TABLE 2.0
30860-1510
FRED C. HART ASSOCIATES
RCRA METALS

All values are mg/L.

Element	4665 WSW-25-DL-1
Arsenic	<0.010
Barium	<0.10
Cadmium	<0.01
Chromium	0.02
Lead	<0.04
Mercury	<0.0002
Selenium	<0.005
Silver	<0.01

TABLE 2.10
30860-1510
FRED C. HART ASSOCIATES

All values are mg/Kg dry basis.

Element	0971 SB-25-2 (10-12)	0972 SB-25-2 (16-18)
Aluminum	5,510	4,320
Antimony	<5.0	<5.0
Arsenic	1.87	<0.50
Barium	6.4	7.7
Beryllium	<0.75	<0.75
Cadmium	<0.75	<0.75
Calcium	267	482
Chromium	2.89	2.60
Cobalt	1.16	<0.75
Copper	6.62	6.51
Iron	10,100	6,740
Lead	14.0	<1.5
Magnesium	1,680	2,090
Manganese	70.0	48.2
Mercury	<0.05	<0.05
Nickel	<0.75	<0.75
Potassium	732	628
Selenium	<0.50	<0.50
Silver	<0.75	<0.75
Sodium	180	398
Thallium	<5.0	<5.0
Vanadium	11.6	16.1
Zinc	18.6	10.7

Aqueous

TABLE 3.0
30860-1510
FRED C. HART ASSOCIATES
EPA HSL VOLATILE COMPOUNDS

All Results Reported as ug/L.

	Sample Identification		
Dilution Factor	1.00	1.00	
Method Blank I.D.	>AX007	>AX007	
Compound	Method Blank	4665 WSW-25 -DL-1	Lower Limits of Detection with no Dilution
chloromethane	U	U	10
bromomethane	U	U	10
vinyl chloride	U	U	10
chloroethane	U	U	10
methylene chloride	5	2JB	5
acetone	9J	8JB	10
carbon disulfide	2J	U	5
1,1-dichloroethene	U	U	5
1,1-dichloroethane	U	2J	5
trans-1,2-dichloroethene	U	7	5
chloroform	2J	U	5
1,2-dichloroethane	U	U	5
2-butanone	U	U	10
1,1,1-trichloroethane	U	U	5
carbon tetrachloride	U	U	5
vinyl acetate	U	U	10
bromodichloromethane	U	U	5
1,1,2,2-tetrachloroethane	U	U	5
1,2-dichloropropane	U	U	5
trans-1,3-dichloropropene	U	U	5
trichloroethene	U	U	5
dibromochloromethane	U	U	5
1,1,2-trichloroethane	U	U	5
benzene	U	U	5
cis-1,3-dichloropropene	U	U	5
2-chloroethylvinylether	U	U	10
bromoform	U	U	5
2-hexanone	4J	U	10
4-methyl-2-pentanone	3J	U	10
tetrachloroethene	U	U	5
toluene	U	U	5
chlorobenzene	U	U	5
ethylbenzene	U	U	5
styrene	U	U	5
total xylenes	U	U	5

*U - See Appendix for definition.
*J - See Appendix for definition.
*B - See Appendix for definition.

Soil

TABLE 3.1
30860-1510
FRED C. HART ASSOCIATES
EPA HSL VOLATILE COMPOUNDS

All Results Reported as ug/Kg.

	Sample Identification			
Dilution Factor	1.00	1.12	1.32	
Method Blank I.D.	>BXX08	>BXX08	>BXX08	
Compound	Method Blank	0971 SB-25-2 (10-12)	0972 SB-25-2 (16-18)	Lower Limits of Detection with no Dilution
chloromethane	U	U	U	10
bromomethane	U	U	U	10
vinyl chloride	U	U	U	10
chloroethane	U	U	U	10
methylene chloride	7	120B	120B	5
acetone	2J	20B	22B	10
carbon disulfide	U	1J	2J	5
1,1-dichloroethene	U	U	U	5
1,1-dichloroethane	U	U	U	5
trans-1,2-dichloroethene	U	U	U	5
chloroform	2J	6B	6B	5
1,2-dichloroethane	U	U	U	5
2-butanone	U	U	U	10
1,1,1-trichloroethane	U	1J	1J	5
carbon tetrachloride	U	U	U	5
vinyl acetate	U	U	U	10
bromodichloromethane	U	U	U	5
1,1,2,2-tetrachloroethane	U	U	U	5
1,2-dichloropropane	U	U	U	5
trans-1,3-dichloropropene	U	U	U	5
trichloroethene	U	2J	1J	5
dibromochloromethane	U	U	U	5
1,1,2-trichloroethane	U	U	U	5
benzene	1J	1JB	1JB	5
cis-1,3-dichloropropene	U	U	U	5
2-chloroethylvinylether	U	U	U	10
bromoform	U	U	U	5
2-hexanone	U	U	U	10
4-methyl-2-pentanone	U	U	U	10
tetrachloroethene	U	U	1J	5
toluene	U	1J	2J	5
chlorobenzene	U	U	U	5
ethylbenzene	U	U	1J	5
Styrene	U	U	U	5
total xylenes	U	2J	U	5

*U - See Appendix for definition.
*J - See Appendix for definition.
*B - See Appendix for definition.

TABLE 4.0
30860-1510
FRED C. HART ASSOCIATES
EPA HSL BASE/NEUTRAL/ACID COMPOUNDS

All results reported in ug/L.

	Sample Identification		
Dilution Factor	1	1	
Method Blank I.D.	>C2230	>C2230	
Compound	Method Blank	4665 WSW-25 -DL-1	Lower Limits of Detection with no Dilution
Phenol	U	U	10
bis(2-Chloroethyl)Ether	U	U	10
2-Chlorophenol	U	U	10
1,3-Dichlorobenzene	U	U	10
1,4-Dichlorobenzene	U	U	10
Benzyl Alcohol	U	U	10
1,2-Dichlorobenzene	U	U	10
2-Methylphenol	U	U	10
bis(2-chloroisopropyl)ether	U	U	10
4-Methylphenol	U	U	10
N-Nitroso-Di-n-propylamine	U	U	10
Hexachloroethane	U	U	10
Nitrobenzene	U	U	10
Isophorone	U	U	10
2-Nitrophenol	U	U	10
2,4-Dimethylphenol	U	U	10
Benzoic Acid	U	U	50
bis(-2-Chloroethoxy)Methane	U	U	10
2,4-Dichlorophenol	U	U	10
1,2,4-Trichlorobenzene	U	U	10
Naphthalene	U	U	10
4-Chloroaniline	U	U	10
Hexachlorobutadiene	U	U	10
4-Chloro-3-methylphenol	U	U	10
2-Methylnaphthalene	U	U	10
Hexachlorocyclopentadiene	U	U	10
2,4,6-Trichlorophenol	U	U	10
2,4,5-Trichlorophenol	U	U	50
2-Chloronaphthalene	U	U	10
2-Nitroaniline	U	U	50
Dimethyl Phthalate	U	U	10
Acenaphthylene	U	U	10
3-Nitroaniline	U	U	50

*U - See Appendix for definition.

Soil

TABLE 5.1
30860-1510
FRED C. HART ASSOCIATES
EPA HSL PESTICIDES

All Results Reported as ug/Kg.

	Sample Identification			
Dilution Factor	1	5	1	
Method Blank I.D.	8/7/86	8/7/86 0971	8/7/86 0972	
Compound	Method Blank	SB-25-2 (10-12)	SB-25-2 (16-18)	Lower Limits of Detection with no Dilution
alpha BHC	U	U	U	0.80
beta BHC	U	U	U	0.66
gamma BHC	U	U	U	0.54
delta BHC	U	U	U	0.80
Heptachlor	U	U	U	0.66
Aldrin	U	U	U	1.3
4,4' DDE	U	U	U	1.3
Dieldrin	U	U	U	1.3
4,4' DDD	U	125	U	1.3
Methoxychlor	U	U	U	110
Endrin Ketone	U	U	U	0.02
4,4' DDT	U	U	U	15
Chlordane	U	U	U	40
Endosulfan I	U	U	U	1.3
Endosulfan II	U	U	U	1.3
Endosulfan Sulfate	U	U	U	9.4
Endrin	U	U	U	1.3
Heptachlor Epoxide	U	85	U	1.3
Toxaphene	U	U	U	220

*U - See Appendix for definition.

YORK LABORATORIES DIVISION

YWC

000001

CHAIN OF CUSTODY RECORD

CLIENT: Fred C. Hart Assoc

JOB No. YWC # 30860-1775

SAMPLE IDENTIFICATION

Sample No.	Sample Description	Condition	Comments
2174	W-25-1		HSL VOA P.P. Metals (Wet Chg) HSL BNA Pest
2175	W-25-1A		HSL VOA P.P. Metals (Wet Chg) HSL BNA Pest
2176	W-25-2		HSL VOA P.P. Metals (Wet Chg) HSL BNA Pest
2177	W-25-3		HSL VOA P.P. Metals (Wet Chg) HSL BNA Pest
2178	W-25-D(A)		HSL VOA P.P. Metals (Wet Chg) HSL BNA Pest

1 NAME: Timothy J. Lotta DATE: 9-11-86

SIGNATURE: Timothy J. Lotta SEALS PLACED ON CONTAINERS? ☒ YES ☐ NO

CUSTODY TRANSFERRED TO:

2 NAME: _____ DATE: _____ TIME: _____

SIGNATURE: _____ ARE SEALS INTACT ? ☐ YES ☐ NO ☐ N/A

CUSTODY TRANSFERRED TO:

3 NAME: _____ DATE: _____ TIME: _____

SIGNATURE: _____ ARE SEALS INTACT ? ☐ YES ☐ NO ☐ N/A

RECEIVED IN LABORATORY BY:

4 NAME: K. Crossman DATE: 9/12 TIME: 6 EC

SIGNATURE: K. Crossman ARE SEALS INTACT ? ☐ YES ☐ NO ☒ N/A

WERE ANY SAMPLES SPLIT WITH ANOTHER PARTY ? ☐ YES ☐ NO

February 13, 1987

30860-1775
FRED C. HART ASSOCIATES
40 Ames Avenue
Meriden, Connecticut 06450

Attention: Mr. Tim Lorette

Re: ConnDot #W-25

PURPOSE

Five (5) aqueous samples were submitted to York Laboratories Division of YWC, Inc. by Fred C. Hart Associates. The client requested that the samples be analyzed for HSL volatile organics, HSL base-neutral acid organics, HSL pesticides, and priority pollutant metals (excluding mercury).

METHODOLOGY

Volatile organics were determined using purge and trap GC/MS. The instrumentation used was a Tekmar Dynamic Headspace Concentrator interfaced with a Hewlett-Packard Model 5995C GC/MS/DS.

Base-neutral acid organics were determined using capillary GC/MS. The instrumentation used was a Hewlett-Packard Model 5890 gas chromatograph interfaced with a Model 5970 Mass Selective Detector.

Pesticides were determined by GC/ECD. The instrumentation used was a Perkin-Elmer Model Sigma 3 gas chromatograph equipped with an electron capture detector (Ni^{63}).

Metals were assayed by atomic absorption spectroscopy using a Perkin-Elmer Model 6500XR ICP and a Zeeman Model 3030 AAS.

RESULTS

The results are presented in the following Tables.

QUALITY ASSURANCE/CONTROL

Attached as Appendix A are the appropriate QA/QC raw data generated for the samples reported.

Prepared by:

Jeffrey C. Curran
Laboratory Manager

JCC/md

The liability of YWC, Inc. is limited to the actual dollar value of this project.

TABLE 1.0
30860-1775
FRED C. HART ASSOCIATES
PRIORITY POLLUTANT METALS

All values are mg/L.

Element	2174 W-25-1	2175 W-25-1A	2176 W-25-2	2177 W-25-3	2178 W-25-0(A)
Antimony	<0.10	<0.10	<0.10	<0.10	<0.10
Arsenic	<0.010	<0.010	<0.010	<0.010	<0.010
Beryllium	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium	<0.004	<0.004	<0.004	<0.004	<0.004
Chromium	<0.02	<0.02	<0.02	<0.02	<0.02
Copper	<0.02	<0.02	<0.02	<0.02	<0.02
Lead	<0.04	<0.04	<0.04	<0.04	<0.04
Nickel	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	<0.20	<0.20	<0.20	<0.20	<0.20
Zinc	0.02	0.02	0.02	0.03	0.02

TABLE 2.0
30860-1775
FRED C. HART ASSOCIATES
EPA HSL VOLATILE COMPOUNDS

Aqueous

All Results Reported as ug/L.

	Sample Identification					
Dilution Factor	1.0	1.0	1.0	1.0	1.0	
Method Blank I.D.	>AX392	>AX392	>AX392	>AX392	>AX392	
Compound	Method Blank	2174 W-25-1	2175 W-25-1A	2176 W-25-2	2177 W-25-3	Lower Limits of Detection with no Dilution
chloromethane	U	U	U	U	U	10
bromomethane	U	U	U	U	U	10
vinyl chloride	U	U	U	U	U	10
chloroethane	U	U	U	U	U	10
methylene chloride	5	U	U	U	U	5
acetone	11	14B	13B	U	U	10
carbon disulfide	U	U	U	U	U	5
1,1-dichloroethene	U	U	U	U	U	5
1,1-dichloroethane	U	U	U	U	U	5
trans-1,2-dichloroethene	U	U	U	U	U	5
chloroform	U	U	U	U	U	5
1,2-dichloroethane	U	U	U	U	U	5
2-butanone	U	U	U	U	U	10
1,1,1-trichloroethane	U	U	U	U	U	5
carbon tetrachloride	U	U	U	U	U	5
vinyl acetate	U	U	U	U	U	10
bromodichloromethane	U	U	U	U	U	5
1,1,2,2-tetrachloroethane	U	U	U	U	U	5
1,2-dichloropropane	U	U	U	U	U	5
trans-1,3-dichloropropene	U	U	U	U	U	5
trichloroethene	U	U	U	U	U	5
dibromochloromethane	U	U	U	U	U	5
1,1,2-trichloroethane	U	U	U	U	U	5
benzene	U	8	U	U	U	5
cis-1,3-dichloropropene	U	U	U	U	U	5
2-chloroethylvinylether	U	U	U	U	U	10
bromoform	U	U	U	U	U	5
2-hexanone	5J	U	U	U	U	10
4-methyl-2-pentanone	U	U	U	U	U	10
tetrachloroethene	U	U	U	U	U	5
toluene	U	U	U	U	U	5
chlorobenzene	U	U	U	U	U	5
ethylbenzene	U	U	U	U	U	5
styrene	U	U	U	U	U	5
total xylenes	U	U	U	U	U	5

*U - See Appendix for definition.
*J - See Appendix for definition.
*B - See Appendix for definition.

Aqueous

TABLE 2.1
30860-1775
FRED C. HART ASSOCIATES
EPA HSL VOLATILE COMPOUNDS

All Results Reported as ug/L.

	Sample Identification	
Dilution Factor	1.0	
Method Blank I.D.	>AX392	
Compound	2178 W-25-0(A)	Lower Limits of Detection with no Dilution
chloromethane	U	10
bromomethane	U	10
vinyl chloride	U	10
chloroethane	U	10
methylene chloride	U	5
acetone	U	10
carbon disulfide	U	5
1,1-dichloroethene	U	5
1,1-dichloroethane	U	5
trans-1,2-dichloroethene	U	5
chloroform	U	5
1,2-dichloroethane	U	5
2-butanone	U	10
1,1,1-trichloroethane	U	5
carbon tetrachloride	U	5
vinyl acetate	U	10
bromodichloromethane	U	5
1,1,2,2-tetrachloroethane	U	5
1,2-dichloropropane	U	5
trans-1,3-dichloropropene	U	5
trichloroethene	U	5
dibromochloromethane	U	5
1,1,2-trichloroethane	U	5
benzene	U	5
cis-1,3-dichloropropene	U	5
2-chloroethylvinylether	U	10
bromoform	U	5
2-hexanone	U	10
4-methyl-2-pentanone	U	10
tetrachloroethene	U	5
toluene	U	5
chlorobenzene	U	5
ethylbenzene	U	5
styrene	U	5
total xylenes	U	5

*U - See Appendix for definition.

TABLE 3.0
30860-1775
FRED C. HART ASSOCIATES
EPA HSL BASE/NEUTRAL/ACID COMPOUNDS

All results reported in ug/L.

	Sample Identification			
Dilution Factor	1.0	1.0	1.0	
Method Blank I.D.	>C2785 Method Blank	>C2785	>C2785	Lower Limits of
Compound	9/23/86	2174 W-25-1	2175 W-25-1A	Detection with no Dilution
Phenol	U	U	U	10
bis(2-Chloroethyl)Ether	U	U	U	10
2-Chlorophenol	U	U	U	10
1,3-Dichlorobenzene	U	U	U	10
1,4-Dichlorobenzene	U	U	U	10
Benzyl Alcohol	U	U	U	10
1,2-Dichlorobenzene	U	U	U	10
2-Methylphenol	U	U	U	10
bis(2-chloroisopropyl)ether	U	U	U	10
4-Methylphenol	U	U	U	10
N-Nitroso-Di-n-propylamine	U	U	U	10
Hexachloroethane	U	U	U	10
Nitrobenzene	U	U	U	10
Isophorone	U	U	U	10
2-Nitrophenol	U	U	U	10
2,4-Dimethylphenol	U	U	U	10
Benzoic Acid	U	U	U	50
bis(-2-Chloroethoxy)Methane	U	U	U	10
2,4-Dichlorophenol	U	U	U	10
1,2,4-Trichlorobenzene	U	U	U	10
Naphthalene	U	U	U	10
4-Chloroaniline	U	U	U	10
Hexachlorobutadiene	U	U	U	10
4-Chloro-3-methylphenol	U	U	U	10
2-Methylnaphthalene	U	U	U	10
Hexachlorocyclopentadiene	U	U	U	10
2,4,6-Trichlorophenol	U	U	U	10
2,4,5-Trichlorophenol	U	U	U	50
2-Chloronaphthalene	U	U	U	10
2-Nitroaniline	U	U	U	50
Dimethyl Phthalate	U	U	U	10
Acenaphthylene	U	U	U	10
3-Nitroaniline	U	U	U	50

*U - See Appendix for definition.

TABLE 3.1
30860-1775
FRED C. HART ASSOCIATES
EPA HSL BASE/NEUTRAL/ACID COMPOUNDS

All results reported in ug/L.

	Sample Identification			
Dilution Factor	1.0	1.0	1.0	
Method Blank I.D.	>C2785	>C2785	>C2785	
Compound	Method Blank 9/23/86	2174 W-25-1	2175 W-25-1A	Lower Limits of Detection with no Dilution
Acenaphthene	U	U	U	10
2,4-Dinitrophenol	U	U	U	50
4-Nitrophenol	U	U	U	50
Dibenzofuran	U	U	U	10
2,4-Dinitrotoluene	U	U	U	10
2,6-Dinitrotoluene	U	U	U	10
Diethylphthalate	1J	U	U	10
4-Chlorophenyl-phenylether	U	U	U	10
Fluorene	U	U	U	10
4-Nitroaniline	U	U	U	50
4,6-Dinitro-2-methylphenol	U	U	U	50
N-Nitrosodiphenylamine	U	U	U	10
4-Bromophenyl-phenylether	U	U	U	10
Hexachlorobenzene	U	U	U	10
Pentachlorophenol	U	U	U	50
Phenanthrene	U	U	2J	10
Anthracene	U	U	U	10
Di-n-Butylphthalate	U	U	U	10
Fluoranthene	U	U	2J	10
Pyrene	U	U	3J	10
Butylbenzylphthalate	U	U	1J	10
3,3'-Dichlorobenzidine	U	U	U	20
Benzo(a)Anthracene	U	U	U	10
bis(2-Ethylhexyl)Phthalate	U	U	U	10
Chrysene	U	U	U	10
Di-n-Octyl Phthalate	U	50	180	10
Benzo(b)fluoranthene	U	U	0.9J	10
Benzo(k)fluoranthene	U	U	U	10
Benzo(a)pyrene	U	U	0.7J	10
Indeno(1,2,3-cd)pyrene	U	U	U	10
Dibenzo(a,h)anthracene	U	U	U	10
Benzo(g,h,i)perylene	U	U	U	10

*U - See Appendix for definition.
*J - See Appendix for definition.

TABLE 3.2
30860-1775
FRED C. HART ASSOCIATES
EPA HSL BASE/NEUTRAL/ACID COMPOUNDS

All results reported in ug/L.

	Sample Identification			
Dilution Factor	1.0	1.0	1.0	
Method Blank I.D.	>C2785	>C2785	>C2785	
Compound	2176 W-25-2	2177 W-25-3	2178 W-25-0(A)	Lower Limits of Detection with no Dilution
Phenol	U	U	U	10
bis(2-Chloroethyl)Ether	U	U	U	10
2-Chlorophenol	U	U	U	10
1,3-Dichlorobenzene	U	U	U	10
1,4-Dichlorobenzene	U	U	U	10
Benzyl Alcohol	U	U	U	10
1,2-Dichlorobenzene	U	U	U	10
2-Methylphenol	U	U	U	10
bis(2-chloroisopropyl)ether	U	U	U	10
4-Methylphenol	U	U	U	10
N-Nitroso-Di-n-propylamine	U	U	U	10
Hexachloroethane	U	U	U	10
Nitrobenzene	U	U	U	10
Isophorone	U	U	U	10
2-Nitrophenol	U	U	U	10
2,4-Dimethylphenol	U	U	U	10
Benzoic Acid	U	U	U	50
bis(-2-Chloroethoxy)Methane	U	U	U	10
2,4-Dichlorophenol	U	U	U	10
1,2,4-Trichlorobenzene	U	U	U	10
Naphthalene	0.7J	U	U	10
4-Chloroaniline	U	U	U	10
Hexachlorobutadiene	U	U	U	10
4-Chloro-3-methylphenol	U	U	U	10
2-Methylnaphthalene	900	U	U	10
Hexachlorocyclopentadiene	U	U	U	10
2,4,6-Trichlorophenol	U	U	U	10
2,4,5-Trichlorophenol	U	U	U	50
2-Chloronaphthalene	U	U	U	10
2-Nitroaniline	U	U	U	50
Dimethyl Phthalate	U	U	U	10
Acenaphthylene	3J	U	U	10
3-Nitroaniline	U	U	U	50

*U - See Appendix for definition.
*J - See Appendix for definition.

TABLE 3.3
30860-1775
FRED C. HART ASSOCIATES
EPA HSL BASE/NEUTRAL/ACID COMPOUNDS

All results reported in ug/L.

	Sample Identification			
Dilution Factor	1.0	1.0	1.0	
Method Blank I.D.	>C2785	>C2785	>C2785	
Compound	2176 W-25-2	2177 W-25-3	2178 W-25-0(A)	Lower Limits of Detection with no Dilution
Acenaphthene	2J	U	U	10
2,4-Dinitrophenol	U	U	U	50
4-Nitrophenol	U	U	U	50
Dibenzofuran	440	U	U	10
2,4-Dinitrotoluene	U	U	U	10
2,6-Dinitrotoluene	U	U	U	10
Diethylphthalate	U	U	U	10
4-Chlorophenyl-phenylether	U	U	U	10
Fluorene	7J	U	U	10
4-Nitroaniline	U	U	U	50
4,6-Dinitro-2-methylphenol	U	U	U	50
N-Nitrosodiphenylamine	U	U	U	10
4-Bromophenyl-phenylether	U	U	U	10
Hexachlorobenzene	U	U	U	10
Pentachlorophenol	U	U	U	50
Phenanthrene	20	U	U	10
Anthracene	4J	U	U	10
Di-n-Butylphthalate	U	U	U	10
Fluoranthene	13	U	U	10
Pyrene	16	U	U	10
Butylbenzylphthalate	U	U	U	10
3,3'-Dichlorobenzidine	U	U	U	20
Benzo(a)Anthracene	U	U	U	10
bis(2-Ethylhexyl)Phthalate	U	U	U	10
Chrysene	7J	U	U	10
Di-n-Octyl Phthalate	10	4J	2J	10
Benzo(b)fluoranthene	3J	U	U	10
Benzo(k)fluoranthene	5J	U	U	10
Benzo(a)pyrene	5J	U	U	10
Indeno(1,2,3-cd)pyrene	U	U	U	10
Dibenzo(a,h)anthracene	U	U	U	10
Benzo(g,h,i)perylene	U	U	U	10

*U - See Appendix for definition.
*J - See Appendix for definition.

Aqueous

TABLE 4.0
30860-1775
FRED C. HART ASSOCIATES
EPA HSL PESTICIDES

All Results Reported as ug/L.

	Sample Identification					
Dilution Factor	1.0	1.0	1.0	1.0	1.0	
Method Blank I.D.	9/18/86	9/18/86	9/18/86	9/18/86	9/18/86	
Compound	Blank	2174 W-25-1	2175 W-25-1A	2176 W-25-2	2177 W-25-3	Lower Limits of Detection with no Dilution
alpha BHC	U	U	U	U	U	0.01
beta BHC	U	U	U	U	U	0.01
gamma BHC	U	U	U	U	U	0.01
delta BHC	U	U	U	U	U	0.01
Heptachlor	U	U	U	U	U	0.01
Aldrin	U	U	U	U	U	0.01
4,4' DDE	U	U	U	U	U	0.01
Dieldrin	U	U	U	U	U	0.01
4,4' DDD	U	U	U	U	U	0.05
Methoxychlor	U	U	U	U	U	0.50
Endrin Ketone	U	U	U	U	U	0.02
4,4' DDT	U	U	U	U	U	0.05
Chlordane	U	U	U	U	U	0.10
Endosulfan I	U	U	U	U	U	0.01
Endosulfan II	U	U	U	U	U	0.05
Endosulfan Sulfate	U	U	U	U	U	0.05
Endrin	U	U	U	U	U	0.05
Heptachlor Epoxide	U	U	U	U	U	0.01
Toxaphene	U	U	U	U	U	1.0

*U - See Appendix for definition.

Aqueous

TABLE 4.1
30860-1775
FRED C. HART ASSOCIATES
EPA HSL PESTICIDES

All Results Reported as ug/L.

	Sample Identification	
Dilution Factor	1.0	
Method Blank I.D.	9/18/86	
Compound	2178 W-25-0(A)	Lower Limits of Detection with no Dilution
lpha BHC	U	0.01
eta BHC	U	0.01
gamma BHC	U	0.01
elta BHC	U	0.01
eptachlor	U	0.01
ldrin	U	0.01
,4' DDE	U	0.01
ieldrin	U	0.01
,4' DDD	U	0.05
Methoxychlor	U	0.50
ndrin Ketone	U	0.02
,4' DDT	U	0.05
hlordane	U	0.10
ndosulfan I	U	0.01
ndosulfan II	U	0.05
ndosulfan Sulfate	U	0.05
ndrin	U	0.05
eptachlor Epoxide	U	0.01
oxaphene	U	1.0

U - See Appendix for definition.

APPENDIX

*U - Indicates that the compound was analyzed for but not detected.

*J - Indicates that the compound was analyzed for and determined to be present in the sample. The mass spectrum of the compound meets the identification criteria of the method. The concentration listed is an estimated value, which is less than the specified minimum detection limit but is greater than zero.

*B - This flag is used when the analyte is found in the blanks as well as the sample. It indicates possible sample contamination and warns the data user to use caution when applying the results of this analyte.

*D - Sample extract was diluted by the factor listed due to the sample matrix and/or concentration levels. All method lower limits of detection for this sample are necessarily increased by this dilution factor.

*N - Indicates that the compound was analyzed for but not requested as an analyte. Value will not be listed on tabular result sheet.

*M - Matrix spike compound.

RAI

Resource Analysts, Incorporated
Box 4778 Hampton, NH 03842
(603) 926-7777

TO:

Mr. Don Anne
Fred C. Hart Associates, Inc.
40 Ames Avenue
Meriden, CT 06450-2943

PO # 05001-00/86001-05
Site SB-25
Date Received: 4/7/87 (1158)

Lab Number: 9366

Date Reported: 5/28/87

Attached please find test results for your sample set SB-25.

Spike recoveries for Antimony, Arsenic and Barium were outside control limits. Spike levels for Antimony and Arsenic will be raised for future soil samples. Barium spike results for soils will be monitored closely for future samples.

No problems were encountered for Volatile Organics.

The matrix spike and duplicate surrogate and spiking compound recoveries for Base/Neutral and Acid Extractables were out of acceptable range for the initial analysis. The matrix spike and matrix spike duplicate analyses were repeated, but there was little improvement in the recoveries, pointing to negative matrix interference.

The Alpha and Gamma Chlordane values for Pesticides/PCB's are flagged with an "X" deliminator due to the fact that the laboratory is calibrated for technical Chlordane (obtained from the EPA) rather than the specific isomers.

Russell Kosker Date 5/28/87

h

Technical Director

CHAIN OF CUSTODY RECORD

FRED C. HART ASSOCIATES, INC.

☐ 530 Fifth Avenue, New York, N.Y. 10036-5166 (212)840-3990
☐ 1110 Vermont Ave., N.W., Washington, D.C. 20005-3522 (202)223-5621
☐ Penn Center West III, Pittsburgh, PA. 15276-0001 (412)787-7144
☐ 296 Washington Ave. Ext., Albany, N.Y. 12203-1007 (518)869-6192
☐ 40 Ames Avenue, Meriden CT 06450-2943 (203)235-4557
☐ P.O. Box 8248, Cherry Hill, N.J. 08002-0248 (609)663-0440
☐ 2041 Business Center Drive, Irvine CA 92715 (714)476-8536

CLIENT NAME: F.C. HART ASSOC. SAMPLED BY: J. Scerra

PROJECT NO.: 05001-00 86001-0~~4~~5 LAB NAME: R.A.I.

SAMPLE IDENTIFICATION	DATE SAMPLED/TIME	NO. OF CONTAINERS	ANALYSIS REQUESTED/REMARKS
3661-1 SB-35-5 (30-32)	3/30/87 @ 1600	3	VOA, BNA, RCRA metals (except Hg)
4 2 SB-35-7 (5-7')	4/2/87 @ 1400	3	— " —
5 3 SB-25-4 (15-17')	4/3/87 @ 1200	3	VOA's, BNA's, Pest. RCRA metals
6			

RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:	DATE/TIME:
Jim Scerra	4/6/87	Beth O'Brien	4/7/87 11:5[illegible]
FINAL DISPOSITION OF SAMPLE(S): Jim Scerra		SHIPMENT METHOD:	
COMMENTS: Seal intact.			

00000

FORM I

Client Sample No. SB-25-4(2700)
Date: 5-20-87

INORGANIC ANALYSIS DATA SHEET

Lab Name: Resource Analysts, Inc.
SOW No.: N/A
Lab No.: 9366-6

Case No.: SB-25
QC Report No. _____

Elements Identified and Measured

Concentration: Low _____ Medium _____
Matrix: Water _____ Soil X Sludge _____ Other _____

ug/L or (mg/Kg) dry weight (Circle One)

1.	Aluminum	13.	Magnesium
2.	Antimony	14.	Manganese
3.	Arsenic 2 U	15.	Mercury 0.1 U
4.	Barium 60 U	16.	Nickel
5.	Beryllium	17.	Potassium
6.	Cadmium 1 U	18.	Selenium 1 U
7.	Calcium	19.	Silver 2 U
8.	Chromium 4 U	20.	Sodium
9.	Cobalt	21.	Thallium
10.	Copper	22.	Vanadium
11.	Iron	23.	Zinc
12.	Lead 2.3		Percent Solids (%) 85

Footnotes: For reporting results to client, standard result qualifiers are used as defined on Cover Page. Additional flags or footnotes explaining results are encourage. Definition of such flags must be explicit and contained on Cover Page, however.

Comments: _____

Lab Manager John E. McCarthy

00001

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO. SB-25-4

Lab Name: RESOURCE ANALYSTS, INC Contract: NP

Lab Code: _____ Case No.: DOT25 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: 9366-3

Sample wt/vol: 4.12 (g/mL) G Lab File ID: >C1686

Level: (low/med) MED Date Received: 4/7/87

% Moisture: not dec. 14.6% Date Analyzed: 4/14/87

Column: (pack/cap) PACK Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	1000	U
74-83-9	Bromomethane	1000	U
75-01-4	Vinyl Chloride	1000	U
75-00-3	Chloroethane	1000	U
75-09-2	Methylene Chloride	800	
67-64-1	Acetone	1000	U
75-15-0	Carbon Disulfide	500	U
75-35-4	1,1-Dichloroethene	500	U
75-34-3	1,1-Dichloroethane	500	U
540-59-0	1,2-Dichloroethene (total)	500	U
67-66-3	Chloroform	500	U
107-06-2	1,2-Dichloroethane	500	U
78-93-3	2-Butanone	1000	U
71-55-6	1,1,1-Trichloroethane	500	U
56-23-5	Carbon Tetrachloride	500	U
108-05-4	Vinyl Acetate	1000	U
75-27-4	Bromodichloromethane	500	U
78-87-5	1,2-Dichloropropane	500	U
10061-01-5	cis-1,3-Dichloropropene	500	U
79-01-6	Trichloroethene	500	U
124-48-1	Dibromochloromethane	500	U
79-00-5	1,1,2-Trichloroethane	500	U
71-43-2	Benzene	500	U
10061-02-6	trans-1,3-Dichloropropene	500	U
75-25-2	Bromoform	500	U
108-10-1	4-Methyl-2-Pentanone	1000	U
591-78-6	2-Hexanone	1000	U
127-18-4	Tetrachloroethene	500	U
79-34-5	1,1,2,2-Tetrachloroethane	500	U
108-88-3	Toluene	500	U
108-90-7	Chlorobenzene	500	U
100-41-4	Ethylbenzene	500	U
100-42-5	Styrene	500	U
1330-20-7	Xylene (total)	500	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB 25-4 (2700)

Lab Name: RESOURCE ANALYSTS, INC. Contract: _____

Lab Code: _____ Case No.: 25 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 9366-6

Sample wt/vol: 30 (g/mL) g Lab File ID: MA706H8

Level: (low/med) LOW Date Received: 4/7/87

% Moisture: not dec. 85.0 dec. _____ Date Extracted: 5/5/87

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 5/6/87

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/kg	Q
108-95-2	Phenol	330	U
111-44-4	bis(2-Chloroethyl)ether	330	U
95-57-8	2-Chlorophenol	330	U
541-73-1	1,3-Dichlorobenzene	330	U
106-46-7	1,4-Dichlorobenzene	330	U
100-51-6	Benzyl alcohol	330	U
95-50-1	1,2-Dichlorobenzene	330	U
95-48-7	2-Methylphenol	330	U
108-60-1	bis(2-Chloroisopropyl)ether	330	U
106-44-5	4-Methylphenol	330	U
621-64-7	N-Nitroso-di-n-propylamine	330	U
67-72-1	Hexachloroethane	330	U
98-95-3	Nitrobenzene	330	U
78-59-1	Isophorone	330	U
88-75-5	2-Nitrophenol	330	U
105-67-9	2,4-Dimethylphenol	330	U
65-85-0	Benzoic acid	1600	U
111-91-1	bis(2-Chloroethoxy)methane	330	U
120-83-2	2,4-Dichlorophenol	330	U
120-82-1	1,2,4-Trichlorobenzene	330	U
91-20-3	Naphthalene	330	U
106-47-8	4-Chloroaniline	330	U
87-68-3	Hexachlorobutadiene	330	U
59-50-7	4-Chloro-3-methylphenol	330	U
91-57-6	2-Methylnaphthalene	330	U
77-47-4	Hexachlorocyclopentadiene	330	U
88-06-2	2,4,6-Trichlorophenol	330	U
95-95-4	2,4,5-Trichlorophenol	1600	U
91-58-7	2-Chloronaphthalene	330	U
88-74-4	2-Nitroaniline	1600	U
131-11-3	Dimethylphthalate	330	U
208-96-8	Acenaphthylene	330	U
606-20-2	2,6-Dinitrotoluene	330	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB 25-4 (2700)

Lab Name: RESOURCE ANALYSTS, INC Contract: _____

Lab Code: _____ Case No.: 25 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 9366-6

Sample wt/vol: 30 (g/mL) g Lab File ID: MA706H8

Level: (low/med) LOW Date Received: 4/7/87

% Moisture: not dec. 85.0 dec. _____ Date Extracted: 5/5/87

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 5/6/87

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/kg	Q
99-09-2	3-Nitroaniline	1600	U
83-32-9	Acenaphthene	330	U
51-28-5	2,4-Dinitrophenol	1600	U
100-02-7	4-Nitrophenol	1600	U
132-64-9	Dibenzofuran	330	U
121-14-2	2,4-Dinitrotoluene	330	U
84-66-2	Diethylphthalate	330	U
7005-72-3	4-Chlorophenyl-phenylether	330	U
86-73-7	Fluorene	330	U
100-01-6	4-Nitroaniline	1600	U
534-52-1	4,6-Dinitro-2-methylphenol	1600	U
86-30-6	N-Nitrosodiphenylamine (1)	330	U
101-55-3	4-Bromophenyl-phenylether	330	U
118-74-1	Hexachlorobenzene	330	U
87-86-5	Pentachlorophenol	1600	U
85-01-8	Phenanthrene	330	U
120-12-7	Anthracene	330	U
84-74-2	Di-n-butylphthalate	330	U
206-44-0	Fluoranthene	330	U
129-00-0	Pyrene	330	U
85-68-7	Butylbenzylphthalate	330	U
91-94-1	3,3'-Dichlorobenzidine	660	U
56-55-3	Benzo(a)anthracene	330	U
218-01-9	Chrysene	330	U
117-81-7	bis(2-Ethylhexyl)phthalate	430	
117-84-0	Di-n-octylphthalate	330	U
205-99-2	Benzo(b)fluoranthene	330	U
207-08-9	Benzo(k)fluoranthene	330	U
50-32-8	Benzo(a)pyrene	330	U
193-39-5	Indeno(1,2,3-cd)pyrene	330	U
53-70-3	Dibenz(a,h)anthracene	330	U
191-24-2	Benzo(g,h,i)perylene	330	U

(1) - Cannot be separated from Diphenylamine

1D

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB-25-4(2700)

Lab Name: RESOURCE ANALYSTS INC. Contract: _____

Lab Code: _____ Case No.: DOT-25 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: 9366-10

Sample wt/vol: 31.0 (g/mL) G. Lab File ID: _____

Level: (low/med) LOW Date Received: 4/7/87

% Moisture: not dec. 85.4 dec. _____ Date Extracted: 4/21/87

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 4/23/87

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg.	Q
319-84-6	alpha-BHC	8.0	U
319-85-7	beta-BHC	8.0	U
319-86-8	delta-BHC	8.0	U
58-89-9	gamma-BHC (Lindane)	8.0	U
76-44-8	Heptachlor	8.0	U
309-00-2	Aldrin	8.0	U
1024-57-3	Heptachlor epoxide	8.0	U
959-98-8	Endosulfan I	8.0	U
60-57-1	Dieldrin	16.0	U
72-55-9	4,4'-DDE	16.0	U
72-20-8	Endrin	16.0	U
33213-65-9	Endosulfan II	16.0	U
72-54-8	4,4'-DDD	16.0	U
1031-07-8	Endosulfan sulfate	16.0	U
50-29-3	4,4'-DDT	16.0	U
72-43-5	Methoxychlor	80.0	U
53494-70-5	Endrin ketone	16.0	U
5103-71-9	alpha-Chlordane	80.0	X
5103-74-2	gamma-Chlordane	80.0	X
8001-35-2	Toxaphene	160.0	U
12674-11-2	Aroclor-1016	80.0	U
11104-28-2	Aroclor-1221	80.0	U
11141-16-5	Aroclor-1232	80.0	U
53469-21-9	Aroclor-1242	80.0	U
12672-29-6	Aroclor-1248	80.0	U
11097-69-1	Aroclor-1254	160.0	U
11096-82-5	Aroclor-1260	160.0	U

DETAILED TEST REPORT

CONNDOT SALT STORAGE AND MAINTENANCE FACILITIES STUDY

HADDAM (HIGGANUM) FACILITY NO. 36

DISTRICT 2, SECTION 3

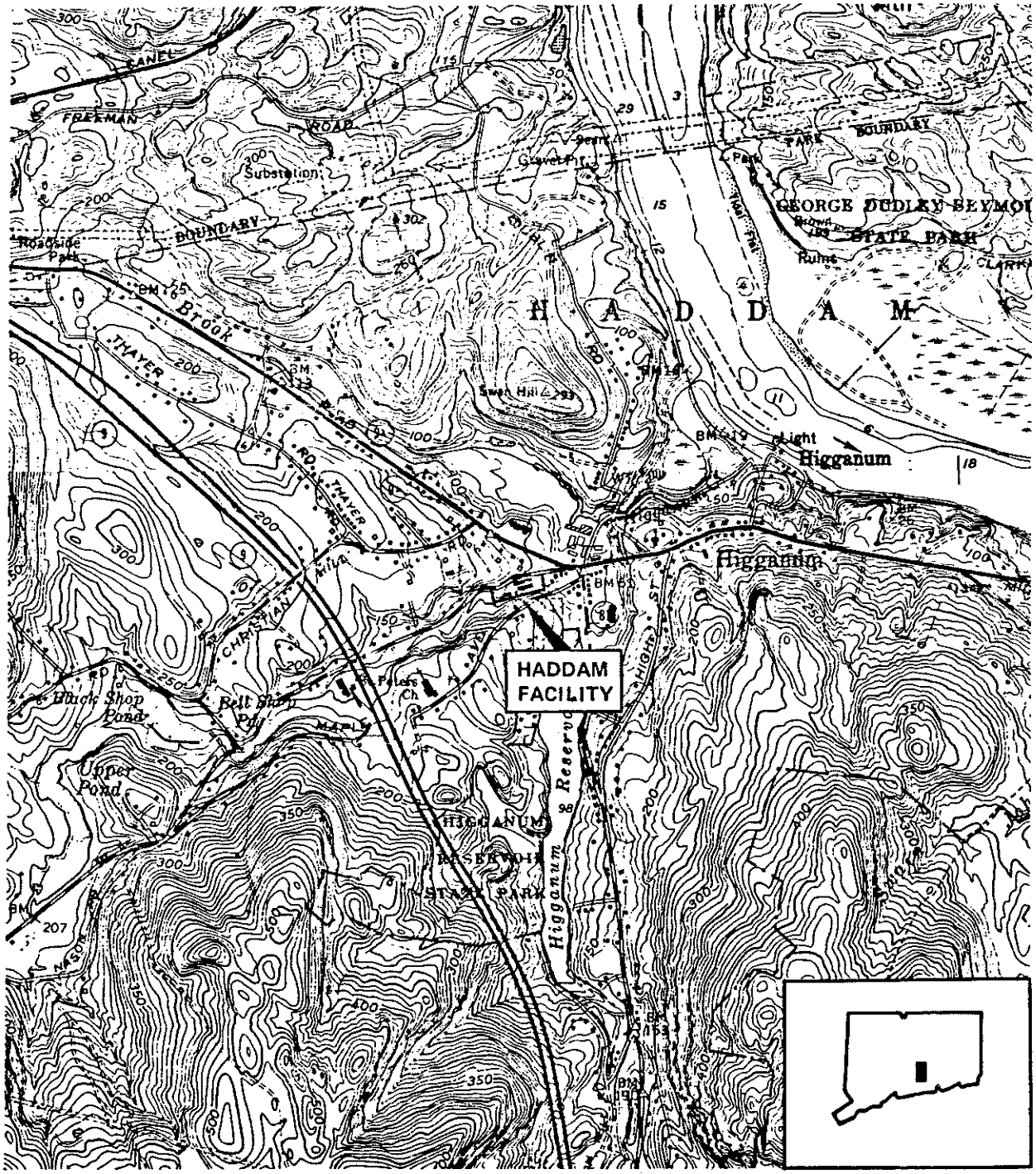
PART A: INTRODUCTION

The Haddam repair facility is located on Candlewood Hill Road, 400 feet west of the intersection of Routes 9A and 81 (see Figure D-36-1). The site has been in operation since 1941. Present activities at the site include vehicle repair, stores, and underground fuel storage. In the past, salt storage and handling and road maintenance were conducted at the site. These latter two activities were discontinued in 1973. Several drinking water wells are located near the garage, as are several industrial buildings.

Trichloroethylene (TCE) was detected in several local drinking water wells in a 1984 survey by the ConnDEP Water Compliance Unit (Winterbottom, 1984). Table D-36-1 summarizes water quality testing conducted in January and June of 1984. The concentrations detected were all below the ConnDOHS action level of 25 ug/l. TCE was not detected in the ConnDOT garage well during the 1984 survey. Even though drinking water violations were not detected, all parties shown in Table D-36-1 began receiving bottled water from ConnDOT in 1984. The location of these parties are given in Figure D-36-2.

In 1975, about 4 leaking drums of 2,4,-D and 2,4,5-T were reportedly buried in a fill area at the western end of the site. The potential pesticide disposal is currently being investigated by the waste disposal consultant. An experimental joint sealer was reportedly disposed of along the banks of Candlewood Hill Brook on ConnDOT property in the early 1960's.

A preliminary test was performed at the Haddam (Higganum) site during Phase I of the Salt Storage and Maintenance Facilities Study. A Preliminary Test Report was submitted in Volume 4 of the Phase I report in January, 1986. A trace level of benzene was detected in one monitoring well, and sodium and chloride were detected in all three monitoring wells on the site. As nearby residential and commercial wells appear to be downgradient of the site, a detailed test was recommended to evaluate potential impacts on these receptors from past releases at the site.



SOURCE: USGS TOPOGRAPHIC MAPS
HADDAM, CT., 1971
MIDDLE HADDAM, CT., 1971

FIG. D-36-1 LOCATION PLAN - HADDAM (HIGGANUM) REPAIR FACILITY

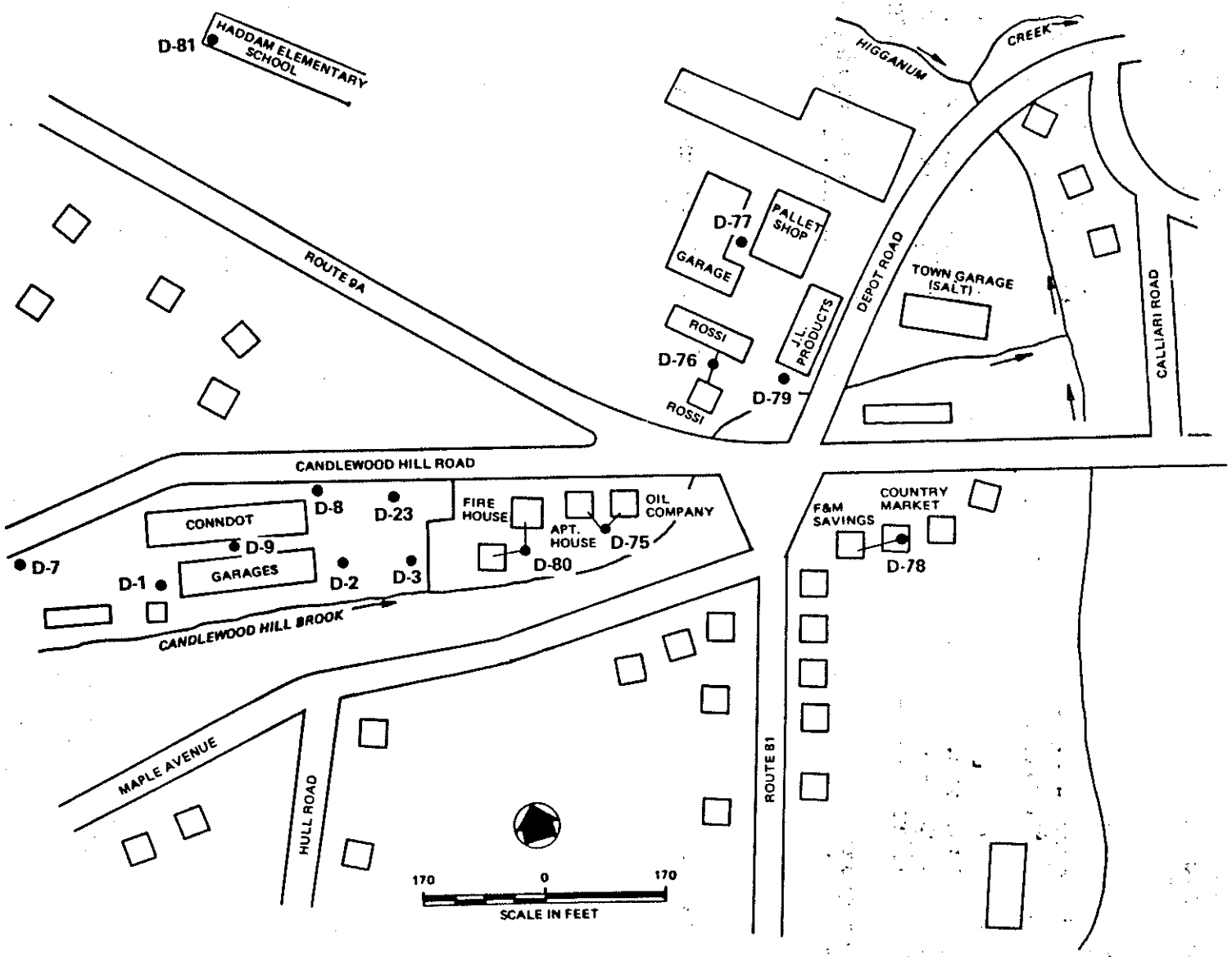


FIG. D-36-2 DETAILED TEST GROUNDWATER SAMPLE LOCATIONS - HADDAM (HIGGANUM) REPAIR FACILITY

TABLE D-36-1. TCE CONCENTRATIONS DETECTED IN 1984 CONNDEP SURVEY

Well	Date of Sample	TCE[1] Concentration (ug/l)
Crum[2] Residence	1/20/84	14
	6/6/84	15
J.C. Products, Inc.	1/20/84	13
	6/6/84	14
Rolumco, Inc.	1/20/84	12
	6/6/84	11
E. Allen, Attorney	1/20/84	11
	6/6/84	10
Farmers and Mechanics Savings Bank	1/20/84	15
	6/6/84	5
ConnDOT Garage	1/20/84	ND[3]

1. Trichloroethylene; ConnDOHS action level = 25 ug/l; proposed USEPA MCL = 5 ug/l.
2. The Crum residence could not be located in the field, and, as such, is not indicated in Figure D-36-2.
3. ND = Not Detected.

PART B: LOCAL ENVIRONMENT AND RECEPTORS

I. Environmental Description

A. Groundwater Quality Classification: The aquifer beneath the Haddam garage is classified as GA by ConnDEP. The classification indicates that groundwater may be suitable for private drinking water use without treatment.

B. Surface Water: The Candlewood Hill Brook flows in an easterly direction along the southern side of the site. The brook flows into Higganum Creek 1400 feet downstream of the Higganum Reservoir. Both the brook and creek are classified "A" by ConnDEP. The A classification indicates that the water may be suitable for drinking water supply and/or recreational purposes.

II. Drinking Water Wells: As public water is not available in Haddam, all local residential and commercial properties utilize private wells. Past contamination problems have been discussed previously (see Table D-36-1). Wells near the Haddam garage are indicated on Figure D-36-2.

PART C: DETAILED TEST RATIONALE

I. Objectives: The objectives of the detailed test may be summarized as follows:

- Determine the number of drinking water wells affected by releases of salt and organics from ConnDOT activities through chemical sampling, and transport and fate analyses.
- Develop a cost effective remedial plan including an alternatives assessment for residences affected by these releases.
- Determine if significant releases of fuel or other organic substances are occurring or have occurred from site activities.
- Assess alternatives for control of floor drain discharges.
- Evaluate whether disposal of soils receiving site drainage or of soils contaminated by disposal of experimental joint sealer is necessary.
- Provide plans for underground fuel tank modifications to achieve conformance with the Connecticut regulations regarding non-residential underground storage of oil and petroleum liquids.

II. Detailed Test Approach

A. Groundwater Contamination: Further information on hydrogeologic conditions and contaminant concentrations were obtained during the detailed test through the following testing and analyses:

- An electromagnetic (EM) survey of the site was conducted to locate residual salt in the unsaturated zone and to locate the salt plume in the groundwater.

- The three existing preliminary test wells, and the abandoned ConnDOT garage well were sampled to establish concentrations of salt and organics in the groundwater.

- Two new monitoring wells were installed upgradient of the site. The two new wells and the garage drinking water well were sampled to establish background concentrations of salt and organics.

- Five local drinking water wells with previously documented problems were located and sampled. Two other wells were sampled to establish regional background groundwater quality.

B. Surface Water Contamination: Candlewood Hill Brook was sampled to determine if groundwater discharges are affecting this surface water.

C. Soils Contamination: Several soil samples were taken to assess the potential environmental impact of residual salt from the historical salt storage and handling operations, disposal of the experimental joint sealer and the floor drain discharge.

III. Sampling Schedule: The following samples were collected at Haddam during detailed testing:

Sample Type	Number of Samples
Groundwater	14
M&E monitoring wells	5
Existing wells (ConnDOT)	2
Existing wells (privately owned)	7
Surface Water	1
Soil	7

The following tables describe sample locations and individual sample analyses. The sample locations are indicated on Figure D-36-2 and D-36-3.

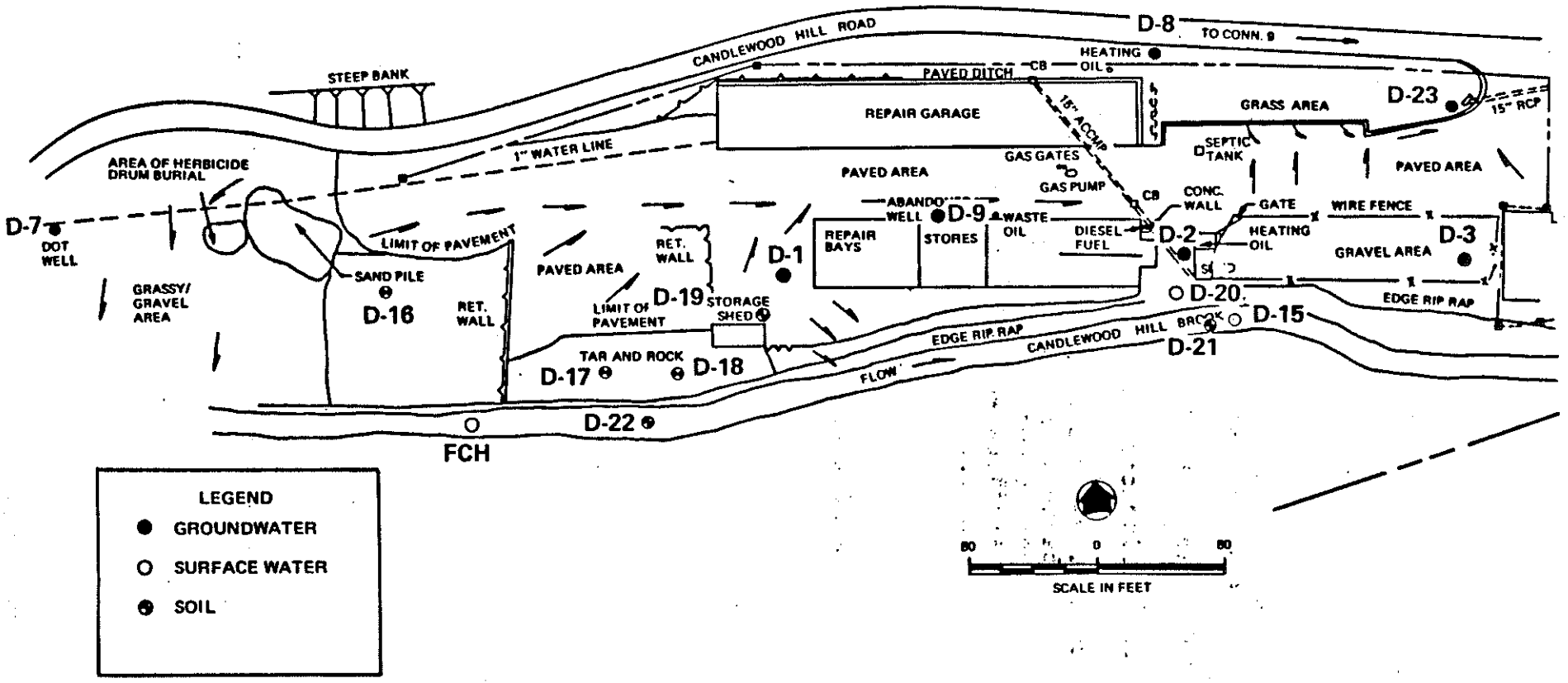


FIG. D-36-3 DETAILED TEST SAMPLE LOCATIONS - HADDAM (HIGGANUM) FACILITY

A. Groundwater:

Sample Descriptor	Location	Analytical Tests
D-36-1-GW	Existing preliminary test well no. P-1. Just west of southern repair garage.	Na, Cl, HSL volatile organics, PP acid extractable organics.
D-36-2-GW	Existing preliminary test well no. P-2. Just east of southern repair garage.	Na, Cl, HSL volatile organics, PP acid extractable organics.
D-36-3-GW	Existing preliminary test well no. 3. At eastern end of site by fenced-in storage area by brook.	Na, Cl, HSL volatile organics, PP acid extractable organics.
D-36-7-GW	Garage drinking water well at west end of site.	Na, Cl, HSL volatile organics.
D-36-8-GW	Near east end of northern repair garage.	Na, Cl, HSL volatile organics.
D-36-9-GW	Existing abandoned well just north of stores office.	Na, Cl, HSL volatile organics.
D-36-23-GW	East end of site by driveway entrance.	Na, Cl, HSL volatile organics.
D-36-75-GW	Root Agency and Higganum Oil Company (formerly E. Allen, Attorney) and apartment building.	Na, Cl, HSL volatile organics.
D-36-76-GW and 77-GW	Rossi Corporation (formerly Rolumco, Inc.).	Na, Cl, HSL volatile organics.
D-36-78-GW	Farmers & Mechanics Savings Bank and Country Store.	Na, Cl, HSL volatile organics.
D-36-79-GW	J.C. Products, Inc.	Na, Cl, HSL volatile organics.
D-36-80-GW	Fire House.	Na, Cl, HSL volatile organics.
D-36-81-GW	Haddam Elementary School.	Na, Cl, HSL volatile organics.

B. Surface Water:

Sample Descriptor	Location	Analytical Tests
D-36-15-SW	In Candlewood Hill Brook near site drainage system outlet.	HSL volatile organics, bulk petroleum hydrocarbons, petroleum hydrocarbon scan.

C. Soil:

Sample Descriptor	Location	Analytical Tests
D-36-16-SL	In borehole in fill area.	Na, Cl.
D-36-17-SL and D-36-18-SL	In boreholes below grade in area where experimental joint sealer was dumped.	Na, Cl, EP toxicity (metals only), bulk petroleum hydrocarbons, petroleum hydrocarbon scan.
D-36-19-SL	In borehole near former salt shed.	Na, Cl.
D-36-20-SL	Soil or sediment near site drainage system outlet.	EP toxicity (metals only), HSL volatile organics, bulk petroleum hydrocarbons, petroleum hydrocarbon scan.
D-36-21-SL	Sediment from Candlewood Hill Brook near site drainage system outlet.	EP toxicity (metals only), bulk petroleum hydrocarbons, petroleum hydrocarbon scan, HSL volatile organics.
D-36-22-SL	Sediment from Candlewood Hill Brook near area of experimental joint sealer disposal.	EP toxicity (metals only), bulk petroleum hydrocarbons, petroleum hydrocarbon scan, HSL volatile organics.

PART D: HYDROGEOLOGIC RESULTS

Based on local topography, boring logs taken from each well, and water table elevations in these wells recorded on both August 22-23, 1985 and August 29, 1986, a hydrogeologic analysis was performed. This entailed:

- Estimation of the direction of the hydraulic gradient;
- Preparation of a geologic cross-section.

I. Geologic Cross Section: An interpretation of the subsurface conditions at the site, based on data from boring numbers 1, 2, 3, and 23, is shown on the geologic cross-section in Figure D-36-4. The surficial materials are primarily stratified drift deposits of sand, gravel, and minor amounts of silt. The stratified drift is relatively well sorted with a moderate permeability. Bedrock was encountered in boring nos. 1, 3, and 23 at approximate depths of 12.5, 9.5 and 7.5 feet respectively. Cores recovered from the borings indicated highly fractured bedrock conditions, as reflected by the low rock quality designations (RQD). RQD is a measure of the degree to which a rock is fractured. An RQD of 100 percent denotes a completely unfractured rock. The computed RQDs at Haddam were 0 percent in boring no. 1 and 15 percent in boring no. 3. Conditions observed in the field were consistent with the literature (Flint, 1978).

II. Local Hydraulic Gradient: The direction of the local hydraulic gradient obtained from water table elevations in well nos. 1, 2, 3, and 23 is generally to the south/southeast. Figure D-36-5 shows the piezometric surface estimated from water level measurements taken on 8/29/86. The maximum hydraulic gradient at this site is estimated to be 0.07 ft/ft and has an average slope of 0.05 ft/ft. Groundwater flows predominantly southeast into Candlewood Hill Brook.

Natural subsurface material at the site consists primarily of fine to coarse sand with some gravel and little silt. Although this material appears to be stratified, no material was encountered in the boreholes which could significantly retard vertical migration of groundwater.

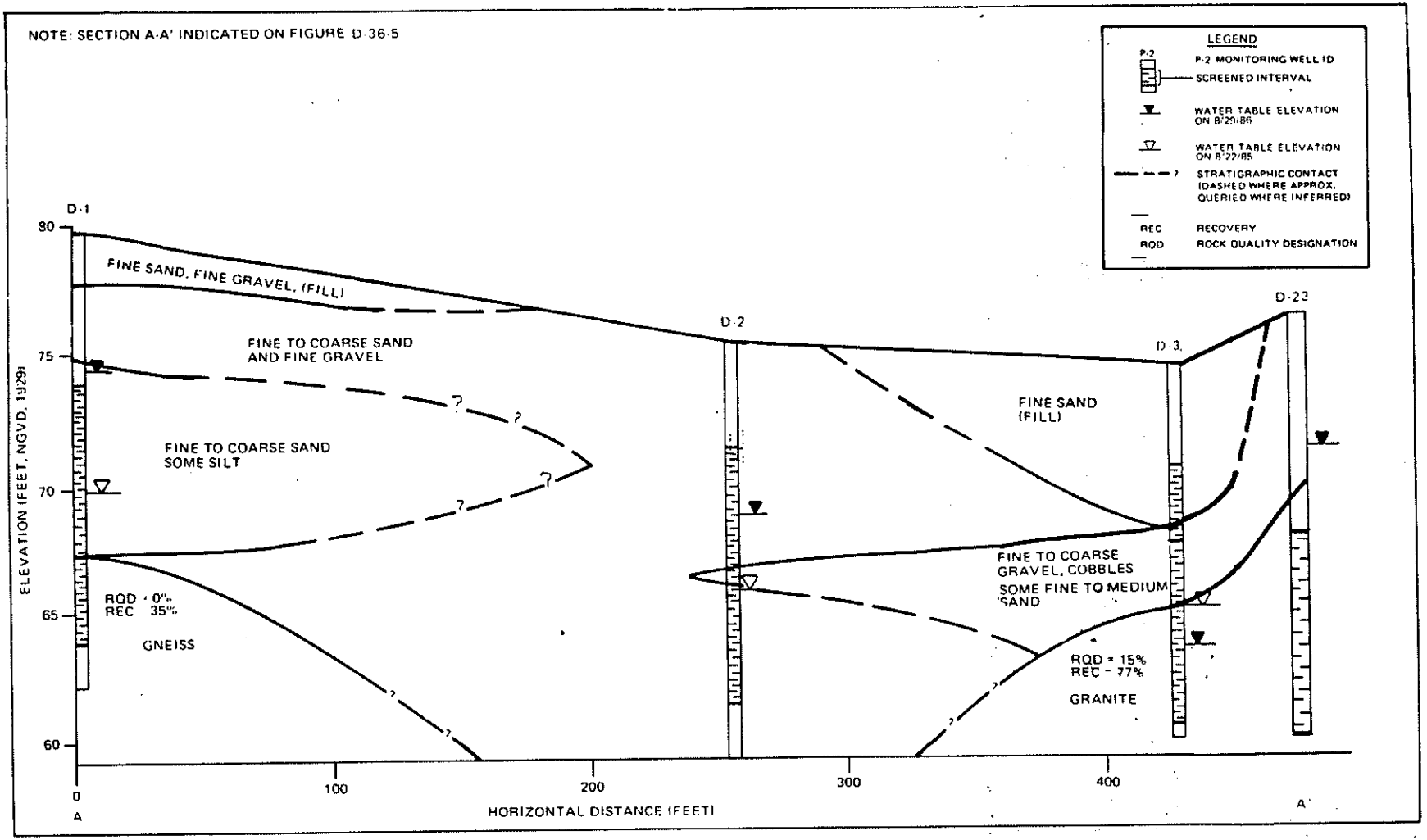


FIG. D-36-4 GEOLOGIC CROSS-SECTION A-A' AT THE HADDAM (HIGGANUM) FACILITY

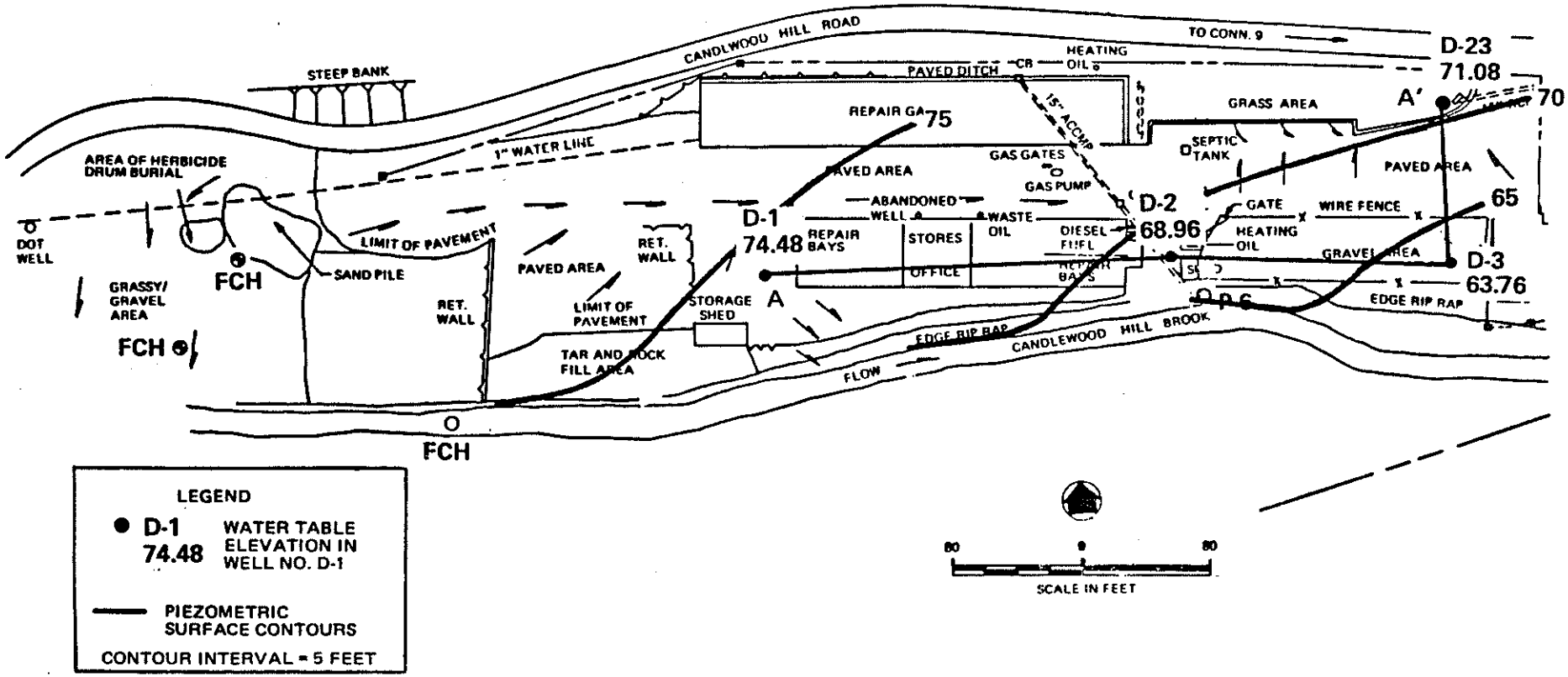


FIG. D-36-5 PIEZOMETRIC SURFACE - HADDAM (HIGGANUM) FACILITY

METCALF & EDDY

PART E: CHEMICAL DATA ANALYSIS

I. Water Quality Data: The following sections describe the results of the various water quality analyses performed during detailed testing.

A. Sodium and Chloride Data: Table D-36-2 lists sodium and chloride water quality data collected during preliminary and detailed testing.

TABLE D-36-2. SODIUM AND CHLORIDE RESULTS FROM PRELIMINARY AND DETAILED TESTING AT HADDAM

Sample Number	Sample Description	Date Collected	Concentration (mg/l) Na	Cl
D-1	Monitoring Well (MW)	8/22/85	349	523
		9/2/86	354	442
D-2	MW	8/22/85	96	231
		8/29/86	107	129
D-3	MW	8/22/85	75	162
		9/2/86	317	669
D-7	ConnDOT Supply Well	9/3/86	10	12
D-8	MW	8/29/86	14	23
D-9	MW	9/2/86	10	13
D-23	MW	8/29/86	237	375
D-75	Root Agency	6/17/86	71	121
		9/3/86	45	84
D-76	Rossi	6/17/86	35	64
D-76		9/3/86	15	26
D-77		9/3/86	14	25
D-78	Farmers Savings	9/3/86	27	43
D-79	J.C. Products	9/3/86	14	29
D-80	Fire House	6/17/86	56	99
		9/3/86	50	88
D-81	Haddam Elementary	6/17/86	9	11
		9/3/86	10	19

B. Volatile Organic Results: Volatile organics were not detected in sample nos. 7, 8, and 23. Table D-36-3 summarizes fuel-related volatile organics detected during both preliminary and detailed testing. Table D-36-4 summarizes non-fuel related organics detected during detailed testing. None of the non-fuel related organics were detected during preliminary testing. Acetone was detected in the surface water sample for Candlewood Hill Brook (sample D-15) at a concentration of 2100 ug/l. Methyl isobutyl ketone was also detected in the sample below the method detection limit of 10 ug/l.

TABLE D-36-3. FUEL-RELATED VOLATILE ORGANIC RESULTS AT HADDAM

Sample Number	Sample Description	Date Collected	Concentration (ug/l) Benzene	Toluene
D-2	MW	8/29/86	4	ND(1)
D-3	MW	8/22/85	1	ND
D-76	Rossi	9/3/86	1	BMDL(2)
D-78	Farmers Savings	9/3/86	3	ND
D-79	J.C. Products	9/3/86	1	ND
Method Detection Limit			1	5

1. Not detected
2. Below method detection limit

C. Acid Extractable Organics: Acid extractable organics were not detected in well nos. D-1, D-2, and D-3 during detailed testing.

D. Petroleum Hydrocarbons: Petroleum hydrocarbons were tested for in Candlewood Hill Brook near the floor drain discharge (sample no. D-15). Weathered kerosene was detected in the surface water at a concentration of 10 mg/l.

TABLE D-36-4. NON-FUEL RELATED HSL VOLATILE ORGANICS DETECTED DURING DETAILED TESTING AT HADDAM

Sample Description	Sample Date	Concentration (ug/l) Trichloro-ethylene	Methylene Chloride	Acetone	Chloroform	Methyl Butyl Ketone	Methyl Isobutyl Ketone	1,1,2,2-Tetrachloro-ethane
D-1	9-2-86	ND[1]	ND	104	ND	ND	ND	ND
D-2	8-29-86	ND	18	83	6	ND	ND	ND
D-3	9-2-86	ND	ND	4	ND	ND	ND	ND
D-9	9-2-86	ND	ND	31	ND	ND	ND	ND
D-79 J.C. Products	9-3-86	13	BMDL[2]	7	ND	ND	ND	ND
D-75 Root Agency	9-3-86	10	ND	ND	ND	BMDL	BMDL	BMDL
D-76 Rossi	9-3-86	11	ND	BMDL	ND	ND	ND	ND
D-77 Rossi	9-3-86	11	ND	BMDL	ND	ND	ND	ND
D-78 Farmers Bank	9-3-86	BMDL	ND	10	ND	ND	ND	ND
D-80 Fire House	9-3-86	13	BMDL	BMDL	ND	ND	ND	ND
D-81 Haddam Elementary	9-3-86	ND	BMDL	BMDL	ND	ND	ND	ND
Method Detection Limit		5	5	10	5	10	10	5

1. Not detected.
2. Below Method Detection Limit.

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II. Soils Quality Data: Several soil samples were collected to assess the potential environmental impact from past salt storage and handling operations, disposal of the experimental joint sealer, and floor drain discharges to Candlewood Hill Brook. The results of these tests are presented below.

A. Inorganics: Table D-36-5 summarizes sodium, chloride, and metals results for soil samples collected during detailed testing.

TABLE D-36-5. SODIUM, CHLORIDE AND METALS DETECTED IN SOILS DURING DETAILED TESTING

Sample Number	Depth Interval (feet)	Concentration			
		Na (mg/kg)	Cl (mg/kg)	Barium (mg/l)	Lead (mg/l)
D-16	5-13	213	76	NA(1)	NA
D-17	5-7	281	101	0.7	5.1
D-18	0-3	1320	141	0.5	ND(2)
D-19	0-6	411	111	NA	NA
D-20	Surface	NA	NA	ND	0.11

1. Not analyzed.
2. Not detected.

B. Organics: The HSL volatile organics and petroleum hydrocarbons which were detected in the soils during detailed testing are presented in Table D-36-6.

III. Numerical Criteria: The analytical results are compared to established numerical criteria to screen for environmental conditions that may have regulatory importance. Such criteria for relevant analytes are listed below.

TABLE D-36-6. VOLATILE ORGANICS AND PETROLEUM HYDROCARBONS DETECTED IN SOILS DURING DETAILED TESTING

Parameter	Concentration					Method Detection Limit
	D-17 (5-9)[1]	D-18 (0-3)[1]	D-20	D-21	D-22	
Benzene (ug/kg)	ND[2]	NA[3]	2	2	ND	1
Toluene (ug/kg)	BMDL	NA	BMDL	BMDL	ND	5
Methylene Chloride (ug/kg)	15	NA	BMDL	BMDL	BMDL	5
Acetone (ug/kg)	ND	NA	BMDL	BMDL	593	10
Carbon Disulfide (ug/kg)	ND	NA	ND	BMDL	6	5
Chloroform (ug/kg)	ND	NA	BMDL	ND	ND	5
1,1,1-Trichloroethane (ug/kg)	18	NA	ND	ND	ND	5
Bulk Petroleum Hydrocarbons (mg/kg)	NA	106	ND	699	143	2
Petroleum Hydrocarbon Scan	NIP[4]	NIP	NIP	Kerosene or #6 oil	Kerosene or #6 oil	--

1. Depth interval in feet
2. ND = Not Detected
3. NA = Not Analyzed
4. NIP = No Identifiable Peaks

A. Water Quality Criteria:

Chemical Parameter	Numerical Criteria	Comments
Sodium	20 mg/l	American Heart Association recommended level for persons on a sodium-restricted diet. USEPA suggested guidance level for the "high risk" population, ConnDOHS drinking water guideline.
Chloride	250 mg/l	USEPA secondary drinking water standard based on palatability, ConnDOHS standard.
Benzene	1 ug/l 5 ug/l	ConnDOHS action level. Proposed USEPA enforceable maximum contaminant level (MCL).
Toluene	1000 ug/l	ConnDOHS action level.
TCE	25 ug/l 5 ug/l	ConnDOHS action level. Proposed federal MCL.
Chloroform	100 ug/l	USEPA MCL for trihalomethanes (THM). Chloroform is a THM.
Methylene Chloride	25 ug/l	ConnDOHS action level.
Acetone	3500 ug/l	USEPA Safe Drinking Water Exposure Level (SDWEL) (USEPA, May, 1986).
Methyl Isobutyl Ketone	1700 ug/l	USEPA SDWEL.

B. Soil Numerical Criteria: The ConnDEP has established numerical guidelines to evaluate conditions where soils may contain "hazardous" or "contaminated" concentrations of metals or hydrocarbons. The "contaminated" numerical criteria are of the same magnitude as the drinking water standard or suggested no adverse response level (SNARL), whichever is the lesser concentration. "Hazardous" soils are identified by metals concentrations more that 30 times the drinking water standard or hydrocarbon concentrations in excess of 50 mg/kg. Hydrocarbons are

defined by a specific list of parameters established by ConnDEP. Table D-36-7 summarizes the numerical guidelines and describes remedial actions recommended by ConnDEP.

IV. Discussion of Results

A. Groundwater Samples: Detailed test data suggest that residual salt from salt storage and handling operations (discontinued in 1973) is persisting in the groundwater local to the Haddam garage. The concentrations of sodium and chloride detected during detailed testing are shown in Figure D-36-6. Based on the local groundwater flow regime, it is likely that the residual salt is causing elevated levels of sodium in two wells, one serving the fire house (D-80), and the other serving the apartment house and oil company (D-75).

Only two other wells with elevated sodium levels were detected during detailed testing, Rossi, Inc. (D-76) and the well serving both the Farmers and Mechanics Savings bank and the Country Market (D-78). The Rossi, Inc. well had a level of 35 mg/l sodium when tested on June 17, 1986 and only a level of 15 mg/l sodium when tested on September 3, 1986.

Volatile organics that were detected and are of regulatory concern are benzene and trichloroethylene. Benzene was found at trace levels, with the highest concentration of 4 ug/l found in an on-site monitoring well (D-2). Benzene was also found on-site in well no. 3 at a concentration of 1 ug/l. The wells serving the fire house (D-80) and oil company (D-75) did not have benzene in them, indicating that off-site receptors are not being affected. Benzene detected at these low concentrations in the wells during detailed testing is more likely to originate from small surface spills while refueling or from pavement runoff rather than from an underground fuel tank leak.

Trichloroethylene (TCE) was detected in five off-site drinking water wells. Trichloroethylene was not detected in any of the five on-site monitoring wells nor in two on-site drinking water supply wells. It is therefore unlikely that the trichloroethylene found in the groundwater during detailed testing is currently originating at the ConnDOT garage.

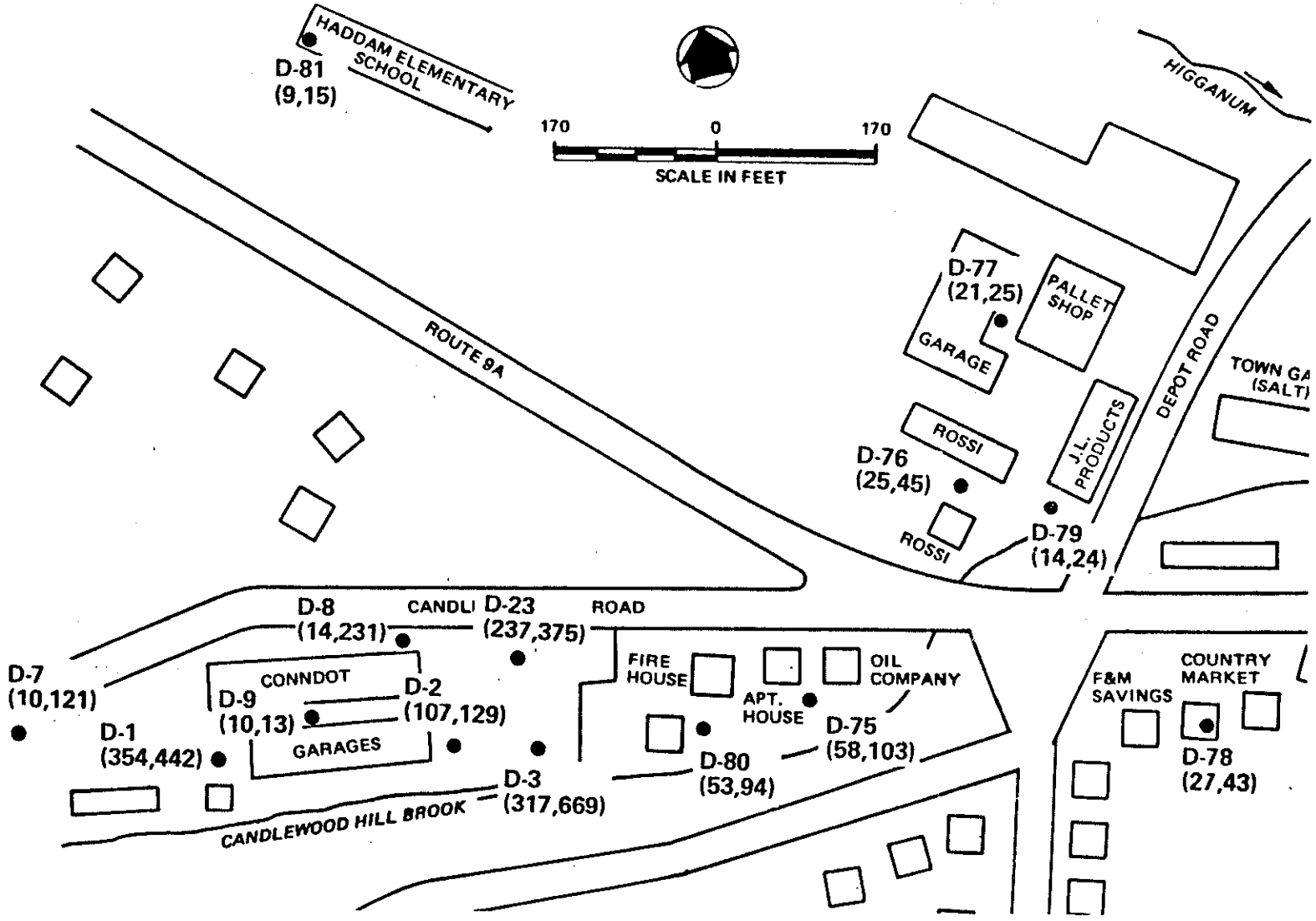

FIG. D-36-6 SODIUM AND CHLORIDE ($NaCl$) CONCENTRATIONS IN MG/L DETECTED DURING DETAILED TESTING

TABLE D-36-7. CONNDEP "CONTAMINATED" AND "HAZARDOUS" SOILS NUMERICAL GUIDELINES AND REMEDIAL RESPONSE RECOMMENDATIONS

Parameter	"Contaminated" Soil		"Hazardous" Soil	
	Numerical Guideline (mg/l)(1)	Remedial Response	Numerical Guideline (mg/l)	Remedial Response
Arsenic	0.05-1.5	Excavate affected soils and dispose of in a ConnDEP approved solid waste disposal facility. Work may be performed by a general contractor.	>1.5	Excavate affected soils, then mainfest, and transport soil for disposal in a permitted hazardous waste waste disposal facility. Excavation should be by a contractor qualified to perform hazardous waste work. Transport should be by a licensed hazardous waste hauler.
Barium	1.0-30.0		>30.0	
Cadmium	0.01-0.3		>0.3	
Chromium	0.05-1.5		>1.5	
Lead	0.05-1.5		>1.5	
Mercury	0.002-0.06		>0.06	
Selenium	0.01-0.03		>0.3	
Silver	0.05-1.5		>1.5	
Hydrocarbons	Any one organic > federal SNARL. (2)		Sum of all hydrocarbons >50 ppm.	

(1) Metals concentrations are determined via EP toxicity procedure.
(2) SNARL = Suggested no adverse response level established by USEPA.

Levels of TCE detected in all groundwater samples were below the ConnDOHS action level of 25 ug/l. The TCE concentration detected in the five off-site drinking water wells were above the proposed federal MCL of 5 ug/l.

B. Surface Water Samples: One surface water sample was collected in a pool of standing water at the outlet of the floor drain discharge near Candlewood Hill Brook. The sample had evidence of a petroleum-like hydrocarbon sheen on its surface. The surface water sample contained weathered kerosene or a number 6 oil. The total bulk petroleum hydrocarbon concentration was 9.7 mg/l. Acetone was also detected (404 mg/l) in this sample. Given the location and appearance of the sample, it appears that the floor drain discharge may contribute to contamination of Candlewood Hill Brook.

C. Soils: A soil sample taken from a borehole where experimental joint sealer was reportedly disposed of (D-17) was found to be ConnDEP "hazardous" with respect to lead. A sample taken from a borehole approximately 30 feet east in the same area (D-18) was not contaminated with metals or hydrocarbons.

A sample taken from the toe of the landfill (D-22) was not contaminated with metals. Although petroleum hydrocarbons resembling a weathered kerosene or #6 oil were detected, volatile organic concentrations were all below applicable numerical criteria. The soils are therefore not "contaminated" per the ConnDEP soils removal guidelines.

Soil sample D-20 collected near the floor drain discharge is ConnDEP "contaminated" with respect to lead. A trace concentration of benzene was detected in this sample and in another sample (D-21) collected about 10 feet further downstream near Candlewood Hill Brook. Petroleum hydrocarbons were also detected near the brook. Although organic compounds were detected in these two samples, the concentrations were all below the numerical criteria.

PART F: CONTAMINANT TRANSPORT AND FATE ANALYSIS

I. Electromagnetic Survey

A. Objectives: In order to characterize the residual salt contamination of groundwater, it is important to identify the horizontal extent of the residual plume and

assess its impacts on local receptors. An electromagnetic (EM) terrain conductivity survey was conducted at the garage site as part of this effort.

Elevated levels of sodium and chloride cause an increase in the conductivity of groundwater. During an EM survey, a hand-held instrument is used to measure the conductivity of the subsurface by inducing an electric current in the ground and measuring the strength of the magnetic field generated by the induced current. By recording EM measurements over a surface grid, a horizontal pattern of bulk soil and water conductivities may be delineated.

B. Survey Date: An EM survey was conducted on the site on Tuesday, March 11, 1986. The EM survey was conducted with an EM31 terrain conductivity meter. Due to the high density of buildings and buried utilities, spot EM readings were taken out of the influence of such structures. Approximately 50 data points were collected. Background conductivity, which was determined by surveying a region upgradient of the site, was typically less than 1.5 millimhos/meter. Surficial materials at the site consist of stratified drift deposits composed primarily of gravel, sand, and minor amounts of silt. The detected background conductivity was consistent with this geology.

C. Contaminant Plumes: The results of the EM survey are shown in Figure D-36-7. The background conductivity is given by the 1.5 millimho/meter contour. Conductivities of up to 18 millimhos/meter were recorded near the former salt storage and handling area. The residual salt plume appears to extend beneath the fire house and the oil company.

D. Buried Metal Detection: EM measurements suggested the presence of buried metal or other conductive objects in many areas of the site.

E. Potentially Affected Resources

1. Drinking water wells: The well serving the fire house and the well serving the Higganum Oil Company and the Root Insurance Agency appear to be located within the residual salt plume. No other wells appear to be affected by releases from the ConnDOT facility.

2. Environmental receptors: The residual salt plume is discharging into Candlewood Hill Brook.

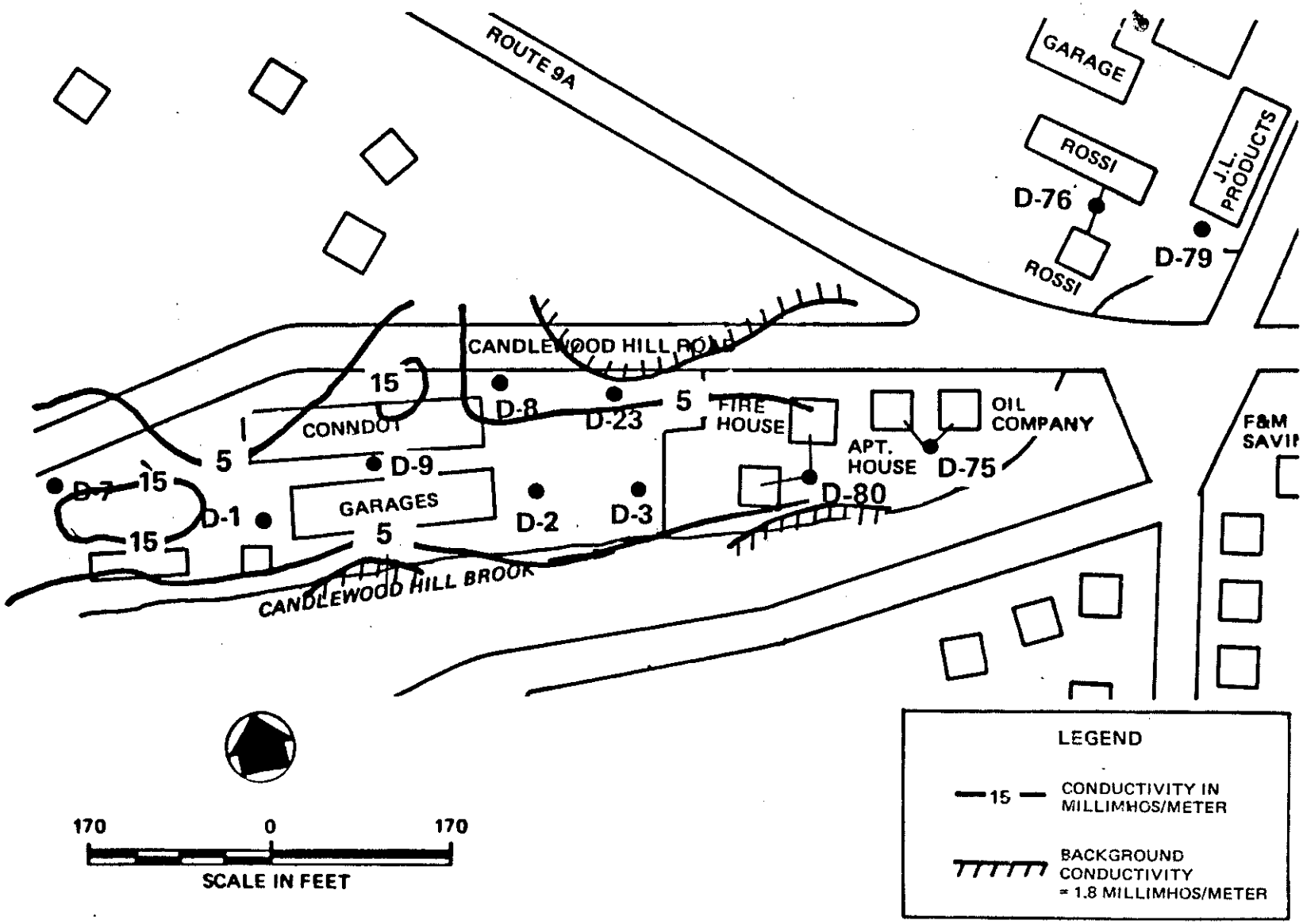

FIG. D-36-7 ELECTROMAGNETIC TERRAIN CONDUCTIVITY SURVEY - HADDAM (HIGGANUM) REPAIR FACILITY

II. Contaminant Transport: Based on the hydrogeologic analysis from Part D, the chemical results and the EM survey, contaminants originating at the site do not migrate via groundwater out of an area defined by Candlewood Hill Brook, Candlewood Hill Road and the western most boundary of the site. Contaminants which enter the groundwater on ConnDOT property will eventually discharge into Candlewood Hill Brook and be significantly diluted.

The brook is likely to have ample assimilative capacity to receive the salt from the groundwater discharge. Given the low levels of benzene and TCE detected in the groundwater ($\leq$ 4 ug/l and $\leq$ 13 ug/l, respectively) this groundwater discharge is also likely to be assimilated by the brook. Benzene and TCE will also volatilize from the brook in addition to being diluted.

Local on-site groundwater flow patterns suggest that contaminants originating at the ConnDOT facility would not migrate toward the Rossi well. Figure D-36-8 illustrates the local groundwater flow regime, derived from the hydrogeologic analysis conducted during detailed testing. The regional flow regime is estimated from local topography. Contaminants will generally migrate along these directions while gradually spreading out as the contaminant plume disperses. As can be seen from Figure D-36-8, contaminants originating at the ConnDOT site are unlikely to reach the industrial park formed by Rossi, Inc., J.L. Products, Inc., and other tenants.

One potential source of the elevated sodium levels in the industrial park wells is from the road salting of Route 9A. The Savings Bank well is on the opposite side of Candlewood Hill Brook and appears to be isolated from contaminants migrating from the ConnDOT garage. A potential source of the elevated sodium levels in this well is the road salting of Route 81.

As TCE would migrate in the same direction as the salt, the TCE found in the industrial park wells (Rossi, J.C. Products) most likely did not originate from the ConnDOT garage. A possible source of the TCE contamination is from disposal of household cleaning agents and other similar products into septic systems or leaching wells (Haddam has no sewer system in this area). A past release from the garage could possibly be causing the elevated levels in the fire house and oil company wells.

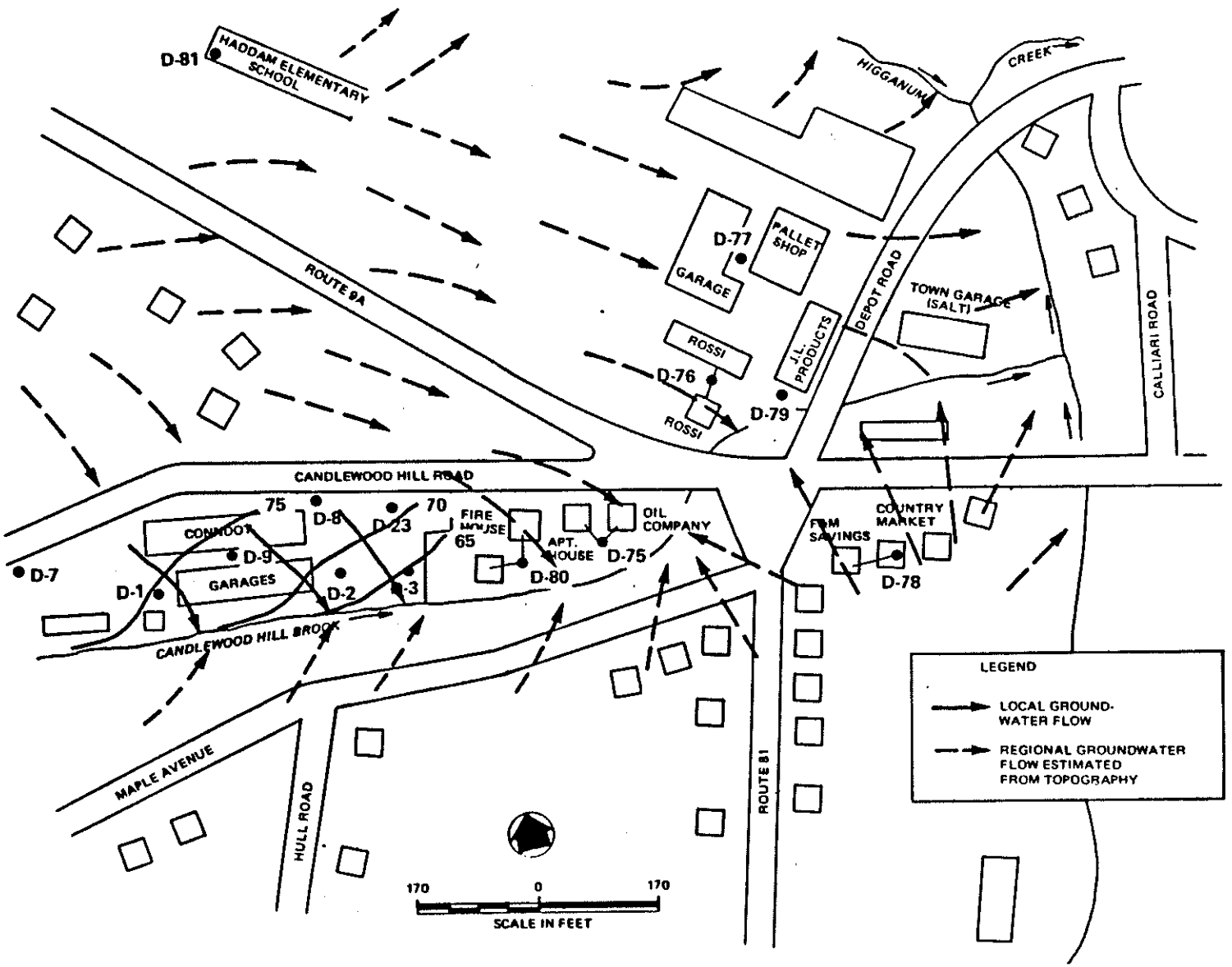

FIG. D-36-8 REGIONAL GROUNDWATER FLOW REGIME - HADDAM (HIGGANUM) REPAIR FACILITY

The natural flushing for the residual contaminants in the groundwater beneath the garage could not be estimated. Residual salt is still present at high concentrations 13 years after the salt storage and handling operation was discontinued. The movement of the chloride ion best reflects the movement of the groundwater. As high concentrations of chloride were observed along with high sodium concentrations, the persistence of salt in the groundwater appears to reflect a slow groundwater velocity.

PART G: RISK ASSESSMENT

The major risk posed by contamination detected at the Haddam site is that lead and sodium detected in soils and groundwater may be affecting downgradient drinking water wells. Benzene detected in monitoring wells on the site could potentially effect downgradient private wells in the future. The wells potentially at risk are the fire house well (D-80) and the apartment and oil company well (D-75). Other wells in the area are not likely to be affected by releases from the ConnDOT site.

I. Exposure Assessment: It has been shown that elevated sodium concentrations in the two affected wells are the result of past salt storage at the Haddam site. As salt storage was discontinued at the site 13 years ago, it appears that groundwater flow and resulting flushing of the aquifer is very slow. It is likely that sodium concentrations will remain above the 20 mg/l guideline concentration for some time into the future.

Lead concentrations were not measured in groundwater during the detailed test, however very high concentrations were detected in the EP toxicity leachate from soils on the site. If lead is being released to the groundwater, it would migrate in a similar direction as has sodium.

Benzene was detected in two monitoring wells on the ConnDOT site. Detailed test results indicate that drinking water receptors are not presently being affected by benzene. However, based on groundwater flow directions, future benzene contamination of the private wells is a possibility.

II. Health Risks

A. Sodium: Ingestion of more than 2 to 3 grams of sodium per day may pose a health risk to persons in the "high risk" population as defined by the

American Heart Association (AHA). For persons in this group, the AHA recommends that the contribution of drinking water sodium to the total dietary sodium intake not exceed 2 percent. This corresponds to drinking two liters of water daily containing no more than 20 mg/l of sodium. The following table presents the contribution of drinking water sodium at critical concentrations detected at Haddam to total dietary intake of sodium. It assumes that for a drinking water sodium concentration of 20 mg/l, the person would ingest a total of 2 grams of sodium daily.

Concentration of Sodium in Water (mg/l)	Condition Similar to	Drinking Water Sodium / Total Dietary Sodium (Percent)
20	Maximum Recommended by AHA	2
53	Fire House	5
58	Apartments and Higganum Oil Co.	6

The above table indicates that if persons in the region affected by the salt plume are in the "high risk" population, consuming groundwater could cause AHA guidelines for drinking water sodium to be slightly exceeded.

B. Lead: Based on the demonstrated adverse health effects of lead, the EPA has established an MCLG for lead in drinking water of 0.02 mg/l. The MCLG is based on an analysis of the effects of lead in infants as a sensitive subpopulation. The MCL (enforceable standard) for lead is 0.05 mg/l (Federal Register, Nov. 13, 1985). Lead concentration in the groundwater at Haddam was not analyzed during detailed testing. However, EP toxicity results for a soil sample indicated a leachable concentration of lead in soils on the site (5.1 mg/l in sample D-17) of more than two orders of magnitude greater than the MCL. As drinking water receptors are located downgradient from the site, there is a potential human health risk from lead contaminated soils.

considered a Community Water Supply System, and that some form of certificate would be required~~, if a single well were installed to replace the two affected wells~~.

A preliminary estimate of the cost to design and install a community water supply system that satisfies the design standards specified by the Connecticut Department of Public Utilities in Docket No. 84-09-18 has been prepared. The system would not provide fire protection, as its objective is to provide acceptable water quality, not quantity. Water treatment includes chlorination and pH control. The estimate may be summarized as follows:

Description	Estimated Cost
2 ConnDOHS approved drinking water wells	40,000
Test drilling	6,000
Storage and Pump Station	70,000
4 Service Connections @ $750 ea.	3,000
Distribution system (assume 500 ft @ $50/ft)	25,000
Subtotal: Construction Cost	144,000
Engineering; Contractor's overhead and profit (@ 40%)	58,000
Contingency (@ 20%)	28,000
Total Cost	$230,000

C. Benzene: Based on the demonstrated carcinogenic capacity of benzene, the USEPA has established a Federal MCLG of zero (Federal Register, June 12, 1984, Nov. 13, 1985). The MCL (enforceable standard) for benzene is 5 ug/l. For comparative purposes the USEPA has derived risk estimates based on the demonstrated carcinogenic effects of benzene. The level which may result in an increase of cancer risk of 1 in 1,000,000 (10^{-6} risk level) is 0.66 ug/l (USEPA, 1986). Concentrations above this level have been detected in the groundwater at the Haddam site. Benzene was not detected in private wells sampled during detailed testing.

PART H: RECOMMENDATIONS

I. Alternative Water Source: A number of human receptors are currently being affected by residual salt concentrations in the aquifer local to the Haddam garage. Bottled water is currently being provided to all receptors shown in Table D-36-1. However, it is likely that the residual salt contamination from the Haddam garage is only responsible for the Higganum Oil Company well (D-75) and the fire house well (D-80). Since the sodium concentrations on-site are still 5-18 times the 20 mg/l criterion after 13 years of natural flushing, and since the flushing time for the private wells is unknown but likely long, alternative water supplies are proposed for the affected receptors.

As Haddam has no public water supplies in this area, the only alternative water supply would be new wells in an unaffected portion of the aquifer. Two potential remedial measures have been identified to provide alternative water to the Higganum Oil Company and the Haddam Fire house. The first, is to provide a single well in an area upgradient from the ConnDOT site to serve both users. The second, is to replace each of the two affected wells with new, deeper wells.

If a single water supply well must serve more than six units or 25 individuals, Connecticut regulations require that a Certificate of Public Convenience and Necessity be obtained for the system to be operated as a new utility. This process may be lengthy and costly. An additional requirement is that the system include two wells. The well serving the Higganum Oil Company office also serves an adjacent apartment house. These residents, combined with the Fire house staff and Oil Company personnel likely would exceed the public utilities limit of 25 individuals. It is likely, therefore, that a single replacement well would be

Additional start-up costs associated with permitting, analytical testing, construction services, and inspection would also be incurred, and are not included in the estimate. Annual operation and maintenance costs would vary depending on whether the system could be operated as a satellite of an existing water supply utility. Annual costs have not been included in the estimate.

The second alternative remedial measure would provide a deeper replacement well for each of the two affected wells. Hydrogeologic conditions at Haddam indicate that deeper, properly constructed wells at the affected sites may be able to produce potable water. The wells should be constructed so that the upper 100 feet of overburden and bedrock be cased off and the casing pressure grouted. An open hole should then be advanced 100 feet into the bedrock and tested for yield. If sufficient yield is not obtained, the hole may be advanced further, or abandoned, at the discretion of the drilling supervisor.

Construction costs for the two replacement wells have been estimated to be about $25,000 assuming that sufficient yield is obtained in the first 100 feet of bedrock drilling. If additional drilling is required, or if a hole has to be abandoned due to insufficient yield, additional costs may be incurred.

It should be noted that groundwater quality data for the bedrock aquifer is not available at this time. Organics including benzene and TCE, as well as salt, have been detected in the overburden aquifer. It is possible that the bedrock aquifer is contaminated, or that the proposed wells could draw contaminated water downward into the bedrock aquifer. For this reason, field analytical tests for sodium should be performed during construction and development of the wells. Samples would have to be collected for laboratory analysis for organics and salt before the wells could be put into use. Monthly testing for salt and organics would also be advisable during the first year of operation of the wells. Costs for testing and laboratory analysis have not been included in the estimated construction cost.

Based on the relative costs of the two remedial options, it appears to be cost effective to pursue replacement of the two affected wells with new, deeper wells. If sufficient potable water cannot be obtained on the two affected sites, the community water system option may have to be pursued.

II. Floor Drains: The existing garage floor drains discharge directly to Candlewood Hill Brook. As this condition is inconsistent with current state regulations, a 2000 gallon

holding tank should be used to collect the floor drain discharge.

III. Underground Fuel Storage Tanks: The following underground steel fuel storage tanks are in use at the Haddam facility:

Tank Number	Material Stored	Capacity (Gallons)	Year Installed
860726	Heating Oil	2000	1941
890090	Gasoline	3000	1960
891022	Diesel Fuel	550	1955
891068	Waste Oil	1000	1968
860622	Fuel Oil	2000	1982

Property Control is in the process of replacing all of the tanks with new FRP tanks. The replacement should be completed by late 1987 and will bring the Haddam facility into compliance with the Connecticut State regulations regarding Nonresidential Underground Storage of Oil and Petroleum Liquids.

IV. Soils Removal: Upon installing a floor drain holding tank, the ConnDEP "contaminated" soils near the present outlet will need to be excavated and taken to a landfill. The soils in the fill area near borehole D-17 will need to be excavated and manifested as they are ConnDEP "hazardous". The volume of soil to be removed in both areas will be determined during the actual excavation by collecting samples for laboratory analysis. Excavated soil will need to be stored on site until laboratory analysis results are evaluated.