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FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES

FIT PROJECT

Wells G&H
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TASK REPORT TO THE ENVIRONMENTAL PROTECTION AGENCY CONTRACT NO. 68-01-6056

CHLORINATED SOLVENT CONTAMINATION
of the
GROUNDWATER
East Central Woburn, Massachusetts

FINAL REPORT

March 8, 1982
TDD No. F1-8203-01

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Field Investigation Team (FIT)
Region 1

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International Specialists in the Environmental Sciences

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TDD # F1-8203-01

Chlorinated Solvent Contamination
of the
Groundwater
East Central Woburn, Massachusetts

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SECTION 1 - INTRODUCTION

In May 1979, several chlorinated solvents were detected by the Massachusetts Department of Environmental Quality Engineering (DEQE) in two of the City of Woburn's municipal drinking water wells. As a result, these wells ("G" and "H") were shut down forcing Woburn to use MDC water to supplement its other groundwater wells located near Horn Pond. The levels of contamination detected prior to shutdown and immediately after shutdown are given in Table 1-1.

Table 1-1

Analyses of Water from Wells

"G" AND "H", Woburn, Massachusetts (ppb)

	"G" Well					
	5/21/79	7/24/79	7/24/79	9/25/79	9/28/79	2/26/81
	(1)	(2)	(2) (Dupl)	(3)	(3)	(4)
1,1,1-trichloroethane	1	28	28	ND	10	ND
1,2-trans-dichloroethylene	ND	0	0	ND	11	14
tetrachloroethylene	21	18	13	13	43	36
trichloroethylene	267	208	236	184	400	210
chloroform	12	ND	ND	ND	ND	ND
trichlorotrifluoroethane	ND	22	23	ND	ND	ND

	"H" Well			
	5/21/79	7/24/79	9/26/79	2/26/81
	(1)	(2)	(3)	(4)
1,1,1-trichloroethane	ND	ND	2	ND
1,2-trans-dichloroethylene	ND	ND	ND	14
tetrachloroethylene	18	26	9	41
trichloroethylene	118	188	63	73
chloroform	1	ND	ND	ND
trichlorotrifluoroethane	ND	23	ND	ND

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1. Introduction - continued

As a result of the detected contamination, the Ecology and Environment, Inc., Region I Field Investigation Team (E & E FIT) was tasked to perform preliminary assessments and site investigations of fourteen potential sources in East and North Woburn (5, 6, 7). These studies indicated that a number of contaminants were being disposed of into the City of Woburn sewer system by several industries. However, no direct sources of the well contamination were discovered.

E & E was then tasked to perform a comprehensive hydrogeologic investigation and groundwater quality evaluation of a ten square mile portion of East and North Woburn (8, 9). From this study, the detected areal extent of contamination for the compounds present in wells "G" and "H" was determined (Figures 1-1 to 1-6). These figures indicate only that a given compound is present at an unknown depth within the noted area. The depths over which the sampled wells are screened is unknown.

To supplement existing data, twenty-two additional monitoring wells were installed. Seven of the additional wells are located near and upgradient of the known contamination plumes affecting wells "G" and "H". Hydrogeologic data for these seven wells and other appropriately situated accessible wells plus bedrock studies of the one square mile study area delineated in Figure 2-1 are the subject of this report.

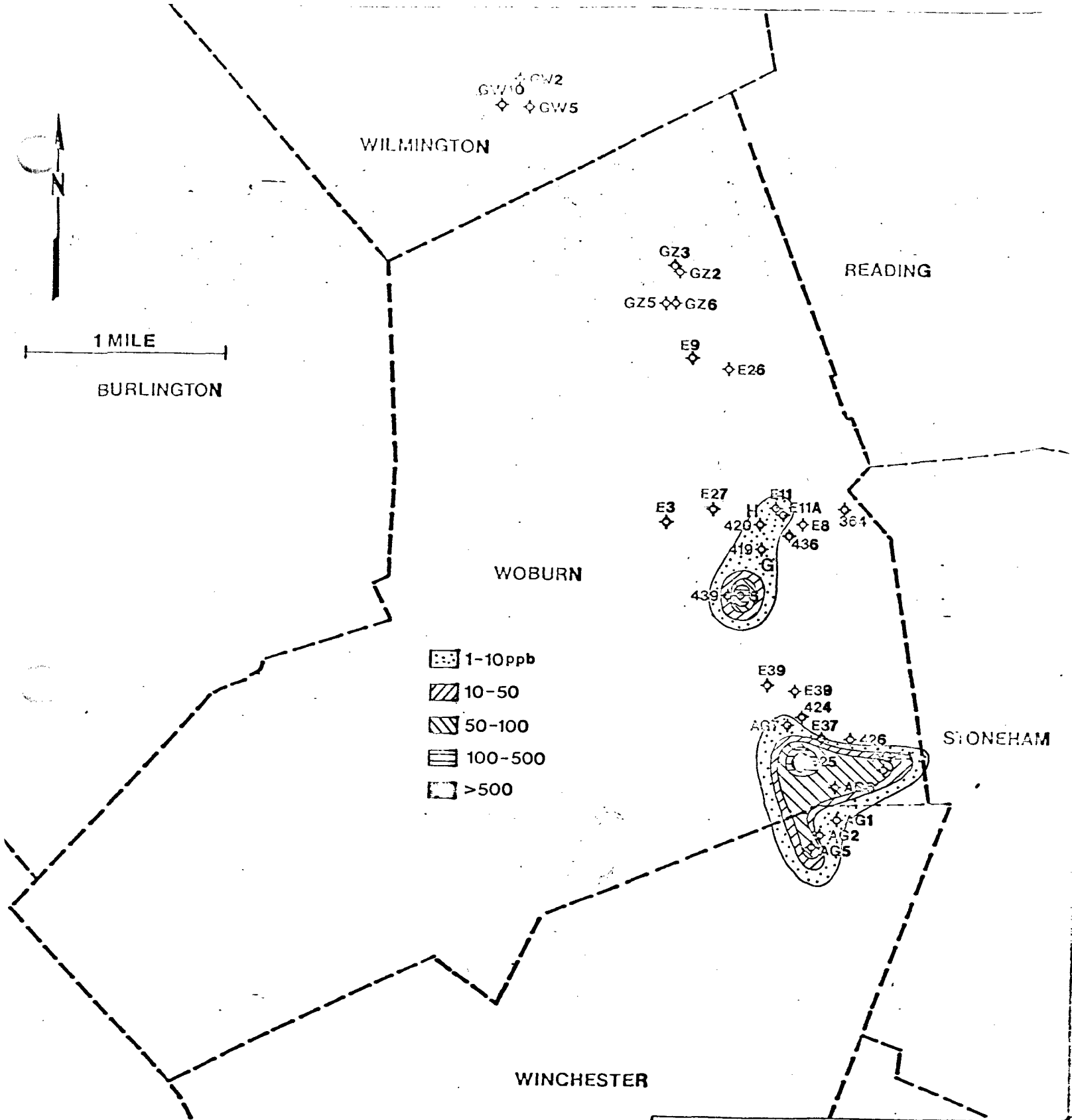

FIGURE 1-1 [9]
AREAL DISTRIBUTION OF
1,1,1-TRICHLOROETHANE
EAST AND NORTH WOBURN, MA.

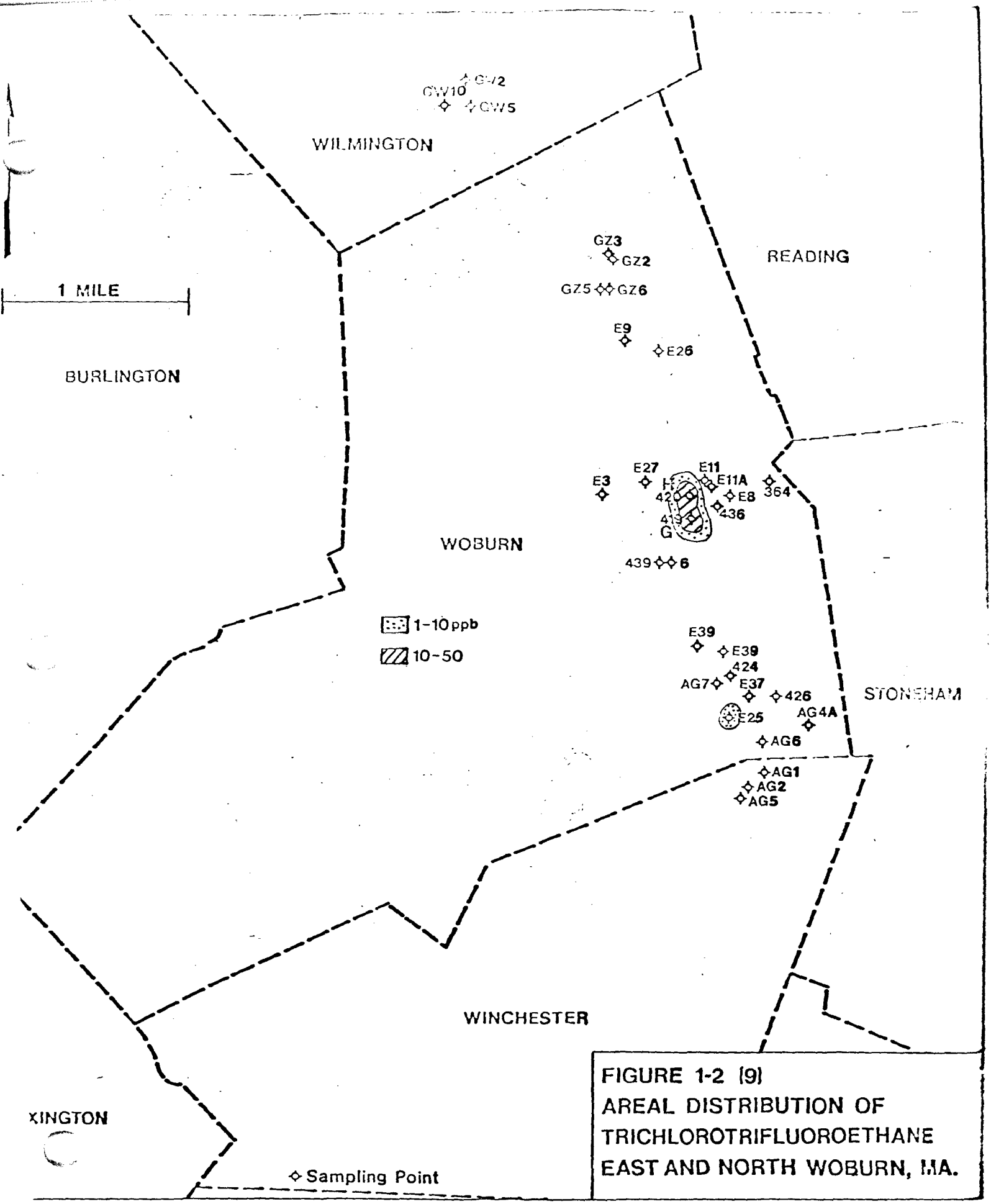

FIGURE 1-2 (9)
AREAL DISTRIBUTION OF TRICHLOROTRIFLUOROETHANE EAST AND NORTH WOBURN, MA.

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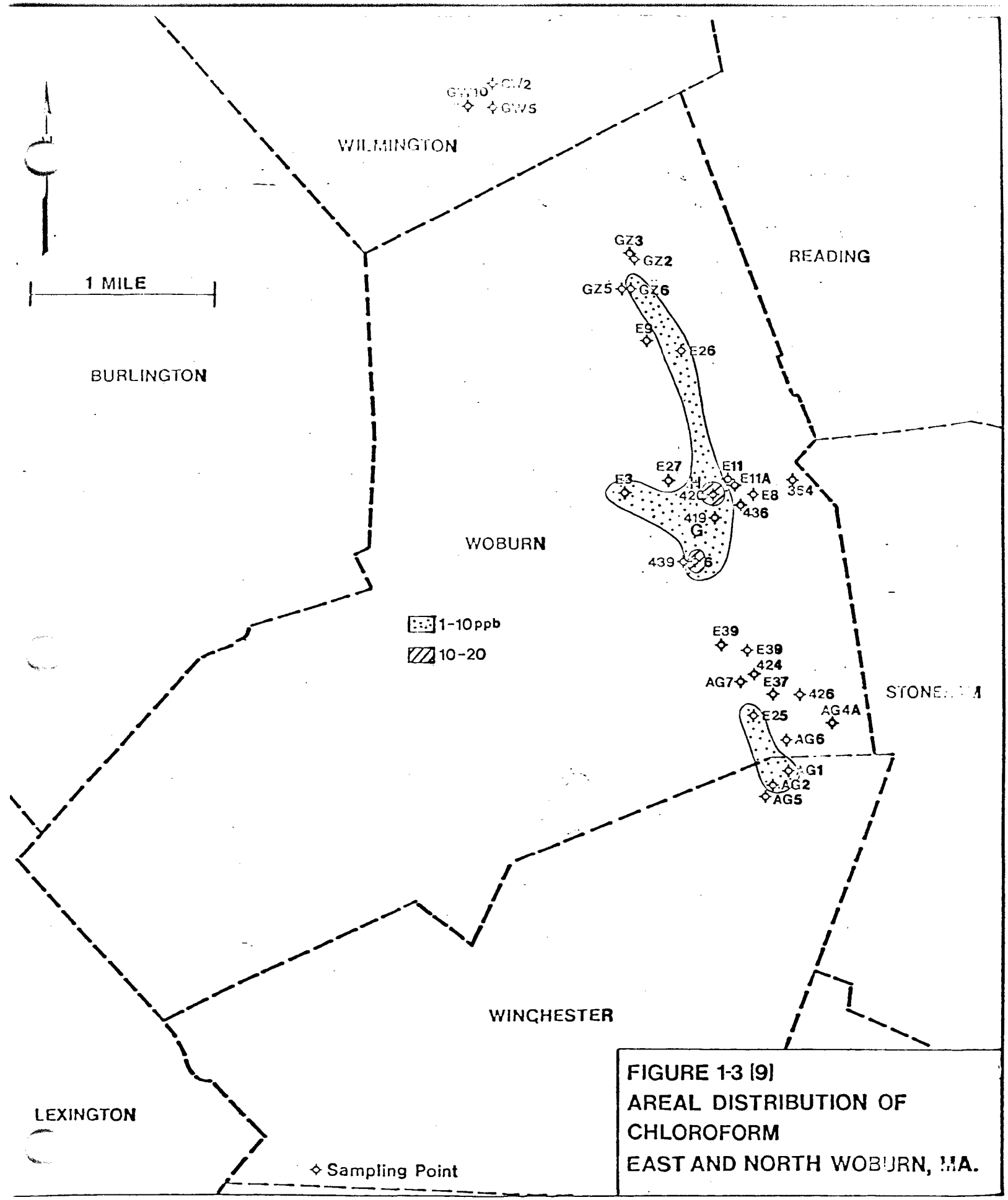

FIGURE 1-3 [9]
AREAL DISTRIBUTION OF CHLOROFORM
EAST AND NORTH WOBURN, MA.

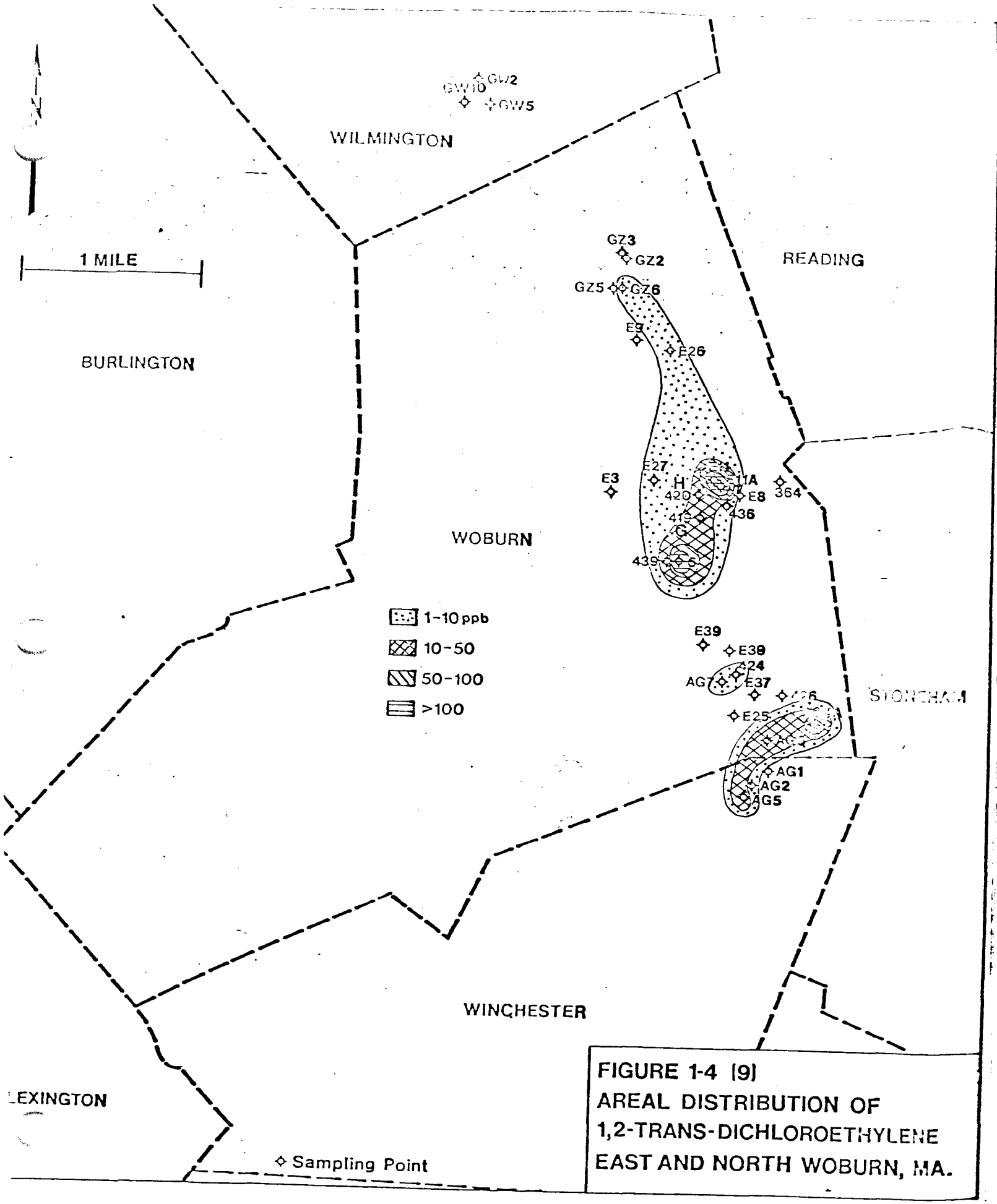

FIGURE 1-4 [9]
AREAL DISTRIBUTION OF
1,2-TRANS-DICHLOROETHYLENE
EAST AND NORTH WOBURN, MA.

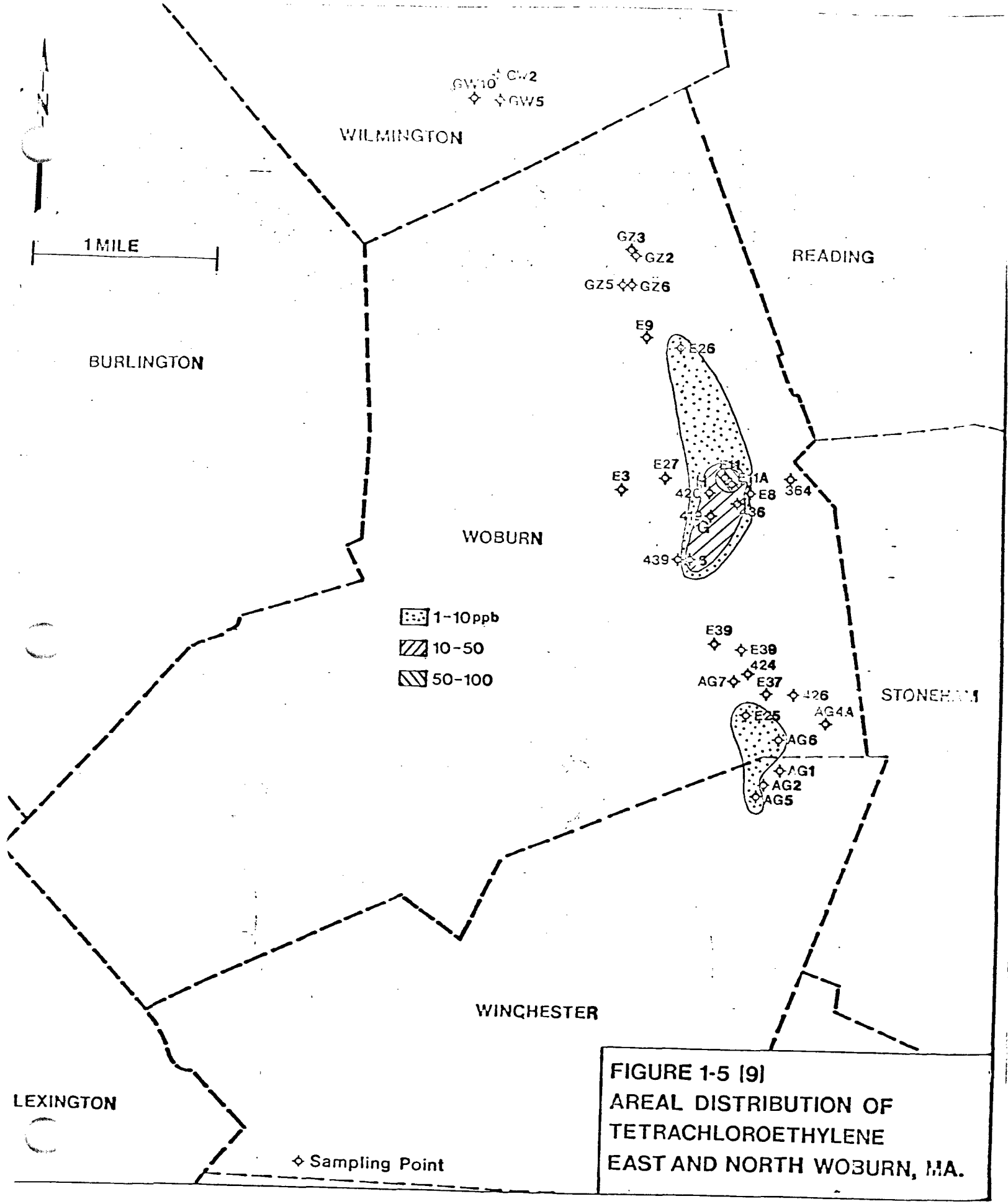

FIGURE 1-5 (9)
AREAL DISTRIBUTION OF
TETRACHLOROETHYLENE
EAST AND NORTH WOBURN, MA.

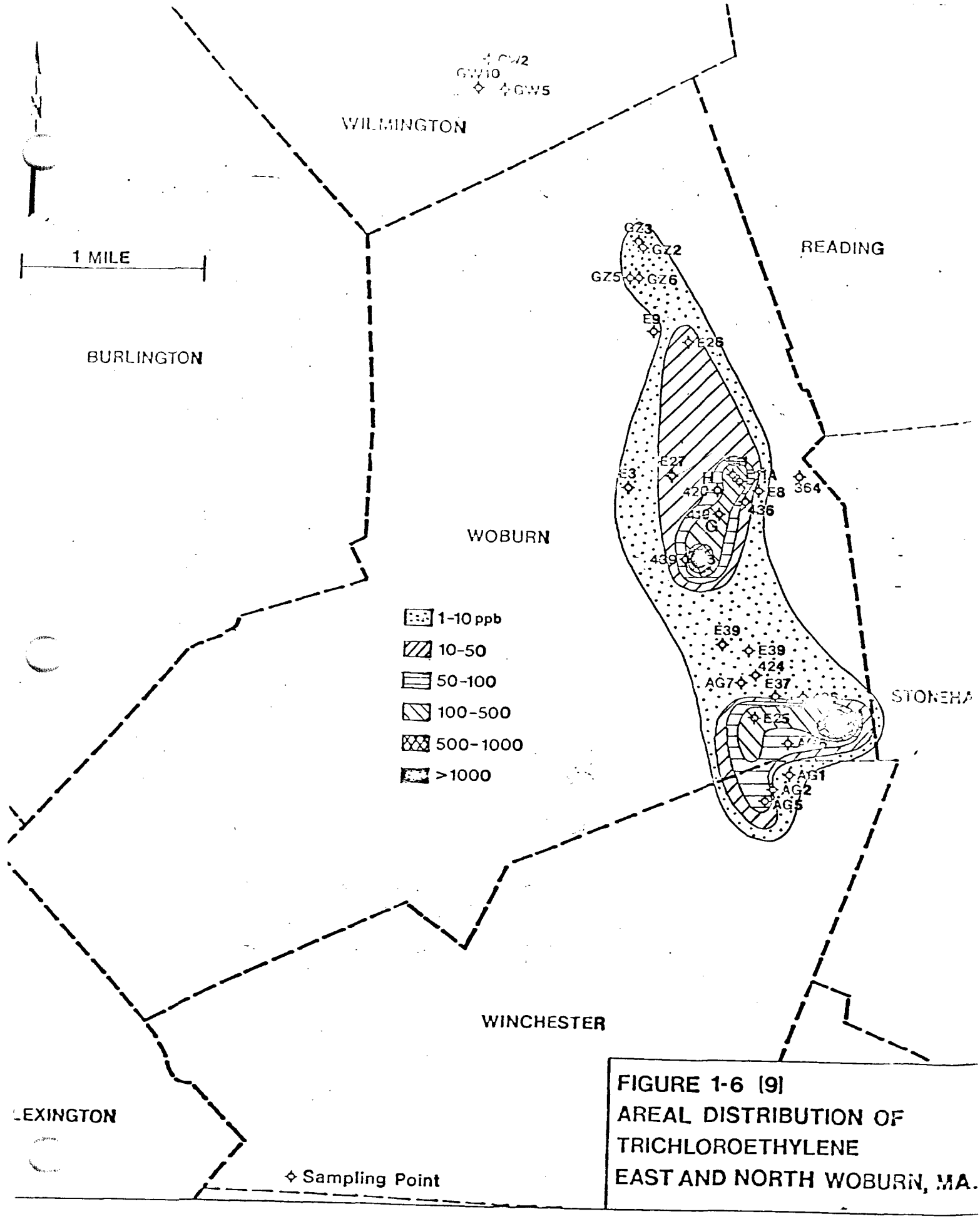

FIGURE 1-6 [9]
AREAL DISTRIBUTION OF
TRICHLOROETHYLENE
EAST AND NORTH WOBURN, MA.

SECTION 2 - DESCRIPTION OF THE STUDY AREA

2.1 INTRODUCTION

Figures 2-1 and 2-2 show the one square mile area covered by this study. The base map (Figure 2-2) was constructed from aerial photographs taken by Northeast Airphoto Associates, Inc. on 7 May 1979. A description of the portions of Woburn located north and south of the study area can be found in References 8 and 10.

A number of commercial and industrial operations are located within the study area. Those which are located near to and upgradient of the plumes affecting wells "G" and "H" are labelled on Figure 2-2 and identified in the key to that figure.

2.2 WELL AND BOREHOLE LOCATIONS

Thirty-five wells and boreholes have been identified within the study area and are identified on Figure 2-2. Table 2-1 gives the relevant parameters for these wells. All available well logs are given in Appendix A. Inaccessible wells are those which have been paved over or destroyed as a result of construction projects. (E 43 is the location of a spring issuing from a bedrock outcrop adjacent to Route 128.)

2.3 SURFACE DRAINAGE

Surface drainage in the study area flows from north to south and consists of the Aberjona River with a few minor tributaries. There is a significant wetlands area associated with the Aberjona in the southwest quadrant of the area. See Figure 2-2 for a map of surface drainage.

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FIGURE 2-1: LOCUS MAP
EAST CENTRAL WOBURN STUDY AREA [11]

SCALE 1:25000

KEY

A. AVA - Warehouse
B. Bachman Distributing Co.-Food distribution
C. Allied Van Lines
D. Woburn Mall - Commercial
E. Arlwood, Inc. - Wood/Metal doors, hardware
F. Brodie, Inc. - Industrial trucks, tractors
G. Brodie, inc. - Industrial trucks, tractors
H. Post Office
I. Bradlee's - Commercial
J. Celotex Corporation - Warehouse
K. Economics Lab, Inc. - Distributor of soap and cleaning compounds
L. ADAP/Kamco. - Commercial, auto parts
M. Waterbed Warehouse - Commercial
N. Charrette - Commercial, art supplies
O. Woburn Foreign Motors
P. Hogan Tire Company - Tire distributor
Q. Bliss marine - Boating equipment
R. Hurlbert Datsun - Automobile sales and repair
s. Cummings Industrial Centers - Offices
T. Northern Research and Engineering Corporation
U. Continental Metal Products - Hospital equipment
V. Cummings Industrial Centers - Offices
W. Cummings Industrial Centers - Offices
X. Interstate Industrial Uniform Rental
Y. Metro Siding and Roofing
Z. W. R. Grace - Food wrapping equipment
AA. Hemingway Transportation, Inc. - General commodities trucking
BB. Cummings Industrial Centers - Offices
CC. Cummings Industrial Centers - Offices
DD. Cummings Industrial Centers - Offices
EE. Cummings Industrial Centers - Offices
FF. McKesson and Robbins Drug Company
GG. 99 Restaurant
HH. Koala Inn
II. New England Plastics - Plastics manufacturing
JJ. Mirra Construction Company, Inc.
KK. Independent Tallow Company

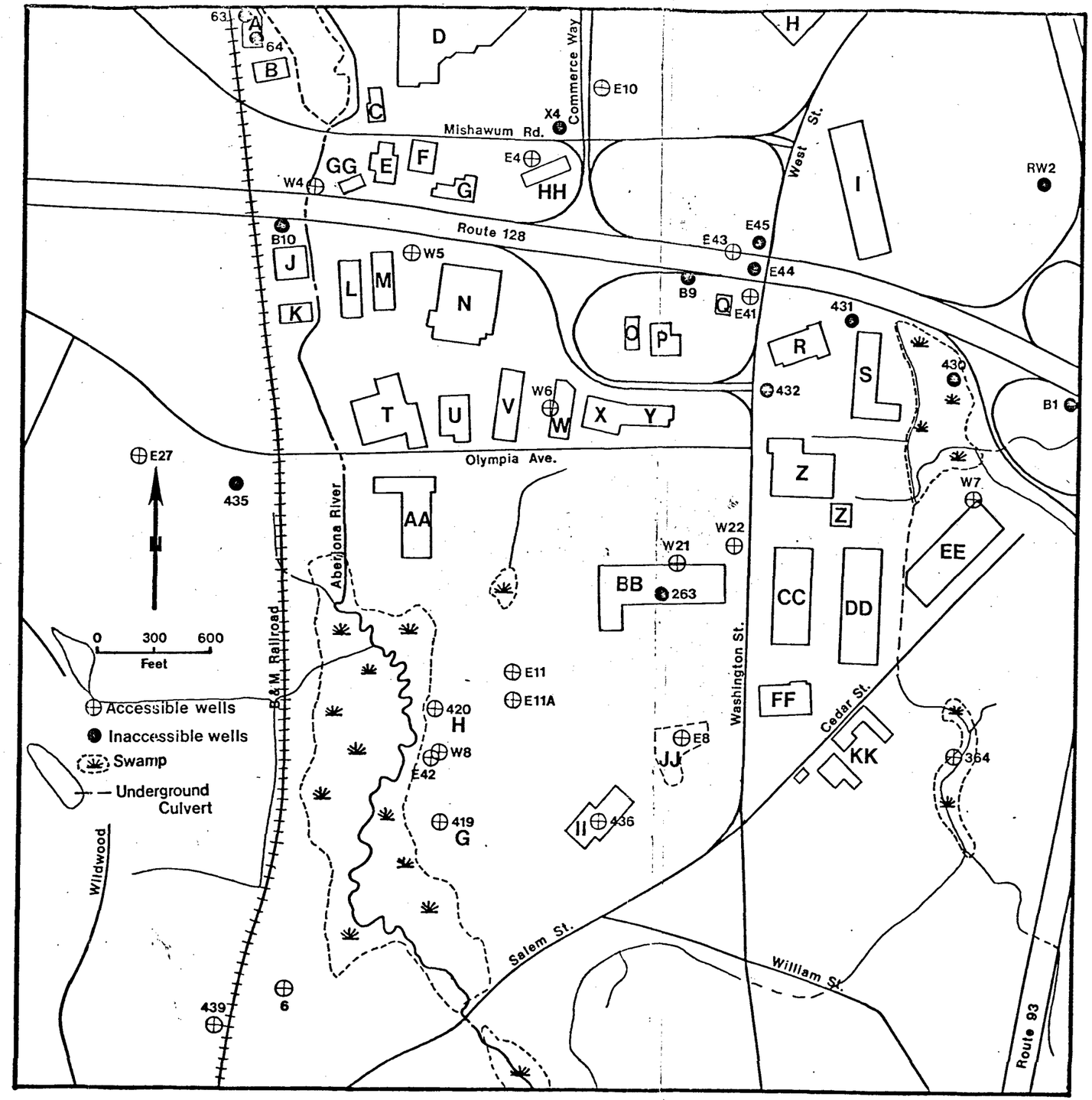

FIGURE 2-2: BASE MAP FOR THE EAST CENTRAL WOBURN STUDY AREA

TABLE 2-1

Parameters for Wells and Boreholes
in East Central Woburn, Massachusetts (8, 12)

Well #	Installed for	Year Installed	Well Diameter (in.)	Well Depth (ft)	Well Use	Depth to Bedrock(ft)	Water Level (ft.)	Water Date Measured	Water Use	Accessible for Sampling	Sampling Method
6	J. J. Riley	1958	24	51	W	--	5	/58	N	X	Tap
63	Stauffer Chem.	1936	18	83	U	--	6	---	N	-	---
64	Stauffer Chem	1937	24	78	W	--	6	---	N	-	---
263	Johnson Bros.	1958	8	364	W	60	--	---	I	-	---
364	Independent Tallow	1940	24	24	W	--	8	---	N	X	Tap
419"G"	Woburn	1967	24	88	W	--	1	---	P	X	Tap
420"H"	Woburn	1964	24	84	W	--	1	---	P	X	Tap
430	Salada Tea Co.	1958	2	15	T	--	0	12/58	U	-	---
431	Salada Tea Co.	1958	2	5	T	--	3	---	U	-	---
432	Salada Tea Co.	1958	2	7	T	--	0	---	U	-	---
435	Lamont	1969	2	86	T	--	6	5/69	U	-	---
436	N.E. Plastics	1962	Unk	358	W	38	15	2/62	N	X	Tap
439	J. J. Riley	1945	Unk	35	W	--	5	---	N	X	Tap
E 4	Koala Inn	1980	6	600	U	--	8	10/81	U	X	Bail
E 8	Mirra Const.	Unk	Unk	Unk	W	--	--	---	N	X	Tap
E10	Woburn Nat'l Bk.	Unk	2	15	W	--	--	---	U	-	---
E11	Mass Rifle	Unk	Unk	Unk	W	--	--	---	R	X	Tap
E11A	Crowley	Unk	Unk	Unk	W	--	--	---	R	X	Tap
E27	Rohtstein	Unk	Unk	Unk	W	--	--	---	N	X	Tap
E41	MDC	1981	2	54	M	24	26	10/81	U	X	Bail
E42	Woburn	Unk	2	27	T	--	2	10/81	U	X	Bail
E43	--	--	-	(25)	-	(0)	--	---	-	X	"Tap"
E44	MDC	1981	-	36	B	8	10	8/81	-	-	---
E45	MDC	1981	-	54	B	14	23	8/81	-	-	---
B 1	MDPW	1955	-	37	B	--	14	6/55	-	-	---
B 9	MDPW	1949	-	10	B	--	--	---	-	-	---
B10	MDPW	1949	-	96	B	--	--	---	-	-	---
X 4	Woburn	Unk	Unk	21	T	--	--	---	U	-	---
RW2	E. A. Porter	1932	36	9	U	--	--	---	U	-	---
W 4	EPA	1981	2	91	M	84	5	10/81	U	X	Bail
W 5	EPA	1981	2	66	M	56	3	10/81	U	X	Bail
W 6	EPA	1981	2	96	M	86	8	10/81	U	X	Bail
W 7	EPA	1981	2	28	M	18	4	10/81	U	X	Bail
W 8	EPA	1981	2	128	M	123	2	10/81	U	X	Bail
W21	EPA	1981	2	31	M	21	19	10/81	U	X	Bail
W22	EPA	1981	2	44	M	36	26	10/81	U	X	Bail

W = Water withdrawal
T = Test
M = Monitoring

B = Borehole
U = Unused
N = Industrial
(-)= Unavailable or Not applicable

I = Irrigation
P = Public supply
R = Domestic

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2.4 SURFACE TOPOGRAPHY

Figure 2-3 is a map of the surface topography of the study area. The primary sources of data for this map were the United States Geological Survey Topographic Maps for the Lexington, Boston North, Wilmington and Reading, Massachusetts Quadrangles. Some modifications were made as a result of field investigations performed by E & E during the course of this study. All gravel pits present in the 8 May 1979 aerial photographs have been added to this map.

The western portion of the study area is topographically low because it is occupied by the Aberjona River and its associated flood plain. The surface elevations rise rapidly on both sides of the river valley. The surface configuration reflects the underlying bedrock surface. A fault trending N-S is present under the Aberjona River Valley. The Aberjona River Valley was very likely controlled by this fault. Many bedrock outcrops are present in the highlands to the east of the river valley.

2.5 WATER TABLE CONFIGURATION AND GROUNDWATER FLOW DIRECTIONS

Figure 2-4 is a contour map of the water table showing the directions of groundwater flow. This map is reproduced from an earlier E & E report (8) with minor modifications resulting from incorporation of water table measurements from the newly installed EPA and MDC wells.

The water table configuration resembles the ground surface and bedrock surface configurations for the study area. Groundwater flows from the west and east portions of the study area toward the Aberjona River Valley and then to the south as shown in Figure 2-4.

2.6 BEDROCK SURFACE CONFIGURATION

A contour map of the bedrock surface is presented in Figure 2-5. This map is reproduced from an earlier E & E report (8) with minor modifications based on bedrock corings performed during the installation of monitoring wells within the study area. Much of the data was derived from a seismic survey performed by Dames and Moore for Reference 8. The bedrock surface is dominated by a N-S trending trench with the rock surface rising rapidly to the east and west. Wells "G" and "H" are located near the deepest part of the trench. A bedrock high is present just south of the study area and may act as a barrier to contaminant migration southward.

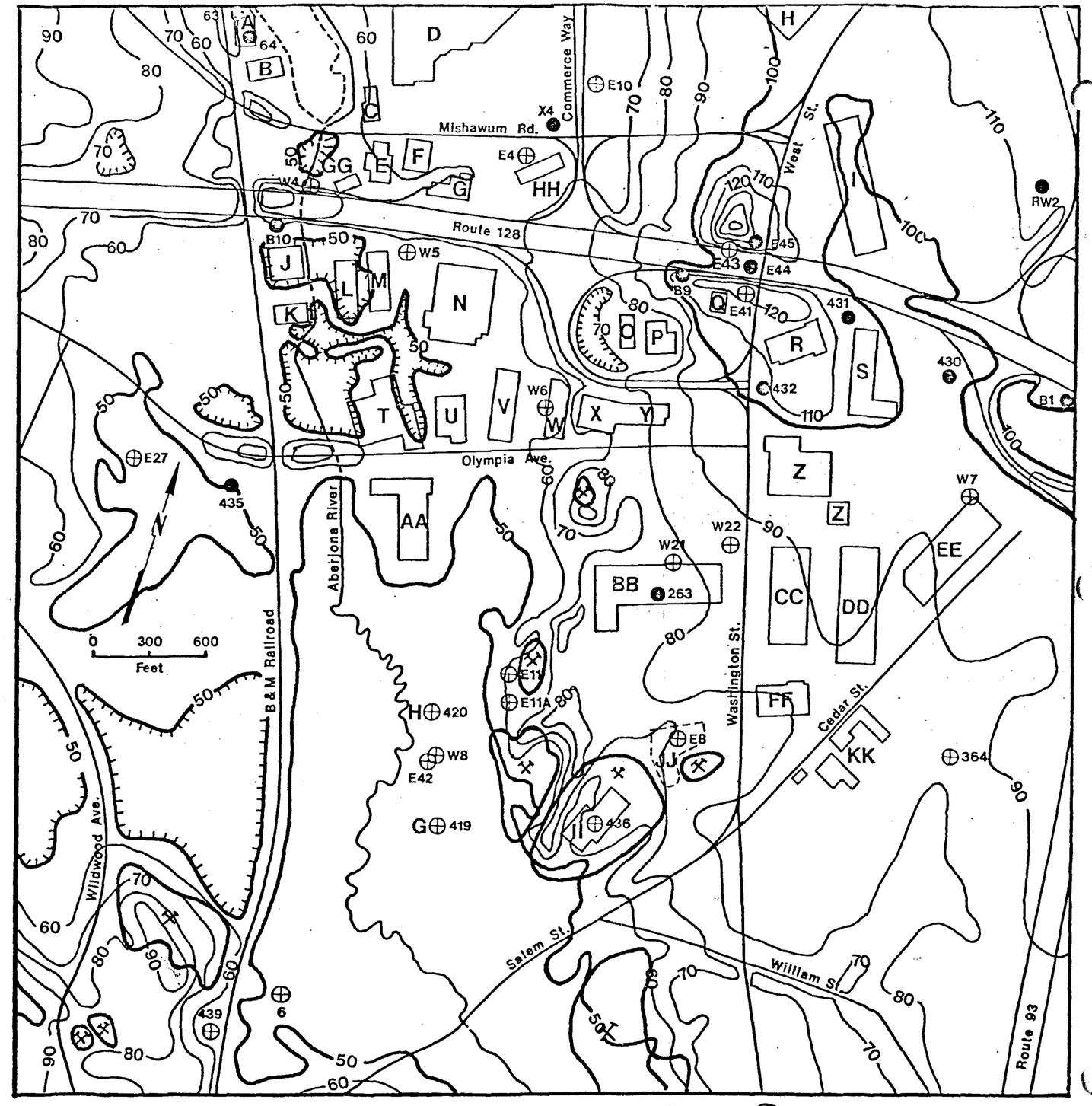

FIGURE 2-3: SURFACE TOPOGRAPHY
10 FOOT CONTOUR INTERVAL, MSL

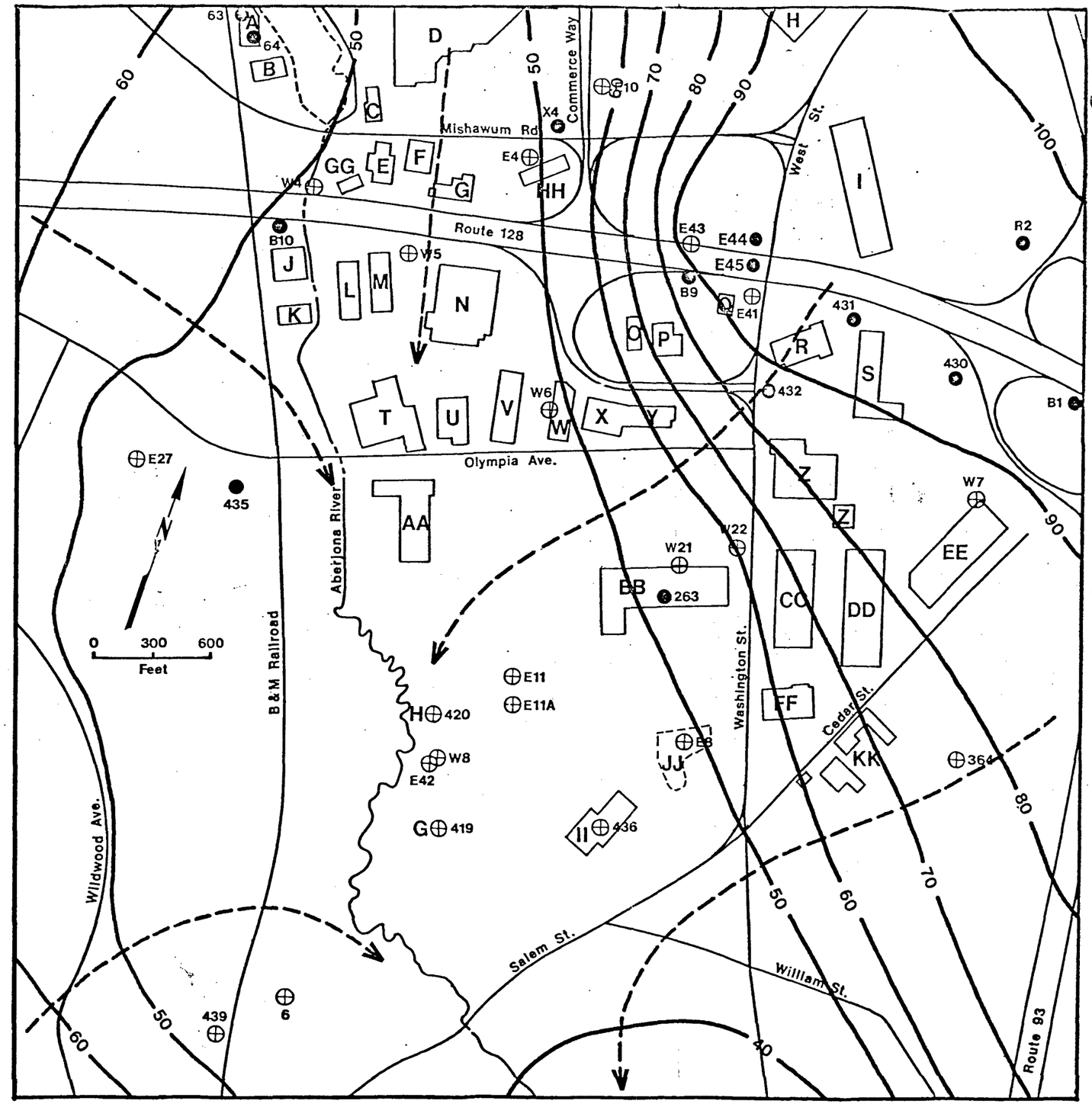

FIGURE 2-4: WATER TABLE CONFIGURATION 10 FOOT CONTOUR INTERVAL, MSL

Groundwater Flow Direction

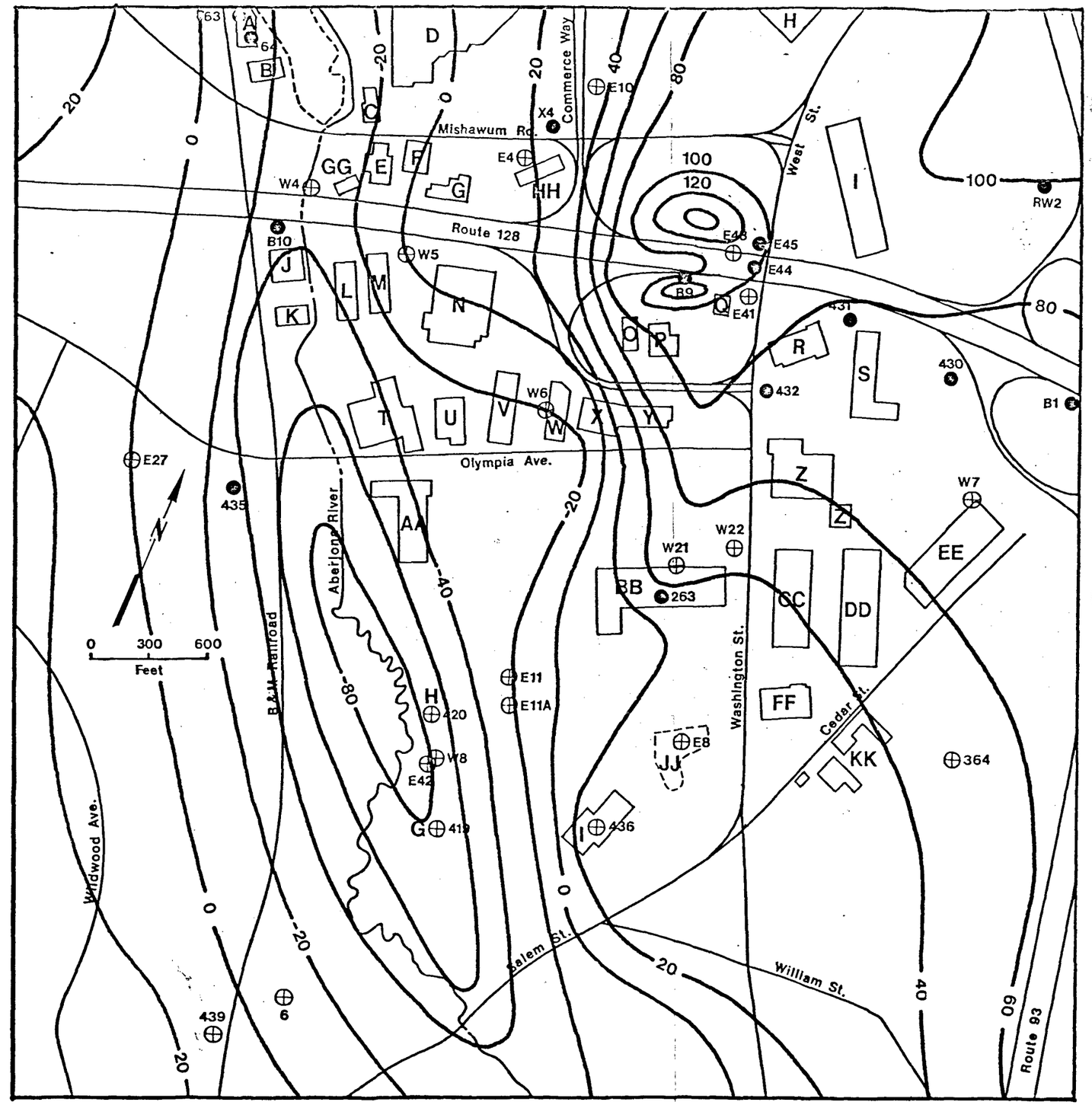

FIGURE 2-5: BEDROCK SURFACE CONFIGURATION 20 FOOT CONTOUR INTERVAL, MSL

2.7 BEDROCK GEOLOGY

Bedrock cores were obtained from wells W-4, 5, 6, 7, 8, 21 and 22. These cores indicate that the area is composed of two types of bedrock; a meta-gabbrodiorite and a granodiorite. The meta-gabbrodiorite cores from wells W-4, 5, 7 and 8 are moderately to highly fractured, while the granodiorite cores from wells W-6 and W-21 exhibit low to moderate amounts of fracturing. The granodiorite core from W-21 is more extensively altered and fractured than that from W-6. Very poor recovery of the core from well W-21 was experienced indicating severe alteration, of the bedrock and numerous fractures. The small amount of core which was obtained did show extensive alteration and fracturing.

Previous and ongoing investigations (8, 9) have shown that wells W-4 and W-8 intersect a large-scale fault that defines the buried bedrock valley beneath the study area. Wells W-21 and 22 may intersect or lie very near a small scale fault, as evidenced by extreme alteration and fracturing in the cores of those two wells. In order to determine the primary directions of fracturing and faulting in bedrock, a survey of all available outcrops was performed. At each outcrop the orientations of fractures (joints and faults) were measured using a Brunton pocket transit. Each fracture measurement, as a strike and dip, was then plotted on a Wulff stereographic net as a pole point (Figure 2-6). This pole point is a graphical representation of the orientation of a planar feature. Once all the measurements had been plotted, the pole points were contoured to show the density of points per unit area of the stereographic net. The contours indicate the relative frequency of fractures of a given orientation. A frequency of 8 to 12 percent indicates a very high preferred orientation of fractures. Figures 2-7 and 2-8 are the contour diagrams for joint and fault surfaces respectively. The joint contour diagram (Figure 2-7) indicates a moderately preferred orientation of joints striking between N63°W and N90°W and dipping from 10° to 40° either to the SW or NE. In general, the joint surfaces have a wide range of orientations; some very likely are related to shrinkage cracks during cooling of the granitic and dioritic plutons. Figure 2-8 indicates that the fault surfaces have a very distinct orientation striking N56°E and dipping steeply at 85°NW. These faults correspond well with known trends such as the Bloody Bluff Fault Zone just north of Woburn, and the Sweetwater Brook Fault Zone just to the south in Stoneham and Woburn.

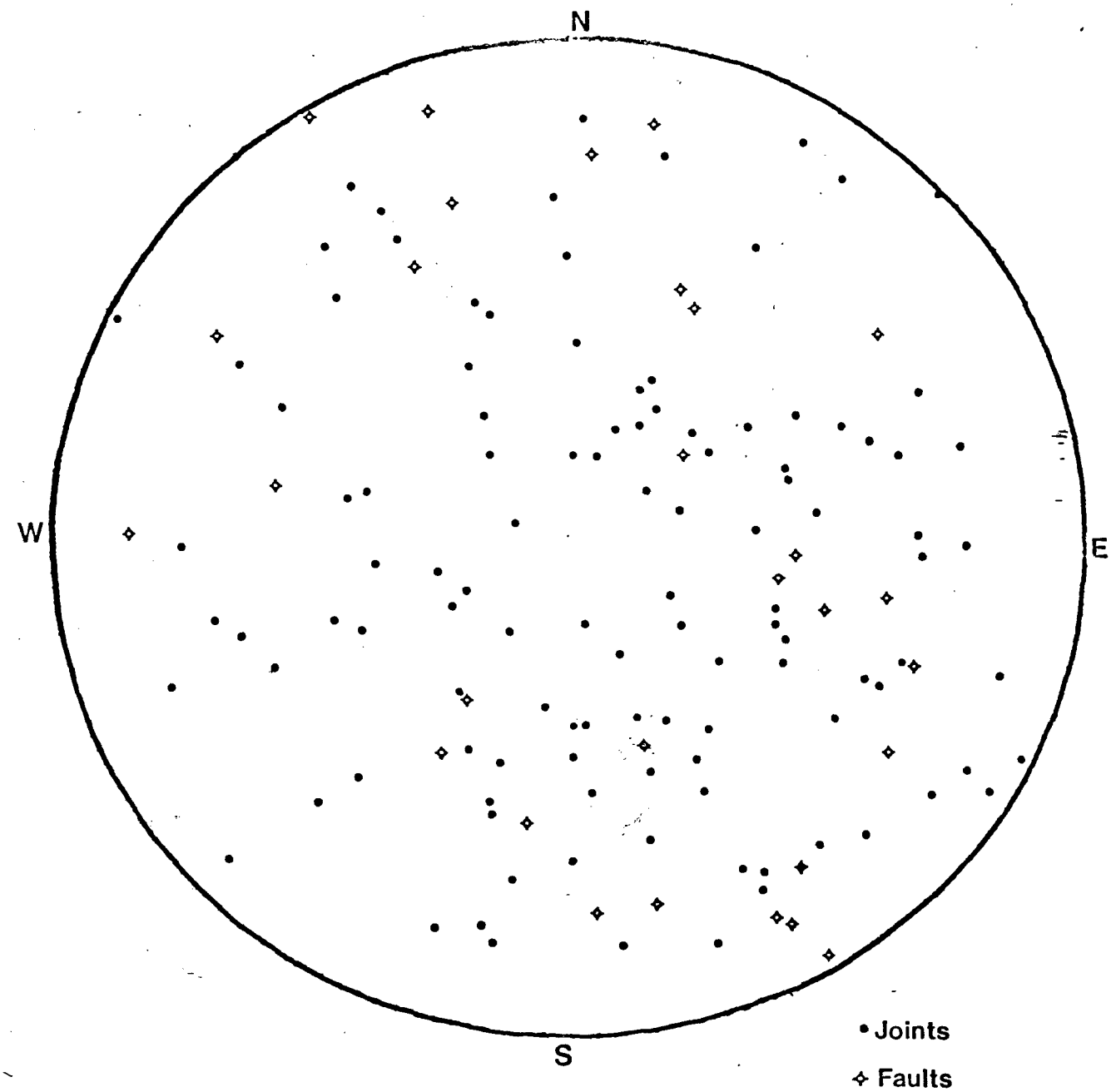

FIGURE 2-6: STEREOGRAPHIC PROJECTION PLOTS OF THE POLES TO 111 JOINT AND 29 FAULT SURFACES EAST CENTRAL WOBURN, MA.

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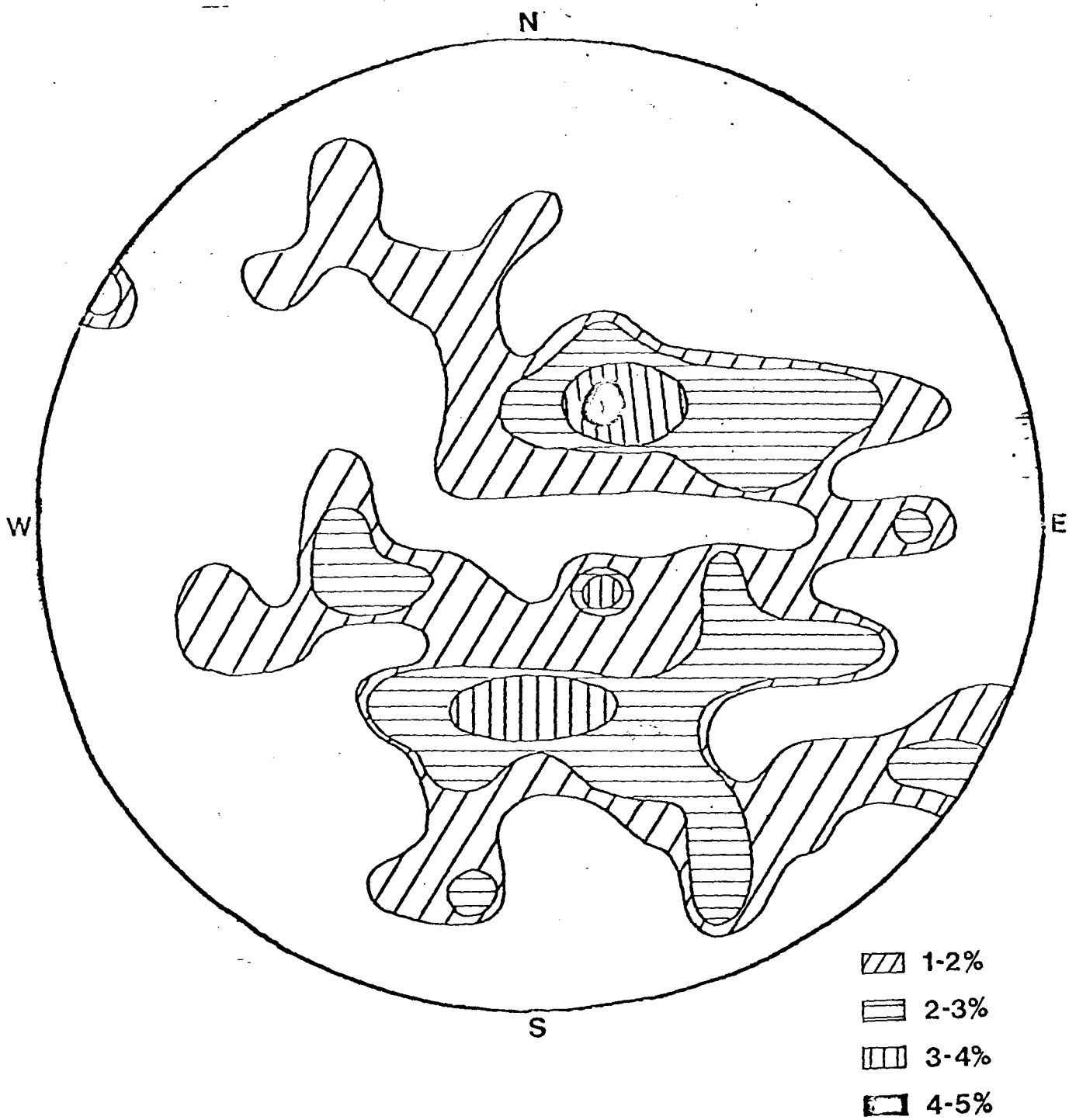

FIGURE 5: CONTOUR DIAGRAM OF THE POLES TO 111 BEDROCK JOINTS - EAST CENTRAL WOBURN, MA.

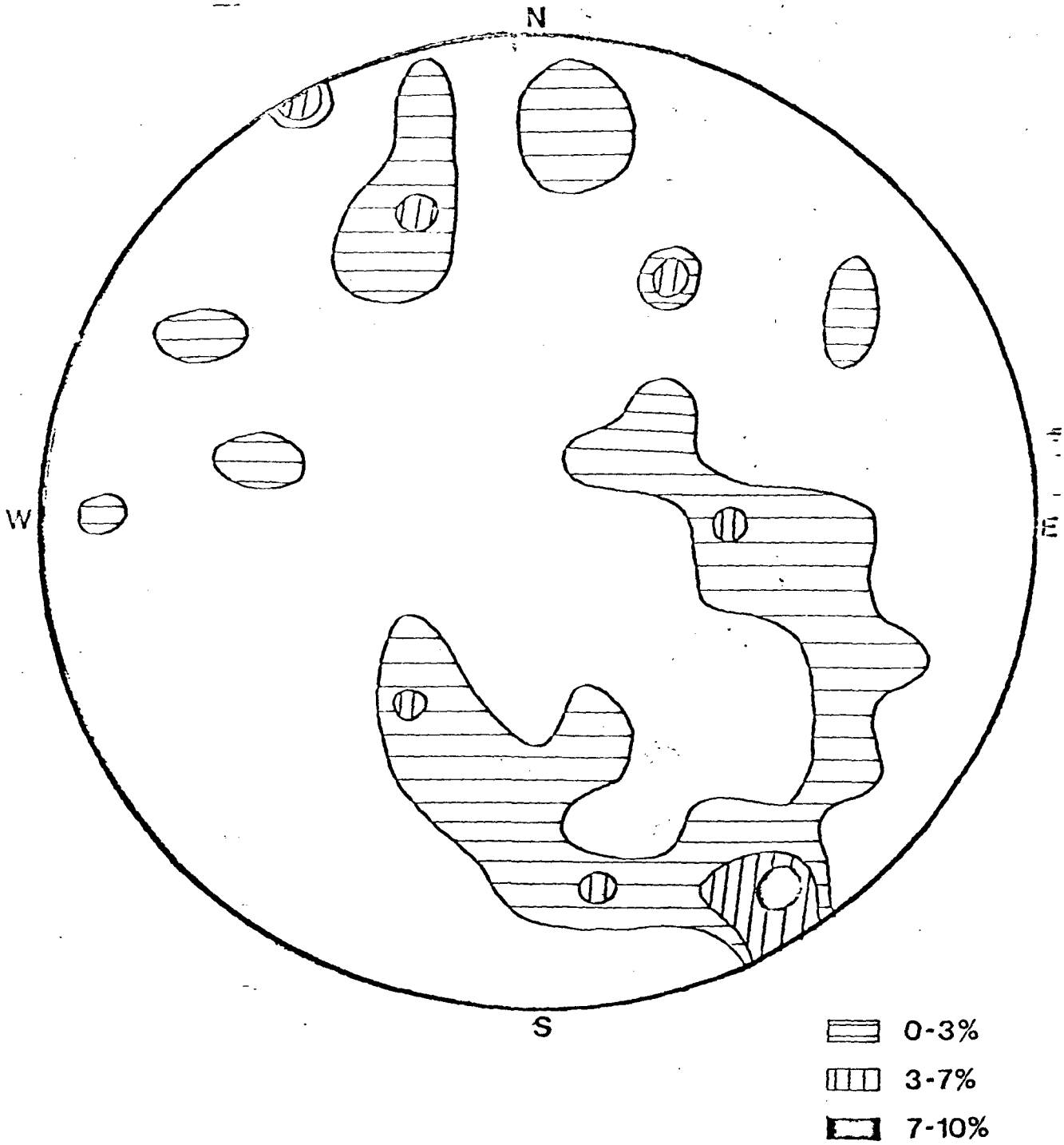

FIGURE 2-8: CONTOUR DIAGRAM OF THE POLES TO 29 FAULTS EAST CENTRAL WOBURN, MA.

2.7 Bedrock Geology - continued

A preliminary thin section analysis of the bedrock cores indicates extensive fault-related features, such as cataclasis, fault gouge and microfaults at well locations W-4, W-8 and W-22. These findings also correspond well with the fault orientations discussed above and suggest that the predominant orientation of faults within the study area trends northeast-southeast.

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SECTION 3 - SAMPLING AND ANALYTICAL DATA

3.1 PRIORITY POLLUTANT SAMPLING AND ANALYSES (11/12/80 - 3/02/81)

E & E sampled 32 accessible wells in East and North Woburn (TDD #F1-8010-04A) between 12 November 1980 and 2 March 1981. These samples were subsequently analyzed for priority pollutants, and the sampling and analytical techniques and results are reported in Reference 9. All samples were collected from taps which were allowed to run for several minutes before samples were taken. Each priority pollutant sample consisted of:

1 - 1 liter plastic bottle for metal analysis
2 - 1/2 gallon bottles for extractibles and purgeables
2 - 40 ml septum vials with no headspace for volatile organics
1 - 40 ml septum vial with headspace for screening using the portable organic vapor analyzer.
Metals samples were preserved with 1.5 ml of concentrated HNO_3.

All samples were shipped at 4°C to the appropriate national contract laboratory within seven (7) days of collection to minimize loss of volatile organics by volatilization. Of the 32 wells sampled, ten are located within the East Central Woburn study area. Table 3-1 summarizes the analytical data for these ten wells. The compounds present in concentrations greater than ten parts per billion are 1,1,1-trichloroethane, 1,2-trans-dichloroethylene, tetrachloroethylene and trichloroethylene. Chloroform and trichlorotrifluoroethane mentioned in Section 1 were not detected. Trichlorotrifluoroethane is not a priority pollutant and may have been present but not analyzed for by the laboratory. Complete analytical results are presented in Appendix C.

3.2 SAMPLING AND VOLATILE ORGANIC ANALYSES (11/4/81 - 11/5/81)

As part of the monitoring well installation program in East and North Woburn (TDD #F1-8010-03A), seven monitoring wells (W-4, 5, 6, 7, 8, 21 and 22) were installed by E & E within the East Central Woburn study area. An additional well, E-41, was installed by Haley and Aldrich of

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TABLE 3-1

Results of Analysis - Volatile Organics (ppb) (9)

11/12/80 - 3/02/81

	Well Number									
	6	364	419"G"	420"H"	436	439	E8	E27	E11	E11A
1,1,1-trichloroethane	133	ND	ND	<10	ND	28	ND	ND	<10	<10
1,2-trans-dichloroethylene	116	ND	14	21	<10	12	ND	<10	210	120
tetrachloroethylene	28	ND	36	41	12	ND	ND	ND	89	63
trichloroethylene	1372	ND	210	73	12	53	<10	19	280	160
Benzene	ND	ND	<10	<10	<10	ND	<10	<10	<10	<10
Chlorobenzene	ND	ND	ND	ND	ND	<10	ND	ND	ND	ND

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3.2 Sampling and Volatile Organic Analyses (11/4/81 - 11/5/81)-continued

Cambridge, Massachusetts for the Metropolitan District Commission (MDC). These eight wells plus six other accessible wells within the study area were sampled by E & E on 3 November 1981. Two static volumes were bailed from each well using an air-lift pump. The samples were then bailed using a stainless steel bailer. Three 40 ml septum vials (two full and one with headspace) were taken from each well. Sampling equipment was decontaminated between sampling with methanol followed by a clean water rinse. The samples were analyzed on 4 and 5 November 1981 at the EPA New England Regional Laboratory (NERL) in Lexington, Massachusetts. The results of these analyses are summarized in Table 3-2, and the analytical conditions are given in Appendix B. 1,1,1-Trichloroethane, 1,2-trans-dichloroethylene, trichloroethylene and tetrachloroethylene are again the primary chlorinated solvents present. A significant concentration (170 ppb) of a compound tentatively identified as acetone was detected in one well (W-5).

A sample from the spring (E43) was collected in a 40 ml septum vial and screened using the Organic Vapor Analyzer (OVA). No contaminants were detected.

During installation of the new monitoring wells, split-spoon samples were taken every five feet. A sample of sediment was collected in a 40 ml septum vial from each split-spoon. These samples were subsequently screened on site for volatile organic contamination using a portable gas chromatograph. The results are discussed in Section 4.

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TABLE 3-2

Results of Analysis - Volatile Organics (ppb)

November 4, 5, 1981

	Well Number													
	E41	W436A	E27	E11	E11A	W6	E8	W436	W4	W5	W22	W21	W8	W7
1,2-trans-dichloroethylene	ND	8	ND	160	110	10	ND	4	ND	ND	52	420	10	ND
trichloroethylene	ND	19	ND	240	160	5	ND	18	ND	<1	170	520	55	ND
tetrachloroethylene	ND	17	ND	140	85	240	ND	20	ND	2	4	98	20	ND
toluene	ND	ND	ND	ND	ND	20	ND	ND	ND	5	ND	ND	ND	ND
chloroform	ND	ND	ND	ND	ND	ND	1	ND	ND	1	ND	ND	ND	ND
1,1,1-trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	110	ND	ND	ND	ND
methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	13	ND	ND	ND	ND
1,1-dichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	ND	ND	ND	ND
acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	170	ND	ND	ND	ND
methyl isopropyl ketone	ND	ND	ND	ND	ND	ND	ND	ND	ND	15	ND	ND	ND	ND

* See Appendix B for analytical conditions for these data

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SECTION 4 - EVALUATION OF ANALYTICAL DATA

Figures 4-1 through 4-4 are plots of the levels of contamination for the four primary chlorinated solvents detected in the groundwater within the East Central Woburn study area. Data from both sampling efforts (See Sections 3.1 and 3.2) are included. Analyses of 4 and 5 November 1981, preempted earlier analyses of the same wells. Data for wells sampled during both efforts were consistent.

Based upon the groundwater flow directions (Figure 2-4) and the contamination plots (Figures 4-1 through 4-4), E & E suggests that the contaminants influencing wells "G" and "H" are likely coming from an area north and/or northeast of these wells.

The detected levels for trichloroethylene and 1,2-trans-dichloroethylene (Figures 4-2 and 4-4) show a similar configuration. Each has two areas of high solvents concentration (>300 ppb); one at well W-21, approximately 1200 feet northeast of wells "G" and "H" and one at well 6, which is located an equal distance southwest of these wells. The high solvents concentrations indicate possible contaminant source areas to the northeast of well W-21 and to the west of well 6. Chemical screening of split spoon samples collected every five feet during drilling detected little or no contamination in the overburden. Increased levels were detected near the bedrock/overburden interface and in the bedrock itself.

It appears that the bulk of contamination within the study area is being carried in a bottom-seeking plume. As a result, the configuration of the bedrock surface and the extent and directions of fracturing and faulting within the bedrock will have a strong influence on the directions of contaminant migration. For this reason, the fracture study described in Section 2.7 was performed. The study indicates extensive fracturing in all bedrock cores and a preferred orientation of faults and fault zones trending approximately north-south and N56°E. Therefore, contamination is very likely moving within the bedrock itself, primarily constrained to the larger fractures and fault zones.

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KEY

A. AVA - Warehouse
B. Bachman Distributing Co.-Food distribution
C. Allied Van Lines
D. Woburn Mall - Commercial
E. Arlwood, Inc. - Wood/Metal doors, hardware
F. Brodie, Inc. - Industrial trucks, tractors
G. Brodie, inc. - Industrial trucks, tractors
H. Post Office
I. Bradlee's - Commercial
J. Celotex Corporation - Warehouse
K. Economics Lab, Inc. - Distributor of soap and cleaning compounds
L. ADAP/Kamco. - Commercial, auto parts
M. Waterbed Warehouse - Commercial
N. Charrette - Commercial, art supplies
O. Woburn Foreign Motors
P. Hogan Tire Company - Tire distributor
Q. Bliss marine - Boating equipment
R. Hurlbert Datsun - Automobile sales and repair
s. Cummings Industrial Centers - Offices
T. Northern Research and Engineering Corporation
U. Continental Metal Products - Hospital equipment
V. Cummings Industrial Centers - Offices
W. Cummings Industrial Centers - Offices
X. Interstate Industrial Uniform Rental
Y. Metro Siding and Roofing
Z. W. R. Grace - Food wrapping equipment
AA. Hemingway Transportation, Inc. - General commodities trucking
BB. Cummings Industrial Centers - Offices
CC. Cummings Industrial Centers - Offices
DD. Cummings Industrial Centers - Offices
EE. Cummings Industrial Centers - Offices
FF. McKesson and Robbins Drug Company
GG. 99 Restaurant
HH. Koala Inn
II. New England Plastics - Plastics manufacturing
JJ. Mirra Construction Company, Inc.
KK. Independent Tallow Company

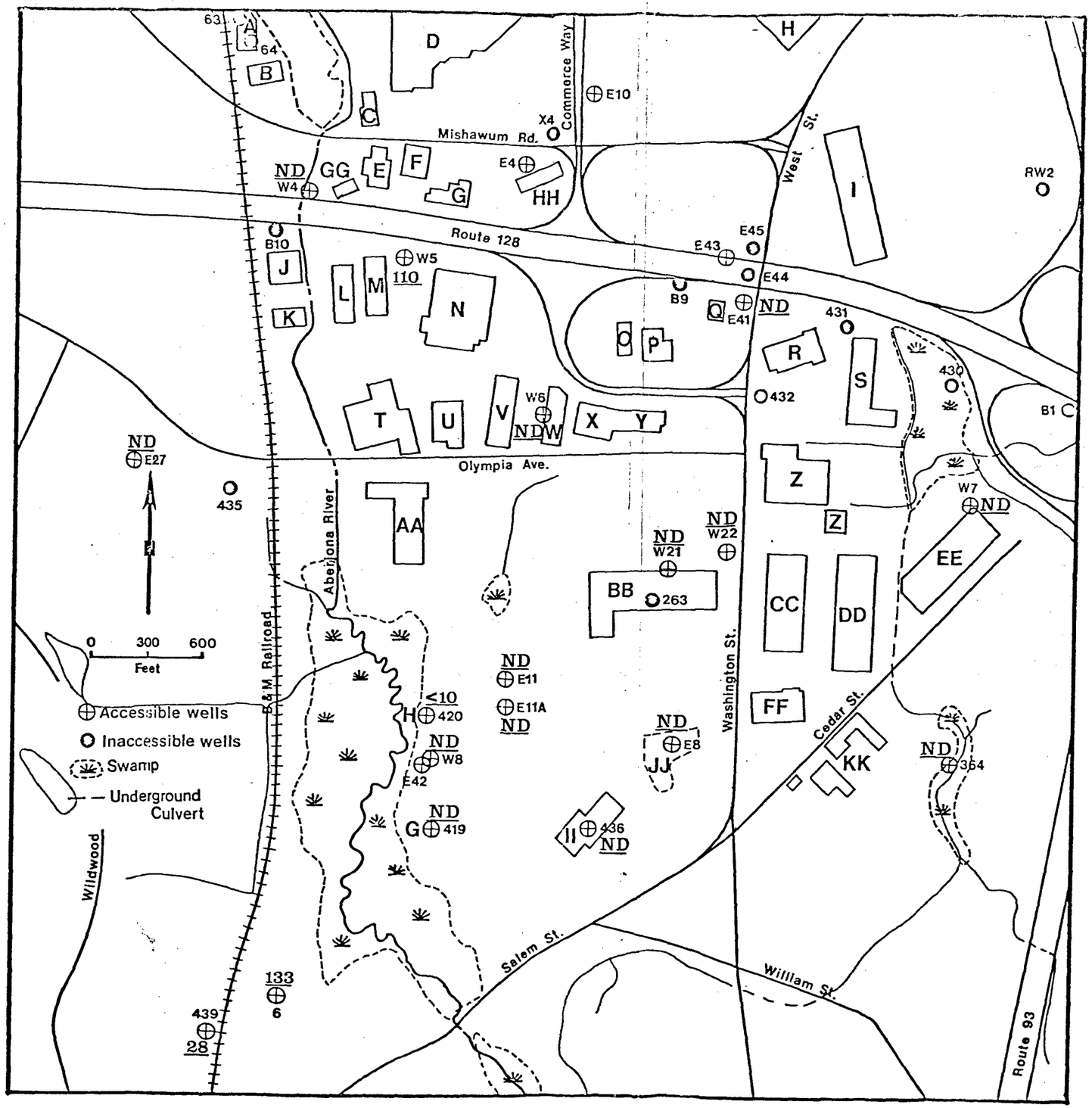

FIGURE 4-1: DETECTED LEVELS OF 1,1,1-TRICHLOROETHANE (ppb)

KEY

A. AVA - Warehouse
B. Bachman Distributing Co.-Food distribution
C. Allied Van Lines
D. Woburn Mall - Commercial
E. Arlwood, Inc. - Wood/Metal doors, hardware
F. Brodie, Inc. - Industrial trucks, tractors
G. Brodie, inc. - Industrial trucks, tractors
H. Post Office
I. Bradlee's - Commercial
J. Celotex Corporation - Warehouse
K. Economics Lab, Inc. - Distributor of soap and cleaning compounds
L. ADAP/Kamco. - Commercial, auto parts
M. Waterbed Warehouse - Commercial
N. Charrette - Commercial, art supplies
O. Woburn Foreign Motors
P. Hogan Tire Company - Tire distributor
Q. Bliss marine - Boating equipment
R. Hurlbert Datsun - Automobile sales and repair
s. Cummings Industrial Centers - Offices
T. Northern Research and Engineering Corporation
U. Continental Metal Products - Hospital equipment
V. Cummings Industrial Centers - Offices
W. Cummings Industrial Centers - Offices
X. Interstate Industrial Uniform Rental
Y. Metro Siding and Roofing
Z. W. R. Grace - Food wrapping equipment
AA. Hemingway Transportation, Inc. - General commodities trucking
BB. Cummings Industrial Centers - Offices
CC. Cummings Industrial Centers - Offices
DD. Cummings Industrial Centers - Offices
EE. Cummings Industrial Centers - Offices
FF. McKesson and Robbins Drug Company
GG. 99 Restaurant
HH. Koala Inn
II. New England Plastics - Plastics manufacturing
JJ. Mirra Construction Company, Inc.
KK. Independent Tallow Company

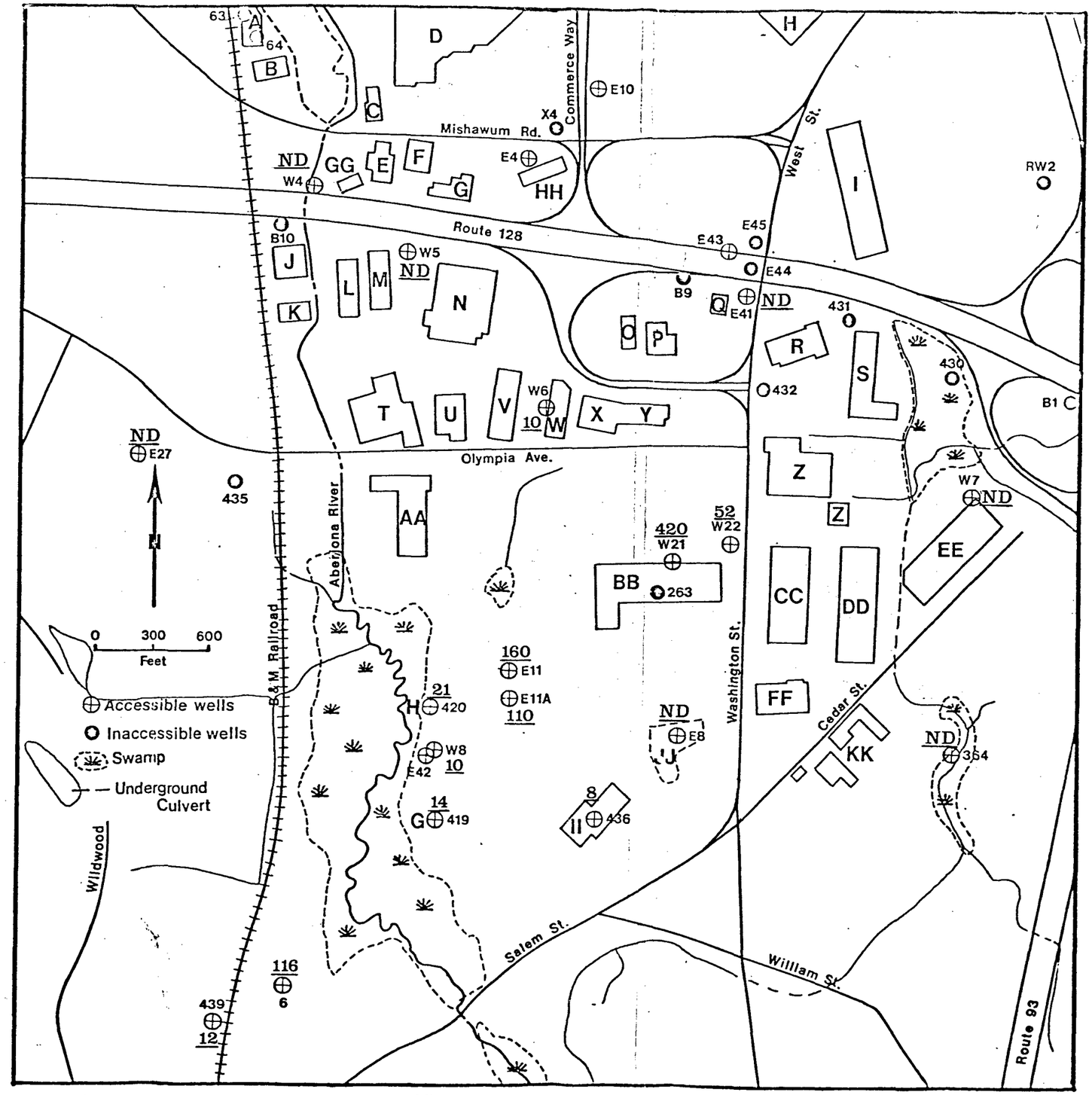

FIGURE 4-2: DETECTED LEVELS OF 1,2-TRANS-DICHLOROETHYLENE (ppb)

KEY

A. AVA - Warehouse
B. Bachman Distributing Co.-Food distribution
C. Allied Van Lines
D. Woburn Mall - Commercial
E. Arlwood, Inc. - Wood/Metal doors, hardware
F. Brodie, Inc. - Industrial trucks, tractors
G. Brodie, inc. - Industrial trucks, tractors
H. Post Office
I. Bradlee's - Commercial
J. Celotex Corporation - Warehouse
K. Economics Lab, Inc. - Distributor of soap and cleaning compounds
L. ADAP/Kamco. - Commercial, auto parts
M. Waterbed Warehouse - Commercial
N. Charrette - Commercial, art supplies
O. Woburn Foreign Motors
P. Hogan Tire Company - Tire distributor
Q. Bliss marine - Boating equipment
R. Hurlbert Datsun - Automobile sales and repair
s. Cummings Industrial Centers - Offices
T. Northern Research and Engineering Corporation
U. Continental Metal Products - Hospital equipment
V. Cummings Industrial Centers - Offices
W. Cummings Industrial Centers - Offices
X. Interstate Industrial Uniform Rental
Y. Metro Siding and Roofing
Z. W. R. Grace - Food wrapping equipment
AA. Hemingway Transportation, Inc. - General commodities trucking
BB. Cummings Industrial Centers - Offices
CC. Cummings Industrial Centers - Offices
DD. Cummings Industrial Centers - Offices
EE. Cummings Industrial Centers - Offices
FF. McKesson and Robbins Drug Company
GG. 99 Restaurant
HH. Koala Inn
II. New England Plastics - Plastics manufacturing
JJ. Mirra Construction Company, Inc.
KK. Independent Tallow Company

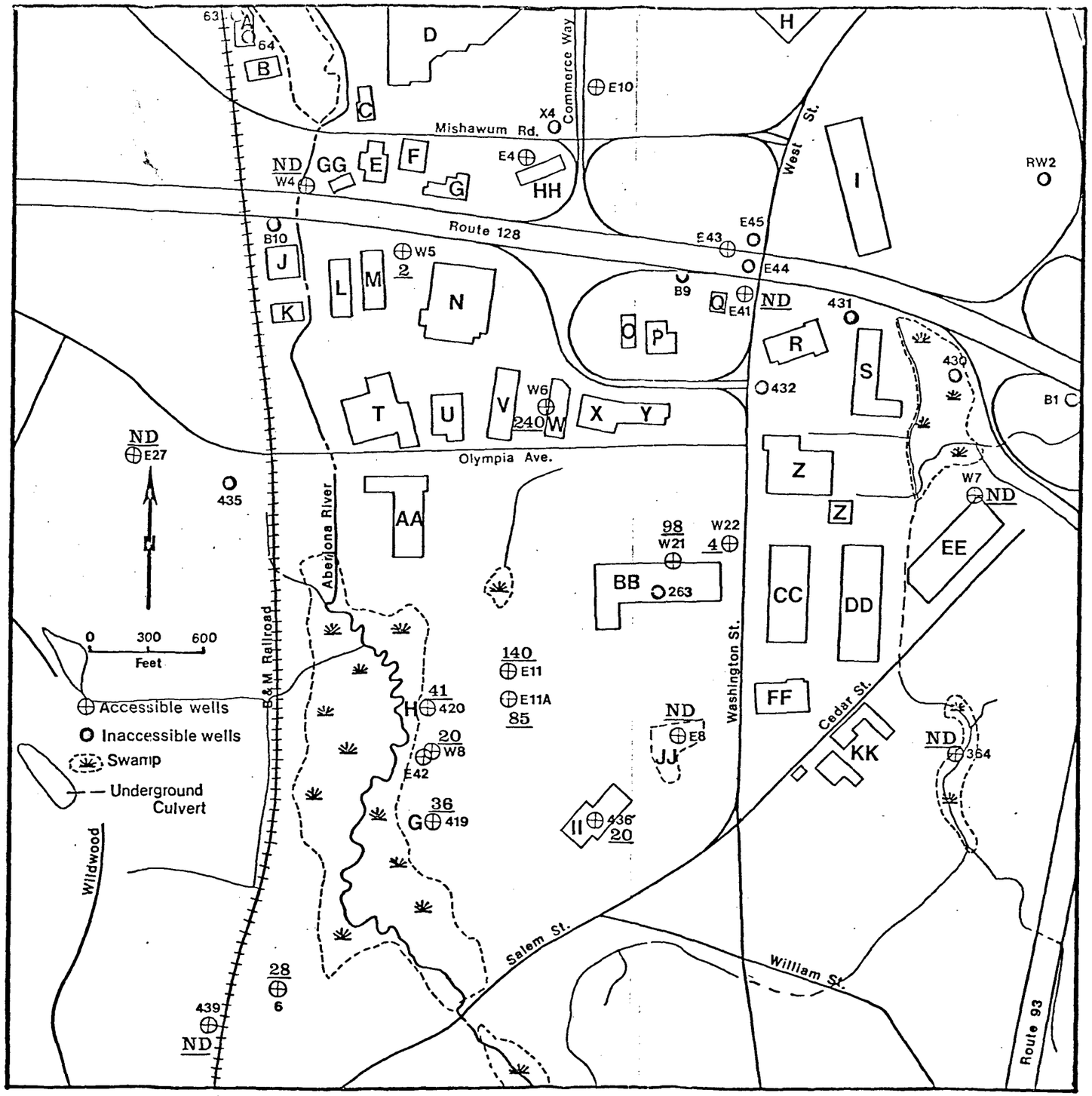

FIGURE 4-3: DETECTED LEVELS OF TETRACHLOROETHYLENE (ppb)

KEY

A. AVA - Warehouse
B. Bachman Distributing Co.-Food distribution
C. Allied Van Lines
D. Woburn Mall - Commercial
E. Arlwood, Inc. - Wood/Metal doors, hardware
F. Brodie, Inc. - Industrial trucks, tractors
G. Brodie, inc. - Industrial trucks, tractors
H. Post Office
I. Bradlee's - Commercial
J. Celotex Corporation - Warehouse
K. Economics Lab, Inc. - Distributor of soap and cleaning compounds
L. ADAP/Kamco. - Commercial, auto parts
M. Waterbed Warehouse - Commercial
N. Charrette - Commercial, art supplies
O. Woburn Foreign Motors
P. Hogan Tire Company - Tire distributor
Q. Bliss marine - Boating equipment
R. Hurlbert Datsun - Automobile sales and repair
s. Cummings Industrial Centers - Offices
T. Northern Research and Engineering Corporation
U. Continental Metal Products - Hospital equipment
V. Cummings Industrial Centers - Offices
W. Cummings Industrial Centers - Offices
X. Interstate Industrial Uniform Rental
Y. Metro Siding and Roofing
Z. W. R. Grace - Food wrapping equipment
AA. Hemingway Transportation, Inc. - General commodities trucking
BB. Cummings Industrial Centers - Offices
CC. Cummings Industrial Centers - Offices
DD. Cummings Industrial Centers - Offices
EE. Cummings Industrial Centers - Offices
FF. McKesson and Robbins Drug Company
GG. 99 Restaurant
HH. Koala Inn
II. New England Plastics - Plastics manufacturing
JJ. Mirra Construction Company, Inc.
KK. Independent Tallow Company

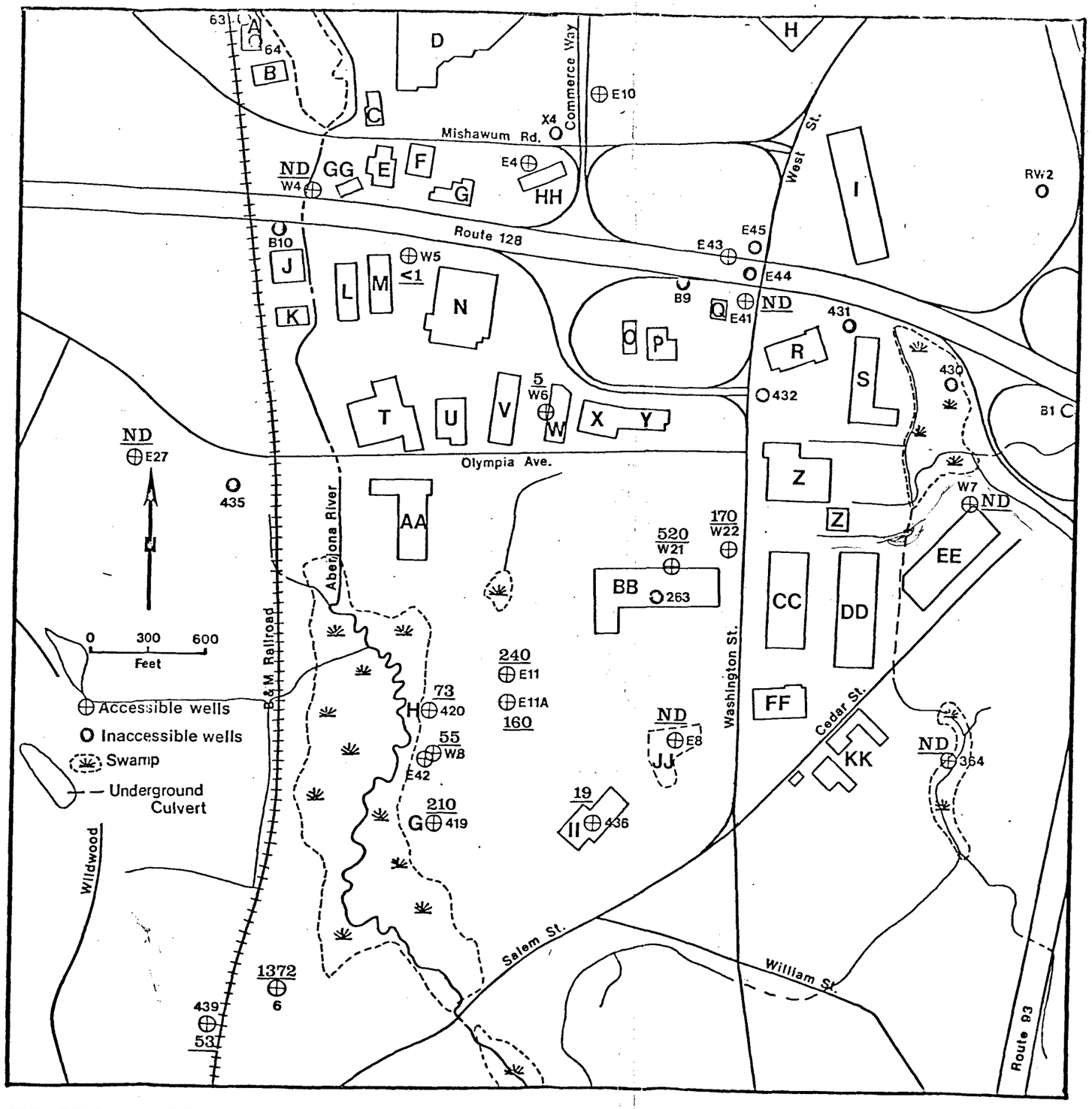

FIGURE 4-4: DETECTED LEVELS OF TRICHLOROETHYLENE (ppb)

Based on the preceding, the source area for the high levels of contamination centered around well W-21 is likely to the north or northeast of that well. The source area for the well 6 contamination is more difficult to determine because the exact configuration of the fault controlled bedrock trench lying beneath the Aberjona River Valley is unknown. If the trench lies further west than indicated in Figure 2-8, than a source area to the north or northeast could influence well 6. if the trench is as it is shown in Figure 2-8, then the source area is most likely to the west of well 6. Further study is required to confirm the source area for this well.

The map of detected levels of 1,1,1-trichloroethane also has two areas of high contaminant concentration (100-200 ppb). Well 6 is again in an area of high concentration. Well W-5 also contains a high concentration of 1,1,1-trichloroethane. Again, no solvents were detected in the overburden during drilling indicating that contamination is migrating within the bedrock, possibly along a fault trending N-S. The source area is most likely to the north or northeast of well W-5 based on Figures 2-4 and 2-5.

Figure 4-3, indicates a high concentration (>200 ppb) of tetrachloroethylene at well W-6 and decreasing levels southward to well 6. As with well W-5, the source area of the contamination most likely lies to the north or northeast with contamination migrating through bedrock fractures.

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SECTION 5 - RECOMMENDATIONS FOR FURTHER STUDY

To further define the source or sources of solvents present in the groundwater within the East Central Woburn study area, the following studies are recommended:

A. An inventory of all solvents used currently or in the past by industries located upgradient of the contaminated wells identified in Section 4 should be performed. Storage and disposed practices of these industries should be carefully evaluated.

B. Once specific industries have been identified as potential sources, groundwater quality monitoring wells should be appropriately sited and installed using hydrogeologic data for the area generated by previous E & E studies.

SECTION 6 - REFERENCES

1. Priority Pollutant Samples collected by Massachusetts DEQE - 14 May 1979, analyzed by Massachusetts DEQE on 21 May 1979.

2. Priority Pollutant Samples collected by EPA/Lexington - 23 July 1979, analyzed by EPA/Lexington on 24 July 1979.

3. Priority Pollutant Samples collected by Massachusetts DEQE - 24 September 1979, analyzed by Lawrence Experiment Station on 25 and 26 September 1979.

4. Priority Pollutant Samples collected by E & E - 23 January 1981 to 30 January 1981, analyzed by Acurex on 26 February 1981.

5. Cook, D. K. Site Inspection Reports for E. C. Whitney and Sons, Whitney Barrel Company, Ritter Trucking Company, Raffi & Swanson, Inc., MDC Septage Receiving Station, New England Resins and Pigments, Woburn Steel Drum, Inc., and Woburn Sanitary Landfill. EPA FIT Project. TDD F1-8006-01. 28 August - 17 September 1980.

6. Cook, D. K. Site Inspection Report for Olin Chemicals Group Wilmington Plant. EPA FIT Project. TDD #F-8005-01F. 48 pp. 5 December 1980.

7. Cook, D. K. Site Inspection Reports for Severence Trucking Company, Inc., Aberjona Auto Parts, John J. Riley Company, Whitney Barrel Company, Atlantic Gelatin and Independent Tallow Company. EPA FIT Project. TDD #F-8005-01E. 20 November - 17 December 1980.

8. Ecology and Environment, Inc. Interim Report on the Geology and Groundwater of North and East Woburn, Massachusetts. EPA FIT Project. TDD #F1-8010-02A/03A. 3 April 1981.

9. Ecology and Environment, Inc. Interim Report on the Groundwater Quality of East and North Woburn, Massachusetts. EPA FIT Project. TDD #F1-8010-04B.

10. Tufts University Department of Urban and Environmental Policy. Hazardous Wastes in Woburn. Prepared for Reading, Massachusetts Conservation Commission. May 1980.

11. U.S. Geological Survey. 1:25000 Topographic sheets for the Boston North, Wilmington, Reading and Lexington, Massachusetts Quadrangles. 1979 photorevisions.

12. Delaney, F. D., and Gay, F. B. Hydrology and Water Resources of the Coastal Drainage Basins of Northeastern Massachusetts, from Castle Neck River, Ipswich to Mystic River, Boston. U.S. Geological Survey Hydrologic Investigations Atlas No. 589 (1980).

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APPENDIX A

Well Logs

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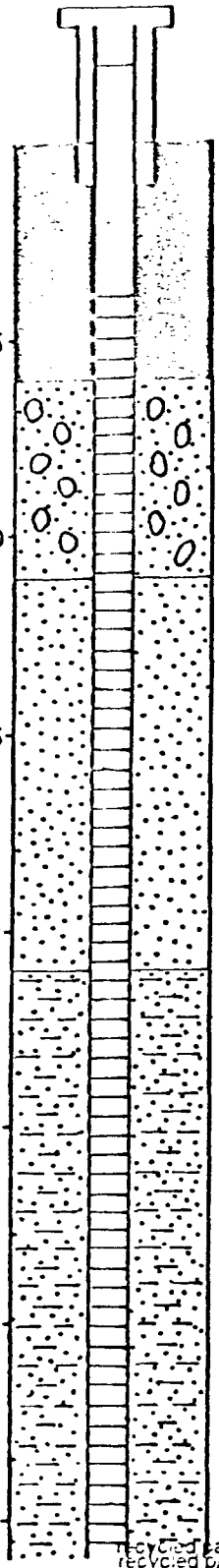
ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 123/1
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
	top soil
5	top soil
10	M-C Br.-Y silt and sand, some cobbles. 20-10-10-8
15	F-M T sand 5-4-7-6
20	F-M T sand 4-3-5-5
25	Gr, F sand, silt 4-4-3-3
30	Gr. fine sand, silt W/R-1-2-2
35	Gr. fine sand and silt 4-2-2-2



Well No. (W-4) S-4
Location Woburn, MA

Owner U.S. EPA
Ground Elev. 53.5' MSL
Driller Geo-Metrics, Inc.
Drilling Completed 7/1/81
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth 91'
Screen Diam. 1.4" ID
Screen Setting 4-91'
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level 5'
Date Measured 10/30/81

WATER QUALITY

Samples Taken Yes x No
No. of Samples -
Type of Samples Priority Pollutant

Date Sampled 11/30/81
Samplers Cook, Porter
Will be Analyzed for

Sampled for Priority Pollutant Organics 11/3/81

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Project Name Woburn Well Survey
Project # TDD F1 8010 03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
40	Gr. fine sand and silt 4-10-10-10
45	Gr. fine sand and silt, trace of clay W/R-2-5-7
50	Gr. fine sand and silt, trace of clay 3-6-4-4
55	Gr. fine sand and silt, trace of clay 6-5-4-4
60	Gr. fine sand and silt, 5-6-12-10
65	Gr. fine sand and silt 5-7-6-5
70	G. fine sand and silt, trace of clay 3-5-5-6
75	Gr. fine sand and silt 1/W/H-2-3

Well No. (W-4) S-4
Location
Owner U.S. EPA
Ground Elev.
Driller Geo-Metrics, Inc.
Drilling Completed
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth
Screen Diam. 1.4" ID
Screen Setting
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level
Date Measured

WATER QUALITY

Samples Taken Yes No
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 123/3
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
80	Gr. fine sand, silt, trace of gravel 19-18-15-100/2 1/2"
85	Bedrock
90	
95	
100	
105	
110	
115	

Well No. (W-4) S-4
Location

Owner U.S. EPA
Ground Elev.
Driller Geo-Metrics, Inc.
Drilling Completed
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth
Screen Diam. 1.4" ID
Screen Setting
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level
Date Measured

WATER QUALITY

Samples Taken Yes No
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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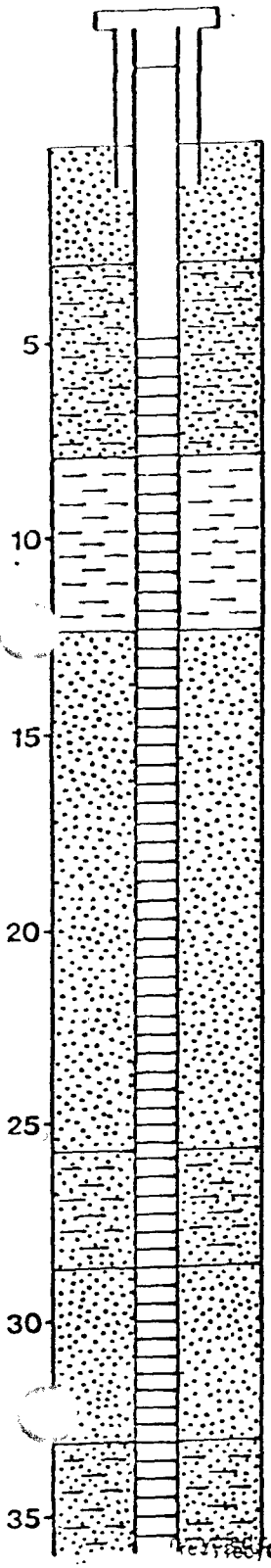
ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 125/1
Project Name Woburn Well Survey
Project # TDD F1 8010 03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M) | Soil Description Blow Counts/6"



Br M Sand 1-3-5-5

Br Silt and F Sand 9-12-14-15

Br Silt

Br F Sand 1-3-7-7

Br F-M Sand 6-7-8-10

Br F Sand grading to Br-Gr Silt with trace clay 10-12-15-17

Br F-M Sand 3-8-9-11

Thin beds of F Silts, Clay and F Sand 6-7-9-10

Well No. (W5) S5
Location Woburn, MA

Owner U.S. EPA
Ground Elev 54' MSL
Driller Geo-Metrics, Inc.
Drilling Completed 7/7/81
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth 65.5'
Screen Diam. 1.4" ID
Screen Setting 4'-65.5'
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level 2' 11"
Date Measured 10/30/81

WATER QUALITY

Samples Taken Yes X No
No. of Samples
Type of Samples Priority Pollutant

Date Sampled 11/30/81
Samplers Cook, Porter
Will be Analyzed for

Sampled for Volatile Organics 11/3/81

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 125/2
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
40	Br F Silt and Clay 8-8-8-7
45	Bedded Br Silt, Trace Clay 4-7-7-20
50	Gravel, Some Silt, Trace Clay (TILL) 94-63-30-27
55	Refusal at 54'7" 55-100/1"
60	Bedrock
65	
70	
75	

Well No. (W-5) S-5
Location

Owner U.S. EPA
Ground Elev.
Driller Geo-Metrics, Inc.
Drilling Completed
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth
Screen Diam. 1.4" ID
Screen Setting
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level
Date Measured

WATER QUALITY

Samples Taken Yes No
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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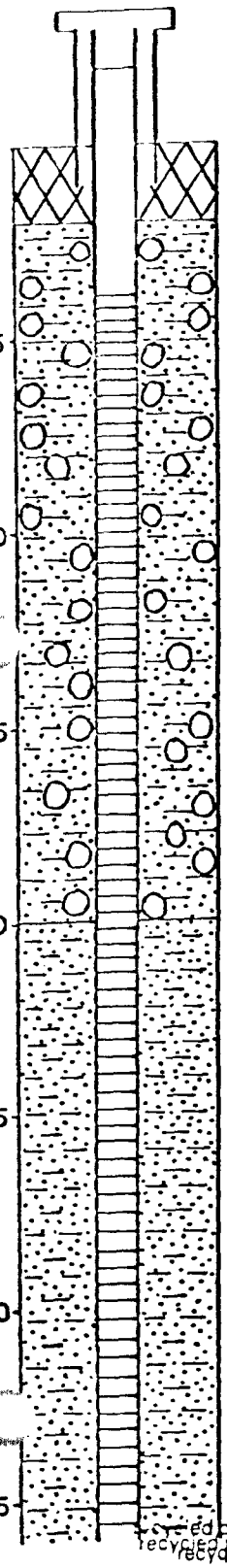
ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 124/1
Project Name Woburn Well Survey
Project # TDD F1 8010 03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
	Fill
5	T. sand and silt, some cobbles. (Till) 7-18-23-25
10	T. C. sand and silt, some cobbles (Till) 8-13-33-60
15	T. sand and silt, and clay, some cobbles (Till) 27-40-93-50/2"
20	T-Gr. sand and silt, Trace of clay, cobbles (Till) 54-100/3"
25	T-Gr. clay, silt and sand (till) 100/4"
30	T.Gr. clay, silt and sand (till) 64-90-112
35	T., Gr, clay, silt and sand and gravel (Till) 100/4"



Well No. (W-6) S-6
Location Woburn, MA

Owner U.S. EPA
Ground Elev. 57.5' MSL
Driller Geo-Metrics, Inc.
Drilling Completed 7/14/81
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth 94'
Screen Diam. 1.4" ID
Screen Setting 4-94'
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level 8'2"
Date Measured 10/30/81

WATER QUALITY

Samples Taken Yes x No
No. of Samples
Type of Samples Priority Pollutant

Date Sampled 11/30/81
Samplers Cook, Porter
Will be Analyzed for

Sampled For Volatile Organics 11/3/81

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

recycled paper
ecology and environment

ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 124/2
Project Name Woburn Well Survey
Project # TDD F1-8010-02A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
40	T. Gr. clay, silt and sand, gravel (Till) 35-53-46-50
45	Tr. Gr. clay silt and sand, some gravel and boulders (till) 100/6'
50	T. gravel, trace of clay some silt (till) 100/4"
55	Tr. T. clay, silt and sand, some gravel (Till) 52-100/5"
60	boulder, gravel
65	Gr. F-M sand and silt with cobbles (Till) 7-37-52-71
70	Gr. f-m sand and silt with cobbles 13-57-100/4"
	T. silt, trace of sand 2" lenses of clay 25-50/100

Well No. (W-6) S-6
Location
Owner U.S. EPA
Ground Elev.
Driller Geo-Metrics, Inc.
Drilling Completed
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth
Screen Diam. 1.4" ID
Screen Setting
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level
Date Measured

WATER QUALITY

Samples Taken Yes No
No. of Samples
Type of Samples
Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 124/3
Project Name Woburn Well Survey
Project # TDD F1 8010 03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
80	silt, sand and boulders (till) 120/5"
85	
90	Bedrock
95	
100	
105	
110	
115	

Well No. (W-6) S-6
Location

Owner U.S. EPA
Ground Elev.
Driller Geo-Metrics, Inc.
Drilling Completed
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth
Screen Diam. 1.4" ID
Screen Setting
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level
Date Measured

WATER QUALITY

Samples Taken Yes No
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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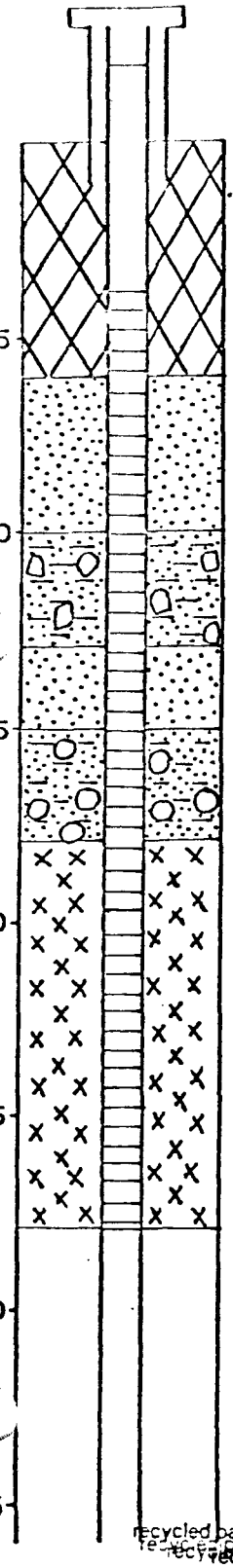
ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 121
Project Name Woburn Well Survey
Project # TDD F1-8010 03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
	Fill 1-7-11-9
5	Fill 2-6-8-5
10	Gr. fine-med sand overlying R-Y clays, silts and sand with angular gravel pieces
	Till 11-20-23-24
15	M-C Br. sand trace silt over Br.-G. silt sand and cobbles
	Till 70-48-54-100
20	
	Bedrock
25	
30	
35	



Well No. (W-7) S-7
Location Woburn, MA

Owner U.S. EPA
Ground Elev. 91' MSL
Driller Geo-Metrics, Inc.
Drilling Completed 6/24/81
Type of Rig Truck Mounted

---------- WELL DATA ----------

Well Diam. 1.4" ID
Depth 28'
Screen Diam. 1.4" ID
Screen Setting 4'-28'
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level 4'1"
Date Measured 10/30/81

-------- WATER QUALITY --------

Samples Taken Yes X No
No. of Samples
Type of Samples Priority Pollutant

Date Sampled
Samplers
Will be Analyzed for

Sampled for Volatile Organics 11/3/81

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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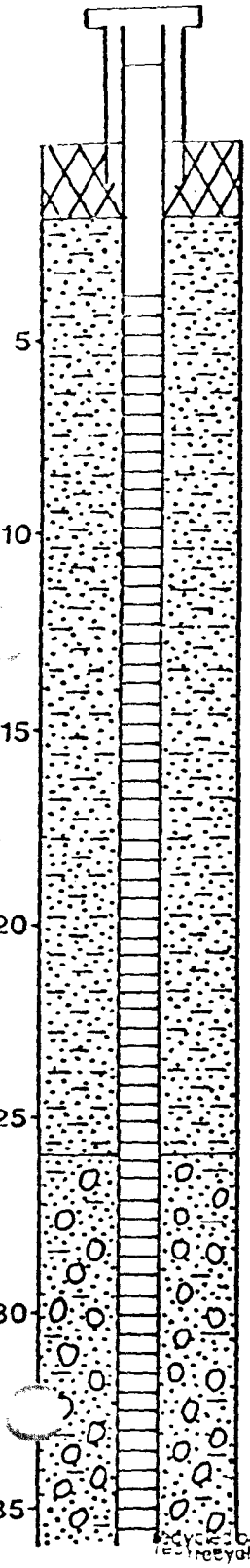
ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 120/1
Project Name Woburn Well Survey
Project # TDD F1 8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
	Fill 1-2-3-4
5	F-M Br Sand 8-12-14-16
10	F Orange sand, trace of silt 4-6-5-3
15	Orange F sand silt, with thin layers of clay 2-6-7-8
20	F-M Br sand 1-2-3-3
25	no recovery 6-5-5-5
30	M-C sand with some cobbles 4-3-5-7
35	C sand and gravel trace of silt 12-13-8-8



Well No. (W-8) S-8
Location Woburn, MA

Owner U.S. EPA
Ground Elev. 45' MSL
Driller Geo-Metrics, Inc.
Drilling Completed 7/25/81
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth 128.5'
Screen Diam. 1.4" ID
Screen Setting 4'-128.5'
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level 2'
Date Measured 10/30/81

WATER QUALITY

Samples Taken Yes X No
No. of Samples
Type of Samples Priority Pollutants

Date Sampled 11/30/81
Samplers Porter and Fucarile
Will be Analyzed for

Sampled for Volatile Organics 11/3/81

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 120/2
Project Name Woburn Well Survey
Project # TDD F1 8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
40	C sand and gravel trace of silt 13-10-12-15
45	C sand and gravel some sand 14-11-11-11
50	Br. C sand and gravel some silt 24-26-76-50
55	Gr. gravel, some sand and silt 17-21-26-36
60	C Gr sand with trace of silt (few thin layers) grading to fine silt and clay 29-30-36-30
65	Gr silt, sand and gravel, trace of clay 34-50-66-78
70	T sand and gravel, some silt, trace of clay 141-187
75	No Recovery wash-med-fine sand 8-25-47-80

Well No. (W-8) S-8
Location
Owner U.S. EPA
Ground Elev.
Driller Geo-Metrics, Inc.
Drilling Completed
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth
Screen Diam. 1.4" ID
Screen Setting
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level
Date Measured

WATER QUALITY

Samples Taken Yes No
No. of Samples
Type of Samples
Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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Woburn, MA 01801

Well Log # 120/3
Project Name Woburn Well Survey
Project # TDD F1 8010 03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
80	Br-T sand and gravel, trace of clay 25-40-40-40
85	Br-T C-sand and gravel trace of silt and clay 10-16-25-25
90	Br. C-sand and gravel trace of silt 14-15-16-21
95	no sample recovery 17-28-26-25
100	T C sand and gravel some silt, trace of clay 20-47-58-60
105	Gr. C. sand and gravel some silt, trace of clay 77-207 for 6"
110	Gr. C. sand and gravel grading to fine sand 24-30-33-27
15	Gr.-T C sand and gravel some silt, trace of clay 20-23-26-20

Well No. (W-8) S-8
Location

Owner U.S. EPA
Ground Elev.
Driller Geo-Metrics, Inc.
Drilling Completed
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth
Screen Diam. 1.4" ID
Screen Setting
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level
Date Measured

WATER QUALITY

Samples Taken Yes No
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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Woburn, MA 01801

Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
120	Gr. C. sand and gravel with trace of silt and clay 43-103-105-89
125	Bedrock
130	
135	
140	
145	
150	
155	

Well No. (W-8) S-8
Location
Owner U.S. EPA
Ground Elev.
Driller Geo-Metrics, Inc.
Drilling Completed
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth
Screen Diam. 1.4" ID
Screen Setting
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level
Date Measured

WATER QUALITY

Samples Taken Yes ____ No ____
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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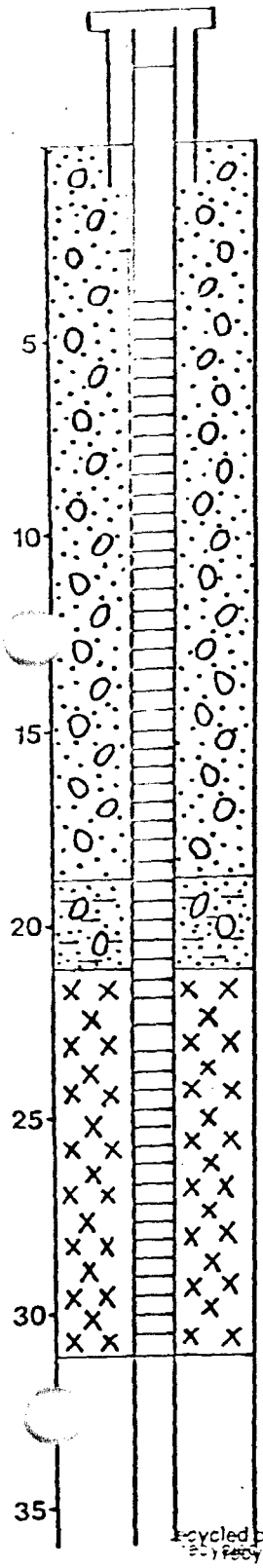
Woburn, MA 01801

Well Log # 122
Project Name Woburn Well Survey
Project # TDD F1 8010 03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
	Fill 2-4-8-19
5	Fill 34-30-50-50
10	Fill, sand and gravel 17-25-35-50
15	Fill, sand and gravel 42-55-23-30
20	R-Y clay, silt and sand 28-20-100/5"
	R-Y clay, silt and sand w/ some gravel 10-15-50/1"
25	Bedrock
30	
35	



Well No. (W21) S-21
Location Woburn, MA

Owner U.S. EPA
Ground Elev. 77' MSL
Driller Geo-Metrics, Inc.
Drilling Completed 9/14/81
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth 31.5'
Screen Diam. 1.4" ID
Screen Setting 4'-31.5"
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level 19' 4"
Date Measured 10/30/81

WATER QUALITY

Samples Taken Yes X No
No. of Samples
Type of Samples Priority Pollutant

Date Sampled
Samplers
Will be Analyzed for

Sampled for Volatile Organics 11/3/81

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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30 East Cummings Park
Woburn, MA 01801

Well Log # 127/1
Project Name Woburn Well Survey
Project # TDD F1 8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
	Sand, topsoil 1-1-46
5	Sand 7-11-23-50/3"
	Boulder Refusal
10	Boulder
	Gr., C sand and gravel 80-84-110/4"
15	
	G.-B. C sand and gravel 47-60-92
20	
25	G.-B C sand and gravel 90-50-47-37
	G.-B. C sand and gravel 80-110/4"
30	
	G.-B. C sand and gravel, some silt 55-125/5"
35	

Well No. (W22) S22
Location Woburn, MA

Owner U.S. EPA
Ground Elev. 84' MSL
Driller Geo-Metrics, Inc.
Drilling Completed 9/22/81
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth 44' MSL
Screen Diam. 1.4" ID
Screen Setting 4'-44'
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level 26'
Date Measured 10/15/81

WATER QUALITY

Samples Taken Yes x No
No. of Samples
Type of Samples Priority Pollutants

Date Sampled
Samplers
Will be Analyzed for

Sampled for Volatile Organics
11/3/81

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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Woburn, MA 01801

Well Log # 127/2
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
40	Bedrock
45	
50	
55	
60	
65	
70	
75	

Well No. (W22) S22
Location

Owner U.S. EPA
Ground Elev.
Driller Geo-Metrics, Inc.
Drilling Completed
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth
Screen Diam. 1.4" ID
Screen Setting
Screen Type Schedule 80 PVC
0.01" Slot
Well Type Monitoring
Static Water Level
Date Measured

WATER QUALITY

Samples Taken Yes No
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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ECOLOGY AND ENVIRONMENT, INC.
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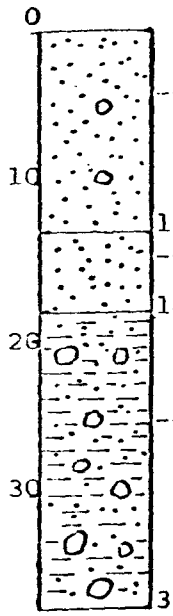
Woburn, MA 01801

Well Log # 1
Project Name Woburn Well Survey
Project # 100 F1-3010-03A
Date Prepared 11/25/80
Prepared By R. DiNitto

Depth, Ft. (M)	Description
0 – 13	Sand (fine); some gravel
13 – 18	Medium sand
18 – 37	Silt; fine sand; gravel



Well No. (B1) 125
Location (Reading) Intersection between Rte. 128 and Rte. 93
Owner State of MA
Ground Elev. 109 feet
Driller
Drilling Completed 1955
Type of Rig

---------- WELL DATA ----------

Hole Diam.
Depth 37 feet
Casing Diam.
Casing Depth
Screen Diam.
Screen Setting
Screen Type
Well Type Test-Unused

---------- TEST DATA ----------

Static Water Level 14 feet
Date Measured 6-1955
Pumping Depth
Test Duration
Pumping Rate
Test Date
Test Type
Pump Setting
Specific Gravity
Final Pump Capacity
Final Pump Setting
Average Pumpage

-------- WATER QUALITY --------

Samples Taken Yes ____ No x
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

Split Samples to

Comments

--------- REMARKS ----------

From Delaney and Gay (1980)

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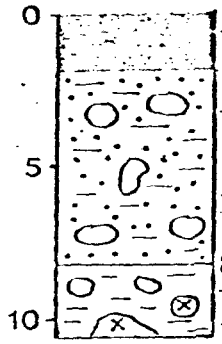
Woburn, MA 01801

Well Log # 54
Project Name Woburn Well Survey
Project # 100 F1 [illegible] 03 A
Date Prepared 11/25/80
Prepared By R. Dimitto

Depth, Ft. (M)	Description
0 – 2	Loam & Sand
2 – 8	Clay, Sand & Gravel
8 – 10.5	Clay, Gravel, Rocks
10.5	Refusal



Well No. (B9) 119
Location Rte. 128, ½ mile west of Rte. 93
Owner State of MA
Ground Elev. 119 feet
Driller
Drilling Completed 1949
Type of Rig

---------- WELL DATA ----------

Hole Diam.
Depth 10.4 feet
Casing Diam.
Casing Depth
Screen Diam.
Screen Setting
Screen Type
Well Type Test-Unused

---------- TEST DATA ----------

Static Water Level
Date Measured
Pumping Depth
Test Duration
Pumping Rate
Test Date
Test Type
Pump Setting
Specific Gravity
Final Pump Capacity
Final Pump Setting
Average Pumpage

-------- WATER QUALITY --------

Samples Taken Yes ____ No X
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

Split Samples to

Comments

--------- REMARKS ----------

From Delaney and Gay (1980)

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ECOLOGY AND ENVIRONMENT, INC.
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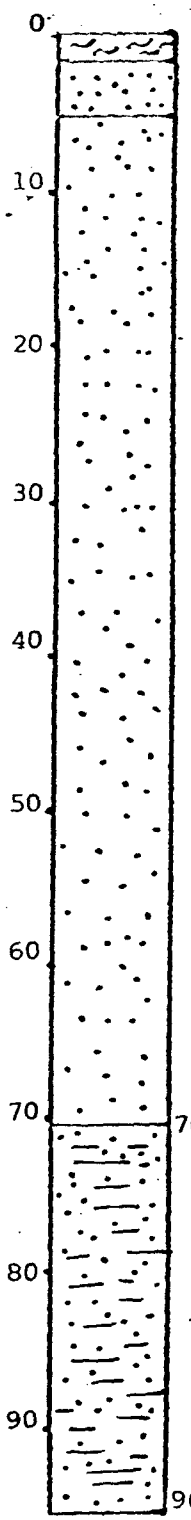
Woburn, MA 01801

Well Log # 55
Project Name Woburn Well Survey
Project # TDD F1 8010-03 A
Date Prepared 11/25/80
Prepared By R. DiNillo

Depth, Ft. (M) | Description



---Artificial Fill
1.5
---Sand
5

---Fine Sand

70.3

---Clay and fine sand

96 ---Refusal

Well No. (B 10) 118
Location Rt. 128, one mile west of Rt. 93
Owner State of MA
Ground Elev. 58 ft.
Driller 1949
Drilling Completed
Type of Rig

---------- WELL DATA ----------

Hole Diam.
Depth 96 ft.
Casing Diam.
Casing Depth
Screen Diam.
Screen Setting
Screen Type
Well Type Test-Unused

---------- TEST DATA ----------

Static Water Level 11 ft.
Date Measured 9-1949
Pumping Depth
Test Duration
Pumping Rate
Test Date
Test Type
Pump Setting
Specific Gravity
Final Pump Capacity
Final Pump Setting
Average Pumpage

-------- WATER QUALITY ---------

Samples Taken Yes ____ No x
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

Split Samples to

Comments

--------- REMARKS ----------

From Delaney and Gay (1980)

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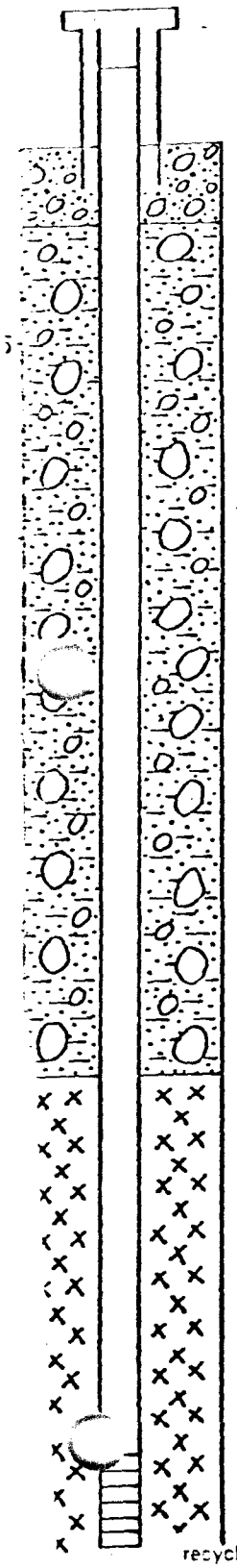
ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 126/1
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
	Br. F-M sand & gravel; Boulder, rock fragments
	Gr.-Br., F-C sand & gravel; some silt, trace boulders (Till)
	Bedrock



Well No. (E41) S60
Location Woburn, MA

Owner MDC
Ground Elev. 122.4' MSL
Driller Guild Drilling Co., Inc.
Drilling Completed 8/7/81
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth 54' 1"
Screen Diam. 1.4" ID
Screen Setting 34'1"-44'1"
Screen Type Schedule 80 PVC 0.01" Slot
Well Type Monitoring
Static Water Level 26'2"
Date Measured 10/30/81

WATER QUALITY

Samples Taken Yes x No
No. of Samples
Type of Samples Priority Pollutants

Date Sampled 11/30/81
Samplers Cook, Porter
Will be Analyzed for

Sampled for Volatile Organics 11/3/81

REMARKS

Well Log Courtesy of Haley & Aldrich, Inc. 238 Main Street Cambridge, MA

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 126/2
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
40	
45	Bedrock
50	
55	
60	
65	
70	
75	

Well No. (E41) S60
Location
Owner
Ground Elev.
Driller
Drilling Completed
Type of Rig Truck Mounted

WELL DATA

Well Diam. -
Depth
Screen Diam.
Screen Setting
Screen Type

Well Type
Static Water Level
Date Measured

WATER QUALITY

Samples Taken Yes No
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-bla
And 40-50%	F-Fine	Y-yel
		T-tr
		Gr-
		R-

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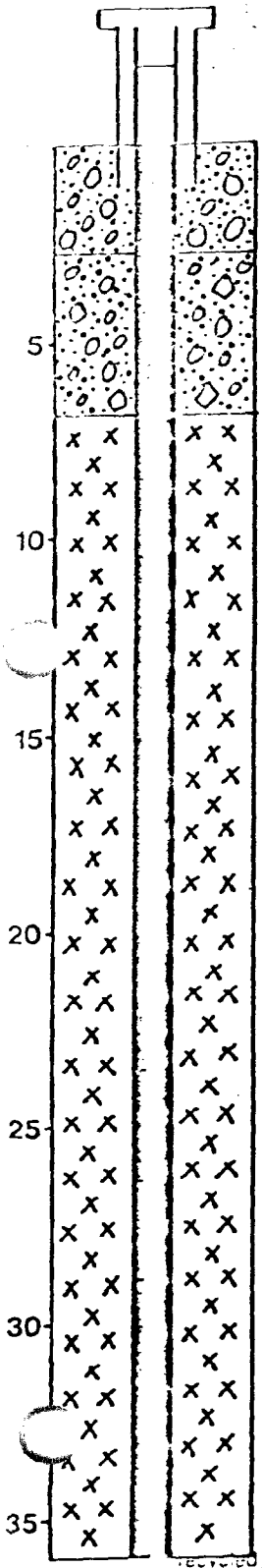
30 East Cummings Park
Woburn, MA 01801

Well Log # 128
Project Name Woburn Well Survey
Project # TDD F1-8010 03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
	Br. F-M sand, some F-M gravel
5	Br. F-M sand and gravel, trace rock or boulder fragments.
10	
15	
20	Bedrock
25	
30	
35	



Well No. (E44)(Boring) 174
Location Woburn, MA

Owner MDC
Ground Elev. 106'2" MSL
Driller Guild Drilling Co., Inc.
Drilling Completed 8/11/81
Type of Rig Truck Mounted

WELL DATA

Well Diam.
Depth 36' 3"
Screen Diam.
Screen Setting
Screen Type

Well Type Boring
Static Water Level
Date Measured

WATER QUALITY

Samples Taken Yes ____ No X
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

Boring Log Courtesy of Haley & Aldrich, Inc., Cambridge, MA.

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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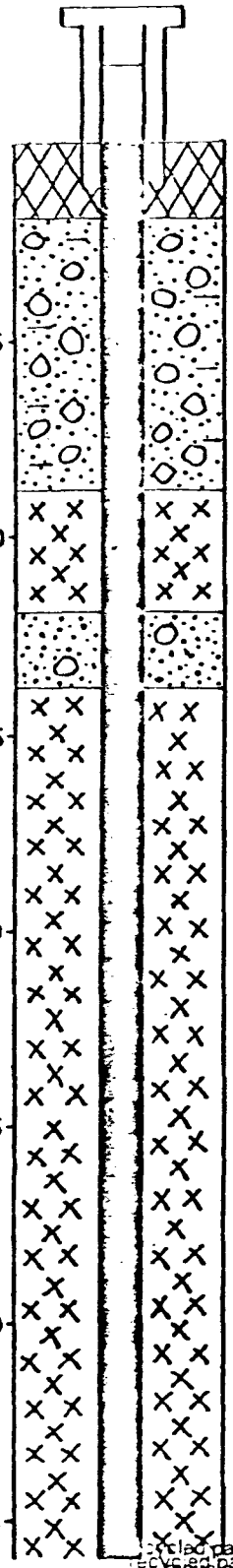
Woburn, MA 01801

Well Log # 129
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
	Topsoil and fill
5	Gr.-Br., F-C sand and gravel, some silt, rock/boulder fragments
10	Boulder
	Br. F-C sand trace F gravel and cobbles
15	
20	
25	Bedrock
30	
35	



Well No. (E 45)(Boring) 175
Location Woburn, MA

Owner MDC
Ground Elev. 122.8' MSL
Driller Guild Drilling Co. Inc.
Drilling Completed 8/14/81
Type of Rig Truck Mounted

WELL DATA

Well Diam.
Depth 54'
Screen Diam.
Screen Setting
Screen Type

Well Type Boring
Static Water Level
Date Measured

WATER QUALITY

Samples Taken Yes No X
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

Boring Log Courtesy of Haley & Aldrich, Inc. Cambridge, MA.

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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Woburn, MA 01801

Well Log # 129
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"
40	
	Bedrock
45	
50	
55	
60	
65	
0	

Well No. (E45) 175
Location
Owner
Ground Elev.
Driller
Drilling Completed
Type of Rig Truck Mounted

WELL DATA

Well Diam.
Depth
Screen Diam.
Screen Setting
Screen Type

Well Type
Static Water Level
Date Measured

WATER QUALITY

Samples Taken Yes No
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

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ECOLOGY AND ENVIRONMENT, INC.
[illegible] East Cummings Park
[illegible]n, MA 01801

Well Log # 73
Project Name Woburn Well Survey
Project # [illegible] F1 [illegible]10-03 A
Date Prepared 3/12/81
Prepared By W. [illegible]

Depth, Ft. (M)	Description
0 – 25	Sand (medium, brown to gray)
25 – 51	Sand and gravel

Well No. (W 6) S46
Location East of RR, North of Salem St. Wob.
Owner J.J. Riley
Ground Elev. 55 ft.
Driller
Drilling Completed 1958
Type of Rig

---------- WELL DATA ----------

Hole Diam. 24 in.
Depth 51 ft.
Casing Diam.
Casing Depth
Screen Diam.
Screen Setting
Screen Type
Well Type Industrial

---------- TEST DATA ----------

Static Water Level 5 ft.
Date Measured 1958
Pumping Depth
Test Duration
Pumping Rate 750 GPM
Test Date
Test Type
Pump Setting
Specific Gravity
Final Pump Capacity
Final Pump Setting
Average Pumpage

-------- WATER QUALITY --------

Samples Taken Yes x No
No. of Samples 6
Type of Samples
Priority Scan

Date Sampled 11/14/1980
Samplers Clay & Cook
Will be Analyzed for
129 Priority Pollutants

Split Samples to J.J. Riley

Comments

--------- REMARKS ----------

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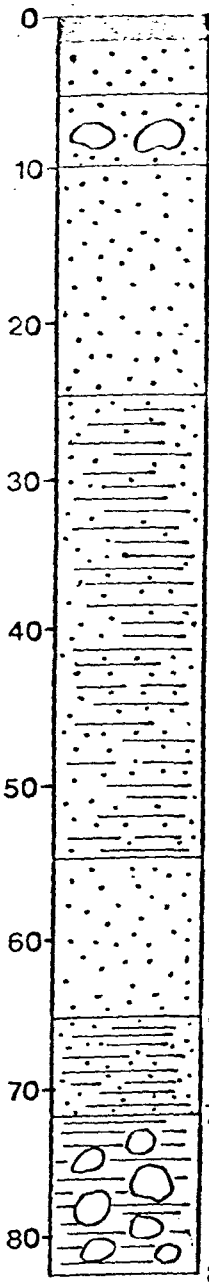
30 East Cummings Park
Woburn, MA 01801

Well Log # 78
Project Name Woburn Well Survey
Project # 100 F1-8010-03 A
Date Prepared 1/5/81
Prepared By R. DiNitto

Depth, Ft. (M)	Description
0–2	Mud
2–5	Fine sand
5–10	Sand and gravel
10–25	Sand
25–55	Clay and fine sand
55–66	Sand
66–72	Clay and sand
72–83	Clay and gravel



Well No. (W 63) 114
Location Within Halls Brook (former Mishwum Lake)
Owner Well no longer exists
Ground Elev. 70 ft.
Driller
Drilling Completed 1936
Type of Rig

---------- WELL DATA ----------

Hole Diam. 18 in.
Depth 83 ft.
Casing Diam.
Casing Depth
Screen Diam.
Screen Setting
Screen Type
Well Type Industrial-Unused

---------- TEST DATA ----------

Static Water Level 6 ft.
Date Measured ?
Pumping Depth
Test Duration
Pumping Rate 1000 GPM
Test Date
Test Type
Pump Setting
Specific Gravity
Final Pump Capacity
Final Pump Setting
Average Pumpage

-------- WATER QUALITY --------

Samples Taken Yes ____ No x
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

Split Samples to

Comments

--------- REMARKS ----------

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Woburn, MA 01801

Well Log # 79
Project Name Woburn Well Survey
Project # TDD F1-8010-03 A
Date Prepared 1/5/81
Prepared By R. DiNitto

Depth, Ft. (M)	Description
0 – 50	Sand, some fine
50 – 68	Gravel
68 – 75	Fine Sand
75 – 79	Gravel

Well No. (W64) 115
Location Within Halls Brook (former Mishawum Lake)
Owner Well no longer exists
Ground Elev. 70 ft.
Driller
Drilling Completed 1937
Type of Rig

---------- WELL DATA ----------

Hole Diam. 24 in.
Depth 78 ft.
Casing Diam.
Casing Depth
Screen Diam.
Screen Setting
Screen Type
Well Type Industrial

---------- TEST DATA ----------

Static Water Level 6
Date Measured ?
Pumping Depth
Test Duration
Pumping Rate 350 GPM
Test Date
Test Type
Pump Setting
Specific Gravity
Final Pump Capacity
Final Pump Setting
Average Pumpage

-------- WATER QUALITY --------

Samples Taken Yes x No
No. of Samples
Type of Samples
Standard Water Quality

Date Sampled 10/21/58
Samplers
Will be Analyzed for

Split Samples to

Comments

--------- REMARKS ----------

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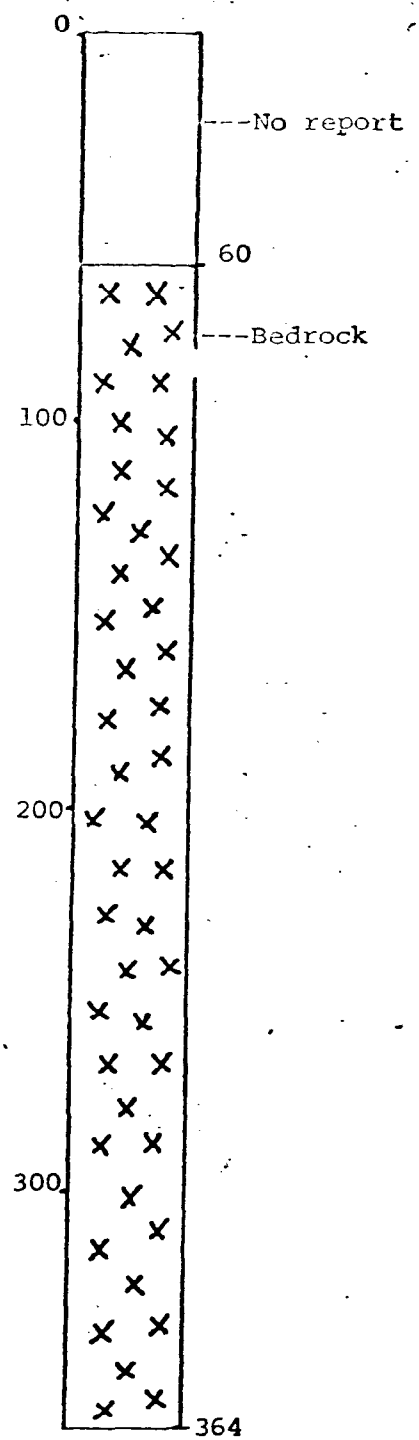
30 East Cummings Park
Woburn, MA 01801

Well Log # 87
Project Name Woburn Well Survey
Project # DOD F1-8010-03 A
Date Prepared 11/18/80
Prepared By R. DiNitto

Depth, Ft. (M) | Description



Well No. (W 263) 127
Location 600 ft. NE of Golden School in East Woburn
Owner Johnson Bros. (Cummings)
Ground Elev. 75' MSL
Driller
Drilling Completed 1958
Type of Rig

---------- WELL DATA ----------

Hole Diam. 8 in.
Depth 364 ft.
Casing Diam.
Casing Depth
Screen Diam.
Screen Setting
Screen Type
Well Type Irrigation

---------- TEST DATA ----------

Static Water Level
Date Measured
Pumping Depth
Test Duration
Pumping Rate 110 GPM
Test Date
Test Type
Pump Setting
Specific Gravity
Final Pump Capacity
Final Pump Setting
Average Pumpage

-------- WATER QUALITY ---------

Samples Taken Yes ____ No x
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

Split Samples to

Comments

--------- REMARKS ----------

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ECOLOGY AND ENVIRONMENT, INC.
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Woburn, MA 01801

Well Log # 93
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 3/11/81
Prepared By R. DiNitto

Depth, Ft. (M)	Description
0	
	Sand, fine
10	
12	
	Sand & Gravel
20	
25	
	Sand, fine
30	
34	Refusal

Well No. (W 364) S44
Location Woburn, North of Forbes Road
Owner Independent Tallow
Ground Elev. 85 ft.
Driller
Drilling Completed 1940
Type of Rig

---------- WELL DATA ----------

Hole Diam. 24 in.
Depth USGS 24 ft. Log 34 ft.
Casing Diam.
Casing Depth
Screen Diam.
Screen Setting
Screen Type
Well Type Industrial

---------- TEST DATA ----------

Static Water Level 5 ft.
Date Measured 12/2/80
Pumping Depth 170 GPM
Test Duration
Pumping Rate
Test Date
Test Type
Pump Setting
Specific Gravity
Final Pump Capacity
Final Pump Setting
Average Pumpage

-------- WATER QUALITY --------

Samples Taken Yes x No
No. of Samples 6
Type of Samples Priority scan

Date Sampled 12/2/80
Samplers D. Cook, P. Clay
Will be Analyzed for
129 Priority Pollutants

Split Samples to

Comments

--------- REMARKS ----------

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30 East Cummings Park
Woburn, MA 01801

Well Log # 105
Project Name Woburn Well Sur.
Project # 100 11 5010-03 A
Date Prepared 3/11/81
Prepared By R. DiNitto

Depth, Ft. (M)	Description
0 – 2	Topsoil
2 – 17	Sand, fine, brown
17 – 26	Clay and fine sand
26 – 28	Sand, med., brown
28 – 45	Sand & Gravel, Brown
45 – 58	Sand (med., brown) & gravel
58 – 88	Sand & Coarse Gravel, brown

Well No. (W 419) S40
Location City Well "G" North of Salem St.; East of Aberjona
Owner City of Woburn
Ground Elev. 45 ft.
Driller Maher
Drilling Completed 1967
Type of Rig

---------- WELL DATA ----------

Hole Diam. 24 in.
Depth 88 ft.
Casing Diam.
Casing Depth
Screen Diam.
Screen Setting Gravel Wall ?
Screen Type Commercial
Well Type Water Withdrawal

---------- TEST DATA ----------

Static Water Level 1 ft.
Date Measured
Pumping Depth
Test Duration
Pumping Rate 800 GPM
Test Date
Test Type
Pump Setting
Specific Gravity
Final Pump Capacity
Final Pump Setting
Average Pumpage

-------- WATER QUALITY --------

Samples Taken Yes x No
No. of Samples 6
Type of Samples Priority Scan

Date Sampled 1/29/81
Samplers R.Palermo, J. Panaro
Will be Analyzed for
129 Priority Pollutants

Split Samples to

Comments

--------- REMARKS ----------

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Woburn, MA 01801

Well Log # 106
Project Name Woburn Well Survey
Project # DOO F1-8010-03A
Date Prepared 3/11/81
Prepared By R. DiNitto

Depth, Ft. (M)	Description
0 – 3	Peat
3 – 27	Sand, fine to med, gray
27 – 56.5	Clay & Sand (fine to med.,brown)
56.5 – 84	Sand (brown) & gravel
84 – 89.3	Sand (fine to coarse, gray to brown) and gravel, trace of clay

Well No. (W 420) S39
Location North of Salem Street East of Aberjona River
Owner City of Woburn "H"
Ground Elev. 45 ft.
Driller Maher
Drilling Completed 1964
Type of Rig

---------- WELL DATA ----------

Hole Diam. 24 in.
Depth 89.3 ft.
Casing Diam.
Casing Depth
Screen Diam.
Screen Setting
Screen Type
Well Type Water withdrawel

---------- TEST DATA ----------

Static Water Level 1 ft.
Date Measured
Pumping Depth
Test Duration
Pumping Rate 700 GPM
Test Date
Test Type
Pump Setting
Specific Gravity
Final Pump Capacity
Final Pump Setting
Average Pumpage

-------- WATER QUALITY --------

Samples Taken Yes x No
No. of Samples 6
Type of Samples Priority Scan

Date Sampled 1/29/81
Samplers R. Palermo, J. Panaro
Will be Analyzed for
129 Priority Pollutants

Split Samples to

Comments

--------- REMARKS ----------

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Woburn, MA 01801

Well Log # 114
Project Name Woburn Well Survey
Project # 100 F1-8010-03 A
Date Prepared 11/20/80
Prepared By R. DiNitto

Depth, Ft. (M)	Description
W430	
0	Elev. 95'
3	Peat
10	Clay, fine brown sand and gravel
15	Refusal
W431	
0	Elev. 100'
5	Clay and till
5	Refusal
W432	
0	Elev. 104'
5	Till
5	Gray Clay
7	Till
7	Refusal

Well No. (W 430-432) 122, 120, 121
Location Hurlbert Datsun (formally Salada Tea)
Owner Washington St. South
Ground Elev. 95 feet
Driller
Drilling Completed 1958
Type of Rig

---------- WELL DATA ----------

Hole Diam. 2 in.
Depth 15 ft., 5 ft., 7 ft.
Casing Diam.
Casing Depth
Screen Diam.
Screen Setting
Screen Type
Well Type Test-Unused

---------- TEST DATA ----------

Static Water Level 0 ft., 3ft
Date Measured 12-58
Pumping Depth
Test Duration
Pumping Rate
Test Date
Test Type
Pump Setting
Specific Gravity
Final Pump Capacity
Final Pump Setting
Average Pumpage

-------- WATER QUALITY --------

Samples Taken Yes ____ No x
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

Split Samples to

Comments

--------- REMARKS ----------

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ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 115
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/18/80
Prepared By R. DiNitto

Depth, Ft. (M)	Description
0–26	---Sand (fine, brown); some gravel
26–78	---Sand (fine, brown); some clay
78–86	---Sand (course, brown) and gravel
86–90	---Sand (fine, brown) and gravel
90	---Refusal

Well No. (W 435) 126
Location Southside Olympia Ave. just west of RR
Owner Lamont
Ground Elev. 50 Ft.
Driller
Drilling Completed 1969
Type of Rig

---------- WELL DATA ----------

Hole Diam. 2 in.
Depth 90 ft. Log.86 (USGS)
Casing Diam.
Casing Depth
Screen Diam.
Screen Setting
Screen Type
Well Type Test-Unused

---------- TEST DATA ----------

Static Water Level 6 ft.
Date Measured 5-69
Pumping Depth
Test Duration 3 hrs.
Pumping Rate 36 GPM
Test Date
Test Type
Pump Setting
Specific Gravity
Final Pump Capacity
Final Pump Setting
Average Pumpage

-------- WATER QUALITY --------

Samples Taken Yes ____ No x
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

Split Samples to

Comments

--------- REMARKS ----------

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Woburn, MA 01801

Well Log # 116
Project Name Woburn Well Sur.
Project # TDD F1-8010-03A
Date Prepared 11/18/80
Prepared By R. DiNitto

Depth, Ft. (M)	Description
0	
10	
20	----No report
30	
38	
40	----Bedrock (not specified)
50	
358	

Well No. (W 436) S41
Location Wob. 800 ft. east of Well # W 419
Owner N.E. Plastics
Ground Elev USGS 60' MSL
Driller
Drilling Completed 1962
Type of Rig

---------- WELL DATA ----------

Hole Diam. 6 in.
Depth 358 ft.
Casing Diam.
Casing Depth
Screen Diam.
Screen Setting
Screen Type
Well Type Industrial

---------- TEST DATA ----------

Static Water Level 15 ft.
Date Measured 2-62
Pumping Depth
Test Duration
Pumping Rate 45 GPM
Test Date
Test Type
Pump Setting
Specific Gravity
Final Pump Capacity
Final Pump Setting
Average Pumpage

-------- WATER QUALITY --------

Samples Taken Yes X No
No. of Samples 6
Type of Samples Priority Scan

Date Sampled 1/23/81
Samplers P. Clay, J. Panaro
Will be Analyzed for
129 Priority Pollutants

Split Samples to

Comments

--------- REMARKS ----------

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Woburn, MA 01801

Well Log # 118
Project Name Woburn Well Survey
Project # 100 F1-8010-03A
Date Prepared 11/18/80
Prepared By R. DiMitto

Depth, Ft. (M)	Description
0	
10	
20	----No report (no bedrock reported)
30	
35	

Well No. (W 439) S47
Location 300 Ft. North of Salem St. Woburn
Owner J.J. Riley
Ground Elev. 55 ft.
Driller
Drilling Completed 1945
Type of Rig

---------- WELL DATA ----------

Hole Diam. ?
Depth 35 ft.
Casing Diam.
Casing Depth
Screen Diam.
Screen Setting
Screen Type
Well Type Industrial

---------- TEST DATA ----------

Static Water Level 5 ft.
Date Measured
Pumping Depth
Test Duration
Pumping Rate 500 GPM
Test Date
Test Type
Pump Setting
Specific Gravity
Final Pump Capacity
Final Pump Setting
Average Pumpage

-------- WATER QUALITY --------

Samples Taken Yes X No
No. of Samples 6
Type of Samples Priority Scan

Date Sampled 11/14/1980
Samplers P. Clay, D. Cook
Will be Analyzed for
129 Priority Pollutants

Split Samples to J.J. Riley

Comments

--------- REMARKS ----------

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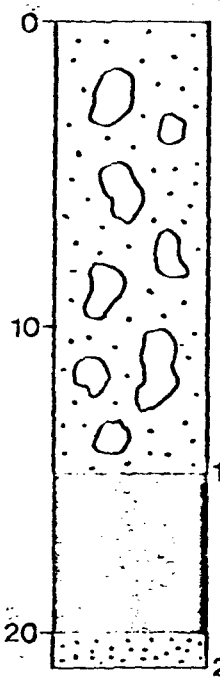
30 East Cummings Park
Woburn, MA 01801

Well Log # 119
Project Name Woburn Well Survey
Project # TDD F1-8010-03 A
Date Prepared 1/5/81
Prepared By R. DiNitto

Depth, Ft. (M)	Description
0	
	---Sand & Broken Gravel
10	
15	
	---Wood & Greasy Material
20	
21.5	---Sand



Well No. (X4) 169
Location Corner of Mishawum Road and Commerce Way
Owner Well no longer exists
Ground Elev. 55 ft.
Driller
Drilling Completed -
Type of Rig

---------- WELL DATA ----------

Hole Diam. NA
Depth 21.5 ft.
Casing Diam.
Casing Depth
Screen Diam.
Screen Setting
Screen Type
Well Type Test-Unused

---------- TEST DATA ----------

Static Water Level
Date Measured
Pumping Depth
Test Duration
Pumping Rate
Test Date
Test Type
Pump Setting
Specific Gravity
Final Pump Capacity
Final Pump Setting
Average Pumpage

-------- WATER QUALITY ---------

Samples Taken Yes ____ No X
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

Split Samples to

Comments

--------- REMARKS ----------

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APPENDIX B

Results of Volatile Organic Analyses Performed at U.S. EPA New England Regional Laboratory

November 4, 5, 1981

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te: Nov. 16, 1981

ject: Volume - 128 VOA

Sent to Johnson
Via Ray Thompson
11/17/81

Elio Goffi & Maria Satarite

: ET

alytical Procedure: Fed Reg Vol 44 #233 Dec. 3, 1979

ethod of Quantitation: Internal Std using response factors

ate Samples Received by Laboratory: Nov. 2, 1981

ate Samples Analyzed: Nov 4-5, 1981

dditional Comments:

A FORM 1220-6 (REV. 3-76)

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Analytical Conditions for
the Purgeables

Instruments:

Tekmar LSC-1
HP-5985

Purge Conditions:

Gas:	Helium
Purge Time and Flow:	12 min, 40 ml/min
Trap:	Six in stainless steel (1/8 in OD) packed with 15 cm 60/80 mesh Tenax-GC plus 8 cm 35/80 mesh Davison type 15 Silica Gel
Desorption Time, Flow, Temperature:	4 min, 20 ml/min, 180°c
Bake out cycle:	7 min

Chromatographic Conditions:

Column:	Eight ft stainless steel (1/8 in OD) packed with 0.2% Carbowax 1500 coated on 60/80 mesh Carbopack C preceded by a 1 ft stainless steel column (1/8 in OD) packed with 3% Carbowax 1500 coated on 60/80 mesh Chromosorb W
Program:	Three min isothermal at 30 °c then 10°/min to 170 °c held for a total time of 45 min
Injector, Separator, Transfer Temperatures:	off, 275 °c, 275 °c
Carrier Gas and Flow:	Helium, 30 ml/min

Mass Spectrometer Conditions:

Electron Energy:	70 V
Mass Range:	45-260 AMU
Emission Current:	0.3 ma
Scan Rate:	12,8 msec/amu

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Purgeable Report
(GC/MS)

W4

ple Number: 50592
tion Location: (W4) S4

mpound	Ion Used to Quantitate	Concentration (ppb)	Comments
loromethane		ND	
chlorodifluoromethane		ND	
omomethane		ND	
nyl chloride		ND	
loroethane		ND	
thylene chloride		ND	
ichlorofluoromethane		ND	
1-dichloroethylene		ND	
1-dichloroethane		ND	
ans-1,2-dichloroethylene		ND	
loroform		ND	
2-dichloroethane		ND	
1,1-trichloroethane		ND	
rbon tetrachloride		ND	
omodichloromethane		ND	
s-chloromethyl ether		ND	
2-dichloropropane		ND	
ans-1,3-dichloropropene		ND	
ichloroethylene		ND	
bromochloromethane		ND	
s-dichloropropene		ND	
1,1,2-trichloroethane		ND	
nzene		ND	
chloroethylvinyl ether		ND	
omoform		ND	
trachloroethylene		ND	
1,2,2-tetrachloroethane		ND	
luene		ND	
lorobenzene		ND	
hylbenzene		ND	
rolein		ND*	
rylonitrile		ND*	
-priority pollutants			
enes		ND	

Concentration is lower than the approximate D.L. because of the compound's response
actor and/or a decrease of interferences in the sample's chromatogram.
D = None detected; approximate sample detection level for priority pollutants 1.0 ppb
D* = None detected; approximate sample detection level
= approximation
= less than
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(GC/MS) 6 5

Sample Number: 505593
Station Location: (105) 85

Compound	Ion Used to Quantitate	Concentration (ppb)	Comments
chloromethane		ND	
dichlorodifluoromethane		ND	
bromomethane		ND	
vinyl chloride		ND	
chloroethane		ND	
methylene chloride	84	~~B~~ 13	
trichlorofluoromethane		ND	
1,1-dichloroethylene	96	~~B~~ 2	
1,1-dichloroethane		ND	
trans-1,2-dichloroethylene		ND	
chloroform	83	~~B~~ JK 1*	
1,2-dichloroethane		ND	
1,1,1-trichloroethane	97	~~B~~ 110	
carbon tetrachloride		ND	
bromodichloromethane		ND	
bis-chloromethyl ether		ND	
1,2-dichloropropane		ND	
trans-1,3-dichloropropene		ND	
trichloroethylene	130	~~B~~ K1	
dibromochloromethane		ND	
cis-1,3-dichloropropene		ND	
1,1,2-trichloroethane		ND	
benzene		ND	
2-chloroethylvinyl ether		ND	
bromoform		ND	
tetrachloroethylene	164	~~B~~ 2	
1,1,2,2-tetrachloroethane		ND	
toluene	92	~~B~~ 5	
chlorobenzene		ND	
ethylbenzene		ND	
acrolein		ND*	
acrylonitrile		ND*	
non-priority pollutants			
xylenes		ND	
ACETONE (Tentative)	43	JK 170*	
METHYL ISOPROPYL KETONE	43	JK 15*	

ND = None detected; approximate sample detection level for priority pollutants 1.0 ppb
ND* = None detected; approximate sample detection level
= approximation
* = less than
* = more than
* = Based on previous survey response factor

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le Number: 50597
ion Location: (607) 57

607

d	Ion Used to Quantitate	Concentration (ppb)	Comments
oromethane		ND	
hlorodifluoromethane		ND	
omomethane		ND	
yl chloride		ND	
oroethane		ND	
hylene chloride		ND	
chlorofluoromethane		ND	
-dichloroethylene		ND	
-dichloroethane		ND	
ns-1,2-dichloroethylene		ND	
oroform		ND	
-dichloroethane		ND	
,1-trichloroethane		ND	
bon tetrachloride		ND	
modichloromethane		ND	
-chloromethyl ether		ND	
-dichloropropane		ND	
ns-1,3-dichloropropene		ND	
chloroethylene		ND	
romochloromethane		ND	
-1,3-dichloropropene		ND	
,2-trichloroethane		ND	
		ND	
ethylvinyl ether		ND	
oform		ND	
achloroethylene		ND	
2,2-tetrachloroethane		ND	
ene		ND	
robenzene		ND	
lbenzene		ND	
lein		ND*	
lonitrile		ND*	
riority pollutants			
es		ND	

None detected; approximate sample detection level for priority pollutants 1.0 ppb
None detected; approximate sample detection level
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ple Number: 50596
tion Location: (102) 58

108

nd	Ion Used to Quantitate	Concentration (ppb)	Comments
loromethane		ND	
chlorodifluoromethane		ND	
omomethane		ND	
nyl chloride		ND	
loroethane		ND	
thylene chloride		ND	
ichlorofluoromethane		ND	
1-dichloroethylene		ND	
1-dichloroethane		ND	
ans-1,2-dichloroethylene	96	~~ND~~ 10	
loroform		ND	
2-dichloroethane		ND	
1,1-trichloroethane		ND	
rbon tetrachloride		ND	
omodichloromethane		ND	
s-chloromethyl ether		ND	
2-dichloropropane		ND	
ans-1,3-dichloropropene		ND	
ichloroethylene	130	~~ND~~ 55	
bromochloromethane		ND	
s-1,3-dichloropropene		ND	
1,2-trichloroethane		ND	
n[illegible]		ND	
cl[illegible]oethylvinyl ether		ND	
omoform		ND	
trachloroethylene	164	~~ND~~ 20	
,2,2-tetrachloroethane		ND	
luene		ND	
lorobenzene		ND	
ylbenzene		ND	
rolein		ND*	
rylonitrile		ND*	
-priority pollutants			
enes		ND	

* None detected; approximate sample detection level for priority pollutants 2.0 ppb
= None detected; approximate sample detection level
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Analysis Report
(GC/MS)

(W 21

Sample Number: 50595
Station Location: (W21) S21

Compound	Ion Used to Quantitate	Concentration (ppb)	Comments
chloromethane		ND	
dichlorodifluoromethane		ND	
bromomethane		ND	
vinyl chloride		ND	
chloroethane		ND	
methylene chloride		ND	
trichlorofluoromethane		ND	
1,1-dichloroethylene		ND	
1,1-dichloroethane		ND	
trans-1,2-dichloroethylene	96	~~ND~~ 420	
chloroform		ND	
1,2-dichloroethane		ND	
1,1,1-trichloroethane		ND	
carbon tetrachloride		ND	
bromodichloromethane		ND	
bis-chloromethyl ether		ND	
1,2-dichloropropane		ND	
trans-1,3-dichloropropene		ND	
trichloroethylene	130	~~ND~~ 520	
dibromochloromethane		ND	
cis-1,3-dichloropropene		ND	
1,1,2-trichloroethane		ND	
benzene		ND	
2-chloroethylvinyl ether		ND	
bromoform		ND	
tetrachloroethylene	164	~~ND~~ 98	
1,1,2,2-tetrachloroethane		ND	
toluene		ND	
chlorobenzene		ND	
ethylbenzene		ND	
acrolein		ND*	
acrylonitrile		ND*	
non-priority pollutants			
xylenes		~~ND~~	

) = None detected; approximate sample detection level for priority pollutants 5.0 ppb
) = None detected; approximate sample detection level
= approximation
= less than
= more than

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(W/AS)

W 22

ple Number: 50594
tion Identification: (W22) 522

ompound	Ion Used to Quantitate	Concentration (ppb)	Comments
loromethane		ND	
ichlorodifluoromethane		ND	
oromethane		ND	
inyl chloride		ND	
loroethane		ND	
ethylene chloride		ND	
ichlorofluoromethane		ND	
,1-dichloroethylene		ND	
1-dichloroethane		ND	
ans-1,2-dichloroethylene	96	~~ND~~ 52	
loroform		ND	
2-dichloroethane		ND	
1,1-trichloroethane		ND	
rbon tetrachloride		ND	
omodichloromethane		ND	
s-chloromethyl ether		ND	
2-dichloropropane		ND	
ans-1,3-dichloropropene		ND	
ichloroethylene	130	~~ND~~ 170	
bromochloromethane		ND	
s-1,3-dichloropropene		ND	
trichloroethane		ND	
e		ND	
chloroethylvinyl ether		ND	
omoform		ND	
trachloroethylene	164	~~ND~~ 4	
1,2,2-tetrachloroethane		ND	
luene		ND	
lorobenzene		ND	
hylbenzene		ND	
crolein		ND*	
crylonitrile		ND*	
-priority pollutants			
lenes		ND	

= None detected; approximate sample detection level for priority pollutants 2.0 ppb
= None detected; approximate sample detection level
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more than

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ple Number: 50586
ation Location: (E27) S37

RONTSTEINS

Compound	Ion Used to Quantitate	Concentration (ppb)	Comments
hloromethane		ND	
ichlorodifluoromethane		ND	
romomethane		ND	
inyl chloride		ND	
hloroethane		ND	
ethylene chloride		ND	
richlorofluoromethane		ND	
,1-dichloroethylene		ND	
,1-dichloroethane		ND	
rans-1,2-dichloroethylene		ND	
hloroform		ND	
,2-dichloroethane		ND	
,1,1-trichloroethane		ND	
arbon tetrachloride		ND	
romodichloromethane		ND	
is-chloromethyl ether		ND	
,2-dichloropropane		ND	
rans-1,3-dichloropropene		ND	
richloroethylene		ND	
ibromochloromethane		ND	
is-1,3-dichloropropene		ND	
,1,2-trichloroethane		ND	
enzene		ND	
-chloroethylvinyl ether		ND	
romoform		ND	
etrachloroethylene		ND	
,1,2,2-tetrachloroethane		ND	
oluene		ND	
hlorobenzene		ND	
hylbenzene		ND	
rolein		ND*	
rylonitrile		ND*	
-priority pollutants			
lenes		ND	

= None detected; approximate sample detection level for priority pollutants 1.0 ppb
* = None detected; approximate sample detection level
roximation
less than
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(GC/MS)

RIFLE RANGE

Number: 50587
Location: CH (S38)

nd	Ion Used to Quantitate	Concentration (ppb)	Comments
methane		ND	
rodifluoromethane		ND	
ethane		ND	
chloride		ND	
ethane		ND	
ene chloride		ND	
orofluoromethane		ND	
chloroethylene		ND	
chloroethane		ND	
1,2-dichloroethylene	96	~~ND~~ 160	
form		ND	
chloroethane		ND	
richloroethane		ND	
tetrachloride		ND	
chloromethane		ND	
oromethyl ether		ND	
hloropropane		ND	
,3-dichloropropene		ND	
roethylene	130	~~ND~~ 240	
chloromethane		ND	
-dichloropropene		ND	
richloroethane		ND	
		ND	
oethylvinyl ether		ND	
rm		ND	
loroethylene	164	~~ND~~ 140	
-tetrachloroethane		ND	
		ND	
enzene		ND	
zene		ND	
		ND*	
trile		ND*	
rity pollutants			
		ND	

detected; approximate sample detection level for priority pollutants 10 ppb
e detected; approximate sample detection level
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Purgeable Report
(GC/MS)

Copy

Sample Number: 50588
Station Location: FUA (SBCR)

Compound	Ion Used to Quantitate	Concentration (ppb)	Comments
chloromethane		ND	
dichlorodifluoromethane		ND	
bromomethane		ND	
vinyl chloride		ND	
chloroethane		ND	
methylene chloride		ND	
trichlorofluoromethane		ND	
1,1-dichloroethylene		ND	
1,1-dichloroethane		ND	
trans-1,2-dichloroethylene	96	~~ND~~ 110	
chloroform		ND	
1,2-dichloroethane		ND	
1,1,1-trichloroethane		ND	
carbon tetrachloride		ND	
bromodichloromethane		ND	
bis-chloromethyl ether		ND	
1,2-dichloropropane		ND	
trans-1,3-dichloropropene		ND	
trichloroethylene	130	~~ND~~ 160	
dibromochloromethane		ND	
cis-1,3-dichloropropene		ND	
1,1,2-trichloroethane		ND	
benzene		ND	
2-chloroethylvinyl ether		ND	
bromoform		ND	
tetrachloroethylene	164	~~ND~~ 85	
1,1,2,2-tetrachloroethane		ND	
toluene		ND	
chlorobenzene		ND	
ethylbenzene		ND	
acrolein		ND*	
acrylonitrile		ND*	
non-priority pollutants			
alkenes		ND	

- = None detected; approximate sample detection level for priority pollutants 10 ppb
- * = None detected; approximate sample detection level
- ≈ = approximation
- < = less than
- > = more than

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(GC/MS) G436

ple Number: 50591
ation Location: G436 (591)

ound	Ion Used to Quantitate	Concentration (ppb)	Comments
loromethane		ND	
chlorodifluoromethane		ND	
omomethane		ND	
nyl chloride		ND	
loroethane		ND	
thylene chloride		ND	
ichlorofluoromethane		ND	
1-dichloroethylene		ND	
1-dichloroethane		ND	
ans-1,2-dichloroethylene		ND	
loroform		ND	
2-dichloroethane		ND	
1,1-trichloroethane	97	~~ND~~ 4	
rbon tetrachloride		ND	
omodichloromethane		ND	
s-chloromethyl ether		ND	
2-dichloropropane		ND	
ans-1,3-dichloropropene		ND	
ichloroethylene	130	~~ND~~ 18	
bromochloromethane		ND	
s-1,3-dichloropropene		ND	
1,2-trichloroethane		ND	
zene		ND	
h ethylvinyl ether		ND	
moform		ND	
rachloroethylene	164	~~ND~~ 20	
2,2-tetrachloroethane		ND	
zene		ND	
robenzene		ND	
lbenzene		ND	
lein		ND*	
lonitrile		ND*	
riority pollutants			
es		ND	

one detected; approximate sample detection level for priority pollutants 1.0 ppb
one detected; approximate sample detection level
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(GC/MS)

NE PLASTICS
(1) 4SA

Sample Number: 50585
Station Location: [illegible] (Colin)

Compound	Ion Used to Quantitate	Concentration (ppb)	Comments
chloromethane		ND	
dichlorodifluoromethane		ND	
bromomethane		ND	
vinyl chloride		ND	
chloroethane		ND	
methylene chloride		ND	
trichlorofluoromethane		ND	
1,1-dichloroethylene		ND	
1,1-dichloroethane		ND	
trans-1,2-dichloroethylene	96	~~ND~~ 7.7	
chloroform		ND	
1,2-dichloroethane		ND	
1,1,1-trichloroethane		ND	
carbon tetrachloride		ND	
bromodichloromethane		ND	
bis-chloromethyl ether		ND	
1,2-dichloropropane		ND	
trans-1,3-dichloropropene		ND	
trichloroethylene	130	~~ND~~ 19	
dibromochloromethane		ND	
cis-1,3-dichloropropene		ND	
1,1,2-trichloroethane		ND	
zene		ND	
2-chloroethylvinyl ether		ND	
bromoform		ND	
tetrachloroethylene	164	~~ND~~ 17	
1,1,2,2-tetrachloroethane		ND	
toluene		ND	
chlorobenzene		ND	
ethylbenzene		ND	
acrolein		ND*	
acrylonitrile		ND*	
non-priority pollutants			
xylenes		ND	

ND = None detected; approximate sample detection level for priority pollutants 1.0 ppb
ND* = None detected; approximate sample detection level
J = approximation
K = less than
L = more than

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(GC/MS)

Sample Number: 50590
Station Location: MS (S12)

Compound	Ion Used to Quantitate	Concentration (ppb)	Comments
chloromethane		ND	
dichlorodifluoromethane		ND	
bromomethane		ND	
vinyl chloride		ND	
chloroethane		ND	
methylene chloride		ND	
trichlorofluoromethane		ND	
1,1-dichloroethylene		ND	
1,1-dichloroethane		ND	
trans-1,2-dichloroethylene		ND	
chloroform	83	~~ND~~ 1K1*	
1,2-dichloroethane		ND	
1,1,1-trichloroethane		ND	
carbon tetrachloride		ND	
bromodichloromethane		ND	
bis-chloromethyl ether		ND	
1,2-dichloropropane		ND	
trans-1,3-dichloropropene		ND	
trichloroethylene		ND	
dibromochloromethane		ND	
cis-1,3-dichloropropene		ND	
1,1,2-trichloroethane		ND	
benzene		ND	
2-chloroethylvinyl ether		ND	
bromoform		ND	
tetrachloroethylene		ND	
1,1,2,2-tetrachloroethane		ND	
toluene		ND	
chlorobenzene		ND	
ethylbenzene		ND	
acrolein		ND*	
acrylonitrile		ND*	
non-priority pollutants			
xylenes		ND	

ND = None detected; approximate sample detection level for priority pollutants 1.0 ppb
ND* = None detected; approximate sample detection level
I = Approximation
< = less than
> = more than
* = Based on preliminary survey response factor

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(GC/MS)

Sample Number: 50589
Station Location: 516 (S16)

Compound	Ion Used to Quantitate	Concentration (ppb)	Comments
chloromethane		ND	
dichlorodifluoromethane		ND	
bromomethane		ND	
vinyl chloride		ND	
chloroethane		ND	
methylene chloride		ND	
trichlorofluoromethane		ND	
1,1-dichloroethylene		ND	
1,1-dichloroethane		ND	
trans-1,2-dichloroethylene	96	~~ND~~ 10	
chloroform		ND	
1,2-dichloroethane		ND	
1,1,1-trichloroethane		ND	
carbon tetrachloride		ND	
bromodichloromethane		ND	
bis-chloromethyl ether		ND	
1,2-dichloropropane		ND	
trans-1,3-dichloropropene		ND	
trichloroethylene	130	~~ND~~ 5	
dibromochloromethane		ND	
cis-1,3-dichloropropene		ND	
1,1,2-trichloroethane		ND	
benzene		ND	
2-chloroethylvinyl ether		ND	
bromoform		ND	
tetrachloroethylene	164	~~ND~~ 240	
1,1,2,2-tetrachloroethane		ND	
toluene	92	~~ND~~ 20	
chlorobenzene		ND	
ethylbenzene		ND	
acrolein		ND*	
acrylonitrile		ND*	
non-priority pollutants			
xylenes		ND	

ND = None detected; approximate sample detection level for priority pollutants 5.0 ppb
ND* = None detected; approximate sample detection level
≈ = approximation
< = less than
> = more than

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(GC/MS)

Sample Number: 505554
Station Location: (E41) S60

Bucs

Compound	Ion Used to Quantitate	Concentration (ppb)	Comments
chloromethane		ND	
dichlorodifluoromethane		ND	
bromomethane		ND	
vinyl chloride		ND	
chloroethane		ND	
methylene chloride		ND	
trichlorofluoromethane		ND	
1,1-dichloroethylene		ND	
1,1-dichloroethane		ND	
trans-1,2-dichloroethylene		ND	
chloroform		ND	
1,2-dichloroethane		ND	
1,1,1-trichloroethane		ND	
carbon tetrachloride		ND	
bromodichloromethane		ND	
bis-chloromethyl ether		ND	
1,2-dichloropropane		ND	
trans-1,3-dichloropropene		ND	
trichloroethylene		ND	
dibromochloromethane		ND	
cis-1,3-dichloropropene		ND	
1,1,2-trichloroethane		ND	
benzene		ND	
2-chloroethylvinyl ether		ND	
bromoform		ND	
tetrachloroethylene		ND	
1,1,2,2-tetrachloroethane		ND	
toluene		ND	
chlorobenzene		ND	
ethylbenzene		ND	
acrolein		ND*	
acrylonitrile		ND*	
non-priority pollutants			
xylenes		ND	

ND = None detected; approximate sample detection level for priority pollutants 1.0 ppb
ND* = None detected; approximate sample detection level
J = Approximation
L = less than
L = more than

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APPENDIX C

Results of Priority Pollutant Analyses Performed Between November 12, 1980 and March 3, 1981

ORGANICS ANALYSIS DATA SHEET

(Dell (EH) 638

LABORATORY NAME ACUREX

LAB SAMPLE ID NO. AB1-01-020

QC REPORT NO. LV-5

Rifle Pass Cluster

	ACID COMPOUNDS	ug/l
21A	2,4,6-trichlorophenol	ND
22A	p-chloro-m-cresol	
24A	2-chlorophenol	
31A	2,4-dichlorophenol	
34A	2,4-dimethylphenol	
57A	2-nitrophenol	
58A	4-nitrophenol	
59A	2,4-dinitrophenol	
60A	4,6-dinitro-o-cresol	
64A	pentachlorophenol	
65A	phenol	

	BASE/NEUTRAL COMPOUNDS	
1B	acenaphthene	ND
5B	benzidine	
8B	1,2,4-trichlorobenzene	
9B	hexachlorobenzene	
12B	hexachloroethane	
18B	bis(2-chloroethyl)ether	
20B	2-chloronaphthalene	
25B	1,2-dichlorobenzene	
26B	1,3-dichlorobenzene	
27B	1,4-dichlorobenzene	
28B	3,3'-dichlorobenzidine	
35B	2,4-dinitrotoluene	
36B	2,6-dinitrotoluene	
37B	1,2-diphenylhydrazine (as azobenzene)	
B	fluoranthene	
40B	4-chlorophenyl phenyl ether	

	BASE/NEUTRAL COMPOUNDS
41B	4-bromophenyl phenyl ether
42B	bis (2-chloroisopropyl) ether
43B	bis (2-chloroethoxy) methane
52B	hexachlorobutadiene
53B	hexachlorocyclopentadiene
54B	isophorone
55B	naphthalene
56B	nitrobenzene
61B	N-nitrosodimethylamine
62B	N-nitrosodiphenylamine
63B	N-nitrosodi-n-propylamine
66B	bis (2-ethylhexyl) phthalate
67B	butyl benzyl phthalate
68B	di-n-butyl phthalate
69B	di-n-octyl phthalate
70B	diethyl phthalate
71B	dimethyl phthalate
72B	benzo(a)anthracene
73B	benzo(a)pyrene
74B	3,4-benzofluoranthene
75B	benzo(k)fluoranthene
76B	chrysene
77B	acenaphthylene
78B	anthracene
79B	benzo(ghi)perylene
80B	fluorene
81B	phenanthrene
82B	dibenzo(a,h)anthracene
83B	Indeno(1,2,3-cd)pyrene
84B	pyrene

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ANALYSIS DATA SHEET - Page 2

LABORATORY NAME ACUREX

LAB SAMPLE ID NO. A81-01-020

QC REPORT NO. LV-5

Rifle Range Chlorinator

	VOLATILES	ug/l
2V	acrolein	ND
3V	acrylonitrile	ND
4V	benzene	*
6V	carbon tetrachloride	ND
7V	chlorobenzene	
10V	1,2-dichloroethane	
11V	1,1,1-trichloroethane	*
13V	1,1-dichloroethane	ND
14V	1,1,2-trichloroethane	
15V	1,1,2,2-tetrachloroethane	
16V	chloroethane	
19V	2-chloroethylvinyl ether	
23V	chloroform	
29V	1,1-dichloroethylene	
[illegible]V	1,2-trans-dichloroethylene	210
32V	1,2-dichloropropane	ND
33V	1,3-dichloropropylene	
38V	ethylbenzene	
44V	methylene chloride	
45V	methyl chloride	
46V	methyl bromide	
47V	bromoform	
48V	dichlorobromomethane	
49V	trichlorofluoromethane	
50V	dichlorodifluoromethane	
51V	chlorodibromomethane	
5V	tetrachloroethylene	89
6V	toluene	ND
7V	trichloroethylene	280
[illegible]	vinyl chloride	ND

	PESTICIDES
89P	aldrin
90P	dieldrin
91P	chlordane
92P	4,4'-DDT
93P	4,4'-DDE
94P	4,4'-DDD
95P	-endosulfan
96P	-endosulfan
97P	endosulfan sulfate
98P	endrin
99P	endrin aldehyde
100P	heptachlor
101P	heptachlor epoxide
102P	-BHC
103P	-BHC
104P	-BHC
105P	-BHC
106P	PCB-1242
107P	PCB-1254
108P	PCB-1221
109P	PCB-1232
110P	PCB-1248
111P	PCB-1260
112P	PCB-1016
113P	toxaphene

	DIOXINS
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin

*Less than 10 ug/l
(pesticides less than 0.1 ug/l)

ND = Not detected

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INORGANICS ANALYSIS DATA SHEET

SES-93

LABORATORY NAME Versar Inc. SAMPLE NO. MA 8043

SAMPLE ID NO. 9212 QC REPORT NO.

TASK 1 (Elements to be identified and measured)

		ug/l			ug/l
1.	Aluminum	< 50.	10.	Nickel	< 20.
2.	Chromium	< 10.	11.	Manganese	20.
3.	Barium	10.	12.	Zinc	180.
4.	Beryllium	< 2.	13.	Boron	< 10.
5.	Cadmium	< 5.	14.	Vanadium	< 10.
6.	Cobalt	< 10.	15.	Calcium	47,300.
7.	Copper	60.	16.	Magnesium	9,500.
8.	Iron	500.	17.	Sodium	40,000.
9.	Lead	< 40.			

TASK 2 (Elements to be identified and measured)

		ug/l			ug/l
.	Arsenic	<10.	5.	Mercury	<1.
.	Antimony	<20.	6.	Tin	<20.
.	Selenium	<10.	7.	Silver	<20.
.	Thallium	<10.			

TASK 3 (Elements to be identified and measured)

.	Ammonia	mg/l	4.	Cyanide	mg/l
.	Fluoride	mg/l	5.	pH	Units
.	Sulfide	mg/l	6.	TOC	mg/l

COMMENTS:

a) with a detection limit of
b) with a detection limit of
c) with a detection limit of
d) analyzed on a sample aliquot preserved with HCl from F/pH sample bot
e) average of two replicate determinations
f) insufficient sample aliquot

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LABORATORY NAME: ACUREX

LAB SAMPLE ID NO. A31 01 020

QC REPORT NO. LV-5

WPU (EIA) S33A

Rifle Range House

ACID COMPOUNDS

		ug/l
21A	2,4,6- trichlorophenol	ND
22A	p-chloro-m-cresol	
24A	2- chlorophenol	
31A	2,4-dichlorophenol	
34A	2,4- dimethylphenol	
57A	2- nitrophenol	
58A	4- nitrophenol	
59A	2,4- dinitrophenol	
60A	4,6- dinitro-o-cresol	
64A	pentachlorophenol	
65A	phenol	

BASE/NEUTRAL COMPOUNDS

	acenaphthene	ND
5B	benzidine	
8B	1,2,4- trichlorobenzene	
9B	hexachlorobenzene	
12B	hexachloroethane	
18B	bis(2-chloroethyl)ether	
20B	2-chloronaphthalene	
25B	1,2-dichlorobenzene	
26B	1,3-dichlorobenzene	
27B	1,4-dichlorobenzene	
28B	3,3'-dichlorobenzidine	
35B	2,4- dinitrotoluene	
36B	2,6- dinitrotoluene	
37B	1,2- diphenylhydrazine (as azobenzene)	
[illegible]	fluoranthene	
[illegible]	4- chlorophenyl phenyl ether	

BASE/NEUTRAL COMPOUNDS

41B	4-bromophenyl phenyl ether
42B	bis (2-chloroisopropyl) ether
43B	bis (2-chloroethoxy) methane
52B	hexachlorobutadiene
53B	hexachlorocyclopentadiene
54B	isophorone
55B	naphthalene
56B	nitrobenzene
61B	N-nitrosodimethylamine
62B	N-nitrosodiphenylamine
63B	N-nitrosodi-n-propylamine
66B	bis (2-ethylhexyl) phthalate
67B	butyl benzyl phthalate
68B	di-n-butyl phthalate
69B	di-n-octyl phthalate
70B	diethyl phthalate
71B	dimethyl phthalate
72B	benzo(a)anthracene
73B	benzo(a)pyrene.
74B	3,4-benzofluoranthene
75B	benzo(k)fluoranthene
76B	chrysene
77B	acenaphthylene
78B	anthracene
79B	benzo(ghi)perylene
80B	fluorene
81B	phenanthrene
82B	dibenzo(a,h)anthracene
83B	indeno(1,2,3-cd)pyrene
84B	pyrene

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LABORATORY NAME ACUREX

LAB SAMPLE ID NO. A81-01-020

QC REPORT NO. LV-5

Rifle Range House

	VOLATILES	ug/l
2V	acrolein	ND
3V	acrylonitrile	ND
4V	benzene	*
6V	carbon tetrachloride	ND
7V	chlorobenzene	
10V	1,2-dichloroethane	
11V	1,1,1-trichloroethane	*
3V	1,1-dichloroethane	ND
4V	1,1,2-trichloroethane	
5V	1,1,2,2-tetrachloroethane	
6V	chloroethane	
9V	2-chloroethylvinyl ether	
3V	chloroform	
V	1,1-dichloroethylene	
	1,2-trans-dichloroethylene	120
V	1,2-dichloropropane	ND
V	1,3-dichloropropylene	
V	ethylbenzene	
V	methylene chloride	
	methyl chloride	
	methyl bromide	
	bromoform	
	dichlorobromomethane	
	trichlorofluoromethane	
	dichlorodifluoromethane	
	chlorodibromomethane	
	tetrachloroethylene	63
	toluene	ND
	trichloroethylene	160
	yl chloride	ND

	PESTICIDES	
89P	aldrin	ND
90P	dieldrin	
91P	chlordane	
92P	4,4'-DDT	
93P	4,4'-DDE	
94P	4,4'-DDD	
95P	-endosulfan	
96P	-endosulfan	
97P	endosulfan sulfate	
98P	endrin	
99P	endrin aldehyde	
100P	heptachlor	
101P	heptachlor epoxide	
102P	-BHC	
103P	-BHC	
104P	-BHC	
105P	-BHC	
106P	PCB-1242	
107P	PCB-1254	
108P	PCB-1221	
109P	PCB-1232	
110P	PCB-1248	
111P	PCB-1260	
112P	PCB-1016	
113P	toxaphene	

	DIOXINS	
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

*Less than 10 ug/l
(pesticides less than 0.1 ug/l)

ND = Not detected

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INORGANICS ANALYSIS DATA SHEET

S35-93

LABORATORY NAME Mecar Inc. SAMPLE NO. MA 8039

LAB SAMPLE ID NO. 9209 QC REPORT NO.

TASK 1 (Elements to be identified and measured)

		ug/l			ug/l
1.	Aluminum	< 50.	10.	Nickel	< 20.
2.	Chromium	< 10.	11.	Manganese	< 10.
3.	Barium	20.	12.	Zinc	50.
4.	Beryllium	< 2.	13.	Boron	< 10.
5.	Cadmium	< 5.	14.	Vanadium	< 10.
6.	Cobalt	< 10.	15.	Calcium	42,000.
7.	Copper	60.	16.	Magnesium	7,900.
8.	Iron	80.	17.	Sodium	37,000.
9.	Lead	< 40.			

TASK 2 (Elements to be identified and measured)

		ug/l			
.	Arsenic	<10.	5.	Mercury	<1.
.	Antimony	<20.	6.	Tin	<20.
.	Selenium	<10.	7.	Silver	<20.
.	Thallium	<10.			

TASK 3 (Elements to be identified and measured)

	Ammonia	mg/l	4.	Cyanide	mg/
	Fluoride	mg/l	5.	pH	Uni
	Sulfide	mg/l	6.	TOC	mg/

COMMENTS:
a) with a detection limit of
b) with a detection limit of
c) with a detection limit of
d) analyzed on a sample aliquot preserved with HCl from F/pH sample bo
e) average of two replicate determinations
f) insufficient sample aliquot

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ANALYSIS DATA SHEET

(Well (E 57) S37

LABORATORY NAME: [illegible]

LAB SAMPLE ID NO. [illegible]-02-002

QC REPORT NO. LV-5

Rohrstedt

	ACID COMPOUNDS	ug/l
21A	2,4,6- trichlorophenol	ND
22A	p-chloro-m-cresol	
24A	2- chlorophenol	
31A	2,4-dichlorophenol	
34A	2,4- dimethylphenol	
57A	2- nitrophenol	
58A	4- nitrophenol	
59A	2,4- dinitrophenol	
60A	4,6- dinitro-o-cresol	
64A	pentachlorophenol	
65A	phenol	

	BASE/NEUTRAL COMPOUNDS	
	acenaphthene	ND
5B	benzidine	
8B	1,2,4- trichlorobenzene	
9B	hexachlorobenzene	
12B	hexachloroethane	
18B	bis(2-chloroethyl)ether	
20B	2-chloronaphthalene	
25B	1,2-dichlorobenzene	
26B	1,3-dichlorobenzene	
27B	1,4-dichlorobenzene	
28B	3,3'-dichlorobenzidine	
35B	2,4- dinitrotoluene	
36B	2,6- dinitrotoluene	
37B	1,2- diphenylhydrazine (as azobenzene)	
39B	fluoranthene	
[illegible]	4- chlorophenyl phenyl ether	

	BASE/NEUTRAL COMPOUNDS
41B	4-bromophenyl phenyl ether
42B	bis (2-chloroisopropyl) ether
43B	bis (2-chloroethoxy) methane
52B	hexachlorobutadiene
53B	hexachlorocyclopentadiene
54B	isophorone
55B	naphthalene
56B	nitrobenzene
61B	N-nitrosodimethylamine
62B	N-nitrosodiphenylamine
63B	N-nitrosodi-n-propylamine
66B	bis (2-ethylhexyl) phthalate
67B	butyl benzyl phthalate
68B	di-n-butyl phthalate
69B	di-n-octyl phthalate
70B	diethyl phthalate
71B	dimethyl phthalate
72B	benzo(a)anthracene
73B	benzo(a)pyrene.
74B	3,4-benzofluoranthene
75B	benzo(k)fluoranthene
76B	chrysene
77B	acenaphthylene
78B	anthracene
79B	benzo(ghi)perylene
80B	fluorene
81B	phenanthrene
82B	dibenzo(a,h)anthracene
83B	Indeno(1,2,3-cd)pyrene
84B	pyrene

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LABORATORY NAME ACUTEX

LAB SAMPLE ID NO. A81 2 002

QC REPORT NO. LV-5

	VOLATILES	ug/l
2V	acrolein	ND
3V	acrylonitrile	
4V	benzene	
6V	carbon tetrachloride	
7V	chlorobenzene	
10V	1,2-dichloroethane	
11V	1,1,1-trichloroethane	
13V	1,1-dichloroethane	
14V	1,1,2-trichloroethane	
15V	1,1,2,2-tetrachloroethane	
16V	chloroethane	
19V	2-chloroethylvinyl ether	
23V	chloroform	
29V	1,1-dichloroethylene	
3[illegible]	1,2-trans-dichloroethylene	*
32V	1,2-dichloropropane	ND
33V	1,3-dichloropropylene	
8V	ethylbenzene	
4V	methylene chloride	
5V	methyl chloride	
6V	methyl bromide	
7V	bromoform	
[illegible]V	dichlorobromomethane	
[illegible]V	trichlorofluoromethane	
[illegible]V	dichlorodifluoromethane	
[illegible]V	chlorodibromomethane	
[illegible]V	tetrachloroethylene	
[illegible]V	toluene	
[illegible]	trichloroethylene	19
[illegible]	[illegible]inyl chloride	ND

	PESTICIDES	ug/l
89P	aldrin	ND
90P	dieldrin	
91P	chlordane	
92P	4,4'-DDT	
93P	4,4'-DDE	
94P	4,4'-DDD	
95P	-endosulfan	
96P	-endosulfan	
97P	endosulfan sulfate	
98P	endrin	
99P	endrin aldehyde	
100P	heptachlor	
101P	heptachlor epoxide	
102P	-BHC	
103P	-BHC	
104P	-BHC	
105P	-BHC	
106P	PCB-1242	
107P	PCB-1254	
108P	PCB-1221	
109P	PCB-1232	
110P	PCB-1248	
111P	PCB-1260	
112P	PCB-1016	
113P	toxaphene	

	DIOXINS	
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

*Less than 10 ug/l
(pesticides less than 0.1 ug/l)

ND = Not detected

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ANALYSIS DATA SHEET No 50GAF

LABORATORY NAME Analec SAMPLE NO. MA3035

LAB SAMPLE ID NO. 2036 QC REPORT NO.

TASK 1 (Elements to be identified and measured)

		ug/l			ug/l
1.	Aluminum	150	10.	Nickel	28
2.	Chromium	<10	11.	Manganese	780
3.	Barium	12	12.	Zinc	150
4.	Beryllium	<2	13.	Boron	230
5.	Cadmium	<5	14.	Vanadium	22
6.	Cobalt	<10	15.	Calcium	40,000
7.	Copper	67	16.	Magnesium	7,300
8.	Iron	4,900	17.	Sodium	28,000
9.	Lead	<40			

TASK 2 (Elements to be identified and measured)

		ug/l			ug/l
	Arsenic	<10	5.	Mercury	<1
	Antimony	<20	6.	Tin	110
	Selenium	<10	7.	Silver	<20
	Thallium	<10			

TASK 3 (Elements to be identified and measured)

	Ammonia	mg/l	4.	Cyanide	mg/l
	Fluoride	mg/l	5.	pH	Units
	Sulfide	mg/l	6.	TOC	mg/l

COMMENTS:

recycled paper
recycled paper
recycled paper

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ORGANICS ANALYSIS DATA SHEET

LABORATORY NAME ACUREX

LAB SAMPLE ID NO. A81-01-019

QC REPORT NO. LV-5

6) FIL (E B) 542

Mina Well

ACID COMPOUNDS		ug/l
21A	2,4,6- trichlorophenol	ND
22A	p-chloro-m-cresol	
24A	2- chlorophenol	
31A	2,4-dichlorophenol	
34A	2,4- dimethylphenol	
57A	2- nitrophenol	
58A	4- nitrophenol	
59A	2,4- dinitrophenol	
60A	4,6- dinitro-o-cresol	
64A	pentachlorophenol	
65A	phenol	

BASE/NEUTRAL COMPOUNDS		
1B	acenaphthene	ND
5B	benzidine	
8B	1,2,4- trichlorobenzene	
9B	hexachlorobenzene	
12B	hexachloroethane	
18B	bis(2-chloroethyl)ether	
20B	2-chloronaphthalene	
25B	1,2-dichlorobenzene	
26B	1,3-dichlorobenzene	
27B	1,4-dichlorobenzene	
28B	3,3'-dichlorobenzidine	
35B	2,4- dinitrotoluene	
36B	2,6- dinitrotoluene	
37B	1,2- diphenylhydrazine (as azobenzene)	
38B	fluoranthene	
39B	4- chlorophenyl phenyl ether	

BASE/NEUTRAL COMPOUNDS	
41B	4-bromophenyl phenyl ether
42B	bis (2-chloroisopropyl) ether
43B	bis (2-chloroethoxy) methane
52B	hexachlorobutadiene
53B	hexachlorocyclopentadiene
54B	isophorene
55B	naphthalene
56B	nitrobenzene
61B	N-nitrosodimethylamine
62B	N-nitrosodiphenylamine
63B	N-nitrosodi-n-propylamine
66B	bis (2-ethylhexyl) phthalate
67B	butyl benzyl phthalate
68B	di-n-butyl phthalate
69B	di-n-octyl phthalate
70B	diethyl phthalate
71B	dimethyl phthalate
72B	benzo(a)anthracene
73B	benzo(a)pyrene.
74B	3,4-benzofluoranthene
75B	benzo(k)fluoranthene
76B	chrysene
77B	acenaphthylene
78B	anthracene
79B	benzo(ghi)perylene
80B	fluorene
81B	phenanthrene
82B	dibenzo(a,h)anthracene
83B	indeno(1,2,3-cd)pyrene
84B	pyrene

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LABORATORY NAME ACUREX

LAB SAMPLE ID NO. A31-01-019

QC REPORT NO. LV-5

Mura Well

	VOLATILES	ug/l
2V	acrolein	ND
3V	acrylonitrile	ND
4V	benzene	*
6V	carbon tetrachloride	ND
7V	chlorobenzene	
10V	1,2-dichloroethane	
11V	1,1,1-trichloroethane	
13V	1,1-dichloroethane	
14V	1,1,2-trichloroethane	
15V	1,1,2,2-tetrachloroethane	
16V	chloroethane	
19V	2-chloroethylvinyl ether	
23V	chloroform	
29V	1,1-dichloroethylene	
3[illegible]	1,2-trans-dichloroethylene	
32V	1,2-dichloropropane	
33V	1,3-dichloropropylene	
38V	ethylbenzene	
4V	methylene chloride	
5V	methyl chloride	
6V	methyl bromide	
7V	bromoform	
[illegible]V	dichlorobromomethane	
[illegible]V	trichlorofluoromethane	
[illegible]V	dichlorodifluoromethane	
[illegible]V	chlorodibromomethane	
[illegible]	tetrachloroethylene	
[illegible]	toluene	
[illegible]	trichloroethylene	*
[illegible]nyl chloride		ND

	PESTICIDES	
89P	aldrin	ND
90P	dieldrin	
91P	chlordane	
92P	4,4'-DDT	
93P	4,4'-DDE	
94P	4,4'-DDD	
95P	-endosulfan	
96P	-endosulfan	
97P	endosulfan sulfate	
98P	endrin	
99P	endrin aldehyde	
100P	heptachlor	
101P	heptachlor epoxide	
102P	-BHC	
103P	-BHC	
104P	-BHC	
105P	-BHC	
106P	PCB-1242	
107P	PCB-1254	
108P	PCB-1221	
109P	PCB-1232	
110P	PCB-1248	
111P	PCB-1260	
112P	PCB-1016	
113P	toxaphene	

	DIOXINS	
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

*Less than 10 ug/l
(pesticides less than 0.1 ug/l)

ND = Not detected

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ecology and environment, inc.

INORGANICS ANALYSIS DATA SHEET MIRA ... WASHINGTON

LABORATORY NAME Analec SAMPLE NO. MA-8032

LAB SAMPLE ID NO. 2033 QC REPORT NO.

TASK 1 (Elements to be identified and measured)

		ug/l			ug/l
1.	Aluminum	140	10.	Nickel	<20
2.	Chromium	<10	11.	Manganese	150.
3.	Barium	35	12.	Zinc	520
4.	Beryllium	<2	13.	Boron	260
5.	Cadmium	<5	14.	Vanadium	19
6.	Cobalt	<10	15.	Calcium	60,000
7.	Copper	150	16.	Magnesium	10,000
8.	Iron	88	17.	Sodium	17,000
9.	Lead	<40			

TASK 2 (Elements to be identified and measured)

		ug/l			ug/l
1.	Arsenic	<10	5.	Mercury	2.4
	Antimony	<20	6.	Tin	84
	Selenium	<10	7.	Silver	<20
	Thallium	<10			

TASK 3 (Elements to be identified and measured)

	Ammonia	mg/l	4.	Cyanide	mg/l
	Fluoride	mg/l	5.	pH	Units
	Sulfide	mg/l	6.	TOC	mg/l

COMMENTS:

recycled paper
recycled paper
recycled paper
ecology and environment
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ORGANICS ANALYSIS DATA SHEET

LABORATORY NAME ACUREX

LAB SAMPLE ID NO. A81-01-019

QC REPORT NO. LV-5

No Phenolics Det. (436) 341

ACID COMPOUNDS

		ug/l
21A	2,4,6- trichlorophenol	ND
22A	p-chloro-m-cresol	
24A	2- chlorophenol	
31A	2,4-dichlorophenol	
34A	2,4- dimethylphenol	
57A	2- nitrophenol	
58A	4- nitrophenol	
59A	2,4- dinitrophenol	
60A	4,6- dinitro-o-cresol	
64A	pentachlorophenol	
65A	phenol	

BASE/NEUTRAL COMPOUNDS

1B	acenaphthene	ND
5B	benzidine	
8B	1,2,4- trichlorobenzene	
9B	hexachlorobenzene	
12B	hexachloroethane	
18B	bis(2-chloroethyl)ether	
20B	2-chloronaphthalene	
25B	1,2-dichlorobenzene	
26B	1,3-dichlorobenzene	
27B	1,4-dichlorobenzene	
28B	3,3'-dichlorobenzidine	
35B	2,4- dinitrotoluene	
36B	2,6- dinitrotoluene	
37B	1,2- diphenylhydrazine (as azobenzene)	
[illegible]	fluoranthene	
40B	4- chlorophenyl phenyl ether	

BASE/NEUTRAL COMPOUNDS

41B	4-bromophenyl phenyl ether	ND
42B	bis (2-chloroisopropyl) ether	
43B	bis (2-chloroethoxy) methane	
52B	hexachlorobutadiene	
53B	hexachlorocyclopentadiene	
54B	isophorone	
55B	naphthalene	
56B	nitrobenzene	
61B	N-nitrosodimethylamine	
62B	N-nitrosodiphenylamine	
63B	N-nitrosodi-n-propylamine	
66B	bis (2-ethylhexyl) phthalate	
67B	butyl benzyl phthalate	
68B	di-n-butyl phthalate	
69B	di-n-octyl phthalate	
70B	diethyl phthalate	
71B	dimethyl phthalate	
72B	benzo(a)anthracene	
73B	benzo(a)pyrene	
74B	3,4-benzofluoranthene	
75B	benzo(k)fluoranthene	
76B	chrysene	
77B	acenaphthylene	
78B	anthracene	
79B	benzo(ghi)perylene	
80B	fluorene	
81B	phenanthrene	
82B	dibenzo(a,h)anthracene	
83B	Indeno(1,2,3-cd)pyrene	
84B	pyrene	

recycled paper
recycled paper
recycled paper
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LABORATORY NAME [illegible]

LAB SAMPLE ID NO. A31 91 019

QC REPORT NO. LV-5

No Photos

	VOLATILES	ug/l
2V	acrolein	ND
3V	acrylonitrile	ND
4V	benzene	*
6V	carbon tetrachloride	ND
7V	chlorobenzene	
10V	1,2-dichloroethane	
11V	1,1,1-trichloroethane	
13V	1,1-dichloroethane	
14V	1,1,2-trichloroethane	
15V	1,1,2,2-tetrachloroethane	
16V	chloroethane	
19V	2-chloroethylvinyl ether	
23V	chloroform	
29V	1,1-dichloroethylene	
V	1,2-trans-dichloroethylene	*
32V	1,2-dichloropropane	ND
33V	1,3-dichloropropylene	
38V	ethylbenzene	
44V	methylene chloride	
45V	methyl chloride	
46V	methyl bromide	
47V	bromoform	
48V	dichlorobromomethane	
49V	trichlorofluoromethane	
50V	dichlorodifluoromethane	
51V	chlorodibromomethane	
85V	tetrachloroethylene	12
86V	toluene	ND
87V	trichloroethylene	12
[illegible]	vinyl chloride	ND

	PESTICIDES
89P	aldrin
90P	dieldrin
91P	chlordane
92P	4,4'-DDT
93P	4,4'-DDE
94P	4,4'-DDD
95P	-endosulfan
96P	-endosulfan
97P	endosulfan sulfate
98P	endrin
99P	endrin aldehyde
100P	heptachlor
101P	heptachlor epoxide
102P	-BHC
103P	-BHC
104P	-BHC
105P	-BHC
106P	PCB-1242
107P	PCB-1254
108P	PCB-1221
109P	PCB-1232
110P	PCB-1248
111P	PCB-1260
112P	PCB-1016
113P	toxaphene

	DIOXINS	
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

*Less than 10 ug/l
(pesticides less than 0.1 ug/l)

ND = Not Detected

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INORGANICS ANALYSIS DATA SHEET

LABORATORY NAME Anatech SAMPLE NO. MA8031

LAB SAMPLE ID NO. 2032 QC REPORT NO.

TASK 1 (Elements to be identified and measured)

		ug/l			ug/l
1.	Aluminum	160	10.	Nickel	<20
2.	Chromium	<10	11.	Manganese	130
3.	Barium	110	12.	Zinc	190
4.	Beryllium	<2	13.	Boron	180
5.	Cadmium	<5	14.	Vanadium	36
6.	Cobalt	<10	15.	Calcium	55,000
7.	Copper	23	16.	Magnesium	11,000
8.	Iron	35	17.	Sodium	36,000
9.	Lead	<40			

TASK 2 (Elements to be identified and measured)

		ug/l			ug/l
.	Arsenic	<10	5.	Mercury	1.2
.	Antimony	<20	6.	Tin	100
.	Selenium	<10	7.	Silver	<20
.	Thallium	<10			

TASK 3 (Elements to be identified and measured)

	Ammonia	mg/l	4.	Cyanide	mg/l
	Fluoride	mg/l	5.	pH	Units
	Sulfide	mg/l	6.	TOC	mg/l

COMMENTS:

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SUMMARY OF ANALYSIS DATA SHEET

LABORATORY NAME ACUREX

LAB SAMPLE ID NO. A81-01 0202

QC REPORT NO. LV-5

Gen (4.0) 549

Rifle Range Well H

ACID COMPOUNDS		ug/l
21A	2,4,6-trichlorophenol	ND
22A	p-chloro-m-cresol	
24A	2-chlorophenol	
31A	2,4-dichlorophenol	
34A	2,4-dimethylphenol	
57A	2-nitrophenol	
58A	4-nitrophenol	
59A	2,4-dinitrophenol	
60A	4,6-dinitro-o-cresol	
64A	pentachlorophenol	
65A	phenol	

BASE/NEUTRAL COMPOUNDS		
1B	acenaphthene	ND
5B	benzidine	
8B	1,2,4-trichlorobenzene	
9B	hexachlorobenzene	
12B	hexachloroethane	
18B	bis(2-chloroethyl)ether	
20B	2-chloronaphthalene	
25B	1,2-dichlorobenzene	
26B	1,3-dichlorobenzene	
27B	1,4-dichlorobenzene	
28B	3,3'-dichlorobenzidine	
35B	2,4-dinitrotoluene	
36B	2,6-dinitrotoluene	
37B	1,2-diphenylhydrazine (as azobenzene)	
	fluoranthene	
40B	4-chlorophenyl phenyl ether	

BASE/NEUTRAL COMPOUNDS	
41B	4-bromophenyl phenyl ether
42B	bis (2-chloroisopropyl) ether
43B	bis (2-chloroethoxy) methane
52B	hexachlorobutadiene
53B	hexachlorocyclopentadiene
54B	isophorone
55B	naphthalene
56B	nitrobenzene
61B	N-nitrosodimethylamine
62B	N-nitrosodiphenylamine
63B	N-nitrosodi-n-propylamine
66B	bis (2-ethylhexyl) phthalate
67B	butyl benzyl phthalate
68B	di-n-butyl phthalate
69B	di-n-octyl phthalate
70B	diethyl phthalate
71B	dimethyl phthalate
72B	benzo(a)anthracene
73B	benzo(a)pyrene
74B	3,4-benzofluoranthene
75B	benzo(k)fluoranthene
76B	chrysene
77B	acenaphthylene
78B	anthracene
79B	benzo(ghi)perylene
80B	fluorene
81B	phenanthrene
82B	dibenzo(a,h)anthracene
83B	indeno(1,2,3-cd)pyrene
84B	pyrene

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LABORATORY NAME ACUREX

LAB SAMPLE ID NO. A81-01-020

QC REPORT NO. LV-5

Raffle Pond Well H

	VOLATILES	ug/l
2V	acrolein	ND
3V	acrylonitrile	ND
4V	benzene	*
6V	carbon tetrachloride	ND
7V	chlorobenzene	
10V	1,2-dichloroethane	
11V	1,1,1-trichloroethane	*
13V	1,1-dichloroethane	ND
14V	1,1,2-trichloroethane	
15V	1,1,2,2-tetrachloroethane	
16V	chloroethane	
19V	2-chloroethylvinyl ether	
23V	chloroform	
29V	1,1-dichloroethylene	
	1,2-trans-dichloroethylene	21
32V	1,2-dichloropropane	ND
33V	1,3-dichloropropylene	
38V	ethylbenzene	
44V	methylene chloride	
45V	methyl chloride	
46V	methyl bromide	
47V	bromoform	
48V	dichlorobromomethane	
49V	trichlorofluoromethane	
50V	dichlorodifluoromethane	
51V	chlorodibromomethane	
55V	tetrachloroethylene	41
56V	toluene	ND
57V	trichloroethylene	73
[illegible]	vinyl chloride	ND

	PESTICIDES	
89P	aldrin	ND
90P	dieldrin	
91P	chlordane	
92P	4,4'-DDT	
93P	4,4'-DDE	
94P	4,4'-DDD	
95P	-endosulfan	
96P	-endosulfan	
97P	endosulfan sulfate	
98P	endrin	
99P	endrin aldehyde	
100P	heptachlor	
101P	heptachlor epoxide	
102P	-BHC	
103P	-BHC	
104P	-BHC	
105P	-BHC	
106P	PCB-1242	
107P	PCB-1254	
108P	PCB-1221	
109P	PCB-1232	
110P	PCB-1248	
111P	PCB-1260	
112P	PCB-1016	
113P	toxaphene	

	DIOXINS	
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

*Less than 10 ug/l
(pesticides less than 0.1 ug/l)

ND = Not detected

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INORGANICS ANALYSIS DATA SHEET

535-93

LABORATORY NAME Versar Inc. SAMPLE NO. MA 8010

SAMPLE ID NO. 9210 QC REPORT NO.

TASK 1 (Elements to be identified and measured)

		ug/l			ug/l
1.	Aluminum	< 50.	10.	Nickel	< 20.
2.	Chromium	< 10.	11.	Manganese	1,300.
3.	Barium	20.	12.	Zinc	< 10.
4.	Beryllium	< 2.	13.	Boron	< 10.
5.	Cadmium	< 5.	14.	Vanadium	< 10.
6.	Cobalt	< 10.	15.	Calcium	38,100.
7.	Copper	< 20.	16.	Magnesium	8,100.
8.	Iron	180.	17.	Sodium	40,400.
9.	Lead	< 40.			

TASK 2 (Elements to be identified and measured)

		ug/l			
1.	Arsenic	<10.[e]	5.	Mercury	<1.
2.	Antimony	<20.	6.	Tin	<100.[a]
3.	Selenium	<10[e]	7.	Silver	<20.[e]
4.	Thallium	<10.[e]			

TASK 3 (Elements to be identified and measured)

1.	Ammonia	mg/l	4.	Cyanide	mg/l
2.	Fluoride	mg/l	5.	pH	Unit
3.	Sulfide	mg/l	6.	TOC	mg/l

COMMENTS:
a) with a detection limit of 100.
b) with a detection limit of
c) with a detection limit of
d) analyzed on a sample aliquot preserved with HCl from F/pH sample bottle
e) average of two replicate determinations
f) insufficient sample aliquot

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LABORATORY NAME [illegible]FX

LAB SAMPLE ID NO. [illegible] 019

QC REPORT NO. IV-5

Dec. (419) 5-10

6 well of minor-fill

	ACID COMPOUNDS	ug/l
21A	2,4,6- trichlorophenol	ND
22A	p-chloro-m-cresol	
24A	2- chlorophenol	
31A	2,4-dichlorophenol	
34A	2,4- dimethylphenol	
57A	2- nitrophenol	
58A	4- nitrophenol	
59A	2,4- dinitrophenol	
60A	4,6- dinitro-o-cresol	
64A	pentachlorophenol	
65A	phenol	

	BASE/NEUTRAL COMPOUNDS	
	acenaphthene	ND
5B	benzidine	
8B	1,2,4- trichlorobenzene	
9B	hexachlorobenzene	
12B	hexachloroethane	
18B	bis(2-chloroethyl)ether	
20B	2-chloronaphthalene	
25B	1,2-dichlorobenzene	
26B	1,3-dichlorobenzene	
27B	1,4-dichlorobenzene	
28B	3,3'-dichlorobenzidine	
35B	2,4- dinitrotoluene	
36B	2,6- dinitrotoluene	
37B	1,2- diphenylhydrazine (as azobenzene)	
39B	fluoranthene	
[illegible]	4- chlorophenyl phenyl ether	

	BASE/NEUTRAL COMPOUNDS	
41B	4-bromophenyl phenyl ether	ND
42B	bis (2-chloroisopropyl) ether	
43B	bis (2-chloroethoxy) methane	
52B	hexachlorobutadiene	
53B	hexachlorocyclopentadiene	
54B	isophorone	
55B	naphthalene	
56B	nitrobenzene	
61B	N-nitrosodimethylamine	
62B	N-nitrosodiphenylamine	
63B	N-nitrosodi-n-propylamine	
66B	bis (2-ethylhexyl) phthalate	
67B	butyl benzyl phthalate	
68B	di-n-butyl phthalate	
69B	di-n-octyl phthalate	
70B	diethyl phthalate	
71B	dimethyl phthalate	
72B	benzo(a)anthracene	
73B	benzo(a)pyrene.	
74B	3,4-benzofluoranthene	
75B	benzo(k)fluoranthene	
76B	chrysene	
77B	acenaphthylene	
78B	anthracene	
79B	benzo(ghi)perylene	
80B	fluorene	
81B	phenanthrene	
82B	dibenzo(a,h)anthracene	
83B	Indeno(1,2,3-cd)pyrene	
84B	pyrene	

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LABORATORY NAME ACUREX

LAB SAMPLE ID NO. A81-01-019

QC REPORT NO. LV-5

6 Well of [illegible]

	VOLATILES	ug/l
2V	acrolein	ND
3V	acrylonitrile	ND
4V	benzene	*
6V	carbon tetrachloride	ND
7V	chlorobenzene	
10V	1,2-dichloroethane	
11V	1,1,1-trichloroethane	
13V	1,1-dichloroethane	
14V	1,1,2-trichloroethane	
15V	1,1,2,2-tetrachloroethane	
16V	chloroethane	
19V	2-chloroethylvinyl ether	
23V	chloroform	
29V	1,1-dichloroethylene	
	1,2-trans-dichloroethylene	14
32V	1,2-dichloropropane	ND
33V	1,3-dichloropropylene	
38V	ethylbenzene	
44V	methylene chloride	
45V	methyl chloride	
46V	methyl bromide	
47V	bromoform	
48V	dichlorobromomethane	
49V	trichlorofluoromethane	
50V	dichlorodifluoromethane	
51V	chlorodibromomethane	
35V	tetrachloroethylene	36
36V	toluene	ND
37V	trichloroethylene	210
[illegible]	vinyl chloride	ND

	PESTICIDES	
89P	aldrin	ND
90P	dieldrin	
91P	chlordane	
92P	4,4'-DDT	
93P	4,4'-DDE	
94P	4,4'-DDD	
95P	-endosulfan	
96P	-endosulfan	
97P	endosulfan sulfate	
98P	endrin	
99P	endrin aldehyde	
100P	heptachlor	
101P	heptachlor epoxide	
102P	-BHC	
103P	-BHC	
104P	-BHC	
105P	-BHC	
106P	PCB-1242	
107P	PCB-1254	
108P	PCB-1221	
109P	PCB-1232	
110P	PCB-1248	
111P	PCB-1260	
112P	PCB-1016	
113P	toxaphene	

	DIOXINS	
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

*Less than 10 ug/l
(pesticides less than 0.1 ug/l)

ND = Not detected

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INORGANICS ANALYSIS DATA SHEET

Rifle Pinnacle
0.00.0

LABORATORY NAME Aiatec SAMPLE NO. MA 8038

LAB SAMPLE ID NO. 2039 QC REPORT NO.

TASK 1 (Elements to be identified and measured)

		ug/l			ug/l
1.	Aluminum	140	10.	Nickel	<20
2.	Chromium	<10	11.	Manganese	420
3.	Barium	44	12.	Zinc	13
4.	Beryllium	<2	13.	Boron	210
5.	Cadmium	<5	14.	Vanadium	20
6.	Cobalt	<10	15.	Calcium	41,000
7.	Copper	<20	16.	Magnesium	7,500
8.	Iron	66	17.	Sodium	25,000
9.	Lead	270			

TASK 2 (Elements to be identified and measured)

		ug/l			ug/l
1.	Arsenic	<10	5.	Mercury	1.1
2.	Antimony	<20	6.	Tin	79
3.	Selenium	<10	7.	Silver	<20
4.	Thallium	<10			

TASK 3 (Elements to be identified and measured)

	Ammonia	mg/l	4.	Cyanide	mg/l
	Fluoride	mg/l	5.	pH	Units
	Sulfide	mg/l	6.	TOC	mg/l

OMMENTS:

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ORGANICS ANALYSIS DATA SHEET

L. Agin
Phone 3 4
Dru (307) 5 4

SAMPLE NAME Rocky Mountains

SAMPLE ID NO. 4/2/1

LAB NO. 2

ID COMPOUNDS	ug/l
,6- trichlorophenol	ND
hloro-m-cresol	ND
chlorophenol	ND
dichlorophenol	ND
dimethylphenol	ND
itrophenol	ND
itrophenol	ND
dinitrophenol	ND
dinitro-o-cresol	ND
achlorophenol	ND
ol	ND

UTRAL COMPOUNDS	
aphthene	ND
dine	ND
trichlorobenzene	ND
hlorobenzene	ND
hloroethane	ND
chloroethyl)ether	ND
ronaphthalene	ND
hlorobenzene	ND
hlorobenzene	ND
hlorobenzene	ND
hlorobenzidine	ND
itrotoluene	ND
itrotoluene	ND
henylhydrazine enzene)	ND
hene	ND
ophenyl phenyl ether	ND

BASE/NEUTRAL COMPOUNDS		ug/l
41B	4-bromophenyl phenyl ether	ND
42B	bis (2-chloroisopropyl) ether	ND
43B	bis (2-chloroethoxy) methane	ND
52B	hexachlorobutadiene	ND
53B	hexachlorocyclopentadiene	ND
54B	isophorone	ND
55B	naphthalene	ND
56B	nitrobenzene	ND
61B	N-nitrosodimethylamine	ND
62B	N-nitrosodiphenylamine	ND
63B	N-nitrosodi-n-propylamine	ND
66B	bis (2-ethylhexyl) phthalate	Blank contaminant
67B	butyl benzyl phthalate	ND
68B	di-n-butyl phthalate	ND
69B	di-n-octyl phthalate	ND
70B	diethyl phthalate	Blank contaminant
71B	dimethyl phthalate	ND
72B	benzo(a)anthracene	ND
73B	benzo(a)pyrene	ND
74B	3,4-benzofluoranthene	ND
75B	benzo(k)fluoranthene	ND
76B	chrysene	ND
77B	acenaphthylene	ND
78B	anthracene	ND
79B	benzo(ghi)perylene	ND
80B	fluorene	ND
81B	phenanthrene	ND
82B	dibenzo(a,h)anthracene	ND
83B	indeno(1,2,3-cd)pyrene	ND
84B	pyrene	ND

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ORGANICS ANALYSIS DATA SHEET - Page 2

LABORATORY NAME [illegible]

LAB SAMPLE ID NO. 672/1

REPORT NO. 3

VOLATILES	ug/l
acrolein	ND
acrylonitrile	ND
benzene	ND
carbon tetrachloride	ND
chlorobenzene	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
1,1-dichloroethane	ND
1,1,2-trichloroethane	ND
1,1,2,2-tetrachloroethane	ND
chloroethane	ND
2-chloroethylvinyl ether	ND
chloroform	ND
-dichloroethylene	ND
1,2-trans-dichloroethylene	ND
1,2-dichloropropane	ND
1,3-dichloropropylene	ND
ethylbenzene	ND
methylene chloride	Blank Contaminant
methyl chloride	ND
methyl bromide	ND
bromoform	ND
dichlorobromomethane	ND
trichlorofluoromethane	ND
dichlorodifluoromethane	ND
chlorodibromomethane	ND
etrachloroethylene	ND
oluene	ND
-1,1-dichloroethylene	ND
inyl chloride	ND

PESTICIDES		ug/l
89P	aldrin	ND
90P	dieldrin	ND
91P	chlordane	ND
92P	4,4'-DDT	ND
93P	4,4'-DDE	ND
94P	4,4'-DDD	ND
95P	-endosulfan	ND
96P	-endosulfan	ND
97P	endosulfan sulfate	ND
98P	endrin	ND
99P	endrin aldehyde	ND
100P	heptachlor	ND
101P	heptachlor epoxide	ND
102P	-BHC	ND
103P	-BHC	ND
104P	-BHC	ND
105P	-BHC	ND
106P	PCB-1242	ND
107P	PCB-1254	ND
108P	PCB-1221	ND
109P	PCB-1232	ND
110P	PCB-1248	ND
111P	PCB-1260	ND
112P	PCB-1016	ND
113P	toxaphene	ND

DIOXINS	
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin

*Less than 10 ug/l
(pesticides less than 0.1 ug/l)

ND = Not detected

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... Sample Management Office
..., Virginia 22313 - 703/557-2490/FTS-8-557-2490

INORGANICS ANALYSIS DATA SHEET

SMS-82

RATORY NAME Versar Inc. SAMPLE NO. MA 8029

AB SAMPLE ID NO. 8232 QC REPORT NO.

TASK 1 (Elements to be identified and measured)

	ug/l			ug/l
Aluminum	980.	10.	Nickel	<20.
Chromium	53.	11.	Manganese	3,250.
Barium	225.	12.	Zinc	188.
Beryllium	<2.	13.	Boron	94.
Cadmium	17.	14.	Vanadium	<10.
Cobalt	44.	15.	Calcium	47,100.
Copper	95.	16.	Magnesium	7,710.
Iron	115,000.	17.	Sodium	70,000.
Lead	1,460.			

TASK 2 (Elements to be identified and measured)

	ug/l			ug/l
Arsenic	<10.	5.	Mercury	<1.
Antimony	<20.	6.	Tin	<20.
Selenium	<10.	7.	Silver	<20.
Thallium	<10.			

TASK 3 (Elements to be identified and measured)

Ammonia	mg/l	4.	Cyanide	mg/l
Fluoride	mg/l	5.	pH	Units
Sulfide	mg/l	6.	TOC	mg/l

MENTS:
a) with a detection limit of
b) with a detection limit of
c) with a detection limit of
d) analyzed on a sample aliquot preserved with HCl
e) average of two replicate determinations

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P.O. Box 224, Alexandria, VA 22313 - 703/683-3885

Sample Number
A 0130

ORGANICS ANALYSIS DATA SHEET

(10 457) 547

LABORATORY NAME ENERGY RESOURCES CO. INC.

SAMPLE ID NO. 25-055

QC REPORT NO. ERCO #3

	ACID COMPOUNDS	ug/l
21A	2,4,6- trichlorophenol	ND
22A	p-chloro-m-cresol	ND
24A	2- chlorophenol	ND
31A	2,4-dichlorophenol	ND
34A	2,4- dimethylphenol	ND
57A	2- nitrophenol	ND
58A	4- nitrophenol	ND
59A	2,4- dinitrophenol	ND
60A	4,6- dinitro-o-cresol	ND
64A	pentachlorophenol	ND
65A	phenol	ND

	BASE/NEUTRAL COMPOUNDS	
1B	acenaphthene	ND
5B	benzidine	ND
8B	1,2,4- trichlorobenzene	ND
9B	hexachlorobenzene	ND
12B	hexachloroethane	ND
18B	bis(2-chloroethyl)ether	ND
20B	2-chloronaphthalene	ND
25B	1,2-dichlorobenzene	ND
26B	1,3-dichlorobenzene	ND
27B	1,4-dichlorobenzene	ND
28B	3,3'-dichlorobenzidine	ND
35B	2,4- dinitrotoluene	ND
36B	2,6- dinitrotoluene	ND
37B	1,2- diphenylhydrazine (as azobenzene)	ND
	fluoranthene	ND
40B	4- chlorophenyl phenyl ether	ND

	BASE/NEUTRAL COMPOUNDS	ug/l
41B	4-bromophenyl phenyl ether	ND
42B	bis (2-chloroisopropyl) ether	ND
43B	bis (2-chloroethoxy) methane	ND
52B	hexachlorobutadiene	ND
53B	hexachlorocyclopentadiene	ND
54B	isophorone	ND
55B	naphthalene	ND
56B	nitrobenzene	ND
61B	N-nitrosodimethylamine	ND
62B	N-nitrosodiphenylamine	ND
63B	N-nitrosodi-n-propylamine	ND
66B	bis (2-ethylhexyl) phthalate	*
67B	butyl benzyl phthalate	ND
68B	di-n-butyl phthalate	*
69B	di-n-octyl phthalate	ND
70B	diethyl phthalate	ND
71B	dimethyl phthalate	ND
72B	benzo(a)anthracene	ND
73B	benzo(a)pyrene	ND
74B	3,4-benzofluoranthene	ND
75B	benzo(k)fluoranthene	ND
76B	chrysene	ND
77B	acenaphthylene	ND
78B	anthracene	ND
79B	benzo(ghi)perylene	ND
80B	fluorene	ND
81B	phenanthrene	ND
82B	dibenzo(a,h)anthracene	ND
83B	indeno(1,2,3-cd)pyrene	ND
84B	pyrene	ND

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Sample No. [illegible]
A 0130

ORGANICS ANALYSIS DATA SHEET - Page 2

LABORATORY NAME ENERGY RESOURCES CO. INC.

LAB SAMPLE ID NO. 25-055

QC REPORT NO. ERCO #3

	* VOLATILES	ug/l
2V	acrolein	ND
3V	acrylonitrile	ND
6V	benzene	
8V	carbon tetrachloride	
7V	chlorobenzene	
10V	1,2-dichloroethane	
11V	1,1,1-trichloroethane	
13V	1,1-dichloroethane	
14V	1,1,2-trichloroethane	
15V	1,1,2,2-tetrachloroethane	
16V	chloroethane	
19V	2-chloroethylvinyl ether	
[illegible]V	chloroform	
29V	1,1-dichloroethylene	
30V	1,2-trans-dichloroethylene	
32V	1,2-dichloropropane	
33V	1,3-dichloropropylene	
38V	ethylbenzene	
44V	methylene chloride	
45V	methyl chloride	
46V	methyl bromide	
47V	bromoform	
48V	dichlorobromomethane	
49V	trichlorofluoromethane	
50V	dichlorodifluoromethane	
51V	chlorodibromomethane	
85V	tetrachloroethylene	
86V	toluene	
[illegible]V	trichloroethylene	
[illegible]V	vinyl chloride	

	PESTICIDES	ug/l
89P	aldrin	ND
90P	dieldrin	ND
91P	chlordane	ND
92P	4,4'-DDT	ND
93P	4,4'-DDE	ND
94P	4,4'-DDD	ND
95P	α -endosulfan	ND
96P	β -endosulfan	ND
97P	endosulfan sulfate	ND
98P	endrin	ND
99P	endrin aldehyde	ND
100P	heptachlor	ND
101P	heptachlor epoxide	ND
102P	α -BHC	ND
103P	β -BHC	ND
104P	δ -BHC	ND
105P	γ -BHC	ND
106P	PCB-1242	ND
107P	PCB-1254	ND
108P	PCB-1221	ND
109P	PCB-1232	ND
110P	PCB-1248	ND
111P	PCB-1260	ND
112P	PCB-1016	ND
113P	toxaphene	ND

	DIOXINS	
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

*Less than 10 ug/l
(pesticides less than 0.1 ug/l)

* All volatiles except for acrolein & acrylonitrile are not applicable.

ND = Not detected and minimum [illegible]

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LABORATORY NAME MEAD TECHNOLOGY LABORATORY

J.V. Pump - 10-02 (00) (00)

SAMPLE ID NO. 3578

ART NO. 04

DEC 23 1991

VOLATILES	ug/l
acrolein	ND
acrylonitrile	ND
benzene	ND
carbon tetrachloride	ND
chlorobenzene	*
1,2-dichloroethane	ND
1,1,1-trichloroethane	23
1,1-dichloroethane	ND
1,1,2-trichloroethane	ND
1,1,2,2-tetrachloroethane	ND
chloroethane	ND
2-chloroethylvinyl ether	ND
chloroform	ND
1,1-dichloroethylene	ND
1,2-trans-dichloroethylene	12
1,2-dichloropropane	ND
1,3-dichloropropylene	ND
ethylbenzene	ND
methylene chloride	ND
methyl chloride	ND
methyl bromide	ND
bromoform	ND
chlorobromomethane	ND
trichlorofluoromethane	ND
chlorodifluoromethane	ND
dibromochloromethane	ND
tetrachloroethylene	ND
toluene	ND
trichloroethylene	53
vinyl chloride	ND

	PESTICIDES	ug/l
89P	aldrin	ND
90P	dieldrin	ND
91P	chlordane	ND
92P	4,4'-DDT	ND
93P	4,4'-DDE	ND
94P	4,4'-DDD	ND
95P	α-endosulfan	ND
96P	β-endosulfan	ND
97P	endosulfan sulfate	ND
98P	endrin	ND
99P	endrin aldehyde	ND
100P	heptachlor	ND
101P	heptachlor epoxide	ND
102P	α-BHC	ND
103P	β-BHC	ND
104P	γ-BHC	ND
105P	δ-BHC	ND
106P	PCB-1242	ND
107P	PCB-1254	ND
108P	PCB-1221	ND
109P	PCB-1232	ND
110P	PCB-1248	ND
111P	PCB-1260	ND
112P	PCB-1016	ND
113P	toxaphene	ND

	DIOXINS
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin

*Less than 10 ug/l
(pesticides less than [illegible])

ND - Not [illegible]

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P.O. Box 818 - Alexandria, Virginia 22313 - 703/557-2600/FTS 8-557-2600

INORGANICS ANALYSIS DATA SHEET

SDS- 76

LABORATORY NAME Versar Inc. SAMPLE NO. MA 8073

LAB SAMPLE ID NO. 7679 QC REPORT NO.

TASK 1 (Elements to be identified and measured)

		ug/l			ug/l
1.	Aluminum	<50.	10.	Nickel	<20.
2.	Chromium	<10.	11.	Manganese	1,200.
3.	Barium	83.	12.	Zinc	43.
4.	Beryllium	<2.	13.	Boron	108.
5.	Cadmium	<5.	14.	Vanadium	<10.
6.	Cobalt	<10.	15.	Calcium	69,700.
7.	Copper	<20.	16.	Magnesium	9,900.
8.	Iron	134.	17.	Sodium	220,000.
9.	Lead	<40.			

TASK 2 (Elements to be identified and measured)

		ug/l			ug/l
1.	Arsenic	<10.	5.	Mercury	<1.[c]
2.	Antimony	<20.	6.	Tin	<20.
3.	Selenium	<10.	7.	Silver	<20.
4.	Thallium	<10.			

TASK 3 (Elements to be identified and measured)

1.	Ammonia	mg/l	4.	Cyanide	mg/l
2.	Fluoride	mg/l	5.	pH	Units
3.	Sulfide	mg/l	6.	TOC	mg/l

COMMENTS:
a) with a detection limit of
b) with a detection limit of
c) with a detection limit of
d) analyzed on a sample aliquot preserved with HCl
e) average of two replicate determinations

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[illegible], Springfield, VA 22313 - 703/683-0885

Sample Number
A 0131

ORGANICS ANALYSIS DATA SHEET

Well (6) 546

LABORATORY NAME ENERGY RESOURCES CO. INC.

LAB SAMPLE ID NO. 25-056

QC REPORT NO. ERCO #3

	ACID COMPOUNDS	ug/l
21A	2,4,6- trichlorophenol	ND
22A	p-chloro-m-cresol	ND
24A	2- chlorophenol	ND
31A	2,4-dichlorophenol	ND
34A	2,4- dimethylphenol	ND
57A	2- nitrophenol	ND
58A	4- nitrophenol	ND
59A	2,4- dinitrophenol	ND
60A	4,6- dinitro-o-cresol	ND
64A	pentachlorophenol	ND
65A	phenol	ND

	BASE/NEUTRAL COMPOUNDS	
1B	acenaphthene	ND
5B	benzidine	ND
8B	1,2,4- trichlorobenzene	ND
9B	hexachlorobenzene	ND
12B	hexachloroethane	ND
18B	bis(2-chloroethyl)ether	ND
20B	2-chloronaphthalene	ND
25B	1,2-dichlorobenzene	ND
26B	1,3-dichlorobenzene	ND
27B	1,4-dichlorobenzene	ND
28B	3,3'-dichlorobenzidine	ND
35B	2,4- dinitrotoluene	ND
36B	2,6- dinitrotoluene	ND
37B	1,2- diphenylhydrazine (as azobenzene)	ND
	fluoranthene	ND
40B	4- chlorophenyl phenyl ether	ND

	BASE/NEUTRAL COMPOUNDS	ug/l
41B	4-bromophenyl phenyl ether	ND
42B	bis (2-chloroisopropyl) ether	ND
43B	bis (2-chloroethoxy) methane	ND
52B	hexachlorobutadiene	ND
53B	hexachlorocyclopentadiene	ND
54B	isophorone	ND
55B	naphthalene	ND
56B	nitrobenzene	ND
61B	N-nitrosodimethylamine	ND
62B	N-nitrosodiphenylamine	ND
63B	N-nitrosodi-n-propylamine	ND
66B	bis (2-ethylhexyl) phthalate	ND
67B	butyl benzyl phthalate	ND
68B	di-n-butyl phthalate	ND
69B	di-n-octyl phthalate	ND
70B	diethyl phthalate	ND
71B	dimethyl phthalate	ND
72B	benzo(a)anthracene	ND
73B	benzo(a)pyrene	ND
74B	3,4-benzofluoranthene	ND
75B	benzo(k)fluoranthene	ND
76B	chrysene	ND
77B	acenaphthylene	ND
78B	anthracene	ND
79B	benzo(ghi)perylene	ND
80B	fluorene	ND
81B	phenanthrene	ND
82B	dibenzo(a,h)anthracene	ND
83B	indeno(1,2,3-cd)pyrene	ND
84B	pyrene	ND

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Sample Number
A 0131

ORGANICS ANALYSIS DATA SHEET - Page 2

LABORATORY NAME ENERGY RESOURCES CO. INC.

LAB SAMPLE ID NO. 25-056

QC REPORT NO. ERCO #3

	* VOLATILES	ug/l
2V	acrolein	ND
3V	acrylonitrile	ND
4V	benzene	
6V	carbon tetrachloride	
7V	chlorobenzene	
10V	1,2-dichloroethane	
11V	1,1,1-trichloroethane	
13V	1,1-dichloroethane	
14V	1,1,2-trichloroethane	
15V	1,1,2,2-tetrachloroethane	
16V	chloroethane	
[illegible]	2-chloroethylvinyl ether	
2[illegible]	chloroform	
29V	1,1-dichloroethylene	
30V	1,2-trans-dichloroethylene	
32V	1,2-dichloropropane	
33V	1,3-dichloropropylene	
38V	ethylbenzene	
44V	methylene chloride	
45V	methyl chloride	
46V	methyl bromide	
47V	bromoform	
48V	dichlorobromomethane	
49V	trichlorofluoromethane	
50V	dichlorodifluoromethane	
51V	chlorodibromomethane	
85V	tetrachloroethylene	
86V	toluene	
[illegible]	trichloroethylene	
[illegible]	vinyl chloride	

* All volatiles except for acrolein & acrylonitrile are not applicable.

	PESTICIDES	ug/l
89P	aldrin	ND
90P	dieldrin	ND
91P	chlordane	ND
92P	4,4'-DDT	ND
93P	4,4'-DDE	ND
94P	4,4'-DDD	ND
95P	α-endosulfan	ND
96P	β-endosulfan	ND
97P	endosulfan sulfate	ND
98P	endrin	ND
99P	endrin aldehyde	ND
100P	heptachlor	ND
101P	heptachlor epoxide	ND
102P	α-BHC	ND
103P	β-BHC	ND
104P	δ-BHC	ND
105P	γ-BHC	ND
106P	PCB-1242	ND
107P	PCB-1254	ND
108P	PCB-1221	ND
109P	PCB-1232	ND
110P	PCB-1248	ND
111P	PCB-1260	ND
112P	PCB-1016	ND
113P	toxaphene	ND

	DIOXINS	
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

*Less than 10 ug/l
(pesticides less than 0.1 ug/l)

ND = Not detected

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ORGANICS ANALYSIS DATA SHEET - Page 2

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RATORY NAME MEAD TECHNOLOGY LABORATORY

SAMPLE ID NO. 3073

RT NO. 04

VOLATILES	ug/l
acrolein	ND
acrylonitrile	ND
benzene	ND
carbon tetrachloride	ND
chlorobenzene	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	133
1,1-dichloroethane	ND
1,1,2-trichloroethane	ND
1,1,2,2-tetrachloroethane	ND
chloroethane	ND
2-chloroethylvinyl ether	ND
oroform	ND
1,1-dichloroethylene	ND
1,2-trans-dichloroethylene	116
1,2-dichloropropane	ND
1,3-dichloropropylene	ND
ethylbenzene	ND
methylene chloride	ND
methyl chloride	ND
methyl bromide	ND
bromoform	ND
dichlorobromomethane	ND
trichlorofluoromethane	ND
dichlorodifluoromethane	ND
chlorodibromomethane	ND
tetrachloroethylene	28
ene	ND
trichloroethylene	1372
vinyl chloride	ND

	PESTICIDES	ug/l
89P	aldrin	ND
90P	dieldrin	ND
91P	chlordane	ND
92P	4,4'-DDT	ND
93P	4,4'-DDE	ND
94P	4,4'-DDD	ND
95P	α -endosulfan	ND
96P	β -endosulfan	ND
97P	endosulfan sulfate	ND
98P	endrin	ND
99P	endrin aldehyde	ND
100P	heptachlor	ND
101P	heptachlor epoxide	ND
102P	α-BHC	ND
103P	β-BHC	ND
104P	γ-BHC	ND
105P	δ-BHC	ND
106P	PCB-1242	ND
107P	PCB-1254	ND
108P	PCB-1221	ND
109P	PCB-1232	ND
110P	PCB-1248	ND
111P	PCB-1260	ND
112P	PCB-1016	ND
113P	toxaphene	ND

	DIOXINS
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin

*Less than 10 ug/l
(pesticides less

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U.S. ENVIRONMENTAL PROTECTION AGENCY - IEA Sample Management Office
P.O. Box 818 - Alexandria, Virginia 22313 - 703/557-2490, FTS-8-557-2490

INORGANICS ANALYSIS DATA SHEET

585- 76

LABORATORY NAME Versar Inc. SAMPLE NO. MA 8024

LAB SAMPLE ID NO. 7680 QC REPORT NO.

TASK 1 (Elements to be identified and measured)

		ug/l			ug/l
1.	Aluminum	<50.	10.	Nickel	<20
2.	Chromium	<10.	11.	Manganese	410.
3.	Barium	19.	12.	Zinc	<10.
4.	Beryllium	<2.	13.	Boron	85.
5.	Cadmium	<5.	14.	Vanadium	<10.
6.	Cobalt	<10.	15.	Calcium	32,600.
7.	Copper	<20.	16.	Magnesium	6,800.
8.	Iron	490.	17.	Sodium	71,500.
9.	Lead	<40.			

TASK 2 (Elements to be identified and measured)

		ug/l			ug/l
1.	Arsenic	<10.	5.	Mercury	<1.
2.	Antimony	<20.	6.	Tin	<20.
3.	Selenium	<10.	7.	Silver	<20.
4.	Thallium	<10.			

TASK 3 (Elements to be identified and measured)

1.	Ammonia	mg/l	4.	Cyanide	mg/l
2.	Fluoride	mg/l	5.	pH	Units
3.	Sulfide	mg/l	6.	TOC	mg/l

COMMENTS:
a) with a detection limit of
b) with a detection limit of
c) with a detection limit of
d) analyzed on a sample aliquot preserved with HCl
e) average of two replicate determinations

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