SOUTH BEND, INDIANA
DEPARTMENT OF ECONOMIC DEVELOPMENT
ENVIRONMENTAL ASSESSMENT
OF THE FORMER TRANSWESTERN BUILDING

NOVEMBER 25, 1988

EIS ENVIRONMENTAL ENGINEERS, INC.
1701 NORTH IRONWOOD DRIVE
SOUTH BEND, INDIANA 46635

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1.0 INTRODUCTION

EIS Environmental Engineers, Inc. (EIS) was retained by the South Bend Department of Economic Development to perform an environmental assessment of the former Transwestern site along Lafayette Blvd. in South Bend, Indiana (See Figure 1.1). The scope of work consisted of collecting and analyzing soil and groundwater samples from three (3) soil borings conducted on or near the former Transwestern site. During the borings, soil samples were collected and screened in the field for the presence of Volatile Organic Compounds (VOC) using an analyzer equipped with a photoionization detector (PID). One soil sample, which exhibited the highest PID analyzer measurement, was selected for laboratory VOC analysis. A groundwater sample from each boring was collected for laboratory analysis of VOC and heavy metals.

Figure 1.1

Site Location Map
Transwestern Facility
South Bend, Indiana

2.0 PROCEDURES

Locations of the borings were selected on the basis of expected groundwater flow direction and proximity to the former Transwestern building. Groundwater flow directions in the South Bend area are generally toward the St. Joseph River. Therefore, the expected flow direction at the former Transwestern site would likely be toward the northeast. Three (3) borings were located so as to provide one boring (BH-1) upgradient and two borings (BH-2, BH-3) downgradient with respect to the expected groundwater flow direction (see Figure 2.1).

A CME-75 drill rig equipped with a screened hollow stem auger was used to bore a hole to the water table at each location. As the boring was advanced, soil samples were collected at three foot intervals using an 18 inch (1.5 feet) split-spoon sampler (ASTM Method D-1586). Descriptions of the soil samples were made using a hand lens, grain-size chart, and a standardized color chart. The descriptions were recorded on a subsurface exploration log and are provided in Appendix C. All equipment expected to contact the subsurface soil was washed prior to use at the site. Furthermore, the split-spoon sampler was washed with trisodium phosphate (TSP) and rinsed with deionized water prior to use at each boring location.

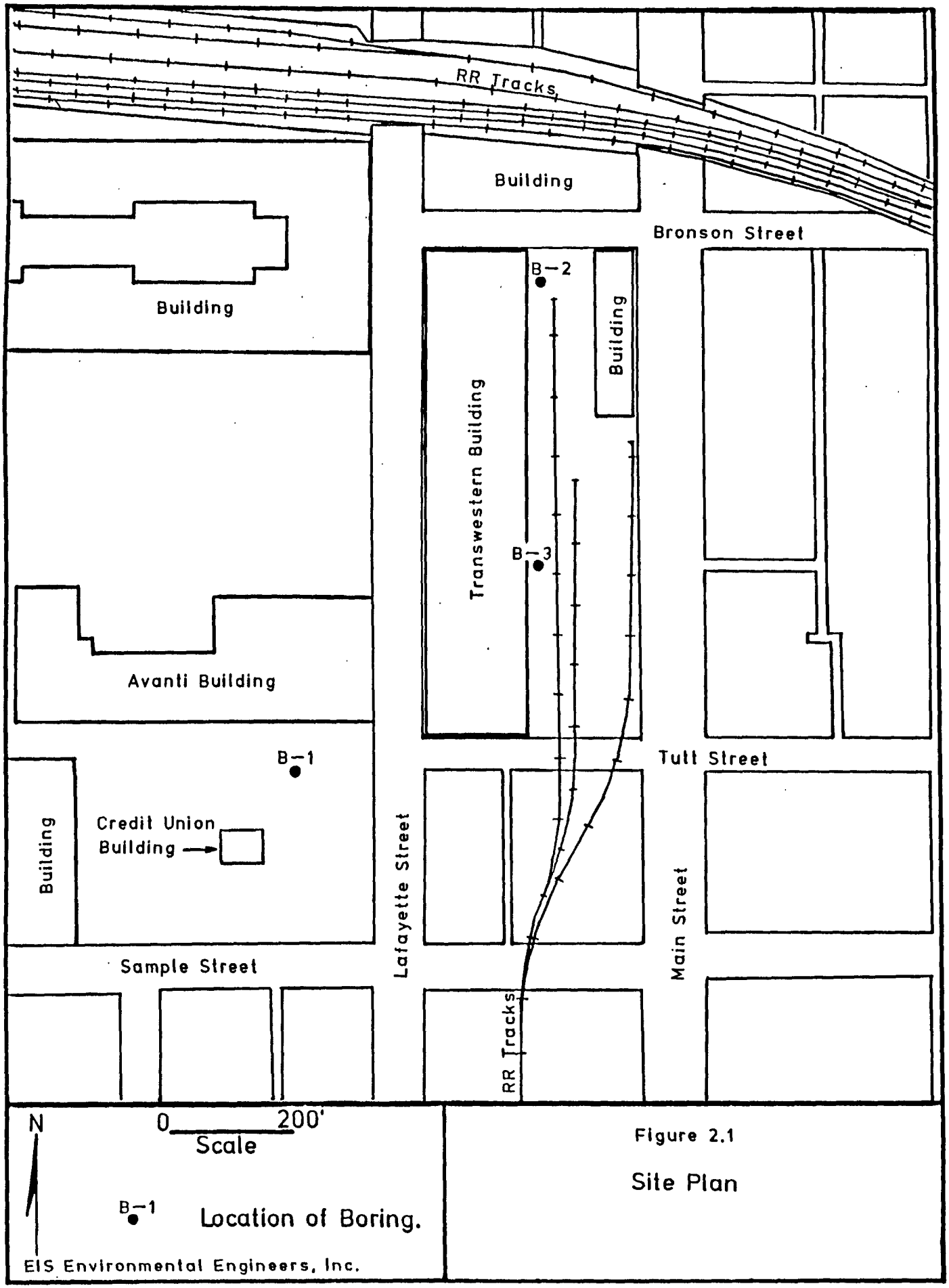

Figure 2.1

Site Plan

A portion of each split-spoon soil sample was placed into a glass jar, sealed with aluminum foil, and allowed to sit for approximately five (5) minutes. The probe of an HNU PID analyzer was then inserted through the aluminum foil seal to sample the air in the headspace of the jar for the possible presence of VOC. Included in Appendix D is a copy of Section 5.4 of the EIS Standard Operating Procedures for soil vapor analysis. The soil sample which exhibited the highest PID measurement was collected in a 40cc glass vial, placed into an iced cooler and transported back to the EIS laboratory for analysis. This sample was collected from boring BH-2 at a depth of 27.0 to 28.5 feet.

At each boring, an electronic water level indicator (Roctest, Model CRR6) was used to measure the static water level within the hollow stem auger. Groundwater samples for VOC and heavy metals analysis were collected with a Teflon bailer from each boring. Samples for VOC analysis were placed into pre-preserved 40cc glass vials, whereas samples for heavy metals analysis were placed into pre-preserved one liter plastic bottles. These samples were placed into an iced cooler and transported to the EIS laboratory for analysis. The bailer, bailer rope and water level indicator were cleaned with TSP and rinsed with deionized water prior to use at each boring.

Upon the completion of each boring, the auger stem was removed and a tremie pipe was used to pressure grout the bore hole with a Bentonite clay mixture to grade.

3.0 RESULTS

The PID analyzer calibration and field analysis records are included in Appendix B. The PID headspace analysis performed on the soil samples from the borings generally resulted in measurements no greater than background levels suggesting that VOC contamination of the soil was unlikely to be present. The one exception was the soil sample from boring BH-2 at a depth of 27.0'-28.5' below grade. The peak PID analyzer reading for this sample was 6 ppm which was approximately three times greater than the background level. A PID analyzer reading of greater than twice background level is generally considered by EIS to be indicative of the possible presence of VOC contamination. However, the PID analyzer field results are not definitive and laboratory analysis is required to confirm the presence of VOC contamination and to define the specific compounds involved.

The laboratory VOC and metals analysis reports are provided in Appendix A and summarized in Table 3.1. Laboratory analysis did not detect VOC contamination in the soil sample but did detect VOC contamination in the groundwater sample from each boring. Trace amounts of 1,1,1-Trichloroethane, Tetrachloroethylene and Toluene were present in the groundwater sample from boring BH-1, and trace amounts of c-1,2-Dichloroethylene were present in the groundwater sample from boring BH-3.

TABLE 3.1

ANALYSIS RESULTS FOR VOC

Parameter	Concentrations - Groundwater - µg/l BH-1	BH-2	BH-3	Soil (ppm) BH-2	USEPA Maximum Contaminant Levels
c-1,2-Dichloroethylene	N.D.*	N.D.	4.4	N.D.	N.E.**
1,1,1-Trichloroethane	<1	N.D.	N.D.	N.D.	200
Tetrachloroethylene	2.7	N.D.	N.D.	N.D.	N.E.
Toluene	1.9	N.D.	N.D.	N.D.	N.E.
Fuel Hydrocarbons	N.D.	760	N.D.	N.D.	N.E.

ANALYSIS RESULTS FOR HEAVY METALS

Parameter	Concentrations - Groundwater (mg/l) BH-1	BH-2	BH-3	National Drinking Water Standards (Primary Standards)
Arsenic	0.01	0.01	<0.01	0.05
Barium	4.6	1.6	1.4	1.0
Cadmium	0.05	0.04	0.04	0.010
Chromium (T)	0.64	0.33	0.30	0.05
Lead	8.6	2.3	2.4	0.05
Mercury	0.025	0.0035	0.0025	0.002
Selenium	<0.01	<0.01	<0.01	0.01
Silver	<0.05	<0.05	<0.05	0.05

* N.D. = Not Detected

** N.E. = Not Established

The only detected VOC contamination in the groundwater sample from boring BH-2 was fuel hydrocarbons at a level of 760 parts per billion (ppb). Laboratory analysis detected heavy metal contamination in the groundwater sample from each boring.

The U.S. Environmental Protection Agency (EPA) has established a maximum contaminant level in drinking water of 200 ppb for 1,1,1-Trichloroethane. The 1,1,1-Trichloroethane detected in the groundwater sample collected from boring BH-1 was below the Practical Quantitation Limit (PQL) of 1 ppb. There are presently no established EPA maximum contaminant levels for c-1,2-Dichloroethylene, Tetrachloroethylene, Toluene or fuel hydrocarbons. The levels of metals contamination detected in the groundwater sample from each boring exceed the Primary National Drinking Water Standards for Barium, Cadmium, Chromium (T), Lead and Mercury, but do not exceed the standards for Arsenic, Selenium and Silver.

The fuel hydrocarbons observed in the groundwater sample collected from boring BH-2 appear likely to have a source other than the soil in the immediate area of the boring.

The groundwater flow direction, as determined from the static water levels measured in each of the three borings, appears to be approximately S 60° E (see Figure 3.1). This southeasterly flow direction differs approximately ninety degrees from the

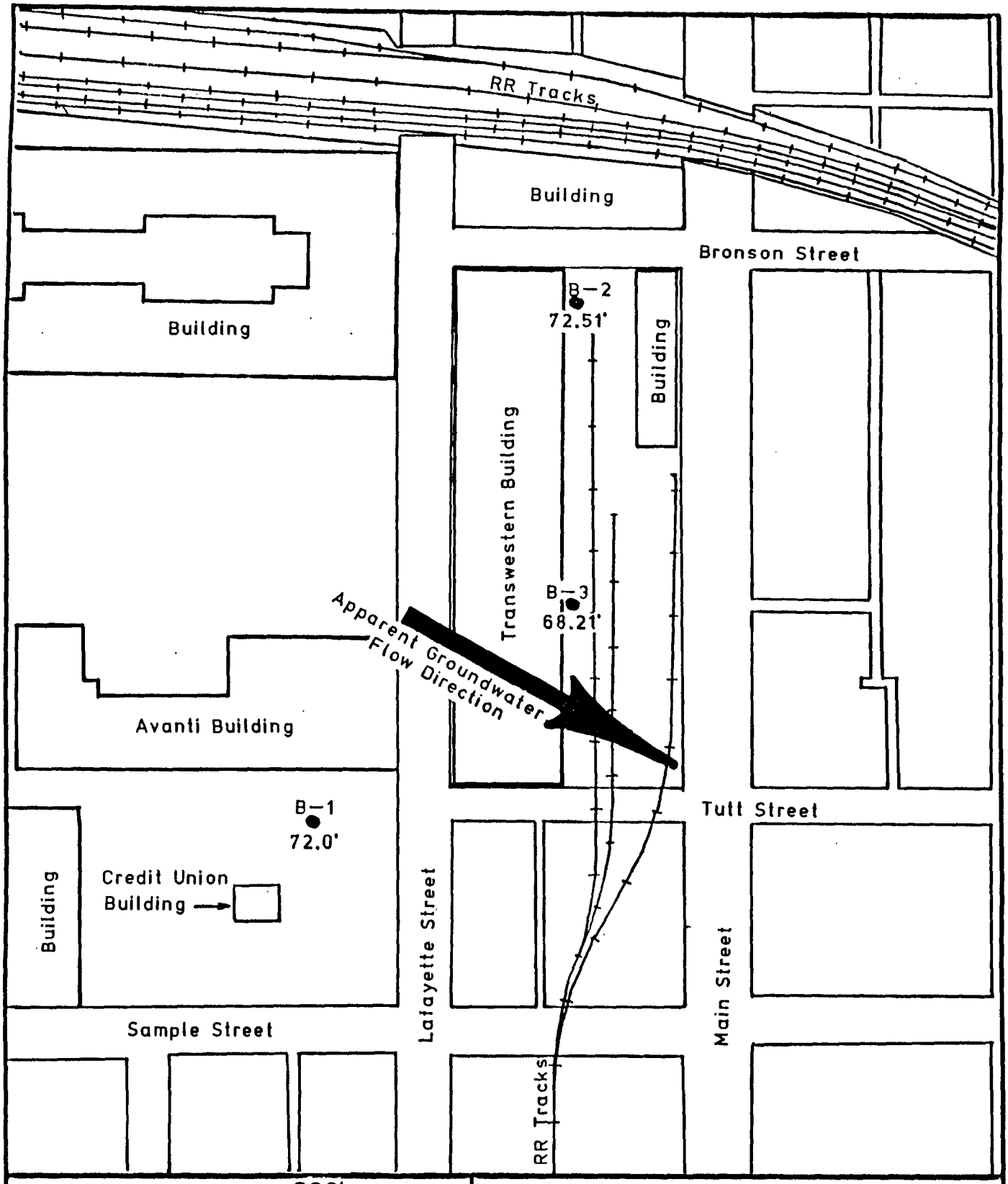

Figure 3.1

Groundwater Flow Map

initially expected northeasterly flow direction and may represent the effect of possible large scale pumping activity in the area. Such large scale pumping activity is referenced in the Indiana Department of Natural Resources, 1987 Publication "Water Resource Availability in the St. Joseph River Basin, Indiana, Water Resource Assessment 87-1". However, it should also be noted that the static water levels in the borings may not have stabilized when the measurements were taken. Consequently, the apparent groundwater flow direction indicated by the static water levels may not be indicative of the actual flow direction.

APPENDIX A

LABORATORY ANALYSIS REPORTS

ANALYTICAL REPORT SHEET

CLIENT: Mr. K. C. Pocius
South Bend Dept. of Econ. Dev.
1200 County-City Bldg.
South Bend, IN 46601

ANALYSIS NO: 5081H - 5085H

DATE SAMPLED: 09-28-88

DATE RECEIVED: 09-28-88

DATE FORWARDED: 11-21-88

SAMPLE IDENTIFICATION:

Groundwater from Boreholes
Transwestern Site

Collected by EIS (JCS)
9-28-88

EIS Project #1456-01

Parameter	Concentration (mg/l) Boring 1	Boring 2	Boring 3	Trip Blank
Arsenic	0.01	0.01	<0.01	<0.01
Barium	4.6	1.6	1.4	<0.5
Cadmium	0.05	0.04	0.04	<0.04
Chromium, Total	0.64	0.33	0.30	<0.05
Lead	8.6	2.3	2.4	<0.1
Mercury	0.025	0.0035	0.0025	<0.0002
Selenium	<0.01	<0.01	<0.01	<0.01
Silver	<0.05	<0.05	<0.05	<0.05

Volatile Organic Compounds — See Attached Report

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CHAIN OF CUSTODY RECORD – EIS ENVIRONMENTAL ENGINEERS INC

Project No: 456-01 | Project Name: Hydrogeologic Study-Tranwastern Site

Samplers: (Signature) F. C. Hoelden

a.No.	Date	Time	Comp	Grab	Station Location	Quantity of Containers	ANALYSIS: VOC G.W.	Metals (Total)	VOC Soil	Remarks	EIS LAB USE ONLY (I=Intact B=Broken): Sample State	Tape
ip Blank	9-28-88	6:30		X	Trip Blanks	2	X	X			5081H	
-1	"	9:30		X	Boring #1	3 ~~4~~	X	X	~~X~~	No VOC soil submitted (F.C. Hoelden)	5082H	Soil
-2	"	12:20		X	Boring #2	4	X	X	X		5083H	E5084H
-3	"	3:35		X	Boring #3	3 ~~4~~	X	X	~~X~~	No VOC soil submitted (F.C. Hoelden)	5085H	
~~4~~	"				~~Boring #4~~	~~4~~	X	X	X	→ Samples from Boring 4 were not collected. (F. C. Hoelden)		

Relinquished by:	Date	Time	Received by:
F. C. Hoelden	9-28-88	6:00PM	

Relinquished by:	Date	Time	Received by:

Type of Transportation: EIS Vehicle | Public Transportation | Carrier: | Way or Air Bill No.

VOLATILE ORGANIC COMPOUND (VOC) ANALYSIS REPORT

Mr. K.C. Pocius
CLIENT: South Bend Department of Economic Development
1200 County-City Building
South Bend, IN 46601
P.O. # LOA
Sample ID: Transwestern Site

. Groundwater from Bore Holes #1,2,3
. Soil from Bore Hole #2

Date Reported: 10-26-88
EIS Lab No.: 5081H - 5085H
Sample Date: 9-28-88
Date Received: 9-28-88
Date Analyzed: 10-06-88
Samples Received

Refrigerated:	**Yes** ✓	**No** ___
In 40 cc Vials:	**Yes** ✓	**No** ___
Air Space:	**Yes** ✓	**No** ✓

RESULTS

o Table 1 presents results of analysis.

SAMPLE RESULTS WILL LIST ONLY THOSE COMPOUNDS WHICH ARE ACTUALLY DETECTED IN THE SAMPLE. If no compounds of interest are detected, the following type of statement is given:

"No Table 3 Volatile Organic Compounds (VOC) were detected in this sample."

o Table 2 summarizes test procedures used.

o Table 3 lists the types of compounds which can be detected by the test procedures employed. This table also lists Practical Quantitation Limits (PQL) for each compound in both water and soil samples.

o Additional data which might accompany this report includes chromatograms, Quality Assurance data sheets, Chain-of-Custody forms and allowable contaminant limits (if available). This data is analysis support documentation.

o The following support data is enclosed.

- Chromatograms of the analysis
- National Drinking Water Standards

o The soil sample exhibited headspace as is normal for this type of sample collection.

Andrea Rozite
LABORATORY DIRECTOR

TABLE 1
ANALYTICAL RESULTS - VOC

Client Description Groundwater from Bore Holes and Soil
Sample Type _____ Analytical Method 601 + 602

	CONCENTRATION					
	GROUNDWATERS (µg/l)				SOIL (ppm as received)	
			DUPLICATES		DUPLICATES	
PARAMETER	BH-1	BH-2	BH-3	BH-3	BH-2	BH-2
c-1,2-Dichloroethylene	ND	ND	4.4	4.4	ND	ND
1,1,1-Trichloroethane	<1	ND	ND	ND	ND	ND
Tetrachloroethylene	2.7	ND	ND	ND	ND	ND
Toluene	1.9	ND	ND	ND	ND	ND
PQL	X1	X1	X1	X1	X1	X1
Fuel Hydrocarbons	ND	760	ND	ND	ND	ND
Moisture (%)	-	-	-	-	16.1	-

NOTES:

1. ND = Not Detected

2. < = Detected but below the PQL

3. The Trip Blank exhibited no detectable levels of VOC

4. GC/MS confirmation of groundwaters from BH-1 and BH-2 was performed.

5. The fuel hydrocarbon in groundwater BH-2 is quantitated as #2 Fuel Oil but not so specifically identified. The GC fingerprint of this species resembles gasoline but no detectable levels of Benzene, Toluene and Xylenes were present. GC/MS showed that compound classes such as alkanes and alkenes were present. Trace levels of naphthalenes were also noted. The probable identity of this fuel hydrocarbon is gasoline.

- -

PQL Discussion: PQL (Detection Limit) varies with individual compounds, the type of sample, laboratory treatment (dilutions) and method of analysis (601 + 602 or 624).

PQL for clean samples is shown in Table 3. The PQL value shown above, expressed as X(#), is the value by which the Table 3 PQL is to be multiplied in order to determine the "Detection Limit" for individual compounds for the sample in question.

Revised (10-11-88)

TABLE 2

REFERENCE METHODS/ANALYTICAL PROCEDURES

REFERENCES

- "Test Methods: Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", USEPA-600/4-82-057, July 1982, Methods 601, 602, 624
- "Test Methods for Evaluating Solid Waste: Physical/Chemical Methods", SW-846, Third Edition, November 1986

ANALYTICAL PROCEDURES

VOC of interest are liberated from the matrix by use of Purge and Trap procedures. Surrogate compounds are employed for each Purge and Trap run.

The effluent from the gas chromatograph is monitored by Photoionization and Hall 700A Electrolytic Conductivity Detectors operating in series. Component separation is achieved by a SPB-1 capillary column, 60m x 0.75 mm I.D.

In certain situations, confirmation of the sample response is performed by use of Mass Spectrometry.

Analysis Method Numbers are different in different reference manuals even though the procedures used are essentially the same. With respect to this analysis, Method Numbers are referenced to "Test Methods: Methods For Organic Chemical Analysis of Municipal and Industrial Wastewater", USEPA 600/4-82-057, July 1982. The samples reported herein were analyzed by the following methods:

GC/Hall/PID	(Method 601 + 602)	X
GC/MS	(Method 624)	

SUPPORTING DATA

If GC tracings or GC/MS data is supplied with this report, surrogate/internal standards are identified by the letters (S) and/or (IS).

TABLE 3
PARTIAL LISTING - VOLATILE ORGANIC COMPOUNDS
DETECTABLE BY PROCEDURES LISTED IN TABLE 2
AND PRACTICAL QUANTITATION LIMITS (PQL)

Compound Name	Practical Quantitation Limits (PQL) Water (µg/l) 601 + 602	Water (µg/l) 624	Soils (ppm) 601 + 602	Soils (ppm) 624
Acetone	10	10	0.5	0.5
Acrolein		10		0.5
Acrylonitrile		10		0.5
Benzene	1	5	0.05	0.25
Bromodichloromethane	1	5	0.05	0.25
Bromoform	1	5	0.05	0.25
Bromomethane	1	10	0.05	0.5
Carbon Disulfide		5		0.25
Carbon Tetrachloride	1	5	0.05	0.25
Chlorobenzene	1	5	0.05	0.25
Chloroethane	1	10	0.05	0.5
2-Chloroethylvinyl Ether	10	5	0.5	0.25
Chloroform	1	5	0.05	0.25
Chloromethane	1	10	0.05	0.5
Dibromochloromethane	1	5	0.05	0.25
1,2-Dibromoethane	1	5	0.05	0.25
Dibromomethane		5		0.25
1,2-Dichlorobenzene	1	5	0.05	0.25
1,3-Dichlorobenzene	1	5	0.05	0.25
1,4-Dichlorobenzene	1	5	0.05	0.25
Dichlorodifluoromethane	1	5	0.05	0.25
1,1-Dichloroethane	1	5	0.05	0.25
1,2-Dichloroethane	1	5	0.05	0.25
1,1-Dichloroethylene	1	5	0.05	0.25
c-1,2-Dichloroethylene	1	5	0.05	0.25
t-1,2-Dichloroethylene	1	5	0.05	0.25
1,2-Dichloropropane	1	5	0.05	0.25
c-1,2-Dichloropropene	1	5	0.05	0.25
t-1,2-Dichloropropene	1	5	0.05	0.25
Ethyl Benzene	1	5	0.05	0.25
2-Hexanone	10	10	0.5	0.5
Iodomethane				
Methylene Chloride	1	5	0.05	0.25
Methyl Ethyl Ketone	10	10	0.5	0.5
Methyl Isobutyl Ketone	10	10	0.5	0.5
Styrene	1	5	0.05	0.25
1,1,2,2-Tetrachloroethane	1	5	0.05	0.25
Tetrachloroethylene	1	5	0.05	0.25
Tetrahydrofuran	10	10	0.5	0.5
Toluene	1	5	0.05	0.25
1,1,1-Trichloroethane	1	5	0.05	0.25
1,1,2-Trichloroethane	1	5	0.05	0.25
Trichloroethylene	1	5	0.05	0.25
Trichlorofluoromethane	1	5	0.05	0.25
1,2,3-Trichloropropane	1	5	0.05	0.25
Vinyl Acetate	10	10	0.5	0.5
Vinyl Chloride	2	5	0.1	0.25
Xylenes	1	5	0.05	0.25

In addition, fuel type hydrocarbons such as gasoline, fuel oil and kerosene and industrial mixtures such as naphtha and thinners are also detected by these procedures.

Note: Soil PQL is on an "as received basis". Both water and soil PQL values are for CLEAN samples. PQL increases with sample matrix problems.

EIS ENVIRONMENTAL ENGINEERS, INC.
QUALITY ASSURANCE DATA SHEET
VOLATILE ORGANIC COMPOUNDS

QC Description: Surrogate Recovery
EIS Lab Numbers: 5081H - 5085H Date Analyzed: 10-6-88

Client Sample Description	RECOVERY DATA * Method 601 + 602 S1	S2	S3	S4	Method 624 S1	S2	S3
GW B-1	101	98	97	102			
GW B-2	95	107	*	113			
GW B-3	95	105	97	103			
Soil B-2	98	109	100	105			
Trip Blank	94	88	100	93			

* SURROGATE COMPOUND DESCRIPTIONS AND QUALITY CONTROL LIMITS

METHOD 601 + 602

Compound #	Compound Name	QC Limits
S1	1-Bromo-2-chloroethane	70 - 130
S2	1,4-Dichlorobutane	70 - 130
S3	Toluene, d6	70 - 130
S4	1,9-Decadiene	70 - 130

METHOD 624

Compound #	Compound Name	QC Limits
S1	1,2-Dichloroethane,d4	70 - 130
S2	Toluene, d6	70 - 130
S3	Bromofluorobenzene	70 - 130

EIS ENVIRONMENTAL ENGINEERS, INC.
QUALITY ASSURANCE DATA SHEET
VOLATILE ORGANIC COMPOUNDS

QC Description: Check Standard
Client Sample Group: Transwestern Site
EIS Lab Numbers: 5081H - 5085H
Date Analyzed: 10-6-88

Analysis Method: 601 + 602
Concentration Units: µg/l

SURROGATE RESPONSES

EPA Methods 601 + 602		EPA Method 624		QA/QC
Compound Name	% Rec	Compound Name	% Rec	Limits
1-Bromo-2-chloroethane	111	1,2-Dichloroethane,d4		70-130
1,4-Dichlorobutane	112	Toluene,d6		70-130
Toluene,d6	98	Bromofluorobenzene		70-130
1,9-Decadiene	118			70-130

SAMPLE RESULTS

Parameter	Concentration True	Concentration Found	Recovery %	624 Response Factors (RF) Initial	Found	% RSD
Acetone	56.2	58.0	103			
Acrolein						
Acrylonitrile						
Benzene	10.8	11.3	105			
Bromoform **	15.6	12.0	77	0.175		
Bromodichloromethane						
Bromomethane						
Carbon Disulfide						
Carbon Tetrachloride	9.8	8.7	89			
Chlorobenzene **	12.3	11.8	96	1.324		
Chlorodibromomethane	12.1	11.0	91			
Chloroethane						
2-Chloroethylvinylether						
Chloroform *	9.5	11.2	118	7.525		
1-Chlorohexan						
Chloromethane **						
2-Chlorotoluene						
4-Chlorotoluene						
1,2-Dibromoethane						
Dibromomethane						
1,2-Dichlorobenzene	13.0	13.8	106			
1,3-Dichlorobenzene						
1,4-Dichlorobenzene	21.2	18.6	88			
1,4-bichloro-2-butane						
Dichlorodifluoromethane						
1,1-Dichloroethane **	9.1	9.6	105	6.852		
1,2-Dichloroethane	7.5	7.4	99			
1,1-Dichloroethene *				3.874		
c-1,2-Dichloroethene	9.8	8.4	86			
t-1,2-Dichloroethene						

EIS ENVIRONMENTAL ENGINEERS, INC.
QUALITY ASSURANCE DATA SHEET
VOLATILE ORGANIC COMPOUNDS
Check Standard Continuation

Parameter	Concentration True	Concentration Found	Recovery %	624 Response Factors (RF) Initial	624 Response Factors (RF) Found	624 Response Factors (RF) % RSD
1,2-Dichloropropane *	10.3	10.5	102	0.408		
1,3-Dichloropropane						
c-1,2-Dichloropropene						
t-1,2-Dichloropropene						
Diethyl Ether						
Ethylbenzene *	10.7	9.7	91	2.548		
Ethyl Methacrylate						
2-Hexanone	42.0	41.1	98			
Iodomethane						
Methylene Chloride	10.4	11.7	113			
Methyl Ethyl Ketone	38.6	35.8	93			
Methyl Isobutyl Ketone	37.8	30.5	81			
Methyl Methacrylate						
Paraldehyde						
Styrene	11.7	11.7	100			
1,1,2,2-Tetrachloroethane**				0.403		
Tetrachloroethylene	11.2	10.1	90			
Tetrahydrofuran	71.8	56.3	78			
Toluene *	10.7	9.8	92	2.372		
1,1,1-Trichloroethane	12.6	12.6	100			
1,1,2-Trichloroethane	11.8	11.2	95			
Trichloroethylene	10.2	9.3	91			
Trichlorofluoromethane						
1,2,3-Trichloropropane						
1,1,2-Trichlorotrilfluoroethane						
Vinyl Acetate						
Vinyl Chloride *				0.945		
m-Xylene						
o-Xylene	11.1	11.0	99			
p-Xylene	10.8	10.5	97			

QA/QC Interpretation

* Calibration Check Compound (CCC) with maximum % RSD = 30%

** System Performance Check Compound (SPCC) with minimum RF = 0.3 (0.25 for Bromoform)

EIS ENVIRONMENTAL ENGINEERS, INC.
QUALITY ASSURANCE DATA SHEET
VOLATILE ORGANIC COMPOUNDS

QC Description: Duplicate Matrix Spike
Client Sample Group: Transwestern Site
EIS Lab Numbers: 5081H-5085H
Date Analyzed: 10-6-88
Matrix: Groundwater
Analysis Method: 601 + 602
Concentration Units: µg/l

SURROGATE RESPONSES

EPA Methods 601 + 602		EPA Method 624		QA/QC
Compound Name	% Rec	Compound Name	% Rec	Limits
1-Bromo-2-chloroethane	97/97	1,2-Dichloroethane,d4		70-130
1,4-Dichlorobutane	106/109	Toluene,d6		70-130
Toluene,d6	100/98	Bromofluorobenzene		70-130
1,9-Decadiene	90/90			70-130

SAMPLE RESULTS

Parameter	Spike Level	Back-ground	Amount Recovered #1	Amount Recovered #2	Recovery Data %R	Recovery Data RPD
Acetone						
Acrolein						
Acrylonitrile						
Benzene						
Bromoform	17.3	-	12.1	13.4	74	10
Bromodichloromethane						
Bromomethane						
Carbon Disulfide						
Carbon Tetrachloride						
Chlorobenzene						
Chlorodibromomethane						
Chloroethane						
2-Chloroethylvinylether						
Chloroform						
1-Chlorohexan						
Chloromethane						
2-Chlorotoluene						
4-Chlorotoluene						
1,2-Dichlorobenzene						
1,3-Dichlorobenzene						
1,4-Dichlorobenzene						
1,4-Bichloro-2-butane						
Dichlorodifluoromethane						
1,1-Dichloroethane						
1,2-Dichloroethane						
1,1-Dichloroethene	16.9	-	19.6	20.6	119	5
c-1,2-Dichloroethene	17.3	-	18.4	18.9	108	3
t-1,2-Dichloroethene						

EIS ENVIRONMENTAL ENGINEERS, INC.
QUALITY ASSURANCE DATA SHEET
VOLATILE ORGANIC COMPOUNDS
Duplicate Matrix Spike Continuation

Parameter	Spike Level	Back-ground	Amount Recovered #1	Amount Recovered #2	Recovery Data %R	Recovery Data RPD
1,2-Dichloropropane						
1-3,Dichloropropane						
c-1,2-Dichloropropene						
t-1,2-Dichloropropene						
Diethyl Ether						
Ethylbenzene						
Ethyl Methacrylate						
2-Hexanone						
Iodomethane						
Methylene Chloride						
Methyl Ethyl Ketone						
Methyl Isobutyl Ketone						
Paraldehyde						
Styrene						
1,1,2,2-Tetrachloroethane						
Tetrachloroethylene	16.9	-	16.6	18.4	104	10
Tetrahydrofuran						
Toluene						
1,1,1-Trichloroethane	16.8	-	14.9	15.4	90	3
1,1,2-Trichloroethane	17.1	-	15.5	15.5	91	0
Trichloroethylene						
Trichlorofluoromethane						
1,2,3-Trichloropropane						
1,1,2-Trichlorotril-fluoroethane						
Vinyl Acetate						
Vinyl Chloride						
m-Xylene						
o-Xylene						
p-Xylene						

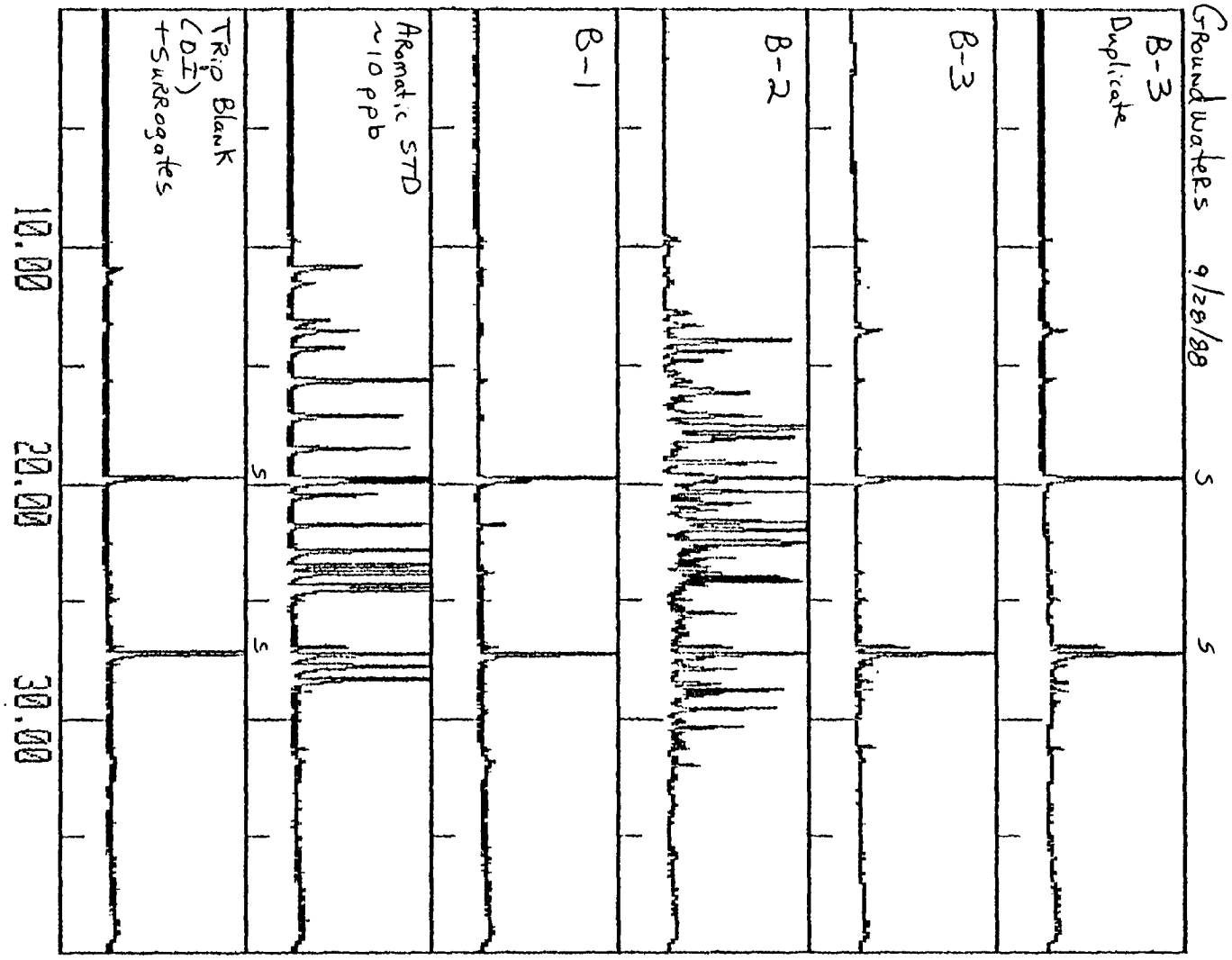
NATIONAL DRINKING WATER STANDARDS

Parameter	Concentration (mg/l unless otherwise shown) Primary Standards (Health Standards)	Secondary Standards (Aesthetic Quality)	Recommended Limits Other Substances
Arsenic	0.05		
Barium	1.0		
Cadmium	0.010		
Chromium (T)	0.05		
Lead	0.05		
Mercury	0.002		
Selenium	0.01		
Silver	0.05		
Fluoride	4	2	
Nitrate (as Nitrogen)	10		
Endrin	0.0002		
Lindane	0.004		
Methoxychlor	0.1		
Toxaphene	0.005		
2,4-D	0.1		
Silvex	0.01		
Tot.Coliform (Colonies/100ml)	0		
Trihalomethanes *	0.1		
Chloride		250	
Copper		1	
Detergents (foaming Agents)		0.5	
Iron		0.3	
Manganese		0.05	
pH (pH units)		6.5 - 8.5	
Sulfate		250	
Total Dissolved Solids		500	
Zinc		5	
Benzene			0.005
Vinyl Chloride			0.002
Carbon Tetrachloride			0.005
1,2-Dichloroethane			0.005
Trichloroethylene			0.005
1,1-Dichloroethylene			0.007
1,1,1-Trichloroethane			0.20
1,4-Dichlorobenzene			0.075

* Chloroform, Chlorodibromomethane, Bromodichloromethane, Bromoform

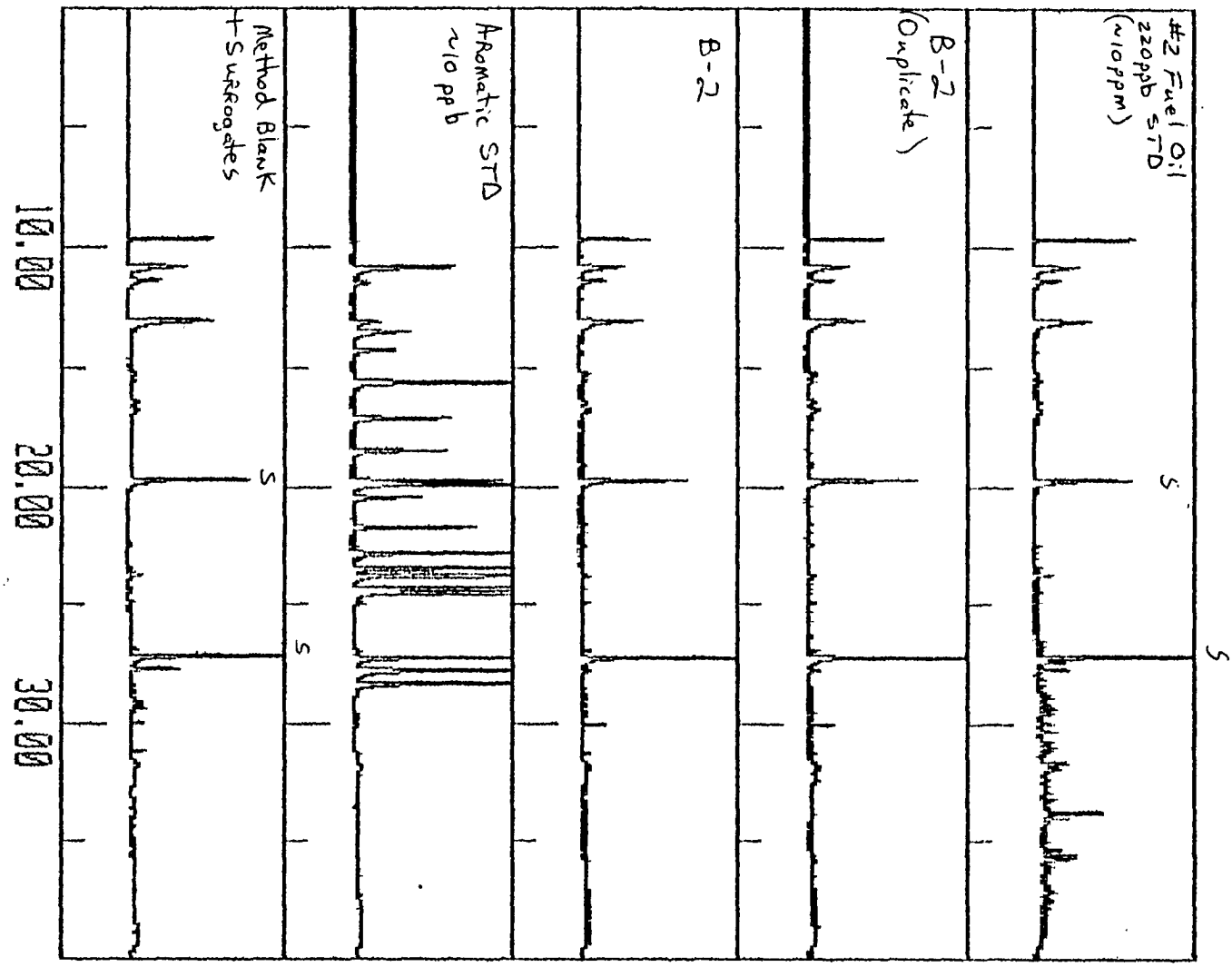
S.B.DEPT.of ECON.DEV. vs AROMATIC VOC

Chromatogram	Data File	Sample Name	Start Time (min)	Stop Time (min)	Scale Range (mV)	Scale Offset (mV)
1	VPID53	5081H (5ml)	0.00	40.00	2	-4
2	VPID46	STD 092388 (L2)	0.00	40.00	2	-4
3	VPID51	5082H (5ml)	0.00	40.00	2	-4
4	VPID47	5083H (5ml)	0.00	40.00	2	-4
5	VPID48	5085H (5ml)	0.00	40.00	2	-4
6	VPID50	5085H (5ml) LAB	0.00	40.00	2	-4



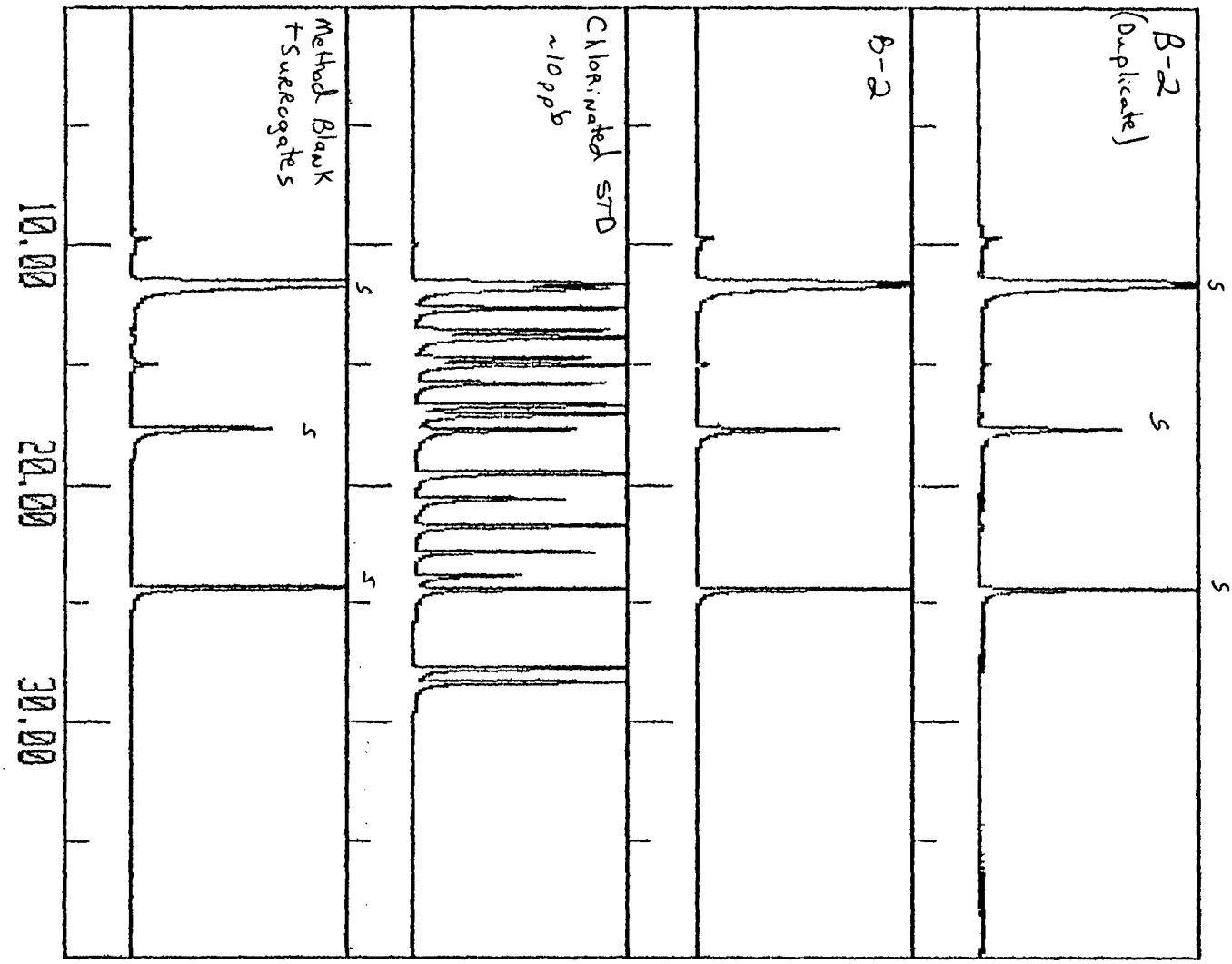
S.B.DEPT.of ECON.DEV.SOIL vs AROMATIC

Chromatogram	Data File	Sample Name	Start Time (min)	Stop Time (min)	Scale Range (mV)	Scale Offset (mV)
1	VPID29	MB (1/50+SUR)	0.00	40.00	4	-4
2	VPID25	STD 092388 (L2)	0.00	40.00	4	-4
3	VPID33	5084H (1/50)	0.00	40.00	4	-4
4	VPID36	5084H (1/50) LAB	0.00	40.00	4	-4
5	VPID37	FUELOIL STD	0.00	40.00	4	-4



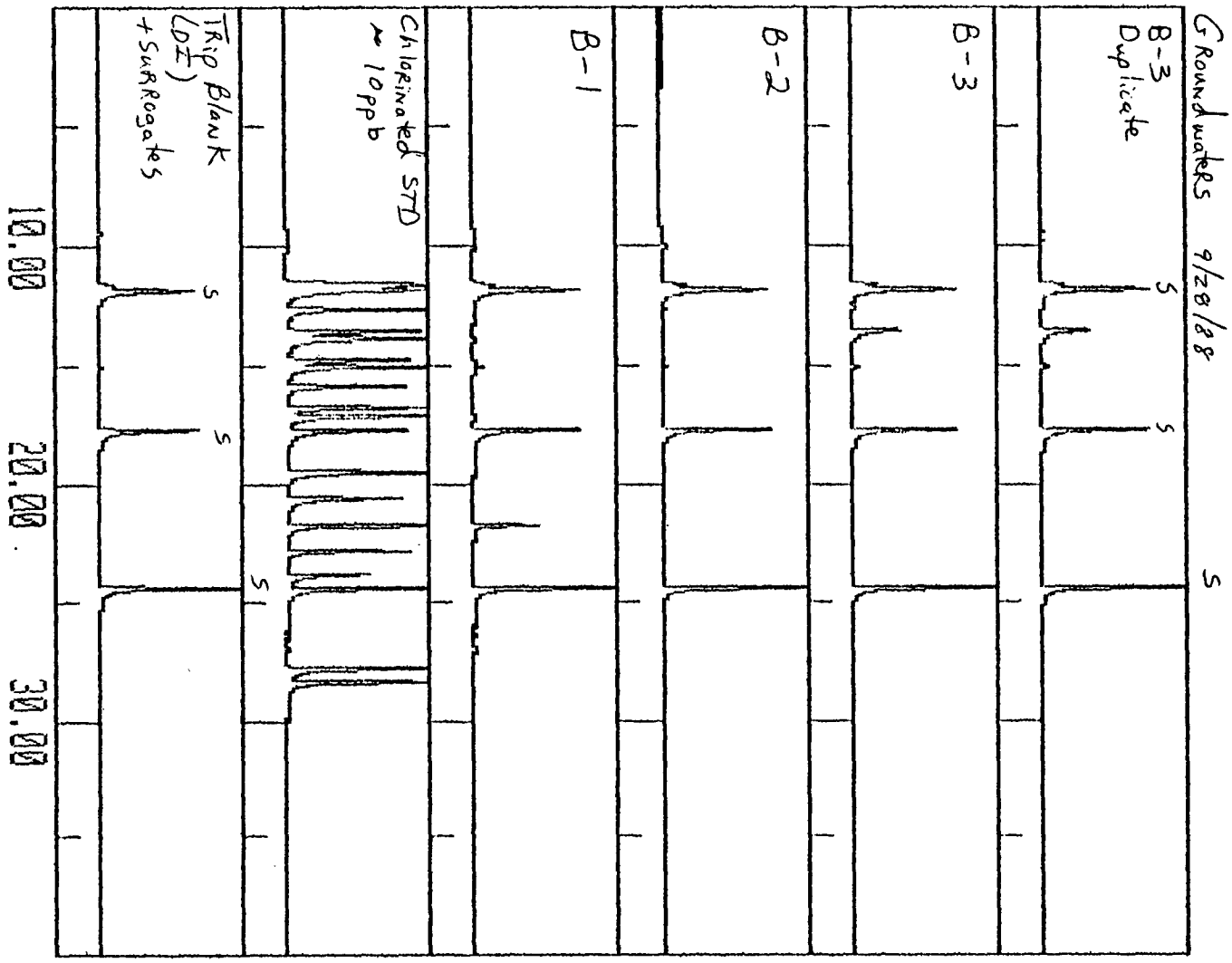
S.B.DEPT.of ECON.DEV.SOIL vs CHLORINATED

Chromatogram	Data File	Sample Name	Start Time (min)	Stop Time (min)	Scale Range (mV)	Scale Offset (mV)
1	VHED29	MB (1/50+SUR)	0.00	40.00	65	11
2	VHED25	STD 092388 (L2)	0.00	40.00	65	11
3	VHED33	5084H (1/50)	0.00	40.00	65	11
4	VHED36	5084H (1/50) LAB	0.00	40.00	65	11

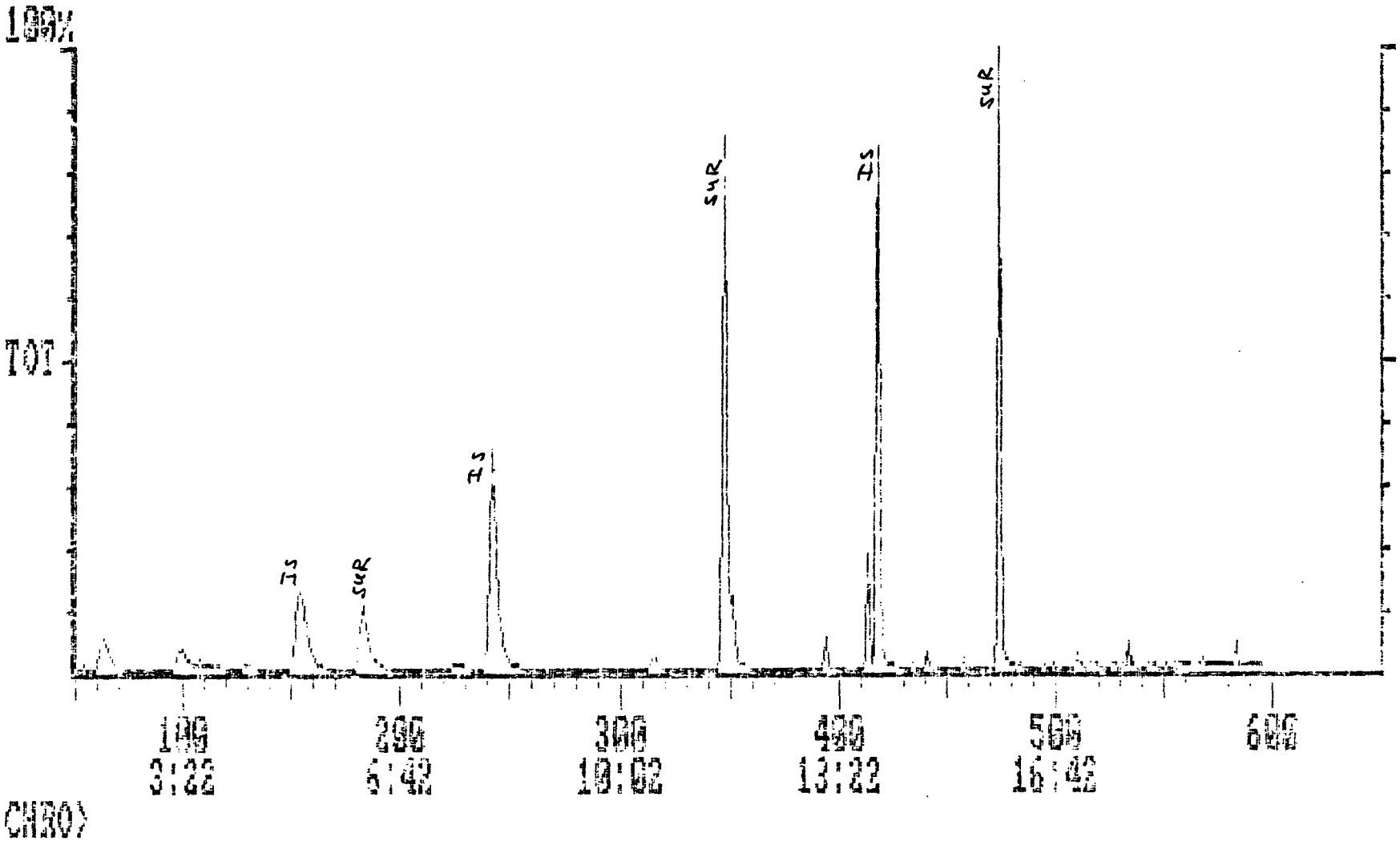


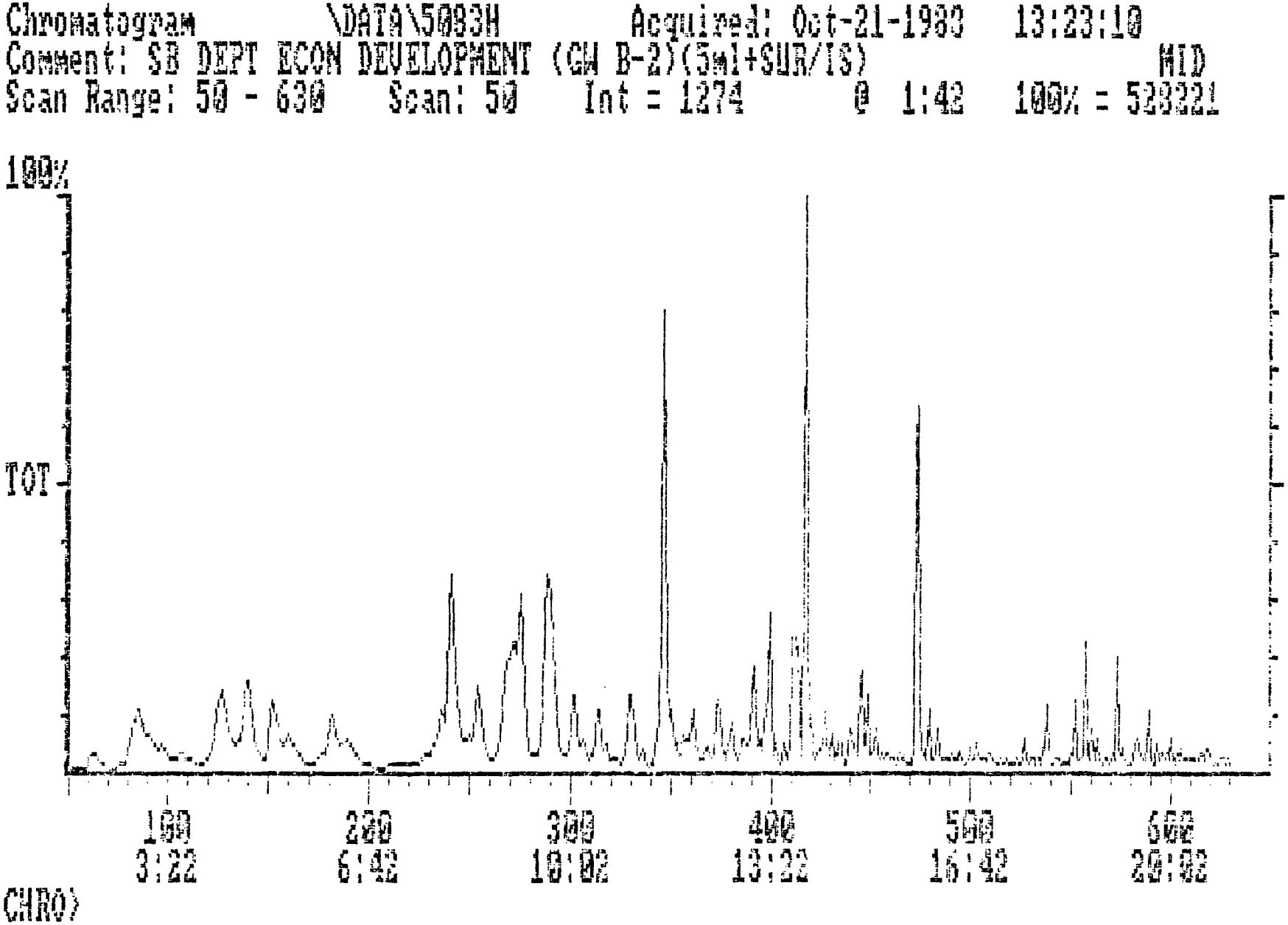
S.B.DEPT.of ECON.DEV. vs CHLORINATED VOC

Chromatogram	Data File	Sample Name	Start Time (min)	Stop Time (min)	Scale Range (mV)	Scale Offset (mV)
1	VHED53	5081H (5ml)	0.00	40.00	65	11
2	VHED46	STD 092388 (L2)	0.00	40.00	65	11
3	VHED51	5082H (5ml)	0.00	40.00	65	11
4	VHED47	5083H (5ml)	0.00	40.00	65	11
5	VHED48	5085H (5ml)	0.00	40.00	65	11
6	VHED50	5085H (5ml) LAB	0.00	40.00	65	11

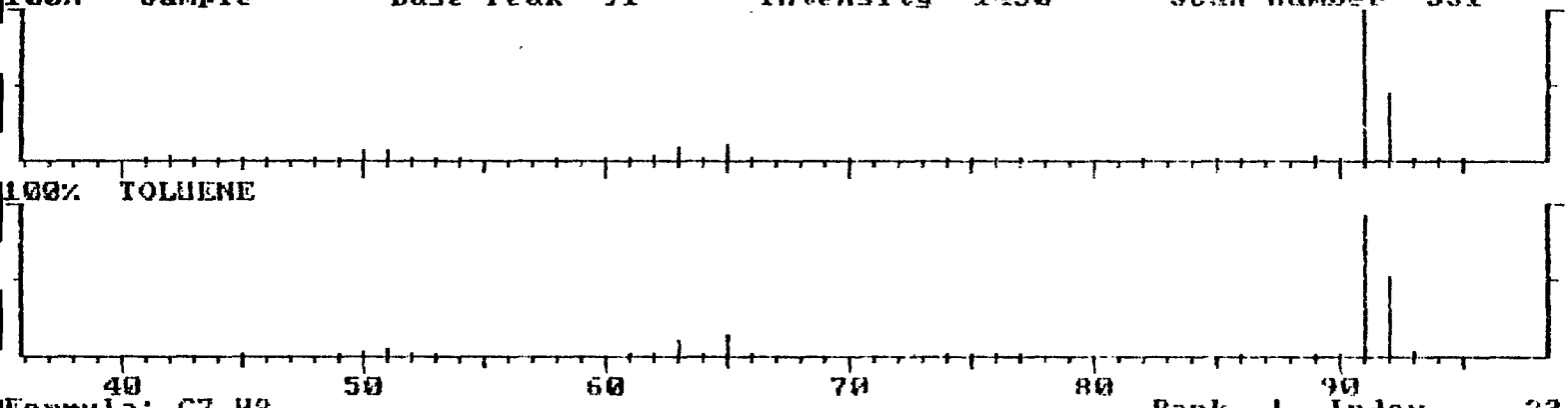


Chromatogram \DATA\5082H Acquired: Oct-21-1988 12:23:34
Comment: SB DEPT ECON DEVELOPMENT (GH B-1)(5ml+SUR/IS) MID
Scan Range: 50 - 595 Scan: 50 Int = 1118 @ 1:42 100% = 446624




Chromatogram \DATA\5083H Acquired: Oct-21-1983 13:23:10
Comment: SB DEPT ECON DEVELOPMENT (GW B-2)(5ml+SUR/IS) MID
Scan Range: 50 - 630 Scan: 50 Int = 1274 @ 1:42 100% = 523221
100%
TOT
100
3:22
200
6:42
300
10:02
400
13:22
500
16:42
600
20:02
CHRO>

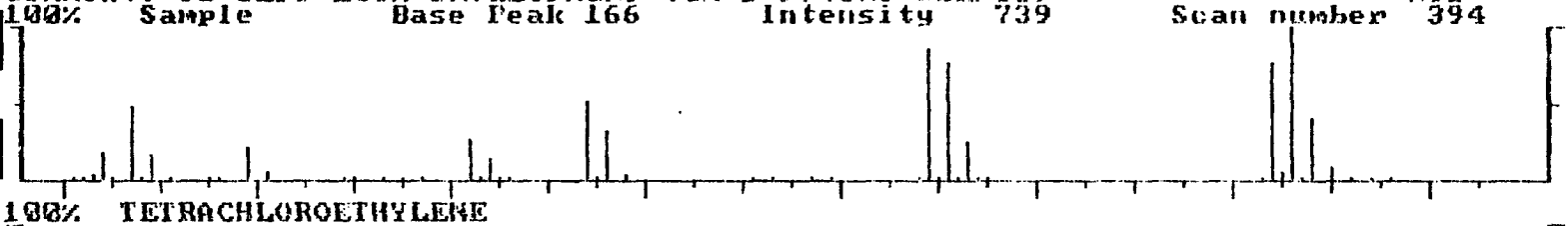
Library Search \DATA\5082H Acquired:Oct-21-1988 12:28:34 + 11:44
Comment: SB DEPT ECON DEVELOPMENT (GW B-1)(5ml+SUR/IS) MID
100% Sample Base Peak 91 Intensity 1430 Scan number 351



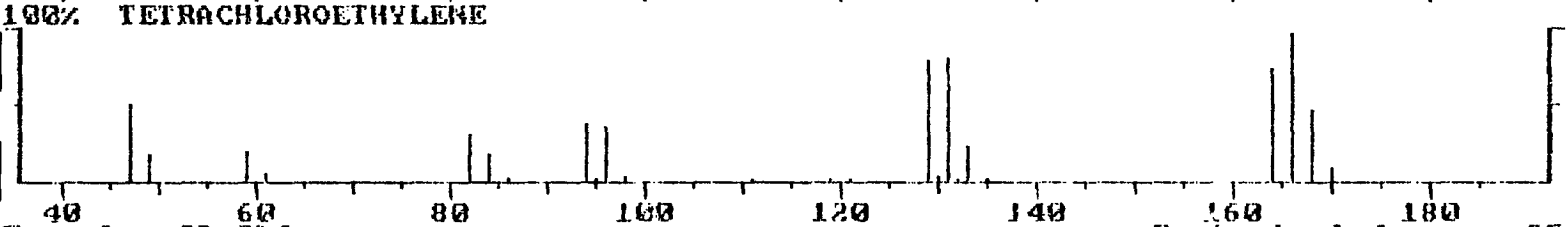
100% TOLUENE

Formula: C7.H8. Rank 1 Index 23
Molecular weight 92 Purity [illegible] Fit [illegible] Rfit [illegible] Cas# 0-00-0
EIS(LB) (Purity, mass range 36 - 95, weight range 0 - 1023)

Library Search \DATA\5082H Acquired:Oct-21-1988 12:28:34 + 13:10
Comment: SB DEPT ECON DEVELOPMENT (GW B-1)(5ml+SUR/IS) MID
100% Sample Base Peak 166 Intensity 739 Scan number 394

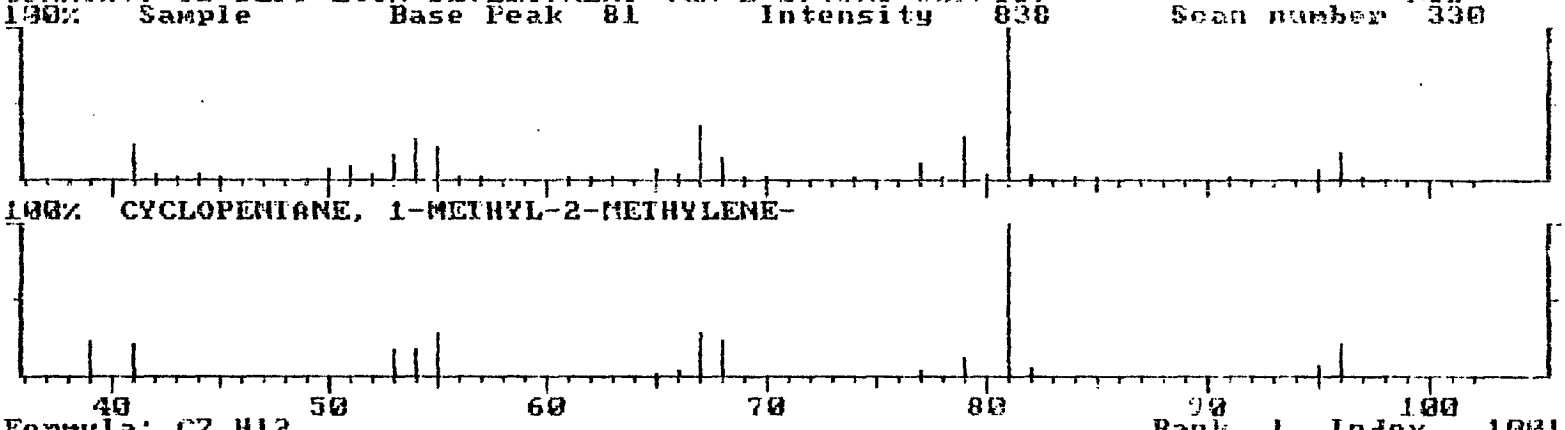


100% TETRACHLOROETHYLENE



Formula: C2.Cl4. Rank 1 Index 27
Molecular weight 166 Purity [illegible] Fit [illegible] Rfit [illegible] Cas# 0-00-0
EIS(LB) (Purity, mass range 36 - 181, weight range 0 - 1023)

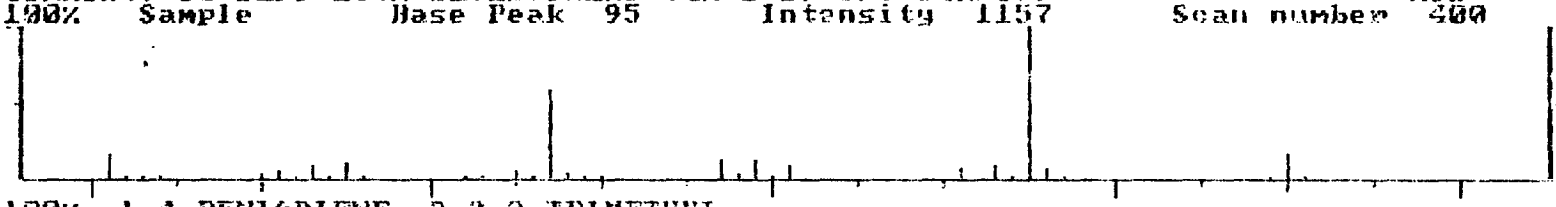
Library Search \DATA\5083H Acquired:Oct-21-1988 13:23:10 + 11:02
Comment: SB DEPT ECON DEVELOPMENT (GW B-2)(5ml+SUR/IS) MID
100% Sample Base Peak 81 Intensity 838 Scan number 330



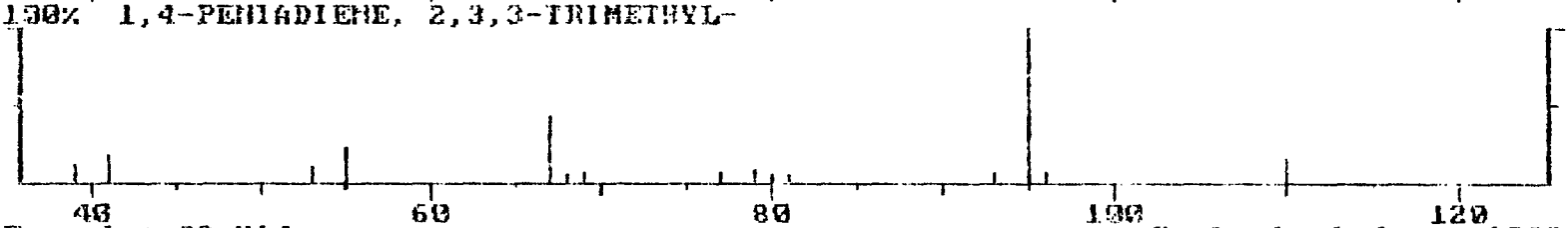
100% CYCLOPENTANE, 1-METHYL-2-METHYLENE-

Formula: C7.H12. Rank 1 Index 1001
Molecular weight 96 Purity [illegible] Fit [illegible] Rfit [illegible] Cas# 41158-41-2
LIBR(NB) (Purity, mass range 36 - 102, weight range 0 - 1023)

Library Search \DATA\5083H Acquired:Oct-21-1988 13:23:10 + 13:22
Comment: SB DEPT ECON DEVELOPMENT (GW B-2)(5ml+SUR/IS) MID
100% Sample Base Peak 95 Intensity 1157 Scan number 400

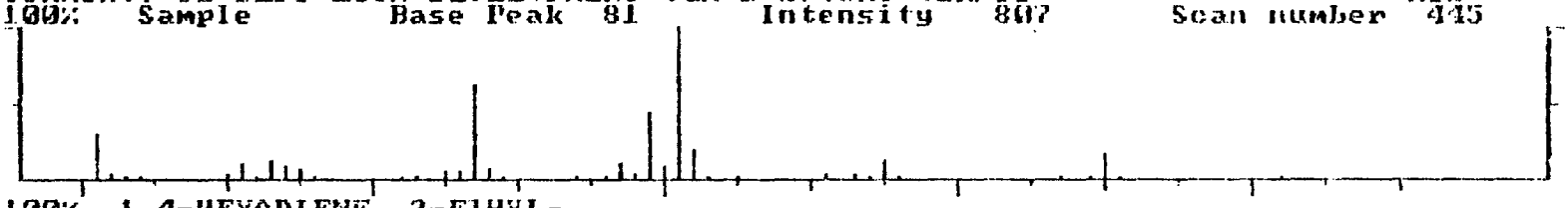


100% 1,4-PENTADIENE, 2,3,3-TRIMETHYL-

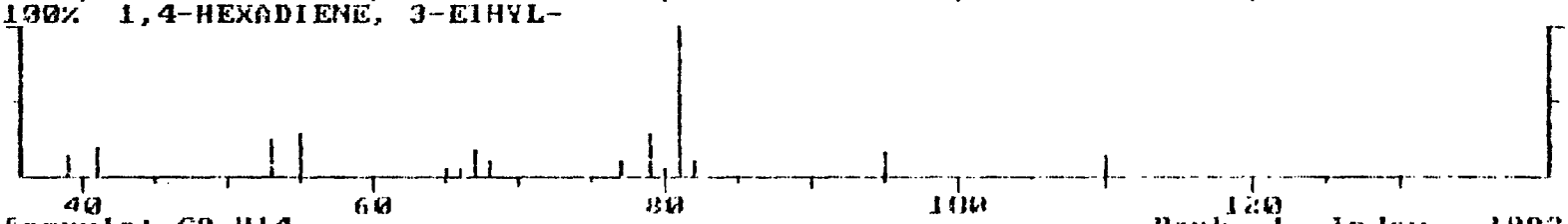


Formula: C8.H14. Rank 1 Index 1969
Molecular weight 110 Purity [illegible] Fit [illegible] Rfit [illegible] Cas# 756-02-5
LIBR(NB) (Purity, mass range 36 - 116, weight range 0 - 1023)

Library Search \DATA\5083H Acquired:Oct-21-1988 13:23:10 + 14:52
Comment: SB DEPT ECON DEVELOPMENT (GW B-2)(5ml+SUR/IS) MID
100% Sample Base Peak 81 Intensity 807 Scan number 445

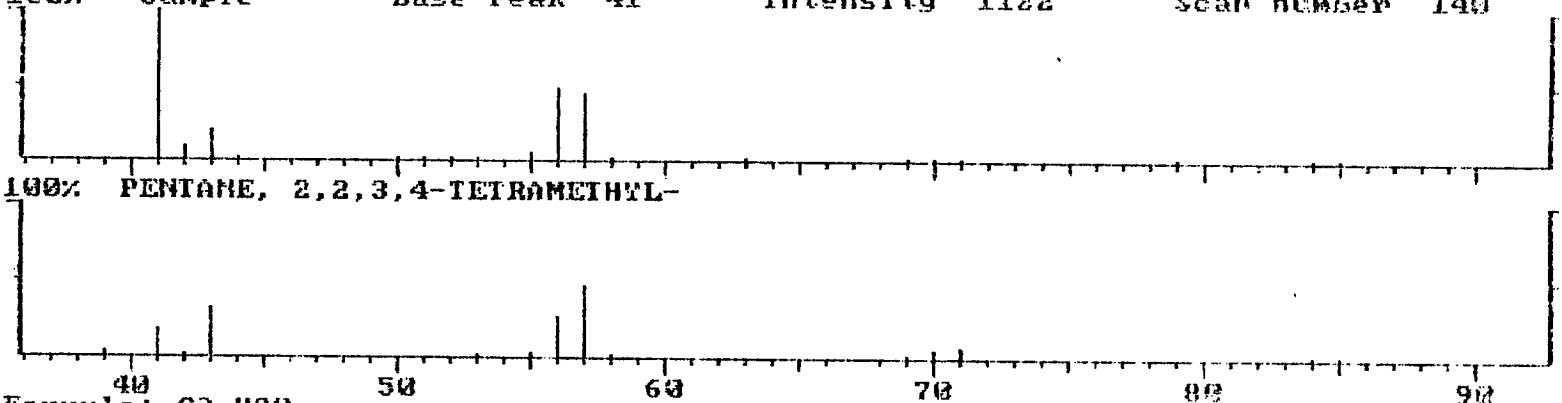


100% 1,4-HEXADIENE, 3-ETHYL-



Formula: C8.H14. Rank 1 Index 1983
Molecular weight 110 Purity [illegible] Fit [illegible] Rfit [illegible] Cas# 2000-89-9
LIBR(NB) (Purity, mass range 36 - 127, weight range 0 - 1023)

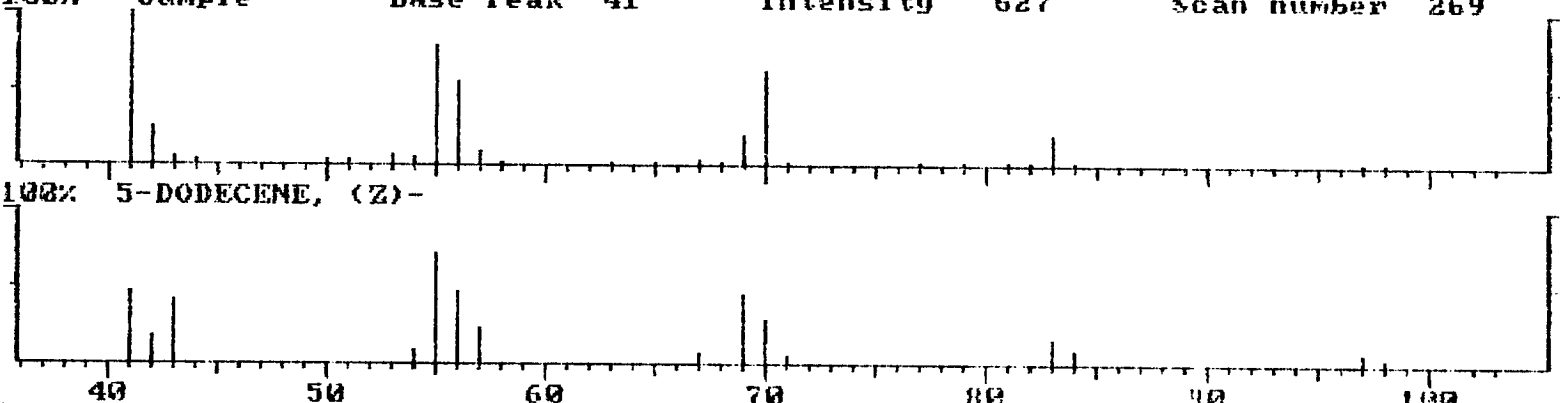
Library Search \DATA\5083H Acquired:Oct-21-1988 13:23:10 + 4:42
Comment: SB DEPT ECON DEVELOPMENT (GW B-2)(5ml+SUR/IS) MID
100% Sample Base Peak 41 Intensity 1122 Scan number 140



100% PENTANE, 2,2,3,4-TETRAMETHYL-

Formula: C9.H20,
Molecular weight 128 Purity[redacted] Fit[redacted] Rfit[redacted] Rank 1 Index 4129
LIBR(NB) (Purity, mass range 36 - 90, weight range 0 - 1023) Cas# 1186-53-4

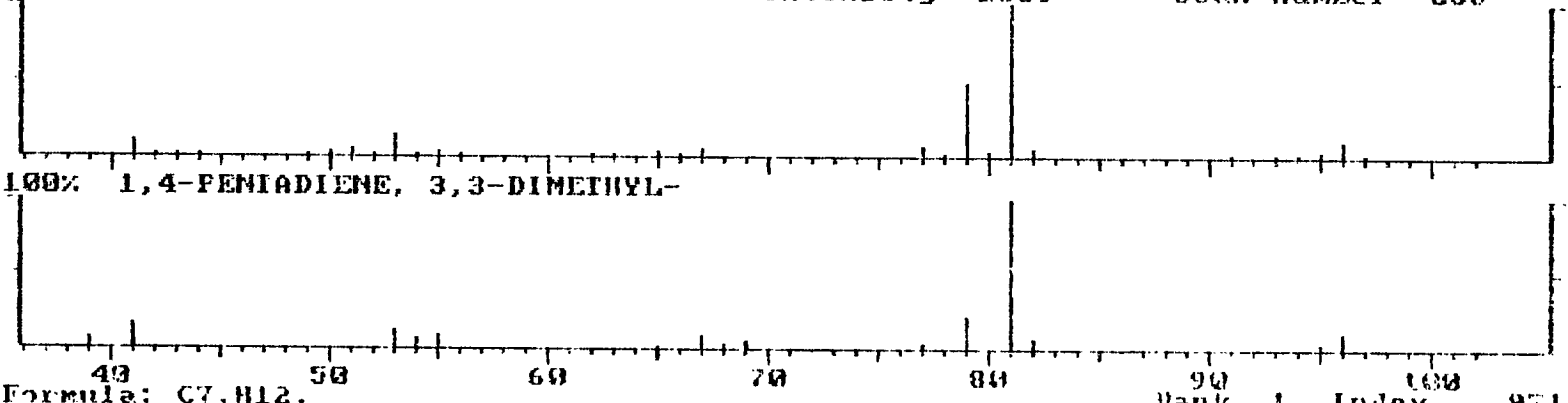
Library Search \DATA\5083H Acquired:Oct-21-1988 13:23:10 + 9:00
Comment: SB DEPT ECON DEVELOPMENT (GW B-2)(5ml+SUR/IS) MID
100% Sample Base Peak 41 Intensity 627 Scan number 269



100% 5-DODECENE, (Z)-

Formula: C12.H24,
Molecular weight 168 Purity[redacted] Fit[redacted] Rfit[redacted] Rank 1 Index 11016
LIBR(NB) (Purity, mass range 36 - 103, weight range 0 - 1023) Cas# 7206-28-2

Library Search \DATA\5083H Acquired:Oct-21-1988 13:23:10 + 9:38
Comment: SB DEPT ECON DEVELOPMENT (GW B-2)(5ml+SUR/IS) MID
100% Sample Base Peak 81 Intensity 1559 Scan number 280



100% 1,4-PENTADIENE, 3,3-DIMETHYL-

Formula: C7.H12,
Molecular weight 96, Purity[redacted] Fit[redacted] Rfit[redacted] Rank 1 Index 971
LIBR(NB) (Purity, mass range 36 - 102, weight range 0 - 1023) Cas# 1112-35-2

APPENDIX B

PID ANALYZER CALIBRATION AND FIELD ANALYSIS RECORDS

Page 1 of ___

SOIL VAPOR FIELD ANALYSIS RECORD

PROJECT NAME Hydrogeologic Study - Transwestern Site PROJECT NUMBER 1456-01

LOCATION AND PURPOSE OF SURVEY Transwestern Site, South Bend, IN.
~~Four~~ Three Soil borings, head-space analysis with PID, 1 soil VOC,

ANALYZER/LAMP HNU, 11.7eV lamp. DATE 9-28-88

Site No.	Sample Type*	Sample Depth	Scale Readings Peak	Scale Readings Steady	HNU Range	PPM **	Time	Location/Comments
B-1	AA-B	NA	0.4	0.4	0-20	0.4	7:15Am	At Boring #1 (Background Defined as 2.)
"	SS-HS	0-1.5	0.4	0.4	0-20		7:35	
"	"	3.0-4.5	0.4	0.3	0-20		7:45Am	VOC Soil sample collected.
"	AA-B	NA	0.4	0.4	0-20	0.4	7:55Am	Air ≈ 10 feet from bore.
"	SS-HS	6.0-7.5	0.4	0.4	0-20		8:15Am	
"	"	9-10.5	0.4	0.4	0-20		8:20Am	
"	"	12-13.5	0.4	0.4	0-20		8:25Am	
"	"	15-16.5	0.4	0.4	0-20		8:30	
"	"	18-19.5	0.4	0.4	0-20		8:35	
"	~~AA~~-B	NA	0.4	0.4	0-20	0.4	8:45	
"	~~SS~~-HS	21-22.5	0.4	0.4	0-20		8:40	
"	"	24-25.5	0.4	0.4	0-20		8:50	
"	"	27-28.5	0.4	0.4	0-20		8:55	Water @ 28.0'
"	"	30-31.5	0.4	0.4	0-20		9:00	
"	AA-B	NA	0.4	0.4	0-20	0.4	9:05	
B-2	AA-B	NA	0.4	0.4	0-20	0.4	11:00	B-2 (NE corner of Transwestern Bldg.
"	SS-HS	0-1.5	0.4	0.4	0-20		11:00	

* Sample Type = HP (Hole Punch) HA (Hand Auger) AA (Ambient Air) SS(Split-spoon) HS (Head Space - include minutes sitting i.e. HS-5) B (Background)

Comments: Weather: overcast, windy, ≈ 55° @ 7:25Am.
PID measurements read approximately 5 minutes after collection and recording with Foil

** ppm as Isobutylene unless otherwise specified

SOIL VAPOR FIELD ANALYSIS RECORD J.C. Sporleder

ANALYZER/LAMP HNU DATE 9-28-88

Site No.	Sample Type*	Sample Depth	Scale Readings Peak	Scale Readings Steady	HNU Range	PPM **	Time	Location/Comments
B-2	SS-HS	3-4.5	0.4	0.4	0-20		11:10	B-2 (continued).
"	"	6-7.5	0.4	0.4	"		11:15	
"	"	9-10.5	0.4	0.4	"		11:20	
"	"	12-13.5	0.4	0.4	"		11:25	Collected VOC soil sample.
"	"	15-16.5	0.4	0.4	"		11:30	
"	"	18-19.5	0.4	0.4	"		11:35	
"	AA-B	NA	0.4	0.4	"	0.4	11:37	
"	SS-HS	21-22.5	0.4	0.4	"		11:40	
"	"	24-25.5	0.5	0.4	"		11:45	VOC soil collected.
"	"	27-28.5	6.0	0.6	"		11:55	VOC soil collected. A (Highest of B-2 Samples submitted to lab
"	AA-B	NA	0.5	0.5	"	0.5	12:05	
B-3	AA-B	NA	0.8	0.4	0-20	0.4-0.8 Defined=0.8	2:10	Boring 3, East side of Transformer Bldg (Driller drilled rig gas tank & co
"	SS-HS	0-1.5	0.5	0.4	"		2:10	
"	"	3-4.5	0.4	0.3	"		2:15	
"	"	6-7.5	0.4	0.4	"		2:20	
"	"	9-10.5	0.4	0.4	"		2:25	
"	"	12-13.5	0.4	0.4	"		2:30	
"	AA-B	NA	0.4	0.4	"	0.4	2:35	
"	SS-HS	15-16.5	0.4	0.4	"		2:35	
"	"	18-19.5	0.4	0.4	"		2:50	
"	"	21-22.5	0.4	0.4	"		2:55	

* Sample Type = HP (Hole Punch) HA (Hand Auger) AA (Ambient Air) SS(Split-spoon) HS (Head Space - include minutes sitting i.e. HS-5) B (Background)

** ppm as Isobutylene unless otherwise specified

SOIL VAPOR FIELD ANALYSIS RECORD

ANALYZER/LAMP HNU / 11.7 eV Lamp DATE 9-28-88

Site No.	Sample Type*	Sample Depth	Scale Readings Peak	Scale Readings Steady	HNU Range	PPM **	Time	Location/Comments
B-3	SS-HS	24-25.5	0.4	0.4	0-20		3:00	Boring 3 (continued)
"	"	27-28.5	0.4	0.4	"		3:10	Collected VOC Soil Sample.
"	AA-B	NA	0.4	0.4	"	0.4	3:15	

* Sample Type = HP (Hole Punch) HA (Hand Auger) AA (Ambient Air) SS(Split-spoon) HS (Head Space - include minutes sitting i.e. HS-5) B (Background)

** ppm as Isobutylene unless otherwise specified

PHOTOIONIZATION ANALYZER FIELD CALIBRATION RECORD

Project Name Hydro. Study, Transwestern Site

Project Number 1456-01

Analyst J.C. Sporleder

Date 9-28-88

CALIBRATION GAS		
Isobutylene in Nitrogen	(Y)	N
If No, describe		
PID ANALYZER		
HNU with 11.7 eV lamp	✓	
Tip II with 10.5 eV lamp		
Tip II with 11.7 eV lamp		

ALL BLANK BOXES BELOW ARE TO BE FILLED IN

INITIAL CALIBRATION @ 7:00 (AM)/PM

Standard No.	Known ppm	TIP Zero	TIP Span	HNU Range	HNU Span	Reading
NA	ZERO	NA	////	/////	////	Ambient Air 0.4
I-88-05	100 H	////	NA	0-200	3.47	100
I-88-03	19.6 L	////	////	0-200	////	48

MIDDLE OF THE DAY CHECK @ 1:00 AM/(PM)

. Adjust zero . Analyze HIGH Std . Calculate % D

High Standard Reading 220

% Difference 120% (H)

% D Criteria
>±10% Recalibrate

Standard No.	Known ppm	TIP Zero	TIP Span	HNU Range	HNU Span	Reading
NA	ZERO	NA	////	/////	////	Ambient Air 0.4
I-88-05	100 H	////	NA	0-200	8.09	100
I-88-03	19.6 L	////	////	0-200	////	36

END OF DAY CALIBRATION @ 3:25 AM/(PM)

Standard No.	Known ppm	Scale Reading	% Difference
NA	ZERO	Ambient Air	////////////////
I-88-05	100 H	140	40% (H)
I-88-03	19.6 L	56	////////////////

ZERO Adjustment During The Day

Time	Y / N SET

COMMENTS:

APPENDIX C

SUBSURFACE EXPLORATION LOGS

Boring No. B-1
Sheet 1 of 2
Project No. 1456-01

SUBSURFACE EXPLORATION LOG

Client South Bend Dept. of Economic Dev. Site Location Transwestern Site
Logged By J. C. Sporleder Date Started 9-28-88 Date Completed
Boring Location B-1, See site map Hammer Wt. 140 lbs
Boring Method HOLLOW STEM AUGER Drop Distance 30"
Sampler Type SPLIT SPOON Sampler Size 18"
Datum Surface Elevation
GROUNDWATER DEPTH: While Drilling 28.0' Ft. At Completion 28 Ft.
After Completion 1/2 Hrs. 28 Ft; Hrs. Ft; Hrs. Ft; Hrs. Ft.

Sample Data					Interval		Log	Soil Description
No.	From	To	Inches Recov.	Blows/6"	From	To		
					0	1		At surface: Gravel & cinder slag <1cm diam. Light gray, N-7, ≈ 2" thick
								2" to 1': Silty Loam with much (≈ 30%) Black particles of crushed cinder & Ang, crs - Sand- size, Grayish Black, N-2
1	0	1.5	15	8-9-5				
2	3.0	4.5	18	3-3-4				
3	6.0	7.5	13	2-2-1	1	2		Loam ≈ 40% Med sand, remainder Si/H. sd. trace coal fragments Dark Yellowish brown, friable.
4	9.0	10.5	13	3-7-9				
5	12.0	13.5	18	1-1-2	2	3		Clayey Sand: ≈ 70% Med. Sand, rd, Cohesive 25% clay 5% silt. Light Brown, 5YR 5/6
6	15.0	16.5	13	2-6-8				
7	18.0	19.5	16	7-13-17	3	9		Sand: ≈ 70% med, rd. 25% fine, rd. 5% Coarse Sand Trace Si/H Noncohesive Moderate Yellowish brown 10YR 5/4, Trace gravel @ 6.0', <7cm diam Coarse Sand % increases with depth to about 40% crs, rd. ≈ 50% med, rd ≈ 10% fine. moist.
8	21.0	22.5	18	4-10-9				
9	24.0	25.5	18	4-9-16				
10	27.0	28.5	15	3-7-13				
11	30.0	31.5	8"	3-7-11				
					9	22		Sand: Med. rd ≈ 80% Crs. rd ≈ 15% fin rd ≈ 5% Trace gravel moist, Dusky Yellow 5Y 6/4

continued →

Boring No. B-1
Sheet 2 of 2
Project No. 1456-01

SUBSURFACE EXPLORATION LOG CONT'D

Sample Data					Interval		Log	Soil Description
No.	From	To	Inches Recov.	Blows/6"	From	To		(Continued from Page 1)
					9	22		Color change @ ≈ 12' = to mod. yellowish Brown 10YR 5/4.
								1" Crs Sand lense @ 15.2'
								Color change @ ± 15' to Dusky Yellow 5Y 6/4
								Crs. Sand % increases to about 25% @ ≈ 18'.
								Med sand ≈ 75%.
					22	31.5		Med Sand. Well sorted.
						End of Bore		Med Sand, rd ≈ 95%.
								Fine Sand ≈ 5%
								Non cohesive, dry.
								Moderate Yellowish brown 10YR 5/4
								Wet @ 28.0'
								Trace gravel, < 4mm dia
								; ≈ 10% rd Crs. Sand @ 30'
								Last split-spoon @ 30-31.5'
								End of Boring @ 31.5'
								Boring was pressure grouted using Tremie Pipe with Bentonite (Volclay)/initiator Grout.
								Sampled for GW VOC & metals from auger @ 9-30'

Boring No. B-2
Sheet 1 of ____
Project No. 1456-01

SUBSURFACE EXPLORATION LOG

Client South Bend Dept. of Economic Dev. Site Location Transwestern Site
Logged By J. C. Sparleer Date Started 9-28-88 Date Completed ____
Boring Location B-2 See site map Hammer Wt. 140 lbs
Boring Method HOLLOW STEM AUGER Drop Distance 30"
Sampler Type SPLIT SPOON Sampler Size 18"
Datum ____ Surface Elevation ____
GROUNDWATER DEPTH: While Drilling 27' Ft. At Completion 26.5' Ft.
After Completion 0.5 Hrs. 26.5 Ft; ____ Hrs. ____ Ft; ____ Hrs. ____ Ft; ____ Hrs. ____ Ft.

Sample Data					Interval		Log	Soil Description
No.	From	To	Inches Recov.	Blows/6"	From	To		
					0	3.2		Top Soil ≈ 1" @ Top. Black, roots. Sandy Loam: Med, rd Sand ≈ 80% silt & clay remainder. Cohesive to Semi cohesive Moderate Brown 5YR 4/4
1	0	1.5	14	4-7-7				
2	3.0	4.5	18	2-3-3				
					3.2	9.3		Sand: Med. rd ≈ 90% Fine rd ≈ 5% Crs rd ≈ 5% moist, Moderate Yellowish Brown 10 YR 5/4 Fine sand ≈ 75% from 6.0 to 6.3'. (Med. rd ≈ 70%, Crs ≈ 5%). moist.
3	6.0	7.5	18	2-2-2				
4	9.0	10.5	15	2-3-4				
5	12.0	13.5	14	3-4-6				
6	15.0	16.5	14	3-8-11				
7	18.0	19.5	15	3-7-11	9.3	24.0		Sand: Med & Crs. Med ≈ 70% Crs ≈ 20% Moderate Yellowish Brown. Coarse sand lense 2" thick @ 16.2'. Color change @ 21' to Dusky Yellow.
8	21.0	22.5	8	4-9-13				
9	24.0	25.5	18	4-8-11				
10	27.0	28.5	18	4-8-11				
					24.0	28.5 End of Boring		Sand. Med. Well sorted rd ≈ 95% Fine, rd ≈ 5% Moist. Dusky Yellow 5Y 6/4 Water @ 27.0' End of Boring @ 28.5' Grouted (Pressure) with Bentonite & cuttings using Tremie pipe. Sampled Groundwater from Auger for VOC's at @ 27.0'

Boring No. B-3
Sheet 1 of ____
Project No. 1456-01

SUBSURFACE EXPLORATION LOG

Client South Bend Dept. of Economic Dev. Site Location Transwestern Site
Logged By J. C. Sporleder Date Started 9-28-88 Date Completed ____
Boring Location B-3, See site map Hammer Wt. 140 lbs
Boring Method HOLLOW STEM AUGER Drop Distance 30"
Sampler Type SPLIT SPOON Sampler Size 18"
Datum ____ Surface Elevation ____
GROUNDWATER DEPTH: While Drilling 28 Ft. At Completion 28.5 Ft.
After Completion 0.5 Hrs. 28.5 Ft; ____ Hrs. ____ Ft; ____ Hrs. ____ Ft; ____ Hrs. ____ Ft.

Sample Data					Interval		Log	Soil Description
No.	From	To	Inches Recov.	Blows/6"	From	To		
					0	0.5		Top Soil with plant roots, Gry Black N-2
1	0	1.5	15	3-10-10	0.5	1.5		Crushed cinders, coal, Trace gravel Black N-1, Noncohesive.
2	3.0	4.5	18	2-3-4	1.5	3.0		Sandy Clay: med to fine sand ≈ 35% clay ≈ 65% Cohesive, Moderate Brown 5YR 4/4
3	6.0	7.5	18	2-4-3				
4	9.0	10.5	18	2-4-5	3.0	28.5		Sand: Med, rd ≈ 95% Gravel, ≤ 1cm dim ≈ 2.5% Crs Sand ≈ 2.5% Light Brown 5YR 5/6
5	12.0	13.5	18	2-5-8		Last split spoon		
6	15.0	16.5	18	3-7-10		End of Bore @ 30'.		Coarse Sand lense 2" thick @ 8'
7	18.0	19.5	18	4-8-9				Color change @ 6' to Med. Yellowish Brown 10YR 5/4
8	21.0	22.5	15	2-5-6				Non cohesive, dry.
9	24.0	25.5	15	1-4-7				Color change @ 9' to Dusky Yellow 5Y 6/4
10	27.0	28.5	18	3-7-13				Two 2 mm thick Black stringers (possibly coal stringers) @ 10'.
								Moist ≈ 16'.
								(Crs Sand increases to ≈ 10% @ 18' med rd ≈ 85% small gravel ≈ 5%)
								2 mm thick coal stringer at 22'
								Wet @ 28'.
								Last split-spoon is 27 - 28.5'.
								Auger advanced to 30' to provide enough water to sample.
								Pressure grouted with Bentonite/initiator using tremie pipe.
								Sampled Groundwater in auger for VOC's & metals.

APPENDIX D

SECTION 5.4 OF THE EIS PID ANALYZER STANDARD OPERATING PROCEDURES

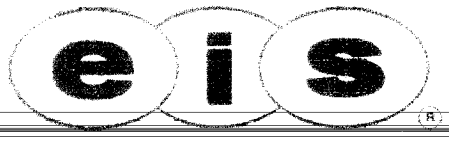
5.4 Headspace Soil Vapor Monitoring Method

Once the split-spoon/hand auger sample is collected from the bore hole, part of the sample is used to monitor the soil vapors from the boring.

Using a clean stainless steel spatula portions of the split-spoon/hand auger sample are collected into a glass jar. Aluminum foil is used to seal the jar. The samples are then warmed for a predetermined amount of time, then headspace analysis is performed. The aluminum foil is punctured with the tip of the PID instrument and the soil vapors measured.

When recording the headspace results, always indicate the minutes used to equilibrate the soil inside the jar prior to reading (per instructions on the soil vapor field analysis record sheet).

Temperature conditions to which all jars are exposed should be approximately the same during the course of the day. These conditions are to be annotated in the Comments section of the field sheet.



EIS ENVIRONMENTAL ENGINEERS, INC.