Five-Year Review Report

Second Five-Year Review Report

for

Wells G&H Superfund Site

Woburn

Middlesex County, Massachusetts

September 2004

PREPARED BY:

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Region I, New England
Boston, Massachusetts

Approved by:

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U.S. EPA, Region 1 – New England

Date:

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APPENDIX

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym/ Abbreviation	Definition
AOC	Administrative Order on Consent
AMSL	Above Mean Sea Level
ARAR	Applicable or Relevant and Appropriate Requirement
AS	Air Sparging
ATSDR	Agency for Toxic Substances and Disease Registry
AWQC	Ambient Water Quality Criteria
Beatrice	Beatrice Corporation
B&M	Boston and Maine
BOH	Board of Health
BRA	Baseline Risk Assessment
BTEX	Benzene, toluene, ethylbenzene and xylene
CAA	Clean Air Act
CATOX	Catalytic Oxidation
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cis-1,2-DCE	cis-1,2-Dichloroethene
COC	Contaminant of Concern
COPC	Contaminants of Potential Concern
CWA	Clean Water Act
DCE	1,2-Dichloroethene
E&E	Ecology & Environment, Inc.
Determination	MADEP's Groundwater Use and Value Determination
DEQE	Department of Environmental Quality Engineering (now the MADEP)
DNAPL	Dense Non-Aqueous Phase Liquid
EO	Executive Order
ESD	Explanation of Significant Difference
EPA	United States Environmental Protection Agency
FID	Flame Ionization Detector
FDDA	Former Drum Disposal Area
FS	Feasibility Study
GAC	Granular Activated Carbon
GeoTrans	GeoTrans, Inc. (consultant to Grace)
gpm	gallons per minute
Grace	W.R. Grace & Co. – Conn

Acronym/ Abbreviation	Definition
HASP	Health and Safety Plan
HBHA	Halls Brook Holding Area
HPS	Harvard Project Services, LLC (consultant to UniFirst)
HRS	Hazard Ranking System
LED	Light Emitting Diode
LNAPL	Light Non-Aqueous Phase Liquid
LTM	Long Term Monitoring
MADEP	Massachusetts Department of Environmental Protection
MBTA	Massachusetts Bay Transportation Authority
MCL	Maximum Contaminant Level
MCP	Massachusetts Contingency Plan
MDC	Metropolitan District Commission
M&E	Metcalf & Eddy, Inc.
MNA	Monitored Natural Attenuation
MSGRP	Multiple Source Groundwater Response Plan
MWRA	Massachusetts Water Resources Authority
NAPL	Non-Aqueous Phase Liquid
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NEP	New England Plastics Corporation
NPL	National Priorities List
Olympia	Olympia Nominee Trust
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
OU-1	Operable Unit 1 – Wells G&H Source Area Properties
OU-2	Operable Unit 2 – Central Area
OU-3	Operable Unit 3 – Aberjona River Study
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
PID	Photoionization Detector
ppb	parts per billion
ppm(v)	parts per million-volume
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
psi	Pounds per square inch

Acronym/ Abbreviation	**Definition**
RETEC	The RETEC Group (consultant to Beatrice at Wildwood)
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RPM	Remedial Project Manager
scfm	standard cubic feet per minute
SDWA	Safe Drinking Water Act
SVE	Soil Vapor Extraction
TBCs	To Be Considereds
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
1,1,1-TCA	1,1,1-Trichloroethane
trans-1,2-DCE	trans-1,2-Dichloroethene
TRC	TRC Environmental Corporation
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage and Disposal Facility
TTNUS	TetraTech NUS, Inc.
UniFirst	UniFirst Corporation
UV/Ox	Ultra-violet/chemical oxidation
VOC	Volatile Organic Compound
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
Wildwood	Wildwood Conservation Corporation
Woodard and Curran	Woodard and Curran, Inc. (consultant to NEP)
WRA	Woburn Redevelopment Authority

EXECUTIVE SUMMARY

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

The Site is segregated into three operable units, the Source Area (OU-1) properties, the Central Area (OU-2), and the Aberjona River Study (OU-3).

The OU-1 Source Area properties consist of the W.R. Grace & Company (Grace), UniFirst Corporation (UniFirst), New England Plastics (NEP), Wildwood Conservation Corporation (Wildwood), and Olympia Nominee Trust (Olympia), the locations of which are depicted on Figure 2 (provided in Attachment 1).

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

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

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

Significant Changes

- On-site incineration of soils at the Wildwood, NEP, and Olympia properties was changed to off-site incineration;
- In-situ volatilization would be used on the UniFirst property rather than incineration; and

- A typographical error was corrected resulting in more stringent target clean-up levels for groundwater.

Other Non-Significant Change

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

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

Operable Units 2 (Central Area) and 3 (the Aberjona River Study) have been identified for further study by certain Potentially Responsible Parties (PRPs) and EPA, respectively. A remedy has not yet been selected for the Central Area (OU-2) and the Aberjona River Study (OU-3).

This is the second five-year review for the Wells G&H Site. The first five-year review was completed in August 1999. The five-year review is required because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

This five-year review concluded that the Source Area (OU-1) remedy is functioning as designed and continues to be protective of current human health and the environment. However, in order for the remedy to be protective in the long term, institutional controls should be implemented at the source areas to prevent exposure to contaminated groundwater until the remedy is completed. Additional treatment and/or measures to ensure capture may be required at some of the Source Area (OU-1) properties. The Endangerment Assessment performed for EPA in 1988 did not cover all potential exposures to groundwater, and the basis for identifying contaminants of concern (COCs) has changed since implementation of the ROD, which will require additional evaluation to ensure future protectiveness. Indoor air vapor intrusion has also emerged as an issue as EPA technical guidance on this matter has evolved. Lastly, Ambient Water Quality Criteria (AWQC) associated with aquatic life have decreased since the ROD; therefore, the impact of these changes needs to be assessed since discharge limitations on remedial system effluent were based in part on AWQCs. (Overall impacts of AWQC changes on the Aberjona River will be evaluated as part of the Aberjona River Study [OU-3]).

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION

Site name *(from WasteLAN)*: Wells G&H Superfund Site

EPA ID *(from WasteLAN)*: MAD980732168

Region: 1	**State:** MA	**City/County:** Middlesex

SITE STATUS

NPL status: ☒ Final ☐ Deleted ☐ Other (specify) ________________

Remediation status (choose all that apply): ☐ Under Construction ☒ Operating ☐ Complete

Multiple OUs?* ☒ YES ☐ NO	**Construction completion date:**

Has site been put into reuse? ☐ YES ☒ NO

REVIEW STATUS

Lead agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency ____________

Author name: Joseph F. LeMay, PE

Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA Region 1

Review period:** 5 /11/ 2004 to 9/30/ 2004

Date of site inspection: 8/3/2004, 8/18/2004

Type of review:

☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion

Review number: ☐ 1 (first) ☒ 2 (second) ☐ 3 (third) ☐ Other (specify)

Triggering action:
☐ Actual RA Onsite Construction at OU1____ ☐ Actual RA Start at OU#____
☐ Construction Completion ☒ Previous Five-Year Review Report
☐ Other (specify) ________________

Triggering action date *(from WasteLAN)*: August 1999

Due date *(five years after triggering action date)*: September 2004
*["OU" refers to operable unit.]
**[Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

There is no information that calls into question the current protectiveness of the Source Area (OU-1) remedy. However, conditions were identified that could affect the future protectiveness of the Source Area (OU-1) remedy and require further data collection, analysis or remedial/corrective actions. These issues include:

1. Lack of institutional controls at Source Area (OU-1) properties;
2. Lack of groundwater treatment at NEP and presence of PCE and TCE above ROD action levels in groundwater;
3. Groundwater extraction at UniFirst is not achieving design capture objectives;
4. Soil remedy at UniFirst has not been implemented;
5. Area south of Wildwood treatment system may have groundwater in excess of ROD action levels and is not receiving treatment;
6. Insufficient information to document groundwater contaminant capture in bedrock at Wildwood;
7. The 1988 Endangerment Assessment did not comprehensively evaluate non-ingestion uses of groundwater and therefore may not be representative of all potential exposures;
8. Arsenic and manganese were not identified as COCs in the 1989 ROD. At some of the source area properties, historical arsenic concentrations exceed the current arsenic primary MCL (10 ug/L), and manganese concentrations exceed current manganese toxicity values;
9. An evaluation of the groundwater to indoor air pathway indicates potential risks at Source Area (OU-1) properties depending on future land use;
10. AWQCs associated with aquatic life have decreased since the ROD. AWQCs were used, in part, to establish effluent limits for remedial system discharges; and
11. Groundwater remedy at Olympia has not been implemented.

Additional concerns were identified that affect neither current nor future protectiveness of the Source Area (OU-1) remedy but may impact operations and maintenance, or are associated with the Central Area (OU-2) or the Aberjona River Study (OU-3). Any concerns related to operation and maintenance and OU-2 will be addressed with the PRPs. Any other concerns related to OU-3 will be addressed by EPA.

Recommendations and Follow-Up Actions

1. Implement institutional controls at Source Area properties.
2. Assess groundwater conditions since treatment shut down, evaluate the need for further groundwater and soil treatment, and where appropriate consider other treatment options. Install downgradient monitoring well(s) to define downgradient extent of groundwater contamination.
3. Replace extraction pump.
4. Review soil contamination issues at UniFirst to establish data needs for implementation of technical solutions.
5. Assess groundwater conditions south of Wildwood Treatment System, evaluate the need for further groundwater and soil treatment, and where appropriate consider other treatment remedies
6. Develop and implement plan to assess capture in bedrock at Wildwood.
7. Evaluate exposures not addressed by Endangerment Assessment using up-to-date groundwater data.
8. Assess groundwater conditions at appropriate Source Area properties
9. Evaluate risk from exposure to indoor air at the Source Area (OU-1) properties based on up-to-date groundwater data if property is developed.
10. Revise NPDES equivalent discharge standards as needed based upon current AWQCs.
11. Evaluate progress of Olympia TCE soil remedy under the AOC removal action. Assess need for groundwater cleanup at end of removal action.

Five-Year Review Summary Form, cont'd.

Protectiveness Statement(s)

The remedy at the Wells G&H Superfund Site currently protects human health and the environment. However, in order for the remedy to be protective in the long term, institutional controls should be implemented at the Source Area properties to prevent exposure to groundwater and unremediated soil areas until the remedy is completed. Additional treatment and/or measures to ensure capture may be required at some of the Source Area (OU-1) properties. The Endangerment Assessment did not cover all potential exposures to groundwater, and the basis for identifying COCs has changed since implementation of the ROD, which will require additional evaluation to ensure representativeness and future protectiveness. Indoor air vapor intrusion has also emerged as an issue as EPA technical guidance on this matter has evolved. Lastly, AWQCs associated with aquatic life have decreased since the ROD; therefore, the impact of these changes needs to be assessed.

Other Comments

Operable Units 2 (Central Area) and 3 (the Aberjona River Study) have been identified for further study by the PRPs and EPA, respectively. However, a remedy has not yet been selected for the Central Area (OU-2) and Aberjona River Study (OU-3).

1.0 INTRODUCTION

The purpose of this five-year review is to determine whether the remedy for the Wells G&H Superfund Site (the Site) is protective of human health and the environment. The methods, findings and conclusions of this review are documented in this second Five-Year Review Report. In addition, this report identifies issues found during this five-year review along with recommendations to address them.

United States Environmental Protection Agency (EPA) Region I has conducted this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP). CERCLA §121 states:

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

The NCP part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) states:

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

This is the second five-year review for the Wells G&H Superfund Site. The completion of the first five-year review, in August 1999, is the trigger for this second five-year review. This statutory review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

2.0 SITE CHRONOLOGY

Table 1: Chronology of Site Events	
Event	**Date**
"Riley Well 2" began operation on Wildwood Conservation Corporation (Wildwood) property.	1958
Municipal water well G developed.	1964
Municipal water well H developed.	1967
Woburn police find abandoned drums at Massachusetts Bay Transportation Authority (MBTA) property on Mishawum Road.	1979
The Massachusetts Department of Environmental Protection (MADEP) finds contamination in the City of Woburn water wells G and H. The wells are subsequently closed.	1979
The United States Environmental Protection Agency (EPA) investigates groundwater contamination.	1981
The Wells G&H Site is proposed for the National Priorities List (NPL).	December 1982
The Wells G&H Site is listed on the NPL.	September 1983
Three Potentially Responsible Parties (PRPs) are ordered by EPA to study groundwater and soil contamination. The PRPs complying with the order are Grace and Co.–Conn (Grace), UniFirst Corporation (UniFirst), and Beatrice Corporation (Beatrice).	1983
EPA begins investigation of the entire 330-acre Wells G&H Site.	1985
Under EPA orders, Olympia Nominee Trust (Olympia) removes 12 55-gallon drums from southwest corner of property on west side of Aberjona River in area known as the Former Drum Disposal Area (FDDA).	1986
The United States Geological Survey (USGS) conducts 30-day aquifer test at Wells G&H under agreement with EPA.	1987
Under EPA orders, Olympia Nominee Trust (Olympia) removes an additional 5 55-gallon drums from southwest corner of property on west side of Aberjona River in area known as the Former Drum Disposal Area (FDDA).	1987
EPA issues an Administrative Order to UniFirst to install monitoring wells and remove contaminants.	1987
EPA finishes soil and groundwater studies and completes the Supplemental Remedial Investigation (RI).	September 1988
The "Riley Well 2" production well on the Wildwood property ceases operation.	1989

Table 1: Chronology of Site Events	
Event	**Date**
EPA issues the Wells G&H Record of Decision (ROD), which presents the long-term clean-up approach.	September 14, 1989
Consent Decree (CD) is signed.	September 1990
EPA issues Explanation of Significant Difference (ESD)	April 25, 1991
PRPs begin design of long-term clean-up. Combined Grace-UniFirst groundwater treatment pilot study conducted.	1991
Two of five PRPs begin long-term groundwater clean-up and two others begin soil excavation.	September 1992
Combined Grace-UniFirst groundwater recovery and treatment system commences operation.	September 1992
PRPs (Beatrice, UniFirst, and Grace) issue Phase IA Wells G&H Site Central Area Investigation Report for the Central Area Operable Unit 2 (OU-2).	February 1994
Beatrice issues Draft Remedial Investigation Report for Southwest Properties).	February 1994
Clean Harbors issues Hydrogeologic Characterization Report for Murphy Waste Oil (1 of 3 properties of the OU-2 Southwest Properties.	February 1994
Remediation of sludge, debris and mixed contaminant soil completed at Wildwood.	1994
EPA and U.S. Fish and Wildlife Service (USFWS) conduct investigations in support of the Aberjona River Study (OU-3).	1995
Clean Harbors issues Addendum I to Hydrogeologic Characterization Report for Murphy Waste Oil Site.	January 1995
Clean Harbors, Inc. issues Corrective Action Investigation Report Part I and II for Murphy Waste Oil Site.	1996 and 1997
Clean Harbors issues Focused Human Health Imminent Hazard Evaluation and Evaluation of Imminent Hazard to Environmental Receptors for Murphy Waste Oil Site.	October 1996
Second round of Aberjona River Study sampling conduced by EPA and Metcalf & Eddy, Inc. (M&E).	1997
EPA investigates Romicon facility as part of OU-2.	Summer 1997
Grace reduced number of pumping wells from the original 22 to current 16 wells.	1997
New England Plastics (NEP) initiates Source Control Remedy (air sparging with soil vapor extraction).	February 2, 1998

Table 1: Chronology of Site Events	
Event	**Date**
EPA conducts Phase I Pre-Design Investigation of FDDA at the Olympia Site.	March 1998
Wildwood soil and groundwater remediation system startup.	May 6, 1998
Clean Harbors issues Addendum to Corrective Action Report (Part II) for Murphy Waste Oil Site.	December 1998
First 5-year review report issued.	August 4, 1999
NEP discontinues soil remediation.	March 7, 2000
Wildwood replaces catalytic oxidation unit with activated carbon filtration unit.	June 2000
EPA, TetraTech NUS, Inc. (TTNUS), and M&E conduct supplemental field activities in support of Aberjona River Study (OU-3).	2000-2002
Grace replaces ultra-violet/chemical oxidation (UV/Ox) system with two granular activated carbon filters operating in series.	2002
EPA prepares and issues Olympia Data Summary Report.	December 2002
Olympia enters into first Administrative Order on Consent (AOC) with EPA Removal Program to conduct contaminated soil removal activities.	March 12, 2003
EPA issues Draft Baseline Human Health and Ecological Risk Assessment Report for Aberjona River Study (OU-3).	May 2003
EPA issues Draft Preliminary MSGRP Report - Southern Area as part of Industri-Plex/Aberjona River Study that evaluates potential contaminant sources in the Aberjona Watershed south of Route 128.	June 2003
Contaminated surface soil and polychlorinated biphenyl (PCB) material at Olympia property excavated and disposed offsite by PRP.	June – August 2003
Beatrice undertakes Supplemental RI of Southwest Properties and issues Draft Supplemental RI Report.	August 2003
UniFirst replaces ultra-violet/chemical oxidation (UV/Ox) system with two carbon adsorption units operating in series.	October 2003
EPA issues Baseline Human Health and Ecological Risk Assessment for the Southwest Properties.	March 2004
PRP enters into second AOC with EPA Removal Program to address trichloroethene (TCE) impacted soils associated with the FDDA at the Olympia Site.	June 9, 2004
EPA conducts second five-year review of the Wells G&H Site.	September 2004

3.0 BACKGROUND

3.1 Physical Characteristics/Land and Resource Use

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

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

The Site is segregated into three operable units, the Source Area (OU-1) properties, the Central Area (OU-2), and the Aberjona River Study (OU-3), which are briefly described below.

3.1.1 Operable Unit 1 – Source Area Properties

The OU-1 Source Area properties consist of the W.R. Grace & Company (Grace), UniFirst Corporation (UniFirst), New England Plastics (NEP), Wildwood Conservation Corporation (Wildwood), and Olympia Nominee Trust (Olympia) properties, the locations of which are depicted on Figure 2 (provided in Attachment 1). The UniFirst property is located at 15 Olympia Avenue. The Grace property is approximately 13 acres and is located at 369 Washington Street on the northeastern portion of the Site. The Olympia property is approximately 21 acres located at 60 Olympia Avenue on the western boundary of the Site. NEP property is approximately 2 acres located at 310 Salem Street. The NEP office and plant are on the south side of Cummings Office Park just west of Washington Street. The Wildwood Property is approximately 15 acres located at 278 Rear Salem Street.

The UniFirst facility was a uniform service facility with an in-house dry cleaning operation. In 1965, the site was developed and the facility eventually included office space, processing and storage of industrial uniforms, dry cleaning, and a truck storage garage (PRC, 1986). However, representatives of Harvard Project Services (consultant to UniFirst) assert that no dry-cleaning happened at the UniFirst Property, just bulk storage of solvents (Cosgrave, 2004). The facility is currently used for storage by another company (Extra Space Storage, Inc.). Downgradient of Unifirst are residential and commercial properties, as well as wetlands connected to the Aberjona River.

Grace purchased the 369 Washington Street facility in 1960 and fabricated food wrapping/packaging equipment (PRC, 1986). The Grace property is currently vacant and under consideration by the Woburn Redevelopment Authority (WRA) for development opportunities. Potential uses reviewed by the WRA include office space, research and development, hotel, retail/business services, and light manufacturing (WRA, 2002a). Downgradient of Grace are residential and commercial properties.

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

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

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

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

The mechanism of release at the FDDA appears to have been leaking drums. The drums were discovered in 1979/1980 by representatives of the MADEP (then the DEQE). The drums were removed in 1986 and 1987 by Olympia under an EPA orders. EPA conducted extensive sampling and analysis of soil and groundwater in 2002 and delineated soil and groundwater contamination at the FDDA. Surface soils were contaminated with PCBs, and subsurface soils and groundwater were primarily contaminated with TCE. EPA believes that this area serves as an ongoing source of TCE contamination to the groundwater and to the Aberjona River that flows through the property.

3.1.2 Operable Unit 2 – Central Area

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

The groundwater aquifer underlying the Site is not currently used as a municipal drinking water source. The objectives listed in the Site ROD include restoring the aquifer to drinking water standards. Public opinion has been opposed to utilizing Wells G and H for water supply. However, the City of Woburn has expressed interest in having the source available for the future (MADEP, 2004). The MADEP's Groundwater Use and Value Determination assigned a "medium" use and value for the Site aquifer, based on a balanced consideration of several factors, and contemplates future use of the aquifer for domestic and industrial purposes.

The portion of the Central Area (OU-2) known as the Southwest Properties includes the Aberjona Auto Parts, Whitney Barrel, and Murphy Waste Oil properties. Aberjona Auto Parts began operations in the mid-1950s for the sale and reconditioning of used and wrecked automobiles, and was also a gasoline service station (NUS, 1986). The Aberjona Auto Parts business is no longer in operation, although the automotive salvage yard remains. The property is occupied by an automotive repair shop, a landscaper, and a residence. The WRA is exploring redevelopment of the Aberjona Auto Parts Property as an ice skating rink or industrial-mixed business (WRA, 2002b). EPA has met with the current property owner to discuss ice rink development plans.

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

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

3.1.3 Operable Unit 3 – Aberjona River Study

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

Historically, the Aberjona River watershed contained numerous industrial facilities. The types of manufacturing in the Aberjona River watershed included leather processing, tanning factories, shoe and boot factories, machine shops, and chemical manufacturing. The watershed also includes the Industri-Plex Superfund Site, which is located approximately 1.5 miles upstream from municipal Wells G and H. The land within the watershed is highly developed, but with a higher percentage of office and commercial business space than the industrial and manufacturing land uses seen in the past.

3.2 History of Contamination

On May 4, 1979, 184 55-gallon drums containing polyurethane and toluene diisocyanate were found on Mishawum Road on a vacant lot owned by the Massachusetts Bay Transportation Authority (MBTA). The drums were removed during negotiations with the Massachusetts Department of Environmental Quality Engineering (DEQE) (now the MADEP). The drum discovery prompted DEQE to sample the nearest downgradient public water supply, Wells G and H (NUS, 1986).

Several chlorinated volatile organic compounds (VOCs) were detected in water from Wells G and H at concentrations ranging from 1 to 400 parts per billion (ppb). The City of Woburn was forced to use Metropolitan District Commission (MDC) water to supplement its public water supply when Wells G and H were shut down on May 21, 1979. The MDC (now the Massachusetts Water Resources Authority or MWRA) continues to supplement the City of Woburn's water supply.

EPA and various property owners have conducted numerous studies to determine the nature and extent of contamination at the Site. The following five facilities have been identified as sources of contamination – Grace, UniFirst, NEP, Wildwood, and Olympia. Wells G and H Superfund Site was listed as a Superfund Site on the National Priorities List (NPL) on December 21, 1982.

3.3 Initial Response

EPA evaluated the hydrogeology and groundwater quality of a ten square-mile area east and north of Woburn in 1981 to determine the extent of contamination and identify sources. Following a Hazard Ranking System (HRS) scoring, the Site was listed on the NPL on December 21, 1982 (NUS, 1986).

In May 1983, three administrative orders pursuant to Section 3013 of RCRA were issued to Grace, UniFirst, and Beatrice. The administrative orders required proposals from each company for sampling, analysis, monitoring, and reporting to address possible groundwater contamination on or emanating from their properties. Groundwater monitoring programs were subsequently initiated by the companies at their respective properties (NUS, 1986).

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

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

The Supplemental RI/FS identified the Grace, UniFirst, Wildwood, NEP and Olympia properties as the likely sources of groundwater contamination in the vicinity of Wells G and H. EPA also identified soil contamination above target levels on the Wildwood, UniFirst, NEP and Olympia properties. Specifically, EPA found the following: a mixture of VOCs, pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and lead at Wildwood; VOCs at UniFirst; PAHs at Olympia property; and VOCs at NEP. Aberjona River and wetland sediment samples contained PAHs and metals such as arsenic, mercury and chromium. Finally, sludge and debris were identified at Wildwood.

EPA issued a ROD for the Site in September 1989. The ROD required soils and groundwater contamination be addressed at the Source Area properties.

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

3.4 Basis for Taking Action

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

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

The Grace contamination consists primarily of chlorinated solvents characterized by a high percentage of trichloroethene (TCE) and 1,2-dichloroethene (DCE). Other contaminants include tetrachloroethene (PCE) and vinyl chloride. The UniFirst contamination is predominantly PCE. Secondary constituents are 1,1,1-TCA, and smaller amounts of TCE and 1,2-DCE. The Wildwood contamination consists primarily of TCE detected at a number of wells, with 1,1,1-TCA, DCE, and PCE detected at a few locations. At Olympia, TCE and xylene were detected in the overburden. At NEP, PCE, TCE, 1,1,1-TCA and 1,2-DCE were found in bedrock and overburden wells.

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

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

Sediment/River. Aberjona River and wetland sediments were contaminated with PAHs, PCBs, pesticides, and metals such as arsenic, copper, mercury, zinc, and chromium. Surface water samples revealed low levels of chlorinated VOCs. Metals and phthalates were also noted in surface water.

Air. Air monitoring, conducted during all site investigations, did not reveal any VOC readings above background at the breathing zone.

Potential health risks identified at the Site include ingestion of contaminated groundwater, inhalation of volatiles while showering, and dermal contact or incidental ingestion of surface soils (EPA, 1989). Arsenic in sediment was identified as contributing to risk above a level of concern for recreational site use. For ecological receptors, the evaluation indicated potential risk to aquatic life due to metals and phthalates in surface water. Potential risk to invertebrates and mammals were identified due to metals, pesticides, PAHs, and PCBs in sediments.

4.0 REMEDIAL ACTIONS

4.1 Remedy Selection

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

4.1.1 Operable Unit 1 – Source Area Properties

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

- Treatment of contaminated soil using in-situ volatilization at Wildwood property;

- Excavation and on-site incineration of contaminated soils at Wildwood, Olympia, NEP, and UniFirst;

- Treatment and/or disposal of sludge and debris found at Wildwood property in a manner to be determined during the design phase of the clean-up; and

- Extraction and treatment of contaminated groundwater separately at the five Source Area properties using pre-treatment for metals and an air stripper to remove volatile organic contaminants, or an equally or more effective technology approved by EPA. The extraction systems were to be designed to address the specific bedrock and/or overburden contamination at each source area property.

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

<u>Remedial Objectives for Soil</u>

The remedial objectives for contaminated soil are:

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

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

Remedial Objectives for Groundwater

The remedial objectives for contaminated groundwater are:

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

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

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

Significant Changes

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

Other Non-Significant Change

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

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

4.1.2 Operable Unit 2 – Central Area

The ROD called for a study of the Central Area Aquifer to determine the most effective way of addressing contamination in the Central Area, which will be addressed as a separate operable unit.

Three of the five Source Area properties PRPs (Beatrice, UniFirst, and Grace) participated in an investigation of the Central Area (OU-2) and its aquifer under the 1991 Consent Decree (CD). The objectives of the Central Area Study, as identified in the ROD, included:

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

Three industrial properties known as the Southwest Properties (Murphy Waste Oil, Whitney Barrel, and Aberjona Auto Parts), were identified by EPA for additional assessment to support a risk assessment.

A remedial decision has not yet been reached for the Central Area (OU-2).

4.1.3 Operable Unit 3 – Aberjona River

EPA took responsibility for the Aberjona River Study (OU-3) for the Site. The Aberjona River Study is designed to investigate the nature and extent of contamination in the Aberjona River sediments and surface water as well as evaluate potential human and ecological risks.

The Aberjona River flows from north to south through both the Industri-Plex and Wells G&H Superfund Sites and thus is a conduit for contaminant migration from the sites. Sediment samples from the Aberjona River and wetlands in the Site are contaminated with metals such as arsenic, chromium, and mercury, and PAHs.

When data obtained from studies at the Industri-Plex (North of Route 128) and Wells G&H (South of Route 128) Superfund Sites indicated that the Aberjona River at both sites contained similar Contaminants of Concern (COCs), EPA concluded that a divided approach to the river and wetlands was no longer reasonable or efficient. Hence, EPA will merge the Wells G&H Aberjona River Study with the Industri-Plex Operable Unit 2 (OU-2) Multiple Source Groundwater Response Plan (MSGRP) Remedial Investigation/ Feasibility Study (RI/FS). EPA announced this merger in a Spring a Fact Sheet (EPA, 2002a). Under the Industri-Plex OU-2 RI/FS, EPA will prepare a comprehensive RI from the Industri-Plex Superfund Site to the Mystic Lakes.

A remedial decision has not yet been reached for the Aberjona River Study (OU-3).

4.2 Remedy Implementation

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

4.2.1 Operable Unit 1 – Source Area Properties

This history and status of remedial actions at the Source Areas (OU-1) is discussed below by property. Attachment 2 contains tables summarizing groundwater monitoring well data that have exceeded ROD cleanup levels within the last five years of monitoring conducted by the PRPs.

4.2.1.1 UniFirst and Grace Properties

The groundwater extraction and treatment systems for both properties began operation in September 1992, and consisted of two extraction and treatment systems. The UniFirst property has one pumping well (UC-22) which captures contaminants in deep bedrock, and the Grace property currently has 16 pumping wells capturing contaminants in the unconsolidated deposits and shallow bedrock (GeoTrans, 2003; HPS, 2003). The remedial systems are currently in the 12^{th} year of operation.

UniFirst's treatment system for groundwater originally included ultra-violet/chemical oxidation (UV/Ox) followed by two carbon adsorption units operating in series. Due to decreased contaminant levels, the UV/Ox system was no longer required and the system was modified in October 2003 (HPS, 2003). The UV/Ox system was replaced with granular activated carbon (GAC) filters. Treated groundwater is discharged to a storm sewer (HPS et al, 2004). Some on-site monitoring wells have achieved the ROD target clean-up levels, while the remaining wells monitored at the Site have remained consistent or show only minor decreases in contaminant concentrations (HPS, 2003).

Attachment 2.1 contains a table summarizing UniFirst groundwater monitoring data over the last five years of monitoring that have exceeded ROD cleanup levels. A figure illustrating monitoring well locations is also included.

The Grace groundwater treatment system initially included particulate filtration and UV/Ox treatment. Treated groundwater is discharged to Snyder Creek. System modifications in 1997 included the reduction in pumping wells from the original 22 to the current 16 wells. In 2002, the use of UV/Ox reactor was discontinued and replaced with two GAC filters in series (GeoTrans, 2003). The remedial system is designed to capture groundwater in the unconsolidated deposits and shallow bedrock before traveling offsite (GeoTrans, 2003). The remaining groundwater contamination emanating from Grace is, by design, allowed to migrate towards the UniFirst property and is reportedly captured by the UniFirst extraction well (UC-22). The UniFirst remedy set forth in the ROD also included soil vapor extraction (SVE) **treatment of contaminated soil. However, the soil treatment remedy has not been implemented at UniFirst. The PRPs have historically expressed concerns with the timing/phasing of soil remedy implementation.**

Attachment 2.2 **contains** a table summarizing Grace groundwater monitoring data over the last five years of monitoring that have exceeded ROD cleanup levels. A figure illustrating monitoring well locations is also included.

4.2.1.2 NEP

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

Ultimately, the source control remedy for NEP included air sparging with soil vapor extraction (AS/SVE). This system ran from February 1998 to March 2000. At the time of system shut down, ROD clean-up concentrations in unsaturated soils had been achieved and significant reductions in VOCs in groundwater were realized. However, TCE and PCE contamination remains present in groundwater above ROD action levels. TCE and PCE levels in site groundwater decreased significantly in the source area and downgradient overburden and shallow bedrock groundwater.

Annual groundwater monitoring is conducted to identify contaminant trends. Nine wells in the plume area are sampled annually; sampling of other wells was discontinued in 2001 (Hamel, 2004). Statistical trend analysis indicates that wells do not have an increasing trend of PCE or TCE at a 95-percent or greater confidence level (Woodard & Curran, 2003). However, PCE groundwater contamination is still present above the ROD action level in monitoring wells FW-1, NEP-101, NEP-104B, and NEP-106B. TCE groundwater contamination exceeds the ROD action level in monitoring well NEP-106B (Woodard & Curran, 2003).

Attachment 2.3 **contains** a table summarizing NEP groundwater monitoring data over the last vie years of monitoring that have exceeded ROD cleanup levels. A figure illustrating monitoring well locations is also included.

4.2.1.3 Wildwood Property

As of February 1994, debris, soil, and drums were removed from the Wildwood property (GeoTrans, 1994). A subsurface remediation system for soil and groundwater was constructed and began operation in May 1998. The remediation system includes groundwater pumped from a series of wells screened at varying depths in bedrock combined with AS/SVE (RETEC, 2004).

The Wildwood remedial system has undergone changes during treatment system operations. The monthly monitoring of the vapor collection system was conducted using a photoionization detector (PID) or flame ionization detector (FID). The field screening readings were inconclusive due to moisture or the presence of methane, and monthly system air analytical sampling began in April 2001 (RETEC, 2004). The vapor extraction system used a Catalytic Oxidation (CATOX) unit with an acid gas scrubber to treat vapors until June 12, 2000. The current configuration consists of a duplex vapor phase GAC system treating all SVE vapors (RETEC, 2004). The AS system consists of 24 air injection wells within a 2-acre area. The AS wells operated in a pulse mode until February 2003. The sparging sequence and duration was modified to provide increased efficiency and VOC recovery (RETEC, 2004). Significant savings in electrical power costs have been realized as a result of the sparging sequence modifications (Greacen, 2004).

A review of the remedial system trends indicates decreased concentrations of influent vapor-phase VOCs, dissolved-phase VOCs in groundwater, and VOCs in overburden and bedrock aquifers (RETEC, 2004). Treatment system operations are ongoing.

Attachment 2.4 contains a table summarizing Wildwood groundwater monitoring data over the last five years of monitoring that have exceeded ROD cleanup levels. A figure illustrating monitoring well locations is also included.

At the time the remedy designed by RETEC was approved, the southern portion of the Wildwood property was not targeted for treatment. However, RETEC indicates that chlorinated solvent contamination in excess of MCLs is present in this area.

4.2.1.4 Olympia Property

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

- Define the extent of subsurface contamination (as needed), monitor progress of treatment, and document successful clean-up;

- Treat (oxidize) TCE-contaminated subsurface soils in-situ by sodium permanganate injection;

- Re-vegetate and grade the site; and

- Conduct post-cleanup groundwater quarterly monitoring for three years.

EPA will evaluate TCE cleanup and groundwater monitoring data, and, as necessary, consider the need for further groundwater treatment. Soil and ground clean up goals are as set forth in the ROD.

Groundwater data collected by EPA in 2002 **during an investigation of the Olympia FDDA that exceed ROD cleanup criteria are tabulated in Attachment 2.5. A figure illustrating** monitoring well locations is also included.

4.2.2 Operable Unit 2 – Central Area

A remedy has not been selected for the Central Area (OU-2).

4.2.3 Operable Unit 3 – Aberjona River Study

A remedy has not been selected for the Aberjona River Study (OU-3).

4.3 System Operations/Operation and Maintenance (O&M)

4.3.1 UniFirst

UniFirst's deep bedrock groundwater extraction and treatment system has been in operation for approximately 12 years. Bi-monthly samples are taken from the treatment system influent and monthly samples are taken from the treatment system effluent. Routine O&M includes weekly system inspections, quarterly sensor check, and annual inspection and maintenance (HPS, 2003).

At the time of the Five-Year review Site Inspection, the groundwater extraction well pump had undergone replacement due to recent failure. The replacement pump is not capable of lowering groundwater table to the design elevation of 15 feet above mean sea level (AMSL) (Cosgrave, 2004). See Section 6.4 for additional observations from the Five-Year Review inspection of the UniFirst Site.

4.3.2 Grace

Grace's overburden and shallow bedrock groundwater extraction and treatment system has been in operation for approximately 12 years. The O&M for the Grace property includes monthly sampling of the treatment system at the first and second GAC vessel effluent, monthly influent sampling, and annual sampling of 12 monitoring wells, 6 recovery wells and Snyder Creek (discharge point) (GeoTrans, 2003).

4.3.3 Wildwood

Wildwood's AS/SVE and bedrock groundwater extraction and treatment system has been in operation for approximately 6 years (RETEC 2004). Monitoring activities at Wildwood include analysis of process water, process vapor and groundwater. Monthly process monitoring activities are conducted for the treatment system. Monthly monitoring activities include:

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

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

4.3.4 NEP

NEP implemented an AS/SVE treatment system which was operational for approximately 2 years between 1998 and 2000. The remedy at NEP was intended to cleanup contaminated soil. Operation of the remediation system (AS/SVE) was discontinued in March 2000; therefore, there are no O&M activities conducted at the site. Annual groundwater monitoring continues to evaluate residual VOC concentrations in groundwater (Woodward & Curran, 2003).

4.3.5 Olympia

As previously discussed, the PRP for the Olympia Site plans to treat TCE contaminated soil in-situ using chemical oxidation (permanganate injection). This work is currently scheduled for year 2004 (EPA, 2004c). Additional on-site groundwater monitoring wells will be installed and the groundwater monitored to determine the effectiveness of this removal action. Monitoring will be implemented during remediation (between each injection event) and after the remediation is complete. Proposed post remedial monitoring includes quarterly groundwater sampling for three years (GeoInsight, 2004; EPA, 2004a).

EPA will evaluate TCE cleanup and groundwater monitoring data, and, as necessary, consider the need for further groundwater treatment.

5.0 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

The following recommendations were made in the previous Five-Year Review Report (EPA, 1999).

- Continue operation of the groundwater extraction and treatment systems at the Grace, UniFirst and Wildwood properties.
- Evaluate SVE systems at Wildwood and NEP each quarter to determine the effectiveness of their continued operation.
- Begin design of a groundwater extraction and treatment system at the NEP property.
- Aggressively pursue negotiations with the owners of Olympia property.
- Proceed with risk assessment on the Southwest Properties.
- Proceed with Aberjona River Study risk assessment.
- Continue discussions with the City of Woburn and the Commonwealth of Massachusetts regarding the future use of the Wells G&H aquifer and any additional remediation that might be necessary given its intended use.

Continued Operation of Grace, UniFirst, and Wildwood Systems.

The Grace, UniFirst and Wildwood treatment systems have operated continuously throughout the prior 5 year period, with the exception of system shut downs for maintenance, repairs and/or system modifications (e.g., changes from CATOX to activated carbon air phase treatment system at Wildwood, replacement of a failed extraction well pump at UniFirst, and replacement of UV/Ox groundwater treatment at Grace and UniFirst with GAC filtration).

Quarterly Evaluation of SVE Systems at Wildwood and NEP.

RETEC, operator of the Wildwood system, provides a quarterly data package for the AS/SVE and groundwater extraction system at Wildwood. NEP terminated operation of the SVE system in March 2000. Consequently, a quarterly evaluation of the AS/SVE system is not conducted for NEP. NEP continues to conduct annual groundwater monitoring.

Initiate Design of NEP Groundwater Extraction System.

A design of a groundwater extraction system at NEP has not been initiated. EPA will evaluate the suitability of a monitored natural attenuation (MNA) remedy or active remedial system to address residual chlorinated solvent contamination in groundwater in excess of ROD action levels during the next five-year review period.

Negotiations with Olympia.

In Spring 2003, EPA reached an agreement with Olympia through an Administrative Order by Consent (AOC) to continue the clean-up of contaminated soils on the Olympia property. Under the AOC, Olympia excavated and disposed of 56 cubic yards of PCB-contaminated surface soils, and approximately 5 cubic yards of PAH-contaminated soil, evaluated various options for addressing the TCE-contaminated soils, and prepared a detailed work plan for cleaning up the TCE by way of in-situ sodium permanganate injection treatment. In June 2004, EPA approved the TCE Work Plan and reached a second AOC with Olympia to implement the work. Cleanup of the TCE contaminated soils is currently underway. Additional on-site groundwater monitoring wells will be installed and the groundwater monitored to determine the effectiveness of the removal action.

Southwest Properties Risk Assessment.

EPA completed a Baseline Human Health and Ecological Risk Assessment for the Southwest Properties in March 2004. This baseline risk assessment (BRA) is part of Operable Unit 2 (OU-2) RI/FS for the Wells G&H Superfund Site. The baseline risk assessment (BRA) provides one of the bases for determining whether or not remedial action is necessary.

The BRA identified current and future human health risk associated with PCBs and hydrocarbons in soil at the Whitney Site. PCBs and chromium in sediments were the primary human health risk contributors and PCBs, chromium, and lead were the primary ecological risk contributors at the Murphy Wetland. TCE, vinyl chloride, and 1,1, 2-trichloroethane were the primary human health risk contributors in groundwater throughout the Southwest Properties. A more detailed description of the risk results can be found in Section 7.2.1 and in the BRA (TRC, 2004).

Aberjona River Risk Assessment.

EPA released the Draft Baseline Human Health and Ecological Risk Assessment for the Aberjona River Study Area in May 2003. The baseline risk assessment for the Aberjona River Study area focused on sediments and soils along six miles of the Aberjona River and wetlands from Route 128 in Woburn to the Mystic Lakes in Arlington and Medford. The study area was divided into six sections along the river, called reaches. Reach 1 contains the Wells G&H Superfund Site and associated 38-acre wetland, while Reach 2 contains a former cranberry bog to the south. After the cranberry bog, the river continues to flow south as a well-defined river channel through Reaches 3, 4 and 5 prior to discharging into Reach 6, or the Mystic Lakes (EPA, 2003a).

EPA analyzed over 390 sediment and soil samples from 52 sampling stations along the study area. Additional sediment samples were collected from twelve stations outside the study area to provide background information for comparison. Surface water and fish samples were also collected from inside and outside the study area. EPA also conducted various studies to more accurately characterize potential risks along the study area (EPA, 2003a).

Arsenic was present in sediments throughout the study area. Other metals, including antimony, chromium, copper, lead, mercury and zinc, were also detected at elevated levels. The Wells G&H 38-acre wetland exhibited some of the highest concentrations of metals within the study area (EPA, 2003a).

The results of the human health risk assessment indicate that sediments may pose a current health risk to people using the study area in two exposure areas along the east side of the Wells G&H 38-acre wetland (near the former municipal Well H), and in the irrigation channels along the western side of the center of the former cranberry bog. Six other exposure areas were evaluated for potential risks along the former cranberry bog, but none of these areas pose a health risk (EPA, 2003b).

The ecological risk assessment did not reveal a risk to fish or green heron within the study area. However, risks were widely observed in depositional sediments in the Wells G&H 38-acre wetland and in the 17-acre former cranberry bog. In addition, two sediment locations in the Mystic Lakes indicate potential risks to benthic invertebrates. The ecological risks were primarily due to exposure to metals contamination in sediments and/or vegetation growing in contaminated sediments.

The draft baseline risk assessment for the Aberjona River Study Area will be expanded to include environmental data collected immediately upstream of the study area (i.e., north of Route 128). Refer to Section 7.2.1 for a more detailed summary of the results of the Aberjona River Study BRA.

Discussion on Future Use of Aquifer.

The MADEP prepared a "Groundwater Use and Value Determination" (Determination), dated June 21, 2004 for the groundwater beneath the Wells G&H Superfund Site. At the request of EPA, MADEP prepared the Determination consistent with the EPA's 1996 *Final Ground Water and Value Determination Guidance*, and *Memorandum of Agreement* between EPA and MADEP. The purpose of the Use and Value Determination is to identify whether the aquifer at the site should be considered of "High", "Medium" or "Low" use and value. In preparing the Determination, MADEP applied the aquifer classification system in the Massachusetts Contingency Plan (MCP; 310 CMR 40.0000). The MCP aquifer classification gives consideration to all factors in EPA's guidance.

MADEP's Determination supports a "medium" use and value for groundwater at the Site. The determination identifies the following exposure scenarios that should be included, at a minimum, for groundwater risk evaluations: ingestion and exposures from certain domestic uses; inhalation of vapors from seepage into buildings; use of water in industrial processes; other potential exposures to the use of the water in industrial and residential activities; worker exposure during excavation into groundwater; and exposures resulting from discharge to surface water. EPA will apply MADEP's Determination and groundwater exposure scenarios to the remaining groundwater concerns for the Central Area (OU-2).

6.0 FIVE-YEAR REVIEW PROCESS

This section describes the activities performed during the five-year review process and provides a summary of findings. The Wells G&H five-year review team was led by Joseph F. LeMay, PE, of EPA, Remedial Project Manager (RPM) for the Site. The team included staff from TRC Environmental Corporation (TRC) and Metcalf & Eddy, Inc. (M&E) with expertise in remediation, hydrogeology, and risk assessment.

6.1 Community Notification and Involvement

Community notification of the initiation and completion of the Five-Year Review was provided through notifications published in the local newspapers. EPA also updated the Wells G&H website regarding initiation and completion of the Five-Year Review

Over the last five years, community interest in the site has been centered on contamination in the Aberjona River (OU-3) and reuse of the Wells G&H site. Public involvement or attention regarding the Source Area (OU-1) remedies has been limited. Public sentiment regarding the future use of the Wells G&H Central Area (OU-2) aquifer as a public water supply is negative, although the Woburn city government has expressed an interest in having the source available for the future. Interviews for this five-year review with various members of the local government and community were conducted throughout the month of August 2004. Local community members and local governmental representatives interviewed, their affiliation, and date of interview are summarized below:

Interviewee	Affiliation	Date of Interview
John Curran	Mayor of Woburn	August 24, 2004
Paul Medeiros	President, Woburn City Council	August 18, 2004
Jack Marlowe	Woburn Redevelopment Authority	August 23, 2004
Jack Fralick	Woburn Board of Health	August 26, 2004
Gretchen Latowsky	Environmental Activist	August 25, 2004
Michael Raymond	Woburn Resident	August 31, 2004
Donna Robbins	Woburn Resident	August 31, 2004
Linda Raymond	Aberjona River Study Coalition, Inc.	August 31, 2004
Kathy Barry	Aberjona River Study Coalition, Inc.	August 31, 2004
John Ciriello	Woburn Resident	August 31, 2004

The results of these and other interviews are summarized in Section 6.5.

Since the last five-year review, EPA has issued several fact sheets and press releases regarding site progress. Public presentations have also been conducted on results of the Baseline Human Health and Ecological Risk Assessment for the Aberjona River Study (OU-3).

In addition, a copy of the five-year review is being placed in the information repository in the Woburn Public Library and posted on the Wells G&H website.

6.2 Document Review

The document review for the Wells G&H five-year review included the documents listed below:

- Record of Decision (September 14, 1989)

- Consent Decree, Civil Action No. 91-11807MA and RD/RA SOW (September 21, 1990)

- Explanation of Significant Difference (April 25, 1991)

- Five-Year Review Report (Type 1A), Wells G&H Superfund Site (August 4, 1999)

- Clarification of the August 1999 Five-Year Review for the Wells G&H Site (December 2001)

- Latest Annual Performance Evaluation and Source Control Reports for the Source Area (OU-1) properties

  - Grace Remedial Action, Annual Report, November 13, 2003
  - RD/RA Year 11 Annual Report for the UniFirst Site, November 14, 2003
  - Annual Report, Integrated Subsurface Treatment System, Wildwood Property, February 2004
  - Groundwater Monitoring Report, New England Plastics Corporation, November 2003

- Last 6 months of Monthly Operations Reports for the Source Area properties

- Approved source area environmental monitoring plans

- Public Health Assessment Addendum, Wells G&H, Woburn, Middlesex County, Massachusetts, CERCLIS No. MAD980732168. Prepared by U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. December 20, 1995.

- Letter Report. RE: Residential Indoor Air Sampling Results: Dewey Avenue Neighborhood, Wells G&H Superfund Site. Prepared by ENSR. July 21, 1989.

- *Endangerment Assessment for the Wells G&H Site, Woburn, Massachusetts.* Prepared for EBASCO Services, Incorporated, Lyndhurst, New Jersey. Prepared by: Clement Associates, Fairfax, Virginia. December 1988.

- 2003 Olympia Nominee Trust AOC for the removal of PCBs and further TCE investigations

- 2004 Olympia Nominee Trust AOC for the treatment of TCE contaminated soils

- Revised Work Plan, Removal Action, 60 Olympia Avenue, Woburn, Massachusetts, January 28, 2004

- *Groundwater Use and Value Determination, Wells G&H Superfund Site, Woburn, Massachusetts.* Prepared by the Massachusetts Department of Environmental Protection. June 2004.

Additional documents and information sources used in the preparation of this report are listed in Attachment 3.

6.3 Data Review

Groundwater monitoring has been performed for a number of years at each of the Source Area properties which have had active remedial systems installed. Specific dates when sampling was initiated and sample collection frequencies vary for each of these properties. As previously mentioned, certain portions of the overall Wells G&H site have not had remedial actions initiated to date.

For the Source Area (OU-1) properties, the ROD identifies the following remedial goals for the groundwater remedial systems:

- Prevent the further introduction of contaminated groundwater from the source areas to the Central Area;

- Limit the further migration of contaminated groundwater off-site from the source areas;

- Restore the bedrock and overburden aquifers in the vicinity of the source areas to drinking water quality; and

- Prevent public contact with contaminated groundwater above the clean-up levels.

The discussions below summarize the results of groundwater monitoring being conducted at the respective Source Area properties. The evaluations of the groundwater monitoring database for each property consider the overall concentration trends of the contaminants of concern since the initiation of remedial activities as well as current trends in concentrations over the last five years of data collection.

Grace

Groundwater is the only environmental media subjected to regular monitoring at the Grace property. The groundwater monitoring program formerly consisted of annual sampling and analysis of groundwater from 10 monitoring wells and 8 pumping wells (GeoTrans, 2002). Subsequent to the submission and EPA approval of a revised Long Term Monitoring (LTM) Plan on April 11, 2004, the groundwater monitoring program now consists of annual sampling and chemical analysis of groundwater from 12 monitoring wells and 6 pumping wells.

The available database shows that overall concentrations of VOCs in groundwater appear to be decreasing at the Grace property. Of the 12 monitoring wells currently included in the sampling program, VOC concentrations have dropped significantly since the initiation of groundwater extraction in 1992. However, exceedances of ROD-identified action levels have been encountered in the last five years in 7 of the 12 wells currently being monitored. Monitoring wells in which exceedances have been detected in the last five years include: G11D, G12D, G23D, G34D, G36D, G36DB and G36DB2.

TCE was detected over the last five years in each of these wells at concentrations above its respective clean-up criteria of 5 ug/L. Detections of TCE above clean-up criteria in wells G12D and G36D have been sporadic over the last five years, with several sampling events showing TCE was not detected in the groundwater from these wells. Detected maximum concentrations of TCE over the last five years vary over time and from monitoring well to monitoring well and range from approximately 10 ug/L to 35 ug/L. Data from the last five years also show PCE has been detected above or equal to its respective clean-up criteria of 5 ug/L, in wells G36DB and G36DB2 at concentrations ranging from approximately 5 to 40 ug/L.

Groundwater from all six pumping wells at Grace have been found to contain TCE and PCE above ROD action levels. The highest VOC concentrations detected over the last five years at the site have been encountered in groundwater from pumping well RW-22. Detections of TCE in well RW-22 have been encountered as high as 890 ug/L. Detections of 1,2-DCE have also been encountered in RW-22 groundwater as high as 1,417 ug/L.

Samples collected from the shallower monitoring wells at the Grace property have been found to be nondetect for the COCs or have had concentrations below clean-up criteria. Deeper contaminated groundwater emanating from the Grace property is reported to be captured by the deeper groundwater recovery system operated at the UniFirst property.

GeoTrans (2003) calculated the mass of VOC removed from the subsurface for September 3, 2002 through September 2, 2003. The calculated total mass removed in that period was 4.45 pounds. The calculation was based on influent concentrations of detected VOC and the total volume of groundwater treated during that period. Values reported as below the detection limit were assumed to be zero in all calculations consistent with prior similar calculations for this Site.

The estimated total mass of VOC that was removed from groundwater beneath the Grace property during the first eleven years of operation is 77.5 pounds. Approximatley 3,923,470 gallons of water were pumped during the eleventh year.

UniFirst

Groundwater is the only environmental media subjected to regular monitoring at the UniFirst property. The groundwater monitoring program at the UniFirst property currently includes sampling from 24 wells and subsequent chemical analysis for VOCs. Over the years since active groundwater pumping has been conducted, variations of the list of wells included in the sampling program have been implemented. There is only one groundwater extraction well operated on the UniFirst property, UC22. Hydraulic capture is reported to be achieved for the overburden and bedrock aquifers from pumping approximately 40 gallons per minute (gpm) from this well.

A review of the data available prior to and since startup of active groundwater pumping shows that for a number of the wells monitored, contaminant concentrations have not changed significantly. Examples include wells UC7-1 and UC7-2, which had total VOC concentrations of approximately 2,500 ug/L in 1991 and total VOC concentrations of 2,400 ug/L and 2,800 ug/L, respectively in 2003. Other wells which do not appear to show a significant decrease in contaminant concentrations include UC10-1 through UC10-5, S81M, UC11-2, and UC7-5. In locations where decreasing contaminant concentrations have been encountered, concentrations generally remain above clean-up criteria.

Shallow groundwater within the unconsolidated deposits appears to contain lesser concentrations of the COCs than deeper groundwater, located within the bedrock. Shallow wells UC10S, UC10M, UC10D, and S70M have had non-detectable concentrations of the COCs repeatedly over several rounds of sampling. It should be noted that these wells also had non-detectable concentrations for these compounds during their respective earliest sampling events.

HPS (2003) calculated the total mass of contaminant removed using the average of the influent concentrations of the contaminants and monthly flows from extraction well UC-22. Approximately 73.5 pounds of PCE and 3.5 pounds of TCE were removed during the eleventh operational year. During the eleventh operational year, approximately 22.56 million gallons of groundwater were extracted from UC-22. Approximately 0.25 pounds of 1,1,1-TCA, 0.42 pounds of 1,2-DCE, and 0.17 pounds of 1,1-DCE also were removed from the subsurface by the extraction and treatment system. Approximately 1,796 pounds of PCE and 85 pounds of TCE have been removed during the eleven years of operation.

New England Plastics

NEP operated the AS/SVE source control remedy from February 2, 1998 to March 7, 2000. Since the shutdown of the remedial system at NEP, ongoing groundwater monitoring is being performed to evaluate trends in contaminant concentrations. Operation of the AS/SVE system reduced concentrations of the COCs detected in site groundwater significantly, with maximum concentrations of total chlorinated VOCs detected in overburden well NEP-101 being reduced from 5,406 ug/L to a range of 10 ug/L to 40 ug/L. Similar reductions have been noted in groundwater within the bedrock.

Although significant reductions of groundwater contaminant concentrations have been achieved, exceedances of ROD action levels remain. The predominant chlorinated VOC in groundwater at the NEP property is PCE (ROD action level of 5 ug/L), typically comprising 75% to 100% of the total chlorinated VOC concentrations. The percentage of PCE contribution to the total chlorinated VOC concentrations is higher in the upgradient well NEP-101 than in those wells in the downgradient portions of the site.

Additionally, a review of historic concentrations of total chlorinated VOCs in groundwater, as presented in Figures 1 and 2 of the annual Groundwater Monitoring Report (Woodard & Curran, 2003) shows the decreases experienced were noted with the startup of the AS/SVE system. Contaminant concentrations since then appear to have stabilized. While no significant increasing trend is noted to have occurred since turning off the AS/SVE system, a trend of further contaminant concentration reductions leading to eventual achievement of clean-up goals in the foreseeable future is not evident.

Contaminant mass removal estimates are not included in NEP annual reporting.

Wildwood

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

Groundwater monitoring activities include quarterly sampling and analysis from 13 wells and annual sampling and analysis from 23 wells. Well locations monitored include extraction wells and monitoring wells located both within the AS/SVE treatment zone and outside of the treatment zone. Review of the groundwater quality data shows no clear trend in contaminant concentrations across the site. At some well locations, concentrations have increased beyond their baseline conditions; at other locations, concentrations have both increased and decreased over time.

Exceedances of clean-up criteria in groundwater persist at most monitoring well locations and within the different aquifer zones (i.e., shallow and intermediate overburden, till, shallow bedrock and deeper bedrock). The overall predominant contaminant detected in overburden groundwater is TCE. Within the deeper bedrock zone a more varied set of contaminants have been detected at greater concentrations, including chloroform and 1,1,1-TCA (both detected at varying concentrations of approximately 200 ug/L in well BW-18RD(LO)). It should be noted that while the deeper bedrock zone contains the highest concentrations of contaminants, only two wells screened within the deep bedrock, one of which is an extraction well, are included in the monitoring program.

Vapor monitoring has not shown any evidence of issues related to contaminant concentrations escaping around or through the cover system installed over the AS/SVE treatment zone.

The most recent annual report for Wildwood prepared by RETEC documents performance of the remedy through Year Five. RETEC (2004) determined the quantity of total VOCs removed from the groundwater and vapor extraction systems based on totalized volumes for the vapor and liquid process streams and contaminant concentrations for these streams. The average monthly composite air sparging system flow rate for Year Five ranged from 113 standard cubic feet per minute (scfm) to 130 scfm. The overall average monthly flow rate was 121 scfm for Year Five. The total volume of injected air for Year Five was 58.6 million cubic feet, which corresponds to an average monthly air injection volume of approximately 4.9 million cubic feet.

The vapor extraction system network operated at a combined average flow rate of 205 scfm for Year Five. The total volume of vapor extracted during Year Five was 98.4 million cubic feet.

Air stripper off-gas flow rates were maintained at a constant flow rate of 260 scfm during Year Five operations. The average monthly rate was 260 scfm. The total volume of air used to treat groundater within the air stripper was approximately 131 million cubic feet.

Vapor phase activated carbon filters receive combined influent air from the vapor extraction system and the air stripper. The average monthly flow rate at the activated carbon filter influent was 460 scfm for Year Five operations, with a range from 439 scfm to 515 scfm. The total volume of air that passed through the vapor phase carbon at the site for Year Five was 233.9 million cubic feet, which is the sum of the air stripper off-gas and the SVE system flow.

The treatment system influent includes groundwater pumped from the five bedrock extraction wells and periodic batch flows of water collected in the two air-water separators on the SVE system. The total volume of water treated between May 2002 and end of April 2003 was 9.2 million gallons.

Water run through the treatment system is composed of the influent from the subsurface treatment system and water generated by plant operations, sampling, and routine maintenance. Both streams are run through the air stripper prior to discharge. The operation sources include backwash water from the sand filter and the two carbon vessels, and water from the acid-gas scrubber (when the catox unit was in operation). Water generated from general decontamination operations is also collected by the floor drains and transferred into the system for treatment. The total volume of system effluent for Year Five operations was 8.33 million gallons.

RETEC (2004) calculations used to estimate mass removal for the groundwater treatment system assume that the total VOCs are comprised entirely of TCE. Mass removal estimates for groundwater are based on laboratory data combined with the totalized influent flow reading collected at the treatment building. The total calculated mass of VOCs removed from groundwater during Year Five operations was 11.5 pounds of VOCs, bringing the five-year total to approximately 132 pounds of VOCs removed.

Mass removal estimates for the SVE system are based on laboratory analytical sampling to determine influent and effluent air concentrations converted to parts per million-volume (ppm(v)) for comparison purposes assuming all detected VOCs comprised of TCE. The

calculated total mass of VOCs removed by the SVE system was 100 pounds for Year Five operations.

Olympia

As no remedial system has been put in place at the Olympia property, routine monitoring of associated environmental media is not conducted. Historic data relative to the FDDA exist as a series of individual sampling events conducted by various parties and including varying sets of monitoring points. The most recent sampling efforts conducted at the FDDA include efforts by TRC (for EPA in 2002) and GeoInsight (for the PRP in 2003).

The overall conclusions from these two sampling activities regarding the presence of the COCs at the site were that elevated concentrations remained within a silty clayey soil layer from approximately 4 to 16 feet below grade. The primary contaminant detected was TCE, which was detected at concentrations of several hundred to several thousand ug/L (GeoInsight, 2004). Evidence of natural degradation occurring at the site was noted in the form of significant concentrations of breakdown byproducts cis-1,2-DCE, and vinyl chloride. However, this evidence was not found throughout the site and given the time elapsed between the removal of the drums from the site and the recent sampling activities, it appears any degradation which may be occurring is proceeding at a very slow rate. Overall, in the absence of any active response action at the FDDA, contaminant concentrations remain at levels similar to those detected over time.

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

Data Review Summary

Remedial systems to address the Source Area properties have been installed on four of the five properties. Based on a review of the analytical groundwater generated to date, COCs persist in groundwater at the Source Area properties at concentrations exceeding ROD action levels.

6.4 Site Inspection

Representatives of M&E and TRC, in conjunction with source area contractor interviews, conducted site inspections of four of the Source Area (OU-1) properties on August 3, 2004 (Grace, UniFirst, and NEP) and August 18, 2004 (Wildwood). The purpose of the inspections was to help assess the protectiveness of the remedy by observing the condition of the site access controls, and the remediation systems. A site inspection of the Olympia site was not conducted; representatives of Olympia were unavailable to participate in the site visit during the Five-Year Review period. However, EPA has a periodic presence at Olympia to oversee response actions conducted under recent AOCs. The status of site actions/activities relative to the AOCs is reported elsewhere in this Five-Year Review.

The following source area representatives participated during the site inspections:

Timothy Cosgrave with Harvard Project Services, LLC, was present during the Five-Year Review site visit of the UniFirst property conducted by M&E and TRC personnel on August 3, 2004;

Maryellen Johns, Senior Project Engineer, with The Remedium Group and **Jonathan R. Bridge**, Associate, Senior Hydrogeologist with GeoTrans, Incorporated were present during the Five-Year Review site visit of the Grace property conducted by M&E and TRC personnel on August 3, 2004;

Jeffrey Hamel, Project Manager with Woodard & Curran, Incorporated, was present during the Five-Year Review site visit of the NEP property conducted by M&E and TRC personnel on August 3, 2004; and

James R. Greacen, Project Manager and Senior Hydrogeologist with The RETEC Group (RETEC), **Peter Cox**, Geologist, with RETEC, and **Brendan Maye**, O&M Technician, with RETEC were present during the Five-Year Review site visit of the Wildwood Property conducted by M&E and TRC personnel on August 18, 2004.

Site inspection checklists are included in Attachment 4. Site inspection photographs are included in Attachment 5. Any concerns raised during the site inspections (as well as concerns raised during interviews - see Section 6.5) that do not relate to the protectiveness of the remedy (e.g. operation and maintenance of the source area treatment facilities, operable unit 2, or operable unit 3), will not be reported as issues under the Five Year Review. Although, EPA will identify all potential concerns raised relative to operation and maintenance and operable unit 2 to the PRPs, and require these concerns be adequately addressed. Any concerns raised relative to the operable unit 3 will be addressed by EPA.

6.5 Interviews

Interviews were conducted for the Five-Year Review consistent with OSWER Directive 9355.7-03B-P *Comprehensive Five-Year Review Guidance*, June 2001 (EPA, 2001a).

Interviews were conducted in person to the extent practicable with representatives of MADEP, PRP consultants and representatives, Woburn city government officials, and the local community, including representatives of local environmental groups. The interviews associated with PRP consultants for Grace, UniFirst, NEP, and Wildwood were performed in conjunction with site visits to the Source Area properties. Representatives of M&E and TRC conducted all interviews on behalf of EPA. The individuals interviewed, their affiliation, date of interviews, and interview types (i.e., in person, telephone, during site visit) are summarized in Table 2. Interview records are provided in Attachment 6. Any concerns raised during interviews (as well as concerns raised during inspections) that do not relate to the protectiveness of the remedy (e.g., operations and maintenance of the source area treatment facilities, operable unit 2, or operable unite 3), will not be reported as issued under the Five Year Review (e.g., Section 8.0). Although EPA will separately identify all potential concerns raised relative to operation and maintenance and operable unit 2 to the PRPs, and require these concerns be adequately addressed. Any concerns raised relative to the operable unit 3 will be addressed by EPA.

Table 2: Summary of Interviewees, Affiliations, and Interview Dates and Types

Interviewee	Affiliation	Interview Date	Interview Type
Timothy Cosgrave	Harvard Project Services – UniFirst Contractor	August 3, 2004	During site visit
Jonathan Bridge	GeoTrans, Inc. – Grace Contractor	August 3, 2004	During site visit
Maryellen Johns	The Remedium Group – Grace Contractor	August 3, 2004	During site visit*
Jeffrey Hamel	Woodard & Curran, Inc. – NEP Contractor	August 3, 2004	During site visit
Jeffrey Lawson	Environmental Project Control, Inc. – Beatrice, UniFirst, and Grace OU-2 Contractor	August 16, 2004	Telephone
James R. Greacen	The RETEC Group – Beatrice Contractor	August 18, 2004	During site visit
Peter Cox	The RETEC Group – Beatrice Contractor	August 18, 2004	During site visit**
Brendan Maye	The RETEC Group – Beatrice Contractor	August 18, 2004	During site visit**
Paul Medeiros	President – Woburn City Council	August 18, 2004	In Person
Anna Mayor	MADEP Project Manager for the Wells G&H Site	August 19, 2004	In Person
Jack Marlowe	Chairman - Woburn Redevelopment Authority	August 23, 2004	In Person

Table 2: Summary of Interviewees, Affiliations, and Interview Dates and Types			
Interviewee	**Affiliation**	**Interview Date**	**Interview Type**
John Curran	Mayor – City of Woburn	August 24, 2004	In Person
Gretchen P. Latowsky	Environmental Activist – For A Cleaner Environment (FACE)	August 25, 2004	In Person
Jack Fralick	Woburn Board of Health	August 26, 2004	Telephone
Michael Raymond	Woburn Resident	August 31, 2004	In Person***
Donna Robbins	Woburn Resident	August 31, 2004	In Person***
Linda Raymond	Aberjona River Study Coalition, Inc.	August 31, 2004	In Person***
Kathy Barry	Aberjona River Study Coalition, Inc.	August 31, 2004	In Person***
John Ciriello	Woburn Resident	August 31, 2004	In Person***

Notes:
* - Documented in interview record for Jonathan Bridge
** - Documented in interview record for James R. Greacen
*** - Interviewed simultaneously. Documented as a group interview.

The following summarizes key information obtained during the interviews. The summaries are grouped by State/Local Government and Community, and by PRP Consultants. The summary does not provide a complete recitation of the interviews. For a detailed accounting of the interviews with each individual or group, refer to the Interview records provided in Attachment 6.

6.5.1 Summary of State/Local Government and Community Interviews

<u>Overall Impression of the Project</u>

Based on the results of the interviews conducted, operation of the selected remedy for the Source Areas (OU-1) has proceeded without significant issue or concern, although several interviewees questioned the decision of NEP to cease operation of their treatment system. These interviewees remain concerned that contaminant concentrations were still present in groundwater above ROD action levels, despite the overall improvement in the extent and magnitude of contamination in soil and groundwater at NEP. Some interviewees felt that further remedial actions are warranted for groundwater at NEP. MADEP commented that NEP has also not met the standard of care for a Monitored Natural Attenuation (MNA) remedy. Representatives of the City of Woburn stated there have been no complaints regarding the operation of the Source Area (OU-1) remedy or related EPA activities.

MADEP indicated they were pleased with the progress at the Source Area (OU-1), but expressed disappointment that an agreement was not reached with Olympia sooner. MADEP is also concerned about the possible lack of plume capture at UniFirst and Grace. The Central Area (OU-2) has been a source of frustration given the lack of progress after the completion of the Phase 1A Report. MADEP did not have much involvement with the Aberjona River Study (OU-

3), but MADEP's role in the river study has increased over recent years.

Site Management/Operation

Many felt that the project is currently well managed and that representatives of EPA are well intentioned and accessible. Many commented favorably about EPA's level of technical expertise and the professionalism and approachability. One local government interviewee commented that compared to the "early days" of the site, the project has progressed in "quantum leaps" and feels the project is "being handled very responsibly by EPA today." Other local government officials noted the EPA availability and willingness to participate in local planning activities, such as those undertaken by the WRA. This same official offered similar comments regarding MADEP. MADEP commented that the level of communication from EPA and invitations for involvement have increased in recent years. Some interviewees noted the slowness of decision-making relative to the site, but also noted the care required because of the site's high profile.

Availability of Information/Communication

City of Woburn representatives, with one exception, feel that information pertaining to the Wells G&H site is readily available to those who might be interested. All noted that EPA-driven communication is generally associated with announcements of EPA initiatives or findings. Some noted that EPA could step up their notification of the availability of new information through the newspapers or through the local cable access television station. Many avail themselves of the Wells G&H website maintained by EPA to stay current or to explore issues of interest. A representative of the City of Woburn Board of Health (BOH), however, asked for a greater level of communication and information dissemination to support the BOH's role in addressing the inquiries of citizens and other parties regarding the Wells G&H site.

MADEP indicated that they are well informed at this time. After the Phase IA report for OU-2 prepared by the PRPs was released, the communication from EPA dropped off. However, communication between EPA and MADEP has increased over recent years.

Project Timeline/Milestones

Most community and local/state governmental interviewees expressed a generally negative sentiment regarding the pace of the project; however, many seemed to acknowledge both the technical complexities of the Wells G&H site and the legal complexities of the Superfund process. Many interviewees were aware of several recent EPA milestones and achievements at the Wells G&H site, including the release of the draft Aberjona River Study (OU-3) and EPA's outreach efforts to explain the outcome of the Aberjona River Study. Some were aware of other recent achievements, such as the publication of the Baseline Human Health and Ecological Risk Assessment for the Southwest Properties.

Public Perception/Stigma

A common theme in many interviews with community members and government officials was the psychology of the local citizenry regarding contamination issues, the on-going public perception, and stigma. One interviewee captured the sense of stigma through anecdotes of comedic jibes at comedy clubs when the interviewee/patron was found to be a Woburn resident, or stories of business trips to other parts of the country, where the individual would receive comments, questions or remarks about Woburn contamination ("Do you drink the water?"). One government official described the stigma associated with Woburn water is "almost insurmountable" despite the present high quality and safety of the public water supply (noting the Horn Pond aquifer and MWRA supplies and state-of-the-art water treatment for the Horn Pond aquifer supply).

Interviewees noted that each step EPA takes to advance the remedy has an impact on the state of mind of Woburn residents. Some expressed that EPA should handle public awareness and public perception with the utmost care. Local government interviewees were sympathetic to the "give and take", or balancing act, between informing the public and avoiding unnecessary fear. The interviewees nonetheless felt that EPA can do a better job of it and desired less volatile ways of informing the public. None suggested that the EPA was insensitive to public perception. Public perception, stigma, and local psychology regarding contamination issues were common concerns with local government officials. Some interviewees clearly had deep emotional connections to the site and either knew the families that suffered the leukemia deaths of their children, or had children of their own who died from the disease.

Future Water Supply Use of Wells G and H

Interviewees expressed strong opinions about the future use of the Wells G&H Central Area (OU-2) aquifer as a public water supply. Community representatives felt that the Wells G&H aquifer should never again be used in the future as a potable water supply. One interviewee stated flatly "over my dead body." However, the City of Woburn is currently disinclined to decommission the wells. MADEP noted that since EPA is requiring clean-up to drinking water standards, the community's underlying concern will at some future point be addressed, but it will be a long time before people agree to use the Central Area aquifer as a potable water supply. MADEP added that the City's awareness of the public concerns, and willingness to postpone a decision on the use of the aquifer to some future time, is nonetheless consistent with EPA's goals for aquifer restoration.

MADEP noted that the Wells G&H ROD mentions one sentence on implementing institutional controls on groundwater until the groundwater is cleaned up or the groundwater contamination is controlled. It is not clear what uses should be restricted until the Central Area (OU-2) risk assessment is conducted. Local property owners might tap into the groundwater for irrigation and suggested that a moratorium or ban be considered on water supply well installations. Controls may need to be worked out through the City government. Restrictions may not be necessary until after the OU-2 risk assessment is completed. Following the risk assessment, the institutional control could be targeted more to the pathways/uses that present the greatest risk/concern.

The Aberjona River Study

Interviewee comments on the Aberjona River Study (OU-3) were varied. Some criticized the linkage of the Industri-Plex and Wells G&H sites in the river study, although the connections between the two sites were understood. Some noted the results, which evidenced human health and ecological risk in certain areas of the 38-acre wetland and former cranberry bog, weakened enthusiasm for passive recreational reuse plans for the Superfund site. One interviewee noted that the news of the contamination described in the Aberjona River Study has stopped regular volunteer clean ups of streams, etc., by local groups/environmental organizations. Some acknowledge the difficult "translation" of the conservative technical risk assessment results to reasonable warnings and/or descriptions of the actual public health impact. Signage installed by EPA to warn local residents of the hazards received a mixed review, and some interviewees noted the perpetuation of the stigma. Many welcomed the information provided by the Aberjona River Study, in the context that more information is better than less, and noted that now the hazards presented by the river are understood more concretely and can be dealt with accordingly. Some called for a "peer" review of the study by a consultant selected by the community, and expressed dissatisfaction with EPA's selection of an outside reviewer (the TOSC/University of Connecticut review). Others felt that the issues raised by the University of Connecticut as part of the TOSC review were inconsequential. Some were concerned about the coverage of sampling conducted to support the Aberjona River Study and wondered if there may be more areas that pose risk that have not yet been detected, while others indicated that those who had that point-of-view were "on the fringe" and perhaps did not "understand the science." Some mentioned the impacts to local property values and the possible expansion of the Superfund site, while one local governmental official indicated that these concerns were fostered, and most loudly expressed, by the Wells G&H and Industri-Plex PRPs.

MADEP expressed concern that residential use around the Wells G&H 38-acre wetland has not been sufficiently evaluated for the future scenario. Future residential development in this area cannot be ruled out. However, MADEP's concern is substantially alleviated because of the fairly conservative recreational exposure scenarios used, and because this area will likely be the focus of a remedy. A remedy will require the Superfund Five Year Review process, which can reopen the remedy in the future if necessary to address new or unaccounted for scenarios. MADEP noted the concerns of the Town of Winchester BOH related to Aberjona River flooding and risk posed to construction workers implementing a potential flood control remedy, but felt that the information presented in the Aberjona River Study addressed their concerns.

All were very interested in what remedy would ultimately be selected for the Aberjona River. Some expressed that the contaminants should not be disturbed and questioned the ability for anyone to dredge the sediments without leading to downstream impacts (e.g., the Town of Winchester and the Mystic Lakes). Some expressed concern over the reliability and long-term responsibility for any institutional control that might be implemented with a sediment capping remedy.

Complaints/Incidents

The only complaints or incidents noted by interviewees at the Wells G&H Site were related to peripheral issues such as the paintball recreational activity near Wells G&H, instances of illegal dumping in the vicinity of the site and former cranberry bog, and concerns regarding the potential environmental impact of the rifle range. All expressed concern over the future use of the site and whether the site could be used safely in the future. One interviewee felt that EPA's studies should end with the river, noting further that the site has been "studied to death."

Help to the Neighborhood and/or Community

When asked if the activities conducted to date have helped the local community, some commented that the studies performed relative to pump and treat remedies at the Source Areas, the Aberjona River study, etc., have "shown what is in people's back yards." Therefore, the activities conducted to date have helped by providing information, and the community has benefitted by being informed. Others felt that the only activity that has actually helped the community was shutting down the wells.

MADEP also thought the shut down of the wells was the first step to help the community. However, EPA's examination of vapor intrusion issues and industrial exposures to contaminated groundwater will be helpful. Direct exposure routes to contaminated groundwater are currently limited and the Source Area (OU-1) remedies are helping to prevent further degradation, but the Central Area (OU-2) aquifer is still not cleaned up.

MADEP commented further that the community would realize further benefit once the exposures attributable to contaminated river sediments and vapor intrusion are addressed. Since the public knows the Source Areas (OU-1) are being addressed, and paid for, by the PRPs, the public might derive some satisfaction that the polluters are paying for the clean-up.

MADEP noted with regard to the Central Area (OU-2) and the Aberjona River (OU-3) that people are concerned that the continued activity will perpetuate the stigma of Woburn as a polluted place. However, MADEP felt that the remediation of the river will be a significant help to the neighborhood and will have a very obvious impact.

Industri-Plex Superfund Site

Many local government and community interviewees offered comments about the nearby Industri-Plex Superfund site. These comments were not summarized here unless they had direct bearing on discussions concerning the Wells G&H Site. See the Interview Records provided in Attachment 6 for additional information.

6.5.2 Summary of PRP Consultant Interviews

Overall Impression/General Sentiment

PRP consultants felt that the remedial systems they installed and/or oversee at the Source Area (OU-1) properties are working as intended. At the properties where systems are installed and running (Grace, UniFirst, Wildwood), interviewees noted decreases in contaminant concentrations over the last five years, but the decreases have not been dramatic. NEP's consultant commented on the success of their system, which removed 85 pounds of VOCs using an SVE system between February 1998 and March 2000. ROD soil clean-up criteria have been met, but 4 wells with PCE and 1 well with TCE still exceed clean-up levels. RETEC noted that they are getting good contaminant recovery from the Wildwood treatment system and that they are happy with how the treatment system is running.

The consultant for Beatrice-UniFirst-Grace for the Central Area (OU-2) commented that his impression is influenced by his sense of "what's next?" He views project activity relative to the Central Area (OU-2) as dormant, but not done. Fieldwork for OU-2 was completed in 1993 and the Phase 1A report prepared by the PRPs was submitted in 1994. They are waiting for EPA comments on the 1994 Phase IA report.

O&M Presence

At the properties where systems are installed and running (Grace, UniFirst, Wildwood), interviewees noted that they have a regular physical presence at the site (generally once to three times per week, depending on the property) and that their systems are equipped with electronic monitoring capabilities that will alert them to malfunctions/problems that occur when they are not on-site. NEP has not had a regular presence at the site since the system was shut down in March 2000, although they continue to monitor groundwater contamination annually.

Changes to Remedial Systems

The most significant changes to the systems are generally related to unit operation equipment changes, such as replacing UV/Ox treatment systems with GAC units as influent contaminant levels have dropped. Generally, the PRPs have realized an improvement in efficiency (cost effectiveness) with the treatment equipment changes they have implemented (for example, GAC systems are less energy intensive than UV/Ox systems). Grace also noted a change from UV/Ox treatment to GAC units only. Grace also changed the frequency and number of wells used for monitoring, and began using passive diffusion bag samplers instead of groundwater sampling pumps. Grace reported receiving separate approvals from EPA for these changes.

NEP operated their AS/SVE system from February 1998 to March 2000 having achieved soil clean-up criteria. NEP now monitors only 9 wells in the plume area annually. Sampling of other wells at NEP was discontinued in about 2001.

RETEC described monitoring changes at Wildwood with regard to the vapor phase treatment system, where they switched from FID/PID monitoring of the vapor stream to the eventual use of laboratory analysis by Method TO-14 with samples collected by SUMMA® canister. RETEC stated that the changes were implemented at EPA's request. RETEC continues to screen with a PID along with the sampling for laboratory analysis. Also, the catalytic oxidation (CATOX) unit used to treat vapor phase emissions was replaced with an activated carbon treatment system in June 2000.

O&M Difficulties

The PRP consultants reported periodic O&M difficulties. UniFirst reported power supply issues while running the UV/Ox system, and experienced numerous power outages. However, the UV/Ox system has since been replaced. Consequently, the power supply situation is no longer an issue. UniFirst has had fewer problems since the change over to GAC. 1,1,1-TCA was noted to pass through the UniFirst system without much treatment, which is detected at less than 5 ppb in the effluent. UniFirst reports that 1,1,1-TCA has no groundwater action limit in the ROD.

Grace indicated that the reliability of pneumatic pump hose connections was initially problematic. They also found the UV/Ox system to be unreliable and costly, characterized by frequent bulb failures and problems pumping hydrogen peroxide, with frequent pump failures. Grace also noted that beavers had caused flooding in the wetlands near the treatment system discharge pipe, and the replacement of well G36 due to a stuck bailer.

RETEC indicated that there have been no unexpected O&M difficulties with the Wildwood system.

O&M Optimization

O&M optimization attempts by the PRPs have generally been directed at improving efficiency and cost effectiveness. UniFirst is considering increasing the size of their activated carbon filters to reduce the frequency of change out.

In 1997, Grace shut off 6 recovery wells due to declining concentration and flow, with EPA approval; additional monitoring was required after shut off, but then Grace received approval to stop the additional monitoring. The 6 recovery wells are now filled with concrete.

At Wildwood, RETEC reported changes in the air sparging sequence and duration to improve system efficiency based on an optimization study that targeted sampling points with the highest detections that generally correlated with the highest contaminant recoveries presumed to be associated with source areas. RETEC stated that these are also the areas of highest groundwater contamination.

Suggestions

Suggestions, when offered by the PRP consultants, have generally involved reducing the frequency of sampling. UniFirst and RETEC (Wildwood) suggested sampling reductions. Grace offered no suggestions.

RETEC also raised the issue of whether off-gas treatment is still required. If allowed to eliminate off-gas treatment, they would realize significant cost savings. RETEC claimed that the off-gas levels from the Wildwood system are protective based on the MADEP off-gas policy.

Clean-up Progress/Contaminant Changes

Regarding the progress of groundwater clean-up, the PRP consultants generally report slowly decreasing contaminant concentrations at this phase of treatment. None have experienced any changes in the mix of contaminants they are monitoring and treating. Grace reports that they are down to ppb levels for their contaminants.

Regarding the Central Area (OU-2), the project is not at the remedy stage. The PRPs are in mid-process and awaiting further comment/direction from EPA. However, the Beatrice, UniFirst and Grace consultant noted that long-term monitoring has shown decreasing concentrations with time.

Presence of LNAPL/DNAPL

None have reported any indication that DNAPL or light non-aqueous phase liquid (LNAPL) is present. However, none have actively checked for the presence of separate phase product recently, including the UniFirst property, which was identified as a chlorinated solvent DNAPL site during early remedial investigations. Grace indicated that their concentrations are not indicative of DNAPL. NEP indicated that they have not checked for the presence of DNAPL. RETEC has had no indication of NAPL presence at Wildwood based on dissolved phase concentrations and a long history of well gauging. They have never observed free-phase DNAPL. RETEC described DNAPL dye testing that was performed at the site that did not demonstrate a separate phase liquid contaminant.

Changes in Pumping Rates

The groundwater-pumping rate at UniFirst has recently changed following a recent replacement of a failed extraction pump. The goal at the UniFirst site is to maintain a groundwater elevation of 15 feet above sea level, and pumping rates vary to meet this goal. However, UniFirst is currently having trouble maintaining the 15-foot elevation because the new pump, which was installed within 2 weeks of the August 3, 2004 interview, has inadequate pumping capacity.

Grace reported they pump at 5 or 6 gpm, which fluctuates with rainfall and soil conductivity in different areas of the site.

As noted previously, NEP discontinued use of the SVE system in March 2000.

RETEC noted that pumping rates at Wildwood are generally consistent with the exception of a blockage incident in one of the lines during the last six months. Pumping rates for one well dropped from 21 gpm to 12 gpm. However, the pumping rates have been restored since rectifying the problem. RETEC switched to a spare line installed during system construction and swapped pumps to solve the problem.

Projections for Achieving Clean-up

Projections for achieving clean-up overall or in subportions of the site are unclear at this time. The PRP consultants interviewed either have not performed projection calculations recently, or deferred to other members of their consulting team (i.e., Harvard Project Services deferred to The Johnson Company for a clean-up projection for the UniFirst site). Consultants for UniFirst added that it is difficult to isolate a subportion of the site due to the fractured bedrock at the site.

Grace indicated that they have never estimated the projected clean-up.

NEP indicated that projecting overall clean-up is difficult and noted that clean up criteria exceedances at NEP are in shallow groundwater.

RETEC has not forecasted the completion of clean-up at Wildwood, although they expect to reach an asymptote at some point. RETEC has no knowledge of what volume/mass of contaminant was initially released at Wildwood; therefore it is difficult to forecast system performance based on a mass balance. RETEC noted that given Wildwood's fractured bedrock setting, they are comfortable with the capture being achieved, stating further that the system is "working as advertised." They can demonstrate drawdowns in the bedrock wells, but conceded that the density of well installations is not sufficient to develop piezometric surface contour plots. RETEC noted that there might be isolated locations where the MCLs are exceeded at Wildwood outside of the system footprint to the south.

Regarding the Central Area (OU-2), all the companies involved see this as a multi-decade process to achieve the clean-up goals. The PRPs have one decade's worth of data supporting this conclusion.

Clean-up Performance Expectations

The PRP consultants have generally seen contaminant levels steady recently, and were not certain that contaminant levels would drop further with time, suggesting asymptotic tailing. Grace indicated that they have no expectations for future contaminant behavior relative to prescribed clean-up levels. RETEC anticipates achieving asymptotic contaminant reductions. NEP believes they are very close to achieving clean-up.

Regarding the Central Area (OU-2), the Beatrice-UniFirst-Grace consultant noted that other sources on other properties will affect the Central Area clean-up. The practicality of restoring the Central Area was questioned, citing the potential impact of the Aberjona River sediments and impacts from other multiple contaminant sources in the watershed. The Central Area is cross and downgradient of other sources, and there are other sources upgradient of Olympia. The Central Area is complicated because other sources are impacting it.

Pulse Pumping

Some PRP consultants have considered and/or implemented pulsed pumping/system operation. UniFirst does not employ pulsed pumping, but Grace and Wildwood have implemented pulsed pumping to improve extraction efficiency. Grace formerly cycled the pumping of Recovery Well 22 (the presumed location of small solvent dumping near a door), but are now pumping constantly and concentrations are declining. No further pumping changes are anticipated by Grace.

At Wildwood, RETEC indicated that have considered and implemented pulse operation of the sparge points. They believe the pulsing has helped, but has not made a significant difference in contaminant removal rates. They have, however, realized a significant savings in electricity. Their optimization study found that there were diminishing returns when they operated the individual sparge points for more than 8 consecutive hours.

Potential Off-Site Contaminant Impacts

With regard to potential off-site contaminant impacts, the UniFirst system works by design to capture contaminated groundwater originating from the Grace property, which has only a shallow bedrock/overburden treatment system.

Grace noted that they have discussed this topic many times with EPA and believe that offsite chlorinated solvent contaminants are entering the site from the South due to the groundwater withdrawals at the Grace site.

NEP was not aware of any potential off-site source of contamination with the potential to impact their site.

RETEC identified the Industri-Plex site north of Route 128 as an upgradient site with the potential to impact site clean-up at Wildwood. RETEC stated that they have not seen any data to say that Industri-Plex is contributing to contamination of their site in any significant way. Nonetheless, it makes them wonder what impact Industri-Plex has had, or could have, on the Wildwood property.

Potential Off-Site Hydraulic Impacts

None were aware of any off-site anthropogenic hydraulic impacts or groundwater withdrawal unrelated to the Source Area (OU-1) treatment systems that could be impacting system performance. By design, the UniFirst and Grace systems work in concert.

RETEC noted that beavers have had an impact on local hydrology at Wildwood due to dam construction. There are beaver dams north and south of the Wildwood property on the Aberjona River.

Seasonal Effects/Impacts on Remedial Systems

Seasonal effects impact some of the Source Area treatment systems. UniFirst reported that their remedial system appears to struggle when groundwater elevations are highest such as in the spring. Also, during spring rain events, the groundwater is much more turbid, which causes problems with the filter systems and increases O&M time. Grace and NEP noted that they only monitor water levels annually, and therefore cannot not comment on seasonal gradient changes. Grace operates their system in batches and does not currently experience system impacts due to water levels, although water levels did affect the old system.

RETEC reported no seasonal impacts to the Wildwood system.

Integrity of Sewers

When asked about the integrity of the on-site sewers, UniFirst deferred to The Johnson Company, and added that PCE was not used on-site (no dry cleaning performed on-site); PCE was only stored in tanks to buffer price fluctuations.

Grace reported that sewers are present on-site and described smoke testing of the sewers conducted many years ago to determine the discharge locations for different portions of the building. Currently, storm drains are present and a sanitary sewer serves the building.

NEP's consultant stated that they were not aware of the condition of the on-site sewers and referred the question to NEP.

At Wildwood, RETEC stated that the sewer lines serving the remedial system are intact and noted the annual monitoring (camera inspections) conducted by the MWRA on the Authority's sewer line, which crosses the Wildwood property. Both the MWRA and City of Woburn sewer lines run through the Wildwood treatment area. No distinction has been made during investigations between soil and the sewer bedding. RETEC stated that the action of the Wildwood sparging system should treat any contamination in the bedding medium.

Regarding the Central Area (OU-2), the Beatrice-UniFirst-Grace consultant noted that the trunk sewer by the railroad tracks traditionally overflowed. However, over the last 10 years there have been no reports of overflows. The Romicon facility in East Cummings Park had corroded sewer pipes and they were chlorinated solvent users. They could have introduced contaminants to groundwater. Romicon is no longer located in East Cummings Park and the sewers may have been fixed. Grace and UniFirst have submitted information to EPA in this regard in the past.

Remaining Surficial Soil Contamination

The following summarizes responses received relative to the presence of surface soil contamination. Several interviewees also discussed subsurface soil contamination; therefore, this information is also included.

UniFirst acknowledged the presence of residual soil contamination on the UniFirst property. Soil contamination is likely deep and below the loading dock. The original contamination was assessed as being from PCE unloading to the storage tank in the loading dock. The working theory is that after the PCE was pumped to the tank, the filler hose was allowed to empty to the ground in the dock area. The dock drained to a dry well, which resulted in releases to soil and groundwater. The dock area is now covered by a building and is inaccessible. Once the groundwater is cleaned-up, the contaminated soil can be remedied. UniFirst's consultant stated that if groundwater is not cleaned-up first, then the soil could become re-contaminated.

Grace acknowledged that soil contamination is likely present by recovery well RW-22, which is where workers likely disposed of used solvents to the ground. EPA will further discuss with Grace the potential for soil contamination to remain by RW-22. **[Historically, Grace removed**

soil contamination from their property in the mid-1980's prior to EPA's remedy decision. Consequently, a soil remedy at Grace was not called for in the ROD.]

NEP indicated that the source area is paved and that the AS/SVE system removed subsurface contamination to below clean-up levels.

RETEC stated that there is no surficial soil contamination remaining on the Wildwood property.

Regarding the Central Area (OU-2), the Beatrice-UniFirst-Grace consultant was not aware of any surficial soil contamination in the Central Area, but noted that the Central Area RI focused on groundwater. He noted the occurrence of a small patch of petroleum contamination on a city parcel back when Barbara Newman (EPA) was involved. He noted that it was not considered a concern. He recalled that it was an extremely minor issue that may have been documented in an Ecology & Environment, Incorporated (E&E) report or later supplemental or interim RI reports.

Changes in Site Ownership

The ownership of the Source Area properties has not changed in the last 5 years. However, occupancy of the UniFirst property has changed. A storage company now occupies the UniFirst facility. The Grace facility is currently inactive, but the site was used as a warehouse prior to 1995. Grace is currently marketing the property and reported active interest by a restaurant. Grace is seeking to rezone the property for commercial uses.

RETEC and NEP reported no changes in site ownership or occupancy at the Wildwood and NEP sites, respectively.

Institutional Controls

Consultants for Grace stated that no institutional controls have been implemented on the Grace property. Consultants for UniFirst, NEP, and Wildwood were not aware of any institutional controls placed on the properties.

7.0 TECHNICAL ASSESSMENT

This section discusses the technical assessment of the remedy and provides answers to the three questions posed in the EPA Guidance (EPA, 2001a).

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

The remedy at OU-1 is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risk are being controlled, or could be controlled with the use of institutional controls. Potential limitations have been identified with respect to the documentation of an adequate degree of hydraulic control and groundwater contamination capture being achieved at some of the Source Area properties (as previously described).

7.2 *Question B*: Are the exposure assumptions, toxicity data, clean-up levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

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

Operable Unit 1 – Source Areas Properties

Risk Assessment Review

The Endangerment Assessment (Ebasco, 1988) evaluated potential impacts to human health and the environment in the absence of remedial action under both current and potential future use scenarios. The site was divided into six areas which were treated individually. The six areas included the five Source Area properties and the Central Area , defined as the area surrounding Wells G and H, the Aberjona River, and the wetlands (i.e., the nonsource areas). Human exposures were considered at all six areas; ecological exposures were only evaluated for the Central Area. Further summary information relative to the Central Area evaluation is included under the Central Area (OU-2) and Aberjona River Study (OU-3) sections which follow.

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

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

In this five-year review report, the toxicity values that served as the basis for the clean-up levels, as contained in the ROD, have been re-evaluated to determine whether any changes in toxicity impact the protectiveness of the remedy. Any changes in current or potential future exposure pathways or exposure assumptions that may impact remedy protectiveness are also noted. In addition, environmental data, available since the last five-year review, have been evaluated to determine whether exposure levels existing at the Site present a risk to current human receptors.

Changes in Toxicity

Table 3 presents the changes in toxicity values (oral reference doses and oral cancer slope factors) for compounds selected as COPCs in the 1988 Endangerment Assessment. Updated toxicity information was obtained from the *Integrated Risk Information System* (IRIS; EPA, 2004d) and from the National Center for Environmental Assessment (NCEA), a division of EPA. In general, minor changes (i.e., slight increases or decreases) in toxicity values have occurred for most COPCs. However, the safe level of exposure to manganese (i.e. manganese toxicity value) has been reduced by a factor of 10 since 1988 rendering the compound more toxic than had previously been believed. Manganese levels in groundwater were not above a level of concern in the 1988 Endangerment Assessment, despite the fact that manganese was present at levels that may have been aesthetically unpleasing (exceeded the secondary MCL of 50 ug/L). Based upon a current evaluation of manganese using the current toxicity estimates, future exposures to manganese in groundwater may exceed safe levels at some of the Source Area OU-1 properties. Therefore, manganese in OU-1 groundwater may require further investigation to determine if concentration exceed risk levels based upon the current toxicity estimates.

Clean-up standards for groundwater were established as MCLs, which is consistent with the current selection of groundwater clean-up standards in areas that may serve as a potential source of drinking water. Therefore, changes in toxicity values for these compounds do not impact the protectiveness of the remedy. All COCs in groundwater, based on the results of the 1988 Endangerment Assessment, were targeted for clean-up, with the exception of arsenic. At that time, groundwater concentrations at the Source Area properties were not considered above the arsenic MCL of 50 ug/L. However, the MCL for arsenic has been reduced to 10 ug/L since 1988. Concentrations of arsenic in groundwater at the Source Area properties did not exceed the historical MCL of 50 μg/L.

Table 3: Comparison of 1988 and 2004 Oral Reference Doses and Oral Cancer Slope Factors for Compounds of Potential Concern Wells G&H Superfund Site				
Contaminant of Potential Concern	Oral Reference Dose (RfD) (mg/kg-day)		Oral Slope Factor (SF) (mg/kg-day)[1]	
	1988	2004	1988	2004
1,1-Dichloroethane	0.12	0.1	0.091	N/A
1,1-Dichloroethene	0.009	0.05	0.6	N/A
1,1,1-Trichloroethane	0.09	0.28	N/A	N/A
1,2-Dichlorobenzene	0.09	0.09	N/A	N/A
1,2-Dichloroethane	N/A	0.02	0.091	0.091
Acetone	0.1	0.9	N/A	N/A
Chloroform	0.01	0.01	0.081	N/A
Methylene Chloride	0.06	0.06	0.0075	0.0075
Tetrachloroethene	0.02	0.01	0.051	0.54
trans-1,2-Dichloroethene	0.01	0.02	N/A	N/A
Toluene	0.3	0.2	N/A	N/A
Trichloroethene	N/A	0.0003	0.011	0.4
Vinyl Chloride	N/A	0.003	2.3	1.5
Xylenes	2	0.2	N/A	N/A
bis(2-Ethylhexyl)phthalate	0.02	0.02	0.0084	0.014
PAHs[1]	0.41	0.02	11.5	7.3
Pentachlorophenol	0.03	0.03	N/A	0.12
Phenol	0.04	0.3	N/A	N/A
4,4'-DDT	0.0005	0.0005	0.34	0.34
Aldrin	0.00003	0.00003	17	17
Chlordane	0.00005	0.00005	1.3	0.35
PCBs[2]	N/A	0.00002	7.7	2
Antimony	0.0004	0.0004	N/A	N/A
Arsenic	N/A	0.0003	1.5	1.5
Barium	0.05	0.07	N/A	N/A
Cadmium (water)	0.0005	0.001	N/A	N/A
Chromium VI	0.005	0.003	N/A	N/A
Copper	0.037	0.03	N/A	N/A
Iron[3]	1	N/A	N/A	N/A
Lead[4]	0.0006	N/A	N/A	N/A
Manganese (water)	0.22	0.024	N/A	N/A
Manganese (other media)	0.22	0.07	N/A	N/A
Mercury (inorganic)	0.0014	0.0003	N/A	N/A
Mercury (organic)	0.0014	0.0001	N/A	N/A
Nickel	0.02	0.02	N/A	N/A
Zinc	0.21	0.3	N/A	N/A

N/A = Not Applicable or Not Available

1. Naphthalene used for RfD; benzo(a)pyrene used for slope factor. The slope factor is then adjusted for relative potency of other carcinogenic PAHs. No adjustment for relative potency was made in 1988.
2. 1988 value for slope factor used Aroclor 1260
3. No toxicity value is currently available for iron. Region I does not concur with the provisional value for this compound.
4. Lead currently evaluated through the use of lead exposure models for children and adults.

Based upon a current evaluation of arsenic using the current MCL, future exposures to arsenic in groundwater may exceed safe levels at some of the Source Area OU-1 properties. Therefore, arsenic in OU-1 groundwater may require further investigation to determine if concentration exceed risk levels based upon current toxicity estimates.

Soil contaminants requiring clean-up were based on the COCs identified as presenting a direct-contact hazard by the Endangerment Assessment. VOCs selected as groundwater COCs were also targeted for clean-up in soil based on their potential to serve as a source of contamination to groundwater. Only tetrachloroethene in NEP soils presented a direct contact risk to humans. However, to assure that the clean-up levels for other volatile compounds in soil do not present a direct contact risk using current toxicity information, a comparison of the leaching-based soil clean-up levels to Region 9 residential soil preliminary remediation goals (PRGs) has been performed. PRGs are developed based on current toxicity information and correspond to a carcinogenic risk of 1E-06 and a noncarcinogenic risk of 1. This comparison indicates that the soil clean-up levels are adequately protective for a residential exposure scenario. The soil clean-up level for lead was calculated by using the *Integrated Exposure Uptake Biokinetic Model* (EPA, 2002c). This model continues to be used to evaluate acceptable levels in soil. Clean-up levels for non-volatile contaminants (chlordane, 4,4'-DDT, PAHs, and PCBs) were based on a direct contact risk. Further evaluation of these compounds (lead and non-volatile contaminants) also indicates that the soil clean-up levels remain protective with respect to human health.

Even though soil and groundwater clean-up levels remain largely protective at the Source Area properties, until the clean-up is complete, exposure to levels of contamination in soil and groundwater in excess of clean-up levels should be prevented. Subsurface soil contamination in excess of clean-up levels may remain at the Unifirst and Olympia properties. Access controls to source area properties (e.g. fencing, paving, foundations, etc.) are currently present to prevent surface soil contact, even though significant residual surface soil contamination is unlikely to be present based on remedy implementation. Institutional controls may be necessary to prevent the use of groundwater from the Source Area properties and prevent direct contact with residual subsurface soil contamination at the Unifirst and Olympia properties.

Changes in Exposure Pathways/Assumptions

The 1988 Endangerment Assessment did not comprehensively evaluate non-ingestion uses of groundwater such as dermal contact exposures during industrial groundwater usage. Direct contact exposures associated with excavation into the water table by workers were also not evaluated. Until groundwater treatment is complete, institutional controls should be implemented to prevent the use of source area groundwater and to limit contact with shallow (i.e., less than 15 feet below ground surface) groundwater encountered during excavation activities.

A second pathway of current potential concern for the Source Area properties is the indoor air pathway. The UniFirst and Grace properties were the subject of indoor air sampling in April/May 1989 (ENSR, 1989). Included in the analysis of indoor air samples were trans-1,2,-dichloroethene, 1,1,1-trichloroethane, tetrachloroethene, trichlorothene, and vinyl chloride. Vinyl chloride was not detected in any of the historical indoor air samples. These historical indoor air data have been evaluated to determine potential risk based on the use of current recommended exposure assumptions and toxicity values. Attachment 7.1 contains the indoor air risk calculations performed for the UniFirst and Grace properties.

Maximum detected indoor air concentrations from ENSR (1989) were selected for evaluation. Table 1 in Attachment 7.1 provides a summary of the maximum detected indoor air concentrations. The UniFirst property is a current active commercial property, and is likely to remain commercial in the future. The Grace property is currently unoccupied, but is likely to be used commercially in the future, consistent with previous commercial use of the property. Therefore, commercial workers were evaluated by assuming exposure for 8 hours per day, 250 days of the year, for an exposure duration of 25 years (Table 2 in Attachment 7.1; EPA, 1997). These exposure assumptions represent Reasonable Maximum Exposure (RME) assumptions for a commercial scenario presented in the Exposure Factors Handbook (EPA, 1997). Inhalation toxicity values for noncarcinogenic and carcinogenic effects are provided in Tables 3 and 4, respectively, in Attachment 7.1. This evaluation of the historical indoor air results indicates that risks to commercial workers at the Grace property were within or below EPA risk management guidelines, while risks to commercial workers at the UniFirst property may have exceeded EPA risk management guidelines (Table 5 in Attachment 7.1).

Because the historical indoor air data may not represent current site conditions, the risk associated with indoor air exposures based on the indoor air data is uncertain. Therefore, this pathway has been further evaluated through use of recent source area groundwater data in the following section.

Evaluation of Recent Sampling Data

To further address the potential indoor air exposure pathway, a risk screening has been conducted. The risk screening uses current source area property shallow groundwater data to model indoor air concentrations that may exist currently or in the future at each of the Source Area properties, followed by the use of current recommended exposure assumptions and toxicity values to estimate potential risks. Recent groundwater data was also evaluated for potential indoor air exposure pathways at the Southwest Properties. This is discussed briefly below in the Central Area subsection.

The UniFirst and NEP properties are current active commercial properties, and are likely to remain commercial in the future. The Grace property is currently unoccupied, but is likely to be used commercially in the future, consistent with previous commercial use of the property. Because future use of these properties may change, residential use has also been included in the screening-level evaluation. The Wildwood and Olympia properties are currently unoccupied. Personnel involved with the investigation, cleanup activities, and maintenance of these properties are periodically on-site. Because the Wildwood and Olympia properties are in areas of mixed commercial/residential use, future use of these properties may include either commercial or residential development.

Consistent with these current and future use assumptions, the Source Area properties have been evaluated for both commercial and residential future use.

In order to evaluate the potential for indoor air exposures at the Source Area properties, vapor intrusion modeling was performed using current shallow groundwater contaminant concentrations. The maximum detected contaminant concentrations identified in shallow monitoring wells (i.e., less than 30 feet deep) during the most recent round of sampling at each source area were selected for the screening. Table 6 in Attachment 7.1 presents the maximum detected groundwater concentrations at each source area property and a comparison of those concentrations to screening levels provided in the *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (EPA, 2002d). These screening values, based on a cancer risk of 1E-06 and adjusted to a noncarcinogenic risk of 0.1, are used to focus the evaluation on the most significant potential risk contributors. Based on this screening, the following contaminants were selected for further evaluation:

UniFirst	cis-1,2-dichloroethene, tetrachloroethene, and trichloroethene;
Grace	1,2-dichloroethene (total), tetrachloroethene, trichloroethene, and vinyl chloride;
NEP	tetrachloroethene;
Wildwood	tetrachloroethene, trichloroethene, and vinyl chloride; and
Olympia	dichlorodifluoromethane, cis-1,2-dichloroethene, Freon 113, tetrachloroethene, trichloroethene, and vinyl chloride.

The Johnson and Ettinger model (EPA, 2003c) was then used to estimate potential indoor air concentrations, based on groundwater data for these compounds, using assumptions provided in Table 7 of Attachment 7.1. The maximum modeled indoor air concentrations (Table 8 of Attachment 7.2) were finally compared to conservative PRGs for ambient air (EPA, 2002b; cancer risk of 1E-06 and noncarcinogenic risk of 0.1). Because the modeled air concentration of tetrachloroethene at the NEP property was below the risk-based PRG, this source area property was not further evaluated. The modeled indoor air concentrations of the following compounds exceeded the risk-based PRGs and were further evaluated:

UniFirst	tetrachloroethene and trichloroethene;
Grace	tetrachloroethene, trichloroethene, and vinyl chloride;
Wildwood	tetrachloroethene, trichloroethene, and vinyl chloride; and
Olympia	tetrachloroethene, trichloroethene, and vinyl chloride.

For the purposes of risk screening, commercial workers were assumed to be exposed 8 hours per day, 250 days of the year, for 25 years. Residents (adults and young children) were assumed to be exposed 24 hours per day, 350 days of the year, for a combined exposure duration of 30 years. The exposure assumptions are presented in Table 9 of Attachment 7.1 and represent RME assumptions for commercial and residential scenarios recommended by EPA (EPA, 1997). Inhalation toxicity values for noncarcinogenic and carcinogenic effects are provided in Tables 10 and 11, respectively, in Attachment 7.1.

This evaluation indicates that current potential risks at the UniFirst, Grace, NEP, and Wildwood properties are within or below EPA risk management guidelines, based on assumed commercial site use. Risk associated with future residential use at the Unifirst, Grace, and NEP properties are also within or below EPA risk management guidelines. However, estimated future risks at the Olympia property (i.e. Former Drum Disposal Area), based on commercial and residential use assumptions, and the Wildwood property, based on assumed residential use, may exceed EPA risk management guidelines. Commercial risks are presented in Table 12 in Attachment 7.1; residential risks are presented in Tables 13 through 18 in Attachment 7.1.

Because risk projections are based on currently incomplete pathways of exposure (e.g. no commercial activities or exposures at the Olympia property (FDDA)), the indoor air pathways at the Source Area properties are unlikely to present a current risk of harm to humans and the remedy remains protective with respect to the indoor air pathway. However, should commercial activities be proposed for the Olympia property (FDDA), land use change to residential for the Olympia and Wildwood properties, or shallow groundwater VOCs concentrations change significantly from this evaluation, indoor air exposures to VOCs from groundwater may present a hazard requiring further consideration/evaluation.

Operable Unit 2 – Central Area

The Endangerment Assessment (Ebasco, 1988) evaluated potential impacts to human health and the environment in the absence of remedial action under both current and potential future use scenarios for the Central Area, defined as the area surrounding Wells G and H, the Aberjona River, and the wetlands (i.e., the nonsource areas). Information relative to soil, sediment, and surface water exposures within the Aberjona River and wetlands is included under the Aberjona River Study (OU-3) section which follows.

Human exposures to groundwater within the Central Area were examined. Future residential groundwater use was evaluated and included the ingestion of drinking water and inhalation of volatiles while showering. Because groundwater was used at the time as process water at the Riley Tannery, Central Area groundwater was also evaluated for the inhalation of volatiles released to indoor air during commercial groundwater use. Only the future residential use of groundwater within the Central Area resulted in estimated risks above a level of concern. Significant groundwater risk contributors included tetrachloroethene and trichloroethene.

EPA also completed a baseline risk assessment for the Southwest Properties portion of OU-2 in March 2004. The risk assessment evaluated human and ecological risks at the three properties (Aberjona, Whitney, and Murphy) and at the Murphy Wetland, situated between the Murphy and Whitney properties. The results of the risk assessment indicated that groundwater at the site poses a risk to human health under a future residential drinking water scenario. The significant groundwater risk contributors were identified as 1,3-dichlorobenzene, benzene, cis-1,2-dichloroethene, 1,1,2-trichloroethane, trichloroethene, vinyl chloride, C9-C18 aliphatic hydrocarbons, C11-C22 aromatic hydrocarbons, arsenic, and manganese. Future indoor air exposures at the Whitney property were also indicated to pose a significant human health risk due to the presence of petroleum hydrocarbons in the subsurface that may migrate into a future building. The subsurface vapor intrusion pathway did not indicate a risk above EPA risk management criteria at the Murphy and Aberjona properties. Risks below EPA risk management criteria were determined for direct contact with shallow groundwater (less than 15 feet below the ground surface) for a construction worker scenario. The risks associated with direct contact and ingestion of soil exceeded EPA risk management criteria only at the Whitney property. Primary risk contributors included PCBs, chlordane, and petroleum hydrocarbons. Direct contact and ingestion of sediment within the Murphy wetland also exceeded risk management criteria due to the presence of PCBs and chromium. The baseline ecological risk assessment suggests that PCBs in sediments may pose current and future risks to mammals, as represented by the muskrat and/or short-tailed shrew. PCBs may also pose current and future risks to sediment organisms inhabiting the seasonally ponded area of the Murphy Wetland. In addition, several inorganic contaminants (e.g., chromium and lead) in sediments may also pose risk to mammals foraging within the seasonally ponded area as well as sediment organisms inhabiting this area. Detailed risk information for the Southwest Properties can be found in the March 2004 Southwest Properties Baseline Risk Assessment (see TRC, 2004).

The MADEP *Groundwater Use and Value Determination* for OU-2 (MADEP, 2004) indicates that groundwater within the Central Area has a medium use and value. The determination further describes that groundwater exposure scenarios should include, but not be limited to: (1) ingestion and exposures from other domestic uses (e.g., showering and bathing); (2) inhalation of vapors from seepage into buildings; (3) use of groundwater in industrial processes; (4) other potential exposures during industrial and residential activities; (5) worker exposures during excavation into groundwater; and (6) exposures resulting from discharge to surface water. With the exception of the groundwater to surface water discharge pathway, evaluated under the Aberjona River Study (OU-3), all other pathways identified should be evaluated for potential human health risk.

The evaluation of OU-2 is ongoing and will include the completion of a baseline human health risk assessment for groundwater likely in 2005. Based on the MADEP groundwater use and value determination, this risk assessment should include an evaluation of ingestion, inhalation, and dermal contact exposures during household water use, but also an evaluation of other non-ingestion groundwater uses (e.g., irrigation, filling of swimming pools, industrial process water, and warm-water car washing) and exposures (e.g., excavation worker, impacts to indoor and outdoor air). These exposures were partially evaluated as part of the previous risk assessments completed for Southwest Properties portion of OU-2. A comprehensive round of groundwater sampling was performed in support of the Phase 1A Remedial Investigation Report (RETEC, 1994). No significant further study of the Central Area has been conducted since 1994. However, limited sampling of groundwater monitoring wells located within portions of the Central Area, conducted primarily in support of the Southwest Properties risk assessment, indicate continued exceedances of MCLs. Because current risk assessment guidance recommends the use of groundwater data representative of current site conditions, collected using low flow sampling procedures, additional data collection will likely be necessary before initiation of the Central Area (OU-2) Aquifer baseline human health risk assessment.

One pathway of current potential concern for the Central Area is the indoor air pathway. Because residential areas are located immediately downgradient of the UniFirst, Grace, and NEP properties, it is possible that groundwater from the Source Area properties may be impacting indoor air quality in these nearby residential areas. To address this potential exposure pathway, a risk screening has been conducted to: (1) re-evaluate existing historical indoor air data using current recommended exposure assumptions and toxicity values; and (2) model current groundwater data to estimate indoor air concentrations in downgradient residential areas, followed by the use of current recommended exposure assumptions and toxicity values to estimate potential risks.

The Dewey Avenue area, including the Puddle Duck Day Care Center, is downgradient of the UniFirst and Grace properties. This area was the subject of indoor air sampling in July 1989 and October 1991, followed by an evaluation of those data in 1995 (ATSDR, 1995). Contaminants detected in indoor air samples and stated as potentially being site-related include 1,1,1-trichloroethane, tetrachloroethene, and trichloroethene. Other detected indoor air contaminants were identified as likely the result of usage of household chemicals (e.g., cleaning products) at the residences and day care center. The conclusion of the 1995 ATSDR report was that "indoor air in the site vicinity represents no apparent public health hazard." These historical indoor air data, along with current groundwater data collected in the vicinity of downgradient residential areas, have been evaluated to determine whether this conclusion remains valid. Attachment 7.2 contains the vapor intrusion modeling and indoor air risk calculations performed for the Dewey Avenue area.

Maximum detected indoor air concentrations from ATSDR (1995) were selected for re-evaluation. Table 1 in Attachment 7.2 provides a summary of the maximum detected air concentrations. 1,1,1-Trichloroethane, 2-butanone, tetrachloroethene, toluene, and trichloroethene were selected for evaluation since these contaminants were detected in both historical indoor air samples from the downgradient residential area and recent shallow groundwater samples collected from the upgradient Source Area properties. Vinyl chloride was not detected in historical indoor air samples. Residents (adults and young children) were assumed to be exposed 24 hours per day, 350 days of the year, for a combined exposure duration of 30 years (Table 2 in Attachment 7.2; EPA, 1997). Inhalation toxicity values for noncarcinogenic and carcinogenic effects are provided in Tables 3 and 4, respectively, in Attachment 7.2. This re-evaluation of the historical indoor air results confirms the 1995 ATSDR conclusions by indicating that risks to Dewey Avenue residents are, based on historical indoor air data, within or below EPA risk management guidelines (Tables 5 through 7 in Attachment 7.2).

In order to evaluate the potential for current indoor air exposures at the Dewey Avenue area, vapor intrusion modeling was performed using current groundwater contaminant concentrations. The maximum detected contaminant concentrations in monitoring wells UC7-1, UC7-2, UC7-3, and UC7-4, located proximate to the residential area, were selected for the screening-level evaluation. Detected contaminants include 1,1,1-trichloroethane, cis-1,2,-dichloroethene, tetrachloroethene, toluene, and trichloroethene. Table 8 in Attachment 7.2 presents the maximum detected groundwater concentrations and a comparison of those concentrations to vapor intrusion screening levels (EPA, 2002d), as previously described. Based on this screening, cis-1,2-dichloroethene, tetrachloroethene, and trichloroethene were selected for vapor intrusion modeling. The Johnson and Ettinger model (EPA, 2003c) was used to estimate potential indoor air concentrations based on groundwater data for these three compounds and assumptions provided in Table 9 of Attachment 7.2. The maximum modeled indoor air concentrations (Table 10 of Attachment 7.2) were finally compared to risk-based ambient air PRGs (EPA, 2002b). Because the modeled air concentrations of tetrachloroethene and trichloroethene exceeded the risk-based ambient air concentrations, risk was estimated using RME exposure assumptions and current toxicity values as previously described. The estimated risks (Tables 11 through 13 in

Attachment 7.2) are within or below EPA risk management guidelines, confirming earlier results based on indoor air sampling.

The indoor air pathway is also potentially complete downgradient of the NEP property. A residence was identified on Rifle Range Road, downgradient of monitoring well NEP-106B. The maximum detected contaminant concentrations in this monitoring well were used for the screening-level evaluation. Detected contaminants include tetrachloroethene and trichloroethene. Table 8 in Attachment 7.2 presents the maximum detected groundwater concentrations and a comparison of those concentrations to vapor intrusion screening levels provided in EPA, 2002d. Because the maximum detected concentrations of both contaminants exceed the screening values, tetrachloroethene and trichloroethene were further evaluated through vapor intrusion modeling (Table 9 of Attachment 7.2). The maximum modeled indoor air concentrations (Table 10 of Attachment 7.2) were then compared to risk-based ambient air PRGs (EPA, 2002b). Because the modeled air concentration of trichloroethene exceeded its risk-based ambient air PRG, risk was estimated using RME exposure assumptions and current toxicity values. The estimated risks (Tables 11, 12, and 14 in Attachment 7.2) are within or below EPA risk management guidelines.

Although the risk screening results suggest that the indoor air pathway may not be of concern in downgradient residential areas, monitoring wells have not been installed in this area, and therefore, no groundwater data are available from within the Dewey Avenue neighborhood or in close proximity to the downgradient residence on Rifle Range Road. In addition, there are no current indoor air data available for these residential areas. Therefore, it is recommended that, as part of the Central Area (OU-2) investigation, monitoring wells be installed in the immediate vicinity of the downgradient residences to characterize the nature and extent of potential groundwater plumes in the areas. In addition, the results of this risk screening should be confirmed using: (1) indoor air collected from the downgradient residences; (2) recent groundwater data collected from the immediate vicinity of the downgradient residences; or (3) soil gas data collected from beneath or adjacent to residential foundations in these areas. The use of soil gas data for risk assessment purposes is preferred because it reduces the uncertainty associated with modeling from groundwater to indoor air while providing a reasonable degree of confidence that the data generated are representative of source area impact rather than the indoor use of chemicals in residential settings. The data gathered should be used to assess the indoor air pathway in the baseline human health risk assessment planned for OU-2, as well as any other exposures to groundwater.

Operable Unit 3 – Aberjona River Study

The Endangerment Assessment (Ebasco, 1988) evaluated potential floodplain surface soil, sediment, and surface water impacts to human health and the environment for the area in the vicinity of the Aberjona River and wetland, near the Source Area properties.

For the human health evaluation, current child and adult recreational exposures were evaluated for ingestion and dermal contact with surface soil, dermal contact with sediment, and ingestion of surface water. Arsenic in sediment was identified as contributing to risk above a level of concern. For ecological receptors, the evaluation indicated potential risk to aquatic life due to aluminum, iron, lead, and phthalates in surface water. Potential risk to invertebrate species were also identified due to copper, arsenic, chromium, and zinc in sediments. Birds and shrew, which feed predominantly on earthworms, may be at risk due to the presence of pesticides, PAHs, and PCBs in sediment.

A baseline human health and ecological risk assessment is currently in progress for the Aberjona River Study area (OU-3). A draft of the baseline risk assessment was released for public comment in May 2003. EPA has responded to the public comments, and the revised baseline risk assessment report is scheduled for release in Fall 2004. The objective of the Aberjona River Study is to determine whether contaminated media (surface water, sediment, floodplain surface soil, and biota) within the study area pose risk to human health and the environment. The draft risk assessment report included the evaluation of environmental data collected between 1995 and 2002, and bioassays with study area sediment.

Potential human health risks were quantitatively estimated for surface water, sediment and/or floodplain surface soil exposures at each station determined to be accessible to human receptors currently or in the future. Risks were estimated for young child and adult recreational receptors exposed during recreational activities (i.e., swimming or wading). The dermal contact exposure pathway was evaluated for surface water; the ingestion and dermal contact exposure pathways were evaluated for sediment and floodplain surface soil. In addition, risk estimation was performed for the ingestion of fish fillet tissue from river.

Only dermal contact with and ingestion of sediments resulted in risks in excess of EPA risk management guidelines, primarily due to arsenic. Sediments at two exposure areas (WH and CB-03) may pose a current risk to humans. WH is situated along the east side of the Wells G&H 38-acres wetland, near former municipal Well H. CB-03 is located in an irrigation channel along the western side of the center of the former cranberry bog. For these two exposure areas, EPA has installed warning signs discouraging contact with the sediments in these areas. Exposures at four additional areas within the 38-acre wetland indicated the potential for risk above EPA risk management criteria under a potential future scenario. The future scenario assumes that physical access obstacles (e.g., fencing) are removed, or the area is developed by the construction of a boardwalk or pier out into the wetland.

For the baseline ecological risk assessment, receptor species were selected for exposure evaluation to represent various components of the food chain in the river/wetland ecosystem. Receptor species selected for the evaluation included muskrat, green heron, mallard, and short-tailed shrew. Additional indicator species/communities selected included fish and benthic invertebrates. The exposure estimates for each receptor species or community were evaluated on spatial scales representative of the home range of each receptor species. Risks were identified for muskrat, mallard, shrew, and the benthic invertebrate community. The highest risk to ecological receptors was found in the Wells G&H 38-acre wetland and the former cranberry bog, associated with arsenic in sediment. Chromium, copper, lead, and mercury in sediment also contributed to risk to a lesser extent for one or more stations and/or receptors.

The results presented in the draft report will be updated in the revised baseline risk assessment report, scheduled for release in Fall 2004. Revisions to the draft report will include the incorporation of comprehensive baseflow and storm event surface water data collected from the entire river, additional floodplain surface soil and sediment data collected from south of Bacon Street in Winchester, and sediment core data collected from the entire river to partially characterize the vertical extent of contaminants in sediment. EPA intends to expand this draft risk assessment to include environmental data collected immediately upstream of the study area along the Halls Brook Holding Area (HBHA). The comprehensive risk assessment will be included in a comprehensive RI report documenting all the data collected along the Aberjona River and HBHA from North Woburn to the Mystic Lakes. The comprehensive RI will also be used to develop a comprehensive remedy for the entire river that will address human health and ecological risks along with the control of contaminant migration from identified sources, if necessary.

7.2.1 ARARs Review

This five-year review includes a review of Applicable or Relevant and Appropriate Requirements (ARARs) to check the impact on the remedy **due to changes in standards that were identified as ARARs in the ROD, newly promulgated standards for COPCs, and TBCs (to be considereds) that may affect the protectiveness of the remedy. The tables in Attachment 8 provide** the ARARs review. The review is summarized below.

The ROD set forth the following ARARs for the selected remedy:

<u>Location-Specific:</u>

- Resource Conservation and Recovery Act (RCRA)
- Clean Water Act (CWA)
- Wetlands Executive Order (EO 11990)
  - Floodplains Executive Order (EO11888)
  - Protection of Archaeological Resources (32 CFR 229)
  - Massachusetts Wetland Protection Requirements (310 CMR 10.00)
  - Massachusetts Waterways Licenses (310 CMR 9.00)
  - Massachusetts Certification for Dredging and Filling (314 CMR 9.00)
- Massachusetts Surface Water Discharge Permit Program Requirements (314 CMR 3.00)
- Massachusetts Surface Water Quality Standards (314 CMR 4.00)
- Massachusetts Groundwater Quality Standards (314 CMR 6.00) and Groundwater Discharge Permit Program (314 CMR 5.00)
- Air Emission Limitations for Unspecified Sources of Volatile Emissions (310 CMR 7.18 (17))
- Inland Wetland Orders (302 CMR 6.00)
- Operation and Maintenance and Pretreatment Standards for Waste Water Treatment Works and Indirect Discharges (314 CMR 12.0)
- EPA Groundwater Protection Strategy
- EPA Directive 9355.0-28; Air Stripper Control Guidance

<u>Chemical-Specific:</u>

- Safe Drinking Water Act (SDWA)
- Resource Conservation and Recovery Act (RCRA)
- CWA Federal Ambient Water Quality Criteria (AWQC)
- EPA Reference Doses (RfDs)
- EPA Carcinogen Assessment Group Potency Factors
- Massachusetts Drinking Water Regulations (310 CMR 22.00)
  - Massachusetts Groundwater Quality Standards
  - Massachusetts Drinking Water Health Advisories

Action-Specific:

- Record of Decision (September 14, 1989)
- Resource Conservation and Recovery Act (RCRA)
- Toxic Substances Control Act (TSCA)
- Clean Water Act (CWA)
- Clean Air Act (CAA)
- Occupational Safety and Health Administration (OSHA)
- Department of Transportation
- Hazardous Waste Management Requirements (310 CMR 30.00)
- Hazardous Waste Incinerator Air Emission Requirements (310 CMR 7.08(4))
- Ambient Air Quality Standards for the Commonwealth of Massachusetts (310 CMR 6.00)
- Air Pollution Controls (310 CMR 7.00)
- Employee and Community Right to Know (310 CMR 7.00)

Tables A8-1, A8-2, and A8-3 of Attachment 8 provide an evaluation of ARARs using the regulations and requirement synopses listed in the ROD as a basis. The evaluation includes a determination of whether the regulation is currently ARAR or TBC and whether the requirements have been met. Most of the listed ARARs remain applicable or relevant and appropriate to the Site and are being complied with. As indicated in the attached tables some ARARs no longer apply, such as the requirements that applied to the on-site incineration component of the remedy as identified in the ROD. The on-site incineration component was eliminated by the April 1991 ESD.

Changes have been made to ARARs since the development of the ROD. Theses changes are provided in the table in Attachment 8. No ARARs evaluations were conducted for OU-2 or OU-3 since these OUs do not have a signed ROD.

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

There is no information that calls into question the current protectiveness of the Source Area (OU-1) remedy. However, conditions were identified that could affect the future protectiveness of the Source Area (OU-1) remedy and require further data collection, analysis or remedial/corrective actions. These issues include:

- Lack of institutional controls at Source Area (OU-1) properties.;
- Lack of groundwater treatment at NEP and presence of PCE and TCE above ROD action levels in groundwater;
- Groundwater extraction at UniFirst that is not achieving design capture objectives;
- Soil remedy at UniFirst has not been implemented;
- Area south of Wildwood treatment system may have groundwater in excess of ROD action levels and is not receiving treatment;
- Limited documentation of groundwater contaminant capture in bedrock at Wildwood;
- The 1988 Endangerment Assessment did not comprehensively evaluate non-ingestion uses of groundwater and therefore may not be representative of all potential future exposures;
- Arsenic and manganese were not identified as COCs in the 1989 ROD. At some of the source area properties, historical arsenic concentrations exceed the current arsenic primary MCL (10 ug/L) and manganese concentrations exceed current manganese toxicity values;
- An evaluation of the groundwater to indoor air pathway indicates potential risks at Source Area (OU-1) properties depending on future land use; and
- AWQCs associated with aquatic life have decreased since the ROD. The impact of this change must be assessed to evaluate impact on future protectiveness since AWQCs were used, in part, to set effluent limits for remedial system effluent discharges. (Overall impacts of AWQC changes on the Aberjona River will be evaluated as part of the Aberjona River Study [OU-3]).

These and other issues identified as part of the Five-Year Review are summarized in Section 8.0.

7.4 Technical Assessment Summary

According to the data reviewed, the site inspections and the interviews, the Source Area (OU-1) remedy is functioning as intended by the ROD, as modified by the current ESD. There have been no changes in the physical conditions of the Site that would affect the current protectiveness of the remedy. Most of the ARARs identified in the ROD remain applicable or relevant and appropriate and either have been met or are being complied with; Tables A8-1, A8-2, and A8-3 of Attachment 8 provide an evaluation of ARARs.

8.0 ISSUES

Issues associated with the remedy set forth in the ROD and ESD for the Source Area (OU-1) properties are assessed for their current and future protectiveness in Table 4.

Table 4. Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Institutional controls have not been implemented at the Source Areas (OU-1) properties. The ROD calls for institutional controls.	N	Y
Lack of groundwater treatment at NEP following AS/SVE shutdown. Groundwater concentrations of PCE and TCE in some wells at NEP still exceed ROD action levels. Potential exists for off-property migration and dowwngradient indoor air impacts.	N	Y
Insufficient groundwater extraction at UniFirst due to a recently installed replacement pump that is not achieving design capture.	N	Y
Soil remedy at UniFirst (SVE) has not been implemented.	N	Y
Area south of Wildwood treatment system may have groundwater contamination in excess of ROD action levels not receiving treatment.	N	Y
Insufficient information to document capture in bedrock at Wildwood.	N	Y
Arsenic was not identified as a COC in OU-1 groundwater under the 1988 Endangerment Assessment when the MCL was 50 ug/L. However, the arsenic MCL was recently lowered to 10 ug/L, and historical arsenic groundwater concentrations at some of the Source Areas were either above 10 ug/L, or detection limits exceeded 10 ug/L, and may exceed safe levels.	N	Y
The 1988 Endangerment Assessment did not comprehensively evaluate non-ingestion uses of groundwater such as dermal contact during industrial groundwater usage or direct contact during trench excavation under certain current (commercial worker) and future (commercial worker, residential) scenarios at Source Area properties.	N	Y

Table 4. Issues		
Issues	**Affects Current Protectiveness (Y/N)**	**Affects Future Protectiveness (Y/N)**
Manganese was not identified as a COC in OU-1 groundwater under the 1988 Endangerment Assessment, but manganese toxicity values have been reduced by a factor of 10 since the assessment. Based upon current toxicity estimates, future exposures to manganese in groundwater may exceed safe levels at some of the Source Areas.	N	Y
An evaluation of the groundwater to indoor air pathway indicates that potential risks at the UniFirst, Grace, NEP, and Wildwood properties are within or below EPA risk management guidelines, based on assumed commercial site use. However, estimated future risks at the Olympia property (commercial, residential) and Wildwood property (residential) exceed EPA risk management guidelines.	N	Y
AWQCs associated with aquatic life have decreased since the ROD. AWQCs were used, in part, to establish effluent limits for remedial system discharges.	N	Y
Groundwater remedy at Olympia has not been implemented.	N	Y

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

In response to the issues noted in Section 8.0, it is recommended that the actions listed in Table 5 be taken:

Table 5. Recommendations and Follow-Up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness	
					Current	Future
Institutional controls have not been implemented at the Source Area properties (OU-1).	Implement institutional controls at Source Area properties.	PRP, EPA, State and City	EPA	By Next 5 Year Review	N	Y
Lack of groundwater treatment following AS/SVE shutdown at NEP. Groundwater concentrations of PCE and TCE in some wells at NEP still exceed ROD action levels. Potential exists for off-property migration and downgradient indoor air impacts.	Assess groundwater conditions since AS/SVE shutdown, evaluate the need for further groundwater treatment, and where appropriate consider other treatment remedies. Install downgradient monitoring well(s) to define downgradient extent of groundwater contamination.	PRP	EPA	Fall 2005	N	Y
Insufficient groundwater extraction at UniFirst due to a recently installed replacement pump that is not achieving design capture.	Replace extraction pump with appropriate extraction pump.	PRP	EPA	Fall 2004	N	Y
Soil remedy at UniFirst (SVE) has not been implemented.	Review soil contamination issues at UniFirst to establish data needs for implementation of technical solutions.	PRP and EPA	EPA	Spring 2005	N	Y
Area south of Wildwood treatment system may have groundwater contamination in excess of ROD action levels that is not receiving treatment.	Assess groundwater conditions south of Wildwood Treatment System, evaluate the need for further groundwater and soil treatment, and where appropriate consider other treatment remedies.	PRP and EPA	EPA	Fall 2005	N	Y

Table 5. Recommendations and Follow-Up Actions						
					Affects Protectiveness	
Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Current	Future
Insufficient information to document capture in bedrock at Wildwood.	Develop and implement plan to assess capture in bedrock at Wildwood.	PRP	EPA	Spring 2005	N	Y
Arsenic MCL recently changed from 50 ug/L to 10 ug/L. Arsenic was not previously targeted for cleanup based on prior MCL. Historical arsenic groundwater concentrations were either above 10 ug/L, or detection limits exceeded 10 ug/L.	Assess groundwater conditions relative to arsenic at Source Area properties. Where appropriate, EPA assess potential arsenic risks.	PRP (data) EPA (risk)	EPA	Spring 2005	N	Y
The 1988 Endangerment Assessment did not comprehensively evaluate non-ingestion uses of groundwater such as dermal contact during industrial groundwater usage or direct contact during trench excavation under certain current (commercial worker) and future (commercial worker, residential) scenarios at Source Area Properties.	Evaluate exposures not addressed by Endangerment Assessment using up-to-date groundwater data. Where appropriate consider the implementation of institutional controls.	PRP (data) EPA (risk)	EPA	Spring 2005	N	Y
Manganese was not identified as a COC in OU-1 groundwater under the 1988 Endangerment Assessment, but manganese toxicity values have been reduced by a factor of 10 since the assessment. Based upon current toxicity estimates, future exposures to manganese in groundwater may exceed safe levels at some of the Source Areas.	Assess groundwater conditions relative to manganese at Source Area properties. Where appropriate, EPA assess potential manganese risks.	PRP (data) EPA (risk)	EPA	Spring 2005	N	Y

Table 5. Recommendations and Follow-Up Actions						
Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness	
					Current	Future
An evaluation of the groundwater to indoor air pathway indicates that potential risks at the UniFirst, Grace, NEP, and Wildwood properties are within or below EPA risk management guidelines, based on assumed commercial site use. However, estimated future risks at the Olympia property (commercial, residential) and Wildwood property (residential) exceed EPA risk management guidelines.	Evaluate risk from exposure to indoor air at the Source Area properties based on up-to-date data if property is developed.	PRP (data) EPA (risk)	EPA	Spring 2005	N	Y
AWQCs associated with aquatic life have decreased since the ROD. AWQCs were used, in part, to establish effluent limits for remedial system discharges.	Revise NPDES equivalent discharge standards based upon current AWQCs. (Note: Overall impacts of AWQC changes on Aberjona River will be evaluated as part of Aberjona River Study [OU-3]).	PRP	EPA	Spring 2005	N	Y
Groundwater remedy at Olympia has not been implemented.	Evaluate progress of Olympia TCE soil remedy under the AOC removal action. Assess need for groundwater cleanup at end of removal action.	EPA	EPA	By next Five Year Review	N	Y

10.0 PROTECTIVENESS STATEMENT(S)

The Source Area (OU-1) remedy at the Wells G&H Superfund Site currently protects human health and the environment. However, in order for the Source Area (OU-1) remedy to be protective in the long term, institutional controls should be implemented at the Source Area (OU-1) properties to prevent exposure to contaminated groundwater **and unremediated soil areas** until the remedy is completed. Additional treatment and/or measures to ensure capture may be required at some of the Source Area (OU-1) properties. The Endangerment Assessment did not cover all potential exposures to groundwater, and the basis for identifying COCs has changed since implementation of the ROD, which will require additional evaluation to ensure representativeness and future protectiveness. Indoor air vapor intrusion has also emerged as an issue as EPA technical guidance on this matter has evolved. Lastly, AWQCs associated with aquatic life have decreased since the ROD; therefore, the impact of these changes needs to be assessed.

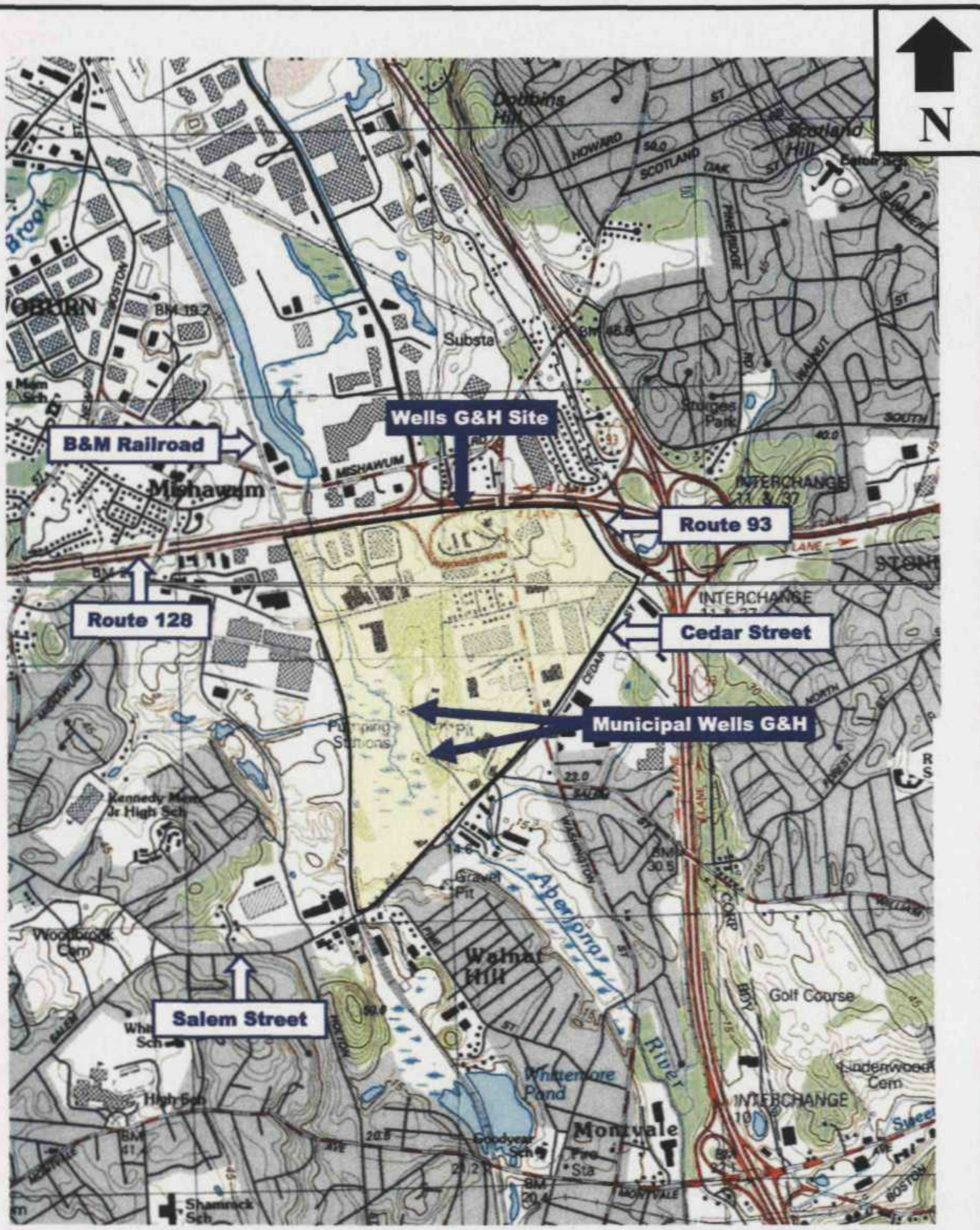
Also, Operable Units 2 (Central Area) and 3 (the Aberjona River Study) have been identified for further study by the PRPs and EPA, respectively. However, a remedy has not yet been selected for the Central Area (OU-2) and Aberjona River Study (OU-3).

11.0 NEXT REVIEW

The next Five-Year Review for the Wells G&H Superfund Site is September 2009, five years from the date of this review. The next Five-Year Review should include a complete review of issues identified herein for all three operable units. The next review should also include a complete review of data generated from groundwater, soil, and/or soil gas monitoring to confirm that the remedial actions are protective of human health and the environment.

Attachment 1

Site Maps



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

0 1000 2000 3000

scale in feet

Originals in color.

FIGURE 1.
LOCATION MAP
WELLS G&H
SUPERFUND SITE
WOBURN, MASSACHUSETTS

M&E Metcalf & Eddy

TRC

Boott Mills South
Foot of John Street
Lowell, MA 01852
978-970-5600

QUADRANGLE LOCATION

MASS

TRC PROJ. NO.: 02136-0530-12125

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061

02136/MULTI SITE 5 YEAR/OLYMPIA/LOCATION

Original includes color coding.

LEGEND

Wells G&H Source Area Properties

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

Metcalf & Eddy

TRC

Boott Mills South
Foot of John Street
Lowell, MA 01852
978-970-5600

QUADRANGLE LOCATION

MASS

TRC PROJ. NO.: 02136-0530-12125

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061

02136/MULTI SITE 5 YEAR/OLYMPIA/SITE MAP

Attachment 2

Groundwater Data/ROD Cleanup Criteria Exceedance Tables

Attachment 2.1

UniFirst Groundwater Data in Excess of ROD Cleanup Levels

1998 to 2003

Unifirst - Monitoring Wells Exceeding ROD Cleanup Goals for Last Five Years (ug/L)						
Well	Contaminant	Min	Max	Most Recent	Average	ROD Cleanup Goal
UC10-1	tetrachloroethene	55	400	55	232.5	5
UC10-1	trichloroethene	23	100	23	68.7	5
UC10-1	1,2-dichloroethene	190	720	450	466.7	70
UC10-2	tetrachloroethene	100	190	150	140	5
UC10-2	trichloroethene	41	60	56	50.3	5
UC10-2	1,2-dichloroethene	100	160	120	133.3	70
UC10-3	tetrachloroethene	68	190	120	117	5
UC10-3	trichloroethene	27	56	43	39.8	5
UC10-3	1,2-dichloroethene	120	510	120	236	70
UC10-4	tetrachloroethene	83	130	120	113.3	5
UC10-4	trichloroethene	26	35	28	31.3	5
UC10-4	1,2-dichloroethene	50	170	50	89	70
UC10-5	tetrachloroethene	28	90	28	65.8	5
UC10-5	trichloroethene	14	30	14	23.8	5
UC10-5	1,2-dichloroethene	98	400	310	203	70
UC10-6	tetrachloroethene	12	37	12	22.7	5
UC10-6	trichloroethene	7	18	7	10.8	5

UC10-6	1,2-dichloroethene	28	80	80	51.7	70
G36D	trichloroethene	< 2	6.4	< 2	2.9	5
G36DB	tetrachloroethene	5.4	40.9	5.4	25.7	5
G36DB	trichloroethene	11.1	31.2	11.1	22.2	5
G36DB2	tetrachloroethene	< 2	16.2	5.4	8.4	5
G36DB2	trichloroethene	< 2	25.7	24.6	19.3	5
UC7-1	tetrachloroethene	1,800	3,500	2,400	2,683.3	5
UC7-1	trichloroethene	< 50	71	< 50	56.2	5
UC7-2	tetrachloroethene	1,100	6,500	2,800	4,183.3	5
UC7-2	trichloroethene	< 100	71	< 100	63.7	5
UC7-3	tetrachloroethene	1,500	3,300	1,500	2,176.7	5
UC7-3	trichloroethene	36	130	120	71.3	5
UC7-4	tetrachloroethene	760	2,200	1,200	1,443.3	5
UC7-4	trichloroethene	< 10	55	< 10	33.5	5
UC7-5	tetrachloroethene	110	610	610	280	5
UC7-5	trichloroethene	8	32	30	23.3	5
UC7-5	1,2-dichloroethene	< 2	130	130	69.8	70
G01DB	tetrachloroethene	15	26	15	23	5
UG1-4	trichloroethene	0.6	29	0.6	10.8	5
UG1-4	1,2-dichloroethene	2	160	83	84	70

UC6	tetrachloroethene	32	59	36	39.5	5
UC6S	tetrachloroethene	0.7	45	2	12.8	5
S81S	tetrachloroethene	2	19	7	11.3	5
S81M	tetrachloroethene	40	180	92	147	5
S81D	tetrachloroethene	100	200	100	166.7	5
S81D	trichloroethene	3	11	5	5.7	5
S71S	tetrachloroethene	48	180	92	95	5
S71D	tetrachloroethene	49	110	73	80.5	5
UC11-2	tetrachloroethene	72	210	72	128.2	5
UC11-2	trichloroethene	56	100	56	81.2	5
UC11-2	1,2-dichloroethene	2	280	250	155.2	70
S70D	tetrachloroethene	< 1	7	2	3.3	5

Note:

Non-detects averaged at ½ the laboratory reporting limit.
< - Non-detect at specified laboratory reporting limit

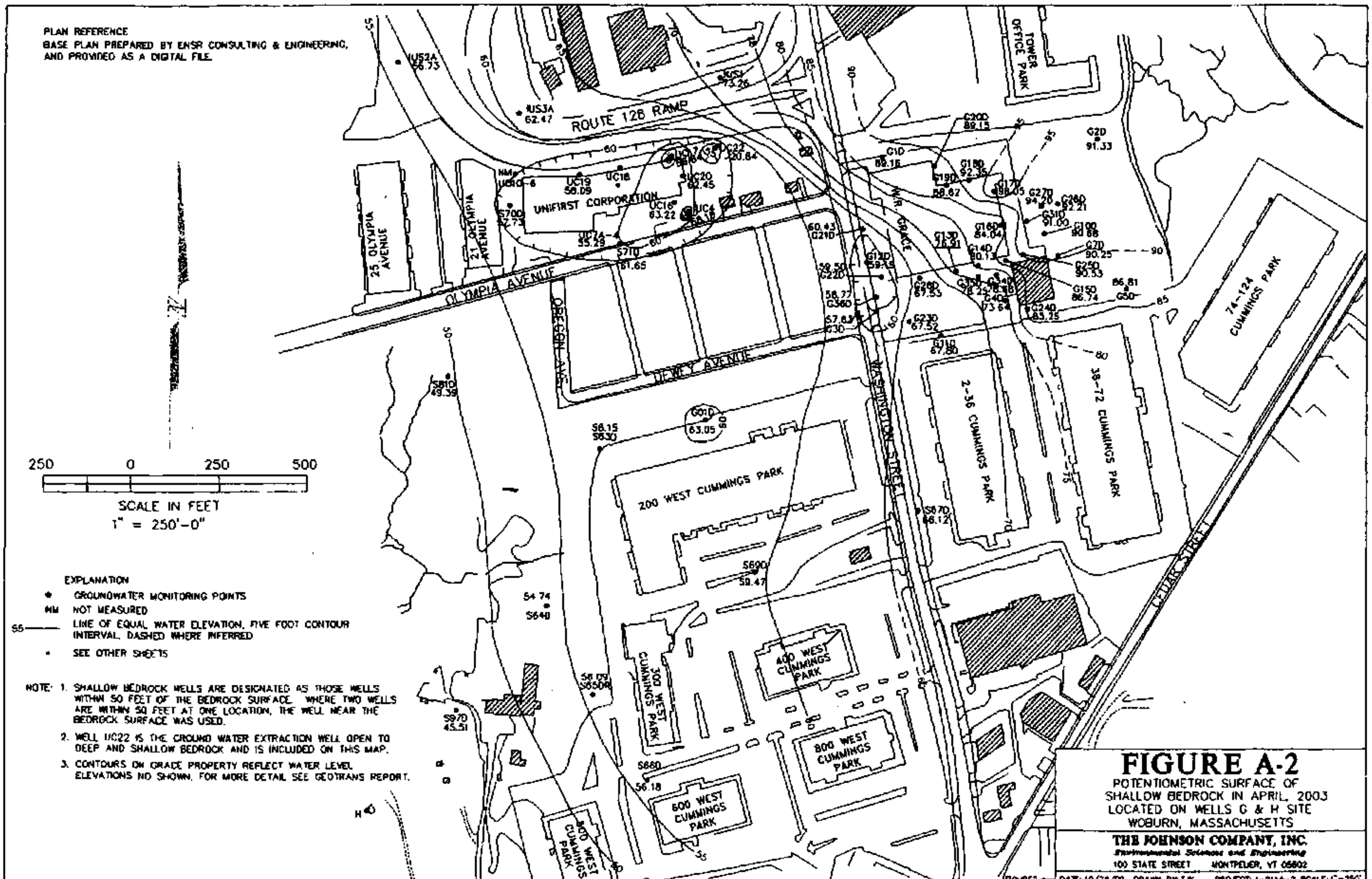


FIGURE A-2
POTENTIOMETRIC SURFACE OF SHALLOW BEDROCK IN APRIL, 2003 LOCATED ON WELLS G & H SITE WOBURN, MASSACHUSETTS

Attachment 2.2

Grace Groundwater Data in Excess of ROD Cleanup Levels

1998 to 2003

Grace - Monitoring Wells Exceeding ROD Cleanup Goals for Last Five Years (ug/L)						
Well	Contaminant	Min	Max	Most Recent	Average	ROD Cleanup Goal
G11D	trichloroethene	3	10	3	6.5	5
G12D	trichloroethene	< 2	44.8	< 2	8.9	5
G23D	trichloroethene	16.7	31.4	16.7	21.7	5
G34D	trichloroethene	15.3	32.6	15.3	19	5
G36D	trichloroethene	< 2	6.4	< 2	2.2	5
G36DB	tetrachloroethene	5.4	42.7	5.4	27.9	5
G36DB	trichloroethenc	11.1	35.9	11.1	25.7	5
G36DB2	tetrachloroethene	< 2	16.2	5.4	7.2	5
G36DB2	trichloroethene	< 2	25.7	24.6	19.5	5
RW10	tetrachloroethene	39.2	91.8	45.6	57.6	5
RW10	trichloroethene	5.5	7.8	5.5	7.8	5
RW12	tetrachloroethene	< 2	22.2	22.2	5.1	5
RW12	trichloroethene	10.3	106	10.3	49.1	5
RW13	tetrachloroethene	76.4	144	76.4	107.7	5
RW13	trichloroethene	4.7	14	4.7	9	5
RW17	tetrachloroethene	12.5	21	14.7	16.2	5
RW17	trichloroethene	29.2	70	29.2	44.8	5

RW20	tetrachloroethene	< 2	18	8.1	8.3	5
RW20	trichloroethene	6.5	22	7.3	10.7	5
RW22	tetrachloroethene	5.7	15.2	5.7	9.9	5
RW22	trichloroethene	391	1080	391	639.8	5
RW22	1,2-dichloroethene	213.4	1417.4	740.4	809.8	70
RW22	vinyl chloride	2.1	88.1	16.8	27.5	2

Note:

Non-detects averaged at ½ the laboratory reporting limit.
< - Non-detect at specified laboratory reporting limit

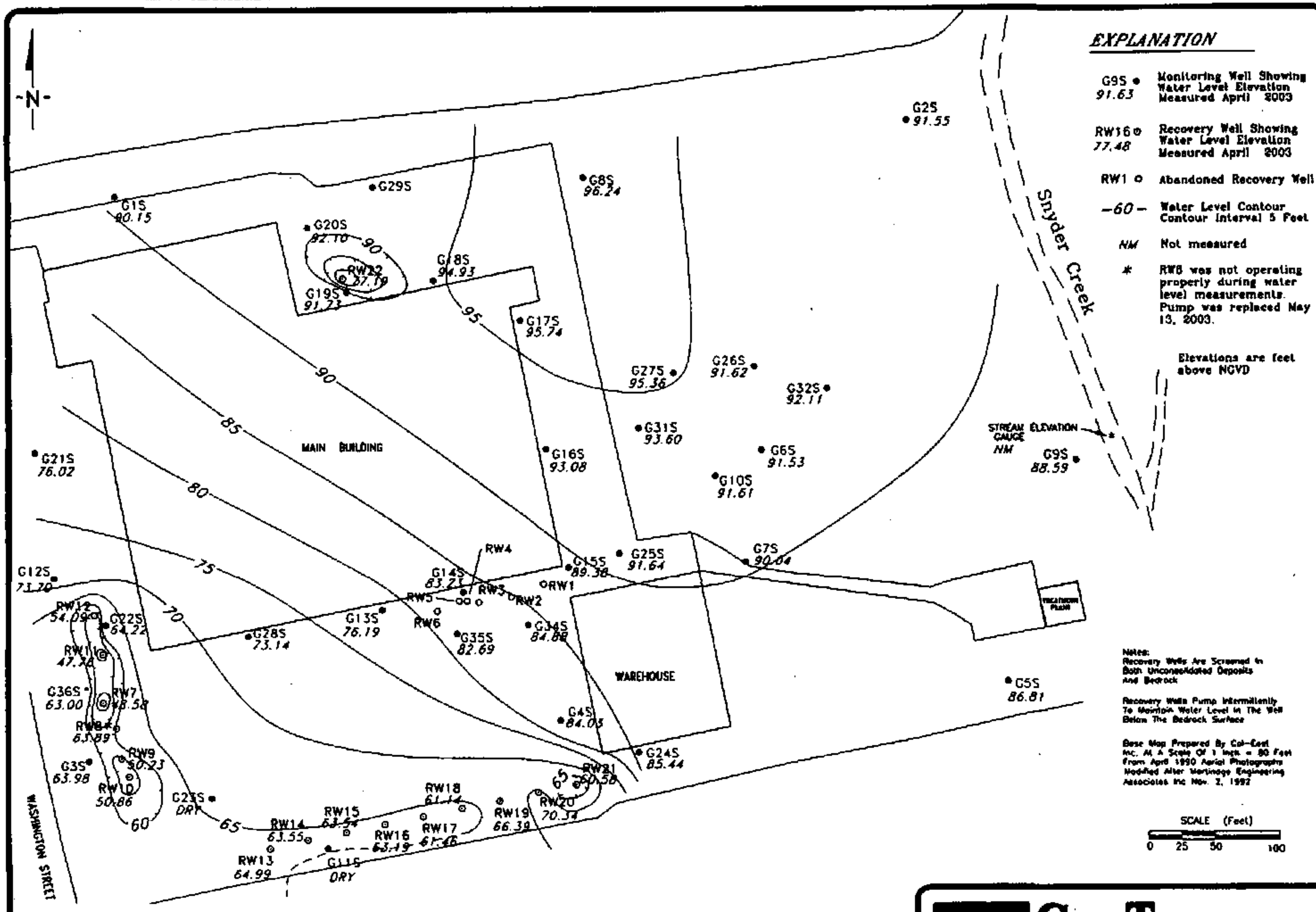


Figure 2-1 Water Table Map, April 2003

GeoTrans, Inc. A TETRA TECH COMPANY

Attachment 2.3

NEP Groundwater Data in Excess of ROD Cleanup Levels

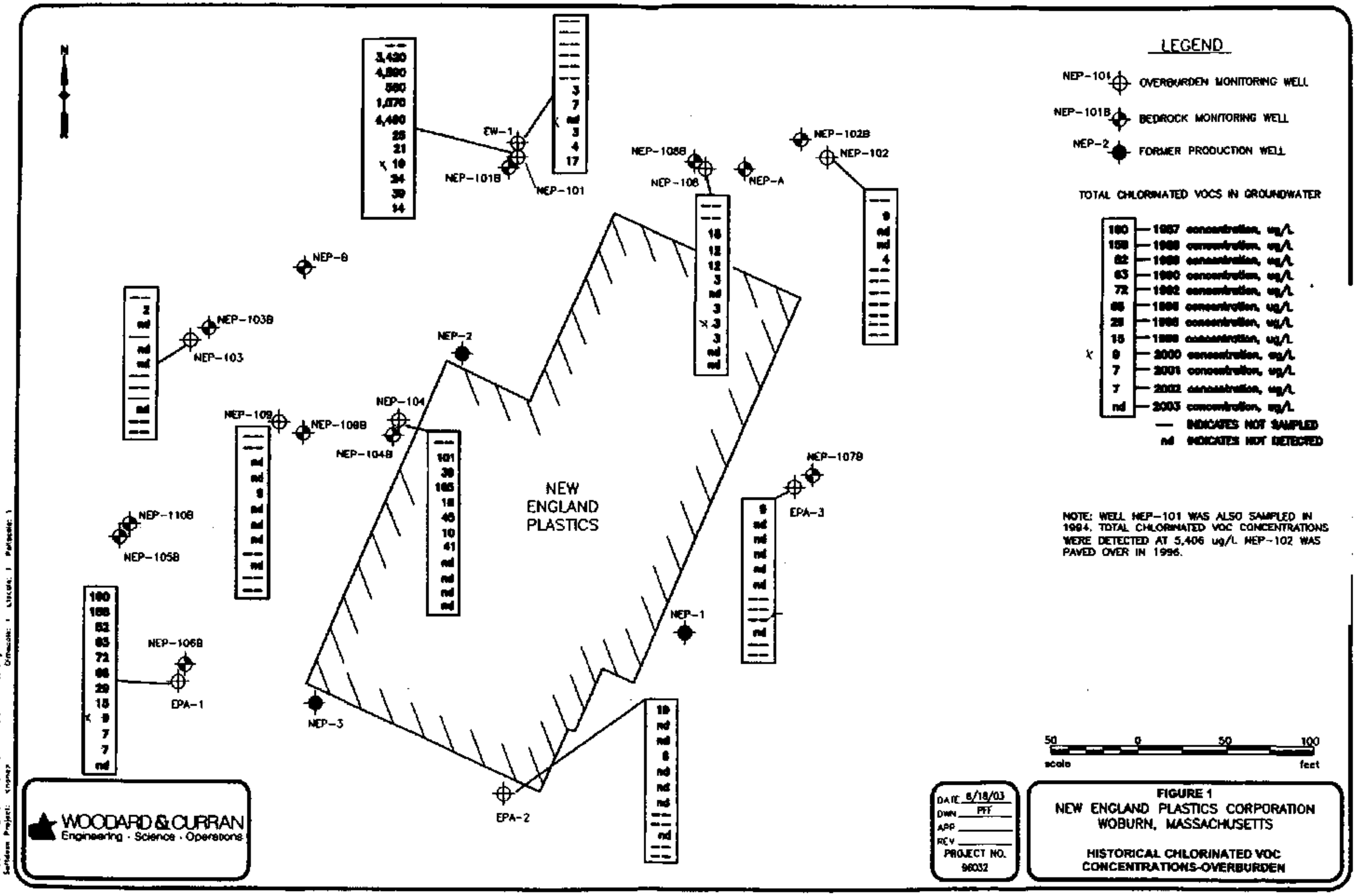
1998 to 2003

NEP - Monitoring Wells Exceeding ROD Cleanup Goals for Last Five Years (ug/L)

Well	Contaminant	Min	Max	Most Recent	Average	ROD Cleanup Goal
EPA-1	tetrachloroethene	< 5	26	< 5	11.1	5
EW-1	tetrachloroethene	2	17	17	6	5
NEP-101	tetrachloroethene	14	36	14	22.4	5
NEP-101B	tetrachloroethene	< 5	110	< 5	15.5	5
NEP-101B	trichloroethene	< 5	20	< 5	4.3	5
NEP-104	tetrachloroethene	< 5	33	< 5	8.8	5
NEP-104	trichloroethene	< 5	6	< 5	3.1	5
NEP-104B	tetrachloroethene	11	69	17	28	5
NEP-104B	trichloroethene	< 5	12	< 5	4.9	5
NEP-106B	tetrachloroethene	23	51	23	38	5
NEP-106B	trichloroethene	8	15	8	11.7	5
NEP-108B	tetrachloroethene	< 5	10	< 5	4.7	5

Note:

Non-detects averaged at ½ the laboratory reporting limit.
< - Non-detect at specified laboratory reporting limit



LEGEND
NEP-101 OVERBURDEN MONITORING WELL
NEP-101B BEDROCK MONITORING WELL
NEP-2 FORMER PRODUCTION WELL
TOTAL CHLORINATED VOCS IN GROUNDWATER
— INDICATES NOT SAMPLED
nd INDICATES NOT DETECTED
NOTE: WELL NEP-101 WAS ALSO SAMPLED IN 1994. TOTAL CHLORINATED VOC CONCENTRATIONS WERE DETECTED AT 5,406 ug/L. NEP-102 WAS PAVED OVER IN 1996.
NEW ENGLAND PLASTICS
EW-1
NEP-101B
NEP-101
NEP-106B
NEP-106
NEP-A
NEP-102B
NEP-102
NEP-8
NEP-103B
NEP-103
NEP-2
NEP-109
NEP-109B
NEP-104
NEP-104B
NEP-107B
EPA-3
NEP-110B
NEP-105B
NEP-1
NEP-106B
EPA-1
NEP-3
EPA-2
scale
feet
WOODARD & CURRAN
Engineering · Science · Operations
DATE 6/18/03
DWN PFF
APP
REV
PROJECT NO. 96032
FIGURE 1
NEW ENGLAND PLASTICS CORPORATION
WOBURN, MASSACHUSETTS
HISTORICAL CHLORINATED VOC CONCENTRATIONS-OVERBURDEN

Attachment 2.4

Wildwood Groundwater Data in Excess of ROD Cleanup Levels

1998 to 2003

Wildwood Property - Monitoring Wells Exceeding ROD Cleanup Goals for Last Five Years (ug/L)						
Well	Contaminant	Min	Max	Most Recent	Average	ROD Cleanup Goal
BOW-10	trichloroethene	4	24	19	13.2	5
BSSW-15	trichloroethene	< 1	6	6	3.1	5
BOW-8	tetrachloroethene	< 1	21	< 1	6.5	5
BOW-8	trichloroethene	2	190	4	17	5
BSW-1	tetrachloroethene	<50	850	200	277	5
BSW-1	trichloroethene	460	13,000	890	3,700	5
BSW-1	vinyl chloride	< 1	620	< 1	323	2
BSW-13	tetrachloroethene	< 1	8	< 1	1	5
BSW-13	trichloroethene	< 1	110	49	25.1	5
BSW-14	trichloroethene	< 1	7.3	< 1	1.9	5
BSW-14	vinyl chloride	< 1	15	15	3.4	2
BSW-6	tetrachloroethene	< 1	19	< 1	7.1	5
BSW-6	1,1,1-trichloroethane	< 1	340	< 1	36.9	200
BSW-6	trichloroethene	48	9,000	48	1,375	5
BCW-13	trichloroethene	8	70	36	34.2	5
BCW-15	trichloroethene	< 1	190	12	41.6	5
BCW-18	trichloroethene	< 1	1,100	< 1	221	5

BW-6R	tetrachloroethene	10	24	10	47.8	5
BW-6R	1,1,1-trichloroethane	130	340	130	184	200
BW-6R	trichloroethene	3,600	12,000	3,600	8,500	5
BW-10	trichloroethene	2	67	29	12.6	5
BW-13	trichloroethene	79	970	79	296	5
BW-14	1,1-dichloroethane	< 1	7	< 1	2.9	5
BW-14	tetrachloroethene	< 1	12	< 1	2.3	5
BW-14	trichloroethene	2	2,300	580	631	5
BW-15RP	trichloroethene	7	1,600	18	106.4	5
BW-17R	trichloroethene	63	240	170	140.2	5
BW-8	tetrachloroethene	< 1	6	6	1.6	5
BW-8	trichloroethene	4	23	16	15.6	5
PW-1	trichloroethene	22	202	22	113.5	5
PW-2	trichloroethene	35	2,300	35	486.1	5
PW-3	1,1-dichloroethane	< 1	32	2	4.8	5
PW-3	trichloroethene	110	8,800	110	1,097	5
BW-19R	trichloroethene	81	640	140	231.1	5
BW-6RD(LO)	chloroform	< 1	260	6	44.1	100
BW-6RD(LO)	1,1-dichloroethane	< 1	240	15	45.7	5
BW-6RD(LO)	1,1-dichloroethene	< 1	31	< 1	28.1	7

BW-6RD(LO)	tetrachloroethene	< 1	90	57	49.1	5
BW-6RD(LO)	1,1,1-trichloroethane	< 1	330	5.7	46.7	200
BW-6RD(LO)	trichloroethene	1,100	29,000	2,500	6,670	5
BW-6RD(LO)	vinyl chloride	< 1	3	< 1	26.2	2
BW-18RD(LO)	chloroform	< 1	500	< 200	275.1	100
BW-18RD(LO)	1,1-dichloroethane	< 1	150	< 200	131.1	5
BW-18RD(LO)	1,1,1-trichloroethane	< 1	510	< 200	285.1	200
BW-18RD(LO)	1,1-dichloroethene	< 1	50	< 200	106.4	5
BW-18RD(LO)	tetrachloroethene	< 1	37	< 200	104.8	5
BW-18RD(LO)	trichloroethene	13,000	55,000	28,000	33,250	5
BW-18RD(LO)	vinyl chloride	< 1	30	< 200	104.1	2

Note:

Non-detects averaged at ½ the laboratory reporting limit.
< - Non-detect at specified laboratory reporting limit

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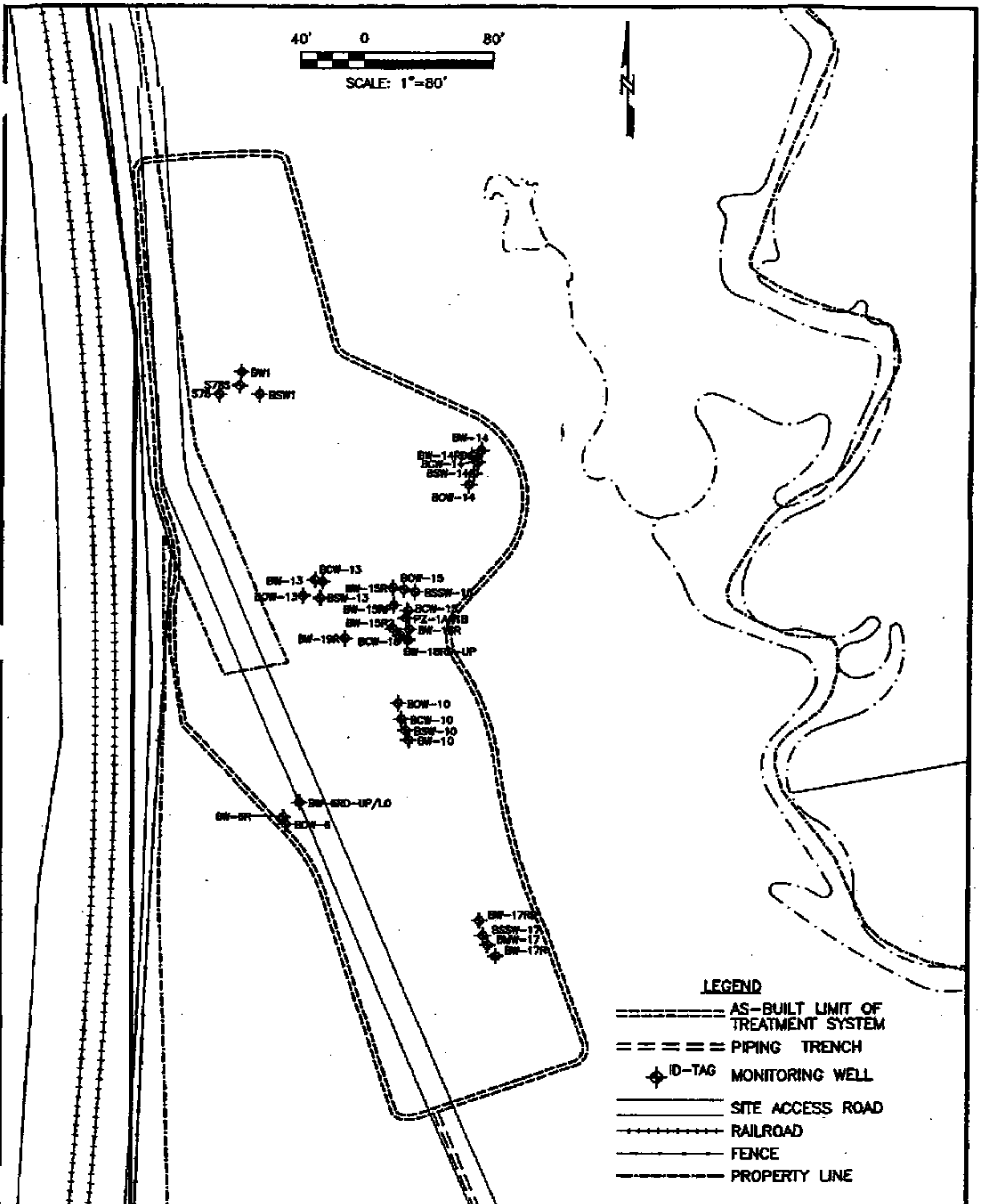


RETEC

WELLS G & H SUPERFUND SITE

CNAGR-3684-750

MONITORING WELL LOCATIONS

WOBURN, MASSACHUSETTS

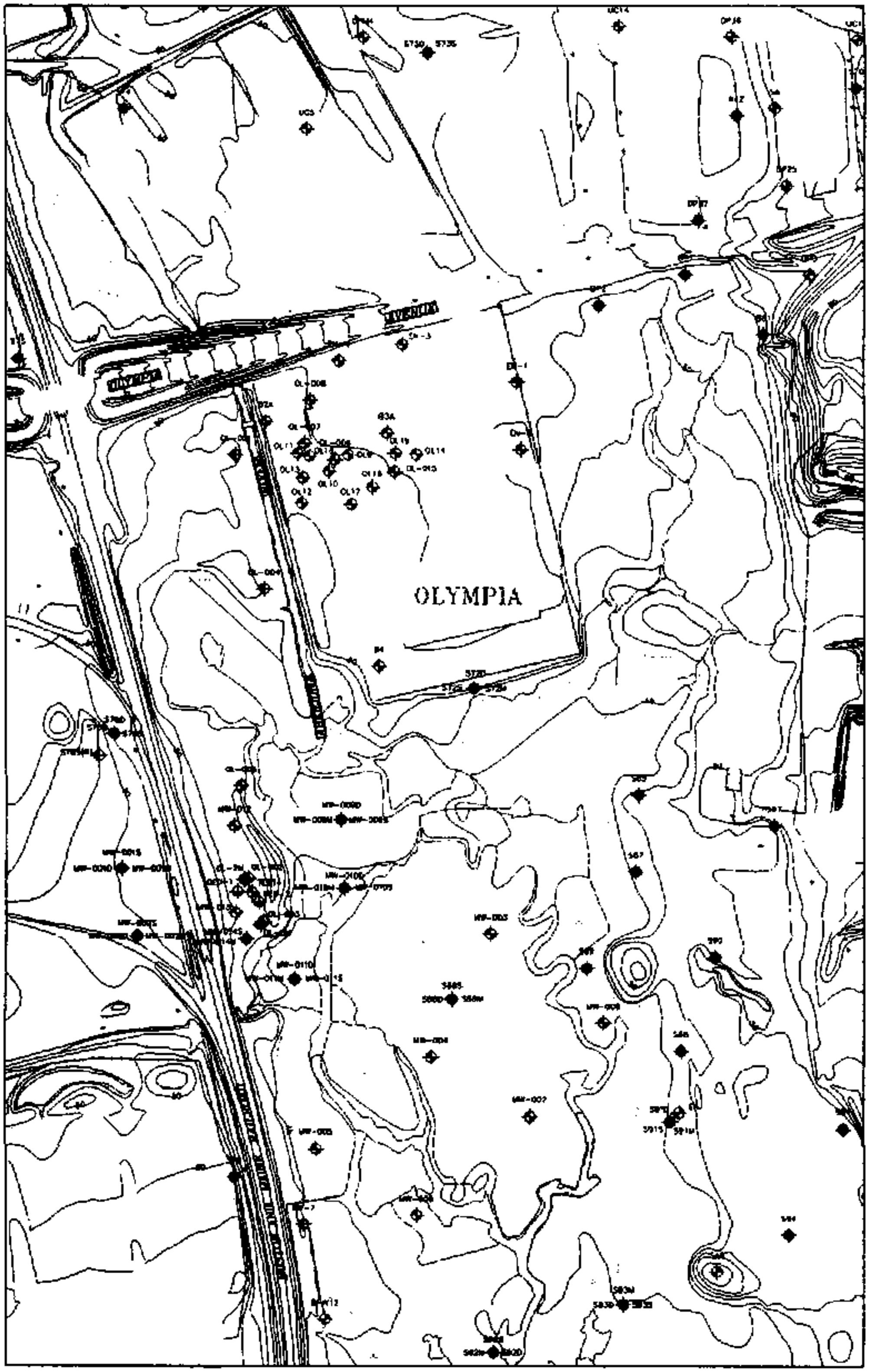
DATE: 11/03 | DRWN: BcV/CON | FIGURE: 1-4

Attachment 2.5

Olympia Groundwater Data in Excess of ROD Cleanup Levels from EPA's 2002 Investigation of the Former Drum Disposal Area

Olympia Groundwater Data in Excess of ROD Cleanup Levels from EPA's 2002 Investigation of the Former Drum Disposal Area

Well ID	Contaminant	Detected Value	ROD Cleanup Goal
B3A	Tetrachloroethene	10	5
EN-001	Tetrachloroethene	27	5
EN-002	Tetrachloroethene	23	5
EN-004	Tetrachloroethene	2	5
MW-006	Tetrachloroethene	5	5
MW-011M	Tetrachloroethene	7	5
MW-013	Tetrachloroethene	410	5
MW-014S	Tetrachloroethene	25	5
S91D	Tetrachloroethene	50	5
S93D	Tetrachloroethene	8	5
TEST-01	Tetrachloroethene	14	5
MW-006	Trichloroethene	14	5
MW-011M	Trichloroethene	120	5
MW-013	Trichloroethene	780	5
MW-014S	Trichloroethene	180	5
OL-006	Trichloroethene	7900	5
OL-001	Trichloroethene	13	5
OL-003M	Trichloroethene	5	5
S91D	Trichloroethene	10	5
S92D	Trichloroethene	9	5
S92M	Trichloroethene	8	5
S93M	Trichloroethene	6	5
S93S	Trichloroethene	5	5
TEST-01	Trichloroethene	12000	5
MW-014S	Vinyl Chloride	190	2
OL-001	Vinyl Chloride	16	2
TEST-01	Vinyl Chloride	2	2



LEGEND

- SHALLOW MONITORING WELL
- INTERMEDIATE MONITORING WELL
- DEEP MONITORING WELL
- BEDROCK MONITORING WELL
- MULTI-LEVEL MONITORING WELL

- NEWLY INSTALLED MONITORING WELLS-SAMPLED
- CENTRAL AREA/FORMER DRUM DISPOSAL AREA WELLS-SAMPLED
- PREVIOUSLY INSTALLED OLYMPIA PROPERTY MONITORING WELLS-SAMPLED
- PREVIOUSLY INSTALLED MONITORING WELLS-NOT SAMPLED

0 100 200 300 400
SCALE IN FEET

N

FIGURE 7
GROUNDWATER
MONITORING WELL LOCATIONS

Metcalf & Eddy

TRC

TRC PROJ. NO.: 02136-0370-01483

EPA CONTRACT NO.: 68-W8-0042

RAC SUBCONTRACT NO.: 107081

Attachment 3

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Attachment 4

Five-Year Review Site Inspection Checklists

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Wildwood	**Date of inspection:** August 18, 2004
Location and Region: Woburn USEPA Region 1	**EPA ID:** Wells G&H MAD980732168
Agency, office, or company leading the five-year review: TRC / Metcalf & Eddy, Inc.	**Weather/temperature:** Cloudy 80 °

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ■ Access controls
- ☐ Institutional controls
- ■ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ■ Other Air sparging/soil vapor extraction (AS/SVE)
- ☐ 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** James R. Greacen, PG, LSP — Project Manager, The RETEC Group — 8/18/04
   Name / Title / Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. 978-772-1105
   Problems, suggestions; ☐ Report attached

2. **O&M staff** Brendan Maye / Peter Cox — Onsite O&M / Project Geologist — 8/18/04
   Name / Title / Date
   Interviewed ■ at site ☐ at office ☐ by phone Phone no.
   Problems, suggestions; ☐ Report attached See Interview Record for James R. Greacen.

Team members on attached Table

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

Agency ______________________
Contact ____________________ ____________ ______ ________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____________________________________

Agency ______________________
Contact ____________________ ____________ ______ ________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____________________________________
____

Agency ______________________
Contact ____________________ ____________ ______ ________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____________________________________
____

Agency ______________________
Contact ____________________ ____________ ______ ________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____________________________________
____

4. **Other interviews (optional)** ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1. O&M Documents			
□ O&M manual	■ Readily available	■ Up to date	□ N/A
□ As-built drawings	■ Readily available	■ Up to date	□ N/A
□ Maintenance logs	■ Readily available	■ Up to date	□ N/A
Remarks O&M manual dated 7/2000.			
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 In the annual reports - on site.			
6. Settlement Monument Records	□ Readily available	□ Up to date	■ N/A
Remarks			
7. Groundwater Monitoring Records	■ Readily available	■ Up to date	□ N/A
Remarks In the annual reports - on site.			
8. Leachate Extraction Records	□ Readily available	□ Up to date	■ N/A
Remarks			
9. Discharge Compliance Records			
□ Air	■ Readily available	■ Up to date	□ N/A
□ Water (effluent)	■ Readily available	■ Up to date	□ N/A
Remarks			
10. Daily Access/Security Logs	■ Readily available	■ Up to date	□ N/A
Remarks RETEC maintains access records for RETEC/Wildwood representatives. Others (EPA and Olympia contractors) asked to keep their own when on site.			

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ■ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other______________________________

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place contract with Harvard Project Services
Original O&M cost estimate not sure ☐ Breakdown attached

Total annual cost by year for review period if available

From________ To________ ____________ ☐ Breakdown attached
Date Date Total cost
From________ To________ ____________ ☐ Breakdown attached
Date Date Total cost
From________ To________ ____________ ☐ Breakdown attached
Date Date Total cost
From________ To________ ____________ ☐ Breakdown attached
Date Date Total cost
From________ To________ ____________ ☐ Breakdown attached
Date Date Total cost

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

Describe costs and reasons:______________________________

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 Signs present every 100-200 feet along fence.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

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

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

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

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

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

D. General

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

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

3. **Land use changes off site** ■ N/A
Remarks ____________

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☐ N/A

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

B. Other Site Conditions
Remarks______

VII. AS/SVE COVERS ■ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ■ Settlement not evident
   Areal extent______ Depth______
   Remarks______

2. **Cracks** ☐ Location shown on site map ■ Cracking not evident
   Lengths______ Widths______ Depths______
   Remarks______

3. **Erosion** ☐ Location shown on site map ■ Erosion not evident
   Areal extent______ Depth______
   Remarks______

4. **Holes** ☐ Location shown on site map ■ Holes not evident
   Areal extent______ Depth______
   Remarks______

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

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks Gravel cover appears in good shape.

7. **Bulges** ☐ Location shown on site map ■ Bulges not evident
   Areal extent______ Height______
   Remarks______

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

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent______________
Remarks____

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

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

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

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

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

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent______________ Depth____________
Remarks____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type______________ Areal extent______________
Remarks____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent______________ Depth____________
Remarks____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent______________ Depth____________
Remarks____

5. **Obstructions** Type____________________ ☐ No obstructions
☐ Location shown on site map Areal extent______________
Size____________
Remarks____

6.	**Excessive Vegetative Growth** Type___________ ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent___________ Remarks___________
D. Cover Penetrations ■ Applicable ☐ N/A	
1.	**Gas Vents** ☐ Active ☐ Passive ■ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks___________
2.	**Gas Monitoring Probes** ■ Properly secured/locked ■ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks___________
3.	**Monitoring Wells** (within surface area of AS/SVE) ■ Properly secured/locked ■ Functioning ☐ Routinely sampled ■ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks___________
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ■ N/A Remarks___________
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ■ N/A Remarks___________

E. SVE Collection and Treatment	■ Applicable ☐ N/A
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ■ Good condition ☐ Needs Maintenance Remarks Granular activated carbon filtration.
2.	**Gas Collection Wells, Manifolds and Piping** ■ Good condition ☐ Needs Maintenance Remarks
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks
F. Cover Drainage Layer	☐ Applicable ■ N/A
1.	**Outlet Pipes Inspected** ☐ Functioning ■ N/A Remarks
2.	**Outlet Rock Inspected** ☐ Functioning ■ N/A Remarks
G. Detention/Sedimentation Ponds	☐ Applicable ■ N/A
1.	**Siltation** Areal extent___ Depth___ ☐ N/A ☐ Siltation not evident Remarks
2.	**Erosion** Areal extent___ Depth___ ☐ Erosion not evident Remarks
3.	**Outlet Works** ☐ Functioning ☐ N/A Remarks
4.	**Dam** ☐ Functioning ☐ N/A Remarks

H. Retaining Walls	☐ Applicable	■ N/A	
1.	**Deformations** Horizontal displacement__________ Vertical displacement__________ Rotational displacement__________ Remarks__________	☐ Location shown on site map	☐ Deformation not evident
2.	**Degradation** Remarks__________	☐ Location shown on site map	☐ Degradation not evident
I. Perimeter Ditches/Off-Site Discharge	☐ Applicable	■ N/A	
1.	**Siltation** Areal extent__________ Depth__________ Remarks__________	☐ Location shown on site map	☐ Siltation not evident
2.	**Vegetative Growth** ☐ Vegetation does not impede flow Areal extent__________ Type__________ Remarks__________	☐ Location shown on site map	☐ N/A
3.	**Erosion** Areal extent__________ Depth__________ Remarks__________	☐ Location shown on site map	☐ Erosion not evident
4.	**Discharge Structure** Remarks__________	☐ Functioning	☐ N/A
VIII. VERTICAL BARRIER WALLS	☐ Applicable	■ N/A	
1.	**Settlement** Areal extent__________ Depth__________ Remarks__________	☐ Location shown on site map	☐ Settlement not evident
2.	**Performance Monitoring** Type of monitoring__________ ☐ Performance not monitored Frequency__________ Head differential__________ Remarks__________	☐ Evidence of breaching	

IX. GROUNDWATER/SURFACE WATER REMEDIES ■ Applicable ☐ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ■ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ■ Good condition ■ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ■ Good condition ☐ Needs Maintenance Remarks
3. **Spare Parts and Equipment** ■ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ■ N/A
1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks

C. Treatment System ■ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal None ☐ Oil/water separation None ☐ Bioremediation None
■ Air stripping None ■ Carbon adsorbers
Filters Sand filter (between post-air stripper equalization tank and carbon vessels).
☐ 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 In Reports
☐ Quantity of surface water treated annually N/A
Remarks ______

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

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

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks ______

5. **Treatment Building(s)**
☐ N/A ■ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored Unused chemicals should be disposed
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:* *As per RETEC / James Greacen
■ Groundwater plume is effectively contained ■ Contaminant concentrations are declining

D. Monitored Natural Attenuation N/A

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

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

Remedial system consists of an AS/SVE system designed to address contamination in the overburden and a groundwater pump and treat system designed to address contaminated groundwater in bedrock. Based on a review of the available data and discussions with RETEC representatives, it is not clear that the bedrock system is achieving the required degree of capture due to limited data points (i.e., appropriately screened monitoring wells).

B. Adequacy of O&M

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

O&M of the remedial system constructed at the site is being performed well. The overall condition of the site and treatment system is very good. Access controls to the site are well maintained and they remain protective.

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 noted.

D. Opportunities for Optimization

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

RETEC has recently completed an optimization study which resulted in changes in the sparge sequencing.

Table 1. UniFirst Inspection Team Rooster

5-Year Inspection Team Members	Company
David M. Sullivan, LSP, CHMM	TRC
Diane Silverman, Ph.D.	M&E
Michael Plumb, PE	TRC
Interviewed PRP Staff	
James R. Greacen, PG, LSP	The RETEC Group
Peter Cox	The RETEC Group
Brendan Maye	The RETEC Group

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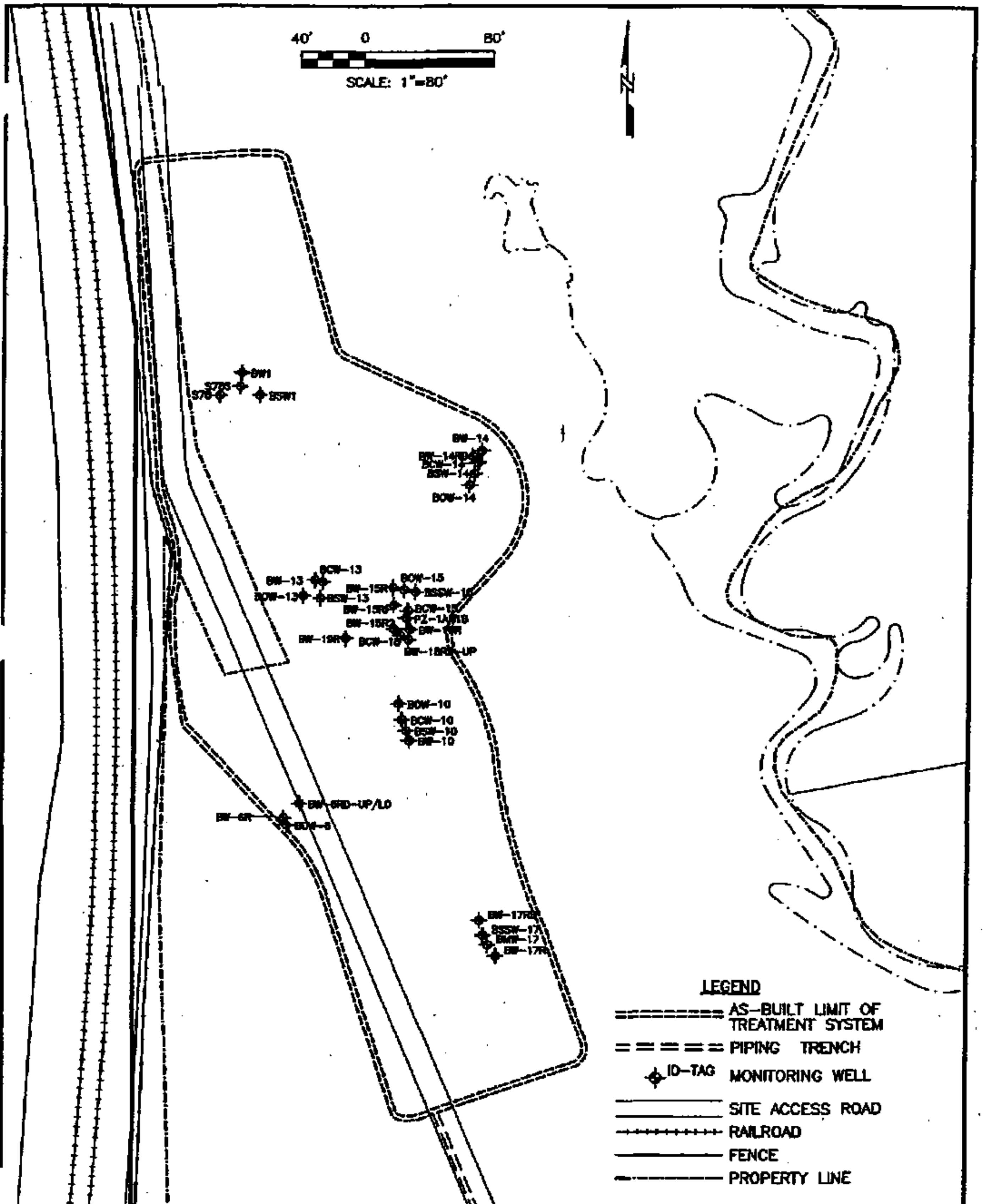


RETEC

WELLS G & H SUPERFUND SITE	MONITORING WELL LOCATIONS
CNAGR-3564-750	WOBURN, MASSACHUSETTS
DATE: 11/03 DRWN: BcV/CON	FIGURE: 1-4

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: UniFirst	**Date of inspection:** August 3, 2004
Location and Region: Woburn USEPA Region 1	**EPA ID:** Wells G&H MAD980732168
Agency, office, or company leading the five-year review: TRC / Metcalf & Eddy, Inc.	**Weather/temperature:** Clear, warm

Remedy Includes: (Check all that apply)

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

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

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Timothy M. Cosgrave (Name) O&M Manager, Harvard Project Services (Title) 8/3/04 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. 978-772-1105
   Problems, suggestions; ☐ Report attached ______

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

Team members on attached Table

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

Agency ______________________
Contact ______________________ ______________ ________ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________

Agency ______________________
Contact ______________________ ______________ ________ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________
____

Agency ______________________
Contact ______________________ ______________ ________ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________
____

Agency ______________________
Contact ______________________ ______________ ________ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________
____

4. **Other interviews** (optional) ☐ Report attached.

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

1. **O&M Documents**
☐ O&M manual ☐ Readily available ☐ Up to date ☐ N/A
☐ As-built drawings ☐ Readily available ☐ Up to date ☐ N/A
☐ Maintenance logs ☐ Readily available ■ Up to date ☐ N/A
Remarks New O&M manual on personal computer only prior plan dated 2/1/93, revised 9/30/02. The EPA approved changes in 2003 that should be done shortly. A tablet PC is used to enter maintenance record.

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 Hardcopy Health and Safety Plan dated 12/24/89 (not up-to-date).

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A
Remarks Training records not available onsite

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

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ■ N/A
Remarks None

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ■ N/A
Remarks None

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☐ N/A
Remarks Groundwater monitoring records are not kept on-site.

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ■ N/A
Remarks None

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ■ N/A
■ Water (effluent) ☐ Readily available ☐ Up to date ☐ N/A
Remarks The discharge compliance records are not kept on-site.

10. **Daily Access/Security Logs** ■ Readily available ☐ Up to date ☐ N/A
Remarks Date of last visit: 8/3/04. Old records kept in office. However, no access records of carbon supplier delivering granular activated carbon to the UniFirst facility weekly.

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other Harvard Project Services, contractor to UniFirst, operates the groundwater extraction and treatment system.

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place contract with Harvard Project Services
Original O&M cost estimate not sure ☐ Breakdown attached

Total annual cost by year for review period if available

Costs are approximately $125,000 per year ± $20,000

From________ To________ ____________ ☐ Breakdown attached
Date Date Total cost
From________ To________ ____________ ☐ Breakdown attached
Date Date Total cost
From________ To________ ____________ ☐ Breakdown attached
Date Date Total cost
From________ To________ ____________ ☐ Breakdown attached
Date Date Total cost
From________ To________ ____________ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: On July 14, 2004 the system went down due to a groundwater extraction pump failure. The new pump was installed on July 28, 2004. Historically, they have had problems with electricity supply and big rain events tend to accelarate particulate filter clogging.

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

A. Fencing

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

B. Other Access Restrictions

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

C. Institutional Controls (ICs)			
1.	**Implementation and enforcement**		
	Site conditions imply ICs not properly implemented	☐ Yes ☐ No ■ N/A	
	Site conditions imply ICs not being fully enforced	☐ Yes ☐ No ■ N/A	
	Type of monitoring (*e.g.*, self-reporting, drive by) ________		
	Frequency ________		
	Responsible party/agency ________		
	Contact ________ Name ________ Title ________ Date ________ Phone no.		
	Reporting is up-to-date	☐ Yes ☐ No ■ N/A	
	Reports are verified by the lead agency	☐ Yes ☐ No ■ N/A	
	Specific requirements in deed or decision documents have been met	☐ Yes ☐ No ■ N/A	
	Violations have been reported	☐ Yes ☐ No ■ N/A	
	Other problems or suggestions: ☐ Report attached		
2.	**Adequacy** ☐ ICs are adequate* ☐ ICs are inadequate	■ N/A	
	Remarks ________		
D. General			
1.	**Vandalism/trespassing** ☐ Location shown on site map ☐ No vandalism evident		
	Remarks None		
2.	**Land use changes on site** ☐ N/A		
	Remarks None		
3.	**Land use changes off site** ☐ N/A		
	Remarks None		
VI. GENERAL SITE CONDITIONS			
A. Roads ☐ Applicable ☐ N/A			
1.	**Roads damaged** ☐ Location shown on site map ☐ Roads adequate	☐ N/A	
	Remarks Yes, potholes and cracks in pavement. Runoff could enter unsecured wells.		

B. Other Site Conditions

Remarks____

____

____

____

____

VII. LANDFILL COVERS ☐ Applicable ■ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent______________ Depth____________
   Remarks____
   ____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths____________ Widths___________ Depths__________
   Remarks____
   ____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent______________ Depth____________
   Remarks____
   ____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent______________ Depth____________
   Remarks____
   ____

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

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

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent______________ Height____________
   Remarks____
   ____

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

9.	**Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability Areal extent______________ Remarks______________
B. Benches	☐ Applicable ☐ N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)
1.	**Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay Remarks______________
2.	**Bench Breached** ☐ Location shown on site map ☐ N/A or okay Remarks______________
3.	**Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay Remarks______________
C. Letdown Channels	☐ Applicable ■ N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)
1.	**Settlement** ☐ Location shown on site map ☐ No evidence of settlement Areal extent______________ Depth______________ Remarks______________
2.	**Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation Material type______________ Areal extent______________ Remarks______________
3.	**Erosion** ☐ Location shown on site map ☐ No evidence of erosion Areal extent______________ Depth______________ Remarks______________
4.	**Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting Areal extent______________ Depth______________ Remarks______________
5.	**Obstructions** Type______________ ☐ No obstructions ☐ Location shown on site map Areal extent______________ Size______________ Remarks______________

6.	**Excessive Vegetative Growth** Type________________ ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent____________ Remarks____
D. Cover Penetrations ☐ Applicable ■ N/A	
1.	**Gas Vents** ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
2.	**Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
3.	**Monitoring Wells (within surface area of landfill)** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A Remarks____

E. Gas Collection and Treatment ☐ Applicable ■ N/A	
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks____________
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks____________
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks____________
F. Cover Drainage Layer ☐ Applicable ■ N/A	
1.	**Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks____________
2.	**Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks____________
G. Detention/Sedimentation Ponds ☐ Applicable ■ N/A	
1.	**Siltation** Areal extent________ Depth________ ☐ N/A ☐ Siltation not evident Remarks____________
2.	**Erosion** Areal extent________ Depth________ ☐ Erosion not evident Remarks____________
3.	**Outlet Works** ☐ Functioning ☐ N/A Remarks____________
4.	**Dam** ☐ Functioning ☐ N/A Remarks____________

H. Retaining Walls ☐ Applicable ■ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement____________ Vertical displacement_______________
   Rotational displacement____________
   Remarks____
   ____

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

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

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent______________ Depth____________
   Remarks____
   ____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent______________ Type____________
   Remarks____
   ____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent______________ Depth____________
   Remarks____
   ____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks____
   ____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ■ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent______________ Depth____________
   Remarks____
   ____

2. **Performance Monitoring** Type of monitoring__________________________
   ☐ Performance not monitored
   Frequency_______________________________ ☐ Evidence of breaching
   Head differential__________________________
   Remarks____
   ____

IX. GROUNDWATER/SURFACE WATER REMEDIES ■ Applicable ☐ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ■ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ■ Good condition ☐ All required wells properly operating ■ Needs Maintenance ☐ N/A Remarks Wells damaged which might allow stormwater runoff to enter wells. Groundwater flows in buried plastic pipes from extraction well to treatment plant.
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ■ Needs Maintenance Remarks Extraction well pump rated too low to meet project drawdown objectives, flow gauge damaged.
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 None ☐ Oil/water separation None ☐ Bioremediation None ☐ Air stripping None ■ Carbon adsorbers Filters Multimedia ☐ Additive (*e.g.*, chelation agent, flocculent) None ☐ Others ■ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional Yes ☐ Sampling/maintenance log displayed and up to date On computer ☐ Equipment properly identified Yes ☐ Quantity of groundwater treated annually varies ☐ Quantity of surface water treated annually N/A Remarks
2.	**Electrical Enclosures and Panels** (properly rated and functional) ☐ N/A ■ Good condition ☐ Needs Maintenance Remarks
3.	**Tanks, Vaults, Storage Vessels** ☐ N/A ■ Good condition ☐ Proper secondary containment ☐ Needs Maintenance Remarks
4.	**Discharge Structure and Appurtenances** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks Cannot be assured that it discharges to the city sewer because he has not observed the tie-in.
5.	**Treatment Building(s)** ☐ N/A ■ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Unused chemicals should be disposed Remarks Some water on floor of treatment building.
6.	**Monitoring Wells** (pump and treatment remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ■ Needs Maintenance ☐ N/A Remarks Several wells damaged need locks and repair casing and flush mounted boxes to prevent runoff from entering wells.

D. Monitoring Data	
1.	Monitoring Data ■ Is routinely submitted on time ■ Is of acceptable quality
2.	Monitoring data suggests: *According to Harvard Project Services ■ Groundwater plume is effectively contained * ■ Contaminant concentrations are declining

D. Monitored Natural Attenuation

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

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

The remedial goal is to contain the contamination in groundwater. The site inspection the team found that many records were not available as hardcopy onsite, several wells were damaged, a flow meter was damaged, and the extraction well was undersized for the proposed water level objectives. Also the site is not disposing of spent carbon as RCRA hazardous waste although it may meet this classification. The site also has several pieces of treatment equipment onsite that are no longer used and should be dismatled.

B. Adequacy of O&M

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

O&M procedures are in a state of flux due to a change in treatment design. Generally O&M appears adequate except as noted. Fire extinguishers should be inspected. An "exit" light was observed to be out. More documents should be maintained onsite to facilitate regulatory inspections.

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.

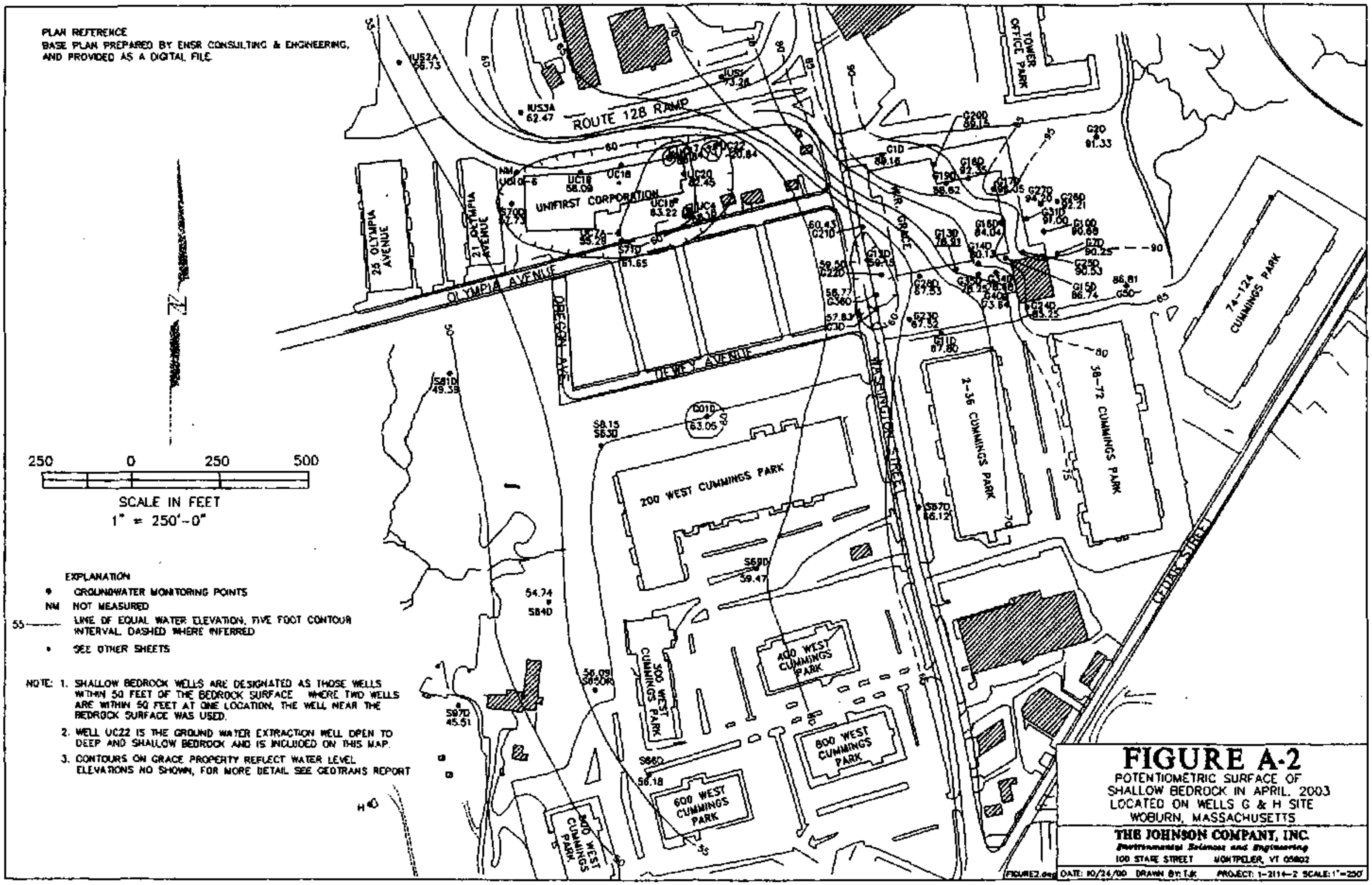
Current pump is unable to drop water level in extraction well to the design standard. The pump should be replaced. Based on a review of monitoring reports, interception of groundwater in the unconsolidated sediments is poor.

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

Extraction system operation could provide more containment by installing shallow wells to the south and west. Monitoring in the residential neighborhood to the south should would provide more assurance that capture is being achieved.

Table 1. UniFirst Inspection Team Rooster

5-Year Inspection Team Members	Company
Joanna M. Hall	TRC
Diane Silverman, Ph.D.	M&E
Andrew H. Smyth, P.G., LSP	TRC
Interviewed PRP Staff	
Timothy M. Cosgrave	Harvard Project Services


PLAN REFERENCE
BASE PLAN PREPARED BY ENSR CONSULTING & ENGINEERING, AND PROVIDED AS A DIGITAL FILE.
ROUTE 128 RAMP
UNIFIRST CORPORATION
OLYMPIA AVENUE
25 OLYMPIA AVENUE
21 OLYMPIA AVENUE
OREGON AVE
DEWEY AVENUE
WASHINGTON STREET
W.R. GRACE
TOWER OFFICE PARK
74-124 CUMMINGS PARK
38-72 CUMMINGS PARK
2-36 CUMMINGS PARK
200 WEST CUMMINGS PARK
300 WEST CUMMINGS PARK
400 WEST CUMMINGS PARK
600 WEST CUMMINGS PARK
800 WEST CUMMINGS PARK
900 WEST CUMMINGS PARK
CEDAR STREET
250 0 250 500
SCALE IN FEET
1" = 250'-0"
EXPLANATION
GROUNDWATER MONITORING POINTS
NM NOT MEASURED
55 LINE OF EQUAL WATER ELEVATION, FIVE FOOT CONTOUR INTERVAL. DASHED WHERE INFERRED
SEE OTHER SHEETS
NOTE: 1. SHALLOW BEDROCK WELLS ARE DESIGNATED AS THOSE WELLS WITHIN 50 FEET OF THE BEDROCK SURFACE. WHERE TWO WELLS ARE WITHIN 50 FEET AT ONE LOCATION, THE WELL NEAR THE BEDROCK SURFACE WAS USED.
2. WELL UC22 IS THE GROUND WATER EXTRACTION WELL OPEN TO DEEP AND SHALLOW BEDROCK AND IS INCLUDED ON THIS MAP.
3. CONTOURS ON GRACE PROPERTY REFLECT WATER LEVEL ELEVATIONS NO SHOWN, FOR MORE DETAIL SEE GEOTRANS REPORT
FIGURE A-2
POTENTIOMETRIC SURFACE OF SHALLOW BEDROCK IN APRIL, 2003 LOCATED ON WELLS G & H SITE WOBURN, MASSACHUSETTS
THE JOHNSON COMPANY, INC.
Environmental Sciences and Engineering
100 STATE STREET MONTPELIER, VT 05602
FIGURE2.dwg DATE: 10/24/00 DRAWN BY: TJK PROJECT: 1-2114-2 SCALE: 1"=250'

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: New England Plastics (NEP)	**Date of inspection:** August 3, 2004
Location and Region: Woburn USEPA Region 1	**EPA ID:** Wells G&H MAD980732168
Agency, office, or company leading the five-year review: TRC / Metcalf & Eddy, Inc.	**Weather/temperature:** Clear, warm

Remedy Includes: (Check all that apply)

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

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

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Jeffrey A. Hamel, LSP (Name) Vice President, Woodard & Curran, Inc. (Title) 8/3/04 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. 978-557-8150
   Problems, suggestions; ☐ Report attached

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

Team members on attached Table 1

3.	**Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply. Agency ______________________ Contact ____________________ ____________ ______ ________ Name Title Date Phone no. Problems; suggestions; ☐ Report attached ____________________________________ Agency ______________________ Contact ____________________ ____________ ______ ________ Name Title Date Phone no. Problems; suggestions; ☐ Report attached ____________________________________ ____ Agency ______________________ Contact ____________________ ____________ ______ ________ Name Title Date Phone no. Problems; suggestions; ☐ Report attached ____________________________________ ____ Agency ______________________ Contact ____________________ ____________ ______ ________ Name Title Date Phone no. Problems; suggestions; ☐ Report attached ____________________________________ ____
4.	**Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1. **O&M Documents**			
☐ O&M manual	■ Readily available	☐ Up to date	■ N/A
☐ As-built drawings	■ Readily available	☐ Up to date	■ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	■ N/A
Remarks June 1997 annual monitoring plan (groundwater sampling record report). Note: The treatment system has been shut off after meeting cleanup goals in the soil.			
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 Not available onsite - updated annually			
3. **O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☐ N/A
Remarks Not available onsite			
4. **Permits and Service Agreements**			
☐ Air discharge permit None	☐ Readily available	☐ Up to date	■ N/A
☐ Effluent discharge None	☐ Readily available	☐ Up to date	■ N/A
☐ Waste disposal, POTW None	☐ Readily available	☐ Up to date	■ N/A
☐ Other permits None	☐ Readily available	☐ Up to date	■ N/A
Remarks			
5. **Gas Generation Records**	☐ Readily available	☐ Up to date	■ N/A
Remarks			
6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	■ N/A
Remarks			
7. **Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☐ N/A
Remarks Maintained offsite			
8. **Leachate Extraction Records**	☐ Readily available	☐ Up to date	■ N/A
Remarks			
9. **Discharge Compliance Records**			
☐ Air	☐ Readily available	☐ Up to date	■ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	■ N/A
Remarks			
10. **Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☐ N/A
Remarks No visitors other than for annual sampling. Records kept offsite.			

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other Woodard & Curran is a direct contractor to NEP.

2. **O&M Cost Records**

☐ Readily available No ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate __________ ☐ Breakdown attached

About $12,000 per year

Total annual cost by year for review period if available

From__________ To__________ (Date, Date) __________________ Total cost ☐ Breakdown attached
From__________ To__________ (Date, Date) __________________ Total cost ☐ Breakdown attached
From__________ To__________ (Date, Date) __________________ Total cost ☐ Breakdown attached
From__________ To__________ (Date, Date) __________________ Total cost ☐ Breakdown attached
From__________ To__________ (Date, Date) __________________ Total cost ☐ Breakdown attached

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

Describe costs and reasons: None

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

A. Fencing

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

Remarks Only roadways gated.

B. Other Access Restrictions

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

Remarks Road gates are locked at night. No signs or automatic security systems are used.

C. Institutional Controls (ICs)		
1.	**Implementation and enforcement** Site conditions imply ICs not properly implemented ☐ Yes ☐ No ■ N/A Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ■ N/A Type of monitoring (*e.g.*, self-reporting, drive by) ____ Frequency ____ Responsible party/agency ____ Contact ____ Name ____ Title ____ Date ____ Phone no. Reporting is up-to-date ☐ Yes ☐ No ■ N/A Reports are verified by the lead agency ☐ Yes ☐ No ■ N/A Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ■ N/A Violations have been reported ☐ Yes ☐ No ■ N/A Other problems or suggestions: ☐ Report attached	
2.	**Adequacy** ☐ ICs are adequate* ☐ ICs are inadequate ■ N/A Remarks None	
D. General		
1.	**Vandalism/trespassing** ☐ Location shown on site map ■ No vandalism evident Remarks None	
2.	**Land use changes on site** ☐ N/A Remarks No change.	
3.	**Land use changes off site** ☐ N/A Remarks No change.	
VI. GENERAL SITE CONDITIONS		
A. Roads ☐ Applicable ☐ N/A		
1.	**Roads damaged** ☐ Location shown on site map ■ Roads adequate ☐ N/A Remarks Paving appears to be in good repair.	

B. Other Site Conditions
Remarks______________________________________

VII. LANDFILL COVERS ☐ Applicable ■ N/A

A. Landfill Surface			
1.	**Settlement** (Low spots) Areal extent__________ Remarks______________________________	☐ Location shown on site map Depth__________	☐ Settlement not evident
2.	**Cracks** Lengths__________ Widths__________ Remarks______________________________	☐ Location shown on site map Depths__________	☐ Cracking not evident
3.	**Erosion** Areal extent__________ Remarks______________________________	☐ Location shown on site map Depth__________	☐ Erosion not evident
4.	**Holes** Areal extent__________ Remarks______________________________	☐ Location shown on site map Depth__________	☐ Holes not evident
5.	**Vegetative Cover** ☐ Grass ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks______________________________	☐ Cover properly established	☐ No signs of stress
6.	**Alternative Cover (armored rock, concrete, etc.)** Remarks______________________________	☐ N/A	
7.	**Bulges** Areal extent__________ Remarks______________________________	☐ Location shown on site map Height__________	☐ Bulges not evident
8.	**Wet Areas/Water Damage** ☐ Wet areas ☐ Ponding ☐ Seeps ☐ Soft subgrade Remarks______________________________	☐ Wet areas/water damage not evident ☐ Location shown on site map ☐ Location shown on site map ☐ Location shown on site map ☐ Location shown on site map	 Areal extent__________ Areal extent__________ Areal extent__________ Areal extent__________

9.	**Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability Areal extent_____________ Remarks_____________
B. Benches	☐ Applicable ■ N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)
1.	**Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay Remarks_____________
2.	**Bench Breached** ☐ Location shown on site map ☐ N/A or okay Remarks_____________
3.	**Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay Remarks_____________
C. Letdown Channels	☐ Applicable ■ N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)
1.	**Settlement** ☐ Location shown on site map ☐ No evidence of settlement Areal extent_____________ Depth_____________ Remarks_____________
2.	**Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation Material type_____________ Areal extent_____________ Remarks_____________
3.	**Erosion** ☐ Location shown on site map ☐ No evidence of erosion Areal extent_____________ Depth_____________ Remarks_____________
4.	**Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting Areal extent_____________ Depth_____________ Remarks_____________
5.	**Obstructions** Type_____________ ☐ No obstructions ☐ Location shown on site map Areal extent_____________ Size_____________ Remarks_____________

6.	**Excessive Vegetative Growth** Type_______________ ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent_____________ Remarks____
D. Cover Penetrations ☐ Applicable ■ N/A	
1.	**Gas Vents** ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
2.	**Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
3.	**Monitoring Wells** (within surface area of landfill) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A Remarks____

E. Gas Collection and Treatment ☐ Applicable ■ N/A		
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks	
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks	
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ■ N/A Remarks	
F. Cover Drainage Layer ☐ Applicable ■ N/A		
1.	**Outlet Pipes Inspected** ☐ Functioning ■ N/A Remarks	
2.	**Outlet Rock Inspected** ☐ Functioning ■ N/A Remarks	
G. Detention/Sedimentation Ponds ☐ Applicable ■ N/A		
1.	**Siltation** Areal extent______ Depth______ ■ N/A ☐ Siltation not evident Remarks	
2.	**Erosion** Areal extent______ Depth______ ☐ Erosion not evident Remarks	
3.	**Outlet Works** ☐ Functioning ■ N/A Remarks	
4.	**Dam** ☐ Functioning ■ N/A Remarks	

H. Retaining Walls	☐ Applicable ■ N/A
1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident Horizontal displacement__________ Vertical displacement__________ Rotational displacement__________ Remarks__________	
2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident Remarks__________	
I. Perimeter Ditches/Off-Site Discharge	☐ Applicable ■ N/A
1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident Areal extent__________ Depth__________ Remarks__________	
2. **Vegetative Growth** ☐ Location shown on site map ■ N/A ☐ Vegetation does not impede flow Areal extent__________ Type__________ Remarks__________	
3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident Areal extent__________ Depth__________ Remarks__________	
4. **Discharge Structure** ☐ Functioning ■ N/A Remarks__________	
VIII. VERTICAL BARRIER WALLS	☐ Applicable ■ N/A
1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident Areal extent__________ Depth__________ Remarks__________	
2. **Performance Monitoring** Type of monitoring__________ ☐ Performance not monitored Frequency__________ ☐ Evidence of breaching Head differential__________ Remarks__________	

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ■ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ■ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ■ N/A Remarks Everything from old system is currently mothballed.
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ■ N/A
1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks

C. Treatment System ☐ Applicable ■ 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 Yes
Remarks ____________

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

4. **Discharge Structure and Appurtenances**
■ N/A ☐ Good condition ☐ Needs Maintenance
Remarks ____________

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

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ■ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks Wells 8A and 8B are not labeled.

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

D. Monitored Natural Attenuation

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

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

The original remedy was to cleanup contaminated soils, which Jeffrey Hamel reports has been accomplished. Now the remedy is to monitor groundwater to determine whether further groundwater treatment is necessary. During the site visit the treatment system was mothballed/shut down. Currently only groundwater monitoring is conducted.

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.

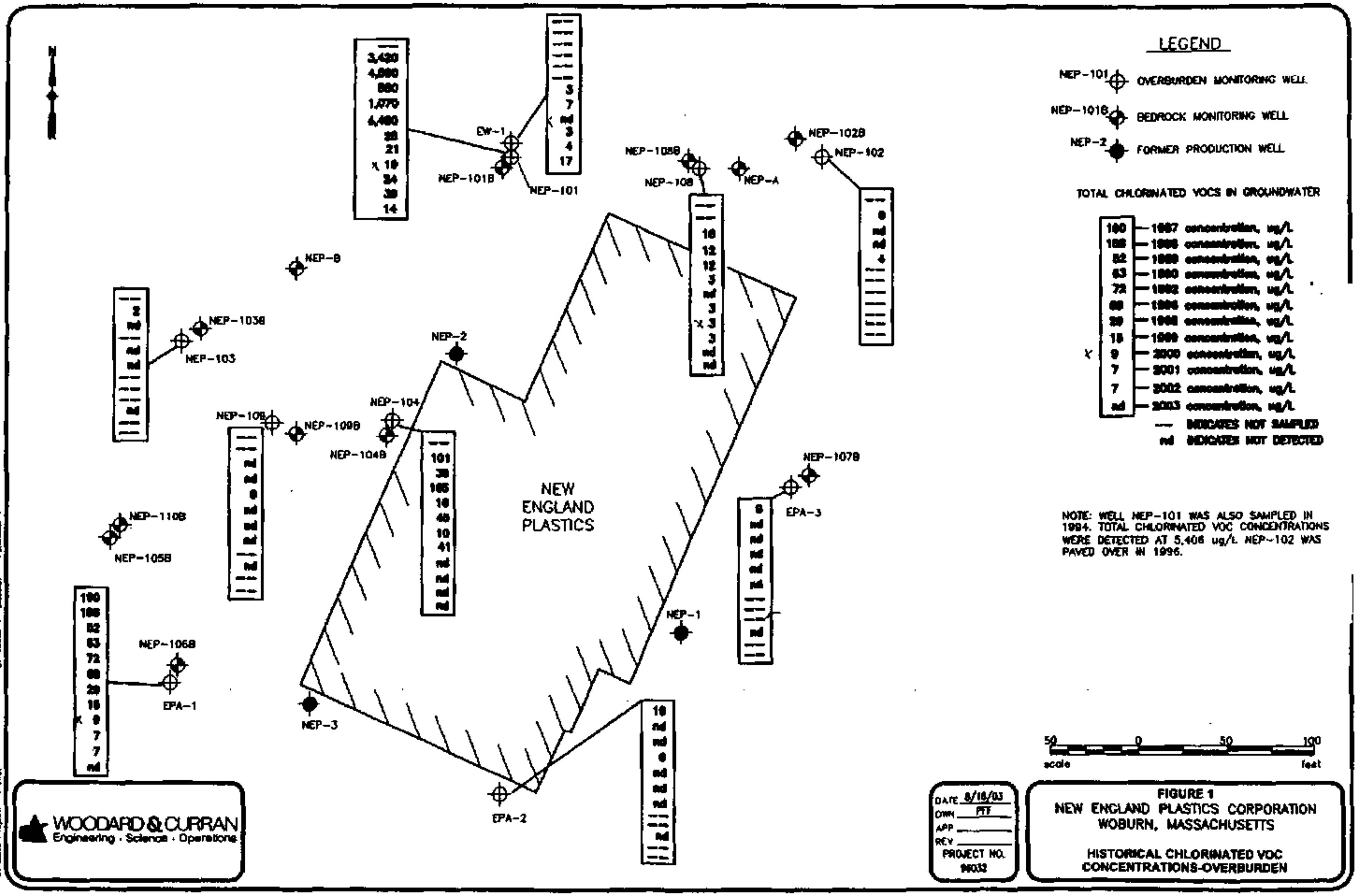
Two monitoring wells were not labeled (8A & 8B). Spent activated carbon from the now discontinued AS/SVE remedy has not been disposed.

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.
None.	

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
The wells that were not labeled should be labeled and the spent activated carbon from the mothballed treatment system should be disposed of immediately.	

Table 1. NEP Inspection Team Rooster

5-Year Inspection Team Members	**Company**
Joanna M. Hall	TRC
Diane Silverman, Ph.D.	M&E
Andrew H. Smyth, P.G., LSP	TRC
Interviewed PRP Staff	
Jeffrey Hamel, LSP, Vice President	Woodard & Curran, Inc.


LEGEND
NEP-101 OVERBURDEN MONITORING WELL
NEP-101B BEDROCK MONITORING WELL
NEP-2 FORMER PRODUCTION WELL
TOTAL CHLORINATED VOCS IN GROUNDWATER
190 — 1997 concentration, ug/L
106 — 1998 concentration, ug/L
52 — 1999 concentration, ug/L
63 — 1990 concentration, ug/L
72 — 1992 concentration, ug/L
66 — 1996 concentration, ug/L
29 — 1998 concentration, ug/L
15 — 1999 concentration, ug/L
9 — 2000 concentration, ug/L
7 — 2001 concentration, ug/L
7 — 2002 concentration, ug/L
nd — 2003 concentration, ug/L
--- INDICATES NOT SAMPLED
nd INDICATES NOT DETECTED
NOTE: WELL NEP-101 WAS ALSO SAMPLED IN 1994. TOTAL CHLORINATED VOC CONCENTRATIONS WERE DETECTED AT 5,406 ug/L. NEP-102 WAS PAVED OVER IN 1996.
NEW ENGLAND PLASTICS
EW-1
NEP-101
NEP-101B
NEP-105B
NEP-106
NEP-A
NEP-102B
NEP-102
NEP-8
NEP-103B
NEP-103
NEP-2
NEP-104
NEP-104B
NEP-108
NEP-109B
NEP-110B
NEP-105B
NEP-106B
EPA-1
NEP-3
EPA-2
NEP-1
NEP-107B
EPA-3
3,420
4,800
880
1,070
4,400
28
21
19
24
39
14
3
7
nd
3
4
17
10
12
12
3
nd
3
3
3
nd
nd
9
nd
4
101
105
16
40
10
41
190
106
52
63
72
66
29
15
9
7
7
nd
scale
feet
50 0 50 100
WOODARD & CURRAN
Engineering · Science · Operations
DATE 8/18/03
DWN PTT
APP
REV
PROJECT NO. 96032
FIGURE 1
NEW ENGLAND PLASTICS CORPORATION
WOBURN, MASSACHUSETTS
HISTORICAL CHLORINATED VOC CONCENTRATIONS-OVERBURDEN

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: W. R. Grace	**Date of inspection:** August 3, 2004
Location and Region: Woburn USEPA Region 1	**EPA ID:** Wells G&H MAD980732168
Agency, office, or company leading the five-year review: TRC / Metcalf & Eddy, Inc.	**Weather/temperature:** Clear, warm

Remedy Includes: (Check all that apply)

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

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

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Maryellen C. Johns (Name) Senior Project Manager, Remedium Group, Inc (Title) 8/3/04 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☐ Report attached ______

2. **O&M staff** Jonathan R. Bridge (Name) Associate, Senior Hydrogeologist, GeoTrans, Inc. (Title) 8/3/04 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. 518-373-1200
   Problems, suggestions; ☐ Report attached ______

Team members on attached Table 1

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

Agency ___________________________
Contact ___________________________ ______________ _______ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____

Agency ___________________________
Contact ___________________________ ______________ _______ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____
____

Agency ___________________________
Contact ___________________________ ______________ _______ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____
____

Agency ___________________________
Contact ___________________________ ______________ _______ __________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ____
____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	☐ O&M manual Dated 10/4/02	■ Readily available	■ Up to date	☐ N/A
	☐ As-built drawings	■ Readily available	■ Up to date	☐ N/A
	☐ Maintenance logs Through 1995	■ Readily available	■ Up to date	☐ N/A
	Remarks Many of the inspections in the O&M manual are not documented as having occurred., such as water leaks, air leaks, noises, vibrations, etc.			
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 The health and safety plan is dated 01/09/04.			
3.	**O&M and OSHA Training Records**	■ Readily available	☐ Up to date	☐ N/A
	Remarks OSHA records not available onsite.			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit None	☐ Readily available	☐ Up to date	☐ N/A
	☐ Effluent discharge None	☐ Readily available	☐ Up to date	☐ N/A
	☐ Waste disposal, POTW None	☐ Readily available	☐ Up to date	☐ N/A
	☐ Other permits None	☐ Readily available	☐ Up to date	☐ N/A
	Remarks			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	■ N/A
	Remarks			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	■ N/A
	Remarks			
7.	**Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☐ N/A
	Remarks Maintained offsite			
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 No	☐ Up to date	☐ N/A
	Remarks Maintained offsite			
10.	**Daily Access/Security Logs**	☐ Readily available	■ Up to date	☐ N/A
	Remarks Maintained offsite			

IV. O&M COSTS

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

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

About $160,000 per year

Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached

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

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

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ■ Gates secured ☐ N/A
Remarks Part of fence never installed near wetland area.

B. Other Access Restrictions

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

C. Institutional Controls (ICs)			
1.	**Implementation and enforcement**		
	Site conditions imply ICs not properly implemented	☐ Yes ☐ No ■ N/A	
	Site conditions imply ICs not being fully enforced	☐ Yes ☐ No ■ N/A	
	Type of monitoring (*e.g.*, self-reporting, drive by) ________		
	Frequency ________		
	Responsible party/agency ________		
	Contact ________ Name ________ Title ________ Date ________ Phone no.		
	Reporting is up-to-date	☐ Yes ☐ No ■ N/A	
	Reports are verified by the lead agency	☐ Yes ☐ No ■ N/A	
	Specific requirements in deed or decision documents have been met	☐ Yes ☐ No ■ N/A	
	Violations have been reported	☐ Yes ☐ No ■ N/A	
	Other problems or suggestions: ☐ Report attached		
2.	**Adequacy** ☐ ICs are adequate* ☐ ICs are inadequate ■ N/A		
	Remarks ________		

D. General		
1.	**Vandalism/trespassing** ☐ Location shown on site map ■ No vandalism evident	
	Remarks None	
2.	**Land use changes on site** ☐ N/A	
	Remarks None, but may change in future as site is marketed for development.	
3.	**Land use changes off site** ☐ N/A	
	Remarks None	

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☐ N/A		
1.	**Roads damaged** ☐ Location shown on site map ■ Roads adequate ☐ N/A	
	Remarks Workable, grass growing through cracks in some locations.	

B. Other Site Conditions
Remarks________________________________

VII. LANDFILL COVERS ☐ Applicable ■ N/A			
A. Landfill Surface			
1.	**Settlement** (Low spots) Areal extent____________ Remarks________________	☐ Location shown on site map Depth____________	☐ Settlement not evident
2.	**Cracks** Lengths__________ Widths__________ Depths__________ Remarks________________	☐ Location shown on site map	☐ Cracking not evident
3.	**Erosion** Areal extent____________ Remarks________________	☐ Location shown on site map Depth____________	☐ Erosion not evident
4.	**Holes** Areal extent____________ Remarks________________	☐ Location shown on site map Depth____________	☐ Holes not evident
5.	**Vegetative Cover** ☐ Grass ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks________________	☐ Cover properly established	☐ No signs of stress
6.	**Alternative Cover (armored rock, concrete, etc.)** Remarks________________	☐ N/A	
7.	**Bulges** Areal extent____________ Remarks________________	☐ Location shown on site map Height____________	☐ Bulges not evident
8.	**Wet Areas/Water Damage** ☐ Wet areas ☐ Ponding ☐ Seeps ☐ Soft subgrade Remarks________________	☐ Wet areas/water damage not evident ☐ Location shown on site map ☐ Location shown on site map ☐ Location shown on site map ☐ Location shown on site map	 Areal extent____________ Areal extent____________ Areal extent____________ Areal extent____________

9.	**Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability Areal extent_____________ Remarks_____________
B. Benches	☐ Applicable ■ N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)
1.	**Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay Remarks_____________
2.	**Bench Breached** ☐ Location shown on site map ☐ N/A or okay Remarks_____________
3.	**Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay Remarks_____________
C. Letdown Channels	☐ Applicable ■ N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)
1.	**Settlement** ☐ Location shown on site map ☐ No evidence of settlement Areal extent_____________ Depth_____________ Remarks_____________
2.	**Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation Material type_____________ Areal extent_____________ Remarks_____________
3.	**Erosion** ☐ Location shown on site map ☐ No evidence of erosion Areal extent_____________ Depth_____________ Remarks_____________
4.	**Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting Areal extent_____________ Depth_____________ Remarks_____________
5.	**Obstructions** Type_____________ ☐ No obstructions ☐ Location shown on site map Areal extent_____________ Size_____________ Remarks_____________

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

D. Cover Penetrations ☐ Applicable ■ N/A

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

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

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

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

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

E. Gas Collection and Treatment	☐ Applicable	■ N/A	
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks______________________________		
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks______________________________		
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks______________________________		
F. Cover Drainage Layer	☐ Applicable	■ N/A	
1.	**Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks______________________________		
2.	**Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks______________________________		
G. Detention/Sedimentation Ponds	☐ Applicable	■ N/A	
1.	**Siltation** Areal extent______________ **Depth**___________ ☐ N/A ☐ Siltation not evident Remarks______________________________		
2.	**Erosion** Areal extent______________ **Depth**___________ ☐ Erosion not evident Remarks______________________________		
3.	**Outlet Works** ☐ Functioning ☐ N/A Remarks______________________________		
4.	**Dam** ☐ Functioning ☐ N/A Remarks______________________________		

H. Retaining Walls ☐ Applicable ■ N/A

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

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

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

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent__________ Depth__________
Remarks__________

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent__________ Type__________
Remarks__________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent__________ Depth__________
Remarks__________

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

VIII. VERTICAL BARRIER WALLS ☐ Applicable ■ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent__________ Depth__________
Remarks__________

2. **Performance Monitoring** Type of monitoring__________
☐ Performance not monitored
Frequency__________ ☐ Evidence of breaching
Head differential__________
Remarks__________

IX. GROUNDWATER/SURFACE WATER REMEDIES ■ Applicable ☐ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ■ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ■ Good condition ☐ All required wells properly operating ■ Needs Maintenance ☐ N/A Remarks
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ■ Needs Maintenance Remarks Noted a sheen in vault for one well (RW-21) and one well unlocked. Inlet pressure recorder broken.
3. **Spare Parts and Equipment** ☐ Readily available ■ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks Spare pumps for wells, spare totalizers
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ■ N/A
1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks

C. Treatment System ☐ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ■ Carbon adsorbers
Filters Bag
☐ Additive (*e.g.*, chelation agent, flocculent) None
☐ Others
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional Yes
☐ Sampling/maintenance log displayed and up to date Log available.
☐ Equipment properly identified
☐ Quantity of groundwater treated annually Totalizer readings
☐ Quantity of surface water treated annually None
Remarks Groundwater logs and separate monthly sampling log.

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

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

4. **Discharge Structure and Appurtenances**
☐ N/A ■ Good condition ☐ Needs Maintenance
Remarks Discharge to wetland above water surface

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

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ■ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ■ Needs Maintenance ☐ N/A
Remarks One well unlocked, a sheen in the vault for one well - possibly leaking oil from pump.

D. Monitoring Data

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

2. Monitoring data suggests: * According to GeoTrans
■ Groundwater plume is effectively contained* ■ Contaminant concentrations are declining

D. Monitored Natural Attenuation

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

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

The remedy is groundwater containment for the shallow aquifer with the UniFirst extraction well supplying deep aquifer containment (the systems are designed to work in concert). From the field review, TRC noted that one well had a sheen in the vault, one well was unlocked, a variety of documents were not available onsite, and one meter was not working.

B. Adequacy of O&M

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

See comments above in "A"

C.	Early Indicators of Potential Remedy Problems

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

There is very little monitoring data directly west of the facility in the residential neighborhood to help show capture zones. Groundwater concentrations have not declined as much near the building where solvents may have been disposed directly to the aquifer. These may be contamination under the building. Many of the O&M manual inspections are not documented.

D. Opportunities for Optimization

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

Additional wells to the west would help ensure capture zone. Additional site characterization in the vicinity of RW-22 would help understand the extent of contamination.

Table 1. W. R. Grace Inspection Team Rooster

5-Year Inspection Team Members	Company
Joanna M. Hall	TRC
Diane Silverman, Ph.D.	M&E
Andrew H. Smyth, P.G., LSP	TRC
Interviewed PRP Staff	
Maryellen C. Johns	Remedium Group, Inc. / a Subsidiary of W. R. Grace & Co.
Jonathan R. Bridge	GeoTrans, Inc.

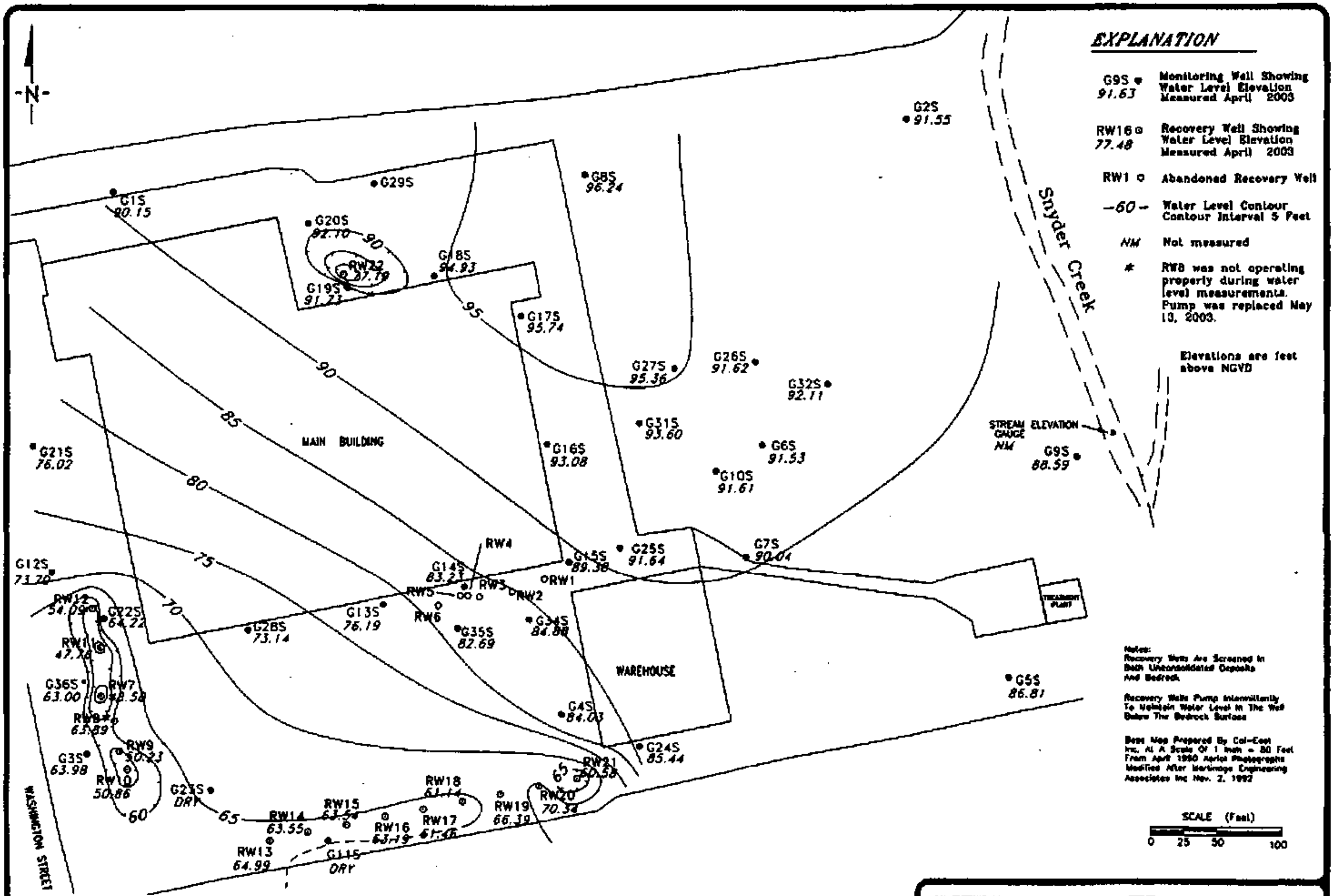


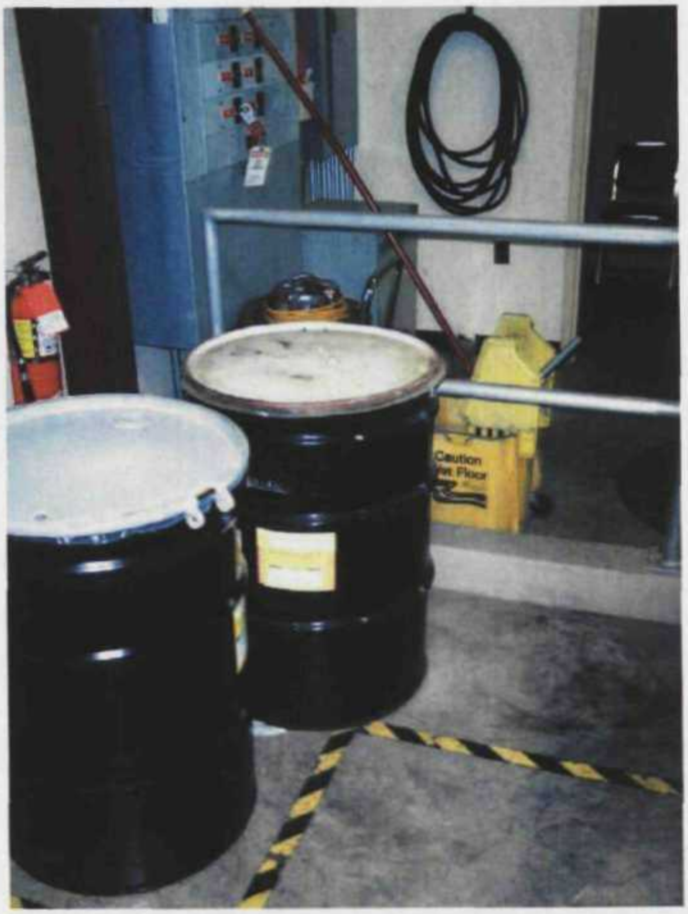
Figure 2-1 Water Table Map, April 2003

GeoTrans, Inc.
A TETRA TECH COMPANY

Attachment 5

Site Inspection Photographs

W.R. GRACE & COMPANY (GRACE) PHOTOGRAPHS



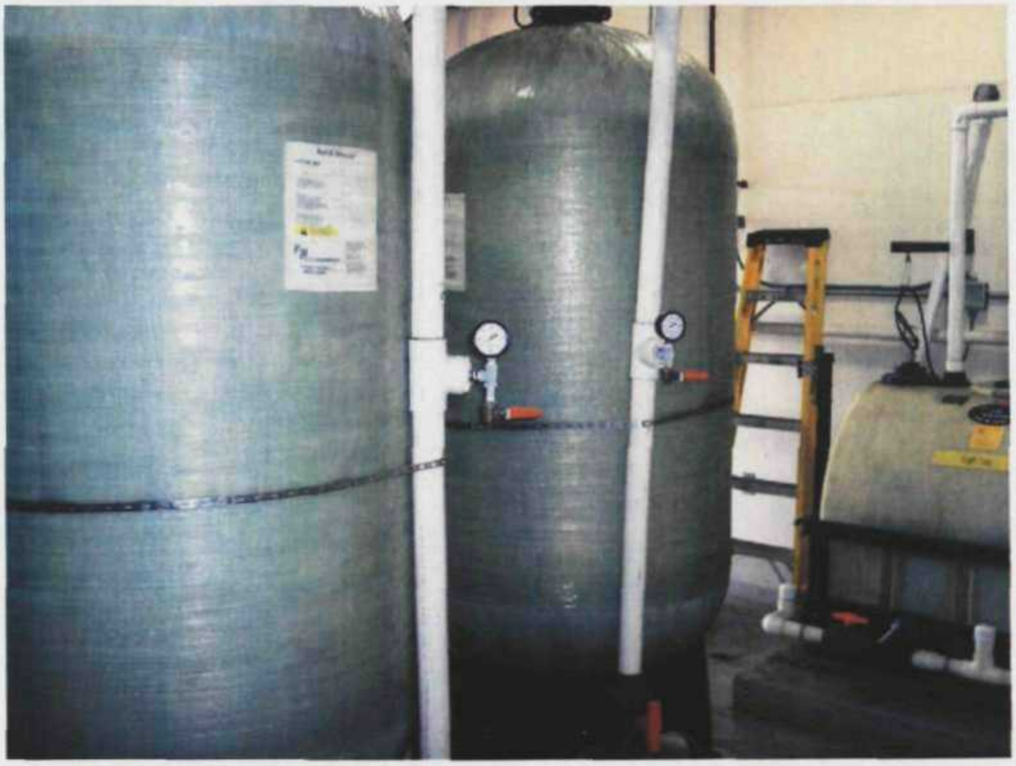
Grace Photo 1: Waste Filter Bags

Grace Photo 2: Influent Piping

Originals in color.

Grace Photo 3: Bag Filters and Pressure Gauges

Grace Photo 4: Equalization Tank



Grace Photo 5: Carbon Units

Grace Photo 6: Floor Sump Area, note excess water on floor

Originals in color.

W.R. GRACE & COMPANY (GRACE) PHOTOGRAPHS

Grace Photo 7: Emergency Shower

Originals in color.

Grace Photo 8: Air Receiver

Originals in color.

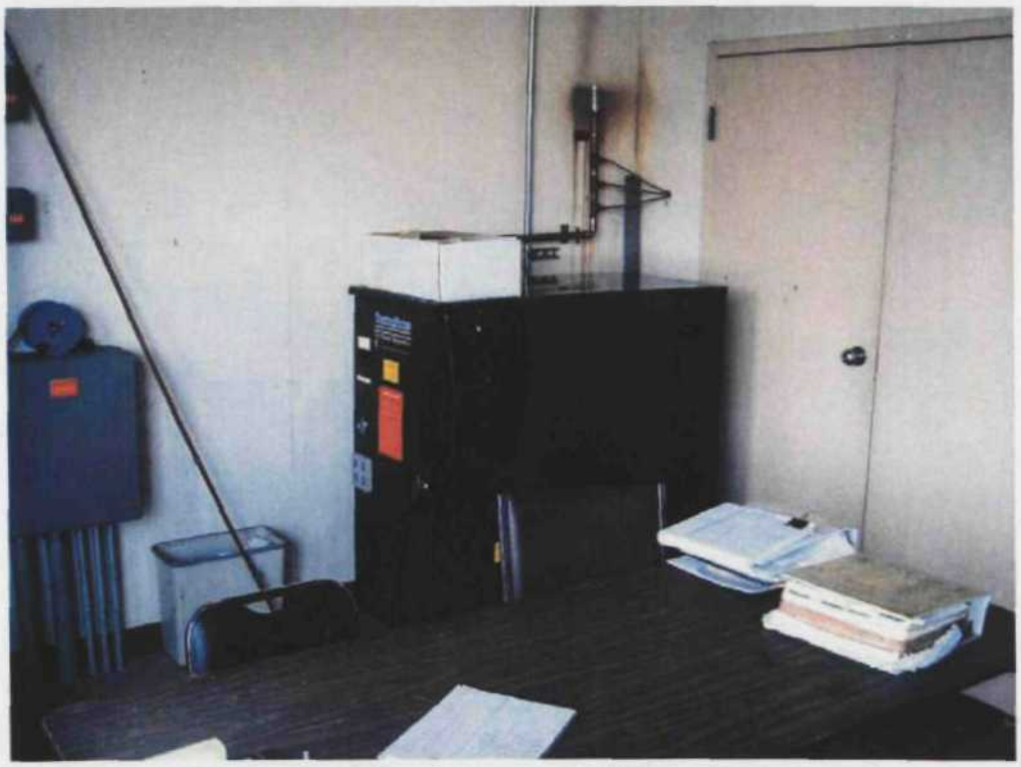
W.R. GRACE & COMPANY (GRACE) PHOTOGRAPHS

Grace Photo 9: Alarm Panel

Grace Photo 10: Air Compressors

Originals in color.

Grace Photo 11: Unlabeled 1-Gallon Containers



Grace Photo 12: Air Stream Oil/Water Separator

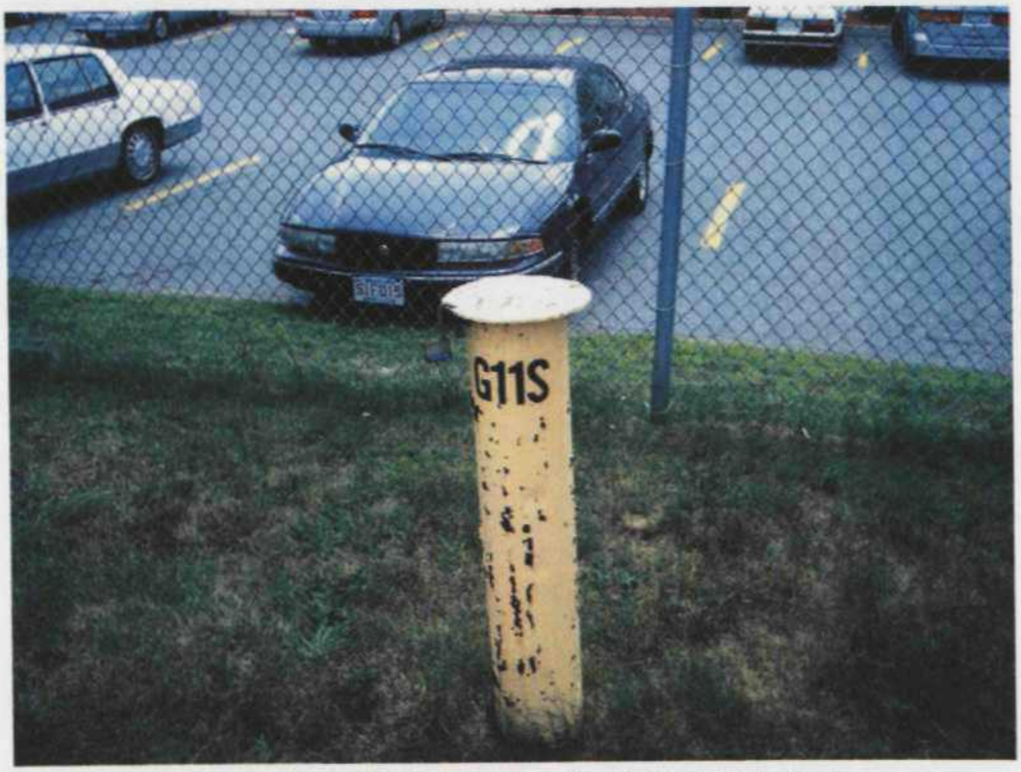
Originals in color.

Grace Photo 13: Effluent Water Discharge

Grace Photo 14: Beaver Deceiver

Originals in color.

Grace Photo 15: Pumping Well RW 21, with Slight Sheen in Access Manhole

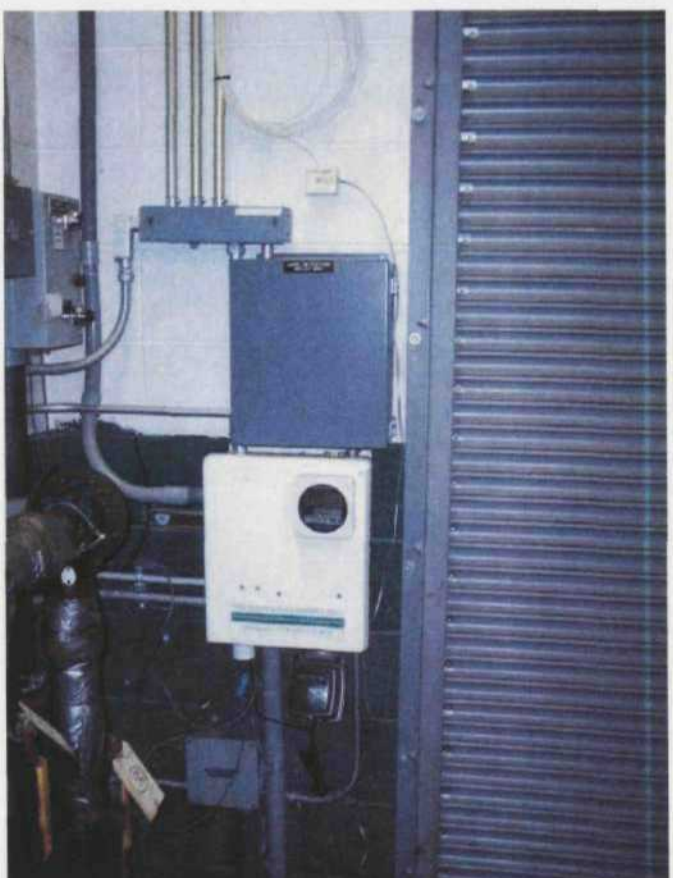


Grace Photo 16: Monitoring Well G11S Unlocked

Originals in color.

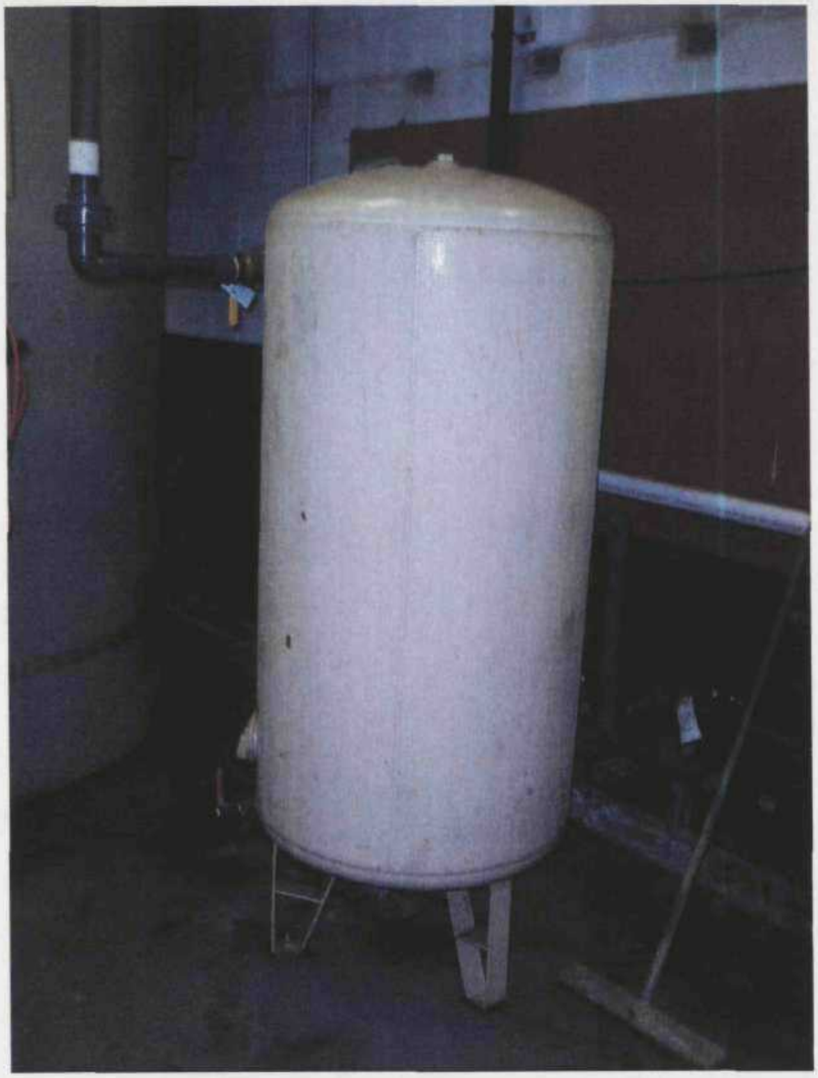
UNIFIRST CORPORATION (UNIFIRST) PHOTOGRAPHS

UniFirst Photo 1: Influent Piping/Gauging



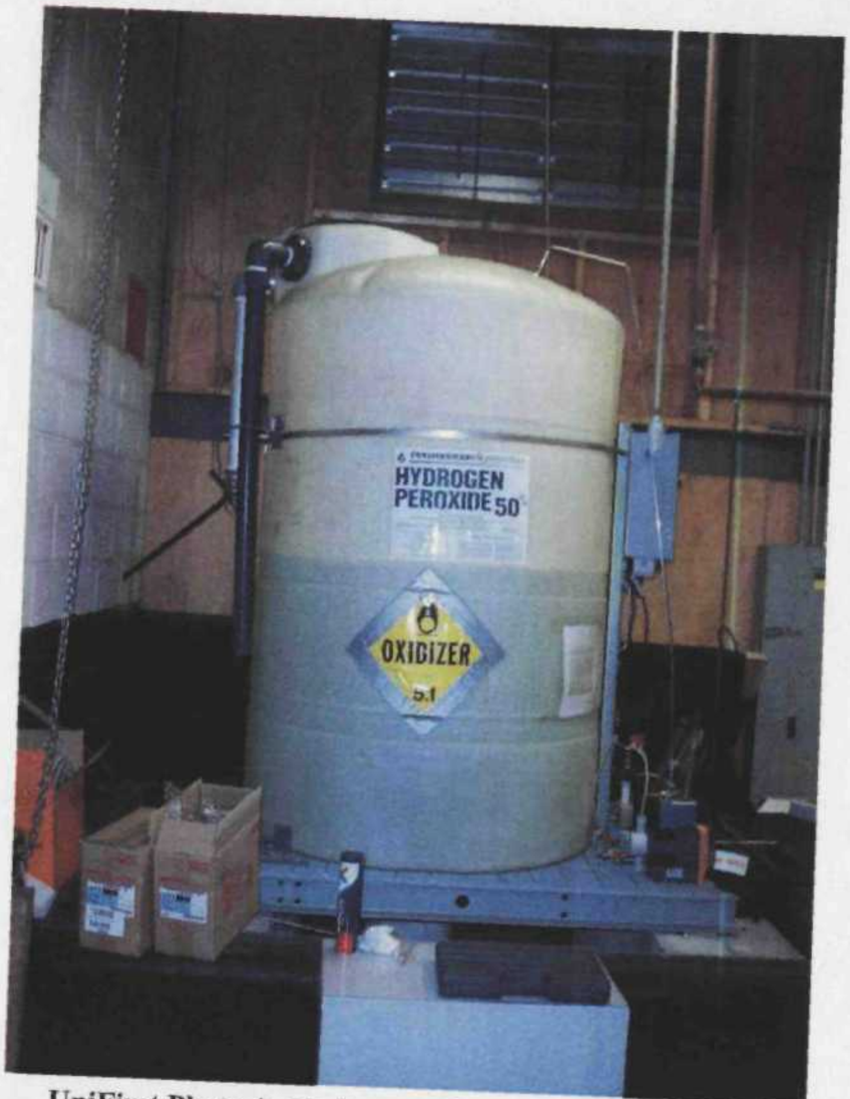
UniFirst Photo 2: Data Logger

Originals in color.



UniFirst Photo 3: Multimedia Tank

Originals in color.



UniFirst Photo 4: No Longer Operational H_2O_2 Tank

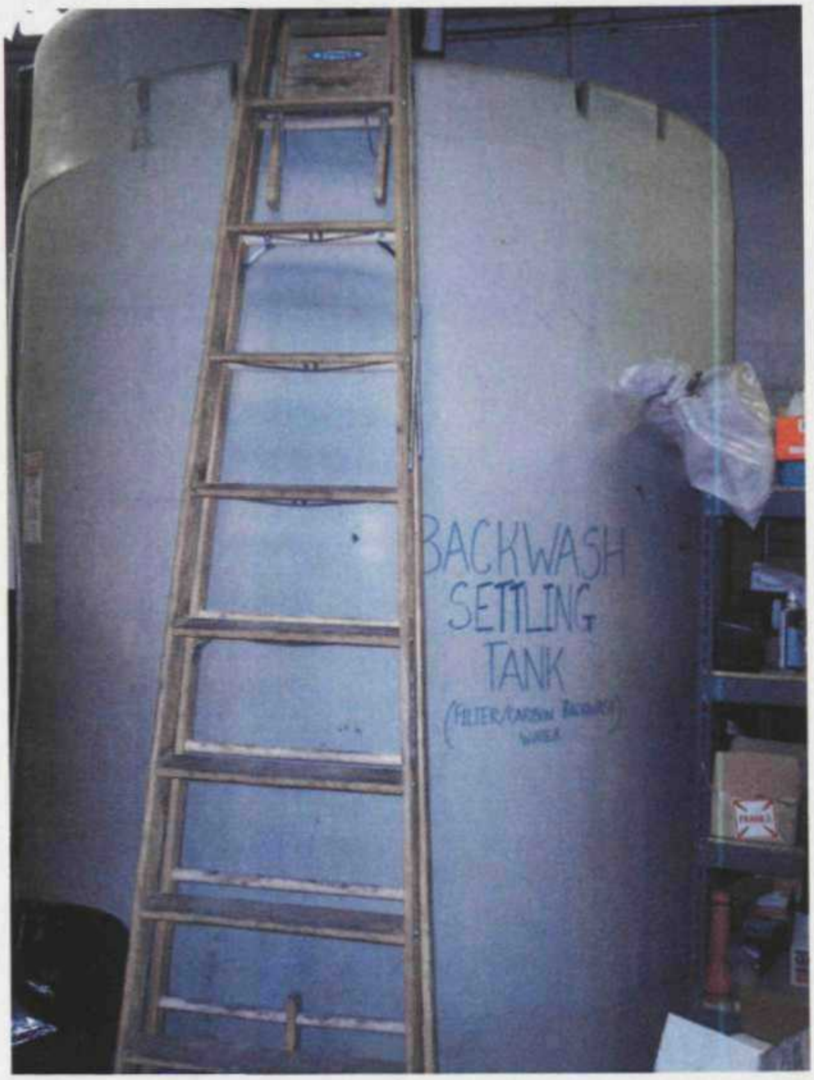
Originals in color.

UniFirst Photo 5: Safety Showers - Boxes

Originals in color.

UniFirst Photo 6: UV Peroxide Unit

Originals in color.

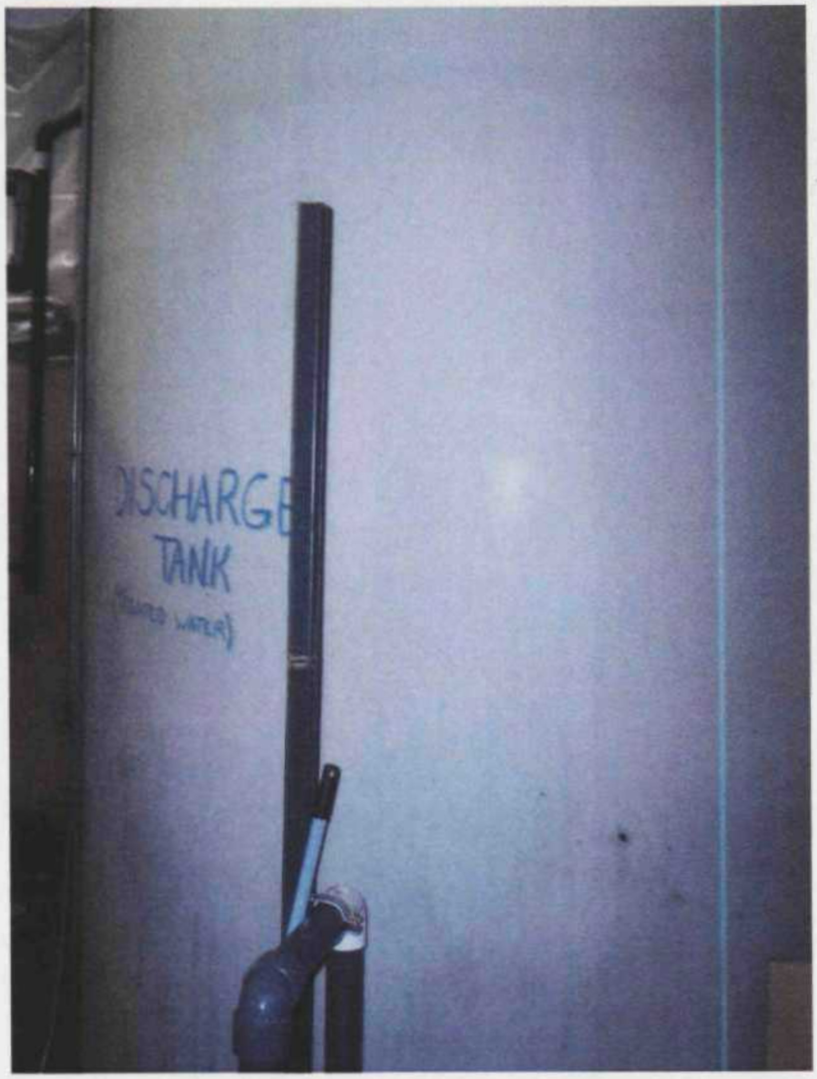


UniFirst Photo 7: Backwash Settling Tank

Originals in color.

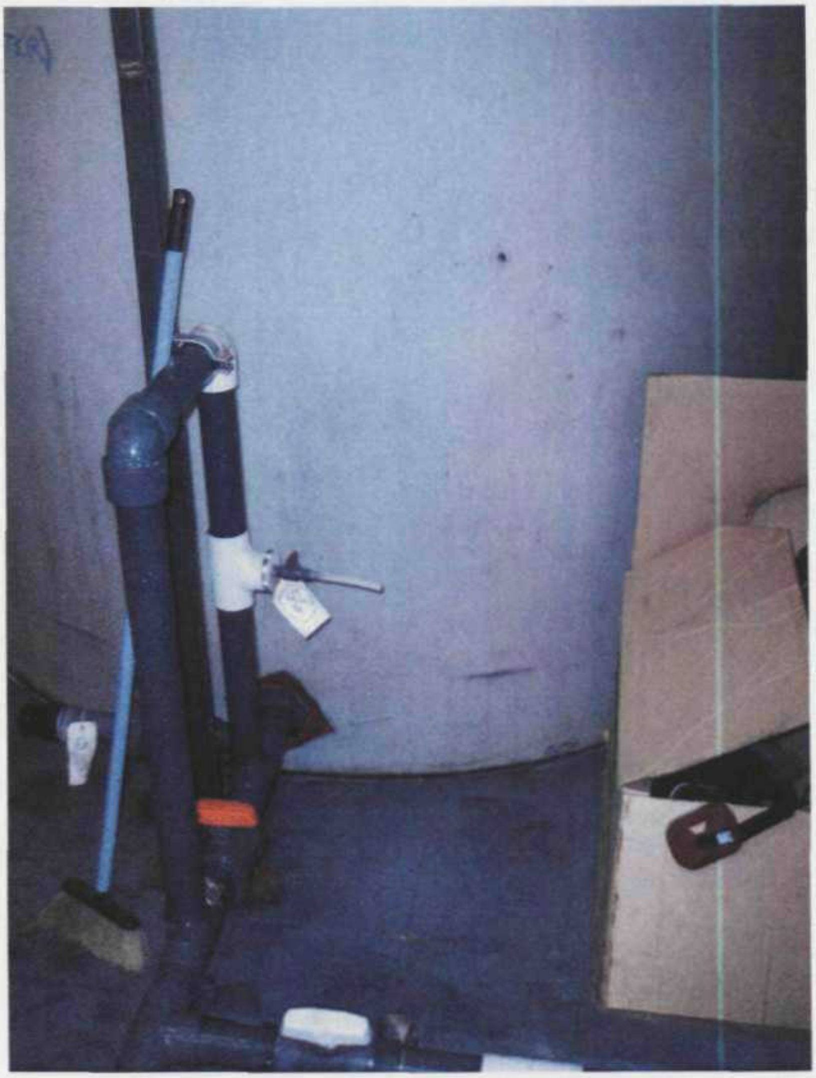
UniFirst Photo 8: Carbon Units

Originals in color.



UniFirst Photo 9: Discharge Tank

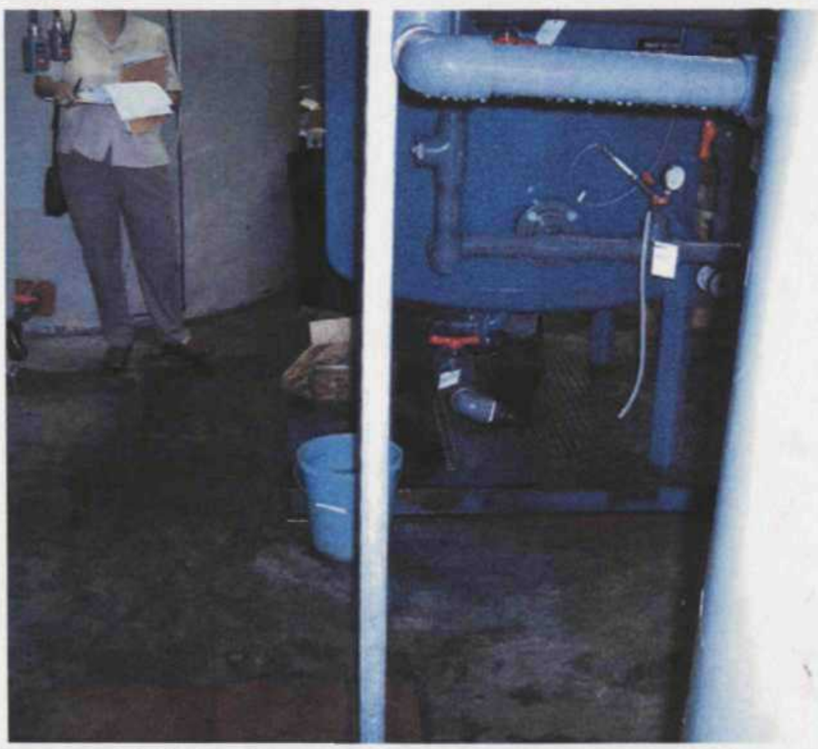
Originals in color.



UniFirst Photo 10: Discharge Sampling S-6

UNIFIRST CORPORATION (UNIFIRST) PHOTOGRAPHS

UniFirst Photo 11: Discharge Clean Water to Storm Sewer



UniFirst Photo 12: Floor Area, note excess water on floor

Originals in color.

UniFirst Photo 13: Pumping Well UC22

UniFirst Photo 14: UC18

UniFirst Photo 15: Soil Vapor Probes

Originals in color.

WILDWOOD CONSERVATION CORPORATION (WILDWOOD)
PHOTOGRAPHS

Wildwood Photo 1: Riley Well Enclosure and Storage Shed

Wildwood Photo 2: Treatment Building

Originals in color.

WILDWOOD CONSERVATION CORPORATION (WILDWOOD) PHOTOGRAPHS

Wildwood Photo 3: GAC Units

Wildwood Photo 4: Equalization Tank

Originals in color.

WILDWOOD CONSERVATION CORPORATION (WILDWOOD) PHOTOGRAPHS

Wildwood Photo 5: Air Scrubber

Wildwood Photo 6: Vapor Phase Carbon

Originals in color.

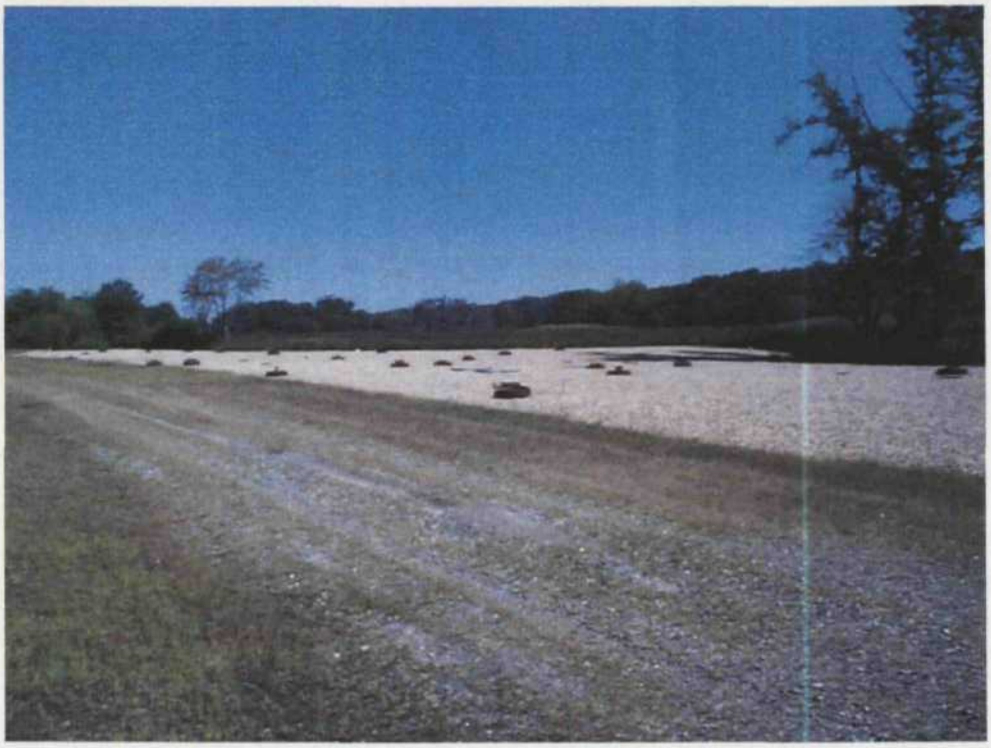
WILDWOOD CONSERVATION CORPORATION (WILDWOOD) PHOTOGRAPHS

Wildwood Photo 7: Catox System

Wildwood Photo 8: Site Looking North

Originals in color.

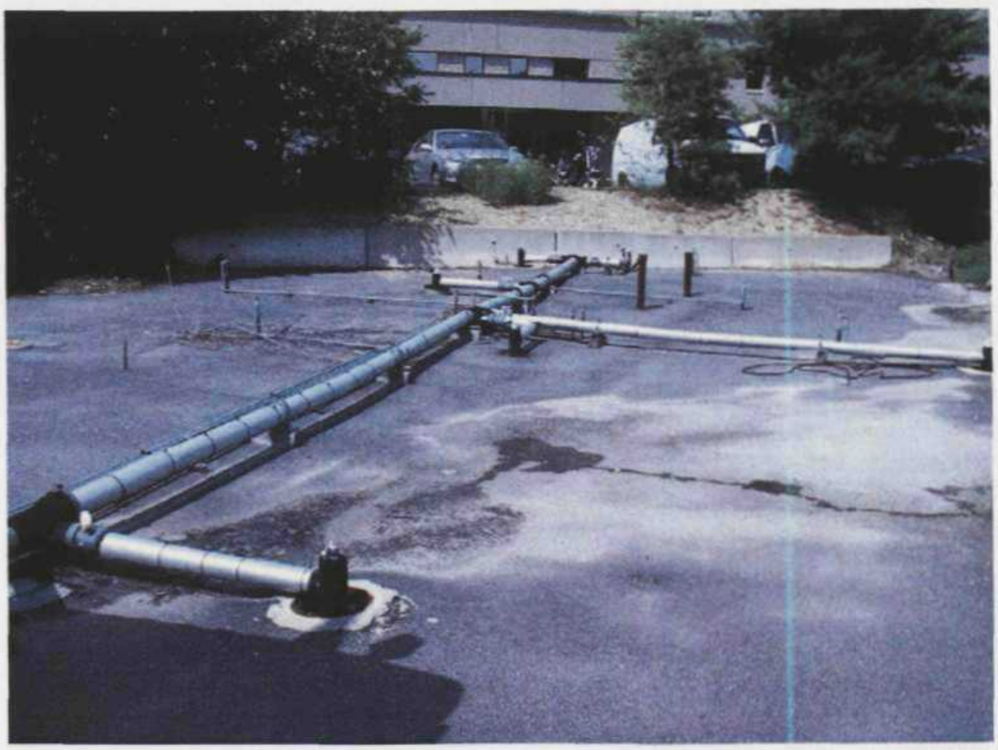
WILDWOOD CONSERVATION CORPORATION (WILDWOOD)
PHOTOGRAPHS



Wildwood Photo 9: Site Looking Northeast at River

NEW ENGLAND PLASTICS (NEP) PHOTOGRAPHS

NEP Photo 1: Monitoring well MW-8A



NEP Photo 2: Air Sparge System Wells 101 A&B

Originals in color.

NEW ENGLAND PLASTICS (NEP) PHOTOGRAPHS

NEP Photo 3: Treatment System

Originals in color.

Attachment 6

Interview Records

INTERVIEW DOCUMENTATION FORM

The following is a list of individuals interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.

Name	Title/Position	Organization	Date
Timothy Cosgrave	Project Manager	Harvard Project Services - UniFirst Contractor	August 3, 2004
Jonathan Bridge	Associate/ Sr. Hydrogeologist	GeoTrans, Inc. (Grace Contractor)	August 3, 2004
Maryellen C. Johns	Sr. Project Engineer	The Remedium Group (a Grace Subsidiary)	August 3, 2004*
Jeffrey Hamel	Vice President	Woodard & Curran, Inc. (NEP Contractor)	August 3, 2004
Jeffrey T. Lawson	Principal	Environmental Project Control, Inc. (Beatrice, UniFirst, and Grace OU-2 Contractor)	August 16, 2004
James R. Greacen	Project Manager	The RETEC Group (Beatrice Contractor)	August 18, 2004
Peter Cox	Project Geologist	The RETEC Group (Beatrice Contractor)	August 18, 2004**
Brendan Maye	Treatment System Operator	The RETEC Group (Beatrice Contractor)	August 18, 2004**
Paul A. Medeiros	President	Woburn City Council	August 18, 2004
Anna Mayor	Project Manager Wells G&H Site	MADEP	August 19, 2004
Jack Marlowe	Chairman	Woburn Redevelopment Authority	August 23, 2004
John Curran	Mayor	City of Woburn	August 24, 2004

INTERVIEW DOCUMENTATION FORM			
Gretchen P. Latowsky	Environmental Activist	For A Cleaner Environment (FACE)	August 25, 2004
Jack Fralick	Health Agent	Woburn Board of Health	August 26, 2004
Michael Raymond	Resident	City of Woburn	August 31, 2004***
Donna Robbins	Resident	City of Woburn	August 31, 2004***
Linda Raymond	Environmental Activist	Aberjona River Study Coalition, Inc.	August 31, 2004***
Kathy Barry	Environmental Activist	Aberjona River Study Coalition, Inc.	August 31, 2004***
John Ciriello	Resident	City of Woburn	August 31, 2004***

Notes:
* - Documented in Interview Record for Jonathan Bridge.
** - Documented in Interview Record for James. R. Greacen.
*** - Conducted as a group interview.

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	**EPA ID No.:** MAD980732168	
Subject: Five Year Review	**Time:** 2:15 pm	**Date:** 8/19/04
Type: ☐ Telephone ■ Visit ☐ Other **Location of Visit:** Metcalf & Eddy, Inc., Wakefield, MA	☐ Incoming ☐ Outgoing N/A	

Contact Made By:

Name:	**Title:**	**Organization:**
David M. Sullivan, LSP, CHMM	**Project Manager**	**TRC**
Diane Silverman, Ph.D.	**Risk Assessor**	**Metcalf & Eddy**

Individual Contacted:

Name:	**Title:**	**Organization:**
Anna Mayor	**Project Manager**	**MADEP**

Telephone No.: 617-556-1112 **Fax No.:** **E-mail Address: anna.mayor@state.ma.us**	**Street Address:** **1 Winter Street** **Boston, MA 02108**

Preface: The interview with Anna Mayor was conducted at the offices of Metcalf & Eddy, Inc. in Wakefield, Massachusetts. Ms. Major's involvement with the Wells G&H Site began with the design and installation of the remedy at the Wildwood Conservation Corporation (Wildwood) property in the mid-1990s and subsequently evolved into a management role for the entire Wells G&H Site, and the Industri-Plex Superfund Site to the north, on behalf of MADEP.

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

Ms. Mayor responded that she is fairly pleased with work that has been done on the four Source Area (Operable Unit 1; OU-1) properties by the Potentially Responsible Parties (PRPs). She feels that the most crucial part of the Wells G&H Site is the Source Areas (OU-1).

She expressed disappointment that a negotiated agreement had not been reached with the Olympia Nominee Trust (Olympia) sooner. She commented further that MADEP did not participate in the recent Administrative Order on Consent (AOC) regarding the Olympia property because the Commonwealth did not have costs to recover. She noted that negotiating with the Whittens [the owners of the Olympia property] was difficult, but nonetheless felt that Olympia could have been addressed by EPA sooner. Her disappointment stems in part from the fact that the contamination recently delineated by EPA [documented in the November 2002 Data Trend Evaluation report] has continued to leach contaminants to the aquifer over the years. She noted that MADEP deals with the petroleum contamination issues at the Olympia trucking terminal [under the Massachusetts Contingency Plan].

She also noted that the New England Plastics (NEP) site was slow in implementing a remedy and felt that the remedial work could have been implemented more quickly. However, she conceded that the contractors hired by NEP had an impact on implementation. She commented favorably on the pace of work at NEP when Woodard & Curran, Inc. came onboard as NEP's environmental consultant.

Ms. Mayor described the work at Wildwood as a good example amongst the Source Areas (OU-1) and commented favorably on RETEC as a contractor.

She stated that she started work on the Wells G&H site with the Wildwood property. At that time (mid-1990s), W.R. Grace (Grace) and Unifirst Incorporated (Unifirst) were already underway with remedies at their respective properties. However, she is perturbed by Unifirst's position on soil remediation at their site, and cannot see why a soil remedy has not been implemented at the Unifirst property. In her opinion, Unifirst's consultants (notably John Cherry and associates) seemed to overwhelm EPA.

Ms. Mayor has found the Central Area (OU-2) to be a source of frustration. She stated that progress stalled on the Central Area (OU-2) shortly after the PRPs issued the January 1994 Wells G&H Site Central Area Remedial Investigation Phase IA Report (Phase IA). She felt that MADEP contributions related to information on the groundwater source were not used effectively, since progress continued to stall. She expressed that she does not have the full picture as to why progress on the Central Area (OU-2) stalled.

With regard to the Aberjona River (OU-3), Ms. Mayor indicated that MADEP was not involved very much. She indicated that the previous Remedial Project Manager (RPM) for EPA (Mary Garren) felt that the MADEP did not have involvement in this aspect of the project. She indicated that MADEP's involvement with the Aberjona River was minimal until Joseph LeMay assumed the role of RPM for the Wells G&H Site.

2.A. Have there been routine communication or activities (site visits, inspections) involving your office regarding the site? If so, please give purpose and results.

Ms. Mayor indicated that communication or activities at the site have not been routine for MADEP. She cited the example of school tours of the Wells G&H Site, where she and Mary Garren, EPA's prior RPM, would share the burden of leading the tours, as available. Periodically, MADEP's reviews of Source Area (OU-1) monthly reports would prompt telephone calls to Mary Garren for clarification/information, or would lead to site visits. MADEP's greatest involvement was with regard to discharges to surface water from Source Area (OU-1) remedial systems, particularly Wildwood, where MADEP played a role in determining appropriate dilutions and discharge limits. She noted that Wildwood had problems with metals in their discharge and recollected that Wildwood sampled for a year prior to discharge to evaluate/remedy the problem. MADEP had close involvement with this issue.

3.A. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office. If so, please give details of the events and results of the response.

Ms. Mayor stated that the most frequent complaints at Wildwood concerned the beaver dam near the Salem Street bridge. When the water level of the river reached a certain elevation, it would have a deleterious effect on the wellheads at the Wildwood site. She noted calls from Wildwood seeking to extend the "beaver permit" with the Fish and

Wildlife Department (F&W). The permit would allow them to "disturb" the beaver dam (but not the lodge). Now this approval is granted through the Woburn Board of Health (BOH). She noted that there is a limited window of time when the dam can be disturbed (generally summer time). She does not know how the Woburn BOH is proceeding with this responsibility. She noted that F&W was strict. For example, traps could not be used on the beaver.

She has received occasional calls regarding the Grace property from prospective purchasers/tenants inquiring as to the soil contaminant conditions at the property. However, MADEP did not have information on soil testing at the Grace property. She noted that documents she recently received from Joseph LeMay (EPA's RPM) have some soil data.

4.A. Do you feel well informed about the site's activities and progress?

Ms. Mayor stated that at this time she feels well informed. After the Phase IA was released, the communication from EPA dropped off, but this may have also coincided with the period Mary Garren, EPA's prior RPM, began working part-time. When Joe LeMay assumed the role of RPM, communication between EPA and MADEP increased.

Ms. Mayor noted that communication had been good throughout on concerning Olympia. MADEP got involved at Olympia concerning the potential for including the terminal portion of the property in the Superfund site activities since site-related wastes/contaminants had been detected there, possibly originating from Unifirst.

She views Unifirst as a potential continuing source, noting the Dense Non-Aqueous Phase Liquid (DNAPL) may have migrated down-slope along bedrock. She wondered if good quality bedrock mapping existed in this area to help evaluate this hypothesis.

She mentioned indoor air issues and the testing conducted at the Puddle Duck Day Care center and at some nearby residences in the Dewey Avenue area. She understands that indoor air/vapor intrusion may be a future focus at the Wells G&H Site.

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

Ms. Mayor noted that the Wells G&H Record of Decision (ROD) mentions one sentence on implementing institutional controls on groundwater until the groundwater is cleaned up or the groundwater contamination is controlled. She commented further that it is not clear what uses should be restricted until the Central Area (OU-2) risk assessment is conducted. She is concerned that the local property owners might tap into the groundwater for irrigation and suggested that a moratorium or ban be considered on water supply well installations. She feels that some sort of control is required prior to all the source areas achieving cleanup and that such controls may need to be worked out through the City government. Restrictions may not be necessary until after the OU-2 risk assessment is completed, which should be within one year. Following the risk assessment, the institutional control could be targeted more to the pathways/uses that present the greatest risk/concern.

In response to a follow-up question regarding the existence of a well survey, Ms. Mayor referred to the Multiple Source Groundwater Response Plan (MSGRP) work performed by Gordon Bullard of TetraTech NUS (TTNUS) as a potential source for this information. She thought also that the Woburn BOH or Plumbing Department might require boring logs to be submitted for such wells.

Ms. Mayor also mentioned the lack of sufficient basis/documentation for monitored natural attenuation (MNA) at NEP (where the remedial system has been shut off) and the southern portion of the Wildwood property outside the footprint of the existing treatment system. She is not convinced that the planning and documentation necessary to support MNA, consistent with EPA guidance, is in evidence. She felt that the basis for asserting MNA at these locations should be further examined by EPA.

In addition, Ms. Mayor expressed concern over plume capture at Unifirst and Grace. She and Mary Garren challenged the PRPs at Unifirst on this issue, particularly with a lack of capture on the west side of the property. She recalled that Mary Garren issued letters to the PRPs noting concerns regarding west side capture. However, the concern has not been addressed to her knowledge. She is less familiar with the setting and circumstances at Grace, but recalls that EPA was concerned about a lack of capture at this property on the west side also.

With regard to the Central Area (OU-2), discussion focused on efforts undertaken by Mary Garren to find other sources, particularly associated with Romicon and Cummings Properties. Ms. Mayor expressed that it may be useful to see if there are other sources contributing to contamination in the Central Area (OU-2). She mentioned that Grace claims their groundwater extraction system is pulling in contaminants unrelated to past Grace operations from off-property sources.

At OU-3, Ms. Mayor expressed a nagging concern that residential use in the future has not been sufficiently addressed for the future scenario. She is concerned because future residential development can not be ruled out. What alleviates her concern on this matter is that the 5-year review process can re-open the remedy in a particular area if new (unaccounted for) residential development takes place. She felt that the level of protection is probably as good as it gets right now, provided it can be re-opened in the future through the 5-year review or other process.

SUPPLEMENTAL QUESTIONS

1.B. What concerns do you have about the site?

See response to Question 5 above in the state and local officials category.

2.B. Are you aware of any community concerns regarding the site? Provide details.

With regard to OU-3 (the Aberjona River), Ms. Mayor mentioned the Town of Winchester BOH concerns related to Aberjona River flooding and risk posed to construction workers implementing a potential flood control remedy. Ms. Mayor acknowledged that flooding is addressed in the Aberjona River Study (OU-3) risk assessment and thinks the communities concern has been addressed from a technical perspective. Nonetheless, the community concern exists.

Ms. Mayor is aware of complaints from affected property owners regarding the management of/responsibility for contaminated sediments. It is an issue that the EPA cannot necessarily address, unless the EPA undertakes direct remedial actions such as dredging. Likely, private law suits will follow directed at the PRPs.

With regard to OU-2 (the Central Area), Ms. Mayor noted the communities feeling that the Wells G&H aquifer never again be used in the future as a potable water supply. She recognizes that the City of Woburn is hedging their water resources and understands why they are disinclined to decommission the wells. However, because EPA is requiring cleanup to drinking water standards, the community's underlying concern will at some future point be addressed, but it will be long time before people agree to use the Central Area aquifer as a potable water supply. She expressed the opinion that the City's awareness of the public concerns and willingness to postpone a decision on the use of the aquifer to some future time works well with EPA's goals for aquifer restoration.

3.B. Have the activities to date at the site helped the neighborhood and/or community?

Ms. Mayor thought that the shut down of the wells was the first step to help the community. She also felt that EPA's examination of vapor intrusion issues and industrial exposures to contaminated groundwater will be helpful. She acknowledged that direct exposure routes to contaminated groundwater are currently limited and that the Source Area (OU-1) remedies are helping to prevent further degradation, but the Central Area (OU-2) aquifer is still not cleaned up.

She felt the community would realize further benefit once the exposures attributable to sediments and vapor intrusion are addressed. However, the only help the community has realized thus far is the shutdown of Wells G&H.

The public knows the Source Areas (OU-1) area being addressed, and paid for, by the PRPs. She suggested that some satisfaction might be derived by the general public from having the polluters pay for the cleanup.

Regarding to the Central Area (OU-2) and the Aberjona River (OU-3), people are concerned that the continued activity will perpetuate the stigma of Woburn as a polluted place. However, the remediation of the river will be a significant help to the neighborhood. It will have a very obvious impact.

4.B. Are you aware of any events of vandalism or trespassing at the site?

Ms. Mayor mentioned break-ins at the RETEC field trailer during the installation of the remedial system. She also mentioned that tree removal/right of way maintenance along the railroad led to damage of the fencing at Wildwood (e.g., fallen limbs during the maintenance fell on the fence in places and caused damage.)

5.B. Are you aware of any changes in projected land use at or near the site?

Ms. Mayor noted the potential redevelopment of Aberjona Autoparts property into an ice rink. She is also aware of a potential new building at the Charrette property (the proponents may demolish the existing building and construct a new facility, possibly an office building). The Salem Place residential development at the former Consolidated Freightways terminal on Salem Street was also discussed during the interview.

6.B. We understand that groundwater from that site may be used in the distant future. Are there plans for use of groundwater at the site in the near term?

Ms. Mayor mentioned the potential for commercial/industrial use of Central Area groundwater and mentioned that the City of Woburn Plumbing Department will not allow potable use.

7.B. Are there any pending changes in laws or regulations that may impact the site?

Ms. Mayor mentioned the change in the arsenic Maximum Contaminant Level (MCL) under the Safe Drinking Water Act, but is not sure how much the change will affect the Central Area (OU-2) aquifer. She is not sure when the arsenic MCL will change at the state level. She mentioned that MADEP is going through another round of promulgation.

She acknowledged that the Massachusetts Contingency Plan (MCP) regulations are not ARARS, but that EPA might acknowledge certain aspects of the MCP as ARARs, such as the MCP's groundwater classifications. However, Ms. Mayor is not aware of any other law or regulatory changes that would impact the Wells G&H site.

She also mentioned comments on the Aberjona River Study concerning dermal exposure assumptions. She noted that the differences observed in the assumptions in the document appear to "balance out", but agreed to check with the MADEP Office of Research and Standards (ORS) about another other changes in exposure assumptions or toxicological values.

8.B. Do you have any suggestions or recommendations regarding the project?
Regarding the Aberjona River remedy, Ms. Mayor suggested that too much reliance on capping of the sediments might involve a burdensome future institutional control responsibility, depending on the responsible party.

9.B. Is there any other information that you wish to share that might be of use?
Ms. Mayor anticipates close communication between EPA and MADEP in the future regarding the rifle range located in the Central Area. She has attempted to convince the management of the rifle range to adopt Best Management Practices (BMPs) to mitigate potential contamination caused by rifle range activities. She commented that she has meet with some resistance from the rifle range management regarding these initiatives. Lead was noted as a potential ecological concern based on the findings of the Aberjona River study and that lead contaminated sediments potentially attributable to the rifle range were detected in sediments in the 38-acre wetland of the Wells G&H site. She recalled some progress with the rifle range, where they agreed not to shoot toward the wetland. MADEP is not interested in shutting down the rifle range. They simply want them to modify their activities (i.e., adopt BMPs).

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	**EPA ID No.:** MAD980732168	
Subject: Five Year Review	**Time:** 5:15 pm	**Date:** 8/24/04
Type: ☐ Telephone ■ Visit ☐ Other **Location of Visit:** Woburn City Hall	☐ Incoming ☐ Outgoing N/A	

Contact Made By:

Name:	**Title:**	**Organization:**
David M. Sullivan, LSP, CHMM	**Project Manager**	**TRC**
Diane Silverman, Ph.D.	**Risk Assessor**	**Metcalf & Eddy**

Individual Contacted:

Name:	**Title:**	**Organization:**
John Curran	**Mayor**	**City of Woburn**

Telephone: 781-932-4503 **Fax No.** **E-mail Address**	**Street Address:** **Woburn City Hall** **10 Common Street** **Woburn, MA01801**

<u>**Preface:**</u> Prior to conducting the interview, TRC and M&E engaged in an informal discussion of current status and recent progress at the Wells G&H site with Mayor John Curran. During this discussion, Mr. Curran asked, regarding the outcome of the Aberjona River Study, what would be accomplished with excavation of the sediments, if chosen as a remedy. He also inquired as to the status of remedial activities north of Route 128 (the Industri-Plex Superfund Site). He described how the stigma associated with Woburn water is almost insurmountable. He acknowledged the role of the Environmental Protection Agency (EPA) and Superfund as a vehicle for remediation, but despite the progress, it is hard for Woburn to shake the image. He viewed the warning signs recently installed along the river and the cranberry bog as well intended, but the signs have the unintended effect of perpetuating the stigma. Mr. Curran noted the gap in the conservatism of the risk assessment, and the communication to the general public the actual danger posed by the contaminated sediments. He acknowledged that it is tough to bridge a warning sign regarding the sediments with a practical understanding of what it takes to truly sustain a harmful exposure. He wondered if there was a better way to communicate this information.

His job is to make sure Woburn does not suffer unnecessarily from Superfund activity and the perception of contamination. Despite the current good quality of the City's drinking water, people still say, "Don't drink the water." Each step EPA takes to advance the remedy has an impact on the state of mind of Woburn residents. The Superfund process in Woburn has a definite public impact.

5-YEAR REVIEW QUESTIONS FOR STATE/LOCAL OFFICIALS

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

Mr. Curran felt that the project has been successful from a technical/environmental standpoint. His main concern, beside public health, was the impact of the cleanup on public perception. He wants the project to have as little negative impact on public perception as possible without interfering with the technical goals of the project.

He stated that the EPA has been good about contacting his office and keeping people aware as the project evolves. EPA has always kept him aware. He has never felt blind-sided by information because he has been made aware of significant results in advance.

2.A. Have there been routine communication or activities (site visits, inspections) involving your office regarding the site? If so, please give purpose and results.

Mr. Curran answered, "yes." He added that his visits or inspections were generally tied to some milestone in the project where he would participate in site meetings or visits with Joseph LeMay, Remedial Project Manager (RPM) for EPA. For example, he visited the cranberry bog following the Aberjona River Study risk assessment to see the contaminated areas identified as presenting risk. He added that Joseph LeMay was very good at pointing things out and explaining the repercussions.

3.A. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office. If so, please give details of the events and results of the response.

Mr. Curran that he has received no complaints related to EPA activities. He has received complaints about illegal dumping in the area, but that the complaints are not related to the Wells G&H Superfund Site. He also received complaints regarding the paint ball activity on the City owned property by Wells G&H. There have been no complaints related to the ongoing remedial activities, either.

4.A. Do you feel well informed about the site's activities and progress?

Mr. Curran answered, "yes."

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

Mr. Curran stressed that he wants public awareness and public perception to be handled with the utmost care. He noted the "give and take" between informing the public, while avoiding unnecessary fear. He acknowledged that public health is the highest priority, but feels it is very important to protect the perceived quality of life in Woburn, the value of Woburn as a community. He feels EPA can do a better job of it and desires less volatile ways of informing the public. He stated the recent posting of warning signs as one example. No one is "breaking down the door" to voice objections, but it is still a concern. He does not want to imply that anyone at EPA has been derelict in his or her duty. EPA has been very professional and he feels the job is well managed. Nonetheless, he wants greater attention paid to perception.

SUPPLEMENTAL QUESTIONS

1.B. What concerns do you have about the site?

Mr. Curran expressed that north of Route 128 [Industri-Plex] is a big concern to him because it is an area where they have the least knowledge. He wonders about the impact of what migrates out from under the cap in groundwater and wonders if there is a remedial solution for this. His impression is that there is further remedial work required for groundwater in this area despite the cap. He is concerned about how this contamination will be managed.

Another concern is the Olin Site in Wilmington at the edge of the Aberjona Watershed. He wonders how contamination from Olin will impact the site in Woburn. He understands that some of the groundwater at Olin flows the other way, toward Wilmington, but nonetheless would appreciate more information on the Olin site. He is aware that Wilmington residents have found contamination in their groundwater and he heard rumors that the Massachusetts Department of Environmental Protection (MADEP) was trying to move away from management responsibility for the Olin Site, perhaps due to ongoing resource constraints at their agency. He wants to know what relationship this site has to the Woburn watershed. He reflected on Wilmington's approach to the Olin site, noting that they are approaching it in quiet manner, which he feels is intended to minimize or avoid stigma. Wilmington will need to connect to the Massachusetts Water Resource Authority (MWRA) to supplement their supply, as did Woburn. He understands that Olin is to pay for the sewer line extension. The situation is like that of Woburn in the early stages of the response to the contamination. Stigma versus Cleanup, it is something all municipalities are very concerned about. He feels many municipalities have learned from Woburn's experience. Mr. Curran noted that wherever he goes in the country, everyone is aware of Woburn's plight.

Mr. Curran reflected on the tremendous positive impact the Superfund remedial process can have, citing the recently redeveloped areas in North Woburn, such as Presidential Way and the area near the new highway interchange. He also spoke favorably of the role of MetroNorth in the revitalization of the area. Woburn experienced tremendous growth even during the economic downturn due to the recent development activity in this area. He acknowledged EPA's leverage and stated that it is necessary to have EPA involvement foster the kind of change realized at Industri-Plex.

2.B. Are you aware of any community concerns regarding the site? Provide details.

Mr. Curran stated that when the Aberjona River Study results were released, there was some concern about property values along the river, but more from the commercial sector than the residential. He explained how Joseph LeMay showed how the results should have no impact on residential values. Mr. Curran felt that the results should also have limited impact on commercial property values given where most of the contamination presenting risk is located. He attributed the relatively small amount of concern expressed by the local residents to the experiences of the community as whole, suggesting that the experience has made the average resident much more aware/educated than residents in other communities. He stated that he received more calls from the Potentially Responsible Parties (PRPs) than he did from local residents. There was relatively little outcry from the local citizens, and he stated that the study had no impact on the mayoral election. He felt that the PRPs, too, were concerned about public perception, but for much different reasons than his own. The PRPs did not want the Aberjona River Study report to be released. He also noted the PRP's financial interests.

3.B. Have the activities to date at the site helped the neighborhood and/or community?

Mr. Curran answered, "yes" and referred to prior answers provided. He restated that the Superfund process at Industri-Plex has helped with economic development that has sustained Woburn for the last 8 years. The planning for Presidential Way and nearby areas really paid off, since the City put a lot of effort into planning this development. Mr. Curran added that he was a previous member of the Planning Board and City Council during the planning stages and is very aware of the planning activities regarding this area.

He cited the Superfund activities in North Woburn [Industri-Plex] as an example, which have fostered an economic boom that will allow the City to secure $180 million in debt service. This new development is a tremendous economic base for the City. He reflected on the naming of the Anderson Transportation Center for the Anderson child who died from leukemia, noting that the site has been reused without forgetting the price.

He cited the redevelopment of the Industri-Plex area as a tremendous success and wishes that more of EPA's Superfund remedial efforts could be as successful. It was a very positive outcome. He mentioned how the state took an interest when they needed to cite a transportation center and how they helped with the cap. He noted that they would not have taken an interest in the area if they were not aware of the intensive re-use undertaken in the area. He remarked about how the Industri-Plex Site Remedial Trust was motivated to maximize property value and increase their return. He noted the efforts of former Mayor John Rabbit, Cindy Stanton Brooks of the trust, and the impacts of zoning adjustments, that made the construction of the highway interchange more attractive. With the advent of the interchange, development really took off. The improved traffic flow between Wilmington and Woburn has also been a plus.

He noted how these experiences have given Woburn a greater sensitivity to the protection of their existing water supply [Horn Pond Aquifer] and he is pleased by the attention paid and the technology implemented to ensure a safe water supply. He noted the new water treatment system with a chemist on duty.

4.B. Are you aware of any events of vandalism or trespassing at the site?

Mr. Curran is not aware of vandalism or trespassing at the site. See prior responses regarding the paint ball activity, which for a period of time was allowed by the City on City property near Wells G and H. Some residents complained about the paint ball activity. See also prior comments about illegal dumping activity in the vicinity of the site.

5.B. Are you aware of any changes in projected land use at or near the site?

Mr. Curran is not aware of any changes in projected land use at or near the site. He noted that Woburn Redevelopment Authority's EPA grant to study proposed uses. He indicated that there are no concrete proposals, but that the general sentiment is for some form of passive recreational use.

6.B. We understand that groundwater from that site may be used in the distant

future. Are there plans for use of groundwater at the site in the near term?

Mr. Curran stated that there are no plans to use the water. The only uses he could see involve use of the water for cooling purposes, like Atlantic Gelatin. He recalled that the City was approached by Tennessee Gas about a power plant proposal, but their water needs were far greater than could be supplied by the aquifer. He wondered that if the water were used in this way, that perhaps the user could treat the water prior to returning it to the aquifer, thus accomplishing some treatment. However, he acknowledged that it is an unlikely scenario.

7.B. Are there any pending changes in laws or regulations that may impact the site?

Mr. Curran stated that the City is revising their Master Plan, but that the Master Plan does not contemplate anything inconsistent with what is already in place at the site.

8.B. Do you have any suggestions or recommendations regarding the project?

Mr. Curran felt that his suggestions or recommendations were already covered in previous responses. He added that he has no concerns about EPA's assessment and remediation objectives, but stressed his concern about managing public perception and its impact on the quality of life in Woburn.

9.B. Is there any other information that you wish to share that might be of use?
Mr. Curran felt that this area was already covered in previous responses.

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	**EPA ID No.:** MAD980732168
Subject: Five Year Review	**Time:** 9:30 am **Date:** 8/26/04
Type: ■ Telephone ☐ Visit ☐ Other **Location of Visit:**	☐ Incoming ■ Outgoing

Contact Made By:

Name:	**Title:**	**Organization:**
Diane Silverman, Ph.D.	**Risk Assessor**	**Metcalf & Eddy**

Individual Contacted:

Name:	**Title:**	**Organization:**
John (Jack) Fralick Jr.	**Health Agent**	**Board of Health, City of Woburn**

Telephone No.: 781-932-4407 **Fax No.:** **E-Mail Address:**	**Street Address:** **Woburn City Hall** **10 Common Street** **Woburn, MA 01801**

5-YEAR REVIEW QUESTIONS FOR STATE/LOCAL OFFICIALS

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

Mr. Fralick stated that overall, the project has moved too slowly. He noted that he fully understands that data need to be gathered and analyzed, and that reports need to be written. But he cannot imagine why the process has taken so long. He realizes that progress has been made at the site; the treatment plants are operating and thousands of pounds of waste have been removed from groundwater. Mr. Fralick referred to the site as a "black eye that won't go away". Woburn has been in the media forefront for 25 years. He is hoping that the community will be provided with the closure it needs. The studies to date have not provided the closure.

Mr. Fralick noted that activities at the site continue to set off alarms to the community. He used the recent installation of the warning signs at the cranberry bog as an example. He would have preferred that a fence, rather than signs, be installed since a fence would have been a less obvious indication of potential harm. What he would really prefer is a solution rather than a sign. The City wants a concrete cleanup outcome that clearly indicates that a level of no significant risk has been reached.

Mr. Fralick stated that he uses the Aberjona River Study report as a reference to answer community questions. He receives numerous phone calls expressing three basic types of concerns regarding the site: (1) individuals who want to move into the community but have concerns about the site; (2) residents of Woburn who have children with health problems seeking answers to those problems; and (3) past residents of Woburn who have been diagnosed with cancer or have children diagnosed with cancer looking for a possible answer to why the cancer happened. He stated that he what he needs is concrete results and information to answer these questions and report to the community.

Because he feels that not enough had been done at the site over the last 25 years, he would like to see the site fast tracked. However, he is pleased that progress is being made and that cleanup is being actively addressed.

2. Have there been routine communication or activities (site visits, inspections) involving your office regarding the site? If so, please give purpose and results.

Mr. Fralick indicated "no" in response to this question. He commented that he reads reports, but rarely receives other communication regarding the site. He noted that he is aware of the EPA grant to the Woburn Redevelopment Authority (WRA) but has had limited involvement with that process. During his limited involvement, he advised the WRA that doing nothing with the Wells G&H wetland may be the best option. Placing walkways in contaminated areas does not make sense from a public health position, especially near the hot spot at Well H.

In further response to the question, Mr. Fralick stated that he has visited the site for a variety of reasons. He participated in a cleanup of asbestos-concrete piping on Rifle Range Road, he checks for illegal dumping, and has visited the Southwest Properties to perform dumpster checks. He is aware that a skating rink is being considered at the Aberjona junkyard and hopes that EPA is participating in those discussions.

3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office. If so, please give details of the events and results of the response.

Mr. Fralick again noted complaints relative to the City's storage of concrete-asbestos piping and the removal of the piping, which had been stored there for a prolonged period of time. He has also received complaints of midnight dumping in the wetland area, and lead concerns at the rifle range. He hopes that EPA and MADEP will deal with the concerns relative to lead at the rifle range. Other complaints received concerned a local hydroseeder withdrawing water from a tributary to the river and a fumigant manufacturer operating near the cranberry bog. He felt that the fumigant manufacturing process was not a problem since the insecticides were being used in a controlled and contained manner.

4. Do you feel well informed about the site's activities and progress?

Mr. Fralick stated that he does not feel well informed about the site. He has only received the human health portion of the River Study report and the response to comments on that report. He has not received the ecological portion of the River Study report and does not appear to be on the distribution list to receive communication about the site. He does not feel that he needs to know everything about the site, but stated that he would like to see progress reports on the source area properties and other aspects of the site so that he could be better informed. He could put the information to good use as he makes recommendations and answers questions regarding the site. He would be better able to provide an explanation of the current status of the site and address community concerns if he had more information.

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

Mr. Fralick reiterated that getting him information is the most important suggestion he can make. This site is very complex, so he could use additional information. Mr. Fralick further commented that he hopes the right steps are being taken at the site and that the process can be accelerated. He understands that there may be financial constraints or legal ramifications that may be impeding the process. He questioned whether the installation of an additional treatment system might speed up the groundwater remedy.

Mr. Fralick lastly commented that he believes that EPA is doing a decent job overall. By supplying the Board of Health with additional site information, the community will be better served and minds will be more at ease. He would very much like to communicate the positives aspects of the process to the community.

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	EPA ID No.: MAD980732168	
Subject: Five Year Review	Time: 5:00 pm	Date: 8/18/04
Type: ☐ Telephone ■ Visit ☐ Other Location of Visit: Woburn City Hall	☐ Incoming	☐ Outgoing N/A

Contact Made By:

Name:	Title:	Organization:
David M. Sullivan, LSP, CHMM	Project Manager	TRC
Diane Silverman, Ph.D.	Risk Assessor	Metcalf & Eddy

Individual Contacted:

Name:	Title:	Organization:
Paul A. Medeiros	President	Woburn City Council

Telephone No.: 781-938-0297 Fax No.: E-Mail Address: paulderman@prodigy.net	Street Address: 9 Marietta Street Woburn, MA 01801

Preface: Prior to conducting the interview, TRC and M&E engaged in an informal discussion of current status and recent progress at the Wells G&H site with Mr. Paul Medeiros. During this discussion, Mr. Medeiros acknowledge that he periodically accessed the EPA's Wells G&H website for information on the project.

5-YEAR REVIEW QUESTIONS FOR STATE/LOCAL OFFICIALS

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

Mr. Medeiros felt that the project was moving along. He expressed that he was not happy with the Wells G&H/IndustriPlex River Study linkage, although he understands the connections between the two projects. Nonetheless, he thought that EPA should have kept the projects separate. He has reservations about the numbers of samples collected at different stations (more in some locations, less in others) and wonders whether there is really sufficient coverage and characterization of the river. He discussed that he had suggested to EPA that the City was entitled to a peer review of the Aberjona River Study. He was not satisfied with the TOSC review provided by University of Connecticut (Uconn) and Tufts University faculty. He mentioned that he had notified Joseph LeMay, Remedial Project Manager (RPM) for the Wells G&H Site, as well as Mr. LeMay's superior, that the review performed by UConn/Tufts was not sufficient. At this point, Mr. Medeiros' desire for a peer review of the Aberjona River Study is not satisfied.

2.A. Have there been routine communication or activities (site visits,

inspections) involving your office regarding the site? If so, please give purpose and results.

Mr. Medeiros stated that Joseph LeMay (the RPM) has made himself very available throughout the Aberjona River Study. He noted that Mr. LeMay has also been available to the Woburn Redevelopment Authority (WRA). He has also made himself available to the City for various planning purposes regarding Wells G&H. He noted, however, that planning activities for development at the wetland ceased when the findings of the draft Aberjona River Study were revealed, due to concerns over public health and liability. Mr. Medeiros also comments that the DEP (Anna Mayor) has also been available to the City.

3.A. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office. If so, please give details of the events and results of the response.

The only complaint Mr. Medeiros recalled, which was originated by Mr. Medeiros, was related to the paint ball activity near municipal wells G and H. Originally, the Mayor allowed the paint ball recreational activity to proceed in this location. However, because the levels of contamination were not known at the time, Mr. Medeiros discussed the paint ball activity with the Mayor and expressed that it should be stopped due to possible public health concerns. The Mayor agreed and the activity ceased.

He also noted some incidental dumping of solid waste (e.g., old appliances) in the cranberry bog.

In another matter, a local citizen requested Citizen Participation Time at a City Council Meeting regarding concerns with lead shot contamination at the Mass Rifle facility. He arranged for a representative of Mass Rifle to be present to address the issues raised. He found that Mass Rifle was responsive and forthcoming with how they manage lead shot in the target banks, etc. (e.g., lime treatment). He indicated, based on his own due diligence, that Mass Rifle responses and lead shot management activities were consistent with what he learned from various state officials and knowledgeable individuals.

4.A. Do you feel well informed about the site's activities and progress?

Mr. Medeiros answered, "Yes."

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

Mr. Medeiros asked that EPA improve how they notify the public when new information is available on the Wells G&H site. He noted there was a local cable television station and two local newspapers and suggested that use of these media to provide notification of new information might get more people involved in Wells G&H issues.

SUPPLEMENTAL QUESTIONS

1.B. What concerns do you have about the site?

Mr. Medeiros is concerned about future use of the Wells G&H site and what they will be able to with the site safely. He is also concerned about talk of re-opening the wells and referred anecdotally to a prior Mayor's very public demolition of the wells G and H pump houses, and that Mayor's declaration to never use the water from the site again.

He is also concerned that some of the contamination may not be receiving complete treatment, and noted the New England Plastics (NEP) site's shutdown of their treatment system as a possible example.

2.B. Are you aware of any community concerns regarding the site? Provide details.

Mr. Medeiros expressed community concerns regarding pockets of arsenic contamination and wondered if there may be more areas that pose risk that have noted yet been detected. He also expressed concern over whether the agency or other entity will be responsive if more contamination posing risk is found. He further noted the community's concern over what will become of the Wells G&H site in the future.

3.B. Have the activities to date at the site helped the neighborhood and/or community?

Mr. Medeiros answered, "Yes" and commented that the studies performed relative to pump and treat, the Aberjona River study, etc., have "shown what is in people's back yards." He expressed the philosophy that more information is better than less. Therefore, the activities conducted to date have helped by providing information.

He also acknowledged the negative impacts of the information, noting that the news of the contamination described in the Aberjona River Study has stopped regular volunteer clean ups of streams, etc., by local groups/environmental organizations. Nonetheless, the community has benefited by being informed.

4.B. Are you aware of any events of vandalism or trespassing at the site?

Mr. Medeiros noted only the occasional dirt bike on the railroad tracks, but nothing leading to damage or vandalism at the site.

5.B. Are you aware of any changes in projected land use at or near the site?

Mr. Medeiros noted several changes or potential changes, which are summarized below:

- Residential development (Salem Place) of the Consolidated Freightways site (as many as 80 units/townhouses) off Salem Street. Consolidated Freightways is a former trucking terminal.
- The potential ice rink at the Aberjona Autoparts facility on Salem Street.
- The interest of several parties in the W.R. Grace facility at 369 Washington Street. Potential for restaurants or a world headquarters for a company. Mr. Medeiros did not mention the names of the interested parties.
- The car dealership north of W.R. Grace will be rebuilt, with a new building erected on another portion of the property. The existing building is to be demolished.

- The new Admiral Roofing storage facility on Olympia Avenue/3 Wheeling Avenue. Admiral Roofing is relocating to Woburn from Wilmington.
- The Fuller Systems facility at 226-228 Washington Street had a fire. Fuller Systems, a pesticide manufacturer, manufactured fumigating smokes. The City has ordered the remaining facility to be torn down since it is a nuisance.

6.B. We understand that groundwater from that site may be used in the distant future. Are there plans for use of groundwater at the site in the near term?

Mr. Medeiros answered, "no." He noted that he felt that water from the Wells G&H aquifer will not be seen as potable by the public.

7.B. Are there any pending changes in laws or regulations that may impact the site?

Mr. Medeiros stated that he is not aware of any changes in laws or regulations that may impact the site.

8.B. Do you have any suggestions or recommendations regarding the project?

Mr. Medeiros stated that he wants a peer review of the Aberjona River Study.

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

Mr. Medeiros answered, "no." However, he did note that Woburn Residents Environmental Network (WREN) maintains an email list that may be useful to EPA for information dissemination. He also noted that, even though voluntary cleanup of the wetland had stopped for the most part, some cleanup still occurred in the upland areas and one resident near the Cranberry Bog regularly mowed the paths in the wetland to maintain access for emergency vehicles. The City had been planning a pilot test to use beetles to rid a portion of the wetland of purple loosestrife. Those plans were discontinued when the draft River Study report was released.

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site		**EPA ID No.:** MAD980732168	
Subject: Five Year Review		**Time:** 3:00 pm	**Date:** 8/23/04
Type: ☐ Telephone ■ Visit ☐ Other **Location of Visit:** Gulde Insurance Agency, Inc. Burlington, MA (Mr. Marlowe's place of business.)		☐ Incoming ☐ Outgoing N/A	

Contact Made By:

Name:	**Title:**	**Organization:**
David M. Sullivan, LSP, CHMM	**Project Manager**	**TRC**
Diane Silverman, Ph.D.	**Risk Assessor**	**Metcalf & Eddy**

Individual Contacted:

Name:	**Title:**	**Organization:**
Jack Marlowe	**Chairman**	**Woburn Redevelopment Authority (WRA)**

Telephone No.: 781-935-3010 (WRA) **Fax No.:** **E-Mail Address:**	**Street Address** **(WRA) 365 Main Street** **Woburn, MA 01801**

Preface: Prior to conducting the interview, TRC and M&E engaged in an informal discussion with Mr. Marlowe concerning his overall background relative the Wells G&H Superfund Site. Mr. Marlowe noted his involvement in the early 1980s with the grass roots environmental advocacy group For A Cleaner Environment (FACE), which was started by Reverend Bruce Young, a local Episcopal Minister, and Anne Anderson, whose son contracted leukemia. He is friends with Ann Anderson and expressed that discussing the Wells G&H site still stirs deep-seated emotions. His wife was involved with FACE when the organization was incorporated. Mr. Marlowe later became president of FACE for a few years. He later became involved with the Woburn Redevelopment Authority (WRA) and helped develop the area to the west of the railroad tracks. He was also involved in the development of the new highway interchange and the Anderson Transportation Center. He is 65 years of age and grew up in Woburn. As a child, he played in the very areas that are now Superfund Sites. He was there at many of the significant events at the Wells G&H site, like the aquifer pump test conducted by the United States Geological Survey (USGS) and during the excavation of drums on the W.R. Grace property. He mentioned his strong dislike for Attorney Jan Schlictmann, although he acknowledged he was a great attorney (the reasons for his dislike were not explained or explored).

He offered that he has a "pretty good working relationship with EPA", but characterized his early relationship with EPA as a member of FACE as "politely adversarial." In the early days of the Wells G&H site, he recalls working closely with Richard Chalpin of the Massachusetts Department of Environmental Protection (MADEP), who he credited with detecting trichloroethene (TCE) in the Aberjona River and with helping to find the arsenic pits in North Woburn.

He has very strong feelings for the City of Woburn and feels all the Superfund issues have "put a smudge" on the community he loves. He has since undertaken the mission of changing the image of Woburn. Early on, he had issues with the EPA, who apparently was reluctant to install a fence around the Industri-Plex site. Later, he felt that EPA "softened" and embraced the concerns of the community to a greater degree. He felt that the testimony of Ann Anderson and Rev. Bruce Young before congress leading up to the reauthorization of the Superfund law in the early 1980s was the turning point for EPA relative to Woburn Superfund Sites, after which Woburn got greater political attention and EPA became a more positive force.

With Mr. Marlowe's involvement both in city affairs (e.g., WRA) and his early involvement with FACE, questions appropriate for both state/local officials and community groups were posed during the interview.

5-YEAR REVIEW QUESTIONS FOR STATE/LOCAL OFFICIALS

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

Mr. Marlowe felt that EPA was very responsible when they conducted the Aberjona River human health and ecological risk studies. The Aberjona River Study did lead to some "flare ups" of local concern, but those "in the know" appreciated what was done. He felt that some "on the fringe" questioned the science, but feels that EPA did a good job. He also felt that the issues raised by the University of Connecticut as part of the TOSC review were inconsequential.

He further commented that compared to the early days of the site, the project has progressed in quantum leaps and feels today that the project is being handled very responsibly by EPA.

2.A. Have there been routine communication or activities (site visits, inspections) involving your office regarding the site? If so, please give purpose and results.

Mr. Marlowe is not a direct recipient of communication from EPA, but he receives communication through the political process.

Mr. Marlowe discussed further that he has worked with three consecutive mayors (Rabbit, Dever, and Curran) and stated that he was a confidant of all three. He commented negatively on EPA's decision to divide the site into the three Operable Units and was not sure what purpose it served.

He commented further regarding the psychology of the community: No one wants to hear about the site anymore. He noted further that no one will ever drink the water from the Wells G&H aquifer and asked aloud why is EPA pursuing cleanup of the aquifer. Then he acknowledged that his opinion later turned around when it became clear that good science had been done and correct decisions had been made, particularly with regard to the Aberjona River study.

He reflected on the results of the Aberjona River study, and noted how some areas are contaminated, such as in the bend in the river, and other areas are less contaminated.

He further discussed the EPA grant to the WRA to evaluate reuse, and mentioned ideas for a viewing platform at Well H. He noted that the people are now concerned about potential exposures, which has lessened interest/enthusiasm for reuse of the area around Wells G&H. In his opinion, the Wells G&H wetland area could be an ideal recreational area since it cannot be developed, but asked what happens if someone goes swimming? He remarked favorably about the results of the Aberjona River Study. He appreciates the documentation of his suspicions and what backs it up.

With regard to the work undertaken by the WRA relative to the EPA Superfund Redevelopment Grant, Mr. Marlowe stated that his organization is still wrestling with what they will say in their final report, which is due December 31, 2004. He acknowledges his own bias stemming from his own involvement in FACE, and expressed concern if something is overlooked.

3.A. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office. If so, please give details of the events and results of the response.

As part of the WRA, his has not aware of any complaints, violations, or other incidents.

As part of FACE, he recalls an incident near the present day location of the Anderson Transportation Center where a contractor excavating to connect to the water supply encountered chromium waste. Mr. Marlowe remembered attempting to reach EPA and MADEP to see what they could do to rectify the situation, and explained how finally the Building Inspector issued a Cease and Desist Order because the contractor had not obtained a permit for the work. Incidents like this make him wonder who will be responsible for Institutional Controls in the future.

4.A. Do you feel well informed about the site's activities and progress?

Mr. Marlowe answered, "Yes."

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

Mr. Marlowe remarked that this is a tough question. The WRA has a grant for examining the redevelopment of the Wells G&H Superfund Site. This authority includes areas south of the Salem Street Bridge and extends to the border of the rifle range and also includes the W.R. Grace Site. Formal recommendations will be provided in the WRA's final report due December 31, 2004.

Mr. Marlowe stated that he has considerable respect for Joseph LeMay, the Remedial Project Manager (RPM) for the Wells G&H site. However, he felt that it takes Mr. LeMay an inordinate amount of time to make a decision. Mr. Marlowe also acknowledged that
Mr. LeMay can not make snap decisions because of the high visibility and profile of the site.

SUPPLEMENTAL QUESTIONS

1.B. What concerns do you have about the site?

Mr. Marlowe commented that he has nothing more to offer than what has already been stated. He commented further about the extraordinary arsenic concentrations in the sediments and feels that as long as the contaminated sediments are not disturbed, that the situation is OK.

Mr. Marlowe commented further: From a FACE perspective, lets get the PRPs to clean up the river. From a businessman's perspective, he wonders why one would bother to clean up the contamination. What is the point?

In a further comment on the Aberjona River Study, he felt that sampling was not performed deep enough, regardless of the limited mobility characteristics of arsenic.

2.B. Are you aware of any community concerns regarding the site? Provide details.

Mr. Marlowe stated that as long at the cleanup goes on and it is not completed, there will be community concerns. He noted his comedy club experience, when the comic found out that he was from Woburn and made fun of him and the Woburn contamination situation, driving home the point of the deep-seated and widely known stigma. He wants this to end and feels the site has been studied to death. He thinks EPA's remedial actions should stop with the river. If EPA is going to clean it up, then clean it up. Twenty-four years or more is a long time to wait.

3.B. Have the activities to date at the site helped the neighborhood and/or community?

Mr. Marlowe stated that the only activity that helped was the closing of the wells. He remarked that the average person does not understand the content of the Aberjona River Study. He remarked that Mayor John Rabbit's razing of the well houses was a good move.

4.B. Are you aware of any events of vandalism or trespassing at the site?

Mr. Marlowe is not aware of any vandalism. Regarding trespassing, he noted that it is an open site with little preventing anyone's access to the site, like signs. He noted that he visits the site himself from time to time.

5.B. Are you aware of any changes in projected land use at or near the site?

Mr. Marlowe referred to prior discussions concerning the WRA's $100,000 EPA grant to evaluate site reuse and the pending final report due December 31, 2004.

6.B. We understand that groundwater from that site may be used in the distant future. Are there plans for use of groundwater at the site in the near term?

Mr. Marlowe answered, "Over my dead body." He stated emphatically that he would do what ever he could to stop it.

He recognizes that the City could abandon the water supply, but also understands the City's motivations for not doing so. No one in the City will make the decision to abandon the water supply and thus remove the potential for cleanup in the future.

Mr. Marlowe noted beyond the groundwater issue his concern over flooding of neighboring properties and downstream Winchester. He felt that the floodwaters had to have contaminated soils on neighboring properties and in Winchester.

7.B. Are there any pending changes in laws or regulations that may impact the site?

Mr. Marlowe stated that he was not aware of any pending changes in laws or regulations that may impact the site.

8.B. Do you have any suggestions or recommendations regarding the project?

Refer to State/Local Official Question No. 5A.

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

Mr. Marlowe referred to prior discussions concerning the WRA's $100,000 EPA grant to evaluate site reuse and the pending final report due December 31, 2004.

5-YEAR REVIEW QUESTIONS FOR COMMUNITY

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

Mr. Marlowe indicated that he is not involved in any community groups involved in environmental issues or issues related to the Wells G&H Site. His only current involvement is with the WRA.

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

Mr. Marlowe indicated that today, the impact of site operations is miniscule. Historically, however, the news coverage, book, and movie have had a tremendous psychological impact on members of the community.

3.C. Are you aware of any community concerns regarding the site's operation and administration? If so, please give details.

Mr. Marlowe indicated that the site's operation and administration has never been questioned. FACE initially questioned/challenged EPA, but today, EPA's intent is known and understood.

4.C. Are you aware of any events, incidents, or activities at the site (such as emergency responses)? If so, please give details.

Mr. Marlowe answered, "no."

5.C. Do you feel well informed about the site's activities and progress?

Mr. Marlowe answered, "yes" and attributed it to his position on the WRA. He stated that EPA has always been forthcoming, although they only call a meeting when they have a result. He contrasted the "new EPA" with the "old EPA", commenting that the "new EPA" is significantly better. He defined "old" and "new" EPA as pre- and post-Superfund reauthorization (in the early 1980s). After Superfund was reauthorized at that time, Woburn got political attention. He commented favorably on Senator Kennedy's humanitarianism towards those impacted by contamination in Woburn and described it as "tremendous." He is less enamored of Senator Kerry's efforts relative to Woburn contamination.

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

See prior answers.

SUPPLEMENTAL QUESTIONS FOR COMMUNITY GROUPS

1.D. What concerns do you have about the site?

Mr. Marlowe has no concerns as long as the river contamination is not disturbed. He considers the site relatively safe as long as the contamination is not disturbed. He wonders what is gained if you dig up the contaminated sediments given the difficulty of controlling what would move downstream when disturbed. Views capping as a preferred alternative, but still is concerned about disturbing the contamination during capping.

2.D. Are you aware of any other community concerns regarding the site? Provide details.

Mr. Marlowe answered, "no."

3.D. Have the activities to date at the site helped the neighborhood and/or community?

See prior comments about closing the wells and razing the pump houses.

4.D. Are you aware of any events of vandalism or trespassing at the site?

See prior comments about vandalism, trespassing and site access.

5.D. Are you aware of any other activities at the site that might be of importance (e.g., flooding)?

Mr. Marlowe noted flooding and reflected on hurricane Carol in 1954. At the time, Carol caused tremendous flooding and led to the inundation of the area now occupied by the Woburn Mall, etc., north of Route 128. The entire area was flooded as deep as 7 feet because the water could not get through the constriction caused by the highway. With the continued loss of the natural flood plain, Mr. Marlowe wonders about the impact of such a 100-year storm in the future on the contaminants in the river.

6.D. Are you aware of any changes in projected land use at or near the site?

Mr. Marlowe referred to prior discussions concerning the WRA's $100,000 EPA grant to evaluate site reuse and the pending final report due December 31, 2004.

7.D. Is there any sentiment from the community about the future use of groundwater from the site?

See prior comments about Mr. Marlowe's personal objection to the future use of groundwater and related public sentiment.

8.D. Do you have any suggestions or recommendations regarding the project?

Mr. Marlowe referred back to answers provided to prior questions like this, and added that there is tremendous opportunity for community redevelopment associated with the Southwest Properties (Aberjona Autoparts, Whitney Barrel, and Murphy Waste Oil). He would be an advocate of reasonable development of these properties.

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

Mr. Marlowe stated that he has offered the information he wished to share. He emphasized the psychological impact of the contamination on the community. The worst thing that could happen would be to bring more contamination issues to light. If more issues are found, then prove to him that it is necessary to burden the community further.

Mr. Marlowe closed by recommending that Ms. Cindy Stanton Brook be interviewed. She has her own firm, but works on behalf of Monsanto regarding Industri-Plex. He indicated that she had a significant role in the redevelopment of the area, including the Anderson Regional Transportation Center, and has some involvement/interest in the activities at Wells G&H. He was confident that her comments would be interesting.

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	**EPA ID No.:** MAD980732168	
Subject: Five Year Review	**Time:** 5:00 pm	**Date:** 8/31/04
Type: ☐ Telephone ■ Visit ☐ Other **Location of Visit:** Metcalf & Eddy, Inc., Wakefield, Massachusetts	☐ Incoming ☐ Outgoing	

Contact Made By:

Name:	Title:	Organization:
David M. Sullivan, LSP, CHMM	Project Manager	TRC
Diane Silverman, Ph.D	Risk Assessor	Metcalf & Eddy

Individual Contacted:

Name:	Title:	Organization:
Michael Raymond	Resident	City of Woburn
Donna Robbins	Resident	City of Woburn
Linda Raymond	Environmental Activist	Aberjona River Study Coalition, Inc.
Kathy Barry	Environmental Activist	Aberjona River Study Coalition, Inc.
John Ciriello	Resident	City of Woburn

Telephone No.: Various **Fax No.:** **E-Mail Address:**	**Street Address:** Various

Preface: A group interview was conducted with three members of the local community and two members of the Aberjona Study Coalition (ASC). The ASC represents six communities (Woburn, Wilmington, Reading, Winchester, Medford, and Arlington) with an approximate population of 225,000.

The three local community members included Michael Raymond, Donna Robbins, and John Ciriello. John Ciriello is also a Ward 6 Councilor, but participated in the interview as a resident of Woburn, not as an elected official. Donna Robbins is a past member and co-founder of the environmental group FACE (For A Cleaner Environment). Linda Raymond and Kathy Barry are members of ASC. Linda Raymond, wife of Michael Raymond, is a resident of Woburn. Kathy Barry is a resident of the Town of Wilmington.

Prior to the interview, TRC and M&E engaged in an informal discussion of current status and recent progress at the Wells G&H site. During this discussion, the interviewees commented on a variety of site-related topics. Michael Raymond and others commented about the plans for constructing an ice rink at the Aberjona Autoparts facility on Salem Street. The interviewees were curious about a letter issued by the Environmental Protection Agency (EPA) to the current owner of the Aberjona Autoparts property (Bob Holland). Apparently, an attorney for the property owner represented before a local Special Permit Meeting that he had a letter "with EPA's blessing" to proceed with the ice rink project. John Ciriello asked for a copy of the letter and indicated that the attorney was reluctant to reveal the conditions in the letter and indicated that he was not sure if the letter was open to the public. The group indicated that they are interested in obtaining the letter so that the property owner's adherence to the conditions can be monitored (perhaps as part of local permitting conditions). One interviewee indicated that they have attempted to get the letter from EPA. None of the interviewees had obtained the letter as of the time of the interview.

The discussion lead to comments provided by ASC courtesy of their consultants (Cambridge Environmental, Inc.) on the Aberjona River Study. Stephen Zemba and Anne Marie Desmariais were mentioned as human health risk assessor, and Bonnie Potocki as the ecological risk assessors. The interviewees noted that for the most part, they are focused on the Aberjona River Study, but they are interested in the work conducted, and accomplished, at the other Operable Units (OUs).

5-YEAR REVIEW QUESTIONS FOR COMMUNITY

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

Donna Robbins commented that the whole idea of the project is good and she hopes that there is a good outcome. She hopes that everything is out in the open.

Kathy Barry of ASC noted that this is a formidable project. It affords EPA the opportunity to see what is in the aquifer. As long as EPA is objective, EPA can come up with reasonable remedial options. Given the knowledge from the Aberjona River Study and other study efforts, EPA should be able to give everyone a sense of comfort that everything is being taken care of, such as flooding issues, etc. Ms. Barry would also like to have the studies conducted by EPA north of Route 128 include the sites in Wilmington, specifically the south Wilmington area. Not just the Olin site, but Raffi & Swanson, Ritter Trucking, Whitney Barrel. Ms. Barry noted that N-nitrosodimethylamine (NDMA) was implicated in the Wilmington drinking water supply well closures. She noted that the NDMA is forming in-situ. She also mentioned some analyses that were performed that indicated contamination with a variety of organic chemical compounds.

Michael Raymond wants EPA to focus more on people than on the business community. The 3500 page report [the Aberjona River Study] and the report findings seemed to him to "side with business interests" because the remediation standards were not as stringent as he felt they could have been. They hear they can go into the cranberry bog or the wetland, but just wear boots and gloves. But what about the pets who run into the bog and wetland? What about what they track home? He noted that these concerns were also articulated in the ASC comments on the Aberjona River Study.

Linda Raymond thought that EPA should consider all aspects of the river study area. EPA needs to involve the whole river. EPA needs to go all the way to the end of the river. She noted the 225,000 residents that the ASC represents and stressed her desire for EPA to do everything they can to remedy the river.

John Ciriello echoed Kathy Barry and Linda Raymond's remarks. Knowing the boundaries of the river, they want the river study to go far enough north and include the landfills, Olin Chemical, etc.

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

Donna Robbins initially offered no response. However, as the group conversation proceeded, she called for the Woburn and Wilmington governments to work together and get more involved with the contamination situations. She expressed disappointment that people do not want to hear about the contamination unless their lives have been touched by it. She referred to it as a "head in the sand attitude."

Michael Raymond felt that the site has not gotten enough publicity. He expressed how he and other he knows found out more about the Source Areas and other aspects of the site from Scott Bair of Ohio State University than they have from EPA. He felt that people might want to know more about the successful aspects of the site or even the moderately successful things.

Kathy Barry thought it would be impressive to see what has been done. She felt that others would be interested, too. She felt that some additional Public Relations efforts would be great. She acknowledged the city government's concern with stigma, but feels it would be good to bring out the story of what has been accomplished. Focus on the good things that have been achieved. She personally wants an objective assessment of what has been accomplished.

Kathy Barry added that EPA should get the information on the achievements out to the public to improve people's skepticism. She commented that people think that ASC is trying to "bring things down", but she feels that ASC is trying to disseminate the available information. She feels that the attitude of the general public can be turned around by providing more information and making it more accessible.

John Ciriello felt that if you can explain that some things have gotten better (e.g., the cleanup achieved to date at the Source Areas), then the outlook of people could change.

The group acknowledged that when meetings are conducted, people do not attend. No public officials for example were present at Scott Bair's presentation of the animated modeling results, which they found extremely interesting. Subsequent conversation centered on how to improve this situation and get more people interested. Later responses to questions return to this topic.

3.A. Are you aware of any community concerns regarding the site's operation and administration? If so, please give details.

Each interviewee answered, "no."

4.A. Are you aware of any events, incidents, or activities at the site (such as emergency responses)? If so, please give details.

Donna Robbins was not aware of any emergency incidents. However, she expressed disappointment with the dumping evident on City of Woburn property by Wells G&H. She's seen a lot of dumping over the years that she has visited the site and feels the City should be more responsible about preventing it and should make the area more secure so as to prevent dumping. She noted the presence of tree stumps and debris and stated that you cannot get near Well G due to the build up of material. There is also dumping near Well H. She feels the continued dumping in the area reflects how much the city really cares.

Donna Robbins further commented that she doesn't see much progress at the site and feels the ice rink proposed for the Aberjona property should be put in a safer location.

She commented that if Senator Kennedy and others had to visit the site in white suits, then what about the kids? Her fear is that they will push the rink through without much cleanup and she doesn't think it is right. She also fears that they will use water from the Aberjona for the ice.

Michael Raymond noted that not one person stood up to complain about building the rink on a contaminated site.

Donna Robbins told the story of an indifferent response by the City to a hazmat incident at the 3M facility that she felt was indicative of the City's overall attitude towards contamination issues.

Kathy Barry is afraid of a band-aid approach from the City to the site and contamination issues.

Donna Robbins felt that people are still going to be at risk. She does not feel anything is going to get cleaned up enough to be safe. She feels that there is not enough policing of North Woburn and Wilmington industries and their hazardous materials practices. She noted that Mishawum Lake has been re-routed, etc., without much concern for contamination. The City keeps letting things happen. They don't seriously care about protecting natural resources. They are not concerned. She feels that they are complacent. She feels the site has been "studied to death" and then nothing visible happens. What good does it do? She does not see good results.

5.A. Do you feel well informed about the site's activities and progress?

Each interviewee answered, "no." (See prior remarks for comments related to this issue.) Member of the ASC felt that due to their involvement with the site that they are more informed than the general public, which they feel is not well informed. They feel that the ASC is trying to educate the public and that they are a conduit for information. The want more information from EPA and others so they can address the perceived need for information. They feel that they are between the "officials" and the public in this role. The feel they are not perpetuating the negative aspects. They want to bring out the positive information about the site, but at the same time not ignore the "lapses." They do not have the funds to get to where they want to go with their organization. They feel the Potentially Responsible Parties (PRPs) should "step up to the plate" to help provide information.

They feel the studies use a lot of tax dollars that could be applied toward cleanup. They mentioned their own out-of-pocket expenses to support their activities.

TRC/M&E noted to the interviewees that EPA does engage in cost recovery from the PRPs that defray some of EPA's costs. They were pleased that this is the case.

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

The interviewees felt that this topic had been covered in prior responses.

SUPPLEMENTAL QUESTIONS FOR COMMUNITY GROUPS

1.B. What concerns do you have about the site?

John Ciriello expressed concern with not knowing what contamination is there and how it interacts with other contamination that has been released (i.e., synergistic effects). He expressed fear of the unknown and fear that the site will never be cleaned. He stated that he would rather know that it couldn't be cleaned than to be provided an unrealistic expectation for success.

2.B. Are you aware of any other community concerns regarding the site? Provide details.

Linda Raymond noted that ASC represents six community groups in Reading, Medford, Winchester, Woburn, Wilmington, and Arlington (approximately 225,000 residents).

Michael Raymond added that Winchester and Medford are concerned that the floodplain delineation is poorly written and the river contamination could still affect them through flooding. He's heard stories of people wondering what MIT people are doing in their neighborhood and being told that they are investigating Industri-Plex contamination, when they thought they were outside the floodplain.

Kathy Barry has also heard concerns that storm and flood flows could cause contamination to impact people downstream.

Linda Raymond noted concern with the unlined Woburn landfill and the effects of this source of contamination on the aquifer and watershed. She has heard of beryllium contamination attributed to the landfill. She indicated that the construction manager for the landfill said the contamination would still come out despite the actions taken to address the landfill. She also mentioned that the Phase II report for the Olin site indicates that contamination is flowing into the East Ditch, which flows into the Halls Brook Holding Area (HBHA).

3.B. Have the activities to date at the site helped the neighborhood and/or community?

The interviewees answered "no." Some commented that what you see when you drive around the site is "the same old barbed wire." You see no real change. People do not know what is really happening at the site in terms of treatment, etc. The group all expressed interest in greater communication on progress. They suggested putting the information in the media rather than conducting meetings. The local residents do not tend to attend informational meetings.

Michael Raymond noted the awareness of rumors of the development of the Grace property. People are very interested in this development. Some question whether the site is clean enough to be occupied again.

Linda Raymond mentioned ASC's website as facilitating the dissemination of information regarding the site.

Donna Robbins thought that small amounts of information on site progress, etc., provided through the newspaper or local cable station might help inform the public better. She thought the interviews on the cable television station might be another means of getting people interested.

One of the interviewees thought that "tickler" messages on the local cable station would help (e.g., "See update on cleanup progress at Wells G&H Website.")

4.B. Are you aware of any events of vandalism or trespassing at the site?

The interviewees noted the frequent instances of unauthorized dumping near the site.

Donna Robbins noted a picture taken some years back of a tanker truck abandoned in the area of the site with a sign that read, "Do not drink the water."

5.B. Are you aware of any other activities at the site that might be of importance (e.g., flooding)?

Ms. Robbins commented about her concerns regarding how future building and incremental encroachment will change the flow of water and impact/exacerbate flooding leading to greater potential to spread contamination.

Some in the group discussed the discovery of arsenic contamination at the Winchester high school ball field that was attributed to recent flooding and deposition of arsenic contamination from the Aberjona River. They felt that the Aberjona River Study should address this type of contamination all the way down the river.

6.B. Are you aware of any changes in projected land use at or near the site?

The interviewees noted their awareness of changes in projected land use at or near the site and felt the content of prior responses covered this topic.

7.B. Is there any sentiment from the community about the future use of groundwater from the site?

The interviewees expressed strong feelings about the potential for re-opening the wells. Some felt that if the wells were re-opened, it would "add insult to injury." Some expressed that it is insulting to have it as a consideration.

As the discussion unfolded, some wondered what really is preventing the cleanup of the water. Others raised the connections between destroyed lives and the wells. The connection to the tragedy was mentioned as the crux of the aquifer re-use question. One interviewee alluded to an emerging cancer situation that may be evolving in the Town of Wilmington.

John Ciriello thought that the use of the Wells G&H water supply will have to be considered down the road as water supplies run scarce. He thought that they should not have to wait for feelings to die down and wondered what it would take to fix the contamination problem.

Donna Robbins felt that the Wells G&H area is not a good place to start as a water supply given the contamination and industrial land use in the area.

Others noted that Wells G&H, when operating, could pull in contamination from a wide area. The area would have to be "clean" first before considering re-use of the aquifer. Sources of contamination need to be identified and cleaned.

Kathy Barry noted that she doesn't feel confident that the water supply could be used at this time, and that any future use will require lots of public relations and confidence building. She noted that Wilmington was forced to shut down their wells, but that there is willingness to bring them back on line with a treatment system. Wilmington does not want to abandon the wells.

Linda Raymond wondered who sets the standard for clean.

8.B. Do you have any suggestions or recommendations regarding the project?

The interviewees felt that someone needs to closely police the industrial activities all through Woburn, Wilmington, etc. Some suggested annual inspections, but did not express confidence in local officials to do this work. They felt a greater authority was needed.

They expressed that EPA needs to use its governing authority more strongly to establish good practices. They are looking for more "stick" than "carrot." They felt that local officials do not have sufficient incentive to accomplish this task. Contrary opinions were expressed that felt that EPA would not perform a task like this anytime soon.

All agreed that EPA should expand their efforts to all who are accountable for contamination in the area.

Some felt that companies in the area are not complying with the rules that are already out there. If releases happen, they feel that they are not likely to be reported.

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

The interviewees noted a petition letter citing objections to the proposed New England Transrail, LLC project in Wilmington and Woburn. They are concerned about spills that could happen at this proposed transfer station that could affect the Aberjona watershed. They cited environmental justice as a basis for objecting to the project, noting the disproportionate amount of Superfund Sites and other release sites in the area.

They asked, "Why clean the Wells G&H aquifer if you are going to invite this operation in?" They felt that the Federal report prepared for the Transrail project has a "tough luck" tone.

The Transrail facility opens the door to bring in all kinds of waste to the area. They are concerned that residential areas are nearby. They understand that the project proponents would entertain handling radioactive waste.

The interviewees felt that if the New England Transrail project goes through, that it could catalyze other such developments. In their opinion, the region has "had enough." They felt that allowing this type of operation to proceed is contrary to what EPA is trying to accomplish with cleanup in the area.

Others mentioned the acceptance of fly ash at the Woburn landfill.

The interviewees noted in closing that because of money, greed, etc., industry is invited in at the detriment of what EPA in trying to accomplish in terms of cleanup.

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	**EPA ID No.:** MAD980732168
Subject: Five Year Review	**Time:** 5:15 pm / **Date:** 8/25/04
Type: ☐ Telephone ■ Visit ☐ Other **Location of Visit:** Metcalf & Eddy, Inc., Wakefield, MA	☐ Incoming ☐ Outgoing N/A

Contact Made By:

Name:	Title:	Organization:
David M. Sullivan, LSP, CHMM	Project Manager	TRC
Diane Silverman, Ph.D.	Risk Assessor	Metcalf & Eddy

Individual Contacted:

Name:	Title:	Organization:
Gretchen P. Latowsky	Environmental Activist	For a Cleaner Environment (FACE)

Telephone No.:
Fax No.:
E-mail Address:

Preface: Ms. Gretchen P. Latowsky was interviewed due to her long-standing involvement with local environmental groups, particularly the Woburn organization For A Cleaner Environment (FACE). Ms. Latowsky, a resident of the Town of Reading, became involved due to the "Woburn Odor", which was associated with a contractor's excavation of buried hides on the Industri-Plex site in North Woburn. Prevailing winds carried strong odors from the decaying hides to the Town of Reading.

Ms. Latowsky's direct involvement with FACE and Woburn environmental issues has lessened in recent years, but she remains committed to environmentalism. An example of her current involvement with environmental issues is her seat on the Massachusetts Licensed Site Professional Board. Prior to the interview, TRC and M&E engaged in an informal discussion of current status and recent progress at the Wells G&H site. During this discussion, Ms. Latowsky commented that she has not been involved in recent developments at the Wells G&H site, but added that she reviewed some materials on the Environmental Protection Agency (EPA) Wells G&H web site to help prepare for the interview.

The discussion lead to the status of the Southwest Properties Sites and historic aerial photographs, referred to as 'EPIC', that shows overlays of successive changes in land use. She also noted her past involvement in a court case involving the PRPs for the Olympia Site, who sought relief from Superfund liability. She commented on some of the changes in land use, recollecting from the EPIC photos that a tannery facility may have been located near the current Patriot flooring facility. She noted that the EPIC photos might be available from Massachusetts Department of Environmental Protection (MADEP) personnel (Anna Mayor or Jay Naparstek). She also noted a series of 150 photographs taken along the Aberjona River in the 1920s by the Massachusetts Department of Fisheries and Wildlife that depict outfalls and lagoons. She offered to provide the photographs for our use.

5-YEAR REVIEW QUESTIONS FOR COMMUNITY

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

Ms. Latowsky stated that it is nice to see the project progressing, although she finds that fact that the project has taken 25 years to get this far to be shocking. She appreciates, however, the level of technical attention the project is now receiving and feels that compares favorably to the work conducted by Ecology & Environment, Inc. (E&E) in the 1980s. She feels that the level of remediation accomplished has been minimal and feels that is good that no one has used the water in the mean time.

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

Ms. Latowsky felt that this was a difficult question for her to answer. She has not been closely involved with the project lately and is not a Woburn resident. It has had little or no effect on the Town of Reading where she lives.

3.A. Are you aware of any community concerns regarding the site's operation and administration? If so, please give details.

Mr. Latowsky felt this question, too, was difficult for her to answer since she has not been closely involved with the project lately and is not a Woburn resident. She does not get the Woburn paper and has not been deeply involved lately.

4.A. Are you aware of any events, incidents, or activities at the site (such as emergency responses)? If so, please give details.

See replies to Questions 2.A and 3.A.

5.A. Do you feel well informed about the site's activities and progress?

Ms. Latowsky appreciated being updated during the preface to the interview. It refocused her interest in what is going on. She finds the site interesting and commented that you cannot help but be interested in it.

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

Ms. Latowsky felt that she cannot comment, positively or negatively, since she has not be very involved recently.

SUPPLEMENTAL QUESTIONS FOR COMMUNITY GROUPS

1.B. What concerns do you have about the site?

Ms. Latowsky's primary concern is the amount of time it is taking to reach a remedy. She recognizes that some of the 'legalistic' aspects of Superfund have contributed to the pace of the work. She is concerned about what is migrating down river and the impact of the migrating contamination on the Mystic Lakes. She wonders if there will ever be a cleanup. She is also concerned about the cover at Industri-Plex and how it has had no affect on oxidation-reduction conditions in groundwater and the associated migration of arsenic and chromium in groundwater. She is interested in understanding what has been done to address arsenic and chromium in groundwater at Industri-Plex because the remedy that was implemented has no impact on this migration. She commented that the mechanisms causing the migration were revealed after the Record of Decision (ROD) and noted that EPA did not go back go re-open the ROD. She feels the legalistic aspect of the Superfund process and the difficulties with negotiating with 29 PRPs contributed to the failure to revisit this issue at the time. She recalls efforts to try to get EPA to address the issue, but they did not work. She was disappointed with this outcome at Industri-Plex.

2.B. Are you aware of any other community concerns regarding the site? Provide details.

Ms. Latowsky answered, "no."

3.B. Have the activities to date at the site helped the neighborhood and/or community?

Ms. Latowsky noted that when she used to give talks, she would say that the only actions that helped was the fencing of Industri-Plex and the closing of Wells G&H, although she was not impressed with the demolition of the pump houses. With regard to Industri-Plex, she commented that the purpose of the cap (approximately $100,000) was to prevent contact, and for that purpose they did not need a $50 million dollar remedy. After all that money, there still is not a remedy in place for groundwater at Industri-Plex. She also wonders if there are any other sources out there.

4.B. Are you aware of any events of vandalism or trespassing at the site?

Ms. Latowsky answered, "no." She recalls some illegal dumping. She also recalled a walk at the Industri-Plex property about 10 years after the discovery of the Industri-Plex contamination where they encountered illegal dumped drums, which she reported to MADEP.

5.B. Are you aware of any other activities at the site that might be of importance (e.g., flooding)?

Ms. Latowsky answered, "no." She commented again that her involvement with the site has been less in recent years. She is concerned about talk of a new ice rink at the Aberjona Autoparts property and wondered if it would be protective and whether the autobody shop would remain. She recalled strong chemical odors from the autobody shop in the past.

6.B. Are you aware of any changes in projected land use at or near the site?

Ms. Latowsky is only familiar with the talk of the new ice rink at Aberjona Autoparts.

7.B. Is there any sentiment from the community about the future use of groundwater from the site?

Ms. Latowsky felt certain that the people in Woburn would not want to use that water as long as anyone is around that remembers the events and the 29 cases of leukemia. She recalled a presentation conducted by MADEP regarding wellhead treatment that was not well received. They received a very negative reaction from the residents.

8.B. Do you have any suggestions or recommendations regarding the project?

Ms. Latowsky is concerned about the on-going effects of contamination and the migration of arsenic and chromium in the Aberjona River. She wants to see the mechanism responsible for the continued migration of arsenic and chromium to be addressed. She mentioned that Harold Hemond of the Massachusetts Institute of Technology (MIT) informed her that the mechanism of release could go on for a century. She also asked whether soil samples were collected along the river as part of the Aberjona River Study. [Dr. Silverman of M&E, who worked on the river study, informed Ms. Latowsky that soil samples had been collected in the Aberjona River floodplain].

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

Ms. Latowsky stated that she offered that information during the course of the interview.

However, she asked about the Olin site in Wilmington and would like to be more informed about that site.

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	EPA ID No.: MAD980732168	
Subject: Five Year Review	Time: 10:30 am	Date: 8/03/04
Type: ☐ Telephone ■ Visit ☐ Other Location of Visit: W.R. Grace Property, Woburn, MA	☐ Incoming ☐ Outgoing N/A	

Contact Made By:

Name:	Title:	Organization:
Andrew H. Smyth	Project Hydrogelogist	TRC
Joanna M. Hall	Vice President	TRC
Diane Silverman	Risk Assessor	Metcalf & Eddy

Individuals Contacted:

Name:	Title:	Organization:
Jonathan R. Bridge	Associate/Sr. Hydrogeologist	GeoTrans, Inc.
Maryellen C. Johns	Senior Project Engineer	Remedium Group (A Subsidiary of Grace)

<u>J. Bridge</u> Telephone No.: 508-376-1200 Fax No.: E-mail Address:	Street Address 1532 Route 9, Suite 2 Clifton Park, NY 12065
<u>M. Johns</u> Telephone No.: 617-498-2668 Fax No.: E-mail Address:	Street Address 1532 Route 9, Suite 2 Clifton Park, NY 12065

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

Maryellen Johns - Remedium Group (A subsidiary of Grace), Jonathan Bridge - GeoTrans
System is working fine - as anticipated.

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

Remedy is functioning as expected and is working fine

3.A. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

Yes, in 5 years each well decreased for all COCs

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

frequency of site inspections and activities.

Monthly water level measurement; monthly sampling of influent/effluent and mid point between carbon canisters - flow totalizers are present for each recovery well.

Weekly - Site Visit

Annual - Water level measurement and sampling of 12 monitoring wells and recovery wells.

Alarm system sends message to Handex (the primary O&M company); data goes to GeoTrans and is maintained by them.

5.A. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routes 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.

Change treatment from UV/peroxide to carbon only (May 02 submitted Work Plan) also changed frequency and number of wells; and use of diffusion bags instead of groundwater sampling - separate approvals from EPA for these changes- no change since then.

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

Reliability of pneumatic pumps initially - hose connections - fixed later; UV system unreliable and costly - bulbs failed; issues with bulb getting hot; problems pumping peroxide; system shut-down frequently.

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

In 1997, Grace shut off 6 recovery wells (Recovery Well 1 thru 6) due to declining concentration and flow. The shut off of the wells was approved by EPA;. Additional monitoring was required after the shut off, then approval to stop the additional monitoring was received from EPA. Wells are now filled with concrete.

Recovery Well 22 (presumed location of small solvent dumping near door); groundwater was 20 ppm . First 6 years cycled pumping, now constant and concentrations declining to 300 ppb.

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

No suggestions.

SUPPLEMENTAL QUESTIONS

Groundwater Cleanup

1.B. Are certain wells continuing to have high detections while others are dropping? What explains these results?

Down to ppb concentrations in all wells. RW-22 has highest levels (possibly due to dumping of spent degreaser solvent by back door?).

2.B. Has the mix of contaminants changed in the monitoring or treatment system? What accounts for these changes?

Not in 12 years; prior, were pulling in PCE (from east of site), vinyl chloride first few years, now ND.

3.B. Is there an indication that DNAPL or LNAPL is present? How have you checked or verified?

Never seen DNAPL - don't check. Concentrations do not indicate the presence of DNAPL.

4.B. Discuss how the treatment processes changed or have been adjusted over time.

See above. Now using a carbon only treatment system previously pretreated with UV/Ox and hydrogen peroxide

5.B. How have pumping rates changed over time and why have they changed?

5 or 6 gpm; fluctuate with rainfall and soil conductivity in different areas.

6.B. What are your most recent projections for achieving cleanup overall or in subportions of the site?

Never made estimates.

7.B. What changes do you anticipate will be made in the operation of the system as subportions of the site are cleaned-up?

Nothing noted.

8.B. Do you expect cleanup to be achieved below regulatory prescribed levels or do you envision that a constant/asymptotic level of contamination will remain above numerical cleanup criteria?

No expectations

9.B. Are you considering pulsing the pumping operation in a different manner than in the past? Has pulsing helped?

No changes being considered. Have shut down several wells in the past which had resulted in changes in the amount of total pumping.

Potential Local Contaminant/Hydraulic Impacts/Effects

10.B. What upgradient sites are believed to be impacting site cleanup and to what degree? Are there any suggested steps that could be taken to deal with impacts?

Grace has discussed this many times with EPA. Consider that offsite PCE is entering the site from the South due to the groundwater drawdown at the Grace site.

11.B. Are you noticing the impact of offsite entities on the aquifer in terms of offsite pumping or other hydraulic impacts that may be impacting the local water table?

Grace sees hydraulic effects from the Unifirst groundwater recovery system across the road to the west.

12.B. How has the natural gradient changed and are seasonal gradients present that vary from the average yearly gradient? Does the system function best at low water table or high water table or somewhere in between?

Only do annual water level monitoring. No change in system due to water levels; batch processing now. Water levels did affect the old system.

Nature and Extent

13.B. What is the integrity of the facility sewers? Is it possible that there are continuing sources of release at the site from buried pipelines and tanks?

Sewers present; only smoke testing conducted of the sewers to determine the discharge locations for different portions of the building. The smoke testing was conducted many years ago. Currently storm drain are present; sanitary sewer connection to buildings; utilities from main building stormwater catch basins; no underground tanks. The building are essentially unoccupied except for some operations and maintenance staff.

14.B. Is there any known surficial soil contamination remaining at the property?

Soil contamination likely present by RW-22. At this location workers likely disposed of used solvents to the ground.

Reporting

15.B. What site investigation and remediation reports have been generated in the past 5 years?

No reports other than the monthly status and annual reports

16.B. Provide a summary of the types of problems or errors that have been made in the prior 5 years.

Historically, had problems maintaining the UV/Ox system and beavers had caused flooding in the wetlands near the treatment system discharge pipe.

17.B. Have you conducted a regulatory compliance audit (internal or external) and is a report available describing any deficiencies identified?

No audits conducted at facility or of Handex.

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

No.

Land Use

19.B. Has site ownership changed?

No.

20.B. Has site occupancy changed? Are there any occupancy changes in the foreseeable future? If so, please describe.

Not since 1995. The site was used as a warehouse prior to 1995. Currently marketing the property and there has been active interest by a restaurant. Working on rezoning the property for commercial uses.

21.B. What is the zoning of the property? Are there any institutional controls/deed restrictions in place?

Industrial zoning. No institutional controls/restrictions.

22.B. Are there new industrial processes occurring at the site or has there been a change in chemicals used at the site?

Not recently. The facility is inactive except that some storage warehousing occurs at the site. No longer store hydrogen peroxide onsite since shutdown of the UV/Ox system.

23.B. What are the current uses of the property (indoor and outdoor [landscaping])?

Currently warehouse and main building storage.

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

Varies, about twice a week an employee of the facilities management company is on-site for maintenance and checking alarms/fencing.

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

Grace is negotiating long-term lease for transition to a restaurant/park - preliminary. Maryellen has talked to Joe LeMay about this.

26.B. Is groundwater currently used (e.g., as process water) on the property?

Not since 1995.

27.B. Are there plans to use groundwater on-site in the future?

Not at this time.

Exposure Information

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

Fence installed in Spring 1992, however the fence does not completely enclose the site. Near the Cummins Property there is a 300 foot gap in the fencing. The unfenced area is mostly wetlands. Note that institutional controls were not part of the remedy.

29.B. Is there evidence or sightings of trespassers on the property? If yes, how often and what type of activities do they engage in?

No evidence to their knowledge.

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

No vandalism.

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

Beaver dam construction, did not get flooded. Water level in the wetland did increase.

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

No complaints.

Wrap-Up

33.B. Do you have any recommendations for reducing or increasing activities at the site?

None

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

G36 well was replaced because a bailer got stuck inside.

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	**EPA ID No.:** MAD980732168
Subject: Five Year Review	**Time:** 8:00 am — **Date:** 8/03/04
Type: ☐ Telephone ■ Visit ☐ Other **Location of Visit:** Unifirst Property, Woburn, MA	☐ Incoming ☐ Outgoing N/A

Contact Made By:

Name:	Title:	Organization:
Andrew H. Smyth, P.G., LSP	Project Hydrogeologist	TRC
Joanna M. Hall	Vice President	TRC
Diane Silverman, Ph.D.	Risk Assessor	Metcalf & Eddy

Individual Contacted:

Name:	Title:	Organization:
Timothy M. Cosgrave	Project Manager	Harvard Project Services (consultant to UniFirst)

Telephone No: 978-772-1105 **Fax No:** **E-Mail Address:** tcosgrave@harvardprojects.com	**Street Address:** 249 Ayer Road, Suite 206 Harvard, MA 01451-1132

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

Tim Cosgrave , Harvard Project Services - Only maintains the onsite treatment system, so he is not aware of other issues like pumping rates etc. Johnson Company would have more information.

System is running; monitoring is occurring; system is capturing groundwater.

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

Yes, it is doing what was expected; system functioning as designed.

3.A. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

No dramatic decreases are occurring now, although there were earlier in the project. Michael Moore with Johnson Company has more of the big picture.

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

Site visit by Tim Cosgrave once a week to physically check on status.

He dials in at least once a week additionally to check w/data logger.

System automatically pages Tim Cosgrave when it goes down and he goes to check on problem.

Compliance sampling on final discharge once a month, every other month collects influent and uses data to prepare monthly reports.

April each year, samples 26 monitoring wells at the same time as Grace to prepare annual report (submitted in November).

5.A. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routes 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.

In October 2003, rewrote O&M plan (EPA approved); made changes for virgin carbon system to replace peroxide (UV/Ox) - concentrations of the PCE not high enough (to justify using UV/Ox). The carbon treatments system is expected to be less costly; system was originally designed for 10,000 ppb; concentrations never above 3,000 ppb; now at 500 ppb. UV/Ox system was expensive due to power demands. Carbon system is acceptable because no vinyl chloride present. Calibration of system ongoing.

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

None recently but, Boston Edison power supply was up and down when using UV/Ox - many power outages and he had to reset system often (system reset with difficulty). New system resets easily. Planning for a remote start-up of the new system.

2001 or 2002 spring rains clogged the multimedia filter, but not many other problems since changeover to carbon.

TCA tends to pass through system.

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

Carbon is lasting as long as was calculated (approximately 3 months). Not sure if cost of filter is more or less; would have to speak with Johnson Company. Also, he is not familiar with the pumping side.

TCA has no limit in ROD. It is detected at <5ppb in the effluent. Always use virgin carbon, 1000 to 1200 lbs per tank with 3 tanks in series. May increase mass of carbon in tanks so tanks last longer. Used carbon shipped offsite as non-hazardous.

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

None but PRP would probably prefer less frequent sampling of site.

SUPPLEMENTAL QUESTIONS

Groundwater Cleanup

1.B. Are certain wells continuing to have high detections while others are dropping? What explains these results?

NA. Slowly decreasing trends overall; no information on specific wells.

2.B. Has the mix of contaminants changed in the monitoring or treatment system? What accounts for these changes?

He does not think so.

3.B. Is there an indication that DNAPL or LNAPL is present? How have you checked or verified?

He has not checked for DNAPL lately, but this site is known to be a DNAPL site.

4.B. Discuss how the treatment processes changed or have been adjusted over time.

See above change to all carbon.

5.B. How have pumping rates changed over time and why have they changed?

He cannot answer. Speak with Johnson Company. The goal is to maintain a groundwater elevation of 15 feet above sea level. Pumping rates vary to meet this goal. Currently having trouble maintaining the 15 feet elevation because new pump installed within the last 2 weeks has inadequate pumping capacity.

6.B. What are your most recent projections for achieving cleanup overall or in subportions of the site?

He has never calaculated or projected an expected cleanup period. Speak with Johnson Company.

7.B. What changes do you anticipate will be made in the operation of the system as subportions of the site are cleaned-up?

None for now, Because of the bedrock fractures it is difficult to isolate one portion of the site. Speak with Johnson Company.

8.B. Do you expect cleanup to be achieved below regulatory prescribed levels or do you envision that a constant/asymptotic level of contamination will remain above numerical cleanup criteria?

Contamination levels have steadied and he was not sure if the concentrations would drop over time. Speak with Johnson Company.

9.B. Are you considering pulsing the pumping operation in a different manner than in the past? Has pulsing helped?

The system is not pulsed. Speak with Johnson Company.

<u>Potential Local Contaminant/Hydraulic Impacts/Effects</u>

10.B. What upgradient sites are believed to be impacting site cleanup and to what degree? Are there any suggested steps that could be taken to deal with impacts?

Speak with Johnson Company. Noted that deep groundwater from the W.R. Grace site should be impacting Unifirst since the Grace treatment system is a shallow treatment system and the Unifirst system is designed to assist in the collection of Grace's deep plume.

11.B. Are you noticing the impact of offsite entities on the aquifer in terms of offsite pumping or other hydraulic impacts that may be impacting the local water table?

He indicated that there did not appear to be any offsite impacts. Speak with Johnson Company.

12.B. How has the natural gradient changed and are seasonal gradients present that vary from the average yearly gradient? Does the system function best at low water table or high water table or somewhere in between?

Haven't looked at seasonal groundwater levels since early nineties. Monitor levels once a year in April. The system appears to struggle when groundwater elevations are highest (e.g., Spring). Recovery has decreased over the years. During spring rain events the groundwater is much more turbid and that causes problems with the filter systems.

<u>Nature and Extent</u>

13.B. What is the integrity of the facility sewers? Is it possible that there are continuing sources of release at the site from buried pipelines and tanks?

He cannot answer. Speak with Johnson Company. But PCE was not used on-site (no dry cleaning performed on-site); PCE only stored in tanks to buffer the price.

14.B. Is there any known surficial soil contamination remaining at the property?

Haven't looked at soil contamination. Site is mostly paved. Soil contamination is likely deep and below the loading dock. The original contamination was assessed as being from PCE unloading to the storage tank in the loading dock. The working theory is that after the PCE was pumped to the tank that the filler hose was allowed to empty to the ground in the dock area. The dock was drained to a dry well and that resulted in releases to soil and groundwater. The dock area is now covered by a building and is inaccessible. Once the groundwater is cleaned-up then soil can be remediated. If the groundwater is not cleaned-up first then the soil could become recontaminated.

<u>Reporting</u>

15.B. What site investigation and remediation reports have been generated in the past 5 years?

Only the status and monitoring reports.

16.B. Provide a summary of the types of problems or errors that have been

made in the prior 5 years.

No major problems but did originally have problems with obtaining a steady electricity supply and during spring rains extra time was required to maintain the system.

17.B. Have you conducted a regulatory compliance audit (internal or external) and is a report available describing any deficiencies identified?

Unifirst corporate has conducted audits. No reports other than monthly status and annual reports.

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

None of which he is aware.

Land Use

19.B. Has site ownership changed?

No (owned by Unifirst).

20.B. Has site occupancy changed? Are there any occupancy changes in the foreseeable future? If so, please describe.

Site has been and continues to be used for storage with minimal office space (on average, 2 people on-site). No plans to change site use that he is aware of.

21.B. What is the zoning of the property? Are there any institutional controls/deed restrictions in place?

Not sure.

22.B. Are there new industrial processes occurring at the site or has there been a change in chemicals used at the site?

Facility was used for storage not manufacture - PCE stored in a 5000 gallon tank - transferred to other facilities for their use - likely cause of release. The treatment plant still contains a half full tank of peroxide despite that the peroxide system is no longer part of the treatment system.

23.B. What are the current uses of the property (indoor and outdoor [landscaping])?

Storage and office space. Most of site is paved. Small number of unpaved areas are periodically maintained by weed wacking.

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

Daily, 5 or 6 days a week (storage facility open Monday - Saturday), one shift per day.

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

Same use.

26.B. Is groundwater currently used (e.g., as process water) on the property?

No.

27.B. Are there plans to use groundwater on-site in the future?

No.

Exposure Information

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

The site is fully fenced. The gate is unlocked during normal business hours (Monday - Saturday). The gate is locked at night. However, several locks were missing from monitoring wells.

29.B. Is there evidence or sightings of trespassers on the property? If yes, how often and what type of activities do they engage in?

Trespassers have not been noted.

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

No vandalism has occurred. The treatment system is housed and secured.

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

None

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

No community complaints.

Wrap-Up

33.B. Do you have any recommendations for reducing or increasing activities at the site?

No.

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

No.

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	**EPA ID No.:** MAD980732168	
Subject: Five Year Review	**Time:** 10:00 am	**Date:** 8/18/04
Type: ☐ Telephone ■ Visit ☐ Other **Location of Visit:** Wildwood Property, Woburn, MA	☐ Incoming ☐ Outgoing N/A	

Contact Made By:

Name:	Title:	Organization:
David M. Sullivan, LSP, CHMM	Project Manager	TRC
Mike Plumb, PE	Remedial Engineer	TRC
Diane Silverman, Ph.D.	Risk Assessor	Metcalf & Eddy

Individual Contacted:

Name:	Title:	Organization:
James R. Greacen	Project Manager	The RETEC Group
Peter Cox	Project Geologist	(Consultant to Beatrice)
Brenden Maye	Treatment System Operator	

Contact Information for J. Greacen
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Preface: In this interview, James R. Greacen, Project Manager and Senior Hydrogeologist with The RETEC Group (RETEC), was the representative for the Wildwood Conservation Corporation (Wildwood) property. Also in attendance were Peter Cox, Geologist with RETEC, and Brenden Maye, the treatment system operator for RETEC. Mr. Cox and Mr. Maye periodically supported Mr. Greacen during the interview by providing detailed information specific to their roles and responsibilities at the Wildwood property.

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

Mr. Greacen stated that he felt things are rolling along. He noted that they are getting good contaminant recovery from the treatment system and that he is happy with how the treatment system is running.

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

Mr. Greacen stated that the remedy is functioning as expected.

3.A. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

Mr. Greacen stated that the data show contaminant levels are decreasing over time.

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

Messrs. Greacen, Cox and Maye described the on-site presence at the site. On average, Mr. Maye is at the site 3 full days per week, but occasionally more frequently as maintenance and sampling requirements demand. The remediation system is equipped with a dial-out system that alerts the treatment system operator to malfunctions, thus providing virtually continuous monitoring.

Staff activities at the site include process waste sampling, vapor sampling, grounds keeping, as needed repairs/maintenance, data collection from system instrumentation or via field instrumentation, groundwater monitoring/sampling, and coordination of site access.

5.A. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routes 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.

Mr. Greacen reported that they implemented one monitoring change with regard to the vapor phase treatment system. In April 2001, they switched from Flame Ionization Detector (FID)/Photoionization Detector (PID) monitoring of the vapor stream to the use of Draeger tubes backed up by FID/PID readings. The monitoring later evolved to vapor collection with Tedlar bags followed by laboratory analysis by Method TO-14 at EPA's request. RETEC continued to screen with a PID. Over the past year, the Tedlar bag sampling approach has been replaced by vapor collection with Summa canisters. PID screening continues as well.

In addition, the air sparging sequence and duration has changed in an attempt to improve system efficiency. RETEC performed an optimization study (presented in one of the annual reports) that described targeting sampling points with the highest detections, which are locations that generally correlated with the highest contaminant recoveries. The high concentration areas are speculated to be associated with presumed source areas, which in turn are associated with the highest areas of groundwater contamination.

Also, the catalytic oxidation (Catox) unit used to treat vapor phase emissions was replaced with an activated carbon treatment system in June 2000.

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

Mr. Greacen answered, "no."

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

See response to Question 5 for a discussion of air sparging optimization.

Mr. Greacen noted RETEC's recommendation in last year's annual report to reduce the frequency of groundwater sampling.

Mr. Greacen also raised the issue of whether off-gas treatment is still required. If allowed to eliminate off-gas treatment, they would realize significant cost savings. Mr. Greacen claimed that the off-gas levels are protective per the Massachusetts Department of Environmental Protection (MADEP) off-gas policy, which uses "SCREEN 3" to model off-gas emissions.

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

None other than what was previously stated.

SUPPLEMENTAL QUESTIONS

Groundwater Cleanup

1.B. Are certain wells continuing to have high detections while others are dropping? What explains these results?

Mr. Greacen stated that there is nothing puzzling that jumps out. There is some variability, but there is an overall downward trend in contaminant concentrations. He mentioned that they observed this variability before system startup. In general, the wells that originally had the highest concentrations continue to have the highest concentrations. Overall, the concentrations in the wells tend to be similar.

2.B. Has the mix of contaminants changed in the monitoring or treatment system? What accounts for these changes?

Mr. Greacen stated that there has been no change.

3.B. Is there an indication that DNAPL or LNAPL is present? How have you checked or verified?

Mr. Greacen stated that they have no indication of NAPL being present based on dissolved phase concentrations and a long history of well gauging. They have never observed free-phase DNAPL. Mr. Cox mentioned DNAPL dye testing that was performed at the site that did not demonstrate a separate liquid phase contaminant. Mr. Greacen noted further that their major contaminant is trichloroethene (TCE).

4.B. Discuss how the treatment processes changed or have been adjusted over time.

Mr. Greacen stated that the major change to the treatment process involves the switch from a Catox to an activated carbon system for vapor phase treatment. The system was shut down in February/March 2000 to replace the unit, and the system was back on-line in June 2000.

5.B. How have pumping rates changed over time and why have they changed?

Mr. Greacen stated that pumping rates are generally consistent with the exception of a blockage incident in one of the lines during the last six months. Pumping rates for one well dropped from 21 gallons per minute (gpm) to 12 gpm. However, the pumping rates have been restored since rectifying the problem. RETEC switched to a spare line installed during system construction and swapped pumps to solve the problem.

6.B. What are your most recent projections for achieving cleanup overall or in subportions of the site?

Mr. Greacen stated that he has not "done the math" recently to forecast the completion of cleanup. He noted that he expects to reach an asymptote at some point. RETEC has no knowledge of what volume/mass of contaminant got into the ground initially, therefore it is difficult to forecast system performance based on a mass balance.

He noted that the system footprint covers the vast majority of contamination, and he noted further that the system covers more than the known area of soil contamination. He further described how any contaminated groundwater flowing at the site flows through the area of the sparge points and thus receives treatment.

Non-volatile soil contaminants were excavated prior to system installation.

Mr. Greacen noted that there might be isolated locations where the Maximum Contaminant Levels (MCLs) are exceeded outside of the system footprint to the south.

He provided some details about the system configuration:

- The groundwater extraction wells are in bedrock.
- One extraction well produces 90-percent of the flow.
- The air sparging points are installed on top of bedrock.

He noted that even with the fractured bedrock setting, they are comfortable with the capture being achieved. He stated that the system is "working as advertised." He mentioned that they performed modeling to help document their capture, but deferred on the details of the modeling since he was not the groundwater modeler. He implied that the flow rates and groundwater quality measurements they have collected document capture. He stated that there are draw downs in the bedrock wells, but conceded that there is not sufficient density of well installations to develop piezometric surface contour plots.

He further described that overburden capture is accomplished through the air sparging and soil vapor extraction system.

7.B. What changes do you anticipate will be made in the operation of the system as subportions of the site are cleaned-up?

Mr. Greacen suggested reducing the frequency of monitoring as the concentrations decrease. He feels that the current frequency of monitoring is providing redundant information.

8.B. Do you expect cleanup to be achieved below regulatory prescribed levels or do you envision that a constant/asymptotic level of contamination will remain above numerical cleanup criteria?

Mr. Greacen stated that it is likely the latter (i.e., a constant/asymptotic level of contamination will be achieved).

9.B. Are you considering pulsing the pumping operation in a different manner than in the past? Has pulsing helped?

Mr. Greacen stated that they considered and implemented pulse operation of the sparge points. They believe the pulsing has helped, but has not made a significant difference in contaminant removal rates. They have, however, realized a significant savings in electricity. He noted that their optimization study found that they got diminishing returns when they operated the individual sparge points for more than 8 consecutive hours.

Potential Local Contaminant/Hydraulic Impacts/Effects

10.B. What upgradient sites are believed to be impacting site cleanup and to what degree? Are there any suggested steps that could be taken to deal with impacts?

Mr. Greacen identified the Industriplex site north of Route 128 as an upgradient site with the potential to impact site cleanup. He stated that he has not seen any data to say that Industriplex is contributing to contamination of their site in any significant way. Nonetheless, it makes him wonder what impact Industriplex has had, or could have, on the Wildwood property.

11.B. Are you noticing the impact of offsite entities on the aquifer in terms of offsite pumping or other hydraulic impacts that may be impacting the local water table?

Mr. Greacen stated that beavers have had an impact on local hydrology due to dam construction. Brenden Maye noted that there are beaver dams north and south of the Wildwood property.

12.B. How has the natural gradient changed and are seasonal gradients present that vary from the average yearly gradient? Does the system function best at low water table or high water table or somewhere in between?

Mr. Greacen stated that that have not seen any significant seasonal variability in the natural gradient. The only change is that induced by the groundwater withdrawal of the remedial system. He and Peter Cox described the apparent gradient changes they observed when they monitored groundwater elevations when the sparging system was operating. They now shut down the sparging system in advance of groundwater elevation monitoring to obtain truer readings.

Nature and Extent

13.B. What is the integrity of the facility sewers? Is it possible that there are continuing sources of release at the site from buried pipelines and tanks?

Mr. Greacen stated the sewer lines serving the remedial system are intact. Brenden Maye noted the annual monitoring (camera inspections) conducted by the Massachusetts Water Resources Authority (MWRA) on their sewer line, which crosses the Wildwood property.

With regard to buried pipelines and tanks, Mr. Greacen remarked that he could not imagine such features not being detected in the investigations leading up to the installation of the remedy.

Mr. Greacen acknowledged that the MWRA and City of Woburn sewer lines both run through the treatment area. No distinction has been made during investigations between soil and the sewer bedding. The action of the sparging system should treat this medium.

14.B. Is there any known surficial soil contamination remaining at the property?

Mr. Greacen answered, "no."

Reporting

15.B. What site investigation and remediation reports have been generated in the past 5 years?

Mr. Greacen answered that the only reports generated are the monthly, quarterly, and annual operations and maintenance (O&M) monitoring reports.

16.B. Provide a summary of the types of problems or errors that have been made in the prior 5 years.

Mr. Greacen answered that operations have been basically routine. Problems encountered, which were discussed previously, include the pipe clog, the issues regarding vapor phase monitoring, and the associated calculation of Destruction and Removal Efficiency (DRE). He noted that their vapor phase levels have dropped so low that they had to adopt analytical procedures with lower and lower reporting limits so that they could quantitatively calculate DRE. RETEC worked with EPA and EPA's prior oversight contractor (Tetra Tech/Foster Wheeler) to resolve this issue.

17.B. Have you conducted a regulatory compliance audit (internal or external) and is a report available describing any deficiencies identified?

Mr. Greacen replied that no formal auditing has been conducted.

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

Mr. Greacen replied that there are no health and safety issues on-site.

Land Use

19.B. Has site ownership changed?

Mr. Greacen is not aware of any ownership changes in the last five years.

20.B. Has site occupancy changed? Are there any occupancy changes in the foreseeable future? If so, please describe.

Mr. Greacen stated that occupancy has not changed and that it is not expected to change in the foreseeable future.

21.B. What is the zoning of the property? Are there any institutional

controls/deed restrictions in place?

Mr. Greacen does not know the zoning designation of the property. He is also not aware of any institutional controls/deed restrictions. He noted that the property is fenced on three sides in accordance with an EPA order that predated the Record of Decision (ROD).

22.B. Are there new industrial processes occurring at the site or has there been a change in chemicals used at the site?

Mr. Greacen replied that there are no new industrial processes occurring at the Wildwood property or changes in the chemicals used.

23.B. What are the current uses of the property (indoor and outdoor [landscaping])?

Mr. Greacen replied that the current use of the property is site remediation.

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

Mr. Maye, the treatment system operator, replied that he visits the site, on average, for 3 days per week for approximately 6 to 8 hours per day. During rounds of groundwater sampling, he may be present at the site for a full week, but that this is included in the overall average.

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

Mr. Greacen said that he is not aware of any future uses planned for the property that are different from the current use.

26.B. Is groundwater currently used (e.g., as process water) on the property?

Mr. Greacen answered, "no."

27.B. Are there plans to use groundwater on-site in the future?

Mr. Greacen answered, "no."

Exposure Information

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

Mr. Greacen replied that the site is fenced on three sides (the fourth side is the river), alarms and locks are installed on the treatment building, and the area of contamination is capped. The gates to the property are locked when the site is unoccupied.

29.B. Is there evidence or sightings of trespassers on the property? If yes, how often and what type of activities do they engage in?

Mr. Greacen and Mr. Maye noted that they have experienced three break-ins over the last five years. Also, EPA's contractor's trailer, which was formerly located behind the treatment building, was broken into on one occasion.

Also, when the book and movie "A Civil Action" came out, they occasionally dealt with unannounced visitors who were curious about the site.

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

See question 29.B.

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

Mr. Greacen stated that they experience periodic flooding of the Aberjona River.

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

Mr. Greacen answered, "no."

<u>Wrap-Up</u>

33.B. Do you have any recommendations for reducing or increasing activities at the site?

Mr. Greacen referred to his prior comments about reducing the frequency of sampling (see Question No. 7).

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

Mr. Greacen replied nothing further than what has already been discussed.

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	**EPA ID No.:** MAD980732168
Subject: Five Year Review	**Time:** 1:30 pm / **Date:** 8/03/04
Type: ☐ Telephone ■ Visit ☐ Other **Location of Visit:** New England Plastics Site , Woburn, MA	☐ Incoming ☐ Outgoing N/A

Contact Made By:

Name:	**Title:**	**Organization:**
Andrew H. Smyth, P.G., LSP	**Project Hydrogeologist**	**TRC**
Joanna M. Hall	**Vice President**	**TRC**
Diane Silverman, Ph.D.	**Risk Assessor**	**Metcalf & Eddy**

Individual Contacted:

Name:	**Title:**	**Organization:**
Jeffrey A. Hamel	**Vice President**	**Woodward & Curran (consultant to New England Plastics)**

Telephone No.: 978-557-8150 **Fax No.: 978-557-7948** **E-Mail Address: jhamel@woodwardcurran.com**	**Street Address: 35 New England Business Center, Suite 180** **Andover, MA 01810**

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

Jeffrey Hamel - Woodard & Curran - Successful in that 85 lb of VOC removed (by SVE system) between 2/98 and 3/2000; compliance source testing < 100ppb and air sparge/SVE shut down; ROD soil cleanup criteria met; 4 wells with PCE and 1 well with TCE now close to cleanup levels.

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

Soil remedy already completed, monitoring groundwater levels to determine whether they continue to decline

3.A. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

Yes, groundwater levels are now below or just barely exceeding limits. Recently completed another round of annual sampling should have data shortly.

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

No continuous site presence, treatment system no longer required.

5.A. Have there been any significant changes in the O&M requirements,

maintenance schedules, or sampling routes 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.

Now only 9 wells in plume area are sampled annually. Sampling of other wells discontinued in about 2001.

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

NA

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

NA

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

NA

SUPPLEMENTAL QUESTIONS

Groundwater Cleanup

1.B. Are certain wells continuing to have high detections while others are dropping? What explains these results?

Highest overburden concentrations at source area (well 101). Highest shallow bedrock concentrations in downgradient well 106B.

2.B. Has the mix of contaminants changed in the monitoring or treatment system? What accounts for these changes?

No change in mix of contaminants. NA for treatment

3.B. Is there an indication that DNAPL or LNAPL is present? How have you checked or verified?

Have not checked.

4.B. Discuss how the treatment processes changed or have been adjusted over time.

Used to have a soil vapor recovery system now no longer operating (mothballed onsite)

5.B. How have pumping rates changed over time and why have they changed?

No groundwater recovery system

6.B. What are your most recent projections for achieving cleanup overall or in subportions of the site?

Hard to predict. Exceedances are in shallow groundwater.

7.B. What changes do you anticipate will be made in the operation of the system as subportions of the site are cleaned-up?

NA, once groundwater is below criteria monitoring may no longer be necessary

8.B. Do you expect cleanup to be achieved below regulatory prescribed levels or do you envision that a constant/asymptotic level of contamination will remain above numerical cleanup criteria?

Expect that groundwater will eventually meet cleanup standard, very close now

9.B. Are you considering pulsing the pumping operation in a different manner than in the past? Has pulsing helped?

NA

Potential Local Contaminant/Hydraulic Impacts/Effects

10.B. What upgradient sites are believed to be impacting site cleanup and to what degree? Are there any suggested steps that could be taken to deal with impacts?

None

11.B. Are you noticing the impact of offsite entities on the aquifer in terms of offsite pumping or other hydraulic impacts that may be impacting the local water table?

No

12.B. How has the natural gradient changed and are seasonal gradients present that vary from the average yearly gradient? Does the system function best at low water table or high water table or somewhere in between?

NEP only monitors water levels once a year.

Nature and Extent

13.B. What is the integrity of the facility sewers? Is it possible that there are continuing sources of release at the site from buried pipelines and tanks?

Not sure, will double check with NEP.

14.B. Is there any known surficial soil contamination remaining at the property?

No. Source area is paved and soil vapor system removed contamination to below cleanup levels.

Reporting

15.B. What site investigation and remediation reports have been generated in the past 5 years?

Only the monthly status and annual monitoring reports

16.B. Provide a summary of the types of problems or errors that have been made in the prior 5 years.

None

17.B. Have you conducted a regulatory compliance audit (internal or external) and is a report available describing any deficiencies identified?

No. EPA has not conducted split sampling for two years.

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

Not that he knows of.

Land Use

19.B. Has site ownership changed?

No.

20.B. Has site occupancy changed? Are there any occupancy changes in the foreseeable future? If so, please describe.

Not sure, would have to check with NEP.

21.B. What is the zoning of the property? Are there any institutional controls/deed restrictions in place?

Industrial? Not sure, would have to check with NEP.

22.B. Are there new industrial processes occurring at the site or has there been a change in chemicals used at the site?

No. Making plastic bowling ball returns. General use as storage and plastic manufacturing.

23.B. What are the current uses of the property (indoor and outdoor [landscaping])?

Plastic manufacturing and molding, office space, storage. A residence is located immediately downgradient of the site (downgradient of well 106B).

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

Workers are present for approximately 8 hours/day, 5 days/week.

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

Same

26.B. Is groundwater currently used (e.g., as process water) on the property?

No.

27.B. Are there plans to use groundwater on-site in the future?

No.

Exposure Information

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

No property line fence. Drivable areas are gated. The site is primarily paved. Non-paved areas are maintained.

29.B. Is there evidence or sightings of trespassers on the property? If yes, how often and what type of activities do they engage in?

Not that he is aware of.

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

Not that he is aware of.

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

Not that he is aware of.

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

Not that he is aware of.

Wrap-Up

33.B. Do you have any recommendations for reducing or increasing activities at the site?

No

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

No.

INTERVIEW RECORD

Site Name: Wells G&H Superfund Site	**EPA ID No.:** MAD980732168	
Subject: Five Year Review	**Time:** 9:00 am	**Date:** 8/16/04
Type: ■ Telephone ☐ Visit ☐ Other **Location of Visit:**	☐ Incoming ■ Outgoing	

Contact Made By:

Name:	Title:	Organization:
David M. Sullivan, LSP, CHMM	Project Manager	TRC
Diane Silverman, Ph.D.	Risk Assessor	Metcalf & Eddy

Individual Contacted:

Name:	Title:	Organization:
Jeffrey T. Lawson	Principal	Env. Project Control, Inc. (consultant to Beatrice-UniFirst-Grace for Central Area (OU-2))

Telephone No.: 978-692-8400 **Fax No.:** 978-692-8458 **E-Mail Address:** jlawson@projectcontrol.com	**Street Address:** 239 Littleton Road, Suite 4A Westford, MA 01886

Preface: In this interview, Jeffrey Lawson commented based on his role as a representative of W.R. Grace, Unifirst, and Beatrice regarding Central Area/Operable Unit-2 (OU-2). He also is under contract to Unifirst regarding Source Area/Operable Unit-1 (OU-1) compliance; however, Timothy Cosgrave of Harvard Project Services was previously interviewed regarding Unifirst and OU-1. Therefore, all questions were answered from the perspective of OU-2, unless clearly indicated otherwise.

BACKGROUND INFORMATION

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

Mr. Lawson commented that his impression is influenced by his sense of "what's next?" He views the project as dormant, but not done. Field work for OU-2 was completed in 1993. The Phase 1A report was submitted in 1994; they are waiting for EPA comments on that report. Work on OU-2 was suspended in spring of 1995.

2.A. What effects have site operations had on the surrounding community

Mr. Lawson noted that for the person on the street, there is no discernable effect. There is no hint of what's going on in the Central Area per se. Certain individuals such as Paul Medeiros [a Woburn selectmen] and members of the Woburn Redevelopment Authority (WRA) are aware. The WRA has a grant from EPA to explore property reuse. At a local government administration level people pay attention to the Central Area (OU-2), but since the Aberjona River Study came out, there has been diminished curiosity in the Central Area (OU-2). People's focus has shifted to the Aberjona River Study and the concern with metals rather than OU-2 contaminants (e.g., chlorinated VOCs). People at the level of government are aware of the long-term operations at the source areas, too, but it's an "out of site, out of mind" phenomenon.

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

Mr. Lawson commented that he is in direct contact with certain members of the community since he sits on the WRA's Advisory Board for Land Use Study on behalf of Beatrice, Unifirst and Grace. Consequently, he is in contact with Mr. Pierce and Paul Medeiros. He indicated that people are not really concerned with the Central Area (OU-2). They are lately focused on the Aberjona River Study because it is fresh and new.

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

Mr. Lawson is not aware of any emergency responses or vandalism. Anecdotally, he noted that others have commented about the paint ball site off Salem Street, near well G. He's heard that the paint ball situation is no longer a problem. Grace and Unifirst long term monitoring wells have not been vandalized.

5.A. Do you feel well informed about the site's activities and progress?

His impression is that the Central Area is not on the front burner for EPA. He noted that the Potentially Responsible Party (PRP) lawyers have contacted the EPA lawyer (Gretchen Muench) on Central Area (OU-2) matters and have found her forthcoming. Mr. Lawson noted that Joseph LeMay, the EPA Remedial Project Manager (RPM), is also forthcoming with regard to the Central Area (OU-2) when asked. Both the EPA RPM and EPA lawyer are responsive and available. He is left with the impression that there are more pressing things at hand at EPA.

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

Mr. Lawson stated that he had no suggestions. Mr. Lawson noted that Joseph LeMay and Gretchen Muench of EPA are communicative and judged the communication to be good. He noted that the delay in activities on the Central Area (OU-2) has been long; but that he has been made aware of EPA's renewed attention to the Central Area (OU-2) and appreciated recent communication from EPA in that regard.

PERFORMANCE, OPERATION AND MAINTENANCE PROBLEMS

1.B. Is the remedy functioning at expected? How wells is the remedy performing?

Mr. Lawson noted that since we are not at the remedy stage for the Central Area (OU-2), there is nothing to report. The PRPs are in mid-process and awaiting further comment/direction from EPA.

From the perspective of the Central Area (OU-2), he felt the Source Area (OU-1) systems have stopped off-site migration at Unifirst and Grace. Mr. Lawson noted how the Grace and Unifirst systems work in concert, with the Unifirst system capturing bedrock contamination migrating from Grace, and the Grace system handling overburden and shallow bedrock contamination on the Grace Property. Consequently, two large known sources of contamination have been cutoff.

2.B. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

Mr. Lawson stated that long term monitoring has shown decreasing concentrations with time. For detailed information, Mr. Lawson suggested contacting Michael Moore of the Johnson Company or Jack Guswa at GeoTrans. He noted how Unifirst's inlet concentrations have decreased over time and that the system is behaving as expected at a Dense Non-Aqueous Phase Liquid (DNAPL) site. He noted that Grace has shut down some of their extraction wells due to groundwater quality improvements.

SUPPLEMENTAL QUESTIONS

Groundwater Cleanup

1.C. Are certain wells continuing to have high detections while others are dropping? What explains these results?

Mr. Lawson noted that there are wells that continue to have high concentrations, but felt that this is not unexpected. The presence of DNAPL and multiple off-property source areas not associated with the site "confounds things." It is not a system design issue. The persistent high concentrations are attributable to other sources and DNAPL. The systems are operating as expected.

2.C. Is there an indication that DNAPL or LNAPL is present? How have you checked or verified?

Mr. Lawson stated that Unifirst is clearly a DNAPL site. Mr. Lawson noted that he personally pulled a bailer full of DNAPL from well UC-8 at the Unifirst site. He commented further that Grace and Wildwood have classic signatures of separate phase material in groundwater. For more in depth analysis, he would defer to the technical experts. He noted that Unifirst is the only site where genuine free-phase DNAPL was observed.

3.C. What are your most recent projections for achieving cleanup overall or in subportions of the site?

Mr. Lawson noted that it is fair to say that all the companies involved see this as a multi-decade process to achieve the cleanup goals. Mr. Lawson added that they have one decade's worth of data supporting this conclusion.

4.C. What changes do you anticipate will be made in the operation of the system as subportions of the site are cleaned-up?

Mr. Lawson stated that with regard to the Central Area (OU-2), we are not at the remedy stage.

With regard to the Source Areas (OU-1), Mr. Lawson anticipates that better/more cost effective systems or tweaks will be implemented in response to changes. Pumping rates might be varied, and perhaps reduced, if capture was still sufficient to save energy costs and carbon usage. In general, he anticipates subtle changes. He commented that RETEC's system is more complicated, but that refinements and tweaks may be warranted over time.

5.C. Do you expect cleanup to be achieved below regulatory prescribed levels or do you envision that a constant/asymptotic level of contamination will remain above numerical cleanup criteria?

In Mr. Lawson's opinion, he expects that we will see asymptotic leveling and would expect rebound if systems were shut off, due to NAPL. He noted that other sources on other properties will affect the Central Area cleanup. He also noted the potential impact of the Aberjona River sediments on the Central Area in such a widely impacted watershed and asked if it is really practical to clean up Aberjona River sediments.

<u>Potential Local Contaminant/Hydraulic Impacts/Effects</u>

6.C. What upgradient sites are believed to be impacting site cleanup and to what degree? Are there any suggested steps that could be taken to deal with impacts?

Mr. Lawson noted that upgradient per se is not an issue. He commented that the Central Area is cross and downgradient of other sources, and that there are other sources upgradient of Olympia. The Central Area is complicated because other sources are impacting it.

7.C. Are you noticing the impact of offsite entities on the aquifer in terms of offsite pumping or other hydraulic impacts that may be impacting the local water table?

Mr. Lawson answered, "No, nothing off-site." He noted that New England Plastics (NEP) had wells for process water. They could have induced flow in the past, but he recalled some mid-1980s fieldwork that demonstrated that this did not occur. He does not know of anything perturbing groundwater.

<u>Nature and Extent</u>

8.C. What is the integrity of facility/local/municipal sewers? Is it possible that there are continuing sources of release at the site from buried pipelines and tanks?

Mr. Lawson noted that the big trunk sewer by the railroad tracks traditionally overflowed. However, over the last 10 years we as not heard of any issues in this regard. He noted that the Romicon facility in East Cummings Park had corroded sewer pipes and they were chlorinated solvent users. They could have introduced contaminants. Romicon is no longer located in East Cummings Park and he thinks the sewers have been fixed. He noted that Grace and Unifirst have submitted information in this regard to EPA.

9.C. Is there any known surficial soil contamination remaining at the property?

Mr. Lawson is not aware of any surficial soil contamination in the Central Area, but he noted that the Central Area RI focused on groundwater. He noted the occurrence of a small patch of petroleum contamination on a city parcel back when Barbara Newman

(EPA) was involved. He noted that it was not considered a concern. He recalled that it was an extremely minor issue that may have been documented in an Ecology & Environment, Inc. (E&E) report or later supplemental or interim Remedial Investigation (RI) reports.

Reporting

10.C. Provide a summary of the types of problems or errors that have been made in the prior 5 years.

Mr. Lawson answered, "none." He is waiting for EPA's next move. There have been no activities to criticize.

Land Use

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

With regard to the Central Area, Mr. Lawson does not see any significant changes. He noted that the WRA Advisory Committee has entertained passive uses, soccer fields, etc., on properties in the Central Area near the wetland, although recently they are leaning more towards passive uses (e.g., viewing stands on the natural elevation near well H). He recommended speaking with Don Borchelt of the WRA for further information.

12.C. Is groundwater currently used (e.g., as process water) in the Central Area?

Mr. Lawson is not aware of any process water withdrawals. He is only aware of the Source Area (OU-1) groundwater withdrawals at Grace, Unifirst and Wildwood.

13.C. Are there plans to use groundwater in the future?

Mr. Lawson is not aware of any plans to use groundwater in the future. He noted that individuals with the WRA, Paul Medeiros, and an individual on the Woburn Conservation Commission feel that groundwater from the Central Area (OU-2) will not be used in the future. The public perception and stigma regarding use of the water is too big to tackle.

Exposure Information

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

Mr. Lawson is not aware of any complaints. He noted that there is no remedy in place in the Central Area (OU-2) to complain about. The Source Area (OU-1) systems are not visible and do not generate odors, so they do not attract the attention of the general public. The only complaint he is aware of is the paint ball complaint.

Wrap-Up

15.C. Do you have any recommendations for reducing or increasing activities at

the site?

Mr. Lawson answered "No, other than returning the Grace site to commercial use." The commercial area at UniFirst is fully utilized.

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

Mr. Lawson answered, "No." The Central Area (OU-2) is a complicated site. He feels that EPA is in a quandary and he has no other information to share. Everything appears to be staying the same.

Attachment 7

Risk Calculations

Attachment 7.1

TABLE 1
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
WELLS G&H SUPERFUND SITE

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Indoor Air

Exposure Point (1)	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution) (2)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (3)	Rationale (4)
WR Grace Building									
	1,1,1-Trichloroethane	N/A	N/A	N/A	N/A	1.1E+01	ug/m^3		
	trans-1,2-Dichloroethene	N/A	N/A	N/A	N/A	1.3E+00	ug/m^3		
	Tetrachloroethene	N/A	N/A	N/A	N/A	1.8E+01	ug/m^3		
	Trichloroethene	N/A	N/A	N/A	N/A	5.0E+00	ug/m^3		
Unifirst Building									
	1,1,1-Trichloroethane	N/A	N/A	N/A	N/A	1.4E+02	ug/m^3		
	trans-1,2-Dichloroethene	N/A	N/A	N/A	N/A	9.5E+00	ug/m^3		
	Tetrachloroethene	N/A	N/A	N/A	N/A	1.8E+03	ug/m^3		
	Trichloroethene	N/A	N/A	N/A	N/A	4.1E+01	ug/m^3		

(1) Refer to text for sample groupings for each exposure point.
(2) T - Transformed; N - Normal; NP - Non-parametric; <4 - sample size too small to calculate 95% UCL
(3) Statistics: Maximum Detected Value (Max); 95% UCL of Transformed Data (95% UCL - T); 95% UCL of Normal Data (95% UCL - N); 95% UCL of Non-parametric Data (95% UCL - NP); Arithmetic Mean (Mean)
(4) Rationale:
(a) Due to small sample size (<4), the maximum detected concentration is used.
(b) When the maximum detected concentration is selected as the RME EPC, the arithmetic mean concentration is selected as the CT EPC.
(c) If the arithmetic mean concentration equals or exceeds the maximum detected concentration, the maximum detected concentration is used as the CT EPC.
(d) Shapiro-Wilk W Test or Lilliefors Test indicates data are normally distributed.
(e) Shapiro-Wilk W Test or Lilliefors Test indicates data are log-normally distributed.
(f) Shapiro-Wilk W Test or Lilliefors Test indicates data are neither normally nor log-normally distributed.
(g) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC

J = Estimated Concentration
Max = Maximum Detected Concentration
N/A = Not Applicable
UCL = Upper Confidence Limit
EPC = Exposure Point Concentration
RME = Reasonable Maximum Exposure
CT = Central Tendency

TABLE 2
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
WELLS G&H SUPERFUND SITE

Scenario Timeframe: Future
Medium: Air
Exposure Medium: Indoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Commercial Worker	Adult	Commercial Buildings	CA	Modeled Concentration in Air	see Table 1	ug/m^3	see Table 1	Chronic Daily Intake (CDI) (ug/m^3) =
				ET	Exposure Time	8	hrs/day	USEPA, 1997a	$\frac{CA \times ET \times EF \times ED}{CF \times AT}$
				EF	Exposure Frequency	250	days/year	USEPA, 2004	
				ED	Exposure Duration	25	years	USEPA, 2004	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	
				CF	Conversion Factor	24	hrs/day	- -	

TABLE 3
NON-CANCER TOXICITY DATA – INHALATION
WELLS G&H SUPERFUND SITE

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD(1)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
trans-1,2-Dichloroethene	Chronic	6.00E+01	ug/m^3	N/A	N/A	Liver/Lung	3000	NCEA	9/1/2004
Tetrachloroethene	Chronic	2.70E+02	ug/m^3	N/A	N/A	CNS	100	ATSDR	9/1/2004
Trichloroethene	Chronic	4.00E+01	ug/m^3	N/A	N/A	CNS/Liver	3000	NCEA	9/1/2004
1,1,1-Trichloroethane	Chronic	2.20E+03	ug/m^3	N/A	N/A	Respiratory	3000	IRIS	9/1/2004

IRIS = Integrated Risk Information System
NCEA = National Center for Environmental Assessment
ATSDR = Agency for Toxic Substances and Disease Registry
N/A = Not Applicable

TABLE 4
CANCER TOXICITY DATA – INHALATION
WELLS G&H SUPERFUND SITE

Chemical of Potential Concern (1)	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
trans-1,2-Dichloroethene	N/A	N/A	N/A	N/A	D	IRIS	9/1/2004
Tetrachloroethene	5.90E-06	$(ug/m^3)^{-1}$	N/A	N/A	B2	CalEPA	9/1/2004
Trichloroethene	1.10E-04	$(ug/m^3)^{-1}$	N/A	N/A	C-B2	NCEA	9/1/2004
1,1,1-Trichloroethane	N/A	N/A	N/A	N/A	C	IRIS	9/1/2004

IRIS = Integrated Risk Information System
NCEA = National Center for Environmental Assessment
CalEPA = California Environmental Protection Agency
N/A = Not Applicable
(1) An alternative inhalation toxicity value from CalEPA [2E-06 $ug/m^3)^{-1}$] has been used to provide a range of possible risks associated with exposure to trichloroethene.

EPA Group:
A - Human carcinogen
B1 - Probable human carcinogen - indicates that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen (by the oral route)
E - Evidence of noncarcinogenicity

TABLE 8
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
WELLS G&H SUPERFUND SITE

Scenario Timeframe: Future
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Air	Indoor Air	WR Grace Building	Inhalation													
				1,1,1-Trichloroethane	1E+01	ug/m³	9.3E-01	ug/m3	N/A	N/A	N/A	2.6E+00	ug/m3	2.2E+03	ug/m3	1.2E-03
				trans-1,2-Dichloroethene	1E+00	ug/m³	1.1E-01	ug/m3	N/A	N/A	N/A	3.0E-01	ug/m3	6.0E+01	ug/m3	5.0E-03
				Tetrachloroethene	2E+01	ug/m³	1.9E+00	ug/m3	5.9E-06	(ug/m3)⁻¹	8.7E-06	4.1E+00	ug/m3	2.7E+02	ug/m3	1.5E-02
				Trichloroethene	5E+00	ug/m³	4.1E-01	ug/m3	1.1E-04	(ug/m3)⁻¹	4.5E-05	1.1E+00	ug/m3	4.0E+01	ug/m3	2.8E-02
			Exp. Route Total								5E-05					5E-02
		Exposure Point Total									5E-05					5E-02
		Unifirst Building	Inhalation													
				1,1,1-Trichloroethane	1E+02	ug/m³	1.1E+01	ug/m3	N/A	N/A	N/A	3.1E+01	ug/m3	2.2E+03	ug/m3	1.4E-02
				trans-1,2-Dichloroethene	1E+01	ug/m³	7.8E-01	ug/m3	N/A	N/A	N/A	2.2E+00	ug/m3	6.0E+01	ug/m3	3.6E-02
				Tetrachloroethene	2E+03	ug/m³	1.3E+02	ug/m3	5.9E-06	(ug/m3)⁻¹	7.5E-04	3.8E+02	ug/m3	2.7E+02	ug/m3	1.3E+00
				Trichloroethene	4E+01	ug/m³	3.3E+00	ug/m3	1.1E-04	(ug/m3)⁻¹	3.7E-04	9.4E+00	ug/m3	4.0E+01	ug/m3	2.3E-01
			Exp. Route Total								1E-03					2E+00
		Exposure Point Total									1E-03					2E+00
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
									Total of Receptor Risks Across All Media		N/A			Total of Receptor Hazards Across All Media		N/A

WR Grace Building Cancer Risk with CalEPA unit risk for TCE: 9E-06

Unifirst Building Cancer Risk with CalEPA unit risk for TCE: 8E-04

TABLE 6. EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
WELLS G&H SUPERFUND SITE - OU-1

Unifirst

Detected Analyte	Maximum Detection (ug/L)	Indoor Air Screening Value (ug/L)[1]	Evaluate via Modeling?
1,1-Dichloroethane	2	220	No
2-Butanone	94	44000	No
Acetone	55	22000	No
cis-1,2-Dichloroethene	450	21	Yes
Methylene chloride	5	58	No
Tetrachloroethene	150	5	Yes
Toluene	33	150	No
Trichloroethene	56	5	Yes

W.R. Grace

Detected Analyte	Maximum Detection (ug/L)	Indoor Air Screening Value (ug/L)[1]	Evaluate via Modeling?
1,1-Dichloroethene	2.2	19	No
1,2-Dichloroethene (total)	740	21	Yes
Tetrachloroethene	391	5	Yes
Trichloroethene	391	5	Yes
Vinyl chloride	16.8	2	Yes

NEP

Detected Analyte	Maximum Detection (ug/L)	Indoor Air Screening Value (ug/L)[1]	Evaluate via Modeling?
cis-1,2-Dichloroethene	6	21	No
Tetrachloroethene	17	5	Yes

Wildwood

Detected Analyte	Maximum Detection (ug/L)	Indoor Air Screening Value (ug/L)[1]	Evaluate via Modeling?
1,1,1-Trichloroethane	130	310	No
1,1-Dichloroethane	3	220	No
Chloroform	6	80	No
Tetrachloroethene	200	5	Yes
Trichloroethene	3600	5	Yes
Vinyl chloride	15	2	Yes

Olympia

Detected Analyte	Maximum Detection (ug/L)	Indoor Air Screening Value (ug/L)[1]	Evaluate via Modeling?
Dichlorodifluoromethane	6	1.4	Yes
1,2-Dichlorobenzene	6	260	No
4-Methyl-2-pentanone	1	1400	No
Acetone	4	22000	No
Carbon disulfide	2	56	No
Chloroform	64	80	No
cis-1,2-Dichloroethene	1500	21	Yes
Ethylbenzene	25	700	No
Freon 113	410	150	Yes
Methyl tert-butyl ether	1	12000	No
Methylene chloride	2	58	No
Tetrachloroethene	410	5	Yes
Toluene	1	150	No
trans-1,2-Dichloroethene	9	18	No
Trichloroethene	12000	5	Yes
Vinyl chloride	190	2	Yes
Xylenes (total)	160	2200	No

Notes
1. Non-carcinogenic analyte screening values adjusted to a hazard index of 0.1

TABLE 7
GROUNDWATER TO INDOOR AIR
SHALLOW GROUNDWATER

	GW EPC C_w	GW Temp. T_S	GW Temp. T_S	Henry's Law Constant at ref. temp. H_R	Henry's Law Reference Temp. T_R	Normal Boiling Point T_B	Enthalpy of vaporization at T_B $\Delta H_{v,B}$	Critical Temp. T_C	constant n	Enthalpy of vaporization at T_S $\Delta H_{v,TS}$	Gas Constant R_c	Henry's Law Constant at T_S H_{TS}	Gas Constant R	Henry's Law Constant H'_{TS}
Units:	µg/L	°C	K	atm-m³/mol	K	K	cal/mol	K	unitless	cal/mol	cal/mol-K	atm-m³/mol	m³-atm/mol-K	unitless
Formula:	Input	(10 for screening)	(T_S + 273.15)	lookup	(lookup+273.15)	lookup	lookup	lookup	(Note 7)	(Note 8)		(Note 9)		H_{TS} / (R * T_S)
Analyte														
cis-1,2-Dichloroethene	4.5E+02	1.00E+01	2.83E+02	4.07E-03	2.98E+02	3.34E+02	7.19E+03	5.44E+02	3.38E-01	7.73E+03	1.99E+00	4.07E-03	8.21E-05	1.75E-01
Tetrachloroethene	1.5E+02	1.00E+01	2.83E+02	1.84E-02	2.98E+02	3.94E+02	8.29E+03	6.20E+02	3.55E-01	9.55E+03	1.99E+00	1.84E-02	8.21E-05	7.92E-01
Trichloroethene	5.6E+01	1.00E+01	2.83E+02	1.03E-02	2.98E+02	3.60E+02	7.51E+03	5.44E+02	3.74E-01	8.56E+03	1.99E+00	1.03E-02	8.21E-05	4.43E-01
1,2-Dichloroethene (total)	7.4E+02	1.00E+01	2.83E+02	4.07E-03	2.98E+02	3.34E+02	7.19E+03	5.44E+02	3.38E-01	7.73E+03	1.99E+00	4.07E-03	8.21E-05	1.75E-01
Tetrachloroethene	3.9E+02	1.00E+01	2.83E+02	1.84E-02	2.98E+02	3.94E+02	8.29E+03	6.20E+02	3.55E-01	9.55E+03	1.99E+00	1.84E-02	8.21E-05	7.92E-01
Trichloroethene	3.9E+02	1.00E+01	2.83E+02	1.03E-02	2.98E+02	3.60E+02	7.51E+03	5.44E+02	3.74E-01	8.56E+03	1.99E+00	1.03E-02	8.21E-05	4.43E-01
Vinyl chloride	1.7E+01	1.00E+01	2.83E+02	2.71E-02	2.98E+02	2.59E+02	5.25E+03	4.32E+02	3.28E-01	5.00E+03	1.99E+00	2.71E-02	8.21E-05	1.17E+00
Tetrachloroethene	1.7E+01	1.00E+01	2.83E+02	1.84E-02	2.98E+02	3.94E+02	8.29E+03	6.20E+02	3.55E-01	9.55E+03	1.99E+00	1.84E-02	8.21E-05	7.92E-01
Tetrachloroethene	2.0E+02	1.00E+01	2.83E+02	1.84E-02	2.98E+02	3.94E+02	8.29E+03	6.20E+02	3.55E-01	9.55E+03	1.99E+00	1.84E-02	8.21E-05	7.92E-01
Trichloroethene	3.6E+03	1.00E+01	2.83E+02	1.03E-02	2.98E+02	3.60E+02	7.51E+03	5.44E+02	3.74E-01	8.56E+03	1.99E+00	1.03E-02	8.21E-05	4.43E-01
Vinyl chloride	1.5E+01	1.00E+01	2.83E+02	2.71E-02	2.98E+02	2.59E+02	5.25E+03	4.32E+02	3.28E-01	5.00E+03	1.99E+00	2.71E-02	8.21E-05	1.17E+00
Dichlorodifluoromethane	6.0E+00	1.00E+01	2.83E+02	3.90E-01	2.98E+02	NA	NA	NA	NA	NA	1.99E+00	3.90E-01	8.21E-05	1.68E+01
cis-1,2-Dichloroethene	1.5E+03	1.00E+01	2.83E+02	4.07E-03	2.98E+02	3.34E+02	7.19E+03	5.44E+02	3.38E-01	7.73E+03	1.99E+00	4.07E-03	8.21E-05	1.75E-01
Freon 113	4.1E+02	1.00E+01	2.83E+02	3.17E-01	2.98E+02	NA	NA	NA	NA	NA	1.99E+00	3.17E-01	8.21E-05	1.36E+01
Tetrachloroethene	4.1E+02	1.00E+01	2.83E+02	1.84E-02	2.98E+02	3.94E+02	8.29E+03	6.20E+02	3.55E-01	9.55E+03	1.99E+00	1.84E-02	8.21E-05	7.92E-01
Trichloroethene	1.2E+04	1.00E+01	2.83E+02	1.03E-02	2.98E+02	3.60E+02	7.51E+03	5.44E+02	3.74E-01	8.56E+03	1.99E+00	1.03E-02	8.21E-05	4.43E-01
Vinyl chloride	1.9E+02	1.00E+01	2.83E+02	2.71E-02	2.98E+02	2.59E+02	5.25E+03	4.32E+02	3.28E-01	5.00E+03	1.99E+00	2.71E-02	8.21E-05	1.17E+00

TABLE 7 (continued)
GROUNDWATER TO INDOOR AIR
SHALLOW GROUNDWATER

	Conversion Factor m³ to L	Source Vapor Conc.	Depth below grade to bottom of enclosed space	Depth below grade to water table	Source Trench Separation	SCS soil type directly above water table	SCS soil type in vadose zone	Capillary zone mean particle diameter	Thickness of capillary zone	Diffusivity in air	Diffusivity in water	Vadose zone soil total porosity
	Conv01	C_{source}	L_F	L_{WT}	L_T	ST_{WT}	ST_v	D_{cz}	L_{cz}	D_a	D_w	n_v
Units:	L/m^3	$\mu g/m^3$	cm	cm	cm	unitless	unitless	cm	cm	cm^2/s	cm^2/s	cm^3/cm^3
Formula:		C_w*H'_{TS}*Conv01	(15 or 200 for screening)	(Note 3)	L_{WT} - L_F	(Note 10)	(Note 11)	lookup	(Note 12)	lookup	lookup	(0.43 for screening)
Analyte												
cis-1,2-Dichloroethene	1.00E+03	7.88E+04	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.36E-02	1.13E-05	4.30E-01
Tetrachloroethene	1.00E+03	1.19E+05	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.20E-02	8.20E-06	4.30E-01
Trichloroethene	1.00E+03	2.48E+04	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.90E-02	9.10E-06	4.30E-01
1,2-Dichloroethene (total)	1.00E+03	1.30E+05	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.36E-02	1.13E-05	4.30E-01
Tetrachloroethene	1.00E+03	3.10E+05	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.20E-02	8.20E-06	4.30E-01
Trichloroethene	1.00E+03	1.73E+05	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.90E-02	9.10E-06	4.30E-01
Vinyl chloride	1.00E+03	1.96E+04	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	1.06E-01	1.23E-06	4.30E-01
Tetrachloroethane	1.00E+03	1.35E+04	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.20E-02	8.20E-06	4.30E-01
Tetrachloroethene	1.00E+03	1.58E+05	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.20E-02	8.20E-06	4.30E-01
Trichloroethene	1.00E+03	1.60E+06	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.90E-02	9.10E-06	4.30E-01
Vinyl chloride	1.00E+03	1.75E+04	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	1.06E-01	1.23E-06	4.30E-01
Dichlorodifluoromethane	1.00E+03	1.01E+05	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	6.65E-02	9.92E-06	4.30E-01
cis-1,2-Dichloroethene	1.00E+03	2.63E+05	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.36E-02	1.13E-05	4.30E-01
Freon 113	1.00E+03	5.59E+06	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.80E-02	8.20E-06	4.30E-01
Tetrachloroethene	1.00E+03	3.25E+05	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.20E-02	8.20E-06	4.30E-01
Trichloroethene	1.00E+03	5.32E+06	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.90E-02	9.10E-06	4.30E-01
Vinyl chloride	1.00E+03	2.22E+05	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	1.06E-01	1.23E-06	4.30E-01

TABLE 7 (continued)
GROUNDWATER TO INDOOR AIR
SHALLOW GROUNDWATER

	Vadose zone soil water-filled porosity $\theta_{w,v}$	Vadose zone soil air-filled porosity $\theta_{a,v}$	Vadose zone Effective Diffusion Coeff. D_v^{eff}	Capillary zone soil total porosity n_{cz}	Capillary zone residual soil water content $\theta_{r,cz}$	Capillary zone saturated soil water content $\theta_{s,cz}$	Capillary zone van Genuchten shape parameter M_{cz}	Capillary zone soil water-filled porosity $\theta_{w,cz}$	Capillary zone soil air-filled porosity $\theta_{a,cz}$	Capillary zone Effective Diffusion Coeff. D_{cz}^{eff}	Total Overall Effective Diffusion Coeff. D_T^{eff}
Units:	cm^3/cm^3	cm^3/cm^3	cm^2/s	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	unitless	cm^3/cm^3	cm^3/cm^3	cm^2/s	cm^2/s
Formula:	(0.3 for screening)	$n_v - \theta_{w,v}$	(Note 13)	(0.43 for screening)	lookup	lookup	lookup	(Note 15)	$n_{cz} - \theta_{w,cz}$	(Note 14)	(Note 4)
Analyte											
cis-1,2-Dichloroethene	3.00E-01	1.30E-01	4.52E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	8.30E-05	2.71E-04
Tetrachloroethene	3.00E-01	1.30E-01	4.37E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	7.21E-05	2.49E-04
Trichloroethene	3.00E-01	1.30E-01	4.81E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	8.07E-05	2.76E-04
1,2-Dichloroethene (total)	3.00E-01	1.30E-01	4.52E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	8.30E-05	2.71E-04
Tetrachloroethene	3.00E-01	1.30E-01	4.37E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	7.21E-05	2.49E-04
Trichloroethene	3.00E-01	1.30E-01	4.81E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	8.07E-05	2.76E-04
Vinyl chloride	3.00E-01	1.30E-01	6.42E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	1.04E-04	3.61E-04
Tetrachloroethene	3.00E-01	1.30E-01	4.37E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	7.21E-05	2.49E-04
Tetrachloroethene	3.00E-01	1.30E-01	4.37E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	7.21E-05	2.49E-04
Trichloroethene	3.00E-01	1.30E-01	4.81E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	8.07E-05	2.76E-04
Vinyl chloride	3.00E-01	1.30E-01	6.42E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	1.04E-04	3.61E-04
Dichlorodifluoromethane	3.00E-01	1.30E-01	4.03E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	6.51E-05	2.27E-04
cis-1,2-Dichloroethene	3.00E-01	1.30E-01	4.52E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	8.30E-05	2.71E-04
Freon 113	3.00E-01	1.30E-01	4.73E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	7.63E-05	2.66E-04
Tetrachloroethene	3.00E-01	1.30E-01	4.37E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	7.21E-05	2.49E-04
Trichloroethene	3.00E-01	1.30E-01	4.81E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	8.07E-05	2.76E-04
Vinyl chloride	3.00E-01	1.30E-01	6.42E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	1.04E-04	3.61E-04

TABLE 7 (continued)
GROUNDWATER TO INDOOR AIR
SHALLOW GROUNDWATER

	Area of Enclosed Space Below Grade A_B	Building Ventilation Rate $Q_{building}$	Pressure Diff. between soil & enclosed space ΔP	Vadose zone soil saturated hydraulic conductivity $K_{s,v}$	Conversion Factor hr to s Conv02	Viscosity of water at 10°C $\mu_{w,10}$	Viscosity of water at system temp. μ_w	Density of water ρ_w	Acceleration due to gravity g	Vadose zone soil intrinsic permeability $k_{i,v}$	Vadose zone residual soil water content $\theta_{r,v}$	Vadose zone effective total fluid saturation S_{te}
Units:	cm^2	cm^3/s	$g/cm\text{-}s^2$	cm/hr	s/hr	g/cm-s	g/cm-s	g/cm^3	cm/s^2	cm^2	cm^3/cm^3	unitless
Formula:	(Note 2)	(56335 for screening)	(40 for screening)	lookup			(Note 16)	(0.999 for screening)		(Note 17)	lookup	(Note 18)
Analyte												
cis-1,2-Dichloroethene	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Tetrachloroethene	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Trichloroethene	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
1,2-Dichloroethene (total)	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Tetrachloroethene	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Trichloroethene	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Vinyl chloride	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Tetrachloroethene	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Tetrachloroethene	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Trichloroethene	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Vinyl chloride	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Dichlorodifluoromethane	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
cis-1,2-Dichloroethene	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Freon 113	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Tetrachloroethene	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Trichloroethene	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Vinyl chloride	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01

TABLE 7 (continued)
GROUNDWATER TO INDOOR AIR
SHALLOW GROUNDWATER

	Vadose zone van Genuchten shape parameter M_v	Vadose zone soil relative air permeability k_{rg}	Vadose zone soil effective vapor permeability k_v	Floor-wall seam perimeter X_{crack}	Vapor viscosity at avg. soil temp. μ_{TS}	Crack depth below grade Z_{crack}	Total area of cracks A_{crack}	Crack-to-total area ratio η	Equivalent crack radius r_{crack}	Avg. Vapor Flow Rate Into Bldg. Q_{soil}	Foundation or Slab Thickness L_{crack}	Crack Effective Diffusion Coeff. D^{crack}
Units:	unitless	unitless	cm^2	cm	g/cm-s	cm	cm^2	unitless	cm	cm^3/s	cm	cm^2/s
Formula:	lookup	(Note 19)	(Note 20)	(3844 for screening)	$0.00018*(T_S/298.15)^{0.5}$	(= L_F for screening)	(384 for screening)	A_{crack}/A_B	$\eta(A_B/X_{crack})$	(Note 5)	(15 for screening)	(Note 1)
Analyte												
cis-1,2-Dichloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.52E-04
Tetrachloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.37E-04
Trichloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.81E-04
1,2-Dichloroethene (total)	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.52E-04
Tetrachloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.37E-04
Trichloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.81E-04
Vinyl chloride	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	6.42E-04
Tetrachloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.37E-04
Tetrachloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.37E-04
Trichloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.81E-04
Vinyl chloride	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	6.42E-04
Dichlorodifluoromethane	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.03E-04
cis-1,2-Dichloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.52E-04
Freon 113	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.73E-04
Tetrachloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.37E-04
Trichloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.81E-04
Vinyl chloride	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	6.42E-04

TABLE 7 (continued)
GROUNDWATER TO INDOOR AIR
SHALLOW GROUNDWATER

	Infinite Source Indoor Attenuation Coeff.	Infinite Source Bldg. Conc.
	α	$C_{building}$
Units:	unitless	$\mu g/m^3$
Formula:	(Note 6)	$C_{source} * \alpha$
Analyte		
cis-1,2-Dichloroethene	9.87E-06	7.8E-01
Tetrachloroethene	9.65E-06	1.1E+00
Trichloroethene	9.91E-06	2.5E-01
1,2-Dichloroethene (total)	9.87E-06	1.3E+00
Tetrachloroethene	9.65E-06	3.0E+00
Trichloroethene	9.91E-06	1.7E+00
Vinyl chloride	1.05E-05	2.1E-01
Tetrachloroethene	9.65E-06	1.3E-01
Tetrachloroethene	9.65E-06	1.5E+00
Trichloroethene	9.91E-06	1.6E+01
Vinyl chloride	1.05E-05	1.8E-01
Dichlorodifluoromethane	9.42E-06	9.5E-01
cis-1,2-Dichloroethene	9.87E-06	2.6E+00
Freon 113	9.82E-06	5.5E+01
Tetrachloroethene	9.65E-06	3.1E+00
Trichloroethene	9.91E-06	5.3E+01
Vinyl chloride	1.05E-05	2.3E+00

Notes:

Reference: *User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings*, USEPA, September 1997.

(1) Assumed equivalent to D_i^{eff} of soil layer i in contact with the floor

(2) For screening, assume a trench 4 ft deep, 3 ft wide, and 30 ft long.

(3) Depth to water table minus depth to bottom of floor must be > thickness of capillary fringe, which is based on the soil type (typ. around 30 cm). Use 400 cm for screening purposes.

(4) $D_T^{eff} = L_T / (((L_{WT} - L_{cz} - L_F) / D_v^{eff}) + (L_{cz} / D_{cz}^{eff}))$

(5) $Q_{soil} = \Delta P * k_v * L_{crack}) / \mu_{TS}$; not from above reference

(6) $\alpha = [D_T^{eff} * A_B / (Q_{building} * L_T)] / [(D_T^{eff} * A_B / (Q_{soil} * L_T)) + 1]$; assumes no resistance (Peclet number is infinite)

(7) A function of the ratio T_B/T_C:

T_B/T_C	n
<0.57	0.30
0.57-0.71	$0.74(T_B/T_C)-0.116$
>0.71	0.41

(8) $\Delta H_{v,TS} = \Delta H_{v,B} * [(1-T_S/T_C)/(1-T_B/T_C)]^n$

(9) $H_{TS} = EXP[-\Delta H_{v,TS}/R_c * (1/T_S - 1/T_R)] * H_R$

(10) Refer to 12 SCS soil types - use SC for screening.

(11) Refer to 12 SCS soil types - use SCL for screening.

(12) $L_{cz} = 0.15 / (0.2 * D_{cz})$

(13) $D_v^{eff} = D_a * (\theta_{a,v}^{3.33}/n_v^2) + (D_w/H'_{TS})(\theta_{w,v}^{3.33}/n_v^2)$

(14) $D_{cz}^{eff} = D_a * (\theta_{a,cz}^{3.33}/n_{cz}^2) + (D_w/H'_{TS})(\theta_{w,cz}^{3.33}/n_{cz}^2)$

(15) $\theta_{w,cz} = \theta_{r,cz} + ((\theta_{s,cz} - \theta_{r,cz})/(2^{1/M}))$, where the value 2 in the formula is used for screening, but may be refined based on soil parameters (see USEPA, 1999).

(16) $\mu_{w} = \mu_{w,10} * (T_S / 283.15)^{0.5}$

(17) $k_{i,v} = K_{s,v} * 1/Conv02 * \mu_w / (\rho_w * g)$

(18) $S_{te} = (\theta_{w,v} - \theta_{r,v}) / (n_v - \theta_{r,v})$

(19) $k_{rg} = (1 - S_{te})^{0.5} * (1 - S_{te}^{1/M})^{2M}$

(20) $k_v = k_{i,v} * k_{rg}$; note that the model is very sensitive to this parameter and if site-specific values are available, they should be used.

TABLE 8
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
WELLS G&H SUPERFUND SITE - OU-1

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Indoor Air

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Unifirst (a)	156-59-2	cis-1,2-Dichloroethene	N/A	7.8E-01	ug/m³	N/A	N/A	N/A	7.8E-01	N/A	3.7 N	N/A	N/A	N	BSL
	127-18-4	Tetrachloroethene	N/A	1.1E+00	ug/m³	N/A	N/A	N/A	1.1E+00	N/A	0.67 C	N/A	N/A	Y	ASL
	79-01-6	Trichloroethene	N/A	2.5E-01	ug/m³	N/A	N/A	N/A	2.5E-01	N/A	0.017 C	N/A	N/A	Y	ASL
W.R. Grace (a)	540-59-0	1,2-Dichloroethene (total)	N/A	1.3E+00	ug/m³	N/A	N/A	N/A	1.3E+00	N/A	3.7 N	N/A	N/A	N	BSL
	127-18-4	Tetrachloroethene	N/A	3.0E+00	ug/m³	N/A	N/A	N/A	3.0E+00	N/A	0.67 C	N/A	N/A	Y	ASL
	79-01-6	Trichloroethene	N/A	1.7E+00	ug/m³	N/A	N/A	N/A	1.7E+00	N/A	0.017 C	N/A	N/A	Y	ASL
	75-01-4	Vinyl chloride	N/A	2.1E-01	ug/m³	N/A	N/A	N/A	2.1E-01	N/A	0.11 C	N/A	N/A	Y	ASL
NEP (a)	127-18-4	Tetrachloroethene	N/A	1.3E-01	ug/m³	N/A	N/A	N/A	1.3E-01	N/A	0.87 C	N/A	N/A	N	BSL
Wildwood (a)	127-18-4	Tetrachloroethene	N/A	1.5E+00	ug/m³	N/A	N/A	N/A	1.5E+00	N/A	0.67 C	N/A	N/A	Y	ASL
	79-01-6	Trichloroethene	N/A	1.6E+01	ug/m³	N/A	N/A	N/A	1.6E+01	N/A	0.017 C	N/A	N/A	Y	ASL
	75-01-4	Vinyl chloride	N/A	1.8E-01	ug/m³	N/A	N/A	N/A	1.8E-01	N/A	0.11 C	N/A	N/A	Y	ASL
Olympia (a)	75-71-8	Dichlorodifluoromethane	N/A	9.5E-01	ug/m³	N/A	N/A	N/A	9.5E-01	N/A	21 N	N/A	N/A	N	BSL
	156-59-2	cis-1,2-Dichloroethene	N/A	2.6E+00	ug/m³	N/A	N/A	N/A	2.6E+00	N/A	3.7 N	N/A	N/A	N	BSL
	76-13-1	Freon 113	N/A	5.5E+01	ug/m³	N/A	N/A	N/A	5.5E+01	N/A	3100 N	N/A	N/A	N	BSL
	127-18-4	Tetrachloroethene	N/A	3.1E+00	ug/m³	N/A	N/A	N/A	3.1E+00	N/A	0.67 C	N/A	N/A	Y	ASL
	79-01-6	Trichloroethene	N/A	6.3E+01	ug/m³	N/A	N/A	N/A	6.3E+01	N/A	0.017 C	N/A	N/A	Y	ASL
	75-01-4	Vinyl chloride	N/A	2.3E+00	ug/m³	N/A	N/A	N/A	2.3E+00	N/A	0.11 C	N/A	N/A	Y	ASL

(a) Refer to text for sample groupings.

All contaminants detected in groundwater exposure points with Henry's Law constants >1E-05 atm-m³/mol and molecular weights <200 g/mol have been included.

(1) The modeled groundwater contributions to indoor air have been presented in the *Maximum Concentration* field.
Refer to Table 2 for model results.
(2) Maximum concentration used for screening.
(3) Refer to supporting information for background discussion.
(4) USEPA Region 9 PRGs for ambient air (adjusted to an hazard quotient = 0.1 for noncarcinogens), October 1, 2002.
PRG for cis-1,2-dichloroethene has been used for 1,2-dichloroethene (total).
(5) Rationale Codes:
Selection Reason: Above Screening Levels (ASL)
No Screening Level (NSL)
Deletion Reason: No Toxicity Information (NTX)
Below Screening Level (BSL)

Definitions:
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
PRG = Preliminary Remedial Goal
N/A = Not Applicable or Not Available
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 9
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
WELLS G&H SUPERFUND SITE - OU-1

Scenario Timeframe: Current/Future
Medium: Air
Exposure Medium: Indoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Commercial Worker	Adult	Commercial Buildings	CA	Modeled Concentration in Air	see Table 3a	ug/m^3	see Table 3a	Chronic Daily Intake (CDI) (ug/m^3) =
				ET	Exposure Time	8	hrs/day	USEPA, 1997a	$\frac{CA \times ET \times EF \times ED}{CF \times AT}$
				EF	Exposure Frequency	250	days/year	USEPA, 2004	
				ED	Exposure Duration	25	years	USEPA, 2004	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	
				CF	Conversion Factor	24	hrs/day	--	
	Resident	Adult	Residence	CA	Modeled Concentration in Air	see Table 3a	ug/m^3	see Table 3a	Chronic Daily Intake (CDI) (ug/m^3) =
				ET	Exposure Time	24	hrs/day	USEPA, 2004	$\frac{CA \times ET \times EF \times ED}{CF \times AT}$
				EF	Exposure Frequency	350	days/year	USEPA, 2004	
				ED	Exposure Duration	24	years	USEPA, 2004	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	
				CF	Conversion Factor	24	hrs/day	--	
		Child	Residence	CA	Modeled Concentration in Air	see Table 3a	ug/m^3	see Table 3a	Chronic Daily Intake (CDI) (ug/m^3) =
				ET	Exposure Time	24	hrs/day	USEPA, 2004	$\frac{CA \times ET \times EF \times ED}{CF \times AT}$
				EF	Exposure Frequency	350	days/year	USEPA, 2004	
				ED	Exposure Duration	6	years	USEPA, 2004	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	
				CF	Conversion Factor	24	hrs/day	--	

TABLE 10

NON-CANCER TOXICITY DATA – INHALATION

WELLS G&H SUPERFUND SITE - DU-1

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD[1]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Tetrachloroethene	Chronic	2.70E+02	ug/m^3	N/A	N/A	CNS	100	ATSDR	9/1/2004
Trichloroethene	Chronic	4.00E+01	ug/m^3	N/A	N/A	CNS/Liver	3000	NCEA	9/1/2004
Vinyl chloride	Chronic	1.00E+02	ug/m^3	N/A	N/A	Liver	30	IRIS	9/1/2004

IRIS = Integrated Risk Information System

NCEA = National Center for Environmental Assessment

ATSDR = Agency for Toxic Substances and Disease Registry

N/A = Not Applicable

TABLE 11
CANCER TOXICITY DATA – INHALATION
WELLS G&H SUPERFUND SITE - OU-1

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Tetrachloroethene	5.90E-06	$(ug/m^3)^{-1}$	N/A	N/A	B2	CalEPA	9/1/2004
Trichloroethene	1.10E-04	$(ug/m^3)^{-1}$	N/A	N/A	C-B2	NCEA	9/1/2004
Vinyl chloride (Comm. Worker)	4.40E-06	$(ug/m^3)^{-1}$	N/A	N/A	A	IRIS	9/1/2004
Vinyl chloride (Resident)	8.80E-06	$(ug/m^3)^{-1}$	N/A	N/A	A	IRIS	9/1/2004

IRIS = Integrated Risk Information System
NCEA = National Center for Environmental Assessment
CalEPA = California Environmental Protection Agency

(1) An alternative inhalation toxicity value from CalEPA [2E-06 $ug/m^3)^{-1}$] has been used to provide a range of possible risks associated with exposure to trichloroethene.

EPA Group:
- A - Human carcinogen
- B1 - Probable human carcinogen - indicates that limited human data are available
- B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
- C - Possible human carcinogen
- D - Not classifiable as a human carcinogen (by the oral route)
- E - Evidence of noncarcinogenicity

TABLE 12

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

WELLS G&H SUPERFUND SITE - OU-1

Scenario Timeframe: Current/Future
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Air	Indoor Air	Unifirst - 21 Olympia Ave.	Inhalation	Tetrachloroethene	1E+00	ug/m^3	9.4E-02	ug/m3	5.9E-06	(ug/m3)$^{-1}$	5.5E-07	2.6E-01	ug/m3	2.7E+02	ug/m3	9.7E-04
				Trichloroethene	2E-01	ug/m^3	2.0E-02	ug/m3	1.1E-04	(ug/m3)$^{-1}$	2.2E-06	5.6E-02	ug/m3	4.0E+01	ug/m3	1.4E-03
			Exp. Route Total								3E-06					2E-03
		Exposure Point Total									3E-06					2E-03
		W.R. Grace	Inhalation	Tetrachloroethene	3E+00	ug/m^3	2.4E-01	ug/m3	5.9E-06	(ug/m3)$^{-1}$	1.4E-06	6.8E-01	ug/m3	2.7E+02	ug/m3	2.5E-03
				Trichloroethene	2E+00	ug/m^3	1.4E-01	ug/m3	1.1E-04	(ug/m3)$^{-1}$	1.5E-05	3.9E-01	ug/m3	4.0E+01	ug/m3	9.8E-03
				Vinyl Chloride	2E-01	ug/m^3	1.7E-02	ug/m3	4.4E-06	(ug/m3)$^{-1}$	7.4E-08	4.7E-02	ug/m3	1.0E+02	ug/m3	4.7E-04
			Exp. Route Total								2E-05					1E-02
		Exposure Point Total									2E-05					1E-02
		Wildwood	Inhalation	Tetrachloroethene	2E+00	ug/m^3	1.2E-01	ug/m3	5.9E-06	(ug/m3)$^{-1}$	7.4E-07	3.5E-01	ug/m3	2.7E+02	ug/m3	1.3E-03
				Trichloroethene	2E+01	ug/m^3	1.3E+00	ug/m3	1.1E-04	(ug/m3)$^{-1}$	1.4E-04	3.6E+00	ug/m3	4.0E+01	ug/m3	9.0E-02
				Vinyl Chloride	2E-01	ug/m^3	1.5E-02	ug/m3	4.4E-06	(ug/m3)$^{-1}$	6.6E-08	4.2E-02	ug/m3	1.0E+02	ug/m3	4.2E-04
			Exp. Route Total								1E-04					9E-02
		Exposure Point Total									1E-04					9E-02
		Olympia - FDOA	Inhalation	Tetrachloroethene	3E+00	ug/m^3	2.6E-01	ug/m3	5.9E-06	(ug/m3)$^{-1}$	1.5E-06	7.2E-01	ug/m3	2.7E+02	ug/m3	2.7E-03
				Trichloroethene	5E+01	ug/m^3	4.3E+00	ug/m3	1.1E-04	(ug/m3)$^{-1}$	4.7E-04	1.2E+01	ug/m3	4.0E+01	ug/m3	3.0E-01
				Vinyl Chloride	2E+00	ug/m^3	1.9E-01	ug/m3	4.4E-06	(ug/m3)$^{-1}$	8.3E-07	5.3E-01	ug/m3	1.0E+02	ug/m3	5.3E-03
			Exp. Route Total								5E-04					3E-01
		Exposure Point Total									5E-04					3E-01
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
							Total of Receptor Risks Across All Media				N/A	Total of Receptor Hazards Across All Media				N/A

Unifirst Cancer Risk with CalEPA unit risk for TCE	6E-07
WR Grace Cancer Risk with CalEPA unit risk for TCE	2E-06
Wildwood Cancer Risk with CalEPA unit risk for TCE	3E-06
Olympia Cancer Risk with CalEPA unit risk for TCE	1E-05

TABLE 13
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
WELLS G&H SUPERFUND SITE - OU-1

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Air	Indoor Air	Unifirst - 21 Olympia Ave.	Inhalation													
				Tetrachloroethene	1E+00	ug/m^3	3.6E-01	ug/m3	5.9E-06	(ug/m3)$^{-1}$	2.2E-06	1.1E+00	ug/m3	2.7E+02	ug/m3	4.1E-03
				Trichloroethene	2E-01	ug/m^3	8.1E-02	ug/m3	1.1E-04	(ug/m3)$^{-1}$	8.9E-06	2.4E-01	ug/m3	4.0E+01	ug/m3	5.9E-03
			Exp. Route Total								1E-05					1E-02
		Exposure Point Total									1E-05					1E-02
		W.R. Grace	Inhalation													
				Tetrachloroethene	3E+00	ug/m^3	9.9E-01	ug/m3	5.9E-06	(ug/m3)$^{-1}$	5.8E-06	2.9E+00	ug/m3	2.7E+02	ug/m3	1.1E-02
				Trichloroethene	2E+00	ug/m^3	5.6E-01	ug/m3	1.1E-04	(ug/m3)$^{-1}$	6.2E-05	1.6E+00	ug/m3	4.0E+01	ug/m3	4.1E-02
				Vinyl chloride	2E-01	ug/m^3	6.8E-02	ug/m3	8.8E-06	(ug/m3)$^{-1}$	6.0E-07	2.0E-01	ug/m3	1.0E+02	ug/m3	2.0E-03
			Exp. Route Total								7E-05					5E-02
		Exposure Point Total									7E-05					5E-02
		Wildwood	Inhalation													
				Tetrachloroethene	2E+00	ug/m^3	5.0E-01	ug/m3	5.9E-06	(ug/m3)$^{-1}$	3.0E-06	1.5E+00	ug/m3	2.7E+02	ug/m3	5.4E-03
				Trichloroethene	2E+01	ug/m^3	5.2E+00	ug/m3	1.1E-04	(ug/m3)$^{-1}$	5.7E-04	1.5E+01	ug/m3	4.0E+01	ug/m3	3.8E-01
				Vinyl chloride	2E+01	ug/m^3	5.2E+00	ug/m3	8.8E-06	(ug/m3)$^{-1}$	4.6E-05	1.5E+01	ug/m3	1.0E+02	ug/m3	1.5E-01
			Exp. Route Total								6E-04					5E-01
		Exposure Point Total									6E-04					5E-01
		Olympia - FDDA	Inhalation													
				Tetrachloroethene	3E+00	ug/m^3	1.0E+00	ug/m3	5.9E-06	(ug/m3)$^{-1}$	6.1E-06	3.0E+00	ug/m3	2.7E+02	ug/m3	1.1E-02
				Trichloroethene	5E+01	ug/m^3	1.7E+01	ug/m3	1.1E-04	(ug/m3)$^{-1}$	1.9E-03	5.1E+01	ug/m3	4.0E+01	ug/m3	1.3E+00
				Vinyl chloride	2E+00	ug/m^3	7.7E-01	ug/m3	8.8E-06	(ug/m3)$^{-1}$	6.7E-06	2.2E+00	ug/m3	1.0E+02	ug/m3	2.2E-02
			Exp. Route Total								2E-03					1E+00
		Exposure Point Total									2E-03					1E+00
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	N/A				Total of Receptor Hazards Across All Media	N/A

Unifirst Cancer Risk with CalEPA unit risk for TCE	2E-06
W.R. Grace Cancer Risk with CalEPA unit risk for TCE	6E-06
Wildwood Cancer Risk with CalEPA unit risk for TCE	6E-05
Olympia Cancer Risk with CalEPA unit risk for TCE	5E-05

TABLE 14

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

WELLS G&H SUPERFUND SITE - OU-1

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Air	Indoor Air	Unifirst - 21 Olympia Ave.	Inhalation													
				Tetrachloroethene	1E+00	ug/m³	9.4E-02	ug/m3	5.9E-06	(ug/m3) -1	5.6E-07	1.1E+00	ug/m3	2.7E+02	ug/m3	4.1E-03
				Trichloroethene	2E-01	ug/m³	2.0E-02	ug/m3	1.1E-04	(ug/m3) -1	2.2E-06	2.4E-01	ug/m3	4.0E+01	ug/m3	5.9E-03
			Exp. Route Total								3E-06					1E-02
		Exposure Point Total									3E-06					1E-02
		W.R. Grace	Inhalation													
				Tetrachloroethene	3E+00	ug/m³	2.5E-01	ug/m3	5.9E-06	(ug/m3) -1	1.4E-06	2.9E+00	ug/m3	2.7E+02	ug/m3	1.1E-02
				Trichloroethene	2E+00	ug/m³	1.4E-01	ug/m3	1.1E-04	(ug/m3) -1	1.6E-05	1.6E+00	ug/m3	4.0E+01	ug/m3	4.1E-02
				Vinyl chloride	2E-01	ug/m³	1.7E-02	ug/m3	8.8E-06	(ug/m3) -1	1.5E-07	2.0E-01	ug/m3	1.0E+02	ug/m3	2.0E-03
			Exp. Route Total								2E-05					5E-02
		Exposure Point Total									2E-05					5E-02
		Wildwood	Inhalation													
				Tetrachloroethene	2E+00	ug/m³	1.3E-01	ug/m3	5.9E-06	(ug/m3) -1	7.4E-07	1.5E+00	ug/m3	2.7E+02	ug/m3	5.4E-03
				Trichloroethene	2E+01	ug/m³	1.3E+00	ug/m3	1.1E-04	(ug/m3) -1	1.4E-04	1.5E+01	ug/m3	4.0E+01	ug/m3	3.8E-01
				Vinyl chloride	2E+01	ug/m³	1.3E+00	ug/m3	8.8E-06	(ug/m3) -1	1.1E-05	1.5E+01	ug/m3	1.0E+02	ug/m3	1.5E-01
			Exp. Route Total								2E-04					5E-01
		Exposure Point Total									2E-04					5E-01
		Olympia - FDDA	Inhalation													
				Tetrachloroethene	3E+00	ug/m³	2.8E-01	ug/m3	5.9E-06	(ug/m3) -1	1.5E-06	3.0E+00	ug/m3	2.7E+02	ug/m3	1.1E-02
				Trichloroethene	5E+01	ug/m³	4.3E+00	ug/m3	1.1E-04	(ug/m3) -1	4.8E-04	5.1E+01	ug/m3	4.0E+01	ug/m3	1.3E+00
				Vinyl chloride	2E+00	ug/m³	1.9E-01	ug/m3	8.8E-06	(ug/m3) -1	1.7E-06	2.2E+00	ug/m3	1.0E+02	ug/m3	2.2E-02
			Exp. Route Total								5E-04					1E+00
		Exposure Point Total									5E-04					1E+00
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
							Total of Receptor Risks Across All Media				N/A	Total of Receptor Hazards Across All Media				N/A

Unifirst Cancer Risk with CalEPA unit risk for TCE	6E-07
W.R. Grace Cancer Risk with CalEPA unit risk for TCE	2E-06
Wildwood Cancer Risk with CalEPA unit risk for TCE	1E-05
Olympia Cancer Risk with CalEPA unit risk for TCE	1E-05

TABLE 15
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
WELLS G&H SUPERFUND SITE - OU-1

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Young Child + Adult					Non-Carcinogenic Hazard Quotient Young Child				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Air	Indoor Air	Unifirst - 21 Olympia Ave.	Tetrachloroethene	--	3E-06	--	--	3E-06	CNS	--	4E-03	--	4E-03
			Trichloroethene	--	1E-05	--	--	1E-05	CNS/Liver	--	6E-03	--	6E-03
			Chemical Total	--	1E-05	--	--	1E-05		--	1E-02	--	1E-02
			Radionuclide Total										
		Exposure Point Total						1E-05					1E-02
	Exposure Medium Total							1E-05					1E-02
Medium Total								1E-05					1E-02
Receptor Total								1E-05					1E-02

-- = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 1E-05

Unifirst Cancer Risk with CalEPA unit risk for TCE: 3E-06

Total Hazard Across All Media: 1E-02

Total Blood HI =	N/A
Total Cardiovascular HI =	N/A
Total Developmental HI =	N/A
Total General Toxicity HI =	N/A
Total GI System HI =	N/A
Total Immune System HI =	N/A
Total Kidney HI =	N/A
Total Liver HI =	6E-03
Total Nervous System HI =	1E-02
Total Skin HI =	N/A
Total Respiratory HI =	N/A

TABLE 18
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
WELLS G&H SUPERFUND SITE - OU-1

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Young Child + Adult					Non-Carcinogenic Hazard Quotient Young Child				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Air	Indoor Air	W.R. Grace											
			Tetrachloroethene	--	7E-06	--	--	7E-06	CNS	--	1E-02	--	1E-02
			Trichloroethene	--	8E-05	--	--	8E-05	CNS/Liver	--	4E-02	--	4E-02
			Vinyl chloride	--	7E-07	--	--	7E-07	Liver	--	2E-03	--	2E-03
			Chemical Total	--	9E-05	--	--	9E-05		--	5E-02	--	5E-02
			Radionuclide Total										
		Exposure Point Total						9E-05					5E-02
	Exposure Medium Total							9E-05					5E-02
Medium Total								9E-05					5E-02
Receptor Total								9E-05					5E-02

-- = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 9E-05

Total Hazard Across All Media: 5E-02

W.R. Grace Cancer Risk with CalEPA unit risk for TCE: 9E-06

Total Blood HI =	N/A
Total Cardiovascular HI =	N/A
Total Developmental HI =	N/A
Total General Toxicity HI =	N/A
Total GI System HI =	N/A
Total Immune System HI =	N/A
Total Kidney HI =	N/A
Total Liver HI =	4E-02
Total Nervous System HI =	5E-02
Total Skin HI =	N/A
Total Respiratory HI =	N/A

TABLE 17
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
WELLS G&H SUPERFUND SITE - OU-1

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Young Child + Adult					Non-Carcinogenic Hazard Quotient Young Child				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Air	Indoor Air	Wildwood											
			Tetrachloroethene	--	4E-06	--	--	4E-06	CNS	--	5E-03	--	5E-03
			Trichloroethene	--	7E-04	--	--	7E-04	CNS/Liver	--	4E-01	--	4E-01
			Vinyl chloride	--	6E-05	--	--	6E-05	Liver	--	2E-01	--	2E-01
			Chemical Total	--	8E-04	--	--	8E-04		--	5E-01	--	5E-01
			Radionuclide Total										
		Exposure Point Total						8E-04					5E-01
	Exposure Medium Total							8E-04					5E-01
Medium Total								8E-04					5E-01
Receptor Total								8E-04					5E-01

-- = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 8E-04

Wildwood Cancer Risk with CalEPA unit risk for TCE: 7E-05

Total Hazard Across All Media: 5E-01

Total Blood HI =	N/A
Total Cardiovascular HI =	N/A
Total Developmental HI =	N/A
Total General Toxicity HI =	N/A
Total GI System HI =	N/A
Total Immune System HI =	N/A
Total Kidney HI =	N/A
Total Liver HI =	5E-01
Total Nervous System HI =	4E-01
Total Skin HI =	N/A
Total Respiratory HI =	N/A

TABLE 18
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
WELLS G&H SUPERFUND SITE - OU-1

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Young Child + Adult					Non-Carcinogenic Hazard Quotient Young Child				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Air	Indoor Air	Olympia - FDDA											
			Tetrachloroethene	--	6E-06	--	--	6E-06	CNS	--	1E-02	--	1E-02
			Trichloroethene	--	2E-03	--	--	2E-03	CNS/Liver	--	1E+00	--	1E+00
			Vinyl chloride	--	8E-06	--	--	8E-06	Liver	--	2E-02	--	2E-02
			Chemical Total	--	2E-03	--	--	2E-03		--	1E+00	--	1E+00
			Radionuclide Total										
		Exposure Point Total						2E-03					1E+00
	Exposure Medium Total							2E-03					1E+00
Medium Total								2E-03					1E+00
Receptor Total								2E-03					1E+00

-- = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 2E-03

Olympia Cancer Risk with CalEPA unit risk for TCE: 6E-05

Total Hazard Across All Media: 1E+00

Total Blood HI =	N/A
Total Cardiovascular HI =	N/A
Total Developmental HI =	N/A
Total General Toxicity HI =	N/A
Total GI System HI =	N/A
Total Immune System HI =	N/A
Total Kidney HI =	N/A
Total Liver HI =	1E+00
Total Nervous System HI =	1E+00
Total Skin HI =	N/A
Total Respiratory HI =	N/A

Attachment 7.2

TABLE 1
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
WELLS G&H SUPERFUND SITE - OU-2

Scenario Timeframe: Current
Medium: Air
Exposure Medium: Indoor Air

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale (1)
Dewey Avenue Area									
	1,1,1-Trichloroethane	N/A	N/A	N/A	N/A	1.4E+02	ug/m^3	Max	
	2-Butanone	N/A	N/A	N/A	N/A	5.8E+01	ug/m^3	Max	
	Tetrachloroethene	N/A	N/A	N/A	N/A	1.3E+01	ug/m^3	Max	
	Toluene	N/A	N/A	N/A	N/A	1.2E+02	ug/m^3	Max	
	Trichloroethene	N/A	N/A	N/A	N/A	9.1E-01	ug/m^3	Max	

(1) Rationale: The maximum detected concentration from all samples collected in 1989 and 1991 have been used for screening.

J = Estimated Concentration
Max = Maximum Detected Concentration
N/A = Not Applicable
UCL = Upper Confidence Limit
EPC = Exposure Point Concentration
RME = Reasonable Maximum Exposure
CT = Central Tendency

TABLE 2

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

WELLS G&H SUPERFUND SITE - OU-2

Scenario Timeframe: Current
Medium: Air
Exposure Medium: Indoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Residence	CA	Modeled Concentration in Air	see Table 1	ug/m^3	see Table 1	Chronic Daily Intake (CDI) (ug/m^3) =
				ET	Exposure Time	24	hrs/day	USEPA, 2004	$\frac{CA \times ET \times EF \times ED}{CF \times AT}$
				EF	Exposure Frequency	350	days/year	USEPA, 2004	
				ED	Exposure Duration	24	years	USEPA, 2004	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	
				CF	Conversion Factor	24	hrs/day	--	
		Child	Residence	CA	Modeled Concentration in Air	see Table 1	ug/m^3	see Table 1	Chronic Daily Intake (CDI) (ug/m^3) =
				ET	Exposure Time	24	hrs/day	USEPA, 2004	$\frac{CA \times ET \times EF \times ED}{CF \times AT}$
				EF	Exposure Frequency	350	days/year	USEPA, 2004	
				ED	Exposure Duration	6	years	USEPA, 2004	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	
				CF	Conversion Factor	24	hrs/day	--	

TABLE 3

NON-CANCER TOXICITY DATA – INHALATION

WELLS G&H SUPERFUND SITE

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD(1)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
1,1,1-Trichloroethane	Chronic	2.20E+03	ug/m^3	N/A	N/A	Respiratory	3000	IRIS	9/1/2004
2-Butanone	Chronic	5.00E+03	ug/m^3	N/A	N/A	Developmental	300	IRIS	9/1/2004
cis-1,2-Dichloroethene	Chronic	2.00E+02	ug/m^3	N/A	N/A	Liver	30	IRIS	9/1/2004
Tetrachloroethene	Chronic	2.70E+02	ug/m^3	N/A	N/A	CNS	100	ATSDR	9/1/2004
Toluene	Chronic	4.00E+02	ug/m^3	N/A	N/A	CNS	300	IRIS	9/1/2004
Trichloroethene	Chronic	4.00E+01	ug/m^3	N/A	N/A	CNS/Liver	3000	NCEA	9/1/2004

IRIS = Integrated Risk Information System

NCEA = National Center for Environmental Assessment

ATSDR = Agency for Toxic Substances and Disease Registry

N/A = Not Applicable

(1) RfC for 1,1-dichloroethene used for cis-1,2-dichloroethene

TABLE 4

CANCER TOXICITY DATA -- INHALATION

WELLS G&H SUPERFUND SITE

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
1,1,1-Trichloroethane	N/A	N/A	N/A	N/A	C	IRIS	9/1/2004
2-Butanone	N/A	N/A	N/A	N/A	D	IRIS	9/1/2004
cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	D	IRIS	9/1/2004
Tetrachloroethene	5.90E-06	$(ug/m^3)^{-1}$	N/A	N/A	B2	CalEPA	9/1/2004
Toluene	N/A	N/A	N/A	N/A	D	IRIS	9/1/2004
Trichloroethene	1.10E-04	$(ug/m^3)^{-1}$	N/A	N/A	C-B2	NCEA	9/1/2004

IRIS = Integrated Risk Information System

NCEA = National Center for Environmental Assessment

CalEPA = California Environmental Protection Agency

N/A = Not Applicable

(1) An alternative inhalation toxicity value from CalEPA [2E-06 $ug/m^3)^{-1}$] has been used to provide a range of possible risks associated with exposure to trichloroethene.

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen (by the oral route)

E - Evidence of noncarcinogenicity

TABLE 5

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

WELLS G&H SUPERFUND SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Air	Indoor Air	Dewey Avenue Area	Inhalation													
				1,1,1-Trichloroethane	1E+02	ug/m^3	4.9E+01	ug/m3	N/A	N/A	N/A	1.3E+02	ug/m3	2.2E+03	ug/m3	5.9E-02
				2-Butanone	6E+01	ug/m^3	1.9E+01	ug/m3	N/A	N/A	N/A	5.4E+01	ug/m3	5.0E+03	ug/m3	1.1E-02
				Tetrachloroethene	1E+01	ug/m^3	4.2E+00	ug/m3	5.9E-06	$(ug/m3)^{-1}$	2.5E-05	1.2E+01	ug/m3	2.7E+02	ug/m3	4.6E-02
				Toluene	1E+02	ug/m^3	4.0E+01	ug/m3	N/A	N/A	N/A	1.2E+02	ug/m3	4.0E+02	ug/m3	2.9E-01
				Trichloroethene	9E-01	ug/m^3	3.0E-01	ug/m3	1.1E-04	$(ug/m3)^{-1}$	3.3E-05	8.8E-01	ug/m3	4.0E+01	ug/m3	2.2E-02
			Exp. Route Total								6E-05					4E-01
		Exposure Point Total									6E-05					4E-01
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
							Total of Receptor Risks Across All Media				N/A	Total of Receptor Hazards Across All Media				N/A

Dewey Avenue Area Cancer Risk with CalEPA unit risk for TCE: 3E-05

TABLE 6

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

WELLS G&H SUPERFUND SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Air	Indoor Air	Dewey Avenue Area	Inhalation													
				1,1,1-Trichloroethane	1E+02	ug/m^3	1.1E+01	ug/m3	N/A	N/A	N/A	1.3E+02	ug/m3	2.2E+03	ug/m3	5.9E-02
				2-Butanone	6E+01	ug/m^3	4.6E+00	ug/m3	N/A	N/A	N/A	5.4E+01	ug/m3	5.0E+03	ug/m3	1.1E-02
				Tetrachloroethene	1E+01	ug/m^3	1.1E+00	ug/m3	5.9E-06	$(ug/m3)^{-1}$	6.2E-06	1.2E+01	ug/m3	2.7E+02	ug/m3	4.8E-02
				Toluene	1E+02	ug/m^3	9.9E+00	ug/m3	N/A	N/A	N/A	1.2E+02	ug/m3	4.0E+02	ug/m3	2.9E-01
				Trichloroethene	9E-01	ug/m^3	7.5E-02	ug/m3	1.1E-04	$(ug/m3)^{-1}$	8.3E-06	8.8E-01	ug/m3	4.0E+01	ug/m3	2.2E-02
			Exp. Route Total								1E-05					4E-01
		Exposure Point Total									1E-05					4E-01
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
							Total of Receptor Risks Across All Media				N/A	Total of Receptor Hazards Across All Media				N/A
							Dewey Avenue Area Cancer Risk with CalEPA unit risk for TCE				6E-06					

TABLE 7
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
WELLS G&H SUPERFUND SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Young Child + Adult					Non-Carcinogenic Hazard Quotient Young Child				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Air	Indoor Air	Dewey Avenue Area											
			1,1,1-Trichloroethane	--	N/A	--	--	N/A	Respiratory	--	6E-02	--	6E-02
			2-Butanone	--	N/A	--	--	N/A	Developmental	--	1E-02	--	1E-02
			Tetrachloroethene	--	3E-05	--	--	3E-05	CNS	--	5E-02	--	5E-02
			Toluene	--	N/A	--	--	N/A	CNS	--	3E-01	--	3E-01
			Trichloroethene	--	4E-05	--	--	4E-05	CNS/Liver	--	2E-02	--	2E-02
			Chemical Total	--	7E-05	--	--	7E-05		--	4E-01	--	4E-01
			Radionuclide Total										
		Exposure Point Total						7E-05					4E-01
	Exposure Medium Total							7E-05					4E-01
Medium Total								7E-05					4E-01
Receptor Total								7E-05					4E-01

-- = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 7E-05

Dewey Avenue Area Cancer Risk with CalEPA unit risk for TCE: 3E-05

Total Hazard Across All Media: 4E-01

Total Blood HI =	N/A
Total Cardiovascular HI =	N/A
Total Developmental HI =	1E-02
Total General Toxicity HI =	N/A
Total GI System HI =	N/A
Total Immune System HI =	N/A
Total Kidney HI =	N/A
Total Liver HI =	2E-02
Total Nervous System HI =	4E-01
Total Skin HI =	N/A
Total Respiratory HI =	6E-02

TABLE 8. EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
WELLS G&H SUPERFUND SITE

Dewey Avenue Area

Detected Analyte	Maximum Detection (ug/L)	Indoor Air Screening Value (ug/L)[1]	Evaluate via Modeling?
1,1,1-Trichloroethane	16	310	No
cis-1,2-Dichloroethene	55	21	Yes
Tetrachloroethene	2800	5	Yes
Toluene	36	150	No
Trichloroethene	120	5	Yes

Rifle Range Road Area

Detected Analyte	Maximum Detection (ug/L)	Indoor Air Screening Value (ug/L)[1]	Evaluate via Modeling?
Tetrachloroethene	23	5	Yes
Trichloroethene	8	5	Yes

Notes

1. Non-carcinogenic analyte screening values adjusted to a hazard index of 0.1

TABLE 9
GROUNDWATER TO INDOOR AIR
SHALLOW GROUNDWATER

	GW EPC	GW Temp.	GW Temp.	Henry's Law Constant at ref. temp.	Henry's Law Reference Temp.	Normal Boiling Point	Enthalpy of vaporization at T_B	Critical Temp.	constant	Enthalpy of vaporization at T_S	Gas Constant	Henry's Law Constant at T_S	Gas Constant	Henry's Law Constant
	C_w	T_S	T_S	H_R	T_R	T_B	$\Delta H_{v,B}$	T_C	n	$\Delta H_{v,TS}$	R_c	H_{TS}	R	H'_{TS}
Units:	µg/L	°C	K	atm-m³/mol	K	K	cal/mol	K	unitless	cal/mol	cal/mol-K	atm-m³/mol	m³-atm/mol-K	unitless
Formula	Input	(10 for screening)	(T_S + 273.15)	lookup	(lookup+273.15)	lookup	lookup	lookup	(Note 7)	(Note 8)		(Note 9)		H_{TS} / (R * T_S)
Analyte														
cis-1,2-Dichloroethene	5.5E+01	1.00E+01	2.83E+02	4.07E-03	2.98E+02	3.34E+02	7.19E+03	5.44E+02	3.38E-01	7.73E+03	1.99E+00	4.07E-03	8.21E-05	1.75E-01
Tetrachloroethene	2.8E+03	1.00E+01	2.83E+02	1.84E-02	2.98E+02	3.94E+02	8.29E+03	6.20E+02	3.55E-01	9.55E+03	1.99E+00	1.84E-02	8.21E-05	7.92E-01
Trichloroethene	1.2E+02	1.00E+01	2.83E+02	1.03E-02	2.98E+02	3.60E+02	7.51E+03	5.44E+02	3.74E-01	8.36E+03	1.99E+00	1.03E-02	8.21E-05	4.43E-01
Tetrachloroethene	2.3E+01	1.00E+01	2.83E+02	1.84E-02	2.98E+02	3.94E+02	8.29E+03	6.20E+02	3.55E-01	9.55E+03	1.99E+00	1.84E-02	8.21E-05	7.92E-01
Trichloroethene	8.0E+00	1.00E+01	2.83E+02	1.03E-02	2.98E+02	3.60E+02	7.51E+03	5.44E+02	3.74E-01	8.36E+03	1.99E+00	1.03E-02	8.21E-05	4.43E-01

TABLE 9 (continued)
GROUNDWATER TO INDOOR AIR
SHALLOW GROUNDWATER

	Conversion Factor m^3 to L	Source Vapor Conc.	Depth below grade to bottom of enclosed space	Depth below grade to water table	Source Trench Separation	SCS soil type directly above water table	SCS soil type in vadose zone	Capillary zone mean particle diameter	Thickness of capillary zone	Diffusivity in air	Diffusivity in water	Vadose zone soil total porosity
	Conv01	C_{source}	L_F	L_{WT}	L_T	ST_{WT}	ST_v	D_{cz}	L_{cz}	D_a	D_w	n_v
Units:	L/m^3	$\mu g/m^3$	cm	cm	cm	unitless	unitless	cm	cm	cm^2/s	cm^2/s	cm^3/cm^3
Formula:		C_w*H'_{TS}*Conv01	(15 or 200 for screening)	(Note 3)	L_{WT} - L_F	(Note 10)	(Note 11)	lookup	(Note 12)	lookup	lookup	(0.43 for screening)
Analyte												
cis-1,2-Dichloroethene	1.00E+03	9.63E+03	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.36E-02	1.13E-05	4.30E-01
Tetrachloroethene	1.00E+03	2.22E+06	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.20E-02	8.20E-06	4.30E-01
Trichloroethene	1.00E+03	5.32E+04	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.90E-02	9.10E-06	4.30E-01
Tetrachloroethene	1.00E+03	1.82E+04	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.20E-02	8.20E-06	4.30E-01
Trichloroethene	1.00E+03	3.55E+03	2.00E+02	4.00E+02	2.00E+02	SC	SCL	2.50E-02	3.00E+01	7.90E-02	9.10E-06	4.30E-01

TABLE 9 (continued)
GROUNDWATER TO INDOOR AIR
SHALLOW GROUNDWATER

	Vadose zone soil water-filled porosity $\theta_{w,v}$	Vadose zone soil air-filled porosity $\theta_{a,v}$	Vadose zone Effective Diffusion Coeff. D_v^{eff}	Capillary zone soil total porosity n_{cz}	Capillary zone residual soil water content $\theta_{r,cz}$	Capillary zone saturated soil water content $\theta_{s,cz}$	Capillary zone van Genuchten shape parameter M_{cz}	Capillary zone soil water-filled porosity $\theta_{w,cz}$	Capillary zone soil air-filled porosity $\theta_{a,cz}$	Capillary zone Effective Diffusion Coeff. D_{cz}^{eff}	Total Overall Effective Diffusion Coeff. D_T^{eff}
Units:	cm^3/cm^3	cm^3/cm^3	cm^2/s	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	unitless	cm^3/cm^3	cm^3/cm^3	cm^2/s	cm^2/s
Formula:	(0.3 for screening)	$n_v - \theta_{w,v}$	(Note 13)	(0.43 for screening)	lookup	lookup	lookup	(Note 15)	$n_{cz} - \theta_{w,cz}$	(Note 14)	(Note 4)
Analyte											
cis-1,2-Dichloroethene	3.00E-01	1.30E-01	4.52E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	8.30E-05	2.71E-04
Tetrachloroethene	3.00E-01	1.30E-01	4.37E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	7.21E-05	2.49E-04
Trichloroethene	3.00E-01	1.30E-01	4.81E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	8.07E-05	2.76E-04
Tetrachloroethene	3.00E-01	1.30E-01	4.37E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	7.21E-05	2.49E-04
Trichloroethene	3.00E-01	1.30E-01	4.81E-04	4.30E-01	1.17E-01	3.85E-01	1.72E-01	3.55E-01	7.52E-02	8.07E-05	2.76E-04

TABLE 9 (continued)
GROUNDWATER TO INDOOR AIR
SHALLOW GROUNDWATER

	Area of Enclosed Space Below Grade	Building Ventilation Rate	Pressure Diff. between soil & enclosed space	Vadose zone soil saturated hydraulic conductivity	Conversion Factor hr to s	Viscosity of water at 10°C	Viscosity of water at system temp.	Density of water	Acceleration due to gravity	Vadose zone soil intrinsic permeability	Vadose zone residual soil water content	Vadose zone effective total fluid saturation
	A_B	$Q_{building}$	ΔP	$K_{s,v}$	Conv02	$\mu_{w,10}$	μ_w	ρ_w	g	$k_{i,v}$	$\theta_{r,v}$	S_{te}
Units:	cm^2	cm^3/s	$g/cm\text{-}s^2$	cm/hr	s/hr	g/cm-s	g/cm-s	g/cm^3	cm/s^2	cm^2	cm^3/cm^3	unitless
Formula:	(Note 2)	(56335 for screening)	(40 for screening)	lookup			(Note 16)	(0.999 for screening)		(Note 17)	lookup	(Note 18)
Analyte												
cis-1,2-Dichloroethene	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Tetrachloroethene	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Trichloroethene	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Tetrachloroethane	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01
Trichloroethane	1.69E+06	5.63E+04	4.00E+01	5.50E-01	3.60E+03	1.31E-02	1.31E-02	9.99E-01	9.81E+02	2.04E-09	6.30E-02	6.46E-01

TABLE 9 (continued)
GROUNDWATER TO INDOOR AIR
SHALLOW GROUNDWATER

	Vadose zone van Genuchten shape parameter M_v	Vadose zone soil relative air permeability k_{rg}	Vadose zone soil effective vapor permeability k_v	Floor-wall seam perimeter X_{crack}	Vapor viscosity at avg. soil temp. μ_{TS}	Crack depth below grade Z_{crack}	Total area of cracks A_{crack}	Crack-to-total area ratio η	Equivalent crack radius r_{crack}	Avg. Vapor Flow Rate Into Bldg. Q_{soil}	Foundation or Slab Thickness L_{crack}	Crack Effective Diffusion Coeff. D^{crack}
Units:	unitless	unitless	cm^2	cm	g/cm-s	cm	cm^2	unitless	cm	cm^3/s	cm	cm^2/s
Formula:	lookup	(Note 19)	(Note 20)	(3844 for screening)	$0.00018*(T_S/298.15)$^0.5	(= L_F for screening)	(384 for screening)	A_{crack}/A_B	$\eta(A_B/X_{crack})$	(Note 5)	(15 for screening)	(Note 1)
Analyte												
cis-1,2-Dichloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.52E-04
Tetrachloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.37E-04
Trichloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.81E-04
Tetrachloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.37E-04
Trichloroethene	2.48E-01	5.42E-01	1.10E-09	3.84E+03	1.75E-04	2.00E+02	3.84E+02	2.27E-04	9.99E-02	7.34E-01	1.50E+01	4.81E-04

TABLE 9 (continued)
GROUNDWATER TO INDOOR AIR
SHALLOW GROUNDWATER

	Infinite Source Indoor Attenuation Coeff.	Infinite Source Bldg. Conc.
	α	$C_{building}$
Units:	unitless	$\mu g/m^3$
Formula:	(Note 6)	$C_{source} * \alpha$
Analyte		
cis-1,2-Dichloroethene	9.87E-06	9.5E-02
Tetrachloroethene	9.65E-06	2.1E+01
Trichloroethene	9.91E-06	5.3E-01
Tetrachloroethene	9.65E-06	1.8E-01
Trichloroethene	9.91E-06	3.5E-02

Notes:

Reference: *User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings*, USEPA, September 1997.

(1) Assumed equivalent to D_i^{eff} of soil layer i in contact with the floor

(2) For screening, assume a trench 4 ft deep, 3 ft wide, and 30 ft long.

(3) Depth to water table minus depth to bottom of floor must be > thickness of capillary fringe, which is based on the soil type (typ. around 30 cm). Use 400 cm for screening purposes.

(4) $D_T^{eff} = L_T / (((L_{WT} - L_{cz} - L_F) / D_v^{eff}) + (L_{cz} / D_{cz}^{eff}))$

(5) $Q_{soil} = \Delta P * k_v * L_{crack}) / \mu_{TS}$; not from above reference

(6) $\alpha = [D_T^{eff} * A_B / (Q_{building} * L_T)] / [(D_T^{eff} * A_B / (Q_{soil} * L_T)) + 1]$; assumes no resistance (Peclet number is infinite)

(7) A function of the ratio T_B/T_C:

T_B/T_C	n
<0.57	0.30
0.57-0.71	$0.74(T_B/T_C)$-0.116
>0.71	0.41

(8) $\Delta H_{v,TS} = \Delta H_{v,B} * [(1 - T_S/T_C)/(1 - T_B/T_C)]^n$

(9) $H_{TS} = EXP[-\Delta H_{v,TS}/R_c * (1/T_S - 1/T_R)] * H_R$

(10) Refer to 12 SCS soil types - use SC for screening.

(11) Refer to 12 SCS soil types - use SCL for screening.

(12) $L_{cz} = 0.15 / (0.2 * D_{cz})$

(13) $D_v^{eff} = D_a * (\theta_{a,v}^{3.33}/n_v^2) + (D_w/H'_{TS})(\theta_{w,v}^{3.33}/n_v^2)$

(14) $D_{cz}^{eff} = D_a * (\theta_{a,cz}^{3.33}/n_{cz}^2) + (D_w/H'_{TS})(\theta_{w,cz}^{3.33}/n_{cz}^2)$

(15) $\theta_{w,cz} = \theta_{r,m} + ((\theta_{s,m} - \theta_{r,m})/(2^{M/N}))$, where the value 2 in the formula is used for screening, but may be refined based on soil parameters (see USEPA, 1999).

(16) $\mu_w = \mu_{w,10} * (T_S / 283.15)^{0.5}$

(17) $k_{i,v} = K_{s,v} * 1/Conv02 * \mu_w / (\rho_w * g)$

(18) $S_{te} = (\theta_{w,v} - \theta_{r,v}) / (n_v - \theta_{r,v})$

(19) $k_{rg} = (1 - S_{te})^{0.5} * (1 - S_{te}^{1/M})^{2M}$

(20) $k_v = k_{i,v} * k_{rg}$; note that the model is very sensitive to this parameter and if site-specific values are available, they should be used.

TABLE 10
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
WELLS G&H SUPERFUND SITE - OU-2

Scenario Timeframe: Current
Medium: Groundwater
Exposure Medium: Indoor Air

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Dewey Avenue Area (a)	156-59-2	cis-1,2-Dichloroethene	N/A	9.5E-02	ug/m^3	N/A	N/A	N/A	9.5E-02	N/A	3.7 N	N/A	N/A	N	BSL
	127-18-4	Tetrachloroethene	N/A	2.1E+01	ug/m^3	N/A	N/A	N/A	2.1E+01	N/A	0.67 C	N/A	N/A	Y	ASL
	79-01-6	Trichloroethene	N/A	5.3E-01	ug/m^3	N/A	N/A	N/A	5.3E-01	N/A	0.017 C	N/A	N/A	Y	ASL
Rifle Range Road Area (a)	127-18-4	Tetrachloroethene	N/A	1.8E-01	ug/m^3	N/A	N/A	N/A	1.8E-01	N/A	0.67 C	N/A	N/A	N	BSL
	79-01-6	Trichloroethene	N/A	3.5E-02	ug/m^3	N/A	N/A	N/A	3.5E-02	N/A	0.017 C	N/A	N/A	Y	ASL

(a) Refer to text for sample groupings.
All contaminants detected in groundwater exposure points with Henry's Law constants >1E-05 atm-m^3/mol and molecular weights <200 g/mol have been included.

(1) The modeled groundwater contributions to indoor air have been presented in the Maximum Concentration field. Refer to Table 9 for model results.
(2) Maximum concentration used for screening.
(3) Refer to supporting information for background discussion.
(4) USEPA Region 9 PRGs for ambient air (adjusted to an hazard quotient = 0.1 for noncarcinogens), October 1, 2002.
PRG for cis-1,2-dichloroethene has been used for 1,2-dichloroethene (total).
(5) Rationale Codes:
Selection Reason: Above Screening Levels (ASL)
No Screening Level (NSL)
Deletion Reason: No Toxicity Information (NTX)
Below Screening Level (BSL)

Definitions:
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
PRG = Preliminary Remedial Goal
N/A = Not Applicable or Not Available
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 11

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

WELLS G&H SUPERFUND SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Air	Indoor Air	Dewey Avenue Area	Inhalation	Tetrachloroethene	2E+01	ug/m^3	7.0E+00	ug/m3	5.9E-06	$(ug/m3)^{-1}$	4.2E-05	2.1E+01	ug/m3	2.7E+02	ug/m3	7.8E-02
				Trichloroethene	5E-01	ug/m^3	1.7E-01	ug/m3	1.1E-04	$(ug/m3)^{-1}$	1.9E-05	5.1E-01	ug/m3	4.0E+01	ug/m3	1.3E-02
			Exp. Route Total								6E-05					9E-02
		Exposure Point Total									6E-05					9E-02
		Rifle Range Road Area	Inhalation	Trichloroethene	4E-02	ug/m^3	1.2E-02	ug/m3	1.1E-04	$(ug/m3)^{-1}$	1.3E-06	3.4E-02	ug/m3	4.0E+01	ug/m3	8.4E-04
			Exp. Route Total								1E-06					8E-04
		Exposure Point Total									1E-06					8E-04
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
							Total of Receptor Risks Across All Media				N/A	Total of Receptor Hazards Across All Media				N/A

Dewey Avenue Area Cancer Risk with CalEPA unit risk for TCE	4E-05
Rifle Range Road Area Cancer Risk with CalEPA unit risk for TCE	2E-08

TABLE 12

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

WELLS G&H SUPERFUND SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Air	Indoor Air	Dewey Avenue Area	Inhalation	Tetrachloroethene	2E+01	ug/m^3	1.8E+00	ug/m3	5.9E-06	(ug/m3)$^{-1}$	1.0E-05	2.1E+01	ug/m3	2.7E+02	ug/m3	7.8E-02
				Trichloroethene	5E-01	ug/m^3	4.3E-02	ug/m3	1.1E-04	(ug/m3)$^{-1}$	4.7E-06	5.1E-01	ug/m3	4.0E+01	ug/m3	1.3E-02
			Exp. Route Total								2E-05					9E-02
		Exposure Point Total									2E-05					9E-02
		Rifle Range Road Area	Inhalation	Trichloroethene	4E-02	ug/m^3	2.9E-03	ug/m3	1.1E-04	(ug/m3)$^{-1}$	3.2E-07	3.4E-02	ug/m3	4.0E+01	ug/m3	8.4E-04
			Exp. Route Total								3E-07					8E-04
		Exposure Point Total									3E-07					8E-04
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	N/A				Total of Receptor Hazards Across All Media	N/A

Dewey Avenue Area Cancer Risk with CalEPA unit risk for TCE: 1E-05

Rifle Range Road Area Cancer Risk with CalEPA unit risk for TCE: 6E-09

TABLE 13
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
WELLS G&H SUPERFUND SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Young Child + Adult					Non-Carcinogenic Hazard Quotient Young Child				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Air	Indoor Air	Dewey Avenue Area	Tetrachloroethene	--	5E-05	--	--	5E-05	CNS	--	8E-02	--	8E-02
			Trichloroethene	--	2E-05	--	--	2E-05	CNS/Liver	--	1E-02	--	1E-02
			Chemical Total	--	8E-05	--	--	8E-05		--	9E-02	--	9E-02
			Radionuclide Total										
		Exposure Point Total						8E-05					9E-02
	Exposure Medium Total							8E-05					9E-02
Medium Total								8E-05					9E-02
Receptor Total								8E-05					9E-02

-- = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media 8E-05

Dewey Avenue Area Cancer Risk with CalEPA unit risk for TCE 5E-05

Total Hazard Across All Media 9E-02

Total Blood HI =	N/A
Total Cardiovascular HI =	N/A
Total Developmental HI =	N/A
Total General Toxicity HI =	N/A
Total GI System HI =	N/A
Total Immune System HI =	N/A
Total Kidney HI =	N/A
Total Liver HI =	1E-02
Total Nervous System HI =	9E-02
Total Skin HI =	N/A
Total Respiratory HI =	N/A

Attachment 8

ARARs Review

TABLE A8-1. LOCATION-SPECIFIC ARARS WELLS G&H SITE - OU-1				
SITE FEATURES	**REQUIREMENTS**	**ORIGINAL STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**SECOND FIVE-YEAR REVIEW**
Federal Regulatory Requirements	RCRA - Location Standards (40 CFR 264.18). Alternatives SC-10 and MOM-2	Applicable	This regulation outlines the requirements for constructing a RCRA facility on a 100-year floodplain. A facility located on a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood, unless waste may be removed safely before floodwater can reach the facility, or no adverse effects on human health and the environment would result if washout occurred.	These requirements remain applicable. The ROD assumed that remediation facilities would be located outside the floodplain or designed to allow quick mobilization out of the area and to prevent damage by initial floodwaters. The management of RCRA regulated wastes takes place outside the floodplain.
Federal Regulatory Requirements	CWA - Section 404 Dredge and Fill Requirements (Guidelines at 40 CFR 230). Alternatives SC-10 and MOM-2	Applicable	For activities under Section 404 jurisdiction, the governing regulations favor practicable alternatives that have less impact on wetlands. If no mitigated practicable alternative exists, impacts must be mitigated.	Activities at the Source Areas governed by this requirement are complete. No PRP facility is proposing to conduct dredge and fill operations.
Federal Regulatory Requirements	Wetlands Executive Order (EO 11990). Alternatives SC-10 and MOM-2	Applicable	Under this Executive Order, federal agencies are required to select alternatives that minimize the destruction, loss or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If no practicable alternative exists impacts must be mitigated	Activities at the Source Areas governed by this requirement are complete. No PRP facility is proposing work in a wetland.

TABLE A8-1. LOCATION-SPECIFIC ARARS WELLS G&H SITE - OU-1				
SITE FEATURES	**REQUIREMENTS**	**ORIGINAL STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**SECOND FIVE-YEAR REVIEW**
Federal Regulatory Requirements	Floodplains Executive Order (EO 11888). Alternatives SC-10 and MOM-2	Applicable	Federal agencies are required to reduce the risk of flood loss, to minimize impact of floods, and to restore and preserve the natural and beneficial value of floodplains. In addition, practicable alternatives must be selected that have less impact on wetlands.	Activities at the Source Areas governed by this requirement are completed. No PRP facility is proposing further work in the floodplain.
Federal Regulatory Requirements	Protection of Archaeological Resources (32 CFR 229). Alternative SC-10	Status not provided in ROD	These regulations develop procedures for the protection of archaeological resources.	Archeological resources were not discovered during response actions and are not expected to be in the future.
State Regulatory Requirements	Massachusetts Wetlands Protection Requirements (310 CMR 10.00). Alternatives SC-10 and MOM-2	Applicable	These requirements control regulated activities in freshwater wetlands, 100 year floodplains, and 100 foot buffer zones beyond these areas. Regulated activities include virtually any construction or excavation activity. Performance standards are provided for evaluation of the acceptability of various activities.	Activities at the Source Areas governed by this requirement are complete. No PRP facility is proposing work in a wetland.
State Regulatory Requirements	Massachusetts Waterways Licenses (310 CMR 9.00). Alternative MOM-2	Applicable	Controls dredging, filling, and other work in water of the Commonwealth.	The centralized treatment facility for the Wells G&H Source Areas is no longer a component of the remedy; therefore, these requirements are not applicable to OU-1.
State Regulatory Requirements	Inland Wetland Orders (302 CMR 6.00). Alternative MOM-2	Relevant and Appropriate	Defines wetland areas, establishes encroachment lines along waterways or floodplain areas, and regulates activities in these areas.	The centralized treatment facility is no longer a component of the remedy; therefore, these requirements are not relevant and appropriate.

TABLE A8-1. LOCATION-SPECIFIC ARARS WELLS G&H SITE - OU-1				
SITE FEATURES	**REQUIREMENTS**	**ORIGINAL STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**SECOND FIVE-YEAR REVIEW**
State Regulatory Requirements	Operation and Maintenance and Pretreatment Standards for Waste Water Treatment Works and Indirect Discharges (314 CMR 12.0). Alternative MOM-2	Relevant and Appropriate	Insures the proper operation and maintenance of waste water treatment facilities including operation and maintenance, sampling, and discharges.	These requirements remain relevant and appropriate. Proper operation, maintenance, sampling and discharge procedures are being complied with at the UniFirst, Grace and Wildwood facilities.

TABLE A8-2. CHEMICAL-SPECIFIC ARARs AND TBCs WELLS G&H SITE - OU-1				
SITE FEATURES	**REQUIREMENTS**	**ORIGINAL STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**SECOND FIVE-YEAR REVIEW**
Federal Regulatory Requirements	SDWA - Maximum Contaminant Levels (MCLs) (40 CFR 141.11 - 141.16)	Relevant and Appropriate	MCLs have been promulgated for a number of common organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered relevant and appropriate for groundwater aquifers potentially used for drinking water.	The MCL for arsenic in drinking water has decreased since the 1988 Endangerment Assessment. Manganese was not originally identified as a COC in groundwater, but concentrations have historically exceeded the secondary MCL. Arsenic and manganese concentrations in OU-1 should be further evaluated to determine if currently associated with a risk above regulatory guidelines. Groundwater is not being used at OU-1; nonetheless, these requirements remain relevant and appropriate.

TABLE A8-2. CHEMICAL-SPECIFIC ARARs AND TBCs WELLS G&H SITE - OU-1				
SITE FEATURES	REQUIREMENTS	ORIGINAL STATUS	REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS	SECOND FIVE-YEAR REVIEW
Federal Regulatory Requirements	RCRA - Maximum Concentration Limits (MCLs) (40 CFR 264.94)	Relevant and Appropriate	RCRA MCLs provide groundwater protection standards for 14 common contaminants. All are equal to the SDWA MCLs for those contaminants.	The MCL for arsenic in drinking water has decreased since the 1988 Endangerment Assessment. Manganese was not originally identified as a COC in groundwater, but concentrations have historically exceeded the secondary MCL. Arsenic and manganese concentrations in OU-1 should be further evaluated to determine if currently associated with a risk above regulatory guidelines. Groundwater is not being used at OU-1; nonetheless, these requirements remain relevant and appropriate.
Federal Regulatory Requirements	CWA - Ambient Water Quality Criteria (AWQC) - Protection of Freshwater Aquatic Life, Human Health - Fish Consumption	Relevant and Appropriate	AWQC are developed under the Clean Water Act (CWA) as guidelines from which states develop water quality standards. A more stringent AWQC for aquatic life may be found relevant and appropriate rather than an MCL, when protection of aquatic organisms is being considered at a site.	Ambient Water Quality Criteria have been updated since the 1989 ROD (EPA-822-R-02-047, November 2002 and EPA-822-F-03-012, December 2003). These criteria remain relevant and appropriate.

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TABLE A8-2. CHEMICAL-SPECIFIC ARARs AND TBCs WELLS G&H SITE - OU-1				
SITE FEATURES	**REQUIREMENTS**	**ORIGINAL STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**SECOND FIVE-YEAR REVIEW**
State Regulatory Requirements	Massachusetts Drinking Water Regulations Maximum Contaminant Levels (MCLs) (310 CMR 22.00)	Relevant and Appropriate	Massachusetts MCLs establish levels of contaminants allowable in public water supplies. They are essentially equivalent to SDWA MCLs.	The MCL for arsenic in drinking water has decreased since the 1988 Endangerment Assessment. Manganese was not originally identified as a COC in groundwater, but concentrations have historically exceeded the secondary MCL. Arsenic and manganese concentrations in OU-1 should be further evaluated to determine if currently associated with a risk above regulatory guidelines. Groundwater is not being used at OU-1; nonetheless, these requirements remain relevant and appropriate.
State Regulatory Requirements	Massachusetts Groundwater Quality Standards (314 CMR 6.00)	Relevant and Appropriate	These standards consist of groundwater classifications which designate and assign the uses of Commonwealth groundwaters, and water quality criteria necessary to substain these uses. There is a presumption that all groundwaters are Class I.	These standards remain relevant and appropriate.

TABLE A8-2. CHEMICAL-SPECIFIC ARARs AND TBCs WELLS G&H SITE - OU-1				
SITE FEATURES	**REQUIREMENTS**	**ORIGINAL STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**SECOND FIVE-YEAR REVIEW**
Federal Criteria, Guidance, Advisories to be Considered	EPA Risk Reference Doses (RfDs)	TBC	RfDs are dose levels developed by the EPA for noncarcinogenic effects. Other toxicity values have changed also. See text.	The toxicity values for manganese and arsenic in drinking water have decreased since the 1988 Endangerment Assessment. Manganese and arsenic concentrations in OU-1 should be further evaluated to determine if associated with a risk above regulatory guidelines. While groundwater is not being used at OU-1, these requirements remain TBCs .
	EPA Carcinogen Assessment Group Potency Factors	TBC	Potency Factors are developed by the EPA from Health Assessments or evaluation by the Carcinogen Efforts Assessment Group. Note that potency factors have changed since the Endangerment Assessment. See text for additional information.	These requirements remain TBCs.
	Massachusetts Drinking Water Health Advisories	TBC	MADEP Health Advisories are guidance criteria for drinking water.	These guidelines remain TBCs.

TABLE A8-3. ACTION-SPECIFIC ARARS WELLS G&H SITE - OU-1				
SITE FEATURES	**REQUIREMENTS**	**ORIGINAL STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**SECOND FIVE-YEAR REVIEW**
Federal Regulatory Requirements	RCRA - General Facility Requirements (40 CFR 264.10 264.18). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	General facility requirements outline general waste security measures, inspections, and training requirements.	These requirements remain relevant and appropriate and have been complied with.
Federal Regulatory Requirements	RCRA - Incineration Requirements (40 CFR 264 Subpart 0). Alternative SC-10.	Relevant and Appropriate	Principal Organic Hazardous Constituents (POHC) are to be destroyed to 99.99 percent destruction and removal efficiency, stringent particulate and HCL limits are imposed.	The Explanation of Significant Differences (ESD) eliminated on-site incineration component required by the ROD in favor of off-site incineration and disposal of soil from Wildwood, NEP and Olympia. In-situ volatilization of soil would be used on the UniFirst property. Therefore, these requirements are no longer relevant and appropriate.
Federal Regulatory Requirements	RCRA - Land Disposal Restrictions (40 CFR 268). Alternatives SC-10 and MOM-2	Relevant and Appropriate	Provides treatment standards and schedules governing land disposal of RCRA wastes and of materials contaminated with or derived from RCRA wastes.	The ESD eliminated on-site incineration component required by the ROD in favor of off-site incineration and disposal of soil from Wildwood, NEP and Olympia. In-situ volatilization of soil would be used on the UniFirst property. Therefore, these requirements are no longer relevant and appropriate.

TABLE A8-3. ACTION-SPECIFIC ARARS
WELLS G&H SITE - OU-1

SITE FEATURES	REQUIREMENTS	ORIGINAL STATUS	REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS	SECOND FIVE-YEAR REVIEW
Federal Regulatory Requirements	TSCA - PCB Incineration Requirements (40 CFR 761.70(a)(2) (b). Alternative SC-10.	Applicable	Contaminated soil in excess of 50 ppm PCB concentration must be incinerated to a 99.9999 percent destruction efficiency.	The ESD eliminated on-site incineration component required by the ROD in favor of off-site incineration and disposal of soil from Wildwood, NEP and Olympia. Therefore, these requirements are no longer applicable.
Federal Regulatory Requirements	RCRA - Generator and Transporter Responsibilities (40 CFR 262 and 263). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	Provides standards for packing and accumulating hazardous waste prior to off site disposal.	These requirements remain relevant and appropriate.
Federal Regulatory Requirements	RCRA - Land Disposal Restrictions (40 CFR 268). Alternative SC-10.	Relevant and Appropriate	Provides treatment standards and schedules governing land disposal of RCRA wastes and of materials contaminated with or derived from RCRA wastes.	The ESD eliminated on-site incineration component required by the ROD in favor of off-site incineration and disposal of soil from Wildwood, NEP and Olympia. In-situ volatilization of soil would be used on the UniFirst property. Therefore, these requirements are no longer applicable.
Federal Regulatory Requirements	RCRA - Container Requirements (40 CFR 264 Subpart I). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	This regulation sets forth RCRA requirements for use and management of containers at RCRA facilities.	These requirements remain relevant and appropriate and have been complied with. On-site treatment systems continue to generate RCRA regulated waste materials and must comply with container requirements. .

TABLE A8-3. ACTION-SPECIFIC ARARS WELLS G&H SITE - OU-1				
SITE FEATURES	**REQUIREMENTS**	**ORIGINAL STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**SECOND FIVE-YEAR REVIEW**
Federal Regulatory Requirements	DOT - Transportation of Hazardous Waste Requirements (49 CFR 171 179). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	Those regulations set forth DOT requirements for transportation of hazardous waste. These are generally identical to RCRA requirements at 40 CFR 263.	These requirements are off-site requirements and are not ARARs per se. All applicable requirements will be met.
Federal Regulatory Requirements	RCRA - Tank Requirements (40 CFR 264 Subpart J). Alternative SC-10.	Relevant and Appropriate	Provides design and operating requirements for RCRA waste treatment facilities utilizing tanks.	These requirements remain relevant and appropriate. Note that none of the PRP sites maintain hazardous waste tanks at this time.
Federal Regulatory Requirements	RCRA - Preparedness and Prevention (40 CFR 264.30 264.31). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	This regulation outlines requirements for safety equipment and spill control.	These requirements remain relevant and appropriate and have been complied with.
Federal Regulatory Requirements	RCRA - Contingency Plan and Emergency Procedures (40 CFR 264.50 264.56). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	This regulation outlines the requirements for emergency procedures to be used following explosions, fires, etc.	These requirements remain relevant and appropriate and have been complied with.
Federal Regulatory Requirements	RCRA - Manifesting, Recordkeeping, and Reporting (40 CFR 264.70 264.77). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	This regulation specifies the recordkeeping and reporting requirements for RCRA facilities.	These requirements remain relevant and appropriate and have been complied with.
Federal Regulatory Requirements	RCRA - Closure and Post Closure (40 CFR 264 Subpart G). Alternative SC-10.	Relevant and Appropriate	This regulation details the specific requirements for closure and post-closure care of hazardous waste facilities.	Closure requirements may be relevant and appropriate to soil clean ups.
Federal Regulatory Requirements	OSHA - General Industry Standards (29 CFR 1910). Alternatives SC-10 and MOM-2.	Applicable	This regulation specifies the 8 hour, time - weighted average concentration for various organic compounds and 2 PCB compounds; site control procedures; training; and protective clothing requirements for worker protection at site remediations.	These requirements are not environmental standards and therefore, are not ARARs. However, they are health and safety requirements that are required to be met.

TABLE A8-3. ACTION-SPECIFIC ARARS WELLS G&H SITE - OU-1				
SITE FEATURES	**REQUIREMENTS**	**ORIGINAL STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**SECOND FIVE-YEAR REVIEW**
Federal Regulatory Requirements	OSHA - Safety and Health Standards (29 CFR 1926). Alternatives SC-10 and MOM-2.	Applicable	This regulation specifies the type of safety equipment and procedures to be followed during construction and excavation activities.	These requirements are not environmental standards and therefore are not ARARs. However, they are health and safety requirements that are required to be met.
Federal Regulatory Requirements	OSHA - Recordkeeping, Reporting and Related Regulations (29 CFR 1904). Alternatives SC-10 and MOM-2.	Applicable	The regulation outlines the recordkeeping and reporting requirements for an employer under OSHA.	These requirements are not environmental standards and therefore are not ARARs. However, they are health and safety requirements that are required to be met.
Federal Regulatory Requirements	TSCA - Marking of PCBs and PCB Items (40 CFR 761.40 761.79). Alternative SC-10.	Applicable	50 ppm PCB storage areas, storage items, and transport equipment must be marked with the HL mark.	These requirements have been complied with.
Federal Regulatory Requirements	TSCA - Storage and Disposal (40 CFR 761.60 761.79). Alternative SC-10.	Applicable	This requirement specifies the requirements for storage and disposal/destruction of PCBs in excess of 50 ppm. These PCB-contaminated soils would have to be disposed of or treated in a facility permitted for PCBs, in compliance with TSCA regulations. Treatment must be performed using incineration or some other method with equivalent destruction efficiencies.	The storage requirements were complied with during soil excavation. Disposal requirements were not applicable since soil was shipped off-site.
Federal Regulatory Requirements	TSCA - Records and Reports (40 CFR 761.18 761.185). Alternative SC-10.	Applicable	This regulation outlines the requirements for recordkeeping for storage and disposal of >50 ppm PCBs.	These requirements were complied with.

TABLE A8-3. ACTION-SPECIFIC ARARS WELLS G&H SITE - OU-1				
SITE FEATURES	**REQUIREMENTS**	**ORIGINAL STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**SECOND FIVE-YEAR REVIEW**
Federal Regulatory Requirements	CAA - National Air Quality Standards for Total Suspended Particulates (40 CFR 129.105, 750). Alternatives SC-10 and MOM-2.	Applicable	This regulation specifies maximum primary and secondary 24 hour concentrations for particulate matter.	These requirements are not ARARs, but rather the regulations promulgated by states as part of their state implementation pursuant to standards, and would be applicable.
Federal Criteria Guidance Advisories to be Considered	RCRA - Proposed Air Emission Standards for Treatment Facilities (52 FR 3748, February 5, 1987). Alternatives SC-10 and MOM-2.	TBC	This proposal would set performance standards for RCRA treatment facility air emissions.	These requirements are TBC for the Wildwood vapor collection system and are being complied with.
Federal Criteria Guidance Advisories to be Considered	EPA Groundwater Protection Strategy. Alternative MOM-2.	TBC	EPA Classifies groundwater into three categories depending on current, past or potential use. This serves as a guide for protection of the resource.	Wells G&H aquifer is a Class II B aquifer - potentially useable aquifer. At the end of remediation, the MOM alternative will attain standards for Class II B aquifers.
Federal Criteria Guidance Advisories to be Considered	USEPA office of Solid Waste and Emergency Response, Directive 9355.0-28; Air Stripper Control Guidance. Alternative MOM-2.	TBC	Establishes guidance on the control of air emissions from air strippers used at Superfund sites for groundwater treatment.	These requirements are TBC for the Wildwood vapor collection system and are being complied with.
State Regulatory Requirements	Massachusetts Certification for Dredging and Filling (314 CMR 9.00). Alternative MOM-2.	Applicable	Establishes water quality-based standards for filling activities (CWA Section 401).	The Central Area treatment facility is no longer a component of the remedy; therefore these requirements are not applicable.
State Regulatory Requirements	Surface Water Discharge Permit Program Requirements (314 CMR 3.00). Alternative MOM-2.	Applicable	Provides permitting process for surface water body point discharges. This requirement is generally identical to CWA NPDES.	These requirements remain applicable and have been complied with.

TABLE A8-3. ACTION-SPECIFIC ARARS WELLS G&H SITE - OU-1				
SITE FEATURES	**REQUIREMENTS**	**ORIGINAL STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**SECOND FIVE-YEAR REVIEW**
State Regulatory Requirements	Surface Water Quality Standards (314 CMR 4.00) Alternative MOM-2.	Applicable	This regulation consists of surface water classifications which designate and assign uses, and water quality criteria necessary to sustain the designated uses.	These requirements remain applicable and have been complied with.
State Regulatory Requirements	Groundwater Quality Standards (314 CMR 6.00) and Groundwater Discharge Permit Program (314 CMR 5.00). Alternative MOM-2.	Applicable	This regulation consists of groundwater classifications which designate and assign uses, and water quality criteria necessary to sustain the designated uses.	This requirement remains applicable. Class I groundwater quality criteria will be achieved at the end of the remediation process.
State Regulatory Requirements	Air Emission Limitations for Unspecified Sources of Volatile Organic Compounds (310 CMR 7.18(17)) Alternative MOM-2.	Relevant and Appropriate	Unspecified source with the potential to emit 100 tons/year of VOCs must install "Reasonably Available Control Technology" (RACT).	These requirements are relevant and appropriate for the Wildwood vapor collection system and are being complied with.
State Regulatory Requirements	Hazardous Waste Management Requirements (310 CMR 30.00). Alternatives SC-10 and MOM-2.	Relevant and Appropriate	These regulations provide comprehensive monitoring, storing, recordkeeping, etc. programs at hazardous waste sites.	The requirements remain relevant and appropriate. Since the Source Area (OU-1) treatment system continues to generate RCRA regulated wastes.
State Regulatory Requirements	Hazardous Waste Incinerator Air Emission Requirements 310 CMR 7.08(4). Alternative SC-10.	Relevant and Appropriate	Provides air emission requirements for hazardous waste incinerators. Principal Organic Hazardous Constituents (POHCS) destroyed to 99.99 percent, PCBs to 99.9999 percent. Particulate, HCL and CO emissions also controlled.	The ESD eliminated on-site incineration component required by the ROD in favor of off-site incineration and disposal of soil from Wildwood, NEP and Olympia. Therefore, these requirements are no longer relevant.

TABLE A8-3. ACTION-SPECIFIC ARARS WELLS G&H SITE - OU-1				
SITE FEATURES	**REQUIREMENTS**	**ORIGINAL STATUS**	**REQUIREMENT SYNOPSIS AND APPLICATION FOR THE RI/FS**	**SECOND FIVE-YEAR REVIEW**
State Regulatory Requirements	Ambient Air Quality Standards for the Commonwealth of Massachusetts (310 CMR 6.00). Alternatives SC-10 and MOM-2.	Applicable	This regulation specifies dust, odor, and noise emissions from construction activities.	These requirements remain applicable and have been complied with. Contaminated soils at UniFirst may still require removal.
State Regulatory Requirements	Air Pollution Controls (310 CMR 7.00). Alternatives SC-10 and MOM-2.	Applicable	Regulates new sources of air pollution to prevent air quality degradation. Requires the use of "Best Available Control Technology" (BACT) on all new sources.	These requirements are applicable for the Wildwood vapor collection system and are being complied with.
State Regulatory Requirements	Employee and Community Right-to-Know Requirements (310 CMR 33). Alternatives SC-10 and MOM-2.	Applicable	Establishes rules for the dissemination of information related to toxic and hazardous substances to the public.	These requirements remain applicable and have been complied with.
Federal Regulatory Requirements	CWA National Pollutant Discharge Elimination System (NPDES) (40 CFR 122 125). Alternatives MOM-2.	Applicable	Provides permitting process for surface water body point source discharges.	Treated water is discharged to a storm sewer at UniFirst. Compliance monitoring is conducted monthly. At Grace, treated water is discharged to Snyder Creek. Compliance monitoring is conducted monthly. Treated water at Wildwood is discharged to the Aberjona River. Compliance monitoring is conducted monthly. These requirements remain applicable and are being complied with.

APPENDIX

Comments Received from Support Agencies and/or the Community

NO COMMENTS WERE RECEIVED ON THE DOCUMENT.