review period if available

Costs provide via email subsequent to site visit. The cost data below are compiled during UniFirst's fiscal year, which starts in late August (e.g., FY18 represents roughly September 2017 through August 2018).

FY2018 = $106,223
FY2017 = $156,024
FY2016 = $200,420

These numbers include all costs of contractors, laboratories, equipment repair and replacement, but does not account for in-house Unifirst labor. As the SVE system has settled in, the costs of operation have been going down.

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.
SVE supplemental treatment increased O&M costs, but this cost increase was not unanticipated.

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 interior 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: Nearby Grace Property undergoing redevelopment. Incremental increases in development density in the general area.

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 building is parking area. Paved access along north, east, and west sides of building. Parking lot condition OK.

B. Other Site Conditions

Remarks: Snow cover due to recent weather. Some wells could not be located or observed due to snow cover.

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: Extraction well UC-22 working fine. Supplemental extraction well EX-1 not pumping at desired rate on the day of the site visit. Trouble-shooting on-going.
_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
■ Good condition ☐ Needs Maintenance
Remarks: Maintained and replaced as needed.

3. **Spare Parts and Equipment**
■ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks: Spare well pump for UC-22 maintained on site. The pump in EX-1 is easy to procure if needed (i.e., Grundfos brand).

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 (Both Groundwater and soil vapor systems).
Filters Multimedia (sand and bag filter)
☐ 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/Annual Reports to EPA.
☐ 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 was 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: Building was neat, sample ports and controls were easily accessible.

6. **Monitoring Wells/Points** (pump and treatment *and SVE* remedy)
■ Properly secured/~~locked~~ ☐ Functioning ■ Routinely sampled (annually) ☐ Good condition
☐ All required wells located ■ Needs Maintenance ☐ N/A
Remarks: Due to snow cover, not all of the flush mounted wells could be located or observed. However, observed wells and monitoring probes located inside the Building were found to be properly secured. Covers for some of the observed flush-mounted wells were missing bolts and at least one well with a stick up did not have a lock. Wells were not opened during inspection (e.g., covers for flush-mounted wells were frozen in place). In the 25 year Annual Report, DP37D, UC31M and UC31D were found to be sand locked. According to Tim Cosgrave, the Johnson Company is currently working on a plan to restore these wells. Although wells outside the building are within a fenced area, the site is accessible to the public during operating hours and some wells are located outside the fence. Therefore, all wells monitored for water levels/water quality for the UniFirst Remedy should be inspected after snow cover has melted to identify wells that need to be secured and/or require maintenance.

D. Monitoring Data

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

Monitoring data suggests: *According to T. Cosgrave (UniFirst)
■ 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. SVE has been added during this five-year review period as an additional treatment. The SVE system appears to be in good condition and operating as designed. SVE performance is reported monthly and annually to EPA. The inspection revealed no issues with the SVE system.

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.).

An objective of the groundwater treatment system is prevent off-property migration of contaminated groundwater from the UniFirst Property. In 2015, a supplemental extraction well (EX-1) was installed in overburden capture impacted groundwater at the southwest corner of on the UniFirst Property. EX-1 in combination with UC-22 achieves this objective. A second objective of the treatment system is to reduce the concentrations of VOCs in groundwater to cleanup levels identified in the Record of Decision. The treatment system continues to extract contaminated groundwater and over time, should reduce concentrations of VOCs to cleanup levels. However, elevated VOC mass in the form of residual dense non-aqueous phase liquid (DNAPL) is present beneath the eastern portion of the building. Aggressive remedial enhancements to the existing pump and treat system could reduce the timeframe to achieve cleanup goals.

EPA's primary objectives for the SVE system is to reduce VOC mass and concentrations of VOCs in soil to soil cleanup levels presented in the ROD and reduce the potential for vapor intrusion into the building. The SVE system has been effective in removing VOC mass from soil and continues to do so. A negative vacuum is maintained in soil beneath the building indicating that the potential for vapor intrusion is being controlled. Soil data has not been collected in the past five years to assess current concentrations in soil.

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. There were no concerns identified 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 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. The addition of extraction well EX-1 has optimized capture, and the SVE system has resulted in the capture of VOCs to mitigate vapor intrusion into the building with collateral removal of VOCs from soil. In-situ DNAPL treatment, when path forward on this aspect is agreed to with EPA, will help reduce overall timeframe of the cleanup.

Table 1. UniFirst Inspection Team Rooster

5-Year Inspection Team Members	**Company**
Jeffrey S. Hansen, PH	TRC
David M. Sullivan, LSP	TRC
Interviewed PRP Staff	
Timothy M. Cosgrave	UniFirst

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Olympia	**Date of inspection:** 02.19.2019
Location and Region: Woburn, MA (EPA Region 1)	**EPA ID:** MAD980732168
Agency, office, or company leading the five-year review: TRC	**Weather/temperature:** Cold, sunny, bright

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 took place in November 2018 at southeast corner near MW-217 monitoring well cluster according to Christene Binger of GeoInsight.

Attachments: ■ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Christene Binger
Name Title
Interviewed ■ at site ☐ at office ☐ by phone Phone No. 978-679-1600 (office)
Problems, suggestions; ☐ Report attached Status quo routine (inject, check, inject)

2. **O&M staff** Cam Simmons (not in attendance) Project Scientist
Name Title
Interviewed ☐ at site ☐ at office ☐ by phone Phone No. 978-679-1600
Problems, suggestions; ☐ Report attached _____

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. *Not applicable.*

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** *(There is no site building for this source area. Records kept at Littleton, MA office).*

☐ 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 submitted to EPA.

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 in Littleton, MA

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A
Remarks: Available at GeoInsight Office in Littleton, MA

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 In Littleton, MA. Periodic reporting to EPA.

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☐ N/A
Remarks:_____

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☐ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☐ N/A
Remarks:_____

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☐ N/A
Remarks: Site access through Wildwood Site. Gates locked when site personnel not present. Olympia site is fully fenced with a locked gate at this time.

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

No O &M. Periodic injections only with monitoring. No instrumentation, power, pumps, etc.

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: Site is fully fenced and gates are secured/locked.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks: Sign on gate at beginning of road leading to the site through Wildwood Property.

C. Institutional Controls (ICs)

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

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

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

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

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

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ■ No vandalism evident
   Remarks: _____

2. **Land use changes on site** ☐ N/A
   Remarks: Recent vegetation clearing along railroad by Keolis.
   _____

3. **Land use changes off site** ☐ N/A
   Remarks: Generally increased development in local area.

VI. GENERAL SITE CONDITIONS

A. Roads ■ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ■ Roads adequate ☐ N/A

Remarks Gravel/dirt road, wooden bridge.

B. Other Site Conditions

Remarks: Snow form recent weather. First gate into Olympia site frozen to the ground.

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:_Treatment cell surrounded by sheet pile wall.
_____

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: Contaminated groundwater and soil treated through periodic injection of in-situ chemical oxidant (sodium permanganate) through wells, direct push points and trenches.

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: The vast majority of monitoring wells and the treatment cell is inside a chain link fence; however; the fence could be crossed with minimal difficulty. Wells inside the fenced area were not locked; numerous wells had no covers or plugs and several wells had sample tubing protruding from the wells. Some wells were bent on an angle. Reportedly, the wells have been evaluated formally for integrity for some time. Wells outside the fenced area were locked but tubing protruded out from beneath the cover which could be pulled out by hand. Assessment of well integrity warranted and wells should be secured with locking caps/plugs.

D. Monitoring Data

Monitoring Data *(Not on a regular schedule, but reported annually to EPA.)*
■ Is routinely submitted on time ■ Is of acceptable quality

Monitoring data suggests:
☐ Groundwater plume is effectively contained ■ Contaminant concentrations are declining
Some asymptotic declines noted by GeoInsight.

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 consists of injection of chemical oxidant (i.e., ISCO) to destroy organic contamination in groundwater and adsorbed to shallow soils. Monitoring data shows some contaminant concentration reduction has been achieved since injections began. Most recent injections were in November 2018, which focused on the area of the MW-217 well cluster at southeast corner of the treatment cell

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 periodic 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. GeoInsight follows an iterative approach of '*treat and check*' to advance progress at the site.

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 Rooster

5-Year Inspection Team Members	**Company**
Jeffrey S. Hansen, PH	TRC
David M. Sullivan, LSP	TRC
Interviewed Staff	**Company**
Christene Binger	GeoInsight, Inc.