FOURTH FIVE-YEAR REVIEW REPORT FOR GROVELAND WELLS SUPERFUND SITE ESSEX COUNTY, MASSACHUSETTS

JUNE 2020

Prepared by

U.S. Environmental Protection Agency
Region 1
Boston, Massachusetts

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Date

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LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
DCE	Dichloroethylene
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
ERH	Electrical Resistance Heating/In-situ Thermal Treatment
ESD	Explanation of Significant Differences
FS	Feasibility Study
FYR	Five-Year Review
gpm	Gallons per Minute
GRC	Groveland Resources Corporation
GWTF	Groundwater Treatment Facility
HA	Health Advisory
HB	Hazard Based
HQ	Hazard Quotient
IC	Institutional Control
IGCL	Interim Groundwater Cleanup Level
ISTT	In-situ Thermal Treatment/Electrical Resistive Heating
MassDEP	Massachusetts Department of Environmental Protection
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
µg/kg	Micrograms per Kilogram
mg/kg	Milligram per Kilogram
µg/L	Micrograms per Liter
MMCL	Massachusetts Maximum Contaminant Level
MNA	Monitored Natural Attenuation
MOM	Management of Migration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ng/L	Nanogram per Liter
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
ORSG	Office of Research and Standards Guideline
PCE	Tetrachloroethylene
PFAS	Per- and Polyfluoroalkyl Substances
PFBS	Perfluorobutanesulfonic acid
PFDA	Perfluorodecanoic acid
PFHpA	Perfluoroheptanoic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
ppb	Part per Billion
PPRTV	Provisional Peer Reviewed Toxicity Value
ppt	Part per Trillion
RAO	Remedial Action Objective
RfD	Reference Dose
RI	Remedial Investigation
ROD	Record of Decision

RPM	Remedial Project Manager
RSL	Regional Screening Level
SAM	Site Assessment Manager
SVE	Soil Vapor Extraction
TCE	Trichloroethylene
UCL95	Upper 95th confidence limit on the mean
UST	Underground Storage Tank
UU/UE	Unlimited Use and Unrestricted Exposure
VI	Vapor Intrusion
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound

I. INTRODUCTION

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

The U.S. Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii)) and considering EPA policy.

This is the fourth FYR for the Groveland Wells Superfund site (the Site). The triggering action for this policy review is the completion date of the previous FYR. The FYR has been prepared because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE). The Site consists of two operable units (OUs), which are both addressed in this FYR. OU1 (Management of Migration) encompasses an 850-acre study area that includes the aquifer that recharges Groveland Municipal Well Station Nos. 1 and 2 (two town wells that were adversely impacted by the site contaminants). OU2 (Source Control) is limited to the original release area and the immediately surrounding property.

EPA remedial project manager (RPM) Derrick Golden led the FYR. Participants included Mandy Liao (EPA Site Assessment Manager (SAM)), Massachusetts Department of Environmental Protection (MassDEP) project manager Janet Waldron, and Johnny Zimmerman-Ward and Kirby Webster (EPA FYR support contractor, Skeo). The review began on 12/16/2019. Appendix A provides a list of the site-related resources used to prepare this FYR Report. Appendix B provides the Site's chronology of events.

Site Background

The approximately 850-acre Site is located in Groveland, Essex County, Massachusetts, in an area with residential, commercial and industrial uses (Figure 1). From 1963 to 2001, metal and plastic parts manufacturing took place on the Valley Manufactured Products Company, Inc. (Valley) property, located at 64 Washington Street in the southwestern portion of the Site. On-site processes included machining, degreasing and finishing of metal parts that used solvents, caustic soda and acid solutions for cleaning. Several subsurface disposal systems were used on the property and Groveland Resources Corporation (GRC) reportedly installed six underground storage tanks (USTs) for storage of cutting oils, solvents and mineral spirits on the southern part of the Valley property. GRC was another company that the responsible party owned and operated. From 1963 to 1983, trichloroethylene (TCE), methylene chloride, and other solvents were used in the vapor degreasing operations. On-site operations/disposal practices resulted in the contamination of groundwater and soil with metals and volatile organic compounds (VOCs). GRC and Valley are entities responsible for the release of the contaminants at the Site.

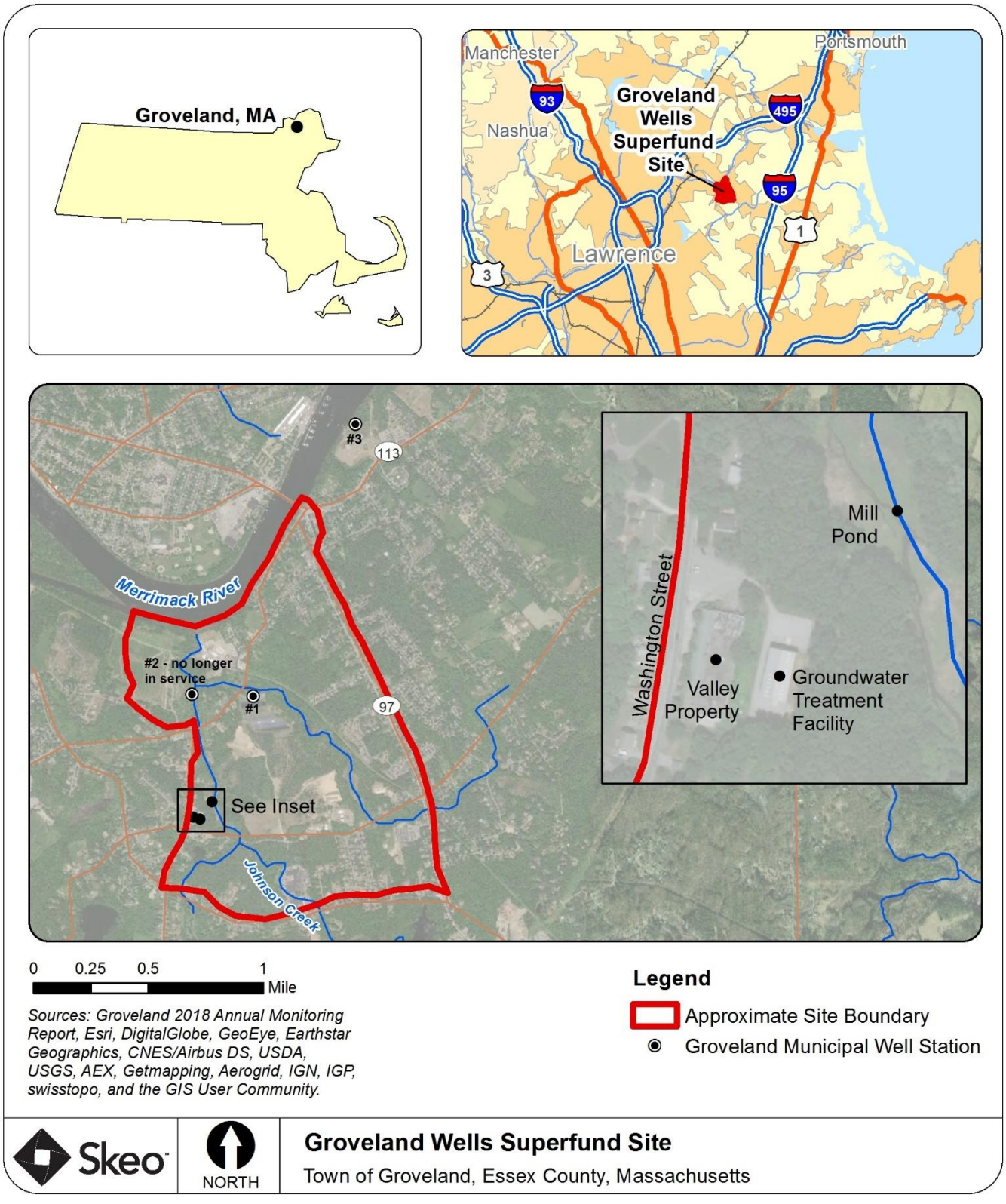
The Site is located in the Johnson Creek drainage basin. Johnson Creek originates south of the Site and flows in a northerly direction through Mill Pond. Mill Pond is located about 450 feet northeast of the Valley property. Site groundwater occurs in two interconnected zones, the overburden and the underlying bedrock. The two zones are also referred to as the stratified drift aquifer, which are used to supply the area's drinking water. Groundwater generally flows to the north through the Site toward the Merrimack River. The overall groundwater flow pattern is from the higher elevations located to the south, east and west, toward the valley that forms much of the Site, then north following the trend of the valley toward its outlet. Two Town of Groveland (Town) drinking water supply wells, Groveland Municipal Well Station Nos. 1 and 2, were impacted with site contamination. The wells were taken offline and a treatment system was added to Station No. 1. A new drinking water well, Station No. 3, was installed outside of the Johnson Creek watershed. Station No. 2 was permanently taken offline in 1979.

In approximately 2001, Valley ceased operations at the facility. Currently, the manufacturing building on the Valley property is unused and in disrepair. East of the manufacturing building, the groundwater treatment facility is being decommissioned by MassDEP under EPA oversight. The clean groundwater treatment facility building will then be transitioned to the Roman Catholic Archdiocese of Boston (property owner).

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Groveland Wells		
EPA ID: MAD980732317		
Region: 1	**State:** MA	**City/County:** Groveland/Essex
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the Site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name: Derrick Golden, with additional support provided by Skeo		
Author affiliation: EPA Region 1		
Review period: 12/16/2019 - 6/1/2020		
Date of site inspection: 1/9/2020		
Type of review: Policy		
Review number: 4		
Triggering action date: 6/29/2015		
Due date (*five years after triggering action date)*: 6/29/2020		

Figure 1: Site Vicinity Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

TCE was the major contaminant released at the Valley property. In 1973, 500 gallons of TCE were reportedly released into the soil underneath the concrete slab from an UST. A total of 3,000 gallons of contaminants are estimated to have been discharged to the environment from several surface and subsurface sources, including the loading dock drainage system, the Brite Dip disposal system (consists of a concrete distribution box, associated drains and piping and a leach field located outside the building's southeast corner), the USTs, and from routine operation practices (Figure C-1). These releases migrated to groundwater beneath the Valley property and eventually contaminated the overburden aquifer that supplies the Town's drinking water. In 1982, EPA determined that the groundwater contamination at the Site constituted a threat to public health and the environment. EPA placed the Site on the Superfund program's National Priorities List (NPL) in December 1982.

In 1983, EPA and MassDEP inspected and sampled the subsurface disposal systems on the Valley property and found elevated concentrations of TCE and some metals. MassDEP and Valley entered into a consent agreement in 1983 that was intended to bring plant discharges into compliance with state and federal regulations. Valley implemented changes to the subsurface disposal system and practices.

Valley completed a remedial investigation (RI) (1985) and feasibility study (FS) (1986), but EPA determined that it was inadequate and did not provide enough information to serve as the basis for selection of a remedy. Valley's consultant performed a supplemental RI in 1988, after substantial development and negotiation of a detailed work plan with EPA. EPA contractors oversaw the supplemental RI and prepared an endangerment assessment (1987) and an endangerment assessment amendment (1988). In 1991, an EPA contractor also prepared a supplemental RI/FS.

Surface soil at the Valley property was not found to be contaminated, but subsurface soil was found to be contaminated with VOCs (Table 1). The greatest potential risks were attributed to the ingestion of contaminated groundwater, which exceeded EPA risk management criteria for all areas of the plume. It was determined that contaminated groundwater represented a possible future threat if Station No. 1 were to increase its pumping rate, or if additional drinking water wells were placed in the aquifer. However, risk and hazard estimates for the surface water, sediment and fish tissue exposure pathways did not exceed EPA risk management criteria. Risks to the ecological community of the Johnson Creek watershed from site contaminants were also considered minimal.

Table 1: Contaminants of Concern (COCs), by Media

COC	Subsurface Soil	Groundwater
Antimony		X
Arsenic		X
Barium		X
Beryllium		X
Cadmium		X
Chromium		X
1,2-Dichloroethylene (DCE)	X	X
Methylene chloride	X	
Tetrachloroethylene (PCE)	X	
1,1,1-Trichloroethane	X	

COC	Subsurface Soil	Groundwater
TCE	X	X
Notes: X = a COC in media Blank = not a COC in media		

Response Actions

In July 1985, EPA approved an initial remedial measure to rehabilitate Station No. 1 by using granular activated carbon treatment to remove VOCs from the groundwater. In 1987, EPA completed installation of the treatment system. Station No. 1 was used as a supplemental supply to Station No. 3 and Station No. 2 was permanently shut down by the Town. The granular activated carbon treatment system was turned off in 1994; VOCs had not been detected at Station No. 1 since 1989. In 2008, the Drinking Water Section of MassDEP's, Northeast Region Office, approved the Groveland Water Department's request to remove the GAC treatment system at Station No. 1.

In December 1986, through EPA's Superfund Innovative Technology Evaluation (SITE) Program, the Valley property was nominated for a demonstration of the Terra-Vac, Inc. soil vapor extraction (SVE) system. The Responsible Parties (RP's) funded, operated and maintained the system until they ceased operations in 2001. During its operation, the SVE system removed an estimated 1,300 pounds of VOCs from the unsaturated soil at the property.

The EPA 1988 Record of Decision for OU2 (Source Control), required the RP's to construct and operate a groundwater extraction and air stripping treatment system to intercept and treat the VOC plume at Mill Pond. The system began operating in April 1988. It consisted of two extraction wells, G1 and G2, and an air-stripping unit installed at the north end of Mill Pond. Treated water was discharged to Johnson Creek immediately downstream of the pond. The average flow from the system ranged from 31 gallons per minute (gpm) to 75 gpm. The system operated until 2000 when it was replaced by a groundwater extraction and treatment system constructed by EPA for OU1.

EPA selected the OU1 (Management of Migration) remedy in the Site's 1991 Record of Decision (ROD) and modified it in the Site's 1996 Explanation of Significant Differences (ESD). Remedial action objectives (RAOs) from the 1991 ROD included:

- Prevent ingestion of groundwater contamination in excess of relevant and appropriate drinking water standards [maximum contaminant levels (MCLs)/maximum contaminant level goals (MCLGs)/Massachusetts drinking water standards (MMCLs)] or, in their absence, an excess cancer risk level of 10^{-6}, for each carcinogenic compound. Also, prevent ingestion of groundwater contaminated in excess of a total excess cancer risk level for all carcinogenic compounds of 10^{-4} to 10^{-6}.
- Prevent ingestion of groundwater contaminated in excess of relevant and appropriate drinking water standards for each non-carcinogenic compound and a total hazard index greater than unity (1) for non-carcinogenic compounds having the same target endpoint of toxicity.
- Restore the groundwater aquifer to relevant and appropriate drinking water standards (MCLs/MCLGs/MMCLs) or, in their absence, the more stringent of an excess cancer risk of 10^{-6}, for each carcinogenic compound or a hazard quotient of unity for each non-carcinogenic compound. Also, restore the aquifer to the more stringent of (1) a total excess cancer risk of 10^{-4} to 10^{-6} or (2) a hazard index not to exceed an acceptable range for non-carcinogenic compounds having the same target endpoint of toxicity.

Major remedial components from the 1991 ROD and 1996 ESD are listed below.

- Establishment of interim groundwater cleanup levels (IGCLs) for COCs identified in the risk assessment as posing unacceptable risk to public health or the environment (Table 2).
- Installation of a groundwater extraction and treatment system at the property adjacent to the Valley property on Washington Street (Archdiocese of Boston property).

- Natural attenuation and periodic groundwater monitoring for the less-concentrated portions of contaminated groundwater found north of Mill Pond (1996 ESD).
- Construction of treatment units to remove inorganics and treatment units to destroy organic contaminants via ultraviolet oxidation technology.
- Extraction and treatment of contaminated groundwater.
- Discharge of treated water to Johnson Creek.
- Establishment of institutional controls to prohibit use of groundwater in the contaminated area until cleanup levels have been achieved.
- When groundwater Applicable or Relevant and Appropriate Requirement (ARARs) have been attained, performance of a risk assessment to determine whether the remedial action is protective.

EPA selected the OU2 (Source Control) remedy in the Site's 1988 ROD and modified it in the Site's 1996 and 2007 ESDs. The 1988 ROD identified the following RAOs:

- Prevent ingestion of groundwater contaminated in excess of relevant and appropriate drinking water standards (MCLs/MCLGs) or, in their absence, an excess cancer risk level of 10^{-6} for each carcinogenic compound. Also, to prevent ingestion of groundwater contaminated in excess of a total excess cancer risk level for all carcinogenic compounds of 10^{-4} to 10^{-7}.
- Prevent ingestion of groundwater contaminated in excess of relevant and appropriate drinking water standards for each noncarcinogenic compound and a total hazard index greater than unity (1) for all noncarcinogenic compounds.
- Prevent migration of contaminants in soils and groundwater that would result in groundwater contamination in excess of relevant and appropriate drinking water standards and surface water contamination in excess of relevant and appropriate ambient water quality criteria for the protection of aquatic life.
- Remediate inorganic contamination to the extent that such remediation is incidental to organics remediation, and to evaluate attainment of the applicable or relevant and appropriate requirements of federal and state environmental regulations.

Major remedial components from the 1988 ROD and 1996 and 2007 ESDs are listed below.[1]

- Installation, operation and maintenance of a SVE system and in-situ thermal treatment (ISTT) to meet site-specific soil cleanup goals (Table 3).
- Installation, operation and maintenance of a groundwater recovery/re-circulation system.
- Extract water and pipe it to the management of migration groundwater treatment facility.
- Treatment of air emissions from the aeration process by carbon adsorption.
- Groundwater monitoring.
- Sealing or disconnecting all drains and lines to the acid bath finishing process disposal system.
- Incidental treatment of inorganic compounds and other contaminants will be provided as necessary in order to efficiently operate the VOC contaminant treatment system and to meet applicable discharge permit requirements.

[1] While not part of the selected remedy, it was anticipated that EPA would review closure of the USTs under the UST program and closure of the septic systems under Resource Conservation and Recovery Act.

Table 2: Interim Groundwater Cleanup Levels[2]

Groundwater COC	1991 ROD Cleanup Level (µg/L)	Basis
Noncarcinogenic COCs		
Acetone	700	MMCL
Antimony	3	MCL
Arsenic	50	MCL
Barium	1,000	MCL
Beryllium	1	MCL
Cadmium	5	MCL
Chlorobenzene	100	MCL
Chromium (VI)	50	MCL
1,1-Dichloroethane	5	MMCL
1,1-DCE	7	MCL
1,2-DCE(c)	70	MCL
Mercury	2	MCL
Methylene chloride	5	MCL
Nickel	100	MCL
Selenium	10	MCL
Silver	50	MMCL
PCE	5	MCL
Toluene	1,000	MCL
1,1,1-trichloroethane	200	MCL
Vanadium	240	HB
Carcinogenic COCs		
Arsenic	50	MCL
Benzene	5	MCL
Beryllium	1	MCL
1,1-DCE	7	MCL
Lead	15	Policy[a]
Methylene chloride	5	MCL
PCE	5	MCL

[2] The 1991 ROD stated that "While these interim cleanup levels are consistent with ARARs (and suitable criteria to be considered) for groundwater, a cumulative risk that could be posed by these compounds may exceed EPA's goals for remedial action. Consequently, these levels are considered interim cleanup levels for groundwater. When all groundwater ARARs identified in the ROD, and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy, have been attained, a risk assessment will be performed on residual groundwater contamination to determine whether the remedial action is protective. Remedial actions shall continue until protectiveness concentrations of residual contamination have been achieved or until the remedy is otherwise deemed protective. These protective residual levels shall constitute the final cleanup levels for this Management of Migration ROD and shall be considered performance standards for remedial action. If final cleanup levels differ significantly from interim cleanup levels, EPA will reevaluate the selected remedy and take appropriate action to ensure that the cleanup levels are attained."

Groundwater COC	1991 ROD Cleanup Level (µg/L)	Basis
TCE	5	MCL
Vinyl chloride	2	MCL

Notes:
a. Superfund Policy Memo from Henry Longest, Director, Office of Emergency and Remedial Response to Patrick Tobin, Director, Waste Management Division, Region IV, Cleanup Level for Lead in Groundwater, June 1990.
MMCL = Massachusetts MCL
µg/L = micrograms per liter
HB = hazard based
Source: Table 23 of the 1991 ROD.

Table 3: Soil Cleanup Goals

Contaminant	1988 ROD Cleanup Goal (µg/kg)[a]	2007 ESD Soil Cleanup Levels (µg/kg)
TCE	6.3	77
Vinyl chloride	1.14	11
Methylene chloride	0.44	22
PCE	18.2	56
1,1-DCE	4.6	45
Trans-1,2-DCE	41.3	626
Toluene	6,000	22,753
1,1,1-trichloroethane	302	1,388
Cis-1,2-DCE	--[b]	418

Notes:
a. Protective of groundwater (MCLs), direct contact exposure (i.e., the incidental ingestion, dermal contact and inhalation of dust released from the soil) and for the subsurface vapor intrusion pathway (i.e., the inhalation of contaminated air).
b. The 1988 ROD did not include a soil cleanup goal for cis-1,2-DCE.
µg/kg = micrograms per kilogram
Source: Table VI-3 of the 1988 ROD; Table 1 and Table 2 of the 2007 ESD; Appendix A, Table 3 of the 2007 ESD.

Status of Implementation

Sealing or Disconnecting All Drains and Lines to the Acid Bath Finishing Process Disposal System (OU2)
In 2006, EPA removed the six USTs remaining in the southern portion of the Valley property and removed the Brite Dip leach field and disconnected the discharge lines, as called for in the 1988 OU2 ROD. The USTs were dismantled, decontaminated and taken off site for disposal. The Brite Dip leach field remedy included removal, decontamination and off-site disposal of all pipes, collars and concrete boxes. The discharge line and other drains inside the Valley building were reported to have been previously plugged.

SVE/ISTT for the Source Area (OU2)
Contractors for Valley/GRC designed a full-scale SVE system and a groundwater extraction, treatment and reinjection system to be installed on the property. The SVE system began operating in 1992 and was permanently shut down in spring 2002 as a result of Valley terminating its business operations. After SVE operations ceased, EPA performed a comprehensive source area re-evaluation from 2004 to 2006. It concluded that the SVE system had been minimally successful in removing VOCs from the source area and that significant source area contamination remained.

Following the 2007 ESD, construction of the ISTT system began in March 2010. The ISTT system operated from August 2010 through February 2011, at which time soil concentrations in the source area had been significantly reduced by the ISTT system. Remaining elevated concentrations of TCE were localized in two relatively small areas in the vadose zone on the south end of the Valley building. Based on confirmation groundwater sampling results, EPA determined the remaining TCE in the vadose zone did not appear to affect groundwater.

Source Area (OU2) and Management of Migration (OU1) Groundwater Extraction and Treatment Systems
In 1994, during design work for the OU2 remedy, results from on-site hydrogeological studies indicated that maximum yields from the aquifer beneath the Valley/GRC property would be low. Therefore, it was more cost effective to pipe the water to the treatment facility to be constructed for remediation of groundwater (OU1). As a result, EPA decided to pursue a combined remedy for groundwater from both OUs that involved extraction and treatment in a combined facility, using the technology of ultraviolet oxidation to destroy the VOCs.

Construction of a combined groundwater treatment facility and extraction/discharge system for groundwater from both OUs finished in 2000.

2013 Optimization Review
In January 2013, EPA performed an optimization review. EPA concluded that, through continuous operation of the groundwater treatment facility and the performance of ISTT, COC concentrations (primarily TCE and cis-1,2-DCE) in source area soil and groundwater and in downgradient groundwater had been significantly reduced. The Optimization Review Report provided several recommendations including shutdown criteria for extraction wells EW-S1 through EW-S4.

Monthly groundwater sampling was performed in select source area and downgradient monitoring wells from June 2013 through April 2014. Results from monthly sampling events indicated that COC concentrations remained relatively steady and there was no notable increase of COC concentrations.

In December 2013, EPA issued a Technical Memorandum, *RE: Decision Framework for Pump and Treat Shutdown Based on Optimization Review Groveland Wells Numbers 1 and 2 Superfund Site*, which established criteria for stopping extraction and treatment operations. MassDEP, with approval from EPA, stopped extraction and treatment operations in April 2014.

The Site continues to undergo remediation through the process of natural attenuation for groundwater, as described in the 1996 ESD for OU1. Natural attenuation includes monitoring for parameters that indicate whether conditions are suitable for degradation as well as measuring concentrations of contaminants that remain in groundwater.

Institutional Control (IC) Review
The 1991 ROD required the establishment of institutional controls to prohibit use of groundwater in the contaminated area until cleanup levels have been achieved. Groundwater institutional controls were implemented in July and August 2014 to prohibit use of groundwater from the contaminated area in the form of Grants of Environmental Restrictions and Easements (Table 4, Figure 2). Institutional controls also restrict residential and agricultural use and activities that would affect the implementation, integrity or protectiveness of the selected remedy. The institutional controls are available for review on EPA's website for the Groveland Wells Superfund Site at:
https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.redevelop&id=0100750#Limits.

The Site is located in the town of Groveland Aquifer Protection District. The source area where institutional controls are in place is located in Zone 3 while the groundwater plume extends into Zone 2. The town of Groveland bylaws require special permitting for groundwater withdrawal out of Zone 2 (Figure 2). [3]

[3] Located at:
https://www.grovelandma.com/sites/grovelandma/files/uploads/zoning_bylaws_2018_adopted_at_town_meeting_-_april_30_2018.pdf

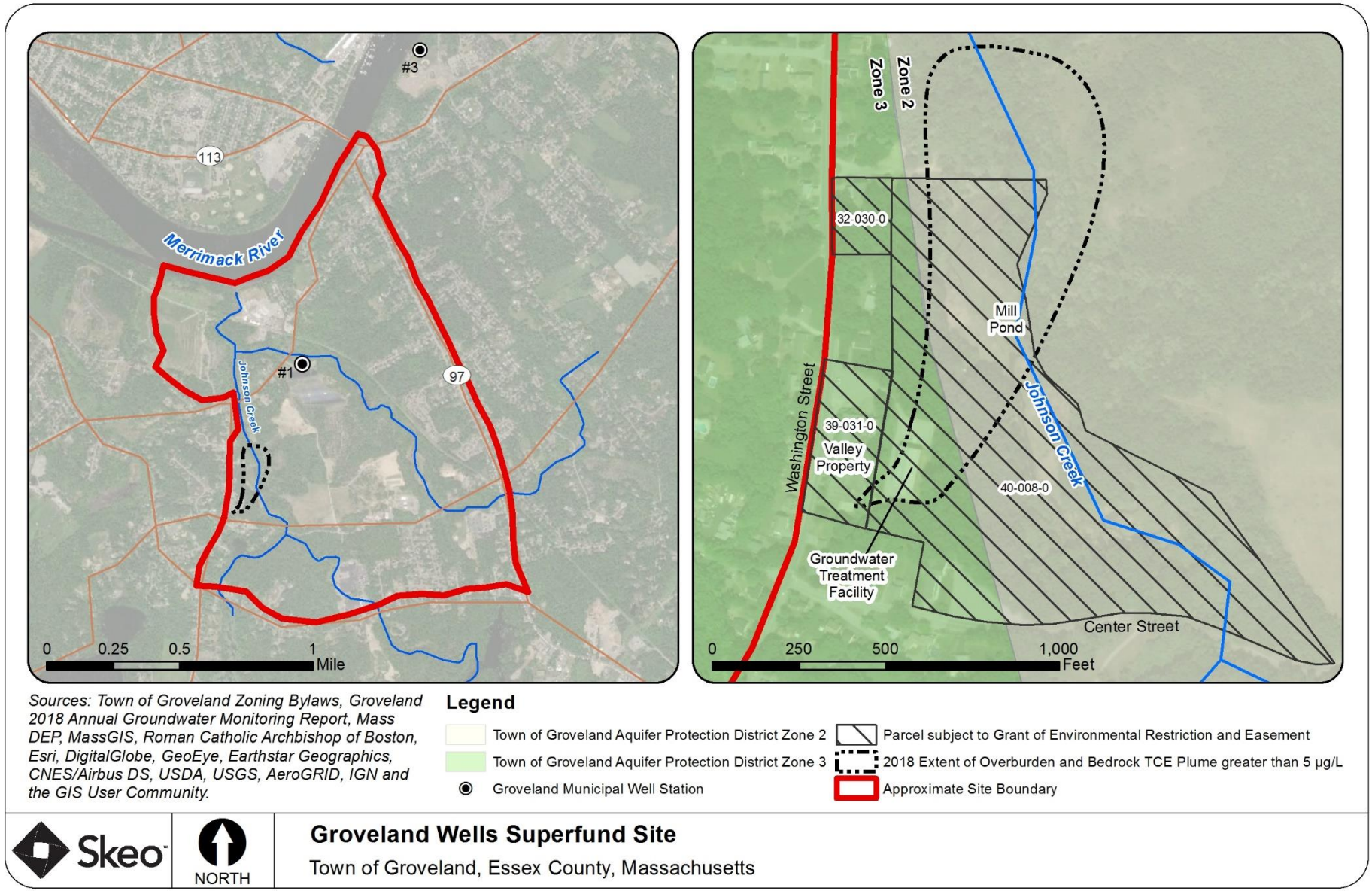
Table 4: Summary of Planned and/or Implemented Institutional Controls (ICs)

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)[a]	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater	Yes	Yes	32-030-0	Prohibit use of groundwater from the contaminated area until cleanup levels have been achieved.	Grant of Environmental Restriction and Easement Instrument Number 4014070100606 Book 33384, Page 331[b]
			39-031-0		Grant of Environmental Restriction and Easement Southern Essex District Registry 554225 (44222)[c]
			40-008-0		Grant of Environmental Restriction and Easement Instrument Number 201480600268 Book 33461, Page 328[d]
			Parcels above plume in Zone 2		Groveland Aquifer Protection District Zone 2

Notes:

a. Parcels identified from: http://massgis.maps.arcgis.com/apps/OnePane/basicviewer/index.html?appid=47689963e7bb4007961676ad9fc56ae9 (accessed 2/18/2020).
b. Online at: https://semspub.epa.gov/src/document/01/563919
c. Online at: https://semspub.epa.gov/src/document/01/588531
d. Online at: https://semspub.epa.gov/src/document/01/563920 and https://semspub.epa.gov/src/document/01/591648

Figure 2: Institutional Control Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Systems Operations/Operation and Maintenance (O&M)

EPA was responsible for the operation of the long-term response action from 2000 through 2011. Following this approximately 10-year period, the responsibility transferred to MassDEP. The groundwater treatment facility ceased operations in 2014 and therefore did not operate during this current FYR period from 2015 to 2020. MassDEP is in the process of decommissioning the groundwater treatment facility. MassDEP conducts long-term monitoring of groundwater for natural attenuation parameters and VOCs. The 2005 FYR states that "Several rounds of groundwater monitoring for metals were conducted prior to construction of the GWTF [groundwater treatment facility], but analysis for metals was discontinued when data showed that metals concentrations were below primary drinking water standards." Sampling was conducted quarterly through 2017. Beginning in 2018, two sentinel wells are sampled quarterly, and a comprehensive event is conducted annually.

Surface water samples were collected from Mill Pond in the spring of 2000, prior to groundwater treatment facility startup, and during the spring of 2001, 2002 and 2003. Samples were analyzed for VOCs and metals. The purpose of the sampling was to monitor the impact of the groundwater treatment facility discharge on Mill Pond. Results showed no significant difference in the level of contaminants or change in water quality in Mill Pond following startup of the groundwater treatment facility or after three years of operation. Surface water sampling was discontinued in 2004 because the treatment plant discharge had no adverse effects during the first three years of operation.

III. PROGRESS SINCE THE PREVIOUS REVIEW DG

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

Table 5: Protectiveness Determinations/Statements from the 2015 FYR Report

OU #	Protectiveness Determination	Protectiveness Statement
1	Short-term Protective	The remedy at OU1 MOM [management of migration] currently protects human health and the environment because ICs have been implemented, the MassDEP has increased the routine groundwater sampling frequency since GWTF shutdown in April 2014, and groundwater sampling results from sentinel monitoring wells have not detected COCs above laboratory reporting limits. However, in order for the remedy to be protective in the long term, the Town of Groveland needs to notify EPA and MassDEP if the Town of Groveland plans to increase pumping rates from municipal well number 1 or install a new drinking water supply well in this aquifer. MassDEP and their Drinking Water Program and EPA will review any proposed increase of pumping from the Towns drinking water supply in this aquifer.
2	Protective	The remedy at OU2 Source Control is protective of human health and the environment because the ERH [electrical resistance heating] remedy was completed, ICs have been implemented, and the MassDEP has increased the routine groundwater sampling frequency since GWTF shutdown in April 2014. The ISTT system effectively reduced contaminant concentrations in Source Area soil and groundwater. Groundwater sampling should continue until contaminant concentrations in the Source Area achieve cleanup goals.

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Short-term Protective	The current remedy is considered protective in the short term because ICs have been implemented, the MassDEP has increased the routine groundwater sampling frequency since GWTF shutdown in April 2014, and groundwater sampling results from sentinel monitoring wells have not detected COCs above laboratory reporting limits. However, in order for the remedy to be protective in the long term groundwater sampling results should continue to be evaluated for potential COC impacts to the Town of Groveland drinking water supply and if the Town of Groveland plans to increase pumping rates they must notify the State and EPA, and evaluate the effects of any proposed change in water supply pumping rates or any proposed new water supply well. Long-term protectiveness will be achieved once the MOM remedy achieves cleanup or protective levels in the groundwater. Institutional controls have been implemented to prevent exposure to contaminants until groundwater cleanup standards are achieved.

Table 6: Status of Recommendations from the 2015 FYR Report

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	The Town of Groveland has expressed interest in installing a new municipal water supply well in the aquifer off Center Street. Additional pumping in the aquifer may impact the groundwater contaminant plume, drawing it into the municipal well(s) or closer to downgradient residences.	Continue to require the Town of Groveland to evaluate all potential impacts of additional aquifer pumping prior to implementing any changes.	Ongoing	The Town continues to look for additional options for drinking water well locations. The Town is currently not evaluating drinking water well options in the area of the Site. If a drinking water well were to be installed in the aquifer off Center Street in the future, the Town of Groveland would need to evaluate all potential impacts of additional aquifer pumping prior to implementing any changes.	N/A

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

A press release was made available by online posting on 3/13/2020 at https://www.epa.gov/newsreleases/epa-begins-reviews-nine-massachusetts-superfund-site-cleanups-year (Appendix E). It stated that the FYR was underway and invited the public to submit any comments to the EPA. No comments or questions were received concerning this FYR. The results of the review and the report will be made available at the Site's information repository, Langley-Adams Library, located at 185 Main Street in Groveland, Massachusetts, on-line and at the EPA Records Center in Boston, MA.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date**.** The interviews are summarized below. Completed interview forms are included in Appendix F.

Janet Waldron, MassDEP project manager, said that the project has gone quite well once the source of contamination was mostly eliminated. The only concern that she is aware of is the Valley building itself. It has been condemned by the local fire department and the roof is falling in. She said that the potential for a future municipal well downgradient of the source area could be a concern if the well were to be located in bedrock. There is still bedrock contamination found at the Site and the bedrock has not been well defined. MassDEP's contractor feels that, overall, the project is a Superfund success story. Concentrations of TCE in the source area continue to exhibit a downward trend when compared to concentrations prior to and immediately following the ISTT. There have not been any unexpected O&M difficulties or opportunities to optimize O&M activities.

Colin Stokes, the Groveland Water & Sewer Superintendent, said that he has not had much interaction with the project since he has been in the role of superintendent. He said he feels well informed about site activities and the progress of the cleanup. He said that the Town is looking at additional well locations but not in the area of the Valley property. On March, 5, 2020, representatives from EPA met with the town and MA Senator Bruce Tarr, at the Site. The purpose of the Site visit was to discuss the possible reuse of the Valley property and walk around the exterior of the Valley building. There were no signs of trespassing, no evidence of homeless activity, and no signs of unauthorized access to the interior of the building. However, two portions of the pitched roof have collapsed into the interior of the building and portions of the cinder block wall are deteriorating.

Data Review

This section summarizes data collected during this FYR period. Groundwater monitoring is conducted in accordance with the 2015 Field Sampling Plan/Quality Assurance Project Plan. Groundwater sampling monitors the current remedy of natural attenuation and shows the extent of the groundwater plume. During this review period, sampling for emerging contaminants, 1,4-dioxane and per- and polyfluoroalkyl substances (PFAS), has been conducted.

TCE, cis-1,2-DCE and vinyl chloride are the only COCs that exceeded the IGCLs during this review period. It is unclear from the data collected since the shutdown of the groundwater treatment facility whether the remedy of natural attenuation will be effective in all areas of the plume to attain RAOs. More years of data may need to be collected to evaluate if natural attenuation is likely to attain RAOs in a reasonable time period.

Constituents have not been detected above the IGCLs in sentinel groundwater wells 3R and 109[4], which are located downgradient of the plume and upgradient from the Groveland drinking water wells. This demonstrates that the town well is protected.

Source Area and Downgradient Wells

Groundwater monitoring is conducted at the source area and downgradient of the source area to the north. During this review period, quarterly groundwater monitoring was conducted for all VOCs through 2017. Beginning in 2018, sampling was reduced to an annual comprehensive monitoring event conducted in the fall with quarterly groundwater monitoring for sentinel wells.

In general, TCE concentrations in the source area continue to exhibit a downward trend when compared to concentrations prior to and immediately following completion of ISTT in 2011 and groundwater treatment facility shutdown in April 2014. The only contaminants that continue to exceed IGCLs are TCE, cis-1,2-DCE and vinyl chloride. Table 7 shows maximum concentrations of these contaminants during this review period.

[4] Well 3R is shown in Figure 3. Well 109 is in the same location, but not shown on Figure 3 because of the extent.

Table 7: Maximum Concentrations of TCE, Cis-1,2-DCE and Vinyl Chloride

Contaminant	IGCL (µg/L)	2015 Maximum Concentration (µg/L)	2016 Maximum Concentration (µg/L)	2017 Maximum Concentration (µg/L)	2018 Maximum Concentration (µg/L)
TCE	5	**52** (TW-24)	**37** (TW-24)	**39** (TW-24)	**16** (EW-S1, EW-S4, EW-S5)
Cis-1,2-DCE	70	**420** (EW-M3)	**420** (EW-M3)	**390** (EW-M3)	**410** (EW-M3)
Vinyl chloride	2	**6.1** (ERT-9)	**4.4** (ERT-9)	**7.1** (ERT-9)	**3.1** (ERT-9)

Notes:
Bold = concentration exceeds IGCL
Source: 2015-2016 Annual Report Table 6-1 and 6-2; 2017 Annual Report Table 6-1 and 6-2; 2018 Annual Report Table 6-1.

TCE

The TCE overburden groundwater plume has been reduced significantly since cleanup began (see Figure 3). During groundwater treatment facility operation, the overburden TCE plume was reduced in size by about 95%, from 36 acres in 2000 to 1.8 acres in 2013. Following shutdown of the groundwater treatment facility in 2014, the plume expanded to approximately 4.59 acres in fall 2015 and has decreased slightly to about 4.21 acres based on fall 2017 and fall 2018 data.

In 2018, of the 35 wells sampled, 17 wells exceeded the 5 µg/L TCE IGCL. Figure 4 shows the approximate location of the current TCE plume in the bedrock in 2018. The bedrock TCE plume in fall 2018 extends from the source area north to just beyond bedrock monitoring well ERT-9 and bedrock extraction well EW-M3. This is consistent with groundwater flow direction and generally consistent with the estimated limits of the plume prior to groundwater treatment facility shutdown, except that the plume appears to extend a short distance beyond extraction well EW-M3, which may have previously captured contaminant flow at the northeast extent of the plume.

Cis-1,2-DCE

One (EW-M3) of the 35 wells sampled in 2018 exceeded the 70 µg/L cis-1,2-DCE IGCL. Figure 5 shows a trend of TCE and cis-1,2-DCE in EW-M3. It is located downgradient of the source area. . This well has exceeded the IGCL for TCE and cis-1,2-DCE since July 2014. The 2015 FYR suggested that the pumping at EW-S4 caused significant contaminant dilution in the samples collected during pumping. Post shutdown samples are collected using passive diffusion samples and likely represent the undiluted groundwater present under non-pumping conditions. The 2018 Annual Report says that the values indicate that some contaminated groundwater was likely migrating in the bedrock beneath Mill Pond. Continued long-term monitoring at the Site will provide a better understanding of contaminated groundwater flow through bedrock in the areas downgradient of the source area. Given the consistent concentrations of cis-1,2-DCE observed in this well during this review period, more years of data may need to be collected to evaluate if natural attenuation is likely to attain RAOs in a reasonable time period.

Downgradient bedrock well 108 has remained stable with respect to TCE and cis-1,2-DCE concentrations during this time period (Table D-2).

Vinyl chloride

Vinyl chloride exceeded the 2 µg/L IGCL at one well in 2018 with a concentration of 3.1 µg/L at ERT-09 (Table D-1).

PFAS

The fall 2018 groundwater sampling event included analyses for PFAS to evaluate whether and to what degree they are present on site. Table 8 shows the results of PFAS sampling at the Site. PFAS are present on site below EPA groundwater screening levels. In 2018, PFAS was not detected in the sentinel groundwater monitoring wells.

Table 8: 2018 PFAS Sampling

Well	EPA Screening Level Values (ppt)	PFAS (ng/L)
RW-03	40	4.8 (PFOA) 2.4 (PFOS)
RW-05	40	5.6 (PFOA) 5.0 (PFOS)
RW-10B	40	3.8 (PFHxA) 5.2 (PFOA)
ME-10D	40	4.9 (PFHxA) 2.5 (PFHpA) 7.9 (PFOA) 2.1 (PFOS)
3R	40	None detected
109	40	None detected
Source: Table 6-4 of the 2018 Annual Groundwater Monitoring Report for the Site, prepared for MassDEP.		

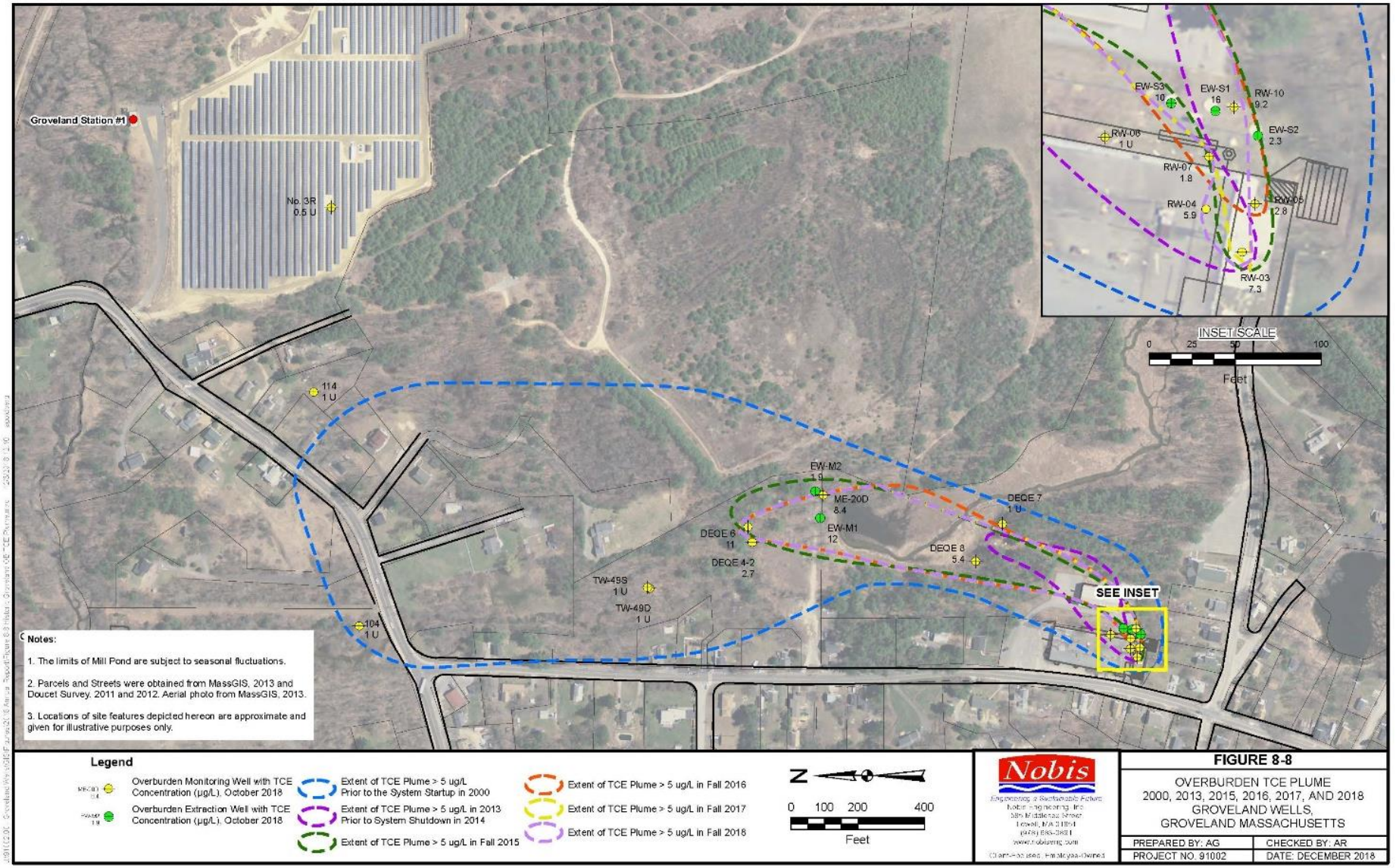
1,4-Dioxane

1,4-Dioxane was not detected during this review period. Detection limits ranged from 0.5 to 250 µg/L. In 2018, 1,4-dioxane detection limits in the sentinel wells was 0.5 µg/L. EPA has not established an MCL for 1,4-dioxane in drinking water, EPA's tapwater regional screening level (RSL) is 0.46 µg/L based on a 1 x 10^{-6} cancer risk and 57 µg/L based on noncarcinogenic hazard of 1.

Monitoring of Natural Attenuation Parameters

The annual reports summarize fall 2015, 2016 and 2017 analyses for natural attenuation parameters to evaluate whether and to what degree natural attenuation of contaminants is occurring within the contaminant plume. The reports say that the results of the screening process indicate that the potential for natural biodegradation is highly variable across the Site. The 2017 Annual Report summarizes that there is evidence to suggest that anaerobic degradation of TCE is occurring in some limited downgradient areas of the Site. The source area and the area immediately downgradient do not currently exhibit favorable conditions for natural anaerobic reduction of contaminants. The report says that this may be in part caused by the ISTT conducted in the source area in 2010 and 2011, which likely killed off resident populations of bacteria present prior to treatment and decreased the natural organic content in source area soils. Natural attenuation parameters were not collected or evaluated in the 2018 Annual Report.

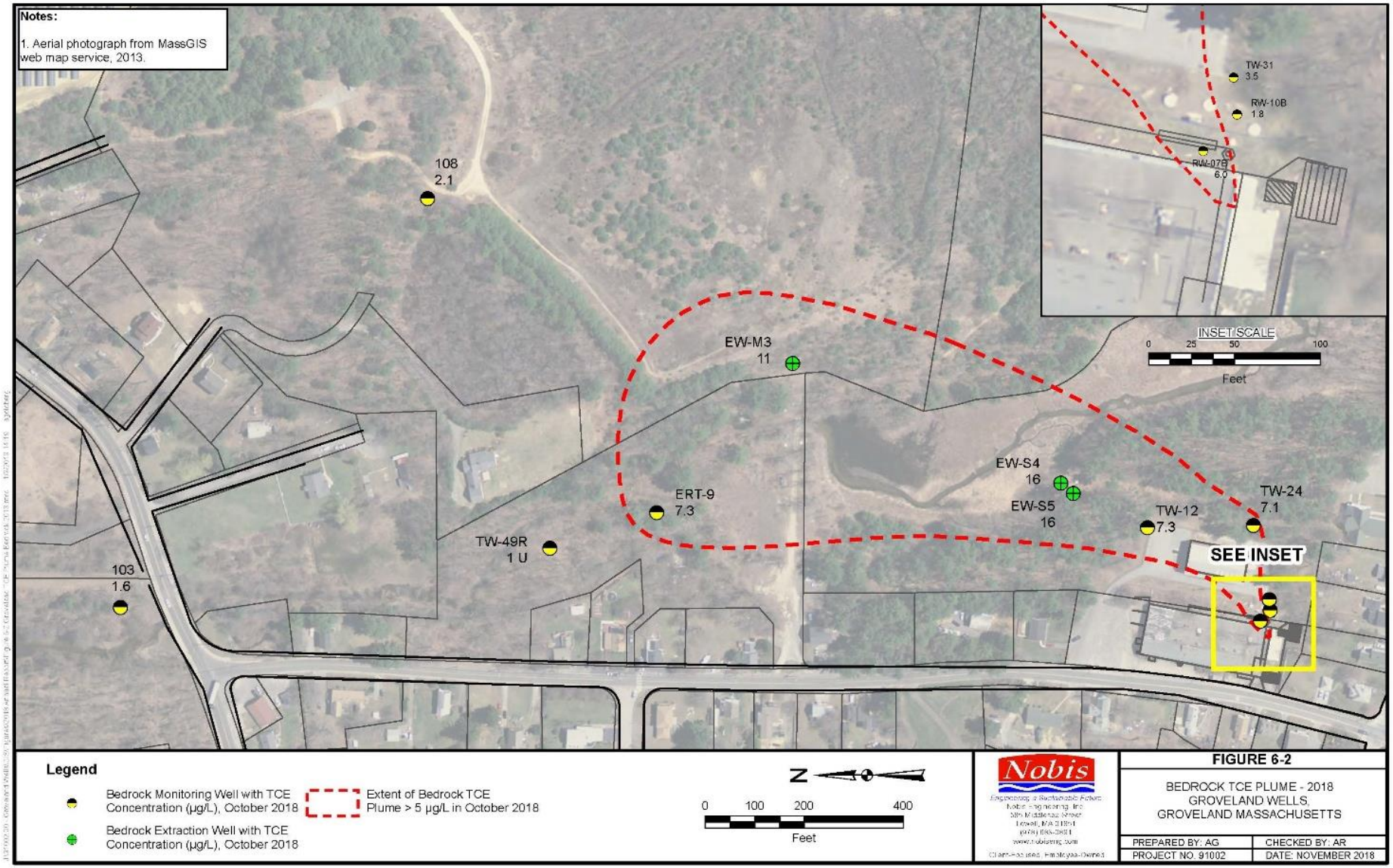
Figure 3: Overburden TCE Plume[5]



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

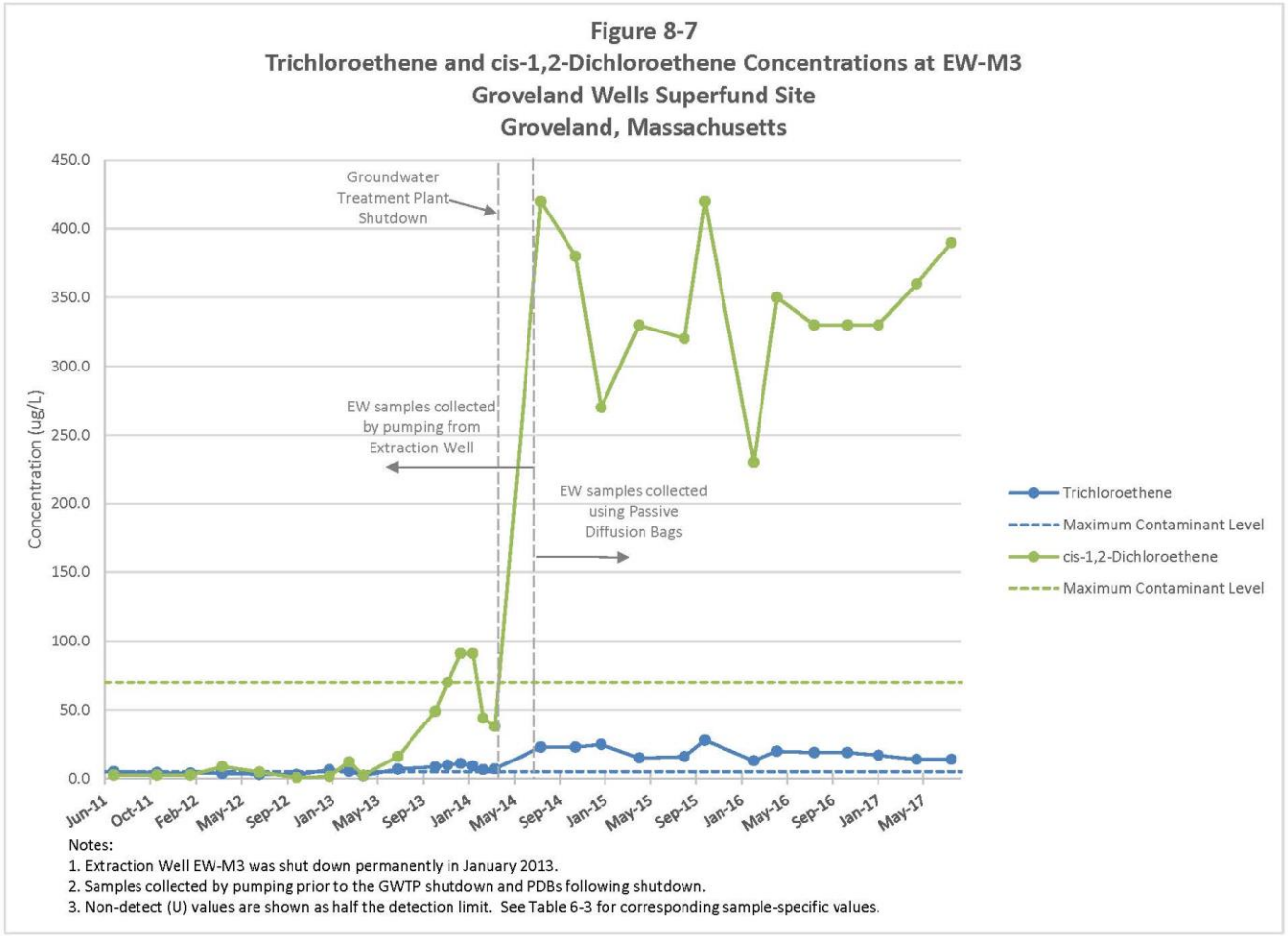
[5] Figure 8-8 of the 2018 Annual Monitoring Report.

Figure 4: Bedrock TCE Plume[6]



[6] Figure 6-2 of the 2018 Annual Monitoring Report.

Figure 5: TCE and 1,2-DCE Concentrations at Bedrock Well EW-M3[7]



[7] Figure 8-7 of the 2018 Annual Monitoring Report.

Site Inspection

The site inspection took place on 1/9/2020. Participants included EPA RPM Derrick Golden and EPA SAM Mandy Liao, MassDEP project manager Janet Waldron, and Johnny Zimmerman-Ward and Kirby Webster (EPA FYR support contractor Skeo). The purpose of the inspection was to assess the protectiveness of the remedy. Appendix G includes the site inspection checklist. Appendix H includes site inspection photos.

Site inspection participants met at the groundwater treatment facility, located at 62 Washington Street in Groveland, Massachusetts. The groundwater treatment facility is no longer being used. It is surrounded by a locked fence. The building has an operating security system. Participants discussed the history of the Site, including the operation and shutdown of the groundwater treatment facility. Site inspection participants discussed the current status of the groundwater plume and the current status of the institutional controls on the Site. There was also a brief discussion about the Valley Manufacturing Building and potential reuse of the land where the building is located at some point in the future. Inspection participants walked through the groundwater treatment facility and observed the treatment train that was in place when the facility was operating. Current plans are for the groundwater treatment building to be put into use by the Archdiocese of Boston.

Site inspection participants walked down to Mill Pond and observed some of the remaining groundwater monitoring wells that are submerged in the pond. No issues were observed that would bring into question the protectiveness of the remedy. Site inspection participants said that there have been no trespassing or vandalism issues at the site.

Skeo representatives visited the designated site information repository, Langley-Adams Library, located at 185 Main Street in Groveland, Massachusetts. EPA's 2016 fact sheet about the Site was available for viewing.

V. TECHNICAL ASSESSMENT

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

Question A Summary:
Yes, the remedy is functioning as intended by the decision documents, the 1996 ESD's and the 2007 ESD. The OU1 remedy included the establishment of IGCLs, installation of a groundwater extraction and treatment system, and institutional controls. The OU2 remedy included soil treatment and groundwater treatment in conjunction with the OU1 remedy. It also included natural attenuation and groundwater monitoring. Groundwater extraction and treatment stopped in April 2014. The Site continues to undergo remediation through the process of natural attenuation. Groundwater data indicate concentrations continue to decline, with the exception of cis-1,2-DCE in EW-M3. This well should continue to be monitored closely. In the past, the town of Groveland has expressed interest in installing a new municipal water supply well in the aquifer off Center Street. Additional pumping in the aquifer may impact the groundwater contaminant plume, drawing it into the municipal well(s) or closer to downgradient residences. The OU2 soil remedy has effectively treated most of the source soils. Institutional controls are in place to control unacceptable exposures to remaining soil and groundwater contamination.

Remedial Action Performance

The remedial actions of groundwater and soil treatment have been effective in treating the soil and groundwater. Since groundwater treatment facility shutdown in 2014, the groundwater plume appears to have stabilized, but cis-1,2-DCE consistently exceeding IGCLs in EW-M3.

System Operations/O&M

Current O&M activities indicate procedures are working in a manner that will continue to maintain the effectiveness of the remedy. In 2018, groundwater sampling was reduced from quarterly to annual. Sentinel wells continue to be monitored quarterly.

Implementation of Institutional Controls and Other Measures

The Site is located in the town of Groveland Aquifer Protection District. The groundwater plume extends into the area where the town of Groveland bylaws require special permitting for groundwater withdrawal. Institutional controls, in the form of Grants of Environmental Restrictions and Easement, have been put in place on three site properties: 46 Washington Street, 64 Washington Street and 114 Center Street. In order to ensure compliance with Institutional Controls in place at the Site, the public should refer to the IC section of the Groveland Wells Superfund Site Profile Page at https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.redevelop&id=0100750#Limits. The information contains the actual IC legal instruments in place at the Site that are necessary to ensure that the Site remains protective of human health, and a form by which the public may request additional assistance.

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

Question B Summary:
No. There have been changes in toxicity values, exposure assumptions, exposure pathways and methods of evaluating risk, potential standards, and TBCs since the 1988 and 1991 RODs and subsequent ESDs were issued as discussed below. The changes as described below are not expected to alter the protectiveness of the remedy because of availability of public water and ICs in place preventing use of Site-impacted groundwater.

Changes in Standards and TBCs

While there have been some changes in groundwater standards, none of the changes could call into question the protectiveness of the remedy (Appendix I). In addition, there are currently no completed exposure pathways. At such time that interim groundwater cleanup levels have been attained, the 1991 OU1 ROD indicates that a risk evaluation will be performed to determine whether the remedial action is protective.

Appendix J provides a screening level risk review of soil cleanup goals. The cleanup levels used at the time of the remedy are still valid.

PFAS:

In May 2016, EPA issued final lifetime drinking water HA for PFOA and PFOS. The EPA HA for PFOA and PFOS is 70 nanogram per liter (ng/L) or part per trillion (ppt) individually or combined. See also EPA's *Interim Recommendations to Address Groundwater Contaminated with Perfluorooctanoic Acid and Pefluorooctanesulfonate* [OSWER DIRECTIVE 9283.1-47, Dec. 19, 2019]

In June 2019, MassDEP established an Office of Research and Standards Guideline (ORSG) level for drinking water that extended the EPA advisory to include PFOS, PFOA, perfluorononanoic acid (PFNA), perfluorohexane sulfonic acid (PFHxS), and perfluoroheptanoic acid (PFHpA). The ORSG level is 70 ng/L (ppt) and applies to the total summed level of all five compounds. MassDEP has proposed an MMCL of 20 ng/L (ppt) for these five compounds plus PFDA; public comment closed in February 2020.

1,4 Dioxane:

Using 2013 updated IRIS toxicity information and the standard Superfund risk assessment approach, EPA's carcinogenic risk range of 10-6 to 10-4 for 1,4-dioxane equates to a concentration range of 0.46 to 46 micrograms per liter (µg/L) (parts per billion (ppb)).

Changes in Toxicity and Other Contaminant Characteristics

- ***2016 PFOA/PFOS*** *non-cancer toxicity values*

In May 2016, EPA issued final lifetime drinking water health advisories for PFOA and PFOS, which identified a chronic oral reference dose (RfD) of 2 x 10^{-5} mg/kg-day for PFOA and PFOS (USEPA, 2016). These RfD values should be used when evaluating potential risks from ingestion of contaminated groundwater at Superfund sites where PFOA and PFOS might be present based on site history. Potential estimated health risks from PFOA and PFOS, if identified, would likely increase total site risks due to groundwater exposure. Further evaluation of potential risks from exposure to PFOA and PFOS in other media at the Site might be needed based on site conditions and may also affect total site risks.

- ***2014 Perfluorobutanesulfonic Acid (PFBS)*** *non-cancer toxicity value*

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

PFAS at the Groveland NPL Site:

The fall 2018 groundwater sampling event included analyses for PFAS to evaluate whether and to what degree it is present on site. PFAS is present on site below EPA's groundwater screening level of 40 ppt. PFAS is not present in the sentinel wells and detections of PFAS do not impact the protectiveness of the remedy because public water is available and ICs are in place preventing exposure to groundwater.

Changes in Risk Assessment Methods

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

In 2014, EPA finalized a Directive to determine groundwater exposure point concentrations (EPCs) https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=236917. This Directive provides recommendations to develop groundwater EPCs. The recommendations to calculate the 95% upper confidence limit of the arithmetic mean concentration for each contaminant from wells within the core/center of the plume, using the statistical software ProUCL, could result in lower groundwater EPCs than the maximum concentrations routinely used for EPCs as past practice in risk assessment, leading to changes in groundwater risk screening and evaluation. In general, this approach could result in slightly lower risk or higher screening levels (Reference: EPA. 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1- 120. February 6, 2014.)

Changes in Exposure Pathways

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

In 2014, EPA finalized a Directive to update standard default exposure factors and frequently asked questions associated with these updates. https://www.epa.gov/sites/production/files/2015-11/documents/oswer_directive_9200.1-120_exposurefactors_corrected2.pdf. Many of these exposure factors differ from those used in the risk assessment(s) supporting the ROD(s). These changes in general would result in a slight decrease of the risk estimates for most chemicals. (Reference: USEPA. 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February 6, 2014.)

- ***2018 EPA VISL Calculator***

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

Vapor intrusion (VI) was not identified as an exposure pathway in the original risk assessment; however, has since been identified as a potential exposure concern if a residential or commercial/industrial building were to be built above the most contaminated portion of the groundwater plume. Appendix J includes a VI screening for the groundwater data collected in 2018. The screening results indicate that a complete VI pathway would not result in unacceptable risks for a commercial/industrial worker; however unacceptable risks for a future resident could occur if a VI pathway were to become complete. A Grant of Environmental Restrictions and Easement currently restricts residential and agricultural use of this property. If land use were to change at the Site, additional lines of evidence may be needed to determine if the vapor intrusion pathway is a complete exposure pathway.

Expected Progress Toward Meeting RAOs

The remedy has been progressing as expected toward meeting RAOs. The only RAO that has not yet been met is to restore the groundwater quality to meet federal and state drinking water standards or goals, as well as other ARARs and/or protective levels. It is unclear from data collected since shutdown of the groundwater treatment facility whether the remedy of natural attenuation will be effective in all areas of the plume to attain RAOs. More years of data may need to be collected to evaluate if natural attenuation is likely to attain RAOs in a reasonable time period.

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

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

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
OU2

Issues and Recommendations Identified in the FYR:

OU(s): 1	**Issue Category: Other**			
	Issue: The town of Groveland may be interested in installing a new municipal water supply well in the Center Street aquifer. Additional pumping in the aquifer may impact the groundwater contaminant plume, drawing it into the municipal well(s) or closer to downgradient residences.			
	Recommendation: Continue to require the town of Groveland to evaluate all potential impacts of additional aquifer pumping prior to implementing any changes.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Other	EPA/State	6/30/2023

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement	
Operable Unit: 1	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The remedy at OU1 currently protects human health and the environment because there are no completed exposure pathways to remaining contaminated groundwater. However, in order for the remedy to be protective in the long term, the following action needs to be taken: continue to require the town of Groveland to evaluate all potential impacts of additional aquifer pumping prior to implementing any changes to ensure protectiveness.	

Protectiveness Statement	
Operable Unit: 2	*Protectiveness Determination:* Protective
Protectiveness Statement: The remedy at OU2 is protective of human health and the environment. Remedial components for OU2 have been completed and RAOs have been met for this OU.	

Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedy at the Site currently protects human health and the environment because there are no completed exposure pathways to remaining contamination. However, in order for the remedy to be protective in the long term, the following action needs to be taken: continue to require the town of Groveland to evaluate all potential impacts of additional aquifer pumping prior to implementing any changes to ensure protectiveness.

VIII. NEXT REVIEW

The next FYR Report for the Groveland Wells Superfund site is required five years from the completion date of this review, in June of 2025.

APPENDIX A – REFERENCE LIST

2015-2016 Data Evaluation Report. Groveland Wells Superfund Site. Long Term Groundwater Monitoring. Prepared for Massachusetts Department of Environmental Protection by Nobis Engineering. May 3, 2017.

2017 Data Evaluation Report. Groveland Wells Superfund Site. Long Term Groundwater Monitoring. Prepared for Massachusetts Department of Environmental Protection by Nobis Engineering, Inc. February 2018.

2018 Groundwater Data Evaluation Report. Groveland Wells Superfund Site. Long Term Groundwater Monitoring. Prepared for Massachusetts Department of Environmental Protection by Nobis Group. February 2019.

Data Evaluation Report for Remedial Action. Spring 2003 Monitoring Round. Groveland Wells Nos. 1 and 2 Superfund Site Operable Unit No. 1. Groveland, Massachusetts. Prepared by Metcalf & Eddy. December 2003.

Declaration for the Record of Decision. Groveland Wells Nos. 1 & 2, Operable Unit 1. Groveland, Massachusetts. EPA Region 1. September 30, 1991.

Explanation of Significant Differences (ESD). Groveland Wells Nos. 1 & 2 Superfund Site. Source Control/Operable Unit II. U.S. Environmental Protection Agency. Region 1 – New England. September 2007.

Federal Reserve Notice on the 2016 Health Advisories for PFOA and PFOS. Ground Water and Drinking Water. U.S. EPA. May 25, 2016.

Final Explanation of Significant Differences. Management of Migration Operable Unit. Groveland Wells Nos. 1 & 2 Site. U.S. EPA Office of Site Remediation and Restoration. November 15, 1996.

Final Explanation of Significant Differences. Source Control Operable Unit. Groveland Wells Nos. 1 & 2 Site. U.S. EPA Office of Site Remediation and Restoration. November 15, 1996.

Five-Year Review Report for Groveland Wells Nos. 1 & 2 Superfund Site. Groveland, Essex County, Massachusetts. Prepared by: United States Environmental Protection Agency, Region 1, Boston, Massachusetts. June 2005.

Optimization Review. Groveland Wells Number 1 and 2 Superfund Site. Town of Groveland, Essex County, Massachusetts. United States Environmental Protection Agency. Office of Solid Waste and Emergency Response. January 2013.

Remedial Action. Volume I – Text, Tables, and Figures. Groveland Wells Superfund Site – Operable Unit 2. Prepared by Nobis Engineering, Inc. for US Environmental Protection Agency Region 1. September 2011.

Second Five-Year Review Report for Groveland Wells Numbers 1 and 2. Groveland, Massachusetts. Prepared by The United States Environmental Protection Agency, Region 1, New England, Boston, Massachusetts. June 2010.

Superfund Record of Decision, Groveland Wells, MA. First Remedial Action. U.S. Environmental Protection Agency. September 30, 1988.

Technical Memorandum. Decision Framework for Pump and Treat (P&T) Shutdown Based on Optimization Review Groveland Wells Number 1 and 2 Superfund Site. EPA ERT. December 12, 2013.

Third Five-Year Review Report for Groveland Wells Numbers 1 and 2 Superfund Site. Groveland, Massachusetts. U.S. Environmental Protection Agency, Region 1, Boston, Massachusetts. June 29, 2015.

APPENDIX B – SITE CHRONOLOGY

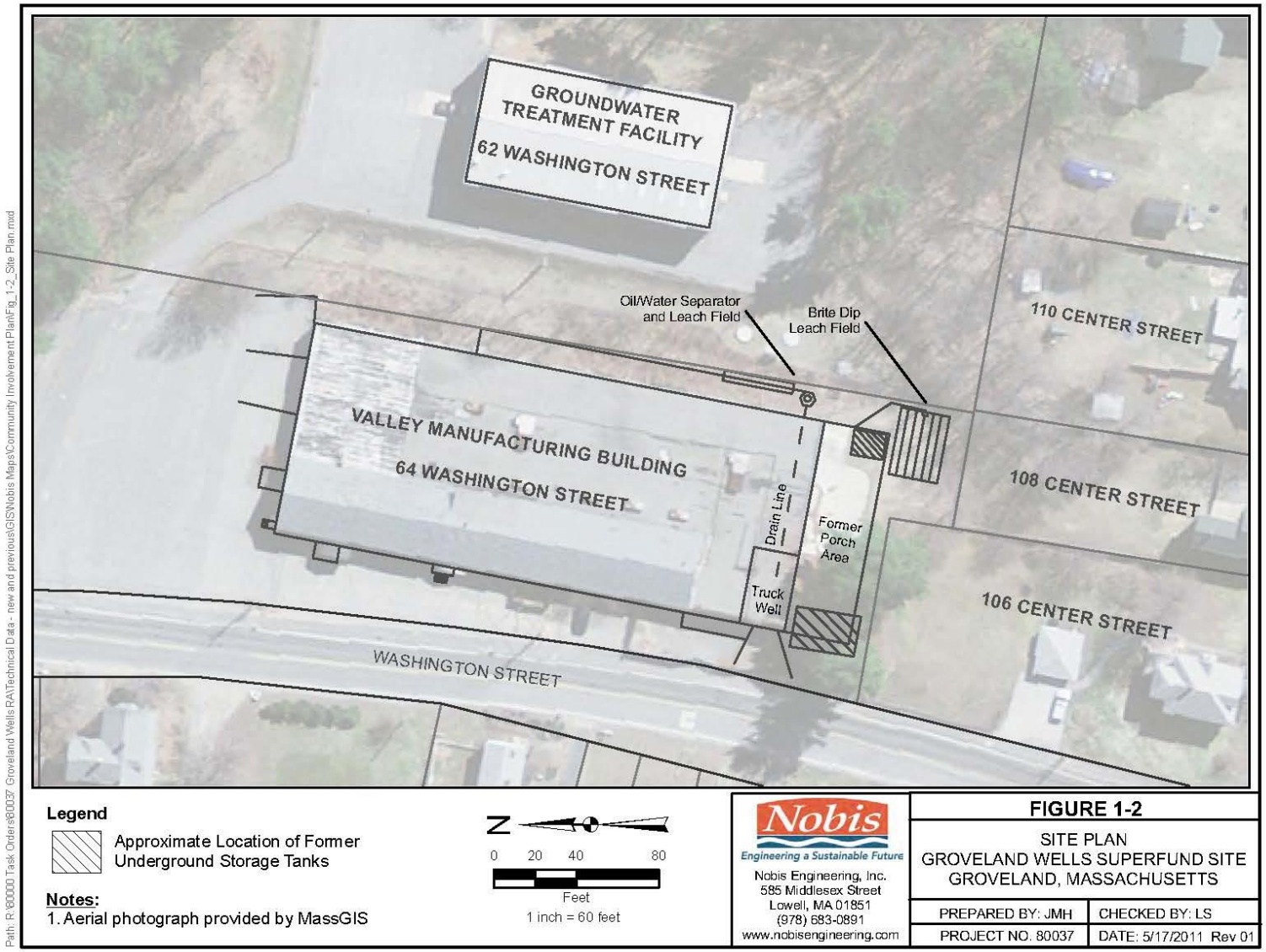
Table B-1: Site Chronology

Event	Date
GRC leased property at 64 Washington Street in Groveland to house a metal products manufacturing plant	May 1963
GRC began metal products manufacturing operations	May 1963
Groveland municipal well Station No. 1 put into operation	1965
GRC purchased property at 64 Washington Street in Groveland	November 1966
Groveland municipal well Station No. 2 put into operation	1973
TCE detected in Station No. 1; well was shut down	May 1979
Valley Manufactured Products acquired GRC's manufacturing operations	August 1979
TCE detected in Station No. 2; Groveland municipal well Station No. 3 put into operation	September 1979
Station No. 2 permanently shut down	October 1979
EPA added the Site to the NPL	December 1982
Valley completed OU1 RI	1985
Valley completed OU1 FS	August 1986
MassDEP issued amendment to 1984 consent order requiring Valley/GRC to construct a groundwater interceptor treatment unit north of Mill Pond	1986
Activated carbon treatment system installed and Station No. 1 reactivated	1987
EPA issued consent order to Valley and GRC to conduct a supplemental RI	September 1987
Pilot study conducted of soil vapor vacuum extraction system at OU2	Late 1987 – Early 1988
Valley/GRC installed Mill Pond groundwater extraction/treatment system	April 1988
Valley/GRC subcontractor completed the Final Phase I Supplemental RI Report	July 1988
EPA subcontractors completed the supplemental FS for the Valley property	August 1988
EPA signed the OU2 ROD	September 1988
EPA subcontractor completed supplemental OU1 RI Report	February 1991
EPA subcontractor completed the supplemental OU1 FS	July 1991
EPA signed the OU1 ROD	September 1991
EPA issued an Administrative Order to Valley/GRC to remediate soil and groundwater at OU2	March 1992
EPA issued an Administrative Order to Valley/GRC to remediate groundwater contamination that had migrated beyond the Valley property	May 1992
Valley/GRC informed EPA that they could not comply with the Administrative Order to remediate OU1	June 1992
EPA issued a Notice of Failure to Comply to Valley/GRC for failure to initiate work to remediate OU1	August 1992
EPA approved the SVE and groundwater treatment system design for the Valley property	August 1992
Valley/GRC informed EPA that they could not continue to comply with the Administrative Order for remediation of OU2	October 1992
EPA issued a Notice of Failure to Comply to Valley/GRC for failure to continue OU2 remedial work	November 1992
EPA learned that the SVE system had been constructed and was in operation	December 1992
EPA issued a Second Notice of Failure to Comply to Valley/GRC for failure to submit monthly progress reports on the SVE system	January 1993
Town took activated carbon treatment system at Station No. 1 offline, with approval from MassDEP, because TCE contamination had not been detected in the influent water since 1989	May 1994

Event	Date
Valley/GRC began routine submission of monthly progress reports to EPA	June 1994
EPA approved the 100% design for the OU1 groundwater extraction and treatment system	January 1995
EPA put construction of the OU1 groundwater extraction and treatment facility on hold because of budget constraints	Spring 1995
EPA conducted sampling of 22 monitoring wells and determined that the plume had decreased in extent	March 1996
EPA issued ESDs for OU1 and OU2, modifying the remedies to treat groundwater from both OUs in a combined facility	August 1996
EPA approved the final design for the combined facility	April 1997
Mobilization and site clearing began for the combined facility	April 1999
New groundwater extraction and treatment system started up and Mill Pond system was shut down	April 2000
Routine O&M activities for groundwater extraction and treatment system began	May 2000
Remedial action subcontractor submitted Operational and Functional Completion Report and certification to EPA	September 2000
Operational and Functional Completion Report and certification submitted to EPA and revised to address MassDEP comments	March 2001
Valley ceases manufacturing operations	2001
SVE system shut down and abandoned by responsible parties	April 2002
Remedial System Evaluation Report completed for the groundwater treatment facility	September 2002
EPA initiated source area re-evaluation	April 2004
EPA issued Site's first FYR Report	June 26, 2005
EPA performed chemical oxidation pilot study as part of the source area re-evaluation	2006
EPA removed six USTs and the Brite Dip system leaching field from Valley property	August 2006
EPA source area re-evaluation completed; report recommended using thermal treatment technologies to treat residual contamination in the source area	September 2006
EPA issued an ESD outlining the enhancement of the existing SVE system with a thermal treatment system; the ESD was also written to address the recalculation of the soil cleanup levels originally specified in the 1988 ROD	September 2007
EPA and Valley GRC entered into a Consent Decree stating Valley/GRC will pay the government 100% of the net sale or net lease proceeds from the property	January 2008
Construction of the enhanced OU2 source control remedial action began with site clearing and surveying	April 2009
Construction of the ISTT system began	March 2010
EPA issued Site's second FYR Report	June 29, 2010
ISTT construction completed and ISTT system startup in source area	August 2010
Completion of ISTT remediation of source area soil and overburden groundwater	February 2011
Completion of confirmatory soil and groundwater sampling for OU2 remedial action	August 2011
MassDEP shut down the groundwater treatment facility with concurrence from EPA	April 2014
The EPA issued the Site's third FYR Report	June 29, 2015
EPA begins the fourth FYR Report	December 2019
MassDEP dismantles and auctions the groundwater treatment system equipment	January 2020

APPENDIX C – SITE MAPS

Figure C-1: Source Area Layout[8]



[8] Figure 1-2 from the OU2 Final Remedial Action Report.

APPENDIX D – DATA TABLES

Table D-1: Summary Statistics for 2018[9]

Table 6-1
Summary Statistics for TCE, cis-1,2-DCE, and VC in Monitoring Wells and Extraction Wells
Groveland Wells Superfund Site
Groveland, Massachusetts

Chemical Name	Units	Sample Date	No. of Locations Sampled	No. of Samples Analyzed	No. of Detects	Percent Detected	MCL	No. of Samples Above MCL	Percent Detected Above MCL	Max Concentration Detected	Min Concentration Detected	Average Concentration Detected	Overall Average Concentration	Max Location
Source Area - VOC														
Trichloroethene	ug/L	Fall 2018	12	12	11	92%	5	6	50%	16	1.8	6.1	5.6	EW-S1
cis-1,2-Dichloroethene	ug/L	Fall 2018	12	12	10	83%	70	0	0%	17	1	5.1	4.3	RW-03
North of Source Area - VOC														
Trichloroethene	ug/L	Fall 2018	23	23	12	52%	5	9	39%	16	1.6	7.41	4.68	EW-S4 & EW-S5
cis-1,2-Dichloroethene	ug/L	Fall 2018	23	23	13	57%	70	1	4%	410	1.1	41.5	25.9	EW-M3
Vinyl chloride	ug/L	Fall 2018	23	23	1	4%	2	1	4%	3.1	3.1	3.10	1.03	ERT-9

Notes:

1. Statistics are presented for cis-1,2-DCE, TCE, and vinyl chloride in monitoring and extraction wells during sampling events in 2018. The only other VOCs detected in monitoring and extraction wells were acetone, 1,1-Dichloroethylene, trans-1,2-Dichloroethylene, and Benzene which are not considered COCs for the Site.
2. See Table 3-1 for monitoring well locations included in the data set for each sampling event.
3. Duplicate samples from same sample location are considered as one sample for the purposes of these summary statistics.
4. All concentrations are micrograms per liter (µg/L).
5. Maximum Contaminant Level (MCL)-Federal/Massachusetts MCL current as of June 2016. MCL/MMCL set as the Interim Groundwater Cleanup Level (IGCL) in the Record of Decision (USEPA, 1991).
6. Average concentrations detected exclude non-detect values.
7. Overall average was calculated using one half (1/2) the detection limit values at locations where analytes were not detected.

[9] Table 6-1 from the 2018 Final Data Evaluation Report. Nobis Engineering.

Table D-2: TCE and cis-1,2-DCE from 2009-2018[10]

Table 6-2
Cis-1,2-Dichloroethene and Trichloroethene Concentrations Detected in Monitoring Wells - August 2009 through October 2018
Groveland Wells Superfund Site
Groveland, Massachusetts
Page 1 of 5

WELL ID	Source Area													
	RW-03		RW-04		RW-05		RW-06		RW-07		RW-07B		RW-10	
Aquifer	Overburden		Overburden		Overburden		Overburden		Overburden		Bedrock		Overburden	
Date	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE
08/09[2]	260 DJ	11,000 D	57	290 D	325 DJ	11,000	5 U	5 U	37	83	4.5 J	52	180 D	390 D
10/09	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/10	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10/10	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
04/11	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
08/11	11	17	14	20	78 [1]	78 [1]	4.7 J	8.9	9.2	11	5 U	7.2	1.9 J	1.9 J
12/11	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
06/12	23 [2]	29 [2]	NS	NS	68 [2]	32 [2]	NS	NS	NS	NS	NS	NS	20 [2]	20 [2]
11/12	130 [1]	27 [2]	9.2	17	32 [3]	14 [3]	3.8	14	NS	NS	1.4 [3]	2.6 [3]	6.6	6.2
05/13	6.3 [3]	9.5 [3]	9.5	20	21	7.4	2.4 [3]	5.6 [3]	6.6 [3]	10 [3]	1 U	1.8	16 [3]	7.5 [3]
06/13	4.65 [1]	4.65 [1]	17	24	18	13	1 U	1.6	2.9	4.4	1 U	1.7	9.5	4.1
07/13	1.25 [1]	3.65 [1]	4.8	9.3	24	11	1 U	1 U	4.9	7.3	1 U	1.6	33	11
08/13	2.55 [1]	3.5 [1]	4.9	16	36	8.3	2.7	5.5	4.6	6.9	1 U	1.5	15	4.6
09/13	13 [1]	5.8 [1]	14	12	20	7.9	3.4	6.4	11	9.1	1 U	1.9	8.4	2.6
10/13	52.5 [1]	18 [1]	14	9.4	8.3	4.2	2.8	5.5	12	7.4	1 U	2.2	4.8	1.9
11/13	14.5 [1]	5.9	12	8.1	6.8	2.9	2.9	7.3	15	6.2	1.0 U	2.4	9.6	3.4
12/13	10.75 [1]	4.7 [1]	3.6	6.8	6.0	1.8	2.9	8.1	21	8.9	1.0 U	2.3	5.6	2.4
1/14	20 [1]	14 [1]	6.4	8	9.8	3.6	3.2	9.6	15	8.8	1 U	2.7	9.5	3.5
2/14	2.4 [1]	7.3 [1]	23	9.8	46	6.9	3.6	11	18	8.1	1.0 U	3.3	12	4.4
3/14	NS	NS	19	9.7	34	6.2	2.3	9	21	6.9	1.0 U	2.8	11	4.2
4/14	1.45 [1]	2.25 [1]	31	28	42	9.2	1.0 U	1.0 U	19	8.7	1.0 U	2.9	52	17
7/14	70 [1]	21 [1]	1.6	3.6	4.9	4.7	2.8	6.8	5.6	8.4	1 U	2.8	20.5 [1]	9.8 [1]
10/14	140 [1]	49.5 [1]	1	2.8	14	5.1	3.3	6.7	5.1	6.3	1 U	3.3	21	9.9
01/15	NS	NS	7.2	7.5	NS	NS	1 U	1 U	10	5.7	NS	NS	NS	NS
04/15	1 U	1.8	18	16	45	6.1	1 U	1 U	4.9	6.8	1 U	3.6	20	11
07/15	NS	NS	4.3	6.4	NS	NS	2.3	4.4	2.8	9.2	NS	NS	NS	NS
10/15	190	42	1.9	4.5	8.3	8	2.2	3.7	6.1	7.6	1.6	5.8	26	8.7
2/16	NS	NS	1.7	7.7	NS	NS	1.6	6.1	21	10	NS	NS	NS	NS
4/16	1 U	1.5	7.2	12	2.1	1.7	1 U	2.2	12	5.9	1.4	4.8	17	14
7/16	NS	NS	1.8	10	NS	NS	1.6	3.9	8.2	4.9	NS	NS	NS	NS
10/16	10	2.7	1 U	2.5	10	4.9	1.1	3.3	5.6	3.7	1.5	5.4	13	10
1/17	NS	NS	2	8.6	NS	NS	1	6.7	12	13	NS	NS	NS	NS
4/17	1 U	2.1	1.2	2.5	1.4	1.3	1 U	1 U	14	19	1.6	6.2	33	34
7/17	NS	NS	1.4	3.5	NS	NS	1 U	1 U	4.4	4.3	NS	NS	NS	NS
10/17	73	8.4	1 U	4.8	4.1	4	1 U	2.2	1.9	1.8	1	5	10	5.9
10/18	17	7.3	1 U	5.9	1	2.8	1 U	1 U	1.7	1.8	1.6	6	6.2	9.2

Notes:
All groundwater samples were collected using PDB technology unless otherwise noted.
[1] A field duplicate was collected at this location and the value reported is the average of the two detections.
[2] Samples were collected using low flow sampling methods until the Summer 2015 sampling event, when PDB technology began being
BOLD/SHADE - Detected concentration exceeds the applicable Interim Groundwater Cleanup Level.
Monitoring well was installed after this sampling event.

[10] Table 6-2 and 6-3 from the 2018 Final Data Evaluation Report. Nobis Engineering.

Table 6-2
Cis-1,2-Dichloroethene and Trichloroethene Concentrations Detected in Monitoring Wells - August 2009 through October 2018
Groveland Wells Superfund Site
Groveland, Massachusetts

WELL ID	Source Area													
	RW-10B		TW-31		RW-01		RW-02		RW-08		RW-09		MPE-06	
Aquifer	Bedrock		Bedrock		Overburden		Overburden		Overburden		Overburden		Overburden	
Date	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE
08/09[2]	5 U	1.4 J	5 U	**8.7 B**	5 U	5 U	3.1 J	**15**	5 U	4 J	2.8 J	**10**		
10/09	NS	NS	5 U	5 J	NS	NS	NS	NS	NS	NS	NS	NS		
5/10	NS	NS	5.0 U	3 J	NS	NS	NS	NS	NS	NS	NS	NS		
10/10	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		
04/11	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		
08/11	5 U	5 U	4.1 J	**38**	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NS	NS
12/11	NS	NS	1.3	**13**	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
06/12	NS	NS	1.6	**6.4**	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/12	1 U[3]	1 U[3]	1.2	4.5	1 U[3]	1 U[3]	1 U[3]	1 U[3]	1 U[3]	1 U[3]	1 U[3]	1 U[3]	NS	NS
05/13	1 U	1 U	1 U	**8**	1 U	1 U	1 U	1 U	NS	NS	1 U[3]	1	1 U	3.7[3]
06/13	NS	NS	1 U	4.9	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
07/13	NS	NS	1 U	4	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
08/13	NS	NS	1 U	4.1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
09/13	NS	NS	1 U	3.7	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10/13	NS	NS	1 U	3.6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/13	1.0 U	1.0 U	1.0 U	3	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.3
12/13	NS	NS	1.0 U	2.9	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1/14	NS	NS	1 U	3.4	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/14	NS	NS	1.1	4.3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3/14	NS	NS	1.0 U	3.6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4/14	NS	NS	1.0 U	**5.5**	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/14	1.8	1.4	2.9	3.8	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10/14	1.5	1.4	2.2	3.2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
01/15	NS	NS	10[1]	**5.5**[1]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
04/15	3.4	2.2	3.9	3.4	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
07/15	NS	NS	2.95[1]	3.45[1]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10/15	3.2	1.9	1.8[1]	3.0[1]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/16	NS	NS	1 U[1]	1.95[1]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4/16	3.4	2.5	5.8[1]	3.45[1]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/16	NS	NS	2.65[1]	2.3[1]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10/16	2.9	1.9	1.3	2.6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1/17	NS	NS	2	2.5	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4/17	2.7	2.7	6.6	4.8	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/17	NS	NS	3.3	4.8	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10/17	2.2	1.8	2.2	3.7	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10/18	1.7	1.8	3	3.5	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Notes:
All groundwater samples were collected using PDB technology unless otherwise noted.
[1] A field duplicate was collected at this location and the value reported is the average of the two detections.
[2] Samples were collected using low flow sampling methods until the Summer 2015 sampling event, when PDB technology began being used.
BOLD/SHADE - Detected concentration exceeds the applicable Interim Groundwater Cleanup Level.
Monitoring well was installed after this sampling event.

Table 6-2
Cis-1,2-Dichloroethene and Trichloroethene Concentrations Detected in Monitoring Wells - August 2009 through October 2018
Groveland Wells Superfund Site
Groveland, Massachusetts

WELL ID	Downgradient Area											
	TW-12		TW-24		103		104		108		114	
Aquifer	Bedrock		Bedrock		Bedrock		Overburden		Bedrock		Overburden	
Date	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE
08/09[2]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10/09	5 U	**6.1**	0.56 [1]	**25 D[1]**	8.4	0.93	4.1	0.28 J	0.65	1.3	0.31 J	0.5 U
5/10	5.0 U	**15**	5.0 U [1]	**51 [1]**	11	1	NS	NS	0.53	1.3	0.5	0.5 U
10/10	NS	NS	5.0 U [1]	**34 [1]**	15	1.2	23 D	0.43 J	1.2	2	0.82	0.5 U
04/11	3.2 J	**26**	0.54 J [1]	**19 [1]**	16	1.6	NS	NS	0.68	1.5	1	0.5 U
08/11	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/11	3.6	**30**	1.0 U [1]	**17 [1]**	14	2.1	12	1.0 U	1.0 U	2.2	1.5	1.0 U
06/12	NS	NS	1 U	**67**	16	1.8 U	12	1 U	1.1	4	NS	NS
11/12	6	**52**	1 U [1]	**49 [1]**	12	1.7	7	1 U	1.1	2.6	NS	NS
05/13	1.3	**18**	1.4 [1]	**64.5**	18	1.5	8.8	1 U	1 U	1 U	NS	NS
06/13	1.3	**12**	1.3	**68**	NS	NS	NS	NS	NS	NS	NS	NS
07/13	1.1	**12**	1.1	**63**	NS	NS	NS	NS	NS	NS	NS	NS
08/13	1.2	**12**	1 U	**36**	NS	NS	NS	NS	NS	NS	NS	NS
09/13	NS[4]	NS[4]	1.3	**68**	NS	NS	NS	NS	NS	NS	NS	NS
10/13	NS[4]	NS[4]	1 U	**58**	NS	NS	NS	NS	NS	NS	NS	NS
11/13	NS[4]	NS[4]	1 U	**58**	19	1.5	6.6	1.0 U	1.1	2.2	1.7	1.0 U
12/13	NS[4]	NS [4]	1.0 U	**56**	NS	NS	NS	NS	NS	NS	NS	NS
1/14	NS[4]	NS [4]	1 U	**56**	NS	NS	NS	NS	NS	NS	NS	NS
2/14	2.3	**23**	1.2	**65**	NS	NS	NS	NS	NS	NS	NS	NS
3/14	2.0	**19**	1.0 U	**58**	NS	NS	NS	NS	NS	NS	NS	NS
4/14	1.4	**14**	1	**63**	NS	NS	NS	NS	NS	NS	NS	NS
7/14	1.6	**14**	1.3	**71**	21	1.5	4.4	1 U	1 U	1 U	1.6	1 U
10/14	1.9	**16**	1.1	**61**	23	1.6	6.4	1 U	1.3	2	1.9	1 U
01/15	2.1	**15**	1 U [1]	**20 [1]**	26	1.9	6.5	1 U	1.1	2.4	2	1 U
04/15	1.3	**13**	1.2	**24**	29	1.6	6.2	1 U	1 U	1.5	1.8	1 U
07/15	1.7	**12**	1 U [1]	**18.5 [1]**	30	1.9	5.3	1 U	1.1	2.1	2.5	1 U
10/15	1.6	**11**	1 U	**52**	28	1.6	5.5	1 U	1.5	2.6	2.7	1 U
2/16	1.2	**11**	1 U	**37**	25	1 U	NS	NS	1 U	1.3	2.4	1 U
4/16	1.6	**10**	1 U	**14**	29	1.6	5.8	1 U	1 U	1.9	1 U	1 U
7/16	1 U	**8.1**	1 U	**37**	16	1 U	NS	NS	1 U	1.7	1.8	1 U
10/16	1 U	**9.8**	1 U	**35**	23	1.5	6.6	1 U	1 U	1 U	2.6	1 U
1/17	1.2	**11**	1 U	**39**	28	1.5	NS	NS	1 U	1.6	2.3	1 U
4/17	1 U	**11**	1 U	**22**	33	1.6	7.4	1 U	1 U	1.6	2.3	1 U
7/17	1 U	**9.4**	1 U	**12**	31	1.6	NS	NS	1 U	1.8	2	1 U
10/17	1 U	**8.6**	1 U	**28**	27	1.3	6.8	1 U	1 U	1.8	1.7	1 U
10/18	1 U	**7.3**	1 U	**7.1**	38	1.6	7.2	1 U	1.1	2.1	1.9	1 U

Notes:
All groundwater samples were collected using PDB technology unless otherwise noted.
[1] A field duplicate was collected at this location and the value reported is the average of the two detections.
[2] Samples were collected using low flow sampling methods until the Summer 2015 sampling event, when PDB technology began being used.
BOLD/SHADE - Detected concentration exceeds the applicable Interim Groundwater Cleanup Level.
Monitoring well was installed after this sampling event.

Table 6-2
Cis-1,2-Dichloroethene and Trichloroethene Concentrations Detected in Monitoring Wells - August 2009 through October 2018
Groveland Wells Superfund Site
Groveland, Massachusetts
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WELL ID	Downgradient Area															
	DEQE-4-2		DEQE-6		DEQE-7		DEQE-8		ERT-9		ME-20D		TW-49S		TW-49D	
Aquifer	Overburden		Overburden		Overburden		Overburden		Bedrock		Overburden		Overburden		Overburden	
Date	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE
08/09[2]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS				
10/09	0.39 J	0.76	0.5 U	1.1	0.5 U	0.5 U	0.76	0.38 J	40.5 D[1]	2.81[1]	0.34	0.68				
5/10	0.81	1.1	0.3	2.2	0.5 U	0.39 J	0.5 U	0.5 U	61[1]	3.1 J[1]	NS	NS				
10/10	0.94	1.2	0.72	2.7	0.5 U	0.5 U	0.5	0.3 J	**90 D**[1]	**5.1**[1]	0.5 U	0.5 U				
04/11	0.61	1.3	0.81	3.6	0.5 U	0.5 U	0.31 J	0.24 J	**87.5**[1]	**6.9**[1]	NS	NS	0.5 U[2]	0.5 U[2]	0.5 U[2]	0.5 U[2]
08/11	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/11	1.0 U	1.6	1.3	3.3	1.0 U	1.0 U	1.0 U	1.0 U	**97**[1]	**5.9**[1]	1.0 U	1.0 U	1.0 U[3]	1.0 U[3]	1.0 U[3]	1.0 U[3]
06/12	1 U	2.3	2.2	3.2	NS	NS	1 U	NS	**73.5**[1]	**6.8**[1]	NS	NS	1 U	1 U	1 U	1 U
11/12	1 U	1 U	1.7	**5.8**	1 U	1 U	1 U	1 U	55.5[1]	4.8[1]	1 U	1 U	1 U	1 U	1 U	1 U
05/13	1 U	2.2	1 U	3	NS	NS	1 U	1 U	61.5[1]	**5.7**[1]	NS	NS	1 U	1 U	1 U	1 U
06/13	NS	NS	1 U	2.8	NS	NS	NS	NS	69	**5.4**	NS	NS	NS	NS	NS	NS
07/13	NS	NS	1 U	3.85[1]	NS	NS	NS	NS	28	3.8	NS	NS	NS	NS	NS	NS
08/13	NS	NS	1.4	3.6	NS	NS	NS	NS	45	4.7	NS	NS	NS	NS	NS	NS
09/13	NS	NS	1.5	3.8	NS	NS	NS	NS	24	4.4	NS	NS	NS	NS	NS	NS
10/13	NS	NS	1.4	2.1	NS	NS	NS	NS	22	3.4	NS	NS	NS	NS	NS	NS
11/13	1.2	2.1	1.2	2	1.0 U	1.0 U	1.0 U	1.0 U	9.3	2.6	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
12/13	NS	NS	1.2	2.4	NS	NS	NS	NS	67	**5.3**	NS	NS	NS	NS	NS	NS
1/14	NS	NS	1.2	2	NS	NS	NS	NS	65	**6.8**	NS	NS	NS	NS	NS	NS
2/14	NS	NS	1.4	2.2	NS	NS	NS	NS	55	**6.7**	NS	NS	NS	NS	NS	NS
3/14	NS	NS	1	2.1	NS	NS	NS	NS	69	**6.2**	NS	NS	NS	NS	NS	NS
4/14	NS	NS	1.0 U	1.8	NS	NS	NS	NS	**80**	**7**	NS	NS	NS	NS	NS	NS
7/14	1 U	2.1	1 U	**8.7**	1 U	1 U	2.4	**9.8**	32[1]	4.1[1]	1 U	1 U	1 U	1 U	1 U	1 U
10/14	1 U	1.3	2,2	3	1 U	1 U	2.3	**12**	53	**5.2**	1 U	1.6	1 U	1 U	1 U	1 U
01/15	1 U	1.8	1.6	3.9	1 U	1 U	4.8	**27**	**92**	**8.2**	1 U	1.2	1 U	1 U	1 U	1 U
04/15	1 U	1.2	1.3	3.9	NS	NS	5.0[1]	**21**[1]	**84.5**[1]	**7.9**[1]	1 U	1 U	1 U	1 U	1 U	1 U
07/15	1	2.4	1.3	**11**	1 U	1 U	3.3	**18**	**77**	**6.1**	2	**13**	1 U	1 U	1 U	1 U
10/15	1 U	1.5	3	**8**	1 U	1 U	3.2	**19**	**76**	**7**	3.7	**18**	1 U	1 U	1 U	1 U
2/16	1	2.2	1.6	**7.6**	NS	NS	2.6	**17**	59	**6.9**	2.2	**7.6**	NS	NS	NS	NS
4/16	1 U	1.8	1.4	**6.2**	1 U	1 U	3.1	**18**	63	**8.8**	1 U	4.5	1 U	1 U	1 U	1 U
7/16	1 U	1.7	1.4	**8.7**	NS	NS	7.2	**16**	27	4.5	3.2	**10**	NS	NS	NS	NS
10/16	1 U	2.4	1.7	**11**	1 U	1 U	3.5	**22**	68	**9**	3.7	**8.4**	1 U	1 U	1 U	1 U
1/17	1 U	2.2	2.4	**9.2**	NS	NS	2.5	**17**	68	**9**	2.1	4.4	NS	NS	NS	NS
4/17	1 U	1.8	2.5	**8.9**	1 U	1 U	2.4	**14**	58	**9.1**	1.4	2.3	1 U	1 U	1 U	1.8
7/17	1	1.7	4.1	**12**	NS	NS	2.7	**11**	40	**5.6**	1 U	1 U	NS	NS	NS	NS
10/17	1 U	1.8	5.6	**13**	1 U	1 U	1.3	**11**	62	**5.4**	4.3	**8.4**	1 U	1 U	1 U	1 U
10/18	1.3	2.7	4.9	**11**	1 U	1 U	1 U	**5.4**	59	**7.3**	2.8	2.3	1 U	1 U	1 U	1 U

Notes:
All groundwater samples were collected using PDB technology unless otherwise noted.
[1] A field duplicate was collected at this location and the value reported is the average of the two detections.
[2] Samples were collected using low flow sampling methods until the Summer 2015 sampling event, when PDB technology began being used.
BOLD/SHADE - Detected concentration exceeds the applicable Interim Groundwater Cleanup Level.
Monitoring well was installed after this sampling event.

Table 6-2
Cis-1,2-Dichloroethene and Trichloroethene Concentrations Detected in Monitoring Wells - August 2009 through October 2018
Groveland Wells Superfund Site
Groveland, Massachusetts
Page 5 of 5

WELL ID	Downgradient Area																	
	TW-49R		109		No. 3/No. 3 R [2]		ERT-11		ERT-13		ERT-16		NUS-4A		DEQE-13D		ME-10D	
Aquifer	Bedrock		Bedrock		Overburden		Overburden		Overburden		Overburden		Bedrock		Overburden		Overburden	
Date	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE	cis-1,2 DCE	TCE
08/09[2]			NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10/09			0.5 U	0.5 U	NS	NS	0.5 U	0.24	0.27 J	0.65	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.28 J
5/10			NS	NS	NS	NS	0.5 U	0.5 U	0.52	0.9	0.5 U	0.5 U	0.5 U	0.23	0.5 U	0.5 U	0.5 U	0.19 J
10/10			0.5 U	0.5 U	NS	NS	0.5 U	0.5 U	0.5 U	0.53	0.56	0.69	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
04/11	0.23 J[2]	0.71[2]	NS	NS	NS	NS	0.5 U	0.5 U	0.5 U	0.67	0.5 U	0.5 U	0.5 U	0.25 J	0.5 U	0.5 U	0.33 J	0.27 J
08/11	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/11	3.5[3]	2.0 U[3]	1.0 U	1.0 U	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	2.3	3.1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
06/12	3	1.1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/12	2	1 U	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
05/13	1.8	1 U	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
06/13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
07/13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
08/13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
09/13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10/13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/13	2	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1/14	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/14	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3/14	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4/14	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/14	1.5	1 U	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10/14	1.4	1 U	1 U	1 U	0.5 U	0.5 U	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
01/15	1.3	1 U	0.5 U	0.5 U	0.5 U	0.5 U	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
04/15	1.0	1 U	0.5 U	0.5 U	0.5 U	0.5 U	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
07/15	1.2	1 U	0.5 U	0.5 U	0.5 U	0.5 U	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10/15	1.3	1 U	0.5 U	0.5 U	0.5 U	0.5 U	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/16	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4/16	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/16	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10/16	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1/17	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4/17	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	2.1	NS	NS	NS	NS	NS	NS	NS	NS
7/17	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1.2	NS	NS	NS	NS	NS	NS	NS	NS
10/17	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1.3	NS	NS	NS	NS	NS	NS	NS	NS
10/18	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Notes:
All groundwater samples were collected using PDB technology unless otherwise noted.
[1] A field duplicate was collected at this location and the value reported is the average of the two detections.
[2] Samples were collected using low flow sampling methods until the Summer 2015 sampling event, when PDB technology began being
BOLD/SHADE - Detected concentration exceeds the applicable Interim Groundwater Cleanup Level.
Monitoring well was installed after this sampling event.

Table 6-3
Trichloroethene and cis-1,2-Dichloroethene in Extraction Wells - July 2009 through October 2018
Groveland Wells Superfund Site
Groveland, Massachusetts
Page 1 of 2

WELL ID	EW-S1		EW-S2		EW-S3		EW-S4		EW-S5		EW-M1		EW-M2		EW-M3	
Aquifer	Overburden/Bedrock		Overburden/Bedrock		Overburden/Bedrock		Bedrock		Bedrock		Deep Overburden		Deep Overburden		Bedrock	
Date	TCE	cis-1,2-DCE	TCE	cis-1,2-DCE	TCE	cis-1,2-DCE	TCE	cis-1,2-DCE	TCE	cis-1,2-DCE	TCE	cis-1,2-DCE	TCE	cis-1,2-DCE	TCE	cis-1,2-DCE
7-Jul-09	1,500 D	42	1,700 D	36	28	6.6	7.7	0.93 J	2.6 J	5.0 U	4.6 J	1.7 J	5.0 U	5.0 U	7.4	36
6-Oct-09	2,800 D	51	1,600 D	47	55	8.1	9.9	1.1 J	3.0 J	5.0 U	5.6	2.0	5.0 U	5.0 U	16	82
5-Jan-10	1,600 D	47	5,000 D	100	99	9.2	5.3	5.0 U	5.0 U	5.0 U	3 J	5.0 U	5.0 U	5.0 U	16	260 D
3/4/2010 [1]	NS	NS	NS	NS	NS	NS	NS	NS	5.0 U	5.0 U	NS	NS	NS	NS	3.8 J	11
6-Apr-10	820 D	120	8,500 D	160	180	31.0	14	2.5 J	0.5 J	5.0 U	4.2 J	1.2 J	5.0 U	5.0 U	4.4 J	9.5
6-Jul-10	1,500 D	32	100	44	9.5	4.2 J	13	2.3 J	4.1 J	5.0 U	5.8	13.0	5.0 U	5.0 U	3 J	0.99 J
5-Oct-10	NS[2]	NS[2]	NS[2]	NS[2]	NS[2]	NS[2]	12	2.0 J	2.3 J	5.0 U	6.4	2.0 J	5.0 U	5.0 U	26	620 D
4-Jan-11	NS[2]	NS[2]	NS[2]	NS[2]	NS[2]	NS[2]	15	1.8 J	31.0	4.8 J	4.4 J	1.4 J	2.0 J	2.4 J	6.3	9.8
5-Apr-11	NS[2]	NS[2]	NS[2]	NS[2]	NS[2]	NS[2]	19	2.2 J	9.7	0.7 J	3.3 J	1.2 J	5.0 U	0.7 J	5 U	7.2
29-Jun-11	5.0 JB	5 U	2.1 JB	5 U	19.0 B	5 U	18.0 B	5.0 U	5.7 JB	5.0 U	2.8 JB	5.0 U	0.35 JB	5.0 U	4.9 JB	5 U
21-Oct-11	5.2 B**	5 U**	10.0 U	5 U	6.3 B	5 U	15.0 B	5.0 U	4.2 JB	5.0 U	1.6 JB	5.0 U	5.0 U	5.0 U	4.2 JB	5 U
17-Jan-12	21.0 B**	5 U**	6.5 B	5 U	5.3 B	5 U	17.0 B	5.0 U	1.2 JB	5.0 U	2.6 JB	5.0 U	0.2 B	5.0 U	3.8 JB	5 U
11-Apr-12	26.0 E**	17.0 **	5.6	3.9	7.8	4.6	13.0	1.8	1.8	0.2 J	2.0	0.7	0.5 U	0.5 U	3.7	8.7
18-Jul-12	6.6 **	4.0 J**	9.9	15.1 J	13.0	7.2 J	0.72	0.1 J	9.0	1.12 J	2.2	0.72	0.8	0.51	3.0	4.6 J
24-Oct-12	6.2 **	6.7 **	4.7	10.1	15.0	6.2	7.80	1.1	1.0	0.10 J	2.0	0.49 J	2.2	0.26 J	2.8	0.59
18-Jan-13	10.0 **	13.1 **	4.0	14.1	12.0	7.4	12	1.6	1.3	0.17 J	3.1	0.59	0.2 J	0.5 U	6.3	1.50
11-Mar-13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.3	12.1
17-Apr-13	6.4 **	9.2 **	4.4	15.1	10.0	5.0	7.1	0.9	1.3	0.13 J	2.6	0.91	0.1 J	0.5 U	2.0	2.2
22-May-13	6.2	8.1	4.8	11.0	10.0	5.4	5.7	0.8	1.0	0.10 J	NS	NS	NS	NS	NS	NS
26-Jun-13	4.7	7.2	3.3	13.6	9.6	6.3	7.3	1.0	0.81	0.5 U	2.4	1.10	NS	NS	NS	NS
17-Jul-13	6.0 **	6.8 **	4.9	18.1	7.9	4.3	6.6	0.8	0.083	0.5 U	2.7	1.0	0.98	0.5 U	6.8	16.1
23-Aug-13	4.2	6.5	3.2	8.7	NS	NS	4.5	0.64	0.086	0.5 U	NS	NS	NS	NS	NS	NS
30-Sep-13	4.2	5.3	1.4	5.2	7.2	4.8	4	0.62	0.052	0.5 U	NS	NS	NS	NS	NS	NS
24-Oct-13	3.8	4.8	1.6	5.3	6.2	4.3	4.2	0.57	0.59	1 U	2.6	0.61	0.5 U	1 U	8.5	49
26-Nov-13	2.2	3.3	0.87	2.8	8.8	5.8	3.9	0.63	0.48	1 U	NS	NS	NS	NS	9.7	70
31-Dec-13	4.7	6	0.99	2.6	8.6	5.7	3.6	0.51	0.73	1 U	NS	NS	NS	NS	11	91
31-Jan-14	4.8	7.4	1.4	4.4	9.3	6.9	5.2	0.68	0.95	1 U	3.3	0.74	0.42	1 U	9	91
27-Feb-14	6.6	9.6	1.6	5.8	9	6.4	4.2	0.59	1 U	1 U	NS	NS	NS	NS	6.5	44

Table 6-3
Trichloroethene and cis-1,2-Dichloroethene in Extraction Wells - July 2009 through October 2018
Groveland Wells Superfund Site
Groveland, Massachusetts
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WELL ID	EW-S1		EW-S2		EW-S3		EW-S4		EW-S5		EW-M1		EW-M2		EW-M3	
Aquifer	Overburden/Bedrock		Overburden/Bedrock		Overburden/Bedrock		Bedrock		Bedrock		Deep Overburden		Deep Overburden		Bedrock	
Date	TCE	cis-1,2-DCE	TCE	cis-1,2-DCE	TCE	cis-1,2-DCE	TCE	cis-1,2-DCE	TCE	cis-1,2-DCE	TCE	cis-1,2-DCE	TCE	cis-1,2-DCE	TCE	cis-1,2-DCE
31-Mar-14	**11**	24	4.1	18	**9.9**	8.2	**5.4**	0.71	1 U	1 U	NS	NS	NS	NS	**7**	38
30-Apr-14	**6.8**	13	3.3	9.5	**9.4**	4.5	**6.7**	0.67	0.56	1 U	3.5	0.39	0.26	1 U	NS	NS
30-Jul-2014 [3]	**13**	24	**5.1**	15	**6.5**	6.4	**42**	13	**35**	4.8	4.7	1 U	1 U	1 U	**23**	**420**
27 to 30-Oct-14	**15**	26	**5.7** **	17.5 **	**5.7**	3.8	**36**	5.5	**34**	4.4	2.1	1 U	1 U	1 U	**23**	**380**
5 to 6-Jan-15	**15**	19	**12**	24	**8.3**	5.9	**34**	5	**38**	5.6	**22**	1.4	1.6	1 U	**25**	**270**
14 to 16-April-15	**12**	21	1.2	2.6	**6.6**	5.4	**28**	5.4	**20**	3.2	**19**	1.2	1 U	1 U	**15**	**330**
13-Aug-15	**19**	33	3.9	11	**5.7**	3	**28**	5.1	**26**	4.1	**12**	1.5	2.4	1 U	**16**	**320**
6 to 8-Oct-15	**15**	28	3.2	9.1	**4.8**	2.4	**25**	4.9	**27**	3.9	**9.8**	1.8	**5.45** **	1.8 **	**28**	**420**
11 to 12-Feb-16	**21**	29	4.1	6	**14**	11	**22**	3.8	4.8	11	**11**	1.5	**6.9** **	4.85 **	**13**	**230**
13-Apr-16	**26**	26	6.9	8.9	**11**	7.1	**23**	4.3	1 U	20	**17**	1.7	3.8 **	1.2 **	**20**	**350**
21-Jul-16	**14**	15	4.1	6.4	**7.8**	4.8	**25**	4.6	2.6	19	**13**	2.2	1 **	1 U **	**19**	**330**
17-Oct-16	**14** **	15 **	4.1	6.4	**7.8**	4.8	**25**	4.6	2.6	19	**13**	2.2	1 **	1 U **	**19**	**330**
6-Jan-17	**27** **	24.5 **	**8.2**	7.4	**11**	4.2	**16**	1.8	1 U	1 U	**14**	1.9	2.8 **	6.2 **	**17**	**330**
17-Apr-17	**10** **	9.95 **	3.6	4.5	**13**	5.9	**16**	2.7	**22**	1 U	**22**	1.7	1.75 **	1 **	**14**	**360**
17-Jul-17	**6.5** **	3.6 **	2.9	4.4	**6.4**	3.4	**22**	5.2	1 U	28	**21**	1.8	1 U**	1 U**	**14**	**390**
11-Oct-17	**11**	9.2	2.7	6.4	**6.4**	1.3	**19**	2.9	**7**	12	**11**	2.6	1 U	2.6	**11**	**330**
24-Oct-18	**16** **	14 **	2.3	1.9	**10**	2.4	**16**	2.4	**16**	1.8	**12**	2.5	1.95 **	7.15 **	**11**	**410**

Notes:

BOLD/SHADE - Detected concentration exceeds the applicable MCL.

TCE = Trichloroethene - (The MCL for TCE is 5 µg/L).

cis-1,2-DCE = cis-1,2-dichloroethene - (The MCL for cis-1,2-DCE is 70 µg/L).

NS - No sample collected.

D - Concentration is reported from a dilution of the sample.

J - Quantitation is estimated, as it is below the SSDL.

SSDL - Sample-specific detection limit

U - Not detected above the SSDL. Value shown is the SSDL.

1. Samples were collected from EW-S5 and EW-M3 in March 2010 to monitor contaminant concentrations following pump move from EW-S5 to EW-M3.

2. Pump removed from well; In-Situ Thermal Treatment ongoing in source area.

3. Prior to July 2014, samples for VOC analysis were collected using the submersible pump installed in the extraction well. Beginning July 2014 all samples collected using Passive Diffusion Bag (PDB) technology.

4. Thermal treatment was conducted in the Source Area from August 2010 to February 2011.

EW-M2 was shut down prior to 2011. EW-M3 was shut down on January 22, 2013. All other extraction wells and the groundwater treatment facility were shut down on April 30, 2014.

**- Duplicate sample collected at this location. The concentration shown is an average of two samples taken.

APPENDIX E – PRESS RELEASE

EPA United States Environmental Protection Agency

News Releases from Region 01

EPA Begins Reviews of Nine Massachusetts Superfund Site Cleanups This Year

03/13/2020

Contact Information:
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BOSTON – The U.S. Environmental Protection Agency (EPA) will conduct comprehensive reviews of previously-completed cleanup work at nine National Priorities List (NPL) Superfund sites in Massachusetts this year. The sites, including one federal facility that is also listed as a NPL Superfund site, will undergo a legally-required Five-Year Review to ensure that previous remediation efforts at the site continue to protect public health and the environment.

"It is a major EPA priority to make continued progress cleaning up Superfund sites across New England. Once cleanup work at all or a portion of a site is completed, EPA conducts regular periodic reviews of our previous work to ensure that it is continuing to protect human health and the environment," **said EPA New England Regional Administrator Dennis Deziel.**

"EPA's Five-Year Reviews help to ensure that the cleanup at Superfund sites continue to meet the Commonwealth's requirements, protecting public health and the environment," **said Massachusetts Department of Environmental Protection Commissioner Martin Suuberg.**

Background

The Superfund program, a federal program established by Congress in 1980, investigates and cleans up the most complex, uncontrolled or abandoned hazardous waste sites in the country and works to facilitate activities to return them to productive use. Under the Trump Administration, the Superfund program has reemerged as a priority to fulfill EPA's core mission of protecting human health and the environment.

EPA is actively involved in Superfund studies and cleanups at 40 sites in Massachusetts, including eight federal facilities. There are many phases of the Superfund cleanup process including considering future use and redevelopment and conducting post-cleanup monitoring of sites. EPA must ensure completed remedies continue to be protective of public health and the environment. The NPL

Superfund sites where EPA will begin work on Five-Year Reviews in 2020 are listed below, and the web links provide detailed information on site status and past assessment and cleanup activity. Once the Five-Year Review is complete, its findings will be posted to the website in a final report.

Five-Year Reviews of Superfund sites in Massachusetts to be completed in 2020

Blackburn & Union Privileges, Walpole, Mass.
www.epa.gov/superfund/blackburn
Norwood PCBS, Norwood, Mass. www.epa.gov/superfund/norwood
Atlas Tack, Fairhaven, Mass. www.epa.gov/superfund/atlas
Cannon Engineering, Bridgewater, Mass. www.epa.gov/superfund/cannon
Charles George Reclamation Trust Landfill, Tyngsborough, Mass.
www.epa.gov/superfund/charlesgeorge
Groveland Wells, Groveland, Mass. www.epa.gov/superfund/groveland
New Bedford, New Bedford, Mass. www.epa.gov/superfund/newbedford
PSC Resources, Palmer, Mass. www.epa.gov/superfund/psc

Federal Facility
Fort Devens, Ayer, Shirley, Lancaster and Harvard., Mass.
www.epa.gov/superfund/devens

More information on Superfund and other cleanup sites in New England:
https://www.epa.gov/cleanups/cleaning-new-england

LAST UPDATED ON MARCH 13, 2020

APPENDIX F – INTERVIEW FORMS

GROVELAND WELLS SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: Groveland Wells	
EPA ID: MAD980732317	
Interviewer name: NA	**Interviewer affiliation:**
Subject name: Janet Waldron	**Subject affiliation: MassDEP**
Subject contact information: 617-556-1156	
Interview date: 2/20/2020	**Interview time:**
Interview location:	
Interview format (circle one): In Person Phone Mail Email Other:	
Interview category: State Agency	

1. What is your overall impression of the project? (general sentiment)
   The project has gone quite well once the source of contamination was mostly eliminated.

2. Are you aware of any community concerns or complaints related to the Superfund site (e.g., odor, noise, health, etc.)?
   The only concern I am aware of is the Valley building itself. The building has been condemned by the local Fire Department. The roof is falling in.

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

4. Are there any areas of known or suspected contamination at the site that you feel are not being adequately addressed by the remedial actions?
   No.

5. Are you aware of any changes in land use in the vicinity of the site?
   No.

6. Are you aware of trespassers entering the property, and if yes, how often and in what type of activities do they engage?
   No.

7. Are you aware of the Institutional Controls (ICs) associated with the site, which prohibit certain activities (no residential use, no extraction of groundwater, no disturbance of the remedy) at: 46, 62 & 64 Washington Streets?
   Yes.

8. Do you have any other comments, questions or concerns regarding the site?
   The potential for a future municipal well downgradient of the source area could be a concern if the well were to be located in bedrock. There is still bedrock contamination found at the Site, and the bedrock itself has not been well defined (no modeling, investigation of fractures, etc.).

9. Do you consent to have your name included along with your responses to this questionnaire in the FYR report?
   Yes.

GROVELAND WELLS SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: Groveland Wells	
EPA ID: MAD980732317	
Subject name:	**Subject affiliation: MassDEP Contractor**
Subject contact information: P:978-703-6014 Email: aroy@nobis-group.com	
Interview date: 1/15/2020	**Interview time:0830**
Interview location: NA	
Interview format (circle one): In Person Phone Mail (Email) Other:	
Interview category: O&M Contractor	

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   A: Overall, I think the project is a Superfund success story. Source Area in-situ thermal treatment (ISTT) performed in 2010 through 2011 significantly reduced concentrations of VOCs to a level that permitted the shutdown of the groundwater treatment facility (GWTF).

2. What is your assessment of the current performance of the remedy in place at the Site?

   A: Nobis has been performing long term groundwater monitoring at the Site since the completion of the Source Area ISTT in 2011. Concentrations of VOCs in groundwater have remained steady during that time and the Site has transitioned from active pump and treat to long term groundwater monitoring remedy. Our ongoing evaluation of groundwater sampling results indicates that the current remedy is protective of human health and the environment.

3. What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time at the Site?

   A: Overall, TCE concentrations in source area monitoring wells and extraction wells during the most recent sampling event (Fall 2019) were generally comparable to the concentrations observed in 2018. In general, TCE concentrations in the source area continue to exhibit a downward trend when compared to concentrations prior to and immediately following ISTT.

   TCE and cis-1,2-DCE concentrations in most downgradient monitoring and extraction wells remained relatively consistent in 2019. TCE concentrations at extraction well EW-S4 increased sharply (from near the MCL of 5 µg/L to 42 µg/L) when the extraction wells were shut down in April 2014. Since 2014, TCE concentrations at EW-S4 have remained relatively stable fluctuating generally between 16 and 36 µg/L. Similar to EW-S4, TCE concentrations at EW-S5 increased significantly after extraction well shutdown. TCE concentrations were below the MCL during 2016 sampling events, but slightly increased above the MCL in Spring and Fall 2017 and continued to exceed the MCL in Fall 2018 and Fall 2019. Bedrock extraction well EW-M3 exhibits a similar trend to that observed at EW-S4 and EW-S5, with a significant increase in TCE and cis-1,2-DCE following extraction well shutdown in 2014. TCE and cis-1,2-DCE concentrations exceeded the

MCL and remained relatively consistent throughout the 2015, 2016, 2017, 2018, and 2019 monitoring periods.

TCE is the primary COC that is consistently detected above the MCL in Source Area and downgradient monitoring wells (overburden and bedrock) since completion of ISTT in 2011. The overburden TCE plume (TCE concentrations above the MCL, 5 µg/L) extends from the Source Area north-northeast to the northern portion of Mill Pond, just north of monitoring well DEQE-6. This is consistent with the groundwater flow direction. The 2019 data indicate that the plume extent has expanded slightly since GWTF shutdown but has remained relatively consistent since 2015.

The bedrock TCE plume extends from the source area north to just before bedrock monitoring well ERT-9 and bedrock extraction well EW-M3. This is consistent with groundwater flow direction and generally consistent with the estimated limits of the plume prior to GWTF shutdown, with the exception that the plume appears to extend a short distance beyond extraction well EW-M3, which may have previously captured contaminant flow at the northeast extent of the plume. There is uncertainty in extent of the TCE plume in bedrock, particularly around EW-M3, because of the inadequate number and distribution of bedrock wells near and downgradient of Mill Pond, the absence of nearby wells directly downgradient from EW-M3, and lack of information about the location and orientation of bedrock fractures through which the contaminant plume may be migrating. However, based on the relatively low concentrations of TCE in bedrock wells ERT-9 and EW-M3 and the non-detect or extremely low TCE concentrations detected in bedrock wells 108, TW-49R, and 103, it appears that the TCE plume dissipates long before reaching the Town water supply wells or other potential receptors.

The current extent of TCE above the MCL has been reduced significantly when compared to plume extents in 2000; however, it appears to have expanded slightly since 2013, prior to GWTF shutdown. The overburden TCE plume was reduced in size by approximately 95%, from 36 acres in 2000 to 1.8 acres in 2013 during GWTF operation. Following shutdown of the GWTF in 2014, the plume expanded to approximately 4.59 acres in Fall 2015 and decreased slightly to approximately 4.21 acres based on Fall 2017 and Fall 2018 data. With a TCE concentration of 4.9 µg/l at ERT-9 in Fall 2019, the plume decreased slightly to approximately 3.96 acres in Fall 2019.

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

   A: There is no continuous O&M presence at the Site. Nobis performs monthly inspections at the site and procures subcontractor services to perform routine landscaping maintenance (mowing and nuisance vegetation removal) and snow removal activities.

5. Have there been any significant changes in site 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.

   A: There have been no significant changes to the Site O&M requirements since the last five year review.

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

A: No.

7. Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies.

   A: No. Cost savings measures have been implemented to reduce costs associated with building maintenance. Nobis is currently supporting MassDEP with efforts to remove old equipment and supplies from the GWTF building and preparing to transition the building back to the Roman Catholic Archdiocese of Boston.

8. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?

   A: No, O&M activities at the Site have been reduced to the extent feasible.

9. Do you consent to have your name included along with your responses to this questionnaire in the FYR report?

GROVELAND WELLS SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: Groveland Wells	
EPA ID: MAD980732317	
Interviewer name: Kirby Webster	**Interviewer affiliation: EPA Contractor**
Subject name: Colin Stokes	**Subject affiliation: Water and Sewer Department**
Interview date: 1/31/2020	**Interview time: 10:45 a.m.**
Interview format (circle one): In Person (Phone) Mail Email Other:	
Interview category: Local Government	

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

It has been shut down since I have been in the role as superintendent, so I have not had much interaction, if any, with it.

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

I know that the roof is collapsing on the Valley Screw building. I believe the Selectman are in talks with EPA and various other people about what is going on with the Site.

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

Yes.

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

Not that I am aware of.

5. Are you aware of any changes in land use in the vicinity of the Site?

Not that I am aware of.

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

Not to my knowledge.

7. Are you aware of the Institutional Controls (ICs) associated with the site, which prohibit certain activities (no residential use, no extraction of groundwater, no disturbance of the remedy) at: 46, 62 & 64 Washington Streets?

No.

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

Not at this time.

9. Are there any immediate plans to install additional drinking water wells in the vicinity of the Site and/or plans to increase the withdrawal rate of the existing Town drinking water well No. 1?

No. We are looking at additional well locations but not in that area.

10. Do you consent to have your name included along with your responses to this questionnaire in the FYR Report?

Yes.

APPENDIX G – SITE INSPECTION CHECKLIST

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Groveland Wells	**Date of Inspection:** 01/09/2020
Location and Region: Groveland, MA 1	**EPA ID: MAD980732317**
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature:** 27 degrees Fahrenheit/Sunny

Remedy Includes: (Check all that apply)

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

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** — Janet Waldron (Name) — MassDEP Project Manager (Title) — 02/20/2020 (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems, suggestions ☐ Report attached: _____

2. **O&M Staff** — Not included (Name) — Mass DEP contractor (Title) — 01/15/2020 (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

   Agency Water and Sewer Department
   Contact Colin Stokes (Name) — Superintendent (Title) — 01/31/2020 (Date) — _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

   Agency _____
   Contact _____ (Name) — _____ (Title) — _____ (Date) — _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

   Agency _____
   Contact _____ (Name) — _____ (Title) — _____ (Date) — _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

   Agency _____
   Contact _____ (Name) — _____ (Title) — _____ (Date) — _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

   Agency _____
   Contact _____ (Name) — _____ (Title) — _____ (Date) — _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

4. **Other Interviews** (optional) ☐ Report attached: _____

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)

1. **O&M Documents**

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

Remarks: _____

2.	**Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
	☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			

4. **Permits and Service Agreements**

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

Remarks: _____

5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
7.	**Groundwater Monitoring Records**	☒ Readily available	☐ Up to date	☐ N/A
	Remarks: _____			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			

9. **Discharge Compliance Records**

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

Remarks: _____

10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☒ Contractor for state

☐ PRP in-house ☐ Contractor for PRP

☐ Federal facility in-house ☐ Contractor for Federal facility

☐ _____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place ☒ Unavailable

Original O&M cost estimate: _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached

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

Describe costs and reasons: _____

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

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: _____

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☒ N/A

Remarks: _____

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

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

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

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

Frequency: _____

Responsible party/agency: _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up to date ☐ Yes ☐ No ☒ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☒ No ☐ N/A

Other problems or suggestions: ☐ Report attached

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

Remarks: Current institutional controls effectively restrict use of groundwater where contamination remains.

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land Use Changes On Site** ☐ N/A

Remarks: Discussions are underway as to how the Site will be used once the groundwater treatment facility has been completely decomissioned.

3. **Land Use Changes Off Site** ☒ N/A

Remarks: _____

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

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

Remarks: _____

B. Other Site Conditions

Remarks: The Valley Building is in disrepair.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A (the groundwater treatment is no longer in operation; currently natural attenuation.)

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

1. **Pumps, Wellhead Plumbing and Electrical**

☐ Good condition ☐ All required wells properly operating ☐ Needs maintenance ☐ N/A

Remarks: _____

2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

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

1. **Collection Structures, Pumps and Electrical**

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon adsorbers

☐ Filters: _____

☐ Additive (e.g., chelation agent, flocculent): _____

☐ Others: _____

☐ Good condition ☐ Needs maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of groundwater treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: _____

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

5. **Treatment Building(s)**

☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair

☐ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☒ Is routinely submitted on time ☒ Is of acceptable quality

2. **Monitoring Data Suggests:**

☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

E. Monitored Natural Attenuation

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

☒ Properly secured/locked ☐ Functioning ☒ Routinely sampled ☐ Good condition

☒ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: During the site inspection, Mill Pond was flooded and overtook some monitoring wells.

X. OTHER REMEDIES

If there are remedies applied at the site and 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 designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).

EPA conducted an optimization study for the Site and developed an exit strategy in 2013 to complete cleanup actions. The conclusions of the optimization and exit strategy were that active groundwater extraction and treatment activities could cease because the cleanup removed the mass of residual TCE contamination in the source area soil. EPA transitioned from active groundwater treatment to natural attenuation. MassDEP and EPA are decommissioning the groundwater treatment facility.

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.

Currently only natural attenuation is taking place, which only requires groundwater monitoring, which is performed regularly.

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.
None.

APPENDIX H – SITE INSPECTION PHOTOS

Signage at entrance of fenced groundwater treatment facility building


Groundwater treatment facility building

Interior of groundwater treatment facility building

Signage on fence between groundwater treatment facility building and Mill Pond

Mill Pond

Monitoring well in Mill Pond, which is higher than normal

Fenced extraction well near Mill Pond

Northern end of Valley Manufacturing Building

Thermal treatment area on southern side of Valley Manufacturing Building

Thermal treatment area on southern side of Valley Manufacturing Building

APPENDIX I – DETAILED ARARS REVIEW TABLES

CERCLA Section 121(d)(1) requires that Superfund remedial actions attain "a degree of cleanup of hazardous substance, pollutants, and contaminants released into the environment and control of further release at a minimum which assures protection of human health and the environment." The remedial action must achieve a level of cleanup that at least attains those requirements that are legally applicable or relevant and appropriate. In performing the FYR for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed.

Groundwater

The 1991 ROD identified interim groundwater cleanup goals for all COCs identified in the baseline risk assessment found to pose an unacceptable risk to either public health or the environment. Interim cleanup levels were set based on state and federal ARARs, if available. Many of the COCs have established federal drinking water MCLs or MMCLs. In the absence of an MCL or MMCL, other suitable criteria were selected such as federal health-based levels or state guidance levels known as Office of Research and Standards guidance levels. Table I-1 compares 1991 IGCL's to current standards. The current standard is more stringent for arsenic. Arsenic sampling was discontinued along with other metal sampling prior to the construction of the groundwater treatment facility. Contaminants with hazard-based remedial goals are reviewed in Appendix J.

Table I-1: Review of OU1 Groundwater IGCLs

Groundwater COC	1991 IGCL (µg/L)[a]	2020 Standard[e] (µg/L)	ARAR Change
Noncarcinogenic COCs			
Acetone	700[b]	6,300[f]	Less stringent
Antimony	3	6	Less stringent
Arsenic	50	10	More stringent
Barium	1,000	2,000	Less stringent
Beryllium	1	4	Less stringent
Cadmium	5	5	None
Chlorobenzene	100	100	None
Chromium (VI)	50	100[g]	Less stringent
1,1-Dichloroethane	5[b]	70[f]	Less stringent
1,1-DCE	7	7	No change
1,2-DCE(c)	70	70	No change
Mercury	2	2	No change
Methylene chloride	5	5	No change
Nickel	100	No current MCL	
Selenium	10	50	Less stringent
Silver	50[b]	100[f]	Less stringent
PCE	5	5	No change
Toluene	1,000	1,000	No change
1,1,1-Trichloroethane	200	200	No change
Vanadium[c]	NA	NA	No change
Carcinogenic COCs			
Arsenic	50	10	More stringent
Benzene	5	5	No change
Beryllium	1	4	Less stringent
1,1-DCE	7	7	No change
Lead	15[d]	15[h]	No change
Methylene chloride	5	5	No change
PCE	5	5	No change

Groundwater COC	1991 IGCL (µg/L)[a]	2020 Standard[e] (µg/L)	ARAR Change
TCE	5	5	No change
Vinyl chloride	2	2	No change

Notes:

a. The 1991 ROD selected ICGLs based on the federal MCL unless otherwise noted.
b. The 1991 ROD selected the IGCL as the MMCL.
c. IGCL hazard based (noncarcinogen).
d. IGCL policy based.
e. National Primary Drinking Water Standards, available at https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations (accessed 2/5/2020).
f. MMCLs, Office of Research and Standards guidance levels, and secondary MCLs, available at https://www.mass.gov/guides/drinking-water-standards-and-guidelines (accessed 2/5/2020).
g. For total chromium, which includes contributions from chromium III and chromium VI.
h. Action Level.

NA – an ARAR has not been established for this COC; the 1991 ROD established a health-based value as the IGCL, which is reviewed further in Appendix J.

Soil

The 1988 ROD identified the MCLs established in the Safe Drinking Water Act (40 CFR 141. – 141.16) and the Massachusetts groundwater quality standards (314 CMR 6.00) as the chemical-specific ARARs as a basis for the soil cleanup goals, which were determined to be relevant and appropriate to remediation of the Site. The 2007 ESD updated the soil cleanup levels based on site-specific data and EPA guidance. These levels are reviewed in Appendix J.

APPENDIX J – SCREENING-LEVEL RISK REVIEW

Groundwater

The IGCL in the 1991 AROD for vanadium was a health-based value since an MCL or MMCL had not been established. Since toxicity values have changed since the 1991 ROD was signed, this FYR compared the vanadium cleanup goal to EPA's tapwater RSL. Table J-1 shows that the noncancer Hazard Quotient (HQ) slightly exceeds 1, however, sampling for metals was discontinued. The vanadium IGCL remains valid because data in the 2005 FYR shows that groundwater samples collected and analyzed for vanadium between 2000 and 2005 were all below detection limits, with the exception of one sample. Detection limits ranged from less than 1 µg/L to less than 5 µg/L, and the one detection in 2003 was 6 µg/L. Both the detection limits and the one detection are below the tap water RSL of 86 µg/L.

Table J-1: Screening-Level Tapwater Risk Review

COC	1991 AROD IGCL (µg/L)	Tapwater RSL[a] (µg/L)		Cancer Risk[b]	Noncancer HQ[c]
		1 x 10^{-6} Risk	HQ = 1.0		
Vanadium	240	--	86[d]	--	**3**

Notes:

a. Current EPA RSLs, dated 2019, are available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables (accessed 3/13/2020).
b. The cancer risks were calculated using the following equation, based on the fact that RSLs are derived based on 1 x 10^{-6} risk: cancer risk = (cleanup level ÷ cancer-based RSL) × 10^{-6}.
c. The noncancer HQ was calculated using the following equation: HQ = cleanup level ÷ noncancer-based RSL.
d. EPA has not established a toxicity value for vanadium but derived an RSL based on the toxicity of vanadium pentoxide and by factoring out the molecular weight of the oxide ion to adjust the toxicity.

-- = not applicable; toxicity criteria not established.
Bold - HQ > 1
µg/L = micrograms per Liter

Soil

The 2007 ESD identified recalculated soil cleanup levels based on protection of groundwater. Given that current conversations surrounding the Site reference site reuse, this FYR compared the recalculated soil cleanup levels to EPA's current RSLs for residential use. Table J-2 provides a screening-level residential risk review of the soil cleanup levels. It shows that the cleanup levels result in a cancer risk within EPA's acceptable risk range and a HQ of less than 1. According to the 2015 FYR, two of the 44 confirmation samples collected in 2011 exceeded the soil cleanup goals. The screening level risk review of these two samples show that the individual samples are equivalent to a HQ of 1 or slightly above the HQ of 1 (Table J-3). This evaluation is very conservative as there were 44 samples collected within the treatment area, many of which were lower detections. Exposure generally occurs as an average exposure across an area. Thus, according to risk assessment guidance, an exposure point concentration was averaged by generating an upper 95th confidence limit on the mean (UCL95) using EPA's ProUCL software. A UCL95 was calculated on the confirmation samples from 0-11 feet as presented in the 2011 OU2 remedial action report (Figure 7-3). Also to be conservative, a UCL95 was calculated on all confirmation samples from 0 - 45 feet (Figure 7-3, 7-4 and 7-5). When considering an average exposure scenario the screening-level cancer risks for both UCL95 concentrations are within EPA's risk management range and below the target noncancer HQ of 1 for both residential (Table J-4) and commercial/industrial exposures (Table J-4). A Grant of Environmental Restriction currently restricts this parcel to commercial and industrial use, which may be more restrictive than necessary for this area.

Table J-2: Screening-Level Residential Risk Review of Soil Cleanup Levels

COC	2007 ESD Soil Cleanup Level (mg/kg)	Residential RSL[a] (mg/kg)		Cancer Risk[b]	Noncancer HQ[c]
		1 x 10^{-6} Risk	HQ = 1.0		
TCE	0.077	0.94	4.1	8 x 10^{-8}	0.02
Vinyl chloride	0.011	0.059	70	2 x 10^{-7}	0.0002
Methylene chloride	0.022	57	350	4 x 10^{-10}	0.00006
Tetrachloroethene	0.056	24	81	2 x 10^{-9}	0.0007
1,1-DCE	0.045	--	230	--	0.0002
Trans-1,2-DCE	0.626	--	1,600	--	0.0004
Toluene	22.753	--	4,900	--	0.005
1,1,1-Trichloroethane	1.388	--	8,100	--	0.0002
Cis-1,2-DCE	0.418	--	160	--	0.003

Notes:

a. Current EPA RSLs, dated 2019, are available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables (accessed 2/5/2020).

b. The cancer risks were calculated using the following equation, based on the fact that RSLs are derived based on 1 x 10^{-6} risk: cancer risk = (cleanup level ÷ cancer-based RSL) × 10^{-6}.

c. The noncancer HQ was calculated using the following equation: HQ = cleanup level ÷ noncancer-based RSL.

-- = not applicable; toxicity criteria not established.

mg/kg = milligrams per kilogram

Table J-3: Screening-Level Residential Risk Review of 2011 Soil Confirmation Sampling

COC	2011 Confirmation Sampling Exceeding 2007 ESD Cleanup Level (mg/kg)	Residential RSL[a] (mg/kg)		Cancer Risk[b]	Noncancer HQ[c]
		1 x 10^{-6} Risk	HQ = 1.0		
TCE	7 (CSB-13, 3-5ft sample)	0.94	4.1	7 x 10^{-6}	**2**
	5.6 (CSB-10, 23-25 ft sample)			6 x 10^{-6}	1
	UCL95 of 2.4 (confirmation samples 0-45 ft)	0.94	4.1	3 x 10^{-6}	0.6
	UCL95 of 1.5 (confirmation samples 0-11 ft)	0.94	4.1	2 x 10^{-6}	0.4

Notes:

a. Current EPA RSLs, dated 2019, are available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables (accessed 2/5/2020).

b. The cancer risks were calculated using the following equation, based on the fact that RSLs are derived based on 1 x 10^{-6} risk: cancer risk = (cleanup level ÷ cancer-based RSL) × 10^{-6}.

c. The noncancer HQ was calculated using the following equation: HQ = cleanup level ÷ noncancer-based RSL.

-- = not applicable; toxicity criteria not established.

Table J-4: Screening-Level Commercial/Industrial Risk Review of 2011 Soil Confirmation Sampling

COC	2011 Confirmation Sampling Exceeding 2007 ESD Cleanup Level (mg/kg)	Commercial/Industrial RSL[a] (mg/kg)		Cancer Risk[b]	Noncancer HQ[c]
		1 x 10^{-6} Risk	HQ = 1.0		
TCE	7 (CSB-13, 3-5ft sample)	6	19	1 x 10^{-6}	0.4
	5.6 (CSB-10, 23-25 ft sample)			9 x 10^{-7}	0.3
	UCL95 of 2.4 (confirmation samples 0-45 ft)	6	19	4 x 10^{-7}	0.1
	UCL95 of 1.5 (confirmation samples 0-11 ft)	6	19	3 x 10^{-7}	0.08

COC	2011 Confirmation Sampling Exceeding 2007 ESD Cleanup Level (mg/kg)	Commercial/Industrial RSL[a] (mg/kg)		Cancer Risk[b]	Noncancer HQ[c]
		1 x 10^{-6} Risk	HQ = 1.0		

Notes:

a. Current EPA RSLs, dated 2019, are available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables (accessed 2/5/2020).

b. The cancer risks were calculated using the following equation, based on the fact that RSLs are derived based on 1 x 10^{-6} risk: cancer risk = (cleanup level ÷ cancer-based RSL) × 10^{-6}.

c. The noncancer HQ was calculated using the following equation: HQ = cleanup level ÷ noncancer-based RSL.

-- = not applicable; toxicity criteria not established.

Vapor Intrusion

In considering reuse for the property, the vapor intrusion pathway is an exposure pathway of concern due to the presence of volatile COCs in the groundwater. Table J-5 provides a VISL assessment for residential or unrestricted use. Per vapor intrusion guidance, groundwater wells monitoring the most shallow zone (e.g., overburden wells) within 100 feet of a building are considered for the evaluation. Groundwater monitoring well EW-S1 is the well that had the most contamination in 2018. Detected concentrations of VOCs were included in the VISL. Table J-5 indicates that if a residential building were to be built at this location while concentrations of TCE remain at their current state, additional study would be necessary to ensure the vapor intrusion pathway is not a completed exposure pathway. Table J-6 indicates that current TCE concentrations do not pose a vapor intrusion concern for commercial/industrial use.

Table J-5: Residential Screening-Level Vapor Intrusion Risk Evaluation of Shallow Groundwater Results

COC	Groundwater Concentration (µg/L)[a]	Cancer Risk[a]	Non-cancer HQ[a]
TCE	16 (EW-S1)	1×10^{-5}	**3**
Cis-1,2-DCE	14 (EW-S1)	NA	NA
Cumulative Total		1×10^{-5}	**3**

Notes:

a. Risk and hazard quotient calculated using EPA's November 2019 VISL calculator (https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator) assuming a commercial/industrial exposure and default groundwater temperature of 25 degrees Celsius, accessed 2/27/2020.

NA = not applicable

Source: 2018 Groundwater Data Evaluation Report, Appendix B-4, February 2019.

Table J-6: Commercial/Industrial Screening-Level Vapor Intrusion Risk Evaluation of Shallow Groundwater Results

COC	Groundwater Concentration (µg/L)[a]	Cancer Risk[a]	Non-cancer HQ[a]
TCE	16 (EW-S1)	2×10^{-6}	0.7
Cis-1,2-DCE	14 (EW-S1)	NA	NA
Cumulative Total		2×10^{-6}	0.7

Notes:

b. Risk and hazard quotient calculated using EPA's November 2019 VISL calculator (https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator) assuming a commercial/industrial exposure and default groundwater temperature of 25 degrees Celsius, accessed 2/27/2020.

NA = not applicable

Source: 2018 Groundwater Data Evaluation Report, Appendix B-4, February 2019.