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1994 ANNUAL REPORT

PREPARED FOR
COOK COMPOSITES AND POLYMERS
SAUKVILLE, WISCONSIN

PREPARED BY
RMT, INC.
MADISON, WISCONSIN

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TABLE OF CONTENTS

List of Tables

List of Figures

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TABLE OF CONTENTS (CONTINUED)

List of Appendices

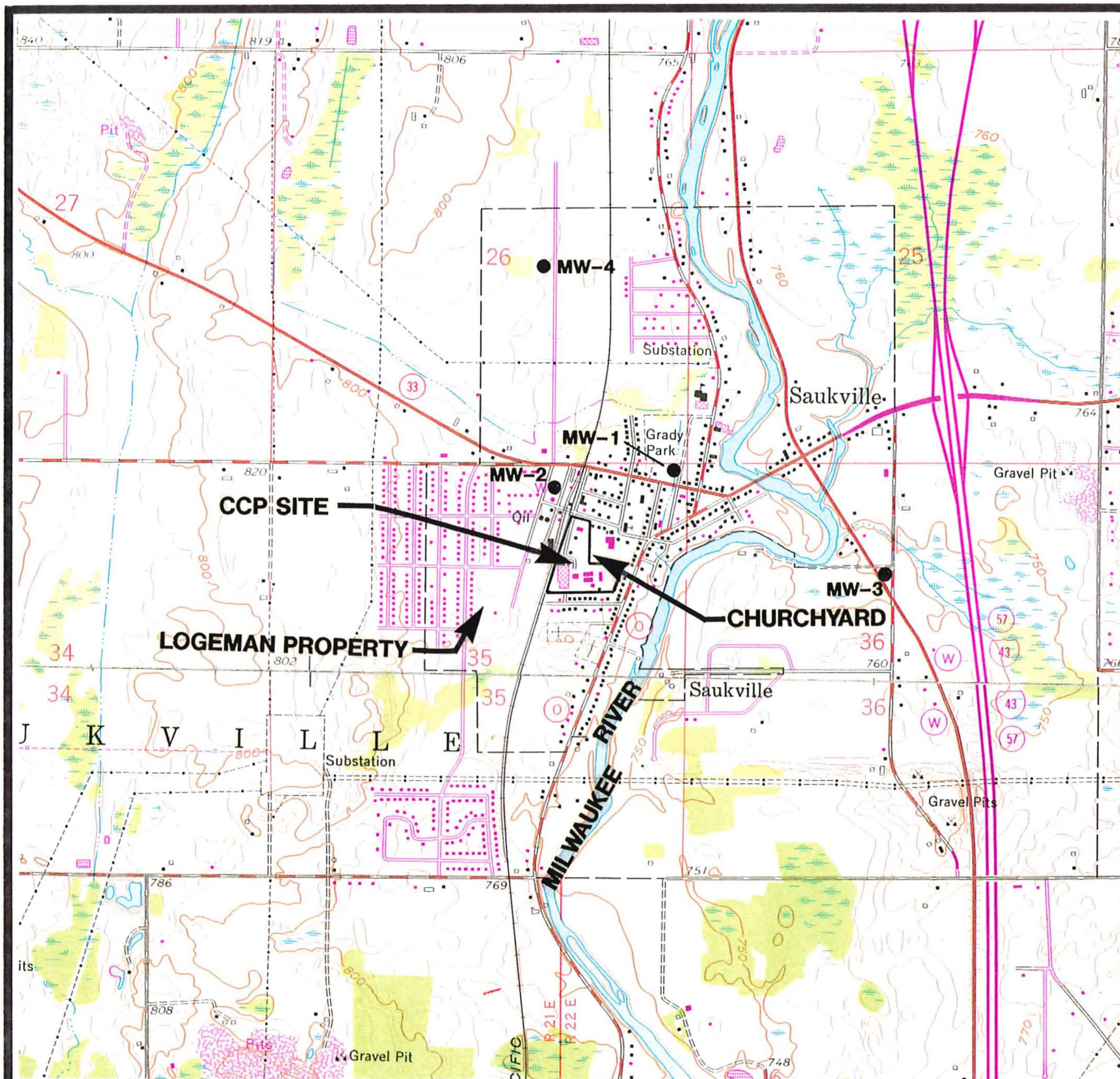
EXECUTIVE SUMMARY

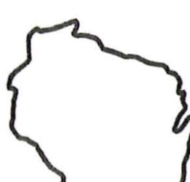
The groundwater flow and quality information that is presented in this report indicates that the remedial systems operating at the Cook Composites and Polymers Company (CCP) site are reducing the mass of volatile organic compounds (VOCs) in the groundwater, based on generally decreasing levels of VOCs detected in the remedial progress wells. In addition, water table and potentiometric maps indicate that operation of the remedial systems continues to control off-site migration of impacted groundwater.

Section 1
INTRODUCTION

CCP operates an ester, acrylic, and urethane resins manufacturing plant in Saukville, Wisconsin (Figure 1). Prior to 1991, the plant was owned and operated by Freeman Chemical Corporation.

In compliance with the 1987 Corrective Action Order on Consent (CAO) V-W-88-R-002, CCP completed four rounds of groundwater sampling and analysis in 1994, including January (winter), April (spring), July (summer), and October (fall) sampling events. The summer event comprised the annual sampling event. RMT, Inc. (RMT), in Madison, Wisconsin, conducted the groundwater sampling for the 1994 quarterly monitoring events. The groundwater samples were analyzed at RMT, Inc., Laboratories in Madison, Wisconsin. The field data and results of chemical analyses of groundwater were compiled by RMT, and were submitted in quarterly reports by CCP to the USEPA Region V and the Wisconsin Department of Natural Resources (WDNR). Volatile organic compound (VOC) exceedances of Wisconsin Administrative Code NR 140 Preventive Action Limits (PALs) or Enforcement Standards (ESs) were reported quarterly by CCP in accordance with NR 508.





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SITE LOCATION, MUNICIPAL WELLS, AND OFF SITE AREAS OF CONCERN

COOK COMPOSITES AND POLYMERS SAUKVILLE, WISCONSIN

SOURCE: BASE MAP FROM PORT WASHINGTON WEST AND CEDARBURG, WISCONSIN USGS QUADRANGLES.

RMT INC.

DWN. BY:	BLG
APPROVED BY:	COB
DATE:	JANUARY 1995
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FIGURE 1

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Section 2
PURPOSE AND SCOPE

This document presents a summary of the data collected during the four quarterly groundwater sampling events that were conducted at CCP in 1994, and provides an evaluation of water level and groundwater quality trends at the site. Since the water quality data have been submitted to the USEPA and the WDNR in the quarterly reports, they will not be reproduced in this document.

The scope of this report includes the following:

- A summary of water levels that were measured in on-site monitoring wells in 1994, and potentiometric surface maps of the glacial drift and shallow dolomite hydrogeologic units
- An evaluation of groundwater flow directions in the glacial drift and shallow dolomite hydrogeologic units, and the effects of groundwater extraction on these patterns of groundwater flow
- A summary of the site groundwater monitoring program and the quarterly total VOC concentrations by well
- Isoconcentration maps for dissolved total VOCs in the glacial drift and shallow dolomite wells
- Time-concentration plots of dissolved total VOCs in selected wells
- An evaluation of the trends in groundwater quality for each monitoring well group for 1994
- An evaluation of the effectiveness of plume containment by groundwater extraction, based on groundwater flow and quality data

Section 3
SUMMARY OF RESULTS

3.1 Groundwater Monitoring Program Summary

The groundwater monitoring program at the CCP Saukville site includes 44 monitoring points: 20 glacial drift wells, 12 shallow dolomite wells, 6 deep dolomite wells, 3 Ranney collectors (essentially French drains), and 3 publicly owned treatment works (POTW) sampling points. The monitoring points are grouped according to four sampling objectives: receptor, perimeter, remediation progress, and groundwater elevation monitoring. The organization of wells by monitoring objective is presented in Table 1.

Receptor points include four municipal water supply wells (MW-1 through MW-4); POTW influent, effluent, and sludge monitoring points; and the Ranney collectors (RC-1, RC-2, and RC-3). The Ranney collectors are monitored because they discharge to the sanitary sewer. Perimeter points are monitoring wells on- and off-site that are located at or beyond the edge of the VOC plume. These wells provide the necessary information to define the lateral extent of the plume. Remediation progress points are monitoring wells that are located within the VOC plume. These wells provide information concerning the effectiveness of the on-site remedial systems. Groundwater elevation monitoring wells are located both on- and off-site and provide data on groundwater flow patterns and the effectiveness of on-site pumping wells.

Each of these well groupings is further subdivided into glacial drift, shallow, and deep dolomite hydrogeologic units. This subdivision allows for a more effective evaluation of on-site groundwater flow and quality trends.

3.2 Groundwater Flow

3.2.1 Description of Hydrogeologic Units

The glacial drift hydrogeologic unit includes glacial till, glaciolacustrine deposits, and glaciofluvial deposits that consist of interbedded clay, silt, sand, and gravel layers (Hatcher-Sayre, 1986). These sediments generally range from approximately 10 to 25 feet in thickness (Hatcher, 1986). The stratigraphic order of the deposits from the ground surface downward is typically sand and silt overlying a laterally continuous layer of laminated silt and clay (glaciolacustrine deposits) above dense clay (glacial

TABLE 1

SUMMARY OF 1994 GROUNDWATER SAMPLING PROGRAM
COOK COMPOSITES AND POLYMERS

Monitoring Objective/ Well Group	Unit Monitored	Sampling Point	Sampling Frequency and EPA Method Number		
			Quarterly	Semiannually[1]	Annually[2]
Receptor	Glacial drift	RC-1	8021		
		RC-2	8021		
		RC-3	8021		
	Deep dolomite	MW-1	8260		
		MW-2*	8260		
		MW-3	8260		
		MW-4	8260		
	POTW	POTW-I	8260		
		POTW-E	8260		
		POTW-S	8260		
Perimeter	Glacial drift	W-01A		8260	
		W-03B		8260	
		W-04A		8260	
		W-08		8260	
		W-20		8260	
		W-27		8260	
	Shallow dolomite	W-03A		8260	
		W-07		8260	
		W-22		8260	
		W-23		8260	
		W-25		8260	
	Deep dolomite	PW-08		8260	

TABLE 1 (CONTINUED)

SUMMARY OF 1994 GROUNDWATER SAMPLING PROGRAM
COOK COMPOSITES AND POLYMERS

Monitoring Objective/ Well Group	Unit Monitored	Sampling Point	Sampling Frequency and EPA Method Number		
			Quarterly	Semiannually[1]	Annually[2]
Remediation progress	Glacial drift	W-06A			8021
		W-19A			8021
		W-37			8021
		W-41			8021
		W-42			8021
		W-43			8021
		W-47			8021
	Shallow dolomite	W-21A			8021
		W-24A			8021
		W-28			8021
		W-29			8021
		W-38			8021
	Deep dolomite	W-30			8021
Groundwater Elevation Monitoring	Glacial drift	W-14B	Quarterly water level measurements only.		
		W-16A	Quarterly water level measurements only.		
		W-18A	Quarterly water level measurements only.		
		W-44	Quarterly water level measurements only.		
		W-45	Quarterly water level measurements only.		
		W-46	Quarterly water level measurements only.		
		W-48	Quarterly water level measurements only.		
	Shallow dolomite	W-39	Quarterly water level measurements only.		
		W-40	Quarterly water level measurements only.		

NOTES:

1 Semiannual samples were collected in April and October.
2 Annual samples were collected in July.
* MW-2 was monitored once because it is not used for water supply purposes.

till). A thin layer of sand and gravel (glacial outwash) lies between this till unit and bedrock.

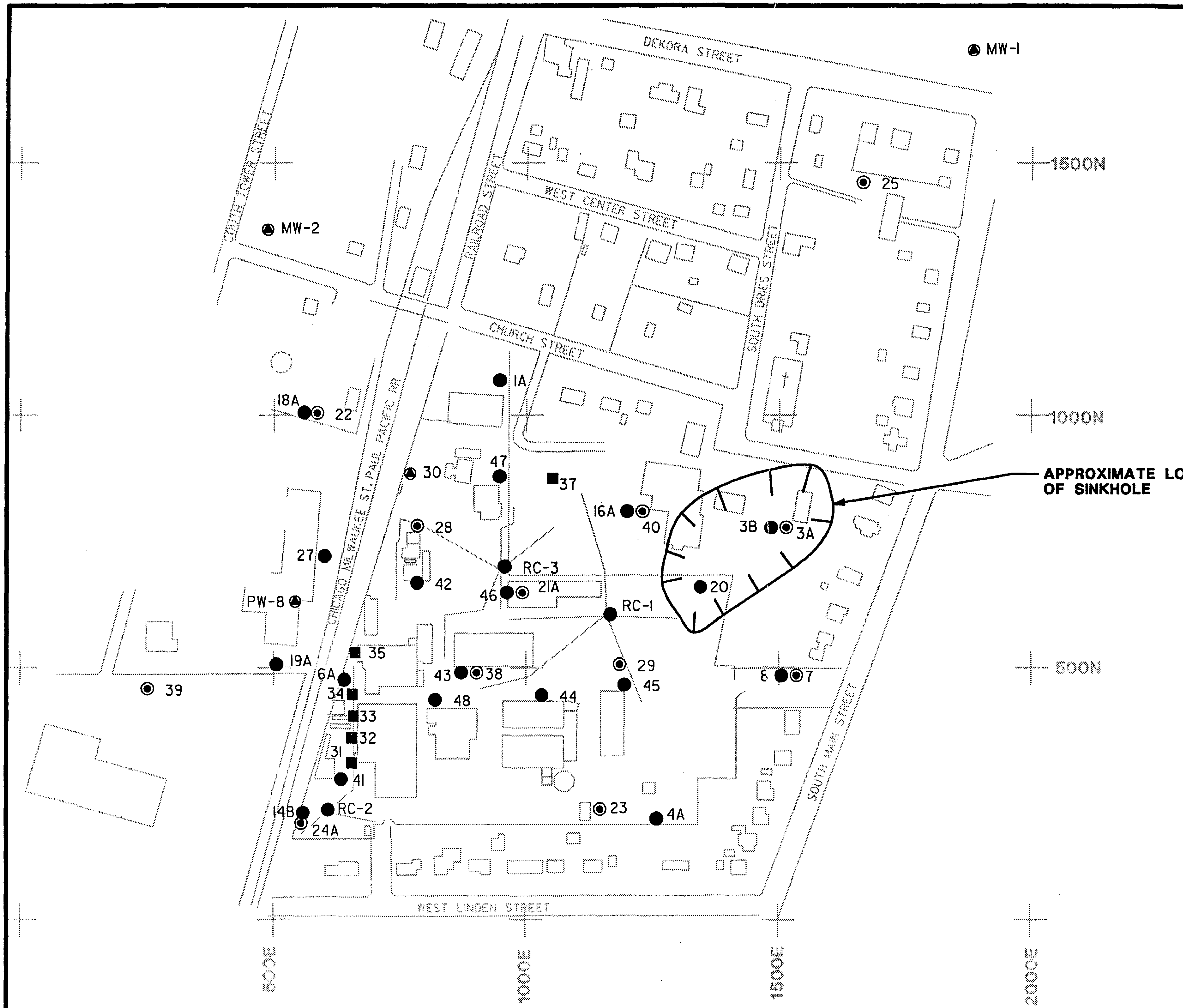
The uppermost bedrock unit beneath the site is the Niagaran Dolomite, which is highly fractured in its upper 10 to 15 feet and which contains abundant solution channels and cavities at depth. The Niagaran dolomite is the aquifer from which Saukville derives its municipal water supply. The base of the Niagaran dolomite is more than 500 feet below ground surface (bgs), based on local well logs. The elevation of the bedrock surface is highly variable across the site, as defined by soil borings (Hatcher, Inc., 1986) and seismic reflection investigations (Minnesota Geophysical Associates, Inc. [MGA], 1989). A bedrock high (bedrock depths of less than 20 feet below ground surface) is located near the center of the CCP site. A closed depression in the dolomite with a depth of more than 200 feet bgs, likely a sinkhole (Figure 2), is located in the northeastern corner of the site.

3.2.2 Groundwater Levels and Flow Patterns in 1994

Groundwater levels in site monitoring wells were measured prior to purging during quarterly sampling events. Table 2 presents a summary of water levels for each quarter, and Figure 2 shows the locations of site monitoring wells. The water level data were used to construct a water table map for the glacial drift unit, and a potentiometric surface map of the shallow dolomite unit (Appendix A).

The Glacial Drift Hydrogeologic Unit

The water table occurs in the glacial drift unit, as shown on Figures 3a through 3d (Appendix A). Wells W-3B and W-20 are completed as piezometers within the glacial drift present in the sinkhole in the northeastern portion of the site (Figure 2), and the hydraulic heads within these two wells are representative of groundwater flow in the shallow dolomite unit. Therefore, water levels from wells W-3B and W-20 were not used to construct the water table maps on Figures 3a through 3d, but have been used to construct the potentiometric surface maps for the shallow dolomite unit (Figures 4a through 4d).



LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY COLLECTOR

NOTES

1. BASE MAP WAS DEVELOPED FROM HATCHER-SAYRE, INC., 1992.

MONITORING WELL LOCATION MAP

COOK COMPOSITES AND POLYMERS
SAUKVILLE, WISCONSIN

RMT INC.

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Approved By:	COB
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FIGURE 2

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TABLE 2
COOK COMPOSITES & POLYMERS
SUMMARY OF WATER LEVELS, 1994 (FEET, MSL)

GEOLOGIC UNIT	SAMPLE ID	01/94	04/94	07/94	10/94
Glacial	W-01A	756.21	761.22	759.58	755.35
Glacial	W-03B	737.99	739.51	740.73	731.65
Glacial	W-04A	746.73	757.25	754.59	<748.08
Glacial	W-06A	763.71	766.2	766.39	764.74
Glacial	W-08	748.63	752.87	750.9	<746.62
Glacial	W-14B	762.28	766.38	NM	761.31
Glacial	W-16A	<752.06	759.97	754.36	<752.06
Glacial	W-18A	764.83	769.09	768.63	766.63
Glacial	W-19A	761.42	767.18	767.64	763.29
Glacial	W-20	735.4	736.01	738.68	727.42
Glacial	W-27	765.84	768.72	768.66	766.66
Glacial	W-37	762.1	NM	NM	758.04
Glacial	W-41	756.72	760.84	762.05	756.17
Glacial	W-42	754.13	761.2	759.74	754.06
Glacial	W-43	759.28	761.41	759.38	760.54
Glacial	W-44	754.53	754.76	754.66	<753.88
Glacial	W-45	<752.27	<752.27	752.72	<752.27
Glacial	W-46	754.93	762.07	762.17	761.5
Glacial	W-47	758.03	761.16	760.51	757.01
Glacial	W-48	762.14	764.52	763.75	761.93
Shallow Dolomite	W-03A	737.58	738.98	740.35	730.98
Shallow Dolomite	W-07	742.59	747.36	745	741.55
Shallow Dolomite	W-21A	700	699.38	706.1	707.51
Shallow Dolomite	W-22	727.57	731.67	731.51	727.36
Shallow Dolomite	W-23	742.78	745.69	746.27	737.98
Shallow Dolomite	W-24A	756.71	747.29	760.85	756.03
Shallow Dolomite	W-25	744.92	749.25	747.25	743.21
Shallow Dolomite	W-28	742.4	743.63	746.35	732.69
Shallow Dolomite	W-29	729.7	733.22	740.38	728.15
Shallow Dolomite	W-38	749.96	752.59	752.83	748.5
Shallow Dolomite	W-39	756.44	760.02	760.19	755.39
Shallow Dolomite	W-40	741.59	745.08	745.64	737.33
Deep Dolomite	MW-01	494	496	496	491
Deep Dolomite	MW-02	NM	NM	604.03	NM
Deep Dolomite	MW-03	NM	NM	NM	NM
Deep Dolomite	MW-04	NM	NM	NM	NM
Deep Dolomite	PW-08	735.97	739.33	738.5	733.12
Deep Dolomite	W-30	686.14	681.52	658.42	674.59

NM = NOT MEASURED

NOTE: WATER LEVELS IN RANNEY COLLECTORS (RC-1 THROUGH RC-3) AND WITHDRAWAL WELLS W-31 THROUGH W-35 ARE NOT MEASURED.

Horizontal groundwater flow at the water table is generally eastward, toward the Milwaukee River with a hydraulic gradient of 0.02, based on summer 1994 water level data. Hydraulic calculations are included in Appendix B.

At the CCP site, shallow groundwater flow in the till is deflected toward the Ranney collectors. The localized cones of depression caused by the Ranney collectors are superimposed on the regional pattern of shallow groundwater discharge to the Milwaukee River, as shown on Figures 3A through 3D, Appendix A. A comparison of the water table maps to the summary of well running times (Table 3) indicates that shallow groundwater withdrawal is dewatering portions of the glacial drift unit. Based on the available data, the shallow groundwater extraction system is controlling off-site migration of shallow groundwater in the till.

The water table remained within the glacial drift unit, even at its lowest level during the fall quarter. With few exceptions, groundwater elevations measured in 1994 in the glacial drift were approximately 1 to 2 feet lower, on average, than the groundwater elevations measured during respective quarters in 1993. A comparison of the summer water elevations between 1993 and 1994 shows the least difference in groundwater levels. The greatest difference in water elevations is observed between the winter quarters of 1993 and 1994. Groundwater levels in the glacial drift unit decreased an average of 4 feet between the spring and fall quarters of 1994. This is the same average drop observed between the spring and fall quarters of 1993.

Downward hydraulic gradients were observed from the till to the dolomite during 1994. The magnitude of the downward gradients was on the order of 0.3 to 0.9 (Appendix B).

The Shallow Dolomite Hydrogeologic Unit

The potentiometric surface in the shallow dolomite unit for the winter, spring, summer, and fall quarters of 1994 is shown on Figures 4a, 4b, 4c, and 4d (Appendix A). Because the piezometers constructed at the site have been completed at varying elevations in the dolomite, only those piezometers with bottom elevations between

TABLE 3

SUMMARY OF WELL RUNNING TIMES (1994)

Hydrogeologic Unit	Well I.D.	Monthly Running Time (hours)												Annual Total (hours)	Comments
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.		
Glacial drift 751.57	W-31	0.0	0.0	1.1	1.8	0.4	0.0	0.3	0.0	0.0	0.0	0.0	0.0	3.6	Groundwater elevation is significantly affected by pumping at RC-2.
	W-32	2.3	0.1	83.5	119.1	97.9	0.0	68.6	0.0	0.1	0.0	0.0	0.2	371.8	Groundwater elevation appears to be affected by pumping at RC-2.
	W-33	5.9	4.2	10.2	2.1	0.0	0.0	0.0	2.1	1.7	1.9	2.2	7.3	37.6	Groundwater elevation appears to be affected by pumping at RC-2.
	W-34	842.4	672.6	834.3	660.5	670.9	841.5	672.7	673.0	837.0	669.6	673.1	832.0	8879.6	Consistent elevated months were 5 weeks long.
	W-35	1.3	1.0	2.1	1.3	1.2	1.5	1.7	1.5	1.5	2.9	1.1	1.3	18.4	Pumping was between 0.2 and 0.5 hours/week.
	W-37	0.0	1.9	9.9	2.2	0.0	1.0	1.5	7.9	3.3	0.8	0.4	0.7	29.6	Water table maps indicate that groundwater elevation was above the bottom of the well at each monitoring event.
	RC-1	2.4	166.5	258.5	404.2	630.5	836.5	671.9	670.0	796.4	10.9	9.8	17.7	4475.3	Consistent weekly pumping hours during January, and May through December. Inconsistent weekly rates February, March, and April.
	RC-2	719.4	352.1	266.5	0.0	0.0	238.8	672.3	673.0	837.0	441.7	430.5	820.8	5452.1	Fairly consistent weekly rates except February through June.
	RC-3	0.1	15.9	219.0	83.4	30.1	24.3	66.9	36.2	14.6	0.3	0.2	0.0	491.0	Very inconsistent pumping throughout the year.
Shallow dolomite	W-21A	821.4	588.2	444.0	300.5	219.1	564.5	562.6	562.0	312.9	49.3	25.4	55.4	4505.3	Consistently greater than 100 hours/week during January, February, June, July, August, and first 2 weeks of September. Typically less than 15 hours/week from second week of September through end of year.
	W-24A	18.7	58.7	8.4	8.8	32.5	11.1	5.3	5.8	10.3	45.0	9.7	7.8	222.1	Typically less than 5 hours/week, with a few exceptions. The only week with greater than 20 hours was first week of February with 44.4 hours.
	W-28	842.1	672.7	834.1	674.7	671.0	841.0	671.7	68.6	27.1	639.6	585.1	456.4	6984.1	Typically over 100 hours/week except August, September, and December.
	W-29	406.7	316.1	239.8	165.7	246.6	234.3	290.3	39.2	68.0	74.7	70.3	117.3	2269.0	Consistently 40 to 100 hours/week January through May. Typically less than 25 hours/week June through December.

680 and 710 feet above mean sea level (AMSL) were used in preparation of Figures 4A through 4D. In general, the potentiometric elevations in the shallow dolomite were lower during each quarter of 1994 than they were during the respective 1993 quarters. The average drop in potentiometric elevations ranged from 0.5 foot per well when comparing the spring quarters from 1993 and 1994, to 4 feet per well when comparing fall 1993 to fall 1994.

The contours on Figures 4a, 4b, 4c, and 4d indicate that groundwater in the shallow dolomite flows toward the center of the site, as a result of the pumping at well W-21A. A cone of depression up to 40 feet deep is defined centering on well W-21A. Based on a comparison of the water table maps and the shallow dolomite potentiometric surface maps, portions of the dolomite near W-21A are being dewatered.

The Deep Dolomite Hydrogeologic Unit

Potentiometric maps for the deep dolomite were not prepared because pumping rates and durations at three locations at which measurements were made are unknown. The data available are insufficient to determine the local flow patterns in the deep dolomite.

3.3 Groundwater Quality

3.3.1 Background

Table 1 presents the sampling schedule that was developed for 1994 groundwater monitoring, along with the VOC analysis method used each quarter. The parameters analyzed for in Methods 8260 and 8021 are listed in Table 4. The winter, spring, and fall quarter samples were analyzed for the full VOC list (8260), and the summer quarter samples were analyzed for either the full VOC list or the shorter aromatic VOC list (8021) as part of the annual sampling event.

3.3.2 Total VOC Data

The tabulated results of VOC concentrations in each well and the supporting laboratory data sheets were presented in the four quarterly reports (RMT, 1994a, 1994b, 1994c, and 1994d). Tables 5, 6, and 7 present a summary of total VOC

TABLE 4

SUMMARY OF ANALYTES ANALYZED FOR IN METHODS 8260 AND 8021
COOK COMPOSITES & POLYMERS

Volatile Organic Compounds by Method 8260		Aromatic Volatile Organic Compounds by Method 8021
Chloroethane	1,1,2,2-Tetrachloroethane	Benzene
Chloromethane	1,2-Dichloropropane	Toluene
Bromomethane	trans-1,2-Dichloropropene	Ethylbenzene
Vinyl chloride	Trichloroethene	Chlorobenzene
Methylene chloride	Dibromochloromethane	Xylenes (total)
Acetone	1,1,2-Trichloroethane	1,4-Dichlorobenzene
Carbon disulfide	Benzene	1,3-Dichlorobenzene
1,1-Dichloroethene	cis-1,3-Dichloropropene	1,2-Dichlorobenzene
1,1-Dichloroethane	Bromoform	
1,2-Dichloroethene (total)	2-Hexanone	
Chloroform	4-Methyl-2-Pentanone	
1,2-Dichloroethane	Tetrachloroethene	
2-Butanone	Toluene	
1,1,1-Trichloroethane	Chlorobenzene	
Carbon tetrachloride	Ethylbenzene	
Vinyl acetate	Styrene	
Bromodichloromethane	Xylenes (total)	

concentrations in each well for the four quarters. The wells are organized by monitoring objective and hydrogeologic unit as described in Subsection 3.1 and Table 1. Figure 2 shows the locations of the monitoring wells. The lateral distribution of VOCs in the glacial drift unit and in the shallow dolomite unit for the year is depicted on two composite isoconcentration maps. Composite maps for 1994 were constructed using VOC concentration data from all four quarterly sampling rounds. The isoconcentration maps are included on Figures 5 and 6 of Appendix C.

VOC Patterns in the Glacial Drift Unit

The extent of VOC contamination in the glacial drift unit for 1994 is shown on Figure 5 of Appendix C. As noted in Subsection 3.2, wells W-3B and W-20 are completed in the glacial drift in the sinkhole and are therefore more representative of water quality in the shallow dolomite aquifer. Isoconcentration contours in the glacial drift unit (Figure 5) do not include VOC detections in the Ranney collectors because these are composite groundwater samples that were collected from areas of the site through radial collection lines.

The pattern of VOC concentrations in 1994 (Figure 5) is similar to that observed in 1993 and in previous years (RMT, 1993; and Hatcher-Sayre, Inc., 1992).

Three major VOC plumes are apparent in the pattern of VOC concentrations in the glacial drift unit (Figure 5 of Appendix C). The first plume, which is located in the northern portion of the site, is centered at the former hazardous waste incinerator/former urethane laboratory area, with total VOC concentrations greater than 500,000 μg/L, and extends off-site to the east under the churchyard. The second plume, which is located in the southwestern portion of the site, is centered in the area of the former dry well and extends a short distance to the south and east. Total VOC concentrations in this area range from 500 μg/L to over 100,000 μg/L. The third prominent plume is centered around W-43, with a total VOC concentration of greater than 90,000 μg/L. This plume appears to originate in the vicinity of the former tank farm area and is effectively captured by the collection lines of RC-1. The water table maps (Figures 3a through 3d) and the isoconcentration map (Figure 5 of Appendix C)

TABLE 5A - TOTAL VOCS DETECTED, 1994
RECEPTOR GROUP - GLACIAL UNIT

SAMPLE ID	01/94		04/94		07/94		10/94	
RC-1			19330	UG/L	1596	UG/L	352.6	UG/L
RC-2	303.1	UG/L			4041	UG/L	65490	UG/L
RC-3	3616	UG/L	80200	UG/L	37340	UG/L	22540	UG/L

TABLE 5B - TOTAL VOCS DETECTED, 1994
RECEPTOR GROUP - DEEP DOLOMITE UNIT AND POTW

SAMPLE ID	01/94		04/94		07/94		10/94	
MW-01	ND	UG/L	ND	UG/L	.3	UG/L	ND	UG/L
MW-02					ND	UG/L		
MW-03	ND	UG/L	1.5	UG/L	ND	UG/L	ND	UG/L
MW-03 DUP					ND	UG/L		
MW-04	ND	UG/L	ND	UG/L	ND	UG/L	ND	UG/L
MW-04 DUP	ND	UG/L	ND	UG/L			ND	UG/L
POTW-E	ND	UG/L	3.3	UG/L	3.5	UG/L	ND	UG/L
POTW-I	2	UG/L	92.1	UG/L	2.8	UG/L	58	UG/L
POTW-S	13	UG/L	1189	UG/L	.5	UG/L	ND	UG/L

1. Ranney collectors RC-1, RC-2, and RC-3 are shallow groundwater drains sampled at the manhole, prior to discharge to the POTW. Wells MW-01, MW-02, MW-03, and MW-04 are screened in the deep dolomite. Well MW-02 is only sampled in July. Monitoring points POTW-E, POTW-I, and POTW-S are sampled at the wastewater treatment facility.

2. Blank entries mean that a sample was not collected at the monitoring point during that quarter, typically because the well was dry.

3. Refer to summary tables in the quarterly reports (RMT, Inc., 1994a,b,c,d) for specific analytes detected. Typical VOC detections included benzene, toluene, ethylbenzene, and xylenes.

4. Total VOCs were calculated by summing all measured and estimated values, except those qualified with a "U", which are considered undetected because of associated blank contamination.

ND = None detected.

TABLE 6A - TOTAL VOCS DETECTED, 1994
PERIMETER GROUP - GLACIAL UNIT

SAMPLE ID	04/94		10/94	
W-01A	ND	UG/L	2.6	UG/L
W-03B	ND	UG/L	ND	UG/L
W-03B DUP	ND	UG/L	ND	UG/L
W-04A	.4	UG/L		
W-08	ND	UG/L		
W-20	ND	UG/L	ND	UG/L
W-27	112.7	UG/L	217	UG/L

TABLE 6B - TOTAL VOCS DETECTED, 1994
PERIMETER GROUP - SHALLOW DOLOMITE UNIT

SAMPLE ID	04/94		10/94	
PW-08	2	UG/L	2	UG/L
W-03A	ND	UG/L	ND	UG/L
W-07	ND	UG/L	ND	UG/L
W-22	.6	UG/L	17	UG/L
W-23	22	UG/L	18.9	UG/L
W-23 DUP	21	UG/L	20.1	UG/L
W-25	ND	UG/L	ND	UG/L

1. Well PW-08 is a deep dolomite well.

2. Blank entries mean that a sample was not collected at the monitoring point during that quarter, typically because the well was dry.

3. Refer to summary tables in the quarterly reports (RMT, Inc., 1994a,b,c,d) for specific analytes detected. Typical VOC detections included 1,2-dichloroethene, trichloroethene, benzene, toluene, ethylbenzene, and xylenes.

4. Total VOCs were calculated by summing all measured and estimated values, except those qualified with a "U", which are considered undetected because of associated blank contamination.

ND = None detected.

TABLE 7A - TOTAL VOCS DETECTED, 1994
REMEDIATION PROGRESS GROUP - GLACIAL UNIT

SAMPLE ID	07/94		10/94	
W-06A	196750	UG/L		
W-19A	ND	UG/L		
W-19A DUP	ND	UG/L		
W-37			163520	UG/L
W-41	550	UG/L		
W-42	13990	UG/L		
W-43			93600	UG/L
W-47			550000	UG/L

TABLE 7B - TOTAL VOCS DETECTED, 1994
REMEDIATION PROGRESS GROUP - SHALLOW DOLOMITE UNIT

SAMPLE ID	07/94	
W-21A	28600	UG/L
W-24A	ND	UG/L
W-28	14	UG/L
W-29	5160	UG/L
W-30	3	UG/L
W-30 DUP	3.7	UG/L
W-38	2430	UG/L

1. Well W-30 is a deep dolomite well.

2. Wells W-37, W-43, and W-47 were not sampled in July due to high water levels precluding safe access to the wells, therefore, the wells were sampled in October.

3. Refer to summary tables in the quarterly reports (RMT, Inc., 1994a,b,c,d) for specific analytes detected. Typical VOC detections included benzene, toluene, ethylbenzene, and xylenes.

4. Total VOCs were calculated by summing all measured and estimated values, except those qualified with a "U", which are considered undetected because of associated blank contamination.

ND = None detected.

indicate that off-site migration of impacted groundwater is generally being controlled by on-site pumping.

VOC Patterns in the Shallow Dolomite Unit

Dissolved VOC concentrations in the shallow dolomite unit for 1994 are shown on Figure 6 of Appendix C. The level and pattern of VOC concentrations are similar to those documented in 1993 (RMT, 1993).

The concentrations of detected VOCs in the shallow dolomite are highest near the center of the site (well W-21A), and decrease with distance in all directions to levels generally below 10 μg/L at the perimeter of the site. This indicates that off-site migration of impacted groundwater is being controlled by on-site pumping.

3.3.3 VOC Trends by Monitoring Objective

This section describes trends in total VOC concentrations for each of the monitoring objectives. Total VOC concentration versus time plots for individual wells are presented in Appendix D. The discussion that follows is organized by monitoring objective (receptor, perimeter, remediation progress) followed by the hydrogeologic unit (glacial drift, shallow dolomite, deep dolomite). The total VOC data shown prior to 1992 were obtained from Hatcher-Sayre, Inc.

Receptor Monitoring

Ranney Collectors and POTW

Total VOCs were monitored in the shallow groundwater that was discharged from the Ranney collectors (RC-1, RC-2, and RC-3) and in the influent, effluent, and sludge samples that were collected at the POTW. These analyses were performed to monitor the levels of chemical compounds leaving the CCP site and being processed at the POTW. The total VOCs detected in 1994 are shown in Tables 5A and 5B. The total VOC concentrations in the Ranney collector discharges are variable, but overall exhibit a decreasing trend from over 100,000 μg/L in 1987 to levels in the 10's of thousands in 1994. RC-1 shows the most dramatic decrease in total VOC concentrations, down to levels under 1,000 μg/L. A steady decline in VOC concentrations is apparent in RC-3, and RC-2.

3.4.2 The Shallow Dolomite Unit

Over the past 3 years, VOC concentrations in the shallow dolomite have remained moderate to high in remediation progress wells. Perimeter wells in this unit generally contained low (less than 10 μg/L) to nondetectable levels of VOCs, with the exception of W-27. Migration of the contaminant plume in the shallow dolomite is being effectively controlled.

3.4.3 The Deep Dolomite Unit

VOC concentrations in the deep dolomite receptor and remediation progress wells (e.g., MW-1, MW-2, MW-3, MW-4, and W-30) continue at near or below detection limits. VOC concentrations at PW-08 have fluctuated over the past few years. VOC concentrations at W-30 have decreased since 1989.

3.4.4 Hydraulic Communication Between the Aquifers

The hydraulic head data indicate downward seepage from source areas in the glacial drift into the shallow dolomite through fractures in the upper portion of the bedrock.

TABLE 3

SUMMARY OF WELL RUNNING TIMES (1994)

Hydrogeologic Unit	Well I.D.	Monthly Running Time (hours)												Annual Total (hours)	Comments
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.		
Glacial drift 751.57	W-31	0.0	0.0	1.1	1.8	0.4	0.0	0.3	0.0	0.0	0.0	0.0	0.0	3.6	Groundwater elevation is significantly affected by pumping at RC-2.
	W-32	2.3	0.1	83.5	119.1	97.9	0.0	68.6	0.0	0.1	0.0	0.0	0.2	371.8	Groundwater elevation appears to be affected by pumping at RC-2.
	W-33	5.9	4.2	10.2	2.1	0.0	0.0	0.0	2.1	1.7	1.9	2.2	7.3	37.6	Groundwater elevation appears to be affected by pumping at RC-2.
	W-34	842.4	672.6	834.3	660.5	670.9	841.5	672.7	673.0	837.0	669.6	673.1	832.0	8879.6	Consistent elevated months were 5 weeks long.
	W-35	1.3	1.0	2.1	1.3	1.2	1.5	1.7	1.5	1.5	2.9	1.1	1.3	18.4	Pumping was between 0.2 and 0.5 hours/week.
	W-37	0.0	1.9	9.9	2.2	0.0	1.0	1.5	7.9	3.3	0.8	0.4	0.7	29.6	Water table maps indicate that groundwater elevation was above the bottom of the well at each monitoring event.
	RC-1	2.4	166.5	258.5	404.2	630.5	836.5	671.9	670.0	796.4	10.9	9.8	17.7	4475.3	Consistent weekly pumping hours during January, and May through December. Inconsistent weekly rates February, March, and April.
	RC-2	719.4	352.1	266.5	0.0	0.0	238.8	672.3	673.0	837.0	441.7	430.5	820.8	5452.1	Fairly consistent weekly rates except February through June.
	RC-3	0.1	15.9	219.0	83.4	30.1	24.3	66.9	36.2	14.6	0.3	0.2	0.0	491.0	Very inconsistent pumping throughout the year.
Shallow dolomite	W-21A	821.4	588.2	444.0	300.5	219.1	564.5	562.6	562.0	312.9	49.3	25.4	55.4	4505.3	Consistently greater than 100 hours/week during January, February, June, July, August, and first 2 weeks of September. Typically less than 15 hours/week from second week of September through end of year.
	W-24A	18.7	58.7	8.4	8.8	32.5	11.1	5.3	5.8	10.3	45.0	9.7	7.8	222.1	Typically less than 5 hours/week, with a few exceptions. The only week with greater than 20 hours was first week of February with 44.4 hours.
	W-28	842.1	672.7	834.1	674.7	671.0	841.0	671.7	68.6	27.1	639.6	585.1	456.4	6984.1	Typically over 100 hours/week except August, September, and December.
	W-29	406.7	316.1	239.8	165.7	246.6	234.3	290.3	39.2	68.0	74.7	70.3	117.3	2269.0	Consistently 40 to 100 hours/week January through May. Typically less than 25 hours/week June through December.

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680 and 710 feet above mean sea level (AMSL) were used in preparation of Figures 4A through 4D. In general, the potentiometric elevations in the shallow dolomite were lower during each quarter of 1994 than they were during the respective 1993 quarters. The average drop in potentiometric elevations ranged from 0.5 foot per well when comparing the spring quarters from 1993 and 1994, to 4 feet per well when comparing fall 1993 to fall 1994.

The contours on Figures 4a, 4b, 4c, and 4d indicate that groundwater in the shallow dolomite flows toward the center of the site, as a result of the pumping at well W-21A. A cone of depression up to 40 feet deep is defined centering on well W-21A. Based on a comparison of the water table maps and the shallow dolomite potentiometric surface maps, portions of the dolomite near W-21A are being dewatered.

The Deep Dolomite Hydrogeologic Unit

Potentiometric maps for the deep dolomite were not prepared because pumping rates and durations at three locations at which measurements were made are unknown. The data available are insufficient to determine the local flow patterns in the deep dolomite.

3.3 Groundwater Quality

3.3.1 Background

Table 1 presents the sampling schedule that was developed for 1994 groundwater monitoring, along with the VOC analysis method used each quarter. The parameters analyzed for in Methods 8260 and 8021 are listed in Table 4. The winter, spring, and fall quarter samples were analyzed for the full VOC list (8260), and the summer quarter samples were analyzed for either the full VOC list or the shorter aromatic VOC list (8021) as part of the annual sampling event.

3.3.2 Total VOC Data

The tabulated results of VOC concentrations in each well and the supporting laboratory data sheets were presented in the four quarterly reports (RMT, 1994a, 1994b, 1994c, and 1994d). Tables 5, 6, and 7 present a summary of total VOC

TABLE 4

SUMMARY OF ANALYTES ANALYZED FOR IN METHODS 8260 AND 8021
COOK COMPOSITES & POLYMERS

Volatile Organic Compounds by Method 8260		Aromatic Volatile Organic Compounds by Method 8021
Chloroethane	1,1,2,2-Tetrachloroethane	Benzene
Chloromethane	1,2-Dichloropropane	Toluene
Bromomethane	trans-1,2-Dichloropropene	Ethylbenzene
Vinyl chloride	Trichloroethene	Chlorobenzene
Methylene chloride	Dibromochloromethane	Xylenes (total)
Acetone	1,1,2-Trichloroethane	1,4-Dichlorobenzene
Carbon disulfide	Benzene	1,3-Dichlorobenzene
1,1-Dichloroethene	cis-1,3-Dichloropropene	1,2-Dichlorobenzene
1,1-Dichloroethane	Bromoform	
1,2-Dichloroethene (total)	2-Hexanone	
Chloroform	4-Methyl-2-Pentanone	
1,2-Dichloroethane	Tetrachloroethene	
2-Butanone	Toluene	
1,1,1-Trichloroethane	Chlorobenzene	
Carbon tetrachloride	Ethylbenzene	
Vinyl acetate	Styrene	
Bromodichloromethane	Xylenes (total)	

concentrations in each well for the four quarters. The wells are organized by monitoring objective and hydrogeologic unit as described in Subsection 3.1 and Table 1. Figure 2 shows the locations of the monitoring wells. The lateral distribution of VOCs in the glacial drift unit and in the shallow dolomite unit for the year is depicted on two composite isoconcentration maps. Composite maps for 1994 were constructed using VOC concentration data from all four quarterly sampling rounds. The isoconcentration maps are included on Figures 5 and 6 of Appendix C.

VOC Patterns in the Glacial Drift Unit

The extent of VOC contamination in the glacial drift unit for 1994 is shown on Figure 5 of Appendix C. As noted in Subsection 3.2, wells W-3B and W-20 are completed in the glacial drift in the sinkhole and are therefore more representative of water quality in the shallow dolomite aquifer. Isoconcentration contours in the glacial drift unit (Figure 5) do not include VOC detections in the Ranney collectors because these are composite groundwater samples that were collected from areas of the site through radial collection lines.

The pattern of VOC concentrations in 1994 (Figure 5) is similar to that observed in 1993 and in previous years (RMT, 1993; and Hatcher-Sayre, Inc., 1992).

Three major VOC plumes are apparent in the pattern of VOC concentrations in the glacial drift unit (Figure 5 of Appendix C). The first plume, which is located in the northern portion of the site, is centered at the former hazardous waste incinerator/former urethane laboratory area, with total VOC concentrations greater than 500,000 μg/L, and extends off-site to the east under the churchyard. The second plume, which is located in the southwestern portion of the site, is centered in the area of the former dry well and extends a short distance to the south and east. Total VOC concentrations in this area range from 500 μg/L to over 100,000 μg/L. The third prominent plume is centered around W-43, with a total VOC concentration of greater than 90,000 μg/L. This plume appears to originate in the vicinity of the former tank farm area and is effectively captured by the collection lines of RC-1. The water table maps (Figures 3a through 3d) and the isoconcentration map (Figure 5 of Appendix C)

TABLE 5A - TOTAL VOCS DETECTED, 1994
RECEPTOR GROUP - GLACIAL UNIT

SAMPLE ID	01/94		04/94		07/94		10/94	
RC-1			19330	UG/L	1596	UG/L	352.6	UG/L
RC-2	303.1	UG/L			4041	UG/L	65490	UG/L
RC-3	3616	UG/L	80200	UG/L	37340	UG/L	22540	UG/L

TABLE 5B - TOTAL VOCS DETECTED, 1994
RECEPTOR GROUP - DEEP DOLOMITE UNIT AND POTW

SAMPLE ID	01/94		04/94		07/94		10/94	
MW-01	ND	UG/L	ND	UG/L	.3	UG/L	ND	UG/L
MW-02					ND	UG/L		
MW-03	ND	UG/L	1.5	UG/L	ND	UG/L	ND	UG/L
MW-03 DUP					ND	UG/L		
MW-04	ND	UG/L	ND	UG/L	ND	UG/L	ND	UG/L
MW-04 DUP	ND	UG/L	ND	UG/L			ND	UG/L
POTW-E	ND	UG/L	3.3	UG/L	3.5	UG/L	ND	UG/L
POTW-I	2	UG/L	92.1	UG/L	2.8	UG/L	58	UG/L
POTW-S	13	UG/L	1189	UG/L	.5	UG/L	ND	UG/L

1. Ranney collectors RC-1, RC-2, and RC-3 are shallow groundwater drains sampled at the manhole, prior to discharge to the POTW. Wells MW-01, MW-02, MW-03, and MW-04 are screened in the deep dolomite. Well MW-02 is only sampled in July. Monitoring points POTW-E, POTW-I, and POTW-S are sampled at the wastewater treatment facility.

2. Blank entries mean that a sample was not collected at the monitoring point during that quarter, typically because the well was dry.

3. Refer to summary tables in the quarterly reports (RMT, Inc., 1994a,b,c,d) for specific analytes detected. Typical VOC detections included benzene, toluene, ethylbenzene, and xylenes.

4. Total VOCs were calculated by summing all measured and estimated values, except those qualified with a "U", which are considered undetected because of associated blank contamination.

ND = None detected.

TABLE 6A - TOTAL VOCS DETECTED, 1994
PERIMETER GROUP - GLACIAL UNIT

SAMPLE ID	04/94		10/94	
W-01A	ND	UG/L	2.6	UG/L
W-03B	ND	UG/L	ND	UG/L
W-03B DUP	ND	UG/L	ND	UG/L
W-04A	.4	UG/L		
W-08	ND	UG/L		
W-20	ND	UG/L	ND	UG/L
W-27	112.7	UG/L	217	UG/L

TABLE 6B - TOTAL VOCS DETECTED, 1994
PERIMETER GROUP - SHALLOW DOLOMITE UNIT

SAMPLE ID	04/94		10/94	
PW-08	2	UG/L	2	UG/L
W-03A	ND	UG/L	ND	UG/L
W-07	ND	UG/L	ND	UG/L
W-22	.6	UG/L	17	UG/L
W-23	22	UG/L	18.9	UG/L
W-23 DUP	21	UG/L	20.1	UG/L
W-25	ND	UG/L	ND	UG/L

1. Well PW-08 is a deep dolomite well.

2. Blank entries mean that a sample was not collected at the monitoring point during that quarter, typically because the well was dry.

3. Refer to summary tables in the quarterly reports (RMT, Inc., 1994a,b,c,d) for specific analytes detected. Typical VOC detections included 1,2-dichloroethene, trichloroethene, benzene, toluene, ethylbenzene, and xylenes.

4. Total VOCs were calculated by summing all measured and estimated values, except those qualified with a "U", which are considered undetected because of associated blank contamination.

ND = None detected.

TABLE 7A - TOTAL VOCS DETECTED, 1994
REMEDIATION PROGRESS GROUP - GLACIAL UNIT

SAMPLE ID	07/94		10/94	
W-06A	196750	UG/L		
W-19A	ND	UG/L		
W-19A DUP	ND	UG/L		
W-37			163520	UG/L
W-41	550	UG/L		
W-42	13990	UG/L		
W-43			93600	UG/L
W-47			550000	UG/L

TABLE 7B - TOTAL VOCS DETECTED, 1994
REMEDIATION PROGRESS GROUP - SHALLOW DOLOMITE UNIT

SAMPLE ID	07/94	
W-21A	28600	UG/L
W-24A	ND	UG/L
W-28	14	UG/L
W-29	5160	UG/L
W-30	3	UG/L
W-30 DUP	3.7	UG/L
W-38	2430	UG/L

1. Well W-30 is a deep dolomite well.

2. Wells W-37, W-43, and W-47 were not sampled in July due to high water levels precluding safe access to the wells, therefore, the wells were sampled in October.

3. Refer to summary tables in the quarterly reports (RMT, Inc., 1994a,b,c,d) for specific analytes detected. Typical VOC detections included benzene, toluene, ethylbenzene, and xylenes.

4. Total VOCs were calculated by summing all measured and estimated values, except those qualified with a "U", which are considered undetected because of associated blank contamination.

ND = None detected.

indicate that off-site migration of impacted groundwater is generally being controlled by on-site pumping.

VOC Patterns in the Shallow Dolomite Unit

Dissolved VOC concentrations in the shallow dolomite unit for 1994 are shown on Figure 6 of Appendix C. The level and pattern of VOC concentrations are similar to those documented in 1993 (RMT, 1993).

The concentrations of detected VOCs in the shallow dolomite are highest near the center of the site (well W-21A), and decrease with distance in all directions to levels generally below 10 μg/L at the perimeter of the site. This indicates that off-site migration of impacted groundwater is being controlled by on-site pumping.

3.3.3 VOC Trends by Monitoring Objective

This section describes trends in total VOC concentrations for each of the monitoring objectives. Total VOC concentration versus time plots for individual wells are presented in Appendix D. The discussion that follows is organized by monitoring objective (receptor, perimeter, remediation progress) followed by the hydrogeologic unit (glacial drift, shallow dolomite, deep dolomite). The total VOC data shown prior to 1992 were obtained from Hatcher-Sayre, Inc.

Receptor Monitoring

<u>Ranney Collectors and POTW</u>

Total VOCs were monitored in the shallow groundwater that was discharged from the Ranney collectors (RC-1, RC-2, and RC-3) and in the influent, effluent, and sludge samples that were collected at the POTW. These analyses were performed to monitor the levels of chemical compounds leaving the CCP site and being processed at the POTW. The total VOCs detected in 1994 are shown in Tables 5A and 5B. The total VOC concentrations in the Ranney collector discharges are variable, but overall exhibit a decreasing trend from over 100,000 μg/L in 1987 to levels in the 10's of thousands in 1994. RC-1 shows the most dramatic decrease in total VOC concentrations, down to levels under 1,000 μg/L. A steady decline in VOC concentrations is apparent in RC-3, and RC-2.

Ranney collector discharge is mixed with wastewater from diverse sources upon arrival at the POTW, which explains the variability in POTW influent VOC concentrations. The low or nondetectable levels of VOCs in the discharge effluent demonstrate that the discharge from CCP does not adversely affect the permit requirements for the POTW. Total VOC concentrations in the POTW sludge varied from no detections to over 1,000 μg/L in 1994.

Municipal Wells (Deep Dolomite Wells)

VOC concentrations in the municipal wells (MW-1 through MW-4) were generally not detected or detected below the reporting limit for 1994, indicating that the Village water supply wells continue to be unaffected by the CCP site. The total VOC concentrations reported in Table 5B of 1.5 μg/L in well MW-3 and 0.3 μg/L in well MW-1 represent VOCs detected below the reporting limit.

Perimeter Monitoring

Glacial Drift Wells

VOC concentrations in the perimeter wells screened in the glacial drift in 1994 were typically low (< 10 μg/L) or nondetectable with the exception of the concentrations at W-27. These concentrations are consistent with those of the past 3 years. Well W-27 continued to show a high degree of variability in chlorinated hydrocarbon concentrations and a return to concentrations in excess of 100 μg/L. Well W-27 is hydraulically upgradient of the CCP facility; therefore, concentrations of chlorinated hydrocarbons suggest an off-site source of chlorinated constituents.

Well W-27 exhibited exceedances of the Wisconsin Administrative Code NR 140 Enforcement Standard (ES) for trichloroethene, and exceedances of the Preventive Action Limit (PAL) for 1,2-dichloroethene. Well W-27 has consistently shown concentrations of chlorinated VOCs since 1988. The presence of these compounds in an upgradient well suggests migration from an upgradient source. Well W-01A (north of the facility) had one PAL exceedance for trichloroethene.

Dolomite Wells

VOC levels in remediation progress wells screened in the dolomite displayed concentrations within ranges established over the past 3 years. W-21A and W-28 show little change in concentration over the last several years. Decreasing trends have been noted in wells W-24A, W-29, W-30, and W-38.

Several wells contained VOCs at concentrations exceeding either their ESs or PALs. The exceedances were for one or more of the BTEX compounds in wells W-21A, W-28, W-29, W-30, and W-38. These wells are located near the center of the site or just to the west of center. Chlorinated compounds were consistently detected in remediation progress well W-24A, which is located on the southwestern corner of the site, from 1988 through 1992. Only one remedial progress well screened in the shallow dolomite and not located on the west side of the site (W-29) showed concentrations of chlorinated compounds (1988 and 1992). Chlorinated compounds have not been analyzed in wells W-24A and W-29 since 1992.

3.4 Plume Containment

The discussion in this section combines groundwater flow and quality trends from the receptor, perimeter, and remediation progress wells in the glacial drift and dolomite, to present an evaluation of the effectiveness of the plume containment in the remedial system at the Saukville site.

3.4.1 The Glacial Drift Unit

The groundwater quality data and water table maps suggest little or no off-site migration of contaminants. The concentrations of total VOCs in remediation progress wells are generally within ranges established over the past 3 years. Exceptions include well W-47 in the northwestern portion of the site, which has shown a decreasing trend in VOC concentrations over the past 3 years, and W-19A just west of the site, which had no VOC detections in 1994. These data indicate that off-site migration of contaminated groundwater within the glacial drift unit is being effectively controlled.

3.4.2 The Shallow Dolomite Unit

Over the past 3 years, VOC concentrations in the shallow dolomite have remained moderate to high in remediation progress wells. Perimeter wells in this unit generally contained low (less than 10 μg/L) to nondetectable levels of VOCs, with the exception of W-27. Migration of the contaminant plume in the shallow dolomite is being effectively controlled.

3.4.3 The Deep Dolomite Unit

VOC concentrations in the deep dolomite receptor and remediation progress wells (e.g., MW-1, MW-2, MW-3, MW-4, and W-30) continue at near or below detection limits. VOC concentrations at PW-08 have fluctuated over the past few years. VOC concentrations at W-30 have decreased since 1989.

3.4.4 Hydraulic Communication Between the Aquifers

The hydraulic head data indicate downward seepage from source areas in the glacial drift into the shallow dolomite through fractures in the upper portion of the bedrock.

Section 4

REFERENCES

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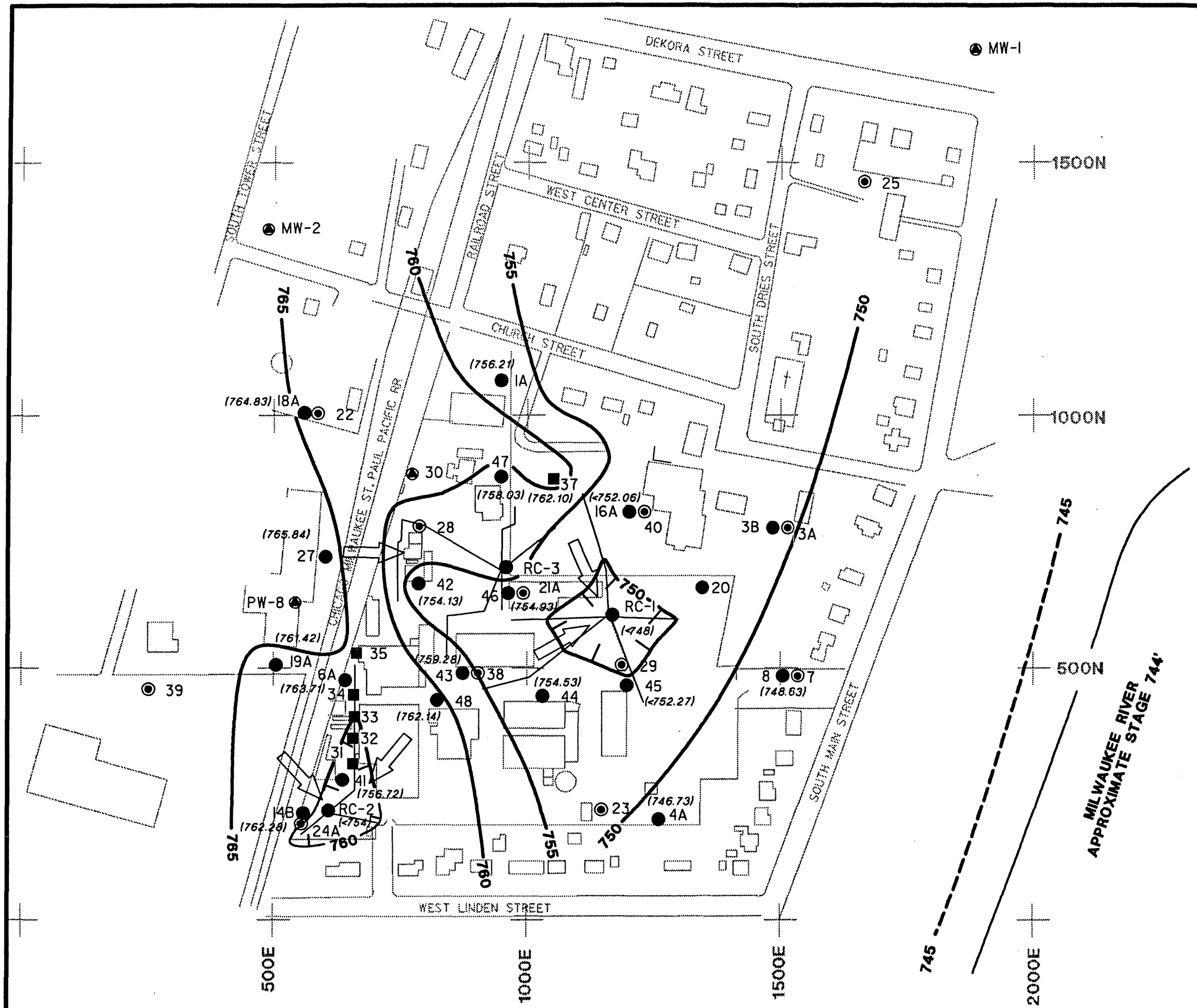
RMT, Inc. 1994c. 1994 Summer quarter groundwater results. Prepared for: Cook Composites and Polymers Co. September 1994.

RMT, Inc. 1994d. 1994 Fall quarter groundwater results. Prepared for: Cook Composites and Polymers Co. January 1995.

APPENDIX A

WATER TABLE AND POTENTIOMETRIC SURFACE MAPS



LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY COLLECTOR
- (756.21) WATER TABLE ELEVATION
- 750 WATER TABLE CONTOUR (5-foot INTERVAL)
- GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP WAS DEVELOPED FROM HATCHER-SAYRE, INC., 1992.
2. ELEVATIONS EXPRESSED IN FEET ABOVE MEAN SEA LEVEL.

WATER TABLE MAP
GLACIAL DRIFT - WINTER 1994
COOK COMPOSITES AND POLYMERS
SAUKVILLE, WISCONSIN

RMT INC.

Dwn. By:	BLG
Approved By:	COB
Date:	JANUARY 1995
Proj. #:	1832.63
File #:	18326307

FIGURE 3A

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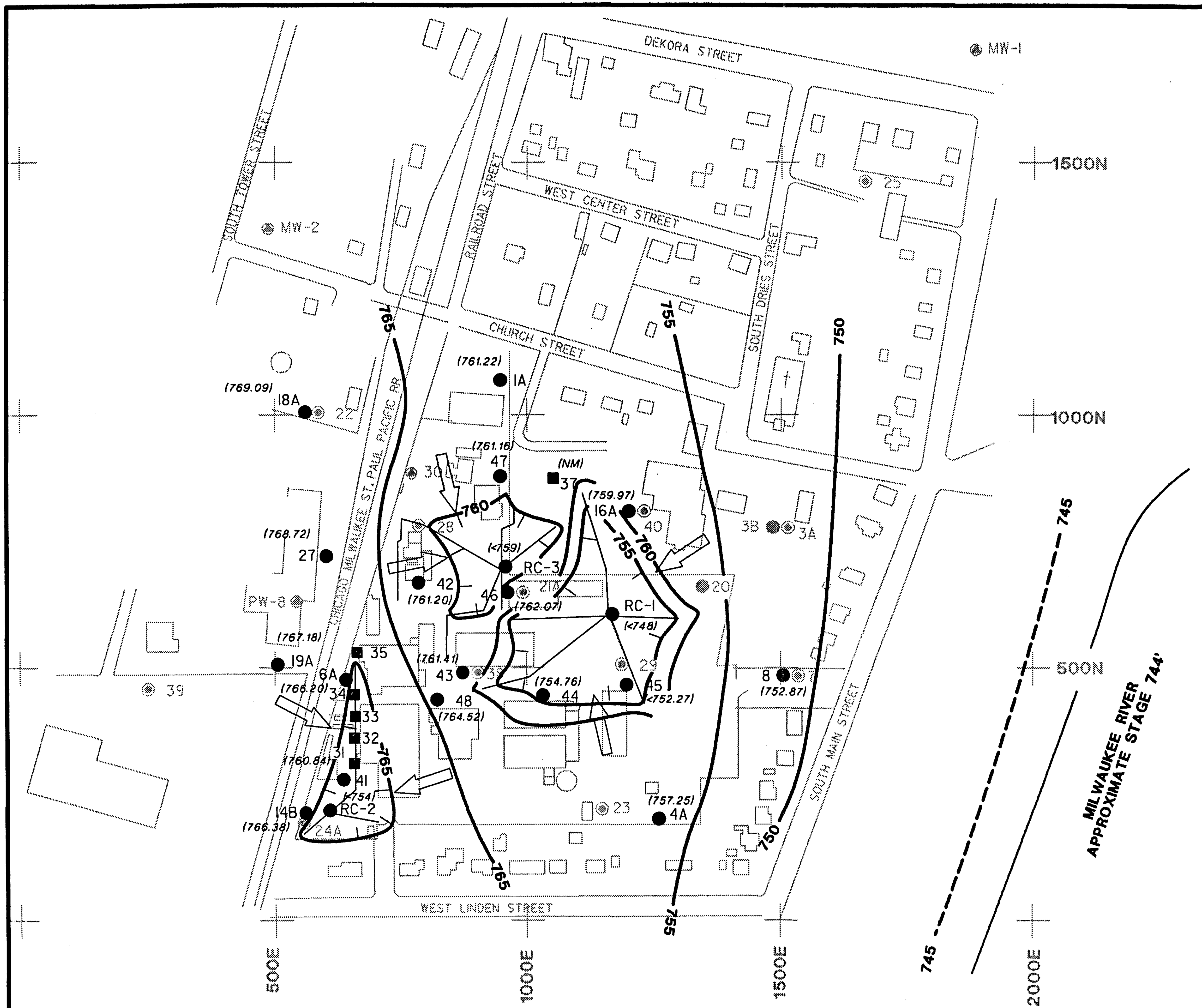

LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY COLLECTOR
- *(756.21)* WATER TABLE ELEVATION
- 750 WATER TABLE CONTOUR (5-foot INTERVAL)
- GROUNDWATER FLOW DIRECTION
- *(NM)* NOT MEASURED

NOTES

1. BASE MAP WAS DEVELOPED FROM HATCHER-SAYRE, INC., 1992.
2. ELEVATIONS ARE EXPRESSED IN FEET ABOVE MEAN SEA LEVEL.

0 200 400
SCALE: 1"=200'

WATER TABLE MAP
GLACIAL DRIFT - SPRING 1994
COOK COMPOSITES AND POLYMERS
SAUKVILLE, WISCONSIN

RMT INC.

Dwn. By:	BLG
Approved By:	COB
Date:	JANUARY 1995
Proj. #:	1832.63
File #:	18326308

FIGURE 3B

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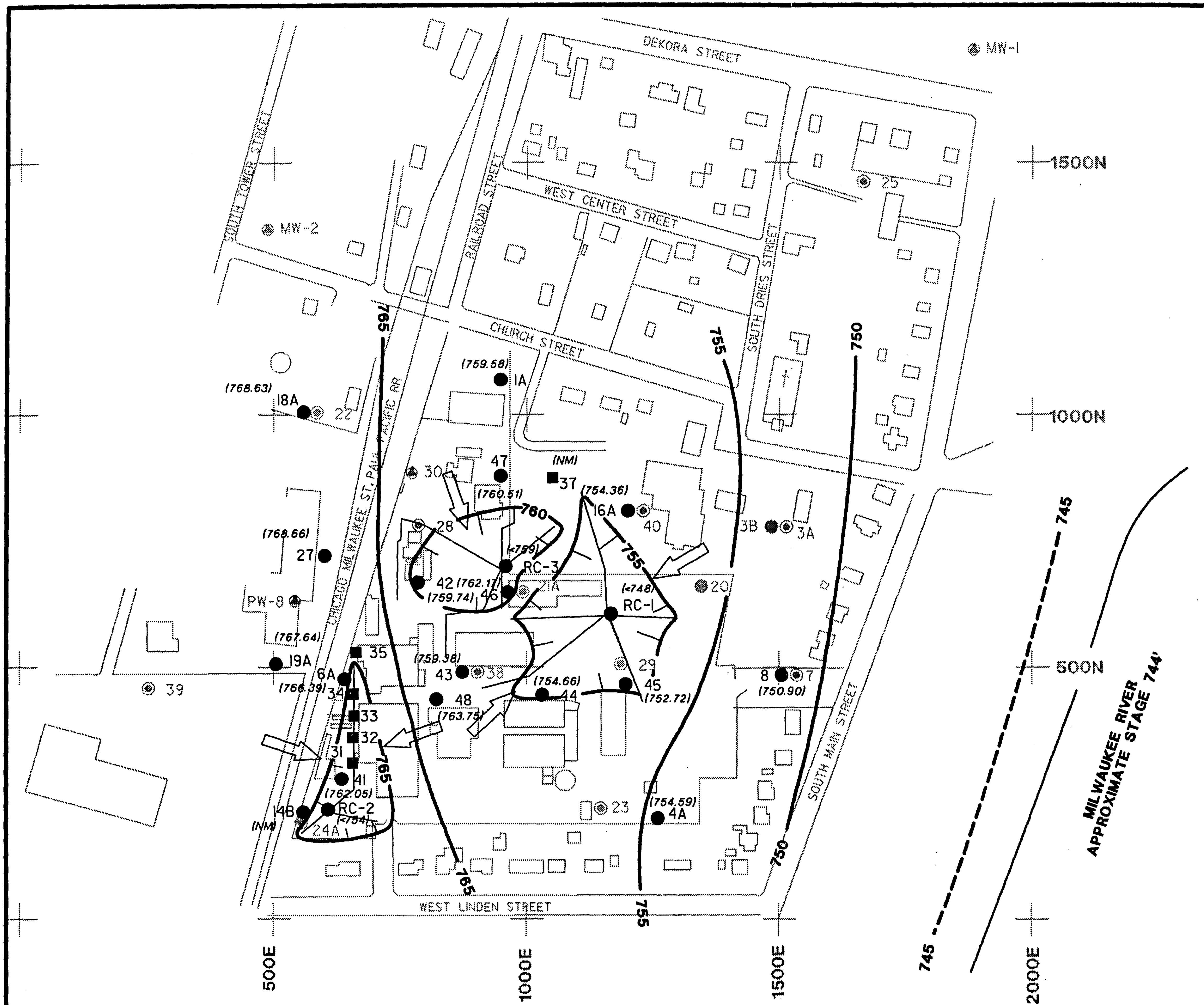

LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY COLLECTOR
- (756.21) WATER TABLE ELEVATION
- 750 WATER TABLE CONTOUR (5-foot INTERVAL)
- GROUNDWATER FLOW DIRECTION
- (NM) NOT MEASURED

NOTES

1. BASE MAP WAS DEVELOPED FROM HATCHER-SAYRE, INC., 1992.
2. ELEVATIONS ARE EXPRESSED IN FEET ABOVE MEAN SEA LEVEL.

0 200 400

SCALE: 1"=200'

WATER TABLE MAP GLACIAL DRIFT - SUMMER 1994

COOK COMPOSITES AND POLYMERS SAUKVILLE, WISCONSIN

RMT INC.

Dwn.By:	BLG
Approved By:	C.O.B
Date:	JANUARY 1995
Proj.#:	1832.63
File #:	18326309

FIGURE 3C

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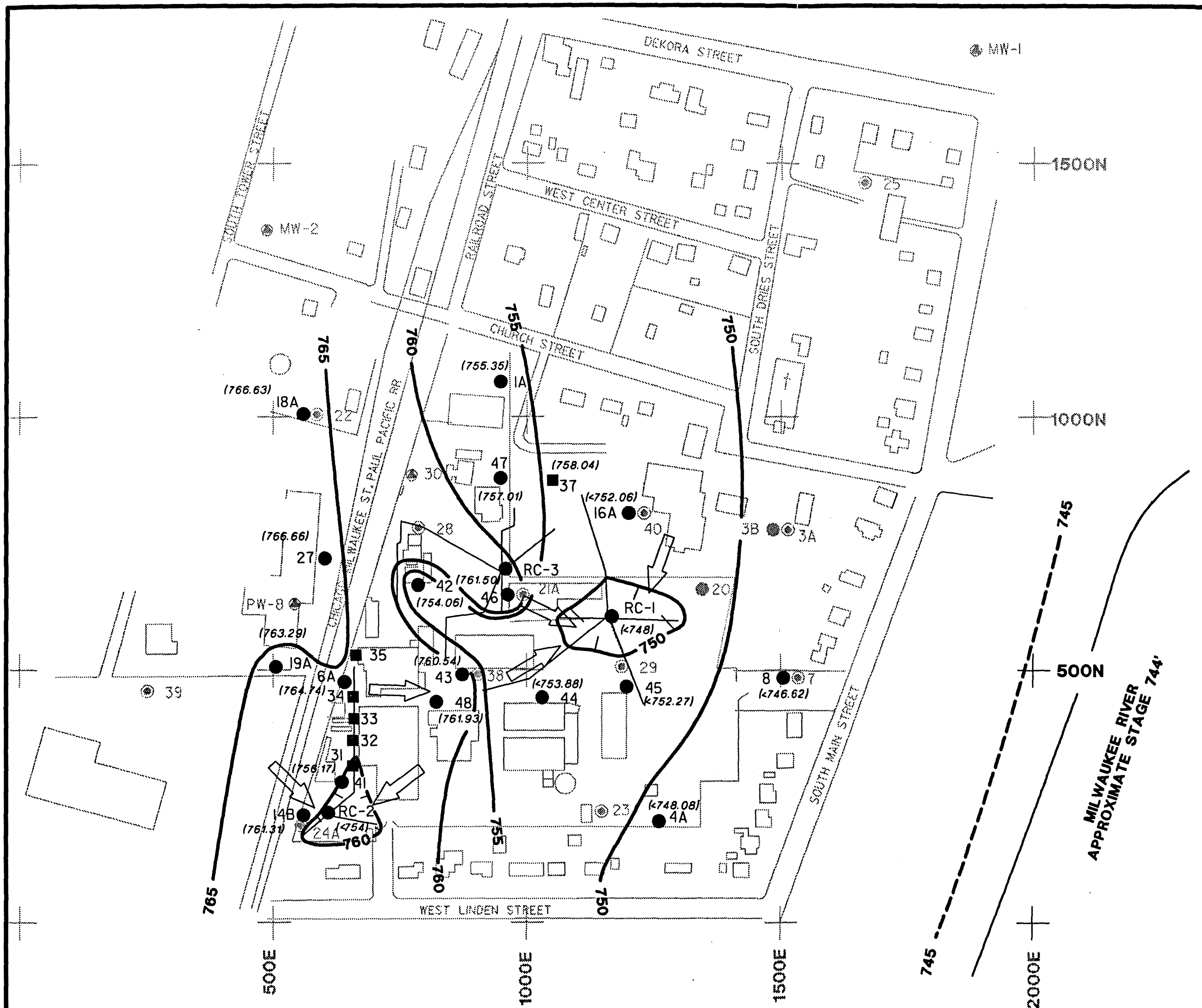


LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY COLLECTOR
- *(756.21)* WATER TABLE ELEVATION
- 750 WATER TABLE CONTOUR (5-foot INTERVAL)
- GROUNDWATER FLOW DIRECTION
- *(NM)* NOT MEASURED

NOTES

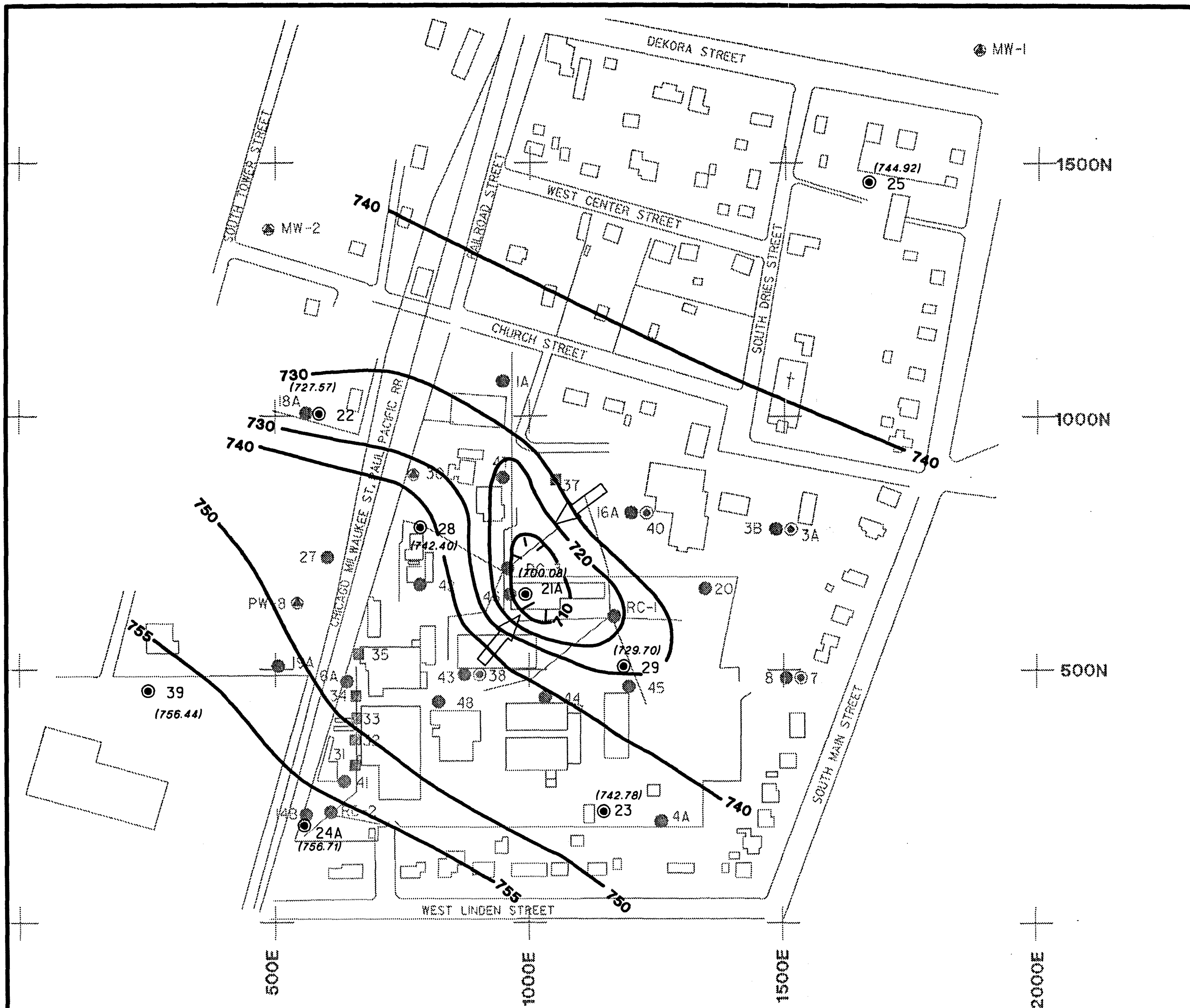
1. BASE MAP WAS DEVELOPED FROM HATCHER-SAYRE, INC., 1992.
2. ELEVATIONS ARE EXPRESSED IN FEET ABOVE MEAN SEA LEVEL.

WATER TABLE MAP
GLACIAL DRIFT - FALL 1994
COOK COMPOSITES AND POLYMERS
SAUKVILLE, WISCONSIN

RMT INC.

Dwn.By:	BLG
Approved By:	COB
Date:	JANUARY 1995
Proj.#:	1832.63
File #:	18326310

FIGURE 3D

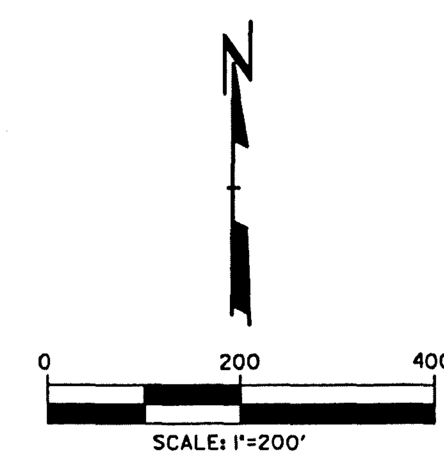


LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY COLLECTOR
- (744.92) POTENTIOMETRIC ELEVATION
- 740 POTENTIOMETRIC CONTOUR (10-foot INTERVAL)
- GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP WAS DEVELOPED FROM HATCHER-SAYRE, INC., 1992.
2. ELEVATIONS EXPRESSED IN FEET ABOVE MEAN SEA LEVEL.
3. THE ELEVATIONS OF THE BOTTOMS OF THE SHALLOW DOLOMITE WELLS USED TO CONSTRUCT THIS FIGURE ARE BETWEEN 680 AND 710 FEET ABOVE MSL.



POTENTIOMETRIC SURFACE MAP SHALLOW DOLOMITE - WINTER 1994

COOK COMPOSITES AND POLYMERS SAUKVILLE, WISCONSIN

RMT INC.

Dwn.By:	BLG
Approved By:	COB
Date:	JANUARY 1995
Proj.#:	1832.63
File #:	18326303

FIGURE 4A

User is unknown
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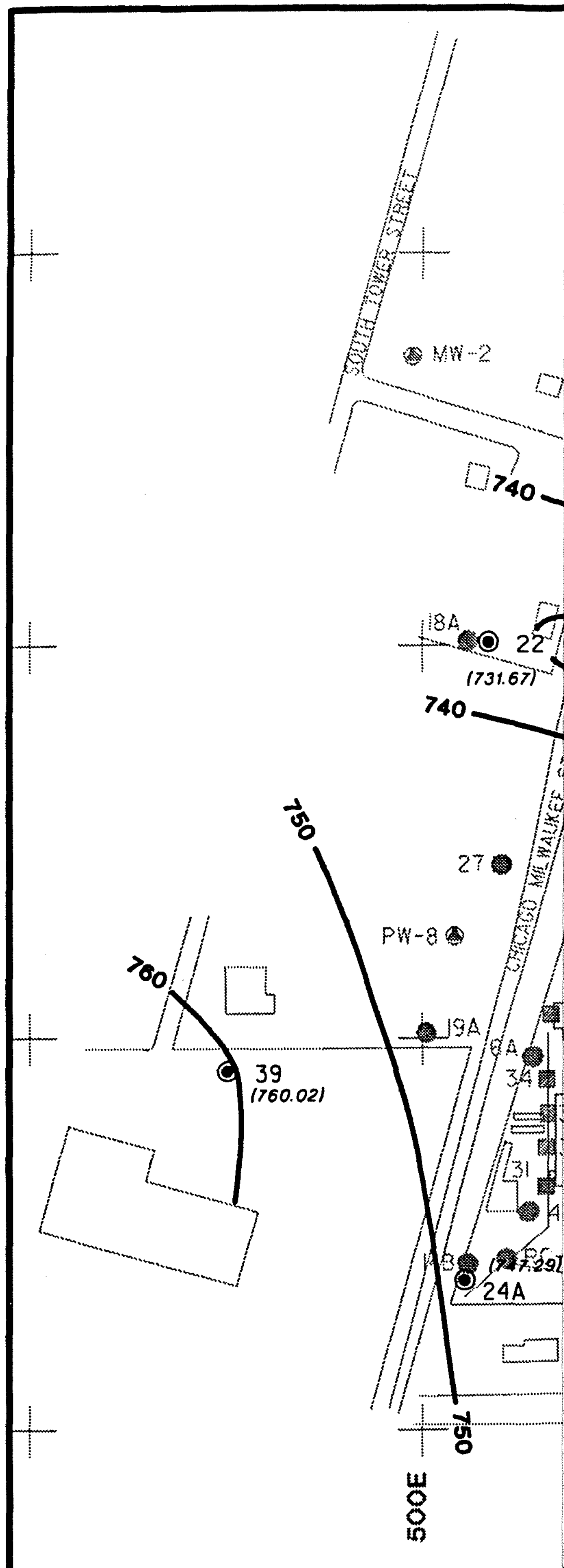

LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY COLLECTOR
- (14.92) POTENTIOMETRIC ELEVATION
- POTENTIOMETRIC CONTOUR (10-foot INTERVAL)
- GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP WAS DEVELOPED FROM HATCHER-SAYRE, INC., 1992.
2. ELEVATIONS EXPRESSED IN FEET ABOVE MEAN SEA LEVEL.
3. THE ELEVATIONS OF THE BOTTOMS OF THE SHALLOW DOLOMITE WELLS USED TO CONSTRUCT THIS FIGURE ARE BETWEEN 680 AND 710 FEET ABOVE MSL.

N

0 200 400

SCALE: 1"=200'

POTENTIOMETRIC SURFACE MAP
SHALLOW DOLOMITE - SPRING 1994

COOK COMPOSITES AND POLYMERS
SAUKVILLE, WISCONSIN

RMT INC.

Dwn.By:	BLG
Approved By:	COB
Date:	JANUARY 1995
Proj.#:	1832.63
File #:	18326304

FIGURE 4B

Design File = h:\1832_63\18326304.dgn
Plot File = P:\MSPC\18326304.PRF
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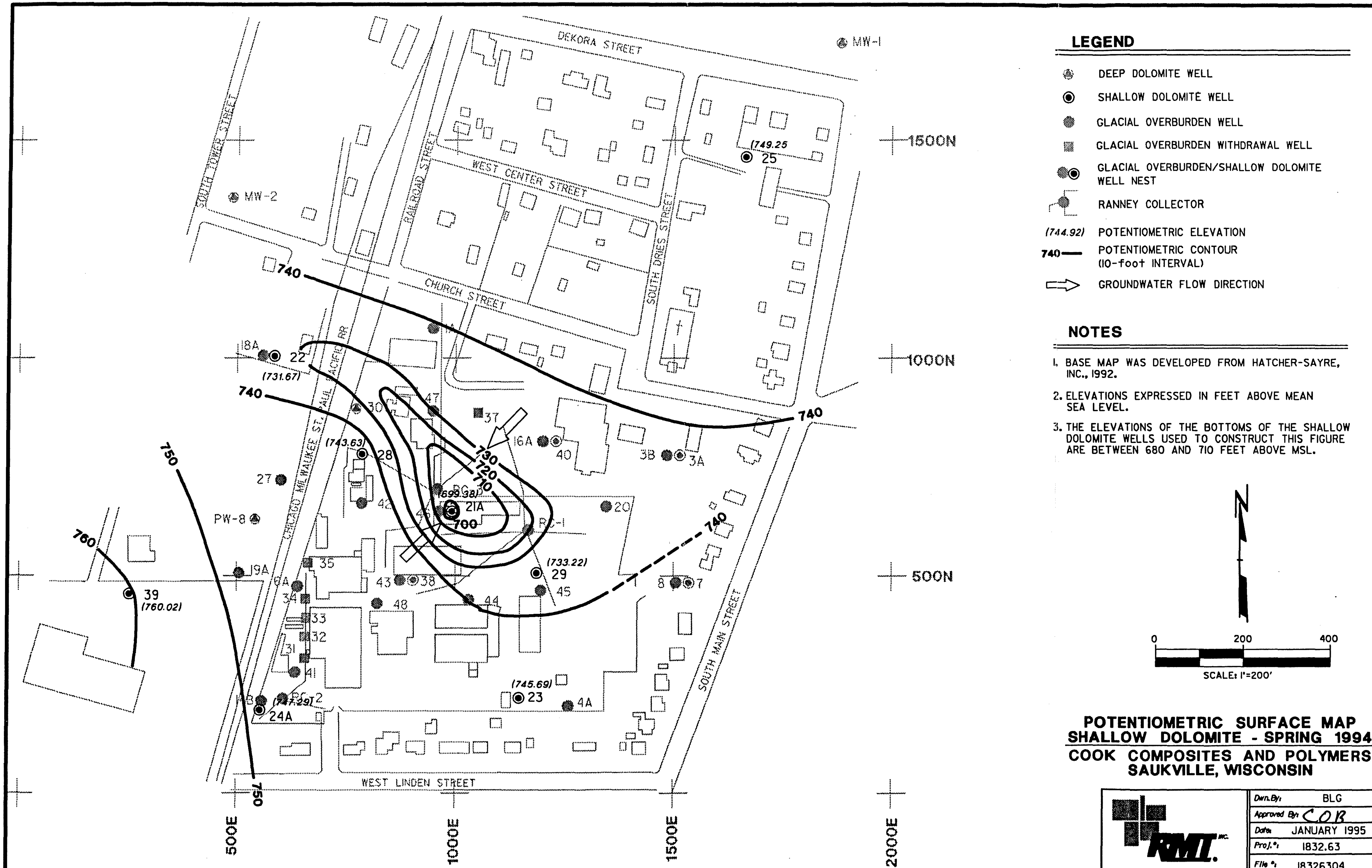
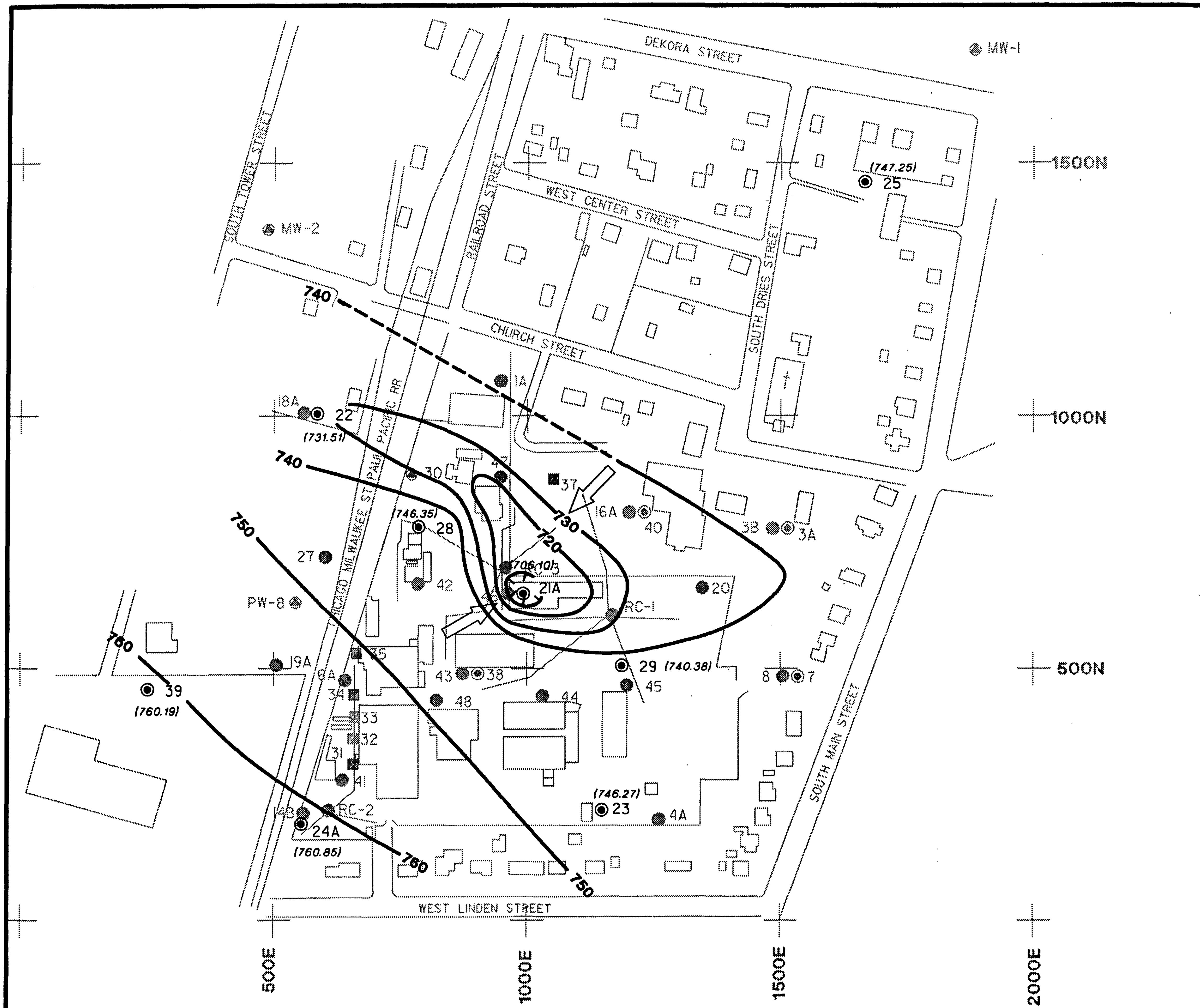

DEKORA STREET
MW-1
MW-2
SOUTH TOWER STREET
RAILROAD STREET
WEST CENTER STREET
CHURCH STREET
SOUTH DRIES STREET
CHICAGO MILWAUKEE ST. PAUL PACIFIC RR
SOUTH MAIN STREET
WEST LINDEN STREET
(749.25
25
18A
22
(731.67)
740
750
760
730
720
710
700
47
37
30
(743.63)
28
16A
40
3B
3A
27
RC-3
(699.38)
21A
42
46
20
RC-1
PW-8
(733.22)
29
45
19A
35
6A
43
38
8
7
34
44
48
39
(760.02)
33
32
31
41
(745.69)
23
4A
18B
RC-2
(747.29)
24A
1500N
1000N
500N
500E
1000E
1500E
2000E
LEGEND
DEEP DOLOMITE WELL
SHALLOW DOLOMITE WELL
GLACIAL OVERBURDEN WELL
GLACIAL OVERBURDEN WITHDRAWAL WELL
GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
RANNEY COLLECTOR
(744.92) POTENTIOMETRIC ELEVATION
740 POTENTIOMETRIC CONTOUR (10-foot INTERVAL)
GROUNDWATER FLOW DIRECTION
NOTES
1. BASE MAP WAS DEVELOPED FROM HATCHER-SAYRE, INC., 1992.
2. ELEVATIONS EXPRESSED IN FEET ABOVE MEAN SEA LEVEL.
3. THE ELEVATIONS OF THE BOTTOMS OF THE SHALLOW DOLOMITE WELLS USED TO CONSTRUCT THIS FIGURE ARE BETWEEN 680 AND 710 FEET ABOVE MSL.
N
0
200
400
SCALE: 1"=200'
POTENTIOMETRIC SURFACE MAP
SHALLOW DOLOMITE - SPRING 1994
COOK COMPOSITES AND POLYMERS
SAUKVILLE, WISCONSIN
RMT INC.
Dwn.By: BLG
Approved By: COB
Date: JANUARY 1995
Proj.#: 1832.63
File #: 18326304

FIGURE 4B



LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY COLLECTOR
- (744.92) POTENTIOMETRIC ELEVATION
- 740 — POTENTIOMETRIC CONTOUR (10-foot INTERVAL)
- GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP WAS DEVELOPED FROM HATCHER-SAYRE, INC., 1992.
2. ELEVATIONS EXPRESSED IN FEET ABOVE MEAN SEA LEVEL.
3. THE ELEVATIONS OF THE BOTTOMS OF THE SHALLOW DOLOMITE WELLS USED TO CONSTRUCT THIS FIGURE ARE BETWEEN 680 AND 710 FEET ABOVE MSL.

N

0 200 400

SCALE: 1"=200'

POTENTIOMETRIC SURFACE MAP SHALLOW DOLOMITE - SUMMER 1994

COOK COMPOSITES AND POLYMERS SAUKVILLE, WISCONSIN

RMT INC.

Dwn.By:	BLG
Approved By:	COB
Date:	JANUARY 1995
Proj.#:	1832.63
File #:	18326305

FIGURE 4C

sign h:\83 83263
user is unknown
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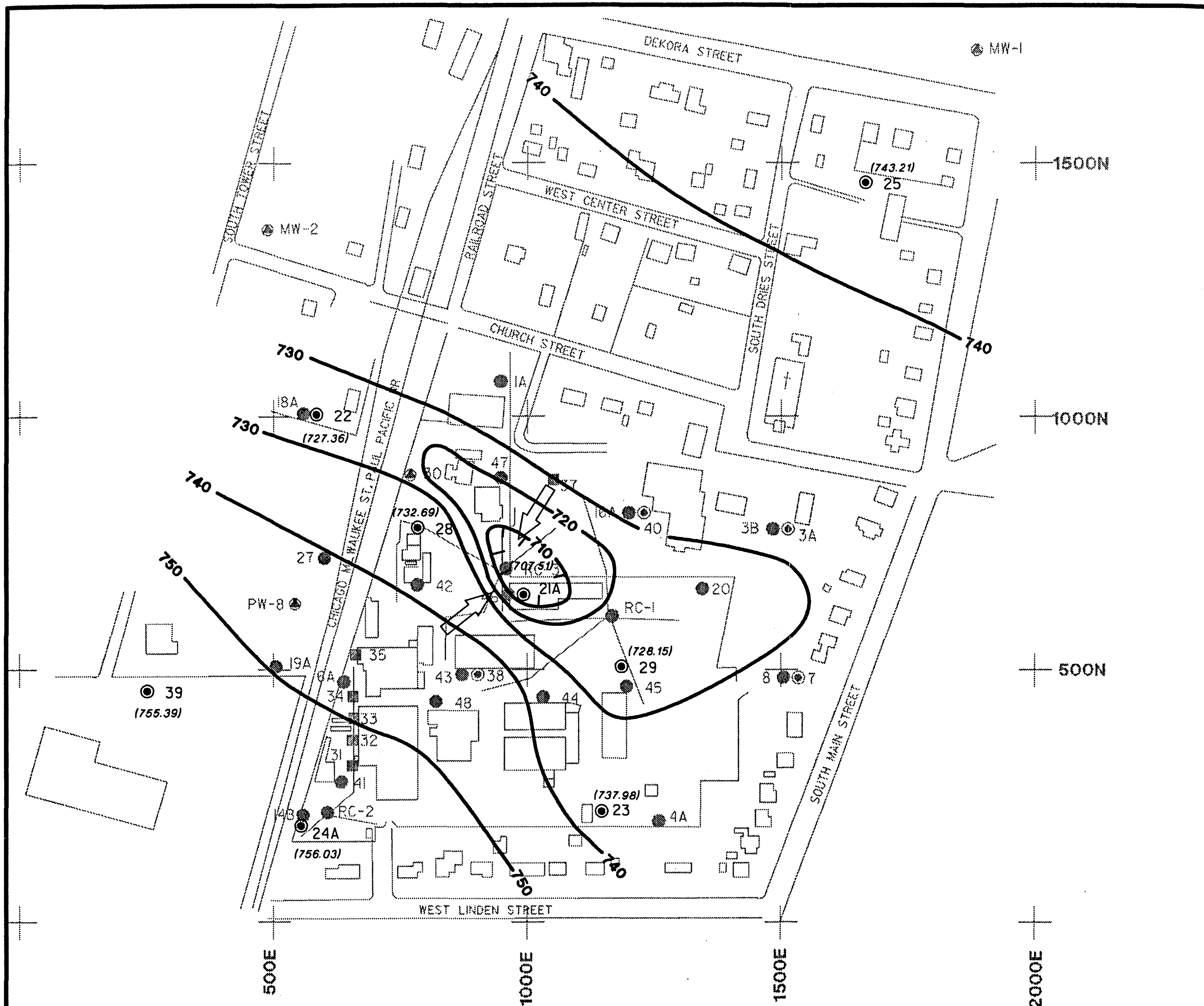


LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY COLLECTOR
- (744.92) POTENTIOMETRIC ELEVATION
- 740 — POTENTIOMETRIC CONTOUR (10-foot INTERVAL)
- GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP WAS DEVELOPED FROM HATCHER-SAYRE, INC., 1992.
2. ELEVATIONS EXPRESSED IN FEET ABOVE MEAN SEA LEVEL.
3. THE ELEVATIONS OF THE BOTTOMS OF THE SHALLOW DOLOMITE WELLS USED TO CONSTRUCT THIS FIGURE ARE BETWEEN 680 AND 710 FEET ABOVE MSL.

N

0 200 400

SCALE: 1"=200'

POTENTIOMETRIC SURFACE MAP SHALLOW DOLOMITE - FALL 1994

COOK COMPOSITES AND POLYMERS SAUKVILLE, WISCONSIN

RMT INC.

Dwn. By:	BLG
Approved By:	COB
Date:	JANUARY 1995
Proj.#:	1832.63
File #:	18326306

Plot File = P:\MSPC\18326306.PRF
Plot Date = Tue Jan 31 09:31:51 1995
Pen Table = h:\1832_63\table\18326306.tbl

FIGURE 4D

APPENDIX B

HYDROGEOLOGIC CALCULATIONS
SUMMER 1994

APPENDIX B

HYDROGEOLOGIC CALCULATIONS
SUMMER 1994

Horizontal

***Glacial Drift Unit*:**

$$I = \frac{dH}{dL} = \frac{765-750}{915} = 0.02 \ (\textit{eastward})$$

Vertical Gradient

Between Glacial Drift Unit and Shallow Dolomite Unit

W18A/W22
center D = (772.53-66) + 1/2(40) = 726.53

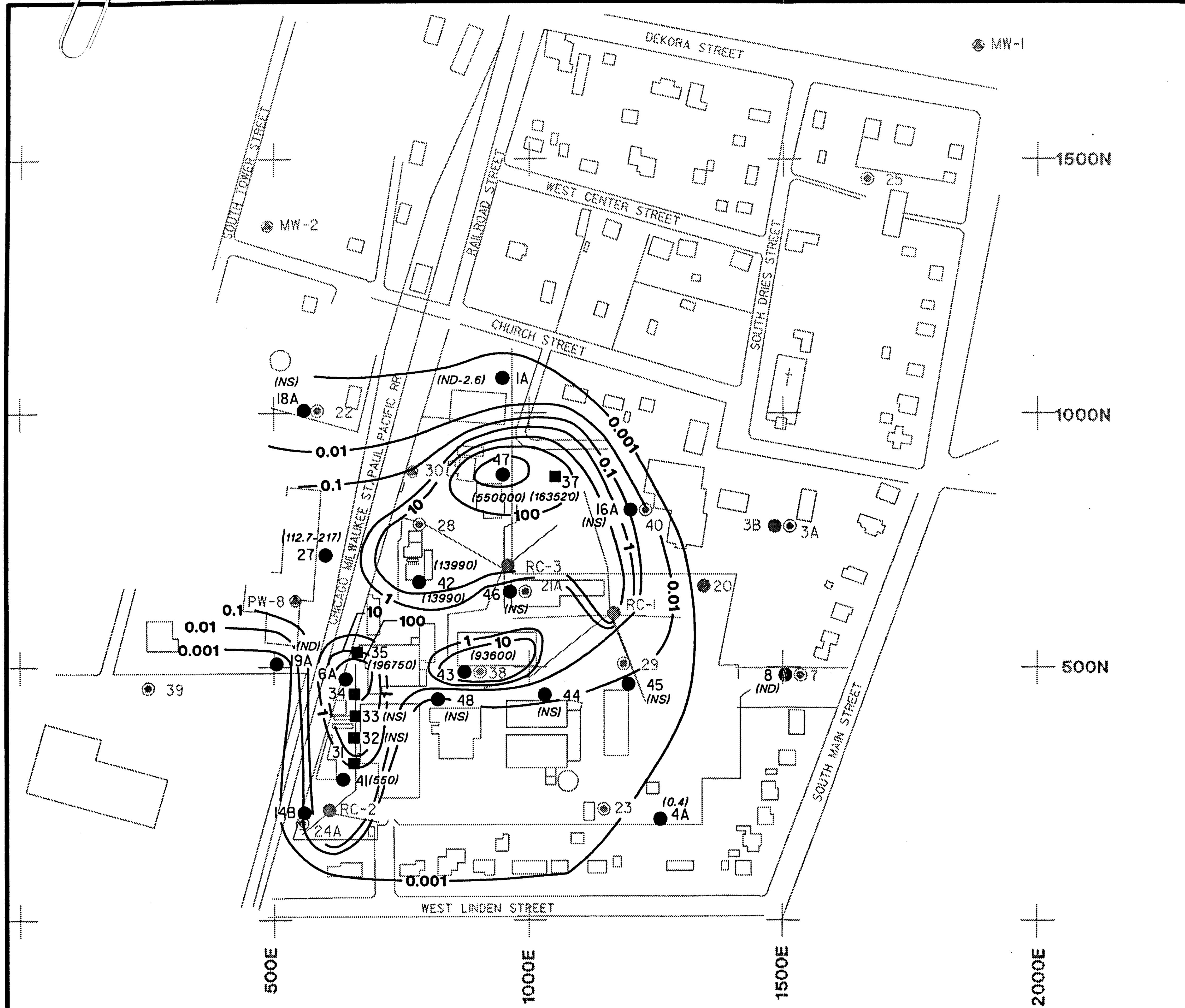
$$i_v = \frac{WLS-WLD}{WLS-center\ D} = \frac{768.63-731.51}{768.63-726.53} = 0.9 \ (\textit{downward})$$

W-43/W-38
center D = (770.98-49.00) + 1/2(16.8) = 730.38'

$$i_v = \frac{WLS-WLD}{WLS-center\ D} = \frac{759.38-752.83}{759.38-730.38} = 0.3 \ (\textit{downward})$$

APPENDIX C

ISOCONCENTRATION MAPS



LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY COLLECTOR
- *(ND-2.6)* TOTAL VOC CONCENTRATION (ug/L)
- —**0.01** TOTAL VOC ISOCONCENTRATION CONTOUR (THOUSANDS OF ug/L) (LOGARITHMIC CONTOUR INTERVAL)
- *(ND)* NOT DETECTED
- *(NS)* NOT SAMPLED

NOTES

1. BASE MAP WAS DEVELOPED FROM HATCHER-SAYRE, INC., 1992.
2. FIGURE INCLUDES CONCENTRATION DATA FROM SEVERAL QUARTERLY GROUNDWATER MONITORING EVENTS IN 1994.

0 200 400

SCALE: 1"=200'

COMPOSITE 1994
TOTAL VOC CONCENTRATIONS
- GLACIAL DRIFT WELLS

COOK COMPOSITES AND POLYMERS
SAUKVILLE, WISCONSIN

RMT INC.

Dwn. By:	BLG
Approved By:	COB
Date:	JANUARY 1995
Proj.#:	1832.63
File #:	18326311

FIGURE 5

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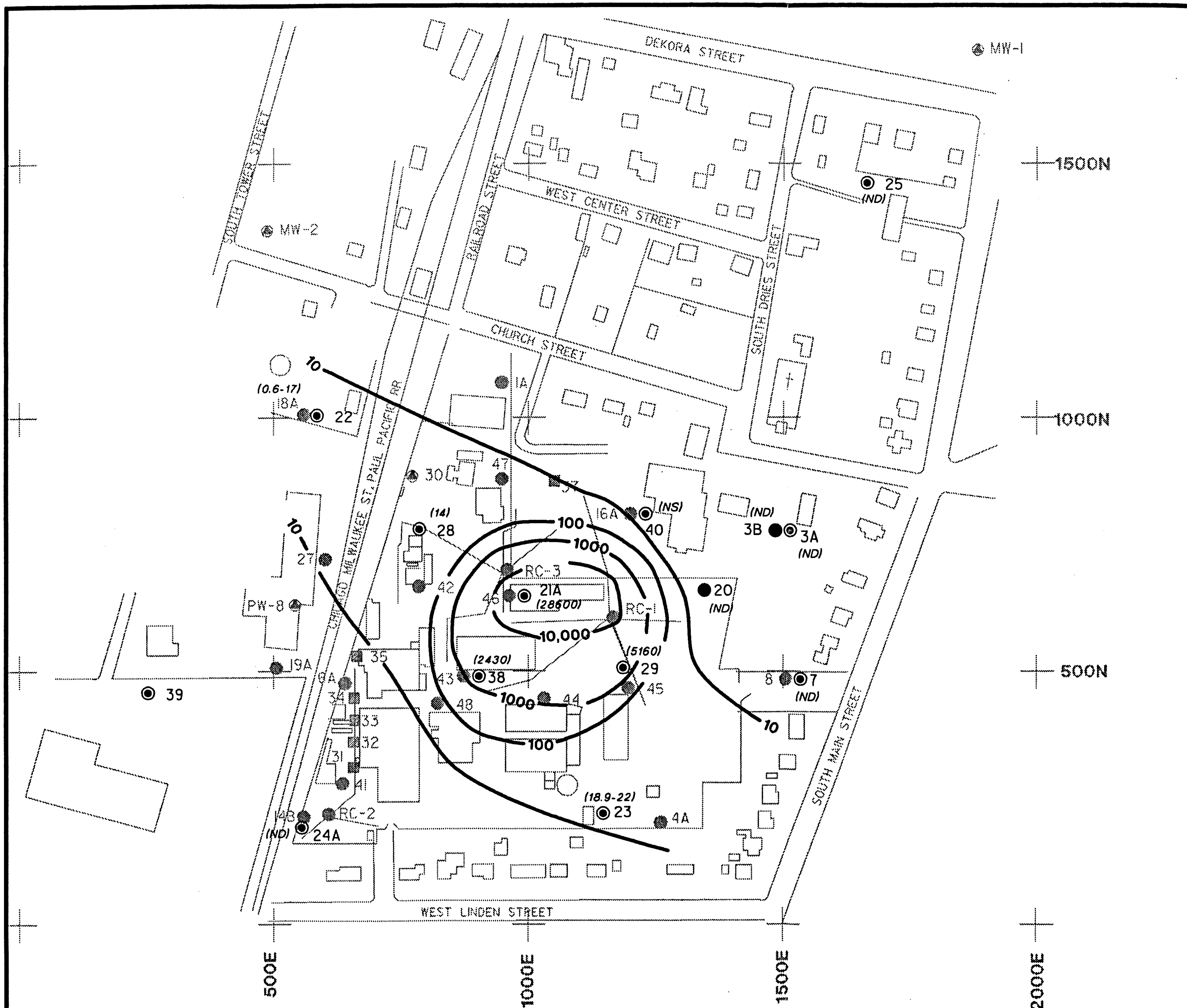

LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY COLLECTOR
- (0.6-17) TOTAL VOC ISOCONCENTRATION (ug/L)
- 10 TOTAL VOC ISOCONCENTRATION CONTOUR (ug/L) (LOGARITHMIC CONTOUR INTERVAL)
- (ND) NOT DETECTED
- (NS) NOT SAMPLED

NOTES

1. BASE MAP WAS DEVELOPED FROM HATCHER-SAYRE, INC., 1992.
2. SHALLOW DOLOMITE WELLS PENETRATE UP TO APPROXIMATELY THE TOP 60' OF THE DOLOMITE UNIT.
3. FIGURE INCLUDES CONCENTRATION DATA FROM SEVERAL QUARTERLY GROUNDWATER MONITORING EVENTS IN 1994.

N

0 200 400

SCALE: 1"=200'

COMPOSITE 1994 TOTAL VOC CONCENTRATIONS SHALLOW DOLOMITE WELLS

COOK COMPOSITES AND POLYMERS SAUKVILLE, WISCONSIN

RMT INC.

Dwn. By:	BLG
Approved By:	COB
Date:	JANUARY 1995
Proj. #:	1832.63
File #:	18326312

FIGURE 6

esign ht\18 18326
User is unknown
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Pen Table = h:\1832_63\table\18326312.tbl

APPENDIX D

TREND ANALYSIS PLOTS

APPENDIX D

TREND ANALYSIS PLOTS

Glacial Drift Wells

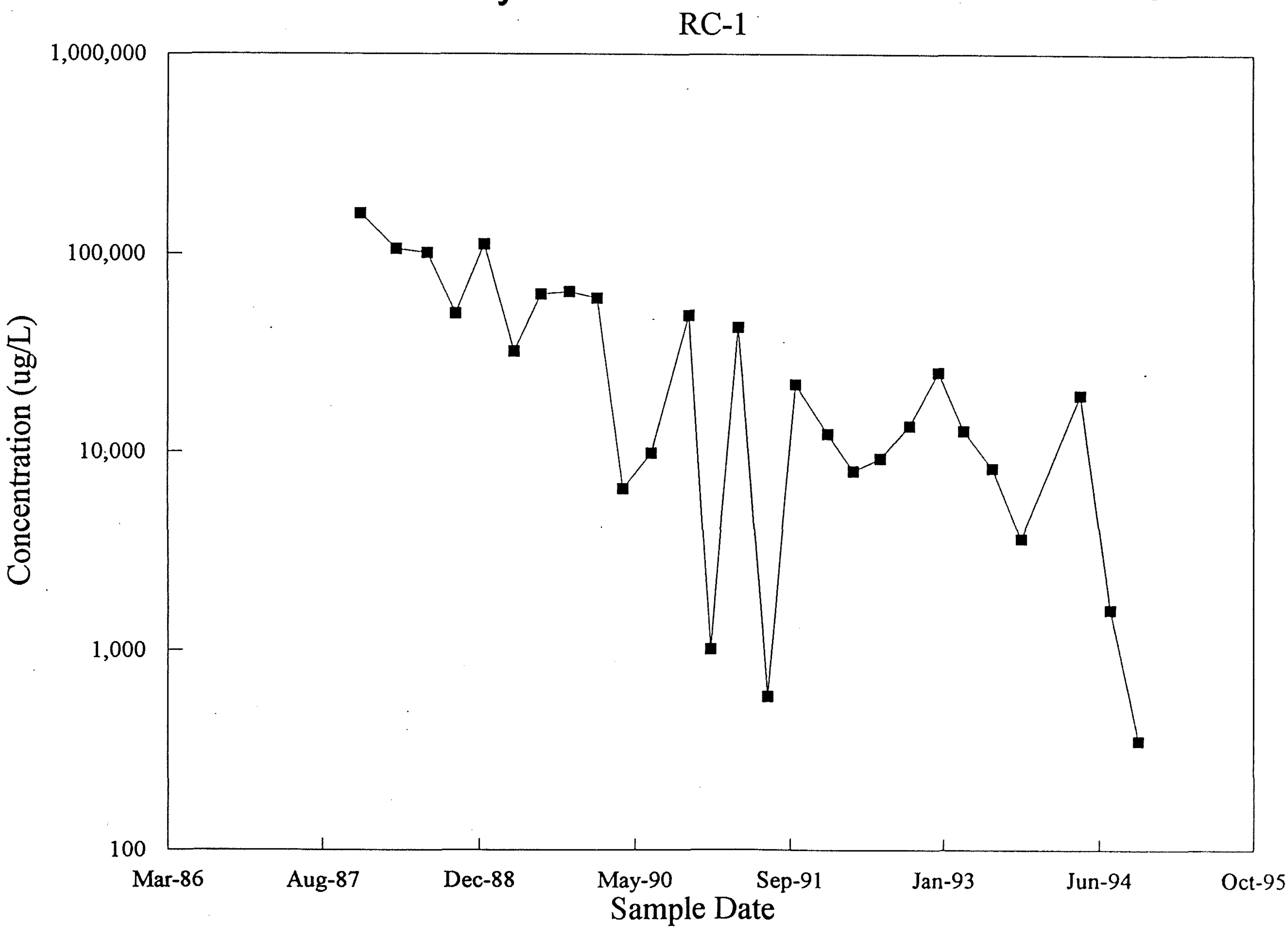
Receptor:	RC-1, RC-2, RC-3
Perimeter:	W-01A, W-03B, W-04A, W-08, W-20, W-27
Remediation Progress:	W-06A, W-19A, W-37, W-41, W-42, W-43, W-47

Dolomite Wells

Receptor:	MW-1, MW-2, MW-3, MW-4
Perimeter:	W-03A, W-07, W-22, W-23, W-25, PW-08
Remediation Progress:	W-21A, W-24A, W-28, W-29, W-30, W-38

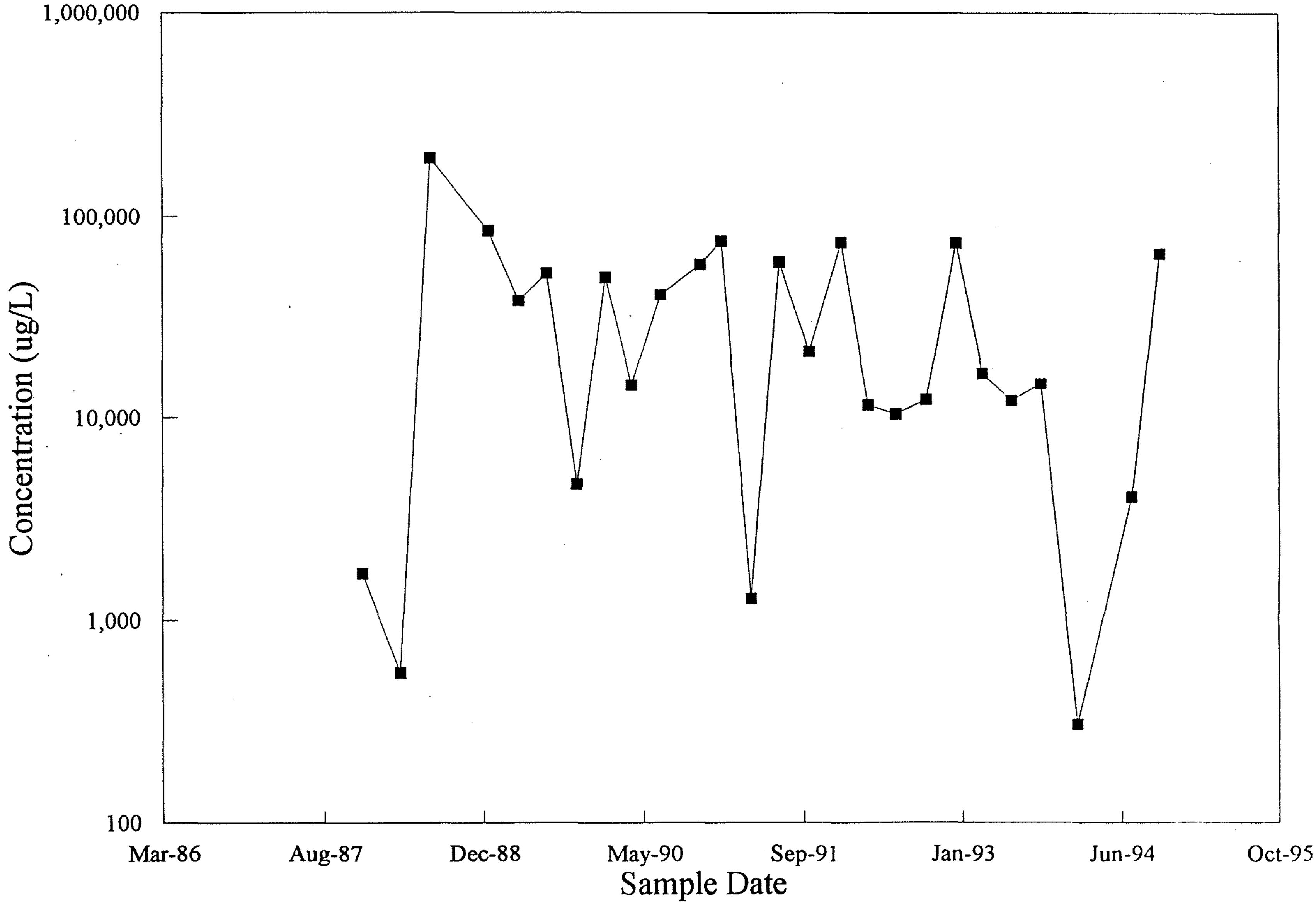
NOTES: When sample analyses indicate nondetectable levels of total VOCs, these events are depicted on the following plots by a symbolic value of 0.01 μg/L. Because of changes in laboratories, methods, and detection limits since 1983, this value does not represent the detection limit (or the absolute concentration).

Trend Analysis: Total VOC Concentrations



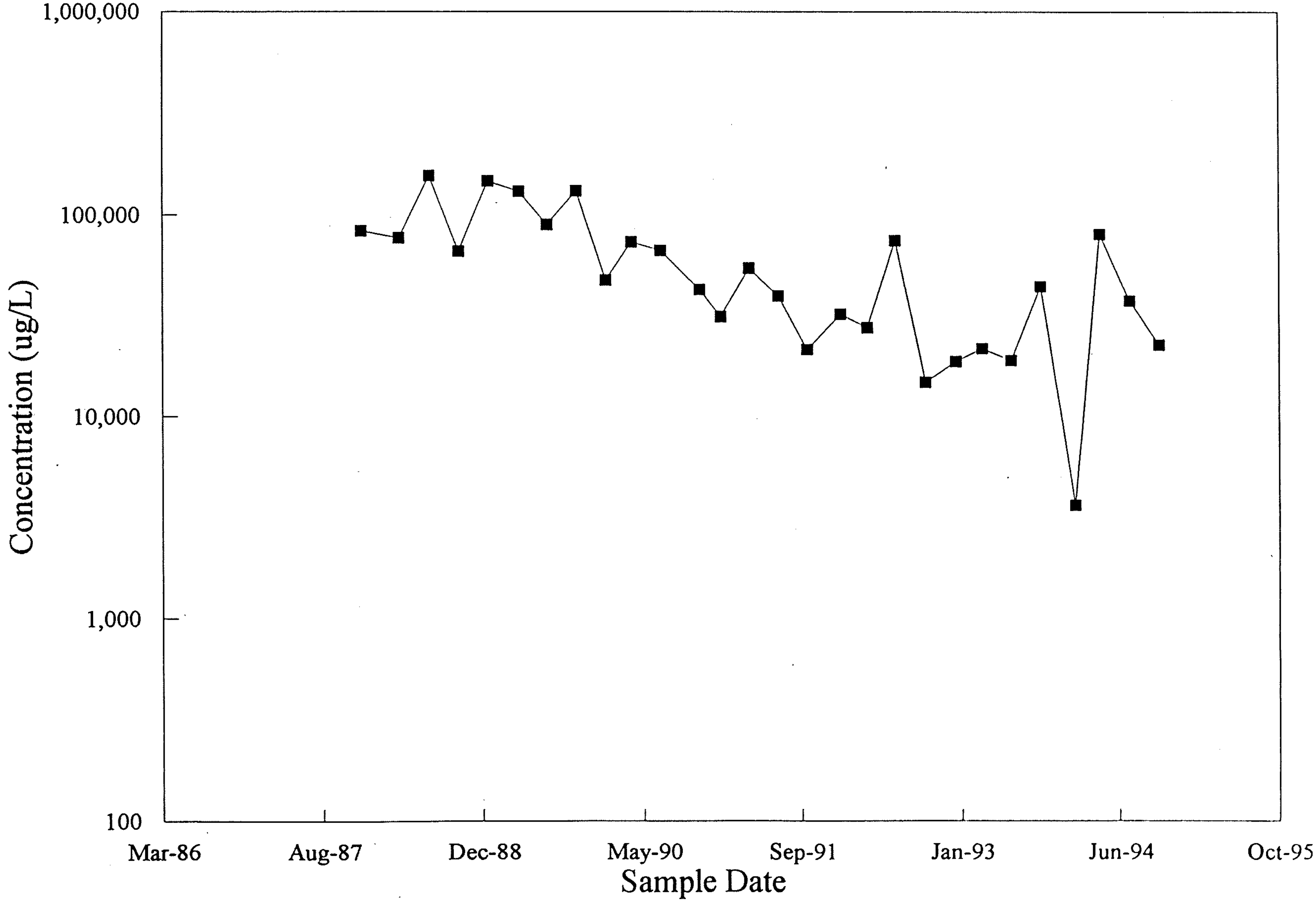
Trend Analysis: Total VOC Concentrations

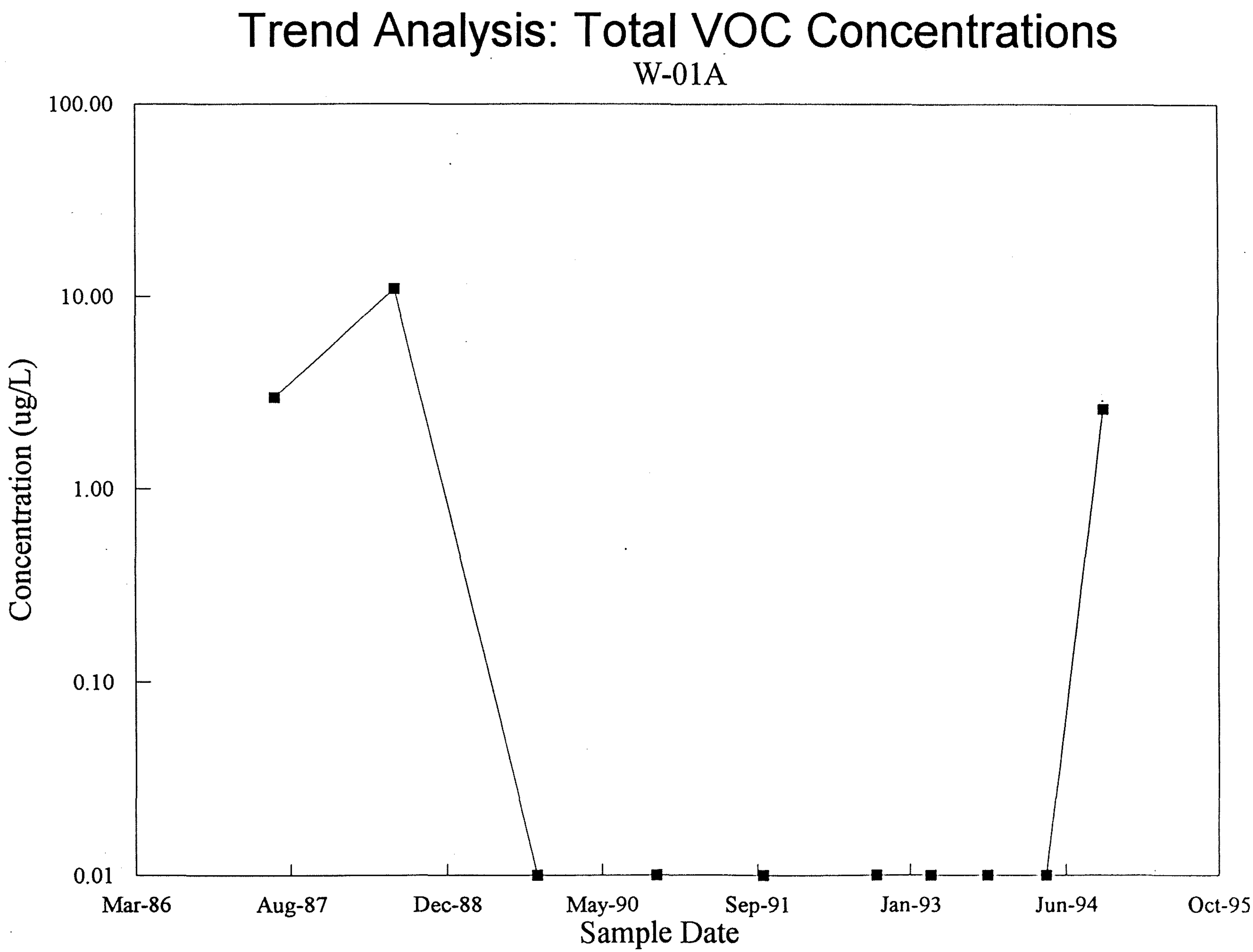
RC-2



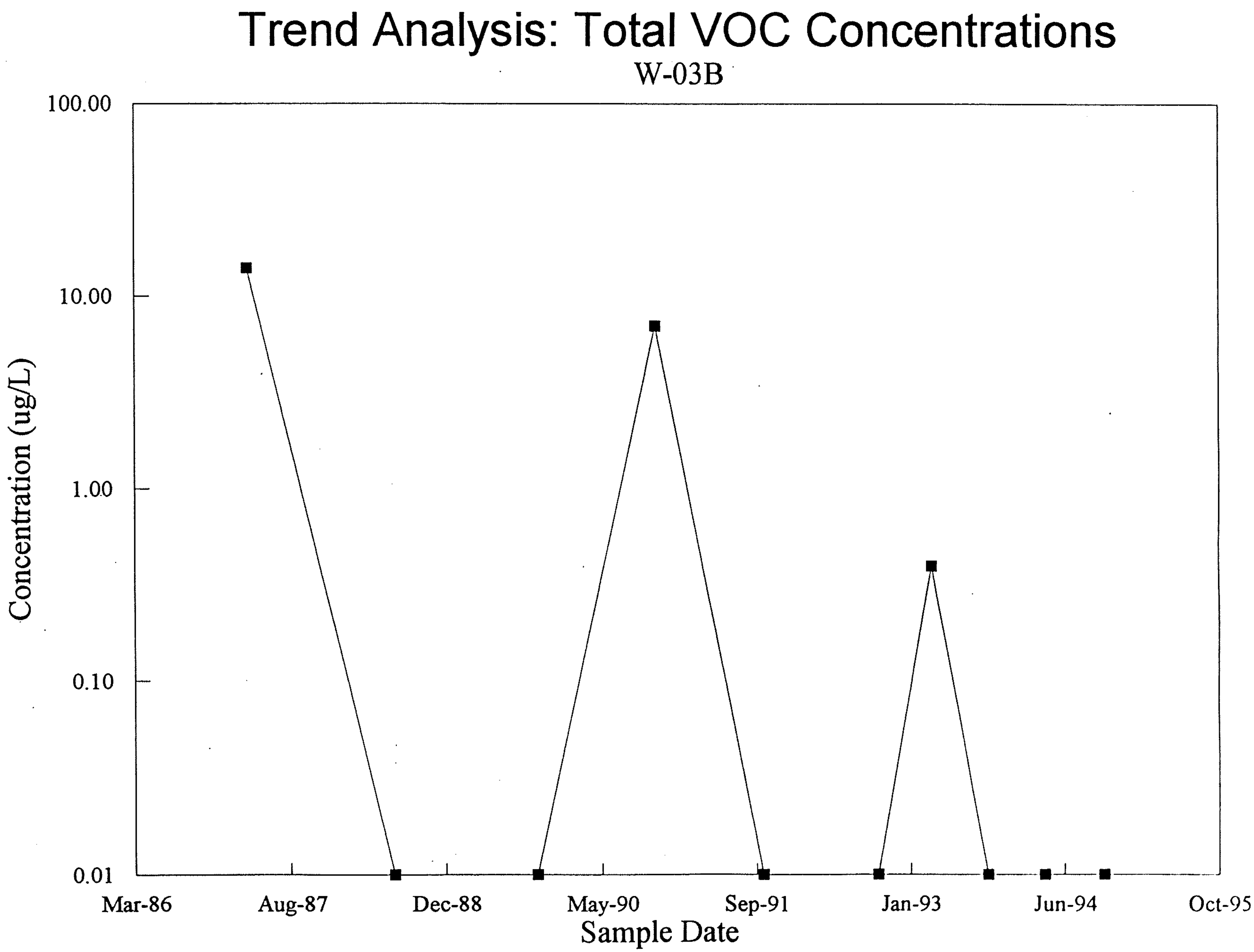
Trend Analysis: Total VOC Concentrations

RC-3



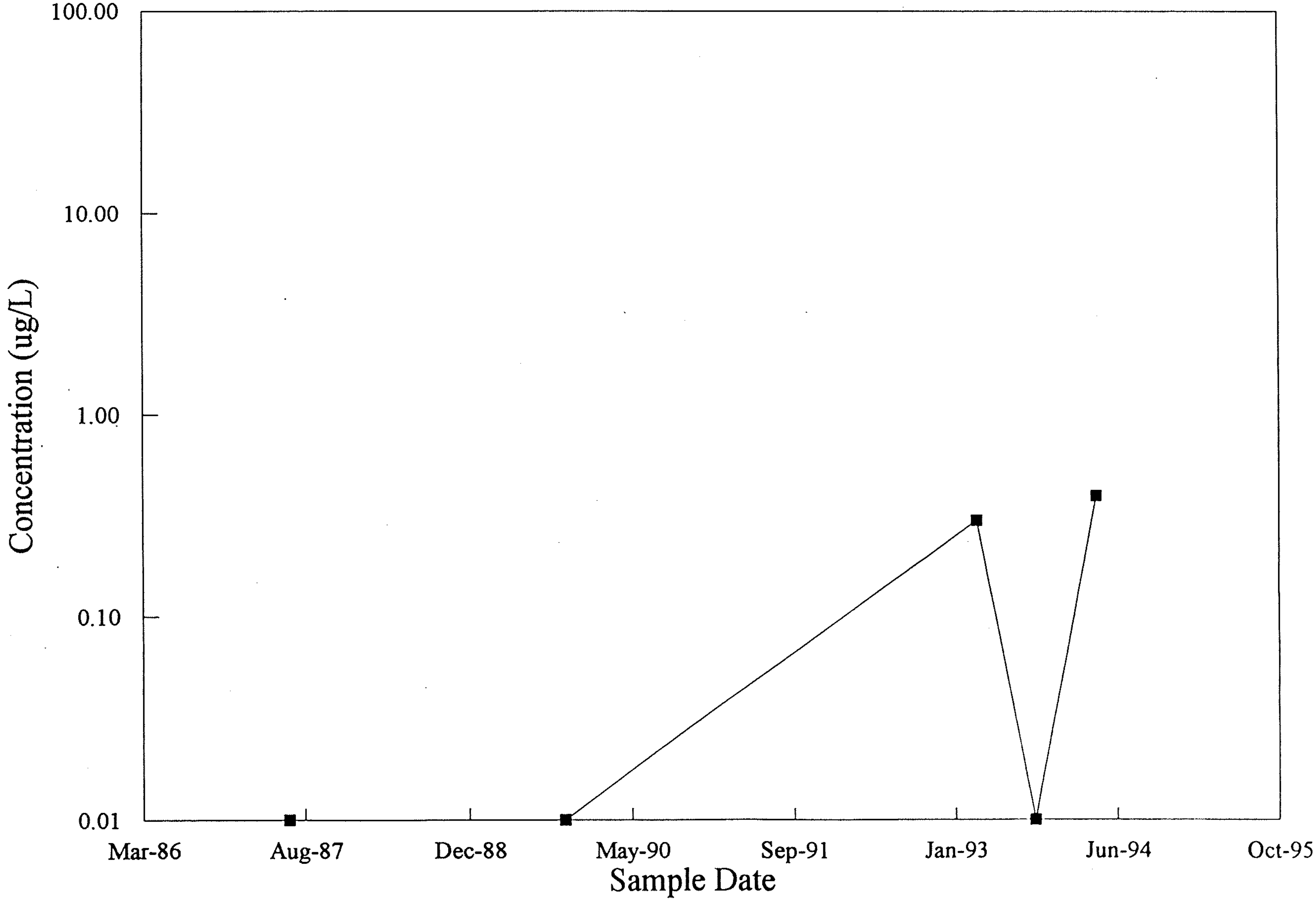


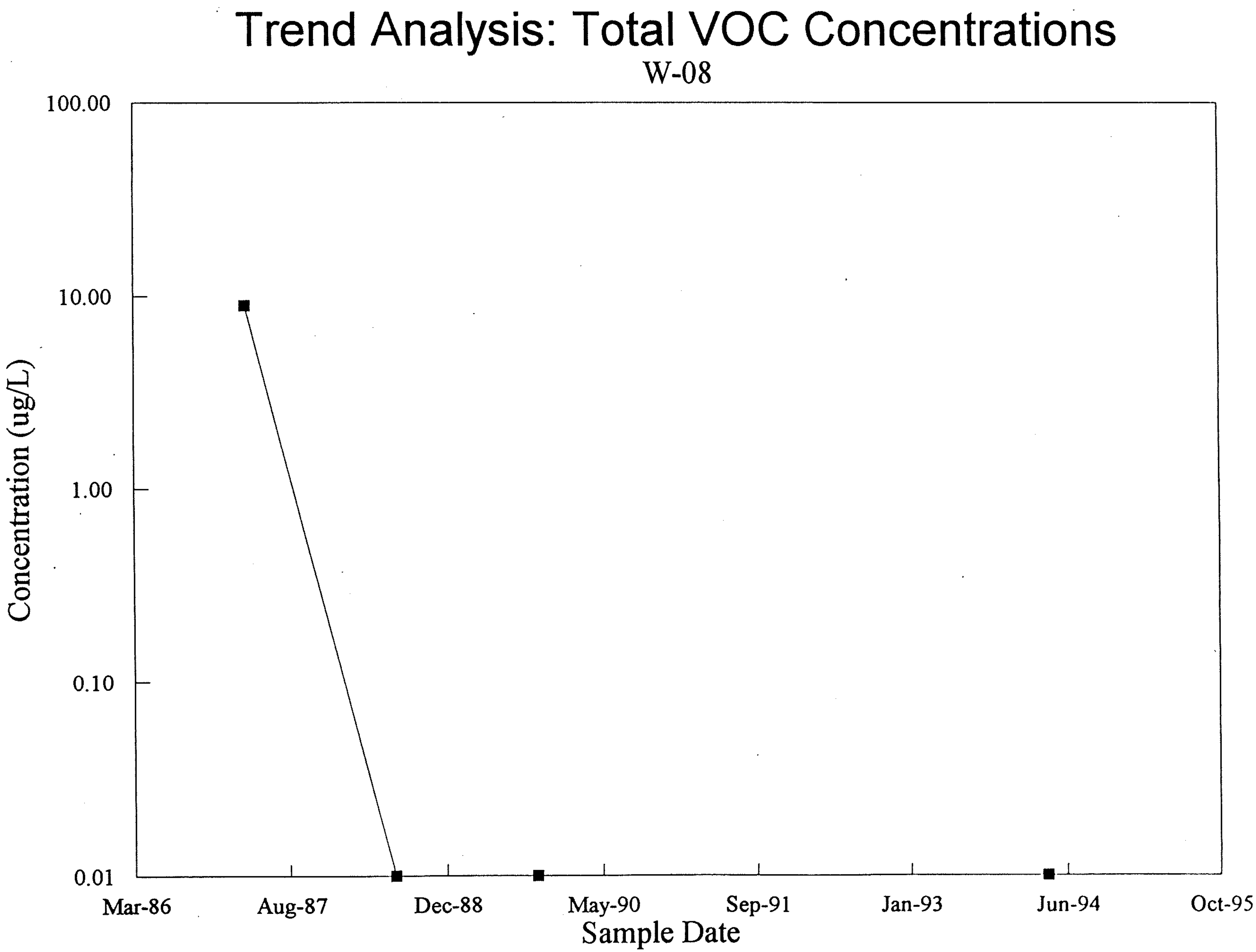
Trend Analysis: Total VOC Concentrations
W-01A
100.00
10.00
1.00
0.10
0.01
Concentration (ug/L)
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date

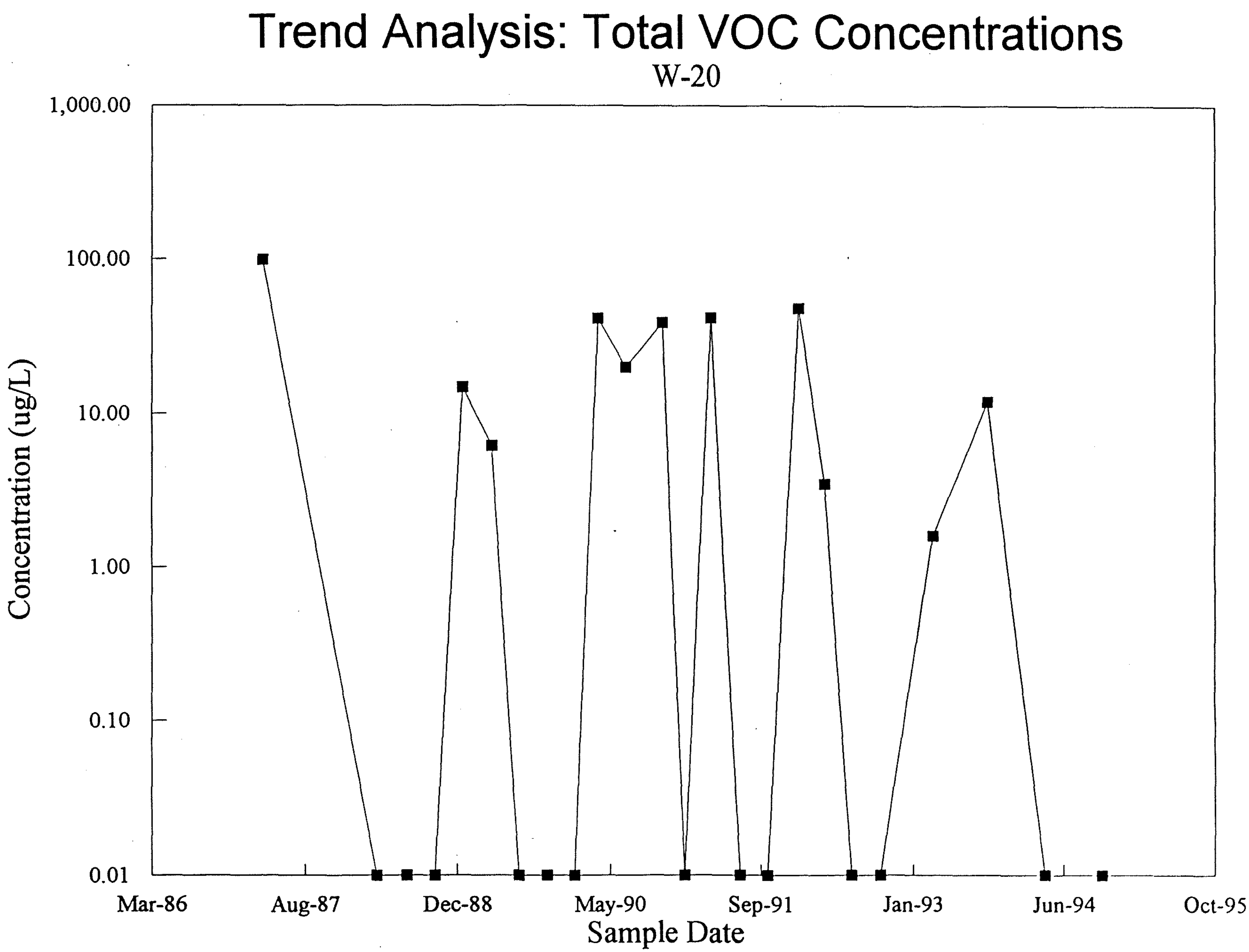

Trend Analysis: Total VOC Concentrations
W-03B
100.00
10.00
1.00
0.10
0.01
Concentration (ug/L)
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date

Trend Analysis: Total VOC Concentrations

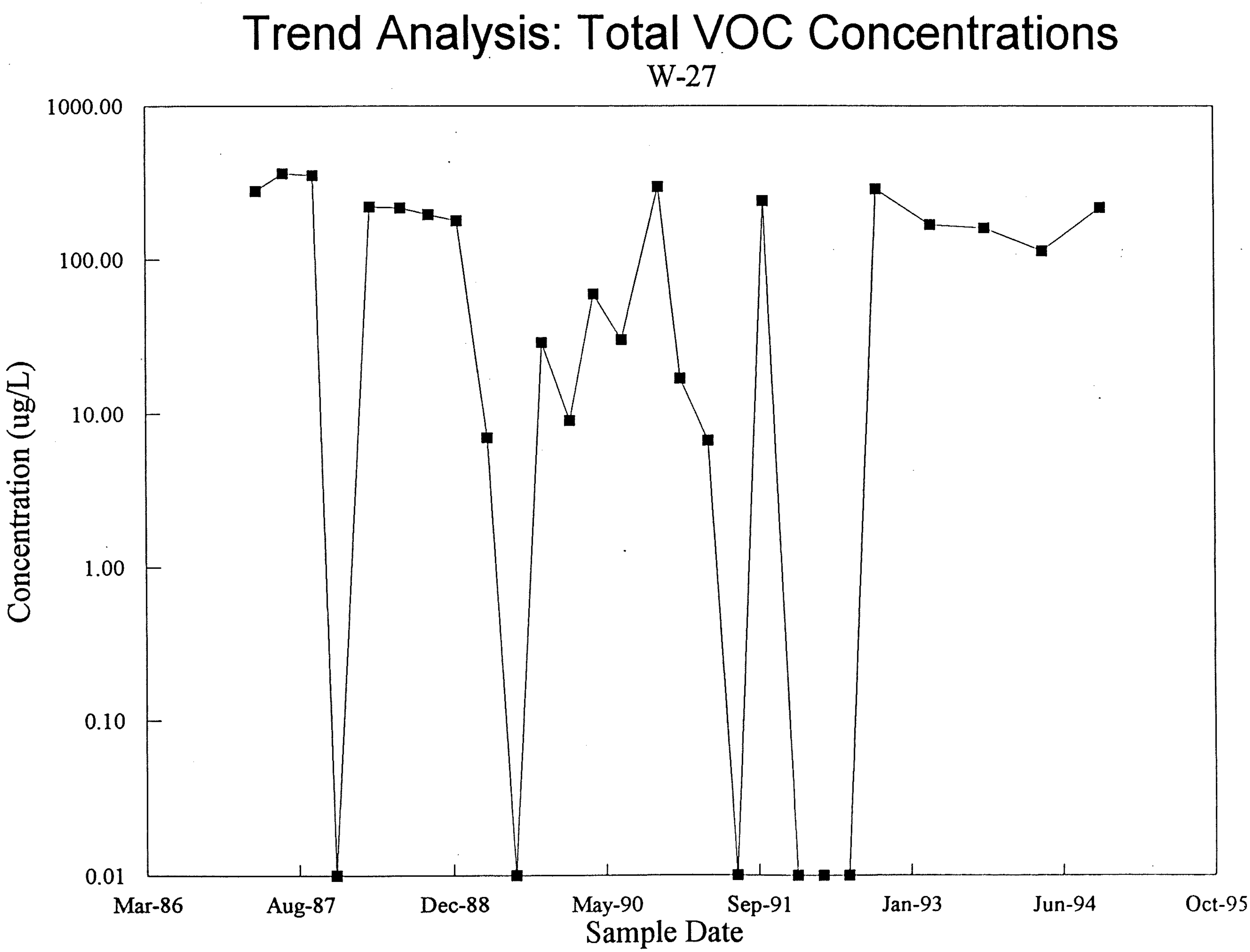
W-04A




Trend Analysis: Total VOC Concentrations
W-08
Concentration (ug/L)
100.00
10.00
1.00
0.10
0.01
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date

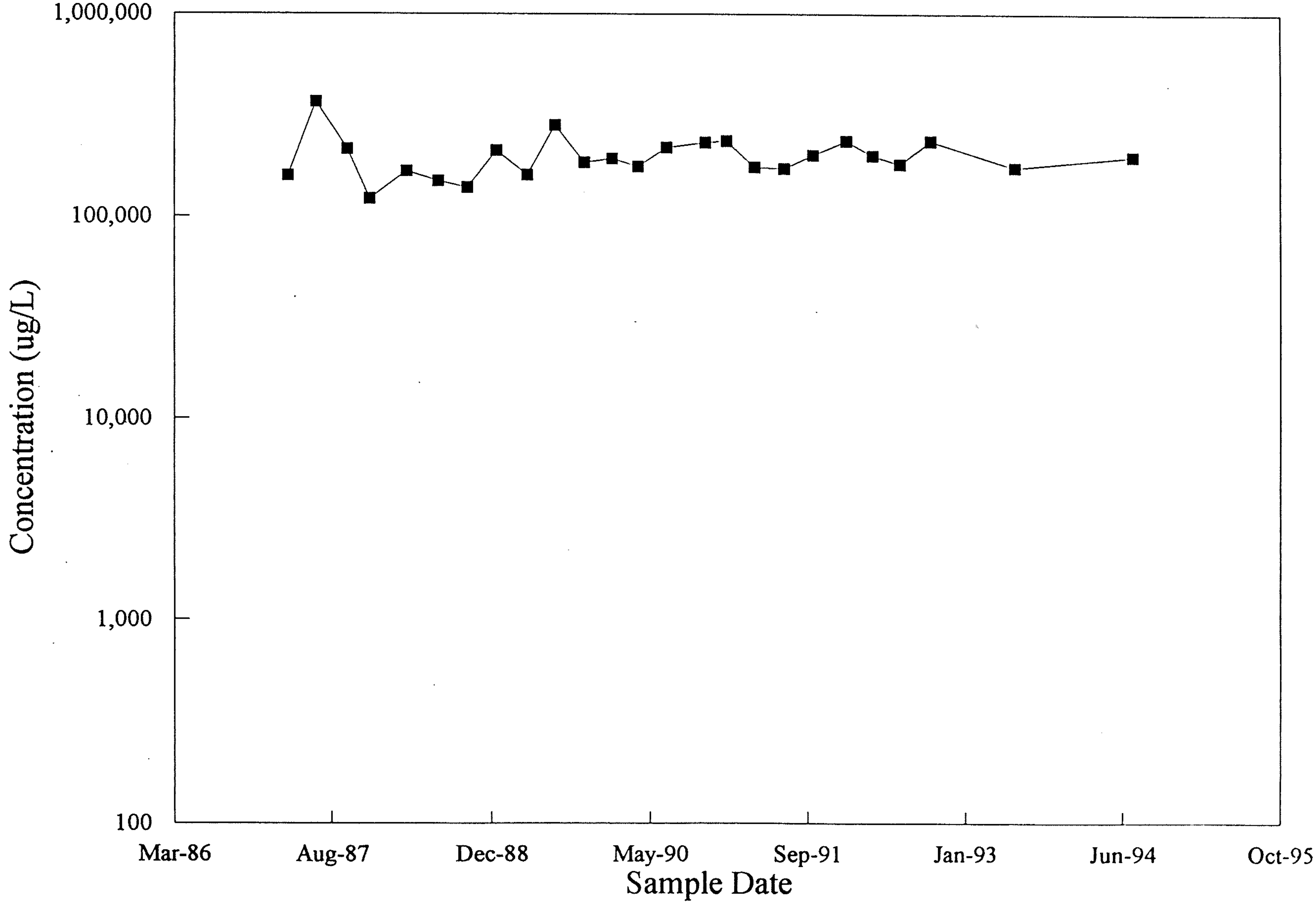


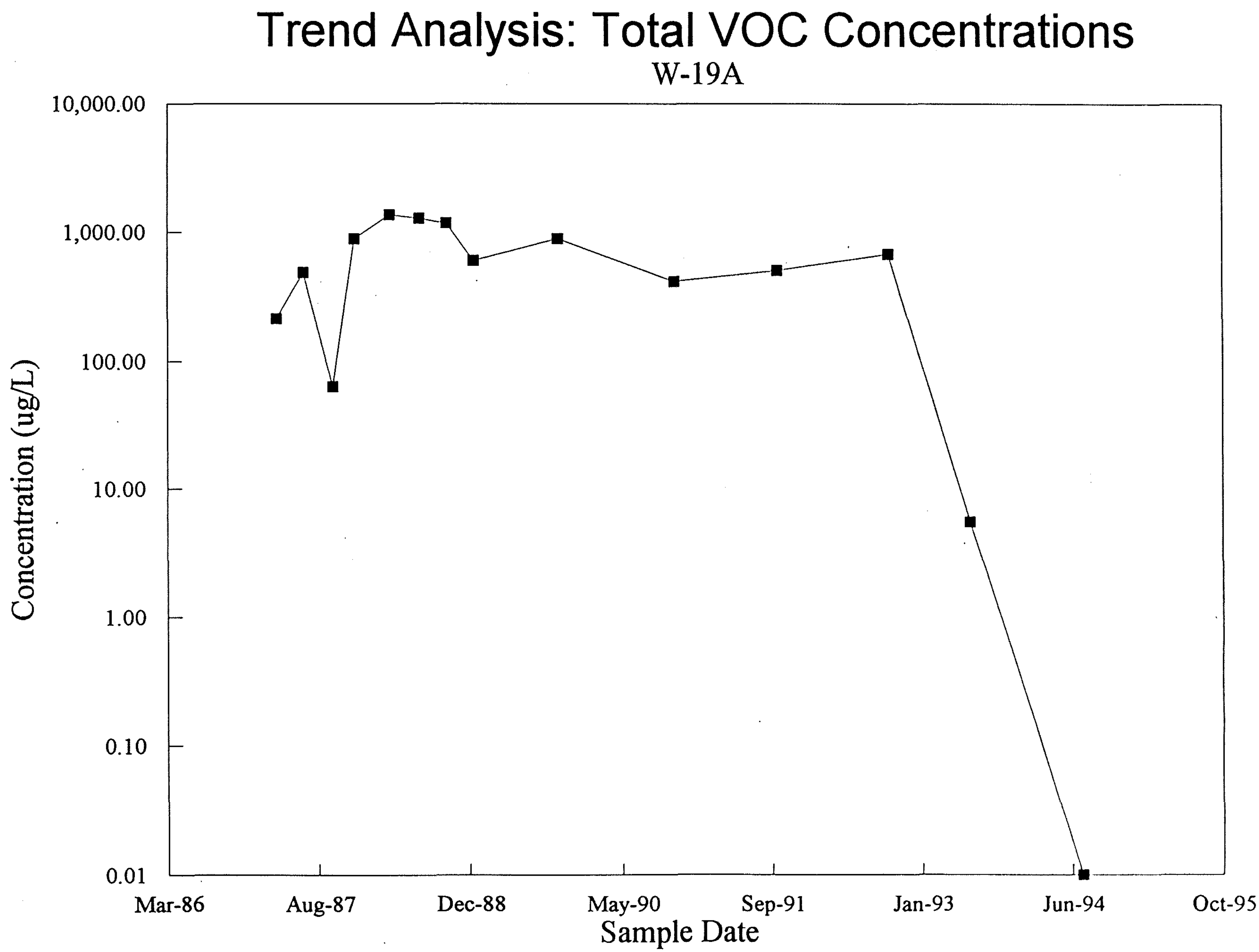
Trend Analysis: Total VOC Concentrations
W-20
1,000.00
100.00
10.00
1.00
0.10
0.01
Concentration (ug/L)
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date


Trend Analysis: Total VOC Concentrations
W-27
1000.00
100.00
10.00
1.00
0.10
0.01
Concentration (ug/L)
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date

Trend Analysis: Total VOC Concentrations

W-06A

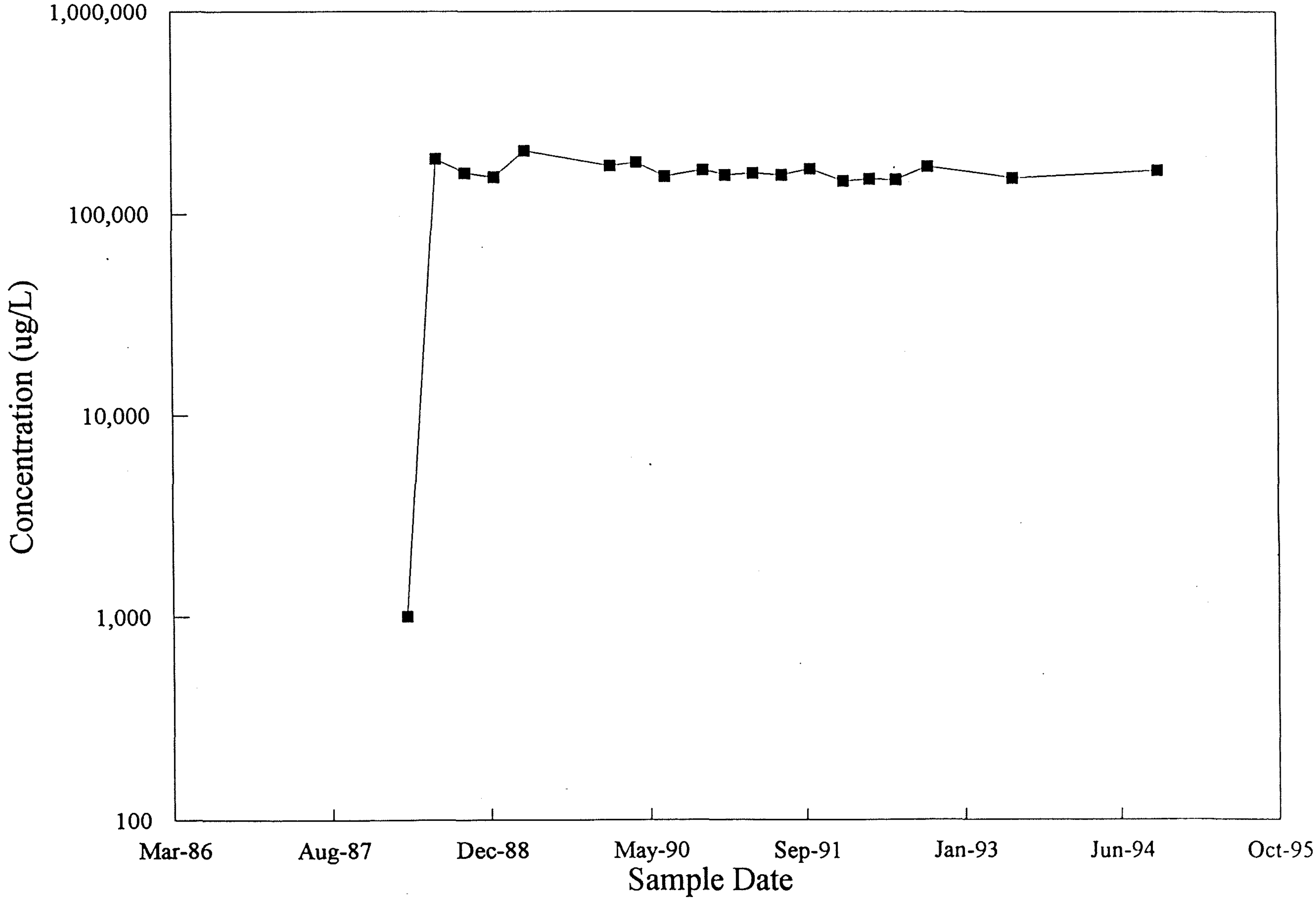




Trend Analysis: Total VOC Concentrations
W-19A
10,000.00
1,000.00
100.00
10.00
1.00
0.10
0.01
Concentration (ug/L)
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date

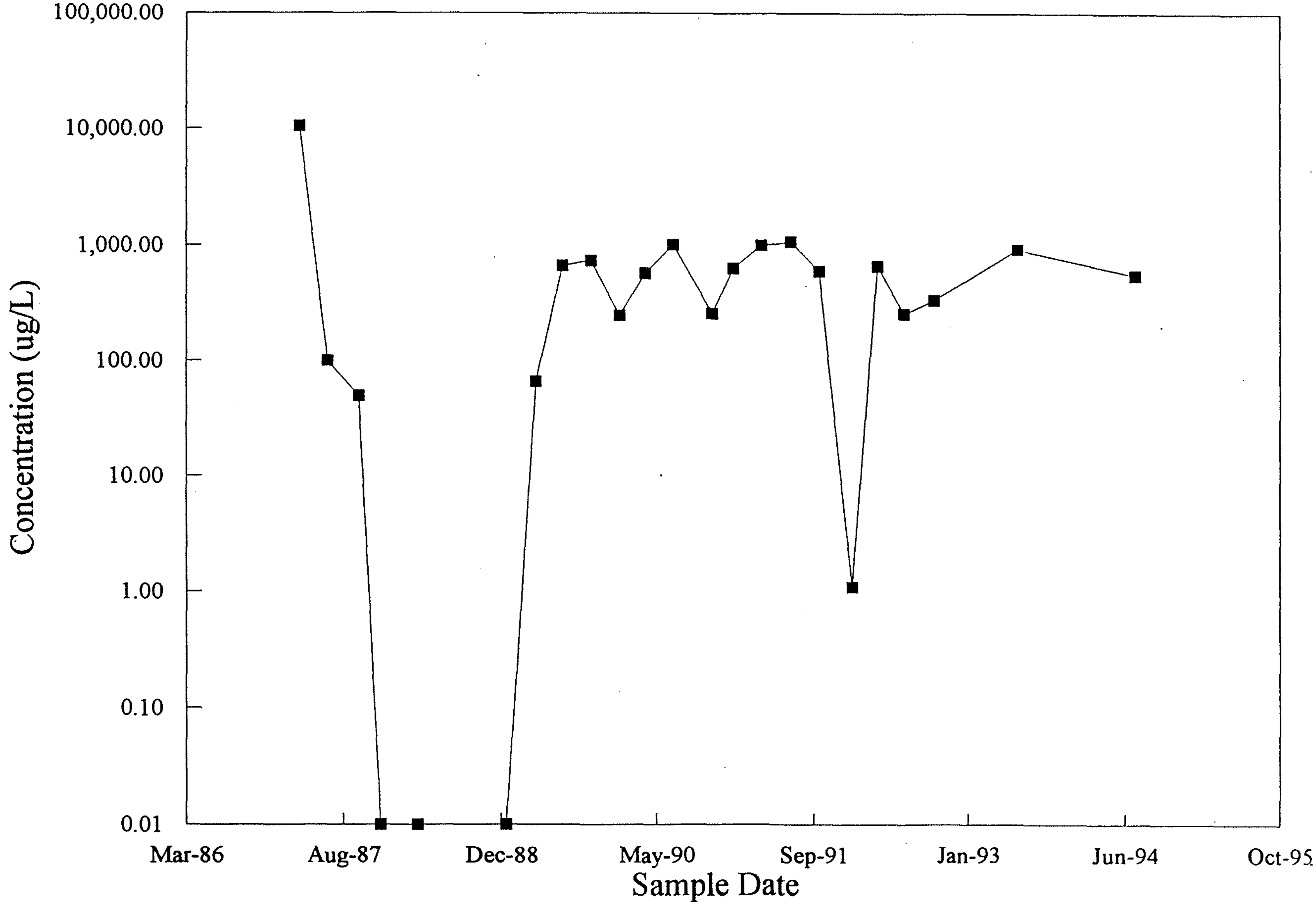
Trend Analysis: Total VOC Concentrations

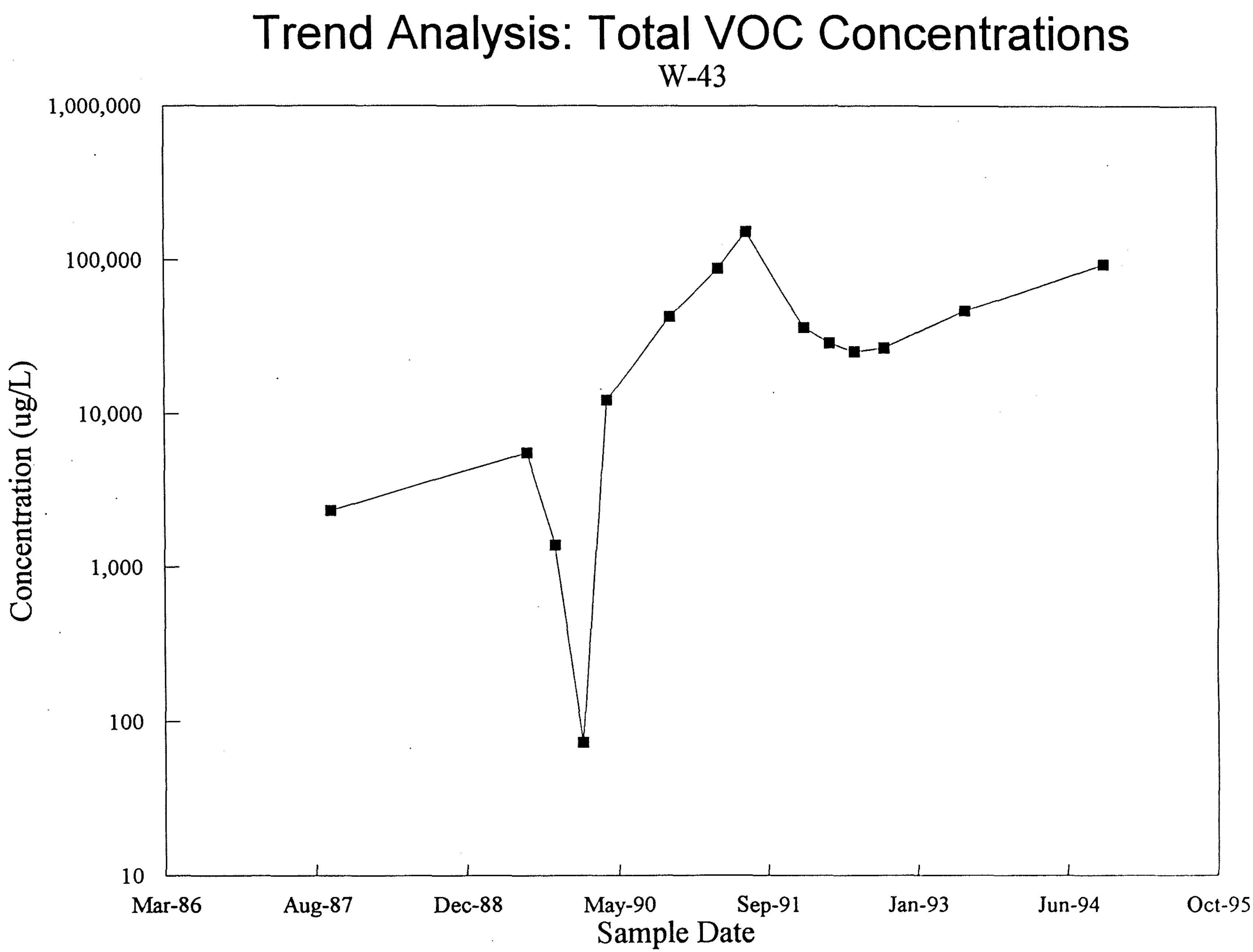
W-37

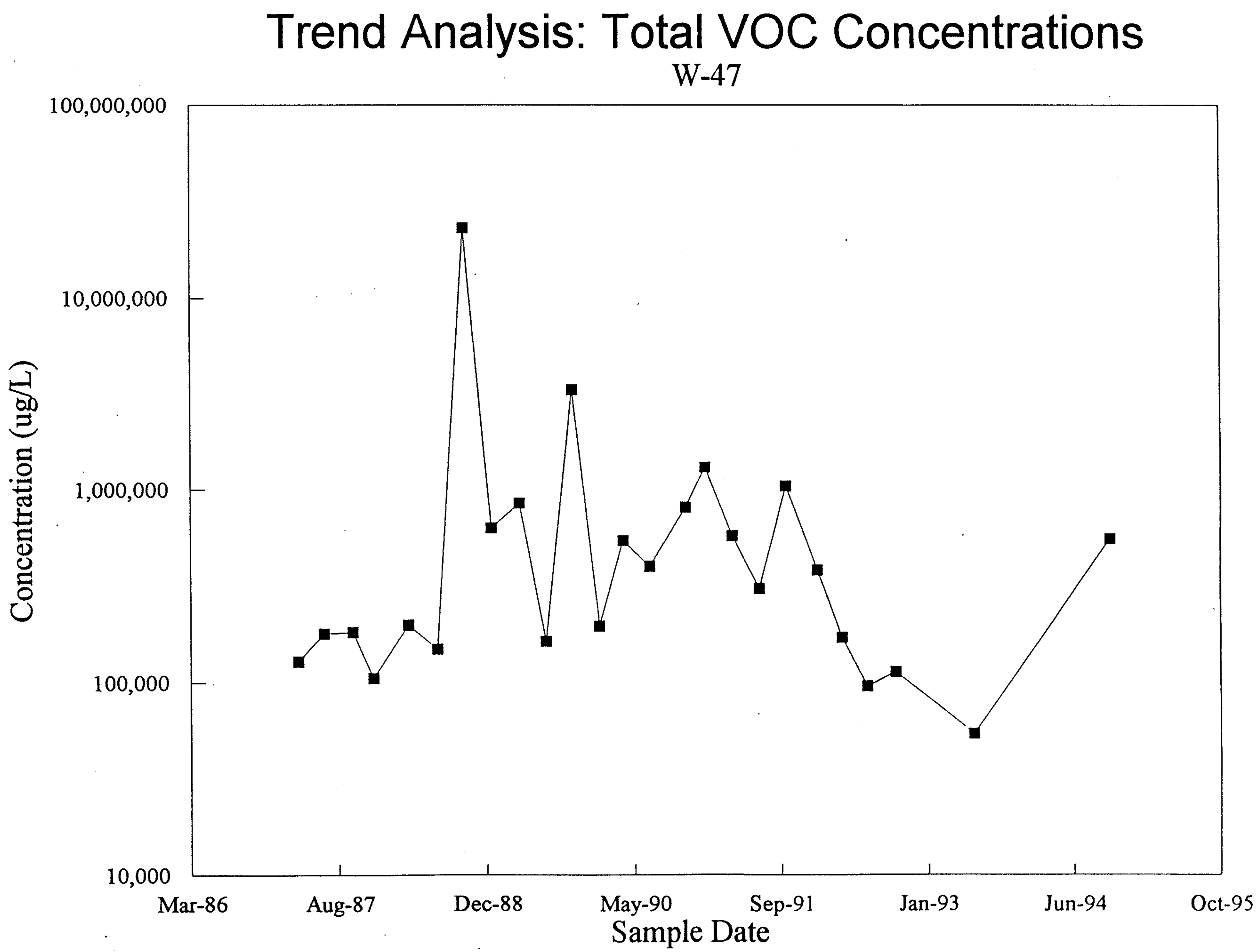


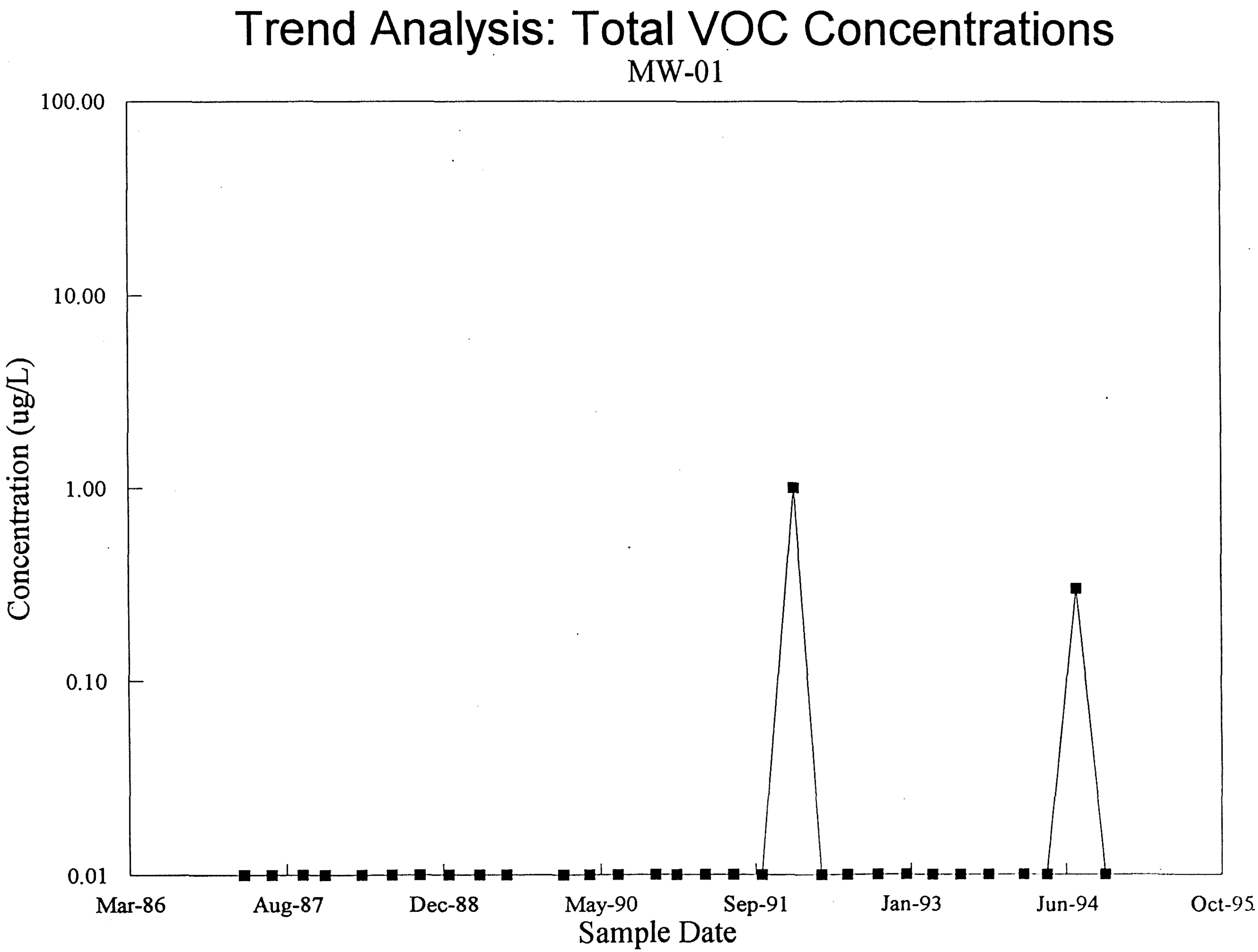
Trend Analysis: Total VOC Concentrations

W-41




Trend Analysis: Total VOC Concentrations
W-43
1,000,000
100,000
10,000
1,000
100
10
Concentration (ug/L)
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date

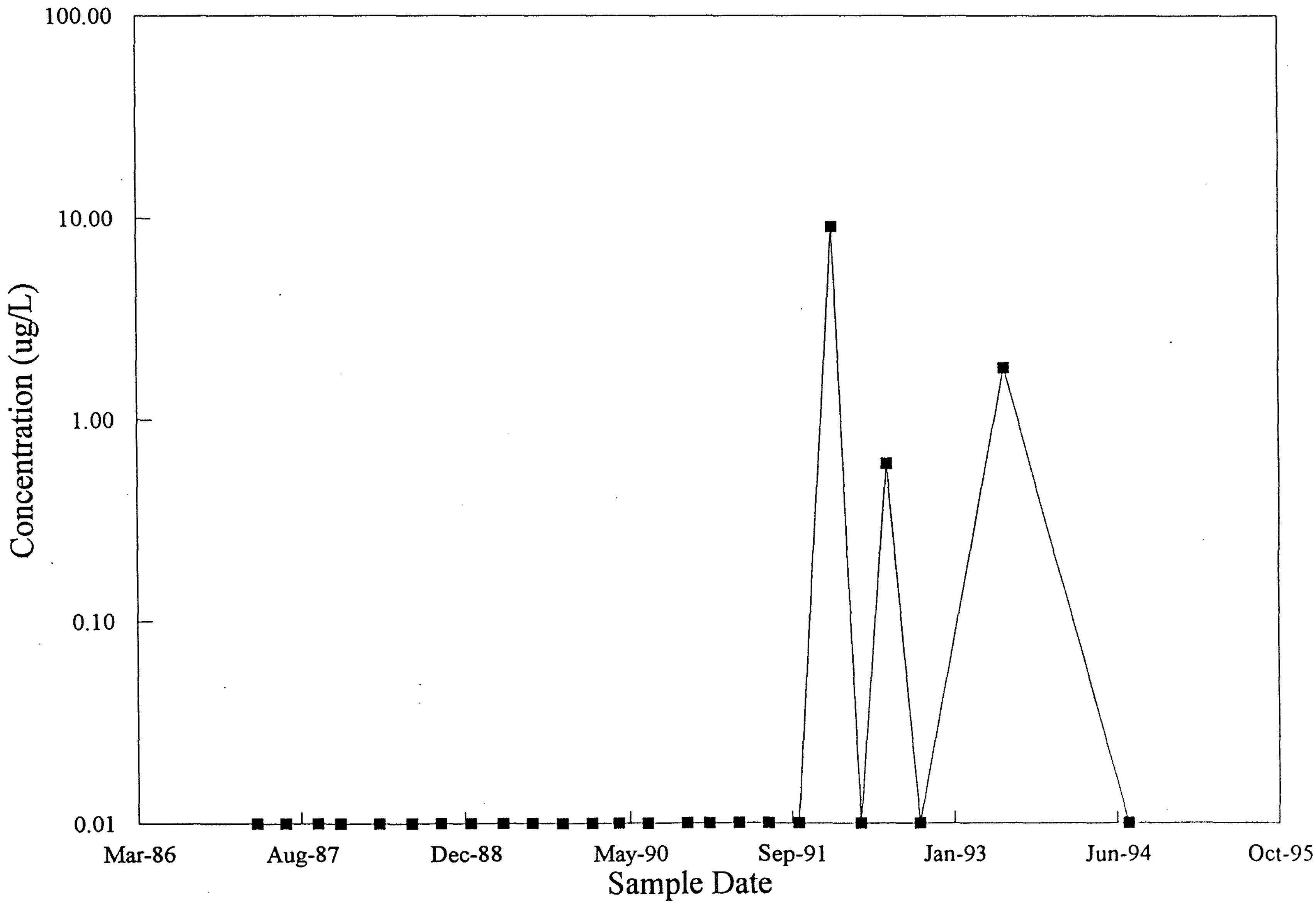

Trend Analysis: Total VOC Concentrations
W-47
100,000,000
10,000,000
1,000,000
100,000
10,000
Concentration (ug/L)
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date

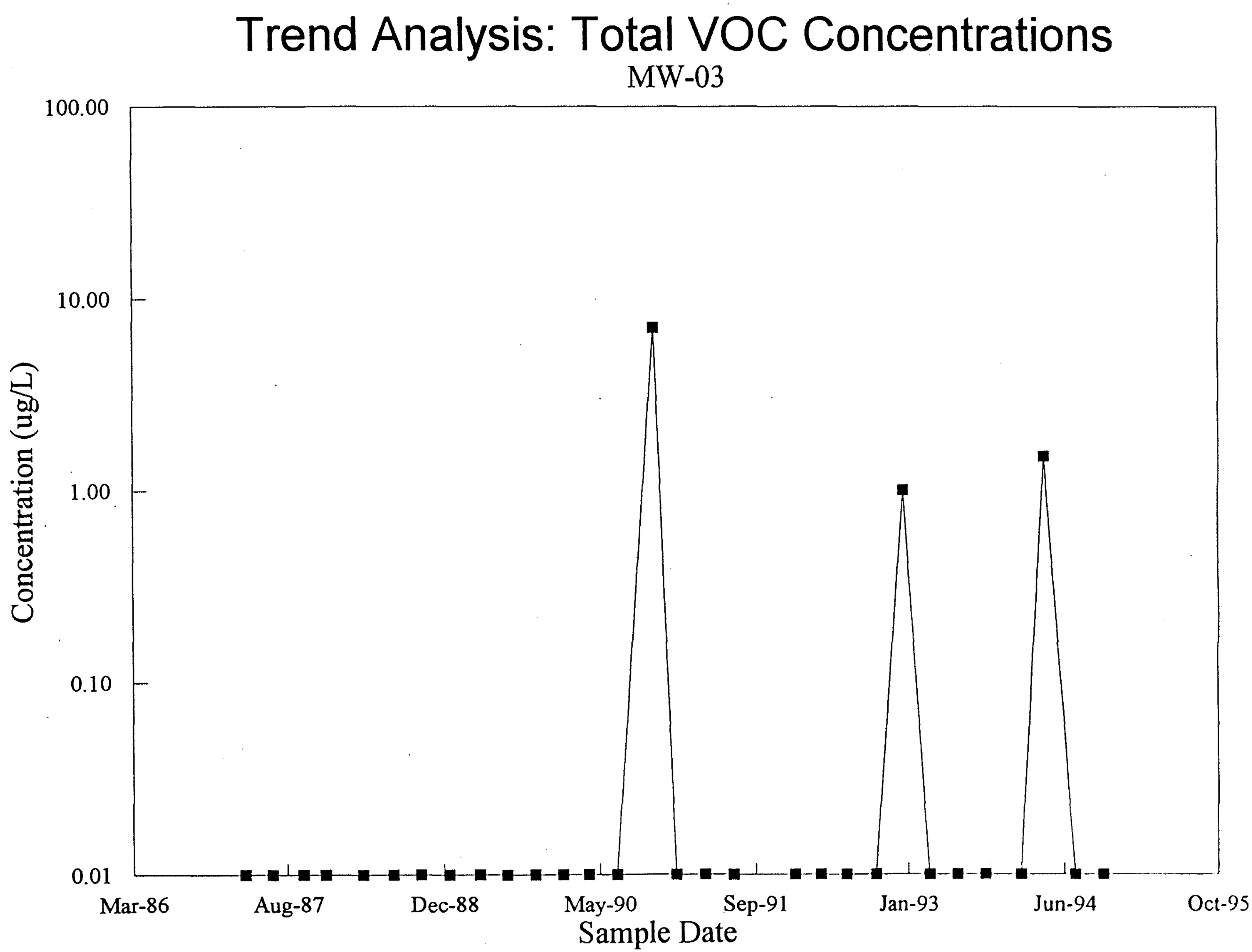


Trend Analysis: Total VOC Concentrations
MW-01
100.00
10.00
1.00
0.10
0.01
Concentration (ug/L)
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date

Trend Analysis: Total VOC Concentrations

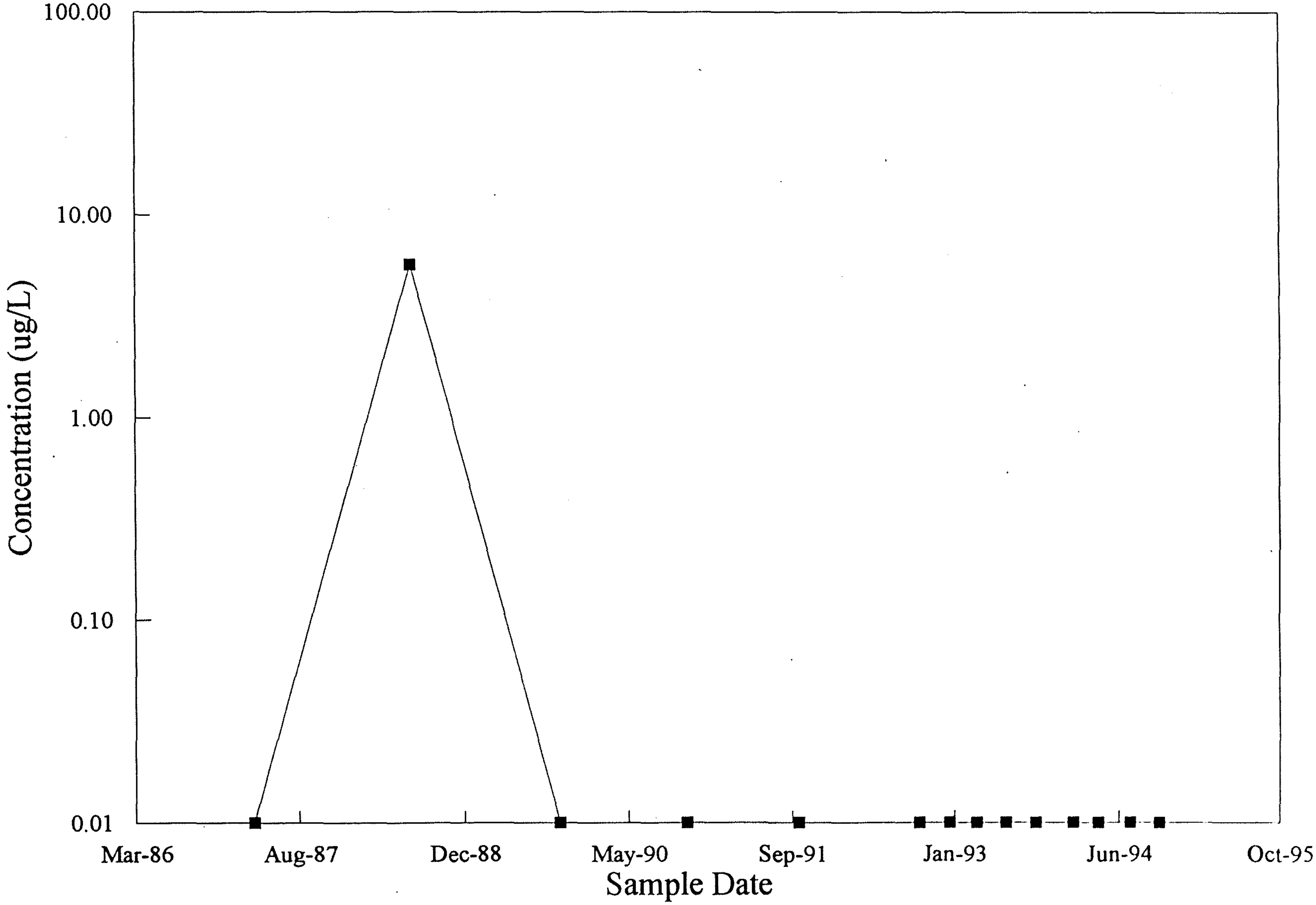
MW-02

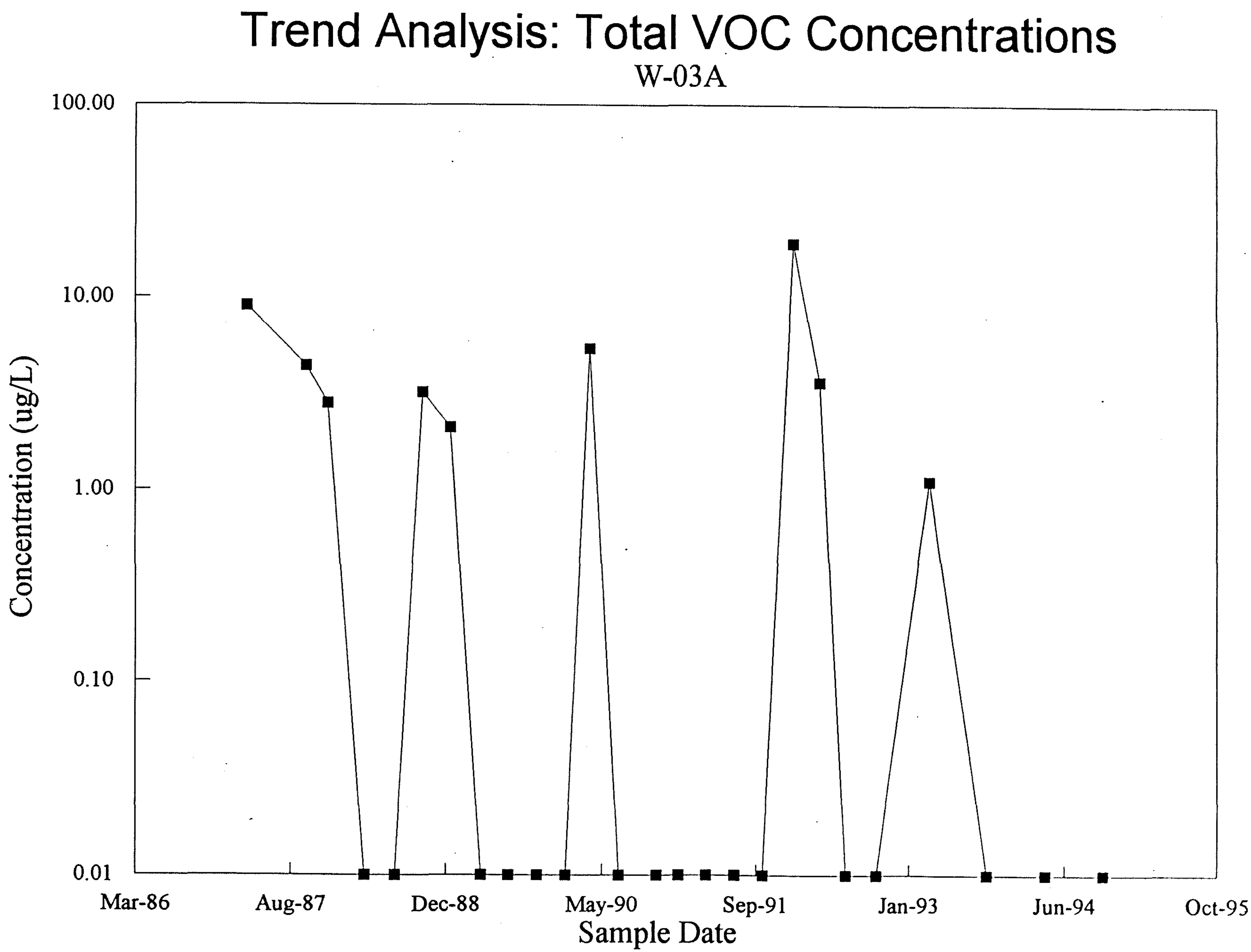



Trend Analysis: Total VOC Concentrations
MW-03
Concentration (ug/L)
100.00
10.00
1.00
0.10
0.01
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date

Trend Analysis: Total VOC Concentrations

MW-04

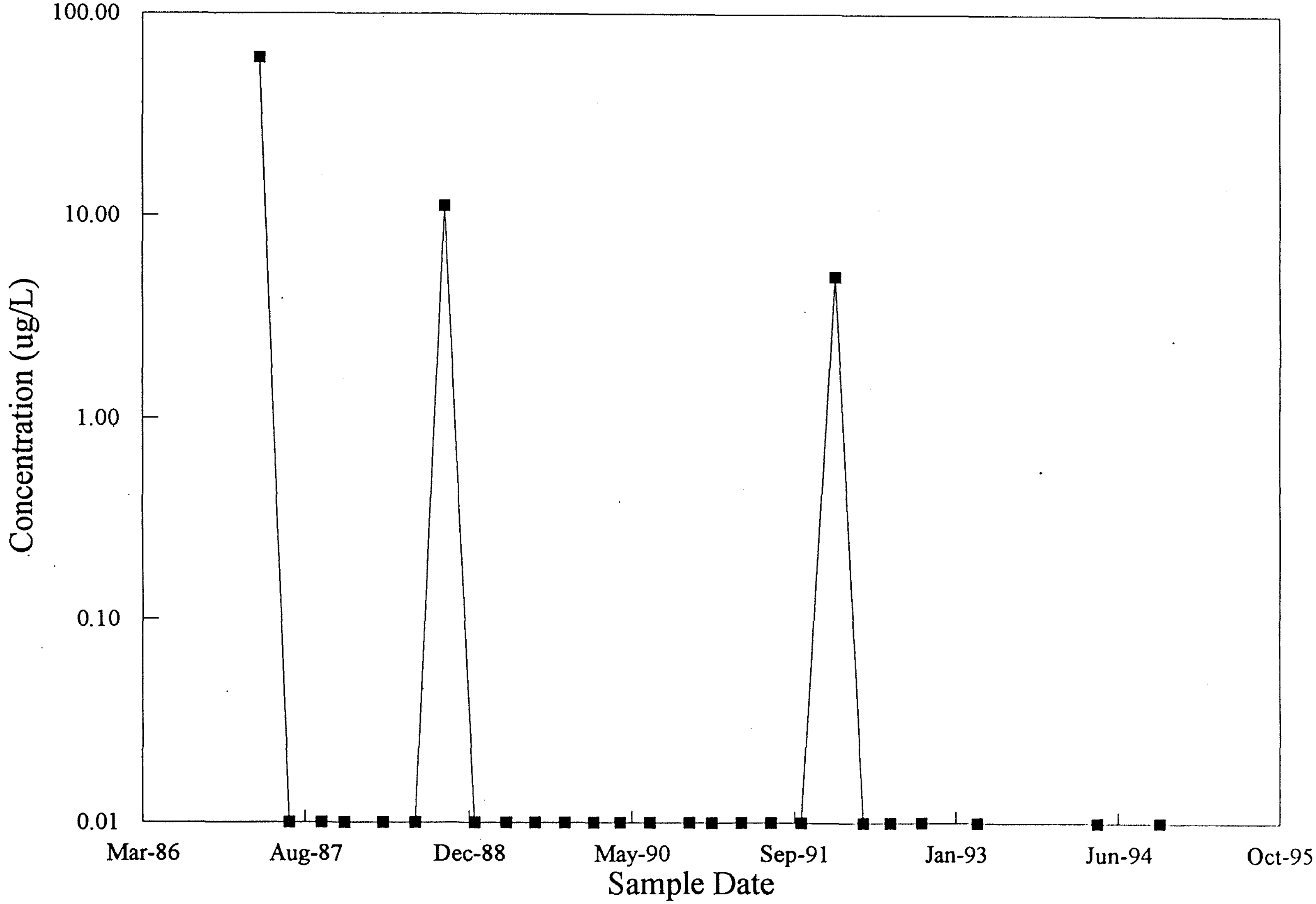


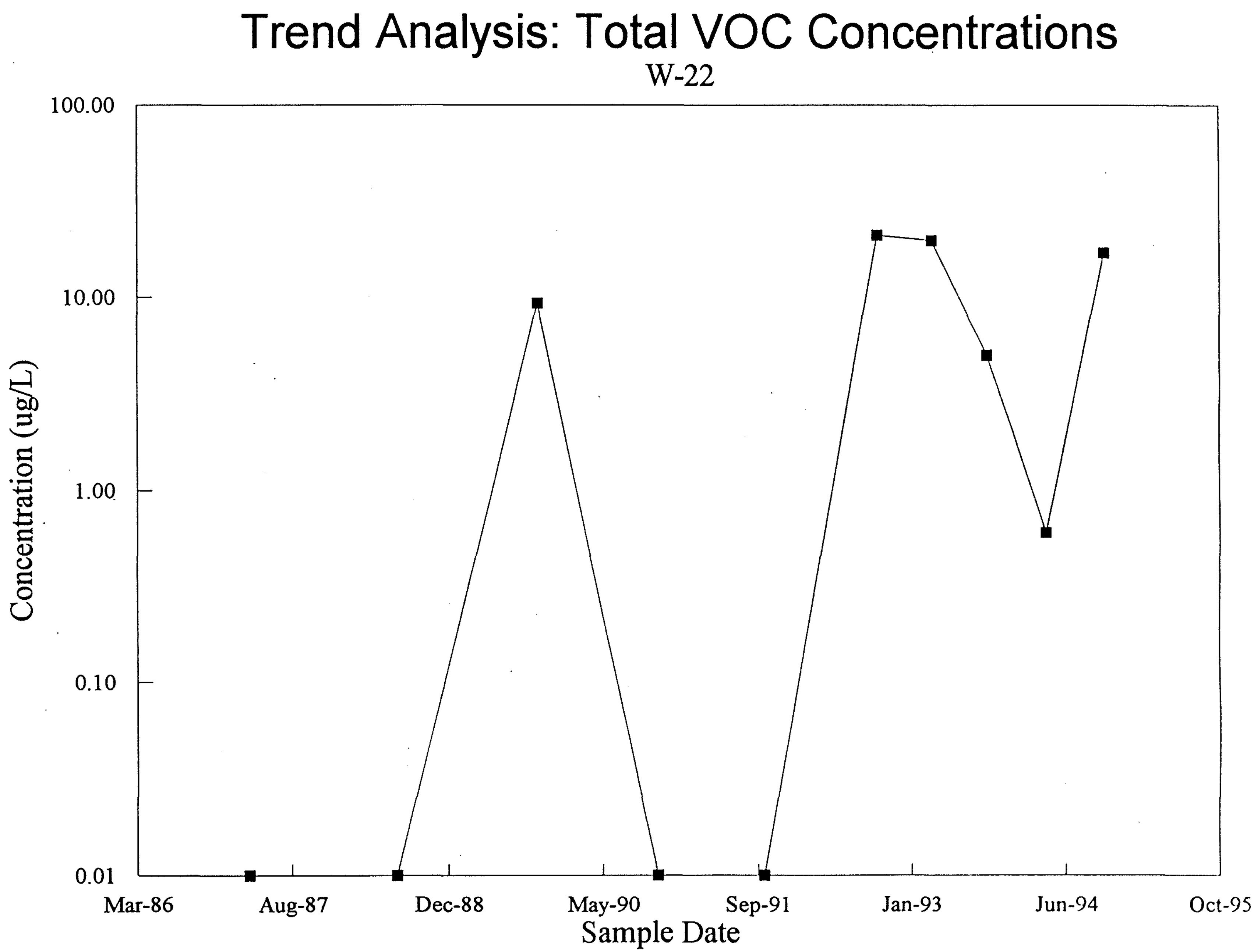


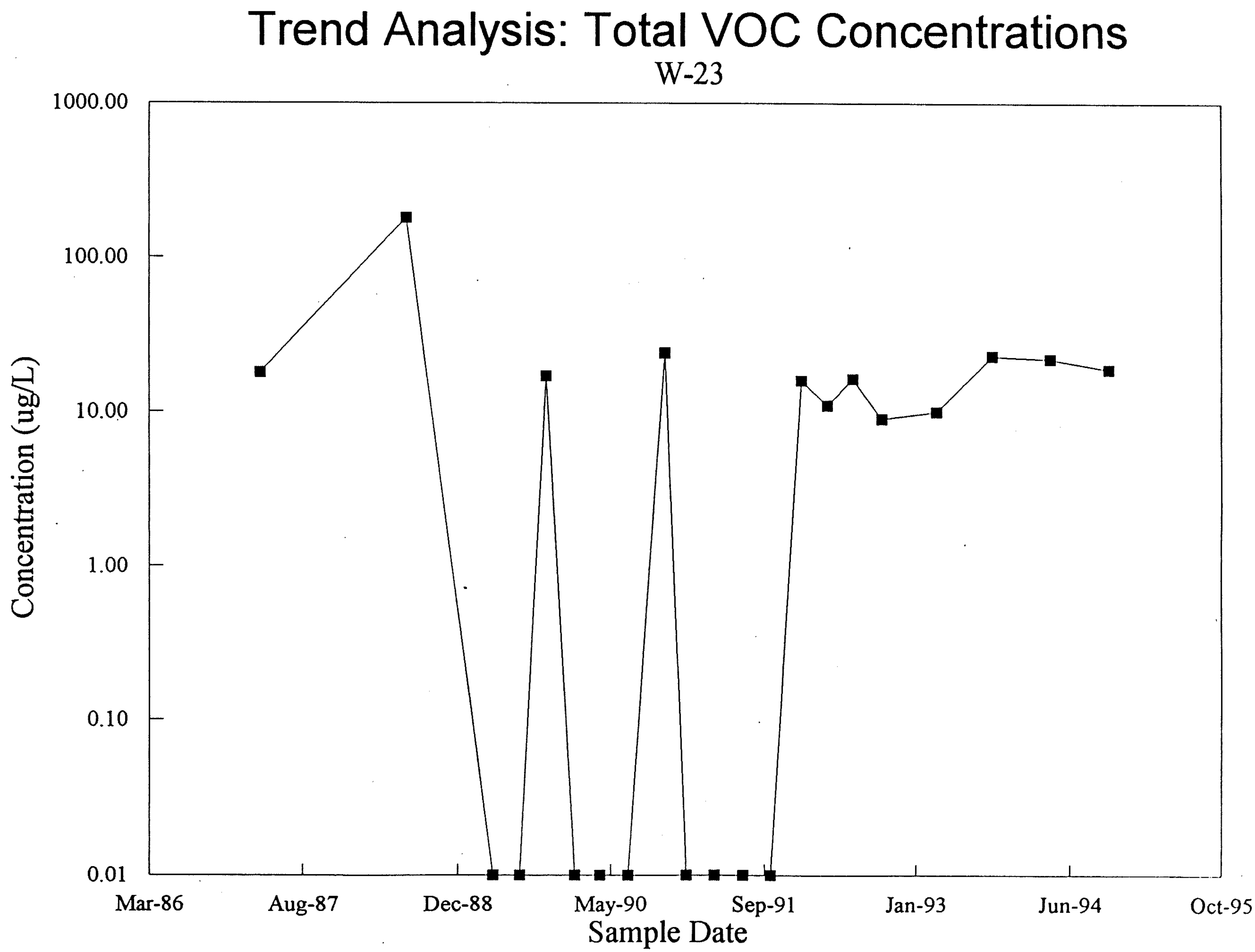
Trend Analysis: Total VOC Concentrations
W-03A
100.00
10.00
1.00
0.10
0.01
Concentration (ug/L)
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date

Trend Analysis: Total VOC Concentrations

W-07

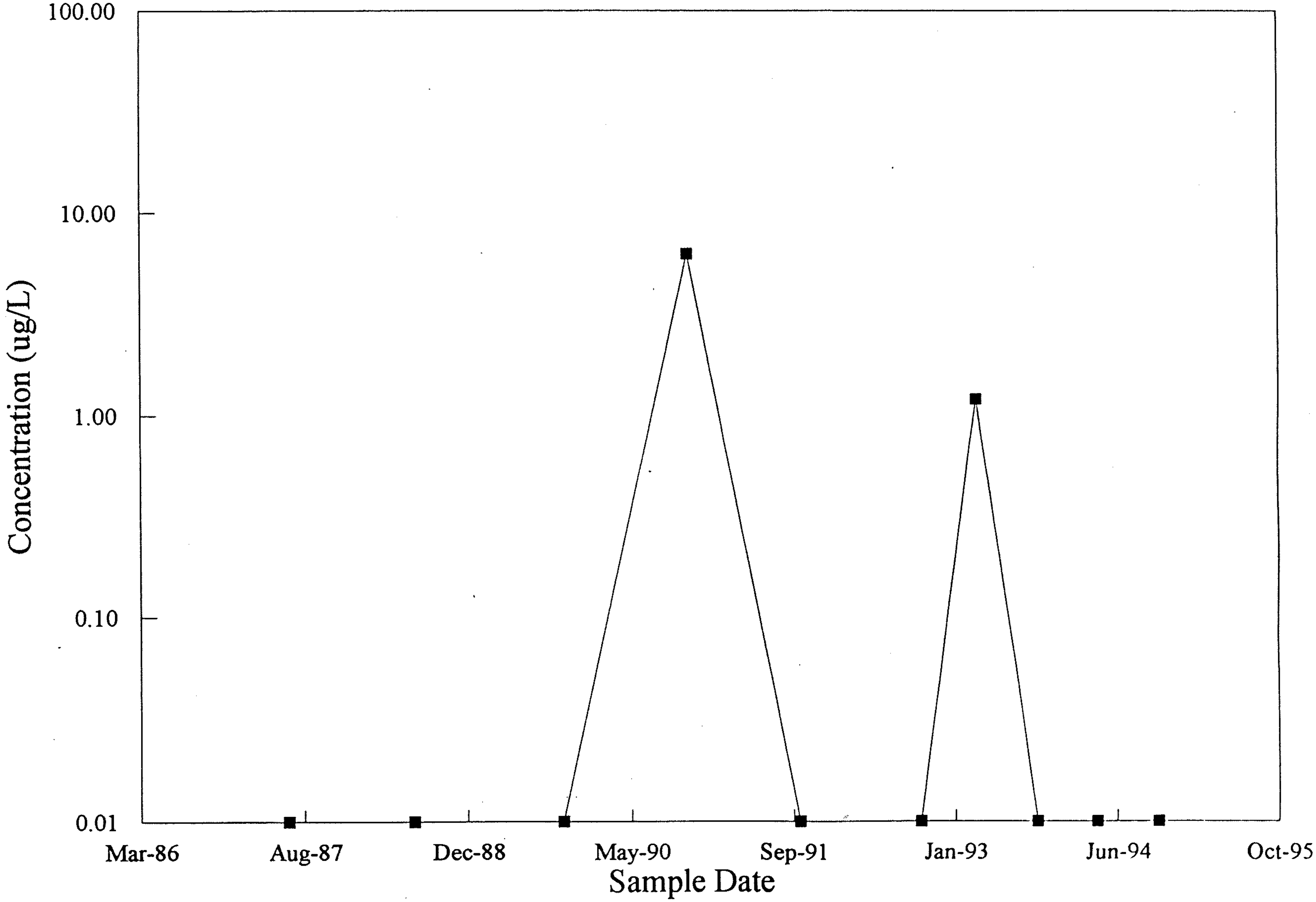



Trend Analysis: Total VOC Concentrations
W-22
100.00
10.00
1.00
0.10
0.01
Concentration (ug/L)
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date


Trend Analysis: Total VOC Concentrations
W-23
1000.00
100.00
10.00
1.00
0.10
0.01
Concentration (ug/L)
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date

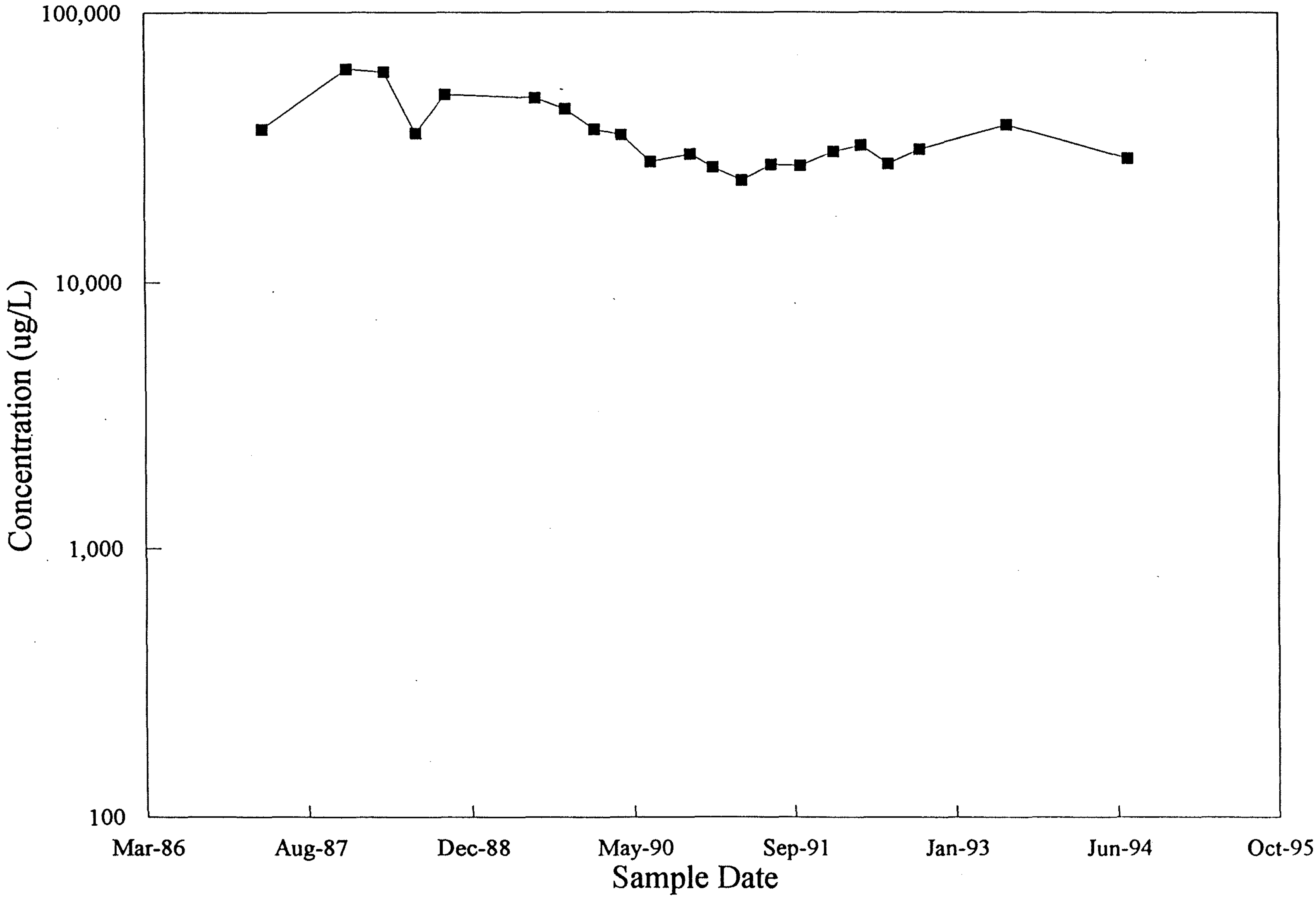
Trend Analysis: Total VOC Concentrations

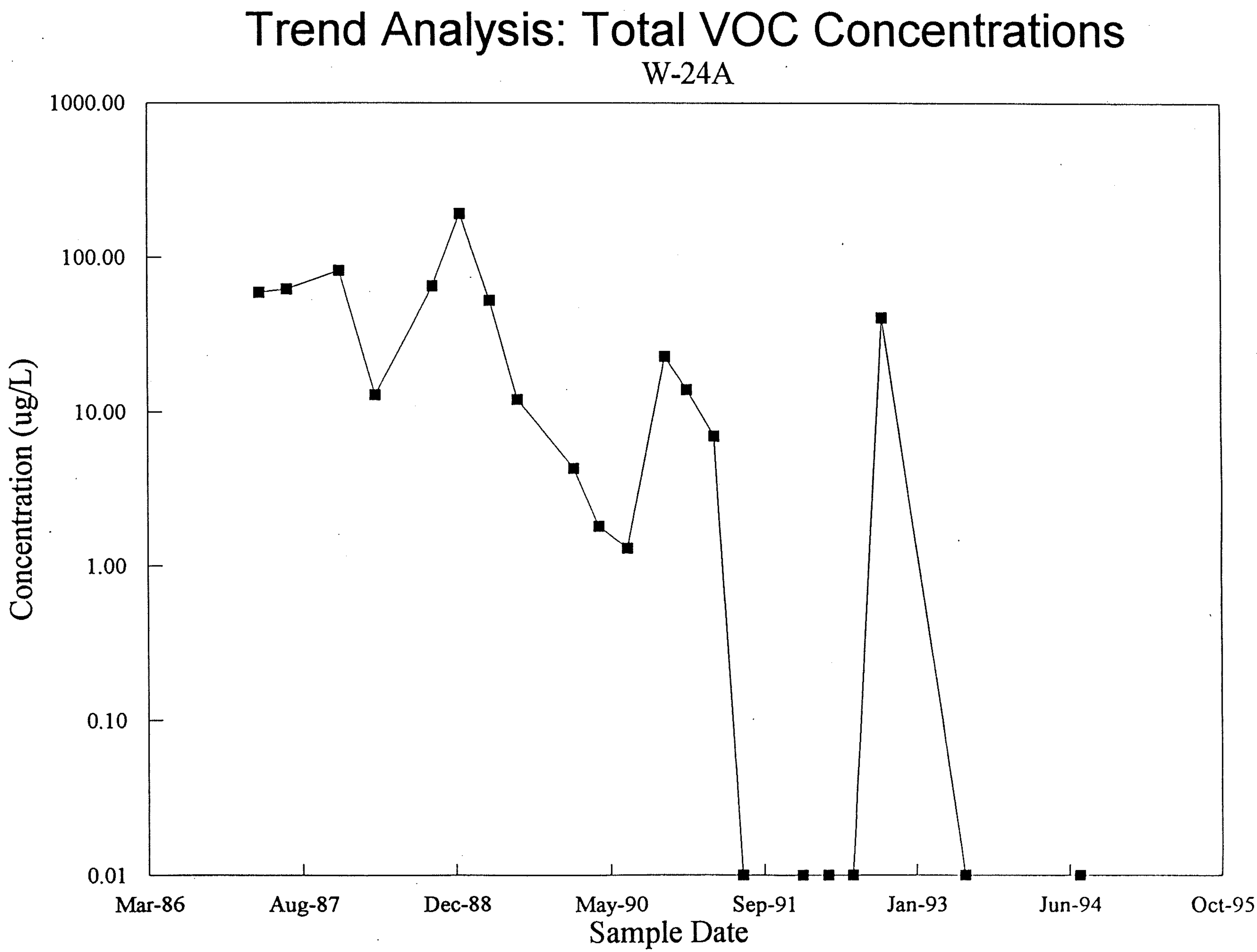
W-25



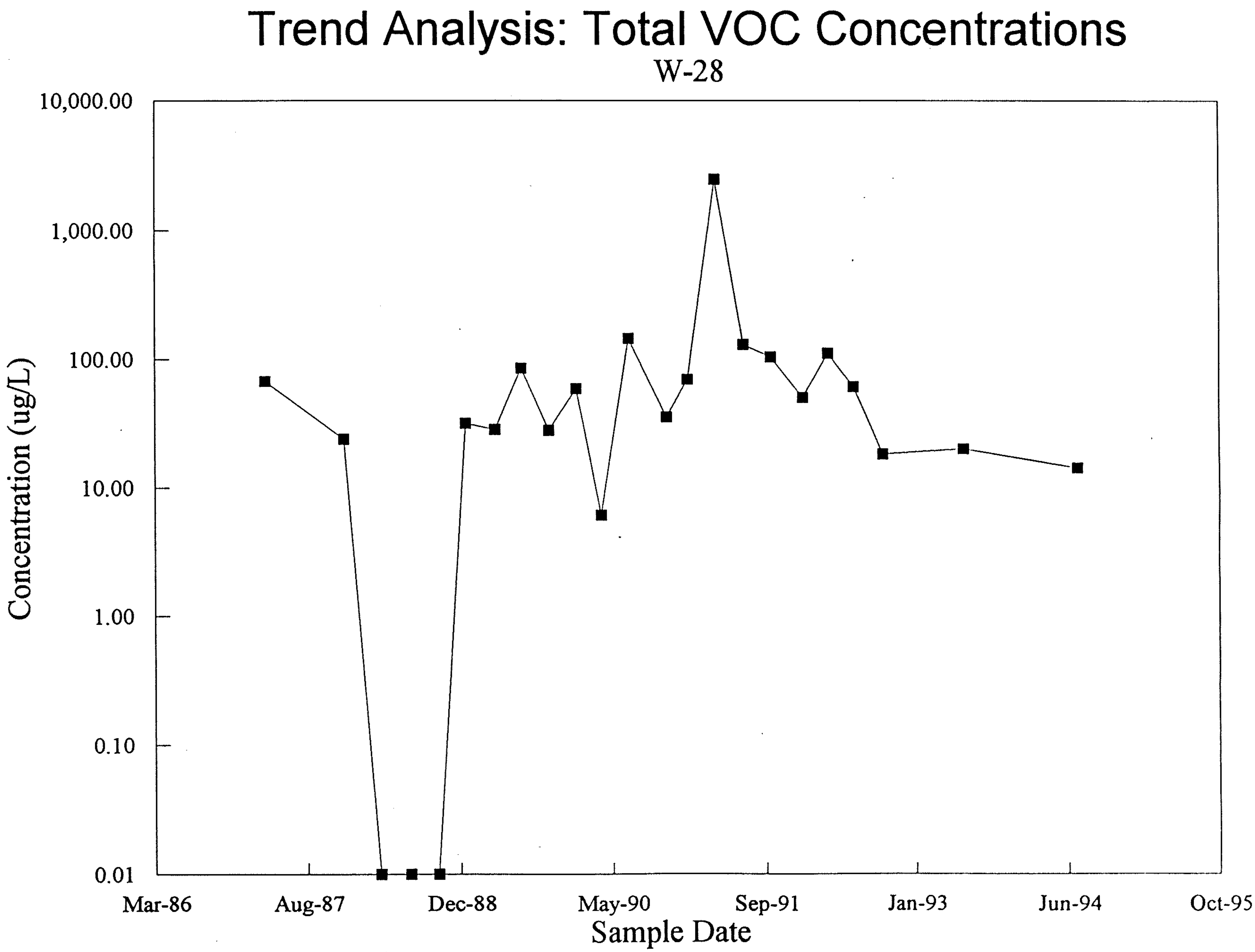
Trend Analysis: Total VOC Concentrations

W-21A





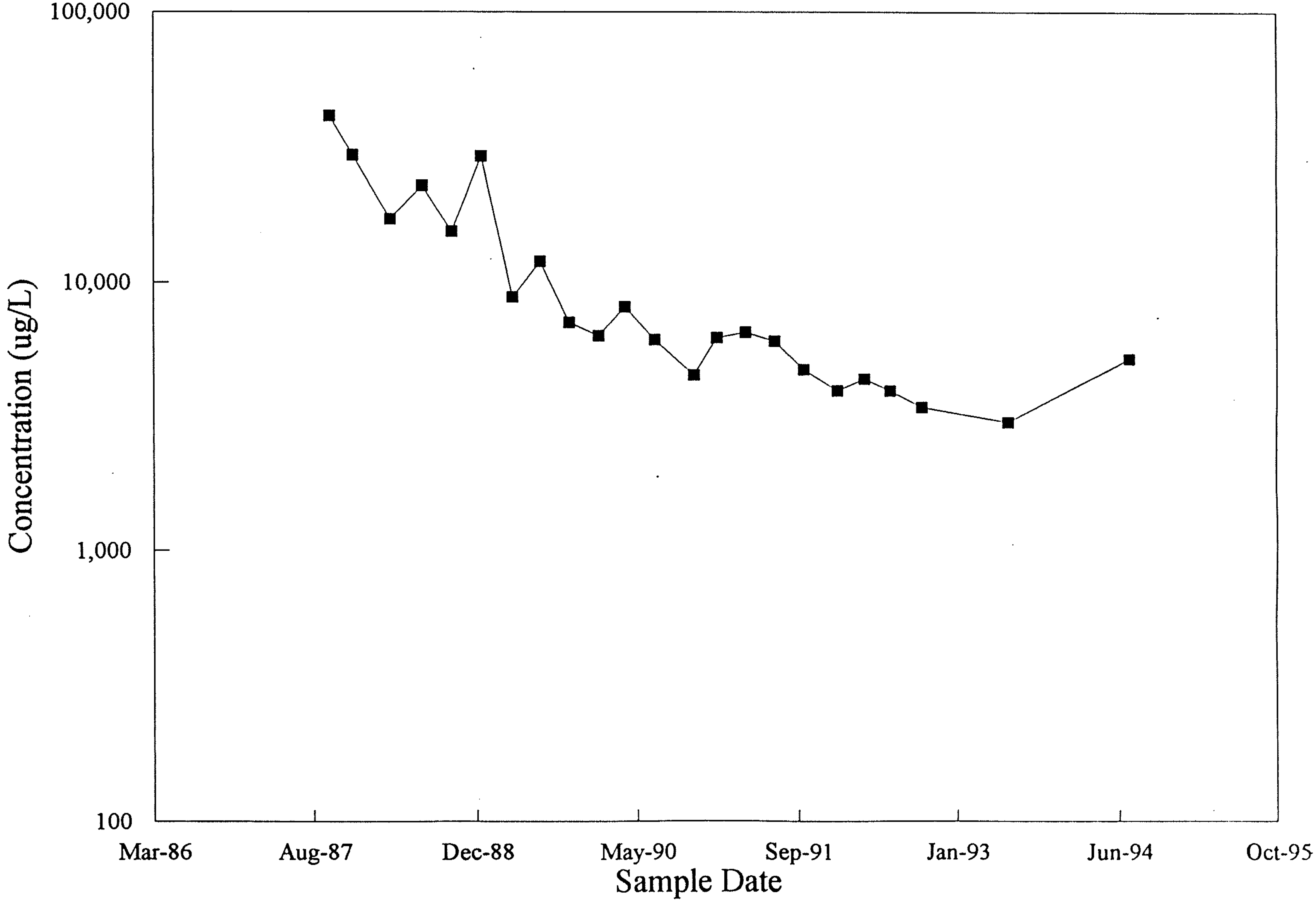
Trend Analysis: Total VOC Concentrations
W-24A
1000.00
100.00
10.00
1.00
0.10
0.01
Concentration (ug/L)
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date

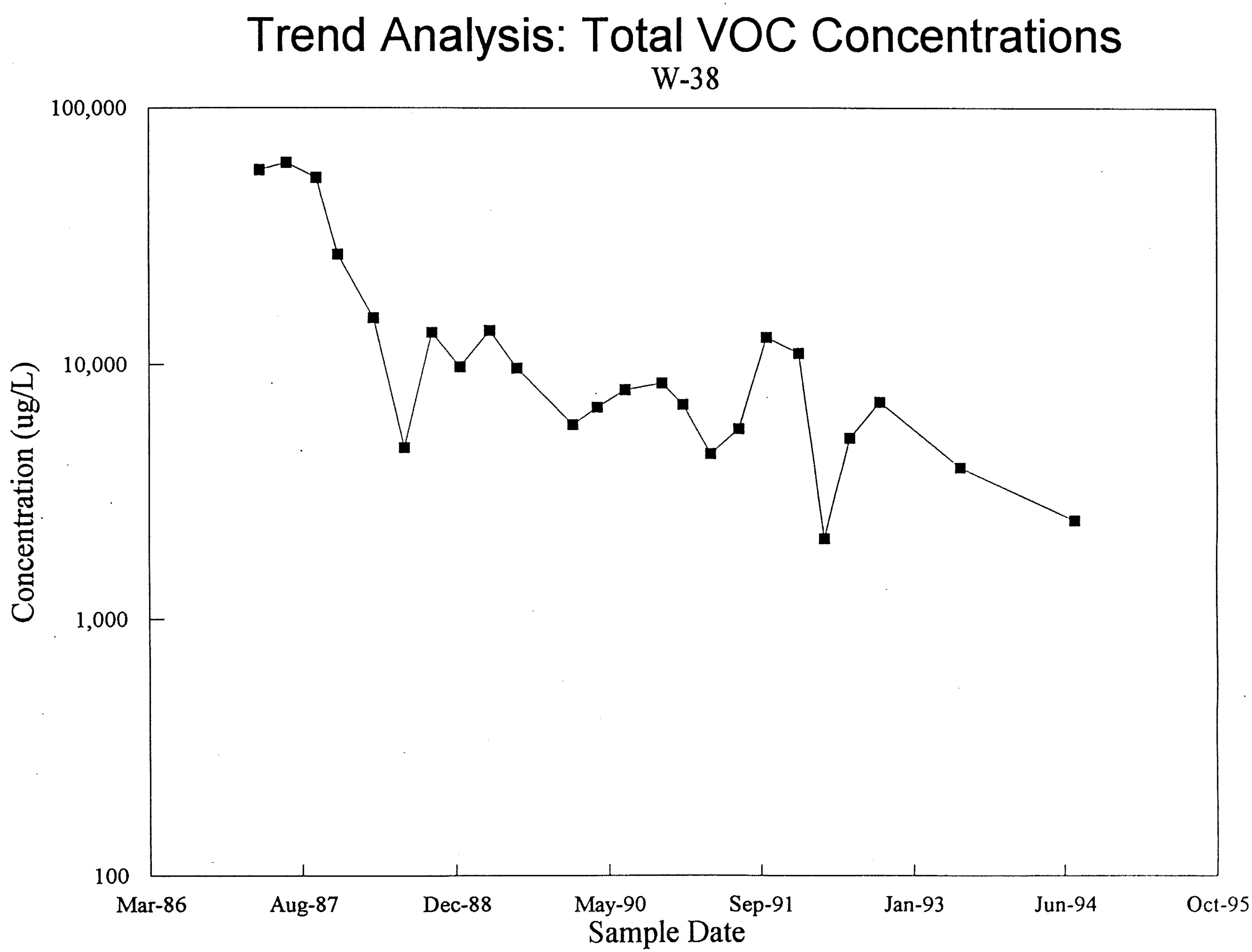


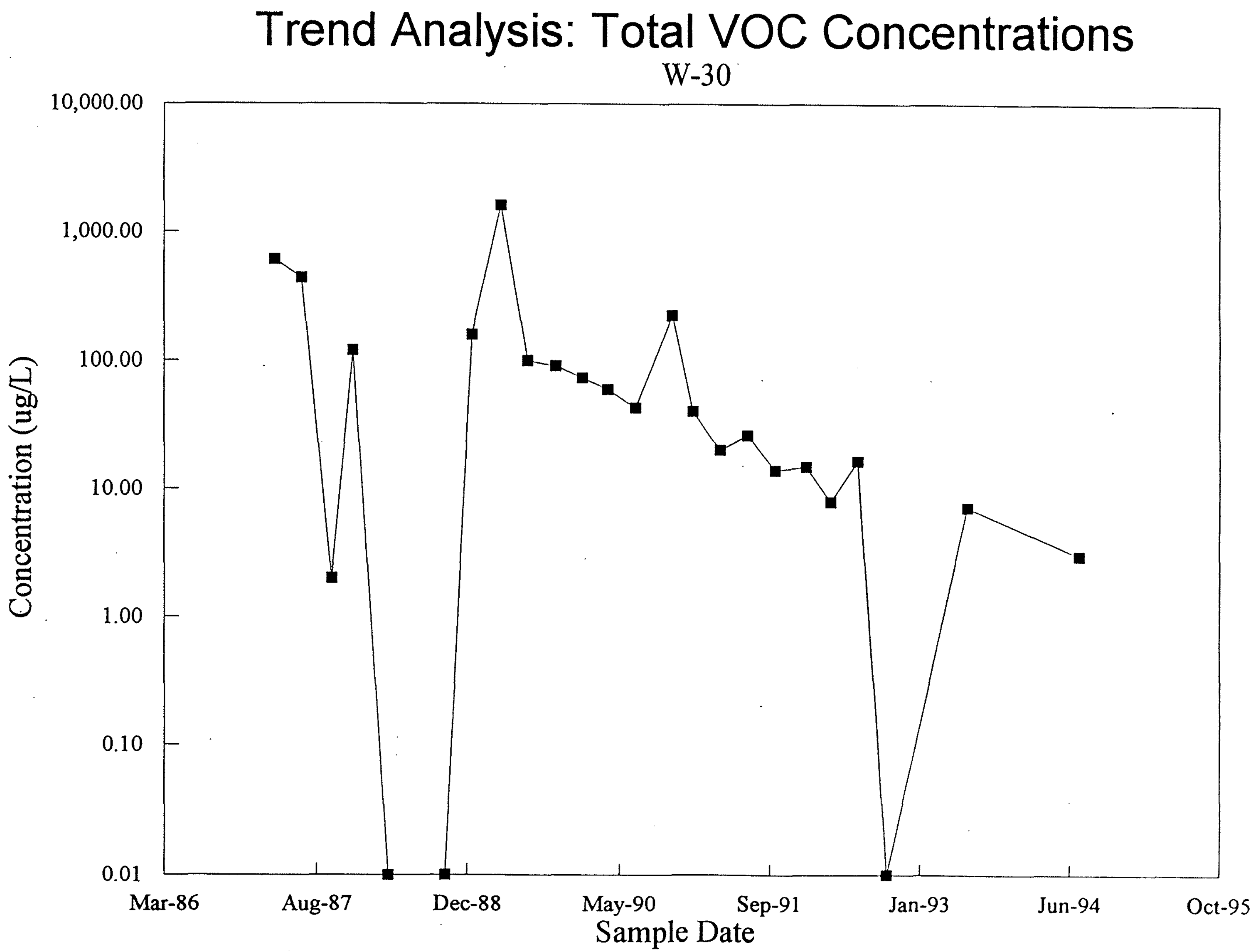
Trend Analysis: Total VOC Concentrations
W-28
10,000.00
1,000.00
100.00
10.00
1.00
0.10
0.01
Concentration (ug/L)
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date

Trend Analysis: Total VOC Concentrations

W-29




Trend Analysis: Total VOC Concentrations
W-38
100,000
10,000
1,000
100
Concentration (ug/L)
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date


Trend Analysis: Total VOC Concentrations
W-30
10,000.00
1,000.00
100.00
10.00
1.00
0.10
0.01
Concentration (ug/L)
Mar-86
Aug-87
Dec-88
May-90
Sep-91
Jan-93
Jun-94
Oct-95
Sample Date