

J-FIELD
PHYTOREMEDIATION GROUNDWATER
WELL AND LYSIMETER MONITORING REPORT

J-FIELD STUDY AREA

ABERDEEN PROVING GROUND, MARYLAND

NOVEMBER 1997

J-FIELD PHYTOREMEDICATION
GROUNDWATER WELL AND LYSIMETER MONITORING REPORT
ABERDEEN PROVING GROUND, MARYLAND

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1.0 INTRODUCTION

1.1 Background

J-Field is located at the tip of Gunpowder Neck, Edgewood Area of Aberdeen Proving Ground (APG) in Harford County, Maryland (Figure 1). The Toxic Pits area of J-Field was once the disposal site for chemical warfare agents, munitions, and industrial chemicals. The Toxic Pits area consists of two parallel disposal pits that are approximately 10 feet deep by 15 feet wide by 200 feet long (Figure 2). Remnants of other pits extend into the marsh area to the east. The pits were used for open-pit burning and detonation from 1940 through 1980.

During open burning, wood was first placed in one of the pits and the agents, munitions, and chemicals were placed on top. The pit was then flooded with fuel oil and ignited. After the first burn, a reburn of any remaining material was performed in the adjacent pit. Any remaining debris was then pushed into the marsh. The pits and surrounding land have been disturbed by the activities that took place on J-Field. The area to the northeast of the pits appears to be the main pushout area for the pits.

The types of materials handled at these pits included:

- High explosives
- Nerve agents
- Mustard agents
- Smoke materials
- Solvents

The contaminants of concern in the groundwater adjacent to the toxic pits are:

- 1,1,2,2-tetrachloroethane (1122)
- 1,1,1,2-tetrachloroethane (1112)
- 1,1,2-trichloroethane (TCA)
- trans-1,2-dichloroethene (t-DCE)
- cis-1,2-dichloroethene (c-DCE)
- trichloroethene (TCE)
- tetrachloroethene (PCE)

1.2 Objectives of the Study

As part of the remedial action selected for the site, a pilot-scale phytoremediation study was implemented in the spring of 1996. The objectives of the phytoremediation study are to show that the surficial aquifer in the area of the toxic pits can be intercepted and contained, and to show that volatile organic compounds (VOCs) in the groundwater can be removed and/or destroyed through natural mechanisms. This report presents only groundwater data for the period from February through October 1997.

Other objectives of the study are to determine the aquifer drawdown within the study area and the trees' zone of influence; to correlate findings from tree tissue and transpirational gas sampling with water quality data from the capillary fringe; and to determine the mechanisms responsible for VOC reduction. These include:

- Passive evaporation from groundwater through plant leaves without VOC degradation.
- Metabolism of VOCs in plant tissue leading to a release of degradation products through evapotranspiration.

Incorporation, with or without modification, of VOC contaminants into plant tissue.
Degradation of VOCs in soil by microbial populations, which are likely increased in the rhizosphere due to root exudates.

These objectives will be met through field investigation which will involve the collection and analysis of plant tissue, roots, transpirational gas, soil, and groundwater contaminant concentration and elevation data over a five year period. The sap flow rate in trees along with transpirational gases will be measured. These data will be correlated with weather parameter data (solar radiation, relative humidity, temperature, and wind speed) in order to estimate the effect the trees are having on the concentration of contaminants in the aquifer and the elevation of the water table.

Possible outcomes of the pilot study are as follows:

A) Groundwater contamination remains the same or increases over time.

- 1) Trees are not reducing VOCs.
- 2) Trees are reducing VOCs, but the contaminant source [soil or dense nonaqueous phase liquid (DNAPL)] is replenishing the groundwater.
- 3) Trees are reducing VOCs at an undetectable rate.

B) Groundwater contamination decreases over time.

- 1) Trees are aiding in soil microbial biodegradation of VOCs in the rhizosphere.
- 2) Trees are removing and metabolizing VOCs.
- 3) Trees are removing and transpiring VOCs.
- 4) Trees are removing and accumulating VOCs.

1.3 Monitor Well and Lysimeter Installation

Prior to November 1996, there were nine wells located in the surficial aquifer near the phytoremediation study area. In order to obtain additional data necessary to determine the effects of the phytoremediation study on the groundwater, five additional wells and four lysimeters were installed by Response Engineering and Analytical Contract (REAC) and U.S. Environmental Protection Agency's Environmental Response Team Center (U.S. EPA/ERTC). The placement of these wells and lysimeters was determined based on monitoring objectives, site conditions, and accessibility. The new monitor wells were screened approximately 3 to 13 feet below ground surface (bgs) (Table 1) to allow for the sampling and water level monitoring of the upper part of the surficial aquifer. The lysimeters, two at 4 feet and two at 7.5 feet bgs will allow for coverage of the capillary zone during seasonal highs and lows in the groundwater table level.

J-Field phytoremediation study monitor well #1 (JFP-1) was placed as far up gradient of the phytoremediation study area as possible. The objective of the placement of this well is to obtain a representative sample of groundwater before being impacted by the trees. JFP-2 and JFP-3 were placed within the study planting area to monitor the tree's affect on water quality and water table levels. JFP-4 was placed in-line, down gradient of JFP-1, JFP-2, and JFP-3 so that the affect of a larger planting area on water quality and groundwater elevations can be determined. JFP-5 was placed in the wooded area to the south of the site approximately 100 feet from the study border. This well will provide missing contaminant and elevation information south of the study area (Figure 2).

Two sets of two lysimeters JFL-1 and -2 and JFL-3 and -4 were installed near monitor wells JFP-2 and JFP-3, respectively. The lysimeters were placed in pairs and set at depths of 4 feet (odd numbered lysimeters) and 7.5 feet (even numbered lysimeters) bgs. The 4-foot lysimeter was placed closest to the well. See REAC report *J-Field Phytoremediation and Lysimeter Installation Report April 1997* for additional information relating to the wells and lysimeters.

2.0 METHODOLOGY

2.1 Lysimeter Sampling

Lysimeters (JFL-1 through JFL-4) were sampled according to the manufacturers (Timco™ Mfg., Inc.) instructions (Appendix A). An electrically powered vacuum/pressure pump was utilized for the evacuation and sampling of the lysimeters. New lengths of 0.25-inch teflon tubing were utilized for sampling at each lysimeter location. Lysimeters were evacuated of any water within the cup, placed under vacuum and evacuated a second time before being sampled.

The following methodology was followed:

1. Connect the pressure port of the vacuum/pressure pump to the vacuum/pressure (VP) port on the lysimeter head assembly.
2. Close the VP valve and open the sample (S) valve on the lysimeter head assembly.
3. Turn on the vacuum/pressure pump and loosen air release valve at rear of pump until pressure on the gauge reads near zero.
4. Open VP valve on the lysimeter head assembly.
5. Slowly close the air release valve at the rear of the pump until all water is purged from the sample line.
6. Close the VP valve and turn off pump.
7. Connect the vacuum port of the vacuum/pressure pump to the vacuum/pressure (VP) port on the lysimeter head assembly.
8. Close the S valve on the lysimeter head assembly.
9. Turn on vacuum/pressure pump and loosen air release valve at rear of pump until vacuum on the gauge reads near zero.
10. Open the VP valve on the lysimeter head assembly.
11. Slowly close the air release valve until a vacuum of 18 to 21 inches of mercury is placed on the lysimeter cup.
12. Close the VP valve.
13. Allow the vacuum in the lysimeter to reach near zero.
14. Repeat steps 1 through 13 once more and discard sample.
15. Allow lysimeters to sit overnight and repeat steps 1 through 13 and collect the sample for analysis.

2.2 Monitor Well Sampling

Monitor well sampling was performed according to Aberdeen Proving Ground (APG) Standard Operating Procedure (SOP) #013 *Collection of Monitoring Well Sample* (Appendix B). Equivalent volume (EV) calculations were based on an 8-inch sand pack in the wells. Based on these calculations, there is 0.9 gallons of water per foot (gal/ft) in the 2-inch well and 1.05 gal/ft in the 4-inch well. Purging of the wells was performed with a bailer or a submersible pump with the exception of February 1997 sampling where peristaltic pumps were utilized for purging. Sampling of the wells was performed with a clean disposable bailer. Water quality parameters such as dissolved oxygen (DO), temperature, salinity, pH, conductivity, and turbidity were recorded to determine when sampling of the well was to commence. A minimum of two EVs were purged from each well.

2.3 Groundwater Elevation Monitoring

Personnel from REAC or APG utilize a hand operated water level meter to measure the depth to groundwater in each well. The meter produces an audible alarm when touching water. Measurements of the depth of water in the well are recorded to the nearest 1/100 of a foot to the top of the PVC or steel well casing.

3.0 RESULTS

3.1 Monitor Well and Lysimeter Sampling

3.1.1 February 1997

On 20 and 21 February 1997, the five REAC wells (JFP-1 through 5) and two of the four lysimeters (JFL-1 and 3) were sampled for organic and inorganic contaminants. Only lysimeters JFL-1 and 3 were sampled due to the high groundwater table at that time. Well purge and groundwater quality data is presented in Table 2. Dissolved oxygen (DO), temperature, pH, conductivity and turbidity were measured using an ICM Aqua-Check™ water analyzer during the purge process. Turbidity measurements were taken with an HACH 2100P portable turbidimeter. Measurements were not recorded for JFP-2 through 4 due to equipment malfunction. Results of the VOC analysis, wet chemistry analysis, and metals analysis are presented in Tables 3, 4, and 5, respectively. Only the compounds which were detected are listed in the tables, see appendix C for a complete listing. The contaminants of concern, PCE, 1112, 1122, t-DCE, c-DCE, TCE, and TCA were detected in JFP-1, 2, 3, and 5. None of these compounds were detected in JFP-4 and JFL-1 and 3. Tentatively identified compounds (TICs) were detected in lysimeter JFL-1 samples only. See Appendix C for a complete listing of compounds. Chloride levels ranged from 1.5 to 440 milligrams per liter (mg/L), total organic halides (TOX) from non detect to 100 mg/L, nitrate from non detect to 2.7 mg/L, and ammonia from non detect to 0.12 mg/L (Table 4). In addition, nitrate, chloride, and ammonia analysis was performed on site using field portable test kits. CHEMetrics, Inc., test kits were utilized for nitrate (0.1 to 2 mg/L) and ammonia-nitrogen (0.2 to 1 mg/L) analysis, and a HACH Co. test kit was utilized for chloride (25 to >500 mg/L) analysis. Results of these analyses are presented in Table 6. Samples for metals analysis were filtered on site and represent dissolved concentrations in the groundwater.

3.1.2 May 1997

On 14 through 16 May 1997, a full round of well and lysimeter sampling was performed. Fourteen wells and four lysimeters were sampled and analyzed for organic and inorganic contaminants. All four lysimeters, JFL-1 through 4 were sampled due to the low groundwater table at that time. Well purge and groundwater quality data for the 14 wells is presented in Table 7. Dissolved oxygen (DO), temperature, salinity, pH, conductivity and turbidity were measured during the purge process using a Horiba Water Checker U-10 water analyzer. Results of the VOC analysis, wet chemistry analysis, and metals analysis are presented in Tables 8, 9, and 10, respectively. No contaminants of concern, PCE, 1112, 1122, t-DCE, c-DCE, TCE, and TCA, were detected in wells JFP-4 or P2. TICs were detected in JF63 samples only. See Appendix D for a complete listing of compounds. Chloride levels ranged from non detect to 460 mg/L, TOX from non detect to 220 mg/L, nitrate from non detect to 2100 mg/L, and ammonia from non detect to 1.7 mg/L (Table 9 and Appendix E). Samples for metals analysis were filtered on site and represent dissolved concentrations in the groundwater. No contaminants of concern were detected in lysimeters JFL-1 or JFL-3. Lysimeter VOC results are presented in Table 11.

3.1.3 July 1997

On 21 and 22 July 1997, four of the REAC wells (JFP-1 through 4) and one lysimeter (JFL-4) were sampled. No sample was obtained from lysimeters JFL-1 and 3 due to the low groundwater table at that time. Also, no sample was obtained from JFL-2 due to a problem with the lysimeter. It was later determined that the JFL-2 ceramic cup was cracked and would need to be replaced. Well purge and groundwater quality data is presented in Table

12. Dissolved oxygen (DO), temperature, pH, conductivity, and turbidity were measured using an ICM Aqua-Check™ water analyzer during the purge process. Turbidity measurements were taken with an HACH 2100P turbidity meter. Turbidity measurements were not recorded due to equipment malfunction. Only VOC analysis was performed on the groundwater samples. Results of these analyses are presented in Table 13. The contaminants of concern were detected in JFP-1, 2, and 3. None of these compounds were detected in JFP-4. Chloroform, TCE, PCE, and 1122 were detected in JFL-4. TICs were detected in well JFP-3 samples only. See Appendix F for a complete listing of compounds. Nitrate and ammonia analyses were performed on site using CHEMetrics field portable test kits. Results are presented in Table 14.

3.2 Groundwater Elevation Data

Groundwater elevation data of 15 wells within the phytoremediation area were recorded to determine the affect the study was having on the shallow aquifer in the area (Table 15). Data is presented as elevations from mean sea level (MSL). Groundwater elevation data for four REAC wells (JFP-1 through 4) is presented in Figures 3 and 4. In Figure 3, the data is presented as a fence diagram to graphically depict any drawdown along that line of wells. In Figure 4, the data is presented to graphically depict the trend in the lowering of the groundwater table as the year progressed.

3.3 Groundwater History

Groundwater elevation data for wells P2, P3, P4, JF53, JF63, JF73, and JF-83 prior to the installation of the REAC wells is presented in Table 16. Groundwater VOC contamination data for wells P2, P3, P4, JF53, JF63, JF73, JF83, and JF-183 since 1990 is presented in Table 17.

4.0 DISCUSSION OF RESULTS

4.1 Lysimeter Sampling

Lysimeter results for JFL-1 and JFL-3 for February 1997 (Table 3) show no chlorinated compounds of concern detected at 4 feet bgs. This may be due to the fact that this surficial water is primarily from precipitation infiltrating clean surface soils. Historically, little to no compounds have been detected in the shallow soils. The compounds that were detected in JFL-1 (acetone, methylene chloride, 2-butanone, 4-methyl-2-pentanone, and toluene) were possibly contamination from the manufacturing and/or installation of the lysimeter. These compounds decreased in concentration during the May sampling event (Table 11) and were not detected in any other lysimeters above the method detection limit.

Chlorinated compounds were detected in the deep lysimeters JFL-2 in May 1997 and JFL-4 (7.5 ft bgs) in May and July 1997 (Tables 11 and 13, respectively). TCE and 1122 were detected at concentrations between 5.2 and 36 ug/L in both May and July. PCE and chloroform were detected at concentrations below 1.3 ug/L in July 1997 in JFL-4. Chloroform was also detected at concentrations less than 2.5 ug/L in JFL-1 and JFL-2 in May 1997. Chloroform may be a breakdown product of other chlorinated compounds.

Because VOC concentrations in the saturated zone above the groundwater table (lysimeters at 7.5 ft bgs) are 100 to 1000 times lower than in the adjacent wells screened to 13.5 feet bgs and because the tree roots will not penetrate the groundwater table but stay within the saturated zone, this may explain why the high concentrations (260 mg/L) of volatiles in the groundwater are not toxic to the trees.

4.2 Monitor Well Sampling

The three monitor well sampling events for 1997 (February, May, and July) show no decrease in the concentration of volatile organic contaminants in the groundwater within the phytoremediation area. As shown in Tables 3, 11, and 13 and Figures 5 and 6, total VOC concentrations across the phytoremediation area range from approximately 260,000 ug/L (JFP-1) to non detect (JFP-4) in a distance of less than 150 feet. Only total VOC concentrations in well JFP-2 have changed significantly, rising from approximately 650 ug/L to 55,000 ug/L over the five month period. This rise is mainly due to 1122 between February and May, and to 1122, c- and t-DCE and TCE between May and July. There may be several explanations for this, some of which are: (1) the trees are drawing groundwater from JFP-1 towards JFP-2, (2) this is a seasonal variation, and (3) the pump test performed on JF-183 during June 1997 had an effect on the concentration of contaminants in JFP-2. The combined concentrations of TCE and 1122 comprise 88 to 97 percent of the total VOC contamination in all the wells. TCE is 16 to 37 percent of the total and 1122 is 57 to 81 percent of the total. This same trend is not always seen in the lysimeters which may contain more TCE than 1122. The pH in the JFP wells ranges approximately from 5.4 to 7.1. Chloride and total organic halide (TOX) concentrations are higher in well JFP-1 than the other JFP wells. Concentrations of most metals are higher in well JFP-1 than the other JFP wells.

4.3 Groundwater Elevation Model

Surfer® Contouring and 3D Surface Mapping software was utilized to produce groundwater elevation and concentration contour maps of the study area. The software utilizes weighted average interpolation algorithms for gridding. The method of kriging was used for all plots generated. Groundwater elevation data for February through November 1997 is presented graphically in Figures 7 through 17. Figure 8 includes well JF-173 data whereas the other figures do not. Data for 21 February is presented with and without well JF-173 (Figures 7 and 8) to show the upwelling (higher groundwater elevation) occurring at this well. This upwelling is possibly due to the deeper depth and the shorter screen interval at which this well was placed (Table 1). This upwelling is seen for all data. Because of this upwelling, Well JF-173 data was removed from the other plots.

As shown in Figures 7 and 9, groundwater flow is predominantly to the east from the pits and follows the land surface contour. In May (Figure 10), groundwater elevation data for JF-73 and JFP-3 were corrected by 3.00 feet. It is believed that the depth to groundwater from the top of casing which was originally reported as 9.60 and 9.98 feet bgs is actually 6.60 and 6.98 feet bgs, respectively. This data is supported by a USGS continuous level recorder which was located in well JF-73 and the fact that a depression in the groundwater table of this size is unlikely. From May through August (Figures 10 through 13), groundwater flow appears to be predominantly to the southeast, and in September (Figure 14 and 15) and October (Figures 16 and 17) the flow is predominantly to the south. Starting in June (Figure 11) a depression at JFP-2 is seen. In September, this depression extends further north to include JFP-1 and JF-73. This depression of approximately 0.3 feet is most likely due to the phytoremediation study trees. Although it is too early to make a determination until the remaining data for the year is collected to see what occurs when the trees go dormant. Other data which supports this is that the direction of groundwater flow has moved perpendicular to the land surface contour and in some cases 180 degrees to the land surface contour which the groundwater flow typically follows.

4.4 Groundwater Contamination Model

Historic groundwater quality data is presented in Table 17 along with data from the May 1997 sampling event for wells P2, P3, P4, JF53, JF63, JF73, JF83, and JF183. Total VOC contamination is decreasing in wells P2, P3, and JF183. Contamination appears to be increasing in wells JF53 and JF73. Trends in wells P4, JF63, and JF83 are not apparent. A graphical depiction of contamination concentrations in all the wells for May 1997 is presented in Figure 18. Groundwater contamination

is predominantly moving south and east of the pits. This movement is supported by the seasonal flow direction seen in Figures 7 through 17. Additional wells located to the west of JFP-1 would be necessary to more precisely define the contaminant plume.

5.0 CONCLUSIONS

- Shallow lysimeters at 4 feet bgs (JFL-1 and JFL-3) were sampled only once during the year due to low groundwater levels. No VOCs of concern were detected in these lysimeters.
- Total VOC contamination (19 to 65 ug/L) was detected in the deep lysimeters at 7.5 feet bgs (JFL-2 and 4) during the May and July sampling events.
- Groundwater contamination is moving predominantly south and east of the pits.
- Groundwater contaminant concentrations in well JFP-2 have increased substantially throughout the year. This may be due to the drawdown observed at this well as caused by the trees and/or this may have been due to the pump tests conducted on well JF-183 during the month of June.
- Total VOC concentrations in the monitor wells range from non detect to 261 mg/L.
- High concentrations of VOCs in the groundwater (up to 261 mg/L) do not appear to have any effect on the growth of the trees. This may be due to the fact that the trees are drawing water from the saturated zone above the groundwater table which, as shown by the lysimeters at 7.5 feet bgs, is not as contaminated as the groundwater.
- Water table elevations from February through October 1997 have fallen 5 to 7 feet over the entire area.
- Water table elevations that were higher in February, April, May, and June for JFP-2 than for JFP-3 and 4 were lower for July, August, September, and October. This again shows the possible effect the trees are having on the drawdown of the water table.
- Well JFP-1 showed the greatest water table elevation drop from February through October. Elevation drops were greatest next to the pits followed by locations to the south, east, and lastly north of the pits.

WELL LOCATION	ELEVATION DROP* (feet from MSL)	WELL LOCATION	ELEVATION DROP* (feet from MSL)
JFP-1	6.99	JFP-3	5.41
P4	6.84	JFP-5	5.27
P2	6.08	JFP-4	5.23
P3	5.94	JF-73	5.16
JF-83	5.74	JF-203	4.70
JFP-2	5.70	JF-53	4.67
JF-183	5.68	JF-63	3.51

* = Elevation drop from February through October 1997

6.0 RECOMMENDATIONS

- Groundwater elevations should be collected at least once a month to measure variations.
- A full round of groundwater sampling should be performed during May of each year to minimize any seasonal effects there may be on the water quality.
- Wells JFP-1 through 4 should be sampled at three other times during the year, preferably during February, July, and November to be consistent with the first year data.

TABLE 1
J-Field Well Descriptions
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD

Harford County Identification	Well #	Color	REAC Elevation TOC*	USGS Elevation TOC*	USGS Land Elevation*	Well Size (inch)	Material of Construction	Depth TOC (ft bgs)	Screen Interval (ft bgs)	Date Installed
HA-94-0443	JF-203	orange	8.77			2	ss	29.6	13 to 23	Jan 96
HA-93-0173	JF-173	silver	9.65			4	ss	33.6	26 to 31	Oct 93
HA-94-0436	JF-183	yellow	11.88			4	ss	46.4	13 to 44	Aug 94
Princeton Aqua Science										
HA-81-0526	P-2	rust	11.16	11.16	8.18	4	PVC	17	5 to 20	Nov 88**
HA-81-0527	P-3	rust	10.27	10.27	7.76	4	PVC	22.3	5 to 20	March 89**
HA-81-0520	P-4	rust	10.22	10.19	7.19	4	PVC	21.9	5 to 17	Nov 88**
Weston/REAC										
HA-94-1334	JFP-1	yellow	11.76			2	PVC	17.2	3.6 to 13.6	Nov 96
HA-94-1335	JFP-2	yellow	11.04			2	PVC	16.5	3.5 to 13.5	Nov 96
HA-94-1336	JFP-3	yellow	10.42			2	PVC	15.1	2.5 to 12.5	Nov 96
HA-94-1337	JFP-4	yellow	10.45			2	PVC	16.5	3.6 to 13.6	Nov 96
HA-94-1338	JFP-5	yellow	8.40			2	PVC	17	3.75 to 13.75	Nov 96
USGS										
HA-88-1051	JF-53	orange	8.10	8.07	5.1	4	PVC	22.3	14.2 to 19.2	Nov 89***
HA-88-1054	JF-63	orange	6.80	6.82	4.1	4	PVC	22.3	16 to 19	Nov 89***
HA-88-1057	JF-73	orange	10.04	10.03	7.48	4	PVC	21.4	15 to 18	Nov 89***
HA-88-1060	JF-83	orange	13.18	13.18	10.42	4	PVC	22.9	15 to 20	Nov 89***

ss = stainless steel

PVC = polyvinyl chloride

TOC = top of casing

bgs = below ground surface

* = feet above mean sea level

** = date of known first sample, believed to be installed in 1984

*** = date of known first sample

TABLE 2
Well Purge Parameters
February 20 and 21, 1997
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD

	Purge	DO	Temp	pH	Cond	Turb
	(L)	(ppm)	(deg F)	(s.u.)	(uS)	(NTU)
JFP-1	10	3.5	49.5	6.36	172	137
	32	7.0	48.5	6.54	186	21.8
	sample	6.4	52.5	6.38	169	14.5

Note: purged dry <0.5 L/min

JFP-2	10	4.2	56.0	7.05	357	NR
	30	6.4	50.7	7.07	376	NR
	45	8.2	49.3	7.00	378	NR
	60	7.1	48.0	7.04	389	NR
	75	7.2	47.1	7.09	381	NR

Note: purge @ 1 L/min

JFP-3	5	3.0	56.9	6.74	449	NR
	30	7.0	53.0	6.50	466	NR
	45	9.8	49.6	6.46	513	NR
	60	10.4	48.5	6.77	580	NR
	75	6.4	47.9	6.82	493	NR
	95	8.4	45.9	6.69	524	NR

Note: purge @ 1 L/min

JFP-4	5	3.0	65.1	7.27	274	NR
	35	3.9	55.7	6.99	282	NR
	55	5.4	56.4	6.63	275	NR
	75	5.7	50.9	6.68	275	NR
	90	5.9	51.6	6.81	267	NR

Note: purge @ 1 L/min

JFP-5	13	2.7	48.5	5.74	195	111
	40	3.1	45.2	5.70	219	7.39
	54	5.6	44.1	5.47	159	3.06
	67	6.8	44.3	5.40	166	2.57
	81	3.6	44.6	5.48	163	2.24

Note: purge @ 0.9 L/min

Purge (L) = purge volume in liters

DO (ppm) = dissolved oxygen in parts per million

Temp (deg F) = temperature in degrees Fahrenheit

pH (s.u.) = pH in standard units

Cond (uS) = conductivity in micro siemens

Turb (NTU) = turbidity in nephelometric turbidity units

TABLE 3
Well and Lysimeter Volatile Organic Results
February 20 and 21, 1997
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD

Designation	Wells					Lysimeters	
	JFP-1	JFP-2	JFP-3	JFP-4	JFP-5	JFL-1	JFL-3
Contaminant	ug/L						
tetrachloroethene (PCE)	7000	22	130	ND	21	ND	ND
1,1,1,2-tetrachloroethane (1112)	140	ND	2.8	ND	ND	ND	ND
1,1,2,2-tetrachloroethane (1122)	140000	370	5500	ND	680	ND	ND
trans-1,2-dichloroethene (t-DCE)	260	4	48	ND	26	ND	ND
cis-1,2-dichloroethene (c-DCE)	940	12	140	ND	78	ND	ND
trichloroethene (TCE)	41000	240	1300	ND	220	ND	ND
1,1,2-trichloroethane (TCA)	870	4.8	50	ND	29	ND	ND
chloroform	ND	1	1.5	ND	ND	ND	ND
methyl-tertiary-butylether	ND	ND	ND	7.9	ND	ND	ND
acetone	ND	ND	ND	ND	ND	130	ND
methylene chloride	ND	ND	ND	ND	ND	35	ND
2-butanone	ND	ND	ND	ND	ND	19	ND
4-methyl-2-pentanone	ND	ND	ND	ND	ND	2.2	ND
toluene	ND	ND	ND	ND	ND	23	ND
Total Organics (2)	190210	653	7171	0	1054	0	0
TICs	none	none	none	none	none	yes (1)	none

ND = not detected

(1) see analytical report in Appendix C for listing

(2) sum of PCE, 1112, 1122, t-DCE, c-DCE, TCE, TCA

ug/L = micrograms/liter

TABLE 4
Well Wet Chemistry Results
February 20 and 21, 1997
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD

Compound	JFP-1	JFP-2	JFP-3	JFP-4	JFP-5
	mg/L				
Nitrogen, Ammonia	0.12	<0.10	<0.10	<0.10	<0.10
Total Organic Halides (TOX)	100	2.5	11	<0.0050	1.8
Chloride	440	4	6.9	1.5	14
Nitrogen, Nitrate	0.31	2.7	2.3	0.12	<0.11

< indicates compound detection limit

samples were not filtered

mg/L = milligrams per liter

TABLE 5
Well Metals Results
February 20 and 21, 1997
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD

Compound	JFP-1	JFP-2	JFP-3	JFP-4	JFP-5
mg/L					
Aluminum	ND	ND	ND	ND	55
Arsenic	33	2.7	8.7	ND	3.9
Barium	150	19	18	7.9	14
Calcium	310000	84000	110000	59000	22000
Chromium	ND	ND	6.9	ND	ND
Cobalt	17	5	ND	7.1	ND
Iron	910	ND	ND	ND	3200
Magnesium	13000	2000	6200	1100	3800
Manganese	1000	3.1	18	ND	97
Potassium	2100	ND	ND	ND	ND
Silver	ND	ND	ND	5.5	ND
Sodium	77000	9200	9100	2800	7900
Vanadium	ND	5.1	6	5.4	ND
Zinc	5	ND	ND	ND	8.1

ND = not detected (see Appendix C for detection limits)

samples were filtered before analysis

mg/L = milligrams per liter

TABLE 6
Field Test Kit Analysis Results
February 20 and 21, 1997
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD

	Nitrate	Chloride	Ammonia
	(mg/L)		
JFP-1	0.2	>500	1.0
JFP-2	2.0	25	0.4
JFP-3	1.0	30	0.3
JFP-4	0.1	20	0.2
JFP-5	0.1	40	0.2

mg/L = milligrams per liter

TABLE 7 Cont'd.
Well Purge Parameters
May 14 - 16, 1997
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD

JF-53	Purge	DO	Temp	Sal	pH	Cond	Turb
	(gal)	(ppm)	(deg C)	(%)	(s.u.)	(uS/cm)	(NTU)
	40	11.97	12.3	0.03	5.92	0.848	115
45	11.88	13.3	0.03	5.96	0.835	999	
50	12.36	13.6	0.03	5.95	0.859	658	
60	11.51	14.4	0.03	5.70	0.839	192	

Note: very slow recharge

JF-63	25	11.17	12.3	0.06	4.51	1.34	69
	35	12.69	12.3	0.05	5.49	1.28	62
	38	11.68	13.3	0.05	5.69	1.21	139
	60	12.31	13.4	0.05	5.86	1.13	999

Note: very slow recharge

JF-73	35	13.15	11.8	0.02	6.65	0.635	-10
	50	12.98	12.00	0.02	6.53	0.670	403
	70	12.37	12.00	0.02	6.77	0.645	-10

JF-83	65	11.48	15.5	0.02	6.02	0.489	81
	67	11.77	15.9	0.02	6.24	0.500	102
	76	11.65	15.6	0.02	6.01	0.495	176

Note: Well purged with pump @ 1 gpm

183	45	11.67	13.6	0.01	6.34	0.446	9
	80	11.95	13.1	0.01	6.27	0.474	0
	100	11.91	13.0	0.01	6.12	0.480	0
	120	11.70	13.1	0.01	6.05	0.450	188
	150	11.02	14.9	0.02	5.95	0.499	0
	170	11.20	14.6	0.01	6.32	0.441	0
	200	11.17	15.3	0.01	6.23	0.473	182
	220	11.55	15.1	0.01	6.22	0.475	3

Note: Well purged with pump @ 2 gpm

very slow recharge

JF-203	20	11.19	12.5	0.01	6.60	0.327	21
	40	12.26	12.2	0.01	6.83	0.322	600
	55	12.48	11.7	0.01	6.78	0.319	128
	80	9.86	12.5	0.01	6.87	0.332	199

Purge (L) = purge volume in liters

DO (ppm) = dissolved oxygen in parts per million

Temp (deg C) = temperature in degrees Celcius

Sal (%) = salinity in percent

pH (s.u.) = pH in standard units

Cond (uS) = conductivity in micro siemens per centimeter

Turb (NTU) = turbidity in nephelometric turbidity units

TABLE 8
Well Volatile Organic Results
May 14 - 16, 1997
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD

Contaminant	JFP-1	JFP-2	JFP-3	JFP-4	JFP-5	P2	P3	P4	JF-53	JF-63	JF-73	JF-83	JF-183	JF-203
tetrachloroethene (PCE)	9000	52	220	ND	14	ND	330	ND	ND	26	440	2900	400	55
1,1,1,2-tetrachloroethane (1112)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-tetrachloroethane (1122)	170000	3400	12000	ND	370	ND	2.7	580	12000	ND	11000	160000	25000	1300
trans-1,2-dichloroethene (t-DCE)	ND	32	ND	20	ND	24	690	1400	1.4	3900	2600	ND	ND	ND
cis-1,2-dichloroethene (c-DCE)	640	130	160	ND	61	ND	140	2500	4800	81	13000	9600	950	120
trichloroethene (TCE)	61000	870	2400	ND	190	ND	56	4500	5500	430	6400	38000	4200	2200
1,1,2-trichloroethane (TCA)	930	28	ND	ND	16	ND	ND	290	ND	230	ND	ND	ND	ND
methyl-tertiary-butylether (MTBE)	ND	ND	14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-dichloroethene	ND	ND	ND	ND	ND	ND	ND	3.3	ND	ND	ND	ND	ND	ND
chloroform	ND	ND	ND	ND	ND	ND	ND	1.2	ND	ND	0.8J	ND	ND	ND
1,2-dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.9J	ND	ND	ND
benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.9J	ND	ND	ND
chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.5	ND	ND	ND
o-xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.6	ND	ND	ND
isopropylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7J	ND	ND	ND
1,3,5-trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4	ND	ND	ND
1,2,4-trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND
TICs (1)	none	none	none	none	none	none	none	yes	none	none	none	none	none	none
TOTAL ORGANICS (2)	241570	4512	14780	0	671	0	553	8270	23990	538	34970	213100	30550	3675

ND = not detected

ug/L = micrograms per liter

(1)=see analytical report in Appendix D for listing

(2) = sum of PCE, 1112, 1122, t-DCE, c-DCE, TCE, TCA

TABLE 9
 Well Water Chemistry Results
 May 14 - 16, 1997
 J-Field Phytoremediation Study
 Aberdeen Proving Ground, MD

Sample ID.	JFP-1	JFP-2	JFP-3	JFP-4	JFP-5	P1	P3	P4	JF-53	JF-63	JF-73	JF-83	JF-203
Sample Number	10178	10179	10180	10181	10175	10182	10177	10184	10186	10188	10183	10189	10187
Analyte													ug/L
ammonia	80	ND	ND	ND	30	ND	1700	30	560	530	40	ND	ND
chloride	340000	ND	4400	2700	6200	4400	4400	250000	380000	460000	86000	98000	15000
nitrate	480	5500	5200	260	870	ND	2100000	ND	320	700	3300	2500	4700
TOX	220000	2600	11000	ND	1600	200	4000	2100	20000	ND	22000	190000	22000

TOX = total organic halide
 ug/L = micrograms per liter

TABLE 10
Well Metals Results
May 14 - 16, 1997
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD

Sample Location	JFP-1	JFP-2	JFP-3	JFP-4	JFP-5	P2	P3	P4	JF-53	JF-63	JF-73	JF-83	JF-183	JF-203	
Sample Number	10178	10179	10180	10181	10175	10182	10177	10184	10186	10188	10183	10189	10187	10105	
Analyte	ug/L														
aluminum	ND	ND	280	ND	870	ND	ND	ND	130	100	ND	820	90	580	
antimony	ND	ND	ND	ND	ND	ND	16	ND	ND	ND	ND	ND	ND	ND	
arsenic	28	ND	ND	ND	ND	ND	18	ND	5	ND	59	11	ND	ND	
barium	130	39	38	16	59	17	33	110	240	270	98	84	30	27	
beryllium	ND	ND	ND	0.33	ND	0.056	ND	ND	0.087	ND	0.1	ND	ND	ND	
cadmium	0.82	ND	0.86	0.98	3.3	ND	0.68	2.4	0.1	1.3	1.3	ND	ND	0.58	
calcium	250000	830000	980000	720000	140000	19000	8900	140000	71000	110000	100000	46000	69000	64000	
chromium	8.1	21	9.4	6	ND	14	4.6	18	3.6	35	5.2	13	15	5.2	
cobalt	8.9	1.7	1.5	0.83	5.9	1.2	1.4	8.5	5.6	3.5	2.7	12	1.3	1.3	
copper	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	92	ND	ND	ND	
iron	ND	280	430	ND	2800	ND	1000	2100	39000	35000	3100	1300	500	1100	
lead	ND	ND	20	11	33	ND	9.4	8.3	9.1	30	ND	13	ND	ND	
magnesium	8700	1900	5300	1300	2200	2000	18000	28000	23000	6800	20000	4200	2100		
manganese	780	22	49	9.3	81	11	170	200	1200	1000	350	130	37	19	
nickel	12	15	6.8	4.6	7.3	12	23	19	300	31	100	16	11	7.1	
potassium	1600	440	830	340	460	820	16000	2700	1600	2000	1200	320	220	380	
selenium	ND	ND	ND	ND	ND	ND	3.7	ND	ND	ND	ND	14	ND	ND	
silver	ND	ND	ND	ND	ND	ND	1.4	ND	ND	ND	1.6	ND	ND	ND	
sodium	81000	10000	18000	4000	6400	9600	12000	76000	16000	33000	18000	18000	9300	6700	
thallium	ND	ND	ND	ND	ND	ND	5	ND	ND	ND	ND	ND	ND	ND	
vanadium	3.3	0.94	2	0.77	3.5	ND	4.7	4.4	4.5	3.8	1.9	4.7	1.3	2.8	
zinc	22	ND	23	ND	41	ND	140	87	87	31	28	34	25	22	

ND = nondetect
 ug/L = micrograms per liter

TABLE 11
 Well and Lysimeter Volatile Organic Results
 May 14 - 16, 1997
 J-Field Phytoremediation Study
 Aberdeen Proving Ground, MD

Contaminant	Wells				Lysimeters				
	JFP-1	JFP-2	JFP-3	JFP-4	JFP-5	JFL-1	JFL-2	JFL-3	JFL-4
tetrachloroethene (PCE)	9000	52	220	ND	14	ND	ND	ND	ND
1,1,1,2-tetrachloroethane (1112)	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-tetrachloroethane (1122)	170000	3400	12000	ND	370	ND	14	ND	36
trans-1,2-dichloroethene (t-DCE)	ND	32	ND	ND	20	ND	ND	ND	ND
cis-1,2-dichloroethene (c-DCE)	640	130	160	ND	61	ND	ND	ND	ND
trichloroethene (TCE)	61000	870	2400	ND	190	ND	5.2	ND	29
1,1,2-trichloroethane (TCA)	930	28	ND	ND	16	ND	ND	ND	ND
acetone	ND	ND	ND	ND	ND	110	ND	ND	ND
methylene chloride	ND	ND	ND	ND	10B	ND	ND	ND	ND
2-butanone	ND	ND	ND	ND	ND	5.9	ND	ND	ND
methyl-tertiary-butylether (MTBE)	ND	ND	ND	14	ND	ND	ND	ND	ND
chloroform	ND	ND	ND	ND	ND	2.5	1.7	ND	ND
4-methyl-2-pentanone	ND	ND	ND	ND	ND	1.6J	ND	ND	ND
toluene	ND	ND	ND	ND	ND	19	0.8J	ND	ND
TOTAL ORGANICS (2)	241570	4512	14780	0	671	0	19	0	65
TICs (1)	none	none	none	none	yes	none	none	none	none

ND = not detected

- (1) see analytical report in Appendix D for listing
 (2) sum of PCE, 1112, 1122, t-DCE, c-DCE, TCE, TCA

TABLE 12
Well Purge Parameters
July 21 and 22, 1997
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD

	Purge (gal)	DO (ppm)	Temp (deg C)	pH (s.u.)	Cond (uS)	Turb (NTU)
JFP-1	3	4.10	18.6	6.43	1730	NR

Note: purged dry at 3 gal

JFP-2	5.5	5.4	18	6.27	440	NR
	11	4.7	17.1	6.43	439	NR
	16.5	5.3	17.1	6.6	442	NR

JFP-3	5	0	20.6	6.77	419	>1000
	10	3.9	18.8	6.29	489	NR
	15	4.3	17.6	6.41	497	NR

JFP-4	6	5.7	19.2	6.98	274	NR
	12	5.7	17.9	6.88	258	NR
	18	5.9	19.9	6.38	252	NR

Purge (L) = purge volume in liters

DO (ppm) = dissolved oxygen in parts per million

Temp (deg F) = temperature in degrees Farenheit

pH (s.u.) = pH in standard units

Cond (uS) = conductivity in micro siemens

Turb (NTU) = turbidity in nephelometric turbidity units

TABLE 13
Well and Lysimeter Volatile Organic Results
July 21 and 22, 1997
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD

Designation	Wells				Lysimeter
	JFP-1	JFP-2	JFP-3	JFP-4	JFL-4
Contaminant	(ug/L)				
tetrachloroethene (PCE)	11000	900	240	ND	1.3
1,1,1,2-tetrachloroethane (1112)	130	ND	3.6	ND	ND
1,1,2,2-tetrachloroethane (1122)	180000	37000	11000	ND	19
trans-1,2-dichloroethene (t-DCE)	950	1200	59	ND	ND
cis-1,2-dichloroethene (c-DCE)	3100	3900	180	ND	ND
trichloroethene (TCE)	65000	11000	2600	ND	27
1,1,2-trichloroethane (TCA)	1200	440	75	ND	ND
chloroform	54J	ND	1.9	ND	0.7J
methyl-tertiary-butylether	ND	ND	ND	ND	ND
acetone	ND	ND	ND	ND	ND
methylene chloride	ND	ND	ND	ND	ND
2-butanone	ND	ND	ND	ND	ND
4-methyl-2-pentanone	ND	ND	ND	ND	ND
toluene	ND	ND	ND	ND	ND
Total Organics (2)	261380	54440	14158	0	47
TICs (1)	none	none	yes	none	none

ND = not detected

(1) see analytical report in Appendix F for listing

(2) sum of PCE, 1112, 1122, t-DCE, c-DCE, TCE, TCA

ug/L = micrograms per liter

TABLE 14
Field Test Kit Analysis Results
July 21 and 22, 1997
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD

	Nitrate	Ammonia
	(mg/L)	
JFP-1	<1	<1
JFP-2	5.0	<1
JFP-3	2.0	<1
JFP-4	<1	<1
JFP-5	0.1	0.2

mg/L = milligrams per liter

TABLE 15
Groundwater Elevation Data Since February 1997
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD

WELL ELEVATION*	P2	P3	P4	JF53	JF63	JF73	JF83	JFP-1	JFP-2	JFP-3	JFP-4	JFP-5	JF 173	JF 183	JF 203
	11.16	10.27	10.22	8.10	6.80	10.04	13.18	11.78	11.04	10.42	10.45	8.40	9.65	11.88	8.77
DATE	(feet above mean sea level)														
21-Feb-97	6.48	6.42	6.50	4.08	3.28	4.31	5.16	6.04	4.58	4.43	4.25	4.04	4.91	4.75	3.81
04-Apr-97	6.65	6.53	6.47	4.22	4.37	4.44	5.35	6.01	4.76	4.66	4.42	4.14	5.05	4.92	3.93
12-May-97	5.31	5.21	5.80	3.44	3.80	3.44	4.10	4.72	3.52	3.44	3.36	3.00	3.69	3.16	
02-Jun-97	4.09	4.06	3.09	2.45	3.00	2.35	2.87	3.05	2.31	2.30	2.29	1.93	3.11	2.48	2.28
21-Jul-97	2.22	2.13	1.33	0.67	0.82	0.50	0.95	0.86	0.09	0.40	0.39	-0.15	1.22	0.52	0.35
18-Aug-97	1.17	1.15	-0.06	-0.43	-0.13	-0.63	-0.11	-0.26	-0.76	-0.72	-0.72	-1.21	0.25	-0.80	-0.72
16-Sep-97	0.84	0.92	0.05	-0.28	0.15	-0.53	-0.24	-0.60	-0.74	-0.69	-0.65	-1.01	0.24	-0.83	-0.55
22-Sep-97	0.74	0.86	-0.02	-0.43	-0.18	-0.81	-0.56	-0.67	-0.84	-0.78	-0.74	-1.15	0.14	-0.72	-0.64
03-Oct-97	-0.43	0.68	-0.18	-0.50	-0.11	-0.59	-0.48	-0.82	-0.98	-0.90	-0.88	-1.12	0.00	-0.85	-0.79
16-Oct-97	0.40	0.48	-0.34	-0.59	-0.23	-0.85	-0.58	-0.95	-1.12	-0.98	-0.98	-1.23	-0.10	-0.93	-0.89

Bold = depth to water from top of casing was corrected by adding 3.00 feet

(it is believed that the depth to water was read as 9 feet bgs instead of 6 feet bgs)

* = elevation to top of casing in feet above mean sea level

TABLE 16
History of J-Field Groundwater Elevation
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD

Well #	P2	P3	P4	JF53	JF63	JF73	JF83
Elevation (ft)	11.16	10.27	10.19	8.07	6.82	10.03	13.18
16-Nov-89	4.60	5.27	6.44	3.64	4.10	3.64	4.24
17-Apr-90	6.49	6.38	6.49	4.35	4.60	4.66	5.39
10-Jul-90	3.49	3.20	2.15	1.72	1.90	1.60	2.21
28-Jan-91	5.88	5.92	6.20	5.28	4.20	3.94	4.76
09-Jul-91	2.63	3.55	1.56	1.21	1.60	—	1.57
20-May-92	4.19	3.92	3.77	2.62	3.00	2.55	3.11
12-Aug-92	—	1.85	0.50	0.30	0.70	0.12	0.66
10-Jun-93	4.51	4.62	3.66	2.87	3.50	2.75	3.35
19-Aug-93	1.24	1.36	-0.01	-0.41	0.10	-0.62	0.01
22-Nov-93	1.13	1.33	2.00	0.58	1.20	0.37	0.62
11-Mar-94	7.58	—	6.53	5.08	3.40	5.56	6.60
22-Aug-94	3.28	3.65	5.79	2.01	2.90	1.86	2.41

All readings are in feet above mean sea level

TABLE 17
History of Well VOC Contamination
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD

WELL	DATE	PCE	1,1,1,2	1,1,2,2	c- & t-DCE	TCE	TCA	Total Organics
ug/L								
P2	06/12/90	<1	—	100	10	44	4	158
	01/14/93	<10	—	<10	<10	<10	<10	0
	5/94	<10	—	<10	<10	<10	<10	0
	05/15/97	<1	<1	<1	<1	<1	<1	0
P3	06/07/90	—	—	—	—	—	—	—
	01/21/93	3400	—	<200	980	570	<200	4950
	5/94	2400	—	4	1100	390	<10	3894
	05/15/97	330	<1	2.7	164	56	<1	553
P4	06/07/90	—	—	—	—	—	—	—
	01/21/93	<200	—	500	3300	3600	65	7465
	5/94	19	—	3500	13000	1800	68	18387
	05/15/97	ND	<50	580	3190	4500	<50	8270
JF53	06/13/90	<1	—	3500	850	820	110	5280
	01/21/93	<400	—	4900	>10000	4200	290	9390
	5/94	7	—	550	2200	390	58	3205
	05/15/97	<100	<100	12000	6200	5500	290	23990
JF63	06/14/90	18	—	<1.5	7.3	600	<1	625
	01/20/93	130	—	75	120	4400	<250	4725
	5/94	32	—	50	100	680	<10	862
	05/15/97	26	<1	<1	82	430	<1	538
JF73	06/12/90	<1	—	340	7150	1800	67	9357
	01/19/93	280	—	9000	920	5100	90	15390
	5/94	250	—	13000	8900	4100	200	26450
	05/15/97	440	<100	11000	16900	6400	230	34970
JF83	06/12/90	1000	—	250	7150	4900	7100	20400
	01/19/93	3600	—	260000	12000	41000	2000	318600
	5/94	1100	—	160000	4100	21000	990	187190
	05/15/97	2900	<1000	160000	12200	38000	<1000	213100
JF183	12/94	830	—	39000	10000	13000	600	63430
	05/15/97	400	<200	25000	950	4200	<200	30550

< = compound detection limit

— = not reported or not analyzed for

ug/L = micrograms per liter

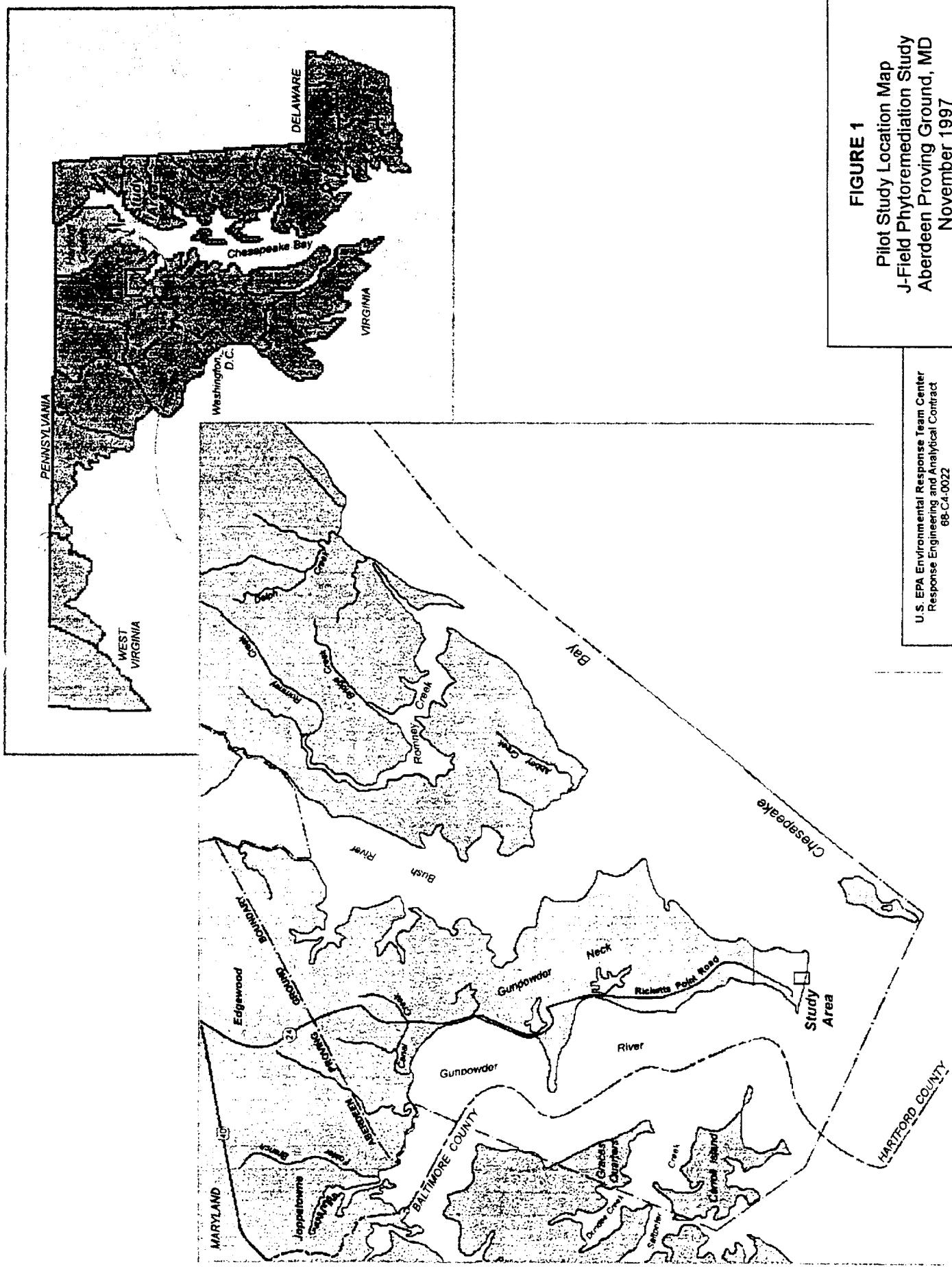
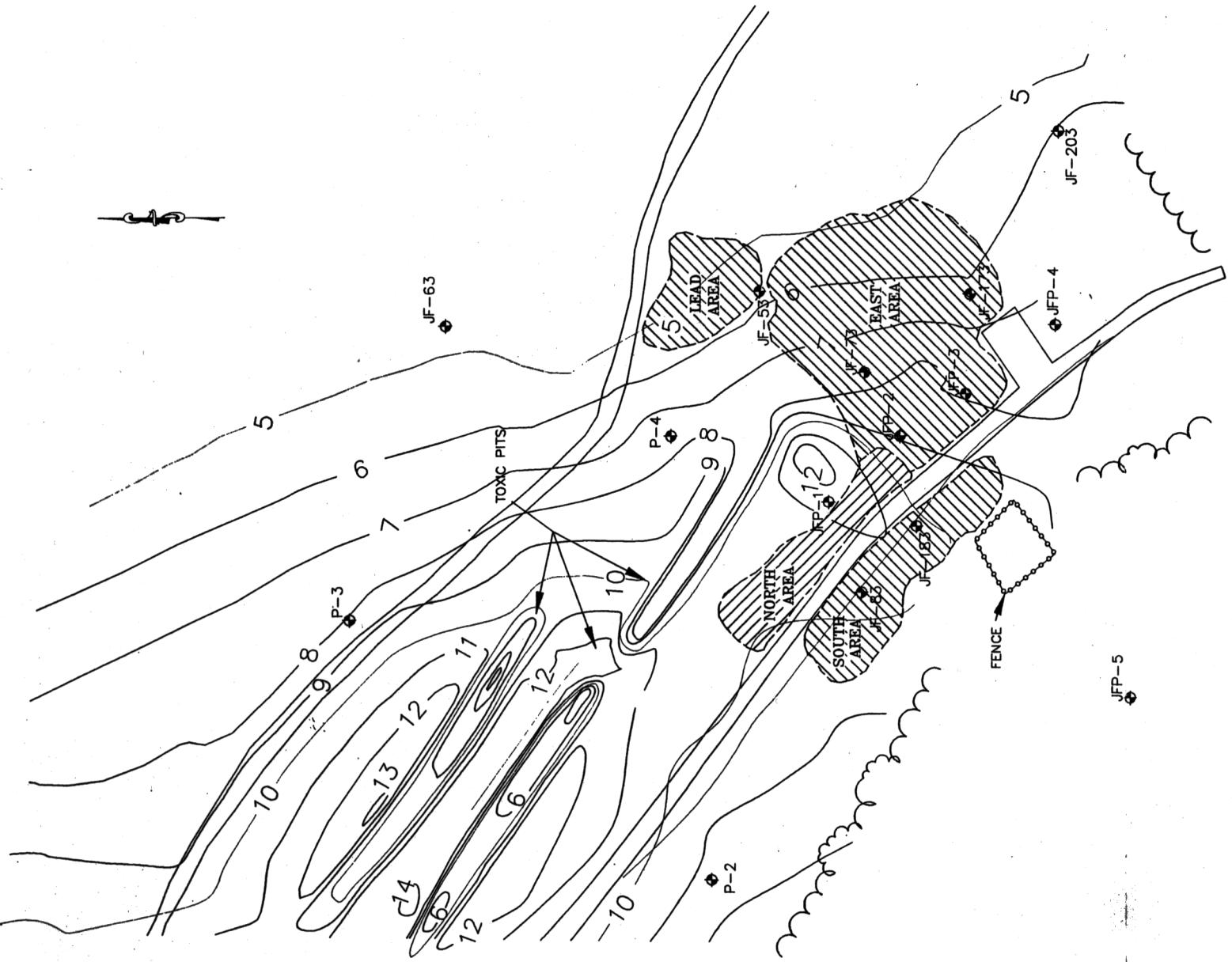


FIGURE 1
Pilot Study Location Map
J-Field Phytoremediation Study
Aberdeen Proving Ground, MD
November 1997

U.S. EPA Environmental Response Team Center
Response Engineering and Analytical Contract
68-C4-0022
WO # 03347-142-001-2173-01



LEGEND:

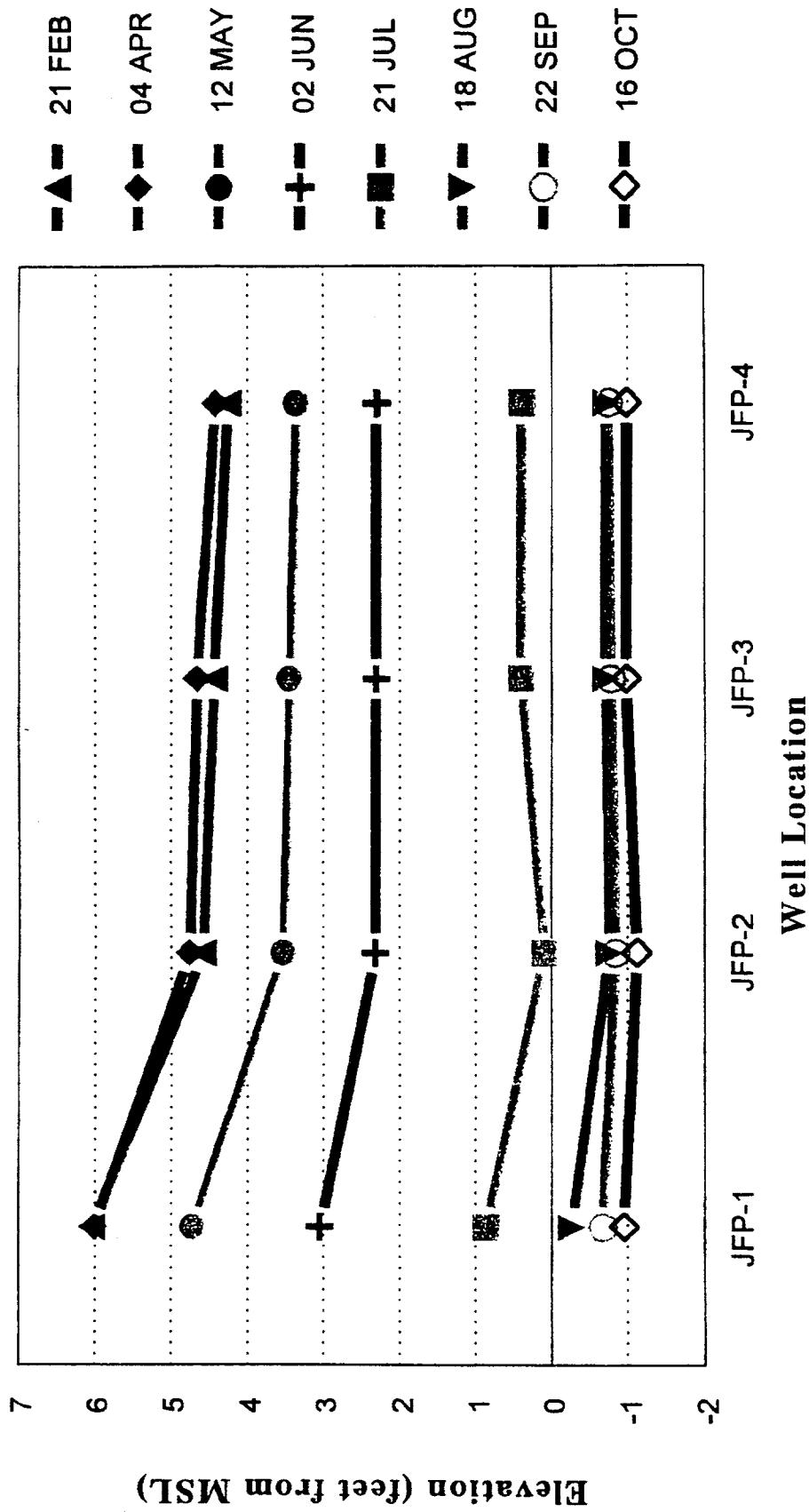
- ◆ MONITOR WELL
- - - CONTOUR INTERVAL
- - - PHYTOREMEDIALION AREA

SCALE:
50'

FIGURE 2
J-FIELD AREA MAP
J-FIELD PHYTOREMEDIATION STUDY
ABERDEEN PROVING GROUND, MD
NOVEMBER 1997

U.S. EPA ENVIRONMENTAL RESPONSE TEAM CENTER
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
CPC INC.
V.A.D. 02337-94-001-073-00

GROUNDWATER ELEVATION REAC WELLS

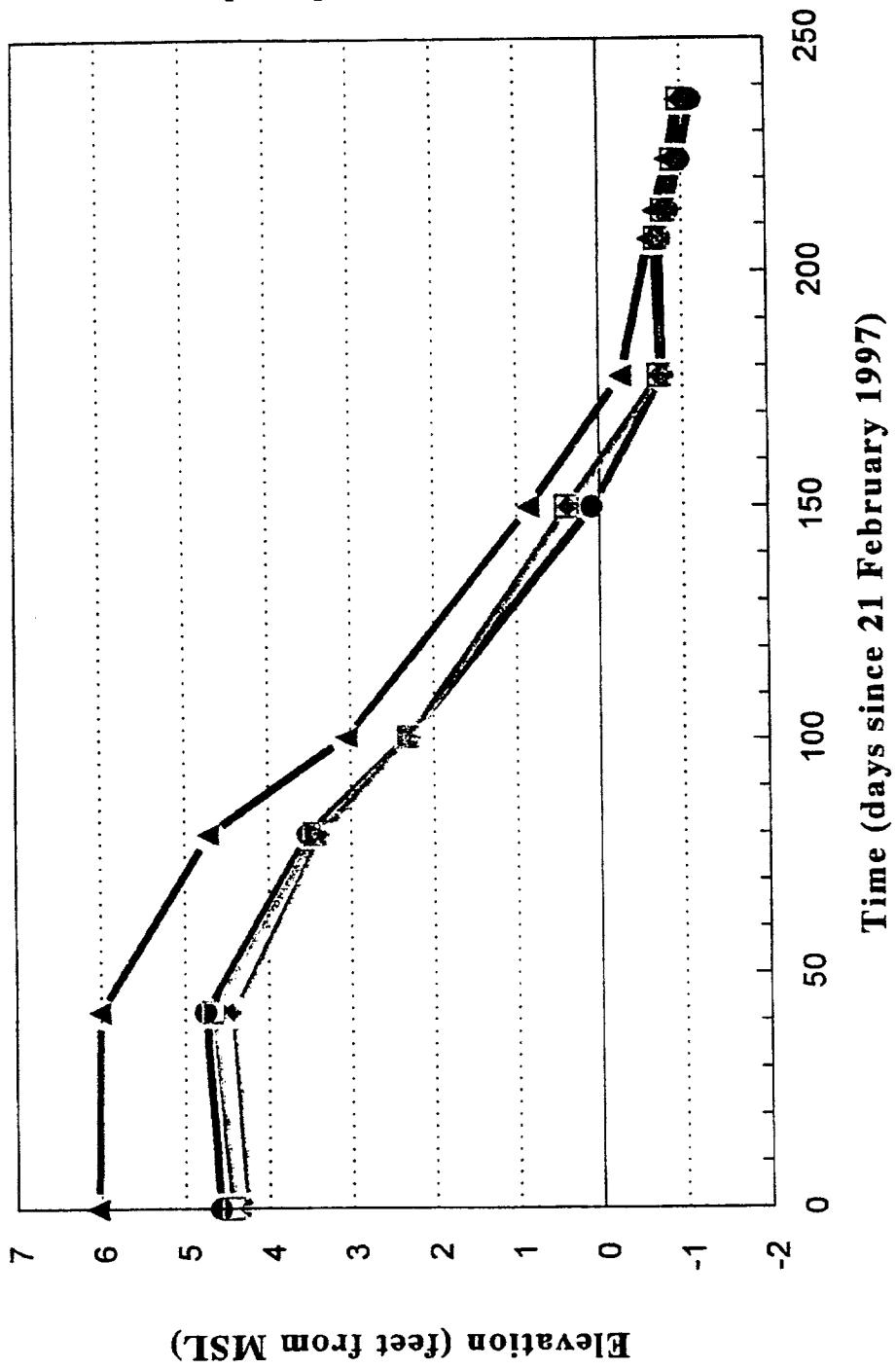


fence1.tcx

U.S. EPA ENVIRONMENTAL RESPONSE TEAM CENTER
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-C4-0022
W.O.# 03347-142-001-2173-01

FIGURE 3
J-FIELD PHYTOREMEDIAL STUDY
ABERDEEN PROVING GROUND, MD
NOVEMBER, 1997

GROUNDWATER ELEVATION -VS- TIME REAC WELLS



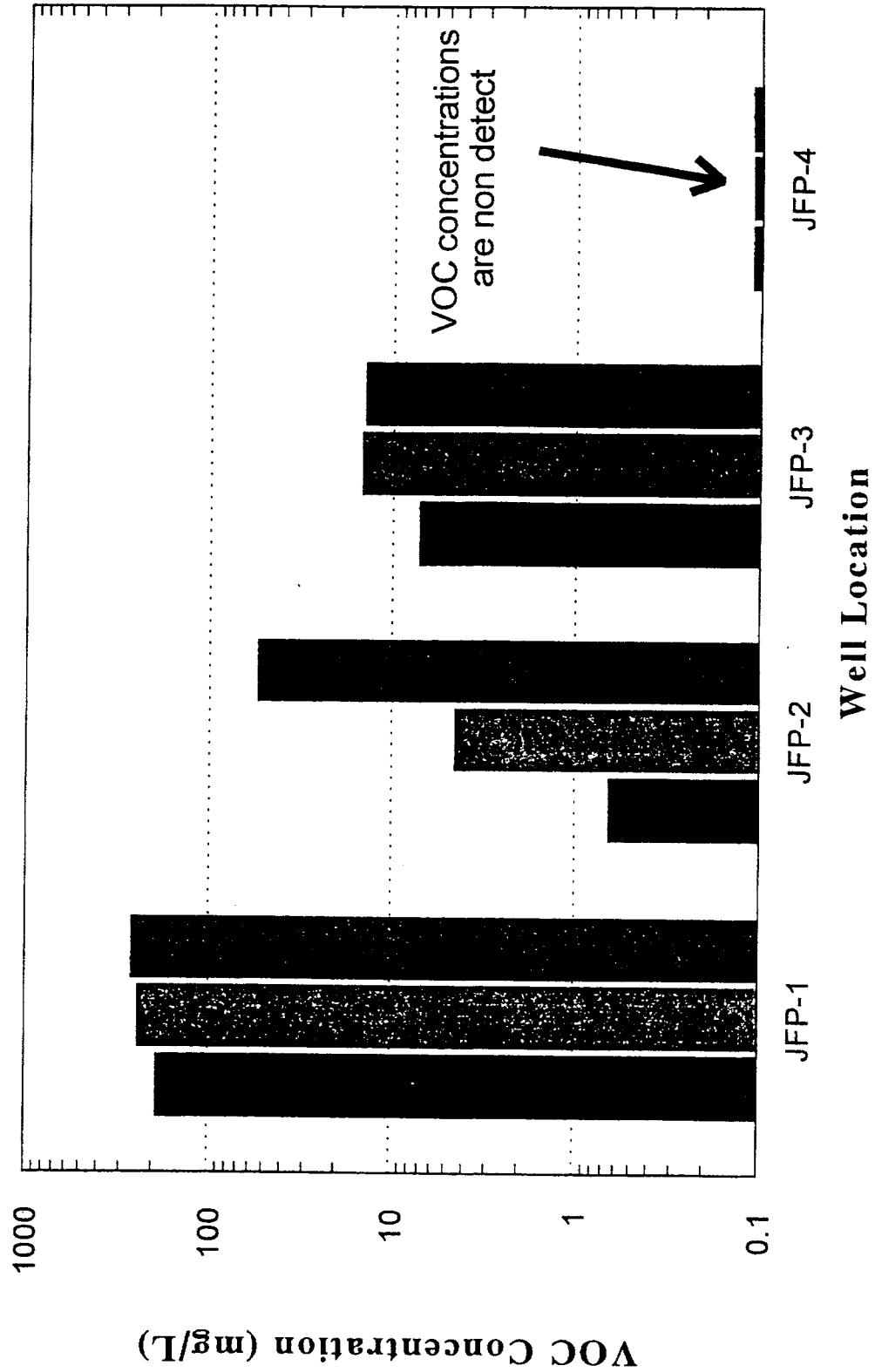
elev4.tc

U.S. EPA ENVIRONMENTAL RESPONSE TEAM CENTER
J-FIELD PHYTOREMEDICATION STUDY
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-C4-0022

W.O.# 03347-142-001-2173-01

FIGURE 4
J-FIELD PHYTOREMEDICATION STUDY
ABERDEEN PROVING GROUND, MD
NOVEMBER, 1997

TOTAL VOC CONCENTRATION REAC WELLS (log scale)

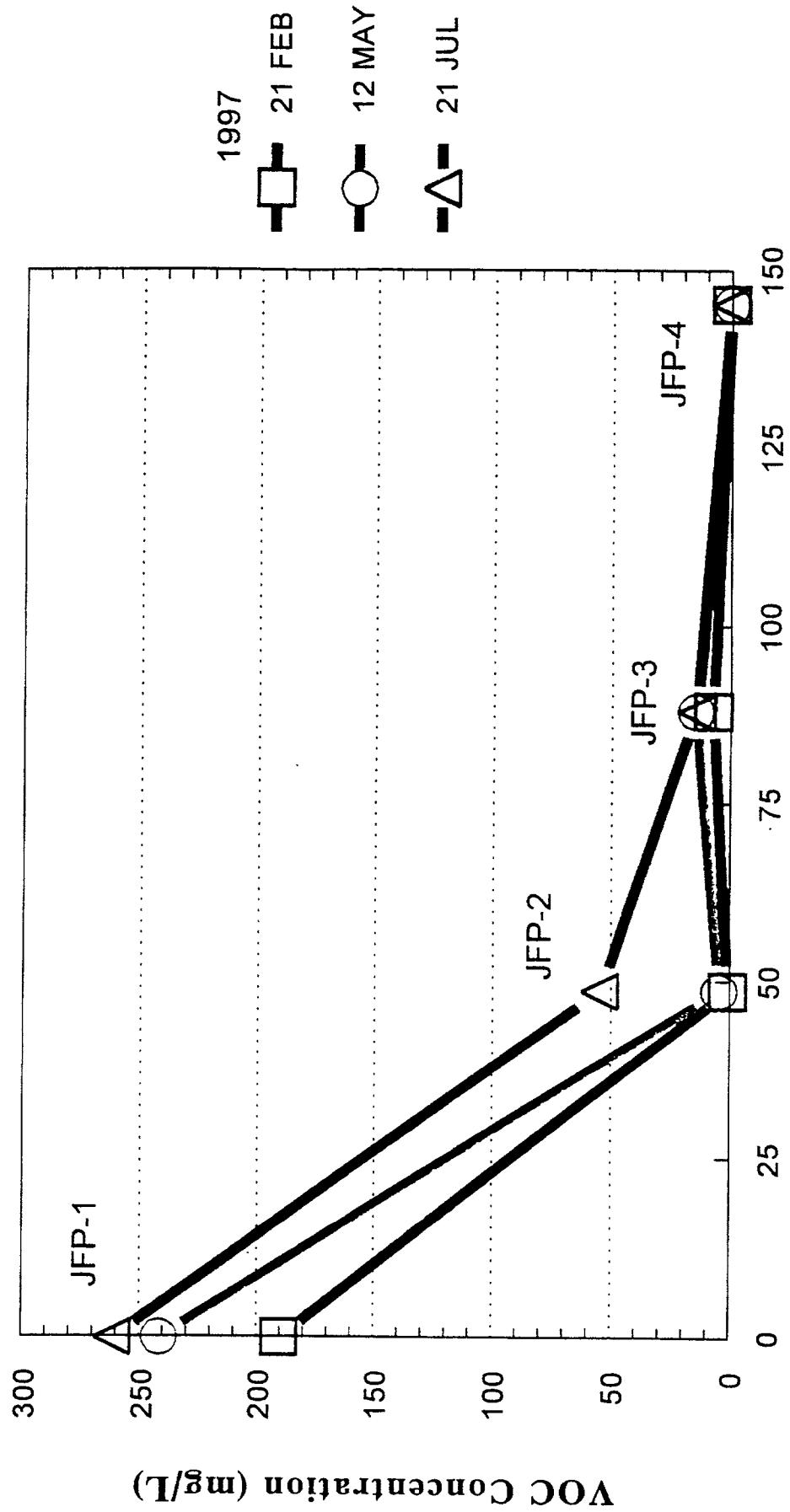


voccont1.tc

U.S. EPA ENVIRONMENTAL RESPONSE TEAM CENTER
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-C4-0022
W.O.# 03347-142-001-2173-01

FIGURE 5
J-FIELD PHOTOREMEDIATION STUDY
ABERDEEN PROVING GROUND, MD
NOVEMBER, 1997

TOTAL VOC CONCENTRATION VS DISTANCE REAC WELLS



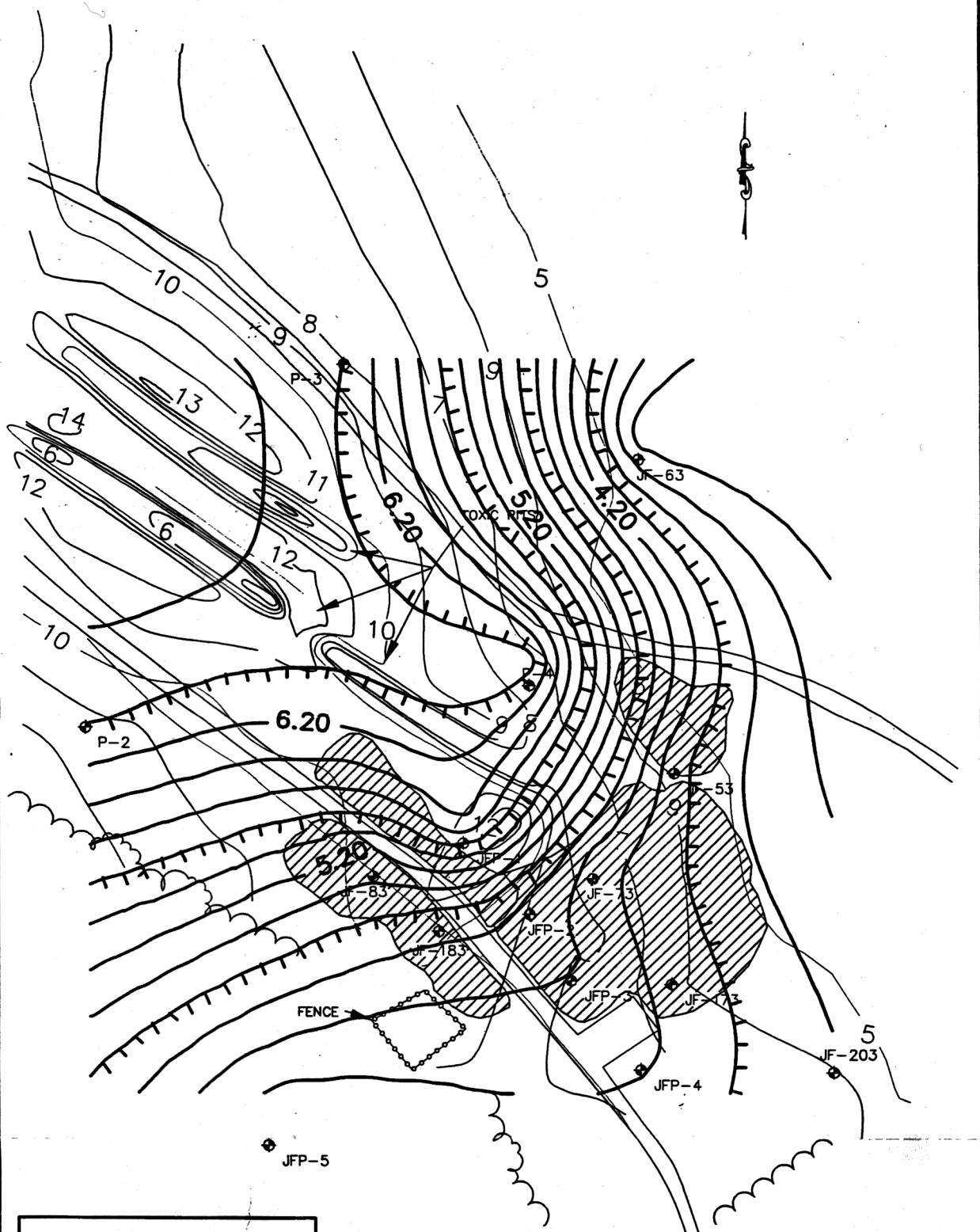
voccont2.tc

U.S. EPA ENVIRONMENTAL RESPONSE TEAM CENTER
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-C4-0022
W.O.# 03347-142-001-2173-01

J-FIELD PHYTOREMEDIA STUDY
ABERDEEN PROVING GROUND, MD
NOVEMBER, 1997

FIGURE 6

J-FIELD PHYTOREMEDIA STUDY
68-C4-0022
W.O.# 03347-142-001-2173-01
NOVEMBER, 1997

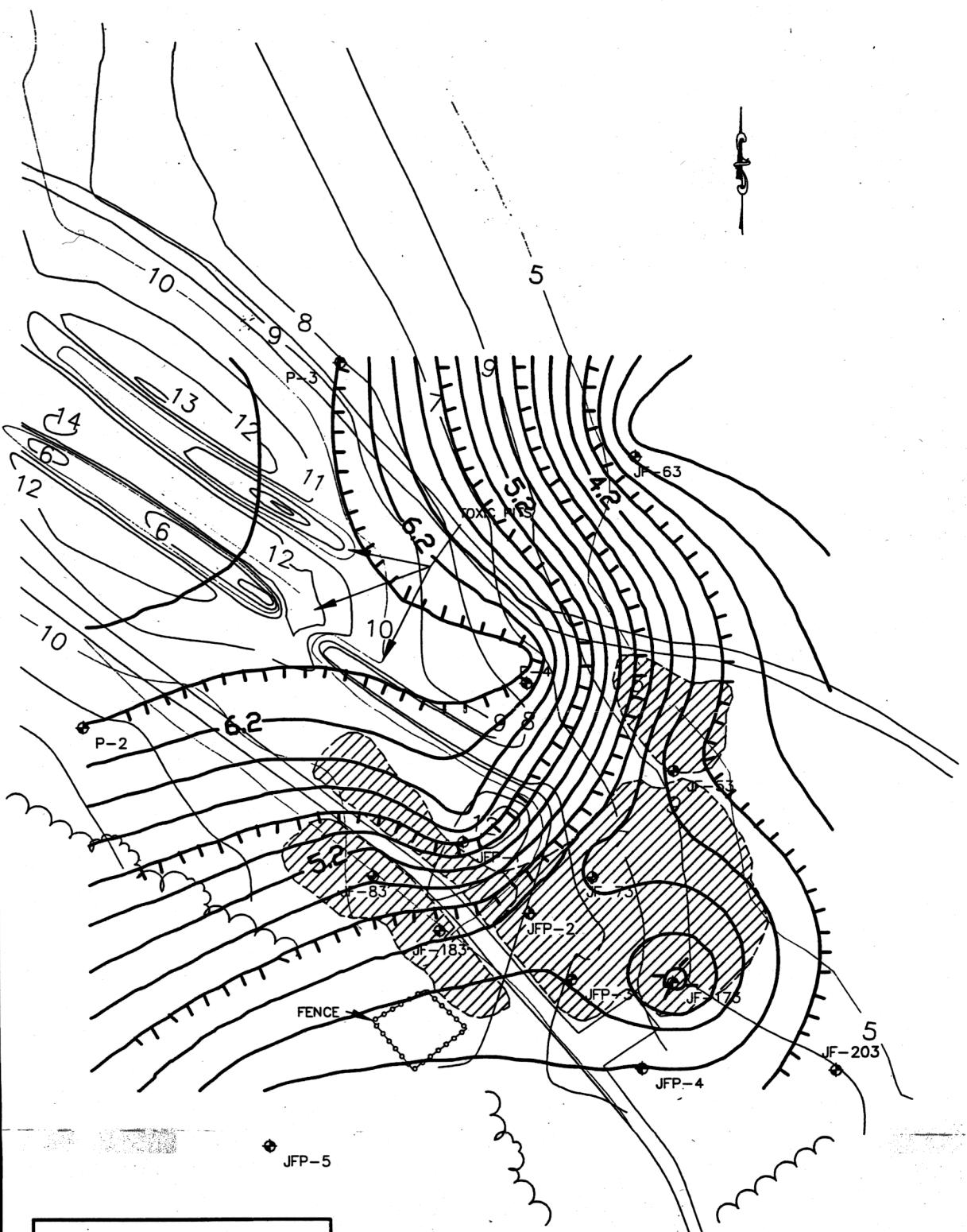


LEGEND:

- ◆ MONITOR WELL
- 4.20 — GROUNDWATER ELEVATION CONTOUR
- 9 — CONTOUR INTERVAL
- ▨ PHYTOREMEDIAL AREA

SCALE:

50'

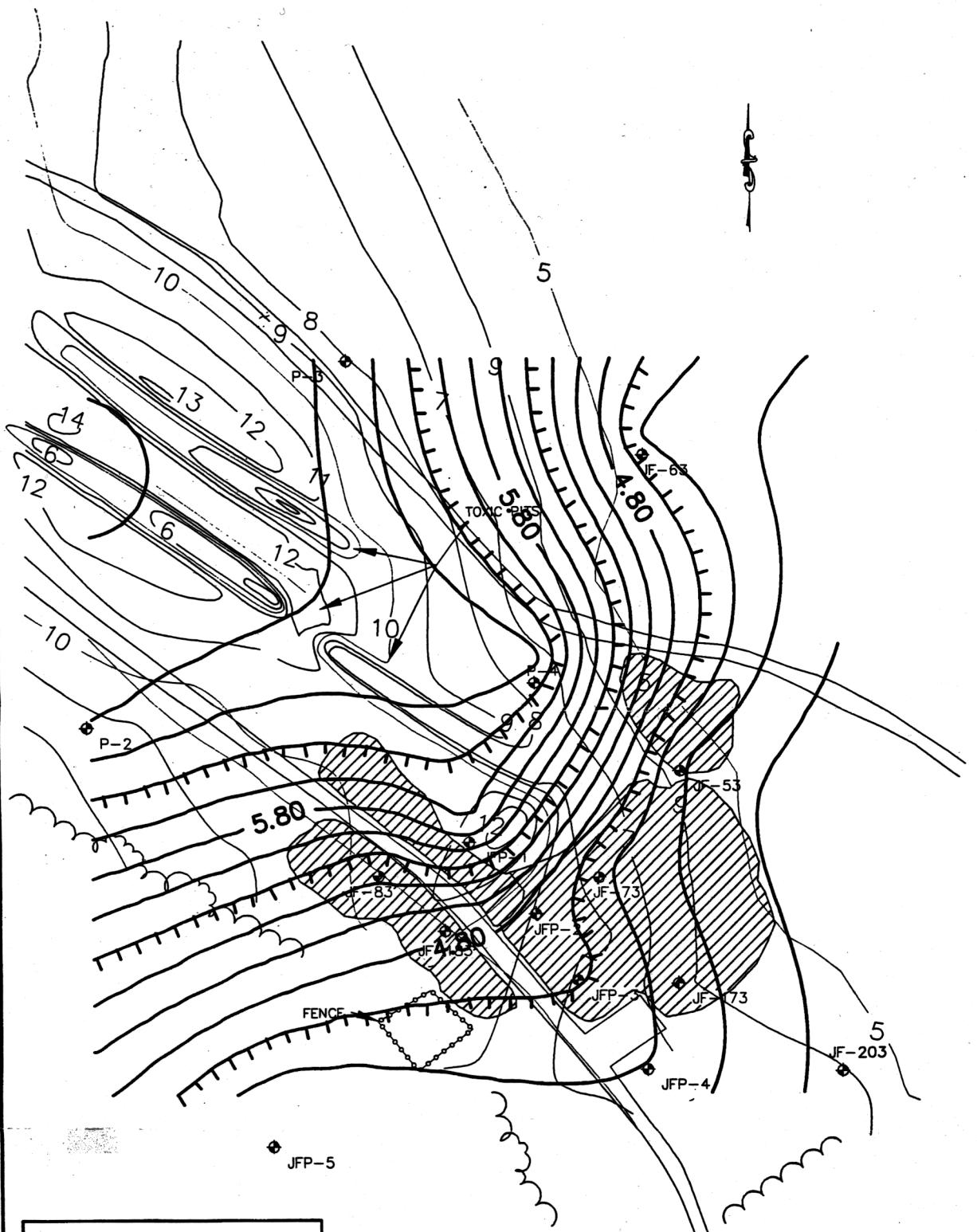


LEGEND:

- ◆ MONITOR WELL
- 4.2 — CROWNDWATER ELEVATION CONTOUR
- 9 — CONTOUR INTERVAL
- ▨ PHYTOREMEDIATION AREA

SCALE:

50'



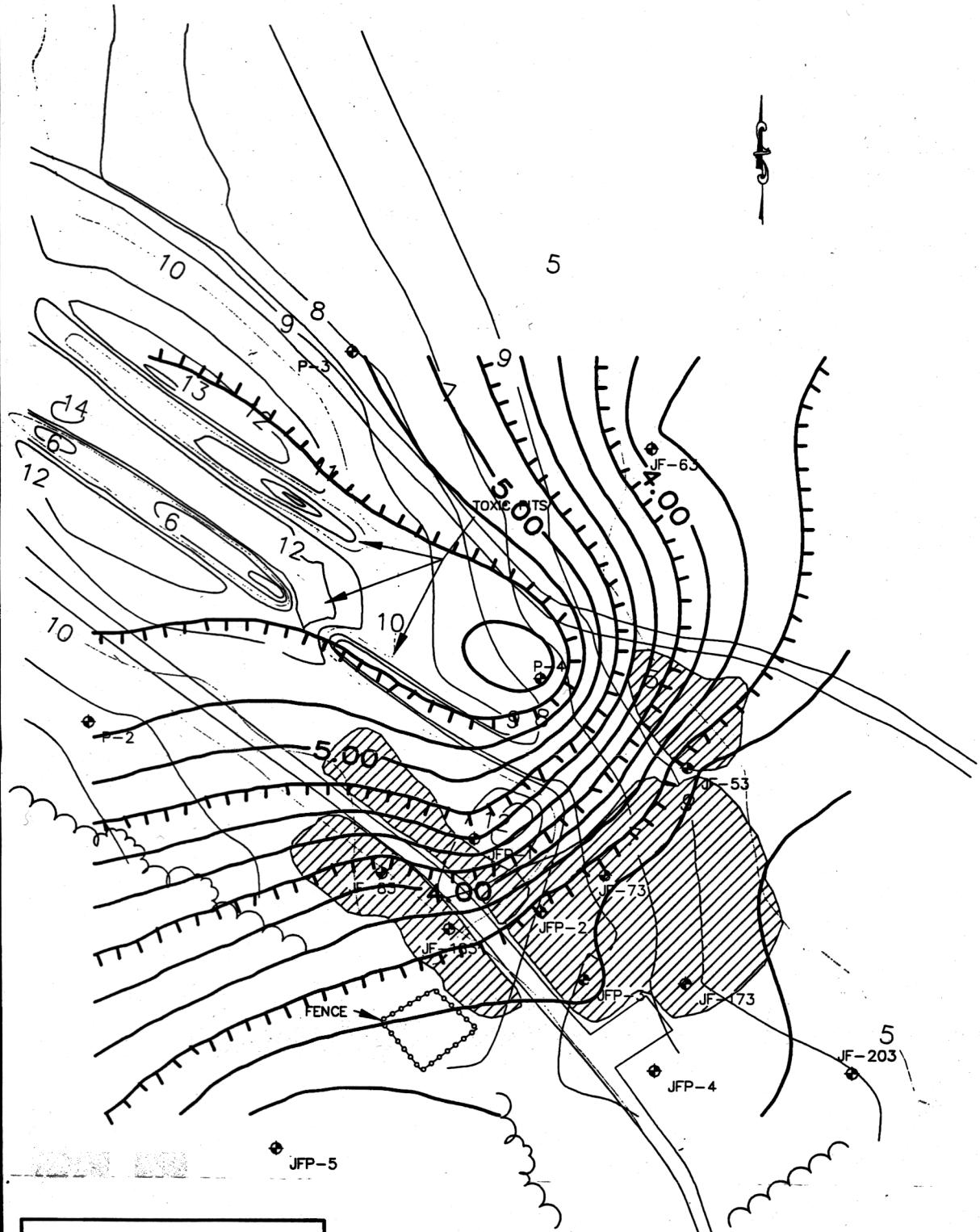
LEGEND:

- ◆ MONITOR WELL
- CROWNDWATER ELEVATION CONTOUR
- CONTOUR INTERVAL
- ◆ PHYTOREMEDICATION AREA

SCALE:

50'

FIGURE 9
GROUNDWATER ELEVATION CONTOUR
FOR 4 APRIL 1997
J-FIELD PHYTOREMEDICATION STUDY
ABERDEEN PROVING GROUND, MD
NOVEMBER 1997



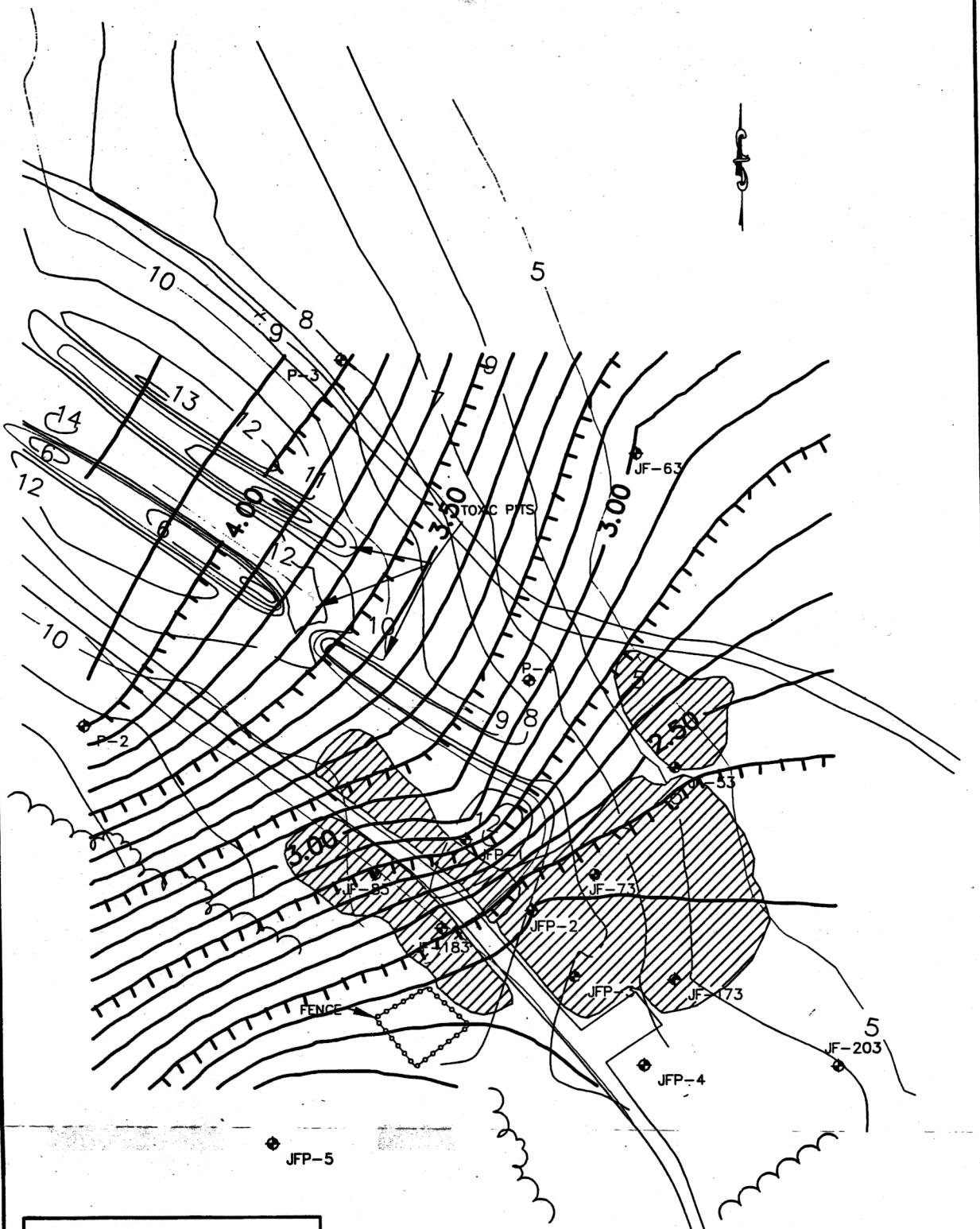
LEGEND:

- ◆ MONITOR WELL
- 4.00 — CROWNDWATER ELEVATION CONTOUR
- 9 — CONTOUR INTERVAL
- ◆ PHYTOREMEDIATION AREA

SCALE:

50'

FIGURE 10
GROUNDWATER ELEVATION CONTOUR
FOR 12 MAY 1997
J-FIELD PHYTOREMEDIAL STUDY
ABERDEEN PROVING GROUND, MD
NOVEMBER 1997

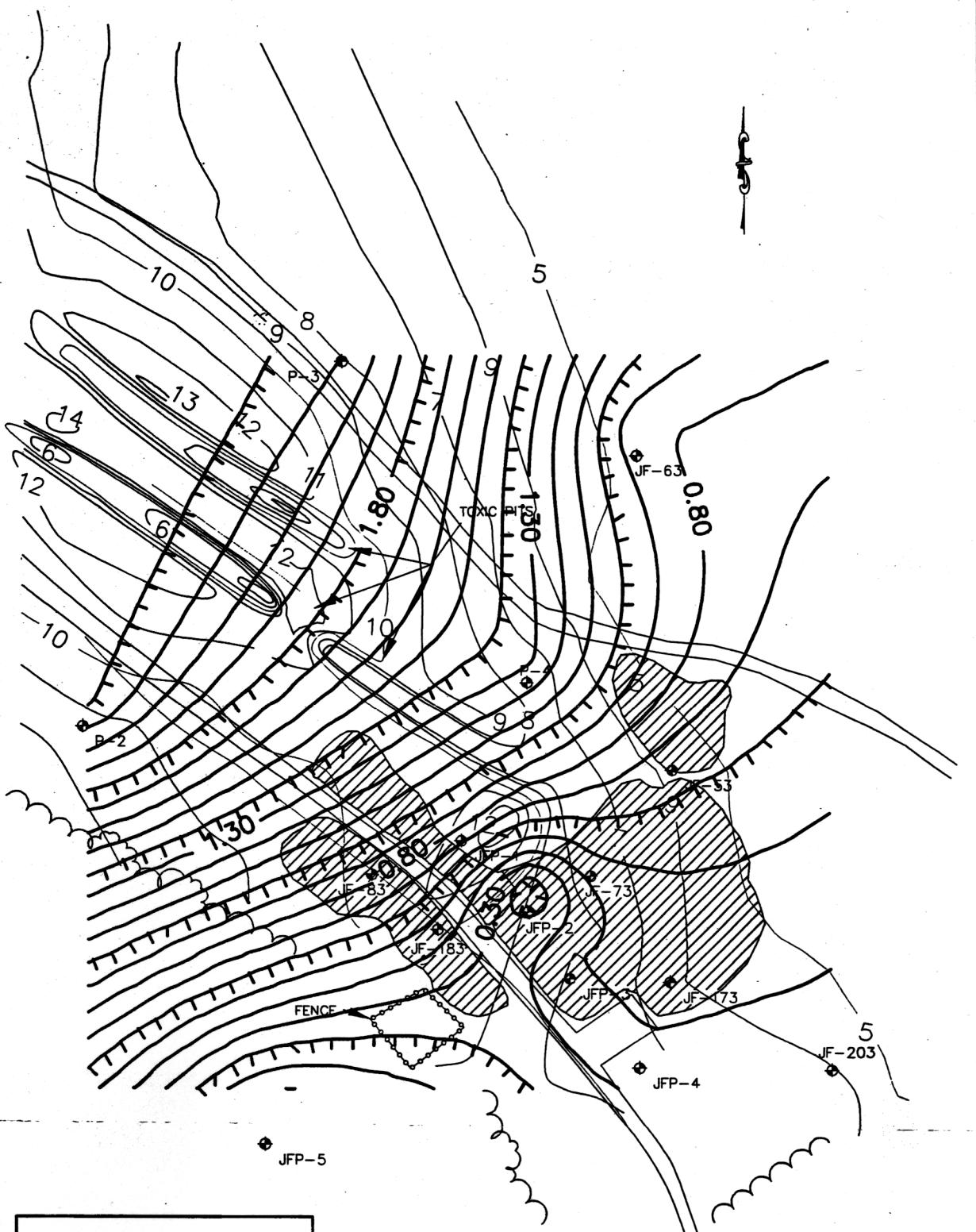


LEGEND:

- ◆ MONITOR WELL
- 3.50 CROWNDWATER ELEVATION CONTOUR
- 9 CONTOUR INTERVAL
- ◆ PHYTOREMEDIATION AREA

SCALE:

50'

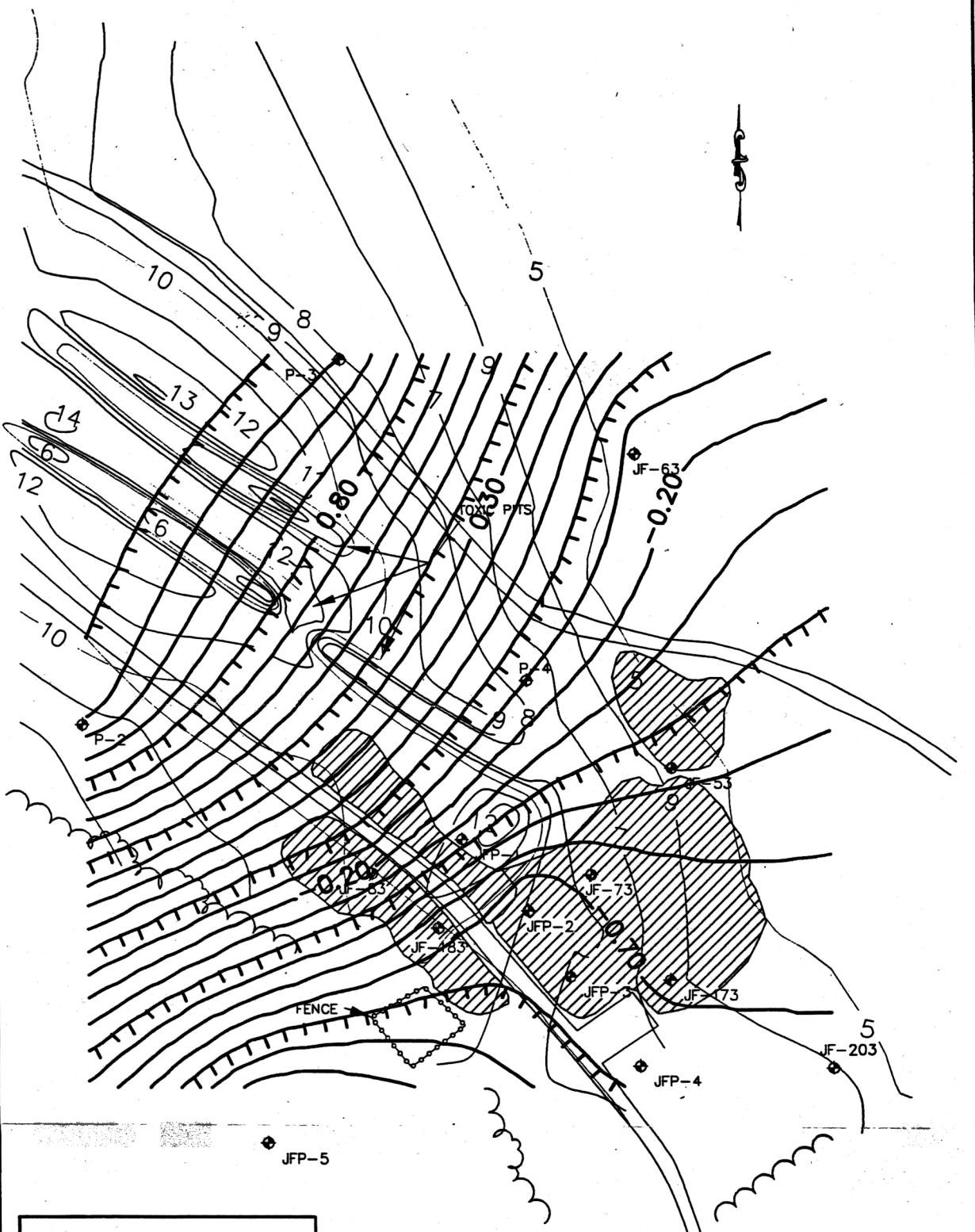


LEGEND:

- ◆ MONITOR WELL
- 1.30 — CROWNDWATER ELEVATION CONTOUR
- 9 — CONTOUR INTERVAL
- ◆ PHYTOREMEDIATION AREA

SCALE:

50'



LEGEND:

- ◆ MONITOR WELL
- 0.30 — CROWNDWATER ELEVATION CONTOUR
- 9 — CONTOUR INTERVAL
- ◆ PHYTOREMEDIA AREA

SCALE:

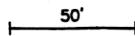
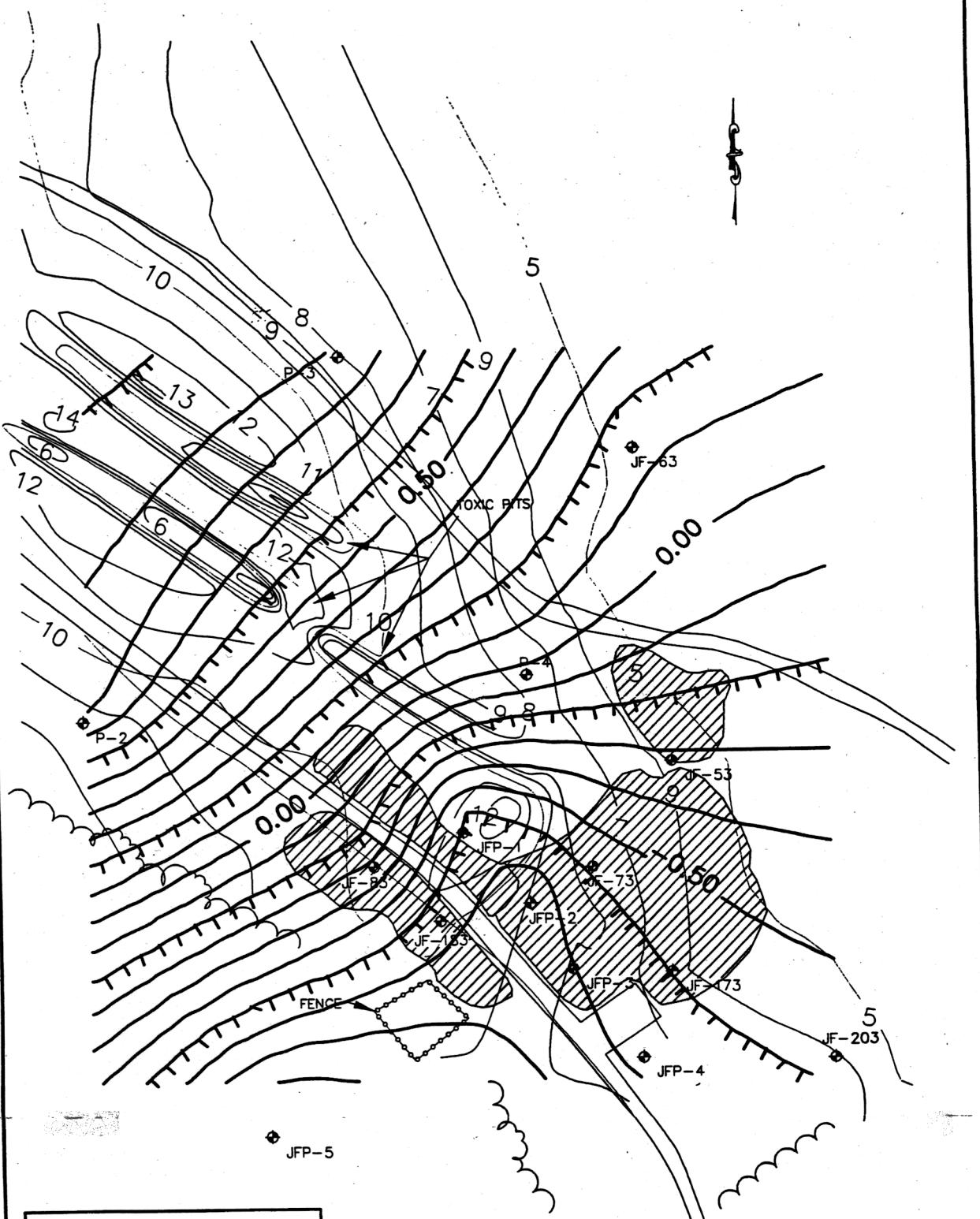


FIGURE 13
GROUNDWATER ELEVATION CONTOUR
FOR 18 AUGUST 1997
J-FIELD PHYTOREMEDIATION STUDY
ABERDEEN PROVING GROUND, MD
NOVEMBER 1997



LEGEND:

- ◆ MONITOR WELL
- 0.50 — CROWNDWATER ELEVATION CONTOUR
- 9 — CONTOUR INTERVAL
- ◆ PHYTOREMEDIAL AREA

SCALE:

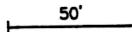
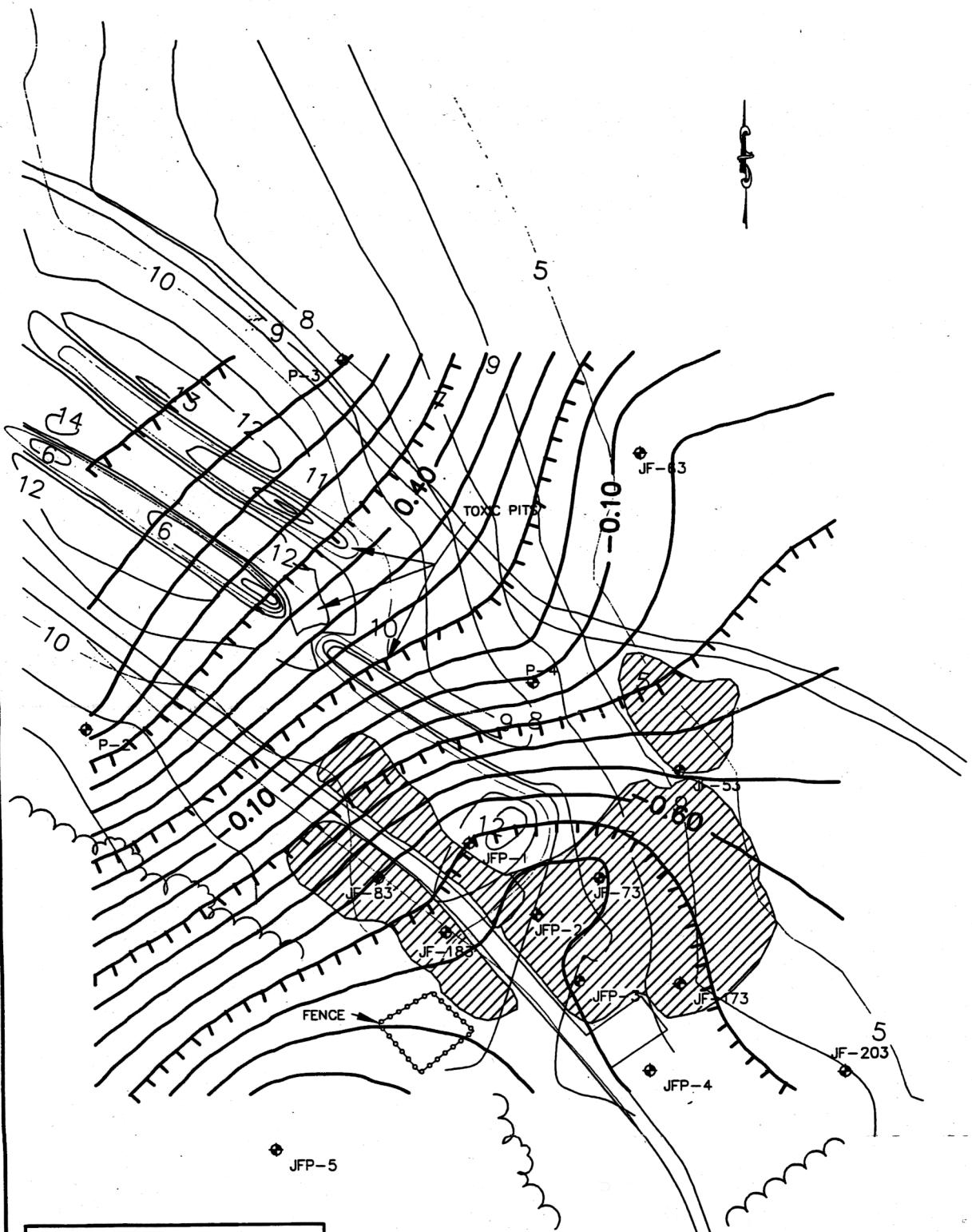


FIGURE 14
GROUNDWATER ELEVATION CONTOUR
FOR 16 SEPTEMBER 1997
J-FIELD PHYTOREMEDIAL STUDY
ABERDEEN PROVING GROUND, MD
NOVEMBER 1997

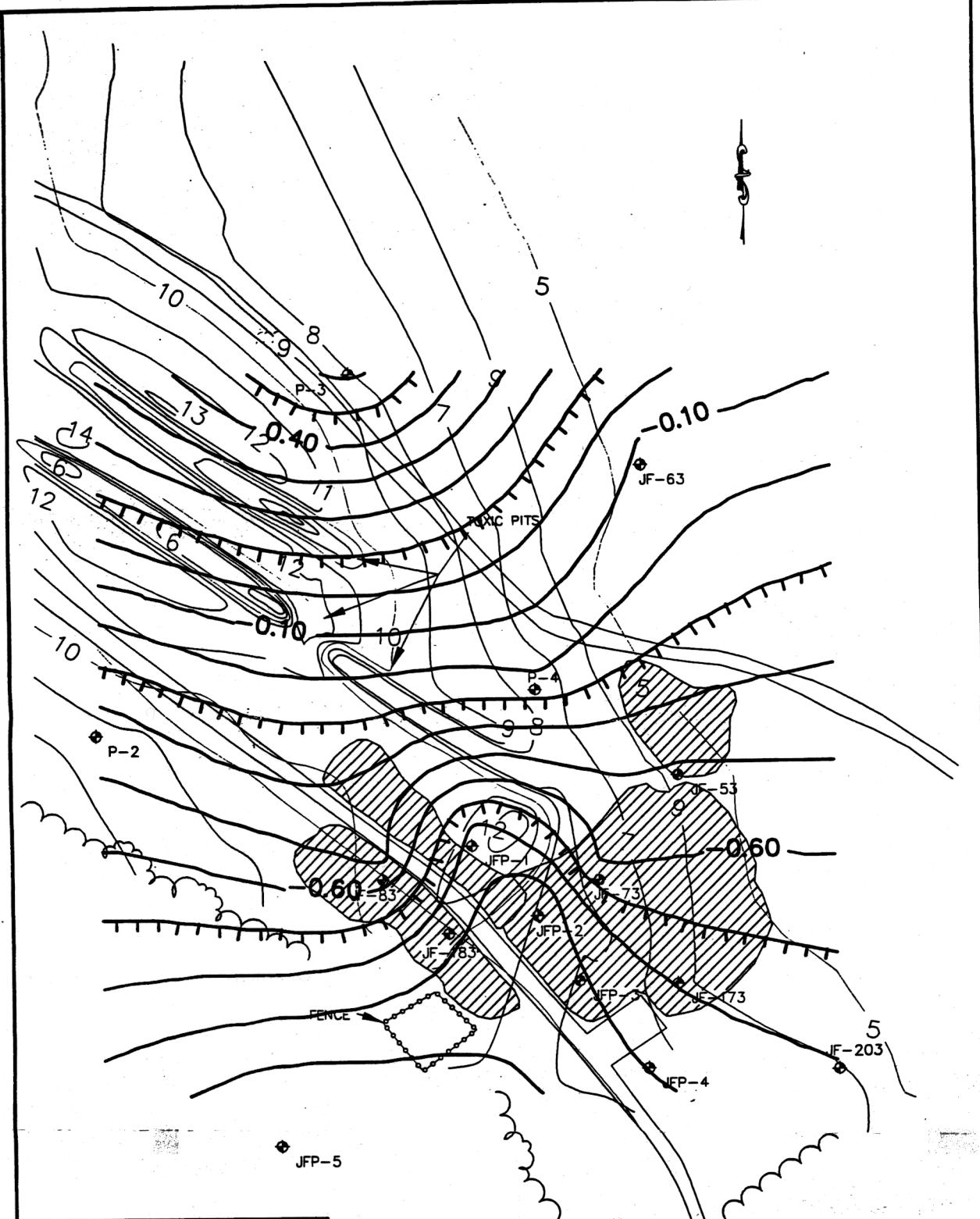


LEGEND:

- ◆ MONITOR WELL
- 0.40 CROWNDWATER ELEVATION CONTOUR
- 9 CONTOUR INTERVAL
- PHYTOREMEDIATION AREA

SCALE:

50'

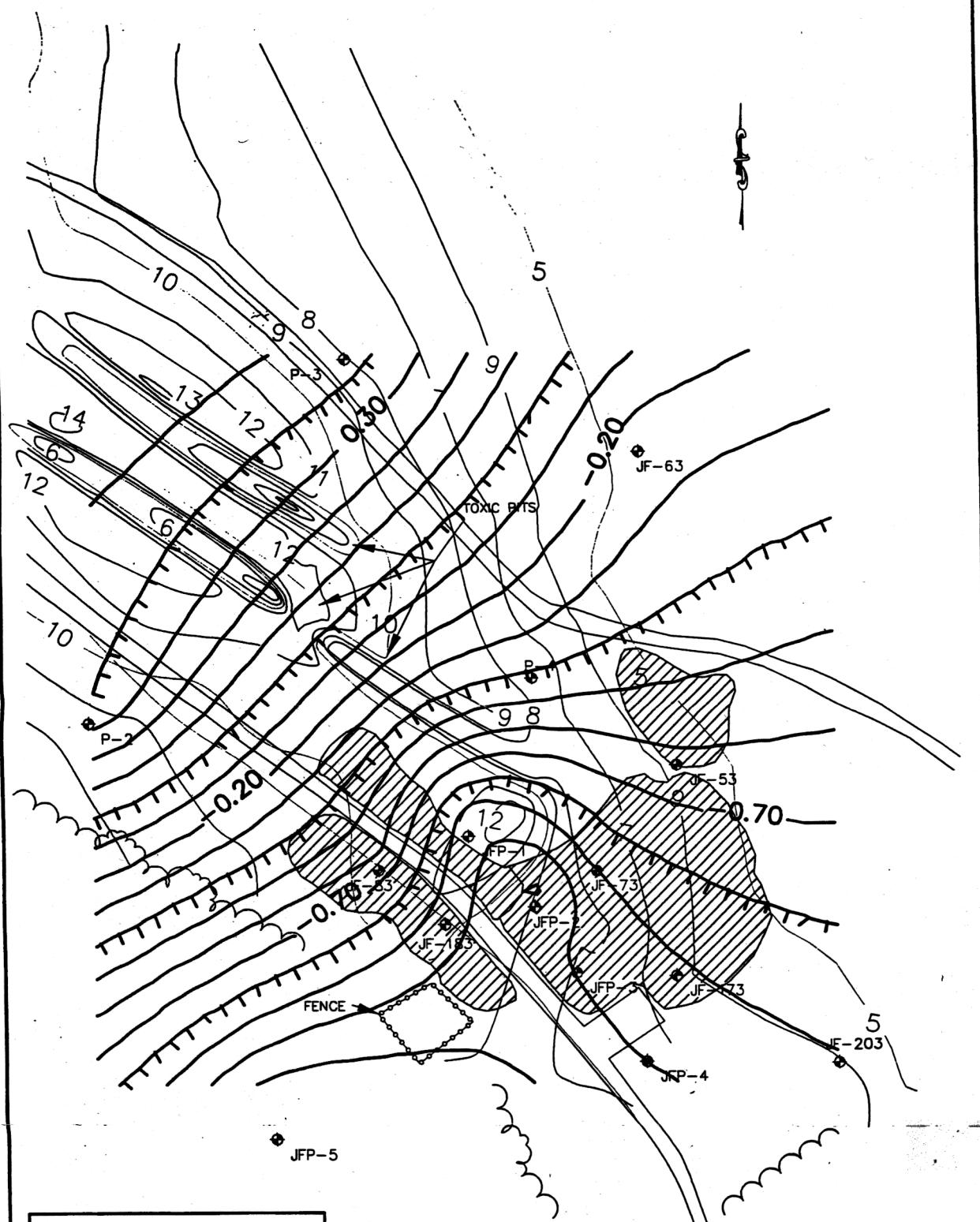


LEGEND:

- ◆ MONITOR WELL
- 0.40 — CROWNDWATER ELEVATION CONTOUR
- 9 — CONTOUR INTERVAL
- ◆ PHYTOREMEDIATION AREA

SCALE:

50'



LEGEND:

- ♦ MONITOR WELL
- 0.30 — GROUNDWATER ELEVATION CONTOUR
- 9 — CONTOUR INTERVAL
- ◆ PHYTOREMEDIAL AREA

SCALE:

50'

FIGURE 17
GROUNDWATER ELEVATION CONTOUR
FOR 16 OCTOBER 1997
J-FIELD PHYTOREMEDIAL STUDY
ABERDEEN PROVING GROUND, MD
NOVEMBER 1997

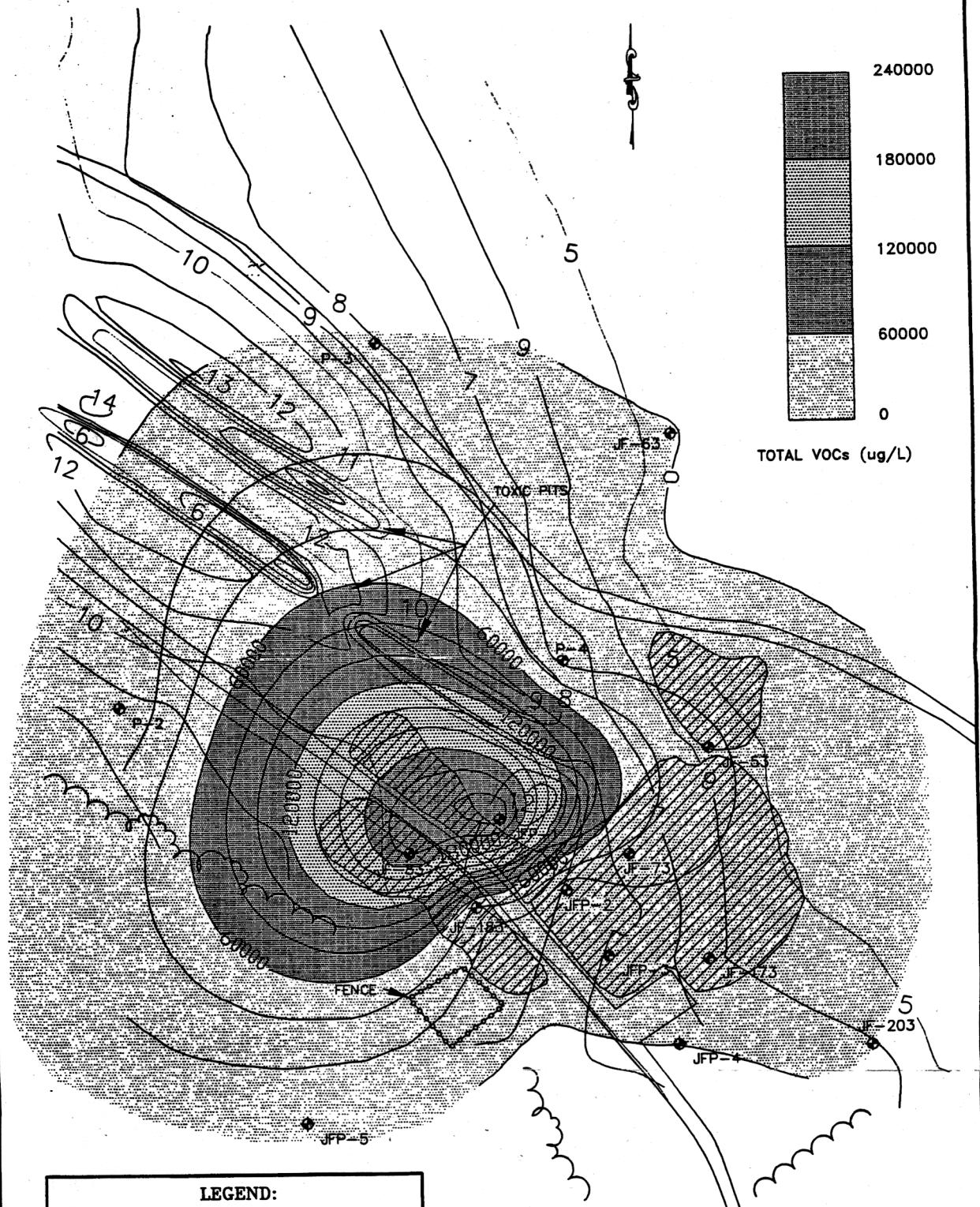


FIGURE 18
GROUNDWATER CONTAMINATION CONTOUR FOR MAY 1997
J-FIELD PHYTOREMEDIATION STUDY
ABERDEEN PROVING GROUND, MD
NOVEMBER 1997

APPENDIX A
Timco™ Lysimeter Manual
J-field Phytoremediation Study
Groundwater Well And Lysimeter Monitoring Report
Aberdeen Proving Ground, Maryland
November 1997



TIMCO™ LYSIMETER MANUAL

CLEANING AND DECONTAMINATION

The following advice is provided by TIMCO™. TIMCO™ can assume no liability and provides no guarantee the procedures will ensure that a TIMCO™ product has been 100% cleaned. TIMCO™ does however believe the procedures will give the proper purity characteristic required under state of the art conditions.

Teflon® & Ceramic Components

Step 1 - Disassemble all components.

Step 2 - Prepare a normal solution of Hydrochloric Acid.
(120 g. concentrated HCL diluted in 1 liter distilled water).

Step 3 - Rinse all components in distilled water.

Step 4 - Submerge all components in this solution for 30 minutes minimum. Use a tool to remove from the solution. Soak in distilled water.

Step 5 - Resubmerge the components in clean water at least 2 more times to remove all traces of Hydrochloric Acid.

Step 6 - TIMCO™ believes an additional step of an Isopropyl Alcohol (IPA) bath and then another bath of Hydrogen Peroxide should render the equipment clean.

Step 7 - In all cases a final rinse in distilled, deionized water should ensure that the device is then suitable for representative sampling.

PVC Components

Step 1 - All products must be thoroughly cleaned of loose PVC particles, machining burrs and any other loose materials both inside and out.
(Timco normally does this with all products shipped, but occasionally mistakes happen).

Step 2 - Prepare a suitable Isopropyl Alcohol (IPA) bath which will allow total immersion of the product to be decontaminated.

Step 3 - Allow products to remain fully immersed for a period of no less than 10 minutes.

Step 4 - Remove products with clean surgical gloves to reduce chances of new contamination. Allow excess IPA to drain off

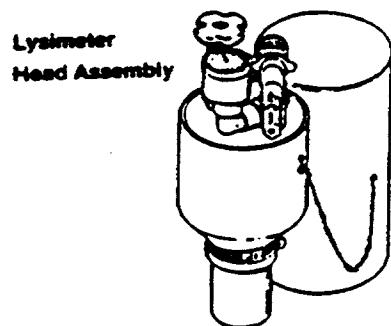


TIMCO™ LYSIMETER MANUAL

LYSIMETER ACCESSORIES

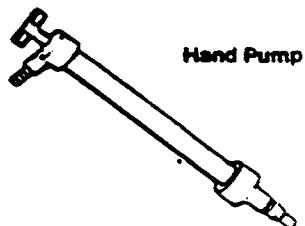
Lysimeter Head Assembly

Designed to fit the top of the casing string. It includes a vacuum/pressure gauge, a valve for the sample evacuation line and a valve for the vacuum/pressure line. All are inclosed in a protective slip cap.



Vacuum/Pressure Hand Pump

The pump is used to apply a vacuum to the Lysimeter during extraction phase and pressure to deliver the sample to the surface.



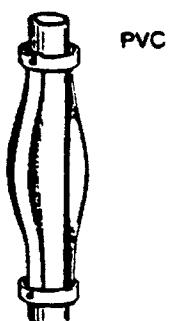
TIMCO™ Silica Flour

TIMCO™ Silica Flour has been found to be the best for use with TIMCO™ Lysimeters. It is 200 mesh, 99.88% pure silica flour, available in 50 lb. sealed pails.



Tubing

For connection of vacuum/pressure and sample evacuation lines. Teflon® or polyethylene tubing is recommended.



TIMCO™ Deka-Seal Casing

Available in PVC or Teflon®. Will thread directly on to the Lysimeter to direct casing string within the center of borehole. Conduit for vacuum/pressure and sample tubing.



TIMCO™ Centralizers

Varisize for PVC installations. Cloverleaf for Teflon® installations. Recommended for depths greater than 20 feet.

Steel Protective Cover

A locking cover for protection against weather and vandalism.



Tube Groover

If the installation requires the tubing to be cut, the new end will need to be grooved. The tool cuts and places the groove at the correct distance from the end of the tubing.



TIMCO™ LYSIMETER MANUAL

TIMCO™ Deep-Sampling Cup and Tube Type Lysimeters

The TIMCO™ Deep-Sampling Lysimeters are used when the area to be investigated is deeper than 20 feet. The maximum operational depth is 300 feet. This system is operated exactly the same as a shallow installation except that pressure must be used to evacuate the sample. All instructions for installation, and activating the system are the same as the shallow installation.

If sampling deeper than 100 feet, the pressure supplied by the hand pump may not be sufficient to remove the sample. A pressure of .44 psi is required for each foot of depth. A portable nitrogen tank or air compressor may be used as an alternate pressure source.

Evacuating the Deep-Sampling Lysimeter

- 1) Open the sample evacuation valve and the vacuum/pressure valve.
- 2) Connect the pressure outlet of the TIMCO™ Hand Pump to the vacuum/pressure port of the head assembly.
- 3) Gently increase pressure until 9 psi is achieved to lift the sample into the holding chamber of the Deep-Sampling Lysimeter. (If 9 psi were applied instantly, it is possible the silica pack would be damaged resulting in a Lysimeter system failure.)
- 4) Apply the correct amount of pressure required to lift the sample to the surface and into a collection flask. (Example: 100 feet x .44 psi = 44 psi of lift to evacuate the Lysimeter.)



TIMCO™ LYSIMETER MANUAL

INSTALLATION AND EVACUATION OF THE SHALLOW LYSIMETER

The installation of a TIMCO™ Lysimeter System should be in accordance with the following procedure. It is suitable for depths of up to 20 feet. For greater depths a TIMCO™ Deep-Sampling Lysimeter should be used.

1.) Borehole Preparation

The borehole must provide adequate space to allow the Lysimeter body to be surrounded by the silica slurry pack. For a 1.9" diameter Lysimeter use a 6" or larger borehole. The borehole must allow for at least a 1.5" thickness of silica slurry all around the porous filter of the Lysimeter. If difficulties are anticipated in maintaining an open borehole, use casing to hold back the material. Immediately after installation of the silica pack and Lysimeter, pull back the casing and install a bentonite plug.

2.) Mixing the Silica Flour Slurry

The TIMCO™ 200 mesh, 99.88% pure crystalline silica flour is mixed with distilled water using a ratio of 150 mls. water to 450 grams of silica flour. The TIMCO™ Silica Flour is supplied in a 50 lb. sealed pail. This will require about 2 gallons of distilled water to make the slurry and will be sufficient for a single Lysimeter installation on a 6" borehole. Add the flour slowly to the distilled water with constant stirring. The mix must be completely blended and lumpfree. Constant stirring is essential as the silica is not water soluble and will settle if not agitated.

3.) Placing the Silica Slurry Pack

Pour part of the silica slurry into the borehole to provide a bed for the Lysimeter. A minimum of 4" depth for the cup-type Lysimeter and 2" for the tube-type Lysimeter. Depending upon the borehole diameter, between a quarter and a third of the total mix is usually sufficient.

The TIMCO™ Lysimeter System should now be lowered into the borehole. Take particular care to make certain that the Lysimeter body is centrally located within the borehole diameter. A minimum of 1.5" of silica slurry around the annular area of the unit is essential. TIMCO™ suggests Deka-Seal® casing be used for support and accurate placement. Centralizers will also assure correct placement.

The balance of the silica slurry should now be poured into the borehole to completely cover and surround the Lysimeter body. Note that you must have the Lysimeter in intimate contact with the silica slurry and the slurry must fill all voids in the bottom of the borehole. The Lysimeter should be supported at the surface with stakes for at least 2 hours until the silica sets.

A bentonite seal should be installed next, followed by tamped backfill. A second bentonite seal is suggested near the surface. Protection at the surface can be achieved with the TIMCO™ Lysimeter Head Assembly and a TIMCO™ Protective Cover set in concrete.

4.) Activating the Lysimeter

If the Lysimeter was filled with distilled water before installation, this should now be removed and discarded. TIMCO™ recommends the use of a two port rubber stopper in a collection flask. The flask should be of adequate size to hold the sample from a full Lysimeter. This method is unlikely to disturb the silica pack and break the seal between the pack and the porous section of the Lysimeter which would result in a Lysimeter system failure.



TIMCO™ LYSIMETER MANUAL

TESTING THE SYSTEM

Effective use of the Lysimeter Systems requires there be no air leaks. Two methods are described to check the assembled system for leaks.*

Pressure Testing

Completely immerse the Lysimeter and the tubing connections in distilled water. Connect the pressure outlet of the TIMCO™ hand pump to the vacuum/pressure line fitting on the head assembly. Close the sample port on the head assembly. Apply 15 psi of air pressure. Observe all connections for evidence of bubble leakage. The porous filter section should give off bubbles over its entire surface area. If leaks are observed in the tubing fittings, disassemble and check for correct assembly and retighten. Leaks at the fitting connections to the Lysimeter body or the head assembly may be wrapped with Teflon® tape prior to reassembly. Leaks involving the body components of the Lysimeter should be checked for cleanliness, particularly the surface that touches the O-rings.

Vacuum Testing

The porous filter media of the Lysimeter body is sealed off with a latex or flexible plastic membrane. Secure a seal by placing rubber bands over the membrane and securing it to the body of the Lysimeter above the porous filter. Shut off the sample valve. Connect the vacuum inlet of the pump to the vacuum/pressure port on the head assembly, and apply a vacuum in excess of 20 inches of mercury. Shut off the vacuum valve. Note the vacuum reading on the gauge. Leave the system for several hours and then recheck the vacuum reading. A small drop of up to 3 inches of mercury may be expected. If a large drop is noted, check and retighten all connections as described above.

Prewetting the Porous Filter Media

Finally, before taking the assembled Lysimeter system to the installation site, TIMCO™ recommends that the Lysimeter body be placed in distilled water and a vacuum of about 15 inches of mercury be applied for 1 hour. This procedure prevents all surfaces of the porous filter media, eliminating any entrapped air in the filter media. The Lysimeter should be installed with the body filled with distilled water if no riser casing is used. An empty, unsupported Lysimeter will float on the wet silica slurry when placed in the borehole.

*Note — All TIMCO™ Lysimeters are tested at TIMCO™ prior to shipping. Fittings may loosen during transit.



TIMCO™ LYSIMETER MANUAL

ASSEMBLING THE LYSIMETER

If properly installed, the typical Lysimeter system will be expected to produce representative samples for several decades. It is therefore important to check out the system thoroughly before taking it to the installation site. Prior to installation the system should be pressure and/or vacuum tested to ensure it is leak free.

The Lysimeter system components supplied by TIMCO™ are cleaned and packed in plastic bags. They have not been subjected to the rigorous decontamination procedures required for equipment used to obtain samples for subsequent micro-analysis of trace pollutants. If complete decontamination is required, see the section titled "Decontamination Procedures" and/or follow those specified for the specific job. Note: If the Lysimeter body is decontaminated it will be necessary to pass at least 2 liters of distilled water through the porous section to ensure complete removal of liquids used for the decontamination. After this procedure is completed, the components should be bagged. Subsequent handling should be done in a clean area using sterile gloves.

The system components supplied are manufactured by TIMCO™ to satisfy the requirements of the order. Mixing these with components from other sources may lead to incompatibility problems resulting in leakage or failure of the Lysimeter system.

Assembly of Tubing to Fittings

Tubing, because of its slippery nature and rigidity, has to be specially grooved before a fitting is attached. Failure to do so will allow the tubing to slip out of the fitting and cause leakage. TIMCO™ normally grooves each end of the tubing supplied with the order. If the installation requires the tubing to be shortened the new end will need to be grooved using a special grooving tool available from TIMCO™. The tool not only cuts the groove but also places the groove at the correct distance from the end of the tube.

Assembling the System

- 1) As mentioned earlier, it is suggested the complete system be assembled away from the installation site. This will allow for the assembly and testing under clean conditions. The assembled Lysimeter may then be easily placed at the job site.
- 2) Attach the vacuum/pressure and sample evacuation lines to the Lysimeter top plug. If necessary cut each to length, making certain the cuts are clean and vertical to the horizontal length of the tubing.
- 3) Follow the previous instructions for the grooving. Note the vacuum/pressure outlet at the top of the Lysimeter plug is marked with a "V". Make certain the other end of the tube connected to this fitting is suitably marked or tagged. (A piece of tape works well.) This will assure the tubing is correctly connected to the TIMCO™ Head Assembly.
- 4) If the installation is to involve threaded casing, assemble it at this time.
- 5) Pass the two tubes from the Lysimeter through the casing string.
- 6) To complete the assembly attach the sample evacuation and vacuum/pressure lines to the bottom of the head assembly. The TIMCO™ vacuum/pressure hand pump is connected on the vacuum mode. The black female hose connector should be used to attach the end of the tubing to the hand pump (black end).



TIMCO™ LYSIMETER MANUAL

SYSTEM REQUIREMENTS

The following items will be required for a typical TIMCO™ Lysimeter Installation up to 20 feet beneath the ground surface.

- A TIMCO™ Shallow Cup-Type or Tube-Type Lysimeter
- A TIMCO™ Lysimeter Head Assembly
- A 50 lb. Pail of TIMCO™ Silica Flour (200 mesh, 99.88% pure)
- Up to 40 feet of Teflon® or Polyethylene Tubing, and tube groover
- A TIMCO™ Vacuum/Pressure Hand Pump
- Up to 20 feet of TIMCO™ Deka-Seal™, Teflon®, or PVC flush threaded casing
- TIMCO™ Surface Protective Cover

Additional items not provided by TIMCO™ :

- Chemicals and distilled water for decontamination (optional)
- Distilled water for pressure testing, de-airing and prefilling
- Plastic gloves for handling the decontaminated system
- A latex membrane for vacuum testing the system
- Clean plastic bags to wrap the assembled system for transfer to the installation site
- 2 gallons of distilled water for each 50 lb. pail of TIMCO™ Silica Flour
- A large clean silica flour mixing container
- A large rigid spatula to mix the silica slurry
- A clean sample collection container with a 2 port stopper seal compatible with the TIMCO™ Teflon® tubing. The capacity should be greater than that of the Lysimeter.
- Bentonite to seal the borehole above the Lysimeter
- A padlock for the protective cover



TIMCO™ LYSIMETER MANUAL

OPERATING PRINCIPLES

The TIMCO™ Lysimeter System is designed for long term use in one location. Care must be taken with the installation to ensure correct operation for a long period. The assembled system should be checked for leaks prior to being put in the ground.

A tube or cup type Lysimeter has an outside diameter of 1.9" and should be placed in boreholes of at least 6" in diameter, this allows for an adequate silica slurry pack to surround the Lysimeter.

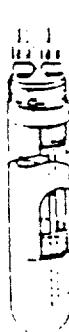
The Lysimeter has the vacuum/pressure outlet marked on the Lysimeter top plug. This connection leads to the vacuum gauge on the head assembly. It allows a vacuum to be applied to the system, thereby creating a vacuum gradient between the inside of the Lysimeter, the slurry pack, and the soil under investigation. The second marked connection is the sample evacuation tube. This is connected to the head assembly sample line.

The specification of the silica flour used to surround the installed Lysimeter is optional and can be purchased from TIMCO™. If a 6" borehole is used, a single 50 lb. pail will be sufficient for each Lysimeter installation. The silica slurry is used to establish a continuum between the Lysimeter and the surrounding soil. Since the TIMCO™ silica is not water soluble, it immediately begins to separate itself from the distilled water. When placed in the ground the water migrates into the soil and establishes the continuity required for surface tension to be transmitted in an outward direction upon application of a vacuum. This allows any moisture attached to the soil particles to be drawn into the Lysimeter through the silica pack.

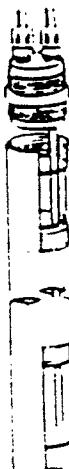
It must be mentioned here that TIMCO™ suggests that the use of silica flour in a Lysimeter installation is optional. Alternate materials can be used in establishing continuity between the porous filter and the soils under investigation. Sifted or filtered backfill can be used with TIMCO™ Lysimeters.

TIMCO™ manufactures a variety of Lysimeters for use in vadose zone investigations. The Ceramic Filter models and Teflon® Filter models have different applications and varied situations within an application. Typically the Teflon® Filter models are used in saturated vadose zone situations like golf courses or irrigated farmland, and the Ceramic Filter models are used in dry soil conditions. The cup-type models (filter media in cup form at the bottom of Lysimeter) will pull a sample from a larger area than the tube-type. The tube-type (filter media in the center of Lysimeter) insures the sample will not migrate back into the soil. The Shallow Sampling Lysimeter is designed for placement at 20 feet or less. For installations at depths of 20 feet to 300 feet a Deep Sampling Lysimeter is required. While all models are manufactured to the highest quality standards, TIMCO™ cautions the user to be careful in the choice of a Lysimeter, and to be certain the choice made is one that is compatible with the Lysimeter capability.

Ceramic Filters with PVC Bodies



TIMCO™
Cup Type Lysimeter



TIMCO™



TIMCO™



TIMCO™
Deep Sampling Lysimeter
Tube Type



TIMCO™ LYSIMETER MANUAL

INTRODUCTION

TIMCO™ Manufacturing Inc. began manufacturing well screens in 1970. This was in response to expressed market needs for better quality materials to be used for water and monitoring wells. Associated geotechnical products were designed, evaluated and subsequently marketed.

Over the years TIMCO™ has led the industry with innovative products and manufacturing techniques. TIMCO™ was the first company to introduce flush threaded joints for well screens and casing. This provided the industry with a jointing system strong enough to allow placement of flush wells down to a depth of over 2,000 feet without the use of solvents.

Current developments in ground water monitoring techniques using the fluorocarbon Teflon® were originated by TIMCO™. TIMCO™ developed extruders for the casing material and special techniques to slot this totally inert man-made material. Later TIMCO™ developed and patented the process to manufacture Teflon® in a porous form. This material is used as a porous media in the TIMCO™ Lysimeter System, the subject of this application manual.

TIMCO™ has an active program of research and development. This is conducted at the principal facility in Prairie du Sac, Wisconsin. In addition, TIMCO™ continues to support research at leading institutions concerned with the development of techniques to monitor one of our most valuable resources —the groundwater.

If you have any suggestions or ideas you would like to share with us, please give us a call or write to us at the address below.



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TIMCO™, Deka-Seal™, are Trademarks of TIMCO Manufacturing Inc.
Teflon® is Dupont's Trademark for their fluorocarbon resin

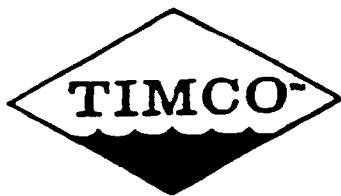
TIMCO™ Porous Teflon® Lysimeters
are protected by U.S. Patent 4,692,287



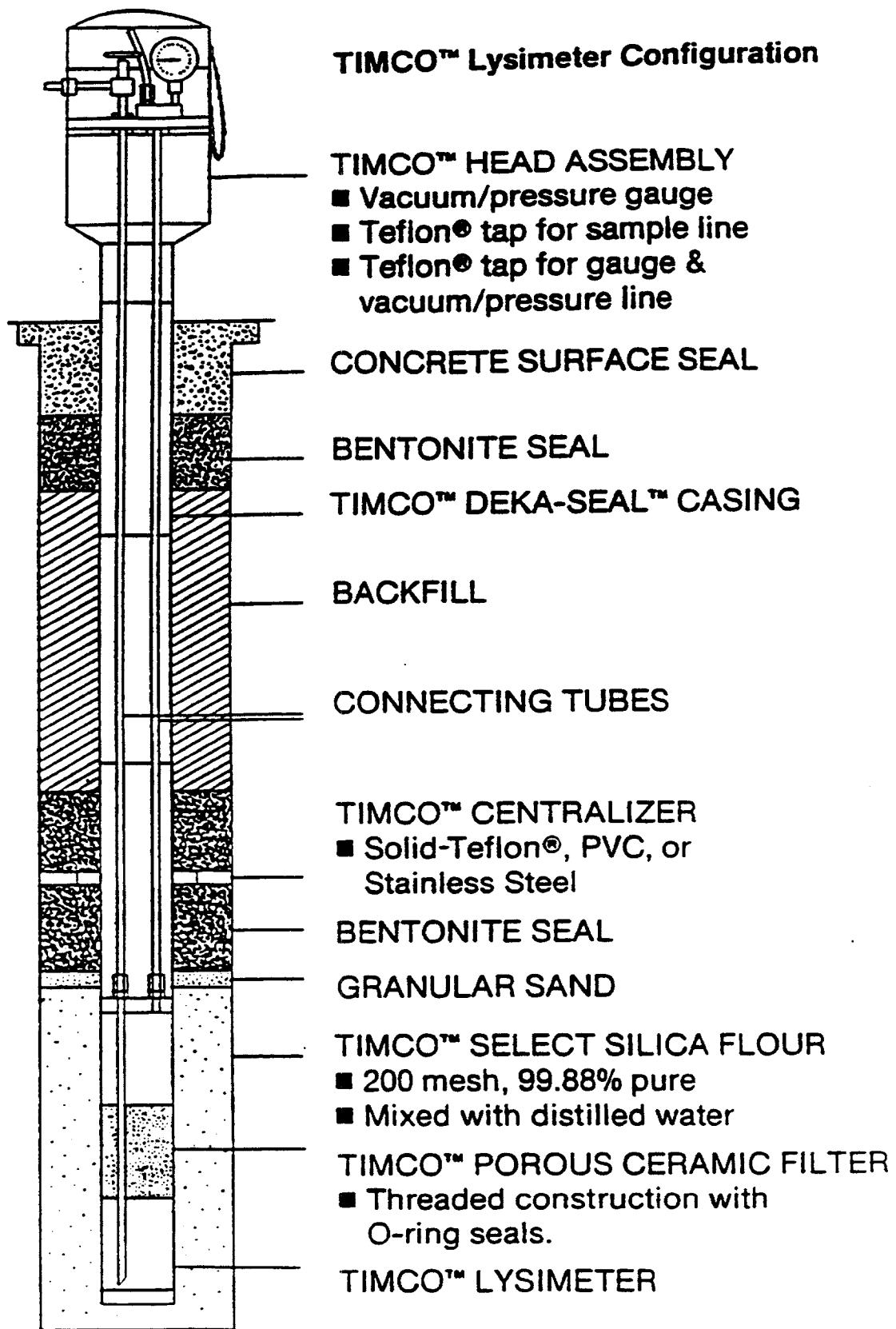
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TIMCO™ LYSIMETER MANUAL



APPENDIX B
APG Standard Operating Procedure 013
J-field Phytoremediation Study
Groundwater Well And Lysimeter Monitoring Report
Aberdeen Proving Ground, Maryland
November 1997

STANDARD OPERATING PROCEDURE 013 COLLECTION OF MONITORING WELL SAMPLES

1.0 Scope and Application

The purpose of this standard operating procedure is to delineate protocols for the collection of groundwater samples from monitoring wells.

2.0 Material

- a. Conductivity meter
- b. Thermometer (optional)¹
- c. pH meter with ORP probe
- d. Turbidity meter
- e. Dissolved Oxygen meter
- f. Water-level indicator
- g. Transparent bailer with a double check valve
- h. PVC bailer (for purging only)
- i. Stainless steel bailer (for purging and sampling)
- j. Polytetrafluoroethylene (PTFE) bailer with PTFE-coated stainless steel cable, double check valve top and controlled flow bottom discharge attachment² for VOC sampling (40-mL vials), and top discharge attachment for collecting larger samples (1-L bottles) (for purging and sampling)
- k. Polypropylene rope
- l. Submersible pump and hose (for purging only)
- m. Peristaltic pump with tubing for filtering samples
- n. Variable speed, low flow submersible pump (e.g. Grundfos MP1 ground-water sampling pump) (for purging and sampling)
- o. Bladder pump (dedicated to one well only)
- p. 0.45FM filters
- q. Sample bottles and labels
- r. Logbook or book of field parameter forms
- s. Generator
- t. Tygon tubing
- u. Plastic sheeting
- v. Photoionization Detector (PID) Organic Vapor Analyzer

*Dip. T. detector
CC*

¹ Temperature compensation and measurement capabilities are generally available as integral functions of pH meters and conductivity meters. If this is the case, a separate thermometer is not required.

² Although use of a controlled flow bottom discharge valve is historically preferred, use of such a device can cause aeration of the sample.

3.0 Procedure

- 3.1 General: Ground-water sampling will follow these general steps:
- † Arrive on site
 - † Set up apparatus (generators, pumps, etc.)
 - † Glove
 - † Perform all steps of SOP 010 - organic vapor check, water level and well depth measurements
 - † Sample NAPLs (as required)
 - † Begin purge procedure
 - † If using bailer to purge and sample see § 3.6.
 - † If using pump to purge and bailer to sample see § 3.7.
 - † If using bladder or low-flow pump to purge and sample see § 3.8.
 - † Decon/reglove
 - † Take samples
 - † If with bailer see § 3.6.5
 - † If with bladder or low flow pumps see § 3.8
 - † Decon/dispose of wastes, move equipment to next site.
- 3.2 General Rules for Groundwater Field Parameter Logbook (see SOP 016 for further procedures):
- 3.2.1 Only one site or installation per logbook, and only one sampling location per page or form (if using pre-printed forms). The same book maybe used for more than one sampling event.
- 3.2.2 First five pages will be reserved for index, general notes, etc. Sign and date each entry.
- 3.2.3 Last five pages will be reserved for recording calibration data for the pH, temperature, turbidity, ORP, DO, and conductivity meters. Use the page number or a separately recorded "Cal Reference Number" to refer to each calibration.
- 3.2.4 (As appropriate). Insert the cardboard flap under the form being filled out, so that writing does not go through to the pages below.
- 3.2.5 (As appropriate). Fill in the forms from front to back of the logbook, tearing out the white copy for each sample when the sample has been collected. This copy goes in the cooler with the sample, directly to the laboratory. The original copy must be torn out before you write on the back of the duplicate form.
- 3.2.6 (As appropriate). Duplicate copies, index pages, and calibration sheets remain intact.

3.3 Groundwater Sampling General Rules

- 3.3.1 Refer to SOPs 001-005, 008-012, 036, 037, and 039

- 3.3.2 Groundwater samples will be collected from the least contaminated wells first, progressing to the most contaminated³.
- 3.3.3 Upon arrival at the well site, immediately set up and organize the purging, sampling, and filtration equipment. If needed, due to muddy or contaminated ground, remoteness from sampling vehicle, and/or for placement of hose(s) and/or power cord if a pump is used, place clean plastic sheeting at, or around the well, to serve as a clean staging area for purging and sampling equipment, as conditions warrant. Care must be exercised not to step on plastic sheeting.
- 3.3.4 If the well is remote from the sampling vehicle set up the filtration equipment and place rope, wrapped bailer, and pre-labeled sample containers on the plastic sheet, uphill from the well.
- 3.3.5 When a pump is to be used situate the portable generator on level ground approximately 15 feet away from and downwind from the well. All generator maintenance (oil and fueling) is to be performed off site. If the hose(s) and/or power cord of the pump are not on a reel, place the pump with its hose and power cord on the plastic sheeting downhill from the well.
- 3.3.6 Glove. Check well headspace for organic vapor which may pose a health and safety hazard and indicate the presence of NAPL. Measure depth(s) to and thickness(es) of NAPL(s) as appropriate. Measure the depth to water and depth of well. From the water depth, well diameter, sand pack length, etc., calculate the equivalent volume (1 EV) of water in the well.

1 EV = volume in casing + volume in saturated sand pack. Therefore; if the water table lies below the top of the sandpack, use the following equation:

$$1 \text{ EV} = [(8R_w^3 h_w) + (0.30B(R_s^3 - R_w^3)h_s)] * (0.0043) \text{ gal/ft}^3$$

If the water table lies above the top of the sandpack use this equation:

$$1 \text{ EV} = [(8R_w^3 h_w) + (0.30B(R_s^3 - R_w^3)h_s)] * (0.0043)$$

2" well 8" Sand pack
 $= 0.9 \text{ gal/ft}^3$

150.3 156.3 3.36
603.2 - 542.9

³ First round samples are to be collected from upgradient wells first, moving to downgradient wells under the assumption that upgradient wells will be less contaminated than downgradient wells. Results of first round analysis may mandate a change in sampling sequence.

$$B = \pi r^2$$

where: R_s = radius of sandpack in inches
 R_w = radius of well casing in inches
 h_s = height of sandpack in inches
 h_w = water depth in inches

0.0043 gal/in³
Assumed filter pack porosity = 30%

Tables and graphs showing equivalent volumes for typical well constructions are available.

Alternate equations for calculating EV are acceptable, two alternates are given in SOP 010

- 3.3.7 Samples will always be collected in order of decreasing volatility (i.e., the samples to be analyzed for the volatile constituents should be collected first.) Deliver the VOC sample to the vial by allowing the water to trickle down the inside wall of the vial at a rate no greater than approximately 100 ml/min. Other samples may be delivered at a faster rate. Sampling rates will at no time exceed 1 L/min. Procedures for each class of samples are contained in Appendix A of the GWP, the QAPP, and SOP 039.
- 3.3.8 When collecting samples for volatile analysis care should be taken to prevent analyte loss by volatilization. The following procedures should be adhered to when collecting these samples⁴:
- 3.3.8.1 Avoid excessive aeration and agitation of sample.
 - 3.3.8.2 Fill vial so that a reverse meniscus is present by adjusting the flow rate from the sampling device.
 - 3.3.8.3 Place septum on vial so that the PTFE side is in contact with the sample. After the cap is on the bottle, check for air bubbles in the sample. If air bubbles are present, properly dispose of that sample and recollect the sample in the same vial.
 - 3.3.8.4 Make sure vial is labeled and immediately transfer the vial to the cooler with ice.

⁴ Although EPA Region III policy is to preserve VOA samples by acidifying to pH < 2, the possibility of generating mustard agent by reverse hydrolysis of thioglycol mandates that at the Edgewood Area, APG this not be done. Instead, the holding time on all VOA samples shall not exceed 7 days.

- 3.3.9 Filtered and unfiltered samples will be taken for inorganics (metals) analyses. The samples will be filtered through an in-line 0.45FM filter (preferred method), or by gravity through a 0.45FM membrane placed in a filter funnel. Use forceps to place the membrane into the funnel and pour sample through funnel until appropriate volumes have been filtered.

If necessary, due to slow filtering, a peristatic pump may be used to filter the sample through an in-line filter. Connect the pump to the generator, attach tygon tubing to the bottom discharge valve on the bailer. Start pump and collect sample from the end of the in-line filter directly into the proper container, preserved (as required by SOP 039), and placed in the cooler. Filtered samples will be preserved in the field with acid to a pH of less than 2. Make sure sample bottle is labeled and the cap is on tightly. Then place in cooler with ice immediately.

- OR -

If a low flow pump is used collect the samples, filtered samples will be taken by installing a 0.45FM filter in-line and pumping the water through the filter. Collect sample from the end of the in-line filter directly into the proper container, preserved (as required by SOP 039), and placed in the cooler. Filtered samples will be preserved in the field with acid to a pH of less than 2. Make sure sample bottle is labeled and the cap is on tightly. Then place in cooler with ice immediately.

- 3.3.10 Unfiltered samples will be collected by slowly pouring the sample water into the appropriate sample container, being careful not to agitate or cause bubbles to form. Do not overfill bottles. Make sure sample bottle is labeled and the cap is on tightly. Then place the sample in cooler with ice immediately.
- 3.3.11 All samples will be delivered to the laboratory as soon as possible. If possible, samples will be shipped on the same day as they are collected. If samples must be retained due to weekend sampling (Friday through Sunday), the lab shall be notified as to the time sensitive nature of the samples.
- 3.3.12 Refer to SOP 1-5, 16, 31, and 39 .

3.4 Sampling of Non-Aqueous Phase Liquids

- 3.4.1 If NAPLs are detected in the well, a sample from all layers must be collected prior to any purging activities. Non-aqueous phase liquids (NAPLs) may be indicated by the presence of volatiles in the well headspace, and confirmed by the oil/water interface probe (see SOP 10 § 3.2 - 3.2.2.3).

- 3.4.1.1 Collecting LNAPLs will be accomplished using a transparent bailer with a double check valve. This bailer will be slowly lowered until the bottom of the bailer is 1-2 in. below the LNAPL-water interface, as determined in SOP 010 then slowly withdrawn. Verify that the interface was sampled by visual inspection of the bailer contents through the side of the bailer. Measure the thickness of the LNAPL in the bailer and note in the Field Notebook. Sample for laboratory analysis. An additional field verification may be performed by decanting the remainder of the contents of the bailer into a glass jar, adding a hydrophobic dye such as Sudan IV, or Redoil, shaking the sample and looking for coloration of NAPL. Alternate field tests are: examine the sample under ultra violet light (many fluoresce), or allow the sample to stand overnight, and examine for interface and/or volatiles in the headspace the following day. Refer to following sections on purging and sample collection for set up and general operation.
- 3.4.1.2 Collecting dense non-aqueous phase liquids (DNAPLs) will be accomplished using a transparent bailer with a double check valve. The bailer must be lowered very slowly to the bottom of the well and raised slowly out of the well in a controlled fashion. Sample for analysis as above. The same field check described above may be employed for DNAPL. Refer to following sections on purging and sample collection for set up, and general operation.
- 3.4.1.3 If NAPLs are present in the well, and a low-flow pump is to be used for purging and sampling, the well will be allowed to re-equilibrate prior to purging and sampling. This will be accomplished by allowing the well to stand undisturbed for at least 8 hours prior to purging and sample collection.

3.5 Well Purging - General Rules

Water within the casing of a well will stagnate, degas, lose volatiles, possibly precipitate metals due to changes in redox potential, and may react with the screen and/or casing material. It is therefore necessary to purge a sufficient volume of this stagnant water from the well and/or casing to ensure that a representative sample of formation water can be obtained. Traditionally, the volume of water to be purged was arbitrarily set at 3 to 5 equivalent volumes. Recent advances in sampling technologies have caused a re-thinking of such arbitrary purge volumes. It is for this reason that Monitoring of select chemical and physical properties of the sample medium will be used instead of strict volumes to determine when a representative sample may be taken from a well.

- 3.5.1 Acceptable purge/sampling devices include: bailers, high-discharge submersible pumps (purge only), and variable speed, low-flow pumps which include both submersible pumps (purge and sample), and dedicated bladder pumps (purge and sampling). It is recommended to purge and sample at similar rates with one type device per well. An acceptable exception to this general rule is to use a high-discharge submersible pump to purge a deep, fast-recharging well, and a bailer to sample the same well.
- 3.5.2 Peristaltic, gas-lift, and centrifugal pumps can cause volatilization, produce high pressure differentials, and can result in variability in the analysis of some analytes of interest. These types of pumps shall not be used to purge or sample wells.

- 3.5.3 To prevent ground-water from cascading down the sides of the screen in to an open hole, thereby aerating the sample, purge rates will closely match recharge rates. If the static water level is within the casing, the initial purge rates may be set high enough to lower the water level to the top of the screen, then reduced to maintain that level.
- 3.5.4 Purging will be accomplished with either a submersible pump, a low-flow (submersible or bladder) pump, or bailer. The choice of bailer or pump will be based on depth to water table, volume to be purged, and permeability of the aquifer. If the well recharges rapidly and/or has greater than 20 gallons (estimated EV) to be purged, water may be removed with a submersible pump or a low-flow pump. If the well recharges slowly and/or has less than 20 gallons to be purged, water will be removed with a bailer or a low-flow pump.
- 3.5.5 Purging will be accomplished with as minimal disturbance to the surrounding formation as possible.
- 3.5.6 Purge water will be containerized⁵ on site until analysis of samples is completed. At that time, if the samples are non-hazardous, the water may be disposed of through the waste water treatment plant on-post. If the purge water is found to be hazardous, it will be disposed of as hazardous waste in a licensed TSDF.
- 3.5.7 If the water level is within the screened interval and the well recharge rate is less than 0.1 L/min purge the well using a low-flow pump as follows:
- 3.5.7.1 Draw the water down to within 1 foot of the top of the pump.
- 3.5.7.2 Allow the well to recover.
- 3.5.7.3 Check and record field parameters (§ 3.7.3).

⁵ If, after two rounds of quarterly samples, the water has proven to be uncontaminated, and the purge volume does not exceed 10,000 Gal/day, the purge water may be discharged on the surface, at least 50 ft downhill from the well. If the water is contaminated but does not exceed 100 ppm total VOC, and other contaminants are non toxic to aquatic life as defined in COMAR 26.08.02.03-2, Table 1, MDE may be petitioned on a case-by case basis for a waiver for surface discharge. This letter will be drafted by the contractor for DSHE signature.

3.5.7.4 Repeat steps 3.5.7.1 through 3.5.7.3 then collect samples for metals analysis only

- 3.5.7.5 Note the event in the field log book, and report the problem to the APG project manager. If this extremely low recharge problem consistently occurs in a given well, the well may be considered for re-development and/or replacement.
- 3.5.7.6 If adjacent wells have elevated VOC levels, additional soil gas surveys will be considered in the vicinity of the low recharge well to help determine the need for replacement.

3.6 Purging and Sampling With Bailers

- 3.6.1 Bailers may be used for both purging and sampling wells if: a) the well recharge rate is less than 4 L/min, b) depth to the water table is less than 50 ft, and c) less than 20 gal are to be purged (5 EV < 20 gal)⁷.
- 3.6.2 When purging with a bailer, either a PVC, PTFE, or stainless steel bailer may be used. The bailer will be attached to either a spool of PTFE-coated stainless steel cable or polypropylene rope. If using cable, attach it to the bailer using stainless steel cable clamps. Thoroughly decon the cable after each use, prior to rewinding cable onto spool. Cable clamps and raw cable ends may serve to trap contamination. Exercise particular caution in deconning these areas. If using rope, attach the rope to the bailer using a bowline knot, dispense the needed length (a few feet more than the well depth) and cut the remainder away, then, at the end opposite the bailer, make a slip knot and place it around the well casing or protective posts to prevent losing the bailer and rope down the well. The polypropylene rope will be not reused, it will be properly disposed of. Either type of bailer will be repeatedly lowered gently into the well until it fills with water, removed, and the water will be discharged into an appropriate container until purging is complete. Care must be taken not to unduly agitate the water, as this tends to aerate the sample, increase turbidity, makes stabilization of required parameters (3.6.3) difficult to achieve, and generally prolongs purging.

⁶ Analyte losses due to volatilization in a drained well are too high for valid VOC sampling (McAlary and Barker, 1987).

⁷ These numbers are based on the following assumptions: 1) In purging, it is preferable to remove water at approximately the recharge rate. 2) Four L/min is estimated as the approximate maximum rate at which water can be removed with a bailer from depths of 20-50 feet. 3) Twenty gallons is estimated to be at the limit of the sampler's endurance, at which point fatigue and sloppiness of technique begin.

- 3.6.3 After purging 2 EV, obtain a sample of groundwater and measure the following stabilization parameters: temperature (SOP 009), conductivity (SOP 012), pH (SOP 008), turbidity (SOP 036), redox potential (Eh) (SOP 038), and dissolved oxygen level (SOP 037) at each successive half-well volume. When three of these stabilization parameters are in agreement within approximately 10% in three consecutive half-well volume samples, sufficient water has been purged from the well. The results of these tests should be recorded in the sampling logbook. Should these parameters not reach agreement, no more than five well volumes will be purged.
 - 3.6.4 Immediately upon completion of purging, collect samples for laboratory analysis using a PTFE bailer on a PTFE-coated stainless steel cable. The bailer will be equipped with double check valve top and controlled flow bottom discharge attachments for VOC sampling (40-mL vials), and top discharge attachment for collecting larger samples (1-L bottles).
 - 3.6.5 Slowly, so as not to agitate the water, lower the bailer into the well, using a spool of PTFE-coated cable. Allow bailer to fill, withdraw smoothly. Refill bailer as needed.
 - 3.6.5.1 Please see footnote 2. If the controlled flow bottom discharge attachment is used for VOC sampling, attach it to the bottom of the bailer. Using the stopcock valve on the bailer to control the flow, fill sample vials as described above in § 3.3.8.
 - 3.6.5.2 Remove check valve top and pour unfiltered sample into inorganics sample bottles.
 - 3.6.5.3 Collect filtered samples as described in § 3.3.9 (above).
 - 3.6.6 Decon bailer and cable in accordance with SOP 005 § 3.3.1.1
- 3.7 Purging With Pump, Sampling With Bailer
- 3.7.1 If the recharge rate of the well is greater than 30 L/min, or the water level is deeper than 50 ft, or more than 20 gal of purge water will be generated ($5 \text{ EV} > 20 \text{ gal}$), then purging and sampling may be accomplished using a submersible pump / bailer combination.

- 3.7.2 When purging with a pump, gradually lower the intake until it is submerged within the screened interval. Lower an electronic water level probe to the top of the screen (as determined from completion records) to the monitor water level, start pump, and slowly lower the pump as the water level continues to fall. Care should be exercised to lower the water column to the top of the screened interval (water level probe will stop beeping) but not below the top of the screen if possible. This will ensure that the stagnant layer has been removed, but should minimize the detrimental effects of over pumping the well. Secure hose(s) and/or power cord to casing and place discharge hose into the proper container, downhill and as far away from the well as possible. Determine and record the discharge rate.

Discharge rate = volume of container/time to fill container

The discharge rate will be established at approximately equal to or just greater than the well's recharge rate (determined from well development). If well development records are incomplete, recharge rate can be determined by monitoring the rise/fall of the water level within the casing as one purges the well. If the water level is static at a given pumping rate, but fluctuates up or down as pumping rate is decreased or increased, the pumping rate at which the water level is static is the recharge rate.

- 3.7.3 After purging 2 EV, obtain a sample of groundwater and measure the following stabilization parameters: temperature, conductivity, pH, turbidity, redox potential (Eh), and dissolved oxygen level at each successive half-well volume. When three of these stabilization parameters are in agreement within approximately 10% in three consecutive half-well volume samples, sufficient water has been purged from the well. The results of these tests should be recorded in the sampling logbook. Should these parameters not reach agreement, no more than five well volumes will be purged.
- 3.7.4 Immediately upon completion of purging, collect samples for laboratory analysis using a PTFE bailer on a PTFE-coated stainless steel cable. The bailer will be equipped with double check valve top and controlled flow bottom discharge attachments for VOC sampling (40-mL vials), and top discharge attachment for collecting larger samples (1-L bottles). Filtration of metals samples will be accomplished using either an in-line filter attached to the bottom of the bailer, or a funnel and appropriate filter (see § 3.3.9 above).
- 3.7.5 Slowly, so as not to agitate the water, lower the bailer into the well, using a spool of PTFE-coated cable. Allow bailer to fill, withdraw smoothly, fill sample containers as described above in § 3.6.5
- 3.7.6 Decon bailer and cable in accordance with SOP 005 § 3.3.1.1. Decon pump in accordance with SOP 005 § 3.3.1.2.

3.8 Purging and Sampling With Low-Flow Pump

To obtain representative samples, subsurface disturbances should be kept to a minimum, thereby preventing sample alteration due to sampling actions. The reasoning behind the use of low-flow pumps to purge and sample monitoring wells is that these pumps minimize physical disturbance (turbulence) at the sampling point and chemical changes (aeration) in the medium. For these reasons, the low-flow pump is the preferred method for both purging and sampling in most cases. For the purposes of this SOP, "low-flow pumps" are defined as either dedicated bladder pumps or variable speed submersible pumps. Practical operational flow rates for these sampling devices range from 0.1 L/min to 30 L/min.

3.8.1 Low-flow pumps may be used for purging and sampling any well having recharge greater than 0.1 L/min, which is the practical lower limit of pump performance. Below that pumping rate, pump inefficiencies and/or overheating may alter the physical and chemical properties of the sample. If the pump is continuously operated at sampling rates higher than the well recharge rate, the water level will be lowered in the well, possibly allowing aeration of the sample which is unacceptable sampling procedure. Low-flow pumps are suitable for sampling wells with recharge rates lower than 0.1 L/min if precautions are taken to avoid aeration of the sample.

3.8.2 Low flow submersible pumps will be used as follows:

3.8.2.1 Lower the pump into the well, slowly so as not to agitate the water, until the pump is at the mid-point of the screened interval or the mid-point of the water column if the static water table lies below the top of the screen¹.

3.8.2.2 Attach the pump's umbilical cord (which will consist of power cord and sampling tubing) to the protective casing, or lock the cord spool so that the pump cannot move vertically in the well during sampling.

3.8.2.3 Lower the water level probe into the well behind the pump until it just touches water. This will allow the sampler to monitor the water level while purging and sampling, and prevent the inadvertent drying of the well.

¹ This assumes a 10-ft. screened interval. If the screened interval is greater than 10-ft., multiple samples should be taken as follows:

If the screen is 10 - 12 ft., sample the center of the water column, as outlined above.

If the screen is longer than 12-ft., and the water column is 10-ft or less, sample the center of the water column.

If the screen is longer than 12-ft., and the water column fills the screen, or extends above the screen, sample at 1/3 and 2/3 the height of the water column, or about every 6-ft.

- 3.8.2.4 Begin purging at the pump's lowest setting, then gradually increase rate⁹ until the pumping rate matches the aquifer recharge rate. If the water level is above the top of the screen, the pumping rate may be allowed to slightly exceed recharge rate, lowering the water level to no less than 1 foot above the screen, then reduced until it matches recharge rate and purging continued. If the water level is below the top of the screen, always keep the purge rate lower than well's recharge rate.
 - 3.8.2.5 Monitor stabilization parameters listed in § 3.6.3 beginning immediately, using an in-line monitoring system. Record parameters regularly, at a rate of one set of parameters per each 1-3 liters of water removed from the well. When these parameters stabilize to within 10% over 3 consecutive readings, reduce¹⁰ flow rate to 0.1 L/min (if needed) and begin collecting VOC samples directly from the discharge line.
 - 3.8.2.6 If the well recharges at a rate less than 0.1 L/min, purge until the water level is even with the top of the screen, allow the well to recover and sample immediately.
 - 3.8.2.7 Remove and decon water level probe (SOP 005 § 3.3.1.5) and pump (SOP 005 § 3.3.1.2).
- 3.8.3 The length of tubing used in conjunction with the low-flow pump will be appropriate to the depth of the well (i.e. A 100 ft roll of tubing may not be used in sampling a 30 ft well. A 50 ft roll would be used instead, thereby generating less decon solution, and providing less opportunity for physical and chemical changes in the sample due to contact with the spooled tubing (see § 3.8.4)). This means that the contractor will have on hand: a) spools of varying length (e.g. 25, 50, 75, and 100 ft spools) or b) several short e.g. 10 ft lengths of tubing with a secure means of connecting them end-to-end.
- 3.8.4 When a sampling event occurs during summer months, in full sun, shade will be provided for the spooled tubing. Otherwise the tubing will be an effective water heater, warming the ground-water sample, creating the potential for volatilization of organics.
- 3.8.5 Spooled tubing will be monitored to ensure that no air bubbles are trapped at the top of a coil. Trapped air bubbles can enhance volatilization of organics.
- 3.8.6 If a dedicated bladder pump is used, follow steps 3.8.2.3 through 3.8.2.5. for purging and sampling.

⁹ Some sources indicate that the pumping rate should not exceed 1 L/min, with 0.5 L/min being preferable. The optimal purge rate is highly aquifer dependent, and may range from less than 0.5 L/min to greater than 10 L/min. The purge rate for a given well will; therefore, be a field decision, based on well development, purge, and sampling records rather than SOP mandate.

¹⁰ Sampling should occur at the same rate as purging as long as aeration of sample does not occur.

4.0 Maintenance

Refer to manufacturer's requirements for maintenance of pumps and generators.

5.0 Precautions

Refer to the HASP for appropriate PPE.

6.0 References

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APPENDIX C
REAC Analytical Report April 1997
J-field Phytoremediation Study
Groundwater Well And Lysimeter Monitoring Report
Aberdeen Proving Ground, Maryland
November 1997

ANALYTICAL REPORT

Prepared by
Roy F. Weston, Inc.

J-Field Phytoremediation Study, APG
Aberdeen, MD

April, 1997

EPA Work Assignment No. 1-173
WESTON Work Order No. 03347-041-001-1173-01
EPA Contract No. 68-C4-0022

Submitted to
H. Compton
EPA-ERTC

R. Tobia
Task Leader

Date

4/7/97

Analysis by:
REAC
Accutest

V. Kansal
Analytical Section Leader

4/10/97
Date

Prepared by:
G. Karusis

E. Gilardi
Project Manager

Date

Reviewed by:
M. Barkley

REAC, L..son, NJ
(908) 321 4200
EPA Contract 68-C

CHAIN OF CUSTODY RECORD

Project Name: J - FIELD
Project Number: 03347-041-001-1173-01
RFW Contact: JOHNSON Phone: (902) 321-4200
No: 07858

Sample Identification

Matrix:	Sediment	PW-	Soil Water	* NS/MSD on parameters
SD-		GW-	W-	09108 all
DS-	Drum Scratches	SW-	O-	parameters
DL-	Drum Liquids	SL-	A-	
X -	Other			(B)

FOR SUBCONTRACTING USE ONLY

**FROM CHAIN OF
CUSTODY #**

INTRODUCTION

REAC, in response to ERT WA # 1-173, provided analytical support for environmental samples collected at the J-Field Phytoremediation Study, APG Site in Aberdeen, MD as described in the following table. This support involved the analyses and subcontracted analyses of water samples. The support also included the QA/QC, data review and the preparation of a report summarizing the analytical methods, results, and the QA/QC results.

The samples were treated with procedures consistent with those described in SOP # 1008.

COC *	Number of Samples	Sampling Date	Date Received	Matrix	Analysis	Laboratory
07857	2	2/20/97	2/21/97	Water	VOC, TAL Metals	REAC
07857	1	2/20/97	2/21/97	Water	VOC	REAC
07857	3	2/21/97	2/21/97	Water	TAL Metals, VOC	REAC
07857	3	2/21/97	2/21/97	Water	VOC	REAC
07858	3	2/20/97	2/21/97	Water	TOX, Ammonia, Chloride, Nitrate	Accutest
07858	2	2/21/97	2/21/97	Water	TOX, Ammonia, Chloride, Nitrate	Accutest

* COC # denotes Chain of Custody number

00001

1173\DEL\AR\9704\REPORT

CASE NARRATIVE

VOC Package F 106

The method blank of 2/25/97 contained 0.85 ppb TCE and 3.62 ppb 1,1,2,2-tetrachloroethane. The data are not affected because these analytes were not detected in the samples that are associated with this method blank.

The acceptable QC limits were exceeded for the surrogate bromofluorobenzene (84%) for sample 9709. The detected VOC values for all target compounds for this sample should be regarded as estimated.

Metals Package F 122

The data were examined and were found to be acceptable.

Wet Chemistry Package G 077

The data were examined and were found to be acceptable.

Summary of Abbreviations

AA	Atomic Absorption				
B	The analyte was found in the blank				
BFB	Bromofluorobenzene				
BPQL	Below the Practical Quantitation Limit				
C	Centigrade				
D	(Surrogate Table) this value is from a diluted sample and was not calculated (Result Table) this result was obtained from a diluted sample				
Dioxin	denotes Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans and/or PCDD and PCDF				
CLP	Contract Laboratory Protocol				
COC	Chain of Custody				
CONC	Concentration				
CRDL	Contract Required Detection Limit				
CRQL	Contract Required Quantitation Limit				
DFTPP	Decafluorotriphenylphosphine				
DL	Detection Limit				
E	The value is greater than the highest linear standard and is estimated				
EMPC	Estimated maximum possible concentration				
ICAP	Inductively Coupled Argon Plasma				
ISTD	Internal Standard				
J	The value is below the method detection limit and is estimated				
LCS	Laboratory Control Sample				
LCSD	Laboratory Control Sample Duplicate				
MDL	Method Detection Limit				
MQL	Method Quantitation Limit				
MI	Matrix Interference				
MS	Matrix Spike				
MSD	Matrix Spike Duplicate				
MW	Molecular Weight				
NA	either Not Applicable or Not Available				
NC	Not Calculated				
NR	Not Requested				
NS	Not Spiked				
% D	Percent Difference				
% REC	Percent Recovery				
PQL	Practical Quantitation Limit				
PPBV	Parts per billion by volume				
QL	Quantitation Limit				
RPD	Relative Percent Difference				
RSD	Relative Standard Deviation				
SIM	Selected Ion Mode				
TCLP	Toxic Characteristics Leaching Procedure				
U	Denotes not detected				
m³	cubic meter	kg	kilogram	µg	microgram
L	liter	g	gram	pg	picogram
ml	milliliter	mg	milligram		
µL	microliter				
*	denotes a value that exceeds the acceptable QC limit				
	Abbreviations that are specific to a particular table are explained in footnotes on that table				

Revision 3/7/97

Analytical Procedure for VOC in Water
(Tekmar Series 3000 Concentrator/Dynatech Sampler)

A modified 524.2 method was used for the analysis of Volatile Organic Compounds in water. Samples were purged, trapped, and desorbed to a GC/MS system. Prior to purging, the samples were spiked with a three component surrogate mixture consisting of toluene-d₆, 4-bromofluorobenzene and 1,2-dichloroethane-d₄, and a three component internal standard mixture consisting of bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-d₄. The following conditions and parameters were utilized:

The purge and trap unit consisted of: A Tekmar concentrator (3000 series) equipped with an autosampler (Dynatech) and a trap consisting of a VOCARB 4000 (Supelco), which itself contained of four adsorbent beds: Carbopack B (graphitized carbon 60/80 mesh), Carbopack C (graphitized carbon 60/80 mesh), Carboxen-1000 (60/80 mesh), and Carboxen-1001 (60/80 mesh).

The purge and trap instrument conditions were:

Purge	10 min at 25° C
Dry Purge	2 min at 25° C
Desorb Preheat	230° C
Desorb	4 min at 230° C
Purge Flow Rate	40 mL/min
Bake	8 min at 250° C

A Hewlett Packard 5970 GC/MSD equipped with an RTE-A data system was used to analyze the data.

The instrument conditions were:

Column:	30 meter x 0.53mm ID, RTx-Volatiles (Restek Corp.) column with 3.0 μ m thickness.
Temperature:	5 min at 10° C 6° C/min to 140° C 0.1 min at 140° C 12° C/min to 160° C 5 min at 160° C
Flow Rate	Helium at 10 mL/min
GC/MS Interface	Glass jet separator with 30 mL/min helium make-up gas at 250° C.

GC/MS Interface: Glass jet separator with 30 mL make-up gas at 250° C.

Mass Spectrometer: Electron impact Ionization at a nominal electron energy of 70 electron volts, scanning from 35-300 amu at one scan/sec.

Computer: Preprogrammed to plot Extracted Ion Current Profile (EICP); capable of integrating ions and plotting abundances vs time or scan number. A library search (NBS-Wiley) for tentatively identified compounds was performed on samples.

The GC/MS system was calibrated using 6 VOC standards at 5, 20, 50, 100, 150, and 200 μ g/l. Before analysis each day, the system was tuned with 50 ng BFB and passed a continuing calibration check when analyzing a 50 μ g/l standard mixture in which the responses were evaluated by comparison to the average response of the calibration curve.

The results are in Table 1.1; the tentatively identified compounds are listed in Table 1.2. The concentrations of the analytes were calculated using the following equation:

$$C_t = \frac{A_t \times I_u}{A_u \times RF \text{ (or } RF_{av} \text{)} \times V_p}$$

where

- C_t = Concentration of target analyte ($\mu\text{g/L}$)
 A_t = Area of the target analyte
 I_u = mass of specific internal standard (ng)
 A_u = Area of the specific internal standard
RF = Response Factor
 RF_{av} = average Response Factor
 V_p = Volume of sample purged (mL), taking into account dilutions

The average Response Factor is used when a sample is associated with an initial calibration curve. The Response Factor is used when a sample is associated with a continuing calibration curve.

Response Factor calculation:

The response factor (RF) for each specific analyte is quantitated based on the area response from the continuing calibration check as follows:

$$RF = \frac{A_t \times I_u}{A_u \times I_t}$$

where,

- RF = Response factor for a specific analyte
 A_t = Area of the analyte in the standard
 I_u = Mass of the specific internal standard
 A_u = Area of the specific internal standard
 I_t = Mass of the analyte in the standard

$$RF_{av} = \frac{RF_1 + RF_2 + \dots + RF_n}{n}$$

and

n = number of Samples

Revision of 1/27/97

Analytical Procedure for Metals in Water

Sample Preparation

A representative 45 mL aliquot of each sample was mixed with 5.0 mL concentrated nitric acid, placed in an acid rinsed Teflon container, capped with a Teflon lined cap, and digested according to SW-846, Method 3015 in a CEM MDS-2100 microwave oven, which was programmed to bring the samples to 160 +/- 4°C in 10 minutes (first stage) and slowly rise to 165-170°C in the second 10 minutes (second stage). After digestion, samples were allowed to cool to room temperature and were transferred to polyethylene bottles. Samples were analyzed for all metals, except mercury, by US EPA SW-846, Method 7000 Atomic Absorption (AA) or Method 6010 Inductively Coupled Argon Plasma (ICAP) procedures.

A 100 mL aliquot of each sample was transferred to a 300-mL BOD bottle and prepared according to SW-846, Method 7470. The samples were heated for 2 hours on a hot plate at 95 °C, cooled to room temperature, and reduced with Hydroxylamine hydrochloride ($\text{NH}_2\text{OH}\cdot\text{HCl}$). Mercury was then analyzed separately on a Varian SpectrAA-300 Atomic Absorption Spectrophotometer equipped with a Varian VGA-76 vapor gas analyzer by SW-846, Method 7470.

A reagent blank and a blank spike sample were carried through the sample preparation procedure for each analytical batch of samples processed. One matrix spike (MS) and one matrix spike duplicate (MSD) sample were also processed for each analytical batch or every 10 samples.

Analysis and Calculations

The AA and ICAP instruments were calibrated and operated according to SW-846, Method 7000/7470/6010 and the manufacturer's operating instructions. After calibration, initial calibration verification (ICV), initial calibration blank (ICB), and QC check standards were run to verify proper calibration. The continuing calibration verification (CCV) and continuing calibration blank (CCB) standards were run after every 10 samples to verify proper operation during sample analysis.

The metal concentrations in solution, in micrograms per liter ($\mu\text{g/L}$) were read directly from the read-out systems of the instruments. ICAP and Mercury results were taken directly from instrument read-outs. The ICAP results were corrected for digestion volume (45 mL sample + 5 mL nitric acid) prior to instrument read-out; AA read-outs (excluding Mercury) were externally corrected for digestion volume ($1.111 \times \text{AA}$ read-out).

For samples that required dilution to fall within the instrument calibration range:

$$\mu\text{g/L metal in sample} = A [(C+B) / C]$$

where:

A = direct read-out (ICAP and Mercury)

A = corrected read-out (AA)

B = acid blank matrix used for dilution, mL

C = sample aliquot, mL

Results of the analyses are listed in Table 1.3.

Analytical Procedure for Total Organic Halides

The subcontract laboratory determined the concentration of total organic halides in the samples using SW-846 Method 9020. The results of the analysis are listed in Table 1.4.

Analytical Procedure for Nitrate

The subcontract laboratory determined the concentration of nitrate in the samples using USEPA Method 353.2. The results of the analysis are listed in Table 1.4.

Analytical Procedure for Ammonia

The subcontract laboratory determined the concentration of ammonia in the samples using USEPA Method 350.1. The results of the analysis are listed in Table 1.4.

Analytical Procedure for Chloride

The subcontract laboratory determined the concentration of chloride in the samples using USEPA Method 325.3. The results of the analysis are listed in Table 1.4.

Table 1.1 Results of the Analysis for VOC in Water
WA # 1-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	09708	09709	09710	09712					
LOCATION		JFP-4	JFP-3	JFP-2	JFL-3					
COLLECTED		02/20/97	02/20/97	02/20/97	02/20/97					
ANALYZED	02/24/97	02/24/97	02/24/97	02/24/97	02/24/97					
INJECTED	15:50	16:48	17:35	18:21	19:56					
FILE #	B2928	B2929	B2930	B2931	B2933					
DIL. FACT.	1	1	1	1	1					
UNIT	ug/L	ug/L	ug/L	ug/L	ug/L					
COMPOUND	CONC.	NDL	CONC.	NDL	CONC.	NDL	CONC.	NDL	CONC.	NDL
Dichlorodifluoromethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Chloromethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Vinyl Chloride	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Bromomethane	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0
Chloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Trichlorofluoromethane	U	1.0	U	1.0	U	2.0	U	2.0	U	2.0
Acetone	U	2.0	U	2.0	U	1.0	U	1.0	U	1.0
1,1-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Carbon Disulfide	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Methylene Chloride	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Methyl-tertiary-butylether	U	1.0	7.9	1.0	U	1.0	U	1.0	U	1.0
trans-1,2-Dichloroethene	U	1.0	U	1.0	48	1.0	4.0	1.0	U	1.0
1,1-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
2-Butanone	U	4.0	U	4.0	U	4.0	U	4.0	U	4.0
2,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
cis-1,2-Dichloroethene	U	1.0	U	1.0	140	1.0	12	1.0	U	1.0
Chloroform	U	1.0	U	1.0	1.5	1.0	1.0	1.0	U	1.0
1,1-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,1,1-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Carbon Tetrachloride	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Benzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Trichloroethene	U	1.0	U	1.0	1300	1.0	240	1.0	U	1.0
1,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Dibromomethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Bromodichloromethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
cis-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
trans-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,1,2-Trichloroethane	U	1.0	U	1.0	50	1.0	4.8	1.0	U	1.0
1,3-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Dibromochloromethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dibromoethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Bromoform	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
4-Methyl-2-Pentanone	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 1-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	09708 JFP-4	09709 JFP-3	09710 JFP-2	09712 JFL-3			
LOCATION		02/20/97	02/20/97	02/20/97	02/20/97			
COLLECTED		02/24/97	02/24/97	02/24/97	02/24/97			
ANALYZED	02/24/97	02/24/97	02/24/97	02/24/97	02/24/97			
INJECTED	15:50	16:48	17:35	18:21	19:56			
FILE	82928	82929	82930	82931	82933			
DIL. FACT.	1	1	1	1	1			
UNIT	µg/L	µg/L	µg/L	µg/L	µg/L			
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Toluene	U	1.0	U	1.0	U	1.0	U	1.0
2-Hexanone	U	2.0	U	2.0	U	2.0	U	2.0
Tetrachloroethane	U	1.0	U	1.0	130	1.0	22	1.0
Chlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0	2.8	1.0	U	1.0
Ethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0
p & m-Xylene	U	1.0	U	1.0	U	1.0	U	1.0
o-Xylene	U	1.0	U	1.0	U	1.0	U	1.0
Styrene	U	1.0	U	1.0	U	1.0	U	1.0
Isopropylbenzene	U	1.0	U	1.0	U	1.0	U	1.0
1,1,2,2-Tetrachloroethane	U	1.0	U	1.0	5500	1.0	370	1.0
1,2,3-Trichloropropene	U	1.0	U	1.0	U	1.0	U	1.0
Bromobenzene	U	1.0	U	1.0	U	1.0	U	1.0
n-Propylbenzene	U	1.0	U	1.0	U	1.0	U	1.0
2-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.0
4-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.0
1,3,5-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0
tert-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0
1,2,4-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0
sec-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0
1,3-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0
p-Isopropyltoluene	U	1.0	U	1.0	U	1.0	U	1.0
1,4-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0
n-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dibromo-3-Chloropropane	U	1.0	U	1.0	U	1.0	U	1.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0
Naphthalene	U	1.0	U	1.0	U	1.0	U	1.0
Hexachlorobutadiene	U	1.0	U	1.0	U	1.0	U	1.0
1,2,3-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 1-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	09703	09704			
LOCATION	F/TB	JFP-5				
COLLECTED	02/21/97	02/21/97	02/21/97			
ANALYZED	02/24/97	02/24/97	02/24/97			
INJECTED	15:50	20:44	21:31			
FILE #	82928	82934	82935			
DIL. FACT.	1	1	1			
UNIT	#g/L	#g/L	#g/L			
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL
Dichlorodifluoromethane	U	1.0	U	1.0	U	1.0
Chloromethane	U	1.0	U	1.0	U	1.0
Vinyl Chloride	U	1.0	U	1.0	U	1.0
Bromomethane	U	2.0	U	2.0	U	2.0
Chloroethane	U	1.0	U	1.0	U	1.0
Trichlorofluoromethane	U	1.0	U	1.0	U	1.0
Acetone	U	2.0	U	2.0	U	2.0
1,1-Dichloroethene	U	1.0	U	1.0	U	1.0
Carbon Disulfide	U	1.0	U	1.0	U	1.0
Methylene Chloride	U	1.0	U	1.0	U	1.0
Methyl-tertiary-butylether	U	1.0	U	1.0	U	1.0
trans-1,2-Dichloroethene	U	1.0	U	1.0	26	1.0
1,1-Dichloroethane	U	1.0	U	1.0	U	1.0
2-Butanone	U	4.0	U	4.0	U	4.0
2,2-Dichloropropane	U	1.0	U	1.0	U	1.0
cis-1,2-Dichloroethene	U	1.0	U	1.0	78	1.0
Chloroform	U	1.0	U	1.0	U	1.0
1,1-Dichloropropene	U	1.0	U	1.0	U	1.0
1,2-Dichloroethane	U	1.0	U	1.0	U	1.0
1,1,1-Trichloroethane	U	1.0	U	1.0	U	1.0
Carbon Tetrachloride	U	1.0	U	1.0	U	1.0
Benzene	U	1.0	U	1.0	U	1.0
Trichloroethene	U	1.0	U	1.0	220	1.0
1,2-Dichloropropane	U	1.0	U	1.0	U	1.0
Dibromomethane	U	1.0	U	1.0	U	1.0
Bromodichloromethane	U	1.0	U	1.0	U	1.0
cis-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0
trans-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0
1,1,2-Trichloroethane	U	1.0	U	1.0	29	1.0
1,3-Dichloropropane	U	1.0	U	1.0	U	1.0
Dibromochloromethane	U	1.0	U	1.0	U	1.0
1,2-Dibromoethane	U	1.0	U	1.0	U	1.0
Bromoform	U	1.0	U	1.0	U	1.0
4-Methyl-2-Pentanone	U	2.0	U	2.0	U	2.0

Table 1.1 (Cont) Results of the Analysis for VOC In Water
WA # 1-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	09703	09704			
LOCATION	F/TB	JPP-5				
COLLECTED	02/21/97	02/21/97	02/24/97			
ANALYZED	02/26/97	02/26/97	02/26/97			
INJECTED	15:50	20:44	21:31			
FILE	82928	82934	82935			
DIL. FACT.	1	1	1			
UNIT	ug/L	ug/L	ug/L			
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL
Toluene	U	1.0	U	1.0	U	1.0
2-Hexanone	U	2.0	U	2.0	U	2.0
Tetrachloroethene	U	1.0	U	1.0	21	1.0
Chlorobenzene	U	1.0	U	1.0	U	1.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0
Ethylbenzene	U	1.0	U	1.0	U	1.0
p & m-Xylene	U	1.0	U	1.0	U	1.0
o-Xylene	U	1.0	U	1.0	U	1.0
Styrene	U	1.0	U	1.0	U	1.0
Isopropylbenzene	U	1.0	U	1.0	680	1.0
1,1,2,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0
1,2,3-Trichloropropane	U	1.0	U	1.0	U	1.0
Bromobenzene	U	1.0	U	1.0	U	1.0
n-Propylbenzene	U	1.0	U	1.0	U	1.0
2-Chlorotoluene	U	1.0	U	1.0	U	1.0
4-Chlorotoluene	U	1.0	U	1.0	U	1.0
1,3,5-Trimethylbenzene	U	1.0	U	1.0	U	1.0
tert-Butylbenzene	U	1.0	U	1.0	U	1.0
1,2,4-Trimethylbenzene	U	1.0	U	1.0	U	1.0
sec-Butylbenzene	U	1.0	U	1.0	U	1.0
1,3-Dichlorobenzene	U	1.0	U	1.0	U	1.0
p-Isopropyltoluene	U	1.0	U	1.0	U	1.0
1,4-Dichlorobenzene	U	1.0	U	1.0	U	1.0
1,2-Dichlorobenzene	U	1.0	U	1.0	U	1.0
n-Butylbenzene	U	1.0	U	1.0	U	1.0
1,2-Dibromo-3-Chloropropene	U	1.0	U	1.0	U	1.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	1.0
Naphthalene	U	1.0	U	1.0	U	1.0
Hexachlorobutadiene	U	1.0	U	1.0	U	1.0
1,2,3-Trichlorobenzene	U	1.0	U	1.0	U	1.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 1-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	09711	09705			
LOCATION		JF1-1	JPF-1			
COLLECTED		02/20/97	02/21/97			
ANALYZED	02/26/97	02/26/97	02/26/97			
INJECTED	13:00	16:48	19:52			
FILE #	B2960	B2965	B2969			
DIL. FACT.	1	1	100			
UNIT	µg/L	µg/L	µg/L			
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL
Dichlorodifluoromethane	U	1.0	U	1.0	U	100.0
Chloromethane	U	1.0	U	1.0	U	100.0
Vinyl Chloride	U	1.0	U	1.0	U	100.0
Bromomethane	U	2.0	U	2.0	U	200.0
Chloroethane	U	1.0	U	1.0	U	100.0
Trichlorofluoromethane	U	1.0	U	1.0	U	100.0
Acetone	U	2.0	130	2.0	U	200.0
1,1-Dichloroethene	U	1.0	U	1.0	U	100.0
Carbon Disulfide	U	1.0	U	1.0	U	100.0
Methylene Chloride	U	1.0	35	1.0	U	100.0
Methyl-tertiary-butylether	U	1.0	U	1.0	U	100.0
trans-1,2-Dichloroethene	U	1.0	U	1.0	260	100.0
1,1-Dichloroethane	U	1.0	U	1.0	U	100.0
2-Butanone	U	4.0	19	4.0	U	400.0
2,2-Dichloropropane	U	1.0	U	1.0	U	100.0
cis-1,2-Dichloroethene	U	1.0	U	1.0	940	100.0
Chloroform	U	1.0	U	1.0	U	100.0
1,1-Dichloropropene	U	1.0	U	1.0	U	100.0
1,2-Dichloroethane	U	1.0	U	1.0	U	100.0
1,1,1-Trichloroethane	U	1.0	U	1.0	U	100.0
Carbon Tetrachloride	U	1.0	U	1.0	U	100.0
Benzene	U	1.0	U	1.0	U	100.0
Trichloroethene	U	1.0	U	1.0	41000	100.0
1,2-Dichloropropene	U	1.0	U	1.0	U	100.0
Dibromomethane	U	1.0	U	1.0	U	100.0
Bromodichloromethane	U	1.0	U	1.0	U	100.0
cis-1,3-Dichloropropene	U	1.0	U	1.0	U	100.0
trans-1,3-Dichloropropene	U	1.0	U	1.0	U	100.0
1,1,2-Trichloroethane	U	1.0	U	1.0	870	100.0
1,3-Dichloropropane	U	1.0	U	1.0	U	100.0
Dibromochloromethane	U	1.0	U	1.0	U	100.0
1,2-Dibromoethane	U	1.0	U	1.0	U	100.0
Bromoform	U	1.0	U	1.0	U	100.0
4-Methyl-2-Pentanone	U	2.0	2.2	2.0	U	200.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 1-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	09711	09705			
LOCATION	JF1-1	JPF-1				
COLLECTED	02/20/97	02/26/97	02/21/97			
ANALYZED	02/26/97	02/26/97	02/26/97			
INJECTED	13:00	16:48	19:52			
FILE	B2960	B2965	B2969			
DIL. FACT.	1	1	100			
UNIT	µg/L	µg/L	µg/L			
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL
Toluene	U	1.0	23	1.0	U	100.0
2-Hexanone	U	2.0	U	2.0	U	200.0
Tetrachloroethene	U	1.0	U	1.0	7000	100.0
Chlorobenzene	U	1.0	U	1.0	U	100.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0	140	100.0
Ethylbenzene	U	1.0	U	1.0	U	100.0
p & m-Xylene	U	1.0	U	1.0	U	100.0
o-Xylene	U	1.0	U	1.0	U	100.0
Styrene	U	1.0	U	1.0	U	100.0
Isopropylbenzene	U	1.0	U	1.0	U	100.0
1,1,2,2-Tetrachloroethane	U	1.0	U	1.0	140000	100.0
1,2,3-Trichloropropane	U	1.0	U	1.0	U	100.0
Bromobenzene	U	1.0	U	1.0	U	100.0
n-Propylbenzene	U	1.0	U	1.0	U	100.0
2-Chlorotoluene	U	1.0	U	1.0	U	100.0
4-Chlorotoluene	U	1.0	U	1.0	U	100.0
1,3,5-Trimethylbenzene	U	1.0	U	1.0	U	100.0
tert-Butylbenzene	U	1.0	U	1.0	U	100.0
1,2,4-Trimethylbenzene	U	1.0	U	1.0	U	100.0
sec-Butylbenzene	U	1.0	U	1.0	U	100.0
1,3-Dichlorobenzene	U	1.0	U	1.0	U	100.0
p-Isopropyltoluene	U	1.0	U	1.0	U	100.0
1,4-Dichlorobenzene	U	1.0	U	1.0	U	100.0
1,2-Dichlorobenzene	U	1.0	U	1.0	U	100.0
n-Butylbenzene	U	1.0	U	1.0	U	100.0
1,2-Dibromo-3-Chloropropane	U	1.0	U	1.0	U	100.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	100.0
Naphthalene	U	1.0	U	1.0	U	100.0
Hexachlorobutadiene	U	1.0	U	1.0	U	100.0
1,2,3-Trichlorobenzene	U	1.0	U	1.0	U	100.0

**Table 1. 2 Results of the TICs for VOC in Water
WA# 1-173 J-Field Phytoremediation Study, APG**

Sample #	LAB BLANK		Unit	µg/L
LabFile#	B2928	Con. Factor	1	
1	NO PEAKS FOUND			0
2				0
3				0
4				0
5				0
6				0
7				0
8				0
9				0
10				0
11				0
12				0
13				0
14				0
15				0
16				0
17				0
18				0
19				0
20				0

* the concentration is estimated
the response factor was assumed to be 1

00014

Table 1.2 (Cont) Results of the TICs for VOC in Water
WA# 1-173 J-Field Phytoremediation Study, APG

Sample #	09708	Unit	$\mu\text{g/L}$
LabFile#	B2929	Con. Factor	1
Compound			
1	NO PEAKS FOUND	Q	RT
2			0
3			0
4			0
5			0
6			0
7			0
8			0
9			0
10			0
11			0
12			0
13			0
14			0
15			0
16			0
17			0
18			0
19			0
20			0

* the concentration is estimated
the response factor was assumed to be 1

00015

Table 1.2 (Cont) Results of the TICs for VOC in Water
WA# 1-173 J-Field Phytoremediation Study, APG

Sample #	09709	Unit	$\mu\text{g/L}$
LabFile#	B2930	Con. Factor	1
Compound			
1	NO PEAKS FOUND	Q	RT
2			0
3			0
4			0
5			0
6			0
7			0
8			0
9			0
10			0
11			0
12			0
13			0
14			0
15			0
16			0
17			0
18			0
19			0
20			0

* the concentration is estimated
the response factor was assumed to be 1

00016

1173\DEL\VAR\9704\TIC

Table 1.2 (Cont) Results of the TICs for VOC in Water
WA# 1-173 J-Field Phytoremediation Study, APG

Sample #	09710	Unit	$\mu\text{g/L}$
LabFile#	B2931	Con. Factor	1
Compound			
1	NO PEAKS FOUND	Q	RT
2			0
3			0
4			0
5			0
6			0
7			0
8			0
9			0
10			0
11			0
12			0
13			0
14			0
15			0
16			0
17			0
18			0
19			0
20			0

* the concentration is estimated
the response factor was assumed to be 1

00017

Table 1. 2 (Cont) Results of the TICs for VOC in Water
WA# 1-173 J-Field Phytoremediation Study, APG

Sample #	09712	Unit	$\mu\text{g/L}$
LabFile#	B2933	Con. Factor	1
Compound			
1	NO PEAKS FOUND	Q	RT
2			0
3			0
4			0
5			0
6			0
7			0
8			0
9			0
10			0
11			0
12			0
13			0
14			0
15			0
16			0
17			0
18			0
19			0
20			0

* the concentration is estimated
the response factor was assumed to be 1

00018

Table 1.2 (Cont) Results of the TICs for VOC in Water
WA# 1-173 J-Field Phytoremediation Study, APG

Sample #	09703	Unit	$\mu\text{g/L}$
LabFile#	B2934	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

* the concentration is estimated
the response factor was assumed to be 1

00019

Table 1. 2 (Cont) Results of the TICs for VOC in Water
WA# 1-173 J-Field Phytoremediation Study, APG

Sample #	09704	Unit	$\mu\text{g/L}$
LabFile#	B2935	Con. Factor	1
Compound			
1	NO PEAKS FOUND	Q	RT
2			0
3			0
4			0
5			0
6			0
7			0
8			0
9			0
10			0
11			0
12			0
13			0
14			0
15			0
16			0
17			0
18			0
19			0
20			0

* the concentration is estimated
the response factor was assumed to be 1

00020

Table 1.2 (Cont) Results of the TICs for VOC in Water
WA# 1-173 J-Field Phytoremediation Study, APG

Sample #	Lab File#	LAB BLANK	B2960	Unit	Con. Factor	$\mu\text{g/L}$
						1
1		NO PEAKS FOUND				0
2						0
3						0
4						0
5						0
6						0
7						0
8						0
9						0
10						0
11						0
12						0
13						0
14						0
15						0
16						0
17						0
18						0
19						0
20						0

* the concentration is estimated
the response factor was assumed to be 1

00021

Table 1. 2 (Cont) Results of the TICs for VOC in Water
WA# 1-173 J-Field Phytoremediation Study, APG

Sample #	09711	Unit	$\mu\text{g/L}$
LabFile#	B2965	Con. Factor	1
1	UNKNOWN	Q	4.27
2	UNKNOWN		7.84
3	UNKNOWN		9.97
4	UNKNOWN PROPYL FURAN		11.74
5	UNKNOWN		13.65
6	UNKNOWN		13.89
7	UNKNOWN		16.87
8	UNKNOWN ESTER		17.03
9			0
10			0
11			0
12			0
13			0
14			0
15			0
16			0
17			0
18			0
19			0
20			0

* the concentration is estimated
the response factor was assumed to be 1

00022

Table 1.2 (Cont) Results of the TICs for VOC in Water
WA# 1-173 J-Field Phytoremediation Study, APG

Sample #	09705	Unit	$\mu\text{g/L}$
LabFile#	B2969	Con. Factor	100

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

* the concentration is estimated
the response factor was assumed to be 1

00023

**Table 1.3 Results of the Analysis for Metals in Water
WA # 1-173 J-Field Phytoremediation Study, APG**

Client ID Location	Method	Method Blank Lab		A09708 JFP-4		A09709 JFP-3		A09710 JFP-2		A09704 JFP-5		A09705 JFP-1	
		Conc µg/L	MDL ug/L	Conc µg/L	MDL ug/L	Conc µg/L	MDL ug/L	Conc µg/L	MDL ug/L	Conc µg/L	MDL ug/L	Conc µg/L	MDL ug/L
Aluminum	ICAP	U	50	U	50	U	50	U	50	55	50	U	50
Antimony	AA-Fur	U	22	U	22	U	22	U	22	39	22	33	22
Arsenic	AA-Fur	U	22	U	22	8.7	22	27	22	14	3.0	150	3.0
Barium	ICAP	U	3.0	7.9	3.0	18	3.0	19	3.0	U	2.0	U	2.0
Beryllium	ICAP	U	2.0	U	2.0	U	2.0	U	2.0	U	3.0	U	3.0
Cadmium	ICAP	U	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U	3.0
Calcium	ICAP	U	100	50000	100	110000	100	84000	100	22000	100	310000	100
Chromium	ICAP	U	5.0	U	5.0	6.9	5.0	U	5.0	U	5.0	U	5.0
Cobalt	ICAP	U	5.0	7.1	5.0	U	5.0	5.0	5.0	U	5.0	U	5.0
Copper	ICAP	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0
Iron	ICAP	U	25	U	25	U	25	U	25	3200	25	910	25
Lead	AA-Fur	U	22	U	22	U	22	U	22	U	22	U	22
Magnesium	ICAP	U	500	1100	500	6200	500	2000	500	3800	500	13000	500
Manganese	ICAP	U	2.0	U	2.0	18	2.0	3.1	2.0	97	2.0	1000	2.0
Mercury	Cold Vapor	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20
Nickel	ICAP	U	10	U	10	U	10	U	10	U	10	U	10
Potassium	ICAP	U	2000	U	2000	U	2000	U	2000	U	2000	U	2000
Selenium	AA-Fur	U	22	U	22	U	22	U	22	U	22	U	22
Silver	ICAP	U	5.0	5.5	5.0	U	5.0	U	5.0	U	5.0	U	5.0
Sodium	ICAP	U	500	2800	500	9100	500	9200	500	7900	500	77000	500
Thallium	AA-Fur	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2
Vanadium	ICAP	U	5.0	5.4	5.0	6	5.0	5.1	5.0	U	5.0	U	5.0
Zinc	ICAP	U	5.0	U	5.0	U	5.0	U	5.0	8.1	5.0	5.0	5.0

Table 1.4 Results of the Wet Chemistry Analysis in Water
WA # 1-173 J-Field Phytoremediation Study, APG

Sample ID	Location	N	MOL	TOX**	MDL	Chloride	MDL	N	MDL
		Ammonia	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Blank		U	0.10	U	0.050	U	1.0	NA	NA
H,E 09708	JFP-4	U	0.10	U	0.050	NR	NA	NR	NA
I,F 09708	JFP-4	NR	NA	NR	NA	1.5	1.0	0.12	0.11
E 09709	JFP-3	U	0.10	11	0.20	NR	NA	NR	NA
F 09709	JFP-3	NR	NA	NR	NA	8.9	1.0	2.3	0.11
E 09710	JFP-2	U	0.10	2.5	0.20	NR	NA	NR	NA
F 09710	JFP-2	NR	NA	NR	NA	4.0	1.0	2.7	0.11
E 09704	JFP-5	U	0.10	1.8	0.20	NR	NA	NR	NA
F 09704	JFP-5	NR	NA	NR	NA	14	1.0	U	0.11
E 09705	JFP-1	0.12	0.10	100	1.0	NR	NA	NR	NA
F 09705	JFP-1	NR	NA	NR	NA	440	10	0.31	0.11

** TOX denotes Total Organic Halides

QA/QC for VOC

Prior to analysis, each sample was spiked with a three component mixture of CLP surrogate standards consisting of toluene-d₆, 4-bromofluorobenzene and 1,2-dichloroethane-d₂. The surrogate percent recoveries, listed in Table 2.1, ranged from 84 to 106. Fifty out of fifty-one values were within the acceptable QC limits.

The internal standard areas (for bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-d₄) are also listed in Table 2.1. All fifty-one areas are within the acceptable QC limits.

Sample 09708 was chosen for the matrix spike/matrix spike duplicate (MS/MSD) analyses. The percent recoveries, ranging from 90 to 103, are listed in Table 2.2. All ten values were within the acceptable QC limits. The relative percent differences, also listed in Table 2.2, ranged from 0 (zero) to 6, and all five were within the acceptable QC limits.

The initial calibration is listed in Table 2.3.

The continuing calibrations are listed in Table 2.4.

Table 2.1 Results of the Internal Standard Areas and Surrogate Recoveries for VOC in Water
WA # 1-173 J-Field Phytoremediation Study, APG

Sample #	Data File	Internal Standards			Surrogates		
		1 area	2 area	3 area	DIC %	TOL %	BRO %
CAL CHECK	50 PPB VOC	>82926	63089	321559	272680	NA	NA
LAB BLANK		>82928	67850	342543	299712	89	99
09708		>82929	66252	342747	280463	85	101
09709		>82930	56754	298664	269502	94	95
09710		>82931	57863	297931	252113	96	100
09712		>82933	51913	276838	231546	92	100
09703		>82934	49642	264861	224203	101	99
09704		>82935	48997	258196	217894	94	100
CAL CHECK	50 PPB VOC	>82944	53232	268998	227990	NA	NA
LAB BLANK		>82946	51471	257871	221178	90	98
09708MS		>82951	42756	226052	193635	106	98
09708MSD		>82952	42656	228808	193329	104	98
CAL CHECK	50 PPB VOC	>82958	46382	243915	217799	NA	NA
LAB BLANK		>82960	46303	244837	219011	93	98
(1:1000DL) 09705		>82961	45704	242047	215692	93	99
(1:1000IL) 09709		>82962	49910	265835	233411	91	100
(1:10 DIL) 09710		>82963	52054	275772	232170	86	101
(1:100IL) 09704		>82964	53874	275367	231144	88	102
09711		>82965	51591	276730	235339	88	100
09705		>82969	42945	226270	199462	92	100

SURROGATE LIMITS WATER

S1 (DIC) = 1,2-Dichloroethane-d4 (76-114)
 S2 (TOL) = Toluene-d8 (88-110)
 S3 (BRO) = Bromofluorobenzene (86-115)

Table 2.2 Results of MS/MSD Analysis for VOC in Water
WA # 1-173 J-Field Phytoremediation Study, APG

Sample ID: 09708

Compound Name	Sample	MS	MSD	MS	MSD	MS	MSD	QC Limits			
	Conc. ($\mu\text{g/L}$)	Spike Added	Spike Added					% Rec	% Rec	RPD	RPD
1,1-Dichloroethane	U	50	50	51.1	51.3	102	103	0	14	61 -	145
Trichloroethene	U	50	50	47.7	45.0	95	90	6	14	71 -	120
Benzene	U	50	50	51.0	49.1	102	98	4	11	76 -	127
Toluene	U	50	50	49.2	48.5	98	97	1	13	76 -	125
Chlorobenzene	U	50	50	49.7	48.9	99	98	2	13	75 -	130

Table 2.3 Results of the Initial Calibration for VOC in Water
WA # 1-173 J-Field Phytoremediation Study, APG

Instrument ID: GCMSD-2(3034A12982)
Calibration Date: 01/08/97

Minimum \overline{RF} for SPCC is 0.30

Maximum % RSD for CCC is 30.0%

Compound	Laboratory ID: >82536 >82538 >82539 >82540 >82541 >82542						\overline{RRT}	\overline{RF}	% RSD	CCC	SPCC
	RF 5.00	RF 20.00	RF 50.00	RF 100.00	RF 150.00	RF 200.00					
Dichlorodifluoromethane	3.92877	3.60551	3.92319	3.56567	3.71799	3.71926	.238	3.74336	4.114		
Chloromethane	1.14768	1.17714	1.20760	1.13383	1.13997	1.15018	.270	1.15940	2.406	**	
Vinyl Chloride	1.47566	1.37903	1.49402	1.35275	1.37972	1.37511	.286	1.40938	4.226	*	
Bromomethane	1.31109	1.38199	1.45471	1.44032	1.50297	1.50559	.353	1.43278	5.237		
Chloroethane	.96177	.91251	.96228	.90198	.92719	.92109	.373	.93114	2.726		
Trichlorofluoromethane	6.25331	5.80025	6.20526	5.78026	5.98860	6.02620	.434	6.00898	3.285		
Acetone	.55308	.50216	.48294	.50002	.45952	.49419	.531	.49865	6.197		
1,1-Dichloroethene	1.80014	1.71107	1.76712	1.67613	1.71074	1.72238	.561	1.73126	2.580	*	
Carbon Disulfide	4.14053	4.07043	4.24562	4.07068	4.14372	4.18128	.633	4.14204	1.619		
Methylene Chloride	1.82499	1.74703	1.78514	1.69500	1.71485	1.70727	.662	1.74571	2.903		
trans-1,2-Dichloroethene	1.97039	1.85466	1.93290	1.87013	1.89686	1.88972	.736	1.90244	2.238		
Methyl-tertiary-butylether	5.60502	5.28316	5.24495	5.18306	5.22203	5.31496	.733	5.30900	2.866		
1,1-Dichloroethane	3.62046	3.63774	3.75553	3.59966	3.63902	3.66773	.823	3.65002	1.492	**	
2-Butanone	.68347	.66854	.65477	.68395	.62370	.65704	.921	.66191	3.398		
2,2-Dichloropropane	4.17871	4.00586	4.22189	4.07689	4.12408	4.19797	.947	4.13423	1.963		
cis-1,2-Dichloroethene	2.07693	2.05234	2.09028	2.04561	2.02901	2.03537	.947	2.05459	1.151		
Chloroform	4.99258	4.91148	5.08919	4.93806	4.92566	4.97663	.982	4.97193	1.307	*	
1,1-Dichloropropene	3.28965	3.15415	3.34744	3.23311	3.22718	3.23840	1.101	3.24832	2.003		
1,2-Dichloroethane	3.32133	3.16871	3.26715	3.20812	3.17881	3.19653	1.134	3.22344	1.832		
1,2-Dichloroethane-d4 (SURR)	2.09898	2.15392	2.28420	2.12727	2.11180	2.13527	1.116	2.15191	3.138		(Conc=50.0, 50.
1,1,1-Trichloroethane	.90562	.90472	.95223	.91321	.95759	.96209	.875	.93254	2.945		
Carbon Tetrachloride	.87709	.87490	.93290	.91715	.95053	.95078	.916	.91722	3.740		
Benzene	1.01270	.99962	1.02262	.99789	1.00770	1.00051	.937	1.00684	.949		
Trichloroethene	.51443	.50356	.50360	.50032	.49649	.49004	1.045	.50107	1.685		
1,2-Dichloropropane	.40731	.40430	.41185	.40428	.41473	.40942	1.068	.40865	1.024	*	
Dibromomethane	.44472	.45340	.43511	.44578	.43295	.42605	1.097	.43934	2.410		
Bromodichloromethane	.90491	.91663	.95903	.93413	.95097	.96290	1.100	.93476	2.212		
cis-1,3-Dichloropropene	.65365	.62897	.66680	.66406	.68008	.68386	1.199	.66290	3.008		
trans-1,3-Dichloropropene	.56630	.56579	.60359	.61902	.62854	.63522	1.283	.60274	5.156		
1,1,2-Trichloroethane	.33955	.33911	.34809	.34436	.34298	.34687	1.303	.34349	1.076		

RF - Response Factor (Subscript is amount in ppb)

RRT - Average Relative Retention Time (RT Std/RT Istd)

\overline{RF} - Average Response Factor

%RSD - Percent Relative Standard Deviation

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

**Table 2.3 (Cont) Results of the Initial Calibration for VOC in Water
WA # 1-173 J-Field Phytoremediation Study, APG**

Instrument ID: GCMSD-2(3034A12982)
Calibration Date: 01/08/97

Minimum \overline{RF} for SPCC is 0.30 Maximum % RSD for CCC is 30.0%

Compound	Laboratory ID: >B2536 >B2538 >B2539 >B2540 >B2541 >B2542						RRT	\overline{RF}	% RSD	CCC	SPCC
	RF 5.00	RF 20.00	RF 50.00	RF 100.00	RF 150.00	RF 200.00					
1,3-Dichloropropane	.64299	.61744	.64441	.63762	.63164	.64112	1.347	.63587	1.591		
Dibromo-chloromethane	.78440	.75431	.80576	.81671	.81625	.81153	1.376	.79783	3.044		
1,2-Dibromoethane	.63333	.60433	.60884	.61784	.60947	.62099	1.409	.61580	1.716		
Bromoform	.55391	.55789	.58515	.61379	.60577	.61284	1.635	.58823	4.609	**	
4-Methyl-2-Pentanone	.36151	.37311	.37091	.39818	.37281	.39807	.796	.37910	4.045		
Toluene-d8 (SURR)	1.10456	1.14150	1.12702	1.14049	1.16233	1.14652	.835	1.13707	1.722		(Conc=50.0,50)
Toluene	.86262	.84649	.84211	.83960	.85117	.83833	.844	.84672	1.076	*	
2-Hexanone	.24290	.27532	.26654	.28585	.26795	.27929	.894	.26964	5.541		
Tetrachloroethene	.71185	.70307	.68139	.68551	.67886	.66113	.918	.68697	2.640		
Chlorobenzene	1.15536	1.13286	1.14833	1.13376	1.16724	1.12564	1.004	1.14053	1.002	**	
1,1,1,2-Tetrachloroethane	.66488	.66204	.67503	.67952	.68331	.66632	1.012	.67185	1.290		
Ethylbenzene	1.96123	1.91838	1.92952	1.89581	1.91036	1.72869	1.020	1.89067	4.355	*	(Conc=10.0,40)
p & m-Xylene	1.64414	1.57854	1.62171	1.51842	1.31845	1.12250	1.031	1.46729	14.005		
α -Xylene	1.65226	1.60285	1.62685	1.58887	1.62116	1.58431	1.078	1.61271	1.595		
Styrene	.71631	.71999	.75736	.73898	.75422	.74453	1.080	.73856	2.325		
Isopropylbenzene	1.98104	1.86816	1.92706	1.86828	1.92067	1.78315	1.127	1.89136	3.582		
1,1,2,2-Tetrachloroethane	.67217	.67884	.68618	.69337	.69160	.69758	1.137	.68662	1.397	**	
p-Bromofluorobenzene (SURR)	.64002	.62320	.61803	.63501	.63468	.62433	1.145	.62921	1.359		(Conc=50.0,50)
1,2,3-Trichloropropane	.21820	.22260	.21634	.22114	.21813	.22329	1.152	.21962	1.534		
Bromobenzene	.70672	.67393	.67262	.67978	.67260	.66405	1.161	.67825	2.186		
n-Propylbenzene	.53955	.50202	.52145	.50471	.51426	.51000	1.175	.51533	2.666		
2-Chlorotoluene	.48039	.44253	.48531	.49086	.48424	.46531	1.185	.47478	3.791		
4-Chlorotoluene	.52527	.50308	.47679	.47042	.48019	.48321	1.193	.48983	4.200		
1,3,5-Trimethylbenzene	1.93774	1.79634	1.84065	1.78030	1.80136	1.68715	1.196	1.80692	4.530		
tert-Butylbenzene	1.97523	1.77991	1.83361	1.79503	1.82062	1.79826	1.238	1.83378	3.921		
1,2,4-Trimethylbenzene	1.91830	1.76625	1.83849	1.77263	1.80470	1.68297	1.241	1.79723	4.384		
sec-Butylbenzene	2.60140	2.34471	2.43219	2.35210	2.32792	2.03601	1.265	2.34906	7.828		
1,3-Dichlorobenzene	1.19953	1.08202	1.11603	1.10371	1.11160	1.11918	1.278	1.12201	3.586		
p-Isopropyltoluene	2.14888	1.95110	2.04608	1.98485	2.00107	1.81522	1.285	1.99120	5.528		
1,4-Dichlorobenzene	1.30772	1.17807	1.19256	1.18265	1.19559	1.16524	1.291	1.20364	4.331		
1,2-Dichlorobenzene	1.14622	1.07993	1.09228	1.08126	1.07845	1.06547	1.332	1.09060	2.618		
n-Butylbenzene	2.07957	1.89757	1.99611	1.88613	1.92325	1.75444	1.335	1.92285	5.710		
1,2-Dibromo-3-Chloropropane	.18698	.17971	.18647	.20628	.19697	.20888	1.425	.19422	6.053		
1,2,4-Trichlorobenzene	.87649	.80183	.88087	.88433	.90137	.91369	1.537	.87643	4.465		
Naphthalene	1.07815	1.02966	1.21640	1.21065	1.27410	1.30372	1.556	1.18545	9.181		
Hexachlorobutadiene	.82868	.69496	.70815	.68342	.68848	.70161	1.563	.71755	7.687		
1,2,3-Trichlorobenzene	.83489	.71858	.81615	.80223	.81882	.82968	1.586	.80339	5.362		

RF - Response Factor (Subscript is amount in ppb)

RRT - Average Relative Retention Time (RT Std/RT Istd)

RF - Average Response Factor

%RSD - Percent Relative Standard Deviation

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

Table 2.4 Results of the Continuing Calibration for VOC in Water
WA # 1-173 J-Field Phytoremediation Study, APG

Calibration Date: 02/24/97

Time: 14:17

Instrument ID: GCMSD-2(3034A12982)

Initial Calibration Date: 01/08/97

Minimum RF for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	RF	RF	%Diff	CCC	SPCC
Dichlorodifluoromethane	3.74336	3.52584	5.81		
Chloromethane	1.15940	1.23028	6.11	**	
Vinyl Chloride	1.40938	1.49012	5.73	*	
Bromomethane	1.43278	1.45602	1.42		
Chloroethane	.93114	.96350	3.48		
Trichlorodifluoromethane	6.00898	5.60286	6.76		
Acetone	.49865	.60865	22.06		
1,1-Dichloroethene	1.73126	1.68188	2.85	*	
Carbon Disulfide	4.14204	4.30390	3.91		
Methylene Chloride	1.74571	1.74476	.05		
trans-1,2-Dichloroethene	1.90264	1.84254	3.15		
Methyl-tertiary-butylether	5.30900	4.96914	6.40		
1,1-Dichloroethane	3.65002	3.71439	1.76	**	
2-Butanone	.66191	.76874	13.12		
2,2-Dichloropropane	4.13623	3.73453	9.67		
cis-1,2-Dichloroethene	2.05459	1.99834	2.74		
Chloroform	4.97193	4.90753	1.30	*	
1,1-Dichloropropene	3.24832	3.17753	2.18		
1,2-Dichloroethane	3.22344	3.16735	1.74		
1,2-Dichloroethane-d4 (SURR)	2.15191	2.21803	3.07		
1,1,1-Trichloroethane	.95254	.89669	3.84		
Carbon Tetrachloride	.91722	.85797	6.46		
Benzene	1.00684	1.06437	5.71		
Trichloroethene	.50107	.49933	.35		
1,2-Dichloropropene	.40865	.43138	5.56	*	
Dibromomethane	.43934	.44854	2.09		
Bromodichloromethane	.93476	.97669	4.69		
cis-1,3-Dichloropropene	.66290	.66026	.40		(Conc=50.00)
trans-1,3-Dichloropropene	.60274	.59582	1.15		(Conc=50.00)
1,1,2-Trichloroethane	.36349	.35714	3.97		
1,3-Dichloropropene	.63587	.65795	3.67		
Dibromochloromethane	.79783	.78698	1.36		

RF - Response Factor from daily standard file at 50.00 ppb

RF - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

**Table 2.4 (Cont) Results of the Continuing Calibration for VOC in Water
WA # 1-173 J-Field Phytoremediation Study, APG**

Calibration Date: 02/24/97

Time: 14:17

Instrument ID: GCMSD-2(3034A12982)

Initial Calibration Date: 01/08/97

Minimum \overline{RF} for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	\overline{RF}	RF	%Diff	CCC	SPCC
1,2-Dibromoethane	.61580	.62433	1.39		
Bromoform	.58823	.58849	.05	**	
4-Methyl-2-Pentanone	.37910	.42255	11.46		
Toluene-d8 (SURR)	1.13707	1.14275	.50	*	
Toluene	.84672	.85350	.80	*	
2-Hexanone	.26964	.31962	18.53		
Tetrachloroethene	.68697	.67568	1.64		
Chlorobenzene	1.14053	1.10999	2.68	**	
1,1,1,2-Tetrachloroethane	.67185	.66907	.41		
Ethylbenzene	1.89067	1.92787	1.97	*	
p & m-Xylene	1.46729	1.59770	8.89		(Conc=100.00)
o-Xylene	1.61271	1.61683	.26		
Styrene	.73856	.73724	.18		
Isopropylbenzene	1.89136	1.85446	1.95		
1,1,2,2-Tetrachloroethane	.68662	.71988	4.84		
p-Bromofluorobenzene (SURR)	.62921	.62027	1.42		
1,2,3-Trichloropropene	.21962	.22384	1.93		
Bromobenzene	.67825	.66741	1.60		
n-Propylbenzene	.51533	.49375	4.19		
2-Chlorotoluene	.47478	.46824	1.38		
4-Chlorotoluene	.48983	.46720	4.62		
1,3,5-Trimethylbenzene	1.80692	1.75213	3.03		
tert-Butylbenzene	1.83378	1.74035	5.09		
1,2,4-Trimethylbenzene	1.79723	1.73510	3.46		
sec-Butylbenzene	2.34906	2.34986	.03		
1,3-Dichlorobenzene	1.12201	1.09305	2.58		
p-Isopropyltoluene	1.99120	1.92064	3.54		
1,4-Dichlorobenzene	1.20364	1.15491	4.05		
1,2-Dichlorobenzene	1.09060	1.07942	1.03		
n-Butylbenzene	1.92285	1.94876	1.35		
1,2-Dibromo-3-Chloropropane	.19422	.19805	1.97		
1,2,4-Trichlorobenzene	.87643	.86297	1.54		
Naphthalene	1.18545	1.15491	2.58		
Hexachlorobutadiene	.71755	.65548	8.65		
1,2,3-Trichlorobenzene	.80339	.80805	.58		

RF - Response Factor from daily standard file at 50.00 ppb

\overline{RF} - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

**Table 2.4 (Cont) Results of the Continuing Calibration for VOC in Water
WA # 1-173 J-Field Phytoremediation Study, APG**

Calibration Date: 02/25/97

Time: 12:04

Instrument ID: GCXRD-2(3034A12982)

Initial Calibration Date: 01/08/97

Minimum RF for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	RF	RF	%Diff	CCC	SPCC
Dichlorodifluoromethane	3.74336	3.39593	9.28		
Chloromethane	1.15940	1.25773	6.76	**	
Vinyl Chloride	1.40938	1.46382	3.86	*	
Bromomethane	1.43278	1.25956	12.09		
Chloroethane	.93114	.98103	5.36		
Trichlorodifluoromethane	6.00898	5.42548	9.71		
Acetone	.49865	.49748	.23		
1,1-Dichloroethene	1.73126	1.66670	3.73	*	
Carbon Disulfide	4.14204	4.10452	.91		
Methylene Chloride	1.74571	1.75543	.56		
trans-1,2-Dichloroethene	1.90264	1.87199	1.60		
Methyl-tertiary-butylether	5.30900	4.43139	16.53		
1,1-Dichloroethane	3.65002	3.62119	.79	**	
2-Butanone	.66191	.62239	5.97		
2,2-Dichloropropane	4.13423	3.38629	18.09		
cis-1,2-Dichloroethene	2.05459	1.99767	2.77		
Chloroform	4.97193	4.85700	2.31	*	
1,1-Dichloropropene	3.24832	3.12953	3.66		
1,2-Dichloroethane	3.22344	3.05758	5.15		
1,2-Dichloroethane-d4 (SURR)	2.15191	2.12633	1.19		
1,1,1-Trichloroethane	.95254	.87730	5.92		
Carbon Tetrachloride	.91722	.83076	9.43		
Benzene	1.00684	1.05120	4.61		
Trichloroethene	.50107	.51527	2.83		
1,2-Dichloropropane	.40865	.42445	3.87	*	
Dibromomethane	.43934	.44874	2.14		
Bromodichloromethane	.93476	.97348	4.14		
cis-1,3-Dichloropropene	.66290	.63737	3.85		(Conc=50.00)
trans-1,3-Dichloropropene	.60274	.52817	12.37		(Conc=50.00)
1,1,2-Trichloroethane	.34349	.33830	1.51		
1,3-Dichloropropane	.63587	.63131	.72		
Dibromo-chloromethane	.79783	.78301	1.86		

RF - Response Factor from daily standard file at 50.00 ppb

RF - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

Table 2.4 (Cont) Results of the Continuing Calibration for VOC in Water
WA # 1-173 J-Field Phytoremediation Study, APG

Calibration Date: 02/25/97

Time: 12:04

Instrument ID: GCMSD-2(3034A12982)

Initial Calibration Date: 01/08/97

Minimum RF for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	RF	RF	%Diff	CCC	SPCC
1,2-Dibromoethane	.61580	.58200	5.49		
Bromoform	.58823	.56196	7.87	**	
4-Methyl-2-Pentanone	.37910	.34434	9.17		
Toluene-d8 (SURR)	1.13707	1.14755	.92		
Toluene	.84672	.86476	2.13	*	
2-Hexanone	.26964	.25489	5.67		
Tetrachloroethene	.68697	.71193	3.63		
Chlorobenzene	1.14053	1.14136	.07	**	
1,1,1,2-Tetrachloroethene	.67185	.65829	2.02		
Ethylbenzene	1.89067	1.96120	2.67	*	
p & m-Xylene	1.46729	1.60672	9.37		(Conc=100.00)
o-Xylene	1.61271	1.61703	.27		
Styrene	.73856	.72747	1.50		
Isopropylbenzene	1.89136	1.89640	.27		
1,1,2,2-Tetrachloroethane	.68662	.75458	9.90	**	
p-Bromofluorobenzene (SURR)	.62921	.62258	1.05		
1,2,3-Trichloropropane	.21962	.19666	10.45		
Bromobenzene	.67825	.68930	1.63		
n-Propylbenzene	.51533	.51261	.53		
2-Chlorotoluene	.47678	.47770	.62		
4-Chlorotoluene	.48983	.49243	.53		
1,3,5-Trimethylbenzene	1.80692	1.75962	2.62		
tert-Butylbenzene	1.83378	1.78482	2.67		
1,2,4-Trimethylbenzene	1.79723	1.77709	1.12		
sec-Butylbenzene	2.34906	2.36926	.86		
1,3-Dichlorobenzene	1.12201	1.13633	1.28		
p-Isopropyltoluene	1.99120	1.98429	.35		
1,4-Dichlorobenzene	1.20364	1.19943	.35		
1,2-Dichlorobenzene	1.09060	1.10371	1.20		
n-Butylbenzene	1.92285	1.97519	2.72		
1,2-Dibromo-3-Chloropropane	.19422	.16208	16.55		
1,2,4-Trichlorobenzene	.87643	.87578	.07		
Naphthalene	1.18545	1.09529	7.61		
Hexachlorobutadiene	.71755	.61397	14.43		
1,2,3-Trichlorobenzene	.80339	.78885	1.81		

RF - Response Factor from daily standard file at 50.00 ppb

RF - Average Response Factor from Initial Calibration Form VI

%diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

Table 2.4 (Cont) Results of the Continuing Calibration for VOC in Water
WA # 1-173 J-Field Phytoremediation Study, APG

Calibration Date: 02/26/97

Time: 11:28

Instrument ID: GC80D-2(3034A12982)

Initial Calibration Date: 01/08/97

Minimum RF for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	RF	RF	%Diff	CCC	SPCC
Dichlorodifluoromethane	3.76336	3.44869	7.87		
Chloromethane	1.15940	1.25016	7.83	**	
Vinyl Chloride	1.40958	1.51583	7.55	*	
Bromomethane	1.43278	1.54715	7.98		
Chloroethane	.93114	1.00268	7.66		
Trichlorofluoromethane	6.00096	5.64534	6.05		
Acetone	.49865	.58493	17.30		
1,1-Dichloroethene	1.73126	1.71338	1.03	*	
Carbon Disulfide	4.14204	4.37709	5.67		
Methylene Chloride	1.74571	1.76489	1.10		
trans-1,2-Dichloroethene	1.90244	1.92775	1.33		
Methyl-tertiary-butylether	5.30900	4.80345	9.52		
1,1-Dichloroethane	3.65002	3.79710	4.03	**	
2-Butanone	.66191	.73822	11.53		
2,2-Dichloropropene	4.13423	3.69516	10.62		
cis-1,2-Dichloroethene	2.05459	2.02285	1.54		
Chloform	4.97193	5.05390	1.65	*	
1,1-Dichloropropene	3.24832	3.33470	2.66		
1,2-Dichloroethane	3.22344	3.32416	3.12		
1,2-Dichloroethane-d4 (SURR)	2.15191	2.29041	6.44		
1,1,1-Trichloroethane	.93254	.90254	3.22		
Carbon Tetrachloride	.91722	.87018	5.13		
Benzene	1.00684	1.07966	7.23		
Trichloroethene	.50107	.51071	1.92		
1,2-Dichloropropene	.40865	.44281	8.36	*	
Dibromomethane	.43934	.46014	4.73		
Bromodichloromethane	.93476	1.01015	8.07		
cis-1,3-Dichloropropene	.66290	.68263	2.98		(Conc=50.00)
trans-1,3-Dichloropropene	.60274	.60996	1.20		(Conc=50.00)
1,1,2-Trichloroethane	.34349	.37349	8.73		
1,3-Dichloropropane	.63587	.68648	7.96		
Dibromo-chloromethane	.79783	.81024	1.56		

RF - Response Factor from daily standard file at 50.00 ppb

RF - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

Table 2.4 (Cont) Results of the Continuing Calibration for VOC in Water
WA # 1-173 J-Field Phytoremediation Study, APG

Calibration Date: 02/26/97
Time: 11:28
Instrument ID: GCNED-2(3034A12982)

Initial Calibration Date: 01/08/97

Minimum \overline{RF} for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	\overline{RF}	RF	%Diff	CCC	SPCC
1,2-Dibromoethane	.61580	.64089	4.07		
Bromoform	.58823	.64222	9.18	**	
4-Methyl-2-Pentanone	.37910	.40729	7.44		
Toluene-d8 (SURR)	1.13707	1.12760	.83	*	
Toluene	.84672	.85472	.94	*	
2-Hexanone	.26964	.30308	12.40		
Tetrachloroethene	.68697	.71226	3.68		
Chlorobenzene	1.14053	1.14427	.33	**	
1,1,1,2-Tetrachloroethane	.67185	.67900	1.06		
Ethylbenzene	1.89067	1.99895	5.73	*	
p & m-Xylene	1.46729	1.64507	12.12		(Conc=100.00)
o-Xylene	1.61271	1.67544	3.89		
Styrene	.73856	.75417	2.11		
Isopropylbenzene	1.89136	1.96087	3.68		
1,1,2,2-Tetrachloroethane	.68662	.77004	12.15	**	
p-Bromofluorobenzene (SURR)	.62921	.64768	2.94		
1,2,3-Trichloropropane	.21962	.22357	1.80		
Bromobenzene	.67825	.71623	5.60		
n-Propylbenzene	.51533	.53939	4.67		
2-Chlorotoluene	.67678	.51547	8.57		
4-Chlorotoluene	.48983	.50697	3.50		
1,3,5-Trimethylbenzene	1.80692	1.87999	4.04		
tert-Butylbenzene	1.83378	1.90864	4.08		
1,2,4-Trimethylbenzene	1.79723	1.89290	5.32		
sec-Butylbenzene	2.34906	2.53291	7.83		
1,3-Dichlorobenzene	1.12201	1.19875	6.84		
p-Isopropyltoluene	1.99120	2.11499	6.22		
1,4-Dichlorobenzene	1.20364	1.31768	9.48		
1,2-Dichlorobenzene	1.09060	1.19304	9.39		
n-Butylbenzene	1.92285	2.08179	8.27		
1,2-Dibromo-3-Chloropropane	.19422	.20846	7.34		
1,2,4-Trichlorobenzene	.87643	.96933	10.60		
Naphthalene	1.18545	1.22675	3.48		
Hexachlorobutadiene	.71755	.70783	1.35		
1,2,3-Trichlorobenzene	.80339	.90294	12.39		

\overline{RF} - Response factor from daily standard file at 50.00 ppb

\overline{RF} - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

QA/QC for Metals

QC standards QC-7x100, QC-21x100, ERA-431, TMMA #1 and TMMA #2 were used to check the accuracy of the calibration curve. The percent recoveries ranged from 95 to 108 and all recoveries were within the 95% confidence limits. The recoveries are listed in Table 2.5. The 95% confidence limits for 17 values are not available.

Sample A 09708 was chosen for matrix spike/matrix spike duplicate (MS/MSD) analyses. The percent recoveries, listed in Table 2.6, ranged from 82 to 106 and all thirty-eight values were within the acceptable QC limits. The relative percent differences (RPDs), also listed in Table 2.6 ranged from 0 (zero) to 3 and all nineteen values were within the acceptable QC limits.

The results of the spike blank analysis are reported in Table 2.7. The percent recoveries ranged from 94 to 108 and all twenty-three values were within the acceptable QC limits.

**Table 2.5 Results of the Analysis of the QC Standard for Metals in Water
WA # 1-173 J-Field Phytoremediation Study, APG**

Metal	Date Analyzed	Quality Control Standard	Conc. Rec µg/L	True Value µg/L	95% Confidence Interval	% Rec
Aluminum	03/06/97 03/06/97	QC-7 x100 ERA-431	1023 444	1000 441	NA 362 - 520	102 101
Antimony	02/28/97	TMMA #2	102	100	81.95 - 125.67	102
Arsenic	02/28/97	TMMA #1	50.1	50	41.9-55.9	100
Barium	03/06/97 03/06/97	QC-7 x100 ERA-431	985 397	1000 406	NA 333 - 479	98 98
Beryllium	03/06/97 03/06/97	QC-21 x100 ERA-431	1021 105	1000 103	NA 85 - 122	102 102
Cadmium	03/06/97 03/06/97	QC-21 x100 ERA-431	1027 81	1000 82	NA 67 - 97	103 98
Calcium	03/06/97	QC-21 x100	1072	1000	NA	107
Chromium	03/06/97 03/06/97	QC-21 x100 ERA-431	1049 543	1000 529	NA 434 - 624	105 103
Cobalt	03/06/97 03/06/97	QC-21 x100 ERA-431	1046 457	1000 447	NA 367 - 527	105 104
Copper	03/06/97 03/06/97	QC-21 x100 ERA-431	1015 210	1000 208	NA 171 - 245	102 101
Iron	03/06/97 03/06/97	QC-21 x100 ERA-431	1047 701	1000 676	NA 554 - 798	105 104
Lead	02/27/97	TMMA #1	53.7	50	43.4 - 56.3	107
Magnesium	03/06/97	QC-21 x100	1068	1000	NA	107
Manganese	03/06/97 03/06/97	QC-21 x100 ERA-431	1042 528	1000 518	NA 425 - 611	104 102
Mercury	02/26/97	TMMA #1	1.9	2.00	1.40-2.48	95
Nickel	03/06/97 03/06/97	QC-21 x100 ERA-431	1061 100	1000 94	NA 77 - 111	106 106
Potassium	03/06/97	QC-7 x100	10750	10000	NA	106
Selenium	02/28/97	TMMA #1	50.9	50	39.4-57.4	102
Silver	03/06/97 03/06/97	QC-7 x100 ERA-431	1018 64	1000 65	NA 53 - 76	102 98
Sodium	03/06/97	QC-7 x100	1004	1000	NA	100
Thallium	03/06/97	TMMA #2	52.7	50	39.9-57.97	105
Vanadium	03/06/97 03/06/97	QC-21 x100 ERA-431	1002 334	1000 338	NA 277 - 399	100 99
Zinc	03/06/97 03/06/97	QC-21 x100 ERA-431	1025 433	1000 424	NA 348 - 500	103 102

**Table 2.6 Results of the MS/MSD Analysis for Metals In Water
WA # 1-173 J-Field Phytoremediation Study, APG**

Metal	Client #	Sample Conc. µg/L	Original Conc. Spikes µg/L	Dup µg/L	Recovered Conc. Spikes µg/L	Dup µg/L	% Recovery Spikes Dup	RPD	Recommended Limit % Rec	RPD
Aluminum	A09708	18.7	2222	2222	2159	2183	98 98	1	75-125	20
Antimony	A09708	1.3	55.6	55.6	49.3	48.9	98 95	1	75-125	20
Arsenic	A09708	0.4	55.6	55.6	52.8	53.8	94 96	2	75-125	20
Barium	A09708	7.9	556	556	550	556	98 99	1	75-125	20
Beryllium	A09708	0.2	222	222	225	228	101 103	1	75-125	20
Cadmium	A09708	0.6	222	222	218	220	98 99	1	75-125	20
Chromium	A09708	4.4	222	222	227	232	100 102	2	75-125	20
Cobalt	A09708	7.1	222	222	228	233	98 102	2	75-125	20
Copper	A09708	3.1	222	222	221	225	98 100	2	75-125	20
Iron	A09708	6.6	2222	2222	2258	2293	101 103	2	75-125	20
Lead	A09708	0	55.6	55.6	51.7	52	93 94	1	75-125	20
Manganese	A09708	1.4	222	222	223	227	100 102	2	75-125	20
Mercury	A09708	0	2.00	2.00	1.9	1.9	95 95	0	75-125	20
Nickel	A09708	1.1	222	222	229	230	103 103	0	75-125	20
Selenium	A09708	1.4	55.6	55.6	48.1	47.1	84 82	2	75-125	20
Silver	A09708	5.5	222	222	216	222	95 97	3	75-125	20
Thallium	A09708	1	55.6	55.6	59.1	60	105 106	2	75-125	20
Vanadium	A09708	5.4	556	556	555	565	99 101	2	75-125	20
Zinc	A09708	2.5	222	222	221	223	98 99	1	75-125	20

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Table 2.7 Results of the Blank Spike Analysis for Metals in Water
WA # 1-173 J-Field Phytoremediation Study, APG

Metal	Spike Conc µg/L	Recovered Conc µg/L	% Rec	Recommended Limit
Aluminum	2222	2117	95	75-125
Antimony	55.6	52.4	94	75-125
Arsenic	55.6	58.6	105	75-125
Barium	556	535	96	75-125
Beryllium	222	220	99	75-125
Cadmium	222	213	96	75-125
Calcium	2222	2216	100	75-125
Chromium	222	223	100	75-125
Cobalt	222	223	100	75-125
Copper	222	218	98	75-125
Iron	2222	2238	101	75-125
Lead	55.6	55.6	100	75-125
Magnesium	2222	2156	97	75-125
Manganese	222	220	99	75-125
Mercury	2.00	1.9	95	75-125
Nickel	222	224	101	75-125
Potassium	2222	2126	96	75-125
Selenium	55.6	60.2	108	75-125
Silver	222	213	96	75-125
Sodium	2222	2100	95	75-125
Thallium	55.6	59.9	108	75-125
Vanadium	556	548	99	75-125
Zinc	222	216	97	75-125

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QA/QC for Wet Chemistry

Samples I,F 09708 and H,E 09708 were chosen for the matrix spike (MS) analyses. The percent recoveries, listed in Table 2.8, ranged from 90 to 110. All four percent recoveries were within the acceptable QC limits.

Samples I,F 09708 and H,E 09708 were also chosen for the duplicate analyses. The relative percent differences (RPDs), listed in Table 2.9, ranged from 9 to 12. One out of two values was within the acceptable QC limits. Two RPDs were not calculated because the analyte was not detected in either analysis.

Table 2.8 Results of the Matrix Spike Analysis
for the Wet Chemistry Analysis in Water
WA # 1-173 J-Field Phytoremediation Study, APG

Analyte	Sample ID	Sample Conc mg/L	Spike Conc mg/L	Rec Conc mg/L	% Rec	QC Limit % Rec
Chloride	I,F 09708	1.5	40.0	42.6	103	74-119
Nitrogen, Ammonia	H,E 09708	U	1.00	1.1	110	65-129
Nitrogen, Nitrate+Nitrite	I,F 09708	0.12	1.00	1.2	108	65-136
Total Organic Halides	H,E 09708	U	0.500	0.45	80	75-125

Table 2.9 Results of the Duplicate Analysis in Water
WA # 1-173 J-Field Phytoremediation Study, APG

Analyte	Sample ID	Initial Analysis mg/L	Duplicate Analysis mg/L	RPD	QC Limits RPD
Chloride	I,F 09708	1.5	1.7	12%	0-0
Nitrogen, Ammonia	H,E 09708	U	U	NC	0-34
Nitrogen, Nitrate+Nitrite	I,F 09708	0.12	0.11	9	0-13
Total Organic Halides	H,E 09708	U	U	NC	0-20

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Roy F. Weston, Inc.
GSA Raritan Depot
Building 209 Annex (Bay F)
2800 Woodbridge Avenue
Edison, New Jersey 08837-3679
908-321-4200 • Fax 908-494-4021

Accutest Labs
Fresh Ponds Corp Village, Bldg B
2235 Route 130
Dayton, NJ 08810

Attn: Nancy DeFiccio

19 February 1997

Project # 3347-041-001-1173 J Field

As per Weston REAC Purchase Order number 76096, please analyze samples according to the following parameters:

Analysis/Method	Matrix	# of samples
TOX/SW-846-9020	Water	7
Nitrate/EPA 353.2	Water	7
Ammonia/EPA 350	Water	7
Chloride/EPA 325.3	Water	7
Data package: see attached Deliverables Requirements		

Samples are expected to arrive at your laboratory on February 22, 1997. All applicable QA/QC.(MS/MSD) analysis as per method, will be performed on our sample matrix. Preliminary sample and MS/MSD result tables plus a signed copy of our Chain of Custody must be faxed to REAC 10 business days after receipt of the last samples. The complete data package is due 21 business days after receipt of last batch of samples. The complete data package must include all items on the deliverables checklist.

Please submit all reports and technical questions concerning this project to John Johnson at (908) 321-4248 or fax to (908) 494-4020. Any contractual question, please call Cynthia Davison at (908) 321-4296.

Thank you

Sincerely,

Misty Barkley

Data Validation and Report Writing Group Leader
Roy F. Weston, Inc. / REAC Project

MB:jj Attachments

cc. R. Singhvi
 H. Compton
 1173\mon\mem\9702\sub\1173Con2

V. Kansal
Subcontracting File
B. Lewan

C. Davison
R. Tobias
M. Barkley

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REAC

REAC, son, NJ
 (908) 321-4200
 EPA Contract 68-C4-0022

CHI OF CUSTODY RECORD

Project Name: J-FIELD
 Project Number: 03347-04P-A-001-1073-01
 RFW Contact: R.T.D.BIA

No: 07857
 SHEET NO. 1 OF 1

022197 Sample Identification

REAC #	Sample No.	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	TAL Method	VOA
716	GA 09708	JFP-4	GW	20 Feb 97	2	LL Poly / H2O3	X	
717	BCD09708	JFP-4			1	40 ml VOA / 4°C	X	
718	A09709	JFP-3			1	1L Poly / HNO3	X	
719	BCD09709	JFP-3			3	40 ml VOA / 4°C	X	
720	WNO09708	JFC-4			3	40 ml VOA / 4°C	X	
	Effort 708	JFP-4			2	1L poly		
721	A09710	JFP-2			1	LL poly / H2O3	X	
722	BCD09710	JFP-2			3	40 ml VOA / 4°C	X	
723	BC09711	JFL-1			3	40 ml VOA / 4°C	X	
724	BC09712	JFL-3			3	40 ml VOA / 4°C	X	
725	A09703	Fish / Tri-F BANK		21 Feb 97	3	40 ml VOA / 4°C	X	
726	A09704	JFP-5			1	1L poly / H2O3	X	
727	CCD09701	JFP-5			3	40 ml VOA / 4°C		
728	A09705	JFP-1			1	LL poly / H2O3	X	
729	BCD09705	JFP-1			3	40 ml VOA / 4°C	X	

Matrix:
 SD - Sediment
 DS - Drum Solids
 DL - Drum Liquids
 X - Other

PW - Potable Water
 GW - Groundwater
 SW - Surface Water
 SL - Sludge

S - Soil
 W - Water
 O - Oil
 A - Ash

Special Instructions:

09708 m/sd - All Parameters
 FOR SUBCONTRACTING USE ONLY
 FROM CHAIN OF
 CUSTODY #

check 1 : fl.

Item/Reason	Received By	Date	Time	Name/Reason	Retirquished By	Date	Time	Received By	Date	Time
All Analytes	John	2/19/97	1607	911 VOA	John	2/21/97	0950	John	2/21/97	1600
3/1 Notes	John	3/22/97	1600	John	3/23/97	0950				

REAC, Edison, NJ
(908) 321 4200
EPA Contract 68-C

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CHAIN OF CUSTODY RECORD

Project Name: J-FIELD
Project Number: 03347-0411-001-1173-01
RFW Contact: JOHN MASON Phone: (908) 521-4200
No: 07858

Sample Identification

REAC #	Sample No.	Sampling Location	Matrix	Date Collected	# of Bottles	Containment/Preservative		TOX	Ammonia Chloride, Nitrate
						Containment	Preservative		
E09708	E09708	JFP-4	GW	20 Feb 97	3	⑧	1L Amber/H ₂ SO ₄	X	
-2	E09708	JFP-4					1L Poly / 4°C	X	
-3	E09709	JFP-3				⑨	1L Amber/H ₂ SO ₄	X	
-4	E09709	JFP-3				⑩	1L Poly / 4°C	X	
-5	E09710	JFP-3				⑪	1L Amber/H ₂ SO ₄	X	
-6	E09710	JFP-3				⑫	1L Poly / 4°C	X	
-7	E09704	JFP-5		21 Feb 97	⑬	1L Poly / 4°C		X	
-8	E09704	JFP-5				⑭	1L Amber/H ₂ SO ₄	X	
-9	E09705	JFP-1				⑮	1L Poly / 4°C	X	
-10	E09705	JFP-1							

FOR SUBCONTRACTING USE ONLY		
FROM CHAIN OF CUSTODY #	Specimen Manufactured:	
Matrix:	PW - Potable Water	S - Soil
SD - Sediment	GW - Groundwater	W - Water
DS - Drum Soils	SW - Surface Water	O - Oil
DL - Drum Liquids	SL - Sludge	A - Air
Other		(B)
X -		

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② Tony & knownia BILLY ONLY \$5 TO 40% FULL. 2-21-92
client notes ok, to go with rates, per n. addrs

Item/Reason	Re-requested By	Date	Received By	Date	Time	Notes/Reason	Re-requested by
17442195	JL	2/1/97	2/3/97	2/21/97	15:30		

APPENDIX D
REAC Analytical Report June 1997
J-field Phytoremediation Study
Groundwater Well And Lysimeter Monitoring Report
Aberdeen Proving Ground, Maryland
November 1997

ANALYTICAL REPORT

Prepared by
Roy F. Weston, Inc.

J-Field Phytoremediation Study, APG
Aberdeen, MD

June, 1997

EPA Work Assignment No. 2-173
WESTON Work Order No. 03347-142-001-2173-01
EPA Contract No. 68-C4-0022

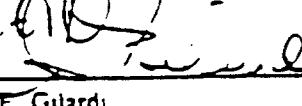
Submitted to
H. Compton
EPA-ERTC

 - 6/13/97
R. Tobias Date

Analysis by:
REAC

 6/16/97
V. Kansal Date
Analytical Section Leader

Prepared by:
G. Karusis

 6/17/97
E. Gilardi Date
Project Manager

Reviewed by:
M. Barkley

Introduction

REAC, in response to ERT WA # 2-173, provided analytical support for environmental samples collected at the J-Field Phytoremediation Study, APG Site in Aberdeen, MD as described in the following table. This support involved the analyses and subcontracted analyses of water samples. The support also included the QA/QC, data review and the preparation of a report summarizing the analytical methods, results, and the QA/QC results.

The samples were treated with procedures consistent with those described in SOP # 1008.

COC *	Number of Samples	Sampling Date	Date Received	Matrix	Analysis	Laboratory
08283	12	5/14/97	5/14/97	Water	VOC	REAC
08285	5	2/20/97	5/15/97	Water	VOC	REAC
08310	5**	5/14/97	5/14/97	Water	VOC	REAC
08313	3	5/16/97	5/16/97	Vegetation	VOC	REAC

* COC # denotes Chain of Custody number

** The analyses of the 6 Summa Cannisters will be given in a separate report

Case Narrative

VOC Package F ???

The method blank of 5/16/97 contained 1.3 µg/L methylene chloride. The result for methylene chloride in sample 10191 should be regarded as not detected ("U") because the concentration is less than ten times the concentration of the method blank.

In the first continuing calibration check standard of 5/19/97, the acceptable QC limits were exceeded for acetone (41%). The data are not affected because acetone was not detected in the associated samples.

In the second continuing calibration check standard of 5/19/97, the acceptable QC limits were exceeded for acetone (50%) and 2-butanone (29%). The data are not affected because acetone and 2-butanone were not detected in the associated samples.

In the continuing calibration check standard of 5/20/97, the acceptable QC limits were exceeded for 2,2-dichloropropane (44%). The data are not affected because 2,2-dichloropropane was not detected in the associated samples.

Summary of Abbreviations

AA	Atomic Absorption				
B	The analyte was found in the blank				
BFB	Bromofluorobenzene				
BPQL	Below the Practical Quantitation Limit				
C	Centigrade				
D	(Surrogate Table) this value is from a diluted sample and was not calculated (Result Table) this result was obtained from a diluted sample				
Dioxin	denotes Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans and/or PCDD and PCDF				
CLP	Contract Laboratory Protocol				
COC	Chain of Custody				
CONC	Concentration				
CRDL	Contract Required Detection Limit				
CRQL	Contract Required Quantitation Limit				
DFTPP	Decafluorotriphenylphosphine				
DL	Detection Limit				
E	The value is greater than the highest linear standard and is estimated				
EMPC	Estimated maximum possible concentration				
ICAP	Inductively Coupled Argon Plasma				
ISTD	Internal Standard				
J	The value is below the method detection limit and is estimated				
LCS	Laboratory Control Sample				
LCSD	Laboratory Control Sample Duplicate				
MDL	Method Detection Limit				
MQL	Method Quantitation Limit				
MI	Matrix Interference				
MS	Matrix Spike				
MSD	Matrix Spike Duplicate				
MW	Molecular Weight				
NA	either Not Applicable or Not Available				
NC	Not Calculated				
NR	Not Requested				
NS	Not Spiked				
% D	Percent Difference				
% REC	Percent Recovery				
PQL	Practical Quantitation Limit				
PPBV	Parts per billion by volume				
QL	Quantitation Limit				
RPD	Relative Percent Difference				
RSD	Relative Standard Deviation				
SIM	Selected Ion Mode				
TCLP	Toxic Characteristics Leaching Procedure				
U	Denotes not detected				
m'	cubic meter	kg	kilogram	ug	microgram
L	liter	g	gram	pg	picogram
mL	milliliter	mg	milligram		
uL	microliter				
-	denotes a value that exceeds the acceptable QC limit				
	Abbreviations that are specific to a particular table are explained in footnotes on that table				

Revision 3/7/97

Analytical Procedure for VOC in Water
(Tekmar Series 3000 Concentrator/Dynatech Sampler)

A modified S24.2 method was used for the analysis of Volatile Organic Compounds in water. Samples were purged, trapped, and desorbed to a GC/MS system. Prior to purging, the samples were spiked with a three component surrogate mixture consisting of toluene-d₄, 4-bromoanisole and 1,2-dichloroethane-d₄, and a three component internal standard mixture consisting of bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-d₄. The following conditions and parameters were utilized:

The purge and trap unit consisted of: A Tekmar concentrator (3000 series) equipped with an autosampler (Dynatech) and a trap consisting of a VOCARB 4000 (Supelco), which itself contained of four adsorbent beds: CarboPack B (graphitized carbon 60/80 mesh), CarboPack C (graphitized carbon 60/80 mesh), Carboxen-1000 (60/80 mesh), and Carboxen-1001 (60/80 mesh).

The purge and trap instrument conditions were:

Purge	10 min at 25° C
Dry Purge	2 min at 25° C
Desorb Preheat	230° C
Desorb	4 min at 230° C
Purge Flow Rate	40 mL/min
Bake	8 min at 250° C

A Hewlett Packard 5970 GC/MSD equipped with an RTE-A data system was used to analyze the data.

The instrument conditions were:

Column: 30 meter x 0.53mm ID, RTx-Volatiles (Restek Corp.) column with 3.0 μ m thickness.

Temperature: 5 min at 10° C
6° C/min to 140° C
0.1 min at 140° C
12° C/min to 160° C
5 min at 160° C

Flow Rate Helium at 10 mL/min
GC/MS Interface Glass jet separator with 30 mL/min helium make-up gas at 250° C.

GC/MS Interface: Glass jet separator with 30 mL make-up gas at 250° C.

Mass Spectrometer: Electron impact ionization at a nominal electron energy of 70 electron volts, scanning from 35-300 amu at one scan/sec.

Computer: Preprogrammed to plot Extracted Ion Current Profile (EICP); capable of integrating ions and plotting abundances vs time or scan number. A library search (NBS-Wiley) for tentatively identified compounds was performed on samples.

The GC/MS system was calibrated using 6 VOC standards at 5, 20, 50, 100, 150, and 200 μ g/l. Before analysis each day, the system was tuned with 50 ng BFB and passed a continuing calibration check when analyzing a 50 μ g/l standard mixture in which the responses were evaluated by comparison to the average response of the calibration curve.

The results are in Table 1.1; the tentatively identified compounds are listed in Table 1.2. The concentrations of the analytes were calculated using the following equation:

$$C_s = \frac{A_t \times I_u}{A_u \times RF \text{ (or } RF_{av} \text{)} \times V_s}$$

where

C_s	= Concentration of target analyte ($\mu\text{g/L}$)
A_t	= Area of the target analyte
I_u	= mass of specific internal standard (ng)
A_u	= Area of the specific internal standard
RF	= Response Factor
RF_{av}	= average Response Factor
V_s	= Volume of sample purged (mL), taking into account dilutions

The average Response Factor is used when a sample is associated with an initial calibration curve. The Response Factor is used when a sample is associated with a continuing calibration curve.

Response Factor calculation:

The response factor (RF) for each specific analyte is quantitated based on the area response from the continuing calibration check as follows:

$$RF = \frac{A_t \times I_u}{A_u \times I_c}$$

where,

RF	= Response factor for a specific analyte
A_t	= Area of the analyte in the standard
I_u	= Mass of the specific internal standard
A_u	= Area of the specific internal standard
I_c	= Mass of the analyte in the standard

$$RF_{av} = \frac{RF_1 + RF_2 + \dots + RF_n}{n}$$

and

n = number of Samples

Revision of 1/27/97

Table 1.1 Results of the Analysis for VOC in Water
MA # 2-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	10190	10178
LOCATION		TB	JFP-1
COLLECTED		05/14/97	05/14/97
ANALYZED	05/15/97	05/16/97	05/16/97
INJECTED	23:44	00:29	04:10
FILE #	AZ398	AZ399	A2404
DIL. FACT.	1	1	500
UNIT	ug/L	ug/L	ug/L
COMPOUND	CONC.	MDL	CONC.
Dichlorodifluoromethane	U	1.0	U
Chloromethane	U	1.0	U
Vinyl Chloride	U	1.0	U
Bromomethane	U	2.0	U
Chloroethane	U	1.0	U
Trichlorofluoromethane	U	1.0	U
Acetone	U	2.0	U
1,1-Dichloroethene	U	1.0	U
Carbon Disulfide	U	1.0	U
Methylene Chloride	U	1.0	U
Methyl-tertiary-butylether	U	1.0	U
trans-1,2-Dichloroethene	U	1.0	U
1,1-Dichloroethane	U	1.0	U
2-Butanone	U	4.0	U
2,2-Dichloropropane	U	1.0	U
cis-1,2-Dichloroethene	U	1.0	U
Chloroform	U	1.0	U
1,1-Dichloropropene	U	1.0	U
1,2-Dichloroethane	U	1.0	U
1,1,1-Trichloroethane	U	1.0	U
Carbon Tetrachloride	U	1.0	U
Benzene	U	1.0	U
Trichloroethene	U	1.0	U
1,2-Dichloropropane	U	1.0	U
Dibromomethane	U	1.0	U
Bromodichloromethane	U	1.0	U
cis-1,3-Dichloropropene	U	1.0	U
trans-1,3-Dichloropropene	U	1.0	U
1,1,2-Trichloroethane	U	1.0	U
1,3-Dichloropropane	U	1.0	U
Dibromochloromethane	U	1.0	U
1,2-Dibromoethane	U	1.0	U
Bromoform	U	1.0	U
4-Methyl-2-Pentanone	U	2.0	U

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	10190	10178			
LOCATION	TB	JPP-1				
COLLECTED	05/16/97	05/16/97	05/16/97			
ANALYZED	05/15/97	05/16/97				
INJECTED	23:44	00:29	04:10			
FILE	"A2398	"A2399	"A2404			
DIL. FACT.	1	1	500			
UNIT	µg/L	µg/L	µg/L			
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL
Toluene	U	1.0	U	1.0	U	500.0
2-Hexanone	U	2.0	U	2.0	U	1000.0
Tetrachloroethene	U	1.0	U	1.0	9000	500.0
Chlorobenzene	U	1.0	U	1.0	U	500.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0	U	500.0
Ethylbenzene	U	1.0	U	1.0	U	500.0
p & m-Xylene	U	1.0	U	1.0	U	500.0
o-Xylene	U	1.0	U	1.0	U	500.0
Styrene	U	1.0	U	1.0	U	500.0
Isopropylbenzene	U	1.0	U	1.0	170000	500.0
1,1,2,2-Tetrachloroethane	U	1.0	U	1.0	U	500.0
1,2,3-Trichloropropane	U	1.0	U	1.0	U	500.0
Bromobenzene	U	1.0	U	1.0	U	500.0
n-Propylbenzene	U	1.0	U	1.0	U	500.0
2-Chlorotoluene	U	1.0	U	1.0	U	500.0
4-Chlorotoluene	U	1.0	U	1.0	U	500.0
1,3,5-Trimethylbenzene	U	1.0	U	1.0	U	500.0
tert-Butylbenzene	U	1.0	U	1.0	U	500.0
1,2,4-Trimethylbenzene	U	1.0	U	1.0	U	500.0
sec-Butylbenzene	U	1.0	U	1.0	U	500.0
1,3-Dichlorobenzene	U	1.0	U	1.0	U	500.0
p-Isopropyltoluene	U	1.0	U	1.0	U	500.0
1,4-Dichlorobenzene	U	1.0	U	1.0	U	500.0
1,2-Dichlorobenzene	U	1.0	U	1.0	U	500.0
n-Butylbenzene	U	1.0	U	1.0	U	500.0
1,2-Dibromo-3-Chloropropane	U	1.0	U	1.0	U	500.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	500.0
Naphthalene	U	1.0	U	1.0	U	500.0
Hexachlorobutadiene	U	1.0	U	1.0	U	500.0
1,2,3-Trichlorobenzene	U	1.0	U	1.0	U	500.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	10195	10177	10176	10182			
LOCATION		TREE 174	P-3	JPP-5 REP	P-2			
COLLECTED		05/16/97	05/16/97	05/16/97	05/16/97			
ANALYZED	05/16/97	05/16/97	05/16/97	05/16/97	05/16/97			
INJECTED	12:44	17:10	18:39	19:23	20:51			
FILE #	A2614	A2620	A2622	A2623	A2625			
DIL. FACT.	1	1	1	1	1			
UNIT	µg/L	µg/L	µg/L	µg/L	µg/L			
COMPOUND	CONC.	NDL	CONC.	NDL	CONC.	NDL	CONC.	NDL
Dichlorodifluoromethane	U	1.0	U	1.0	U	1.0	U	1.0
Chloromethane	U	1.0	U	1.0	U	1.0	U	1.0
Vinyl Chloride	U	1.0	U	1.0	110	1.0	U	1.0
Bromomethane	U	2.0	U	2.0	U	2.0	U	2.0
Chloroethane	U	1.0	U	1.0	U	1.0	U	1.0
Trichlorofluoromethane	U	1.0	U	1.0	U	1.0	U	1.0
Acetone	U	2.0	33	2.0	U	2.0	U	2.0
1,1-Dichloroethene	U	1.0	U	1.0	U	1.0	U	1.0
Carbon Disulfide	U	1.0	U	1.0	U	1.0	U	1.0
Methylene Chloride	1.3	1.0	U	1.0	U	1.0	U	1.0
Methyl-tertiary-butylether	U	1.0	U	1.0	U	1.0	U	1.0
trans-1,2-Dichloroethene	U	1.0	U	1.0	24	1.0	3.4	1.0
1,1-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0
2-Butanone	U	4.0	U	4.0	U	4.0	U	4.0
2,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.0
cis-1,2-Dichloroethene	U	1.0	U	1.0	140	1.0	7.3	1.0
Chloroform	U	1.0	U	1.0	U	1.0	U	1.0
1,1-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0
1,1,1-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.0
Carbon Tetrachloride	U	1.0	U	1.0	U	1.0	U	1.0
Benzene	U	1.0	U	1.0	U	1.0	U	1.0
Trichloroethene	U	1.0	U	1.0	56	1.0	36	1.0
1,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.0
Dibromomethane	U	1.0	U	1.0	U	1.0	U	1.0
Bromodichloromethane	U	1.0	U	1.0	U	1.0	U	1.0
cis-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0
trans-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0
1,1,2-Trichloroethane	U	1.0	U	1.0	U	1.0	6.2	1.0
1,3-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.0
Dibromochloromethane	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dibromoethane	U	1.0	U	1.0	U	1.0	U	1.0
Bromoform	U	1.0	U	1.0	U	1.0	U	1.0
4-Methyl-2-Pentanone	U	2.0	U	2.0	U	2.0	U	2.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
MA # 2-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	10195	10177	10176	10182					
LOCATION	TREE 174	P-3	JPP-5 REP	P-2						
COLLECTED	05/16/97	05/16/97	05/16/97	05/16/97						
ANALYZED	05/16/97	05/16/97	05/16/97	05/16/97						
INJECTED	12:44	17:10	18:39	20:51						
FILE	A2614	A2620	A2622	A2625						
DIL. FACT.	1	1	1	1						
UNIT	µg/L	µg/L	µg/L	µg/L						
COMPOUND	CONC.	MOL	CONC.	MOL	CONC.	MOL	CONC.	MOL	CONC.	MOL
Toluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
2-Hexanone	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0
Tetrachloroethene	U	1.0	U	1.0	330	1.0	5.1	1.0	U	1.0
Chlorobenzene	U	1.0	U	1.0	7.7	1.0	U	1.0	U	1.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Ethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
p & m-Xylene	U	1.0	U	1.0	0.4	1.0	U	1.0	U	1.0
o-Xylene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Styrene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Isopropylbenzene	U	1.0	U	1.0	2.7	1.0	55	1.0	U	1.0
1,1,2,2-Tetrachloroethane	U	1.0	56	1.0	2.7	1.0	55	1.0	U	1.0
1,2,3-Trichloropropane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Bromobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
n-Propylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
2-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
4-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,3,5-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
tert-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,4-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
sec-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,3-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
p-Isopropyltoluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,4-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
n-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dibromo-3-Chloropropane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Naphthalene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Hexachlorobutadiene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,3-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG

SAMPLE # :	LAB BLANK	10191	
LOCATION :	JFL-1		
COLLECTED :	05/16/97	05/16/97	
ANALYZED :	05/16/97	05/16/97	
INJECTED :	12:44	21:36	
FILE # :	A2614	A2626	
DIL. FACT.:	1	1	
UNIT :	ppb/L	ppb/L	
COMPOUND	CONC.	MDL	CONC.
Dichlorodifluoromethane	U	1.0	U
Chloromethane	U	1.0	U
Vinyl Chloride	U	1.0	U
Bromomethane	U	2.0	U
Chloroethane	U	1.0	U
Trichlorofluoromethane	U	1.0	U
Acetone	U	2.0	110
1,1-Dichloroethene	U	1.0	U
Carbon Disulfide	U	1.0	U
Methylene Chloride	1.3	1.0	10 B
Methyl-tertiary-butylether	U	1.0	U
trans-1,2-Dichloroethene	U	1.0	U
1,1-Dichloroethane	U	1.0	U
2-Butanone	U	4.0	5.9
2,2-Dichloropropene	U	1.0	U
cis-1,2-Dichloroethene	U	1.0	U
Chloroform	U	1.0	2.5
1,1-Dichloropropene	U	1.0	U
1,2-Dichloroethane	U	1.0	U
1,1,1-Trichloroethane	U	1.0	U
Carbon Tetrachloride	U	1.0	U
Benzene	U	1.0	U
Trichloroethene	U	1.0	U
1,2-Dichloropropane	U	1.0	U
Dibromomethane	U	1.0	U
Bromodichloromethane	U	1.0	U
cis-1,3-Dichloropropene	U	1.0	U
trans-1,3-Dichloropropene	U	1.0	U
1,1,2-Trichloroethane	U	1.0	U
1,3-Dichloropropane	U	1.0	U
Dibromo-chloromethane	U	1.0	U
1,2-Dibromoethane	U	1.0	U
Bromoform	U	1.0	U
4-Methyl-2-Pentanone	U	2.0	1.6 J

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 2-173 J-Field Photoirradiation Study, APG

SAMPLE # :	LAB BLANK	10191		
LOCATION :	JPL-1			
COLLECTED :	05/16/97	05/16/97		
ANALYZED :	05/16/97	05/16/97		
INJECTED :	12:44	21:36		
FILE :	A2414	A2626		
DIL. FACT.:	1	1		
UNIT :	ug/L	ug/L		
COMPOUND	CONC.	MDL	CONC.	MDL
Toluene	U	1.0	19	1.0
2-Hexanone	U	2.0	U	2.0
Tetrachloroethene	U	1.0	U	1.0
Chlorobenzene	U	1.0	U	1.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0
Ethylbenzene	U	1.0	U	1.0
p & m-Xylene	U	1.0	U	1.0
o-Xylene	U	1.0	U	1.0
Styrene	U	1.0	U	1.0
Isopropylbenzene	U	1.0	U	1.0
1,1,2,2-Tetrachloroethane	U	1.0	U	1.0
1,2,3-Trichloropropane	U	1.0	U	1.0
Bromobenzene	U	1.0	U	1.0
n-Propylbenzene	U	1.0	U	1.0
2-Chlorotoluene	U	1.0	U	1.0
4-Chlorotoluene	U	1.0	U	1.0
1,3,5-Trimethylbenzene	U	1.0	U	1.0
tert-Butylbenzene	U	1.0	U	1.0
1,2,4-Trimethylbenzene	U	1.0	U	1.0
sec-Butylbenzene	U	1.0	U	1.0
1,3-Dichlorobenzene	U	1.0	U	1.0
p-Isopropyltoluene	U	1.0	U	1.0
1,4-Dichlorobenzene	U	1.0	U	1.0
1,2-Dichlorobenzene	U	1.0	U	1.0
n-Butylbenzene	U	1.0	U	1.0
1,2-Dibromo-3-Chloropropane	U	1.0	U	1.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0
Naphthalene	U	1.0	U	1.0
Hexachlorobutadiene	U	1.0	U	1.0
1,2,3-Trichlorobenzene	U	1.0	U	1.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	10188	10196	JFL-2	10192	JFL-3		
LOCATION	63	TREE 19	05/15/97	05/14/97	05/14/97	05/14/97		
COLLECTED			05/15/97	05/19/97	05/19/97	05/19/97		
ANALYZED	05/19/97	05/19/97	05/19/97	05/19/97	05/19/97	05/19/97		
INJECTED	14:05	14:09	15:34	16:19	17:04			
FILE #	A2467	A2448	A2449	A2450	A2451			
DIL. FACT.	1	1	1	1	1			
UNIT	µg/L	µg/L	µg/L	µg/L	µg/L			
COMPOUND	CONC.	NDL	CONC.	NDL	CONC.	NDL	CONC.	NDL
Dichlorodifluoromethane	U	1.0	U	1.0	U	1.0	U	1.0
Chloromethane	U	1.0	U	1.0	U	1.0	U	1.0
Vinyl Chloride	U	1.0	8.8	1.0	U	1.0	U	1.0
Bromomethane	U	2.0	U	2.0	U	2.0	U	2.0
Chloroethane	U	1.0	U	1.0	U	1.0	U	1.0
Trichlorofluoromethane	U	1.0	U	1.0	U	1.0	U	1.0
Acetone	U	2.0	U	2.0	48	2.0	U	2.0
1,1-Dichloroethene	U	1.0	U	1.0	U	1.0	U	1.0
Carbon Disulfide	U	1.0	U	1.0	U	1.0	U	1.0
Methylene Chloride	U	1.0	U	1.0	U	1.0	U	1.0
Methyl-tertiary-butylether	U	1.0	U	1.0	U	1.0	U	1.0
trans-1,2-Dichloroethene	U	1.0	1.4	1.0	U	1.0	U	1.0
1,1-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0
2-Butanone	U	4.0	U	4.0	14	4.0	U	4.0
2,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.0
cis-1,2-Dichloroethene	U	1.0	81	1.0	U	1.0	U	1.0
Chloroform	U	1.0	0.8 J	1.0	U	1.0	1.7	1.0
1,1-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dichloroethane	U	1.0	0.9 J	1.0	U	1.0	U	1.0
1,1,1-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.0
Carbon Tetrachloride	U	1.0	U	1.0	U	1.0	U	1.0
Benzene	U	1.0	0.9 J	1.0	U	1.0	5.2	1.0
Trichloroethene	U	1.0	430	1.0	1.1	1.0	U	1.0
1,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.0
Dibromomethane	U	1.0	U	1.0	U	1.0	U	1.0
Bromodichloromethane	U	1.0	U	1.0	U	1.0	U	1.0
cis-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0
trans-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0
1,1,2-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.0
1,3-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.0
Dibromochloromethane	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dibromoethane	U	1.0	U	1.0	U	1.0	U	1.0
Bromoform	U	1.0	U	1.0	U	1.0	U	1.0
4-Methyl-2-Pentanone	U	2.0	U	2.0	U	2.0	U	2.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	10198	10196	10192	10193					
LOCATION		63	TREE 19	JFL-2	JFL-3					
COLLECTED		05/15/97	05/15/97	05/16/97	05/16/97					
ANALYZED	05/19/97	05/19/97	05/19/97	05/19/97	05/19/97					
INJECTED	14:05	14:49	15:34	16:19	17:04					
FILE	A2647	A2648	A2649	A2650	A2651					
DIL. FACT.	1	1	1	1	1					
UNIT	µg/L	µg/L	µg/L	µg/L	µg/L					
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL		
Toluene	U	1.0	U	1.0	U	1.0	0.8 J	1.0	U	1.0
2-Hexanone	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0
Tetrachloroethene	U	1.0	26	1.0	U	1.0	U	1.0	U	1.0
Chlorobenzene	U	1.0	2.5	1.0	U	1.0	U	1.0	U	1.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Ethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
p & m-Xylene	U	1.0	1.6	1.0	U	1.0	U	1.0	U	1.0
o-Xylene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Styrene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Isopropylbenzene	U	1.0	0.7 J	1.0	U	1.0	14	1.0	U	1.0
1,1,2,2-Tetrachloroethane	U	1.0	U	1.0	11	1.0	U	1.0	U	1.0
1,2,3-Trichloropropane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Bromobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
n-Propylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
2-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
4-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,3,5-Trimethylbenzene	U	1.0	1.4	1.0	U	1.0	U	1.0	U	1.0
tert-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,4-Trimethylbenzene	U	1.0	5.0	1.0	U	1.0	U	1.0	U	1.0
sec-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,3-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
p-Isopropyltoluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,4-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
n-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dibromo-3-Chloropropane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Naphthalene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Hexachlorobutadiene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,3-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	10179	10184	10180	10183					
LOCATION		JPP-2	P-4	JPP-3	JF-73					
COLLECTED		05/14/97	05/14/97	05/14/97	05/14/97					
ANALYZED	05/19/97	05/19/97	05/19/97	05/19/97	05/19/97					
INJECTED	14:05	17:49	18:34	19:18	20:03					
FILE #	A2447	A2452	A2453	A2454	A2455					
DIL. FACT.	1	20	50	100	100					
UNIT	µg/L	µg/L	µg/L	µg/L	µg/L					
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Dichlorodifluoromethane	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Chloromethane	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Vinyl Chloride	U	1.0	U	20.0	U	50.0	U	100.0	200	100.0
Bromomethane	U	2.0	U	40.0	U	100.0	U	200.0	U	200.0
Chloroethane	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Trichlorofluoromethane	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Acetone	U	2.0	U	40.0	U	100.0	U	200.0	U	200.0
1,1-Dichloroethene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Carbon Disulfide	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Methylene Chloride	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Methyl-tertiary-butylether	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
trans-1,2-Dichloroethene	U	1.0	32	20.0	690	50.0	U	100.0	3900	100.0
1,1-Dichloroethane	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
2-Butanone	U	4.0	U	80.0	U	200.0	U	400.0	U	400.0
2,2-Dichloropropene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
cis-1,2-Dichloroethene	U	1.0	130	20.0	2500	50.0	160	100.0	13000	100.0
Chloroform	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
1,1-Dichloropropene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
1,2-Dichloroethane	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
1,1,1-Trichloroethane	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Carbon Tetrachloride	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Benzene	U	1.0	U	20.0	U	50.0	U	100.0	6400	100.0
Trichloroethene	U	1.0	870	20.0	4500	50.0	2400	100.0	6400	100.0
1,2-Dichloropropane	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Dibromomethane	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Bromodichloromethane	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
cis-1,3-Dichloropropene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
trans-1,3-Dichloropropene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
1,1,2-Trichloroethane	U	1.0	28	20.0	U	50.0	U	100.0	230	100.0
1,3-Dichloropropane	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Dibromoethane	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
1,2-Dibromoethane	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Bromoform	U	1.0	U	20.0	U	50.0	U	100.0	U	200.0
4-Methyl-2-Pentanone	U	2.0	U	40.0	U	100.0	U	200.0	U	200.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	10179	10184	10180	10183					
LOCATION	JPP-2	P-4	JPP-3	JF-73						
COLLECTED	05/14/97	05/14/97	05/14/97	05/14/97						
ANALYZED	05/19/97	05/19/97	05/19/97	05/19/97						
INJECTED	14:05	17:49	18:34	19:18						
FILE	*A2447	*A2452	*A2453	*A2454						
DIL. FACT.	1	20	50	100						
UNIT	µg/L	µg/L	µg/L	µg/L						
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Toluene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
2-Hexanone	U	2.0	U	40.0	U	100.0	U	200.0	U	200.0
Tetrachloroethene	U	1.0	52	20.0	U	50.0	220	100.0	440	100.0
Chlorobenzene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
1,1,1,2-Tetrachloroethane	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Ethylbenzene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
p & m-Xylene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
o-Xylene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Styrene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Isopropylbenzene	U	1.0	U	20.0	580	50.0	12000	100.0	11000	100.0
1,1,2,2-Tetrachloroethane	U	1.0	3400	20.0	U	50.0	U	100.0	U	100.0
1,2,3-Trichloropropane	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Bromobenzene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
n-Propylbenzene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
2-Chlorotoluene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
4-Chlorotoluene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
1,3,5-Trimethylbenzene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
tert-Butylbenzene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
1,2,4-Trimethylbenzene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
sec-Butylbenzene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
1,3-Dichlorobenzene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
p-Isopropyltoluene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
1,4-Dichlorobenzene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
1,2-Dichlorobenzene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
n-Butylbenzene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
1,2-Dibromo-3-Chloropropene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
1,2,4-Trichlorobenzene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Naphthalene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
Hexachlorobutadiene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0
1,2,3-Trichlorobenzene	U	1.0	U	20.0	U	50.0	U	100.0	U	100.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APC

SAMPLE #	LAB BLANK	10186	10187			
LOCATION		53	183			
COLLECTED		05/15/97	05/15/97			
ANALYZED	05/19/97	05/19/97	05/19/97			
INJECTED	14:05	20:47	21:31			
FILE #	A2447	A2456	A2457			
DIL. FACT.	1	100	200			
UNIT	µg/L	µg/L	µg/L			
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL
Dichlorodifluoromethane	U	1.0	U	100.0	U	200.0
Chloromethane	U	1.0	U	100.0	U	200.0
Vinyl Chloride	U	1.0	U	100.0	U	200.0
Bromomethane	U	2.0	U	200.0	U	400.0
Chloroethane	U	1.0	U	100.0	U	200.0
Trichlorofluoromethane	U	1.0	U	100.0	U	200.0
Acetone	U	2.0	U	200.0	U	400.0
1,1-Dichloroethene	U	1.0	U	100.0	U	200.0
Carbon Disulfide	U	1.0	U	100.0	U	200.0
Methylene Chloride	U	1.0	U	100.0	U	200.0
Methyl-tertiary-butylether	U	1.0	U	100.0	U	200.0
trans-1,2-Dichloroethene	U	1.0	1400	100.0	U	200.0
1,1-Dichloroethane	U	1.0	U	100.0	U	200.0
2-Butanone	U	4.0	U	400.0	U	800.0
2,2-Dichloropropane	U	1.0	U	100.0	U	200.0
cis-1,2-Dichloroethene	U	1.0	4800	100.0	950	200.0
Chloroform	U	1.0	U	100.0	U	200.0
1,1-Dichloropropene	U	1.0	U	100.0	U	200.0
1,2-Dichloroethane	U	1.0	U	100.0	U	200.0
1,1,1-Trichloroethane	U	1.0	U	100.0	U	200.0
Carbon Tetrachloride	U	1.0	U	100.0	U	200.0
Benzene	U	1.0	U	100.0	U	200.0
Trichloroethene	U	1.0	5500	100.0	4200	200.0
1,2-Dichloropropane	U	1.0	U	100.0	U	200.0
Dibromomethane	U	1.0	U	100.0	U	200.0
Bromodichloromethane	U	1.0	U	100.0	U	200.0
cis-1,3-Dichloropropene	U	1.0	U	100.0	U	200.0
trans-1,3-Dichloropropene	U	1.0	U	100.0	U	200.0
1,1,2-Trichloroethane	U	1.0	290	100.0	U	200.0
1,3-Dichloropropane	U	1.0	U	100.0	U	200.0
Dibromochloromethane	U	1.0	U	100.0	U	200.0
1,2-Dibromoethane	U	1.0	U	100.0	U	200.0
Bromoform	U	1.0	U	100.0	U	200.0
4-Methyl-2-Pentanone	U	2.0	U	200.0	U	400.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APC

SAMPLE #	LAB BLANK	10186	10187			
LOCATION	53	183				
COLLECTED	05/15/97	05/15/97	05/15/97			
ANALYZED	05/19/97	05/19/97	05/19/97			
INJECTED	14:05	20:67	21:31			
FILE	A2447	A2456	A2457			
DIL. FACT.	1	100	200			
UNIT	ug/L	ug/L	ug/L			
COMPOUND	CONC.	NDL	CONC.	NDL	CONC.	NDL
Toluene	U	1.0	U	100.0	U	200.0
2-Hexanone	U	2.0	U	200.0	U	400.0
Tetrachloroethene	U	1.0	U	100.0	400	200.0
Chlorobenzene	U	1.0	U	100.0	U	200.0
1,1,1,2-Tetrachloroethane	U	1.0	U	100.0	U	200.0
Ethylbenzene	U	1.0	U	100.0	U	200.0
p & m-Xylene	U	1.0	U	100.0	U	200.0
o-Xylene	U	1.0	U	100.0	U	200.0
Styrene	U	1.0	U	100.0	U	200.0
Isopropylbenzene	U	1.0	U	100.0	25000	200.0
1,1,2,2-Tetrachloroethane	U	1.0	12000	100.0	U	200.0
1,2,3-Trichloropropane	U	1.0	U	100.0	U	200.0
Bromobenzene	U	1.0	U	100.0	U	200.0
n-Propylbenzene	U	1.0	U	100.0	U	200.0
2-Chlorotoluene	U	1.0	U	100.0	U	200.0
4-Chlorotoluene	U	1.0	U	100.0	U	200.0
1,3,5-Trimethylbenzene	U	1.0	U	100.0	U	200.0
tert-Butylbenzene	U	1.0	U	100.0	U	200.0
1,2,4-Trimethylbenzene	U	1.0	U	100.0	U	200.0
sec-Butylbenzene	U	1.0	U	100.0	U	200.0
1,3-Dichlorobenzene	U	1.0	U	100.0	U	200.0
p-Isopropyltoluene	U	1.0	U	100.0	U	200.0
1,4-Dichlorobenzene	U	1.0	U	100.0	U	200.0
1,2-Dichlorobenzene	U	1.0	U	100.0	U	200.0
n-Butylbenzene	U	1.0	U	100.0	U	200.0
1,2-Dibromo-3-Chloropropene	U	1.0	U	100.0	U	200.0
1,2,4-Trichlorobenzene	U	1.0	U	100.0	U	200.0
Naphthalene	U	1.0	U	100.0	U	200.0
Hexachlorobutadiene	U	1.0	U	100.0	U	200.0
1,2,3-Trichlorobenzene	U	1.0	U	100.0	U	200.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	10207	10208	10196	10185			
LOCATION		FB	TB	JFL-4	203			
COLLECTED		05/16/97	05/16/97	05/16/97	05/16/97			
ANALYZED	05/20/97	05/20/97	05/20/97	05/20/97	05/20/97			
INJECTED	01:12	01:57	02:42	04:11	06:25			
FILE #	A2462	A2463	A2464	A2466	A2469			
DIL. FACT.	1	1	1	1	20			
UNIT	µg/L	µg/L	µg/L	µg/L	µg/L			
COMPOUND	CONC.	NDL	CONC.	NDL	CONC.	NDL	CONC.	NDL
Dichlorodifluoromethane	U	1.0	U	1.0	U	1.0	U	20.0
Chloromethane	U	1.0	U	1.0	U	1.0	U	20.0
Vinyl Chloride	U	1.0	U	1.0	U	1.0	U	20.0
Bromomethane	U	2.0	U	2.0	U	2.0	U	40.0
Chloroethane	U	1.0	U	1.0	U	1.0	U	20.0
Trichlorofluoromethane	U	1.0	U	1.0	U	2.0	U	40.0
Acetone	U	2.0	U	2.0	U	1.0	U	20.0
1,1-Dichloroethene	U	1.0	U	1.0	U	1.0	U	20.0
Carbon Disulfide	U	1.0	U	1.0	U	1.0	U	20.0
Methylene Chloride	U	1.0	U	1.0	U	1.0	U	20.0
Methyl-tertiary-butylether	U	1.0	U	1.0	U	1.0	U	20.0
trans-1,2-Dichloroethene	U	1.0	U	1.0	U	1.0	U	20.0
1,1-Dichloroethane	U	1.0	U	1.0	U	4.0	U	80.0
2-Butanone	U	4.0	U	4.0	U	1.0	U	20.0
2,2-Dichloropropane	U	1.0	U	1.0	U	1.0	120	20.0
cis-1,2-Dichloroethene	U	1.0	U	1.0	U	1.0	U	20.0
Chloroform	U	1.0	U	1.0	U	1.0	U	20.0
1,1-Dichloropropene	U	1.0	U	1.0	U	1.0	U	20.0
1,2-Dichloroethane	U	1.0	U	1.0	U	1.0	U	20.0
1,1,1-Trichloroethane	U	1.0	U	1.0	U	1.0	U	20.0
Carbon Tetrachloride	U	1.0	U	1.0	U	1.0	U	20.0
Benzene	U	1.0	U	1.0	29	1.0	2200	20.0
Trichloroethene	U	1.0	U	1.0	U	1.0	U	20.0
1,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	20.0
Dibromomethane	U	1.0	U	1.0	U	1.0	U	20.0
Bromodichloromethane	U	1.0	U	1.0	U	1.0	U	20.0
cis-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	20.0
trans-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	20.0
1,1,2-Trichloroethane	U	1.0	U	1.0	U	1.0	U	20.0
1,3-Dichloropropane	U	1.0	U	1.0	U	1.0	U	20.0
Dibromochloromethane	U	1.0	U	1.0	U	1.0	U	20.0
1,2-Dibromoethane	U	1.0	U	1.0	U	1.0	U	20.0
Bromoform	U	1.0	U	1.0	U	2.0	U	40.0
4-Methyl-2-Pentanone	U	2.0	U	2.0	U	2.0	U	

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APC

SAMPLE #	LAB BLANK	10207	10208	10196	10185			
LOCATION	FB	TB	JPL-4	203	05/14/97			
COLLECTED	05/16/97	05/16/97	05/16/97	05/14/97	05/20/97			
ANALYZED	05/20/97	05/20/97	05/20/97	05/20/97	05/20/97			
INJECTED	01:12	01:57	02:42	04:11	06:25			
FILE	A2462	A2463	A2464	A2466	A2469			
DIL. FACT.	1	1	1	1	20			
UNIT	ug/L	ug/L	ug/L	ug/L	ug/L			
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Toluene	U	1.0	U	1.0	U	1.0	U	20.0
2-Hexanone	U	2.0	U	2.0	U	2.0	U	40.0
Tetrachloroethene	U	1.0	U	1.0	U	1.0	55	20.0
Chlorobenzene	U	1.0	U	1.0	U	1.0	U	20.0
1,1,2,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	20.0
Ethylbenzene	U	1.0	U	1.0	U	1.0	U	20.0
p & m-Xylene	U	1.0	U	1.0	U	1.0	U	20.0
o-Xylene	U	1.0	U	1.0	U	1.0	U	20.0
Styrene	U	1.0	U	1.0	U	1.0	U	20.0
Isopropylbenzene	U	1.0	U	1.0	U	1.0	1300	20.0
1,1,2,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	20.0
1,2,3-Trichloropropane	U	1.0	U	1.0	U	1.0	U	20.0
Bromobenzene	U	1.0	U	1.0	U	1.0	U	20.0
n-Propylbenzene	U	1.0	U	1.0	U	1.0	U	20.0
2-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	20.0
4-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	20.0
1,3,5-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	20.0
tert-Butylbenzene	U	1.0	U	1.0	U	1.0	U	20.0
1,2,4-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	20.0
sec-Butylbenzene	U	1.0	U	1.0	U	1.0	U	20.0
1,3-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	20.0
p-Isopropyltoluene	U	1.0	U	1.0	U	1.0	U	20.0
1,4-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	20.0
1,2-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	20.0
n-Butylbenzene	U	1.0	U	1.0	U	1.0	U	20.0
1,2-Dibromo-3-Chloropropane	U	1.0	U	1.0	U	1.0	U	20.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	20.0
Naphthalene	U	1.0	U	1.0	U	1.0	U	20.0
Hexachlorobutadiene	U	1.0	U	1.0	U	1.0	U	20.0
1,2,3-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	20.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APC

SAMPLE #	LAB BLANK	10189	10206			
LOCATION	83	TREE 176				
COLLECTED	05/15/97	05/16/97	05/20/97			
ANALYZED	05/20/97	05/20/97	05/20/97			
INJECTED	01:12	07:10	10:37			
FILE #	A2462	A2470	A2474			
DIL. FACT.	1	1000	1			
UNIT	#B/L	#B/L	#B/L			
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL
Dichlorodifluoromethane	U	1.0	U	1000.0	U	1.0
Chloromethane	U	1.0	U	1000.0	U	1.0
Vinyl Chloride	U	1.0	U	1000.0	U	1.0
Bromomethane	U	2.0	U	2000.0	U	2.0
Chloroethane	U	1.0	U	1000.0	U	1.0
Trichlorofluoromethane	U	1.0	U	1000.0	U	1.0
Acetone	U	2.0	U	2000.0	U	2.0
1,1-Dichloroethene	U	1.0	U	1000.0	U	1.0
Carbon Disulfide	U	1.0	U	1000.0	U	1.0
Methylene Chloride	U	1.0	U	1000.0	U	1.0
Methyl-tertiary-butylether	U	1.0	U	1000.0	U	1.0
trans-1,2-Dichloroethene	U	1.0	2600	1000.0	U	1.0
1,1-Dichloroethane	U	1.0	U	1000.0	U	1.0
2-Butanone	U	4.0	U	4000.0	U	4.0
2,2-Dichloropropane	U	1.0	U	1000.0	U	1.0
cis-1,2-Dichloroethene	U	1.0	9600	1000.0	U	1.0
Chloroform	U	1.0	U	1000.0	U	1.0
1,1-Dichloropropene	U	1.0	U	1000.0	U	1.0
1,2-Dichloroethane	U	1.0	U	1000.0	U	1.0
1,1,1-Trichloroethane	U	1.0	U	1000.0	U	1.0
Carbon Tetrachloride	U	1.0	U	1000.0	U	1.0
Benzene	U	1.0	U	1000.0	U	1.0
Trichloroethene	U	1.0	38000	1000.0	U	1.0
1,2-Dichloropropene	U	1.0	U	1000.0	U	1.0
Dibromomethane	U	1.0	U	1000.0	U	1.0
Bromodichloromethane	U	1.0	U	1000.0	U	1.0
cis-1,3-Dichloropropene	U	1.0	U	1000.0	U	1.0
trans-1,3-Dichloropropene	U	1.0	U	1000.0	U	1.0
1,1,2-Trichloroethane	U	1.0	U	1000.0	U	1.0
1,3-Dichloropropane	U	1.0	U	1000.0	U	1.0
Dibromo-chloromethane	U	1.0	U	1000.0	U	1.0
1,2-Dibromoethane	U	1.0	U	1000.0	U	1.0
Bromoform	U	1.0	U	1000.0	U	1.0
4-Methyl-2-Pantanone	U	2.0	U	2000.0	U	2.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 2-173 J-Field Photoremediation Study, APG

SAMPLE #	LAB BLANK	10189	10206			
LOCATION		83	THEE 174			
COLLECTED		05/15/97	05/16/97			
ANALYZED	05/20/97	05/20/97	05/20/97			
INJECTED	01:12	07:10	10:37			
FILE	A2462	A2670	A2674			
DIL. FACT.	1	1000	1			
UNIT	µg/L	µg/L	µg/L			
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL
Toluene	U	1.0	U	1000.0	U	1.0
2-Hexanone	U	2.0	U	2000.0	U	2.0
Tetrachloroethene	U	1.0	2900	1000.0	U	1.0
Chlorobenzene	U	1.0	U	1000.0	U	1.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1000.0	U	1.0
Ethylbenzene	U	1.0	U	1000.0	U	1.0
p & m-Xylene	U	1.0	U	1000.0	U	1.0
o-Xylene	U	1.0	U	1000.0	U	1.0
Styrene	U	1.0	U	1000.0	U	1.0
Isopropylbenzene	U	1.0	U	1000.0	U	1.0
1,1,2,2-Tetrachloroethane	U	1.0	160000	1000.0	1.5	1.0
1,2,3-Trichloropropene	U	1.0	U	1000.0	U	1.0
Bromobenzene	U	1.0	U	1000.0	U	1.0
n-Propylbenzene	U	1.0	U	1000.0	U	1.0
2-Chlorotoluene	U	1.0	U	1000.0	U	1.0
4-Chlorotoluene	U	1.0	U	1000.0	U	1.0
1,3,5-Trimethylbenzene	U	1.0	U	1000.0	U	1.0
tert-Butylbenzene	U	1.0	U	1000.0	U	1.0
1,2,4-Trimethylbenzene	U	1.0	U	1000.0	U	1.0
sec-Butylbenzene	U	1.0	U	1000.0	U	1.0
1,3-Dichlorobenzene	U	1.0	U	1000.0	U	1.0
p-Isopropyltoluene	U	1.0	U	1000.0	U	1.0
1,4-Dichlorobenzene	U	1.0	U	1000.0	U	1.0
1,2-Dichlorobenzene	U	1.0	U	1000.0	U	1.0
n-Butylbenzene	U	1.0	U	1000.0	U	1.0
1,2-Dibromo-3-Chloropropene	U	1.0	U	1000.0	U	1.0
1,2,4-Trichlorobenzene	U	1.0	U	1000.0	U	1.0
Naphthalene	U	1.0	U	1000.0	U	1.0
Hexachlorobutadiene	U	1.0	U	1000.0	U	1.0
1,2,3-Trichlorobenzene	U	1.0	U	1000.0	U	1.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
MA # 2-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	10175	10181			
LOCATION		JFP-5	JFP-4			
COLLECTED		05/14/97	05/14/97			
ANALYZED	05/20/97	05/20/97	05/20/97			
INJECTED	14:57	15:41	17:57			
FILE #	A2480	A2481	A2483			
DIL. FACT.	1	1	1			
UNIT	ug/L	ug/L	ug/L			
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL
Dichlorodifluoromethane	U	1.0	U	1.0	U	1.0
Chloromethane	U	1.0	U	1.0	U	1.0
Vinyl Chloride	U	1.0	U	1.0	U	1.0
Bromomethane	U	2.0	U	2.0	U	2.0
Chloroethane	U	1.0	U	1.0	U	1.0
Trichlorofluoromethane	U	1.0	U	1.0	U	1.0
Acetone	U	2.0	U	2.0	U	2.0
1,1-Dichloroethene	U	1.0	U	1.0	U	1.0
Carbon Disulfide	U	1.0	U	1.0	U	1.0
Methylene Chloride	U	1.0	U	1.0	U	1.0
Methyl-tertiary-butylether	U	1.0	U	1.0	14	1.0
trans-1,2-Dichloroethene	U	1.0	20	1.0	U	1.0
1,1-Dichloroethane	U	1.0	U	1.0	U	1.0
2-Butanone	U	4.0	U	4.0	U	4.0
2,2-Dichloropropane	U	1.0	U	1.0	U	1.0
cis-1,2-Dichloroethene	U	1.0	61	1.0	U	1.0
Chloroform	U	1.0	U	1.0	U	1.0
1,1-Dichloropropene	U	1.0	U	1.0	U	1.0
1,2-Dichloroethane	U	1.0	U	1.0	U	1.0
1,1,1-Trichloroethane	U	1.0	U	1.0	U	1.0
Carbon Tetrachloride	U	1.0	U	1.0	U	1.0
Benzene	U	1.0	U	1.0	U	1.0
Trichloroethene	U	1.0	190	1.0	U	1.0
1,2-Dichloropropane	U	1.0	U	1.0	U	1.0
Dibromomethane	U	1.0	U	1.0	U	1.0
Bromodichloromethane	U	1.0	U	1.0	U	1.0
cis-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0
trans-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0
1,1,2-Trichloroethane	U	1.0	16	1.0	U	1.0
1,3-Dichloropropane	U	1.0	U	1.0	U	1.0
Dibromoethane	U	1.0	U	1.0	U	1.0
1,2-Dibromoethane	U	1.0	U	1.0	U	1.0
Bromoform	U	1.0	U	1.0	U	1.0
4-Methyl-2-Pentanone	U	2.0	U	2.0	U	2.0

Table 1.1 (Cont) Results of the Analysis for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG

SAMPLE #	LAB BLANK	10175	10181			
LOCATION		JPP-5	JPP-4			
COLLECTED		05/16/97	05/16/97			
ANALYZED	05/20/97	05/20/97	05/20/97			
INJECTED	14:57	15:41	17:57			
FILE	A2480	A2481	A2483			
DIL. FACT.	1	1	1			
UNIT	µg/L	µg/L	µg/L			
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL
Toluene	U	1.0	U	1.0	U	1.0
2-Hexanone	U	2.0	U	2.0	U	2.0
Tetrachloroethene	U	1.0	14	1.0	U	1.0
Chlorobenzene	U	1.0	U	1.0	U	1.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0
Ethylbenzene	U	1.0	U	1.0	U	1.0
p & m-Xylene	U	1.0	U	1.0	U	1.0
o-Xylene	U	1.0	U	1.0	U	1.0
Styrene	U	1.0	U	1.0	U	1.0
Isopropylbenzene	U	1.0	U	1.0	U	1.0
1,1,2,2-Tetrachloroethane	U	1.0	370	1.0	U	1.0
1,2,3-Trichloropropane	U	1.0	U	1.0	U	1.0
Bromobenzene	U	1.0	U	1.0	U	1.0
n-Propylbenzene	U	1.0	U	1.0	U	1.0
2-Chlorotoluene	U	1.0	U	1.0	U	1.0
4-Chlorotoluene	U	1.0	U	1.0	U	1.0
1,3,5-Trimethylbenzene	U	1.0	U	1.0	U	1.0
tert-Butylbenzene	U	1.0	U	1.0	U	1.0
1,2,4-Trimethylbenzene	U	1.0	U	1.0	U	1.0
sec-Butylbenzene	U	1.0	U	1.0	U	1.0
1,3-Dichlorobenzene	U	1.0	U	1.0	U	1.0
p-Isopropyltoluene	U	1.0	U	1.0	U	1.0
1,4-Dichlorobenzene	U	1.0	U	1.0	U	1.0
1,2-Dichlorobenzene	U	1.0	U	1.0	U	1.0
n-Butylbenzene	U	1.0	U	1.0	U	1.0
1,2-Dibromo-3-Chloropropane	U	1.0	U	1.0	U	1.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	1.0
Naphthalene	U	1.0	U	1.0	U	1.0
Hexaschlorobutadiene	U	1.0	U	1.0	U	1.0
1,2,3-Trichlorobenzene	U	1.0	U	1.0	U	1.0

**Table 1.2 Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample # LabFile#	LAB BLANK A2398	Unit Con. Factor	µg/L 1
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CAS#	Compound	Q	RT	Conc
1	NO PEAKS FOUND			0
2				0
3				0
4				0
5				0
6				0
7				0
8				0
9				0
10				0
11				0
12				0
13				0
14				0
15				0
16				0
17				0
18				0
19				0
20				0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10190	Unit	µg/L
LabFile#	A2399	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10178	Unit	µg/L
LabFile#	A2404	Con. Factor	500

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample # LabFile#	LAB BLANK A2414	Unit Con. Factor	µg/L 1
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	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10195	Unit	µg/L
LabFile#	A2420	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		ALKENE C5H8		5.57	100
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10177	Unit	µg/L
LabFile#	A2422	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10176	Unit	µg/L
LabFile#	A2423	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10182	Unit	µg/L
LabFile#	A2425	Con. Factor	1
CAS#			
1	NO PEAKS FOUND	Q	RT
2			0
3			0
4			0
5			0
6			0
7			0
8			0
9			0
10			0
11			0
12			0
13			0
14			0
15			0
16			0
17			0
18			0
19			0
20			0

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**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10191	Unit	µg/L
LabFile#	A2426	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		UNKNOWN		4.29	6
2		UNKNOWN		12.36	10
3		UNKNOWN ESTER		17.70	14
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	Lab File#	LAB BLANK	Unit	µg/L
		A2447	Con. Factor	1
1	CAS#	Compound	Q	RT
1		NO PEAKS FOUND		0
2				0
3				0
4				0
5				0
6				0
7				0
8				0
9				0
10				0
11				0
12				0
13				0
14				0
15				0
16				0
17				0
18				0
19				0
20				0

Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
 WA # 2-173 J-Field Phytoremediation Study, APG

Sample #	10188	Unit	$\mu\text{g/L}$
LabFile#	A2448	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		1,2-DIBROMO ETHENE		16.82	9
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10196	Unit	µg/L
LabFile#	A2449	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10192	Unit	µg/L
LabFile#	A2450	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
 WA # 2-173 J-Field Phytoremediation Study, APG

Sample #	10193	Unit	$\mu\text{g/L}$
LabFile#	A2451	Con. Factor	1
CAS#			
1	NO PEAKS FOUND	Q	RT
2			0
3			0
4			0
5			0
6			0
7			0
8			0
9			0
10			0
11			0
12			0
13			0
14			0
15			0
16			0
17			0
18			0
19			0
20			0

Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
 WA # 2-173 J-Field Phytoremediation Study, APG

Sample #	10179	Unit	$\mu\text{g/L}$
LabFile#	A2452	Con. Factor	20

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10184	Unit	µg/L
LabFile#	A2453	Con. Factor	50

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10180	Unit	µg/L
LabFile#	A2454	Con. Factor	100

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG

Sample # 10183 Unit µg/L
LabFile# A2455 Con. Factor 100

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
 WA # 2-173 J-Field Phytoremediation Study, APG

Sample #	10186	Unit	$\mu\text{g/L}$
LabFile#	A2456	Con. Factor	100

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10187	Unit	µg/L
LabFile#	A2457	Con. Factor	200

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample # LabFile#	LAB BLANK A2462	Unit Con. Factor	µg/L 1
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	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10207	Unit	µg/L
LabFile#	A2463	Con. Factor	1
Compound			
1	NO PEAKS FOUND	Q	RT
2			0
3			0
4			0
5			0
6			0
7			0
8			0
9			0
10			0
11			0
12			0
13			0
14			0
15			0
16			0
17			0
18			0
19			0
20			0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10208	Unit	µg/L
LabFile#	A2464	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10194	Unit	µg/L
LabFile#	A2466	Con. Factor	1
Compound			
1	NO PEAKS FOUND	Q	RT
2			0
3			0
4			0
5			0
6			0
7			0
8			0
9			0
10			0
11			0
12			0
13			0
14			0
15			0
16			0
17			0
18			0
19			0
20			0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10185	Unit	µg/L
LabFile#	A2469	Con. Factor	20

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10189	Unit	µg/L
LabFile#	A2470	Con. Factor	1000

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10206	Unit	µg/L
LabFile#	A2474	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		ALKENE C4H8		17.23	31
2		ALDEHYDE C6H10O		19.17	140
3		UNKNOWN		21.68	12
4		UNKNOWN		25.71	22
5		UNKNOWN		27.73	6
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	Lab File#	LAB BLANK	Unit	µg/L
		A2480	Con. Factor	1
Compound				
1		NO PEAKS FOUND	Q	0
2			RT	0
3			Conc	0
4				0
5				0
6				0
7				0
8				0
9				0
10				0
11				0
12				0
13				0
14				0
15				0
16				0
17				0
18				0
19				0
20				0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10175	Unit	µg/L
LabFile#	A2481	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

**Table 1.2 (Cont) Results of the Analysis TICs for VOC in Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample #	10181	Unit	µg/L
LabFile#	A2483	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

QA/QC for VOC

Prior to analysis, each sample was spiked with a three component mixture of CLP surrogate standards consisting of toluene-d₆, 4-bromofluorobenzene and 1,2-dichloroethane-d₂. The surrogate percent recoveries, listed in Table 2.1, ranged from 94 to 111. All one hundred and twenty values were within the acceptable QC limits.

The internal standard areas (for bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-d₁) are also listed in Table 2.1. All one hundred and twenty areas are within the acceptable QC limits.

Samples 10182, 10193 and 10181 were chosen for the matrix spike/matrix spike duplicate (MS/MSD) analyses. The percent recoveries, ranging from 93 to 110, are listed in Table 2.2. All thirty values were within the acceptable QC limits. The relative percent differences, also listed in Table 2.2, ranged from 0 (zero) to 3, and all fifteen values were within the acceptable QC limits.

The initial calibration is listed in Table 2.3.

The continuing calibrations are listed in Table 2.4.

Table 2.1 Results of the Internal Standard Areas and Surrogate Recoveries for VOC
MA # 2-173 J-Field Phytoremediation Study, APG

Sample #	Data File	Internal Standards			Surrogates		
		1 area	2 area	3 area	DIC %	TOL %	BRO %
CAL CHECK	50 PPB VOC	>A2396	66238	292104	232780	NA	NA
LAB BLANK		>A2398	58004	272128	237829	102	96
10190		>A2399	53131	240944	209371	102	96
10178		>A2404	52796	241707	202846	103	97
CAL CHECK	50 PPB VOC	>A2412	58802	271617	226435	NA	NA
LAB BLANK		>A2414	54732	275589	220399	97	101
10195		>A2420	56260	266503	223155	97	99
10177		>A2422	51239	267230	205662	98	99
10176		>A2423	51092	249075	201893	98	101
10182		>A2425	55137	252051	202650	97	102
10191		>A2426	53102	247959	209911	99	101
CAL CHECK	50 PPB VOC	>A2446	51131	241373	206667	NA	NA
LAB BLANK		>A2447	52097	247748	210956	100	99
10188		>A2448	50289	235715	202211	101	99
10196		>A2449	47968	228664	196290	103	99
10192		>A2450	47021	223899	193304	104	98
10193		>A2451	46630	219952	188568	102	99
10179		>A2452	46093	220926	190495	104	98
10184		>A2453	46733	222870	191443	104	99
10180		>A2454	46578	224225	191159	104	99
10183		>A2455	47197	225767	193524	103	100
10186		>A2456	48532	229346	196085	101	100
10187		>A2457	48463	231969	198642	102	100
10178	1000x	>A2458	43794	215508	186332	105	99

SURROGATE LIMITS WATER

S1 (DIC) = 1,2-Dichloroethane-d4 (76-114)
 S2 (TOL) = Toluene-d8 (88-110)
 S3 (BRO) = Bromofluorobenzene (86-115)

Table 2.1 (Cont) Results of the Internal Standard Areas and Surrogate Recoveries for VOC
WA # 2-173 J-Field Phytoremediation Study, APG

CAL CHECK	Sample #	Data File	Internal Standards			Surrogates		
			1 area	2 area	3 area	DIC %	TOL %	BRO %
CAL CHECK	50 PPB VOC	>A2460	47713	226485	195488	NA	NA	NA
LAB BLANK		>A2462	41168	197701	178848	102	98	99
10207		>A2463	40674	194458	173318	103	98	98
10208		>A2464	41091	193020	165151	103	101	99
10194		>A2466	32067	149243	127484	111	101	100
10177 (5x)		>A2468	34792	160086	136129	108	101	101
10185		>A2469	35913	165675	138494	107	101	101
10189		>A2470	35250	168629	142477	110	101	101
10188 (10x)		>A2471	35186	167359	144514	109	101	102
10206		>A2474	33762	160692	142527	102	98	104

CAL CHECK	50 PPB VOC	>A2478	39350	182861	159907	NA	NA	NA
LAB BLANK		>A2480	41144	192582	166963	97	101	99
10175		>A2481	40683	193290	165608	98	102	99
10175 (5x)		>A2482	41533	199308	169762	96	101	99
10181		>A2483	42104	203578	173311	95	101	99
10182MS		>A2484	38843	187217	163930	102	101	100
10182MSD		>A2485	40709	191893	160029	101	103	98
10193MS		>A2486	40987	189691	158296	101	102	98
10193MSD		>A2487	41325	189454	157253	101	103	99
10181MS		>A2488	40350	188311	157757	102	102	99
10181MSD		>A2489	40826	188308	158016	101	102	99

SURROGATE LIMITS WATER

S1 (DIC) = 1,2-Dichloroethane-d4 (76-114)
 S2 (TOL) = Toluene-d8 (88-110)
 S3 (BRO) = Bromofluorobenzene (86-115)

**Table 2.2 Results of MS/MSD Analysis for VOC In Water
WA # 2-173 J-Field Phytoremediation Study, APG**

Sample ID: 10182

Compound Name	Sample Conc. µg/L	MS	MSD	MS Conc. µg/L	MSD Conc. µg/L	MS % Rec.	MSD % Rec.	QC Limits		
		Spike Added µg/L	Spike Added µg/L					RPD	RPD	% Rec.
1,1-Dichloroethene	U	50	50	54.1	54.9	108	110	2	14	61 - 145
Trichloroethene	U	50	50	49.5	48.9	98	98	1	14	71 - 120
Benzene	U	50	50	47.5	47.8	95	95	1	11	76 - 127
Toluene	U	50	50	48.3	49.0	97	98	1	13	76 - 125
Chlorobenzene	U	50	50	49.2	49.0	98	98	0	13	75 - 130

Sample ID: 10183

Compound Name	Sample Conc. µg/L	MS	MSD	MS Conc. µg/L	MSD Conc. µg/L	MS % Rec.	MSD % Rec.	QC Limits		
		Spike Added µg/L	Spike Added µg/L					RPD	RPD	% Rec.
1,1-Dichloroethene	U	50	50	48.7	47.5	98	95	5	14	61 - 145
Trichloroethene	U	50	50	47.5	46.3	95	93	3	14	71 - 120
Benzene	U	50	50	47.7	46.3	95	93	3	11	76 - 127
Toluene	U	50	50	49.2	47.7	98	95	3	13	76 - 125
Chlorobenzene	U	50	50	49.2	47.6	98	95	3	13	75 - 130

Sample ID: 10181

Compound Name	Sample Conc. µg/L	MS	MSD	MS Conc. µg/L	MSD Conc. µg/L	MS % Rec.	MSD % Rec.	QC Limits		
		Spike Added µg/L	Spike Added µg/L					RPD	RPD	% Rec.
1,1-Dichloroethene	U	50	50	50.5	48.9	101	98	3	14	61 - 145
Trichloroethene	U	50	50	48.3	48.4	97	97	0	14	71 - 120
Benzene	U	50	50	47.5	47.2	95	94	1	11	76 - 127
Toluene	U	50	50	49.0	48.3	98	97	1	13	76 - 125
Chlorobenzene	U	50	50	48.7	48.3	97	97	1	13	75 - 130

**Table 2.3 Results of the Initial Calibration for VOC
WA # 2-173 J-Field Phytoremediation Study, APG**

Instrument ID: GCMSD-1(3004A12505)
Calibration Date: 05/15/97

Minimum \overline{RF} for SPCC is 0.30 Maximum % RSD for CCC is 30.0%

Compound	Laboratory ID: >A2386 >A2388 >A2389 >A2390 >A2391 >A2392						\overline{RRT}	\overline{RF}	% RSD	CCC	SPCC
	RF 5.00	RF 20.00	RF 50.00	RF 100.00	RF 150.00	RF 200.00					
Dichlorodifluoromethane	2.53364	2.20629	2.28264	2.38395	2.38489	2.17771	.227	2.32819	5.702		
Chloromethane	1.18514	1.06307	1.07733	1.09688	1.09747	1.01431	.262	1.08903	5.156	*	**
Vinyl Chloride	1.41204	1.18769	1.21950	1.25010	1.25918	1.14910	.279	1.24627	7.288	*	
Bromomethane	1.38074	1.18843	1.28293	1.31453	1.36257	1.26463	.349	1.29897	5.403		
Chloroethane	.84657	.78359	.78722	.81367	.80401	.74208	.372	.79619	4.377		
Trichlorofluoromethane	3.63733	3.06891	3.19090	3.24377	3.29917	3.09561	.434	3.25595	6.330		
Acetone	.73148	.53700	.46171	.44731	.41507	.38627	.561	.49614	25.449		
1,1-Dichloroethene	1.47231	1.28448	1.30620	1.33222	1.33089	1.26912	.567	1.32920	5.772	*	
Carbon Disulfide	3.70133	3.31830	3.55229	3.69385	3.72134	3.53013	.640	3.58621	4.305		
Methylene Chloride	1.72569	1.41619	1.43220	1.45272	1.43778	1.35695	.671	1.46692	8.820		
trans-1,2-Dichloroethene	1.65795	1.41244	1.44372	1.45840	1.44077	1.36903	.763	1.46372	6.851		
Methyl-tertiary-butylether	4.14658	3.25152	3.71495	3.57575	3.71679	3.69227	.743	3.68264	7.820		
1,1-Dichloroethane	3.22632	2.85679	2.84387	2.85398	2.87924	2.76348	.829	2.90361	5.581		
2-Butanone	.75500	.57952	.65258	.55508	.57901	.61054	.926	.62195	11.790		
2,2-Dichloropropane	2.55124	1.10929	2.31177	1.75622	2.12989	2.09614	.950	1.99242	25.391		
cis-1,2-Dichloroethene	1.81025	1.55813	1.57924	1.56330	1.55682	1.50138	.949	1.59485	6.821		
Chloroform	4.13459	3.50702	3.54789	3.56452	3.54385	3.44960	.983	3.62458	6.986	*	
1,1-Dichloropropene	2.62583	2.23405	2.33378	2.27717	2.25621	2.20984	1.098	2.32281	6.644		
1,2-Dichloroethane	2.58846	2.16280	2.26227	2.22857	2.21221	2.18369	1.129	2.27300	6.968		
1,2-Dichloroethane-d ₄ (SURR)	1.90340	1.91406	2.00728	1.89644	1.85294	1.86486	1.111	1.90650	2.866		
1,1,1-Trichloroethane	.68383	.58246	.61790	.63502	.64185	.62831	.881	.63156	5.231		
Carbon Tetrachloride	.55953	.47777	.55014	.54655	.56403	.56564	.920	.54394	6.120		
Benzene	.99100	.85437	.86965	.86927	.85899	.83935	.940	.88044	6.282		
Trichloroethene	.44665	.37817	.39244	.38467	.38193	.37915	1.044	.39384	6.696		
1,2-Dichloropropane	.43230	.37470	.38489	.38305	.37691	.37154	1.066	.38723	5.848	*	
Dibromomethane	.42745	.35884	.37892	.35653	.35852	.36317	1.094	.37390	7.347		
Bromodichloromethane	.80040	.71834	.75223	.76396	.75114	.73001	1.096	.75268	3.805		
cis-1,3-Dichloropropene	.57749	.45062	.55545	.53891	.55343	.54870	1.191	.53743	8.259		
trans-1,3-Dichloropropene	.50940	.40042	.49002	.43584	.48040	.49676	1.271	.46881	8.938		
1,1,2-Trichloroethane	.37247	.30555	.32731	.32330	.31365	.31107	1.291	.32556	7.474		

RF - Response Factor (Subscript is amount in ppb)

RRT - Average Relative Retention Time (RT Std/RT Istd)

RF - Average Response Factor

%RSD - Percent Relative Standard Deviation

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**) (Conc=50.0,50)

Table 2.3 (Cont) Results of the Initial Calibration for VOC
WA # 2-173 J-Field Phytoremediation Study, APG

Instrument ID: GCMSD-1(3004A12505)

Calibration Date: 05/15/97

Minimum RF for SPCC is 0.30 Maximum % RSD for CCC is 30.0%

Compound	Laboratory ID: >A2386 >A2388 >A2389 >A2390 >A2391 >A2392						RRT	RF	% RSD	CCC	SPCC
	RF 5.00	RF 20.00	RF 50.00	RF 100.00	RF 150.00	RF 200.00					
1,3-Dichloropropene	.64613	.52196	.57694	.55711	.54603	.54607	1.331	.54537	7.684		
Dibromochloromethane	.61705	.55486	.60410	.59867	.58751	.60499	1.361	.59486	3.678		
1,2-Dibromoethane	.53376	.45413	.52026	.50907	.49814	.50352	1.392	.50348	5.401		
Bromoform	.42549	.36250	.44170	.43869	.41135	.43167	1.610	.41857	7.051	**	
4-Methyl-2-Pentanone	.47108	.40538	.44612	.40910	.44352	.44316	.802	.44306	7.120		
Toluene-d8 (SURR)	1.03808	1.06767	1.03878	1.03236	1.06372	1.06084	.840	1.05021	1.469		(Conc=50.0, ! .0
Toluene	.81389	.71845	.70225	.69251	.71393	.70209	.848	.72385	6.227	*	
2-Hexanone	.36828	.28815	.31817	.28667	.30261	.32741	.897	.31515	9.725		
Tetrachloroethene	.59890	.53641	.52459	.50811	.51292	.51541	.920	.53272	6.369		
Chlorobenzene	1.08462	.93866	.93688	.91051	.91394	.90710	1.004	.94862	7.167	**	
1,1,1,2-Tetrachloroethene	.53065	.48173	.48606	.47720	.48053	.47638	1.012	.49009	4.905		
Ethylbenzene	1.79645	1.57649	1.59409	1.58180	1.58197	1.52998	1.019	1.61013	5.834	*	
p & m-Xylene	1.44233	1.27432	1.25549	1.23896	1.18980	1.02467	1.030	1.23760	10.913		(Conc=10.0, ! .0
o-Xylene	1.49127	1.29481	1.29662	1.29106	1.27498	1.24628	1.076	1.31584	6.687		
Styrene	.63492	.57816	.58068	.58560	.57865	.56262	1.078	.58677	4.230		
Isopropylbenzene	1.61417	1.41252	1.43610	1.43958	1.41177	1.40209	1.122	1.45270	5.539		
1,1,2,2-Tetrachloroethene	.78072	.66095	.71474	.67995	.69937	.71122	1.132	.70616	5.898	**	
p-Bromofluorobenzene (SURR)	.56752	.55119	.57022	.56750	.55499	.55674	1.140	.56136	1.626		(Conc=50.0, ! .0
1,2,3-Trichloropropene	.19249	.15786	.17643	.16685	.16889	.17460	1.148	.17286	6.737		
Bromobenzene	.58433	.50236	.51259	.50918	.49719	.49675	1.157	.51707	6.693		
n-Propylbenzene	.43527	.36513	.38336	.37733	.36068	.35950	1.169	.38021	7.520		
2-Chlorotoluene	.42171	.35988	.37086	.36207	.35948	.34029	1.180	.36905	7.497		
4-Chlorotoluene	.43705	.36863	.37593	.37084	.33498	.35353	1.187	.37243	9.452		
1,3,5-Trimethylbenzene	1.52568	1.30807	1.34323	1.33172	1.26287	1.24232	1.190	1.33655	7.496		
tert-Butylbenzene	1.47754	1.26105	1.29918	1.28905	1.23113	1.20977	1.231	1.29462	7.398		
1,2,4-Trimethylbenzene	1.52593	1.31664	1.34328	1.33580	1.27383	1.24058	1.233	1.33934	7.422		
sec-Butylbenzene	2.08174	1.77653	1.85366	1.85321	1.77665	1.72524	1.256	1.84451	6.853		
1,3-Dichlorobenzene	.99902	.84733	.86855	.86431	.83449	.81425	1.269	.87133	7.535		
p-Isopropyltoluene	1.59465	1.36981	1.43078	1.42789	1.35780	1.32581	1.275	1.41779	6.759		
1,4-Dichlorobenzene	1.02780	.87827	.90709	.90983	.86267	.84976	1.282	.90590	7.096		
1,2-Dichlorobenzene	.95130	.79901	.83874	.82877	.79806	.76265	1.322	.82975	7.867		
n-Butylbenzene	1.70804	1.45158	1.53803	1.55031	1.46478	1.40229	1.326	1.51917	7.101		
1,2-Dibromo-3-Chloropropane	.13861	.11555	.14877	.14167	.14664	.15536	1.413	.14110	9.781		
1,2,4-Trichlorobenzene	.71390	.58674	.65407	.66712	.63330	.59980	1.515	.64249	7.252		
Naphthalene	1.01611	.88636	1.04763	1.07794	1.08141	1.07171	1.534	1.02983	7.249		
Hexachlorobutadiene	.44722	.35060	.39388	.39713	.37867	.35103	1.540	.38662	9.304		
1,2,3-Trichlorobenzene	.68338	.55305	.61976	.62525	.59925	.56456	1.566	.60754	7.755		

RF - Response Factor (Subscript is amount in ppb)

RRT - Average Relative Retention Time (RT Std/RT Istd)

RF - Average Response Factor

%RSD - Percent Relative Standard Deviation

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

**Table 2.4 Results of the Continuing Calibration for VOC
WA # 2-173 J-Field Phytoremediation Study, APG**

Calibration Date: 05/15/97

Time: 22:16

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 05/15/97

Minimum \overline{RF} for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	\overline{RF}	RF	%Diff	CCC	SPCC
Dichlorodifluoromethane	2.32819	2.35549	1.17		
Chloromethane	1.08903	1.10855	1.79	**	
Vinyl Chloride	1.24627	1.25617	.79	*	
Bromomethane	1.29897	1.31654	1.35		
Chloroethane	.79619	.81760	2.69		
Trichlorofluoromethane	3.25595	3.32025	1.97		
Acetone	.49614	.55953	12.78		
1,1-Dichloroethene	1.32920	1.37551	3.48	*	
Carbon Disulfide	3.58621	3.62576	1.10		
Methylene Chloride	1.46992	1.46982	.01		
trans-1,2-Dichloroethene	1.46372	1.50006	2.48		
Methyl-tertiary-butylether	3.68264	3.88585	5.52		
1,1-Dichloroethane	2.90361	2.94627	1.47	**	
2-Butanone	.62195	.69342	11.49		
2,2-Dichloropropane	1.99242	2.40783	20.85		
cis-1,2-Dichloroethene	1.59485	1.61542	1.29		
Chloroform	3.62458	3.60888	.43	*	
1,1-Dichloropropene	2.32281	2.33516	.53		
1,2-Dichloroethane	2.27300	2.26806	.22		
1,2-Dichloroethane-d4 (SURR)	1.90650	1.92734	1.09		
1,1,1-Trichloroethane	.63156	.64907	2.77		
Carbon Tetrachloride	.54394	.56614	4.08		
Benzene	.88044	.89766	1.96		
Trichloroethene	.39384	.40955	3.99		
1,2-Dichloropropene	.38723	.39508	2.03	*	
Dibromomethane	.37390	.39310	5.13		
Bromodichloromethane	.75268	.76605	1.51		
cis-1,3-Dichloropropene	.53743	.56118	4.42	(Conc=50.00)	
trans-1,3-Dichloropropene	.46881	.48396	3.23	(Conc=50.00)	
1,1,2-Trichloroethane	.32556	.32716	.49		
1,3-Dichloropropane	.56537	.56986	.79		
Dibromochloromethane	.59486	.62928	5.78		

RF - Response Factor from daily standard file at 50.00 ppb

\overline{RF} - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

**Table 2.4 (Cont) Results of the Continuing Calibration for VOC
WA # 2-173 J-Field Phytoremediation Study, APG**

Calibration Date: 05/15/97

Time: 22:16

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 05/15/97

Minimum RF for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	RF	RF	%Diff	CCC	SPCC
1,2-Dibromoethane	.50348	.51597	2.48		
Bromoform	.41857	.42736	2.10	**	
4-Methyl-2-Pentanone	.64306	.66914	5.89		
Toluene-d8 (SLURR)	1.05021	1.06609	1.51		
Toluene	.72385	.75540	4.36	*	
2-Hexanone	.31515	.35583	12.91		
Tetrachloroethene	.53272	.56603	5.88		
Chlorobenzene	.94862	.97752	3.05	**	
1,1,1,2-Tetrachloroethane	.49009	.51159	4.39		
Ethylbenzene	1.61013	1.63615	1.62	*	
p & m-Xylene	1.23760	1.33136	7.58		(Conc=100.00)
o-Xylene	1.31584	1.35427	2.92		
Styrene	.58677	.60893	3.78		
Isopropylbenzene	1.45270	1.49749	3.08		
1,1,2,2-Tetrachloroethane	.70616	.73342	3.86	**	
p-Bromofluorobenzene (SLURR)	.56136	.55625	.91		
1,2,3-Trichloropropane	.17286	.18224	5.43		
Bromobenzene	.51707	.53289	3.06		
n-Propylbenzene	.38021	.38948	2.44		
2-Chlorotoluene	.36905	.40614	10.05		
4-Chlorotoluene	.37243	.35549	4.55		
1,3,5-Trimethylbenzene	1.33655	1.37523	2.89		
tert-Butylbenzene	1.29462	1.33031	2.76		
1,2,4-Trimethylbenzene	1.33934	1.37460	2.63		
sec-Butylbenzene	1.84451	1.88774	2.34		
1,3-Dichlorobenzene	.87133	.88774	1.88		
p-Isopropyltoluene	1.41779	1.44749	2.09		
1,4-Dichlorobenzene	.90590	.93636	3.36		
1,2-Dichlorobenzene	.82975	.84852	2.26		
n-Butylbenzene	1.51917	1.55504	2.36		
1,2-Dibromo-3-Chloropropane	.14110	.14802	4.91		
1,2,4-Trichlorobenzene	.64249	.66688	.68		
Naphthalene	1.02983	1.05081	2.04		
Hexachlorobutadiene	.38642	.37810	2.16		
1,2,3-Trichlorobenzene	.60754	.60713	.07		

RF - Response Factor from daily standard file at 50.00 ppb

RF - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

**Table 2.4 (Cont) Results of the Continuing Calibration for VOC
WA # 2-173 J-Field Phytoremediation Study, APG**

Calibration Date: 05/16/97

Time: 11:16

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 05/15/97

Minimum RF for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	RF	RF	%Diff	CCC	SPCC
Dichlorodifluoromethane	2.32819	2.29926	1.24		
Chloromethane	1.08903	1.10853	1.79	**	
Vinyl Chloride	1.24627	1.24251	.30	*	
Bromomethane	1.29897	1.26849	2.35		
Chloroethane	.79619	.82404	3.50		
Trichlorofluoromethane	3.25595	3.23696	.58		
Acetone	.49614	.58683	18.28		
1,1-Dichloroethene	1.32920	1.32965	.03	*	
Carbon Disulfide	3.58621	3.70743	3.38		
Methylene Chloride	1.46992	1.44750	1.53		
trans-1,2-Dichloroethene	1.46372	1.47907	1.05		
Methyl-tertiary-butylether	3.68264	3.54979	3.61		
1,1-Dichloroethane	2.90361	2.89597	.26	**	
2-Butanone	.62195	.74577	19.91		
2,2-Dichloropropane	1.99242	2.39642	20.28		
cis-1,2-Dichloroethene	1.59485	1.60438	.60		
Chloroform	3.62458	3.61712	.21	*	
1,1-Dichloropropene	2.32281	2.39444	3.08		
1,2-Dichloroethane	2.27300	2.32099	2.11		
1,2-Dichloroethane-d4 (SURR)	1.90650	2.04291	7.16		
1,1,1-Trichloroethane	.63156	.60318	4.49		
Carbon Tetrachloride	.54394	.53931	.85		
Benzene	.88044	.86342	1.93		
Trichloroethene	.39384	.39482	.25		
1,2-Dichloropropane	.38723	.38695	.07	*	
Dibromomethane	.37390	.37481	.26		
Bromodichloromethane	.75268	.76038	1.02		
cis-1,3-Dichloropropene	.53743	.54932	2.21	(Conc=50.00)	
trans-1,3-Dichloropropene	.46881	.46634	.53	(Conc=50.00)	
1,1,2-Trichloroethane	.32556	.32592	.11		
1,3-Dichloropropane	.56537	.58063	2.70		
Dibromo-chloromethane	.59486	.62878	5.70		

RF - Response Factor from daily standard file at 50.00 ppb

RF - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

**Table 2.4 (Cont) Results of the Continuing Calibration for VOC
WA # 2-173 J-Field Phytoremediation Study, APG**

Calibration Date: 05/16/97

Time: 11:16

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 05/15/97

Minimum RF for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	<u>RF</u>	RF	%Diff	CCC	SPCC
1,2-Dibromoethane	.50348	.51588	2.46		
Bromoform	.41857	.43806	4.66	**	
4-Methyl-2-Pentanone	.44306	.44236	.16		
Toluene-d8 (SURR)	1.05021	1.03638	1.32		
Toluene	.72385	.70711	2.31	*	
2-Hexanone	.31515	.35384	12.28		
Tetrachloroethene	.53272	.53093	.34		
Chlorobenzene	.94862	.95037	.19	**	
1,1,1,2-Tetrachloroethane	.49009	.49528	1.06		
Ethylbenzene	1.61013	1.55877	3.19	*	
p & m-Xylene	1.25760	1.27803	3.27		(Conc=100.00)
o-Xylene	1.31584	1.29731	1.41		
Styrene	.58677	.58278	.68		
Isopropylbenzene	1.45270	1.45425	.11		
1,1,2,2-Tetrachloroethane	.70616	.71671	1.49	**	
p-Bromofluorobenzene (SURR)	.56136	.56369	.42		
1,2,3-Trichloropropane	.17286	.17629	1.99		
Bromobenzene	.51707	.51761	.11		
n-Propylbenzene	.38021	.38581	1.67		
2-Chlorotoluene	.36905	.37075	.46		
4-Chlorotoluene	.37243	.39166	5.16		
1,3,5-Trimethylbenzene	1.33655	1.34860	.90		
tert-Butylbenzene	1.29462	1.31836	1.83		
1,2,4-Trimethylbenzene	1.33934	1.35026	.82		
sec-Butylbenzene	1.84451	1.88674	2.29		
1,3-Dichlorobenzene	.87133	.87223	.10		
p-Isopropyltoluene	1.41779	1.45529	2.64		
1,4-Dichlorobenzene	.90590	.91836	1.37		
1,2-Dichlorobenzene	.82975	.84847	2.26		
n-Butylbenzene	1.51917	1.56848	3.25		
1,2-Dibromo-3-Chloropropane	.16110	.14745	4.50		
1,2,4-Trichlorobenzene	.64249	.66855	4.06		
Naphthalene	1.02983	1.02392	.57		
Hexachlorobutadiene	.38642	.40285	4.25		
1,2,3-Trichlorobenzene	.60754	.62432	2.76		

RF - Response Factor from daily standard file at 50.00 ppb

RF - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

Table 2.4 (Cont) Results of the Continuing Calibration for VOC
WA # 2-173 J-Field Phytoremediation Study, APG

Calibration Date: 05/19/97

Time: 12:46

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 05/15/97

Minimum \overline{RF} for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	\overline{RF}	RF	%Diff	CCC	SPCC
Dichlorodifluoromethane	2.32819	2.58205	10.90		
Chloromethane	1.08903	1.24478	14.30	**	
Vinyl Chloride	1.24627	1.38104	10.81	*	
Bromomethane	1.29897	1.43768	10.68		
Chloroethane	.79619	.89552	12.48		
Trichlorofluoromethane	3.25595	3.62056	11.20		
Acetone	.49614	.70018	41.13		
1,1-Dichloroethene	1.32920	1.47885	11.26	*	
Carbon Disulfide	3.58621	4.00483	11.67		
Methylene Chloride	1.46992	1.59025	8.19		
trans-1,2-Dichloroethene	1.46372	1.61002	10.00		
Methyl-tertiary-butylether	3.68264	3.44578	6.43		
1,1-Dichloroethane	2.90361	3.16186	8.89	**	
2-Butanone	.62195	.72269	16.20		
2,2-Dichloropropane	1.99242	1.54587	22.41		
cis-1,2-Dichloroethene	1.59485	1.75661	10.14		
Chloroform	3.62458	3.98780	10.02	*	
1,1-Dichloropropene	2.32281	2.60838	12.29		
1,2-Dichloroethane	2.27300	2.52174	10.94		
1,2-Dichloroethane-d4 (SURR)	1.90650	2.00248	5.03		
1,1,1-Trichloroethane	.63156	.64098	1.49		
Carbon Tetrachloride	.54394	.57056	4.89		
Benzene	.88044	.92288	4.82		
Trichloroethene	.39384	.41664	5.79		
1,2-Dichloropropane	.38723	.40558	4.74	*	
Dibromomethane	.37390	.37930	1.44		
Bromodichloromethane	.75268	.80557	7.03		
cis-1,3-Dichloropropene	.53743	.51470	4.23	(Conc=50.00)	
trans-1,3-Dichloropropene	.46881	.39692	15.33	(Conc=50.00)	
1,1,2-Trichloroethane	.32556	.33320	2.35		
1,3-Dichloropropane	.56537	.58330	3.17		
Dibromochloromethane	.59486	.60474	1.66		

\overline{RF} - Response Factor from daily standard file at 50.00 ppb

\overline{RF} - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

**Table 2.4 (Cont) Results of the Continuing Calibration for VOC
WA # 2-173 J-Field Phytoremediation Study, APG**

Calibration Date: 05/19/97

Time: 12:46

Instrument ID: GCXSD-1(3004A12505)

Initial Calibration Date: 05/15/97

Minimum RF for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	RF	RF	%Diff	CCC	SPCC
1,2-Dibromoethane	.50348	.51393	2.07		
Bromoform	.41857	.42722	2.07	**	
4-Methyl-2-Pentanone	.44306	.41040	7.37		
Toluene-d8 (SURR)	1.05021	1.02651	2.26		
Toluene	.72385	.72799	.57	*	
2-Hexanone	.31515	.33034	4.82		
Tetrachloroethene	.53272	.54053	1.46		
Chlorobenzene	.94862	.96669	1.91	**	
1,1,1,2-Tetrachloroethane	.49009	.49470	.94		
Ethylbenzene	1.61013	1.65333	2.68	*	
p & m-Xylene	1.23760	1.29600	4.72		(Conc=100.00)
o-Xylene	1.31384	1.33757	1.65		
Styrene	.58677	.60147	2.51		
Isopropylbenzene	1.45270	1.47695	1.67		
1,1,2,2-Tetrachloroethane	.70616	.67689	4.14	**	
p-Bromofluorobenzene (SURR)	.56136	.56078	.10		
1,2,3-Trichloropropane	.17286	.16560	4.20		
Bromobenzene	.51707	.52150	.86		
n-Propylbenzene	.38021	.39294	3.35		
2-Chlorotoluene	.36905	.37855	2.58		
4-Chlorotoluene	.37243	.38447	3.23		
1,3,5-Trimethylbenzene	1.33655	1.37457	2.84		
tert-Butylbenzene	1.29462	1.32834	2.60		
1,2,4-Trimethylbenzene	1.33934	1.37163	2.41		
sec-Butylbenzene	1.84451	1.90850	3.47		
1,3-Dichlorobenzene	.87133	.87827	.80		
p-Isopropyltoluene	1.41779	1.46606	3.40		
1,4-Dichlorobenzene	.90590	.92059	1.62		
1,2-Dichlorobenzene	.82975	.82909	.08		
n-Butylbenzene	1.51917	1.59237	4.82		
1,2-Dibromo-3-Chloropropane	.14110	.13118	7.03		
1,2,4-Trichlorobenzene	.66249	.64580	.52		
Naphthalene	1.02983	.95427	7.34		
Hexachlorobutadiene	.38642	.40273	4.22		
1,2,3-Trichlorobenzene	.60754	.59611	1.88		

RF - Response Factor from daily standard file at 50.00 ppb

RF - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds ()**

**Table 2.4 (Cont) Results of the Continuing Calibration for VOC
WA # 2-173 J-Field Phytoremediation Study, APG**

Calibration Date: 05/19/97

Time: 23:42

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 05/15/97

Minimum RF for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	<u>RF</u>	RF	%diff	CCC	SPCC
Dichlorodifluoromethane	2.32819	2.58003	10.82		
Chloromethane	1.08903	1.26965	16.59	**	
Vinyl Chloride	1.24627	1.40901	13.06	*	
Bromomethane	1.29897	1.41676	9.07		
Chloroethane	.79619	.89913	12.93		
Trichlorofluoromethane	3.25595	3.68449	13.16		
Acetone	.49614	.74378	49.91		
1,1-Dichloroethene	1.32920	1.47949	11.31	*	
Carbon Disulfide	3.58621	4.08482	13.90		
Methylene Chloride	1.46992	1.62702	10.69		
trans-1,2-Dichloroethene	1.46372	1.61352	10.23		
Methyl-tertiary-butylether	3.68264	3.72794	1.23		
1,1-Dichloroethane	2.90361	3.18481	9.68	**	
2-Butanone	.62195	.80165	28.89		
2,2-Dichloropropane	1.99242	1.76857	11.24		
cis-1,2-Dichloroethene	1.59485	1.76788	10.85		
Chloroform	3.62458	4.04818	11.69	*	
1,1-Dichloropropene	2.32281	2.66049	14.54		
1,2-Dichloroethane	2.27300	2.62593	15.53		
1,2-Dichloroethane-d4 (SURR)	1.90650	2.07797	8.99		
1,1,1-Trichloroethane	.63156	.63798	1.02		
Carbon Tetrachloride	.54394	.55488	2.01		
Benzene	.88044	.93219	5.88		
Trichloroethene	.39384	.41756	6.02		
1,2-Dichloropropane	.38723	.41175	6.33	*	
Dibromomethane	.37390	.37406	.04		
Bromodichloromethane	.75268	.78697	4.56		
cis-1,3-Dichloropropene	.53743	.52686	1.97	(Conc=50.00)	
trans-1,3-Dichloropropene	.46881	.38700	17.45	(Conc=50.00)	
1,1,2-Trichloroethane	.32556	.34900	7.20		
1,3-Dichloropropane	.56537	.61662	9.06		
Dibromochloromethane	.59486	.63544	6.82		

RF - Response Factor from daily standard file at 50.00 ppb

RF - Average Response Factor from Initial Calibration Form VI

%diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

Table 2.6 (Cont) Results of the Continuing Calibration for VOC
WA # 2-173 J-Field Phytoremediation Study, APG

Calibration Date: 05/19/97

Time: 23:42

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 05/15/97

Minimum RF for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	<u>RF</u>	RF	%Diff	CCC	SPCC
1,2-Dibromoethane	.50348	.55022	9.28		
Bromoform	.41857	.45001	7.51	**	
4-Methyl-2-Pentanone	.44306	.45742	3.24		
Toluene-d8 (SURR)	1.05021	1.01440	3.61		
Toluene	.72385	.73250	1.19	*	
2-Hexanone	.31515	.36674	15.74		
Tetrachloroethene	.53272	.53572	.56		
Chlorobenzene	.94862	.97008	2.26	**	
1,1,1,2-Tetrachloroethane	.49009	.49261	.51		
Ethylbenzene	1.61013	1.66798	2.35	*	
p & m-Xylene	1.23760	1.31847	6.54		(Conc=100.00)
o-Xylene	1.31584	1.36354	3.63		
Styrene	.58677	.61533	4.87		
Isopropylbenzene	1.45270	1.50360	3.50		
1,1,2,2-Tetrachloroethane	.70616	.75015	6.23	**	
p-Bromofluorobenzene (SURR)	.56136	.55484	1.16		
1,2,3-Trichloropropane	.17286	.18020	4.25		
Bromobenzene	.51707	.52341	1.23		
n-Propylbenzene	.38021	.39627	4.22		
2-Chlorotoluene	.36905	.40395	9.46		
4-Chlorotoluene	.37243	.36680	1.51		
1,3,5-Trimethylbenzene	1.33655	1.39152	4.11		
tert-Butylbenzene	1.29462	1.34674	4.03		
1,2,4-Trimethylbenzene	1.33934	1.40155	4.64		
sec-Butylbenzene	1.84451	1.94347	5.37		
1,3-Dichlorobenzene	.87133	.89617	2.85		
p-Isopropyltoluene	1.41779	1.48321	4.61		
1,4-Dichlorobenzene	.90590	.92878	2.53		
1,2-Dichlorobenzene	.82975	.85601	3.16		
n-Butylbenzene	1.51917	1.61927	6.59		
1,2-Dibromo-3-Chloropropane	.14110	.14250	1.00		
1,2,4-Trichlorobenzene	.64249	.65393	1.78		
Naphthalene	1.02983	1.02187	.77		
Hexachlorobutadiene	.38642	.38804	.42		
1,2,3-Trichlorobenzene	.60754	.61323	.94		

RF - Response Factor from daily standard file at 50.00 ppb

RF - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

Table 2.4 (Cont) Results of the Continuing Calibration for VOC
WA # 2-173 J-Field Phytoremediation Study, APG

Calibration Date: 05/20/97

Time: 13:29

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 05/15/97

Minimum RF for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	RF	RF	%Diff	CCC	SPCC
Dichlorodifluoromethane	2.32819	2.64358	13.55		
Chloromethane	1.08903	1.23644	13.54	**	
Vinyl Chloride	1.24627	1.31548	5.55	*	
Bromomethane	1.29897	1.36752	5.28		
Chloroethane	.79619	.86579	8.74		
Trichlorofluoromethane	3.25595	3.03830	17.89		
Acetone	.49614	.51456	3.71		
1,1-Dichloroethene	1.32920	1.42752	7.40	*	
Carbon Disulfide	3.58621	3.77281	5.20		
Methylene Chloride	1.66992	1.54585	5.17		
trans-1,2-Dichloroethene	1.46372	1.56229	6.73		
Methyl-tertiary-butylether	3.68264	4.08041	10.80		
1,1-Dichloroethane	2.90361	3.15878	8.79	**	
2-Butanone	.62195	.73698	18.49		
2,2-Dichloropropane	1.99242	2.86274	43.68		
cis-1,2-Dichloroethene	1.59485	1.70851	7.13		
Chloroform	3.62458	4.12506	13.81	*	
1,1-Dichloropropene	2.32281	2.60534	12.16		
1,2-Dichloroethane	2.27300	2.76633	21.70		
1,2-Dichloroethane-d4 (SURR)	1.90650	2.18666	14.70		
1,1,1-Trichloroethane	.63156	.69966	10.78		
Carbon Tetrachloride	.54394	.53222	2.16		
Benzene	.88044	.92256	4.78		
Trichloroethene	.39384	.43161	9.59		
1,2-Dichloropropene	.38723	.40825	5.43	*	
Dibromomethane	.37390	.41890	12.03		
Bromodichloromethane	.75268	.82048	9.01		
cis-1,3-Dichloropropene	.53743	.61306	14.07	(Conc=50.00)	
trans-1,3-Dichloropropene	.46881	.54486	16.22	(Conc=50.00)	
1,1,2-Trichloroethane	.32556	.35013	7.55		
1,3-Dichloropropane	.56537	.62615	10.75		
Dibromochloromethane	.59486	.60283	1.34		

RF - Response Factor from daily standard file at 50.00 ppb

%Diff - Average Response Factor from Initial Calibration Form VI

CCC - % Difference from original average or curve

SPCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

Table 2.4 (Cont) Results of the Continuing Calibration for VOC
WA # 2-173 J-Field Phytoremediation Study, APG

Calibration Date: 05/20/97

Time: 13:29

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 05/15/97

Minimum \overline{RF} for SPCC is 0.30

Maximum % Diff for CCC is 25.0%

Compound	\overline{RF}	RF	%Diff	CCC	SPCC
1,2-Dibromoethane	.50348	.58896	16.98		
Bromoform	.41857	.44024	5.18	**	
4-Methyl-2-Pentanone	.44306	.49759	12.31		
Toluene-d8 (SURR)	1.05021	1.00464	4.34		
Toluene	.72385	.71406	1.35	*	
2-Hexanone	.31515	.35998	14.23		
Tetrachloroethene	.53272	.54809	2.88		
Chlorobenzene	.96862	.95212	.57	**	
1,1,1,2-Tetrachloroethane	.49009	.48486	1.07		
Ethylbenzene	1.61013	1.59612	.87	*	
p & m-Xylene	1.23760	1.32232	6.85		(Conc=100.00)
o-Xylene	1.31584	1.34555	2.26		
Styrene	.58677	.62456	6.44		
Isopropylbenzene	1.45270	1.47613	1.61		
1,1,2,2-Tetrachloroethane	.70616	.70083	.76	**	
p-Bromofluorobenzene (SURR)	.56136	.58456	4.13		
1,2,3-Trichloropropene	.17286	.18937	9.56		
Bromobenzene	.51707	.53389	3.25		
n-Propylbenzene	.38021	.38091	.18		
2-Chlorotoluene	.36905	.38155	3.39		
4-Chlorotoluene	.37263	.38170	2.49		
1,3,5-Trimethylbenzene	1.33655	1.38639	3.73		
tert-Butylbenzene	1.29462	1.33491	3.11		
1,2,4-Trimethylbenzene	1.33934	1.39826	4.40		
sec-Butylbenzene	1.84451	1.87122	1.45		
1,3-Dichlorobenzene	.87133	.89315	2.50		
p-Isopropyltoluene	1.41779	1.46152	3.08		
1,4-Dichlorobenzene	.90590	.92958	2.61		
1,2-Dichlorobenzene	.82975	.85339	2.85		
n-Butylbenzene	1.51917	1.56831	3.23		
1,2-Dibromo-3-Chloropropane	.14110	.14870	5.39		
1,2,4-Trichlorobenzene	.64249	.68680	6.90		
Naphthalene	1.02983	1.14254	10.94		
Hexachlorobutadiene	.38642	.39766	2.91		
1,2,3-Trichlorobenzene	.60754	.64330	5.89		

RF - Response Factor from daily standard file at 50.00 ppb

%RF - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

REAC, L. son, NJ
(908) 321-4200
EPA Contract 68-C4-0022

CHAIN OF CUSTODY RECORD

Project Name: J - field
Project Number: O 3347 - 041 - 001 - 1173 - 01
RFW Contact: R. Tabis
Phone: 321-4200

No: 08310

SHEET NO. 1 OF 1

05/15/97

Sample Identification

REAC #	Sample No.	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	To Lab	Volume (L)	VOC
017	09401	Tree 174	A	5/14/97	2	Glass tube/ice	✓	4.8 L	
018	09403	Field & Bank	A	5/14/97	1	Glass tube	✓	0	
019	09404	Lot Blank	A	5/14/97	1		✓	0	
020	09405	Assume 100	A	5/14/97	3		✓	0	
021	09406	Tree 175	A	5/14/97	2		✓	4.8	
022	09411	tree 47	A	5/14/97	2		✓	4.8	
023	10001	111-1	Cu		1		✓	0.1401 L	
024	10101	111-2			1				
025	10102	111-3			1				
026	10103	111-4			1				
027	10104	111-5			1				

0006

Special Instructions:

S: Soil
W: Water
D: Oil
A: Air
P: Sludge

FOR SUBCONTRACTING USE ONLY

**FROM CHAIN OF
CUSTODY #**

Item/Reason	Relinquished By	Date	Received By	Date	Time	Item/Reason	Relinquished By	Date	Received By	Date	Time
All / Analysis	Karen Roby	5/15/97	John	5/15/97	10:00	all analyses	Bill Johnson	5/15/97	Bob	5/15/97	10:00
Fill / Backfill	Karen Roby	5/15/97	John	5/15/97	10:00						
6 / Air - VOC	Bob	5/15/97	John	5/15/97	10:00						

J8) 321-4700
'A' Contl. . 6B-C4-0022

Project Name: J-fir 'A'
Project Number: 0331 . 041 - 001 - 1123-01
RFW Contact: R. Indiana
Phone: 321-4703

No: -3313

Sample Identification

7L97

Analyses Requested

TRAC #	Sample No.	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	Volume (L)	VOL
283	09425	Ambient	A	5/16/91	2	9/ass. specific	4.8	
286	D-61020X	Tree L14	X	5/16/91	4	40ml NATA/4%		
287	A-D10101	Field Blank						
288	A-D10204	Tua Park						

G222 0061

Special Instructions:

FOR SUBCONTRACTING USE ONLY
FROM CHAIN OF
CUSTODY #

Soil Water
W. O.
A.

Sediment
Drum Solids
Drum Liquids
Other
X PCTopher

Name/Reason	Received By	Date	Received By	Date	Name/Reason	Received By	Date	Name/Reason	Date	Time
110422	John Murch	5/16/91	Bethany	5/16/91	VSC	Bethany	5/19/91	VSC	5/19/91	0910

REAC, Inc., NJ
(908) 321-4200
EPA Contract 68-C4-0022

CH4 CUSTODY RECORD

Project Name 3/1/01 evi / 6/1/01
Project Number 08283
RFW Contact D. J. Ryan Phone: (908) 526-1177

SHEET NO. 1 OF 1

Sample Identification

REAC #	Sample No.	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	VOC	MS	ASD
028	111111	111		1/1/01	1	1			
029	111111	1							
030	111112	111	ref						
031	111001X	111	1						
032	1110111	111	1						
033	1110110	111	1						
034	1110111	111	1						
035	1110112	111	1						
036	1110113	111	1	1/1/01	1	1			
037	1110114	111	1	1/1/01	1	1			
038	1110115	111	1	1/1/01	1	1			
039	1110116	111	1	1/1/01	1	1			

Matrix: SD - Sediment PW - Potable Water S - Soil
DS - Drum Solids GW - Groundwater W - Water
DL - Drum Liquids SW - Surface Water O - Oil
X - Other SL - Sludge A - Air

Special Instructions:

FOR SUBCONTRACTING USE ONLY
FROM CHAIN OF CUSTODY #

Item/Reason	Relinquished By	Date	Received By	Date	Time	Item/Reason	Relinquished By	Date	Received By	Date	Time
11/1/01	J. O. Zane	1/1/01	STANISLAW J. ZANE	1/1/01	10:00 AM	11/1/01	STANISLAW J. ZANE	1/1/01	B. Zane	1/1/01	10:00 AM
12/1/01	J. O. Zane	1/1/01	STANISLAW J. ZANE	1/1/01	10:00 AM	12/1/01	STANISLAW J. ZANE	1/1/01	B. Zane	1/1/01	10:00 AM

REAC, Edison, NJ
(908) 321-4200
EPA Contract 68-C

(908) 321-4200
EPA Contract 68-C4-0022

Project Name:
Project Number:
RFW Contact:

CHART OF CUSTODY RECORD

08285

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SHEET NO. 1 OF 1

Sample Identification 697

Mean:
SD:
D₃:
D₄:
X:

	S -	W -	O -	A -
PW -	Polarizable Water	Groundwater	Surface Water	Shallow
SW -				
SI -				

GR 1/OC b1 34404

FOR SUBCONTRACTING USE ONLY

**FROM CHAIN OF
CUSTODY #**

ANALYTICAL REPORT

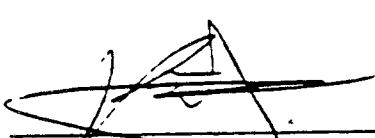
Prepared by
Roy F. Weston, Inc.

J-Field Site
Aberdeen, MD

July, 1997

EPA Work Assignment No. 2-173
WESTON Work Order No. 03347-142-001-2173-01
EPA Contract No. 68-C4-0022

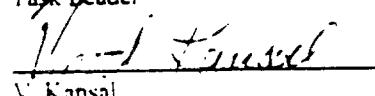
Submitted to
H. Compton
EPA-ERTC


R. Tobia

7/17/97

Date

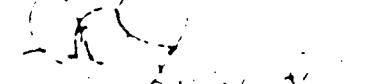
Task Leader


V. Kansal

7/18/97

Date

Analytical Section Leader


E. Gilardi

7/18/97

Date

Project Manager

Analysis by:
Hampton Clark

Prepared by:
J. Johnson

Reviewed by:
M. Barkley

ANALYTICAL REPORT

Prepared by
Roy F. Weston, Inc.

J-Field Site
Aberdeen, MD

July, 1997

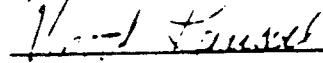
EPA Work Assignment No. 2-173
WESTON Work Order No. 03347-142-001-2173-01
EPA Contract No. 68-C4-0022

Submitted to
H. Compton
EPA-ERTC


R. Tobia
Task Leader

7/17/97
Date

Analysis by:
Hampton Clark


V. Kansal
Analytical Section Leader

7/18/97
Date

Prepared by:
J. Johnson


E. Gilardi
Project Manager

7/18/97
Date

Reviewed by:
M. Barkley

Introduction

REAC, in response to ERTC WA # 2-173, provided analytical support for environmental samples collected at the J-Field Site in Aberdeen, MD as described in the following table. This support involved the analyses and subcontracted analyses of water samples. The support also included the QA/QC, data review and the preparation of a report summarizing the analytical methods, results, and the QA/QC results.

COC #	Number of Samples	Sampling Date	Date Received	Matrix	Analysis	Laboratory
08287	10	05/16/97	05/16/97	Plant Extract	Haloacetic Acid	Hampton Clark
08282	11	05/14/97	05/15/97	Water	Ammonia Chloride Nitrate Total Organic Halide TAL Metals	
08284	4	05/15/97	05/16/97	Water	Ammonia Chloride Nitrate Total Organic Halide TAL Metals	

* COC # denotes Chain of Custody number

Case Narrative

Haloacetic Acid Package G 271

The surrogate recovery for samples 10197, 10198, 10199, 10201, 10202, 10203, 10204, 10205, 10206, and 10206MS was outside the QC limits. The data for these samples are considered estimated.

Metals Analyses - Package G 271

The analytical data have been reviewed and were found to be acceptable.

Wet Chemistry Analyses - Package G 271

The analytical data have been reviewed and were found to be acceptable.

00001

Summary of Abbreviations

AA	Atomic Absorption				
B	The analyte was found in the blank				
B.B.	Bromofluorobenzene				
BPQL	Below the Practical Quantitation Limit				
C	Centigrade				
D	(Surrogate Table) this value is from a diluted sample and was not calculated (Result Table) this result was obtained from a diluted sample				
Dioxin	denotes Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans and/or PCDD and PCDF				
CLP	Contract Laboratory Protocol				
COC	Chain of Custody				
CONC	Concentration				
CRDL	Contract Required Detection Limit				
CRQL	Contract Required Quantitation Limit				
DFTPP	Decafluorotriphenylphosphine				
DL	Detection Limit				
E	The value is greater than the highest linear standard and is estimated				
EMPC	Estimated maximum possible concentration				
ICAP	Inductively Coupled Argon Plasma				
ISTD	Internal Standard				
J	The value is below the method detection limit and is estimated				
LCS	Laboratory Control Sample				
LCSD	Laboratory Control Sample Duplicate				
MDL	Method Detection Limit				
MQL	Method Quantitation Limit				
MI	Matrix Interference				
MS	Matrix Spike				
MSD	Matrix Spike Duplicate				
MW	Molecular Weight				
NA	either Not Applicable or Not Available				
NC	Not Calculated				
NR	Not Requested				
NS	Not Spiked				
% D	Percent Difference				
% REC	Percent Recovery				
PQL	Practical Quantitation Limit				
PPBV	Parts per billion by volume				
QL	Quantitation Limit				
RPD	Relative Percent Difference				
RSD	Relative Standard Deviation				
SIM	Selected Ion Mode				
TCLP	Toxic Characteristics Leaching Procedure				
U	Denotes not detected				
m'	cubic meter	kg	kilogram	μg	microgram
L	liter	g	gram	pg	picogram
ml.	milliliter	mg	milligram		
μL	microliter				
*	denotes a value that exceeds the acceptable QC limit				
	Abbreviations that are specific to a particular table are explained in footnotes on that table				

Revision 3/7/97

00002

Analytical Procedure for Haloacetic Acid in Plant Extract

The subcontract laboratory determined the haloacetic acids concentration in the samples using U.S. EPA Method 552. The results of the analysis are listed in Table 1.1.

Analytical Procedure for Metals in Water

The subcontract laboratory determined the metals concentration in the samples by according to "Test Method for Evaluating Solid Waste, Sept. 1986," USEPA SW-846. The samples were digested according to Method 3050, then analyzed for all metals, except mercury, by USEPA SW-846 Method 7000/6010.

Mercury was analyzed separately using Method 7470. The results of the analysis are listed in Table 1.2.

Analytical Procedure for Ammonia in Water

The subcontract laboratory determined the ammonia concentration in the samples using U.S. EPA Methods 350.1 given in "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1979. The results of the analysis are listed in Table 1.3.

Analytical Procedure for Chloride in Water

The subcontract laboratory determined the chloride concentration in the samples using U.S. EPA Methods 325.3 given in "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1979. The results of the analysis are listed in Table 1.3.

Analytical Procedure for Nitrate in Water

The subcontract laboratory determined the nitrate concentration in the samples using U.S. EPA Methods 352.1 given in "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1979. The results of the analysis are listed in Table 1.3.

Analytical Procedure for Total Organic Halide in Water

The subcontract laboratory determined the total organic halide concentration in the samples using ASTM D2361-91 given in "American Society for Testing & Materials (ASTM)", June 1991. The results of the analysis are listed in Table 1.3.

00003

Table 1.2 Results of the Analysis for TAL Metals in Water
WA #2-173 J Field

Sample ID	Method Blank		10175 JFP 5		10176 JFP 5 Rep		10177 P3		10178 JFP 1	
	Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L
Location										
Metal										
Aluminum	U	0.22	0.87	0.22	0.23	0.22	U	0.22	U	0.22
Antimony	U	0.0044	U	0.0044	U	0.0044	0.016	0.0044	U	0.0044
Arsenic	U	0.0033	U	0.0033	U	0.0033	0.018	0.0033	0.028	0.0033
Barium	U	0.0019	0.058	0.0019	0.022	0.0019	0.033	0.0019	0.13	0.0019
Beryllium	0.000075	0.000040	0.00033	0.000040	0.000049	0.000040	0.000056	0.000040	U	0.000040
Cadmium	U	0.00051	0.0033	0.00051	0.00051	0.00051	0.00068	0.00051	0.00062	0.00051
Calcium	U	0.19	14	0.19	13	0.19	8.9	0.19	250	0.19
Chromium	U	0.0017	U	0.0017	0.086	0.0017	0.0046	0.0017	0.0081	0.0017
Cobalt	U	0.0003	0.0059	0.0003	0.0061	0.0003	0.0014	0.0003	0.0089	0.0003
Copper	U	0.025	U	0.025	U	0.025	U	0.025	U	0.025
Iron	U	0.26	2.8	0.26	2.8	0.26	1.0	0.26	U	0.26
Lead	U	0.0082	0.033	0.0082	U	0.0082	0.0084	0.0082	U	0.0082
Magnesium	U	0.032	2.2	0.032	2.2	0.032	18	0.032	8.7	0.032
Manganese	U	0.0049	0.081	0.0049	0.080	0.0049	0.17	0.0049	0.78	0.0049
Mercury	U	0.00020	U	0.00020	U	0.00020	U	0.00020	U	0.00020
Nickel	0.0032	0.0024	0.0073	0.0024	0.023	0.0024	0.023	0.0024	0.012	0.0024
Potassium	U	0.12	0.46	0.12	0.39	0.12	16	0.12	1.6	0.12
Selenium	U	0.0034	U	0.0034	U	0.0034	0.0037	0.0034	U	0.0034
Silver	U	0.0013	U	0.0013	U	0.0013	0.0014	0.0013	U	0.0013
Sodium	U	0.28	6.4	0.28	7.2	0.28	12	0.28	81	0.28
Thallium	U	0.0030	0.0050	0.0030	U	0.0030	U	0.0030	U	0.0030
Vanadium	U	0.00061	0.0035	0.00061	0.00062	0.00061	0.0047	0.00061	0.0033	0.00061
Zinc	U	0.021	0.041	0.021	0.024	0.021	0.14	0.021	0.022	0.021

00005

Table 1.2 (Cont.) Results of the Analysis for TAL Metals in Water
WA #2-173 J Field Site

Sample ID Location	10184 P4		10185 203		Method Blank		10186 53		10187 183		
	Metal	Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L
Aluminum	U	0.22	0.58	0.22	U	0.22	0.13	0.047	0.080	0.047	0.044
Antimony	U	0.0044	U	0.0044	U	0.0044	U	0.0044	U	0.011	0.0033
Arsenic	U	0.0033	U	0.0033	U	0.0033	U	0.0033	0.030	0.030	0.019
Barium	0.11	0.0019	0.027	0.0019	U	0.0019	0.24	0.0019	U	0.000040	0.000040
Beryllium	U	0.000040	U	0.000040	U	0.000040	U	0.000040	U	0.00051	0.00051
Cadmium	0.0024	0.00051	0.00058	0.00051	U	0.00051	0.0010	0.00051	U	0.19	0.19
Calcium	140	0.19	64	0.19	U	0.19	71	0.19	69	0.15	0.0017
Chromium	0.018	0.0017	0.0052	0.0017	U	0.0017	0.0036	0.0017	0.015	0.0030	0.00030
Cobalt	0.0085	0.00030	0.0013	0.00030	U	0.0003	0.0056	0.00030	0.0013	U	0.025
Copper	U	0.025	U	0.025	U	0.025	U	0.025	U	0.50	0.26
Iron	2.1	0.26	1.1	0.26	U	0.26	39	0.26	U	0.082	0.082
Lead	0.0083	0.0082	U	0.0082	U	0.0082	0.0091	0.0082	U	4.2	0.032
Magnesium	28	0.032	2.1	0.032	U	0.032	23	0.032	U	0.037	0.0049
Manganese	0.20	0.0049	0.019	0.0049	U	0.0049	1.2	0.0049	U	0.0020	0.00020
Mercury	U	0.00020	U	0.00020	U	0.00020	U	0.00020	U	0.011	0.0024
Nickel	0.019	0.0024	0.0071	0.0024	U	0.0024	0.30	0.0024	U	0.22	0.044
Potassium	2.7	0.12	0.38	0.044	U	0.12	1.6	0.044	U	1.4	0.0034
Selenium	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U	U	0.0013
Silver	U	0.0013	U	0.0013	U	0.0013	U	0.0013	U	9.3	1.4
Sodium	76	0.28	6.7	1.4	U	0.28	16	1.4	U	U	0.0030
Thallium	0.0036	0.0030	U	0.0030	U	0.0030	U	0.0030	U	0.0013	0.00061
Vanadium	0.0044	0.00061	0.0026	0.00061	U	0.00061	0.0045	0.00061	0.021	0.025	0.021
Zinc	0.087	0.021	0.022	0.021	U	0.021	0.067	0.021	U	0.025	0.021

000007

Table 1.2 (Cont.) Results of the Analysis for TAL Metals in Water
WA 62-173 J Field Site

Sample ID Location	10188		10189	
	83	83	83	83
Metal	Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L
Aluminum	0.10	0.047	0.62	0.047
Antimony	U	0.0044	U	0.0044
Arsenic	0.0050	0.0033	0.059	0.0033
Barium	0.27	0.0019	0.084	0.0019
Beryllium	0.000067	0.000040	0.00010	0.000040
Cadmium	0.0013	0.00051	U	0.00051
Calcium	110	0.19	46	0.19
Chromium	0.035	0.0017	0.013	0.0017
Cobalt	0.0035	0.00030	0.012	0.00030
Copper	U	0.025	U	0.025
Iron	35	0.26	1.3	0.26
Lead	0.030	0.0082	0.013	0.0082
Magnesium	23	0.032	20	0.032
Manganese	1.0	0.0049	0.13	0.0049
Mercury	U	0.00020	U	0.00020
Nickel	0.031	0.0024	0.018	0.0024
Potassium	2.0	0.044	0.32	0.044
Selenium	U	0.0034	0.014	0.0034
Silver	U	0.0013	U	0.0013
Sodium	33	1.4	19	1.4
Thallium	U	0.0030	U	0.0030
Vanadium	0.0038	0.00061	0.0047	0.00061
Zinc	0.031	0.021	0.034	0.021

00008

**Table 1.3 Results of the Analysis for Wet Chemistry In Water
WA #2-173 J Field**

Sample ID	Method Blank	10175 JFP 5		10176 JFP 5 Rep		10177 P3		10178 JFP 1	
		Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L
Location									
Metal									
Ammonia	U	0.03	0.03	0.03	U	0.03	1.7	0.03	0.06
Chloride	U	1.8	6.2	1.8	6.2	1.8	4.4	1.8	340
Nitrate	U	0.026	0.87	0.052	1.4	0.052	2100	.52	0.48
Total Organic Halide	U	0.067	1.6	0.067	1.2	0.067	4.0	0.067	220

Sample ID	10179 JFP 2		10180 JFP 3		10181 JFP 4		10182 P2		10183 JF-73	
	Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L	Conc. mg/L	MDL mg/L
Location										
Metal										
Ammonia	U	0.03	U	0.03	U	0.03	U	0.03	0.04	0.03
Chloride	U	1.8	4.4	1.8	2.7	1.8	4.4	1.8	86	1.8
Nitrate	5.5	0.13	5.2	0.13	0.26	0.052	U	0.052	3.3	0.052
Total Organic Halide	2.6	0.067	11	0.067	U	0.067	0.2	0.067	22	0.067

Sample ID	10184 P4		10185 203		10186 53		10187 183		10188 63	
	Conc. mg/L	MDL mg/L								
Location										
Metal										
Ammonia	0.03	0.03	U	0.03	0.56	0.03	U	0.03	0.53	0.03
Chloride	250	1.8	4.4	1.8	380	18	15	1.8	460	1.8
Nitrate	U	0.052	0.17	0.052	0.32	0.13	4.7	0.052	0.70	0.052
Total Organic Halide	2.1	0.067	2.1	0.067	20	0.067	22	0.067	U	0.067

Sample ID	10189 83	
	Conc. mg/L	MDL mg/L
Location		
Metal		
Ammonia	U	0.03
Chloride	98	18
Nitrate	2.5	0.052
Total Organic Halide	190	0.20

00009

22

QA/QC for Haloacetic Acids

Results of the Blank Spike Analysis for Haloacetic Acids in Plant Extracts

The percent recoveries, listed in Table 2.1, ranged from 94 to 101. All six recoveries were within QC limits.

Results of the MS Analysis for Haloacetic Acids in Plant Extracts

Sample 10206 was chosen for the matrix spike (MS) analysis. The percent recoveries, listed in Table 2.2, ranged from 116 to 151. Three out of four calculated recoveries were with the QA/QC limits. The percent recoveries for monochloroacetic acid and dibromoacetic acid were reported as NC (not calculated) because of matrix interference.

Results of the Surrogate Recoveries for Haloacetic Acids in Plant Extracts

The surrogate recoveries are listed in Table 2.3. Three out of thirteen surrogate recoveries were within the QC limits.

00010

Table 2.1 Results of the Blank Spike Analysis for Halocetic Acids in Plant Extracts
WA #2-173 J Field

Compounds	Blank Conc. µg/L	Spike added µg/L	BS Recovered µg/L	BS %Rec.	QC Limits %Recovery
Monochloroacetic acid	U	50	46.8	94	70-130
Monobromoacetic acid	U	50	47.80	96	70-130
Dichloroacetic acid	U	50	48.10	96	70-130
Trichloroacetic acid	U	50	50.30	101	70-130
Bromochloroacetic acid	U	50	48.6	97	70-130
Dibromoacetic acid	U	50	49.2	98	70-130

00011

Table 2.2 Results of the MS Analysis for Halocetic Acids in Plant Extracts
WA #2-173 J Field

Sample ID: 10206

Compounds	Sample Conc. µg/L	MS Spike added µg/L	MS Recovered µg/L	MS %Rec.	QC Limits %Recovery
Monochloroacetic acid	U	50	U	NC	70-130
Monobromoacetic acid	U	50	58.50	117	70-130
Dichloroacetic acid	U	50	57.80	116	70-130
Trichloroacetic acid	U	50	61.50	123	70-130
Bromochloroacetic acid	U	50	75.3	151	70-130
Dibromoacetic acid	U	50	131.5	NC	70-130

00012

Table 2.3 Results of the Surrogate Recoveries for Halocetic Acids in Plant Extracts
WA #2-173 J Field

Sample ID	Surrogate *	QC Limits
	% Recovery	% Recovery
Water Blank	114	70-130
Method Blank	106	70-130
10197	189 •	70-130
10198	230 •	70-130
10199	239 •	70-130
10200	117	70-130
10201	179 •	70-130
10202	240 •	70-130
10203	205 •	70-130
10204	225 •	70-130
10205	248 •	70-130
10206	198 •	70-130
10206 MS	33 •	70-130

• 2,3 dichloropropionic acid

00013

QA/QC for TAL Metals in Water

Results of the ICS Analysis for TAL Metals (Water)

The percent recoveries, listed in Table 2.4, ranged from 93 to 106. All forty six recoveries were within QC limits.

Results of the MS/MSD Analysis for TAL Metals in Water

Samples 10186 and 10177 were chosen for the matrix spike/matrix spike duplicate (MS/MSD) analysis. The percent recoveries, listed in Table 2.5, ranged from 62 to 107. Forty five out of forty six recoveries were within the QA/QC limits. The relative percent differences (RPDs), also listed in Table 2.5, ranged from 0 (zero) to 39. There were no QC limits for the RPD values.

Results of the Duplicate Analysis for TAL Metals in Water

Samples 10186 and 10177 were chosen for the sample duplicate analysis. The relative percent differences (RPDs), listed in Table 2.6, ranged from 0 (zero) to 200. There were twenty two out of thirty calculated RPD values within the laboratories established QC limits and fifteen value not calculated (NC) because either the sample or the duplicate analysis was below the detection limit.

Table 2.4 Results of the LCS Analysis for TAL Metals (Water)
WA #2-173 J Field Site

Elements	Reference Value (mg/L)	Observed Value (mg/L)	% Rec.	QC Limits % Rec
Aluminum	5.0	4.838	97	85 - 115
Antimony	0.50	0.526	105	85 - 115
Arsenic	0.50	0.485	97	85 - 115
Barium	0.50	0.501	100	85 - 115
Beryllium	0.50	0.486	97	85 - 115
Cadmium	0.50	0.490	98	85 - 115
Calcium	50	49.041	98	85 - 115
Chromium	0.50	0.495	99	85 - 115
Cobalt	0.50	0.485	97	85 - 115
Copper	0.50	0.499	100	85 - 115
Iron	5.0	5.032	101	85 - 115
Lead	0.50	0.493	99	85 - 115
Magnesium	50	47.638	95	85 - 115
Manganese	0.50	0.505	101	85 - 115
Mercury	0.004	0.00416	106	85 - 115
Nickel	0.50	0.484	97	85 - 115
Potassium	50	47.896	96	85 - 115
Selenium	0.50	0.473	95	85 - 115
Silver	0.50	0.476	95	85 - 115
Sodium	50	48.837	98	85 - 115
Thallium	0.50	0.485	97	85 - 115
Vanadium	0.50	0.495	99	85 - 115
Zinc	0.50	0.509	102	85 - 115

00015

Table 2.4 (Cont.) Results of the LCS Analysis for TAL Metals (Water)
WA #2-173 J Field Site

Elements	Reference Value (mg/L)	Observed Value (mg/L)	%Rec.	QC Limits % Rec
Aluminum	5.0	4.786	85	85 - 115
Antimony	0.50	0.526	105	85 - 115
Arsenic	0.50	0.496	99	85 - 115
Barium	0.50	0.518	104	85 - 115
Beryllium	0.50	0.50	100	85 - 115
Cadmium	0.50	0.505	101	85 - 115
Calcium	50	50.642	101	85 - 115
Chromium	0.50	0.491	98	85 - 115
Cobalt	0.50	0.50	100	85 - 115
Copper	0.50	0.502	100	85 - 115
Iron	5.0	5.087	102	85 - 115
Lead	0.50	0.499	100	85 - 115
Magnesium	50	49.660	99	85 - 115
Manganese	0.50	0.504	101	85 - 115
Mercury	0.004	0.00426	106	85 - 115
Nickel	0.50	0.498	100	85 - 115
Potassium	50	46.551	93	85 - 115
Selenium	0.50	0.494	99	85 - 115
Silver	0.50	0.489	98	85 - 115
Sodium	50	47.929	96	85 - 115
Thallium	0.50	0.468	94	85 - 115
Vanadium	0.50	0.496	99	85 - 115
Zinc	0.50	0.507	101	85 - 115

00016

Table 2.5 Results of the MS/MSD Analysis for TAL Metals in Water
WA #2-173 J Field

Sample ID: 10186

Compounds	Sample Conc. (mg/L)	MS	MS Recovered (mg/L)	MS	MSD	MSD	QC Limits	
		Spikes added (mg/L)		%Rec.	Recovered (mg/L)	%Rec.	RPD	%Recovery
Aluminum	0.129	5.0	5.170	101	4.942	96	5	85 - 115
Antimony	U	0.50	0.537	107	0.537	107	0	85 - 115
Arsenic	U	0.50	0.490	98	0.491	98	0	85 - 115
Barium	0.236	0.50	0.733	99	0.719	97	3	85 - 115
Beryllium	U	0.50	0.486	97	0.491	98	1	85 - 115
Cadmium	0.0010	0.50	0.487	97	0.492	98	1	85 - 115
Calcium	70.826	50	116.663	92	116.388	91	1	85 - 115
Chromium	0.0036	0.50	0.501	89	0.498	99	1	85 - 115
Cobalt	0.0056	0.50	0.487	96	0.491	97	1	85 - 115
Copper	U	0.50	0.508	102	0.503	101	1	85 - 115
Iron	39.015	5.0	43.605	92	42.094	62 *	38	85 - 115
Lead	0.0091	0.50	0.554	109	0.514	101	8	85 - 115
Magnesium	23.402	50	71.964	97	71.899	97	0	85 - 115
Manganese	1.170	0.50	1.616	89	1.599	86	4	85 - 115
Mercury	0.00025	0.0040	0.00405	95	0.00392	92	3	75 - 125
Nickel	0.303	0.50	0.775	94	0.773	94	0	85 - 115
Potassium	1.6	50	50.77	98	51.439	100	1	85 - 115
Selenium	U	0.50	0.470	94	0.472	94	0	85 - 115
Silver	U	0.50	0.483	97	0.484	97	0	85 - 115
Sodium	16	50	65.68	98	64.483	97	2	85 - 115
Thallium	U	0.50	0.488	98	0.489	98	0	85 - 115
Vanadium	0.0045	0.50	0.495	98	0.495	98	0	85 - 115
Zinc	0.087	0.50	0.624	107	0.588	100	7	85 - 115

00017

Table 2.5 (Cont.) Results of the MS/MSD Analysis for TAL Metals in Water
WA #2-173 J Field

Sample ID 10177

Compounds	Sample Conc. (mg/L)	MS	MS Recovered (mg/L)	MS	MSD	MSD	QC Limits
		Spike added (mg/L)		%Rec.	Recovered (mg/L)	%Rec.	%Recovery
Aluminum	U	5.0	4.787	96	4.584	91	5 85 - 115
Antimony	0.016	0.50	0.469	91	0.467	90	0 85 - 115
Arsenic	0.018	0.50	0.460	88	0.468	90	2 85 - 115
Barium	0.033	0.50	0.509	95	0.503	94	1 85 - 115
Beryllium	0.000056	0.50	0.459	92	0.484	93	1 85 - 115
Cadmium	0.00068	0.50	0.479	96	0.476	95	1 85 - 115
Calcium	8.9	50	55.021	92	54.930	92	0 85 - 115
Chromium	0.0046	0.50	0.453	90	0.468	93	3 85 - 115
Cobalt	0.0014	0.50	0.465	93	0.486	93	0 85 - 115
Copper	U	0.50	0.488	98	0.490	98	0 85 - 115
Iron	1.034	5.0	5.44	88	5.408	88	1 85 - 115
Lead	0.0094	0.50	0.476	93	0.478	94	0 85 - 115
Magnesium	17.962	50	63.916	92	63.840	92	0 85 - 115
Manganese	0.166	0.50	0.618	90	0.627	92	2 85 - 115
Mercury	U	0.0040	0.0041	103	0.004	100	3 75 - 125
Nickel	0.023	0.50	0.486	94	0.487	94	0 85 - 115
Potassium	15.788	50	62.491	93	59.520	87	7 85 - 115
Selenium	0.0037	0.50	0.499	99	0.492	98	1 85 - 115
Silver	0.0014	0.50	0.451	90	0.453	90	0 85 - 115
Sodium	12.39	50	60.488	96	57.770	91	6 85 - 115
Thallium	U	0.50	0.453	91	0.489	98	8 85 - 115
Vanadium	0.0047	0.50	0.459	91	0.470	93	2 85 - 115
Zinc	0.136	0.50	0.599	93	0.621	97	5 85 - 115

00018

Table 2.6 Results of the Duplicate Analysis for TAL Metals in Water
WA #2-173 J Field

Sample ID: 10186

Compound	Sample Conc. (mg/L)	Duplicate Conc. (mg/L)	RPD	QC Limits
Aluminum	0.129	0.251	64 *	20
Antimony	U	U	NC	20
Arsenic	U	U	NC	20
Barium	0.236	0.242	3	20
Beryllium	U	U	NC	20
Cadmium	0.0010	0.0015	200 *	20
Calcium	70.826	70.349	1	20
Chromium	0.0036	0.0075	70 *	20
Cobalt	0.0056	0.0056	0	20
Copper	U	U	NC	20
Iron	39.015	39.396	1	20
Lead	0.0091	0.023	87 *	20
Magnesium	23.402	23.275	1	20
Manganese	1.170	1.143	2	20
Mercury	U	U	NC	20
Nickel	0.303	0.302	0	20
Potassium	1.550	1.490	4	20
Selenium	U	U	NC	20
Silver	U	U	NC	20
Sodium	15.201	15.881	2	20
Thallium	U	U	NC	20
Vanadium	0.0045	0.0044	2	20
Zinc	0.087	0.094	8	20

00019

Table 2.5 (Cont.) Results of the Duplicate Analysis for TAL Metals in Water
WA #2-173 J Field

Sample ID: 10177

Compound	Sample Conc. (mg/L)	Duplicate Conc. (mg/L)	RPD	QC Limits
Aluminum	U	U	NC	20
Antimony	0.016	0.009	56 *	20
Arsenic	0.018	0.015	18	20
Barium	0.033	0.032	3	20
Beryllium	0.00006	U	NC	20
Cadmium	0.00068	U	NC	20
Calcium	8.909	8.729	2	20
Chromium	0.0046	0.0043	7	20
Cobalt	0.0014	0.0011	24 *	20
Copper	U	U	NC	20
Iron	1.034	0.879	16	20
Lead	0.009	0.008	12	20
Magnesium	17.962	17.728	1	20
Manganese	0.166	0.160	4	20
Mercury	U	U	NC	20
Nickel	0.023	0.022	4	20
Potassium	15.788	15.124	4	20
Selenium	0.004	U	NC	20
Silver	0.001	0.002	67 *	20
Sodium	12.390	11.928	4	20
Thallium	U	U	NC	20
Vanadium	0.005	0.004	22 *	20
Zinc	0.136	0.120	13	20

00020

QA/QC for Wet Chemistry in Water

Results of MS/MSD Analysis for Wet Chemistry in Water

Samples 10186 and 10177 were chosen for the matrix spike/ matrix spike duplicate(MS/MSD) analysis. The percent recoveries ranged from 72 to 148 and are listed in Table 2.7. Fifteen out of sixteen recoveries were within the laboratories QC limits.

Results of the Sample Duplicate Analysis for Wet Chemistry in Water

Samples 10186 and 10177 were chosen for the sample duplicate analysis. The relative percent differences (RPDs), listed in Table 2.8, ranged from 0 (zero) to 16. All six RPD values were within the laboratories established QC limits.

Table 2.7 Results of the MS/MSD Analysis for Wet Chemistry in Water
WA #2-173 J Field

Sample ID: 10186

Compounds	Sample Conc. (mg/L)	MS Spike added (mg/L)	MS Recovered (mg/L)	MS %Rec.	MSD Recovered (mg/L)	MSD %Rec.	QC Limits %Recovery
Ammonia	0.56	1.00	1.28	72	1.35	79	70-128
Chloride	381.09	500.00	824.00	89	808.00	85	75 - 125
Nitrate	0.317	1.00	1.70	138	1.80	148	70-146
Total Organic Halide	19.7	28.50	50.20	107	50.10	107	75 - 125

Sample ID 10177

Compounds	Sample Conc. (mg/L)	MS Spike added (mg/L)	MS Recovered (mg/L)	MS %Rec.	MSD Recovered (mg/L)	MSD %Rec.	QC Limits %Recovery
Ammonia	0.835 **	1.00	1.81	98	1.87	104	70-128
Chloride	4.4	50	54.1	99	50.5	92	75 - 125
Nitrate	2056	1000	3113	106	3092	104	70-146
Total Organic Halide	4.0	28.5	30	91	33.9	105	75 - 125

** One half the sample was diluted 2x

00022

**Table 2.8 Results of the Duplicate Analysis for Wet Chemistry in Water
WA #2-173 J Field**

Sample ID: 10186

Compound	Sample Conc. (mg/L)	Duplicate Conc. (mg/L)	RPD	QC Limits
Ammonia	0.56	0.55	2	31
Nitrate	0.317	0.337	6	21

Sample ID: 10177

Compound	Sample Conc. (mg/L)	Duplicate Conc. (mg/L)	RPD	QC Limits
Ammonia	1.67	1.59	5	31
Chloride	4.43	4.43	0	20
Nitrate	2056	2120	3	21
Total Organic Halide	4.0	3.4	16	20

00023



Roy F. Weston, Inc.
GSA Partian Depot
Building 209 Annex (Bay F)
2890 Woodbridge Avenue
Edison, New Jersey 08837-3679
908-321-4200 • Fax 908-494-4021

Hampton-Clarke/Veritech.
175 Route 46 West
Fairfield, NJ 07004

Att: Tom Cady

14 May 1997

Project # 3347-041-001-1173 J Field

As per Weston REAC Purchase Order number 79931, please analyze samples according to the following parameters:

Analysis/Method	Matrix	# of samples
TOX/SW-846-9020	Water	15
Nitrate/EPA 352.1	Water	15
Ammonia/EPA 350	Water	15
Chloride/EPA 325	Water	15
TAL Metals/SW-846-6010 or Series 7000	Water	15
Haloacetic acid/EPA 552	Water	9
Data package: see attached Deliverables Requirements		

Samples are expected to arrive at your laboratory between May 14-21, 1997. All applicable QA/QC (MS/MSD) analysis as per method, will be performed on our sample matrix. Preliminary sample and MS/MSD result tables plus a signed copy of our Chain of Custody must be faxed to REAC 10 business days after receipt of the last samples. The complete data package is due 21 business days after receipt of last batch of samples. The complete data package must include all items on the deliverables checklist.

Please submit all reports and technical questions concerning this project to John Johnson at (908) 321-4248 or fax to (908) 494-4020. Any contractual question, please call Cynthia Davison at (908) 321-4296.

Thank you

Sincerely,

Misty Barkley

Data Validation and Report Writing Group Leader
Roy F. Weston, Inc. / REAC Project

MB:jj Attachment

cc. R. Singhvi
H. Compton
1173\non\mem\9705\sub\1173Con3

V. Kansal
Subcontracting File
B. Lewan

C. Davison
R. Tobias
M. Barkley

00024

REAC, Edison, NJ
(908) 321-4200
EPA Contract 68-C4-0022

CHAIN OF CUSTODY RECORD

05/18/17/14

Project Name: Z-311-D011-0411-1113-04
Project Number: 2-311-D011-0411-1113-04
RFW Contact: D.L.S. Tiller

No: 08287

Phone: (201) 321-4200

SHEET NO. FOR 1

Sample Identification

REAC #	Sample No.	Sampling Location	Main#	Date Collected	# of Bottles	Container/Preservative	CM 952 ✓
1	464989	100111	Z	5/18/17/14		Scorches / 1.0C	
2	464920	100115	Z	5/18/17/14			
3	464991	100113	Z	5/18/17/14			
4	464992	100100	Z	5/18/17/14			
5	464995	101101	Z	5/18/17/14			
6	464994	102002	Z	5/18/17/14			
7	464955	102003	Z	5/18/17/14			
8	464996	100204	Z	5/18/17/14			
9	464997	102005	Z	5/18/17/14			
10	464998	100101	Z	5/18/17/14			

Special Instructions:

① Direct to A.J. & P.M.S.
② All Samples sent to Lab by R.S.
③ All Samples sent to Lab by R.S.

FOR SUBCONTRACTING USE ONLY
FROM CHAIN OF CUSTODY #

Reason	Retripathed By	Date	Received By	Date	Time	Instrument	Regrate issued by	Date	Time
SO - Sediment	P.W.	Portable Water	S.	Soil					
DS - Drum Solids	GW.	Groundwater	W.	Water					
DL - Drum Liquids	SW.	Surface Water	O.	Oil					
X - Other	SL.	Sludge	A.	Air					
K - Print-Audit									

00025

REAC, Edison, NJ
(908) 321-4200
EPA Contract 68-C4-0022

CHAIN OF CUSTODY RECORD

Project Name: I - field
Project Number: 331104100111301
REW Contact: D. T. Tschirhart
Phone: (908) 344-7771
No: 08284

Sample Identification

REAC #	Sample No.	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative		For Analysis	Chem. Analyst	Title	MS/USD
						1	2	3	4	5	6
AB46485	140111-1	5, 2	(1)	15-Nov-77	6	2	10	1	1	1	1
AB46486	140111-1	1, 2, 3	(1)		3	1	10	1	1	1	1
AB46487	140111-1	1, 2, 3	(1)		1	1	10	1	1	1	1
AB46488	140111-1	1, 2, 3	(1)		1	1	10	1	1	1	1

00026

FOR SUBCONTRACTING USE ONLY	
FROM CHAIN OF CUSTODY #	
Matrix:	Sediment
SD -	PW - Potable Water
DS -	CW - Groundwater
DL -	SW - Surface Water
X -	SL - Sludge
	Water
	Oil
	Air
	① 115°C
	② 110°C
	③ H2O, / F/H/J

FOR SUBCONTRACTING USE ONLY

**FROM CHAIN OF
CUSTODY #**

FOR SUBCONTRACTING USE ONLY

**FROM CHAIN OF
CUSTODY #**

W-	Potable Water	S-	Soil
W-	Groundwater	-	Water
W-	Surface Water	W-	Oil
W-	Sludge	O-	Air
W.	-	A-	

Matrix:	Sediment
SD -	Drum Solids
DS -	Drum Liquids
DL -	Other
X -	

REAC, Edison, NJ
 (008) 321-4200
 EPA Contract 68-C4-0022

CHAIN OF CUSTODY RECORD

05/15/2020

Project Name: Site 1
 Project Number: 321-041000117301
 RFW Contact: R. Tch; Phone: (408) 321-4200

No: 08282

SHEET NO. 1 OF 1

Sample Identification

REAC #	Sample No.	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Reservoir	Tor/Amm	Chloride/Alk	Tellurite
1	46407	101175	11P-3	6/6/97	3	200	✓	✓	✓
2 *	46408	101171	1P-3	6/6/97	3	200	✓	✓	✓
3	46409	101170	1P-3	6/6/97	3	200	✓	✓	✓
4	46410	101172	P-3	6/6/97	3	200	✓	✓	✓
5	46411	101173	1P-3	6/6/97	3	200	✓	✓	✓
6	46412	101174	P-4	6/6/97	3	200	✓	✓	✓
7	46413	101175	20P-3	6/6/97	3	200	✓	✓	✓
8	46414	101176	1P-1	6/6/97	3	200	✓	✓	✓
9	46415	101177	1P-2	6/6/97	3	200	✓	✓	✓
10	46416	101178	1P-3	6/6/97	3	200	✓	✓	✓
11	46417	101179	1P-4	6/6/97	3	200	✓	✓	✓

000027

FOR SUBCONTRACTING USE ONLY									
FROM CHAIN OF CUSTODY #									
<u>101177</u>									
Mat:	Sediment	BW:	Bottled Water	W:	Soil	Water	C21/OC b,	Special Instructions:	
SD:	Drum Solids	GW:	Groundwater	W:	Oil	Oil	X M/S/MSD	<u>101177</u>	
DS:	Drum Liquids	SW:	Surface Water	W:	Sludge	Sludge			
DL:	Other	SL:							
X:									

Item/Reason	Requester	Date	Received By	Date	Received By	Date	Time	Item/Reason	Requester	Date	Received By	Date	Time
① H_2SO_4	<u>J. B.</u>	5/14/97	<u>John</u>	5/14/97	<u>John</u>	5/14/97	10:00 AM	② $15^{\circ}C$	<u>John</u>	5/14/97	<u>John</u>	5/14/97	10:00 AM
③ H_2SO_4	<u>J. B.</u>	5/14/97	<u>John</u>	5/14/97	<u>John</u>	5/14/97	10:00 AM	④ $15^{\circ}C$	<u>John</u>	5/14/97	<u>John</u>	5/14/97	10:00 AM

APPENDIX F
REAC Analytical Report October 1997
J-field Phytoremediation Study
Groundwater Well And Lysimeter Monitoring Report
Aberdeen Proving Ground, Maryland
November 1997

ANALYTICAL REPORT

Prepared by
Roy F. Weston, Inc.

J-Field Phytoremediation Study
Aberdeen Proving Ground, Maryland

October 1997

EPA Work Assignment No. 2-173
WESTON Work Order No. 03347-142-001-2173-01
EPA Contract No. 68-C4-0022

Submitted to
H. Compton
EPA-ERTC

11/10/97

R. Tobia Date
Task Leader

Analysis by
REAC
Southwest Research Institute (SRI)

11/10/97

V. Kansal Date
Analytical Section Leader

Prepared by:
N. McGuire

11/10/97

E. Gilardi Date
Project Manager

Reviewed by:
M. Barkley

2173\DELA\AR\9710\FIELDAR

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Appendices will be furnished on request.

Introduction

REAC, in response to ERTC WA # 2-173, provided analytical support for environmental samples collected at the J-Field Site in Aberdeen, MD. This support involved the analyses of environmental samples, QA/QC, data review and the preparation of a report summarizing the analytical methods, results, and the QA/QC results.

The samples were treated with procedures consistent with those described in SOP # 1008 and are summarized in the following table

Chain of Custody	Number of Samples	Sampling Date	Date Received	Matrix	Analysis	Laboratory
7822	6	7/22/97	7/22/97	Water	VOA	REAC
7825	5 5 10	7/31/97 8/1/97 8/1/97	8/4/97	Tree Condensate Tree Condensate Plant Extract	VOA	REAC
9688	10	8/1/97	8/4/97	Plant Extract	Haloacetic Acids	SWRI

2173 DELVAR 9710 JFIELDAR

Case Narrative

VOC in Water Package G418

A total of 26 samples was received. Following the instructions of the Task Leader, the following samples from COC 7825 were not analyzed: 11837, 11839, 11840, 11844, and 11845. The 21 remaining samples are reported here.

For the following samples and lab blanks, 1.0 mL of antifoam agent was added prior to analysis: samples 11838, 11842, 11843, 11841, and lab blanks >A2847 and >A2866.

In the continuing calibration of 7/22/97, the acceptable QC limit was exceeded for trans-1,3-dichloropropene (29%). This compound was not found in the associated samples; the data are not affected.

In the continuing calibration of 7/23/97, the acceptable QC limit was exceeded for 2-butanone (34%). This compound was found in the associated samples; the data are not affected.

In the continuing calibration of 8/4/97, the acceptable QC limit was exceeded for 1,3-dichloropropene (36%). This compound was not found in the associated samples; the data are not affected. For the same continuing calibration, %D for 2,2-dichloropropane (59%) exceeded the QC limits. The concentrations of this analyte are considered estimated in the following samples: Lab Blank, 11846, 11847, 11848, 11849, 11851, 02352, 05293, 05294, 05295, and 05296.

In the continuing calibration on 8/7/97, the acceptable QC limits were exceeded for hexachlorobutane (35%) and 1,2,3-trichlorobenzene (34%). These compounds were not found in the associated samples; the data are not affected. For the same continuing calibration, the acceptable QC limits were exceeded for naphthalene (55%). The concentrations of this analyte are considered estimated in the following samples: Lab Blank, 11850, 11838, 11842, and 11843.

For the continuing calibration on 8/11/97, %D for dichlorodifluoromethane (34%), chloromethane (38%), vinyl chloride (34%), bromomethane (27%), chloroethane (31%), acetone (31%), carbon disulfide (26%), methylene chloride (28%), 1,1-dichloroethane (27%), 2-butanone (30%), 1,1-dichloropropene (25%), 4-methylpentanone (33%), and 1,2,3-trichlor (36%) exceeded the QC limits. These compounds were not found in the associated samples; the data are not affected. For the same continuing calibration, %D for naphthalene (51%) exceeded the QC limits. The concentrations of this analyte are considered estimated in the following samples: Lab Blank, 11841.

Haloacetic Acids Package G445

Samples were received by the contract laboratory at a temperature of 21.6°C instead of 4°C; the data are not affected.

Surrogate recoveries were outside the QC limits for samples A11839, A11840, A11842, A11843, and A11845 because of interference. The results for these samples are considered estimated.

Some internal standard areas were outside the QC limits for samples A11838, A11837, A11839, A11842, A11843, and A11845 on the second column. These areas were not used to calculate results in the associated samples; the data are not affected.

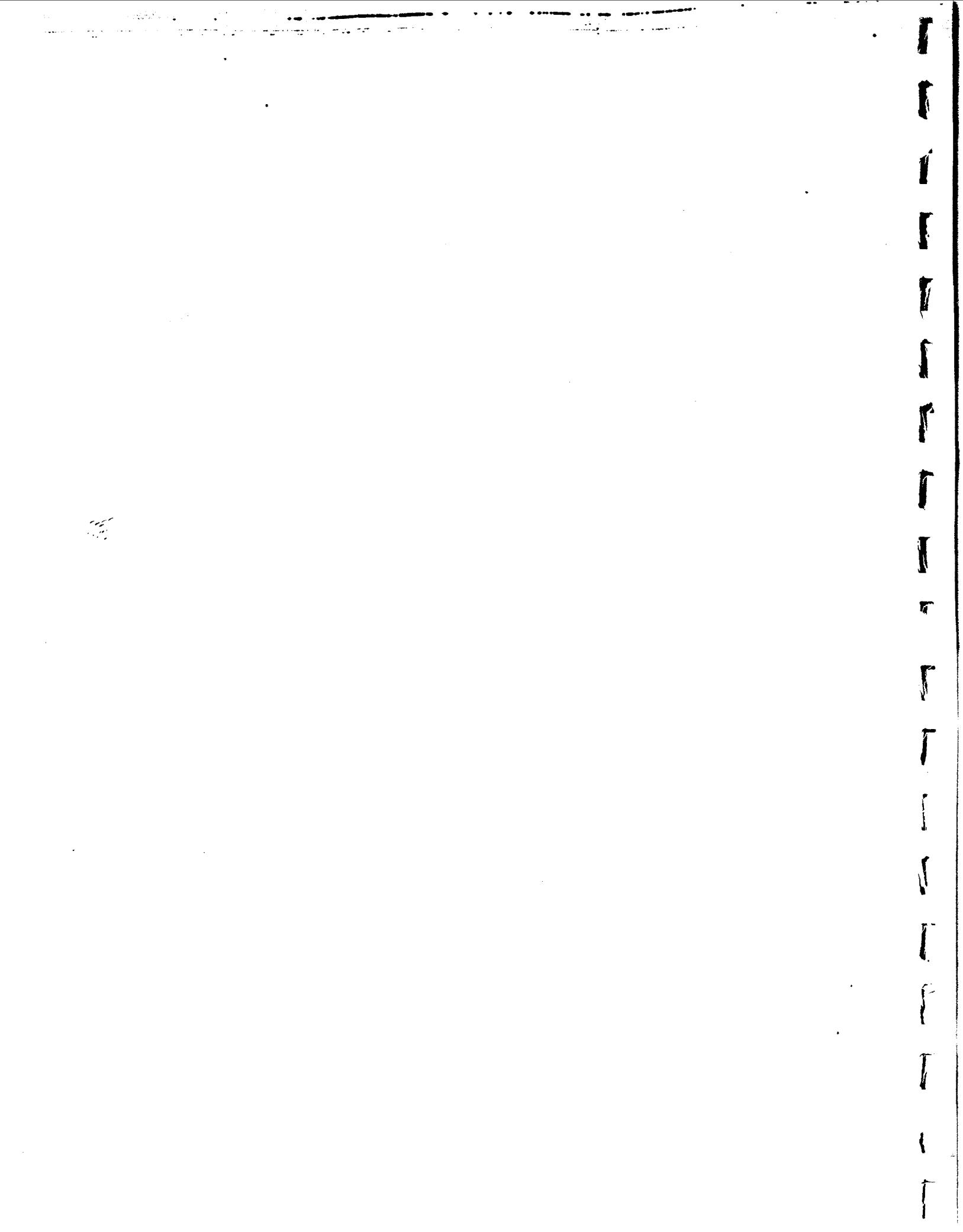
Summary of Abbreviations

AA	Atomic Absorption		
B	The analyte was found in the blank		
BFB	Bromofluorobenzene		
BPQL	Below the Practical Quantitation Limit		
C	Cenigrade		
D	(Surrogate Table) this value is from a diluted sample and was not calculated (Result Table) this result was obtained from a diluted sample		
CLP	Contract Laboratory Protocol		
COC	Chain of Custody		
CONC	Concentration		
CRDL	Contract Required Detection Limit		
CRQL	Contract Required Quantitation Limit		
DFTPP	Decafluorotriphenylphosphine		
DL	Detection Limit		
E	The value is greater than the highest linear standard and is estimated		
EMPC	Estimated maximum possible concentration		
J	The value is below the method detection limit and is estimated		
HHL	High Hazard Laboratory		
ICAP	Inductively Coupled Argon Plasma		
IDL	Instrument Detection Limit		
ISTD	Internal Standard		
MDL	Method Detection Limit		
MQL	Method Quantitation Limit		
MI	Matrix Interference		
MS	Matrix Spike		
MSD	Matrix Spike Duplicate		
MW	Molecular Weight		
NA	Either Not Applicable or Not Available		
NC	Not Calculated		
NR	Not Requested		
NS	Not Spiked		
% D	Percent Difference		
% REC	Percent Recovery		
POL	Practical Quantitation Limit		
PPBV	Parts per billion by volume		
QL	Quantitation Limit		
RPD	Relative Percent Difference		
RSD	Relative Standard Deviation		
SIM	Selected Ion Mode		
ND	Denotes not detected		
m ³	cubic meter	kg	kilogram
l	liter	g	gram
dl	deciliter	cg	centigram
ml	milliliter	mg	milligram
--	microliter	-g	microgram
		ng	nanogram
		pg	picogram

denotes a value that exceeds the acceptable QC limit

Abbreviations that are specific to a particular table are explained in footnotes on that table

Revision 7/30/96



Analytical Procedure for Haloacetic Acids in Plant Extracts

The subcontracted laboratory analyzed plant extract samples for Haloacetic Acids using EPA Method 552 and GC/ECD detectors with dual columns. Eight-point quadratic calibration curves were used. All calibration curves had R^2 of 0.995 or greater.

Results of the analysis for Haloacetic Acids in water are listed in Table 1.3.

The results are listed in Table 1.1 and the Tentatively Identified Compounds are listed in Table 1.2. The concentrations of the analytes were calculated using the following equation:

$$C_s = \frac{A_s x I_u}{A_{us} x RF (\text{or } RF_{av}) x F_s}$$

where

C _s	= Concentration of the target analyte ($\mu\text{g/L}$)
A _s	= Area of the target analyte
I _u	= Mass of specific internal standard (ng)
A _{us}	= Area of the specific internal standard
RF	= Response Factor
RF _{av}	= Average Response Factor
V _s	= Volume of sample purged (mL), taking into account dilutions

The average Response Factor is used when a sample is associated with an initial calibration curve. The Response Factor is used when a sample is associated with a continuing calibration curve.

Response Factor Calculation:

The response factor (RF) for each specific analyte is quantitated based on the area response from the continuing calibration check as follows:

$$RF = \frac{A_e x I_u}{A_{us} x I_e}$$

where:

RF	= Response factor for a specific analyte
A _e	= Area of the analyte in the standard
I _u	= Mass of the specific internal standard
A _{us}	= Area of the specific internal standard
I _e	= Mass of the analyte in the standard

$$RF_{av} = \frac{RF_1 + RF_2 + \dots + RF_n}{n}$$

where:

n = number of Samples

Revision of 1-27-97

Analytical Procedure for VOC in Water

A modified 524.2 method was used for the analysis of Volatile Organic Compounds in water. Samples were purged, trapped, and desorbed to a GC/MS system. Prior to purging, the samples were spiked with a three-component surrogate mixture consisting of toluene-d₄, 4-bromofluorobenzene and 1,2-dichloroethane-d₄, and a three-component internal standard mixture consisting of bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-d₄.

The purge and trap unit consisted of a Tekmar concentrator (3000 series) equipped with an autosampler (Dynatech) and a VOCARB 4000 (Supelco) trap. The trap contained four adsorbent beds: Carbopack B (graphitized carbon, 60/80 mesh), Carbopack C (graphitized carbon, 60/80 mesh), Carboxen-1000, (60/80 mesh), and Carboxen-1001 (60/80 mesh).

The purge and trap instrument conditions were:

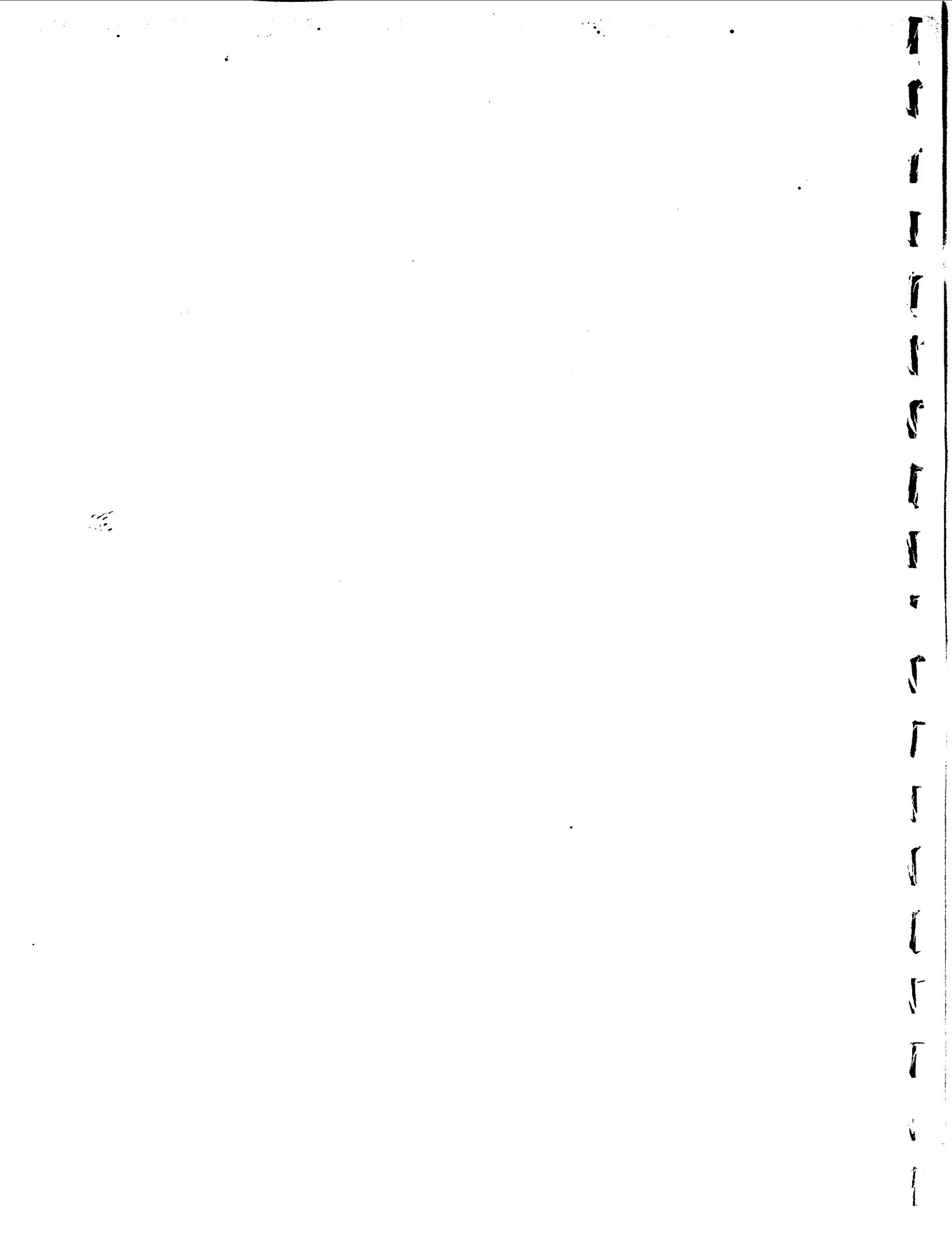
Purge	10 min at 25 °C
Dry Purge	2 min at 25 °C
Desorb Preheat	230 °C
Desorb	4 min at 230 °C
Purge Flow Rate	40 mL/min
Bake	8 min at 250 °C

A Hewlett Packard 5970 GC/MSD equipped with an RTE-A data system was used to analyze the data.

The instrument conditions were:

Column:	30 meter x 0.53 mm ID, RTx-Volatiles (Restek Corp.) column with 3.0 µm thickness.
Temperature:	5 min at 10 °C 6 °C/min to 140 °C 0.1 min at 140 °C 12 °C/min to 160 °C 5 min at 160 °C
Flow Rate	Helium at 10 mL/min
GC/MS Interface	Glass jet separator with 30 mL/min helium make-up gas at 250 °C.
Mass Spectrometer:	Electron impact ionization at a nominal electron energy of 70 electron volts. scanning from 35-300 amu at one scan/sec.
Computer:	Preprogrammed to plot Extracted Ion Current Profile (EICP); Capable of integrating ions and plotting abundances vs time or scan number. A library search (NBS-Wiley) for tentatively identified compounds was performed on samples.

The GC/MS system was calibrated using 6 VOC standards at 5, 20, 50, 100, 150, and 200 µg/L. Before analysis each day, the system was tuned with 50 ng BFB and passed a continuing calibration check when analyzing a 50 µg/L standard mixture in which the responses were evaluated by comparison to the average response of the calibration curve.



**Table 1.1 Results of the Analysis for VOC in Water
WA# 2-173 J-Field Phytoremediation Study**

SAMPLE #	LAB BLANK	11801	11802
LOCATION	JFP-4	JFP-3	
COLLECTED	07/22/97	07/22/97	
ANALYZED	07/22/97	07/22/97	
INJECTED	11:56	17:42	
FILE #	A2703	A2708	
DIL. FACT.	1	1	
UNIT	µg/L	µg/L	
Conc.	MDL	Conc.	MDL
Dichlorodifluoromethane	U	1.0	U
Chloromethane	U	1.0	U
Vinyl Chloride	U	1.0	U
Bromomethane	U	2.0	U
Chloroethane	U	1.0	U
Trichlorofluoromethane	U	1.0	U
Acetone	U	2.0	U
1,1-Dichloroethene	U	1.0	U
Carbon Disulfide	U	1.0	U
Methylene Chloride	U	1.0	U
Methyl-tertiary-butylether	U	1.0	U
trans-1,2-Dichloroethene	U	1.0	59
1,1-Dichloroethane	U	1.0	U
2-Butanone	U	4.0	U
1,1-Dichloropropane	U	1.0	U
cis-1,1-Dichloroethene	U	1.0	180
Chloroform	U	1.0	U
1,1-Dichloropropene	U	1.0	U
1,2-Dichloroethane	U	1.0	U
1,1,1-Trichloroethane	U	1.0	U
Carbon Tetrachloride	U	1.0	U
Henzene	U	1.0	U
Trichloroethene	U	1.0	2600
1,1-Dichloropropane	U	1.0	U
Dibromomethane	U	1.0	U
Bromodichloromethane	U	1.0	U
cis-1,1-Dichloropropene	U	1.0	U
trans-1,1-Dichloropropene	U	1.0	U
1,1,2-Trichloroethane	U	1.0	75
1,1,3-Trichloroethane	U	1.0	U
Dibromochloromethane	U	1.0	U
1,2-Dibromoethane	U	1.0	U
Bromoform	U	1.0	U
4-Methyl-2-Pentanone	U	2.0	U

**Table 1.1 (cont.) Results of the Analysis for VOC in Water
WA# 2-173 J-Field Phytoremediation Study**

SAMPLE # :	LAB BLANK	11801 JFP-4	11802 JFP-3			
LOCATION :		07/22/97	07/22/97			
COLLECTED :		07/22/97	07/22/97			
ANALYZED :	07/22/97	07/22/97	07/22/97			
INJECTED :	11:56	17:42	18:26			
FILE :	A2703	A2708	A2709			
DIL. FACT.:	1	1	1			
UNIT :	µg/L	µg/L	µg/L			
Conc.	MDL	Conc.	MDL			
Conc.	MDL	Conc.	MDL			
Toluene	U	1.0	U	1.0	U	1.0
2-Hexanone	U	2.0	U	2.0	U	2.0
Tetrachloroethene	U	1.0	U	1.0	240	1.0
Chlorobenzene	U	1.0	U	1.0	U	1.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0	3.6	1.0
Ethylbenzene	U	1.0	U	1.0	U	1.0
p & m-Xylene	U	1.0	U	1.0	U	1.0
o-Xylene	U	1.0	U	1.0	U	1.0
Styrene	U	1.0	U	1.0	U	1.0
Isopropylbenzene	U	1.0	U	1.0	U	1.0
1,1,2,2-Tetrachloroethane	U	1.0	U	1.0	11000	1.0
1,2,3-Trichloropropane	U	1.0	U	1.0	U	1.0
Bromobenzene	U	1.0	U	1.0	U	1.0
n-Propylbenzene	U	1.0	U	1.0	U	1.0
2-Chlorotoluene	U	1.0	U	1.0	U	1.0
4-Chlorotoluene	U	1.0	U	1.0	U	1.0
1,3,5-Trimethylbenzene	U	1.0	U	1.0	U	1.0
tert-Butylbenzene	U	1.0	U	1.0	U	1.0
1,2,4-Trimethylbenzene	U	1.0	U	1.0	U	1.0
sec-Butylbenzene	U	1.0	U	1.0	U	1.0
1,3-Dichlorobenzene	U	1.0	U	1.0	U	1.0
p-Isopropyltoluene	U	1.0	U	1.0	U	1.0
1,4-Dichlorobenzene	U	1.0	U	1.0	U	1.0
1,2-Dichlorobenzene	U	1.0	U	1.0	U	1.0
n-Butylbenzene	U	1.0	U	1.0	U	1.0
1,2-Dibromo-3-Chloropropan	U	1.0	U	1.0	U	1.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	1.0
Naphthalene	U	1.0	U	1.0	U	1.0
Hexachlorobutadiene	U	1.0	U	1.0	U	1.0
1,2,3-Trichlorobenzene	U	1.0	U	1.0	U	1.0

Table 1.1 (cont.) Results of the Analysis for VOC in Water
WAC 2-173 LF Field Fluviorremediation Study

SAMPLE #	LAB BLANK	11886	11888	11884	11885					
LOCATION:		JFL-4	JFL-2	JFL-1	TB					
COLLECTED:	07/23/97	07/23/97	07/22/97	07/22/97	07/22/97					
ANALYZED:	18:30	20:30	21:57	22:41	01:38					
INJECTED:	AZ717	AZ719	AZ721	AZ722	AZ726					
FILE #:	1	1	50	100	1					
DIL. FACT.:	mg/L	mg/L	mg/L	mg/L	mg/L					
UNIT:										
	Conc.	MDL	Conc.	MDL	Conc.	MDL	Conc.	MDL	Conc.	MDL
Dichlorodifluoromethane	U	1.0	U	1.0	U	50	U	100	U	1.0
Chloroethane	U	1.0	U	1.0	U	50	U	100	U	1.0
Vinyl Chloride	U	1.0	U	20	U	100	U	200	U	2.0
Bromoethane	U	2.0	U	1.0	U	50	U	100	U	1.0
Chloroethene	U	1.0	U	1.0	U	50	U	100	U	1.0
Trichlorodifluoromethane	U	1.0	U	20	U	100	U	200	U	2.0
Anetene	U	2.0	U	1.0	U	50	U	100	U	1.0
1,1-Dichloroethane	U	1.0	U	1.0	U	50	U	100	U	1.0
Carbon Disulfide	U	1.0	U	1.0	U	50	U	100	U	1.0
Methylene Chloride	U	1.0	U	1.0	U	50	U	100	U	1.0
Methyl-tert-butyl-ether	U	1.0	U	1.0	1200	50	950	100	U	1.0
trans-1,2-Dichloroethane	U	1.0	U	1.0	U	50	U	100	U	1.0
1,1-Dichloroethene	U	1.0	U	4.0	U	200	U	400	U	4.0
2-Bromone	U	4.0	U	1.0	U	50	U	100	U	1.0
2,2-Dichloropropane	U	1.0	U	1.0	3200	50	3100	100	U	1.0
cis-1,2-Dichloroethane	U	1.0	0.7(5)	1.0	U	50	54(5)	100	U	1.0
Chloroform	U	1.0	U	1.0	U	50	U	100	U	1.0
1,1-Dichloropropane	U	1.0	U	1.0	U	50	U	100	U	1.0
1,2-Dichloroethane	U	1.0	U	1.0	U	50	U	100	U	1.0
1,1,1-Trichloroethane	U	1.0	U	1.0	U	50	U	100	U	1.0
Carbon Tetrachloride	U	1.0	U	1.0	U	50	U	100	U	1.0
Benzene	U	1.0	U	1.0	11000	50	63000	100	U	1.0
Trichloroethene	U	1.0	27	1.0	U	50	U	100	U	1.0
1,2-Dichloropropene	U	1.0	U	1.0	U	50	U	100	U	1.0
Dibromoethane	U	1.0	U	1.0	U	50	U	100	U	1.0
Bromo-dichloroethane	U	1.0	U	1.0	U	50	U	100	U	1.0
cis-1,3-Dichloropropene	U	1.0	U	1.0	U	50	U	100	U	1.0
trans-1,3-Dichloropropene	U	1.0	U	1.0	440	50	1200	100	U	1.0
1,1,2-Trichloroethane	U	1.0	U	1.0	U	50	U	100	U	1.0
1,3-Dichloropropene	U	1.0	U	1.0	U	50	U	100	U	1.0
Dibromo-dichloroethane	U	1.0	U	1.0	U	50	U	100	U	1.0
1,2-Dibromoethane	U	1.0	U	1.0	U	50	U	100	U	1.0
Bromoform	U	1.0	U	1.0	U	50	U	100	U	1.0
4-Methyl-1-Pentanone	U	2.0	U	2.0	U	100	U	200	U	2.0

**Table 1.1 (cont.) Results of the Analysis for VOC in Water
WAF 2-173 J-Field Phytoremediation Study**

SAMPLE # :	LAB BLANK	11806	11803	11804	11805					
LOCATION :	JFL-4	JFP-2	JFP-1	TB						
COLLECTED :	07/22/97	07/22/97	07/22/97	07/22/97						
ANALYZED :	07/23/97	07/23/97	07/23/97	07/24/97						
INJECTED :	18:30	20:30	21:37	01:38						
FILE # :	A2717	A2719	A2721	A2722						
DIL. FACT.:	1	1	50	100						
UNIT :	µg/L	µg/L	µg/L	µg/L						
	Conc.	MDL	Conc.	MDL	Conc.	MDL	Conc.	MDL	Conc.	MDL
Toluene	U	1.0	U	1.0	U	50	U	100	U	1.0
2-Hexanone	U	2.0	U	2.0	U	100	U	200	U	2.0
Tetrachloroethane	U	1.0	1.3	1.0	900	50	11000	100	U	1.0
Chlorobenzene	U	1.0	U	1.0	U	50	U	100	U	1.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0	U	50	U	100	U	1.0
Ethylbenzene	U	1.0	U	1.0	U	50	U	100	U	1.0
p & m-Xylene	U	1.0	U	1.0	U	50	U	100	U	1.0
o-Xylene	U	1.0	U	1.0	U	50	U	100	U	1.0
Styrene	U	1.0	U	1.0	U	50	U	100	U	1.0
Isopropylbenzene	U	1.0	U	1.0	U	50	U	100	U	1.0
1,1,2,2-Tetrachloroethane	U	1.0	19	1.0	37000	50	120000	100	U	1.0
1,2,3-Trichloropropane	U	1.0	U	1.0	U	50	U	100	U	1.0
Bromobenzene	U	1.0	U	1.0	U	50	U	100	U	1.0
n-Propylbenzene	U	1.0	U	1.0	U	50	U	100	U	1.0
2-Chlorotoluene	U	1.0	U	1.0	U	50	U	100	U	1.0
4-Chlorotoluene	U	1.0	U	1.0	U	50	U	100	U	1.0
1,3,5-Trimethylbenzene	U	1.0	U	1.0	U	50	U	100	U	1.0
tert-Butylbenzene	U	1.0	U	1.0	U	50	U	100	U	1.0
1,2,4-Trimethylbenzene	U	1.0	U	1.0	U	50	U	100	U	1.0
sec-Butylbenzene	U	1.0	U	1.0	U	50	U	100	U	1.0
1,3-Dichlorobenzene	U	1.0	U	1.0	U	50	U	100	U	1.0
p-Isopropyltoluene	U	1.0	U	1.0	U	50	U	100	U	1.0
1,4-Dichlorobenzene	U	1.0	U	1.0	U	50	U	100	U	1.0
1,2-Dichlorobenzene	U	1.0	U	1.0	U	50	U	100	U	1.0
n-Butylbenzene	U	1.0	U	1.0	U	50	U	100	U	1.0
1,2-Dibromo-1-Chloropropane	U	1.0	U	1.0	U	50	U	100	U	1.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	50	U	100	U	1.0
Naphthalene	U	1.0	U	1.0	U	50	U	100	U	1.0
Hexachlorobutadiene	U	1.0	U	1.0	U	50	U	100	U	1.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	50	U	100	U	1.0

**Table 1.1 (cont.) Results of the Analysis for VOC in Water
WAN 2-173 J-Field Photooxidation Study**

SAMPLE # :	LAB BLANK	11846 FB	11847 TRE 174E	11848 TRE 174E	11849 TRE 175					
LOCATION :		08/04/97	07/31/97	07/31/97	07/31/97					
COLLECTED :		08/04/97	08/04/97	08/04/97	08/04/97					
ANALYZED :										
INJECTED :	13:47	14:32	15:16	16:00	16:45					
FILE # :	A2799	A2800	A2801	A2802	A2803					
DIL. FACT.:	1	1	1	1	1					
UNIT :	ng/L	ng/L	ng/L	ng/L	ng/L					
	Conc.	NDL	Conc.	NDL	Conc.	NDL	Conc.	NDL	Conc.	NDL
Dichlorodifluoromethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Chloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Vinyl Chloride ^a	U	1.0	U	1.0	U	1.0	U	1.0	U	2.0
Bromoethane	U	2.0	U	2.0	U	1.0	U	1.0	U	1.0
Chloroethene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Trichlorofluoromethane	U	1.0	U	2.0	4	2.0	160	2.0	24	2.0
Acetone	U	2.0	U	1.0	U	1.0	U	1.0	U	1.0
1,1-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Carbon Disulfide	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Methylvinyl Chloride	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Methyl-tertary-butyl ether	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
trans-1,2-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,1-Dichloroethane	U	1.0	U	1.0	U	40	92	40	40	40
2-Butanone	U	4.0	U	4.0	U	1.0	U	1.0	U	1.0
2,2-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
cis-1,2-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Chloroform	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,1-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,1,1-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Carbon Tetrachloride	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Benzene	U	1.0	U	1.0	4.8	1.0	U	1.0	25	1.0
Trichloroethene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Dibromomethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Bromodichloromethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
cis-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
trans-1,3-Dichloropropene	U	1.0	U	1.0	12	1.0	22	1.0	1.0	1.0
1,1,2-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Dibromoethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dibromoethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Bromoform	U	1.0	U	1.0	U	1.0	U	1.0	U	2.0
1,1-Methyl-2-Pentanone	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0

**Table 1.1 (cont.) Results of the Analysis for VOC in Water
WAN 2-173 J-Field Photoremediation Study**

SAMPLE # :	LAB BLANK	11846 FB	11847 TREK 174N	11848 TREK 174E	11849 TREK 175					
LOCATION :		06/01/97	07/31/97	07/31/97	07/31/97					
COLLECTED :		06/04/97	06/04/97	06/04/97	06/04/97					
ANALYZED :										
INJECTED :		13:47	14:32	19:36	16:43					
FILE # :		A2799	A2800	A2801	A2802					
DIL. FACT.:	1	1	1	1	1					
UNIT :	µg/L	µg/L	µg/L	µg/L	µg/L					
Cone.	MDL	Cone.	MDL	Cone.	MDL	Cone.	MDL	Cone.	MDL	
Toluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
2-Hexanone	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0
Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Chlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Ethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
p & m-Xylenes	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
o-Xylene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Styrene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Isopropylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,1,2,2-Tetrachloroethane	U	1.0	U	1.0	340	1.0	640	1.0	100	1.0
1,2,3-Trichloropropane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Bromobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
n-Propylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
2-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
4-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,3,5-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
tert-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,4-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
sec-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,3-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
p-Isopropyltoluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,4-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
n-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dibromo-3-Chloropropane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Naphthalene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Hexachlorobutadiene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0

**Table 1.1 (cont.) Results of the Analysis for VOC in Water
WAN 2-173 J-Field Pyrolyzed Water Study**

SAMPLE # :	LAB BLANK	11851 TREK 139	02352 TREK 170	02353 TREK 170	02354 TREK 148						
LOCATION :		07/31/97	08/01/97	08/01/97	08/01/97						
COLLECTED :		08/04/97	08/04/97	08/04/97	08/04/97						
ANALYZED :											
INJECTED :	13:47	18:14	18:26	19:44	20:28						
FILE # :	A2799	A2805	A2806	A2807	A2808						
DIL. FACT.:	1	1	1	1	1						
UNIT :	µg/L	µg/L	µg/L	µg/L	µg/L						
Conc.	MDL	Conc.	MDL	Conc.	MDL						
Conc.	MDL	Conc.	MDL	Conc.	MDL						
Dichlorodifluoromethane	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Chloroethane	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Vinyl Chloride	U	1.0	U	2.0	U	2.0	U	2.0	2.0	2.0	2.0
Bromoethane	U	2.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Chloroethene	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Trichlorodifluoromethane	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Acetone	U	2.0	39	2.0	15	2.0	14	2.0	1.0	1.0	1.0
1,1-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Carbon Disulfide	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Methylene Chloride	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Methyl-tertiary-butyl ether	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
trans-1,2-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
1,1-Dichloroethene	U	1.0	U	4.0	U	4.0	U	4.0	4.0	4.0	4.0
2-Butanone	U	4.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
2,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
cis-1,2-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Chloroform	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
1,1-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
1,2-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
1,1,1-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Carbon Tetrachloride	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Benzene	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Trichloroethene	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
1,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Dibromoethane	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Bromodichloromethane	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
cis-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
trans-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
1,1,2-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Dibromochloromethane	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
1,2-Dibromoethane	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
Hexamethyl	U	1.0	U	1.0	U	1.0	U	1.0	1.0	1.0	1.0
4-Methyl-1,3-Pentanediene	U	2.0	U	2.0	U	2.0	U	2.0	2.0	2.0	2.0

Table 1.1 (cont.) Results of the Analysis for VOC in Water
WAN 2-173 J-Field Pyrolyzed Study

SAMPLE # :	LAB BLANK	11851	02252	03293	03294					
LOCATION :		TREE 139	TREE 162	TREE 170	TREE 148					
COLLECTED :		07/31/97	08/01/97	08/01/97	08/01/97					
ANALYZED :		08/04/97	08/04/97	08/04/97	08/04/97					
INJECTED :		18:14	18:28	19:44	20:23					
FILE # :		A2799	A2805	A2806	A2808					
DIL. FACT.:	1	1	1	1	1					
UNIT :	ppb	ppb	ppb	ppb	ppb					
	Conc.	MDL	Conc.	MDL	Conc.	MDL	Conc.	MDL	Conc.	MDL
Toluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
2-Hexanone	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0
Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Chlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Ethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
p & m-Xylene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
o-Xylene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Styrene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Isopropylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,1,2,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,3-Trichloropropane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Bromoethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
n-Propylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
2-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
4-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,3,5-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
tert-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,4-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
sec-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,3-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
p-isopropyltoluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,4-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
n-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dibromo-1-Chloropropane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Naphthalene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Hexachlorobutadiene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,3-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0

**Table 1.1 (cont.) Results of the Analysis for VOC in Water
WA# 2-173 J-Field Phytoremediation Study**

SAMPLE # :	LAB BLANK	05295	05296			
LOCATION :		TREE 55	TREE 65			
COLLECTED :		08/01/97	08/01/97			
ANALYZED :	08/04/97	08/04/97	08/04/97			
INJECTED :	13:47	21:13	21:57			
FILE # :	A2799	A2809	A2810			
DIL. FACT.:	1	1	1			
UNIT :	µg/L	µg/L	µg/L			
Conc.	MDL	Conc.	MDL			
Conc.	MDL	Conc.	MDL			
Dichlorodifluoromethane	U	1.0	U	1.0	U	1.0
Chloromethane	U	1.0	U	1.0	U	1.0
Vinyl Chloride	U	1.0	U	1.0	U	1.0
Bromomethane	U	2.0	U	2.0	U	1.0
Chloroethane	U	1.0	U	1.0	U	1.0
Trichlorofluoromethane	U	1.0	U	1.0	U	1.0
Acetone	U	2.0	24	2.0	24	2.0
1,1-Dichloroethene	U	1.0	U	1.0	U	1.0
Carbon Disulfide	U	1.0	U	1.0	U	1.0
Methylene Chloride	U	1.0	U	1.0	U	1.0
Methyl-tertiary-butylether	U	1.0	U	1.0	U	1.0
trans-1,2-Dichloroethene	U	1.0	U	1.0	U	1.0
1,1-Dichloroethane	U	1.0	U	1.0	U	1.0
2-Butanone	U	4.0	U	4.0	U	4.0
1,2-Dichloropropane	U	1.0	U	1.0	U	1.0
cis-1,2-Dichloroethene	U	1.0	U	1.0	U	1.0
Chloroform	U	1.0	U	1.0	U	1.0
1,1-Dichloropropene	U	1.0	U	1.0	U	1.0
1,2-Dichloroethane	U	1.0	U	1.0	U	1.0
1,1,1-Trichloroethane	U	1.0	U	1.0	U	1.0
Carbon Tetrachloride	U	1.0	U	1.0	U	1.0
Benzene	U	1.0	U	1.0	U	1.0
Trichloroethene	U	1.0	U	1.0	U	1.0
1,2-Dichloropropene	U	1.0	U	1.0	U	1.0
Dibromomethane	U	1.0	U	1.0	U	1.0
Iodomodichloromethane	U	1.0	U	1.0	U	1.0
cis-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0
trans-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0
1,1,2-Trichloroethane	U	1.0	U	1.0	U	1.0
1,3-Dichloropropane	U	1.0	U	1.0	U	1.0
Dibromochloromethane	U	1.0	U	1.0	U	1.0
1,2-Dibromoethane	U	1.0	U	1.0	U	1.0
Bromoform	U	1.0	U	1.0	U	1.0
1-Methyl-2-Pentanone	U	2.0	U	2.0	U	2.0

Table 1.1 (cont.) Results of the Analysis for VOC in Water
WA# 2-173 J-Field Phytoremediation Study

SAMPLE # :	LAB BLANK	05295 TREE 55 08/01/97	05296 TREE 65 08/01/97
LOCATION :			
COLLECTED :			
ANALYZED :	08/04/97	08/04/97	08/04/97
INJECTED :	13:47	21:13	21:57
FILE # :	A2799	A2809	A2810
DIL. FACT.:	1	1	1
UNIT :	µg/L	µg/L	µg/L
Conc.	MDL	Conc.	MDL
Toluene	U	1.0	1.0
2-Hexanone	U	2.0	2.0
Tetrachloroethene	U	1.0	1.0
Chlorobenzene	U	1.0	1.0
1,1,1,2-Tetrachloroethane	U	1.0	1.0
Ethylbenzene	U	1.0	1.0
p & m-Xylene	U	1.0	1.0
o-Xylene	U	1.0	1.0
Styrene	U	1.0	1.0
Isopropylbenzene	U	1.0	1.0
1,1,2,2-Tetrachloroethane	U	1.0	1.0
1,2,3-Trichloropropane	U	1.0	1.0
Bromobenzene	U	1.0	1.0
n-Propylbenzene	U	1.0	1.0
2-Chlorotoluene	U	1.0	1.0
4-Chlorotoluene	U	1.0	1.0
1,3,5-Trimethylbenzene	U	1.0	1.0
tert-Butylbenzene	U	1.0	1.0
1,2,4-Trimethylbenzene	U	1.0	1.0
sec-Butylbenzene	U	1.0	1.0
1,3-Dichlorobenzene	U	1.0	1.0
p-Isopropyltoluene	U	1.0	1.0
1,4-Dichlorobenzene	U	1.0	1.0
1,2-Dichlorobenzene	U	1.0	1.0
n-Butylbenzene	U	1.0	1.0
1,2-Dibromo-3-Chloropropan	U	1.0	1.0
1,2,4-Trichlorobenzene	U	1.0	1.0
Naphthalene	U	1.0	1.0
Hexachlorobutadiene	U	1.0	1.0
1,2,3-Trichlorobenzene	U	1.0	1.0

**Table 1.1 (cont.) Results of the Analysis for VOC in Water
WA# 2-173 J-Field Phytoremediation Study**

SAMPLE # :	LAB BLANK	11841
LOCATION :		TREE 174
COLLECTED :		08/01/97
ANALYZED :	08/11/97	08/11/97
INJECTED :	12:56	13:42
FILE # :	A2866	A2867
DIL. FACT.:	1	1
UNIT :	µg/L	µg/L

	Conc.	MDL	Conc.	MDL
Dichlorodifluoromethane	U	1.0	U	1.0
Chloromethane	U	1.0	U	1.0
Vinyl Chloride	U	1.0	U	1.0
Bromomethane	U	2.0	U	2.0
Chloroethane	U	1.0	U	1.0
Trichlorofluoromethane	U	1.0	U	1.0
Acetone	U	2.0	U	2.0
1,1-Dichloroethene	U	1.0	U	1.0
Carbon Disulfide	U	1.0	U	1.0
Methylene Chloride	U	1.0	U	1.0
Methyl-tertiary-butylether	U	1.0	U	1.0
trans-1,2-Dichloroethene	U	1.0	U	1.0
1,1-Dichloroethane	U	1.0	U	1.0
2-Butanone	U	4.0	U	4.0
2,2-Dichloropropane	U	1.0	U	1.0
cis-1,2-Dichloroethene	U	1.0	U	1.0
Chloroform	U	1.0	U	1.0
1,1-Dichloropropene	U	1.0	U	1.0
1,2-Dichloroethane	U	1.0	U	1.0
1,1,1-Trichloroethane	U	1.0	U	1.0
Carbon Tetrachloride	U	1.0	U	1.0
Benzene	U	1.0	U	1.0
Trichloroethene	U	1.0	U	1.0
1,2-Dichloropropane	U	1.0	U	1.0
Dibromomethane	U	1.0	U	1.0
Bromodichloromethane	U	1.0	U	1.0
cis-1,3-Dichloropropene	U	1.0	U	1.0
trans-1,3-Dichloropropene	U	1.0	U	1.0
1,1,2-Trichloroethane	U	1.0	U	1.0
1,3-Dichloropropane	U	1.0	U	1.0
Dibromo-chloromethane	U	1.0	U	1.0
1,2-Dibromoethane	U	1.0	U	1.0
Bromoform	U	1.0	U	1.0
4-Methyl-2-Pentanone	U	2.0	U	2.0

**Table 1.1 (cont.) Results of the Analysis for VOC in Water
WA# 2-173 J-Field Phytoremediation Study**

SAMPLE # :	LAB BLANK	11841
LOCATION :		TREE 174
COLLECTED :		08/01/97
ANALYZED :	08/11/97	08/11/97
INJECTED :	12:56	13:42
FILE # :	A2866	A2867
DIL. FACT.:	1	1
UNIT :	µg/L	µg/L

	Conc.	MDL	Conc.	MDL
Toluene	U	1.0	U	1.0
2-Hexanone	U	2.0	U	2.0
Tetrachloroethene	U	1.0	U	1.0
Chlorobenzene	U	1.0	U	1.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0
Ethylibenzene	U	1.0	U	1.0
p & m-Xylene	U	1.0	U	1.0
o-Xylene	U	1.0	U	1.0
Styrene	U	1.0	U	1.0
Isopropylbenzene	U	1.0	U	1.0
1,1,2,2-Tetrachloroethane	U	1.0	79	1.0
1,2,3-Trichloropropane	U	1.0	U	1.0
Bromobenzene	U	1.0	U	1.0
n-Propylbenzene	U	1.0	U	1.0
2-Chlorotoluene	U	1.0	U	1.0
t-Chlorotoluene	U	1.0	U	1.0
1,3,5-Trimethylbenzene	U	1.0	U	1.0
tert-Butylbenzene	U	1.0	U	1.0
1,2,4-Trimethylbenzene	U	1.0	U	1.0
sec-Butylbenzene	U	1.0	U	1.0
1,3-Dichlorobenzene	U	1.0	U	1.0
p-Isopropyltoluene	U	1.0	U	1.0
1,4-Dichlorobenzene	U	1.0	U	1.0
1,2-Dichlorobenzene	U	1.0	U	1.0
n-Butylbenzene	U	1.0	U	1.0
1,2-Dibromo-3-Chloropropan	U	1.0	U	1.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0
Naphthalene	U	1.0	U	1.0
Hexachlorobutadiene	U	1.0	U	1.0
1,2,3-Trichlorobenzene	U	1.0	U	1.0

**Table 1.1 (cont.) Results of the Analysis for VOC in Water
WAN 2-173 J-Field Photooxidation Study**

SAMPLE #:	LAB BLANK	11830		11835		11842		11843	
		TIME 140	TIME 145	TIME 148	TIME 175	TIME 177	TIME 179	TIME 139	TIME 137
LOCATION:		07/01/97	07/01/97	07/01/97	07/01/97	07/01/97	07/01/97	07/01/97	07/01/97
COLLECTED:		08/07/97	08/07/97	08/07/97	08/07/97	08/07/97	08/07/97	08/07/97	08/07/97
ANALYZED:		13:04	13:50	16:00	17:13	18:18			
INJECTED:		A2847	A2848	A2852	A2853	A2854			
FILE #:				1	1	1			
DIL. FACT.:		1	1	1	1	1			
UNIT:		µg/L	µg/L	µg/L	µg/L	µg/L			
Conc.	MDL	Conc.	MDL	Conc.	MDL	Conc.	MDL	Conc.	MDL
1,1-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U
Chloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U
Vinyl Chloride	U	1.0	U	1.0	U	1.0	U	1.0	U
Bromoethane	U	2.0	U	2.0	U	1.0	U	1.0	U
Chloroethene	U	1.0	U	1.0	U	1.0	U	1.0	U
Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U
Acetone	U	2.0	35	20	5.8	20	5.4	20	7.9
1,1-Dichloroethene	U	1.0	U	1.0	U	1.0	U	1.0	U
Carbon Disulfide	U	1.0	U	1.0	U	1.0	U	1.0	U
Methylene Chloride	U	1.0	U	1.0	U	1.0	U	1.0	U
Methyl-tertary-butylether	U	1.0	U	1.0	U	1.0	U	1.0	U
trans-1,2-Dichloroethene	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U
2-Bromone	U	4.0	U	4.0	U	4.0	U	1.0	U
2,2-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	U
cis-1,2-Dichloroethene	U	1.0	U	1.0	U	1.0	U	1.0	U
Chloroform	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1,1-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U
Carbon Tetrachloride	U	1.0	U	1.0	U	1.0	U	1.0	U
Benzene	U	1.0	U	1.0	U	1.0	U	1.0	U
Trichloroethene	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.0	U
Dibromoethane	U	1.0	U	1.0	U	1.0	U	1.0	U
Bromodichloromethane	U	1.0	U	1.0	U	1.0	U	1.0	U
cis-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	U
trans-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1,2-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U
1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.0	U
Dibromoethane	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-Dibromoethane	U	1.0	U	1.0	U	1.0	U	1.0	U
bromoform	U	1.0	U	1.0	U	1.0	U	1.0	U
4-Nitro-1,2-Pentanone	U	2.0	U	2.0	U	2.0	U	2.0	U

**Table 1.1 (cont.) Results of the Analysis for VOC in Water
WAN 2-173 J-Field Phytoremediation Study**

SAMPLE #:	LAB BLANK	11830		11832		11842		11843		
		TREE 140	07/31/97	TREE 148	08/01/97	TREE 173	08/01/97	TREE 139	08/01/97	
LOCATION:										
COLLECTED:										
ANALYZED:	08/07/97		08/07/97		08/07/97		08/07/97		08/07/97	
INJECTED:	13:04		13:30		14:49		17:33		18:18	
FILE #:	A2847		A2848		A2852		A2853		A2854	
DIL. FACT.:	1		1		1		1		1	
UNIT:	ng/L		ng/L		ng/L		ng/L		ng/L	
	Conc.	MDL	Conc.	MDL	Conc.	MDL	Conc.	MDL	Conc.	MDL
Toluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
2-Hexanone	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0
Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Chlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Ethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
p & m-Xylene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
o-Xylene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Styrene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Isopropylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,1,2,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,1,3-Trichloropropane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Bromobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
n-Propylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
2-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
4-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,3,5-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
tert-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,4-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
sec-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,3-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
p-Isopropyltoluene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,4-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
n-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2-Dibromo-3-Chloropropane	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Naphthalene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
Hexachlorobutadiene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0
1,2,3-Trichloronitrobenzene	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0

**Table 1. 2 Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	LAB BLANK	Unit	µg/L
LabFile#	A2703	Con. Factor	1

	CAS#	Compound	O	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	11801	Unit	µg/L
LabFile#	A2708	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1.2 (cont.) Results of TIC for VOC in Water
WAF 2-173 J-FIELD Phytoremediation Study**

Sample #	11802	Unit	$\mu\text{g/L}$
LabFile#	A2709	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		UNKNOWN CHLORO ALKANE		23.93	5
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	LAB BLANK	Unit	µg/L
LabFile#	A2717	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1.2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	11806	Unit	$\mu\text{g/L}$
LabFile#	A2719	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	11803	Unit	µg/L
LabFile#	A2721	Con. Factor	50

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

Table 1. 2 (cont.) Results of TIC for VOC in Water
WAN 2-173 J-FIELD Phytoremediation Study

Sample #	11804	Unit	$\mu\text{g/L}$
LabFile#	A2722	Con. Factor	100

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

Table 1.2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study

Sample #	11805	Unit	µg/L
LabFile#	A2726	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study

Sample #	LAB BLANK	Unit	$\mu\text{g/L}$
LabFile#	A2799	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	11846	Unit	$\mu\text{g/L}$
LabFile#	A2800	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1.2 (cont.) Results of TIC for VOC in Water
WA#2-173 J-FIELD Phytoremediation Study**

Sample #	11847	Unit	$\mu\text{g/L}$
LabFile#	A2801	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		UNKNOWN		4.42	13
2		UNKNOWN PENTADIENE		5.54	19
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	11848	Unit	$\mu\text{g/L}$
LabFile#	A2802	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		UNKNOWN		4.43	41
2		UNKNOWN PENTADIENE		5.44	5
3	75183	THIOBIS-METHANE C2H8S		6.47	7
4		UNKNOWN ESTER		7.16	19
5		UNKNOWN ESTER		10.99	7
6		UNKNOWN ALCOHOL		14.93	10
7		UNKNOWN ALCOHOL		23.68	70
8		UNKNOWN ALCOHOL		23.92	7
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1.2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	02352	Unit	$\mu\text{g/L}$
LabFile#	A2806	Con. Factor	1

CAS#	Compound	Q	RT	Conc
1	UNKNOWN PENTADIENE		5.92	88
2				0
3				0
4				0
5				0
6				0
7				0
8				0
9				0
10				0
11				0
12				0
13				0
14				0
15				0
16				0
17				0
18				0
19				0
20				0

*Estimated Concentration (Response Factor = 1.0)

Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study

Sample #	05293	Unit	$\mu\text{g/L}$
LabFile#	A2807	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		UNKNOWN PENTADIENE		5.49	110
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	11849	Unit	$\mu\text{g/L}$
LabFile#	A2803	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		UNKNOWN		4.43	6
2		UNKNOWN PENTADIENE		5.53	100
3	75183	THIOBIS-METHANE C2H6S		6.44	5
4		UNKNOWN		23.62	5
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	11851	Unit	$\mu\text{g/L}$
LabFile#	A2805	Con. Factor	1

CAS#	Compound	Q	RT	Conc
1	UNKNOWN		4.38	7
2	UNKNOWN PENTADIENE		5.53	35
3				0
4				0
5				0
6				0
7				0
8				0
9				0
10				0
11				0
12				0
13				0
14				0
15				0
16				0
17				0
18				0
19				0
20				0

*Estimated Concentration (Response Factor = 1.0)

**Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	05294	Unit	$\mu\text{g/L}$
LabFile#	A2808	Con. Factor	1
Compound			
1	UNKNOWN PENTADIENE	Q	RT
2			5.51
3			0
4			0
5			0
6			0
7			0
8			0
9			0
10			0
11			0
12			0
13			0
14			0
15			0
16			0
17			0
18			0
19			0
20			0

*Estimated Concentration (Response Factor = 1.0)

**Table 1.2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	05295	Unit	$\mu\text{g/L}$
LabFile#	A2809	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		UNKNOWN PENTADIENE		3.53	81
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1.2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	05296	Unit	$\mu\text{g/L}$
LabFile#	A2810	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		UNKNOWN		4.39	7
2		UNKNOWN PENTADIENE		5.51	100
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	LAB BLANK	Unit	µg/L
LabFile#	A2847	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		UNKNOWN		30.82	6
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	11850	Unit	$\mu\text{g/L}$
LabFile#	A2848	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		UNKNOWN PENTADIENE		5.20	24
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	11838	Unit	$\mu\text{g/L}$
LabFile#	A2852	Con Factor	1

	CAS#	Compound	Q	RT	Conc
1		UNKNOWN		17.30	110
2		UNKNOWN		19.21	83
3		UNKNOWN SILOXANE		25.64	13
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	11842	Unit	$\mu\text{g/L}$
LabFile#	A2853	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		UNKNOWN		13.40	8
2		UNKNOWN		17.39	84
3		UNKNOWN		19.23	240
4		UNKNOWN		21.71	7
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	11843	Unit	µg/L
LabFile#	A2854	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		UNKNOWN		5.32	6
2		UNKNOWN		13.39	9
3		UNKNOWN		17.39	35
4		UNKNOWN		19.22	280
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	LAB BLANK	Unit	µg/L
LabFile#	A2866	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1. 2 (cont.) Results of TIC for VOC in Water
WA# 2-173 J-FIELD Phytoremediation Study**

Sample #	11841	Unit	µg/L
LabFile#	A2867	Con. Factor	1

	CAS#	Compound	Q	RT	Conc
1		UNKNOWN		13.34	12
2		UNKNOWN		17.24	55
3		UNKNOWN		19.23	430
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

**Table 1.3 Results of the Analysis for Halogenated Acids in Plant Extracts
WA # 2-173 J-Field Phytoremediation Study**

Sample #	Method Blank	A11837	A11838	A11839
Location	_____	Tree # 148	Tree # 148	Tree # 170
Collected	_____	01-Aug-97	01-Aug-97	01-Aug-97
Analyzed	13-Aug-97	13-Aug-97	13-Aug-97	13-Aug-97
Dilution Factor	1.0	1.0	1.0	1.0
Units	µg/L	µg/L	µg/L	µg/L
Analyst	Conc.	MDL	Conc.	MDL
Monochloroacetic acid	U	0.31	U	0.31
Dichloroacetic acid	U	0.31	U	0.31
Monobromoacetic acid	U	0.31	U	0.31
Trichloroacetic acid	U	0.31	U	0.31
Bromochloroacetic acid	U	0.31	U	0.31
Dibromoacetic acid	U	0.31	U	0.31

Sample #	A11840	A11841	A11842	A11843
Location	Tree # 102	Tree # 174	Tree # 175	Tree # 139
Collected	01-Aug-97	01-Aug-97	01-Aug-97	01-Aug-97
Analyzed	13-Aug-97	14-Aug-97	14-Aug-97	14-Aug-97
Dilution Factor	1.0	1.0	1.0	1.0
Units	µg/L	µg/L	µg/L	µg/L
Analyst	Conc.	MDL	Conc.	MDL
Monochloroacetic acid	U	0.31	U	0.31
Dichloroacetic acid	U	0.31	U	0.31
Monobromoacetic acid	U	0.31	U	0.31
Trichloroacetic acid	U	0.31	5.1	0.31
Bromochloroacetic acid	U	0.31	U	0.31
Dibromoacetic acid	U	0.31	U	0.31

Sample #	A11844	A11845	A11846
Location	Tree # 63	Tree # 170D	Blank
Collected	01-Aug-97	01-Aug-97	01-Aug-97
Analyzed	14-Aug-97	14-Aug-97	14-Aug-97
Dilution Factor	1.0	1.0	1.0
Units	µg/L	µg/L	µg/L
Analyst	Conc.	MDL	Conc.
Monochloroacetic acid	U	0.31	U
Dichloroacetic acid	U	0.31	U
Monobromoacetic acid	U	0.31	U
Trichloroacetic acid	U	0.31	U
Bromochloroacetic acid	U	0.31	U
Dibromoacetic acid	U	0.31	U

QA/QC for VOC in Water

Results of the Internal Standard Areas and Surrogate Recoveries

Each sample was spiked with a three-component surrogate mixture consisting of 1,2-dichloroethane-d₄, toluene-d₆, and bromofluorobenzene and an internal standards mixture consisting of bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-d₅. The internal standard areas and surrogate recoveries are listed in Table 2.1. All 108 internal standard areas were within QC criteria. The surrogate percent recoveries ranged from 93 to 111. All 108 recoveries were within acceptable QC limits.

Results of the MS/MSD Analysis

The samples 11801 and 05294 were chosen for the matrix spike/matrix spike duplicate (MS/MSD) analyses. The percent recoveries, listed in Table 2.2, ranged from 86 to 108. All 20 recoveries were within acceptable QC limits. The relative percent differences (RPDs), also listed in Table 2.2, ranged from 1 to 5. All ten RPD values were within acceptable QC limits.

Results of the Initial Calibrations for VOC are listed in Table 2.3.

Results of the Continuing Calibrations for VOC are listed in Table 2.4.

**Table 2.1 Results of the Internal Standard Areas and Surrogate Recoveries
for VOC in Water
WA #2-173 J-Field Phytoremediation Study**

Sample #	Date File	Internal Standards			Surrogates		
		1 ppm	2 ppm	3 ppm	DIC %	TOL %	BRO %
CAL CHECK	50 PPB VOC >A2702	64657	354346	328856	NA	NA	NA
LAB BLANK	>A2703	60817	345033	322936	103	99	100
11801	>A2708	61209	360303	333661	103	99	100
11802	>A2709	59793	336042	320017	103	100	101
CAL CHECK	50 PPB VOC >A2716	58304	325204	298196	NA	NA	NA
LAB BLANK	>A2717	55262	318218	299824	102	98	98
11806	>A2719	47250	308477	272904	97	101	94
11802	>A2720	53931	301108	272252	102	101	97
11803	>A2721	54647	306456	278475	103	99	96
11804	>A2722	53334	297109	273679	102	99	96
11801MS	>A2723	52952	290031	269068	103	99	103
11801MSD	>A2724	51568	287212	280445	106	97	102
11805	>A2726	51690	303596	293847	105	96	97
11802	>A2728	54236	306105	274168	103	100	96
11803	>A2729	52687	293269	266047	103	100	97
11804	>A2730	50864	286652	260418	103	100	96
CAL CHECK	50 PPB VOC >A2798	79693	376648	317617	NA	NA	NA
LAB BLANK	>A2799	75596	378467	317801	102	100	96
11846	>A2800	75316	377962	320012	101	99	95
11847	>A2801	75250	376009	318022	101	99	97
11848	>A2802	76408	379916	321437	101	99	99
11849	>A2803	70499	346151	298155	100	99	97
11851	>A2805	67785	337354	291997	103	99	95
02352	>A2806	74772	370396	316941	102	98	96
05293	>A2807	69770	356644	304389	104	99	96
05294	>A2808	66580	334720	291663	105	98	96
05295	>A2809	71758	350407	284294	102	101	94
05296	>A2810	74922	369753	300200	104	101	94
CAL CHECK	50 PPB VOC >A2846	75639	358281	307785	NA	NA	NA
LAB BLANK	>A2847	77852	363474	312142	98	99	98
11850	>A2848	75180	363322	312319	98	98	99
11847	>A2850	74767	354865	307269	96	99	99
11848	>A2851	73330	354014	304082	97	99	99
11838	>A2852	67104	345335	289854	93	102	93
11842	>A2853	71164	348201	291790	95	101	96
11843	>A2854	70010	355914	296329	94	100	95
05294MS	>A2857	76278	348161	291155	99	101	97
05294MSD	>A2858	75910	353884	292064	100	101	97
CAL CHECK	50 PPB VOC >A2863	87056	399365	355180	NA	NA	NA
LAB BLANK	>A2866	76292	385689	332182	98	102	96
11841	>A2867	74578	374874	322430	98	103	95

SURROGATE LIMITS

WATER

S1 (DIC) = 1,2-Dichloroethane-d4 (76-114)
 S2 (TOL) = Toluene-d8 (88-110)
 S3 (BRO) = Bromofluorobenzene (86-115)

**Table 2.2 Results of the MS/MSD Analysis for VOC in Water
WA # 2-173 J-Field Phytoremediation Study**

Sample ID: 11801

Compound Name	Sample Conc. ($\mu\text{g/L}$)	MS Spike Added ($\mu\text{g/L}$)	MSD Spike Added ($\mu\text{g/L}$)	MS Conc. ($\mu\text{g/L}$)	MSD Conc. ($\mu\text{g/L}$)	MS % Rec.	MSD % Rec.	RPD	QC Limits	
									RPD	% Rec.
1,1-Dichloroethene	U	50	50	53.1	52.1	106	104	2	14	61 - 145
Trichloroethene	U	50	50	54.2	51.5	108	103	5	14	71 - 120
Benzene	U	50	50	51.5	50.8	103	102	1	11	76 - 127
Toluene	U	50	50	49.6	48.4	99	97	2	13	76 - 125
Chlorobenzene	U	50	50	50.3	49.9	101	100	1	13	75 - 130

Sample ID: 05294

Compound Name	Sample Conc. ($\mu\text{g/L}$)	MS Spike Added ($\mu\text{g/L}$)	MSD Spike Added ($\mu\text{g/L}$)	MS Conc. ($\mu\text{g/L}$)	MSD Conc. ($\mu\text{g/L}$)	MS % Rec.	MSD % Rec.	RPD	QC Limits	
									RPD	% Rec.
1,1-Dichloroethene	U	50	50	44.9	47.3	90	95	5	14	61 - 145
Trichloroethene	U	50	50	47.2	48.7	94	97	3	14	71 - 120
Benzene	U	50	50	47.7	49.8	95	100	5	11	76 - 127
Toluene	U	50	50	42.8	44	86	88	5	13	76 - 125
Chlorobenzene	U	50	50	46.7	48.2	93	96	3	13	75 - 130

**Table 2.3 Results of the Initial Calibration for VOC
WA 83-173 J-Field Photoionization Study**

Instrument ID: GCMSD-1(3004A)12305
Calibration Date: 07/08/97

Minimum RF for SPCC = 0.05 Minimum % RSD for CCC is 30%

Laboratory ID	>A2614 RF	>A2615 RF	>A2616 RF	>A2617 RF	>A2618 RF	>A2619 RF	\bar{RT}	\bar{RF}	% RSD	CCC	SPCC
Compound	5.00000	20.00000	50.00000	100.00000	150.00000	200.00000					
Dichloroethane	2.46977	2.44544	2.26879	2.24088	2.11330	2.09774	0.225	2.27212	7.033	—	—
Chloroethane	0.99907	1.00194	0.95075	0.92958	0.84536	0.86579	0.259	0.93342	6.930	—	—
Vinyl Chloride	1.14740	1.17381	1.16880	1.08342	1.01915	1.01237	0.274	1.08081	6.077	—	—
Bromoethane	1.31130	1.30704	1.22406	1.24759	1.14825	1.20546	0.345	1.24993	4.326	—	—
Chloroethene	0.73914	0.74098	0.72462	0.71027	0.66595	0.66499	0.367	0.70764	4.861	—	—
Trichloroethane	3.97752	3.93236	3.76991	3.68297	3.46114	3.49546	0.436	3.70869	5.777	—	—
Aromatics	0.50013	0.55163	0.49515	0.46544	0.43367	0.44120	0.335	0.48004	10.537	—	—
1,1-Dichloroethane	1.35153	1.36543	1.31272	1.32874	1.23347	1.24760	0.365	1.31482	4.357	—	—
Carbon Disulfide	3.11880	3.28086	3.26382	3.37976	3.15342	3.20893	0.357	3.22876	2.980	—	—
Methylvinyl Chloride	1.57348	1.51369	1.41317	1.39298	1.32485	1.36870	0.468	1.42111	7.408	—	—
trans-1,2-Dichloroethene	1.56260	1.56010	1.46758	1.45181	1.36320	1.36330	0.341	1.46143	6.073	—	—
Methyl-vinyl-tert-butylether	4.10426	4.04688	3.72303	3.65604	3.46944	3.62443	0.341	3.77146	6.388	—	—
1,1-Dichloroethene	2.97609	3.03534	2.81844	2.83821	2.71071	2.72078	0.327	2.84993	4.641	—	—
2-Bromopropane	0.71886	0.67466	0.59999	0.57573	0.51405	0.56603	0.326	0.68555	12.443	—	—
2,2-Dichloropropene	2.76581	2.87141	2.72256	2.68209	2.18984	2.69088	0.349	2.63536	8.933	—	—
cis-1,2-Dichloroethene	1.75225	1.72280	1.60350	1.59939	1.51386	1.49945	0.346	1.61433	6.548	—	—
Chloroform	4.21444	4.11977	3.83876	3.81671	3.65987	3.63220	0.363	3.88379	6.087	—	—
1,1-Dichloropropene	2.55962	2.56225	2.44849	2.40814	2.26228	2.28140	1.088	2.42137	5.432	—	—
1,2-Dichloroethane	2.80383	2.73344	2.57402	2.51087	2.37569	2.40370	1.130	2.36760	6.773	—	—
1,2-Dichloroethane-d4 (SURJ)	2.21205	2.23034	2.20222	2.09422	1.96026	1.98248	1.112	2.16573	5.853	—	—
1,1,1-Trichloroethane	0.61801	0.64747	0.63336	0.64018	0.60307	0.64644	0.360	0.63397	1.731	—	—
Carbon Tetrachloride	0.52029	0.56029	0.54943	0.53987	0.54372	0.58362	0.319	0.53327	3.902	—	—
Benzene	0.93677	0.81372	0.76282	0.75454	0.74159	0.72915	0.359	0.77476	5.254	—	—
1-Chloroethene	0.41521	0.41673	0.39620	0.39924	0.38821	0.38881	1.044	0.40107	3.999	—	—
1,2-Dichloropropene	0.34624	0.34035	0.33138	0.33042	0.32281	0.32466	1.066	0.33014	2.840	—	—
Dibromoethane	0.45449	0.42479	0.40040	0.38934	0.37477	0.38045	1.093	0.40457	7.395	—	—
Bromodichloroethene	0.70397	0.74426	0.72521	0.72771	0.70403	0.71154	1.087	0.71853	2.168	—	—
cis-1,3-Dichloropropene	0.45470	0.51423	0.49985	0.49728	0.46229	0.52317	1.193	0.46225	5.715	—	—
trans-1,3-Dichloropropene	0.39193	0.44926	0.44302	0.43182	0.37455	0.46806	1.274	0.42044	9.435	—	—
1,1,2-Trichloroethane	0.31139	0.30352	0.28957	0.25236	0.26385	0.27923	1.293	0.28899	5.891	—	—

RF - Response Factor (Subscript is amount in ppb)

\bar{RT} - Average Relative Retention Time (RT Std/RT Avg)

\bar{RF} - Average Response Factor

*RSD - Percent Relative Standard Deviation

CCC - Calibration Check Compounds (%)

**Table 2.3 (cont.) Results of the Initial Calibration for VOC
WA #2-173 J-Field Photoremediation Study**

Instrument ID: GCMSD-1(3004A)2505

Calibration Date: 07/08/97

Minimum RF for SPCC is 0.05 Maximum % RSD for CCC is 30%

Laboratory ID	>A2614 RF 5.00000	>A2615 RF 20.00000	>A2616 RF 50.00000	>A2617 RF 100.00000	>A2618 RF 150.00000	>A2619 RF 200.00000	\bar{RT}	\bar{RF}	% RSD	CCC	SPCC
Compound											
1,3-Dichloropropene	0.54066	0.54071	0.51338	0.50237	0.48851	0.50899	1.334	0.51594	6.134	-	-
Dibromoethane	0.55691	0.57285	0.62754	0.61986	0.59833	0.63701	1.363	0.60504	4.844	-	-
1,2-Dibromoethane	0.52684	0.53948	0.51037	0.49807	0.45982	0.50723	1.385	0.50482	5.428	-	-
Bromoform	0.35932	0.43334	0.44417	0.45032	0.41427	0.48161	1.614	0.43057	9.986	-	-
4-Methyl-2-Pentanone	0.37289	0.37672	0.35386	0.34322	0.32038	0.38891	0.882	0.35650	5.182	-	-
Toluene-d8 (SURR)	1.05734	1.05907	1.08048	1.08671	1.08454	1.08776	0.888	1.07315	1.237	-	-
Toluene	0.65802	0.65989	0.62981	0.67946	0.62094	0.61991	0.847	0.63394	2.871	-	-
2-Hexanone	0.25995	0.27293	0.25493	0.34136	0.22662	0.22328	0.886	0.25151	6.329	-	-
Tetrachloroethane	0.55266	0.54833	0.59460	0.54477	0.52235	0.52614	0.919	0.53011	2.301	-	-
Chlorobenzene	0.92647	0.91046	0.86812	0.87385	0.83114	0.83883	1.084	0.87815	3.971	-	-
1,1,2-Tetrachloroethane	0.46359	0.49730	0.48386	0.48915	0.46089	0.48807	1.012	0.48044	3.093	-	-
Ethylbenzene	1.55514	1.53622	1.43916	1.44706	1.37082	1.29167	1.019	1.44004	6.899	-	-
p & m-Xylenes	1.28619	1.24867	1.19650	1.16281	0.96022	0.64384	1.028	1.06337	22.389	-	-
o-Xylene	1.30882	1.28972	1.22897	1.22032	1.14834	1.16100	1.076	1.22573	5.298	-	-
Styrene	0.38798	0.59225	0.56272	0.56416	0.53420	0.54107	1.078	0.54073	4.189	-	-
Isopropylbenzene	1.43232	1.42348	1.37977	1.39223	1.29026	1.30238	1.123	1.37004	4.415	-	-
1,1,2,2-Tetrachloroethane	0.60925	0.61346	0.57802	0.55439	0.51139	0.57085	1.133	0.57220	6.549	-	-
p-Bromoform (SURR)	0.61586	0.62185	0.63742	0.64225	0.62714	0.63295	1.141	0.63425	2.287	-	-
1,2,3-Trichloropropane	0.17127	0.17337	0.16174	0.15754	0.14452	0.16165	1.146	0.16168	6.429	-	-
Bromoform	0.56112	0.53795	0.52615	0.52037	0.49963	0.51367	1.157	0.52768	4.179	-	-
n-Propylbenzene	0.37086	0.38038	0.36764	0.36799	0.33669	0.35778	1.170	0.34069	3.932	-	-
2-Chlorotoluene	0.41783	0.37792	0.36837	0.36381	0.32798	0.38095	1.181	0.37628	7.751	-	-
4-Chlorotoluene	0.36072	0.40019	0.36466	0.34684	0.33475	0.32220	1.188	0.33306	7.088	-	-
1,3,5-Trimethylbenzene	1.37242	1.37094	1.30637	1.29214	1.17233	1.18576	1.191	1.20333	6.798	-	-
tert-Butylbenzene	1.32237	1.32891	1.27512	1.26167	1.14836	1.21406	1.222	1.23830	5.426	-	-
1,2,4-Trimethylbenzene	1.37423	1.36341	1.30790	1.28055	1.17098	1.17189	1.234	1.27816	7.012	-	-
sec-Butylbenzene	1.81790	1.82910	1.74507	1.73531	1.58347	1.48737	1.238	1.70304	8.068	-	-
1,3-Dichlorobenzene	0.89979	0.90346	0.86764	0.87647	0.79487	0.84226	1.271	0.86411	4.708	-	-
p-Isopropylbenzene	1.44662	1.45935	1.39645	1.41140	1.29229	1.34623	1.277	1.36889	6.836	-	-
1,4-Dichlorobenzene	0.94521	0.95116	0.91025	0.90612	0.82323	0.89444	1.283	0.90374	5.142	-	-
1,2-Dichlorobenzene	0.86977	0.86147	0.83767	0.82142	0.73022	0.78620	1.323	0.81779	6.397	-	-
n-butylbenzene	1.52050	1.49552	1.42949	1.40160	1.36268	1.22843	1.325	1.38970	8.645	-	-
1,2-Ditromo-3-Chloropropane	0.11486	0.13388	0.13607	0.13302	0.11981	0.14929	1.414	0.13115	9.390	-	-
1,2,4-Trichlorobenzene	0.64607	0.69622	0.68476	0.70057	0.62914	0.67361	1.518	0.67173	4.251	-	-
Naphthalene	0.86611	0.99754	0.98918	0.99650	0.90134	0.99895	1.536	0.95832	6.151	-	-
Hexachlorobutadiene	0.43709	0.43590	0.41935	0.42988	0.39202	0.41144	1.543	0.42095	4.106	-	-
1,2,3-Trichlorobenzene	0.44501	0.60640	0.60916	0.62327	0.56531	0.60777	1.569	0.59204	5.075	-	-

RF = Response Factor (Subscript is amount in ppb)

\bar{RT} = Average Relative Retention Time (RT_{Std}/RT_{Lead})

\bar{RF} = Average Response Factor

*RSI = Percent Relative Standard Deviation

CCC = Calibration Check Compounds (**)

SPCC = System Performance Check Compounds (**)

**Table 2.4 (cont.) Results of the Continuing Calibration for VOC
WA #2-173 J-Field Phytoremediation Study**

Calibration Date: 07/22/97

Time: 11:12

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 07/08/97

Minimum $\bar{R}F$ for SPCC is 0.05

Maximum % Diff for CCC is 25.0

Compound	RRT	$\bar{R}F$	% Diff	CCC	SPCC
1,2-Dibromoethane	0.50482	0.50503	0.04		
Bromoform	0.43057	0.40736	5.39	•	•
4-Methyl-2-Pentanone	0.35650	0.32602	8.55		
Toluene-d8 (SURR)	1.07315	1.01203	5.87		
Toluene	0.63594	0.64370	1.22	•	
2-Hexanone	0.25151	0.24779	1.48		
Tetrachloroethane	0.53911	0.57321	6.33		
Chlorobenzene	0.87815	0.88527	0.81	•	•
1,1,1,2-Tetrachloroethane	0.48044	0.46768	2.66		
Ethylbenzene	1.44004	1.44788	0.54	•	
p & m-Xylene	1.08337	1.19230	10.06		
o-Xylene	1.22573	1.21008	1.28		
Syrene	0.56373	0.54681	3.00		
Isopropylbenzene	1.37004	1.34941	1.51		
1,1,2,2-Tetrachloroethane	0.57323	0.52416	8.56	•	
p-Bromofluorobenzene (SURR)	0.63425	0.64628	1.90		
1,2,3-Trichloropropene	0.16168	0.14788	8.54		
Bromobenzene	0.52788	0.52679	0.21		
n-Propylbenzene	0.36389	0.36576	0.51		
2-Chlorotoluene	0.37628	0.34926	7.18		
4-Chlorotoluene	0.35506	0.36932	4.01		
1,3,5-Trimethylbenzene	1.28333	1.26084	1.75		
tert-Butylbenzene	1.25850	1.23994	1.47		
1,2,4-Trimethylbenzene	1.27816	1.24736	2.41		
sec-Butylbenzene	1.70304	1.65336	2.92		
1,3-Dichlorobenzene	0.86411	0.85329	1.25		
p-isopropyltoluene	1.36989	1.34405	1.89		
1,4-Dichlorobenzene	0.90374	0.89291	1.20		
1,2-Dichlorobenzene	0.81779	0.79891	2.31		
n-Hutylbenzene	1.38970	1.32295	4.80		
1,2-Dibromo-3-Chloropropane	0.13115	0.10887	16.99		
1,2,4-Trichlorobenzene	0.67173	0.59814	10.95		
Naphthalene	0.95832	0.75389	21.33		
Hexachlorobuladiene	0.42095	0.38944	7.48		
1,2,4-Trichlorobenzene	0.59204	0.49301	16.73		

R_T - Response Factor from daily standard file at 50.00 ppb

$\bar{R}F$ - Average Response Factor from Initial Calibration Form VI

*Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

**Table 2.4 (cont.) Results of the Continuing Calibration for VOC
WA #2-173 J-Field Phytoremediation Study**

Calibration Date: 07/23/97

Time: 18:05

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 07/08/97

Minimum \bar{RF} for SPCC is 0.05

Maximum % Diff for CCC is 25.0

<u>Compound</u>	<u>RRT</u>	<u>RF</u>	<u>% Diff</u>	<u>CCC</u>	<u>SPCC</u>
Dichlorodifluoromethane	2.27212	2.09932	7.61		..
Chloromethane	0.93542	1.00455	7.39		
Vinyl Chloride	1.09081	1.17284	7.52		
Bromomethane	1.24895	1.43321	14.75		
Chloroethane	0.70764	0.82049	15.95		
Trichlorofluoromethane	3.70989	3.91460	5.52		
Acetone	0.49004	0.60974	24.43		
1,1-Dichloroethene	1.31482	1.47060	11.85		
Carbon Disulfide	3.22876	3.17194	1.76		
Methylene Chloride	1.42111	1.61600	13.71		
trans-1,2-Dichloroethene	1.46143	1.66462	13.90		
Methyl-tertiary-butylether	3.77146	4.09637	8.61		
1,1-Dichloroethane	2.84993	3.19750	12.20		..
2-Butanone	0.60855	0.81245	33.51		
2,2-Dichloropropene	2.65536	3.00424	13.14		
cis-1,2-Dichloroethene	1.61433	1.88541	16.79		
Chloroform	3.88379	4.33192	11.54		
1,1-Dichloropropene	2.42137	2.75957	13.97		
1,2-Dichloroethane	2.56760	2.89565	12.78		
1,2-Dichloroethane-d4 (SURR)	2.10573	2.18220	3.63		
1,1,1-Trichloroethane	0.63597	0.61643	3.07		
Carbon Tetrachloride	0.55327	0.54349	1.77		
Benzene	0.77476	0.80321	3.67		
Trichloroethene	0.40107	0.42659	6.36		
1,2-Dichloropropane	0.33314	0.34535	3.66		
Dibromomethane	0.40457	0.42686	5.51		
Bromodichloromethane	0.71853	0.70407	2.01		
cis-1,3-Dichloropropene	0.49225	0.50363	2.31		
trans-1,3-Dichloropropene	0.42944	0.43789	1.97		
1,1,2-Trichloroethane	0.28899	0.29555	2.27		
1,1,3-Dichloropropane	0.51594	0.54187	5.03		
Dibromo-chloromethane	0.60504	0.58635	3.09		

RF - Response Factor from daily standard file at 50.00 ppb

\bar{RF} - Average Response Factor from initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

**Table 2.4 (cont.) Results of the Continuing Calibration for VOC
WA #2-173 J-Field Phytoremediation Study**

Calibration Date: 07/23/97

Time: 18:05

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 07/08/97

Minimum RF for SPCC is 0.05

Maximum % Diff for CCC is 25.0

Compound	RRT	RF	% Diff	CCC	SPCC
1,2-Dibromoethane	0.50482	0.52084	3.17		
Bromoform	0.43057	0.41212	4.28		..
4-Methyl-2-Pentanone	0.35650	0.33933	4.81		
Toluene-d8 (SURR)	1.07515	1.03119	4.09		
Toluene	0.63594	0.62625	1.52		
2-Hexanone	0.25151	0.26217	4.24		
Tetrachloroethane	0.53911	0.54391	0.89		
Chlorobenzene	0.87815	0.86156	1.89		..
1,1,2-Tetrachloroethane	0.48044	0.45172	5.98		
Ethybenzene	1.44004	1.41718	1.59		
p & m-Xylene	1.08337	1.12528	3.87		
o-Xylene	1.22573	1.15896	5.45		
Styrene	0.56373	0.52449	6.96		
Isopropylbenzene	1.37004	1.32036	3.63		
1,1,2-Tetrachloroethane	0.57323	0.55009	4.04		..
p-Bromofluorobenzene (SURR)	0.63425	0.64769	2.12		
1,2,3-Trichloropropane	0.16168	0.14961	7.46		
Bromobenzene	0.52788	0.50316	4.68		
n-Propylbenzene	0.36389	0.35090	3.57		
2-Chlorotoluene	0.37628	0.35463	5.75		
4-Chlorotoluene	0.35506	0.33708	5.06		
1,3,5-Trimethylbenzene	1.28333	1.21048	5.68		
tert-Butylbenzene	1.25850	1.19016	5.43		
1,2,4-Trimethylbenzene	1.27816	1.21253	5.13		
sec-Butylbenzene	1.70304	1.60079	6.00		
1,3-Dichlorobenzene	0.86411	0.81175	6.06		
p-Isopropyltoluene	1.36989	1.30619	4.65		
1,4-Dichlorobenzene	0.90374	0.84279	6.74		
1,2-Dichlorobenzene	0.81779	0.76314	6.68		
n-Bunylbenzene	1.38970	1.26240	9.16		
1,2-Dibromo-3-Chloropropane	0.13113	0.10810	17.58		
1,2,4-Trichlorobenzene	0.67173	0.56416	16.01		
Naphthalene	0.95832	0.75752	20.95		
Hexachlorobutadiene	0.42095	0.36306	13.75		
1,2,3-Trichlorobenzene	0.59204	0.47469	19.82		

RF - Response Factor from daily standard file at 50.00 ppb

R̄ - Average Response Factor from Initial Calibration Form VI

*Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

**Table 2.4 (cont.) Results of the Continuing Calibration for VOC
WA #2-173 J-Field Phytoremediation Study**

Calibration Date: 08/04/97

Time: 13:03

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 07/08/97

Minimum \bar{R} F for SPCC is 0.05

Maximum % Diff for CCC is 25.0

<u>Compound</u>	<u>RRT</u>	<u>RF</u>	<u>% Diff</u>	<u>CCC</u>	<u>SPCC</u>
Dichlorodifluoromethane	2.27212	2.11966	6.71		..
Chloromethane	0.93542	0.90507	3.24		
Vinyl Chloride	1.09081	1.06693	2.19		
Bromomethane	1.24895	1.16574	6.66		
Chloroethane	0.70764	0.70752	0.02		
Trichlorofluoromethane	3.70989	3.38089	8.87		
Acetone	0.49004	0.48225	1.59		
1,1-Dichloroethene	1.31482	1.32146	0.51		
Carbon Disulfide	3.22876	2.99696	7.18		
Methylene Chloride	1.42111	1.36303	4.09		
trans-1,2-Dichloroethene	1.46143	1.43978	1.48		
Methyl-tetrahydro-butylether	3.77146	3.25710	13.64		
1,1-Dichloroethane	2.84993	2.72208	4.49	..	
2-Butanone	0.60855	0.56632	6.94		
2,2-Dichloropropane	2.65536	1.09205	58.87		
cis-1,2-Dichloroethene	1.61433	1.61330	0.06		
Chloroform	3.88379	3.67008	5.50		
1,1-Dichloropropene	2.42137	2.33171	3.70		
1,2-Dichloroethane	2.56760	2.29134	10.76		
1,2-Dichloroethane-d4 (SURR)	2.10573	1.86786	11.30		
1,1,1-Trichloroethane	0.63597	0.60963	4.14		
Carbon Tetrachloride	0.55327	0.46124	16.63		
Benzene	0.77476	0.80713	4.18		
Trichloroethene	0.40107	0.42459	5.86		
1,2-Dichloropropane	0.33314	0.34953	4.92		
Dibromomethane	0.40457	0.40648	0.47		
Bromodichloromethane	0.71853	0.69509	3.26		
cis-1,3-Dichloropropene	0.49225	0.42753	13.15		
trans-1,3-Dichloropropene	0.42944	0.27657	35.60		
1,1,2-Trichloroethane	0.28899	0.28473	1.47		
1,3-Dichloropropane	0.51594	0.49177	4.68		
Dibromo-chloromethane	0.60504	0.56791	6.14		

RF - Response Factor from daily standard file at 50.00 ppb

\bar{R} F - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

**Table 2.4 (cont.) Results of the Containing Calibration for VOC
WA #2-173 J-Field Phytoremediation Study**

Calibration Date: 06/04/97

Time: 13:03

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 07/08/97

Maximum RF for SPCC is 0.05

Maximum % Diff for CCC is 25.0

Compound	RRT	RF	% Diff	CCC	SPCC
1,2-Dibromoethane	0.50482	0.46532	7.82		..
Bromoform	0.43057	0.40421	6.12		
4-Methyl-2-Pentanone	0.35650	0.31489	11.67		
Toluene-d8 (SURR)	1.07515	0.98319	8.55		
Toluene	0.63594	0.68246	7.31		
2-Hexanone	0.25151	0.24947	0.81		
Tetrachloroethane	0.53911	0.61083	13.30		
Chlorobenzene	0.87815	0.95594	8.86		..
1,1,1,2-Tetrachloroethane	0.48044	0.50004	4.08		
Ethylbenzene	1.44004	1.54787	7.49		
p & m-Xylene	1.08337	1.27436	17.63		
o-Xylene	1.22573	1.30617	6.56		
Styrene	0.56373	0.58583	3.93		
Isopropylbenzene	1.37004	1.47692	7.80		
1,1,2,2-Tetrachloroethane	0.57323	0.54824	4.36		
p-Bromofluorobenzene (SURR)	0.63425	0.63607	0.29		
1,2,3-Trichloropropane	0.16168	0.15244	5.72		
Bromobenzene	0.52788	0.58381	10.60		
n-Propylbenzene	0.36389	0.40072	10.12		
2-Chlorotoluene	0.37628	0.41850	11.22		
4-Chlorotoluene	0.35506	0.37896	6.73		
1,3,5-Trimethylbenzene	1.28333	1.38126	7.63		
tert-Butylbenzene	1.25850	1.36734	8.65		
1,2,4-Trimethylbenzene	1.27816	1.38467	8.33		
sec-Butylbenzene	1.70304	1.84968	8.61		
1,3-Dichlorobenzene	0.86411	0.96224	11.36		
p-Isopropyltoluene	1.36989	1.50658	9.98		
1,4-Dichlorobenzene	0.90374	0.99568	10.17		
1,2-Dichlorobenzene	0.81779	0.89233	9.11		
n-Humulene	1.38970	1.48822	7.09		
1,2-Dibromo-3-Chloropropane	0.13115	0.10994	16.17		
1,2,4-Trichlorobenzene	0.67173	0.65480	2.52		
Naphthalene	0.95832	0.78934	17.63		
Heptachlorobutadiene	0.42095	0.44534	5.79		
1,2,3-Trichlorobenzene	0.59204	0.53199	10.14		

RT - Response Factor from daily standard file at 50.00 ppb

RT̄ - Average Response Factor from initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (%)

SPCC - System Performance Check Compounds (**)

**Table 2.4 (cont.) Results of the Continuing Calibration for VOC
WA #2-173 J-Field Phytoremediation Study**

Calibration Date: 08/07/97
Time: 12:20
Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 07/08/97

Minimum \bar{RF} for SPCC is 0.05

Maximum % Diff for CCC is 25.0

Compound	RRT	RF	% Diff	CCC	SPCC
Dichlorodifluoromethane	2.27212	2.00475	11.77		..
Chloromethane	0.93542	0.76865	17.83		
Vinyl Chloride	1.09081	0.93970	13.85		
Bromomethane	1.24895	1.02796	17.69		
Chloroethane	0.70764	0.59323	16.17		
Trichlorofluoromethane	3.70989	3.63331	2.06		
Acetone	0.49004	0.40733	16.88		
1,1-Dichloroethene	1.31482	1.30102	1.05		
Carbon Disulfide	3.22876	3.04262	5.76		
Methylene Chloride	1.42111	1.31235	7.65		
trans-1,2-Dichloroethene	1.46143	1.39357	4.64		
Methyl-tertary-butylether	3.77146	3.23242	14.29		
1,1-Dichloroethane	2.84993	2.47700	13.09		..
2-Butanone	0.60855	0.48932	19.59		
2,2-Dichloropropene	2.65536	3.01776	13.65		
cis-1,2-Dichloroethene	1.61433	1.53331	5.02		
Chloroform	3.88379	3.84090	1.10		
1,1-Dichloropropene	2.42137	2.28316	5.71		
1,2-Dichloroethane	2.56760	2.39106	6.88		
1,2-Dichloroethane-d4 (SURR)	2.10573	1.91882	8.88		
1,1,1-Trichloroethane	0.63597	0.69774	9.71		
Carbon Tetrachloride	0.55327	0.52830	4.51		
Benzene	0.77476	0.73767	4.79		
Trichloroethene	0.40107	0.44501	10.96		
1,2-Dichloropropane	0.33314	0.30987	6.99		
Dibromomethane	0.40457	0.46380	14.64		
Bromodichloromethane	0.71853	0.75861	5.58		
cis-1,3-Dichloropropene	0.49225	0.54006	9.71		
trans-1,3-Dichloropropene	0.42944	0.49660	15.64		
1,1,2-Trichloroethane	0.28899	0.26882	6.98		
1,1-Dichloropropane	0.51594	0.48577	5.85		
Dibromo-chloromethane	0.60504	0.65175	7.72		

RF - Response Factor from daily standard file at 50.00 ppb

\bar{RF} - Average Response Factor from initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

**Table 2.4 (cont.) Results of the Continuing Calibration for VOC
WA #2-173 J-Field Phytoremediation Study**

Calibration Date: 08/07/97

Time: 12:20

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 07/08/97

Minimum RF for SPCC is 0.05

Maximum % Diff for CCC is 25.0

Compound	RRT	RF	% Diff	CCC	SPCC
1,2-Dibromoethane	0.50482	0.51110	1.24		..
Bromoform	0.43057	0.47945	11.35		
4-Methyl-2-Pentanone	0.35650	0.27473	22.94		
Toluene-d8 (SURR)	1.07515	0.96405	10.33		
Toluene	0.63594	0.63485	0.17		
2-Hexanone	0.25151	0.21758	13.49		
Tetrachloroethane	0.53911	0.65195	20.93		
Chlorobenzene	0.87815	0.94262	7.34		..
1,1,1,2-Tetrachloroethane	0.48044	0.52797	9.89		
Ethylbenzene	1.44004	1.47567	2.47		
p & m-Xylene	1.08337	1.22280	12.87		
o-Xylene	1.22573	1.26521	3.22		
Styrene	0.56373	0.60426	7.19		
Isopropylbenzene	1.37004	1.46417	6.87		
1,1,2,2-Tetrachloroethane	0.57323	0.50715	11.53		..
p-Bromofluorobenzene (SURR)	0.63425	0.71896	13.36		
1,2,3-Trichloropropane	0.16168	0.15099	6.62		
Bromobenzene	0.52788	0.61808	17.09		
n-Propylbenzene	0.36389	0.39852	9.52		
2-Chlorotoluene	0.37628	0.43540	15.71		
4-Chlorotoluene	0.35506	0.36532	2.89		
1,3,5-Trimethylbenzene	1.28333	1.39582	8.77		
tert-Butylbenzene	1.25850	1.39427	10.79		
1,2,4-Trimethylbenzene	1.27816	1.40363	9.82		
sec-Butylbenzene	1.70304	1.82632	7.24		
1,3-Dichlorobenzene	0.86411	0.97986	13.39		
n-Isopropyltoluene	1.36989	1.53042	11.72		
1,4-Dichlorobenzene	0.90374	0.99747	10.37		
1,2-Dichlorobenzene	0.81779	0.90018	10.07		
n-Butylbenzene	1.38970	1.40116	0.82		
1,2-Dibromo-2-Chloropropane	0.13115	0.11499	12.33		
1,2,4-Trichlorobenzene	0.67173	0.60822	9.45		
Naphthalene	0.95832	0.43443	54.67		
Hexachlorobutadiene	0.42095	0.56761	34.84		
1,2,4-Trichlorobenzene	0.59204	0.39074	34.00		

R! - Response Factor from daily standard file at 50.00 ppb

RF - Average Response Factor from Initial Calibration Form VI

*Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

**Table 2.4 (cont.) Results of the Continuing Calibration for VOC
WA #2-173 J-Field Phytoremediation Study**

Calibration Date: 08/11/97

Time: 09:54

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 07/08/97

Minimum $\bar{R}F$ for SPCC is 0.05

Maximum % Diff for CCC is 25.0

Compound	RRT	RF	% Diff	CCC	SPCC
Dichlorodifluoromethane	2.27212	1.49114	34.37		
Chloromethane	0.93542	0.58310	37.66		**
Vinyl Chloride	1.09081	0.72317	33.70		*
Bromomethane	1.24895	0.90929	27.20		
Chloroethane	0.70764	0.48947	30.83		
Trichlorofluoromethane	3.70989	2.89904	21.86		
Acetone	0.49004	0.34050	30.51		
1,1-Dichloroethene	1.31482	1.02268	22.22		*
Carbon Disulfide	3.22876	2.37362	26.49		
Methylene Chloride	1.42111	1.03016	27.51		
trans-1,2-Dichloroethene	1.46143	1.10478	24.40		
Methyl-tertiary-butylether	3.77146	2.85553	24.29		
1,1-Dichloroethane	2.84993	2.07040	27.35		**
2-Butanone	0.60855	0.42588	30.02		
2,2-Dichloropropane	2.65536	2.36488	10.94		
cis-1,2-Dichloroethene	1.61433	1.22565	24.08		
Chloroform	3.88379	3.02730	22.05		*
1,1-Dichloropropene	2.42137	1.80495	25.46		
1,2-Dichloroethane	2.56760	1.97286	23.16		
1,2-Dichloroethane-d4 (SURR)	2.10573	1.92732	8.47		
1,1,1-Trichloroethane	0.63597	0.57042	10.31		
Carbon Tetrachloride	0.55327	0.47867	13.48		
Benzene	0.77476	0.60823	21.49		
Trichloroethene	0.40107	0.35937	10.40		
1,2-Dichloropropane	0.33314	0.25679	22.92		
Dibromomethane	0.40457	0.39273	2.93		
Bromodichloromethane	0.71853	0.62633	12.83		
cis-1,3-Dichloropropene	0.49225	0.44676	9.24		
trans-1,3-Dichloropropene	0.42944	0.41563	3.21		
1,1,2-Trichloroethane	0.28899	0.22710	21.42		
1,3-Dichloropropane	0.51594	0.41536	19.49		
Dibromochloromethane	0.60504	0.57094	5.64		

RF - Response Factor from daily standard file at 50.00 ppb

$\bar{R}F$ - Average Response Factor from initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

**Table 2.4 (cont.) Results of the Continuing Calibration for VOC
WA #2-173 J-Field Phytoremediation Study**

Calibration Date: 08/11/97

Time: 9:54

Instrument ID: GCMSD-1(3004A12505)

Initial Calibration Date: 07/08/97

Minimum \bar{RF} for SPCC is 0.05

Maximum % Diff for CCC is 25.0

Compound	RRT	RF	% Diff	CCC	SPCC
1,2-Dibromoethane	0.50482	0.43784	13.27		
Bromoform	0.43057	0.40598	5.71	..	
4-Methyl-2-Pentanone	0.35650	0.23891	32.99		
Toluene-d8 (SURR)	1.07515	0.94131	12.45		
Toluene	0.63594	0.50685	20.30		
2-Hexanone	0.25151	0.19334	23.13		
Tetrachloroethene	0.53911	0.51111	5.19		
Chlorobenzene	0.87815	0.74746	14.88	..	
1,1,1,2-Tetrachloroethane	0.48044	0.42166	12.24		
Ethylbenzene	1.44004	1.19270	17.18		
p & m-Xylene	1.08337	0.95413	11.93		
o-Xylene	1.22573	0.99899	18.50		
Styrene	0.56373	0.48028	14.80		
Isopropylbenzene	1.37004	1.14815	16.20		
1,1,2,2-Tetrachloroethane	0.57323	0.43573	23.98	..	
p-Bromofluorobenzene (SURR)	0.63425	0.71512	12.75		
1,2,3-Trichloropropane	0.16168	0.12871	20.39		
Bromobenzene	0.52788	0.49673	5.90		
n-Propylbenzene	0.36389	0.31469	13.52		
2-Chlorotoluene	0.37628	0.31837	15.39		
4-Chlorotoluene	0.35506	0.31656	10.84		
1,3,5-Trimethylbenzene	1.28333	1.10329	14.03		
tert-Buribenzene	1.25850	1.09825	12.73		
1,2,4-Trimethylbenzene	1.27816	1.10660	13.42		
sec-Buribenzene	1.70304	1.41919	16.67		
1,3-Dichlorobenzene	0.86411	0.78453	9.21		
p-isopropyltoluene	1.36989	1.19760	12.58		
1,4-Dichlorobenzene	0.90374	0.80310	11.14		
1,2-Dichlorobenzene	0.81779	0.73634	9.96		
n-Butylbenzene	1.38970	1.09968	20.87		
1,2-Dibromo-3-Chloropropane	0.13115	0.10422	20.53		
1,2,4-Trichlorobenzene	0.67173	0.53285	20.67		
Naphthalene	0.95832	0.47247	50.70		
Hexachlorobutadiene	0.42095	0.42375	0.66		
1,2,3-Trichlorobenzene	0.59204	0.37733	36.27		

RF - Response Factor from daily standard file at 50.00 ppb

\bar{RF} - Average Response Factor from Initial Calibration Form VI

*Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*)

SPCC - System Performance Check Compounds (**)

QA/QC for Haloacetic Acids in Plant Extracts

Results of the Surrogate Recoveries

Prior to analysis, each sample was spiked with the surrogate 3,5-dichlorobenzoic acid. The surrogate percent recoveries, listed in Table 2.5, ranged from 98 to 129. All eight reported recoveries were within acceptable QC limits. Five recoveries could not be calculated because of matrix interference.

Results of the BS/BSD Analysis

Because of the small amount of available sample extract, spike analysis was performed on blank samples. The percent recoveries, listed in Table 2.6, ranged from 64 to 126. Seven of twelve recoveries were within acceptable QC limits. The relative percent differences (RPDs), also listed in Table 2.6, ranged from 6 to 30. All six RPD values were within acceptable QC limits.

**Table 2.5 Results of the Surrogate Recoveries
for Haloacetic Acids in Plant Extracts
WA# 2-173 J-Field Phytoremediation Study**

3,5-Dichlorobenzoic Acid Surrogate

Sample ID	%Recovery	Flag
BLK	98	
BLKMS	100	
BLKMSD	109	
A11837	114	
A11838	129	
A11839	MI	*
A11840	MI	*
A11841	110	
A11842	MI	*
A11843	MI	*
A11844	121	
A11845	MI	*
A11846	109	

* QC limits 70-130%

**Table 2.6 Results of the RS/BSD Analysis
for Halogenic Acids in Plant Extracts
WA #2-173 J-Field Phytoremediation Study**

Sample ID: BLKOMS/BLKNMSD

Compound Name	Sample Conc. ($\mu\text{g/L}$)	RS Spikes Added ($\mu\text{g/L}$)	BSD Spikes Added ($\mu\text{g/L}$)	RS Conc. ($\mu\text{g/L}$)	BSD Conc. ($\mu\text{g/L}$)	RS % Rec.	BSD % Rec.	RFD	QC Limits	
									RFD	% Rec.
Monochloroacetic Acid	U	5.0	5.0	3.5	3.7	70	74	6	50	45 - 50
Dichloroacetic Acid	U	5.0	5.0	5.0	6.3	100	126	• 23	50	55 - 101
Monobromoacetic Acid	U	5.0	5.0	3.9	4.4	75	88	• 12	50	42 - 72
Trichloroacetic Acid	U	5.0	5.0	4.0	5.4	80	106	• 30	50	73 - 99
Bromochloroacetic Acid	U	5.0	5.0	5.1	6.1	102	122	• 18	50	69 - 111
Dibromoacetic Acid	U	5.0	5.0	3.2	4.3	64	86	29	50	56 - 92



Roy F. Weston, Inc.
GSA Ramen Depot
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732-321-4200 • Fax 732-494-4021

Southwest Research Institute
PO Box 28510, 6220 Culebra Road
San Antonio, TX 78228-0510

Attn: Jo Ann Boyd

25 July 1997

Project # 3347-142-001-2173 J Field

As per Weston REAC Purchase Order number 83018, please analyze samples according to the following parameters:

Analysis/Method	Matrix	# of samples
Halocyclic acid/EPA 552	Water	10

Data package: see attached Deliverables Requirements

Samples are expected to arrive at your laboratory on August 1, 1997. All applicable QA/QC (MS/MSD) analysis as per method, will be performed on our sample matrix. Preliminary sample and MS/MSD result tables plus a signed copy of our Chain of Custody must be faxed to REAC 10 business days after receipt of the last samples. The complete data package is due 21 business days after receipt of last batch of samples. The complete data package must include all items on the deliverables checklist.

Please submit all reports and technical questions concerning this project to John Johnson at (908) 321-4248 or fax to (908) 494-4020 Any contractual question, please call Cynthia Davison at (908) 321-4296.

Thank you

Sincerely,

Marty Ba
Marty Barkley

Data Validation and Report Writing Group Leader
Roy F. Weston, Inc. / REAC Project

MB:J Attachment

cc: R. Singhvi
H. Compton
2173:non-mem 97071sub 2173Con

V. Kansal
Subcontracting File
C. Gasser

C. Davison
R. Tobia
M. Barkley

REC'D

Roy F. Weston, Inc.
REAC, Edison, N.J.
EPA Contract 68-03-3482

CHAIN OF CUSTODY

Project Name
Project Number
RFW Contact

No: 78.
1825 SHEET NO. 1

U30117

SAMPLE IDENTIFICATION

REAC#	Sample No.	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative		V.O.N.
						1	2	
771	10/1847	Tree 174 N	TC	7/31/77	2			X
772	10/1848	Tree 174 E	TC		3			X
773	10/1849	Tree 175	TC		2			X
774	10/1850	Tree 175	TC		1			X
775	10/1851	Tree 175	TC	8/1/77	2			X
776	BC 0353	Tree 102	TC		1			X
777	COS 313	Tree 170	TC		2			X
778	BCO 5294	Tree 148	TC		1			X
779	BOS 195	Tree 55	TC		1			X
780	BOS 276	Tree 65	TC		1			X
781	BOS 1837	Phragmites	TC	8/1/77	3			X
782	BOS 1838	Tree 144	TC		1			X
783	BOS 1839	Tree 170	TC		1			X
784	BOS 1840	Tree 102	TC		1			X
785	BOS 1841	Tree 174	TC		1			X
786	BOS 1842	Tree 175	TC		1			X
787	BOS 1843	Tree 129	TC		1			X
788	BOS 1844	Tree 65	TC		1			X
789	BOS 1845	Tree 170 D	TC		1			X
790	BOS 1846	Field Blank	TC		1			X

Note:

SD : Sediment PW : Potable Water S : Soil
 DS : Drum Solids GW : Groundwater W : Water
 DL : Drum Liquids SW : Surface Water O : On Air
 X : Other SL : Sludge A : In Air

Special Instructions: (Enter if sample is being held)

FOR SUBCONTRACTING USE ONLY
FROM CHAIN OF
CUSTODY #

Name/Reason	Retrieved By	Date	Time	Name/Reason	Retrieved By	Date	Time	Name/Reason	Retrieved By	Date	Time
All Analyses	J. H. Weston	8/1/77	9:55	All Analyses	C. Hansen	-	-	All Analyses	C. Hansen	8/4/77	10:10

