0049943

Environmental Restoration Contractor **ERC Team**

Meeting Minutes

061120

Job No. 22192
Written Response Required: NO
Due Date: N/A
Actionee: N/A
Closes CCN: N/A
OU: 200-ZP-1 & 2
TSD: N/A
ERA: CC14
Subject Code: 8220

SUBJECT 200-ZP-1 AND 2 UNIT MANAGER MEETING

TO Distribution

FROM M. A. Buckmaster 8/31/98

DATE August 28, 1998

ATTENDEES	DISTRIBUTION
M. A. Buckmaster H0-19, w/a	Attendees
D. A. Faulk B5-01, w/a	R. L. Jackson H9-02, w/a
D. Goswami B5-18, w/a	L. C. Swanson H9-02, w/a
V. J. Rohay H9-02, w/a	C. Ward H9-01, w/a
A. C. Tortoso H0-12, w/a	Document and Information Services H0-09

A meeting on the above subject was held on July 6, 1998, at 3350 George Washington Way, Room 2C22.

The agenda is included as Attachment 1.

200-ZP-2 Soil Vapor Extraction System

The 14.2 m^3/min soil vapor extraction (SVE) system was operated at the Z-1A/Z-18/Z-12 site from 3/30/98 through 6/30/98 to remove carbon tetrachloride from the vadose zone. V. J. Rohay provided a graph of the carbon tetrachloride concentrations observed at the SVE inlet between 3/30/98 and 6/29/98 (Attachment 2). Comparison of the changes in concentration to the changes in the mix of on-line wells indicates that higher concentrations tend to be associated with the Z-1A wells. A plot of carbon tetrachloride inlet concentrations extracted from Z-1A/Z-18/Z-12 wells from 7/18/97 through 9/30/97, following the rebound study, is presented in Attachment 3. Comparison of the 1998 and 1997 data indicates that the concentrations extracted from Z-1A wells in June 1998 were similar to those in August-September 1997. During 91 days of operation in 1998, 250 kg of carbon tetrachloride were removed from the vadose zone at the Z-1A/Z-18/Z-12 site (Attachment 4).

Soil vapor monitoring, including monitoring near the groundwater and ground surface, was conducted at the Z-1A/Z-18/Z-12 and Z-9 sites from October 1997 through March 1998 while the SVE system was shut down. Monitoring was continued at the Z-9 site from April through June 1998 while SVE was ongoing at the Z-1A site. As requested by A. C. Tortoso and D. A. Faulk, monitoring locations were added near the caliche layer at the Z-9 site to provide an indication of concentrations that could be expected during restart of soil vapor extraction. V. J. Rohay provided a table comparing the maximum concentration at each monitoring location to the maximum observed at that location during the rebound study (November 1996 through July 1997) and a table of all the non-operational monitoring data as of 6/30/98 (Attachment 5). The maximum concentrations observed since October 1997 are similar to those observed during the rebound study.

061120

On 7/2/98 the system was moved to the Z-9 site, and operations were restarted on 7/6/98. The SVE system will be operated at the Z-9 site through 9/30/98. At the Z-9 site, the SVE system will initially be used to extract from only one well, W15-217. During monitoring, carbon tetrachloride rebound concentrations were the highest at this well in both 1997 (797 ppmv) and 1998 (630 ppmv) (Attachment 5). The purpose of extracting from one high concentration well is to observe the change in concentration with time. After concentrations extracted from W15-217 have reached steady-state, anticipated to take two to four days, additional wells will be added to the on-line mix.

Soil vapor monitoring, including monitoring near the groundwater, caliche layer, and ground surface, will be conducted at the Z-1A site during July through September while it is not undergoing active SVE. A. C. Tortoso and D. A. Faulk requested that soil vapor monitoring locations be added to measure carbon tetrachloride concentrations near the lower permeability silt/caliche zone where rebound concentrations are expected to be highest.

A six-month off-line, six-month on-line operating schedule is planned for next fiscal year also. Between September 1998 and March 1999, the system will be off-line and will remain at the Z-9 site. The system will then be operated at Z-9 from April through June 1999 and at Z-1A/Z-18/Z-12 from July through September 1999. As a consequence of this alternating schedule, SVE will not be resumed at the Z-1A site for 12 months. Soil vapor monitoring will be continued at vadose zone locations near the groundwater, the caliche layer, and the ground surface at the Z-1A/Z-18/Z-12 and Z-9 sites while they are not being actively remediated using SVE.

D. A. Faulk raised the issue of whether action levels should be developed based on the soil vapor concentrations, especially those monitored near the groundwater. It was suggested, as an example, that an action level could be based on the theoretical concentration (calculated using Henry's Law) for vapor in equilibrium with measured groundwater concentrations. If measured vapor concentrations monitored near groundwater were to exceed this theoretical vapor concentration, the chemical gradient would then tend to drive carbon tetrachloride toward the groundwater and potentially increase groundwater contamination. Based on 1997 and 1998 rebound concentrations, it is anticipated that actual vadose zone vapor concentrations near the groundwater will not exceed these levels. However, it was noted that there are only a limited number of deep wells in this area at which measurements of vapor or groundwater can be collected.

A. C. Tortoso is finalizing a letter to J. Wright, DOE EM-50, to request that the Innovative Treatment Remediation Demonstration (ITRD) program address the carbon tetrachloride plume next year.
A. C. Tortoso and D. A. Faulk agreed that ITRD is the preferred approach for reviewing the available remedial technologies to find the best match with the project needs. In addition, they noted that both the ZP-2 and ZP-1 projects need to continue to collect data to support future operations and to be creative in optimizing data collection and cleanup within the given budget.

200-ZP-1 Pump and Treat System

M. A. Buckmaster reported that the 200-ZP-1 pump-and-treat system is typically operating with no problems. However, over the previous weekend, the system was shut down because of a high carbon tetrachloride concentration measured between the first and second canisters of granular activated carbon

061120

(GAC). This elevated concentration indicates saturation of the first GAC canister, which will be changed out to fix the problem.

Between August 1994 and March 1998, the pump-and-treat system removed 1,431 kg of carbon tetrachloride and treated nearly 500,000,000 liters of water (Attachment 6). During the past quarter (January through March 1998), the concentration trend was upward or stable at all six extraction wells. The process data for the six extraction wells indicates that carbon tetrachloride concentrations are highest at wells W15-33, near the northwest corner of the 231-Z building at PFP, and W15-32, at the northeast corner of the Z-9 trench. The source of the high concentrations at W15-33 is uncertain. The pumping rate is greatest from well W15-35, east of the 231-Z building and north of the Z-9 trench.

Only one well, W15-29, is being used for injection of clean, treated water to the aquifer. Short-term injection rate tests conducted at the other four injection wells to the south indicate that these wells transmit water at an equal or slower rate. A change in injection wells will be implemented soon to observe long-term injection rates and buildup at these other wells. Although no problems have been encountered with the current injection well, operational experience with the different injection wells will support selection of future injection-extraction operating patterns.

The regional ZP-1 water table is higher to the west and slopes to the east. Locally, the water table elevations are highest at the location of the injection well and lowest at the locations of the extraction wells. The regional water level in the ZP-1 area has continued to decline as the regional groundwater mound dissipates. The water level dropped by 0.2 m (0.7 ft) between January and March 1998 (Attachment 6). Five of the pump-and-treat extraction well screens are 50 ft long; the sixth is 40 ft long. All of the screens were installed within the upper 50 ft of the unconfined aquifer.

The hydraulic capture modeled through March 1998 indicates that the six extraction wells are containing the carbon tetrachloride plume (Attachment 6). The hydraulic capture based on measured drawdown is in good agreement with the modeled hydraulic capture.

Based on the successful hydraulic capture using the extraction system and the successful removal efficiency using the treatment system, no major changes are planned for ZP-1 pump-and-treat operations. The problems with the leak detection cable and pipe, which occasionally shut down the system unnecessarily, will continue to be investigated.

The anticipated budget for next fiscal year could potentially include a review of remedial alternatives and characterization methods to investigate the presence of DNAPL in the aquifer. The results would be presented using a mechanism such as a white paper.

V. J. Rohay reported on the results of her correspondence with J. W. Massmann at the University of Washington regarding CRESP support for future studies at ZP-2 (action item from the 6/2/98 ZP-1/ZP-2 meeting). J. W. Massmann wrote that he has CRESP funding for a student, beginning in September, to continue work at the carbon tetrachloride site. He also noted that in the next couple of months he will need to propose work for the March 1999-March 2000 timeframe. D. A. Faulk indicated that it would be useful to determine the vapor concentrations at the ZP-2 site that would maintain groundwater compliance at the future site uses working group boundary and would be protective of the Columbia River. A. C. Tortoso and V. J. Rohay suggested an evaluation and uncertainty analysis of potential carbon tetrachloride

061120

migration within the vadose zone toward the Site boundary in the up-groundwater-gradient direction. It was agreed that the ZP-1/ZP-2 team would develop specific suggestions before discussing these options further with Dr. Massmann.

DNAPL Detection Demonstration at Savannah River Site

D. Goswami reported on the results of a demonstration conducted at Savannah River Site of two optical sensors designed to directly detect DNAPL. One of the sensors uses measured Raman spectra to identify compounds, and the other sensor measures refractive index changes in the pore fluid of the sediments (Attachment 7). Both sensors are designed for use with a cone penetrometer. D. Goswami said that the sensors were successful at detecting DNAPL during the testing. The ZP-1/ZP-2 team expressed interest in obtaining the full evaluation of the test results when they are available from Savannah River Site in September.

VJR:cw

Attachments: (1) Agenda
(2) Graph of Carbon Tetrachloride Concentrations at the SVE Inlet
(3) A Plot of Carbon Tetrachloride Inlet Concentrations from Z-1A/Z-18/Z-12 Wells
(4) Carbon Tetrachloride Extracted from the Vadose Zone
(5) Comparison of Carbon Tetrachloride Concentrations
(6) Information showing removal of Carbon Tetrachloride with Pump-and-Treat System
(7) Information on Cone Penetrometer Technologies

Attachment 1

AGENDA

UNIT MANAGERS MEETING

061120

200-ZP-1 AND 200-ZP-2

JULY 6, 1998

200-ZP-2 SOIL VAPOR EXTRACTION REMEDIATION

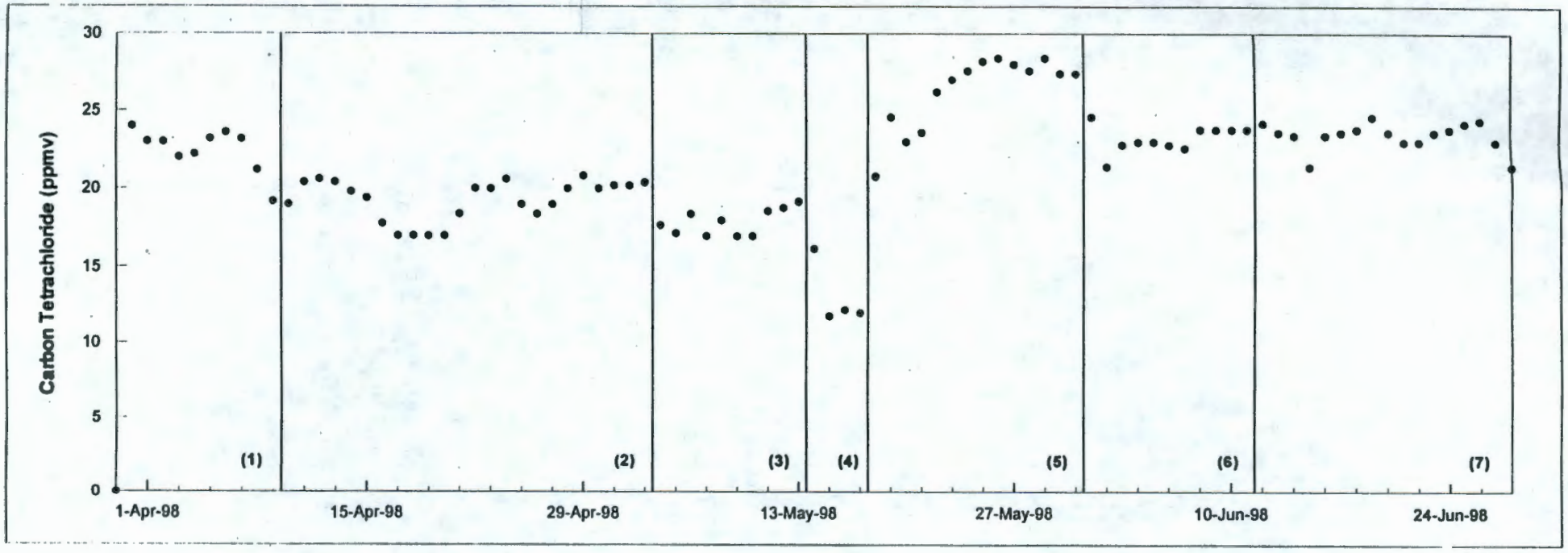
- Summary of Z-1A Operations
- Status of Non-Operational Monitoring
- Status of SVE System Move to Z-9 Site
- Plan for Z-9 Operations

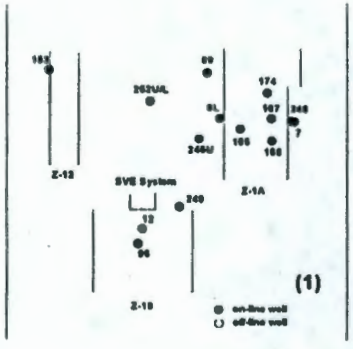
200-ZP-1 PUMP-AND-TREAT REMEDIATION

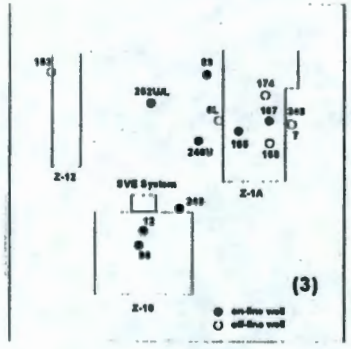
- Status of Pump-and-Treat Operations

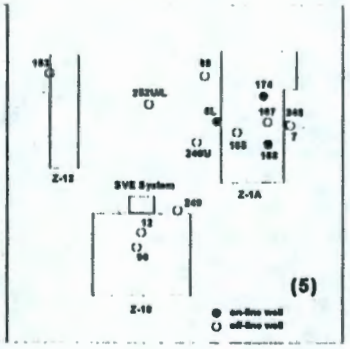
DISCUSSION OF FUTURE PLANS

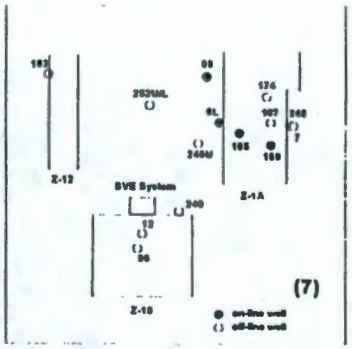
- DNAPL Detection Demonstration at Savannah River Site
- DNAPL Investigations
- SVE Enhancements
- CRESP project

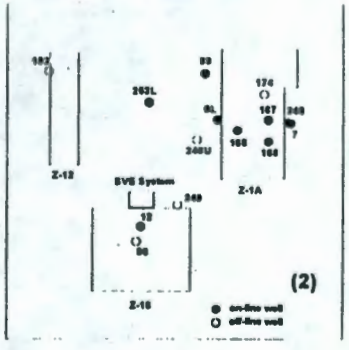


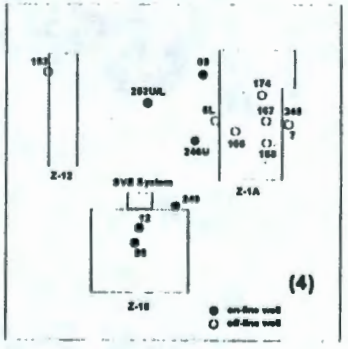


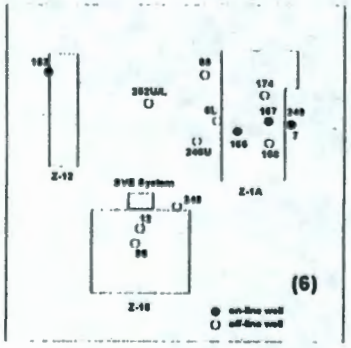






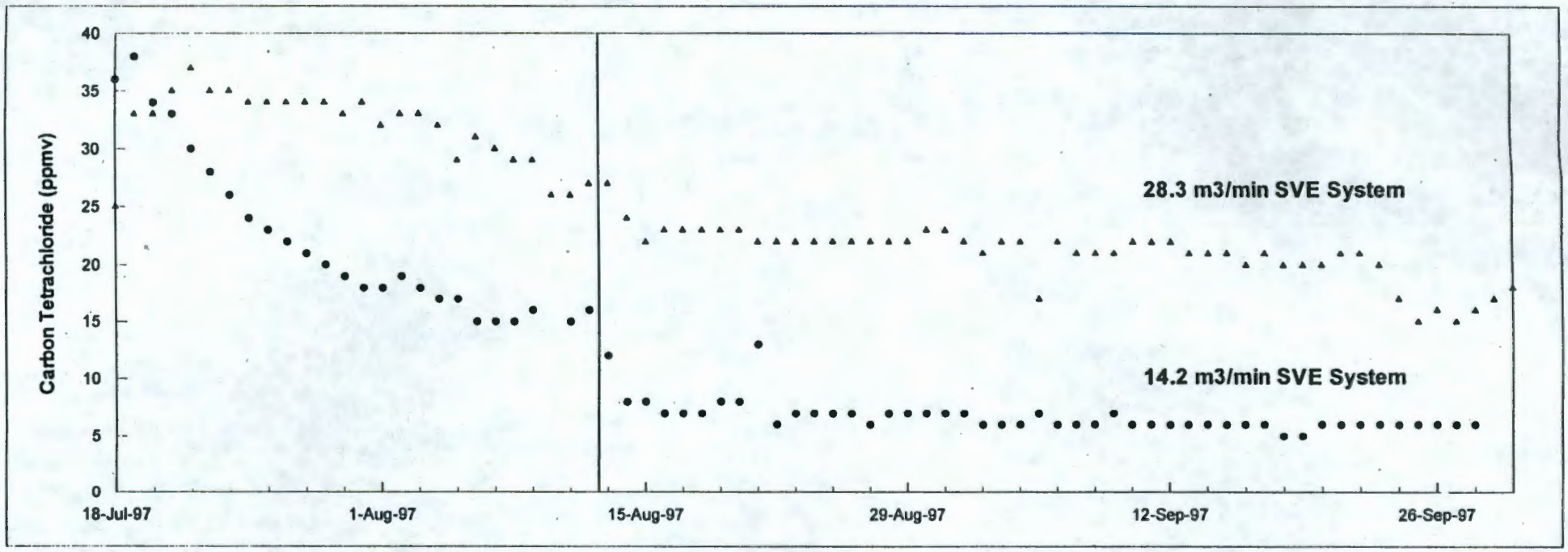


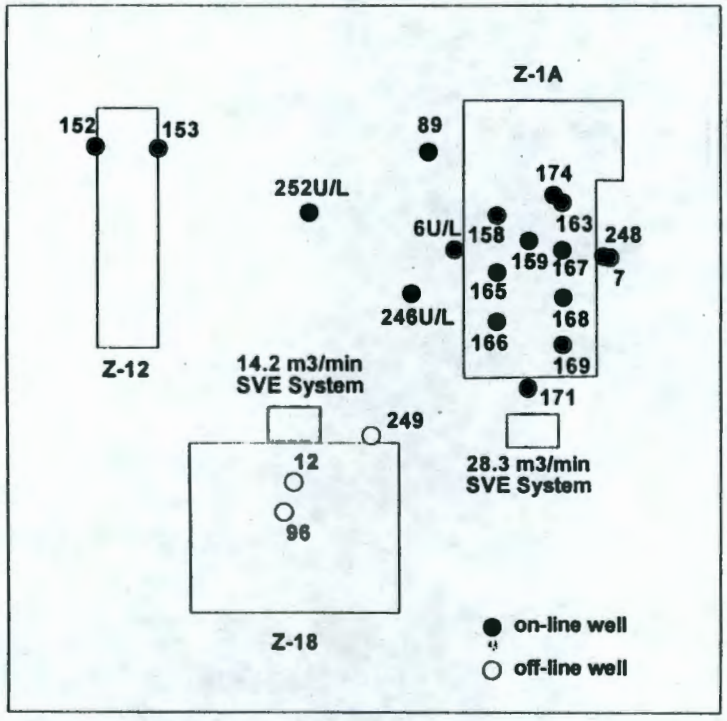


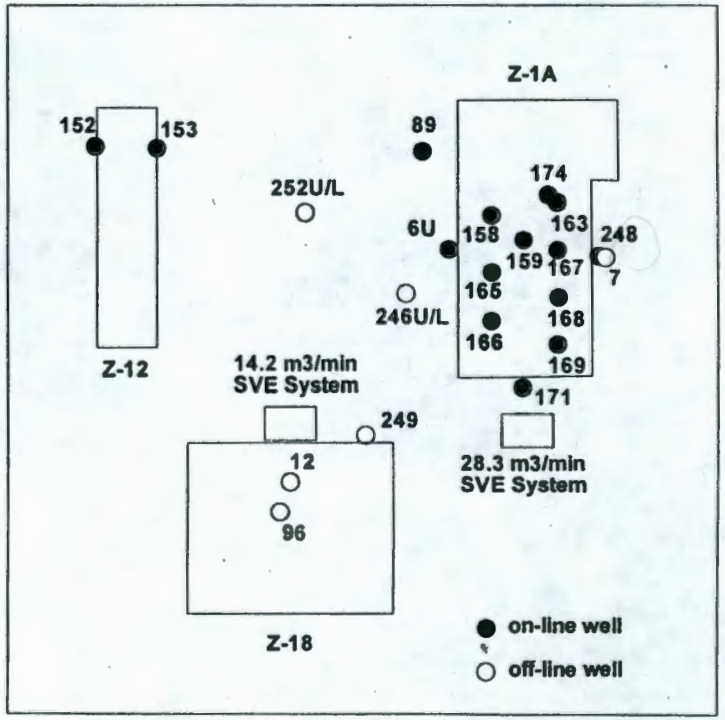


Attachment 2

061120





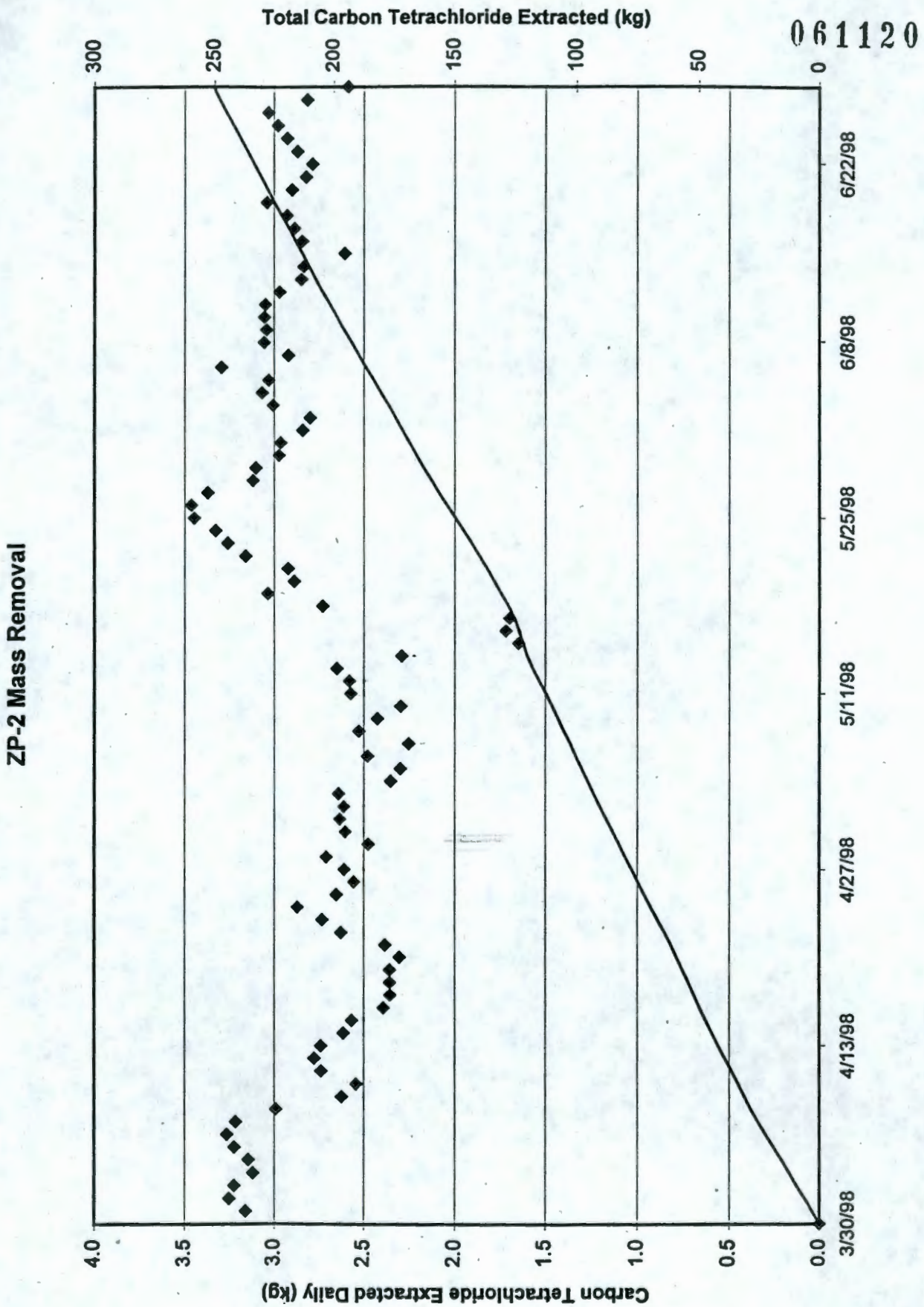


Attachment 3

061120

Attachment 4

061120



Attachment 5

Comparison of Maximum Carbon Tetrachloride Rebound Concentrations
Monitored at 200-ZP-2 Soil Vapor Extraction Sites
1997 and 1998

061120

200-ZP-2 Location (Well or Probe) /feet bgs	Site	Zone	November 1996 - July 1997 Maximum Rebound Carbon Tetrachloride (ppmv)	October 1997 - March 1998 Maximum Rebound Carbon Tetrachloride (ppmv)	October 1997 - June 1998 Maximum Rebound Carbon Tetrachloride (ppmv)
79-11/ 5 ft	Z-1A	1	0	0	deleted April 1998
86-06/ 5 ft	Z-9	1	1.3	0	0
87-01R/ 5 ft	Z-1A	1	3.5	0	deleted April 1998
87-09/ 5 ft	Z-1A	1	not measured	0	deleted April 1998
94-09/ 5 ft	Z-9	1	1.4	1.3	1.3
95-11/ 5 ft	Z-9	1	0	1.2	2.1
95-12/ 5 ft	Z-9	1	1.1	0	1.5
N-6/ 5 ft	Z-1A	1	not measured	0	deleted April 1998
CPT-13A/ 9 ft	Z-1A	2	not measured	0	0
CPT-16/ 10 ft	Z-9	2	not measured	0	0
CPT-17/ 10 ft	Z-9	2	not measured	1.2	4.2
CPT-18/ 15 ft	Z-9	2	not measured	0	6.5
CPT-31/ 25 ft	Z-1A	2	not measured	0	deleted April 1998
CPT-32/ 25 ft	Z-1A	2	not measured	9.1	deleted April 1998
CPT-7A/ 32	Z-1A	2	not measured	2.3	deleted April 1998
CPT-1A/ 35 ft	Z-1A	2	2.0	1.2	1.3
CPT-28/ 40 ft	Z-9	2	40.1	21.6	21.6
CPT-33/ 40 ft	Z-1A	2	not measured	1.8	deleted April 1998
CPT-21A/ 45 ft	Z-9	2	65.6	42.9	52.7
CPT-9A/ 60 ft	Z-9	2	45.5	40.9	40.9
W15-216L/ 184 ft	Z-9	5	16.7	17.3	17.3
W15-6L/ 189 ft	Z-9	6	22.6	16.3	17.8
W15-9L/ 189 ft	Z-9	6	18.3	14.6	15.0
W18-6L/ 201 ft	Z-1A	6	36.0	31.3	deleted April 1998
W18-7/ 203 ft	Z-1A	6	28.5	15.8	deleted April 1998
added April 1998					
CPT-28/ 60 ft	Z-9	2	not measured		1.3
CPT-24/ 70 ft	Z-9	2	not measured		3.2
W15-82/ 82 ft	Z-9	2	28.9		5.5
W15-95/ 82 ft	Z-9	2	not measured		15.3
CPT-21A/ 86 ft	Z-9	2	221		206
CPT-28/ 87 ft	Z-9	2	280		230
CPT-9A/ 91 ft	Z-9	2	103		34.5
W15-218U/ 108 ft	Z-9	3	41.4		0
W15-223/ 108 ft	Z-9	3	31.2		2.2
W15-217/ 115 ft	Z-9	3	797		630
CPT-24/ 118 ft	Z-9	3	44.6		37.7

Carbon Tetrachloride Rebound Concentrations
Monitored at 200-ZP-2 Soil Vapor Extraction Sites
October 1997 - June 1998

200-ZP-2		November 1996 -								
Location		July 1997	12/1/97	1/10/98	1/29/98	2/26/98	3/24/98	4/30/98	5/26/98	6/29/98
(Well or Probe)	Zone	Maximum Rebound								
/feet bgs		Carbon Tetrachloride	CCl4	CCl4	CCl4	CCl4	CCl4	CCl4	CCl4	CCl4
		(ppmv)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	(ppmv)
79-11/ 5 ft	1	0	0	0	0	0	0	del 4/98	del 4/98	del 4/98
86-06/ 5 ft	1	1.3	0	0	0	0	0	0	0	0
87-01R/ 5 ft	1	3.5	0	0	0	0	0	del 4/98	del 4/98	del 4/98
87-09/ 5 ft	1	not measured	0	0	0	0	0	del 4/98	del 4/98	del 4/98
94-09/ 5 ft	1	1.4	1.3	0	0	1.3	0	0	0	0
95-11/ 5 ft	1	0	0	0	0	0	1.2	0	2.1	1.8
95-12/ 5 ft	1	1.1	0	0	0	0	0	1.4	1.5	1.2
N-6/ 5 ft	1	not measured	0				0	del 4/98	del 4/98	del 4/98
CPT-13A/ 9 ft	2	not measured	0	0	0	0	0	0	0	0
CPT-16/ 10 ft	2	not measured	0	0	0	0	0	0	0	0
CPT-17/ 10 ft	2	not measured	0	0	0	0	1.17	3.6	4.2	4.1
CPT-18/ 15 ft	2	not measured	0	0	0	0	0	1.0	4.3	6.5
CPT-31/ 25 ft	2	not measured	0	0	0	0	0	del 4/98	del 4/98	del 4/98
CPT-32/ 25 ft	2	not measured	0	0	5.1	6.6	9.1	del 4/98	del 4/98	del 4/98
CPT-7A/ 32	2	not measured	0	0	1.9	2.3	2.2	del 4/98	del 4/98	del 4/98
CPT-1A/ 35 ft	2	2.0	0	0	0	0	1.2	1.2	1.3	0
CPT-28/ 40 ft	2	40.1	17.0	19.1	21.6	19.2	11.7	13.3	(e)	(e)
CPT-33/ 40 ft	2	not measured	0	1.8	1.8	1.3	1.4	del 4/98	del 4/98	del 4/98
CPT-21A/ 45 ft	2	65.6	18.5	30.5	37.1	21.5	42.9	41.4	52.7	33.7
CPT-9A/ 60 ft	2	45.5	35.8	37.5	39.1	40.9	38.9	39.1	38.8	38.0
W15-216L/ 184 ft	5	16.7		14.1	15.5	15.0	17.3	15.0	15.3	12.8
W15-6L/ 189 ft	6	22.6		15.2	16.1	16.1	16.3	16.4	17.8	17.6
W15-9L/ 189 ft	6	18.3		13.3	14.6	8.7	14.6	14.0	15.0	8.6
W18-6L/ 201 ft	6	36.0		24.0	25.8	31.3	0 (a)	del 4/98	del 4/98	del 4/98
W18-7/ 203 ft	6	28.5		12.6	14.4	15.7	15.8	del 4/98	del 4/98	del 4/98
added April 1998										
CPT-28/ 60 ft (e)	2	not measured							1.3	0
CPT-24/ 70 ft (b)	2	not measured						1.8	3.2	2.9
W15-82/ 82 ft (c)	2	28.9						0	5.54	0
W15-95/ 82 ft (c)	2	not measured						11.9	15	15.3
CPT-21A/ 86 ft	2	221						169	168	206
CPT-28/ 87 ft	2	280						229	229	230
CPT-9A/ 91 ft	2	103						27.6	34.5	33.6
W15-218U/ 108 ft	3	41.4						0 (d)	0 (d)	0 (c)
W15-223/ 108 ft (c)	3	31.2						0	2.18	0
W15-217/ 115 ft	3	797					64.9 (c)	25.4 (d)	630	504
CPT-24/ 118 ft	3	44.6						37.7	36.5	37.5

(a) sampling tube removed, SVE wellhead adapter installed prior to sampling; sample from wellhead after well had been open to atmosphere for wellhead assembly changeout

(b) unable to pull sample from CPT-24/95 ft; substituted CPT-24/70 ft

(c) sampled from wellhead without tubing after 3 minute purge

(d) sampled from wellhead without tubing after 10 minute purge

(e) unable to pull sample from CPT-28/40 ft; substituted CPT-28/60 ft

Table 3-1. Volume of Groundwater Treated and Mass of Carbon Tetrachloride Removed Since Startup of Operations at 200-ZP-1.

Reporting Period	Liters Treated	Mass of Carbon Tetrachloride Removed (kg)
August 1994 – July 1996	26,676,000	75.85
August 1996 – September 1996	33,232,327	60.96
October 1996 – December 1996	44,583,715	143.54
January 1997 – March 1997	69,869,604	237.2
April 1997 – June 1997	41,877,094	140.8
July 1997 – September 1997	62,469,305	228.8
October 1997 – December 1997	77,192,021	262.6
January 1998 – March 1998	71,545,712	281.4
Total	427,445,778	1,431

Table 3-2. Approximate Pumping Rates for 200-ZP-1 Extraction Wells from January 1 to March 31, 1998.

Well Name	Well Number	Flow Rate L/min
299-W15-33	1	68
299-W15-34	2	108
299-W15-35	3	310
299-W15-32	4	86
299-W15-36	5	115
299-W15-37	6	67
	Total	754

Figure 3-3. 200-ZP-1 Extraction Well Discharge Rates from January 1 to March 31, 1998.

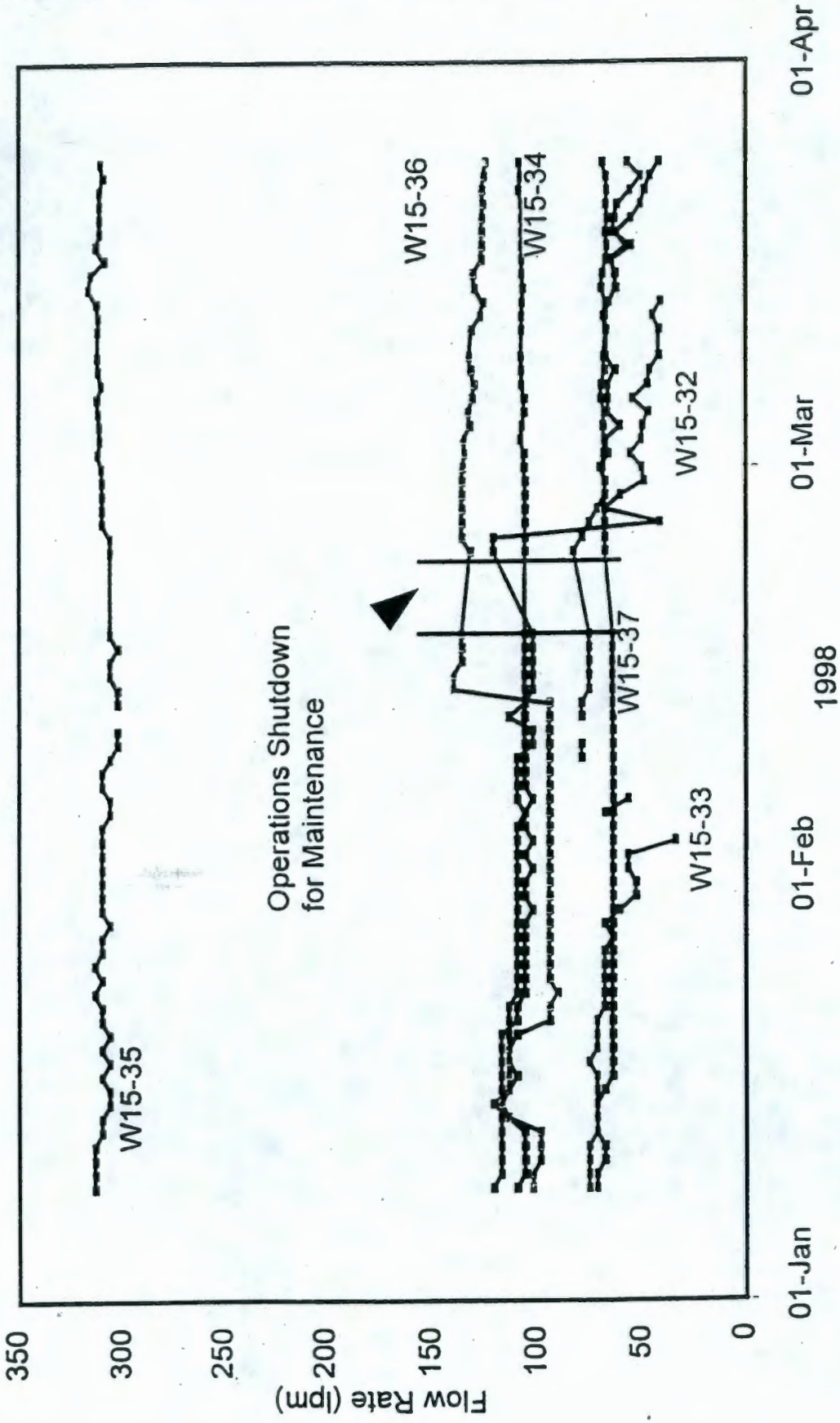


Figure 3-8. Carbon Tetrachloride Time-Series Plot for 200-ZP-1 Extraction Wells from July 1997 Through March 1998.

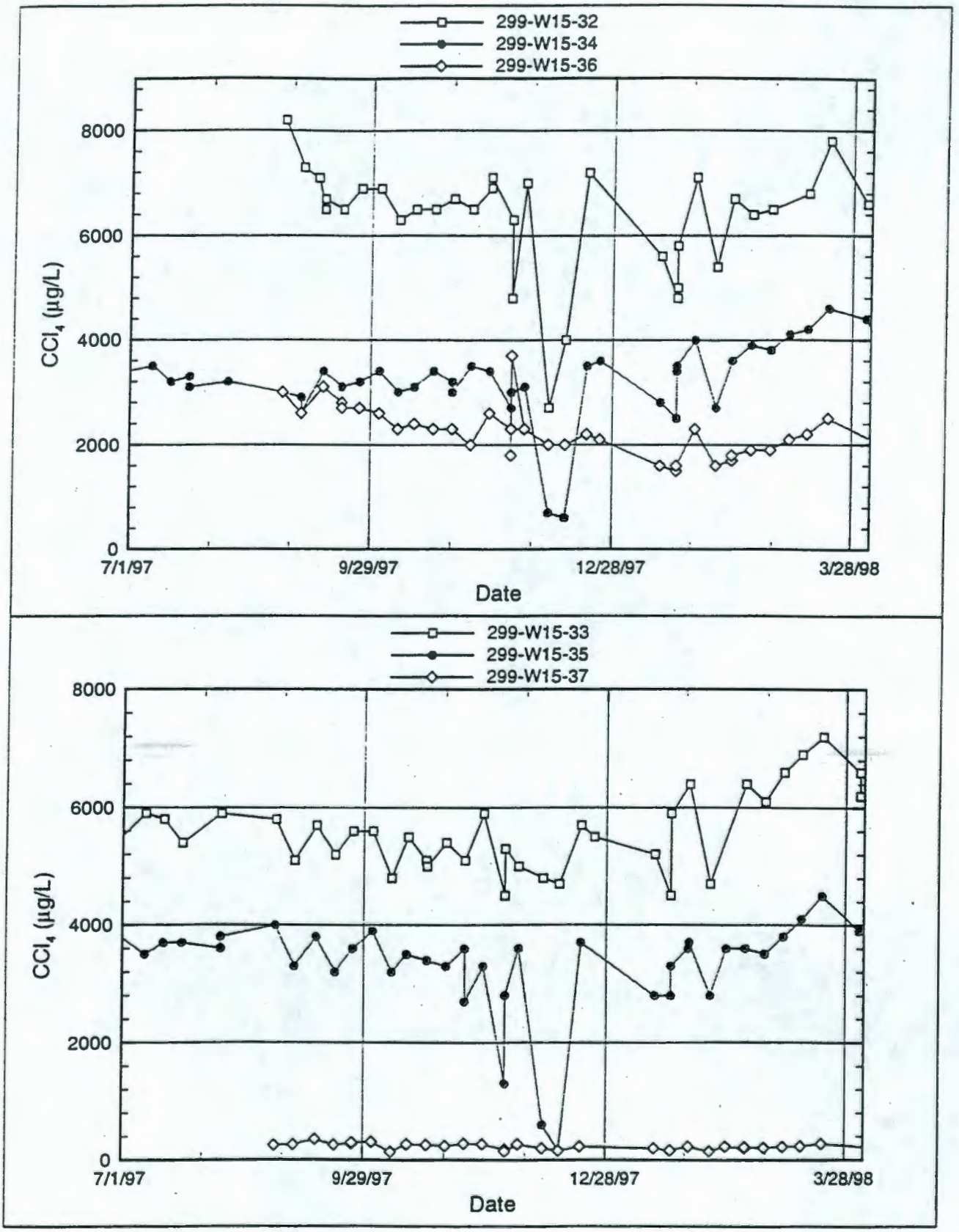


Table 3-4. Average Concentrations for Carbon Tetrachloride, Chloroform and Trichlorolethylene at the 200-ZP-1 Extraction Wells and Influent Tank T-01 from February Through March 1998.

Constituent	Average Well/Tank Concentrations (µg/L)[a]						
	W15-32	W15-33	W15-34	W15-35	W15-36	W15-37	Influent Tank
Carbon Tetrachloride	6,917	6,550	4,033	3,850	2,014	230	4,022
TCM	40	28	15	18	23	22	-
TCE	5	10	11	6	8	2	-

[a] January data were not used for the estimate because of variabilities in operations that, if included, would misrepresent actual average concentrations.

Table 3-5. Summary of Modeled and Measured Drawdown and Buildup in 200-ZP-1 Wells

Well	Measured Drawdown (m)	Modeled Drawdown (m)	Measured Buildup (m)	Modeled Buildup (m)
299-W15-33	7.45	1.3	-----	-----
299-W15-34	7.96	2.22	-----	-----
299-W15-35	7.54	6.57	-----	-----
299-W15-32	2.38	1.8	-----	-----
299-W15-36	No Data	1.41	-----	-----
299-W15-37	6.49	0.89	-----	-----
299-W15-25	0.89	0	-----	-----
299-W15-10	0.78	0.68	-----	-----
299-W15-11	0.39	0.19	-----	-----
299-W15-31A	0.2	0.05	-----	-----
299-W15-1	0.71	0.28	-----	-----
299-W15-7	0.71	0.41	-----	-----
299-W15-38	0.49	0.24	-----	-----
299-W15-39	0.33	0.14	-----	-----
299-W15-29	-----	-----	20.01	8.37
299-W18-36	-----	-----	1.13	0.56
299-W18-37	-----	-----	0.47	0.53
299-W18-38	-----	-----	0.29	0.04
299-W18-39	-----	-----	0.2	0.01
699-39-79	-----	-----	0.53	0.47
299-W15-24	-----	-----	0.35	0.15
299-W18-26	-----	-----	0.29	0.2

Figure 3-6. Influent and Effluent Tank Carbon Tetrachloride Concentration Trend Plots from January to March 1998.

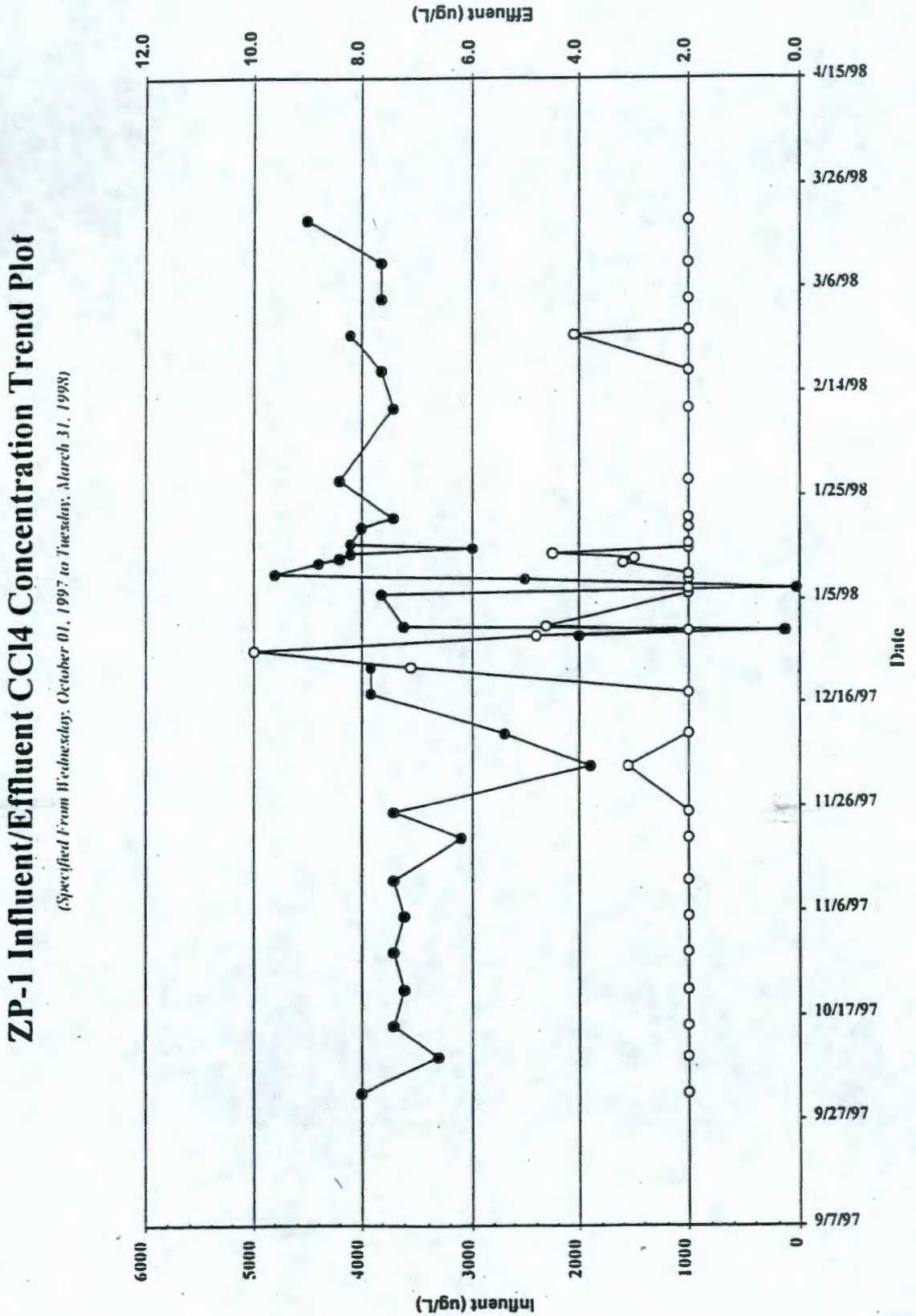


Figure 3-5. Carbon Tetrachloride Removal Efficiency from January Through March 1998.

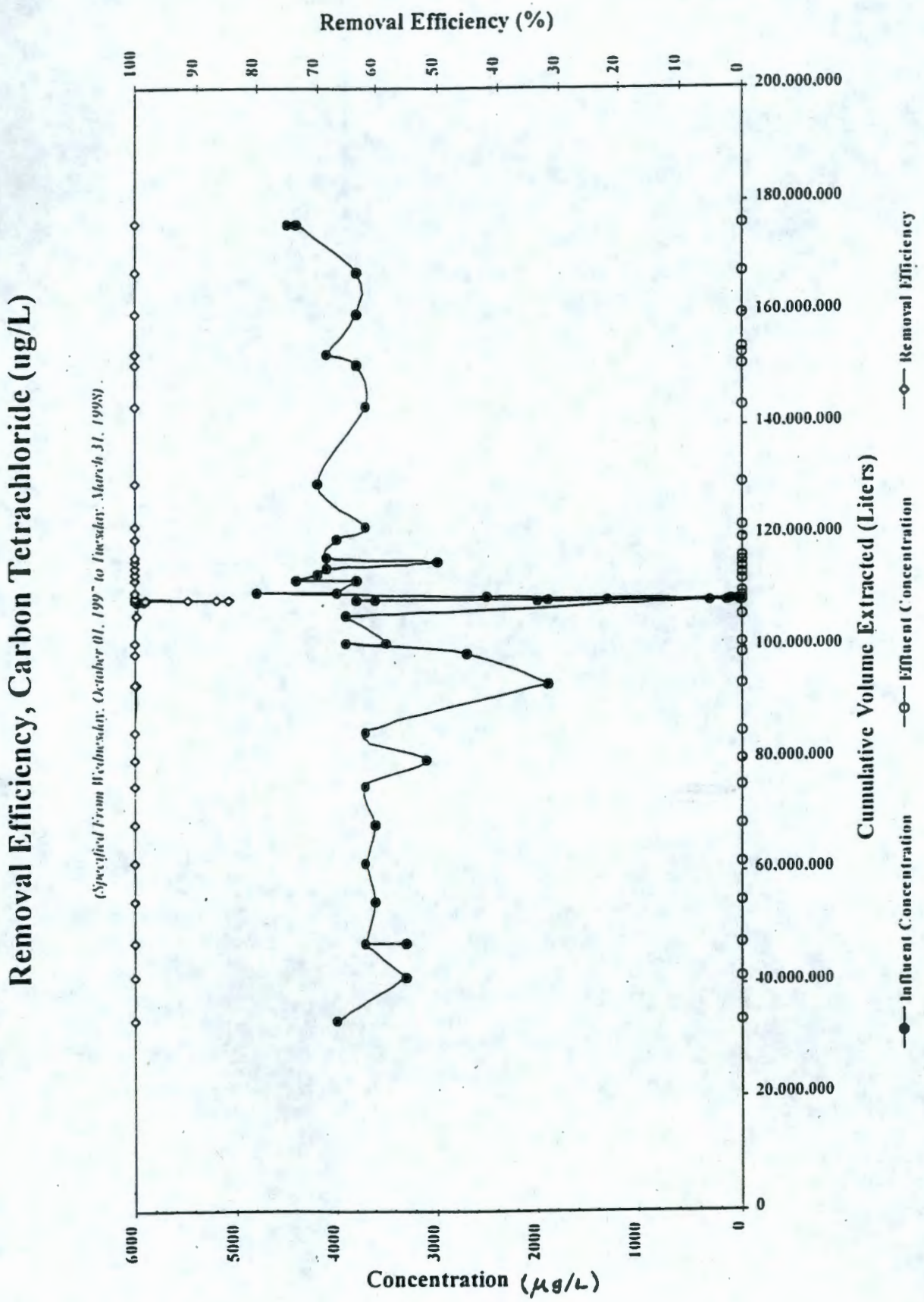
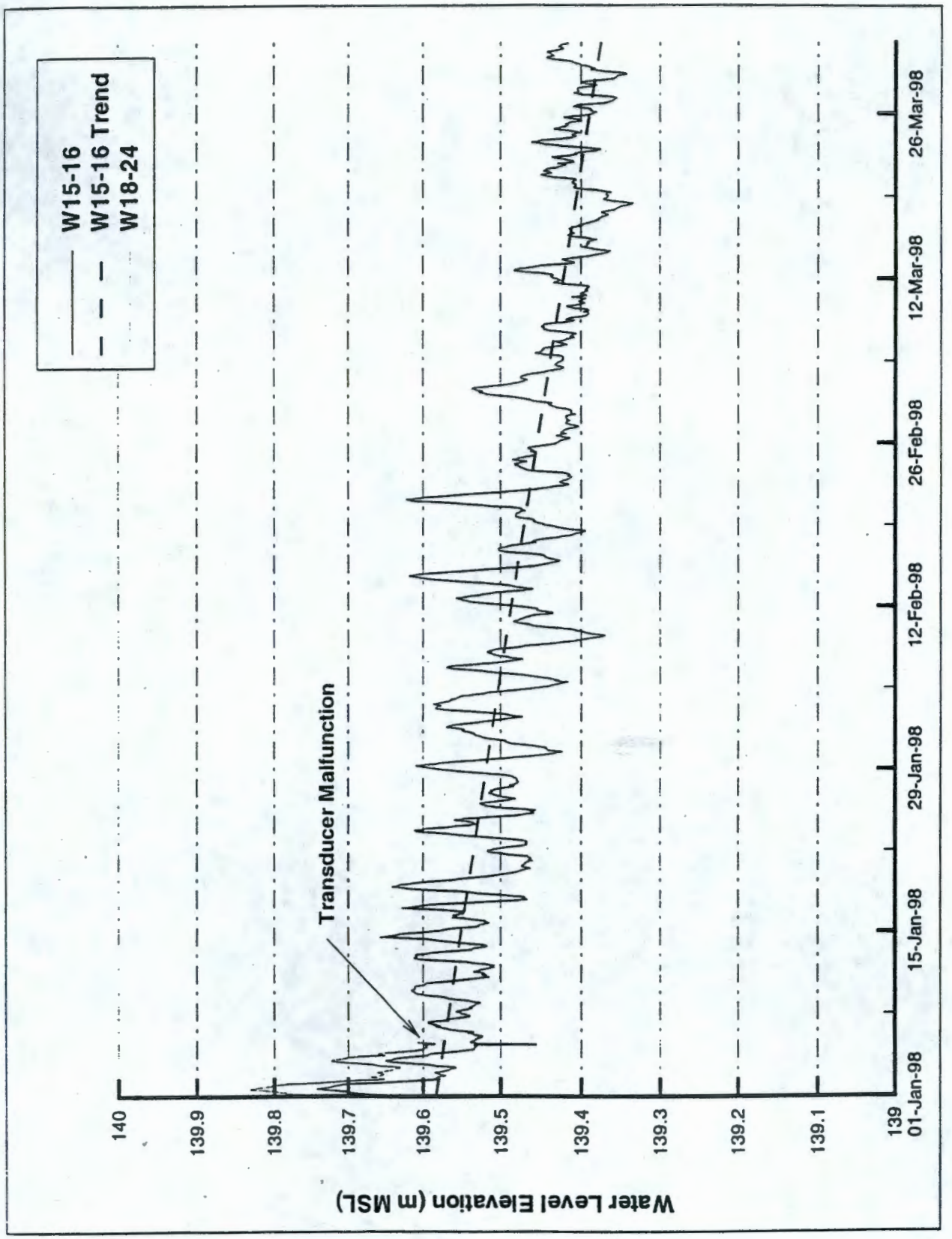


Figure 3-11. Hydrograph of Wells 299-W15-16 and 299-W18-24 (Showing Regional Water Level Decline of 0.2 m for the Quarter).



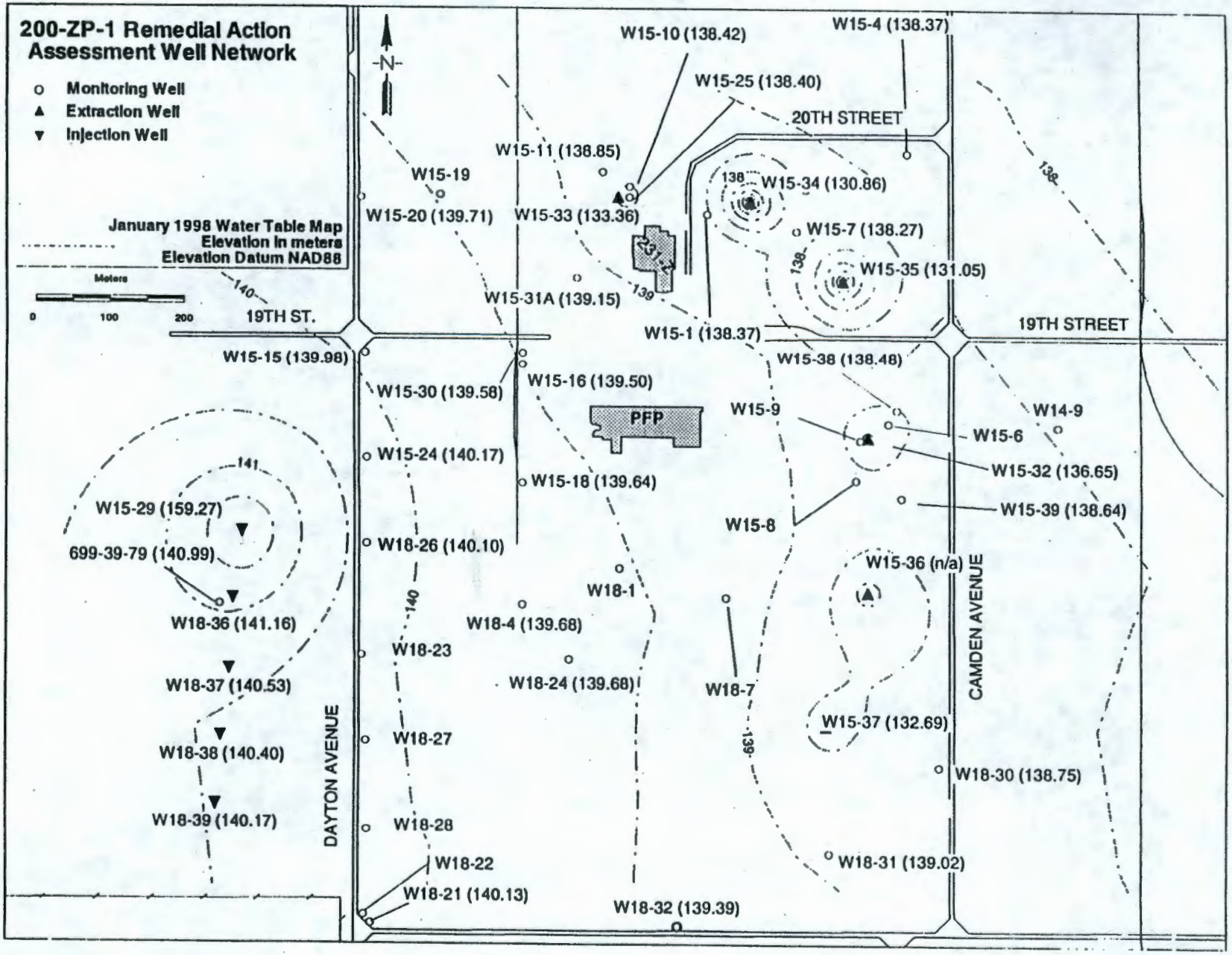
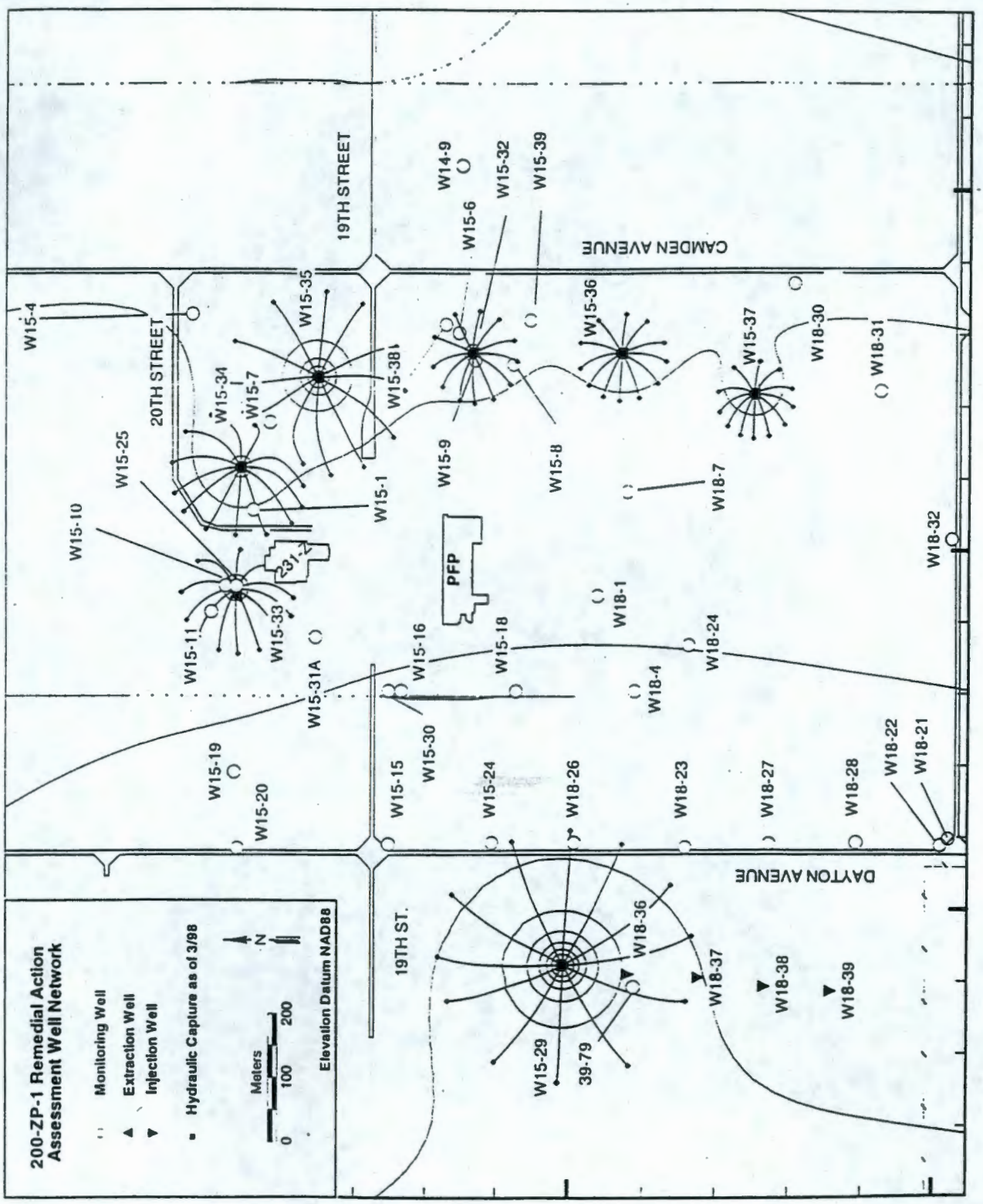


Figure 3-26. 200-ZP-1 Water Table Map, January 1998.

Figure 3-25. Hydraulic Capture Through March 1998



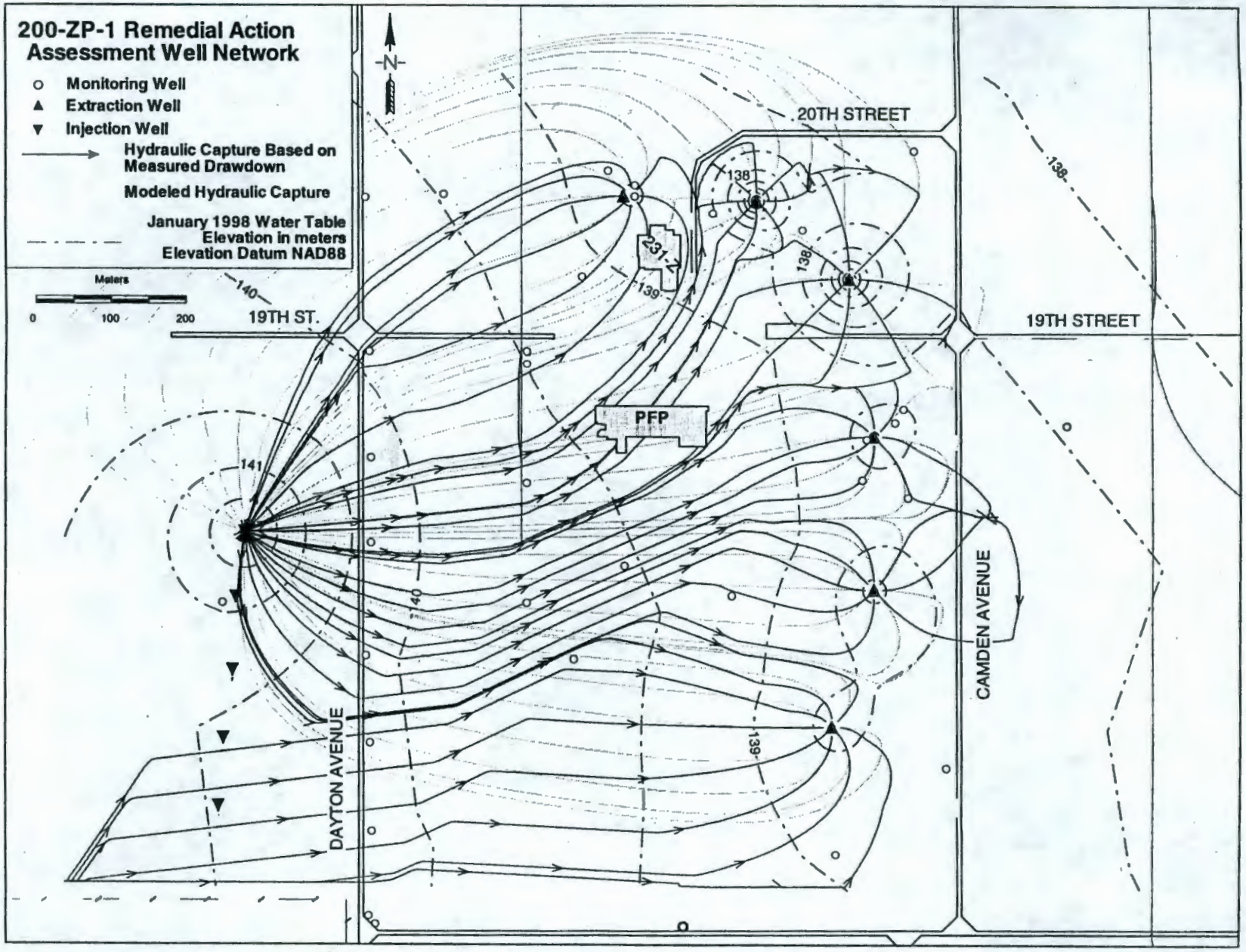

200-ZP-1 Remedial Action Assessment Well Network
Monitoring Well
Extraction Well
Injection Well
Hydraulic Capture Based on Measured Drawdown
Modeled Hydraulic Capture
January 1998 Water Table Elevation in meters Elevation Datum NAD88
Meters
0
100
200
N
20TH STREET
19TH ST.
19TH STREET
PFP
DAYTON AVENUE
CAMDEN AVENUE
138
139
140
141

Table 3-6. Summary of Carbon Tetrachloride Concentrations in 200-ZP-1 Extraction and Monitoring Wells.

Well	Constituent	Units	Jan. 1998	Feb. 1998	Mar. 1998	Sep – Dec 1997	Trend for the Jan - Mar 1998	Trend Reported for Sep – Dec 1998
299-W14-9	CCl_4	µg/L		40		75	Continuing downward trend which began in 3rd quarter 1997	Stabilizing
299-W15-1	CCl_4	µg/L		4900		4400	Continuing current upward trend which began in early 1996	Upward trend
299-W15-4	CCl_4	µg/L		390		327	Concentration remaining stable, but with slight upward trend	Downward trend
299-W15-7	CCl_4	µg/L		2700		2200	Concentration remaining stable	Stable
299-W15-11	CCl_4	µg/L		2400		2758	Concentration remaining stable	Stable
299-W15-15	CCl_4	µg/L	770/920			827	Concentration remaining stable	Stable
299-W15-16	CCl_4	µg/L	6500			7871	Concentration peaked last quarter and now appears to be stabilizing	Upward trend
299-W15-18	CCl_4	µg/L	780			2128	Concentration remaining stable	Stable
299-W15-19	CCl_4	µg/L				35	No samples take for this quarter	Downward trend
299-W15-31A	CCl_4	µg/L	4800		5100	5816	Concentration peaked last quarter and now appears to be decreasing	Upward trend
299-W15-32*	CCl_4	µg/L	5660	6080	7300	6100	Concentration remaining stable	
299-W15-33*	CCl_4	µg/L	5500	5733	6900	5193	Concentration appears to be rising toward the end of this quarter	
299-W15-34*	CCl_4	µg/L	3240	3500	4300	2880	Concentration appears to be rising toward the end of this quarter	
299-W15-35*	CCl_4	µg/L	3240	3375	4133	2790	Concentration appears to be rising toward the end of this quarter	
299-W15-36*	CCl_4	µg/L	1750	1780	2267	2327	Concentration remaining stable	
299-W15-37*	CCl_4	µg/L	190	202	250	228	Concentration remaining stable	
299-W15-38	CCl_4	µg/L		2600		3272	Concentration remaining stable	Upward trend
299-W15-39	CCl_4	µg/L		1300/1400		1389	Concentration remaining stable	Upward trend
299-W18-1	CCl_4	µg/L		1400		1730	Concentration peaked last quarter and now appears to be decreasing	Upward trend
299-W18-21	CCl_4	µg/L	220/260			221	Continuing downward trend which began in mid 1995	Continuing downward trend which began in mid 1995
299-W18-24	CCl_4	µg/L	1400			1880	Trending is difficult to detect	Trending is difficult to detect
299-W18-26	CCl_4	µg/L	780/800		290/300	109	Concentration peaked again in January 1998 and now is trending downward**	Stable
299-W18-27	CCl_4	µg/L	270/320			303	Concentration remaining stable	Stable
299-W18-30	CCl_4	µg/L		540		613	Continuing general downward trend	Downward trend
299-W19-15	CCl_4	µg/L				360	No samples take for this quarter	Upward trend
699-39-79	CCl_4	µg/L	2		2	4	Concentration remaining stable	Downward trend
*Extraction Wells → Results from extraction wells are given as monthly and quarterly averages. Summary of trends are approximate please see accompanying trend plots.								

Pt Attachment 7

Joan Dallex, SVC
803-725-7236

Field Demonstration and Evaluation of the Cone Penetrometer Technologies for the Direct Detection of DNAPL

061120

Visitor's Day
June 4, 1998
at the Savannah River Site

Sponsored by the

U. S. Department of Energy's Office of Science and Technology Characterization, Monitoring, and Sensor Technology Program

U. S. Department of Energy's Savannah River Field Office

Federal Energy Technology Center

EIC, Inc.

Savannah River Technology Center

You are invited to attend a Visitor's Day at the Savannah River Site for a demonstration of two sensors designed to directly detect dense non aqueous phase liquid (DNAPL) contamination in the subsurface. These sensors use optical methods of detection to identify the DNAPL; specifically, one of the sensors uses measured Raman spectra to identify compounds, and the other sensor measures refractive index changes in the pore fluid of the sediments.

DOE Cone Penetrometer Sensor Evaluation Program

The cone penetrometer is becoming the tool of choice for environmental site characterization in unconsolidated and semi-consolidated formations because it allows access to the subsurface in a rapid and cost effective manner. Many sensors and probes for use with the cone penetrometer are currently under development by government, university and commercial groups. DOE's Office of Science and Technology has an ongoing program since 1993 to provide independent testing and evaluation of these sensors in appropriate field sites. Since 1995, this program has been operated at the Savannah River Site.

During 1998, we will evaluate two types of sensors, i.e., two Raman sensors and an index of refraction sensor. Both of the Raman sensors were developed with funding by the Office of Science and Technology, one at LLNL and the other by EIC, Inc. with funding through the Federal Energy Technology Center. The Internal Reflection Sensor was also developed by EIC, Inc. with funding from the Federal Energy Technology Center. At the Visitor's Day, both of the sensors developed by EIC, Inc. will be demonstrated.

The focus of the evaluation is to determine the capability of these two optical methods to detect subsurface dense non aqueous phase liquid (DNAPL) contaminants. Two of the sensors are

designed to acquire Raman spectra of sediments immediately outside of an optical window on the cone penetrometer. The other sensor determines the presence of DNAPL by measuring refractive index changes in the pore fluid of the sediments. Fact sheets developed by the Federal Energy Technology Center with specific information on two of the sensors are included in this packet. Field testing will be conducted at the Savannah River Site (SRS) in three waste sites that have a high probability of DNAPL occurrence. An evaluation report summarizing the cost and performance results of all three sensors will be available from WSRC in September.

Registration

The demonstration will take place on June 4, 1998, at M Area of the Savannah River Site near Aiken, South Carolina. The day will begin with an orientation at the SRS Visitors Control building, 703-46A, where participants are asked to register at 8:30 a.m. Registration will be followed by presentations at the 708-A Cafeteria and a field site visit.

Individuals interested in attending the demonstration should complete the attached registration form and fax it to Carol Eddy-Dilek at 513-529-3218 or reply by e-mail to carol.eddy-dilek@srs.gov. Please be sure to provide the following information, including your Social Security number if you do not have a current DOE security badge, so that we can make arrangements for a security badge and send you specific information regarding the logistical arrangements. SRS participants should meet at 9:00 am at the 708-A Cafeteria.

Name:
Title:
Organization:
Address:
City, State, Zip Code:
Telephone Number:
FAX Number:
E-mail Address:
Citizenship: US Other, please specify:
Social Security Number

Dress for the demonstration is casual. Weather conditions in Aiken in June tend to be very warm. Long pants and sturdy work shoes will be required for all visitors to the field site. Registrants should fly into Augusta's Bush Field Airport. Numerous hotel accommodations are available in Aiken, South Carolina and Augusta, Georgia. For further information on the demonstration logistics contact Carol Eddy-Dilek at 513-529-3218.

Project Coordinators

Joe Rossabi
Westinghouse Savannah River Company
Building 773-42A
Aiken, South Carolina 29808
(803) 725-2418

Carol A. Eddy-Dilek
Westinghouse Savannah River Company
Building 773-42A
Aiken, South Carolina 29808
(513) 529-3218
(803) 725-2418

Mike Carrabba
EIC, Inc.
111 Downey Street
Norwood, MA 02620
617-769-9540

Jagdish L. Malhotra
Federal Energy Technology Center
3610 Collins Ferry Road
Morgantown, WV 26507
304-285-4053

Probe Evaluation

The evaluation of the probes will be done using a standard piezocone penetrometer tip with the sensor to be evaluated incorporated immediately behind the cone tip. Each of the three sensors will be tested in separate pushes within a 3-meter diameter circle at each of the four test sites. Continuous sensor data will be collected as the cone penetrometer is pushed at each location. Since the Raman sensors acquire data at a slower rate than the standard piezocone sensors, the spectral data will be an average over a specific depth interval. If the spectrum at a discrete depth indicates DNAPL, a longer spectral scan to improve spectral clarity may be taken. The penetrometer will then be advanced 10 cm (4 in) and a new 10 second spectrum will be taken with the same option for longer spectral scans. Confirmatory sediment samples for analysis that correspond with the discrete Raman measurements will be collected by conventional drilling and split spoon sampling within the 3-meter diameter circle at each site.

TECHNOLOGY DEVELOPMENT DATA SHEET

Internal Reflection Sensor for the Cone Penetrometer

Developer: EIC Laboratories, Inc.
Contract Number: DE-AR21-96MC33079
Crosscutting Area: CMST & ESP

Subsurface Contaminants FOCUS AREA

Problem:

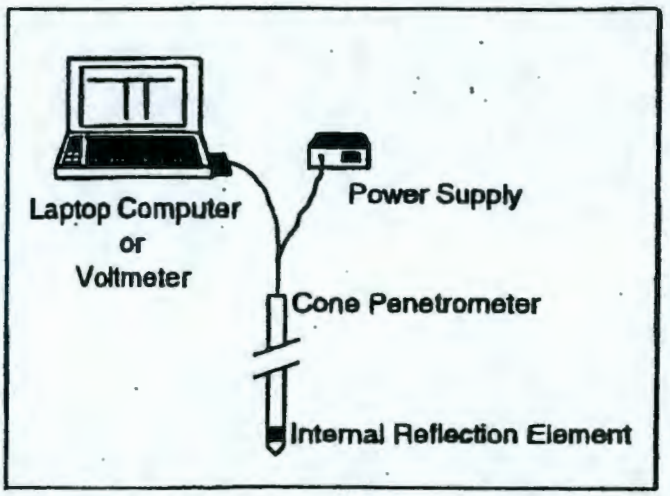
Non-aqueous phase liquids (NAPLs) are environmental contaminants of particular concern because of the long-term threat they pose to drinking water supplies. NAPLs such as trichloroethylene, perchloroethyene and gasoline have low water solubilities and therefore, as "free phase" contaminant sources, are depleted only very slowly by dissolution into large volumes of groundwater. The result is widespread pollution that can continue for many years if the NAPLs are not located and removed. Locating NAPLs is a challenging task because they migrate through cracks and fissures in the subsurface soil to form small, isolated "pools" of contamination.

Solution:

Develop a rugged, inexpensive sensor that can be deployed in a cone penetrometer, for real-time detection of NAPLs, during site characterization.

Benefits:

- Meets sensing need for which no technology currently exists
- Improves the quality and reduces the time and cost of site characterization



Technology:

The heart of the sensor is the internal reflection element. This element is positioned in the wall of the penetrometer cone so that its sensing face is in contact with the soil or groundwater as the cone is pushed into the ground. When no contaminants are present at the sensing face, laser light is fully reflected within the element and is detected in the sensor head. However, when NAPLs come into contact with the sensing face, the internally reflected light is diminished. This results in a decrease in the signal output by the detector - a positive indicator of NAPL presence. Because the response from the detector is continuously measured at the surface by a voltmeter or computer, NAPLs can be detected instantaneously. An important feature of the device is response only to NAPL contaminants, without interference from natural soil components, groundwater or dissolved chemicals. The sensor operates in both the vadose and saturated zones.

100% successful - DNAPL -

This project is planned in two phases to demonstrate internal reflection sensing as a viable technique for locating NAPLs in the subsurface. Phase I includes the fabrication and laboratory testing of the internal reflection sensor. Phase II will demonstrate the technology in a cone penetrometer at a site contaminated by NAPLs.

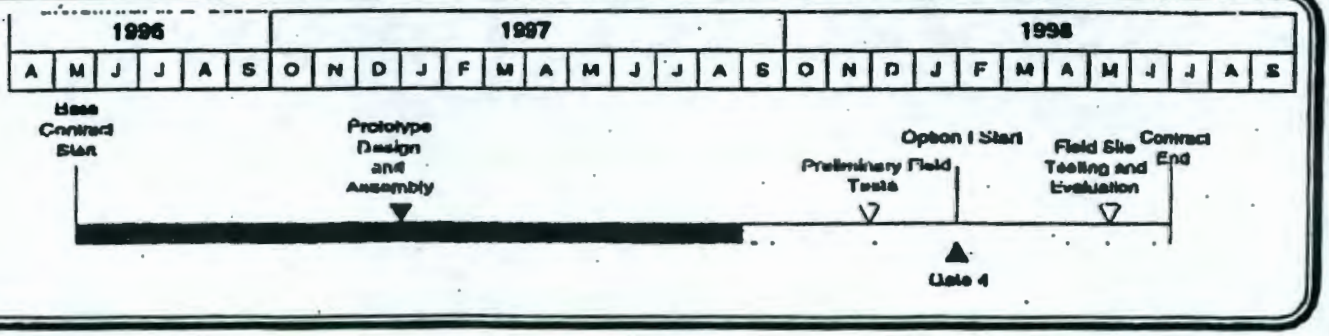
Contacts:

EIC Laboratories, Inc. develops sensors for environmental and other applications, including hazardous waste site characterization. For information regarding this project, the contractor contact is:

Principal Investigator:
Dr. John W. Haas III
EIC Laboratories, Inc.
111 Downey Street
Norwood, MA 02062
Phone: (617) 769-9450
Fax: (617) 769-2099
E-mail: None

DOE's Federal Energy Technology Center supports the Environmental Management - Office of Science and Technology by contracting the research and development of new technologies for waste site characterization and cleanup. For information regarding this project, the DOE contact is:

DOE Project Manager:
Jagdish L. Malhotra
Federal Energy Technology Center
3610 Collins Ferry Road
Morgantown, WV 26507-8880
Phone: (304) 285-4053
Fax: (304) 285-4403
E-mail: jmalho@fetc.doe.gov



TECHNOLOGY DEVELOPMENT DATA SHEET

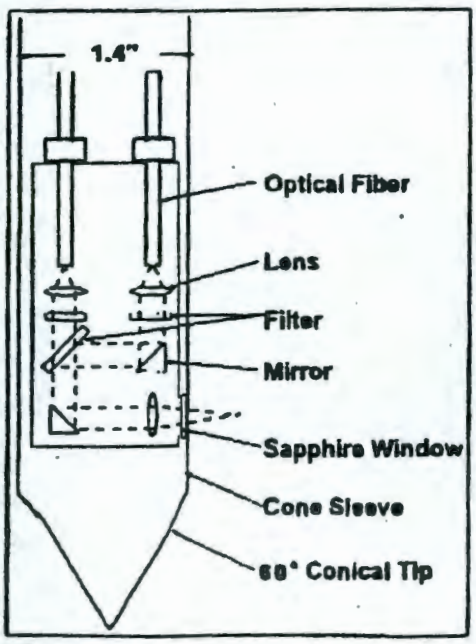
Field Raman Spectrograph for Environmental Analysis

Developer: EIC Laboratories, Inc.
Contract Number: DE-AC21-92MC29108
Crosscutting Area: CMST

Tanks FOCUS AREA

Problem:

Instrumentation for on-site use is needed to provide highly specific in situ chemical characterization and mapping of a wide variety of wastes, corrosion products, and pollutants that are located in storage tanks, soils, and ground and surface waters at Department of Energy (DOE) sites. The history of many of the contamination sources is unknown, thus making plans for environmental restoration difficult. Concentrated wastes tend to be heterogenous and cannot currently be characterized unless multiple samples are taken.



Solution:

A field-hardened Raman Spectrograph has been designed which can be used to obtain "chemical fingerprints" of concentrated and dilute hazardous waste contaminants in storage tanks, soil, and water. The instrument is a portable, small, analytical device capable of in situ measurements that can identify compounds more than 50 meters away from the spectrometer via fiber optic probes. The system is designed to be suitable for detection of highly concentrated materials and in specially designed probes, for Parts-per-billion levels.

Benefits:

- In situ detection, characterization, and mapping of previously unknown concentrated wastes.
- Detection of corrosion on the interior surface of storage tanks which would indicate areas of weakness or leakage.
- Characterization of dilute waste plumes which require more sensitive analytical methods.
- Reduction of costs of site characterization by eliminating the need for expensive processing of samples removed from the waste site.
- Near real-time on-site identification of contaminants as compared to off-site labs.
- More complete and cost-effective site mapping than is possible with drilled and excavated wells.

Technology:

The overall purpose of this project is to develop and field demonstrate a portable Raman spectrograph and associated sampling accessories that can be used in the field for screening, monitoring, and identification of a wide variety of contaminants. This instrumentation development project combines fiber optics, Raman Spectroscopy, Echelle grating, lasers, micro-optical lenses, charged-coupled devices, and fiber- optically coupled deployable probe heads.

The optics allow measurements to be made from more than 50 meters between the Raman instrument and probe head. The unit is designed to be capable of operating using

DNAPL only

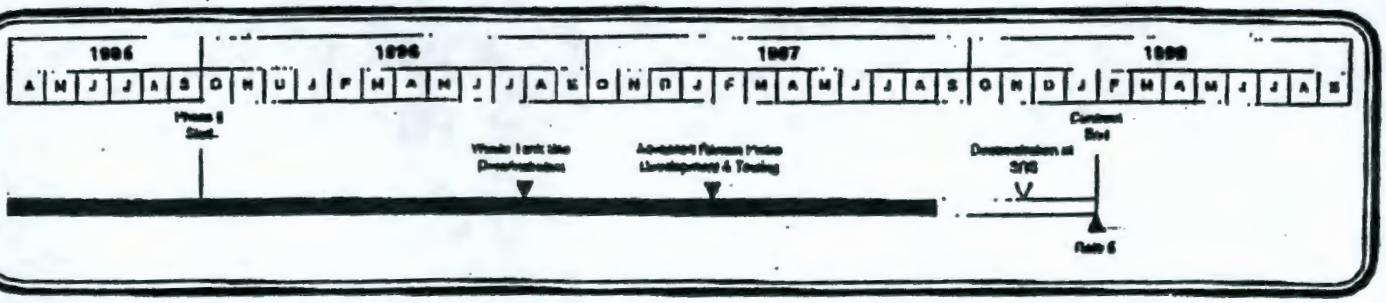
modest power from a portable generator and could be integrated into an instrument platform.

Key features of the project will be the fabrication of a fully fieldable spectrometer based on a breadboard version developed under an earlier DOE-sponsored project, development of an extensive library of DOE contaminants, and a field demonstration at Savannah River Site.

Contacts:

EIC Laboratories Inc., is active in the area of Raman instrumentation development and application for DOE, the Office of Naval Research, and the U.S. Army. For information regarding this project please contact:

Principal Investigator:
Dr. Michael M. Carrabba
EIC Laboratories
111 Downey Street
Norwood, MA 02062
Phone: (617) 769-9450
Fax: (617) 769-2099
E-mail: None

DOE's Federal Energy Technology Center supports the Environmental Management - Office of Science and Technology by contracting the research and development of new technologies for waste site characterization and cleanup. For information regarding this project, the DOE contact is:

DOE Project Manager:
Jagdish L. Malhotra
Federal Energy Technology Center
3610 Collins Ferry Road
Morgantown, WV 26507-8880
Phone: (304) 285-4053
Fax: (304) 285-4403
E-mail: jmalho@fetc.doe.gov