

W92283F

**FINAL  
FIVE-YEAR REVIEW REPORT**

Site: Kellogg-Deering
Date: 7/1
Other: OVI

**TECHNICAL ASSISTANCE**

**KELLOGG-DEERING WELL FIELD SUPERFUND SITE  
OPERABLE UNIT NO. 1  
NORWALK, CONNECTICUT**

**HALLIBURTON NUS Environmental Corporation**

**EPA Work Assignment No. 31-1R56  
EPA Contract No. 68-W8-0117  
HNUS Project No. 8092**

**December 1992**



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*for G. D. Gardner*

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Program Manager

**TABLE OF CONTENTS  
FINAL FIVE-YEAR REVIEW REPORT  
KELLOGG-DEERING WELL FIELD SITE, OPERABLE UNIT NO. 1  
NORWALK, CONNECTICUT**

<u>SECTION</u>	<u>PAGE</u>
1.0 INTRODUCTION	1-1
1.1 Scope of the Five-Year Review	1-1
1.2 Description of the Remedy	1-2
2.0 SITE DESCRIPTION AND BACKGROUND	2-1
3.0 STANDARDS REVIEW AND UPDATE	3-1
4.0 SUMMARY OF REQUIREMENTS OF THE ROD AND ADMINISTRATIVE ORDER/REMEDIAL ACTION PLAN	4-1
5.0 SITE VISIT SUMMARY	5-1
6.0 FIVE-YEAR REVIEW SUMMARY OF FINDINGS	6-1
APPENDIX A-1 EXEMPTION LETTER	
APPENDIX A-2 INSPECTION REPORT BY CONNECTICUT DOHS	
APPENDIX A-3 TOWER INSPECTION REPORT BY HYDRO-GROUP	

**TABLES**

<u>NUMBER</u>	<u>PAGE</u>
3-1 DRINKING WATER STANDARDS COMPARISON: 1992/1986	3-2
5-1 VOLATILE ORGANIC COMPOUNDS DETECTION SUMMARY: SEMI-MONTHLY SAMPLING - AIR STRIPPER INFLUENT/ EFFLUENT	5-2
5-2 VOLATILE ORGANIC CONTAMINANTS OF CONCERN DETECTION SUMMARY: QUARTERLY SAMPLING - AIR STRIPPER INFLUENT/EFFLUENT	5-12

**FIGURES**

<u>NUMBER</u>	<u>PAGE</u>
2-1 LOCATION MAP	2-2
2-2 SITE MAP	2-4

## 1.0 INTRODUCTION

As requested by EPA, HALLIBURTON NUS Environmental Corporation (HNUS) conducted a five-year review of the remedial action (air stripper) selected for the Kellogg-Deering Well Field, Operable Unit No. 1, in Norwalk, Connecticut. Pursuant to Section 121 (c) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), as amended, and Section 300.430 (f) (4) (ii) of the National Oil and Hazardous Substances Pollution Contingency Plan, reviews are mandated for all remedial actions which result in any hazardous substances remaining at the site. Reviews are conducted at least every five years after the initiation of the remedial action to assure that human health and the environment are being protected by the implemented remedial action.

The activities conducted for the five-year review were based on the Scope of Work prepared by EPA and dated June 1992 and on the Draft Work Plan, Technical Assistance - Five-Year Review, Kellogg-Deering Well Field Superfund Site, Operable Unit No. 1, prepared by HNUS and dated August 1992. Work conducted for this review was authorized under Work Assignment No. 31-1R56.

### 1.1 Scope of the Five-Year Review

Activities conducted to complete the five-year review included:

- Document Review: applicable site-related documents were reviewed to become familiar with the site history and status. The following documents or files were reviewed:
  - Record of Decision for Operable Unit 1 signed September 25, 1986
  - Administrative Order issued to the Norwalk First Taxing District (NFTD) on May 1, 1987
  - EPA Regional Site Files, including historical operation and maintenance and sampling plans, data, and correspondence received from NFTD through July 1988
  - Administrative Record (EPA Records Center)
  - Analytical results on influent and effluent samples from the air stripper, obtained from the Connecticut Department of Health Services (DOHS)

- Standards/ARARs Review: federal criteria, advisories, and guidance and State standards which were listed in the ROD were reviewed and updated with revisions promulgated subsequent to the implementation of the ROD, with respect to site-related contaminants of concern listed in the ROD. The purpose of this review was to ensure that the selected remedy remains protective of human health and the environment, in light of revised standards such as lowered MCLs. Table 3-1 presents the applicable standards as listed in the 1986 ROD, with revisions effective in 1992.
- Site Visit: a site visit to the Kellogg-Deering Well Field - Operable Unit No. 1 was conducted to observe the current operation of the air stripper unit and to obtain information on the operation and maintenance of the facility from the Norwalk First Tax District (NFTD), owners and operators of the facility. Sampling and analysis data was obtained prior to the site visit from the Connecticut Department of Health Services (DOHS) in Hartford, as requested by NFTD and EPA. Section 5.0, Site Visit Summary presents a summary of information obtained during the site visit. Tables 5-1 and 5-2 present a summary of sampling results obtained from the Connecticut DOHS.

## **1.2 Description of the Remedy**

In September 1986, a Record of Decision (ROD) was approved by the U.S. EPA Regional Administrator for the selection of a remedial action for the Kellogg-Deering Well Field Site, Operable Unit No. 1. The primary objective of the remedy for the Kellogg-Deering Well Field Operable Unit No. 1 is to protect the public by assuring a reliable supply of safe, potable water to the public currently dependent on the well field.

As stated in the 1986 ROD, the remedy consisted of bringing into operation the existing packed tower air stripping facilities to remove volatile organic compounds from the contaminated groundwater at the Kellogg-Deering Well Field. The stripped water is then discharged into the existing conventional water treatment plant and distribution system. The stripper has been designed to be 99 percent efficient in the removal of trichloroethylene (TCE), the contaminant of most concern, and other chlorinated hydrocarbons.

The air stripper is capable of treating water from any of the four existing production wells. To accommodate the disparity between system demand and production rate, a large holding tank/clear well (750,000 gallons) had been installed. Following installation, cracks developed in the tank rendering it unusable and thus preventing the operation of the air stripper. The selected remedy

included the repair of the holding tank; operation and maintenance of the air stripper; groundwater monitoring of seven wells located east of the Norwalk River to allow for early detection of possible deterioration in the water producing aquifer and time for any needed corrective action at the well field; sampling and testing of the treatment system's performance; and air monitoring during trial and operation of the air stripper to confirm that air emissions treatment is not required.

Site-related contaminants of concern, as listed in the ROD, include trichloroethylene (TCE); 1,2-dichloroethylene; tetrachloroethylene; methylene chloride; 1,1,1-trichloroethane; benzene; and xylenes.

## 2.0 SITE DESCRIPTION AND BACKGROUND

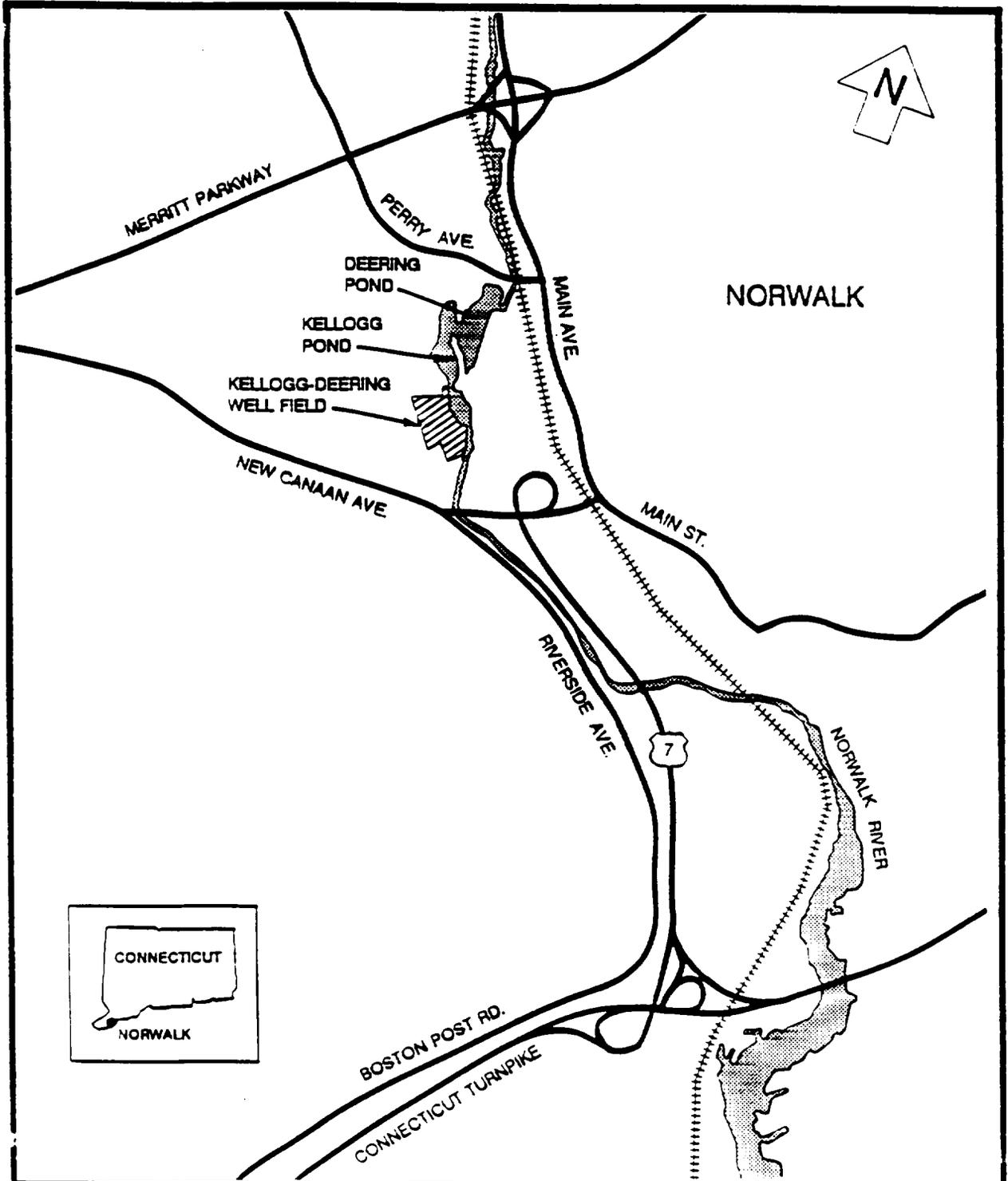
The Kellogg-Deering Well Field Superfund Site is located in Norwalk, Fairfield County, Connecticut and consists of an approximately 10-acre municipal well field and adjacent areas that contribute to the well field contamination. A general location map of the Kellogg-Deering Site is presented as Figure 2-1. The well field is bordered to the east by the Norwalk River, to the north by residences along Broad Street, to the west by residences along Lakeview Avenue, and to the south by wooded land and residences in the vicinity of East Lakeview Drive and Nutmeg Place. The adjacent areas include light industrial and residential neighborhoods on the east side of the river.

The Kellogg-Deering Well Field is owned and operated by the Norwalk First Taxing District (NFTD) Water Department and includes four municipal supply wells (Layne 1, Layne 2, Deering 1, and Deering 2) which supply approximately 25 percent of the residential water for Norwalk. The primary source of public water supply to the NFTD is surface water from four reservoirs; reservoir water is blended with well field water at varying ratios depending on reservoir storage and distribution system location.

Elevated levels of trichloroethylene (TCE) in groundwater at the well field resulted in closure of the affected wells in 1975 until an air stripping treatment system was installed by NFTD in 1981. The Site was placed on the National Priorities List (NPL) in 1984; a Remedial Investigation and Feasibility Study (RI/FS) was conducted between 1984 and 1986 to determine the nature and extent of groundwater contamination at the Site and the treatment options for water at the municipal supply wells. Based on the information provided in this first operable unit RI/FS, a Record of Decision (ROD) was issued in 1986 that required the completion and operation of an existing well head treatment system (air stripper) at the Kellogg-Deering Well Field.

In May 1987, EPA issued Administrative Order Docket number 1871067 to the NFTD to complete construction of, and to test and operate, the air stripping system required by the 1986 First Operable Unit ROD. This well head treatment facility became operational in 1988 and presently removes TCE and other volatile organic compounds (VOCs) from the contaminated groundwater prior to discharge into a conventional water treatment plant and distribution system. Wells currently in use include only Layne 2, Deering 1, and Deering 2 due to elevated levels of TCE, iron, manganese, and suspended solids in the Layne 1 well. In May 1988, EPA certified in a letter to the NFTD that the District had satisfactorily implemented the selected remedial action and was in compliance with the administrative order.

FIGURE 2-1

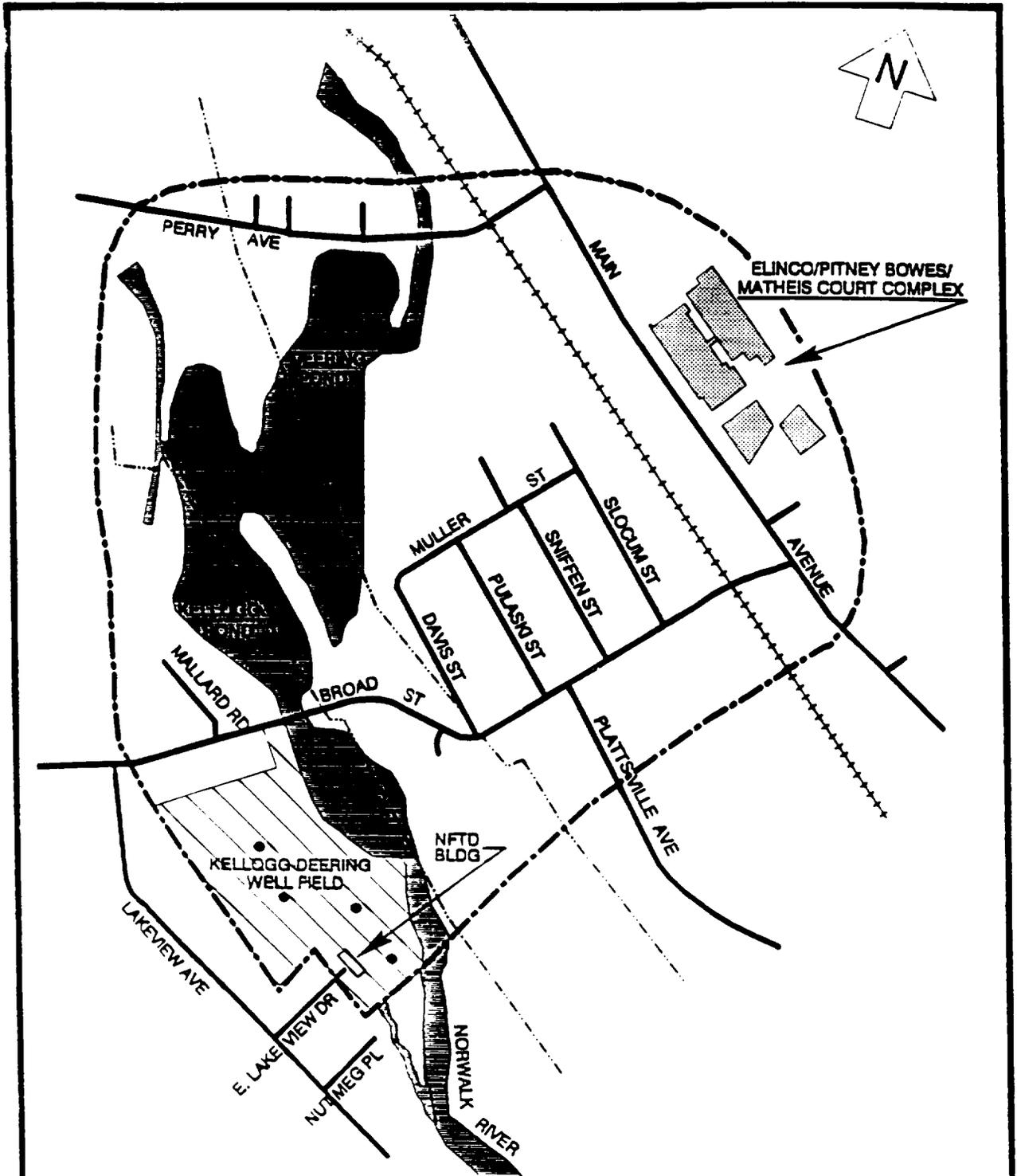


<p><b>LEGEND</b></p> <p>———— MAJOR ROADWAY</p> <p>———— PENN CENTRAL RAILROAD</p>	<p><b>HALLIBURTON NUS</b> Environmental Corporation</p> <p>87 BALLARDOVALE STREET SUITE A-100 MILMINGTON, MASSACHUSETTS 01887 3081658-7899</p>	<p>TITLE: GENERAL LOCATION MAP KELLOGG-DEERING WELL FIELD NORWALK, CONNECTICUT</p>	
		<p>CLIENT: EPA</p> <p>SCALE: NOT TO SCALE</p> <p>DRAWING NO: FIGURE 2-1</p>	<p>CONTRACT NO: 68-WR-0117</p> <p>DATE: _____</p> <p>WA. NO: W.A.-NO</p> <p>ACFILE NAME: _____</p> <p>REV: _____</p>

In 1987, a supplemental RI/FS was initiated to provide further information regarding the source(s) and extent of groundwater TCE contamination at the Site (the Second Operable Unit). In addition to better defining the area of groundwater contamination found during the initial RI, the supplemental RI also identified a major source area of groundwater and soil TCE contamination at the Elinco/Pitney Bowes/Matheis Court Complex (the complex) located at 272 and 282 Main Avenue in Norwalk. The supplemental RI concluded that the contamination at the complex is contributing to the contamination at the Kellogg-Deering Well Field and the aquifer supplying the Well Field. The supplemental RI also identified soil gas contamination sources at the complex and provided an analysis of indoor air quality. The complex is considered to be a major soil and groundwater contamination source area. Figure 2-2 presents a Site Map, including approximate locations of the municipal wells and of the complex, discussed above.

In September 1989, EPA signed a ROD for the second operable unit which provides for the source control and contaminant migration management at the source area. The selected remedy is a comprehensive approach to Site remediation which addresses contamination of soils and groundwater. The primary components of the remedy for the second operable unit include in-situ vapor extraction to remediate contaminated soils, and pumping, treating, and discharging contaminated groundwater at the source area. In September 1990, a Consent Decree for performance of the second operable unit Remedial Design/Remedial Action (RD/RA) was signed with four Potentially Responsible Parties. The Consent Decree was lodged in February 1991. EPA is currently awaiting entry of this Consent Decree. The remedial design is expected to begin in 1993.

FIGURE 2-2



<p><b>LEGEND</b></p> <ul style="list-style-type: none"> <li>- - - - - ROUTE 7 RIGHT OF WAY</li> <li>• KELLOGG-DEERING WELL</li> <li>— PENN CENTRAL RAILROAD</li> <li>- - - - - APPROXIMATE STUDY AREA BOUNDARY</li> </ul>	 <p><b>HALLIBURTON NUS</b> Environmental Corporation</p> <p>187 BALLAROVALE STREET SUITE A-100 WILMINGTON, MASSACHUSETTS 01887 (508)938-7899</p>	<p>TITLE: SITE MAP KELLOGG-DEERING WELL FIELD NORWALK, CONNECTICUT</p> <table border="1"> <tr> <td>CLIENT: EPA</td> <td>CONTRACT NO: 68-WB-0117</td> </tr> <tr> <td>SCALE: NOT TO SCALE</td> <td>DATE:</td> </tr> <tr> <td>DRAWING NO: FIGURE 2-2</td> <td>W.A. NO.:</td> </tr> <tr> <td>AGILE NAME:</td> <td>REV.:</td> </tr> </table>	CLIENT: EPA	CONTRACT NO: 68-WB-0117	SCALE: NOT TO SCALE	DATE:	DRAWING NO: FIGURE 2-2	W.A. NO.:	AGILE NAME:	REV.:
CLIENT: EPA	CONTRACT NO: 68-WB-0117									
SCALE: NOT TO SCALE	DATE:									
DRAWING NO: FIGURE 2-2	W.A. NO.:									
AGILE NAME:	REV.:									

### 3.0 STANDARDS REVIEW AND UPDATE

The National Contingency Plan (NCP) requires that relevant Federal criteria, advisories, and guidance and State standards shall be considered during the evaluation of proposed remedial action alternatives. Applicable standards at the time of implementation of the ROD for Operable Unit No. 1 of the Kellogg-Deering Site (1986) were listed in the ROD as follows:

- Connecticut Air Hazard Limiting Values
- Connecticut Drinking Water Regulations
- National Drinking Water Advisory Council recommendations
- Proposed Maximum Contaminant Level (PMCL), Recommended MCL (RMCL), and Proposed-Recommended MCL (PRMCL)
- Suggested Adjusted Acceptable Daily Intake

Federal and State drinking water standards and guidelines in effect in 1986 were presented in the ROD and are shown in Table 3-1 for comparison. Current (1992) Federal and State drinking water standards for contaminants of concern listed in the ROD are also presented in Table 3-1.

Since the signing of the ROD in 1986, several new Maximum Contaminant Levels (MCLs) have been established for compounds listed as contaminants of concern at the Site including tetrachloroethylene (MCL = 5 ug/l); trans-1,2-dichloroethylene (MCL = 100 ug/l); methylene chloride (MCL = 5 ug/l); 1,1,1-trichloroethane (MCL = 200 ug/l); and xylenes (MCL = 10,000 ug/l). As presented in the analytical data summaries, Tables 5-1 and 5-2, the air stripper effluent has not exceeded the MCLs for any of the sampled contaminants and, according to the sampling and analytical data available, is achieving 100 percent removal of volatile organic compounds.

Following the receipt of an air permit application from NFTD for operation of the air stripper, the Connecticut DEP issued an exemption letter to the NFTD stating that the District is not required to obtain an air emissions permit, based on the projected maximum volatile chemical emissions from the air stripper stated in the permit application (see Appendix A-1). The Connecticut Air Hazard Limiting Values are therefore not included as applicable standards for the NFTD facility.

**TABLE 3-1**  
**DRINKING WATER STANDARDS COMPARISON: 1992/1986**  
**FINAL FIVE-YEAR REVIEW REPORT**  
**KELLOGG-DEERING WELL FIELD - OPERABLE UNIT NO. 1**  
**NORWALK, CONNECTICUT**  
 (all units in ug/l)

Contaminants of Concern	1992			1986			
	USEPA Drinking Water Standards (1)		Connecticut State Drinking Water Standards	Federal Exposure Criteria and Guidance (5)			Connecticut State Limits (5)
VOLATILE ORGANICS	MCL	MCLG	MCL	PMCL	RMCL	PRMCL	AADI
Trichloroethylene	5	0	5 (2)	5	0		260
Tetrachloroethylene	5	0	5 (2)				
1,2-dichloroethylene						70	
(cis-1,2-)	70	70					
(trans-1,2-)	100	100					
Methylene chloride	5	0	25 (3)	0			350*
1,1,1-trichloroethane	200	200	200 (2)				
Benzene	5	0	5 (4)	5	0		25
Xylenes	10000	10000	10,000 (2)				

- NOTES: (1) Drinking Water Regulations and Health Advisories, April 1992. USEPA Office of Drinking Water.  
 (2) Standard is proposed "in Phase 2": currently in legal review process - may be effective March - April 1993  
 (3) State "Action Level"  
 (4) Public Health Code Regulations 19-13-B102, Connecticut Department of Health Services, updated as of February 6, 1992.  
 (5) Record of Decision, Kellogg-Deering Well Field, Norwalk, Connecticut, EPA Region I, September 25, 1986.  
 MCL Maximum Contaminant Level (P = Proposed; R = Recommended)  
 MCLG Maximum Contaminant Level Goal  
 AADI Suggested Adjusted Acceptable Daily Intake (not considering carcinogenic effects and assuming 100% contribution from drinking water.  
 \* Lifetime Health Advisory assuming 20% contribution from drinking water.

#### 4.0 SUMMARY OF REQUIREMENTS OF THE ROD AND ADMINISTRATIVE ORDER/REMEDIAL ACTION PLAN

As stated in the ROD, the primary objective of the selected remedial alternative for Operable Unit No. 1 is to assure a reliable supply of safe, potable water to the public. To ensure that NFTD effectively implemented the ROD, specific requirements were detailed in the Administrative Order/Remedial Action Plan issued on May 1, 1987. Many of these requirements were applicable during the initial trial and operation of the air stripper or through the first year of operation. Based on monthly operational data submitted by NFTD, EPA notified the NFTD in May 1988 of the successful implementation of the remedial action/Administrative Order and successful operation of the air stripper and storage tank.

Additional long-term/ongoing operation and maintenance and sampling requirements which were also listed in the Remedial Action Plan are summarized below:

- Water exceeding Federal and/or State contaminant levels shall not be discharged into the public supply distribution.
- NFTD shall submit a monitoring program to EPA for review and approval by June 30, 1987. The program shall include:
  - groundwater monitoring on the east side of the Norwalk River for early detection of migration of high levels of contamination towards the well field
  - water monitoring at the well field prior to stripping, after stripping, and prior to discharge into the public water supply system
  - water monitoring at various points along the distribution system
  - special monitoring during the trial period of the stripper system, including the monitoring activities listed above, and air sampling to determine whether stripper emissions require treatment
  - a Quality Assurance/Quality Control (QA/QC) plan for all monitoring requirements specified above, to be reviewed and approved by EPA prior to implementation

- NFTD shall submit to EPA by June 15, 1987 a maintenance plan for review and approval describing and scheduling all necessary maintenance activities to insure the proper continuous operation of the treatment system, including stripper tower and storage tank maintenance requirements and estimated costs for such maintenance.
- NFTD shall submit to EPA a contingency plan by June 30, 1987 which shall discuss in detail measures to be taken in the event that:
  - the stripper fails to lower contaminant concentrations below Federal and/or State maximum acceptable levels for drinking water, due to mechanical failure or any other reason
  - monitoring on the east side of the river reveals the migration of highly contaminated groundwater towards the well field (to be indicated by a TCE level above 5,000 ppb at the closest monitoring well on the east side of the river)
  - the demand for public water supply exceeds the air stripper's treatment capacity

Additional details applicable to long-term sampling and operation and maintenance activities as provided in the ROD are specified below:

- Quarterly sampling of the production wells not in use for public water supply; weekly sampling of the production wells in use will be required. Any well water used for public supply must first be treated by the air stripper, unless otherwise approved by EPA. Any water used for public supply must satisfy available Federal and State criteria and standards.
- Annual inspections of the air stripper unit to ensure proper functioning.
- Off-site monitoring including quarterly sampling of seven monitoring wells on the east side of the river, including 6M, 6D, K2A, K2B, K-8 (or MW-3), 15, and 15R (some may be relocated due to construction of Route 7).
- Anticipated additional repairs to the storage tank after fifteen years of operation.

A summary of previous and ongoing activities by NFTD applicable to these requirements and potential areas of noncompliance are included in Sections 5.0 - Site Visit Summary, and 6.0 - Five-Year Review Summary of Findings.

## 5.0 SITE VISIT SUMMARY

HALLIBURTON NUS Environmental Corporation conducted a Site visit to the Kellogg-Deering Well Field - Operable Unit No. 1 on September 3, 1992, to observe the current operation of the air stripper unit and to obtain information on the operation and maintenance of the facility from the Norwalk First Tax District (NFTD), owners and operators of the facility. Sampling and analysis data was obtained prior to the Site visit from the Connecticut Department of Health Services (DOHS) in Hartford, as requested by NFTD and EPA. A summary of analytical results obtained from DOHS is presented in Tables 5-1 and 5-2. Information obtained during the Site visit relating to the operation and maintenance and current status of the air stripper facility is summarized below:

- Minimal daily maintenance is required of the air stripper unit. NFTD staff conduct routine visual inspections of the air stripper facility twice daily, including the blower screen (washed if necessary), blower belt (checked for wear and replaced if needed), visual checks for leaks, cracks, or corrosion in the tower. NFTD stated that it utilizes Hydro Group's "Packed Column Air Stripper Instructions and Maintenance" manual. NFTD owns two blower motors which are alternated every year.  
  
"Norwalk Electric Motor" is responsible for storing, cleaning, lubricating, and changing the motors annually.
- The treatment facility operates continuously and is staffed 24 hours a day. The pumps for each well can be controlled from the treatment building or at the pump house. A control panel in the treatment building includes lights which signal which wells are currently pumping; any loss of power would be signalled at this control panel. The facility has a generator onsite for backup to ensure continuous operation even during power outages.
- Bypass of the air stripper is not possible since piping from each well pumps directly to the stripper tower and then gravity feeds to the clearwell/storage tank (750,000 gallon capacity, pre-stressed concrete). The water level in the clearwell is continuously monitored to assure it is maintained at between 8 and 12 feet. Water is then pumped to the treatment station and distribution system.

**TABLE 5-1**  
**VOLATILE ORGANIC COMPOUNDS DETECTION SUMMARY: SEMI-MONTHLY SAMPLING - AIR STRIPPER INFLUENT/EFFLUENT**  
**FINAL FIVE-YEAR REVIEW REPORT**  
**KELLOGG-DEERING WELL FIELD - OPERABLE UNIT NO. 1**  
**NORWALK, CONNECTICUT**

Sample Date	Sample Location	Influent Pumping Rate (MGD)	Compounds (all units in µg/ℓ)																							
			Bromodichloro-methane		Bromoform		Carbon tetrachloride		Chloroform		Dibromochloro-methane		1,1-Dichloroethane		1,2-Dichloroethane		trans-1,2-Dichloro-ethylene		Tetrachloro-ethylene		1,1,1-Trichloro-ethane		1,1,2-Trichloro-ethane		Trichloro-ethylene	
			Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff
04/29/87	Influent Effluent (L-2)	NR					2.1	BDL							12.4	ND	1.5	BDL							55.8	BDL
05/05/87	Influent Effluent (L-2)	NR					2.0	ND							14.3	ND	1.0	ND							55.8	BDL
06/08/87	Influent (NR) Effluent (L-2)	NR										1.4				4.4				1.8						10.9
06/22/87	Influent Effluent (D-2)	NR					1.4	ND							13.1	ND			2.2	ND	1.0	ND			88.6	BDL
06/23/87	Influent Effluent (L-2)	NR					1.4	ND							14.2	ND			2.4	ND	1.0	ND			91.7	1.1
06/29/87	Influent Effluent (L-2)	NR			ND	1.9	1.2	ND				1.8	1.0	9.7	ND	2.1	BDL							57.5	BDL	
06/30/87	Influent Effluent (L-2)	NR					1.4	ND					1.9	1.1	11.0	BDL	2.0	BDL							54.5	BDL
07/01/87	Influent Effluent (L-2)	NR					1.4	BDL					1.9	ND	12.1	ND	1.9	BDL							54.3	BDL
07/02/87	Influent Effluent (L-2)	NR					1.4	BDL					3.1	1.8	12.2	ND	2.2	BDL	1.0	ND					54.9	BDL
07/16/87	Influent (D-1/ D-2) Effluent (NR)	NR					1.1					1.4			3.5		1.3		1.4						20.7	
07/16/87	Influent Effluent (L-2)	NR					1.2	ND							9.7	ND	1.9	ND							82.5	BDL
08/04/87	Influent Effluent (L-2)	NR					1.6	ND							16.0	ND	2.1	ND	1.3	ND					58.9	ND
08/25/87	Influent Effluent (L-2)	NR					1.7	ND							26.4	ND	2.5	ND	2.1	ND					67.5	1.0

W92283F

5-2

TABLE 5-1  
VOLATILE ORGANIC COMPOUNDS DETECTION SUMMARY: SEMI-MONTHLY SAMPLING - AIR STRIPPER INFLUENT/EFFLUENT  
FINAL FIVE-YEAR REVIEW REPORT  
KELLOGG-DEERING WELL FIELD - OPERABLE UNIT NO. 1  
PAGE TWO

Sample Date	Sample Location	Influent Pumping Rate (MGD)	Compounds (all units in µg/l)																							
			Bromodichloro methane		Bromoform		Carbon tetrachloride		Chloroform		Dibromochloro methane		1,1-Dichloroethane		1,2-Dichloroethane		trans-1,2-Dichloroethylene		Tetrachloroethylene		1,1,1-Trichloroethane		1,1,2-Trichloroethane		Trichloroethylene	
			Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff
09/29/87	Influent Effluent (L-2)	NR														14.1	ND	2.6	ND	2.8	ND			47.0	ND	
10/19/87	Influent Effluent (L-2)	NR										2.1	ND			7.6	ND	4.8	ND	15.3	ND			70.5	BDL	
11/03/87	Influent Effluent (L-2)	NR										2.7	ND			7.8	ND	3.4	ND	14.5	ND			61.1	ND	
11/10/87	Influent Effluent (L-2)	NR																						62.0	ND	
11/16/87	Influent Effluent (L-2)	NR																						66.0	ND	
11/23/87	Influent Effluent (L-2)	NR																						77.0	ND	
01/20/88	Influent Effluent (L-2)	NR																						42.0	ND	
02/17/88	Influent Effluent (L-2)	NR																						36.0	ND	
02/22/88	Influent Effluent (D-1/D-2)	NR																								
03/07/88	Influent Effluent (D-1/D-2)	NR														3.6	ND			1.4	ND			8.4	ND	
03/28/88	Influent Effluent (L-2)	NR						2.7	BDL							8.9	ND							67.3	ND	

W92283F

S-3



TABLE 5-1  
 VOLATILE ORGANIC COMPOUNDS DETECTION SUMMARY: SEMI-MONTHLY SAMPLING - AIR STRIPPER INFLUENT/EFFLUENT  
 FINAL FIVE-YEAR REVIEW REPORT  
 KELLOGG-DEERING WELL FIELD - OPERABLE UNIT NO. 1  
 PAGE FOUR

Sample Date	Sample Location	Influent Pumping Rate (MGD)	Compounds (all units in µg/l)																							
			Bromodichloro methane		Bromoform		Carbon tetrachloride		Chloroform		Dibromochloro methane		1,1-Dichloroethane		1,2-Dichloroethane		trans-1,2-Dichloroethylene		Tetrachloroethylene		1,1,1-Trichloroethane		1,1,2-Trichloroethane		Trichloroethylene	
			Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.
08/23/88	Influent Effluent (D-1, D-2, L-2)	NR																2.1	ND	1.4	ND			36.3	ND	
09/14/88	Influent (D-1, Effluent L-2)	NR														3.6	ND								40.8	ND
09/19/88	Influent Effluent (D-1, D-2, L-2)	NR					1.5	1.5				1.1	ND												54.1	ND
10/11/88	Influent Effluent (D-1, D-2, L-2)	NR																							35.9	ND
10/24/88	Influent Effluent (D-1, D-2, L-2)	NR																							34.5	ND
11/08/88	Influent Effluent (D-1, D-2, L-2)	NR																							30.7	ND
11/16/88	Influent (D-1, Effluent D-2)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	5.8	BDL
11/16/88	Influent Effluent L-2	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	43.4	BDL
12/06/88	Influent (D-1, Effluent D-2)	NR																							3.2	ND
12/28/88	Influent (D-1, Effluent D-2)	NR													ND	2.1									17.6	1.6
01/10/89	Influent (D-1, Effluent D-2)	NR					11.3	11.3							3.0	4.2			ND	8.5					24.9	ND
01/30/89	Influent (D-1, Effluent D-2)	NR																							6.0	ND
02/22/89	Influent Effluent D-1	NR					1.8	1.2	1.1	1.2								1.4	ND	1.4	ND				30.5	ND

W92283F

5-5

TABLE 5-1  
 VOLATILE ORGANIC COMPOUNDS DETECTION SUMMARY: SEMI-MONTHLY SAMPLING - AIR STRIPPER INFLUENT/EFFLUENT  
 FINAL FIVE-YEAR REVIEW REPORT  
 KELLOGG-DEERING WELL FIELD - OPERABLE UNIT NO. 1  
 PAGE FIVE

W92283F

5-6

Sample Date	Sample Location	Influent Pumping Rate (MGD)	Compounds (all units in µg/l)																							
			Bromodichloro methane		Bromoform		Carbon tetrachloride		Chloroform		Dibromochloro methane		1,1-Dichloroethane		1,2-Dichloroethane		trans-1,2-Dichloroethylene		Tetrachloroethylene		1,1,1-Trichloroethane		1,1,2-Trichloroethane		Trichloroethylene	
			Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff
03/07/89	Influent (L-2, Effluent D-1)	NR																1.2	ND						22.7	ND
03/22/89	Influent (L-2, Effluent D-1)	NR																3.8	ND						41.6	ND
04/17/89	Influent Effluent (L-2)	NR						3.7	ND					0.9	ND			1.8	ND						38.0	ND
06/05/89	Influent (L-2, Effluent D-2)	NR												1.6	ND					2.1	ND				22.4	ND
06/12/89	Influent (L-2, Effluent D-2)	NR						1.5	ND					1.6	ND			1.9	ND	10.1	ND				21.6	ND
06/26/89	Influent (L-2, Effluent D-2)	NR												1.2	ND			2.4	ND	2.0	ND				23.8	ND
07/06/89	Influent (L-2, Effluent D-2)	NR																1.2	ND						33.4	ND
07/17/89	Influent (L-2, Effluent D-2)	NR																							36.6	ND
08/14/89	Influent Effluent (L-2)	NR																2.4	ND						36.4	ND
08/21/89	Influent (L-2, Effluent D-2)	NR															1.4	ND							18.2	ND
09/18/89	Influent (L-2, Effluent D-2)	NR						2.0	1.0									2.4	ND						40.4	ND
10/10/89	Influent Effluent (L-2)	NR																4.5	ND						46.2	ND
10/16/89	Influent Effluent (L-2)	NR																2.7	ND	1.1	ND				45.3	ND

TABLE 5-1  
 VOLATILE ORGANIC COMPOUNDS DETECTION SUMMARY: SEMI-MONTHLY SAMPLING - AIR STRIPPER INFLUENT/EFFLUENT  
 FINAL FIVE-YEAR REVIEW REPORT  
 KELLOGG-DEERING WELL FIELD - OPERABLE UNIT NO. 1  
 PAGE SIX

Sample Date	Sample Location	Influent Pumping Rate (MG/D)	Compounds (all units in µg/l)																							
			Bromodichloro methane		Bromoform		Carbon tetrachloride		Chloroform		Dibromochloro methane		1,1-Dichloroethane		1,2-Dichloroethane		trans-1,2-Dichloroethylene		Tetrachloroethylene		1,1,1-Trichloroethane		1,1,2-Trichloroethane		Trichloroethylene	
			Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff
11/07/89	Influent (D-1, Effluent D-2)	NR										1.9	ND					0.7	ND					6.1	ND	
11/27/89	Influent (D-1, Effluent D-2)	NR	NR		NR		NR		NR		NR		NR		NR		NR		NR		NR		NR		14.9	ND
12/05/89	Influent Effluent (L-2)	NR	NR		NR		NR		NR		NR		NR		NR		NR		NR		NR		NR		92.6	ND
12/18/89	Influent Effluent (D-1, D-2, L-2)	NR										1.1	ND					11.7	ND					97.6	ND	
01/16/90	Influent Effluent (L-1)	NR					ND	0.9				1.0	ND					1.1	ND					40.8	ND	
01/29/90	Influent (D-1, Effluent D-2)	1.98										1.2	ND					0.9	ND					4.8	ND	
02/14/90	Influent (D-1, Effluent D-2)	1.98										0.9	ND					0.8	ND					7.8	ND	
03/05/90	Influent (D-1, Effluent D-2)	1.90	ND	1.2	ND	2.1		ND	1.3	ND	1.7	1.4	ND					3.1	ND					13.7	ND	
03/12/90	Influent (L-2, Effluent D-1)	2.01	1.6	ND				2.9	1.2					0.8	ND			1.9	ND					34.7	ND	
03/19/90	Influent Effluent L-2	1.44	NR		NR		NR		NR		NR		NR		NR		NR		NR		NR		NR		38.7	ND
04/02/90	Influent (D-1, Effluent D-2)	1.95										1.4	ND											11.0	ND	
04/16/90	Influent (D-1, Effluent D-2)	1.94										1.1	ND					0.6	ND					7.7	ND	
06/18/90	Influent (L-2, Effluent D-1)	1.95																1.6	ND					14.0	ND	

W92283F

5-7

TABLE 5-1  
 VOLATILE ORGANIC COMPOUNDS DETECTION SUMMARY: SEMI-MONTHLY SAMPLING - AIR STRIPPER INFLUENT/EFFLUENT  
 FINAL FIVE-YEAR REVIEW REPORT  
 KELLOGG-DEERING WELL FIELD - OPERABLE UNIT NO. 1  
 PAGE SEVEN

Sample Date	Sample Location	Influent Pumping Rate (MGD)	Compounds (all units in µg/l)																								
			Bromodichloro methane		Bromoform		Carbon tetrachloride		Chloroform		Dibromochloro methane		1,1-Dichloroethane		1,2-Dichloroethane		trans-1,2-Dichloroethylene		Tetrachloroethylene		1,1,1-Trichloroethane		1,1,2-Trichloroethane		Trichloroethylene		
			Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	
07/02/90	Influent (D-1, Effluent L-2)	1.98										1.0	ND					1.5	ND						6.0	ND	
07/16/90	Influent (D-1, Effluent L-2)	1.95																1.8	ND						38.4	ND	
09/10/90	Influent (D-1, Effluent L-2)	1.94																1.5	ND						25.2	ND	
09/24/90	Influent (D-1, Effluent L-2)	1.95																2.0	ND						26.7	ND	
10/09/90	Influent (D-1, Effluent D-2)	1.94										1.1	ND					0.9	ND						4.2	ND	
10/22/90	Influent (D-1, Effluent D-2)	1.94										1.3	ND					1.1	ND						2.1	ND	
11/05/90	Influent NR Effluent	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	ND
12/10/90	Influent (D-1, Effluent L-2)	1.94																1.4	ND						18.0	ND	
12/17/90	Influent (D-1, Effluent D-2)	1.92										1.1	ND					1.3	ND						3.7	ND	
01/08/91	Influent (D-1, Effluent D-2)	1.88																1.0	ND						14.5	ND	
01/23/91	Influent (D-1, Effluent D-2)	1.93																0.9	ND						2.7	ND	
02/04/91	Influent Effluent (D-1, D-2, L-2)	3.12																1.1	ND						13.0	ND	
02/13/91	Influent Effluent NR	NR					0.9	ND										1.4	ND						15.0	ND	

W92283F

5 - 8

TABLE 5-1  
 VOLATILE ORGANIC COMPOUNDS DETECTION SUMMARY: SEMI-MONTHLY SAMPLING - AIR STRIPPER INFLUENT/EFFLUENT  
 FINAL FIVE-YEAR REVIEW REPORT  
 KELLOGG-DEERING WELL FIELD - OPERABLE UNIT NO. 1  
 PAGE EIGHT

Sample Date	Sample Location	Influent Pumping Rate (MGD)	Compounds (all units in µg/ℓ)																							
			Bromodichloro methane		Bromoform		Carbon tetrachloride		Chloroform		Dibromochloro methane		1,1-Dichloroethane		1,2-Dichloroethane		trans-1,2-Dichloro-ethylene		Tetrachloro-ethylene		1,1,1-Trichloro-ethane		1,1,2-Trichloro-ethane		Trichloro-ethylene	
			Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff
02/19/91	Influent Effluent (D-1, D-2, L-2)	2.97															2.0	ND							22.1	ND
03/04/91	Influent (D-1, Effluent D-2)	1.65					0.8	ND				1.1	ND				2.0	ND							4.1	ND
03/18/91	Influent (D-1, Effluent L-2)	1.93					ND	1.1									2.4	ND							15.6	ND
04/01/91	Influent (D-1, Effluent L-2)	1.94															2.3	ND							15.6	ND
04/22/91	Influent (D-1, Effluent L-2)	1.98					1.1	ND									2.0	ND							23.6	ND
04/29/91	Influent (D-1, Effluent D-2)	2.05					1.2	ND				1.4	ND				1.5	ND							5.0	ND
05/13/91	Influent (D-1, Effluent L-2)	1.96					1.0	ND									2.0	ND							15.4	ND
06/17/91	Influent Effluent (D-1, D-2, L-2)	3.32										1.5	ND												16.3	ND
06/24/91	Influent Effluent (D-1, D-2, L-2)	3.24															2.8	ND							18.9	ND
07/01/91	Influent (D-2, Effluent L-2)	2.74					1.7	ND									2.0	ND							19.4	ND
07/15/91	Influent Effluent (D-1, D-2, L-2)	3.31										0.7	ND				2.0	ND							17.8	ND
08/12/91	Influent Effluent (D-1, D-2, L-2)	3.40															1.5	ND							12.9	ND

M92283F

5-9

TABLE 5-1  
 VOLATILE ORGANIC COMPOUNDS DETECTION SUMMARY: SEMI-MONTHLY SAMPLING - AIR STRIPPER INFLUENT/EFFLUENT  
 FINAL FIVE-YEAR REVIEW REPORT  
 KELLOGG-DEERING WELL FIELD - OPERABLE UNIT NO. 1  
 PAGE NINE

Sample Date	Sample Location	Influent Pumping Rate (MGD)	Compounds (all units in µg/β)																							
			Bromodichloro methane		Bromoform		Carbon tetrachloride		Chloroform		Dibromochloro methane		1,1-Dichloroethane		1,2-Dichloroethane		trans-1,2-Dichloro-ethylene		Tetrachloro-ethylene		1,1,1-Trichloro-ethane		1,1,2-Trichloro-ethane		Trichloro-ethylene	
			Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff
09/09/91	Influent Effluent (D-1, D-2, L-2)	3.30					1.7	ND			1.1	ND			1.7	ND	0.6	ND					3.9	ND		
09/23/91	Influent Effluent (D-2)	1.53					1.6	3.0			1.9	ND			1.3	ND	1.0	ND					5.2	ND		
10/07/91	Influent Effluent (D-2)	1.49					ND	1.7			1.5	ND			4.5	ND							4.5	ND		
10/23/91	Influent Effluent (L-2)	1.40	ND	0.6			ND	1.8	ND	0.8					1.4	ND							20.9	ND		
11/19/91	Influent Effluent (D-2)	1.34					1.8	1.9															16.0	ND		
11/26/91	Influent Effluent (L-2)	1.44					ND	1.0															8.6	ND		
12/10/91	Influent Effluent (L-2)	1.38																					10.9	ND		
12/23/91	Influent Effluent (L-2)	1.38					0.7	0.6									0.6	ND					14.9	ND		
01/06/92	Influent Effluent (L-2)	1.38													1.4	ND							10.7	ND		
01/22/92	Influent (D-1, Effluent D-2)	1.98	ND	0.5							1.9	ND			1.4	ND	0.5	ND					ND	ND		
02/03/92	Influent (D-1, Effluent L-2)	1.98													1.2	ND							15.2	ND		
02/04/92	Influent Effluent (D-2)	1.30									2.1	ND			2.4	ND							9.9	ND		
03/02/92	Influent Effluent (L-2)	1.35																					4.7	ND		

W92283F

5-10

**TABLE 5-1**  
**VOLATILE ORGANIC COMPOUNDS DETECTION SUMMARY: SEMI-MONTHLY SAMPLING - AIR STRIPPER INFLUENT/EFFLUENT**  
**FINAL FIVE-YEAR REVIEW REPORT**  
**KELLOGG-DEERING WELL FIELD - OPERABLE UNIT NO. 1**  
**PAGE TEN**

Sample Date	Sample Location	Influent Pumping Rate (MGD)	Compounds (all units in µg/l)																							
			Bromodichloromethane		Bromoform		Carbon tetrachloride		Chloroform		Dibromochloromethane		1,1-Dichloroethane		1,2-Dichloroethane		trans-1,2-Dichloroethylene		Tetrachloroethylene		1,1,1-Trichloroethane		1,1,2-Trichloroethane		Trichloroethylene	
			Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.
03/16/92	Influent Effluent (D-2)	1.40					2.0	ND				4.1	ND					3.4	ND	2.0	ND				12.0	ND
04/28/92	Influent Effluent (D-1, L-2)	1.99																1.0	ND						3.3	ND
05/04/92	Influent Effluent (D-1, D-2)	1.94					1.5	ND				1.3	ND					1.7	ND	0.8	ND				3.3	ND
06/15/92	Influent Effluent (D-1, D-2)	1.98	ND	13.6	ND	3.0		ND	10.6	ND	12.8	1.1	ND					1.6	ND						2.4	ND
07/07/92	Influent Effluent (L-2)	1.34																1.1	ND						4.8	ND
07/20/92	Influent Effluent (L-2)	1.34	ND	7.3	ND	2.5		ND	4.8	ND	10.5							1.5	ND						6.2	ND

NOTES: Influent is prior to packed column of air stripper  
 Effluent is after treatment system (chlorination, etc.)  
 A blank space indicates compound was not detected  
 MGD = million gallons per day  
 BDL = Below Detection Limit (Detection Limit is 1.0 or 0.5 ug/l)

ND = None Detected  
 NR = Not reported or not sampled  
 D-1 = Deering 1 well  
 D-2 = Deering 2 well  
 L-2 = Layne 2 well

Results listed through 06/13/88 are from laboratory data pages submitted to EPA from First District Water Department, Norwalk, CT. Analytical Method listed is 8010 for Halogenated Volatile Organics. All other results are from Connecticut DOHS Summary Table, based on data they received from Norwalk's First Taxing District Water Department. Trihalomethane (THM) compounds (bromodichloromethane, bromoform, chloroform, and dibromochloromethane) are presented only when detailed by compound on DOHS' Summary Table.

W92283F

5-11

**TABLE 5-2**  
**VOLATILE ORGANIC CONTAMINANTS OF CONCERN DETECTION SUMMARY: QUARTERLY SAMPLING-AIR STRIPPER INFLUENT/EFFLUENT**  
**FINAL FIVE-YEAR REVIEW REPORT**  
**KELLOGG-DEERING WELL FIELD - OPERABLE UNIT NO. 1**  
**NORWALK, CONNECTICUT**

W92283F

5-12

Sample Date	Sample Location	Pumping Well(s)	Compounds (all units in µg/l)							
			Benzene	cis-1,2-Dichloroethylene Inf	Eff	Methylene Chloride	Meta Xylene	Ortho-Xylene	Para Xylene	
02/25/91	Influent Effluent	D-1, D-2								
02/26/91	Influent Effluent	L-2		4.2	ND					
06/04/91	Influent Effluent	D-1, D-2		1.1	ND					
06/19/91	Influent Effluent	L-2		5.1	ND					
07/29/91	Influent Effluent	D-1, D-2		1.9	ND					
08/05/91	Influent Effluent	D-2, L-2		4.3	ND					
11/12/91	Influent Effluent	D-1, D-2		2.3	ND					
11/13/91	Influent Effluent	L-2		3.2	ND					
02/03/92	Influent Effluent	L-2, D-1		1.2	ND					
02/04/92	Influent Effluent	D-2								
05/11/92	Influent Effluent	D-1, D-2		2.2	ND					
05/12/92	Influent Effluent	L-2								

**NOTES:** Influent is prior to packed column of air stripper  
Effluent is after treatment system (chlorination, etc.)  
A blank space indicates compound was not detected (Detection Limit is 0.5 ug/l)  
ND = None Detected (Detection Limit is 0.5 ug/l)  
D-1 = Deering 1 well  
D-2 = Deering 2 well  
L-2 = Layne 2 well  
Results are from Connecticut Department of Health Services (CT DOHS, data they received from Norwalk's First Taxing District Water Department). Additional data for quarterly sampling from previous years is available at the CT DOHS.

Bypass piping from the wells around the stripper tower does not exist, per order of the State. (A flow diagram of the facility is included in Appendix A-2, Inspection Report of Norwalk First District Water Department, by State of Connecticut Department of Health Services.)

- Hydro Group of Bridgewater, New Jersey, designers and installers of the air stripper system, conducted a tower inspection at the NFTD facility on April 12, 1989 (the inspection report is included as Appendix A-3). Cleaning and flushing of the tower has not yet been determined necessary, since there has been no deterioration in performance of the air stripper system (100 percent removal of volatile organic compounds, see Tables 5-1 and 5-2). Hydro Group's visual inspection of the packing noted some discoloration of the packing and walls, due to iron, however no significant buildup was evident. NFTD stated that Hydro Group is scheduled to conduct a second 3-year inspection of the air stripper system in September or October, 1992.
- No vandalism to the air stripper unit or unusual problems have been noted by NFTD. An incident of breaking and entering into the pump house has been reported, however no damage to the adjacent air stripper unit was evident. Although the well field property is fenced, trespassing does occur.
- NFTD currently utilizes groundwater from only 3 of the 4 existing wells (Layne 2, Deering 1, and Deering 2) on a rotating basis. Layne 1 has not been used for a water supply since its initial deactivation, because of high levels of iron, manganese, trichloroethene, and turbidity. A new well is currently being installed and tested to replace Layne 1. (Both the well field and the air stripper have a higher capacity rating than is currently being utilized.) The new well may go into operation in early 1993, following State approval. This well water would also be treated by the air stripper prior to distribution.

The following requirements of the ROD/Administrative Order are not being met:

- Sampling of the monitoring wells east of the Norwalk River, as required in the ROD and Administrative Order, is not being conducted by NFTD. NFTD is not aware of the last date of sampling of the wells.

- NFTD has not conducted air emissions sampling from the stripper unit. The Connecticut DEP issued NFTD an exemption letter (see Appendix A-1) stating that the unit does not require an air permit based on the projected maximum emissions, as described in the permit application.
- According to NFTD personnel, no QA/QC plan for sampling was submitted to EPA, as specified in the Administrative Order, and QA/QC samples such as duplicates and blanks are not collected. Information on sample holding times was not included in the data reviewed. According to NFTD personnel, the analytical laboratory for VOCs (Environmental Laboratories, Inc., New Haven, Connecticut, a State-certified laboratory) reports "completion date", however, it is not known if this is the actual date of analysis. Based on available information, it appears that no review of holding times or other data validation efforts are conducted. VOC samples are reportedly preserved with thiosulfate.

Information obtained from the Connecticut DOHS pertaining to sampling and analysis of the air stripper influent and effluent is summarized below:

- According to U.S. EPA monitoring requirements for the selected remedy for this Superfund Site, sampling and analysis of the influent and effluent (following treatment/chlorination, etc.) to the packed tower/air stripper system is conducted approximately twice each month for 40 volatile organic compounds (VOCs). Additional quarterly sampling and analysis of the influent and effluent to the packed tower/air stripper system is conducted to meet State monitoring requirements for public water supply systems. This quarterly sampling includes testing of 50 VOCs: 8 regulated compounds (with established Maximum Contaminant Levels (MCLs) and 42 "unregulated" compounds. Some of these 50 VOCs are also analyzed during the semi-monthly sampling and analysis events. Samples are analyzed by Environmental Laboratories, Inc., a State-certified laboratory, and results are forwarded by NFTD to the Connecticut DOHS.
- A summary table of compounds detected in the semi-monthly sampling is presented as Table 5-1. Contaminants of concern (as listed in the ROD) which are analyzed during the semi-monthly sampling include: trichloroethylene; tetrachloroethylene; trans-1,2-dichloroethylene; and 1,1,1-trichloroethane. Recent analytical results (1991-1992) for the other contaminants of concern which are analyzed only in the quarterly sampling events (cis-1,2-dichloroethylene; methylene chloride; benzene; and

xylenes) are presented as Table 5-2. Additional data for quarterly sampling conducted prior to 1991 is available at the Connecticut DOHS.