FIVE-YEAR REVIEW REPORT FOR W.R. GRACE & CO., INC. (ACTON PLANT) SUPERFUND SITE MIDDLESEX COUNTY, MASSACHUSETTS

Prepared by

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09/23/14
Date

TABLE OF CONTENTS

FIGURES

LIST OF ACRONYMS

ACRONYM	DEFINITION
1,1- DCE	1,1-Dichloroethene (also known as vinylidene chloride)
AAL	Allowable Ambient Limits
ADAF	Age-Dependent Adjustment Factor
ARAR	Applicable or Relevant and Appropriate Requirement
ARS	Aquifer Restoration System
AWD	Acton Water District
BEHP	Bis(2-ethylhexyl)phthalate
BERA	Baseline Ecological Risk Assessment
CDM	Camp, Dresser, & McKee Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
CMR	Code of Massachusetts Regulations
COC	Contaminants of Concern
COPC	Contaminants of Potential Concern
CWA	Clean Water Act
D&A	Dewey & Almy
EPA	Environmental Protection Agency
EPH	Extractable Petroleum Hydrocarbons
FLA	Former Lagoon Area
FS	Feasibility Study
FYR	Five Year Review
gpm	gallons per minute
GPs	Government Parties
GWTS	Groundwater Treatment System
ICs	Institutional Controls
IGCLs	Interim Groundwater Cleanup Levels

ACRONYM	DEFINITION
MassDEP	Massachusetts Department of Environmental Protection
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MNA	Monitored Natural Attenuation
MTBE	Methyl-tert-Butyl Ether
NCP	National Contingency Plan
NE	Northeast
NPL	National Priorities List
O&M	Operation and Maintenance
ORS	Office of Research and Standards (MassDEP)
ORSG	Office of Research and Standards Guideline (MassDEP)
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PCE	Perchloroethene (also known as tetrachloroethene)
PPM	Parts Per Million
PAHs	Polycylic Aromatic Hydrocarbons
PEC	Probable Effects Concentration
PRP	Potentially Responsible Party
RA	Remedial Action
RAC	Response Action Contract
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RfD	Reference Dose
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SDWA	Safe Drinking Water Act
SE	Southeast
SEL	Severe Effects Level

ACRONYM	DEFINITION
SOW	Scope of Work
SW	Southwest
TBC	To Be Considered
TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
TELs	Threshold Effects Exposure Limits
UCL	Upper Confidence Level
USEPA	United States Environmental Protection Agency
UU/UE	Unlimited Use and Unrestricted Exposure
VC	Vinyl Chloride
VDC	Vinylidene Chloride (also known as 1,1-dichloroethene)
VI	Vapor Intrusion
VISL	Vapor Intrusion Screening Levels
VOC	Volatile Organic Compound
VPH	Volatile Petroleum Hydrocarbons

EXECUTIVE SUMMARY

This is the fourth Five-Year Review (FYR) for the W.R. Grace & Co., Inc. (Acton Plant) Superfund (Site) located in the Towns of Acton and Concord, Middlesex County, Massachusetts (Figure 1). The purpose of this FYR is to review information to determine if the remedy is and will continue to be protective of human health and the environment. The triggering action for this statutory FYR was the signing of the previous FYR on 9/23/2009.

The Site is a former chemical manufacturing facility composed of approximately 260 acres. The Site is organized into three operable units (OUs), which are:

- OU-1 Disposal areas and surficial contamination areas at the Site;
- OU-2 Residual contamination in disposal areas at the Site following implementation of OU-1; and
- OU-3 Contaminated groundwater and associated sediment and surface water contamination

The selected remedy identified in the 1989 Record of Decision (ROD) for OU-1 included excavation of contaminated material from various source areas, off-site incineration of highly contaminated soil and sludge, and on-site solidification of less contaminated soil, sludge, and sediment after removal of volatile organic compounds (VOCs) by heat. Solidified waste was then disposed on-site in the Industrial Landfill, an unlined landfill that was already in existence at the Site and used by W.R. Grace for disposal of various wastes and sludges. The remedy included capping of the Industrial Landfill following placement of solidified waste within it, landfill gas collection and treatment, and grading of the excavated waste areas. In addition, prior to the 1989 ROD, an Aquifer Restoration System (ARS) was put in place to address groundwater contamination at the Site. The ARS was replaced in 2011 by the groundwater extraction and treatment systems that were developed for OU-3.

The 1989 ROD stated that a remedy for OU-2 would be necessary only if, following completion of the OU-1 remedy, residual contamination in soils under the source areas exceeded soil cleanup goals established for OU-1. Data collected during and after the completion of the OU-1 remedy indicated that the soil cleanup goals were met for each of the source areas, and therefore no remedy for OU-2 was necessary.

The ROD for OU-3 was issued in 2005. The selected remedy identified in the 2005 ROD for groundwater and sediments at the Site included: active treatment of contaminated groundwater by extraction, above-ground treatment, and discharge; monitored natural attenuation of groundwater beyond the active treatment zones; institutional controls to restrict groundwater use until cleanup objectives have been met; and cleanup of contaminated sediments in Sinking Pond and the North Lagoon Wetland.

The third Five-Year Review was signed by the Director of the Office of Site Remediation & Restoration (OSRR) on September 23, 2009, and that date is the trigger for this fourth five-year review. Five-Year Reviews are required to be performed because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

Protectiveness Statement

This Five-Year Review concludes that the remedy for OU-1 is protective of human health and the environment. Soil in excess of cleanup levels has been excavated, stabilized, and either placed in the Industrial Landfill or shipped off-site for treatment and disposal. The Industrial Landfill was then closed with an impermeable cap designed and constructed in accordance with Massachusetts Hazardous Waste Regulations for landfills. The PRP has filed a deed notice with the Registry of Deeds to regulate land use of the Industrial Landfill, and the PRP maintains ownership of the landfill. Continued operation and maintenance is needed at the Industrial Landfill in order for the remedy at OU-1 to remain protective.

There is no protectiveness statement for OU-2 because it was determined that a remedy for OU-2 was not needed.

The remedies have been constructed and implemented for OU-3. More specifically, groundwater in the vicinity of the Industrial Landfill is currently being extracted and treated by a new system that was constructed by W. R. Grace in 2011. In addition, a separate groundwater extraction and treatment system was installed in the Northeast Area of the Site and operated from April 2010 to September 2013. The system was designed and operated to reduce contaminant mass in this area, and it had accomplished this objective as set forth in the ROD by September 2013, when EPA and MassDEP allowed it to be shut down. Additionally, the Acton Water District provides treatment of groundwater from the five public water supply wells in the vicinity of the Site, and the Acton Board of Health has established an administrative hold on the installation of private irrigation wells within 500 feet of the current groundwater contaminant plume. Areas of contaminated sediment in the North Lagoon Wetland and in Sinking Pond were excavated for off-site disposal during the summer and fall of 2011 and the cleanup levels established in the ROD were achieved. The wetlands have been restored and monitoring of the effectiveness of restoration efforts continues. As a result of all of the above, the remedy at OU-3 is protective in the short-term, because there is no current exposure. However, in order for the remedy to remain protective in the long-term, additional institutional control for groundwater may be needed to supplement the administrative hold to prevent groundwater use until cleanup levels are reached.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: W. R. Grace & Co., Inc. (Acton Plant)		
EPA ID: MAD001002252		
Region: 1	**State:** MA	**City/County:** Acton and Concord/Middlesex County

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

REVIEW STATUS
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:**
Author name (Federal or State Project Manager): Derrick Golden
Author affiliation: U.S. EPA
Review period: 10/1/2009 - 9/30/2014
Date of site inspection: 5/21/2014
Type of review: Statutory
Review number: 4
Triggering action date: 9/23/2009
Due date *(five years after triggering action date)*: 9/23/2014

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU-1 – There are no issues/recommendations for OU-1.
OU-2 – There are no issues/recommendations for OU-2. It was determined that a remedy for OU-2 was not needed.

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 3	**Issue Category: Institutional Controls**			
	Issue: The Acton Board of Health has established an administrative hold on the installation of private irrigation wells within 500 feet of the mapped region of contaminated groundwater from the W.R. Grace Site. It may be necessary to establish additional institutional controls to further prevent groundwater use within the contaminated plume area until cleanup goals are met. An Institutional Controls Plan was prepared in 2011 but action on it has stalled due to concerns raised by the Town of Acton.			
	Recommendation: Continue efforts with the Town to ensure that the Town administrative hold remains in place and continue discussions about the draft IC plan.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	9/30/2019

Five-Year Review Summary Form (continued)

Protectiveness Statement(s)	
Operable Unit:	*Protectiveness Determination:*
1	Protective

Protectiveness Statement:
The remedy for OU-1 is protective of human health and the environment. Soil in excess of cleanup levels has been excavated, stabilized, and either placed in the Industrial Landfill or shipped off-site for treatment and disposal. The Industrial Landfill was then closed with an impermeable cap to prevent potential exposure. The PRP has filed a deed notice with the Registry of Deeds to regulate land use of the Industrial Landfill, the PRP maintains ownership of the landfill and maintains the cap, and there is a perimeter fence enclosing the landfill.

Protectiveness Statement(s)	
Operable Unit:	*Protectiveness Determination:*
3	Short-term Protective

Protectiveness Statement:
The remedy at OU-3 is protective in the short-term, because there is no current exposure to contamination in groundwater or sediment. Groundwater in the vicinity of the Industrial Landfill is currently being extracted and treated by a new system that was constructed in 2011 (the Landfill Area). A separate groundwater extraction and treatment system was installed in the Northeast Area of the Site and operated from April 2010 to September 2013, at which time it was determined that it had met the ROD objective of reducing contaminant mass in this area. The Acton Water District provides treatment of groundwater from the five public water supply wells in the vicinity of the Site, and the Acton Board of Health has established an administrative hold on the installation of private irrigation wells within 500 feet of the current groundwater contaminant plume. Areas of contaminated sediment in the North Lagoon Wetland and in Sinking Pond were excavated for off-site disposal during the summer and fall of 2011 and the cleanup levels established in the ROD were achieved. The wetlands have been restored and monitoring of the effectiveness of restoration efforts continues. However, in order for the remedy to be protective in the long-term, additional institutional controls for groundwater may be needed to supplement the town's administrative hold on installing private wells near the plume to prevent groundwater use until cleanup levels are reached.

Sitewide Protectiveness Statement
Protectiveness Determination:
Short-term Protective

Protectiveness Statement:
The remedial actions taken are protective of human health and the environment in the short-term because there is no current exposure to contamination. Soil and sediment have been remediated and contaminated soil left on site in the Industrial Landfill was capped. The Landfill Area groundwater remedy is operating and will reduce contaminant concentrations to cleanup levels over time through a combination of active extraction and treatment combined with monitored natural attenuation. To be protective in the long-term, additional institutional controls may be needed for groundwater within the vicinity of the contaminant plume to supplement the existing controls (the Town's administrative hold) already in place.

INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Contingency Plan (NCP). CERCLA Section 121 states:

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

EPA interpreted this requirement further in the NCP, at 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

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

EPA conducted a FYR on the remedy implemented at the W. R. Grace & Co., Inc. (Acton Plant) Superfund Site in Acton and Concord, Middlesex County, Massachusetts (Figure 1). EPA is the lead agency for developing and implementing the remedy for the Site. The Massachusetts Department of Environmental Protection (MassDEP), as the support agency representing the Commonwealth of Massachusetts, has reviewed all supporting documentation and provided input to EPA during the FYR process.

This is the fourth FYR for the W.R. Grace & Co., Inc. (Acton Plant) Superfund Site. Previous Five Year Reviews were conducted in 1999, 2004, and 2009. All of these previous reviews determined that the remedies were protective. The triggering action for this statutory review is the completion date of the previous (2009) FYR. Five Year Reviews are required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. The Site consists of three Operable Units, all of which are addressed in this FYR.

PROGRESS SINCE THE LAST REVIEW

Table 1: Protectiveness Determinations/Statements from the 2009 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Protective	This Five-Year Review concludes that the remedy for OU-1 currently protects human health and the environment. Soil in excess of cleanup levels has been excavated, stabilized, and either placed in the Industrial Landfill or shipped off-site for treatment and disposal. The Industrial Landfill was then sealed/closed with an impermeable cap designed and constructed in accordance with Massachusetts Hazardous Waste Regulations for landfills specified at 310 CMR 30.580-595 and 30.620-633. The Industrial Landfill is owned and maintained by W.R. Grace, access is restricted by a fence, and a deed notice has been filed with the Registry of Deeds that puts parties on notice that the landfill cannot be disturbed except by written permission of MassDEP.
3	Will be Protective	The remedial action is currently underway for OU-3. The remedy at OU-3 is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

Table 2: Status of Recommendations from the 2009 FYR

OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
1	Additional Institutional Controls required for the Industrial Landfill to ensure the remedy remains protective in the future.	Evaluate options for institutional controls and implement as part of the Institutional Control Plan required under the RD/RA SOW.	PRP	EPA/State	9/23/2014	Completed	
1	Assess additional operation & maintenance options, i.e., more frequent removal of weeds and grass clippings from the swales and/or improvements to the drainage system.	Assess additional operation & maintenance options with the responsible parties.	PRP	EPA/State	9/23/2014	Completed	

Remedy Implementation Activities

Remedial implementation activities that were completed prior to the last FYR in 2009 are summarized in Appendix A. Activities since 2009 included: 1) construction, operation and maintenance, and shutdown of the Northeast Area groundwater extraction, treatment and reinjection system, 2) construction and operation and maintenance of the Landfill Area groundwater extraction and treatment system, and 3) remediation of wetland soil and sediment in Sinking Pond and the North Lagoon Wetland and wetland restoration of remediated areas. Former and current areas within the Site that are relevant to discussions of remedial activities are shown on Figures 2 and 3. Work also continued to establish enforceable institutional controls (ICs), with the submission of a draft Institutional Controls Plan that was submitted by the PRP in May 2011 (Tetra Tech GEO, 2011). These activities are summarized below.

Northeast Area Groundwater Extraction and Treatment System Construction

The goal of the Northeast Area remedial action was to achieve mass removal from the most highly contaminated portion of the residual VDC plume that migrates through the bedrock aquifer to Fort Pond Brook and the School Street public water supply wells. According to the ROD (EPA, 2005), it was estimated that the system would need to be operated for three years, after which an evaluation was to be made to assess if continued operation (in two-year increments) was technically and economically justified.

Prior to the 2009 FYR, pre-design investigations had been completed; a concept design had been submitted and conditionally approved by EPA; and construction activities had begun. The Northeast Area remedial system design was approved by EPA in June 2009, and the system was constructed between June 2009 and March 2010. The system consisted of three primary components: an extraction well, a groundwater treatment system, and two injection wells.

An extraction well was drilled at the location of the highest VDC concentrations in the Northeast Area. Through an iterative program of drilling and testing, it was found that the single extraction well could withdraw VDC-contaminated groundwater from the upper 110 feet of the bedrock aquifer at the target rate of 20 gallons per minute (gpm).

The groundwater treatment system initially consisted of an air stripper for removal of VDC; an arsenic reduction vessel; and vapor-phase carbon for odor control. When C5-C8 hydrocarbons were detected in the influent and effluent from the plant, liquid-phase carbon treatment was added to the treatment process while Grace operated the Northeast Area treatment system. Two injection wells were drilled near the treatment system and the extraction well. The wells were screened from approximately 20 feet above, to 20 feet below the water table in the overburden aquifer. Each well was capable of injecting the entire effluent flow of 20 gpm. Two injection wells were constructed so that the system would not have to be shut down if redevelopment became necessary.

The system began operation in April 2010. As explained below, the system operated for about 3.5 years. The system is currently inactive but is capable of re-start in the rare event that ongoing monitoring indicates that the ROD required objectives are no longer being achieved and continued operations are warranted.

Landfill Area Groundwater Extraction and Treatment System Construction

The goal of the Landfill Area remedial action is to capture and treat contaminated groundwater within the ROD Capture Zone and to discharge the treated water to Sinking Pond. Based on groundwater modeling during the Feasibility Study, it was predicted that the capture zone would be achieved by pumping approximately 90 gpm from two existing extraction wells and two new extraction wells. The two existing wells, MLF and WLF, were part of the Aquifer Restoration System (ARS) that had been extracting groundwater from various areas within the Site for decades. Groundwater beyond the ROD Capture Zone will be remediated by Monitored Natural Attenuation (MNA). Prior to the 2009 FYR, pre-design investigations had been completed; a concept design had been submitted and conditionally approved by EPA; and two new extraction wells (SWLF-1 and SELF-1) had been constructed.

A third new extraction well (SELF-2) was constructed in June 2010 after an evaluation of the four-well system indicated that it was not achieving the ROD Capture Zone. In April 2011, extraction well SWLF-1 was replaced with SWLF-2 due to a declining yield that could not be restored with redevelopment.

In December 2010, the Landfill Area treatment system final design was submitted. While the ROD had envisioned that the treatment would consist of metals removal and air stripping, the post-ROD discovery of 1,4-dioxane at the Site led to the substitution of a photocatalytic oxidation system for the air stripper. The final design was approved by EPA in February 2011, and construction of the treatment system was completed in April 2011.

The ARS treatment system was shut down in late April 2011, and the Landfill Area treatment system was started up in early May 2011. The Landfill Area treatment system initially consisted of a metals microfiltration unit to reduce concentrations of arsenic, iron, manganese, and phosphorus, and a photocatalytic oxidation system to destroy VOCs and 1,4-dioxane. After a shakedown period of about one year, a liquid phase carbon unit was added to the system in May 2012 to remove residual chlorine from the effluent. Prior to EPA determining that this system was operational and functional, toxicity testing was conducted on the effluent discharge. This was required to ensure that the effluent discharge would not negatively impact the ecology of Sinking Pond. The results of the toxicity testing were within acceptable limits.

Sinking Pond and North Lagoon Wetland Remediation

The goal of the sediment removal action in the North Lagoon Wetland was to remediate the wetland area such that the upper one foot of sediment had concentrations of arsenic and manganese at or below the target cleanup levels of 28 mg/kg arsenic and 2,030 mg/kg manganese. The goal of the sediment removal action in Sinking Pond was to remediate the inlet area of the pond and the pond itself such that the upper one foot of sediment for both human accessible and ecological areas had concentrations of arsenic at or below the target cleanup level of 42 mg/kg arsenic. The ecological-based cleanup levels identified in the ROD provided for a short-term clean up level that was based on an arsenic concentration of 730 mg/kg arsenic, and consideration of three other metals, provided that a trend of reducing arsenic concentrations in

surface sediment was demonstrated through monitoring. As documented in the Final Sediment Remedial Design Report (ARCADIS, 2011), W.R. Grace developed a remedial design that was intended to achieve the long-term goal of 42 mg/kg arsenic throughout the applicable portion of the pond such that subsequent monitoring for a reducing trend toward 42 mg/kg would not be necessary.

Remedial activities were implemented at Sinking Pond and North Lagoon Wetland between June and November 2011. Excavation in North Lagoon Wetland was performed in three areas: the sedge marsh, the channel, and the wooded swamp. Based on the confirmatory post-excavation survey data (ARCADIS, 2012), the volume of sediment excavated from North Lagoon Wetland was 2,040 cubic yards. These excavated areas were backfilled with a minimum of 12 inches of topsoil to pre-construction grades, seeded, and planted. The hydraulic barrier along the border of Fort Pond Brook was left in place to stabilize the bank.

Remedial activities in Sinking Pond included excavation of sediments in the Inlet, and between elevations 144.5 feet and 128 feet around the border of the pond. Confirmatory sampling was performed at least three days after dredging was completed in each area. Based on these results, an additional one foot of sediment removal was implemented within approximately 1,720 square yards, mainly along the eastern shore of the pond. The total volume of excavated sediment for the entire pond and inlet area was 8,100 cubic yards. Site restoration activities at Sinking Pond included placement of a minimum of 6 inches of clean topsoil in the excavated portions of the pond between the water line and the historical high water elevation (144.5 feet). Disturbed portions of the pond bank from the edge of water to 144.5 feet were seeded and planted. The Inlet was restored to a lower final elevation than pre-design conditions, with a permanent check dam to support a deeper emergent marsh area, planted with plugs of aquatic vegetation.

Sediment remedial activities were determined to be complete and the final site inspection occurred on November 17, 2011.

Additional sediment sampling was conducted in Sinking Pond and the North Lagoon Wetland, in 2014, to support this 2014 Five Year Review. See the report entitled: *5 Year Sediment Investigation Summary Report*, prepared by ARCADIS, dated June 6, 2014. The results indicate that the respective clean up goals are still being achieved and the remedy remains protective in both areas.

Institutional Controls Implementation

Table 3 summarizes the status of the institutional controls for the Site. A draft Institutional Controls Plan for OU-3 (groundwater) was submitted by the PRP on May 12, 2011 (Tetra Tech GEO, 2011). The Town of Acton expressed concerns about their role in the plan in a letter dated June 6, 2011, and EPA and MassDEP issued a letter in response to those concerns on July 11, 2011. There is currently no resolution regarding the ultimate form of the IC that will be used to restrict installation of private wells in the vicinity of the plume, but the existing IC (an administrative hold on the installation of private irrigation wells by the Acton Board of Health) remains in effect.

Table 3: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
OU-1: Capped Industrial Landfill	Yes	Yes	Industrial Landfill and surrounding groundwater (landfill area plume)	Ensure continued maintenance and prevent disturbance of the Industrial Landfill cap.	Deed Notice is on file with the Registry of Deeds.
OU-3: Groundwater	Yes	Yes	Properties within 500 feet of the mapped groundwater contaminant plume	Prevent installation of private wells near or within contaminant plume boundaries	The Acton Board of Health has an administrative hold on private irrigation well installations in effect, but additional IC's may also be needed. Agreement on the form of additional IC's to be used is not yet reached among EPA, MassDEP, and the Town.

System Operation/Operation and Maintenance Activities

Operation and Maintenance activities between 2009 and 2014 included: operation and maintenance of two groundwater extraction and treatment systems, monitoring of the effectiveness of wetland restoration activities, annual groundwater monitoring to assess the effectiveness of the extraction and treatment systems, and maintenance of the Industrial Landfill cap. Additional information is provided below for each O&M activity.

Northeast Area Treatment System

During its 3.5 years of operation, the Northeast Area groundwater extraction and treatment system was maintained and monitored in accordance with the O&M Plan (O&M Inc. and GeoTrans, Inc., 2010). Following an initial period of operation during which many system operations were monitored at least weekly, the frequency was decreased to monthly for most monitoring activities, including influent and effluent sampling, arsenic reduction system monitoring, odor monitoring, and extraction and injection well performance. Treatment system inspection reports were issued monthly.

As stated above, according to the ROD, the system was expected to operate for approximately three years, after which it would be evaluated to determine if continued operations were technically and economically feasible. In February 2013, Grace submitted an evaluation (Tetra Tech, 2013a) of the system's operation that indicated that the ROD objectives had been met, and that therefore continued operations were not warranted. After review of Grace's evaluation, EPA conditionally approved shutdown of the system in late September 2013, but required that the system remain in place (not be decommissioned) for at least one year. That condition was imposed in case the 2014 annual groundwater monitoring results indicate that the ROD required objectives are no longer being achieved, and restored operations are warranted.

Landfill Area Treatment System

The Landfill Area extraction and treatment system is maintained and monitored in accordance with the O&M Plan (Tetra Tech GEO and O&M, Inc., 2012). Following a startup period during which many system operations were monitored daily or weekly, the frequency was decreased to monthly or quarterly for most monitoring activities, including individual extraction well and treatment system effluent sampling, and monitoring of extraction and injection well flow performance. Treatment system inspection reports are issued monthly, and performance reports are issued annually.

Each year, as part of the Groundwater Monitoring program, groundwater elevations are measured across the entire Site, and potentiometric maps are created for the overburden and bedrock aquifers. As part of the evaluation of groundwater flow patterns, the capture zone of the Landfill Area extraction system is determined to confirm that ROD-required groundwater capture is being attained. These evaluations are included in the OU-3 annual monitoring program reports.

Wetland Restoration Monitoring

As discussed in the Final Sediment Remedial Design Report (ARCADIS, 2011), post construction monitoring was required to assess the establishment, quality, and survival of seeded and planted vegetation in areas that were affected by the sediment remedial activities and subsequently restored. The monitoring frequency for the restored wetland areas associated with North Lagoon Wetland and Sinking Pond is twice per year for five years. Monitoring was conducted, as required, in spring and summer of 2012 and 2013. Monitoring included

photographs and general description of restored areas, counts of the survivorship of planted trees and shrubs (spring), and detailed inspection of specific monitoring quadrats to evaluate the percent cover and species composition of seeded vegetation (summer). In addition, counts of the surviving emergent aquatic vegetation species, of the five species planted in the inlet of Sinking Pond, were also conducted annually. The restored upland areas associated with North Lagoon Wetland and Sinking Pond were also subject to monitoring following the first full growing season after restoration activities were completed. The monitoring is intended to evaluate the growth of seeded and planted vegetation and determine maintenance needs. Reports summarizing the findings of the first two annual post construction vegetation monitoring events have been submitted for 2012 and 2013 (ARCADIS, 2012b and 2013).

Groundwater Monitoring

Groundwater samples are collected annually from wells throughout the Site in the late summer or early fall. Samples are analyzed for one or more of the following: VOCs, inorganics, geochemical indicator parameters, Volatile Petroleum Hydrocarbons (VPH), Extractable Petroleum Hydrocarbons (EPH), and 1,4-dioxane. The number of wells sampled and the number analyzed for each substance and parameter vary from year to year in accordance with changing conditions and data requirements for different parts of the Site. The results are reported in annual monitoring program reports.

Industrial Landfill Closure Monitoring

The Post-Closure Operation & Maintenance Plan (CDM, 1996) forms the basis for operation, maintenance, and monitoring of the Industrial Landfill through the year 2028. This plan applies to the physical maintenance of fencing/security systems, roadways, drainage systems, and the Industrial Landfill final cover and gas control systems.

Inspections are designed to evaluate the Site for signs of deterioration, malfunction, or improper operation of various systems. Site inspections are currently performed on a quarterly basis and documented on Inspection Log forms that are included in Progress Reports provided to EPA and MassDEP.

Landfill Gas Control. Gas extraction wells/vents are visually examined during inspections. Following approximately four years of active landfill gas extraction and treatment via thermal oxidation, it was determined that system shutdown (change to passive venting only) would not cause an unacceptable health risk. However, as noted in the concurrence by EPA and MassDEP (EPA, 2002), the thermal oxidation unit and all associated piping and equipment were to remain in place and be maintained. The purpose of maintaining this equipment was so that it could be activated again if long-term air quality monitoring detected an unacceptable health risk. The final round of air quality monitoring was completed in 2007 and results confirmed that passive venting was not causing an unacceptable health risk (Sullivan DCM, 2007). As a result, EPA, in consultation with MassDEP, gave approval that the thermal oxidizer could be decommissioned and the landfill gas passively vented to the atmosphere.

FIVE-YEAR REVIEW PROCESS

Administrative Components

The PRP was notified of the initiation of the five-year review on February 13, 2014. The W. R. Grace & Co., Inc. (Acton Plant) Superfund Site Five-Year Review was led by Derrick Golden of the U.S. EPA, Remedial Project Manager for the Site and Sarah White, the Community Involvement Coordinator (CIC). Jennifer McWeeney of the MassDEP assisted in the review as the representative for the support agency.

The review, which began on February 13, 2014, consisted of the following components:

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

Community Notification and Involvement

A press release was issued by EPA Region 1 on February 13, 2014 announcing the start of the FYR for this site as well as multiple other sites in the region. A Site-specific fact sheet announcing the start of the FYR was issued on March 19, 2014 and distributed to local officials. It stated the purpose of the review and where the results of the review would be made available; i.e., the EPA web site and the Site information repository located at the Acton Town Library.

Document Review

This five-year review consisted of a review of relevant documents, including O&M records and monitoring data. Applicable soil, sediment, and groundwater cleanup standards, as listed in the Records of Decision for OU-1 (September 1989) and OU-3 (September 2005), were also reviewed. Appendix B lists the documents reviewed for this current FYR as well as other references cited throughout this report.

Data Review

Groundwater Monitoring

Five rounds (2009 through 2013) of annual groundwater monitoring have been performed since the last FYR. In each round, samples were collected from a varying number of wells and analyzed for one or more of the following: VOCs, inorganics, geochemical parameters, EPH and VPH, and 1,4-dioxane. VDC, VC, and benzene continue to be the most frequently detected

compounds at concentrations greater than their Interim Groundwater Cleanup Levels (IGCLs), and 1,4-dioxane is a compound of interest. Figures 4 through 7 illustrate the extent of each of these compounds in the groundwater at the Site in 2013. For comparison purposes, a depiction of the extent of VDC in the groundwater in 2001 (Figure 8) is also included. Since VDC is widespread at the Site, a comparison of Figure 5 to Figure 8 gives a good visual summary of the extent of the improvement in groundwater quality since the FS and the ROD were completed.

The presence of 1,4-dioxane at the Site was first noted in 2006, when EPA requested that Grace sample for it. Since then, the concentrations of 1,4-dioxane have been monitored in various wells throughout the entire Site. EPA has determined that even using the maximum detected concentration of 1,4-dioxane found in Site groundwater (36 µg/L), 1,4-dioxane-contaminated groundwater does not pose an unacceptable cancer risk necessitating an EPA cleanup action. This issue was discussed in detail in a fact sheet issued by EPA in March 2012 (USEPA, 2012). There is no enforceable federal or Massachusetts maximum contaminant level (MCL) for 1,4-dioxane.

In 2011, MassDEP reduced the drinking water guideline for 1,4-dioxane from 3 µg/L to 0.3 µg/L. The MassDEP drinking water guideline is not considered an enforceable standard. Similarly, in 2014, MassDEP reduced the Method 1 GW-1 standard for 1,4-dioxane (used to regulate cleanup of MassDEP sites) from 3.0 µg/L to 0.3 µg/L.

The appropriate level of monitoring for 1,4-dioxane has undergone several cycles of review and revision by the AWD and MassDEP Drinking Water Program staff, as well as by EPA and MassDEP Superfund program staff. As a result, Grace is performing additional monitoring activities, including additional sampling of the public water supply wells. Selected monitoring for 1,4-dioxane will continue into the future, with results for this compound reported as part of the monitoring program reports that are produced on an annual basis. The annual sampling program will be re-evaluated each year by EPA and MassDEP as part of their review of Site-wide groundwater quality.

For evaluation of groundwater conditions, the Site has historically been divided into six areas: the Former Lagoon Area, the Northeast Area, the Southwest Area, the Assabet River Area, the Southwest Landfill Area, and the Southeast Landfill Area. These areas are shown on Figure 4. The results of groundwater monitoring in each of these areas is discussed below, with emphasis on the 2013 data (Tetra Tech, 2013b).

Former Lagoon Area. The four extraction wells (SLBR, SLGP-R, NLBR-R, and NLGP) in the Former Lagoon Area (FLA) that were part of the former (ARS) groundwater extraction system were shut down in late 2008 and early 2009. The groundwater remedy for this area is Monitored Natural Attenuation (MNA), and those four ARS extraction wells were not included in the remedial action for this area.

Until 2010, the results from the monitoring well sampling in the FLA had shown that the groundwater had fairly low levels of residual contamination. In 2010, the concentrations of VDC and benzene in well OSA-13B increased to about 100 µg/L. These results were presumed to reflect changes in groundwater flow resulting from the shutdown of the extraction wells in this area in 2008 and 2009. In response to the increase in contaminant levels found in OSA-13B,

sampling was expanded in 2011 to include other nearby existing wells. The expanded monitoring showed that the extent of the more highly-contaminated groundwater around OSA-13B is limited both vertically and horizontally.

In other parts of the FLA, data from 2013 showed that the three primary groundwater contaminants at the Site, VDC, VC, and benzene, exceeded their IGCLs of 7 µg/L, 2 µg/L, and 5 µg/L, at four, three, and one monitoring well(s), respectively. With the exception of benzene at OSA-13B (77 µg/L), the concentrations that exceed IGCLs are within an order of magnitude of the levels noted above.

Six monitoring wells (one bedrock and five overburden) in the FLA were analyzed for geochemical parameters in 2013, including arsenic, manganese, and iron. Arsenic and/or manganese concentrations remained notably elevated (As >50 µg/L, Mn > 700 µg/L) in four of the six monitoring wells that are sampled for these parameters in the FLA. Site data suggest that geochemical conditions associated with Site activities near former source areas have resulted in increased solubility of naturally-occurring arsenic, as well as manganese and iron. As the organic contaminant concentrations decline, it is expected that geochemical conditions will return to a state in which the solubility of the naturally-occurring metals is no longer enhanced in groundwater.

Sampling for 1,4-dioxane in the FLA was limited to one sample from each of three wells in 2011. The detected concentrations were 0.11J µg/L, < 0.2 µg/L, and 2.07 µg/L. The highest concentration was detected in well OSA-13B.

Northeast Area. When the lagoons at the Site were in operation, contaminated groundwater flowed south and northeast from the FLA. The operation of the ARS extraction wells in the FLA captured the contaminated groundwater in the source area near the former lagoons; however, the portions of the plumes that were already beyond the area of capture were left to migrate toward discharge points along portions of Fort Pond Brook or towards the School Street water supply wells (where the contaminants are removed by treatment systems). The groundwater contamination in the Northeast Area is the cut-off portion of the plume that flowed northeast from the FLA. Cut off from its original source area, the plume is being flushed from the aquifer as the groundwater flows to Fort Pond Brook or the School Street public water supply wells. The plume is in the bedrock aquifer across much of the Northeast Area but rises into the overburden north of Lawsbrook Road to discharge to the brook or the supply wells. The primary plume contaminants are VDC and VC.

The untreated water from the School Street public water supply wells is currently, and has been for decades, treated by air stripping to remove VOCs. The concentrations of COCs (VDC and VC) in the untreated water have been close to or below MCLs in recent years. However, at the time the OU-3 ROD was written, a portion of the plume in the bedrock aquifer beneath the Linde (then BOC Gases) property had VDC concentrations in excess of 200 µg/L (see Figure 8), and the ROD was written to require mass removal in that area to hasten the decline of VOC concentrations in the well field.

As described above, an extraction, treatment and reinjection system was constructed in the NE Area and operated from April 2010 to September 2013. During that time, the VDC

concentration in the extraction well (NE-1) decreased from 170 µg/L to about 30 µg/L. VC concentrations decreased from 5 µg/L to < 2 µg/L, while arsenic concentrations were relatively stable in the range of 4 µg/L to 6 µg/L (which is below the MCL of 10 µg/L).

The success of the extraction system in removing VDC was also reflected in the monitoring wells in the NE Area. In 2009, before the system was activated, VDC concentrations in the NE plume were >100 µg/L in the area between the Linde facility and Lawsbrook Road, and were >60 µg/L from there to well cluster AR-31 in the School Street Well Field. By 2013, just prior to the shutdown of the system, VDC concentrations in the northeast plume were >60 µg/L only in the immediate vicinity of well cluster AR-31 (66 µg/L), and were 30 µg/L or less at all other sampled locations (see Figure 5). VC concentrations were equal to the MCL of 2 µg/L near the former extraction well and were slightly higher (3.3 µg/L) at well cluster AR-31.

In 2013, one bedrock and six overburden monitoring wells in the NE Area were sampled for inorganics. Extraction well NE-1 was sampled for arsenic, manganese, and iron. None of the wells had a concentration of arsenic greater than the IGCL of 10 µg/L. One of the overburden wells had a highly elevated manganese concentration (2,600 µg/L), and one of the bedrock wells had a moderately elevated manganese concentration (620 µg/L).

Sampling of monitoring wells in the NE Area between 2006 and 2009 indicated that 1,4-dioxane was present in the groundwater in the vicinity of the School Street Well Field at concentrations up to about 2 µg/L. Samples from the water supply wells in the well field only had concentrations of 1,4-dioxane less than 0.25 µg/L, since supply wells tend to "average" the water quality in their zones of contribution. In well MW-06B, located in the area targeted for mass removal, the 1,4-dioxane concentration was about 1 µg/L during this same time period. Upgradient of that area, the concentration was 3.7 µg/L in well MW-07B.

Although there is no MCL for 1,4-dioxane, the concentrations in the wells in the School Street Well Field were well below a concentration level that would pose an unacceptable cancer risk and necessitate an EPA cleanup action. The concentrations were also below the MassDEP ORS non-enforceable drinking water guideline concentration of 3 µg/L for 1,4-dioxane that existed in 2009. However, continued monitoring of 1,4-dioxane was (and still is) required by the agencies as a precaution.

When the NE Area remediation system was started up in April 2010, extraction well NE-1 had 1,4-dioxane concentrations of about 0.7 µg/L. After about four months of operation, the concentrations rose to about 2 µg/L and, for the remainder of the period of operation, the concentrations averaged about 2 µg/L. The NE Area treatment system was not designed to treat for 1,4 dioxane, and the effluent that was injected into the upper overburden aquifer also had an average concentration of about 2 µg/L.

From the fall of 2013 to the fall of 2014, an expanded program for 1,4-dioxane sampling was implemented by Grace in response to agency requests. In the NE Area, the concentrations of 1,4-dioxane in the Lawsbrook and Scribner supply wells were greater than 0.3 µg/L in multiple samples, though no concentration exceeded 0.35 µg/L. The concentrations of 1,4-dioxane in the Christofferson supply well were 0.2 µg/L or less in multiple samples. The results from the monitoring wells in the NE Area generally were similar to previous rounds, with a maximum

concentration of 1.6 µg/L in well PS-22B. All of these levels are well below EPA Superfund requirements.

Southwest Area. The groundwater contamination has been almost completely flushed from the bedrock and overburden aquifers in this area. VDC, VC, and benzene concentrations were well below IGCLs in the few monitoring wells that were still being sampled in this area between 2009 and 2013.

Arsenic and manganese were analyzed at one bedrock and one overburden monitoring well in the Southwest Area in 2013. The arsenic concentrations were below 10 µg/L in both wells. The overburden well had a highly elevated manganese concentration (4,300 µg/L), and the bedrock well had a moderately elevated manganese concentration (600 µg/L). Any residual contamination in this area will be remediated by MNA.

The expanded program for 1,4-dioxane sampling implemented by Grace in 2013 and 2014 included some wells in the Southwest (SW) Area. In the SW Area, the concentrations of 1,4-dioxane in the Assabet 1A supply well were greater than 0.3 µg/L in three of four quarterly samples, with a maximum concentration of 0.38 µg/L. In the nearby Assabet 2A water supply well, concentrations of 1,4-dioxane were greater than 0.3 µg/L in one of four samples (0.39 µg/L).

The results for 1,4-dioxane from the monitoring wells in the SW Area in 2013 and 2014 were generally similar to previous rounds and show that 1,4-dioxane is widespread in the bedrock aquifer in this area at concentrations in the range of 1 µg/L to 2 µg/L. The 1,4-dioxane concentration in well PT-03B1 was marginally higher at 2.9 µg/L in 2013; the 1,4-dioxane in this well is believed to originate from a source area on the opposite side of the Assabet River from the Grace Site.

Assabet River Area. Similar to the Northeast Area, the groundwater contamination in the Assabet River Area is the cut-off portion of a plume that flowed south in this area when the Site was an active facility. Cut off from its original source area by the decades of operation of the ARS, the plume is being flushed from the aquifer as the groundwater flows to the Assabet River. The plume is present only in the downgradient part of this area, close to the river. Investigations completed during the OU-3 RI showed that the bedrock aquifer exhibited low levels of contamination across this area. The plume is primarily in the overburden aquifer and rises in response to upward vertical gradients to discharge to the river.

Two overburden monitoring wells in the downgradient part of this area, close to the Assabet River, were sampled between 2009 and 2013. Only VOCs were analyzed. By 2013, the benzene concentrations in both wells had declined to levels below the IGCL of 5 µg/L. The VDC concentration (44 µg/L) in one well exceeded the IGCL of 7 µg/L, and the VC concentrations (6.9 µg/L and 20 µg/L) in both wells exceeded the IGCL of 2 µg/L. The remediation of this area will be by MNA, as the end of the cut-off plume discharges to the Assabet River.

Southwest and Southeast Landfill Areas. The groundwater in these two areas downgradient of the Industrial Landfill exhibits high levels of VDC, VC, benzene, and arsenic. The OU-3 ROD requires that groundwater with the highest levels of these contaminants be captured and treated

for discharge to Sinking Pond. Lower levels of contamination beyond the required capture zone will be remediated by MNA.

In the Southwest Landfill Area, groundwater is extracted from wells MLF and WLF in the overburden and from SWLF-2 in the bedrock. The highly-contaminated part of the plume is within the capture zone of the extraction wells in both the bedrock and overburden aquifers. This part of the plume was characterized in 2013 by VDC concentrations up to 310 µg/L in the bedrock and up to 200 µg/L in the overburden. VC concentrations were up to 130 µg/L in the bedrock and up to 55 µg/L in the overburden. Benzene concentrations in the SW Landfill Area were lower, with a maximum of 15 µg/L in the bedrock and 24 µg/L in the overburden.

In the Southeast Landfill Area, groundwater is extracted from wells SELF-1 and SELF-2 in the overburden. The highly-contaminated part of the plume is present in the overburden aquifer and was characterized in 2013 by benzene concentrations up to 270 µg/L. VDC and VC concentrations in the Southeast Landfill Area in 2013 were lower, with maximum levels of 34 and 75 µg/L, respectively.

In 2013, one bedrock and five overburden monitoring wells in the two Landfill Areas were sampled for geochemical parameters including arsenic, manganese, and iron. The five extraction wells (one bedrock and four overburden) were sampled for arsenic, manganese, and iron. The arsenic concentrations in the two bedrock wells (SWLF-2 and AR-21), which are in or close to the SW Landfill Area, were less than the IGCL of 10 µg/L. The three overburden wells in the SW Landfill Area had arsenic concentrations in the range of 16 µg/L to 60 µg/L. In the SE Landfill Area, two overburden wells that are screened near the water table had arsenic concentrations less than 10 µg/L. However, the other four overburden wells in that area had significantly higher arsenic concentrations, in the range of 50 µg/L to 310 µg/L.

Like the arsenic concentrations, the manganese concentrations in the two bedrock wells were relatively low, less than 300 µg/L. However, except for one overburden well in the SW Landfill Area which also had a manganese concentration less than 300 µg/L, the other overburden extraction and monitoring wells had manganese levels in the range of 1,700 µg/L to 4,500 µg/L.

Most of the data concerning the concentrations of 1,4-dioxane in the Landfill Areas are from the extraction wells, which have been sampled three or four times per year since 2009. In the SW Landfill Area, the concentrations in the extraction wells range generally from 1 µg/L to 6 µg/L. No monitoring wells in this area have been sampled for 1,4-dioxane since 2006. In the SE Landfill Area, concentrations are as high as about 35 µg/L in the extraction wells and about 25 µg/L in the two monitoring wells that are sampled for it. The levels of 1,4-dioxane in the SE Landfill Area are the highest at the Site but are still considered within acceptable limits by EPA.

Summary of Groundwater Monitoring Results. In the NE Area, the area of elevated VDC concentrations that was the target of the remediation system (see Figure 8) was nearly gone by 2013 (see Figure 5). The end of the plume is currently in the vicinity of well AR-31D, which has the highest remaining concentrations of VDC (66 µg/L) and VC (3.3 µg/L) in the NE Area. It is anticipated that these levels will continue to decline.

VOCs are mostly below IGCLs in the FLA, the SW Area, and the Assabet River Area.

Concentrations of VOCs and inorganics that are above IGCLs, located mostly in the downgradient portion of the Assabet River Area and at several isolated areas in the FLA, are expected to decline as the MNA remedy proceeds.

In the SW and SE Landfill Areas, concentrations of VOCs and inorganics are elevated but mostly declining. The highest levels of contamination are within the capture zone of the extraction system, which is being sustained as required by the ROD. Beyond the capture zone, the concentrations of VOCs and inorganics are expected to decline as the MNA remedy for that portion of the Landfill Area proceeds.

The highest concentrations of 1,4-dioxane are detected in the Landfill Areas, where concentrations in the range of 4 µg/L to about 35 µg/L occur currently. EPA has determined that even using the maximum detected concentration of 1,4-dioxane found in Site groundwater (36 µg/L), 1,4-dioxane-contaminated groundwater does not pose an unacceptable cancer risk that would necessitate an EPA cleanup action (USEPA, 2012). There is no MCL for 1,4-dioxane, and a cleanup level was not established by EPA in the ROD; however, concentrations of 1,4-dioxane continue to be monitored, in response to stakeholder concerns.

North Lagoon Wetland Monitoring

Monitoring of the restored wetland areas of North Lagoon Wetland and Sinking Pond, affected by the remedial activities, was conducted in 2012 and 2013, the first two years after sediment removal activities. The results of the 2012 monitoring activities identified several conditions that could affect the ability of the Site to meet all vegetation performance standards within the prescribed monitoring period. Adaptive management steps, including additional seeding, supplemental planting, and invasive species removal were undertaken in 2012 to facilitate achievement of the restoration goals.

The 2013 spring monitoring results showed that the total percent of the planted trees and shrubs was 80%, below the 85% survivorship standard. Maintenance activities have been proposed to address replacement plantings, in 2014. In 2013, counts of aquatic plants in the inlet of Sinking Pond showed that the number of observed aquatic plants significantly exceeded the number of plants originally planted in this area. A total of six different species were observed. These results indicate that planted plugs have helped to colonize the Inlet.

Results of the 2013 monitoring activities indicate that maintenance work performed in 2012 and early 2013 was successful in improving conditions in the restored habitats of the Site. The ground cover performance standard was met in all restored habitats in 2013, sedges now dominate the sedge marsh, and aquatic plants at the Inlet to Sinking Pond are almost triple the number originally introduced.

Overall the monitoring of restored wetland habitats indicates that restoration has been largely successful. In order to meet performance standards, in 2014, there will be additional monitoring and management of invasive species, and possibly planting of more trees and shrubs.

Sinking Pond Sediment Monitoring

Post-construction monitoring and maintenance procedures established in the Final Sediment Demonstration of Compliance and Maintenance Plan (ARCADIS, 2012c) included sampling of both sediment remediation areas (North Lagoon Wetland and Sinking Pond) in advance of this Five Year Review. Sediment sampling was performed in the Sinking Pond and North Lagoon Wetland areas in April 2014, in compliance with remedy monitoring requirements. This sampling included collection of sediment from 20 locations in Sinking Pond and 15 locations in the North Lagoon Wetland at a depth of 0-12 inches below the surface of the sediment.

Data for the Sinking Pond and North Lagoon Wetland sediments were evaluated using EPA's ProUCL software to determine 95% upper confidence level (UCL) values for the following datasets:

- Arsenic results for all Sinking Pond samples (i.e., representing the portion of the pond above the thermocline where the cleanup levels apply).

- Arsenic results for the 10 Sinking Pond samples located within the defined "human accessible" portion of the pond (as described in the Sediment Remedial Design Report, ARCADIS 2011).

- Arsenic and manganese data for all samples from the North Lagoon Wetland area.

Based on the ProUCL results, each of the data sets had 95% UCL values below the corresponding clean-up target values. The calculated 95% UCL concentrations of arsenic were 9.7 mg/kg for all of the areas of Sinking Pond, and 15 mg/kg for the subset of samples in human-accessible areas. Both of these values are below the target clean-up level for sediments of 42 mg/kg. Similarly, the 95% UCLs for sediment in the North Lagoon Wetland were 14 mg/kg arsenic and 240 mg/kg manganese, which are both also below the target clean-up levels of 28 mg/kg arsenic and 2,030 mg/kg manganese, for this area.

Site Inspection

The inspection of the Site was conducted on May 21, 2014. In attendance were Derrick Golden, U.S. EPA; Jennifer McWeeney, MassDEP; Thor Helgason (*de maximis* - site manager for the PRP); Anthony Esposito (ARCADIS – wetland restoration contractor for the PRP); and Sean Czarniecki and Deborah Roberts (AECOM – oversight contractor for EPA). The purpose of the inspection was to assess the protectiveness of the remedy. The Site Inspection Checklist and selected photographs taken during the inspection are included in Appendix C. The inspection included the following items: 1) Industrial Landfill inspection, 2) inspection of Landfill Area groundwater treatment system; and 3) inspection of restored areas (North Lagoon Wetland and Sinking Pond).

Landfill Area Inspections. The purpose of the Industrial Landfill and Landfill Area treatment system inspections was to help assess the protectiveness of the OU-1 and OU-3 remedies by

observing the condition of the site fence, the landfill cover and drainage system, the landfill gas passive vent system, and the landfill area groundwater collection/treatment system.

Similar to the previous (2009) inspection, minor issues were noted during the site inspection of the landfill:

- There is standing water in several locations in the rip-rapped perimeter drainage swale around the landfill. Standing water in the perimeter swale on the south, southeast, and northwest areas appears to either be the result of sedimentation adjacent to and directly below the rip-rap down chutes just downstream of the standing water, or the result of localized settling. The vegetation is trimmed regularly and there does not appear to be any impact to the underlying liner.

- An apparent groundhog burrow was observed on the side of the landfill, near one of the landfill gas monitoring points.

- One passive landfill gas vent on the southern side of the landfill was noticeably leaning, as if struck by a mowing tractor. Onsite personnel stated that it is still venting. There was no visual evidence of gas buildup or emissions elsewhere (via stressed vegetation).

Monitoring of vegetative growth in the perimeter swale should continue. Sediment and mowing clippings should be removed from the perimeter swale to promote positive drainage and eliminate standing water on the south, southeast and northwest sides of the landfill.

Construction of the landfill area groundwater treatment system was completed in 2011, so the equipment/operation is fairly new and appears to be operating efficiently. There are no floor drains leaving the building. Containment areas and closed sumps will capture any spills that may occur. Chemicals appear to be stored properly. A bypass piping system was developed for the extraction system to allow for cleaning (pigging) of the piping due to iron fouling. It may be appropriate to revise the O&M plan to include the procedure for establishing a bypass during the cleaning process.

Wetland Restoration Inspection. The site visit included an inspection of the wetlands restoration at Sinking Pond and the North Lagoon Wetland. Areas of the Site impacted by excavation of sediments and subsequently restored had been seeded and planted in 2011 following the removal actions. Site observations during the inspection were consistent with the wetland monitoring results reported by ARCADIS in the 2013 Vegetation Monitoring Report, discussed above.

In general, both restoration locations are well-vegetated. The upland banks around Sinking Pond are covered with herbaceous vegetation, mostly grasses, with no major areas of wash-outs. The water levels at Sinking Pond appeared lower than previous years and were to be confirmed by ARCADIS in a later data collection event in June 2014. The areas of bordering vegetated wetlands at the edge of the water line around the pond were developing wetland vegetation slowly. The vegetation planted in the inlet of Sinking Pond appeared to be maturing, thereby meeting performance standards. There has been some mortality of shrubs and trees around the bank of Sinking Pond since data was collected for the 2013 monitoring report. Data on the

number of surviving trees and shrubs will be included by ARCADIS in a 2014 monitoring report.

The area of the sedge marsh within the North Lagoon Wetland has developed a good density of wetland vegetation, dominated by sedges along the edges of the marsh, with cattails and sedges prominent in the center of the marsh. The remainder of the North Lagoon Wetland, located in the wooded marsh and along Fort Pond Brook, has become covered with suitable wetland vegetation. There seems to be an increase in the mortality of planted trees and shrubs since data collection in 2013. Data on the number of surviving trees and shrubs in the North Lagoon Wetland area will be included by ARCADIS in a 2014 monitoring report. Depending on the percentage rate of survival, additional trees and/or shrubs may need to be planted.

Interviews

During the FYR process, interviews were conducted with Town of Acton and Acton Water District officials, citizens who have been involved in Site activities, the PRP representative, and the MassDEP project manager. The purpose of the interviews was to document any perceived problems or successes with the remedy implementation to date. Most respondents elected to provide written responses to questions submitted to them in advance. Others responded to questions provided in advance during a telephone conversation that was subsequently documented on an interview record form. Completed interview record forms for all parties are included in Appendix D.

TECHNICAL ASSESSMENT

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

The review of documents indicates that the OU-1 remedy was implemented in accordance with the ROD for OU-1 and is functioning as intended. The Industrial Landfill is owned and maintained by W.R. Grace, wastes were solidified and capped, access is restricted by a fence, and a deed notice has been filed with the Registry of Deeds that puts parties on notice that the landfill cannot be disturbed except by written permission of MassDEP; hence, there is no current potential for exposure to waste left in place. The fence surrounding the landfill is intact and kept in good repair. The passive venting of landfill gas does not pose an unacceptable health risk or hazard (see Question B below for details of this evaluation). W.R. Grace has stated that it intends to maintain ownership of the land surrounding the Industrial Landfill, and control access to it.

The OU-3 groundwater remedial action is performing as expected, and it is anticipated that cleanup levels will be achieved in a reasonable time frame. The Landfill Area groundwater extraction system is containing the plume within the ROD-required capture zone. Operation procedures are adequate to maintain extraction well yields. Beyond the capture zone, contaminant concentrations are decreasing through MNA. The Landfill Area groundwater treatment system is removing VOCs and inorganics from the influent and meeting the standards for discharge of the effluent to Sinking Pond. Operation and maintenance procedures are adequate to maintain the functionality of the treatment system at the required level of performance.

Also part of OU-3, the Northeast Area groundwater extraction and treatment system operated for 3.5 years. The system reduced the VOC concentrations in the most contaminated portion of the plume, as intended, and the concentrations of the remaining contaminant mass are still decreasing through continued MNA. In 2013, no VOCs were detected at concentrations above MCLs in the supply wells in the School Street Well Field. The Town of Acton has expressed concern regarding EPA's decision to shut down the Northeast Area treatment system in 2013. However, EPA continues to believe that the system has served its purpose as intended under the ROD, and the decision to shut down the system was the correct one.

Treated water is supplied to Town residents and there is an administrative hold on private irrigation well installation within 500 feet of the plume areas. Ongoing monitoring and evaluation of groundwater contaminant concentrations Site-wide will continue, as planned, until cleanup goals are attained.

Under OU-3 actions, contaminated sediments were removed from Sinking Pond and the North Lagoon Wetland between June and November 2011 and disposed off-site. Confirmatory samples were collected and additional excavation was performed, as needed, to attain cleanup levels, and both areas were restored in late 2011. Monitoring of restored wetland habitats is ongoing and indicates the restoration has been largely successful.

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

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

The risk assessment conducted for OU-1 (Alliance, 1989) evaluated the risks and hazards associated with the ingestion of groundwater, direct human contact with soil, and ingestion of surface soil, for: (1) the entire Site considered as a single source; and (2) each individual source area. The primary risks and hazards observed in this analysis were those associated with ingestion of contaminated groundwater by a small child and adult/youth. The primary risk contributors for the groundwater ingestion pathway were VDC, VC, arsenic, lead, and zinc. The risks and hazards associated with incidental ingestion of and dermal contact with surface soil were less significant than those estimated for groundwater ingestion. However, elevated risks and hazards for soil exposures were attributable to VDC, VC, and arsenic.

The risk assessment conducted for OU-3 (Menzie-Cura, 2005) included a re-evaluation of the risks and hazards of contaminated groundwater used as household water or as irrigation water, as well as direct contact with shallow groundwater contaminants by excavation workers. The potential for vapor intrusion (VI) from groundwater contaminants into structures overlying the groundwater was also considered. In addition, the analysis also quantified the risks and hazards associated with recreational exposure to contaminants in surface water and sediment by incidental ingestion and dermal contact. Potential risks associated with the VI pathway, worker contact with shallow groundwater, and recreational exposures to surface water were deemed to be insignificant. However, risks and hazards above EPA's risk management guidelines were calculated for groundwater used in households or as irrigation water for all six geographic areas of the Site, and for sediment in Sinking Pond and at North Lagoon Wetland. The primary risk-contributing chemicals for groundwater included benzene, methyl tert-butyl ether (MTBE), VDC, VC, trichloroethene (TCE), bis(2-ethylhexyl) phthalate (BEHP), arsenic, chromium, manganese and nickel. Beryllium and lead, though not contributing significantly to risk and hazard, exceeded MCLs or MCLGs. For sediment, arsenic was the primary risk contributor.

For soil, EPA established cleanup goals for future residential land use for five indicator chemicals (VDC, VC, ethylbenzene, benzene, and BEHP) listed in Table 3 of the OU-1 ROD. The attainment of cleanup goals for the five chemicals was expected to reduce residual contamination of other compounds found at the Site to such low levels as to present no significant risk from direct contact or from migration of contaminants to groundwater. The indicator chemicals selected also included compounds identified in underlying soils that could contribute to risk following leaching to groundwater. The soil cleanup goals were generated based on a model that calculated the level of the indicator chemical which, if left in soil as a residual, would not lead to further contamination of groundwater at levels that exceed drinking water standards (i.e., MCLs). A number of additional chemicals were identified as soil and groundwater "indicator chemicals", as listed in Table 1 of the OU-1 ROD.

The OU-3 ROD established IGCLs as MCLs or MCLGs, if available. For chemicals lacking regulatory limits, risk-based values or practical quantitation limits were used as IGCLs. Sediment cleanup goals for arsenic in Sinking Pond and at North Lagoon Wetland were set at site-specific background concentrations.

In this Five-Year Review report, the toxicity values that served as the basis for the soil, groundwater, and sediment cleanup levels, as contained in the OU-1 and OU-3 RODs, as well as the toxicity values used for the soil "indicator chemicals" have been re-evaluated to determine whether any changes in toxicity impact the protectiveness of the remedy. Any changes in current or potential future exposure pathways or exposure assumptions that may impact remedy protectiveness are also noted, as described below. In addition, environmental data, available since the last Five-Year Review, have been qualitatively evaluated to determine whether exposure levels existing at the Site present a risk to current human receptors.

Changes in Toxicity Values

Appendix E, Table 1, presents the changes in toxicity values (oral reference doses and oral cancer slope factors) of compounds for which soil cleanup levels were developed, as well as compounds selected as soil "indicator chemicals" in 1989 and for compounds of potential concern selected in the 2005 risk assessment. Updated toxicity information was obtained from the Integrated Risk Information System (IRIS; USEPA, 2014) and other current EPA sources (e.g., the Superfund Technical Support Center).

For most contaminants, changes to toxicity information have been minimal and primarily reflect decreases in toxicity (e.g., VDC and barium), though some compounds are now believed to have greater toxicity than thought in 1989 (e.g., arsenic, TCE, and benzene). Changes in toxicity values for most groundwater compounds (e.g., arsenic, VDC, and TCE) would not affect remedy protectiveness since IGCLs are based on MCLs or MCLGs. Toxicity values have not changed since 2005 for those groundwater compounds with risk-based cleanup levels (nickel, manganese, and MTBE). Once IGCLs are achieved, an evaluation should be performed to demonstrate that the risk associated with potable groundwater use is within or below EPA's risk management guidelines. Until IGCLs are achieved and groundwater use is demonstrated to not pose a risk to human health, the installation of private wells and associated groundwater exposure pathways should be prevented. The Town provides treated water for use in the community, and the Acton Board of Health has established an administrative hold on the installation of private irrigation wells within 500 feet of the mapped region of contaminated groundwater that lies within the Town, preventing current exposure to remaining groundwater contamination.

One compound not identified as a groundwater compound of potential concern in the risk assessment is 1,4-dioxane. Though commonly associated with chlorinated solvent contamination, sampling for this compound was not conducted until after the OU-3 ROD was signed. Because it has now been detected in groundwater, the risk evaluation to be performed after achieving IGCLs should include 1,4-dioxane as a potential risk contributor.

To assure that the soil cleanup goals for the selected indicator compounds in soil do not present a direct contact risk using current toxicity information, a comparison of the soil cleanup goals to

EPA 2014 risk-based residential soil screening levels is provided in Table 4. The residential soil screening levels are developed based on current toxicity information and correspond to a carcinogenic risk of 1 x 10^{-6} and a noncarcinogenic hazard of 1. Soil cleanup levels are below the risk-based screening level except for the highest cleanup level developed for VC at the Secondary Lagoon. However, the highest cleanup level for VC (75 µg/kg) only slightly exceeds the screening level set at a cancer risk of 1 x 10^{-6} (59 µg/kg). Therefore, this comparison indicates that the soil cleanup levels would not be associated with a cumulative cancer risk and noncancer hazard greater than EPA's risk management criteria, and the soil cleanup levels remain adequately protective for future residential land use.

Table 4. Comparison of ROD Soil Cleanup Levels to 2014 Risk-Based Screening Levels

Pollutant	Low Range of Soil Cleanup Level (µg/kg)	High Range of Cleanup Level (µg/kg)	2014 Residential Risk-Based Screening Level (µg/kg)
Ethylbenzene	619	4914	5,800
Vinyl chloride	9	75	59
Benzene	1	7	1,200
Bis(2-ethylhexyl)phthalate	61	491	38,000
1,1-Dichloroethene	8	65	230,000

Even though soil cleanup goals remain protective, soil containing contaminant levels in excess of cleanup goals exists in the capped Industrial Landfill. In order to prevent direct contact exposures and the leaching of contaminants from these soils, continued maintenance of the landfill cap is required.

Sediment cleanup levels for Sinking Pond and the North Lagoon Wetland were established based on site-specific background concentrations, protective of future recreational exposures. Because residual sediment arsenic concentrations in human accessible portions of Sinking Pond and the North Lagoon Wetland are consistent with background concentrations, based on a 95% Upper Confidence Level comparison, the remedy remains protective for recreational sediment exposures, should they occur in the future.

Emissions from the Industrial Landfill were not evaluated in the 1989 risk assessment, but have been evaluated since then to support the change from an active landfill gas collection and treatment system to passive venting. Air dispersion modeling was performed most recently on November 2007 landfill gas emission data for six target compounds to estimate exposure concentrations during passive venting. The November 2007 sampling was the final round of sampling of emissions, per the O&M plan for the landfill (CDM, 1996). These data were evaluated in the 2009 Five-Year Review, and it was concluded that the landfill emissions do not cause an unacceptable human health risk or hazard. Due to changes in toxicity values between

2009 and 2014, the 2007 modeled air concentrations are compared in Table 5 to risk-based screening levels (EPA, 2014), to be protective of continuous exposures to the most sensitive receptor populations and based on the most up-to-date toxicity information available. The target risk levels for the screening levels are a noncarcinogenic hazard quotient of 1 and an incremental lifetime cancer risk of 1×10^{-6}. Because the modeled air concentrations are significantly below the risk-based screening levels, the landfill emissions do not cause an unacceptable human health risk or hazard.

Table 5. Comparison of Modeled Air Concentrations to 2014 Risk-Based Screening Levels

Pollutant	24-hour Impact ($\mu g/m^3$)	Annual Impact ($\mu g/m^3$)	2014 Risk-Based Screening Level for Residential Air ($\mu g/m^3$)
Ethylbenzene	0.0618	0.01	1.1
Vinyl chloride	0.0396	0.005	0.17
Xylenes	0.1226	0.015	100
Benzene	0.0480	0.006	0.36
Toluene	0.0560	0.007	5200
1,1-Dichloroethene	0.0595	0.007	210

Changes in Exposure Pathways/Assumptions

There have been no changes in land use since the last Five-Year Review. The W.R. Grace property continues to be vacant and partially fenced, preventing exposures to remaining contamination except for the possible occasional trespasser. The OU-3 remedy is complete at Sinking Pond and at North Lagoon Wetland, and residual concentrations of arsenic are consistent with site-specific background concentrations. With respect to groundwater use, the Town provides treated water for use in the community, and the Acton Board of Health has an administrative hold on issuing permits for the installation of private irrigation wells in and near the plume area. The current institutional controls, consisting of the deed notice on the Industrial Landfill and the administrative hold on private well installation, may need to be supplemented with additional controls.

A new method to evaluate compounds with mutagenic modes of action is now recommended by EPA. The currently recommended method was not implemented in the 1989 and 2005 risk assessments because the EPA carcinogen risk assessment guidance was published after completion of the risk assessments. The current methodology calls for the use of age-specific adjustment factors to account for an increased sensitivity during early life for compounds including methylene chloride, VC, TCE, and carcinogenic PAHs detected at the Site. In the 2005 Supplemental Guidance for Assessing Susceptibility from Early-Life Exposures to Carcinogens, EPA recommends evaluating chemicals with mutagenic modes of action using either chemical-specific data on susceptibility from early-life exposures or age-dependent adjustment factors

(ADAF) applied to the cancer slope factor. Because chemical-specific data on susceptibility from early-life exposure were available for the derivation of VC's updated cancer slope factor, the updated slope factor is used for risk characterization and an ADAF is not applied. ADAFs are applied when assessing risk for methylene chloride, TCE, and the carcinogenic PAHs.

The 2005 risk assessment included the early-life calculation for VC since guidance was available for this compound at that time. However, the supplemental early life calculation was not performed for the other chemicals in 2005. Carcinogenic PAHs and methylene chloride were largely non-detect in groundwater, while the MCL is used as the IGCL for TCE. For sediment, TCE and methylene chloride were largely non-detect. Carcinogenic PAHs in sediment were minor risk contributors and, in retrospect, their significance would not increase to a level of concern if the early-life risk was added to the 2005 sediment risk. Therefore, the lack of the early-life calculation for methylene chloride, TCE, and carcinogenic PAHs does not affect remedy protectiveness for sediment or groundwater. Based on the report entitled: *5 Year Sediment Investigation Summary Report*, prepared by ARCADIS, dated June 6, 2014, and the extent of soil clean-up performed, it is likely that these compounds are present in soils at negligible levels or at levels consistent with background concentrations.

In February 2014, EPA published updated default exposure assumptions for Superfund Sites, based on exposure studies considered and evaluated in the 2011 Exposure Factors Handbook. Some of the recommended exposure assumptions are more conservative than those used previously, while some are less conservative. Overall, however, use of the 2014 recommended exposure assumptions results in a slight decrease in risk levels, which supports the continued protectiveness of the remedies. It should also be noted that because the Industrial Landfill is capped, there is no potential exposure. Also, the 2014 sediment monitoring results indicate that background concentrations have been achieved. Lastly, once groundwater cleanup levels are achieved, groundwater risk will then be re-evaluated.

Though the VI pathway from groundwater to indoor air was evaluated in the 2005 risk assessment and was determined, at that time, to be associated with negligible risk, this pathway has been re-evaluated due to the February 2014 update in the standard default exposure factor assumptions and recent updates to toxicity values. The VI screening evaluation is presented in the following section (Evaluation of Recent Sampling Data). The re-evaluation determined that the remedies still remain protective and the VI pathway is not a concern.

Evaluation of Recent Sampling Data

Groundwater

The VI pathway updated risk-based screening has been conducted in a manner generally consistent with that used in the 2005 risk assessment. Nine exposure areas were evaluated, as presented on Table 6 below. The two most recent rounds of groundwater data (see Table 2 in Appendix E for specific dates) were assessed using the new screening levels as part of an updated assessment of the VI pathway for each exposure area. For the Assabet River Area, none of the applicable wells had been sampled more recently than for the 2005 risk assessment (i.e., 2000 or 2001). As a result, for this area, the 2000/2001 data were re-screened using updated groundwater VI screening levels (VISLs). For all other exposure areas, monitoring well VOC data collected between 2005 and 2013 were used, as available (see Table 2 in Appendix E for specific details). In addition, for the Northeast Area, baseline well data from four wells installed in 2011 were also used to assess the VI pathway.

At each exposure area, groundwater concentrations were compared to VISLs to see if there could be a potential impact to indoor air. The VISLs were calculated from formulas obtained from EPA's 2014 VISL calculator (version 3.2.1) and EPA's May 2014 residential indoor air RSLs, as presented in Appendix E, Table 3. The VISLs correspond to a cancer risk of 1×10^{-6} for carcinogens or a hazard quotient of 1 for noncarcinogens.

VOC concentrations are below the VISLs presented in Table 6, except for benzene, 1,2-dichloroethane, ethylbenzene, TCE, and VC, at select locations. For benzene, 1,2-dichloroethane, ethylbenzene and TCE, the maximum detected concentrations exceed the VISLs based on a cancer risk of 1×10^{-6} by less than 2-fold, indicating the cancer risk is less than 2×10^{-6} for each of these compounds. For VC, the maximum detected concentrations exceed the cancer-based VISL by less than 10-fold, except for the maximum concentration in the Former Lagoon Area, which exceeds the VISL by 12-fold. This indicates that VC may be associated with a cancer risk of up to approximately 1×10^{-5}, which is within the EPA acceptable risk range of 10^{-4} to 10^{-6}.

Therefore, the VI pathway would not be associated with a cumulative cancer risk and noncarcinogenic hazard greater than EPA's risk management criteria, confirming the conclusions of the 2005 risk assessment and indicating that the remedy is protective of VI. This pathway may require further consideration as methods used to evaluate this complex pathway evolve. However, it is expected that the potential for VI should decrease as groundwater cleanup progresses and concentrations of volatile groundwater contaminants continue to decrease over time.

Table 6: Comparison of Maximum Groundwater Concentrations to Vapor Intrusion Screening Criteria		
VOC	Maximum Groundwater Concentration (µg/L)	Vapor Intrusion Screening Level (µg/L) [(a)]
Assabet Wellfield Public Water Supply		
Chloromethane	0.32	260
Methyl tert-butyl ether	0.83	460
Trichloroethene	0.23	1.2
Assabet River Area		
Acetone	1.4	22,000,000
Benzene	0.23	1.6
2-Butanone	1.3	2,200,000
1,1-Dichloroethene	1.7	200
Trichloroethene	0.39	1.2
Vinyl chloride	0.2	0.15
Former Lagoon Area		
Acetone	59	22,000,000
2-Butanone	3.1	2,200,000
Carbon disulfide	1.7	1,200
1,1-Dichloroethene	14	200
Ethylbenzene	5.8	3.4
Styrene	0.72	8,900
Toluene	7.5	19,000
Vinyl chloride	1.8	0.15
Northeast Area		
Acetone	64	22,000,000
Benzene	0.45	1.6
2-Butanone	1.3	2,200,000
Carbon disulfide	0.68	1,200
Chloroform	0.35	0.8

Chloromethane	0.26	260
Dibromochloromethane	0.77	3.1
Cis-1,2-Dichloroethene	0.66	NA
1.1-Dichloroethene	28	200
Methyl tert-butyl ether	1.1	460
Methylene chloride	1.9	750
Tetrachloroethene	0.33	15
Trichloroethene	2.4	1.2
Vinyl chloride	0.97	0.15
Powder Mill Plaza Irrigation Well		
Methyl tert-butyl ether	0.31	460
Trichloroethene	1.2	1.2
Southeast Landfill Area		
Acetone	24	22,000,000
Benzene	3	1.6
2-Butanone	3.1	2,200,000
1,1-Dichloroethane	2.6	7.8
1,2-Dichloroethane	3.9	2.3
1,1-Dichloroethene	8	200
Cis-1,2-Dichloroethene	0.3	NA
1,2-Dichloropropane	1.5	2.4
Vinyl chloride	0.74	0.15
School Street Wellfield Public Water Supply		
1,1-Dichloroethene	4.1	200
Methyl tert-butyl ether	0.27	460
Southwest Area		
1,1-Dichloroethene	0.95	200
Southwest Landfill Area		
Acetone	97	22,000,000

2-Butanone	2.8	2,200,000
Chloromethane	0.34	260
1,1-Dichloroethane	0.34	7.8
1,2-Dichloroethane	1	2.3
1,1-Dichloroethene	4.1	200
1,2-Dichloropropane	0.51	2.4
Methyl tert-butyl ether	0.54	460

(a) Values taken from Appendix E, Table 3. The screening concentrations corresponding to a cancer risk of 10^{-6} and noncancer hazard of 1.
NA – Not available.

Starting in 2006, groundwater samples were collected for analysis of 1,4-dioxane. Monitoring for 1,4-dioxane will continue as part of the annual program. 1,4-Dioxane has not been included in this VI screening. However, because 1,4-dioxane does not readily volatilize from groundwater and does not meet EPA's definition of a volatile compound, the lack of inclusion of this compound in the VI screening does not affect EPA's conclusion that the remedies still remain protective and the VI pathway is not a concern.

Discharge Effluent to Sinking Pond

The Landfill Area Groundwater Treatment System (GWTS) began operation in 2011. Extracted groundwater is being treated for removal of arsenic, manganese, iron and VOCs, including 1,4-dioxane and chlorine, before surface discharge to Sinking Pond. According to the 2013 and 2014 GWTS reports, effluent concentrations ranged from non-detect to 1.5 µg/L for VDC, non-detect to 1.3 µg/L for benzene and were non-detect for VC. Concentrations of arsenic, iron and manganese ranged from 0.62 to 2.9 µg/L, non-detect to 83 µg/L and 0.79 to 200 µg/L, respectively, in the discharge effluent. The low levels of VOCs being discharged to the pond quickly volatilize and dilute into the surface water, posing a negligible risk to potential trespassers at the pond. The concentrations of arsenic, iron and manganese, as well as other metals measured in the effluent discharge in 2013 and 2014, are lower than or consistent with those evaluated in the 2005 risk assessment, indicating that surface water exposure pathways continue to be associated with negligible risk to potential current as well as future users of the pond.

With the remedial action completed, arsenic levels in Sinking Pond sediment are consistent with site-specific background concentrations. The arsenic concentrations in the GWTS effluent have been in the range of approximately 0.6 µg/L to 3 µg/L, and the discharge limit is 4 µg/L. At a flow rate of about 50 gpm, the rate at which arsenic is being added to the pond by the GWTS is too low to significantly re-contaminate the sediment. Note that the elevated concentrations of arsenic that existed in the sediment prior to remediation were believed to have been the result of decades of ARS discharge of effluent with arsenic concentrations in the range of 20 µg/L to 30 µg/L, at a flow rate nearly an order of magnitude higher than the GWTS.

Ecological Risk Review

A Baseline Ecological Risk Assessment (BERA) was completed for OU-3 in 2005 (Menzie-Cura, 2005b). The two habitats of concern that were the focus of the BERA were North Lagoon Wetland and Sinking Pond. North Lagoon Wetland is a wetland area between the former North Lagoon and the perennial stream Fort Pond Brook. Sinking Pond is a kettle pond located in the southwestern portion of the Site that does not have an outlet, and receives discharges from the Landfill Area groundwater treatment system and storm water runoff from surrounding areas. In the BERA, risks were identified to semi-aquatic wildlife and benthic invertebrates in sediment from the North Lagoon Wetland and Sinking Pond and additionally to fish in Sinking Pond. The 2005 BERA concluded that there were no unacceptable ecological risks from exposure to surface water.

The BERA was conducted using methodology which would generally comply with current EPA risk assessment guidance. The minor discrepancies between current guidance and previous guidance exist in the areas of benchmarks and toxicity values utilized. For most contaminants, changes to toxicity information have been minimal. The selection of contaminants of concern (COCs) in sediment was based on screening that is generally consistent with methodology and benchmarks currently used in ecological risk assessments and consistent with guidance.

The ROD for OU-3 developed RAOs for sediments for the protection of the environment, including the control of discharge of treated effluent groundwater to prevent unacceptable impacts to sediment and surface water in Sinking Pond, and prevention of exposure to contaminants in sediment that pose unacceptable risk to the environment. As stated in the 2005 ROD, the selected remedy included excavation of contaminated sediments exceeding cleanup levels within Sinking Pond and the North Lagoon Wetland.

Cleanup levels were set in the ROD for ecological receptors in the North Lagoon Wetland and in Sinking Pond to address exposure to sediments. In the North Lagoon Wetland, the basis of the ecological clean-up goal for arsenic was 28 mg/kg (maximum background concentration) for the protection of both invertebrates and semi-aquatic wildlife receptors. The protective level for manganese in sediments was set at 2,030 mg/kg and was a site-specific risk-based level based on dietary models for mammalian receptors in the North Lagoon Wetland.

The ROD identified the short-term goal for the most biologically active areas of Sinking Pond (the inlet and areas where the ground slope is shallow) as remediation of the areas with arsenic greater than 730 mg/kg or where any of the four COCs (arsenic, copper, iron and manganese) exceeds an effects-based benchmark [Probable Effects Concentration (PEC) or Severe Effects Level (SEL)]. The short term goal for sediments in other areas of the pond that were covered by less than 12 feet of water included areas with arsenic concentrations greater than 730 mg/kg and copper, iron, or manganese above an effects-based benchmark, and then evaluate the need to remediate such areas based on risks, feasibility, and implementability. The basis of the short-term clean-up level of 730 mg/kg sediment arsenic was evaluation of toxicity testing data in Sinking Pond sediments that indicated this was the lowest arsenic concentration at which toxicity was observed in sediment toxicity testing. The long-term goal under the 2005 ROD is to achieve sediment concentrations at or below the maximum background concentration of 42 mg/kg sediment arsenic within the top two inches of sediment.

Using these clean-up levels, additional data collected in pre-design investigations served as the basis for the extent of excavation of sediments. As documented in the Final Sediment Remedial Design Report (ARCADIS, 2011), W.R. Grace developed a remedial design that was intended to achieve the long-term goal of 42 mg/kg arsenic throughout the applicable portion of the pond such that subsequent monitoring for a reducing trend toward 42 mg/kg would not be necessary.

The remedy included excavation of 2,040 cubic yards of sediment from North Lagoon Wetland and restoration of the excavated areas by backfilling with a minimum of 12 inches of topsoil to pre-construction grades, seeding and planting to restore wetland habitats. Approximately 8,000 cubic yards of sediment were excavated from Sinking Pond. Site restoration activities at Sinking Pond included placement of a minimum of 6 inches of clean topsoil in the excavated portions of the pond between the water line and the historical high water elevation (144.5 feet). Disturbed portions of the pond bank from the edge of water to 144.5 feet were seeded and planted.

As discussed above, an assumption of the ecological exposures for the remedy included removal of sediment from the most biologically active area of the pond encompassing the sediments above an elevation of 128 feet. This was the elevation selected to represent the location of the thermocline based on pre-design data. In 2009, field data indicated that the thermocline was at approximately 12 feet below the surface of the pond in the fall when the surface elevation was at 140 feet. Therefore, at that time the thermocline corresponded to an elevation of 128 feet. In 2014, field data indicated the early summer thermocline (June 24, 2014) was at approximately 8 - 10 feet below the surface of the water. The surface elevation at the time of sampling in 2014 was approximately 135 feet. This places the early summer thermocline at 127 to 125 feet in 2014. This thermocline will likely stabilize several feet lower at the end of the summer. Since the implementation of the remedy in 2011, the pond surface water elevation has been observed to be several feet lower than pre-design conditions (formerly about elevation 140 feet to 145 feet). This may be due to the fact that less water is being discharged to Sinking Pond compared to when the ARS system was operational.

The current pond conditions will result in the upper, warm water area of the pond (epilimnion) being at an elevation lower than the estimated 128 feet based on pre-design estimates. This affects exposure assumptions that were the basis of the remedy, since the depression of the surface water elevation, and correspondingly the thermocline elevation, may result in the change in elevation of the epilimnion, including in areas below the level of the sediment removal area. The intent of the remedy was to remove contaminated sediments at elevations above 128 feet in order to limit exposures of aquatic organisms to sediment contaminants in the most ecologically sensitive areas of the pond. The depression of the thermocline of Sinking Pond is not likely to have a significant effect on the effectiveness of the remedy as a whole, as this area represents a small potential exposure area within the larger area of Sinking Pond. Over the long term, we expect the redisposition of new clean sediment to continue to cover and layer the existing sediment. Several samples in the area 4 or 5 feet below the 128 feet remedy depth showed elevated arsenic concentrations at the time of the Sediment Pre-Design Results Report (ARCADIS, 2008). While it is not likely to affect the protectiveness of the remedy, it is recommended that additional temperature profile data and surface water elevations be collected in fall of 2015 and 2016, to confirm the location of the existing thermocline. Based on those data, in can be determined if reevaluation of exposure assumptions or additional sampling will be needed prior to the next five year review.

In conclusion, since the BERA was prepared in 2005, there are no newly promulgated standards relevant to the Site that impact on protectiveness of the remedy. The reference values and exposure assumptions in the BERA were conservative and therefore protective. Other than the elevation of the thermocline post-remediation, there are no major changes in site conditions or exposure assumptions that would result in increased exposure or risk.

The results of the April 2014 sediment sampling demonstrate that the sediment remedial activities undertaken in 2011 continue to be effective in the area of sediment removal. For both the Sinking Pond and North Lagoon Wetland areas, the 95% UCL values remain below the long-term cleanup goals that were targeted and achieved via the remedial activities.

ARARs Review

EPA has reviewed the Applicable or Relevant and Appropriate Requirements (ARARs) to check for possible impacts on the remedy due to changes in standards that were identified as ARARs in the RODs for OU-1 and OU-3, newly promulgated standards for chemicals of potential concern, and TBCs (to be considered).

The tables in Appendix F provide an evaluation of ARARs using the regulations and requirement synopses listed in the OU-1 ROD (Table 1) and the OU-3 ROD (Table 2). The evaluation includes a determination of whether the regulation is currently an ARAR or TBC and whether the requirements have been met. Most of the regulations and requirements remain ARARs for the site and all are being complied with. Some regulations/requirements that were originally identified as ARARs are now either applicable requirements that apply to off-site activities or other laws that must be met at the site (e.g., OSHA).

The Massachusetts Sanitary Landfill Regulations are no longer considered ARAR. They would have been applicable to capping in place of the Battery Separator Area chip piles, which was part of the ROD-specified remedy for OU-1. However, the chip piles were excavated and placed in the Industrial Landfill instead of being capped in place.

In 2011, the MassDEP Office of Research and Standards (ORS) lowered their drinking water guideline (ORSG) for 1,4-dioxane from 3 µg/L to 0.3 µg/L. MassDEP's MCP (Massachusetts Contingency Plan) contains promulgated (Method 1) generic soil and groundwater standards that may be used at sites that meet the Method 1 criteria. The Method 1 GW-1 standard for 1,4-dioxane was recently reduced from 3.0 µg/L to 0.3 µg/L to match the Massachusetts drinking water guideline.

The lowered ORSG for 1,4-dioxane has been considered, in so far as it has led to increased monitoring of groundwater and public water supply wells for this compound, in response to concerns raised by the Acton Water District and the MassDEP Drinking Water Program. However, the changed guideline does not affect remedy protectiveness, as measured concentrations of 1,4-dioxane in samples from public water supply wells are well below the level that would pose an unacceptable cancer risk and necessitate an EPA cleanup action.

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

Although there have been changes in toxicity values, exposure assumptions and risk assessment methods since the risk assessments for the Site were completed, the changes do not affect remedy protectiveness as long as the Industrial Landfill cap remains intact, treated water is supplied to Town residents, the administrative hold on private irrigation well installation within 500 feet of the plume area continues, and ongoing monitoring and evaluation of groundwater contaminant concentrations continue. The depression of the thermocline of Sinking Pond 4 or 5 feet below the target elevation of 128 feet is not likely to have a significant effect on the protectiveness of the remedy as this area (between 128 feet and 123 feet) would represent a small exposure area.

Technical Assessment Summary

According to the data reviewed and the site inspection, the OU-1 remedy is functioning as intended by the ROD. Remedial actions for OU-1 have been completed. No remedy for OU-2 was necessary, as residual contamination in soils under the source areas did not exceed soil cleanup goals established for OU-1. The OU-1 soil cleanup goals remain adequately protective for a residential exposure scenario, based on a comparison of the goals to 2014 residential soil risk-based screening levels.

According to the data reviewed and the site inspection, the OU-3 remedy is also functioning as intended by the ROD. Sediments have been remediated and wetlands restored, groundwater is being extracted and treated in the Landfill Area of the site, and in other areas of the site groundwater contaminant concentrations continue to decline due to natural attenuation. A groundwater extraction, treatment and reinjection system operated in the Northeast Area for 3.5 years and has met the 2005 ROD objectives. Annual groundwater monitoring continues to evaluate remedy effectiveness.

The toxicity values that served as the basis for the soil, groundwater, and sediment cleanup levels, as contained in the OU-1 and OU-3 RODs, as well as the toxicity values used for the soil "indicator chemicals" were re-evaluated to determine whether any changes in toxicity impact the protectiveness of the remedy, and no changes affecting protectiveness were noted. Other than the location of the thermocline in Sinking Pond post-remediation, there are no major changes in site conditions, risk assessment methods, or exposure assumptions upon which the risk assessment was based that would result in increased exposure or risk. The depression of the thermocline of Sinking Pond is not likely to have a significant effect on the protectiveness of the remedy, as this area represents a small exposure area.

The remedy for OU-1 is protective of human health and the environment as long as the Industrial Landfill cap remains intact, treated water is supplied to Town residents, the administrative hold on private irrigation well installation within the plume area is continued, and ongoing monitoring and evaluation of groundwater contaminant concentrations continue.

The remedy at OU-3 is protective in the short-term, because there is no current exposure to contamination in groundwater or sediment. However, in order for the remedy to be protective in

the long-term, additional institutional controls may be needed to supplement the administrative hold on installing wells near the plume, to prevent groundwater use until cleanup levels are reached.

Site-wide, the remedial actions taken are protective of human health and the environment in the short-term because there is no current exposure to contamination. Soil and sediment have been remediated and contaminated soil left on site in the Industrial Landfill was capped. The Landfill Area groundwater remedy is operating and will reduce contaminant concentrations to cleanup levels over time through a combination of active extraction and treatment combined with monitored natural attenuation. However, to be protective in the long-term, additonal institutional controls may need to be implemented for groundwater within the vicinity of the contaminant plume to supplement the existing controls (the Town's administrative hold) already in place.

ISSUES/RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Table 7: Issues and Recommendations/Follow-up Actions

OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
						Current	Future
3	The Acton Board of Health has established an administrative hold on the installation of private irrigation wells within 500 feet of the mapped region of contaminated groundwater that lies within the town. It may be necessary to establish additional institutional controls to prevent groundwater use within the contaminated plume area until cleanup goals are met. An Institutional Controls Plan was prepared in 2011 but action on it has stalled due to concerns raised by the Town of Acton.	Continue efforts with the Town to establish additional institutional controls if needed.	PRP	EPA/State	9/30/2019	No	Yes

In addition, the following are recommendations from this FYR that do not affect protectiveness, but could improve the effectiveness of the remedies and/or support future FYRs in drawing conclusions regarding protectiveness:

- ***OU-1: Industrial Landfill Maintenance:*** Monitoring of vegetative growth in the perimeter swale should continue. Sediment and mowing clippings should be removed from the perimeter swale to promote positive drainage and eliminate standing water on the south, southeast and northwest sides of the landfill. Checking swale grades should also be considered, and if necessary the swale bottom should be re-graded to provide positive drainage to the outlet.

- ***OU-3: Sinking Pond Monitoring:*** In order to confirm the effectiveness of the remedy, it is recommended that additional temperature profile data and surface water

elevations be collected in fall of 2015 and 2016, to confirm the location of the existing thermocline. Based on those data, in can be determined if reevaluation of exposure assumptions or additional sampling will be needed prior to the next five year review.

PROTECTIVENESS STATEMENT

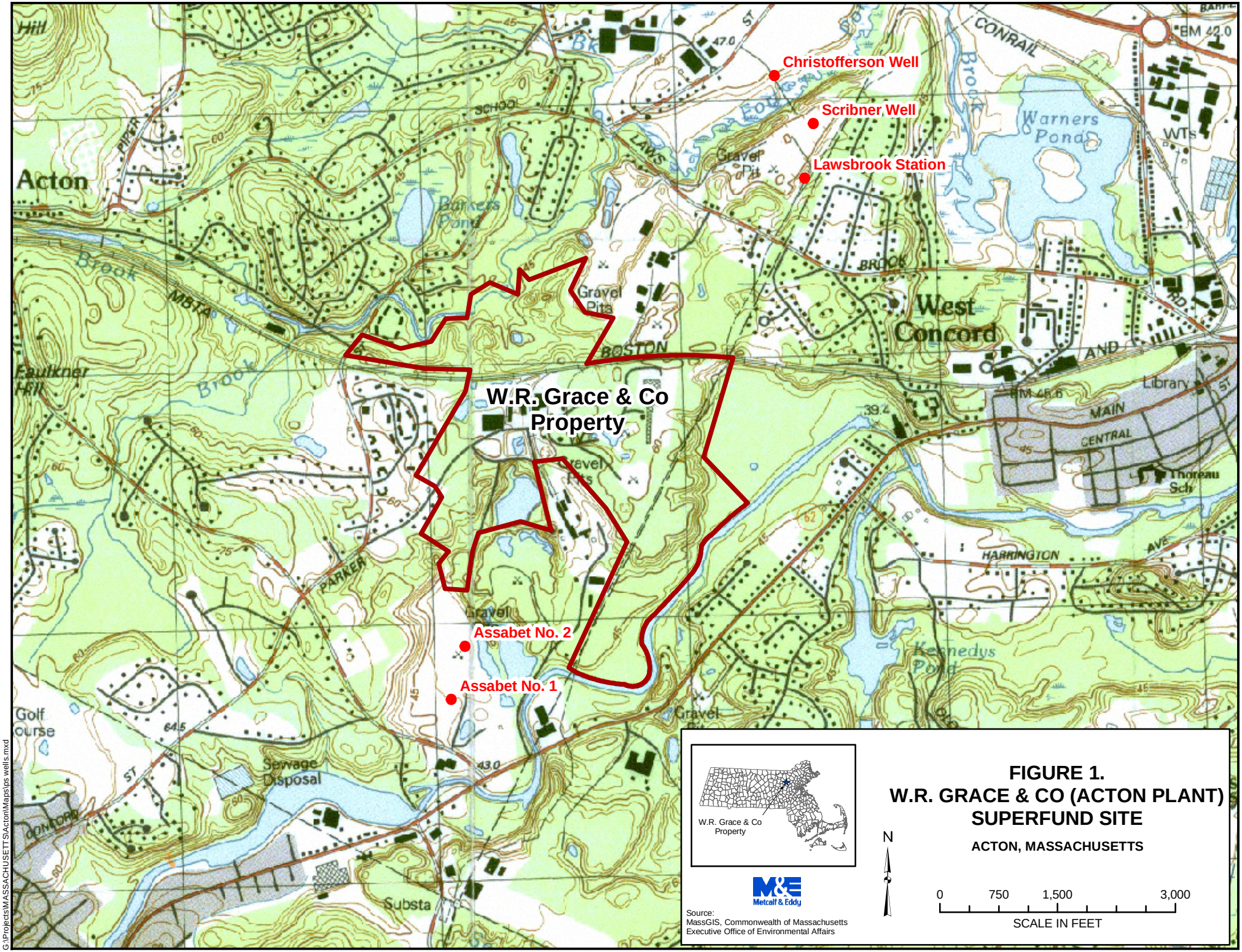
Protectiveness Statement(s)	
Operable Unit:	*Protectiveness Determination:*
1	Protective
Protectiveness Statement: The remedy for OU-1 is protective of human health and the environment. Soil in excess of cleanup levels has been excavated, stabilized, and either placed in the Industrial Landfill or shipped off-site for treatment and disposal. The Industrial Landfill was then closed with an impermeable cap to prevent potential exposure. The PRP has filed a deed notice with the Registry of Deeds to regulate land use of the Industrial Landfill, and the PRP maintains ownership of the landfill and maintains the cap, and there is a perimeter fence enclosing the landfill.	
Protectiveness Statement(s)	
Operable Unit:	*Protectiveness Determination:*
3	Short-term Protective
Protectiveness Statement: The remedy at OU-3 is protective in the short-term, because there is no current exposure to contamination in groundwater or sediment. Groundwater in the vicinity of the Industrial Landfill is currently being extracted and treated by a new system that was constructed in 2011 (the Landfill Area). A separate groundwater extraction and treatment system was installed in the Northeast Area of the Site and operated from April 2010 to September 2013, at which time it was determined that it had met the ROD objective of reducing contaminant mass in this area. The Acton Water District provides treatment of groundwater from the five public water supply wells in the vicinity of the Site, and the Acton Board of Health has established an administrative hold on the installation of private wells within 500 feet of the current groundwater contaminant plume. Areas of contaminated sediment in the North Lagoon Wetland and in Sinking Pond were excavated for off-site disposal during the summer and fall of 2011 and the cleanup levels established in the ROD were achieved. The wetlands have been restored and monitoring of the effectiveness of restoration efforts continues. However, in order for the remedy to be protective in the long-term, additional institutional controls for groundwater may be needed to supplement the town's administrative hold on installing wells near the plume to prevent groundwater use until cleanup levels are reached.	

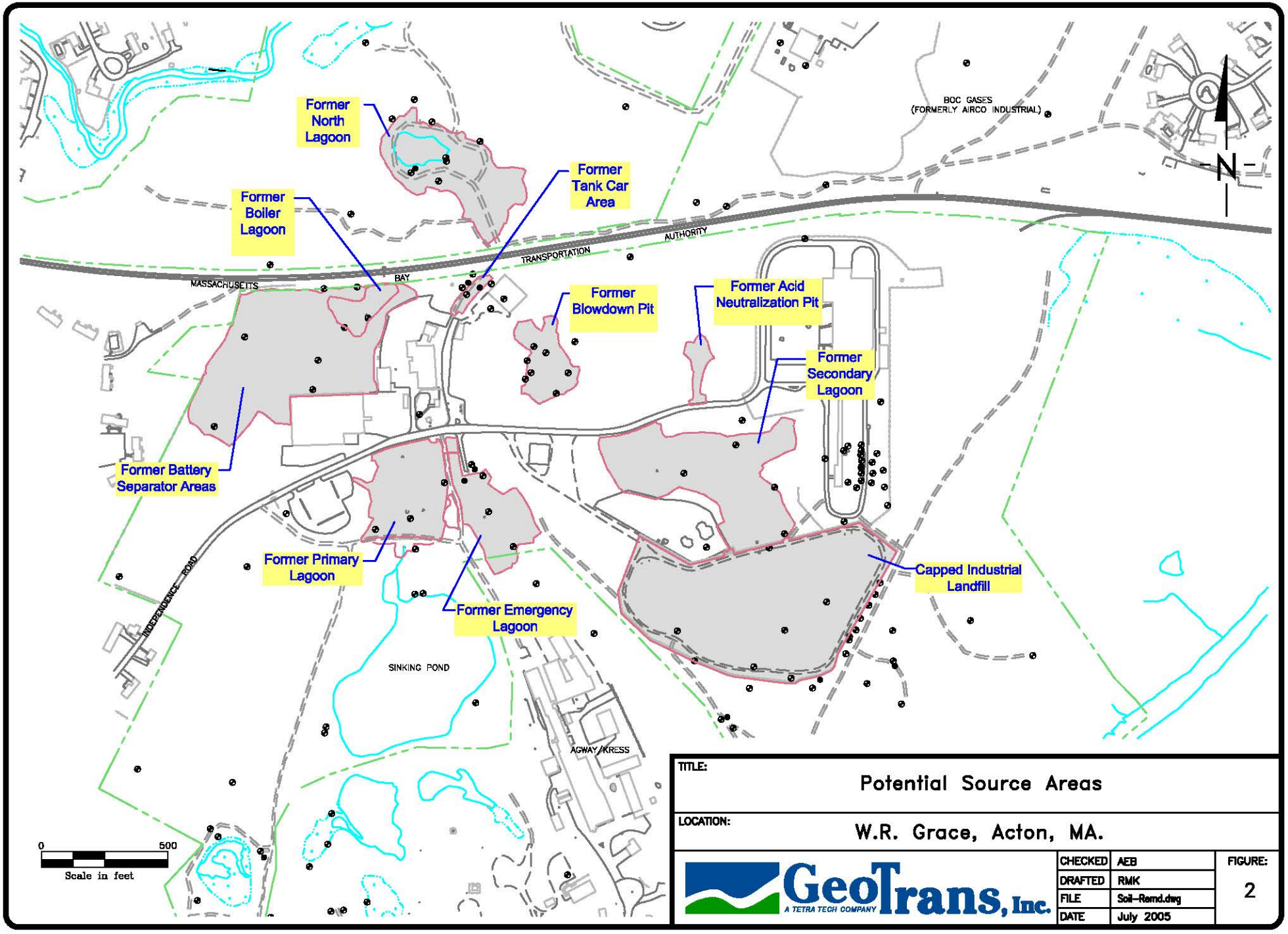
Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedial actions taken are protective of human health and the environment in the short-term because there is no current exposure to contamination. Soil and sediment have been remediated and contaminated soil left on site in the Industrial Landfill was capped. The Landfill Area groundwater remedy is operating and will reduce contaminant concentrations to cleanup levels over time through a combination of active extraction and treatment combined with monitored natural attenuation. To be protective in the long-term, additional institutional controls may be needed for groundwater within the vicinity of the contaminant plume to supplement the existing controls (the Town's administrative hold) already in place..

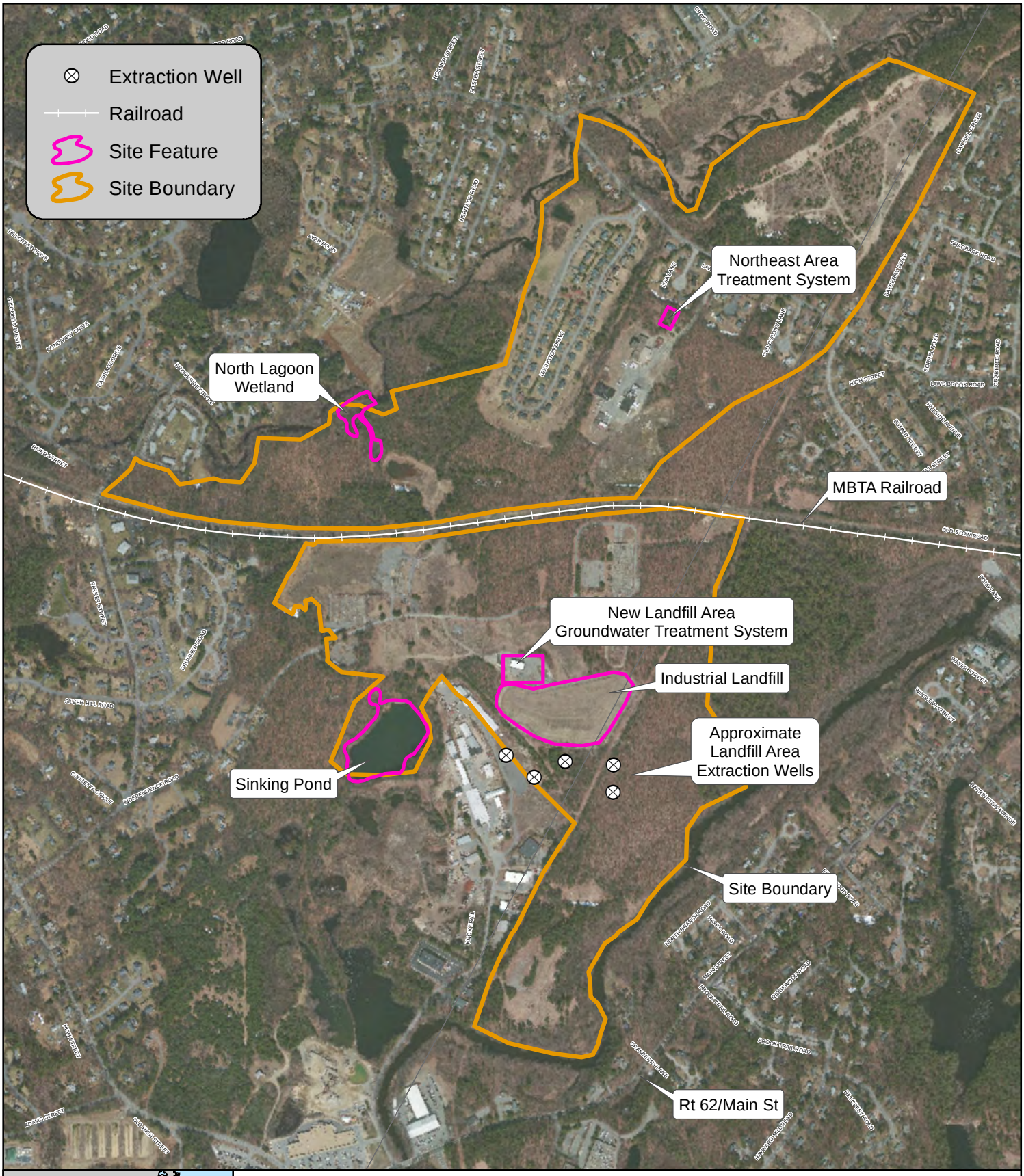
NEXT REVIEW

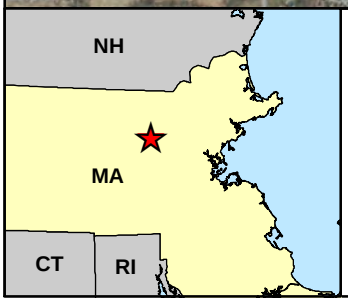
The next (2019) five-year review report for the W. R. Grace & Co., Inc. (Acton Plant) Superfund Site is required five years from the completion date of this review.

FIGURES


Christofferson Well
Scribner Well
Lawsbrook Station
W.R. Grace & Co Property
Assabet No. 2
Assabet No. 1
Acton
West Concord
Warners Pond
Bankers Pond
Kennedys Pond
Gravel Pits
Golf Course
Sewage Disposal
Substa
Library
Thoreau Sch
MBTA
CONRAIL
BOSTON
MAIN
CENTRAL
HARRINGTON
PARKER
LAWS
PIPER
SCHOOL
BROOK
AND
AVE
RD
ST
W.R. Grace & Co Property
Metcalf & Eddy
Source:
MassGIS, Commonwealth of Massachusetts
Executive Office of Environmental Affairs
N
0
750
1,500
3,000
SCALE IN FEET
FIGURE 1.
W.R. GRACE & CO (ACTON PLANT)
SUPERFUND SITE
ACTON, MASSACHUSETTS
G:\Projects\MASSACHUSETTS\Acton\Maps\ps wells.mxd


Former North Lagoon
Former Boiler Lagoon
Former Tank Car Area
Former Blowdown Pit
Former Acid Neutralization Pit
Former Secondary Lagoon
Former Battery Separator Areas
Former Primary Lagoon
Former Emergency Lagoon
Capped Industrial Landfill
BOC GASES (FORMERLY AIRCO INDUSTRIAL)
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
INDEPENDENCE ROAD
SINKING POND
AGWAY/KRESS
N
0
500
Scale in feet
TITLE:
Potential Source Areas
LOCATION:
W.R. Grace, Acton, MA.
GeoTrans, Inc.
A TETRA TECH COMPANY
CHECKED AEB
DRAFTED RMK
FILE Soil-Remd.dwg
DATE July 2005
FIGURE:
2





N

0 600 1,200 2,400

Feet

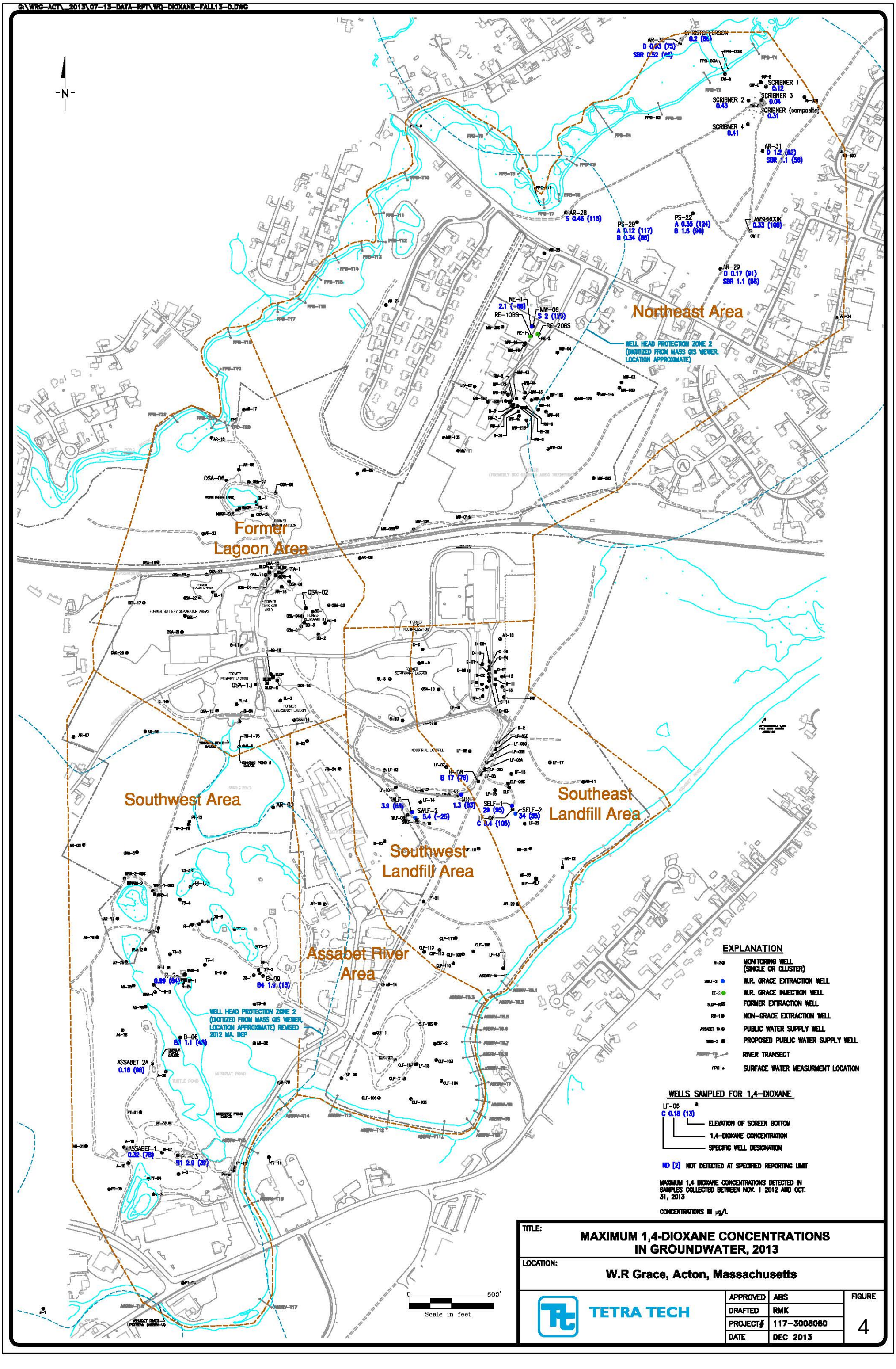
FIGURE 3

REMEDIATION AREAS

AECOM

G:\Projects\MUNI\60313385HPL\Maps\Site Locus.mxd

G:\WRG-ACT_2013\07-13-DATA-RPT\WQ-DIOXANE-FALL13-D.DWG



TITLE:

MAXIMUM 1,4-DIOXANE CONCENTRATIONS IN GROUNDWATER, 2013

LOCATION:

W.R Grace, Acton, Massachusetts

TETRA TECH

APPROVED	ABS
DRAFTED	RMK
PROJECT#	117-3008080
DATE	DEC 2013

FIGURE 4

G:\WRG-ACT_2013\07-13-DATA-RPT\FALL13-VDC-B.DWG

NOTE: BASE MAP BY COL-EAST 1998. WELL LOCATIONS, W.R. GRACE PROPERTY LINE & MISC. SITE FEATURES COMPILED FROM INFORMATION PROVIDED BY CAMP DRESSER & McKEE. SURROUNDING PROPERTY LINE LOCATIONS ARE FROM THE TOWN OF ACTON AND CONCORD ASSESSORS MAPS.

N

LINDE
(FORMERLY BOC GASES & AIRCO INDUSTRIAL)

AGWAY/KRESS

EXPLANATION

- W.R. GRACE PROPERTY BOUNDARY (APPROXIMATE)
- MONITORING WELL (SINGLE OR CLUSTER)
- WR GRACE EXTRACTION WELL
- WR GRACE INJECTION WELL
- FORMER EXTRACTION WELL
- NON-GRACE RECOVERY WELL
- PUBLIC WATER SUPPLY WELL
- PROPOSED PUBLIC WATER SUPPLY WELL
- RIVER TRANSECT

VDC CONCENTRATION 2013

- >200 – 310 ug/L VDC
- >100–200 ug/L VDC
- >60–100 ug/L VDC
- >30–60 ug/L VDC
- >7–30 ug/L VDC

ROD CAPTURE BOUNDARY

COMPOSITE CAPTURE BOUNDARY

0 600

Scale in feet

SAMPLES COLLECTED BETWEEN AUG. 21 AND SEPT. 19, 2013

VDC CONCENTRATIONS SHOWN ARE MAXIMUM REGARDLESS OF DEPTH. CONCENTRATION BOUNDARIES ARE APPROXIMATE.

VDC = VINYLIDENE CHLORIDE = 1.1-DICHLOROETHENE

TITLE:

DISTRIBUTION OF VDC IN GROUNDWATER, 2013

LOCATION:

W.R. Grace, Acton, MA.

TETRA TECH

APPROVED	ABS
DRAFTED	RMK
PROJECT#	117-3008080
DATE	DEC. 2013

FIGURE 5

G:\WRG-ACT_2013\07-13-DATA-RPT\FALL13-VINCLR-B.DWG

NOTE: BASE MAP BY COL-EAST 1998. WELL LOCATIONS, W.R. GRACE PROPERTY LINE & MISC. SITE FEATURES COMPILED FROM INFORMATION PROVIDED BY CAMP DRESSER & McKEE. SURROUNDING PROPERTY LINE LOCATIONS ARE FROM THE TOWN OF ACTON AND CONCORD ASSESSORS MAPS.

N

LINDE
(FORMERLY BOC GASES & AIRCO INDUSTRIAL)

EXPLANATION

- W.R. GRACE PROPERTY BOUNDARY (APPROXIMATE)
- MONITORING WELL (SINGLE OR CLUSTER)
- WR GRACE EXTRACTION WELL
- WR GRACE INJECTION WELL
- FORMER EXTRACTION WELL
- NON-GRACE RECOVERY WELL
- PUBLIC WATER SUPPLY WELL
- PROPOSED PUBLIC WATER SUPPLY WELL
- RIVER TRANSECT

VINYL CHLORIDE CONCENTRATION 2013

- >100-130 ug/L VINYL CHLORIDE
- >30-100 ug/L VINYL CHLORIDE
- >2-30 ug/L VINYL CHLORIDE

- ROD CAPTURE BOUNDARY
- COMPOSITE CAPTURE BOUNDARY

SAMPLES COLLECTED BETWEEN AUG. 21 AND SEPT. 19, 2013

VINYL CHLORIDE CONCENTRATIONS SHOWN ARE MAXIMUM REGARDLESS OF DEPTH. CONCENTRATION BOUNDARIES ARE APPROXIMATE.

0 600
Scale in feet

TITLE:
DISTRIBUTION OF VINYL CHLORIDE IN GROUNDWATER, 2013

LOCATION:
W.R. Grace, Acton, MA.

TETRA TECH

APPROVED	ABS
DRAFTED	RMK
PROJECT#	117-3008080
DATE	DEC 2013

FIGURE 6

G:\WRG-ACT_2013\07-13-DATA-RPT\FALL13-BENZ-B.DWG

NOTE: BASE MAP BY COL-EAST 1998. WELL LOCATIONS, W.R. GRACE PROPERTY LINE & MISC. SITE FEATURES COMPILED FROM INFORMATION PROVIDED BY CAMP DRESSER & McKEE. SURROUNDING PROPERTY LINE LOCATIONS ARE FROM THE TOWN OF ACTON AND CONCORD ASSESSORS MAPS.

N

LINDE
(FORMERLY BOC GASES & AIRCO INDUSTRIAL)

AGWAY/KRESS

ACTON
CONCORD

EXPLANATION

- W.R. GRACE PROPERTY BOUNDARY (APPROXIMATE)
- MONITORING WELL (SINGLE OR CLUSTER)
- WR GRACE EXTRACTION WELL
- WR GRACE INJECTION WELL
- FORMER EXTRACTION WELL
- NON-GRACE RECOVERY WELL
- PUBLIC WATER SUPPLY WELL
- PROPOSED PUBLIC WATER SUPPLY WELL
- RIVER TRANSECT

BENZENE CONCENTRATION 2013

- >100-270 ug/L BENZENE
- >30-100 ug/L BENZENE
- >5-30 ug/L BENZENE

ROD CAPTURE BOUNDARY

COMPOSITE CAPTURE BOUNDARY

SAMPLES COLLECTED BETWEEN AUG 21 AND SEPT 19, 2013

BENZENE CONCENTRATIONS SHOWN ARE MAXIMUM REGARDLESS OF DEPTH. CONCENTRATION BOUNDARIES ARE APPROXIMATE.

0 600
Scale in feet

TITLE:
DISTRIBUTION OF BENZENE IN GROUNDWATER, 2013

LOCATION:
W.R. Grace, Acton, MA.

TETRA TECH

APPROVED	ABS
DRAFTED	RMK
PROJECT#	117-3008080
DATE	DEC 2013

FIGURE 7

NOTE: BASE MAP BY COL-EAST 1998. WELL LOCATIONS, W.R. GRACE PROPERTY LINE & MISC. SITE FEATURES COMPILED FROM INFORMATION PROVIDED BY CAMP DRESSER & McKEE. SURROUNDING PROPERTY LINE LOCATIONS ARE FROM THE TOWN OF ACTON AND CONCORD ASSESSORS MAPS.

N

Northeast Area

Former Lagoon Area

Southwest Area

Southeast Landfill Area

Southwest Landfill Area

Assabet River Area

EXPLANATION

- W.R. GRACE PROPERTY BOUNDARY (APPROXIMATE)
- MONITORING WELL (SINGLE OR CLUSTER)
- EXTRACTION WELL
- PUBLIC WATER SUPPLY WELL
- PROPOSED PUBLIC WATER SUPPLY WELL
- RIVER TRANSECT

VDC CONCENTRATION 2001/2002

- 200 - 660 ug/L VDC
- 100-200 ug/L VDC
- 60-100 ug/L VDC
- 30-60 ug/L VDC
- 7-30 ug/L VDC

SAMPLES COLLECTED BETWEEN JULY 2001 AND JUNE 2002

VDC CONCENTRATIONS SHOWN ARE MAXIMUM REGARDLESS OF DEPTH. CONCENTRATION BOUNDARIES ARE APPROXIMATE.

VDC = VINYLIDENE CHLORIDE = 1,1-DICHLOROETHENE

0 600

Scale in feet

TITLE: Distribution of VDC in Groundwater, 2001 - 2002

LOCATION: W.R. Grace, Acton, MA.

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	AES
DRAFTED	RMK
FILE	
DATE	July 2

FIGURE: 8

APPENDIX A – EXISTING SITE INFORMATION

A. SITE CHRONOLOGY

The chronology of the Site, including significant site events and dates, is included in Table A-1.

Table A-1: Chronology of Site Events

Event	Date
Dewey & Almy Chemical Company manufactures various products at the Acton site at various times, such as: latex, resins, plasticizers, and paper battery separators	1945 – 1954
W.R. Grace acquires Dewey & Almy and continues various chemical manufacturing processes at the Acton site	1954 – 1991
Organic contaminants (vinylidene chloride,vinyl chloride, ethylbenzene, and benzene) detected in municipal wells, Assabet #1 and #2	1978
The United States sues W.R. Grace to require cleanup of the Site	April 17, 1980
MassDEP issues an Administrative Order to W.R. Grace, specifying procedures and requirements for evaluating and correcting Site contamination	July 14, 1980
W.R. Grace and EPA enter into a Consent Decree to clean up waste disposal areas and restore groundwater in drinking water aquifers. The provisions of the Consent Decree are similar to the requirements of the July 14, 1980 MassDEP Administrative Order.	October 21, 1980
MassDEP issues an Amended Order to W.R. Grace, amending MassDEP's July 14, 1980 order to conform with the Consent Decree language	April 15, 1981
Site added to the National Priorities List	September 8, 1983
Aquifer Restoration System construction completed and operation begins	March 1985
Phase IV Report and Addendum, detailing the OU-1 remedy, was completed by Camp, Dresser & McKee (CDM) for W.R. Grace	June 6, 1989
Risk Analysis Report completed by Alliance Technologies Corporation for EPA	June 30, 1989
Record of Decision for OU-1 signed by Paul G. Keough, Acting Regional Administrator	September 29, 1989

Table A-1: Chronology of Site Events	
Event	**Date**
CDM issued Remedial Design/Remedial Action (RD/RA) Work Plan for OU-1	January 1991
CDM issued report on Field Pilot Programs for upgrading air stripping tower portion of ARS	May 1991
Quarterly well monitoring begins	March 1992
Odor controls for air-stripping tower installed and operational; Site security measures implemented	September 1992
CDM submitted revised 100% design package for OU-1 remedial action	August 1993
GZA issued Final Site Work Plan and Construction Quality Control Plan for OU-1 remedial action	July 1994
OU-1 Remedial Action initiated; Air monitoring system installed	October 17, 1994
Landfill gas treatment system delivered and installed; Permanent fencing around landfill installed	March 1997
Final site inspection performed	June 1997
Remedial Action Report for OU-1 issued by EPA	September 30, 1997
Revised Construction Quality Assurance Closeout Report for OU-1 issued by CDM for W.R. Grace	February 1998
Statement of Work for OU-3 Remedial Investigation/Feasibility Study is signed	March 25, 1998
First 5-year review report issued by EPA for the Site	September 1999
Draft Remedial Investigation Report and Phase 2 Work Plan for OU-3 issued by GeoTrans for W.R. Grace	August 30, 2002
Phase 2 Remedial Investigation Report issued by GeoTrans for W.R. Grace	May 14, 2003
Draft Baseline Ecological Risk Assessment issued by Menzie-Cura for W.R. Grace	July 30, 2004
Draft Public Health Risk Assessment Deliverable 3 issued by Menzie-Cura for W.R. Grace	August 5, 2004
Second 5-year review report issued by EPA for the Site	September 29, 2004
Public Review Remedial Investigation and Feasibility Study Reports for OU-3 issued by GeoTrans for W.R. Grace	July 1, 2005

Table A-1: Chronology of Site Events	
Event	**Date**
Proposed Plan for OU-3 released to public	July 8, 2005
Public Meeting on Proposed Plan for OU-3	July 19, 2005
Public Hearing on Proposed Plan for OU-3	August 4, 2005
OU-3 ROD signed	September 30, 2005
W.R. Grace and EPA come to agreement on a Remedial Design/Remedial Action Statement of Work for OU-3	August 30, 2006
Approval for performing a topographical survey and wetland assessment/delineation is granted by EPA and MassDEP	April 3, 2007
Sediment Pre-Design Work Plan is Conditionally Approved by EPA	July 24, 2007
Landfill Area and Northeast Area Groundwater Pre-Design Work Plans are Conditionally Approved by EPA	August 30, 2007
Request to Discontinue Pumping from Existing Recovery Well RLF is Conditionally Approved by EPA, with Existing Recovery Well ELF to remain operational until new recovery wells (SELF-1 and SWLF-1) are brought on line	January 15, 2008
Northeast Area Groundwater Pre-Design Results Report Conditionally Approved by EPA	November 26, 2008
Petition to discontinue pumping from extraction wells NLBR-R, NLGP, SLBR, and SLGP-R in the Former Lagoon Area is Conditionally Approved by EPA	January 9, 2009
Sediment Pre-Design Results Report Conditionally Approved by EPA	February 26, 2009
Northeast Area Groundwater Concept Design Conditionally Approved by EPA	April 24, 2009
Landfill Area Groundwater Pre-Design Results Report Conditionally Approved by EPA	June 9, 2009
Northeast Area Design Approved by EPA	June 11, 2009
Landfill Area Concept Design Submitted	September 8, 2009
Third 5-year review report issued by EPA for the Site	September 23, 2009
Landfill Area Concept Design Approved by EPA	January 22, 2010

Table A-1: Chronology of Site Events	
Event	**Date**
Startup of Northeast Area Groundwater Extraction and Treatment System	April 5, 2010
Northeast Area Groundwater Extraction and Treatment System determined to be "Operational and Functional" by EPA	May 14, 2010
Sediment Concept Design Report Submitted	June 2010
Sediment 100% Design Submitted	September 2010
Sediment 100% Design Conditionally Approved by EPA	September 30, 2010
Landfill Area Extraction System Capture Zone Conditionally Approved by EPA	October 29, 2010
Landfill Area Final Design Submitted	December 10, 2010
Landfill Area Final Design Approved by EPA	February 14, 2011
Revised Sediment 100% Design Submitted	March 2011
Startup of Landfill Area Treatment System	May 2, 2011
Shake-down of Landfill Area Treatment System	May 2011 – May 2012
Sediment Construction Final Inspection	November 17, 2011
Sediment Construction determined to be "Operational and Functional" by EPA	January 10, 2012
Preliminary Closeout Report for the Site issued by EPA	February 8, 2012
Landfill Area Groundwater Extraction and Treatment System determined to be "Operational and Functional" by EPA	May 25, 2012
Grace submits evaluation of first 2.5 years of NE Area remediation system operations, with petition to shut down in April 2013	February 25, 2013
EPA conditionally approves shutdown of NE Area remediation system	September 20, 2013
NE Area remediation system shut down	September 24, 2013

B. BACKGROUND

Physical Characteristics and Land and Resource Use

The Site is a former chemical manufacturing facility which occupies approximately 260 acres in Acton and Concord, Massachusetts. The Site is located off Independence Road and is bounded to the northwest by Fort Pond Brook and to the southeast by the Assabet River. The Site is bounded by industrial parks to the south and northeast, and by residential housing to the northwest, east, and west. A sand and gravel pit is located south of the Site. All buildings associated with the former chemical manufacturing operations have been demolished. Only those buildings associated with the remedial action currently exist on the Site.

Waste disposal areas identified on-site include the former Battery Separator Area, the former Blowdown Pit, the former Primary Lagoon, the former North Lagoon, the former Tank Car Area, the former Secondary Lagoon, the former Emergency Lagoon, the former Boiler Lagoon (located between the Battery Separator Area and the Tank Car Area), the former Acid Neutralization Pit, and the Industrial Landfill (see Figure 2).

Groundwater beneath the Site is classified as GW-1 by MassDEP, defined as a current or potential future drinking water source area. The Site straddles a groundwater divide, so groundwater from the Site flows either to the northwest toward Fort Pond Brook or to the southeast and south toward the Assabet River. The Assabet Wellfield, which supplies water for the Town of Acton, is located southwest of the Site. The wellfield consists of two municipal drinking water wells, Assabet #1 and Assabet #2A. Assabet #2A replaced Assabet #2 as a public water supply well in May 2001. Presently, both wells are operating, and the extracted water is treated with an air stripping unit prior to public distribution. The Acton Water District is currently in the process of developing Assabet 3 as a future public supply well within this area. Assabet 3 was a former production well used by W.R. Grace when the Acton manufacturing facility was operational. The Lawsbrook, Scribner, and Christofferson wells, comprising the School Street Wellfield, are located approximately 3,700 feet north of the Site. All three wells are within the Fort Pond Brook watershed. The Scribner and Lawsbrook wells are 150 and 1,000 feet south of Fort Pond Brook, respectively. The Christofferson well is immediately north of Fort Pond Brook. Water from the School Street wells is also treated using an air stripper prior to public distribution.

In addition to the five public wells, six private water supply wells (1 Lisa Lane, 5 Bellantoni Drive, Powder Mill Plaza, Valley Sports Arena, and two wells at the Starmet-Nuclear Metals Superfund Site property) were identified during the private well survey conducted for the Site. The Lisa Lane and Bellantoni Drive wells were located in a residential area north of the W.R. Grace property and south of the School Street Wellfield. Both wells withdrew water from the bedrock aquifer for residential irrigation. When it was discovered that these two wells were within the plume from the Site, the well at 1 Lisa Lane was converted into a monitoring well, and the well at 5 Bellantoni Drive was properly decommissioned. The other four wells identified during the private well survey were found to be unaffected by Site-related contaminants.

History of Contamination

The Site is a former chemical manufacturing facility, used for industrial purposes for over one hundred

years. American Cyanamid Company and the Dewey & Almy Chemical Company (D&A) were former occupants of the Site. American Cyanamid manufactured explosives, and D&A produced synthetic rubber container sealant products, latex products, plasticizers, and resins. W. R. Grace acquired the property in 1954, and chemical operations were continued at the Site. Operations at the W. R. Grace facility included the production of materials used to make concrete and organic chemicals, container sealing compounds, latex products, and paper and plastic battery separators. Wastewater and solid industrial wastes from these operations were disposed of in several unlined lagoons (the Primary Lagoon, Secondary Lagoon, North Lagoon, and Emergency Lagoon), and were buried in or placed onto an on-site Industrial Landfill and several other waste sites (see Figure 2). These other waste sites include the Battery Separator Area (lagoon and chip pile), the Tank Car Area, and the Boiler Lagoon which was located between the Battery Separator and Tank Car Areas. Periodically, sludge from the Primary Lagoon was dredged, dried along the banks, and trucked to the landfill for disposal. In addition, the by-products of some chemical processes were disposed of in the Blowdown Pit. Discharge to all lagoons and the Battery Separator Area ceased in 1980. The production of organic chemicals was discontinued in 1982. A small distribution center for concrete additives was moved to another location in September 1996. A second plant for the manufacture of battery separators, known as the Daramic facility, was constructed in 1979, but operations there ceased in 1991. All buildings, with the exception of those associated with the remedial actions, have been demolished.

Investigations in 1978 indicated that two Acton municipal wells, Assabet #1 and Assabet #2, were contaminated with vinylidene chloride (VDC, also known as 1,1-dichloroethene or 1,1-DCE). Significant levels of vinyl chloride (VC), ethylbenzene, and benzene were also detected in these wells. Shortly thereafter, the Town took the precautionary action of closing the two wells. As a result of the discovery of the municipal well contamination, W. R. Grace and EPA entered into a Consent Decree requiring cleanup of the Site in October 1980 (1980 Consent Decree) under the Resource Conservation and Recovery Act. A similar settlement was reached between W.R. Grace and the state of Massachusetts. In September 1983, the Site was added to the National Priorities List (NPL).

Initial Response

The 1980 Consent Decree outlined the procedural framework for cleanup of the Site. One requirement of the Consent Decree was cleanup and restoration of the drinking water in the aquifer, the source of water for Assabet Wells #1 and #2. W. R. Grace initiated development of an engineering plan for aquifer cleanup which included a recovery well network to capture contaminated groundwater and prevent further off-site migration. Contaminated groundwater extracted from the network of wells would be pumped to a central treatment facility or treated at the well-head. Following EPA and State approval of this cleanup plan, construction of the Aquifer Restoration System (ARS) was begun in December 1983. Construction of the ARS was completed in March 1985. As explained below, parts of the ARS extraction well network were deactivated in 2002 and in 2008, while other parts remain in operation as part of the groundwater remedy. As required by the 2005 ROD, the ARS treatment system will be replaced by a new treatment system currently being designed by W. R. Grace.

The 1980 Consent Decree also required W.R. Grace to assess and control sources of waste on-site using a phased investigation under EPA oversight. In Phases I and II, W.R. Grace prepared plans for studying and determining the nature and extent of contamination at the source areas, and after EPA approval, performed the study. In Phase III of the source area investigation, W.R. Grace identified, analyzed, and evaluated cleanup and remedial measures for the source areas. Following conditional approval of the Phase III scope of work, W.R. Grace performed the evaluations and submitted the results to EPA in a Phase IV Report. The final draft of the Phase IV Report was submitted to EPA on August 31, 1988.

Following a series of meetings to discuss revisions to the report, W.R. Grace submitted an Addendum to the draft Phase IV Report on June 6, 1989. The remedial measures evaluated in the Phase IV Report and Addendum provided the basis for the remedy that was selected in the ROD for OU-1, signed on September 29, 1989.

As described in the Record of Decision (ROD) for OU-1, the Site remedy was organized into three operable units (OUs):

- OU-1 Disposal areas and surficial contamination areas at the Site;
- OU-2 Residual contamination in disposal areas at the Site following implementation of OU-1; and
- OU-3 Contaminated groundwater in the area of the Grace facility that is not contained or adequately addressed by the Aquifer Restoration System. OU-3 also includes contaminated sediments and surface water.

Basis for Taking Action

Two major series of investigations have been conducted at the Site. The first occurred in the 1980s and led to construction of the ARS, development of the 1989 ROD for OU-1, and cleanup of the source areas at the Site. The second set of investigations, conducted mainly between 2000 and 2002, resulted in development of the 2005 ROD for OU-3 and led to the remedial designs that are currently underway.

OU-1. The investigations of the nature and extent of contamination at the Site that were conducted in the 1980s were focused on source areas and groundwater. The contaminants that were detected in various media at the Site during those investigations are summarized below.

Soil & Sludge. Soil and sludge were identified as "surface materials" in the 1989 ROD. The Blowdown Pit contained the most highly contaminated material on the Site (primarily VDC), while material in and under the Boiler Lagoon demonstrated lower contaminant levels than the other lagoons.

VDC, VC, benzene, and ethylbenzene were the primary contaminants identified in the Primary Lagoon, Secondary Lagoon, and Emergency Lagoon sludge and underlying soils. Benzene, toluene, and ethylbenzene were the prominent compounds in soils underlying the Industrial Landfill. In North Lagoon sludges and underlying soils, VOC contamination was detected along with phthalates, metals, and cyanide. The principal contaminants found in Boiler Lagoon sludges and underlying soils were phthalates and metals, while VDC, benzene, ethylbenzene, formaldehyde, phenol, and metals predominated in Battery Separator Area soils/sludges. Soils in the Tank Car Area were contaminated with VDC, phthalates, and metals. Eight chemicals were selected for evaluation in the risk assessment. The eight chemicals included: VDC, VC, benzene, toluene, ethylbenzene, formaldehyde, arsenic, and cadmium.

Groundwater. Fifteen groundwater contaminants were identified as indicator chemicals in the 1989 ROD for OU-1. The fifteen indicator chemicals were VDC, VC, benzene, toluene, ethylbenzene, trichloroethene (TCE), formaldehyde, arsenic, beryllium, cadmium, chromium, copper, lead, nickel, and zinc.

Surface Water. VDC and 1,1,1-trichloroethane (TCA) were detected in surface water samples from the Assabet River. VDC, benzene, toluene, xylene, tetrachloroethene (PCE) and chloroform were detected in Fort Pond Brook surface water samples.

A risk assessment was performed by Alliance Technologies Corporation (Alliance, 1989) that evaluated future human health risks associated with site-wide exposure to surface materials and groundwater, and specific source area exposures assuming residential use of the property. The risk assessment concluded that the W. R. Grace property was likely to pose significant carcinogenic and non-carcinogenic risk to human health in the event the property was developed and used for residential purposes, in the absence of remediation. Significant groundwater risk contributors included VDC, VC, arsenic, lead, and zinc. Risks associated with exposure to surface material were primarily attributed to VDC, VC, and arsenic. These conclusions formed the basis of the selected remedy for OU-1 and OU-2. The OU-1 remedial actions were completed in 1997, and no follow-up OU-2 actions were needed.

OU-3. The objectives for the investigations associated with OU-3, which were described in the OU-3 Remedial Investigation/Feasibility Study (RI/FS) Statement of Work (approved by EPA and MassDEP April 1998), were to define the extent of groundwater contamination and its impacts, if any, on surface water, sediments, and air at the Site. The RI for OU-3 began with the preparation of an Initial Site Characterization Report (ISCR) by HSI GeoTrans in August 1998. The data gaps that were identified in the ISCR were addressed by investigations conducted between April 2000 and November 2002. Human health and ecological risk assessments were completed in 2005. The contaminants that were detected at the Site as a result of the remedial investigations and sampling for the risk assessments are summarized, by medium, below.

Groundwater. The primary chemicals that were identified as groundwater contaminants at the Site include VDC, VC, benzene, 1,2-dichloropropane, 1,2-dichloroethane, methylene chloride, bis (2-ethylhexyl) phthalate, arsenic, and manganese. Contaminants that were detected less frequently include TCE, methyl-tert-butyl-ether, 1,4-dioxane, chromium, and nickel.

Sediment. The Human Health Risk Assessment identified future risks to receptors from exposure to sediments in North Lagoon Wetland and in Sinking Pond. Unacceptable risks to potential future recreational receptors (waders) were identified in Sinking Pond and in North Lagoon wetland due to elevated arsenic in sediments.

Unacceptable risks to the environment were also identified and attributed to arsenic in portions of Sinking Pond (above the thermocline) in water less than 12 feet deep, and to exposure to elevated concentrations of other metals in sediments of Sinking Pond including manganese, iron, and copper. The band of shallow water around the pond posing a risk to ecological receptors overlaps with areas of potential human exposure and risk to human receptors from swimming/wading. Risks to ecological receptors in sediments of the North Lagoon Wetland were attributed to arsenic and manganese.

Surface Water. VDC and TCA were detected in surface water samples from the Assabet River. VDC, benzene, toluene, xylene, PCE, and chloroform were detected in Fort Pond Brook surface water samples.

These conclusions formed the basis of the selected remedy for OU-3 of the Site. Design and construction of the OU-3 remedies were completed between 2009 and 2012, and operation and maintenance activities are ongoing.

C. REMEDIAL ACTIONS

Remedy Selection

This section describes the selected remedies for the three operable units (OU-1, OU-2, and OU-3) that comprise the Site.

OU-1. The ROD for OU-1 was signed on September 29, 1989. This ROD addressed the first of three operable units planned for the Site. The remedial action objectives as presented in the ROD for the Site were to:

- *Protect exposure points, where humans or wildlife may be exposed to contaminants in soil, groundwater, surface water, and sediments, during and after site remediation.*

- *Prevent the migration of contaminants in groundwater from sources on-site to public drinking water supplies.*

- *Protect on- and off-site groundwater from contamination by site contaminants in excess of drinking water quality.*

- *Eliminate the potential for contact in the future with waste materials by the public and the environment.*

- *Protect on- and off-site surface water from contamination by site contaminants.*

- *Prevent the migration of contaminated run-off from the waste sites.*

- *Protect against direct contact with site contaminants and minimize environmental exposure during remedial activities.*

- *Reduce to the maximum extent practicable the number of source areas to eliminate long-term management and permit unrestricted use.*

The goals of the selected remedy were to protect the drinking water aquifer by minimizing further contamination of the groundwater and surface water, and to eliminate the threats posed by direct contact with or ingestion of contaminants in soil and waste sludges at the Site.

The selected remedy for OU-1 (source control), as identified in the ROD, consisted of the following components:

- *Excavation and transportation off-site for incineration of highly contaminated material from the Blowdown Pit;*

- *Excavation and stabilization of the remaining contents of the Blowdown Pit, as well as the contaminated sludges and soils of the Primary Lagoon, Secondary Lagoon, North Lagoon, and Emergency Lagoon;*

- *Excavation of contaminated soils from the Battery Separator Lagoons, Boiler Lagoon, and Tank Car Area;*

- *Placing both the stabilized and the non-stabilized materials excavated from the Site on the existing Industrial Landfill, and covering these materials with an impermeable cap;*

- *Post-excavation sampling and analysis;*

- *Capping the Battery Separator Chip Pile;*

- *Covering any disposal area which attains the soil cleanup goals;*

- *Modifying the ARS to address air stripper emission controls; and*

- *Establishing long-term environmental monitoring at each disposal area designed to monitor the effectiveness of the proposed remedy.*

OU-2. The ROD for OU-1 stated that a remedy for OU-2 would be necessary only if, following completion of the OU-1 remedy, residual contamination in soils under the source areas exceeded soil cleanup goals established for OU-1. Data collected during and after the completion of the OU-1 remedy indicated that the soil cleanup goals were met for each of the source areas; therefore, no remedy for OU-2 was necessary (USEPA, 1999).

OU-3. The ROD for OU-3 was signed on September 30, 2005. This ROD addresses the third and final operable unit for the Site.

The goals of the selected remedy are to restore the drinking water aquifer and to eliminate the threats posed by direct contact with or ingestion of contaminants in sediment in the North Lagoon Wetland and Sinking Pond.

The selected remedy for OU-3, as identified in the ROD, consists of the following components:

- *Cleanup of contaminated sediments and soils posing an unacceptable risk to human health and/or the environment in Sinking Pond and the North Lagoon Wetlands;*

- *Extraction and treatment of groundwater contamination in the Southeast and Southwest Industrial Landfill Areas on the Grace property and at targeted areas in the Northeast Area;*

- *A redesigned and/or modified Aquifer Restoration System that will treat extracted groundwater for both metals and organic contaminants. Treatment processes for extracted groundwater would include air-stripping, activated carbon (air treatment), and metals precipitation prior to surface water discharge to Sinking Pond;*

- *Monitored Natural Attenuation of areas of groundwater contamination not captured by the extraction system;*

- *Institutional Controls such as deed restrictions and/or local ordinances to prevent unacceptable exposures to contaminated groundwater until cleanup levels are met and to protect against*

unacceptable future exposures to any wastes left in place on-Site;

- *Long-term groundwater, surface water, and sediment monitoring, and periodic Five-Year Reviews of the remedy.*

Remedy Implementation

OU-1. The remedial design/remedial action activities for OU-1 were performed by W. R. Grace under the 1980 Consent Decree. For more detailed information on OU-1 remedial activities, see the Remedial Action Report for Operable Unit One, which was prepared by Foster Wheeler Environmental Corporation (September 1997).

Consistent with the 1989 ROD the following work has been conducted at the Site:

- The contents of the Battery Separator Lagoons, Boiler Lagoon, and the Tank Car Area were excavated to a depth of at least five feet. Additional excavation greater than five feet in depth was performed until the soil cleanup goals (see page 30 of the 1989 ROD) were met. These materials were then placed on the Industrial Landfill. The contaminant level of all excavated materials from these areas was analyzed prior to placement on the landfill. If unexpected levels of contaminants were detected that could present implementation problems or impact the effectiveness of the landfill remedy, then those materials were stabilized prior to placement on the landfill or were disposed of off-site. Post-excavation sampling and analysis was conducted to ensure that soil cleanup goals were attained.

- Sludges and at least two feet of soil in each of the Primary, Secondary, and Emergency Lagoons were excavated, stabilized using the VFL process (developed by VFL Technology Corporation and consisting of mixing contaminated soils/sludges with quicklime, flyash, and portland cement), and placed on the Industrial Landfill. Additional excavation greater than two feet in depth was performed until the soil cleanup goals were met. Sediments from the North Lagoon were removed to a depth equivalent to the low groundwater level. These sediments were trucked to the treatment area, stabilized using the VFL process and placed on the Industrial Landfill. Materials in the Blowdown Pit containing greater than 100 parts per million (ppm) of VDC were excavated and shipped to an off-site disposal facility. Remaining sludge and other contaminated materials and at least two feet of underlying soil were excavated, stabilized using the VFL process and placed on the Industrial Landfill. Post-excavation sampling was then conducted to ensure that soil cleanup goals were attained.

- The Industrial Landfill was covered with excavated soils and then with stabilized materials from the lagoons and Blowdown Pit and then graded using excavated materials from the other waste disposal areas. The landfill was then sealed/closed with an impermeable cap designed and constructed in accordance with Massachusetts Hazardous Waste Regulations for landfills specified at 310 CMR 30.580-595 and 30.620-633. The impermeable cap included a synthetic cover to prevent infiltration of surface water into the waste materials beneath the cap.

  The cap was also constructed with vents to allow gases generated from the existing and new material to vent to the surface outside the landfill. Emissions from the Industrial Landfill were initially controlled utilizing a thermal oxidation unit, but, after proper evaluation, have since been allowed to vent passively to the atmosphere (USEPA, 2002).

Additionally, a groundwater monitoring and recovery system was designed and installed at the Industrial Landfill to supplement the existing ARS recovery wells.

- Originally, the Battery Separator Chip Pile was to be capped in place, but the need to remove the underlying soils made in-place capping not feasible. Therefore, the battery separator chips were excavated and placed in the Industrial Landfill and were covered with non-solidified material excavated from the source areas.

- Prior to implementation of the remediation work provided for in the ROD for OU-1, W.R. Grace constructed an ARS. This system began treating contaminated groundwater that was extracted from bedrock and overburden wells through an air stripping tower. The ARS began operation in March 1985 and has continued, with modifications, to treat groundwater through the present. The air stripping tower component of the ARS required upgrading by installing carbon filters to control vapors and odors; these upgrades were completed in September 1992 (Foster Wheeler, 1997).

All of the above remedial action activities were completed and the contractor, Camp, Dresser & McKee, Inc. (CDM) certified that the remedy was constructed according to all approved plans and specifications, as documented in the Revised Construction Quality Assurance Closeout Report, prepared by CDM, dated February 1998.

OU-3. The remedial designs were completed and the remedial actions were constructed by W.R. Grace since the last FYR in 2009, as discussed in the section of this report entitled "Progress Since the Last Review."

APPENDIX B – LIST OF DOCUMENTS REVIEWED/REFERENCES

Alliance Technologies Corporation, 1989. Risk Analysis of the W.R. Grace Site, Acton, Massachusetts. Prepared for U.S. Environmental Protection Agency, Office of Waste Programs Enforcement, Washington, DC, Contract No. 68-W9-0003. June 30, 1989.

ARCADIS. 2008. W.R. Grace Superfund Site Sediment Pre-Design Results Report. April 2008.

ARCADIS. 2011. W.R. Grace Superfund Site Final Sediment Remedial Design Report. March 2011.

ARCADIS, 2012a. Draft 2012 Vegetation Monitoring Report. W.R. Grace Superfund Site, Operable Unit 3, Acton-Concord, Massachusetts. October 2013.

ARCADIS. 2012b. W.R. Grace Superfund Site Final Sediment Construction Summary and Final Sediment Remedial Action Report. June 2012.

ARCADIS, 2012c. W.R. Grace Superfund Site Final Sediment Demonstration of Compliance and Maintenance Plan. April 2012.

ARCADIS, 2013. Draft 2013 Vegetation Monitoring Report. W.R. Grace Superfund Site, Operable Unit 3, Acton-Concord, Massachusetts. October 2013.

ARCADIS, 2014. 5-Year Sediment Investigation Summary Report, W.R. Grace Superfund Site, Acton, Massachusetts. June 2014.

Camp Dresser & McKee. 1988. Appendix D Risk Assessment for W.R. Grace Site, Acton, Massachusetts. August 31, 1988.

Camp Dresser & McKee. 1996. Post-Closure Operations and Maintenance (O&M) Plan. W.R. Grace Superfund Site, Acton, Massachusetts. August 15, 1996.

GeoTrans and O&M, Inc. 2011. *Northeast Area Groundwater Remedial Action Report,* January 20, 2011.

HSI GeoTrans, 1998. *Initial Site Characterization Report - Operable Unit Three*. W.R. Grace Superfund Site, Acton, Massachusetts, prepared for W.R. Grace & Co. August 12, 1998.

Menzie-Cura & Associates. 2005a. Public Health Risk Assessment. July.

Menzie-Cura & Associates. 2005b. Baseline Ecological Risk Assessment. July.

O&M Inc. and GeoTrans, Inc. 2010. *Northeast Area Groundwater Operation and Maintenance Plan.* June 2010.

Sullivan Design and Construction Management (DCM), P.C. 2007. November 2007 Landfill Gas Emission Monitoring. W.R. Grace Landfill, Acton, Massachusetts. January 3, 2008.

Tetra Tech, 2013a. *Evaluation of Northeast Area Remedial Action,* February 25, 2013.

Tetra Tech, 2013b. *OU3 Monitoring Program Report, 2013, W.R. Grace Superfund Site, Acton, MA,* December 20, 2013.

Tetra Tech GEO and O&M, Inc. 2012a. *Landfill Area Groundwater Operation and Maintenance Plan*, July 10, 2012.

Tetra Tech GEO and O&M, Inc. 2012b. *Final Landfill Area Groundwater Remedial Action Report*, September 25, 2012.

Tetra Tech GEO, 2011. *Institutional Controls Plan,* May 12, 2011.

United States Environmental Protection Agency (USEPA). 1988. Record of Decision, September 1988.

United States Environmental Protection Agency (USEPA). 1989. Record of Decision, W.R. Grace (Acton Plant) Superfund Site, Acton, Massachusetts. September 29, 1989

United States Environmental Protection Agency (USEPA). 1999. Five Year Review, W.R. Grace (Acton Plant) Superfund Site, Acton, Massachusetts. September 1999.

United States Environmental Protection Agency (USEPA). 2001. *Comprehensive Five-Year Review Guidance*. June 2001.

United States Environmental Protection Agency (USEPA). 2000. *Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups*. EPA 540-F-005. September 2000.

U. S. Environmental Protection Agency (USEPA), 2005. *Record of Decision, W.R. Grace & Co. (Acton Plant) Superfund Site, Operable Unit Three,* September 2005.

U. S. Environmental Protection Agency (USEPA), 2009a. *Regional Screening Levels Table.* Oak Ridge National Laboratories. U.S. EPA. http://epa-prgs.ornl.gov/chemicals/index.shtml April 2009.

U. S. Environmental Protection Agency (USEPA), 2014. *Integrated Risk Information System (IRIS).* On-line Database. July 2014.

U.S. Environmental Protection Agency (USEPA). 2002. Letter from Derrick S. Golden, EPA Remedial Project Manager, to Maryellen Johns, Remedium Group, Inc., Re: The Thermal Oxidation Unit on the Industrial Landfill at the W.R. Grace Superfund Site - Acton, Massachusetts. October 31, 2002.

U. S. Environmental Protection Agency (USEPA), 2012. Fact Sheet: *1,4-Dioxane, W.R. Grace (Acton Plant, Acton, MA. U.S. EPA - Hazardous Waste Program at EPA New England.* March 2012.

APPENDIX C – SITE INSPECTION CHECKLIST AND PHOTOGRAPHS

Five-Year Review Site Inspection Checklist

("N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: W.R. Grace (Acton Plant) Superfund Site	**Date of inspection:** May 21, 2014
Location and Region: Acton, MA; Region I	**EPA ID:** MAD001002252
Agency, office, or company leading the five-year review: USEPA/AECOM	**Weather/temperature:** Clear/75°F
Remedy Includes: (Check all that apply) X Landfill cover/containment X Access controls X Institutional controls X Groundwater pump and treatment □ Surface water collection and treatment □ Other_____ _____	X Monitored natural attenuation □ Groundwater containment □ Vertical barrier walls
Attachments: □ Inspection team roster attached □ Site map attached	
II. INTERVIEWS	
Interviews were performed by USEPA/AECOM and are included separately.	

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	X O&M manual	X Readily available	☐ Up to date	☐ N/A
	☐ As-built drawings	☐ Readily available	☐ Up to date	☐ N/A
	X Maintenance logs	X Readily available	X Up to date	☐ N/A
	Remarks: While the O&M manual was not reviewed (besides noting that it was there), recent iron fouling of extraction system may justify review/revision in the near future.			
2.	**Site-Specific Health and Safety Plan**	X Readily available	☐ Up to date	☐ N/A
	☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: Not reviewed beyond noting that it was available at the treatment plant.			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: Not reviewed (records available at home offices)			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	X N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	X N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	X N/A
	☐ Other permits_____	☐ Readily available	☐ Up to date	X N/A
	Remarks: Annual fee paid to Acton for storage of hazardous materials (verbal discussion).			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	X N/A
	Remarks: No ongoing monitoring			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	X N/A
	Remarks: No settling monuments			
7.	**Groundwater Monitoring Records**	X Readily available	X Up to date	☐ N/A
	Remarks: Not reviewed – available offsite			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	X N/A
	Remarks: No leachate collection			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	X N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	X N/A
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	X N/A
	Remarks:			

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house X Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____
_____

2. **O&M Cost Records**

Not Reviewed

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

Describe costs and reasons: Electricity costs for oxidation system very high. Looking at other options for cost reduction._____
_____
_____
_____

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

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map X Gates secured ☐ N/A

Remarks: Fencing appeared to be in good shape.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map X N/A

Remarks_____
_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No X N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☐ No X 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 X N/A
Reports are verified by the lead agency ☐ Yes ☐ No X N/A

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

_____
ICs not yet in place. _____
_____
_____

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

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map X No vandalism evident
Remarks___Sapling protection tubes were removed, apparently by someone who thought that the tubes weren't good for the trees._____

2. **Land use changes on site** X N/A
Remarks_____
_____

3. **Land use changes off site** X N/A
Remarks_____
_____

VI. GENERAL SITE CONDITIONS

A. Roads X Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map X Roads adequate ☐ N/A
Remarks_____
_____

B. Other Site Conditions

Remarks _Conditions around Sinking Pond and North Lagoon Wetland were reviewed by wetlands specialist, Deb Roberts.

_____

_____

_____

VII. LANDFILL COVERS X Applicable ☐ N/A

A. Landfill Surface

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

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

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

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

   Remarks One hole near LFG monitoring point 4 – appears to be groundhog burrow

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

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

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

8. **Wet Areas/Water Damage** X 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 X No evidence of slope instability
   Areal extent_____
   Remarks_____
   _____

B. Benches X 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 X N/A or okay
   Remarks_____
   _____

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

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

C. Letdown Channels X 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 X No evidence of settlement
   Areal extent_____ Depth_____
   Remarks_____
   _____

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

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

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

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

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

Remarks: _____

D. Cover Penetrations X Applicable ☐ N/A

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

Remarks: One vent is noticeably leaning on southern side of landfill. Onsite personnel state that it is still venting. No visual evidence of gas buildup or emissions elsewhere.

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

Remarks: Manholes locked. Many of the plastic Keep Out signs are no longer on the manhole covers, but there is no evidence of trespassers on the landfill.

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

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

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

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

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

   Remarks: No longer active. Not inspected.

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

   Remarks: No longer active. Not inspected.

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

F. Cover Drainage Layer X Applicable ☐ N/A

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

   Remarks: Not inspected

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

   Remarks: Not inspected

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

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

   Remarks: Siltation was observed. Detention basin still appears to be functioning properly.

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 X 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 X Applicable ☐ N/A

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

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

   Remarks: There was some minor vegetative growth in the perimeter channel due to standing water. Regrading may need to be looked into in the future, but it currently doesn't appear to be a problem.

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

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

   Remarks: Actual structure not inspected. Flow does not appear to be restricted leaving the perimeter ditch.

VIII. VERTICAL BARRIER WALLS ☐ Applicable X 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 X Applicable ☐ N/A

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

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

   Remarks: Not inspected. Records show operating as designed.

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

   Remarks: Not inspected. Exterior piping system developed for bypass when primary piping requires cleaning.

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

   Remarks: Not inspected.

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

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

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

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A X Good condition ☐ Proper secondary containment ☐ Needs Maintenance
   Remarks_____
   _____

4. **Discharge Structure and Appurtenances**
   ☐ N/A X Good condition ☐ Needs Maintenance
   Remarks_____
   _____

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

6. **Monitoring Wells** (pump and treatment remedy)
   X Properly secured/locked ☐ Functioning X Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A

   Remarks: One location near railroad tracks damaged and will require repair.

D. Monitoring Data: Not reviewed

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

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

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

X Properly secured/locked ☐ Functioning X Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A

Remarks: One location near railroad tracks damaged and will require repair.

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

This source control/containment remedy appears to be operating as designed.

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.

The landfill cover and landfill gas systems appear to be well-maintained.

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.

None

D. Opportunities for Optimization

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

The operators are currently attempting to optimize removal of 1,4-dioxane. This effort should continue, as there are significant costs associated with that removal.

Northwest entrance of landfill, facing southeast

Northwest entrance of landfill, facing east

View of northwest bottom-of-slope drainage channel with minor vegetative growth

View of inactive thermal oxidizer unit stack

Animal burrow next to landfill gas monitoring point MP-4 on southern side of landfill

View of southern bottom-of-slope drainage channel, facing west

View of southern bottom-of-slope drainage channel, facing east, showing standing water

Tilted passive landfill gas vent in southwest area of landfill

View of northern bottom-of-slope drainage channel showing standing water and vegetation

Groundwater equalization tank in southwest area of landfill

Passive gas vents on top of landfill, facing east

View inside groundwater treatment plant

View inside groundwater treatment plant – Purifics unit

View inside groundwater treatment plant

View inside groundwater treatment plant

View inside groundwater treatment plant

View inside groundwater treatment plant

OVERSIGHT REPORT
W.R. Grace Superfund Site
Acton, Massachusetts

DATE PREPARED:	May 25, 2014	**REPORT NO:**	WRGRACE240514
DATE ON SITE :	May 21, 2014		
HOURS AT SITE:	10:15 – 13:00	**PREPARED BY:**	D. Roberts
WEATHER CONDITIONS:	Sunny, 73°		

I. SUMMARY OF WORK PERFORMED:

1. The purpose of the visit was to conduct an inspection of the wetlands restoration at Sinking Pond and the North lagoon wetlands and in addition, for EPA and MassDEP to complete a five-year review Inspection of the Landfill Area Treatment System (LATS) and the Industrial Landfill at the site. The group (see list, Section III, below) met at the parking area near the former trailer location. We walked first to Sinking Pond, then to North Lagoon wetland to observe site conditions. Everyone then toured the treatment facility with the exception of Anthony.

II. GENERAL COMMENTS AND OBSERVATIONS:

1. Sinking Pond. The upland area and banks of Sinking Pond have filled in with dense rye grass cover. No large areas of wash-out or sparse vegetation were observed from the northern end of the pond. Only a very limited number of the aquatic vegetation plantings appeared to have germinated from the plug planting of the inlet area. A few leaves of pond lilies and arrowhead were visible. Anthony indicated that the need for supplemental planting will be evaluated upon performance of the summer vegetation monitoring in August.

   The tree and shrub survivorship appeared to be high. Most of the woody plantings observed were in good health around the inlet and northern end of the pond.

   There was dense growth of rye grass mixed with a few other species along the edge of the pond. However, no evidence of germination of plants that were seeded as part of the wetland seed mix was observed.

   A large number of bullfrog tadpoles were observed along the edge of Sinking Pond, along with some small fish (possibly minnows) and a turtle.

2. Similar to the area around Sinking Pond, there was dense growth of rye grass mixed with a few other species in the upland bordering North Lagoon Wetland. The tree and shrub survivorship here also appeared to be high. Even those tree tubes that appeared empty had small high bush blueberry shrubs in them which appeared in good condition.

   The deeper area of the sedge marsh had been planted with a sedge seed mix. There was no evidence of sedges germinating. However, the area is still inundated with several inches of standing water. Tadpoles were observed in the sedge marsh.

The water levels in the North Lagoon Wetland near Fort Pond Brook showed areas of inundation and other areas of saturation, which appeared to be appropriate conditions for the time of the season. The woody plantings in the tubes appeared to be in good condition. Some sparse herbaceous vegetation is starting to grow, dominated by beggar's tick (*Bidens* sp.) which was in the seed mix, but is also a common first year wetland plant that appears in mitigation areas in New England. The detailed vegetation monitoring will be done by Arcadis later in the summer when more of the wetland plants are established.

The haybales that formed part of the bank stabilization along Fort Pond Brook were still in place, and will be left as part of the bank.

3. Thor Helgason gave us a tour of the treatment plant. The landfill area treatment system is in operation, and yesterday EPA received preliminary results of the toxicity tests on the effluent collected from a pipe just before the treated effluent is discharged from the plant. The preliminary results were discussed with Bart Hoskins of EPA. AECOM will prepare a memo to EPA regarding the test results after the final report on the results is received. Another round of toxicity tests on the effluent water is scheduled for August.

III. SUMMARY OF CONTRACTORS AND PERSONNEL:

Contractor	Site Activity/Role	Personnel
EPA	Oversight/TOPO	Derrick Golden
DEP	Oversight/Project manager	Jennifer McWeeney
AECOM	Oversight/Project engineer	Sean Czarniecki
AECOM	Oversight/Ecological Risk-Wetlands	Deborah Roberts
de maximis	Construction Management	Thor Helgason
ARCADIS	Remedial Contractor/Wetland Specialist	Anthony Esposito

DAILY PHOTO LOG
WR Grace Superfund Site
Acton, Massachusetts

DATE PREPARED:	May 22, 2014	**PHOTO LOG NO:**	WRGR21May2014
DATE ON SITE :	May 21, 2014	**PREPARED BY:**	D. Roberts

Photo File Name	Description
P1100295	Sinking Pond discharge from culvert to inlet
P1100296	Sinking Pond Inlet
P1100297	Sinking Pond Inlet
P1100298	Sinking Pond Inlet looking south toward weir
P1100299	Sinking Pond west shore
P1100300	Sinking Pond looking south from inlet area
P1100301	Sinking Pond northeast shore
P1100302	Sinking Pond upland at northern end of pond with tree tubes
P1100303	Sinking Pond at North Lagoon Wetland
P1100304	North Lagoon Wetland looking north up the channel from sedge marsh
P1100305	North Lagoon Wetland looking up the channel to the south toward sedge marsh
P1100306	North Lagoon Wetland - wooded swamp area
P1100307	North Lagoon Wetland - wooded swamp area
P1100308	North Lagoon Wetland - wooded swamp area, looking north toward marsh and the brook
P1100309	Fort Pond Brook - restored stream bank
P1100310	North Lagoon Wetland emergent marsh area
P1100311	North Lagoon Wetland looking back toward area of wooded swamp
P1100312	North Lagoon Wetland - sediment sample North Lagoon Wetland-01 near Fort Pond Brook

P1100313	Sinking Pond at the discharge of the inlet. Shoreline in the vicinity of vegetation plot P-11, on the west side of the outlet channel near tall metal stake.
P1100314	Sinking Pond - Shoreline in the vicinity of vegetation plot P-11 near tall metal stake.
P1100315	Sinking Pond- along the Bordering Vegetated Wetland (BVW) at water's edge, north shore
P1100316	Sinking Pond - BVW and bank, north shore
P1100317	Sediment location Sinking Pond-75 in sandy delta area of BVW, north shore

Site Photographs
WR Grace Superfund Site
May 21, 2014

P1100295

P1100296

P1100297

P1100298

P1100299

P1100300

P1100300

P1100301

P1100302

P1100303

P1100304

P1100305

P1100306

P1100307

P1100308

P1100309

P1100310

P1100311

P1100312

P1100313

P1100314

P1100315

P1100316

P1100317

APPENDIX D – INTERVIEW RECORD FORMS

INTERVIEW RECORD

Site Name: W. R. Grace Superfund Site (Acton, MA)	**EPA ID No.:** MAD001002252	
Subject: Five Year Review	**Time:** 9:30 AM	**Date:** 7/28/2014
Type: ■ Telephone ☐ Visit ☐ Other **Location of Visit:**	☐ Incoming ■ Outgoing	

Contact Made By:

Name: Barbara Weir	**Title:** Task Order Manager	**Organization:** AECOM

Individual Contacted:

Name: Jane Ceraso	**Title:**	**Organization:** ACES and Green Acton
Telephone No: **Fax No:** **E-Mail Address:** jane.ceraso@paragon-c.com	**Street Address:**	

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

The project seems to have changed over time – in earlier years, there was a great deal of public involvement but in the past 5 or 6 years, the public involvement has become less extensive. ACES members noted that after about 2006 is when the change occurred. This corresponds to when the ROD was signed (September 2005). After 2006, ACES member Mary Michelman (since deceased) noted to Jane that she felt that ACES had a lesser seat at the table.

2. Are you aware of any community concerns or complaints related to the site (e.g., odor, noise, health, etc.)?

People are concerned about the 1,4-dioxane issue and impacts to their drinking water, and do not want it to become a secondary issue to the rest of the contamination issues. There is concern because the Acton Water District cannot remove 1,4-dioxane from the water. People's biggest concern is that the drinking water be protected.

3. Do you feel well informed about site activities and progress of the cleanup?

Jane said yes, she feels well informed and that there has been a fair bit of back and forth – EPA has done a good job and people can become informed pretty easily.

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

Jane recommends that ongoing monitoring for 1,4-dioxane continue. She thinks it is important that EPA continue to keep track of the issue and that everyone has a handle on what is present in the aquifer.

5. Do you **have any other comments, suggestions, or recommendations regarding the project?**

See above regarding monitoring for 1,4-dioxane. In general – keep up the monitoring and do not shut down systems too soon. She noted that it is really difficult to say when a cleanup is "done" and that it takes a long time, especially for groundwater, and that this is even more difficult because of the impacts to drinking water. People are concerned about "cutting corners" and it is important to keep people informed about the progress of the cleanup to help address these concerns.

6. EPA **understands that the old Acton Citizens for Environmental Safety is being merged into the Green Acton organization – could you provide some information on Green Acton and its mission?**

Jane explained that ACES decided to merge into Green Acton because of attrition in its members (deaths, relocation) and it was a struggle to keep ACES going. Green Acton is a new organization with lots of energy and the mission of ACES fits within it – its mission is more general than ACES (which focused on health and safety and the Grace site) and is about sustainability, education, recycling, and waste reduction efforts. Green Acton is not incorporated as ACES is. By the end of the year they will become one organization and be an incorporated non-profit. Funds from ACES will be used to help with programs Green Acton has started. Jane will continue to be active in Green Acton as well as a couple of other ACES members (Pam Resor for one), and the Green Acton members are ready to take up health and safety issues that were ACES mission, including keeping tabs on the Grace site. Jane offered to communicate to EPA once the merger is final.

INTERVIEW RECORD

Site Name: W. R. Grace Superfund Site (Acton, MA)		**EPA ID No.:** MAD001002252
Subject: Five Year Review	**Time:**	**Date:**
Type: ■ Telephone ☐ Visit ☐ Other **Location of Visit:** N/A	☐ Incoming	■ Outgoing

Contact Made By:

Name:	**Title:**	**Organization:**
Barbara Weir	Task Order Manager	AECOM

Individual Contacted:

Name:	**Title:**	**Organization:**
Doug Halley Submitted in writing via email 7/16/2014	Health Director	Acton Board of Health
Telephone No: 978-264-9634 **Fax No:** **E-Mail Address:** dhalley@town.acton.ma.us	**Street Address:** Acton Board of Health 472 Main Street, Acton, MA 01720	

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

In general I am satisfied with the continued effort by WR Grace, the oversight provided by EPA and MADEP and the information provided to the Town and the Water District. However, I remain concerned with Grace's shutdown of the treatment system for the Northeast Plume, the continued reliance on the Water District's treatment system to capture and treat Grace's contaminant plumes, and the reliance on natural attenuation to resolve unaddressed plumes of contamination. Noting that this project started in 1978 it is discouraging that 36 years later Grace has not yet achieved and cannot yet identify an end date for contamination levels to reach public health standards.

2. Have there been any health or safety issues associated with the site?

In addition to the threat to public drinking water wells from Grace's contaminant plumes, I remain concerned that EPA has identified a health issue for private wells to the extent that EPA considers it necessary for the Board of Health to have an administrative hold on the installation of private wells. As of this date EPA has not provided a strategy as to how and when the right to use the ground water resources will be restored.

3. **Are you aware of trespassers entering the property, and if yes, how often and in what type of activities do they engage?**

Abutters and the general public continue to use the Grace property as an accessible place to walk/hike. With the exception of the fenced off area at the landfill it is not unusual to see someone walking the property on a daily basis.

4. **Are you aware of any changes in land use in the vicinity of the site? If so, please describe.**

The Water District is in the process of building a Water Treatment Facility just south of the Grace property. Some minor commercial development is on-going along Knox Trail. There has been some and it is anticipated there will be more residential development in the area due to public sewers along Parker Street and Independence Road.

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

There remains a strong community concern regarding the recent shutdown of the Northeast Plume treatment system. The Water District rate payers continue to fund public treatment systems to protect against and remove Grace's contaminants, yet Grace as the responsible party is not held to the same standard or required to apply the same measures. The Water District cannot rely upon Natural Attenuation as a means to bring safe drinking water to its customers, yet Grace has been relieved of the obligation to treat the ground water to remove its contaminants.

7. **Is the Town planning to maintain the administrative hold on private irrigation well permits in the plume area until the cleanup is complete?**

The Board of Health needs an updated map of the area of concern that is tied to the current levels of contamination. The Board needs to see an updated recommendation from EPA regarding which properties should be included in the administrative hold area, tied to verified health risk. The Board needs to be provided with a recommended strategy from EPA on how and when the administrative hold should be re-evaluated and what findings must be evident to determine its necessity. As Health Director, I remain concerned that EPA is relying on the administrative hold to prevent the public from utilizing ground water

resources while allowing the polluter to shut down a treatment system which would have accelerated the clean-up of the aquifer.

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

The Board of Health remains concerned that the shutdown of the Northeast Plume treatment system was predicated on the introduction of a byproduct contaminant that does not yet have a health standard established. The treatment system was effectively removing the contaminants that are subject to public health standards and was shrinking the plume more effectively than expected greatly reducing the time it would take for natural attenuation to reach the same levels. The Town is caught in a Catch 22. The byproduct was a concern at the State level due to future standards that might be applied and yet the federal government could not regulate its removal because no standards have been identified. Instead a choice was made to let natural attenuation resolve the remaining contaminants of concern and leave the responsibility of removing the byproduct to the Water District

9. **Do you have any other comments, questions or concerns regarding the site?**

My comments, questions and concerns regarding the site have been adequately expressed in the above questions and in the Town's position in the pending litigation concerning the site.

INTERVIEW RECORD

Site Name: W. R. Grace Superfund Site (Acton, MA)	**EPA ID No.:** MAD001002252	
Subject: Five Year Review	**Time:** 10:29 AM	**Date:** 7/17/2014
Type: ☐ Telephone ☐ Visit ■ Other **Location of Visit:** NA. Jennifer provided written responses using this form and submitted them to EPA and B. Weir via email.	☐ Incoming ☐ Outgoing	

Contact Made By:

Name: Barbara Weir	**Title:** Task Order Manager	**Organization:** AECOM

Individual Contacted:

Name: Jennifer McWeeney	**Title:** Project Manager	**Organization:** MassDEP
Telephone No: 617-654-6560 **Fax No:** **E-Mail Address:** jennifermcweeney@state.ma.us	**Street Address:** MassDEP One Winter Street, Boston, MA 02108	

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

My overall impression is that the project is well managed and is making progress towards its cleanup goals.

As you know, contaminated sediment in both Sinking Pond and North Lagoon wetland has been successfully remediated and vegetation in these areas is being restored.

Groundwater contaminant levels in both the Landfill Area and the Northeast Area of the site continue to decline. The Landfill Area groundwater treatment system continues to operate. VDC levels in the Northeast Area declined enough to warrant shutdown of that temporary system after 3 years of operation. Natural attenuation is expected to further reduce VDC levels in the Northeast Area, and groundwater monitoring will continue to be conducted confirm this.

2. Has the site been the subject of any community complaints directed to your agency (e.g., odor, noise, health, etc.)?

Yes. The Town of Acton complained about the shutdown of the Northeast Area

groundwater treatment system after 3 years of operation. As you know, MassDEP considered all information, including the information provided in their complaint, when we made our recommendation for shutdown of this temporary system.

Secondly, the Acton Water District complained that groundwater extracted at the School Street and Assabet public water supply wells sometimes exceeds MassDEP's Drinking Water Guideline for 1,4-dioxane.

3. Are there any areas of known or suspected contamination at the site that you feel are not being adequately addressed by the remedial actions?

Yes, MassDEP continues to be concerned about the concentrations of 1,4 dioxane being detected at the School Street and Assabet public water supply wells, at concentrations near and exceeding MassDEP drinking water guideline of 0.3 ug/L.

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

Yes, we recommend that USEPA continue to work with MassDEP (including MassDEP's Drinking Water Program) to maintain an adequate groundwater monitoring program for 1,4-dioxane at and near the Acton Water District water supply wells. We also recommend that USEPA continue to work with MassDEP to evaluate and possibly implement appropriate response measures to address future dioxane levels.

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

No.

INTERVIEW RECORD

Site Name: W. R. Grace Superfund Site (Acton, MA)		**EPA ID No.:** MAD001002252
Subject: Five Year Review		**Time:** 3:13 pm **Date:** 7/30/14
Type: ☐ Telephone ☐ Visit ☐ Other **Location of Visit:** NA. Matt provided written responses using this form and submitted them to EPA and B. Weir via email.		☐ Incoming ☐ Outgoing

Contact Made By:

Name: Barbara Weir	**Title:** Task Order Manager	**Organization:** AECOM

Individual Contacted:

Name: Matthew Mostoller	**Title:** Environmental Compliance Manager	**Organization:** Acton Water District
Telephone No: 978-263-9107 **Fax No:** 978-264-0148 **E-Mail Address:** Matt@actonwater.com	**Street Address:** Acton Water District 693 Massachusetts Avenue, Acton, MA 01720	

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

   Due to the major cleanup activities being complete, I feel that the site does not have the same level of attention from EPA. The long range clean up goals seem to be pushed along from year to year with out a full vetting of how effective cleanup actions are or if gains are sustainable.

2. **Do you feel well informed about site activities and progress of the cleanup?**

   Yes, however, not as well informed or included in the review process as in prior years. This includes a lack of stakeholder conference calls and unclear timeframes for providing feedback, if it is actively solicited at all.

3. Have you received any inquiries from the District's customers expressing concern about the site?

Yes. Customers, especially new residents, regularly inquire about the site. Many are surprised to learn that a Superfund site is in Acton and that we pump water in the area of the site. In particular, home owners in areas impacted by the site are concerned with possible soil and vapor intrusion issues.

4. What is the current status of the new treatment system for the Assabet well field?

It is under construction and is required to be operational no later than January 15, 2015.

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

Site management (EPA, MassDEP, and WR Grace) should continue outreach efforts to the community. With a large turnover in residents, ongoing education about the site and long term clean strategies is necessary. The outstanding issue of 1,4-dioxane should be addressed in conjunction with the on-going site cleanup at the NMI/Starmet Superfund site.

6. Do you have any other comments, questions or concerns regarding the site?

The District is interested in the long term re-use of the site and what opportunities and risks this might present to the public water supply.

INTERVIEW RECORD

Site Name: W. R. Grace Superfund Site (Acton, MA)	**EPA ID No.:** MAD001002252	
Subject: Five Year Review	**Time:**	**Date:**8/25/2014
Type: ☐Telephone ☐ Visit ■ Other **Location of Visit:** NA. Mr. Helgason provided written responses using this form and submitted them to EPA and B. Weir via email on 8/25/2014.	☐ Incoming ☐ Outgoing	

Contact Made By:

Name:	**Title:**	**Organization:**
Barbara Weir	Task Order Manager	AECOM

Individual Contacted:

Name:	**Title:**	**Organization:**
Thor Helgason	Project Manager	de maximis, inc.
Telephone No: 781-642-8775 **Fax No:** 781-642-1078 **E-Mail Address:** thelgas@demaximis.com	**Street Address:** 135 Beaver Street, 4th Floor Waltham, MA 02452	

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

Overall, the project is going well, although W.R. Grace remains concerned about the technical feasibility of treating 1,4-dioxane to discharge levels of less than 3.0 ug/l.

2.A. Is the remedy functioning as expected? How well is the remedy performing?

The Sediment Remedy is performing as expected. The Landfill Area Groundwater Treatment system continues to meet all discharge criteria.

4.A. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

The Landfill Area Treatment system is staffed four to five days per week. The hours on-site vary day to day.

5.A. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

No significant changes have taken place.

6.A. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

The Purifics photocatalytic oxidation unit within the Landfill Area Treatment system has not performed as W.R. Grace expected, based on bench-scale testing conducted during the design phase. Adjustments were made to the Purifics unit following start-up to enhance the treatment efficiency for 1,4-dioxane. After several months of working closely with the designers of the Purifics unit, performance was optimized by introducing a 25 mg/l solution of sodium persulfate immediately prior to the Purifics unit. This approach resulted in reducing 1,4-dioxane from a range of 3 ug/l - 5 ug/l in the influent to about 2.6 ug/l in the effluent. The discharge criterion for the Landfill Area Treatment system is 3.0 ug/l. W.R. Grace remains concerned about the technical feasibility of consistent treatment of groundwater containing 1,4-dioxane to discharge criteria below 3.0 ug/l.

7.A. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

The Landfill Area Treatment system is fully optimized. See response to 6.A for information concerning the optimization of the groundwater treatment system.

8.A. Do you have any comments, suggestions, or recommendations regarding the project?

The technical feasibility of treating 1,4-dioxane to criteria below 3.0 ug/l is of considerable concern to W.R. Grace, given the extensive work performed to optimize the Landfill Area Treatment system following system start-up in May 2011. W.R. Grace does not believe adequate treatment technology currently exists commercially to consistently treat 1,4-dioxane to levels below 3.0 ug/l, given the current influent quality and flow rate.

SUPPLEMENTAL QUESTIONS

1.B. How have the treatment processes changed or been adjusted over the last five years?

See the response to Question 6A.

2.B. Have there been any health and safety issues on-site?

No.

3.B. Has site ownership changed?

No.

4.B. What is the zoning of the property? Are there any institutional controls/deed restrictions in place? Are additional IC's anticipated? When? Where (location)?

The property is zoned as "Technology District". A groundwater use restriction, dated November 19, 2007, is in place.

5.B. How frequently are authorized individuals present at the property (days/week)?

Authorized individuals are at the property 4 to 5 days per week.

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

W.R. Grace is attempting to sell the property.

7.B. What measures have been taken to secure the site and the contaminated areas (e.g., fencing, locks, signage etc.)? How successful have these measures been?

The main gate to the site at Independence Drive is locked, and "No Trespassing" signs are posted along Independence Drive, and elsewhere along the perimeter of the property. While much of the property is fenced, there have been instances where the fencing and gates have been vandalized and breached.

8.B. Is there evidence or sightings of trespassers on the property? If yes, how often and what type of activities do they engage in? What actions are taken if trespassing occurs? What actions are taken to prevent trespassing?

Trespassers enter the site to engage in motorized dirt bike operation, as well as drinking, as evidenced by remnants of campfires and discarded beverage containers. The Acton Police have been notified, and have increased patrols of the area.

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

See response to 7.B, above. None of the treatment equipment has been vandalized.

10.B. Have there been any unusual or unexpected activities or events at the site (e.g., flooding)?

No.

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

No.

APPENDIX E - TOXICITY VALUE AND VI PATHWAY REVIEW

TABLE 1. COMPARISON OF 1989/2005/2009 AND 2014 ORAL REFERENCE DOSES AND ORAL CANCER SLOPE FACTORS FOR COMPOUNDS OF POTENTIAL CONCERN W.R. GRACE SUPERFUND SITE, ACTON, MASSACHUSETTS

Contaminant of Potential Concern	Oral Reference Dose (RfD) (mg/kg-day)				Oral Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$			
	1989	2005	2009	2014	1989	2005	2009	2014
1,1-Dichloroethene	0.009	0.05	0.05	0.05	0.6	N/A	N/A	N/A
1,2-Dichloroethane	NE	0.02	0.02	0.006	NE	0.091	0.091	0.091
1,2-Dichloropropane	NE	0.02	0.09	0.09	NE	0.068	0.036	0.036
1,1,2-Trichloroethane	NE	0.004	0.004	0.004	NE	0.057	0.057	0.057
2-Butanone	NE	0.6	0.6	0.6	NE	N/A	N/A	N/A
2-Hexanone	NE	0.04	0.08	0.005	NE	N/A	N/A	N/A
4-Methylphenol	NE	0.005	0.005	0.1	NE	N/A	N/A	N/A
Acetone	NE	0.9	0.9	0.9	NE	N/A	N/A	N/A
Benzene	N/A	0.004	0.004	0.004	0.029	0.055	0.055	0.055
Bromodichloromethane	NE	0.02	0.02	0.02	NE	0.062	0.062	0.062
Chloroethane	NE	0.4	N/A	N/A	NE	N/A	N/A	N/A
Chloroform	NE	0.01	0.01	0.01	NE	N/A	0.031	0.031
Chloromethane	NE	N/A	N/A	N/A	NE	N/A	N/A	N/A
Dibromochloromethane	NE	0.02	0.02	0.02	NE	0.084	0.084	0.084
Ethylbenzene	0.1	0.1	0.1	0.1	N/A	N/A	0.011	0.011
Methyl tert-butyl ether	NE	0.3	N/A	N/A	NE	0.0018	0.0018	0.0018
Methylene chloride	NE	0.06	0.06	0.006	NE	0.0075	0.0075	0.002
Tetrachloroethene	NE	0.01	0.01	0.006	NE	0.54	0.54	0.0021
Toluene	0.3	NE	0.08	0.08	N/A	NE	N/A	N/A
Trichloroethene	0.007	0.0003	N/A	0.0005	0.011	0.4	0.013	0.046
Vinyl chloride	N/A	0.003	0.003	0.003	2.3	0.75	0.72	0.72
Xylenes	NE	0.2	0.2	0.2	NE	N/A	N/A	N/A
Benzo(a)anthracene	NE	0.03	N/A	N/A	NE	0.73	0.73	0.73
Benzo(a)pyrene	NE	0.03	N/A	N/A	NE	7.3	7.3	7.3
Benzo(b)fluoranthene	NE	0.03	N/A	N/A	NE	0.73	0.73	0.73
bis(2-chloroethyl)ether	NE	N/A	N/A	N/A	NE	1.1	1.1	1.1
bis(2-ethylhexyl)phthalate	NE	0.02	0.02	0.02	NE	0.014	0.014	0.014
Dibenz(a,h)anthracene	NE	0.03	N/A	N/A	NE	7.3	7.3	7.3
Dibenzofuran	NE	0.002	N/A	0.001	NE	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	NE	0.03	N/A	N/A	NE	0.73	0.73	0.73
Naphthalene	NE	0.02	0.02	0.02	NE	N/A	N/A	N/A
4,4'-DDD	NE	0.002	N/A	N/A	NE	0.24	0.24	0.24
4,4'-DDE	NE	0.0003	N/A	N/A	NE	0.34	0.34	0.34
4,4'-DDT	NE	0.0005	0.0005	0.0005	NE	0.34	0.34	0.34
Aldrin	NE	0.00003	0.00003	0.00003	NE	17	17	17
alpha-BHC	NE	0.0005	0.008	0.008	NE	6.3	6.3	6.3
Chlordane	NE	0.0005	0.0005	0.0005	NE	0.35	0.35	0.35
Dieldrin	NE	0.00005	0.00005	0.00005	NE	16	16	16
Heptachlor epoxide	NE	0.000013	0.000013	0.000013	NE	9.1	9.1	9.1
PCB Aroclors	NE	0.00002	0.00002	0.00002	NE	2	2	2
Antimony	NE	0.0004	0.0004	0.0004	NE	N/A	N/A	N/A
Arsenic	0.001	0.0003	0.0003	0.0003	15	1.5	1.5	1.5
Barium	NE	0.07	0.2	0.2	NE	N/A	N/A	N/A
Beryllium	0.0005	0.002	0.002	0.002	N/A	N/A	N/A	N/A
Cadmium (food)	0.0005	0.001	0.001	0.001	N/A	N/A	N/A	N/A
Cadmium (water)	0.0005	0.0005	0.0005	0.0005	N/A	N/A	N/A	N/A
Chromium (as VI)	0.005	0.003	0.003	0.003	N/A	N/A	N/A	0.5
Copper	0.037	NE	0.04	0.04	N/A	NE	N/A	N/A
Lead (a)	0.0014	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese (non-water)	NE	0.07	0.07	0.07	NE	N/A	N/A	N/A
Manganese (water)	NE	0.024	0.024	0.024	NE	N/A	N/A	N/A
Methyl mercury	NE	0.0001	0.0001	0.0001	NE	N/A	N/A	N/A
Nickel	0.02	0.02	0.02	0.02	N/A	N/A	N/A	N/A
Thallium	NE	0.000066	0.000065	0.00001	NE	N/A	N/A	N/A
Vanadium	NE	0.007	0.007	0.005	NE	N/A	N/A	N/A
Zinc	0.2	NE	0.3	0.3	N/A	NE	N/A	N/A

N/A = Not Applicable or Not Available
NE = Not evaluated as a COPC
COPC = Contaminant of Potential Concern
(a) Lead is currently evaluated through the use of exposure modeling for adults and children.

Table 2

Wells Used for Groundwater Vapor Intrusion Screening

Area	Well Identifier	Dates of Most Recent Sampling
Assabet Wellfield Public Water Supply	ASSABET 1A	2012/2013
	ASSABET 2A	2012/2013
Assabet River Area	AR-04P	2000
	AR-14B1	2001
	AR-15P	2001
	CLF-2B	2001
Former Lagoon Area	NLBR-R	2012/2013
	NLGP	2009/2010
	NMGP	2011/2012
	OSA-01A	2012/2013
	OSA-02A	2012/2013
	OSA-06B	2005/2006
	OSA-09B	2005/2006
	OSA-11A	2005/2006
	OSA-13A	2012/2013
	SLGP-R	2012/2013
Northeast Area	AR-31S	2009/2010
	PS-22B	2012/2013
	RE-1OBS	2011
	RE-2OBS	2011
	RE-1	2011
	RE-2	2011
Powder Mill Plaza Irrigation Well	POWDERMILL	2002
Southeast Landfill Area	AR-22	2005/2006
	B-08D	2005/2006
	ELF	2008/2009
	LF-06S	2005/2006
	LF-15	2005/2006
	RLF	2008/2009
School Street Wellfield Public Water Supply	CHRISTOFFERSON	2012/2013
	LAWSBROOK	2012/2013
	SCRIBNER	2012/2013
Southwest Area	B-05B2	2005/2006
	RP-1	2005
	WRG-1	2011
Southwest Landfill Area	AR-20A	2009/2010
	LF-12A	2005/2006
	LF-21D	2005/2006

Table 3

Vapor Intrusion Screening Levels for Groundwater[1]

						Residential Target Indoor Air Concentration (ILCR=1E-06)	**Residential Target Indoor Air Concentration (HQ=1)**		**Target Groundwater Concentration (ILCR=1E-06)**	**Target Groundwater Concentration (HI=1)**
Chemical	Basis of Target Concentration C=Cancer Risk; N/C=Non cancer Risk	Inhalation Unit Risk ($\mu g/m^3)^{-1}$		Reference Concentration ($\mu g/m^3$)		$\mu g/m^3$	$\mu g/m^3$	Dimensionless Henry's Law Constant (unitless)	$\mu g/L$	$\mu g/L$
Acetone	NC	NA		3.1E+04	A	NA	3.2E+04	1.43E-03	NA	2.2E+07
Benzene	C	7.8E-06	I	3.0E+01	I	3.6E-01	3.1E+01	2.27E-01	1.6E+00	1.4E+02
2-Butanone	NC	NA		5.0E+03	I	NA	5.2E+03	2.33E-03	NA	2.2E+06
Carbon disulfide	NC	NA		7.0E+02	I	NA	7.3E+02	5.89E-01	NA	1.2E+03
Chloroform	C	2.3E-05	I	9.8E+01	A	1.2E-01	1.0E+02	1.50E-01	8.0E-01	6.7E+02
Chloromethane	NC	NA		9.0E+01	I	NA	9.4E+01	3.61E-01	NA	2.6E+02
Dibromochloromethane	C	2.7E-05	C	NA		1.0E-01	NA	3.20E-02	3.1E+00	NA
1,1-Dichloroethane	C	1.6E-06	C	NA		1.8E+00	NA	2.30E-01	7.8E+00	NA
1,2-Dichloroethane	C	2.6E-05	I	7.0E+00	P	1.1E-01	7.3E+00	4.82E-02	2.3E+00	1.5E+02
1,1-Dichloroethene	NC	NA		2.0E+02	I	NA	2.1E+02	1.07E+00	NA	2.0E+02
1,2-Dichloropropane	C	1.0E-05	C	4.0E+00	I	2.8E-01	4.2E+00	1.15E-01	2.4E+00	3.6E+01
Ethylbenzene	C	2.5E-06	C	1.0E+03	I	1.1E+00	1.0E+03	3.22E-01	3.4E+00	3.1E+03
Methylene chloride	C	1.0E-08	I	6.0E+02	I	1.0E+02	6.3E+02	1.33E-01	7.5E+02	4.7E+03
Methyl tert-butyl ether	C	2.6E-07	C	3.0E+03	I	1.1E+01	3.1E+03	2.40E-02	4.6E+02	1.3E+05
Styrene	NC	NA		1.0E+03	I	NA	1.0E+03	1.12E-01	NA	8.9E+03
Tetrachloroethene	C	2.6E-07	I	4.0E+01	I	1.1E+01	4.2E+01	7.24E-01	1.5E+01	5.8E+01
Toluene	NC	NA		5.0E+03	I	NA	5.2E+03	2.71E-01	NA	1.9E+04
Trichloroethene	C	4.1E-06	I	2.0E+00	I	4.8E-01	2.1E+00	4.03E-01	1.2E+00	5.2E+00
Vinyl chloride	C	4.4E-06	I	1.0E+02	I	1.7E-01	1.0E+02	1.14E+00	1.5E-01	8.8E+01
cis-1,2-Dichloroethene	NA	NA		NA		NA	NA	1.67E-01	NA	NA

[1] Table Footnotes:

Toxicity Values used as basis of Target Indoor Air and Groundwater Concentrations are available on the Regional Screening Levels Table at http://www.epa.gov/reg3hwmd/risk/human/index.htm (May 2014)
NA - Not Available.

Toxicity Value References: C = CalEPA; I = IRIS; A = Agency for Toxic Substances and Disease Registry; P = Provisional Peer-Reviewed Toxicity Value for Superfund

Henry's Law Constants from Regional Screening Levels Table (May 2014)

Screening value is based on $1x10^{-6}$ cancer risk or HI = 1.

Residential Target Indoor Air values are found in Regional Screening Levels table (http://www.epa.gov/reg3hwmd/risk/human/index.htm).

The equation for the target groundwater concentration (Cgw) is:

$$Cgw = \frac{Cia,target}{AFgw \times (1000\ L/m^3) \times HLC}$$

where Cia is the target indoor air concentration, AFgw is the generic attenuation factor for groundwater (default value = 0.001) and HLC is Henry's Law Constant.

The lower of the target groundwater concentration based on an ILCR of 1E-06 or a HQ=1 is selected as the groundwater Vapor Intrusion Screening Level (VISL).

APPENDIX F – ARARS REVIEW

TABLE 1. CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 1 - ACTON AND CONCORD, MASSACHUSETTS

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
Federal Regulatory Requirements	SDWA - Maximum Contaminant Levels (MCLs) (40 CFR 141.11 - 141.16)	MCLs have been promulgated for a number of 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 used for drinking water. MCLs for indicator compounds were used as target cleanup levels for groundwater under each waste area. Attaining soil cleanup goals was expected to ensure that any future migration of residual contaminants in the soil will not cause exceedances of MCLs in groundwater under each waste area.	Soil cleanup goals were met during the OU-1 source control remedy. Soil cleanup goals were selected so that these standards can be met in the future.
State Regulatory Requirements	Massachusetts Drinking Water Regulations (310 CMR 22.00)	Establishes MCLs for drinking water supplies, as the federal MCLs. State drinking water standards are the same as the federal MCLs that were used.	See above.

TABLE 1. CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 1 - ACTON AND CONCORD, MASSACHUSETTS

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
	Massachusetts Groundwater Quality Standards (314 CMR 6.00)	Establishes minimum groundwater quality criteria. Similar to MCLs, groundwater quality criteria were expected to be attained by reducing residual soil contaminants to the Soil Cleanup Goals. *This regulation was rescinded in March 2009 because revisions to 314 CMR 5.00 (Groundwater Discharge Permits) promulgated in March 2009 eliminated the need for this regulation*.	Soil cleanup goals were met during the OU-1 source control remedy. Soil cleanup goals were selected so that these standards could be met in the future. Groundwater quality criteria attainment is being evaluated as part of OU-3.

TABLE 2. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 1 - ACTON AND CONCORD, MASSACHUSETTS

ARARs	REQUIREMENTS	ORIGINAL STATUS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
Federal Regulatory Requirements	Clean Air Act - National Air Quality Standards for Total Suspended Particulates (40 CFR 50.6)	Applicable	This regulation specifies maximum primary and secondary 24-hour concentrations for particulate matter.	These requirements are not ARARs per se, but are implemented through the State implementation requirements.
	OSHA - Worker Safety Regulations (29 CFR 1926)	Applicable	This regulation specifies the type of safety equipment, training and procedures to be followed during construction of the remedy. These regulations were applicable during construction of the selected remedy.	The OSHA rules are not ARARs per se, but they are worker safety rules that must always be complied with during operations, maintenance, and monitoring activities at the site.
	Protection of Archaeological Resources (32 CFR 229.4)	Applicable	This provides procedures for the protection of archaeological resources. If any of these resources are found during soil excavation, work would stop until the area has been reviewed by federal and state archaeologists. Research performed prior to remedy construction suggested that none would be found at this site.	No archaeological resources were found during remedy implementation.

TABLE 2. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 1 - ACTON AND CONCORD, MASSACHUSETTS

ARARs	REQUIREMENTS	ORIGINAL STATUS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
	DOT Rules for the Transportation of Hazardous Materials (49 CFR 107, 171.1 - 171.500)	Applicable	This regulation outlines procedures for the packaging, labeling, manifesting, and transport of hazardous materials. Any shipments to and from the site during the remedy are to comply with these rules.	DOT rules are not ARARs because they regulate off-site activities. DOT rules were complied with for off-site shipments.
State Regulatory Requirements	Massachusetts Standards for All (Permitted Hazardous Waste) Facilities (310 CMR 30.510-516)	Relevant and Appropriate	This regulation provides general facility requirements for waste analysis, security measures, inspections, and training requirements.	The Industrial Landfill was constructed and is operated in accordance with these requirements. These requirements remain relevant and appropriate and are being complied with.
	Contingency Plan, Emergency Procedures, Preparedness and Prevention (310 CMR 30.520-524)	Relevant and Appropriate	This regulation outlines the requirements for emergency procedures to be used following explosions and fires, as well as safety equipment and spill-control requirements. This regulation also requires that threats to public health and the environment be minimized.	These requirements remain relevant and appropriate and are being complied with.
	Massachusetts Manifest System, Recordkeeping, and Reporting (310 CMR 30.530-544)	Relevant and Appropriate	Requires manifesting hazardous waste shipped off-site for disposal. Any off-site shipments of waste materials were to be manifested.	These requirements are not ARARs, as they are considered off-site requirements.

TABLE 2. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 1 - ACTON AND CONCORD, MASSACHUSETTS

ARARs	REQUIREMENTS	ORIGINAL STATUS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
State Regulatory Requirements (continued)	Massachusetts Closure and Post-closure (310 CMR 30.580-596)	Relevant and Appropriate	This requirement details the specific requirements for closure and post-closure of hazardous waste facilities.	The landfill cap was constructed in accordance with these requirements. These requirements remain relevant and appropriate. Post-closure operations, maintenance and monitoring are currently being performed in accordance with the Post Closure Operations and Maintenance Plan. The landfill closure was designed to meet RCRA requirements for landfill closure.

TABLE 2. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 1 - ACTON AND CONCORD, MASSACHUSETTS

ARARs	REQUIREMENTS	ORIGINAL STATUS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
	Massachusetts - Landfills (310 CMR 30.620-633)	Relevant and Appropriate	Establishes requirements for construction, operation, monitoring, and maintenance of hazardous waste landfills.	The landfill cap was constructed in accordance with these requirements. Operations and maintenance have also been performed in accordance with these requirements. These requirements remain relevant and appropriate. The landfill closure was designed to meet the requirements for landfill closure. Post-closure operations, maintenance and monitoring are currently being performed in accordance with the Post Closure Operations and Maintenance Plan.

TABLE 2. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 1 - ACTON AND CONCORD, MASSACHUSETTS

ARARs	REQUIREMENTS	ORIGINAL STATUS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
State Regulatory Requirements (continued)	Massachusetts Groundwater Protection (310 CMR 30.660-675)	Relevant and Appropriate	Provides performance requirements for a groundwater monitoring network, and standards for a monitoring program and sample analysis.	Groundwater at each disposal area is monitored to determine the effectiveness of the remedial measures. An annual groundwater monitoring program has been ongoing for the Landfill Area as well as other portions of the plume, and is reviewed each year and adjusted as necessary. These regulations are still relevant and appropriate.

TABLE 2. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 1 - ACTON AND CONCORD, MASSACHUSETTS

ARARs	REQUIREMENTS	ORIGINAL STATUS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
	Massachusetts Ambient Air Quality Standards (310 CMR 6.00) and Air Pollution Control Regulations (310 CMR 7.00)	Applicable	Establishes primary and secondary standards for emissions of dust and odor from construction and remedial activities.	These requirements remain applicable. The Northeast Area treatment system air stripper (now shut down, but the equipment remains in place in case it is needed again) includes vapor-phase carbon for odor control. The Landfill Area treatment system currently does not require emissions control because it does not employ an air stripper. Particulate emissions during excavation and solidification activities were controlled to meet the requirements. Odor emissions from the previous groundwater treatment air stripper (the ARS) were controlled with Best Available Control Technology (BACT). A gas control system utilizing BACT was installed during landfill cap construction to control emissions.

TABLE 2. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 1 - ACTON AND CONCORD, MASSACHUSETTS

ARARs	REQUIREMENTS	ORIGINAL STATUS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
State Regulatory Requirements (continued)	Massachusetts Solid Waste Management Facility Regulations (310 CMR 19.000)	Applicable	This regulation outlines the requirements for closure of solid waste landfills. The Battery Separator Area chip piles were to be closed as a solid waste landfill with, among other things, an intermediate cover consisting of impervious material or flexible membrane which prevents the percolation of surface or rain water.	These requirements are no longer applicable. These requirements would have applied to capping of the Battery Separator Area chip piles, which was part of the OU-1 ROD-specified remedy. However, the chips were actually excavated and placed in the Industrial Landfill.

TABLE 3. CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
GROUNDWATER REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
Federal Criteria, Advisories, and Guidance	Safe Drinking Water Act ("SDWA") National Primary Drinking Water Regulations Maximum Contaminant Levels ("MCLs"), 40 C.F.R. § 141.11-141.16, 141.60-141.62 **ROD Status: Relevant and Appropriate** **5-Year Review Status: Relevant and Appropriate**	Maximum Contaminant Levels (MCLs) have been promulgated for several common organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies. MCLs are applicable only at the tap, but are relevant and appropriate because the groundwater underneath parts of the Site may be or is being used as a drinking water source.	MCLs are exceeded in groundwater at some site locations. However, the groundwater remedy is expected to attain MCLs in the future. Groundwater is being extracted and treated or is attenuating naturally as part of the remedy and is monitored annually to evaluate progression towards cleanup goals. Institutional controls prevent use of affected groundwater in the meantime.
	Non-zero SDWA Maximum Contaminant Level Goals ("MCLGs"), 40 C.F.R. § 141.50-141.51. **ROD Status: Relevant and Appropriate** **5-Year Review Status: Relevant and Appropriate**	MCLGs, defined by SDWA regulations as the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, and which allows an adequate margin of safety, are non-enforceable health goals under the SDWA. Because MCLGs are not enforceable regulatory standards, they are not applicable. However, they are relevant and appropriate because groundwater aquifers beneath parts of the Site may be or is being used as a source for drinking water.	MCLGs are exceeded in groundwater at some site locations. However, the remedy is expected to attain non-zero MCLGs in the future. Groundwater is being extracted and treated or is attenuating naturally as part of the remedy and is monitored annually to evaluate progression towards cleanup goals. Institutional controls prevent use of affected groundwater in the meantime.

TABLE 3. CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
GROUNDWATER REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
	Office of Research and Standards Guidelines ("ORSGs"), as found in Massachusetts Drinking Water Standards and Guidelines for Chemicals in Massachusetts Drinking Waters (last updated in the spring of 2014) **ROD Status: TBC** **5-Year Review Status: TBC**	The ORS has identified risk-based guidelines applicable to drinking water. Because the ORSGs are not regulations, they are TBCs, rather than ARARs.	ORSGs are exceeded in groundwater at some site locations. However, the remedy is expected to attain ORSGs in the future.
	Human health Reference Doses (RfDs) and Cancer Slope Factors (CSFs) found in USEPA's IRIS database. **ROD Status: TBC** **5-Year Review Status: TBC**	USEPA requires the use of these values in the assessment of human health risk.	These values were used in the risk assessment and calculation of numerical remediation goals. Any future evaluation of residual risk is expected to also use these values. The FYR text presents a qualitative evaluation of changes in these values relative to what they were in 2005 when the ROD was written, and concludes that the changes do not affect protectiveness.

TABLE 3. CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
GROUNDWATER REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
State Criteria, Advisories, and Guidance	Massachusetts Drinking Water Regulations, 310 CMR 22.06, 22.06B, 22.07A, 22.07B **ROD Status: Relevant and Appropriate** **5-Year Review Status: Relevant and Appropriate**	These regulations set forth Massachusetts MCLs ("MMCLs"), based on health and technical practicality, for public water systems. The aquifer on site is not a public water system, but the requirements are relevant and appropriate for those areas of the Site that are "GW-1" areas under the MCP, because the groundwater in those areas of the Site may be potentially used as a source for drinking water. When MMCLs are more stringent than federal levels, the state levels must be met. The MMCLs for 1,4-Dichlorobenzene (also known as para-Dichlorobenzene in 310 CMR 22.07B) and ethylene dibromide are more stringent than the MCLs, but these are not contaminants of concern at the site.	MMCLs are exceeded in groundwater at some site locations. However, the alternative is expected to attain MMCLs in the future.

TABLE 3. CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
GROUNDWATER REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
	Massachusetts Ground Water Quality Standards ("GWQS"), 314 CMR 6.01-6.10 **ROD Status: Relevant and Appropriate** **5-Year Review Status: Not ARAR – regulation was rescinded in March 2009**	The GWQSs were numeric limits for certain contaminants (e.g., arsenic, cadmium, copper, lead, manganese, mercury and non-numeric health-based standards for others (e.g., pathogenic organisms), as well as a pH range. This regulation was rescinded in March 2009 because revisions to 314 CMR 5.00 (Groundwater Discharge Permits) that were promulgated in March 2009 eliminated the need for this regulation.	Not ARAR – regulation was rescinded in March 2009

TABLE 4. LOCATION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
GROUNDWATER REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
State Regulatory Requirements	Massachusetts Wetlands Protection Act and Regulations, M.G.L. c. 131, § 40; 310 CMR 10.00 **ROD Status: Applicable** **5-Year Review Status: Applicable**	The Wetlands Protection Act (WPA) imposes requirements and limitations for alteration of wetlands and establishes performance standards for projects that affect wetlands. Because there are lands under water bodies on the Site that are being remediated, these regulations are applicable.	The discharge of treated groundwater to Sinking Pond was designed to comply with applicable provisions of the WPA and regulations.
	Massachusetts Groundwater Supply Protection Regulations, 310 CMR 22.21 **ROD Status: Applicable** **5-Year Review Status: Applicable**	310 CMR 22 requires that protective zones around a wellhead be established that limit activities and land uses (such as storage of chemicals and removal of soil) in the zones. Because the Assabet and School Street wellfields are within the Site, and because the Assabet 1 and 2, Christofferson, Scribner, and Lawsbrook wells have DEP-approved Zone II wellhead protection areas which overlap with the site, these requirements are applicable.	The groundwater treatment remedy was designed to comply with 310 CMR 22.21.

TABLE 5. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
GROUNDWATER REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
Federal Regulatory Requirements	Clean Water Act (CWA) § 402 (33 U.S.C. §1342) **ROD Status: Relevant and Appropriate** **5-Year Review Status: Relevant and Appropriate**	Section 402 of the CWA requires issuance of an NPDES permit prior to discharge of any pollutant to a water of the United States. Permits can only be issued in compliance with applicable technology standards.	The discharge for the groundwater remedy was designed to meet applicable substantive standards under NPDES regulations.
	Clean Water Act (CWA) § 304(a) (33 U.S.C. §1314(a)) **ROD Status: Relevant and Appropriate** **5-Year Review Status: Relevant and Appropriate**	Federal National Recommended Water Quality Criteria (NRWQC) include (1) human health-based criteria and (2) other water quality parameters protective of fish and aquatic life. NRWQC for the protection of human health provide levels for exposure from drinking water and consuming aquatic organisms, and from consuming fish alone. Discharges subject to NPDES permitting requirements must not result in exceedances of NRWQCs.	The discharge to Sinking Pond will not cause or contribute to an exceedance of NRWQC.
	Resource Conservation and Recovery Act (RCRA, 42 USC 6901-6992) - Groundwater Protection; 40 CFR Part 264, Subpart F. **ROD Status: Relevant and Appropriate** **5-Year Review Status: Relevant and Appropriate**	These regulations establish acceptable concentrations of hazardous constituents in the groundwater at licensed RCRA hazardous waste facilities. The point of compliance is set at the edge of the waste management unit(s). The regulations also establish groundwater monitoring requirements.	The groundwater monitoring provisions of Subpart F are considered when developing the long-term monitoring plan for the Site. The monitoring plan for groundwater is re-evaluated annually by Grace, EPA, and MassDEP.

TABLE 5. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
GROUNDWATER REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
	RCRA - Identification and Listing of Hazardous Wastes; 40 CFR Part 261 **ROD Status: Relevant and Appropriate** **5-Year Review Status: Not ARAR**	Part 261 establishes requirements for determining whether wastes are hazardous.	These regulations were used to determine whether any wastewater treatment residuals are hazardous waste, and no residuals were found to be such.
	RCRA Generator Requirements; 40 CFR Part 262 **ROD Status: Relevant and Appropriate** **5-Year Review Status: Not ARAR**	RCRA establishes requirements applicable to generators of hazardous waste. Those requirements include provisions addressing hazardous waste determinations, manifesting, pre-transport requirements, and recordkeeping.	No wastewater treatment residuals have been determined to be hazardous waste.
	Safe Drinking Water Act, Underground Injection Control Requirements, 40 CFR Part 144 **ROD Status: Applicable** **5-Year Review Status: Applicable**	The Underground Injection Control program regulations promulgated under Part C of the Safe Drinking Water Act (SDWA) establish requirements for underground injection of treated groundwater.	These requirements were met when treated water is re-injected as part of the groundwater remedy. Re-injection of treated groundwater was practiced for the Northeast Area treatment system when it was in operation.

TABLE 5. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
GROUNDWATER REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
	Policy on Control of Air Emissions Superfund Sites OSWER Directive 9355.0-28 **ROD Status: TBC** **5-Year Review Status: TBC**	Provides EPA Policy regarding control of emissions from air strippers used during cleanup at Superfund Sites	This policy was considered in the design of the air stripper used in the Northeast Area treatment system. Emissions were found to not pose a risk but emissions were treated with carbon as a means of controlling the potential for odors.
	USEPA Region 1 Memo Lois Gitto to Merrill Hohman, July 12, 1989 **ROD Status: TBC** **5-Year Review Status: TBC**	Lays out Regional policy on emissions from air strippers at Superfund Sites	See above.
State Regulatory Requirements	Massachusetts Air Pollution Control Regulations, 310 CMR 7.00 **ROD Status: Applicable** **5-Year Review Status: Applicable**	These regulations set requirements on the control of fugitive emissions and dust.	These requirements were met during construction activities.
	Massachusetts Clean Water Act; G.L. ch. 21, § 26-53; 314 CMR 3.00 Surface Water Discharge Permit Program **ROD Status: Applicable** **5-Year Review Status: Applicable**	The Massachusetts Clean Water Act and regulations impose requirements for permits prior to discharges to waters of the Commonwealth.	The groundwater remedy was designed and is being operated in compliance with the substantive requirements of MCWA and 314 CMR 3.00.

TABLE 5. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
GROUNDWATER REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
	Massachusetts Clean Water Act, G.L. ch. 21, § 26-51; 314 CMR 4.00 Surface Water Quality Standards. **ROD Status: Applicable** **5-Year Review Status: Applicable**	The Massachusetts regulations provide that discharges to waters of the Commonwealth shall not result in exceedances of Massachusetts Surface Water Quality Standards. These standards are the same as the NRWQCs for the compounds analyzed for at the Site.	The discharge to Sinking Pond was designed and is operated so that it will not cause or contribute to an exceedance of the MSWQS.
	Massachusetts Hazardous Waste Rules for Identification and Listing of Hazardous Waste; 310 CMR 30.100. **ROD Status: Applicable** **5-Year Review Status: Not ARAR**	310 CMR 30.100 establishes requirements for determining whether wastes are hazardous.	These regulations were used to determine whether any wastewater treatment residuals are hazardous waste, and no residuals were found to be such
	Massachusetts Hazardous Waste Rules for Generators of Hazardous Waste; 310 CMR 30.300. **ROD Status: Applicable** **5-Year Review Status: Not ARAR**	310 CMR 30.300 establishes requirements applicable to generators of hazardous waste. Those requirements include provisions addressing hazardous waste determinations, manifesting, pre-transport requirements, and recordkeeping.	No wastewater treatment residuals have been determined to be hazardous waste.
	Massachusetts Rules for Remedial Air Emissions, 310 CMR 40.0049 **ROD Status: Relevant and Appropriate** **5-Year Review Status: Relevant and Appropriate**	The Massachusetts rules set forth standards for emissions from remedial activities, including a general requirement for 95% control over emissions from the remedial system, unless it is not feasible or necessary based upon an evaluation of conventional treatment technologies and risks to surrounding human or ecological populations..	The Northeast Area groundwater remedy was designed and operated in compliance with these requirements. Emissions control was employed as a means of odor control only, as the emissions were found to pose no significant human health risk.

TABLE 5. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
GROUNDWATER REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
	Massachusetts Threshold Exposure Limits (TELs) and Allowable Ambient Limits (AALs) for Ambient Air **ROD Status: TBC** **5-Year Review Status: TBC**	DEP has issued guidance setting out permissible concentrations of air toxics in ambient air. The TELs and AALs are used to guide permitting decisions for sources of air toxics.	The groundwater remedy was designed and operated so that remedial air emissions did not cause any exceedances of TELs or AALs.
	Massachusetts Wetlands Protection Act and Regulations, M.G.L. c. 131, § 40; 310 CMR 10.00 **ROD Status: Applicable** **5-Year Review Status: Applicable**	The Wetlands Protection Act imposes requirements and limitations for alteration of wetlands. It establishes performance standards for projects that affect wetlands. Because there are wetlands on the Site, these regulations are applicable.	The discharge of treated groundwater to Sinking Pond was designed to comply with applicable provisions of the WPA and regulations.
	Massachusetts Well Decommissioning Requirements, 313 CMR 3.03 **ROD Status: Applicable** **5-Year Review Status: Applicable**	Massachusetts regulations provide for certain notification requirements upon well abandonment.	The Massachusetts regulations will be followed to the extent that the remedy involves decommissioning any wells.

TABLE 6. CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
SINKING POND SEDIMENT REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
State Criteria, Advisories, and Guidance	Consensus-Based Sediment Quality Guidelines; MassDEP, 2002. Technical Update, Freshwater Sediment Screening Benchmarks for Use Under the Massachusetts Contingency Plan. **ROD Status: TBC** **5-Year Review Status: TBC**	MassDEP recommends using the MacDonald et al. (2000) screening values for evaluating freshwater sediment and risks to benthic organisms. MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of Environmental Contamination and Toxicology, 39, 20-31.	These guidelines were considered in the risk assessments and in developing risk-based remedial goals for sediment. Any future evaluation of residual risk is expected to also use these values.

TABLE 6. CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
SINKING POND SEDIMENT REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
Other Criteria, Advisories, and Guidance	Ontario Provincial Sediment Quality Guideline **ROD Status: TBC** **5-Year Review Status: TBC**	The Ontario Provincial Lowest Effect Levels (LEL) are used to identify sediment at which most benthic organisms are unaffected. (Ontario Ministry of the Environment, 1993a and b, 1994). Ontario Ministry of the Environment and Energy, 1993a. *Development of the Ontario Provincial Sediment Quality Guidelines for PCBs and the Organochlorine Pesticides,* Water Resources Branch. Ontario Ministry of the Environment and Energy, 1993b. *Development of the Ontario Provincial Sediment Quality Guidelines for Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Nickel, and Zinc,* Water Resources Branch. Ontario Ministry of the Environment and Energy, 1994. *Development of the Ontario Provincial Sediment Quality Guidelines for Polycyclic Aromatic Hydrocarbons (PAH),* Water Resources Branch.	These guidelines were considered in the risk assessments and in developing risk-based remedial goals for sediment. Any future evaluation of residual risk is expected to also use these values.

TABLE 7. LOCATION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
SINKING POND SEDIMENT REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
State Regulatory Requirements	Massachusetts Wetlands Protection Act and Regulations, M.G.L. c. 131, § 40; 310 CMR 10.00 **ROD Status: Applicable** **5-Year Review Status: Applicable**	The Wetlands Protection Act (WPA) imposes requirements and limitations for alteration of areas subject to protection under the WPA, including land under water bodies and establishes performance standards for projects that affect land under water bodies. Because Sinking Pond contains areas subject to jurisdiction under the WPA, these regulations are applicable.	The remedial action was designed to be consistent with the performance standards in the Wetlands Protection Act Regulations.
	Bordering Vegetated Wetland Delineation Criteria and Methodology, Issued: March 1, 1995 **ROD Status: TBC** **5-Year Review Status: TBC**	This policy defines which plant species or other plants are wetland indicator plants as specified in the wetland regulations (310 CMR 10.55(2)(c)). This policy also identifies a standard methodology for determining the boundary of Bordering Vegetated Wetlands (BVWs) in accordance with 310 CMR 10.55(2)(c)(1-3).	The remedy was implemented in compliance with this Policy.

TABLE 8. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
SINKING POND SEDIMENT REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
Federal Regulatory Requirements	RCRA - Identification and Listing of Hazardous Wastes; 40 CFR Part 261 **ROD Status: Relevant and Appropriate** **5-Year Review Status: Relevant and Appropriate**	Part 261 establishes requirements for determining whether wastes are hazardous.	The remedy was implemented to comply with the Part 261 regulations in determining whether any excavated sediments are hazardous waste. No sediments were determined to be hazardous waste.
	RCRA Generator Requirements; 40 CFR Part 262 **ROD Status: Relevant and Appropriate** **5-Year Review Status: Not ARAR**	RCRA establishes requirements applicable to generators of hazardous waste. Those requirements include provisions addressing hazardous waste determinations, manifesting, pre-transport requirements, and recordkeeping.	No excavated sediments were determined to be hazardous waste.
State Regulatory Requirements	Massachusetts Hazardous Waste Rules for Identification and Listing of Hazardous Waste; 310 CMR 30.100. **ROD Status: Applicable** **5-Year Review Status: Applicable**	310 CMR 30.100 establishes requirements for determining whether wastes are hazardous.	The remedy was implemented to comply with 310 CMR 30.100 in determining whether any excavated sediments are hazardous waste. No sediments were determined to be hazardous waste.
	Massachusetts Hazardous Waste Rules for Generators of Hazardous Waste; 310 CMR 30.300. **ROD Status: Applicable** **5-Year Review Status: Not ARAR**	310 CMR 30.300 establishes requirements applicable to generators of hazardous waste. Those requirements include provisions addressing hazardous waste determinations, manifesting, pre-transport requirements, and recordkeeping.	No excavated sediments were determined to be hazardous waste.

TABLE 8. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
SINKING POND SEDIMENT REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
	Massachusetts Wetlands Protection Act and Regulations, M.G.L. c. 131, § 40; 310 CMR 10.00 **ROD Status: Applicable** **5-Year Review Status: Applicable**	The Wetlands Protection Act (WPA) imposes requirements and limitations for alteration of areas subject to protection under the WPA, including land under water bodies and establishes performance standards for projects that affect land under water bodies. Because Sinking Pond contains areas subject to jurisdiction under the WPA, these regulations are applicable.	The remedial action was designed to be consistent with the performance standards in the Wetlands Protection Act Regulations.
	Massachusetts Solid Waste Management Regulations (310 CMR 19.000) **ROD Status: Applicable** **5-Year Review Status: Not ARAR**	These regulations address non-hazardous waste and closure, post closure and maintenance of solid waste landfills. If non-hazardous wastes are left on site as part of this remedy, the disposal Closure/Post Closure Standards would be met.	No non-hazardous wastes were left on site as part of this remedy.

TABLE 9. CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
NORTH LAGOON WETLAND SEDIMENT REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
State Criteria, Advisories, and Guidance	Consensus-Based Sediment Quality Guidelines; MassDEP, 2002. Technical Update, Freshwater Sediment Screening Benchmarks for Use Under the Massachusetts Contingency Plan. **ROD Status: TBC** **5-Year Review Status: TBC**	MassDEP recommends using the MacDonald et al. (2000) screening values for evaluating freshwater sediment and risks to benthic organisms. MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of Environmental Contamination and Toxicology, 39, 20-31.	These guidelines were considered in the risk assessments and in developing risk-based remedial goals for sediment. Any future evaluation of residual risk is expected to also use these values.

TABLE 9. CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
NORTH LAGOON WETLAND SEDIMENT REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
Other Criteria, Advisories, and Guidance	Ontario Provincial Sediment Quality Guideline **ROD Status: TBC** **5-Year Review Status: TBC**	The Ontario Provincial Lowest Effect Levels (LEL) are used to identify sediment at which most benthic organisms are unaffected. (Ontario Ministry of the Environment, 1993a and b, 1994). Ontario Ministry of the Environment and Energy, 1993a. *Development of the Ontario Provincial Sediment Quality Guidelines for PCBs and the Organochlorine Pesticides,* Water Resources Branch. Ontario Ministry of the Environment and Energy, 1993b. *Development of the Ontario Provincial Sediment Quality Guidelines for Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Nickel, and Zinc,* Water Resources Branch. Ontario Ministry of the Environment and Energy, 1994. *Development of the Ontario Provincial Sediment Quality Guidelines for Polycyclic Aromatic Hydrocarbons (PAH),* Water Resources Branch.	These guidelines were considered in the risk assessments and in developing risk-based remedial goals for sediment. Any future evaluation of residual risk is expected to also use these values.

TABLE 10. LOCATION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
NORTH LAGOON WETLAND SEDIMENT REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
Federal Regulatory Requirements	Protection of Wetlands Executive Order No. 11990 (May 24, 1977), 42 Fed. Reg. 26961, 18 C.F.R. § 725. **ROD Status: Applicable** **5-Year Review Status: Applicable**	The Executive Order (EO) imposes requirements on federal agencies that oversee projects undertaken in wetlands areas, including natural ponds. It requires federal agencies to avoid construction in wetlands unless there is no practicable alternative to such construction. If there is no practical alternative to conducting work in the wetlands, all practicable measures to minimize harm to wetlands from such construction must be taken. The North Lagoon Wetland is a jurisdictional wetland area. Because there are wetlands on the Site and a federal agency is overseeing the remediation, this requirement is applicable.	Because the contamination that was remediated was located in wetlands, there was no practical alternative to address this contamination. Measures were taken to minimize impacts and the wetland has been restored. Ongoing monitoring is evaluating the success of the restoration effort.

TABLE 10. LOCATION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
NORTH LAGOON WETLAND SEDIMENT REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
	Floodplain Management Executive Order No. 11988 (May 24, 1977), 42 Fed. Reg. 26951, 18 C.F.R. § 725. **ROD Status: Applicable** **5-Year Review Status: Applicable**	The Executive Order (EO) imposes requirements on federal agencies that oversee projects undertaken in floodplains. It requires federal agencies to avoid activities in floodplains unless there is no practicable alternative to such activities. If there is no practical alternative to conducting work in the floodplain, all practicable measures to minimize impacts must be taken. Because there is a floodplain on the Site and a federal agency is involved with the remediation, this requirement is applicable	Because some of the contamination in the North Lagoon Wetland that presented an unacceptable risk was located in a floodplain, there was no practical alternative to address this contamination. Measures were taken to minimize impacts.
State Regulatory Requirements	Massachusetts Wetlands Protection Act and Regulations, M.G.L. c. 131, § 40; 310 CMR 10.00 **ROD Status: Applicable** **5-Year Review Status: Applicable**	The Wetlands Protection Act (WPA) imposes requirements and limitations for alteration of wetlands and establishes performance standards for projects that affect wetlands. Because the North Lagoon Wetland contains areas subject to jurisdiction under the WPA, these regulations are applicable.	The remedial action was conducted in accordance with these regulations.

TABLE 10. LOCATION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
NORTH LAGOON WETLAND SEDIMENT REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
	Bordering Vegetated Wetland Delineation Criteria and Methodology, Issued: March 1, 1995 **ROD Status: TBC** **5-Year Review Status: TBC**	This policy defines which plant species or other plants are wetland indicator plants as specified in the wetland regulations (310 CMR 10.55(2)(c)). This policy also identifies a standard methodology for determining the boundary of Bordering Vegetated Wetlands (BVWs) in accordance with 310 CMR 10.55(2)(c)(1-3).	This guidance was used to define the boundary of the wetlands for state wetland purposes.

TABLE 11. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
NORTH LAGOON WETLAND SEDIMENT REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
Federal Regulatory Requirements	RCRA - Identification and Listing of Hazardous Wastes; 40 CFR Part 261 **ROD Status: Relevant and Appropriate** **5-Year Review Status: Relevant and Appropriate**	Part 261 establishes requirements for determining whether wastes are hazardous.	The remedy was implemented to comply with the Part 261 regulations in determining whether any excavated sediments are hazardous waste. No sediments were determined to be hazardous waste.
	RCRA Generator Requirements; 40 CFR Part 262 **ROD Status: Relevant and Appropriate** **5-Year Review Status: Not ARAR**	RCRA establishes requirements applicable to generators of hazardous waste. Those requirements include provisions addressing hazardous waste determinations, manifesting, pre-transport requirements, and recordkeeping.	No excavated sediments were determined to be hazardous waste.
	Clean Water Act (CWA) § 402 (33 U.S.C. §1342) **ROD Status: Applicable** **5-Year Review Status: Applicable**	Section 402 of the CWA requires issuance of an NPDES permit prior to discharge of any pollutant to a water of the United States. Permits can only be issued in compliance with applicable technology standards.	Impacted water generated during remedial activities resulted primarily from equipment cleaning activities and precipitation that contacted impacted materials in the sediment dewatering and decontamination pads. This water was collected, filtered, and treated in the new Landfill Area groundwater treatment system which discharges into Sinking Pond. Effluent limitations were met.

TABLE 11. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
NORTH LAGOON WETLAND SEDIMENT REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
	Clean Water Act (CWA) § 304(a) (33 U.S.C. §1314(a)) **ROD Status: Applicable** **5-Year Review Status: Applicable**	Federal National Recommended Water Quality Criteria (NRWQC) include (1) human health-based criteria and (2) other water quality parameters protective of fish and aquatic life. NRWQC for the protection of human health provide levels for exposure from drinking water and consuming aquatic organisms, and from consuming fish alone. Discharges subject to NPDES permitting requirements must not result in exceedances of NRWQCs.	The discharge from the dewatering operations was treated and discharged to Sinking Pond. Collection and treatment was designed and operated so that it would not cause or contribute to an exceedance of the NRWQC.
State Regulatory Requirements	Massachusetts Clean Water Act, G.L. ch. 21, § 26-51; 314 CMR 3.00. **ROD Status: Applicable** **5-Year Review Status: Applicable**	The Massachusetts regulations provide that discharges to waters of the Commonwealth shall not result in exceedances of Massachusetts Surface Water Quality Standards. These standards are the same as the NRWQCs for the compounds analyzed for at the Site.	The discharge from the dewatering operations was treated and discharged to Sinking Pond. Collection and treatment was designed and operated so that it would not cause or contribute to an exceedance of the MSWQS.
	Massachusetts Hazardous Waste Rules for Identification and Listing of Hazardous Waste; 310 CMR 30.100. **ROD Status: Applicable** **5-Year Review Status: Applicable**	310 CMR 30.100 establishes requirements for determining whether wastes are hazardous.	The remedy was implemented to comply with 310 CMR 30.100 in determining whether any excavated sediments are hazardous waste. No sediments were determined to be hazardous waste.

TABLE 11. ACTION-SPECIFIC ARARS
W.R. GRACE SUPERFUND SITE – OPERABLE UNIT 3 - ACTON AND CONCORD, MASSACHUSETTS
NORTH LAGOON WETLAND SEDIMENT REMEDIATION

ARARs	REQUIREMENTS	REQUIREMENT SYNOPSIS	FIVE YEAR REVIEW
	Massachusetts Hazardous Waste Rules for Generators of Hazardous Waste; 310 CMR 30.300. **ROD Status: Applicable** **5-Year Review Status: Not ARAR**	310 CMR 30.300 establishes requirements applicable to generators of hazardous waste. Those requirements include provisions addressing hazardous waste determinations, manifesting, pre-transport requirements, and recordkeeping.	No excavated sediments were determined to be hazardous waste.
	Massachusetts Air Pollution Control Regulations, 310 CMR 7.00 **ROD Status: Applicable** **5-Year Review Status: Applicable**	These regulations set requirements on the control of fugitive emissions and dust.	These requirements were met during construction activities.
	Massachusetts Solid Waste Management Regulations (310 CMR 19.00) **ROD Status: Applicable** **5-Year Review Status: Not ARAR**	These regulations address non-hazardous waste and closure, post closure and maintenance of solid waste landfills. If non-hazardous wastes are left on site as part of this remedy, the disposal Closure/Post Closure Standards would be met.	No non-hazardous wastes were left on site as part of this remedy.