

**APPENDIX A**

ANALYTIC RESULTS FOR  
VOLATILE ORGANIC COMPOUNDS IN GROUND WATER  
JANUARY 1992 THROUGH JANUARY 2002

**APPENDIX B**

QA/QC SUMMARY TABLES AND CHAIN-OF-CUSTODY RECORDS,  
FEBRUARY 2001 THROUGH JANUARY 2002

Table B-1. Summary of Sampling QA/QC, February 2001 through January 2002, Applied Materials Building 1, Santa Clara, California

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Who performed sampling (Firm name/address/contact/phone):	Weiss Associates 5801 Christie Avenue, Suite 600, Emeryville, CA 94608 Joyce Adams (510) 450-6000
Chain of Custody forms completed for all samples?	YES
Field parameters stabilized prior to taking sample?	YES
Zero headspace in sample containers (applicable to VOCs only)?	YES
Samples preserved according to analytical method?	YES
Required field QA/QC samples taken?	YES

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\*Explain any "NO" answers:

Table B-2. Summary of Analytical QA/QC, February 2001 through January 2002, Applied Materials Building 1, Santa Clara, California

Who performed analysis (lab name/address/contact/phone):	Entech Analytical Labs, Inc. 3334 Victor Court Santa Clara, CA 95054 Amy Domboski, 408-588-0200
	STL San Francisco 1220 Quarry Lane Pleasanton, CA 94566 Afsaneh Salimpour, 925-484-1919
	Zymax Envirotechnology, 71 Zaca Lane San Luis Obispo, CA 93401 Scott Santala, 805-544-4696
Analytical methods (by method number and chemical category):	21 samples analyzed by USEPA 8010 –Halogenated Volatile Organic Compounds
	Three samples analyzed by USEPA 8260 – Halogenated Volatile Organic Compounds
	Eight samples analyzed by USEPA 8020 – Volatile Aromatic Compounds
	Four samples analyzed by USEPA 300.0 – Nitrate, Sulfate, Chloride, and Alkalinity
	Four samples analyzed by USEPA 376.2 – Sulfide
	Four samples analyzed by USEPA 3810 – Methane, CO <sub>2</sub> , Ethane, and Ethene
	Four samples analyzed by USEPA 6010 – Ferrous Iron and Manganese
	Four samples analyzed by USEPA 415.1 – Total Organic Carbon
	Five samples analyzed by USEPA 8270 – 1,4-dioxane
Is the lab state-certified for the above analytical methods?	YES
Analyses performed according to standard methods?	YES
Sample holding times met?	YES
Analytical results reported for all values above MDL?	YES
QA/QC analyses run consistent with analytical methods?	YES
QA/QC results meet all acceptance criteria?	NO*
QA/QC results and acceptance criteria on file?	YES

\*Explain any “NO” answers:

February 6, 2001- The Method Spike for Method 8020 reported 64.0 percent recovery of toluene. The recovery limits were 65.0-135.0.

## **APPENDIX C**

### **QA/QC ACCEPTANCE CRITERIA FOR GROUND WATER SAMPLES**

## APPENDIX C

The following QA/QC parameters were used to assess the analytical data for this sampling round:

- **SURROGATES** - compounds added to every blank, sample, matrix spike, matrix spike duplicate, and standard; used to evaluate analytical efficiency by measuring recovery. Surrogates are brominated, fluorinated, or isotopically labeled compounds not expected to be detected in environmental media.
- **MATRIX SPIKE** - aliquot of a matrix (water or soil) spiked with known quantities of specific compounds and subjected to the entire analytical procedure to indicate the appropriateness of the method for the matrix by measuring recovery.
- **MATRIX SPIKE DUPLICATE** - a second matrix spike used to determine the precision of the method.
- **METHOD BLANK** - an analytical control consisting of all reagents, internal standards and surrogate standards that is carried through the entire analytical procedure. The method blank is used to evaluate the level of laboratory background contamination.
- **INDIVIDUAL SAMPLE RESULTS** - results for each sampling point will be checked against the historic concentration trend for that sampling point.
- **BLIND DUPLICATES** - duplicate samples submitted to the same laboratory with different identification used to evaluate laboratory precision.
- **INTER-LAB SPLITS** - duplicate samples submitted to a different lab. Used to evaluate inter-laboratory precision and/or accuracy.

Weiss acceptance criteria for each of these parameters are included in this Appendix, along with the QA/QC data provided by the laboratory for this data set. These criteria were set with guidance from the laboratories, and in all cases are at least as stringent as USEPA criteria from SW-846 (USEPA, 1986). If results for surrogate recovery, matrix spike recovery, matrix spike duplicate recovery and/or method blanks do not meet these criteria, the laboratory will correct the problem and rerun any affected samples, within the USEPA approved holding time. Any individual sample, blind duplicate and/or inter-lab split results that do not meet the criteria are checked by Weiss personnel by reviewing the field and laboratory documentation and procedures used. If no explanation for the deviation is found, the data is annotated as anomalous in the database. If an explanation is found and a revised analytical report is issued, only the revised report is included in the database. All revised analytical reports are noted as such in the database.

Table C-1. QA/QC Acceptance Criteria for Ground Water Samples Analyzed by USEPA Method 601/8010

Parameter	Matrix Spike (% REC) <sup>1</sup>	Matrix Spike Duplicate (% RPD) <sup>2</sup>	Acceptable Range <sup>3</sup> (ppb)
Bromodichloromethane	83-136	≤30	X± (0.20X+1.00)
Bromoform	59-121	≤30	X± (0.21X+2.41)
Bromomethane	75-139	≤30	X± (0.36X+0.94)
Carbon tetrachloride	75-130	≤30	X± (0.20X+0.39)
Chlorobenzene	76-120	≤30	X± (0.18X+1.21)
Chloroethane	60-150	≤30	X± (0.17X+0.63)
2-Chloroethyl vinyl ether	67-129	≤30	X± (0.35X)
Chloroform	77-139	≤30	X± (0.19X-0.02)
Chloromethane	56-148	≤30	X± (0.52X+1.31)
Dibromochloromethane	76-114	≤30	X± (0.24X+1.68)
1,2-Dichlorobenzene	76-137	≤30	X± (0.13X+6.13)
1,3-Dichlorobenzene	74-135	≤30	X± (0.26X+2.34)
1,4-Dichlorobenzene	82-140	≤30	X± (0.20X+0.41)
1,1-Dichloroethane	61-118	≤30	X± (0.14X+0.94)
1,2-Dichloroethane	79-140	≤30	X± (0.15X+0.94)
1,1-Dichloroethylene	56-144	≤30	X± (0.29X-0.04)
Total 1,2-Dichloroethylene	62-165	≤30	X± (0.34X+2.92)
Trans-1,2-Dichloroethylene	27-166	≤30	X± (0.17X+1.46)
Cis-1,2-Dichloroethylene	52-144	≤30	X± (0.17X+1.46)
1,2-Dichloropropane	77-129	≤30	X± (0.23X)
cis-1,3-Dichloropropylene	83-139	≤30	X± (0.32X)
trans-1,3-Dichloropropylene	67-128	≤30	X± (0.32X)
Methylene chloride	50-142	≤30	X± (0.21X+1.43)
1,1,2,2-Tetrachloroethane	67-154	≤30	X± (0.23X+2.79)
Tetrachloroethylene	76-132	≤30	X± (0.18X+2.21)
1,1,1-Trichloroethane	72-140	≤30	X± (0.20X+0.37)
1,1,2-Trichloroethane	82-126	≤30	X± (0.19X+0.67)
Trichloroethylene	67-132	≤30	X± (0.23X+0.30)
1,1,2-Trichloro-1,2,2-Trifluoroethane	60-133	≤30	X± (0.26X+0.91)
Vinyl Chloride	74-155	≤30	X± (0.27X+0.40)

Table C-1. QA/QC Acceptance Criteria for Ground Water Samples Analyzed by USEPA Method 601/8010 (continued)

Parameter	Surrogate Spike <sup>4</sup> (% REC)	Method Blanks <sup>5</sup>
1 - chloro-2-fluorobenzene	50-150	
All compounds		Nothing detected above method detection limit of 0.5 ppb

Notes:

(ppb) = parts per billion

<sup>1</sup> % REC = [(Amount Reported - Amount without spike) / (Amount added)] x 100

<sup>2</sup> % RPD = [(Result 1 - Result 2) / ((Result 1 + Result 2) / 2)] x 100

<sup>3</sup> Precision equations taken from SW-846 (USEPA, 1986). Acceptable range for total 1,2-DCE is double that given for trans-1,2-DCE. Acceptable range for 1,1,2-trichloro-1,2,2-trifluoroethane (Freon-113) is the same as that for trichlorofluoromethane (Freon 11).

For inter-lab comparisons:

X = Average of results from two laboratories

<sup>4</sup> If more than 15% of the results do not meet these criteria and/or if any fall more than 10% to either side of the %REC range or exceed the allowable %RPD by more than 10%, the laboratory will recalibrate and/or make whatever other adjustments are necessary to correct the problem.

<sup>5</sup> If this criterion is not met, the laboratory will do whatever is necessary to produce a "Clean" method blank. If a common laboratory solvent, such as acetone or methylene chloride, is detected in a method blank at five times the method detection limit or less, affected samples will be noted in the Weiss database. Otherwise, all potentially affected samples are reanalyzed within the USEPA approved holding time.

Any result that does not meet these criteria is referred to the laboratory, which reviews all documentation associated with the result and either confirms the original value or issues a revised report.

These criteria were set with guidance from the laboratories, and in all cases are at least as stringent as USEPA criteria from SW-846 (USEPA, 1986).

Table C-2. QA/QC Acceptance Criteria for Ground Water Samples Analyzed by USEPA Method 624/8260

Parameter	Matrix Spike (% REC) <sup>1</sup>	Matrix Spike Duplicate (% RPD) <sup>2</sup>	Acceptable Range <sup>3</sup> (ppb)
Benzene	81-128	≤40	X± (0.25X-1.33)
Bromodichloromethane	71-115	≤40	X± (0.20X+1.13)
Bromoform	49-106	≤40	X± (0.17X+1.38)
Bromomethane	40-202	≤40	X± (0.58X)
Carbon tetrachloride	82-128	≤40	X± (0.11X+0.37)
Chlorobenzene	91-123	≤40	X± (0.26X-1.92)
Chloroethane	50-194	≤40	X± (0.29X+1.75)
2-Chloroethyl vinyl ether	51-254	≤40	X± (0.84X)
Chloroform	66-124	≤40	X± (0.18X+0.16)
Chloromethane	46-228	≤40	X± (0.58X+0.43)
Dibromochloromethane	69-133	≤40	X± (0.17X+0.49)
1,2-Dichlorobenzene	47-161	≤40	X± (0.30X-1.20)
1,3-Dichlorobenzene	75-140	≤40	X± (0.18X-0.82)
1,4-Dichlorobenzene	47-161	≤40	X± (0.30X-1.20)
1,1-Dichloroethane	75-139	≤40	X± (0.16X+0.47)
1,2-Dichloroethane	90-135	≤40	X± (0.21X-0.38)
1,1-Dichloroethylene	49-121	≤40	X± (0.43X-0.22)
Trans-1,2-Dichloroethylene	62-123	≤40	X± (0.38X+0.34)
Cis-1,2-Dichloroethylene	68-128	≤40	X± (0.19X+0.17)
Total 1,2-Dichloroethylene	50-170	≤40	X± (0.19X+0.17)
cis-1,3-Dichloropropylene	56-128	≤40	X± (0.45X)
1,2-Dichloropropane	35-175	≤40	X± (0.52X)
trans-1,3-Dichloropropylene	66-120	≤40	X± (0.34X)
Ethyl Benzene	87-140	≤40	X± (0.26X-1.72)
Methylene chloride	37-184	≤40	X± (0.32X+4.00)
1,1,2,2-Tetrachloroethane	72-132	≤40	X± (0.20X+0.41)
Tetrachloroethylene	78-134	≤40	X± (0.16X-0.45)
Toluene	90-139	≤40	X± (0.22X-1.71)
1,1,1-Trichloroethane	70-144	≤40	X± (0.21X-0.39)
1,1,2-Trichloroethane	68-134	≤40	X± (0.18X+0.00)
Trichloroethylene	91-112	≤40	X± (0.12X+0.59)
1,1,2-Trichloro-1,2,2-Trifluoroethane	56-140	≤40	X± (0.34X-0.39)
Vinyl Chloride	42-209	≤40	X± (0.65X)

Table C-2. QA/QC Acceptance Criteria for Ground Water Samples Analyzed by USEPA Method 624/8260 (continued)

Parameter	Surrogate Spike <sup>4</sup> (% REC)	Method Blanks <sup>5</sup>
1,2-Dichloroethane-d4	77-120	
Toluene-d8	85-121	
Bromofluorobenzene	86-119	
All compounds		Nothing detected above method detection limit of 1.0 ppb

Notes:

(ppb) = parts per billion

<sup>1</sup> % REC = [(Amount Reported-Amount without spike) / (Amount added)] x 100

<sup>2</sup> % RPD = [(Result 1 - Result 2) / ((Result 1 + Result 2) / 2)] x 100

<sup>3</sup> Precision equations taken from SW-846 (USEPA, 1986). Acceptable range for total 1,2-DCE is double that given for trans-1,2-DCE. Acceptable range for 1,1,2-trichloro-1,2,2-trifluoroethane (Freon-113) is the same as that for trichlorofluoromethane (Freon 11).

For inter-lab comparisons:

X = Average of results from two laboratories

<sup>4</sup> If more than 15% of the results do not meet these criteria and/or if any fall more than 10% to either side of the %REC range or exceed the allowable %RPD by more than 10%, the laboratory will recalibrate and/or make whatever other adjustments are necessary to correct the problem.

<sup>5</sup> If this criterion is not met, the laboratory will do whatever is necessary to produce a "Clean" method blank. If a common laboratory solvent, such as acetone or methylene chloride, is detected in a method blank at five times the method detection limit or less, affected samples will be noted in the Weiss database. Otherwise, all potentially affected samples are reanalyzed within the EPA approved holding time.

Any result that does not meet these criteria is referred to the laboratory, which reviews all documentation associated with the result and either confirms the original value or issues a revised report.

These criteria were set with guidance from the laboratories, and in all cases are at least as stringent as USEPA criteria from SW-846 (USEPA, 1986).

**APPENDIX D**

VOC MASS REMOVAL CALCULATIONS  
FEBRUARY 6, 2001 THROUGH FEBRUARY 20, 2002

Table D-1. Mass Removal Calculations, Applied Materials Building 1, Santa Clara, California

Extraction Well	Pumping Period	Volume Extracted (gallons)	Total VOCs (mg/L)	Unit Conversion <sup>1</sup>	VOC Mass Removed (kg)	VOC Mass Removed (pounds)
AM1-1	02/06/01-03/12/01	0	0.029	3.8E-06	0.00	0.00
AM1-1	03/12/01-04/04/01	0	0.029	3.8E-06	0.00	0.00
AM1-1	04/04/01-05/08/01	0	0.029	3.8E-06	0.00	0.00
AM1-1	05/08/01-06/25/01	0	0.029	3.8E-06	0.00	0.00
AM1-1	06/25/01-07/11/01	0	0.029	3.8E-06	0.00	0.00
AM1-1	07/11/01-08/10/01	0	0.029	3.8E-06	0.00	0.00
AM1-1	08/10/01-09/06/01	0	0.029	3.8E-06	0.00	0.00
AM1-1	09/06/01-10/04/01	0	0.029	3.8E-06	0.00	0.00
AM1-1	10/04/01-11/06/01	0	0.029	3.8E-06	0.00	0.00
AM1-1	11/06/01-12/04/01	0	0.029	3.8E-06	0.00	0.00
AM1-1	12/05/01-01/15/02	0	0.029	3.8E-06	0.00	0.00
AM1-1	01/05/02-02/20/02	0	0.016	3.8E-06	0.00	0.00
<i>Mass Removed by AM1-1, February 6, 2001 through February 20, 2002:</i>					<b>0.00</b>	<b>0.00</b>
AM1-5E	02/06/01-03/12/01	0	0.029	3.8E-06	0.00	0.00
AM1-5E	03/12/01-04/04/01	0	0.029	3.8E-06	0.00	0.00
AM1-5E	04/04/01-05/08/01	0	0.029	3.8E-06	0.00	0.00
AM1-5E	05/08/01-06/25/01	0	0.029	3.8E-06	0.00	0.00
AM1-5E	06/25/01-07/11/01	0	0.029	3.8E-06	0.00	0.00
AM1-5E	07/11/01-08/10/01	0	0.029	3.8E-06	0.00	0.00
AM1-5E	08/10/01-09/06/01	0	0.029	3.8E-06	0.00	0.00
AM1-5E	09/06/01-10/04/01	0	0.029	3.8E-06	0.00	0.00
AM1-5E	10/04/01-11/06/01	0	0.029	3.8E-06	0.00	0.00
AM1-5E	11/06/01-12/04/01	0	0.029	3.8E-06	0.00	0.00
AM1-5E	12/05/01-01/15/02	0	0.029	3.8E-06	0.00	0.00
AM1-5E	01/05/02-02/20/02	0	0.003	3.8E-06	0.00	0.00
<i>Mass Removed by AM1-5E, February 6, 2001 through February 20, 2002:</i>					<b>0.00</b>	<b>0.00</b>
AM1-10	02/06/01-03/12/01	27,678	0.260	3.8E-06	0.03	0.06
AM1-10	03/12/01-04/04/01	18,689	0.171 <sup>2</sup>	3.8E-06	0.01	0.03
AM1-10	04/04/01-05/08/01	28,502	0.171 <sup>2</sup>	3.8E-06	0.02	0.04
AM1-10	05/08/01-06/25/01	29,953	0.171 <sup>2</sup>	3.8E-06	0.02	0.04
AM1-10	06/25/01-07/11/01	398	0.171 <sup>2</sup>	3.8E-06	0.00	0.00
AM1-10	07/11/01-08/10/01	9,410	0.171 <sup>2</sup>	3.8E-06	0.01	0.01
AM1-10	08/10/01-09/06/01	23,000	0.171 <sup>2</sup>	3.8E-06	0.01	0.03
AM1-10	09/06/01-10/04/01	25,426	0.171 <sup>2</sup>	3.8E-06	0.02	0.04
AM1-10	10/04/01-11/06/01	13,268	0.171 <sup>2</sup>	3.8E-06	0.01	0.02
AM1-10	11/06/01-12/04/01	18,585	0.171 <sup>2</sup>	3.8E-06	0.01	0.03
AM1-10	12/05/01-01/15/02	34,183	0.171 <sup>2</sup>	3.8E-06	0.02	0.05
AM1-10	01/05/02-02/20/02	25,261	0.103	3.8E-06	0.02	0.04
<i>Mass Removed by AM1-10, February 6, 2001 through February 20, 2002:</i>					<b>0.17</b>	<b>0.38</b>
<b>Total Mass Removed from the Site, February 6, 2001 through February 20, 2002:</b>					<b>0.17</b>	<b>0.38</b>

Notes and Abbreviations:

1 = (liters/gallon) (kg/mg)

2 = Total VOC concentration reported in the treatment system influent, sampled 3/12/01.

mg/L = milligrams per liter

VOC = volatile organic compound