941 400B

File: 541.460.000n
M.D.

THE MEMPHIS DEPOT
TENNESSEE

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 941

Part II of II

TABLE F-7
MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 1 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW21-01A	IW21-01B	IW21-03A	IW21-03B	MW-21
		Lab ID	L0610309-07	L0610353-01	L0610353-02	L0610353-03	L0610309-08
		Date	10/10/2006	10/11/2006	10/11/2006	10/11/2006	10/10/2006
		Time	14:00	10:44	10:55	13:27	10:05
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	592	496	<1	<1	<1
Butyric Acid	830-MBA	mg/L	16.2	5.35	<1	<1	<1
Lactic Acid	830-MBA	mg/L	3180	869	<1	22	<1
Propionic Acid	830-MBA	mg/L	1070	652	<10	14.6	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	1.71	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	160000 J	70000 J	33000 J	75000	300000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<25
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<25
Methane	RSK175\5021	ug/L	11	13	6.8	8.7	40
Hydrogen	AM20GAX	nM	1000	4000	5.9	20	1.4

<: Not detected above Reporting Limit (RL)
J: Estimated result based on QC data or reported below RL
B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-7
MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 1 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW21-03	PMW21-03 DUP	IW101-01A	IW101-01B	IW101-01C
		Lab ID	L0610309-14	L0610309-01	L0610200-01	L0610200-02	L0610216-02
		Date	10/10/2006	10/10/2006	10/5/2006	10/5/2006	10/6/2006
		Time	12:00	12:00	13:07	15:00	8:48
		Area	TTA-1 21	TTA-1 21	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	<1	<1	171	<1	<1
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	8630	<1	<1
Propionic Acid	830-MBA	mg/L	<10	<10	<10	<10	14.7
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	260000 J	280000 J	140000	70000	55000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	7.7	7.3	6.2	6.4	6.2
Hydrogen	AM20GAX	nM	2.1	2.2	340	290	2

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TABLE F-7
MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 1 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-03A	IW101-03B	IW101-03C	IW101-04A	IW101-04B
		Lab ID	L0610216-03	L0610216-04	L0610216-05	L0610259-01	L0610259-02
		Date	10/6/2006	10/6/2006	10/6/2006	10/9/2006	10/9/2006
		Time	10:15	11:27	13:40	9:40	11:30
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	172	<1	48.1	223	16.2
Butyric Acid	830-MBA	mg/L	4.58	<1	<1	6.11	<1
Lactic Acid	830-MBA	mg/L	62.7	7.93	3.39	27.5	<1
Propionic Acid	830-MBA	mg/L	298	<10	60.7	368	65.9
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	180000	91000	58000	150000 J	130000 J
Ethane	RSK175\5021	ug/L	<5	<25	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<25	<5	<5	<5
Methane	RSK175\5021	ug/L	6.9	59	9.1	7.1	6.3
Hydrogen	AM20GAX	nM	5600	23	69	3.4	9.3

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TABLE F-7
MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 1 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-04C	IW101-08A	IW101-08B	IW101-08C	PMW101-02A
		Lab ID	L0610259-03	L0610309-02	L0610309-05	L0610309-06	L0610200-03
		Date	10/9/2006	10/10/2006	10/10/2006	10/10/2006	10/5/2006
		Time	14:20	8:15	10:05	11:40	12:20
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	30.7	<1	<1	77	<1
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	103	<1
Propionic Acid	830-MBA	mg/L	65	<10	<10	80.1	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	94000 J	110000 J	72000 J	79000 J	55000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	7.6	9.5	7.6	8.5	6.8
Hydrogen	AM20GAX	nM	3.9	36	3.6	58	2.1

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MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 1 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-02B	PMW101-04A	PMW101-04A DUP	PMW101-04B	PMW101-05A
		Lab ID	L0610200-04	L0610216-06	L0610216-01	L0610216-07	L0610216-08
		Date	10/5/2006	10/6/2006	10/6/2006	10/6/2006	10/6/2006
		Time	13:30	8:20	8:00	9:43	11:05
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	<10	<10	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	90000 J	77000	120000	95000	75000
Ethane	RSK175\5021	ug/L	<5	<25	<5	<25	<25
Ethene	RSK175\5021	ug/L	<5	<25	<5	<25	<25
Methane	RSK175\5021	ug/L	8.4	65	18	64	49
Hydrogen	AM20GAX	nM	1.4	3.2	--	1.8	3.8

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MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 1 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-05B	PMW101-07A	PMW101-07B	PMW101-08A	PMW101-08B
		Lab ID	L0610259-04	L0610259-05	L0610259-06	L0610259-07	L0610309-11
		Date	10/9/2006	10/9/2006	10/9/2006	10/9/2006	10/10/2006
		Time	8:25	9:50	12:20	14:20	8:25
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	<10	<10	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	79000 J	110000 J	200000 J	79000 J	180000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<25
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<25
Methane	RSK175\5021	ug/L	7	8.5	6.9	7	41
Hydrogen	AM20GAX	nM	1.4	2	3.4	2.2	2.2

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MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 1 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW85-04	IW92-01	IW92-03	IW92-03 DUP	IW92-05
		Lab ID	L0610433-01	L0610353-04	L0610399-04	L0610399-02	L0610399-05
		Date	10/13/2006	10/11/2006	10/12/2006	10/12/2006	10/12/2006
		Time	7:30	14:50	8:25	8:25	11:45
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	808	<1	<1	<1	1360
Butyric Acid	830-MBA	mg/L	185	<1	<1	<1	353
Lactic Acid	830-MBA	mg/L	9620	22.4	30.4	28.1	260
Propionic Acid	830-MBA	mg/L	1350	<10	<10	<10	1760
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	1.04
Carbon Dioxide	RSK175\5021	ug/L	170000	84000	93000 J	73000 J	400000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	7	8.8	8.3	7.4	14
Hydrogen	AM20GAX	nM	75000	6.8	24	9.6	2700

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MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 1 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW92-07	DR2-1	DR2-1 DUP	PMW85-01	PMW92-01
		Lab ID	L0610399-06	L0610399-03	L0610399-01	L0610433-02	L0610433-03
		Date	10/12/2006	10/12/2006	10/12/2006	10/13/2006	10/13/2006
		Time	12:55	15:40	15:40	9:45	12:32
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	2740	<1	<1	<1	<1
Butyric Acid	830-MBA	mg/L	256	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	251	<1	6.83	<1	<1
Propionic Acid	830-MBA	mg/L	3400	8.95 J	9.16 J	<10	<10
Pyruvic Acid	830-MBA	mg/L	1.81	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	770000	61000 J	58000 J	79000 J	62000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	2.8 J	<5	<5	<5	3.6 J
Methane	RSK175\5021	ug/L	15	6.2	5.8	7.4	8.3
Hydrogen	AM20GAX	nM	3800	1.8	1.9	12	2.6

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TABLE F-7
MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 1 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW92-04	PMW92-05
		Lab ID	L0610433-04	L0610433-05
		Date	10/13/2006	10/13/2006
		Time	13:05	14:30
		Area	TTA-2	TTA-2
Analyte	**Method**	**Units**		
Acetic Acid	830-MBA	mg/L	<1	<1
Butyric Acid	830-MBA	mg/L	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1
Propionic Acid	830-MBA	mg/L	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	79000 J	82000 J
Ethane	RSK175\5021	ug/L	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5
Methane	RSK175\5021	ug/L	8.6	9.1
Hydrogen	AM20GAX	nM	3	2.4

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TABLE F-8
MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 2 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW21-01A	IW21-01B	IW21-03A	IW21-03A DUP	IW21-03B
		Lab ID	L0611148-03	L0611148-04	L0611148-05	L0611148-01	L0611191-02
		Date	11/7/2006	11/7/2006	11/7/2006	11/7/2006	11/8/2006
		Time	11:30	12:44	14:50	14:50	9:05
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	857	448	<1	<1	94.1
Butyric Acid	830-MBA	mg/L	57.3	21.4	<1	<1	<1
Lactic Acid	830-MBA	mg/L	526	<10	<1	<1	83.9
Propionic Acid	830-MBA	mg/L	1080	559	<10	<10	66.3
Pyruvic Acid	830-MBA	mg/L	<2	<1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	390000 J	290000 J	90000 J	90000 J	130000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	5.3	28	4.8 J	3.5 J	16
Hydrogen	AM20GAX	nM	1100	16	3.5	6.2	8.4

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TABLE F-8
MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 2 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	MW-21	PMW21-03	IW101-01A	IW101-01B	IW101-01C
		Lab ID	L0611149-01	L0611149-03	L0611102-01	L0611102-02	L0611102-03
		Date	11/7/2006	11/7/2006	11/3/2006	11/3/2006	11/3/2006
		Time	10:35	12:05	8:10	9:30	10:35
		Area	TTA-1 21	TTA-1 21	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	<1	<1	319	13.6	20.7
Butyric Acid	830-MBA	mg/L	<1	<1	<100	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	3350	<1	<1
Propionic Acid	830-MBA	mg/L	<10	<10	509	<10	18.6
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<10	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	110000 J	91000	210000 J	81000 J	33000 J
Ethane	RSK175\5021	ug/L	<5	<5	<0.5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	0.35 J	<5	<5
Methane	RSK175\5021	ug/L	7.8	5.5	0.86	6.2	7.5
Hydrogen	AM20GAX	nM	1.2	7.4	280	23	2.3

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MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 2 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-03A	IW101-03B	IW101-03C	IW101-04A	IW101-04B
		Lab ID	L0611102-04	L0611102-07	L0611124-01	L0611124-02	L0611124-03
		Date	11/3/2006	11/3/2006	11/6/2006	11/6/2006	11/6/2006
		Time	12:55	14:25	8:35	10:35	11:35
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	211	14.7	32.4	478	36.1
Butyric Acid	830-MBA	mg/L	6.43	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	109	4.02	<1	135	<1
Propionic Acid	830-MBA	mg/L	276	7.58 J	30.7	762	63.3
Pyruvic Acid	830-MBA	mg/L	0.363	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	180000 J	73000 J	89000	390000 J	120000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	8.4	7.3	6.7	8.6	7.1
Hydrogen	AM20GAX	nM	22000	23	41	34000	1.9

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MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 2 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-04C	IW101-08A	IW101-08B	IW101-08C	PMW101-02A
		Lab ID	L0611124-04	L0611124-05	L0611124-06	L0611148-02	L0611101-01
		Date	11/6/2006	11/6/2006	11/6/2006	11/7/2006	11/3/2006
		Time	12:55	14:45	15:20	9:25	8:50
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	30.5	<1	<1	99.2	12.8
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	3.21	<1	61.4	<1
Propionic Acid	830-MBA	mg/L	45	<10	<10	177	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	85000 J	150000 J	70000 J	79000 J	31000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<0.5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<0.5
Methane	RSK175\5021	ug/L	5.2	5.7	6.5	3.9 J	0.55
Hydrogen	AM20GAX	nM	6	25	2.2	8300	2.5

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MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 2 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-02B	PMW101-04A	PMW101-04B	PMW101-05A	PMW101-05B
		Lab ID	L0611101-02	L0611101-03	L0611101-04	L0611101-05	L0611123-01
		Date	11/3/2006	11/3/2006	11/3/2006	11/3/2006	11/6/2006
		Time	9:35	12:06	12:50	14:20	8:20
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	14.9	14.6	13.9	10.1	<1
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	6.46 J	<10	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	45000 J	26000 J	41000 J	58000 J	75000
Ethane	RSK175\5021	ug/L	0.26 J	<0.5	<0.5	<5	<5
Ethene	RSK175\5021	ug/L	<0.5	<0.5	<0.5	<5	<5
Methane	RSK175\5021	ug/L	0.8	1.1	0.37 J	7.1	6.7
Hydrogen	AM20GAX	nM	1.5	1.4	100	2.6	0.86

<: Not detected above Reporting Limit (RL)
J: Estimated result based on QC data or reported below RL
B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-8
MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 2 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-07A	PMW101-07B	PMW101-08A	PMW101-08B	IW85-04
		Lab ID	L0611123-02	L0611123-03	L0611123-04	L0611149-02	L0611264-01
		Date	11/6/2006	11/6/2006	11/6/2006	11/7/2006	11/9/2006
		Time	9:55	13:30	14:50	8:05	9:05
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-2
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	<1	<1	<1	<1	686
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	1500
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	3370
Propionic Acid	830-MBA	mg/L	<10	<10	<10	<10	1950
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	76000 J	<300	64000 J	61000	530000
Ethane	RSK175\5021	ug/L	<5	<0.5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	1.1	<5	<5	<5
Methane	RSK175\5021	ug/L	7	0.4 J	6.3	6.3	7.1
Hydrogen	AM20GAX	nM	1.5	18	1.5	1.7	45000

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TABLE F-8
MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 2 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW92-01	IW92-03	IW92-05	IW92-07	IW92-07 DUP
		Lab ID	L0611191-03	L0611191-04	L0611191-05	L0611191-06	L0611191-01
		Date	11/8/2006	11/8/2006	11/8/2006	11/8/2006	11/8/2006
		Time	14:10	11:10	12:50	15:25	15:25
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	<1	60.2	<1	<1	884
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	1490
Lactic Acid	830-MBA	mg/L	20.2	37.8	<1	<1	44.1
Propionic Acid	830-MBA	mg/L	73.6	35.3	10.2	<10	1480
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	1.72
Carbon Dioxide	RSK175\5021	ug/L	120000	110000	380000	930000	840000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	5.6	8.4	48	100	120
Hydrogen	AM20GAX	nM	350	63000	6800	1200	300

<: Not detected above Reporting Limit (RL)
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TABLE F-8
MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 2 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	DR2-1	DR2-1 DUP	PMW85-01	PMW92-01	PMW92-04
		Lab ID	L0611192-02	L0611192-01	L0611192-03	L0611192-04	L0611192-05
		Date	11/8/2006	11/8/2006	11/8/2006	11/8/2006	11/8/2006
		Time	11:05	11:05	15:05	8:10	12:40
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Acetic Acid	830-MBA	mg/L	<1	14.6	<1	<1	12.4
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	<10	27.1	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	81000	71000	89000	73000	100000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	7.2	5.7	7	5.8	9.2
Hydrogen	AM20GAX	nM	6.4	1.3	8.4	1.5	2

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TABLE F-8
MONITORED NATURAL ATTENUATION PARAMETERS
DESIGN MONITORING - 2 SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW92-05
		Lab ID	L0611192-06
		Date	11/8/2006
		Time	13:45
		Area	TTA-2
Analyte	**Method**	**Units**	
Acetic Acid	830-MBA	mg/L	11.1
Butyric Acid	830-MBA	mg/L	<1
Lactic Acid	830-MBA	mg/L	<1
Propionic Acid	830-MBA	mg/L	<10
Pyruvic Acid	830-MBA	mg/L	<0.1
Carbon Dioxide	RSK175\5021	ug/L	110000
Ethane	RSK175\5021	ug/L	<5
Ethene	RSK175\5021	ug/L	<5
Methane	RSK175\5021	ug/L	9.6
Hydrogen	AM20GAX	nM	13

<: Not detected above Reporting Limit (RL)
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--: Not Sampled

TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW21-01A	IW21-01A DUP	IW21-01B	IW21-02A	IW21-02B
		Lab ID	L0612275-01	L0612275-04	L0612274-01	L0612274-02	L0612275-02
		Date	12/11/2006	12/11/2006	12/11/2006	12/11/2006	12/11/2006
		Time	9:25	9:25	9:10	11:15	12:20
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	15.6	15.5	12.1	14.9	19.5
Nitrate	300/353.2	mg/L	0.299 J	0.258 J	0.396 J	3.38	3.82
Nitrite	300/354.1	mg/L	0.102 J	0.101 J	0.104 J	<0.4	<0.4
Sulfate	300	mg/L	11.9	12.1	8	9.49	10.2
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	880	889	1250	81	77.2
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	455	448	653 J	7.46 J	7.41
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	0.00594 J	0.00661 J	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.269	0.272	0.247	0.0287	0.0138
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	0.00654 J
Acetic Acid	830-MBA	mg/L	286	295	528	23.3	41.1
Butyric Acid	830-MBA	mg/L	82.3	83	44.1	<1	<1
Lactic Acid	830-MBA	mg/L	129	152	28.8	<1	18.6
Propionic Acid	830-MBA	mg/L	353	343	579	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	230000 J	250000 J	300000 J	140000 J	160000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	10 B	14 B	50	5.7	7.5 B
Hydrogen	AM20GAX	nM	8.2	2.7	66000	6.4	0.94

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TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW21-03A	IW21-03A DUP	IW21-03B	IW21-04A	IW21-04B
		Lab ID	L0612274-05	L0612274-07	L0612274-06	L0612275-03	L0612296-01
		Date	12/11/2006	12/11/2006	12/11/2006	12/11/2006	12/12/2006
		Time	14:05	14:05	16:45	14:35	8:38
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	0.157 J	<0.2
Chloride	300	mg/L	13.3	13.2	12.5	10.2	13.8
Nitrate	300/353.2	mg/L	3.33	3.41	0.313 J	0.308 J	0.647
Nitrite	300/354.1	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	16.5	16.5	12.5	5.46	12.9
Sulfide	376.1	mg/L	<1	<1	<1	<1	0.6 J
Alkalinity, Total	310.2	mg/L	87.5	90.4	232	424	180
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	2.89 J	3.09 J	46.8 J	83.5	51.8
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	0.0281	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.132	0.123	0.0903	0.84	0.157
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	0.00633 J	<0.01	0.00796 J	<0.01
Acetic Acid	830-MBA	mg/L	25.6	33.1	68.5	111	41.1
Butyric Acid	830-MBA	mg/L	<1	<1	2.15	3.03	5.73
Lactic Acid	830-MBA	mg/L	<1	<1	9.34	<1	51.3
Propionic Acid	830-MBA	mg/L	<10	<10	37.7	98	23.6
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	150000 J	140000 J	160000 J	75000 J	110000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	5.8 B	8 B	26	66	12 B
Hydrogen	AM20GAX	nM	3.9	--	20	2.8	6.2

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TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW21-05A	IW21-05B	MW-115	MW-21	PMW21-01
		Lab ID	L0612296-02	L0612295-01	L0612161-03	L0612154-03	L0612154-01
		Date	12/12/2006	12/12/2006	12/6/2006	12/6/2006	12/6/2006
		Time	12:00	9:30	9:22	9:20	11:00
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	13.2	11.7	12	15.4	13.9
Nitrate	300/353.2	mg/L	<0.6	1.84	4.18	4.01	3.44
Nitrite	300/354.1	mg/L	<0.4	<0.4	0.00527 J	<0.01	<0.01
Sulfate	300	mg/L	2.69	12	13.7	10.6	15.7
Sulfide	376.1	mg/L	0.6 J	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	997	125	69.3	64.5	87.9
Organic Carbon, Dissolved	9060	mg/L	441	--	--	--	--
Total Organic Carbon	9060	mg/L	479	20.9	1.33	3.13	4.72
Arsenic, Dissolved	6010B\3005A	mg/L	<0.01	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	0.714	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.789	0.067	0.00726 J	<0.01	0.00707 J
Selenium, Dissolved	6010B\3005A	mg/L	<0.01	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	0.00502 J	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	386	43.2 B	<1	<1	<1
Butyric Acid	830-MBA	mg/L	36.8	1.56	<1	<1	<1
Lactic Acid	830-MBA	mg/L	43.6	4.35	<1	<1	<1
Propionic Acid	830-MBA	mg/L	431	17.1	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	230000 J	180000 J	140000 J	95000 J	160000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	71	26 B	460	4.8 J	5.1
Hydrogen	AM20GAX	nM	64000	4.2	1.4	1.6	1.6

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TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW21-02	PMW21-03	PMW21-03 DUP	PMW21-04	PMW21-05
		Lab ID	L0612154-02	L0612161-01	L0612161-05	L0612161-02	L0612103-01
		Date	12/6/2006	12/6/2006	12/6/2006	12/6/2006	12/5/2006
		Time	12:50	13:20	13:20	10:52	16:05
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	0.232	<0.2
Chloride	300	mg/L	11.7	12.8	12.7	14.5	18.5
Nitrate	300/353.2	mg/L	4.07	3.9	4.06	3.13	3.8
Nitrite	300/354.1	mg/L	0.00632 J	<0.01	<0.01	<0.01	<0.01
Sulfate	300	mg/L	14.2	14.2	13.2	19.1	17.8
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	73.7	82.5	69.5	109	83.2
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	3.04	1.24	1.43	2.06	1.37
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.12	<0.01	<0.01	<0.01	0.0821
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	0.00653 J
Acetic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	<10	<10	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	140000 J	140000 J	110000 J	110000 J	87000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	3.3 J	9	8.7	9	6.1 B
Hydrogen	AM20GAX	nM	2.2	1.6	1.9	2.3	1.6

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--: Not Sampled

TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-01A	IW101-01A DUP	IW101-01B	IW101-01C	IW101-02A
		Lab ID	L0612077-02	L0612077-01	L0612077-03	L0612077-04	L0612077-05
		Date	12/4/2006	12/4/2006	12/4/2006	12/4/2006	12/4/2006
		Time	9:00	9:00	11:10	13:10	15:15
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.8	<0.8	<0.2	<0.2	0.331
Chloride	300	mg/L	15.4	16.3	13.6	16	17.4
Nitrate	300/353.2	mg/L	<2.4	<2.4	1.33	1.45	2.45
Nitrite	300/354.1	mg/L	0.944 J	0.796 J	<0.4	<0.4	<0.4
Sulfate	300	mg/L	<4	2.28 J	25	14.6	14.8
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	2790	2660	152	177	200
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	2870 J	2900 J	1.3	43.8	83.1
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	0.00901 J	0.0106	0.00671 J	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	1.85	1.82	0.159	0.0326	0.124
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	0.00918 J	0.00981 J	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	429	413	<1	28.2	19.8
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	6970	5870	<1	6.09	166
Propionic Acid	830-MBA	mg/L	610	591	<10	42.2	13.5
Pyruvic Acid	830-MBA	mg/L	2.03	1.94	<0.1	1.38	<0.1
Carbon Dioxide	RSK175\5021	ug/L	260000 J	340000 J	150000 J	99000 J	81000 J
Ethane	RSK175\5021	ug/L	<25	<25	<5	<5	<5
Ethene	RSK175\5021	ug/L	<25	<25	<5	<5	<5
Methane	RSK175\5021	ug/L	<25	<25	6.1	7.6	5.9
Hydrogen	AM20GAX	nM	8900	5300	16	25000	6.4

<: Not detected above Reporting Limit (RL)
J: Estimated result based on QC data or reported below RL
B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-02B	IW101-02C	IW101-03A	IW101-03B	IW101-03C
		Lab ID	L0612077-06	L0612104-01	L0612104-02	L0612104-03	L0612104-04
		Date	12/4/2006	12/5/2006	12/5/2006	12/5/2006	12/5/2006
		Time	16:30	8:45	11:40	14:15	15:15
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	0.676	0.662	0.14 J	0.491
Chloride	300	mg/L	16.8	18.4	22.5	21.2	12.6
Nitrate	300/353.2	mg/L	3.84	0.564	1.12	2.23	0.134 J
Nitrite	300/354.1	mg/L	<0.4	0.00597 J	0.00527 J	0.16	0.0181
Sulfate	300	mg/L	18.6	4.94	7.15	14.1	1.27
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	108	269	544	128	247
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	1.86	99.4	263	28.1	131
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	0.00832 J	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	<0.01	0.0707	0.285	0.0375	0.0353
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	0.00611 J	<0.01
Acetic Acid	830-MBA	mg/L	<1	73.5	133	20	111
Butyric Acid	830-MBA	mg/L	<1	1.27	3.97	1.12	4.86
Lactic Acid	830-MBA	mg/L	2.07	2.64	238	12.8	2.07 J
Propionic Acid	830-MBA	mg/L	<10	113	197	23.5	131
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	140000 J	110000 J	190000 J	110000 J	110000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	5.8	6.4 B	6.9 B	7.7 B	10
Hydrogen	AM20GAX	nM	7.8	27000	23000	6	91000

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--: Not Sampled

TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-04A	IW101-04B	IW101-04C	IW101-05A	IW101-05A DUP
		Lab ID	L0612160-01	L0612160-02	L0612160-03	L0612160-04	L0612160-08
		Date	12/6/2006	12/6/2006	12/6/2006	12/6/2006	12/6/2006
		Time	8:15	9:14	11:30	12:20	12:20
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	33.8	17.6	16.4	17.5	18.5
Nitrate	300/353.2	mg/L	0.16 J	<0.25	0.185 J	0.52	0.512
Nitrite	300/354.1	mg/L	<0.01	<0.01	<0.01	<0.01	0.0084 J
Sulfate	300	mg/L	5.96	<1	7.99	13.2	13
Sulfide	376.1	mg/L	0.8 J	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	2060	399	264	226	229
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	1290	96.2	46.4	40.4	39.2
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	0.019	0.00777 J	0.00687 J	0.00772 J
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	1.73	0.524	0.209	0.545	0.532
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	731	73.5	41.5	26.8	27
Butyric Acid	830-MBA	mg/L	22.7	1.27	<1	<1	<1
Lactic Acid	830-MBA	mg/L	600	<1	1.87	36.8	36.2
Propionic Acid	830-MBA	mg/L	1200	117	54.1	22.1	22.3
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Garbon Dioxide	RSK175\5021	ug/L	460000 J	150000 J	97000 J	160000 J	120000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	26	27	55	6.1	7.8
Hydrogen	AM20GAX	nM	100000	26	15	3.8	2.9

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TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-05B	IW101-05C	IW101-06A	IW101-06B	IW101-06C
		Lab ID	L0612160-05	L0612160-06	L0612160-07	L0612203-01	L0612203-02
		Date	12/6/2006	12/6/2006	12/6/2006	12/7/2006	12/7/2006
		Time	13:20	15:20	16:55	8:40	10:19
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	0.14 J	0.222
Chloride	300	mg/L	18.1	19.9	21.9	18.4	9.41
Nitrate	300/353.2	mg/L	1.88	0.25	0.386	2.63	0.215 J
Nitrite	300/354.1	mg/L	<0.01	0.0154	0.179	0.18	0.0686
Sulfate	300	mg/L	23	8.25	10.5	10.2	2.05
Sulfide	376.1	mg/L	<1	<1	0.7 J	<1	<1
Alkalinity, Total	310.2	mg/L	147	605	543	92.5	140
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	6.4	292	286	10.9	53.2
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	0.00954 J	0.00811 J	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.0494	0.251	1.5	0.00599 J	0.0267
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	0.00594 J	<0.01
Acetic Acid	830-MBA	mg/L	<1	205	177	8.91	48.1
Butyric Acid	830-MBA	mg/L	<1	2.73	7.79	<1	2.56
Lactic Acid	830-MBA	mg/L	<1	<1	57.2	15.4	6.11
Propionic Acid	830-MBA	mg/L	<10	375	302	<10	51.3
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	91000 J	210000 J	280000 J	250000 J	210000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	7.5	8.8	7.7	8.8	5.5
Hydrogen	AM20GAX	nM	2.3	12	1100	6	27

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TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-07A	IW101-07B	IW101-07C	IW101-08A	IW101-08A DUP
		Lab ID	L0612203-03	L0612203-04	L0612229-01	L0612229-02	L0612229-05
		Date	12/7/2006	12/7/2006	12/8/2006	12/8/2006	12/8/2006
		Time	15:30	16:30	9:10	11:10	11:10
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.148 J	0.141 J	<0.2	0.151 J	0.15 J
Chloride	300	mg/L	14.7	9.47	8.75	25.7	25.2
Nitrate	300/353.2	mg/L	0.41	0.225 J	0.148 J	3.31	3.41
Nitrite	300/354.1	mg/L	<0.01	0.00666 J	<0.4	<0.4	<0.4
Sulfate	300	mg/L	6.27	4.22	1.29	27.4	27.2
Sulfide	376.1	mg/L	0.6 J	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	153	121	164	192	175
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	50.8	25.4	89	7.59	9.18
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.0366	0.0485	0.0557	0.00859 J	0.00859 J
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	0.00667 J	0.00853 J
Acetic Acid	830-MBA	mg/L	27.2	22.2	86.2 B	43 B	40.9 B
Butyric Acid	830-MBA	mg/L	<1	<1	2.06	<1	<1
Lactic Acid	830-MBA	mg/L	28.6	<1	14.8	14.3	18
Propionic Acid	830-MBA	mg/L	22.6	28.4	86	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	240000 J	92000 J	79000 J	160000 J	160000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	6.6	31	62	5.8	7.3
Hydrogen	AM20GAX	nM	6.1	20	2400	6.2	6.2

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--: Not Sampled

TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-08B	IW101-08C	IW101-09A	IW101-09B	IW101-09C
		Lab ID	L0612229-03	L0612229-04	L0612230-01	L0612230-04	L0612230-05
		Date	12/8/2006	12/8/2006	12/8/2006	12/8/2006	12/8/2006
		Time	12:10	14:10	14:37	16:20	16:00
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	0.303	<0.2	0.579
Chloride	300	mg/L	9.8	7.24	28.3	9.11	10.7
Nitrate	300/353.2	mg/L	3.11	<0.6	2.22	0.395 J	0.307 J
Nitrite	300/354.1	mg/L	<0.4	<0.4	0.147 J	0.238 J	<0.4
Sulfate	300	mg/L	7.4	0.703 J	34.6	2.54	0.767 J
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	69	364	270 J	1240 J	216 J
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	1.17	249	144	808	118
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.00851 J	0.0224	0.00684 J	0.257	0.05
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	0.00785 J	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	37.6 B	190 B	64.1 J	--	125 J
Butyric Acid	830-MBA	mg/L	<1	9.5	1.02	75.8	4.39
Lactic Acid	830-MBA	mg/L	<1	31	321	227	9.83
Propionic Acid	830-MBA	mg/L	<10	213	8.39 J	--	118
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	76000 J	100000 J	150000 J	270000 J	84000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	5.5	7.7	6	10 B	6.9 B
Hydrogen	AM20GAX	nM	54000	7.8	7	76	28000

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--: Not Sampled

TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	MW-101B	MW-101T	DR1-3	PMW101-01A	PMW101-01B
		Lab ID	L0612203-06	L0612203-05	L0612107-04	L0612076-01	L0612076-04
		Date	12/7/2006	12/7/2006	12/5/2006	12/4/2006	12/4/2006
		Time	13:53	12:16	14:56	8:31	11:00
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.182 J	0.195 J	0.179 J	<0.8	<0.8
Chloride	300	mg/L	19.8	19.4	19.5	8.62	17.5
Nitrate	300/353.2	mg/L	3.99	3.81	0.848	<2.4	<2.4
Nitrite	300/354.1	mg/L	<0.01	0.00632 J	0.00632 J	<1.6	<1.6
Sulfate	300	mg/L	20.9	20.8	13.6	2.94 J	2.77 J
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	129	129	142	4470	844
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	1.54	1.18	6.79	1360 J	522
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	0.0124	<0.01	<0.01	<0.01	0.00757 J
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.225	0.168	0.00684 J	78.3 J	1.2
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	0.00674 J	0.00721 J	<0.01	0.00582 B
Acetic Acid	830-MBA	mg/L	3.89	2.71	<1	2150	275
Butyric Acid	830-MBA	mg/L	<1	<1	<1	33.1	13.1
Lactic Acid	830-MBA	mg/L	1.48	<1	<1	1170	<1
Propionic Acid	830-MBA	mg/L	<10	<10	<10	2500	429
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	1.5	<0.1
Carbon Dioxide	RSK175\5021	ug/L	310000 J	120000 J	40000 J	760000 J	290000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<25
Ethene	RSK175\5021	ug/L	<5	<5	<5	2.5 J	<25
Methane	RSK175\5021	ug/L	7.2	7.4	5.3	22	<25
Hydrogen	AM20GAX	nM	1.3	8.3	1.3	2.5	3.2

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TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-02A	PMW101-02B	PMW101-03A	PMW101-03A DUP	PMW101-03B
		Lab ID	L0612078-03	L0612078-04	L0612078-05	L0612078-01	L0612078-06
		Date	12/4/2006	12/4/2006	12/4/2006	12/4/2006	12/4/2006
		Time	10:07	11:43	13:40	13:40	16:10
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.206	0.226	<0.2	<0.2	<0.2
Chloride	300	mg/L	16.3	17.2	18.8	19	18.8
Nitrate	300/353.2	mg/L	3.6	2.57	5.27	5.21	5.01
Nitrite	300/354.1	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	22.6	19.9	15.2	14.7	14.8
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	123	113	74.7	77.3	77.4
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	1.89	2.91	0.782 J	0.845 J	0.735 J
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.0438	0.0174	0.0258	0.0374	<0.01
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	<10	<10	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	93000 J	140000 J	130000 J	120000 J	140000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	5.9	6.1	7.2	7.1	5.7
Hydrogen	AM20GAX	nM	2	9.9	1.4	1.7	1.4

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TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-04A	PMW101-04B	PMW101-05A	PMW101-05B	PMW101-06A
		Lab ID	L0612103-02	L0612103-03	L0612076-05	L0612076-06	L0612076-07
		Date	12/5/2006	12/5/2006	12/4/2006	12/4/2006	12/4/2006
		Time	8:45	10:35	12:37	14:28	16:13
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.158 J	0.169 J	<0.2	<0.2	0.22
Chloride	300	mg/L	20.2	19.6	18.7	9.47	19.9
Nitrate	300/353.2	mg/L	4.68	2.74	<0.6	3.11	3.58
Nitrite	300/354.1	mg/L	0.00527 J	<0.01	<0.4	<0.4	<0.4
Sulfate	300	mg/L	18	13.5	<1	4.92	16.1
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	116	116	269	39	112
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	1.73	1.39	22.1	0.566 J	2.05
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	0.0139	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.00905 J	<0.01	1.19	<0.01	0.044
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	0.00562 J	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	<1	15.8	<1	<1
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	<10	<10	25.4	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	120000 J	130000 J	150000 J	58000 J	160000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	5.7 B	6.1 B	7.4	5.7	5.1
Hydrogen	AM20GAX	nM	1.6	1.6	6.9	1.5	5.3

<: Not detected above Reporting Limit (RL)
J: Estimated result based on QC data or reported below RL
B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-06B	PMW101-07A	PMW101-07B	PMW101-08A	PMW101-08B
		Lab ID	L0612107-01	L0612107-02	L0612107-03	L0612103-04	L0612103-05
		Date	12/5/2006	12/5/2006	12/5/2006	12/5/2006	12/5/2006
		Time	9:51	11:46	13:11	12:18	14:10
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.254	0.203	0.109 J	0.236	0.102 J
Chloride	300	mg/L	17.6	26.2	11.9	30	7.12
Nitrate	300/353.2	mg/L	<0.2	<0.2	3.52	5.59	43.7
Nitrite	300/354.1	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfate	300	mg/L	<1	15.3	5.43	42.3	3.45
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	292	222	53.5	174	23.3
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	53.2	16.7	2.86	1.97	1.05
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	0.0137	0.00668 J	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.138	0.746	<0.01	<0.01	0.014
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	0.00592 J	0.00764 J	0.00517 J
Acetic Acid	830-MBA	mg/L	19.2	15	<1	<1	<1
Butyric Acid	830-MBA	mg/L	1.81	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	71.6	<10	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	85000 J	130000 J	5800 B	140000 J	57000 J
Ethane	RSK175\5021	ug/L	<5	<5	<0.5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<0.5	<5	<5
Methane	RSK175\5021	ug/L	6.8 B	7.3 B	<0.5	6.5 B	8.6 B
Hydrogen	AM20GAX	nM	2	2	21	1.7	1.4

<: Not detected above Reporting Limit (RL)
J: Estimated result based on QC data or reported below RL
B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW85-01	IW85-02	IW85-04	IW92-01	IW92-02
		Lab ID	L0612386-01	L0612386-02	L0612386-03	L0612295-02	L0612296-04
		Date	12/14/2006	12/14/2006	12/14/2006	12/12/2006	12/12/2006
		Time	11:55	8:35	12:55	12:30	14:15
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<2	<0.2	<0.2
Chloride	300	mg/L	19.4	25.5	11.2	18.1	10.8
Nitrate	300/353.2	mg/L	0.379 J	<0.6	<0.6	3.8	0.227 J
Nitrite	300/354.1	mg/L	<0.4	<0.4	0.196 J	<0.4	<0.4
Sulfate	300	mg/L	4.14	1.71	<1	14.3	6.17
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	253	1040	6860	115	265
Organic Carbon, Dissolved	9060	mg/L	--	--	5740 J	--	--
Total Organic Carbon	9060	mg/L	165	565	5540 J	33.3	72.5
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	<0.01	--	--
Arsenic, Total	6010B\3005A	mg/L	0.0064 J	0.0128	0.0382 J	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	5.44 J	--	--
Manganese, Total	6010B\3005A	mg/L	0.979	3.8	4.46 J	0.0518	1.45
Selenium, Dissolved	6010B\3005A	mg/L	--	--	0.0102 J	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.02	<0.05	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	60.1	226	8310	52.2 B	42.7
Butyric Acid	830-MBA	mg/L	34.2	262	229	<1	1.34
Lactic Acid	830-MBA	mg/L	49.2	423	185	14.6	4.3
Propionic Acid	830-MBA	mg/L	95.4	559	242	25.4	48.6
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	1.28	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	460000 J	170000 J	110000 J	93000 J	170000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	6.6 B	53	7.1	6.8 B	5.5 B
Hydrogen	AM20GAX	nM	24000	81000	--	1.6	0.35

<: Not detected above Reporting Limit (RL)
J: Estimated result based on QC data or reported below RL
B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW92-03	IW92-04	IW92-05	IW92-06	IW92-06 DUP
		Lab ID	L0612295-03	L0612336-01	L0612368-01	L0612368-02	L0612368-04
		Date	12/12/2006	12/13/2006	12/13/2006	12/13/2006	12/13/2006
		Time	15:00	8:05	8:10	11:55	11:55
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<2	<1	<1
Chloride	300	mg/L	12.7	12.1	5.65	28.3	28.1
Nitrate	300/353.2	mg/L	0.244 J	<0.6	<0.6	0.342 J	0.338 J
Nitrite	300/354.1	mg/L	<0.4	<0.4	0.113 J	<0.4	<0.4
Sulfate	300	mg/L	3.24	1.49	0.835 J	6.95	6.48
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	440	708	9150	1150	1140
Organic Carbon, Dissolved	9060	mg/L	--	--	--	560	547
Total Organic Carbon	9060	mg/L	251	275	2150 J	530	545
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	<0.01	<0.01
Arsenic, Total	6010B\3005A	mg/L	<0.01	0.00698 J	0.0281	0.045	0.0261
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	1.11	1.19
Manganese, Total	6010B\3005A	mg/L	1.02	8.31	1.55	1.01	0.949
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	<0.01	<0.01
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.02	<0.01	<0.04	<0.02
Acetic Acid	830-MBA	mg/L	113 B	142	557	244	236
Butyric Acid	830-MBA	mg/L	68.7	10.5	1990	480	517
Lactic Acid	830-MBA	mg/L	188	83.8	73.1	16.6	16.1
Propionic Acid	830-MBA	mg/L	139	251	1880	443	453
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	1.03	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	240000 J	190000 J	650000 J	290000 J	330000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	9 B	7.1 B	4900	310	360
Hydrogen	AM20GAX	nM	93000	2600	17	14	1.4

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--: Not Sampled

TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW92-07	IW92-08	DR2-1	DR2-5	IW-01
		Lab ID	L0612336-02	L0612336-03	L0612161-04	L0612202-03	L0612202-04
		Date	12/13/2006	12/13/2006	12/6/2006	12/7/2006	12/7/2006
		Time	11:30	13:30	16:46	14:30	12:25
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	1.49
Chloride	300	mg/L	23	21.7	19.6	16.8	14
Nitrate	300/353.2	mg/L	1.07	<0.6	3.74	3.56	0.44
Nitrite	300/354.1	mg/L	<0.4	<0.4	<0.01	0.00632 J	0.00701 J
Sulfate	300	mg/L	10.9	<1	10	10.8	4.56
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	1360	294	271	42.9	306
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	749	163	91.1	0.611 J	74.3
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	0.00542 J	<0.01	<0.01	0.0162
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	3.07	0.246	0.592	0.00717 J	1.06
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.02	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	153	64.9	63	3.84	39.3
Butyric Acid	830-MBA	mg/L	191	55.5	1.37	<1	1.67
Lactic Acid	830-MBA	mg/L	7.04	84.6	<1	1.43	<1
Propionic Acid	830-MBA	mg/L	231	123	114	<10	54.6
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	230000 J	190000 J	64000 J	33000 J	660000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	1000	17	8.9	6.4	4800
Hydrogen	AM20GAX	nM	6.1	--	1.7	1.5	1.7

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--: Not Sampled

TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	MW-85	PMW85-01	PMW85-01 DUP	PMW85-02	PMW92-01
		Lab ID	L0612231-02	L0612231-01	L0612231-03		L0612154-04
		Date	12/8/2006	12/8/2006	12/8/2006		39057
		Time	8:20	11:40	11:40		0.631944444
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	--	<0.2
Chloride	300	mg/L	19	18.9	18.9	--	20.4
Nitrate	300/353.2	mg/L	3.38	3.13	3.08	--	3.04
Nitrite	300/354.1	mg/L	<0.4	<0.4	<0.4	--	<0.01
Sulfate	300	mg/L	10.6	10.2	10.3	--	9.68
Sulfide	376.1	mg/L	<1	<1	<1	--	<1
Alkalinity, Total	.310.2	mg/L	48.3	42.7	43.8	--	36.1
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	2.86	2.08	1.75	--	1.53
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	--	0.0369
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	<0.01	0.00794 J	0.0064 J	--	0.47
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	--	<0.01
Acetic Acid	830-MBA	mg/L	2.9	3.49	2.92	--	<1
Butyric Acid	830-MBA	mg/L	<1	<1	<1	--	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	--	<1
Propionic Acid	830-MBA	mg/L	<10	<10	<10	--	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	--	<0.1
Carbon Dioxide	RSK175\5021	ug/L	77000 J	73000 J	75000 J	--	69000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	--	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	--	<5
Methane	RSK175\5021	ug/L	6.3 B	5.5 B	9.4 B	--	7.2
Hydrogen	AM20GAX	nM	1.8	1.4	1.7	--	1.4

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--: Not Sampled

TABLE F-9
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW92-02	PMW92-03	PMW92-04	PMW92-05	PMW92-06
		Lab ID	L0612202-01	L0612201-01	L0612202-02	L0612201-02	L0612201-05
		Date	12/7/2006	12/7/2006	12/7/2006	12/7/2006	12/7/2006
		Time	8:15	9:05	10:25	11:40	14:30
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	0.141 J	<0.2	<0.2	<0.2
Chloride	300	mg/L	12.7	19.3	31	20.7	21.7
Nitrate	300/353.2	mg/L	0.225 J	1.86 J	0.385	2.62 J	<0.25
Nitrite	300/354.1	mg/L	<0.01	<0.01	<0.01	<0.01	0.0696
Sulfate	300	mg/L	<1	15.1	9.16	15.1	9.14
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	715	72.1	127	49.1	44.4
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	305	3.18	8.8	2.75	3.99
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	0.0171	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	20.5	0.0215	0.815	<0.01	0.137
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.02	<0.01	<0.01	<0.01	0.00797 J
Acetic Acid	830-MBA	mg/L	249	4.83	8.42	2.52	6.12
Butyric Acid	830-MBA	mg/L	3.92	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	4.17	1.47	1.85	<1	2
Propionic Acid	830-MBA	mg/L	323	<10	5.72 J	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	0.642	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	160000 J	74000 J	90000 J	84000 J	85000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	9	4.2 J	12	5.6	7.2
Hydrogen	AM20GAX	nM	550	240	19	2	3.6

<: Not detected above Reporting Limit (RL)
J: Estimated result based on QC data or reported below RL
B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW21-01A	IW21-01B	IW21-02A	IW21-02B	IW21-03A
		Lab ID	L0703230-08	L0703230-09	L0703246-01	L0703246-02	L0703230-10
		Date	3/8/2007	3/8/2007	3/9/2007	3/9/2007	3/8/2007
		Time	14:30	16:14	14:00	10:57	10:00
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	7.92 J	7.39 J	14.7	16.4	13.7 J
Nitrate	300	mg/L	<0.6	<0.6	0.888	0.79	1.15
Nitrite	300	mg/L	0.877	0.458	<0.4	<0.4	<0.4
Sulfate	300	mg/L	1.7 J	<1	7.17	6.51	17.4 J
Sulfide	376.1	mg/L	<1	<1	<1	0.504 J	<1
Alkalinity, Total	310.2	mg/L	3120	2780	124	118	115
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	2580	2190	14.1	17.6	0.873 B
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.02	<0.02	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.613	0.338	0.0311	0.0234	0.079
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	0.0115	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	1040	1460	<1	<1	<1
Butyric Acid	830-MBA	mg/L	214	96.2 J	<1	<1	<1
Lactic Acid	830-MBA	mg/L	4250	671	18.5	11.8	<1
Propionic Acid	830-MBA	mg/L	1520	2510	<10	11.9	<10
Pyruvic Acid	830-MBA	mg/L	5.62 J	<10	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	650000 J	560000 J	170000	150000	200000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	280	550	6	18	3.3 J
Hydrogen	AM20GAX	nM	40000	41	4.4	74	10

<: Not detected above Reporting Limit (RL)
J: Estimated result based on QC data or reported below RL
B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW21-03B	IW21-04A	IW21-04B	IW21-04B DUP	IW21-05A
		Lab ID	L0703230-11	L0703276-01	L0703246-05	L0703246-06	L0703276-02
		Date	3/8/2007	3/12/2007	3/9/2007	3/9/2007	3/12/2007
		Time	11:50	11:23	16:10	16:10	13:30
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	0.313 J	1.4 J	1.36 J	29.6 J
Chloride	300	mg/L	9.58 J	13.8	15.6	15.8	100
Nitrate	300	mg/L	<0.6	0.478 J	<0.6	<0.6	<3
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	0.98 J
Sulfate	300	mg/L	1.36 J	8	4.07	4.35	<5
Sulfide	376.1	mg/L	0.8 J	1.13	0.672 J	0.989 J	<1
Alkalinity, Total	310.2	mg/L	1010	223	456 J	468 J	2460
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	506	53.7	210	207	1750
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.02
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.121	0.252	0.0672	0.0686	0.68
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	0.00634 J
Acetic Acid	830-MBA	mg/L	437	46.9	176	157	780
Butyric Acid	830-MBA	mg/L	15.6	1.95	10.6	11.9	116
Lactic Acid	830-MBA	mg/L	119	<1	46.9	57.7	1300
Propionic Acid	830-MBA	mg/L	521	42.1	216	211	1220
Pyruvic Acid	830-MBA	mg/L	<1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	250000	180000	180000	220000	450000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	2.6 J
Methane	RSK175\5021	ug/L	120	3300	170	160	670
Hydrogen	AM20GAX	nM	39000	25	5.1	2.3	40000

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--: Not Sampled

TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW21-05B	MW-115	MW-21	PMW21-01	PMW21-01DUP
		Lab ID	L0703276-04	L0703180-10	L0703180-05	L0703180-02	L0703180-01
		Date	3/12/2007	3/7/2007	3/7/2007	3/7/2007	3/7/2007
		Time	15:22	12:55	11:30	8:40	8:40
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.591 J	<0.2	0.29 J	<0.2	<0.2
Chloride	300	mg/L	11.7	11.6 J	16 J	13 J	13.1 J
Nitrate	300	mg/L	0.692	4.14	3.98	3.65	3.68
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	10.3	16.2	11.5	15.4	15.6
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	204	76.4	72.8	91.2	88.4
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	45.2	<1	<1	<1	<1
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.0949	0.0136	<0.01	<0.01	<0.01
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	53.2	<1	<1	<1	<1
Butyric Acid	830-MBA	mg/L	5.64	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	13.9	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	58.2	<10	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	150000	120000	150000	160000	150000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	490	230	3.7 J	3.5 J	4.4 J
Hydrogen	AM20GAX	nM	27	1.1	1.6	1.5	1.8

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--: Not Sampled

TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW21-02	PMW21-03	PMW21-04	PMW21-05	IW101-01A
		Lab ID	L0703180-03	L0703180-04	L0703180-08	L0703180-09	L0703106-01
		Date	3/7/2007	3/7/2007	3/7/2007	3/7/2007	3/5/2007
		Time	14:08	16:08	14:40	10:55	8:46
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	11.6 J	12.1 J	13.5 J	19 J	13.1
Nitrate	300	mg/L	4.57	4.42	3.64	4.67	<0.6
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	0.647
Sulfate	300	mg/L	14.1	13.3	19.5	21.9	0.528 J
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	83.2	74.2	121	62.6	1750
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	<1	<1	<1	<1	1730 B
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.0728	<0.01	<0.01	0.0446	1.38
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	<1	<1	<1	218
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	15.3
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	2970
Propionic Acid	830-MBA	mg/L	<10	<10	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	150000	130000	170000	140000	210000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	3.7 J	5 J	4.1 J	7.3	8.2 B
Hydrogen	AM20GAX	nM	1.4	1.8	1.2	1.6	150000

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TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-01B	IW101-01C	IW101-02A	IW101-02B	IW101-02C
		Lab ID	L0703106-02	L0703106-03	L0703106-04	L0703106-05	L0703140-14
		Date	3/5/2007	3/5/2007	3/5/2007	3/5/2007	3/6/2007
		Time	10:30	12:10	14:00	15:25	12:25
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	15	18.2	19	19	18.6 J
Nitrate	300	mg/L	<0.6	0.431 J	1.23	2.99	0.831
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	19.5	5.82	15.2	18.5	7.76
Sulfide	376.1	mg/L	<1	2.02	0.91 J	<1	0.635 J
Alkalinity, Total	310.2	mg/L	210	316	208	153	309 J
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	<1	95.6	31.9	4.6	92.8
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	0.0102	<0.01	<0.01	<0.01	0.015
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.263	0.0493	0.317	0.0104	0.079
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	14.2	84.3	18.8	3.98	103
Butyric Acid	830-MBA	mg/L	<1	2.34	<1	<1	2.73
Lactic Acid	830-MBA	mg/L	<1	62.6	29.9	6.98	1.53
Propionic Acid	830-MBA	mg/L	<10	117	18.3	<10	124
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	92000 J	160000 J	110000 J	95000 J	130000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	3.9 B	59	8.6 B	3.7 B	65
Hydrogen	AM20GAX	nM	330	37000	33	9.7	4100

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TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-03A	IW101-03B	IW101-03C	IW101-04A DUP	IW101-04A
		Lab ID	L0703140-15	L0703140-16	L0703180-13	L0703230-01	L0703230-04
		Date	3/6/2007	3/6/2007	3/7/2007	3/8/2007	3/8/2007
		Time	14:05	15:40	8:02	11:30	11:30
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	18.4 J	20.7 J	11.7 J	11.1 J	11.5 J
Nitrate	300	mg/L	<0.6	0.936	<0.6	<0.6	<0.6
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.8	<0.8
Sulfate	300	mg/L	1.89	8.61	<1	4.4 J	4.05 J
Sulfide	376.1	mg/L	2.17	1.16	<1	<1	<1
Alkalinity, Total	310.2	mg/L	363 J	300 J	446	1570	1690
Organic Carbon, Dissolved	9060	mg/L	--	--	--	1010	936
Total Organic Carbon	9060	mg/L	396	134	186	1210	1540
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	0.00716 J	0.0111
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	0.563	0.604
Manganese, Total	6010B\3005A	mg/L	0.0787	0.0853	0.0369	0.708	1.03
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	<0.01	<0.01
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	50.4	88.3	232	718	703
Butyric Acid	830-MBA	mg/L	<1	6.24	16.5	32.4	29.6
Lactic Acid	830-MBA	mg/L	524	24.9	1.88	716	765
Propionic Acid	830-MBA	mg/L	48	146	223	976 J	994
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<1	<1
Carbon Dioxide	RSK175\5021	ug/L	130000	170000	150000	500000 J	550000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	22	41	1100	810	960
Hydrogen	AM20GAX	nM	20	1.6	12	3200	2600

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TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-04B	IW101-04C	IW101-05A	IW101-05B	IW101-05C
		Lab ID	L0703230-05	L0703230-06	L0703246-11	L0703246-12	L0703246-13
		Date	3/8/2007	3/8/2007	3/9/2007	3/9/2007	3/9/2007
		Time	13:50	15:11	8:12	9:41	11:00
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	0.969 J
Chloride	300	mg/L	16.9 J	16.9 J	16.8	17.3	20.7
Nitrate	300	mg/L	<0.6	<0.6	1.55	1.9	<0.6
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	0.582 J	1.48 J	13	24.8	4.88
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	342	318	219	152	505 J
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	99.6	75.7	42.3	1.1	220
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	0.0102	0.00804 J	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.677	0.214	0.108	0.0385	0.304
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	121	66.3	32.7	<1	225 J
Butyric Acid	830-MBA	mg/L	3.24 J	1.38	<1	<1	7.92
Lactic Acid	830-MBA	mg/L	3.28	5.01	56.2	<1	<1
Propionic Acid	830-MBA	mg/L	102	93	12.3	<10	234 J
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	210000 J	75000	90000 J	110000 J	200000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	450	170	14	11	460
Hydrogen	AM20GAX	nM	10	5.6	2.7	2.7	4.8

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--: Not Sampled

TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-06A	IW101-06B	IW101-06C	IW101-07A	IW101-07B
		Lab ID	L0703246-14	L0703246-17	L0703246-18	L0703180-14	L0703180-15
		Date	3/9/2007	3/9/2007	3/9/2007	3/7/2007	3/7/2007
		Time	13:20	15:15	16:22	9:35	11:05
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.712 J	<0.2	0.55 J	<0.2	<0.2
Chloride	300	mg/L	22.1	17.5	9.3	13.7 J	8.67 J
Nitrate	300	mg/L	0.939	1.18	<0.6	0.196 J	<0.6
Nitrite	300	mg/L	0.402	0.156 J	<0.4	0.116 J	<0.4
Sulfate	300	mg/L	9.42	9.7	1.15	3.06	0.584 J
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	675 J	137	191	231	224
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	363	20.7	72	101	65
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	2.28 J	0.00743 J	0.025	0.0764	0.0638
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	328 J	<1	<1	<1	76.6
Butyric Acid	830-MBA	mg/L	7.45 J	<1	3.4	<1	0.995 J
Lactic Acid	830-MBA	mg/L	5.6 J	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	377 J	22.8	73.4	31.4	71.7
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	200000 J	110000 J	110000 J	150000	72000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	260	5.7	370	100	70
Hydrogen	AM20GAX	nM	2.6	1.7	440	1.6	2.2

<: Not detected above Reporting Limit (RL)
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--: Not Sampled

TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-07C	IW101-08A	IW101-08A DUP	IW101-08B	IW101-08C
		Lab ID	L0703180-16	L0703276-06	L0703276-05	L0703276-07	L0703276-08
		Date	3/7/2007	3/12/2007	3/12/2007	3/12/2007	3/12/2007
		Time	12:35	9:15	9:15	11:30	13:00
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	0.221 J	0.222 J	0.112 J	2.88 J
Chloride	300	mg/L	10.6 J	24.8	25	12	9.33
Nitrate	300	mg/L	<0.6	2.08	2.43	0.993	<1.2
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.8
Sulfate	300	mg/L	<1	27.7	28.4	7.51	<2
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	241	185	210	106	578
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	99	8.51	7.16	7.36	283
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.0396	0.0452	0.0468	0.0742	0.0977
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	0.00914 J	0.00666 J	<0.01
Acetic Acid	830-MBA	mg/L	<1	<1	<1	<1	259
Butyric Acid	830-MBA	mg/L	4.08	<1	<1	1.2	18
Lactic Acid	830-MBA	mg/L	<1	9.37	4.52	<1	<1
Propionic Acid	830-MBA	mg/L	125	<10	<10	<10	315
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	86000	150000 J	140000	84000	190000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	830	19	23	15	390
Hydrogen	AM20GAX	nM	71	3.3	2.6	14	120

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--: Not Sampled

TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-09A	IW101-09B	IW101-09C	MW-101B	MW-101T
		Lab ID	L0703180-17	L0703180-18	L0703230-07	L0703140-18	L0703140-17
		Date	3/7/2007	3/7/2007	3/8/2007	3/6/2007	3/6/2007
		Time	13:57	15:30	8:22	9:30	8:25
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	31.1 J	5.32 J	13.5	18.8 J	18.4 J
Nitrate	300	mg/L	4.33	<0.6	<0.6	2.93	4.15
Nitrite	300	mg/L	<0.4	0.16 J	<0.4	<0.4	<0.4
Sulfate	300	mg/L	34.7	<1	<1	20	21.3
Sulfide	376.1	mg/L	0.623 J	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	214	1990	364	156 J	127 J
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	19.3	518	195	3.24 B	<1
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	<0.01	0.305	0.0358	0.246	0.0487
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	22	579	203	<1	<1
Butyric Acid	830-MBA	mg/L	<1	471	19.9	<1	<1
Lactic Acid	830-MBA	mg/L	33	354	<10	<1	<1
Propionic Acid	830-MBA	mg/L	<10	893	177	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<1	<1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	150000	410000	170000 J	61000	79000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	2.5 J	<5	<5	<5
Methane	RSK175\5021	ug/L	5 J	1400	900	75	130
Hydrogen	AM20GAX	nM	3.2	1.8	560	2.8	2.3

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--: Not Sampled

TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	DR1-3	PMW101-01A DUP	PMW101-01A	PMW101-01B	PMW101-02A
		Lab ID	L0703180-11	L0703107-05	L0703107-01	L0703107-02	L0703136-01
		Date	3/7/2007	3/5/2007	3/5/2007	3/5/2007	3/5/2007
		Time	8:50	8:50	8:50	12:03	9:12
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	0.23 J
Chloride	300	mg/L	19.9 J	8.34	8.44	18.2	16.6
Nitrate	300	mg/L	0.299 J	<0.6	<0.6	<0.6	1.01 J
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	3.93	0.561 J	0.577 J	0.645 J	12 J
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	243	3270	3210	797	297
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	<2	1810 B	1790 B	213	19.4
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	0.00657 J	0.0111	0.0194	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.0227	96.7	94	1.35	1.97
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	0.0408	0.0381	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	709	822	424	11
Butyric Acid	830-MBA	mg/L	<1	363	419	30.5	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	<10	1340	1500	595	26
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	160000	440000 J	530000 J	140000 J	92000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	27	24	34	260	5.1 B
Hydrogen	AM20GAX	nM	1.7	4.4	3.8	3.3	4.1

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--: Not Sampled

TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-02B	PMW101-03A	PMW101-03B	PMW101-04A	PMW101-04B
		Lab ID	L0703136-02	L0703136-03	L0703136-04	L0703140-01	L0703140-02
		Date	3/5/2007	3/5/2007	3/5/2007	3/6/2007	3/6/2007
		Time	11:05	12:50	15:10	9:20	11:20
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.204 J	0.214 J	0.182 J	<0.2	<0.2
Chloride	300	mg/L	19.3	19.6	20	20.7 J	20 J
Nitrate	300	mg/L	0.211 J	5.57	1.55	4.15	0.286 J
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	2.64 J	15.8 J	12.5 J	20.5	6.93
Sulfide	376.1	mg/L	0.635 J	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	330	93.8	151	119 J	190 J
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	46.1 B	<1	0.535 J	0.543 J	4.67
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	0.00792 J	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.17	0.02	0.167	<0.01	0.05
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	31.3	<1	<1	<1	<1
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	73.1	<10	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	94000 J	43000 J	87000	81000	140000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	5.8 B	5.2 B	16	4 B	6.4 B
Hydrogen	AM20GAX	nM	2.6	1.4	1.3	1.6	1.9

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TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-05A	PMW101-05B	PMW101-06A	PMW101-06B	PMW101-07A
		Lab ID	L0703107-03	L0703107-04	L0703140-07	L0703140-08	L0703140-09
		Date	3/5/2007	3/5/2007	3/6/2007	3/6/2007	3/6/2007
		Time	14:35	16:10	8:55	10:30	12:30
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	19.8	11.4	20.6 J	16.8 J	24.6 J
Nitrate	300	mg/L	<0.6	1.65	1.48	<0.6	<0.6
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	<1	2.21	14.5	<1	3.34
Sulfide	376.1	mg/L	<1	0.504 J	<1	<1	0.55 J
Alkalinity, Total	310.2	mg/L	271	84.9	154 J	385 J	157 J
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	37.2	10.4	3.56 B	122	22.8
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	0.0111	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	1.72	0.0331	0.0482	0.765	0.672
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	32.4	<1	5.54	126	37.3 J
Butyric Acid	830-MBA	mg/L	<1	<1	<1	6.38	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	40.7	12.2	<10	132	11.4
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	140000 J	67000 J	100000	94000	110000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	88	3.8 J	20 B	390	120
Hydrogen	AM20GAX	nM	3.8	1.4	1.3	7.6	5.2

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--: Not Sampled

TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-07B DUP	PMW101-07B	PMW101-08A	PMW101-08B	IW85-01
		Lab ID	L0703140-05	L0703140-12	L0703140-03	L0703140-04	L0703310-04
		Date	3/6/2007	3/6/2007	3/6/2007	3/6/2007	3/13/2007
		Time	15:05	15:05	13:35	15:40	13:48
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	<1
Chloride	300	mg/L	11.4 J	11.6 J	29.8 J	7.38 J	19.6
Nitrate	300	mg/L	4.99	5.02	1.39	3.31	1.52 J
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<2
Sulfate	300	mg/L	6.83	6.53	32.8	2.59	10.2 J
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	46.2 B	46.7 B	209 J	59.1 B	199
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	<1	<1	2.56	0.519 J	88.8 J
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	<0.01	<0.01	0.338	<0.01	0.344
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	<1	5.71	<1	<1
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	14.1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	56.2
Propionic Acid	830-MBA	mg/L	<10	<10	<10	<10	81.9
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	65000 J	65000 J	100000	61000	150000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	4.1 B	4.2 B	9.5 B	3.7 B	110
Hydrogen	AM20GAX	nM	2	1.7	2.1	1.7	160

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--: Not Sampled

TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW85-02	IW85-05	IW85-06	IW92-01	IW92-02
		Lab ID	L0703346-02	L0703346-03	L0703346-04	L0703276-09	L0703346-05
		Date	3/14/2007	3/14/2007	3/14/2007	3/12/2007	3/14/2007
		Time	8:08	11:58	13:40	15:22	10:20
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.8	<0.2	<0.8	0.476 J	<0.2
Chloride	300	mg/L	24.2	19.2	25.3	18.9	12.8
Nitrate	300	mg/L	<2.4	1.17	<2.4	1.71	<0.6
Nitrite	300	mg/L	<1.6	<0.4	<1.6	<0.4	<0.4
Sulfate	300	mg/L	<4	11 J	6.63 J	13.3	3.98 J
Sulfide	376.1	mg/L	<1	<1	<1	<1	5.67
Alkalinity, Total	310.2	mg/L	1040	111	3540	149	376
Organic Carbon, Dissolved	9060	mg/L	--	8.93	--	--	115
Total Organic Carbon	9060	mg/L	741	6.26	2720	27.9	77.4
Arsenic, Dissolved	6010B\3005A	mg/L	--	<0.01	--	--	<0.01
Arsenic, Total	6010B\3005A	mg/L	<0.01	0.0219	<0.02	<0.01	0.0327
Manganese, Dissolved	6010B\3005A	mg/L	--	0.0812	--	--	0.609
Manganese, Total	6010B\3005A	mg/L	2.27	0.0992	2.23	0.0913	2.76
Selenium, Dissolved	6010B\3005A	mg/L	--	<0.01	--	--	<0.01
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	0.00556 J	0.00661 J	<0.02
Acetic Acid	830-MBA	mg/L	329	<1	3230	<1	129
Butyric Acid	830-MBA	mg/L	91.3	<1	43.2	3.6	3.96
Lactic Acid	830-MBA	mg/L	<1	5.96	2900	4.34	23.2
Propionic Acid	830-MBA	mg/L	529	<10	5960	26.5	103
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	1.76	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	550000 J	140000 J	510000 J	85000 J	180000 J
Ethane	RSK175\5021	ug/L	<5	<5	2.8 J	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	2.5 J	<5	<5
Methane	RSK175\5021	ug/L	6900	5.2	4.3 J	13	250
Hydrogen	AM20GAX	nM	7400	--	--	2	--

<: Not detected above Reporting Limit (RL)
J: Estimated result based on QC data or reported below RL
B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW92-03	IW92-04	IW92-05	IW92-06	IW92-07
		Lab ID	L0703310-06	L0703310-09	L0703346-06	L0703346-07	L0703346-08
		Date	3/13/2007	3/13/2007	3/14/2007	3/14/2007	3/14/2007
		Time	10:45	13:55	7:52	13:20	15:20
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<1	<2	<2	<1
Chloride	300	mg/L	12.4	14.5	21.4	25.2	25.8
Nitrate	300	mg/L	0.105 J	<3	<6	<6	<3
Nitrite	300	mg/L	<0.4	<2	<4	<4	<2
Sulfate	300	mg/L	4.64 J	3.07 J	<10	<10	7.66 J
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	161	983	5640	4060	1610
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	55 J	405 J	3400	1900	838
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.05	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	1.08 J	11.6	1.36	1.36	2.19
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.02	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	29.2	279	2020	1350	498
Butyric Acid	830-MBA	mg/L	13.3	98.2	388	607	164
Lactic Acid	830-MBA	mg/L	61.3 J	55.3	18.7	28	13.1
Propionic Acid	830-MBA	mg/L	41.2 J	406	3170	2590	801
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	1.09	1.07	<0.1
Carbon Dioxide	RSK175\5021	ug/L	180000 J	500000 J	730000 J	660000 J	450000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	150	480	1800	3300	1900
Hydrogen	AM20GAX	nM	7.2	150	--	15	2.3

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--: Not Sampled

TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW92-08 DUP	IW92-08	DR2-1	DR2-5	DR2-5 DUP
		Lab ID	L0703310-01	L0703310-03	L0703230-16	L0703310-14	L0703310-10
		Date	3/13/2007	3/13/2007	3/8/2007	3/13/2007	3/13/2007
		Time	8:47	8:47	8:20	8:20	8:20
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<1	<1	<0.2	<0.2	<0.2
Chloride	300	mg/L	23.1	22.5	20.2 J	17.1	17
Nitrate	300	mg/L	<3	<3	4.95	3.88	3.88
Nitrite	300	mg/L	<2	<2	<0.4	<0.4	<0.4
Sulfate	300	mg/L	<5	<5	13.4 J	8.51 J	8.7 J
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	981	994	67.9	36.2 B	34.8
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	521 J	537 J	<1	0.812 B	1.12 B
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.579	0.637	0.0139	<0.01	<0.01
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	330	343	<1	<1	<1
Butyric Acid	830-MBA	mg/L	76.2	80.2	<1	<1	<1
Lactic Acid	830-MBA	mg/L	60	55.2	<1	<1	<1
Propionic Acid	830-MBA	mg/L	493	526	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	510000 J	310000 J	59000	31000 J	51000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	2100	3000	21	5.5 B	4.2 B
Hydrogen	AM20GAX	nM	11000	12000	1.4	1.4	1.3

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B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW-01	MW-85	PMW85-01	PMW85-04	PMW85-05
		Lab ID	L0703276-12	L0703276-11	L0703310-11	L0703310-12	L0703310-13
		Date	3/12/2007	3/12/2007	39154	3/13/2007	3/13/2007
		Time	12:10	15:40	0.482638889	14:40	16:20
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.841 J	0.137 J	<0.2	<0.8	<0.2
Chloride	300	mg/L	19	17.2	19.4	24.5	24.2
Nitrate	300	mg/L	0.926	2.98	1.87	<2.4	2.66
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<1.6	<0.4
Sulfate	300	mg/L	13.6	12.1	10.7 J	4.68 J	8.27 J
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	97.7	46.6	50	184	39.9 B
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	1.3	0.853 J	1.44 B	45 J	0.724 B
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.914	<0.01	0.133	4.78	0.0444
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	0.00544 J	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Butyric Acid	830-MBA	mg/L	<1	<1	0.721 J	1.9	<1
Lactic Acid	830-MBA	mg/L	<1	<1	2.79	<1	<1
Propionic Acid	830-MBA	mg/L	<10	<10	<10	47.2	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	440000 J	79000 J	58000 J	78000 J	77000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	4600	3.2 J	<5	4 B	2.7 B
Hydrogen	AM20GAX	nM	1.6	1.4	5	--	--

<: Not detected above Reporting Limit (RL)
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TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW92-01	PMW92-02	PMW92-03	PMW92-04 DUP	PMW92-04
		Lab ID	L0703230-13	L0703230-14	L0703230-15	L0703246-07	L0703246-08
		Date	3/8/2007	3/8/2007	3/8/2007	3/9/2007	3/9/2007
		Time	10:11	13:15	15:50	12:20	12:20
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	0.66 J	0.755 J
Chloride	300	mg/L	21.5 J	8.12 J	18.2 J	28.2	28
Nitrate	300	mg/L	2.99	<0.6	0.863	0.28 J	0.236 J
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	9.16 J	<1	8.35 J	3.44	3.15
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	47.9	1100	169	223	218
Organic Carbon, Dissolved	9060	mg/L	--	--	--	--	--
Total Organic Carbon	9060	mg/L	<1	605	<1	46.1	48.8
Arsenic, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Manganese, Total	6010B\3005A	mg/L	0.395	14.4	0.602	1.23	1.32
Selenium, Dissolved	6010B\3005A	mg/L	--	--	--	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	426	<1	43.1	35.6 J
Butyric Acid	830-MBA	mg/L	<1	38.1	<1	6.55	9.36
Lactic Acid	830-MBA	mg/L	<1	<10	<1	<1	5.46
Propionic Acid	830-MBA	mg/L	<10	707	<10	47.1	57.7
Pyruvic Acid	830-MBA	mg/L	<0.1	<1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	65000	260000	88000	94000	91000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	4.1 J	400	4 J	40	36
Hydrogen	AM20GAX	nM	1.4	--	3.3	3	3

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TABLE F-10
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW92-05	PMW92-06
		Lab ID	L0703246-09	L0703276-10
		Date	3/9/2007	3/12/2007
		Time	15:45	12:45
		Area	TTA-2	TTA-2
Analyte	**Method**	**Units**		
Bromide	300	mg/L	<0.2	0.147 J
Chloride	300	mg/L	19.9	21.1
Nitrate	300	mg/L	2.77	2.15
Nitrite	300	mg/L	<0.4	<0.4
Sulfate	300	mg/L	15.3	7.71
Sulfide	376.1	mg/L	<1	<1
Alkalinity, Total	310.2	mg/L	55.5	60.3
Organic Carbon, Dissolved	9060	mg/L	--	--
Total Organic Carbon	9060	mg/L	0.697 J	1.77
Arsenic, Dissolved	6010B\3005A	mg/L	--	--
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01
Manganese, Dissolved	6010B\3005A	mg/L	--	--
Manganese, Total	6010B\3005A	mg/L	<0.01	0.441
Selenium, Dissolved	6010B\3005A	mg/L	--	--
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	<1
Butyric Acid	830-MBA	mg/L	<1	<1
Lactic Acid	830-MBA	mg/L	2.4	<1
Propionic Acid	830-MBA	mg/L	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	82000 J	89000 J
Ethane	RSK175\5021	ug/L	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5
Methane	RSK175\5021	ug/L	3.6 J	4.6 J
Hydrogen	AM20GAX	nM	1.4	2.3

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--: Not Sampled

TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW21-01A	IW21-01B	IW21-01B DUP	IW21-02A	IW21-02B
		Lab ID	L0706104-05	L0706104-06	L0706104-09	L0706151-07	L0706151-08
		Date	6/5/2007	6/5/2007	6/5/2007	6/6/2007	6/6/2007
		Time	11:59	14:08	14:12	8:02	9:36
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	0.245	0.178 J
Chloride	300	mg/L	53.9	16.8	17.2	9.7	16.5
Nitrate	300	mg/L	<0.6	<0.6	<0.6	0.268 J	1.05
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	0.115 J
Sulfate	300	mg/L	<1	<1	<1	10.3	5.67
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	3790	948	880	95.5	78.2
Total Organic Carbon	9060MOD	mg/L	4180	451	473	7.28	10.9
Arsenic, Total	6010B\3005A	mg/L	0.0117	<0.01	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.611	0.147	0.145	0.0356	0.0225
Selenium, Total	6010B\3005A	mg/L	0.0147	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	811	410	406	6.85	9.45
Butyric Acid	830-MBA	mg/L	2010	31.7	34.6	<1	<1
Lactic Acid	830-MBA	mg/L	878	<1	13.5	<1	2.64
Propionic Acid	830-MBA	mg/L	1650	614	618	5.52 J	12.1
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	880000	170000	170000	120000 J	140000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	4000	1100	900	7.6	24
Hydrogen	AM20GAX	nM	2900	2.1	2600 J	5.7	150

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--: Not Sampled

TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW21-03A	IW21-03B	IW21-04A	IW21-04A DUP	IW21-04B
		Lab ID	L0706151-09	L0706151-10	L0706151-01	L0706151-03	L0706151-02
		Date	6/6/2007	6/6/2007	6/6/2007	6/6/2007	6/6/2007
		Time	11:20	12:56	13:22	13:24	11:49
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.213	4.97	0.968	1.03	1.22
Chloride	300	mg/L	14	10.8	9.92	9.4	8.95
Nitrate	300	mg/L	1.83	<0.6	<0.6	<0.6	<0.6
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	20	2.13	17.1	17.5	5.73
Sulfide	376.1	mg/L	<1	1.32	0.952 J	0.826 J	0.648 J
Alkalinity, Total	310.2	mg/L	101	290	258	261	283
Total Organic Carbon	9060MOD	mg/L	1.59	345	106	104	123
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.0601	0.0967	0.328	0.317	0.0672
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	265	81	78.7	95.3
Butyric Acid	830-MBA	mg/L	<1	41 J	7.05	5.04	8.32
Lactic Acid	830-MBA	mg/L	<1	11.2	<1	<1	<1
Propionic Acid	830-MBA	mg/L	<10	394	133	124	156
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	130000 J	240000 J	160000 J	160000 J	130000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	27	2700 J	5000	4700	2700
Hydrogen	AM20GAX	nM	79	240	27	26	10

<: Not detected above Reporting Limit (RL)
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B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW21-05A	IW21-05B	MW-115	MW-21	PMW21-01
		Lab ID	L0706151-14	L0706151-18	L0706104-08	L0706073-11	L0706073-07
		Date	6/6/2007	6/6/2007	6/5/2007	6/4/2007	6/4/2007
		Time	11:56	14:00	9:57	9:46	8:21
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	1.16	<0.2	0.188 J	0.206
Chloride	300	mg/L	8.16	8.57	11.8	16.7	9.83
Nitrate	300	mg/L	<0.6	<0.6	3.66	4.25	3.86
Nitrite	300	mg/L	0.291 J	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	0.857 J	8.69	15.3	11	16.3
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	1140	251	59.5	67	91.4
Total Organic Carbon	9060MOD	mg/L	2130	109	<1	0.614 J	0.985 J
Arsenic, Total	6010B\3005A	mg/L	0.0124	0.00657 J	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.632	0.149	0.0133	<0.01	<0.01
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	788	101	<1	<1	<1
Butyric Acid	830-MBA	mg/L	453	8.64	1.12	1.37	1.23
Lactic Acid	830-MBA	mg/L	1400	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	1830	145	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	710000 J	140000 J	66000	51000 J	80000 J
Ethane	RSK175\5021	ug/L	<50	<25	<5	<5	<25
Ethene	RSK175\5021	ug/L	<50	<25	<5	<5	<25
Methane	RSK175\5021	ug/L	3100	1900	650	4.2 J	41 B
Hydrogen	AM20GAX	nM	18000	5.8	1.7	3.6	2

<: Not detected above Reporting Limit (RL)
J: Estimated result based on QC data or reported below RL
B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW21-02	PMW21-03	PMW21-04	PMW21-05	IW101-01A
		Lab ID	L0706073-08	L0706073-09	L0706073-10	L0706104-07	L0706043-04
		Date	6/4/2007	6/4/2007	6/4/2007	6/5/2007	6/1/2007
		Time	11:29	13:14	14:58	8:08	14:05
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.155 J	0.151 J	0.204	<0.2	<0.8
Chloride	300	mg/L	11.8	12.3	9.85	19.4	19.5
Nitrate	300	mg/L	4.41	4.56	3.83	4.47	<2.4
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<1.6
Sulfate	300	mg/L	13.9	12.9	19.4	21.1	<4
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	76.1	65.3	109	45.6	1170
Total Organic Carbon	9060MOD	mg/L	0.582 J	0.603 J	<1	<1	1400
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	0.00627 J
Manganese, Total	6010B\3005A	mg/L	0.0484	<0.01	<0.01	0.0278	1.31
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	0.00565 J
Acetic Acid	830-MBA	mg/L	<1	<1	<1	<1	622
Butyric Acid	830-MBA	mg/L	1.26	1.26	1.21	0.792 J	181
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	1280
Propionic Acid	830-MBA	mg/L	<10	<10	<10	10.7	1470
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	100000 J	110000 J	130000 J	77000	550000 J
Ethane	RSK175\5021	ug/L	<50	<25	<5	<5	<5
Ethene	RSK175\5021	ug/L	<50	<25	<5	<5	<5
Methane	RSK175\5021	ug/L	65 B	30 B	5.1	7.4	1400
Hydrogen	AM20GAX	nM	1.7	9.8	4500	3.2	23

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--: Not Sampled

TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-01A DUP	IW101-01B	IW101-01C	IW101-02A	IW101-02B
		Lab ID	L0706043-01	L0705656-01	L0705656-02	L0705656-03	L0705656-04
		Date	6/1/2007	5/29/2007	5/29/2007	5/29/2007	5/29/2007
		Time	14:10	8:51	11:11	13:34	15:59
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.8	0.161 J	1.03	0.153 J	0.247
Chloride	300	mg/L	19.1	14.4	20.5	19.2	18.5
Nitrate	300	mg/L	<2.4	<0.6	0.21 J	1.79	<0.6
Nitrite	300	mg/L	<1.6	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	<4	13.5	7.2	16.3	<1
Sulfide	376.1	mg/L	<1	<1	0.941 J	0.508 J	<1
Alkalinity, Total	310.2	mg/L	1420	218	273	134	225
Total Organic Carbon	9060MOD	mg/L	1600	29.6	172	32.9	63.2
Arsenic, Total	6010B\3005A	mg/L	0.0114	0.00603 J	<0.01	<0.01	0.0103
Manganese, Total	6010B\3005A	mg/L	1.28	0.272	0.0471	0.277	0.446
Selenium, Total	6010B\3005A	mg/L	0.0088 J	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	642	32.7	120	30.3	42.6
Butyric Acid	830-MBA	mg/L	180	<1	11	<1	1.69
Lactic Acid	830-MBA	mg/L	1290	3.02	4.17	37.2	<1
Propionic Acid	830-MBA	mg/L	1340	30.3	205	21.1	75.3
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	530000 J	90000	240000 J	200000 J	180000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	1700	23	870	99	5.9 B
Hydrogen	AM20GAX	nM	17	9.6	780	7.1	1.5

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TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-02C	IW101-03A	IW101-03B	IW101-03C	IW101-03C DUP
		Lab ID	L0705683-10	L0705683-13	L0706043-05	L0706043-06	L0706043-02
		Date	5/30/2007	5/30/2007	6/1/2007	6/1/2007	6/1/2007
		Time	10:01	15:19	8:50	10:45	10:49
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.8	0.159 J	<0.2	<0.2
Chloride	300	mg/L	20.9	18.2	19.3	13.9	13.8
Nitrate	300	mg/L	0.805	<2.4	2.47	<0.6	<0.6
Nitrite	300	mg/L	<0.4	<1.6	<0.4	<0.4	<0.4
Sulfate	300	mg/L	6.58	<4	15.4	1.49	1.43
Sulfide	376.1	mg/L	<1	1.71	<1	<1	<1
Alkalinity, Total	310.2	mg/L	211	260	107	247	252
Total Organic Carbon	9060MOD	mg/L	152	272	8.33	147	142
Arsenic, Total	6010B\3005A	mg/L	0.00773 J	<0.01	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.0851	0.0962	0.0177	0.02	0.0207
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	146	109	15.1	115	104
Butyric Acid	830-MBA	mg/L	7.63	5.85	1.52 B	18.6	18.3
Lactic Acid	830-MBA	mg/L	3.03	593	<1	<1	<1
Propionic Acid	830-MBA	mg/L	195	148	19.2	177	165
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	210000 J	220000 J	150000 J	78000 J	170000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	1100 J	1200	57	2100	3600
Hydrogen	AM20GAX	nM	52	7800	1.1	220	240

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TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-04A	IW101-04B	IW101-04C	IW101-05A	IW101-05B
		Lab ID	L0706073-12	L0706073-13	L0706073-14	L0706104-01	L0706104-02
		Date	6/4/2007	6/4/2007	6/4/2007	6/5/2007	6/5/2007
		Time	11:35	13:51	15:59	8:55	11:13
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	87.9	0.583	0.537	<0.2	<0.2
Chloride	300	mg/L	21.1	19	18.5	25.4	19
Nitrate	300	mg/L	<0.6	<0.6	<0.6	2.56	2.33
Nitrite	300	mg/L	0.201 J	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	1.27	0.735 J	1.56	6.41	25
Sulfide	376.1	mg/L	<1	<1	<1	1.1	<1
Alkalinity, Total	310.2	mg/L	2740	237	245	294	131
Total Organic Carbon	9060MOD	mg/L	2110	70.8	73.1	295	0.692 J
Arsenic, Total	6010B\3005A	mg/L	0.0204	0.0129	0.0164	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.46	0.598	0.338	0.0265	0.0139
Selenium, Total	6010B\3005A	mg/L	0.0119	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	775	53.9	70	154	<1
Butyric Acid	830-MBA	mg/L	543	6.2	2.02	1.31	1.01
Lactic Acid	830-MBA	mg/L	792	<1	<1	31	<1
Propionic Acid	830-MBA	mg/L	2010	83	90.4	353	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	530000	140000 J	61000 J	100000 J	110000
Ethane	RSK175\5021	ug/L	<25	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<25	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	6800	5000	1100	110	23
Hydrogen	AM20GAX	nM	1.6	11	3.8	2.5	1.9

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TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-05C	IW101-06A	IW101-06B	IW101-06C	IW101-07A
		Lab ID	L0706104-03	L0706104-04	L0706151-15	L0706151-16	L0706073-01
		Date	6/5/2007	6/5/2007	6/6/2007	6/6/2007	6/4/2007
		Time	12:54	15:15	8:12	9:58	8:50
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	0.329	0.163 J
Chloride	300	mg/L	26.5	23.7	19.7	11.7	21.1
Nitrate	300	mg/L	0.223 J	0.719	0.321 J	<0.6	0.766
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	6.56	5.12	12.2	3.28	13.2
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	294	286	110	131	153
Total Organic Carbon	9060MOD	mg/L	104	178	12.4	45.2	26.8
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.182	0.964	0.00711 J	0.024	0.0415
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	160	13.8	36.6	29.8
Butyric Acid	830-MBA	mg/L	6.74	10.3	<1	2.36	<1
Lactic Acid	830-MBA	mg/L	<1	98.1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	175	184	9.53 J	47.9	28.7
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	170000	140000	250000 J	110000 J	120000 J
Ethane	RSK175\5021	ug/L	<5	<5	<50	<10	<5
Ethene	RSK175\5021	ug/L	<5	<5	<50	<10	<5
Methane	RSK175\5021	ug/L	4500	3100	70	830	570
Hydrogen	AM20GAX	nM	5.6	2	2.2	30	2.6

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TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-07B	IW101-07C	IW101-08A	IW101-08B	IW101-08C
		Lab ID	L0706073-02	L0706073-03	L0706073-06	L0706104-11	L0706104-12
		Date	6/4/2007	6/4/2007	6/4/2007	6/5/2007	6/5/2007
		Time	11:09	12:52	15:26	9:07	11:08
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.215	2.88	0.224	<0.2	<0.2
Chloride	300	mg/L	7.48	12.5	25.5	12.3	8.01
Nitrate	300	mg/L	0.101 J	<0.6	1.71	0.562 J	<0.6
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	2.59	1.3	26.1	5.27	<1
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	116	209	184	162	505
Total Organic Carbon	9060MOD	mg/L	35.7	87.4	14.6	40	312
Arsenic, Total	6010B\3005A	mg/L	0.00697 J	<0.01	<0.01	<0.01	0.00574 J
Manganese, Total	6010B\3005A	mg/L	0.0799	0.0336	0.0579	0.133	0.106
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	40.6	74.3 J	<1	34.3	197
Butyric Acid	830-MBA	mg/L	2.39	13.6	<1	7.11	103
Lactic Acid	830-MBA	mg/L	<1	1.71	<1	<1	<1
Propionic Acid	830-MBA	mg/L	40.4	95.5	13.3	34.9	333
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	73000 J	48000 J	130000 J	99000	140000
Ethane	RSK175\5021	ug/L	<25	<5	<25	<5	<5
Ethene	RSK175\5021	ug/L	<25	<5	<25	<5	<5
Methane	RSK175\5021	ug/L	620	320 J	590	950	2300
Hydrogen	AM20GAX	nM	1.7	3.8	1.9	3.4	28

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TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-09A	IW101-09A DUP	IW101-09B	IW101-09C	MW-101B
		Lab ID	L0706104-13	L0706104-10	L0706151-04	L0706151-05	L0705683-15
		Date	6/5/2007	6/5/2007	6/6/2007	6/6/2007	5/30/2007
		Time	14:37	14:34	8:19	9:57	12:05
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	5.2	0.185 J
Chloride	300	mg/L	29.2	29	7.66	6.19	18.6
Nitrate	300	mg/L	2.81	2.6	0.39 J	<0.6	4.44
Nitrite	300	mg/L	0.351 J	<0.4	0.104 J	<0.4	<0.4
Sulfate	300	mg/L	27.5	26.3	2.78	0.579 J	21.6
Sulfide	376.1	mg/L	1.59	2.38	<1	<1	<1
Alkalinity, Total	310.2	mg/L	243	242	470	243	116
Total Organic Carbon	9060MOD	mg/L	23.7	22.2	558	142	0.58 J
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	<0.01	<0.01	0.282	0.0207	0.0151
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	22.4	22.7	233	--	<1
Butyric Acid	830-MBA	mg/L	<1	<1	352	--	<1
Lactic Acid	830-MBA	mg/L	9.51	9.8	<1	--	<1
Propionic Acid	830-MBA	mg/L	<10	<10	449	--	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	--	<0.1
Carbon Dioxide	RSK175\5021	ug/L	70000	88000	180000 J	81000 J	170000 B
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	9.5	6.8	4300	1600	9.3
Hydrogen	AM20GAX	nM	1.5	5.2	2.7	640	1.6

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TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	MW-101T	DR1-3	PMW101-01A	PMW101-01B	PMW101-01B DUP
		Lab ID	L0705683-14	L0706043-09	L0705683-02	L0705683-03	L0705683-01
		Date	5/30/2007	6/1/2007	5/30/2007	5/30/2007	5/30/2007
		Time	13:19	13:50	11:55	14:35	14:38
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.178 J	0.17 J	<2	<0.8	<0.8
Chloride	300	mg/L	19	19.9	19.9	19.1	20.7
Nitrate	300	mg/L	4.9	<0.6	<6	0.42 J	<2.4
Nitrite	300	mg/L	<0.4	<0.4	<4	<1.6	<1.6
Sulfate	300	mg/L	21.1	0.788 J	<10	5.59	5.41
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	106	237	2580	288	559
Total Organic Carbon	9060MOD	mg/L	0.757 J	2.29	1850	323	341
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	0.0367	0.0213	0.0244
Manganese, Total	6010B\3005A	mg/L	<0.01	2.17 J	65.8	0.954	0.936
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	0.0085 J	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	<1	872	186	198
Butyric Acid	830-MBA	mg/L	<1	<1	1230	53.4	43.8
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	<10	<10	1710	401	397
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	210000 J	120000 J	560000	300000	300000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	37	510 J	4100	6100	6700
Hydrogen	AM20GAX	nM	2	1.7	2.5	1.8	1.7

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TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-02A	PMW101-02B	PMW101-03A	PMW101-03B	PMW101-04A
		Lab ID	L0705656-05	L0705656-06	L0705683-04	L0705656-07	L0706016-01
		Date	5/29/2007	5/29/2007	5/30/2007	5/29/2007	5/31/2007
		Time	10:13	14:26	9:01	16:59	8:16
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.643	0.167 J	0.133 J	0.143 J	0.178 J
Chloride	300	mg/L	17.7	18.7	20.8	19.1	21.6
Nitrate	300	mg/L	0.514 J	1.95	5.34	0.652	1.33
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	7.41	15.1	18.9	8.9	14.2
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	278	157	83.6	166	240
Total Organic Carbon	9060MOD	mg/L	59.8	16.5	<1	0.944 J	1.83
Arsenic, Total	6010B\3005A	mg/L	0.00606 J	<0.01	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	6.16	0.016	0.0111	0.0564	0.157
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	57.9	16.1	<1	<1	<1
Butyric Acid	830-MBA	mg/L	5.37	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	40.3	<1	<1	<1
Propionic Acid	830-MBA	mg/L	53.9	<10	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	86000	180000 J	170000 B	230000 J	93000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<50	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<50	<5
Methane	RSK175\5021	ug/L	56	1800	5 J	110	4.1 J
Hydrogen	AM20GAX	nM	1.9	4	1.8	1.5	37

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TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-04B	PMW101-05A	PMW101-05B	PMW101-06A	PMW101-06B
		Lab ID	L0706016-02	L0706016-11	L0706016-12	L0706016-13	L0706016-14
		Date	5/31/2007	5/31/2007	5/31/2007	5/31/2007	5/31/2007
		Time	10:04	8:38	10:15	15:51	13:28
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.21	<0.8	<0.8	0.148 J	<2
Chloride	300	mg/L	18.6	19.6	10.2	20.8	16.1
Nitrate	300	mg/L	0.576 J	<2.4	1.11 J	2.91	<6
Nitrite	300	mg/L	<0.4	<1.6	<1.6	<0.4	<4
Sulfate	300	mg/L	3.55	<4	<4	15.9	<10
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	104	221	160	142	232
Total Organic Carbon	9060MOD	mg/L	14	36.3	27.1	4.08	96.7
Arsenic, Total	6010B\3005A	mg/L	<0.01	0.00581 J	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.41	1.46	0.141	0.079	0.667
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	37.8	<1	<1	74.9
Butyric Acid	830-MBA	mg/L	3.18	<1	<1	<1	3.65
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	18.9	41	65.6	<10	123
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	87000 J	150000 J	58000 J	77000 J	150000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	310	920	13	1700	5500
Hydrogen	AM20GAX	nM	1.6	8.3	2.7	4.2	1.4

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TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-07A	PMW101-07B	PMW101-08A	PMW101-08A DUP	PMW101-08B
		Lab ID	L0706016-03	L0706016-04	L0706043-08	L0706043-07	L0706016-05
		Date	5/31/2007	5/31/2007	6/1/2007	6/1/2007	5/31/2007
		Time	12:20	14:36	10:45	10:38	16:34
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.226	<0.2	0.237	0.227	0.14 J
Chloride	300	mg/L	25.6	11.9	29.9	29.2	7.45
Nitrate	300	mg/L	<0.6	5	2.08	2.24	3.28
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	10.5	6.6	30.2	30.5	2.45
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	181	27.7	198	199	19.9
Total Organic Carbon	9060MOD	mg/L	6.13	<1	0.892 J	<1	<1
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.594	<0.01	0.279	0.27	<0.01
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	12.9	<1	<1	41.5	<1
Butyric Acid	830-MBA	mg/L	<1	<1	1.17 B	0.926 B	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	<10	<10	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	140000 J	60000 J	120000	110000	61000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	920	5.5	58	38	6.6
Hydrogen	AM20GAX	nM	2	1.2	1.4	1.2	1.3

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TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW85-01	IW85-02	IW85-05	IW85-06	IW92-01
		Lab ID	L0706043-14	L0706043-15	L0706073-15	L0706151-13	L0706043-13
		Date	6/1/2007	6/1/2007	6/4/2007	6/6/2007	6/1/2007
		Time	12:50	15:10	9:01	15:28	10:31
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<2	2.21	4.51	<0.2
Chloride	300	mg/L	22.3	28.2	11.8	13.4	19.1
Nitrate	300	mg/L	0.223 J	<6	0.315 J	<0.6	0.896
Nitrite	300	mg/L	<0.4	<4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	2.77	<10	7.47	<1	8.62
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	285	593	206	300	213
Total Organic Carbon	9060MOD	mg/L	397	1450	67.3	201	120
Arsenic, Total	6010B\3005A	mg/L	<0.01	0.0109	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.378	1.04	0.335	2.88	0.391
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	203	812	45.3	163	87.7
Butyric Acid	830-MBA	mg/L	65.3	136	22.3	40.6	17.6
Lactic Acid	830-MBA	mg/L	34.6	175	<1	3.09	20.9
Propionic Acid	830-MBA	mg/L	440	1720	71	333	101
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	250000	430000	90000 J	380000 J	97000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<50	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<50	<5
Methane	RSK175\5021	ug/L	1500	2100	5.9 B	330	250
Hydrogen	AM20GAX	nM	2.5	--	2.5	1.6	--

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TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW92-02	IW92-02 DUP	IW92-03	IW92-04	IW92-05
		Lab ID	L0706201-08	L0706201-07	L0706151-06	L0706201-10	L0706201-01
		Date	6/7/2007	6/7/2007	6/6/2007	6/7/2007	6/7/2007
		Time	8:37	9:04	16:29	12:40	15:56
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.811	1.01	4.52	5.09	--
Chloride	300	mg/L	15.4	15.1	10.5	17.7	--
Nitrate	300	mg/L	0.745	0.891	<0.6	<0.6	--
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	--
Sulfate	300	mg/L	6.25	6.84	1.98	<1	--
Sulfide	376.1	mg/L	<1	<1	<1	<1	--
Alkalinity, Total	310.2	mg/L	220	200	263	523	--
Total Organic Carbon	9060MOD	mg/L	47.3	68	139	625	6360
Arsenic, Total	6010B\3005A	mg/L	0.0365	0.0431	<0.01	<0.01	<0.05
Manganese, Total	6010B\3005A	mg/L	0.374	0.361	0.698	11.2	1.42
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	0.0175
Acetic Acid	830-MBA	mg/L	50.1	45.7	50.2	432	--
Butyric Acid	830-MBA	mg/L	8.81	5.97	32.8	45.1	--
Lactic Acid	830-MBA	mg/L	<1	<1	171	3.36	--
Propionic Acid	830-MBA	mg/L	56.7	52.1	86.2	756	--
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	--
Carbon Dioxide	RSK175\5021	ug/L	130000 J	140000 J	490000 J	360000 J	--
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	--
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	--
Methane	RSK175\5021	ug/L	140	130	860	1700	--
Hydrogen	AM20GAX	nM	--	--	--	--	--

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TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW92-06	IW92-07	IW92-08	DR2-1	DR2-5
		Lab ID	L0706201-02	L0706201-03	L0706201-04	L0705656-09	L0705656-10
		Date	6/7/2007	6/7/2007	6/7/2007	5/29/2007	5/29/2007
		Time	10:42	7:21	9:25	8:51	11:01
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	144	45.3	6.27	0.124 J	0.156 J
Chloride	300	mg/L	36.5	29.4	29.3	21.6	16.9
Nitrate	300	mg/L	<0.6	<0.6	<0.6	4.75	3.78
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	<1	4.9	<1	15.6	8.37
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	183	2330	572	52.6	31.1
Total Organic Carbon	9060MOD	mg/L	3900	1420	106	1.3	<1
Arsenic, Total	6010B\3005A	mg/L	<0.02	<0.01	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	2.13	1.57	0.0776	0.00895 J	<0.01
Selenium, Total	6010B\3005A	mg/L	<0.01	0.00552 J	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	2570	1450	344	<1	<1
Butyric Acid	830-MBA	mg/L	1360	845	69.2 J	<1	<1
Lactic Acid	830-MBA	mg/L	89.3	15.1	7.32	<1	<1
Propionic Acid	830-MBA	mg/L	5170	3130	691	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	750000 J	590000 J	150000 J	73000 J	57000 J
Ethane	RSK175\5021	ug/L	<50	<50	<25	<5	<5
Ethene	RSK175\5021	ug/L	<50	<50	<25	<5	<5
Methane	RSK175\5021	ug/L	5300	2400	710 J	270	4.8 B
Hydrogen	AM20GAX	nM	--	36	--	1.2	1.9

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TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW-01	MW-85	PMW85-01	PMW85-04	PMW85-05
		Lab ID	L0705683-09	L0705656-08	L0706043-16	L0706016-09	L0706016-10
		Date	5/30/2007	5/29/2007	6/1/2007	5/31/2007	5/31/2007
		Time	8:28	14:10	8:30	15:49	13:11
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.729	0.123 J	0.164 J	<0.8	0.149 J
Chloride	300	mg/L	20.3	17.3	19.4	22.7	23.5
Nitrate	300	mg/L	1.08	2.59	1.01	<2.4	2.77
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<1.6	<0.4
Sulfate	300	mg/L	22.8	13.8	7.61	2.03 J	7.95
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	53.8	39	53.4	149	26.9
Total Organic Carbon	9060MOD	mg/L	3.57	<1	0.725 J	37.4	<1
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.702	<0.01	0.166	7.24	0.01
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	<1	<1	37.3	<1
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	3.87	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	<10	<10	<10	44.2	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	490000 J	76000 J	100000	73000 J	79000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	4300	4.3 B	11	5.6	3.9 J
Hydrogen	AM20GAX	nM	0.83	--	3.5	2.7	1.2

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TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW85-05 DUP	PMW92-01	PMW92-02	PMW92-03	PMW92-04
		Lab ID	L0706016-06	L0705683-05	L0705683-06	L0705683-07	L0705683-08
		Date	5/31/2007	5/30/2007	5/30/2007	5/30/2007	5/30/2007
		Time	13:16	10:22	12:22	14:29	16:05
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.151 J	<0.2	<0.8	0.114 J	<0.8
Chloride	300	mg/L	23.8	23.1	16	17.7	29.5
Nitrate	300	mg/L	2.75	2.23	<2.4	0.161 J	<2.4
Nitrite	300	mg/L	<0.4	<0.4	<1.6	<0.4	<1.6
Sulfate	300	mg/L	8.33	10.8	<4	2.53	<4
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	25.8	40.9	1210	233	205
Total Organic Carbon	9060MOD	mg/L	<1	<1	748	10.1	49.4
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	0.0161	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.01	0.404	13.8	0.467	1.17
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	<1	554	<1	39.2
Butyric Acid	830-MBA	mg/L	<1	<1	80.1	1.11	3.94
Lactic Acid	830-MBA	mg/L	<1	<1	19.8	<1	<1
Propionic Acid	830-MBA	mg/L	<10	<10	959	11.6	55
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	71000 J	100000 B	300000 J	180000 B	120000 B
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	3.2 J	4.6 J	3400	53	140
Hydrogen	AM20GAX	nM	1.4	2.2	1.8	1.4	3.3

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TABLE F-11
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW92-05	PMW92-06
		Lab ID	L0706016-07	L0706016-08
		Date	5/31/2007	5/31/2007
		Time	8:43	11:04
		Area	TTA-2	TTA-2
Analyte	**Method**	**Units**		
Bromide	300	mg/L	0.118 J	0.148 J
Chloride	300	mg/L	21.8	21.3
Nitrate	300	mg/L	2.65	1.88
Nitrite	300	mg/L	<0.4	<0.4
Sulfate	300	mg/L	15.2	6.73
Sulfide	376.1	mg/L	<1	<1
Alkalinity, Total	310.2	mg/L	41.7	51
Total Organic Carbon	9060MOD	mg/L	1.7	0.581 J
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	<0.01	0.283
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	<1
Butyric Acid	830-MBA	mg/L	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1
Propionic Acid	830-MBA	mg/L	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	93000 J	80000 J
Ethane	RSK175\5021	ug/L	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5
Methane	RSK175\5021	ug/L	3.9 J	19
Hydrogen	AM20GAX	nM	1.4	2.3

<: Not detected above Reporting Limit (RL)
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--: Not Sampled

TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW21-01A	IW21-01B	IW21-02A	IW21-02B	IW21-03A
		Lab ID	L0709346-09	L0709471-01	L0709530-01	L0709530-02	L0709530-07
		Date	9/14/2007	9/19/2007	9/20/2007	9/20/2007	9/20/2007
		Time	15:41	15:24	8:23	10:13	12:35
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21
Analyte	**Method**	**Units**					
Bromide	300	mg/L	8.85	2.49	0.244	0.17 J	<0.2
Chloride	300	mg/L	10.2 J	11	16.1 J	15.6 J	12.7 J
Nitrate	300	mg/L	<0.6	<0.6	2.37	2.52	1.93
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	5.74	0.529 J	12.4	6.08	18.4
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	754 J	584	80.8 J	88.2 J	107 J
Total Organic Carbon	9060MOD	mg/L	373	261	0.72 J	3.23	1.66
Arsenic, Total	6010B\3005A	mg/L	<0.01	0.00534 J	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.118 J	0.148	0.0143	0.0437	0.133
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	0.00651 J	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	210	189	<1	3.31	1.28
Butyric Acid	830-MBA	mg/L	82.9	33.3	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	0.804 J
Propionic Acid	830-MBA	mg/L	351	290	<10	<10	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	0.732 B	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	140000	180000	190000	130000 J	64000
Ethane	RSK175\5021	ug/L	<5	<25	<25	<25	<5
Ethene	RSK175\5021	ug/L	<5	<25	<25	<25	<5
Methane	RSK175\5021	ug/L	1800	2100	51	40	72
Hydrogen	AM20GAX	nM	39	1.3	3.2	14	27

<: Not detected above Reporting Limit (RL)
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--: Not Sampled

TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW21-03B	IW21-04A	IW21-04B	IW21-05A DUP	IW21-05A
		Lab ID	L0709530-05	L0709471-06	L0709471-02	L0709530-10	L0709530-08
		Date	9/20/2007	9/19/2007	9/19/2007	9/20/2007	9/20/2007
		Time	12:42	13:44	13:37	8:24	8:33
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	0.115 J	<0.2	<0.2	<0.2
Chloride	300	mg/L	13.5 J	11.6	9.78	10.9 J	10.3 J
Nitrate	300	mg/L	<0.6	<0.6	<0.6	<0.6	<0.6
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	1.55	2.26	10.5	3.95	4.34
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	259 J	266	180	1370 J	1390 J
Total Organic Carbon	9060MOD	mg/L	91.4	62.3	29.6	778	822
Arsenic, Total	6010B\3005A	mg/L	<0.01	0.00752 J	0.00688 J	0.0054 J	0.0055 J
Manganese, Total	6010B\3005A	mg/L	0.124	0.109	0.0889	0.317	0.324
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	69.2	47.6	27.3	426	385
Butyric Acid	830-MBA	mg/L	16.1	8.59	2.6	189	158
Lactic Acid	830-MBA	mg/L	<1	<1	<1	1.91	0.727 J
Propionic Acid	830-MBA	mg/L	96.9	60.7	15.8	973	763
Pyruvic Acid	830-MBA	mg/L	0.288 B	0.423	0.391	<0.1	0.826 B
Carbon Dioxide	RSK175\5021	ug/L	140000	100000	160000	320000	310000
Ethane	RSK175\5021	ug/L	<25	<25	<25	<25	<25
Ethene	RSK175\5021	ug/L	<25	<25	<25	<25	<25
Methane	RSK175\5021	ug/L	1600	1100	4000	3300	3400
Hydrogen	AM20GAX	nM	2.8	1.9	7.5	16	14

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TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW21-05B	MW-115	MW21	PMW21-01	PMW21-02
		Lab ID	L0709530-09	L0709471-12	L0709422-05	L0709422-01	L0709422-02
		Date	9/20/2007	9/19/2007	9/18/2007	9/18/2007	9/18/2007
		Time	10:38	11:23	10:11	12:03	13:34
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	11.7 J	11.7	14.8	12.9	11.7
Nitrate	300	mg/L	0.329 J	2.36	3.89	3.5	4.15
Nitrite	300	mg/L	<0.4	0.131 J	<0.4	<0.4	<0.4
Sulfate	300	mg/L	5.77	9.12	10.9	16.2	13.5
Sulfide	376.1	mg/L	1.07	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	179 J	226	81.2	100	89.9
Total Organic Carbon	9060MOD	mg/L	43.5	40.9	<1	<1	<1
Arsenic, Total	6010B\3005A	mg/L	0.00959 J	0.00755 J	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.137	0.238	<0.01	<0.01	0.0328
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	0.00559 J	<0.01
Acetic Acid	830-MBA	mg/L	43.2	17.1	<1	<1	<1
Butyric Acid	830-MBA	mg/L	0.833 J	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	40.3	58.9	11	<10	<10
Pyruvic Acid	830-MBA	mg/L	0.406 B	0.411	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	140000	130000	150000	99000	64000
Ethane	RSK175\5021	ug/L	<25	<25	<25	<25	<50
Ethene	RSK175\5021	ug/L	<25	<25	<25	<25	<50
Methane	RSK175\5021	ug/L	740	5800	39	45	110
Hydrogen	AM20GAX	nM	4.4	2.3	1.9	1.7	6.8

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TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW21-03 DUP	PMW21-03	PMW21-04	PMW21-05	IW101-01A
		Lab ID	L0709471-09	L0709471-11	L0709422-03	L0709422-04	L0709182-10
		Date	9/19/2007	9/19/2007	9/18/2007	9/18/2007	9/10/2007
		Time	8:30	8:27	15:27	8:32	10:42
		Area	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 21	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	12.3	12.6	12.7	24.4	21.5
Nitrate	300	mg/L	4.17	4.18	3.73	4.27	<0.6
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	14.1	14	17.7	18.2	1.46
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	81.2	81.4	115	68.4	2170
Total Organic Carbon	9060MOD	mg/L	<1	<1	<1	<1	1130
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	<0.01	<0.01	0.00648 J	0.0287	1.81
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	0.00591 J	<0.01
Acetic Acid	830-MBA	mg/L	<1	<1	<1	<1	557
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	156
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	384
Propionic Acid	830-MBA	mg/L	<10	<10	<10	<10	1270
Pyruvic Acid	830-MBA	mg/L	0.505	0.394	0.232	0.236	10.2
Carbon Dioxide	RSK175\5021	ug/L	120000	82000	87000	81000	390000
Ethane	RSK175\5021	ug/L	<25	<25	<25	<5	<5
Ethene	RSK175\5021	ug/L	<25	<25	<25	<5	<5
Methane	RSK175\5021	ug/L	34	45	43	5.8	3900
Hydrogen	AM20GAX	nM	1.7	2.7	1.9	1.7	1.2

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TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-01B DUP	IW101-01B	IW101-01C	IW101-02A	IW101-02B
		Lab ID	L0709182-09	L0709182-11	L0709237-01	L0709237-02	L0709280-11
		Date	9/10/2007	9/10/2007	9/11/2007	9/11/2007	9/12/2007
		Time	12:47	12:45	8:07	15:00	8:12
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	0.188 J
Chloride	300	mg/L	14.4	14.4	18	20.8	19.1 J
Nitrate	300	mg/L	<0.6	<0.6	0.586 J	0.626	2.87
Nitrite	300	mg/L	<0.4	<0.4	<0.4	0.108 J	<0.4
Sulfate	300	mg/L	4.17	4.34	13.1	8.9	20.4
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	247	242	180	294	132 J
Total Organic Carbon	9060MOD	mg/L	31.4	30.7	29.3	121	0.583 J
Arsenic, Total	6010B\3005A	mg/L	0.0169	0.017	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.514	0.519	0.04	0.418	0.0137
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	29.6	29.2	30.3	76.6	1.7
Butyric Acid	830-MBA	mg/L	1.72	1.42	3.19	5.91	<1
Lactic Acid	830-MBA	mg/L	<1	0.758 J	<1	5.8	<1
Propionic Acid	830-MBA	mg/L	33.3	39.1	24.8	152	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	0.787	<0.1
Carbon Dioxide	RSK175\5021	ug/L	88000	110000	150000 J	170000 J	170000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	280	250	670	1900	30
Hydrogen	AM20GAX	nM	13	13	3.8	2.5	1.5

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TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-02C	IW101-03A	IW101-03B	IW101-03C	IW101-04A
		Lab ID	L0709280-12	L0709280-13	L0709280-16	L0709280-17	L0709280-07
		Date	9/12/2007	9/12/2007	9/12/2007	9/12/2007	9/12/2007
		Time	9:47	11:43	13:57	15:24	15:57
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.59	0.539	0.164 J	1.44	14.8
Chloride	300	mg/L	20.7 J	21.4 J	11.4 J	12.9 J	24.4 J
Nitrate	300	mg/L	0.615	0.294 J	2.75	0.255 J	<0.6
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	3.27	3.27	15.6	4.03	0.979 J
Sulfide	376.1	mg/L	0.557 J	0.709 J	<1	0.536 J	<1
Alkalinity, Total	310.2	mg/L	267 J	296 J	113 J	202 J	2580 J
Total Organic Carbon	9060MOD	mg/L	78.9 J	145 J	11.5 J	71.4 J	1690 J
Arsenic, Total	6010B\3005A	mg/L	0.0147	<0.01	<0.01	<0.01	0.029
Manganese, Total	6010B\3005A	mg/L	0.199	0.0807	0.0202	0.0313	0.269
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	90.3	104	8.94	47.4	696
Butyric Acid	830-MBA	mg/L	4.17	3.77	1.68	12.6	148
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	873
Propionic Acid	830-MBA	mg/L	88.5	174	12	81	1640
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	25.4
Carbon Dioxide	RSK175\5021	ug/L	230000 J	84000 J	200000 J	99000 J	530000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	3600	4800 J	110	3200	5000
Hydrogen	AM20GAX	nM	370	1.5	1.7	79	2.6

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--: Not Sampled

TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-04B	IW101-04C	IW101-05A	IW101-05B	IW101-05C DUP
		Lab ID	L0709346-11	L0709346-12	L0709237-05	L0709280-08	L0709280-06
		Date	9/14/2007	9/14/2007	9/11/2007	9/12/2007	9/12/2007
		Time	11:20	12:46	15:58	9:13	12:15
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.201	0.716	<0.2	0.207	0.332
Chloride	300	mg/L	17.5 J	16.2 J	22.7	11.8 J	19.7 J
Nitrate	300	mg/L	<0.6	<0.6	0.464 J	1.41	0.711
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	3.41	1.01	4.92	22.7	7.88
Sulfide	376.1	mg/L	<1	<1	2.62	<1	0.616 J
Alkalinity, Total	310.2	mg/L	357 J	245 J	1040	150 J	284 J
Total Organic Carbon	9060MOD	mg/L	21.8	60.8	547	<1	57.4 J
Arsenic, Total	6010B\3005A	mg/L	0.0129	0.00788 J	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.56 J	0.272 J	0.0519	0.0412	0.0899
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	7.52	30.5	353	<1	24.6
Butyric Acid	830-MBA	mg/L	<1	0.518 J	12.1	<1	1.38
Lactic Acid	830-MBA	mg/L	<1	0.766 J	31.5	<1	<1
Propionic Acid	830-MBA	mg/L	31.8	91.2	728	<10	93.9
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	0.487	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	190000	26000	280000	190000 J	200000 J
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	8900	3700	5600	430	4200
Hydrogen	AM20GAX	nM	2.4	19	3	18	28

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--: Not Sampled

TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-05C	IW101-06A	IW101-06B	IW101-06C	IW101-07A
		Lab ID	L0709280-09	L0709237-06	L0709237-07	L0709237-08	L0709322-02
		Date	9/12/2007	9/11/2007	9/11/2007	9/11/2007	9/13/2007
		Time	12:13	9:45	12:14	14:04	8:29
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.319	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	19.8 J	20.4	16.3	11.2	14.4
Nitrate	300	mg/L	0.656	0.657 J	2.46	<0.6	0.159 J
Nitrite	300	mg/L	<0.4	<0.4	0.229 J	<0.4	<0.4
Sulfate	300	mg/L	8.91	5.14	11.5	2.08	2.45
Sulfide	376.1	mg/L	0.557 J	0.628 J	<1	0.696 J	0.997 J
Alkalinity, Total	310.2	mg/L	285 J	373	97.8	156	165
Total Organic Carbon	9060MOD	mg/L	60.2 J	142	5.05	49.4	28.5
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.0959	0.179	0.00881 J	0.0231	0.082
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	25.3	82.5	4.72	39.6	28.9
Butyric Acid	830-MBA	mg/L	1.47	5.04	<1	6.34	<1
Lactic Acid	830-MBA	mg/L	<1	44.9	<1	<1	<1
Propionic Acid	830-MBA	mg/L	93.5	157	<10	50.3	30.3
Pyruvic Acid	830-MBA	mg/L	<0.1	2.2	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	170000 J	110000	140000	110000	120000 J
Ethane	RSK175\5021	ug/L	<5	<10	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<10	<5	<5	<5
Methane	RSK175\5021	ug/L	4600	1800	21	2200	1800 J
Hydrogen	AM20GAX	nM	28	2.4	14	16	5.1

<: Not detected above Reporting Limit (RL)
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B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-07B	IW101-07C	IW101-08A	IW101-08B DUP	IW101-08B
		Lab ID	L0709322-05	L0709322-06	L0709182-05	L0709182-04	L0709182-06
		Date	9/13/2007	9/13/2007	9/10/2007	9/10/2007	9/10/2007
		Time	10:57	12:19	9:15	11:47	11:49
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	9.54	11.4	21.7	12.2	12.3
Nitrate	300	mg/L	<0.6	<0.6	0.187 J	<0.6	<0.6
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	1.95	1.32	21.1	2.33	2.31
Sulfide	376.1	mg/L	0.791 J	0.628 J	<1	<1	<1
Alkalinity, Total	310.2	mg/L	145	174	258	272	278
Total Organic Carbon	9060MOD	mg/L	27.2	64.9	42.8	129	128
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	0.00682 J	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.0902	0.0447	0.256	0.286	0.271
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	28.4	52.9	27.5	129	127
Butyric Acid	830-MBA	mg/L	<1	7.5	1.93	8.79	8.63
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	25.8	69.9	59.3	123	119
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	100000 J	82000 J	160000	190000	160000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	2500	1800	2100	8500	8500
Hydrogen	AM20GAX	nM	2.7	74	2.6	15	16

<: Not detected above Reporting Limit (RL)
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--: Not Sampled

TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW101-08C	IW101-09A	IW101-09B	IW101-09C	DR1-3 DUP
		Lab ID	L0709182-07	L0709322-07	L0709322-08	L0709346-13	L0709471-03
		Date	9/10/2007	9/13/2007	9/13/2007	9/14/2007	9/19/2007
		Time	14:37	14:40	16:07	11:22	10:49
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	15.5	<0.2
Chloride	300	mg/L	7.72	28	11.9	12.2 J	19.9
Nitrate	300	mg/L	<0.6	3.13	<0.6	<0.6	<0.6
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	1.25	32	<1	<1	<1
Sulfide	376.1	mg/L	<1	1.02	<1	<1	<1
Alkalinity, Total	310.2	mg/L	538	243	1480	513 J	254
Total Organic Carbon	9060MOD	mg/L	309	16.5	989	280	<1
Arsenic, Total	6010B\3005A	mg/L	0.00778 J	<0.01	<0.01	<0.01	0.00674 J
Manganese, Total	6010B\3005A	mg/L	0.0873	<0.01	0.338	0.0379 J	2.84
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	197	29.5	449	173	<1
Butyric Acid	830-MBA	mg/L	85.7	<1	426	146	<1
Lactic Acid	830-MBA	mg/L	1.39	7.51	1.09	0.589 J	<1
Propionic Acid	830-MBA	mg/L	324	<10	851	247	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	0.275
Carbon Dioxide	RSK175\5021	ug/L	410000	160000 J	470000 J	190000	170000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	4800	62	7400	4700	8900
Hydrogen	AM20GAX	nM	220	1.5	2.2	180	2.3

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TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	MW-101B	MW-101T	DR1-3	PMW101-01A	PMW101-01B
		Lab ID	L0709237-04	L0709237-03	L0709471-05	L0709322-10	L0709322-11
		Date	9/11/2007	9/11/2007	9/19/2007	9/13/2007	9/13/2007
		Time	11:37	10:10	10:47	8:59	11:08
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	18.8	18.8	19.9	23.3	18.7
Nitrate	300	mg/L	3.73 J	4.8 J	<0.6	<0.6	0.383 J
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	21.4	20.2	<1	<1	15
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	126	114	252	3580	342
Total Organic Carbon	9060MOD	mg/L	<1	<1	<1	2500	94.2
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	0.0187	0.00836 J
Manganese, Total	6010B\3005A	mg/L	0.0798	<0.01	2.93	17.4	0.337
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.02	0.00656
Acetic Acid	830-MBA	mg/L	<1	<1	<1	959	45.5
Butyric Acid	830-MBA	mg/L	<1	<1	<1	595	5.6
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	<10	<10	<10	2530	120
Pyruvic Acid	830-MBA	mg/L	0.738	<0.1	<0.1	<2	<0.1
Carbon Dioxide	RSK175\5021	ug/L	160000	95000	160000	980000 J	180000 J
Ethane	RSK175\5021	ug/L	<5	<5	<25	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<25	<5	<5
Methane	RSK175\5021	ug/L	260	8.3	9000	22000	7600
Hydrogen	AM20GAX	nM	1.5	1.6	2	2.1	2

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TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-02A	PMW101-02B	PMW101-03A	PMW101-03B	PMW101-04A
		Lab ID	L0709322-12	L0709322-13	L0709399-04	L0709399-05	L0709399-06
		Date	9/13/2007	9/13/2007	9/17/2007	9/17/2007	9/17/2007
		Time	12:59	14:40	8:31	9:50	11:07
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	0.176 J	0.271	0.204
Chloride	300	mg/L	16.6	19.8	20.9	20.1	20.7
Nitrate	300	mg/L	0.167 J	<0.6	1.33	0.3 J	0.322 J
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	7.73	1.33	17.7	2.39	1.9
Sulfide	376.1	mg/L	<1	<1	<1	0.536 J	<1
Alkalinity, Total	310.2	mg/L	374	413	174	274	502
Total Organic Carbon	9060MOD	mg/L	53.3	104	<1	30.2	54.6
Arsenic, Total	6010B\3005A	mg/L	0.0227	0.017	<0.01	0.0164	0.00533 J
Manganese, Total	6010B\3005A	mg/L	8.61	0.778	0.013	0.613	3.1
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	44.5	86.3	<1	9.92	21.2
Butyric Acid	830-MBA	mg/L	3.17	3.88	<1	0.522 J	<1
Lactic Acid	830-MBA	mg/L	<1	<1	1.83	<1	<1
Propionic Acid	830-MBA	mg/L	59.2	139	<10	45.1	85.3
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	0.474	0.308	0.377
Carbon Dioxide	RSK175\5021	ug/L	92000 J	53000 J	100000	83000	94000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<50	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<50	<5
Methane	RSK175\5021	ug/L	2700	5000	19 B	12000	160
Hydrogen	AM20GAX	nM	1.6	4.9	2	3	4.5

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--: Not Sampled

TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-04B	PMW101-05A	PMW101-05B	PMW101-06A	PMW101-06B
		Lab ID	L0709399-07	L0709399-08	L0709399-09	L0709422-09	L0709422-10
		Date	9/17/2007	9/17/2007	9/17/2007	9/18/2007	9/18/2007
		Time	12:38	14:06	15:34	8:43	10:04
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.17 J	0.216	0.154 J	<0.2	<0.2
Chloride	300	mg/L	20.9	19.5	10.8	19.3	17.9
Nitrate	300	mg/L	0.304 J	<0.6	0.757	3.11	<0.6
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	3.29	7.08	0.652 J	17.5	3.08
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	210	191	180	99.8	201
Total Organic Carbon	9060MOD	mg/L	30.4	<1	40.1	<1	2.69
Arsenic, Total	6010B\3005A	mg/L	0.00705 J	0.0124	<0.01	<0.01	0.00693 J
Manganese, Total	6010B\3005A	mg/L	1.12	1.21	0.157	0.0629	0.419
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	0.00583 J	<0.01
Acetic Acid	830-MBA	mg/L	29.6	<1	19.2	<1	5.07
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	29.4	<10	58.6	<10	<10
Pyruvic Acid	830-MBA	mg/L	0.441	<0.1	<0.1	<0.1	0.347
Carbon Dioxide	RSK175\5021	ug/L	95000 J	130000	91000	140000	140000
Ethane	RSK175\5021	ug/L	<5	<25	<5	<25	<25
Ethene	RSK175\5021	ug/L	<5	<25	<5	<25	<25
Methane	RSK175\5021	ug/L	5500 J	13000	1800 J	320	12000
Hydrogen	AM20GAX	nM	1.9	1.5	2	1.7	2.5

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--: Not Sampled

TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW101-07A	PMW101-07B	PMW101-08A	PMW101-08B	IW85-01
		Lab ID	L0709422-11	L0709422-12	L0709422-13	L0709471-04	L0709322-14
		Date	9/18/2007	9/18/2007	9/18/2007	9/19/2007	9/13/2007
		Time	11:38	13:42	15:42	9:12	12:40
		Area	TTA-1 101	TTA-1 101	TTA-1 101	TTA-1 101	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	23.2	11.3	29.4	7.73	19.1
Nitrate	300	mg/L	<0.6	4.5	1.91	3.37	0.89
Nitrite	300	mg/L	<0.4	0.25 J	<0.4	<0.4	<0.4
Sulfate	300	mg/L	36.7	6.93	36.1	2.46	5.03
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	178	55.2	221	41.2	165
Total Organic Carbon	9060MOD	mg/L	<1	0.555 J	0.548 J	0.846 J	57.9
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.425	<0.01	0.24	0.00541 J	0.194
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	<1	<1	<1	40.9
Butyric Acid	830-MBA	mg/L	<1	<1	<1	<1	6.96
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	1.02
Propionic Acid	830-MBA	mg/L	<10	<10	<10	<10	67
Pyruvic Acid	830-MBA	mg/L	0.418	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	150000	98000	210000	67000	94000 J
Ethane	RSK175\5021	ug/L	<25	<25	<25	<5	<5
Ethene	RSK175\5021	ug/L	<25	<25	<25	<5	<5
Methane	RSK175\5021	ug/L	1400	3900	3600	1100	940
Hydrogen	AM20GAX	nM	2.3	1.6	2	1.8	3.5

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--: Not Sampled

TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW85-02	IW85-05 DUP	IW85-05	IW85-06	IW92-01
		Lab ID	L0709346-04	L0709346-01	L0709346-05	L0709322-15	L0709471-07
		Date	9/14/2007	9/14/2007	9/14/2007	9/13/2007	9/19/2007
		Time	11:19	8:29	8:31	14:41	8:58
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	6.87	1.07	1.04	<0.2	<0.2
Chloride	300	mg/L	30.6 J	20.2 J	19.2 J	25.9	16.8
Nitrate	300	mg/L	<0.6	<0.6	<0.6	0.135 J	<0.6
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	<1	3.28	3.42	1.29	7.36
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	1400 J	190 J	189 J	480	180
Total Organic Carbon	9060MOD	mg/L	878	56.7	58.9	184	54.3
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.591 J	0.357 J	0.377 J	2.33	0.282
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	0.00632 J	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	557	40.1	40.3	108	47.2
Butyric Acid	830-MBA	mg/L	63.4	8.5	8.6	12.2	2.25
Lactic Acid	830-MBA	mg/L	2.15	<1	<1	1.08	0.732 J
Propionic Acid	830-MBA	mg/L	1140	65.3	65.1	227	49.5
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	0.214
Carbon Dioxide	RSK175\5021	ug/L	360000	77000	54000	120000	120000
Ethane	RSK175\5021	ug/L	<5	<10	<25	<5	<25
Ethene	RSK175\5021	ug/L	<5	<10	<25	<5	<25
Methane	RSK175\5021	ug/L	5300	14	39	1300	210
Hydrogen	AM20GAX	nM	5.9	2.7	2.6	3.5	2.9

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--: Not Sampled

TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW92-02	IW92-03	IW92-04	IW92-05	IW92-06
		Lab ID	L0709471-08	L0709422-06	L0709422-07	L0709399-01	L0709346-02
		Date	9/19/2007	9/18/2007	9/18/2007	9/17/2007	9/14/2007
		Time	8:25	12:54	9:13	8:56	16:24
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.856	3.58	3.08	<0.2	90.9
Chloride	300	mg/L	16.4	14.7	15.7	<0.2	25.8 J
Nitrate	300	mg/L	<0.6	<0.6	<0.6	<0.6	0.138 J
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	17.6	3.03	1.35	<1	<1
Sulfide	376.1	mg/L	<1	0.568 J	<1	<1	<1
Alkalinity, Total	310.2	mg/L	278	296	1130	9130	3960 J
Total Organic Carbon	9060MOD	mg/L	198	176	668	6790	6450
Arsenic, Total	6010B\3005A	mg/L	<0.01	0.00666 J	<0.01	<0.01	<0.02
Manganese, Total	6010B\3005A	mg/L	0.415	0.294	10.2	0.884	1.35 J
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	0.0113	0.00915 J
Acetic Acid	830-MBA	mg/L	25.9	91.5	492	4080	3360
Butyric Acid	830-MBA	mg/L	8.83	30	31.3	756	1090
Lactic Acid	830-MBA	mg/L	0.878 J	7.38	0.57 J	5.52	12.9
Propionic Acid	830-MBA	mg/L	39.8	159	654	6620	4840
Pyruvic Acid	830-MBA	mg/L	<0.1	0.713	0.236	0.923	2.04
Carbon Dioxide	RSK175\5021	ug/L	140000	220000	140000	470000	580000
Ethane	RSK175\5021	ug/L	<25	<25	<25	<5	<5
Ethene	RSK175\5021	ug/L	<25	<25	<25	<5	<5
Methane	RSK175\5021	ug/L	490	1800	500	1200	4500
Hydrogen	AM20GAX	nM	--	--	--	--	--

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--: Not Sampled

TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW92-07	IW92-08 DUP	IW92-08	DR2-1	DR2-5
		Lab ID	L0709346-03	L0709399-12	L0709399-02	L0709280-05	L0709322-16
		Date	9/14/2007	9/17/2007	9/17/2007	9/12/2007	9/13/2007
		Time	14:07	14:43	14:42	16:16	8:32
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	--	15.4	14.9	0.606	<0.2
Chloride	300	mg/L	16.1 J	26.7	27	22.8 J	16.3
Nitrate	300	mg/L	0.59 J	<0.6	<0.6	<0.6	3.66
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	7.16	<1	<1	7.98	8.55
Sulfide	376.1	mg/L	<1	<1	<1	<1	0.723 J
Alkalinity, Total	310.2	mg/L	1430 J	1410	1380	568 J	46.2
Total Organic Carbon	9060MOD	mg/L	1150	736	723	105 J	<1
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.82 J	0.102	0.102	0.301	0.00508 J
Selenium, Total	6010B\3005A	mg/L	<0.01	0.00603 J	0.00795 J	<0.01	0.0066
Acetic Acid	830-MBA	mg/L	749	418	414	31.8	<1
Butyric Acid	830-MBA	mg/L	187	128	127	4.9	<1
Lactic Acid	830-MBA	mg/L	1.36	1.21	0.919 J	<1	<1
Propionic Acid	830-MBA	mg/L	1500	950	934	163	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	0.288	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	210000	48000	71000	280000 J	41000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	2500	1100	2300	7800	5 J
Hydrogen	AM20GAX	nM	1.9	2.7	--	2	1.7

<: Not detected above Reporting Limit (RL)
J: Estimated result based on QC data or reported below RL
B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	IW-01	MW-85	PMW85-01	PMW85-04	PMW85-05
		Lab ID	L0709346-06	L0709237-13	L0709182-01	L0709182-02	L0709182-03
		Date	9/14/2007	9/11/2007	9/10/2007	9/10/2007	9/10/2007
		Time	13:03	9:20	13:32	11:01	8:30
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	0.43	<0.2	<0.2	<0.2	<0.2
Chloride	300	mg/L	21.2 J	17.6	19.5	27.4	22.7
Nitrate	300	mg/L	1.53	1.11 J	1.36	<0.6	2.63
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	16.5	10.7	7.35	1.49	8.76
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	55.9 J	265	233	530	35.6
Total Organic Carbon	9060MOD	mg/L	1.53	70.2	71.3	470	<1
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.02	<0.01
Manganese, Total	6010B\3005A	mg/L	0.625 J	5.67	0.805	11.7	0.00792 J
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01	<0.01	<0.02	<0.01
Acetic Acid	830-MBA	mg/L	<1	28.5	61	293	<1
Butyric Acid	830-MBA	mg/L	<1	6.28	6.61	19.9	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	<10	109	122	657	<10
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	250000 J	120000 J	130000	190000	58000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	4200 J	9.1	26	1900	9 B
Hydrogen	AM20GAX	nM	1.3	--	2.3	720	1.3

<: Not detected above Reporting Limit (RL)
J: Estimated result based on QC data or reported below RL
B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW92-01	PMW92-02	PMW92-03 DUP	PMW92-03	PMW92-04
		Lab ID	L0709280-02	L0709280-03	L0709280-01	L0709280-04	L0709237-10
		Date	9/12/2007	9/12/2007	9/12/2007	9/12/2007	9/11/2007
		Time	12:52	10:51	8:31	8:34	15:23
		Area	TTA-2	TTA-2	TTA-2	TTA-2	TTA-2
Analyte	**Method**	**Units**					
Bromide	300	mg/L	<0.2	3.4	0.153 J	0.13 J	<0.2
Chloride	300	mg/L	23.8 J	36.2 J	18.8 J	19.2 J	25.6
Nitrate	300	mg/L	1.77	<0.6	<0.6	<0.6	0.363 J
Nitrite	300	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4
Sulfate	300	mg/L	8.68	<1	2.23	2.1	4.38
Sulfide	376.1	mg/L	<1	<1	<1	<1	<1
Alkalinity, Total	310.2	mg/L	62.8 J	1490 J	228 J	228 J	191
Total Organic Carbon	9060MOD	mg/L	<1	1270 J	<3	<1	44.4
Arsenic, Total	6010B\3005A	mg/L	0.0267	0.0187	<0.01	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	0.253	10.4	0.0462	0.0431	1.23
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.02	<0.01	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	770	<1	<1	37.7
Butyric Acid	830-MBA	mg/L	<1	28.2	<1	<1	<1
Lactic Acid	830-MBA	mg/L	<1	<1	<1	<1	<1
Propionic Acid	830-MBA	mg/L	<10	697	<10	<10	49.6
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	120000 J	460000 J	92000 J	76000 J	96000
Ethane	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5	<5	<5	<5
Methane	RSK175\5021	ug/L	7.6	14000	13	6.4	290
Hydrogen	AM20GAX	nM	1.6	2.7	2.4	1.7	2.4

<: Not detected above Reporting Limit (RL)
J: Estimated result based on QC data or reported below RL
B: Estimated result possibly biased high or false positive based on blank data
--: Not Sampled

TABLE F-12
MONITORED NATURAL ATTENUATION PARAMETERS
FORTH QUARTER SAMPLES
YEAR ONE REMEDIAL ACTION OPERATIONS REPORT
Main Installation - Defense Depot Memphis, Tennessee

		Sample ID	PMW92-05	PMW92-06
		Lab ID	L0709237-11	L0709237-12
		Date	9/11/2007	9/11/2007
		Time	13:37	11:26
		Area	TTA-2	TTA-2
Analyte	**Method**	**Units**		
Bromide	300	mg/L	<0.2	<0.2
Chloride	300	mg/L	21.5	20.8
Nitrate	300	mg/L	2.56 J	0.182 J
Nitrite	300	mg/L	<0.4	<0.4
Sulfate	300	mg/L	14.2	3.91
Sulfide	376.1	mg/L	<1	<1
Alkalinity, Total	310.2	mg/L	62.1	156
Total Organic Carbon	9060MOD	mg/L	<1	35.3
Arsenic, Total	6010B\3005A	mg/L	<0.01	<0.01
Manganese, Total	6010B\3005A	mg/L	<0.01	0.65
Selenium, Total	6010B\3005A	mg/L	<0.01	<0.01
Acetic Acid	830-MBA	mg/L	<1	25.4
Butyric Acid	830-MBA	mg/L	<1	3.16
Lactic Acid	830-MBA	mg/L	<1	<1
Propionic Acid	830-MBA	mg/L	<10	41.3
Pyruvic Acid	830-MBA	mg/L	<0.1	<0.1
Carbon Dioxide	RSK175\5021	ug/L	110000 J	150000 J
Ethane	RSK175\5021	ug/L	<5	<5
Ethene	RSK175\5021	ug/L	<5	<5
Methane	RSK175\5021	ug/L	10	130
Hydrogen	AM20GAX	nM	--	1.9

<: Not detected above Reporting Limit (RL)
J: Estimated result based on QC data or reported below RL
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--: Not Sampled

APPENDIX G

DATA QUALITY EVALUATION

APPENDIX G

DATA QUALITY EVALUATION

The Enhanced Bioremediation Treatment (EBT) System sampling for the Baseline, Design Monitoring, and the four Quarterly events at the Main Installation was performed in general accordance with the field and laboratory procedures specified in the *Remedial Action Sampling and Analysis Plan, Revisions 0 and 1* (RA SAP) (MACTEC).

The data quality evaluation (DQE) process involves assessment of all field and laboratory procedures, including the independent data validation completed by Diane Short and Associates, Inc (DSA) in accordance with the RA SAP. This assessment is designed to evaluate any problems with the quality assurance (QA)/quality control (QC) associated with the laboratory data and potential impact to the data quality objectives (DQOs) . The DQE findings are summarized in the following sections.

FIELD ACTIVITIES AND FIELD QUALITY CONTROL

Groundwater monitoring included the evaluation of primary and secondary performance monitoring parameters. The primary parameters are laboratory analyses of VOCs and natural attenuation parameters, including metabolic fatty acids (MFA) which are used to track the distribution of sodium lactate in the EBT zones. Field measurements included the secondary performance parameters oxygen reduction potential (ORP), dissolved oxygen (DO), and pH, and the water quality measurements conductivity, temperature, turbidity, ferrous iron, and carbon dioxide.

The field effort included the collection of groundwater samples from injection and performance monitoring wells. The well locations in the three treatment areas (TTA-1 MW21, TTA-1 MW101, and TTA-2) are provided in Figures 2 and 3 of this report. Field QC samples were also collected at selected wells to evaluate sampling technique and decontamination procedures. These samples included field duplicates, trip blanks, and field equipment (rinsate) blanks. Additional sample volume was collected for matrix spike/matrix spike duplicate (MS/MSD) analyses in the laboratory. Documentation of the sampling was performed in the field to ensure that the sample collected, labeling, chain-of-custody, and request for analysis were in agreement. Sample bottles met EPA requirements for environmentally clean containers. Sample labels were pre-printed and chain-of-custody forms were created by scanning the labels electronically (using a personal data assistant or PDA) to facilitate sample tracking from the field through the laboratory to the final laboratory report. Custody seals were placed on each cooler before shipment by common carrier.

ANALYTICAL METHODS

The groundwater samples were analyzed for VOCs by method 8260B, dissolved gases (ethane, ethane, methane, and carbon dioxide) by method RSK-175, selected metals (arsenic, manganese, and selenium) by method 6010B, anions (bromide, chloride, nitrate, nitrate, and sulfate) by method 300.0, total organic carbon (TOC) by method 9060B, alkalinity by method 310.1, sulfide by method 376.1, and MFAs by method 850 MBA (Kemron, Inc) and dissolved hydrogen by method AM20GAX (Microseeps Corporation). The laboratory QC program, including sample handling, laboratory control, and reporting, is documented in the RA SAP. Sample handling includes documentation of sample receipt, placement in storage, laboratory personnel using the sample, and disposal. The laboratory control consists of instrument calibration and maintenance, laboratory control samples (LCS), method blanks and matrix spikes. Reporting of the laboratory control data was planned prior to the collection of the data, allowing the laboratory to place the appropriate information into the data package so that the DQE could be completed in a timely manner.

DQE SUMMARY

The objective of the DQE was to provide a review of the chemical data reports submitted by the laboratory and to assess the data in relation to the data quality objectives of the EBT System stated in the RA SAP. The DQE consisted of review of laboratory QC data and field QC parameters, and flagging of the data as usable, usable with qualification, or unusable following the DQE standard operating procedures (SOPs) using the criteria stated in the RA SAP for each analytical method performed. The following information was reviewed:

- Sample Integrity (Deliverables)
- Sample Completeness
- Sample Holding Times
- Laboratory Methods for Extraction and Analysis (Calibration, Internal Standards)
- Method Accuracy and Precision (Surrogates, Matrix Spike/Matrix Spike Duplicate, LCS Recoveries)
- Laboratory Performance Criteria (Blanks, Instrument Performance Check)

Field QC parameters were evaluated through field duplicates, field blanks, field documentation, and shipping criteria. The DQE was summarized by use of flags that indicate to the reviewer that the data being considered has been qualified using the established criteria. Sample delivery group (SDG) narratives detailing the evaluation of the laboratory data by DSA are included as attachments to this appendix. The SDGs and associated groundwater samples are listed on Table G-1.

A DQE was completed on the data reported for the Baseline, Design Monitoring, and four Quarterly sampling events conducted at the Main Installation. The following sections provide summary discussions of the required data qualifications for each event at DDMT. A Level III DQE was performed and the data quality indicators (DQIs), expressed in terms of precision, accuracy, representativeness, comparability, completeness, and sensitivity were assessed. This included the evaluation of sample integrity, holding times, trip blanks, field blanks, method blanks, internal standards, surrogate recoveries, matrix spike/matrix spike duplicate (MS/MSD) recoveries, LCSs, and field duplicate precision. The results of the DQI assessment are provided below.

Precision

Field duplicates were collected to assess sampling precision. They consisted of replicate grab samples collected concurrently with the associated field samples. Precision is best expressed in terms of relative percent difference (RPD). In general, the precision goals were acceptable. Complete discussion of the duplicates is discussed in the attached DQE narratives.

Accuracy

Accuracy was measured through the analyses of LCSs and MS/MSDs. Sample specific accuracy is measured through surrogate recovery. Accuracy is expressed as percent recovery (%R). Complete discussion of the duplicates is discussed in the attached DQE narratives.

Recoveries for LCSs in associated groundwater samples indicated estimated ("J" flagged) data qualification for a few acetone VOC results. In these instances, the LCS recovery was high, and there were no positive results in any of the associated samples. MS/MSD recoveries resulted in qualification for various analytes including VOCs, MFA, and inorganics data in project samples as discussed in the sections below for each sampling event.

Representativeness

Representativeness refers to the degree sample data accurately and precisely describes the population of samples at a sampling point or under certain environmental conditions. Samples that are not properly preserved or are analyzed beyond holding times may not be considered representative. Review of sampling procedures, laboratory preparation, analysis holding times, trip blank and field blank analysis help in providing this assessment.

Sampling procedures followed the work plan and were considered representative of the matrices collected. Laboratory preparation and analysis followed method guidelines.

Comparability

The selection of standardized methods and consistent laboratory practices facilitates the comparison of data between EBT events. Previous event data are comparable to later event data.

Completeness

Completeness is determined for both field and analytical objectives. Field completeness is calculated from the number of samples proposed verses the actual number of samples collected. Analytical completeness is expressed in terms of usable data. The project completeness goal stated in the DDMT RA SAP for DDMT is 90%. Data from the seven EBT events met this completeness DQO.

Sensitivity

Analytical sensitivity is the concentration at which the measurement system can quantitate target analytes in the environmental matrices of concern. The ultimate expression of analytical sensitivity is the reporting quantitation limit (RL). The analytical method RLs and MDLs were compared to groundwater protection or screening standards as provided in RA SAP and were determined to meet the overall project objectives. Dilutions were necessary in some cases to achieve the proper quantification of high-level targets, which raises the RLs for all other targets in the run. In such cases, the both results are provided in hardcopy except for the analytes that are above the upper range in the initial run. These are only shown for the reanalysis. Any elevated RLs due to dilution or other QC issues are discussed below or in the attached narratives.

The following sections discuss only those deficiencies encountered during the evaluation that resulted in qualified and/or unusable data.

Baseline Sampling Event – August/September 2006

During the two phases of the Baseline Sampling in August and September of 2006, 121 groundwater samples were collected from 85 injection and performance monitoring wells. Samples were analyzed for VOCs and MNA parameters. Any result reported below the reporting limit (RL) but above the method detection limit (MDL) was flagged "J" and considered an estimated result (unless overridden by other QC flags).

The data are usable with the following qualifications:

MNA

- There was a general tendency for carbon dioxide to be out of acceptance limits. Qualifiers were added to associated data estimated as J, where CCV %D was observed. Such results may be biased due to calibration drift.
- Carbon dioxide was recovered low in one LCS (IW-01), although in control in the LCSD. The result is qualified as estimated J for associated samples
- Methane, ethene and ethane were qualified estimated J in one sample (MW-101B) and pyruvic acid in one sample (PMW101-01A) based on MS/MSD recoveries.
- Total organic carbon could be biased low as indicated by the low matrix spike/matrix spike duplicate analyte recovery in one sample. The associated sample (IW21-03B) was flagged estimated J.
- Data could be biased high for manganese as indicated by the serial dilution percent difference. Associated samples (IW92-08 and IW-01) were flagged estimated J.
- Nitrite and nitrate data could be biased very slightly low due to an exceedence of the holding time by several hours. Associated samples (DR2-1, IW92-01, PMW101-01A, and PMW101-01B) were flagged estimated J.

VOCs

- Some trip blanks and some method blanks contained VOCs that resulted in the qualification of data as possible false positives or biased high values based on the blank data. This resulted in the "B" qualification of some of the acetone and methylene chloride results in the water samples. The

"B"-qualified data were reported at levels below RLs and MCLs and are most likely related to laboratory contamination. Therefore, these results should not adversely impact data quality.

- 1,-2-DCA and PCE results in one sample (IW21-03B) were flagged "J" and qualified as estimated based on MS/MSD performance.

Design Monitoring Events – October/November 2006

During the October and November 2006 Design Monitoring events, 50 and 47 groundwater samples were collected, respectively from 38 injection and performance monitoring wells in each event. Samples were analyzed for Dissolved Gases, Metabolic Fatty Acids and Hydrogen only. Any result reported below the reporting limit (RL) but above the method detection limit (MDL) was flagged "J" and considered an estimated result (unless overridden by other QC flags).

The October and November 2006 data are usable with the following qualifications:

- Carbon dioxide, for which a number of closing calibrations do not meet the 30% D criterion specified for RSK-175, the associated samples were flagged as estimated J. When the closing calibration has drifted, it indicates that at least some of the sample results prior to the CCV may be biased, and for this reason the results are qualified as J.

- Any result reported below the reporting limit (RL) but above the method detection limit (MDL) was flagged "J" and considered an estimated result (unless overridden by other QC flags).

EBT-1 Sampling Event – December 2006

During the December 2006 EBT-1 sampling event, 115 groundwater samples were collected from 85 injection and performance monitoring wells. Samples were analyzed for VOCs and MNA parameters. Any result reported below the reporting limit (RL) but above the method detection limit (MDL) was flagged "J" and considered an estimated result (unless overridden by other QC flags).

The December 2006 data are usable with the following qualifications:

MNA

- Hydrogen in thirty samples was analyzed outside of that holding time due to equipment malfunctions. Sample results for hydrogen with holding times outside of the method recommendation are qualified as estimated J. It should be noted that laboratory data indicates sample stability well beyond the 14-day holding time so this is not expected to impact the hydrogen data significantly.
- All detected carbon dioxide results are qualified as estimated J, indicating the possibility of bias due to poor initial calibration linearity.
- Three samples were qualified as estimated J based on MS/MSD results. One sample had a high recovery in Lactic acid (IW101-03C), Two samples had low recoveries for acetic acid (IW101-09A) and pyruvic acid (PMW92-05).
- Analysis results qualified as rejected due to holding time violation are considered unusable. Note that only the IC nitrate and nitrite analyses are affected and that the laboratory did provide alternate analytical methods to obtain usable nitrate and nitrite results. The rejected IC results were removed from the EDD and replaced with valid results using alternative methods 353.3 and 354.1 for nitrate and nitrite, respectively.
- Two nitrate samples, PMW92-03 and PMW92-05 were qualified estimated J based on MS/MSD results. Also, one sample for nitrate and four for sulfide were qualified as rejected based on spike recoveries.
- Three total alkalinity samples(IW101-09A, IW101-09B,IW101-09C) , and four total organic carbon samples (IW21-01B, IW21-02A, IW21-03A, IW21-03B) could be biased low based on low matrix spike/matrix spike duplicate analyte recoveries and were qualified estimated J.

VOCs

- The possibility of some bias associated with calibration drift with respect to carbon tetrachloride was indicated in four samples (PMW21-03,PMW21-04, MW115,DR2-1), and where the discrepancy in % D was observed, the associated samples were qualified estimated J
- Carbon tetrachloride and PCE results in samples PMW92-05 and IW101-03C, respectively were flagged "J" and qualified as estimated based on MS/MSD performance.

- There were a number of elevated LCS recoveries observed. When a high recovery is associated with a non-detect in samples, no qualifier is added since the indicated bias is high. When the target is detected, the result is qualified as estimated J. Two samples (PMW92-02, PMW92-04) for cis-1,2-DCE were qualified as estimated J based on elevated LCS recoveries.
- Some trip blanks and some method blanks contained VOCs that resulted in the qualification of data as possible false positives or biased high values based on the blank data. This resulted in the "B" qualification of some of the acetone and methylene chloride results in the water samples. The "B"-qualified data were reported at levels below RLs and MCLs and are most likely related to laboratory contamination. Therefore these results should not adversely impact data quality.

EBT-2 Sampling Event – March 2007

During the March 2007 EBT-2 sampling event, 123 groundwater samples were collected from 87 injection and performance monitoring wells. Samples were analyzed for VOCs and MNA parameters. Any result reported below the reporting limit (RL) but above the method detection limit (MDL) was flagged "J" and considered an estimated result (unless overridden by other QC flags).

The March 2007 data are usable with the following qualifications:

MNA

- Six sample results for hydrogen (IW101-01C, IW21-01B, IW21-02B, IW21-05A, IW101-06C, IW101-08C) with holding times outside of the method recommendation were qualified as estimated J based on holding time exceedances.
- For sample IW21-02B there are three analytes (acetic acid, butyric acid, and pyruvic acid) that were not recovered in the matrix spike for metabolic acids, although they were recovered in the MSD. These results are qualified as R (rejected) to indicate that the sample non-detect is rejected because of the failure to recover the analyte in the matrix spike.
- Field duplicate results were in control except for one acetic acid result (PMW21-03) and three hydrogen results in the DUP-1 (IW21-01A), in the DUP-7 (IW92-06), and the DUP-4 (IW101-01A) pairs, respectively..
- Several samples for bromide, sulfate, and chloride were qualified estimated J based on deviations greater than 10% RSD indicating variability of the instrument calibration response over a range of concentrations and MS/MSD recoveries.

VOCs

- Results for MTBE in three samples (IW21-04A. OW21-05A. IW21-05B) were qualified estimated J based on slightly elevated LCS recoveries. No qualifier was added for non-detect data a high bias.
- In the case of DUP5, the parent sample (IW92-08) has a reported level of carbon tetrachloride at 8.2, and the duplicate is at 1.2 µg/L. All other analytes matched in all other duplicate samples.

EBT-3 Sampling Event – May/June 2007

During the May/June 2007 EBT-3 sampling event, 117 groundwater samples were collected from 87 injection and performance monitoring wells. Samples were analyzed for VOCs and MNA parameters. Any result reported below the reporting limit (RL) but above the method detection limit (MDL) was flagged "J" and considered an estimated result (unless overridden by other QC flags).

The May/June 2007 data are usable with the following qualifications:

MNA

- Seven sample results for hydrogen (IW21-03A ,IW21-03B, IW21-02B, IW101-09C ,IW21-01A, PMW21-04, IW21-05A) with holding times outside of the method recommendation are qualified as estimated J. It should be noted that laboratory data indicates sample stability well beyond the 14-day holding time so this is not expected to impact the hydrogen data significantly.
- For two samples (IW21-03B, IW92-08), pyruvic acid was not recovered in the matrix spike for metabolic acids, although they were recovered in the MSD. These results are qualified as R (rejected) to indicate that the sample non-detect is rejected because of the failure to recover the analyte in the matrix spike. Two samples for butyric (IW-92-08,IW21-03B), four for methane (IW101-02C, DR1-3 IW101-07C, IW92-08) and seven for hydrogen were qualified as estimated J based on MS/MSD results.
- Five samples (IW101-01C, IW101-02A, IW101-02B, PMW101-02A, PMW101-03B) for carbon dioxide was qualified estimated J based on an elevated LCS recovery indicating a high bias.
- Samples from seven SDGs for alkalinity were qualified estimated J based on the possibility of some bias associated with calibration drift, where a discrepancy in % D is observed.

- Several samples for alkalinity, chloride, and TOC were qualified estimated J based on MS/MSD recoveries.

VOCs

- Results for MEK in one sample (PMW92-03), and for carbon tetrachloride in three samples (MW-85,DR2-1. DR2-5) were qualified estimated J based on the possibility of some bias associated with calibration drift, where a discrepancy in % D is observed.
- When a high LCS recovery is associated with a non-detect in samples, no qualifier is added since the indicated bias is high. One sample for vinyl chloride (IW101-08C) was qualified as estimated J based on an elevated LCS recovery.
- Results for PCE (IW101-07C), cis-1,2-DCE (IW101-02C), and acetone (IW92-08, respectively were qualified estimated J based on MS/MSD recoveries.

EBT-4 Sampling Event – September 2007

During the September EBT-4 sampling event, 118 groundwater samples were collected from 87 injection and performance monitoring wells. Samples were analyzed for VOCs and MNA parameters. Any result reported below the reporting limit (RL) but above the method detection limit (MDL) was flagged "J" and considered an estimated result (unless overridden by other QC flags).

The September 2007 data are usable with the following qualifications:

MNA

- Certain VOA vials for RSK-175 analysis were not free of headspace, but there were enough vials free of headspace from the 8260 vials that resampling was generally not necessary. There were two samples for RSK-175 that required resampling, PMW85-04 and -05
- One sample (IW101-07A) for acetic acid and propionic acid were qualified as estimated J based on MS/MSD results.
- Four samples for carbon dioxide (IW101-07A, IW21-02B, IW101-03A, IW-01) and one for methane (IW-01) were qualified estimated J based on MS/MSD recoveries.

- Several samples for bromide and alkalinity were qualified estimated J based on deviations greater than 10% RSD indicating variability of the instrument calibration response over a range of concentrations and MS/MSD recoveries
- The laboratory has noted holding time exceedence for samples in SDGs L0709471 and L0709237. The samples for SDG L0709471 were analyzed for nitrate /nitrite 4 days outside of holding time. The nitrate values may be usable, but the nitrite component was qualified as rejected R. Some of the samples for SDG L0709237 were analyzed shortly after the holding time had expired. These samples were qualified estimated J.

VOCs

- When a high LCS recovery is associated with a non-detect in samples, no qualifier is added since the indicated bias is high. Several samples for acetone (IW92-06, IW92-07, IW85-02, IW21-01A) were qualified as estimated J based on an elevated LCS recovery.
- Results for PCE and cis-DCE in one sample (PMW101-05B) and for trichloropropane acetone, and carbon tetrachloride in a second sample (IW-01) were qualified estimated J based on MS/MSD recoveries.
- Whenever methylene chloride or acetone is detected in associated samples at a level less than 10x the method blank (corrected for dilution), the result is qualified as UB, and is the corrected at method blank level. Such results are usable as non-detects.

SUMMARY

The sample data collected from August 2006 through September 2007 from the injection and performance monitoring wells in the TTA-1 and TTA-2 areas have met the data quality objectives and are therefore deemed sufficient to support decisions regarding the effectiveness of the EBT system performance.

TABLE G-1
SDG SUMMARY TABLE

SDG	Groundwater Samples			Quality Control Samples
Baseline Sampling Event - August/September 2006				
L0608210	IW21-01A	IW21-02B	MW-21	TB-080806
	IW21-01B			TTA-1DUP-1
L0608253	IW21-02A	IW21-03B	PMW21-02	TB-080906
	IW21-03A	PMW21-01	PMW21-04	RB-Phase I
L0608292	IW21-04A	IW21-05B	PMW21-03	TB-081006
	IW21-04B	MW-115	PMW21-05	TTA-1DUP2
L0608509	IW101-01A			TB-082106
L0608510	PMW101-01A	PMW101-01B		PMW101-01A MS
				PMW101-01A MSD
L0608515	IW101-01B	IW101-01C	IW101-02A	TB-082206
				Phase II DUP1
L0608517	PMW101-02A	PMW101-04A	PMW101-05A	Phase II DUP2
	PMW101-02B			
L0608552	PMW101-03A	PMW101-05B	PMW101-06A	TB-082306
	PMW101-03B			
L0608553	IW101-03A	IW101-03B		Phase II DUP3
L0608554	IW101-02B	IW101-02C		
L0608581	PMW101-06B	PMW101-08A	PMW101-08B	PMW101-06B MS
	PMW101-07B			PMW101-06B MSD
L0608582	IW101-03C	IW101-04B	IW101-04C	TB-082406
	IW101-04A			EB-1 Phase II
				Phase II DUP4
L0608599	DR1-3	MW-101B	PMW101-07A	TB-082506
	IW101-05C	MW-101T		Phase II DUP5
				Phase II DUP7
				MW-101B MS
				MW-101B MSD
L0608627	IW101-05A	IW101-06C	IW101-08A	TB-082806
	IW101-05B	IW101-07A	IW101-08B	Phase II DUP8
	IW101-06B			
L0608649	IW101-07B	IW101-09A	IW101-09C	TB-082906
	IW101-07C	IW101-09B	PMW101-04B	EB-2 Phase II
	IW101-08C			IW101-09A MS
				IW101-09A MSD
L0608650	IW101-06A			
L0608682	IW21-04A	IW21-05B	PMW21-03	TB-081006
	IW21-04B	MW-115	PMW21-05	TTA-1DUP2
L0608683	MW-85	PMW85-01	PMW92-01	TB-083006
				Phase II DUP6
L0609049	PMW85-02			
L0609050	IW92-02	DR2-5	IW92-01	
	DR2-1			
L0609052	IW92-03	IW92-05	PMW92-02	TB-083106
	IW92-04			
L0609055	IW92-02	DR2-5	IW92-01	
	DR2-1			
L0609057	IW92-03	IW92-05	PMW92-02	
	IW92-04			
L0609059	PMW85-02	IW92-02		
L0609060	IW92-06	IW92-07		
L0609061	IW85-01	IW85-02	IW85-04	TB-090606
L0609066	IW92-06			
L0609098	IW-01	IW92-08		TB-090506

TABLE G-1
SDG SUMMARY TABLE

SDG	Groundwater Samples			Quality Control Samples
Design Monitoring - October/November 2006				
L0610200	IW101-01A	PMW101-02A	PMW101-02B	PMW101-02B MS
	IW101-01B			PMW101-02B MSD
L0610216	PMW101-04A	IW101-01C	IW101-03B	DM1DUP-1
	PMW101-04B	IW101-03A	IW101-03C	
	PMW101-05A			
L0610259	IW101-04A	PMW101-05B	PMW101-07B	
	IW101-04B	PMW101-07A	PMW101-08A	
	IW101-04C			
L0610309	IW101-08A	IW21-01A	PMW101-08B	DM1DUP-2
	IW101-08B	MW-21	PMW21-03	IW101-08A MS
	IW101-08C			IW101-08A MSD
				MW-21 MS
				MW-21 MSD
				PMW101-08B MS
				PMW101-08B MSD
L0610353	IW21-01B	IW21-03B	IW92-01	
	IW21-03A			
L0610399	DR2-1	IW92-05	IW92-07	DM1DUP-3
	IW92-03			DM1DUP-4
L0610433	IW85-04	PMW92-01	PMW92-05	
	PMW85-01	PMW92-04		
L0611101	PMW101-02A	PMW101-04A	PMW101-05A	PMW101-05A MS
	PMW101-02B	PMW101-04B		PMW101-05A MSD
L0611102	IW101-01A	IW101-01C	IW101-03B	IW101-03A MS
	IW101-01B	IW101-03A		IW101-03A MSD
L0611123	PMW101-05B	PMW101-07B	PMW101-08A	
	PMW101-07A			
L0611124	IW101-03C	IW101-04B	IW101-08A	
	IW101-04A	IW101-04C	IW101-08B	
L0611148	IW101-08C	IW21-01B	IW21-03A	DM2DUP-2
	IW21-01A			
L0611149	MW-21	PMW101-08B	PMW21-03	
L0611150				RB-1
				RB-2
L0611191	IW21-03B	IW92-03	IW92-07	DM2DUP-3
	IW92-01	IW92-05		
L0611192	DR2-1	PMW92-01	PMW92-05	DM2DUP-4
	PMW85-01	PMW92-04		
L0611264	IW85-04			

TABLE G-1
SDG SUMMARY TABLE

SDG	Groundwater Samples			Quality Control Samples
EBT-1 Sampling Event - December 2006				
L0612076	PMW101-01A -E-2	PMW101-05A -E-2	PMW101-06A -E-2	PMW101-01A -E-2 MS
	PMW101-01B -E-2	PMW101-05B -E-2		PMW101-01A -E-2 MSD
L0612077	IW101-01A -E-2	IW101-01C -E-2	IW101-02B -E-2	DUP4
	IW101-01B -E-2	IW101-02A -E-2		
L0612078	PMW101-02A -E-2	PMW101-03A -E-2	PMW101-03B -E-2	TB-121106-E-2
	PMW101-02B -E-2			DUP-8
L0612103	PMW101-04A -E-2	PMW101-08A -E-2	PMW21-05-E-2	
	PMW101-04B -E-2	PMW101-08B -E-2		
L0612104	IW101-02C -E-2	IW101-03B -E-2	IW101-03C -E-2	IW101-03C -E-2 MS
	IW101-03A -E-2			IW101-03C -E-2 MSD
L0612107	DR1-3-E-2	PMW101-07A -E-2	PMW101-07B -E-2	Trip Blank
	PMW101-06B -E-2			
L0612154	MW-21-E-2	PMW21-02-E-2	PMW92-01 -E-2	
	PMW21-01-E-2			
L0612160	IW101-04A -E-2	IW101-05A -E-2	IW101-05C -E-2	DUP-5
	IW101-04B -E-2	IW101-05B -E-2	IW101-06A -E-2	
	IW101-04C -E-2			
L0612161	DR2-1-E-2	PMW21-03-E-2	PMW21-04-E-2	Trip Blank
	MW-115-E-2			DUP-3
L0612201	PMW92-03-E-2	PMW92-05-E-2	PMW92-06 -E-2	PMW92-05-E-2 MS
				PMW92-05-E-2 MSD
L0612202	DR2-5-E-2	PMW92-02-E-2	PMW92-04-E-2	
	IW-01-E-2			
L0612203	IW101-06B -E-2	IW101-07A -E-2	MW-101B-E-2	Trip Blank
	IW101-06C -E-2	IW101-07B -E-2	MW-101T-E-2	
L0612229	IW101-07C -E-2	IW101-08B -E-2	IW101-08C -E-2	DUP-6
	IW101-08A -E-2			
L0612230	IW101-09A -E-2	IW101-09B -E-2	IW101-09C -E-2	IW101-09A -E-2 MS
				IW101-09A -E-2 MSD
L0612231	MW-85-E-2	PMW85-01-E-2	PMW85-02-E-2	DUP-9
L0612274	IW21-01B -E-2	IW21-03A -E-2	IW21-03B -E-2	DUP-2
	IW21-02A -E-2			IW21-02A -E-2 MS
				IW21-02A -E-2 MSD
L0612275	IW21-01A -E-2	IW21-02B -E-2	IW21-04A -E-2	DUP-1
L0612295	IW21-05B -E-2	IW92-01-E-2	IW92-03-E-2	
L0612296	IW21-04B -E-2	IW21-05A -E-2	IW92-02-E-2	Trip Blank
L0612336	IW92-04-E-2	IW92-07-E-2	IW92-08-E-2	
L0612368	IW92-05-E-2	IW92-06-E-2		Trip Blank
				DUP-7
L0612386	IW85-01-E-2	IW85-02-E-2	IW85-04-E-2	Trip Blank

TABLE G-1
SDG SUMMARY TABLE

SDG	Groundwater Samples			Quality Control Samples
EBT-2 Sampling Event - March 2007				
L0703106	IW101-01A -EBT-2	IW101-01C -EBT-2	IW101-02B -EBT-2	
	IW101-01B -EBT-2	IW101-02A -EBT-2		
L0703107	PMW101-01A -EBT-2	PMW101-05A -EBT-2	PMW101-05B -EBT-2	DUP-6
	PMW101-01B -EBT-2			
L0703136	PMW101-02A -EBT-2	PMW101-03A -EBT-2	PMW101-03B -EBT-2	
	PMW101-02B -EBT-2			
L0703140	IW101-02C -EBT-2	PMW101-04A -EBT-2	PMW101-07A -EBT-2	TB-032007-EBT-2
	IW101-03A -EBT-2	PMW101-04B -EBT-2	PMW101-07B -EBT-2	DUP-7
	IW101-03B -EBT-2	PMW101-06A -EBT-2	PMW101-08A -EBT-2	RB1-EBT-2
	MW-101B-EBT-2	PMW101-06B -EBT-2	PMW101-08B -EBT-2	PMW101-07A -EBT-2 MS
	MW-101T-EBT-2			PMW101-07A -EBT-2 MSD
L0703180	DR1-3-EBT-2	IW101-09A -EBT-2	PMW21-02-EBT-2	TB-033007-EBT-2
	IW101-03C -EBT-2	IW101-09B -EBT-2	PMW21-03-EBT-2	DUP-2
	IW101-07A -EBT-2	MW-115-EBT-2	PMW21-04-EBT-2	MW-21-EBT-2 MS
	IW101-07B -EBT-2	MW-21-EBT-2	PMW21-05-EBT-2	MW-21-EBT-2 MSD
	IW101-07C -EBT-2	PMW21-01-EBT-2		
L0703230	DR2-1-EBT-2	IW21-01A -EBT-2	PMW92-01 -EBT-2	TB-032907-EBT-2
	IW101-04A -EBT-2	IW21-01B -EBT-2	PMW92-02-EBT-2	DUP-3
	IW101-04B -EBT-2	IW21-03A -EBT-2	PMW92-03-EBT-2	
	IW101-04C -EBT-2	IW21-03B -EBT-2		
	IW101-09C -EBT-2			
L0703233	IW101-04A -EBT-2			DUP-3
L0703246	IW101-05A -EBT-2	IW101-06B -EBT-2	IW21-04B -EBT-2	TB-032807-EBT-2
	IW101-05B -EBT-2	IW101-06C -EBT-2	PMW92-04-EBT-2	DUP-1
	IW101-05C -EBT-2	IW21-02A -EBT-2	PMW92-05-EBT-2	DUP-8
	IW101-06A -EBT-2	IW21-02B -EBT-2		IW101-06A -EBT-2 MS
				IW101-06A -EBT-2 MSD
				IW21-02B -EBT-2 MS
				IW21-02B -EBT-2 MSD
L0703276	IW-01-EBT-2	IW21-04A -EBT-2	IW92-01-EBT-2	TB-032707-EBT-2
	IW101-08A -EBT-2	IW21-05A -EBT-2	MW-85-EBT-2	DUP-4
	IW101-08B -EBT-2	IW21-05B -EBT-2	PMW92-06 -EBT-2	
	IW101-08C -EBT-2			
L0703310	DR2-5-EBT-2	IW92-04-EBT-2	PMW85-04-EBT-2	TB-032607-EBT-2
	IW85-01-EBT-2	IW92-08-EBT-2	PMW85-05-EBT-2	RB2-EBT-2
	IW92-03-EBT-2	PMW85-01-EBT-2		DUP-5
				DUP-9
				IW92-03-EBT-2 MS
				IW92-03-EBT-2 MSD
L0703346	IW85-02-EBT-2	IW92-02-EBT-2	IW92-07-EBT-2	TB-032307-EBT-2
	IW85-05-EBT-2	IW92-05-EBT-2	IW92-06-EBT-2	
	IW85-06-EBT-2			

TABLE G-1
SDG SUMMARY TABLE

SDG	Groundwater Samples			Quality Control Samples
EBT-3 Sampling Event - May/June 2007				
L0705656	IW101-01B -EBT-3	PMW101-02A -EBT-3	MW-85-EBT-3	TB-052907-EBT-3
	IW101-01C -EBT-3	PMW101-02B -EBT-3	DR2-1-EBT-3	
	IW101-02A -EBT-3	PMW101-03B -EBT-3	DR2-5-EBT-3	
	IW101-02B -EBT-3			
L0705683	IW101-02C -EBT-3	PMW101-03A -EBT-3	PMW92-04-EBT-3	TB-053007-EBT-3
	IW101-03A -EBT-3	PMW92-01 -EBT-3	MW-101T-EBT-3	DUP-7
	PMW101-01A -EBT-3	PMW92-02-EBT-3	MW-101B-EBT-3	IW101-02C -EBT-3 MS
	PMW101-01B -EBT-3	PMW92-03-EBT-3	IW-01-EBT-3	IW101-02C -EBT-3 MSD
L0706016	PMW101-04A -EBT-3	PMW101-06B -EBT-3	PMW92-05-EBT-3	TB-053107-EBT-3
	PMW101-04B -EBT-3	PMW101-07A -EBT-3	PMW92-06 -EBT-3	DUP-9
	PMW101-05A -EBT-3	PMW101-07B -EBT-3	PMW85-04-EBT-3	
	PMW101-05B -EBT-3	PMW101-08B -EBT-3	PMW85-05-EBT-3	
	PMW101-06A -EBT-3			
L0706043	IW101-01A -EBT-3	IW92-01-EBT-3	PMW101-08A -EBT-3	TB-060107-EBT-3
	IW101-03B -EBT-3	IW85-01-EBT-3	PMW85-01-EBT-3	DUP-3
	IW101-03C -EBT-3	IW85-02-EBT-3	DR1-3-EBT-3	DUP-4
				DUP-8
				RB1-EBT-3
				RB2-EBT-3
				DR1-3-EBT-3 MS
				DR1-3-EBT-3 MSD
L0706073	PMW21-01-EBT-3	IW101-04A -EBT-3	IW101-07B -EBT-3	TB-060407-EBT-3
	PMW21-02-EBT-3	IW101-04B -EBT-3	IW101-07C -EBT-3	IW101-07C -EBT-3 MS
	PMW21-03-EBT-3	IW101-04C -EBT-3	IW101-08A -EBT-3	IW101-07C -EBT-3 MSD
	PMW21-04-EBT-3	IW101-07A -EBT-3	IW85-05-EBT-3	
	MW-21-EBT-3			
L0706104	IW21-01A -EBT-3	IW101-05A -EBT-3	IW101-08B -EBT-3	TB-060507-EBT-3
	IW21-01B -EBT-3	IW101-05B -EBT-3	IW101-08C -EBT-3	DUP-1
	PMW21-05-EBT-3	IW101-05C -EBT-3	IW101-09A -EBT-3	DUP-5
	MW-115-EBT-3	IW101-06A -EBT-3		
L0706151	IW21-02A -EBT-3	IW21-04B -EBT-3	IW101-09B -EBT-3	TB-060607-EBT-3
	IW21-02B -EBT-3	IW21-05A -EBT-3	IW101-09C -EBT-3	DUP-2
	IW21-03A -EBT-3	IW21-05B -EBT-3	IW92-03-EBT-3	IW21-03B -EBT-3 MS
	IW21-03B -EBT-3	IW101-06B -EBT-3	IW85-06-EBT-3	IW21-03B -EBT-3 MSD
	IW21-04A -EBT-3	IW101-06C -EBT-3		
L0706201	IW92-02-EBT-3	IW92-05-EBT-3	IW92-07-EBT-3	TB-060707-EBT-3
	IW92-04-EBT-3	IW92-06-EBT-3	IW92-08-EBT-3	DUP-6
				IW92-08-EBT-3 MS
				IW92-08-EBT-3 MSD

TABLE G-1
SDG SUMMARY TABLE

SDG	Groundwater Samples			Quality Control Samples
EBT-4 Sampling Event - September 2007				
L0709182	IW101-01A -EBT-4	IW101-08B -EBT-4	PMW85-04-EBT-4	TB-091007-EBT-4
	IW101-01B -EBT-4	IW101-08C -EBT-4	PMW85-05-EBT-4	DUP-3
	IW101-08A -EBT-4	PMW85-01-EBT-4		DUP-5
L0709237	IW101-01C -EBT-4	IW101-06B -EBT-4	PMW92-06 -EBT-4	TB-091107-EBT-4
	IW101-02A -EBT-4	IW101-06C -EBT-4	MW-85-EBT-4	
	IW101-05A -EBT-4	PMW92-04-EBT-4	MW-101T-EBT-4	
	IW101-06A -EBT-4	PMW92-05-EBT-4	MW-101B-EBT-4	
L0709280	IW101-02B -EBT-4	IW101-03C -EBT-4	PMW92-01 -EBT-4	TB-091207-EBT-4
	IW101-02C -EBT-4	IW101-04A -EBT-4	PMW92-02-EBT-4	DUP-4
	IW101-03A -EBT-4	IW101-05B -EBT-4	PMW92-03-EBT-4	DUP-8
	IW101-03B -EBT-4	IW101-05C -EBT-4	DR2-1-EBT-4	IW101-03A -EBT-4 MS
				IW101-03A -EBT-4 MSD
L0709322	IW101-07A -EBT-4	IW101-09B -EBT-4	PMW101-01B -EBT-4	TB-091307-EBT-4
	IW101-07B -EBT-4	IW85-01-EBT-4	PMW101-02A -EBT-4	RB1-EBT-4
	IW101-07C -EBT-4	IW85-06-EBT-4	PMW101-02B -EBT-4	IW101-07A -EBT-4 MS
	IW101-09A -EBT-4	PMW101-01A -EBT-4	DR2-5-EBT-4	IW101-07A -EBT-4 MSD
L0709346	IW21-01A -EBT-4	IW101-09C -EBT-4	IW85-02-EBT-4	TB-091407-EBT-4
	IW101-04B -EBT-4	IW92-06-EBT-4	IW85-05-EBT-4	DUP-7
	IW101-04C -EBT-4	IW92-07-EBT-4	IW-01-EBT-4	IW-01-EBT-4 MS
				IW-01-EBT-4 MSD
L0709399	PMW85-04-EBT-4	PMW101-03A -EBT-4	PMW101-04B -EBT-4	TB-091707-EBT-4
	PMW85-05-EBT-4	PMW101-03B -EBT-4	PMW101-05A -EBT-4	DUP-6
	IW92-05-EBT-4	PMW101-04A -EBT-4	PMW101-05B -EBT-4	PMW101-05B -EBT-4 MS
	IW92-08-EBT-4			PMW101-05B -EBT-4 MSD
L0709422	PMW21-01-EBT-4	IW92-03-EBT-4	PMW101-06B -EBT-4	TB-091807-EBT-4
	PMW21-02-EBT-4	IW92-04-EBT-4	PMW101-07A -EBT-4	
	PMW21-04-EBT-4	IW92-05-EBT-4	PMW101-07B -EBT-4	
	PMW21-05-EBT-4	PMW101-06A -EBT-4	PMW101-08A -EBT-4	
	MW-21-EBT-4			
L0709471	IW21-01B -EBT-4	PMW21-03-EBT-4	IW92-02-EBT-4	TB-091907-EBT-4
	IW21-04A -EBT-4	MW-115-EBT-4	PMW101-08B-EBT-4	DUP-2
	IW21-04B -EBT-4	IW92-01-EBT-4	DR1-3-EBT-4	DUP-9
L0709530	IW21-02A -EBT-4	IW21-03A -EBT-4	IW21-05A -EBT-4	TB-092007-EBT-4
	IW21-02B -EBT-4	IW21-03B -EBT-4	IW21-05B -EBT-4	RB2-EBT-4
				DUP-1
				IW21-02B -EBT-4 MS
				IW21-02B -EBT-4 MSD

ORGANIC DATA QUALITY REVIEW REPORT
VOLATILE ORGANICS SW-846 METHOD 8260B

8260B
SDG: L0608210, L0608253, L0608292, L0608509, L0608510, L0608515, L0608517, L0608552, L0608553, L0608554, L0608581, L0608582, L0608599, L0608627, L0608649, L0608650, L0608682, L0608683, L0609050, L0609052, L0609060, L0609061, L0609098

PROJECT: e2m, Memphis Defense Depot

LABORATORY: Kemron Environmental Services, Marietta, OH

SAMPLE MATRIX: Water

SAMPLING DATE (Month/Year): August, September, 2006

NO. OF SAMPLES: 8260B (Waters) – 114 samples (14 trip blanks, 1 rinse blanks and 2 equipment blank);

ANALYSES REQUESTED: SW-846 8260B

SAMPLE NO.: Method 8260B

DATA REVIEWER: Sammy Huntington and John Huntington (Gateway Enterprises)

QA REVIEWER: Diane Short and Associates Inc. INITIALS/DATE: ________

Telephone Logs included Yes____ No _X__

Contractual Violations Yes____ No _X__

The EPA Contract Laboratory Program National Functional Guidelines for Organic Review, 1999, and the SW-846 Method 8260B has been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. Per the Scope of Work, the review of these samples includes Level III validation of all chains of custody, calibrations and QC forms referencing the QC limits in the above documents.

I. DELIVERABLES

A. All deliverables were present as specified in the Statement of Work (SOW), SW-846, or in the project contract.
Yes ___ No __X__

This is a Level III Report.

L0508292: QC and Calibration data was missing in hardcopy and the pdf file. Called the laboratory and the information was provided as a pdf file.

L0609065: Missing VOA hardcopy; validation performed from pdf.
L0608212: Missing VOA hardcopy; validation performed from pdf.

B. Chain of Custody Documentation was complete and accurate.
Yes ______ No _X__
The project manager is informed of the following and the chain information is to be updated for the project file.

L0608599: IW101-06A was not received but on the chain of custody
L0608515: Narrative states, "One of the 8260 vials of fraction 1W101-01B was received broken. There was sufficient volume remaining."

L0608553: Sample Discrepancy Form states, "Dup3 C/C 1700 = label 1520."

L0609050: The Sample Receipt Form shows "N/A" to the following questions – 'Was the pH tested on preserved water samples'; and 'Were pH ranges acceptable'. All the other SDGs said "Yes".

L0608649: Sample Receipt Form circled Yes and No to' Were samples intact?' The narrative states that they were intact. The Sample Discrepancy Form states - 08C TOC received broken – another container received.

L0608682: Sample Discrepancy Form: Samples PMW85-01 and MW85 TOC no chain of custody received. SXS originally received 8/31/06, TOCs received 9/2/06.

L0608253: Sample Discrepancy Forms states that not all labels filled out with date and times.

C. Samples were received at the required temperature, preservation and intact with no bubbles.
Yes ___X___ No ______

Cooler temperature was in many cases below 2°C but narratives noted that all samples were received in good condition. When samples are below the lower EPA limit of 2° C, as long as there is no damage to the samples, no qualifier is required.

Sample Checklist states that all samples are preserved.

II. ANALYTICAL REPORT FORMS

A. The Analytical Report or Data Sheets are present and complete for all requested analyses.
Yes ___X_ No ____

B. Holding Times
1. The contract holding times were met for all analyses (Time of sample receipt to time of analysis (VOA) or extraction and from extraction to analysis).

Yes ___X___ No______

2. The Clean Water Act (40 CFR 136) or method holding times were met for all analyses (14 days from time of sample collection).
Yes __X__ No____

III. INSTRUMENT CALIBRATION – GC/MS

A. Initial Calibration

1. The Response (RF) and Relative Response Factors (RRF) and average RRF for all compounds for all analyses met the contract criteria of >0.05 or > 0.01 for poor performers.
Yes __X__ No ____ NA____

See the table below for details.

SDG	ICAL Date	Lab Sample#	Analyte	RRF OUT	Qualifiers Added
L0609098	8/25/06 14:22	1-3	All in control		None
L0609061	8/25/06 14:22	1-4, 1RE	All in control		None
L0609060	8/25/06 14:22	1-2, 1RE	All in control		None
L0608627	8/25/06 14:22	1-9, 2RE, 4RE	All in control		None
L0608650	8/25/06 14:22	1	All in control		None
L0608599	8/25/06 14:22	1-3, 6-10, 2RE, 3RE, 6RE, 8RE	All in control		None
	8/25/06 14:22	1-4, 3RE	All in control		None
L0608649	8/25/06 14:22	ALL	All in control		None
L0608253	8/10/06 12:30	ALL	All in control		None
L0608212	8/10/06 12:30	All	All in control		None
L0609065	8/25/06 14:22	All	All in control		None
L0608292	8/10/06 12:30	All	All in control		None

2a. The relative standard deviation (RSD) for the five point calibration was within the 30% limit for the CCCs.
Yes __X__ No____ NA____
This is a method requirement and indicates that the analytical system is in control.

2b. The relative standard deviation (RSD) for the five point calibration was within the 30% limit for all other compounds or a linear curve was used.
Yes __X___ No ____ NA____

3. The 12 hour system Performance Check was performed as required in SW-846.
Yes __X__ No_____ NA____

B. Continuing Calibrations

1. The midpoint standard was analyzed for each analysis at the required frequency and the QC criteria of > 0.05 were met.
Yes__X_ No ____ NA____

The CCVs were analyzed at the proper frequency.

2. The percent difference (%D) limits of ± 25% were met.
Yes_____ No __X__ NA___
See the table below. When there are no detections, unless the %D is biased low and so large as to indicate a significant probability of false negatives, no qualifiers are added for %D outliers when targets are not detected.

SDG	CCV Date	Lab Sample#	Analyte	RRF outliers	%D outliers	Qualifiers Added
L0609061	9/9/06 8:02	1-4	All in control			None
L0609060	9/10/06 9:42	2 RE	All in control			None
L0608627	9/1/06 8:55	1-4,9	All in control			None
	9/8/06 8:02	4RE	All in control			None
L0608599	8/30/06 10:59	1,2,3,6,8,10	All in control			None
	8/31/06 9:26	2,3,6,8 (Res)	All in control			None
	9/1/06 8:55	7,9	All in control			None
			Dichlorodifluoromethane		34	None, ND
			Dichlorodifluoromethane		34	None, ND
			Dichlorodifluoromethane		28	None, ND
			Dichlorodifluoromethane		27.1	None, ND
L0608581	8/26/06 10:55	6RE	Dichlorodifluoromethane		27.4	None, ND
L0609050	9/8/06 7:51	1RE	Dichlorodifluoromethane		27.1	None, ND
	9/8/06 8:02	3RE	All in control			None
			Dichlorodifluoromethane		27.4	None, ND
L0608253	8/12/06 11.59	1,2,3,7	All in control			None
	8/14/06 9:55	4,8,9,10	All in control			None
	8/15/06 8:42	9RE	Carbon Tetrachloride		26.3	None, ND
L0608212	8/10/06 15:01	All	All in control			None
L0608292	8/14/06 9:55	1-9	All in control			None
	8/15/06 8:42	1RE,2RE	Carbon Tetrachloride		26.3	None, ND

IV. GC/MS INSTRUMENT PERFORMANCE CHECK

The BFB performance check was injected once at the beginning of each 12-hour period and relative abundance criteria for the ions were met.

Yes __X___ No ____ NA____

V. INTERNAL STANDARDS

The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows.

Yes __X___ No ____ NA____

VI. SURROGATE

Surrogate spikes were analyzed with every sample.

Yes _X___ No____

And met the recovery limits defined in the current contract, which are the current laboratory limits.

Yes _____ No __X__

8260B: All surrogates are in control.

VII. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed for every analysis performed and for every 20 samples or for every matrix whichever is more frequent.

Yes ___X__ No _____

8260B: There are 97 field water samples including one leachate. There are 5 MS/MSDs for waters and one additional reported due to reanalyses for that sample. This meets the QC goals for MS/MSD frequency.

A. The MS and MSD percent recoveries were within the limits defined in the contract, which are the current laboratory control chart limits.

Yes_____ No __ X ___NA___

The full target list has been spiked. Most MS/MSD recoveries and RPDs are in control. Instances where spike recoveries are out of limits are shown in the table below. In several instances, the sample amount is 4x the spike level or greater. In such cases, the recovery cannot realistically be calculated, because the anticipated normal analytical variability is on the order of the spike level. Thus no qualifiers are added. Only one result has been qualified due to an elevated recovery, and one result qualified due to a low recovery.

Method	SDG	Client Sample ID	Lab Sample ID	Analyte	MS/MSD/RPD	Qualifiers
8260B	L0608253	IW21-03B	4	Bromodichloromethane	132/126/OK	None, ND
				1,2 Dichloroethane	133/OK/OK	JS133
				Tetrachloroethene	OK/58.6/OK	JS58
	L0608510	PMW101-01A	1	Tetrachloroethene	2.82/OK/OK	None, result > 4x spike level
	L0608581	PMW101-06B	1	Chloromethane	OK/132/OK	None, ND
	L0608599	MW-101B	3	Tetrachloroethene	-117/-183/OK	None, result > 4x spike level
		MW-101B	3 (for all the reruns)	All in control		None
	L0608649	IW101-09A	5	bromodichloromethane	125/127/OK	None, ND

A. The MSD relative percent differences (RPD) were within the defined contract limits.
Yes __X___ No ____NA____
See the above table. No qualifiers are added unless the recovery is also out of limits.

A. The MS/MSD were client samples.
Yes __X_ No ____NA____

VIII. LABORATORY CONTROL SAMPLE

A. A Laboratory Control Samples (LCS) was analyzed for every analysis performed and for every 20 samples.
Yes _X___ No ____

B. The LCS percent recoveries were within the limits defined in the contract (the MS limits are used as a reference or laboratory-specific limits for this matrix are defined).
Yes ______ No __ X ____

SDG	Lab Sample #	Batch	Targets Detected	LCS/LCSD/RPD	Qualifiers
L0608517	1RE, 5RE	WG220735	Acetone	196/183/OK	None, ND
			2-Butanone	156/150/OK	None, ND
L0608515	2RE,3RE,4RE	WG220735	Acetone	196/183/OK	JL196 detections
			2-Butanone	156/150/OK	None, ND
L0608553	1-3	WG220789	Chloromethane	132	None, ND
L0608210	4RE	WG219826	Acetone	147/151/OK	None, ND
			2-Butanone	149/151/OK	None, ND
L0608552	3	WG220789	Chloromethane	132	None, ND
L0609052	1RE,2RE	WG221777	2-Butanone	OK/138/OK	None, ND
L0608581	1,4-6	WG220789	Chloromethane	132	None, ND
		WG220861	Chloromethane	147/138/OK	None, ND
			Vinyl chloride	142/135/OK	None, ND
L0608582	1EB, 2TB	WG220789	Chloromethane	132	None, ND
L0609050	1RE	WG221777	2-Butanone	OK/138/OK	None, ND

L0608554	1,2	WG220789	Chloromethane	132	None, ND
	1RE,2RE	WG220861	Chloromethane	147/138/OK	None, ND
			Vinyl chloride	142/135/OK	None, ND
L0608253	9RE	WG219910	Bromidichloromethane	126	None, ND
L0608292	1RE,2RE	WG219910	Bromidichloromethane	126	None, ND

IX. BLANKS

A. Method Blanks were analyzed at the required frequency and for each matrix and analysis.
Yes _X___ No____

B. No blank contamination was found in the Method Blank.
Yes____ No _X___

Contamination was observed in the method blanks indicated in the table, below the reporting limit. Whenever methylene chloride or acetone is detected in associated samples at a level less than 10x the method blank (corrected for dilution), the result is qualified as UB#, where # is the corrected method blank level. Such results are usable as nondetects. Qualifiers added are summarized in the table below. For other targets, the factor used is 5x.

SDG	Lab Sample #	Batch	Targets Detected	Results	Qualifiers
L0608627	1-4,9	WG221315	1,2,3-Trichlorobenzene	.166F	None, ND
			Hexachlorobutadiene	.401	None, ND
L0608650	1	WG221419	Methylene Chloride	.488F	None, ND
L0608649	3,4,8,9,10,11	WG221419	Methylene chloride	.488F	UB0.488 detects
L0608599	7, 9	WG221315	1,2,3 Trichlorobenzene	.166F	None, ND
			Hexachlorobutadiene	.401	None, ND
L0608517	1RE, 5RE	WG220735	Hexachlorobutadiene	.256F	None, ND
	1-5	WG220725	1,2,3 Trichlorobenzene	.241F	None, ND
			1,2,4 Trichlorobenzene	.213F	None, ND
			Methylene Chloride	.408F	UB0.408 detects
			Naphthalene	.404F	None, ND
L0608515	2RE,3RE,4RE	WG220735	Hexachlorobutadiene	.256F	None, ND
	1-5	WG220725	1,2,3 Trichlorobenzene	.241F	None, ND
			1,2,4 Trichlorobenzene	.213F	None, ND
			Methylene Chloride	.408F	UB0.408 detects
			Naphthalene	.404F	None, ND
L0608552	1,5	WG220725	1,2,3 Trichlorobenzene	.241F	None, ND
			1,2,4 Trichlorobenzene	.213F	None, ND
			Methylene Chloride	408F	UB0.408 detects
			Naphthalene	.404F	None, ND
L0609052	1RE,2RE	WG221777	Methylene Chloride	.508F	UB0.508 detects
L0609050	1RE	WG221777	Methylene Chloride	.508F	UB0.508 detects
L0608509	1,2	WG220725	1,2,3 Trichlorobenzene	.241F	None, ND
			1,2,4 Trichlorobenzene	.213F	None, ND
			Methylene Chloride	.408F	UB0.408 detects
			Naphthalene	.404F	None, ND
L0608510	1,4	WG220725	1,2,3 Trichlorobenzene	.241F	None, ND
			1,2,4 Trichlorobenzene	.213F	None, ND
			Methylene Chloride	.408F	None, ND
			Naphthalene	.404F	None, ND
L0608682	1,2	WG221419	Methylene Chloride	.488F	UB0.488 detects
L0608253	9RE	WG219910	Methylene Chloride	.315	None, ND
I0608292	1RE,2RE	WG219910	Methylene Chloride	.315	None, ND

C. If Field Blanks were identified, no blank contamination was found.
Yes____ No __X__
Altogether there were fourteen (14) trip blanks, 1 rinse blank and 2 equipment blanks. A few qualifiers are added to samples in the same manner as is done with method blanks.

SDG	Sample ID	Lab Sample ID	Analyte	Results	Qualifiers
L0608210	TB-080806	L0608210-06	Methylene chloride	663F	None, ND
			Acetone	3.32F	UTB3.32 detects
L0608253	RB-PHASE 1	L0608253-10	None		None
L0608253	TB-080906	L0608253-07	Methylene chloride	.43F	None, ND
			Acetone	2.76F	None, ND
L0608292	TB-081006	L0608292-04	Methylene chloride	.596F	None, ND
L0608509	TB-082106	L0608509-02	Methylene chloride	1.20F	None, ND
L0608515	TB-082206	L0608515-05	Methylene chloride	.935F	None, UB from MB
L0608552	TB-082306	L0608552-05	Acetone	4.31F	None, ND
			Methylene Chloride	1.19F	None, UB from MB
L0608582	EB-1 Phase II	L0608582-01	Acetone	4.40F	None, UB from TB
L0608582	TB-082406	L0608582-07	Acetone	4.12F	UTB4.12 Detects
			Methylene chloride	.982F	UTB0.982 Detects
L0608599	TB-082506	L0608599-10	Methylene chloride	.528F	None, ND
L0608627	TB-082806	L0608627-09	Methylene chloride	.257F	UTB# detects
L0608649	EB-2 Phase II	L0608649-01	None		None
L0608649	TB-082906	L0608649-11	1,2,3-Trichlorobenzene	.128F	None, ND
			Hexachlorobutadiene	.285F	None, ND
			Methylene chloride	.347F	UTB0.347 detects not qual from MB
L0608682	TB-083006	L0608682-05	Chloroform	.188F	None, detects > 5x
			Methylene chloride	.892F	None, ND
L0609052	TB-083106	L0609052-05	Methylene chloride	.733F	None, detects UB from MB
L0609061	TB-090606	L0609061-04	Toluene	.272F	UTB0.272 detects
			Methylene chloride	.459F	None, ND
L0609098	TB-090506	L0609098-03	Methylene chloride	.405F	None, ND

X. FIELD QC

If Field duplicates were identified, they met guidance RPD of < 35% for water or < 50% for soils. For values reported at < 5 x the reporting limit (RL), a difference of 2 x RL is used as guidance (4 x RL for soils). Data are not qualified for field duplicates as these are evaluated for the total project by the client.
Yes ___X___ No ____ NA____

There are 10 samples identifiable as field duplicates. Two of these have names that are different than were identified by the client. Client sample Phase 1 DUP1 appears to have been reported as sample TTA-1-DUP1, and the sample Phase 1 DUP2 appears to have been reported as sample TTA-1-DUP2. We have made that assumption in the table shown below. All are in control.

Method	SDG	Client Sample ID	Lab Sample ID	Parent Sample	Observations
8260B\5030B	L0608210	TTA-1-DUP1	2	MW-21	OK

8260B\5030B	L0608292	TTA-1DUP2	5	IW21-04A	OK
8260B\5030B	L0608515	Phase II DUP1	4	IW101-01C	OK
8260B\5030B	L0608517	Phase II DUP2	5	PMW101-04A	OK
8260B\5030B	L0608553	Phase II DUP3	3	IW101-03B	OK
8260B\5030B	L0608582	Phase II DUP4	6	IW101-04C	OK
8260B\5030B	L0608599	Phase II DUP5	8	MW101-T	OK
8260B\5030B	L0608599	Phase II DUP7	9	PMW101-07A	OK
8260B\5030B	L0608627	Phase II DUP8	8	IW101-06B	OK
8260B\5030B	L0608682	Phase II DUP6	4	MW-85	OK

XI. SYSTEM PERFORMANCE

A. The RICs, chromatograms, tunes and general system performance were acceptable for all instruments and analytical systems.
Yes ____ No____ NA__X__
Not part of this review level

B. The suggested EQLs for the sample matrices in this set were met.
Yes __X__ No____ NA____

XII. TCL COMPOUNDS

A. The identification is accurate and all retention times, library spectra and reconstructed ion chromatograms (RIC) were evaluated for all detected compounds.
Yes ____ No____ NA __X__
Not part of this review level

B. Quantitation was checked to determine the accuracy of calculations for representative compounds in each internal standards quantitation set.
Yes ____ No____ NA__X__
Not part of this review level

XIII. TENTATIVELY IDENTIFIED COMPOUNDS

TICs were properly identified and met the library identification criteria.
Yes____ No____ NA__X___
Not part of this review level

XIV. OVERALL ASSESSMENT OF THE CASE

The laboratory has complied with the requested method. Data are fully usable after consideration of qualifiers.
The following is noted:

Chain of Custody/Deliverables:

L0508292: QC and Calibration data was missing in hardcopy and the pdf file. Called the laboratory and the information was provided as a pdf file.

L0609065: Missing VOA hardcopy; validation performed from pdf.
L0608212: Missing VOA hardcopy; validation performed from pdf.

The project manager is informed of the following and the chain information is to be updated for the project file.

L0608599: IW101-06A was not received but on the chain of custody
L0608515: Narrative states, "One of the 8260 vials of fraction 1W101-01B was received broken. There was sufficient volume remaining."

L0608553: Sample Discrepancy Form states, "Dup3 C/C 1700 = label 1520."

L0609050: The Sample Receipt Form shows "N/A" to the following questions – 'Was the pH tested on preserved water samples'; and 'Were pH ranges acceptable'. All the other SDGs said "Yes".

L0608649: Sample Receipt Form circled Yes and No to' Were samples intact?' The narrative states that they were intact. The Sample Discrepancy Form states - 08C TOC received broken – another container received.

L0608682: Sample Discrepancy Form: Samples PMW85-01 and MW85 TOC no chain of custody received. SXS originally received 8/31/06, TOCs received 9/2/06.

L0608253: Sample Discrepancy Forms states that not all labels filled out with date and times.

Sample Condition

Cooler temperature was in many cases below 2°C but narratives noted that all samples were received in good condition. When samples are below the lower EPA limit of 2° C, as long as there is no damage to the samples, no qualifier is required.

Sample Checklist states that all samples are preserved.

Initial Calibrations:

No qualifications were required for IC.

Continuing Calibrations:

The CCVs were analyzed at the proper frequency. No qualifications were required for CCV.

Surrogates:

8260B: All surrogates are in control.

Matrix Spikes:

8260B: There are 97 field water samples. There are 5 MS/MSDs for waters and one additional reported due to reanalyses for that sample. This meets the QC goals for MS/MSD frequency.

Most MS/MSD recoveries and RPDs are in control. Instances where spike recoveries are out of limits are shown in the table within the report. In several instances, the sample amount is 4x the spike level or greater. In such cases, the recovery cannot realistically be calculated, because the anticipated normal analytical variability is on the order of the spike level. Thus no qualifiers are added. Only one result has been qualified due to an elevated recovery, and one result qualified due to a low recovery.

Method Blanks:

Contamination was observed in the method blanks indicated in the table within the report, below the reporting limit. Whenever methylene chloride or acetone is detected in associated samples at a level less than 10x the method blank (corrected for dilution), the result is qualified as UB#, where # is the corrected method blank level. Such results are usable as nondetects. Qualifiers added are summarized in the table below. For other targets, the factor used is 5x.

Field Blanks:

Altogether there were fourteen (14) trip blanks, 1 rinse blank and 2 equipment blanks. A few qualifiers are added to samples in the same manner as is done with method blanks.

ORGANIC DATA QUALITY REVIEW REPORT

GC REPORT FOR carbon dioxide, ethane, methane, and ethene by EPA SOP RSK-175, Metabolic acids (volatile fatty acids, or VFA) by Laboratory SOP 830-MBA (HPLC Direct Injection)

RSK-175: L0608210, L0608253, L0608292, L0608509, L0608510, L0608515, L0608517, L0608552, L0608553, L0608554, L0608581, L0608582, L0608599, L0608627, L0608649, L0608650, L0608682, L0608683, L0609055, L0609057, L0609060, L0609061, L0609098

Metabolic acids: L0608210, L0608253, L0608292, L0608509, L0608510, L0608515, L0608517, L0608552, L0608553, L0608554, L0608581, L0608582, L0608599, L0608627, L0608649, L0608650, L0608682, L0608683, L0609055, L0609057, L0609060, L0609061, L0609098

PROJECT: e2m, Memphis Defense Depot

LABORATORY: Kemron Environmental Services, Marietta, OH

SAMPLE MATRIX: Water

SAMPLING DATE (Month/Year): August, September, 2006

NO. OF SAMPLES: Metabolic acids – 98 waters (including 1 rinse blank and 2 equipment blanks); RSK-175 - 98 waters (including 1 rinse blank and 2 equipment blanks)

ANALYSES REQUESTED: Metabolic Acids/Volatile Fatty Acids Method SOP 830-MBA; EPA SOP RSK-175

SAMPLE NO.: Attached

DATA REVIEWER: Sammy and John Huntington, Gateway Enterprises

QA REVIEWER: Diane Short & Associates, Inc., INITIALS/DATE:____

Telephone Logs included Yes____ No _X_

Contractual Violations Yes____ No _X_

The EPA Contract Laboratory Program National Functional Guidelines for Organic Review, 1999 (SOP), the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, (SW-846), current updates, and the project-specific methods have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. The review has been tasked for Level III review of all calibrations, holding times, and QC for all samples.

I. DELIVERABLES

A. All deliverables were present as specified in the Statement of Work (SOW), SW-846, or in the project contract.

Yes ____ No __X__

The hardcopy data did not include any data for method 830-MBA. The laboratory had also submitted pdf files of the results, and these files did include the 830-MBA results. In the interests of efficiency, the validation was conducted on these rather than requesting that the hardcopies be completed for this analysis. If the client requires the hardcopy, the laboratory can provide them.

For one SDG, L0608292, the pdfs received did not include data for several of the analyses, including the 830-MBA, RSK-175, and 8260. The laboratory was contacted and the missing data provided to us by pdf.

These missing data appear to be due to internal systems errors associated with the report generation system used by the laboratory. However, the pdf files provided are text-searchable and very complete with the exception noted above. They also include the raw chromatographic data, not required for this project.

Note: This is a Level III Report.

II. ANALYTICAL REPORT FORMS

A. The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes ____ No __X___

Please see the notes above under Deliverables.

III. HOLDING TIMES

A. The contract holding times were met for all analyses (Time of sample receipt to time of extraction and from extraction to analysis.)

Yes __X___ No____

Metabolic Acids: The reviewer has not been able to find documented holding times for the metabolic acids. The normal holding time for the 8015B method is 14 days for preserved water samples. Metabolic acid holding times were all within 14 days. The project manager has verified that no holding time is established for these compounds.

RSK-175: All samples were prepared within 14 days. The samples included analysis for carbon dioxide, so they were not acid-preserved (pH is provided on the run logs). However, the method does not stipulate a change of holding time if the samples are not preserved. Therefore, no qualifiers are added to the sample results if they are obtained within 14 days of sampling.

B. The Clean Water Act (40 CFR 136) or method holding times were met for all analyses (Time of sample receipt to time of extraction and from extraction to analysis.)

Yes __X___ No____

See note above.

C. All chains of custody are complete with signatures and dates.

Yes ____ No __X__

The project manager is informed of the following. Chains are to be updated for the project record.

L0609057: Has two Sample Receipt Forms. The one for cooler 0081 is incomplete, only answering three of the questions. The second form for coolers 89, 115 and 71 is complete and states that the all sample containers were not intact. The Sample Discrepancy Form states that PMW9202 1 of 3 RSK received broken.

L0609055: Sample Receipt form is incomplete for cooler 0081, only answering three of the questions.

L0608599: IW101-06A was not received but on the chain of custody. MW101-B for metabolic acids, the lid was broken on the container. Use the MS container for the parent sample and MSD container for both MS and MSD samples.

L0608599: IW101-06A was not received but on the chain of custody

L0608553: Sample Discrepancy Form states, "Dup3 C/C 1700 = label 1520."

L0609050: The Sample Receipt Form shows "N/A" to the following questions – 'Was the pH tested on preserved water samples?'; and 'Were pH ranges acceptable?' All the other SDGs said "Yes".

L0608649: Sample Receipt Form circled Yes and No to 'Were samples intact?' The narrative states that they were intact. The Sample Discrepancy Form states - 08C TOC received broken – another container received.

L0608682: Sample Discrepancy Form: Samples PMW85-01 and MW85 TOC no chain of custody received. SXS originally received 8/31/06, TOCs received 9/2/06.

L0608253: Sample Discrepancy Forms states that not all labels filled out with date and times.

B. Samples were received at the proper temperature and preservation.
Yes __X_ No_____

IV. INSTRUMENT CALIBRATION (IC) AND CONTINUING CALIBRATION (CC) VERIFICATION

A. The GC standards were analyzed at the required frequency (every 72 hours at a minimum).
Yes ___X___ No_____

B. The chromatographic resolution and separation criteria were met.
Yes __X__ No_____

C. The suggested columns were used and the EQLs were met.
Yes __X___ No_____

D. Calibration factors for IC met the 20% RSD limit or the regression curves were prepared with a correlation coefficient (r) greater than 0.99, per SW-846, Method 8000B.
Yes ___X__ No _____

E. %D's for Continuing Calibration Factors and retention times (RT) were within the 25% Limits.
Yes ____ No __X___

All CCVs met method and validation limits with the exception of those for RSK-175, carbon dioxide analyte. There is a general tendency for this compound to be out of acceptance limits. Qualifiers were added to associated data as JC#, where # is the CCV %D observed. Such results may be biased due to calibration drift. The 'o' field designates the opening calibration and the 'c' field designates the closing calibration.

SDG	CCV Date	Lab Sample #	O	C	Results	%D outliers	Qualifiers Added
L0609057	9/12/06 10:59	1-4	X		Carbon Dioxide	27.7	From close
	9/12/06 12:10			X	Carbon Dioxide	50.3	JC50.3
L0609055	9/12/06 8:31	1-4	X		Carbon Dioxide	52.4	JC50.4
	9/12/06 10:59			X	Carbon Dioxide	27.7	From open
	9/12/06 10:59	4RE	X		Carbon Dioxide	27.7	JC27.7
L0608517	8/29/06 12:12	1	X		Carbon Dioxide	29.4	From Close
	8/29/06 14:11			X	Carbon Dioxide	35.4	JC35.4
	8/29/06 14:11	2-5	X		Carbon Dioxide	35.4	From Close
	8/29/06 15:40			X	Carbon Dioxide	43.9	JC43.9
	8/31/06 12:39	1RE,3RE,5RE	X		Carbon Dioxide	27.7	From Close
	8/31/06 15:03			X	Carbon Dioxide	39.2	JC39.2
L0608515	8/28/06 16:41	1	X		Carbon Dioxide	OK	From Close
	8/28/06 17:37			X	Carbon Dioxide	33.2	JC33.2
	8/29/06 12:12	2-4	X		Carbon Dioxide	29.4	From Close
	8/29/06 14:11			X	Carbon Dioxide	35.4	JC35.4
L0608599	8/31/06 15:03	1	X		Carbon Dioxide	39.2	From Close
	8/31/06 17:44			X	Carbon Dioxide	51.1	JC51.1
	9/1/06 9:15	2,3	X		Carbon Dioxide	OK	None
	9/1/06 11:34			X	Carbon Dioxide	50.0	JC50
	8 1.06 11:34	7-9	X		Carbon Dioxide	50.0	From Close
	9/1/06 12:58			X	Carbon Dioxide	58.4	JC58.4
	9/8/06 14:59	8RE,9RE	X		Carbon Dioxide	OK	None
	9/8/06 16:32			X	Carbon Dioxide	33.2	JC33.2
L0608650	9/7/06 14:27	1	X		Carbon Dioxide	50.4	From Close
	9/7/06 16:30			X	Carbon Dioxide	50 7	JC50.7
L0608627	9/1/06 11:34	1	X		Carbon Dioxide	50.0	From Close
	9/1/06 12:58			X	Carbon Dioxide	58.4	JC58.4
	9/1/06 12:58	2-6	X		Carbon Dioxide	58.4	JC58.4
	9/1/06 15:11			X	Carbon Dioxide	25.8	From Open
	9/1/06 15:11	7,8	X		Carbon Dioxide	25.8	JC25.8
	9/1/06 16:36			X	Carbon Dioxide	OK	None
	9/6/06 13:03	1RE,6RE	X		Carbon Dioxide	OK	None
	9/6/06 15:36			X	Carbon Dioxide	OK	None
L0608553	8/29/06 16:57	1-3	X		Carbon Dioxide	27.2	From Close
	8/29/06 18:07			X	Carbon Dioxide	30.2	JC30.2
	8/31/06 12:39	3RE	X		Carbon Dioxide	27.7	From Close
	8/31/06 15:03			X	Carbon Dioxide	39.2	JC39.2
L0608683	9/8/06 16:32	1-4	X		Carbon Dioxide	33.2	From Close
	9/8/06 18:11			X	Carbon Dioxide	45.7	JC45.7
L0608552	8/29/06 15:40	1-4	X		Carbon Dioxide	43.9	*JC43.9*
	829/06 16:57			X	Carbon Dioxide	27.2	*From Open*
L0608210	8/21/06 14:47	1-3	X		Carbon Dioxide	25.6	*From Close*
	8/21/06 15:47			X	Carbon Dioxide	26.3	*JC26.3*
	8/21/06 15:47	4,5	X		Carbon Dioxide	26.3	*From Close*
	8/21/06 16:44			X	Carbon Dioxide	30.8	*JC30.8*
L0608253	8/21/06 15:47	1	X		Carbon Dioxide	26.3	*From Close*
	8/21/06 16:44			X	Carbon Dioxide	30.8	*JC30.8*
	8/21/06 16:44	2-6	X		Carbon Dioxide	30.8	*From Close*
	8/21/06 17:40			X	Carbon Dioxide	53.6	*JC53.6*

SDG	CCV Date	Lab Sample #	O	C	Results	%D outliers	Qualifiers Added
	8/21/06 17:40	8	X		Carbon Dioxide	53.6	*JC53.6*
	8/21/06 18:36			X	Carbon Dioxide	42.0	*From Open*
	8/21/06 18:36	9	X		Carbon Dioxide	42.0	*From Close*
	8/21/06 19:18			X	Carbon Dioxide	48.6	*JC48.6*
	8/22/06 11:15	10	X		Carbon Dioxide	OK	*From Close*
	8/22/06 13:25			X	Carbon Dioxide	46.3	*JC46.3*
L0608682	9/7/06 14:27	1,2	X		Carbon Dioxide	50.4	*From Close*
	9/7/06 16:30			X	Carbon Dioxide	50.7	*JC50.7*
	9/8/06 16:32	3,4	X		Carbon Dioxide	33.2	*From Close*
	9/8/06 18:11			X	Carbon Dioxide	45.7	*JC45.7*
L0609060					ALL IN CONTROL		*None*
L0609061	9/13/06 13:46	1-3	X		Carbon Dioxide	OK	*None*
	9/13/06 15:06			X	Carbon Dioxide	41.0	*JC41.0*
	9/14/06 12:12	1RE	X		ALL IN CONTROL	OK	*None*
	9/14/06 14:23			X	ALL IN CONTROL	OK	*None*
L0609098	9/13/06 13:46	1-2	X		Carbon Dioxide	OK	*None*
	9/13/06 15:06			X	Carbon Dioxide	41.0	*JC41.0*
	9/14/06 12:12	1RE	X		ALL IN CONTROL	OK	*None*
	9/14/06 14:23			X	ALL IN CONTROL	OK	*None*
L0608510	8/28/06 16:41	1-4	X		Carbon Dioxide	33.2	*JC33.2*
	8/28/06 17:37			X	Carbon Dioxide	OK	*From Open*
L0608554	8/29/06 16:57	1,2	X		Carbon Dioxide	27	*From Close*
	8/29/06 18:07			X	Carbon Dioxide	80.2	*JC80.2*
L0608509			X		ALL IN CONTROL	OK	*None*
				X	ALL IN CONTROL	OK	*None*
L0608649	9/1/06 15:11	2	X		Carbon Dioxide	25.8	JC25.8
	9/1/06 16:36			X	Carbon Dioxide	OK	None
	9/6/06 15:35	1,3-5	X		Carbon Dioxide	OK	*None*
	9/6/06 16:57			X	Carbon Dioxide	48.9	*JC48.9*
	9/7/06 14:27	10	X		Carbon Dioxide	50.4	*From Close*
	9/7/06 16:30			X	Carbon Dioxide	50.7	*JC50.7*
L0608582	8/31/06 15:03	1-6	X		Carbon Dioxide	39.2	*From Close*
	8/31/06 17:44			X	Carbon Dioxide	51.1	*JC51.1*
L0608581	8/29/06 18:07	1	X		Carbon Dioxide	30.2	*From Close*
	8/29/06 19:17			X	Carbon Dioxide	41.3	*JC41.3*
	8/27/06 15:03	4-6	X		Carbon Dioxide	39.2	*From Close*
	8/27/06 17:44			X	Carbon Dioxide	51.1	*JC51.1*
	9/1/06 9:15	5RE	X		Carbon Dioxide	OK	*None*
	9/1/06 11:34			*X*	*Carbon Dioxide*	*50.0*	*JC50.0*

V. BLANKS

A. Laboratory blanks

1. Laboratory blanks were analyzed for every sample set and for each matrix type or once in every ten samples, whichever is more frequent.

Yes __X__ No_____

2. No blank contamination was found in the method blank.

Yes _____ No __X___

Method blank detections are observed for methane in several RSK-175 blanks. Where associated samples have detections less than 5x the method blank level, they are qualified as UB#, where # is the method blank level corrected for dilution. Such results are usable as non-detects.

SDG	Lab Sample #	Batch	Targets Detected	Results	Qualifiers
L0609057	1-4	WG222022	Methane	.255	UB#
L0609055	1-4	WG222022	Methane	.255	UB#
	4RE	WG222175	Methane	.283	UB#
L0608210	1-5	WG220393	Methane	.297	UB# < 5x
L0608253	1-4, 8,9	WG220393	Methane	.297	UB# < 5x
L0608292	2	WG220393	Methane	297	UB# < 5x
L0609060	1,2	WG222175	Methane	.283	UB#
L0609061	1-3	WG222175	Methane	.283	UB#
L0609098	1,2	WG222175	Methane	.283	UB#

3. Instrument blank analysis was performed following all samples that contained analytes at high concentrations.
Yes _____ No____ NA__X___

Not a part of this level of review.

B. Field Blanks
If field blanks were identified, no blank contamination was found.
Yes _____ No__ X ___ NA_____

The rinse and equipment blanks are free of contamination with the exception of carbon dioxide in one sample. The level of this compound is much too low to be significant compared to the result observed in the associated samples, so no qualifiers have been added.

Method	SDG	Sample ID	Lab Sample ID	Outliers		Qualifiers
830-MBA	L0608253	RB-PHASE 1	L0608253-10	None		None
	L0608582	EB-1 Phase II	L0608582-01	None		None
	L0608649	EB-2 Phase II	L0608649-01	None		None
RSK175	L0608253	RB-PHASE 1	L0608253-10	None		None
	L0608582	EB-1 Phase II	L0608582-01	Carbon Dioxide	200F	None, > 5x
	L0608649	EB-2 Phase II	L0608649-01	None		None

VI. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

A. Matrix spike (MS) and matrix duplicate or matrix spike duplicate (MSD) were analyzed for every analyses performed for every 20 samples or for every matrix whichever is more frequent.
Yes __X___ No _____

RSK-175: There are 5 MS/MSDs
Metabolic acids: There are 5 MS/MSDs.
This is a sufficient frequency of MS/MSDs to meet the requirements.

B. The MS and MSD percent recoveries (%R) were within the limits defined by the laboratory or in the contract.
Yes _____ No __ X__

See the table below.

Metabolic acids:
Although there are a number of outliers as shown in the table below, most are elevated recoveries associated with non-detects in the parent sample. Such results are not qualified since the bias would not interfere with the ability to detect the analtye. In one case, pyruvic acid is recovered low and the parent is qualified as JS#, where # is the recovery. This result could be biased low approximately proportional to the recovery observed.

RSK-175:
The table below shows the outliers observed. We note that in the data associated with MW-101B, the MS spike amount is 2.5 x the level reported to have been spiked in the MSD. The observed concentration of each analyte, however, is very close to that observed in the MSD. Although no comment is made in the Case Narrative about this fact, it is suggestive that the MS spike amount used to calculate the recovery is not correct. We recommend that the project manager request the laboratory to review their records to determine if this can be established. The apparent low recoveries result in a qualifier in the parent sample of JS#, where # is the low recovery observed. If the laboratory could establish that the spike level was incorrectly entered, the recoveries may be in control and the qualifiers could be reversed.

All other outliers are associated with carbon dioxide, which is present in the parent samples at levels well in excess of 4x the spike. When this occurs, the expected normal analytical variability is similar to the spike level and calculated recoveries are not meaningful, nor are they indicators of bias. In these cases, no qualifiers are added.

Method	SDG	Client Sample ID	Lab Sample ID	Analyte	MS/MSD/RPD	Qualifiers
830-MBA	L0608253	IW21-03B	4	Propionic Acid	140/OK/31.4	None, ND
	L0608510	PMW101-01A	1	Pyruvic Acid	41.3/42/2/OK	JS41.3
				Lactic Acid	OK/133/OK	None, ND
				Acetic Acid	OK/139/OK	None, ND
	L0608581	PMW101-06B	1	Pyruvic Acid	OK/142/OK	None, ND
				Lactic Acid	153/164/OK	None, ND
				Acetic Acid	374/372/OK	None, ND
	L0608599	MW-101B	3	Pyruvic Acid	132/133/OK	None, ND
				Lactic Acid	146/148/OK	None, ND
				Acetic Acid	147/146/OK	None, ND
	L0608649	IW101-09A	5	Pyruvic Acid	159/154/OK	None, ND
				Lactic Acid	156/153/OK	None, ND
				Acetic Acid	326/314/OK	None, ND
RSK175	L0608253	IW21-03B	4	Carbon Dioxide	OK/156/OK	None, sample > 4x spike
	L0608510	PMW101-01A	1	Carbon Dioxide	46.4/184/OK	None, sample > 4x spike

Method	SDG	Client Sample ID	Lab Sample ID	Analyte	MS/MSD/RPD	Qualifiers
	L0608581	PMW101-06B	1	Carbon Dioxide	27.5/OK/OK	None, sample > 4x spike
	L0608599	MW-101B	3	Methane	38.5/OK/OK	JS38.5
				Ethene	39.2/OK/OK	JS39.2
				Ethane	39.0/OK/OK	JS39.0
	L0608649	IW101-09A	5	Carbon Dioxide	166/177/OK	None, sample > 4x spike

C. The MSD relative percent differences (RPD) were within the defined contract or laboratory limits.
Yes ___ X__ No ____

D. The MS/MSD were client samples.
Yes __X_ No _____

VII. LABORATORY CONTROL SAMPLE AND DUPLICATE (LCS/LCSD) A. Laboratory Control Sample (LCS) and LCS duplicate were analyzed for every analyses performed and for every 20 samples or for every matrix whichever is more frequent.
Yes __X___ No_____

B. The LCS percent recovery (%R) are within the limits defined by the laboratory or in the contract.
Yes _____ No__ X __

Metabolic acids: All LCS recoveries are in control.
RSK-175: All but one of the LCS recoveries are in control. As shown below, carbon dioxide is recovered low in one LCS, although in control in the LCSD. The result is qualified as JL37.9D40.6 for associated samples, where the D40.6 reflects the out of limits RPD resulting from the fact that the LCS is out of control but the LCS is in control. This result impacts only one sample.

SDG	Lab Sample #	Batch	Targets Detected	LCS/LCSD/RPD	Qualifiers
L0609098	1RE	WG222293	Carbon Dioxide	37.9/OK/40.6	JL37.9D40.6

VIII. SURROGATE RECOVERY

A. The Surrogate spike was analyzed with every sample.
Yes _____ No_____ NA __ X__

RSK-175: Surrogates are not used for this analysis.

Metabolic Acids: Surrogates are not used for this analysis.

B. And met the recovery limits defined in the current contract. If recovery limits were exceeded, the sample was re-extracted and re-analyzed.
Yes _____ No__ X ___ NA__X__

C. INTERNAL STANDARDS

The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows. Note: Internal standards are not required for GC analysis, but if they are used, SW-846 stipulates that they meet the same recovery requirements as those specified for GCMS methods.

Yes _____ No _____ NA__ X __

RSK-175: Internal standards are not used for this analysis.

Metabolic acids: Internal standards are not used for this analysis.

IX. FIELD QC

If Field Duplicates or Performance Check Compounds were identified, they met the RPD or % recovery criteria for the project.

Yes ___X__ No _____ NA_____

There are 10 samples identifiable as field duplicates. Two of these have names that are different than were identified by the client. Client sample Phase 1 DUP1 appears to have been reported as sample TTA-1-DUP1, and the sample Phase 1 DUP2 appears to have been reported as sample TTA-1-DUP2. We have made that assumption in the table shown below. All are in control.

Method	SDG	Client Sample ID	Lab Sample ID	Parent Sample	Observations
830-MBA	L0608515	Phase II DUP1	4	IW101-01C	OK
830-MBA	L0608517	Phase II DUP2	5	PMW101-04A	OK
830-MBA	L0608553	Phase II DUP3	3	IW101-03B	OK
830-MBA	L0608582	Phase II DUP4	6	IW101-04C	OK
830-MBA	L0608599	Phase II DUP5	8	MW-101T	OK
830-MBA	L0608599	Phase II DUP7	9	PMW101-07A	OK
830-MBA	L0608627	Phase II DUP8	8	IW101-06B	OK
830-MBA	L0608682	Phase II DUP6	4	MW-85	OK
830-MBA	L0608210	TTA-1-DUP1	2	MW-21?	OK
830-MBA	L0608292	TTA-1-DUP2	5	IW21-04A?	OK
RSK175\5021	L0608515	Phase II DUP1	4	IW101-01C	OK
RSK175\5021	L0608517	Phase II DUP2	5	PMW101-04A	OK
RSK175\5021	L060855	Phase II DUP3	3	IW101-03B	OK

Method	SDG	Client Sample ID	Lab Sample ID	Parent Sample	Observations
	3				
RSK175\5021	L060858 2	Phase II DUP4	6	IW101-04C	OK
RSK175\5021	L060859 9	Phase II DUP5	8	MW101-T	OK
RSK175\5021	L060859 9	Phase II DUP7	9	PMW101-07A	OK
RSK175\5021	L060862 7	Phase II DUP8	8	IW101-06B	OK
RSK175\5021	L060868 2	Phase II DUP6	4	MW-85	OK
RSK175\5021	L060821 0	TTA-1-DUP1	2	MW-21?	OK
RSK175\5021	L060829 2	TTA-1-DUP2	5	IW21-04A?	OK

X. COMPOUND IDENTIFICATION

A. All raw data chromatograms and data system printouts were evaluated for all detected compounds and the identification is accurate.
Yes _____ No_____ NA __X___

Not applicable to this level of data validation.

B. Retention time limits or peak pattern identifications are met.
Yes _____ No_____ NA___X__

Not applicable to this level of data validation.

C. If two column or two detector confirmation was performed, the value of the confirmation was within 25%D of the quantitation value for results > 5 x RL. If the laboratory has flagged data 'COL' for %D > 40%, a JP qualifier has been added for low level results. For values below (5 x RL), the difference is not considered to impact the precision of the data.
Yes ___ No ____ NA __X__

Not applicable to this level of data validation.

XI. COMPOUND QUANTITATION AND REPORTED CRQLS

A. Raw data examination verified that all sample results were correctly calculated.
Yes _____ No_____ NA__X___

Not applicable to this level of data validation.

B. The chromatograms and general system performance were acceptable for all instruments and analytical systems.

Yes ____ No _____ NA___X__

Not applicable to this level of data validation.

XII. OVERALL ASSESSMENT OF THE CASE

The method criteria have been met and the quality of the data, as qualified, is considered fully acceptable and usable. The following is noted:

Chain of Custody and Deliverables:

This is a Level III Report.

The hardcopy data did not include any data for method 830-MBA. The laboratory had also submitted pdf files of the results, and these files did include the 830-MBA results. In the interests of efficiency, the validation was conducted on these rather than requesting that the hardcopies be completed for this analysis.

For one SDG, L0608292, the pdfs received did not include data for several of the analyses, including the 830-MBA, RSK-175, and 8260. The laboratory was contacted and the missing data provided to us by pdf.

These missing data appear to be due to internal systems errors associated with the report generation system used by the laboratory. However, the pdf files provided are text-searchable and very complete with the exception noted above. They also include the raw chromatographic data, not required for this project.

L0609057: Has two Sample Receipt Forms. The one for cooler 0081 is incomplete, only answering three of the questions. The second form for coolers 89, 115 and 71 is complete and states that the all sample containers were not intact. The Sample Discrepancy Form states that PMW9202 1 of 3 RSK received broken.

L0609055: Sample Receipt form is incomplete for cooler 0081, only answering three of the questions.

L0608599: IW101-06A was not received but on the chain of custody. MW101-B for metabolic acids, the lid was broken on the container. Use the MS container for the parent sample and MSD container for both MS and MSD samples.

L0608599: IW101-06A was not received but on the chain of custody

L0608553: Sample Discrepancy Form states, “Dup3 C/C 1700 = label 1520.”

L0609050: The Sample Receipt Form shows “N/A” to the following questions –‘ Was the pH tested on preserved water samples’; and ‘Were pH ranges acceptable’. All the other SDGs said “Yes”.

L0608649: Sample Receipt Form circled Yes and No to ‘Were samples intact?’ The narrative states that they were intact. The Sample Discrepancy Form states - 08C TOC received broken – another container received.

L0608682: Sample Discrepancy Form: Samples PMW85-01 and MW85 TOC no chain of custody received. SXS originally received 8/31/06, TOCs received 9/2/06.

L0608253: Sample Discrepancy Forms states that not all labels filled out with date and times.

Continuing Calibration:

All CCVs met method and validation limits with the exception of those for RSK-175, carbon dioxide analyte. There is a general tendency for this compound to be out of acceptance limits. Qualifiers were added to associated data as JC#, where # is the CCV %D observed. Such results may be biased due to calibration drift.

Method Blanks:

Method blank detections are observed for methane in several RSK-175 blanks. Where associated samples have detections less than 5x the method blank level, they are qualified as UB#, where # is the method blank level corrected for dilution. Such results are usable as non-detects.

Field Blanks:

The rinse and equipment blanks are free of contamination with the exception of carbon dioxide in one sample. The level of this compound is much too low to be significant compared to the result observed in the associated samples, so no qualifiers have been added.

LCS Recoveries:

Metabolic acids: All LCS recoveries are in control.
RSK-175: All but one of the LCS recoveries are in control. As shown below, carbon dioxide is recovered low in one LCS, although in control in the LCSD. The result is qualified as JL37.9D40.6 for associated samples, where the D40.6 reflects the out of limits RPD resulting from the fact that the LCS is out of control but the LCS is in control. This result impacts only one sample.

MS/MSD Recoveries:

RSK-175: There are 5 MS/MSDs
Metabolic acids: There are 5 MS/MSDs.
This is a sufficient frequency of MS/MSDs to meet the requirements.

Metabolic acids:
Although there are a number of outliers as shown in the table within the report, most are elevated recoveries associated with non-detects in the parent sample. Such results are not qualified since the bias would not interfere with the ability to detect the analtye. In one case, pyruvic acid is recovered low and the parent is qualified as JS#, where # is the recovery. This result could be biased low approximately proportional to the recovery observed.

RSK-175:
The table within the report shows the outliers observed. We note that in the data associated with MW-101B, the MS spike amount is 2.5 x the level reported to have been spiked in the MSD. The observed concentration of each analyte, however, is very close to that observed in the MSD. Although no comment is

made in the Case Narrative about this fact, it is suggestive that the MS spike amount used to calculate the recovery is not correct. We recommend that the project manager request the laboratory to review their records to determine if this can be established. The apparent low recoveries result in a qualifier in the parent sample of JS#, where # is the low recovery observed. If the laboratory could establish that the spike level was incorrectly entered, the recoveries may be in control and the qualifiers could be reversed.

All other outliers are associated with carbon dioxide, which is present in the parent samples at levels well in excess of 4x the spike. When this occurs, the expected normal analytical variability is similar to the spike level and calculated recoveries are not meaningful, nor are they indicators of bias. In these cases, no qualifiers are added.

Field Duplicates:

There are 10 samples identifiable as field duplicates. Two of these have names that are different than were identified by the client. Client sample Phase 1 DUP1 appears to have been reported as sample TTA-1-DUP1, and the sample Phase 1 DUP2 appears to have been reported as sample TTA-1-DUP2. We have made that assumption in the table within the report. All are in control.

INORGANIC DATA QUALITY REVIEW REPORT

METALS BY ICP SW-846 METHOD 6010B and Mercury

SDG: L060-8210, -8253, -8292, -8509, -8510, -8515, -8517, -8552, -8553, -8554, -8581, -8582, -8599, -8627, -8649, -8650, -8682, -8683, -9049, -9052, -9055, -9059, -9060, -9061, -9066, -9098

PROJECT: Memphis Site; for e2m

LABORATORY: Kemron Laboratories, Marietta, OH

SAMPLE MATRIX: Water SAMPLING DATE (Month/Year): 8,9 / 06

ANALYSES REQUESTED: SW-846 Method 6010 (ICP), 9030 Sulfide, 9056 (IC) Bromide, Chloride, Nitrate, Nitrite, Sulfate, 9060 Total Organic Carbon; MCAWW Method 310.2 Alkalinity

NO. OF SAMPLES: 97 Total Water, 8 Dissolved Water, 106 Wet Chemistry

SAMPLE NO: See attached results forms

DATA REVIEWER: William Berning

QA REVIEWER: Diane Short and Associates Inc. INITIALS/DATE: _________

Telephone Logs included Yes____ No X

Contractual Violations Yes____ No X

The project Sampling and Analysis Plan (SAP), the EPA Contract Laboratory Program National Functional Guidelines for Inorganic Review, 2002 and the SW-846 and MCAWW Methods have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. Per the Scope of Work, the review includes validation of all calibrations, chains of custody (for sample holding time and preservation only), and QC forms referencing the above documents.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work or project contract.

Yes___X__ No___

The following is noted for clarification:

The packages contained 97 total waters, 8 dissolved waters, and 106 wet chemistry samples analyzed for 3 project-specific ICP metals and 8 wet chemistry parameters. There were also 3 field blanks. Per the contract, all packages were reviewed for holding time, summary QC and calibration (Level III). No raw data were required for review, nor were raw data required for submission. Two SDG's (L0608581 and L0608582) were further evaluated for calibration blank results.

For the wet chemistry, only the IC analyses had ICV/CCV results reported in summaries; there were no calibration blanks reported for the IC. All other wet chemistry analyses were missing both CV and CB QC summaries. None of the packages contained raw data to allow for evaluation of the missing CV/CB data and none of them contained raw data to allow for evaluation of the various instrument initial calibrations (e.g. no calibration curves were provided).

SDG's L0608253 and L0608292 were each missing the metals QC summary information. The laboratory was contacted and provided the missing data as pdf resubs.

SDG L0609055 was missing the TOC QC summary information. The reviewer located it in another SDG (L0609049) and used that to complete the validation.

SDG's L0608253 had a metals double QC set and L0608581 had an IC double QC set. SDG L0608682 had a TOC double QC set. SDG's L0609059 and L0609060 each had two sets of ICP runs reported.

II. CALIBRATIONS

A. All initial instrument calibrations were performed as defined in the contract or Statement of Work (SOW). All correlation coefficients of the 3 point curve were > 0.995.

Yes____ No___ NA__X_

No raw data were required to evaluate this requirement.

B. The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were analyzed at the required frequency.

Yes__X__ No____

Sequencing was not required, but sufficient calibrations were present to verify that the frequencies were met for client samples for ICP and IC. This information was not provided for the rest of the analyses and could not be evaluated for them.

C. And the ICV and CCV standard percent recovery results were within the required control limits of 90 – 110% (Mercury 80 – 120%).

Yes__X_ No____

The requirements were met for client samples for ICP and IC (IC used percent difference). This information was not required for the rest of the analyses and was not evaluated for them.

III. CRDL STANDARDS

The 2 x CRDL standards were analyzed as required in the SOW.

Yes ___ No____ NA__X_

Not required.

IV. BLANKS

Note: the highest blank associated with any particular analyte is used for the qualification process and is the value entered after the "B" blank descriptor.

A. The initial calibration blanks (ICB) and continuing calibration blanks (CCB) were analyzed at the required frequency.

Yes__X_ No____ NA____

Sequencing was not required, but sufficient calibration blanks were present to verify that the frequencies were met for client samples for ICP. This information was not required for the rest of the analyses and was not evaluated for them.

B. And the ICB and CCB results were within the required control limits.

Yes__X__ No____ NA_____

Per the review of the ICP data, there were as some blank analyte detects reported in the calibration blanks, but all client data were either non-detect or much greater than the contamination, so client data overall are not significantly impacted.

C. And all analytes in the Leach Blank were less than the CRDL, or less than 2x the instrument detection limit (IDL), whichever is lower.

Yes____ No____ NA__X__

No TCLP analysis was performed.

V. PREPARATION BLANKS

A. Preparation blanks were prepared and analyzed at the required frequency.

Yes__X__ No____

B. And all analytes in the preparation blank were less than the CRDL, or less than the instrument detection limit (IDL), whichever is lower.

Yes____No__X__

There were some blank analyte detects reported in the preparation blanks, but all client data were either non-detect or much greater than the contamination, so client data overall are not significantly impacted.

C. Field, trip, decon rinse or other field blanks are contained and identified in the package.

Yes __X__ No____ NA____

D. And the reported results are less than the CRDL or less than the IDL, whichever is lower.

Yes ____ No __X_ NA____

Analytes were found in the field blanks at levels requiring qualification for the following parameters.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0608253	All detects <5x .940 mg/l	Total Organic Carbon	UFB.94
L0608649	All detects <5x 9.9 mg/l	Alkalinity	UFB9.9
	All detects <5x 1.1 mg/l	Total Organic Carbon	UFB1.1

Analytes reported as contaminants in the field blank are qualified UFB# in the affected samples, where # is the value of the blank corrected to the units of the sample. Sample detects whose values are less than 5x blank are qualified UFB and are fully usable as undetected values at that level. See the summary table at the end of this report.

VIA. ICP INTERFERENCE CHECK SAMPLE
A. The Interference Check Sample (ICS) was analyzed as required in the SOW or contract.
Yes__X_ No____ NA____

B. And the ICS percent recovery results were reported for all required ICS analytes and were within required control limits of 80% to 120%.
Yes__X__ No____ NA____

C. ICP analysis results for analytes not required to be present in a given ICS standard were within acceptable limits.
Yes____No____ NA__X__
Not requested by client and data not provided by laboratory.

VIB. INTERELEMENT CORRECTION FACTORS
The Interelement Correction Factors are included and complete for all possible interferent analytes.
Yes____No____ NA__X__
Review of possible other contaminants was not requested by the client.

VII. SPIKE SAMPLE RECOVERY
A. A matrix (pre-digestion) spike sample was analyzed for each digestion group and/or matrix or as required in the SOW.
Yes _____ No__X__
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

The laboratory ran variously either matrix duplicates or MS/MSD samples or both or neither.

B. And the Matrix spike percent recoveries were within the required control limits of 75 – 125%.
Yes ____ No__X_ NA____
The following SDGs had matrix spike results that resulted in sample qualification.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0608253	All	Total Organic Carbon	JS70
L0608649	All	Total Organic Carbon	JS73

The samples were qualified JS#, where the # is the percent recovery of that particular analyte. A low matrix spike recovery indicates a possible low bias to the reported result.

B. A Post-digest spike was analyzed if required.
Yes__X__No____ NA____

C. The MS/MSD samples included client samples
Yes __X_ No___ NA____
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

There were at least 5 client samples reported for metals MS/MSD samples and at least 6 client samples reported for wet chemistry MS/MSD samples.

VIII. DUPLICATES

A. Matrix (pre-digestion) duplicate samples were analyzed at the required frequency
Yes __X__ No____
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

The laboratory ran variously either matrix duplicates or MS/MSD samples or both.

B. And the Matrix duplicate relative percent differences (RPD) were within the required control limits (Water 20%, Soil 35%) or the RL limits were met if the duplicate values are < 5 x RL. If the either one of the duplicate results are < 5 X RL, the RPD is not used. The QC limit used is the difference between the original and the duplicate results (± the RL) for water and (± 2X the RL) for soils.
Yes __X_ No ____ NA_____

IX. LABORATORY CONTROL SAMPLE

A. Laboratory control samples (LCS) were analyzed at the required frequency.
Yes _X___ No____
The laboratory also ran an LCS duplicate at times.

B. And LCS recoveries were within the required control limits of 80 to 120%.
Yes __X___ No____

X. MSA RESULTS AND GRAPHITE FURNACE ANALYSIS (GFAA)

Duplicate injections were performed for all analyses and the RSDs were less than 20% for all reported results. (Method of Standard Additions (MSA) requires only a single injection).
Yes____No____ NA__X___
Graphite furnace was not done.

XI. ICP SERIAL DILUTION

A. ICP Serial Dilutions have been analyzed at the required frequency if the analyte concentrations are greater than 50 x IDL.
Yes__X_ No____ NA_____
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

The laboratory sometimes reported serial dilution results and sometimes did not.

B. And the percent difference criteria of ± 10 % have been met.
Yes____ No __X__ NA____
The following analytes were qualified due to serial dilution percent differences out of the control limits.

SDG	**SAMPLE ID (dilution)**	**ANALYTE**	**QUALIFICATION**
L0609098	All (1)	Manganese	JE11

For serial dilution percent difference results that are out of control, the affected sample data have been qualified JE#, where # is the value of the %D. These results indicate possible non-linear chemical or matrix interferences that could add a high bias to the data.

C. The serial dilution analyses were on client samples
Yes __X___ No__X___
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

The laboratory sometimes reported serial dilution results and sometimes did not.

The serial dilution results reported for SDG L0608509 were from a non-client sample and would have resulted in sample data qualification. The serial dilution result for SDG L0608510 was from a client sample collected the same day, however, and so it was used for evaluation instead of the non-client sample in SDG L0608509. No data were qualified because of it.

There were at least 5 reported client samples.

XII. INSTRUMENT DETECTION LIMITS
A. The Instrument Detection Limits have met the Quarterly reporting requirements.
Yes ___X_ No____ NA__
This was determined to be acceptable during the contractual process.

B. And all sample results have met the required detection limits (CRDL).
Yes__X__ No____ NA____
The laboratory has diluted several of the digestates to account for potential matrix effects on the selenium analysis (in the form of excessively negative results for the given samples). The laboratory has reported both the undiluted and the diluted results. The dilutions performed raised the MDL's, the project manager will evaluate whether the elevated MDL's are still below the project reporting limits.

XIII. PREPARATION AND ANALYSIS LOGS
A. All samples were prepared or analyzed within the required holding times referencing the SOW (time of sample receipt to preparation/distillation).
Yes___X_ No____

B. All samples were analyzed within the 40 CFR 136 (Clean Water Act) or method recommended holding times (time of sample collection to date of analysis).
Yes_____ No__X__
The following samples required qualification due to method holding time exceedances.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0608510	All	Nitrate	JH6, JH5
	All	Nitrite	JH6, JH5
L0609055	DR2-1, IW92-01	Nitrate	JH5, JH4
	DR2-1, IW92-01	Nitrite	JH5, JH4

For sample holding time results that are out of control, the affected sample data have been qualified JH#, where # is the number of time units past holding time that the analysis was late. In this case, the time is in hours. Analysis results qualified as estimated due to holding time violations may have a possible low bias to the data due to the potential loss of analyte, as well as a possible reporting of false negatives.

C. Chains of Custody (COC)
1. Chains of Custody (COC) were reviewed and all fields were complete, signatures were present and cross outs were clean and initialed.
Yes_____ No___NA__X__
Per client instructions, this part of the validation was not performed. Chains are being reviewed by the project manager. The COCs were electronically generated and signed.

2. Samples were received at the required temperature and preservation.
Yes__X__ No____

XIV. FIELD QC
A. Field QC samples (duplicates, SRMs) were identified.
Yes __X__ No____
The field duplicates are identified as:

SDG	Duplicate Pair
L0608210	MW-21 / TTA-1-DUP1
L0608292	IW21-04A / TTA-1DUP2
L0608515	IW101-01C / Phase II DUP1
L0608517	PM101-04A / Phase II DUP2
L0608553	IW101-03B / Phase II DUP3
L0608582	IW101-04C / Phase II DUP4
L0608599	MW101T / Phase II DUP5
L0608599	MW-85 / Phase II DUP6
L0608627	IW101-06B / Phase II DUP8

B. Field duplicates were within a guidance limit of < 35% RPD limit for water or <50% RPD limit for soil. If values are < 5 x RL, the water limit is ± 2 x RL and the soil limit is ±4 x RL. Final determination will be made by the project manager.
Yes __X__ No____ NA___
Per the field manager, the duplicates are within project criteria. The reviewer has checked the data and concurs.

XV. GENERAL COMMENTS
The laboratory has complied with the requested methods and the quality of the data is acceptable and usable with consideration of the following qualifications. Note that the following qualifiers are used:

UFB#, where # is the value of the blank contamination. Data are usable as undetected values.
JS# is for matrix spike/matrix spike duplicate recoveries, where # is the analyte recovery. The bias to the data is considered to be high or low proportional to the analyte recovery. (JS125 would indicate the value could be 125% of the true value)
JE#, where # is an indication of non-linear matrix effects. Data could be biased high by the amount indicated by the number (JE15, data could be high by an additional 15%).
JH#, where # is the number of time units the analysis is past holding time. Data may have a possible low bias to the data due to the potential loss of analyte, as well as a possible reporting of false negatives.

Summary:
*Very low level detections of alkalinity and total organic carbon could be false detections due to field contamination, not the presence of the analytes in the sample. (UFB#)

*Total organic carbon could be biased low by the added factor indicated by the low matrix spike/matrix spike duplicate analyte recoveries (JS#).

*The matrix also exhibits the presence of non-linear effects for manganese. Data could be biased high by the added factor indicated by the serial dilution percent difference. (JE#)

*Nitrite and nitrate data could be biased very slightly low due to an exceedence of the holding time by several hours.

Qualification or Comments in Detail
Chains-of-Custody
The project manager is reviewing the chains.

Blanks
There were some blank analyte detects reported in the preparation blanks, but all client data were either non-detect or much greater than the contamination, so client data overall are not significantly impacted.

Analytes were found in the field blanks at levels requiring qualification for the following parameters.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0608253	All detects <5x .940 mg/l	Total Organic Carbon	UFB.94
L0608649	All detects <5x 9.9 mg/l	Alkalinity	UFB9.9

	All detects <5x 1.1 mg/l	Total Organic Carbon	UFB1.1

Analytes reported as contaminants in the field blank are qualified UFB# in the affected samples, where # is the value of the blank corrected to the units of the sample. Sample detects whose values are less than 5x blank are qualified UFB and are fully usable as undetected values at that level. See the summary table at the end of this report.

Holding Times
The following samples required qualification due to method holding time exceedances.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0608510	All	Nitrate	JH6, JH5
	All	Nitrite	JH6, JH5
L0609055	DR2-1, IW92-01	Nitrate	JH5, JH4
	DR2-1, IW92-01	Nitrite	JH5, JH4

For sample holding time results that are out of control, the affected sample data have been qualified JH#, where # is the number of time units past holding time that the analysis was late. In this case, the time is in hours. Analysis results qualified as estimated due to holding time violations may have a possible low bias to the data due to the potential loss of analyte. The time is only a few hours and the exceedence is not expected to impact the data.

Matrix Spikes/Matrix Spike Duplicates
The following SDGs had matrix spike results that resulted in sample qualification.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0608253	All	Total Organic Carbon	JS70
L0608649	All	Total Organic Carbon	JS73

The samples were qualified JS#, where the # is the percent recovery of that particular analyte. A low matrix spike recovery indicates a possible low bias to the reported result.

Serial Dilutions
The following analytes were qualified due to serial dilution percent differences out of the control limits.

SDG	SAMPLE ID (dilution)	ANALYTE	QUALIFICATION
L0609098	All (1)	Manganese	JE11

For serial dilution percent difference results that are out of control, the affected sample data have been qualified JE#, where # is the value of the %D. These results indicate possible non-linear chemical or matrix interferences that could add a high bias to the data.

Detection Limits

The laboratory has diluted several of the digestates to account for potential matrix effects on the selenium analysis (in the form of excessively negative results for the given samples). The laboratory has reported both the undiluted and the diluted results. The dilutions performed raised the MDL's, the project manager will evaluate whether the elevated MDL's are still below the project reporting limits.

Field Duplicates

The field duplicates are identified as:

SDG	Duplicate Pair
L0608210	MW-21 / TTA-1-DUP1
L0608292	IW21-04A / TTA-1DUP2
L0608515	IW101-01C / Phase II DUP1
L0608517	PM101-04A / Phase II DUP2
L0608553	IW101-03B / Phase II DUP3
L0608582	IW101-04C / Phase II DUP4
L0608599	MW101T / Phase II DUP5
L0608599	MW-85 / Phase II DUP6
L0608627	IW101-06B / Phase II DUP8

Per the field manager, the duplicates are within project criteria. The reviewer has checked the data and concurs.

QUALIFICATION SUMMARY TABLE

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0608253	all detects <5x .940 mg/l	Total Organic Carbon	UFB.94
	All	Total Organic Carbon	JS70
L0608649	all detects <5x 9.9 mg/l	Alkalinity	UFB9.9
	all detects <5x 1.1 mg/l	Total Organic Carbon	UFB1.1
	All	Total Organic Carbon	JS73
L0609055	DR2-1, IW92-01	Nitrate	JH5, JH4
	DR2-1, IW92-01	Nitrite	JH5, JH4
L0609098	All (1)	Manganese	JE11

ORGANIC DATA QUALITY REVIEW REPORT
GC REPORT FOR METABOLIC ACIDS by HPLC and ethane, methane, ethane, carbon dioxide by EPA SOP RSK-175

RSK-175: L0610216, L0610259, L0610200, L0610353, L0610399, L0610433, L0610309

Metabolic acids: L0610216, L0610259, L0610200, L0610353, L0610399, L0610433, L0610309

PROJECT: E2m, Memphis Defense Depot Design Monitoring DM-1

LABORATORY: Kemron Environmental Services, Marietta, OH

SAMPLE MATRIX: Water

SAMPLING DATE (Month/Year): October 2006

NO. OF SAMPLES: Metabolic acids – 42 waters; RSK-175 – 42

ANALYSES REQUESTED: Metabolic Acids by HPLC; EPA SOP RSK-175

SAMPLE NO.: Attached

DATA REVIEWER: Sammy and John Huntington, Gateway Enterprises

QA REVIEWER: Diane Short & Associates, Inc., INITIALS/DATE:____

Telephone Logs included Yes____ No _X_

Contractual Violations Yes____ No _X_

The project QAPP, EPA Contract Laboratory Program National Functional Guidelines for Organic Review, 1999 (SOP), the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, (SW-846), current updates, and the project-specific methods have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. The review has been tasked for review of all calibrations, holding times, and QC for all samples.

The data are not reviewed at the raw data level for chromatograms, calculations and two column confirmation at this review level (Level III). General comments regarding the data/analytical quality are not part of the review since a raw data review is not conducted.

I. DELIVERABLES

A. All deliverables were present as specified in the Statement of Work (SOW), SW-846, or in the project contract.
Yes __X__ No ____

This is a Level III Report

II. ANALYTICAL REPORT FORMS

A. The Analytical Report or Data Sheets are present and complete for all requested analyses.
Yes __X__ No_____

III. HOLDING TIMES

A. The contract holding times were met for all analyses (Time of sample receipt to time of extraction and from extraction to analysis.)
Yes __X___ No____
Metabolic Acids: The reviewer has not been able to find documented holding times for the metabolic acids. The normal holding time for the 8015B method is 14 days for preserved water samples. Metabolic acid holding times were all within 14 days. The project manager has verified that no holding time is established for these compounds. There is no indication of sample pH in the data packages, but the sample receipt forms indicate that the pH range is acceptable except in one instance, where it is noted that the laboratory adjusted the pH (see next section). This suggests that the samples were preserved with acid, a good practice for these analytes.

RSK-175: All samples were prepared within 14 days. For RSK-175, pH should not be adjusted when CO_2 is determined, which is the case in this project. It is not clear in the documentation whether samples for RSK-175 were pH-adjusted or not. In the absence of definitive information we have assumed that no acidification occurred. If in fact samples were acidified for RSK-175, it would mean that inorganic carbon in the form of bicarbonate and carbonate would be converted to carbon dioxide, would consequently bias the results high for that analyte. The project manager should clarify this preservation question and regard the data for carbon dioxide accordingly.

B. The Clean Water Act (40 CFR 136) or method holding times were met for all analyses (Time of sample receipt to time of extraction and from extraction to analysis.)
Yes __X___ No____
See note above.

C. All chains of custody are complete with signatures and dates.
Yes ____ No __X__
The project manager is informed of the following and the chain information is to be updated for the project file.

None of the SDGs have a customary chain of custody. Those have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers. Some of the time there is a typed area of the last page with the samplers name, date and time with a shaded area for the signature. The person receiving the samples must remember to write in their name and the sample receipt information as there is no area for that established. In addition, some sample names are truncated on the chain of custody, making them an unacceptable record for those samples.

Our understanding is that the chain of custody is an electronic sample documentation system. We would recommend developing an improved set of chain of custody documents to be generated from this system that provide a more clear hardcopy documentation of the electronic process, particularly once the samples are received at the laboratory. There needs to be signature lines for relinquished and received on all pages of the chain of custody and the pages need to be numbered and uniquely identified.

L0610433: The states no to "were pH ranges acceptable. The discrepancy report says, IW85-04-DM-1 830 – MBA pH 4.5=lab adj st.

B. Samples were received at the proper temperature and preservation.
Yes __X_ No_____

Cooler temperature was in many cases below 2°C but narratives noted that all samples were received in good condition. When samples are below the lower EPA limit of 2° C, as long as there is no damage to the samples, no qualifier is required.

Sample Checklist states that all samples are preserved.

L0610309: The cooler temperature was 0°C but the Sample Checklist states that the samples weren't frozen.

IV. INSTRUMENT CALIBRATION (IC) AND CONTINUING CALIBRATION (CC) VERIFICATION

A. The GC/HPLC standards were analyzed at the required frequency (every 72 hours at a minimum).
Yes ___X___ No_____

B. The chromatographic resolution and separation criteria were met.
Yes __X__ No_____

C. The suggested columns were used and the EQLs were met.
Yes __X____ No_____

D. Calibration factors for IC met the 20% RSD limit or the regression curves were prepared with a correlation coefficient ® greater than 0.99, per SW-846, Method 800B.
Yes ___X__ No _____

E. %D's for Continuing Calibration Factors and retention times (RT) were within the 25% Limits.
Yes ____ No __X___

Metabolic Acids: All calibrations are in control. The laboratory is employing the external standard method and is using opening and closing calibrations appropriately.

RSK-175: The laboratory conducts opening and closing calibrations (bracketing the samples during the analytical run). For RSK-175 there is not a specific requirement in the procedure for closing calibrations, and only calibration verification each 12 hours is specified. SW-846 guidance (method 8000B), however specifically requires such closing calibrations for external standard methods. For detected analytes, SW0846 specifies that the closing calibration must meet the same criteria as the opening calibration. This has been done for all analytes but for carbon dioxide, for which a number of closing calibrations do not meet the 30% D criterion specified for RSK-175. When the closing calibration has drifted, it indicates that at least some of the sample results prior to the CCV may be biased, and for this reason the results are qualified as JC#, where # is the closing CCV %D. We have indicated in the table below the direction (high or low) of the bias observed in the CCV in question, and the specific qualifiers added.

In addition, some opening CCVS show drifts outside of the 30% limit and results from subsequent samples are qualified from the opening CCV in those cases.

It should be noted in this regard that the laboratory appears to use a different criterion for carbon dioxide, since a few CCV results were flagged as being outside of limits, but it is not clear to this reviewer where the laboratory limit is set. This method has not been published as a promulgated method by EPA (it rather exists as an open literature publication and an internal EPA SOP, and it may not have been fully developed for carbon dioxide. Thus the laboratory limits may be realistic for this analyte. Nonetheless, the results appear to indicate a probable bias which should be considered in using the data.

Method	SDG	CCV Date	Lab Sample #	Analyte	%D	Bias	Qualifiers Added
RSK-175	L0610200	10/9/06 18:36	4	carbon dioxide	54.1	Low	JC54 detects (opening CCV)
		10/9/06 20:57	4	carbon dioxide	30.1	Low	None, from above CCV
	L0610259	10/13/06 12:43	3-4	carbon dioxide	46.0	Low	JC46 detects (closing CCV)
		10/14/06 16:11	1-2, 5-7	carbon dioxide	43.8	Low	JC44 detects (closing CCV)
	L0610353	10/18/06 15:20	1-2	carbon dioxide	78.2	Low	JC78 detects (closing CCV)
	L0610399	10/16/06 19:38	1-4	carbon dioxide	54.5	Low	JC55 detects (closing CCV)
	L0610433	10/16/06 19:38	2-5	carbon dioxide	54.5	Low	JC55 detects (closing CCV)
	L0610309	10/13/06 12:43	3-6	carbon dioxide	46.0	Low	JC46 (opening CCV)
		10/13/06 16:51	3-6	carbon dioxide	48.2	Low	None, from above CCV
		10/14/06 16:11	1-2, 7-8, 11-14	carbon dioxide	43.8	Low	JC44 detects (closing and opening CCV)
		10/14/06 18:45	1-2, 7-8, 11-14	carbon dioxide	68.2	Low	None, from above CCV

V. BLANKS

A. Laboratory blanks

1. Laboratory blanks were analyzed for every sample set and for each matrix type or once in every ten samples, whichever is more frequent.
Yes __X__ No_____

2. No blank contamination was found in the method blank.
Yes __X___ No _____

3. Instrument blank analysis was performed following all samples that contained analytes at high concentrations.
Yes _____ No____ NA__X___

B. Field Blanks
If field blanks were identified, no blank contamination was found.
Yes _____ No_____ NA__X___
Field blanks were not present.

VI. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

A. Matrix spike (MS) and matrix duplicate or matrix spike duplicate (MSD) were analyzed for every analyses performed for every 20 samples or for every matrix whichever is more frequent.
Yes ___X__ No_____

RSK-175: There were four (4) MS/MSDs run.
Metabolic Acids: There were four (4) MS/MSD conducted.
The MS/MSDs conducted are summarized in the table below.

METHOD	Matrix	SDG	PARENT	LAB SAMPLE ID
RSKSOP-175	Water	L0610200	PMW101-02B-DM-1	4
		L0610309	IW101-08A-DM-1	2
			MW-21-DM-1	8
			PMW101-08B-DM-1	11
Metabolic Acids	Water	L0610200	PMW101-02B-DM-1	4
		L0610309	IW101-08A-DM-1	2
			MW-21-DM-1	8
			PMW101-08B-DM-1	11

B. The MS and MSD percent recoveries (%R) were within the limits defined by the laboratory or in the contract.
Yes _____ No __X__
See the table below.

RSK-175:
Carbon dioxide gave MS/MSD outliers as shown in the table below. IN each case, the sample level is greater than 4x the spike amount, which means that the anticipated normal analytical variability is greater than the spike amount. In such cases, no recovery can meaningfully be calculated, and no qualifiers are added. There is no indication of bias.

Metabolic acids: There are two elevated recoveries as shown in the table, but since these are not detected in the parent sample, no qualifiers are appended.

METHOD	SDG	PARENT	PREP BATCH	ANALYTE	MS/MSD/RPD	QUALIFIERS
RSK-175	L0610200	4	WG224581	carbon dioxide	23.6/OK/OK	None, Parent > 4x spike
	L0610309	2	WG224966	carbon dioxide	-59.5/-100/OK	None, Parent > 4x spike
		8	WG225109	carbon dioxide	-277/OK/106	None, Parent > 4x spike
		11	WG225109	carbon dioxide	In control	None
Metabolic	L0610200	4	WG224739	acetic acid	165/157/OK	None, Parent ND

METHOD	SDG	PARENT	PREP BATCH	ANALYTE	MS/MSD/RPD	QUALIFIERS
acids						
	L0610309	2	WG224895	pyruvic acid	136/138/OK	None, ND
		8		All in control	All in control	None
		11		All in control	All in control	None

C. The MSD relative percent differences (RPD) were within the defined contract or laboratory limits.
Yes _____ No __ X __
See the above table. No qualifiers are added when the RPD is not associated with out-of-control recoveries.

D. The MS/MSD were client samples.
Yes __X_ No _____

VII. LABORATORY CONTROL SAMPLE AND DUPLICATE (LCS/LCSD)

A. Laboratory Control Sample (LCS) and LCS duplicate were analyzed for every analyses performed and for every 20 samples or for every matrix whichever is more frequent.
Yes __X___ No_____

B. The LCS percent recovery (%R) are within the limits defined by the laboratory or in the contract.
Yes __ X__ No__ ___
The laboratory has analyzed LCS duplicates and the RPD was out of laboratory limits in two cases. No qualifiers are added since the recoveries were in control.

SDG	Lab Sample #	Batch	Targets Detected	LCS/LCSD/RPD	Qualifiers
L0610200	1-4	WG224581	carbon dioxide	OK/OK/46.8	None
L0610353	1,2 RE	WG225410	carbon dioxide	OK/OK/48.6	None

VIII. SURROGATE RECOVERY

A. The Surrogate spike was analyzed with every sample.
Yes _____ No __X___
RSK-175: Surrogates are not required for this analysis.

Metabolic Acids: Surrogates are not required for this analysis

B. And met the recovery limits defined in the current contract. If recovery limits were exceeded, the sample was re-extracted and re-analyzed.
Yes _____ No___ NA __X___

C. INTERNAL STANDARDS

The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows. Note: Internal standards are not required for GC analysis, but if they are used, SW-846 stipulates that they meet the same recovery requirements as those specified for GCMS methods.
Yes ____ No _____ NA__X__
RSK-175: The laboratory uses the external standard procedure, so no internal standards are present.

Metabolic Acids: The laboratory uses the external standard procedure, so no internal standards are present.

IX. FIELD QC

If Field duplicates were identified, they met guidance RPD of < 35% for water or < 50% for soils. For values reported at < 5 x the reporting limit (RL), a difference of 2 x RL is used as guidance (4 x RL for soils). Data are not qualified for field duplicates as these are evaluated for the total project by the client.
Yes _____ No __X___ NA_____
For both methods there are 4 field duplicates. The table below shows that there are outliers for carbon dioxide and methane for one of the duplicates, and for lactic acid in one other duplicate. The others are in control.

Method	SDG	Client Sample ID	Parent Sample	Observations
RSK-175	L0610216	DM1-DUP1	PMW101-04A-DM-1	carbon dioxide RPD = 44%; methane RPD=65%
	L0610309	DM1-DUP2	PMW21-03-DM-1	OK
	L0610399	DM1-DUP3	DR2-1-DM-1	OK
	L0610399	DM1-DUP4	IW92-03-DM-1	OK
Metabolic acids	L0610216	DM1-DUP1	PMW101-04A-DM-1	OK
	L0610309	DM1-DUP2	PMW21-03-DM-1	OK
	L0610399	DM1-DUP3	DR2-1-DM-1	Lactic acid 6.8 in duplicate, ND (PQL=1) in sample
	L0610399	DM1-DUP4	IW92-03-DM-1	OK

X. COMPOUND IDENTIFICATION

A. All raw data chromatograms and data system printouts were evaluated for all detected compounds and the identification is accurate.
Yes ____ No_____ NA ___ X___
This evaluation is not performed at this level of review.

B. Retention time limits or peak pattern identifications are met.
Yes ____ No_____ NA__ X ___
This evaluation is not performed at this level of review.

C. If two column or two detector confirmation was performed, the value of the confirmation was within 25%D of the quantitation value for results > 5 x RL. If the laboratory has flagged data 'COL' for %D > 40%, a JP qualifier has been added for low level results. For values below (5 x RL), the difference is not considered to impact the precision of the data.
Yes ___ No ____ NA __X__
Not part of this level of review. Dual columns are not required for these methods.

XI. COMPOUND QUANTITATION AND REPORTED CRQLS

A. Raw data examination verified that all sample results were correctly calculated.
Yes _____ No_____ NA__X ___
This evaluation is not performed at this level of review.

B. The chromatograms and general system performance were acceptable for all instruments and analytical systems.
Yes _____ No _____ NA__ X ___
This evaluation is not performed at this level of review.

XII. OVERALL ASSESSMENT OF THE CASE

The method criteria have been met and the quality of the data, as qualified, is considered fully acceptable and usable as far as can be determined at this level of review.
No qualifiers are added for the metabolic acid analyses.
The following is noted:

Chain of Custody and Login Checklists:

The project manager is informed of the following and the chain information is to be updated for the project file.

None of the SDGs have a customary chain of custody. Those have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers. Some of the time there is a typed area of the last page with the samplers name, date and time with a shaded area for the signature. The person receiving the samples must remember to write in their name and the sample receipt information as there is no area for that established. In addition some sample names are truncated on the chain of custody, making them an unacceptable record for those samples.

Our understanding is that the chain of custody is an electronic sample documentation system. We would recommend developing an improved set of chain of custody documents to be generated from this system that provide a more clear hardcopy documentation of the electronic process, particularly once the samples are received at the laboratory. There needs to be signature lines for relinquished and received on all pages of the chain of custody and the pages need to be numbered and uniquely identified.

L0610433: The checklist states no to "were pH ranges acceptable. The discrepancy report says, IW85-04-DM-1 830 – MBA pH 4.5=lab adj st.

Sample Condition:

Cooler temperature was in many cases below 2°C but narratives noted that all samples were received in good condition. When samples are below the lower EPA limit of 2° C, as long as there is no damage to the samples, no qualifier is required.

Sample Checklist states that all samples are preserved.

L0610309: The cooler temperature was 0°C but the Sample Checklist states that the samples weren't frozen.

Holding times:

Metabolic Acids: The reviewer has not been able to find documented holding times for the metabolic acids. The normal holding time for the 8015B method is 14 days for preserved water samples. Metabolic acid holding times were all within 14 days. The project manager has verified that no holding time is established for these compounds. There is no indication of sample pH in the data packages, but the sample receipt forms indicate that the pH range is acceptable except in one instance, where it is noted that the laboratory adjusted the pH (see next section). This suggests that the samples were preserved with acid, a good practice for these analytes.

RSK-175: All samples were prepared within 14 days. For RSK-175, pH should not be adjusted when CO_2 is determined, which is the case in this project. It is not clear in the documentation whether samples for RSK-175 were pH-adjusted or not. In the absence of definitive information we have assumed that no acidification occurred. If in fact samples were acidified for RSK-175, it would mean that inorganic carbon in the form of bicarbonate and carbonate would be converted to carbon dioxide, would consequently bias the results high for that analyte. The project manager should clarify this preservation question and regard the data for carbon dioxide accordingly.

Continuing Calibrations:
Metabolic Acids: All calibrations are in control. The laboratory is employing the external standard method and is using opening and closing calibrations appropriately.

RSK-175: The laboratory conducts opening and closing calibrations (bracketing the samples during the analytical run). For RSK-175 there is not a specific requirement in the procedure for closing calibrations, and only calibration verification each 12 hours is specified. SW-846 guidance (method 8000B), however specifically requires such closing calibrations for external standard methods. For detected analytes, SW0846 specifies that the closing calibration must meet the same criteria as the opening calibration. This has been done for all analytes but for carbon dioxide, for which a number of closing calibrations do not meet the 30% D criterion specified for RSK-175. When the closing calibration has drifted, it indicates that at least some of the sample results prior to the CCV may be biased, and for this reason the results are qualified as JC#, where # is the closing CCV %D. We have indicated in the table within the report the direction (high or low) of the bias observed in the CCV in question, and the specific qualifiers added.

In addition, some opening CCVS show drifts outside of the 30% limit and results from subsequent samples are qualified from the opening CCV in those cases.

It should be noted in this regard that the laboratory appears to use a different criterion for carbon dioxide, since a few CCV results were flagged as being outside of limits, but it is not clear to this reviewer where the laboratory limit is set. This method has not been published as a promulgated method by EPA (it rather exists as an open literature publication and an internal EPA SOP, and it may not have been fully developed for carbon dioxide. Thus the laboratory limits may be realistic for this analyte. Nonetheless, the results appear to indicate a probable bias which should be considered in using the data.

MS/MSD Recoveries:
RSK-175: There were four (4) MS/MSDs run. Carbon dioxide gave MS/MSD outliers as shown in the table in the report. In each case, the sample level is greater than 4x the spike amount, which means that the anticipated normal analytical variability is greater than the spike amount. In such cases, no recovery can meaningfully be calculated, and no qualifiers are added. There is no indication of bias.

Metabolic Acids: There were four (4) MS/MSD conducted. There are two elevated recoveries as shown in the table within the report, but since these are not detected in the parent sample, no qualifiers are appended.

Field Duplicates:
For both methods there are 4 field duplicates. The table in the report shows that there are outliers for carbon dioxide and methane for one of the duplicates, and for lactic acid in one other duplicate. The others are in control.

ORGANIC DATA QUALITY REVIEW REPORT

GC REPORT FOR METABOLIC ACIDS by HPLC, Ethane, Methane, Ethene, Carbon dioxide by EPA SOP RSK-175, and Hydrogen by AM20GAX.

RSK-175: L0611101, L0611102, L0611123, L0611124, L0611148, L0611149, L0611150, L0611191, L0611192, and L0611264

Metabolic acids: L0611101, L0611102, L0611123, L0611124, L0611148, L0611149, L0611150, L0611191, L0611192, and L0611264

AM20GAX: P0610136, P0611108, P0611178, and P0611262

PROJECT: e2m, Memphis Defense Depot Design Monitoring DM-2

LABORATORY: Kemron Environmental Services, Marietta, OH

SAMPLE MATRIX: Water and Vapor

SAMPLING DATE (Month/Year): November 2006

NO. OF SAMPLES: Metabolic acids – 43 waters; RSK-175 – 43 waters, AM20GAX – 53 vapor

ANALYSES REQUESTED: Metabolic Acids by HPLC; EPA SOP RSK-175, AM20GAX

SAMPLE NO.: Attached

DATA REVIEWER: Richard Kulp

QA REVIEWER: Diane Short & Associates, Inc., INITIALS/DATE:____

Telephone Logs included Yes____ No X

Contractual Violations Yes____ No X

The project QAPP, EPA Contract Laboratory Program National Functional Guidelines for Organic Review, 1999 (SOP), the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, (SW-846), current updates, and the project-specific methods have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. The review has been tasked for review of all calibrations, holding times, and QC for all samples.

The data are not reviewed at the raw data level for chromatograms, calculations and two column confirmation at this review level (Level III). General comments regarding the data/analytical quality are not part of the review since a raw data review is not conducted.

I. DELIVERABLES

A. All deliverables were present as specified in the Statement of Work (SOW), SW-846, or in the project contract.

Yes __X__ No ____

Note that the laboratory cover pages for most of the data sets had the incorrect Laboratory Report number noted. These have been corrected by the validator to agree with the report number in the associated package. Cover pages were not always present.

This is a Level III Report

II. ANALYTICAL REPORT FORMS

A. The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes __X__ No_____

III. HOLDING TIMES

A. The contract holding times were met for all analyses (Time of sample receipt to time of extraction and from extraction to analysis.)

Yes __X___ No____

Metabolic Acids: The reviewer has not been able to find documented holding times for the metabolic acids. The normal holding time for an analogous HPLC method 8310 is 14 days for preserved water samples. Metabolic acid holding times were all within 14 days. It has been verified on other projects that no holding time is established for these compounds. There is no indication of sample pH in the data packages, but the sample receipt forms indicate that the pH range is acceptable except in isolated instances, where it is noted that the laboratory adjusted the pH (see next section). This suggests that the samples were preserved with acid, a good practice for these analytes.

RSK-175: All samples were prepared within 14 days. For RSK-175, pH should not be adjusted when CO_2 is determined, which is the case in this project. It is not clear in the documentation whether samples for RSK-175 were pH-adjusted or not. In the absence of definitive information we have assumed that no acidification occurred. If in fact samples were acidified for RSK-175, it would mean that inorganic carbon in the form of bicarbonate and carbonate would be converted to carbon dioxide, would consequently bias the results high for that analyte. The project manager should clarify this preservation question and regard the data for carbon dioxide accordingly.

AM20GAX: All samples were analyzed within 14 days.

B. The Clean Water Act (40 CFR 136) or method holding times were met for all analyses (Time of sample receipt to time of extraction and from extraction to analysis.)

Yes __X___ No____

See note above.

C. All chains of custody are complete with signatures and dates.

Yes ____ No __X__

The project manager is informed of the following and the chain information is to be updated for the project file.

Only one SDG for Metabolic acids and RSK-175 methods had a customary chain of custody. The rest have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers. Some of the time there is a typed area of the last page with the samplers name, date and time with a shaded area for the signature. The person receiving the samples must remember to write in their name and the sample receipt information as there is no area for that established. There is a sample receipt form which gives a detail account of the sample conditions.

Our understanding is that the chain of custody is an electronic sample documentation system. We would recommend developing an improved set of chain of custody documents to be generated from this system that provide a more clear hardcopy documentation of the electronic process, particularly once the samples are received at the laboratory. There needs to be signature lines for relinquished and received on all pages of the chain of custody and the pages need to be numbered and uniquely identified.

There are chain of custody's for the AM20GAX method for this project. These COC's are acceptable.

B. Samples were received at the proper temperature and preservation.
Yes __X_ No_____

Cooler temperature was in some cases below 2°C but narratives noted that all samples were received in good condition. When samples are below the lower EPA limit of 2° C, as long as there is no damage to the samples, no qualifier is required.

Sample Checklist states that all samples are preserved.

IV. INSTRUMENT CALIBRATION (IC) AND CONTINUING CALIBRATION (CC) VERIFICATION

A. The GC/HPLC standards were analyzed at the required frequency (every 72 hours at a minimum).
Yes ___X___ No_____

B. The chromatographic resolution and separation criteria were met.
Yes __X__ No_____

C. The suggested columns were used and the EQLs were met.
Yes __X____ No_____

D. Calibration factors for IC met the 20% RSD limit or the regression curves were prepared with a correlation coefficient 'r' greater than 0.99, per SW-846, Method 8000B.
Yes ___X__ No _____

E. %D's for Continuing Calibration Factors and retention times (RT) were within the 25% Limits.
Yes ____ No __X___

Metabolic Acids: All calibrations are in control. The laboratory is employing the external standard method and is using opening and closing calibrations appropriately.

RSK-175: The laboratory conducts opening and closing calibrations (bracketing the samples during the analytical run). For RSK-175 there is not a specific requirement in the procedure for closing calibrations, and only calibration verification each 12 hours is specified. SW-846 guidance (method 8000B), however specifically requires such closing calibrations for external standard methods. For detected analytes, SW-846 specifies that the closing calibration must meet the same criteria as the opening calibration. This has been done for all analytes but for carbon dioxide, for which a number of opening calibrations do not meet the

30% D criterion specified for RSK-175. The samples following the opening CCV's are qualified as JC#, where # is the opening CCV %D. We have indicated in the table below the direction (high or low) of the bias observed in the CCV in question, and the specific qualifiers added.

It should be noted in this regard that the laboratory appears to use a different criterion for carbon dioxide, since a few CCV results were flagged as being outside of limits, but it is not clear to this reviewer where the laboratory limit is set. This method has not been published as a promulgated method by EPA (it rather exists as an open literature publication and an internal EPA SOP), and it may not have been fully developed for carbon dioxide. Thus the laboratory limits may be realistic for this analyte. Nonetheless, the results appear to indicate a probable bias which should be considered in using the data.

Method	SDG	CCV Date	Lab Sample #	Analyte	%D	Bias	Qualifiers Added
RSK-175	L0611101	11/8/06 13:57	1,2,3,4,5	carbon dioxide	56.3	Low	JC56 detects (opening CCV)
	L0611102	11/8/06 13:57	1	carbon dioxide	56.3	Low	JC56 detects (opening CCV)
		11/8/06 17:08	2,3,7	carbon dioxide	38.9	Low	JC39 detects (opening CCV)
		11/9/06 14:01	4	carbon dioxide	44.8	Low	JC45 detects (opening CCV)
	L0611123	11/9/06 14.01	2,4	carbon dioxide	44.8	Low	JC45 detects (opening CCV)
	L0611124	11/9/06 14:01	2,3	carbon dioxide	44.8	Low	JC45 detects (opening CCV)
		11/9/06 17:12	4,6	carbon dioxide	32	Low	JC32 detects (opening CCV)
		11/10/06 12:50	5	carbon dioxide	34	Low	JC34 detects (opening CCV)
	L0611148	11/10/06 12:50	1,2	carbon dioxide	34	Low	JC34 detects (opening CCV)
		11/14/06 13:11	3,4,5	carbon dioxide	34	Low	JC34 detects (opening CCV)
	L0611149	11/14/06 13:11	1	carbon dioxide	34	Low	JC34 detects (opening CCV)
	L0611150	11/14/06 13:11	1,2	carbon dioxide	34	Low	JC34 detects (opening CCV)
	L0611191	11/14/06 13:11	1	carbon dioxide	34	Low	JC34 detects (opening CCV)

AM20GAX: All calibrations are in control. The laboratory is employing the external standard method and is using opening and closing calibrations appropriately.

V. BLANKS

A. Laboratory blanks

1. Laboratory blanks were analyzed for every sample set and for each matrix type or once in every ten samples, whichever is more frequent.

Yes __X__ No_____

2. No blank contamination was found in the method blank.

Yes _____ No __X__

The method blanks in the following SDG's contained Carbon dioxide: L0611124 at 258 mg/L, L0611148 at 258 mg/L, L0611149 at 258 mg/L, and L0611192 at 308 mg/L. All affected samples were either non-detected or the values were greater than 10 times the blank value, therefore no flags were required.

3. Instrument blank analysis was performed following all samples that contained analytes at high concentrations.
Yes _____ No____ NA __X___

B. Field Blanks
If field blanks were identified, no blank contamination was found.
Yes _____ No_____ NA __X___
Field blanks were not present.

VI. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

A. Matrix spike (MS) and matrix duplicate or matrix spike duplicate (MSD) were analyzed for every analyses performed for every 20 samples or for every matrix whichever is more frequent.
Yes _____ No ___X__

In most cases for the RSK-175 and the Metabolic acids, the sample volumes were not sufficient to prepare a matrix spike and matrix spike duplicate.

RSK-175: There were two (2) MS/MSDs run.
Metabolic Acids: There were two (2) MS/MSDs conducted.
AM20GAX: There are no MS/MSDs for this method and they are not required for a vapor method.

The MS/MSDs conducted are summarized in the table below.

METHOD	Matrix	SDG	PARENT	LAB SAMPLE ID
RSKSOP-175	Water	L0611101	PMW101-05A-DM-2	5
		L0611102	IW101-03A-DM-2	4
Metabolic Acids	Water	L0611101	PMW101-05A-DM-2	5
		L0611102	IW101-03A-DM-2	4

B. The MS and MSD percent recoveries (%R) were within the limits defined by the laboratory or in the contract.
Yes _____ No __X__
See the table below.

RSK-175:
Carbon dioxide gave MS/MSD outliers as shown in the table below. In each case, the sample level is greater than 4x the spike amount, which means that the anticipated normal analytical variability is greater than the spike amount. In such cases, no recovery can meaningfully be calculated, and no qualifiers are added. There is no indication of bias.

Metabolic acids: There are two elevated recoveries as shown in the table, but since these are not detected in the parent sample, no qualifiers are appended.

METHOD	SDG	PARENT	PREP BATCH	ANALYTE	MS/MSD/RPD	QUALIFIERS
RSK-175	L0611101	5	WG227000	carbon dioxide	OK/-32/OK	None, Parent > 4x spike
	L0611102	4	WG227108	carbon dioxide	28.2/48.5/OK	None, Parent > 4x spike
Metabolic acids	L0611102	4	WG227512	acetic acid	-137/-129/OK	None, Parent > 4x spike
				Lactic acid	-10.9/-18.8/OK	None, Parent > 4x spike
				Propionic acid	-206/-194/OK	None, Parent > 4x spike

C. The MSD relative percent differences (RPD) were within the defined contract or laboratory limits.
Yes __X___ No _____

D. The MS/MSD were client samples.
Yes __X__ No _____

VII. LABORATORY CONTROL SAMPLE AND DUPLICATE (LCS/LCSD)

A. Laboratory Control Sample (LCS) and LCS duplicate were analyzed for every analyses performed and for every 20 samples or for every matrix whichever is more frequent.
Yes __X___ No_____

B. The LCS percent recovery (%R) are within the limits defined by the laboratory or in the contract.
Yes __X__ No_____

VIII. SURROGATE RECOVERY

A. The Surrogate spike was analyzed with every sample.
Yes _____ No ____ NA_X___
RSK-175 and AM20GAX: Surrogates are not required for this analysis.

Metabolic Acids: The Laboratory 'Data Checklist' notes surrogates as being applicable, but none are reported in the data packages. This item cannot be verified. For an analogous HPLC Method 8310, surrogates are required.

B. And met the recovery limits defined in the current contract. If recovery limits were exceeded, the sample was re-extracted and re-analyzed.
Yes _____ No_____ NA __X___

IX. INTERNAL STANDARDS

The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows. Note: Internal standards are not required for GC analysis, but if they are used, SW-846 stipulates that they meet the same recovery requirements as those specified for GCMS methods.
Yes ____ No _____ NA__X__
RSK-175: The laboratory uses the external standard procedure, so no internal standards are present.

Metabolic Acids: The laboratory uses the external standard procedure, so no internal standards are present.

AM20GAX: The laboratory uses the external standard procedure, so no internal standards are present.

X. FIELD QC

If Field duplicates were identified, they met guidance RPD of < 35% for water or < 50% for soils and gases. For values reported at < 5 x the reporting limit (RL), a difference of 2 x RL is used as guidance (4 x RL for soils). Data are not qualified for field duplicates as these are evaluated for the total project by the client.
Yes _____ No ___X__ NA_____
There are 4 field duplicates. Particularly for the metabolic acids, the differences are significant.

Client Sample ID	Parent Sample	Hydrogen	Met Acids	RSK
DM2DUP1	IW101-08B-DM-2	1.7/ 2.2 = ok	None	None
DM2DUP2	IW21-03A-DM-2	6.2/ 3.5 (RL0.6)	All OK	All OK
DM2DUP3	IW92-07-DM-2	300/ 1200 (RL 12)	Butyric : 1490/ 1u Propionic : 1480/ 10U Pyruvic : 1.72 / 0.1U Acetic : 884 / 1U Lactic : 44.1 / 1u	All OK
DM2DUP-4	DR2-1-DM-2	1.3 / 6.4	Butyric : 1u / 1u Propionic : 27.1/ 10U Pyruvic : 0.1U/ 0.1U Acetic : 14.6 / 1U Lactic : 1 U / 1 U	All OK

XI. COMPOUND IDENTIFICATION

A. All raw data chromatograms and data system printouts were evaluated for all detected compounds and the identification is accurate.
Yes ____ No _____ NA ___X__
This evaluation is not performed at this level of review.

B. Retention time limits or peak pattern identifications are met.
Yes _____ No _____ NA__X___
This evaluation is not performed at this level of review.

C. If two column or two detector confirmation was performed, the value of the confirmation was within 25%D of the quantitation value for results > 5 x RL. If the laboratory has flagged data 'COL' for %D > 40%, a JP qualifier has been added for low level results. For values below (5 x RL), the difference is not considered to impact the precision of the data.
Yes ____ No ____ NA __X__
Not part of this level of review. Dual columns are not required for these methods.

XII. COMPOUND QUANTITATION AND REPORTED CRQLS

A. Raw data examination verified that all sample results were correctly calculated.
Yes _____ No_____ NA__X___
This evaluation is not performed at this level of review.

B. The chromatograms and general system performance were acceptable for all instruments and analytical systems.
Yes _____ No _____ NA__X___
This evaluation is not performed at this level of review.

XIII. OVERALL ASSESSMENT OF THE CASE

The method criteria have been met and the quality of the data, as qualified, is considered fully acceptable and usable as far as can be determined at this level of review.
No qualifiers are added for the metabolic acid analyses.
The following is noted:

Chain of Custody and Login Checklists:
The project manager is informed of the recommendations for chain of custody formats and the chain information is to be updated for the project file as is appropriate.

Only one SDG for Metabolic acids and RSK-175 methods had a customary chain of custody. The rest have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers. Some of the time there is a typed area of the last page with the samplers name, date and time with a shaded area for the signature. The person receiving the samples must remember to write in their name and the sample receipt information as there is no area for that established. There is a sample receipt form which gives a detail account of the sample conditions.

There are chain of custody's for the AM20GAX method for this project. These COC's are acceptable.

Sample Condition:
Cooler temperature was in many cases below 2°C but narratives noted that all samples were received in good condition. When samples are below the lower EPA limit of 2° C, as long as there is no damage to the samples, no qualifier is required.

Sample Checklist states that all samples are preserved.

Holding times:
Metabolic Acids: The reviewer has not been able to find documented holding times for the metabolic acids. The normal holding time for an analogous HPLC method 8310 is 14 days for preserved water samples. Metabolic acid holding times were all within 14 days. It has been verified on other projects that no holding time is established for these compounds. There is no indication of sample pH in the data packages, but the sample receipt forms indicate that the pH range is acceptable except in isolated instances, where it is noted that the laboratory adjusted the pH (see next section). This suggests that the samples were preserved with acid, a good practice for these analytes.
RSK-175: All samples were prepared within 14 days. For RSK-175, pH should not be adjusted when CO_2 is determined, which is the case in this project. It is not clear in the documentation whether samples for RSK-175 were pH-adjusted or not. In the absence of definitive information we have assumed that no acidification occurred. If in fact samples were acidified for RSK-175, it would mean that inorganic carbon in the form of bicarbonate and carbonate would be converted to carbon dioxide, would consequently bias the results high for that analyte. The project manager should clarify this preservation question and regard the data for carbon dioxide accordingly.

AM20GAX: All samples were analyzed within 14 days.

Continuing Calibrations:
Metabolic Acids and Hydrogen: All calibrations are in control. The laboratory is employing the external standard method and is using opening and closing calibrations appropriately.

RSK-175: The laboratory conducts opening and closing calibrations (bracketing the samples during the analytical run). For RSK-175 there is not a specific requirement in the procedure for closing calibrations, and only calibration verification each 12 hours is specified. SW-846 guidance (method 8000B), however specifically requires such closing calibrations for external standard methods. For detected analytes, SW-846 specifies that the closing calibration must meet the same criteria as the opening calibration. This has been done for all analytes but for carbon dioxide, for which a number of opening calibrations do not meet the 30% D criterion specified for RSK-175. The samples following the opening CCV's are qualified as JC#, where # is the opening CCV %D. We have indicated in the table below the direction (high or low) of the bias observed in the CCV in question, and the specific qualifiers added.

It should be noted in this regard that the laboratory appears to use a different criterion for carbon dioxide, since a few CCV results were flagged as being outside of limits, but it is not clear to this reviewer where the laboratory limit is set. This method has not been published as a promulgated method by EPA (it rather exists as an open literature publication and an internal EPA SOP, and it may not have been fully developed for carbon dioxide. Thus the laboratory limits may be realistic for this analyte. Nonetheless, the results appear to indicate a probable bias which should be considered in using the data.

MS/MSD Recoveries:

RSK-175: Carbon dioxide gave MS/MSD outliers as shown in the table below. In each case, the sample level is greater than 4x the spike amount, which means that the anticipated normal analytical variability is greater than the spike amount. In such cases, no recovery can meaningfully be calculated, and no qualifiers are added. There is no indication of bias.

Metabolic acids: There are two elevated recoveries as shown in the table, but since these are not detected in the parent sample, no qualifiers are appended.

AM20GAX: There are no MS/MSDs for this method.

Surrogates

Metabolic Acids: The Laboratory 'Data Checklist' notes surrogates as being applicable, but none are reported in the data packages. This item cannot be verified. For an analogous HPLC Method 8310, surrogates are required.

Field Duplicates:

There are 4 field duplicates. Particularly for the metabolic acids, the differences are significant.

Client Sample ID	Parent Sample	Hydrogen	Met Acids	RSK
DM2DUP1	IW101-08B-DM-2	1.7/ 2.2 = ok	None	None
DM2DUP2	IW21-03A-DM-2	6.2/ 3.5 (RL0.6)	All OK	All OK
DM2DUP3	IW92-07-DM-2	300/ 1200 (RL 12)	Butyric : 1490/ 1u Propionic : 1480/ 10U Pyruvic : 1.72 / 0.1U Acetic : 884 / 1U Lactic : 44.1 / 1u	All OK
DM2DUP-4	DR2-1-DM-2	1.3 / 6.4	Butyric : 1u / 1u Propionic : 27.1/ 10U Pyruvic : 0.1U/ 0.1U Acetic : 14.6 / 1U Lactic : 1 U / 1 U	All OK

ORGANIC DATA QUALITY REVIEW REPORT
VOLATILE ORGANICS SW-846 METHOD 8260B/5030B

8260B/5030B
SDG: L061: 2295, 2296, 2336, 2201, 2203, 2229, 2230, 2274, 2275, 2368, 2202, 2231, 2077, 2386, 2076, 2078, 2107, 2104, 2103, 2161, 2160, 2154

PROJECT: Memphis Defense Depot, EBT-1 for e2m Denver

LABORATORY: Kemron Environmental Services, Marietta, OH

SAMPLE MATRIX: Water

SAMPLING DATE (Month/Year): December, 2006

NO. OF SAMPLES: 8260B/5030B (Waters) – 105 samples including (9 Trip Blanks and 2 Rinse Blanks)

ANALYSES REQUESTED: SW-846 8260B

SAMPLE NO.: See attached result forms and associated edd

DATA REVIEWER: Sammy Huntington and John Huntington (Gateway Enterprises)

QA REVIEWER: Diane Short and Associates Inc. INITIALS/DATE: __________

Telephone Logs included Yes____ No _X__

Contractual Violations Yes____ No _X___

The EPA Contract Laboratory Program National Functional Guidelines for Organic Review, 2001, and the SW-846 Method 8260B has been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. Per the Scope of Work, the review of these samples includes Level III validation of all chains of custody, calibrations and QC forms referencing the QC limits in the above documents.

I. DELIVERABLES

A. All deliverables were present as specified in the Statement of Work (SOW), SW-846, or in the project contract.
Yes _X_ No ____

This is a Level III Report.

B. Chain of Custody Documentation was complete and accurate.
Yes ______ No _X__

The project manager is informed of the following and the chain information is to be updated for the project file.

Most of the SDGs do not have a customary chain of custody. Those have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers. Some of the time there is a typed area of the last page with the samplers name, date and time with a shaded area for the signature. The person receiving the samples must remember to write in their name and the sample receipt information as there is no area for that established. In addition, as indicated in the previous section, some sample names are truncated on the chain of custody, making them an unacceptable record for those samples. Many of these chains of custody have changes to them without initials. There are some SDGs that have customary chains of custody but have gaps in time without documentation or missing signatures, dates and times. The narrative will state the chains of custody numbers but many times they are missing.

Our understanding is that the chain of custody is an electronic sample documentation system. We would recommend developing an improved set of chain of custody documents to be generated from this system that provide a more clear hardcopy documentation of the electronic process, particularly once the samples are received at the laboratory. There needs to be signature lines for relinquished and received on all pages of the chain of custody and the pages need to be numbered and uniquely identified.

L0612103: Sample Receipt Form is not completely checked off.

Sample Discrepancy Form: L0612275 – Kemron did not receive samples for IDs DUP9-E-2, PMW85-01-E-2, PMW85-02-E-02. They were listed on the COC.

Sample Discrepancy Form: L0612386 – IW85-04-E-2 was received on 12/14/06 at 12:55 but was not on the chain of custody.

Sample Discrepancy Form: L0612203 and L0612201 (1 page) – indicates that 1 vial was broken for IW101-06B-E-2 @ 840 and PMW92-05-E-2 @ 1140. The specific analysis impacted appears to be 8260, but since there are multiple vials taken, apparently the laboratory was able to conduct the analysis normally.

Sample Discrepancy Form: L0612336 – Lab received sample containers for ID I292-08-E-2 that were not listed on the COC.

Sample Discrepancy Form: L0612229 – RSK IW101-08B-E-2 received broken.

L0612161 has an Original Chain of Custody #63854 with this SDG.

C. Samples were received at the required temperature, preservation and intact with no bubbles.
Yes ___X___ No ______

L0612231, L0612368, L0612230, L0612078, L0612154, L0612076, L0612107, L0612274, L0612275, L0612202, L0612386, L0612077, L0612203, L0612229, L0612201, L0612336, L0612161, L0612160,

L0612104, L0612103: The cooler temperature was 0-1°C for a few of the coolers but the Sample Checklist states that the samples weren't frozen. No qualifiers are required under these circumstances.

II. ANALYTICAL REPORT FORMS

A. The Analytical Report or Data Sheets are present and complete for all requested analyses.
Yes _X_ No ____

B. Holding Times
1. The contract holding times were met for all analyses (Time of sample receipt to time of analysis (VOA) or extraction and from extraction to analysis).
Yes ___X___ No______

2. The Clean Water Act (40 CFR 136) or method holding times were met for all analyses (14 days from time of sample collection to analysis or extraction).
Yes __X__ No____

III. INSTRUMENT CALIBRATION – GC/MS

A. Initial Calibration
1. The Response (RF) and Relative Response Factors (RRF) and average RRF for all compounds for all analyses met the contract criteria of >0.05.
Yes __X__ No ____ NA____

Per the project manager, the 2001 EPA CLP validation guidance has been applied to the common "poor responders". Acetone, 2-butanone, and 4-methyl-2-pentanone are the compounds for which any calibration response factors below 0.05 have been observed. See the table below for details. The validation guidance allows for a response of 0.01 for these compounds if spectral integrity can be verified at low concentrations. These spectra are not commonly provided and are not part of the deliverable for these data sets. The laboratory has been tasked with providing to the client verification that the 0.01 RF is valid. Given the spectral verification is available, the data are not qualified for response >0.01 < 0.05. No data have been qualified.

The low-responding compounds are highly water-soluble and capable of hydrogen bonding with water. This decreases their purge efficiency and results in the relatively low response. The implication of this low purge efficiency is that a relatively low absolute recovery of such compounds is achieved in the purge step of the analysis. If this recovery is consistent, reasonable accuracy and precision can be achieved in a given matrix, which is indicated for the lab matrix by acceptable recoveries in LCS and calibration checks. However, this causes these targets to be more sensitive to matrix variations that impact purge efficiency (such as ionic strength or the presence of varying levels of soluble non-target organic material) than are the more hydrophobic compounds typically analyzed by this method, and as a result they are more likely to exhibit matrix bias. The likelihood of matrix bias for these compounds in this site matrix is assessed in the MS/MSD section of this report.

SDG	ICAL Date	Lab Sample #	Analyte	RRF OUT	Qualifiers Added
L0612231	11/13/06 16:05	1-4, 1RE, 3RE	acetone	.040	None
L0612368	11/13/06 16:05	1,2,4,6	acetone	.040	None
L0612230	11/13/06 16:05	5,6	acetone	.040	None
	11/20/06 14:29	1-4,5RE	acetone	.035	None
			2-butanone	.048	None
			4-methyl-2-pentanone	.045	None
L0612078	11/13/06 16:05	All	acetone	.040	None
L0612154	11/13/06 16:05	1-4	acetone	.040	None
L0612076	11/28/06 12:56	1,5,1RE	acetone	.036	None
	11/20/06 14:29	4,7	acetone	.035	None

SDG	ICAL Date	Lab Sample #	Analyte	RRF OUT	Qualifiers Added
			2-butanone	.048	None
			4-methyl-2-pentanone	.045	None
L0612107	11/20/06 14:29	1-5	acetone	.035	None
			2-butanone	.048	None
			4-methyl-2-pentanone	.045	None
L0612386	11/28/06 12:56	All	acetone	.036	None
L0612077	11/13/06 16:05	1-5, 4RE,5RE	acetone	.040	None
	11/6/06 14:29	6, 6RE	acetone	.035	None
			2-butanone	.048	None
			4-methyl-2-pentanone	.045	None
L0612203	11/20/06 14:29	2RE,5RE,6RE	acetone	.035	None
			2-butanone	.048	None
			4-methyl-2-pentanone	.045	None
L0612229	11/13/06 16:05	2,5	acetone	.040	None
	11/28/06 12:56	1RE,4RE	acetone	.036	None
	11/20/06 14:29	1,3,4,6	acetone	.035	None
			2-butanone	.048	None
			4-methyl-2-pentanone	.045	None
L0612201	11/20/06 14:29	2RE	acetone	.035	None
			2-butanone	.048	None
			4-methyl-2-pentanone	.045	None
L0612336	11/13/06 16:05	1-3, 1RE,2RE,3RE	acetone	.040	None
L0612296	11/13/06 16:05	All	acetone	.040	None
L0612295	11/13/06 16:05	3, 4,3RE	acetone	.040	None
L0612161	11/28/06 12:56	All	acetone	.036	None
L0612160	11/13/06 16:05	1-6	acetone	.040	None
	11/28/06 12:56	7,8	acetone	.036	None
L0612104	11/20/06 14:29	All	acetone	.035	None
			2-butanone	.048	None
			4-methyl-2-pentanone	.045	None
	11/20/06 14:29	All	acetone	.035	None
			2-butanone	.048	None
			4-methyl-2-pentanone	.045	None

2a.The relative standard deviation (RSD) for the five point calibration was within the 30% limit for the CCCs.
Yes __X__ No____ NA____

This is a method requirement and indicates that the analytical system is in control.

2b.The relative standard deviation (RSD) for the five point calibration was within the 30% limit for all other compounds or a linear curve was used.
Yes __X___ No ____ NA____

3. The 12 hour system Performance Check was performed as required in SW-846.
Yes __X__ No_____ NA____

B. Continuing Calibrations
1. The midpoint standard was analyzed for each analysis at the required frequency and the QC criteria of > 0.05 (.01 for CLP 2001) were met.
Yes __X___ No ____ NA____

The CCVs were analyzed at the proper frequency. The same compounds showed low responses in the continuing calibration as were observed in the initial calibrations. Qualifiers are not added for these outliers since none were below the lower limit of 0.01. No data have been qualified from the response factors and RRFs are not noted since they are essentially the same as the ICAL. This consistency of response for the poor-responding compounds is an indication that there is no significant bias for the laboratory water matrix.

2. The percent difference (%D) limits of ± 25% were met.
Yes _____ No __X__ NA___

See the table below. When there are no detections, unless the %D is biased low and so large as to indicate a significant probability of false negatives, no qualifiers are added for %D outliers when targets are not detected. When targets are detected, the qualifier added is JC#, indicating the possibility of some bias associated with calibration drift, where # is the % D observed.

SDG	CCV Date	Lab Sample #	Analyte	RRF outliers	%D outliers	Qualifiers Added
L0612231	12/16/06 10:30	1-4	trans-1,3-dichloropropene		25.5	None, ND
	12/17/06 6:33	1RE, 3RE	trans-1,3-dichloropropene		27.0	None, ND
L0512230	12/16/06 10:30	5,6	trans-1,3-dichloropropene		25.5	None, ND
L0612229	12/16/06 10:30	2,5	trans-1,3-dichloropropene		25.5	None, ND
	12/16/06 12:55	1RE,4RE	1,1,1-trichloroethane		27.4	None, ND
			carbon tetrachloride		34.5	None, ND
L0612161	12/12/06 8:37	1-6	carbon tetrachloride		25.5	JC26 detection
L0612160	12/11/06 13:27	1-6	carbon tetrachloride		25.1	None, ND

IV. GC/MS INSTRUMENT PERFORMANCE CHECK

The BFB (VOA) or DFTPP (SVOA) performance check was injected once at the beginning of each 12-hour period and relative abundance criteria for the ions were met.
Yes __X___ No ____ NA____

V. INTERNAL STANDARDS

The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows.
Yes __X___ No ____ NA____

VI. SURROGATE

Surrogate spikes were analyzed with every sample.
Yes _X___ No____

And met the recovery limits defined in the current contract, which are the current laboratory limits.
Yes ___X___ No ____

VII. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

A. Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed for every analysis performed and for every 20 samples or for every matrix whichever is more frequent.
Yes ___X__ No _____

There are 5 MS/MSDs which meets the 1:20 ratio.

B. The MS and MSD percent recoveries were within the limits defined in the contract, which are the current laboratory control chart limits.
Yes _____ No __ X ___NA___

The full target list has been spiked. Most MS/MSD recoveries and RPDs are in control. Instances where spike recoveries are out of limits are shown in the table below. In several instances, the sample amount is

4x the spike level or greater. In such cases, the recovery cannot realistically be calculated, because the anticipated normal analytical variability is on the order of the spike level. Thus no qualifiers are added.

Two results are qualified due to low recoveries associated with detections and data could be biased low proportional to the spike recovery. In both instances, the parent sample result is significantly higher than the spike, but not 4 times higher, so the rule of thumb is not applied. However, the sample amount is such that an impact is expected on the ability to calculate a spike recovery, and it is not likely that any actual bias is as large as would be suggested from the recovery observed. One recovery is high, but the compound is not detected and no qualification is required.

SDG	Client Sample ID	Lab Sample ID	Analyte	MS/MSD/RPD	Qualifiers
L0612230	IW101-09A-E-2	1		In control	None
L0612076	PMW101-01A-E-2	1	acetone	-360/-385/OK	None, sample > 4x spike
			2-butanone	-1830/-2360/OK	None, sample > 4x spike
L0612274	IW21-02A-E-2	2	tetrachloroethene	12.5/32.0/OK	None, sample > 4x spike
L0612201	PMW92-05-E-2	2	carbon tetrachloride	35.5/28 3/OK	JS28 parent detection
L0612104	IW101-03C-E-2	4	bromodichloromethane	123/124/OK	None, ND in sample
			tetrachloroethene	59.3/45.1/OK	JS45 parent detection
			trichloroethene	-16.61/-31.1/OK	None, sample > 4x spike

C. The MSD relative percent differences (RPD) were within the defined contract limits.
Yes __X___ No _____NA____

D. The MS/MSD were client samples.
Yes __X_ No ____NA____

VIII. LABORATORY CONTROL SAMPLE

A. Laboratory Control Samples (LCS) was analyzed for every analysis performed and for every 20 samples.
Yes _X___ No ____

B. The LCS percent recoveries were within the limits defined in the contract (the MS limits are used as a reference or laboratory-specific limits for this matrix are defined).
Yes ______ No __ X ____

The full target list has been spiked. There are a number of elevated recoveries observed as shown in the table below. When a high recovery is associated with a non-detect in samples, no qualifier is added since the indicated bias is high. When the target is detected, the result is qualified as JL#, where # is the elevated recovery. For low recoveries, non-detected results are qualified but no such results are present in this data set.

Note that there are no outliers for the compounds having relatively low response (2-butanone, acetone, 4-methyl-2-pentanone). Although the control windows for these targets are relatively wide compared to most others, the actual recoveries observed at a 20 ug/L spike are generally near 100%. This shows that in the laboratory matrix, accuracy is within a normal window. Where LCSDs are available, RPDs are generally in control. Thus accuracy and precision for the lab matrix is good for these targets.

SDG	Lab Sample #	Batch	Targets Detected	LCS/LCSD/RPD	Qualifiers
L0612231	1-4	WG229677	bromodichloromethane	126/128/OK	None, ND
L0612230	5RE	WG229704	bromodifluoromethane	126/128/OK	None, ND

SDG	Lab Sample #	Batch	Targets Detected	LCS/LCSD/RPD	Qualifiers
L0612078	1-6	WG228806	bromodichloromethane	126/123/OK	None, ND
			vinyl chloride	144/32/OK	None, ND
L0612076	1,5,6	WG228821	bromodichloromethane	122	None, ND
L0612202	1RE, 2	WG229550	cis-1,2-dichloroethene	OK/127/OK	JL127 detects
L0612077	4RE,5RE	WG228927	bromodichloromethane	125	None, ND
	1-5	WG228806	bromodichloromethane	126/123/OK	None, ND
			vinyl chloride	144/132/OK	None, ND
L0612229	2,5	WG229677	bromodichloromethane	126/128/OK	None, ND
	1RE,4RE	WG229683	bromodichloromethane	123/128/OK	None, ND
L0612201	1RE	WG229550	cis-1,2-dichloroethene	123/127/OK	JL127 detect
L0612336	1-3	WG229878	bromodichloromethane	124/OK/OK	None, ND
L0612296	1,2,4,5	WG229843	bromodichloromethane	124	None, ND
			chloromethane	138	None, ND
			vinyl chloride	143	None, ND
L0612295	3	WG229843	bromodichloromethane	124	None, ND
			chloromethane	138	None, ND
			vinyl chloride	143	None, ND
	4,3RE	WG229876	bromodichloromethane	124/OK/OK	None, ND
L0612161	4RE	WG229379	bromodichloromethane	123	None, ND

IX. BLANKS

A. Method Blanks were analyzed at the required frequency and for each matrix and analysis.
Yes _X___ No____

B. No blank contamination was found in the Method Blank.
Yes____ No _X___

Contamination was observed in some method blanks indicated in the table, below the reporting limit. Whenever methylene chloride or acetone is detected in associated samples at a level less than 10x the method blank (corrected for dilution), the result is qualified as UB#, where # is the corrected method blank level. Such results are usable as nondetects. Qualifiers added are summarized in the table below. For other targets, the factor used is 5x.

SDG	Lab Sample #	Batch	Targets Detected	Results	Qualifiers
L0612231	1-4	WG229677	methylene chloride	.297F	None, ND
L0612230	5	WG229677	methylene chloride	.297F	UB.3 detect
	1,2,3,4,6	WG229552	1,2,3-trichlorobenzene	.329	None, ND
			1,2,4-trichlorobenzene	.212	None, ND
			naphthalene	.301	None, ND
L0612107	1-5	WG229123	1,2,3-trichlorobenzene	.229F	None, ND
			1,2,4-trichlorobenzene	.229F	None, ND
			hexachlorobutadiene	.376*	None, ND
			naphthalene	.247F	
L0612386	1,2,3,5	WG230113	1,2,3-trichlorobenzene	.230F	None, ND
			hexachlorobutadiene	.366*	None, ND
			methylene chloride	.288F	UB.29 detects < 10x MB
			naphthalene	.249F	None, ND
L0612203	2RE,5RE,6RE	WG229552	1,2,3-trichlorobenzene	.329	None, ND
			1,2,4-trichlorobenzene	.212	None, ND
			naphthalene	.301	None, ND

SDG	Lab Sample #	Batch	Targets Detected	Results	Qualifiers
L0612229	2,5	WG229677	methylene chloride	.297F	None, ND
	1RE,4RE	WG229683	chlorobenzene	.210F	None, ND
	1,2,4,6	WG229552	1,2,3-trichlorobenzene	.329	None, ND
			1,2,4-trichlorobenzene	.212	None, ND
			naphthalene	.301	UB.3 detect
L0612201	2RE	WG229552	1,2,3-trichlorobenzene	.329	None, ND
			1,2,4-trichlorobenzene	.212	None, ND
			naphthalene	.301	None, ND
L0612103	1-5	WG229123	1,2,3-trichlorobenzene	.248F	None, ND
			1,2,4-trichlorobenzene	.229F	None, ND
			hexachlorobutadiene	.376F	None, ND
			naphthalene	.247F	None, ND

C. If Field Blanks were identified, no blank contamination was found.
Yes____ No __X__

There are 9 trip blanks and two rinse blanks. There are detections observed below the reporting limit as shown in the table. Some of these are qualified UB due to detections in the associated method blank, thus are not used for qualifying associated samples. When analytes are present in both the field blank and the associated samples, the results in the samples are qualified in the same manner as for method blanks. For clarity, the qualifiers used in this case are UTB# for trip blanks and URB# for rinse blanks.

In some instances several SDGs are contained in the same shipment. For instance, SDG L0612076, L0612077, and L0612078 all have sampling dates on 12/4/06. There is only one trip blank in this set, TB-121106-E-2, in SDG L0612078. The chain of custody numbers are different, and the laboratory checklist indicates that several coolers contained VOA samples, and it is not clear which cooler contains the trip blank. Therefore we have assumed that the samples are associated with a trip blank by virtue of the SDG and not the sample date. If this were not the case, and volatiles samples from multiple SDGs were in the same cooler, there would be additional qualifiers for some samples.

We recommend that if possible, a trip blank be included in each cooler that contains VOA samples, and that the documentation be such that each trip blank can be properly matched with the samples with which it was shipped. One of the most important functions of trip blanks is to detect cross-contamination that can occur between high-level samples and low-level samples that are contained in the same cooler.

SDG	Sample ID	Lab Sample ID	Analyte	Results	Qualifiers
L0612230	TB-122006-E-2	6	methylene chloride	.417F	UTB.42 detection
L0612078	TB-121106-E-2	2	methylene chloride	.326F	None, ND
L0612107	Trip Blank	5	methylene chloride	.419F	UTB.42 detection
L0612274	TB-12806-E-2	8	methylene chloride	.462F	None, ND
L0612203	Trip Blank	7	methylene chloride	.476F	UTB.48 detects
L0612229	RB1-E-2	6	acetone	3.72F	URB3.7 detects
			benzene	.284F	URB.28 detects
			naphthalene	.266F	None, ND
			toluene	.628F	None, ND
L0612296	Trip Blank	5	methylene chloride	.321F	None, ND
L0612295	RB2-E-2	4	acetone	8.10F	URB8 1 detects < 10x RB
			benzene	.220F	None, ND
			toluene	.576F	None, ND

SDG	Sample ID	Lab Sample ID	Analyte	Results	Qualifiers
L0612161	Trip Blank	6	methylene chloride	.467F	UTB 47 detect
L0612368	Trip Blank	6	NA	All OK	None
L0612386	Trip Blank	5	methylene chloride	0.39F	None, UB from MB

X. FIELD QC

If Field duplicates were identified, they met guidance RPD of < 35% for water or < 50% for soils. For values reported at < 5 x the reporting limit (RL), a difference of 2 x RL is used as guidance (4 x RL for soils). Data are not qualified for field duplicates as these are evaluated for the total project by the client.
Yes __X___ No ____ NA____

There are 9 identified field duplicates. Observations are summarized in the table.

SDG	Client Sample ID	Parent Sample	Observations
L0612275	DUP1-E-2	IW21-01A -E-2	In control
L0612274	DUP2-E-2	IW21-03A-E-2	In control
L0612161	DUP3-E-2	PMW21-03-E-2	In control
L0612077	DUP4-E-2	IW101-01A-E-2	In control
L0612160	DUP5-E-2	IW101-05A-E-2	In control
L0612229	DUP6-E-2	IW101-08A-E-2	In control
L0612368	DUP7-E-2	IW92-06-E-2	In control
L0612078	DUP8-E-2	PMW101-03A-E-2	In control
L0612231	DUP9-E-2	PMW85-01-E-2	In control

XI. SYSTEM PERFORMANCE

A. The RICs, chromatograms, tunes and general system performance were acceptable for all instruments and analytical systems.
Yes ____ No____ NA__X__
Not part of this review level

B. The suggested EQLs for the sample matrices in this set were met.
Yes __X__ No____ NA____

Dilutions were necessary in some cases to achieve the proper quantification of high-level targets, which raises the EQLs for all other targets in the run. In such cases, the both results are provided in hardcopy except for the analytes that are above the upper range in the initial run. These are only shown for the reanalysis.

In the EDD, only the initial run is provided for most analytes, and only the reanalysis is provided for the analytes which are above the upper linear range in the first run.

XII. TCL COMPOUNDS

A. The identification is accurate and all retention times, library spectra and reconstructed ion chromatograms (RIC) were evaluated for all detected compounds.
Yes ____ No____ NA __X__
Not part of this review level

B. Quantitation was checked to determine the accuracy of calculations for representative compounds in each internal standards quantitation set.
Yes ____ No____ NA__X__
Not part of this review level

XIII. TENTATIVELY IDENTIFIED COMPOUNDS

TICs were properly identified and met the library identification criteria.
Yes____ No___ NA__X___
Not part of this review level

XIV. OVERALL ASSESSMENT OF THE CASE

The laboratory has complied with the requested method. Data are fully usable after consideration of qualifiers.
The following is noted:

Chain of Custody/Deliverables:
The project manager is informed of the following and the chain information is to be updated for the project file.

Most of the SDGs do not have a customary chain of custody. Those have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers. Some of the time there is a typed area of the last page with the samplers name, date and time with a shaded area for the signature. The person receiving the samples must remember to write in their name and the sample receipt information as there is no area for that established. In addition, as indicated in the previous section, some sample names are truncated on the chain of custody, making them an unacceptable record for those samples. Many of these chains of custody have changes to them without initials. There are some SDGs that have customary chains of custody but have gaps in time without documentation or missing signatures, dates and times. The narrative will state the chains of custody numbers but many times they are missing.

Our understanding is that the chain of custody is an electronic sample documentation system. We would recommend developing an improved set of chain of custody documents to be generated from this system that provide a more clear hardcopy documentation of the electronic process, particularly once the samples are received at the laboratory. There needs to be signature lines for relinquished and received on all pages of the chain of custody and the pages need to be numbered and uniquely identified.

L0612103: Sample Receipt Form is not completely checked off.

Sample Discrepancy Form: L0612275 – Kemron did not receive samples for IDs DUP9-E-2, PMW85-01-E-2, PMW85-02-E-02. They were listed on the COC.

Sample Discrepancy Form: L0612386 – IW85-04-E-2 was received on 12/14/06 at 12:55 but was not on the chain of custody.

Sample Discrepancy Form: L0612203 and L0612201 (1 page) – indicates that 1 vial was broken for IW101-06B-E-2 @ 840 and PMW92-05-E-2 @ 1140. The specific analysis impacted appears to be 8260, but since there are multiple vials taken, apparently the laboratory was able to conduct the analysis normally.

Sample Discrepancy Form: L0612336 – Lab received sample containers for ID I292-08-E-2 that were not listed on the COC.

Sample Discrepancy Form: L0612229 – RSK IW101-08B-E-2 received broken.

L0612161 has an Original Chain of Custody #63854 with this SDG.

Sample Condition:
L0612231, L0612368, L0612230, L0612078, L0612154, L0612076, L0612107, L0612274, L0612275, L0612202, L0612386, L0612077, L0612203, L0612229, L0612201, L0612336, L0612161, L0612160,

L0612104, L0612103: The cooler temperature was 0-1°C for a few of the coolers but the Sample Checklist states that the samples weren't frozen. No qualifiers are required under these circumstances.

Initial Calibrations:
Per the project manager, the 2001 EPA CLP validation guidance has been applied to the common "poor responders". Acetone, 2-butanone, and 4-methyl-2-pentanone are the compounds for which any calibration response factors below 0.05 have been observed. See the table within the report body for details. The validation guidance allows for a response of 0.01 for these compounds if spectral integrity can be verified at low concentrations. These spectra are not commonly provided and are not part of the deliverable for these data sets. The laboratory has been tasked with providing to the client verification that the 0.01 RF is valid. Given the spectral verification is available, the data are not qualified for response >0.01 < 0.05. No data have been qualified.

The low-responding compounds are highly water-soluble and capable of hydrogen bonding with water. This decreases their purge efficiency and results in the relatively low response. The implication of this low purge efficiency is that a relatively low absolute recovery of such compounds is achieved in the purge step of the analysis. If this recovery is consistent, reasonable accuracy and precision can be achieved in a given matrix, which is indicated for the lab matrix by acceptable recoveries in LCS and calibration checks. However, this causes these targets to be more sensitive to matrix variations that impact purge efficiency (such as ionic strength or the presence of varying levels of soluble non-target organic material) than are the more hydrophobic compounds typically analyzed by this method, and as a result they are more likely to exhibit matrix bias. The likelihood of matrix bias for these compounds in this site matrix is assessed in the MS/MSD section of this report.

Continuing Calibrations:
The CCVs were analyzed at the proper frequency. The same compounds showed low responses in the continuing calibration as were observed in the initial calibrations. Qualifiers are not added for these outliers since none were below the lower limit of 0.01. No data have been qualified from the response factors and RRFs are not noted since they are essentially the same as the ICAL. This consistency of response for the poor-responding compounds is an indication that there is no significant bias for the laboratory water matrix.

See the table within the report. When there are no detections, unless the %D is biased low and so large as to indicate a significant probability of false negatives, no qualifiers are added for %D outliers when targets are not detected. When targets are detected, the qualifier added is JC#, indicating the possibility of some bias associated with calibration drift, where # is the % D observed.

LCS Recoveries:
The full target list has been spiked. There are a number of elevated recoveries observed as shown in the table within the report body. When a high recovery is associated with a non-detect in samples, no qualifier is added since the indicated bias is high. When the target is detected, the result is qualified as JL#, where # is the elevated recovery. For low recoveries, non-detected results are qualified but no such results are present in this data set.
Note that there are no outliers for the compounds having relatively low response (2-butanone, acetone, 4-methyl-2-pentanone). Although the control windows for these targets are relatively wide compared to most others, the actual recoveries observed at a 20 ug/L spike are generally near 100%. This shows that in the laboratory matrix, accuracy is within a normal window. Where LCSDs are available, RPDs are generally in control. Thus accuracy and precision for the lab matrix is good for these targets.

Matrix Spikes:
There are 5 MS/MSDs which meets the 1:20 ratio.

The full target list has been spiked. Most MS/MSD recoveries and RPDs are in control. Instances where spike recoveries are out of limits are shown in the table below. In several instances, the sample amount is 4x the spike level or greater. In such cases, the recovery cannot realistically be calculated, because the anticipated normal analytical variability is on the order of the spike level. Thus no qualifiers are added.

Two results are qualified due to low recoveries associated with detections and data could be biased low proportional to the spike recovery. In both instances, the parent sample result is significantly higher than the spike, but not 4 times higher, so the rule of thumb is not applied. However, the sample amount is such that an impact is expected on the ability to calculate a spike recovery, and it is not likely that any actual bias is as large as would be suggested from the recovery observed. One recovery is high, but the compound is not detected and no qualification is required.

Method Blanks:
Contamination was observed in some method blanks indicated in the table in the report, below the reporting limit. Whenever methylene chloride or acetone is detected in associated samples at a level less than 10x the method blank (corrected for dilution), the result is qualified as UB#, where # is the corrected method blank level. Such results are usable as nondetects. Qualifiers added are summarized in the table. For other targets, the factor used is 5x.

Field Blanks:
There are 9 trip blanks and two rinse blanks. There are detections observed below the reporting limit as shown in the table within the report. Some of these are already qualified UB due to detections in the associated method blank, thus are not used for qualifying associated samples. When analytes are present in both the field blank and the associated samples, the results in the samples are qualified in the same manner as for method blanks. For clarity, the qualifiers used in this case are UTB# for trip blanks and URB# for rinse blanks.

In some instances several SDGs are contained in the same shipment. For instance, SDG L0612076, L0612077, and L0612078 all have sampling dates on 12/4/06. There is only one trip blank in this set, TB-121106-E-2, in SDG L0612078. The chain of custody numbers are different, and the laboratory checklist indicates that several coolers contained VOA samples, but it is not clear which cooler contains the trip blank. Therefore we have assumed that the samples are associated with a trip blank by virtue of the SDG and not the sample date. If this were not the case, and volatiles samples from multiple SDGs were in the same cooler, there would be additional qualifiers for some samples.

We recommend that if possible, a trip blank be included in each cooler that contains VOA samples, and that the documentation be such that each trip blank can be properly matched with the samples with which it was shipped. One of the most important functions of trip blanks is to detect cross-contamination that can occur between high-level samples and low-level samples that are contained in the same cooler.

EQLs:
Dilutions were necessary in some cases to achieve the proper quantification of high-level targets, which raises the EQLs for all other targets in the run. In such cases, the both results are provided in hardcopy except for the analytes that are above the upper range in the initial run. These are only shown for the reanalysis.

In the EDD, only the initial run is provided for most analytes, and only the reanalysis is provided for the analytes which are above the upper linear range in the first run.

Field QC:
There are 9 identified field duplicates. All show reproducibility compared to the parent sample within acceptance limits.

ORGANIC DATA QUALITY REVIEW REPORT

GC REPORT FOR Metabolic Acids by HPLC; Ethane, Methane, Ethene, Carbon dioxide by EPA SOP RSK-175; and Hydrogen by AM20GAX (GC/RGD).

RSK-175:
SDG: L061: 2295, 2296, 2336, 2201, 2203, 2229, 2230, 2274, 2275, 2386, 2202, 2231, 2077, 2386, 2076, 2078, 2107, 2104, 2103, 2161, 2160, 2154
Metabolic acids:
SDG: L061: 2295, 2296, 2336, 2201, 2203, 2229, 2230, 2274, 2275, 2386, 2202, 2231, 2077, 2386, 2076, 2078, 2107, 2104, 2103, 2161, 2160, 2154

AM20GAX: P0612318, P0612137, P0612205, P0612095

PROJECT: Memphis Defense Depot, EBT-1 for e2m Denver

LABORATORY: Kemron Environmental Services, Marietta, OH; Hydrogen subcontracted to Microseeps, Inc, Pittsburg, PA

SAMPLE MATRIX: Water and Vapor

SAMPLING DATE (Month/Year): December, 2006

NO. OF SAMPLES: Metabolic acids – 98 waters including 2 rinse blanks; RSK-175 – 98 waters including 2 rinse blanks, AM20GAX – 93 vapor

ANALYSES REQUESTED: Metabolic Acids by HPLC; EPA SOP RSK-175, Microseeps AM20GAX

SAMPLE NO.: Attached

DATA REVIEWER: Sammy Huntington and John Huntington (Gateway Enterprises)

QA REVIEWER: Diane Short & Associates, Inc., INITIALS/DATE:

Telephone Logs included Yes___ No X

Contractual Violations Yes___ No X

The project QAPP, EPA Contract Laboratory Program National Functional Guidelines for Organic Review, 2001 (SOP), the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, (SW-846), current updates, and the project-specific methods have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. The review has been tasked as Level III for review of all calibrations, holding times, and QC for all samples.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW), SW-846, or in the project contract.

Yes __X__ No ____

This is a Level III Report

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes __X__ No_____

III. HOLDING TIMES

A. The contract holding times were met for all analyses (Time of sample receipt to time of extraction and from extraction to analysis.)

Yes _____ No __X__

See Section B. below

B. The Clean Water Act (40 CFR 136) or method holding times were met for all analyses (Time of sample collection to time of extraction and from extraction to analysis.)

Yes _____ No __X__

Metabolic Acids: The reviewer has not been able to find documented holding times for the metabolic acids. The normal holding time for an analogous HPLC method 8310 is 14 days for preserved water samples. Metabolic acid holding times were all within 14 days. It has been verified on other projects that no holding time is established for these compounds. There is no indication of sample pH in the data packages, but the sample receipt forms indicate that the pH range is acceptable except in isolated instances, where it is noted that the laboratory adjusted the pH (see next section). This suggests that the samples were preserved with acid, a good practice for these analytes.

RSK-175: All samples were prepared within 14 days from collection. For RSK-175, pH should not be adjusted when CO_2 is determined, which is the case in this project. It is not clear in the documentation whether samples for RSK-175 were pH-adjusted or not. In the absence of definitive information we have assumed that no acidification occurred. If in fact samples were acidified for RSK-175, it would mean that inorganic carbon in the form of bicarbonate and carbonate would be converted to carbon dioxide, would consequently bias the results high for that analyte. The project manager should clarify this preservation question and regard the data for carbon dioxide accordingly.

AM20GAX: This method is a procedure developed by Microseeps, Inc. Recommended holding times in the procedure are 14 days. Several samples were analyzed outside of that holding time due to equipment malfunctions. This is documented in the analyst notes provided as a Case Narrative. Sample results with holding times outside of the method recommendation are qualified as JH#, where # is the number of days by which the holding time was exceeded. A list of samples that are out of holding, along with the qualifiers added, is provided in the table below.

Microseeps indicates that samples are very stable in the vials used for this procedure, but we cannot provide a technical assessment of the stability for hydrogen itself beyond the 14 days specified in the Microseeps procedure.

We would assume that some losses of hydrogen could occur, with a resulting possibility of low bias.

SAMPLE_NO	LAB_ID	SAMP_DATE	ANAL_DATE	ANAL_TIME	HT	QUALIFIER
PMW92-03	P0612137-15A	12/7/2006	12/27/2006	16:03	20	JH6
PMW92-02	P0612137-25A	12/7/2006	12/27/2006	16:28	20	JH6
IW101-06A	P0612137-31A	12/7/2006	12/27/2006	16:41	20	JH6
IW21-01B	P0612205-01A	12/11/2006	1/4/2007	13:57	24	JH10
IW21-03A	P0612205-02A	12/11/2006	12/27/2006	17:57	16	JH2
IW21-02A	P0612205-03A	12/11/2006	12/27/2006	18:09	16	JH2
IW21-01A	P0612205-04A	12/11/2006	12/27/2006	18:22	16	JH2
IW21-04A	P0612205-05A	12/11/2006	12/27/2006	18:34	16	JH2
DUP-1	P0612205-06A	12/11/2006	12/27/2006	18:46	16	JH2
IW21-03A	P0612205-07A	12/11/2006	12/27/2006	18:58	16	JH2
DUP-6	P0612205-08A	12/8/2006	12/27/2006	19:11	19	JH5
IW101-09C	P0612205-09A	12/8/2006	1/4/2007	14:09	27	JH13
IW101-09B	P0612205-10A	12/8/2006	1/4/2007	14:22	27	JH13
IW101-09A	P0612205-11A	12/8/2006	12/28/2006	18:19	20	JH6
IW101-08B	P0612205-12A	12/8/2006	1/4/2007	14:36	27	JH13
IW101-07C	P0612205-13A	12/8/2006	1/4/2007	15:02	27	JH13
IW101-08C	P0612205-14A	12/8/2006	1/4/2007	15:14	27	JH13
IW101-07B	P0612205-15A	12/8/2006	12/28/2006	19:09	20	JH6
MW-85	P0612205-16A	12/8/2006	12/28/2006	19:21	20	JH6
IW101-09A	P0612205-17A	12/8/2006	12/28/2006	19:33	20	JH6
DUP-9	P0612205-18A	12/8/2006	1/2/2007	14:29	25	JH11
PMW-85-01	P0612205-19A	12/8/2006	1/2/2007	14:44	25	JH11
IW92-03	P0612318-01A	12/12/2006	1/4/2007	15:40	23	JH9
IW21-03B	P0612318-02A	12/12/2006	1/2/2007	15:11	21	JH7
IW21-05B	P0612318-03A	12/12/2006	1/2/2007	15:25	21	JH7
IW21-02B	P0612318-04A	12/11/2006	1/2/2007	15:44	22	JH8
IW92-01	P0612318-05A	12/12/2006	1/2/2007	15:56	21	JH7
IW85-01	P0612318-09A	12/14/2006	1/4/2007	16:00	21	JH7
IW85-02	P0612318-10A	12/14/2006	1/4/2007	16:33	21	JH7
IW92-04	P0612318-12A	12/13/2006	1/4/2007	16:49	22	JH8
IW21-04B	P0612318-13A	12/12/2006	1/2/2007	16:09	21	JH7
IW21-05A	P0612318-14A	12/12/2006	1/4/2007	17:02	23	JH9
IW92-02	P0612318-15A	12/12/2006	1/2/2007	16:37	21	JH7

C. All chains of custody are complete with signatures and dates.
Yes ____ No X

The project manager is informed of the following and the chain information is to be updated for the project file.

Most of the SDGs do not have a customary chain of custody. Those have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers. Some of the time there is a typed area of the last page with the samplers name, date and time with a shaded area for the signature. The person receiving the samples must remember to write in their name and the sample receipt information as there is no area for that established. In addition, as indicated in the previous section, some sample names are truncated on the chain of custody, making them an unacceptable record for those samples. Many of these chains of custody have changes to them without initials. There are some SDGs that have customary chains of custody but have gaps in time without documentation or missing signatures, dates and times. The narrative will state the chains of custody numbers but many times they are missing.

Our understanding is that the chain of custody is an electronic sample documentation system. We would recommend developing an improved set of chain of custody documents to be generated from this system that provide a more clear hardcopy documentation of the electronic process, particularly once the samples are received at the laboratory. There needs to be signature lines for relinquished and received on all pages of the chain of custody and the pages need to be numbered and uniquely identified.

L0612103: Sample Receipt Form is not completely checked off.

Sample Discrepancy Form: L0612275 – Kemron did not receive samples for IDs DUP9-E-2, PMW85-01-E-2, PMW85-02-E-02. They were listed on the COC.

Sample Discrepancy Form: L0612230 – One of the RSK175 vials of sample IW101-09A-MS was received broken. There was sufficient volume remaining to proceed with analysis.

Sample Discrepancy Form: L0612386 – IW85-04-E-2 was received on 12/14/06 at 12:55 but was not on the chain of custody.

Sample Discrepancy Form: L0612336 – Lab received sample containers for ID I292-08-E-2 that were not listed on the COC.

Sample Discrepancy Form: L0612229 – RSK IW101-08B-E-2 received broken.

L0612161 has an Original Chain of Custody #63854 with this SDG.

For hydrogen analysis, conventional chain of custody documents were used. There were some problems with the documentation, as follows:

SDG P0612205 (Kemron L0702003): The chain of custody provided had no laboratory receipt signature, date, or time.
SDG P0612318 (Kemron L0702004): Documentation was in order.
SDG P0612095 (Kemron L0701687): Documentation was in order.
SDG P0612137 (Kemron L0702002): Documentation was in order except for the second page of the three-page chain of custody, which was not signed as relinquished by the sampler.

In addition, shipping documents or tracking numbers covering the period of shipment were not provided.

D. Samples were received at the proper temperature and preservation.
Yes __X_ No_____

L0612231, L0612368, L0612230, L0612078, L0612154, L0612076, L0612107, L0612274, L0612275, L0612202, L0612386, L0612077, L0612203, L0612229, L0612201, L0612336, L0612161, L0612160,

L0612104, L0612103: The cooler temperature was 0-1°C for a few of the coolers but the Sample Checklist states that the samples weren't frozen. No qualifiers are required under these circumstances.

Sample Discrepancy Form: L0612386: Sample IW85-04-E2 were received at pH 6 for metabolic acids, according to the receiving checklist. A note was appended indicating that this could not be adjusted by the laboratory. There was no further explanation provided.

Sample Discrepancy Form: L0612077 – The sample receiving checklist shows that samples PMW101-01A-E2, its MS and MSD containers, DUP4-E2, and IW101-01A-E2 were received at a pH higher than 2 (3.5) for the metabolic acids. The documentation shows that the pH was adjusted by the laboratory to a level < 2.

IV. INSTRUMENT CALIBRATION (IC) AND CONTINUING CALIBRATION (CC) VERIFICATION

A. The GC/HPLC standards were analyzed at the required frequency (every 72 hours at a minimum).
Yes ___X___ No_____

B. The chromatographic resolution and separation criteria were met.
Yes __X__ No_____

C. The suggested columns were used and the EQLs were met.
Yes ___X__ No_____

D. Calibration factors for IC met the 20% RSD limit or the regression curves were prepared with a correlation coefficient 'r' greater than 0.99, per SW-846, Method 8000B.
Yes _____ No __X___

Initial calibrations were in control for all methods with the exception of carbon dioxide in the RSK-175 analyses. The laboratory has not commented about this. Laboratory criteria for assessing carbon dioxide calibration acceptance is not provided. As the reviewer considers the RSD to exceed good laboratory practice limits, all detected carbon dioxide results are qualified as JC64, indicating the possibility of bias due to poor initial calibration linearity.

Method	SDG	ICAL Date	Lab Sample #	Analyte	%RSD	R	Qualifiers Added
RSK-175	All	9/27/06 15:29	ALL	carbon dioxide	63.9	0.955	JC64

E. Percent Difference (%D's) for Continuing Calibration Factors and retention times (RT) were within the 25% Limits.
Yes ____ No __X___

Metabolic Acids: All calibrations are in control. The laboratory is employing the external standard method and is using opening and closing calibrations appropriately.

RSK-175: The laboratory conducts opening and closing calibrations (bracketing the samples during the analytical run). For RSK-175 there is not a specific requirement in the procedure for closing calibrations, and only calibration verification each 12 hours is specified. SW-846 guidance (method 8000B), however specifically requires such closing calibrations for external standard methods. For detected analytes, SW-846 specifies that the closing calibration must meet the same criteria as the opening calibration. This has been done for all analytes but for carbon dioxide, for which a number of opening calibrations do not meet the 30% D criterion specified for RSK-175. The samples have already been qualified for the initial calibration non-linearity and no additional qualifiers have been added.

It should be noted in this regard that the laboratory appears to use a different criterion for carbon dioxide, since a few CCV results were flagged as being outside of limits, but it is not clear to this reviewer where the laboratory limit is set. This method has not been published as a promulgated method by EPA (it rather exists as an open literature publication and an internal EPA SOP), and it may not have been fully developed for carbon dioxide. Thus the laboratory limits may be realistic for this analyte. Nonetheless, the results appear to indicate a probable bias which should be considered in using the data.

AM20GAX: All calibrations are in control. The laboratory is employing the external standard method and is using opening and closing calibrations appropriately.

Method	SDG	CCV Date	Lab Sample #	Analyte	%D	Qualifiers Added
RSK-175	L0612368	12/22/06 18:16	1RE,2RE,4RE	carbon dioxide	31.0	From ICAL
	L0612230	12/19/06 13:03	1RE, 4RE	carbon dioxide	43.0	From ICAL
	L0612078	12/11/06 14:31	1,3,4-6 all REs	carbon dioxide	29.4	From ICAL
	L0612154	12/13/06 14:18	1-4	carbon dioxide	58.0	From ICAL
		12/14/06 9:24	1RE,2RE,3RE	carbon dioxide	49.3	From ICAL
	L0612076	12/6/06 13:42	4,5RE,7RE	carbon dioxide	34.9	From ICAL
		12/18/06 10:03	1,4,6,7	carbon dioxide	36.1	From ICAL
		12/11/06 15:40	1RE	carbon dioxide	29.4	From ICAL
	L0612274	12/19/06 13:03	2,5,6,7,1RE	carbon dioxide	43.0	From ICAL
		12/21/06 9:04	5RE,6RE,7RE	carbon dioxide	59.5	From ICAL
	L0612275	12/19/06 13:03	1-4	carbon dioxide	43.0	From ICAL
		12/21/06 9:04	1RE,2RE,4RE	carbon dioxide	59.5	From ICAL
	L0612202	12/1/8/06 11:07	1RE,4RE	carbon dioxide	54.3	From ICAL
	l0612103	12/12/06 13:43	2RE,3RE,4RE	carbon dioxide	51.4	From ICAL
	L0612104	12/13/06 13:43	1RE,2RE,3RE,4RE	carbon dioxide	51.4	From ICAL
	L0612160	12/14/06 9:24	1RE,2RE,3RE,4RE	carbon dioxide	49.3	From ICAL
		2/14/06 12:13	5RE,6RE,7RE,8RE	carbon dioxide	29.9	From ICAL
	L0612296	12/22/06 18:16	4RE	carbon dioxide	31.0	From ICAL
	L0612336	12/22/06 18:16	1RE,2RE,3RE	carbon dioxide	31.0	From ICAL
	L0612229	12/15/06 17:18	2-5	carbon dioxide	49.4	From ICAL
	L0612203	12/18/06 11:07	1,2,3,5,6 (all REs)	carbon dioxide	54.3	From ICAL

V. BLANKS

A. Laboratory blanks

1. Laboratory blanks were analyzed for every sample set and for each matrix type or once in every ten samples, whichever is more frequent.
Yes __X__ No_____

2. No blank contamination was found in the method blank.
Yes _____ No __X__

There are a number of method blanks for RSK-175 which have low-level detections (*) of methane and carbon dioxide, as shown in the table below. When the associated sample result is less than 5x the method blank level (corrected for sample dilution), the sample result is qualified as UB#, where # is the corrected method blank result. Such results are usable as non-detected values.

Method blanks for hydrogen analysis and for metabolic acids are in control.

Method	SDG	Lab Sample #	Batch	Targets Detected	Target	Qualifiers
RSK-175	L0612231	1-3	WG229785	methane	.269*	UB# detects
				carbon dioxide	174*	None, result > 5x MB
	L0612230	1,4,5	WG229785	methane	.269*	UB# detects
				carbon dioxide	174*	None, result > 5x MB
	L0612368	1,2,4	WG230108	methane	.288*	None, result > 5x MB
	L0612078	1,3,4-6 all REs	WG229191	carbon dioxide	184*	None, result > 5x MB
	L0612076	1RE	WG229191	carbon dioxide	184*	None, result > 5x MB
	L0612107	1,2	WG229191	methane	.276*	UB# detects
		4,1RE,2RE,3RE	WG229307	carbon dioxide	174*	UB# results < 5x MB
	L0612274	1RE,2,5-7	WG229898	methane	.335*	UB# results < 5x MB
		1	WG229785	methane	.269*	None, result > 5x MB
	L0612275	1-4	WG229898	methane	.335*	UB# results < 5x MB
	L0612202	1RE,4RE	WG229785	methane	.269*	None,results > 5x MB
	L0612386	1	WG230108	methane	.288*	UB# detection
		2RE,3RE	WG230355	carbon dioxide	180*	None, result > 5x MB
	L0612103	1-5	WG229191	carbon dioxide	184*	None, result > 5x MB
				methane	.276*	UB# results < 5x MB
		2RE,3RE,4RE	WG229307	carbon dioxide	174*	None, result > 5x MB
	L0612104	1-4	WG229191	methane	.276*	UB# results < 5x MB
				carbon dioxide	174*	None, result > 5x MB
		1RE,2RE,3RE,4RE	WG229307	carbon dioxide	174*	None, result > 5x

Method	SDG	Lab Sample #	Batch	Targets Detected	Target	Qualifiers
						MB
	L0612295	1-4	WG229898	methane	.335*	UB# results < 5x MB
	L0612296	1,2	WG229898	methane	.335*	UB# results < 5x MB
		4, 1RE,2RE	WG230108	methane	.288*	UB# results < 5x MB
	L0612336	1-3	WG230108	methane	.288*	UB# results < 5x MB
	L0612229	2RE,4RE,5RE	WG229785	carbon dioxide	174*	None, result > 5x MB
		6	WG229898	methane	.335*	UB.34 (RB)
	L0612203	1,2,3,5,6 (all REs)	WG229785	carbon dioxide	174*	None, result > 5x MB

3. Instrument blank analysis was performed following all samples that contained analytes at high concentrations.
Yes _____ No____ NA__X___

B. Field Blanks
If field blanks were identified, no blank contamination was found.
Yes _____ No__X___ NA_____

Rinse blanks for RSK-175 and metabolic acids show some detected levels for methane, carbon dioxide, and acetic acid. Results are already qualified from the method blank levels for RSK-175, and so no additional qualifiers are added. For metabolic acids, acetic acid is qualified as URB#, where # is the dilution-corrected rinse blank level, when the level in the associated sample is less than 5x the rinse blank.

Method	SDG	Sample ID	Lab Sample ID	Analyte	Results	Qualifiers
RSK-175	L0612295	RB2-E-2	4	methane	.7.9	None, UB from MB
				carbon dioxide	1700F	None, samples > 5x RB
	L0612229	RB1-E-2	6	methane	.56	None, UB from MB
				carbon dioxide	1000	None, samples > 5x RB
M.A	L0612295	RB2-E-2	4	acetic acid	25.0	URB25 detects
	L0612229	RB1-E-2	6	acetic acid	34.8	URB35 detects

VI. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

A. Matrix spike (MS) and matrix duplicate or matrix spike duplicate (MSD) were analyzed for every analyses performed for every 20 samples or for every matrix whichever is more frequent.
Yes __X___ No ____

In most cases for the RSK-175 and the Metabolic acids, the sample volumes were not sufficient to prepare a matrix spike and matrix spike duplicate.

RSK-175: There were five (5) MS/MSDs which meet the 20 to 1 ratio.
Metabolic Acids: There were five (5) MS/MSDs which meet the 20 to 1 ratio.
AM20GAX: There are no MS/MSDs for this method. They are not required or possible for hydrogen analysis.

The MS/MSDs conducted are summarized in the table below.

METHOD	SDG	PARENT	LAB SAMPLE ID
RSKSOP-175	L0612230	IW101-9A-E-2	1
	L0612076	PMW101-01A-E-2	1
	L0612274	IW21-02A-E-2	2
	L0612104	IW101-03C-E-2	4
	L0612201	PMW92-05-E-2	2
Metabolic Acids	L0612230	IW101-9A-E-2	1
	L0612076	PMW101-01A-E-2	1
	L0612274	IW21-02A-E-2	2
	L0612104	IW101-03C-E-2	4
	L0612201	PMW92-05-E-2	2

B. The MS and MSD percent recoveries (%R) were within the limits defined by the laboratory or in the contract.
Yes _____ No __X__

RSK-175:
Carbon dioxide gave MS/MSD outliers as shown in the table below. In each case, the sample level is greater than 4x the spike amount, which means that the anticipated normal analytical variability is greater than the spike amount. In such cases, no recovery can meaningfully be calculated, and no qualifiers are added. There is no indication of bias.

Metabolic acids: Metabolic acid MS/MSDs had several outliers. These included high recoveries associated with non-detects in the parent sample and recoveries associated with samples that were greater than 4x the spike level. In neither of these cases are qualifiers applied. In three cases, qualifiers were applied as JS#, where # is the recovery observed. A matrix bias roughly proportional to the recovery appears to be present in these instances. There is one extremely low recovery (8%) for acetic acid and the data should be used with caution.

METHOD	SDG	PARENT	PREP BATCH	Analyte	MS/MSD/RPD	QUALIFIERS
RSK-175	L0612076	1	WG2209042	carbon dioxide	136/-296/OK	None, parent> 4x spike
	L0612201	2	WG229610	carbon dioxide	40/OK/OK	None, parent> 4x spike
Metabolic acids	L0612230	1	WG229440	pyruvic acid	146/49.5/98.4	None, ND in parent
				lactic acid	-198/-215/OK	None, parent> 4x

METHOD	SDG	PARENT	PREP BATCH	Analyte	MS/MSD/RPD	QUALIFIERS
						spike
				acetic acid	25.3/8.06/OK	JS8 detection
	L0612076	1	WG229222	lactic acid	-1540/-1410/OK	None, parent> 4x spike
				acetic acid	.2500/-2150/OK	None, parent> 4x spike
				propionic acid	-3010/-2790/OK	None, parent> 4x spike
	L0612104	4	WG229222	pyruvic acid	OK/131/OK	None, ND in parent
				lactic acid	OK/139/OK	JS139 detect
				acetic acid	-13.3/185/30.3	None, parent> 4x spike
				propionic acid	-24.4/OK/OK	None, parent> 4x spike
	L0612201	2	WG229201	pyruvic acid	OK/38.0/94.1	JS38D94 parent

C. The MSD relative percent differences (RPD) were within the defined contract or laboratory limits.
Yes _____ No __X___

See the section above. The parent sample is qualified as JD#, where # is the RPD outlier, when both RPD and spike recoveries are out of limits. Otherwise samples are not qualified for RPD outliers.

D. The MS/MSD were client samples.
Yes __X__ No _____

VII. LABORATORY CONTROL SAMPLE AND DUPLICATE (LCS/LCSD)

A. Laboratory Control Sample (LCS) and LCS duplicate were analyzed for every analyses performed and for every 20 samples or for every matrix whichever is more frequent.
Yes __X___ No_____

B. The LCS percent recovery (%R) are within the limits defined by the laboratory or in the contract.
Yes __X__ No_____

VIII. SURROGATE RECOVERY

A. The Surrogate spike was analyzed with every sample.
Yes _____ No ____ NA_X___

RSK-175 and AM20GAX: Surrogates are not required for this analysis.

Metabolic Acids: The Laboratory 'Data Checklist' notes surrogates as being applicable, but none are reported in the data packages. This item cannot be verified. For an analogous HPLC Method 8310, surrogates are required.

B. And met the recovery limits defined in the current contract. If recovery limits were exceeded, the sample was re-extracted and re-analyzed.
Yes _____ No_____ NA __X___

IX. INTERNAL STANDARDS

The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows. Note: Internal standards are not required for GC analysis, but if they are used, SW-846 stipulates that they meet the same recovery requirements as those specified for GCMS methods.

Yes ____ No _____ NA__X__

RSK-175, Metabolic Acids, AM20GAX: The laboratory uses the external standard procedure, so no internal standards are present or required.

X. FIELD QC

If Field duplicates were identified, they met guidance RPD of < 35% for water or < 50% for soils and gases. For values reported at < 5 x the reporting limit (RL), a difference of 2 x RL is used as guidance (4 x RL for soils). Data are not qualified for field duplicates as these are evaluated for the total project by the client.

Yes _____ No __X__ NA_____

There are 9 field duplicates for RSK-175 and metabolic acids. These are all in control with the exception of one acetic acid result (see Table below)

For the hydrogen analysis, there are 8 field duplicates present. One of these is associated with a parent sample which does not appear to be present in the data set. Thus we are able to identify 7 field duplicate-parent sample pairs. Several of these are outside the limits identified above, and are noted in the table.

Method	SDG	Client Sample ID	Parent Sample	Observations
AM20GAX	P0612205	DUP1-E-2	IW21-01A -E-2	Hydrogen in parent 8.2, duplicate 2.7
	Not Present	DUP2-E-2	IW21-03A-E-2	Not present in hydrogen data
	P0612137	DUP3-E-2	PMW21-03-E-2	In control
	P0612095	DUP4-E-2	IW101-01A-E-2	Hydrogen in parent 8900, dup 5300
	P0612137	DUP5-E-2	IW101-05A-E-2	In control
	P0612205	DUP6-E-2	IW101-08A-E-2	cannot locate parent results
	P0612318	DUP7-E-2	IW92-06-E-2	Hydrogen in parent 14, dup 1.4
	P0612095	DUP8-E-2	PMW101-03A-E-2	In control
	P0612205	DUP9-E-2	PMW85-01-E-2	In control
RSK-175	L0612275	DUP1-E-2	IW21-01A -E-2	In control
	L0612274	DUP2-E-2	IW21-03A-E-2	In control
	L0612161	DUP3-E-2	PMW21-03-E-2	In control
	L0612077	DUP4-E-2	IW101-01A-E-2	In control
	L0612160	DUP5-E-2	IW101-05A-E-2	In control
	L0612229	DUP6-E-2	IW101-08A-E-2	In control
	L0612368	DUP7-E-2	IW92-06-E-2	In control
	L0612078	DUP8-E-2	PMW101-03A-E-2	In control
	L0612231	DUP9-E-2	PMW85-01-E-2	In control
MBA	L0612275	DUP1-E-2	IW21-01A -E-2	In control
	L0612274	DUP2-E-2	IW21-03A-E-2	In control
	L0612161	DUP3-E-2	PMW21-03-E-2	Acetic acid 25.6 in parent, ND in dup

Method	SDG	Client Sample ID	Parent Sample	Observations
	L0612077	DUP4-E-2	IW101-01A-E-2	In control
	L0612160	DUP5-E-2	IW101-05A-E-2	In control
	L0612229	DUP6-E-2	IW101-08A-E-2	In control
	L0612368	DUP7-E-2	IW92-06-E-2	In control
	L0612078	DUP8-E-2	PMW101-03A-E-2	In control
	L0612231	DUP9-E-2	PMW85-01-E-2	In control

XI. COMPOUND IDENTIFICATION

A. All raw data chromatograms and data system printouts were evaluated for all detected compounds and the identification is accurate.
Yes ____ No _____ NA __X___

This evaluation is not performed at this level of review.

B. Retention time limits or peak pattern identifications are met.
Yes _____ No _____ NA__X___

This evaluation is not performed at this level of review.

C. If two column or two detector confirmation was performed, the value of the confirmation was within 25%D of the quantitation value for results > 5 x RL. If the laboratory has flagged data 'COL' for %D > 40%, a JP qualifier has been added for low level results. For values below (5 x RL), the difference is not considered to impact the precision of the data.
Yes ____ No ____ NA __X__

Not part of this level of review. Dual columns are not required for these methods.

XII. COMPOUND QUANTITATION AND REPORTED CRQLS

A. Raw data examination verified that all sample results were correctly calculated.
Yes _____ No_____ NA__X___

This evaluation is not performed at this level of review.

B. The chromatograms and general system performance were acceptable for all instruments and analytical systems.
Yes _____ No _____ NA__X___

This evaluation is not performed at this level of review.

XIII. OVERALL ASSESSMENT OF THE CASE

The method criteria have been met and the quality of the data, as qualified, is considered fully acceptable and usable as far as can be determined at this level of review.
The following is noted:

Chain of Custody and Login Checklists:

The project manager is informed of the following and the chain information is to be updated for the project file.
Most of the SDGs do not have a customary chain of custody. Those have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers. Some of the time there is a typed area of the last page with the samplers name, date and time with a shaded area for the signature. The person receiving the samples must remember to write in their name and the sample receipt information as there is no area for that established. In addition, as indicated in the previous section, some sample names are truncated on the chain of custody, making them an unacceptable record for those samples. Many of these chains of custody have changes to them without initials. There are some SDGs that have customary chains of custody but have gaps in time without documentation or missing signatures, dates and times. The narrative will state the chains of custody numbers but many times they are missing.

Our understanding is that the chain of custody is an electronic sample documentation system. We would recommend developing an improved set of chain of custody documents to be generated from this system that provide a more clear hardcopy documentation of the electronic process, particularly once the samples are received at the laboratory. There needs to be signature lines for relinquished and received on all pages of the chain of custody and the pages need to be numbered and uniquely identified.

L0612103: Sample Receipt Form is not completely checked off.

Sample Discrepancy Form: L0612275 – Kemron did not receive samples for IDs DUP9-E-2, PMW85-01-E-2, PMW85-02-E-02. They were listed on the COC.

Sample Discrepancy Form: L0612230 – One of the RSK175 vials of sample IW101-09A-MS was received broken. There was sufficient volume remaining to proceed with analysis.

Sample Discrepancy Form: L0612386 – IW85-04-E-2 was received on 12/14/06 at 12:55 but was not on the chain of custody.

Sample Discrepancy Form: L0612336 – Lab received sample containers for ID I292-08-E-2 that were not listed on the COC.

Sample Discrepancy Form: L0612229 – RSK IW101-08B-E-2 received broken.

L0612161 has an Original Chain of Custody #63854 with this SDG.

For hydrogen analysis, conventional chain of custody documents were used. There were some problems with the documentation, as follows:

SDG P0612205 (Kemron L0702003): The chain of custody provided had no laboratory receipt signature, date, or time.
SDG P0612318 (Kemron L0702004): Documentation was in order.
SDG P0612095 (Kemron L0701687): Documentation was in order.
SDG P0612137 (Kemron L0702002): Documentation was in order except for the second page of the three-page chain of custody, which was not signed as relinquished by the sampler.

In addition, shipping documents or tracking numbers covering the period of shipment were not provided.

Sample Condition:
L0612231, L0612368, L0612230, L0612078, L0612154, L0612076, L0612107, L0612274, L0612275, L0612202, L0612386, L0612077, L0612203, L0612229, L0612201, L0612336, L0612161, L0612160, L0612104, L0612103: The cooler temperature was 0-1°C for a few of the coolers but the Sample Checklist states that the samples weren't frozen. No qualifiers are required under these circumstances.

Sample Discrepancy Form: L0612386: Sample IW85-04-E2 were received at pH 6 for metabolic acids, according to the receiving checklist. A note was appended indicating that this could not be adjusted by the laboratory. There was no further explanation provided.

Sample Discrepancy Form: L0612077 – The sample receiving checklist shows that samples PMW101-01A-E2, its MS and MSD containers, DUP4-E2, and IW101-01A-E2 were received at a pH higher than 2 (3.5) for the metabolic acids. The documentation shows that the pH was adjusted by the laboratory to a level < 2.

Holding times:
Metabolic Acids: The reviewer has not been able to find documented holding times for the metabolic acids. The normal holding time for an analogous HPLC method 8310 is 14 days for preserved water samples. Metabolic acid holding times were all within 14 days. It has been verified on other projects that no holding time is established for these compounds. There is no indication of sample pH in the data packages, but the sample receipt forms indicate that the pH range is acceptable except in isolated instances, where it is noted that the laboratory adjusted the pH (see next section). This suggests that the samples were preserved with acid, a good practice for these analytes.

RSK-175: All samples were prepared within 14 days from collection. For RSK-175, pH should not be adjusted when CO_2 is determined, which is the case in this project. It is not clear in the documentation whether samples for RSK-175 were pH-adjusted or not. In the absence of definitive information we have assumed that no acidification occurred. If in fact samples were acidified for RSK-175, it would mean that inorganic carbon in the form of bicarbonate and carbonate would be converted to carbon dioxide, would consequently bias the results high for that analyte. The project manager should clarify this preservation question and regard the data for carbon dioxide accordingly.

AM20GAX: This method is a procedure developed by Microseeps, Inc. Recommended holding times in the procedure are 14 days. Several samples were analyzed outside of that holding time due to equipment malfunctions. This is documented in the analyst notes provided as a Case Narrative. Sample results with holding times outside of the method recommendation are qualified as JH#, where # is the number of days by which the holding time was exceeded. A list of samples that are out of holding, along with the qualifiers added, is provided in the table within the report.

Microseeps indicates that samples are very stable in the vials used for this procedure, but we cannot provide a technical assessment of the stability for hydrogen itself beyond the 14 days specified in the Microseeps procedure. We would assume that some losses of hydrogen could occur, with a resulting possibility of low bias.

Initial Calibrations:
Initial calibrations were in control for all methods the exception of carbon dioxide in the RSK-175 analyses. The laboratory has not commented about this. Laboratory criteria for assessing carbon dioxide calibration acceptance is not provided. All detected carbon dioxide results are qualified as JC64, indicating the possibility of bias due to poor initial calibration linearity.

Continuing Calibrations:
Metabolic Acids: All calibrations are in control. The laboratory is employing the external standard method and is using opening and closing calibrations appropriately.

RSK-175: The laboratory conducts opening and closing calibrations (bracketing the samples during the analytical run). For RSK-175 there is not a specific requirement in the procedure for closing calibrations, and only calibration verification each 12 hours is specified. SW-846 guidance (method 8000B), however specifically requires such closing calibrations for external standard methods. For detected analytes, SW-846 specifies that the closing calibration must meet the same criteria as the opening calibration. This has been done for all analytes but for carbon dioxide, for which a number of opening calibrations do not meet the 30% D criterion specified for RSK-175. The samples have already been qualified for the initial calibration non-linearity and no additional qualifiers have been added.

It should be noted in this regard that the laboratory appears to use a different criterion for carbon dioxide, since a few CCV results were flagged as being outside of limits, but it is not clear to this reviewer where the laboratory limit is set. This method has not been published as a promulgated method by EPA (it rather exists as an open literature publication and an internal EPA SOP), and it may not have been fully developed for carbon dioxide. Thus the laboratory limits may be realistic for this analyte. Nonetheless, the results appear to indicate a probable bias which should be considered in using the data.

AM20GAX: All calibrations are in control. The laboratory is employing the external standard method and is using opening and closing calibrations appropriately.

MS/MSD Recoveries:
In most cases for the RSK-175 and the Metabolic acids, the sample volumes were not sufficient to prepare a matrix spike and matrix spike duplicate.

RSK-175: There were five (5) MS/MSDs which meet the 20 to 1 ratio.
Metabolic Acids: There were five (5) MS/MSDs which meet the 20 to 1 ratio.
AM20GAX: There are no MS/MSDs for this method. They are not required or possible for hydrogen analysis.

RSK-175:
Carbon dioxide gave MS/MSD outliers as shown in the table below. In each case, the sample level is greater than 4x the spike amount, which means that the anticipated normal analytical variability is greater than the spike amount. In such cases, no recovery can meaningfully be calculated, and no qualifiers are added. There is no indication of bias.

Metabolic acids: Metabolic acid MS/MSDs had several outliers. These included high recoveries associated with non-detects in the parent sample and recoveries associated with samples that were greater than 4x the spike level. In neither of these cases are qualifiers applied. In three cases, qualifiers were applied as JS#, where # is the recovery observed. A matrix bias roughly proportional to the recovery appears to be present in these instances. There is one extremely low recovery (8%) for acetic acid and the data should be used with caution.

Field Duplicates:
There are 9 field duplicates for RSK-175 and metabolic acids. These are all in control with the exception of one acetic acid result (see Table below)

For the hydrogen analysis, there are 8 field duplicates present. One of these is associated with a parent sample which does not appear to be present in the data set. Thus we are able to identify 7 field duplicate-parent sample pairs. Several of these are outside the limits identified above, and are noted in the table.

Method Blanks:

There are a number of method blanks for RSK-175 which have low-level detections of methane and carbon dioxide, as shown in the table within the report. When the associated sample result is less than 5x the method blank level (corrected for sample dilution), the sample result is qualified as UB#, where # is the corrected method blank result. Such results are usable as non-detected values.

Method blanks for hydrogen analysis and for metabolic acids are in control.

Field Blanks:

Rinse blanks for RSK-175 and metabolic acids show some detected levels for methane, carbon dioxide, and acetic acid. Results are already qualified from the method blank levels for RSK-175, and so no additional qualifiers are added. For metabolic acids, acetic acid is qualified as URB#, where # is the dilution-corrected rinse blank level, when the level in the associated sample is less than 5x the rinse blank.

INORGANIC DATA QUALITY REVIEW REPORT

METALS BY ICP SW-846 METHOD 6010B and WET CHEMISTRY

SDG: L0612-076, -077, -078, -103, -104, -107, -154, -160, -161, -201, -202, -203, -229, -230, -231, -274, -275, -295, -296, -336, -368, -386

PROJECT: Memphis Defense Depot Site; EBT-1 phase for e2m

LABORATORY: Kemron Laboratories, Marietta, OH

SAMPLE MATRIX: Water SAMPLING DATE (Month/Year): 12 / 06

ANALYSES REQUESTED: SW-846 Method 6010 (ICP), 9056 (IC) Bromide, Chloride, Nitrate, Nitrite, Sulfate, 9060 Total Organic Carbon; MCAWW Method 310.2 Alkalinity, 353.3 Nitrate Nitrogen, 354.1 Nitrite Nitrogen, 376.1 Sulfide

NO. OF SAMPLES: 110 Total Water, 3 dissolved Water, 109 Wet Chemistry

SAMPLE NO: See attached results forms

DATA REVIEWER: William Berning

QA REVIEWER: Diane Short and Associates Inc. INITIALS/DATE: ____

Telephone Logs included Yes____ No _X___

Contractual Violations Yes____ No _X___

The project Sampling and Analysis Plan (SAP), the EPA Contract Laboratory Program National Functional Guidelines for Inorganic Review, 2002 and the SW-846 and MCAWW Methods have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. Per the Scope of Work, the review includes validation of all calibrations, chains of custody, and QC forms referencing the above documents.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work or project contract.
Yes___X__ No___
The following is noted for clarification:
The packages contained 110 total waters, 3 dissolved waters, and 109 wet chemistry samples analyzed for 3 project-specific ICP metals and 8 wet chemistry parameters. There were also 2 field blanks. All packages were reviewed for COC, holding time, summary QC and calibration. In addition, for all wet chemistry parameters (except for IC) the raw data were reviewed for initial instrument calibration (e.g. calibration curves) and ICV/CCV's, since no QC summaries were reported for them (again, except for IC). For 9 SDG's, an IC failure meant that the Nitrate Nitrogen and Nitrite Nitrogen analyses were done by separate methods (MCAWW Methods 353.2 and 354.1, respectively) rather than as a part of the IC analysis. Each of these additional methods was also reviewed using the raw data, since again few or no QC summaries were provided. Two SDG's (L0612077 and L0612274) were further evaluated for calibration blank results for all analyses.

SDG L0612077 had a TOC triple QC set plus three analytical runs, as well as a double sulfide QC set. SDG L0612078 had a double sulfide QC set. SDG L0612104 had a double alkalinity QC set, as well as a double sulfide QC set, and two nitrate analytical runs. SDG L0612107 had a TOC double QC set. SDG L0612160 had a double alkalinity QC set, as well as a double TOC QC set plus two TOC analytical runs. SDG's L0612201, L0612202 and L0612203 each had two sets of ICP runs reported. SDG L0612230 had a TOC double QC set plus three analytical runs. SDG's L0612274 and L0612295 each had a TOC double QC set plus two analytical runs. SDG L0612296 had a TOC triple QC set plus three analytical runs. SDG L0612368 had a double alkalinity QC set.

In SDG L0612076, there were laboratory "B" flags with no analyte values reported for some of the selenium results. The laboratory was contacted and explained that these laboratory "B" flags were reporting errors and that the analyte results should be considered "U" values.

In SDG's L0612296, L06012368 and L06012386, the client needs to confirm whether or not the laboratory's designation of certain samples as dissolved matches the actual field circumstances of collection for dissolved metals or for dissolved TOC analyses.

II. CALIBRATIONS

A. All initial instrument calibrations were performed as defined in the contract or Statement of Work (SOW). All correlation coefficients of the 3 point curve were > 0.995.
Yes__X__ No___ NA___
Per the raw data review.

B. The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were analyzed at the required frequency.
Yes__X__ No____
Sequencing was not required, but sufficient calibrations were present to verify that the frequencies were met for client samples.

C. And the ICV and CCV standard percent recovery results were within the required control limits of 90 – 110% (Mercury 80 – 120%).
Yes__X_ No____
The requirements were met for client samples (IC used percent difference). In SDG L0612104, several alkalinity CCV's appear to be out of control by a factor of 2x. The analyst hand-amended the results to

account for the factor of 2x. Since the ICV and matrix QC samples were all well within limits, the hand-emendations are accepted and no qualifications have been applied. No mention of this circumstance was made by the laboratory.

III. CRDL STANDARDS
The 2 x CRDL standards were analyzed as required in the SOW.
Yes ___ No____ NA__X_
Not required.

IV. BLANKS
Note: the highest blank associated with any particular analyte is used for the qualification process and is the value entered after the "B" blank descriptor.

A. The initial calibration blanks (ICB) and continuing calibration blanks (CCB) were analyzed at the required frequency.
Yes__X_ No____ NA____
Sequencing was not required, but sufficient calibration blanks were present to verify that the frequencies were met for client samples.

B. And the ICB and CCB results were within the required control limits.
Yes____ No__X__ NA_____
Per the review of the QC summaries and the raw data, there were some blank analyte detects reported in the calibration blanks, but all client data were either non-detect or much greater than the contamination, so client data overall are not impacted.

C. And all analytes in the Leach Blank were less than the CRDL, or less than 2x the instrument detection limit (IDL), whichever is lower.
Yes____ No____ NA__X__
No TCLP analysis was performed.

V. PREPARATION BLANKS
A. Preparation blanks were prepared and analyzed at the required frequency.
Yes__X__ No____

B. And all analytes in the preparation blank were less than the CRDL, or less than the instrument detection limit (IDL), whichever is lower.
Yes____No__X__
Analytes were found in the preparation blanks at levels requiring qualification for the following parameters.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0612076	All detects <5x .00542 mg/l	Selenium	UPB.00542

Analytes reported as contaminants in the preparation blank are qualified UPB# in the affected samples, where # is the value of the blank corrected to the units of the sample. Sample detects whose values are less than 5x blank are qualified UPB and are fully usable as undetected values at that level. See the summary table at the end of this report.

C. Field, trip, decon rinse or other field blanks are contained and identified in the package.
Yes __X__ No____ NA____

D. And the reported results are less than the CRDL or less than the IDL, whichever is lower.
Yes ____ No __X_ NA____
There were some blank analyte detects reported in the field blanks, but all client data were either non-detect or much greater than the contamination, so client data overall are not significantly impacted.

VIA. ICP INTERFERENCE CHECK SAMPLE
A. The Interference Check Sample (ICS) was analyzed as required in the SOW or contract.
Yes__X_ No____ NA____

B. And the ICS percent recovery results were reported for all required ICS analytes and were within required control limits of 80% to 120%.
Yes__X__ No____ NA____

C. ICP analysis results for analytes not required to be present in a given ICS standard were within acceptable limits.
Yes____No____ NA__X__
Not requested by client and data not provided by laboratory.

VIB. INTERELEMENT CORRECTION FACTORS
The Interelement Correction Factors are included and complete for all possible interferent analytes.
Yes____No____ NA__X__
Review of possible other contaminants was not requested by the client.

VII. SPIKE SAMPLE RECOVERY
A. A matrix (pre-digestion) spike sample was analyzed for each digestion group and/or matrix or as required in the SOW.
Yes _____ No__X__
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number). There appear to be sufficient client samples to meet the project frequency.

The laboratory ran variously either matrix duplicates or MS/MSD samples or both or neither.

B. And the Matrix spike percent recoveries were within the required control limits of 75 – 125%.
Yes ____ No__X_ NA____
The following SDGs had matrix spike results that resulted in sample qualification.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0612076	All Non-detects	Sulfide [client sample]	RS0
L0612201	All Non-detects	Nitrate [client sample]	RS18
	All Detects	Nitrate [client sample]	JS18

L0612230	All	Total Alkalinity [client sample]	JS54
L0612274	All	Total Organic Carbon [client sample]	JS44

The samples were qualified JS# or RS#, where the # is the percent recovery of that particular analyte. A low matrix spike recovery indicates a possible low bias to the reported result. A matrix spike recovery below 30% results in rejection of all non-detect data associated with that analyte. Rejected data are considered unusable for project purposes as significantly low values could be reported or false undetected values.

B. A Post-digest spike was analyzed if required.
Yes__X__No____ NA___

C. The MS/MSD samples included client samples
Yes __X_ No___ NA____
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

There were at least 5 client samples reported for metals MS/MSD samples and at least 6 client samples reported for wet chemistry MS/MSD samples. This would meet project frequency of 1/20.

VIII. DUPLICATES
A. Matrix (pre-digestion) duplicate samples were analyzed at the required frequency
Yes __X__ No__X__
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

The laboratory ran variously either matrix duplicates or MS/MSD samples or both or neither.

B. And the Matrix duplicate relative percent differences (RPD) were within the required control limits (Water 20%, Soil 35%) or the RL limits were met if the duplicate values are < 5 x RL. If the either one of the duplicate results are < 5 X RL, the RPD is not used. The QC limit used is the difference between the original and the duplicate results (± the RL) for water and (± 2X the RL) for soils.
Yes __X__ No ____ NA_____

IX. LABORATORY CONTROL SAMPLE
A. Laboratory control samples (LCS) were analyzed at the required frequency.
Yes _X___ No____
The laboratory also ran an LCS duplicate at times.

B. And LCS recoveries were within the required control limits of 80 to 120%.
Yes __X___ No____

X. MSA RESULTS AND GRAPHITE FURNACE ANALYSIS (GFAA)
Duplicate injections were performed for all analyses and the RSDs were less than 20% for all reported results. (Method of Standard Additions (MSA) requires only a single injection).
Yes____No____ NA__X___
Graphite furnace was not done.

XI. ICP SERIAL DILUTION
A. ICP Serial Dilutions have been analyzed at the required frequency if the analyte concentrations are greater than 50 x IDL.
Yes__X_ No____ NA_____
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

The laboratory sometimes reported serial dilution results and sometimes did not.

B. And the percent difference criteria of ± 10 % have been met.
Yes__X__ No _____ NA____

C. The serial dilution analyses were on client samples
Yes __X___ No_____
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number). The laboratory sometimes reported serial dilution results and sometimes did not.

There were at least 10 reported client samples all of which were within acceptance limits and would exceed a project frequency of 1/20.

XII. INSTRUMENT DETECTION LIMITS
A. The Instrument Detection Limits have met the Quarterly reporting requirements.
Yes ___X_ No____ NA___
This was determined to be acceptable during the contractual process.

B. And all sample results have met the required detection limits (CRDL).
Yes__X__ No____ NA____
The laboratory has diluted several of the digestates to account for potential matrix effects on the selenium analysis (in the form of excessively negative results for the given samples) as well as for the IC bromide analysis. The laboratory has reported both the undiluted and the diluted results. The dilutions performed raised the MDL's; the project manager will evaluate whether the elevated MDL's are still below the project reporting limits.

XIII. PREPARATION AND ANALYSIS LOGS
A. All samples were prepared or analyzed within the required holding times referencing the SOW (time of sample receipt to preparation/distillation).
Yes___X_ No____
For the SDG's listed below, IC failure caused the IC nitrate and nitrite analyses to be well outside of holding times. Although data rejection has occurred for the IC nitrate and nitrite, the laboratory did

provide alternate analytical methods to obtain usable nitrate and nitrite results for the samples involved. Both results are reported in the data package and in the electronic deliverable.

B. All samples were analyzed within the 40 CFR 136 (Clean Water Act) or method recommended holding times (time of sample collection to date of analysis).
Yes_____ No__X__
The following samples required qualification due to method holding time exceedances.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0612103	All IC	IC Nitrate	RH192
	All IC	IC Nitrite	RH192
L0612104	All IC	IC Nitrate	RH240
	All IC	IC Nitrite	RH240
L0612107	All IC ·	IC Nitrate	RH240
	All IC	IC Nitrite	RH240
L0612154	All IC	IC Nitrate	RH240
	All IC	IC Nitrite	RH240
L0612160	All IC	IC Nitrate	RH240
	All IC	IC Nitrite	RH240
L0612161	All IC	IC Nitrate	RH168
	All IC	IC Nitrite	RH168
L0612201	All IC	IC Nitrate	RH144
	All IC	IC Nitrite	RH144
L0612202	All IC	IC Nitrate	RH216
	All IC	IC Nitrite	RH216
L0612203	All IC	IC Nitrate	RH192
	All IC	IC Nitrite	RH192

For sample holding time results that are out of control, the affected sample data have been qualified JH# or RH#, where # is the number of time units past holding time that the analysis was late. In this case, the time is in hours. Analysis results qualified as estimated due to holding time violations may have a possible low bias to the data due to the potential loss of analyte, as well as a possible reporting of false negatives. Analysis results qualified as rejected due to holding time violation are considered unusable. Note that only the IC nitrate and nitrite analyses are affected and that the laboratory did provide alternate analytical methods to obtain usable nitrate and nitrite results. The reviewer, therefore, does not recommend using any of the above noted results. The rejected results can be easily identified and removed from the client data set via the EDD which contains the RH# qualifier for these data. The acceptable data are present in the EDD without qualification unless noted in this report for other QC outliers.

C. Chains of Custody (COC)

1. Chains of Custody (COC) were reviewed and all fields were complete, signatures were present and cross outs were clean and initialed.

Yes_____ No__X__

None of the automated COC's included the initial (i.e. field) sample relinquishment signature, date, and time.

In SDG L0612296, the hand-completed COC is lacking laboratory receipt information.

2. Samples were received at the required temperature and preservation.

Yes_____ No__X__

Per the COCs and the laboratory log-in records, all applicable chemical preservatives were properly used except as follows.

In SDG L0612076, the field metals aliquots for samples PMW101-01A-E-2 MS and PMW101-01A-E-2 MSD were not at proper pH upon laboratory receipt. In SDG L0612077, the field metals aliquots for samples IW101-01A-E-2, DUP4-E-2 and PMW101-01A-E-2 were also not at proper pH upon laboratory receipt. In SDG L0612365, the field metals aliquot for sample IW92-05-E-2 was also not at proper pH upon laboratory receipt. All of these may be due to inherent matrix buffering. The laboratory correctly added HNO_3 to bring them to the proper pH. The pH adjustment does not specify whether acid was missing or just insufficient. For these particular shipments, the samples were properly cooled and the shipping time was relatively brief. Since all analytes of interest are stable when cooled, no such stable analytes of interest received qualification for insufficient field chemical preservation of the samples.

In SDG L0612386, the total and dissolved field metals aliquots for sample IW85-04-E-2 were also not at proper pH upon laboratory receipt. This may be due to inherent matrix buffering. The laboratory correctly added HNO_3 to bring them to the proper pH, but the pH remained well above control, despite the pH adjustment attempt. Although for this particular shipment the samples were properly cooled and the shipping time was relatively brief, the higher pH might not have allowed the analytes of interest in this case to be held in solution. Therefore, the arsenic, manganese, and selenium results in these samples have been qualified as estimated "JP" due to insufficient field preservation, with a possible low bias of unknown magnitude.

In SDG L0612076, the field TOC aliquots for samples PMW101-01A-E-2, PMW101-01A-E-2 MS and PMW101-01A-E-2 MSD were not at proper pH upon laboratory receipt. In SDG L0612077, the field TOC aliquots for samples IW101-01A-E-2 and DUP4-E-2 were also not at proper pH upon laboratory receipt. In SDG L0612368, the field TOC aliquot for sample IW92-05-E-2 was also not at proper pH upon laboratory receipt. All of these may be due to inherent matrix buffering. The laboratory correctly added H_2SO_4 to bring them to the proper pH. The pH adjustment does not specify whether acid was missing or just insufficient. Although for these particular shipments the samples were properly cooled and the shipping time was relatively brief, the analyte of interest in this case is not stable when only cooled. Therefore, the TOC results in these six samples have been qualified as estimated "JP" due to improper field preservation, with a possible low bias of unknown magnitude.

In SDG L0612386, the total and dissolved field TOC aliquots for sample IW85-04-E-2 were also not at proper pH upon laboratory receipt. This may be due to inherent matrix buffering. The laboratory correctly added H_2sO_4 to bring them to the proper pH, but the pH remained well above control, despite the pH adjustment attempt. Although for this particular shipment the samples were properly cooled and the shipping time was relatively brief, the analyte of interest in this case is not stable when only cooled. Therefore, the TOC results in these samples have been qualified as estimated "JP" due to improper field preservation, with a possible low bias of unknown magnitude.

In SDG L0612103, the laboratory receipt checklist is incomplete and doesn't verify proper sample receipt pH. Based upon case narrative statements that the sample receipt was without issues, no qualifiers have been applied. The laboratory receipt checklist should be completed, however.

XIV. FIELD QC

A. Field QC samples (duplicates, SRMs) were identified.
Yes __X__ No____
The field duplicates are identified as:

SDG	Duplicate Pair
L0612077	IW101-01A / DUP4
L0612077	PMW101-03A / DUP8
L0612160	IW101-05A / DUP5
L0612161	PMW21-03 / DUP3
L0612229	IW101-08A / DUP6
L0612231	PMW85-01 / DUP9
L0612274	IW21-03A / DUP2
L0612275	IW21-01A / DUP1
L06012365	IW92-06-E-2 / DUP7

B. Field duplicates were within a guidance limit of < 35% RPD limit for water or <50% RPD limit for soil. If values are < 5 x RL, the water limit is ± 2 x RL and the soil limit is ±4 x RL. Final determination will be made by the project manager.
Yes __X__ No____ NA___
Per the field manager, the duplicates are within project criteria. The reviewer has checked the data and concurs.

XV. GENERAL COMMENTS

The laboratory has complied with the requested methods and the quality of the data is acceptable and usable with consideration of the following qualifications. Note that the following qualifiers are used:

UPB#, where # is the value of the blank contamination. Data are usable as undetected values.
JS# is for matrix spike/matrix spike duplicate recoveries, where # is the analyte recovery. The bias to the data is considered to be high or low proportional to the analyte recovery. (JS126 would indicate the value could be 126% of the true value)
RS# is for matrix spike/matrix spike duplicate recoveries below 30%R, where # is the analyte recovery and non-detects are the affected results. The data are considered to be unusable for project purposes.
RH#, where # is the number of time units the analysis is past holding time. The data are considered to be unusable for project purposes.
JP, where field sample preservation, based upon laboratory receipt pH measurements, is outside of the control limits. Data may have a possible low bias due to the potential loss of analyte, as well as a possible reporting of false negatives.

Summary:
*Very low level detections of selenium could be false detections due to field contamination, not the presence of the analytes in the sample. (UPB#)

*Nitrate, total alkalinity, and total organic carbon could be biased low by the added factor indicated by the low matrix spike/matrix spike duplicate analyte recoveries (JS#).

*Sulfide non-detect data and nitrate non-detect data are rejected due to extremely low matrix spike recoveries.

*Nitrite and nitrate data are rejected due to gross exceedance of the holding time. This is only for certain IC nitrate and nitrite analyses and acceptable nitrate and nitrite data that cover these rejected data were obtained by the laboratory, using alternate method. These results can be easily identified and removed from the client data via the EDD which contains the RH# qualifier for these data.

Qualification or Comments in Detail

Chains-of-Custody

None of the automated COC's included the initial (i.e. field) sample relinquishment signature, date, and time.

In SDG L0612296, the hand-completed COC is lacking laboratory receipt information.

Blanks

Per the review of the QC summaries and the raw data, there were some blank analyte detects reported in the calibration blanks, but all client data were either non-detect or much greater than the contamination, so client data overall are not significantly impacted.

Analytes were found in the preparation blanks at levels requiring qualification for the following parameters.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0612076	All detects <5x .00542 mg/l	Selenium	UPB.00542

Analytes reported as contaminants in the preparation blank are qualified UPB# in the affected samples, where # is the value of the blank corrected to the units of the sample. Sample detects whose values are less than 5x blank are qualified UPB and are fully usable as undetected values at that level. See the summary table at the end of this report.

There were some blank analyte detects reported in the field blanks, but all client data were either non-detect or much greater than the contamination, so client data overall are not significantly impacted.

Matrix Spikes/Matrix Spike Duplicates

The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number). The laboratory ran variously either matrix duplicates or MS/MSD samples or both or neither. Sufficient client samples were submitted to fulfill the project frequency.

The following SDGs had matrix spike results that resulted in sample qualification.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0612076	All Non-detects	Sulfide [client sample]	RS0
L0612201	All Non-detects	Nitrate [client sample]	RS18
	All Detects	Nitrate [client sample]	JS18
L0612230	All	Total Alkalinity [client sample]	JS54
L0612274	All	Total Organic Carbon [client sample]	JS44

The samples were qualified JS# or RS#, where the # is the percent recovery of that particular analyte. A low matrix spike recovery indicates a possible low bias to the reported result. A matrix spike recovery below 30% results in rejection of all non-detect data associated with that analyte. Rejected data are considered unusable for project purposes. Rejected data are considered unusable for project purposes as significantly low values could be reported or false undetected values.

Serial Dilutions

The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number). The laboratory sometimes reported serial dilution results and sometimes did not. Adequate client samples were identified and submitted to fulfill the project frequency and all were acceptable.

Detection Limits

The laboratory has diluted several of the digestates to account for potential matrix effects on the selenium analysis (in the form of excessively negative results for the given samples) as well as for the IC bromide analysis. The laboratory has reported both the undiluted and the diluted results. The dilutions performed raised the MDL's; the project manager will evaluate whether the elevated MDL's are still below the project reporting limits.

Holding Times

For the SDG's listed below, IC failure caused the IC nitrate and nitrite analyses to be well outside of holding times. Although data rejection has occurred for the IC nitrate and nitrite, the laboratory did provide alternate analytical methods to obtain usable nitrate and nitrite results for the samples involved.

The following samples required qualification due to method holding time exceedances.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION

L0612103	All IC	IC Nitrate	RH192
	All IC	IC Nitrite	RH192
L0612104	All IC	IC Nitrate	RH240
	All IC	IC Nitrite	RH240
L0612107	All IC	IC Nitrate	RH240
	All IC	IC Nitrite	RH240
L0612154	All IC	IC Nitrate	RH240
	All IC	IC Nitrite	RH240
L0612160	All IC	IC Nitrate	RH240
	All IC	IC Nitrite	RH240
L0612161	All IC	IC Nitrate	RH168
	All IC	IC Nitrite	RH168
L0612201	All IC	IC Nitrate	RH144
	All IC	IC Nitrite	RH144
L0612202	All IC	IC Nitrate	RH216
	All IC	IC Nitrite	RH216
L0612203	All IC	IC Nitrate	RH192
	All IC	IC Nitrite	RH192

For sample holding time results that are out of control, the affected sample data have been qualified JH# or RH#, where # is the number of time units past holding time that the analysis was late. In this case, the time is in hours. Analysis results qualified as estimated due to holding time violations may have a possible low bias to the data due to the potential loss of analyte, as well as a possible reporting of false negatives. Analysis results qualified as rejected due to holding time violation are considered unusable. Note that only the IC nitrate and nitrite analyses are affected and that the laboratory did provide alternate analytical methods to obtain usable nitrate and nitrite results. The reviewer, therefore, does not recommend using any of the above noted results. The rejected results can be easily identified and removed from the client data set via the EDD which contains the RH# qualifier for these data. The acceptable data are present in the EDD without qualification unless noted in this report for other QC outliers.

Sample Preservation

Per the COCs and the laboratory log-in records, all applicable chemical preservatives were properly used except as follows.

In SDG L0612076, the field metals aliquots for samples PMW101-01A-E-2 MS and PMW101-01A-E-2 MSD were not at proper pH upon laboratory receipt. In SDG L0612077, the field metals aliquots for samples IW101-01A-E-2, DUP4-E-2 and PMW101-01A-E-2 were also not at proper pH upon laboratory receipt. In SDG L0612365, the field metals aliquot for sample IW92-05-E-2 was also not at proper pH upon laboratory receipt. All of these may be due to inherent matrix buffering. The laboratory correctly added HNO_3 to bring them to the proper pH. The pH adjustment does not specify whether acid was missing or just insufficient. For these particular shipments, the samples were properly cooled and the shipping time was relatively brief. Since all analytes of interest are stable when cooled, no such stable analytes of interest received qualification for insufficient field chemical preservation of the samples.

In SDG L0612386, the total and dissolved field metals aliquots for sample IW85-04-E-2 were also not at proper pH upon laboratory receipt. This may be due to inherent matrix buffering. The laboratory correctly added HNO_3 to bring them to the proper pH, but the pH remained well above control, despite the pH adjustment attempt. Although for this particular shipment the samples were properly cooled and the shipping time was relatively brief, the higher pH might not have allowed the analytes of interest in this case to be held in solution. Therefore, the arsenic, manganese, and selenium results in these samples have been qualified as estimated "JP" due to insufficient field preservation, with a possible low bias of unknown magnitude.

In SDG L0612076, the field TOC aliquots for samples PMW101-01A-E-2, PMW101-01A-E-2 MS and PMW101-01A-E-2 MSD were not at proper pH upon laboratory receipt. In SDG L0612077, the field TOC aliquots for samples IW101-01A-E-2 and DUP4-E-2 were also not at proper pH upon laboratory receipt. In SDG L0612368, the field TOC aliquot for sample IW92-05-E-2 was also not at proper pH upon laboratory receipt. All of these may be due to inherent matrix buffering. The laboratory correctly added H_2SO_4 to bring them to the proper pH. The pH adjustment does not specify whether acid was missing or just insufficient. Although for these particular shipments the samples were properly cooled and the shipping time was relatively brief, the analyte of interest in this case is not stable when only cooled. Therefore, the TOC results in these six samples have been qualified as estimated "JP" due to improper field preservation, with a possible low bias of unknown magnitude.

In SDG L0612386, the total and dissolved field TOC aliquots for sample IW85-04-E-2 were also not at proper pH upon laboratory receipt. This may be due to inherent matrix buffering. The laboratory correctly added H_2sO_4 to bring them to the proper pH, but the pH remained well above control, despite the pH adjustment attempt. Although for this particular shipment the samples were properly cooled and the shipping time was relatively brief, the analyte of interest in this case is not stable when only cooled. Therefore, the TOC results in these samples have been qualified as estimated "JP" due to improper field preservation, with a possible low bias of unknown magnitude.

Field Duplicates

The field duplicates are identified as:

SDG	Duplicate Pair
L0612077	IW101-01A / DUP4
L0612077	PMW101-03A / DUP8
L0612160	IW101-05A / DUP5
L0612161	PMW21-03 / DUP3
L0612229	IW101-08A / DUP6
L0612231	PMW85-01 / DUP9
L0612274	IW21-03A / DUP2
L0612275	IW21-01A / DUP1

L06012365 IW92-06-E-2 / DUP7

QUALIFICATION SUMMARY TABLE

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0612076	All detects <5x .00542 mg/l	Selenium	UPB.00542
	All Non-detects	Sulfide [client sample]	RS0
	PMW101-01A-E-2, PMW101-01A-E-2 MS, PMW101-01A-E-2 MSD	Total Organic Carbon	JP
L0612077	IW101-01A-E-2, DUP4-E-2	Total Organic Carbon	JP
L0612103	All IC	IC Nitrate	RH192
	All IC	IC Nitrite	RH192
L0612104	All IC	IC Nitrate	RH240
	All IC	IC Nitrite	RH240
L0612107	All IC	IC Nitrate	RH240
	All IC	IC Nitrite	RH240
L0612154	All IC	IC Nitrate	RH240
	All IC	IC Nitrite	RH240
L0612160	All IC	IC Nitrate	RH240
	All IC	IC Nitrite	RH240
L0612161	All IC	IC Nitrate	RH168
	All IC	IC Nitrite	RH168
L0612201	All IC	IC Nitrate	RH144
	All IC	IC Nitrite	RH144
	All Non-detects	Nitrate [client sample]	RS18
	All Detects	Nitrate [client sample]	JS18
L0612202	All IC	IC Nitrate	RH216
	All IC	IC Nitrite	RH216

L0612230	All	Total Alkalinity [client sample]	JS54
L0612274	All	Total Organic Carbon [client sample]	JS44
L0612368	IW92-05-E-2	Total Organic Carbon	JP
L0612386	IW85-04-E-2 total	Arsenic, Manganese, Selenium	JP
	IW85-04-E-2 dissolved	Arsenic, Manganese, Selenium	JP
	IW85-04-E-2 total	Total Organic Carbon	JP
	IW85-04-E-2 dissolved	Total Organic Carbon	JP

ORGANIC DATA QUALITY REVIEW REPORT
VOLATILE ORGANICS SW-846 METHOD 8260B/5030B

8260B/5030B
SDG: L070: 3346, 3140, 3136, 3106, 3107, 3180, 3310, 3246, 3230, 3276

PROJECT: Memphis Defense Depot, EBT-2 for E2m ,Texas

LABORATORY: Kemron Environmental Services, Marietta, OH

SAMPLE MATRIX: Water

SAMPLING DATE (Month/Year): March, 2007

NO. OF SAMPLES: 8260B/5030B (Waters) – 107 samples including (8 Trip Blanks and 2 Rinse Blanks)

ANALYSES REQUESTED: SW-846 8260B

SAMPLE NO.: See attached result forms and associated edd

DATA REVIEWER: Sammy Huntington and John Huntington (Gateway Enterprises)

QA REVIEWER: Diane Short and Associates Inc. INITIALS/DATE: ___________

Telephone Logs included Yes____ No _X__

Contractual Violations Yes____ No _X___

The EPA Contract Laboratory Program National Functional Guidelines for Organic Review, 2002, and the SW-846 Method 8260B has been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. Per the Scope of Work, the review of these samples includes Level III validation of all chains of custody, calibrations and QC forms referencing the QC limits in the above documents.

I. DELIVERABLES

A. All deliverables were present as specified in the Statement of Work (SOW), SW-846, or in the project contract.
Yes __X_ No _____

This is a Level III Report. No raw data are provided, nor required for review.

B. Chain of Custody Documentation was complete and accurate.
Yes ______ No _X__

The project manager is informed of the following and the chain information is to be updated for the project file.

Most of the SDGs do not have a customary chain of custody. Those have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers.
They have been improved since we first pointed out these issues in that each page does have a printed area for the sampler name, date, time, and signature. However, there is no similar printed area for receipt signatures, dates, and times to be entered, and in this case only the first page has been so signed by the laboratory.

A few sample names are being truncated on the Chain of Custody because the field width is not sufficient to allow the full name to appear. This seems to be a less severe problem than in the past, but it still does occur.

Our understanding is that the chain of custody is a printout of an electronic sample documentation system. We reiterate our recommendation that the printout be improved to add a printed area for the laboratory to receive the samples, and to include page numbers. Preferably, the laboratory signature should appear on each page of the Chain of Custody, but at the very least should appear each time a new COC# is applied. Alternatively, some type of electronic signature system could be used using a system compliant with EPA's proposed cross-media electronic reporting rule. The present system does not appear fulfill the authentication criteria for sample tracking.

C. Samples were received at the required temperature, preservation and intact with no bubbles.
Yes ______ No __ X ___

Most of the SDGs had at least one cooler that was under 2°C but the Sample Checklist states that the samples weren't frozen. No qualifiers are required under these circumstances.

In addition, new EPA regulations (See Federal Register, March 12, 2007, 40CFR Part 122) require only that the temperature of samples delivered to the laboratory be less than 6° C. Thus the sample receipt conditions are fully compliant with applicable regulations.

L0703140 narrative states: "One of the 8260 vials of ID PMW101-08A-EBT leaked during transit. This vial will not be used for analysis." No qualifiers are required for this since there are enough duplicate vials for analysis to proceed normally.

II. ANALYTICAL REPORT FORMS

A. The Analytical Report or Data Sheets are present and complete for all requested analyses.
Yes _X_ No ____

B. Holding Times

1. The contract holding times were met for all analyses (Time of sample receipt to time of analysis (VOA) or extraction and from extraction to analysis).
Yes ___X___ No______

2. The Clean Water Act (40 CFR 136) or method holding times were met for all analyses (14 days from time of sample collection to analysis or extraction).
Yes __X__ No____

III. INSTRUMENT CALIBRATION – GC/MS

A. Initial Calibration

1. The Response (RF) and Relative Response Factors (RRF) and average RRF for all compounds for all analyses met the contract criteria of >0.01.
Yes __X__ No ____ NA____

Per the project manager, the 2001 EPA CLP validation guidance has been applied to the common "poor responders". Acetone, 2-butanone, and 4-methyl-2-pentanone are the compounds for which any calibration response factors below 0.05 have been observed. The validation guidance used for this project allows for a response of 0.01 for these compounds if spectral integrity can be verified at low concentrations. These spectra are not commonly provided and are not part of the deliverable for these data sets. The laboratory has been tasked with providing to the client verification that the 0.01 RF is valid. Given the spectral verification is available, the data are not qualified for response >0.01 < 0.05. No data have been qualified.

The low-responding compounds are highly water-soluble and capable of hydrogen bonding with water. This decreases their purge efficiency and results in the relatively low response. The implication of this low purge efficiency is that a relatively low absolute recovery of such compounds is achieved in the purge step of the analysis. If this recovery is consistent, reasonable accuracy and precision can be achieved in a given matrix, which is indicated for the lab matrix by acceptable recoveries in LCS and calibration checks. However, this causes these targets to be more sensitive to matrix variations that impact purge efficiency (such as ionic strength or the presence of varying levels of soluble non-target organic material) than are the more hydrophobic compounds typically analyzed by this method, and as a result they are more likely to exhibit matrix bias. The likelihood of matrix bias for these compounds in this site matrix is assessed in the MS/MSD section of this report.

2a.The relative standard deviation (RSD) for the five point calibration was within the 30% limit for the CCCs.
Yes __X__ No____ NA____

This is a method requirement and indicates that the analytical system is in control.

2b.The relative standard deviation (RSD) for the five point calibration was within the 30% limit for all other compounds or a linear curve was used.
Yes _____ No __X__ NA____

There are several targets that are shown in the ICAL forms with %RSD greater than 30%, the validation limit. These instances where this occurred and the laboratory did not use an acceptable regression curve in place of the response factor average are shown in the table below. Because none of these outliers are associated with detected targets, and because the %RSD is not so severely out of limits to indicate a significant probability of a false negative, no qualifiers are applied.

SDG	ICAL Date	Lab Sample#	Analyte	%RSD	RRF OUT	Qualifiers Added
L0703276	3/14/07 21:05	1-8	Bromoform	45.3		None, ND
			1,2,3-trichorobenzene	38.4		None, ND
L0703230	3/14/07 21:05	ALL	Bromoform	45.3		None, ND
			1,2,3-trichorobenzene	38.4		None, ND
L0703180	3/9/07 20:40	1-5, 8-11	1,2,3-trichorobenzene	36.5		None, ND
			Bromobenzene	35.3		None, ND

SDG	ICAL Date	Lab Sample#	Analyte	%RSD	RRF OUT	Qualifiers Added
L0703140	3/9/07 20:40	1,2,3,6,9	1,2,3-trichorobenzene	36.5		None, ND
			Bromobenzene	35.3		None, ND

3. The 12 hour system Performance Check was performed as required in SW-846.
Yes __X__ No_____ NA____

B. Continuing Calibrations
1. The midpoint standard was analyzed for each analysis at the required frequency and the QC criteria of > 0.05 (.01 for CLP 2001) were met.
Yes __X___ No ____ NA____

The CCVs were analyzed at the proper frequency. The same compounds showed low responses in the continuing calibration as were observed in the initial calibrations. Qualifiers are not added for these outliers since none were below the lower limit of 0.01. No data have been qualified from the response factors and RRFs are not noted since they are essentially the same as the ICAL. This consistency of response for the poor-responding compounds is an indication that there is no significant bias for the laboratory water matrix.

2. The percent difference (%D) limits of ± 25% were met.
Yes _____ No __X__ NA___

See the table below. When there are no detections, unless the %D is biased low and so large as to indicate a significant probability of false negatives, no qualifiers are added for %D outliers when targets are not detected. When targets are detected, the qualifier added is JC#, indicating the possibility of some bias associated with calibration drift, where # is the % D observed.

SDG	CCV Date	Lab Sample #	Analyte	%D outliers	RRF outliers	Qualifiers Added
L0703276	3/22/07 7:41	1-8	Bromomethane	25.8		None, ND
L0703180	3/13/07 11:29	1-5, 8-11	Acetone	169		None, ND

IV. GC/MS INSTRUMENT PERFORMANCE CHECK

The BFB (VOA) performance check was injected once at the beginning of each 12-hour period and relative abundance criteria for the ions were met.
Yes __X___ No ____ NA____

V. INTERNAL STANDARDS

The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows.
Yes __X___ No ____ NA____

VI. SURROGATE

Surrogate spikes were analyzed with every sample.
Yes _X___ No____

And met the recovery limits defined in the current contract, which are the current laboratory limits.
Yes ___X___ No ____

VII. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

A. Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed for every analysis performed and for every 20 samples or for every matrix whichever is more frequent.
Yes ___X__ No _____

There are 5 MS/MSDs which meets the 1:20 ratio.

Matrix Spikes in Project:

Method	SDG	Client Sample ID	Parent Sample ID
8260B\5030B	L0703140	PMW101-07A-EBT	L0703140-9
	L0703180	MW-21-EBT-2	L0703180-05
	L0703246	IW101-06A-EBT-2	L0703246-14
		IW21-02B-EBT-2	L0703246-02
	L0703310	IW92-03-EBT-2	L0703310-06

B. The MS and MSD percent recoveries were within the limits defined in the contract, which are the current laboratory control chart limits.
Yes _____ No __ X ___NA___

The full target list has been spiked. Most MS/MSD recoveries and RPDs are in control. Instances where spike recoveries are out of limits are shown in the table below. In several instances, the sample amount is 4x the spike level or greater. In such cases, the recovery cannot realistically be calculated, because the anticipated normal analytical variability is on the order of the spike level. Thus no qualifiers are added.

The MSD recovery for acetone is 143% in one case and the result is qualified as JS143. The MS is in control. No other qualifiers are required for MS/MSD recoveries.

MS/MSD Outliers

Method	SDG	Client Sample ID	Lab Sample ID	Type	Analyte	Recov	RPD	Qualifiers
8260	L0703180	MW-21-EBT-2-MS	L0703180-06	MS	Tetrachloroethene	15.9		None,sample>4x spike
	L0703180	MW-21-EBT-2-MSD	L0703180-07	MSD	Tetrachloroethene	-24.1		None,sample>4x spike
	L0703246	IW101-06A-EBT-2-MSD	L0703246-16	MSD	Acetone	142.5	30.9	JS143D31 parent
	L0703246	IW21-02B-EBT-2-MS	L0703246-03	MS	Tetrachloroethene	28.4		None,sample>4x spike
	L0703246	IW21-02B-EBT-2-MSD	L0703246-04	MSD	Tetrachloroethene	29.4		None,sample>4x spike
	L0703246	IW101-06A-EBT-2-MS	L0703246-15	MS	MEK (2-Butanone)	19.1		None,sample>4x spike
	L0703310	IW92-03-EBT-2		MSD	Methyl t-butyl ether (MTBE)	124		None, ND
		IW92-03-EBT-2	L0703310-07	MS	Tetrachloroethene	-80.4		None,sample>4x spike
		IW92-03-EBT-2	L0703310-08	MSD	Tetrachloroethene	-73.1		None,sample>4x spike
		IW92-03-EBT-2-MSD	L0703310-08	MSD	Bromodichloromethane	122		

C. The MSD relative percent differences (RPD) were within the defined contract limits.
Yes _____ No __ X __NA____
In the case of the high acetone MSD recovery, the RPD is also out of limits and the parent sample is qualified as JD#, where # is the RPD outlier. This indicates a possibility of lower precision than is desired for this analyte in this matrix. .This may be an example of the kind of behavior discussed in the initial calibration section for analytes that purge with low efficiency.

D. The MS/MSD were client samples.
Yes __X_ No ____NA____

VIII. LABORATORY CONTROL SAMPLE

A. Laboratory Control Samples (LCS) was analyzed for every analysis performed and for every 20 samples.
Yes _X___ No ____

B. The LCS percent recoveries were within the limits defined in the contract (the MS limits are used as a reference or laboratory-specific limits for this matrix are defined).
Yes ______ No __ X ____

The full target list has been spiked. There are a few elevated recoveries observed as shown in the table below. When a high recovery is associated with a non-detect in samples, no qualifier is added since the indicated bias is high. When the target is detected, the result is qualified as JL#, where # is the elevated recovery. For low recoveries, non-detected results are qualified but no such results are present in this data set. In this case, three samples required qualification for detected targets due to an associated high recovery. Note that there are no outliers for the compounds having relatively low response (2-butanone, acetone, 4-methyl-2-pentanone). Although the control windows for these targets are relatively wide compared to most others, the actual recoveries observed at a 20 ug/L spike are generally near 100%. This shows that in the laboratory matrix, accuracy is within a normal window. Where LCSDs are available, RPDs are generally in control. Thus accuracy and precision for the lab matrix is good for these targets.

SDG	Lab Sample #	Batch	Targets Detected	LCS/LCSD/RPD	Qualifiers
L0703310	3-6, 9-14	WG236074	Bromodichloroethane	122	None, ND
			MTBE	125	None, ND
	2TB	WG236070	MTBE	OK/124/OK	None, ND
L0703276		WG236070	MTBE	OK/124/OK	JL124 detections

IX. BLANKS

A. Method Blanks were analyzed at the required frequency and for each matrix and analysis.
Yes _X___ No____

B. No blank contamination was found in the Method Blank.
Yes____ No _X___

Contamination was observed in some method blanks indicated in the table, below the reporting limit. Whenever methylene chloride or acetone is detected in associated samples at a level less than 10x the method blank (corrected for dilution), the result is qualified as UB#, where # is the corrected method blank level. Such results are usable as nondetects. Qualifiers added are summarized in the table below. For other targets, the factor used is 5x.

SDG	Lab Sample #	Batch	Targets Detected	Results	Qualifiers
L0703310	1	WG236177	1,2,3-trichlorobenzene	.276F	None, ND
			1,2,4-trichlorobenzene	.236F	None, ND
			Naphthalene	.261F	None, ND
L0703276	9-12	WG236177	1,2,3-trichlorobenzene	.276F	None, ND
			1,2,4-trichlorobenzene	.236F	None, ND
			Naphthalene	.261F	None, ND
L0703246	1,2,5,6,10	WG235782	1,2,3-trichlorobenzene	.271F	UB.27 detect
			1,2,4-trichlorobenzene	264F	None, ND
	7-9, 1-3, 17,18, 18RE	WG235890	1,2,3-trichlorobenzene	321F	None, ND
			1,2,4-trichlorobenzene	.254F	None, ND
			Naphthalene	.258F	None, ND
L0703230	1,4-12	WG235713	1,2,3-trichlorobenzene	.344F	None, ND

SDG	Lab Sample #	Batch	Targets Detected	Results	Qualifiers
			1,2,4-trichlorobenzene	.294F	None, ND
			Naphthalene	.303F	None, ND
	13-16	WG235715	1,2,3-trichlorobenzene	.268	None, ND
			Methylene chloride	.277F	UB.28 detect
			n-propylbenzene	.276F	None, ND
L0703346	1-8	WG236177	1,2,3-trichlorobenzene	.276F	None, ND
			1,2,4-trichlorobenzene	.236F	None, ND
			Naphthalene	.261F	None, ND
L0703180		WG235206	1,2,3-trichlorobenzene	.471F	None, ND
			1,2,4-trichlorobenzene	.360F	None, ND
			Hexachlorobutadiene	.262F	None, ND
			Naphthalene	.375F	UB.38 detects
		WG235707	1,2,3-trichlorobenzene	.331F	None, ND
			1,2,4-trichlorobenzene	.260F	None, ND
			Naphthalene	.442F	None, ND
		WG235713	1,2,3-trichlorobenzene	.344F	None, ND
			1,2,4-trichlorobenzene	.294F	None, ND
			Naphthalene	.303F	None, ND
L0703140	1,2,9	WG235077	1,2,3-trichlorobenzene	.635*	UB.64 detect
			1,2,4-trichlorobenzene	.400F	None, ND
			Hexachlorobutadiene	.346*	None, ND
			Naphthalene	.484F	None, ND
	3,6	WG235110	1,2,3-trichlorobenzene	.677*	None, ND
			1,2,4-trichlorobenzene	.527*	None, ND
			Hexachlorobutadiene	.400*	None, ND
			Naphthalene	.563*	None, ND
L0703136		WG235077	1,2,3-trichlorobenzene	.635*	None, ND
		1-4	1,2,4-trichlorobenzene	.400F	None, ND
			Hexachlorobutadiene	.346*	None, ND
			Naphthalene	.484F	None, ND

C. If Field Blanks were identified, no blank contamination was found.
Yes____ No __X__

There are 8 trip blanks and two rinse blanks. There are detections observed below the reporting limit as shown in the table. Some of these are qualified UB due to detections in the associated method blank, thus are not used for qualifying associated samples. When analytes are present in both the field blank and the associated samples, the results in the samples are qualified in the same manner as for method blanks. For clarity, the qualifiers used in this case are UTB# for trip blanks and UFB# for rinse blanks.

Trip blanks are free of contamination, but qualification was required for the rinse blanks.

SDG	Sample ID	Lab Sample ID	Analyte	Results	Qualifiers
L0703310	TB-032607-EBT-2	2	All in control		None
L0703276	TB-032707-EBT-2	3	All in control		None
L0703106	TB-032107-EBT-2	6	All in control		None
L0703230	TB-032907-EBT-2	12	All in control		None
L0703346	TB-032307-EBT-2	1	All in control		None
L0703180	TB-033007-EBT-2	12	All in control		None
L0703140	TB-032007-EBT-2	6	All in control		None
			All in control		None

SDG	Sample ID	Lab Sample ID	Analyte	Results	Qualifiers
L0703140	RB1-EBT-2	13	acetone	13.8	UFB14 detects
			benzene	.312F	None, ND
			naphthalene	.308F	None, ND
			o-xylene	.421F	None, ND
			toluene	.761F	None, ND
			MEK (2-Butanone)	4.35F	UFB4.4 detect
L0703310	RB2-EB-2	5	Benzene	.28F	UFB.28 detects
			Naphthalene	.31F	None, ND
			Toluene	.49F	None, ND
			MEK (2-Butanone)	5.6F	UFB5.6 detects
			Acetone	16.2	UFB16 detects

X. FIELD QC

If Field duplicates were identified, they met guidance RPD of < 35% for water or < 50% for soils. For values reported at < 5 x the reporting limit (RL), a difference of 2 x RL is used as guidance. Data are not qualified for field duplicates as these are evaluated for the total project by the client.
Yes ______ No __X__ NA____

There are 9 identified field duplicates. Observations are summarized in the table. Agreement is generally very good between the field duplicate and the parent sample. In the case of DUP5, the parent sample has a reported level of carbon tetrachloride at 8.2, and the duplicate is at 1.2 ug/L. The RL is 1 ug/l and the < 5 x RL criteria would apply. This does not meet the criteria above. There are many detections in this sample and the difference appears to be due to interferences in the matrix.

SDG	Analyte	Client Sample ID	Parent Sample	Observations
L0703107		DUP6-EBT-2	PMW101-01A -EBT-2	ok
L0703140		DUP7-EBT-2	PMW101-07B –EBT-2	ok
L0703180		DUP2-EBT-2	PMW21-01-EBT-2	ok
L0703230		DUP3-EBT-2	IW101-04A -EBT-2	ok
L0703246		DUP1-EBT-2	IW21-04B -EBT-2	ok
L0703246		DUP8-EBT-2	PMW92-04-EBT-2	ok
L0703276		DUP4-EBT-2	IW101-08A -EBT-2	ok
L0703310	carbon tetrachloride	DUP5-EBT-2 (8.2)	IW92-08-EBT-2 (1.2)	Diff 7
L0703310		DUP9-EBT-2	DR2-5-EBT-2	ok

XI. SYSTEM PERFORMANCE

A. The RICs, chromatograms, tunes and general system performance were acceptable for all instruments and analytical systems.
Yes ____ No____ NA__X__

Not part of this review level

B. The suggested EQLs for the sample matrices in this set were met.
Yes __X__ No____ NA____

Dilutions were necessary in some cases to achieve the proper quantification of high-level targets, which raises the EQLs for all other targets in the run. In such cases, the both results are provided in hardcopy except for the analytes that are above the upper range in the initial run. These are only shown for the reanalysis.

In the EDD, only the initial run is provided for most analytes, and only the reanalysis is provided for the analytes which are above the upper linear range in the first run.

XII. TCL COMPOUNDS

A. The identification is accurate and all retention times, library spectra and reconstructed ion chromatograms (RIC) were evaluated for all detected compounds.

Yes ____ No____ NA __X__

Not part of this review level

B. Quantitation was checked to determine the accuracy of calculations for representative compounds in each internal standards quantitation set.

Yes ____ No____ NA__X__

Not part of this review level

XIII. TENTATIVELY IDENTIFIED COMPOUNDS

TICs were properly identified and met the library identification criteria.

Yes____ No____ NA__X___

Not part of this review level

XIV. OVERALL ASSESSMENT OF THE CASE

The laboratory has complied with the requested method. Data are fully usable after consideration of qualifiers.

The following is noted:

Chain of Custody/Deliverables:

The project manager is informed of the following and the chain information is to be updated for the project file.

Most of the SDGs do not have a customary chain of custody. Those have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers.

They have been improved since we first pointed out these issues in that each page does have a printed area for the sampler name, date, time, and signature. However, there is no similar printed area for receipt signatures, dates, and times to be entered, and in this case only the first page has been so signed by the laboratory.

A few sample names are being truncated on the Chain of Custody because the field width is not sufficient to allow the full name to appear. This seems to be a less severe problem than in the past, but it still does occur.

Our understanding is that the chain of custody is a printout of an electronic sample documentation system. We reiterate our recommendation that the printout be improved to add a printed area for the laboratory to receive the samples, and to include page numbers. Preferably, the laboratory signature should appear on each page of the Chain of Custody, but at the very least should appear each time a new COC# is applied. Alternatively, some type of electronic signature system could be used using a system compliant with EPA's proposed cross-media electronic reporting rule. The present system does not appear fulfill the authentication criteria for sample tracking.

Sample Condition:

Most of the SDGs had at least one cooler that was under 2°C but the Sample Checklist states that the samples weren't frozen. No qualifiers are required under these circumstances.

In addition, new EPA regulations (See Federal Register, March 12, 2007, 40CFR Part 122) require only that the temperature of samples delivered to the laboratory be less than 6° C. Thus the sample receipt conditions are fully compliant with applicable regulations.

L0703140 narrative states: "One of the 8260 vials of ID PMW101-08A-EBT leaked during transit. This vial will not be used for analysis. No qualifiers are required for this since there are enough duplicate vials for analysis to proceed normally.

Initial Calibrations:

Per the project manager, the 2001 EPA CLP validation guidance has been applied to the common "poor responders". Acetone, 2-butanone, and 4-methyl-2-pentanone are the compounds for which any calibration response factors below 0.05 have been observed. The validation guidance used for this project allows for a response of 0.01 for these compounds if spectral integrity can be verified at low concentrations. These spectra are not commonly provided and are not part of the deliverable for these data sets. The laboratory has been tasked with providing to the client verification that the 0.01 RF is valid. Given the spectral verification is available, the data are not qualified for response >0.01 < 0.05. No data have been qualified.

The low-responding compounds are highly water-soluble and capable of hydrogen bonding with water. This decreases their purge efficiency and results in the relatively low response. The implication of this low purge efficiency is that a relatively low absolute recovery of such compounds is achieved in the purge step of the analysis. If this recovery is consistent, reasonable accuracy and precision can be achieved in a given matrix, which is indicated for the lab matrix by acceptable recoveries in LCS and calibration checks. However, this causes these targets to be more sensitive to matrix variations that impact purge efficiency (such as ionic strength or the presence of varying levels of soluble non-target organic material) than are the more hydrophobic compounds typically analyzed by this method, and as a result they are more likely to exhibit matrix bias. The likelihood of matrix bias for these compounds in this site matrix is assessed in the MS/MSD section of this report.

There are several targets that are shown in the ICAL forms with %RSD greater than 30%, the validation limit. These instances where this occurred and the laboratory did not use an acceptable regression curve in place of the response factor average are shown in the table within the report body. Because none of these outliers are associated with detected targets, and because the %RSD is not so severely out of limits to indicate a significant probability of a false negative, no qualifiers are applied.

Continuing Calibrations:

The CCVs were analyzed at the proper frequency. The same compounds showed low responses in the continuing calibration as were observed in the initial calibrations. Qualifiers are not added for these outliers since none were below the lower limit of 0.01. No data have been qualified from the response factors and RRFs are not noted since they are essentially the same as the ICAL. This consistency of response for the poor-responding compounds is an indication that there is no significant bias for the laboratory water matrix.

See the table within the report for %D outliers. When there are no detections, unless the %D is biased low and so large as to indicate a significant probability of false negatives, no qualifiers are added for %D outliers when targets are not detected. When targets are detected, the qualifier added is JC#, indicating the possibility of some bias associated with calibration drift, where # is the % D observed.

LCS Recoveries:

The full target list has been spiked. There are a few elevated recoveries observed as shown in the table within the report. When a high recovery is associated with a non-detect in samples, no qualifier is added since the indicated bias is high. When the target is detected, the result is qualified as JL#, where # is the elevated recovery. For low recoveries, non-detected results are qualified but no such results are present in this data set. In this case, three samples required qualification for detected targets due to an associated high recovery.

Note that there are no outliers for the compounds having relatively low response (2-butanone, acetone, 4-methyl-2-pentanone). Although the control windows for these targets are relatively wide compared to most others, the actual recoveries observed at a 20 ug/L spike are generally near 100%. This shows that in the laboratory matrix, accuracy is within a normal window. Where LCSDs are available, RPDs are generally in control. Thus accuracy and precision for the lab matrix is good for these targets.

Matrix Spikes:
There are 5 MS/MSDs which meets the 1:20 ratio.

The full target list has been spiked. Most MS/MSD recoveries and RPDs are in control. Instances where spike recoveries are out of limits are shown in the table below. In several instances, the sample amount is 4x the spike level or greater. In such cases, the recovery cannot realistically be calculated, because the anticipated normal analytical variability is on the order of the spike level. Thus no qualifiers are added.

The MSD recovery for acetone is 143% in one case and the result is qualified as JS143. The MS is in control. No other qualifiers are required for MS/MSD recoveries.

In the case of the high acetone MSD recovery, the RPD is also out of limits and the parent sample is qualified as JD#, where # is the RPD outlier. This indicates a possibility of lower precision than is desired for this analyte in this matrix. This may be an example of the kind of behavior discussed in the initial calibration section for analytes that purge with low efficiency.

Method Blanks:
Contamination was observed in some method blanks indicated in the table within the report, below the reporting limit. Whenever methylene chloride or acetone is detected in associated samples at a level less than 10x the method blank (corrected for dilution), the result is qualified as UB#, where # is the corrected method blank level. Such results are usable as nondetects. Qualifiers added are summarized in the table below. For other targets, the factor used is 5x.

Field Blanks:
There are 8 trip blanks and two rinse blanks. There are detections observed below the reporting limit as shown in the table in the report. Some of these are qualified UB due to detections in the associated method blank, thus are not used for qualifying associated samples. When analytes are present in both the field blank and the associated samples, the results in the samples are qualified in the same manner as for method blanks. For clarity, the qualifiers used in this case are UTB# for trip blanks and URB# for rinse blanks.

Trip blanks are free of contamination, but qualification was required for the rinse blanks.

EQLs:
Dilutions were necessary in some cases to achieve the proper quantification of high-level targets, which raises the EQLs for all other targets in the run. In such cases, the both results are provided in hardcopy except for the analytes that are above the upper range in the initial run. These are only shown for the reanalysis.

In the EDD, only the initial run is provided for most analytes, and only the reanalysis is provided for the analytes which are above the upper linear range in the first run.

Field QC:

There are 9 identified field duplicates. Observations are summarized in the table within the report. Agreement is generally very good between the field duplicate and the parent sample. In the case of DUP5, the parent sample has a reported level of carbon tetrachloride at 8.2, and the duplicate is at 1.2 ug/L. This does not meet the criteria above. There are many detections in this sample.

ORGANIC DATA QUALITY REVIEW REPORT

GC REPORT FOR Metabolic Acids by HPLC; Ethane, Methane, Ethene, Carbon dioxide by EPA SOP RSK-175; and Hydrogen by AM20GAX (GC/RGD).

RSK-175:
SDG: L070: 3346, 3140, 3136, 3106, 3107, 3180, 3310, 3246, 3230, 3276

Metabolic acids:
SDG: L070: 3346, 3140, 3136, 3106, 3107, 3180, 3310, 3246, 3230, 3276

AM20GAX (Hydrogen):
SDG: P0703153, P0703152, P0703151, P0703156, P0703150, P0703250

PROJECT: Memphis Defense Depot, EBT-2 for e2m, Texas

LABORATORY: Kemron Environmental Services, Marietta, OH; Hydrogen subcontracted to Microseeps, Inc, Pittsburg, PA

SAMPLE MATRIX: Water and Vapor

SAMPLING DATE (Month/Year): March, 2007

NO. OF SAMPLES: Metabolic acids – 99 waters including 2 rinse blanks; RSK-175 – 99 waters including 2 rinse blanks, AM20GAX – 90 vapor samples

ANALYSES REQUESTED: Metabolic Acids by HPLC; EPA SOP RSK-175, Microseeps AM20GAX

SAMPLE NO.: Attached

DATA REVIEWER: Sammy Huntington and John Huntington (Gateway Enterprises)

QA REVIEWER: Diane Short & Associates, Inc., INITIALS/DATE:___

Telephone Logs included Yes____ No X

Contractual Violations Yes____ No X

The project QAPP, EPA Contract Laboratory Program National Functional Guidelines for Organic Review, 2002 (SOP), the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, (SW-846), current updates, and the project-specific methods have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. The review has been tasked as Level III for review of all calibrations, holding times, and QC for all samples.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW), SW-846, or in the project contract.
Yes ____ No __X__

This is a Level III Report. No raw data are provided, nor required for review.

Initial calibration reports for metabolic acids and RSK-175 are not accurate and complete. See the discussion in the calibration section. The initial calibration reports are misleading and contain errors, and the laboratory should endeavor to produce summary initial calibration reports that are accurate.

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.
Yes __X__ No_____

III. HOLDING TIMES

A. The contract holding times were met for all analyses (Time of sample receipt to time of extraction and from extraction to analysis.)
Yes _____ No __X__

See Section B. below. Note that in a few cases, the laboratory has indicated exceeding the holding time by 1-2 hours. Per EPA guidance, for validation purposes we calculate the holding time to the nearest day in cases where the regulation or method specifies holding time units of days. Thus such cases are not qualified or noted below.

B. The Clean Water Act (40 CFR 136) or method holding times were met for all analyses (Time of sample collection to time of extraction and from extraction to analysis.)
Yes _____ No __X__

Metabolic Acids: The reviewer has not been able to find documented holding times for the metabolic acids. The normal holding time for an analogous HPLC method 8310 is 14 days for preserved water samples. Metabolic acid holding times were all within 14 days except as noted above. It has been verified on other projects that no holding time is established for these compounds. There is no indication of sample pH in the data packages, but the sample receipt forms indicate that the pH range is acceptable except in isolated instances, where it is noted that the laboratory adjusted the pH (see next section). This suggests that the samples were preserved with acid, a good practice for these analytes.

RSK-175: For RSK-175, pH should not be adjusted when CO_2 is determined, which is the case in this project. It is not clear in the documentation whether samples for RSK-175 were pH-adjusted or not. In the absence of definitive information we have assumed that no acidification occurred. If in fact samples were acidified for RSK-175, it would mean that inorganic carbon in the form of bicarbonate and carbonate would be converted to carbon dioxide, would consequently bias the results high for that analyte. The project manager should clarify this preservation question and regard the data for carbon dioxide accordingly. When pH is adjusted, the holding time is 14 days per the method, and we have used this as the acceptable holding time.

Some runs were conducted after the 14-day holding time for both RSK-175 and metabolic acids, as shown in the table below. In the case of RSK-175, this only occurred for carbon dioxide runs. In the case of metabolic acids, the analtyes impacted are shown in the table. Qualifiers are added as JH#, where

is the difference between the observed holding time and the method holding time. It is not likely in any of these cases that a significant bias will result from these deviations.

Method	SDG	Sample ID	Lab Sample ID	Batch	HT	Targets	Qualifier
MBA	L0703230	DUP3-EBT-2	L0703230-01	WG235508	19	Propionic Acid	JH5
		DR2-1-EBT-2	L0703230-16	WG236492	20	Acetic Acid	JH6
		DR2-1-EBT-2	L0703230-16	WG236492	20	Butyric Acid	JH6
		DR2-1-EBT-2	L0703230-16	WG236492	20	Lactic Acid	JH6
	L0703230	DR2-1-EBT-2	L0703230-16	WG236492	20	Propionic Acid	JH6
		DR2-1-EBT-2	L0703230-16	WG236492	20	Pyruvic Acid	JH6
	L0703246	PMW92-04-EBT-2	L0703246-08	WG236033	17	Acetic Acid	JH3
		IW101-05C-EBT-2	L0703246-13	WG236033	17	Acetic Acid	JH3
		IW101-05C-EBT-2	L0703246-13	WG236033	17	Propionic Acid	JH3
		IW101-06A-EBT-2	L0703246-14	WG236353	17	Acetic Acid	JH3
		IW101-06A-EBT-2	L0703246-14	WG236353	17	Propionic Acid	JH3
		IW101-06A-EBT-2	L0703246-14	WG236353	18	Butyric Acid	JH4
		IW101-06A-EBT-2	L0703246-14	WG236353	18	Lactic Acid	JH4
		IW101-06A-EBT-2	L0703246-14	WG236353	18	Pyruvic Acid	JH4
RSK175	L0703310	DR2-5-EBT-2	L0703310-14	WG236389	15	Carbon Dioxide	JH1
		IW92-03-EBT-2	L0703310-06	WG236389	15	Carbon Dioxide	JH1
		IW92-04-EBT-2	L0703310-09	WG236389	15	Carbon Dioxide	JH1
		PMW85-01-EBT-2	L0703310-11	WG236389	15	Carbon Dioxide	JH1
		PMW85-04-EBT-2	L0703310-12	WG236389	15	Carbon Dioxide	JH1
		PMW85-05-EBT-2	L0703310-13	WG236389	15	Carbon Dioxide	JH1

AM20GAX - Hydrogen: This method is a procedure developed by Microseeps, Inc. Recommended holding times in the procedure are 14 days. A few samples were analyzed outside of that holding time as shown in the table below. Sample results with holding times outside of the method recommendation are qualified as JH#, where # is the number of days by which the holding time was exceeded. A list of samples that are out of holding, along with the qualifiers added, is provided in the table below.

Microseeps indicates that samples are very stable in the vials used for this procedure, but we cannot provide a technical assessment of the stability for hydrogen itself beyond the 14 days specified in the Microseeps procedure.

We would assume that some losses of hydrogen could occur, with a resulting possibility of low bias.

SDG	SAMPLE NO	LAB ID	BATCH NO	HT	Qualifier
P0703152	IW101-01C	P0703152-07A	M070320017	**14.9**	JH1
P0703250	IW21-01B	P0703250-07A	M070327029	**18.1**	JH4
P0703250	IW21-02B	P0703250-08A	M070327029	**17.9**	JH4
P0703250	IW21-05A	P0703250-13A	M070327034	**15.0**	JH1
P0703250	IW101-06C	P0703250-32A	M070327034	**15.2**	JH1
P0703250	IW101-08C	P0703250-36A	M070327034	**15.0**	JH1

C. All chains of custody are complete with signatures and dates.
Yes ____ No __X__

The project manager is informed of the following and the chain information is to be updated for the project file.

Most of the SDGs do not have a customary chain of custody. Those have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers.
They have been improved since we first pointed out these issues in that each page does have a printed area for the sampler name, date, time, and signature. However, there is no similar printed area for receipt signatures, dates, and times to be entered, and in this case only the first page has been so signed by the laboratory.

A few sample names are being truncated on the Chain of Custody because the field width is not sufficient to allow the full name to appear. This seems to be a less severe problem than in the past, but it still does occur.

Our understanding is that the chain of custody is a printout of an electronic sample documentation system. We reiterate our recommendation that the printout be improved to add a printed area for the laboratory to receive the samples, and to include page numbers. Preferably, the laboratory signature should appear on each page of the Chain of Custody, but at the very least should appear each time a new COC# is applied. Alternatively, some type of electronic signature system could be used using a system compliant with EPA's proposed cross-media electronic reporting rule. The present system does not appear fulfill the authentication criteria for sample tracking.

For hydrogen analysis, conventional chain of custody documents were used. All were properly signed and dated except for the document associated with SDG P0703250, which had no relinquished signature, date, or time.
In addition, shipping documents or tracking numbers covering the period of shipment were not provided. We could also locate no record of sample temperature on receipt.

D. Samples were received at the proper temperature and preservation.
Yes __X_ No_____

Most of the SDGs had at least one cooler that was under 2°C but the Sample Checklist states that the samples weren't frozen. No qualifiers are required under these circumstances.

In addition, new EPA regulations (See Federal Register, March 12, 2007, 40CFR Part 122) require only that the temperature of samples delivered to the laboratory be less than 6° C. Thus the sample receipt conditions are fully compliant with applicable regulations.

L0703346 narrative states: "Several of the samples required pH adjustments in the lab." This includes IW92-05-EBT-2 (received at pH 3.5) and IW92-06-EBT-2 (received at pH 4.5), which were pH- adjusted using phosphoric acid for Method 830 to a pH < 2 after receipt in the laboratory. These samples were received one day after sampling and were already mildly acidic, so this requirement is not likely to indicate any significant degradation and no qualifiers are added.

AM20GAX (Hydrogen): We were not able to locate any receipt temperature or any other documentatioin of sample condition for any of the hydrogen SDGs.

IV. INSTRUMENT CALIBRATION (IC) AND CONTINUING CALIBRATION (CC) VERIFICATION

A. The GC/HPLC standards were analyzed at the required frequency (every 72 hours at a minimum).
Yes ___X___ No_____

B. The chromatographic resolution and separation criteria were met.
Yes __X__ No_____

C. The suggested columns were used and the EQLs were met.
Yes __X___ No_____

D. Calibration factors for IC met the 20% RSD limit or the regression curves were prepared with a correlation coefficient 'r' greater than 0.99, per SW-846, Method 8000B.
Yes _____ No __X___

MBA: The initial calibration report associated with the metabolic acids appears to be inaccurate. The calibration report provides only a %RSD for each analyte, with a note at the bottom that the linear calibration model is used. However, the observed r or r^2 values are not reported, although the criteria used are shown.

The %RSDs shown are within acceptance windows except for propionic acid, as shown in the table below, which is reported as having a %RSD of 89.8. Although this report is a level III report, we did have access to pdf files showing the raw data, including the calibration data. When we calculated the calibration results as required using that data, we obtained the same average response factor as that in the table, but we calculated a %RSD of 43.8, not 89.8. We determined that the linear regression fit for the data produces an r2 value of 0.999, in control by any criteria. We also made several checks of the calculation of samples using both the linear regression model and the average response factor and it appears that the laboratory is using the linear regression model. For this reason, since the regression curve meets criteria, no qualifiers have been added. The reviewer and validation project manager determined that it would be more timely and productive to recalculate the calibration results than have the laboratory do it and send it out.

RSK-175: Carbon dioxide is in control in this initial calibration, unlike the previous report. However, the same problem appears to exist in the initial calibration report for RSK-175 as observed in the MBA analysis. In this case, methane is reported with a %RSD of 70 in the initial calibration. In this case, however, the raw data includes a linear plot for methane showing an acceptable r^2 value. However, the curve is forced through the origin, which is specifically disallowed by SW-846. Since this is not an SW-846 method, we have evaluated this situation using professional judgment. The use of the forced intercept in this case results in a considerably better recalculation of the individual low-level data points, and we believe that this is an acceptable approach. Therefore no qualifiers are added.

AM20GAX (Hydrogen): All initial calibrations are conducted using a linear regression curve and all are in control.

Method	SDG	ICAL Date	Lab Sample #	Analyte	%RSD	Qualifiers
MBA	L0703246	2/5/07 20:39	All	Propionic Acid	89.8	None, r^2 OK

Method	SDG	ICAL Date	Lab Sample #	Analyte	%RSD	Qualifiers
	L0703230	2/5/07 20:39	All	Propionic Acid	89.8	None, r^2 OK
	L0703107	2/5/07 20:39	All	Propionic Acid	89.8	None, r^2 OK
	L0703180	2/5/07 20:39	All	Propionic Acid	89.8	None, r^2 OK
	L0703310	2/5/07 20:39	All	Propionic Acid	89.8	None, r^2 OK
	L0703106	2/5/07 20:39	All	Propionic Acid	89.8	None, r^2 OK
	L0703276	2/5/07 20:39	All	Propionic Acid	89.8	None, r^2 OK
	L0703136	2/5/07 20:39	All	Propionic Acid	89.8	None, r^2 OK
	L0703140	2/5/07 20:39	All	Propionic Acid	89.8	None, r^2 OK
	L0703346	2/5/07 20:39	All	Propionic Acid	89.8	None, r^2 OK
RSK-175	L0703246	1/8/07 16:52	All	Methane	70	None, r^2 OK
	L0703230	1/8/07 16:52	All	Methane	70	None, r^2 OK
	L0703107	1/8/07 16:52	All	Methane	70	None, r^2 OK
	L0703180	1/8/07 16.52	All	Methane	70	None, r^2 OK
	L0703310	1/8/07 16.52	All	Methane	70	None, r^2 OK
	L0703106	1/8/07 16:52	All	Methane	70	None, r^2 OK
	L0703276	1/8/07 16:52	All	Methane	70	None, r^2 OK
	L0703136	1/8/07 16:52	All	Methane	70	None, r^2 OK
	L0703140	1/8/07 16:52	All	Methane	70	None, r^2 OK
	L0703346	1/8/07 16:52	All	Methane	70	None, r^2 OK

E. Percent Difference (%D's) for Continuing Calibration Factors and retention times (RT) were within the 25% Limits.
Yes ____ No __X___

MBA: All calibrations are in control. The laboratory is employing the external standard method and is using opening and closing calibrations appropriately.

RSK-175: The laboratory conducts opening and closing calibrations (bracketing the samples during the analytical run). For RSK-175 there is not a specific requirement in the procedure for closing calibrations, and only calibration verification each 12 hours is specified. SW-846 guidance (method 8000B), however specifically requires such closing calibrations for external standard methods. For detected analytes, SW-846 specifies that the closing calibration must meet the same criteria as the opening calibration. This has been achieved for all analytes but for carbon dioxide, for which a number of opening and closing calibrations do not meet the 30% D criterion specified for RSK-175.

In such cases, detected levels of carbon dioxide are qualified as JC#, where # is the applicable opening or closing CCV outlier. Such results may be biased due to calibration drift. Please see the qualified reports or the EDD for details.

It should be noted in this regard that the laboratory appears to use a different criterion for carbon dioxide, since a few CCV results were flagged as being outside of limits, but it is not clear to this reviewer where the laboratory limit is set. This method has not been published as a promulgated method by EPA (it rather exists as an open literature publication and an internal EPA SOP), and it may not have been fully developed for carbon dioxide. Thus the laboratory limits may be realistic for this analyte. Nonetheless, the results appear to indicate a probable bias which should be considered in using the data.

AM20GAX: All calibrations are in control. The laboratory is employing the external standard method. There are no closing CCVs reported in the data package.

V. BLANKS

A. Laboratory blanks

1. Laboratory blanks were analyzed for every sample set and for each matrix type or once in every ten samples, whichever is more frequent.
Yes __X__ No_____

2. No blank contamination was found in the method blank.
Yes _____ No __X__

There are a number of method blanks for RSK-175 which have low-level detections (*) of methane and carbon dioxide, as shown in the table below. When the associated sample result is less than 5x the method blank level (corrected for sample dilution), the sample result is qualified as UB#, where # is the corrected method blank result. Such results are usable as non-detected values.

Method blanks for hydrogen analysis and for metabolic acids are in control.

Method	SDG	Lab Sample #	Batch	Targets Detected	Target	Qualifiers
RSK-175	L0703346	2-8 RE	WG236389	Carbon Dioxide	476*	None, Result > 5x MB
	L0703310	1,3-5, 11-14	WG236389	Carbon Dioxide	476*	None, Result > 5x MB
	L0703136	1-4	WG235013	Methane	.273*	UB.273 detects < 5x
	L0703106	1-5	WG235013	Methane	.273*	UB.273 detects < 5x
	L0703107	1-5	WG235013	Methane	.273*	UB.273 detects < 5x
	L0703180	1-5, 8-11, 13-18	WG235814	Carbon Dioxide	175*	None, Result > 5x MB
MBAs				All in control		None
AM20GAX				All in control		None

3. Instrument blank analysis was performed following all samples that contained analytes at high concentrations.
Yes _____ No____ NA__X__

B. Field Blanks
If field blanks were identified, no blank contamination was found.
Yes _____ No__X ___ NA_____

Rinse blanks for RSK-175 show some detected levels for methane. Detections of methane in the associated samples are qualified as UFB#, where # is the methane level in the rinse blank corrected for sample dilution. This qualifier is applied only if the result is less than 5x the rinse blank level. Such results are usable as non-detects. The table below shows the rinse blank results and associated qualifiers for all methods.

AM20GAX (Hydrogen): No rinse blanks are present. For hydrogen such blanks are probably unnecessary.

Method	SDG	Sample ID	Lab Sample ID	Analyte	Results	Qualifiers
RSK-175	L0703310	RB2-EBT-2	5	Methane	.56	UFB# detects < 5x RB
	L0703140	RB1-EBT-2	13	Methane	.44F	UFB# detects < 5x RB
MBA	L0703310	RB2-EBT2	5	All in control		None
	L0703140	RB1-EBT2	13	All in control		None

VI. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

A. Matrix spike (MS) and matrix duplicate or matrix spike duplicate (MSD) were analyzed for every analyses performed for every 20 samples or for every matrix whichever is more frequent.
Yes __X___ No ____

RSK-175: There were five (5) MS/MSDs which meet the 20 to 1 ratio.
Metabolic Acids: There were five (5) MS/MSDs which meet the 20 to 1 ratio.
AM20GAX: There are no MS/MSDs for this method. They are not required or possible for hydrogen analysis.

The MS/MSDs conducted are summarized in the table below.

Method	SDG	Client Sample ID	Lab Sample ID
MBA	L0703140	PMW101-07A-EBT-MS	L0703140-09
	L0703180	MW-21-EBT-2-MS	L0703180-05
	L0703246	IW101-06A-EBT-2-MS	L0703246-14
		IW21-02B-EBT-2-MS	L0703246-02
	L0703310	IW92-03-EBT-2	L0703310-06
RSK175\5021	L0703140	PMW101-07A-EBT-MS	L0703140-09
	L0703180	MW-21-EBT-2-MS	L0703180-05
	L0703246	IW101-06A-EBT-2-MS	L0703246-14
		IW21-02B-EBT-2-MS	L0703246-02
	L0703310	IW92-03-EBT-2-MS	L0703310-06

B. The MS and MSD percent recoveries (%R) were within the limits defined by the laboratory or in the contract.
Yes _____ No __X__

RSK-175: Carbon dioxide gave MS/MSD outliers as shown in the table below. In each case, the sample level is greater than 4x the spike amount, which means that the anticipated normal analytical variability is greater than the spike amount. In such cases, no recovery can meaningfully be calculated, and no qualifiers are added. There is no indication of bias.

Metabolic acids: Metabolic acid MS/MSDs had several outliers. A matrix bias roughly proportional to the recovery appears to be present in these instances. Such results are qualified as JS#, where # is the recovery which is out of limits. In the case of sample IW21-02B-EBT-2 there are three analytes that were not recovered in the matrix spike, although they were recovered in the MSD. These results are qualified as RS0 (rejected) to indicate that the sample non-detect is rejected because of the failure to recover the analyte in the matrix spike. As one of the spike results is zero, the RPD is not calculated (NC). The laboratory has not offered any explanation of the results that would allow the data to be used.

MS/MSD Outliers

Method	SDG	Client Sample ID	Lab Sample ID	Analyte	MS/MSD/RPD	Qualifiers
MBA	L0703140	PMW101-07A-EBT	L0703140-09	Acetic Acid	63.2/58.3/OK	JS58 parent
	L0703180	MW-21-EBT-2	L0703180-05		All in control	None
	L0703246	IW101-06A-EBT-2	L0703246-14, 14RE	Acetic Acid	58.1/63/OK	JS58 parent
				Propionic Acid	55.6/52.3/OK	JS52 parent
		IW21-02B-EBT-2	L0703246-02, 2RE	Pyruvic Acid	0/66/200 (NC)	RS0 parent
				Acetic Acid	0/194/200 (NC)	RS0 parent

Method	SDG	Client Sample ID	Lab Sample ID	Analyte	MS/MSD/RPD	Qualifiers
				Butyric Acid	0/OK/NC	RS0 parent
	L0703310	IW92-03-EBT-2	L0703310-06	Pyruvic Acid	61/59.9/OK	JS60 parent
				Lactic Acid	11/54.1/OK	JS11 parent
				Propionic Acid	30.9/66.6/OK	JS31 parent
RSK175	L0703246	IW101-06A-EBT-2	L0703246-14	Carbon Dioxide	OK/-15.6/OK	None, sample > 4x spike
		IW21-02B-EBT-2	L0703246-02	All in control		None
	L0703310	IW92-03-EBT-2	L0703310-06	Carbon Dioxide	3.97/220/OK	None, sample > 4x spike
	L0703140	PMW101-07A-EBT	L0703140-09 and 09RE	Carbon Dioxide	OK/-785/181	None, sample > 4x spike
	L0703180	MW-21-EBT-2	L0703180-05	All in control		None

C. The MSD relative percent differences (RPD) were within the defined contract or laboratory limits.
Yes _____ No __X ___

See the section above. The parent sample is qualified as JD#, where # is the RPD outlier, when both RPD and spike recoveries are out of limits. Otherwise samples are not qualified for RPD outliers. Please note that in the case of IW21-02B-EBT-2 for metabolic acid analysis, there are three analytes which have been rejected due to no recovery in the matrix spike. However, in the MSD the recovery for these analytes are either normal or elevated, and these have been qualified with the "D" qualifier to indicate a significant difference between the MS and the MSD result.

D. The MS/MSD were client samples.
Yes __X__ No _____

VII. LABORATORY CONTROL SAMPLE AND DUPLICATE (LCS/LCSD)

A. Laboratory Control Sample (LCS) and LCS duplicate were analyzed for every analyses performed and for every 20 samples or for every matrix whichever is more frequent.
Yes __X___ No_____

B. The LCS percent recovery (%R) are within the limits defined by the laboratory or in the contract.
Yes ____ No __X__

MBA: All LCS recoveries are in control.
RSK-175: All LCS recoveries are in control except for one carbon dioxide LCS with a high recovery as shown in the table below. The LCSD was in control, and the %RSD was 101. The Associated sample detections are qualified as JL166D101 to indicate that there is a possible laboratory accuracy and precision issue for these samples.
AM20GAX (Hydrogen): All LCS recoveries are in control.

Method	SDG	Lab Sample #	Batch	Targets Detected	Target	Qualifiers
RSK-175	L0703246	12-14,17,18 (all REs)	WG236173	Carbon Dioxide	166/OK/101	JL166D101

VIII. SURROGATE RECOVERY

A. The Surrogate spike was analyzed with every sample.
Yes _____ No ____ NA_X___

RSK-175 and AM20GAX: Surrogates are not required for this analysis.

Metabolic Acids: The Laboratory 'Data Checklist' notes surrogates as being applicable, but none are reported in the data packages. This item cannot be verified. For an analogous HPLC Method 8310, surrogates are required

.

AM20GAX (Hydrogen): Surrogates are not applicable to this method.

B. And met the recovery limits defined in the current contract. If recovery limits were exceeded, the sample was re-extracted and re-analyzed.
Yes _____ No_____ NA __X___

IX. INTERNAL STANDARDS

The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows. Note: Internal standards are not required for GC analysis, but if they are used, SW-846 stipulates that they meet the same recovery requirements as those specified for GCMS methods.
Yes ____ No _____ NA__X__

RSK-175, Metabolic Acids, AM20GAX: The laboratory uses the external standard procedure, so no internal standards are present or required.

X. FIELD QC

If Field duplicates were identified, they met guidance RPD of < 35% for water or < 50% for soils and gases. For values reported at < 5 x the reporting limit (RL), a difference of 2 x RL is used as guidance (4 x RL for soils). Data are not qualified for field duplicates as these are evaluated for the total project by the client.
Yes _____ No __X__ NA_____

There are 9 field duplicates for RSK-175, metabolic acids, and hydrogen analysis.
Results are in control per the above criteria except for one lactic acid result in DUP-8 where
Results are in control per the above criteria except for one lactic acid result in DUP-8, one lactic acid result in DUP 4, and one hydrogen result for DUP-1.

Method	SDG	Client Sample ID	Parent Sample	Observations
830-MBA	L0703107	DUP6-EBT-2	PMW101-01A -EBT-2	OK
	L0703140	DUP7-EBT-2	PMW101-07B -EBT-2	OK
	L0703180	DUP2-EBT-2	PMW21-01-EBT-2	OK
	L0703230	DUP3-EBT-2	IW101-04A -EBT-2	OK
	L0703246	DUP1-EBT-2	IW21-04B -EBT-2	OK
	L0703246	DUP8-EBT-2	PMW92-04-EBT-2	Sample 5.4, Dup = ND; Not calculated as ND = 0
	L0703276	DUP4-EBT-2	IW101-08A -EBT-2	Sample 9 4, Dup 4.5, RL = 1 (RPD 70, difference 4.9)
	L0703310	DUP5-EBT-2	IW92-08-EBT-2	OK
	L0703310	DUP9-EBT-2	DR2-5-EBT-2	OK

Method	SDG	Client Sample ID	Parent Sample	Observations
RSK175	L0703107	DUP6-EBT-2	PMW101-01A -EBT-2	OK
	L0703140	DUP7-EBT-2	PMW101-07B -EBT-2	OK
	L0703180	DUP2-EBT-2	PMW21-01-EBT-2	OK
RSK175	L0703230	DUP3-EBT-2	IW101-04A -EBT-2	OK
	L0703246	DUP1-EBT-2	IW21-04B -EBT-2	OK
	L0703246	DUP8-EBT-2	PMW92-04-EBT-2	OK
	L0703276	DUP4-EBT-2	IW101-08A -EBT-2	OK
	L0703310	DUP5-EBT-2	IW92-08-EBT-2	OK
	L0703310	DUP9-EBT-2	DR2-5-EBT-2	OK
AM20GAX	P0703150	DUP-7	PMW101-07B -EBT-2	OK
	P0703151	DUP-6	PMW101-01A -EBT-2	OK
	P0703153	DUP-3	IW101-04A -EBT-2	OK
	P0703156	DUP-2	PMW21-01-EBT-2	OK
	P0703250	DUP-5	IW92-08-EBT-2	OK
	P0703250	DUP-1	IW21-04B -EBT-2	Sample 5.1, DUP 2.3
	P0703250	DUP-8	PMW92-04-EBT-2	OK
	P0703250	DUP-9	DR2-5-EBT-2	OK
	P0703250	DUP-4	IW101-08A -EBT-2	OK

XI. COMPOUND IDENTIFICATION

A. All raw data chromatograms and data system printouts were evaluated for all detected compounds and the identification is accurate.

Yes ____ No _____ NA __X___

This evaluation is not performed at this level of review.

B. Retention time limits or peak pattern identifications are met.

Yes _____ No _____ NA__X___

This evaluation is not performed at this level of review.

C. If two column or two detector confirmation was performed, the value of the confirmation was within 25%D of the quantitation value for results > 5 x RL. If the laboratory has flagged data 'COL' for %D > 40%, a JP qualifier has been added for low level results. For values below (5 x RL), the difference is not considered to impact the precision of the data.

Yes ____ No ____ NA __X__

Not part of this level of review. Dual columns are not required for these methods.

XII. COMPOUND QUANTITATION AND REPORTED CRQLS

A. Raw data examination verified that all sample results were correctly calculated.

Yes _____ No_____ NA__X___

This evaluation is not performed at this level of review. However, see the initial calibration section. Calculations had to be reproduced in several instances in order to confirm calibration acceptability, due to a deficiency in the initial calibration forms.

B. The chromatograms and general system performance were acceptable for all instruments and analytical systems.
Yes _____ No _____ NA__X___

This evaluation is not performed at this level of review.

XIII. OVERALL ASSESSMENT OF THE CASE

The method criteria have been met and the quality of the data, after consideration of qualifiers, is considered acceptable and usable as far as can be determined at this level of review.
The following is noted:

Deliverables:

This is a Level III Report
Initial calibration reports for metabolic acids and RSK-175 are not accurate and complete. See the discussion in the calibration section. The initial calibration reports are misleading and contain errors, and the laboratory should endeavor to produce summary initial calibration reports that are accurate.

Chain of Custody and Login Checklists:

The project manager is informed of the following and the chain information is to be updated for the project file.

Most of the SDGs do not have a customary chain of custody. Those have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers.
They have been improved since we first pointed out these issues in that each page does have a printed area for the sampler name, date, time, and signature. However, there is no similar printed area for receipt signatures, dates, and times to be entered, and in this case only the first page has been so signed by the laboratory.

A few sample names are being truncated on the Chain of Custody because the field width is not sufficient to allow the full name to appear. This seems to be a less severe problem than in the past, but it still does occur.

Our understanding is that the chain of custody is a printout of an electronic sample documentation system. We reiterate our recommendation that the printout be improved to add a printed area for the laboratory to receive the samples, and to include page numbers. Preferably, the laboratory signature should appear on each page of the Chain of Custody, but at the very least should appear each time a new COC# is applied. Alternatively, some type of electronic signature system could be used using a system compliant with EPA's proposed cross-media electronic reporting rule. The present system does not appear fulfill the authentication criteria for sample tracking.

For hydrogen analysis, conventional chain of custody documents were used. All were properly signed and dated except for the document associated with SDG P0703250, which had no relinquished signature, date, or time.
In addition, for the hydrogen analyses, shipping documents or tracking numbers covering the period of shipment were not provided. We could also locate no record of sample temperature on receipt.

Sample Condition:

Most of the SDGs had at least one cooler that was under 2°C but the Sample Checklist states that the samples weren't frozen. No qualifiers are required under these circumstances.

In addition, new EPA regulations (See Federal Register, March 12, 2007, 40CFR Part 122) require only that the temperature of samples delivered to the laboratory be less than 6° C. Thus the sample receipt conditions are fully compliant with applicable regulations.

L0703346 narrative states: "Several of the samples required pH adjustments in the lab." This includes IW92-05-EBT-2 (received at pH 3.5) and IW92-06-EBT-2 (received at pH 4.5), which were pH- adjusted using phosphoric acid for Method 830 to a pH < 2 after receipt in the laboratory. These samples were received one day after sampling and were already mildly acidic, so this requirement is not likely to indicate any significant degradation and no qualifiers are added.

AM20GAX (Hydrogen): We were not able to locate any receipt temperature or any other documentatioin of sample condition for any of the hydrogen SDGs.

Holding times:

Some holding times are out of limits. Note that in a few cases, the laboratory has indicated exceeding the holding time by 1-2 hours. Per EPA guidance, for validation purposes we calculate the holding time to the nearest day in cases where the regulation or method specifies holding time units of days. Thus such cases are not qualified or noted below.

Metabolic Acids: The reviewer has not been able to find documented holding times for the metabolic acids. The normal holding time for an analogous HPLC method 8310 is 14 days for preserved water samples. Metabolic acid holding times were all within 14 days except as noted above. It has been verified on other projects that no holding time is established for these compounds. There is no indication of sample pH in the data packages, but the sample receipt forms indicate that the pH range is acceptable except in isolated instances, where it is noted that the laboratory adjusted the pH (see next section). This suggests that the samples were preserved with acid, a good practice for these analytes.

RSK-175: For RSK-175, pH should not be adjusted when CO_2 is determined, which is the case in this project. It is not clear in the documentation whether samples for RSK-175 were pH-adjusted or not. In the absence of definitive information we have assumed that no acidification occurred. If in fact samples were acidified for RSK-175, it would mean that inorganic carbon in the form of bicarbonate and carbonate would be converted to carbon dioxide, would consequently bias the results high for that analyte. The project manager should clarify this preservation question and regard the data for carbon dioxide accordingly. When pH is adjusted, the holding time is 14 days per the method, and we have used this as the acceptable holding time.

Some runs were conducted after the 14-day holding time for both RSK-175 and metabolic acids, as shown in the table within the report. In the case of RSK-175, this only occurred for carbon dioxide runs. In the case of metabolic acids, the analtyes impacted are shown in the table. Qualifiers are added as JH#, where # is the difference between the observed holding time and the method holding time. It is not likely in any of these cases that a significant bias will result from these deviations.

AM20GAX - Hydrogen: This method is a procedure developed by Microseeps, Inc. Recommended holding times in the procedure are 14 days. A few samples were analyzed outside of that holding time as shown in the table within the report. Sample results with holding times outside of the method recommendation are qualified as JH#, where # is the number of days by which the holding time was exceeded.

Microseeps indicates that samples are very stable in the vials used for this procedure, but we cannot provide a technical assessment of the stability for hydrogen itself beyond the 14 days specified in the Microseeps procedure.

We would assume that some losses of hydrogen could occur, with a resulting possibility of low bias.

Initial Calibrations:

MBA: The initial calibration report associated with the metabolic acids appears to be inaccurate. The calibration report provides only a %RSD for each analyte, with a note at the bottom that the linear calibration model is used. However, the observed r or r^2 values are not reported, although the criteria used are shown.

The %RSDs shown are within acceptance windows except for propionic acid, as shown in the table below, which is reported as having a %RSD of 89.8. Although this report is a level III report, we did have access to pdf files showing the raw data, including the calibration data. When we calculated the calibration results as required using that data, we obtained the same average response factor as that in the table, but we calculated a %RSD of 43.8, not 89.8. We determined that the linear regression fit for the data produces an r2 value of 0.999, in control by any criteria. We also made several checks of the calculation of samples using both the linear regression model and the average response factor and it appears that the laboratory is using the linear regression model. For this reason, since the regression curve meets criteria, no qualifiers have been added. The reviewer and validation project manager determined that it would be more timely and productive to recalculate the calibration results than have the laboratory do it and send it out.

RSK-175: Carbon dioxide is in control in this initial calibration, unlike the previous report. However, the same problem appears to exist in the initial calibration report for RSK-175 as observed in the MBA analysis. In this case, methane is reported with a %RSD of 70 in the initial calibration. In this case, however, the raw data includes a linear plot for methane showing an acceptable r^2 value. However, the curve is forced through the origin, which is specifically disallowed by SW-846. Since this is not an SW-846 method, we have evaluated this situation using professional judgment. The use of the forced intercept in this case results in a considerably better recalculation of the individual low-level data points, and we believe that this is an acceptable approach. Therefore no qualifiers are added.

AM20GAX (Hydrogen): All initial calibrations are conducted using a linear regression curve and all are in control.

Continuing Calibrations:

MBA: All calibrations are in control. The laboratory is employing the external standard method and is using opening and closing calibrations appropriately.

RSK-175: The laboratory conducts opening and closing calibrations (bracketing the samples during the analytical run). For RSK-175 there is not a specific requirement in the procedure for closing calibrations, and only calibration verification each 12 hours is specified. SW-846 guidance (method 8000B), however specifically requires such closing calibrations for external standard methods. For detected analytes, SW-846 specifies that the closing calibration must meet the same criteria as the opening calibration. This has been achieved for all analytes but for carbon dioxide, for which a number of opening and closing calibrations do not meet the 30% D criterion specified for RSK-175.

In such cases, detected levels of carbon dioxide are qualified as JC#, where # is the applicable opening or closing CCV outlier. Such results may be biased due to calibration drift. Please see the qualified reports or the EDD for details.

It should be noted in this regard that the laboratory appears to use a different criterion for carbon dioxide, since a few CCV results were flagged as being outside of limits, but it is not clear to this reviewer where the laboratory limit is set. This method has not been published as a promulgated method by EPA (it rather exists as an open literature publication and an internal EPA SOP), and it may not have been fully developed for carbon dioxide. Thus the laboratory limits may be realistic for this analyte. Nonetheless, the results appear to indicate a probable bias which should be considered in using the data.

AM20GAX: All calibrations are in control. The laboratory is employing the external standard method. There are no closing CCVs reported in the data package.

LCS Recoveries:

MBA: All LCS recoveries are in control.
RSK-175: All LCS recoveries are in control except for one carbon dioxide LCS with a high recovery as shown in the table within the report. The LCSD was in control, and the %RSD was 101. The Associated sample detections are qualified as JL166D101 to indicate that there is a possible laboratory accuracy and precision issue for these samples.
AM20GAX (Hydrogen): All LCS recoveries are in control.

MS/MSD Recoveries:

RSK-175: There were five (5) MS/MSDs which meet the 20 to 1 ratio.
Metabolic Acids: There were five (5) MS/MSDs which meet the 20 to 1 ratio.
AM20GAX: There are no MS/MSDs for this method. They are not required or possible for hydrogen analysis.

RSK-175: Carbon dioxide gave MS/MSD outliers as shown in the table within the report. In each case, the sample level is greater than 4x the spike amount, which means that the anticipated normal analytical variability is greater than the spike amount. In such cases, no recovery can meaningfully be calculated, and no qualifiers are added. There is no indication of bias.

Metabolic acids: Metabolic acid MS/MSDs had several outliers. A matrix bias roughly proportional to the recovery appears to be present in these instances. Such results are qualified as JS#, where # is the recovery which is out of limits. In the case of sample IW21-02B-EBT-2 there are three analytes that were not recovered in the matrix spike, although they were recovered in the MSD. These results are qualified as RS0 (rejected) to indicate that the sample non-detect is rejected because of the failure to recover the analyte in the matrix spike. As one of the spike results is zero, the RPD is not calculated (NC). The laboratory has not offered any explanation of the results that would allow the data to be used.

Field Duplicates:

There are 9 field duplicates for RSK-175, metabolic acids, and hydrogen analysis. Results are in control per the above criteria except for one lactic acid result in DUP-8 pair, one lactic acid result in DUP -4 pair and one hydrogen result for DUP-1 pair. Details are shown in the table within the report.

Method Blanks:

There are a number of method blanks for RSK-175 which have low-level detections (*) of methane and carbon dioxide, as shown in the table within the report. When the associated sample result is less than 5x the method blank level (corrected for sample dilution), the sample result is qualified as UB#, where # is the corrected method blank result. Such results are usable as non-detected values.

Method blanks for hydrogen analysis and for metabolic acids are in control.

Field Blanks:

Rinse blanks for RSK-175 show some detected levels for methane. Detections of methane in the associated samples are qualified as UFB#, where # is the methane level in the rinse blank corrected for sample dilution. This qualifier is applied only if the result is less than 5x the rinse blank level. Such results are usable as non-detects. The table within the report shows the rinse blank results and associated qualifiers for all methods.

AM20GAX (Hydrogen): No rinse blanks are present. For hydrogen such blanks are probably unnecessary.

INORGANIC DATA QUALITY REVIEW REPORT

METALS BY ICP SW-846 METHOD 6010B and WET CHEMISTRY

SDG: L070: 3106, 3107, 3136, 3140, 3180, 3230, 3233, 3246, 3276, 3346

PROJECT: Memphis Defense Depot Site; EBT2 phase for e2m

LABORATORY: Kemron Laboratories, Marietta, OH

SAMPLE MATRIX: Water SAMPLING DATE (Month/Year): 3 / 07

ANALYSES REQUESTED: SW-846 Method 6010 (ICP), 9056 (IC) Bromide, Chloride, Nitrate, Nitrite, Sulfate, 9060 Total Organic Carbon; MCAWW Method 310.2 Alkalinity, Method 376.1 Sulfide

NO. OF SAMPLES: 103 Total Water, 2 dissolved Water, 103 Wet Chemistry

SAMPLE NO: See attached results forms

DATA REVIEWER: Kulp Consulting

QA REVIEWER: Diane Short and Associates Inc. INITIALS/DATE: ________

Telephone Logs included Yes___ No X

Contractual Violations Yes___ No X

The project Sampling and Analysis Plan (SAP), the EPA Contract Laboratory Program National Functional Guidelines for Inorganic Review, 2002 and the SW-846 and MCAWW Methods have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. Per the Scope of Work, the review includes validation of all calibrations, chains of custody, and QC forms referencing the above documents.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work or project contract.

Yes ___X__ No ___

The following is noted for clarification:

Data are reviewed as Level III. No raw data review is to be required. Many of the Wet Chem methods, however, do not have standard reporting forms for the calibrations and these have been determined from the raw data provided.

The packages contained 103 total waters, 2 dissolved waters (metals and TOC), and 103 wet chemistry samples analyzed for 3 project-specific ICP metals and 8 wet chemistry parameters. There were also 2 field blanks. All packages were reviewed for COC, holding time, summary QC and calibration. In addition, for all wet chemistry parameters (except for IC) the raw data were reviewed for initial instrument calibration (e.g. calibration curves) and ICV/CCV's, since no QC summaries were reported for them (again, except for IC). Four SDG's (L070: 3230, 3346, 3180 and 03140) were further evaluated for calibration blank results for all analyses.

II. CALIBRATIONS

A. All initial instrument calibrations were performed as defined in the contract or Statement of Work (SOW). All correlation coefficients of the 3 point curve were > 0.995.

Yes ____ No _X_ NA____

Per the raw data review, the Method 300 reports a % RSD of the response factors as part of the calibration criteria. The % RSD is not defined in the validation guidance, but good laboratory practice would recommend a minimum of 10% deviation for wet chemistry methods. Deviations greater than this value indicate variability of the instrument response over a range of concentrations. The validator recommends that the following qualifers be applied to detected data (data which have been quantitated from the analyte curve). Data would be qualified JC#, where # is the %RSD.

SDG	Analyte	%RSD	Qualifier
L0703230	Bromide	10.4	None, all ND
	Sulfate	11	JC11
L070 3140	Bromide	21	JC21
L0703346	Bromide	10.4	None, all ND
	Sulfate	12.9	JC12.9
L0703180	Bromide	21	JC21
L0703136	Bromide	12.9	JC13
	Sulfate	12.1	JC12
L0703276	Bromide	13.4, 13.5, 13.4	JC13
L0703310	Bromide	10.4	JC10.4
	Sulfate	12.9	JC13

B. The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were analyzed at the required frequency.

Yes __X__ No ____

Sequencing was not required, but sufficient calibrations were present to verify that the frequencies were met for client samples.

Note that the alkalinity uses a 5 point curve with each set of data. No ICV or CCV is reported.

For sulfide, no ICV or CCV, as such, is reported. Two sets of LCS and LCS duplicates are submitted.

C. And the ICV and CCV standard percent recovery results were within the required control limits of 90 – 110% (Mercury 80 – 120%).
Yes __X_ No____
The requirements were met for client samples (IC used percent difference). Note that the TOC raw data have an 'error!!' message in the tables for the standards. The data have been checked against the standard values and the reason for this message does not seem to correlate to any QC or calibration problem as calibrations were acceptable. TOC data do not have %R reported. These have been manually determined.

III. CRDL STANDARDS
The 2 x CRDL standards were analyzed as required in the SOW.
Yes ____ No ____ NA__X_
Not required.

IV. BLANKS
Note: the highest blank associated with any particular analyte is used for the qualification process and is the value entered after the "B" blank descriptor.

A. The initial calibration blanks (ICB) and continuing calibration blanks (CCB) were analyzed at the required frequency.
Yes ___X_ No____ NA ____
Sequencing was not required, but sufficient calibration blanks were present to verify that the frequencies were met for client samples.

B. And the ICB and CCB results were within the required control limits.
Yes ___X__ No____ NA _____
Per the review of the QC summaries, there were no reported analyte detects reported in the calibration blanks at the level of the 10% raw data review.

C. And all analytes in the Leach Blank were less than the CRDL, or less than 2x the instrument detection limit (IDL), whichever is lower.
Yes____ No____ NA __X__
No TCLP analysis was performed.

V. PREPARATION BLANKS
A. Preparation blanks were prepared and analyzed at the required frequency.
Yes __X__ No ____

B. And all analytes in the preparation blank were less than the CRDL, or less than the instrument detection limit (IDL), whichever is lower.
Yes ____ No __X__
Analytes were found in the preparation blanks at levels requiring qualification for the following parameters.

SUMMARY TABLE FOR PREPARATION BLANKS

SDG	Result	ANALYTE	QUALIFICATION
L0703346	0.53 mg/kg	TOC	None, U or 5x
L0703140	0.506	TOC	None, U or 5x
L0703180	0.63	TOC	None, U or 5x
L0703230 L0703246	0.84	TOC	UB.84 WG235432 All > 5x
L0703230 L0703246	0.64	TOC	None, U or > 5x
L0703233	0.506	TOC	None, >5X
L0703276	0.529	TOC	None, 5X WG235979
	0.00793	Selenium	UB.0073
L0703310	0.53	TOC	None, all > 5x

Analytes reported as contaminants in the preparation blank are qualified UB# in the affected samples, where # is the value of the blank corrected to the units of the sample. Only sample detects whose values are less than 5x blank are qualified UB and are fully usable as undetected values at that level.

C. Field, trip, decon rinse or other field blanks are contained and identified in the package.
Yes __X__ No ____ NA ____
Field Blanks are identified as RB1-EBT-2, RB2-EBT-2.

D. And the reported results are less than the CRDL or less than the IDL, whichever is lower.
Yes ____ No __X_ NA ____
There were some blank analyte detects reported in the field blanks, but all client data were either non-detect or much greater than the contamination with the following exceptions. Data are qualified UFB #, where # is the field blank value. Data are fully usable as undetected values. Only data less than 5 x blank are qualified.

Field Blank	Analyte	Result	Qualifier
RB1	TOC	0.96	UFB.96
	Alkalinity	15.9	UFB16
RB-2	TOC	0.922	UFB.92
	Alkalinity	8.98	UFB9

VIA. ICP INTERFERENCE CHECK SAMPLE
A. The Interference Check Sample (ICS) was analyzed as required in the SOW or contract.
Yes __X__ No____ NA____

B. And the ICS percent recovery results were reported for all required ICS analytes and were within required control limits of 80% to 120%.

Yes __X__ No ____ NA____

C. ICP analysis results for analytes not required to be present in a given ICS standard were within acceptable limits.
Yes ____ No ____ NA __X__
Not requested by client and data not provided by laboratory.

VIB. INTERELEMENT CORRECTION FACTORS
The Interelement Correction Factors are included and complete for all possible interferent analytes.
Yes ____ No____ NA__X__
Review of possible other contaminants was not requested by the client and is not applicable to limited list metals.

VII. SPIKE SAMPLE RECOVERY
A. A matrix (pre-digestion) spike sample was analyzed for each digestion group and/or matrix or as required in the SOW.
Yes __X___ No____
The laboratory ran variously either matrix duplicates or MS/MSD samples or both or neither. The client has identified the following MS/MSDs (all IDs end with EBT-2)
IW21-02B, MW21, IW101-06A, IW92-03, PMW101-07A, IW21-04A, PMW101-03B, IW101-02B, PMW101-01A. Other samples may also have been used.
For a number of the wet chemistry analyses, no MS or MD was reported for the particular data set, but the overall frequency appears to have been met. When an MS or MD was not reported, an LCS, LCSD pair was reported. Final overall frequency will be determined by the project manager. Note that although data are reported as separate work groups, the client samples were run together on the same day using a client sample as the 1/20 QC sample. This was determined from the raw data analysis run logs. The same work groups were not run together for all the same methods however.

B. And the Matrix spike percent recoveries were within the required control limits of 75 – 125%.
Yes ____ No __X_ NA____
The following SDGs had matrix spike results that resulted in sample qualification.

SDG	ANALYTE	RESULT	QUALIFICATION
L0703140	Alkalinity	158/ 162 %	JS 162 detects
	TOC	123/ 104 % (lab limit 115%)	Meet CLP limits, no qualification
	Chloride	47.8/ 58.4 %	JS48
L070 3180	Chloride	68.2/ 68.7 %	JS68
L0703230	Chloride	58/ 58%	JS58
L0703107	Bromide	41.7/ 43%	JS42
	Manganese	1130/ 1130%	None *
L0703253	Manganese	59.1/ 38.6%	None*

L0703310	Manganese	98/73 %	None *
	Alkalinity	84.9/ 79.1 (Lab limit 85%)	None, Meets CLP
	TOC	79.8 / 72.6 %	JS73
L0703246	Manganese	59/37	None *

* The parent sample results were very high compared to the spike added, making the percent recoveries statistically invalid.

The samples were qualified JS#, where the # is the percent recovery of that particular analyte. A high matrix spike recovery indicates a possible high bias to the reported result. Only detected data are qualified. A low matrix spike recovery indicates a possible low bias to the reported result. A matrix spike recovery below 30% results in rejection of all non-detect data associated with that analyte. Rejected data are considered unusable for project purposes as significantly low values could be reported or false undetected values.

B. A Post-digest spike was analyzed if required.
Yes __X__ No____ NA___

C. The MS/MSD samples included client samples
Yes __X_ No___ NA____
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number). Sufficient client samples have been used for the QC samples and the only qualifiers that have been applied are from client samples.

VIII. DUPLICATES
A. Matrix (pre-digestion) duplicate samples were analyzed at the required frequency
Yes __X__ No ____
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

The laboratory ran variously either matrix duplicates or MS/MSD samples or both or neither.

B. And the Matrix duplicate relative percent differences (RPD) were within the required control limits (Water 20%, Soil 35%) or the RL limits were met if the duplicate values are < 5 x RL. If the either one of the duplicate results are < 5 X RL, the RPD is not used. The QC limit used is the difference between the original and the duplicate results (± the RL) for water and (± 2X the RL) for soils.
Yes __X__ No ____ NA_____

IX. LABORATORY CONTROL SAMPLE
A. Laboratory control samples (LCS) were analyzed at the required frequency.
Yes _X___ No____
The laboratory also ran an LCS duplicate at times.

B. And LCS recoveries were within the required control limits of 80 to 120%.

Yes __X__ No____

X. MSA RESULTS AND GRAPHITE FURNACE ANALYSIS (GFAA)
Duplicate injections were performed for all analyses and the RSDs were less than 20% for all reported results. (Method of Standard Additions (MSA) requires only a single injection).
Yes ____ No____ NA__X__
Graphite furnace was not done.

XI. ICP SERIAL DILUTION
A. ICP Serial Dilutions have been analyzed at the required frequency if the analyte concentrations are greater than 50 x IDL.
Yes __X_ No____ NA____
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

B. And the percent difference criteria of ± 10 % have been met.
Yes __X__ No _____ NA____

C. The serial dilution analyses were on client samples.
Yes __X___ No_____
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number). The laboratory sometimes reported serial dilution results and sometimes did not.

XII. INSTRUMENT DETECTION LIMITS
A. The Instrument Detection Limits have met the Quarterly reporting requirements.
Yes ___X_ No____ NA___
This was determined to be acceptable during the contractual process.

B. And all sample results have met the required detection limits (CRDL).
Yes __X__ No____ NA____
The laboratory has diluted several of the digestates to account for potential matrix effects on the IC chloride analysis as well as for alkalinity and TOC. The laboratory has reported only the diluted results. The dilutions performed raised the MDL's; the project manager will evaluate whether the elevated MDL's are still below the project reporting limits.

XIII. PREPARATION AND ANALYSIS LOGS
A. All samples were prepared or analyzed within the required holding times referencing the SOW (time of sample receipt to preparation/distillation).
Yes ___X_ No____

B. All samples were analyzed within the 40 CFR 136 (Clean Water Act) or method recommended holding times (time of sample collection to date of analysis).
Yes __X___ No____
The laboratory has noted a holding time exceedence in L0703230, but the analysis over 2 days was chloride, not nitrate or nitrite and the holding time is acceptable.

For L0703276, the Method 300 IC holding time table lists the sample date as 3/8/07 and the sample receipt date as 3/7/07. This is obviously an error. Times have been taken from the result forms.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0703136	PMW101-02A	Nitrite and Nitrate	JH4
	PMW101-02B	Nitrite and Nitrate	JH2.5

For sample holding time results that are out of control, the affected sample data have been qualified JH#, where # is the number of time units past holding time that the analysis was late. In this case, the time is in hours. Analysis results qualified as estimated due to holding time violations may have a possible low bias to the data due to the potential loss of analyte, as well as a possible reporting of false negatives. Only the IC nitrate and nitrite analyses are affected and the exceedences are very slight. No impact to the data is expected as the samples were immediately put in coolers, arrived cold and were put in coolers upon arrival.

C. Chains of Custody (COC)

1. Chains of Custody (COC) were reviewed and all fields were complete, signatures were present and cross outs were clean and initialed.

Yes_____ No __X__

None of the automated COC's included the initial (i.e. field) sample relinquishment signature, date, and time.

2. Samples were received at the required temperature and preservation.

Yes_____ No __X__

Per the COCs and the laboratory log-in records, all applicable chemical preservatives were properly used except as follows.

In SDG L070 3346, L0703106, L0703107, L0703233, L0703276, and 0703230, several samples were noted as being above the required pH of 2. Samples were acidified as soon as they were received by the laboratory and the exceedence is not expected to impact the data as the time was less than 24 hours. All of these may be due to inherent matrix buffering as the exceedences were not high indicating that acid had been properly added in the field. The laboratory correctly added HNO_3 to bring them to the proper pH. For these particular shipments, the samples were properly cooled and the shipping time was relatively brief. Since all analytes of interest are stable when cooled, no such stable analytes of interest received qualification for insufficient field chemical preservation of the samples.

TABLE OF INSUFFICIENT pH

Sample	Analysis
IW92-05	TOC and metals
IW85-06	TOC and metals
IW21-01A and 01B	TOC and metals
IW101-04A	Metals
IW21-05A	Metals
IW101-01A	Metals
Dup3	Metals
Dup6	Metals

PMW101-01A	Metals

XIV. FIELD QC

A. Field QC samples (duplicates, SRMs) were identified.

Yes __X__ No____

The field duplicates are identified as:

SDG	Duplicate Pair
L0703230	IW101-04A / DUP3 (Total and diss)
L0703107	PMW101-01A / DUP6
L0703140	PMW101-07B / DUP7
L0703180	PMW21-01 / DUP2
L0703276	IW101-08A / DUP4
L0703246	PMW92-04 / DUP8
L0703246	IW21-04B / DUP1
L0703310	DR2-5 / DUP9
L0703310	IW92-08 / DUP5

B. Field duplicates were within a guidance limit of < 35% RPD limit for water or <50% RPD limit for soil. If values are < 5 x RL, the water limit is ± 2 x RL and the soil limit is ±4 x RL. Final determination will be made by the project manager.

Yes ____ No__X__ NA___

For the pair DUP 3 / IW101-4A, the total samples were in set L0703230. There was a sample in set L0703230 which is only noted as filtered Metal (TOC)-EBT2 on the chains and per the result forms. The project manager has provided a list of samples that lists an IW101-4A filtered sample in set L0703233. In that set, there is only the DUP 3 sample (dissolved). The following applies if the filtered sample in Set 3230 is the parent of the dissolved sample in set 3233. All precision was acceptable per guidance noted above with the following exceptions. Data are not qualified for field precision.

SDG	DUP 3	IW101-4A	RPD
3230	Manganese (t) 0.708	1.03	35%
	TOC (t) 1210	1540	24%

XV. GENERAL COMMENTS

The laboratory has complied with the requested methods and the quality of the data is acceptable and usable with consideration of the following qualifications. Note that the following qualifiers are used:

UB#, UFB#, where # is the value of the preparation or field blank contamination. Data are usable as undetected values.

JC#, where # is the % RSD of the calibration curve. There could be a variability to the reported result due to variability in the instrument response over a range of concentrations.

JS# is for matrix spike/matrix spike duplicate recoveries, where # is the analyte recovery. The bias to the data is considered to be high or low proportional to the analyte recovery. (JS126 would indicate the value could be 126% of the true value)

JH#, where # is the number of time units the analysis is past holding time.

Summary:

*Very low level detections of TOC and alkalinity could be false detections due to field contamination, not the presence of the analytes in the sample. (UFB#)
*Very low levels of TOC and selenium could be false detections due to method blank contamination (UB#)
*Chloride and one TOC set could be biased low by the added factor indicated by the low matrix spike/matrix spike duplicate analyte recoveries (JS#). Alkalinity could be biased high. Manganese was out of limits, but in all cases the spike level was statistically too low to determine compared to the sample value
*Bromide and sulfate calibration responses indicate variability in instrument response over a range of concentrations (JC#).
* Nitrate and Nitrite data could be biased very slightly low due to low hold time exceedence (JH#)

Qualification or Comments in Detail

Chains-of-Custody
None of the automated COC's included the initial (i.e. field) sample relinquishment signature, date, and time.

Calibration

Per the raw data review, the Method 300 reports a % RSD of the response factors as part of the calibration criteria. The % RSD is not defined in the validation guidance, but good laboratory practice would recommend a minimum of 10% deviation for wet chemistry methods. Deviations greater than this value indicate variability of the instrument response over a range of concentrations. The validator recommends that the following qualifiers be applied to detected data (data which have been quantitated from the analyte curve). Data would be qualified JC#, where # is the %RSD.

SDG	Analyte	%RSD	Qualifier
L0703230	Bromide	10.4	None, all ND
	Sulfate	11	JC11
L070 3140	Bromide	21	JC21
L0703346	Bromide	10.4	None, all ND
	Sulfate	12.9	JC12.9
L0703180	Bromide	21	JC21
L0703136	Bromide	12.9	JC13
	Sulfate	12.1	JC12
L0703276	Bromide	13.4, 13.5, 13.4	JC13
L0703310	Bromide	10.4	JC10.4
	Sulfate	12.9	JC13

Blanks

Analytes were found in the preparation blanks at levels requiring qualification for the following parameters.

SUMMARY TABLE FOR PREPARATION BLANKS

SDG	Result	ANALYTE	QUALIFICATION
L0703346	0.53 mg/kg	TOC	None, U or 5x
L0703140	0.506	TOC	None, U or 5x
L0703180	0.63	TOC	None, U or 5x
L0703230 L0703246	0.84	TOC	UB.84 WG235432 All > 5x
L0703230 L0703246	0.64	TOC	None, U or > 5x
L0703233	0.506	TOC	None, >5X
L0703276	0.529	TOC	None, 5X WG235979
	0.00793	Selenium	UB.0073
L0703310	0.53	TOC	None, all > 5x

Analytes reported as contaminants in the preparation blank are qualified UB# in the affected samples, where # is the value of the blank corrected to the units of the sample. Only sample detects whose values are less than 5x blank are qualified UB and are fully usable as undetected values at that level.

There were some blank analyte detects reported in the field blanks, but all client data were either non-detect or much greater than the contamination with the following exceptions. Data are qualified UFB #, where # is the field blank value. Data are fully usable as undetected values. Only data less than 5 x blank are qualified.

Field Blank	Analyte	Result	Qualifier
RB1	TOC	0.96	UFB.96
	Alkalinity	15.9	UFB16
RB-2	TOC	0.922	UFB.92
	Alkalinity	8.98	UFB9

Matrix Spikes/Matrix Spike Duplicates

The laboratory ran variously either matrix duplicates or MS/MSD samples or both or neither. The client has identified the following MS/MSDs (all IDs end with EBT-2) IW21-02B, MW21, IW101-06A, IW92-03, PMW101-07A, IW21-04A, PMW101-03B, IW101-02B, PMW101-01A. Other samples may also have been used.

For a number of the wet chemistry analyses, no MS or MD was reported for the particular data set, but the overall frequency appears to have been met. When an MS or MD was not reported, an LCS, LCSD pair was reported. Final overall frequency will be determined by the project manager. Note that although data are reported as separate work groups, the client samples were run together on the same day using a client sample as the 1/20 QC sample. This was determined from the raw data analysis run logs. The same work groups were not run together for all the same methods however.

The following SDGs had matrix spike results that resulted in sample qualification.

SDG	ANALYTE	RESULT	QUALIFICATION

L0703140	Alkalinity	158/ 162 %	JS 162 detects
	TOC	123/ 104 % (lab limit 115%)	Meet CLP limits, no qualification
	Chloride	47.8/ 58.4 %	JS48
L070 3180	Chloride	68.2/ 68.7 %	JS68
L0703230	Chloride	58/ 58%	JS58
L0703107	Bromide	41.7/ 43%	JS42
	Manganese	1130/ 1130%	None *
L0703253	Manganese	59.1/ 38.6%	None*
L0703310	Manganese	98/73 %	None *
	Alkalinity	84.9/ 79.1 (Lab limit 85%)	None, Meets CLP
	TOC	79.8 / 72.6 %	JS73
L0703246	Manganese	59/37	None *

* The parent sample results were very high compared to the spike added, making the percent recoveries statistically invalid.

The samples were qualified JS#, where the # is the percent recovery of that particular analyte. A high matrix spike recovery indicates a possible high bias to the reported result. Only detected data are qualified. A low matrix spike recovery indicates a possible low bias to the reported result. A matrix spike recovery below 30% results in rejection of all non-detect data associated with that analyte. Rejected data are considered unusable for project purposes as significantly low values could be reported or false undetected values.

Serial Dilutions

The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number). The laboratory sometimes reported serial dilution results and sometimes did not.

Detection Limits

The laboratory has diluted several of the digestates to account for potential matrix effects on the IC chloride analysis as well as for alkalinity and TOC. The laboratory has reported only the diluted results. The dilutions performed raised the MDL's; the project manager will evaluate whether the elevated MDL's are still below the project reporting limits.

Holding Times

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0703136	PMW101-02A	Nitrite and Nitrate	JH4

	PMW101-02B	Nitrite and Nitrate	JH2.5

For sample holding time results that are out of control, the affected sample data have been qualified JH#, where # is the number of time units past holding time that the analysis was late. In this case, the time is in hours. Analysis results qualified as estimated due to holding time violations may have a possible low bias to the data due to the potential loss of analyte, as well as a possible reporting of false negatives. Only the IC nitrate and nitrite analyses are affected and the exceedences are very slight. No impact to the data is expected as the samples were immediately put in coolers, arrived cold and were put in coolers upon arrival.

Sample Preservation

Per the COCs and the laboratory log-in records, all applicable chemical preservatives were properly used except as follows. In SDG L070 3346, L0703106, L0703107, L0703233, L0703276, and 0703230, several samples were noted as being above the required pH of 2. Samples were acidified as soon as they were received by the laboratory and the exceedence is not expected to impact the data as the time was less than 24 hours. All of these may be due to inherent matrix buffering as the exceedences were not high indicating that acid had been properly added in the field. The laboratory correctly added HNO_3 to bring them to the proper pH. For these particular shipments, the samples were properly cooled and the shipping time was relatively brief. Since all analytes of interest are stable when cooled, no such stable analytes of interest received qualification for insufficient field chemical preservation of the samples.

TABLE OF INSUFFICIENT PRESERVATION

Sample	Analysis
IW92-05	TOC and metals
IW85-06	TOC and metals
IW21-01A and 01B	TOC and metals
IW101-04A	Metals
IW21-05A	Metals
IW101-01A	Metals
Dup3	Metals
Dup6	Metals
PMW101-01A	Metals

Field Duplicates

The field duplicates are identified as:

SDG	Duplicate Pair
L0703230	IW101-04A / DUP3 (Total and diss)
L0703107	PMW101-01A / DUP6
L0703140	PMW101-07B / DUP7
L0703180	PMW21-01 / DUP2
L0703276	IW101-08A / DUP4

L0703246	PMW92-04 / DUP8
L0703246	IW21-04B / DUP1
L0703310	DR2-5 / DUP9
L0703310	IW92-08 / DUP5

For the pair DUP 3 / IW101-4A, the total samples were in set L0703230. There was a sample in set L0703230 which is only noted as filtered Metal (TOC)-EBT2 on the chains and per the result forms. The project manager has provided a list of samples that lists an IW101-4A filtered sample in set L0703233. In that set, there is only the DUP 3 sample (dissolved). The following applies if the filtered sample in Set 3230 is the parent of the dissolved sample in set 3233. All precision was acceptable per guidance noted above with the following exceptions. Data are not qualified for field precision.

SDG	DUP 3	IW101-4A	RPD
3230	Manganese (t) 0.708	1.03	35%
	TOC (t) 1210	1540	24%

Please see the project edd for a full table of qualified data.

ORGANIC DATA QUALITY REVIEW REPORT
VOLATILE ORGANICS SW-846 METHOD 8260B/5030B

SDG: L070: 5683, 6043, 6104, 6201, 5656, 6016, 6073, 6151

PROJECT: Memphis Defense Depot, EBT-3 for e2m Texas

LABORATORY: Kemron Environmental Services, Marietta, OH

SAMPLE MATRIX: Water

SAMPLING DATE (Month/Year): May and June 2007

NO. OF SAMPLES: 8260B/5030B (Waters) – 108 samples including (8Trip Blanks and 2 Rinse Blanks)

ANALYSES REQUESTED: SW-846 8260B

SAMPLE NO.: See attached result forms and associated EDD

DATA REVIEWER: Sammy Huntington and John Huntington (Gateway Enterprises)

QA REVIEWER: Diane Short and Associates Inc. INITIALS/DATE: ____

Telephone Logs included Yes___ No _X__

Contractual Violations Yes___ No _X__

The EPA Contract Laboratory Program National Functional Guidelines for Organic Review, 2001, and the SW-846 Method 8260B has been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. Per the Scope of Work, the review of these samples includes Level III validation of all chains of custody, calibrations and QC forms referencing the QC limits in the above documents.

I. DELIVERABLES

A. All deliverables were present as specified in the Statement of Work (SOW), SW-846, or in the project contract.
Yes __X_ No _____

This is a Level III Report, which includes review of chains of custody, calibrations and summary QC. No raw data are required, nor provided.

B. Chain of Custody Documentation was complete and accurate.
Yes __X____ No ___

The project manager is informed of the following and the chain information is to be updated for the project file.

Most of the SDGs do not have a customary chain of custody. Those have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers.
They have been improved since we first pointed out these issues in that each page does have a printed area for sampler name, date, time, and signature. However, there is no similar printed area for receipt signatures, dates, and times to be entered. All relinquished signatures, dates and times are on all pages of the Chains of Custody. Previously, the laboratory has not always signed each page. In this case, all pages had laboratory receipt signature, date and time, but in the case of SDGs L0706201, L0706073, and L0706104 the receipt time is not present. The receipt time is shown in each case on the sample receiving checklist.

A few sample names are being truncated on the Chain of Custody because the field width is not sufficient to allow the full name to appear. This seems to be a less severe problem than in the past, but it still does occur.

Our understanding is that the chain of custody is a printout of an electronic sample documentation system. We reiterate our recommendation that the printout be improved to add a printed area for the laboratory to receive the samples, and to include page numbers. Preferably, the laboratory signature should appear on each page of the Chain of Custody, but at the very least should appear each time a new COC# is applied. Alternatively, some type of electronic signature system could be used using a system compliant with EPA's proposed cross-media electronic reporting rule. The present system does not appear to fully protect the data from potential challenge.

C. Samples were received at the required temperature, preservation and intact with no bubbles.
Yes __X____ No ____

Most of the SDGs had at least one cooler that was under 2°C but the Sample Checklist states that the samples weren't frozen. No qualifiers are required under these circumstances.

In addition, new EPA regulations (See Federal Register, March 12, 2007, 40CFR Part 122) require only that the temperature of samples delivered to the laboratory be less than 6° C. Thus the sample receipt conditions are fully compliant with applicable regulations.

L0705656: Sample Receipt Checklist states that the sample containers and labels were not intact and did not match COC. Further it says that the "chains not scanned correct". We could not find any further documentation of the issue, and no discussion of corrective action. The narrative states that all samples were received intact.
L0706151: Sample IW21-05B-EBT-3 and TB060607 were received but not on the Chain of Custody.

II. ANALYTICAL REPORT FORMS

A. The Analytical Report or Data Sheets are present and complete for all requested analyses.
Yes _X_ No ____

B. Holding Times

1. The contract holding times were met for all analyses (Time of sample receipt to time of analysis (VOA) or extraction and from extraction to analysis).
Yes __X___ No______

2. The Clean Water Act (40 CFR 136) or method holding times were met for all analyses (14 days from time of sample collection to analysis or extraction).
Yes _X__ No____

All holding times were between 3-11 days. The laboratory cannot check VOA samples on receipt for pH. However, the run logs include a pH for each sample and all reviewed are < 2. Thus the applicable holding times are 14 days per 40 CFR.

III. INSTRUMENT CALIBRATION – GC/MS

A. Initial Calibration

1. The Response (RF) and Relative Response Factors (RRF) and average RRF for all compounds for all analyses met the contract criteria of >0.01.
Yes __X__ No ____ NA____

Per the project manager, the 2001 EPA CLP validation guidance has been applied to the common "poor responders". Acetone, 2-butanone, and 4-methyl-2-pentanone are the compounds for which any calibration response factors below 0.05 have been observed. The validation guidance used for this project allows for a response of 0.01 for these compounds if spectral integrity can be verified at low concentrations. These spectra are not commonly provided and are not part of the deliverable for these data sets. The laboratory has been tasked with providing to the client verification that the 0.01 RF is valid. Given the spectral verification is available, the data are not qualified for response >0.01 < 0.05. No data have been qualified.

'The low-responding compounds are highly water-soluble and capable of hydrogen bonding with water. This decreases their purge efficiency and results in the relatively low response. The implication of this low purge efficiency is that a relatively low absolute recovery of such compounds is achieved in the purge step of the analysis. If this recovery is consistent, reasonable accuracy and precision can be achieved in a given matrix, which is indicated for the lab matrix by acceptable recoveries in LCS and calibration checks. However, this causes these targets to be more sensitive to matrix variations that impact purge efficiency (such as ionic strength or the presence of varying levels of soluble non-target organic material) than are the more hydrophobic compounds typically analyzed by this method, and as a result they are more likely to exhibit matrix bias. The likelihood of matrix bias for these compounds in this site matrix is assessed in the MS/MSD section of this report.

2a.The relative standard deviation (RSD) for the five point calibration was within the 30% limit for the CCCs.
Yes __X_ No____ NA____

This is a method requirement and indicates that the analytical system is in control.

2b.The relative standard deviation (RSD) for the five point calibration was within the 30% limit for all other compounds or a linear curve was used.
Yes _____ No __X__ NA____

Only one initial calibration, conducted on May 8, shows any %RSD outliers that were not converted to a regression curve. Only m-,p-xylenes have this problem, with a %RSD of 38.4% on the HPMS6 instrument. The associated samples have no detections of this analyte, so no qualifiers are added.

SDG	ICAL Date	Batch#	Analyte	%RSD	Qualifiers Added
L0705683	5/17/07 15:55	WG241683 and WG242113	All in control		None
	5/8/07 16:28	WG242009	m-,p-Xylene	38.4	None, ND
	5/6/07 18:59	WG242199	All in control		None
L0706201	5/6/07 18:59	WG242798 and WG242808	All in control		None
L0706151	5/17/07 15:55	WG242473	All in control		None
	5/6/07 18:59	WG242667	All in control		None
L0706073	5/17/07 15:55		All in control		None
	5/8/07 15:05		All in control		None
	5/6/07 18:59		All in control		None
L0705656	5/8/07 16:28	WG241582	m-,p-Xylene	38.4	None, ND
L0706043	5/17/07 15:55		All in control		None
	5/6/07 18:59		All in control		None

3. The 12 hour system Performance Check was performed as required in SW-846.
Yes __X__ No_____ NA____

B. Continuing Calibrations

1. The midpoint standard was analyzed for each analysis at the required frequency and the QC criteria of > 0.05 (.01 for CLP 2001) were met.
Yes __X___ No ____ NA____

The CCVs were analyzed at the proper frequency. The same compounds showed low responses in the continuing calibration as were observed in the initial calibrations. Qualifiers are not added for these outliers since none were below the lower limit of 0.01. No data have been qualified from the response factors and RRFs are not noted since they are essentially the same as the ICAL. This consistency of response for the poor-responding compounds is an indication that there is no significant bias for the laboratory water matrix.

2. The percent difference (%D) limits of ± 25% were met.
Yes _____ No __X__ NA___

See the table below. When there are no detections, unless the %D is biased low and so large as to indicate a significant probability of false negatives, no qualifiers are added for %D outliers when targets are not detected. When targets are detected, the qualifier added is JC#, indicating the possibility of some bias associated with calibration drift, where # is the % D observed.

SDG	CCV Date	Batch#	Analyte	%D outliers	Qualifiers Added
L0705683	6/4/07 10:09	WG241683	All in control		None
	6/8/07 9:26	WG242113	All in control		None
	6/7/07 9:23	WG242009	Carbon Tetrachloride	27.7	None, all ND
	6/9/07 10:00	WG242199	2-Butanone	25.2	JC25 detect
L0706201	6/17/07 10:58	WG242798	Bromomethane	31.6	None, all ND
	6/18/07 8:17	WG242808	All in control		None
L0706151	6/13/07 9:25	WG242473	All in control		None
	6/14/07 10:28	WG242573	All in control		None
	6/15/07 7:45	WG242667	Bromomethane	33.0	None, all ND
L0706073	6/9/07 13:16		All in control		None
	6/9/07 11:25		All in control		None
	6/10/07 12:59		All in control		None
	6/10/07 13:25		All in control		None

SDG	CCV Date	Batch #	Analyte	%D outliers	Qualifiers Added
L0705656	6/1/07 10:56	WG241582	Carbon Tetrachloride	27.7	JC28 detects
L0706016	6/9/07 13.16		All in control		None
	6/10/07 11:45		All in control		None
	6/8/07 7:55	WG242096	Carbon Tetrachloride	26.5	None, all ND
	6/8/07 7:39	WG242094	Bromomethane	33.1	None, all ND
L0706043	6/8/07 9:26		All in control		None
	6/9/07 13:16		All in control		None

IV. GC/MS INSTRUMENT PERFORMANCE CHECK

The BFB (VOA) performance check was injected once at the beginning of each 12-hour period and relative abundance criteria for the ions were met.

Yes __X___ No ____ NA____

V. INTERNAL STANDARDS

The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows.

Yes _____ No __X__ NA____

L0705656 – Sample DR2-5-EBT-3 (lab sample 10) had the last internal standard (2,4-dichlorobenzene-d4) just out of limits at 49.9% recovery. Associated targets in that sample are qualified as JI49.9. This is not likely to create a significant bias. Surrogates are all within limits indicating that there is no impact to the data quantitation.

VI. SURROGATE

Surrogate spikes were analyzed with every sample.

Yes __X__ No ____

And met the recovery limits defined in the current contract, which are the current laboratory limits.

Yes __X___ No ____

VII. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

A. Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed for every analysis performed and for every 20 samples or for every matrix whichever is more frequent.

Yes ___X__ No _____

There are 5 MS/MSDs which meets the 1:20 ratio.

Matrix Spikes in Project:

SDG	Client Sample ID	Lab Sample ID
L0705683	IW101-02C-EBT-3	L0705683-10
L0706043	DR1-3-EBT-3	L0706043-09
L0706073	IW101-07C-EBT-3	L0706073-03
L0706151	IW21-03B-EBT-3	L0706151-10
L0706201	IW92-08-EBT-3	L0706201-04

B. The MS and MSD percent recoveries were within the limits defined in the contract, which are the current laboratory control chart limits.

Yes _____ No __ X ___NA___

The full target list has been spiked. Most MS/MSD recoveries and RPDs are in control. Instances where spike recoveries are out of limits are shown in the table below. In several instances, the sample amount is 4x the spike level or greater. In such cases, the recovery cannot realistically be calculated, because the anticipated normal analytical variability is on the order of the spike level. Thus no qualifiers are added. If recoveries are elevated and the parent sample has no detection of the target, no qualifiers are added.

MS/MSD Outliers

SDG	Client Sample ID	Lab Sample ID	Type	Analyte	Recov	Qualifiers
L0705683	IW101-02C-EBT-3	L0705683-10	MS	cis-1,2-Dichloroethene	60	JS60
L0705683	IW101-02C-EBT-3		MS	Tetrachloroethene	28.2	None, parent > 4x spike
L0705683	IW101-02C-EBT-3		MSD	cis-1,2-Dichloroethene	62.8	From MS
L0705683	IW101-02C-EBT-3		MSD	Tetrachloroethene	25.9	None, parent > 4x spike
L0706073	IW101-07C-EBT-3	L0706073-03	MS	Bromodichloromethane	124	None, parent ND
L0706073	IW101-07C-EBT-3		MSD	Tetrachloroethene	62.5	From MS
L0706073	IW101-07C-EBT-3		MSD	Trichloroethene	-73.5	None, parent > 4x spike
L0706073	IW101-07C-EBT-3		MS	cis-1,2-Dichloroethene	-11.2	None, parent > 4x spike
L0706073	IW101-07C-EBT-3		MS	Tetrachloroethene	57.1	JS57
L0706073	IW101-07C-EBT-3		MS	Trichloroethene	-74.5	None, parent > 4x spike
L0706073	IW101-07C-EBT-3		MSD	Bromodichloromethane	125	None, parent ND
L0706073	IW101-07C-EBT-3		MSD	cis-1,2-Dichloroethene	-7.23	None, parent > 4x spike
L0706201	IW92-08-EBT-3	L0706201-04	MS	1,2,3-Trichloropropane	25.6	None, parent > 4x spike
L0706201	IW92-08-EBT-3		MS	Acetone	188	JS188
L0706201	IW92-08-EBT-3		MS	Chloroform	54.4	None, parent > 4x spike
L0706201	IW92-08-EBT-3		MS	cis-1,2-Dichloroethene	-30.7	None, parent > 4x spike
L0706201	IW92-08-EBT-3		MSD	1,2,3-Trichloropropane	6.34	None, parent > 4x spike
L0706201	IW92-08-EBT-3		MSD	Chloroform	38.5	None, parent > 4x spike
L0706201	IW92-08-EBT-3		MSD	cis-1,2-Dichloroethene	-70.8	None, parent > 4x spike

C. The MSD relative percent differences (RPD) were within the defined contract limits.
Yes __X__ No __ __NA____

D. The MS/MSD were client samples.
Yes __X_ No ____NA____

VIII. LABORATORY CONTROL SAMPLE

A. Laboratory Control Samples (LCS) was analyzed for every analysis performed and for every 20 samples.
Yes _X___ No ____

B. The LCS percent recoveries were within the limits defined in the contract (the MS limits are used as a reference or laboratory-specific limits for this matrix are defined).
Yes ______ No __ X ____

The full target list has been spiked. There are a few elevated recoveries observed as shown in the table below. When a high recovery is associated with a non-detect in samples, no qualifier is added since the indicated bias is high. When the target is detected, the result is qualified as JL#, where # is the elevated recovery. There are no low recoveries in this set so no qualifiers for low recoveries have been required.

SDG	Batch	Targets Detected	LCS/LCSD/RPD	Qualifiers
L0705683	WG242113	Vinyl Chloride	137	None, ND
L0706201	WG242796	Vinyl Chloride	141/OK/OK	None, ND
L0706104	WG242242	Bromodichloromethane	122	None, ND
		Vinyl Chloride	149	JL149, detects
L0705656	WG241582	Bromodichloromethane	122	None, ND
L0706016	WG242094	Bromodichloromethane	145/146/OK	None, ND

IX. BLANKS

A. Method Blanks were analyzed at the required frequency and for each matrix and analysis.
Yes _X___ No____

B. No blank contamination was found in the Method Blank.
Yes____ No _X___

Contamination was observed in some method blanks indicated in the table, below the reporting limit. Whenever methylene chloride or acetone is detected in associated samples at a level less than 10x the method blank (corrected for dilution), the result is qualified as UB#, where # is the corrected method blank level. Such results are usable as nondetects. Qualifiers added are summarized in the table below. For other targets, the factor used is 5x.

SDG	Batch	Targets Detected	Results	Qualifiers
L0706016	WG242094	Methylene Chloride	.261F	UB0.26 results < 10x
L0706043	WG242113	1,2,3-Trichlorobenzene	.135F	None, ND
	WG242202	1,2,3-Trichlorobenzene	.293F	None, ND
		Hexachlorobutadiene	.365*	None, ND
L0706104	WG242242	1,2,3-Trichlorobenzene	.289F	None, ND
		Hexachlorobutadiene	.356*	None, ND
L0705683	WG241683	1,2,3-Trichlorobenzene	.286F	None, ND
	WG242113	1,2,3-Trichlorobenzene	.135F	None, ND

C. If Field Blanks were identified, no blank contamination was found.
Yes____ No __X__

There are 8 trip blanks and 2 rinse blanks. There are detections observed below the reporting limit as shown in the table. Some of these are qualified UB (see table above) due to detections in the associated method blank, thus are not used for qualifying associated samples. When analytes are present in both the field blank and the associated samples, the results in the samples are qualified in the same manner as for method blanks. For clarity, the qualifiers used in this case are UTB# for trip blanks and UFB# for rinse blanks.

SDG	Sample ID	Sample Date	Analyte	Result	Qualifier
L0705656	TB-052907-EBT-3	5/29/2007 12:01 AM	Methylene chloride	0.852F	UTB.85 detects < 10x
		5/29/2007 12:01 AM	Tetrachloroethene	1.27	UTB1.27 detect < 5x
L0705683	TB-053007-EBT-3	5/30/2007 12:00 AM	Methylene chloride	0.612F	UTB.61 detects < 10x
		5/30/2007 12:00 AM	Tetrachloroethene	1.09	UTB1.1 1 detects < 5x

SDG	Sample ID	Sample Date	Analyte	Result	Qualifier
L0706016	TB-053107-EBT-3	5/31/2007 12:01 AM	Methylene chloride	0.611F	UTB.61 detects < 10x
		5/31/2007 12:01 AM	Tetrachloroethene	1.07	UTB1.1 detects < 5x
L0706043	RB1-EBT-3	6/1/2007 11:10 AM	1,4-Dichlorobenzene	0.615	UFB.62 detects < 5x0
		6/1/2007 11:10 AM	Acetone	11	UFB11 detects < 10x
		6/1/2007 11:10 AM	MEK (2-Butanone)	4.52F	UFB4.5 detects < 10x
		6/1/2007 11:10 AM	Methylene chloride	0.304F	From second RB
		6/1/2007 11:10 AM	Tetrachloroethene	0.273F	None, detects > 5x
	RB2-EBT-3	6/1/2007 03:58 PM	Chloroform	0.815	UFB detects < 5x
		6/1/2007 03:58 PM	Methylene chloride	0.58F	UFB0.58 detects < 10x
		6/1/2007 03:58 PM	Tetrachloroethene	0.443F	None, detects > 5x
L0706043	TB-060107-EBT-3	6/1/2007 12:01 AM	Chloromethane	1.96	None, all ND
L0706073	TB-060407-EBT-3	6/4/2007 12:01 AM	Methylene chloride	0.586F	UTB0.59 detects < 10x
		6/4/2007 12:01 AM	Tetrachloroethene	1.02	UTB1.0 detects < 5x
L0706104	TB-060507-EBT-3	6/5/2007 12:01 AM	Methylene chloride	0.513F	UTB0.51 detects < 10x
		6/5/2007 12:01 AM	Tetrachloroethene	1.01	UTB1.0 detects < 5x
L0706151	TB-060607-EBT-3	6/6/2007 12:01 AM	Methylene chloride	0.647F	UTB0.65 detects < 10x
		6/6/2007 12:01 AM	Tetrachloroethene	0.986F	UTB0.99 detect < 5x
L0706201	TB-060707-EBT-3	6/7/2007 12:01 AM	Methylene chloride	0.972F	UTB0.97 detects < 10x
		6/7/2007 12:01 AM	Tetrachloroethene	2.06	UTB2.1 detect < 5x

X. FIELD QC

If Field duplicates were identified, they met guidance RPD of < 35% for water or < 50% for soils. For values reported at < 5 x the reporting limit (RL), a difference of 2 x RL is used as guidance (4 x RL for soils). Data are not qualified for field duplicates as these are evaluated for the total project by the client.
Yes ___X___ No ___ NA____

There are 9 identified field duplicates. Observations are summarized in the table. Agreement is generally very good between the field duplicate and the parent sample.

SDG	Client Sample ID	Parent Sample	Observations
L0706104	DUP1-EBT-3	IW21-01B-EBT-3	OK
L0706151	DUP2-EBT-3	IW21-04A-EBT-3	OK
L0706043	DUP3-EBT-3	IW101-01A-EBT-3	OK
L0706043	DUP4-EBT-3	IW101-03C-EBT-3	OK
L0706104	DUP5-EBT-3	IW101-09A-EBT-3	OK
L0706201	DUP6-EBT-3	IW92-02-EBT-3	OK
L0705683	DUP7-EBT-3	PMW101-01B-EBT	OK
L0706043	DUP8-EBT-3	PMW101-08A-EBT-3	OK
L0706016	DUP9-EBT-3	PMW85-05-EBT-3	OK

XI. SYSTEM PERFORMANCE

A. The RICs, chromatograms, tunes and general system performance were acceptable for all instruments and analytical systems.
Yes ____ No____ NA__X__

Not part of this review level

B. The suggested EQLs for the sample matrices in this set were met.

Yes __X__ No____ NA____

Dilutions were necessary in some cases to achieve the proper quantification of high-level targets, which raises the EQLs for all other targets in the run. In such cases, the both results are provided in hardcopy except for the analytes that are above the upper range in the initial run. These are only shown for the reanalysis.

In the EDD, only the initial run is provided for most analytes, and only the reanalysis is provided for the analytes which are above the upper linear range in the first run.

XII. TCL COMPOUNDS

A. The identification is accurate and all retention times, library spectra and reconstructed ion chromatograms (RIC) were evaluated for all detected compounds.
Yes____ No____ NA __X__

Not part of this review level

B. Quantitation was checked to determine the accuracy of calculations for representative compounds in each internal standards quantitation set.
Yes ____ No____ NA__X__

Not part of this review level

XIII. TENTATIVELY IDENTIFIED COMPOUNDS

TICs were properly identified and met the library identification criteria.
Yes____ No____ NA__X___

Not part of this review level

XIV. OVERALL ASSESSMENT OF THE CASE

The laboratory has complied with the requested method. Data are fully usable after consideration of qualifiers.
The following is noted:

Chain of Custody/Deliverables:
The project manager is informed of the following and the chain information is to be updated for the project file.

Most of the SDGs do not have a customary chain of custody. Those have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers.
They have been improved since we first pointed out these issues in that each page does have a printed area for sampler name, date, time, and signature. However, there is no similar printed area for receipt signatures, dates, and times to be entered. . Previously, the laboratory has not always signed each page. In this case, all pages had laboratory receipt signature, date and time, but in the case of SDGs L0706201, L0706073, and L0706104 the receipt time is not present. The receipt time is shown in each case on the sample receiving checklist.

A few sample names are being truncated on the Chain of Custody because the field width is not sufficient to allow the full name to appear. This seems to be a less severe problem than in the past, but it still does occur.

Our understanding is that the chain of custody is a printout of an electronic sample documentation system. We reiterate our recommendation that the printout be improved to add a printed area for the laboratory to receive the samples, and to include page numbers. Preferably, the laboratory signature should appear on each page of the Chain of Custody, but at the very least should appear each time a new COC# is applied. Alternatively, some type of electronic signature system could be used using a system compliant with EPA's proposed cross-media electronic reporting rule. The present system does not appear to fully protect the data from potential challenge.

Sample Condition:
Most of the SDGs had at least one cooler that was under 2°C but the Sample Checklist states that the samples weren't frozen. No qualifiers are required under these circumstances.

In addition, new EPA regulations (See Federal Register, March 12, 2007, 40CFR Part 122) require only that the temperature of samples delivered to the laboratory be less than 6° C. Thus the sample receipt conditions are fully compliant with applicable regulations.

L0705656: Sample Receipt Checklist states that the sample containers and labels were not intact and did not match COC. Further it says that the "chains not scanned correct". We could not find any further documentation of the issue, and no discussion of corrective action. The narrative states that all samples were received intact.
L0706151: Sample IW21-05B-EBT-3 and TB060607 were received but not on the Chain of Custody.

Initial Calibrations:
Only one initial calibration, conducted on May 8, shows any %RSD outliers that were not converted to a regression curve. Only m-,p-xylenes have this problem, with a %RSD of 38.4% on the HPMS6 instrument. The associated samples have no detections of this analyte, so no qualifiers are added.

Continuing Calibrations:
See the table within the report for %D outliers observed. When there are no detections, unless the %D is biased low and so large as to indicate a significant probability of false negatives, no qualifiers are added for %D outliers when targets are not detected. When targets are detected, the qualifier added is JC#, indicating the possibility of some bias associated with calibration drift, where # is the % D observed. In this case qualifiers have been added for some detected compounds.

LCS Recoveries:
The full target list has been spiked. There are a few elevated recoveries observed as shown in the table within the report. When a high recovery is associated with a non-detect in samples, no qualifier is added since the indicated bias is high. When the target is detected, the result is qualified as JL#, where # is the elevated recovery. There are no low recoveries in this set so no qualifiers for low recoveries have been required.

Matrix Spikes:
There are 5 MS/MSDs which meets the 1:20 ratio.

Matrix Spikes in Project:

SDG	Client Sample ID	Lab Sample ID
L0705683	IW101-02C-EBT-3	L0705683-10
L0706043	DR1-3-EBT-3	L0706043-09
L0706073	IW101-07C-EBT-3	L0706073-03
L0706151	IW21-03B-EBT-3	L0706151-10
L0706201	IW92-08-EBT-3	L0706201-04

The full target list has been spiked. Most MS/MSD recoveries and RPDs are in control. Instances where spike recoveries are out of limits are shown in the table within the report. In several instances, the sample amount is 4x the spike level or greater. In such cases, the recovery cannot realistically be calculated, because the anticipated normal analytical variability is on the order of the spike level. Thus no qualifiers are added. If recoveries are elevated and the parent sample has no detection of the target, no qualifiers are added.

Internal Standards:

L0705656 – Sample DR2-5-EBT-3 (lab sample 10) had the last internal standard (2,4-dichlorobenzene-d4) just out of limits at 49.9% recovery. Associated targets in that sample are qualified as JI49.9. This is not likely to create a significant bias. Surrogates are all within limits indicating that there is no impact to the data quantitation.

Method Blanks:

Contamination was observed in some method blanks indicated in the table within the report, below the reporting limit. Whenever methylene chloride or acetone is detected in associated samples at a level less than 10x the method blank (corrected for dilution), the result is qualified as UB#, where # is the corrected method blank level. Such results are usable as nondetects. Qualifiers added are summarized in the table. For other targets, the factor used is 5x.

Field Blanks:

There are 15 trip blanks and 8 rinse blanks. There are detections observed below the reporting limit as shown in the table within the report. Some of these are qualified UB due to detections in the associated method blank, thus are not used for qualifying associated samples. When analytes are present in both the field blank and the associated samples, the results in the samples are qualified in the same manner as for method blanks. For clarity, the qualifiers used in this case are UTB# for trip blanks and UFB# for rinse blanks.

EQLs:

Dilutions were necessary in some cases to achieve the proper quantification of high-level targets, which raises the EQLs for all other targets in the run. In such cases, the both results are provided in hardcopy except for the analytes that are above the upper range in the initial run. These are only shown for the reanalysis.

In the EDD, only the initial run is provided for most analytes, and only the reanalysis is provided for the analytes which are above the upper linear range in the first run.

Field QC:

There are 9 identified field duplicates. Observations are summarized in the table. Agreement is generally very good between the field duplicate and the parent sample.

ORGANIC DATA QUALITY REVIEW REPORT

GC REPORT FOR Metabolic Acids by HPLC; Ethane, Methane, Ethene, Carbon dioxide by EPA SOP RSK-175; and Hydrogen by AM20GAX (GC/RGD).

RSK-175:
SDG: L070: 5683, 6043, 6104, 6201, 5656, 6016, 6073, 6151

Metabolic acids:
SDG: L070: 5683, 6043, 6104, 6201, 5656, 6016, 6073, 6151

AM20GAX (Hydrogen):
SDG: P0706057, P0706054, P0706176, P0706184, P0706049, P0706151

PROJECT: Memphis Defense Depot, EBT-3 for e2m Texas

LABORATORY: Kemron Environmental Services, Marietta, OH; Hydrogen subcontracted to Microseeps, Inc, Pittsburg, PA

SAMPLE MATRIX: Water and Vapor

SAMPLING DATE (Month/Year): May, June 2007

NO. OF SAMPLES: Metabolic acids –97 waters including 2 rinse blanks; RSK-175 – 98 waters including 2 rinse blanks, AM20GAX – 87 vapor samples

ANALYSES REQUESTED: Metabolic Acids by HPLC; EPA SOP RSK-175, Microseeps AM20GAX

SAMPLE NO.: Attached

DATA REVIEWER: Sammy and John Huntington (Gateway Enterprises)

QA REVIEWER: Diane Short & Associates, Inc., INITIALS/DATE:__

Telephone Logs included Yes____ No _X_

Contractual Violations Yes____ No _X_

The project QAPP, EPA Contract Laboratory Program National Functional Guidelines for Organic Review, 2001 (SOP), the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, (SW-846), current updates, and the project-specific methods have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. The review has been tasked as Level III for review of all calibrations, holding times, and QC for all samples.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW), SW-846, or in the project contract.
Yes ____ No __X__
This is a Level III Report.
Initial calibration reports for RSK-175 are not accurate and complete. See the discussion in the calibration section. The initial calibration reports are misleading, and the laboratory should endeavor to produce summary initial calibration reports that are more accurately reflective of their calibrations.

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.
Yes __X__ No_____

III. HOLDING TIMES

A. The contract holding times were met for all analyses (Time of sample receipt to time of extraction and from extraction to analysis.)
Yes _____ No __X__
See Section B. below. Per EPA guidance, for validation purposes we calculate the holding time to the nearest day in cases where the regulation or method specifies holding time units of days.

B. The Clean Water Act (40 CFR 136) or method holding times were met for all analyses (Time of sample collection to time of extraction and from extraction to analysis.)
Yes _____ No __X__
Metabolic Acids: The reviewer has not been able to find documented holding times for the metabolic acids. The normal holding time for an analogous HPLC method 8310 is 14 days for preserved water samples. Metabolic acid holding times were all within 14 days except as noted in the table below. It has been verified on other projects that no holding time is established for these compounds. Samples are preserved with acid for this analysis, and the laboratory uses 28 days as a holding time specification based on the holding time tables provided. These compounds should be stable if protected from further microbial degradation, so we have not qualified results for holding times > 14 but < 28 days. In all cases, runs beyond 14 days were reanalyses to bring high-level targets into linear range.

SDG	SAMPLE NO	LAB ID	COMMENT	HT	Qualifier
L0706104	IW101-08C-EBT-3	12	rerun for high-level targets	**16**	None
L0706151	IW21-03B-EBT-3	10	rerun for high-level targets	**15**	None
	IW21-04B-EBT-3	2	rerun for high-level targets	**15**	None
	IW21-04A-EBT-3	1	rerun for high-level targets	**15**	None
	DUP-2-EBT-3	3	rerun for high-level targets	**15**	None
	IW85-06-EBT-3	13	rerun for high-level targets	**15**	None
	IW92-03-EBT-3	6	rerun for high-level targets	**15**	None
L0706016	PMW101-06B-EBT-3	14	rerun for high-level targets	**16**	None

RSK-175: For RSK-175, pH should not be adjusted when CO_2 is determined, which is the case in this project. It is not explicitly stated in the documentation whether samples for RSK-175 were pH-adjusted or not, but it appears that they were not. In the absence of definitive information we have assumed that no acidification occurred. If in fact samples were acidified for RSK-175, it would mean that inorganic carbon in the form of bicarbonate and carbonate would be converted to carbon dioxide, would consequently bias the results high for that analyte. The project manager should clarify this preservation question and regard the data for carbon dioxide accordingly. When pH is adjusted, the holding time is 14 days per the method, and we have used this as the acceptable holding time. No samples were analyzed beyond 14 days.

AM20GAX - Hydrogen: This method is a procedure developed by Microseeps, Inc. Recommended holding times in the procedure are 14 days. A few samples were analyzed outside of that holding time as shown in the table below. Sample results with holding times outside of the method recommendation are qualified as JH#, where # is the number of days by which the holding time was exceeded. A list of samples that are out of holding, along with the qualifiers added, is provided in the table below.

Microseeps indicates that samples are very stable in the vials used for this procedure, but we cannot provide a technical assessment of the stability for hydrogen analysis beyond the 14 days specified in the Microseeps procedure. We would assume that some losses of hydrogen could occur, with a resulting possibility of low bias.

SDG	SAMPLE_NO	LAB_ID	BATCH_NO	HT	Qualifier
P0706176	IW21-03A	10A	M070621018	**15**	JH1
	IW21-03B	02A	M070621018	**15**	JH1
	IW21-02B	17A	M070621018	**15**	JH1
	IW101-09C	04A	M070621018	**15**	JH1
	IW21-01A	08A	M070621018	**16**	JH2
	DUP-1	16A	M070621018	**16**	JH2
	PMW21-04	24A	M070621018	**17**	JH3
	IW21-05A	05A	M070621018	**15**	JH1

C. All chains of custody are complete with signatures and dates.
Yes ____ No __X__
The project manager is informed of the following and the chain information is to be updated for the project file.

Most of the SDGs do not have a customary chain of custody. Those have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers.

They have been improved since we first pointed out these issues in that each page does have a printed area for sampler name, date, time, and signature. However, there is no similar printed area for receipt signatures, dates, and times to be entered. All relinquished signatures, dates and times are on all pages of the Chains of Custody. Previously, the laboratory has not always signed each page. In this case, all pages had laboratory receipt signature, date and time, but in the case of SDGs L0706201, L0706073, and L0706104 the receipt time is not present. The receipt time is shown in each case on the sample receiving checklist.

A few sample names are being truncated on the Chain of Custody because the field width is not sufficient to allow the full name to appear. This seems to be a less severe problem than in the past, but it still does occur. Our understanding is that the chain of custody is a printout of an electronic sample documentation system. We reiterate our recommendation that the printout be improved to add a printed area for the laboratory to receive the samples, and to include page numbers. Preferably, the laboratory signature should appear on each page of the Chain of Custody, but at the very least should appear each time a new COC# is applied. Alternatively, some type of electronic signature system could be used using a system compliant with EPA's proposed cross-media electronic reporting rule. The present system does not appear to fully protect the data from potential challenge.

For hydrogen analysis, conventional chain of custody documents were used. All were properly signed and dated except for the document associated with SDG P0706054, which had no received date and time. In addition, shipping documents or tracking numbers covering the period of shipment were not provided. We could also locate no record of sample temperature on receipt.

D. Samples were received at the proper temperature and preservation.
Yes ___ No __X___
Most of the SDGs had at least one cooler that was under 2°C. No qualifiers are required under these circumstances as long as samples are intact.

In addition, new EPA regulations (See Federal Register, March 12, 2007, 40CFR Part 122) require only that the temperature of samples delivered to the laboratory be less than 6° C. Thus the sample receipt temperatures are fully compliant with applicable regulations.

L0706043: Sample receipt checklist states that the pH ranges were not acceptable. The laboratory indicates on the checklist that this applied to two samples, DUP-3 and IW101-01A (metals and metabolic acids). The notes indicate that the laboratory adjusted the pH.

L0706073: Sample receipt checklist states that the pH ranges were not acceptable. The laboratory checklist indicates that the pH for IW101-04A had a pH of 4.5 (metals and metabolic acids). It does not indicate if the laboratory adjusted the pH.

L0706151: Sample receipt checklist states that the pH ranges were not acceptable. The laboratory checklist and notes on the C of C (not signed and dated) indicate that there were several discrepancies: Sample IW21-05/b-EBT-3 was received but not on the Chain of Custody; samples IW21-05A for metals and metabolic acids were received at a pH of 3.5. Sample IW101-09C is indicated as having a broken container for metabolic acids. Actions taken have not been indicated.

L0706104: Sample receipt checklist states that the pH ranges were not acceptable. The laboratory checklist indicates that the pH was "out" for metals and metabolic acids for sample IW21-01A. There was no indication of actions taken by the laboratory.

L0706201: Sample receipt checklist states that the pH ranges were not acceptable. Sample IW92-06 was received at pH 6 for metabolic acids. No indication of actions taken by the laboratory is present. Sample IW92-04-EBT-33 was received but not on the Chain of Custody.

L0705683: Sample Receipt Checklist states that the sample containers and labels were not intact and match COC. Sample receipt checklist states that the pH ranges were not acceptable. PMW101-01A is shown as having a pH of 4.5. IW101-02C-EBT-MSD Metabolic Acids is shown as having a broken bottle. Sample DUP-7 is shown as having the pH out at 6, but not for which method. No indication is made of laboratory actions taken.

A buffer effect has been observed over the course of this project for Memphis samples. There do not seem to be cases where improper acid was added, only that the standard acid in the laboratory-supplied collection containers is insufficient for the buffering capacity of the sample matrix. As samples are cooled immediately and pH is adjusted as soon as they reach the laboratory, no qualifier has been added in the cases.

The laboratory has been diligent about documenting sample receipt problems. However, there should be more information about actions taken in response to them.

AM20GAX (Hydrogen): We were not able to locate any receipt temperature or any other documentation of sample condition for any of the hydrogen SDGs. The laboratory is being contacted in order to verify sample integrity.

IV. INSTRUMENT CALIBRATION (IC) AND CONTINUING CALIBRATION (CC) VERIFICATION

A. The GC/HPLC standards were analyzed at the required frequency (every 72 hours at a minimum).
Yes ___X___ No_____

B. The chromatographic resolution and separation criteria were met.
Yes __X__ No_____

C. The suggested columns were used and the EQLs were met.
Yes __X___ No_____

D. Calibration factors for IC met the 20% RSD limit or the regression curves were prepared with a correlation coefficient 'r' greater than 0.99, per SW-846, Method 8000B.
Yes _____ No __X___

MBA: The initial calibration reports for the metabolic acids are inaccurate. The calibration report provides only a %RSD for each analyte, with a note at the bottom that the linear calibration model is used. However, the observed r or r^2 values are not reported, although the criteria used are shown. In the Case Narrative, the laboratory has indicated that all initial calibrations have used linear regression, and that all acceptance criteria are met.

In the previous level IV data review for this project, we were able to confirm from the raw data that regression curves were in fact used and that they met criteria. We cannot confirm this for the present Level III review, but have assumed that the laboratory Case Narrative is correct and have not qualified the results for the %RSDs in the initial calibration reports that are out of limits. We have, however, documented these in the table below. RSDs are out of the method limits as noted in the tables and if they are accureate, detected data would be qualified for biases proportional to the %RSD.

We would urge the laboratory to correct the system that produces these inaccurate ICAL reports.

RSK-175: All initial calibrations are in control.

AM20GAX (Hydrogen): All initial calibrations are conducted using a linear regression curve and all are in control.

Method	SDG	ICAL Date	Batch#	Analyte	%RSD	Qualifiers
M.A.	L0706073	6/1/07 14:25	WG241845 & WG241968	Propionic Acid	91.9	None, see text
	L0706151	6/15/07 15:08	WG242734	Acetic Acid	172	None, see text
				Butyric Acid	159	None, see text

Method	SDG	ICAL Date	Batch #	Analyte	%RSD	Qualifiers
				Lactic Acid	75.3	None, see text
				Propionic Acid	95.0	None, see text
				Pyruvic Acid	25.1	None, see text
	L0706016	6/1/07 14:25	WG241740 except sample 14RE	Propionic Acid	91.9	None, see text
		6/15/07 15:08	WG241740 ONLY ample 14RE	Acetic Acid	172	None, see text
				Butyric Acid	159	None, see text
				Lactic Acid	75.3	None, see text
				Propionic Acid	95.0	None, see text
				Pyruvic Acid	25.1	None, see text
	L0706043	6/1/07 14:25	WG241845	Propionic Acid	91.9	None, see text
	L0705683	6/1/07 14:25	WG241625	Propionic Acid	91.9	None, see text
	L0706201	6/15/07 15:08	WG242744	Acetic Acid	172	None, see text
				Butyric Acid	159	None, see text
				Lactic Acid	75.3	None, see text
				Propionic Acid	95.0	None, see text
				Pyruvic Acid	25.1	None, see text
	L0705656	6/1/07 14:25	WG241625	Propionic Acid	91.9	None, see text
	L0706104	6/1/07 14:25	WG241968 (1-9)	Propionic Acid	91.9	None, see text
		6/15/07 15:08	WG241968 (1,3,4,5,6,9REs) WG242734 (1-13 REs)	Acetic Acid	172	None, see text
				Butyric Acid	159	None, see text
				Lactic Acid	75.3	None, see text
				Propionic Acid	95.0	None, see text
				Pyruvic Acid	25.1	None, see text

E. Percent Difference (%D's) for Continuing Calibration Factors and retention times (RT) were within the 25% Limits.

Yes ____ No ___X__

MBA: All calibrations are in control. The laboratory is employing the external standard method and is using opening and closing calibrations appropriately.

RSK-175: The laboratory conducts opening and closing calibrations (bracketing the samples during the analytical run). For RSK-175 there is not a specific requirement in the procedure for closing calibrations, and only calibration verification each 12 hours is specified. SW-846 guidance (method 8000B), however specifically requires such closing calibrations for external standard methods. For detected analytes, SW-846 specifies that the closing calibration must meet the same criteria as the opening calibration. This has been achieved for all analytes but for carbon dioxide, for which a number of opening and closing calibrations do not meet the 30% D criterion specified for RSK-175.

In such cases, detected levels of carbon dioxide are qualified as JC#, where # is the applicable opening or closing CCV outlier. Such results may be biased due to calibration drift. Please see the qualified reports or the EDD for details.

It should be noted in this regard that the laboratory appears to use a different criterion for carbon dioxide, since a few CCV results were flagged as being outside of limits, but it is not clear to this reviewer where the laboratory limit is set. This method has not been published as a promulgated method by EPA (it rather exists as an open literature publication and an internal EPA SOP), and it may not have been fully developed for carbon dioxide. Thus the laboratory limits may be realistic for this analyte. Nonetheless, the results appear to indicate a probable bias which should be considered in using the data.

AM20GAX: All calibrations are in control. The laboratory is employing the external standard method. There are no closing CCVs reported in the data package.

V. BLANKS

A. Laboratory blanks

1. Laboratory blanks were analyzed for every sample set and for each matrix type or once in every ten samples, whichever is more frequent.
Yes __X__ No_____

2. No blank contamination was found in the method blank.
Yes _____ No __X__
Method blanks for hydrogen analysis and for metabolic acids are in control.

There are a number of method blanks for RSK-175 which have low-level detections (*) of methane and carbon dioxide, as shown in the table below. When the associated sample result is less than 5x the method blank level (corrected for sample dilution), the sample result is qualified as UB#, where # is the corrected method blank result. Such results are usable as non-detected values.

Method	SDG	Batch	Targets Detected	Target	Qualifiers
RSK-175	L0705683	WG241851	carbon dioxide	373*	UB# detections < 5x
	L0705656	WG241424	methane	.274*	UB0# detections < 5x
	L0706043	WG242585	methane	.281*	None, all > 5x
	L0706104	WG242585	methane	.281*	None, all > 5x
	L0706073	WG242585	methane	.281*	UB# detections < 5x
MBAs			ALL IN CONTROL		None
AM20GAX			ALL IN CONTROL		None

3. Instrument blank analysis was performed following all samples that contained analytes at high concentrations.
Yes _____ No____ NA__X___

B. Field Blanks
If field blanks were identified, no blank contamination was found.
Yes _____ No__X ___ NA_____
MBA: Two rinse blanks contain butyric acid.
RSK-175: One rinse blank has a detection of methane below the reporting limit.
AM20GAX (Hydrogen): No rinse blanks are present. For hydrogen such blanks are unnecessary.

Method	SDG	Sample ID	Sample Date	Analyte	Result	Qualifier
MBA	L0706043	RB1-EBT-3	6/1/2007 11:10 AM	Butyric Acid	1.37	UFB# detects < 5x
	L0706043	RB2-EBT-3	6/1/2007 03:58 PM	Butyric Acid	0.968F	From first RB
RSK175	L0706043	RB1-EBT-3	6/1/2007 11:10 AM	All OK	All OK	None
	L0706043	RB2-EBT-3	6/1/2007 03:58 PM	Methane	0.26F	None, related samples > 5x

VI. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

A. Matrix spike (MS) and matrix duplicate or matrix spike duplicate (MSD) were analyzed for every analyses performed for every 20 samples or for every matrix whichever is more frequent.
Yes __X___ No ____
RSK-175: There were five (5) MS/MSDs which meet the 20 to 1 ratio.

Metabolic Acids: There were five (5) MS/MSDs which meet the 20 to 1 ratio.
AM20GAX: There are no MS/MSDs for this method. They are not required or possible for hydrogen analysis.
The MS/MSDs conducted are summarized in the table below.

Method	SDG	Client Sample ID	Lab Sample ID
RSK175\5021	L0705683	IW101-02C-EBT-3	L0705683-10
	L0706043	DR1-3-EBT-3	L0706043-09
	L0706073	IW101-07C-EBT-3	L0706073-03
	L0706151	IW21-03B-EBT-3	L0706151-10
	L0706201	IW92-08-EBT-3	L0706201-04
830-MBA	L0705683	IW101-02C-EBT-3	L0705683-10
	L0706043	DR1-3-EBT-3	L0706043-09
	L0706073	IW101-07C-EBT-3	L0706073-03
	L0706151	IW21-03B-EBT-3	L0706151-10
	L0706201	IW92-08-EBT-3	L0706201-04

B. The MS and MSD percent recoveries (%R) were within the limits defined by the laboratory or in the contract.
Yes _____ No __X__
RSK-175: Carbon dioxide gave MS/MSD outliers as shown in the table below. In some cases, the sample level is greater than 4x the spike amount, which means that the anticipated normal analytical variability is greater than the spike amount. In such cases, no recovery can meaningfully be calculated, and no qualifiers are added. There is no indication of bias. In other cases, qualifiers are added to the parent as JS#, where # is the recovery observed, and a bias may be present proportional to the recovery.

MBA: Metabolic acid MS/MSDs had several outliers. A matrix bias roughly proportional to the recovery appears to be present in these instances. Such results are qualified for the parent as JS#, where # is the recovery which is out of limits. In several cases pyruvic acid is recovered below 10%. These results are qualified for the parent sample only as RS# (rejected) to indicate that the sample non-detect is rejected because of an apparent very low bias. False undetected data could be reported if the compound is potentially present at this location.

MS/MSD Outliers

Method	SDG	Client Sample ID	Lab Sample ID	Type	Analyte	Recov	RPD	Qualifiers
MBA	L0705683	IW101-02C-EBT-3	10	MS	Propionic Acid	-89.3		None, parent> 4x spike
		IW101-02C-EBT-3		MSD	Propionic Acid	-85.8		None, parent> 4x spike
		IW101-02C-EBT-3		MS	Acetic Acid	-94.4		None, parent> 4x spike
		IW101-02C-EBT-3		MSD	Acetic Acid	-93.3		None, parent> 4x spike
	L0706073	IW101-07C-EBT-3	·03	MS	Acetic Acid	19.3		JS19 Parent
		IW101-07C-EBT-3		MSD	Acetic Acid	33.8		From MS
		IW101-07C-EBT-3		MS	Propionic Acid	-1.32		None, parent> 4x spike
		IW101-07C-EBT-3		MSD	Propionic Acid	-1.74		None, parent> 4x spike
	L0706151	IW21-03B-EBT-3	10	MS	Acetic Acid	-159		None, parent> 4x spike
		IW21-03B-EBT-3		MSD	Acetic Acid	-193		None, parent> 4x spike
		IW21-03B-EBT-3		MS	Butyric Acid	49.0		JS49 Parent

Method	SDG	Client Sample ID	Lab Sample ID	Type	Analyte	Recov	RPD	Qualifiers
		IW21-03B-EBT-3		MSD	Butyric Acid	53.8		From MS
		IW21-03B-EBT-3		MS	Propionic Acid	-259		None, parent> 4x spike
		IW21-03B-EBT-3		MSD	Propionic Acid	-258		None, parent> 4x spike
		IW21-03B-EBT-3		MS	Pyruvic Acid	10.0		From MSD
		IW21-03B-EBT-3		MSD	Pyruvic Acid	9.54		RS9 5 Parent
	L0706201	IW92-08-EBT-3	03	MS	Acetic Acid	-296		None, parent> 4x spike
		IW92-08-EBT-3		MSD	Acetic Acid	-297		None, parent> 4x spike
		IW92-08-EBT-3		MS	Propionic Acid	-582		None, parent> 4x spike
		IW92-08-EBT-3		MSD	Propionic Acid	-523		None, parent> 4x spike
		IW92-08-EBT-3		MS	Pyruvic Acid	8.09		From MSD
		IW92-08-EBT-3		MSD	Pyruvic Acid	7.02		RS7 Parent
		IW92-08-EBT-3		MS	Butyric Acid	56.5		From MSD
		IW92-08-EBT-3		MSD	Butyric Acid	44.1		JS44 Parent
RSK175	L0705683	IW101-02C-EBT-3	10	MS	Methane	149		From MSD
		IW101-02C-EBT-3		MSD	Methane	185		JS185 Parent
		IW101-02C-EBT-3		MS	Carbon Dioxide	OK		None
		IW101-02C-EBT-3		MSD	Carbon Dioxide	170		None, parent> 4x spike
	L0706043	DR1-3-EBT-3	09	MS	Carbon Dioxide	46		JS46
		DR1-3-EBT-3		MS	Methane	123		JS123 Parent
		DR1-3-EBT-3		MSD	Methane	121		From MS
	L0706073	IW101-07C-EBT-3	03	MS	Carbon Dioxide	156		JS156 Parent
		IW101-07C-EBT-3		MS	Methane	157	35.3	JS157D35 Parent
	L0706201	IW92-08-EBT-3	04	MS	Methane	147		From MSD
		IW92-08-EBT-3		MSD	Methane	165		JS165 Parent

C. The MSD relative percent differences (RPD) were within the defined contract or laboratory limits.
Yes _____ No __X___

See the section above. The parent sample is qualified as JD#, where # is the RPD outlier, when both RPD and spike recoveries are out of limits. Otherwise samples are not qualified for RPD outliers.

D. The MS/MSD were client samples.
Yes __X__ No _____

VII. LABORATORY CONTROL SAMPLE AND DUPLICATE (LCS/LCSD)

A. Laboratory Control Sample (LCS) and LCS duplicate were analyzed for every analyses performed and for every 20 samples or for every matrix whichever is more frequent.
Yes __X___ No_____

B. The LCS percent recovery (%R) are within the limits defined by the laboratory or in the contract.
Yes ____ No __X__

MBA: All LCS recoveries are in control.

RSK-175: All LCS recoveries are in control except for one carbon dioxide LCS with a high recovery as shown in the table below. The LCSD was in control, and the %RSD was in control. The Associated sample detections are qualified as JL176 to indicate that there is a possible high laboratory accuracy bias for these samples.
MBA: All in control
AM20GAX (Hydrogen): All LCS recoveries are in control.

Method	SDG	Lab Sample #	Batch	Targets Detected	LCS/LCSD/RPD	Qualifiers
RSK-175	L0705656		WG241689	carbon dioxide	176/OK/OK	JL176
	L0705683		WG241689	carbon dioxide	176/OK/OK	JL176

VIII. SURROGATE RECOVERY

A. The Surrogate spike was analyzed with every sample.
Yes _____ No ____ NA_X___
RSK-175: Surrogates are not required for this analysis.
Metabolic Acids: Surrogates are not required for this analysis.
AM20GAX (Hydrogen): Surrogates are not applicable to this method.

B. And met the recovery limits defined in the current contract. If recovery limits were exceeded, the sample was re-extracted and re-analyzed.
Yes _____ No_____ NA __X___

IX. INTERNAL STANDARDS

The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows. Note: Internal standards are not required for GC analysis, but if they are used, SW-846 stipulates that they meet the same recovery requirements as those specified for GCMS methods.
Yes ____ No _____ NA__X__
RSK-175, Metabolic Acids, AM20GAX: The laboratory uses the external standard procedure, so no internal standards are present or required.

X. FIELD QC

If Field duplicates were identified, they met guidance RPD of < 35% for water or < 50% for soils and gases. For values reported at < 5 x the reporting limit (RL), a difference of 2 x RL is used as guidance (4 x RL for soils). Data are not qualified for field duplicates as these are evaluated for the total project by the client.
Yes _____ No _X___ NA_____
There are 9 field duplicates for RSK-175 and metabolic acids. For hydrogen analysis there are 8 field duplicates, but for DUP8 and DUP2, the parent sample designated by the client is not present. As shown in the table below, there are several field duplicate results that are significantly different from the parent sample. In particular for hydrogen, DUP-1 has a reported result of 2600 whereas the parent has a result of 2.1. The hydrogen results should be reviewed for dilution factor errors or sample designation errors.

SDG	Client Sample ID	Parent Sample	Observations
L0706104	DUP1-EBT-3	IW21-01B-EBT-3	MBA: Lactic acid 13.5 in DUP, ND in sample;RSK-175: All OK Hydrogen: DUP 2600, parent 2.1
L0706151	DUP2-EBT-3	IW21-04A-EBT-3	MBA: All OK;RSK-175: All OK;Hydrogen: Parent not present
L0706043	DUP3-EBT-3	IW101-01A-EBT-3	MBA. All OK;RSK-175: All OK;Hydrogen: OK
L0706043	DUP4-EBT-3	IW101-03C-EBT-3	MBA: All OK;RSK-175: Carbon dioxide RPD=74%;Hydrogen· OK

SDG	Client Sample ID	Parent Sample	Observations
L0706104	DUP5-EBT-3	IW101-09A-EBT-3	MBA: All OK;RSK-175: All OK;Hydrogen: RPD=110%
L0706201	DUP6-EBT-3	IW92-02-EBT-3	MBA: Butyric acid RPD=38%;RSK-175: All OK;Hydrogen: Parent and DUP not present
L0705683	DUP7-EBT-3	PMW101-01B-EBT	MBA: All OK;RSK-175: All OK;Hydrogen: OK
L0706043	DUP8-EBT-3	PMW101-08A-EBT-3	MBA: Acetic acid 41.5 in DUP, ND in sample;RSK-175: Methane RPD 41%; Hydrogen: Parent not present
L0706016	DUP9-EBT-3	PMW85-05-EBT-3	MBA: All OK;RSK-175: All OK;Hydrogen: OK

XI. COMPOUND IDENTIFICATION

A. All raw data chromatograms and data system printouts were evaluated for all detected compounds and the identification is accurate.

Yes ____ No _____ NA __X__

This evaluation is not performed at this level of review.

B. Retention time limits or peak pattern identifications are met.

Yes _____ No _____ NA__X__

This evaluation is not performed at this level of review.

C. If two column or two detector confirmation was performed, the value of the confirmation was within 25%D of the quantitation value for results > 5 x RL. If the laboratory has flagged data 'COL' for %D > 40%, a JP qualifier has been added for low level results. For values below (5 x RL), the difference is not considered to impact the precision of the data.

Yes ____ No ____ NA __X__

Not part of this level of review. Dual columns are not required for these methods.

XII. COMPOUND QUANTITATION AND REPORTED CRQLS

A. Raw data examination verified that all sample results were correctly calculated.

Yes _____ No_____ NA__X__

This evaluation is not performed at this level of review.

B. The chromatograms and general system performance were acceptable for all instruments and analytical systems.

Yes _____ No _____ NA__X__

This evaluation is not performed at this level of review.

XIII. OVERALL ASSESSMENT OF THE CASE

The method criteria have been met and the quality of the data, after consideration of qualifiers, is considered acceptable and usable as far as can be determined at this level of review.
The following is noted:

Deliverables:
This is a Level III Report.
Initial calibration reports for RSK-175 are not accurate and complete. See the discussion in the calibration section. The initial calibration reports are misleading, and the laboratory should endeavor to produce summary initial calibration reports that are more accurately reflective of their calibrations.

Chain of Custody and Login Checklists:
The project manager is informed of the following and the chain information is to be updated for the project file.

Most of the SDGs do not have a customary chain of custody. Those have a running list of samples with date and time collected with no relinquished and received areas at the bottom of each page. They do not have page numbers.

They have been improved since we first pointed out these issues in that each page does have a printed area for sampler name, date, time, and signature. However, there is no similar printed area for receipt signatures, dates, and times to be entered. All relinquished signatures, dates and times are on all pages of the Chains of Custody. Previously, the laboratory has not always signed each page. In this case, all pages had laboratory receipt signature, date and time, but in the case of SDGs L0706201, L0706073, and L0706104 the receipt time is not present. The receipt time is shown in each case on the sample receiving checklist.

A few sample names are being truncated on the Chain of Custody because the field width is not sufficient to allow the full name to appear. This seems to be a less severe problem than in the past, but it still does occur. Our understanding is that the chain of custody is a printout of an electronic sample documentation system. We reiterate our recommendation that the printout be improved to add a printed area for the laboratory to receive the samples, and to include page numbers. Preferably, the laboratory signature should appear on each page of the Chain of Custody, but at the very least should appear each time a new COC# is applied. Alternatively, some type of electronic signature system could be used using a system compliant with EPA's proposed cross-media electronic reporting rule. The present system does not appear to fully protect the data from potential challenge.

For hydrogen analysis, conventional chain of custody documents were used. All were properly signed and dated except for the document associated with SDG P0706054, which had no received date and time. In addition, shipping documents or tracking numbers covering the period of shipment were not provided. We could also locate no record of sample temperature on receipt.

Sample Condition:
Most of the SDGs had at least one cooler that was under 2°C. No qualifiers are required under these circumstances as long as samples are intact.

In addition, new EPA regulations (See Federal Register, March 12, 2007, 40CFR Part 122) require only that the temperature of samples delivered to the laboratory be less than 6° C. Thus the sample receipt temperatures are fully compliant with applicable regulations.

L0706043: Sample receipt checklist states that the pH ranges were not acceptable. The laboratory indicates on the checklist that this applied to two samples, DUP-3 and IW101-01A (metals and metabolic acids). The notes indicate that the laboratory adjusted the pH.

L0706073: Sample receipt checklist states that the pH ranges were not acceptable. The laboratory checklist indicates that the pH for IW101-04A had a pH of 4.5 (metals and metabolic acids). It does not indicate if the laboratory adjusted the pH.

L0706151: Sample receipt checklist states that the pH ranges were not acceptable. The laboratory checklist and notes on the C of C (not signed and dated) indicate that there were several discrepancies: Sample IW21-05/b-EBT-3 was received but not on the Chain of Custody; samples IW21-05A for metals and metabolic acids were received at a pH of 3.5. Sample IW101-09C is indicated as having a broken container for metabolic acids. Actions taken have not been indicated.

L0706104: Sample receipt checklist states that the pH ranges were not acceptable. The laboratory checklist indicates that the pH was "out" for metals and metabolic acids for sample IW21-01A. There was no indication of actions taken by the laboratory.

L0706201: Sample receipt checklist states that the pH ranges were not acceptable. Sample IW92-06 was received at pH 6 for metabolic acids. No indication of actions taken by the laboratory is present. Sample IW92-04-EBT-33 was received but not on the Chain of Custody.

L0705683: Sample Receipt Checklist states that the sample containers and labels were not intact and match COC. Sample receipt checklist states that the pH ranges were not acceptable. PMW101-01A is shown as having a pH of 4.5. IW101-02C-EBT-MSD Metabolic Acids is shown as having a broken bottle. Sample DUP-7 is shown as having the pH out at 6, but not for which method. No indication is made of laboratory actions taken.

A buffer effect has been observed over the course of this project for Memphis samples. There do not seem to be cases where improper acid was added, only that the standard acid in the laboratory-supplied collection containers is insufficient for the buffering capacity of the sample matrix. As samples are cooled immediately and pH is adjusted as soon as they reach the laboratory, no qualifier has been added in the cases.

The laboratory has been diligent about documenting sample receipt problems. However, there should be more information about actions taken in response to them.

AM20GAX (Hydrogen): We were not able to locate any receipt temperature or any other documentation of sample condition for any of the hydrogen SDGs.

Holding times:

Metabolic Acids: The reviewer has not been able to find documented holding times for the metabolic acids. The normal holding time for an analogous HPLC method 8310 is 14 days for preserved water samples. Metabolic acid holding times were all within 14 days except as noted in the table within the report. It has been verified on other projects that no holding time is established for these compounds. Samples are preserved with acid for this analysis, and the laboratory uses 28 days as a holding time specification based on the holding time tables provided. These compounds should be stable if protected from further microbial degradation, so we have not qualified results for holding times > 14 but < 28 days. In all cases, runs beyond 14 days were reanalyses to bring high-level targets into linear range.

RSK-175: For RSK-175, pH should not be adjusted when CO_2 is determined, which is the case in this project. It is not explicitly stated in the documentation whether samples for RSK-175 were pH-adjusted or not, but it appears that they were not. In the absence of definitive information we have assumed that no acidification occurred. If in fact samples were acidified for RSK-175, it would mean that inorganic carbon in the form of bicarbonate and carbonate would be converted to carbon dioxide, would consequently bias the results high for that analyte. The project manager should clarify this preservation question and regard the data for carbon dioxide accordingly. When pH is adjusted, the holding time is 14 days per the method, and we have used this as the acceptable holding time. No samples were analyzed beyond 14 days.

AM20GAX - Hydrogen: This method is a procedure developed by Microseeps, Inc. Recommended holding times in the procedure are 14 days. A few samples were analyzed outside of that holding time as shown in the table within the report. Sample results with holding times outside of the method recommendation are qualified as JH#, where # is the number of days by which the holding time was exceeded. A list of samples that are out of holding, along with the qualifiers added, is provided in the table within the report.

Microseeps indicates that samples are very stable in the vials used for this procedure, but we cannot provide a technical assessment of the stability for hydrogen analysis beyond the 14 days specified in the Microseeps procedure. We would assume that some losses of hydrogen could occur, with a resulting possibility of low bias.

Initial Calibrations:

MBA: The initial calibration reports for the metabolic acids are inaccurate. The calibration report provides only a %RSD for each analyte, with a note at the bottom that the linear calibration model is used. However, the observed r or r^2 values are not reported, although the criteria used are shown. In the Case Narrative, the laboratory has indicated that all initial calibrations have used linear regression, and that all acceptance criteria are met.

In the previous level IV data review for this project, we were able to confirm from the raw data that regression curves were in fact used and that they met criteria. We cannot confirm this for the present Level III review, but have assumed that the laboratory Case Narrative is correct and have not qualified the results for the %RSDs in the initial calibration reports that are out of limits. We have, however, documented these in the table within the report. RSDs are out of the method limits as noted in the tables and if they are accurate, detected data would be qualified for biases proportional to the %RSD.

We would urge the laboratory to correct the system that produces these inaccurate ICAL reports.

RSK-175: All initial calibrations are in control.

AM20GAX (Hydrogen): All initial calibrations are conducted using a linear regression curve and all are in control.

Continuing Calibrations:

MBA: All calibrations are in control. The laboratory is employing the external standard method and is using opening and closing calibrations appropriately.

RSK-175: The laboratory conducts opening and closing calibrations (bracketing the samples during the analytical run). For RSK-175 there is not a specific requirement in the procedure for closing calibrations, and only calibration verification each 12 hours is specified. SW-846 guidance (method 8000B), however specifically requires such closing calibrations for external standard methods. For detected analytes, SW-846 specifies that the closing calibration must meet the same criteria as the opening calibration. This has been achieved for all analytes but for carbon dioxide, for which a number of opening and closing calibrations do not meet the 30% D criterion specified for RSK-175.

In such cases, detected levels of carbon dioxide are qualified as JC#, where # is the applicable opening or closing CCV outlier. Such results may be biased due to calibration drift. Please see the qualified reports or the EDD for details.

It should be noted in this regard that the laboratory appears to use a different criterion for carbon dioxide but it is not clear to this reviewer where the laboratory limit is set, or what justification is used. This method has not been published as a promulgated method by EPA (it rather exists as an open literature publication and an internal EPA SOP), and it may not have been fully developed for carbon dioxide. Thus the laboratory limits may be realistic for this analyte. Nonetheless, the results appear to indicate a probable bias which should be considered in using the data.

AM20GAX: All calibrations are in control. The laboratory is employing the external standard method. There are no closing CCVs reported in the data package.

LCS Recoveries:
RSK-175: All LCS recoveries are in control except for one carbon dioxide LCS with a high recovery as shown in the table in the report. The LCSD was in control, and the %RSD was in control. The Associated sample detections are qualified as JL176 to indicate that there is a possible high laboratory accuracy bias for these samples.

MBA: All in control

AM20GAX (Hydrogen): All LCS recoveries are in control.

MS/MSD Recoveries:
RSK-175: There were five (5) MS/MSDs which meet the 20 to 1 ratio.

Metabolic Acids: There were five (5) MS/MSDs which meet the 20 to 1 ratio.

AM20GAX: There are no MS/MSDs for this method. They are not required or possible for hydrogen analysis.

The MS/MSDs conducted are summarized in the table within the report.

RSK-175: Carbon dioxide gave MS/MSD outliers as shown in the table in the report body. In some cases, the sample level is greater than 4x the spike amount, which means that the anticipated normal analytical variability is greater than the spike amount. In such cases, no recovery can meaningfully be calculated, and no qualifiers are added. There is no indication of bias. In other cases, qualifiers are added to the parent as JS#, where # is the recovery observed, and a bias may be present proportional to the recovery.

MBA: Metabolic acid MS/MSDs had several outliers. A matrix bias roughly proportional to the recovery appears to be present in these instances. Such results are qualified for the parent as JS#, where # is the recovery which is out of limits. In several cases pyruvic acid is recovered below 10%. These results are qualified for the parent sample only as RS# (rejected) to indicate that the sample non-detect is rejected because of an apparent very low bias. False undetected data could be reported if the compound is potentially present at this location.

Field Duplicates:
There are 9 field duplicates for RSK-175 and metabolic acids. For hydrogen analysis there are 8 field duplicates, but for DUP8 and DUP2, the parent sample designated by the client is not present. As shown in the table within the report, there are several field duplicate results that are significantly different from

the parent sample. In particular for hydrogen, DUP-1 has a reported result of 2600 whereas the parent has a result of 2.1. The hydrogen results should be reviewed for dilution factor errors or sample designation errors.

Method Blanks:
Method blanks for hydrogen analysis and for metabolic acids are in control.

There are a number of method blanks for RSK-175 which have low-level detections (*) of methane and carbon dioxide, as shown in the table within the report. When the associated sample result is less than 5x the method blank level (corrected for sample dilution), the sample result is qualified as UB#, where # is the corrected method blank result. Such results are usable as non-detected values.

Field Blanks:
MBA: Two rinse blanks contain butyric acid.

RSK-175: One rinse blank has a detection of methane below the reporting limit.

AM20GAX (Hydrogen): No rinse blanks are present. For hydrogen such blanks are unnecessary. Associated samples are qualified for field blank outliers in the same manner as for method blanks. The qualifiers added in this case are shown in the table within the report body.

INORGANIC DATA QUALITY REVIEW REPORT

METALS BY ICP SW-846 METHOD 6010B and WET CHEMISTRY

SDG: L070: 5656, 5683, 6016, 6043, 6073, 6104, 6151, 6201

PROJECT: Memphis Defense Depot Site; EBT3 phase for e2m, TX

LABORATORY: Kemron Laboratories, Marietta, OH

SAMPLE MATRIX: Water SAMPLING DATE (Month/Year): 5,6 / 07

ANALYSES REQUESTED: SW-846 Method 6010 (ICP), 9056 (IC) Bromide, Chloride, Nitrate, Nitrite, Sulfate, 9060 Total Organic Carbon; MCAWW Method 310.2 Alkalinity, Method 376.1 Sulfide

NO. OF SAMPLES: 110 Metals, 109 TOC, and 108 Wet Chemistry

SAMPLE NO: See attached results forms

DATA REVIEWER: Kulp Consulting

QA REVIEWER: Diane Short and Associates Inc. INITIALS/DATE: _________

Telephone Logs included Yes____ No X

Contractual Violations Yes____ No X

The project Sampling and Analysis Plan (SAP), the EPA Contract Laboratory Program National Functional Guidelines for Inorganic Review, 2002 and the SW-846 and MCAWW Methods have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. Per the Scope of Work, the review includes validation of all calibrations, chains of custody, and QC forms referencing the above documents.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work or project contract.

Yes __X__ No___

The following is noted for clarification:

Data are reviewed as Level III. No raw data review is to be required. Many of the Wet Chem methods, however, do not have standard reporting forms for the calibrations and these have been determined from the raw data provided.

The packages contained 110 metals, 109 TOC, and 108 wet chemistry samples analyzed for 3 project-specific ICP metals and 8 wet chemistry parameters. There were also 2 field blanks. All packages were reviewed for COC, holding time, summary QC and calibration. In addition, for all wet chemistry parameters (except for IC) the raw data were reviewed for initial instrument calibration (e.g. calibration curves) and ICV/CCV's, since no QC summaries were reported for them (again, except for IC). One SDG's 6043 was further evaluated for calibration blank results for all analyses.

II. CALIBRATIONS

A. All initial instrument calibrations were performed as defined in the contract or Statement of Work (SOW). All correlation coefficients of the 3 point curve were > 0.995.

Yes ____ No _X__ NA____

Per the raw data review, the Method 300 reports a % RSD of the response factors as part of the calibration criteria. The % RSD is not defined in the validation guidance, but good laboratory practice would recommend a minimum of 10% deviation for wet chemistry methods. Deviations greater than this value indicate variability of the instrument response over a range of concentrations. No data were qualified for the % RSD.

Several of the correlation coefficients for Alkalinity were less than 0.995. The validator recommends that the following qualifiers be applied to affected data. Data would be qualified JC#, where # is the correlation coefficient.

SDG	**Analyte**	**Correlation coefficient**	**Qualifier**
L0706073	Alkalinity	0.991	JC.991
L0706151	Alkalinity	0.992	JC.992
L0706104	Alkalinity	0.991	JC.991
L0706201	Alkalinity	0.992	JC.0992
L0706016	Alkalinity	0.994	JC.994, Samples 6-14
	Alkalinity	0.993	JC.993, Samples 1-5
L0706043	Alkalinity	0.994	JC.994
L0705683	Alkalinity	0.993	JC.993

B. The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were analyzed at the required frequency.

Yes __X__ No ____

Sequencing was not required, but sufficient calibrations were present to verify that the frequencies were met for client samples.

C. And the ICV and CCV standard percent recovery results were within the required control limits of 90 – 110% (Mercury 80 – 120%).

Yes __X_ No____

The requirements were met for client samples (IC used percent difference).

III. CRDL STANDARDS
The 2 x CRDL standards were analyzed as required in the SOW.
Yes ___ No ____ NA__X_
Not required.

IV. BLANKS
Note: the highest blank associated with any particular analyte is used for the qualification process and is the value entered after the "B" blank descriptor.

A. The initial calibration blanks (ICB) and continuing calibration blanks (CCB) were analyzed at the required frequency.
Yes ___X_ No____ NA ____
Sequencing was not required, but sufficient calibration blanks were present to verify that the frequencies were met for client samples.

B. And the ICB and CCB results were within the required control limits.
Yes ___X__ No____ NA _____
Per the 10% review of the QC summaries, there were no reported analyte detects reported in the calibration blanks.

C. And all analytes in the Leach Blank were less than the CRDL, or less than 2x the instrument detection limit (IDL), whichever is lower.
Yes____ No____ NA __X__
No TCLP analysis was performed.

V. PREPARATION BLANKS
A. Preparation blanks were prepared and analyzed at the required frequency.
Yes __X__ No ____

B. And all analytes in the preparation blank were less than the CRDL, or less than the instrument detection limit (IDL), whichever is lower.
Yes ____ No __X__
Analytes were found in the preparation blanks at levels requiring qualification for the following parameters.

SUMMARY TABLE FOR PREPARATION BLANKS

SDG	Result (mg/Kg)	Work Group	ANALYTE	QUALIFICATION
L0706073	0.53	WG242321	TOC	None, U or >5x
	0.54	WG242013	TOC	None, U or >5x
L0706151	0.53	WG242614	TOC	None, U or >5x
	0.53	WG242691	TOC	UB.53, detects <5X
L0706104	0.554	WG242441	TOC	UB.55, detects <5X
	0.553	WG242614	TOC	None, all >5X

	0.534	WG242691	TOC	None, all >5X
L0706201	0.534	WG242691	TOC	None, all >5X
	0.52	WG242777	TOC	None, all >5X
L0706016	0.547	WG241801	TOC	UB.55, detects <5X
	0.53	WG241873	TOC	UB.53, detects <5X
	0.54	WG242013	TOC	None, all >5X
L0705656	0.562		Sulfide	UB.56, detects <5X
	0.545	WG241472	TOC	UB.55, detects <5X
	0.547	WG241801	TOC	UB.55, detects <5X
L0706043	0.538	WG242013	TOC	None, all >5X
L0705683	0.547	WG241801	TOC	None, all >5X

Analytes reported as contaminants in the preparation blank are qualified UB# in the affected samples, where # is the value of the blank corrected to the units of the sample. Sample detects whose values are less than 5x blank are qualified UB and are fully usable as undetected values at that level.

C. Field, trip, decon rinse or other field blanks are contained and identified in the package.
Yes __X__ No ____ NA ____
Field Blanks are identified as RB1-EBT-3, RB2-EBT-3.

D. And the reported results are less than the CRDL or less than the IDL, whichever is lower.
Yes ____ No __X_ NA ____
There were some blank analyte detects reported in the field blanks, but all client data were either non-detect or much greater than the contamination with the following exceptions. Data are qualified UFB #, where # is the field blank value. Data are fully usable as undetected values. Only data less than 5 x blank are qualified.

Field Blank	**Sample**	**Analyte**	**Result**	**Qualifier**
RB1	L0706043-12	TOC	0.711	UFB.71
RB2	L0706043-3	TOC	1.03	UFB1

VIA. ICP INTERFERENCE CHECK SAMPLE
A. The Interference Check Sample (ICS) was analyzed as required in the SOW or contract.
Yes __X__ No____ NA____

B. And the ICS percent recovery results were reported for all required ICS analytes and were within required control limits of 80% to 120%.
Yes __X__ No ____ NA____

C. ICP analysis results for analytes not required to be present in a given ICS standard were within acceptable limits.
Yes ____ No ____ NA __X__
Not requested by client and data not provided by laboratory.

VIB. INTERELEMENT CORRECTION FACTORS
The Interelement Correction Factors are included and complete for all possible interferent analytes.
Yes ____ No____ NA__X__

Review of possible other contaminants was not requested by the client and is not applicable to limited list metals.

VII. SPIKE SAMPLE RECOVERY

A. A matrix (pre-digestion) spike sample was analyzed for each digestion group and/or matrix or as required in the SOW.

Yes __X__ No____

The laboratory ran variously either matrix duplicates or MS/MSD samples or both or neither. The client has identified the following MS/MSDs (all IDs end with EBT-3):

IW92-08, IW101-07C, IW21-03B, IW101-02C, DR1-3. Other samples may also have been used.

For a number of the wet chemistry analyses, no MS or MD was reported for the particular data set, but the overall frequency appears to have been met. When an MS or MD was not reported, an LCS, LCSD pair was reported. Final overall frequency will be determined by the project manager.

B. And the Matrix spike percent recoveries were within the required control limits of 75 – 125%.

Yes ____ No __X_ NA____

The following SDGs had matrix spike results that resulted in sample qualification.

SUMMARY TABLE FOR MS/MSD QUALIFIERS

SDG	ANALYTE	RESULT	QUALIFICATION
L0706073	Alkalinity	49.6/53 %	JS 53, detects
	TOC	160/ 168 %	JS168, detects
L0706151	TOC	106/159 %	None*
	Chloride	25.7/22.7 %	JS23
	Alkalinity	-6/-8.5 %	None*
L0706201	Chloride	59/67%	JS59
	Alkalinity	-14.9/0.43 %	None*
L0706043	Manganese	180/222 %	None *
	Alkalinity	55.8/60 %	JS56
L0705683	TOC	83/139 %	JS139

* The parent sample results were very high compared to the spike added, making the percent recoveries unreliable.

The samples were qualified JS#, where the # is the percent recovery of that particular analyte. A high matrix spike recovery indicates a possible high bias to the reported result. Only detected data are qualified. A low matrix spike recovery indicates a possible low bias to the reported result. A matrix spike recovery below 30% results in rejection of all non-detect data associated with that analyte. No data have been rejected.

B. A Post-digest spike was analyzed if required.

Yes __X__ No____ NA___

C. The MS/MSD samples included client samples
Yes __X_ No___ NA____
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

There were at least 5 client samples reported for MS/MSD samples and at least 6 client samples reported for wet chemistry MS/MSD or MD samples. This would meet project frequency of 1/20.

VIII. DUPLICATES

A. Matrix (pre-digestion) duplicate samples were analyzed at the required frequency
Yes __X__ No ____
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

The laboratory ran variously either matrix duplicates or MS/MSD samples or both or neither.

B. And the Matrix duplicate relative percent differences (RPD) were within the required control limits (Water 20%, Soil 35%) or the RL limits were met if the duplicate values are < 5 x RL. If the either one of the duplicate results are < 5 X RL, the RPD is not used. The QC limit used is the difference between the original and the duplicate results (± the RL) for water and (± 2X the RL) for soils.
Yes __X__ No ____ NA_____

IX. LABORATORY CONTROL SAMPLE

A. Laboratory control samples (LCS) were analyzed at the required frequency.
Yes _X___ No____
The laboratory also ran an LCS duplicate at times.

B. And LCS recoveries were within the required control limits of 80 to 120%.
Yes __X___ No____

X. MSA RESULTS AND GRAPHITE FURNACE ANALYSIS (GFAA)

Duplicate injections were performed for all analyses and the RSDs were less than 20% for all reported results. (Method of Standard Additions (MSA) requires only a single injection).
Yes ____ No____ NA__X___
Graphite furnace was not done.

XI. ICP SERIAL DILUTION

A. ICP Serial Dilutions have been analyzed at the required frequency if the analyte concentrations are greater than 50 x IDL.
Yes __X_ No____ NA____
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

B. And the percent difference criteria of ± 10 % have been met.
Yes ____ No __X___ NA____
Manganese in SDG L0706016 had a serial dilution value of 11.1%. The samples were qualified JE11. Data could be biased high due to non-linear chemical or matrix effects.

C. The serial dilution analyses were on client samples.
Yes __X___ No_____
The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number). The laboratory sometimes reported serial dilution results and sometimes did not.

XII. INSTRUMENT DETECTION LIMITS
A. The Instrument Detection Limits have met the Quarterly reporting requirements.
Yes ___X_ No____ NA___
This was determined to be acceptable during the contractual process.

B. And all sample results have met the required detection limits (CRDL).
Yes __X__ No____ NA____
The laboratory has diluted several of the digestates to account for potential matrix effects on the IC chloride analysis as well as for alkalinity and TOC. The laboratory has reported only the diluted results. The dilutions performed raised the MDL's; the project manager will evaluate whether the elevated MDL's are still below the project reporting limits.

XIII. PREPARATION AND ANALYSIS LOGS
A. All samples were prepared or analyzed within the required holding times referencing the SOW (time of sample receipt to preparation/distillation).
Yes ___X_ No____

B. All samples were analyzed within the 40 CFR 136 (Clean Water Act) or method recommended holding times (time of sample collection to date of analysis).
Yes __X'__ No____
The laboratory has noted a holding time exceedence for some samples in L0706151. The range was from 1.79 to 2.44 days. The validator determined that this slight overage was not significant and did not qualify the data.

C. Chains of Custody (COC)
1. Chains of Custody (COC) were reviewed and all fields were complete, signatures were present and cross outs were clean and initialed.
Yes_____ No __X__
None of the automated COC's included the initial (i.e. field) sample relinquishment signature, date, and time.

2. Samples were received at the required temperature and preservation.
Yes_____ No __X__
Per the COCs and the laboratory log-in records, all applicable chemical preservatives were properly used except as follows.

In SDG L070 6074, L0706151, L0706104, L0706201, L0705683, and 0706043, several samples were noted as being above the required pH of 2. Samples were acidified as soon as they were received by the laboratory and the exceedence is not expected to impact the data as the time was less than 24 hours. All of these may be due to inherent matrix buffering as the exceedences were not high indicating that acid had been properly added in the field. The laboratory correctly added HNO_3 to bring them to the proper pH. For these particular shipments, the samples were properly cooled and the shipping time was relatively brief. Since all analytes of interest are stable when cooled, no such stable analytes of interest received qualification for insufficient field chemical preservation of the samples.

TABLE OF INSUFFICIENT pH

SDG	Sample	Analysis
L0706073	IW101-04	Metals
L0706151	IW21-05A	Metals
L0706104	IW21-01A	Metals
L0706201	IW92-05	Metals
	IW92-06A	Metals
L0705683	PMW101-01A	Metals
	Dup7	Metals
L0706043	IW101-01A	Metals
	Dup3	Metals

XIV. FIELD QC

A. Field QC samples (duplicates, SRMs) were identified.

Yes __X__ No____

The field duplicates are identified as:

SDG	Duplicate Pair
L0706151	IW21-04A / DUP2
L0706104	IW21-01B / DUP1
	IW101-09A / DUP5
L0706201	IW92-02 / DUP6
L0706016	PMW85-05 / DUP9
L0706043	IW101-01A / DUP3
	IW101-03C / DUP4
	PMW101-08A / DUP8
L0705683	PMW101-01B / DUP7

B. Field duplicates were within a guidance limit of < 35% RPD limit for water or <50% RPD limit for soil. If values are < 5 x RL, the water limit is ± 2 x RL and the soil limit is ±4 x RL. Final determination will be made by the project manager.

Yes ____ No __X__ NA___

The following duplicate pairs had percent RPD's that were above limits. There are no qualifications required.

SDG	ANALYTE	DUP	Mg/L	SAMPLE	Mg/L	RPD
L0706140	Sulfide	Dup5	2.38	IW101-09	1.59	39.8%
L0706201	TOC	Dup6	68	IW92-02	47.3	36.7%
L0705683	Alkalinity	Dup7	559	PMW101-01B	288	67%

XV. GENERAL COMMENTS

The laboratory has complied with the requested methods and the quality of the data is acceptable and usable with consideration of the following qualifications. Note that the following qualifiers are used:

UB#, UFB#, where # is the value of the preparation or field blank contamination. Data are usable as undetected values.
JC#, where # is the correlation coefficient of the calibration curve. There could be a variability to the reported result due to variability in the instrument response over a range of concentrations.
JS# is for matrix spike/matrix spike duplicate recoveries, where # is the analyte recovery. The bias to the data is considered to be high or low proportional to the analyte recovery. (JS126 would indicate the value could be 126% of the true value).
JE# , where # is the percent difference between an undiluted and a 4x dilution. Data could be biased high due to non-linear chemical or matrix effects.

Summary:
*Very low level detections of TOC and alkalinity could be false detections due to field contamination, not the presence of the analytes in the sample. (UFB#)

*Chloride could be biased low by the added factor indicated by the low matrix spike/matrix spike duplicate analyte recoveries (JS#). Alkalinity could be biased high.

* Manganese could be biased high due to non-linear matrix effects.

Qualification or Comments in Detail

Chains-of-Custody
None of the automated COC's included the initial (i.e. field) sample relinquishment signature, date, and time.

Blanks

Field Blank	Sample	Analyte	Result	Qualifier
RB1	L0706043-12	TOC	0.711	UFB.71
RB2	L0706043-3	TOC	1.03	UFB1

SUMMARY TABLE FOR PREPARATION BLANKS

SDG	Result (mg/Kg)	Work Group	ANALYTE	QUALIFICATION
L0706073	0.53	WG242321	TOC	None, U or 5x

	0.54	WG242013	TOC	None, U or 5x
L0706151	0.53	WG242614	TOC	None, U or 5x
	0.53	WG242691	TOC	UB.53, detects <5X
L0706104	0.554	WG242441	TOC	UB.55, detects <5X
	0.553	WG242614	TOC	None, all >5X
	0.534	WG242691	TOC	None, all >5X
L0706201	0.534	WG242691	TOC	None, all >5X
	0.52	WG242777	TOC	None, all >5X
L0706016	0.547	WG241801	TOC	UB.55, detects <5X
	0.53	WG241873	TOC	UB.53, detects <5X
	0.54	WG242013	TOC	None, all >5X
L0705656	0.562		Sulfide	UB.56, detects <5X
	0.545	WG241472	TOC	UB.55, detects <5X
	0.547	WG241801	TOC	UB.55, detects <5X
L0706043	0.538	WG242013	TOC	None, all >5X
L0705683	0.547	WG241801	TOC	None, all >5X

Matrix Spikes/Matrix Spike Duplicates

The following SDGs had matrix spike results that resulted in sample qualification.

SUMMARY TABLE FOR MS/MSD QUALIFIERS

SDG	ANALYTE	RESULT	QUALIFICATION
L0706073	Alkalinity	49.6/53 %	JS 53, detects
	TOC	160/ 168 %	JS168, detects
L0706151	TOC	106/159 %	None*
	Chloride	25.7/22.7 %	JS23
	Alkalinity	-6/-8.5 %	None*
L0706201	Chloride	59/67%	JS59
	Alkalinity	-14.9/0.43 %	None*
L0706043	Manganese	180/222 %	None *
	Alkalinity	55.8/60 %	JS56
L0705683	TOCe	83/139 %	JS139

* The parent sample results were very high compared to the spike added, making the percent recoveries unreliable.

Serial Dilutions

The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number). The laboratory sometimes reported serial dilution results and sometimes did not.
Manganese in SDG L0706016 had a serial dilution value of 11.1%. The samples were qualified JE11. Data could be biased high due to non-linear chemical or matrix effects.

Detection Limits

The laboratory has diluted several of the digestates to account for potential matrix effects on the IC chloride analysis as well as for alkalinity and TOC. The laboratory has reported only the diluted results. The dilutions performed raised the MDL's; the project manager will evaluate whether the elevated MDL's are still below the project reporting limits.

Holding Times

The laboratory has noted a holding time exceedence for some samples in L0706151. The range was from 1.79 to 2.44 days. The reviewer determined that this slight overage was not significant and did not qualify the data.

Sample Preservation

Since all analytes of interest are stable when cooled, no such stable analytes of interest received qualification for insufficient field chemical preservation of the samples.

TABLE OF INSUFFICIENT pH

SDG	Sample	Analysis
L0706073	IW101-04	Metals
L0706151	IW21-05A	Metals
L0706104	IW21-01A	Metals
L0706201	IW92-05	Metals
	IW92-06A	Metals
L0705683	PMW101-01A	Metals
	Dup7	Metals
L0706043	IW101-01A	Metals
	Dup3	Metals

QUALIFICATION SUMMARY TABLE

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
L0705656	IW101-01C	Sulfide	UB.56
	IW101-02A	Sulfide	UB.56
	PMW101-03B	TOC	UB.55
	DR2-1	TOC	UB.55

L0705683	All samples	Alkalinity	JC.993
	Dup 7	TOC	JS139
	PMW101-01A	TOC	JS139
	PMW101-01B	TOC	JS139
	PMW92-02	TOC	JS139
	PMW92-03	TOC	JS139
	PMW92-04	TOC	JS139
	IW-01	TOC	JS139
	IW101-02C	TOC	JS139
	IW101-03A	TOC	JS139
	MW-101T	TOC	JS139
	MW-101B	TOC	JS139
L0706016	All samples	Manganese	JE11
	PMW101-04A	Alkalinity	JC.993
	PMW101-04B	Alkalinity	JC.993
	PMW101-07A	Alkalinity	JC.993
	PMW101-07B	Alkalinity	JC.993
	PMW101-08B	Alkalinity	JC.993
L0706016	Dup9	Alkalinity	JC.994
	PMW92-05	Alkalinity	JC.994
	PMW92-06	Alkalinity	JC.994
	PMW85-04	Alkalinity	JC.994
	PMW85-05	Alkalinity	JC.994
	PMW101-05A	Alkalinity	JC.994
	PMW101-05B	Alkalinity	JC.994
	PMW101-06A	Alkalinity	JC.994
	PMW101-06B	Alkalinity	JC.994
	PMW101-04A	TOC	UB.55
	PMW92-05	TOC	UB.53
	PMW92-06	TOC	UB.53
L0706043	All samples	Alkalinity	JC.994S56
	PMW101-08A	TOC	UFB1
	DR1-3	TOC	UFB1
	PMW85-01	TOC	UFB1
L0706073	All samples	Alkalinity	JS53C.911
	All samples except PMW21-04	TOC	JS168
L0706104	All samples	Alkalinity	JC.991
	IW101-05B	TOC	UB.55
L0706151	All samples	Chloride	JS23
	All samples	Alkalinity	JC.992
	IW21-03A	TOC	UB.53
L0706201	All samples	Chloride	JS59
	All samples	Alkalinity	JC.992

ORGANIC DATA QUALITY REVIEW REPORT
VOLATILE ORGANICS SW-846 METHOD 8260B/5030B

8260B/5030B
SDG: L070: 9280, 9182, 9237, 9399, 9322, 9346, 9530, 9422, 9471

PROJECT: Memphis Defense Depot, EBT-4 for e2m , Texas

LABORATORY: Kemron Environmental Services, Marietta, OH

SAMPLE MATRIX: Water

SAMPLING DATE (Month/Year): September 2007

NO. OF SAMPLES: 8260B/5030B (Waters) – 108 samples including (9 Trip Blanks and 2 Rinse Blanks)

ANALYSES REQUESTED: SW-846 8260B

SAMPLE NO.: See attached result forms and associated EDD

DATA REVIEWER: Sammy Huntington and John Huntington (Gateway Enterprises)

QA REVIEWER: Diane Short and Associates Inc. INITIALS/DATE: ________

Telephone Logs included Yes___ No _X__

Contractual Violations Yes___ No _X__

The EPA Contract Laboratory Program National Functional Guidelines for Organic Review, 2001, and the SW-846 Method 8260B has been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. Per the Scope of Work, the review of these samples includes Level III validation of all chains of custody, calibrations and QC forms referencing the QC limits in the above documents.

I. DELIVERABLES

A. All deliverables were present as specified in the Statement of Work (SOW), SW-846, or in the project contract.
Yes __X_ No _____
This is report has been requested to include the following review:
Holding times and sample integrity (chains of custody, sample log in)
Calibrations
Summary QC

B. Chain of Custody Documentation was complete and accurate.
Yes ______ No _X__
No qualifiers have been added for chain of custody issues. The chain of custody on use has been discussed in detail in previous reports, and those general comments apply. All chain of custody documents in this set were properly signed and dated.

C. Samples were received at the required temperature, preservation and intact with no bubbles.
Yes ______ No __ X __
Most of the SDGs had at least one cooler that was under 2°C but the Sample Checklist states that the samples weren't frozen. No qualifiers are required under these circumstances.

In addition, new EPA regulations (See Federal Register, March 12, 2007, 40CFR Part 122) require only that the temperature of samples delivered to the laboratory be less than 6° C. Thus the sample receipt conditions are fully compliant with applicable regulations.

L0709182: VOA samples were not free of headspace, but there were enough vials free of headspace for 8260 that resampling was not necessary. There were two samples for RSK-175 that required resampling, including PMW85-04 and -05.

L0709346: pH ranges were acceptable for all organic samples. VOA sample TB-091407 was not free of headspace in two containers. The laboratory was able to use other containers for the analysis.

L0709471: pH ranges were acceptable for all organic samples. VOA sample TB091907 had headspace in two containers. The laboratory was able to use other containers for the analysis.

II. ANALYTICAL REPORT FORMS

A. The Analytical Report or Data Sheets are present and complete for all requested analyses.
Yes _X_ No ____

B. Holding Times
1. The contract holding times were met for all analyses (Time of sample receipt to time of analysis (VOA) or extraction and from extraction to analysis).
Yes __X___ No______

2. The Clean Water Act (40 CFR 136) or method holding times were met for all analyses (14 days from time of sample collection to analysis or extraction).
Yes _X__ No____

III. INSTRUMENT CALIBRATION – GC/MS

A. Initial Calibration
1. The Response (RF) and Relative Response Factors (RRF) and average RRF for all compounds for all analyses met the contract criteria of >0.01.

Yes __X__ No ____ NA____
Per the project manager, the 2001 EPA CLP validation guidance has been applied to the common "poor responders". Acetone, 2-butanone, and 4-methyl-2-pentanone are the compounds for which any calibration response factors below 0.05 have been observed. The validation guidance used for this project allows for a response of 0.01 for these compounds if spectral integrity can be verified at low concentrations. These spectra are not commonly provided and are not part of the deliverable for these data sets. The laboratory has been tasked with providing to the client verification that the 0.01 RF is valid. Given the spectral verification is available, the data are not qualified for response >0.01 < 0.05. No data have been qualified.

The low-responding compounds are highly water-soluble and capable of hydrogen bonding with water. This decreases their purge efficiency and results in the relatively low response. The implication of this low purge efficiency is that a relatively low absolute recovery of such compounds is achieved in the purge step of the analysis. If this recovery is consistent, reasonable accuracy and precision can be achieved in a given matrix, which is indicated for the lab matrix by acceptable recoveries in LCS and calibration checks. However, this causes these targets to be more sensitive to matrix variations that impact purge efficiency (such as ionic strength or the presence of varying levels of soluble non-target organic material) than are the more hydrophobic compounds typically analyzed by this method, and as a result they are more likely to exhibit matrix bias. The likelihood of matrix bias for these compounds in this site matrix is assessed in the MS/MSD section of this report.

2a.The relative standard deviation (RSD) for the five point calibration was within the 30% limit for the CCCs.
Yes __X_ No____ NA____
This is a method requirement and indicates that the analytical system is in control.

2b.The relative standard deviation (RSD) for the five point calibration was within the 30% limit for all other compounds or a linear curve was used.
Yes _____ No __X__ NA____
One analyte was just above the 30% RSD limit and was not calibrated using linear regression. No qualifiers are added since the target is not conducted in any sample.

SDG	ICAL Date	Batch#	Lab Sample#	Analyte	%RSD	Qualifiers Added
L0709280	9/12/07 17:13	WG250530	12,13,16,17	1-Chlorohexane	30.3	None, ND
L0709346	9/12/07 17:13	WG250530	1,2,3,4,6,9	1-Chlorohexane	30.3	None, ND

3. The 12 hour system Performance Check was performed as required in SW-846.
Yes __X__ No_____ NA____

B. Continuing Calibrations
1. The midpoint standard was analyzed for each analysis at the required frequency and the QC criteria of > 0.05 (.01 for CLP 2001) were met.
Yes __X___ No ____ NA____
The CCVs were analyzed at the proper frequency. The same compounds showed low responses in the continuing calibration as were observed in the initial calibrations. Qualifiers are not added for these outliers since none were below the lower limit of 0.01. No data have been qualified from the response factors and RRFs are not noted since they are essentially the same as the ICAL. This consistency of response for the poor-responding compounds is an indication that there is no significant bias for the laboratory water matrix.

2. The percent difference (%D) limits of ± 25% were met.
Yes _____ No __X__ NA___
See the table below. When there are no detections, unless the %D is biased low and so large as to indicate a significant probability of false negatives, no qualifiers are added for %D outliers when targets are not detected.

SDG	CCV Date	Batch#	Lab Sample ID	Analyte	%D outliers	Qualifiers Added
L0709346	9/25/07 8:29	WG250907	5,11,12,13	Dichlorodifloromethane	29.5	None, ND
				Vinyl Acetate	31.9	None, ND

IV. GC/MS INSTRUMENT PERFORMANCE CHECK

The BFB (VOA) or DFTPP (SVOA) performance check was injected once at the beginning of each 12-hour period and relative abundance criteria for the ions were met.
Yes __X___ No ____ NA____

V. INTERNAL STANDARDS

The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows.
Yes __X___ No ____ NA____

VI. SURROGATE

Surrogate spikes were analyzed with every sample.
Yes __ X __ No ____

And met the recovery limits defined in the current contract, which are the current laboratory limits.
Yes __X___ No ____

VII. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

A. Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed for every analysis performed and for every 20 samples or for every matrix whichever is more frequent.
Yes ___X__ No _____
There are 5 MS/MSDs which meets the 1:20 ratio.

Matrix Spikes in Project:

SDG	Client Sample ID	Lab Sample ID
L0709322	PMW101-07A-EBT-4	2
L0709399	PMW101-05B-EBT-4	9
L0709530	PMW21-02B-EBT-4	2
L0709280	PMW101-03A-EBT-4	13
L0709346	PMW-01-EBT-4	6

B. The MS and MSD percent recoveries were within the limits defined in the contract, which are the current laboratory control chart limits.
Yes _____ No __ X ___NA___
The full target list has been spiked. Most MS/MSD recoveries and RPDs are in control. Instances where spike recoveries are out of limits are shown in the table below. In several instances, the sample amount is 4x the spike level or greater. In such cases, the recovery cannot realistically be calculated, because the anticipated normal analytical variability is on the order of the spike level. Thus no qualifiers are added. If recoveries are elevated and the parent sample has no detection of the target, no qualifiers are added.
Data are qualified JS#, where # is the spike recovery. Data could be biased high or low proportional to the spike recovery.

MS/MSD Outliers

SDG	Client Sample ID	Lab Sample ID	Analyte	MS/MSD/RPD	Qualifiers
L0709322	IW101-07A-EBT-4	2	Carbon Disulfide	48.1/OK/OK	JS48
L0709399	PMW101-05B—EBT-4	9	cis-1,2-Dichloroethene	69.1/69.9/OK	JS69

SDG	Client Sample ID	Lab Sample ID	Analyte	MS/MSD/RPD	Qualifiers
			Trichloroethene	-21.4/-37.5/OK	None, parent > 4x spike
			Tetrachloroethene	64.9/61.3/OK	JS61
L0709530	PMW21-02B-EBT-4	2	Tetrachloroethene	50/45/OK	None, parent > 4x spike
L0709346	PMW-01-EBT-4	6	1,2,3-Trichloropropane	127/127/OK	JS127 detection
			1,2-Dibromo-3-chloropropane	138/140/OK	None, ND in parent
			Acetone	143/145/OK	JS145 detection
			Bromodichloromethane	123/OK/OK	None, ND in parent
			Carbon tetrachloride	OK/63.4/OK	JS63 parent
			cis-1,2-Dichloroethene	67.3/OK/OK	None, parent 4x spike
			Methyl-t-buytl ether	130/134/OK	None, ND in parent
			Tetrachloroethene	-62.5/OK/OK	None, parent > 4x spike

C. The MSD relative percent differences (RPD) were within the defined contract limits.
Yes __X__ No ____NA____

D. The MS/MSD were client samples.
Yes __X_ No ____NA____

VIII. LABORATORY CONTROL SAMPLE

A. Laboratory Control Samples (LCS) was analyzed for every analysis performed and for every 20 samples.
Yes _X___ No ____

B. The LCS percent recoveries were within the limits defined in the contract (the MS limits are used as a reference or laboratory-specific limits for this matrix are defined).
Yes ______ No __ X ____

The full target list has been spiked. There are a few elevated recoveries observed as shown in the table below. When a high recovery is associated with a non-detect in samples, no qualifier is added since the indicated bias is high. When the target is detected, the result is qualified as JL#, where # is the elevated recovery.

SDG	Batch	Targets Detected	LCS/LCSD/RPD	Qualifiers
L0709322	WG250762	2-Hexanone	131	None, ND in samples
		Acetone	140	JL140 one result
		Bromodichloromethane	122	None, ND in samples
L0709237	WG250431	1,1,1,2-Tetrachloroethane	134/OK/OK	None, ND in samples
		1,1,1-Trichloroethane	142/124/OK	None, ND in samples
		Bromodichloromethane	128/OK/OK	None, ND in samples
L0709346	WG250762	2-Hexanone	131	None, ND in samples
		Acetone	140	None, ND in samples
		Bromodichloromethane	122	None, ND in samples
	WG250775	1,2 Dibromo-3-chloropropene	133	None, ND in samples
		Acetone	142	JL142 detects
		Bromodichloromethane	123	None, ND in samples
		Methyl-t-butyl ether	126	JL126 detect

IX. BLANKS

A. Method Blanks were analyzed at the required frequency and for each matrix and analysis.
Yes _X___ No____

B. No blank contamination was found in the Method Blank.
Yes____ No _X___
Contamination was observed in some method blanks indicated in the table, below the reporting limit. Whenever methylene chloride or acetone is detected in associated samples at a level less than 10x the method blank (corrected for dilution), the result is qualified as UB#, where # is the corrected method blank level. Such results are usable as nondetects. Qualifiers added are summarized in the table below. For other targets, the factor used is 5x.

SDG	Batch	Targets Detected	Results	Qualifiers
L0709322	WG250652	1,2,3-Trichlorobenzene	.193F	None, ND in samples
	WG250762	1,2,3-Trichlorobenzene	.251	None, ND in sample
		Hexachlorobutadiene	.280	None, ND in sample
		Naphthalene	.358	None, ND in sample
L0709399	WG251022	1,2,3-Trichlorobenzene	.281F	None, ND in samples
	WG251061	1,2,3-Trichlorobenzene	.307F	None, ND in samples
L0709237	WG250324	Methylene Chloride	.362F	None, ND in samples
	WG250431	Methylene Chloride	.315	UB.32 detects
	WG250332	Methylene Chloride	.294	None, ND in sample
L0709280	WG250386	1,2,3-Trichlorobenzene	.204F	None, ND in samples
L0709346	WG250762	1,2,3-Trichlorobenzene	.251F	None, ND in samples
		Hexachlorobutadiene	.280F	None, ND in samples
	WG250907	1,2,3-Trichlorobenzene	.125F	None, ND in samples
		1,2,4-Trichlorobenzene	.262F	None, ND in samples
	WG250775	Methylene Chloride	.405F	UB.41 detects < 10x MB

C. If Field Blanks were identified, no blank contamination was found.
Yes____ No __X__
There are 9 trip blanks and 2 rinse blanks. There are detections observed below the reporting limit as shown in the table. Some of these are qualified UB (see table above) due to detections in the associated method blank, thus are not used for qualifying associated samples. When analytes are present in both the field blank and the associated samples, the results in the samples are qualified in the same manner as for method blanks. For clarity, the qualifiers used in this case are UTB# for trip blanks and UFB# for rinse blanks.

SDG	Sample ID	Sample Date	Analyte	Result	Qualifier
L0709182	TB-091007-EBT-4	9/10/2007	Acetone	2.6F	UTB2.6 results < 10x TB
		9/10/2007	Chloromethane	0.896F	UTB.9 detects
		9/10/2007	Methylene chloride	0.301F	None, UB or > 10x TB
L0709237	TB-091107-EBT-4	9/11/2007	Chloromethane	1.14	UTB1.1 detects
L0709280	TB-091207-EBT-4	9/12/2007	Chloromethane	0.878F	UTB.88 detects
L0709322	RB1-EBT-4	9/13/2007	Acetone	7.27F	UFB7.3 detects
		9/13/2007	Benzene	0.211F	UFB.21 detects
		9/13/2007	MEK (2-Butanone)	3.16F	UFB# detects < 10x FB
		9/13/2007	Naphthalene	0.532F	None, all ND
		9/13/2007	Toluene	0.381F	None, all ND
		9/13/2007	1,4 Dichlorobenzene	1.92	UFB1.9 detects
	TB-091307-EBT-4	9/13/2007	Chloromethane	0.978F	UTB.98 detects
L0709346	TB-091407-EBT-4	9/14/2007	Chloromethane	0.838F	UTB.84 detects
L0709399	TB-091707-EBT-4	9/17/2007	Chloromethane	0.752F	UTB.75 detects

SDG	Sample ID	Sample Date	Analyte	Result	Qualifier
L0709422	TB-091807-EBT-4	9/18/2007	1,4-Dichlorobenzene	1.17	UTB1.2 detects
L0709471	TB-091907-EBT-4	9/19/2007	Chloromethane	0.821F	UTB.82 detects
L0709530	RB-2-EBT-4	9/20/2007	1,4-Dichlorobenzene	0.844	UFB.84 detects
		9/20/2007	Chloromethane	0.375F	From TB
	TB-092007-EBT-4	9/20/2007	Chloromethane	1.01	UTB1 detects

X. FIELD QC

If Field duplicates were identified, they met guidance RPD of < 35% for water or < 50% for soils. For values reported at < 5 x the reporting limit (RL), a difference of 2 x RL is used as guidance (4 x RL for soils). Data are not qualified for field duplicates as these are evaluated for the total project by the client.

Yes ______ No _X__ NA___

There are 9 identified field duplicates. Observations are summarized in the table. A detection of acetone had an RPD of 58%, but all other detections meet criteria.

SDG	Client Sample ID	Parent Sample	Observations
L0709530	DUP1-EBT-4	IW21-05A -EBT-4	Acetone RPD 58%
L0709471	DUP2-EBT-4	PMW21-03-EBT-4	OK
L0709182	DUP3-EBT-4	IW101-01B -EBT-4	OK
L0709280	DUP4-EBT-4	IW101-05C -EBT-4	OK
L0709182	DUP5-EBT-4	IW101-08B -EBT-4	OK
L0709399	DUP6-EBT-4	IW92-08-EBT-4	OK
L0709346	DUP7-EBT-4	IW85-05-EBT-4	OK
L0709280	DUP8-EBT-4	PMW92-03-EBT-4	OK
L0709471	DUP9-EBT-4	DR1-3-EBT-4	OK

XI. SYSTEM PERFORMANCE

A. The RICs, chromatograms, tunes and general system performance were acceptable for all instruments and analytical systems.

Yes____ No____ NA__X__

Not part of this review level

B. The suggested EQLs for the sample matrices in this set were met.

Yes __X__ No____ NA____

Dilutions were necessary in some cases to achieve the proper quantification of high-level targets, which raises the EQLs for all other targets in the run. In such cases, the both results are provided in hardcopy except for the analytes that are above the upper range in the initial run. These are only shown for the reanalysis.

In the EDD, only the initial run is provided for most analytes, and only the reanalysis is provided for the analytes which are above the upper linear range in the first run.

XII. TCL COMPOUNDS

A. The identification is accurate and all retention times, library spectra and reconstructed ion chromatograms (RIC) were evaluated for all detected compounds.

Yes____ No____ NA __X__

Not part of this review level

B. Quantitation was checked to determine the accuracy of calculations for representative compounds in each internal standards quantitation set.

Yes____ No____ NA__X__

Not part of this review level

XIII. TENTATIVELY IDENTIFIED COMPOUNDS

TICs were properly identified and met the library identification criteria.
Yes____ No____ NA__X___
Not part of this review level

XIV. OVERALL ASSESSMENT OF THE CASE

The laboratory has complied with the requested method. Data are fully usable after consideration of qualifiers.
The following is noted:

Sample Condition:
Most of the SDGs had at least one cooler that was under 2°C but the Sample Checklist states that the samples weren't frozen. No qualifiers are required under these circumstances.

In addition, new EPA regulations (See Federal Register, March 12, 2007, 40CFR Part 122) require only that the temperature of samples delivered to the laboratory be less than 6° C. Thus the sample receipt conditions are fully compliant with applicable regulations.

L0709182: VOA samples were not free of headspace, but there were enough vials free of headspace for 8260 that resampling was not necessary. There were two samples for RSK-175 that required resampling, including PMW85-04 and -05.

L0709346: pH ranges were acceptable for all organic samples. VOA sample TB-091407 was not free of headspace in two containers. The laboratory was able to use other containers for the analysis.

L0709471: pH ranges were acceptable for all organic samples. VOA sample TB091907 had headspace in two containers. The laboratory was able to use other containers for the analysis.

LCS Recoveries:
The full target list has been spiked. There are a few elevated recoveries observed as shown in the table within the report. When a high recovery is associated with a non-detect in samples, no qualifier is added since the indicated bias is high. When the target is detected, the result is qualified as JL#, where # is the elevated recovery.

Matrix Spikes:
There are 5 MS/MSDs which meets the 1:20 ratio.
Matrix Spikes in Project:

SDG	Client Sample ID	Lab Sample ID
L0709322	PMW101-07A-EBT-4	2
L0709399	PMW101-05B-EBT-4	9
L0709530	PMW21-02B-EBT-4	2
L0709280	PMW101-03A-EBT-4	13
L0709346	PMW-01-EBT-4	6

The full target list has been spiked. Most MS/MSD recoveries and RPDs are in control. Instances where spike recoveries are out of limits are shown in the table within the report. In several instances, the sample amount is 4x the spike level or greater. In such cases, the recovery cannot realistically be calculated, because the anticipated normal analytical variability is on the order of the spike level. Thus no qualifiers are added. If recoveries are elevated and the parent sample has no detection of the target, no qualifiers are added. Data are qualified JS#, where # is the spike recovery. Data could be biased high or low proportional to the spike recovery.

Method Blanks:
Contamination was observed in some method blanks indicated in the table within the report, below the reporting limit. Whenever methylene chloride or acetone is detected in associated samples at a level less than 10x the method blank (corrected for dilution), the result is qualified as UB#, where # is the corrected method blank level. Such results are usable as nondetects. Qualifiers added are summarized in the table below. For other targets, the factor used is 5x.

Field Blanks:
There are 9 trip blanks and 2 rinse blanks. There are detections observed below the reporting limit as shown in the table within the report. Some of these are qualified UB (see table above) due to detections in the associated method blank, thus are not used for qualifying associated samples. When analytes are present in both the field blank and the associated samples, the results in the samples are qualified in the same manner as for method blanks. For clarity, the qualifiers used in this case are UTB# for trip blanks and UFB# for rinse blanks.

EQLs:
Dilutions were necessary in some cases to achieve the proper quantification of high-level targets, which raises the EQLs for all other targets in the run. In such cases, the both results are provided in hardcopy except for the analytes that are above the upper range in the initial run. These are only shown for the reanalysis.

In the EDD, only the initial run is provided for most analytes, and only the reanalysis is provided for the analytes which are above the upper linear range in the first run.

Field QC:
There are 9 identified field duplicates. Observations are summarized in the table within the report. A detection of acetone had an RPD of 58%, but all other detections meet criteria.

ORGANIC DATA QUALITY REVIEW REPORT

GC REPORT FOR Metabolic Acids by HPLC; Ethane, Methane, Ethene, Carbon dioxide by EPA SOP RSK-175; and Hydrogen by AM20GAX (GC/RGD).

RSK-175:
SDG: L070: 9280, 9182, 9237, 9399, 9322, 9346, 9530, 9422, 9471

Metabolic acids:
SDG: L070: 9280, 9182, 9237, 9399, 9322, 9346, 9530, 9422, 9471

AM20GAX (Hydrogen):
SDG: P079346 (no form I's in HC, used from CD), P0709222, P0709345, P0709344, P0709343, P0709221

PROJECT: Memphis Defense Depot, EBT-4 for e2m, Texas

LABORATORY: Kemron Environmental Services, Marietta, OH; Hydrogen subcontracted to Microseeps, Inc, Pittsburg, PA

SAMPLE MATRIX: Water and Vapor

SAMPLING DATE (Month/Year): September 2007

NO. OF SAMPLES: Metabolic acids –99 waters including 2 rinse blanks; RSK-175 – 99 waters including 2 rinse blanks, AM20GAX – 89 vapor samples

ANALYSES REQUESTED: Metabolic Acids by HPLC; EPA SOP RSK-175, Microseeps AM20GAX

SAMPLE NO.: Attached

DATA REVIEWER: Sammy Huntington and John Huntington (Gateway Enterprises)

QA REVIEWER: Diane Short & Associates, Inc., INITIALS/DATE:

Telephone Logs included Yes____ No X

Contractual Violations Yes____ No X

The project QAPP, EPA Contract Laboratory Program National Functional Guidelines for Organic Review, 2001 (SOP), the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, (SW-846), current updates, and the project-specific methods have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. The review has been tasked as Level III for review of all calibrations, holding times, and QC for all samples.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW), SW-846, or in the project contract.

Yes __X__ No ____

This report is tasked for review of holding times, sample integrity, calibrations and summary QC. Initial calibration reports for RSK-175 are not accurate and complete. No qualifiers have been added due to this deficiency. Please see previous reports for details.

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes __ X___ No ____

III. HOLDING TIMES

A. The contract holding times were met for all analyses (Time of sample receipt to time of extraction and from extraction to analysis.)

Yes __X___ No ____

See Section B. below. Per EPA guidance, for validation purposes we calculate the holding time to the nearest day in cases where the regulation or method specifies holding time units of days.

B. The Clean Water Act (40 CFR 136) or method holding times were met for all analyses (Time of sample collection to time of extraction and from extraction to analysis.)

Yes __X___ No ____

Metabolic Acids: The reviewer has not been able to find documented holding times for the metabolic acids. The normal holding time for an analogous HPLC method 8310 is 14 days for preserved water samples. Metabolic acid holding times were all within 14 days except as noted in the table below. It has been verified on other projects that no holding time is established for these compounds. Samples are preserved with acid for this analysis, and the laboratory uses 28 days as a holding time specification based on the holding time tables provided. These compounds should be stable if protected from further microbial degradation, so we have not qualified results for holding times > 14 but < 28 days.

SDG	LAB ID	HT	Qualifier
L0709322	15	**15**	None
L0709399	2,12,2RE,12RE, 12RERE	**15**	None
L0709422	12,13,14,	**15**	None
	14RE,14RERE	**16**	None
L0709530	9,10,11,8RE,10RE	**15**	None

RSK-175: For RSK-175, pH should not be adjusted when CO_2 is determined, which is the case in this project. It is not explicitly stated in the documentation whether samples for RSK-175 were pH-adjusted or not, but it appears that they were not. In the absence of definitive information we have assumed that no acidification occurred.

When pH is adjusted, the holding time is 14 days per the method, and we have used this as the acceptable holding time. One sample (PMW101-04B-EBT-4 in SDB L0709399) was reanalyzed at a dilution for methane and carbon dioxide 21 days after sampling. These results are qualified as JH7 to indicate that they were analyzed 7 days after the expiration of the 14-day holding time and could be biased.

AM20GAX (Hydrogen): This method is a procedure developed by Microseeps, Inc. Recommended holding times in the procedure are 14 days. All samples were analyzed within 14 days and no qualifiers are issued.

C. All chains of custody are complete with signatures and dates.
Yes ___X_ No ____
The project manager is informed of the following and the chains are updated for the project record. No qualifiers have been added for chain of custody issues. The chain of custody on use has been discussed in detail in previous reports, and those general comments apply. All chain of custody documents for RSK-175 and metabolic acids were properly signed and dated.

For hydrogen, SDG P0709346 had a hardcopy report in which the COC did not contain a proper relinquishment signature. This was also the case for the pdf version of this report.

D. Samples were received at the proper temperature and preservation.
Yes ___ No __X___
Most of the SDGs had at least one cooler that was under 2°C but the Sample Checklist states that the samples weren't frozen. No qualifiers are required under these circumstances.

In addition, new EPA regulations (See Federal Register, March 12, 2007, 40CFR Part 122) require only that the temperature of samples delivered to the laboratory be less than 6° C. Thus the sample receipt conditions are fully compliant with applicable regulations.

L0709322: pH ranges were not acceptable for one metabolic acid sample. Sample PTMW101-01A-EBT4 was at pH 5.5, and the laboratory adjusted the pH

L0709399: PMW101-30A-EBT-4 – used correct bottles but switched labels on metabolic acid and alkalinity.
In addition, pH ranges were not acceptable for four samples, but it is not clear from the documentation for which method. These were PMW101 -04B-EBT4, -04A-EBT4, -03B-EBT4, and DUP6-EBT4. The laboratory adjusted the pH in these samples. .

L0709182: pH ranges were not acceptable for metabolic acids for sample IW101-01A-EBT4. There were two samples for RSK-175 that required resampling, including PMW85-04 and -05.

L0709280: pH ranges were not acceptable for one metabolic acids sample, which was adjusted by the laboratory. This was sample IW101-04A.

L0709422: pH ranges were not acceptable for one metabolic acids sample, which was adjusted by the laboratory. This was sample IW92-05-EBT4.

L0709530: pH ranges were not acceptable for one metabolic acid sample, which was adjusted the laboratory. This was sample IW21-05A-EBT4.

This is a common occurrence for samples at this site. The proper sample bottles have been issued and used. There is a buffering capacity to these matrices that results in slightly elevated pH. The pH is adjusted as soon as the samples reach the laboratory and the impact on the sample data is considered to be minimal.

IV. INSTRUMENT CALIBRATION (IC) AND CONTINUING CALIBRATION (CC) VERIFICATION

A. The GC standards were analyzed at the required frequency.
Yes __X____ No_____

B. The chromatographic resolution and separation criteria were met.
Yes __X__ No_____

C. The suggested columns were used and the EQLs were met.
Yes __X___ No_____

D. Calibration factors for IC met the 20% RSD limit or the regression curves were prepared with a correlation coefficient 'r' greater than 0.99, per SW-846, Method 8000B.
Yes __X___ No _____
MBA: The initial calibration reports for the metabolic acids are inaccurate. The calibration report provides only a %RSD for each analyte, with a note at the bottom that the linear calibration model is used. However, the observed r or r^2 values are not reported, although the criteria used are shown. In the Case Narrative, the laboratory has indicated that all initial calibrations have used linear regression, and that all acceptance criteria are met. No further action is required.

In the previous level IV data review for this project, we were able to confirm from the raw data that regression curves were in fact used and that they met criteria. We cannot confirm this for the present Level III review, but have assumed that the laboratory Case Narrative is correct and have not qualified the results for the %RSDs in the initial calibration reports that are out of limits. We have, however, documented these in the table below.

Method	SDG	ICAL Date	Analyte	%RSD	Qualifiers
MBA	ALL SDGs	9/18/07 14:28	Propionic Acid	99.8	None – see text above

RSK-175: All initial calibrations are in control.

AM20GAX (Hydrogen): All initial calibrations are conducted using a linear regression curve and all are in control.

E. Percent Difference (%D's) for Continuing Calibration Factors and retention times (RT) were within the 25% Limits.
Yes ____ No __X___
RSK-175: The laboratory conducts opening and closing calibrations (bracketing the samples during the analytical run). For RSK-175 there is not a specific requirement in the procedure for closing calibrations, and only calibration verification each 12 hours is specified. SW-846 guidance (method 8000B), however specifically requires such closing calibrations for external standard methods. For detected analytes, SW-846 specifies that the closing calibration must meet the same criteria as the opening calibration. This has been achieved for all analytes but for carbon dioxide, for which a number of opening and closing calibrations do not meet the 30% D criterion specified for RSK-175.

In such cases, detected levels of carbon dioxide are qualified as JC#, where # is the applicable opening or closing CCV outlier. Such results may be biased due to calibration drift. Please see the qualified reports or the EDD for details.

It should be noted in this regard that the laboratory appears to use a different criterion for carbon dioxide, since a few CCV results were flagged as being outside of limits, but it is not clear to this reviewer where the laboratory limit is set. This method has not been published as a promulgated method by EPA (it rather exists as an open literature publication and an internal EPA SOP), and it may not have been fully developed for carbon dioxide. Thus the laboratory limits may be realistic for this analyte. Nonetheless, the results appear to indicate a probable bias which should be considered in using the data.)

MBA: All calibrations are in control.

AM20GAX: All calibrations are in control. The laboratory is employing the external standard method. There are no closing CCVs reported in the data package.

Method	SDG	CCV Date	Analyte	%D	Qualifiers
RSK0175	L0709346	9/27/07 17:22	Methane	90.3	None, due to syringe failure, next CCV OK
			Ethene	90.9	None, due to syringe failure, next CCV OK
			Ethane	90.7	None, due to syringe failure, next CCV OK
	L0709237	9/23/07 14:12	Carbon Dioxide	68.7	JC69 associated samples
		9/24/07 19:44	Carbon Dioxide	75.8	JC76 associated samples
	L0709280	9/25/07 19:25	Carbon Dioxide	64.6	JC65 associated samples
		9/26/07 00:17	Carbon Dioxide	83.7	None, not reported from runs
	L0709399	9/27/07 17:22	Methane	90.3	None, due to syringe failure, next CCV OK
			Ethene	90.9	None, due to syringe failure, next CCV OK
			Ethane	90.7	None, due to syringe failure, next CCV OK
	L0709422	9/29/07 19:15	Carbon Dioxide	73.9	None, not reported from runs
	L0709322	9/24/07 20:40	Carbon Dioxide	82.5	None, not reported from runs
		9/25/07 1:49	Carbon Dioxide	64.7	JC65 associated samples
		9/25/07 2:31	Carbon Dioxide	74.8	JC75 associated samples
		9/25/07 19:25	Carbon Dioxide	64.6	None, not reported from run
		9/26/07 00:17	Carbon Dioxide	83.7	JC84 associated samples
		9/26/07 2:52	Carbon Dioxide	65.5	JC84 from opening CCV
		9/26/07 5:26	Carbon Dioxide	86.4	JC86 associated samples
		9/26/07 21:55	Carbon Dioxide	82.4	JC82 associated samples

V. BLANKS

A. Laboratory blanks

1. Laboratory blanks were analyzed for every sample set and for each matrix type or once in every ten samples, whichever is more frequent.
Yes __X__ No_____

2. No blank contamination was found in the method blank.
Yes _____ No __X__

Method blanks for hydrogen analysis and for metabolic acids are in control.

There are a number of method blanks for RSK-175 which have low-level detections (*) of methane and carbon dioxide, as shown in the table below. When the associated sample result is less than 5x the method blank level (corrected for sample dilution), the sample result is qualified as UB#, where # is the corrected method blank result. Such results are usable as non-detected values.

Method	SDG	Batch	Lab Sample #	Targets Detected	Target	Qualifiers
RSK-175	L0709182	WG250267	1,4,5,6	Methane	.340	None, results > 5x blank
		WG250514	9RE, 7RE,10RE 11RE	Carbon Dioxide	272	None, results > 5x blank

Method	SDG	Batch	Lab Sample #	Targets Detected	Target	Qualifiers
	L0709237	WG250853	3,4,6,7,8,10,11 (all REs)	Carbon Dioxide	160	None, results > 5x blank
	L0709280	WG251011	1-7,8,9,11,12,16 17, 13 (All REs)	Methane	.455	UB.46 results < 5x blank (EB)
	L0709399	WG251224	2,4,9,13,14	Methane	.576	UB# results < 5x blank
	L0709422	WG251564	10,11,13	Carbon Dioxide	188	None, results > 5x blank
	L0709530	WG251928	8-11	Carbon Dioxide	159	UB159 results < 5x blank (RB)
	L0709322	WG251011	1-4	Methane	.455	UB 46 results < 5x blank (EB)

3. Instrument blank analysis was performed following all samples that contained analytes at high concentrations.
Yes _____ No____ NA__X___

B. Field Blanks
If field blanks were identified, no blank contamination was found.
Yes _____ No__X ___ NA_____
AM20GAX (Hydrogen): No rinse blanks are present. For hydrogen such blanks are unnecessary. For metabolic acids and RSK-175, the table below summarizes the results. Samples were qualified UFB.47 for detections of pyruvic acid in one field blank.

Method	SDG	Field Blank	Analyte	Result	Qualifier
RSK-175	L0709322	RB1-EBT-4	All in control		None
	L0709530	RB-2-EBT-4	Carbon Dioxide	610	None, UB from MB
M.A.	L0709530	RB-2-EBT-4	Pyruvic Acid	.470	UFB.47 detections < 5x FB
	L0709322	RB1-EBT-4	All in Control		None

VI. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

A. Matrix spike (MS) and matrix duplicate or matrix spike duplicate (MSD) were analyzed for every analyses performed for every 20 samples or for every matrix whichever is more frequent.
Yes __X___ No ____
RSK-175: There were five (5) MS/MSDs which meet the 20 to 1 ratio.
Metabolic Acids: There were five (5) MS/MSDs which meet the 20 to 1 ratio.
AM20GAX: There are no MS/MSDs for this method. They are not required or possible for hydrogen analysis.
The MS/MSDs conducted are summarized in the table below.

Method	SDG	Client Sample ID	Lab Sample ID
RSK175\5021	L0709346	IW-01-EBT-4	6
	L9709280	IW101-03A-EBT-4	13
	L0709399	PMW101-05B-EBT-4	9
	L0709530	IW21-02B-EBT-4	2
	L0709322	IW101-07A-EBT-4	2
MBA	L9709346	IW-01-EBT-4	6
	L0709399	PMW101-05B-EBT-4	9
	L0709280	IW101-03A-EBT-4	13
	L0709322	IW101-07A-EBT-4	2

Method	SDG	Client Sample ID	Lab Sample ID
	L0709530	IW21-02B-EBT-4	2

B. The MS and MSD percent recoveries (%R) were within the limits defined by the laboratory or in the contract.
Yes _____ No __X__
RSK-175: Carbon dioxide gave MS/MSD outliers as shown in the table below. In some cases, the sample level is greater than 4x the spike amount, which means that the anticipated normal analytical variability is greater than the spike amount. In such cases, no recovery can meaningfully be calculated, and no qualifiers are added. There is no indication of bias. In other cases, qualifiers are added to the parent as JS#, where # is the recovery observed, and a bias may be present proportional to the recovery.

MBA: Metabolic acid MS/MSDs had several outliers. A matrix bias roughly proportional to the recovery appears to be present in two instances. Such results are qualified for the parent as JS#, where # is the recovery which is out of limits.

MS/MSD Outliers

Method	SDG	Client Sample ID	Lab Sample ID	Analyte	MS/MSD/RPD	Qualifiers
RSK-175	L0709346	IW-01-EBT-4	6	Methane	126/OK/OK	JS126
				Carbon Dioxide	33.6/OK/41.8	JS34D42
	L9709280	IW101-03A-EBT-4	13	Methane	148/OK/OK	None, sample > 4x spike
			13	Carbon Dioxide	162/OK/OK	JS162
	L0709399	PMW101-05B-EBT-4	9	Methane	352/442/OK	None, sample > 4x spike
	L0709530	IW21-02B-EBT-4	2	Carbon Dioxide	OK/152/OK	JS152
	L0709322	IW101-07A-EBT-4	2	Carbon Dioxide	25.4/OK/43.7	JS25D44
				Methane	28.6/OK/OK	None, sample > 4x spike
M.A.	L0709280	IW101-03A-EBT-4	13	Acetic Acid	-0.719/-0.900/OK	None, sample > 4x spike
				Propionic Acid	-96.6/-100/OK	None, sample > 4x spike
	L0709322	IW101-07A-EBT-4	2	Acetic Acid	68.6/68.1/OK	JS69
				Propionic Acid	67.7/66.7/OK	JS67

C. The MSD relative percent differences (RPD) were within the defined contract or laboratory limits.
Yes _____ No __X___
See the section above. The parent sample is qualified as JD#, where # is the RPD outlier, when both RPD and spike recoveries are out of limits. Otherwise samples are not qualified for RPD outliers.

D. The MS/MSD were client samples.
Yes __X__ No _____

VII. LABORATORY CONTROL SAMPLE AND DUPLICATE (LCS/LCSD)

A. Laboratory Control Sample (LCS) and LCS duplicate were analyzed for every analyses performed and for every 20 samples or for every matrix whichever is more frequent.
Yes __X___ No_____

B. The LCS percent recovery (%R) are within the limits defined by the laboratory or in the contract.
Yes ____ No __X__
MBA: All LCS recoveries are in control.
RSK-175: There are three LCS runs for carbon dioxide that are out of limits. In one case, results for carbon dioxide are reported from a different batch so no qualifiers are added. In the other two runs there are associated results, and these are qualified as JL# to indicate a potential bias roughly proportional to the LCS outlier.
AM20GAX (Hydrogen): All LCS recoveries are in control.

Method	SDG	Lab Sample #	Batch	Targets Detected	LCS/LCSD/RPD	Qualifiers
RSK-175	L0709346	11,12,13	WG251140	Carbon Dioxide	140	None, not used for analyte
	L0709322		WG250854	Carbon Dioxide	28.4	JL28
			WG251012	Carbon Dioxide	34.5/27/3/OK	JL27

VIII. SURROGATE RECOVERY

A. The Surrogate spike was analyzed with every sample.
Yes _____ No ____ NA_X___
RSK-175: Surrogates are not required for this analysis.
Metabolic Acids: Surrogates are not required for this analysis.
AM20GAX (Hydrogen): Surrogates are not applicable to this method.

B. And met the recovery limits defined in the current contract. If recovery limits were exceeded, the sample was re-extracted and re-analyzed.
Yes _____ No_____ NA __X___

IX. INTERNAL STANDARDS

The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows. Note: Internal standards are not required for GC analysis, but if they are used, SW-846 stipulates that they meet the same recovery requirements as those specified for GCMS methods.
Yes ____ No _____ NA__X__
RSK-175, Metabolic Acids, AM20GAX: The laboratory uses the external standard procedure, so no internal standards are present or required.

X. FIELD QC

If Field duplicates were identified, they met guidance RPD of < 35% for water or < 50% for soils and gases. For values reported at < 5 x the reporting limit (RL), a difference of 2 x RL is used as guidance (4 x RL for soils). Data are not qualified for field duplicates as these are evaluated for the total project by the client.
Yes _____ No __X__ NA_____
There are 9 identified field duplicates. Observations are summarized in the table, showing that one RPD for hydrogen and one RPD for methane falls outside the limits.

SDG	Client Sample ID	Parent Sample	Observations
L0709530	DUP1-EBT-4	IW21-05A -EBT-4	Hydrogen RPD 51%
L0709471	DUP2-EBT-4	PMW21-03-EBT-4	OK
L0709182	DUP3-EBT-4	IW101-01B -EBT-4	OK
L0709280	DUP4-EBT-4	IW101-05C -EBT-4	OK

SDG	Client Sample ID	Parent Sample	Observations
L0709182	DUP5-EBT-4	IW101-08B -EBT-4	OK
L0709399	DUP6-EBT-4	IW92-08-EBT-4	Methane RPD 71%
L0709346	DUP7-EBT-4	IW85-05-EBT-4	OK
L0709280	DUP8-EBT-4	PMW92-03-EBT-4	OK
L0709471	DUP9-EBT-4	DR1-3-EBT-4	OK

XI. COMPOUND IDENTIFICATION

A. All raw data chromatograms and data system printouts were evaluated for all detected compounds and the identification is accurate.

Yes ____ No _____ NA __X__

This evaluation is not performed at this level of review.

B. Retention time limits or peak pattern identifications are met.

Yes _____ No _____ NA__X__

This evaluation is not performed at this level of review.

C. If two column or two detector confirmation was performed, the value of the confirmation was within 25%D of the quantitation value for results > 5 x RL. If the laboratory has flagged data 'COL' for %D > 40%, a JP qualifier has been added for low level results. For values below (5 x RL), the difference is not considered to impact the precision of the data.

Yes ____ No ____ NA __X__

Not part of this level of review. Dual columns are not required for these methods.

XII. COMPOUND QUANTITATION AND REPORTED CRQLS

A. Raw data examination verified that all sample results were correctly calculated.

Yes _____ No_____ NA__X__

This evaluation is not performed at this level of review.

B. The chromatograms and general system performance were acceptable for all instruments and analytical systems.

Yes _____ No _____ NA__X__

This evaluation is not performed at this level of review.

XIII. OVERALL ASSESSMENT OF THE CASE

The method criteria have been met and the quality of the data, after consideration of qualifiers, is considered acceptable and usable as far as can be determined at this level of review.
The following is noted:

Deliverables:

Initial calibration reports for RSK-175 are not accurate and complete. No qualifiers have been added due to this deficiency. Please see previous reports for details.

Chain of Custody and Login Checklists:

The project manager has been informed of chain of custody issues and the chains are updated for the project record. No qualifiers have been added for chain of custody issues. The chain of custody on use has been discussed in detail in previous reports, and those general comments apply. All chain of custody documents for RSK-175 and metabolic acids were properly signed and dated.

For hydrogen, SDG P0709346 had a hardcopy report in which the COC did not contain a proper relinquishment signature. This was also the case for the pdf version of this report.

Sample Condition:
Most of the SDGs had at least one cooler that was under 2°C but the Sample Checklist states that the samples weren't frozen. No qualifiers are required under these circumstances.

In addition, new EPA regulations (See Federal Register, March 12, 2007, 40CFR Part 122) require only that the temperature of samples delivered to the laboratory be less than 6° C. Thus the sample receipt conditions are fully compliant with applicable regulations.

L0709322: pH ranges were not acceptable for one metabolic acid sample. Sample PTMW101-01A-EBT4 was at pH 5.5, and the laboratory adjusted the pH

L0709399: PMW101-30A-EBT-4 – used correct bottles but switched labels on metabolic acid and alkalinity.
In addition, pH ranges were not acceptable for four samples, but it is not clear from the documentation for which method. These were PMW101 -04B-EBT4, -04A-EBT4, -03B-EBT4, and DUP6-EBT4. The laboratory adjusted the pH in these samples. .

L0709182: pH ranges were not acceptable for metabolic acids for sample IW101-01A-EBT4. There were two samples for RSK-175 that required resampling, including PMW85-04 and -05.

L0709280: pH ranges were not acceptable for one metabolic acids sample, which was adjusted by the laboratory. This was sample IW101-04A.

L0709422: pH ranges were not acceptable for one metabolic acids sample, which was adjusted by the laboratory. This was sample IW92-05-EBT4.

L0709530: pH ranges were not acceptable for one metabolic acid sample, which was adjusted the laboratory. This was sample IW21-05A-EBT4.

This is a common occurrence for samples at this site. The proper sample bottles have been issued and used. There is a buffering capacity to these matrices that results in slightly elevated pH. The pH is adjusted as soon as the samples reach the laboratory and the impact on the sample data is considered to be minimal.

Holding times:
RSK-175: For RSK-175, pH should not be adjusted when CO_2 is determined, which is the case in this project. It is not explicitly stated in the documentation whether samples for RSK-175 were pH-adjusted or not, but it appears that they were not. In the absence of definitive information we have assumed that no acidification occurred.
When pH is adjusted, the holding time is 14 days per the method, and we have used this as the acceptable holding time. One sample (PMW101-04B-EBT-4 in SDB L0709399) was reanalyzed at a dilution for methane and carbon dioxide 21 days after sampling. These results are qualified as JH7 to indicate that they were analyzed 7 days after the expiration of the 14-day holding time and could be biased.

Initial Calibrations:

Initial calibrations are in control. See comments in the report regarding report deficiencies.

Continuing Calibrations:
RSK-175: The laboratory conducts opening and closing calibrations (bracketing the samples during the analytical run). For RSK-175 there is not a specific requirement in the procedure for closing calibrations, and only calibration verification each 12 hours is specified. SW-846 guidance (method 8000B), however specifically requires such closing calibrations for external standard methods. For detected analytes, SW-846 specifies that the closing calibration must meet the same criteria as the opening calibration. This has been achieved for all analytes but for carbon dioxide, for which a number of opening and closing calibrations do not meet the 30% D criterion specified for RSK-175.

In such cases, detected levels of carbon dioxide are qualified as JC#, where # is the applicable opening or closing CCV outlier. Such results may be biased due to calibration drift. Please see the qualified reports or the EDD for details.

LCS Recoveries:
RSK-175: There are three LCS runs for carbon dioxide that are out of limits. In one case, results for carbon dioxide are reported from a different batch so no qualifiers are added. In the other two runs there are associated results, and these are qualified as JL# to indicate a potential bias roughly proportional to the LCS outlier.

MS/MSD Recoveries:
RSK-175: There were four (4) MS/MSDs which meet the 20 to 1 ratio. Carbon dioxide gave MS/MSD outliers as shown in the table within the report. In some cases, the sample level is greater than 4x the spike amount, which means that the anticipated normal analytical variability is greater than the spike amount. In such cases, no recovery can meaningfully be calculated, and no qualifiers are added. There is no indication of bias. In other cases, qualifiers are added to the parent as JS#, where # is the recovery observed, and a bias may be present proportional to the recovery.

MBA: There were four (4) MS/MSDs which meet the 20 to 1 ratio. Metabolic acid MS/MSDs had several outliers. A matrix bias roughly proportional to the recovery appears to be present in two instances. Such results are qualified for the parent as JS#, where # is the recovery which is out of limits.

Field Duplicates:
There are 9 identified field duplicates. Observations are summarized in the table, showing that one RPD for hydrogen and one RPD for methane falls outside the limits.

Method Blanks:
There are a number of method blanks for RSK-175 which have low-level detections (*) of methane and carbon dioxide, as shown in the table within the report. When the associated sample result is less than 5x the method blank level (corrected for sample dilution), the sample result is qualified as UB#, where # is the corrected method blank result. Such results are usable as non-detected values.

Field Blanks:
For metabolic acids and RSK-175, the table within the report summarizes the results. Samples were qualified UFB.47 for detections of pyruvic acid in one field blank.

INORGANIC DATA QUALITY REVIEW REPORT

METALS BY ICP SW-846 METHOD 6010B and WET CHEMISTRY

SDG: L070: 9182, 9237, 9280, 9322, 9346, 9399, 9422, 9471, 9530

PROJECT: Memphis Defense Depot Site; EBT4 phase for e2m, TX

LABORATORY: Kemron Laboratories, Marietta, OH

SAMPLE MATRIX: Water SAMPLING DATE (Month/Year): 9 / 07

ANALYSES REQUESTED: SW-846 Method 6010 (ICP), 9056 (IC) Bromide, Chloride, Nitrate, Nitrite, Sulfate, 9060 Total Organic Carbon; MCAWW Method 310.2 Alkalinity, Method 376.1 Sulfide

NO. OF SAMPLES: 110 Metals, 109 TOC, and 108 Wet Chemistry

SAMPLE NO: See attached results forms

DATA REVIEWER: JJ Egry Consulting

QA REVIEWER: Diane Short and Associates Inc. INITIALS/DATE: ______

Telephone Logs included Yes____ No X

Contractual Violations Yes____ No X

The project Sampling and Analysis Plan (SAP), the EPA Contract Laboratory Program National Functional Guidelines for Inorganic Review, 2002 and the SW-846 and MCAWW Methods have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. Per the Scope of Work, the review includes validation of all calibrations, chains of custody, and QC forms referencing the above documents.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work or project contract.

Yes __X__ No___

The following is noted for clarification:

Data are reviewed as Level III. No raw data review is to be required. Many of the Wet Chem. methods, however, do not have standard reporting forms for the calibrations and these have been determined from the raw data provided.

The packages contained 107 metals, 107 TOC, and 107 wet chemistry samples analyzed for 3 project-specific ICP metals and 8 wet chemistry parameters. There were also 2 field blanks. All packages were reviewed for COC, holding time, summary QC, and calibration. In addition, for all wet chemistry parameters (except for IC) the raw data were reviewed for initial instrument calibration (e.g. calibration curves) and ICV/CCV's, since no QC summaries were reported for them (again, except for IC). One SDG (L0709322) was further evaluated for calibration blank results for all analyses.

II. CALIBRATIONS

A. All initial instrument calibrations were performed as defined in the contract or Statement of Work (SOW). All correlation coefficients of the 3 point curve were > 0.995.

Yes ____ No _X__ NA____

Per the raw data review, the Method 300 reports a % RSD of the response factors as part of the calibration criteria. The % RSD is not defined in the validation guidance, but good laboratory practice would recommend a minimum of 10% deviation for wet chemistry methods. Deviations greater than this value indicate variability of the instrument response over a range of concentrations.

One of the % RSDs for Bromide was greater than 10%. The validator recommends that the following qualifiers be applied to affected data. Data would be qualified JC#, where # is the % RSD.

SDG	Sample ID	Analyte	Qualifier
L0709471	All detected data	Bromide	JC10.8

B. The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were analyzed at the required frequency.

Yes __X__ No ____

Sequencing was not required, but sufficient calibrations were present to verify that the frequencies were met for client samples.

C. And the ICV and CCV standard percent recovery results were within the required control limits of 90 – 110% (Mercury 80 – 120%).

Yes ___ No__X__

Several CCVs for Alkalinity were above 110%. The validator recommends that the following qualifiers be applied to the affected data. Data would be qualified JC# where # is the percent recovery in the worst-case CCV. Data whose percent recovery is greater than 110% could possibly be biased high with respect to the recovery. Undetected data are not qualified for high CCV recoveries. Sequencing was not required. Per the method, these samples should have been re-run with an in-control calibration. The laboratory was contacted and has responded that their acceptance limit is 85 – 115%. Data will not be qualified, but the following is noted as a potential high bias.

SDG	Sample ID	Analyte	Qualifier
L0709280	All detected data	Alkalinity, Total	JC111
L0709322	All detected data	Alkalinity, Total	JC115
L0709346	All detected data	Alkalinity, Total	JC112
L0709422	All detected data	Alkalinity, Total	JC111
L0709530	All detected data	Alkalinity, Total	JC113

III. CRDL STANDARDS
The 2 x CRDL standards were analyzed as required in the SOW.
Yes ___ No ____ NA __X_

Not required for Level III.

IV. BLANKS
Note: the highest blank associated with any particular analyte is used for the qualification process and is the value entered after the "B" blank descriptor.

A. The initial calibration blanks (ICB) and continuing calibration blanks (CCB) were analyzed at the required frequency.
Yes ___X_ No____ NA ____

Sequencing was not required, but sufficient calibration blanks were present to verify that the frequencies were met for client samples.

B. And the ICB and CCB results were within the required control limits.
Yes ___X__ No____ NA _____

Per the 10% review of the QC summaries, there were no reported analyte detections reported in the calibration blanks.

C. And all analytes in the Leach Blank were less than the CRDL, or less than 2x the instrument detection limit (IDL), whichever is lower.
Yes____ No____ NA __X__

No TCLP analysis was performed.

V. PREPARATION BLANKS
A. Preparation blanks were prepared and analyzed at the required frequency.
Yes __X__ No ____

B. And all analytes in the preparation blank were less than the CRDL, or less than the instrument detection limit (IDL), whichever is lower.
Yes ____ No __X__

Analytes were found in the preparation blanks at levels requiring qualification for the following parameters.

Analytes reported as contaminants in the preparation blank are qualified UB# in the affected samples, where # is the value of the blank corrected to the units of the sample. Sample detects whose values is less than 5x blank are qualified as noted and are fully usable as undetected values at that level.

SDG	Result	Work Group	Analyte	Qualifier
L0709322	0.00515	WG251073	Selenium	UB.00515
L0709237	0.315	WG250156	Chloride	UB.315

C. Field, trip, decon rinse or other field blanks are contained and identified in the package.
Yes __X__ No ____ NA ____

Field Blanks are identified as RB1-EBT-4 and RB2-EBT-4.

D. And the reported results are less than the CRDL or less than the IDL, whichever is lower.
Yes ____ No __X_ NA ____

There were some blank analytes detects reported in the field blanks, but most client data were either non-detect or much greater than the contamination with the following exceptions. Data are qualified UFB #, where # is the field blank value. Data are fully usable as undetected values. Only data less than 5X blank are qualified.

Field Blank	Sample	Analyte	Result	Qualifier
RB1-EBT-4	L0709322-01	Alkalinity	13.7	UFB13.7
RB2-EBT-4	L0709530-11	Alkalinity	10.8	UFB10.8

VIA. ICP INTERFERENCE CHECK SAMPLE

A. The Interference Check Sample (ICS) was analyzed as required in the SOW or contract.
Yes __X__ No____ NA____

B. And the ICS percent recovery results were reported for all required ICS analytes and were within required control limits of 80% to 120%.
Yes __X__ No ____ NA____

C. ICP analysis results for analytes not required to be present in a given ICS standard were within acceptable limits.
Yes ____ No ____ NA __X__

Not requested by client and data not provided by laboratory.

VIB. INTERELEMENT CORRECTION FACTORS

The Interelement Correction Factors are included and complete for all possible interferent analytes.
Yes ____ No____ NA__X__

Review of possible other contaminants was not requested by the client and is not applicable to limited list metals.

VII. SPIKE SAMPLE RECOVERY

A. A matrix (pre-digestion) spike sample was analyzed for each digestion group and/or matrix or as required in the SOW.
Yes __X___ No____

The laboratory ran variously either matrix duplicates or MS/MSD samples or both or neither. The client has identified the following MS/MSDs:
PMW101-05B-EBT-4, IW101-07A-EBT-4, IW-01-EBT-4, IW21-02B-EBT-4, PMW85-04-EBT-4, and IW101-03A-EBT-4.
Other samples may also have been used. For a number of the wet chemistry analyses, no MS or MD was reported for the particular data set, but the overall frequency appears to have been met. When an MS or MD was not reported, an LCS, LCSD pair was reported. Final overall frequency will be determined by the project manager.

B. And the Matrix spike percent recoveries were within the required control limits of 75 – 125%.
Yes ____ No __X_ NA____

The samples were qualified JS#, where the # is the percent recovery of that particular analyte. A high matrix spike recovery indicates a possible high bias to the reported result. Only detected data are qualified. A low matrix spike recovery indicates a possible low bias to the reported result. A matrix spike recovery below 30% results in rejection of all non-detect data associated with that analyte. No data have been rejected. The MS and the MSD samples for alkalinity have the same results as the parent and it is possible that the sample was not spiked. Extremely low alkalinity spikes have not been present in these data sets to date. If this is the case, the qualifier would not be applicable.

The following SDGs had matrix spike results that resulted in sample qualification.

SDG	ANALYTE	RESULT	Qualifier
L0709280	Chloride	15.5/15.6	JS15.5
	Alkalinity	32.1/33.1	JS32.1
	TOC	45.5/284	*
L0709322	Alkalinity	0.713/-1.94	JS0
	TOC	203/196	JS203
L0709346	Manganese	137/105	JS137
	Chloride	148/147	JS148

* The parent sample results were very high (> 4 x spike) compared to the spike added, making the percent recoveries unreliable. Per the validation guidance, data are not qualified in this case.

B. A Post-digest spike was analyzed if required.
Yes __X__ No____ NA___

C. The MS/MSD samples included client samples
Yes __X_ No___ NA____

The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

There were at least 6 client samples reported for MS/MSD samples and at least 6 client samples reported for wet chemistry MS/MSD or MD samples. This would meet project frequency of 1/20.

VIII. DUPLICATES

A. Matrix (pre-digestion) duplicate samples were analyzed at the required frequency
Yes __X__ No ____

The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

The laboratory ran variously either matrix duplicates or MS/MSD samples or both or neither.

B. And the Matrix duplicate relative percent differences (RPD) were within the required control limits (Water 20%, Soil 35%) or the RL limits were met if the duplicate values are < 5 x RL. If the either one of the duplicate results are < 5 X RL, the RPD is not used. The QC limit used is the difference between the original and the duplicate results (± the RL) for water and (± 2X the RL) for soils.

Yes ____ No __X__ NA_____

Data are qualified JD# for out of control relative percent differences (RPD) between duplicate spikes where the # is the % RPD. It is possible that matrix interference or sample inhomogeneity are affecting the consistency of the reported results. It is possible the variability of the reported results increases as the RPD or difference between the values increases.

SDG	Sample ID	Analyte	Qualifier
L0709280	All samples	Total Organic Carbon	JD21

IX. LABORATORY CONTROL SAMPLE

A. Laboratory control samples (LCS) were analyzed at the required frequency.
Yes _X___ No____

The laboratory also ran an LCS duplicate at times.

B. And LCS recoveries were within the required control limits of 80 to 120%.
Yes __X___ No____

X. MSA RESULTS AND GRAPHITE FURNACE ANALYSIS (GFAA)

Duplicate injections were performed for all analyses and the RSDs were less than 20% for all reported results. (Method of Standard Additions (MSA) requires only a single injection).
Yes ____ No____ NA__X___

Graphite furnace was not done.

XI. ICP SERIAL DILUTION

A. ICP Serial Dilutions have been analyzed at the required frequency if the analyte concentrations are greater than 50 x IDL.
Yes __X_ No____ NA_____

The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

B. And the percent difference criteria of ± 10 % have been met.
Yes __X__ No _____ NA____

C. The serial dilution analyses were on client samples.
Yes __X___ No_____

The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number). The laboratory sometimes reported serial dilution results and sometimes did not.

XII. INSTRUMENT DETECTION LIMITS

A. The Instrument Detection Limits have met the Quarterly reporting requirements.
Yes ___X_ No____ NA___

This was determined to be acceptable during the contractual process.

B. And all sample results have met the required detection limits (CRDL).
Yes __X__ No____ NA____

The laboratory has diluted several of the digestates to account for potential matrix effects on the IC chloride analysis as well as for alkalinity and TOC. The laboratory has reported only the diluted results. The dilutions performed raised the MDL's; the project manager will evaluate whether the elevated MDL's are still below the project reporting limits.

XIII. PREPARATION AND ANALYSIS LOGS

A. All samples were prepared or analyzed within the required holding times referencing the SOW (time of sample receipt to preparation/distillation).
Yes ____ No__X__

B. All samples were analyzed within the 40 CFR 136 (Clean Water Act) or method recommended holding times (time of sample collection to date of analysis).
Yes _____ No_X___

The laboratory has noted holding time exceedence for samples in SDGs L0709471 and L0709237. The samples for SDG L0709471 were analyzed for Nitrate /Nitrite 4 days outside of holding time. The nitrate values could be usable, but the nitrite component is rejected. Data are qualified RH #, where # is number of **days** analyzed outside of holding time. Some of the samples for SDG L0709237 were analyzed shortly after the holding time had expired. These samples are qualified JH#, where # is the number of **hours** analyzed outside of holding time.

SDG	Sample ID	Collection Date	Collection Time	Analyte	Analysis Date/Time	Qualifier
L0709471	IW21-01B-EBT-4	9/19/2007	15:24	Nitrate	9/25/2007 10:52	RH4
	IW21-01B-EBT-4	9/19/2007	15:24	Nitrite	9/25/2007 10:52	RH4
	IW21-04B-EBT-4	9/19/2007	13:37	Nitrate	9/25/2007 11:09	RH4
	IW21-04B-EBT-4	9/19/2007	13:37	Nitrite	9/25/2007 11:09	RH4
	DUP9-EBT-4	9/19/2007	10:49	Nitrate	9/25/2007 11:26	RH4
	DUP9-EBT-4	9/19/2007	10:49	Nitrite	9/25/2007 11:26	RH4
	PMW101-08B-EBT-4	9/19/2007	9:12	Nitrate	9/25/2007 11:44	RH4
	PMW101-08B-EBT-4	9/19/2007	9:12	Nitrite	9/25/2007 11:44	RH4
	DR1-3-EBT-4	9/19/2007	10:47	Nitrate	9/25/2007 12:01	RH4
	DR1-3-EBT-4	9/19/2007	10:47	Nitrite	9/25/2007 12:01	RH4
	IW21-04A-EBT-4	9/19/2007	13:44	Nitrate	9/25/2007 12:19	RH4
	IW21-04A-EBT-4	9/19/2007	13:44	Nitrite	9/25/2007 12:19	RH4

SDG	Sample ID	Collection Date	Collection Time	Analyte	Analysis Date/Time	Qualifier
	IW92-01-EBT-4	9/19/2007	8:58	Nitrate	9/25/2007 12:37	RH4
	IW92-01-EBT-4	9/19/2007	8:58	Nitrite	9/25/2007 12:37	RH4
	IW92-02-EBT-4	9/19/2007	8:25	Nitrate	9/25/2007 13:47	RH4
	IW92-02-EBT-4	9/19/2007	8:25	Nitrite	9/25/2007 13:47	RH4
	DUP2-EBT-4	9/19/2007	8:30	Nitrate	9/25/2007 14:04	RH4
	DUP2-EBT-4	9/19/2007	8:30	Nitrite	9/25/2007 14:04	RH4
	PMW21-03-EBT-4	9/19/2007	8:27	Nitrate	9/25/2007 14:22	RH4
	PMW21-03-EBT-4	9/19/2007	8:27	Nitrite	9/25/2007 14:22	RH4
	MW-115-EBT-4	9/19/2007	11:23	Nitrate	9/25/2007 14:39	RH4
	MW-115-EBT-4	9/19/2007	11:23	Nitrite	9/25/2007 14:39	RH4
L0709237	IW101-01C-EBT-4	9/11/2007	8:07	Nitrate	9/13/2007 11:15	JH3
	IW101-01C-EBT-4	9/11/2007	8:07	Nitrite	9/13/2007 11:15	JH3
	MW-101T-EBT-4	9/11/2007	10:10	Nitrate	9/13/2007 11:50	JH2
	MW-101T-EBT-4	9/11/2007	10:10	Nitrite	9/13/2007 11:50	JH2
	MW-101B-EBT-4	9/11/2007	11:37	Nitrate	9/13/2007 12:07	JH.5
	MW-101B-EBT-4	9/11/2007	11:37	Nitrite	9/13/2007 12:07	JH.5
	IW101-06A-EBT-4	9/11/2007	9:45	Nitrate	9/13/2007 12:42	JH3
	IW101-06A-EBT-4	9/11/2007	9:45	Nitrite	9/13/2007 12:42	JH3
	PMW92-05-EBT-4	9/11/2007	13:37	Nitrate	9/13/2007 14:44	JH1
	PMW92-05-EBT-4	9/11/2007	13:37	Nitrite	9/13/2007 14:44	JH1
	PMW92-06-EBT-4	9/11/2007	11:26	Nitrate	9/13/2007 15:01	JH3.5
	PMW92-06-EBT-4	9/11/2007	11:26	Nitrite	9/13/2007 15:01	JH3.5
	MW-85-EBT-4	9/11/2007	9:20	Nitrate	9/13/2007 15:19	JH6
	MW-85-EBT-4	9/11/2007	9:20	Nitrite	9/13/2007 15:19	JH6

C. Chains of Custody (COC)

1. Chains of Custody (COC) were reviewed and all fields were complete, signatures were present and cross outs were clean and initialed.
Yes__X___ No ____

2. Samples were received at the required temperature and preservation.
Yes_____ No __X__

Per the COCs and the laboratory log-in records, all applicable chemical preservatives were properly used except as follows.

In SDGs L0709182, L0709280, L0709322, L0709346, L0709399, L0709422, and L0709471 several samples were noted as being above the required pH of 2. Samples were acidified as soon as they were received by the laboratory and the exceedence is not expected to impact the data, as the time was less than 24 hours. All of these may be due to inherent matrix buffering, as the exceedences were not high indicating that acid had been properly added in the field. The laboratory correctly added HNO_3 to bring them to the proper pH. For these particular shipments, the samples were properly cooled and the shipping time was relatively brief. Since all analytes of interest are stable when cooled, no such stable analytes of interest received qualification for insufficient field chemical preservation of the samples.

TABLE OF INSUFFICIENT pH

SDG	Sample	Analysis
L0709182	IW101-01A-EBT-4	Metals
	IW101-01B-EBT-4	Metals
L0709280	IW101-04A-EBT-4	Metals
	IW101-03B-EBT-4	Metals
	IW101-03A-EBT-4	Metals
	IW101-02C-EBT-4	Metals
	IW101-02B-EBT-4	Metals
L0709322	PMW101-01A-EBT-4	Metals
	PMW101-01A-EBT-4	TOC
	IW101-09B-EBT-4	Metals
	IW101-01B-EBT-4	Metals
	IW101-07A-EBT-4-MS	Metals
	IW101-07A-EBT-4	Metals
	PMW101-02B-EBT-4	Metals
	PMW101-02A-EBT-4	Metals
	RB1-EBT-4	Metals
	IW85-06-EBT-4	Metals
L0709346	IW101-09C-EBT-4	Metals
	IW92-07-EBT-4	Metals
	IW92-06-EBT-4	Metals
	IW92-06-EBT-4	TOC
L0709399	PMW101-04B-EBT-4	Metals
	PMW101-04A-EBT-4	Metals
	PMW101-03B-EBT-4	Metals
	Dup6	Metals
L0709422	PM101-06A-EBT-4	Metals
L0709471	IW21-04A-EBT-4	Metals

XIV. FIELD QC

A. Field QC samples (duplicates, SRMs) were identified.

Yes __X__ No____

The field duplicates are identified as:

SDG	Duplicate Pair
L0709182	IW101-01B-EBT-4/Dup 3
	IW101-08B-EBT-4/Dup 5
L0709280	IW101-05C-EBT-4/Dup 4
	PMW92-03-EBT-4/Dup 8

L0709346	IW85-05-EBT-4/Dup 7
L0709399	IW92-08-EBT-4/Dup 6
L0709471	DR1-3-EBT-4/Dup 9
	PMW21-03-EBT-4/Dup 2
L0709530	IW21-05A-EBT-4/Dup 1

B. Field duplicates were within a guidance limit of < 35% RPD limit for water or <50% RPD limit for soil. If values are < 5 x RL, the water limit is ± 2 x RL and the soil limit is ±4 x RL. Final determination will be made by the project manager.
Yes __X__ No ____ NA___

XV. GENERAL COMMENTS
The laboratory has complied with the requested methods and the quality of the data is acceptable and usable with consideration of the following qualifications. Note that the following qualifiers are used:

UB#, UFB#, where # is the value of the preparation or field blank contamination. Data are fully usable as undetected values.
JC#, where # is the percent RSD of the calibration curve, or # is the percent recovery of the Continuing Calibration Verification (CCV). There could be a variability to the reported result due to variability in the instrument response over a range of concentrations.
JD#, where the # is the % RPD between the matrix spike and the matrix spike duplicate. It is possible that matrix interference or sample inhomogeneity are affecting the consistency of reported results.
JS# is for matrix spike/matrix spike duplicate recoveries, where # is the analyte recovery. The bias to the data is considered to be high or low proportional to the analyte recovery. (JS126 would indicate the value could be 126% of the true value).
JH#, where # is the number of hours the sample was analyzed outside of holding time. Data could be biased low due to degradation.
RH#, where # is the number of Days outside of holding time. Data are considered to be rejected due to a holding time exceedence greater than 2 x the limit.

Qualification or Comments in Detail

Calibration
Per the raw data review, the Method 300 reports a % RSD of the response factors as part of the calibration criteria. The % RSD is not defined in the validation guidance, but good laboratory practice would recommend a minimum of 10% deviation for wet chemistry methods. Deviations greater than this value indicate variability of the instrument response over a range of concentrations.

One of the % RSDs for Bromide was greater than 10%. The validator recommends that the following qualifiers be applied to affected data. Data would be qualified JC#, where # is the % RSD.

Five data sets had CCVs for Alkalinity that were above 110%. The validator recommends that the qualifiers noted in the text be applied to the affected data. Data would be qualified JC# where # is the percent recovery in the worst-case CCV. Data whose percent recovery is greater than 110% could possibly be biased high with respect to the recovery. Undetected data are not qualified for high CCV recoveries. Sequencing was not required. Per the method, these samples should have been re-run with an in-control calibration. The laboratory was contacted and has responded that their acceptance limit is 85 – 115%. Data will not be qualified, but the table in the text is noted with potential high biases.

Blanks

Analytes reported as contaminants in the preparation blank are qualified UB# in the affected samples, where # is the value of the blank corrected to the units of the sample. Sample detects whose values is less than 5x blank are qualified as noted and are fully usable as undetected values at that level.

SDG	Result	Work Group	Analyte	Qualifier
L0709322	0.00515	WG251073	Selenium	UB.00515
L0709237	0.315	WG250156	Chloride	UB.315

There were some blank analytes detects reported in the field blanks, but most client data were either non-detect or much greater than the contamination with the following exceptions. Data are qualified UFB #, where # is the field blank value. Data are fully usable as undetected values. Only data less than 5X blank are qualified.

Field Blank	Sample	Analyte	Result	Qualifier
RB1-EBT-4	L0709322-01	Alkalinity	13.7	UFB13.7
RB2-EBT-4	L0709530-11	Alkalinity	10.8	UFB10.8

Matrix Spikes/Matrix Spike Duplicates

The following SDGs had matrix spike results that resulted in sample qualification.
Data are qualified JS# is for matrix spike/matrix spike duplicate recoveries, where # is the analyte recovery. The bias to the data is considered to be high or low proportional to the analyte recovery.

SUMMARY TABLE FOR MS/MSD QUALIFIERS

SDG	ANALYTE	RESULT	Qualifier
L0709280	Chloride	15.5/15.6	JS15.5
	Alkalinity	32.1/33.1	JS32.1
	TOC	45.5/284	*
L0709322	Alkalinity	0.713/-1.94	JS0
	TOC	203/196	JS203
L0709346	Manganese	137/105	JS137
	Chloride	148/147	JS148

* The parent sample results were very high (> 4 x spike) compared to the spike added, making the percent recoveries unreliable. Per the validation guidance, data are not qualified in this case.

Data are qualified JD# for out of control relative percent differences (RPD) between duplicate spikes where the # is the % RPD. It is possible that matrix interference or sample inhomogeneity are affecting the consistency of the reported results. It is possible the variability of the reported results increases as the RPD or difference between the values increases.

SDG	Sample ID	Analyte	Qualifier
L0709280	All samples	Total Organic Carbon	JD21

Serial Dilutions

The actual identification of samples reported for this QC analysis could not be done under the SOW provided, except where the laboratory specifically reported a recognizable client ID (as opposed to a laboratory internal tracking number).

Detection Limits

The laboratory has diluted several of the digestates to account for potential matrix effects on the IC chloride analysis as well as for alkalinity and TOC. The laboratory has reported only the diluted results. The dilutions performed raised the MDL's; the project manager will evaluate whether the elevated MDL's are still below the project reporting limits.

Holding Times

The laboratory has noted holding time exceedence for samples in SDGs L0709471 and L0709237. The samples for SDG L0709471 were analyzed for Nitrate /Nitrite 4 days outside of holding time. The nitrate values could be usable, but the nitrite component is rejected. Data are qualified RH #, where # is number of days analyzed outside of holding time. Some of the samples for SDG L0709237 were analyzed shortly after the holding time had expired. These samples are qualified JH#, where # is the number of hours analyzed outside of holding time. A full table is contained in the text.

Sample Preservation

Since all analytes of interest are stable when cooled, no such stable analytes of interest received qualification for insufficient field chemical preservation of the samples.

TABLE OF INSUFFICIENT pH

SDG	Sample	Analysis
L0709182	IW101-01A-EBT-4	Metals
	IW101-01B-EBT-4	Metals
L0709280	IW101-04A-EBT-4	Metals
	IW101-03B-EBT-4	Metals
	IW101-03A-EBT-4	Metals
	IW101-02C-EBT-4	Metals
	IW101-02B-EBT-4	Metals
L0709322	PMW101-01A-EBT-4	Metals
	PMW101-01A-EBT-4	TOC
	IW101-09B-EBT-4	Metals
	IW101-01B-EBT-4	Metals
	IW101-07A-EBT-4-MS	Metals
	IW101-07A-EBT-4	Metals
	PMW101-02B-EBT-4	Metals
	PMW101-02A-EBT-4	Metals
	RB1-EBT-4	Metals
	IW85-06-EBT-4	Metals
L0709346	IW101-09C-EBT-4	Metals
	IW92-07-EBT-4	Metals
	IW92-06-EBT-4	Metals
	IW92-06-EBT-4	TOC
L0709399	PMW101-04B-EBT-4	Metals
	PMW101-04A-EBT-4	Metals
	PMW101-03B-EBT-4	Metals
	Dup6	Metals
L0709422	PM101-06A-EBT-4	Metals
L0709471	IW21-04A-EBT-4	Metals

QUALIFICATION SUMMARY TABLE

Note data qualified with a JC# are recommendations at this time.

SDG	Sample ID	Analyte	Qualifier
L0709237	IW101-01C-EBT-4	Nitrate	JH3
	IW101-01C-EBT-4	Nitrite	JH3
	MW-101T-EBT-4	Nitrate	JH2
	MW-101T-EBT-4	Nitrite	JH2
	MW-101B-EBT-4	Nitrate	JH.5
	MW-101B-EBT-4	Nitrite	JH.5
	IW101-06A-EBT-4	Nitrate	JH3
	IW101-06A-EBT-4	Nitrite	JH3
	PMW92-05-EBT-4	Nitrate	JH1
	PMW92-05-EBT-4	Nitrite	JH1
	PMW92-06-EBT-4	Nitrate	JH3.5
	PMW92-06-EBT-4	Nitrite	JH3.5
	MW-85-EBT-4	Nitrate	JH6
	MW-85-EBT-4	Nitrite	JH6
L0709280	DUP8-EBT-4	Alkalinity, Total	JC111S32.1
	DUP8-EBT-4	Total Organic Carbon	JD21
	DUP8-EBT-4	Chloride	JS15.5
	PMW92-01-EBT-4	Chloride	JS15.5
	PMW92-01-EBT-4	Alkalinity, Total	JC111S32.1
	PMW92-01-EBT-4	Total Organic Carbon	JD21
	PMW92-02-EBT-4	Alkalinity, Total	JC111S32.1
	PMW92-02-EBT-4	Total Organic Carbon	JD21
	PMW92-02-EBT-4	Chloride	JS15.5
	PMW92-03-EBT-4	Alkalinity, Total	JC111S32.1
	PMW92-03-EBT-4	Chloride	JS15.5
	PMW92-03-EBT-4	Total Organic Carbon	JD21
	DR2-1-EBT-4	Total Organic Carbon	JD21
	DR2-1-EBT-4	Alkalinity, Total	JC111S32.1
	DR2-1-EBT-4	Chloride	JS15.5
	DUP4-EBT-4	Total Organic Carbon	JD21
	DUP4-EBT-4	Chloride	JS15.5
	DUP4-EBT-4	Alkalinity, Total	JC111S32.1
	IW101-04A-EBT-4	Chloride	JS15.5
	IW101-04A-EBT-4	Alkalinity, Total	JC111S32.1
	IW101-04A-EBT-4	Total Organic Carbon	JD21
	IW101-05B-EBT-4	Chloride	JS15.5
	IW101-05B-EBT-4	Total Organic Carbon	JD21
	IW101-05B-EBT-4	Alkalinity, Total	JC111S32.1
	IW101-05C-EBT-4	Chloride	JS15.5
	IW101-05C-EBT-4	Total Organic Carbon	JD21
	IW101-05C-EBT-4	Alkalinity, Total	JC111S32.1
	IW101-02B-EBT-4	Total Organic Carbon	JD21
	IW101-02B-EBT-4	Chloride	JS15.5

SDG	Sample ID	Analyte	Qualifier
	IW101-02B-EBT-4	Alkalinity, Total	JC111S32.1
	IW101-02C-EBT-4	Total Organic Carbon	JD21
	IW101-02C-EBT-4	Alkalinity, Total	JC111S32.1
	IW101-02C-EBT-4	Chloride	JS15.5
	IW101-03A-EBT-4	Chloride	JS15.5
	IW101-03A-EBT-4	Alkalinity, Total	JC111S32.1
	IW101-03A-EBT-4	Total Organic Carbon	JD21
	IW101-03B-EBT-4	Total Organic Carbon	JD21
	IW101-03B-EBT-4	Alkalinity, Total	JC111S32.1
	IW101-03B-EBT-4	Chloride	JS15.5
	IW101-03C-EBT-4	Chloride	JS15.5
	IW101-03C-EBT-4	Total Organic Carbon	JD21
	IW101-03C-EBT-4	Alkalinity, Total	JC111S32.1
L0709322	RB1-EBT-4	Alkalinity, Total	JC115S0
	IW101-07A-EBT-4	Total Organic Carbon	JS203
	IW101-07A-EBT-4	Alkalinity, Total	JC115S0
	IW101-07A-EBT-4-MS	Alkalinity, Total	JC115S0
	IW101-07A-EBT-4-MSD	Alkalinity, Total	JC115S0
	IW101-07B-EBT-4	Total Organic Carbon	JS203
	IW101-07B-EBT-4	Alkalinity, Total	JC115S
	IW101-07C-EBT-4	Total Organic Carbon	JS203
	IW101-07C-EBT-4	Alkalinity, Total	JC115S0
	IW101-09A-EBT-4	Total Organic Carbon	JS203
	IW101-09A-EBT-4	Alkalinity, Total	JC115S0
	IW101-09B-EBT-4	Total Organic Carbon	JS203
	IW101-09B-EBT-4	Alkalinity, Total	JC115S0
	PMW101-01A-EBT-4	Alkalinity, Total	JC115S0
	PMW101-01A-EBT-4	Total Organic Carbon	JS203
	PMW101-01B-EBT-4	Total Organic Carbon	JS203
	PMW101-01B-EBT-4	Alkalinity, Total	JC115S0
	PMW101-02A-EBT-4	Alkalinity, Total	JC115S0
	PMW101-02A-EBT-4	Total Organic Carbon	JS203
	PMW101-02B-EBT-4	Alkalinity, Total	JC115S0
	PMW101-02B-EBT-4	Total Organic Carbon	JS203
	IW85-01-EBT-4	Alkalinity, Total	JC115S0
	IW85-01-EBT-4	Total Organic Carbon	JS203
	IW85-06-EBT-4	Total Organic Carbon	JS203
	IW85-06-EBT-4	Alkalinity, Total	JC115S0
	DR2-5-EBT-4	Alkalinity, Total	UFB13.7JC115S0
L0709346	DUP7-EBT-4	Chloride	JS148
	DUP7-EBT-4	Alkalinity, Total	JC112
	DUP7-EBT-4	Manganese, Total	JS137
	IW92-06-EBT-4	Chloride	JS148
	IW92-06-EBT-4	Alkalinity, Total	JC112
	IW92-06-EBT-4	Manganese, Total	JS137

SDG	Sample ID	Analyte	Qualifier
	IW92-07-EBT-4	Manganese, Total	JS137
	IW92-07-EBT-4	Chloride	JS148
	IW92-07-EBT-4	Alkalinity, Total	JC112
	IW85-02-EBT-4	Manganese, Total	JS137
	IW85-02-EBT-4	Alkalinity, Total	JC112
	IW85-02-EBT-4	Chloride	JS148
	IW85-05-EBT-4	Chloride	JS148
	IW85-05-EBT-4	Alkalinity, Total	JC112
	IW85-05-EBT-4	Manganese, Total	JS137
	IW-01-EBT-4	Chloride	JS148
	IW-01-EBT-4	Alkalinity, Total	JC112
	IW-01-EBT-4	Manganese, Total	JS137
	IW21-01A-EBT-4	Alkalinity, Total	JC112
	IW21-01A-EBT-4	Manganese, Total	JS137
	IW21-01A-EBT-4	Chloride	JS148
	IW101-04B-EBT-4	Alkalinity, Total	JC112
	IW101-04B-EBT-4	Manganese, Total	JS137
	IW101-04B-EBT-4	Chloride	JS148
	IW101-04C-EBT-4	Alkalinity, Total	JC112
	IW101-04C-EBT-4	Manganese, Total	JS137
	IW101-04C-EBT-4	Chloride	JS148
	IW101-09C-EBT-4	Chloride	JS148
	IW101-09C-EBT-4	Alkalinity, Total	JC112
	IW101-09C-EBT-4	Manganese, Total	JS137
L0709422	PMW21-01-EBT-4	Alkalinity, Total	JC111
	PMW21-02-EBT-4	Alkalinity, Total	JC111
	PMW21-04-EBT-4	Alkalinity, Total	JC111
	PMW21-05-EBT-4	Alkalinity, Total	JC111
	MW21-EBT-4	Alkalinity, Total	JC111
	IW92-03-EBT-4	Alkalinity, Total	JC111
	IW92-04-EBT-4	Alkalinity, Total	JC111
	PMW101-06A-EBT-4	Alkalinity, Total	JC111
	PMW101-06B-EBT-4	Alkalinity, Total	JC111
	PMW101-07A-EBT-4	Alkalinity, Total	JC111
	PMW101-07B-EBT-4	Alkalinity, Total	JC111
	PMW101-08A-EBT-4	Alkalinity, Total	JC111
	IW92-05-EBT-4	Alkalinity, Total	JC111
L0709471	IW21-01B-EBT-4	Bromide	JC10.8
	IW21-01B-EBT-4	Nitrate	RH4
	IW21-01B-EBT-4	Nitrite	RH4
	IW21-04B-EBT-4	Bromide	JC10.8
	IW21-04B-EBT-4	Nitrate	RH4
	IW21-04B-EBT-4	Nitrite	RH4
	DUP9-EBT-4	Bromide	JC10.8
	DUP9-EBT-4	Nitrate	RH4

SDG	Sample ID	Analyte	Qualifier
	DUP9-EBT-4	Nitrite	RH4
	PMW101-08B-EBT-4	Bromide	JC10.8
	PMW101-08B-EBT-4	Nitrate	RH4
	PMW101-08B-EBT-4	Nitrite	RH4
	DR1-3-EBT-4	Bromide	JC10.8
	DR1-3-EBT-4	Nitrate	RH4
	DR1-3-EBT-4	Nitrite	RH4
	IW21-04A-EBT-4	Bromide	JC10.8
	IW21-04A-EBT-4	Nitrate	RH4
	IW21-04A-EBT-4	Nitrite	RH4
	IW92-01-EBT-4	Bromide	JC10.8
	IW92-01-EBT-4	Nitrate	RH4
	IW92-01-EBT-4	Nitrite	RH4
	IW92-02-EBT-4	Bromide	JC10.8
	IW92-02-EBT-4	Nitrate	RH4
	IW92-02-EBT-4	Nitrite	RH4
	DUP2-EBT-4	Bromide	JC10.8
	DUP2-EBT-4	Nitrate	RH4
	DUP2-EBT-4	Nitrite	RH4
	PMW21-03-EBT-4	Bromide	JC10.8
	PMW21-03-EBT-4	Nitrate	RH4
	PMW21-03-EBT-4	Nitrite	RH4
	MW-115-EBT-4	Bromide	JC10.8
	MW-115-EBT-4	Nitrate	RH4
	MW-115-EBT-4	Nitrite	RH4
L0709530	IW21-02A-EBT-4	Chloride	JS73.2
	IW21-02A-EBT-4	Alkalinity, Total	JC113
	IW21-02B-EBT-4	Chloride	JS73.2
	IW21-02B-EBT-4	Alkalinity, Total	JC113
	IW21-03B-EBT-4	Chloride	JS73.2
	IW21-03B-EBT-4	Alkalinity, Total	JC113
	IW21-03A-EBT-4	Alkalinity, Total	JC113
	IW21-03A-EBT-4	Chloride	JS73.2
	IW21-05A-EBT-4	Chloride	JS73.2
	IW21-05A-EBT-4	Alkalinity, Total	JC113
	IW21-05B-EBT-4	Alkalinity, Total	JC113
	IW21-05B-EBT-4	Chloride	JS73.2
	DUP1-EBT-4	Alkalinity, Total	JC113
	DUP1-EBT-4	Chloride	JS73.2
	RB-2-EBT-4	Alkalinity, Total	JC113
	RB-2-EBT-4	Chloride	JS73.2

APPENDIX H

EBT REVIEW – AR ENVIRONMENTAL

April 22, 2008

Memorandum

Subject: Review of Enhanced Biotreatment (EBT)-Baseline to EBT-4
Memphis Depot

From: Hugh H. Russell, Ph.D.

To: Thomas C. Holmes

Attached is a review of the EBT at the Memphis Depot that uses data from the Baseline sampling event to the EBT-4 sampling event. At the majority of the wells (IW and PMW) it appears that where the TOC is above some 40 ppm, reductive dechlorination is active. Both chloroethenes and chloromethanes are being attenuated.

One needs to keep in mind that our observations are limited. In the case of PMW by the advective transport of the lactate (organic carbon) and hydraulic connection with paired or up-gradient IW. Within the 21-Series, this problem affects data analysis, as for all intents and purposes TOC has not broken through at the PMW. However, the IW can be used to assess microbial activity in regard to reductive dechlorination. As of EBT-4 the injection process has not attenuated the plume through dilution. There does not appear to be a mass loss as a result of the injection. Therefore observations at IW can be used to correlate reductive dechlorination within un-monitored portions of the aquifer. Data from all three EBT locations (21-Series, 101-Series and TTA-2) show that reductive dechlorination is active and attenuating the plume(s).

If I can be of further assistance please contact me.

Hugh H. Russell, Ph.D.

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Enhanced Bio-Treatment (EBT)
Review- Baseline through EBT-4

Introduction

The Enhanced Bio-Treatment (EBT) at the Memphis Depot has been reviewed in regard to the onset of reductive dechlorination at monitored locations and efficiency. The intent was to determine how well the EBT has performed from the baseline to the EBT-4 sampling event.

Approach

The IW (Injection Wells) and PMW (Performance Monitoring Wells) wells were first divided into two categories; Category 1 or wells where reductive dechlorination was not occurring, and Category 2, wells were either reductive dechlorination was apparent or there was a proven loss of either chloroethene (cis-Dichloroethene, Trichloroethene, Tetrachloroethene) or chloromethane (Carbon Tetrachloride, Chloroform) mass. In the latter case, reductive dechlorination did not have to be proven.

Wells were divided into the two categories by analyzing the Volatile Organic Chemical (VOC) data from the baseline sampling event to EBT-4. Wells positive for reductive dechlorination were those where a definite loss of progenitor (Tetrachloroethene or Carbon Tetrachloride) was mirrored by an increase in either Trichloroethene or Chloroform (or other known daughter products). An IW or PMW well could also be placed in the "positive" category if there was an observed loss of mass of progenitor. In this case, the loss had to have been sustained, temporary "blips" in mass loss were not taken as proof of a mass loss.

Wells were placed in the "negative" category (no proven reductive dechlorination or mass loss) if there was no evidence of either reductive dechlorination or sustained mass loss. In short these wells had no evidence of attenuation.

The "positive" wells were then further analyzed by determining the percent mass of the progenitor and daughter products to the total of the VOCs. During active reductive dechlorination, the percent of the total of the progenitor should decrease, while the percent of the total of one or more daughter products should increase. Through this analysis, it became evident that some of the "positive" wells were responding better than others. These wells were then placed in a third category, "best". The "best" category contained IW and PMW wells that had very active reductive dechlorination.

Once the three categories were made and pertinent wells placed in each category, they were then placed in either the 21-Series, 101-Series or TTA-2 set. Once all wells were placed in the appropriate series, the average concentration of the Monitored Natural Attenuation (MNA) parameters was determined at each sampling event. Thus, within each series (21-Series, 101-Series and TTA-2) there were three sets of averaged MNA parameters. No reductive dechlorination, wells positive for reductive dechlorination or mass loss and wells with the "best" reductive dechlorination. Each MNA parameter was then compared between each group.

Results

In total, 18 wells were designated as negative for reductive dechlorination or mass loss between the Baseline and EBT-4 sampling event. The wells are PMW-92-01, PMW-92-05, PMW-85-05, IW-01, MW-21, MW-115, PMW-21-01, PMW-101-06A, PMW-101-07A, PMW-21-05, IW101-06A, IW21-02A, IW-101-06B, IW-101-03B, IW-21-03B, IW-101-08A, IW-101-09A and PMW-101-08A. Of these wells, it is likely that IW-101-08A, IW-101-09A and PMW-101-08A may not belong in any group. The concentration of chlorinated solvents in these wells is less than 5 ppb and in many instances less than 1 ppb. Observation of reductive dechlorination or mass loss in these wells is unlikely given the low solvent concentration. Previously, it has been noted that a TOC of around 50 is indicative of active reductive dechlorination. Two wells within this group have TOC concentrations above this number, IW-101-06A and IW-21-03B. Of the two wells, the most interesting is IW-21-03B as the chloroethene concentrations in IW-101-06A are low. In IW-101-06A, the PCE concentration ranges from about 7 (baseline) to 17 ppb (EBT-4). Perhaps an insufficient concentration to sustain observable growth. Well IW-21-03B however is a different case, the average PCE concentration over the period is around 50 ppb.

Certainly, all of the parameters are in place at IW-21-03B. The ORP over the period (Baseline to EBT-4) is -96.3, -247.6, -205.3, -127.4. The pH has declined from neutrality (7.1) to around 6. Both sulfate and nitrate have been removed to comparable concentrations in other wells where reductive dechlorination is occurring. In short, this is the only well within the 18 where all parameters suggest that reductive dechlorination should be active. The others appear to be limited in carbon (hydrogen or electron donor) or acceptor, chlorinated solvents. In cases where the wells are limited by chlorinated solvent concentration (IW-101-08A, IW-101-09A and PMW-101-08A) as acceptors, there is a loss of both sulfate and nitrate across Baseline to EBT-4. This would indicate as within IW-21-03B, there is microbial activity as a result of carbon in the system. In the case of IW-21-03B, it simply does manifest itself as either reductive dechlorination or a mass loss of chloroethenes.

That there are only 18 (or more correctly 15) wells where there is no reductive dechlorination or mass loss observed suggests that the EBT is progressing. There is an active change from progenitor to daughter products and an overall reduction in mass of contaminants.

That the TOC in some PMW wells is low is not surprising. In the case of PMW wells where there is a hydraulic connection between them and the IW wells the TOC will continue to rise because of advective transport. In the case of IW wells, the low TOC (and subsequently metabolic VFAs) is surprising, but not implausible. It appears that a "sink" is associated with some IW wells. The injected lactate solution does not appear to remain in the near well bore for an extended period of time. There does not appear to be a major difference in the time, pressure or volume in regard to the injection of the lactate solution. This would suggest that the IWs "take" the injection fluid similarly. In some cases movement away from the IWs is rather rapid, depleting TOC prior to sampling. The lactate solution simply does not remain in the near well bore. Given that there are only a few locations where this occurs and that the majority of the wells are positive for reductive dechlorination, it can be assumed that wherever within the aquifer the lactate solution "goes", there is microbial activity and likely reductive dechlorination. As will be shown later, the presence of lactate (or TOC) correlates well with active reductive dechlorination. All other MNA parameters appear to simply respond as expected in the presence of oxidizable (usable) organic carbon, in this case lactate.

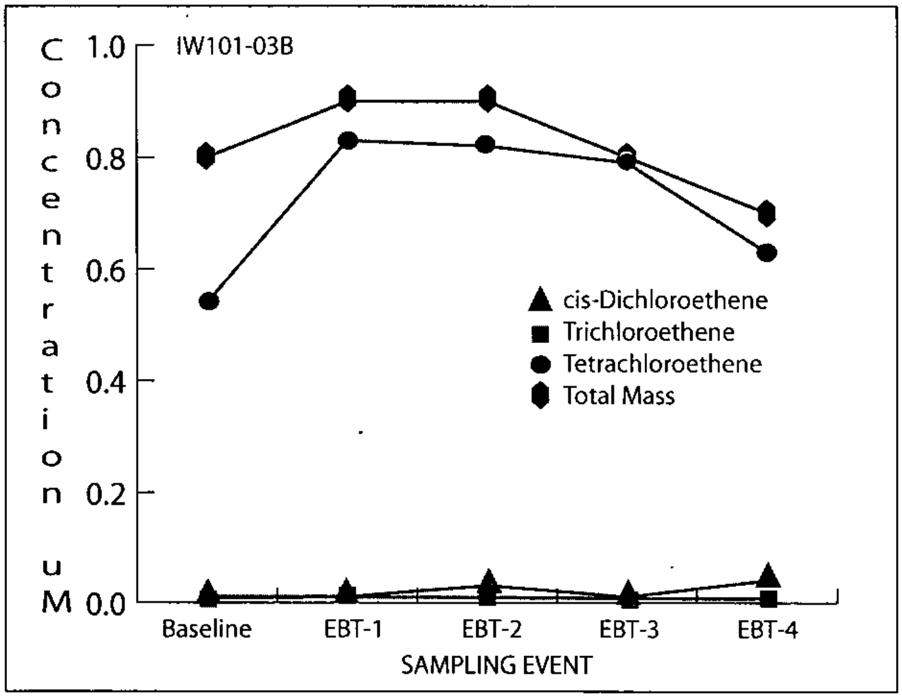


Figure 1.0- Total Mass of Chloroethenes from Baseline to EBT-4 at IW-101-03B. Reductive Dechlorination is not Active.

For illustration purposes, the VOC data from IW-101-03B is shown in Figure 1.0. As shown, there is no active reductive dechlorination at this location. Over the monitoring period, the total mass remains fairly constant at about 0.8 millimolar and the majority of the mass of chloroethenes resides as the progenitor, PCE. The curve for PCE mirrors the total mass curve. Essentially, there is no detectable increase in the concentration of either the first (TCE) or second (cDCE) daughter product. The majority of the mass of chloroethenes at the Baseline sampling is PCE and at EBT-4. No reductive dechlorination has been observed. For other Category 1 wells (where no mass reduction or reductive dechlorination is noted) produced graphs would be similar.

The remaining wells (Category 2) either have a noted reduction in mass (without **proven** reductive dechlorination) or obvious reductive dechlorination. In some cases, the efficiency is quite good as all chloroethenes or in some cases chloromethanes are below ground water MCLs for respective constituents. In most cases, cDCE is now above the ground water MCL of 70 ppb. Likely this is a transient condition and the cDCE will be transformed to Vinyl Chloride (VC) and ultimately to ethene, which is environmentally benign.

In regard to chloroethenes, there appears to be two basic conditions or parameters in regard to activity. Where PCE is the major component, there appears to be a rapid progression to cDCE, without observed production of TCE. In other words, the second daughter product (cDCE) appears to be produced without TCE being produced as a daughter product. That TCE is produced during reductive dechlorination is a fact.

The second set of conditions appears in some (a minority) of wells where the mass of TCE is greater or equal to that of PCE. In this case, the reduction of TCE appears to be "greater" or "faster" than PCE. This is likely the result of the mass differential. The higher concentration of TCE assures that it is used preferentially as an electron acceptor, though from a thermodynamic standpoint the more oxidized PCE would be the preferred terminal electron acceptor (TEA). This is suggestive that the reductive dechlorination activity is very high. The reduction of TCE is the result of the higher mass available rather than oxidation state.

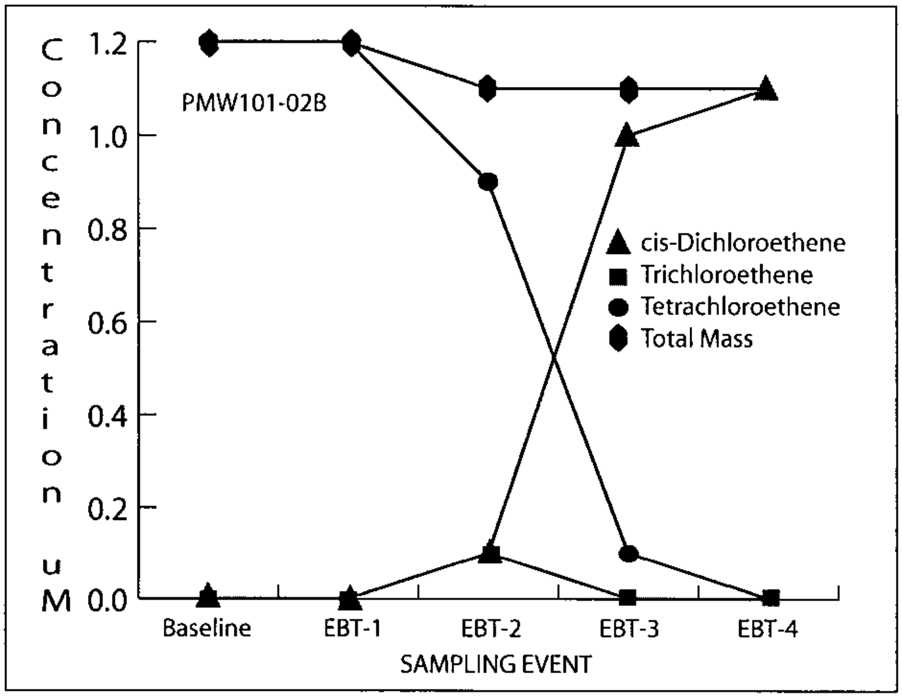


Figure 2.0-Total Mass of Chloroethenes at PMW-101-02B. This Figure Shows Text Book Reductive Dechlorination.

Figure 2.0 is an illustration of reductive dechlorination and an example of the results from the wells that are "positive" (Category 2) for reductive dechlorination. The total mass of chloroethenes (black line) remains fairly constant from the Baseline to EBT-4. On the other hand the mass of PCE declines while the mass of cDCE increases. Given that the total mass does not change, the PCE transformed is recovered as cDCE. There appears to be a slight increase of TCE concurrent with an increase of cDCE. However, the increase is not sustained while the cDCE increases and at EBT-4 is the major portion of the total mass of chloroethenes. This would be a textbook example of reductive dechlorination.

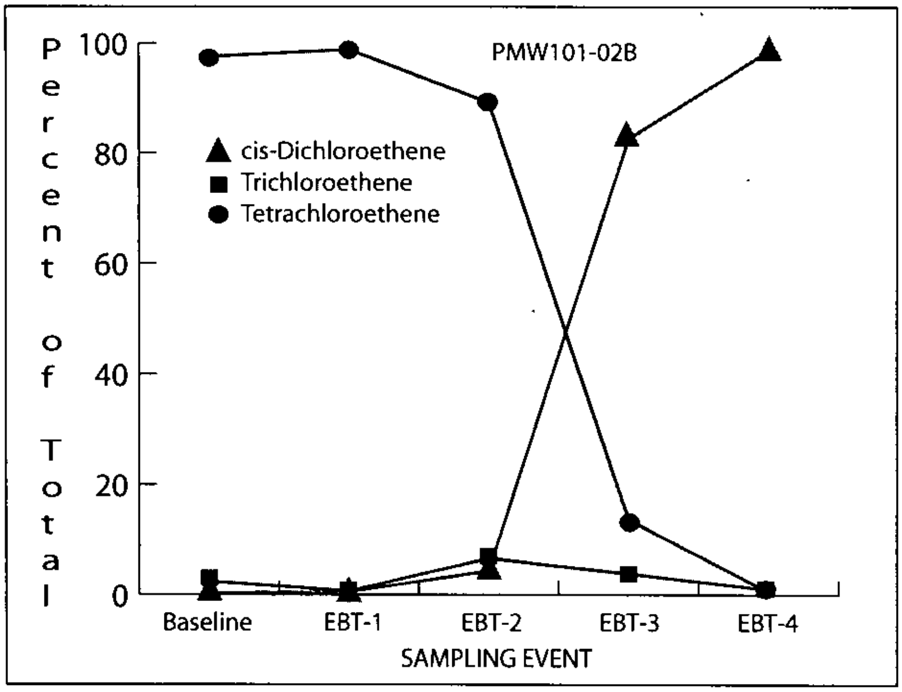


Figure 3.0- Percent of the Total of Individual Chloroethenes From Baseline to EBT-4.

Figure 3.0 illustrates how when reductive dechlorination is active, the percent of the total mass of chloroethenes is changed. At PMW-101-02B at the Baseline sampling event, almost 100% of the total mass of chloroethenes is PCE. At EBT-4, almost 100% of the mass of chloroethenes is composed of cDCE. As a result of reductive dechlorination, the PCE has been transformed to cDCE. This figure is an example of the results from the wells where reductive dechlorination is proven. This well would have to be termed as one of the "best" in regard to reductive dechlorination. There are a number of wells where transformation of PCE is not close to the 100% seen at PMW-101-02B.

In addition to the wells positive for reductive dechlorination, the positive category includes wells where there is a mass loss without positive proof of reductive dechlorination. As with some of the wells in the negative category, it is likely that these wells do not belong in the "positive" category.

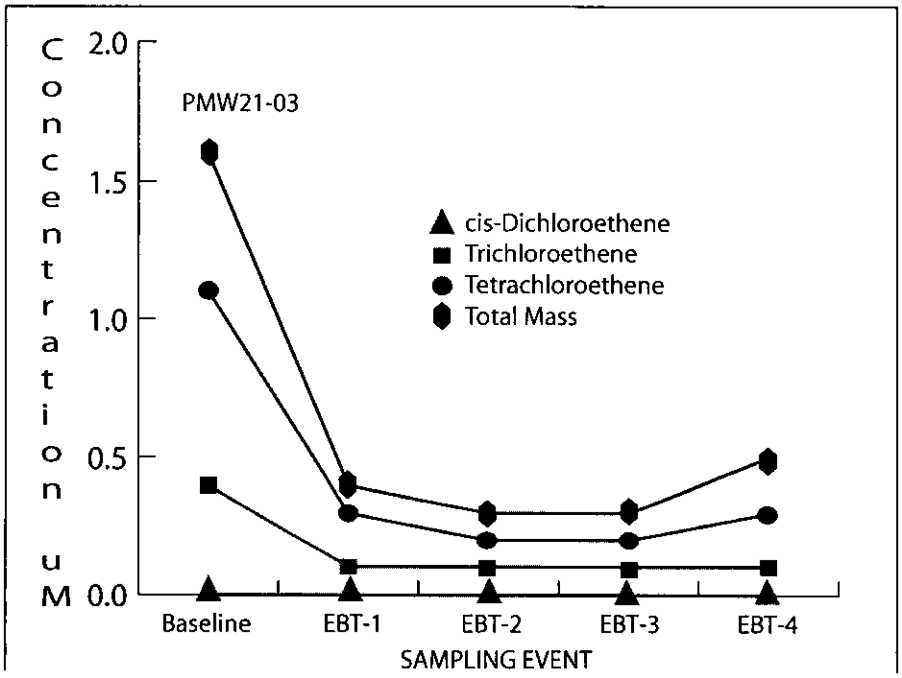


Figure 4.0- Total Mass and Individual Component Mass of Chloroethenes from Baseline to EBT-4.

Figure 4.0 is an example of a well where there is a mass loss, but no reductive dechlorination. In this case, while there is a reduction in mass of PCE, the loss is similar to the total mass without an increase in either the first or second daughter product. The data suggests that perhaps the Baseline sample was an outlier and the results from EBT-1 through EBT-4 are more representative of ground water quality at this location.

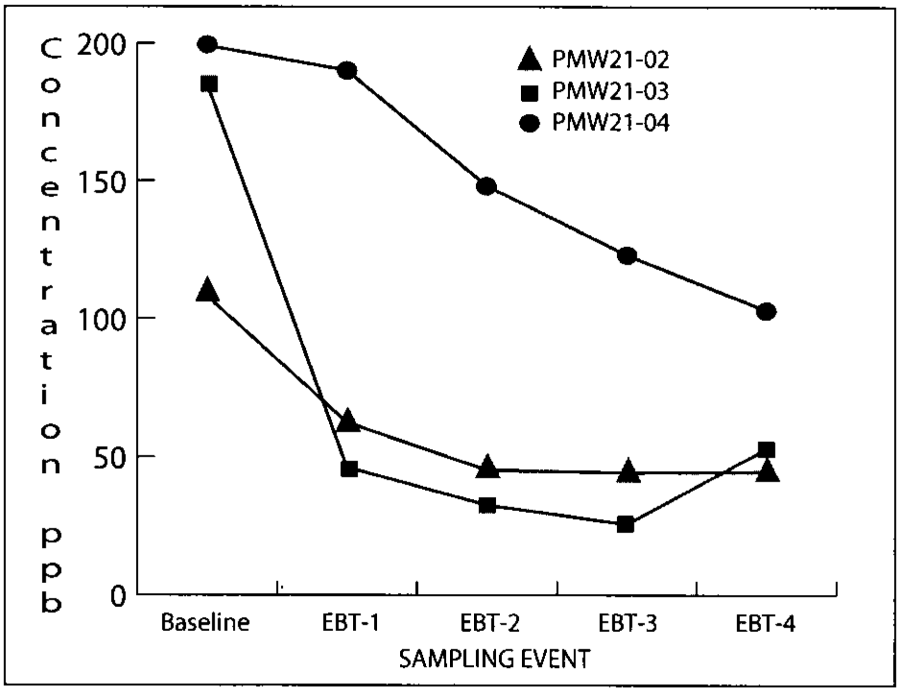


Figure 5.0- PCE Concentration [ppb] from Baseline to EBT-4.

Figure 5.0 compares the PCE loss at PMW-21-02, PMW21-03 and PMW21-04. As shown, the mass removal at these locations is dissimilar. As stated earlier, these wells may not belong in the positive category. The TOC values are low and there has been no loss of sulfate. Suggesting that there is no microbial activity present. It is possible though that the loss of PCE is the result of the EBT. Removal is the result of reductive dechlorination in the immediate vicinity of the near well bore. There is then diffusion of PCE from the near well bore to an area of lower concentration, i.e. where reductive dechlorination has removed or attenuated PCE and other chlorinated ethenes. Since these are performance monitoring wells, this observed loss is not simply as a result of dilution from the injection process. It can be a result of diffusion of PCE away from the PMW into un-monitored portions of the aquifer, where reductive dechlorination is active.

In TTA-2, the EBT has had an effect on the chloromethanes present in this area. In most instances, CT has been transformed to CF.

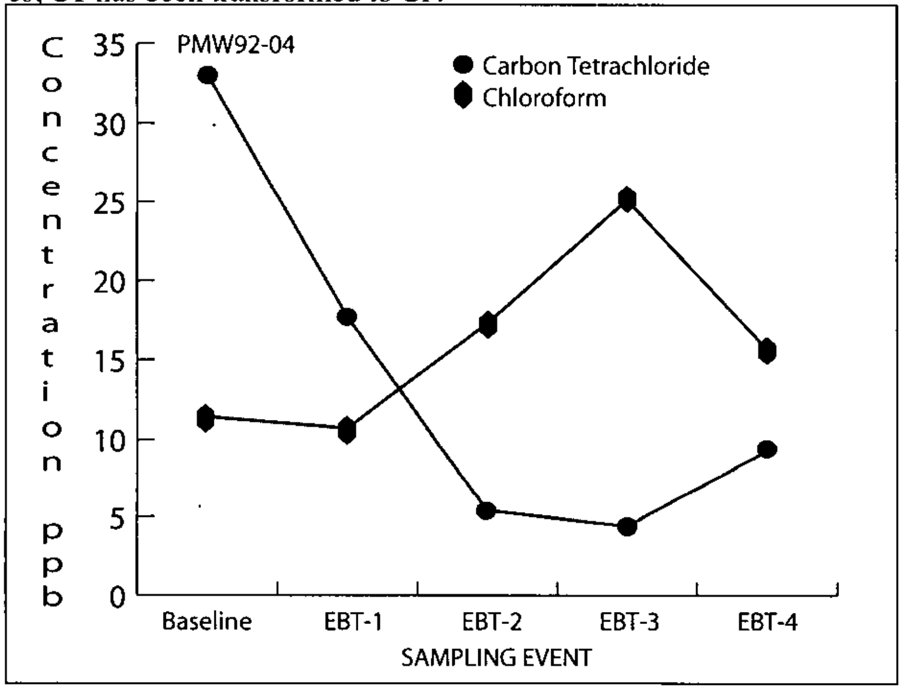


Figure 6.0- Chloromethanes [uM] at Location PMW-92-04

Figure 6.0 is a graph showing the carbon tetrachloride and chloroform (ppb) concentrations at PMW-92-04. As shown, the loss of carbon tetrachloride (progenitor) is followed by subsequent increase in chloroform, the first daughter product.

While the reductive dechlorination is not complete at PMW-92-04, as shown in Figure 7.0, at PMW-92-02, the PCE has been completely reduced to cDCE. Both PCE and TCE at this location are below the ground water MCL of 5 ppb. The cDCE is above the MCL of 70 ppb, but as indicated by the curve, the concentration of cDCE did reach a peak at EBT-1, but appears to be declining since the EBT-2 sampling event. At this time, Figure 7.0 suggests that PMW92-02

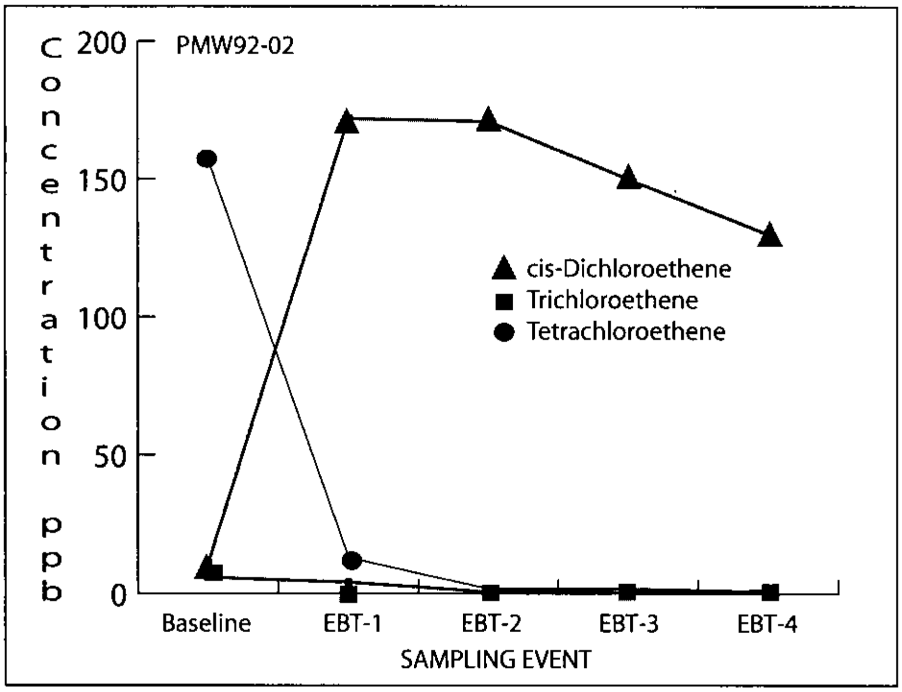


Figure 7.0- Chloroethene Concentration [ppb] PMW-92-02

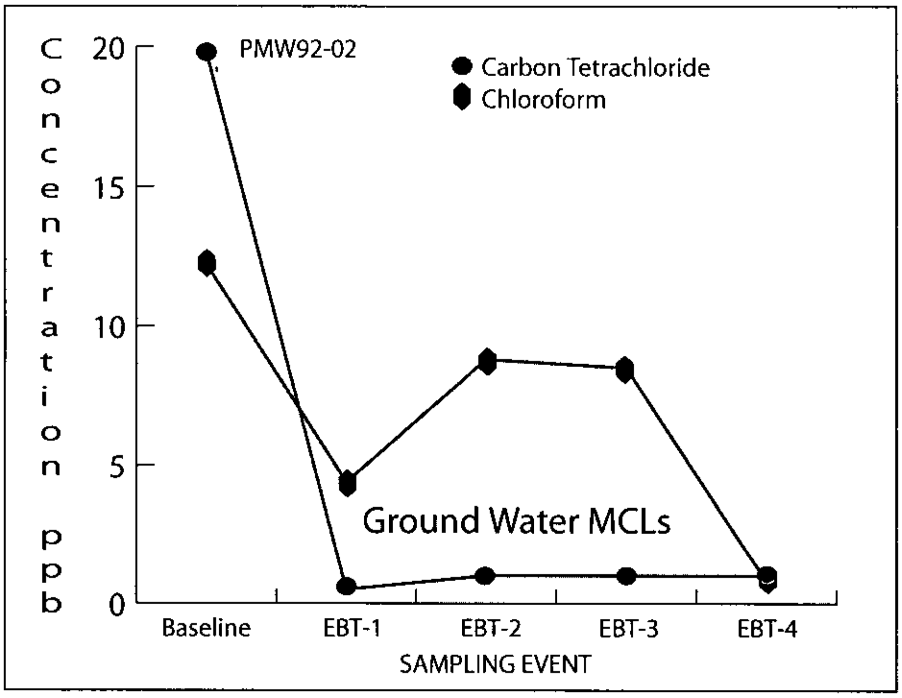


Figure 8.0- Carbon Tetrachloride and Chloroform [ppb] from the Baseline Sampling to EBT-4. PMW-92-02.

will be below MCL for all chloroethenes. At PMW-92-02 the chloromethane series of COCs have been treated to below MCL. Figure 8.0 shows that reductive dechlorination has removed carbon tetrachloride and chloroform to less than the mandated MCL of 5 ppb. The carbon tetrachloride at this location was reduced by the second quarter to less than 5 ppb, where it has since remained. Arguably, the chloromethane concentrations at PMW-92-02 were low. However, given that the chloroethenes at this location have also been successfully treated, reductive dechlorination is having a positive effect. Again, since this is a PMW well, the data suggests that areas within the aquifer where lactate is present are subject to reductive dechlorination, but are not monitored.

There appears to be no "perfect" monitoring parameter (MNA, MFA, Hydrogen as examples) in regard to where within the system reductive dechlorination is active. The primary parameter that appears to reflect reductive dechlorination is TOC and then by deduction lactate and metabolic fatty acids. One might use sulfate or nitrate as an indicator, but the concentration of each does not in itself denote reductive dechlorination. There is no proper concentration where either sulfate or nitrate suggests that reductive dechlorination is occurring. As with chlorinated solvent concentration, both nitrate and sulfate decline in the presence of lactate or degradation products of lactate, in other words organic carbon. In the wells where there is no indication of a mass loss or reductive dechlorination the sulfate and nitrate is of course higher than wells that are "positive". Again, the lack of sulfate or nitrate reduction is because there is a lack of donor (lactate). There appears to be quite a difference in sulfate concentration among the various series. The sulfate concentration ranges from about 10 to 40 ppm. However, though the sulfate varies it is just as likely that wells with a Baseline concentration of 40 ppm show reductive dechlorination as wells with 10 ppm The concentration of sulfate over time appears to correspond to the TOC concentration within a location. The nitrate concentration within the wells appears to be between 2 and 3 ppm. Again, loss of nitrate appears to occur when organic carbon is present and microbial activity is not limited by same.

Table 1.0 on the following page compares and contrasts the MNA parameters in the 21-Series of wells within the three categories. There appears not to be a parameter that is "out of line" in regard to well placement (on an average basis) in a category. At a IW or PMW an increase in TOC correlates to an increase in organic carbon (lactate or metabolic fatty acids), carbon dioxide,

	Carbon Dioxide [mg/L]			Ethane [ug/L]			Ethene [ug/L]			Methane [ug/L]		
21 Series	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells
Baseline	87	95	95	5.00	4.82	4.67	5.00	4.35	4.20	118.40	7.55	8.37
EBT-1	131	214	181	5.00	7.65	5.00	5.00	7.65	5.00	85.65	393.39	36.33
EBT-2	165	199	358	5.00	4.97	5.00	5.00	4.88	4.60	61.75	505.30	829.17
EBT-3	106	209	360	8.33	10.95	15.83	8.33	10.95	15.83	568.37	1457.57	2655.00
EBT-4	132	132	162	21.67	23.64	21.67	21.67	23.64	21.67	1256.80	1222.73	2074.17

	Acetic Acid [mg/L]			Butyric Acid [mg/L]			Lactic Acid [mg/L]			Propionic Acid [mg/L]		
21 Series	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells
Baseline	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	10.00	10.00	10.00
EBT-1	15.97	125.18	225.52	1.19	186.23	28.83	2.39	56.31	42.45	14.62	270.31	249.10
EBT-2	73.67	248.35	583.98	3.43	45.48	73.29	23.58	160.39	1044.98	95.17	402.00	919.68
EBT-3	45.98	214.68	364.38	7.75	126.26	418.56	2.70	91.04	380.33	73.37	431.76	732.17
EBT-4	15.05	82.70	143.32	3.52	26.47	47.73	1.00	0.96	0.95	32.80	142.80	248.42

	Pyruvic Acid [mg/L]			Nitrate [mg/L]			Sulfate [mg/L]			Alkalinity [mg/L]		
21 Series	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells
Baseline	0.10	0.10	0.10	3.58	2.93	2.46	15.56	17.70	18.12	83.32	110.86	126.02
EBT-1	0.10	0.15	0.10	3.17	1.11	1.03	12.97	5.58	9.19	104.82	964.59	635.58
EBT-2	0.25	0.37	2.67	2.99	1.71	1.62	12.26	7.23	5.51	239.50	737.52	1518.87
EBT-3	0.10	0.10	0.10	2.85	1.62	1.26	12.69	7.01	6.43	108.17	440.21	1080.72
EBT-4	0.31	0.29	0.37	2.83	1.80	1.20	11.40	8.98	6.23	135.90	348.59	542.57

	TOC [mg/L]		
21 Series	Neg. Wells	Pos. Wells	"Best" Wells
Baseline	3.33	4.00	4.74
EBT-1	10.51	328.58	287.26
EBT-2	87.35	413.32	1130.78
EBT-3	59.31	397.19	1165.10
EBT-4	22.67	145.39	258.15

Table 1.0- MNA Parameters from the 21-Series of Wells

methane, hydrogen and alkalinity. There is a decline in nitrate and sulfate concentration. The concentration of sulfate and nitrate decline because they are used as anaerobic terminal electron acceptors. The concentration of chloroethenes and chloromethanes also decline as they are used as terminal electron acceptors. At un-monitored locations within the aquifer where there is organic carbon, reductive dechlorination is active and plume attenuation is occurring.

21-Series

Sampling Event	Negative Wells	Positive Wells	"Best" Wells
Baseline	2	9	9
EBT-1	5	11821	21670
EBT-2	6502	7290	13346
EBT-3	43	2335	3492
EBT-4	2	11	11

Table 2.0- Hydrogen [nanomoles] Concentration 21-Series.

Hydrogen data for the 21-Series of wells is shown in Table 2.0. In the case of the 21-Series, the data is skewed because of IW-21-03B. As stated earlier all "signs" point to microbial activity at this well. The high hydrogen values in the negative well group results from the hydrogen concentration at IW-21-03B. As with other parameters, on average the hydrogen concentration correlates well with microbial activity.

The average concentration values suggest that microbial activity within the 21-Series has been affected by the EBT. In regard to parameters that would suggest microbial activity (TOC, lactate, MFAs, carbon dioxide, methane and hydrogen) there appears to be an initial buildup and then decline in concentration. Suggesting that the microbial activity within the aquifer has increased (carbon degradation) to a point where lactate is assimilated after injection and a build-up does not occur.

Table 3.0 on the following page presents the MNA data for the 101-Series of wells. The results are similar to those for the 21-Series. All parameters are responding as would be expected in regard to microbial activity. The difference being that within the 101-Series parameters have either reached a sustained plateau (TOC, lactate, MFAs) or are continuing to increase (carbon dioxide, methane as examples) in wells where reductive dechlorination (or mass reduction) is shown. As a result within the 101-Series, in difference to the 21-Series there appears to be sufficient lactate (TOC) to sustain the reductive dechlorination process. Within the 21-Series of wells 59% are negative for reductive dechlorination. Within the 101-Series the percentage is 24%. It can be assumed that this plateau or steady increase of parameters observed within the 101-Series of wells suggests that lactate (TOC) is responsible. There is a requirement for organic carbon for reductive dechlorination. This of course makes sense, Lactate is the carbon source added to the aquifer to drive reductive dechlorination. The lactate is acting as the electron donor for terminal electron acceptors, such as sulfate, nitrate, chloroethenes and chloromethanes. When comparing the 21-Series Wells to the 101-Series (and TTA-2) that the lactate has not to date impacted the PMW-21 Series must be kept in mind.

	Carbon Dioxide [mg/L]			Ethane [ug/L]			Ethene [ug/L]			Methane [ug/L]		
101 Series	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells
Baseline	96	80	77	7.00	5.54	5.00	7.00	5.54	5.00	11.18	7.96	7.28
EBT-1	148	163	170	5.00	5.96	6.37	5.00	5.89	6.27	6.88	12.52	14.87
EBT-2	131	148	163	5.00	5.00	5.00	5.00	4.93	4.90	51.09	228.78	251.98
EBT-3	126	172	180	11.50	7.43	8.46	11.50	7.43	8.46	702.11	1494.62	1933.50
EBT-4	150	189	205	13.50	8.38	9.04	13.50	8.38	9.04	1951.30	4735.87	5558.81

	Acetic Acid [mg/L]			Butyric Acid [mg/L]			Lactic Acid [mg/L]			Propionic Acid [mg/L]		
101 Series	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells
Baseline	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	10.00	10.00	10.00
EBT-1	33.20	135.76	181.26	1.69	5.46	7.09	42.57	257.66	348.05	40.39	182.51	243.67
EBT-2	49.09	120.30	149.95	2.17	28.99	39.97	7.89	130.12	158.76	61.72	166.52	213.04
EBT-3	22.92	115.88	142.68	2.00	71.53	101.23	11.56	78.01	85.56	28.60	237.94	300.71
EBT-4	15.82	118.16	143.15	1.57	44.66	61.88	6.04	35.88	49.29	29.83	251.02	309.53

	Pyruvic Acid [mg/L]			Nitrate [mg/L]			Sulfate [mg/L]			Alkalinity [mg/L]		
101 Series	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells
Baseline	0.10	0.10	0.10	5.01	4.37	4.22	22.11	16.09	15.53	112.74	95.78	91.52
EBT-1	0.10	0.22	0.23	6.47	1.80	1.69	18.76	9.52	7.96	189.88	476.83	597.83
EBT-2	0.10	0.17	0.20	1.65	1.31	1.20	14.73	7.13	5.32	233.31	470.47	563.52
EBT-3	0.10	0.10	0.10	1.75	1.67	1.39	14.62	7.50	5.90	170.79	369.31	449.91
EBT-4	0.34	1.19	1.58	1.88	0.94	0.73	17.91	6.07	3.86	187.68	510.19	614.51

	TOC [mg/L]		
101 Series	Neg. Wells	Pos. Wells	"Best" Wells
Baseline	2.29	3.69	3.24
EBT-1	50.52	233.49	308.29
EBT-2	57.69	219.16	274.01
EBT-3	25.14	232.46	291.89

Table 3.0- 101-Series of Wells Average MNA Parameters.

The hydrogen data for the 101-Series is shown in Table 4.0. In wells where reductive dechlorination is occurring hydrogen is present. Of interest is that these values (positive and best wells) are comparable to the 21-Series of wells. The loss of hydrogen in the "best" wells suggests that it is being used for reductive dechlorination. In the case of the 21-Series of wells the hydrogen loss does not appear to be associated with active reductive dechlorination. The data is skewed by the lack of observed reductive dechlorination at IW-21-03B. Table 4.0 suggests that the hydrogen concentration within the "best" wells (101-Series) is higher than the negative or positive wells, but there is a greater loss of hydrogen between EBT-2 and EBT-3 within the "best" wells.

101-Series

Sampling Event	Negative Wells	Positive Wells	"Best" Wells
Baseline	16	20	38
EBT-1	114	9469	8483
EBT-2	2	5142	6088
EBT-3	2	262	34
EBT-4	3	29	38

Table 4.0- Hydrogen [nanomoles] 101-Series of Wells.

As would be expected wells with lactate (TOC) have higher hydrogen concentrations than the wells where lactate or TOC concentrations are low. There is a correlation between lactate/TOC and hydrogen. Thus, a correlation between both and microbial activity.

The average MNA parameter concentrations for TTA-2 are shown on the following page in Table 5.0. The data is similar to that for the 101-Series in that no parameter when graphed would produce a bell-shaped curve. All pertinent parameters in regard to microbial activity appear to either plateau or continue to increase in concentration. Microbial activity has not yet reached a zenith.

Data from the TTA-2 series of wells is skewed by wells that where installed during the EBT. For purposes of this analysis, the initial sampling event whether it occurred at EBT-2 or EBT-3 was considered as a part of the Baseline Sampling Event. This has to an extent increased Baseline values in certain instances. This method though has not adversely affected the average data.

In the case of TTA-2, 21% of the wells are negative for reductive dechlorination. This is as would be expected given the MNA parameters average comparable to the 24% in the 101-Series. Both the 101-Series and TTA-2 appear to be responding similarly to the EBT. There is active reductive dechlorination and it is being sustained. This has been the case over the course Baseline to EBT-4. The 101-Series and TTA-2 appear to be responding to the EBT better than the 21-Series of wells. This statement though must be given in context. It appears that a number of PMW wells within the 21-Series are up or cross-gradient, to the IW wells. Within the 21-Series there are a number of IW wells that have active reductive dechlorination and therefore one must conclude that reductive dechlorination is active within the aquifer in the vicinity of the 21-Series, IW wells. That the EBT within the 21-Series does not appear to be as effective as the 101-Series or TTA-2, is the result of the cross-gradient location of the PMW wells.

	Carbon Dioxide [mg/L]			Ethane [ug/L]			Ethene [ug/L]			Methane [ug/L]		
TTA 2	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells
Baseline	129	76	82	5.00	4.67	4.52	4.56	4.65	4.50	924.36	6.05	6.15
EBT-1	185	199	200	5.00	7.37	8.21	5.00	7.37	8.21	964.62	352.83	454.63
EBT-2	135	272	267	5.00	4.88	5.00	5.00	4.87	5.00	924.44	967.70	1067.63
EBT-3	185	248	250	5.00	13.16	13.46	5.00	13.16	13.46	1078.33	1010.46	931.35
EBT-4	130	194	151	5.00	10.56	11.15	5.00	10.56	11.15	1055.65	1663.37	1287.15

	Acetic Acid [mg/L]			Butyric Acid [mg/L]			Lactic Acid [mg/L]			Propionic Acid [mg/L]		
TTA 2	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells
Baseline	1.00	162.45	231.64	1.00	3.16	4.08	1.00	146.70	208.79	10.00	309.36	437.66
EBT-1	9.53	115.64	127.37	1.13	166.75	187.82	1.09	50.54	63.72	18.92	248.39	284.71
EBT-2	1.00	456.67	292.41	1.00	82.14	63.90	1.28	170.77	18.33	8.02	794.55	460.33
EBT-3	1.00	360.15	309.35	1.00	143.83	98.64	1.72	28.87	32.35	10.00	719.19	611.82
EBT-4	1.00	576.46	218.67	1.00	130.79	37.54	1.00	2.30	1.54	10.00	956.68	420.86

	Pyruvic Acid [mg/L]			Nitrate [mg/L]			Sulfate [mg/L]			Alkalinity [mg/L]		
TTA 2	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells	Neg. Wells	Pos. Wells	"Best" Wells
Baseline	0.10	0.18	0.22	2.05	2.73	2.64	10.47	10.81	10.43	75.26	240.33	315.95
EBT-1	0.10	0.15	0.21	2.49	1.20	0.96	9.62	6.00	5.69	92.20	879.65	1058.18
EBT-2	0.10	0.34	0.24	2.64	2.43	1.95	11.07	7.49	6.25	54.58	1083.67	913.95
EBT-3	0.10	0.10	0.10	2.44	1.55	1.53	14.29	5.38	4.16	45.47	404.26	527.85
EBT-4	0.10	0.30	0.17	2.38	0.73	0.67	11.98	5.45	5.01	56 75	1196.49	594.99

	TOC [mg/L]		
TTA 2	Neg. Wells	Pos. Wells	"Best" Wells
Baseline	8.22	148.84	216.03
EBT-1	16.04	299.00	344.70
EBT-2	0.96	605.27	484.94
EBT-3	2.09	490.58	381.06

Table 5.0- Average MNA Parameters TTA-2

TTA-2

Sampling Event	Negative Wells	Positive Wells	"Best" Wells
Baseline	2	6	10
EBT-1	2	11837	14787
EBT-2	1	1519	2175
EBT-3	2	5	7
EBT-4	2	82	92

Table 6.0- Hydrogen [nanomoles] TTA-2 Series of Wells

Table 6.0 shows the hydrogen concentration within the TTA-2 series of wells. The data is comparable to the 101-Series. The hydrogen appears to be used for reductive dechlorination. As with the 101-Series at EBT-4 there appears to be a higher concentration of hydrogen than that shown for the 21-Series of wells.

Table 7.0 lists the wells within the 21-Series and presents information regarding mass loss, reductive dechlorination and whether or not MCLs have been reached for individual components within the chloroethenes or chloromethanes. The data from EBT-4 has been used to determine if MCLs have been obtained.

				Chloroethenes Baseline			Chloroethenes EBT-4							Chloroethenes Baseline			Chloroethenes EBT-4		
Well	Red. Dec.	Mass Loss	TOC	cDCE	TCE	PCE	cDCE	TCE	PCE	Well	Red. Dec.	Mass Loss	TOC	cDCE	TCE	PCE	cDCE	TCE	PCE
MW-21	No	No	3.13							IW21-01A	Yes	Yes	4180						
MW-115	No	No	40.9							IW21-01B	Yes	No	2190						
PMW 21-01	No	No	4.72							IW21-02A	No	No	14.1						
PMW 21-05	No	No	3.43							IW21-02B	Maybe	No	17.6						
PMW 21-02	No	Yes	3.15							IW21-03A	No	Yes	2.89						
PMW 21-03	No	Yes	4.97							IW21-03B	No	No	134						
PMW 21-04	No	Yes	3.98							IW21-04A	Yes	Yes	106						
										IW21-04B	Yes	Yes	210						
										IW21-05A	Yes	Yes	2130						
										IW21-05B	Yes	No	109						

☐	Constituent Detected below MCLS
☐	Constituent Detected above MCLS

Table 7.0-21-Series Evaluation in Regard to Reductive Dechlorination, Mass Loss and if MCLs Have Been Reached.

As shown in Figure 7.0, within the 21-Series of wells the only real change is that in some cases, cDCE (second daughter product) concentration has risen above the MCL. At location IW-21-01B, the PCE has been removed to less than 5 ppb. A few of the other IW wells have PCE concentrations that are around 10-15 ppb. Changes as a result of the EBT are certainly not evident in the PMW wells within the 21-Series of wells.

Table 8.0 (following page) is the evaluation of the 101-Series wells in regard to mass loss, reductive dechlorination and individual components in regard to MCLs. As shown, the EBT has had an affect on the wells within the 101-Series. Where reductive dechlorination is proven there is a notable increase in cDCE and in some instances treatment of PCE to less than the MCL Wells where MCLs have been achieved for PCE are 17 of the 46 or 37%. As with the 21-Series, there are a number of locations where the concentration of PCE is approximately 10 ppb or near the MCL. Wells within the 101-Series are responding well to the EBT.

An interesting location within the 101-Series is DR-1-3. As shown in Figure 9.0 though the TOC within this location has not risen, reductive dechlorination has attenuated both PCE and TCE to below the MCLs for either component. The total mass at DR-1-3 has declined from approximately 50 to 32 millimolar. This well is certainly the furthermost well from the IW wells, being close to 18th street. Data from the well suggests that reductive dechlorination is occurring at this location and responsible for the attenuation. If this is the case, it would certainly argue that there are preferential flow paths within the aquifer as would be expected.

Even though DR-1-3 appears to be located outside what one would expect to be the area of influence of the EBT, reductive dechlorination is evident at this location. The decline in PCE is mirrored by an almost equa-molar basis increase in cDCE. There is little loss of mass at DR-1-3, but reductive dechlorination, transformation of PCE to the second daughter product. There is no evidence of an increase in MFAs or TOC at DR-1-3.

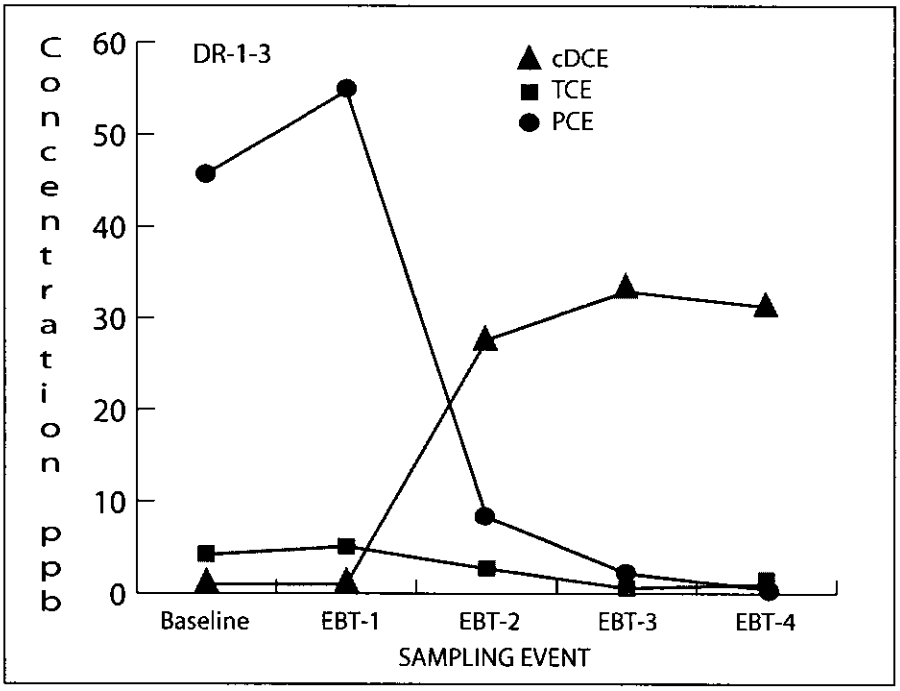


Figure 9.0-Chloroethene Concentration at DR-1-3.

				Chloroethenes Baseline			Chloroethenes EBT-4							Chloroethenes Baseline			Chloroethenes EBT-4		
Well	Red. Dec.	Mass Loss	TOC	DCE	TCE	PCE	DCE	TCE	PCE	Well	Red. Dec.	Mass Loss	TOC	DCE	TCE	PCE	DCE	TCE	PCE
IW101-03B	No	No	506		▨			▨		PMW101-01B	Yes	Maybe	522			■			■
IW101-06A	No	No	363		▨			▨		PMW101-02A	Yes	Yes	59.8			■			■
IW101-06B	No	No	20.7		▨	▨		▨	▨	PMW101-02B	Yes	No	104			■			
IW101-08A	No	No	42.8							PMW101-03A	Maybe	Yes	1.05			■			■
IW101-09A	No	No	144							PMW101-03B	Yes	Yes	20.2			■			■
PMW101-06A	No	No	4.08						■	PMW101-04A	Yes	Yes	54.6			■			■
PMW101-07A	No	No	22.8							PMW101-04B	Yes	Yes	30.4		■	■			■
PMW101-08A	No	No	2.56							PMW101-05A	Yes	Yes	37.2			■	■		
PMW101-08B	No	No	1.05		■	■		■	■	PMW101-05B	Yes	Maybe	40.1		■	■		■	■
IW101-01A	Yes	No	2870			■				PMW101-06B	Yes	Yes	122		■	■			
IW101-01B	Yes	No	30.7			■				PMW101-07B	Yes	Yes	2.86		■	■		■	■
IW101-01C	Yes	Yes	172			■		■	■	MW-101B	No	Yes	3.24			■			■
IW101-05C	Yes	No	292			■		■	■	MW-101T	No	Yes	2.47			■			■
IW101-06C	Yes	No	53.2		■	■	■	■	■	IW101-02A	Yes	Yes	121			■			■
IW101-07A	Yes	No	101			■		■	■	IW101-02B	Maybe	Yes	63.2			■			■
IW101-07B	Yes	Yes	65		■	■	■	■		IW101-02C	Yes	No	152			■	■	■	■
IW101-07C	Yes	No	99		■	■	■	■	■	IW101-03A	Maybe	Maybe	396			■			■
IW101-08B	Yes	No	128		■	■				IW101-03C	Yes	No	186		■	■		■	■
IW101-08C	Yes	No	312		■	■	■	■		IW101-04A	Yes	Yes	2110			■			
IW101-09B	Yes	No	989		■	■	■	■		IW101-04B	Yes	Yes	99.6			■			
IW101-09C	Yes	Maybe	280		■	■	■	■	■	IW101-04C	Yes	No	60.8		■	■	■	■	■
PMW101-01A	Maybe	Yes	2500			■				IW101-05A	Yes	No	547			■			■
DR1-3	Yes	No	6.79			■				IW101-05B	Yes	Maybe	6.4			■			■

□ Constituent Detected below MCLS

■ Constituent Detected above MCLS

Table 8.0-101-Series Evaluation in Regard to Reductive Dechlorination, Mass Loss and if MCLs Have

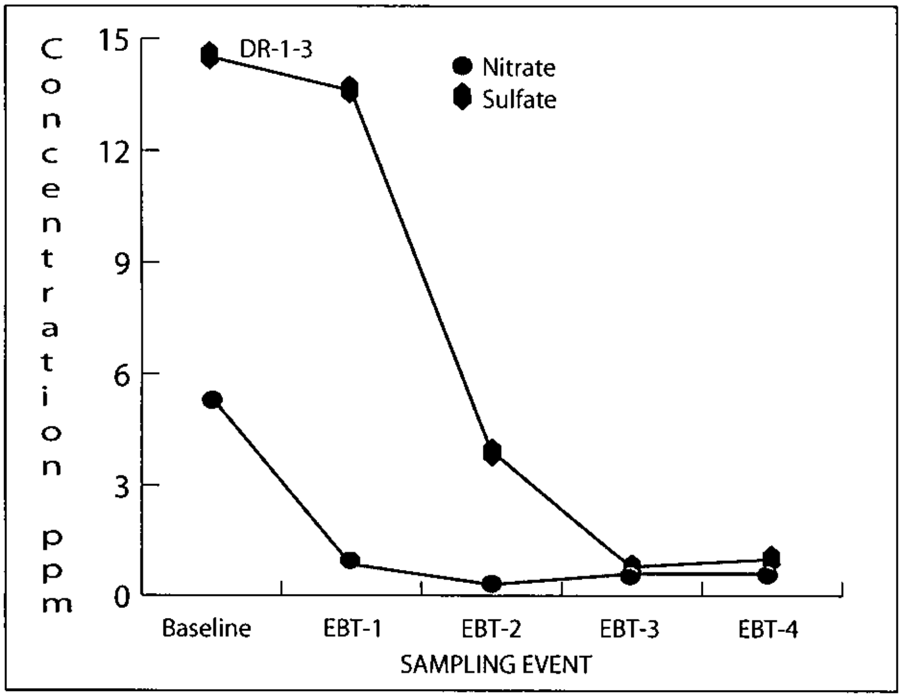


Figure 10.0- Sulfate and Nitrate Concentration [ppm] at DR-1-3. From the Baseline Sampling to EBT-4.

However, as shown in Figure 10.0 the loss of both sulfate and nitrate at DR-1-3 would bolster the argument that microbial activity either within DR-1-3 or immediately up-gradient is responsible for the observed attenuation. Certainly ground water within the immediate vicinity of DR-1-3 is being affected by some process. This type of data can certainly be expected from some of the PMW locations. They should reflect (prior to breakthrough of TOC) microbial activity immediately up-gradient. If this is the case at DR-1-3 the data suggests that at least in certain portions of the aquifer, reductive dechlorination is being carried past cDCE and to ethene (or mineralization).

It would appear that DR-1-3 is down gradient from the IW in the 101-Series. It appears to be approximately 375 feet down gradient from the IW-101-4 cluster of wells. The data suggests that reductive dechlorination began at DR-1-3 between EBT-2 and EBT-3. There is no data available to suggest that lactate from the IW could have reached location DR-1-3. On a macroscopic scale, DR-1-3 is in a relative line that includes the A and B wells from PMW-101-01, PMW-101-02, PMW-101-03 and PMW-101-004 (listed in distance from the IW). Breakthrough of TOC occurred at the PMW-101-01 and -02 A wells by EBT-1. Breakthrough of TOC appears to occur at -04A and B at EBT-4. This would argue that there is no possible way that the reductive dechlorination at DR-1-3 could result from the EBT. However, there is evidence that breakthrough of TOC occurred at PMW-101-03A at EBT-2. This location is the most distant from the IW wells. This breakthrough is not dependent on one point, but rather a second TOC above background at EBT-3 and evidence of reductive dechlorination at PMW-101-03B at EBT-2. There is also evidence of reductive dechlorination at PMW-101-04A and -04B. It is possible that DR-1-3 is in direct hydraulic connection with an injection well(s) through a permeability channel, perhaps best described as an ancient buried streambed. While the bulk flow of water and lactate is considerably slower, movement of ground water and lactate through this permeability feature is considerably faster. Certainly, at DR-1-3 the data is similar to what one would expect to see if an up-gradient source was removed, as there is a decline in contaminant concentration. That this "source removal" is biological is shown by the decrease in inorganic (sulfate and nitrate) and organic (PCE) terminal electron acceptors. Two secondary indicators of microbial activity, carbon dioxide and methane have also increased at DR-1-3. This increase in both carbon dioxide and methane can only be the result of microbial oxidation of an electron donor, specifically anaerobic oxidative metabolism. Mass loss at DR-1-3 is the result of microbial activity.

COC	Baseline Avg. [ppb] (All Wells)	Baseline Total [ppb] (All Wells)	EBT-4 Avg [ppb] (All Wells)	EBT-4 Total [ppb] (All Wells)
cDCE	3.3	150.0	61.7	2775.2
TCE	46.0	2070.0	16.6	746.5
PCE	105.1	4730.8	30.6	1378.1
	Baseline Avg. [uM]	Baseline Total [uM]	EBT-4 Avg [uM]	EBT-4 Total [uM]
Total Mass	1.0	**46.0**	0.9	**43.0**
	Baseline Avg. [ppb] (IW Wells)	Baseline Total [ppb] (IW Wells)	EBT-4 Avg [ppb] (IW Wells)	EBT-4 Total [ppb] (IW Wells)
cDCE	3.9	104.1	76.1	2055.5
TCE	53.5	1445.3	15.1	406.2
PCE	97.2	2624.7	31.8	859.0
	Baseline Avg. [uM] IW Wells	Baseline Total [uM] IW Wells	EBT-4 Avg [uM] IW Wels	EBT-4 Total [uM] IW Wells
Total Mass	1.0	27.9	1.1	29.5
	Baseline Avg. [ppb] (PMW Wells)	Baseline Total [ppb] (PMW Wells)	EBT-4 Avg [ppb] (PMW Wells)	EBT-4 Total [ppb] (PMW Wells)
cDCE	2.6	45.9	40.0	719.7
TCE	34.7	624.7	18.9	340.3
PCE	117.0	2106.1	28.8	519.1
	Baseline Avg. [uM] PMW Wells	Baseline Total [uM] PMW Wells	EBT-4 Avg [uM] PMW Wels	EBT-4 Total [uM] PMW Wells
Total Mass	1.0	**17.9**	0.7	**13.1**

Table 9.0- Chloroethene Evaluation 101-Series of Wells.

Table 9.0 is an evaluation of data from the 101-Series of wells. The top data set is an evaluation of the ppb concentration of each COC at the Baseline and EBT-4 if data from all of the wells (IW and PMW) is used. As would be expected with active reductive dechlorination, there is an increase in both average and total cDCE. This mirrors a decrease in both average and total PCE and TCE. On the whole, reductive dechlorination is not only attenuating PCE, but TCE as well. A number of wells have more TCE than PCE. There appears to be approximately a 3 micromolar loss of mass.

If only the IW wells are evaluated, the results are similar, but there is no mass loss. The data suggests that there is a slight mass increase of 1.6 micro-molar. One possible explanation is that there is among the IW wells a higher starting mass. The increase in mass may be as a result of PCE (or TCE) moving from binding sites on the aquifer solids into the aqueous phase. As PCE (or TCE) in solution is converted to cDCE, this would increase the desorption rate from aquifer solids into solution. It may simply also only be that we are dealing with ppb concentrations of the COCs. There may be no statistical significance to the difference in these values.

If only the PMW wells are evaluated it appears that the EBT is "working better". On average, the DCE concentration is less than the 70 ppb MCL (Average IW wells 104 ppb), though similar results for PCE and TCE are noted. In fact the total mass loss within the PMW series is close to 5 micro-molar (4.8). One can assume that the aquifer between the IW and hydraulically connected PMW has been treated similarly. On average there has been approximately a 3-fold loss in PCE within the 101-series. There has been a 50% loss of TCE within the same time frame. As would be expected there is a subsequent increase in cDCE.

				Chloroethenes Baseline			Chloroethenes EBT-4			Chloro-methanes Baseline		Chloro-methanes EBT-4		
Well	Red. Dec.	Mass Loss Chloro-ethenes	Mass Loss Chloro-methanes	cDCE	TCE	PCE	cDCE	TCE	PCE	CT	CF	CT	CF	TOC
IW-01	No	No	No											74.3
PMW 92-01	No	No	No											15.6
PMW 92-03	Yes	No	Yes											10.1
PMW 92-05	No	No	No											2.75
PMW 92-02	Yes	No	Yes											1270
PMW 92-04	Yes	No	No											49.4
PMW 92-06	Yes	Maybe	Yes											35.3
MW-85	Maybe	Maybe	Yes											70.2
PMW 85-01	No	Yes	Yes											71.3
IW85-01	Yes	No	No											397
PMW 85-04	Yes	No	Yes											49.4
IW85-02	Yes	No	Yes											1450
IW85-05	Yes	No	Yes											58.5
IW85-06	Yes	No	No											2720
IW92-01	Yes	No	No											120
IW92-02	Yes	No	No											198
IW92-03	Yes	No	No											251
IW92-04	Yes	Maybe	Yes											668
IW92-05	Yes	Maybe	Yes											6790
IW92-06	Yes	No	Yes											6450
IW92-07	Yes	No	No											1420
IW92-08	Yes	Yes	Yes											723
DR2-1	Yes	No	No											105
DR2-5	No	No	Yes											1.8

	Constituent Detected below MCLS
	Constituent Detected above MCLS

Table 10.0-TTA-2-Series Evaluation in Regard to Reductive Dechlorination, Mass Loss and if MCLs Have Been Reached.

Table 10.0 on the preceding page is the evaluation of the TTA-2-Series of wells, that in addition to the chloroethenes is evaluated for the chloromethanes (CT and CF). As with the 101-Series, within TTA-2 the EBT appears to be working quite well, in the case of both the chloroethenes and chloromethanes. At locations such as PMW-92-02, IW-92-03 and IW-92-4, PCE, TCE, CT and CF have been attenuated below their representative MCLs. Again, as within the 101-Series of wells, there is proven effective reductive dechlorination at not only the IW but PMW as well. This would suggest that there is movement of the lactate (or TOC as MFAs) from the IW to PMW locations. Given that there is proven effective reductive dechlorination at both the IW and PMW it can be assumed that it is occurring within the aquifer between the locations.

The following discussion is used to prove that the IW are truly representative of conditions within the aquifer. The injection of lactate to date has not through dilution changed the overall mass of chloroethenes or chloromethanes. That the injection process has little effect on the total concentration of chloroethenes is illustrated in Figure 11.0. Though this well is used for injection of lactate, the total mass has been affected only slightly from the Baseline to EBT-4. The average PCE concentration is around 120 ppb. As shown, the injection process has had little if any affect on the total mass of chloroethenes at this location, where reductive dechlorination is evidently not occurring. The same basic curve is seen in the majority of the IW wells, there is little change in total mass of chloroethenes. The only wells where there is a known loss of mass is the PMW within the 21 Series previously mentioned. Mass loss within the 21 and 101 Series can be tied to reductive dechlorination. Data from the IW wells is useful in determining the contribution of the EBT to attenuation.

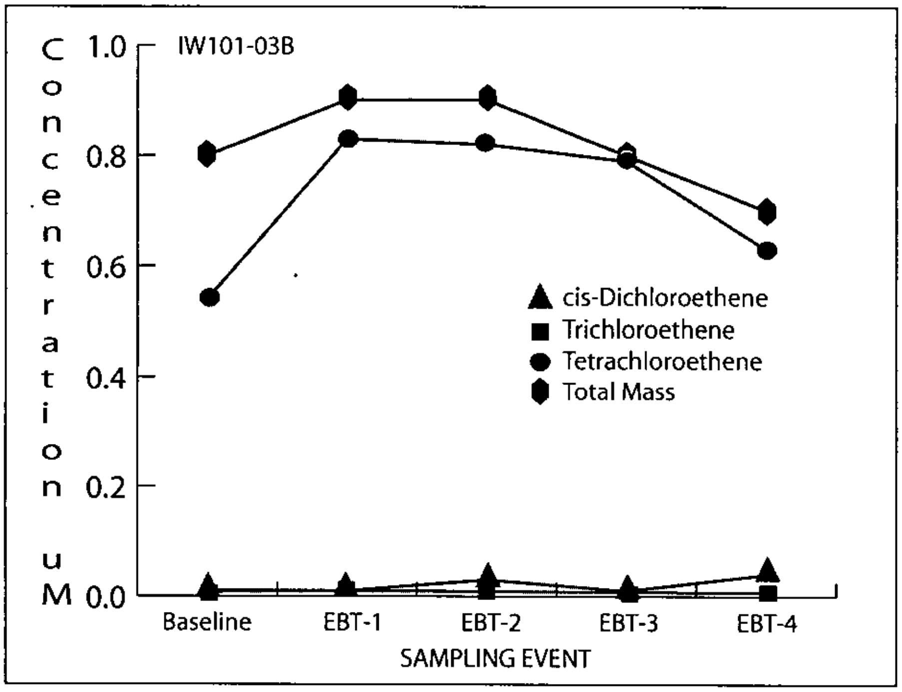


Figure 11.0- Chloroethene [uM] and Total Mass at IW-101-03B.

In conclusion, the EBT appears to be progressing. All areas appear to be holding sufficient carbon to sustain reductive dechlorination. This parameter should be monitored carefully to assure that there is sufficient carbon to assure that this remains the case.

A map showing the TOC concentrations at wells within the 101-Series of wells is shown on the following page. As shown, as of EBT-4 the aquifer in this portion of the EBT appears to have been widely impacted by the lactate injection process. Where the Baseline values where approximately 1 ppm, only four wells have a TOC concentration below 40 ppm. One is PMW-101-08

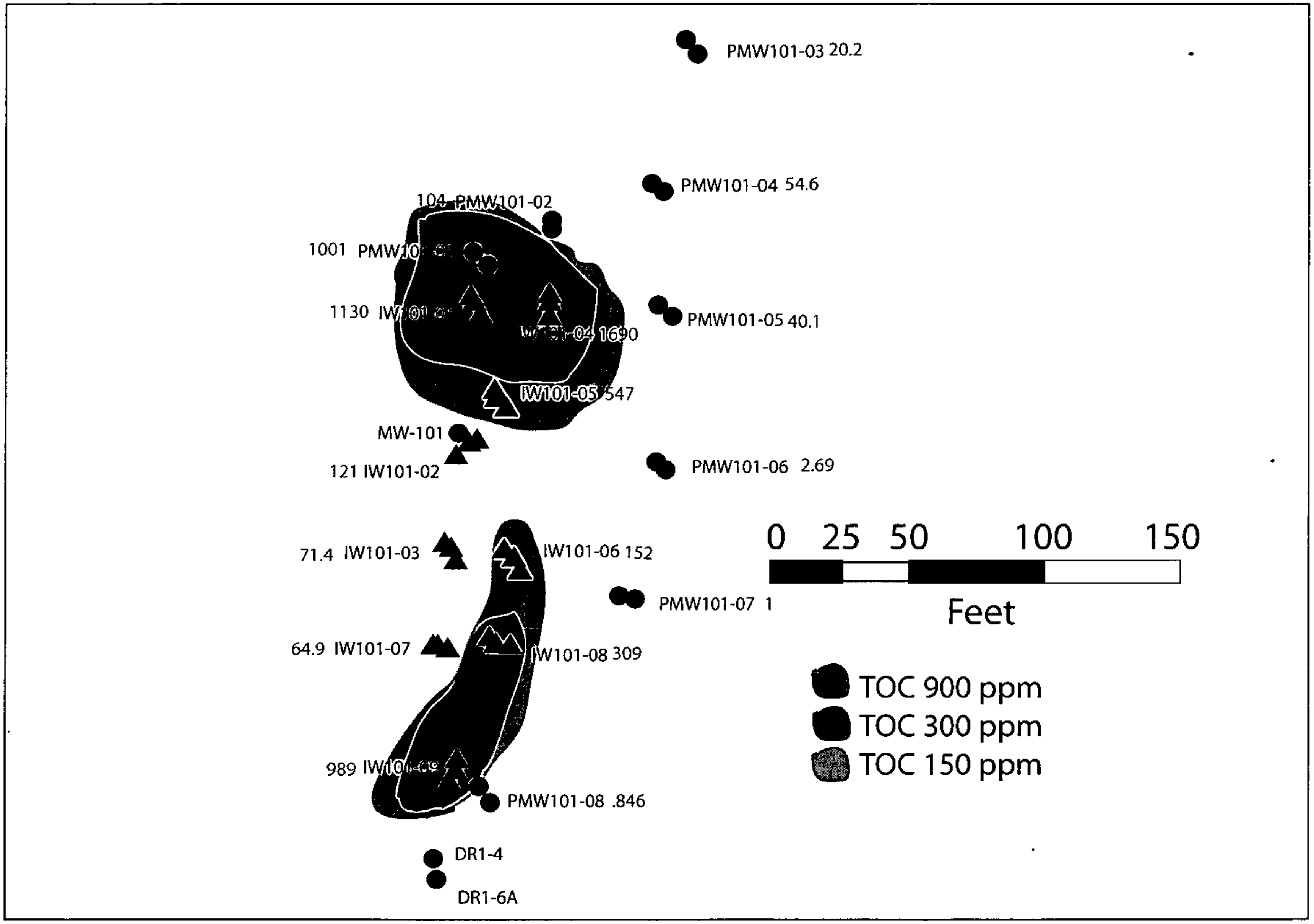


Figure 12.0- Total Organic Carbon Concentration (EBT-4) 101-Series of Wells

that appears to be up gradient of all of the IW wells. What appears to be cross gradient wells, PMW-101-06 and -07 and of course the furthermost down gradient PMW-101-03. As stated earlier PMW-101-03 has had a TOC of about 40 ppm. The A wells (PMW-101-06, 07 and 08) are lightly impacted by chloroethenes (PCE < 20 ppb), while the B wells have on average between 40 and 50 ppb PCE. Further indication that these wells are near the plume edge and likely not in the "heart". That there has not been a breakthrough of TOC certainly argues that these wells are cross gradient to the "paired" IW. Though TOC is certainly not a conservative tracer, it can be assumed that if breakthrough has occurred at several PMW down gradient from IW wells, it makes since that if lactate movement was toward the Northeast, breakthrough at these locations should have been observed. The lactate appears to be moving toward the North from IW-101-09 to PMW -101-01 and then turn towards the North-Northeast. If one assumes that this apparent movement of TOC defines a preferential higher permeability flow path, it would bolster the case that data from DR-1-3 does result for the EBT.

The EBT appears to have impacted the area immediately down gradient from the IW. It can be assumed that the majority of the aquifer is also undergoing reductive dechlorination, similar to that shown in the IW and PMW. Data from the IW can be used to assess efficacy because there appears to be little if any mass loss in any well within the 101-Series, where reductive dechlorination is not proven (Figure 11.0, page 19.0).

The TOC isopleths for TTA-2 are shown on the preceding page (Figure 13.0). The results are similar to those for the 101-Series, a wide area of the aquifer appears to be impacted by the injection of lactate. Where the "front' of TOC does not appear to have moved to the PMW, specifically PMW-92-01, -02, -03 and -04, the former is the only well where reductive dechlorination is not proven. The latter are under active reductive dechlorination for COC attenuation. In fact, these are some of the best wells in regard to reductive dechlorination. This statement is true in regard to both the chloroethene and chloromethanes. The assumption can be made that the aquifer where lactate (or TOC) is present, there is likely active reductive dechlorination.

There are only four wells in TTA-2 where reductive dechlorination is not proven. The aforementioned PMW-92-01, is of course one where reductive dechlorination is not currently active. Another is DR-2-5, which appears to be up gradient or cross gradient from the nearest IWs. The third is PMW-92-05, a well that appears to be cross gradient from the nearest IW. The fourth is IW-01. The rest of the wells appear to be well underway in regard to reductive dechlorination and attenuation.

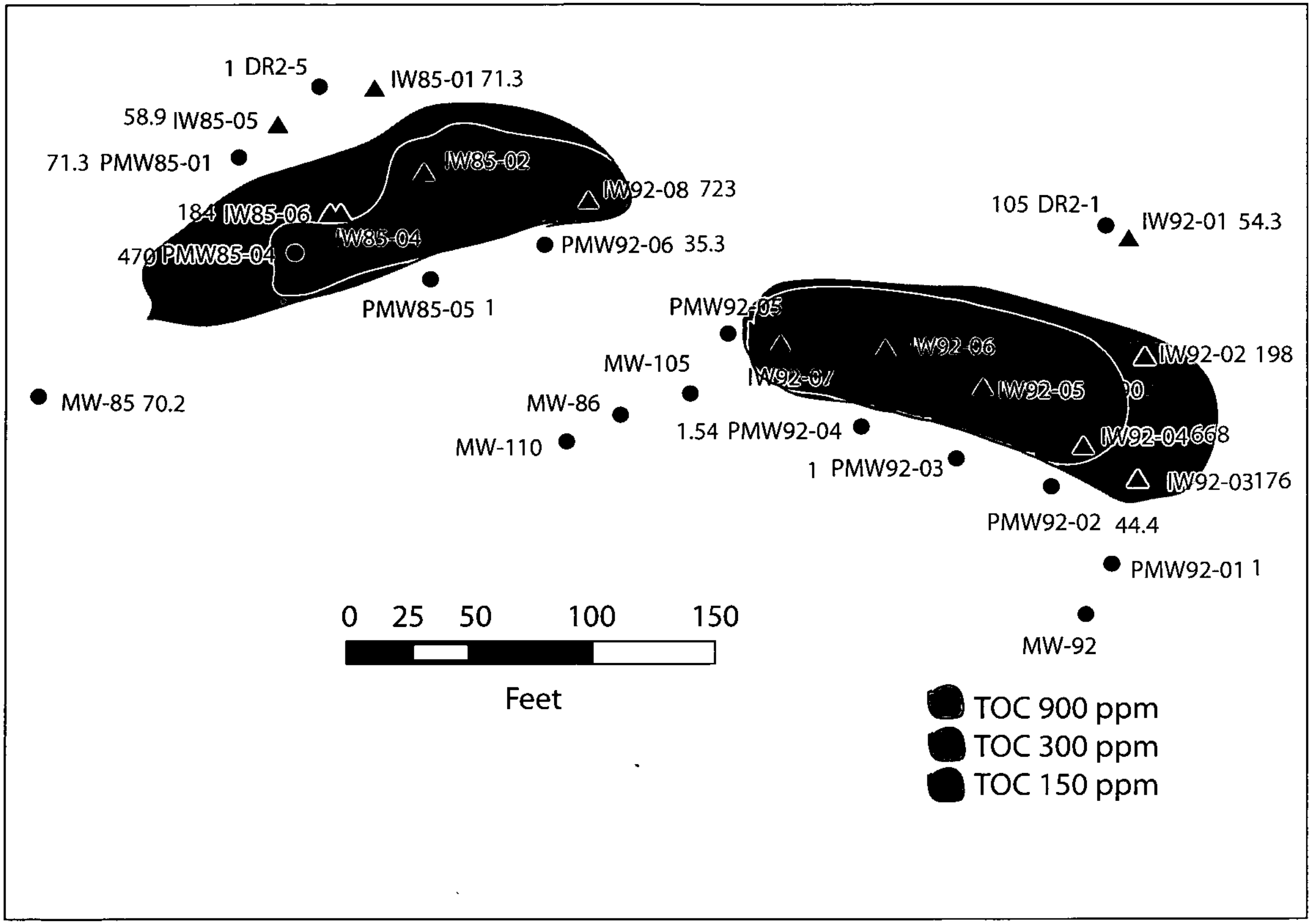


Figure 13.0- Total Organic Carbon Concentration (EBT-4) TTA-2-Series of Wells

The TOC values for the 21-Series of wells is shown in Figure 14.0 on the following page. The data suggests that the lactate injection has been limited only to the IW within this series. This would appear to simply be the result of the location of the PMW 21 Series wells. All of the PMW appear to be at the least cross gradient to the IW. It is likely that the aquifer has been impacted by lactate and likely reductive dechlorination. Ground water contours suggest that the head and likely flow lines run Southwest to Northeast, similar to the line of IW. This would make the PMW cross gradient to the IW and not down gradient. The one exception may be PMW-21-03. This PMW well may actually be in the flow path where some of the IW introduce lactate. It is interesting that of all the wells, these 3 cross gradient PMW wells show valid mass loss without reductive dechlorination.

Recommendations

The EBT appears to be working. Reductive dechlorination can be tied to 1) a loss of PCE and TCE, and 2) a small though perhaps not statistically significant overall mass loss. From the data at the present time, there does not appear to be a problem with the production and build-up of vinyl chloride. If sufficient organic carbon is maintained, this problem should not surface.

1. There are three PMW in the 21-Series that are cross gradient. These are PMW-21-01, PMW-21-02 and PMW-21-04. A valid change would be to turn either PMW-21-01 or both PMW-21-02 and PMW-21-04 into IW. As shown, the IW are valid as monitoring locations because there is no mass loss (or certainly no substantial) as a result of the injection process. This would assure that more of the 21-Series aquifer is impacted by lactate. As shown on page 19, Figure 11.0, an IW well is perfectly acceptable as a monitoring location. To date the injection process has not had a dilution effect on mass of chloroethene or chloromethane mass.

2. TOC should be monitored in all three areas (21,101 and TTA-2). If necessary, the amount of lactate should be increased to assure that sufficient oxidizable organic carbon, in this case lactate is present. There appears to be no need to sample for the MNA parameters. Both sulfate and nitrate appear to be attenuated prior to or concurrent with reductive dechlorination. Monitoring microbial activity, and the use of both as a TEA. However, the starting concentration of neither affects the onset of reductive dechlorination. Wells with initial sulfate concentrations as high as 40 ppm are as likely to have reductive dechlorination as wells with initial concentration less than half this value.

In essence, the MFAs (and lactate) can be monitored by TOC. As would be expected, in instances where microbial activity is high, the concentration of both methane and carbon dioxide increases. This is a well known fact and does not require further investigation. In short, it appears that no one parameter(s) is a harbinger of reductive dechlorination. In fact, the most interesting location is IW-21-03B. Every parameter within this location suggests that reductive dechlorination should be occurring. Sulfate has gone from 33 ppm to approximately 1, nitrate has been removed and there is sufficient TOC to drive the process. There has also been sufficient hydrogen present, and the pH is around 6. Yet, reductive dechlorination is not evident. The concentration of cDCE, TCE and PCE has remained steady from the Baseline to EBT-4. The only common factor in regard to reductive dechlorination (when COCs are present) is TOC, except again in the case of IW-21-03B. Another interesting fact is that IW-21-03A cannot hold TOC and neither sulfate or nitrate has been removed. At IW-21-03A, the PCE

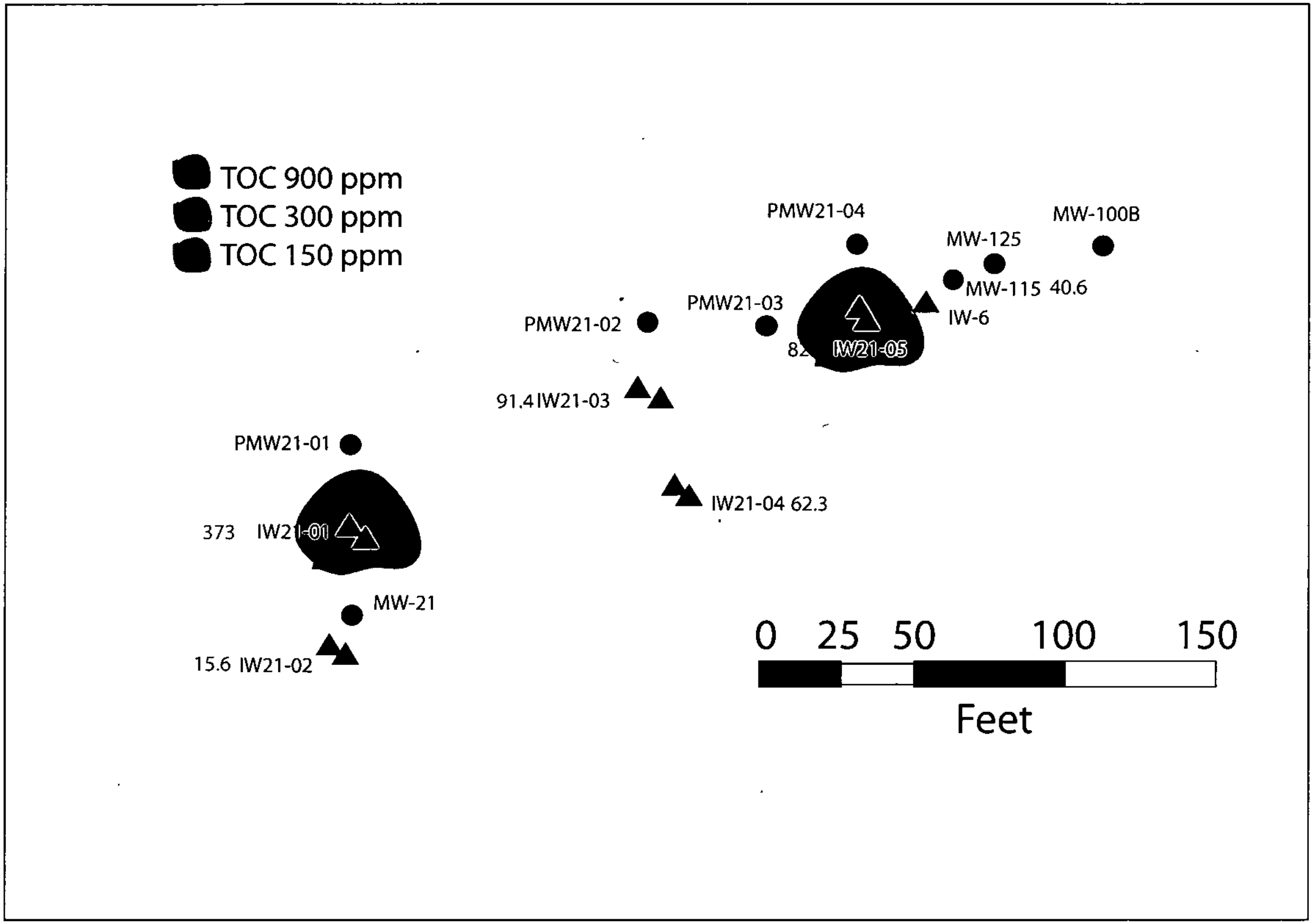


Figure 14.0- Total Organic Carbon Concentration (EBT-4) 21-Series of Wells

concentration has remained steady at about 1 uM until EBT-4. The PCE concentration at EBT-4 was approximately 0.5 uM. There is no concurrent increase in cDCE. At the moment, historical data (1.0 uM) is favored over the single 0.5 uM detection. Both IW-21-03A and -03B are perfect examples of IW wells where there appears to be a "sink" for TOC. The lactate appears to move away from these locations rapidly, immediately after injection without any direct or indirect affect on chloroethene and chloromethane concentration. Another reason that the 21-Series may appear to be less effective than the 101-Series or TTA-2. Data from IW wells within the 21-Series where the TOC is above 40 ppm shows that reductive dechlorination is occurring. One can assume that wherever within the aquifer the lactate is moving after injection at IW-21-03A and -03B if chloroethenes are present reductive dechlorination is active.

The following parameters should be monitored:

A. TOC, Methane, Carbon Dioxide, Ethene and Ethane- The TOC within the system must be monitored to assure that it is sufficient to drive the reductive dechlorination process. The methane and carbon dioxide, because they are relatively cheap direct indicators of microbial growth. Ethene and ethane are included simply because they are measured using the same SOP. It is uncertain whether the low concentrations of each that may be produced can be accurately measured.

B. Metabolic Fatty Acids (MFAs)- This will provide some information in regard to microbial activity and possible trigger for reductive dechlorination. In other words, if the onset of reductive dechlorination requires a specific concentration of acetate or other MFA. Information to date suggests that there is no MFA trigger.

C. Volatile Organic Compounds (VOCs)- The loss of each within a location is very important.

Given the results to date, it does not appear that the concentration of arsenic, manganese, bromide, chloride has any affect on microbial activity. Certainly, there is little if any difference in the concentration of these parameters at locations where reductive dechlorination is active and ones where it is not. If the chloroethene and chloromethane concentrations were an order of magnitude higher, an increase in chloride would reflect reductive dechlorination. At the chloroethene and chloromethane concentrations involved, it is unlikely.

There appears to be no need to monitor sulfate/sulfide or nitrate/nitrite concentrations at this time. The concentration of either might have been important if reductive dechlorination did not initiate within the system. The presence of other more favorable electron acceptors (nitrate or sulfate) might have been responsible. As it stands, neither appear to be related to either the onset of or sustained reductive dechlorination.

The continued monitoring of hydrogen does not appear to be necessary. Certainly proof has been provided that hydrogen is being produced within the system and used for reductive dechlorination. There does not appear to be any necessary concentration of hydrogen for reductive dechlorination.

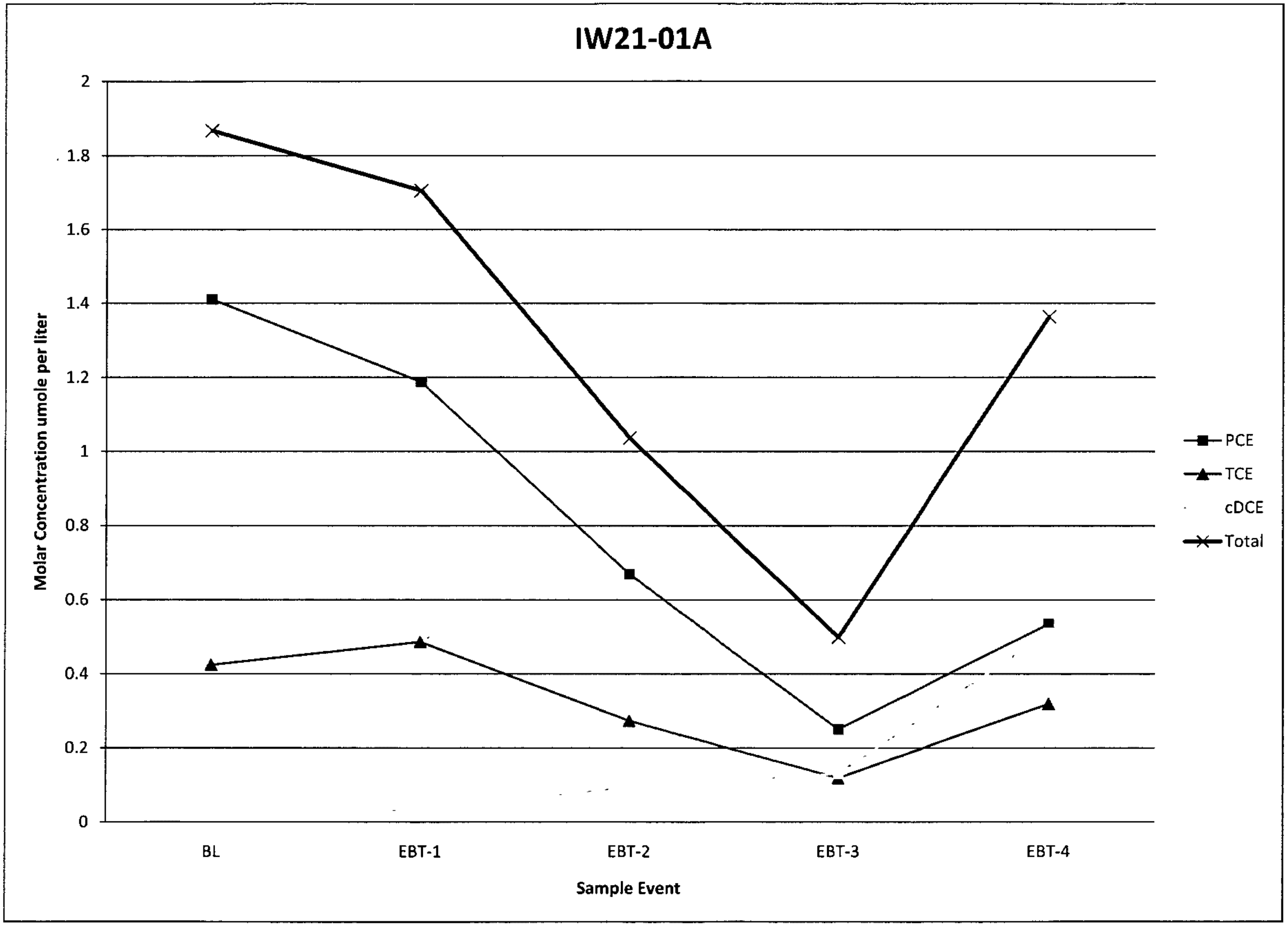
3. There does not appear to be a need to take ORP, pH, DO and temperature measurements prior to the injection process. Certainly, these measurements should be taken and used as parameters for stabilization during sampling. None appear to correlate with wells where reductive dechlorination has begun. There is sufficient historical data to suggest that these parameters within each location are amenable to anaerobic biological activity.

4. There are two changes that would increase the efficacy of the EBT, bioaugmentation and changes in the electron donor. One problem with reductive dechlorination is that while the rate of dechlorination to TCE and cDCE is rapid, from cDCE to ethene the rate of dechlorination is lower. In addition, there is only one known bacterium capable of completely reducing PCE to ethene. The addition of microorganisms that are capable of converting cDCE to ethene would increase attenuation rates within the aquifer.

For purposes of this discussion, electron donors (organic carbon) can be divided into three categories, Fast, Medium and Slow. Fast Donors being defined as organic carbon that immediately contribute the majority of contained reducing equivalents to the hydrogen pool for reductive dechlorination. In contrast Medium and Slow Donors must first go through a transformation or degradation. During this initial degradation or transformation a small portion of the reducing equivalents are donated to the hydrogen pool. In essence, a Medium or Slow Donor is converted to lactate or acetate (or other MFAs). During the conversion, some hydrogen is produced and can be used for reductive dechlorination. An example of a Slow Donor would be vegetable oil. The initial conversion of a Medium or Slow Donor is performed by fermentative bacteria. In effect adding a mixture of substrates increases the microbial population used for reductive dechlorination. For example some clostridia (fermentative bacteria) are capable of dechlorinating cDCE. By mixing substrates a wider range of microorganisms (consortium) can be employed for the reductive dechlorination process. Adding any number of complex substrates such as cellulose or vegetable oil would increase the efficacy of the process.

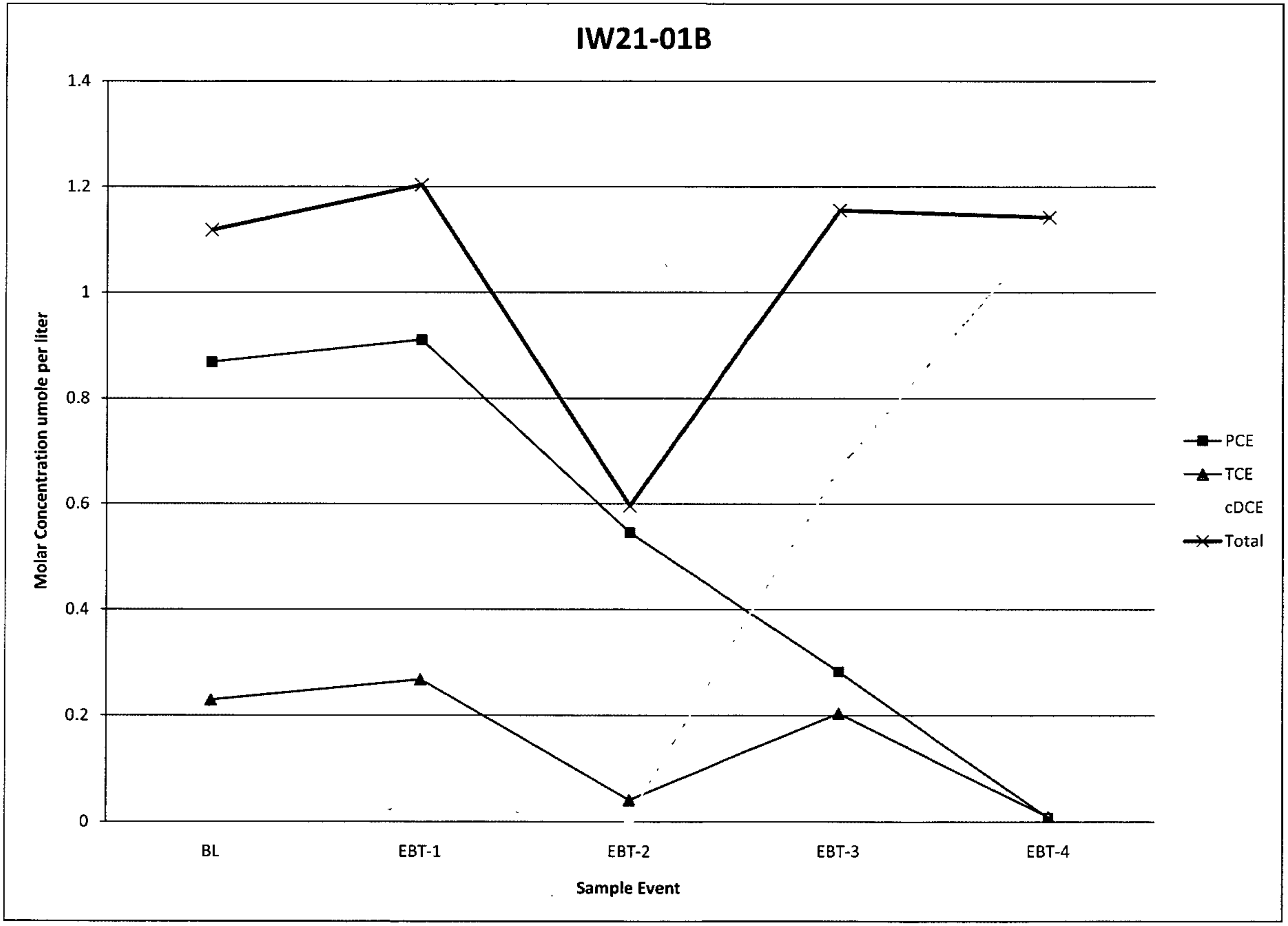
APPENDIX I

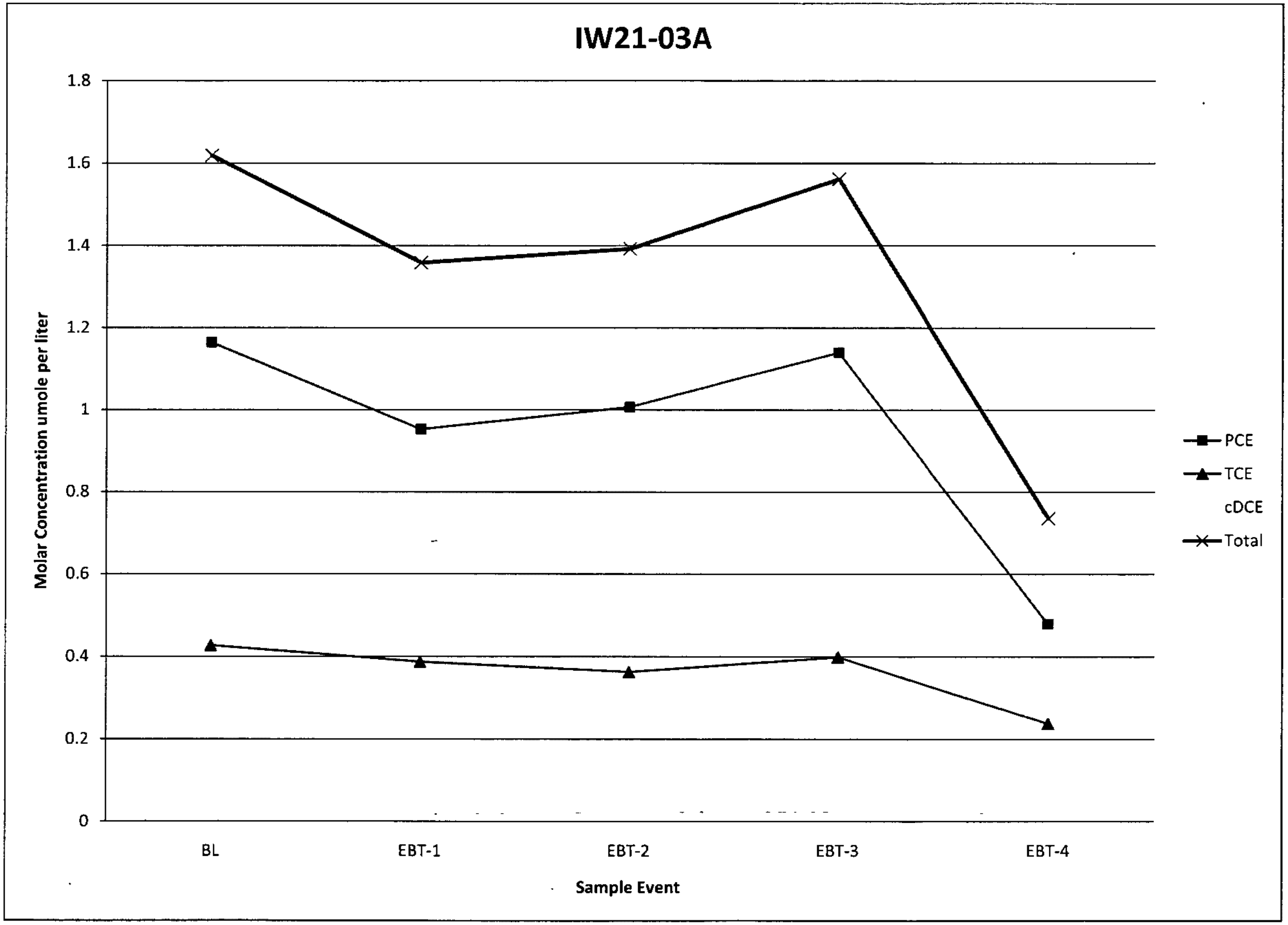
PCE MASS BALANCE CHARTS

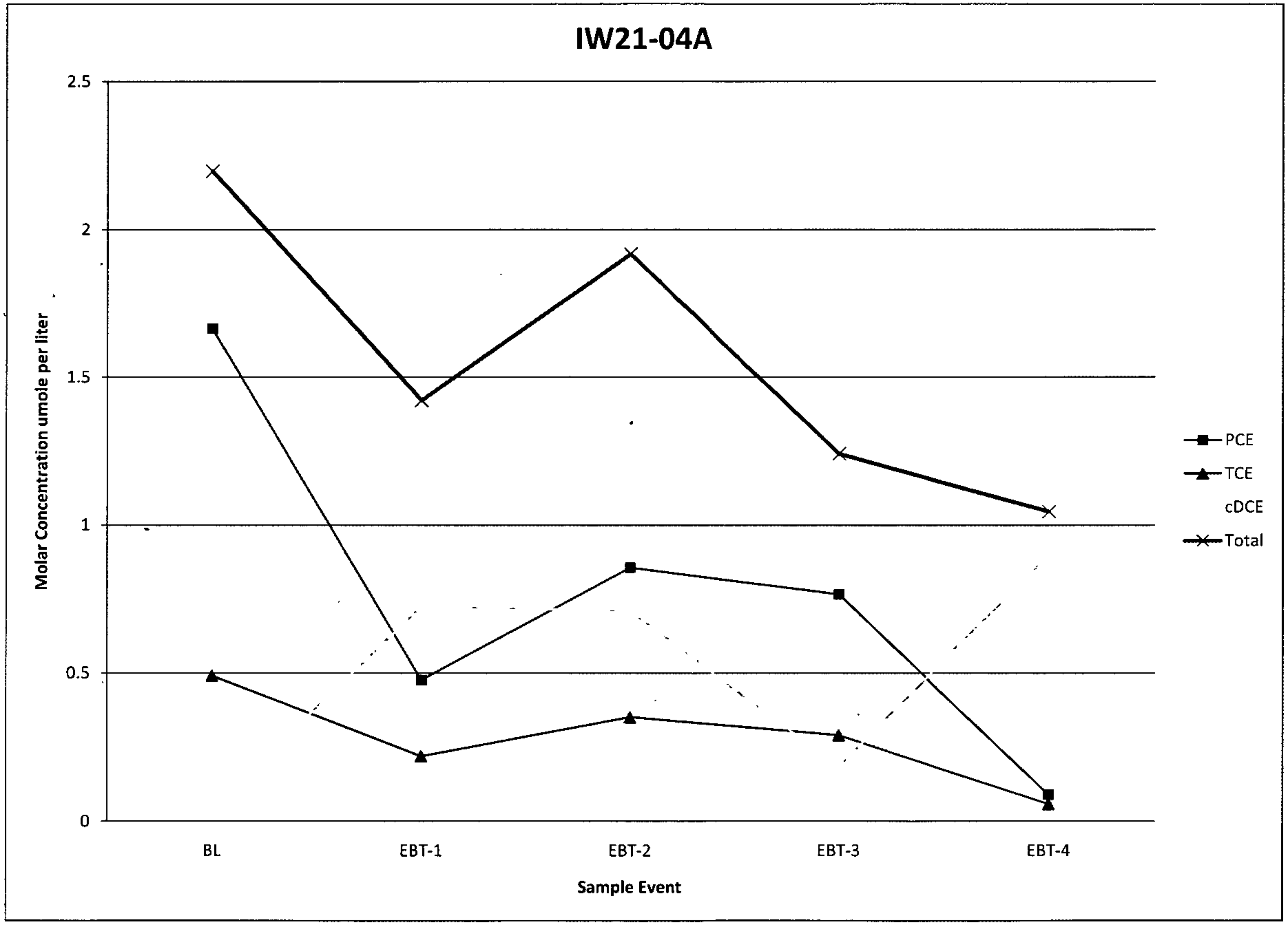


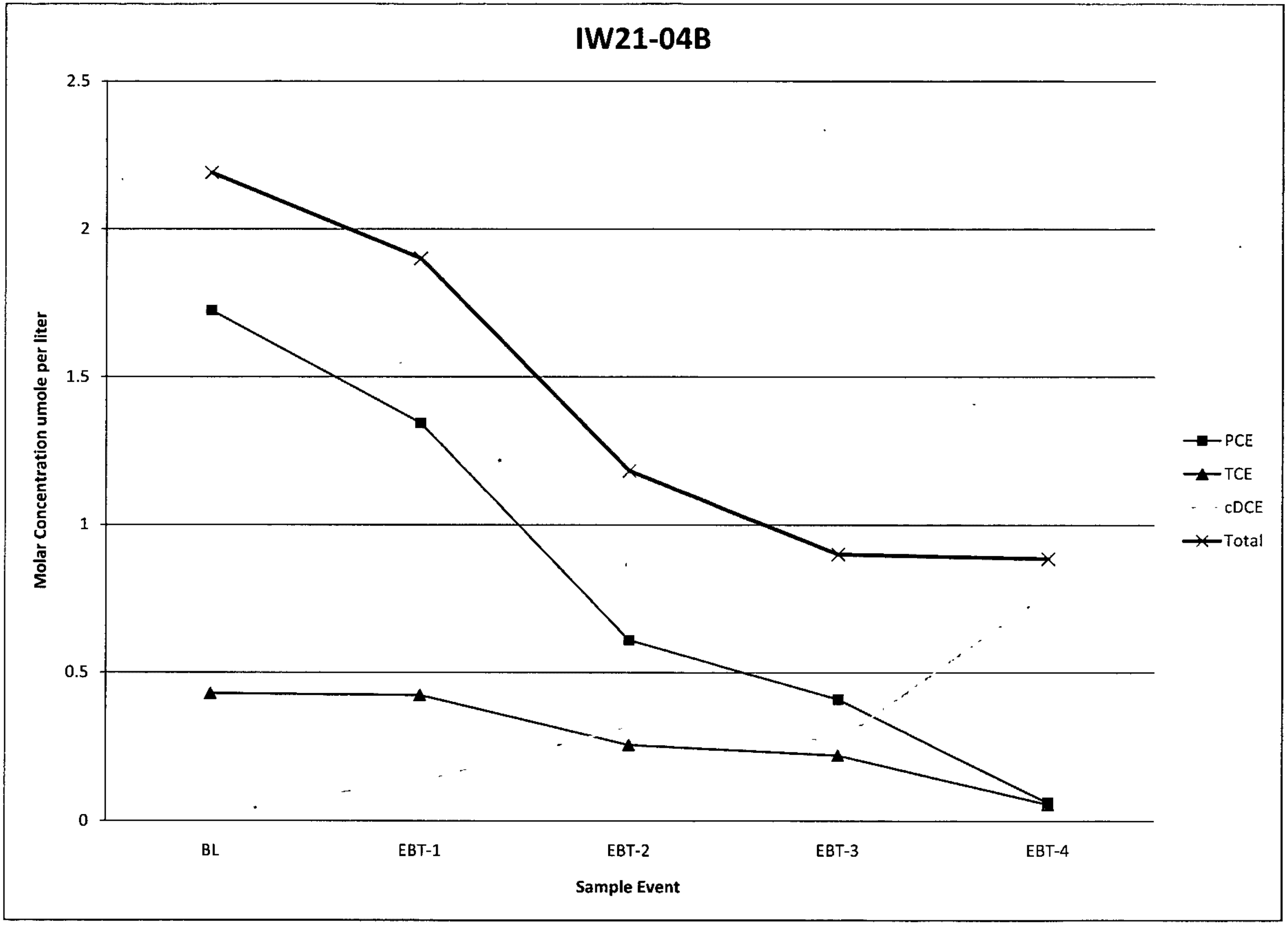
IW21-01A

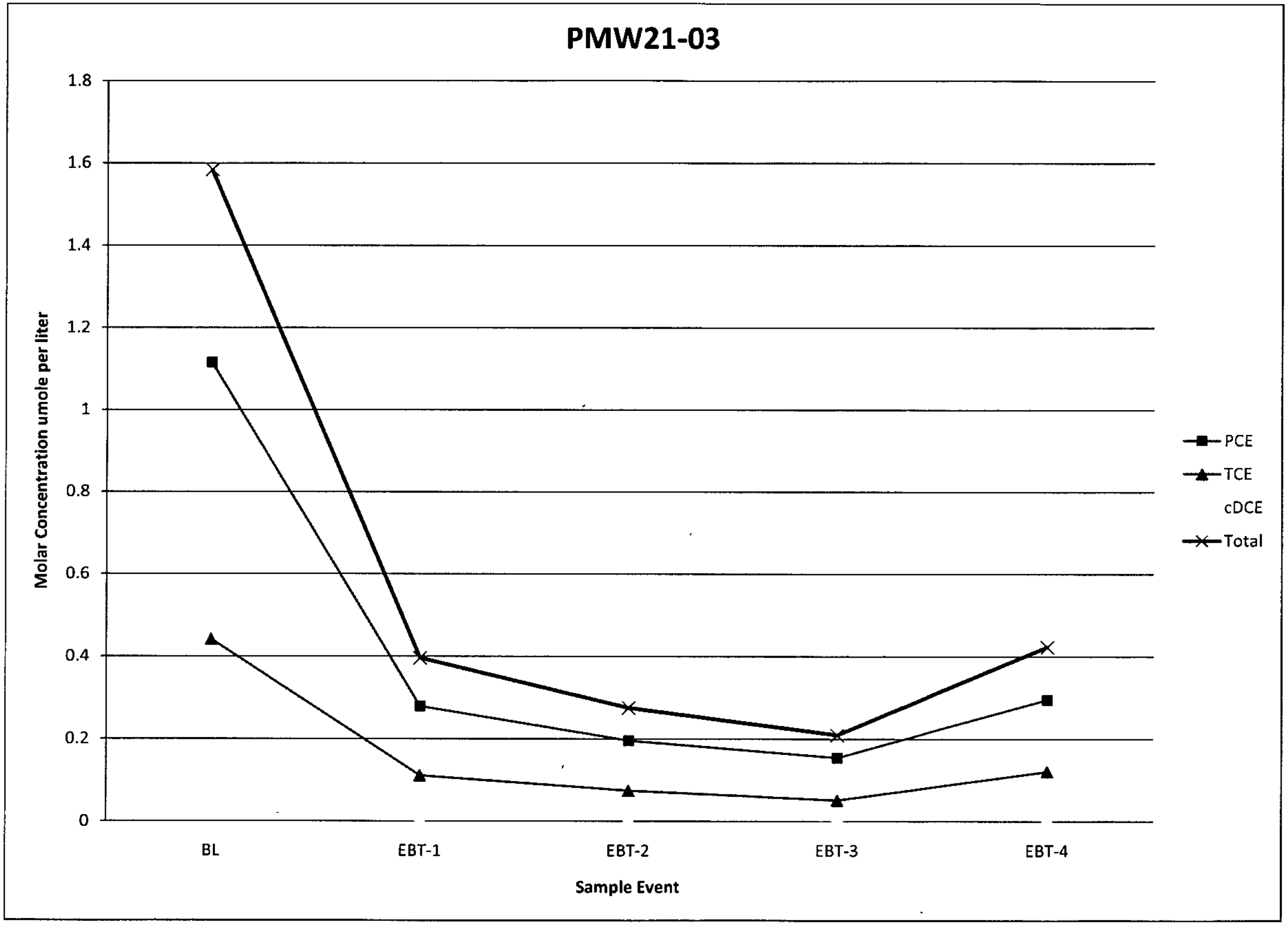
Molar Concentration umole per liter
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total


IW21-01B
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Molar Concentration umole per liter
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total


IW21-03A
Molar Concentration umole per liter
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total

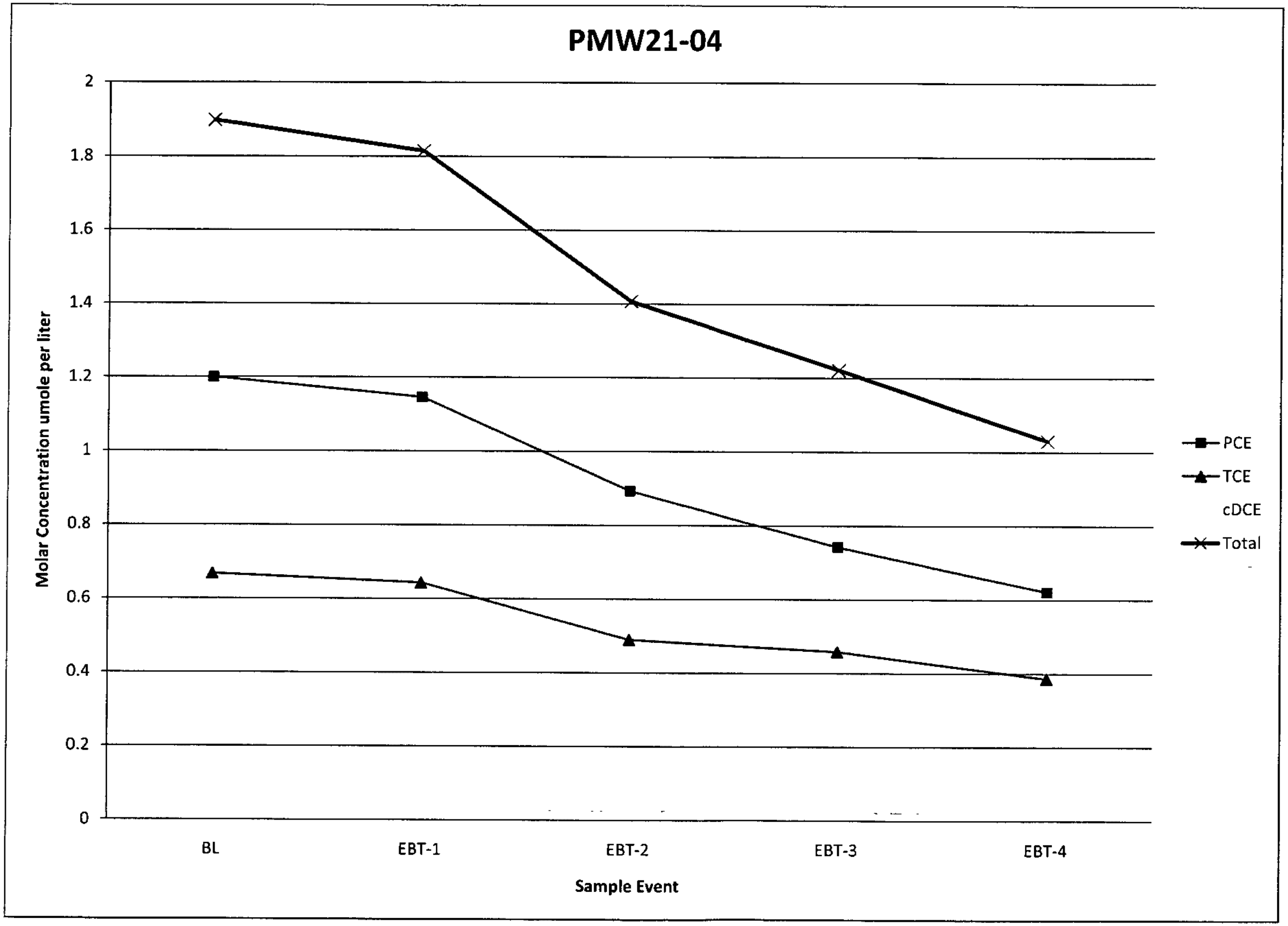

IW21-04A
Molar Concentration umole per liter
2.5
2
1.5
1
0.5
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total

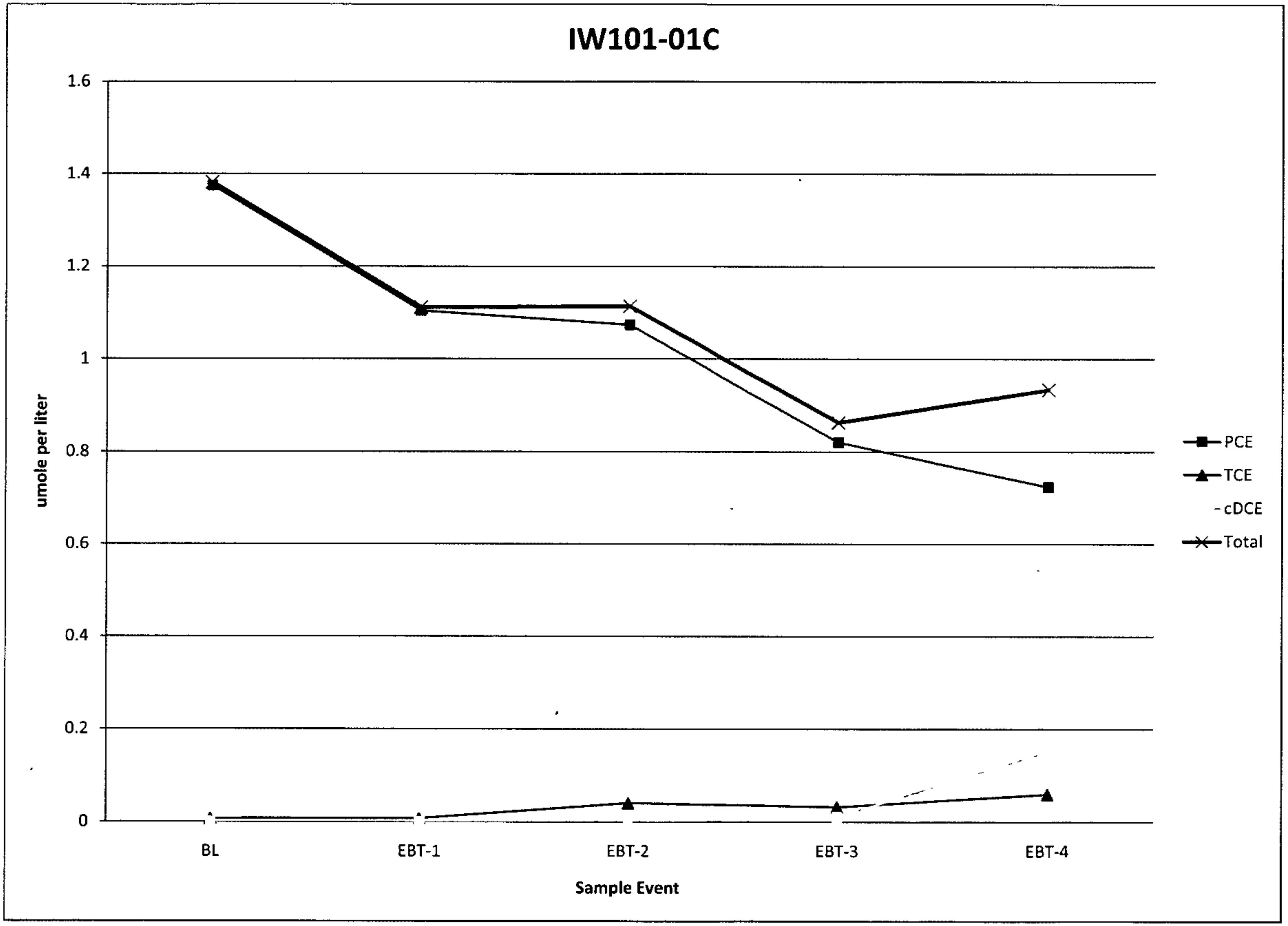

IW21-04B
Molar Concentration umole per liter
2.5
2
1.5
1
0.5
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total

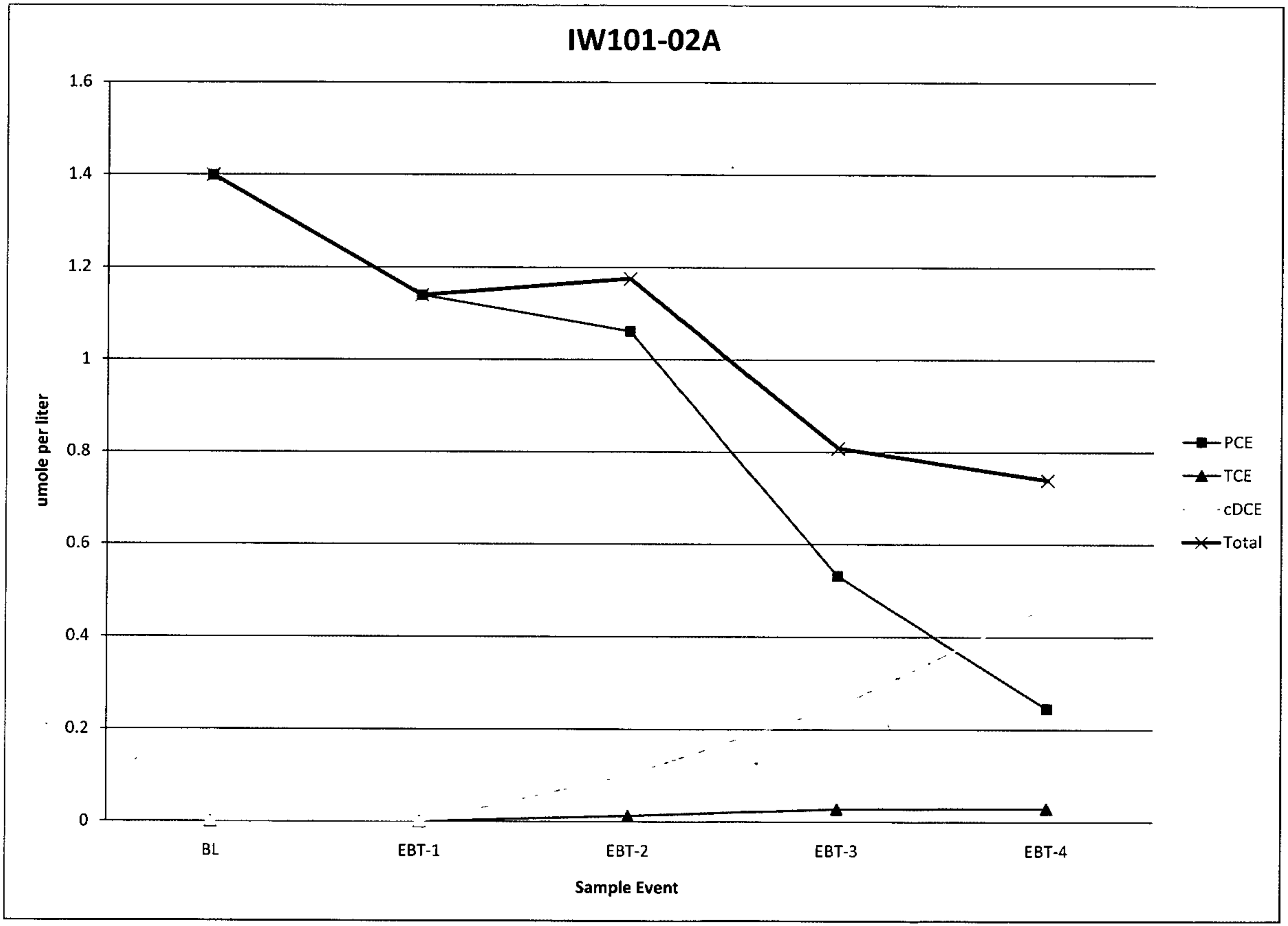


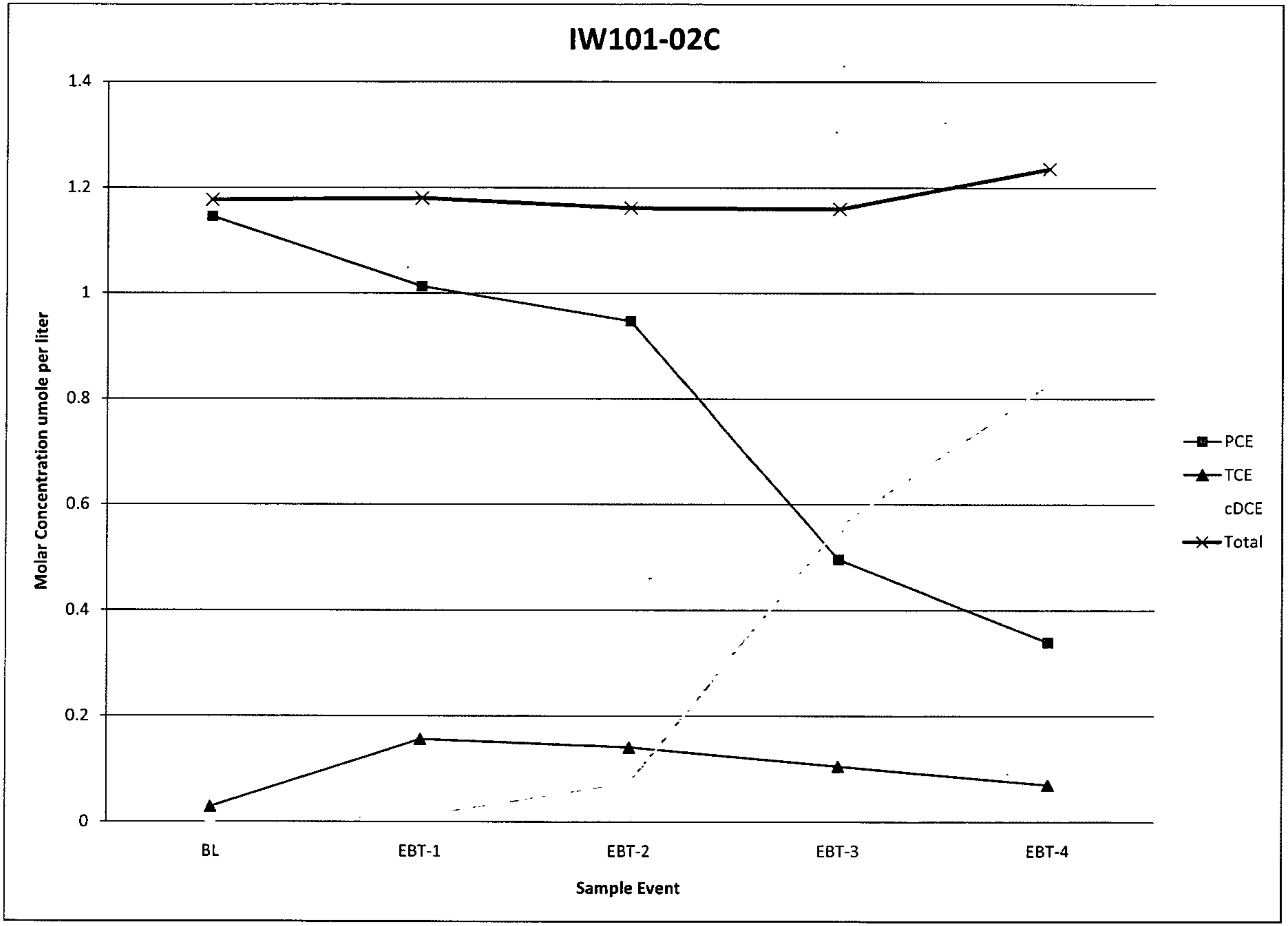
PMW21-03

Molar Concentration umole per liter
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total


PMW21-04
Molar Concentration umole per liter
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total

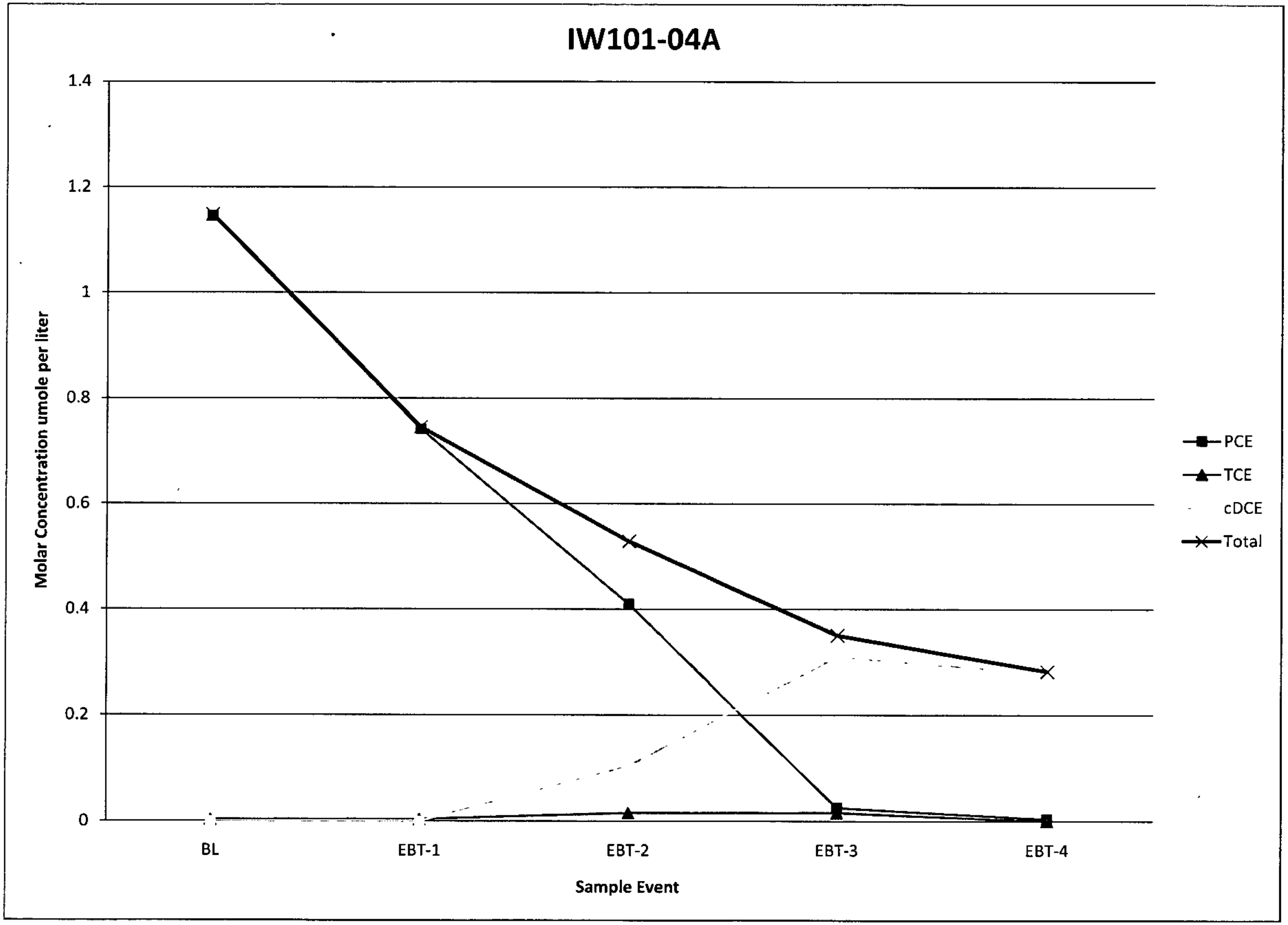

IW101-01C
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
umole per liter
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total


IW101-02A
umole per liter
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total

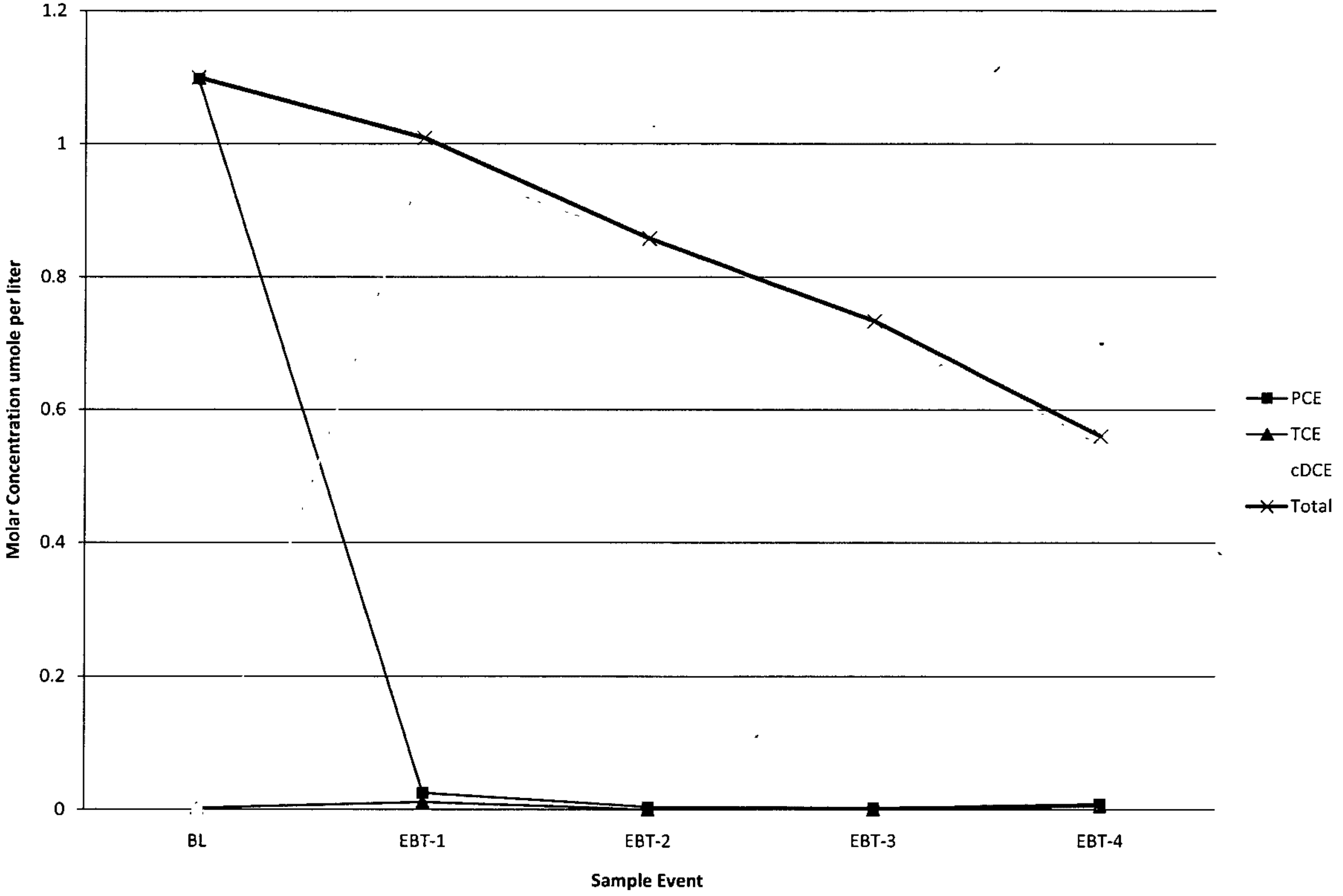


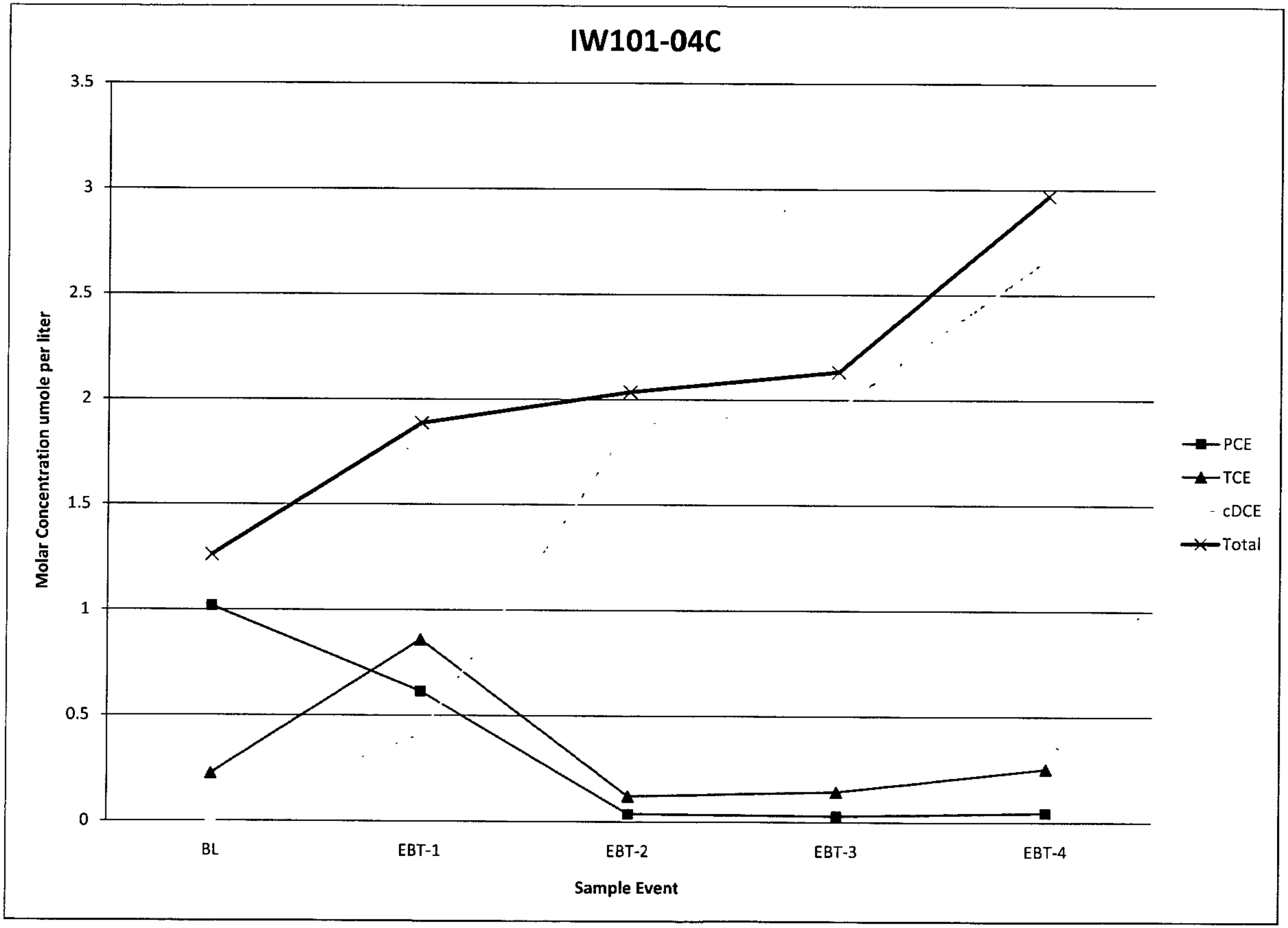
IW101-02C

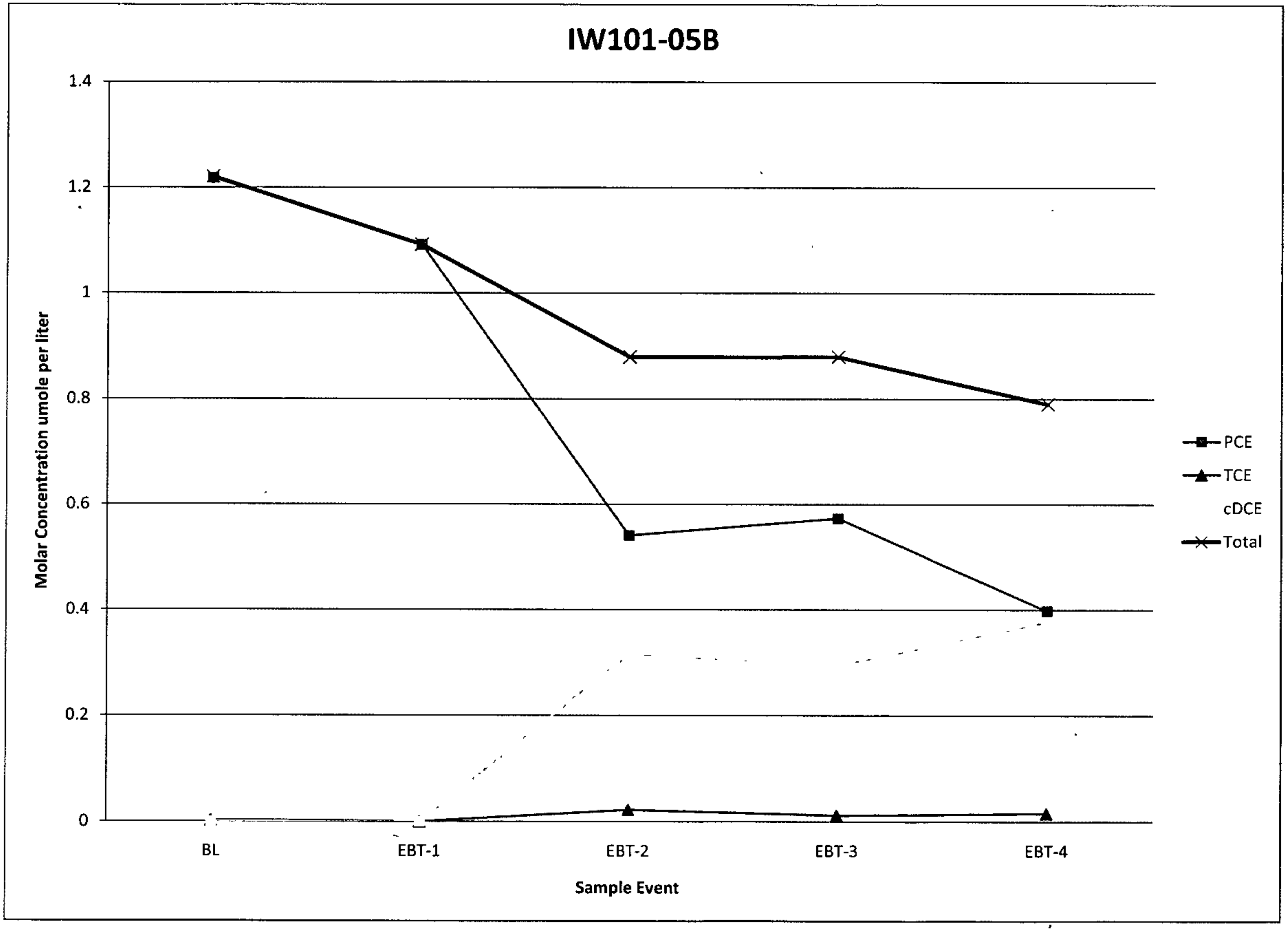
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Molar Concentration umole per liter
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total

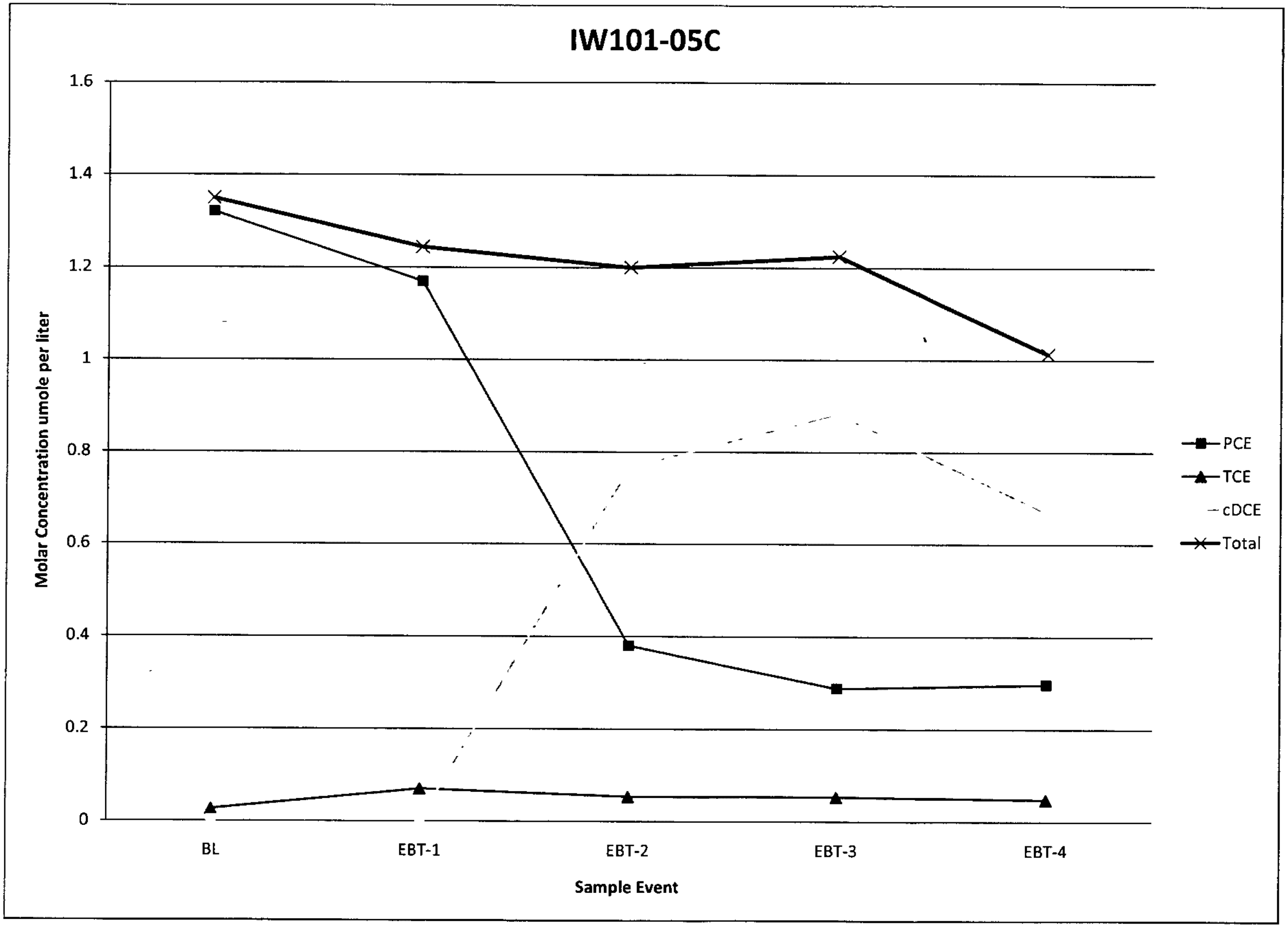

IW101-04A
Molar Concentration umole per liter
1.4
1.2
1
0.8
0.6
0.4
0.2
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total

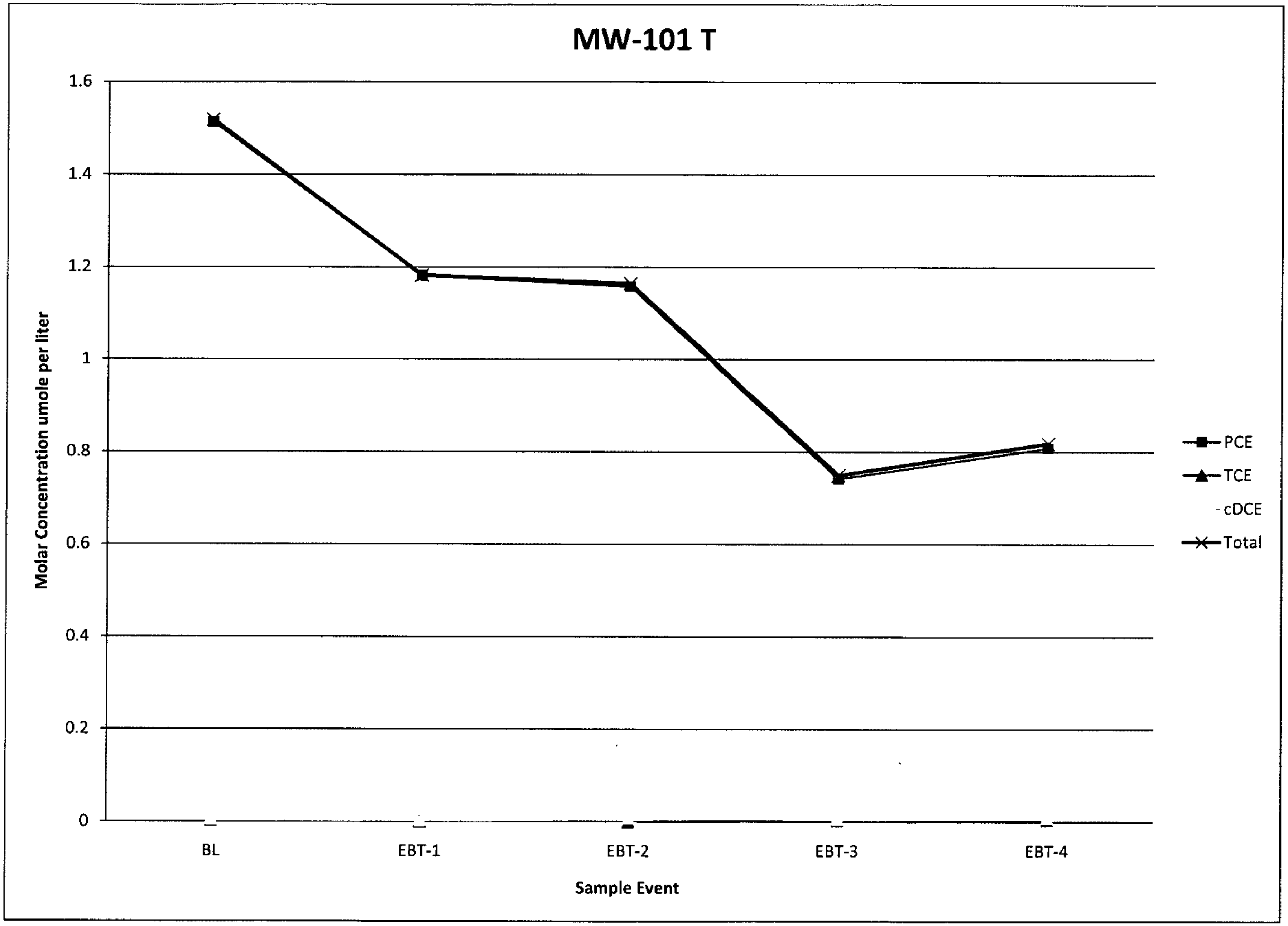
IW101-04B

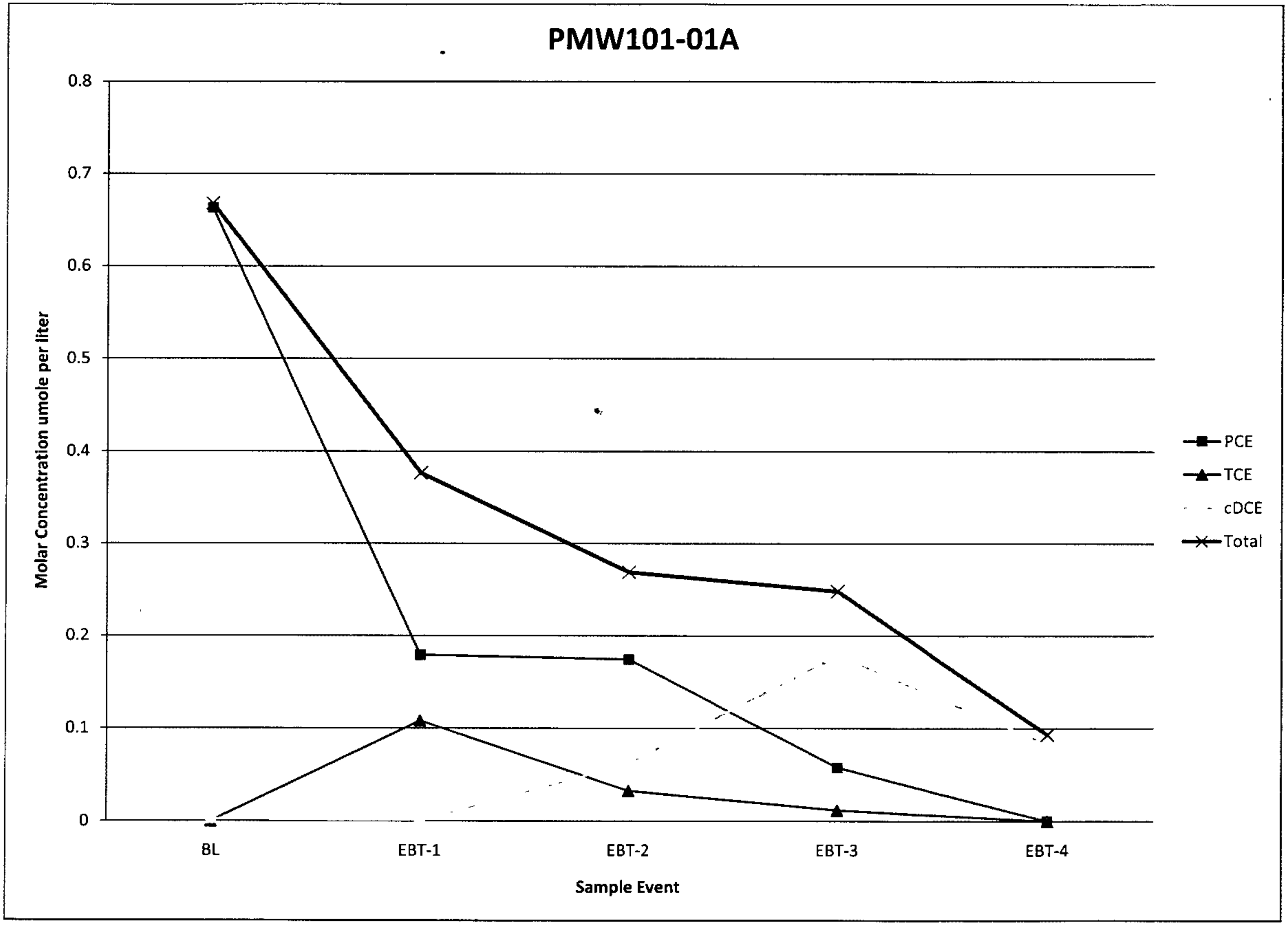

1.2
1
0.8
0.6
0.4
0.2
0
Molar Concentration umole per liter
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total


IW101-04C
Molar Concentration umole per liter
3.5
3
2.5
2
1.5
1
0.5
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total


IW101-05B
Molar Concentration umole per liter
1.4
1.2
1
0.8
0.6
0.4
0.2
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total


IW101-05C
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Molar Concentration umole per liter
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total

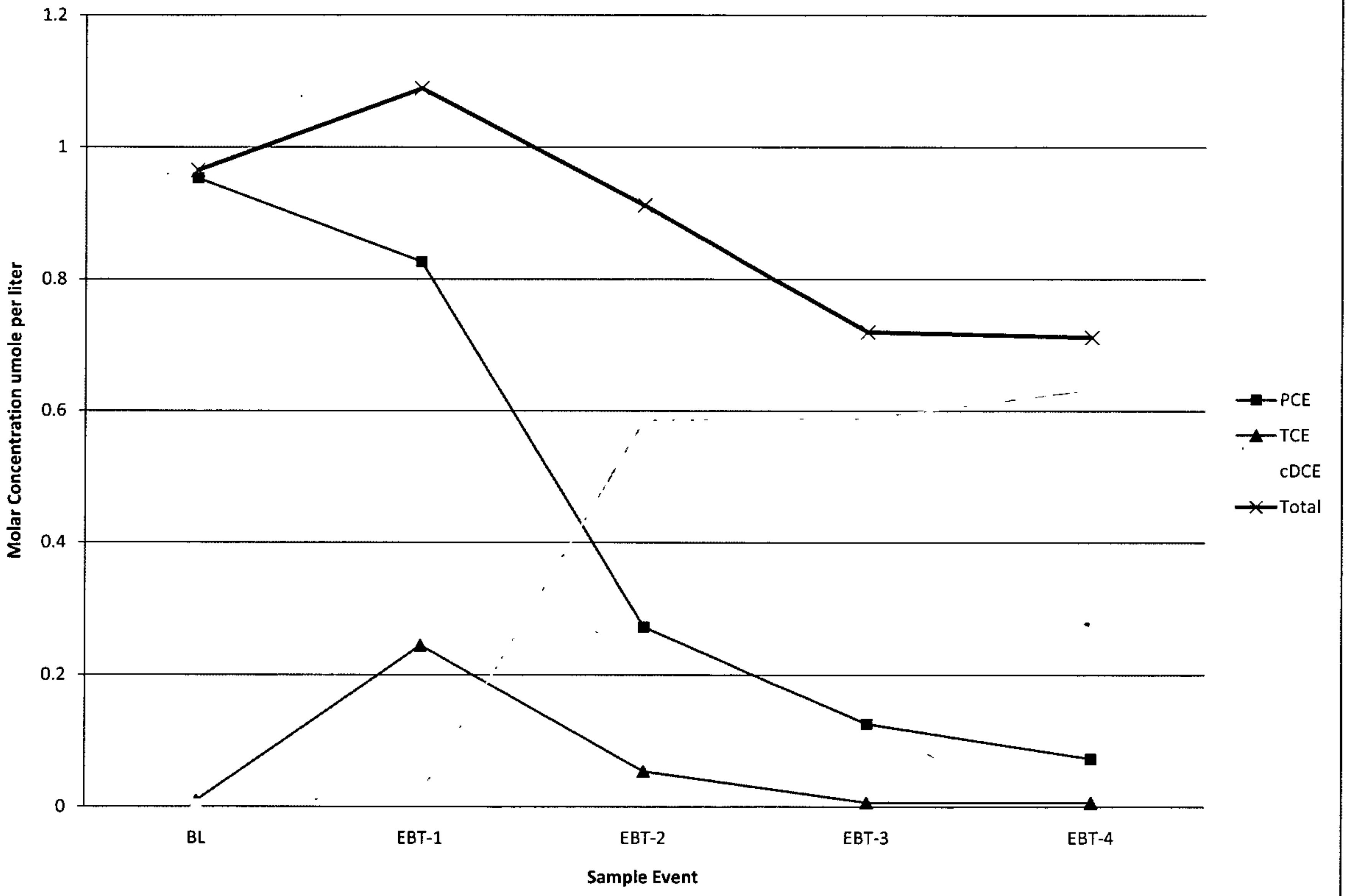

MW-101 T
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Molar Concentration umole per liter
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total

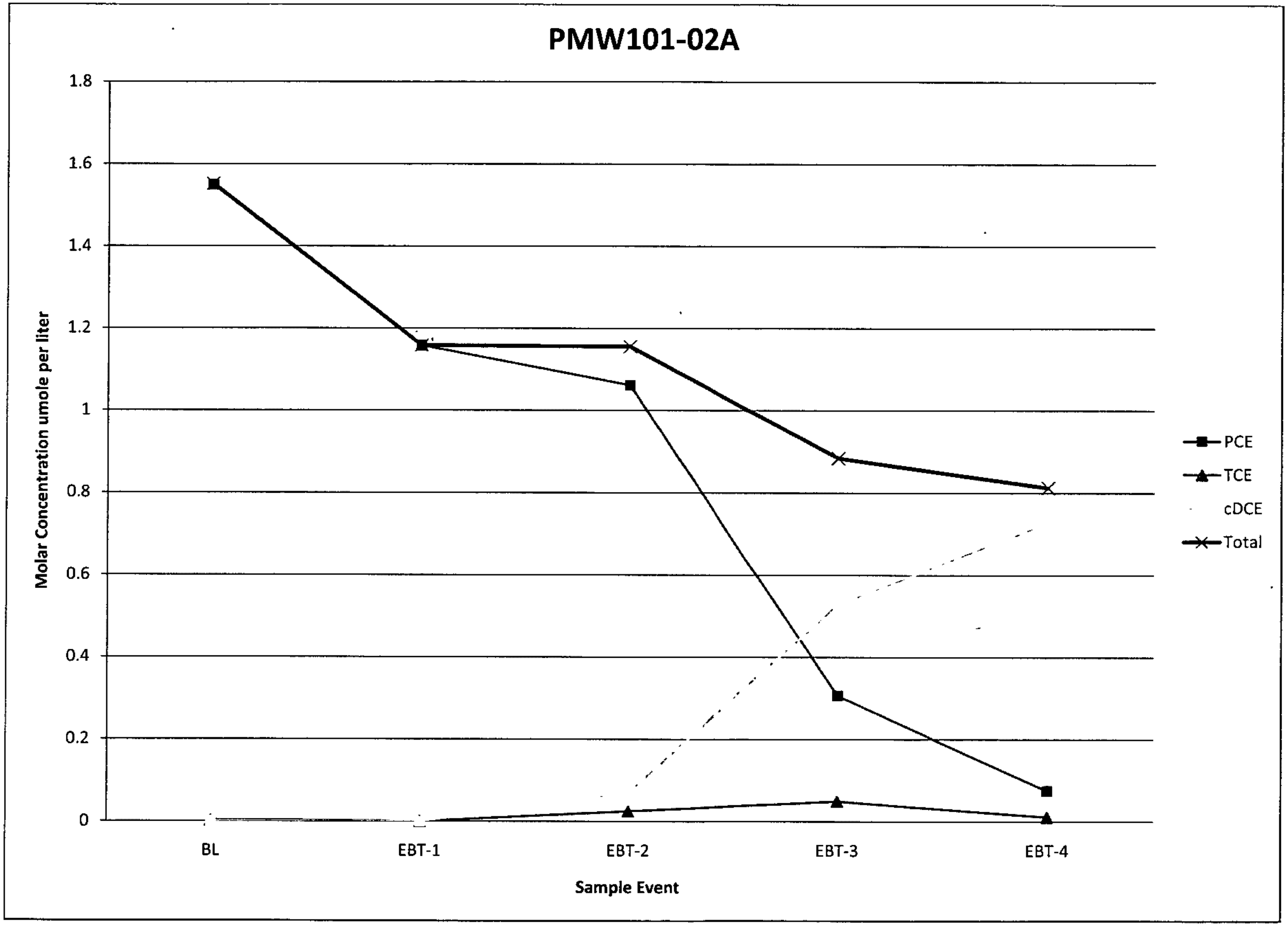


PMW101-01A

Molar Concentration umole per liter
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total

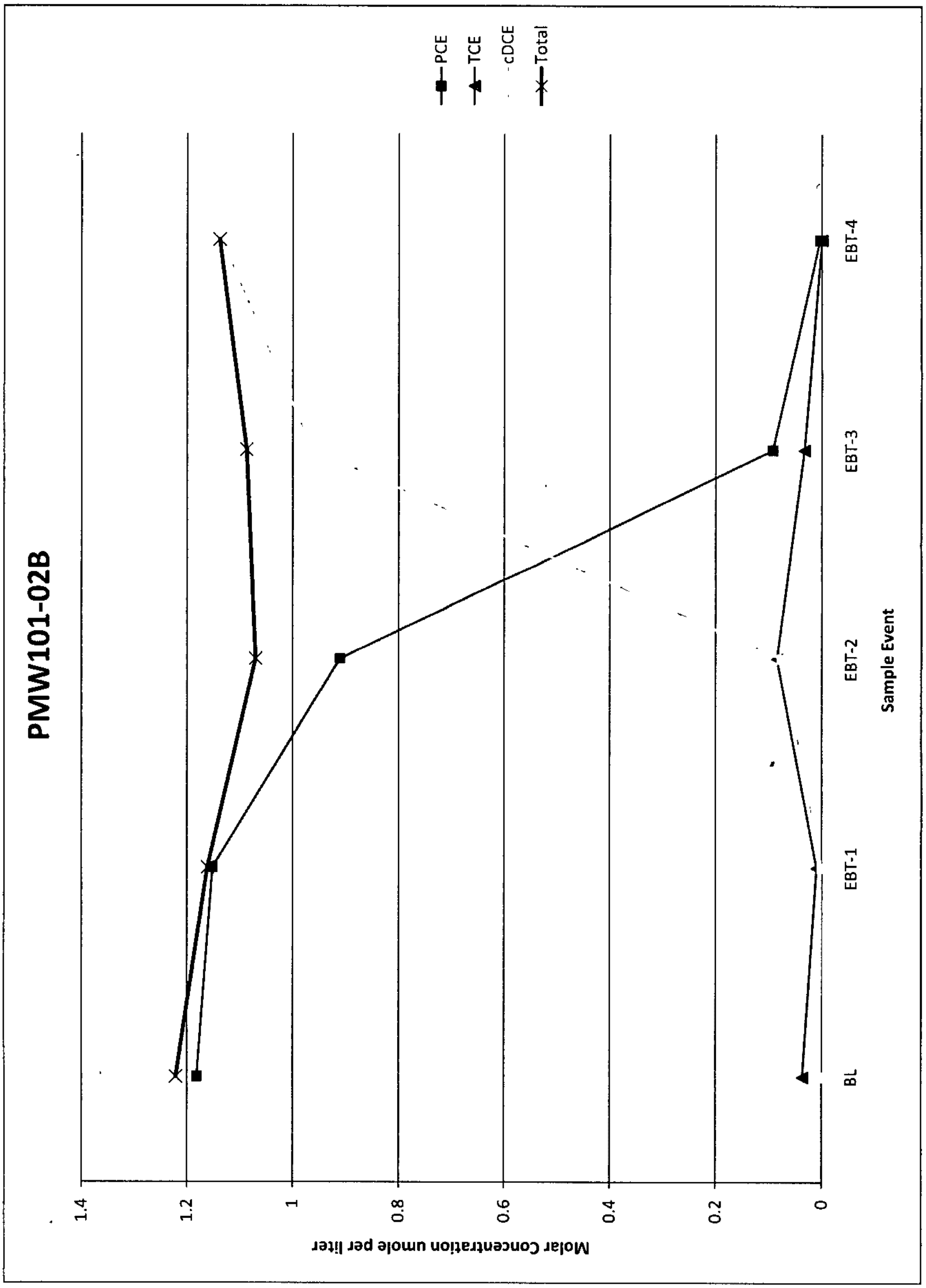
PMW101-01B

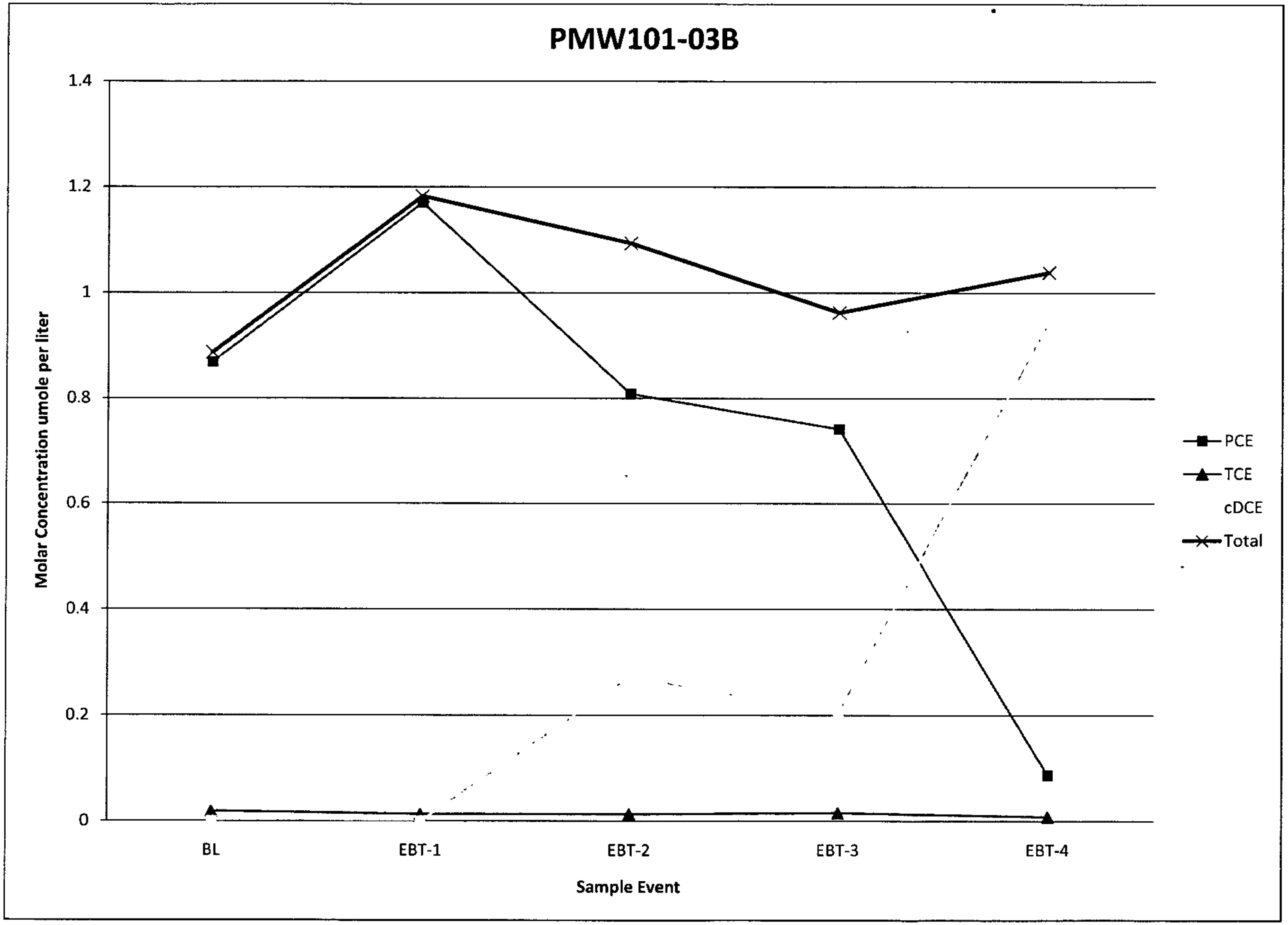

Molar Concentration umole per liter
1.2
1
0.8
0.6
0.4
0.2
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total

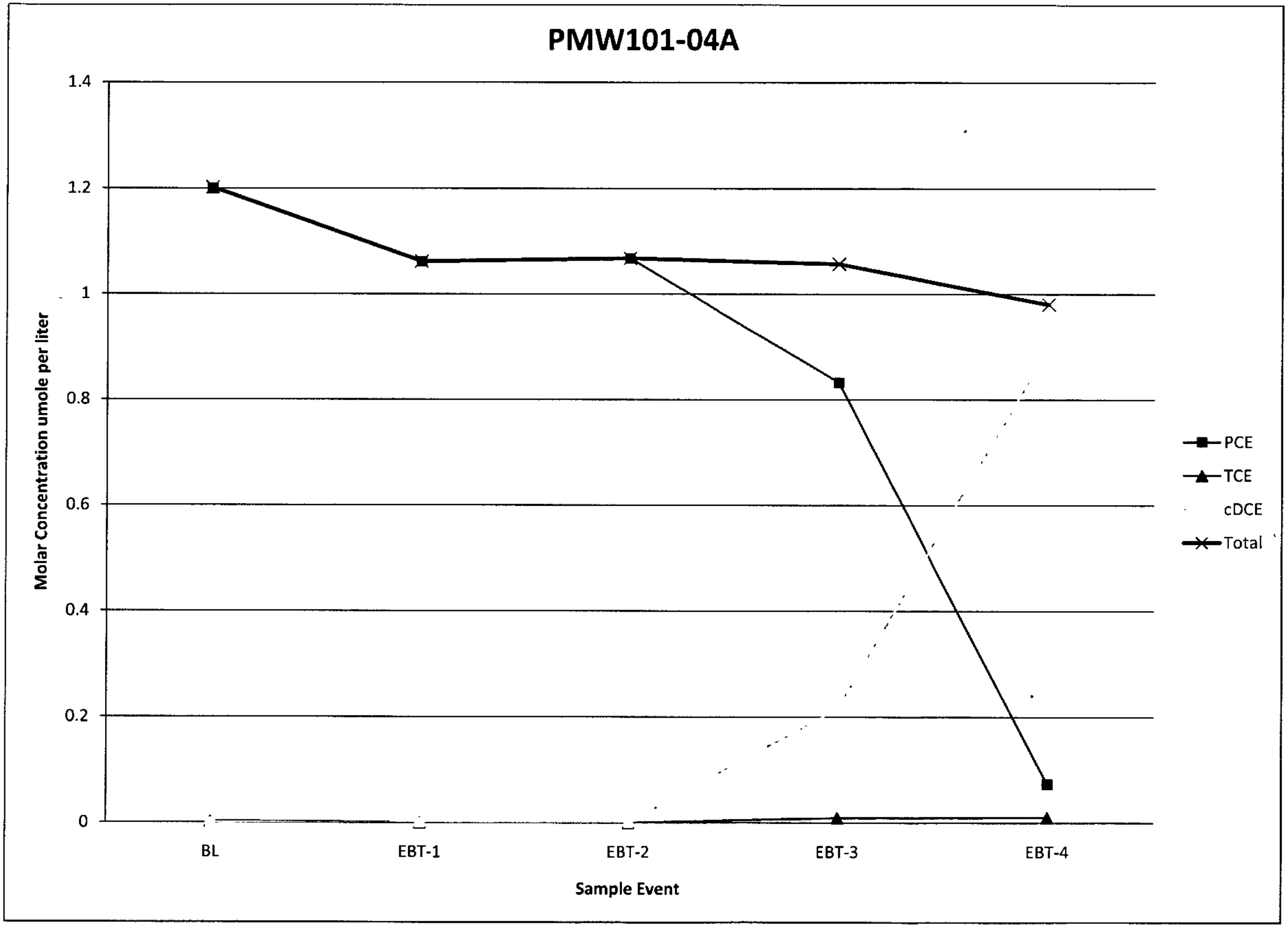


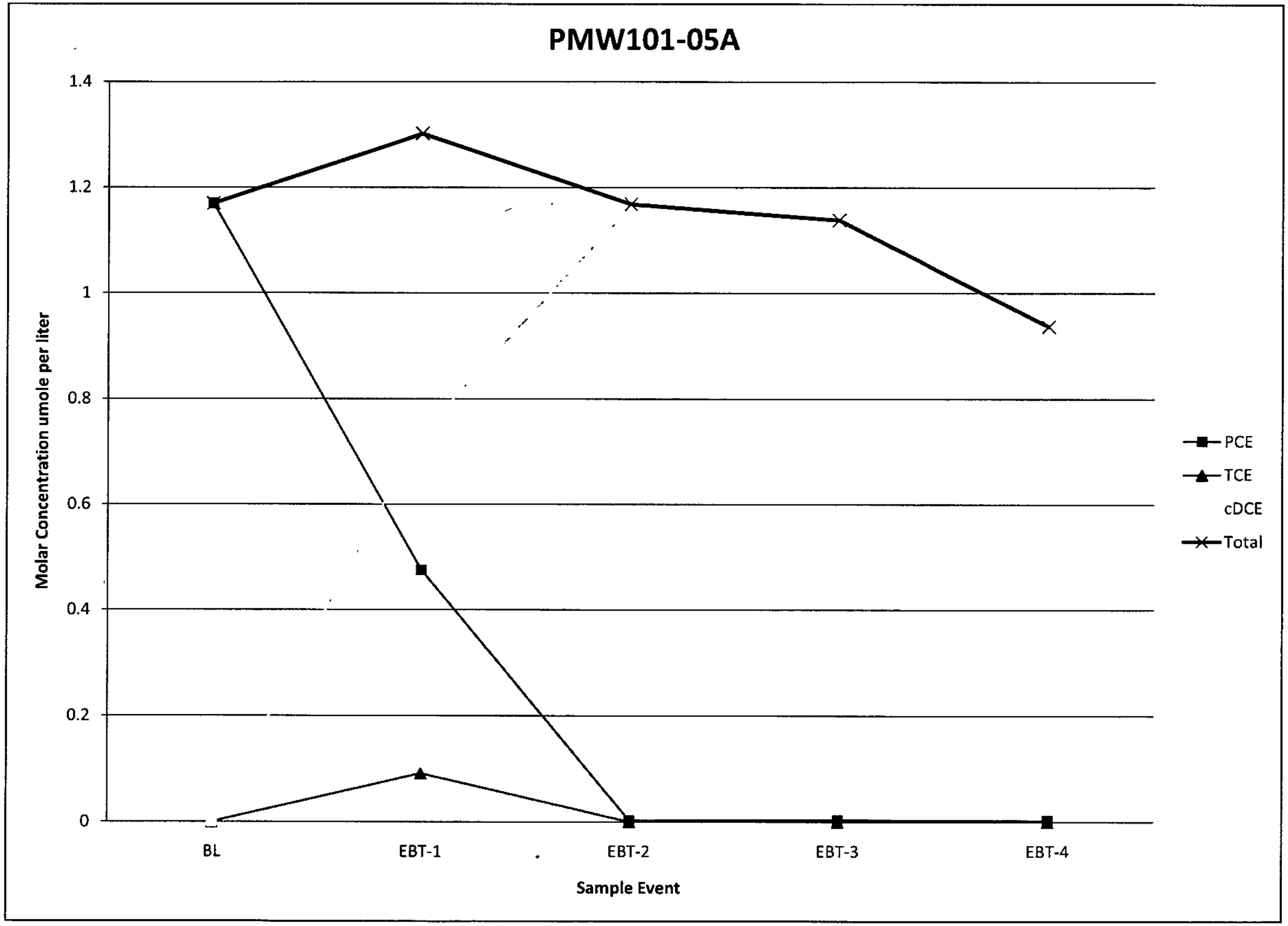
PMW101-02A

Molar Concentration umole per liter
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total

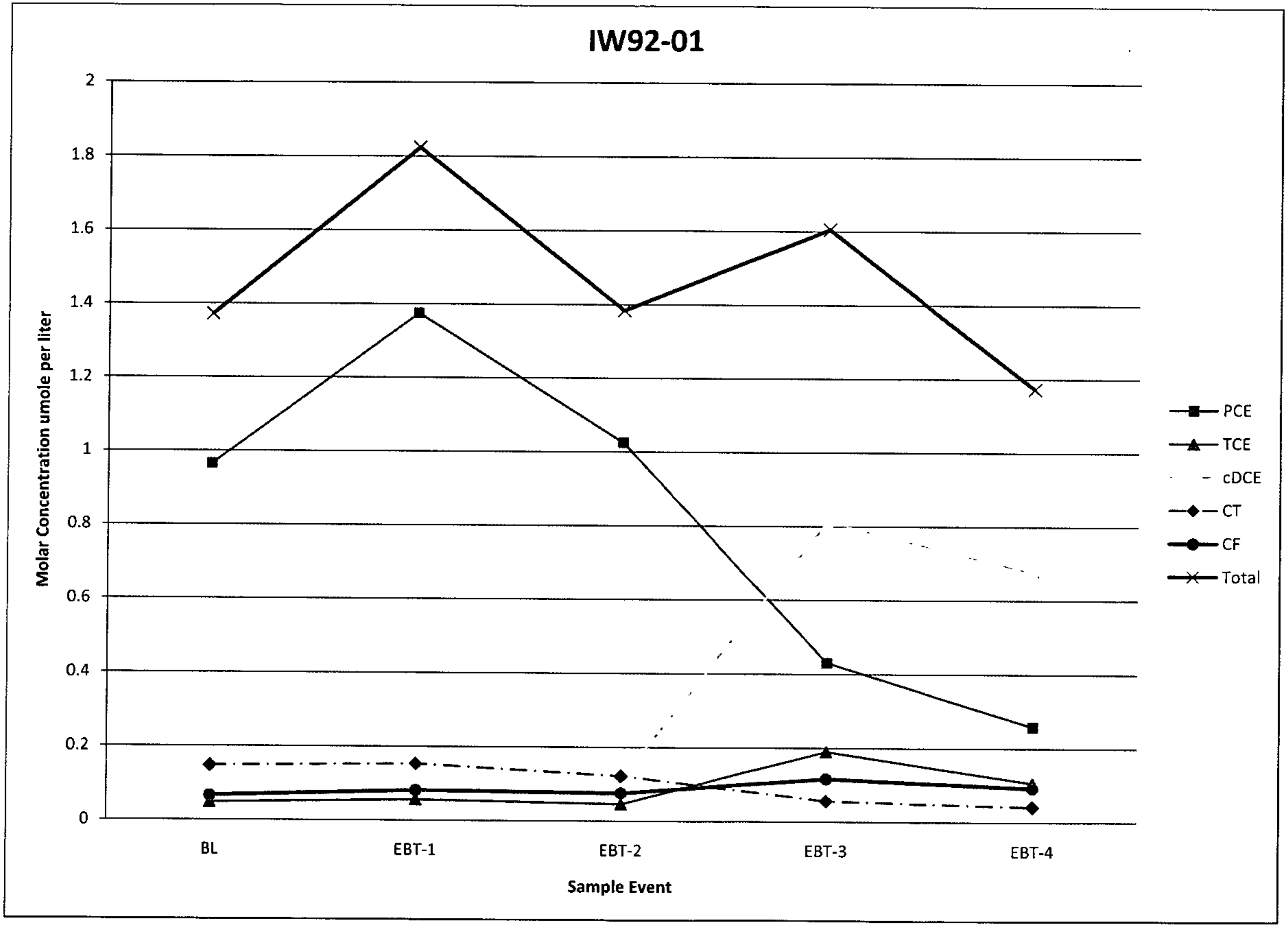

PMW101-02B
Molar Concentration umole per liter
0
0.2
0.4
0.6
0.8
1
1.2
1.4
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total


PMW101-03B
Molar Concentration umole per liter
1.4
1.2
1
0.8
0.6
0.4
0.2
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total


PMW101-04A
Molar Concentration umole per liter
1.4
1.2
1
0.8
0.6
0.4
0.2
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total

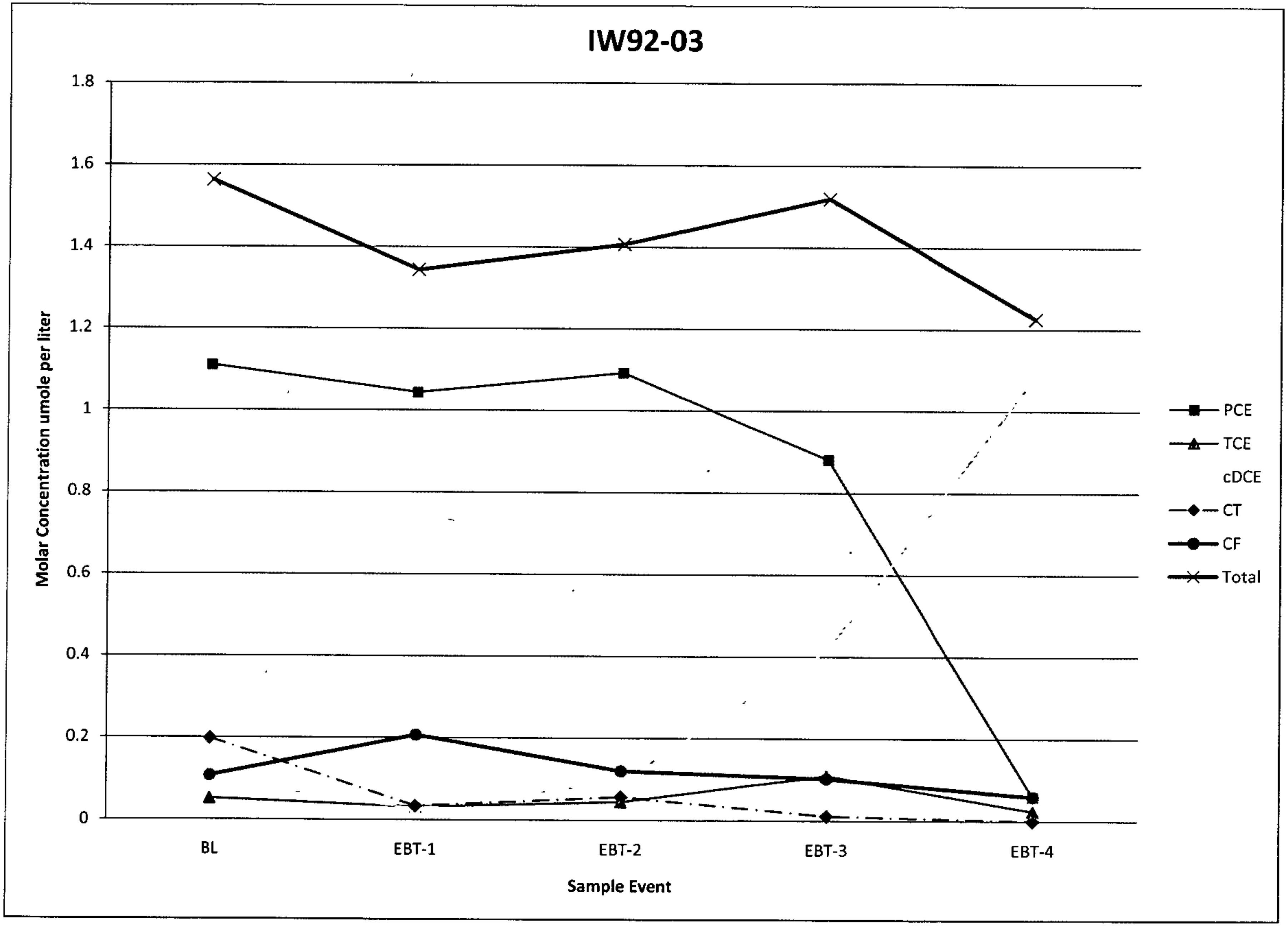

PMW101-05A

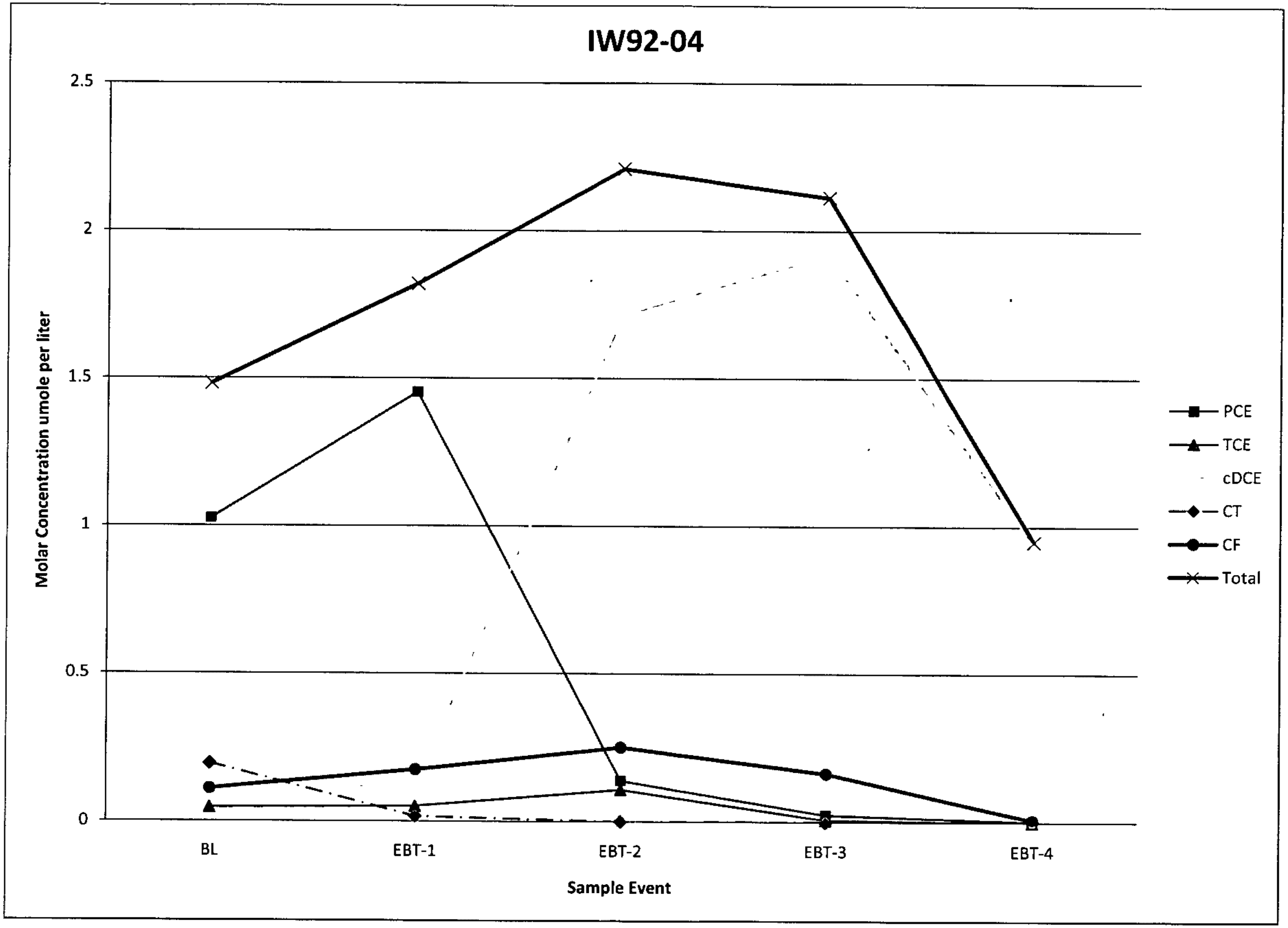
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Molar Concentration umole per liter
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
Total

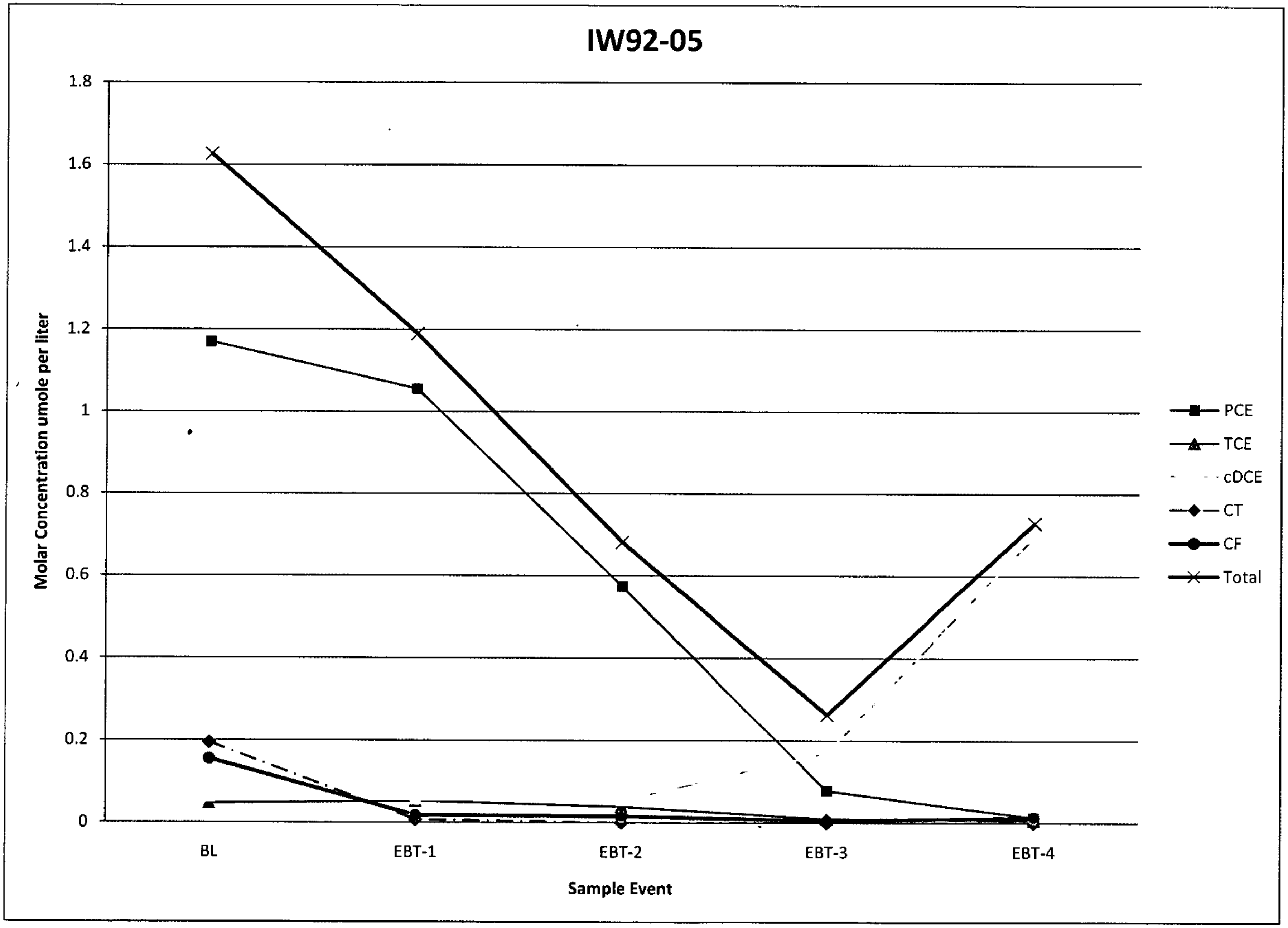


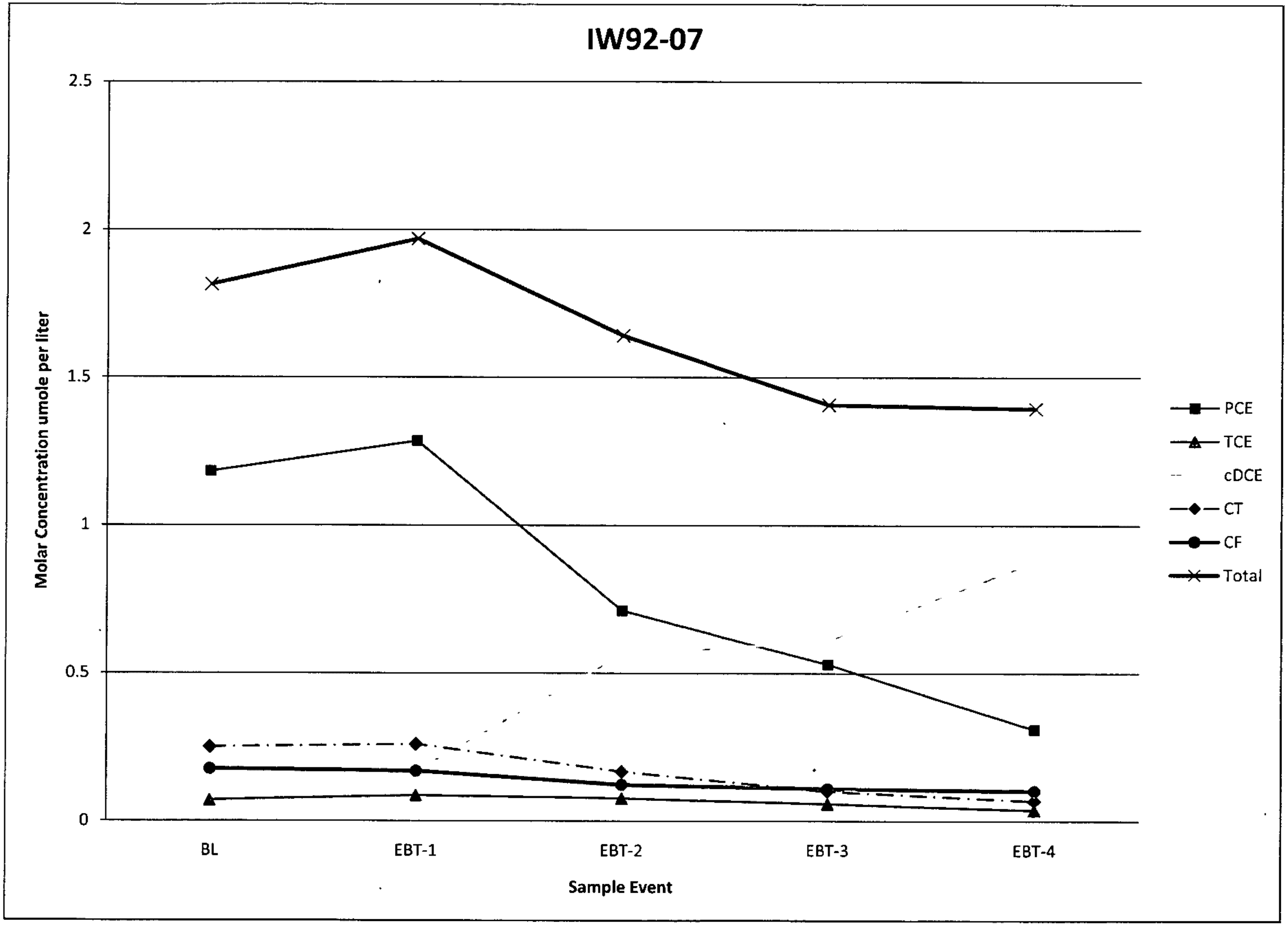
IW92-01

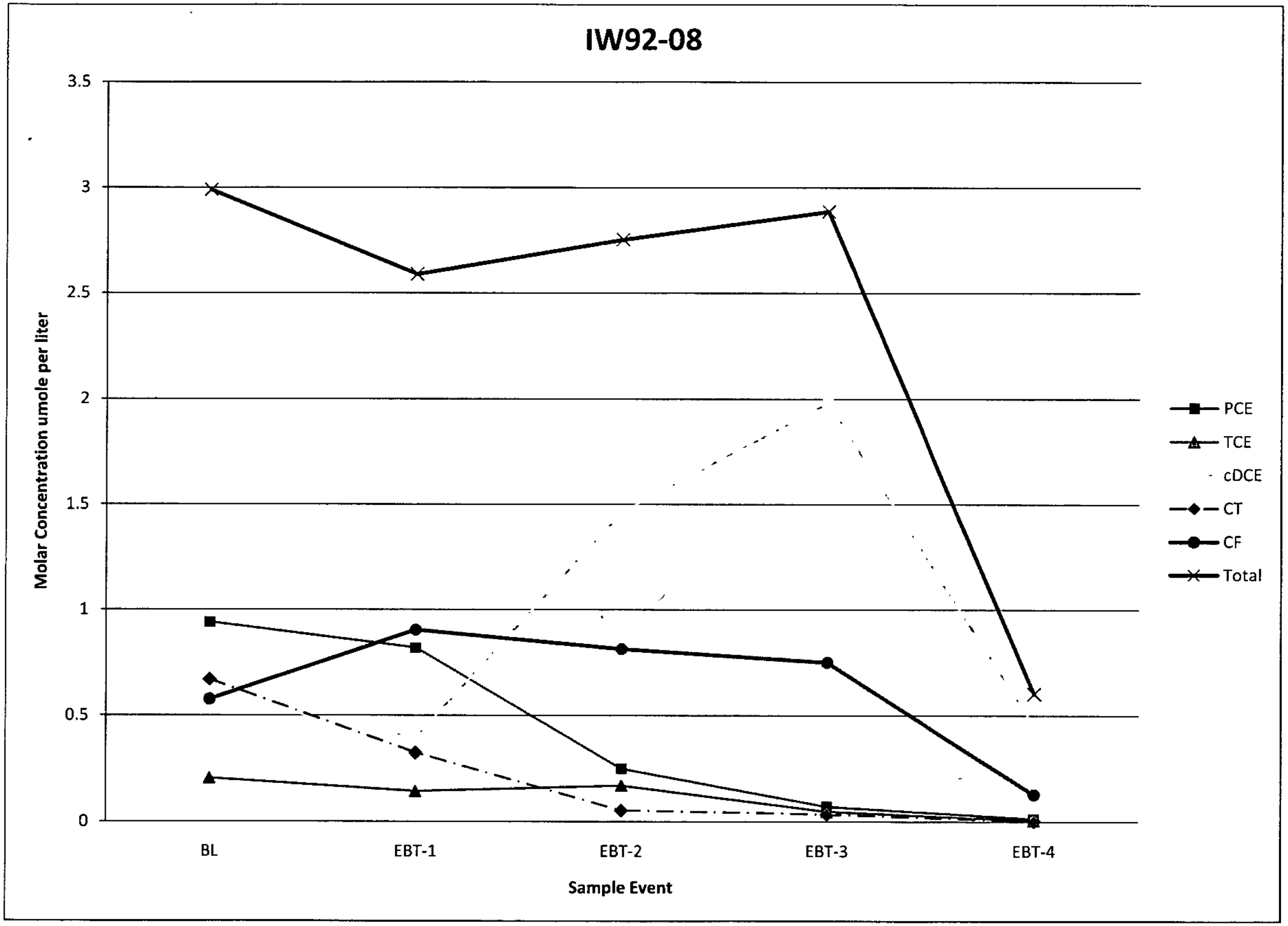
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Molar Concentration umole per liter
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
CT
CF
Total

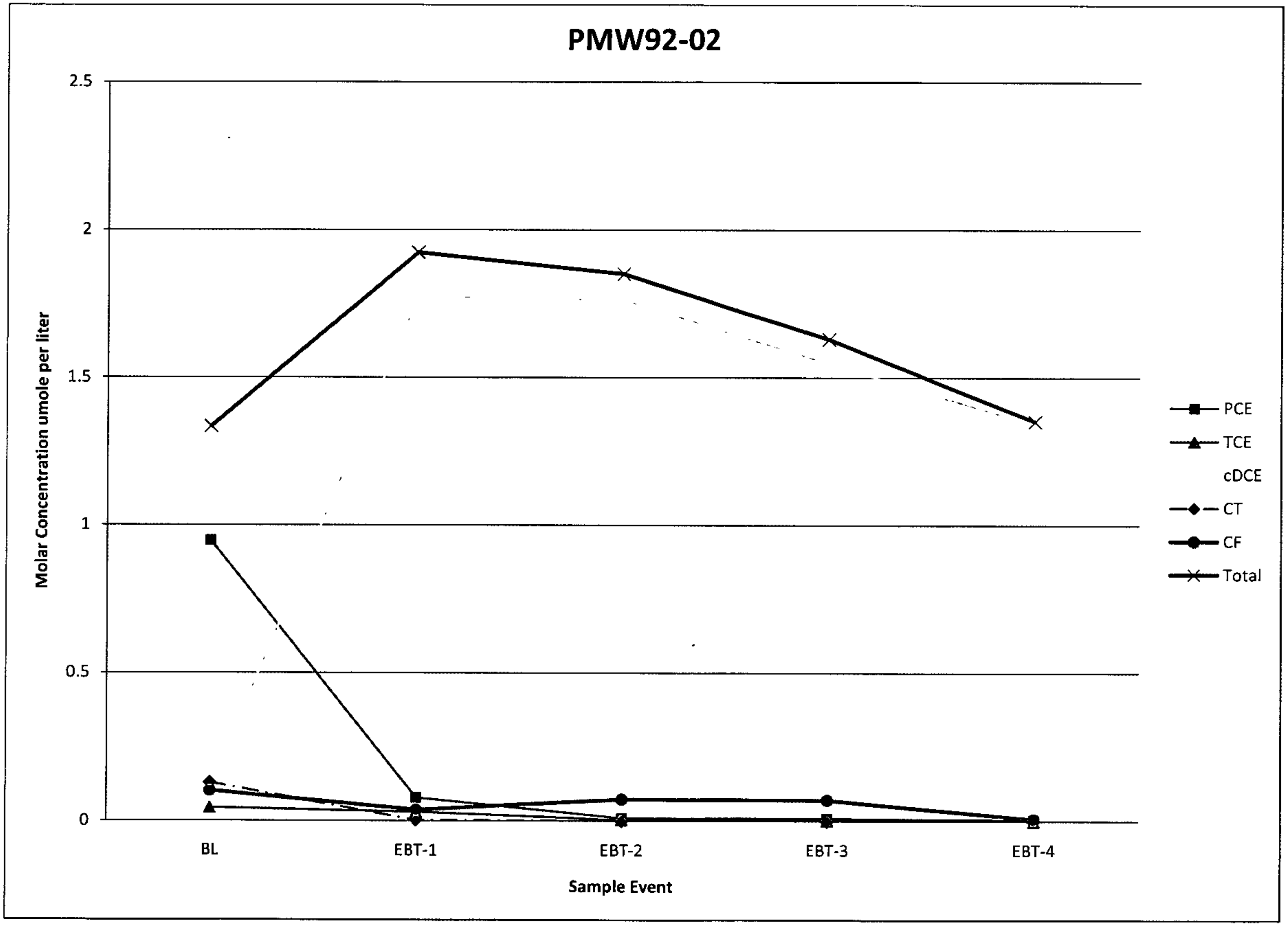

IW92-03
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Molar Concentration umole per liter
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
CT
CF
Total

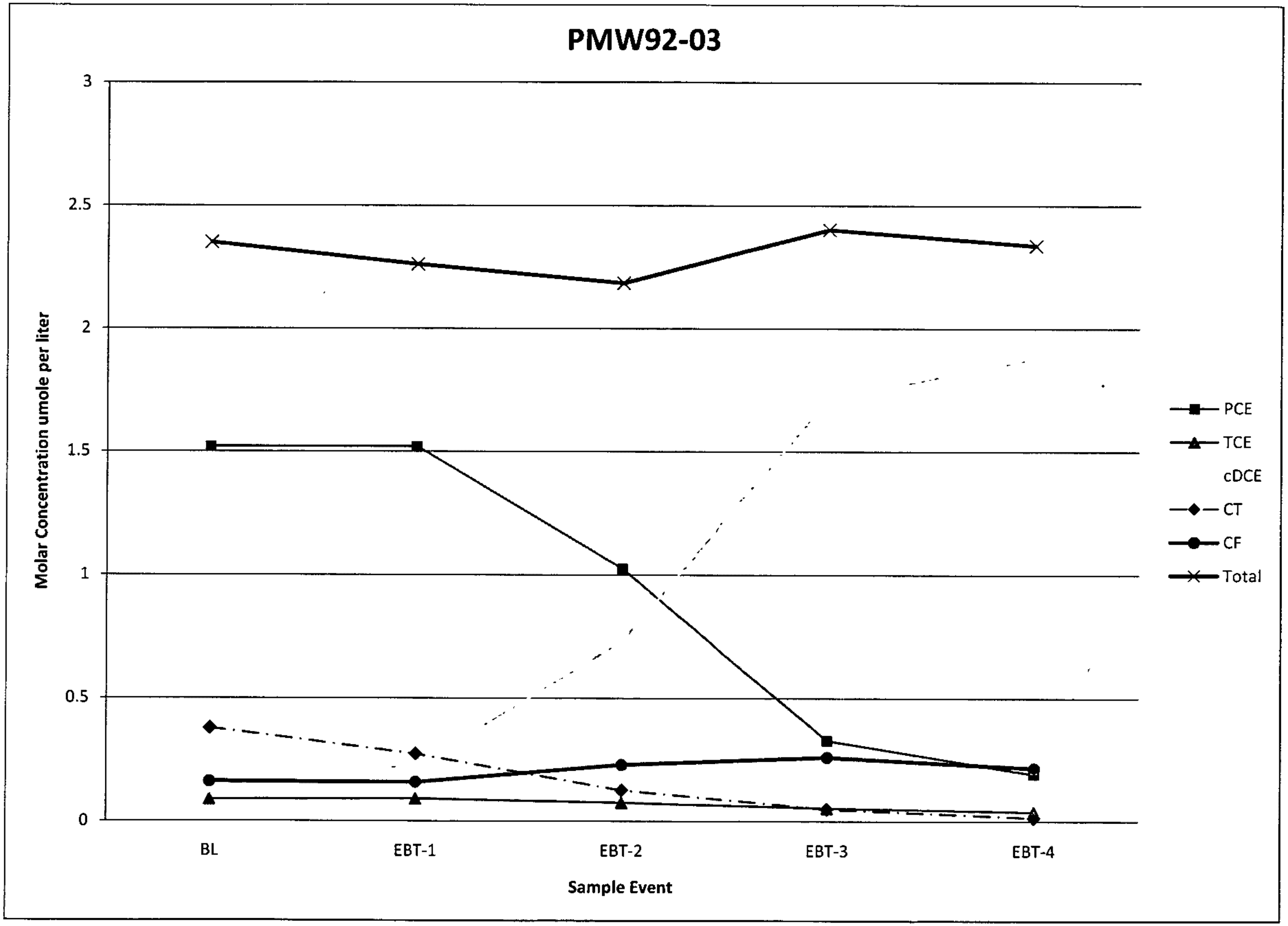

IW92-04
Molar Concentration umole per liter
2.5
2
1.5
1
0.5
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
CT
CF
Total


IW92-05
Molar Concentration umole per liter
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
CT
CF
Total

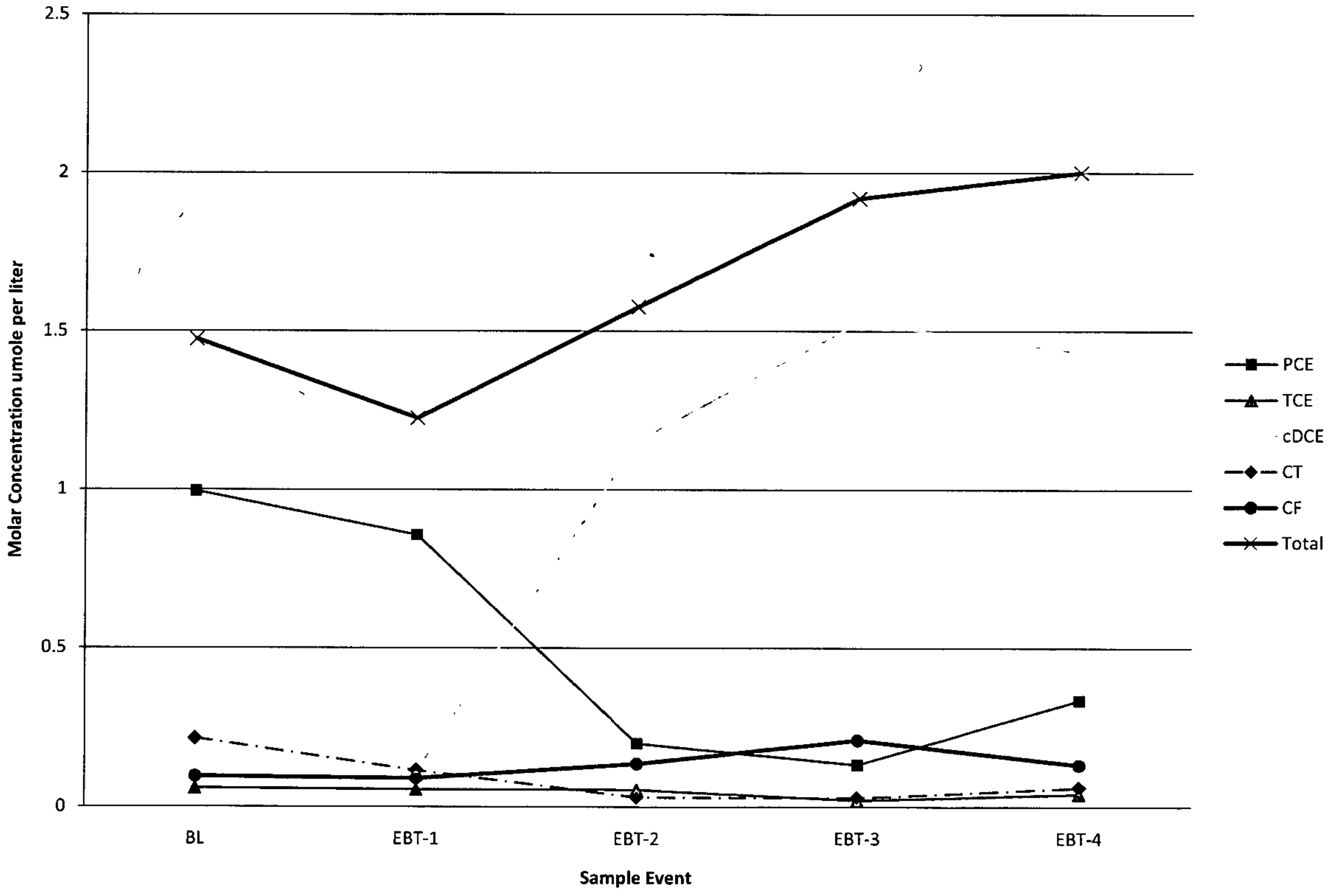

IW92-07
Molar Concentration umole per liter
2.5
2
1.5
1
0.5
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
CT
CF
Total

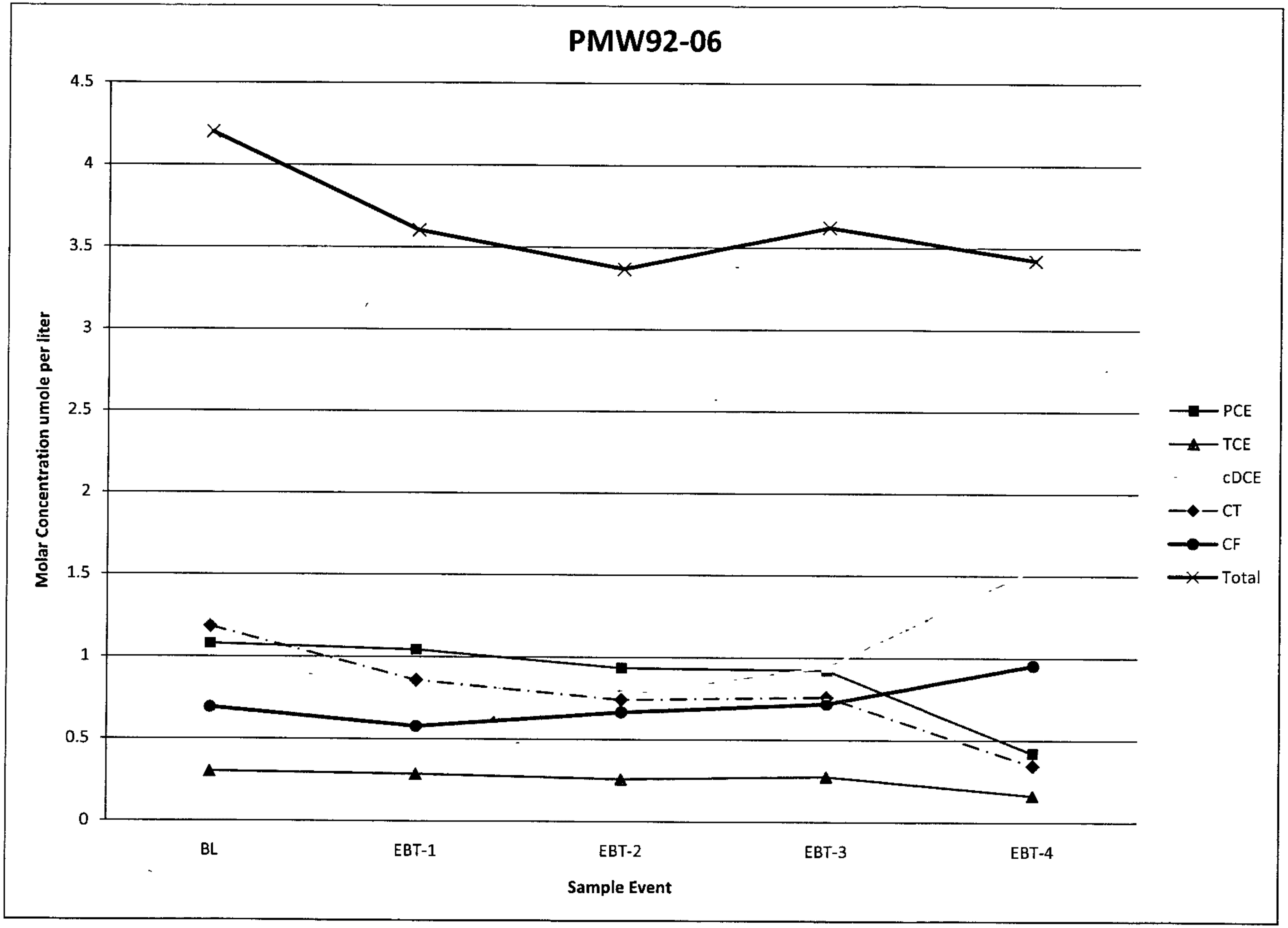

IW92-08
Molar Concentration umole per liter
3.5
3
2.5
2
1.5
1
0.5
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
CT
CF
Total


PMW92-02
Molar Concentration umole per liter
2.5
2
1.5
1
0.5
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
CT
CF
Total


PMW92-03
Molar Concentration umole per liter
3
2.5
2
1.5
1
0.5
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
CT
CF
Total

PMW92-04


Molar Concentration umole per liter
2.5
2
1.5
1
0.5
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
CT
CF
Total


PMW92-06
Molar Concentration umole per liter
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
BL
EBT-1
EBT-2
EBT-3
EBT-4
Sample Event
PCE
TCE
cDCE
CT
CF
Total

FINAL PAGE

ADMINISTRATIVE RECORD

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