FIVE-YEAR REVIEW REPORT FOR KELLOGG-DEERING WELL FIELD SUPERFUND SITE FAIRFIELD COUNTY, CONNECTICUT

Superfund Records Center
SITE: Kellogg-Deering
BREAK: 9.2.3
OTHER: 522179

Prepared by

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

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James T. Owens, III, Office Director

9/28/12
Date

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EXECUTIVE SUMMARY

The remedy selected to address contamination at the Kellogg-Deering Well Field Superfund Site in Norwalk, Connecticut, includes air stripping for volatile organic compound in the Well Field (Operable Unit 1 (OU-1)), groundwater and soil gas extraction and treatment at the Source Area (OU-2), monitoring, and five-year reviews. This is the fifth five-year review for OU-1 and third five-year review for OU-2. The triggering action for this statutory review is the completion of the last five-year review in 2007. Also discussed in this report are conditions in OU-3 that is downgradient of the Source Area and upgradient of the Well Field where a remedy has not yet been selected.

The assessment of this five-year review found that the OU-1 remedy for the Site is currently protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled by the wellhead treatment system.

The assessment of this five-year review found that the OU-2 remedy for the Site is currently protective of human health and the environment because exposure pathways that could result in unacceptable risks are being controlled through institutional controls that prevent use of contaminated site groundwater. Groundwater extraction and treatment continues, but VOC mass removal has not yet achieved the cleanup standards that were established in the ROD. Based upon a review of recent groundwater sampling, the possibility exists that the current groundwater extraction and treatment system may not achieve restoration of the groundwater. Additionally, because the potential exists for redevelopment of the Source Area property, further actions may be needed to prevent direct contact with contaminated soil and inhalation of contaminated soil vapors so that the remedy remains protective in the long term.

Soil gas and indoor air studies performed since the last five-year review found that the vapor intrusion pathway does exist for some buildings in OU-3. In 2009 using contemporaneous screening criteria and toxicity values EPA determined that the pathway did not create exposure to unacceptable risks. Since those studies were performed, the screening criteria and toxicity values have been adjusted. Comparison of the sub-slab and indoor air data to the new screening criteria similarly did not indicate exposure to an unacceptable risk through this pathway.

LIST OF ABBREVIATIONS

AO	Administrative Order
ARARs	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability
CFR	Code of Federal Regulations
COCs	Contaminants of Concern
CTDEP	Connecticut Department of Environmental Protection
CTDEEP	Connecticut Department of Energy and Environmental Protection
CTDPH	Connecticut Department of Public Health
DCA	dichloroethane
DCE	dichloroethene
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
GAA	CT Groundwater classification
GA	CT Groundwater classification
ITS	Integrated Treatment System
MCLs	Federal Maximum Contaminant Levels
mgd	Million Gallons per Day
MiBK	methyl isobutyl ketone
NFTD	Norwalk First Taxing District
NPL	National Priorities List
OU	Operable Unit
O&M	Operation and Maintenance
PCE	tetrachloroethene
ppb	parts per billion
ppm	parts per million
PRPs	Potentially Responsible Parties
RAO	Remedial Action Objective
RD/RA	Remedial Design/Remedial Action
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SOW	Statement of Work
SRA	Source Remediation Area
SVE	Soil Vapor Extraction
TBC	To be considered
TCA	1,1,1-trichloroethane
TCE	trichloroethene
VOC	Volatile Organic Compound
µg/Kg	Microgram per kilogram
µg/L	Microgram per liter

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Kellogg-Deering Well Field Superfund Site		
EPA ID: CTD980670814		
Region: 1	**State:** CT	**City/County:** Norwalk/Fairfield County

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

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:** Click here to enter text.
Author name (Federal or State Project Manager): Terrence Connelly
Author affiliation: Region 1
Review period: January 24, 2012 – September 28, 2012
Date of site inspection: August 9 and 29, 2012
Type of review: Statutory
Review number: 5
Triggering action date: September 28, 2007
Due date *(five years after triggering action date)*: September 28, 2012

Five-Year Review Summary Form (continued)

Issues/Recommendations

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 1	**Issue Category: No Issue**			
	Issue: Click here to enter text.			
	Recommendation: Click here to enter text.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Choose an item.	Choose an item	Choose an item.	Choose an item.	Enter date.

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 2	**Issue Category: Remedy Performance**			
	Issue: Large contaminant mass remains in Source Area			
	Recommendation: Complete optimization study in response to this issue			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	06/30/2013

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 2	**Issue Category: Remedy Performance**			
	Issue: Efficiency and effectiveness of groundwater extraction system may have decreased			
	Recommendation: Complete optimization study in response to this issue			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	06/30/2013

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 2	**Issue Category: Remedy Performance**			
	Issue: Elevated concentrations remain in OU-3			
	Recommendation: Complete assessment of alternate pumping schemes			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	06/30/2013

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 3	**Issue Category: No Issue**			
	Issue: No remedy has been selected for OU-3			
	Recommendation: Develop a ROD for OU-3 to address potential long-term issues			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	12/31/2015

Protectiveness Statement(s)

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU-1	Protective	Click here to enter date

Protectiveness Statement:
The remedial action for OU-1 has been completed and is protective of human health and the environment. Exposure pathways that could result in unacceptable risk are being controlled through use of an air stripper. Long-term monitoring of the influent from the individual production wells and effluent from the air stripper will ensure that the OU-1 remedy remains protective.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU-2	Protective	Click here to enter date

Protectiveness Statement:
The remedy for OU-2 is protective of human health and the environment. Exposure pathways that could result in unacceptable risk are being controlled with a Connecticut statute that prohibits groundwater use. The groundwater extraction and treatment system prevents further migration of the contaminant plume. Long-term operation and maintenance of the system and long-term groundwater monitoring will continue to ensure that the treatment system successfully captures the contaminant plume.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU-3	Short-term Protective	Click here to enter date

Protectiveness Statement.
No remedy has been selected for OU-3. The Connecticut statute that prohibits use of groundwater in OU-2 also applies in OU-3. A study of the vapor intrusion pathway did not find unacceptable risks. Contaminant concentrations in groundwater in OU-3 continue to decrease. Therefore, from the data available, OU-3 is currently protective in the short term. However to be protective in the long term, EPA needs to develop a ROD for OU-3.

Sitewide Protectiveness Statement

Protectiveness Determination:	*Addendum Due Date (if applicable):*
Protective	Click here to enter date.

Protectiveness Statement:
Because the remedial actions at OU-1 and OU-2 are protective, and exposure pathways in OU-3 are either controlled or do not create an unacceptable risk, the Site is protective of human health and the environment.

1.0 INTRODUCTION

This is the fifth five-year review for the Kellogg-Deering Well Field Superfund Site (Site) in Norwalk, Connecticut. The purpose of this five-year review is to determine if the selected remedy is protective of human health and the environment. This report summarizes the five-year review process, investigations and remedial actions undertaken at the Site; evaluates the monitoring data collected; reviews the Applicable or Relevant and Appropriate Requirements (ARARs) specified in the decision documents for changes; discusses any issues identified during the review; and presents recommendations to address these issues. The decision documents include a 1989 Record of Decision (ROD) and a 1997 Explanation of Significant Differences (ESD).

The United States Environmental Protection Agency, Region 1 (EPA) prepared this five-year review pursuant to the Section 121 of the Comprehensive Environmental Response Compensation, and Liability Act (CERCLA) and the National Contingency Plan. 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.

Under the regulations promulgated to implement these requirements, 40 CFR § 300.430(f)(4)(ii) of the National Contingency Plan 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 statutory five-year review is required since hazardous substances remain at the Site above levels that allow for unlimited use and unrestricted exposure. The triggering action for this statutory review is the completion of the last five-year review in 2007. EPA conducted this five-year review of the remedial actions implemented at the Site. Work on this review was performed in August and September 2012. Assistance was provided by the Connecticut Department of Energy and Environmental Protection (CTDEEP), Settling Party ITT/Exelis, and GZA GeoEnvironmental, Inc., consultant working for ITT/Exelis. As referenced in the 1992 Consent Decree, ITT/Exelis participated in the five-year review process. The review was completed in accordance with EPA Guidance OSWER No. 9355.7-03B-P.

2.0 SITE CHRONOLOGY

The chronology of the Site, including all significant site events and dates is included in Table 2-1.

Table 2-1 Chronology of site events

Event	Date
Zell 1 building constructed by Zell Products Corporation (Zell).	1945
Zell 2 building constructed by Zell to expand production capability.	1955
First drinking water production well installed at the Kellogg-Deering Well Field.	1955
Elinco building constructed by Zell to perform similar operations as Zell 1 and Zell 2.	1961
Second and third drinking water production wells installed at the Well Field.	1965-66
Fourth drinking water production well installed at the Well Field.	1975
Trichloroethylene first detected by the Norwalk First Taxing District (NFTD) during routine sampling of Well Field.	1975
NFTD installs redwood slat aerator at Well Field.	5/1981
Kellogg-Deering Well Field Site placed on the National Priorities List (NPL).	9/21/1984
Remedial Investigation (RI) completed for OU-1. EPA separates the Site into two operable units: OU-1 is the Well Field, OU-2 is the Source Area	4/1986
Feasibility Study (FS) completed for OU-1.	6/1986
EPA issues Record of Decision (ROD) for OU-1.	9/1986
CTDEP issues Consent Order for the Complex (four groundwater extraction wells and air stripper installed).	10/1987
Supplemental RI/FS initiated to provide further information regarding the source(s) and extent of groundwater contamination at OU-2.	1987
Administrative Order for OU-1 remedy issued to NFTD by EPA.	5/1/87
Air stripper begins operating at Well Field.	1988
CTDEP letter to NFTD grants an exemption to air emissions permitting requirements.	7/1988
Supplemental RI/FS completed for OU-2.	7/1989
EPA issues ROD for OU-2 providing for source control and management of migration at the Source Area.	9/1989
Consent Decree for OU-2 signed between EPA and Settling Parties.	11/1992
First five-year review completed (OU-1).	12/1992
Construction of soil vapor extraction (SVE) and groundwater extraction systems begins at OU-2.	9/1995
OU-2 SVE system startup.	4/1996
OU-2 Groundwater extraction and treatment system startup.	5/1996
Operations and Maintenance of the SVE system and groundwater extraction and treatment systems begins at OU-2.	9/30/1996
EPA issues Declaration for the Explanation of Significant Differences for OU-2 and OU-3.	3/1997
Second five-year review completed.	9/1997
Settling Parties submit an Integrated Treatment System Progress Report addressing	3/14/2001

remedial progress of both the SVE and groundwater treatment systems.	
Third five-year review completed; all operable units covered for the first time.	9/2002
Remaining contaminated soils removed for off-site disposal.	2006
Soil cleanup goals achieved. SVE system dismantled.	2006
OU-3 Phase I vapor intrusion pathway assessment completed	8/2006
Zell and Elinco buildings demolished; slabs left in place.	Summer 2007
Fourth five-year review completed; all operable units covered.	9/2007
OU-3 Phase 2 vapor intrusion pathway assessment completed.	2008
OU-3 Phase 3 vapor intrusion pathway assessment completed.	2009
Optimization study for OU-2 completed by Army COE.	4/2010
Optimization activities initiated by Settling Parties.	3/2012
272-280 Main Avenue property sold.	4/2012

3.0 BACKGROUND

The Kellogg-Deering Well Field Superfund Site (Site) is in Norwalk, Fairfield County, Connecticut and consists of an approximately 10-acre municipal well field and the adjacent area that contributes to the well field contamination. EPA has divided the Site into three operable units (OU) for the purpose of selecting and implementing remedial actions. OU-1 encompasses the 10-acre Well Field, which was the initial area of contaminant detection. OU-2 encompasses the upgradient contaminant Source Area (subsequent to the 1989 ROD, this area was also referred to as the Source Remediation Area). OU- 3, also known as the Downgradient Area, includes the area of contamination downgradient from the Source Area but upgradient from the Well Field. An RI/FS process has not been initiated for OU-3. A map depicting the relative locations of the operable units is presented in Figure 1 and an aerial photograph in Figure 2.

3.1 Physical Characteristics

The following is a summary of the physical characteristics of the Site and vicinity.

3.1.1 OU-1 Well Field

The Well Field occupies approximately ten acres along the western bank of the Norwalk River. The Well Field is bordered on the south and west by residential properties; by Broad Street to the north (with residential properties on the north side of Broad St.) and bordered on the east by Kellogg Pond on the Norwalk River. Route 7, an inactive landfill across the river from the well field, and several commercial/light industrial buildings are located to the east of the Well Field across the Norwalk River. None of these businesses have been identified as potential sources of contamination to the Well Field.

The topography of the Well Field is generally flat, and the ground surface is a field that is periodically mowed. According to flood insurance maps for the City of Norwalk, OU-1 lies within the 100-year floodplain of the Norwalk River. Overburden materials in OU-1 consist mostly of glacially-derived sand and gravel and are between 40 and 110 feet thick. A contour map of the bedrock surface at OU-1 indicates that parts of the Well Field lie within a bedrock valley approximately parallel to the Norwalk River. The maximum measured overburden thicknesses were observed within this buried valley.

3.1.2 OU-2 Source Remediation Area

The Source Remediation Area (SRA) is an approximately 9.5-acre area located northeast of OU-1 on the opposite side of the Norwalk River. The SRA was defined in the 1989 ROD as the area where trichloroethene (TCE) concentrations in groundwater exceeded 6,600 parts per billion (ppb). Within the SRA, the Complex covers approximately six acres on the east side of Main Avenue and the ROD identified buildings on the Complex as sources of contamination. At the time of the RI/FS and ROD, most of the Complex and surrounding areas were covered with asphalt pavement. During the summer of 2007 the then owner of the 272-280 Main Avenue property demolished the above-ground structures of the Elinco and two Zell buildings leaving the concrete slabs in place.

The SRA includes the Complex and the area extending approximately 600 feet west, 500 feet north, and 600 feet south of the Complex. The west side of Main Avenue is primarily businesses including a car wash, auto painting, and a service station. The SRA is bordered to the north by a housing development for the elderly and several businesses; to the west by railroad tracks for the Metro-North Railroad passenger service and Providence & Worcester Railroad freight service and Slocum Street; to the south by commercial properties along Broad Street, and to the east by condominiums. The ground surface at the SRA generally slopes from east to west (elevation 70-100 feet) toward the Norwalk River (elevation approximately 40 feet). The ground surface east of the SRA rises steeply above a concrete retaining wall at the east side of the Complex. A north-south trending ridge about 2,000 feet east of the complex is at an elevation of about 230 feet and is the local surface water divide. Flood insurance maps indicate that the SRA is not within the 100-year floodplain of the Norwalk River.

Bedrock outcrops are visible where the surface topography rises steeply east of OU-2. From the eastern boundary of OU-2 to Main Avenue, overburden material consists of approximately ten feet of dense sand and gravel and/or glacial till over bedrock. The thickness of unconsolidated materials ranges from 15 to 30 feet between Main Avenue and the railroad tracks. A bedrock ridge underlies the SRA. The water table is either within or slightly above the bedrock surface east of a buried valley under the Norwalk River. Recent water-level maps show a similar water-table position.

During pre-design field investigations for the OU-2 remedy, a 1-to 2-foot wide fracture zone at a depth of 44 to 54 feet below ground surface was identified between the Zell 1 building and the Metro-North Railroad tracks. According to the Settling Parties' consultant, this fracture zone transmits most of the groundwater flow westward from the Complex.

3.1.3 OU-3 Downgradient Area

The Downgradient Area was defined in the 1989 ROD as the area downgradient of the SRA but upgradient of the Well Field where TCE concentrations in groundwater range between 5 ppb and 6,600 ppb. OU-3 is bordered (approximately) to the north and west by Deering Pond and the Norwalk River, to the east by OU-2 and the Metro-North railroad tracks, and to the south by St. Mary's Cemetery and Plattsville Avenue. Land usage in OU-3 is primarily residential properties with several commercial and light industrial facilities located along Muller Street and along Broad Street. The land surface in OU-3 generally slopes from east to west towards the Norwalk River. The western parts of OU-3 are located within the 100-year floodplain of the Norwalk River. Figure 3-3 shows the streets in OU-3.

Overburden material within OU-3 consists primarily of glacial sand and gravel deposits. Overburden is 15 to 30 feet thick between the railroad tracks and Pulaski Street. Thickness increases gradually to approximately 65 feet near the east side of the Norwalk River. The bedrock surface in OU-3 slopes uniformly from east to west between the railroad tracks and Davis Street and steepens between Davis Street and the Norwalk River.

The Supplemental RI/FS identified a large fracture zone near monitoring well K-21 at a depth of 138 to 145 feet below ground surface (98 to 105 feet below the top of bedrock). Yields of the fractured interval at well K-21were estimated to exceed 50 gallons per minute. Bedrock fractures were determined to be the main conduits for contaminant migration from the Complex through OU-3 to the Well Field.

3.2 Land Resource and Use

The following is a summary of ownership, operational, and land use history for the Site and vicinity. All three operable units are within the City of Norwalk Aquifer Protection Area.

3.2.1 OU-1 Well Field

The Well Field is owned and operated by the Norwalk First Taxing District (NFTD) Water Department. The Well Field consists of four municipal supply wells (Layne 1 Replacement, Layne 2, Deering 1, and Deering 2) that supply drinking water to approximately 45,000 people. NFTD has owned parts of the well field since approximately 1935. The first production well (Layne 1) was installed in 1955, and subsequent wells were installed within the next 20 years. Layne 1 was permanently capped and removed from service in 1994 due to elevated levels of TCE, iron, manganese, and suspended solids, and Layne 1 Replacement was installed to replace it. All four production wells are tied to the wellhead treatment system.

The Well Field is in an aquifer classified as II-A under EPA's Groundwater Protection Strategy and GAA under Connecticut's Water Quality Standards. Both classifications indicate that the aquifer is an existing or potential public drinking-water supply. The NFTD is the only user of groundwater from the aquifer. The aquifer beyond the Well Field is classified by Connecticut as GA, which is defined as groundwater within the area of existing private water supply wells or in an area with the potential to provide water to public or private water-supply wells. For such areas, the state's policy is to restore groundwater to the extent feasible to a quality suitable for drinking without treatment.

At present, the primary source of public water to the NFTD is surface water from four reservoirs located in Norwalk and adjacent communities. Reservoir water is blended with well field water at varying ratios depending on reservoir reserves and distribution system location. Normal water production for the Well Field is approximately 3.8 million gallons per day (mgd), but it is capable of yielding five mgd. Historically, a typical blend of drinking water supplied by NFTD contains 10 to 20 percent well field water. According to City of Norwalk Planning and Zoning Offices maps, the Well Field is in a B Residence Zone (residential zones range from AAA to D).

3.2.2 OU-2 Source Remediation Area

The Complex consisted of three buildings within the SRA that formerly supported light industrial activity which included the production of metal cosmetic containers and handbag frames. Manufacturing at the Complex included cleaning processes done with solvents and plating operations. The Complex was identified in the Supplemental RI as the major source of

VOC contamination to groundwater in OU-1, but the existence of other source areas contributing to the contamination was not precluded.

The Zell 1 building (276 Main Avenue) was built in the mid-1940s by the Zell Products Corporation. In 1969, Pitney Bowes Corporation occupied Zell 1 and used it as a warehouse. The building was later renovated in 1977 and used for office and warehouse space.

The Zell 2 building was constructed in 1955. In 1974, Pitney Bowes occupied the facility and converted it into office space.

The Elinco building (272 Main Avenue) was constructed by Zell in 1961. Elinco Corporation took over the building in the mid-1970s to produce fractional horsepower motors. The Elinco building was used for manufacturing until the late 1990s.

The Zell 1, Zell 2, and Elinco buildings were demolished in the summer of 2007, but the cement slab floors of the building and the building foundations were left in place.

The Matheis Court building (7 Matheis Court) is an office building constructed at the southeast end of the Complex in 1984. The upper floor above the parking area is currently occupied as office space.

Businesses and other buildings located within the SRA that are not part of the Complex include a shopping plaza, car wash, restaurant, gas station, assisted living facility, and single-family residences. According to City of Norwalk Planning and Zoning Office maps, the SRA is zoned as a B2 Residence Zone. B2 zoning allows for mixed use and multi-family residential uses with certain height restrictions. Groundwater in OU-2 is not used as a source of drinking water; all businesses and residences are served by the city water supply.

3.2.3 OU-3 Downgradient Area

OU-3 is primarily occupied by single-or multi-family homes along Slocum, Sniffen, Pulaski, and Davis Streets and this portion of OU-3 is zoned D Residence. Light industrial facilities are currently operating to the north of Muller Street in the Muller Industrial Park, to the east of Slocum Street, and south of Broad Street and these portions of OU-3 are zoned B Residence or NB (Neighborhood Business). A church and associated building is located at the northwestern end of Pulaski Street. All properties are served by municipal water. As discussed in the 1997 ESD, Connecticut law strictly regulates the drilling of water supply wells. (See Conn. Gen. Stat. § 25-126, et seq.) This law and the pertinent provisions of the Connecticut Public Health Code (Conn. Agencies Regs. §19-13-B51m) do not provide for any exemptions that would permit the drilling of water-supply wells on properties on the Site, thus prohibiting the use of groundwater in this area.

3.3 History of Contamination

Elevated levels of TCE in groundwater were first detected at the Well Field in 1975 during routine sampling. Wells with unacceptable levels of TCE were shut down. Between 1975 and

1980 the Connecticut Department of Environmental Protection (now known as Department of Energy and Environmental Protection (CTDEEP) following 2010 state government reorganization) performed several inspections, collected samples from the Well Field and adjacent areas, and initiated investigations of several local industries in an effort to determine the extent of groundwater contamination.

3.4 Initial Response

In 1981 NFTD installed a redwood slat aerator on production well Layne 2 which had unacceptable levels of TCE to allow continued use of the well for public drinking water. In February 1985 NFTD awarded a contract for installation of a more efficient air stripper and storage tank. Following repairs to the holding tank, the air stripper has been in operation since 1988 and receives water from all of the production wells.

In 1986, an RI initiated at the Site concluded that the source of contamination to the Well Field was located to the east of the Well Field. The RI recommended additional investigations to delineate the lateral extent of the contaminant plume. This was undertaken in a Supplemental RI conducted in 1987. The Supplemental RI found that the Complex was a major source of contamination.

3.5 Summary of Basis for Taking Action

The detection of TCE in public water-supply wells prompted environmental investigations at OU-1. Several other contaminants were detected in groundwater samples collected during the RI/FS; the maximum concentrations of the contaminants of concern (COCs) detected during the RI are presented in Table 3-1. TCE and 1,2-dichloroethene (DCE) were detected in more than half of the locations sampled. A risk assessment performed as part of the RI/FS for OU-1 determined the incremental lifetime carcinogenic risk associated with the use of groundwater from the Well Field to be 1.8×10^{-4} for adults, which is above the generally accepted permissible risk limit of 10^{-6} that was used in 1986. EPA projected that if no action was taken to control or to mitigate the contaminant plume, contaminant concentrations would increase by a factor of ten over the next 30 years due to migration of the contaminant plume from OU-2. This projected increase would have resulted in a corresponding increase in the risks associated with use of groundwater from the Well Field by one order of magnitude.

Table 3-1 Maximum concentrations of COCs detected in groundwater during the OU-1 RI

Contaminant	Concentration µg/l	Contaminant	Concentration µg/l
TCE	100,000	Vinyl Chloride	136
Tetrachloroethene (PCE)	1,500	Benzene	260
1,2-DCE	4,000	Toluene	240
1,1-Dichloroethane (DCA)	38	Xylenes (total)	590
1,1,1-Trichloroethane (TCA)	4	Ethylbenzene	72
1,1,2-TCA	630	Phenol	72
Methylene Chloride	900	1,2-Dichlorobenzene	4
Chloroform	600		

The 1987 Supplemental RI/FS investigated potential sources of contamination to OU-1. A risk assessment performed for the Supplemental RI identified the following COCs (Table 3-2) in soil and groundwater in OU-2:

Table 3-2 COCs in soil and groundwater at OU-2

PCE	Benzene
TCE	1,1,1-TCA
1,1-DCE	1,2-DCE
Vinyl chloride	Toluene
Chloroform	Ethylbenzene
Methylene chloride	Xylenes
1,1-DCA	Acetone
1,2-DCA	4-Methyl-2-pentanone

EPA determined that exposures to groundwater from OU-1 containing these contaminants would pose a significant threat to public health if not for the dilution provided by infiltration from the Norwalk River and the removal of contaminants by the existing air stripper. EPA determined that contamination in the aquifer at OU-2 would pose a threat to human health if the aquifer were used as a source of drinking water.

The EPA risk assessment also determined that the volatilization of contaminants in soils beneath the Complex posed a risk to users of the buildings, and that future building demolition or soil excavation in the SRA would substantially increase the risk to public health through direct contact with existing soil contamination. Additionally, EPA concluded that contamination in the soils in the SRA would be a continuing source of contamination to groundwater unless concentrations were reduced.

No significant levels of contaminants were found in surface water or sediments in the Norwalk River during the initial RI, and no further sampling or risk assessment for surface water and sediments was performed during the Supplemental RI or subsequently.

4.0 REMEDIAL ACTIONS

This section provides a summary of remedial actions that have been implemented at OU-1 and OU-2 through the 2007 Five-Year Review. For more detailed information about remedial actions performed prior to the 2007 FYR, please see that report.

4.1 OU-1 Well Field

The Site was placed on the NPL in 1984. On September 25, 1986, following completion of the RI/FS, EPA issued a ROD documenting the development and screening of remedial alternatives for the well field, OU-1.

4.1.1 OU-1 Remedy Selection

The primary Remedial Action Objective (RAO) of the 1986 ROD was to assure a reliable supply of safe, potable water to the public dependent on the Well Field. The selected remedy included operation of the existing air stripper, and implementation of an operation, monitoring, and maintenance plan for the air stripper. The 1986 ROD also stated that EPA would undertake an additional RI/FS to further characterize current and potential sources of contamination.

4.1.2 OU-1 Remedy Implementation

In May 1987, EPA issued an Administrative Order, Docket No. 1871067, (AO) to the NFTD to complete construction of, and to begin operating, the air stripper as required by the ROD. This wellhead treatment facility became operational in 1988, and has been operating since. In February 1993, EPA completed the first five-year review and concluded that the treatment system was removing 100 percent of the contaminants tested for and that safe drinking water standards were being met.

4.1.3 OU-1 Operation and Maintenance

The AO detailed specific requirements for the ongoing operation of the air stripper in order to ensure that the primary RAO is achieved. The primary goal of operation and maintenance of the treatment system is to ensure that no water from the Well Field exceeding Federal and/or State contaminant levels enters into the public water supply distribution system. EPA notified the NFTD in May 1988 of the successful implementation of the remedial action.

O&M activities associated with OU-1 have been integrated into the standard operations of the NFTD. Routine maintenance for the air stripper system is performed by NFTD staff. The motor is taken out annually and replaced with a rebuilt motor from the previous year, so there is always a spare ready. Documentation of water quality from the air stripper effluent prior to discharge to the distribution system is routinely provided, along with other required water-quality information, to the Connecticut Department of Public Health (CTDPH).

4.2 OU-2 Source Remediation Area

In 1986, EPA initiated a Supplemental RI/FS to further investigate the extent of the upgradient contaminant plume that was presumed to be providing a continuing source of contamination to the Well Field. The Supplemental RI/FS determined that the Complex was a major source of groundwater and soil contamination that was contributing to the contamination of the Well Field. The possible existence of other source areas contributing to the contamination, however, was not precluded by the Supplemental RI/FS

On September 29, 1989, EPA issued a ROD that separated the management of migration component for the area upgradient of the Well Field into two operable units. OU-2 was termed the Source Area and was characterized by TCE concentrations greater than 6,600 µg/l. OU-3 was termed the Downgradient Area and was characterized by TCE concentrations exceeding 5 µg/l but less than 6,600 µg/l. The 1989 ROD addressed OU-2 only. Remedial decisions for OU-3 were deferred so that the effect of the OU-2 remedy could be evaluated. OU-3 is discussed further in Section 4.3 below.

The following RAOs were established in the ROD:

- Prevent further introduction of contaminated groundwater from the Source Area to the Downgradient Area and ultimately to the production wells and the Norwalk River;
- Restore the Source Area aquifer to drinking water quality;
- Reduce the mass of contaminants at the Source Area; and
- Prevent human consumption of or contact with contaminated soil and groundwater above the cleanup goals presented in the ROD.

4.2.1 OU-2 Remedy Selection

EPA's selected remedy included source control, management of migration components, and institutional controls. The source control component included an in-situ soil vapor extraction system. The management of migration component included a groundwater extraction and treatment system. The soil and groundwater treatment systems were integrated to provide treatment of air from each component through the use of carbon adsorption. The ROD called for institutional controls to prevent "potential exposure to contamination during implementation of the remedy." Long-term institutional controls were required to restrict the installation and use of private wells in the OU-2 and OU-3 areas.

The ROD specified the soil cleanup standards at the Complex as ranges due to differences in soil types in areas of contamination. The ROD indicated that further refinement of the soil cleanup levels would be completed during the remedial design process. The second column of Table 4-1 presents the ranges set in the ROD.

Table 4-1 Soil cleanup standards for OU-2 (all concentrations in µg/Kg)

Compound	1989 ROD	1994 Design		2005 Revised[1]	
		Zone I	Zone II	Zone I	Zone II
Benzene	1.2 - 36.7	130	110	130	110
Toluene	5,523 - 169,552	154,000	141,000	154,000	141,000
Ethylbenzene	13,771 -	183,000	169,000	183,000	169,000

	422,750				
1,1,1-TCA	560 - 17,332	8,300	7,500	8,300	7,500
1,2-DCA	0.6 - 7.9	43	32	43	32
PCE	33 - 1,036	460	420	15,103	420
TCE	12 - 358	180	160	7,959	12,911
cis-1,2-DCE	76 - 2,321	1,200	1,000	1,200	1,000
1,1-DCE	8.3 - 256	150	130	150	130
Vinyl Chloride	0.3 - 9	38	32	220	220[2]
MiBK	1,246 - 38,243	4,300	3,500	NS[3]	

[1] Revised standards were developed for TCE and PCE only. There were insufficient detections to allow for revised calculations for the other contaminants.
[2] The vinyl chloride standard was set at the lowest Method Detection Limit for 5035 that was attained in the 2004 sampling event.
[3] NS = Not sampled. MiBK was not detected in early sampling events and was eliminated with EPA approval from further sampling.

The management of migration remedy (groundwater extraction, treatment, and discharge) was to consist of a pumping well network designed to intercept groundwater contaminated with VOCs throughout OU-2. The cleanup standards established in the ROD for contaminated groundwater in OU-2 are shown in Table 4-2. These standards are federal Maximum Contaminant Levels (MCLs).

Table 4-2 Groundwater Cleanup Standards established in the ROD for OU-2

Contaminant	Cleanup Standard (µg/L)
Benzene	5
Toluene	2,000
Ethylbenzene	680
1,1,1-TCA	200
1,2-DCA	5
PCE	5
TCE	5
1,2-DCE (total)	70
1,1-DCE	7
Vinyl chloride	2
4-Methyl-2-pentanone	350

4.2.2 OU-2 Remedy Implementation

Soils: In November 1992, EPA and four Settling Parties signed a Consent Decree for implementation of the RD/RA for OU-2. Appendix II to the Consent Decree presented the Statement of Work for the design, installation, operation, and management of the integrated treatment system (ITS). EPA approved an interim RD Report on December 29, 1994; and the Final Remedial Design Report was submitted by the Settling Parties on January 9, 1995. The SVE system was designed to treat soils in six general areas of the Complex where VOC concentrations exceeded cleanup goals as follows:

- Three areas associated with the former Zell Products process areas inside of the Elinco Building, Zell 1, and Zell 2;
- The Zell/Elinco Corridor;
- An area in the courtyard between Zell 1 and Zell 2; and
- A small area just north of the Matheis Court Office Building and a small area below it.

The six soil remediation areas are shown on Figure 4-2. Installation of the SVE system began in September 1995 and the system was activated in April 1996. System modifications were made in the start-up period and subsequently the SVE system operated as expected.

As anticipated in the ROD, two sets of cleanup goals were developed for soil due to variability in organic carbon content, water content, and lateral groundwater flow rates in different parts of OU-2. Zone I was defined as the area to the north of the straight line extending across the Complex, parallel to the north wall of the Elinco Building. Zone II was defined as the area to the south of this line. Columns three and four in Table 4-1 contain the standards developed in the 1994 design and approved by EPA.

In about 1998, consistent with its national approach toward evaluating VOC-contaminated soils, EPA required use of EPA Method 5035 at the Site (instead of the previously utilized Method 5030). EPA Method 5035 is a closed-system purge-and-trap process for the analysis of VOCs in solid materials. It differs from Method 5030 in two ways. First, in the sample collection, Method 5035 utilizes a hermetically-sealed sample vial, the seal of which is never broken from the time of sampling to the time of analysis, whereas Method 5030 utilizes an unsealed sample container. Since the Method 5035 sample is never exposed to the atmosphere after sampling, the losses of VOCs during sample transport, handling, and analysis are negligible. Second, in the laboratory Method 5035 utilizes methanol to purge the VOCs from the sample whereas Method 5030 utilizes water. Thus whereas the water purge mimics leaching of VOCs by rainwater percolating through soil, the methanol purge provides the total VOC amount.

As a result of the change in methodology, VOC concentrations were higher in some locations with the new methodology than the RI and pre-design data even after several years of operation of the SVE system. The 5035 methodology essentially negated the soil leaching model used in the FS to set the range of performance standards that factored in the type of soils onsite and the amount of organic carbon present in the soils. Consequently, the performance standards developed in the 1994 design for TCE and PCE were adjusted in 2005 to reflect use of EPA Method 5035 and these standards are presented in columns five and six in Table 4.1.

A total of sixty samples were collected and evaluated against the revised performance standards. Statistical analysis per EPA guidance determined that five of the six areas had met the performance standards. In October 2005, the area in the courtyard between the two Zell buildings and one localized hot spot were excavated (with confirmatory sidewall and bottom of the excavation samples) to address the remaining contamination. In May 2006 EPA approved the Soil Cleanup Completion Report and the SVE system was dismantled in August 2006. Figure 4-2 shows the soil remediation areas.

Groundwater: The Statement of Work specified that the Settling Parties shall remediate groundwater in OU-2 until:

(1) The concentration of each groundwater contaminant is at or below the cleanup standard for the contaminant at every well that is part of the groundwater treatment and monitoring system within the SRA;
(2) The concentration of each groundwater contaminant is at or below the cleanup standard for the contaminant at any well that EPA installs for adequate verification that cleanup standards have been achieved;
(3) The cumulative carcinogenic risk for groundwater falls within the risk range generally considered by EPA to be protective at Superfund Sites; and
(4) The non-carcinogenic risk does not exceed unity on the Hazard Index.

Nine groundwater extraction wells east of the railroad tracks (3 overburden/6 bedrock) and one bedrock well at the Complex were installed in 1994 and 1995 and pumping tests were performed to determine capture zones and other hydrogeological properties of the system. Groundwater treatment system start-up occurred at the end of May 1996 and formal operation of the SVE and groundwater extraction systems began on September 30, 1996. The groundwater monitoring network is shown in Figure 3.

Institutional Controls: The 1997 ESD stated that as existing Connecticut statutes contain criteria that prohibit the installation of groundwater wells in OU-2 or OU-3, Site-specific institutional controls (i.e., environmental easements) pertaining to groundwater was not necessary. The 1997 ESD also stated that institutional controls preventing excavation of the Complex soils were in place. The ROD contemplates that these would be temporary measures to prevent potential exposure to contamination during implementation of the remedy. While subsequent research has not confirmed the existence of institutional controls on the Complex soils, with the attainment of the soil performance standards in 2006, institutional controls pertaining to the Complex soils as required by the SOW are no longer needed.

4.2.3 OU-2 Operation and Maintenance

An O&M plan was submitted by the Settling Parties in August 1995 for all OU-2 remedial activities. As noted earlier, the SVE system was dismantled in 2006.

The groundwater monitoring program initially included quarterly, annual, and bi-annual sampling of different groups of wells. The results of the quarterly monitoring events were reported in Quarterly Groundwater Monitoring Reports Nos. 1 through 11 (December 1993 to September 1996). Beginning in December 1996, groundwater monitoring was combined into the quarterly ITS reports. Beginning in 2002 monitoring was performed semi-annually in the spring and fall of each year, and the ITS monitoring report was prepared semi-annually. The semi-annual monitoring included extraction wells, selected SRA wells, and one non-SRA well. The approximate locations of the monitoring locations are shown on Figure 3.

4.3 OU-3 Downgradient Area

As noted above, the management of migration component in the 1989 ROD was separated into two operable units. EPA deferred selection of a remedy for the Downgradient Area in order to be able to evaluate:

- The effectiveness of the Source Area groundwater extraction and treatment system in remediating contamination in the Downgradient Area groundwater;
- Any future data indicating that the contamination plume at the site is having a negative impact on the Norwalk River; and
- Accessibility of the Downgradient Area after the construction of Route 7 is complete.

EPA stated in the 1997 ESD that further actions would not likely be needed. The ESD also stated that "the final remedial decision regarding the Downgradient Area will not be made until an evaluation of the success of the OU-2 treatment system in reducing contaminant concentrations in the groundwater at the Site is performed. If necessary, modifications to the SRA monitoring and remediation system can be made".

5.0 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This is the fifth five-year review for the Site. The fourth five-year review, completed by EPA in September 2007, assessed the three operable units and made the following conclusions:

> The OU1 remedy for the Kellogg-Deering Well Field is currently protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled by the wellhead treatment system. However, should contamination from OU2 not be fully contained and if it is moving toward the well field, protectiveness in the future could be threatened if wellhead treatment is no longer occurring.
>
> With the possible exception of vapor intrusion, the remedy for OU2 currently protects human health and the environment because exposure pathways that could result in unacceptable risks are being addressed through treatment and/or institutional controls that prevent direct contact with contaminated soil, inhalation of contaminated soil vapors, and use of contaminated site groundwater. Groundwater extraction and treatment continue, but VOC mass removal has not yet achieved the cleanup standards that were established in the ROD.
>
> Recent soil gas sampling indicates that vapor intrusion to residences and businesses is possible over an area that includes OU2 and OU3. The vapor intrusion pathway should be investigated and appropriate response measures taken to address unacceptable risks. Based upon the results of further investigation, vapor intrusion could present a current risk to some occupants of properties in the OU2 and OU3 areas of the Site.

As noted previously, no remedy has been selected for OU-3.

The 2007 FYR identified the following issues and made the recommendations (in italics) for each:

<u>OU-2</u>

- A large mass of contaminants remains in the source remediation area; high concentrations of VOCs persist in groundwater. *Evaluate methods that could increase the rate of contaminant removal and consider implementation of viable technologies*

- The current declining pumping rate may not fully contain the plume. *Test the efficiency of each extraction well and recondition or replace wells if needed.*

- Elevated concentrations of contaminants in the Downgradient Area indicate that the treatment system is not fully containing the plume in OU-2. *Review alternative pumping schemes to maximize contaminant removal and capture. Install additional wells in OU-3 to demonstrate hydraulic containment by pumping.*

- Vapor intrusion is a potential threat to businesses and residents in the area of the contaminant plume. *Complete the previously initiated assessment of the vapor intrusion pathway.*

  OU-3

- The extent and fate and transport of contaminants in ground water are not fully known. Vapor intrusion to residences and businesses is possible for an area that includes OU-3. *Complete the previously initiated assessment of the vapor intrusion pathway at OU-3.*

No issues or recommendations were made for OU-1.

The following describes the progress made in addressing these recommendations following the 2007 FYR:

Source removal options – The focus during this review period was on increasing the effectiveness and efficiency of the groundwater extraction and treatment system and monitoring program rather than looking at fundamental changes to the remedy. It is noted that the 2007 FYR did not identify "viable technologies".

Extraction well efficiency – The Settling Parties repaired piping at extraction well EW-3 in 2010. Per the approved optimization work plan, the Settling Parties rehabilitated the extraction wells in the central portion of the network in Summer 2012. With these actions, it is anticipated that the extraction well efficiency will improve.

Adjust pumping configuration – The Army COE (who performed the 2007 five-year review for EPA) submitted an optimization study in April 2010. This study was shared with all interested parties. The Settling Parties have submitted a work plan and following EPA approval, they have begun activities that will include further piezometric data and computer modeling to assess different pumping configurations of the groundwater extraction system. It is anticipated that these pumping configurations will be implemented in late 2013.

Vapor intrusion evaluation – EPA completed a three phase evaluation after the 2007 FYR that involved collection of soil vapor gas and indoor air samples from OU-3. An investigation of a potential vapor pathway in OU-2 was not conducted as the buildings on the Complex had been demolished, the adjacent building (Matheis Court) was above an open-sided parking garage, and the properties on the west side of Main Avenue were commercial properties, some of which use solvents and other VOCs in their businesses. The evaluation concluded that there were no unacceptable risks associated with a vapor intrusion pathway in OU-3 and did not recommend further evaluation.

6.0 FIVE-YEAR REVIEW PROCESS

6.1 Administrative Components

EPA, the lead agency for this five-year review, notified CTDEEP and the Settling Parties in Spring 2012 that the five-year review would take place during the summer of 2012. A meeting was held on the Complex on August 9, 2012 with the Settling Parties and representatives of the new owner of the Complex. A visit to OU-1 and an inspection of the OU-3 area were made on August 29, 2012. Jeffrey Wilcox of CTDEEP is part of the review team.

The schedule established by EPA included completion of the review by September 2012.

6.2 Community Involvement

EPA issued a public notice on August 24, 2012 announcing EPA's review of the progress of the Kellogg-Deering Well Field Site cleanup. The notice was placed in the Norwalk Hour, the local daily newspaper. The notice encouraged public participation. Since the publication of the notice, there has been no response from the public to EPA regarding the five-year review. This level of response is similar to that to the previous five-year review public notice. Public involvement in the site has been minimal since the mid-1980s.

The Administrative Records for OU-1 and OU-2 are not currently available at the Norwalk Public Library. The library had discarded the original paper copies of both Administrative Records. EPA Records Center replaced them with electronic copies in May 2006 and again in July 2011. Attempts by the library staff to locate the electronic copies were not successful on August 29, 2012. EPA informed the reference librarian that new copies would be provided. In the search for the electronic copies, none of the librarians recalled anyone requesting to see them.

6.3 Document Review

This five-year review consisted of a review of relevant documents including decision documents and monitoring reports. The documents reviewed as part of this effort are included in the list of references in Section 12.

6.4 Data Review

Semi-annual monitoring reports and plans were reviewed to assess contaminant levels and relevant trends that may be indicative of remedy performance. A summary of data regarding the components of the Site remedy is presented below.

6.4.1 OU-1 Well Field

Influent data from the individual production wells and effluent data from the Well Field air stripper for February 2007 through February 2012 were provided by the NFTD. Influent samples were collected from the individual production wells one to three times a year depending on their usage whereas quarterly effluent samples were collected after the air stripping tower.

For this reporting period, the range of TCE and total VOCs detected in the individual wells are in the table below. Compounds associated with the disinfectant process were very infrequently detected at 1 ppb in the system effluent, but neither TCE, PCE, nor any other compounds associated with the Source Area was detected (reporting limit of 1 ppb) in the treated water during this five-year review period.

Well	Number of Samples	TCE Range µg/L	Total VOCs Range ug/L	MCLs Met
Deering-1	7	ND	1 – 4	Yes
Deering-2	10	1 – 3	3 – 9	Yes
Layne-1R	7	ND – 1	ND – 4	Yes
Layne-2	10	ND - 1	ND – 2	Yes
System Effluent	22	ND	ND – 1	Yes

6.4.2 OU-2 Source Remediation Area

The semi-annual ITS reports were reviewed for the source control and groundwater remedies for OU-2. Analytical data from groundwater samples, groundwater treatment system influent and effluent samples were reviewed. Mass removal calculations for the groundwater treatment system also were reviewed. The following sections provide a description of relevant data for this review period.

The groundwater extraction and treatment system has been in operation continuously since 1996 other than for periods of maintenance when pumps or other equipment needed to be repaired or replaced. The ITS currently consists of a series of six bedrock and three overburden extraction wells. Groundwater removal from each well is accomplished with a submersible pump and dedicated two inch diameter piping from the wellheads to the treatment building. The extracted groundwater is pumped into an equalization tank and then processed through a tray aerator to the existing storm water system and ultimately to the Norwalk River under a general permit issued by CTDEEP. The VOC-laden air from the aerator is polished through two 3,800 pound regenerable vapor phase carbon adsorption vessels prior to discharge to the atmosphere. Piezometric data is collected during the semi-annual sampling events. From this information groundwater contour maps are prepared to demonstrate capture of the groundwater plume during this period of operation. Figure 4A presents the bedrock groundwater elevation contours and this figure is consistent with similar figures created for the other monitoring reports in this review period.

6.4.2.1 Groundwater Analytical Data

During the period covered in this five-year review, groundwater samples were collected semi-annually based on the schedule in the approved monitoring plan. Semi-annual and annual sampling was performed in the fall and the other semi-annual event was performed in the spring. As part of the recently initiated optimization work, the sampling frequency of some wells was

adjusted to once every five years to coincide with the five-year reviews. The monitoring report number and number of wells sampled during this period are as follows:

ITS Report No.	Sampling Event	Number of Wells	Well Distribution
#33	Fall 2007	45	36 monitoring and 9 extraction
#34	Spring 2008	24	15 monitoring and 9 extraction
#36	Spring 2009	25	15 monitoring and 10 extraction
#37	Fall 2009	47	37 monitoring and 10 extraction
#38	Spring 2010	24	15 monitoring and 9 extraction
#39	Fall 2010	43	33 monitoring and 10 extraction
#40	Spring 2011	24	15 monitoring and 9 extraction
#41	Fall 2011	47	37 monitoring and 10 extraction

Extraction Wells

VOC concentrations in the extraction wells during this review period were fairly consistent. For the entire review period, the lowest TCE, PCE, and cis-1,2-DCE concentrations were measured at the EW-5/EW-5-OB couplet (the two northernmost extraction wells located adjacent to the railroad tracks west of Main Avenue). Concentrations for TCE, PCE, cis-1,2-DCE ranged from 10 to 50 ppb, non detect to 10 ppb, and 5 to 30 ppb, respectively.

For this review period, the highest TCE, PCE, and cis-1,2-DCE concentrations were measured either at EW-8 or EW-4. EW-8 is the extraction well located along Main Avenue at the corner of the former Elinco building and EW-4 is located west of Main Avenue in the central portion of the extraction system. Concentrations for TCE, PCE, cis-1,2-DCE in these wells were in the 20,000 to 30,000 ppb, 800 to 1,200 ppb, and 2,300 to 3,000 ppb, respectively. The concentrations in EW-8 have increased since the previous five-year review and indicate the continuing long-standing presence of highly contaminated groundwater in the SRA.

Monitoring wells

TCE concentrations in monitoring wells during this review period were also fairly consistent. Because the frequency of sampling varies for the individual wells (some semi-annual, others annual, and some every five years) the location of the minimum and maximum sample concentrations also varies. Samples collected in March 2012 from Complex wells have the highest TCE concentrations, up to 15,000 ppb.

PCE concentrations overall gradually decreased during this review period and now approximately half of the wells meet the performance standard. Levels of cis-1,2-DCE have oscillated to some degree and in certain wells have increased over time. These observations are expected since cis-1,2-DCE is a breakdown product of TCE and the concentrations are likely to increase as TCE is degraded.

As noted above, as part of the optimization work some monitoring wells were added to the sampling program in March 2012. Several of these wells, primarily located on the Complex,

were last sampled in 2001, accordingly, our confidence in inferring any trends based on these data (because of the interval between sampling events) is low.
In general, cleanup goals for TCE, PCE, and cis-1,2-DCE in groundwater have not been achieved. In March 2012, concentrations of TCE, PCE, and cis-1,2-DCE remained orders of magnitude greater than cleanup goals established in the ROD. Figures 5 and 6 show estimated contours of TCE and PCE concentrations, respectively, in groundwater.

6.4.2.2 Groundwater Treatment System Analytical Data

Treatment system samples are collected monthly from influent and effluent sampling ports within the ITS treatment building, and analyzed for VOCs. Influent total VOC concentrations have remained fairly steady during this review period, fluctuating within an order of magnitude, 330 to 2800 ppb, and an average yearly concentration of approximately 1,150 to 1,350 ppb. These concentrations are similar to those reported in the previous five-year review, indicating a continuing long-term source of contamination. Effluent concentrations met the levels set in discharge permit issued by CTDEP (Permit No. GRS000022).

6.4.2.3 VOC Mass Removal

Estimated groundwater VOC mass removal rates for individual extraction wells are calculated using total VOC concentrations collected during the sampling events (Section 6.4.2.1) and average groundwater extraction rates collected during the operation of the ITS. Individual well VOC removals are then totaled to estimate the total VOC removal for the groundwater treatment system. Table 6-4 provides a summary of semiannual VOC mass removal for the groundwater treatment system since 2007. Mass removal rates decreased from an average of 110 pounds per semi-annual period during the previous five-year review to approximately 80 pounds per semi-annual period. The sharp decline in 2008 is viewed as an outlier created by the decreased operation time for EW-4 rather than an actual reflection of subsurface conditions. As shown in Table 6-4, EW-4 contributed 45 – 80% of the total mass removed during this review period.

Table 6-1 Semi-annual VOC Mass Removed from Groundwater at OU-2, 2007-2011

Reporting Period	Estimated Total Semi-annual VOC Mass Removed from Groundwater (pounds)	Extraction Well with Highest Mass Removed (pounds)
April 2007 – September 2007	110	EW-4 (76)
October 2007 – March 2008	60	EW-4 (29)
April 2008 – September 2008	20	EW-7 (13)
October 2008 – March 2009	60	EW-4 (49)
April 2009 – September 2009	130	EW-4 (107)
October 2009 – March 2010	90	EW-4 (53)
April 2010 – September 2010	90	EW-4 (61)
October 2010 – March 2011	60	EW-4 (49)
April 2011 – September 2011	60	EW-4 (28)

6.4.3 OU-3 Downgradient Area

6.4.3.1 Groundwater

Groundwater from wells located in OU-3 has been sampled and analyzed annually by the Settling Parties. During the most recent sampling event (March 2012), TCE, PCE, 1,2-DCE (cis and trans), and vinyl chloride were detected in groundwater samples.

Concentrations of VOCs in OU-3 overall decreased during this review period, but are still higher than MCLs. The highest TCE concentrations in OU-3 have been detected in monitoring well K-21. Unlike the previous review period, where declining concentrations were not apparent at K-21, the 2007-2011 data show a consistent decline to its current level of 480 ppb.

6.4.3.2 Vapor Intrusion Pathway

A Phase II vapor intrusion study of soil gas and indoor air was conducted in April 2008 and a Phase III study was conducted in May 2009 in OU-3. These studies followed a Phase I study was done in the residential area that is bounded by Broad Street, Davis Street, Slocum Street, and Muller Avenue. The Phase I study detected TCE in six locations that exceeded EPA target concentrations (cancer risk = 10^{-5}). PCE was detected at one location, where the EPA target concentration was exceeded.

The Phase II study included fourteen residences located above the groundwater plume and within the area where elevated levels of VOCs in soil gas were detected during Phase I. The goal of this sampling was to assess the concentrations present in the sub-slab soil gas and the indoor air, and to conduct a human health risk assessment based on the data collected to determine if further actions are required. Of the fourteen residences evaluated, seven had no detections in the indoor air samples. The remaining seven were retained for quantitative risk evaluation

The human health risk assessment indicated that there were no unacceptable risks to any of the home owners, but there were elevated levels of PCE and TCE in the sub-slab soil gas at five homes. Therefore it was recommended that a seasonally variable round of similar samples should be collected at these homes. It was also determined that vinyl chloride should be added to the list of compounds to be analyzed.

The Phase III sampling and analysis was conducted the week of May 25, 2009. Similar to the first two phases of sampling, indoor air, sub-slab soil gas and ambient air samples were collected at each home.

The human health risk assessments performed on the data collected from the homes sampled during Phase II and Phase III of the study indicated that the risks were within EPA's acceptable risk range (e.g. 10^{-4} to 10^{-6}). The Phase III data indicated that there were no risks higher than the 10^{-6} range. Consequently, no further VI investigations were recommended.

6.5 Site Inspection

An inspection of OU-2 was initially conducted by EPA on August 9, 2012 with a follow-up visit on

August 29, 2012. The initial inspection of the Complex included representatives from the new owner and the Settling Parties responsible for the operation and maintenance of the ITS system. The inspection of the Well Field included a meeting on August 9 with personnel from the NFTD, and a tour of the Well Field on August 29 with Mike Elliott from NFTD. At the Well Field, the original air stripper has been dismantled. Earlier this year NFTD received approval from Connecticut Department of Public Health (CTDPH) for the installation of a backup well and plans are to have it installed this fall.

The OU-2 ITS treatment system is largely automated, but is checked monthly by the Settling Parties' contractor and as otherwise needed. All equipment and instrumentation is wired to a central programmable logic controller within the treatment building.

On August 29, the EPA project manager rode through each of the operable units. The primary land use in the area surrounding OU-1 remains single-family residential. The primary land use for OU-2 is commercial. The Complex is bordered by an assisted living facility to the north, a condominium complex to the east, and commercial businesses to the south. The western side of Main Avenue is predominantly businesses in several small shopping areas with common parking and access/egress areas with a few private homes interspersed among the businesses. All of the SRA wells are flush with the pavement and protected by either road boxes or manhole covers. The OU-3 area is primarily multi-family residential, but several businesses are in buildings north of Muller Avenue and along the northern extension of Sniffen Street. Commercial businesses are along both sides of Broad Street and a cemetery is south of Broad Street. Route 7, a four-lane divided highway built after the ROD for OU-1 and before the 1996 start-up of the OU-2 remedy, is at the western edge of OU-3 and physically separates OU-3 from the Norwalk River.

6.6 Interviews

EPA met with interested parties on August 9 and August 29, 2012. Meetings were held with State and local government staff, Norwalk First Taxing District Water Department, Settling Parties and their technical consultants, and the new 272 – 280 Main Avenue property owner and his representatives. Overall, the discussions indicated that implementation of the selected remedies for both OU-1 and OU-2 have proceeded without significant issue or concern. Two related concerns were raised, the potential interaction between the Well Field and the source area, and the future use of the Main Avenue property.

As noted above, CTDPH recently gave approval for the installation of a replacement well in the Well Field and requested that as part of the Settling Parties' optimization work, that modeling simulations be run with different withdrawal rates for the Well Field. The Settling Parties' consultant confirmed that their modeling simulations would include different withdrawal rates.

In April 2012 the 272-280 Main Avenue property was sold. The new owner is seeking to redevelop the property. As of August 29, 2012, the new owner had not contacted the City of Norwalk Planning and Zoning Department so a timeframe for redevelopment that meets the required review process has not been established.

7.0 TECHNICAL ASSESSMENT

The following sections evaluate the remedy based on its function in accordance with decision documents, its adherence to risk data and scenarios and any other information that could have affected the remedy's protectiveness. ARARs and To Be Considered (TBC) guidance for the Site identified during the development of the 1986 ROD for OU-1 and 1989 ROD for OU-2 were provided in Appendix B of the 2007 FYR for reference.

7.1 QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS?

ANSWER A: YES FOR OU-1. Monitoring data from the Well Field indicates that the effluent concentrations have consistently met the performance standards not only for this reporting period but since 1988. Additionally only one influent sample has exceeded a performance standard since 1997 and none during this review period.

ANSWER A: YES FOR OU-2. The source control remedy is complete (Soil Cleanup Completion Report for OU-2 was approved May 6, 2006). For management of migration, three lines of evidence indicate the plume is contained: influent concentrations at the Well Field decreased substantially after operation of the ITS began; piezometric data show flow toward the extraction wells; and concentrations in wells in the Downgradient Area (OU-3) have gradually decreased since ITS operation began.

ANSWER A: N/A FOR OU-3. No remedy has been selected for OU-3.

7.1.1 OU-1 Well Field

Remedial action performance and monitoring results: The site inspection and influent and effluent water sampling results indicate that the remedy is functioning as intended by the ROD. The Well Field treatment system continues to operate as designed, and samples of groundwater collected immediately prior to discharge to the distribution system indicate that the air stripper is removing VOCs from the production well water prior to distribution to the public water supply. As a result, the remedy is accomplishing the objective established in the 1986 ROD to assure a reliable supply of safe, potable water to the public dependent on the Well Field.

The operation and maintenance of the air-stripping tower at OU-1 has become incorporated into NFTD's regular operations for the Well Field. Information collected during the Site inspection indicates that the treatment system is being operated and maintained efficiently, and no changes or improvements are recommended at the time of this five-year review. Perimeter fencing controls access to the well field. As part of a GAA groundwater classification area, private wells are prohibited in the vicinity of the Well Field.

Operations and Maintenance Costs: Operation and maintenance of the air stripper has been incorporated into the overall operation and maintenance of the water department. Costs for the air stripper are not tracked separately. The water department has determined that its operation

provides benefit to the overall treatment of the water so although influent concentrations have been meeting MCLs consistently over the past two review periods the water department has determined that it is cost-effective for the overall operation to continue operating the air stripper.

Opportunities for Optimization: No opportunities for optimization opportunities for OU-1 were identified during this review.

Indicators of Remedy Problems: There do not appear to be any indications of remedy problems for OU-1.

Implementation of Institutional Controls: The 1986 ROD did not include any institutional controls and no site-specific institutional controls have been implemented in OU-1.

7.1.2 OU-2 Source Remediation Area

Remedial Action Performance and Monitoring Results: Review of the ITS monitoring reports indicate that the source control component of the SRA remedy is functioning as intended. As noted above, EPA approved the Soil Cleanup Completion Report in May 2006 and the results of that are covered in more detail in the 2007 Five-Year Review. As to the management of migration component of the SRA remedy, the data indicate it is functioning as intended with the exception that the RAO for restoration of the groundwater is not likely to be achieved.

Operations and Maintenance/Costs: Operation and maintenance costs were not available for this review.

Opportunities for Optimization: An optimization study is underway. The study has five components: assessment of current monitoring network, rehabilitation of the extraction wells, continuous water level monitoring, hydraulic capture analysis, and reporting. The summary report is expected to be completed in Summer 2013.

Indicators of Remedy Problems: There are no indications of remedy problems. Concentrations of contaminants fluctuated during this review period and that is not unexpected given the variability of fractured rock hydrogeology.

Implementation of Institutional Controls: The Connecticut statute prohibits installation of drinking water wells in OU2 and OU3 and this prohibition has been sufficient to prevent any installation of drinking water wells in these areas.

7.1.3 OU-3 Downgradient Area

Remedial Action Performance and Monitoring Results: As noted previously, no decision document has been written for OU-3 and therefore no remedial action has been selected. Groundwater monitoring continues in conjunction with OU-2 though few locations remain in OU-3. Some were lost in the construction of Route 7, others have been lost as roads were repaved, and three have been damaged or destroyed. Of the remaining wells, the concentrations detected in their respective last sampling event are meeting or within an order of magnitude of

meeting MCLs. The one well with more elevated concentrations has followed a declining trend since operation of the groundwater extraction system began, steadily decreasing from 2,800 ppb to 480 ppb. As part of the optimization study the three damaged wells will be replaced.

In addition to the long-term groundwater monitoring, a vapor intrusion study was performed in OU-3 during this review period and it is discussed in Section 6.4.3.2.

Operations and Maintenance/Costs: Not applicable.

Opportunities for Optimization: Not applicable. As to ongoing monitoring, the three wells identified as damaged or destroyed will be replaced as part of the optimization study underway.

Indicators of Remedy Problems: Not applicable.

Implementation of Institutional Controls: As noted for OU-2, no Site-specific institutional controls (i.e., easements) have been implemented for OU-3 as EPA has determined that prohibition of groundwater use by Connecticut statute also applies to OU-3.

7.2 QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEANUP LEVELS AND REMEDIAL ACTION OBJECTIVES (RAOs) USED AT THE TIME OF REMEDY SELECTION STILL VALID?

ANSWER B: NO, though the ROD did identify potential vapor intrusion in OU-2, it did not identify it as a possible exposure pathway in OU-3. Additionally, there have been some changes in the toxicity data and soil cleanup levels since the 1989 ROD. However the changes in the toxicity data do not impact the protectiveness of the remedy and the subsequent assessment did not find an unacceptable vapor intrusion risk in OU-3. RAOs used at the time of the remedy selection, as modified, are still valid.

7.2.1 OU-1 Well Field

Changes in Standards and TBCs: Current chemical-specific ARARs that are applicable to OU-1 include federal and state drinking water standards and state air emissions regulations. Interim cleanup goals for the aquifer at the Kellogg-Deering Site are based on ARARs. Federal drinking water standards (MCLs) have not changed since the last five-year review.

Changes in Exposure Pathways: Two exposure scenarios associated with groundwater were identified in the 1986 ROD, ingestion and inhalation of contaminated groundwater. No new exposure pathways were identified for OU-1 during this review period.

Changes in Toxicity and Other Contaminant Characteristics: During the last five years, several changes have occurred to some of the EPA toxicity values maintained on the Integrated Risk Information System (IRIS) for the contaminants of concern (COCs) identified in the ROD. Upon reviewing the groundwater COCs identified in the ROD and previous five-year review reports, there are five groundwater COCs with changes in toxicity since the 2007 FYR.

Groundwater

1) cis-1,2-DCE In 2010, EPA released the toxicity assessment for cis-1,2-DCE with a non-cancer reference dose toxicity value less stringent than the value used in the ROD which may result in lower risks from exposure to cis-1,2-DCE at the Site. However, this would not affect the remedy selected for the Site because there is no change to cis-1,2-DCE MCL, which was selected for the interim groundwater cleanup level.

2) PCE On February 10, 2012, EPA released the PCE assessment with new cancer and non-cancer toxicity values. EPA now characterizes PCE as likely to be carcinogenic in humans by all routes of exposure and a non-carcinogenic health hazard. Compared to the toxicity values used in the human health risk assessment conducted for the Site, the current PCE non-cancer toxicity values are more stringent and would result in higher PCE hazards while the current PCE cancer toxicity values are less stringent and would result in lower PCE cancer risks from exposure to PCE at the Site. However, this would not affect the remedy selected for the Site because there is no change to PCE MCL, which was selected for the interim groundwater cleanup level.

3) 1,1,1-TCA On September 28, 2007, EPA released the 1,1,1-TCA toxicity assessment with new non-cancer reference dose and reference concentration toxicity values. The assessment concluded that there was inadequate information to assess carcinogenic potential for 1,1,1-TCA and characterized the chemical as a non-carcinogenic health hazard. The previous EPA toxicity assessment for 1,1,1-TCA in 1987 classified the chemical as Group D, which is not classifiable as to human carcinogenicity. This toxicity change would not affect the remedy selected for the Site since there is no change to 1,1,1-TCA MCL, which was selected for the interim groundwater cleanup level.

4) TCE On September 28, 2011, EPA released the TCE assessment with new cancer and non-cancer toxicity values. EPA now formally characterizes TCE as carcinogenic to humans by all routes of exposure and a non-carcinogenic health hazard. Although these toxicity values are more stringent than those used in the human health risk assessment conducted for the Site and would result in higher TCE risks from exposure to TCE at the Site, this would not affect the remedy selected for the Site because there is no change to TCE MCL, which was selected for the interim groundwater cleanup level.

5) vinyl chloride Although there is no recent change in toxicity values for vinyl chloride, based on EPA's 2005 Guidelines for Carcinogen Risk Assessment and 2005 Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, vinyl chloride is considered a known human carcinogen that acts with a mutagenic mode of action. Chemical-specific data on susceptibility from early-life exposure to vinyl chloride were available to derive more stringent risk-based indoor air screening levels. This change does not affect the remedy selected for the Site because there is no change to vinyl chloride MCL, which was selected for the interim groundwater cleanup level.

Changes in Risk Assessment Methods: Since the 2007 FYR EPA has published the Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) (January 2009) (RAGS F). This document

endorses the use of the Reference Concentration (RfC) and Inhalation Unit Risk (IUR) approach to inhalation risk assessment instead of the use of inhalation Reference Doses (RfD_is) and inhalation Cancer Slope Factors (CSF_is).

Expected Progress Towards Meeting RAOs: The 1986 ROD predates the establishment of RAOs, but the description of the selected remedy provides this equivalent objective: "the operable unit serves to assure the reliable supply of safe, potable water to the public dependent on the well field". The remedy has achieved this objective.

7.2.2 OU-2 Source Area

Changes in Standards and TBCs: Current chemical-specific ARARs that are applicable to OU-2 include federal and state drinking water standards. Interim cleanup goals for the aquifer at the Site are based on ARARs. Federal drinking water standards (MCLs) have not changed since the last five-year review.

Changes in Exposure Pathways: Two future exposure scenarios associated with groundwater were identified in the 1989 ROD, ingestion and inhalation of contaminated groundwater. No new current exposure pathways were identified for OU-2 during this review period however vapor intrusion could be a future exposure pathway if the 272-280 Main Avenue property is developed.

Changes in Toxicity and Other Contaminant Characteristics: See the discussion above for OU-1 since the COCs for OU-2 are the same as identified in OU-1.

Changes in Risk Assessment Methods: See the discussion above for OU-1.

Expected Progress Towards Meeting RAOs: The 1989 ROD established four RAOs for the groundwater and two for the soil in the Source Area. Three of the groundwater RAOs and both soil RAOs have been met. With the majority of the groundwater contamination in the bedrock, the remaining RAO, restoration of the groundwater to drinking water quality, is not likely to be met in the foreseeable future.

7.2.3 OU-3 Downgradient Area

Changes in Standards and TBCs: There have been no changes to groundwater standards. Screening levels for vapor intrusion have been changed (see discussion below).

Changes in Exposure Pathways; No changes in exposure pathways for OU-3 were identified during this review.

Changes in Toxicity and Other Contaminant Characteristics; Since the 2009 vapor intrusion study, overall groundwater contaminant concentrations have decreased in the subsequent four sampling rounds, continuing the gradual decrease documented in the monitoring reports since the previous five-year review. With no new indoor air data and with groundwater contaminant

levels not significantly different, it can be assumed that current indoor air levels are also not significantly different from those collected in 2009.

Due to the recent changes in toxicity for these contaminants, the 2009 indoor air data were re-screened against new risk-based indoor air screening levels developed for residential scenario by using the new toxicity values. With the changes in toxicity, the new TCE indoor air screening levels are 0.43 ug/m^3 based on target cancer risk level of 1E-06 and 2 ug/m^3 based on target hazard index of 1, using Superfund's standard long-term exposure assumptions for long-term protection. The maximum detected indoor air concentration at the Site was 2 ug/m^3. This would result in a cancer risk of 4.7E-06 and a non-cancer hazard index of 1. The new PCE screening level of 9.36 ug/m^3 is less stringent than the old screening level and maximum detected indoor air PCE level does not exceed this new screening level. The new screening levels for 1,1-DCE and 1,1,1-TCA are slightly less stringent than the old screening levels and 2009 data also show no detection of these contaminants in indoor air. The new vinyl chloride screening level of 0.16 ug/m^3 based on target cancer risk level of 1E-06 is more stringent than the old screening level but 2009 data show no detection of vinyl chloride in indoor air.

It can be concluded from this re-screening and re-evaluation for vapor intrusion based on 2009 indoor air data that although there are changes in risk-based screening levels for indoor air contaminants of concern, the cumulative cancer risks from being exposed to these levels, assuming that they are the same as in 2009, would be within EPA's acceptable risk range.

Changes in Risk Assessment Methods: The changes in toxicity values were incorporated into the vapor intrusion guidance and the effect of those changes are discussed above.

Expected Progress Towards Meeting RAO: Not Applicable; no RAOs have been established and no remedy has been selected for OU-3.

7.3 QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?

ANSWER C: NO.

7.4 TECHNICAL ASSESSMENT SUMMARY

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended in the 1986 and 1989 RODs.

There have been no significant changes to the physical conditions of OU-1 and OU-3 since the 2007 FYR. The demolition of the three buildings in the Source Area that began in 2007 was completed during the Summer 2012 with the removal of the concrete foundation slabs.

The response actions required for OU-1 have been completed and the groundwater standards continue to be met. The groundwater extraction and treatment system continues to operate in OU-2 and an optimization study is underway with the goal of increasing the system's effectiveness and efficiency.

Since the 2007 FYR, there have been changes in toxicity values for five site-related contaminants but these changes do not affect the protectiveness of the remedies for OU-1 and OU-2.

8.0 ISSUES

8.1 OU-1 Well Field

This review did not identify any issues associated with OU-1. As discussed previously, the remedial action for OU-1 was completed in 1987. Long-term monitoring of the influent shows MCLs have consistently been met for the last two review periods. Additionally, long-term operation and maintenance of the air stripper assures that potable water is being provided.

8.2 OU-2 Source Area

This review did not identify any new issues associated with OU-2; actions are underway to address the four issues identified in the previous review. See Section 5 for a review of progress made on these issues. The groundwater extraction and treatment system has operated consistently during this review period and the piezometric data and downgradient water quality data indicate that the extraction system is successfully containing the plume from migrating away from the Source Area.

8.3 OU-3 Downgradient Area

No remedy has been selected for OU-3. A Connecticut statute prohibits use of groundwater in the area of the Site. A study of the vapor intrusion pathway did not find unacceptable risks. Although the toxicity values have changed somewhat since the vapor intrusion study, a comparison of the 2008 and 2009 data to the new values did not indicate an unacceptable risk. Contaminant concentrations in groundwater in OU-3 continue to decrease.

Additionally, it is noted that much of the impermeable surface (concrete foundation slabs and pavement) has recently been removed from the SRA as part of planned redevelopment. However, as the groundwater extraction system continues to operate, should there be an increase in infiltration, the extraction system will capture any additional contaminant mass released.

Therefore, OU-3 is currently protective in the short term. However to be protective in the long term, EPA needs to develop a ROD for OU-3.

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The 2007 review identified four issues associated with OU-2. One of these issues, vapor intrusion, has been addressed and work is underway to address the other three. Therefore for this review, those issues are carried forward.

The long-term protectiveness for OU-3 was identified as a potential issue. It is recommended that EPA develop a ROD for OU-3 to address this potential issue. No other new issues were identified during this five-year review. It is recommended that the ongoing optimization study continue but that does not impact the protectiveness of the remedy.

With the transfer of the 272-280 Main Avenue property and the new owners' intention to redevelop the property, EPA will work with City and State officials and the new owners to help transition the property back into reuse while assuring that the remedy remains protective.

Issue	**Recommendations/ Follow-up Actions**	**Party Responsible**	**Oversight Agency**	**Milestone Date**	**Affects Protectiveness? (Y/N)**	
					Current	**Future**
Large contaminant remains in Source Area	Complete optimization study to maximize contaminant mass removal	PRPs	EPA	06/30/2013	N	Y
Pumping rates are declining	Complete rehabilitation of extraction wells	PRPs	EPA	06/30/2013	N	Y
Elevated concentrations in OU-3	Complete assessment of alternative pumping schemes	PRPs	EPA	06/30/2013	N	Y
No ROD of OU-3	Develop a ROD for OU-3	EPA	EPA/ CTDEEP	12/31/2015	N	Y

10.0 PROTECTIVENESS STATEMENTS

OU-1: The remedial action for OU-1 has been completed and is protective of human health and the environment. Exposure pathways that could result in unacceptable risk are being controlled through use of an air stripper. Long-term monitoring of the influent from the individual production wells and effluent from the air stripper will ensure that the OU-1 remedy remains protective.

OU-2: The remedy for OU-2 is protective of human health and the environment. Exposure pathways that could result in unacceptable risk are being controlled with a State institutional control that prohibits groundwater use. The groundwater extraction and treatment system prevents further migration of the contaminant plume. Long-term operation and maintenance of the system and long-term groundwater monitoring will continue to ensure that the treatment system successfully captures the contaminant plume. In the event that the Source Area property is redeveloped, State regulations will need to be met and these will prevent exposure to a potential vapor intrusion pathway.

OU-3: No remedy has been selected for OU-3. A Connecticut statute prohibits use of groundwater in the area of the Site. A study of the vapor intrusion pathway did not find unacceptable risks. Contaminant concentrations in groundwater in OU-3 continue to decrease. Therefore, OU-3 is currently is protective in the short term. However to be protective in the long term EPA needs to develop a ROD for OU-3.

Because the remedial actions at OU-1 and OU-2 are protective, and the exposure pathways in OU-3 are either controlled or do not create unacceptable risk, the Site is protective of human health and the environment.

11.0 NEXT REVIEW

The sixth five-year review for the Kellogg-Deering Well Field Site will be conducted in 2017.

12.0 REFERENCES

EPA, 1986, Record of Decision. Kellogg-Deering Well Field Superfund Site, Operable Unit 1-Kellogg-Deering Well Field, September 25, 1986

EPA, 1989, Record of Decision Kellogg-Deering Well Field Superfund Site Operable Unit 2 - Source Control, September 29, 1989

EPA, 1997, Explanation of Significant Differences, Kellogg-Deering Well Field Superfund Site/Second Operable Unit, March 31, 1997.

EPA, 2001, Comprehensive Five-Year Review Guidance. EPA-540-R-01-007, OERR and Remedial Response (5204G), June 2001.

GZA GeoEnvironmental, Inc. 2008, Integrated Treatment System Monitoring Report No. 34 Kellogg-Deering NPL Site; June 2008

GZA GeoEnvironmental, Inc. 2009, Integrated Treatment System Monitoring Report No. 35 Kellogg-Deering NPL Site; March 2009

GZA GeoEnvironmental, Inc. 2009, Integrated Treatment System Monitoring Report No. 36 Kellogg-Deering NPL Site; December 2009

GZA GeoEnvironmental, Inc. 2010, Integrated Treatment System Monitoring Report No. 37 Kellogg-Deering NPL Site; October 2010

GZA GeoEnvironmental, Inc. 2011, Integrated Treatment System Monitoring Report No. 38 Kellogg-Deering NPL Site; June 2011

GZA GeoEnvironmental, Inc. 2011, Integrated Treatment System Monitoring Report No. 39 Kellogg-Deering NPL Site; August 2011

GZA GeoEnvironmental, Inc. 2011, Integrated Treatment System Monitoring Report No. 40 Kellogg-Deering NPL Site; November 2011

GZA GeoEnvironmental, Inc. 2012, Integrated Treatment System Optimization Workplan Kellogg-Deering NPL Site; February 2012

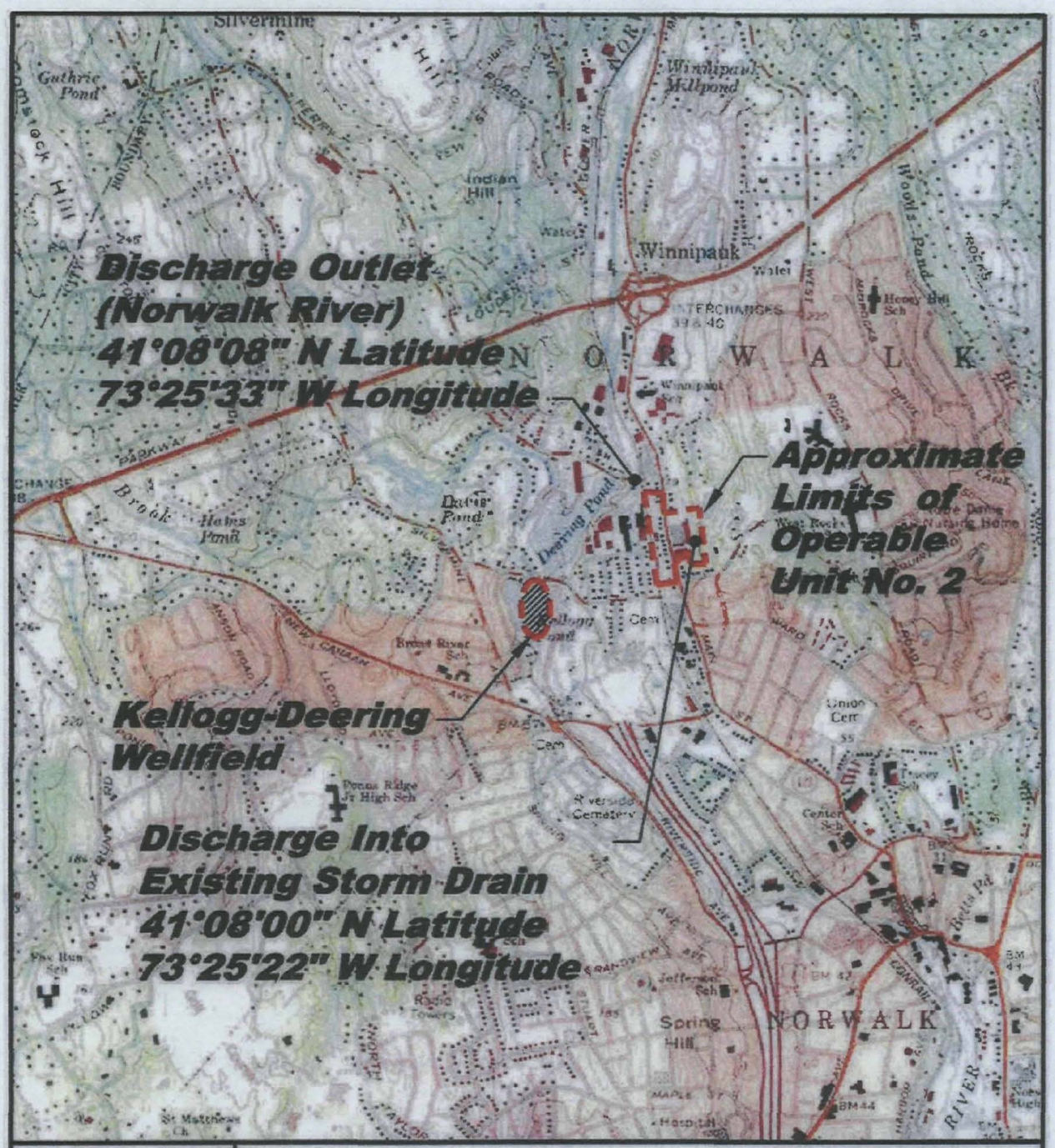
GZA GeoEnvironmental, Inc. 2012, Memorandum, Operable Unit No. 2, Kellogg-Deering NPL Site, August 2012

US Army Corps of Engineers, 2010, Suggestions for Optimizing Groundwater Remediation Pumping and Monitoring at the Kellogg-Deering Well Field Superfund Site, Norwalk, Connecticut; April 2010

2012 FIVE-YEAR REVIEW

KELLOGG-DEERING WELL FIELD SUPERFUND SITE
NORWALK, CONNECTICUT

FIGURES



1"=2000'

0 1000' 2000' 4000'

SOURCE: U.S.G.S. NORWALK N. & S. QUADRANGLE MAP (1992)

NORTH

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KELLOGG-DEERING NPL SITE
OPERABLE UNIT NO. 2

NORWALK, CONNECTICUT

LOCUS PLAN

Project No. 43117

11/14/05

Figure No. 1

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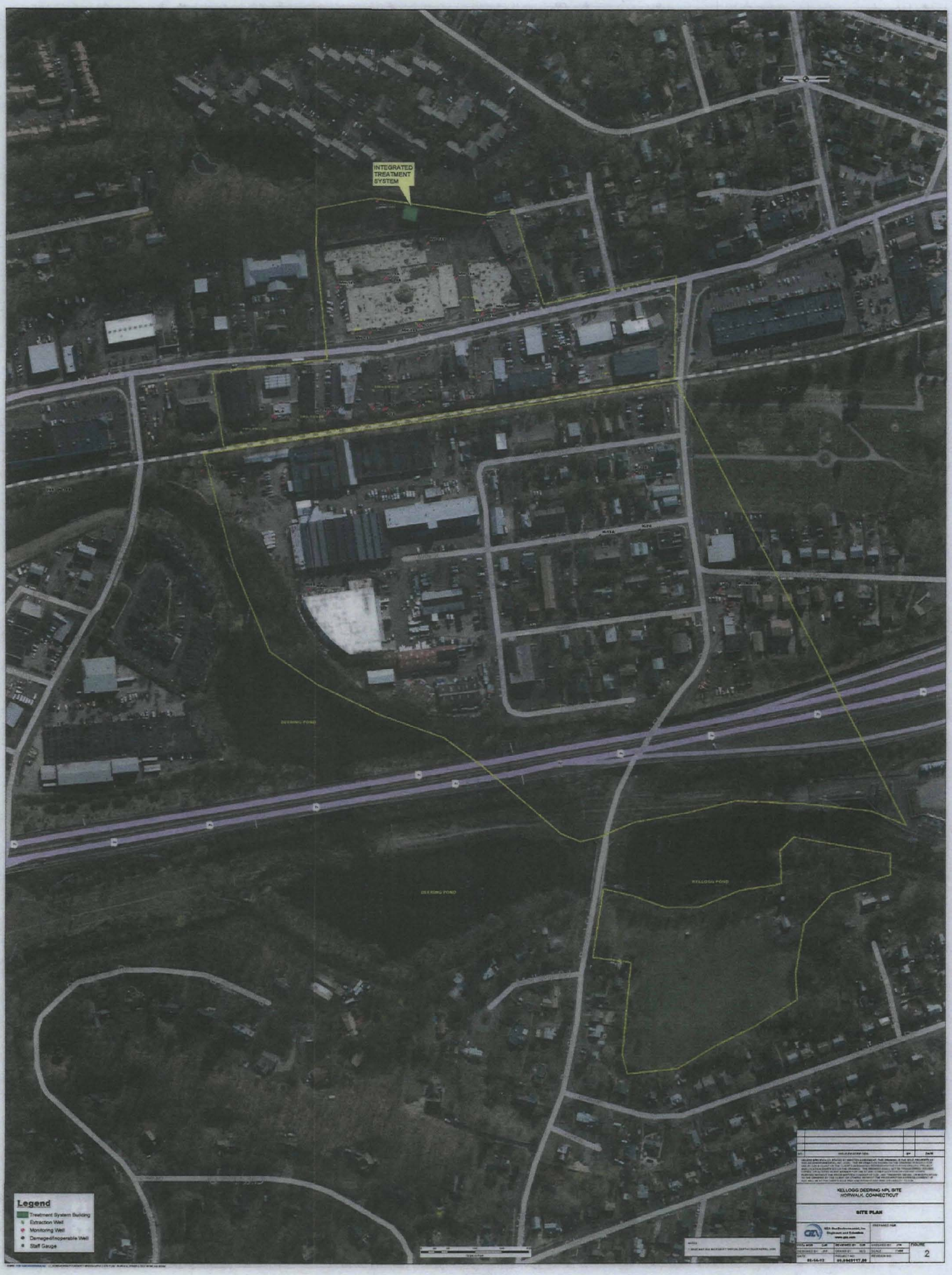
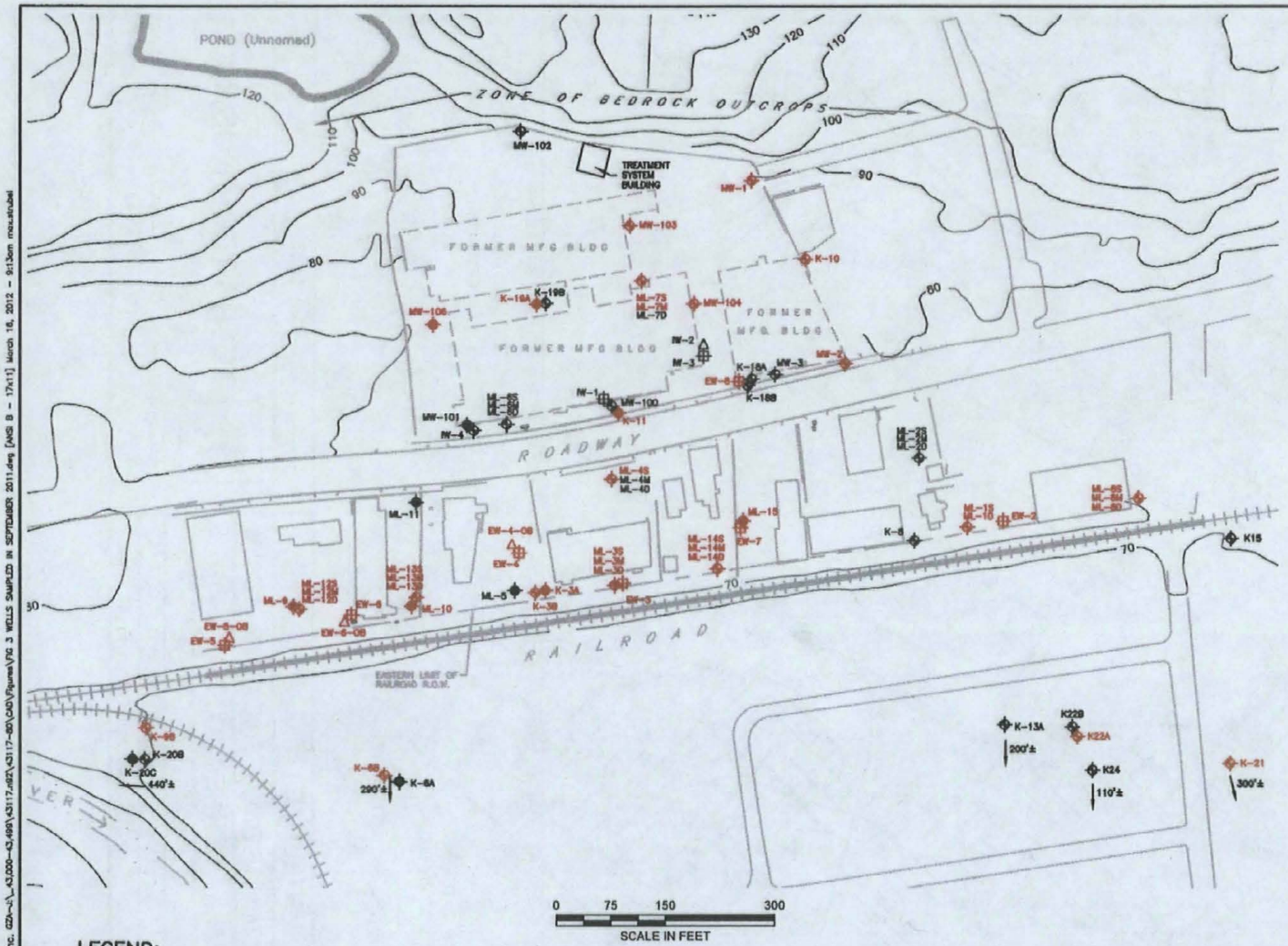

INTEGRATED TREATMENT SYSTEM
DEERING POND
DEERING POND
KELLOGG POND
Legend
Treatment System Building
Extraction Well
Monitoring Well
Damaged/Inoperable Well
Staff Gauge
KELLOGG DEERING NPL SITE
NORWALK, CONNECTICUT
SITE PLAN
FIGURE
2



LEGEND:

- BEDROCK EXTRACTION WELL
- OVERBURDEN EXTRACTION WELL
- BEDROCK MONITORING WELL
- OVERBURDEN MONITORING WELL
- GROUND SURFACE ELEVATION CONTOUR

NOTES:

1. BASE MAP DEVELOPED FROM PLAN PREPARED BY PARSONS, BROMFIELD, REDNISS & MEAD ENTITLED "TOPOGRAPHIC SURVEY, KELLOGG DEERING SUPERFUND SITE", DATED 6/16/94.
2. MONITORING AND EXTRACTION WELLS WERE LOCATED (HORIZONTALLY AND VERTICALLY) BY PARSONS, BROMFIELD, REDNISS & MEAD IN JUNE 1994, WITH THE EXCEPTION OF EXTRACTION WELLS EW-6, EW-7 AND EW-8, WHICH WERE LOCATED BY TAPE MEASUREMENTS FROM EXISTING SITE FEATURES BY GZA AND SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
3. WELL NUMBERS AND SYMBOLS IN BROWN REPRESENT THOSE SAMPLED DURING THE PRESENT SAMPLING ROUND. WELL NUMBERS AND SYMBOLS SHOWN IN BLACK WERE NOT SAMPLED DURING THE PRESENT SAMPLING ROUND.
4. REFER TO TABLE 4 FOR WELL DEPTHS AND SCREEN INTERVALS.

NO.	ISSUE/DESCRIPTION	BY	DATE

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KELLOGG-DEERING NPL SITE
BI-ANNUAL ITS MONITORING REPORT NO. 41
NORWALK, CONNECTICUT

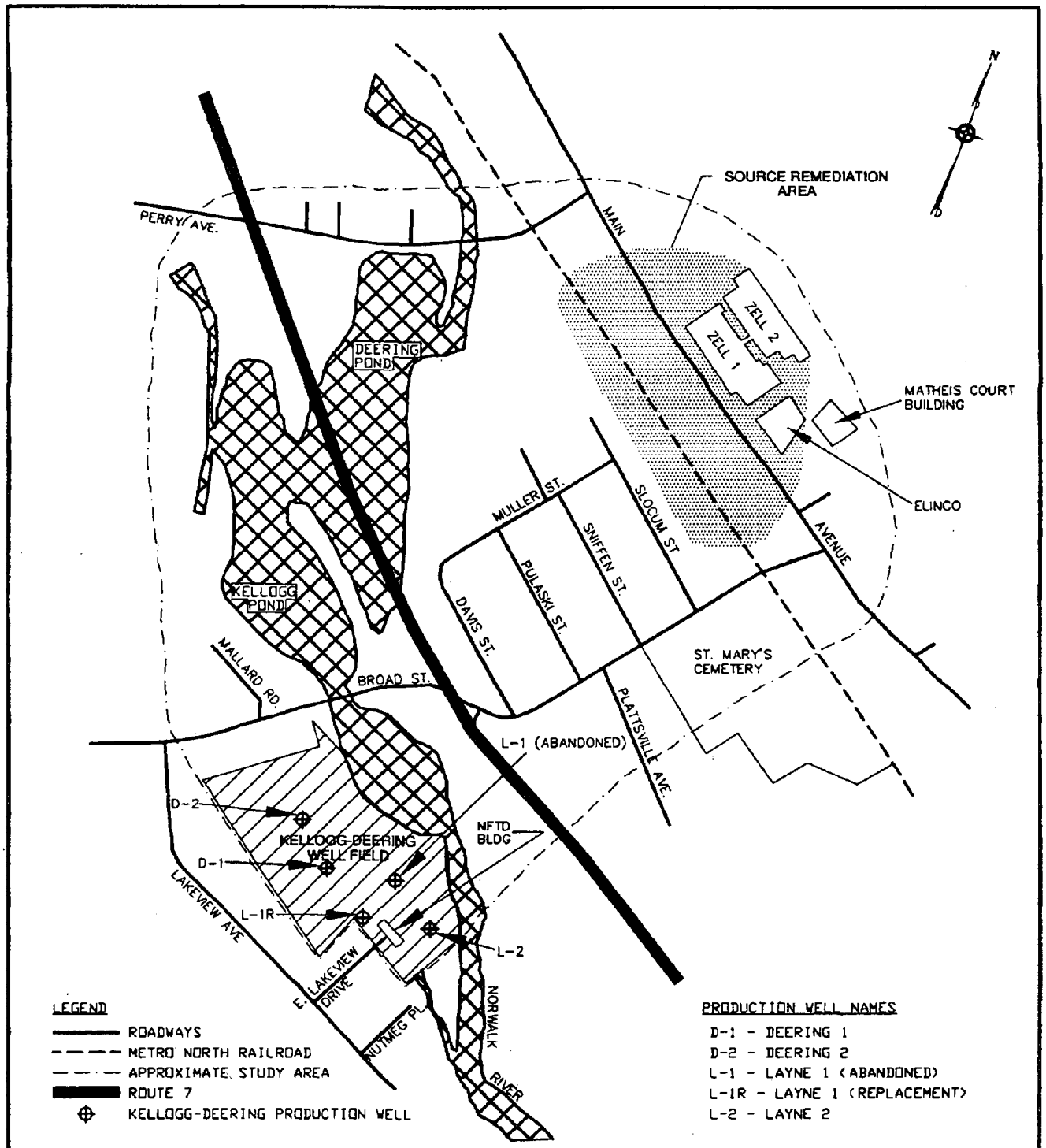
WELLS SAMPLED IN SEPTEMBER 2011

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com

PREPARED FOR:

PROJ MGR: DJR	REVIEWED BY: DJR	CHECKED BY:	FIGURE 3
DESIGNED BY: JPP	DRAWN BY: MJS	SCALE: 1"=150'	
DATE: 03-02-12	PROJECT NO. 05.0043117.80	REVISION NO.	SHEET NO

©2011 - GZA GeoEnvironmental, Inc. GZA-c:_43,000-43,499\43117.80\43117-80\CADD\Figures\Fig 3 WELLS SAMPLED IN SEPTEMBER 2011.dwg [ANSI B - 17x11] March 16, 2012 - 9:13am mcauchdel



SITE MAP			FIGURE 3-3
KELLOGG-DEERING WELL FIELD - FIVE YEAR REVIEW			TETRA TECH NUS, INC.
NORWALK, CONNECTICUT			
DRAWN BY:	D.W. MACDOUGALL	REV.: 0	55 Jonspin Road Wilmington, MA 01887 (508)658-7899
CHECKED BY:	P. CALL	DATE: SEPTEMBER 11, 2002	
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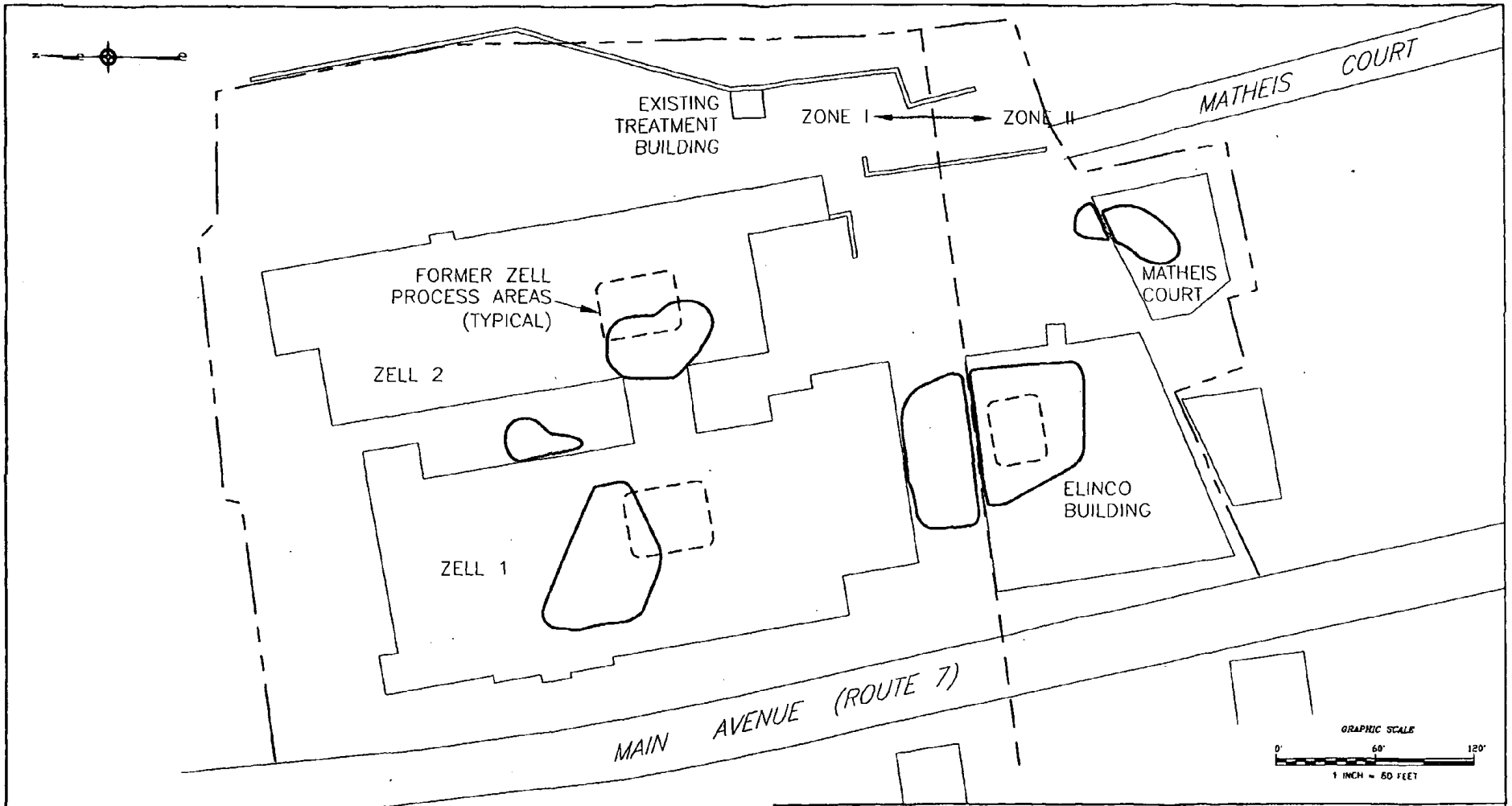


NOTES:

1. REMEDIATION AREAS ARE BASED ON RESULTS FROM SOIL GAS SURVEYS AND SOIL SAMPLE ANALYSIS DESCRIBED IN THE PREDESIGN REPORT FOR SOIL.

2. GROUNDWATER FLOW ZONES ARE BASED ON DATA DESCRIBED IN THE PREDESIGN REPORT FOR GROUNDWATER.

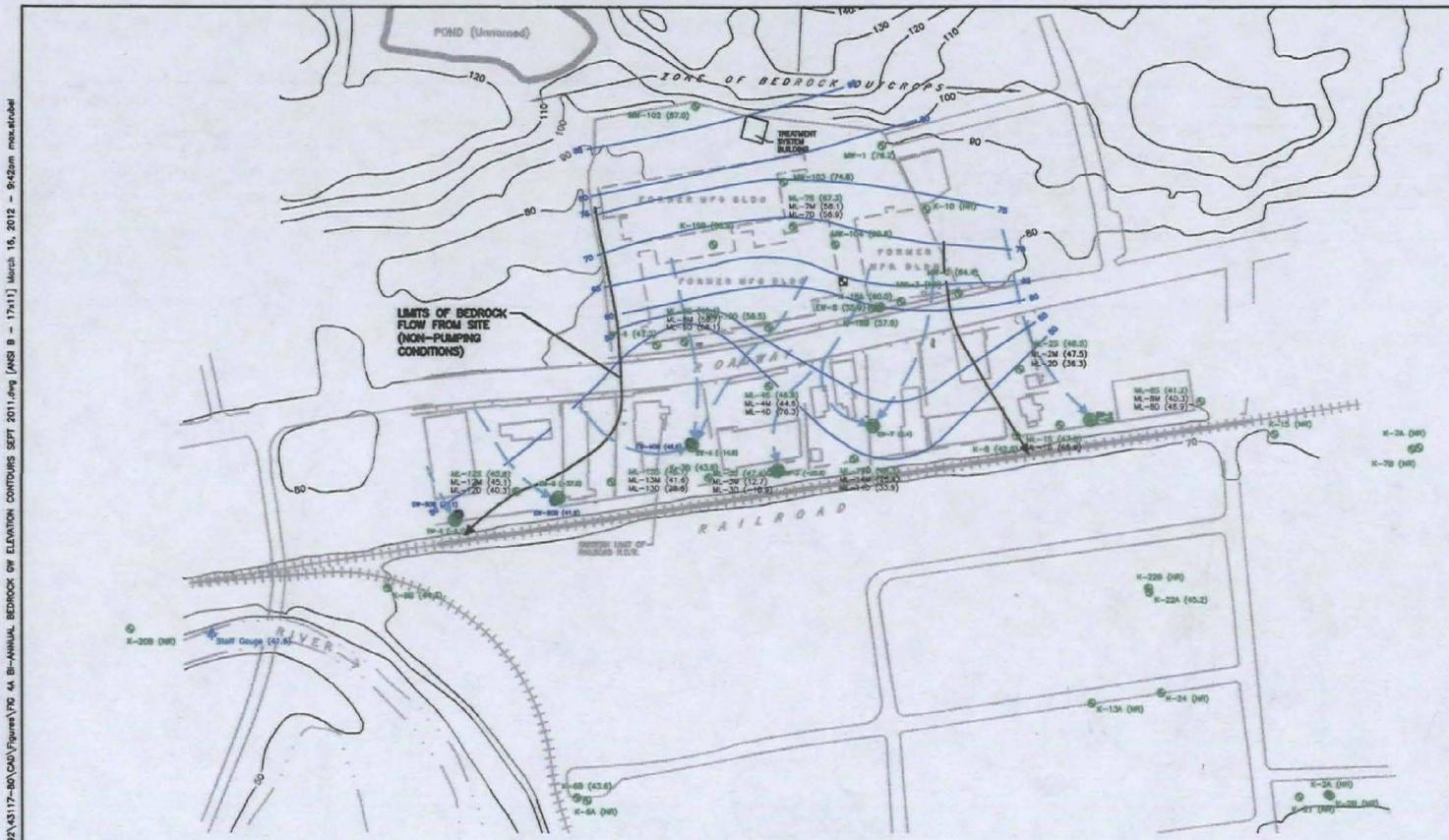
SOURCE: GZA, 1995C.

LEGEND

SOIL REMEDIATION AREA

EXISTING PROPERTY LINE

SOIL REMEDATION AREAS – OU2		FIGURE 4–2
KELLOGG–DEERING WELL FIELD SITE – FIVE YEAR REVIEW		TETRA TECH NUS, INC.
NORWALK, CONNECTICUT		55 Jonspin Road Wilmington, MA 01887 (978)658–7899
DRAWN BY: D.W. MACDOUGALL	REV.: 0	
CHECKED BY: P. CALL	DATE: SEPTEMBER 12, 2002	
SCALE: 1" = 60'	FILE NO: DWG\4256\0600\FIG_4-2.DWG	



0 100 200 400

SCALE IN FEET

LEGEND:

- ML-12S (45.0) / ML-12M / ML-12D — GROUNDWATER ELEVATION AT WELL USED TO DEVELOP CONTOURS; SHALLOW; MIDDLE; DEEP
- EW-5 (-9.1) — BEDROCK EXTRACTION WELL MID-POINT ELEVATION BETWEEN HIGH AND LOW LEVEL SWITCHES
- EW-5OB — OVERBURDEN EXTRACTION WELL
- 60 — GROUNDWATER ELEVATION CONTOUR (DASHED PORTION IS INFERRED)
- GROUNDWATER FLOW DIRECTION

BEDROCK EXTRACTION WELL PUMP RATES:

WELL	AVERAGE SIX-MONTH PUMP RATE (GPM)
EW-2	1.6
EW-3	2.0
EW-4	4.5
EW-5	0.0
EW-6	0.8
EW-7	13.9
TOTAL BEDROCK PUMP RATE	22.8

NOTES:

1. WATER LEVEL READINGS HAVE BEEN TAKEN IN THE WELLS AT THE TIMES AND UNDER THE CONDITIONS STATED IN THE TEXT OF THIS REPORT. HOWEVER, IT MUST BE STATED THAT FLUCTUATIONS IN THE LEVEL OF THE GROUNDWATER MAY HAVE OCCURRED DUE TO VARIATIONS IN TIDES, TEMPERATURE AND RAINFALL SINCE THE TIME MEASUREMENTS WERE TAKEN.
2. GROUNDWATER CONTOURS ARE BASED ON DATA FROM WIDELY SPACED EXPLORATIONS AND MAY NOT REFLECT ACTUAL WATER SURFACE CONDITIONS.
3. PIEZOMETRIC HEADS MEASURED ON SEPTEMBER 6, 2011.
4. PIEZOMETRIC HEADS AT MULTI-LEVEL BEDROCK WELL CLUSTERS USED TO CONSTRUCT THIS PLAN INCLUDE ONLY THE SHALLOW WELL SCREEN. THEREFORE, THIS CONTOUR PLAN REPRESENTS APPROXIMATELY THE UPPER 30 TO 50 FEET OF BEDROCK; THE ZONE BELIEVED TO REPRESENT THE DOMINANT PORTION OF BEDROCK GROUNDWATER FLOW.
5. GROUNDWATER ELEVATION CONTOURS DRAWN FOR THIS PLAN BASED ON GROUNDWATER ELEVATIONS FOR BEDROCK WELLS (SHOWN IN GREEN) ONLY.
6. GROUNDWATER ELEVATIONS IN OVERBURDEN AND BEDROCK EXTRACTION WELLS REPRESENT THE MIDPOINT ELEVATION OF THE PUMP CYCLE, EXCEPT FOR LEVELS AT OVERBURDEN WELL EW-4OB AND IW-2 AND BEDROCK WELLS IW-1, IW-3, IW-4 AND EW-8 WHICH DID NOT OPERATE THIS SIX-MONTH PERIOD.

NO.	ISSUE/DESCRIPTION	BY	DATE

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KELLOGG-DEERING NPL SITE
BI-ANNUAL ITS MONITORING REPORT NO. 41
NORWALK, CONNECTICUT

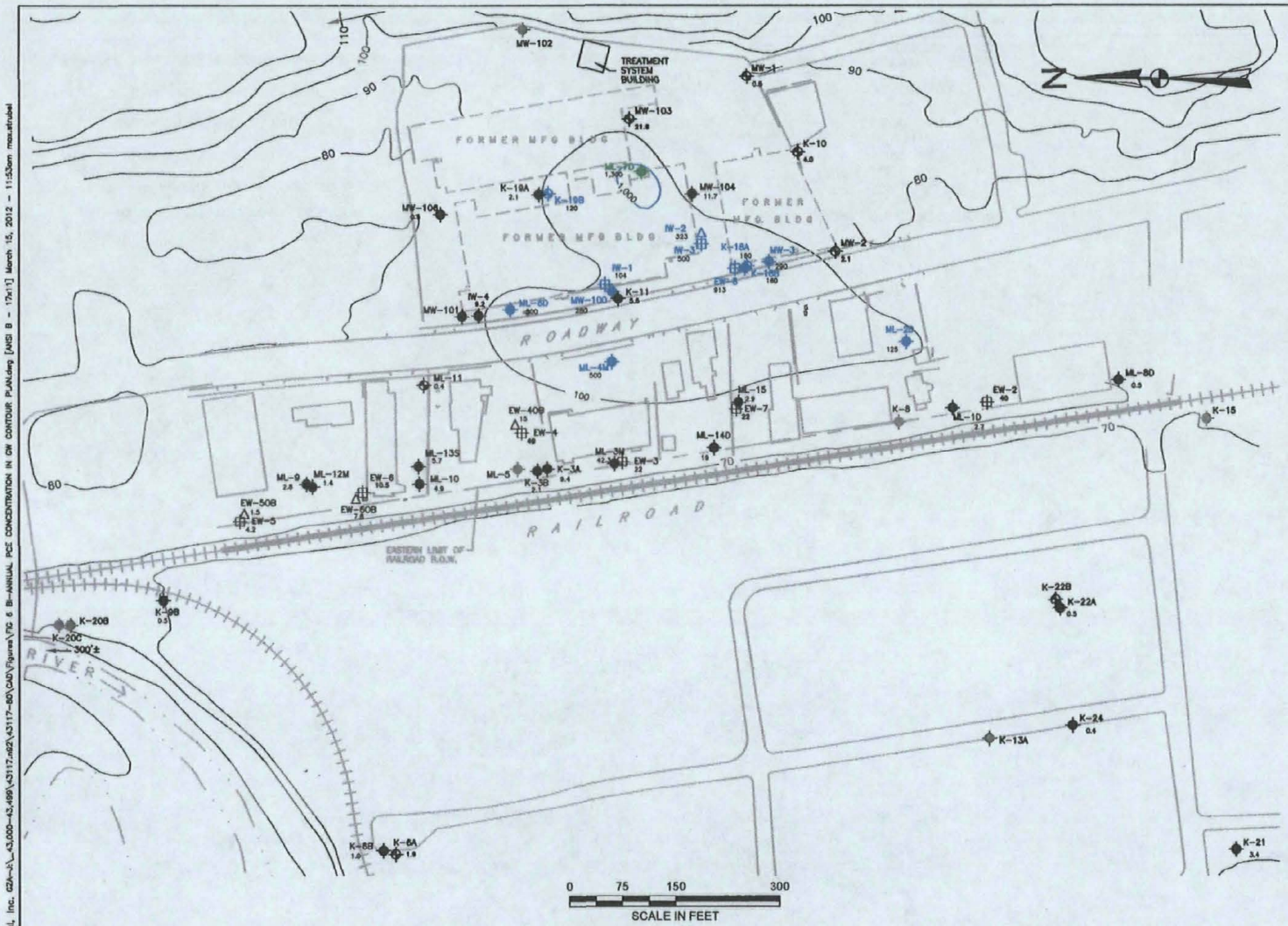
BEDROCK GROUNDWATER ELEVATION CONTOURS DURING COMBINED PUMPING - SEPTEMBER 2011

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com

PREPARED FOR:

PROJ MGR: DJR	REVIEWED BY: DJR	CHECKED BY:	FIGURE 4A
DESIGNED BY: JPP	DRAWN BY: MJS	SCALE: 1"=200'	
DATE: 03-02-12	PROJECT NO. 05.0043117.80	REVISION NO.	SHEET NO.

©2011 - GZA GeoEnvironmental, Inc. G:\Z_43,000-43,499\43117.n92\43117-80\CAD\Figures\FIG 4A BI-ANNUAL BEDROCK GW ELEVATION CONTOURS SEPT 2011.dwg [ANSI B - 17x11] March 16, 2012 - 9:42am mck.strobel



NOTES:

1. REPORTED CONCENTRATIONS FROM THE LATEST THREE SAMPLING ROUNDS WERE AVERAGED TO GENERATE CONTOURS. IF SAMPLES WERE NOT COLLECTED FROM MONITORING WELL ON A SEMI-ANNUAL OR ANNUAL BASIS, THE RESULT FOR THE MOST RECENT ANNUAL MONITORING ROUND IS SHOWN. REFER TO TABLE 8B FOR REPORTED PCE CONCENTRATIONS.
2. GROUNDWATER SAMPLES COLLECTED IN APRIL 2003, JUNE 2002, MARCH 2004, MARCH 2005 AND MARCH 2006 WERE ANALYZED BY EPA METHOD 8021. GROUNDWATER SAMPLES COLLECTED IN DECEMBER 2001 AND SEPTEMBER 2002 THROUGH SEPTEMBER 2011 WERE ANALYZED BY EPA METHOD 8260.
3. AT ML WELLS WHERE SAMPLES WERE COLLECTED FROM SEVERAL DEPTHS, AND AT WELLS THAT ARE LESS THAN APPROXIMATELY 10 FEET APART, THE REPORTED CONCENTRATION IS FOR THE SAMPLE DEPTH OR WELL WITH THE HIGHEST AVERAGE CONCENTRATION FROM THE THREE MOST RECENT SAMPLING ROUNDS. IN GENERAL, HIGHEST CONCENTRATIONS ARE LOCATED IN DEEP BEDROCK WELLS WHERE BEDROCK PERMEABILITY IS VERY LOW AND ACTUAL GROUNDWATER FLOW IS EXTREMELY LOW. THEREFORE RESULTS INDICATE WORST CASE ILLUSTRATION OF TCE CONCENTRATIONS IN GROUNDWATER.
4. CONTOURS OF EQUAL CONCENTRATION ARE IDEALIZED INTERPRETATIONS OF DATA FROM WIDELY SPACED SAMPLING LOCATIONS BOTH SPATIALLY AND WITH DEPTH, AND ARE SUBJECT TO CHANGE WITH TIME.
5. THE INTEGRATED TREATMENT SYSTEM (ITS) WAS OPERATING DURING THIS SAMPLING ROUND. THIS IS THE FORTY-FIRST MONITORING ROUND CONDUCTED DURING ITS OPERATION.
6. DASHED CONTOURS INDICATE AN INFERRED CONCENTRATION CONTOUR. THESE CONTOURS ARE BASED ON WIDELY SPACED DATA POINTS.
7. DATA SHOWN FOR WELLS ML-2D, ML-6D, ML-7D, AND ML-4M ARE FROM THE DECEMBER 2001 SAMPLING ROUND.
8. CONCENTRATION CONTOURS AT UPGRADIENT PORTIONS OF THE SITE ARE CLOSED DUE TO PREVIOUS AND/OR CURRENT SAMPLING AT MW-1, MW-102 AND MW-103 INDICATING CONCENTRATIONS LESS THAN 100 µg/L. TCE CONCENTRATION AT WELL K-11 WAS NOT USED TO GENERATE CONTOURS.
9. REFER TO FIGURES 4A AND 4B FOR GROUNDWATER CONTOURS AND ADDITIONAL NOTES.

LEGEND:

MW-3 — SAMPLE LOCATION DESIGNATION

290 — AVERAGE PCE CONCENTRATION (µg/L)

PCE DATA FROM PREVIOUS SAMPLING ROUND

PCE ANALYSIS NOT CONDUCTED SINCE DECEMBER 1997.

PCE CONCENTRATION

LESS THAN 100 µg/L

100 TO 1,000 µg/L

1,000 TO 10,000µ g/L

10,000 TO 100,000 µg/L

ISO CONCENTRATION CONTOURS

100 µg/L

1,000 µg/L

NO.	ISSUE/DESCRIPTION	BY	DATE

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KELLOGG-DEERING NPL SITE
BI-ANNUAL MONITORING REPORT NO. 41
NORWALK, CONNECTICUT

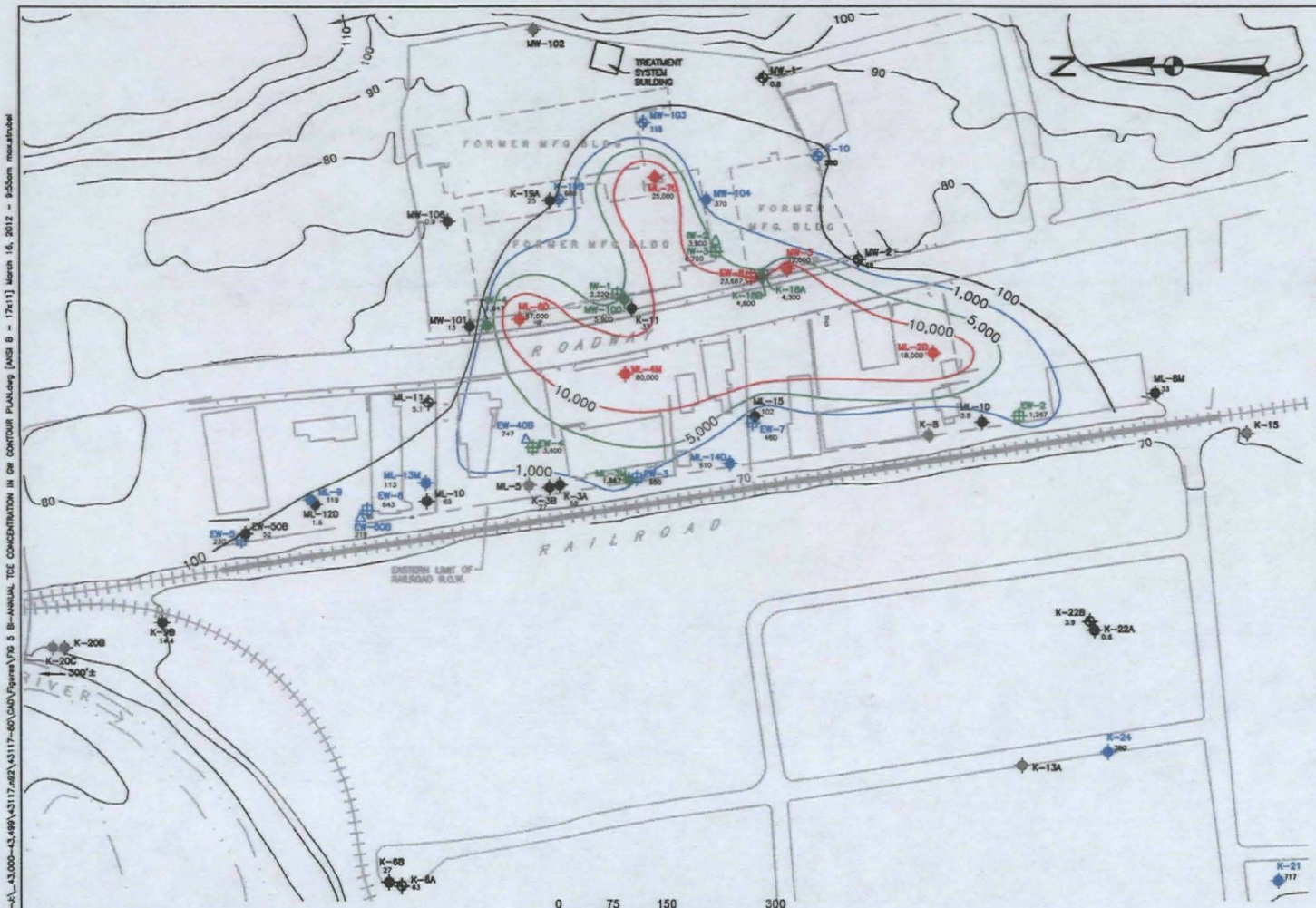
ESTIMATED PCE CONCENTRATION CONTOURS IN GROUNDWATER

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com

PREPARED FOR:

PROJ MGR: DJR	REVIEWED BY: DJR	CHECKED BY:	FIGURE 6
DESIGNED BY: JPP	DRAWN BY: MJS	SCALE: 1"=150'	
DATE: 03-15-12	PROJECT NO. 05.0043117.80	REVISION NO.	SHEET NO.

©2011 - GZA GeoEnvironmental, Inc. GZA-A:\...43,000-43,499\43117.m02\43117-80\CADD\Figures\FIG 6 BI-ANNUAL PCE CONCENTRATION IN GW CONTOUR PLAN.dwg [ANSI B - 17x11] March 15, 2012 - 11:53am mazafrubel



NOTES:

1. REPORTED CONCENTRATIONS FROM THE LATEST THREE SAMPLING ROUNDS WERE AVERAGED TO GENERATE CONTOURS. IF SAMPLES WERE NOT COLLECTED FROM MONITORING WELL ON A SEMI-ANNUAL OR ANNUAL BASIS, THE RESULT FOR THE MOST RECENT ANNUAL MONITORING ROUND IS SHOWN. REFER TO TABLE 8A FOR REPORTED TCE CONCENTRATIONS.
2. GROUNDWATER SAMPLES COLLECTED IN APRIL 2003, JUNE 2002, MARCH 2004, MARCH 2005 AND MARCH 2006 WERE ANALYZED BY EPA METHOD 8021. GROUNDWATER SAMPLES COLLECTED IN DECEMBER 2001 AND SEPTEMBER 2002 THROUGH SEPTEMBER 2011 WERE ANALYZED BY EPA METHOD 8260.
3. AT ML WELLS WHERE SAMPLES WERE COLLECTED FROM SEVERAL DEPTHS, AND AT WELLS THAT ARE LESS THAN APPROXIMATELY 10 FEET APART, THE REPORTED CONCENTRATION IS FOR THE SAMPLE DEPTH OR WELL WITH THE HIGHEST AVERAGE CONCENTRATION FROM THE THREE MOST RECENT SAMPLING ROUNDS. IN GENERAL, HIGHEST CONCENTRATIONS ARE LOCATED IN DEEP BEDROCK WELLS WHERE BEDROCK PERMEABILITY IS VERY LOW AND ACTUAL GROUNDWATER FLOW IS EXTREMELY LOW. THEREFORE RESULTS INDICATE WORST CASE ILLUSTRATION OF TCE CONCENTRATIONS IN GROUNDWATER.
4. CONTOURS OF EQUAL CONCENTRATION ARE IDEALIZED INTERPRETATIONS OF DATA FROM WIDELY SPACED SAMPLING LOCATIONS BOTH SPATIALLY AND WITH DEPTH, AND ARE SUBJECT TO CHANGE WITH TIME.
5. THE INTEGRATED TREATMENT SYSTEM (ITS) WAS OPERATING DURING THIS SAMPLING ROUND. THIS IS THE FORTY-FIRST MONITORING ROUND CONDUCTED DURING ITS OPERATION.
6. DASHED CONTOURS INDICATE AN INFERRED CONCENTRATION CONTOUR. THESE CONTOURS ARE BASED ON WIDELY SPACED DATA POINTS.
7. DATA SHOWN FOR WELLS ML-2D, ML-6D, ML-7D, AND ML-4M ARE FROM THE DECEMBER 2001 SAMPLING ROUND.
8. CONCENTRATION CONTOURS AT UPGRADIENT PORTIONS OF THE SITE ARE CLOSED DUE TO PREVIOUS AND/OR CURRENT SAMPLING AT MW-1, MW-102 AND MW-103 INDICATING CONCENTRATIONS LESS THAN 100 μg/L. TCE CONCENTRATION AT WELL K-11 WAS NOT USED TO GENERATE CONTOURS.
9. REFER TO FIGURES 4A AND 4B FOR GROUNDWATER CONTOURS AND ADDITIONAL NOTES.

LEGEND:

- ML-1D — SAMPLE LOCATION DESIGNATION
- 122.7 — AVERAGE TCE CONCENTRATION (μg/L)
- BEDROCK EXTRACTION WELL
- OVERBURDEN EXTRACTION WELL
- TCE DATA FROM A PREVIOUS SAMPLING ROUND
- TCE ANALYSIS NOT CONDUCTED SINCE DECEMBER 1997.

0 75 150 300
SCALE IN FEET

TCE CONCENTRATION

- LESS THAN 100 μg/L
- 100 TO 1,000 μg/L
- 1,000 TO 10,000 μg/L
- 10,000 TO 100,000 μg/L

ISO CONCENTRATION CONTOURS

- 100 μg/L
- 1,000 μg/L
- 5,000 μg/L
- 10,000 μg/L
- INDICATES INFERRED TCE CONCENTRATION CONTOUR

NO.	ISSUE/DESCRIPTION	BY	DATE

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KELLOGG-DEERING NPL SITE
BI-ANNUAL ITS MONITORING REPORT NO. 41
NORWALK, CONNECTICUT

ESTIMATED TCE CONCENTRATION CONTOURS IN GROUNDWATER

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com

PREPARED FOR:

PROJ MGR: DJR	REVIEWED BY: DJR	CHECKED BY:	FIGURE
DESIGNED BY: JPP	DRAWN BY: MJS	SCALE: 1"=150'	5
DATE: 03-15-12	PROJECT NO. 05.0043117.80	REVISION NO.	SHEET NO.

©2011 - GZA GeoEnvironmental, Inc. GZA-J:_43,000-43,499\43117.82\43117-80\DAD\Figures\FIG 5 BI-ANNUAL TCE CONCENTRATION IN GW CONTOUR PLAN.dwg [ANSI B - 17x11] March 16, 2012 - 9:55am mcustrubel

2012 FIVE-YEAR REVIEW

KELLOGG-DEERING WELL FIELD SUPERFUND SITE
NORWALK, CONNECTICUT

APPENDIX A

Five-Year Review Site Inspection Checklist and Site Photographs

I. SITE INFORMATION	
Site name: Kellogg-Deering Well Field SF Site	**Date of inspection: Aug 9 and 29, 2012**
Location and Region: Norwalk CT/Region 1	**EPA ID:** CTD980670814
Agency, office, or company leading the five-year review: US EPA Region 1	**Weather/temperature: Aug 9 sunny and warm; Aug 29 sunny and warm**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- **X** Institutional controls
- **X** Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other _____
- ☐ 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** David Rusczyk _____ Aug 9, 2012
   Name Title Date
   Interviewed **X** at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

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

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

Agency CTDEEP
Contact Pete Hill, Supervising Environmental Analyst Aug 9 860-424-3912
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency City of Norwalk, Planning and Zoning Dept
Contact Mike Greene, Director Aug 29 203 854-7780
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency City of Norwalk, Redevelopment Agency
Contact Timothy Sheehan, Director Aug 9 203 854-7810
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency Norwalk First Taxing District Water Dept
Contact Mike Elliott, Senior Facility Engineer Aug 29 203 847-7387
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

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

Agency CT Dept Public Health
Contact Eric McPhee, Supervisor, Source Water Protection Unit Aug 8 860 509-7333
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

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

1. **O&M Documents**
   - X O&M manual — X Readily available — X Up to date — ☐ N/A
   - X As-built drawings — X Readily available — X Up to date — ☐ N/A
   - X Maintenance logs — X Readily available — X Up to date — ☐ N/A

   Remarks

2. **Site-Specific Health and Safety Plan** — X Readily available — X Up to date — ☐ N/A
   - X Contingency plan/emergency response plan — X Readily available — X 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 — X N/A
   - X Effluent discharge — X Readily available — X Up to date — ☐ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — X N/A
   - ☐ Other permits_____ — ☐ Readily available — ☐ Up to date — X N/A

   Remarks

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

   Remarks

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

   Remarks

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

   Remarks

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — X N/A

   Remarks

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available — ☐ Up to date — X N/A
   - X Water (effluent) — X Readily available — X Up to date — ☐ N/A

   Remarks Provided quarterly to CTDEEP and with semi-annual monitoring reports

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

    Remarks

IV. O&M COSTS

1. **O&M Organization**

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

2. **O&M Cost Records**

☐ Readily available ☐ Up to date **X Not Available**
☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

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

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

Describe costs and reasons: _____

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

A. Fencing

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

Remarks No damage to fences. Fencing secured at OU-1 by NFTD. Fencing secured at OU-2 by new property owner

B. Other Access Restrictions

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

Remarks_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

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

Type of monitoring (*e.g.*, self-reporting, drive by) Institutional control is a CT Statute prohibiting use of groundwater. There is no monitoring of this control
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** **X** ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks CT Statute prohibits use of groundwater within areas where public water supply is available. There are no site-specific ICs for any of the operable units

D. General

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

2. **Land use changes on site** ☐ N/A
Remarks The 272-280 Main Avenue property, which was identified as the OU-2 Source Area in the ROD has been sold and the new owner plans to redevelop the property. No other changes within the operable units.

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

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable **X** N/A

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

B. Other Site Conditions

Remarks _____

VII. LANDFILL COVERS ☐ Applicable **X** N/A

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

IX. GROUNDWATER/SURFACE WATER REMEDIES **X** Applicable ☐ N/A

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

1. **Pumps, Wellhead Plumbing, and Electrical**
   X Good condition **X** All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks Several extraction wells have been offline for a few years with EPA approval. Upon the conclusion of the optimization study, some of these wells may be reactivated (and others deactivated)

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   X Good condition **X** Needs Maintenance
   Remarks Again, piping for some wells may need to be repaired

3. **Spare Parts and Equipment**
   X Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks Settling Parties' Contractor maintains a network of suppliers such that equipment is replaced within a week.

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

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

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

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

C. Treatment System X Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   X Air stripping X Carbon adsorbers
   X Filters_____
   ☐ Additive (*e.g.*, chelation agent, flocculent)_____
   ☐ Others_____
   X Good condition ☐ Needs Maintenance
   X Sampling ports properly marked and functional
   X Sampling/maintenance log displayed and up to date
   X Equipment properly identified
   ☐ Quantity of groundwater treated annually In semi-annual monitoring reports
   ☐ Quantity of surface water treated annually N/A
   Remarks_____

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

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

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

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

6. **Monitoring Wells** (pump and treatment remedy)
   X Properly secured/locked X Functioning X Routinely sampled X Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks Some of the wells located in OU-3 could not be found and will be replaced. Frequency of sampling varies from semi-annual to every five years.

D. Monitoring Data

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

2. Monitoring data suggests:
   X Groundwater plume is effectively contained X Contaminant concentrations are declining – downgradient of extraction system. Concentrations in Source Area still elevated

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.).
See Sections 6, 7, and 8 in 2012 FYR

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 Sections 6, 7, and 8 in 2012 FYR

C. Early Indicators of Potential Remedy Problems

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

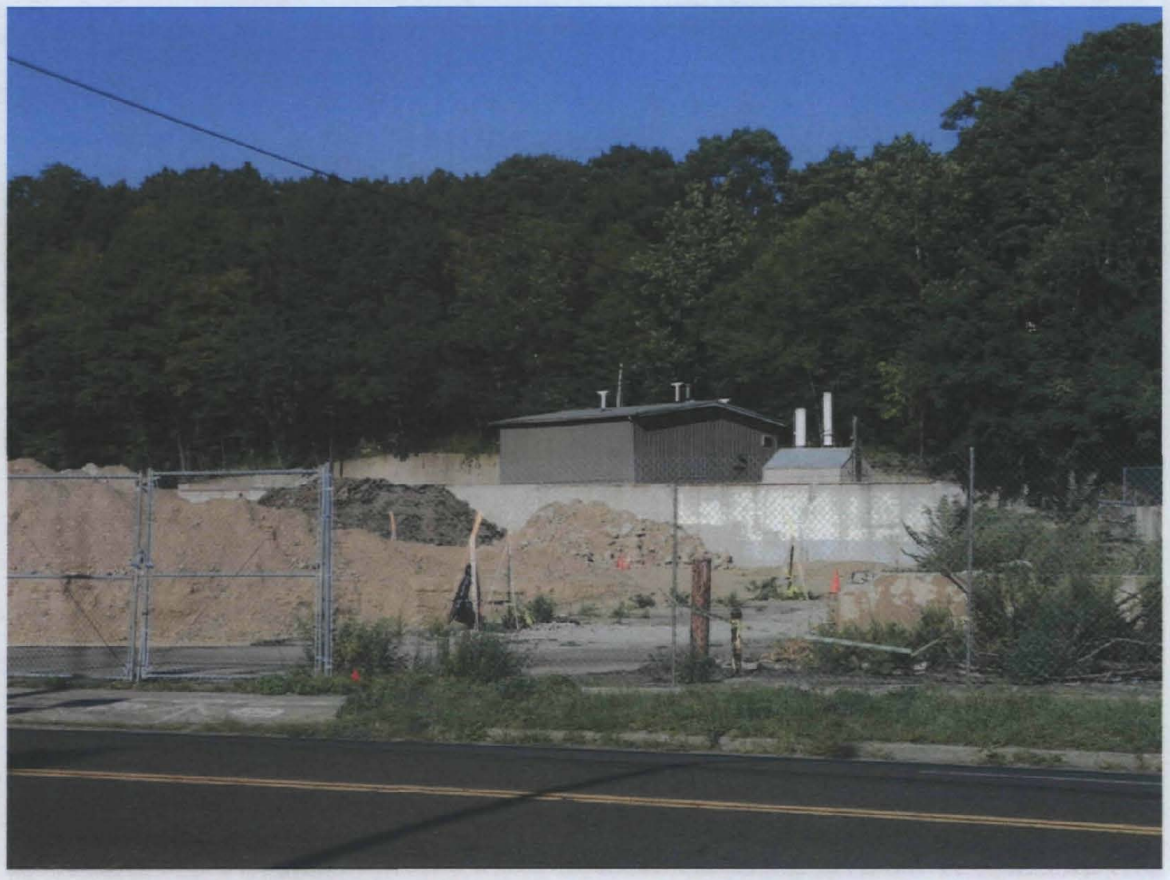
No indications of remedy problems

D. Opportunities for Optimization

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

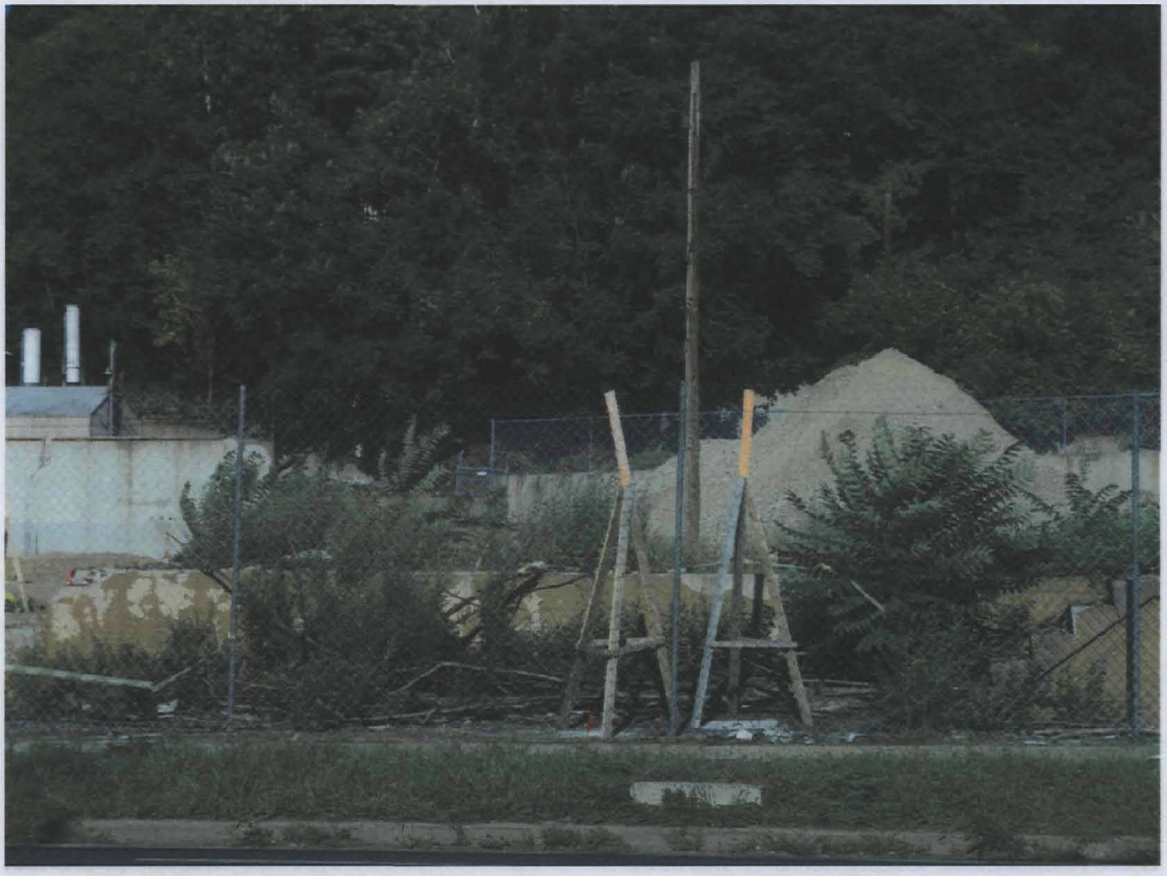
See Section 7 of 2012 FYR. An optimization study is underway and is expected to be completed in Summer 2013. EPA will discuss recommendations with Settling Parties and CTDEEP.

Air Stripper at OU-1 with Layne 1R production well in foreground



ITS treatment building (smaller building to right is the old treatment building for the groundwater extraction system constructed under CTDEP order in 1987 – wells were incorporated into the current system). Soil piles created by new owner while removing building foundation slabs.

Northern end of 272-280 Main Avenue property. The scale of the soil piles can be put in context with the front-end loaders in the foreground.



Tripods placed over monitoring well to protect them during owner's demolition of building foundations. Monitoring wells are finished flush with ground surface. Fence constructed by new owner to secure property.

2012 FIVE-YEAR REVIEW

KELLOGG-DEERING WELL FIELD SUPERFUND SITE
NORWALK, CONNECTICUT

APPENDIX B

Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

79 Elm Street • Hartford, CT 06106-5127 www.ct.gov/deep Affirmative Action/Equal Opportunity Employer

September 26, 2012

James T. Owens
US Environmental Protection Agency
5 Post Office Square – Suite 100
Boston, Massachusetts 02109-3912

Re: Draft Five-Year Review Report
Kellogg-Deering Well Field Site
Norwalk, Connecticut

Dear Mr. Owens:

The Remediation Division of the Connecticut Department of Energy and Environmental Protection ("CT DEEP") has reviewed the draft report titled "Five-Year Review Report For Kellogg-Deering Well Field Superfund Site, Fairfield County, Connecticut" ("Report") received via electronic mail September 18, 2012. The Report was prepared by the United States Environmental Protection Agency ("EPA"). Provided below are CT DEEP's comments on the Report:

Operable Unit 1 – Kellogg Deering Well Field

CT DEEP concurs that the remedy for Operable Unit 1 ("OU1") – air stripping of volatile organic compounds in the Well Field - is protective of human health and the environment.

Operable Unit 2 – Source Area 272-280 Main Avenue, Norwalk

CT DEEP concurs that by controlling the migration of the volatile organic compound groundwater pollution plume, the remedy for Operable Unit 2 ("OU2") – groundwater extraction and treatment – is effective in the protection of human health and the environment

The results of the optimization study initiated this past summer (2012) should provide additional information regarding the effectiveness of the selected remedy in controlling the migration of polluted groundwater and protecting human health and the environment.

The issue of the migration of volatile organic compounds from groundwater into overlying structures must still be addressed. The property is undergoing redevelopment and the property owner is required to remediate the property in accordance with the requirements of the Connecticut Remediation Standard Regulations ("RSRs") (section 22a-133k-1 through 22a-133k-3, inclusive, of the Regulations of Connecticut State Agencies). Remediating the site in accordance with those regulations will result in the mitigation of the pathway for volatile organic compound vapors migrating from the groundwater plume on the property into overlying structures on the property.

Operable Unit 3

CT DEEP concurs that a remedy must be selected for Operable Unit 3 ("OU3"), and a Record of Decision ("ROD") prepared.

It is CT DEEP's assessment that in the selection of a remedy, the long term issue of the migration of volatile organic compound vapors from groundwater into overlying structures requires further consideration.

Additional Comment

In Section 6.6 "Interviews" (page 23), first paragraph, fifth line, should "OU-3" be "OU-2"?

Thank you for the opportunity to provide comments on the Report. We hope that these comments are helpful. Please feel to contact me if you have any questions relating to the Kellogg-Deering Well Field Site. I can be reached at (860) 424-3902 or by e-mail at Jeff.Wilcox@ct.gov.

Sincerely,

Jeffrey Wilcox
Environmental Analyst 3
Remediation Division
Bureau of Water Protection & Land Reuse

C: Terry Connelly, US EPA