17.8.39

Site: WELLS G+H
Break: 17.
Other: 17.8.39

April 1, 1987

Ms. Rodene DeRice
Department of Environmental
Quality Engineering
5 Commonwealth Avenue
Woburn, MA 01801

Re: 60 Olympia Avenue
Woburn, MA

Dear Ms. DeRice:

We enclose a copy of the report prepared by Goldberg, Zoino & Associates in response to your notice dated August 18, 1986. We apologize for the delay in forwarding this information to you.

Very truly yours,

Wayne Kingston

Wayne Kingston

WK/jpm
Enclosure

cc: Louis Massery

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WELLS G AND H
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GZA
GOLDBERG • ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS

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STEVEN J. TRETTEL
CONSULTANTS
WALTER E. JAWORSKI, JR.
STANLEY M. BEMBEN

January 14, 1987
File No. A-7943-C,PC

Mr. Charles Whitten
Juniper Development
39 Holton Street
Winchester, Massachusetts 01890

Re: Groundwater Sampling and Analysis
60 Olympia Avenue
Woburn, Massachusetts

Dear Mr. Whitten:

Pursuant to our proposal of September 30, 1986, Goldberg-Zoino & Associates, Inc. (GZA) has resampled and analyzed groundwater at the above-referenced site in response to a notice of responsibility letter from the Department of Environmental Quality Engineering (DEQE) dated August 18, 1986. This report summarizes the results of the sampling and analysis activities.

BACKGROUND

In February 1985 GZA completed an environmental site assessment at the above-referenced site. The site assessment included the installation of five groundwater observation wells and the analysis of groundwater samples. The analysis detected elevated levels of volatile organic compounds (VOCs) in groundwater from one well location. These VOCs were suspected to have originated from leaks in an underground storage tank system. The tank system was subsequently removed.

On August 18, 1986 the DEQE issued a notice of responsibility letter under MGL Chapter 21E. The DEQE required the submittal of the following information:

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THE GEO BUILDING • 320 NEEDHAM STREET • NEWTON UPPER FALLS, MASSACHUSETTS 02164 • (617) 969-0050
BUFFALO, NY • BRIDGEPORT, CT • VERNON, CT • MANCHESTER, NH • PROVIDENCE, RI • TAMPA, FL
AN EQUAL OPPORTUNITY EMPLOYER

0542

1. The status, age, contents, and construction of all underground storage tanks presently on the site.

2. A determination of whether any of the tanks currently exhibit leakage within the limitations of approved tank testing procedures.

3. Determination of groundwater quality from the on-site wells using EPA Method 602.

GZA was asked to sample and analyze groundwater from observation wells previously installed to respond to the latter requirement.

SAMPLING OF GROUNDWATER OBSERVATION WELLS

On November 14, 1986, GZA staff engineer David Sample, sampled groundwater observation wells B-1, B-3, and B-5. GZA was unable to locate observation well B-2 and B-4. Mr. Sample returned to the site on November 17, 1986 and, with the aid of a metal detector, found the location of observation well B-2. (See Figure 1, Exploration Location Plan, for groundwater observation well locations.) A sample was obtained from this location on November 17, 1986. Samples from observation wells were obtained using 5-foot stainless steel bailers with Teflon ballcheck valves. Separate precleaned bailers were used for each well to avoid cross-contamination. Three times the initial volume of water in the wells was evacuated to remove standing water, and the wells were allowed to recharge. Water samples were collected in precleaned 40 ml glass vials with Teflon septa. Samples were sent to Cambridge Analytical Associates (CAA) for analysis.

RESULTS OF ANALYSIS

Samples obtained on November 14 and November 17, 1986 were analyzed by Cambridge Analytical Associates using EPA Method 602 in accordance with the requirements of DEQE. Benzene, toluene, ethyl benzene, and xylene were not detected. The results of the analysis are presented in Appendix A. A comparison of the results of the analysis versus those presented in a November 1985 report are shown in Table 1.

SUMMARY AND CONCLUSIONS

Groundwater observation wells at 60 Olympia Avenue, Woburn, Massachusetts were sampled and analyzed by EPA Method 602, as required by the DEQE.

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Benzene, toluene, ethyl benzene, and xylene, identified as contaminants being present in the groundwater at the site described in GZA's January 1985 report, were not detected in samples obtained in November 1986.

This report is subject to the limitations and terms and conditions in Appendix B.

We trust this information will satisfy your requirements and those of the DEQE.

Very truly yours,

GOLDBERG-ZOINO & ASSOCIATES, INC.

Charles A. Lindberg
Charles A. Lindberg
Project Reviewer

John J. Balco
John J. Balco
Project Manager

Michael J. Powers FOR
John E. Ayres
Principal-in-Charge

JJB/JEA:smh
Attachments: Table
Figure
Analytical Results
Limitations/Statement of Terms and Conditions
(Env. 4/86)

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January 1987
File No. A-7943

TABLE 1

CAMBRIDGE ANALYTICAL ASSOCIATES
QUANTITATIVE LABORATORY RESULTS
60 OLYMPIA AVENUE - WOBURN, MASSACHUSETTS
(parts per billion)

	Well Location									
	B1*		B2*		B3*		B4*		B5*	
	1/85	12/86	1/85	12/86	1/85	12/86	1/85	12/86**	1/85	12/86
benzene	ND	ND	170	ND	ND	ND	ND	-	ND	ND
toluene	ND	ND	540	ND	T	ND	ND	-	T	ND
ethylbenzene	ND	ND	150	ND	T	ND	ND	-	ND	ND
xylenes	ND	ND	750	ND	T	ND	ND	-	ND	ND

T = Trace (1 to 10 times detection limit of 1 part per billion).

ND = Not detected.

* = Designated GZA-1, GZA-2, GZA-3, and GZA-5 by CAA in Appendix B.

** = Well not located.

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E543

R E P O R T T O

Goldberg-Zoino & Associates
The GEO Building
320 Needham Street
Newton Upper Falls, MA 02164
Attn: Mr. John Balco

Work ID: Olympia Woburn A7943
P.O. No.: 15450
Work Order: 86-11-112

Cambridge Analytical Associates
1106 Commonwealth Avenue / Boston, Massachusetts 02215 / (617) 232-2207

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4542

Page 1
Received: 11/17/86

REPORT
12/08/86 15:53:01

Work Order # 86-11-112

REPORT TO
Goldberg-Zoino & Associates
The GEO Building
320 Needham Street
Newton Upper Falls, MA 02164
ATTEN Mr. John Balco

PREPARED BY
Cambridge Analytical Assoc.
Environmental Division
1106 Commonwealth Avenue
Boston, MA 02215
ATTEN
PHONE 617-232-2207

CERTIFIED BY J. Carian Cole

CONTACT COLE

CLIENT GZA NEWTON SAMPLES 4
COMPANY Goldberg-Zoino & Associates
FACILITY 320 Needham Street
Newton Upper Falls, MA 02164

This report is approved for release by the following staff:
Laboratory Director: [illegible]
Inorganic Laboratory:
Organic Laboratory: Edward A. Barb

WORK ID Olympia Woburn A7943
TAKEN By Client
TRANS By Client
TYPE Aqueous
P.O. # 15450
INVOICE under separate cover

SAMPLE IDENTIFICATION
01 GZA-1
02 GZA-2
03 GZA-3
04 GZA-5

TEST CODES and NAMES used on this report
V602_A VOC/aro-aqueous-EPA 602

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REPORT
Results by Sample

Work Order # 86-11-112

SAMPLE ID GZA-1 FRACTION 01A TEST CODE V602_A NAME VOC/aro-aqueous-EPA 602
Date & Time Collected 11/14/86 Category

Analysis
Completed: 11/18/86

COMPOUND	ug/L(a)
Benzene.....	
Toluene.....	
Ethyl Benzene.....	
total Xylenes.....	
DETECTION LIMIT.....	1

(a) - Concentrations less than the detection limit are left blank

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REPORT
Results by Sample

Work Order # 86-11-112

SAMPLE ID GZA-2

FRACTION 02A TEST CODE V602_A NAME VOC/aro-aqueous-EPA 602
Date & Time Collected 11/14/86 Category

Analysis
Completed: 11/18/86

COMPOUND	ug/L(a)
Benzene	
Toluene	
Ethyl Benzene	
total Xylenes	
DETECTION LIMIT	1

(a) - Concentrations less than the detection limit are left blank

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Page 4
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REPORT
Results by Sample

Work Order # 86-11-112

SAMPLE ID GZA-3 FRACTION 03A TEST CODE V602_A NAME VOC/aro-aqueous-EPA 602
Date & Time Collected 11/14/86 Category

Analysis
Completed: 11/18/86

COMPOUND	ug/L(a)
Benzene.....	
Toluene.....	
Ethyl Benzene.....	
total Xylenes.....	
DETECTION LIMIT.....	1

(a) - Concentrations less than the detection limit are left blank

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Page 5
Received: 11/17/86

REPORT
Results by Sample

Work Order # 86-11-112

SAMPLE ID GZA-5

FRACTION 04A TEST CODE V602_A NAME VOC/aro-agueous-EPA 602
Date & Time Collected 11/14/86 Category

Analysis
Completed: 11/18/86

COMPOUND	ug/L(a)
Benzene	
Toluene	
Ethyl Benzene	
total Xylenes	
DETECTION LIMIT	1

(a) - Concentrations less than the detection limit are left blank

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TEST CODE V602_A NAME VOC/aro-aqueous-EPA 602

Method Reference: U.S. EPA, 1984. Methods for Organic Analysis of Municipal and Industrial Wastewater. Appendix A. 40CFR Part 136. Federal Register, Vol. 49, No. 209. Method 602, test method for volatile aromatic organic compounds.

Method Description: The analytes in an aqueous sample are isolated and concentrated by purging the sample with inert gas and trapping them on an absorbant. The absorbant is thermally desorbed into a gas chromatograph (GC) where the analytes are separated and detected with a photoionization detector (PID).

Quality Control Procedures: Instrument response is calibrated at least once per day using EPA traceable standard reference solutions. Analytes are quantified using the internal standard method. Surrogate standard compounds are added to every sample to monitor method performance. Additional quality control includes the analysis of matrix spikes, duplicate samples and blanks.

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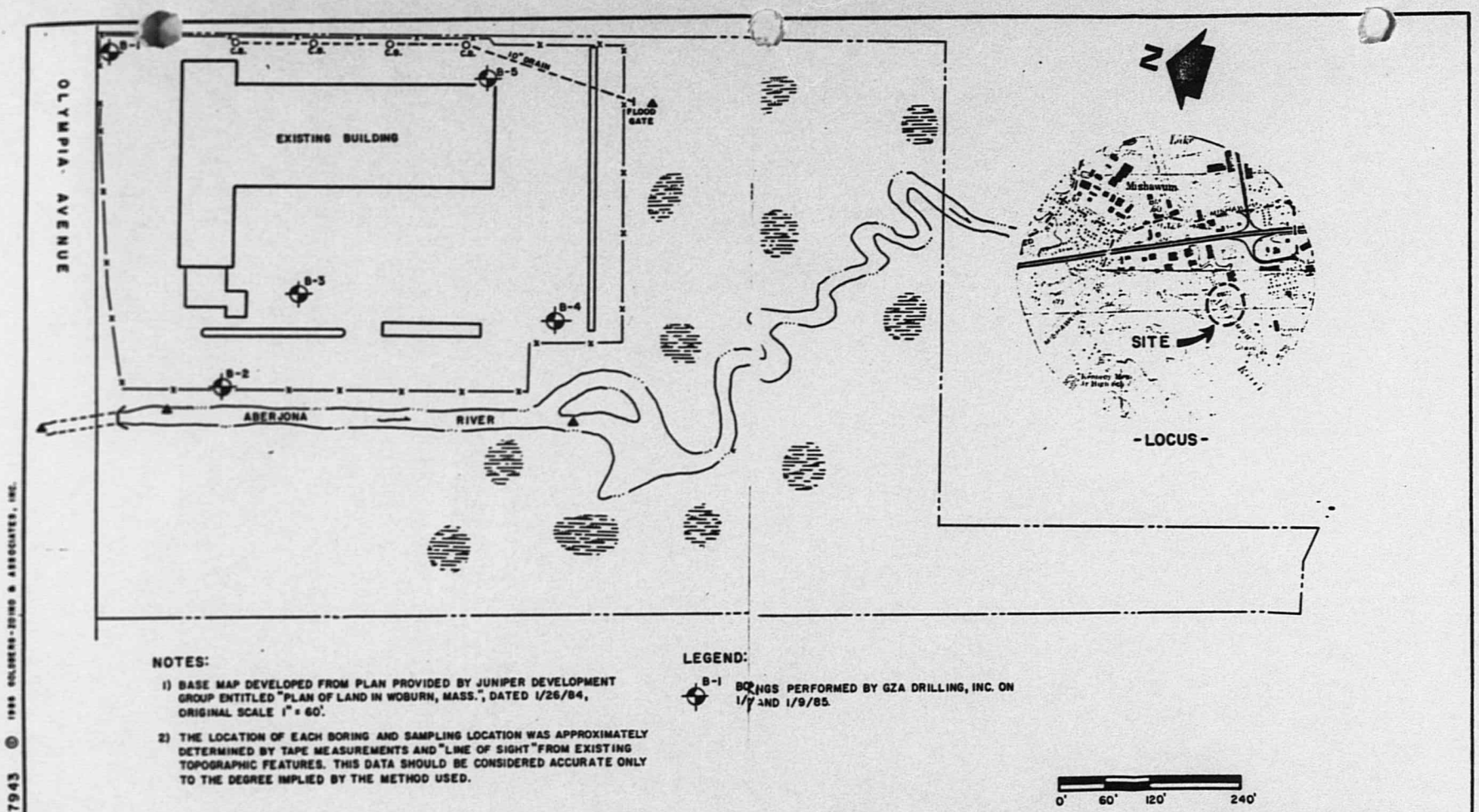
APPENDIX B

LIMITATIONS

1. The observations described in this Report were made under the conditions stated therein. The conclusions presented in the Report were based solely upon the services described therein, and not on scientific tasks or procedures beyond the scope of described services or the time and budgetary constraints imposed by Client. The work described in this report was carried out in accordance with the attached Statement of Terms and Conditions.

2. Quantitative laboratory testing was performed as part of the site assessment by where such analyses have been conducted by an outside laboratory. GZA has relied upon the data provided, and has not conducted an independent evaluation of the reliability of these data.

3. The conclusions and recommendations contained in this report are based in part upon various types of chemical data and are contingent upon their validity. These data have been reviewed and interpretations made in the Report. It should be noted that variations in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time, and other factors. Should additional chemical data become available in the future, these data should be reviewed by GZA, and the conclusions and recommendations presented herein modified accordingly.



NOTES:

1) BASE MAP DEVELOPED FROM PLAN PROVIDED BY JUNIPER DEVELOPMENT GROUP ENTITLED "PLAN OF LAND IN WOBURN, MASS.", DATED 1/26/84, ORIGINAL SCALE 1" = 60'.

2) THE LOCATION OF EACH BORING AND SAMPLING LOCATION WAS APPROXIMATELY DETERMINED BY TAPE MEASUREMENTS AND "LINE OF SIGHT" FROM EXISTING TOPOGRAPHIC FEATURES. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

LEGEND:

B-1 BORINGS PERFORMED BY GZA DRILLING, INC. ON 1/7 AND 1/9/85.

0' 60' 120' 240'

GZA

ENVIRONMENTAL SITE ASSESSMENT 60 OLYMPIA AVENUE WOBURN, MASS.	EXPLORATION LOCATION PLAN DEC., 1986 FIGURE No.1

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Site: [illegible]
Break: 17.8
Other: 17.8.99

SUPPLEMENTAL INFORMATION
FOR
TEST BORING LOGS

ABBREVIATION	DESCRIPTION
OD	Outer Diameter - the outside diameter
SS	Soil Samples
REC	Recovery - Amount of sample, in inches, recovered from the split-spoon sampler
WE	WEHRAN Monitoring Well

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WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG
BORING NO. WE - 1

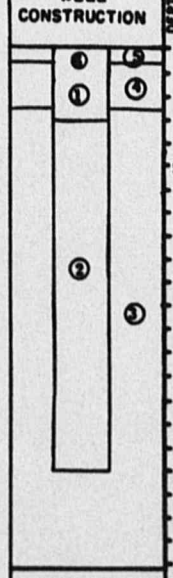
PROJECT: Weyerhaeuser Site, Woburn, MA	SHEET NO. 1 OF 1
CLIENT: Massachusetts DEQE	JOB NO. 51118.21
BORING CONTRACTOR: Carr - Dee Drilling Corp.	ELEVATION 53.56 TO PVC
	DATE STARTED 1/28/87
	DATE FINISHED 1/28/87
	DRILLER Bill Wingerter
	INSPECTOR Stephanie Stowe

GROUND WATER

DATE	TIME	WATER ELEV.	SCREEN INT.
2/2/87	PM	48.41 MSL	3.0'-18.0'

	CAS.	SAMP.	CORE	TUBE
TYPE	STEEL	Split Spoon		
DIA.	4"	2" OD		
WT.	300 lbs	140 lbs		
FALL	24"	30"		

WELL CONSTRUCTION



DEPTH FEET	SAMPLE NO.	TYPE	BLOWS PER 6 INCHES	CLASSIFICATION	REMARKS
0				-ASPHALT- 0.5'	
	S-1	SS	138	Dense, Brown, coarse to fine SAND, some to trace Cobbles, little Silt, Pebbles. 4.5'	REC = 5" Sample taken from 1 to 1.5 ft.
5	S-2	SS	6-6 / 8-8	Loose, Tan, fine SAND, some Silt, trace Pebbles, Cobble. 10'	REC = 4" Sample taken from 4.5 to 6.5 ft.
10	S-3	SS	13-10 / 7-8	Loose, Tan, fine SAND, little Silt, trace medium Sand, Clay. 15'	REC = 22" Two clay layers ½ cm thick at 1.7 and 1.8 ft.
15	S-4	SS	12-8 / 7-8	Loose, Tan, medium to fine SAND, little Silt	REC = 20"
20	S-5	SS	7-8 / 8-9		REC = 23"
25				END OF BORING AT 22 ft.	
30					
35					
40					
45					
50					

END OF BORING AT 22'

(1) 2" ID Sch 40 PVC riser.
(2) 2" ID, flush threaded sch 40 .010 slot PVC screen.
(3) clean silica sand.
(4) Bentonite pellet seal.
(5) Cement pad
(6) Road box

HEADSPACE ANALYSIS

Span setting 10, 10.2 eV probe

Sample #	Depth	Back-ground	Head-space
S-1	1-1½	0.3	1.0
S-2	4-6	0.4	0.9
S-3	10-12	0.4	1.2
S-4	15-17	0.6	2.2
S-5	20-22	0.3	10.2

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ADMINISTRATIVE RECORD

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2449

WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG
BORING NO. WE-2

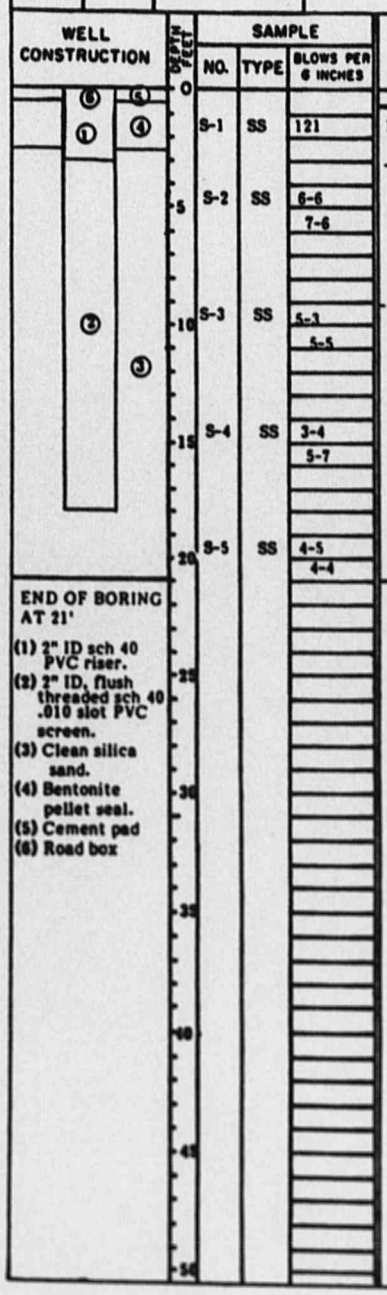
PROJECT: Weyerhaeuser Site, Woburn, MA	SHEET NO. 1 OF 1
CLIENT: Massachusetts DEQE	JOB NO. 51118.21
BORING CONTRACTOR: Carr - Dee Drilling Corp.	ELEVATION 53.58 TOP PVC
	DATE STARTED 1/27/87
	DATE FINISHED 1/27/87
	DRILLER Bill Wingerter
	INSPECTOR Stephanie Stowe

GROUND WATER

DATE	TIME	WATER ELEV.	SCREEN INT.
2/2/87	pm	48.88 MSL	3.0'-18.0'

	CAS.	SAMP.	CORE	TUBE
TYPE		Split Spoon		
DIA.		2" OD		
WT.		140 lbs		
FALL		30"		

WELL CONSTRUCTION



SAMPLE NO.	TYPE	BLOWS PER 6 INCHES	CLASSIFICATION	REMARKS
			-ASPHALT- 0.45'	
S-1	SS	121	Dense, Brown, coarse to fine SAND and to some PEBBLES, little to trace Silt. 3'	REC = 6", Sample from 1 - 1.5'. High number of blow counts due to frozen soil.
S-2	SS	6-6 7-6	Loose, Tan, fine SAND, little Silt. 9'	Driller notes strata change at 3'. REC = 15" NOTE: Rust staining from 5-8" and 12-14", in horizontal bands 1/16" thick.
S-3	SS	5-3 5-5	Loose, Tan, fine SAND, little Silt.	REC = 6" Running sand-completely saturated.
S-4	SS	3-4 5-7		REC = 24" Rust staining 0-10"
S-5	SS	4-5 4-4		REC = 24" Rust staining upper 9-12" of samples.

END OF BORING AT 21'

(1) 2" ID sch 40 PVC riser.
(2) 2" ID, flush threaded sch 40 .010 slot PVC screen.
(3) Clean silica sand.
(4) Bentonite pellet seal.
(5) Cement pad
(6) Road box

END OF BORING AT 21 ft.

NOTE: HNU readings not taken over the split barrel sampler because of operational problems from extremely low temperatures.

HEADSPACE ANALYSIS

Span setting 10, 10.2 eV probe

Sample #	Depth	Back-ground	Head-space
S-1	1-1.5'	0.1	0.2
S-2	4-6'	0.1	0.2
S-3	9-11'	0.1	0.2
S-4	14-16'	0.1	0.2
S-5	19-21'	0.3	0.3

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WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG
BORING NO. WE-3

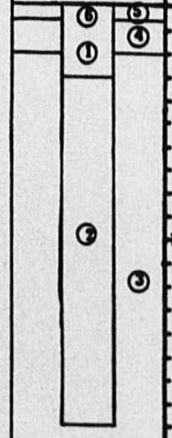
PROJECT:	Weyerhauser Site, Woburn, MA
CLIENT:	Massachusetts DEQE
BORING CONTRACTOR:	Carr - Dee Drilling Corp.
SHEET NO.	1 OF 1
JOB NO.	51118.21
ELEVATION	53.17 TO PVC
DATE STARTED	1/29/87
DATE FINISHED	1/29/87
DRILLER	Bill Wingerter
INSPECTOR	Stephanie Stowe

GROUND WATER

DATE	TIME	WATER ELEV.	SCREEN INT.
2/2/87	pm	47.22 MSL	3.0'-18.0'

	CAS.	SAMP.	CORE	TUBE
TYPE	STEEL	split spoon		
DIA.	4"	2" OD		
WT.	300 lbs	140 lbs		
FALL	24"	30"		

WELL CONSTRUCTION



DEPTH FEET	SAMPLE NO.	TYPE	BLOWS PER 6 INCHES	CLASSIFICATION	REMARKS
0				-ASPHALT- 0.4'	
	S-1	SS	36-21	Dark Brown, coarse to fine SAND, and PEBBLES, trace Silt, Cobbles. 1.16'	REC = 10"
			34-37		
	S-2	SS	11-13	Tan, Loose, coarse to fine SAND, some Silt, trace Pebbles. 1.2'	
5			15-19	Tan, Loose, coarse SAND, trace Pebbles, Silt. 1.8'	
				Medium, Tan, coarse SAND, little medium to fine Sand, Pebbles, trace Cobbles, Silt. 10'	REC = 18"
10	S-3	SS	15-18	Dense, Tan, medium to fine SAND, little Silt, trace micaceous flakes, Pebble.	REC = 12" Rust staining upper 7" of sample.
			19-20		
15	S-4	SS	21-24		REC = 17"
			29-21		
				20'	
20	S-5	SS	19-11	Medium, Tan, fine SAND, little Silt, medium Sand.	REC = 5"
			11-10		
25				END OF BORING AT 22 ft.	
30					
35					
40					
45					
50					

END OF BORING AT 22 ft.

(1) 2" ID sch 40 PVC riser
(2) 2" ID, flush threaded sch 40 .010 slot PVC screen.
(3) Clean silica sand.
(4) Bentonite pellet seal.
(5) Cement pad
(6) Road box

HEADSPACE ANALYSIS

Span setting 10, 10.2 eV probe

Sample #	Depth	Back-ground	Head-space
S-1	1-3	0.4	1.3
S-2	4-6	0.3	0.4
S-3	10-12	0.3	0.9
S-4	15-17	0.4	0.7
S-5	20-21	0.5	0.5

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WEHRAN ENGINEERING
CONSULTING ENGINEERS

VARIABLE HEAD
PERMEABILITY TEST
PIEZOMETER No. WE #1

PROJECT: Weyerhauser Site
CLIENT: Massachusetts DEQE
JOB NO: 51118.21
DATE OF TEST: 2/2/87

SCREENED INTERVAL:
Screen interval is from 18.0 to 3.0 feet below the top of PVC.

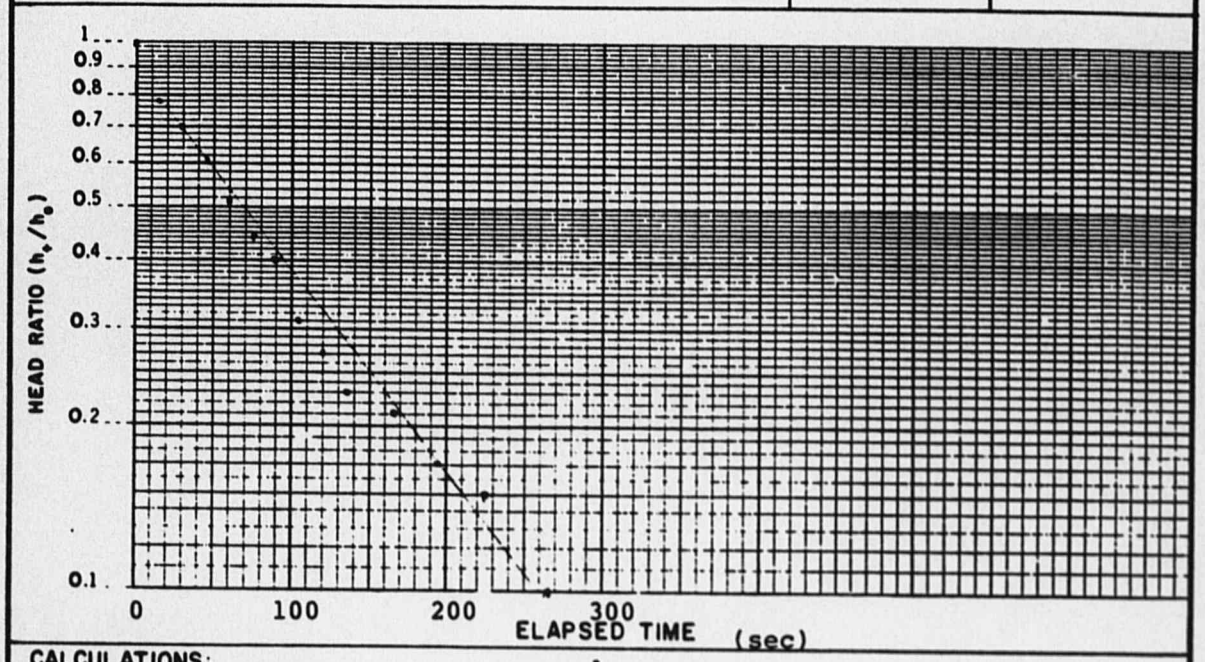
METHOD:
Rising head test

$$K = \frac{r^2 \ln (h_1/h_2)}{2L\,(t_2-t_1)} \cdot \ln \frac{L}{R}$$

From Hvorlsev (1951)

TEST DATA

ELAPSED TIME (sec)		HEAD RATIO (h_t / h_o)	
0	275	1.00	0.08
15	315	0.78	0.06
30	375	0.70	0.04
45	435	0.60	0.04
60		0.51	
75		0.44	
90		0.40	
105		0.31	
120		0.27	
135		0.23	
165		0.21	
195		0.17	
225		0.15	
255		0.10	



CALCULATIONS:

$r = 5.08$ cm
$L = 368.6$ cm
$R = 10.16$ cm
$T_1 = 50$ sec
$T_2 = 165$ sec
$h_1 = 0.58$
$h_2 = 0.23$

$$K = \frac{(5.08)^2 \ln (0.6/0.17)}{2\,(361.19)\,(190-45)} \cdot \ln \frac{361.19}{20.32}$$

$K = 8.94 \times 10^{-4}$ cm/sec

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WELLS G AND H
ADMINISTRATIVE RECORD

WEL 007

2947

WEHRAN ENGINEERING
CONSULTING ENGINEERS

VARIABLE HEAD PERMEABILITY TEST
PIEZOMETER No. WE #1

PROJECT: Weyerhauser Site
CLIENT: Massachusetts DEQE
JOB NO: 51118.21
DATE OF TEST: 2/2/87

SCREENED INTERVAL:
Screen interval is from 18.0 to 3.0 feet below the top of PVC.

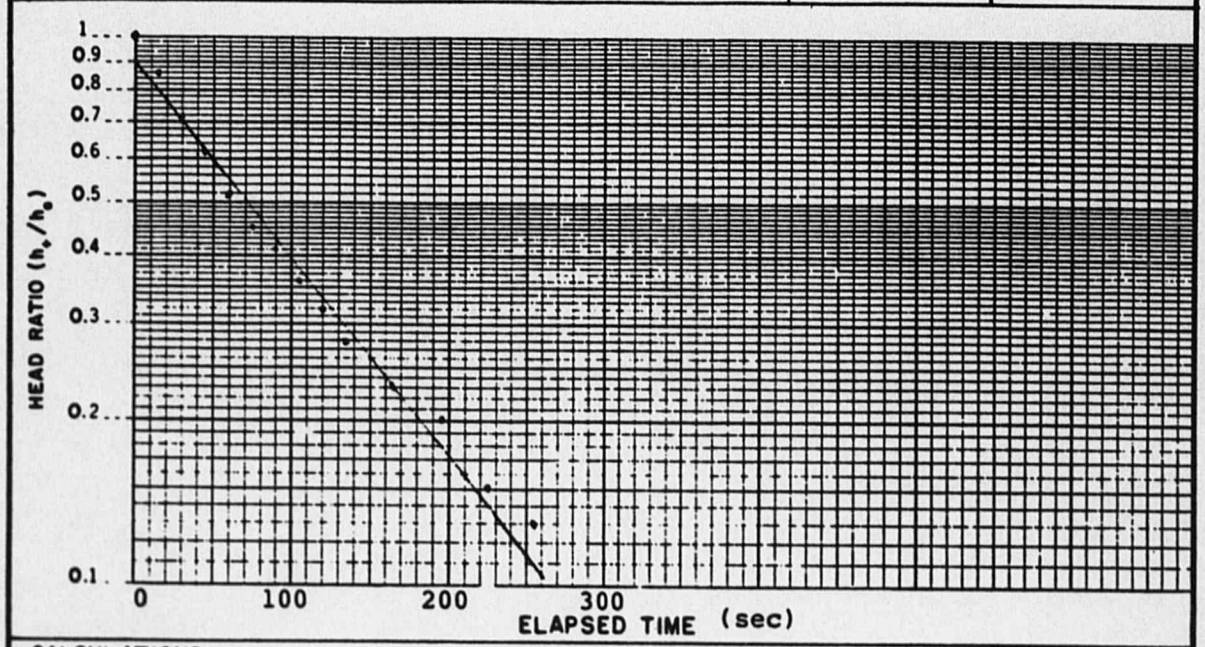
METHOD:
Rising head test.

$$K = \frac{r^2 \ln (h_1/h_2)}{2L\,(t_2-t_1)} \cdot \ln \frac{L}{R}$$

Hvorslev (1951)

TEST DATA

ELAPSED TIME (sec)		HEAD (h_t)	RATIO (h_t / h_o)
0	285	1.00	0.10
15	315	0.86	0.09
20	375	0.71	0.07
45	435	0.61	0.05
60		0.52	
75		0.45	
90		0.41	
105		0.36	
120		0.32	
135		0.28	
165		0.23	
195		0.20	
225		0.15	
255		0.13	



CALCULATIONS:

$r = 5.08$ cm
$L = 368.6$ cm
$R = 10.16$
$T_1 = 50$ sec
$T_2 = 165$ sec
$h_1 = 0.58$
$h_2 = 0.23$

$$K = \frac{(5.08)^2 \ln (0.58/0.23)}{2\,(368.6)\,(165-50)} \cdot \ln \frac{368.6}{10.16}$$

$K = 7.03 \times 10^{-4}$ cm/sec

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8948

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WELLS G AND H
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WEL 007

2469

R E P O R T T O

Wehran Engineering
100 Milk St.
Methuen, MA 01844

Attn: Ms. Stephanie Stowe

Work ID: Weyerhaeuser Site
P.O. No.:
Work Order: 87-02-011

Cambridge Analytical Associates
Environmental Division
1106 Commonwealth Avenue
Boston MA 02215

WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG
BORING NO. WE-3

SHEET NO. 1 OF 1
JOB NO. 51118.21
ELEVATION 53.17 TO PVC
DATE STARTED 1/29/87
DATE FINISHED 1/29/87
DRILLER Bill Wingerter
INSPECTOR Stephanie Stowe

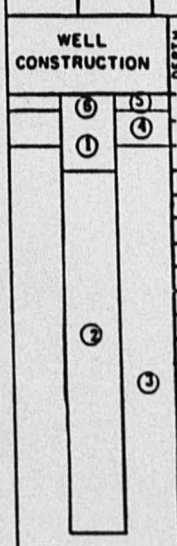
PROJECT: Weyerhauser Site, Woburn, MA
CLIENT: Massachusetts DEQE
BORING CONTRACTOR: Carr - Dee Drilling Corp.

GROUND WATER

DATE	TIME	WATER ELEV.	SCREEN INT.
2/2/87	pm	47.22 MSL	3.0'-18.0'

	CAS.	SAMP.	CORE	TUBE
TYPE	STEEL	Split Spoon		
DIA.	4"	2" OD		
WT.	300 lbs	140 lbs		
FALL	24"	30"		

WELL CONSTRUCTION



END OF BORING AT 22 ft.

(1) 2" ID sch 40 PVC riser
(2) 2" ID, flush threaded sch 40 .010 slot PVC screen.
(3) Clean silica sand.
(4) Bentonite pellet seal.
(5) Cement pad
(6) Road box

DEPTH FEET	SAMPLE NO.	TYPE	BLOWS PER 6 INCHES	CLASSIFICATION	REMARKS
0				-ASPHALT- 0.4'	
	S-1	SS	36-21	Dark Brown, coarse to fine SAND, and PEBBLES, trace Silt, Cobbles. 1.16'	REC = 10"
			34-37		
				Tan, Loose, coarse to fine SAND, some Silt, trace Pebbles. 1.2'	
	S-2	SS	11-13		
5			15-19	Tan, Loose, coarse SAND, trace Pebbles, Silt. 1.8'	
				Medium, Tan, coarse SAND, little medium to fine Sand, Pebbles, trace Cobbles, Silt. 10'	REC = 18"
10	S-3	SS	15-18	Dense, Tan, medium to fine SAND, little Silt, trace micaceous flakes, Pebble.	REC = 12" Rust staining upper 7" of sample.
			19-20		
15	S-4	SS	21-24		REC = 17"
			29-21	20'	
20	S-5	SS	19-11	Medium, Tan, fine SAND, little Silt, medium Sand.	REC = 5"
			11-10	END OF BORING AT 22 ft.	
25					
30					
35					
40					
45					
50					

HEADSPACE ANALYSIS

Span setting 10, 10.2 eV probe

Sample #	Depth	Back-ground	Head-space
S-1	1-3	0.4	1.3
S-2	4-6	0.3	0.4
S-3	10-12	0.3	0.9
S-4	15-17	0.4	0.7
S-5	20-21	0.5	0.5

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0142

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WELLS G AND H
ADMINISTRATIVE RECORD

WEL 007

1441

WEHRAN ENGINEERING
CONSULTING ENGINEERS

VARIABLE HEAD
PERMEABILITY TEST
PIEZOMETER No. WE #1

PROJECT: Weyerhauser Site
CLIENT: Massachusetts DEQE
JOB NO: 51118.21
DATE OF TEST: 2/2/87

SCREENED INTERVAL:
Screen interval is from 18.0 to 3.0 feet below the top of PVC.

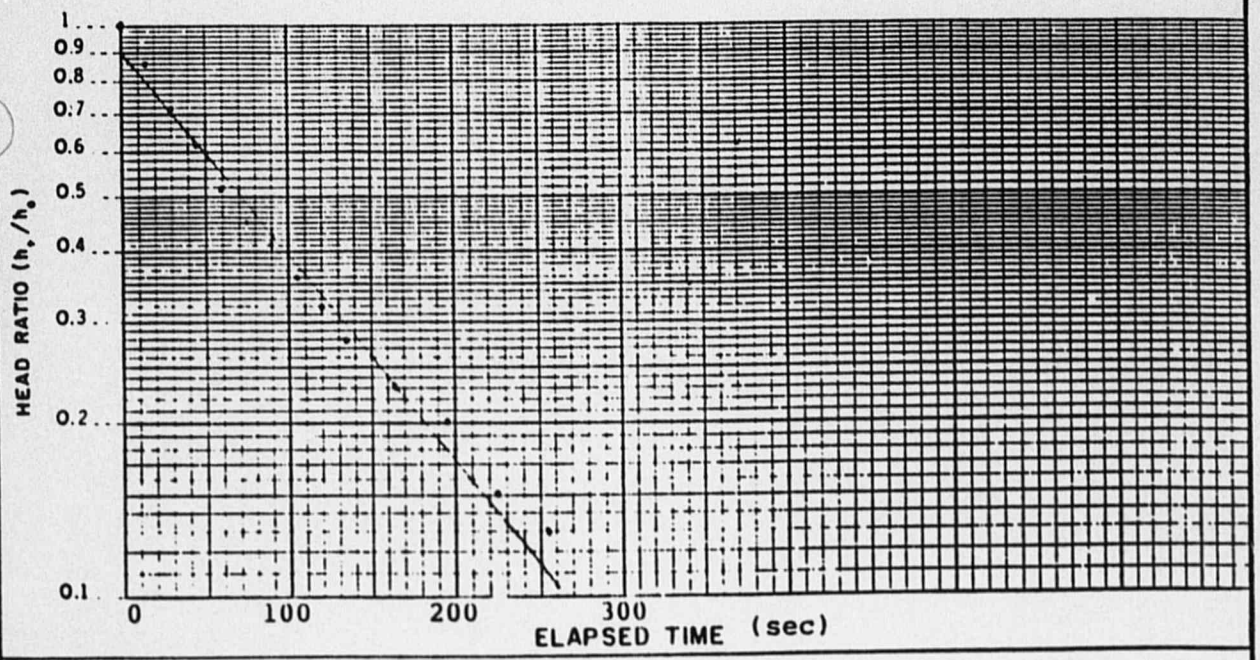
METHOD:
Rising head test.

$$K = \frac{r^2 \ln (h_1/h_2)}{2L\,(t_2-t_1)} \cdot \ln \frac{L}{R}$$

Hvorslev (1951)

TEST DATA

ELAPSED TIME (sec)		HEAD (h_t)	RATIO (h_t / h_0)
0	285	1.00	0.10
15	315	0.86	0.09
20	375	0.71	0.07
45	435	0.61	0.05
60		0.52	
75		0.45	
90		0.41	
105		0.36	
120		0.32	
135		0.28	
165		0.23	
195		0.20	
225		0.15	
255		0.13	



CALCULATIONS:

$r = 5.08$ cm
$L = 368.6$ cm
$R = 10.16$
$T_1 = 50$ sec
$T_2 = 165$ sec
$h_1 = 0.58$
$h_2 = 0.23$

$$K = \frac{(5.08)^2 \ln (0.58/0.23)}{2\,(368.6)\,(165-50)} \cdot \ln \frac{368.6}{10.16}$$

$K = 7.03 \times 10^{-4}$ cm/sec

WEHRAN ENGINEERING
CONSULTING ENGINEERS

VARIABLE HEAD
PERMEABILITY TEST
PIEZOMETER No. WE #2

PROJECT: Weyerhauser Site
CLIENT: Massachusetts DEQE
JOB NO: 51118.21
DATE OF TEST: 2/2/87

SCREENED INTERVAL:
Screen interval is from 18.0 to 3.0 feet below the top of PVC.

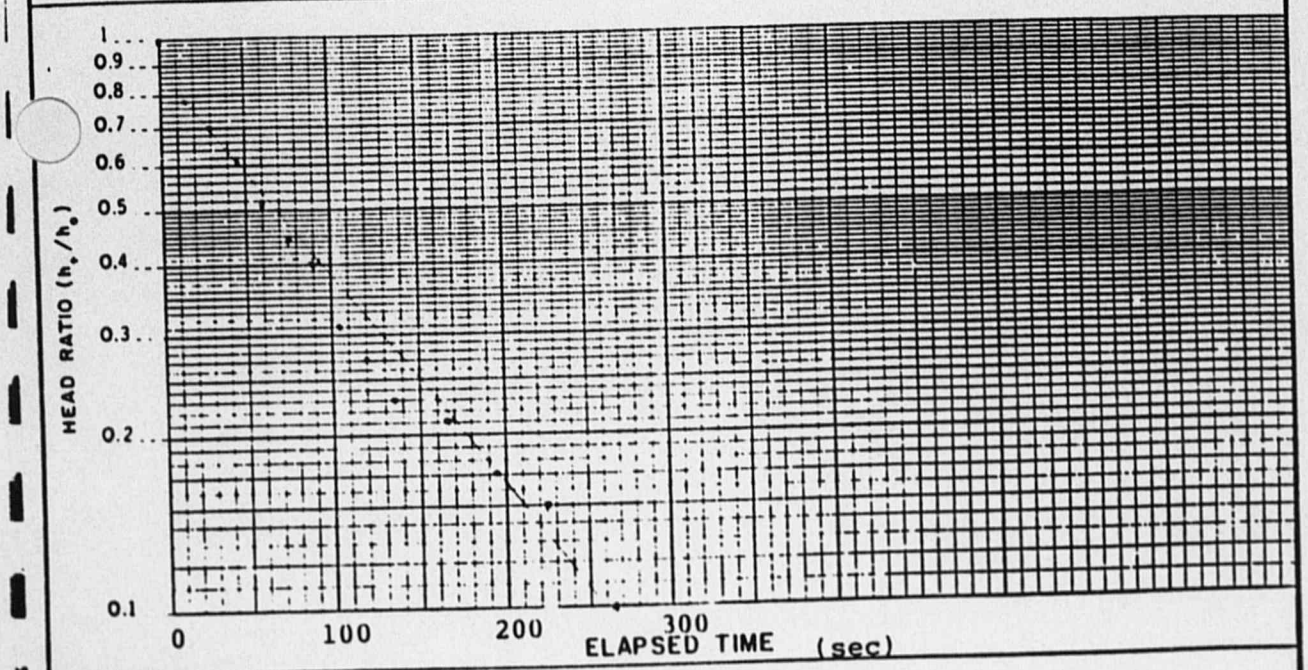
METHOD:
Rising head test

$$K = \frac{r^2 \ln (h_1/h_2)}{2L\,(t_2-t_1)} \cdot \ln \frac{L}{R}$$

From Hvorlsev (1951)

TEST DATA

ELAPSED TIME (sec)		HEAD (h_t / h_o)	RATIO
0	275	1.00	0.08
15	315	0.78	0.06
30	375	0.70	0.04
45	435	0.60	0.04
60		0.51	
75		0.44	
90		0.40	
105		0.31	
120		0.27	
135		0.23	
165		0.21	
195		0.17	
225		0.15	
255		0.10	



CALCULATIONS:

$r = 5.08$ cm
$L = 368.6$ cm
$R = 10.16$ cm
$T_1 = 50$ sec
$T_2 = 165$ sec
$h_1 = 0.58$
$h_2 = 0.23$

$$K = \frac{(5.08)^2 \ln (0.6/0.17)}{2\,(361.19)\,(190-45)} \cdot \ln \frac{361.19}{20.32}$$

$K = 8.94 \times 10^{-4}$ cm/sec

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2472

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WELLS G AND H
ADMINISTRATIVE RECORD

WEL 007

2473

REPORT TO

Wehran Engineering
100 Milk St.
Methuen, MA 01844

Attn: Ms. Stephanie Stowe

Work ID: Weyerhaeuser Site
P.O. No.:
Work Order: 87-02-033

Cambridge Analytical Associates
Environmental Division
1106 Commonwealth Avenue
Boston MA 02215

Method Reference: U.S. EPA, 1984. Methods for Organic Analysis of Municipal and Industrial Wastewater. Appendix A. 40CFR Part 136. Federal Register, Vol. 49, No. 209. Method 625, test method for base/neutral and acid organic compounds.

Method Description: The analytes in an aqueous sample are isolated and concentrated by solvent extraction. The extract is injected into into a gas chromatograph (GC) where the analytes are separated and detected with a mass spectrometric (MS) detector.

Quality Control Procedures: The GC/MS is tuned every twelve hours with decafluorotriphenylphosphine (DFTPP). Instrument response is calibrated every twelve hours using EPA traceable standard reference solutions. Analytes are quantified using the internal standard method. Surrogate standard compounds are added to every sample to monitor method performance. Additional quality control includes the analysis of replicates, duplicate matrix spikes, and blanks.

TEST CODE V624_A NAME VOC-aqueous-EPA 624

Method Reference: U.S. EPA, 1984. Methods for Organic Analysis of Municipal and Industrial Wastewater. Appendix A. 40CFR Part 136. Federal Register, Vol. 49, No. 209. Method 624, test method for volatile organic compounds.

Method Description: The analytes in an aqueous sample are isolated and concentrated by purging the sample with inert gas and trapping them on an absorbant. The absorbant is thermally desorbed into a gas chromatograph (GC) where the analytes are separated and detected with a mass spectrometric (MS) detector.

Quality Control Procedures: The GC/MS is tuned daily with bromofluorobenzene (BFB). Instrument response is calibrated daily using EPA traceable standard reference solutions. Analytes are quantified using the internal standard method. Surrogate standard compounds are added to every sample to monitor method performance. Additional quality control includes the analysis of matrix spikes, duplicate matrix spikes, and blanks.

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ADMINISTRATIVE RECORD

WEL 007

[redacted]

Methuen, MA 01844

ATTEN

CLIENT WEHRAN FIT SAMPLES 2
COMPANY Wehran Engineering
FACILITY 100 Milk St.
Methuen, MA 01844

WORK ID Weyerhaeuser Site
TAKEN By Stephanie Stowe
TRANS By Stephanie Stowe
TYPE Aqueous
P.O. #
INVOICE under separate cover

[redacted]

1106 Commonwealth Avenue
Boston, MA 02215

ATTEN
PHONE 617-232-2207

CERTIFIED BY

CONTACT COLE

This report is approved for release by the following staff:
Laboratory Director:
Inorganic Laboratory:
Organic Laboratory:

SAMPLE IDENTIFICATION
01 WEY-GW-06-106
02 WEY-GW-07-107

TEST CODES and NAMES used on this report

ABN_A	ABN(GC/MS)-aqueous-EPA 625
EXABNA	A/B/N ext-aqueous-EPA 625
V624_A	VOC-aqueous-EPA 624

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WELLS G AND H
ADMINISTRATIVE RECORD

WEL 007

2475

Analysis
Completed: 02/19/87

BASE/NEUTRALS

COMPOUND	ug/L(a)
bis(2-Chloroethyl)Ether	
1,3-Dichlorobenzene	
1,4-Dichlorobenzene	
1,2-Dichlorobenzene	
bis(2-Chloroisopropyl)Ether	
N-Nitroso-di-n-propylamine	
Hexachloroethane	
Nitrobenzene	
Isophorone	
bis(2-Chloroethoxy)Methane	
1,2,4-Trichlorobenzene	
Naphthalene	580
Hexachlorobutadiene	
Hexachlorocyclopentadiene	
2-Chloronaphthalene	
Dimethylphthalate	
Acenaphthylene	44
Acenaphthene	TR(10)
2,4-Dinitrotoluene	
2,6-Dinitrotoluene	
Diethylphthalate	
4-Chlorophenyl-phenylether	
Fluorene	
N-Nitrosodiphenylamine	
4-Bromophenyl-phenylether	
Hexachlorobenzene	
Phenanthrene	42
Anthracene	

COMPOUND	ug/L(a)
Di-n-butylphthalate	
Fluoranthene	
Pyrene	TR(2)
Butylbenzylphthalate	
3,3'-Dichlorobenzidine	
Benzo(a)Anthracene	
bis(2-Ethylhexyl)phthalate	TR(4)
Chrysene	
Di-n-octylphthalate	
Benzo(b)Fluoranthene	
Benzo(k)Fluoranthene	
Benzo(a)Pyrene	
Indeno(1,2,3-cd)Pyrene	
Dibenzo(a,h)Anthracene	
Benzo(g,h,i)Perylene	

The following are non-priority pollutant Hazardous Substance List compounds.

Aniline	
Benzyl Alcohol	
4-Chloroaniline	
2-Methylnaphthalene	47
2-Nitroaniline	
3-Nitroaniline	
Dibenzofuran	
4-Nitroaniline	
DETECTION LIMIT	2

(a) - Concentrations less than the detection limit are left blank. Concentrations between 1 and 10 times the detection limit are listed as trace levels 'TR'.

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ADMINISTRATIVE RECORD

WEL 007

ACID COMPOUNDS

	ug/L(a)
Phenol	
2-Chlorophenol	
2-Nitrophenol	
2,4-Dimethylphenol	
2,4-Dichlorophenol	
4-Chloro-3-methylphenol	
2,4,6-Trichlorophenol	
2,4-Dinitrophenol	
4-Nitrophenol	
4,6-Dinitro-2-methylphenol	
Pentachlorophenol	

The following are non-priority pollutant Hazardous Substance List compounds.

2-Methylphenol	
4-Methylphenol	
Benzoic Acid	
2,4,5-Trichlorophenol	
DETECTION LIMIT	2

(a) - Concentrations less than the detection limit are left blank. Concentrations between 1 and 10 times the detection limit are listed as trace levels 'TR'.

WELLS G AND H
ADMINISTRATIVE RECORD

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Analysis
Completed: 2/18/87

COMPOUND	ug/L(ppb)(a)
Chloromethane	
Bromomethane	
Vinyl Chloride	
Chloroethane	
Methylene Chloride	
1,1-Dichloroethylene	
1,1-Dichloroethane	
trans-1,2-Dichloroethylene	
Chloroform	
1,2-Dichloroethane	
1,1,1-Trichloroethane	
Carbon Tetrachloride	
Bromodichloromethane	
1,2-Dichloropropane	
trans-1,3-Dichloropropene	
Trichloroethylene	
Chlorodibromomethane	
1,1,2-Trichloroethane	
Benzene	180
cis-1,3-Dichloropropene	

COMPOUND	ug/L(ppb)(a)
2-Chloroethylvinyl Ether	
Bromoform	
1,1,2,2-Tetrachloroethane	
Tetrachloroethylene	
Toluene	23
Chlorobenzene	
Ethylbenzene	120
total Xylenes	290

The following are non-priority pollutant Hazardous Substance List compounds.

Carbon Disulfide	
2-Butanone (MEK)	
Vinyl Acetate	
2-Hexanone (MPK)	
4-Methyl-2-pentanone (MIBK)	
Styrene	
DETECTION LIMIT	5

(a) - Concentrations less than the detection limit are left blank
Concentrations between 1 and 10 times the detection limit
are listed as trace levels 'TR'.

WELLS G AND H
ADMINISTRATIVE RECORD

WEL 007

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[redacted] 3 [redacted] me [redacted] l [redacted] rd [redacted] 24/ [redacted] egc [redacted] WA [redacted]

[redacted]alysis
[redacted]pleted: 2/18/87

COMPOUND	ug/L(ppb)(a)	COMPOUND	ug/L(ppb)(a)
Chloromethane		2-Chloroethylvinyl Ether	
Bromomethane		Bromoform	
Vinyl Chloride		1,1,2,2-Tetrachloroethane	
Chloroethane		Tetrachloroethylene	
Methylene Chloride	TR(7)	Toluene	
1,1-Dichloroethylene		Chlorobenzene	
1,1-Dichloroethane		Ethylbenzene	
trans-1,2-Dichloroethylene		total Xylenes	
Chloroform	11		
1,2-Dichloroethane		The following are non-priority pollutant Hazardous Substance List compounds.	
1,1,1-Trichloroethane			
Carbon Tetrachloride			
Bromodichloromethane		Carbon Disulfide	
1,2-Dichloropropane		2-Butanone (MEK)	
trans-1,3-Dichloropropene		Vinyl Acetate	
Trichloroethylene		2-Hexanone (MPK)	
Chlorodibromomethane		4-Methyl-2-pentanone (MIBK)	
1,1,2-Trichloroethane		Styrene	
Benzene			
cis-1,3-Dichloropropene		DETECTION LIMIT	5

(a) - Concentrations less than the detection limit are left blank
Concentrations between 1 and 10 times the detection limit are listed as trace levels 'TR'.

CAA

WELLS G AND H
ADMINISTRATIVE RECORD

WEL 007

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VOLATILE ORGANICS ANALYSI
Surrogate Spike Recovery Summary (Method 624)
CAA Work Order # 87-02-033

Wehran Sample ID	Percent Recovery		
	SS1	SS2	SS3
WEY-GW-06-106	98	92	98
WEY-GW-07-107	99	105	109

SS1= d4-1,2-Dichloroethane SS2= d8-Toluene SS3= 4-Bromofluorobenzene

SEMI-VOLATILE ORGANICS ANALYSIS
Surrogate Spike Recovery Summary (Method 625)
CAA Work Order # 87-02-033

Wehran Sample ID	Percent Recovery					
	SS1	SS2	SS3	SS4	SS5	SS6
WEY_GW-06-106	27	54	126	86	69	103

SS1= 2-Fluorophenol SS2= d5-Phenol SS3= d5-Nitrobenzene SS4= 2-Fluorobiphenyl SS5= 2,4,6-Tribromophenol SS6= d14-p-Terphenyl

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WELLS G AND H
ADMINISTRATIVE RECORD

WEL 007

2480

ORGANIC MATRIX SPIKE ANALYSIS: Aqueous
CAA Work Order # 87-02-033

Fraction	Compound	Conc. Spike Added (ug/L)	Sample Result	Conc. MS	% Rec.
VOA	1,1-Dichloroethane	50	0.0	56	112
8702033-02	Trichloroethene	50	0.0	49	98
	Chlorobenzene	50	0.0	52	104
	Toluene	50	0.0	55	110
	Benzene	50	0.0	51	102
B/N	1,2,4-Trichlorobenzene	50	0.0	26	51
8701112-01	Acenaphthene	50	0.0	38	75
	2,4-Dinitrotoluene	50	0.0	46	91
	Pyrene	50	32	61	58
	N-Nitrosodi-n-Propylamine	50	31	59	55
	1,4-Dichlorobenzene	50	37	49	23
ACID	Pentachlorophenol	170	0.0	224	132
8701112-01	Phenol	100	52	86	34
	2-Chlorophenol	100	0.0	46	46
	4-Chloro-3-Methylphenol	100	0.0	61	61
	4-Nitrophenol	100	0.0	36	36

CAA

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WELLS G AND H
ADMINISTRATIVE RECORD

WEL 007

2H81

ORGANIC MATRIX SPIKE DUPLICATE ANALYSIS-Aqueous
CAA Work Order # 87-02-033

Fraction	Compound	Conc. Spike Added (ug/L)	Sample Result	Conc. MSD	% Rec.	% RSD
VOA	1,1-Dichloroethane	50	0.0	60	120	6
8702033-02	Trichloroethene	50	0.0	52	104	6
	Chlorobenzene	50	0.0	55	110	5
	Toluene	50	0.0	58	116	5
	Benzene	50	0.0	55	110	7
B/N	1,2,4-Trichlorobenzene	50	0.0	29	57	11
8701112-01	Acenaphthene	50	0.0	38	76	2
	2,4-Dinitrotoluene	50	0.0	40	81	12
	Pyrene	50	32	66	68	8
	N-Nitrosodi-n-Propylamine	50	31	59	55	0
	1,4-Dichlorobenzene	50	37	51	27	4
ACID	Pentachlorophenol	170	0.0	241	142	7
8701112-01	Phenol	100	52	91	39	5
	2-Chlorophenol	100	0.0	47	47	1
	4-Chloro-3-Methylphenol	100	0.0	69	69	12
	4-Nitrophenol	100	0.0	34	34	5

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WELLS G AND H
ADMINISTRATIVE RECORD

WEL 007

2482

IN[illegible] C[illegible]OD[illegible] RECORD

CAA

1106 Commonwealth Avenue / Boston, Massachusetts 02[illegible]
(617) 232-2207

OJECT NAME Wehran Engineering - Wehrhaeuser
MPANY
DRESS 100 Milk St, Methuen, MA
ONE (617) 682-1980

87-02-033

MPLED BY Stephanie Stowe (Print Name) — Stephanie Stowe Signature
(Print Name) — Signature
(Print Name) — Signature

ANALYSES

Sample No.	Date	Time	Sample Location	Container Size	Container Type	Grab	Comp.	Containers	Sample Matrix	Preservative	Volatile Organics	Extractable Organics	Pesticides/PCBs	Metals	Cyanide	Phenols	Acid/Base/Neutral									COMMENTS
[illegible]-GW-06-106	2/4	3:30	Wehran	2 l	G			1									✓									
[illegible]-GW-06-106	2/4	3:30	"	[illegible]	G			1			✓															
[illegible]-GW-07-107	2/4	3:30	"	[illegible]	G			1			✓															

Relinquished by:	Date / Time	Received by:	Relinquished by:	Date / Time	Received by:
Stephanie Stowe	2/4 | 4:30			|	
Relinquished by:	Date / Time	Received by:	Relinquished by:	Date / Time	Received for Laboratory by:
	|			2/4 | 4:30	Diane Dunbury

ethod of Shipment

Remarks:

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WEL 007

2483

Commonwealth of Massachusetts
Department of Environmental Quality Engineering
Northeast Regional Office
5 Commonwealth Avenue
Woburn, MA 01801

MIDDLESEX-ESSEX, MA CTR
4 PM
11 SEP
1987

Barbara Newman
U.S. EPA
Region I
J.F.K. Federal Bldg.
Boston, MA 02203

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