

**Table 3.4-5. Internal Standard Tables**  
 Summary of QC Outliers (Page 1 of 3)

**Table 3.4-5A Internal Standards for SW8260B - VOCs**

Sample	Internal Standards	Area (Limits)	VOCs: EPA Method SW8260B Compound	Flag	A or P
HF-5/4.0  LDC Report# 4754A1	1,4-Dichlorobenzene-d4	470000 (645977- 2583908)	Bromobenzene n-Butylbenzene sec-Butylbenzene tert-Butylbenzene 2-Chlorotoluene 4-Chlorotoluene 1,2-Dibromo-3-chloropropane 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichlorobenzene Hexachlorobutadiene p-Isopropyltoluene Naphthalene n-Propylbenzene 1,1,2,2-Tetrachloroethane 1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,3-Trichloropropane 1,2,4-Trimethylbenzene 1,3,5-Trimethylbenzene	UJ (all non-detects)	A
HF-7/0.5  LDC Report# 4754A1	Chlorobenzene-d5 1,4-Dichlorobenzene-d4	708359 (741208- 2964832) 220922 (645977- 2583908)	Bromobenzene n-Butylbenzene sec-Butylbenzene tert-Butylbenzene 2-Chlorotoluene 4-Chlorotoluene 1,2-Dibromo-3-chloropropane 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichlorobenzene Hexachlorobutadiene p-Isopropyltoluene Naphthalene n-Propylbenzene 1,1,2,2-Tetrachloroethane 1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,3-Trichloropropane 1,2,4-Trimethylbenzene 1,3,5-Trimethylbenzene Bromoform Chlorobenzene Dibromochloromethane 1,2-Dibromoethane 1,3-Dichloropropane Ethylbenzene 2-Hexanone Isopropylbenzene Styrene Tetrachloroethene 1,1,1,2-Tetrachloroethene m,p-Xylenes o-Xylene	UJ (all non-detects)	A

**Table 3.4-5. Internal Standard Tables**  
 Summary of QC Outliers (Page 2 of 3)

**Table 3.4-5A Internal Standards for SW8260B - VOCs**

Sample	Internal Standards	Area (Limits)	VOCs: EPA Method SW8260B Compound	Flag	A or P
<b>MW-13/10</b>  LDC Report# 4868A1	1,4-Dichlorobenzene-d4	352765 (894495- 3577978)	Bromobenzene n-Butylbenzene sec-Butylbenzene tert-Butylbenzene 2-Chlorotoluene 4-Chlorotoluene 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene Hexachlorobutadiene Isopropylbenzene p-Isopropyltoluene Naphthalene n-Propylbenzene 1,1,1,2-Tetrachloroethane 1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,3-Trichloropropane 1,2,4-Trimethylbenzene 1,3,5-Trimethylbenzene 1,2-Dibromo-3-chloropropane	UJ (all non-detects)	A

**Note:**

**Bold highlight** indicates that associated field sample results were blank qualified for this analyte.

**Table 3.4-5. Internal Standard Tables**

Summary of QC Outliers (Page 3 of 3)

**Table 3.4-5B Internal Standards for SW8270C - SVOCs**

Sample	Internal Standards	Area (Limits)	Compound	Flag	A or P
SP1-R2 LDC Report# 4864A2	Chrysene-d12 Perylene-d12	733034 (1229889-4919554) 253462 (902173-3608690)	Benzidine Benzo(a)anthracene Bis(2-ethylhexyl)phthalate Butylbenzylphthalate Chrysene 3,3'-Dichlorobenzidine Pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(g,h,i)perylene Benzo(a)pyrene Dibenz(a,h)anthracene Di-n-octylphthalate Indeno(1,2,3-cd)pyrene	UJ (all non-detects)	A
SP2-R2 LDC Report# 4864A2	Perylene-d12	505865 (539500-2157998)	Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(g,h,i)perylene Benzo(a)pyrene Dibenz(a,h)anthracene Di-n-octylphthalate Indeno(1,2,3-cd)pyrene	J- (all detects) UJ (all non-detects)	A
SP3-R4 (SP3-R4/0.5) LDC Report# 4864B2	Perylene-d12	495453 (539500-2157998)	Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(g,h,i)perylene Benzo(a)pyrene Dibenz(a,h)anthracene Di-n-octylphthalate Indeno(1,2,3-cd)pyrene	UJ (all non-detects)	A

**Note:**

**Bold highlight** indicates that associated field sample results were blank qualified for this analyte.

These tables were reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only QC outliers were included. Notes and highlights were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation. The "A" and "P" designations are LDC DVR designations that indicate the LDC validator determined that the finding was based upon technical validation criteria (A) or that the validation finding was related to a protocol/contractual deviation (P).

**Table 3.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 1 of 15)

**Table 3.4-6A MS/MSD Issues for General Chemistry Methods E160.1 /SW9060**

Sample	GENERAL CHEMISTRY: EPA Methods 160.1/160.2/300.0/415.1/ SW9060 Analyte	Finding	Criteria	Flag	A or P
All samples in SDG G0D130323: MW-15 MW-7 MW-6 MW-13  LDC Report# 4812A6	Total organic carbon  <i>The samples listed to left were analyzed with QC sample MW-4A which was reported in SDG G0D180262.</i>	No MS associated with these samples.  <i>Incorrect Assessment: MS/MSD analyses were performed as required and reported in a different SDG.</i>	MS required.	None	P

**Note:**  
 MS/MSD analyses were performed as required. The referenced comments in the DVRs are incorrect and do not affect the technical or contractual quality of the data.

**Table 3.4-6B MS/MSD for Metals - EPA Methods SW6010B/SW7470A/SW7471A**

Spike ID (Associated Samples)	Metals: EPA Methods SW6010B/SW7470A/SW7471A Analyte	%R (Limits)	Flag	A or P
MW-6/1MS (All samples in SDG G0D060121) <b>MW-6/0.5</b> MW-6/1 MW-6/4 MW-6/10 MW-6/15 MW-6/20  LDC Report# 4778B4	<b>Antimony</b>  <b>Chromium</b>  <b>Vanadium</b>	31 (75-125)  151 (75-125)  148 (75-125)	<b>J- (all detects)</b>  <b>J+ (all detects)</b>  <b>J+ (all detects)</b>	A
MW-4AMS (All samples in SDG G0D180262)  <b>MW-4</b>  LDC Report# 4837A4	<b>Mercury</b>	67 (75-125)	<b>UJ (all non-detects)</b>	A

**Note:**  
**Bold highlight** indicates that associated sample results were qualified for this element.

**Table 3.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 2 of 15)

**Table 3.4-6C MS/MSD Issues for SW8015B - TEPH**

Sample	Pesticides: EPA Method SW8081A Compound	Finding	Criteria	Flag	A or P
All soil samples in SDG GOD010147: AR-6/1.0 AR-6/4 AR-6/10 AR-6/15 AR-9/1.0 AR-9/4.0 AR-9/10 AR-9/10.5 AR-9/15 AR-10/0.5 AR-10/4 AR-10/10 AR-10/15 AR-10/17 PE-MO (NOT USED) AR-10/0.5RE (NOT USED) PE-MORE LDC Report# 4743A8	TPH as extractables  <i>The samples listed to left were extracted and analyzed with QC sample AR-6/10MS and AR-6/10 MSD which were reported in SDG GOD010147</i>  <i>The samples listed to left were extracted and analyzed with QC sample MW-9MS and MW-9 MSD which were reported in SDG GOD110255.</i>	No MS/MSD associated with these samples.  <i>Incorrect Assessment: MS/MSD analyses were performed as required and reported in a different SDG.</i>  <i>Incorrect Assessment: MS/MSD analyses were performed as required and reported in a different SDG.</i>	MS/MSD required.	None	P
<b>Note:</b> MS/MSD analyses were performed as required. The referenced comments in the DVRs are incorrect and do not affect the technical or contractual quality of the data.					
All samples in SDG GOD130323: MW-15 MW-7 MW-6 MW-13 LDC Report# 4812A8	TPH as extractables  <i>The samples listed to left were analyzed with QC sample MW-4AMS and MW-4A MSD which were reported in SDG GOD180262</i>	No MS/MSD associated with these samples.  <i>Incorrect Assessment: MS/MSD analyses were performed as required and reported in a different SDG.</i>	MS/MSD required.	None	P
<b>Note:</b> MS/MSD analyses were performed as required. The referenced comments in the DVRs are incorrect and do not affect the technical or contractual quality of the data.					
All samples in SDG GOD250199:  MW-3B LDC Report# 4827F8	TPH as extractables  <i>The sample listed to left was analyzed with QC sample AR-11/10MS and AR-11/10 MSD which were reported in SDG GOD140298</i>	No MS/MSD associated with these samples.  <i>Incorrect Assessment: MS/MSD analyses were performed as required and reported in a different SDG</i>	MS/MSD required.	None	P
<b>Note:</b> MS/MSD analyses were performed as required. The referenced comments in the DVRs are incorrect and do not affect the technical or contractual quality of the data.					

**Table 3.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 3 of 15)

**Table 3.4-6C MS/MSD Issues for SW8015B - TEPH**

Sample	Pesticides: EPA Method SW8081A Compound	Finding	Criteria	Flag	A or P
All water samples in SDG G0D010147: HF-9/K and LDC Report# 4743A8 All samples in SDG G0D080146: SV-S1 LDC Report# 4761A8 and All water samples in SDG G0C310244: MW-15/K TNT-2F/K WV-S2 WV-S2RE AR-12/K NV-S2/A NV-S1 NV-S2 LDC Report# 4769A8 and All samples in SDG G0D200312 : MW-5 LDC Report# 4827C8	TPH as extractables	No MS/MSD associated with these samples.	MS/MSD required.	None	P
<p><b>Note:</b> Samples ending in "/K" were equipment blanks. MS/MSD analyses are not required for equipment blanks. Sample WV-S2 was a PE sample, which was used to determine accuracy (all results met project accuracy criteria), was not of the environmental matrix and does not require an MS/MSD. MS/MSD analyses were performed at an overall frequency of 1:10 field water samples, exceeding the requirement of one MS/MSD per 20 samples per matrix. Additional MS/MSD analyses were not performed due to limited sample volume. The effect of no MS/MSD for the five field water samples on the quality of the data is not expected to be significant.</p>					

**Table 3.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 4 of 15)

**Table 3.4-6D MS/MSD for SW8015B - TEPH**

Spike ID (Associated Samples)	TEPH: EPA Method SW8015B Compound	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
MW8/OMS/MSD (MW8/0)  LDC Report# 4678A8	TPH as extractables	-	-	45 ( $\leq 40$ )	UJ (all non-detects)	A
MW7/OMS/MSD (MW7/0)  LDC Report# 4678B8	TPH as extractables	-	60 (65-135)	-	J- (all detects)	A

**Note:**  
**Bold highlight** indicates that associated sample results were qualified for this analyte.

**Table 3.4-6E MS/MSD Issues for SW8081A - Pesticides**

Sample	Pesticides: EPA Method SW8081A Compound	Finding	Criteria	Flag	A or P
All samples in SDG G0C310244: WV-S1 NV-S2/A NV-S1 NV-S2 LDC Report# 4769A3 and All samples in SDG G0D250199: MW-3B LDC Report# 4827F3a and All samples in SDG G0D200312: MW-4 LDC Report# 4827C3a	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P
<p><b>Note:</b> Sample WV-S1 was a PE sample, which was used to determine accuracy (all results met project accuracy criteria), was not of the environmental matrix and does not require an MS/MSD. MS/MSD analyses were performed at an overall frequency of 1:10 field water samples, exceeding the requirement of one MS/MSD per 20 samples per matrix. Additional MS/MSD analyses were not performed due to limited sample volume. The effect of no MS/MSD for these five samples on the quality of the data is not expected to be significant.</p>					

**Table 3.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 5 of 15)

**Table 3.4-6E MS/MSD Issues for SW8081A - Pesticides**

Sample	Pesticides: EPA Method SW8081A Compound	Finding	Criteria	Flag	A or P
All samples in SDG G0D130323: MW-7 MW-6 MW-13 MW-15  LDC Report# 4812A3a	All TCL compounds  <i>The samples listed to left were extracted and analyzed with QC sample MW-9MS and MW-9MSD which were reported in SDG G0D110255.</i>	No MS/MSD associated with these samples.  <i>Incorrect Assessment: MS/MSD analyses were performed as required and reported in a different SDG.</i>	MS/MSD required.	None	P
<b>Note:</b> MS/MSD analyses were performed as required. The referenced comments in the DVRs are incorrect and do not affect the technical or contractual quality of the data.					

**Table 3.4-6F MS/MSD for SW8081A - Pesticides**

Spike ID (Associated Samples)	Pesticides: EPA Method SW8081A Compound	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
HF-8/0.5MS/MSD (HF-8/0.5)  LDC Report# 4778B3	Endrin	-	141 (30-140)	-	<i>NA (J+ all detects) No samples qualified, all ND</i>	A

**Note:** No data were qualified.

**Table 3.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 6 of 15)

**Table 3.4-6G MS/MSD Issues for SW8082 - PCBs**

Sample	PCBs: EPA Method SW8082 Analyte	Finding	Criteria	Flag	A or P
All samples in SDG G0D130323: MW-7  LDC Report# 4812A3b	All TCL compounds  <i>MS/MSD was performed on the sample listed to left. See Table 3.4-6H.</i>	No MS/MSD associated with these samples.  <i>Incorrect Assessment: MS/MSD analyses were performed on the specified sample. See Table 3.4-6H.</i>	MS/MSD required.	None	P
<b>Note:</b> MS/MSD analyses were performed as required. The referenced comments in the DVRs are incorrect and do not affect the technical or contractual quality of the data.					
All samples in SDG G0D200159: MW-3 LDC Report# 4827B3b and All samples in SDG G0D200312: MW-4 LDC Report# 4827C3b and All samples in SDG #G0D180262: MW-4A LDC Report # 4837A3b	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P
<b>Note:</b> MS/MSD analyses were performed at an overall frequency of 1:4 water samples, exceeding the requirement of one MS/MSD per 20 samples per matrix. Additional MS/MSD analyses were not performed due to limited sample volume. The effect of no MS/MSD for these samples on the quality of the data is not expected to be significant.					

**Table 3.4-6H MS/MSDs for SW8082 - PCBs**

Spike ID (Associated Samples)	PCBs: EPA Method SW8082 Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
MW7/0MS/MSD (MW7/0)  LDC Report# 4678B3b	Aroclor-1260	-	163 (40-140)	-	NA (J+ all detects) <i>(No samples qualified, all ND)</i>	A

**Note:** No data were qualified.

**Table 3.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 7 of 15)

**Table 3.4-6I MS/MSD Issues for SW8260B - VOCs**

Sample	VOCs: EPA Method SW8260B Compound	Finding	Criteria	Flag	A or P
All soil samples in SDG G0B250230: MW1/17.5 MW1/21 MW1/24 MW8/0.5 MW8/4 MW8/10 MW8/15 LDC Report# 4678A1 and	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P
All soil samples in SDG G0B260131: MW9/4 MW9/10 MW9/15 LDC Report# 4678B1 and	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P
All soil samples in SDG G0C300256: MW-13/4 MW-13/4.5 MW-13/10 MW-13/15 LDC Report# 4868A1	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P
All water samples in SDG G0C300256: SV-S1 NV-S1 NV-S2 MW-13/K TB032900B TB032900 LDC Report# 4868A1 and	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P
All water samples in SDG G0D130323: MW-15 TB4-12-00 MW-7 TB4-13-00 MW-6 MW-13 TB4-12-00 LDC Report# 4812A1 and	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P

**Table 3.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 8 of 15)

**Table 3.4-6I MS/MSD Issues for SW8260B - VOCs**

Sample	VOCs: EPA Method SW8260B Compound	Finding	Criteria	Flag	A or P
All water samples in SDG G0D220129: MW-10 MW-10/K MW-12/K TB04-20-00 LDC Report# 4864A1 and	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P
All water samples in SDG G0D250199: MW-3B TB-04-24-00 DC Report# 4827F1	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P
<p><b>Note:</b> Samples ending in "K" are equipment blanks. MS/MSD analyses are not required for equipment blanks. MS/MSD analyses were performed at an overall frequency of 1:15 soil samples and 1:11 water samples, exceeding the requirement of one MS/MSD per 20 field samples per matrix. Additional MS/MSD analyses were not performed due to limited sample volumes. The effect of no MS/MSD for these samples on the quality of the data is not expected to be significant.</p>					

**Table 3.4-6J MS/MSD for SW8260B - VOCs**

Spike ID (Associated Samples)	VOCs: EPA Method SW8260B Compound	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
MW2/20MS/MSD (MW2/20)  LDC Report# 4678C1	Acetone	-	58 (65-135)	-	J- (all detects)	A
MW-3A/15MS/MSD (MW-3A/15)  LDC Report# 4733D1	2-Butanone  Bromoform Carbon disulfide 1,1,2-Trichloro-1,2,2-trifluoroethane Vinyl acetate	- - 164 (65-135) 150 (65-135) 147 (65-135)	151 (65-135)  136 (65-135) 165 (65-135) 151 (65-135) 152 (65-135)	-  - - -	J+ (all detects)  NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <i>No samples qualified, all ND</i>	A
AR-6/10MS/MSD (AR-6/10)  LDC Report# 4743A1	Carbon disulfide Carbon tetrachloride Trichlorofluoromethane 1,1,2-Trichloro-1,2,2-trifluoroethane Vinyl acetate	174 (65-135) 138 (65-135) 145 (65-135) 167 (65-135) 159 (65-135)	174 (65-135) - 140 (65-135) 159 (65-135) 152 (65-135)	- - - - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <i>No samples qualified, all ND</i>	A
HF-5/15.0MS/MSD (HF-5/15.0)  LDC Report# 4754A1	Carbon disulfide 1,1,2-Trichloro-1,2,2-trifluoroethane	159 (65-135) 142 (65-135)	157 (65-135) 144 (65-135)	- -	NA (J+ all detects) NA (J+ all detects) <i>No samples qualified, all ND</i>	A

**Table 3.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**

Summary of QC Outliers (Page 9 of 15)

**Table 3.4-6J MS/MSD for SW8260B - VOCs**

Spike ID (Associated Samples)	VOCs: EPA Method SW8260B Compound	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
HF-8/0.5MS/MSD (HF-8/0.5)	2-Butanone	-	180 (65-135)	49 (≤35)	UJ (all non-detects)	A
	Naphthalene	32 (65-135)	31 (65-135)	-	J- (all detects)	
	1,2,3-Trichlorobenzene	51 (65-135)	49 (65-135)	-	UJ (all non-detects)	
	1,2,4-Trichlorobenzene	60 (65-135)	55 (65-135)	-		
HF-8/0.5MS/MSD (HF-8/0.5) LDC Report# 4778B1	Carbon disulfide	165 (65-135)	160 (65-135)	-	NA (J+ all detects)	A
	1,1,2-Trichloro-1,2,2-trifluoroethane	151 (65-135)	142 (65-135)	-	NA (J+ all detects) No samples qualified, all ND	
AR-11/10MS/MSD (AR-11/10)	2-Butanone	185 (65-135)	-	44 (≤40)	UJ (all non-detects)	
	Naphthalene	-	43 (65-135)	69 (≤40)		
	1,2,3-Trichlorobenzene	-	59 (65-135)	44 (≤40)		
AR-11/10MS/MSD (AR-11/10) LDC Report# 4855A1	Bromoform	143 (65-135)	-	-	NA (J+ all detects)	
	Carbon disulfide	190 (65-135)	180 (65-135)	-	NA (J+ all detects)	
	Carbon tetrachloride	142 (65-135)	-	-	NA (J+ all detects)	
	Chloromethane	146 (65-135)	-	-	NA (J+ all detects)	
	Dichlorodifluoromethane	219 (65-135)	201 (65-135)	-	NA (J+ all detects)	
	Trichlorofluoromethane	154 (65-135)	145 (65-135)	-	NA (J+ all detects)	
	1,1,2-Trichloro-1,2,2-trifluoroethane	173 (65-135)	166 (65-135)	-	NA (J+ all detects)	
	Vinyl acetate	160 (65-135)	147 (65-135)	-	NA (J+ all detects) No samples qualified, all ND	

Note:

Bold highlight indicates that associated sample results were qualified for this analyte.

**Table 3.4-6K MS/MSD for SW8270C - SVOCs**

Spike ID (Associated Samples)	SVOCs: EPA Method SW8270C Compound	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
SP3-R1MS/MSD (SP3-R1) (SP3-R1/0.5) LDC Report# 4864B2	Benzoic acid	9.2 (50-150)	8.0 (50-150)	-	R (all non-detects)	A
	3,3'-Dichlorobenzidine	40 (50-150)	38 (50-150)	-	UJ (all non-detects)	
	2,4-Dimethylphenol	39 (50-150)	37 (50-150)	-	UJ (all non-detects)	
	Carbazole	194 (50-150)	187 (50-150)	-	NA (J+ all detects) No samples qualified, all ND	

Note:

Bold highlight indicates that associated sample results were qualified for this analyte.

**Table 3.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 10 of 15)

**Table 3.4-6L MS/MSD for SW8270CWM - Chloropicrin**

Spike ID (Associated Samples)	Chloropicrin: EPA Method SW8270CWM Compound	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
MW-4RMS/MSD (MW-4R)  LDC Report# 4827G2	Chloropicrin	27 (40-140)	17 (40-140)	44 ( $\leq 40$ )	UJ (all non- detects)	A

**Note:**  
**Bold highlight** indicates that associated sample results were qualified for this analyte.

**Table 3.4-6M MS/MSD for SW8290 - Dioxins/Furans**

Spike ID (Associated Samples)	Dioxins/Furans: EPA Method SW82910 Compound	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
MW1/17.5MS/MSD (MW1/17.5)  LDC Report# 4678A21	OCDF	173 (50-150)	189 (50-150)	-	NA (J+ all detects) <b>No samples qualified, all ND</b>	A

**Note:** No data were qualified.

**Table 3.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 11 of 15)

**Table 3.4-6N MS/MSD Issues for SW8310 - PAHs**

Sample	PAHs: EPA Method SW8310 Compound	Finding	Criteria	Flag	A or P
All samples in SDG G0D130323: MW-15 MW-7 MW-6 MW-13 MW-15RE (NOT USED) MW-7RE (NOT USED) MW-6RE (NOT USED) MW-13RE (NOT USED) LDC Report# 4812A9 and All samples in SDG G0D120283: MW-1 MW-2 MW-14 MW-1A MW-1RE (NOT USED) MW-2RE (NOT USED) MW-14RE (NOT USED) MW-1ARE (NOT USED) LDC Report# 4827A9 and All samples in SDG G0D110255: MW-8 MW-9 MW-8RE (NOT USED) MW-9RE (NOT USED) LDC Report# 4864A9	All TCL compounds  <i>The samples listed to left were extracted and analyzed with QC sample MW-9MS and MW-9 MSD. Due to a spiking error, no MS/MSD results were usable for this sample.</i>  All TCL compounds  All TCL compounds	No MS/MSD associated with these samples.  <i>MS/MSD analyses were performed and reported in a different SDG, however, the results were not usable.</i>  No MS/MSD associated with these samples.  The MS/MSD associated with these samples was not spiked.	MS/MSD required.  MS/MSD required.  The MS/MSD must be spiked with target compounds.	None  None  None	P  P  P
<p><b>Note:</b> MS/MSD analyses were performed on QC sample MW-9 for the batch including the specified 10 samples. Due to a spiking error, the sample was not spiked with target compounds. The MS/MSD analyses could not be performed with the re-extraction/reanalysis of the affected samples as there was inadequate sample volume due to low productivity of the wells. LCS/LCSD analyses were performed for the re-extracted batch instead.</p>					
All water samples in SDG G0D080146: SV-S1 LDC Report# 4761A9 and All water samples in SDG G0D070177: WAT-3 WAT-4 LDC Report# 4754A9	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P

**Table 3.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 12 of 15)

**Table 3.4-6N MS/MSD Issues for SW8310 - PAHs**

Sample	PAHs: EPA Method SW8310 Compound	Finding	Criteria	Flag	A or P
All water samples in SDG G0C310244: WV-S2A NV-S2/A LDC Report# 4769A9 and All samples in SDG G0C300256: NV-S1 NV-S2 LDC Report# 4868A9	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P
All water samples in SDG G0D250199: MW-3B LDC Report# 4827F9	All TCL compounds	No MS/MSD associated with these samples.		None	P
All water samples in SDG G0D220129: MW-10 MW-10/K MW-12/K SP2-R1A/K LDC Report# 4864A9 and All samples in SDG G0D200312: MW-11 LDC Report# 4827C9	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P
<p><b>Note:</b> Samples ending in "/K" were equipment blanks and samples WAT-3 and WAT-4 were source water balnks. MS/MSD analyses are not required for field blanks. MS/MSD analyses were performed at an overall frequency that exceeded the requirement of one MS/MSD per 20 field samples for this matrix. Additional MS/MSD analyses were not performed due to limited sample volumes. The effect of no MS/MSD for these samples on the quality of the data is not expected to be significant.</p>					

**Table 3.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 13 of 15)

**Table 3.4-6O MS/MSD for SW8315M - Hydrazines**

Spike ID (Associated Samples)	Hydrazines: EPA Method SW8315M Compound	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
NV-S2MS/MSD (NV-S2)  LDC Report# 4678D76	UDMH	-	63.2 (65-125)	-	UJ (all non- detects)	A
MW-6MS (MW-6)  LDC Report# 4720B76	MMH  Hydrazine  UDMH	7.0 (65-125)  1.2 (65-125)  10.3 (65-125)	-  -  -	-  -  -	UJ (all non- detects)	A
MW-9MS/MSD (MW-9)  LDC Report# 4720C76	Hydrazine	28.9 (65-125)	22.1 (65-125)	26.5 ( $\leq 25$ )	UJ (all non- detects)	A
MW-12MS (MW-12)  LDC Report# 4733C76	UDMH  Hydrazine	41.5 (65-125)  63.3 (65-125)	-  -	-  -	UJ (all non- detects)	A
MW-11MS (MW-11)  LDC Report# 4733C76	UDMH  Hydrazine	61.7 (65-125)  33.3 (65-125)	-  -	-  -	UJ (all non- detects)	A

**Note:**  
**Bold highlight** indicates that associated sample results were qualified for this analyte.

**Table 3.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 14 of 15)

**Table 3.4-6P MS/MSD Issues for SW8330 - Explosives**

Sample	Explosives: EPA Method SW8330 Compound	Finding	Criteria	Flag	A or P
All samples in SDG G0D130323: MW-15 MW-7 MW-6 MW-13  LDC Report# 4812A40	All TCL compounds  <i>The samples listed to left were analyzed with QC sample MW- 4AMS and MW-4A MSD which were reported in SDG G0D180262</i>	No MS/MSD associated with these samples.  <i>Incorrect Assessment. MS/MSD analyses were performed as required and reported in a different SDG.</i>	MS/MSD required.	None	P
<b>Note:</b> MS/MSD analyses were performed as required. The referenced comments in the DVRs are incorrect and do not affect the technical or contractual quality of the data.					
All water samples in SDG G0C310244: TNT-2F/K WV-S3 WV-S3A NV-S2/A MW-15/K LDC Report# 4769A40 and All water samples in SDG G0D120283 : MW-1 MW-2 MW-14 MW-1A LDC Report# 4827A40 and All water samples in SDG G0D200312: MW-5 MW-11 MW-12 LDC Report# 4827C40 and All water samples in SDG G0D250199: MW-3B LDCB Report# 4827F40 and All water samples in SDG G0D200159: MW-3 NV-S3 LDC Report# 4827B40	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P
<b>Note:</b> Samples ending in "/K" were equipment blanks. MS/MSD analyses are not required for field blanks. MS/MSD analyses were performed at an overall frequency of 1:6 samples for field water samples, exceeding the requirement of one MS/MSD per 20 samples per matrix. Additional MS/MSD analyses were not performed due to limited sample volume. The effect of no MS/MSD for these samples on the quality of the data is not expected to be significant.					

**Table 3.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 15 of 15)

**Table 3.4-6Q MS/MSD for SW8330 - Explosives**

Spike ID (Associated Samples)	Explosives: EPA Method SW8330 Compound	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
HF-5/10.0MS/MSD (HF-5/10.0)  LDC Report# 4754A40	<b>2,4,6-Trinitrotoluene</b>	180 (65-135)	-	56 ( $\leq 35$ )	UJ (all non-detects)	A
TNT-2F/8MS/MSD (TNT-2F/8)  LDC Report# 4769A40	HMX	-	137 (65-135)	-	NA (J+ all detects) <i>No samples qualified, all ND</i>	A
MW-4AMS/MSD (MW-4A)	<b>2,4-Dinitrotoluene</b>  <b>3-Nitrotoluene</b>	-  -	-  -	21 ( $\leq 20$ )  23 ( $\leq 20$ )	UJ (all non-detects)  UJ (all non-detects)	A
MW-13/4MS/MSD (MW-13/4)  LDC Report# 4868A40	<b>2-Amino-4,6-dinitrotoluene</b>  <b>4-Amino-2,6-dinitrotoluene</b>	0 (65-135)  0 (65-135)	0 (65-135)  0 (65-135)	-  -	R (all non-detects)  R (all non-detects)	A
TNT-2F/1MS/MSD (TNT-2F/1)  LDC Report# 4868A40	<b>1,3-Dinitrobenzene</b>  HMX  Nitrobenzene  <b>2-Nitrotoluene</b>	0 (65-135)  0 (65-135)  25 (65-135)  -	0 (65-135)  0 (65-135)  36 (65-135)  450 (65-135)	-  -  -  200 ( $\leq 35$ )	J- (all detects)  J- (all detects)  UJ (all non-detects)  UJ (all non-detects)	A

**Note:** Bold highlight indicates that associated sample results were qualified for this analyte.

These tables were reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only QC outliers were included. Notes and highlights were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation. The "A" and "P" designations are LDC DVR designations that indicate the LDC validator determined that the finding was based upon technical validation criteria (A) or that the validation finding was related to a protocol/contractual deviation (P).

**Table 3.4-7. Laboratory Control Samples (LCS) Tables**  
 Summary of QC Outliers (Page 1 of 10)

**Table 3.4-7A LCS/LCSD for SW8015B - TEPH**

LCS ID (Associated Samples)	TEPH: EPA Method SW8015B Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
0119168LCS/LCSD (WV-S2 NOT USED)  LDC Report# 4769A8	TPH as extractables	34 (60-117)	24 (60-117)	-	J- (all detects) UJ (all non-detects)	A
0118396LCS/LCSD (AR-7/10RE AR-7/20RE AR-8/0.5RE AR-12/0.5RE)  LDC Report# 4769A8	TPH as extractables	120 (60-117)	57 (60-117)	56 ( $\leq 50$ )	J (all detects) UJ (all non-detects)	A
0108462LCS/LCSD MW-1 MW-2 MW-14 MW-1A LDC Report# 4827A8 and MW-9 MW-8 LDC Report# 4858A8	TPH as extractables	54 (60-117)	-	-	UJ (all non-detects)	A
0118157LCS/D (All soil samples in SDG G0D220129) SP1-R1 SP1-R2 SP2-R1 SP2-R2 MW-10/K MW-12/K SP2-R1A/K LDC Report# 4864A8 and (All soil samples in SDG G0D220130) AR-9R (AR-9R/0.5) AR-7R (AR-7R/0.5) AR-4R (AR-4R/0.5) AR-2R (AR-2R/0.5) AR-1R (AR-1R/0.5) AR-8R (AR-8R/0.5) AR-12R (AR-12R/0.5) TW-7R (TW-7R/0.5) HF-2R (HF-2R/0.5) HF-3R1 (HF-3R1/0.5) SP3R1 (SP3-R1/0.5) SP3-R2 (SP3-R2/0.5) SP3-R3 (SP3-R3/0.5) SP3-R4 (SP3-R4/0.5) LDC Report# 4864B8	TPH as extractables	59 (60-117)	-	-	J- (all detects) UJ (all non-detects)	P

**Table 3.4-7. Laboratory Control Samples (LCS) Tables**  
**Summary of QC Outliers (Page 2 of 10)**

**Table 3.4-7A LCS/LCSD for SW8015B - TEPH**

LCS ID (Associated Samples)	TEPH: EPA Method SW8015B Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
0119164LCS/D (TNT-1P/KRE)	TPH as extractables	54 (60-117)	54 (60-117)	-	UJ (all non-detects)	P
0119152LCS (TNT-2F/1RE TNT-2F/2RE TNT-1Q/0RE TNT-1Q/1RE MW-13/0.5RE TNT-1P/0.5RE TNT-1P/0RE  LDC Report# 4868A8	TPH as extractables	59 (60-117)	-	-	J- (all detects) UJ (all non-detects)	P

**Note:**

**Bold highlight** indicates that associated sample results were qualified for this compound.

**Table 3.4-7B LCS/LCSD for SW8260B - VOCs**

LCS ID (Associated Samples)	VOCs: EPA Method SW8260B Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
0063326LCS/D (All water samples in SDG G0B240168) SRC3 MW1/K TRIP BLANK (2/23) TRIP BLANK (2/24) LDC Report# 4678A1 and (All water samples in SDG G0B260131) MW9/K MW7/K TRIP BLANK 2-25-00 LDC Report# 4678B1	Vinyl acetate	161 (65-135)	-	-	NA (J+ all detects) <i>(No samples qualified, all ND)</i>	P
0104404-LCS/LCSD (All water samples in SDG G0C310244) MW-15/K TB033000B AR-12/K TB033000C NV-S2/A  LDC Report# 4769A1	Dichlorodifluoromethane Vinyl acetate	161 (65-135) 363 (65-135)	160 (65-135) 363 (65-135)	- -	NA (J+ all detects) NA (J+ all detects) <i>(No samples qualified, all ND)</i>	P

**Table 3.4-7. Laboratory Control Samples (LCS) Tables**  
 Summary of QC Outliers (Page 3 of 10)

**Table 3.4-7B LCS/LCSD for SW8260B - VOCs**

LCS ID (Associated Samples)	VOCs: EPA Method SW8260B Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
0105287-LCS/D (All water samples in SDG G0D040260) MW-3A/K TB040300A LDC Report# 4733D1 and (All water samples in SDG G0D010147) TB033100A HF-9/K TB033100B LDC Report# 4743A1	Dichlorodifluoromethane Vinyl acetate	143 (65-135) 368 (65-135)	140 (65-135) 368 (65-135)	- -	NA (J+ all detects) NA (J+ all detects) <i>(No samples qualified, all ND)</i>	P
0116366-LCS/D (MW-7 MW-6 MW-13 TB4-12-00 TB4-13-00)  LDC Report# 4812A1	Vinyl acetate	-	51 (65-135)	37 ( $\leq 25$ )	UJ (all non- detects)	P
0117264-LCS/D (MW-15 TB4-12-00) LDC Report# 4812A1 and (All water samples in SDG G0D140298) TB04-14-00 LDC Report# 4855A1	2-Butanone  Vinyl acetate	-  137 (65-135)	-  -	42 ( $\leq 25$ )  39 ( $\leq 25$ )	UJ (all non- detects)  UJ (all non- detects)	P
0102341-LCS/D (All water samples in SDG G0C300256) MW-13/K NV-S1 NV-S2 SV-S1 TB032900 TB032900B  LDC Report# 4868A1	Vinyl acetate	410 (65-135)	315 (65-135)	26 ( $\leq 25$ )	UJ (all non- detects)	P

**Table 3.4-7. Laboratory Control Samples (LCS) Tables**  
 Summary of QC Outliers (Page 4 of 10)

**Table 3.4-7B LCS/LCSD for SW8260B - VOCs**

LCS ID (Associated Samples)	VOCs: EPA Method SW8260B Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
0108367-LCS (All soil samples in SDG G0D040260) MW-3A/3.5 MW-3A/5 MW-3A/5.5 MW-3A/10 MW-3A/15 MW-3A/20  LDC Report# 4733D1	Carbon disulfide Dichlorodifluoromethane 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	178 (65-135) 143 (65-135) 156 (65-135) 153 (65-135)	- - - -	- - - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <i>(No samples qualified, all ND)</i>	P
0108418-LCS (AR-6/4 AR-6/10 AR-6/15 AR-9/4.0 AR-9/10 AR-9/10.5 AR-9/15  LDC Report# 4743A1	Carbon disulfide Trichlorofluoromethane 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	170 (65-135) 139 (65-135) 163 (65-135) 155 (65-135)	- - - -	- - - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <i>(No samples qualified, all ND)</i>	P
0108419-LCS (AR-10/4 AR-10/10 AR-10/15 AR-10/17 HF-9/0.5 HF-9/4 HF-9/10 HF-9/15 HF-9/20)  LDC Report# 4743A1	Carbon disulfide Carbon tetrachloride Trichlorofluoromethane 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	164 (65-135) - 137 (65-135) 158 (65-135) 150 (65-135)	167 (65-135) 136 (65-135) 137 (65-135) 158 (65-135) 155 (65-135)	- - - - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <i>(No samples qualified, all ND)</i>	P
0109206-LCS/LCSD (HF-5/1.0 HF-5/4.0 HF-5/10.0 HF-5/20 HF-7/0.5)  LDC Report# 4754A1	Carbon disulfide 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	166 (65-135) 150 (65-135) 139 (65-135)	157 (65-135) 140 (65-135) 136 (65-135)	- - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <i>(No samples qualified, all ND)</i>	P
0109213-LCS/LCSD (HF-5/0.5 HF-5/15.0 HF-5/25 HF-7/1.0)  LDC Report# 4754A1	Carbon disulfide 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	156 (65-135) 142 (65-135) -	164 (65-135) 144 (65-135) 136 (65-135)	- - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <i>(No samples qualified, all ND)</i>	P

**Table 3.4-7. Laboratory Control Samples (LCS) Tables**  
 Summary of QC Outliers (Page 5 of 10)

**Table 3.4-7B LCS/LCSD for SW8260B - VOCs**

LCS ID (Associated Samples)	VOCs: EPA Method SW8260B Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
0109213-LCS (HF-7/10 HF-7/15 HF-7/20)  LDC Report# 4761A1	Carbon disulfide 1,1,2-Trichloro-1,2,2- trifluoroethane	156 (65-135) 142 (65-135)	- -	- -	NA (J+ all detects) NA (J+ all detects) <i>(No samples qualified, all ND)</i>	P
0115264-LCS (HF-7/4 HF-6/24.5 HF-6/0.5 HF-6/4 HF-6/4.5 HF-6/10 HF-6/15 HF-6/20)  LDC Report# 4761A1	Carbon disulfide Dichlorodifluoromethane Trichlorofluoromethane 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	181 (65-135) 204 (65-135) 144 (65-135) 167 (65-135) 148 (65-135)	- - - - -	- - - - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <i>(No samples qualified, all ND)</i>	P
0108267-LCS/LCSD (AR-8/4 AR-8/4.5 AR-12/4 AR-12/4.5 AR-12/10)  LDC Report# 4769A1	Carbon disulfide Trichlorofluoromethane 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	170 (65-135) 139 (65-135) 163 (65-135) 155 (65-135)	169 (65-135) - 159 (65-135) 155 (65-135)	- - - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <i>(No samples qualified, all ND)</i>	P
0105394-LCS/LCSD (MW-14/4 MW-14/10 MW-15/10 MW-15/15 MW-15/20 AR-7/10 AR-7/15 AR-7/20 AR-8/10) LDC Report# 4769A1 and (All soil samples in SDG G0C300256) MW-13/4 MW-13/4.5 MW-13/10 MW-13/15 LDC Report# 4868A1	Carbon disulfide 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	174 (65-135) 156 (65-135) 158 (65-135)	167 (65-135) 149 (65-135) 153 (65-135)	- - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <i>(No samples qualified, all ND)</i>	P

**Table 3.4-7. Laboratory Control Samples (LCS) Tables**  
 Summary of QC Outliers (Page 6 of 10)

**Table 3.4-7B LCS/LCSD for SW8260B - VOCs**

LCS ID (Associated Samples)	VOCs: EPA Method SW8260B Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
0108367-LCS/LCSD (MW-15/4 AR-7/4) LDC Report# 4769A1 and (HF-8/4 HF-8/10 HF-8/15) LDC Report# 4778B1	Carbon disulfide Dichlorodifluoromethane 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	178 (65-135) 143 (65-135) 156 (65-135) 153 (65-135)	- - - -	- - - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <b>(No samples qualified, all ND)</b>	P
0109206-LCS/D (HF-8/0.5 HF-8/15.5) LDC Report# 4778B1	Carbon disulfide 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	166 (65-135) 150 (65-135) 139 (65-135)	157 (65-135) 140 (65-135) 136 (65-135)	- - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <b>(No samples qualified, all ND)</b>	P
0109213-LCS/D (HF-8/20 HF-8/25) LDC Report# 4778B1	Carbon disulfide 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	156 (65-135) 142 (65-135) -	164 (65-135) 144 (65-135) 136 (65-135)	- - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <b>(No samples qualified, all ND)</b>	P
0115264-LCS (AR-11/4 AR-11/10 AR-11/15) LDC Report# 4855A1	Carbon disulfide Dichlorodifluoromethane Trichlorofluoromethane 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	181 (65-135) 204 (65-135) 144 (65-135) 167 (65-135) 148 (65-135)	- - - - -	- - - - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <b>(No samples qualified, all ND)</b>	P
0115469-LCS/D (AR-11/17 AR-5/4 AR-5/10 AR-5/15) LDC Report# 4855A1	Carbon disulfide Carbon tetrachloride Dichlorodifluoromethane Trichlorofluoromethane 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	180 (65-135) 138 (65-135) 197 (65-135) 146 (65-135) 168 (65-135) 147 (65-135)	181 (65-135) - 193 (65-135) 144 (65-135) 166 (65-135) 152 (65-135)	- - - - - -	NA (J+ all detects) NA (J+ all detects) <b>(No samples qualified, all ND)</b>	P
0108367-LCS (All soil samples in SDG G0D040260)  MW-3A/3.5 MW-3A/5 MW-3A/5.5 MW-3A/10 MW-3A/15 MW-3A/20  LDC Report#4733D1	Carbon disulfide Dichlorodifluoromethane 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	178 (65-135) 143 (65-135) 156 (65-135) 153 (65-135)	- - - -	- - - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <b>(No samples qualified, all ND)</b>	P

**Note:** Bold highlight indicates that associated sample results were qualified for this compound.

**Table 3.4-7. Laboratory Control Samples (LCS) Tables**  
 Summary of QC Outliers (Page 7 of 10)

**Table 3.4-7C LCS/LCSD for SW8270C- SVOCs**

LCS ID	SVOCs EPA Method SW8270C: Compound	%R (Limits)	Associated Samples	Flag	A or P
0118153-LCS	Benzoic acid  Carbazole	34 (50-150)  189 (50-150)	All samples in SDG G0D220130: <b>SP3-R1</b> <b>SP3-R2</b> <b>SP3-R3</b> <b>SP3-R4</b> LDC Report# 4864B2 and All samples in SDG G0D220129: <b>SP1-R1</b> <b>SP1-R2</b> <b>SP2-R1</b> <b>SP2-R2</b> LDC Report# 4864A2	<b>UJ (all non-detects)</b>  <i>NA (J+ all detects) No samples qualified, all ND</i>	P

**Note:**  
**Bold highlight** indicates that associated sample results were qualified for this compound.

**Table 3.4-7D LCS/LCSD for SW8270CWM - Chloropicrin**

LCS ID	Chloropicrin: EPA Method SW8270CWM: Compound	%R (Limits)	Associated Samples	Flag	A or P
0130240-LCS	<b>Chloropicrin</b>	36 (40-140)	All samples in SDG G0E040279: <b>MW-4R</b> <b>MW-3R</b> <b>MW-3R/K</b>  LDC Report# 4827G2	<b>UJ (all non-detects)</b>	P

**Note:**  
**Bold highlight** indicates that associated sample results were qualified for this compound.

**Table 3.4-7. Laboratory Control Samples (LCS) Tables**  
 Summary of QC Outliers (Page 8 of 10)

**Table 3.4-7E LCS/LCSD Issues for SW8310 - PAHs**

Sample (Associated Samples)	PAHs: EPA Method SW8310 Compound	Finding	Criteria	Flag	A or P
0108460-LCS (MW-15 MW-7 MW-6 MW-13 LDC Report# 4812A9 and (MW-9 MW-8) LDC Report# 4858A9	All TCL compounds	The LCS associated with these samples was not spiked with the required full list of target compounds.	The LCS must be performed according to the QAPP.	UJ (all non-detects)	P
0108460-LCS (MW-1 MW-2 MW-14 MW-1A) LDC Report# 4827A9	All TCL compounds	The LCS/LCSD associated with these samples was not spiked.	The LCS/LCSD must be spiked with target compounds.	J (all detects) UJ (all non-detects)	P

**Note:**

**Bold highlight** indicates that associated sample results were qualified for this compound.

The LCS (and MS/MSD) were not spiked for the extraction batch including samples MW-1, MW-1A, MW-2, MW-6, MW-7, MW-8, MW-9, MW-13, MW-14, and MW-15 (and MW-9MS/MSD). The surrogate recoveries for the LCS, MS/MSD, method blank, and all of the affected samples except sample MW-7 were within control limits, indicating acceptable overall batch extraction efficiency and also indicating that the 0% spike recoveries were due to spiking failure, not to extraction or analytical deficiencies. The project chemist was contacted, and the laboratory was directed to re-spike, re-extract, and reanalyze the samples. The reanalyses were performed with all QC within QC limits, however, the reanalyses were grossly (>2X) outside of holding times. As the surrogate recoveries and continuing calibrations for the original analysis were acceptable, and the results for the reanalyses of these samples were the same as in the original analyses, the original results have been used for reporting purposes. The effect on the quality of the data is not expected to be significant.

**Table 3.4-7F LCS/LCSD for SW8310 - PAHs**

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
0131202-LCS/LCSD (MW-4ARE NOT USED) LDC Report# 4837A9	Pyrene	-	-	68 (≤30)	J (all detects) UJ (all non-detects)	P

**Note:** No results used for reporting purposes were qualified.

**Table 3.4-7. Laboratory Control Samples (LCS) Tables**  
 Summary of QC Outliers (Page 9 of 10)

**Table 3.4-7G LCS/LCSD for SW8330 - Explosives**

LCS ID (Associated Samples)	Explosives: EPA Method SW8330 Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
0109136-LCS/D MW-15 MW-7 MW-6 MW-13  LDC Report# 4812A40	4-Nitrotoluene	-	-	30 ( $\leq 20$ )	UJ (all non-detects)	P
0105271-LCS/D (All samples in SDG G0D120283) MW-1 MW-2 MW-14 MW-1A  LDC Report# 4827A40	2,4,6-Trinitrotoluene 4-Amino-2,6-Dinitrotoluene 2,6-Dinitrotoluene	- - -	- - -	21 ( $\leq 20$ ) 22 ( $\leq 20$ ) 29 ( $\leq 20$ )	UJ (all non-detects)	P
0115370-LCS/D (All samples in SDG G0D200312) MW-5 MW-11 MW-12 LDC Report# 4827C40 and (All samples in SDG G0D220129): MW-10 MW-10/K MW-12/K LDC Report# 4864A40 and 0115370-LCS/D (All samples in SDG G0D200159) MW-3 NV-S3 LDC Report# 4827B40	RDX Nitrobenzene 3-Nitrotoluene 4-Nitrotoluene	- - - -	- - - 176 (65-135)	26 ( $\leq 20$ ) 22 ( $\leq 20$ ) 22 ( $\leq 20$ ) 39 ( $\leq 20$ )	J (all detects) UJ (all non-detects)	P
0094459-LCS (All soil samples in SDG G0C300256): NV-S1 NV-S2  LDC Report# 4868A9	2,4,6-Trinitrotoluene	166 (65-135)	-		NA (J+ all detects) <i>(No samples qualified, all ND)</i>	P

**Table 3.4-7. Laboratory Control Samples (LCS) Tables**  
**Summary of QC Outliers (Page 10 of 10)**

**Table 3.4-7G LCS/LCSD for SW8330 - Explosives**

LCS ID (Associated Samples)	Explosives: EPA Method SW8330 Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
0119190-LCS/D (All samples in SDG G0D250199) <b>MW-3B</b>  LDC Report# 4827F40	<b>2-Nitrotoluene</b>	-	-	26 ( $\leq 20$ )	<b>UJ (all non- detects)</b>	<b>P</b>

**Note:**

**Bold highlight** indicates that associated sample results were qualified for this compound.

These tables were reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only QC outliers were included. Notes and highlights were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation. The "A" and "P" designations are LDC DVR designations that indicate the LDC validator determined that the finding was based upon technical validation criteria (A) or that the validation finding was related to a protocol/contractual deviation (P).

**Table 3.4-8. Duplicate Sample Analysis Tables**  
 Summary of QC Outliers (Page 1 of 1)

**Table 3.4-8A. Duplicate Sample Analysis Issues for 160.1/160.2/300.0/415.1 - General Chemistry**

Sample	Analyte	Finding	Criteria	Flag	A or P
All samples in SDG G0D130323: MW-15 MW-7 MW-6 MW-13  LDC Report# 4812A6	Total dissolved solids Total suspended solids Total organic carbon	No DUP analysis associated with these samples.	DUP analysis required.	None	P

**Table 3.4-8B. Duplicate Sample Analysis for SW6010B/7470A/7471A - Metals**

DUP ID (Associated Samples)	Metals: EPA Methods SW6010B/SW7470A/SW7471A Analyte	RPD (Limits)	Difference (Limits)	Flag	A or P
(All samples in SDG G0D120283) MW-1 MW-1A  LDC Report# 4827A4	<b>Potassium</b>	-	773 ug/L (<300)	<b>J (all detects)</b>	A

**Note:**

**Bold highlight** indicates that associated sample results were qualified for this compound.

These tables were reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only QC outliers were included. Notes and highlights were added were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation. The "A" and "P" designations are LDC DVR designations that indicate the LDC validator determined that the finding was based upon technical validation criteria (A) or that the validation finding was related to a protocol/contractual deviation (P).

**Table 3.4-9. ICP Serial Dilution Tables for SW6010B - Metals**  
 Summary of QC Outliers (Page 1 of 1)

Diluted Sample	Metals: EPA Method SW6010B Analyte	%D (Limits)	Associated Samples	Flag	A or P
MW-6/1L  LDC Report# 4778B4	<b>Lead</b>	11.1 (≤10)	All samples in SDG G0D060121: <b>MW-6/0.5</b> <b>MW-6/1</b> <b>MW-6/4</b> <b>MW-6/10</b> <b>MW-6/15</b> <b>MW-6/20</b>	<b>J (all detects)</b>	<b>A</b>

**Note:**

**Bold highlight** indicates that associated sample results were qualified for this compound.

This table was reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only QC outliers were included. Notes and highlights were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation. The "A" and "P" designations are LDC DVR designations that indicate the LDC validator determined that the finding was based upon technical validation criteria (A) or that the validation finding was related to a protocol/contractual deviation (P).

**Table 3.4-10. TEPH Target Compound Identification Tables**  
(Page 1 of 9)

Sample	TEPH: EPA Method SW8015B Hydrocarbon Pattern
MW1/17.5	ND
MW1/21	ND
MW1/24	ND
SRC3	ND
MW1/K	ND
MW8/0	ND
MW8/0.5	ND
MW8/4	ND
MW8/10	ND
MW8/15	ND
LDC Report# 4678A8	
MW7/4	ND
MW7/9	ND
MW9/0	ND
MW9/K	ND
MW7/K	ND
MW7/0	Pattern resembles TPH as Diesel and Motor Oil.
MW7/0.5	ND
LDC Report# 4678B8	
MW2/0	ND
MW2/4	ND
MW2/4.5	ND
MW2/10	ND
MW2/15	ND
MW2/20	ND
MW1/K	ND
LDC Report# 4678C8	

**Table 3.4-10. TEPH Target Compound Identification Tables**  
(Page 2 of 9)

Sample	TEPH: EPA Method SW8015B Hydrocarbon Pattern
MW-3A/0.5	ND
MW-3A/3.5	ND
MW-3A/5	ND
MW-3A/5.5	ND
MW-3A/10	ND
MW-3A/15	ND
MW-3A/20	ND
MW-3A/K	ND
TNT-1P/4	ND
TNT-1P/4.5	ND
TNT-1P/6	ND
TNT-1P/8	ND
TNT-1P/10	ND
TNT-1P/K	ND
LDC Report# 4733D8	
AR-6/1.0	ND
AR-6/4	ND
AR-6/10	ND
AR-6/15	ND
AR-9/1.0	ND
AR-9/4.0	ND
AR-9/10	ND
AR-9/10.5	ND
AR-9/15	ND
AR-10/0.5 (NOT USED)	Pattern resembles an unknown hydrocarbon eluting within the Motor Oil range
AR-10/0.5RE	Pattern resembles an unknown hydrocarbon eluting within the Motor Oil range
AR-10/4	ND

**Table 3.4-10. TEPH Target Compound Identification Tables**  
(Page 3 of 9)

Sample	TEPH: EPA Method SW8015B Hydrocarbon Pattern
AR-10/10	ND
AR-10/15	ND
AR-10/17	ND
PE-MO (NOT USED)	Pattern resembles TPH as Motor Oil
PE-MORE	Pattern resembles TPH as Motor Oil
HF-9/K	ND
LDC Report# 4743A8	
HF-3R/0.5	Pattern resembles TPH as Motor Oil.
HF-3R/4	ND
HF-3R/10	ND
WAT-4	ND
WAT-3	ND
LDC Report# 4754A8	
SV-S1	ND
LDC Report# 4761A8	
TNT-1Q/4	ND
TNT-1Q/6	ND
TNT-1Q/8	ND
TNT-1Q/10	ND
LDC Report# 4778B8	
MW-15	ND
MW-7	ND
MW-6	ND
MW-13	ND
LDC Report# 4812A8	
AR-12/K	ND
NV-S1	ND

**Table 3.4-10. TEPH Target Compound Identification Tables**

(Page 4 of 9)

Sample	TEPH: EPA Method SW8015B Hydrocarbon Pattern
NV-S2	ND
NV-S2/A	ND
AR-12/4	Pattern resembles an unknown hydrocarbon eluting within the motor oil range.
AR-12/0.5	Pattern resembles an unknown hydrocarbon eluting within the motor oil range.
AR-12/10	ND
AR-12/4.5	ND
AR-12/0.5RE	Pattern resembles an unknown hydrocarbon eluting within the motor oil range.
AR-7/0.5RE	Pattern resembles an unknown hydrocarbon eluting within the motor oil range.
AR-7/20RE	Pattern resembles TPH as motor oil.
AR-7/20 (NOT USED)	Pattern resembles TPH as motor oil.
AR-7/10RE	Pattern resembles TPH as motor oil.
AR-7/10 (NOT USED)	Pattern resembles TPH as motor oil.
AR-7/4	ND
AR-7/0.5	Pattern resembles an unknown hydrocarbon eluting within the motor oil range.
AR-8/10	ND
AR-8/4.5	ND
AR-8/4	ND
AR-8/0.5RE	Pattern resembles an unknown hydrocarbon eluting within the motor oil range.
AR-8/0.5 (NOT USED)	Pattern resembles an unknown hydrocarbon eluting within the motor oil range.
MW-14/0.5 (NOT USED)	Pattern resembles an unknown hydrocarbon eluting within the motor oil range.
MW-14/4	ND
MW-14/1	ND
MW-14/0.5RE	Pattern resembles an unknown hydrocarbon eluting within the motor oil range.
MW-14/10	ND
MW-15/K	ND
MW-15/20	ND

**Table 3.4-10. TEPH Target Compound Identification Tables**  
(Page 5 of 9)

Sample	TEPH: EPA Method SW8015B Hydrocarbon Pattern
MW-15/10	ND
MW-15/0.5 (NOT USED)	Pattern resembles an unknown hydrocarbon eluting within the motor oil range.
MW-15/15	ND
MW-15/1	ND
MW-15/4	ND
MW-15/0.5RE	Pattern resembles an unknown hydrocarbon eluting within the motor oil range.
TNT-2F/8	ND
TNT-2F/K	ND
TNT-2F/10	ND
TNT-2F/6	ND
TNT-2F/4	ND
WV-S2 (NOT USED)	Pattern resembles TPH as diesel.
WV-S2RE	Pattern resembles TPH as diesel.
LDC Report# 4769A8	
AR-7/15	ND
MW-4A	Pattern resembles TPH as kerosene.
MW-4	ND
LDC Report# 4837A8	
AR-11/0.5	Pattern resembles and unknown hydrocarbon eluting within the TPH as Motor Oil range.
AR-11/4	ND
AR-11/10 (NOT USED)	ND
AR-11/10RE	ND
AR-11/15	ND
AR-11/17	ND
AR-5/0.5	Pattern resembles and unknown hydrocarbon eluting within the TPH as Motor Oil range.
AR-5/1 (NOT USED)	Pattern resembles and unknown hydrocarbon eluting within the TPH as Motor Oil range.

**Table 3.4-10. TEPH Target Compound Identification Tables**  
(Page 6 of 9)

Sample	TEPH: EPA Method SW8015B Hydrocarbon Pattern
AR-5/1RE AR-5/4 (NOT USED) AR-5/4RE AR-5/10 AR-5/15 (NOT USED)	ND ND ND ND ND
AR-5/15RE LDC Report# 4855A8	ND
MW-9 MW-9RE MW-8 MW-8RE LDC Report# 4858A8	ND ND ND ND
MW-10/K LDC Report# 4864A8	ND
MW-12/K SP2-R1A/K SP1-R1 SP1-R2 SP2-R1 SP2-R2 LDC Report# 4864A8	ND ND Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range. Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range. Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range. Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range.
AR-1R AR-2R AR-4R AR-7R AR-8R AR-9R	Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range. Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range. Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range. Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range. Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range. ND

**Table 3.4-10. TEPH Target Compound Identification Tables**  
(Page 7 of 9)

Sample	TEPH: EPA Method SW8015B Hydrocarbon Pattern
AR-12R	Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range.
HF-2R	Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range.
HF-3R1	Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range.
SP3-R1	Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range.
SP3-R2	Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range.
SP3-R3	Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range.
SP3-R4	Pattern resembles an unknown hydrocarbon eluting within the TPH as Motor Oil range.
TW-7R	ND
SP3-R4C/K LDC Report# 4864B8	ND
TNT-1P/1	ND
TNT-1P/2	ND
TNT-1P/K (NOT USED)	ND
TNT-1P/KRE	ND
TNT-2F/1 (NOT USED)	Severe interference in the Diesel range due to high levels of explosives, with minor components resembling Diesel and Motor Oil.
TNT-2F/1RE	Severe interference in the Diesel range due to high levels of explosives, with minor components resembling Motor Oil.
TNT-2F/2 (NOT USED)	Severe interference in the Diesel range due to high levels of explosives, with minor components resembling Diesel and Motor Oil.
TNT-2F/2RE	Severe interference in the Diesel range due to high levels of explosives, with minor components resembling Motor Oil.
TNT-1Q/0 (NOT USED)	Severe interference in the Diesel range due to high levels of explosives, with minor components resembling Diesel and Motor Oil.
TNT-1Q/0RE	Severe interference in the Diesel range due to high levels of explosives, with minor components resembling Motor Oil.
TNT-1Q/1 (NOT USED)	Severe interference in the Diesel range due to high levels of explosives, with minor components resembling Diesel and Motor Oil.
TNT-1Q/1RE	Severe interference in the Diesel range due to high levels of explosives, with minor components resembling Diesel and Motor Oil.

**Table 3.4-10. TEPH Target Compound Identification Tables**

(Page 8 of 9)

Sample	TEPH: EPA Method SW8015B Hydrocarbon Pattern
TNT-1Q/2	ND
MW-13/0.5 (NOT USED)	Pattern resembles TPH as Motor Oil.
MW-13/0.5RE	Pattern resembles TPH as Motor Oil.
MW-13/4 (NOT USED)	ND
MW-13/4RE	ND
MW-13/4.5	ND
MW-13/10	ND
MW-13/15	ND
TNT-1P/0 (NOT USED)	Pattern resembles an unknown hydrocarbon eluting throughout the entire TPH as Extractables range.
TNT-1P/0.5 (NOT USED)	Pattern resembles an unknown hydrocarbon eluting throughout the entire TPH as Extractables range.
TNT-1P/0.5RE	ND
TNT-2F/0	ND
TNT-1P/0RE	ND
MW-13/K	ND
LDC Report# 4868A8	
MW-3B	ND
LDC Report# 4827F8	
MW-3	ND
NV-S3	ND
LDC Report# 4827B8	
MW-5	ND
LDC Report# 4827C8	
MW-1	ND
MW-2	ND
MW-14	ND

**Table 3.4-10. TEPH Target Compound Identification Tables**

(Page 9 of 9)

Sample	TEPH: EPA Method SW8015B Hydrocarbon Pattern
MW-1A	ND
MW-1RE	ND
MW-2RE	ND
MW-14RE	ND
MW-1ARE LDC Report# 4827A8	Pattern resembles TPH as motor oil below the reporting limit.
MW-9/4	ND
MW-9/10	ND
MW-9/15	ND
LDC Report# 4941A8	

ND = Not Detected, Chromatographic Pattern Identification Not Applicable

This table was reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. All TEPH chromatograms were reviewed and characterized by the laboratory, LDC, and Earth Tech chemists, as presented in the findings in this table. All results reported as detections for specific TEPH fuels represent a characteristic match to the specified chromatographic fuel patterns, and may include inexact matches such as weathered fuel or additional peaks in the pattern.

**Table 3.4-11. Elevated PQL Tables**

(Page 1 of 2)

**Table 3.4-11A Elevated PQLs for SW8015B - TEPH**

Sample	Compound	Finding	Criteria	Flag	A or P
AR-6/1.0	TPH as diesel TPH as kerosene	Laboratory reporting limit reported at 5 mg/Kg.	Reporting limit should be reported at 1.0 mg/Kg per the QAPP.	None	P
AR-6/4				None	
AR-6/10					
AR-6/15					
AR-7/4				None	
AR-7/15	TPH as motor oil	Laboratory reporting limit reported at 25 mg/Kg.	Reporting limit should be reported at 10 mg/Kg per the QAPP.		P
AR-8/4					
AR-8/4.5					
AR-8/10					
AR-9/1.0					
AR-9/4.0					
AR-9/10					
AR-9/10.5					
AR-9/15					
AR-10/4					
AR-10/10					
AR-10/15					
AR-10/17					
AR-12/4					
AR-12/4.5					
AR-12/10					
MW-14/1					
MW-14/4					
MW-14/10					
MW-15/1					
MW-15/4					
MW-15/10					
MW-15/15					
MW-15/20					
MW-2/0					
MW-2/4					
MW-2/4.5					
MW-2/10					
MW-2/15					
MW-2/20					
MW-3A/0.5					
MW-3A/3.5					
MW-3A/5					
MW-3A/5.5					
MW-3A/10					
MW-3A/15					
MW-3A/20					
MW-9/4					
TNT-1P/4					
TNT-1P/4.5					
TNT-1P/6					
TNT-1P/8					
TNT-1P/10					
TNT-1Q/4					
TNT-1Q/6					
TNT-1Q/8					
TNT-1Q/10					
TNT-2F/10					

**Table 3.4-11. Elevated PQL Tables**

(Page 2 of 2)

**Table 3.4-11A Elevated PQLs for SW8015B - TEPH**

Sample	Compound	Finding	Criteria	Flag	A or P
MW-13 MW-15 MW-6 MW-7 MW-8	TPH as diesel TPH as kerosene	Laboratory reporting limit reported at 200 ug/L.	Reporting limit should be reported at 50 ug/L per the QAPP.	None None	P
NV/S1 NV/S2 NV/S2/A SV-S1	TPH as motor oil	Laboratory reporting limit reported at 1000 ug/L.	Reporting limit should be reported at 500 ug/L per the QAPP.	None	P

**Table 3.4-11B Elevated PQLs for SW8260B - VOCs**

Sample	Compound	Finding	Criteria	Flag	A or P
All water samples	Vinyl acetate	Laboratory reporting limit reported at 10 ug/L.	Reporting limit should be reported at 5.0 ug/L per the QAPP.	None	P
	1,1,2-Trichloro-1,2,2-trifluoroethane	Laboratory reporting limit reported at 2.0 ug/L.	Reporting limit should be reported at 1.0 ug/L per the QAPP.	None	P
All soil samples	1,1,2-Trichloro-1,2,2-trifluoroethane Methyl-tert-butyl ether	Laboratory reporting limit reported at 0.01 mg/Kg.	Reporting limit should be reported at 0.005 mg/Kg per the QAPP.	None None	P

These tables were reproduced in part from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only QC outliers were included. Notes and highlights were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation. The "A" and "P" designations are LDC DVR designations that indicate the LDC validator determined that the finding was based upon technical validation criteria (A) or that the validation finding was related to a protocol/contractual deviation (P).



Table 3.4-12. Datagaps Investigation Field Duplicate and Replicate Samples Collected and Analyzed  
(Page 2 of 2)

Sample ID	Depth ft bgs	Matrix	Lab	QUANTERRA (QES) LAB														TRU	BABK	
				Field TNT Soil Test SW8515	Metals SW6010B, SW7470A, SW7471A	TEPH-D/MO LUFT Mod. SW8015	TEPH-K LUFT Mod. SW8015	Pesticides SW8081A	PCBs SW8082	VOCs SW8260B	Chloropicrin SW8270C	Dioxins/Furans SW8290	Explosives SW8330	Nitroglycerin, PETN SW8330	PAHs SW8310	PAHs (SVOCs) SW8270C	Nitrate, Nitrite E300.0			General Water Chemistry
TOTAL NORMAL ANALYSES*				11	24	131	61	22	25	101	8	7	98	19	18	8	21	19	20	18
TOTAL DUPLICATES				1	4	16	5	4	3	13	1	2	14	3	3	0	3	3	3	3
% OF TOTAL ANALYSES				9%	17%	12%	8%	18%	12%	13%	13%	29%	14%	16%	17%	0%	14%	16%	15%	17%
TOTAL NORMAL WATER ANALYSES*				0	19	17	16	15	4	19	2	0	22	19	18	0	16	19	20	18
TOTAL WATER DUPLICATES				0	3	3	3	3	0	3	0	0	3	3	3	0	2	3	3	3
% OF TOTAL ANALYSES				NA	16%	18%	19%	20%	0%	16%	0%	NA	14%	16%	17%	NA	13%	16%	15%	17%
TOTAL NORMAL SOIL ANALYSES*				11	5	114	45	7	21	82	6	7	76	0	0	8	5	0	0	0
TOTAL SOIL DUPLICATES				1	1	13	2	1	3	10	1	2	11	0	0	0	1	0	0	0
% OF TOTAL ANALYSES				9%	20%	11%	4%	14%	14%	12%	17%	29%	14%	NA	NA	0%	20%	NA	NA	NA

Notes:

\*Actual field samples not including replicates or duplicates

Dup = Duplicate soil and water samples

BABK = E. S. Babcock & Sons

QES = Quanterra Environmental Services, West Sacramento Facility, acquired by Severn Trent Laboratories (STL) in February, 2000.

TRU = Truesdail

**Table 3.4-13. Field Duplicate/Replicate Detected Results Precision Tables**  
(Page 1 of 8)

**Table 3.4-13A. Field Duplicate/Replicate Detected Results Precision for General Chemistry**  
Methods: EPA Methods 160.1, 160.2, 300.0 and 415.1/SW9060

Analyte	Concentration (mg/L)		RPD (Limits)
	MW-1	MW-1A	
Chloride	93.9	92.4	2 ( $\leq 30$ )
Nitrate as N	6.0	5.9	2 ( $\leq 30$ )
Nitrite as N	0.45	0.48	6 ( $\leq 30$ )
<b>Total suspended solids</b>	<b>1690</b>	<b>744</b>	<b>78 (<math>\leq 30</math>)</b>
Sulfate	121	119	2 ( $\leq 30$ )
Total dissolved solids	1060	1070	0.9 ( $\leq 30$ )
Total organic carbon	4.1	3.0	-

Analyte	Concentration (mg/L)		RPD (Limits)
	MW-4A	MW-4	
Chloride	59.0	84.0	35 ( $\leq 30$ )
<b>Total suspended solids</b>	<b>12.0</b>	<b>24.0</b>	<b>67 (<math>\leq 30</math>)</b>
Sulfate	80.2	67.8	17 ( $\leq 30$ )
<b>Total dissolved solid</b>	<b>402</b>	<b>682</b>	<b>52 (<math>\leq 30</math>)</b>
<b>Total organic carbon</b>	<b>11.4</b>	<b>1.7</b>	<b>148 (<math>\leq 30</math>)</b>
Nitrate as N	0.10U	1.5	200 ( $\leq 30$ )
Nitrite as N	0.50U	0.19	200 ( $\leq 30$ )
<b>LDC Report# 4837A6</b>			

Analyte	Concentration (mg/L)		Difference (Limits)
	MW-6/0.5	MW-6/1	
Nitrate as N	0.59U	0.34	0.025 mg/Kg ( $\leq 1.0$ )
<b>LDC Report# 4778B6</b>			

**Note:** All field duplicate and replicate results were within specified criteria.

**Table 3.4-13. Field Duplicate/Replicate Detected Results Precision Tables**

--- (Page 2 of 8)

**Table 3.4-13B. Field Duplicate/Replicate Detected Results Precision for Metals: EPA Methods SW6010B/SW7470A/SW7471A**

Analyte	Concentration (mg/L)		RPD (Limits)	Difference (Limits)
	MW-1	MW-1A		
Aluminum	0.154	0.0564	-	0.0976 mg/L ( $\leq 0.020$ )
Barium	0.0911	0.0907	0.4 ( $\leq 30$ )	-
Calcium	45.9	44.8	2 ( $\leq 30$ )	-
Iron	0.193	0.0646	-	0.128 mg/L ( $\leq 0.200$ )
Magnesium	57.8	56.9	3 ( $\leq 30$ )	-
Manganese	0.0123	0.0144	-	0.0021 mg/L ( $\leq 0.005$ )
Potassium	0.957	1.23	-	0.273 mg/L ( $\leq 5.00$ )
Sodium	244	236	3 ( $\leq 30$ )	-
Thallium	0.0038	0.003U	-	0.0008 mg/L ( $\leq 0.010$ )
Zinc	0.0282	0.0325	-	0.0043 mg/L ( $\leq 0.020$ )
LDC Report# 4827A4				
Analyte	Concentration (mg/L)		RPD (Limits)	Difference (Limits)
	MW-4A	MW-4		
Aluminum	0.072	0.20U	-	0.128 mg/L ( $\leq 0.20$ )
Antimony	0.0034	0.060U	-	0.0566 mg/L ( $\leq 0.060$ )
Arsenic	0.0071	0.010U	-	0.0029 mg/L ( $\leq 0.010$ )
<b>Barium</b>	<b>0.059</b>	<b>0.22</b>	<b>115 (<math>\leq 30</math>)</b>	-
<b>Calcium</b>	<b>14.9</b>	<b>96.0</b>	<b>146 (<math>\leq 30</math>)</b>	-
Copper	0.0027	0.0059	-	0.0032 mg/L ( $\leq 0.025$ )
Iron	0.061	0.0058	-	0.0552 mg/L ( $\leq 0.20$ )
<b>Magnesium</b>	<b>10.8</b>	<b>54.0</b>	<b>133 (<math>\leq 30</math>)</b>	-
Manganese	0.080	0.0038	-	0.0762 mg/L ( $\leq 0.005$ )
Nickel	0.0021	0.020U	-	0.0179 mg/L ( $\leq 0.020$ )
Potassium	5.1	0.71	-	4.39 mg/L ( $\leq 5.0$ )
<b>Sodium</b>	<b>137</b>	<b>83.8</b>	<b>48 (<math>\leq 30</math>)</b>	-
Zinc	0.031	0.041	-	0.01 mg/L ( $\leq 0.020$ )
Molybdenum	0.036	0.020U	-	0.016 mg/L ( $\leq 0.020$ )
LDC Report# 4827B14				

**Table 3.4-13. Field Duplicate/Replicate Detected Results Precision Tables**  
(Page 3 of 8)

**Table 3.4-13B. Field Duplicate/Replicate Detected Results Precision for Metals: EPA Methods  
SW6010B/SW7470A/SW7471A**

Analyte	Concentration (mg/Kg)		RPD (Limits)	Difference (Limits)
	MW-6/0.5	MW-6/1		
Aluminum	31500	30900	2 ( $\leq 35^*$ )	-
Antimony	0.81	0.61	-	0.20 ( $\leq 6.0$ )
Arsenic	11.3	12.1	7 ( $\leq 35^*$ )	-
Barium	508	196	-	0.05 ( $\leq 0.8$ )
Beryllium	0.68	0.73	7 ( $\leq 35^*$ )	-
<b>Calcium</b>	<b>45600</b>	<b>4240</b>	<b>166 (<math>\leq 35^*</math>)</b>	-
Chromium	56.3	59.2	5 ( $\leq 35^*$ )	-
Cobalt	21.6	20.8	4 ( $\leq 35^*$ )	-
Copper	45.2	47.1	4 ( $\leq 35^*$ )	-
<b>Iron</b>	<b>452000</b>	<b>49200</b>	<b>161 (<math>\leq 35^*</math>)</b>	-
Lead	6.9	8.0	15 ( $\leq 35^*$ )	-
Magnesium	11000	9110	19 ( $\leq 35^*$ )	-
Manganese	1400	1030	30 ( $\leq 35^*$ )	-
Mercury	0.018	0.011	-	0.07 ( $\leq 0.2$ )
Nickel	49.2	52.9	7 ( $\leq 35^*$ )	-
Potassium	2760	2850	3 ( $\leq 35^*$ )	-
Sodium	445	446	-	1 ( $\leq 400$ )
Vanadium	99.4	103	4 ( $\leq 35^*$ )	-
Zinc	83.0	90.9	9 ( $\leq 35^*$ )	-
Molybdenum	0.56	0.54	-	0.02 ( $\leq 8.0$ )
Phosphorus	207	235	13 ( $\leq 35^*$ )	-
LDC Report# 4778B4				

**Notes:**

Results exceeding field precision criteria are highlighted in **bold**. Results are not qualified for field precision.

\* The control limits listed in the LDC DVRs were incorrect. The correct control limits for field duplicate precision specified in Table 3.2-2 of the QAPP have been inserted for each method.

**Table 3.4-13. Field Duplicate/Replicate Detected Results Precision Tables**  
(Page 4 of 8)

**Table 3.4-13C. Field Duplicate/Replicate Detected Results Precision for TEPH:  
EPA Method SW8015B**

Compound	Concentration (mg/Kg)		RPD (Limits)	Difference (Limits)
	AR-12/4	AR-12/4.5		
Unknown hydrocarbon LDC Report# 4769A8	51	5.8U	-	45.2 mg/Kg ( $\leq 5.8$ )
Compound	Concentration (ug/L)		RPD (Limits)	Difference (Limits)
	MW-4A	MW-4		
TPH as kerosene LDC Report# 4837A8	34	50U	-	16 ( $\leq 50$ )
Compound	Concentration (mg/Kg)		RPD (Limits)	Difference (Limits)
	MW7/0	MW7/0.5		
TPH as diesel	1.2	1.3U	-	0.1 ( $\leq 2.6$ )
TPH as motor oil LDC Report# 4678B8	3.9	13U	-	9.1 ( $\leq 26$ )
Compound	Concentration (mg/Kg)		Difference (Limits)	Flag
	TNT-1P/0	TNT-1P/0.5		
Unknown hydrocarbon	40 ( <i>NOT USED</i> )*	29 ( <i>NOT USED</i> )*	11 mg/Kg ( $\leq 24$ )	-
* Initial analyses of these samples were not silica gel extracted and were not used for reporting purposes. The samples were silica gel extracted on a later date and the reported results were ND at the specified PQL.				

**Notes:**

Results exceeding field precision criteria are highlighted in **bold**. Results are not qualified for field precision.

**Table 3.4-13. Field Duplicate/Replicate Detected Results Precision Tables**

(Page 5 of 8)

**Table 3.4-13D. Field Duplicate/Replicate Detected Results Precision for Pesticides: EPA Method SW8081A**

Compound	Concentration (ug/L)		RPD (Limits)
	NV-S2/A	NV-S2	
4,4'-DDD LDC Report# 4769A3	0.0077	0.10U	0.0923 ( $\leq 0.10$ )

**Note:**  
All field duplicate and replicate results were within specified criteria.

**Table 3.4-13E. Field Duplicate/Replicate Detected Results Precision for PCBs: EPA Method SW8082**

Compound	Concentration (mg/Kg)		RPD (Limits)	Difference (Limits)
	MW7/0	MW7/0.5		
Aroclor-1254 LDC Report# 4678B3	0.038	0.041U	-	0.003 mg/Kg ( $\leq 0.082$ )

**Note:**  
All field duplicate and replicate results were within specified criteria.

**Table 3.4-13. Field Duplicate/Replicate Detected Results Precision Tables**

(Page 6 of 8)

**Table 3.4-13F. Field Duplicate/Replicate Detected Results Precision for VOCs:  
EPA Method SW8260B**

Compound	Concentration (mg/Kg)		Difference (Limits)
	AR-9/10	AR-9/10.5	
Acetone	0.044	0.025	0.019 mg/Kg ( $\leq 0.05$ )
2-Butanone	0.0067	0.025U	0.0183 mg/Kg ( $\leq 0.05$ )
LDC Report# 4743A1			
Compound	Concentration (mg/Kg)		Difference (Limits)
	HF-5/0.5	HF-5/1.0	
Acetone	0.061	0.021	0.04 mg/Kg ( $\leq 0.05$ )
1,2-Dichloroethene, total	0.0096	0.025U	0.0154 mg/Kg ( $\leq 0.05$ )
LDC Report# 4754A1			
Compound	Concentration (mg/Kg)		Difference (Limits)
	HF-7/0.5	HF-7/1.0	
Acetone	0.098	0.063	0.035 mg/Kg ( $\leq 0.04$ )
2-Butanone	0.020	0.022	0.002 mg/Kg ( $\leq 0.04$ )
LDC Report# 4754A1			
Compound	Concentration (mg/Kg)		Difference (Limits)
	HF-6/4	HF-6/4.5	
2-Butanone	0.0096	0.0099	0.0003 mg/Kg ( $\leq 0.048$ )
Acetone	0.024U	0.054	0.03 mg/Kg ( $\leq 0.048$ )
LDC Report# 4761A1			
Compound	Concentration (mg/Kg)		Difference (Limits)
	AR-8/4	AR-8/4.5	
Acetone	0.074	0.047	0.029 mg/Kg ( $\leq 0.052$ )
2-Butanone	0.0092	0.0081	0.0011 mg/Kg ( $\leq 0.052$ )
p-Isopropyltoluene	0.0037	0.0065U	0.0028 mg/Kg ( $\leq 0.013$ )
LDC Report# 4769A1			
Compound	Concentration (mg/Kg)		Difference (Limits)
	AR-12/4	AR-12/4.5	
Acetone	0.058	0.055	0.003 mg/Kg ( $\leq 0.046$ )
2-Butanone	0.0099	0.0089	0.001 mg/Kg ( $\leq 0.046$ )
LDC Report# 4769A1			

**Table 3.4-13. Field Duplicate/Replicate Detected Results Precision Tables**  
(Page 7 of 8)

**Table 3.4-13F. Field Duplicate/Replicate Detected Results Precision for VOCs:**  
**EPA Method SW8260B**

Compound	Concentration (mg/Kg)		Difference (Limits)
	HF-8/15	HF-8/15.5	
Acetone	0.019	0.020	0.001 mg/Kg ( $\leq 0.048$ )
2-Butanone	0.0089	0.024U	0.0151 mg/Kg ( $\leq 0.048$ )
LDC Report# 4778B1			
Compound	Concentration (mg/Kg)		Difference (Limits)
	MW2/4	MW2/4.5	
Naphthalene	0.0018	0.0013	0.0005 mg/Kg ( $\leq 0.0024$ )
LDC Report# 4678C1			
Compound	Concentration (mg/Kg)		Difference (Limits)
	MW-3A/5	MW-3A/5.5	
Acetone	0.033	0.040	0.007 mg/Kg ( $\leq 0.05$ )
2-Butanone	0.025U	0.0063	0.0187 mg/Kg ( $\leq 0.05$ )
LDC Report# 4733D1			
Compound	Concentration (mg/Kg)		Difference (Limits)
	MW-4	MW-4A	
2-Butanone	10U	6.8	3.2 mg/L ( $\leq 10$ )
bromodichloromethane	1.0U	0.15	0.85 mg/L ( $\leq 1.0$ )
carbon disulfide	2.0U	3.7	1.7 mg/L ( $\leq 2.0$ )
<b>chloroform</b>	1.0U	2.9	1.9 mg/L ( $\leq 1.0$ )
methylene chloride	2.0	0.36	1.64 mg/L ( $\leq 2.0$ )
Compound	Concentration (mg/Kg)		Difference (Limits)
	MW-13/4	MW-13/4.5	
Acetone	0.021	0.014	0.007 mg/Kg ( $\leq 44$ )
LDC Report# 4868A1			

**Note:**

Results exceeding field precision criteria are highlighted in **bold**. Results are not qualified for field precision.

**Table 3.4-13. Field Duplicate/Replicate Detected Results Precision Tables**  
(Page 8 of 8)

**Table 3.4-13G. Field Duplicate/Replicate Detected Results Precision for Explosives:  
EPA Method SW8330**

Compound	Concentration (mg/Kg)		RPD (Limits)	Difference (Limits)
	MW2/4	MW2/4.5		
HMX LDC Report# 4678C40	0.14	0.50U	-	0.36 ( $\leq 1.0$ )
Compound	Concentration (mg/Kg)		RPD (Limits)	Difference (Limits)
	MW-3A/5	MW-3A/5.5		
2,4,6-Trinitrotoluene LDC Report# 4733D40	0.40U	0.29	-	0.11 ( $\leq 0.80$ )
Compound	Concentration (mg/Kg)		RPD (Limits)	Difference (Limits)
	MW-13/4	MW-13/4.5		
<b>2,4,6-Trinitrotoluene</b> LDC Report# 4868A40	<b>17</b>	<b>9.2</b>	<b>60 (<math>\leq 40</math>)</b>	-
Compound	Concentration (mg/Kg)		RPD (Limits)	Difference (Limits)
	TNT-1P/4	TNT-1P/4.5		
1,3,5-Trinitrobenzene	24	32	29 ( $\leq 40$ )	-
<b>2,4,6-Trinitrotoluene</b> LDC Report# 4733D40	<b>16</b>	<b>4.1</b>	-	<b>11.9 (<math>\leq 4.0</math>)</b>
Compound	Concentration (mg/Kg)		RPD (Limits)	Difference (Limits)
	TNT-1P/0	TNT-1P/0.5		
<b>1,3,5-Trinitrobenzene</b>	<b>1.2</b>	<b>3.3</b>	-	<b>2.1 mg/Kg (<math>\leq 2.0</math>)</b>
2,4,6-Trinitrotoluene	1400	2400	53 ( $\leq 40$ )	-
2,4-Dinitrotoluene	1.5	2.0	-	0.5 mg/Kg ( $\leq 2.0$ )
RDX	0.87	1.6	-	0.73 mg/Kg ( $\leq 2.0$ )
1,3-Dinitrobenzene	0.40U	0.13	-	0.27 mg/Kg ( $\leq 2.0$ )
LDC Report# 4868A40				
Compound	Concentration (mg/Kg)		RPD (Limits)	Difference (Limits)
	TNT-1P/4	TNT-1P/4.5		
1,3,5-Trinitrobenzene	24	32	29 ( $\leq 40$ )	-
<b>2,4,6-Trinitrotoluene</b> LDC Report# 4733D40	<b>16</b>	<b>4.1</b>	-	<b>11.9 (<math>\leq 4.0</math>)</b>

**Notes:** Results exceeding field precision criteria are highlighted in **bold**. Results are not qualified for field precision.

These tables were reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only field duplicate/replicate samples with detected results were included. Notes and highlights were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies field duplicate/replicate sample results that exceed project precision criteria specified in Table 3.2-3 of the QAPP.

Table 3.7-1. Completeness Table for Data Gaps Investigation, 2000

Analysis	Total Samples	Total analytes	(P) Contract	%	Completeness Analytical	%	Technical Completeness	%
Volatiles	155	10676	150	98.6	785	92.6	103	99.0
TEPH	166	546	28	95.9	163	70.1	15	97.3
PAHs	28	448	160	74.4	179	60.0	0	100.0
Explosives	129	1806	68	96.2	64	96.5	2	99.9
Metals	35	875	0	100	61	93.0	0	100.0
Anions	29	104	10	91.4	22	78.8	7	93.3
TOC	27	27	0	100	0	100.0	0	100.0
TDS	21	21	0	100	0	100.0	0	100.0
TSS	21	21	0	100	0	100.0	0	100.0
Dioxins	14	238	43	81.9	43	81.9	0	100.0
Perchlorate	25	25	0	100	0	100.0	0	100.0
SVOCs	8	576	7	98.3	71	87.7	8	98.6
Chloropicrin	11	11	3	72.7	3	72.7	0	100.0
hydrazines	28	84	0	100	9	89.3	0	100.0
Pesticides	32	672	0	100	0	100.0	0	100.0
PCBs	35	245	84	65.7	84	65.7	7	97.1
PET/NG	32	64	0	100	0	100.0	0	100.0

**Table 3.7-2. Rejected Results for the Data Gaps Investigation, February - May, 2000**  
(1 of 4)

EPA Method	Sample ID	Matrix	ANALYTE	Qualifier	Sampling Date	Lab Code	SDG
E300-NO2N	MW-6/0.5	Soil	nitrogen, nitrite (as N)	R	05-Apr-00	QESS	G0D060121
E300-NO2N	MW-6/1	Soil	nitrogen, nitrite (as N)	R	05-Apr-00	QESS	G0D060121
E300-NO2N	MW-6/10	Soil	nitrogen, nitrite (as N)	R	05-Apr-00	QESS	G0D060121
E300-NO2N	MW-6/15	Soil	nitrogen, nitrite (as N)	R	05-Apr-00	QESS	G0D060121
E300-NO2N	MW-6/20	Soil	nitrogen, nitrite (as N)	R	05-Apr-00	QESS	G0D060121
E300-NO2N	MW-6/4	Soil	nitrogen, nitrite (as N)	R	05-Apr-00	QESS	G0D060121
E300-NO3N	MW-6/0.5	Soil	nitrogen, nitrate (as N)	R	05-Apr-00	QESS	G0D060121
M8015DB	MW-9/10	Soil	diesel fuel #2	R	25-Feb-00	QESS	G0D110256
M8015DB	MW-9/10	Soil	motor oils	R	25-Feb-00	QESS	G0D110256
M8015DB	MW-9/10	Soil	unknown extract. hydrocarbon	R	25-Feb-00	QESS	G0D110256
M8015DB	MW-9/15	Soil	diesel fuel #2	R	25-Feb-00	QESS	G0D110256
M8015DB	MW-9/15	Soil	motor oils	R	25-Feb-00	QESS	G0D110256
M8015DB	MW-9/15	Soil	unknown extract. hydrocarbon	R	25-Feb-00	QESS	G0D110256
M8015DB	MW-9/4	Soil	diesel fuel #2	R	25-Feb-00	QESS	G0D110256
M8015DB	MW-9/4	Soil	motor oils	R	25-Feb-00	QESS	G0D110256
M8015DB	MW-9/4	Soil	unknown extract. hydrocarbon	R	25-Feb-00	QESS	G0D110256
M8015DB	TNT-1Q/1	Soil	diesel fuel #2	R	28-Mar-00	QESS	G0C300256
M8015DB	TNT-1Q/1	Soil	kerosene	R	28-Mar-00	QESS	G0C300256
M8015DB	TNT-1Q/1	Soil	motor oils	R	28-Mar-00	QESS	G0C300256
M8015DB	TNT-2F/2	Soil	diesel fuel #2	R	28-Mar-00	QESS	G0C300256
M8015DB	TNT-2F/2	Soil	kerosene	R	28-Mar-00	QESS	G0C300256
M8015DB	TNT-2F/2	Soil	motor oils	R	28-Mar-00	QESS	G0C300256
SW8082	TNT-1P/0	Soil	PCB-1016 (Arochlor 1016)	R	27-Mar-00	QESS	G0D210210
SW8082	TNT-1P/0	Soil	PCB-1221 (Arochlor 1221)	R	27-Mar-00	QESS	G0D210210
SW8082	TNT-1P/0	Soil	PCB-1232 (Arochlor 1232)	R	27-Mar-00	QESS	G0D210210
SW8082	TNT-1P/0	Soil	PCB-1242 (Arochlor 1242)	R	27-Mar-00	QESS	G0D210210
SW8082	TNT-1P/0	Soil	PCB-1248 (Arochlor 1248)	R	27-Mar-00	QESS	G0D210210
SW8082	TNT-1P/0	Soil	PCB-1254 (Arochlor 1254)	R	27-Mar-00	QESS	G0D210210
SW8082	TNT-1P/0	Soil	PCB-1260 (Arochlor 1260)	R	27-Mar-00	QESS	G0D210210
SW8260B	MW-2/10	Soil	2-chloroethyl vinyl ether	R	22-Feb-00	QESS	G0B240168
SW8260B	MW-2/15	Soil	2-chloroethyl vinyl ether	R	22-Feb-00	QESS	G0B240168
SW8260B	MW-2/20	Soil	2-chloroethyl vinyl ether	R	22-Feb-00	QESS	G0B240168
SW8260B	MW-2/4	Soil	2-chloroethyl vinyl ether	R	22-Feb-00	QESS	G0B240168
SW8260B	MW-2/4.5	Soil	2-chloroethyl vinyl ether	R	22-Feb-00	QESS	G0B240168
SW8260B	MW-3A/10	Soil	2-chloroethyl vinyl ether	R	03-Apr-00	QESS	G0D040260
SW8260B	MW-3A/15	Soil	2-chloroethyl vinyl ether	R	03-Apr-00	QESS	G0D040260
SW8260B	MW-3A/20	Soil	2-chloroethyl vinyl ether	R	03-Apr-00	QESS	G0D040260
SW8260B	MW-3A/3.5	Soil	2-chloroethyl vinyl ether	R	03-Apr-00	QESS	G0D040260
SW8260B	MW-3A/5	Soil	2-chloroethyl vinyl ether	R	03-Apr-00	QESS	G0D040260
SW8260B	MW-3A/5.5	Soil	2-chloroethyl vinyl ether	R	03-Apr-00	QESS	G0D040260
SW8260B	MW-1	Groundwater	2-chloroethyl vinyl ether	R	11-Apr-00	QESS	G0D120283
SW8260B	MW-1/A	Groundwater	2-chloroethyl vinyl ether	R	11-Apr-00	QESS	G0D120283
SW8260B	MW-10	Groundwater	1,2-dibromo-3-chloropropane	R	20-Apr-00	QESS	G0D220129
SW8260B	MW-10	Groundwater	2-chloroethyl vinyl ether	R	20-Apr-00	QESS	G0D220129

**Table 3.7-2. Rejected Results for the Data Gaps Investigation, February - May, 2000**  
(2 of 4)

EPA Method	Sample ID	Matrix	ANALYTE	Qualifier	Sampling Date	Lab Code	SDG
SW8260B	MW-11	Groundwater	1,2-dibromo-3-chloropropane	R	20-Apr-00	QESS	G0D200312
SW8260B	MW-11	Groundwater	2-chloroethyl vinyl ether	R	20-Apr-00	QESS	G0D200312
SW8260B	MW-13	Groundwater	2-chloroethyl vinyl ether	R	12-Apr-00	QESS	G0D130323
SW8260B	MW-14	Groundwater	2-chloroethyl vinyl ether	R	11-Apr-00	QESS	G0D120283
SW8260B	MW-15	Groundwater	2-chloroethyl vinyl ether	R	12-Apr-00	QESS	G0D130323
SW8260B	MW-2	Groundwater	2-chloroethyl vinyl ether	R	11-Apr-00	QESS	G0D120283
SW8260B	MW-3	Groundwater	2-chloroethyl vinyl ether	R	18-Apr-00	QESS	G0D200159
SW8260B	MW-3B	Groundwater	1,2-dibromo-3-chloropropane	R	24-Apr-00	QESS	G0D250199
SW8260B	MW-3B	Groundwater	2-chloroethyl vinyl ether	R	24-Apr-00	QESS	G0D250199
SW8260B	MW-4	Groundwater	1,2-dibromo-3-chloropropane	R	20-Apr-00	QESS	G0D200312
SW8260B	MW-4	Groundwater	2-chloroethyl vinyl ether	R	20-Apr-00	QESS	G0D200312
SW8260B	MW-4A	Groundwater	2-chloroethyl vinyl ether	R	18-Apr-00	QESS	G0D180262
SW8260B	MW-5	Groundwater	1,2-dibromo-3-chloropropane	R	19-Apr-00	QESS	G0D200312
SW8260B	MW-5	Groundwater	2-chloroethyl vinyl ether	R	19-Apr-00	QESS	G0D200312
SW8260B	MW-6	Groundwater	2-chloroethyl vinyl ether	R	12-Apr-00	QESS	G0D130323
SW8260B	MW-7	Groundwater	2-chloroethyl vinyl ether	R	11-Apr-00	QESS	G0D130323
SW8260B	MW-8	Groundwater	1,2-dibromo-3-chloropropane	R	11-Apr-00	QESS	G0D110255
SW8260B	MW-8	Groundwater	2-chloroethyl vinyl ether	R	11-Apr-00	QESS	G0D110255
SW8260B	MW-9	Groundwater	1,2-dibromo-3-chloropropane	R	11-Apr-00	QESS	G0D110255
SW8260B	MW-9	Groundwater	2-chloroethyl vinyl ether	R	11-Apr-00	QESS	G0D110255
SW8260B	NV-S1	Groundwater	1,2-dibromo-3-chloropropane	R	29-Mar-00	QESS	G0C300256
SW8260B	NV-S1	Groundwater	2-chloroethyl vinyl ether	R	29-Mar-00	QESS	G0C300256
SW8260B	NV-S2	Groundwater	1,2-dibromo-3-chloropropane	R	29-Mar-00	QESS	G0C300256
SW8260B	NV-S2	Groundwater	2-chloroethyl vinyl ether	R	29-Mar-00	QESS	G0C300256
SW8260B	NV-S2A	Groundwater	1,2-dibromo-3-chloropropane	R	29-Mar-00	QESS	G0C310244
SW8260B	NV-S2A	Groundwater	2-chloroethyl vinyl ether	R	29-Mar-00	QESS	G0C310244
SW8260B	NV-S3	Groundwater	2-chloroethyl vinyl ether	R	18-Apr-00	QESS	G0D200159
SW8260B	SV-S1	Groundwater	1,2-dibromo-3-chloropropane	R	29-Mar-00	QESS	G0C300256
SW8260B	SV-S1	Groundwater	2-chloroethyl vinyl ether	R	29-Mar-00	QESS	G0C300256
SW8260B	AR-12/K	Water QC Matrix	1,2-dibromo-3-chloropropane	R	30-Mar-00	QESS	G0C310244
SW8260B	AR-12/K	Water QC Matrix	2-chloroethyl vinyl ether	R	30-Mar-00	QESS	G0C310244
SW8260B	HF-6/K	Water QC Matrix	2-chloroethyl vinyl ether	R	07-Apr-00	QESS	G0D080146
SW8260B	HF-9/K	Water QC Matrix	1,2-dibromo-3-chloropropane	R	31-Mar-00	QESS	G0D010147
SW8260B	HF-9/K	Water QC Matrix	2-chloroethyl vinyl ether	R	31-Mar-00	QESS	G0D010147
SW8260B	MW-1/K	Water QC Matrix	2-chloroethyl vinyl ether	R	22-Feb-00	QESS	G0B240168
SW8260B	MW-1/K	Water QC Matrix	2-chloroethyl vinyl ether	R	23-Feb-00	QESS	G0B250230
SW8260B	MW-10/K	Water QC Matrix	1,2-dibromo-3-chloropropane	R	21-Apr-00	QESS	G0D220129
SW8260B	MW-10/K	Water QC Matrix	2-butanone	R	21-Apr-00	QESS	G0D220129
SW8260B	MW-10/K	Water QC Matrix	2-chloroethyl vinyl ether	R	21-Apr-00	QESS	G0D220129
SW8260B	MW-10/K	Water QC Matrix	2-hexanone	R	21-Apr-00	QESS	G0D220129
SW8260B	MW-10/K	Water QC Matrix	4-methyl-2-pentanone	R	21-Apr-00	QESS	G0D220129
SW8260B	MW-10/K	Water QC Matrix	acetone	R	21-Apr-00	QESS	G0D220129
SW8260B	MW-12/K	Water QC Matrix	1,2-dibromo-3-chloropropane	R	21-Apr-00	QESS	G0D220129
SW8260B	MW-12/K	Water QC Matrix	2-chloroethyl vinyl ether	R	21-Apr-00	QESS	G0D220129
SW8260B	MW-13/K	Water QC Matrix	1,2-dibromo-3-chloropropane	R	29-Mar-00	QESS	G0C300256
SW8260B	MW-13/K	Water QC Matrix	2-chloroethyl vinyl ether	R	29-Mar-00	QESS	G0C300256
SW8260B	MW-15/K	Water QC Matrix	1,2-dibromo-3-chloropropane	R	30-Mar-00	QESS	G0C310244
SW8260B	MW-15/K	Water QC Matrix	2-chloroethyl vinyl ether	R	30-Mar-00	QESS	G0C310244

**Table 3.7-2. Rejected Results for the Data Gaps Investigation, February - May, 2000**  
(3 of 4)

EPA Method	Sample ID	Matrix	ANALYTE	Qualifier	Sampling Date	Lab Code	SDG
SW8260B	MW-3A/K	Water QC Matrix	1,2-dibromo-3-chloropropane	R	03-Apr-00	QESS	G0D040260
SW8260B	MW-3A/K	Water QC Matrix	2-chloroethyl vinyl ether	R	03-Apr-00	QESS	G0D040260
SW8260B	MW-7/K	Water QC Matrix	2-chloroethyl vinyl ether	R	24-Feb-00	QESS	G0B260131
SW8260B	MW-9/K	Water QC Matrix	2-chloroethyl vinyl ether	R	25-Feb-00	QESS	G0B260131
SW8260B	SRC-3	Water QC Matrix	2-chloroethyl vinyl ether	R	23-Feb-00	QESS	G0B250230
SW8260B	TB-04-18-00	Water QC Matrix	2-chloroethyl vinyl ether	R	18-Apr-00	QESS	G0D200159
SW8260B	TB-04-18-00A	Water QC Matrix	2-chloroethyl vinyl ether	R	18-Apr-00	QESS	G0D200159
SW8260B	TB-04-20-00	Water QC Matrix	1,2-dibromo-3-chloropropane	R	20-Apr-00	QESS	G0D200312
SW8260B	TB-04-20-00	Water QC Matrix	2-chloroethyl vinyl ether	R	20-Apr-00	QESS	G0D200312
SW8260B	TB-04-24-00	Water QC Matrix	1,2-dibromo-3-chloropropane	R	24-Apr-00	QESS	G0D250199
SW8260B	TB-04-24-00	Water QC Matrix	2-chloroethyl vinyl ether	R	24-Apr-00	QESS	G0D250199
SW8260B	TB032900	Water QC Matrix	1,2-dibromo-3-chloropropane	R	29-Mar-00	QESS	G0C300256
SW8260B	TB032900	Water QC Matrix	2-chloroethyl vinyl ether	R	29-Mar-00	QESS	G0C300256
SW8260B	TB032900B	Water QC Matrix	1,2-dibromo-3-chloropropane	R	29-Mar-00	QESS	G0C300256
SW8260B	TB032900B	Water QC Matrix	2-chloroethyl vinyl ether	R	29-Mar-00	QESS	G0C300256
SW8260B	TB033000B	Water QC Matrix	1,2-dibromo-3-chloropropane	R	30-Mar-00	QESS	G0C310244
SW8260B	TB033000B	Water QC Matrix	2-chloroethyl vinyl ether	R	30-Mar-00	QESS	G0C310244
SW8260B	TB033000C	Water QC Matrix	1,2-dibromo-3-chloropropane	R	30-Mar-00	QESS	G0C310244
SW8260B	TB033000C	Water QC Matrix	2-chloroethyl vinyl ether	R	30-Mar-00	QESS	G0C310244
SW8260B	TB033100A	Water QC Matrix	1,2-dibromo-3-chloropropane	R	31-Mar-00	QESS	G0D010147
SW8260B	TB033100A	Water QC Matrix	2-chloroethyl vinyl ether	R	31-Mar-00	QESS	G0D010147
SW8260B	TB033100B	Water QC Matrix	1,2-dibromo-3-chloropropane	R	31-Mar-00	QESS	G0D010147
SW8260B	TB033100B	Water QC Matrix	2-chloroethyl vinyl ether	R	31-Mar-00	QESS	G0D010147
SW8260B	TB04-14-00	Water QC Matrix	2-chloroethyl vinyl ether	R	14-Apr-00	QESS	G0D140298
SW8260B	TB04-18-00	Water QC Matrix	2-chloroethyl vinyl ether	R	18-Apr-00	QESS	G0D180262
SW8260B	TB04-20-00	Water QC Matrix	1,2-dibromo-3-chloropropane	R	20-Apr-00	QESS	G0D220129
SW8260B	TB04-20-00	Water QC Matrix	2-chloroethyl vinyl ether	R	20-Apr-00	QESS	G0D220129
SW8260B	TB040300A	Water QC Matrix	1,2-dibromo-3-chloropropane	R	03-Apr-00	QESS	G0D040260
SW8260B	TB040300A	Water QC Matrix	2-chloroethyl vinyl ether	R	03-Apr-00	QESS	G0D040260
SW8260B	TB040500A	Water QC Matrix	1,2-dibromo-3-chloropropane	R	05-Apr-00	QESS	G0D060121
SW8260B	TB040600A	Water QC Matrix	1,2-dibromo-3-chloropropane	R	06-Apr-00	QESS	G0D070177
SW8260B	TB040600A	Water QC Matrix	2-chloroethyl vinyl ether	R	06-Apr-00	QESS	G0D070177
SW8260B	TB040600B	Water QC Matrix	1,2-dibromo-3-chloropropane	R	06-Apr-00	QESS	G0D070177
SW8260B	TB040600B	Water QC Matrix	2-chloroethyl vinyl ether	R	06-Apr-00	QESS	G0D070177
SW8260B	TB040600C	Water QC Matrix	1,2-dibromo-3-chloropropane	R	06-Apr-00	QESS	G0D070177
SW8260B	TB040600C	Water QC Matrix	2-chloroethyl vinyl ether	R	06-Apr-00	QESS	G0D070177
SW8260B	TB4-11-00	Water QC Matrix	1,2-dibromo-3-chloropropane	R	11-Apr-00	QESS	G0D110255
SW8260B	TB4-11-00	Water QC Matrix	2-chloroethyl vinyl ether	R	11-Apr-00	QESS	G0D110255
SW8260B	TB4-11-00	Water QC Matrix	2-chloroethyl vinyl ether	R	11-Apr-00	QESS	G0D120283
SW8260B	TB4-12-00	Water QC Matrix	2-chloroethyl vinyl ether	R	12-Apr-00	QESS	G0D130323
SW8260B	TB4-13-00	Water QC Matrix	2-chloroethyl vinyl ether	R	13-Apr-00	QESS	G0D130323
SW8260B	TRIP BLANK	Water QC Matrix	2-chloroethyl vinyl ether	R	07-Apr-00	QESS	G0D080146
SW8260B	TRIP BLANK 2-22-00	Water QC Matrix	2-chloroethyl vinyl ether	R	22-Feb-00	QESS	G0B240168
SW8260B	TRIP BLANK 2-23-00	Water QC Matrix	2-chloroethyl vinyl ether	R	23-Feb-00	QESS	G0B250230
SW8260B	TRIP BLANK 2-24-00	Water QC Matrix	2-chloroethyl vinyl ether	R	24-Feb-00	QESS	G0B250230
SW8260B	TRIP BLANK 2-25-00	Water QC Matrix	2-chloroethyl vinyl ether	R	25-Feb-00	QESS	G0B260131
SW8260B	WAT-3	Water QC Matrix	1,2-dibromo-3-chloropropane	R	06-Apr-00	QESS	G0D070177
SW8260B	WAT-3	Water QC Matrix	2-chloroethyl vinyl ether	R	06-Apr-00	QESS	G0D070177

**Table 3.7-2. Rejected Results for the Data Gaps Investigation, February - May, 2000**  
(4 of 4)

EPA Method	Sample ID	Matrix	ANALYTE	Qualifier	Sampling Date	Lab Code	SDG
SW8260B	WAT-4	Water QC Matrix	2-chloroethyl vinyl ether	R	06-Apr-00	QESS	G0D070177
SW8270C	SP1-R1/0.5	Soil	benzidine	R	20-Apr-00	QESS	G0D220129
SW8270C	SP2-R1/0.5	Soil	benzidine	R	20-Apr-00	QESS	G0D220129
SW8270C	SP2-R2/0.5	Soil	benzidine	R	20-Apr-00	QESS	G0D220129
SW8270C	SP3-R1/0.5	Soil	benzidine	R	21-Apr-00	QESS	G0D220130
SW8270C	SP3-R1/0.5	Soil	benzoic acid	R	21-Apr-00	QESS	G0D220130
SW8270C	SP3-R2/0.5	Soil	benzidine	R	21-Apr-00	QESS	G0D220130
SW8270C	SP3-R3/0.5	Soil	benzidine	R	21-Apr-00	QESS	G0D220130
SW8270C	SP3-R4/0.5	Soil	benzidine	R	21-Apr-00	QESS	G0D220130
SW8330	MW-13/4	Soil	2-amino-4,6-dinitrotoluene	R	29-Mar-00	QESS	G0C300256
SW8330	MW-13/4	Soil	4-amino-2,6-dinitrotoluene	R	29-Mar-00	QESS	G0C300256

## 4.0. QUALITY CONTROL SUMMARY REPORT FOR THE REMOVAL ACTION INVESTIGATION SAMPLING EVENT MAY - JUNE 2000

### EXECUTIVE SUMMARY

This Quality Control Summary Report (QCSR) was prepared in accordance with Section 5.8 of the Environmental Data Quality Management Program Specifications, United States Army Corps of Engineers (USACE) - Sacramento District, Draft Version 1.08 (1999) for work conducted from May 24 through June 8, 2000, at the Tourtelot Property (Project Site) in Benicia, California. Quality assurance/quality control (QA/QC) activities for field, sampling, analytical, and data management for this project were performed according to the *Removal Action Work Plan*, dated May 9, 2000 (the "RAW"), with referenced requirements specified in the *Technical Memorandum for Remedial Investigation*, dated March 2, 2000 (the "Tech Memo"), and the *Non-Ordnance and Explosives Remedial Investigation (RI)/Feasibility Study (FS) Work Plan, Tourtelot Cleanup Project, Benicia, California*, dated February 15, 2000 (the "Final Work Plan").

This QCSR discusses the quality and usability of the definitive-level analytical data for all samples collected from May 30 through June 8, 2000, for this phase of the non-ordnance and explosives remedial investigation (non-OE RI), known as the removal action investigation, and includes additional samples not included in the work plans collected at the TNT Strips at locations TNT-R6 through TNT-R15 on May 24, 2000, and TNT-R16 through TNT-R20 on June 5 through 7, 2000. The QCSR includes discussion of deviations from procedures specified in the Sampling and Analysis Plans (SAPs), Chapter 8.0 of the RAW, Chapter 2.0 of the Final Work Plan and Section 6.0 of the Tech Memo; and the Quality Assurance Project Plan, Chapter 3.0 of the Final Work Plan (QAPP), with Addendum to the Quality Assurance Project Plan, Appendix A of the Tech Memo, referred to collectively as "the QAPP." Discussions of usability of data with respect to decision-making for project objectives are based on the data quality objectives (DQOs) presented in Chapter 2.0 of the Final Work Plan.

Data review and validation were performed on the entire definitive-level data set, including evaluation of results for performance evaluation (PE) samples analyzed by the laboratories receiving the samples for this sampling event. The results indicate the definitive-level data collected for this project meet project objectives except where specified as rejected. No samples with severely impacted (rejected) data were found to be critical to the project objectives. Quality control (QC) results for each QC parameter are summarized in Section 4.4.1 of this QCSR. Data quality and completeness for each method are summarized in Sections 4.6 and 4.7. PE results demonstrated acceptable accuracy for each method, and are discussed in Section 4.4.3. The completeness goals were acceptable, and are discussed in Section 4.7.

Approximately 2.0 percent of the definitive-level data were qualified as rejected and 13.1 percent were qualified as estimated for exceeding data quality criteria which include accuracy, precision, completeness, representativeness, comparability, and sensitivity. The remaining definitive-level data met the data quality criteria.

Definitive-level laboratory analyses for nitroaromatics and nitramines (not including nitroglycerin and pentaerythritol tetranitrate [PETN]) by EPA Method SW8330 in the additional samples collected at Locations TNT-R6 through TNT-R15 and TNT-R16 through TNT-R20 were performed by Caltest Analytical Laboratory (Caltest) in Napa, California. Caltest is certified by the California Environmental Laboratories Accreditation Program (ELAP) to perform analyses by EPA Method SW8330. These samples were not specified in the RAW.

Definitive-level laboratory analyses of standardized analytical methods for the RAW were performed by Severn Trent Laboratories in West Sacramento, California (STL), formerly Quanterra Environmental Services (QES), according to the methods and requirements specified in the QAPP. The methods include United States Environmental Protection Agency (EPA) Methods 300.0 for common anions (nitrate-N and nitrite-N), SW8015B for total extractable petroleum hydrocarbons (TEPH) by gas chromatography (GC), SW8081A for organochlorine pesticides by GC, SW8082 for polychlorinated biphenyls (PCBs) by GC, SW8260B for volatile organic compounds (VOCs) by gas chromatography/mass spectrometry (GC/MS), SW8270C for pentachlorophenol (PCP) by GC/MS, SW8270CWM for chloropicrin by GC/MS, SW8290 for dioxins/furans by high resolution GC/MS (HRGC/MS), SW8310 for polynuclear aromatic hydrocarbons (PAHs) by high performance liquid chromatography (HPLC), SW8330 for nitroaromatics/nitramines by HPLC, and modified SW8330M for nitroglycerin/PETN by HPLC. QES is certified by the California Environmental Laboratories Accreditation Program (ELAP) and the USACE to perform the analyses included in the scope of work for this site. Note that QES was acquired by STL in February of 2000. All references to Severn Trent Laboratories in this report will be to QES/STL.

Special analytical services for the analysis of perchlorate were performed by E. S. Babcock & Sons, Inc. (Babcock) of Riverside, California according to the proprietary modification of the California Department of Health Services (CADHS) Sanitation and Radiation Laboratories Branch (SRLB) modification of EPA Method 300.0 (CADHS 300.0M). The method was updated to meet the requirements of the newly promulgated EPA Method 314.0 for the analysis of perchlorate during the course of this investigation. Definitive-level laboratory analyses for special analytical services were performed according to the methods and requirements specified in the QAPP.

All analyses were performed according to the requirements for these methods in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA SW-846, Third Edition, Third Update, December 1996), *Methods for Chemical Analysis of Water and Wastes*, EPA Manual 600/4-79-020 (EPA, 1983 with additions), or modifications to the specified methods presented in the QAPP. The testing methods used, parameters and analytes reported, and practical quantitation limits (PQLs) required for the analytical program are listed in Table 3.1-1 of the QAPP. Holding time and sample container and preservation requirements are specified in Table 3.1-2 of the QAPP. QA/QC requirements, control limits, and corrective actions are specified in Tables 3.2-1 through 3.2-5 of the QAPP. Data validation flagging conventions are specified in Table 3.4-1 of the QAPP.

Approximately 90 percent of the definitive-level analytical data were provided by the project laboratories in EPA Level III format. This included the case narratives, completed chain-of-custody (COC) documentation, laboratory analysis results reporting forms, and QC summary forms. Greater than 10 percent of the definitive-level analytical data provided by QES/STL and all of the definitive-level data for special analytical services were reported in EPA Level IV format, which included the raw data generated from each analytical method performed in addition to the information provided under Level III format. Raw data consists of sample preparation sheets, instrument run logs, calibration data, chromatograms, mass spectra, calculation sheets, and instrument generated quantitation reports and printouts.

Data validation was performed by Laboratory Data Consultants (LDC) of Carlsbad, California. The QC summary tables and discussions of the QC results are based upon the tables and findings presented in the LDC data validation reports (DVRs), with further review by Earth Tech chemists in San Jose, California. All data qualifiers reported in the results tables presented in Tables 5-1 through 5-24E of the Remedial Investigation/Field Study (RI/FS) are a result of this third party validation and Earth Tech review. Complete data packages from the analytical laboratories and LDC DVRs have been submitted to the California Department of Toxic Substances Control (DTSC) and USACE Sacramento District for technical review.

## 4.1 PROJECT SCOPE

The overall objective of non-OE RI was to evaluate the nature and extent of chemicals of potential concern (excluding OE) which may have impacted either the soil, sediment, surface, and/or groundwater as a result of Department of Defense (DOD)-related activities at the Project Site so appropriate remedial action alternatives could be fully evaluated in the FS; the ultimate goal being to remediate the Project Site to levels acceptable for residential land use.

Non-OE RI data collection was achieved during four phases of field work conducted between May 1999 and August 2000. The four phases of field work are identified in this document as follows: the interim investigation; the remedial investigation; the data gaps 1, 2, and 3 investigations; and, the removal action investigation. Collectively, these investigations are referred to as the non-OE RI. This QCSR summarizes the chemical data quality of the sample analyses performed for the RAW investigation conducted from May 30 through June 8, 2000.

The data for the following additional samples not included in the RAW are included in this QCSR. Ten replicate pairs of soil samples were collected at the surface at locations TNT-R6 through TNT-R15 on May 24, 2000, with pairs of collocated field replicate samples sent to Caltest for analysis of explosives by SW8330. The complete sample volume from the sleeve for one sample for each collocated pair (labeled with the "A" suffix) was thoroughly homogenized according to Section 4.0 of the Addendum to the QAPP prior to removal of the sample aliquot for extraction, and the replicate sample (labeled with the "B" suffix) was not. The aliquot for extraction was then homogenized further according to the method. Samples from five boreholes were collected at four foot intervals on June 5 through 7, 2000 and sent to Caltest for analysis of explosives by SW8330.

A complete list of the samples and analyses performed is presented in Table 4.1-1.

Detailed descriptions of the scope of work associated with each phase of field work are presented in Sections 4.2.1, 4.2.2, 4.2.3, and 4.2.4 and summarized in Tables 4-4, 4-5, 4-6, and 4-7 of the RI/FS.

## 4.2 PROJECT DESCRIPTION

A detailed description of the Project Site, including environmental setting, regional geology and hydrogeology/hydrology, and site history is presented in Chapter 2.0 of the RI/FS.

## 4.3 SAMPLING PROCEDURES

With the exception of the interim investigation, all field investigation activities were conducted in accordance with the protocols and procedures presented in Chapter 2.0 of the Final Work Plan, Section 6.0 of the Tech Memo and Chapter 8.0 of the RAW, as described in Appendix C of the RI/FS. It should be noted that the interim investigation was conducted prior to the development of a formal work plan; however, samples collected during the interim investigation were collected in accordance with industry standard protocols and procedures as described in Appendix C. This QCSR summarizes the chemical data quality for the removal action investigation conducted May 24 through June 8, 2000.

Protocols and procedures used for the collection of samples during the non-OE RI are described in the following sections of Appendix C:

Soil and bedrock sample collection, including discrete sampling and continuous coring: see Section C.6.1

Groundwater sample collection, including purging and sample withdrawal: see Section C.8.4

Sediment, surface water and seep sample collection: see Section C.9

Stockpile sample collection: see Section C.10

Sample handling and shipment, including sample sealing, sample identification, sample labeling, and sample packaging and shipment: see Section C.15.

Samples were taken as specified in the RAW, as presented in Table 4.3-1. Deviations from the sampling plan are presented in the table and are discussed individually in Section 4.7.1 of this QCSR and in the sections of the RI/FS for each site. Note that the samples collected at locations TNT-R6 through TNT-R15 and TNT-R16 through TNT-R20 that were analyzed for explosives by SW8330 were not part of the sampling plan, are therefore not included in Table 4.3-1, and have not been included in the field completeness calculations for the RAW investigation. Field completeness with respect to the sampling plan was 99 percent.

#### **4.4 QUALITY CONTROL ACTIVITIES**

QA/QC activities were performed as specified in the FSP and QAPP, and are summarized in the following sections.

##### **4.4.1 Laboratory Quality Control: Data Validation Assessment**

Data validation is a systematic and independent process of reviewing and qualifying the definitive-level analytical data presented against an established set of criteria. Validation is performed to ensure the quality of the definitive-level data collected and to assess limitations on usability based on the accuracy, precision, completeness, representativeness, comparability, and sensitivity parameters defined in the QAPP, as well as to evaluate laboratory compliance with specified methods and protocols.

Laboratory QC was evaluated in the data validation process. The definitive-level analytical data for all samples collected at the project site during the removal action investigation sampling event were validated according to the QC requirements and control limits specified in the QAPP, consistent with guidelines and procedures outlined in the *EPA Contract Laboratory Program National Functional Guidelines For Organic Data Review* (EPA-540/R-94/012, February 1994) and *National Functional Guidelines For Inorganic Data Review* (EPA-540/R-94-013, February 1994), referred to collectively as the "Functional Guidelines." The reviewer's professional judgment was used to evaluate data quality when called for in the Functional Guidelines and in instances with no clear policy or conflicting guidance on how the data should be qualified.

The data validation process was performed by Laboratory Data Consultants (LDC) in Carlsbad, California. The data were validated at EPA Level IV for a minimum of 10 percent of the samples for each matrix for each method for the non-OE RI as a whole. The remainder were validated at Level III. LDC data validation project summaries which specify the levels of validation are presented in Attachment 1. Validated results with data validation qualifiers are presented in Tables 5-1 through 5-24E of the RI/FS.

The results of the data validation are summarized and discussed for each QC parameter in the following subsections. Summary tables presenting validation qualifications and findings presented in Tables 4.4-1 through 4.4-11 and 4.4-13 were compiled from the LDC DVRs with further review by the Earth Tech project chemist. Only QC outliers were included. Notes and highlights were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation.

Whenever QC criteria were exceeded, re-extractions and/or reanalyses were performed as required in the QAPP unless otherwise specified in the subsections for each QC parameter, and both sets of data were reported by the laboratory and validated by the validators. The data which most closely met the QAPP requirements and DQOs were selected by the validators and reviewed by the project chemist, and used for project reporting and decision-making purposes. All data qualified but not used for reporting purposes are included in the QC summary tables with a "Not Used" designation and were not included in completeness calculations. LDC findings in the QC summary tables based upon technical validation criteria are indicated in the tables with an "A" and findings related to a protocol/contractual deviation are indicated with a "P."

Qualifiers were assigned by the reviewer to all definitive-level data which failed to meet specified analytical and quality control criteria. Data qualified as "R" are rejected and considered unusable. Data qualified with the "J" qualifier are considered estimated and usable as assessed in validation for decision-making purposes. "J+" indicates the possibility that the result may be biased high, and that the actual chemical level may be lower than the reported result. "J-" indicates the possibility that the result may be biased low, and that the actual chemical level may be higher than the reported result or detection limit reported for a non-detected result. The "U" qualifier indicates that the result is non-detected at or above the reporting limit specified, and is applied to all non-detected results.

#### **4.4.1.1 CHAIN-OF-CUSTODY, SAMPLE PRESERVATION, AND HOLDING TIMES**

The quality of the analytical data collected is highly dependent on the integrity of the samples from site collection to laboratory receipt and eventual analysis. The COC records are an integral link in the legal documentation intended to ensure this integrity. Review of the completed COC records includes all entries for custody signatures and dates, sample description, sample collection times and dates, sample container types and preservatives, analyses requested, and condition of the sample containers upon receipt at the laboratory. COC records were properly signed and dated.

Samples were collected in appropriate containers with correct preservatives. The COCs were reviewed for documentation of cooler temperatures. The sample coolers and containers used in this project were received cold (2 to 6 degrees Celsius), sealed, and intact by Babcock, Caltest, and QES/STL, with the exceptions presented in Table 4.4-1 and discussed in the sub-sections for each method, below. One cooler with one equipment blank for several analyses was received at 21°C. The associated non-detected results were qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected. The temperature measured in another cooler received at the laboratory with four soils samples for SW8260B was recorded at 13°C, with a temperature blank measured at 10°C. The associated data were qualified as estimated (J-UJ).

Technical holding times are the maximum allowable times between sample collection and sample preparation or extraction (if applicable), and analysis. Technical holding time criteria are derived from requirements specified for the analytical methods used, and are specified for both aqueous and solid samples in Table 3.1-2 of the QAPP.

Holding times were evaluated by comparing the sample collection dates on the COC forms with the sample preparation, extraction, and analysis dates shown on the laboratory summary reports, extraction logs, or analysis run logs. When holding times were exceeded, all detected results were qualified as estimated (J or J-). When holding times were exceeded by two times or less, all non-detected results were qualified as estimated (UJ). When holding times were grossly exceeded (factor of two or more), all non-detected results were qualified as rejected (R).

All technical holding time requirements were met, with the exceptions presented in Table 4.4-1.

The results for nitrite-N in two samples were rejected and approximately 2.1 percent of the data were qualified as estimated (J/UJ) due to exceeded holding times, mostly for nitrate-N and nitrite-N and for reanalyses of samples due to QC requirements. An additional 4.5 percent of the data were estimated due to the receipt of the four soil samples and an equipment blank at 13°C for SW8260B analysis, and 1.7 percent of the data were rejected due to the receipt of one equipment blank at 23°C for analysis by seven methods. A summary and tables for the qualification of data by each analytical method due to holding times are presented in the following sub-sections.

#### **4.4.1.1.1 Holding Times for General Chemistry Method: EPA Method 300.0**

All technical holding time requirements were met, with the exceptions presented in Table 4.4-1A. Two results for nitrite-N were rejected (R) in soil samples, and results for nitrate-N and nitrite-N were estimated in 33 of 36 soil samples and both aqueous field samples and one of three equipment blanks due to holding time exceedance. In general, the exceedances were due to analyses less than 12 hours past the 48 hour holding time. For the estimated results for nitrate-N and nitrite-N, the potential impact of the holding time qualifications would be for nitrite-N to convert to nitrate-N, with marginal effect on the sum of the two analytes. Note that the 48-hour holding times applied to the soil samples are the result of technical criteria for waters. The effect of exceeding 48-hours for soil samples is not expected to significantly affect results. Estimated data are usable in decision-making for project objectives. Therefore, although 85 percent of the nitrate-N/nitrite-N data were estimated, the qualifications are not expected to significantly affect the project objectives.

#### **4.4.1.1.2 Holding Times for Perchlorate: Method CADHS 300.0-Mod**

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

#### **4.4.1.1.3 Holding Times for EPA Methods SW6010B (Metals), SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils)**

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

#### **4.4.1.1.4 Holding Times for EPA Method SW8015 for TEPH**

One cooler with one equipment blank was received at 21°C, as presented in Table 4.4-1B. The associated non-detected results were qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected. All technical holding time requirements were met, with the exceptions presented in Table 4.4-1C. Two detected results reported as unknown hydrocarbons used for reporting purposes were qualified as estimated (J-) due to holding time exceedance. All other results presented in Table 4.4-1C as qualified due to holding times were not used for reporting purposes. The small number of qualified results do not adversely affect project objectives.

#### **4.4.1.1.5 Holding Times for EPA Method SW8081A for Pesticides**

One cooler with one equipment blank was received at 21°C, as presented in Table 4.4-1D. The associated non-detected results were qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected.

All technical holding time requirements were met, with the exceptions presented in Table 4.4-1E. The original analyses were used for reporting purposes, so the affected results for the reanalyses were not used. No field sample data used for reporting purposes were qualified due to holding time requirements.

#### **4.4.1.1.6 Holding Times for EPA Method SW8082 for PCBs**

One cooler with one equipment blank was received at 21°C, as presented in Table 4.4-1F. The associated non-detected results were qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected. In addition, PCBs are extremely stable and are not likely to dissipate due to storage at the reported temperature, so the non-detected results may be considered to indicate that PCBs are not present in this blank.

All technical holding time requirements were met, with the exceptions presented in Table 4.4-1G. The samples were initially analyzed within the holding time, but required re-extraction and reanalysis due to QC failure (see MS/MSD and LCS comments below). The QC for the reanalyses were acceptable. All results in the original and reanalyses were non-detected. Due to the stability of PCBs in preserved samples, the exceeded holding times do not adversely affect project objectives.

#### **4.4.1.1.7 Holding Times for EPA Method SW8260B for VOCs**

One cooler with one equipment blank was received at 21°C, as presented in Table 4.4-1H. The associated non-detected results were qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected. The temperature measured in another cooler received at the laboratory with four soils samples for SW8260B was recorded at 13°C, with a temperature blank measured at 10°C. The associated data were qualified as estimated (J-/UJ). Estimated data are usable in decision-making for project objectives. The effect on the project objectives is not expected to be significant.

All technical holding time requirements were met, with the exception presented in Table 4.4-1I. The original analysis for this sample was used for reporting purposes, so the affected results for the reanalysis were not used. No field sample data used for reporting purposes were qualified due to holding time requirements.

#### **4.4.1.1.8 Holding Times for EPA Method SW8270C for Pentachlorophenol**

All technical holding time requirements were met, with the exception presented in Table 4.4-1J. The result for pentachlorophenol (PCP) in one water sample was qualified as estimated (UJ) as the extraction exceeded the holding time by one day. The effect on the quality of the data is not expected to be significant.

#### **4.4.1.1.9 Holding Times for Modified Method SW8270CWM for Chloropicrin**

One cooler with one equipment blank was received at 21°C, as presented in Table 4.4-1K. The associated non-detected result was qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected.

All technical holding time requirements were met. No data were qualified due to holding time requirements.

#### **4.4.1.1.10 Holding Times for EPA Method SW8290 for Dioxins/Furans**

One cooler with one equipment blank was received at 21°C, as presented in Table 4.4-1L. The associated non-detected results were qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected.

All technical holding time requirements were met. No data were qualified due to holding time requirements.

#### **4.4.1.1.11 Holding Times for EPA Method SW8310 for PAHs**

One cooler with one equipment blank was received at 21°C, as presented in Table 4.4-1M. The associated non-detected results were qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected.

All technical holding time requirements were met, with the exceptions presented in Table 4.4-1N. The original analyses were used for reporting purposes, so the affected results for the reanalyses were not used. No field sample data used for reporting purposes were qualified due to holding time or preservation requirements.

#### **4.4.1.1.12 Holding Times for EPA Method SW8330 for Explosives**

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

#### **4.4.1.1.13 Holding Times for EPA Method SW8330M for PETN and Nitroglycerin**

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

#### **4.4.1.2 INSTRUMENT PERFORMANCE CRITERIA**

In order to ensure the validity of data generated, several analytical methods specify instrument performance criteria that must be met before sample analysis can proceed. These methods are the gas GC/MS analyses of VOCs by EPA Method SW8260B and SVOCs by EPA Method SW8270C, and the high resolution GC/MS (HRGC/MS) analyses of dioxins and furans by EPA Method SW8290.

The GC/MS performance checks are performed to ensure acceptable mass resolution, correct identification and relative abundance of ions, and acceptable instrument sensitivity. Footnotes a, b, and c of Table 3.2-5 of the QAPP show the instrument performance criteria for EPA Methods SW8260B, SW8270C, and SW8290, respectively. For each analytical method, conformance is demonstrated by analyzing a standard material and meeting specified criteria. Failure to meet the GC/MS instrument performance criteria results in the qualification of the data as either estimated (J/UJ) or rejected and considered unusable (R), depending on the severity of the problem.

Conformance with the instrument performance criteria was verified by reviewing the appropriate quality assurance summary forms. One sample was found to have been analyzed 16 minutes past the 12-hour frequency requirement for GC/MS performance checks, with no effect on the quality of the data. There were no data qualified as estimated due to GC/MS instrument performance results for EPA Methods SW8260B, SW8270C, and SW8290.

#### **4.4.1.3 CALIBRATION**

Calibration criteria ensure that the analytical instruments are capable of producing accurate and reproducible data. The QAPP specifies the calibration procedures that must be followed, the calibration frequency requirements, and the acceptance criteria that must be met to demonstrate satisfactory conformance based on requirements in the methods and other guidance documents. Table 3.1-5 of the QAPP summarizes the calibration procedures and criteria used by the laboratories.

For both organic and inorganic analyses, the initial calibration demonstrates that the system is capable of producing acceptable data at the beginning of the analytical sequence utilizing linear response with an

acceptable correlation coefficient ( $r$ ) or non-linear coefficient of determination ( $r^2$ ) for the calibration curve. For GC/MS and HRGC/MS analyses, review of the initial calibration also includes evaluation of the response factor (RF), percent relative standard deviation (%RSD) of the RFs, and retention times for each analyte in the target list.

When the initial calibration correlation coefficient or the %RSD was not within control limits for an analyte or compound, associated results were qualified as estimated (J/UJ). If the correlation coefficient or the %RSD was grossly outside of control limits ( $r$  less than 0.990,  $r^2$  less than 0.980, or RSD greater than two times the control limit), or if the RF did not meet the minimum criterion of 0.05 specified in Table 3.4-1 of the QAPP, associated non-detected results were qualified as rejected (R). Note that compounds with RFs between 0.01 and 0.05 are considered usable by EPA, and that if the detection limits are raised for these compounds such that the lowest standard used has an absolute response that demonstrates acceptable ability to determine detection at that level, the results should be estimated (UJ) not rejected (R), with the following exception. Compounds with RFs between 0.01 and 0.05 are considered usable by EPA, and non-detected results are estimated (UJ) according to the Functional Guidelines and EPA Region IX data validation protocols instead of rejected (R). For compounds with detection limits raised such that the lowest standard used has an absolute response that demonstrates acceptable sensitivity at the reported PQL, non-detected results were qualified as estimated (UJ) not rejected (R). For the data set included in this QCSR, this exception applies to non-detected compounds with RFs between 0.01 and 0.05. The calibrations for these data demonstrate acceptable instrument response at the reported PQLs, and are defensible and usable for decision-making purposes. Therefore, the DQOs are not adversely affected by the use of this data.

Initial calibration verification (ICV) samples for inorganic methods and continuing calibration verification (CCV) standards for all methods are performed by analyzing standards of known concentration at the frequency specified for each analytical method used. Acceptable recoveries of the ICV and CCVs indicate conformance with the analytical requirements. For GC/MS analyses, continuing calibration review includes the evaluation of the RF and the percent difference (%D) between the RF of the continuing calibration standard and the average RF of the initial calibration curve, or the percent drift (also referred to as %D) between the true and reported concentrations of the CCV. Results associated with ICVs or CCVs outside of specified control limits were qualified as estimated (J/UJ) if marginally outside of QC limits, or qualified as rejected (R) if non-detected and grossly outside of QC limits (greater than two times the control limit), according to EPA guidelines.

Approximately 1.7 percent of the data were qualified as estimated (J/UJ) due to calibration problems. No data were rejected. A summary and tables for the qualification of data by each analytical method due to calibration criteria are presented in the following sub-sections.

#### **4.4.1.3.1 Calibration for General Chemistry Method: EPA Method 300.0 (Anions)**

Initial calibrations for EPA Method 300.0 were performed according to method requirements. All correlation coefficients ( $r$ ) exceeded the 0.995 criterion, and all percent recoveries (%R) for the ICVs and CCVs met the 90-110 %R criteria.

#### **4.4.1.3.2 Calibration for Perchlorate: Method CADHS 300.0-Mod**

Initial calibrations were performed according to method requirements, with the exceptions presented in Table 4.4-2A. Section 3.2.7.2 of the QAPP specifies the use of a minimum of three calibration standards and a blank to establish the calibration curve for all ion chromatography methods. Table 3.2-5 specifies a minimum of three calibration standards. The laboratory used five calibration standards and a blank for most of the analyses; however, for the two equipment blanks in Table 4.4-2A, the blank was not included in the

calibration curve. This was because the laboratory began using EPA Method 314.0, newly promulgated in December of 1999. Method 314.0 does not specify the use of a blank in the initial calibration. The laboratory was contacted during the sampling event, and the use of the blank in the initial calibration was resumed for this project. The calibrations were compliant with EPA Method 314.0 and there is no effect on the quality of the data.

All correlation coefficients ( $r$ ) exceeded the 0.995 criterion, and all %Rs for the ICVs and CCVs met the 90-110%R criteria.

#### **4.4.1.3.3 Calibration for EPA Methods SW6010B (Metals), SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils)**

Initial calibrations for EPA Method SW6010B were performed according to method requirements. All %RSDs met the less than 5 percent criteria, and all %Rs for the ICVs and CCVs met the 90-110%R criteria.

Initial calibrations for EPA Methods SW7470A for waters and SW7471A for soils were performed according to method requirements. All correlation coefficients ( $r$ ) exceeded the 0.995 criterion, and all %Rs for the ICVs and CCVs met the 80-120%R criteria.

#### **4.4.1.3.4 Calibration for EPA Method SW8015 for TEPH**

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less-than or equal-to 20%RSD or correlation coefficient greater than or equal to 0.995 criteria, and all %Ds for the CCVs met the  $\pm 15\%$ D criterion.

#### **4.4.1.3.5 Calibration for EPA Method SW8081A for Pesticides**

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less-than or equal-to 20%RSD or correlation coefficient greater than or equal to 0.995 criteria, and all %Ds for the CCVs met the  $\pm 15\%$ D criterion, with the exceptions presented in Table 4.4-2B.

Data qualification for continuing calibrations resulted in the estimation (UJ) of non-detected results for two compounds in one of the 34 soil samples analyzed by this method and three compounds in 10 soil samples (approximately 3.9 percent of the pesticides data). No data were rejected. Estimated data are usable in decision-making for project objectives. The small number of estimated results does not affect the project objectives.

#### **4.4.1.3.6 Calibration for EPA Method SW8082 for PCBs**

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less-than or equal-to 20%RSD or correlation coefficient greater than or equal to 0.995 criteria, and all %Ds for the CCVs met the  $\pm 15\%$ D criterion.

#### **4.4.1.3.7 Calibration for EPA Method SW8260B for VOCs**

Initial calibrations were performed according to method requirements using required standard concentrations. A curve fit, based on the initial calibration, was established for quantitation for selected compounds. Average relative response factors (RRF) for all volatile target compounds and system monitoring compounds were within validation criteria. Percent RSDs for RRFs were less-than or equal-to 30.0 percent, or for selected compounds the coefficient of determination ( $r^2$ ) was greater than or equal to

0.990, with the exceptions noted in Table 4.4-2C. Average RRFs were within validation criteria, with the exceptions noted in Table 4.4-2D.

Continuing calibration was performed at the required frequencies. All of the continuing calibration %Ds between the initial calibration RRF and the continuing calibration RRF were less-than or equal-to 25.0 percent, with the exceptions noted in Table 4.4-2E. All of the continuing calibration RRF values were within validation criteria, with the exceptions noted in Table 4.4-2F.

Initial and continuing calibration was not performed for 2-chloroethylvinyl ether in any of the soils samples. The SW8260B analyses were not able to be performed within the 48 hour holding time for unpreserved samples, and the methanol preservation performed according to preparation method SW5035 destroyed this compound. Therefore, there were no recoveries for any QC analysis of this compound and the initial and continuing calibrations were not reported. For reporting purposes, the results for 2-chloroethylvinyl ether in all of the soils samples have been qualified as rejected (R) and unusable wherever they are reported. As 2-chloroethylvinyl ether is not a contaminant of concern at the project site, and as the method destroys the compound such that it cannot be reported, there is no effect on the project objectives. The data qualified as rejected for this compound were not counted in the completeness evaluation. No other data were rejected for calibrations.

Data qualification for initial calibrations resulted in the estimation (J/UJ) of results for acetone in two equipment blanks and two trip blanks, for vinyl acetate in one trip blank, and for acetone and 2-butanone in nine soil samples for %RSDs above 30 percent. Results for acetone and 2-butanone were estimated in two water samples, three equipment blanks, and five trip blanks; 2-chloroethylvinyl ether in one equipment blank and three trip blanks; 4-methyl-2-pentanone in one equipment blank and two trip blanks; and acetone in two soil samples due to RRFs less than 0.05 but greater than 0.01.

Data qualification for continuing calibrations resulted in the estimation (J/UJ) of one-to-three compounds in 26 of the 34 soil samples and one compound in one equipment blank and two trip blanks. Results were qualified as estimated (J/UJ) for the same compounds in the same samples as in the initial calibrations due to low RRFs in the continuing calibrations.

Approximately 3.0 percent of the SW8260B results were qualified as estimated due to exceeded calibration criteria, which is within normal parameters for this method. With the exception of 2-chloroethylvinylether in soils, the VOC data are usable in decision-making for project objectives. 2-Chloroethylvinyl ether is not a chemical of potential concern for this project. Estimated data are usable for decision-making purposes. The small number of estimated results does not significantly affect the project objectives.

#### **4.4.1.3.8 Calibration for EPA Method SW8270C for Pentachlorophenol**

Initial calibrations were performed according to method requirements. All %RSDs for the RRFs met the less-than or equal-to 20%RSD or correlation coefficient greater than or equal to 0.995 criteria, and all %Ds for the CCVs met the  $\pm 15\%$ D criterion.

#### **4.4.1.3.9 Calibration for Modified Method SW8270CWM for Chloropicrin**

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less-than or equal-to 20%RSD or correlation coefficient greater than or equal to 0.995 criteria, and all %Ds for the CCVs met the  $\pm 15\%$ D criterion.

#### **4.4.1.3.10 Calibration for EPA Method SW8290 for Dioxins/Furans**

Initial calibrations were performed with a five point initial calibration according to method requirements. All %RSDs for the RFs were less-than or equal-to 20.0 percent for unlabeled compounds (natives) and less-than or equal-to 30.0 percent for labeled compounds (internal standards). Signal-to-noise requirements and ion abundance ratios for all polychlorinated-dibenzodioxins (PCDDs) and polychlorinated-dibenzofurans (PCDFs) were within validation criteria.

Routine (continuing) calibration was performed at the required frequencies. All of the routine calibration %Ds between the initial calibration RF and the routine calibration RF were less-than or equal-to 20.0 percent for unlabeled compounds and less-than or equal-to 30.0 percent signal-to-noise, with the exceptions presented in Table 4.4-2G. The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

The 20.2%D between the initial calibration RF and the routine calibration RF internal standard for octachlorodibenzofuran (OCDF) marginally exceeded the 20%D control limit. The detected results for OCDF in two soil samples were qualified as estimated (J+). The effect on the quality of the data is not significant.

#### **4.4.1.3.11 Calibration for EPA Method SW8310 for PAHs**

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less-than or equal-to 20%RSD or correlation coefficient greater than 0.995 criteria. Calibration verification was performed at required frequencies. The percent recoveries of amounts in continuing standard mixtures were within the 85-115 percent QC limits.

#### **4.4.1.3.12 Calibration for EPA Method SW8330 for Explosives**

Initial calibrations were performed for the primary (quantitation) column and confirmation column according to method requirements. All %RSDs for the RFs met the less-than or equal-to 20%RSD or correlation coefficient greater than 0.995 criteria. Calibration verification was performed at the required frequencies. The %Ds for the CCVs met the less-than or equal-to 15%D criterion, with the exception presented in Table 4.4-2H.

The result for 4-amino-2,6-dinitrotoluene in one soil sample was qualified as estimated (UJ) due to a continuing calibration result that exceeded the control limits. The sample was not a planned sample for the RAW investigation, and the project objectives are not affected.

#### **4.4.1.3.13 Calibration for EPA Method SW8330M for PETN and Nitroglycerin**

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less-than or equal-to 20%RSD or correlation coefficient greater than 0.995 criteria, and all %Ds for the CCVs met the less-than or equal-to 15%D criterion.

#### **4.4.1.4 FIELD AND LABORATORY BLANKS**

Contamination may occur in various stages of the sample collection and laboratory analytical processes and affect the validity of the data collected. The results from the analyses of field and laboratory blanks indicate the presence and magnitude of the contamination. The blanks collected during the RAW investigation field sampling program consisted of equipment blanks and trip blanks. The QC requirements for these blanks and their frequency of collection are summarized in Table 3.2-1 of the QAPP.

Equipment blanks are used to evaluate the cleanliness of the sampling devices used and reflect the efficiency of the decontamination procedures employed in the field. They are prepared by collecting analyte-free (Type II) reagent water poured over or through the sampling device into an appropriate sample container. One set of equipment blanks was prepared for each day of soil sampling per sampling crew. For water samples collected with reusable (Teflon™) bailers, one equipment blank per day was collected. For water samples pumped through a sampling device (except for metal filtration chambers, which require a filtration blank), one equipment blank was collected per pump each day of sampling. Each set of equipment blanks was analyzed for the same parameters requested for the associated samples. Source water blanks were also analyzed for the same parameters requested for the associated samples.

Trip blanks are used to evaluate sample VOC contamination that may occur while the samples are in transit from the sampling site to the laboratory. They are prepared in the laboratory and are shipped to the sampling site where they remained unopened. Trip blanks are then returned to the laboratory with each shipment of samples requiring VOC analysis.

Source water blanks are evaluated to determine if the water used for decontamination and equipment blanks are a source of detectable concentrations of target analytes for each analytical method performed. One source water sample was collected at the beginning of this field effort for the bottled water used for decontamination and equipment blanks, at a frequency of one per vendor lot. Source water is monitored on an ongoing basis by the evaluation of equipment blanks.

Blanks used to evaluate laboratory contamination consisted of method or preparation blanks and continuing calibration blanks. Method or preparation blanks are analyte-free (Type II) reagent water prepared and analyzed in exactly the same manner as the samples. One method or preparation blank is extracted and analyzed with each analytical batch of twenty samples or less. Calibration blanks are analyte-free solutions used to evaluate the cleanliness of the analytical instruments during the analytical runs. One calibration blank is analyzed with each analytical sequence according to frequency requirements specified in Table 3.2-1 of the QAPP for the analytical method used.

Whenever blank contamination was detected, the analytical data for the associated samples were evaluated to determine if data needed to be qualified. Sample results less than five times the maximum level found in the associated blanks or ten times the level of contamination for the common laboratory contaminants methylene chloride, acetone, and common phthalate esters were qualified according to the blank qualification rules. Results for common laboratory contaminants were qualified at concentrations less than ten times the PQL even when not found in associated blanks.

Blank qualified results are considered to be non-detected (ND) at the reported level, therefore, the "U" qualifier is included with the "J" qualifier according to the blank qualification rules. If, in the data reviewer's professional judgment, a result for an analyte less than five times the level reported in an associated blank or less than ten times the PQL for a common laboratory contaminant was above the concentrations normally seen in blanks and was judged to be actually representative of the concentration of that compound in the sample, the result was blank qualified as "J" without the "U" qualifier.

Equipment blanks were qualified by the validation sub-contractor, LDC, as non-detected and estimated (UJ) according to validation protocols followed by LDC. However, according to the Functional Guidelines and EPA Region IX data validation protocols, field blanks (equipment, source-water, and trip blanks) cannot be blank-qualified according to the blank qualification rules as these samples are blanks, not environmental field samples. The results for all field blanks should be considered as detected at the reported concentrations for the purpose of evaluating potential field contamination.

Results for 2-butanone (methyl ethyl ketone [MEK]), generally considered to be a common laboratory contaminant according to EPA Region IX data validation guidelines, have not been blank-qualified for common laboratory contamination by the validators for this project. MEK was reported in one method blank, and results for MEK were blank-qualified (UJ) in the associated samples. Although not qualified for common laboratory contamination, the remaining low level results for MEK in samples located throughout the site should be considered as potential laboratory artifacts due to association with MEK contamination from the pre-made Encore™ soils preservation vial caps used with the Encore™ samplers for preparation according to EPA Method SW5035. QES/STL has determined that the glue used to bind the septum to the Teflon cap may produce low levels of MEK upon heating during sample purge. This type of Encore™ preservation vial cap was used for the samples in this project.

Approximately 0.8 percent of the data were qualified due to blank contamination. Low-level results for nitrate-N by modified EPA Method 300.0 were qualified as estimated (J) due to equipment blanks (see below). Additional results were blank qualified (UJ) for cobalt and chromium in one water sample; acetone in 31 samples, MEK in seven soil samples, and methylene chloride in one soil sample by EPA Method SW8260B; and 1,3,5-trinitrobenzene in one soil sample by EPA Method SW8330. A summary and tables for the qualification of data by each analytical method due to blanks are presented in the following sub-sections. Laboratory and field contamination did not significantly affect the quality of the data.

#### **4.4.1.4.1 Blank Results for General Chemistry Method: EPA Method 300.0 (Anions)**

Method blanks were analyzed for each matrix as applicable. No contaminant concentrations were found in the method blanks. No contaminant concentrations were found in the equipment blanks, with the exceptions presented in Table 4.4-3A. Bold highlight in the table indicates that associated non-blank field sample results were qualified for this analyte. All other field sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated blanks.

No general chemistry field sample results required blank qualification due to field or laboratory blank results, with the exception of nitrate-N in 21 of 36 soil samples due to equipment blank results, as presented in Table 4.4-3B. Field sample results for nitrate-N less than 5 times the equipment blank concentration but detected at concentrations above 0.20 mg/kg have been qualified as estimated (J) instead of non-detected and estimated (UJ) using professional judgement at the request of the project chemist. Such results were not qualifiable due to levels of nitrate-N in the method blanks. The consistent levels of nitrate-N in the equipment blanks were also present in the source water, and are thus not representative of contamination from the sampling equipment. The levels of nitrate-N in the associated field samples are expected to be due to environmental nitrate, but are qualified as estimated (J) due to the levels of nitrate-N reported in the equipment blanks. Blank contamination does not affect the project objectives for this analytical method as no results were qualified as non-detected at the reported concentrations.

#### **4.4.1.4.2 Blank Results for Perchlorate: Method CADHS 300.0-Mod**

No contaminant concentrations were found above the reporting limit in the initial, continuing, preparation, and equipment blanks for this method.

#### **4.4.1.4.3 Blank Results for EPA Methods SW6010B (Metals), SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils)**

Data qualification by the initial, continuing and preparation blanks (ICB/CCB/PBs) was based on the maximum contaminant concentration in the ICB/CCB/PBs in the analysis of each analyte. No contaminant concentrations were found above the reporting limit in the initial, continuing and preparation blanks, with the exceptions presented in Table 4.4-3C. No contaminant concentrations were found in the equipment and

source water blanks, with the exceptions presented in Table 4.4-3D. Bold highlight in the tables indicates that associated non-blank field sample results were blank qualified for this element. All other field sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated blanks. Samples with the prefix "EB" or the suffix "/K" were identified as equipment blanks.

Sample concentrations were compared to the maximum contaminant concentrations detected in the ICB/CCB/PBs and field blanks. Sample results qualified due to ICB/CCB contamination are specified in Table 4.4-3E. No results were qualified due to equipment blank contamination.

The result for cobalt was blank-qualified in one water sample, and the result for chromium was blank-qualified in another water sample. The affected results were all below action levels specified in the Final Work Plan for this project for metals in water. Blank contamination does not affect the project objectives for metals.

#### **4.4.1.4.4 Blank Results for EPA Method SW8015 for TEPH**

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

#### **4.4.1.4.5 Blank Results for EPA Method SW8081A for Pesticides**

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

#### **4.4.1.4.6 Blank Results for EPA Method SW8082 for PCBs**

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

#### **4.4.1.4.7 Blank Results for EPA Method SW8260B for VOCs**

Method blanks were analyzed for each matrix as applicable. No volatile contaminants were found in the method blanks, with the exceptions presented in Table 4.4-3F. No contaminant concentrations were found in the trip, equipment, and source water blanks, with the exceptions presented in Table 4.4-3G. Bold highlight in the tables indicates that associated non-blank field sample results were blank qualified for this compound. All other field sample concentrations were either not detected or were significantly greater (>5X blank contaminants, >10X for common contaminants) than the concentrations found in the associated blanks. Trip blanks were either identified as such in the sample ID, or by use of the prefix "TB." Samples were identified as equipment blanks by use of the prefix "EB." PE samples with the prefix "PE" or "WV". All other associated samples are field samples.

Sample concentrations were compared to the maximum contaminant concentrations detected in the blanks. Sample results qualified due to blank contamination are specified in Table 4.4-3H.

Approximately 1.3 percent of the VOC data were blank-qualified. Results for acetone in 28 soil samples and MEK in seven soil samples by EPA Method SW8260B were blank-qualified due to laboratory blank results. Low level results for methylene chloride in one soil sample and acetone in three soil samples were blank-qualified as common laboratory contaminants, as presented in Table 4.4-3I. No results for other VOCs were blank-qualified.

Acetone and methylene chloride are demonstrated common laboratory contaminants. Due to the prevalence of acetone in method and equipment blanks, all results for acetone, which were at low concentrations, were blank-qualified. In addition, MEK is generally considered to be a common laboratory contaminant according to EPA Region IX data validation guidelines. Results for MEK were not blank-qualified for common laboratory contamination by the validators for this project. However, QES/STL has determined that the glue used to bind the septum to the teflon caps to the Encore™ soils preservation vials used for SW5035 preparation may produce low levels of MEK upon heating during sample purge. This type of Encore™ preservation vial cap was used for the samples in this project. Method blanks were not generally placed in the Encore™ preservation vials, and equipment blanks and trip blanks did not undergo SW5035 preparation, so MEK detections would not be expected in these blanks, even if laboratory contamination were affecting project samples. Therefore, the unqualified low level results reported for MEK should be considered as potential laboratory artifacts. These MEK results were significantly lower (5 orders of magnitude) than the action level specified in the DQOs.

The reported concentrations of the blank-qualified compounds for SW8260B were all significantly lower (2-6 orders of magnitude) than the action levels specified in the DQOs. Blank contamination does not affect the quality of the data for this analytical method.

#### **4.4.1.4.8 Blank Results for EPA Method SW8270C for Pentachlorophenol**

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

#### **4.4.1.4.9 Blank Results for Modified Method SW8270CWM for Chloropicrin**

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

#### **4.4.1.4.10 Blank Results for EPA Method SW8290 for Dioxins/Furans**

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

#### **4.4.1.4.11 Blank Results for EPA Method SW8310 for PAHs**

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method, with the exceptions presented in Table 4.4-3J.

The sample concentrations were non-detected or significantly greater (>5X blank contaminants) than the concentrations found in the associated method blank, with the exceptions presented in Table 4.4-3K. The sample specified in Table 4.4-3K was reanalyzed as required due to the blank contamination. The compounds were not detected in the reanalysis, which was used for reporting purposes. No data were qualified, and there is no effect on the quality of the data.

#### **4.4.1.4.12 Blank Results for EPA Method SW8330 for Explosives**

No contaminant concentrations were found above the reporting limit in the laboratory preparation blanks for this method. No contaminant concentrations were found above the reporting limit in the equipment blanks for this method, with the exception presented in Table 4.4-3L.

Sample concentrations were non-detected or significantly greater (>5X blank contaminants) than the concentration found in the associated equipment blank, with the exception presented in Table 4.4-3M. The

trace result for 1,3,5-trinitrobenzene in one water sample was blank-qualified. The effect on the project objectives is not significant.

#### **4.4.1.4.13 Blank Results for EPA Method SW8330M for PETN and Nitroglycerin**

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

#### **4.4.1.5 SYSTEM MONITORING COMPOUNDS (SURROGATES)**

Surrogate standards are used in most organic analyses to help evaluate the accuracy of the data collected. Surrogates are compounds that are not included in the target analyte list and are not expected to be present in environmental samples. A known concentration of the surrogate compound is added to all standards, blanks, and samples (including field and laboratory QC samples) before preparation and analysis, and the recovery of the compound is compared to control limits specified in the QAPP for each organic method to evaluate the performance of the analytical system and determine if there is any matrix interference affecting the method performance. The surrogate compounds and acceptance criteria for each method and matrix are shown in Table 3.2-4 of the QAPP. Samples with unacceptable surrogate recoveries were reanalyzed, and if the results of the reanalysis were still outside the limits, the problem was attributed to matrix effects if acceptable surrogate recoveries were obtained in the method blank and laboratory control sample (LCS) analyses.

If surrogate recoveries did not meet the specified criteria, the data were qualified as follows. Non-detected results for samples with surrogate recoveries less than 10 percent were qualified as rejected (R) and detected results for samples with surrogate recoveries less than 10 percent were qualified as estimated (J-). Results for samples with surrogate recoveries less than the lower control limit (LCL) but greater than 10 percent were qualified as estimated (J/UJ) and detected results for samples with surrogate recoveries greater than the upper control limit (UCL) were qualified as (J+).

Approximately 2.1 percent of the data were qualified as estimated due to surrogate recoveries outside of specified control limits. No data were rejected. Results for all target compounds in twelve samples for TEPH; two equipment blanks for PCBs; one soil sample for pentachlorophenol; and two soil samples; one water sample, one PE sample, and two equipment blanks for PAHs were qualified as estimated (J-/UJ) for low surrogate recoveries. No data were rejected for surrogate recoveries. Estimated data are usable for decision-making purposes. The small number of estimations for surrogate recoveries does not significantly affect the project objectives.

A summary and the tables for the qualification of data by each analytical method due to surrogate recovery criteria are presented in the following sub-sections.

#### **4.4.1.5.1 Surrogate Recoveries for EPA Method SW8015 for TEPH**

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits, with the exceptions presented in Table 4.4-4A.

Results for TEPH in 12 of the 34 soil samples analyzed by this method (approximately 31 percent) were qualified as estimated (J-/UJ) for low surrogate recoveries. No data were rejected. All of the samples were re-extracted and reanalyzed as required, with similar low surrogate recoveries and analytical results. The results for six samples were less than 65%R but greater than 30%R, which is the lower control limit (LCL) for samples that undergo silica gel extraction cleanup (SGC). According to the laboratory, all of the soil samples underwent SGC for this method; however, the extraction log for the associated preparation batch

was missing the notation that SGC was performed. Therefore, the samples have been qualified as if SGC had not been performed. The recoveries are within the normal range for the extraction and analytical methods used. Estimated data are usable in decision-making for project objectives. The effect on the project objectives is not significant.

#### **4.4.1.5.2 Surrogate Recoveries for EPA Method SW8081A for Pesticides**

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

#### **4.4.1.5.3 Surrogate Recoveries for EPA Method SW8082 for PCBs**

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits, with the exceptions presented in Table 4.4-4B.

Results for PCBs in two equipment blanks were qualified as estimated (UJ) for low surrogate recoveries. No data were rejected. The project objectives are not affected.

#### **4.4.1.5.4 Surrogate Recoveries for EPA Method SW8260B for VOCs**

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

#### **4.4.1.5.5 Surrogate Recoveries for EPA Method SW8270C for Pentachlorophenol**

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits, with the exception presented in Table 4.4-4C.

The result for pentachlorophenol in one of 33 soil samples analyzed by this method was qualified as estimated (UJ) for a low surrogate recovery. No data were rejected. The single estimation for surrogate recovery does not significantly affect the project objectives.

#### **4.4.1.5.6 Surrogate Recoveries for EPA Method SW8310 for PAHs**

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits, with the exceptions presented in Table 4.4-4D.

Non-detected results for all target compounds in two of 34 soil samples, one of two water samples, and two of three equipment blanks were qualified as estimated (J-/UJ) for low surrogate recoveries. In addition, the detected and non-detected results for PAHs in one aqueous PE sample were qualified as estimated. All of the samples with surrogate recoveries outside of QC limits were re-extracted and reanalyzed as required, with acceptable recoveries for all except the qualified samples. Results for original analyses were confirmed in the reanalyses. For the water samples, the low recoveries indicate the possibility of slightly low bias for the reporting limits for the non-detected results. For the soils, the small number of qualifications for surrogate recoveries does not significantly affect the project objectives.

#### **4.4.1.5.7 Surrogate Recoveries for EPA Method SW8330 for Explosives**

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

#### **4.4.1.5.8 Surrogate Recoveries for EPA Method SW8330M for PETN/Nitroglycerin**

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

#### **4.4.1.6 INTERNAL STANDARDS**

For HRGC/MS analyses of dioxins/furans by EPA Method SW8290, labeled internal standards serve the dual purposes of internal standard for quantitation and system monitoring compound (surrogate). Acceptance criteria are presented in Table 3.2-4 of the QAPP. For GC/MS analyses by EPA Methods SW8260B and SW8270C, internal standard area counts were monitored to ensure that GC/MS sensitivity and response were stable during the analysis. For EPA Methods SW8260B and SW8270C the area counts of the internal standards in the sample must fall within 50 to 200 percent of the internal standard area counts in the calibration verification standard for the 12 hour tune period. In addition, the retention times of the internal standards in the sample must be within  $\pm 30$  seconds of the retention times in the calibration standard.

If internal standards did not meet the specified criteria, the data were qualified as follows. Non-detected results associated with extremely low internal standard area counts (less than 25 percent) or internal area counts abruptly dropping off indicating severe loss of sensitivity were qualified as rejected (R). Results associated with area counts not within the 50 to 200 percent control limits were qualified as estimated (J/UJ). For EPA Method SW8290, non-detected results associated with area counts less than 10 percent of the specified percent of the internal standard area for the associated CCV are qualified as rejected (R), and detected results are estimated (J). Detected and non-detected results associated with area counts not within the specified percent of the internal standard area for the associated CCV are qualified as estimated (J/UJ).

Approximately 4.0 percent of the SW8260B results and 2.6 percent of the SW8270C results were qualified as estimated (J/UJ) for internal standard problems (approximately 1.6 percent of the data). No data were qualified for SW8290 and no data were rejected. The low recoveries are attributed to matrix effects. Overall, internal standard areas did not significantly affect the quality of the data with respect to project objectives.

A summary and tables for the qualification of data by each analytical method due to internal standard areas are presented in the following sub-sections.

##### **4.4.1.6.1 Internal Standards for EPA Method SW8260B for VOCs**

All internal standard peak areas and retention times were within QC limits, with the exceptions presented in Table 4.4-5A. Results for one internal standard outside of control limits resulted in the estimation (J-/UJ) of approximately one-third of the target analytes in six of 34 soil samples. Approximately 1.6 percent of the SW8260B results were qualified as estimated (J/UJ) and no data were rejected for internal standard problems. Estimated data are usable in decision-making for project objectives. The effect on the project objectives is not significant.

##### **4.4.1.6.2 Internal Standards for EPA Method SW8270C for Pentachlorophenol**

All internal standard peak areas and retention times were within QC limits, with the exceptions presented in Table 4.4-5B. The results for one internal standard outside of control limits in one equipment blank resulted in the estimation (J-/UJ) of pentachlorophenol. No results were rejected. The project objectives are not affected.

#### **4.4.1.6.3 Internal Standards for Modified Method SW8270CWM for Chloropicrin**

All internal standard peak areas and retention times were within QC limits.

#### **4.4.1.6.4 Internal Standards for EPA Method SW8290 for Dioxins/Furans**

All internal standard peak areas and retention times were within QC limits.

#### **4.4.1.7 MATRIX SPIKE/MATRIX SPIKE DUPLICATES**

Matrix-specific accuracy was evaluated using matrix spike/matrix spike duplicate (MS/MSD) recoveries. Matrix spike samples are actual environmental samples spiked with known concentrations of analytes which are processed like regular samples. The MS/MSD recoveries are indicators of interference specific to the sample matrix. Such interference includes the possibility of instrument response suppression or enhancement due to chemical or physical interference, and digestion or extraction efficiency for the sample matrix. When MS/MSD recoveries are outside the control limits and LCS results are acceptable, matrix related interference is indicated. Acceptance criteria for MS/MSD recoveries were established for each method by matrix, and are shown in Table 3.2-2 of the QAPP.

Organic data are not generally qualified for MS/MSD results alone according to the Functional Guidelines and EPA Region IX data validation protocols. For this project, organic results were qualified in the parent QC sample for analytes with recoveries not within QC limits, as specified in the QAPP. If MS/MSD recoveries did not meet the specified criteria, the data were qualified as follows. Non-detected organic results in the QC sample were qualified as rejected (R) for MS and/or MSD percent recoveries less than 10 percent. Non-detected inorganic results associated with MS/MSD recoveries less than 30 percent were qualified as rejected (R). Non-detected results associated with MS/MSD recoveries less than the LCL but greater than 10 percent for organics or 30 percent for inorganics were qualified as estimated (UJ). Detected results associated with MS/MSD recoveries less than the LCL were qualified as estimated (J-). Detected results associated with MS/MSD recoveries greater than the UCL were qualified as estimated (J+).

Twenty-one results for antimony in soil samples were rejected (R). Approximately 1.6 percent of the data were estimated (J/UJ) due to MS/MSD results outside of QC limits. With the exception of antimony, matrix spike results do not significantly affect the quality of the data.

A summary and tables for the qualification of data by each analytical method due to MS/MSD recovery criteria are presented in the following sub-sections.

#### **4.4.1.7.1 MS and Laboratory Duplicate for General Chemistry Method: EPA Method 300.0**

MS analyses were performed for each matrix as applicable. Percent recoveries were within QC limits.

Duplicate sample analyses were performed for each matrix as applicable. Relative percent differences (RPD) were within QC limits.

#### **4.4.1.7.2 MS/MSD for Perchlorate: Method CADHS 300.0-Mod**

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

Duplicate sample analyses were performed for each matrix as applicable. RPDs were within QC limits.

**4.4.1.7.3 MS/MSD for EPA Methods SW6010B (Metals), SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils)**

MS analyses were performed according to method requirements, with the exceptions presented in Table 4.4-6A. The referenced sample is an equipment blank. MS/MSD analyses are not required for equipment blanks as they do not represent the environmental matrix. The quality of the data is not affected.

MS analyses were performed for each matrix as applicable. Percent recoveries were within QC limits, with the exceptions presented in Table 4.4-6B. Non-detected results for antimony in 21 soil samples were rejected (R) due to MS recoveries less than 30 percent. Results for antimony in 13 soil samples were estimated for potential low bias (J-/UJ); results for barium and cobalt in 13 soil samples were estimated (J-/UJ) for recoveries marginally below 75 percent; results for calcium, magnesium, and vanadium in 10 soil samples, chromium in 23 samples, arsenic in 13 soil samples; and aluminum and iron in two water samples were estimated (J+) for recoveries greater than 125 percent. One equipment blank result for iron was estimated (J+); however, equipment blanks are not an environmental matrix and should not be estimated for MS criteria.

Analyses for 34 soil samples, two water samples, and three equipment blanks were performed by this method. The approximately 2.2 percent of the metals data that were rejected and 11.4 percent of the metals data that were estimated for matrix effects due to MS recoveries is within normal parameters for these methods. Severe matrix interference for antimony in soils is indicated for this method. Results and detection limits for antimony are considered to be biased low. With the exception of the rejected results for antimony, the effect of the data qualifications on the project objectives is not expected to be significant.

Duplicate sample analyses were performed for each matrix as applicable. RPDs were within QC limits, with the exceptions presented in Table 4.4-8 (refer to Section 4.4.1.9.1, below).

**4.4.1.7.4 MS/MSD for EPA Method SW8015 for TEPH**

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

**4.4.1.7.5 MS/MSD for EPA Method SW8081A for Pesticides**

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

**4.4.1.7.6 MS/MSD for EPA Method SW8082 for PCBs**

MS/MSD analyses were performed according to method requirements. The comment in LDC DVR 4962A3b presented in Table 4.4-6C is not applicable to any reported results. The specified samples were initially analyzed on 6/22-23/00; however, the SW8081A spiking solution was used for the LCS/LCSD and MS/MSD instead of the SW8082 spiking solution. The samples were re-extracted and reanalyzed with an LCS/LCSD and MS/MSD on 6/26/00. All QC results were acceptable for the reanalyses, and the results from the reanalyses, although qualified as estimated for exceeded holding times, were reported. All results were non-detected for both sets of analyses. There is no effect on the project objectives.

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

#### **4.4.1.7.7 MS/MSD for EPA Method SW8260B for VOCs**

MS/MSD analyses were performed according to method requirements, with the exceptions presented in Table 4.4-6D. MS/MSD analyses were not analyzed for VOCs in the batch associated with the two water samples and 17 soil samples specified. No MS/MSDs were analyzed for the two grab water samples. Additional volume for the MS/MSDs was not provided due to minimal volume of standing water in the two sampling pits with water. MS/MSD analysis was performed on one of the 34 soil samples for this sampling event. There was inadequate soil sample for additional MS/MSDs as the required additional Encore samplers were not collected for any samples in the respective batches. LCS/LCSD analyses were performed instead. Although one additional MS/MSD was required to meet the minimum of 1:20, interference was not indicated as a significant problem for this method in the MS/MSD that was performed for this sampling event or for samples in other sampling events for this project. The effect on the quality of the data is not expected to be significant.

MS/MSD analyses were performed on one soil sample according to method requirements. Percent recoveries and RPDs were within QC limits, with the exceptions presented in Table 4.4-6E. The results for two compounds were estimated (UJ) in the specified QC soil sample due to high RPDs between the MS/MSD recoveries, which were within QC limits. The compounds are not chemicals of potential concern, no low recoveries were reported, and the results were non-detected. The effect on the project objectives is not significant.

#### **4.4.1.7.8 MS/MSD for EPA Method SW8270C for Pentachlorophenol**

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

#### **4.4.1.7.9 MS/MSD for Modified Method SW8270CWM for Chloropicrin**

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

#### **4.4.1.7.10 MS/MSD for EPA Method SW8290 for Dioxins/Furans**

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

#### **4.4.1.7.11 MS/MSD for EPA Method SW8310 for PAHs**

MS/MSD analyses were performed according to method requirements, with the exceptions presented in Table 4.4-6G. The referenced comment for LDC DVR 4962A9 indicates that MS/MSD analyses were not performed for any aqueous samples for this method. Sample EB-5-31 was an equipment blank. MS/MSD analyses are not required for equipment blanks as they do not represent an environmental matrix. Sample WV-S-6 was a PE sample, and also does not represent an environmental matrix. In addition, the PE sample results measure laboratory accuracy in the PE matrix. The two aqueous environmental field samples were grab water samples from standing water found in the bottom of two sampling pits. Due to low volumes of water in the pits, the triple volumes necessary to perform MS/MSD analyses could not be provided. LCS/LCSD analyses were performed instead. Surrogate recoveries must be used to evaluate potential matrix interference in these samples, for which the matrix could not be characterized.

The second, annotated comment in Table 4.4-6G and the referenced comment in LDC DVR 4812A9 are incorrect and do not affect the technical or contractual quality of the data. MS/MSD analyses were

extracted and analyzed for PAHs in sample LFP-1-S1-6.5-7.0' in the batch associated with the samples specified. All MS/MSD recoveries for this QC sample were within specified criteria.

MS/MSD analyses were performed for the soils matrix as applicable. Percent recoveries and RPDs were within QC limits, with the exceptions presented in Table 4.4-6G. The non-detected results for ten compounds were estimated in one QC soil sample for MS/MSD RPDs that exceeded specified criteria, generally resulting from high recoveries in the MSD. The effect of the small number of qualifications on the project objectives is not significant.

#### **4.4.1.7.12 MS/MSD for EPA Method SW8330 for Explosives**

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits, with the exceptions presented in Table 4.4-6H. The result for 4-amino-2,6-dinitrotoluene in one soil sample was estimated (UJ) for a high RPD in the MS/MSD and the result for tetryl in another soil sample was estimated (UJ) for a marginally low MS recovery. The effect of the small number of qualifications for marginally exceeding control limits on the project objectives is not significant.

#### **4.4.1.7.13 MS/MSD for EPA Method SW8330M for PETN and Nitroglycerin**

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

#### **4.4.1.8 LABORATORY CONTROL SAMPLE/LABORATORY CONTROL SAMPLE DUPLICATES (LCS/LCSD)**

Laboratory accuracy was evaluated using LCS recoveries. Laboratory control samples are reagent water or contamination-free soil or sand spiked with known concentrations of analytes which are processed like regular samples. Since LCSs are free of matrix interference, they are indicators of laboratory and method performance. Acceptance criteria for LCS recoveries were established for each method by matrix, and are shown in Table 3.2-3 of the QAPP.

When LCS/LCSD recoveries did not meet the specified criteria, the data were qualified as follows. Non-detected results associated with LCS recoveries less than 10 percent for organic analyses or less than 50 percent for metals analyses were qualified as rejected (R). Non-detected results associated with LCS recoveries less than the LCL but greater than 10 percent for organic analyses or 50 percent for metals were qualified as estimated (UJ). Detected results associated with LCS recoveries less than the LCL were qualified as estimated (J-). Detected results associated with LCS recoveries greater than the UCL were qualified as estimated (J+).

Less than one percent of the data were qualified as estimated (J/UJ) due to LCS/LCSD results outside of QC limits. No results were rejected for LCS recoveries. Overall, LCS results do not significantly affect the quality of the data.

A summary and tables for the qualification of data by each analytical method due to LCS recovery criteria are presented in the following sub-sections.

#### **4.4.1.8.1 LCS/LCSDs for General Chemistry Method: EPA Method 300.0 (Anions)**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries were within QC limits.

#### **4.4.1.8.2 LCS/LCSD for Perchlorate: Method CADHS 300.0-Mod**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries were within QC limits.

#### **4.4.1.8.3 LCS/LCSD for EPA Methods SW6010B (Metals), SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils)**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries were within QC limits.

#### **4.4.1.8.4 LCS/LCSD for EPA Method SW8015 for TEPH**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits, with the exceptions presented in Table 4.4-7A. The results for TEPH as diesel in 11 soil samples, two water samples, and three equipment blanks; and for TEPH as motor oil in one equipment blank were estimated (J-/UJ) due to low LCS/LCSD recoveries. Analyses for 34 soil samples, two water samples, and three equipment blanks were performed by this method. Approximately 38.4 percent of the TEPH data were estimated. No results were rejected.

The LCSs and the soil samples qualified for low LCS recoveries underwent SGC. Although Table 3.2-3 of the QAPP does not specify an LCL of 30%R for LCSs undergoing SGC, Table 3.2.2 for MS/MSDs and Table 3.2-4 for surrogate recoveries specify LCLs of 30%R for all SGC-treated samples. In addition, the text in Section 3.2.4.2 of the QAPP (Laboratory Analytical Procedures) specifies in the description of SGC by EPA Method SW3630C that "all surrogate, LCS, or MS/MSD recoveries for samples undergoing silica gel cleanup will have a lower control limit of 30-percent recovery." Thus, although the data are qualified as estimated according to the guidelines in Tables 3.2-3 and 3.4-1, the QAPP recognizes that SGC will result in recoveries below the 65%R LCL for all analyses performed by this method. The 44-55 percent LCS recoveries were above the 30 percent LCL specified in the QAPP as acceptable for samples having undergone SGC. As recoveries in the 30-65 percent range are expected, the effect on the project objectives is not expected to be significant.

#### **4.4.1.8.5 LCS/LCSD for EPA Method SW8081A for Pesticides**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

#### **4.4.1.8.6 LCS/LCSD for EPA Method SW8082 for PCBs**

LCS/LCSD analyses were performed according to method requirements. The comment in LDC DVR 4962A3b presented in Table 4.4-7B is not applicable to any reported results. The specified samples were initially analyzed on 6/22-23/00; however, the SW8081A spiking solution was used for the LCS/LCSD and MS/MSD instead of the SW8082 spiking solution. The samples were re-extracted and reanalyzed with an LCS/LCSD and MS/MSD on 6/26/00. All QC results were acceptable for the reanalyses, and the results from the reanalyses, although qualified as estimated for exceeded holding times, were reported. All results were non-detected for both sets of analyses. There is no effect on the project objectives.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits, with the exceptions presented in Table 4.4-7C. The results for Aroclor 1260 in two equipment blanks were estimated (J-/UJ) due to LCS/LCSD RPDs greater than 20 percent. There is no effect on the project objectives.

**4.4.1.8.7 LCS/LCSD for EPA Method SW8260B for VOCs**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits, with the exceptions presented in Table 4.4-7D. All of the recoveries outside of specified criteria were greater than the UCL, and the associated results were non-detected. Therefore, no data were qualified. There is no effect on the project objectives.

**4.4.1.8.8 LCS/LCSD for EPA Method SW8270C for Pentachlorophenol**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

**4.4.1.8.9 LCS/LCSD for Modified Method SW8270CWM for Chloropicrin**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits .

**4.4.1.8.10 LCS/LCSD for EPA Method SW8290 for Dioxins/Furans**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

**4.4.1.8.11 LCS/LCSD for EPA Method SW8310 for PAHs**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits for all LCS analyses performed, with the exceptions presented in Table 4.4-7E.

The results for four compounds in both water samples, two equipment blanks, and a PE sample were estimated (J-/UJ) due to LCS/LCSD results outside of QC limits. Recoveries for one of the compounds were below the LCL for the LCS and LCSD. Recoveries for three of the compounds were below the LCL for the LCS but within QC limits for the LCSD, and the RPDs exceeded specified criteria. No soils data were qualified. Although corrective action was performed, the re-extractions were out of holding times. Estimated data are usable in decision-making for project objectives. The effect of the small number of estimations on the project objectives is not significant.

**4.4.1.8.12 LCS/LCSD for EPA Method SW8330 for Explosives**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits for all LCS analyses performed, with the exceptions presented in Table 4.4-7F.

The results for two-to-three compounds in both water samples, three equipment blanks, and an aqueous PE sample were estimated (J-/UJ) due to LCS/LCSD results outside of QC limits. Recoveries for the specified compounds were generally below the LCL for the LCSD, within QC limits for the LCS, and the RPDs exceeded specified criteria. Re-extraction and reanalysis was not possible for the two grab water samples due to low volumes of water in the pits. No soils data were qualified. Estimated data are usable in decision-making for project objectives. The effect of the small number of estimations on the project objectives is not significant.

#### **4.4.1.8.13 LCS/LCSD for EPA Method SW8330M for PETN and Nitroglycerin**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

#### **4.4.1.9 LABORATORY DUPLICATE PRECISION**

Laboratory precision was evaluated using the RPDs between results for the analysis of laboratory duplicate samples for inorganic analyses, and of MS/MSD results for organic analyses. In the event that MS/MSD analyses were not performed, LCS/LCSD results were evaluated. The RPDs were compared to the acceptance criteria specified for each method, analyte, and matrix in Table 3.2-2 of the QAPP for laboratory duplicate samples and MS/MSDs and Table 3.2-3 of the QAPP for LCS/LCSDs. If the RPDs did not meet the specified criteria, the data were qualified as estimated (J/UJ).

A summary and tables for the qualification of data by each analytical method due to laboratory precision criteria are presented in the following sub-sections.

##### **4.4.1.9.1 Laboratory Duplicate Precision for Inorganic Methods**

Duplicate sample analyses were performed for each matrix as applicable. RPDs were within QC limits for all laboratory duplicate analyses performed, with the exceptions presented in Table 4.4-8A. For metals by EPA Methods SW6010B, SW7470A (mercury - waters), and SW7471A (mercury - soils), results for chromium, aluminum, barium, calcium, manganese, and vanadium were qualified as estimated (J/UJ) in 10 soil samples due to high RPDs in the associated laboratory duplicate sample analysis. The RPDs ranged from 38 percent to 54 percent, and lack of sample homogeneity typical of soil samples for this method is indicated. The effect on the project objectives is not expected to be significant.

##### **4.4.1.9.2 Laboratory Duplicate Precision for Organic Methods**

For MS/MSD or LCS/LCSD RPDs outside of control limits, data qualification information is presented in Tables 4.4-6 and 4.4-7, respectively.

The SW8082 results for Aroclor 1260 in two equipment blanks were estimated (J-/UJ) due to LCS/LCSD RPDs greater than 20 percent.

The results for two SW8260B compounds were estimated (UJ) in the specified QC soil sample due to high RPDs between the MS/MSD recoveries, which were within QC limits.

The results for eight PAHs were estimated in one QC soil sample for MS/MSD RPDs above the UCL. The results for three compounds in two water samples, two equipment blanks, and a PE sample were estimated (J-/UJ) due to low LCS recoveries with RPDs of 31 to 34 percent between the LCS/LCSD that exceeded the 30 RPD criteria.

The SW8330 result for 4-amino-2,6-dinitrotoluene in one soil sample was estimated (UJ) for a 42 RPD (30 RPD criterion) in the MS/MSD. The results for two-to-three SW8330 compounds in two water samples, three equipment blanks, and a PE sample were estimated (J-/UJ) due to LCS/LCSD RPDs (21 RPD for the field samples, 21, 22 and 33 RPD for the equipment blanks) that marginally exceeded the 20 RPD criteria.

The RPD exceedances were intermittent and generally marginally exceeded control limits. No distinct trends were apparent. Laboratory duplicate precision is not expected to affect project objectives.

#### 4.4.1.10 ICP SERIAL DILUTION

For inductively coupled plasma (ICP) analyses of metals by EPA Method SW6010B, a five-fold serial dilution of a representative sample was evaluated to determine if significant matrix interferences may be affecting the quality of the data. For analyte concentrations at least 50 times the instrument detection limit (IDL) in the undiluted QC sample used for serial dilution, the diluted and undiluted results must agree within  $\pm 10\%$ D. For analytes that failed to meet this criterion, associated results were qualified as estimated (J/UJ). Serial dilution criteria were met, with the exception presented in Table 4.4-9.

Results for lead and nickel in 21 soil samples, cadmium in 11 soil samples, and aluminum in two water samples and an equipment blank were qualified as estimated for serial dilution results that exceeded the control limit (approximately 5.6 percent of the metals data). Minor matrix interference is indicated. The qualifications due to serial dilution results do not significantly affect the project objectives.

#### 4.4.1.11 ICP INTERFERENCE CHECK SAMPLE

The ICP analysis of trace metals by EPA Method SW6010B requires the verification of the interelement and background correction factors by analysis of an ICP interference check sample (ICS) at the beginning and end of the analytical sequence or after every 8 hours, whichever is more frequent. Results for the analytes in the ICSA and ICSAB solutions must fall within  $\pm 20$  percent of their true values to demonstrate conformance. In addition, results for analytes not actually spiked into the ICSAB solution must be below the reporting detection limits (RDLs). Failure to meet the ICSA and ICSAB performance criteria results in the qualification of the data as estimated (J/UJ). No results were qualified for ICP interference.

#### 4.4.1.12 ANALYTE IDENTIFICATION

Qualitative criteria for identifying target analytes have been established to minimize the possibility of reporting false positives and false negatives. Most of the identification criteria are directed toward ensuring that a compound is positively identified, and thus toward preventing false positives.

For GC/MS EPA Methods SW8260B and SW8270C, compound identification is made based on comparison of the relative retention times (RRTs) of the chromatographic peaks for the sample and calibration standards, then on comparison of the sample mass spectra against reference mass spectra for each potential target compound. Positive identification is made when all of the following criteria are met: a) all ions present in the standard mass spectra at a relative intensity greater than 10 percent are also present in the sample mass spectra; b) the relative intensities of these ions in the standard and sample mass spectra agree to within 20 percent; c) all ions greater than 10 percent in the sample mass spectrum but not in the standard mass spectrum are accounted for; and d) the compound elutes within  $\pm 0.06$  RRT units of the RRT for that target compound in the calibration standards. Mass spectra for up to 10 peaks for SW8260B and 20 peaks for SW8270C with RRTs not matching target compounds areas and with chromatographic peaks greater than 10 percent of the nearest internal standard peak areas are quantitated and compared to a computerized library of mass spectra. No TICs were reported for any sample.

Results for which compound or analyte identification is considered to be questionable were estimated and were qualified as estimated (J). Examples may include retention times for either column in GC methods not within specified limits, percent differences greater than 50 percent between primary and confirmation columns for GC, or other reasons a compound or analyte is believed to be misidentified.

The characterization of TEPH fuels by chromatographic pattern matching is a subjective process for environmental samples. Patterns may range from an excellent match with a calibration fuel to a mix of different fuels, weathered fuels, or random hydrocarbons. TEPH chromatograms for every sample were

reviewed and characterized by the laboratory, LDC (the third party validators), and Earth Tech chemists in San Jose. A summary of the interpretation of the chromatographic patterns is presented in Table 4.4-10. All results reported as detections for specific TEPH fuels represent a reasonable characteristic match to the specified chromatographic fuel patterns, and may include inexact matches such as weathered fuel or additional peaks in the pattern. TEPH results that did not adequately match the fuel patterns of the standards were reported as Unknown Diesel or Motor Oil Range Hydrocarbons. These results do not represent kerosene, diesel, motor oil or other petroleum fuels as the chromatographic patterns indicate individual peaks or series of peaks not indicative of fuels.

Level III review of the summary forms and Level IV review of the raw data and summary forms for GC/MS analyses by EPA Methods SW8260B and SW8270C; HRGC/MS analyses by SW8290; and HPLC analysis by EPA Methods SW8310, SW8330, and SW8330M did not show any problems associated with correct analyte identification.

#### **4.4.1.13 ANALYTE QUANTITATION**

Data validation for Level IV data also includes a review of the quantitation performed by the laboratory to ensure the accuracy of all concentrations and detection limits reported. The raw data reviewed includes instrument generated quantitation reports, instrument logs, sample preparation sheets, extraction cleanup records, and chromatograms. Calculations for the RF, RRT, %RSD, %D, RPD, r, concentrations, detection limits, percent dry weight, and percent recoveries of surrogates and spikes, are verified for approximately 10 percent of the Level IV data.

Results for which compound or analyte quantitation is considered to be questionable were qualified as estimated (J), indicating that the results may be quantitatively uncertain. Examples may include unaccountable differences in results between dilutions, related results which do not add up, percent differences greater than 25 between primary and confirmation columns for GC, results quantitated and reported from above the demonstrated calibration range of an instrument, or other reasons for quantitative uncertainty. None of the data were qualified due to quantitation results.

#### **4.4.1.14 REPORTING OF RESULTS AND DETECTION LIMITS**

All analytical results and reporting limits for the samples collected in this project were adjusted for dilutions resulting from the preparation procedures required by the method or to get the result for a compound or analyte within the calibration range of the instrument. The PQLs and MDLs were raised by the dilution factor when reported for diluted analyses.

The laboratories reported analytical results that were above the MDL but below the PQL. Such results were qualified as estimated (J) due to possible quantitative or qualitative uncertainty near the limits of detection, and do not indicate analytical problems or affect project objectives.

For some analytes, the PQLs specified in Table 3.1-1 of the QAPP were not met, as presented in Table 4.4-11.

All PQLs for the inorganic methods met the requirements specified in the QAPP. All PQLs for the inorganic methods met project objectives.

All PQLs for the organic methods met the requirements specified in the QAPP, with the exceptions discussed below. The PQLs for two analytes for waters and two analytes for soils exceeded the PQLs specified in the QAPP for SW8260B.

A summary and tables for the PQLs and MDLS for each analytical method are presented in the following sub-sections.

**4.4.1.14.1 PQLs for Inorganic Methods: EPA Method 300.0 (Anions)**

All PQLs for the inorganic methods met the requirements specified in the QAPP. All PQLs for the inorganic methods met project objectives.

**4.4.1.14.2 PQLs for Inorganic Methods: SW6010B (Metals), SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils)**

All PQLs for the metals methods met the requirements specified in the QAPP. All PQLs for the inorganic methods met project objectives.

**4.4.1.14.3 PQLs for Inorganic Methods: CADHS Method 300.0-M (Perchlorate)**

The PQLs for perchlorate met the requirements specified in the QAPP. All PQLs for the inorganic methods met project objectives.

**4.4.1.14.4 PQLs for Organic Methods: EPA Method SW8015B (TEPH)**

For SW8015B for TEPH, all compounds met specified project PQLs. All PQLs for SW8015B met project objectives.

**4.4.1.14.5 PQLs for Organic Methods: EPA Method SW8081A for Pesticides**

For SW8081A for pesticides, all compounds met specified project PQLs. All PQLs for SW8081A met project objectives.

**4.4.1.14.6 PQLs for Organic Methods: EPA Method SW8082 for PCBs**

For SW8082 for PCBs, all compounds met specified project PQLs. All PQLs for SW8082 met project objectives.

**4.4.1.14.7 PQLs for Organic Methods: EPA Method SW8260B (VOCs)**

All PQLs for VOCs met the requirements specified in the QAPP, with the exceptions specified in Table 4.4-11A. For SW8260B in waters, the PQLs for vinyl acetate and 1,1,2-trichloro-1,2,2-trifluoroethane did not meet the PQLs specified in the QAPP. For SW8260B in soils, the PQLs for tert-methyl-butyl ether (MTBE) and 1,1,2-trichloro-1,2,2-trifluoroethane did not meet the PQLs specified in the QAPP.

For all water samples, the 1,1,2-trichloro-1,2,2-trifluoroethane PQL was reported at 2.0 µg/L, whereas the PQL is specified as 1.0 µg/L in the QAPP. The MDL of 1µg/L is at the PQL. For all water samples, the vinyl acetate PQL was reported at 10 µg/L, whereas the PQL is specified as 5 µg/L in the QAPP. The MDL of 1 µg/L is less than one half the PQL, so the laboratory could have reported results using the specified PQL. The low concentration calibration standard for both compounds was analyzed at 1 µg/L, demonstrating acceptable sensitivity and linearity at 1 µg/L. Vinyl acetate is not a chemical of potential concern at the project site. As results are reported down to the MDL, and the action levels specified in the Final Work Plan for this project (see Table 2.4-11) exceed the reported PQLs by 59,000 times for 1,1,2-trichloro-1,2,2-trifluoroethane and 80 times for vinyl acetate, there is no effect on the project objectives.

For all soil samples, the MTBE and 1,1,2-trichloro-1,2,2-trifluoroethane PQLs were reported at 0.010 mg/kg, whereas the PQLs are specified as 0.005 mg/kg in the QAPP. The MDLs of 0.006 mg/kg marginally exceed the PQLs. The low concentration calibration standard for both compounds was analyzed at 0.010 mg/kg. For MTBE, there is no action level specified for soils. As results are reported down to the MDL, and the action levels specified in the Final Work Plan for this project (see Table 2.4-11) exceed the reported PQLs by 59,000 times for 1,1,2-trichloro-1,2,2-trifluoroethane and 80 times for vinyl acetate, there is no effect on the project objectives.

**4.4.1.14.8 PQLs for Organic Methods: EPA Method SW8270C for Pentachlorophenol**

For SW8270C for PCP, all PQLs met project objectives.

**4.4.1.14.9 PQLs for Organic Methods: Modified Method SW8270CWM for Chloropicrin**

For SW8270CWM for chloropicrin, all PQLs met project objectives.

**4.4.1.14.10 PQLs for Organic Methods: EPA Method SW8290 (Dioxins/Furans)**

For the QES/STL analyses of SW8290, the MDLs for all compounds met specified project PQLs. All PQLs for SW8290 met project objectives.

**4.4.1.14.11 PQLs for Organic Methods: EPA Method SW8310 (PAHs)**

For SW8310 for PAHs, all compounds met specified project PQLs. All PQLs for SW8310 met project objectives.

**4.4.1.14.12 PQLs for Organic Methods: EPA Methods SW8330 (Explosives) and SW8330M (PETN/Nitroglycerin)**

For SW8330 for explosives and SW8330M for PETN/nitroglycerin, all compounds met specified project PQLs. All PQLs for SW8310 met project objectives.

**4.4.1.15 METHOD COMPLIANCE AND ANALYTICAL PERFORMANCE**

In addition to the evaluation of the QC parameters discussed above, method and QC parameters were used to assess the laboratories' performance and compliance with the analytical method requirements as part of the full data validation process.

The laboratories met the performance criteria specified for each method, with the exceptions discussed for each QC parameter in subsections 4.4.1.1 through 4.4.1.14, above. As discussed in each subsection, data were qualified if the non-compliance adversely affected the sample results. In general, these non-compliances did not significantly affect the project objectives. The majority of the non-compliances were due to lack of MS/MSD analyses for individual preparation and analytical batches and due to TEPH and PAH sample data qualified as estimated for low LCS recoveries in LCSs that underwent SGC. With the exception of SW8260B for soils (refer to Section 4.4.1.7.7) and SW8310 for two water samples for which inadequate volume of water in the sample pits prevented triple volume for MS/MSD and double volume for re-extraction/reanalyses (refer to Section 4.4.1.7.11), MS/MSD analyses were performed at a frequency in excess of 1:20 samples for each matrix, and adequate MS/MSDs were performed to characterize each matrix. The non-compliances for LCS/LCSDs and MS/MSDs with respect to project environmental field samples are summarized below.

SW8015B results for TEPH as diesel in 11 of 34 soil samples, both grab water samples, and all three equipment blanks; and for TEPH as motor oil in one equipment blank were estimated (J-/UJ) due to low LCS/LCSD recoveries (results for approximately 10.9 percent of the TEPH data). SGC was performed on the TEPH soil samples and LCSs per the QAPP. Results for PAHs by EPA Method SW8310 were qualified as estimated (J-/UJ) in both water samples, two of three equipment blanks, and an aqueous PE sample due to low recoveries (approximately 7.5 percent of the PAH data). No TEPH or PAH data were rejected due to LCSs. Although corrective action was performed, the LCS/LCSD results for SGC-extracted LCSs remained low, and the aqueous re-extractions were out of holding times. Note that the low recoveries for the TEPH soils were not actually non-compliant as the 44-55 percent TEPH LCS recoveries were above the 30 percent LCL specified in the QAPP as acceptable for samples having undergone SGC. As recoveries in the 30-65 percent range are expected, the effect on the project objectives is not expected to be significant. For further discussion of SGC control limits, refer to Section 4.4.1.8.4.

For VOCs by EPA Method SW8260B, no MS/MSDs were analyzed for the two grab water samples. Additional volume for the MS/MSDs was not provided due to minimal volume of standing water in the two sampling pits with water. MS/MSD analysis for VOCs was performed on one of the 34 soil samples for this sampling event. There was inadequate soil sample for any additional MS/MSDs to be performed, as the required additional Encore samplers were not collected for any of the samples. The problem was not discovered until after the sampling event was completed. Although one additional MS/MSD was required to meet the minimum of 1:20 for soils, interference was not indicated as a significant problem for this method in the MS/MSD that was performed for this sampling event or for samples in other sampling events for this project.

MS/MSD analyses were not extracted and analyzed for PAHs by EPA Method SW8310 in the batch associated with both field water samples. These two aqueous environmental field samples were grab water samples from standing water found in the bottom of two sampling pits. Due to low volumes of water in the pits, the triple volumes necessary to perform MS/MSD analyses could not be provided. Surrogate recoveries must be used to evaluate potential matrix interference in these samples, for which the matrix could not be characterized.

Note that the analysis of MS/MSDs is a matrix-specific QC parameter. Batch extraction efficiency and laboratory accuracy and precision are measured with LCS/LCSDs, which were performed for all of the specified batches, and the sample-specific information is measured by surrogate recoveries. The numbers of MS/MSDs allowed for the adequate characterization of matrix effects, and the MS/MSD non-compliances are not expected to affect data quality or project objectives.

These deviations from specified performance criteria affect the contractual completeness calculations. Refer to Section 4.7.2 for further discussion of contractual compliance.

#### **4.4.2 Field Quality Control**

Field QC samples specified in Sections 2 and 3 of the Work Plan include equipment blanks, source water samples, and field duplicate samples. In addition, split samples to be sent for analysis through different laboratories and by different agencies were collected for this project; however, none of the split samples were analyzed by the agencies.

The field quality control samples were collected during the non-OE RI as described in the following sections of Appendix C.

Replicate and duplicate samples: see Section C.13.1

Source water sampling: see Section C.13.2

Trip blanks, equipment blanks, filter blanks, and temperature blanks: see Section C.13.3  
Field-designated matrix spike & matrix spike duplicate samples: see Section C.13.4.

The following field test equipment was used to obtain field groundwater data during the non-OE RI in the following sections of Appendix C.

Beckman pH/Temperature Meter: see Sections C.18.1 and C.18.3  
YSI Model 33 Conductivity Meter: see Section C.18.2  
HF Scientific DRT-15C Turbidimeter: see Section C.18.4.

In addition to the field test equipment listed above, a water level meter was used to collect water level measurements as described in Section C.18.5 of Appendix C.

Field instruments were calibrated at the beginning and end of each sampling day. The calibration information was recorded in the logbooks, which accompanied each field instrument.

Decontamination procedures were implemented during drilling, well installation, and soil/sediment and water sample collection to prevent foreign contamination of samples and cross-contamination between sampling locations. Field equipment and personnel decontamination procedures implemented during the non-OE RI are discussed in Section C.19 of Appendix C.

Evaluation of the field QC samples for each parameter are presented in the following sub-sections.

#### **4.4.2.1 FIELD DUPLICATE SAMPLE PRECISION**

The duplicate samples for soils are considered to be field replicate samples, as defined in the QAPP. These samples were collocated samples, taken from adjacent borings or at consecutive depths. Field replicate samples were collected at an approximate frequency of 10 percent. The only field water samples for this sampling event were taken from standing water in two of the sampling pits. The volume of water was not adequate for duplicate sampling. A summary of field duplicate and replicate samples with frequency summaries is presented in Table 4.4-12.

Replicate samples were analyzed by all methods. RPD values were calculated, where possible, and compared to established acceptance criteria specified for each method, analyte, and matrix, as presented in Tables 3.2-2 and 3.2-3 of the QAPP. The RPD value is not defined for duplicate pairs for which one or both results are below PQL. For values less than five times the PQL, RPDs were not calculated. In these cases, results within one PQL for waters, or within two PQL for soils, are considered acceptable. RPDs below 40 percent for soils and 30 percent for waters generally represent good agreement. Data were evaluated but not qualified for field duplicate results.

Field duplicate aqueous samples by all methods were generally in agreement with each other. Field replicate soils results for each method were generally acceptable, with the exceptions presented in the following sub-sections. Note that the samples for the RAW investigation were taken from a landfill area. For higher RPDs or otherwise notable disagreement between replicates, soil sample heterogeneity is generally the cause, possibly enhanced by the mixed nature of landfill soils. Most of the outliers are within normal parameters for the methods, with the exception of detected results for two dioxins and two furans in one replicate sample which were not detected in the sample. Precision assessment for detected field replicate results is presented in Table 4.4-13. The quality of the data is not expected to be affected with the possible exception of the dioxin/furan results.

A summary and tables with detected results for field replicate pairs by each analytical method are presented in the following sub-sections. Results for samples for which all results were non-detected are not included in the tables as such results are within specified limits.

**4.4.2.1.1 Field Duplicates for General Chemistry Method: EPA Method 300.0 (Anions)**

Field replicate results were within specified criteria. All results for these methods were non-detected or within specified criteria (see Table 4.4-13A). Field duplicate precision does not adversely affect project objectives for this method.

**4.4.2.1.2 Field Duplicates for Perchlorate: Method CADHS 300.0-Mod**

Field replicate results were within specified criteria. All results for perchlorate were non-detected. Field duplicate precision does not adversely affect project objectives for this method.

**4.4.2.1.3 Field Duplicates for EPA Methods SW6010B (Metals), SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils)**

Precision assessment for detected field replicate results is presented in Table 4.4-13B. Results exceeding duplicate precision criteria are highlighted in bold in the table. Field replicate results for one-to-two elements per replicate pair exceeded the specified criteria. No significant trends were noted. Concentrations of metallic elements are expected to vary within soil samples due the differences in concentrations of elements in the various geological components of the soils, and the results that exceeded the specified criteria were within reasonable expectations for the method and can be attributed to lack of sample homogeneity in the soil samples. Field duplicate precision results are not expected to adversely affect project objectives for these methods.

**4.4.2.1.4 Field Duplicates for EPA Method SW8015 for TEPH**

Field replicate results were within specified criteria. All results for TEPH were non-detected. Field duplicate precision does not adversely affect project objectives for this method.

**4.4.2.1.5 Field Duplicates for EPA Method SW8081A for Pesticides**

Field replicate results were within specified criteria. All results for pesticides were non-detected. Field duplicate precision does not adversely affect project objectives for this method.

**4.4.2.1.6 Field Duplicates for EPA Method SW8082 for PCBs**

Field replicate results were within specified criteria. All results for PCBs were non-detected. Field duplicate precision does not adversely affect project objectives for this method.

**4.4.2.1.7 Field Duplicates for EPA Method SW8260B for VOCs**

Field replicate results were within specified criteria. All results for this method were non-detected or within specified criteria (see Table 4.4-13C). Detected results for VOCs were all at low concentrations, and none of the detected compounds were confirmed in the duplicate or replicate sample, with the exception of 2-butanone in collocated replicate samples LFP-29-S2-2.0' and LFP-29-S1-2.5', which were both detected at trace levels but blank qualified as non-detected and estimated (UJ) due to method blank results. Field duplicate precision does not adversely affect project objectives for this method.

#### **4.4.2.1.8 Field Duplicates for EPA Method SW8270C for Pentachlorophenol**

Field replicate results were within specified criteria. All results for PCP were non-detected. Field duplicate precision does not adversely affect project objectives for this method.

#### **4.4.2.1.9 Field Duplicates for Modified Method SW8270CWM for Chloropicrin**

Field replicate results were within specified criteria. All results for chloropicrin were non-detected. Field duplicate precision does not adversely affect project objectives for this method.

#### **4.4.2.1.10 Field Duplicates for EPA Method SW8290 for Dioxins/Furans**

Precision assessment for detected field replicate results is presented in Table 4.4-13D. Results exceeding duplicate precision criteria are highlighted in bold in the table. Detected results for two dioxins and two furans in replicate sample LFP-24-S1A-8.0' were not detected in sample LFP-24-S1-8.0'. Localized concentration of contamination related to the landfill is the expected cause of the difference between the replicate sample results. The detected results are not considered compromised by the non-detected results in the collocated sample, and vice-versa, due to the landfill origin of the samples. Analytical integrity is not considered to be affected. The effect on the project objectives is to document the localized nature of potential contamination in the landfill.

#### **4.4.2.1.11 Field Duplicates for EPA Method SW8310 for PAHs**

All results for PAHs in field replicate samples were non-detected. Field replicate precision does not adversely affect project objectives for this method.

#### **4.4.2.1.12 Field Duplicates for EPA Method SW8330 for Explosives**

All results for explosives in field replicate samples were non-detected. Field replicate precision does not adversely affect project objectives for this method.

In addition to the field duplicate and replicate samples collected for the samples collected according to the RAW sampling plan, ten replicate pairs of soil samples were collected at the surface at locations TNT-R6 through TNT-R15 on May 24, 2000, with pairs of collocated field replicate samples sent to Caltest for analysis of explosives by SW8330. The complete sample volume from the sleeve for one sample for each collocated pair (labeled with the "A" suffix) was thoroughly homogenized according to Section 4.0 of the Addendum to the QAPP prior to removal of the sample aliquot for extraction, and the replicate sample (labeled with the "B" suffix) was not. The aliquot for extraction was then homogenized further according to the method. Field and method precision for these samples were within specified criteria, as all 20 samples were non-detected for explosives. Samples from five boreholes were also collected at four-foot intervals on June 5 through 7, 2000 and sent to Caltest for analysis of explosives by SW8330. As these Caltest samples were not included in the RAW sampling plan, they have not been included in the calculations for field replicate frequency. Note that the 1:3.5 (28.5 percent) field replicate frequency for the TNT site samples analyzed by Caltest exceeds project requirements.

#### **4.4.2.1.13 Field Duplicates for EPA Method SW8330M for PETN and Nitroglycerin**

All results for PETN and nitroglycerin in field replicate samples were non-detected. Field duplicate precision does not adversely affect project objectives for this method.

#### 4.4.2.2 TRIP AND EQUIPMENT BLANKS

Review of the results for trip and equipment blanks (including source water blanks) indicates no detections greater than the PQL, with the exceptions presented in Table 4.4-3. Most equipment blank detections are either non-detected or less than one half the practical quantitation limits (PQLs). Exceptions include nitrate-N and methylene chloride. Results for nitrate-N in 21 of 36 soil samples were qualified as estimated instead of being blank qualified as estimated and non-detected (UJ) due to consistent levels of nitrate-N in the equipment blanks but not in the method blanks. The results may represent actual concentrations of nitrate-N in the environment. Methylene chloride is a common laboratory contaminant, and is often found in equipment and trip blanks. Discussion of all blank results is presented in Section 4.4.1.4 of this QCSR.

Trip, equipment, and source water samples were collected and analyzed according to the requirements specified in Sections 2 and 3 of the Work Plan and in the RAW. Trip, equipment, and source water blank contamination does not affect the project objectives.

#### 4.4.2.3 QUALITY ASSURANCE SPLIT SAMPLES

Split samples to be sent for analysis through different laboratories and by different agencies were not planned or collected for the RAW investigation.

#### 4.4.3 PE Samples

PE samples were provided to the analytical laboratories as specified in Section 3.3.2.3 of the QAPP. PE samples are samples of known concentrations of project target analytes provided to the laboratory to assess laboratory accuracy. PE samples are provided in a manner such that the laboratory knows the samples are for evaluation purposes but does not know the concentrations (single blind), or disguised as a project field sample so the laboratory is not aware the sample is for evaluation and does not know the concentrations (double blind). PE samples of a solid matrix were used to evaluate analyses for some methods. Such samples were submitted single blind, as soil samples cannot be readily submitted double blind. Otherwise, double blind aqueous PE samples were used to evaluate the ability of the laboratory to accurately perform analytical methods. The results for all PE samples for all phases of the project are presented in Attachment 2.

For QES/STL, solid PE samples were provided at the start of the remedial investigation sampling event for EPA Methods SW6010B, SW7471A, SW9060, and 300.0. All PE sample results for QES/STL were within specified criteria. In addition, Earth Tech provides QES/STL with double blind aqueous PE samples for many methods on a semi-annual basis. All QES/STL PE sample results were acceptable in 1999. Earth Tech provided additional PE samples to QES/STL for the RAW investigation as this laboratory was performing additional analyses. The methods for which aqueous PE samples were provided included EPA Methods SW6010B, SW7470A, SW8015 (diesel), SW8081A, SW8260B, SW8270CWM (chloropicrin), SW8310, and SW8330. Solid PE samples was provided for SW8015B (motor oil) and SW8082. All of the PE sample results were within the project accuracy control limits specified in Table 3.2-3 of the QAPP, with the following exceptions.

For EPA Method SW8310, an aqueous double blind PE sample was provided to the laboratory on March 30, 2000 with samples for the data gaps investigation, and an aqueous double blind PE sample and a soil PE sample were provided to the laboratory on May 30, 2000 with samples for the RAW investigation. All results were acceptable for the data gaps aqueous PE sample and for the soil PE sample. For the RAW investigation aqueous PE sample, a false negative was reported for acenaphthene. All other analytes were acceptable. As the 34 percent surrogate recovery was low for this PE sample, the PE sample was re-extracted past the extraction hold time and reanalyzed with an acceptable surrogate recovery. All results

were acceptable with the exception of another false negative for acenaphthene. Acenaphthene was listed by the vendor as having been spiked slightly above the PQL. As the aqueous action level specified in the DQOs of the Work Plan for acenaphthene is 37 times the PQL and 28.5 times the spike concentration in the PE sample, the possibility of a false negative near the action limit is not implied for this compound and the PE result is not expected to have a significant impact on the project objectives. The 94 percent compliance for one PE sample and 100 percent compliance for two others for this laboratory (versus goal of 95 percent), demonstrate acceptable laboratory accuracy for this method.

For EPA Method SW8330, results for the March 30, 2000 aqueous double blind PE sample for all analytes were very good with the exception of tetryl with a 36%R. The true value for tetryl was below the PQL. A low concentration of TNT was accurately reported. Follow-up PE samples of one double blind aqueous sample and one single blind soil sample were provided to the laboratory on May 30, 2000. All results were acceptable for the soil PE sample. For the aqueous PE sample, all results were acceptable with the exception of a marginally low 61%R for 2,6-dinitrotoluene (vs 65%R LCL) for which the true value was one-fifth of the PQL. The results indicate acceptable performance by the laboratory for these analyses, especially at the PQL.

PE samples were not provided by Earth Tech to QES/STL for EPA Methods SW8270C and SW8290. Thirty-five soil samples were analyzed during this sampling event for pentachlorophenol by SW8270C. A PE sample was not ordered as the method was not originally planned as a primary method for this project. Eleven soil samples and two grab water samples were analyzed for dioxin/furans by SW8290. No vendor could be located to provide a dioxin/furan PE sample for analysis by EPA Method SW8290. QES/STL participates in the National Voluntary Laboratory Accreditation Program, and acceptable PE sample results for this method are included in Attachment 2.

Earth Tech provides double blind aqueous PE samples to Babcock for perchlorate by CADHS Method 300.0M at a minimum of once annually. The results for the perchlorate PE samples analyzed in April 1999 and March 2000 were within specified criteria.

Although Caltest was not tested with PE samples prior to or during this sampling event for the Benicia project, documentation of excellent PE results for other projects performed in 1999 indicate acceptable performance by Caltest. In March, May, and December of 1999, Caltest had undergone extensive PE testings from institutions such as CA ELAP, USACE, and American Association for Laboratory Accreditation as part of the accreditation program with excellent results. Refer to Attachment 4. Note that the samples analyzed by Caltest during the RAW investigation were not part of the RAW sampling plan.

The PE sample results for the RAW investigation analyses indicate acceptable accuracy by the participating analytical laboratories.

#### **4.4.4 Audits**

Audits were performed as specified in Section 3.3.2.3 of the QAPP. Discussion of field and laboratory audits are presented in the following subsections.

##### **4.4.4.1 FIELD AUDITS**

A field QA audit of the sampling activities at the project site was not conducted during the RAW sampling event. The RAW event was performed during the course of four days, and the Earth Tech field QA auditor was not available. However, Mike Finch, a representative of the CA DTSC, was present during the RAW sampling event providing oversight of sampling activities.

Prior to the RAW sampling event, field QA audits of the sampling activities at the project site were conducted in accordance with the requirements of Section 3.3.2.3 of the Work Plan on December 9, 1999 and March 30, 2000 by William Knight, P.E. Mr. Knight is an Earth Tech project manager not associated with the project team. The field auditor observed that procedures and techniques were in accordance with the Work Plan and best professional standards. Specific issues identified during the audits were discussed with the Field Team Leader (FTL) during the audits. Responses for each issue were implemented by the FTL during the same day as the audits. More details are provided in the Field QA Audit Memoranda dated December 20, 1999 and March 30, 2000 included in Attachment 3.

#### **4.4.4.2 LABORATORY AUDITS AND CERTIFICATIONS**

Special analytical services for the analysis of perchlorate was performed by E.S. Babcock & Sons, Inc. (Babcock) of Riverside, California according to the proprietary modification of the California Department of Health Services (CADHS) Sanitation and Radiation Laboratories Branch (SRLB) modification of EPA Method 300.0 (CADHS 300.0M). Analytical services for EPA Method SW8330 in samples not specified in the RAW which were collected at locations TNT-R6 through TNT-R15 and TNT-R16 through TNT-R20 were performed by Caltest Analytical Laboratory (Caltest) in Napa, California. Analytical services for all other methods were provided by Quanterra Incorporated (Quanterra) in West Sacramento, CA (QES/STL). Laboratory audits of all project laboratories for the RAW investigation samples were performed in accordance with the requirements of Section 3.3.2.3 of the Work Plan.

##### **4.4.4.2.1 Laboratory Audit of Quanterra Inc., West Sacramento, CA (QES/STL)**

Quanterra West Sacramento (QES/STL) is CA ELAP and USACE certified for the analyses performed for this project. See Attachment 4.

Earth Tech maintains an ongoing QA program for analytical work integral to all federal and DOD programs, including an annual audit program. The Earth Tech federal program audit team based in Long Beach, California performed an in-depth audit of the Quanterra West Sacramento facility, the primary fixed-base laboratory identified for this project, in September 1999. The audit was primarily performed for an Air Force Center for Environmental Excellence (AFCEE) project, and the audit team was accompanied by an AFCEE representative. The audit includes a full report with response items and full closure of all action items, which has been filed with the EPA, and is included in Attachment 5.

As specified in Section 3.3.2.3 of the Work Plan, a follow-on project-specific cursory audit of QES/STL was performed by Debbie Masonheimer, an Earth Tech chemist and laboratory audit team member, while samples from this project were in-house. The audit focused on project-specific QC requirements, and found the laboratory to be meeting the requirements of the QAPP, with one exception. The laboratory implemented the finding, and the quality of the data is not expected to be affected. More details are provided in the Audit Report for Quanterra West Sacramento dated December 27, 1999, included in Attachment 5. The next Earth Tech audit of this facility is scheduled for September 2000.

##### **4.4.4.2.2 Laboratory Audit of E.S. Babcock & Sons**

Babcock is CA DTSC approved for the analyses performed for this project (see Attachment D-4). Earth Tech maintains an ongoing QA program for analytical work integral to all federal and DOD programs, including an annual audit program. The Earth Tech federal program audit team based in Long Beach, California performed an audit of the Babcock facility for its perchlorate analyses in March, 2000 between the remedial and data gap sampling events. The audit includes a full report with response items and full closure of all action items, which has been filed with the EPA and is included in Attachment 5.

#### **4.4.4.2.3 Laboratory Audit of Caltest Analytical Laboratory, Napa, CA**

Caltest Analytical Laboratory is CA ELAP, ACOE, and the American Association for Laboratory Accreditation certified for the analyses performed for this project. See Attachment 4.

As part of the accreditation program, Caltest had undergone extensive PE testings and audits from the above institutions with excellent results. Although Caltest was not audited prior to the RAW investigation sampling event for the Benicia project, documentation of excellent PE results for other projects in March, May, and December 1999 indicate acceptable performance by Caltest. Refer to Attachment 4. Note that the samples analyzed by Caltest during the RAW investigation were not part of the RAW sampling plan.

#### **4.5 ANALYTICAL PROCEDURES**

All analyses for this project were performed according to the analytical procedures and methods specified in Section 3.2.4.2 of the QAPP, with exceptions specified in the evaluations for each QC parameter in Section 4.4 of this QCSR. The analytical procedures fulfill the requirements for decision-making with respect to the project objectives.

#### **4.6 CHEMICAL DATA QUALITY ASSESSMENT**

The data review and validation performed on the entire definitive-level data set, as well as the acceptable results for the PE samples, indicate the overall acceptability of the definitive-level data collected for this project. Approximately 2.0 percent of the data were qualified as rejected (R), and approximately 13.1 percent of the data were qualified as estimated (J/UJ). The remaining data met the data quality assurance objectives for accuracy, precision, sensitivity, and completeness specified in the QAPP. Data qualified with the "J" qualifier solely for reported values less than the PQL but greater than the MDL are not included in the completeness calculations. These qualifiers are not related to the QC parameters, and do not affect the usability of the data.

The data review includes assessment for compliance with the data quality assurance objectives specified throughout the QAPP. This includes achievement of quality assurance objectives related to sample collection, handling, labeling, and custody; analytical methods and procedures; laboratory data reduction, validation, reporting, and management; data package and electronic deliverables verification, validation, and assessment; and documentation and reporting. The compliance with the quality assurance elements of the DQOs indicates a high level of confidence in the data, allowing the data to be used for its intended purposes within the constraints of the data qualifiers.

Data qualified as "R" are rejected and considered unusable. Data qualified with the "J" qualifier are considered estimated and usable as assessed in validation for decision-making purposes. Otherwise, the definitive-level data as presented are of acceptable quality and can be used to support the environmental decision-making and RI project objectives.

A summary of the data quality assessment for each analytical method is provided in the following subsections.

##### **4.6.1 Data Quality Summary for General Chemistry Method: EPA Method 300.0**

Analyses were performed according to the methods and requirements specified in the QAPP. Approximately 86.6 percent of the general chemistry data were qualified as estimated (J/UJ) and 2.4 percent rejected (R) due to QC parameters, mostly due to marginal holding time exceedances.

Analyses of 36 soil samples, two aqueous field samples, and three equipment blanks were performed by this method.

All technical holding time requirements were met, with the exceptions presented in Table 4.4-1A. Two results for nitrite-N were rejected (R) in soil samples, and results for nitrate-N and nitrite-N were estimated in 33 of 36 soil samples and both aqueous field samples and one of three equipment blanks due to holding time exceedance. In general, the exceedances were due to analyses less than 12 hours past the 48-hour holding time. For the estimated results for nitrate-N and nitrite-N, the potential impact of the holding time qualifications would be for nitrite-N to convert to nitrate-N, with marginal effect on the sum of the two analytes. Estimated data are usable in decision-making for project objectives. Therefore, although 85 percent of the nitrate-N/nitrite-N data were estimated, the qualifications are not expected to significantly affect the project objectives.

Initial calibrations for EPA Method 300.0 were performed according to method requirements. All correlation coefficients (r) exceeded the 0.995 criterion, and all percent recoveries (%R) for the ICVs and CCVs met the 90-110%R criteria.

Method blanks were analyzed for each matrix as applicable. No contaminant concentrations were found in the method blanks. Nitrate-N in twenty-one soil samples required blank qualification due to equipment blank results, as presented in Table 4.4-3B. Field sample results for nitrate-N less than 5 times the equipment blank concentration but detected at concentrations above 0.20 mg/kg have been qualified as estimated (J) instead of non-detected and estimated (UJ) using professional judgement at the request of the project chemist. Such results were not qualifiable due to levels of nitrate-N in the method blanks. The consistent levels of nitrate-N in the equipment blanks were also present in the source water, and are thus not representative of contamination from the sampling equipment. The levels of nitrate-N in the associated field samples are expected to be due to environmental nitrate, but are qualified as estimated (J) due to the levels of nitrate-N reported in the equipment blanks. Blank contamination does not affect the project objectives for this analytical method as no results were qualified as non-detected at the reported concentrations.

MS analyses were performed for each matrix as applicable. Percent recoveries were within QC limits.

Duplicate sample analyses were performed for each matrix as applicable. RPDs were within QC limits.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries were within QC limits.

All PQLs for the inorganic methods met the requirements specified in the QAPP. All PQLs for the inorganic methods met project objectives.

Field replicate results were within specified criteria.

All of the PE sample results were within the project accuracy control limits specified in Table 3.2-3 of the QAPP.

Results for the general chemistry EPA Method 300.0 (anions) are valid and usable for decision-making purposes, with the exception of the results for nitrite-N in two soil samples rejected due to grossly exceeded holding time. Although 86.6 percent of the nitrate-N/nitrite-N data were estimated, the qualifications are not expected to significantly affect the project objectives.

#### **4.6.2 Data Quality Summary for Method CADHS 300.0M for Perchlorate**

Analyses were performed according to the methods and requirements specified in the QAPP. None of the perchlorate data were qualified as estimated (J/UJ) or rejected.

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

Initial calibrations were performed according to method requirements. All correlation coefficients (r) exceeded the 0.995 criterion, and all %Rs for the ICVs and CCVs met the 90-110%R criteria.

No contaminant concentrations were found above the reporting limit in the initial, continuing, preparation, and equipment blanks for this method.

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries were within QC limits.

Duplicate sample analyses were performed for each matrix as applicable. RPDs were within QC limits.

All PQLs for the inorganic methods met the requirements specified in the QAPP. All PQLs for the inorganic methods met project objectives.

Field replicate results were within specified criteria. All results for perchlorate were non-detected. Field duplicate precision does not adversely affect project objectives for this method.

PE sample results for this method were acceptable.

Results for perchlorate by CADHS Method 300.0M are valid and usable for decision-making purposes. The data meet the requirements of the project objectives.

#### **4.6.3 Data Quality Summary for EPA Methods SW6010B (Metals), SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils)**

Analyses were performed according to the methods and requirements specified in the QAPP. Approximately 19.5 percent of the metals data were qualified as estimated (J/UJ) and 2.2 percent rejected (R) due to QC parameters.

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

Initial and continuing calibrations for EPA Methods SW6010B, SW7470A for waters, and SW7471A for soils were performed according to method requirements, and met specified criteria.

No contaminant concentrations were found above the reporting limit in the initial, continuing and preparation blanks, with the exceptions presented in Table 4.4-3C. No contaminant concentrations were found in the equipment and source water blanks, with the exceptions presented in Table 4.4-3D. The result for cobalt was blank-qualified in one water sample, and the result for chromium was blank-qualified in another water sample. The affected results were all below action levels for the specified metals in water. Blank contamination does not affect the project objectives for metals.

MS analyses were performed for each matrix as applicable. Percent recoveries were within QC limits, with the exceptions presented in Table 4.4-6B. Non-detected results for antimony in 21 soil samples were rejected (R) due to MS recoveries less than 30 percent. Results for antimony in 13 soil samples were estimated for potential low bias (J-/UJ); results for barium and cobalt in 13 soil samples were estimated (J-/UJ) for recoveries marginally below 75 percent; results for calcium, magnesium, and vanadium in 10 soil samples, chromium in 23 samples, arsenic in 13 soil samples; and aluminum and iron in two water samples were estimated (J+) for recoveries greater than 125 percent. Analyses of 34 soil samples, 2 water samples, and 3 equipment blanks were performed by this method. The approximately 2.2 percent of the metals data that were rejected and 11.4 percent of the metals data that were estimated for matrix effects due to MS recoveries is within normal parameters for these methods. Severe matrix interference for antimony in soils is indicated for this method. With the exception of the rejected results for antimony, the effect of the data qualifications on the project objectives is not expected to be significant.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries were within QC limits.

Results for chromium, aluminum, barium, calcium, manganese, and vanadium were qualified as estimated (J) in 10 soil samples due to high RPDs in the associated laboratory duplicate sample analysis. The RPDs ranged from 38 to 54 percent, and lack of sample homogeneity typical of soil samples for this method is indicated. The effect on the project objectives is not expected to be significant.

Results for lead and nickel in 21 soil samples, cadmium in 11 soil samples, and aluminum in two water samples and an equipment blank were qualified as estimated for a serial dilution result that exceeded the control limit (approximately 5.6 percent of the metals data). Minor matrix interference is indicated. The qualifications due to serial dilution results do not significantly affect the project objectives.

No results were qualified for ICP ICS results.

All PQLs for the metals methods met the requirements specified in the QAPP. All PQLs for the inorganic methods met project objectives.

Field replicate results for small numbers of elements exceeded the specified criteria. No significant trends were noted, and all the results that exceeded the specified criteria were attributed to lack of sample homogeneity in the soil samples. Field duplicate precision results are not expected to adversely affect project objectives for these methods.

All of the PE sample results were within the project accuracy control limits specified in Table 3.2-3 of the QAPP.

Results for metals by EPA Method SW6010B, SW7470A, and SW7471A are valid and usable for decision-making purposes, with the exception of the results for antimony in 21 soil samples rejected due to matrix interference. The numbers and types of qualifications for the metals data are not unusual for the methods and matrices involved. Project objectives for antimony may be affected by severe matrix interference. Results and detection limits for non-detected results for antimony may be biased low. Estimated data are usable in decision-making for project objectives. The estimation of 19.5 percent of the metals data is not expected to significantly affect the project objectives.

#### 4.6.4 Data Quality Summary for EPA Method SW8015B for TEPH

Analyses were performed according to the method and requirements specified in the QAPP. Approximately 2.6 percent of the TEPH data were qualified as rejected (results for one equipment blank) and 38.4 percent were qualified as estimated (J/UJ) due to QC parameters.

One cooler with one equipment blank was received at 21°C. The associated non-detected results were qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected. All technical holding time requirements were met, with the following exceptions. Two detected results reported as unknown hydrocarbons used for reporting purposes were qualified as estimated (J-) due to holding time exceedance. The small number of qualified results do not adversely affect project objectives.

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less-than or equal-to 20%RSD or correlation coefficient greater than or equal to 0.995 criteria, and all %Ds for the CCVs met the  $\pm 15\%$ D criterion.

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits with the following exceptions. Results for TEPH in 12 of the 34 soil samples analyzed by this method (approximately 31 percent) were qualified as estimated (J-/UJ) for low surrogate recoveries. No data were rejected. The results for six of the samples were less than 65%R but greater than 30%R, which is the lower control limit (LCL) for samples that undergo SGC. According to the laboratory, all of the soil samples underwent SGC for this method; however, the extraction log for the associated preparation batch was missing the notation that SGC was performed. Therefore, the samples have been qualified as if SGC had not been performed. The recoveries are within the normal range for the extraction and analytical methods used. Estimated data are usable in decision-making for project objectives. The effect on the project objectives is not significant.

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits with the following exceptions. The results for TEPH as diesel in 11 soil samples, two water samples, and three equipment blanks; and for TEPH as motor oil in one equipment blank were estimated (J-/UJ) due to low LCS/LCSD recoveries. Analyses of 34 soil samples, two water samples, and three equipment blanks were performed by this method. Approximately 38.4 percent of the TEPH data were estimated. No results were rejected. The LCSs and the soil samples qualified for low LCS recoveries underwent SGC. Although the data are qualified as estimated according to the guidelines in the QAPP tables, the QAPP recognizes that SGC will result in recoveries below the 65%R LCL for all analyses by this method (refer to discussion in Section 4.4.1.8.4). The 44-55 percent LCS recoveries were above the 30 percent LCL specified in the QAPP as acceptable for samples having undergone SGC. As recoveries in the 30-65 percent range are expected, the effect on the project objectives is not expected to be significant.

For SW8015B for TEPH, all compounds met specified project PQLs. All PQLs for SW8015B met project objectives.

Field replicate results were within specified criteria. All results for TEPH were non-detected. Field duplicate precision does not adversely affect project objectives for this method.

All of the PE sample results were within the project accuracy control limits specified in Table 3.2-3 of the QAPP.

TEPH chromatograms were reviewed for every sample by the LDC validators and by Earth Tech chemists in San Jose, and a summary of the interpretation of the chromatographic patterns is presented in Table 4.4-10. All results reported as detections for specific TEPH fuels represent a reasonable characteristic match to the specified chromatographic fuel patterns, and may include inexact matches such as weathered fuel or additional peaks in the pattern. TEPH results that did not adequately match the fuel patterns of the standards were reported as Unknown Diesel or Motor Oil Range Hydrocarbons. These results do not represent kerosene, diesel, motor oil or other petroleum fuels as the chromatographic patterns indicate individual peaks or series of peaks not indicative of fuels.

Results for TEPH by EPA Method SW8015B are valid and usable for decision-making purposes, with the exception of rejected results for TEPH in one equipment blank. Results for all but two samples of the 38.4 percent of the TEPH data were qualified as estimated were due to LCS and surrogate recoveries less than 65 percent but greater than 30 percent. These qualifications do not significantly affect the project objectives as the LCSs and samples underwent SGC and recoveries in that range are acceptable according to the QAPP. Estimated data are usable in decision-making for project objectives. The qualifications are not expected to significantly affect the project objectives for this method.

#### **4.6.5 Data Quality Summary for EPA Method SW8081A for Pesticides**

Analyses were performed according to the method and requirements specified in the QAPP. Approximately 2.6 percent of the pesticide data were qualified as rejected (results for one equipment blank) and 3.9 percent were qualified as estimated (J/UJ) due to QC parameters.

One cooler with one equipment blank was received at 21°C. The associated non-detected results were qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected.

All technical holding time requirements were met. No field sample data used for reporting purposes were qualified due to holding time requirements.

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less-than or equal-to 20%RSD or correlation coefficient greater than or equal to 0.995 criteria, and all %Ds for the CCVs met the  $\pm 15\%$ D criterion, with the following exceptions. Data qualification for continuing calibrations resulted in the estimation (UJ) of non-detected results for two compounds in one of the 34 soil samples analyzed by this method and three compounds in 10 soil samples (approximately 3.9 percent of the pesticides data). No data were rejected. Estimated data are usable in decision-making for project objectives. The small number of estimated results does not affect the project objectives.

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

Laboratory duplicate precision was acceptable.

For SW8081A for pesticides, all compounds met specified project PQLs. All PQLs for SW8081A met project objectives.

Field replicate results were within specified criteria. All results for this method were non-detected or within specified criteria. Field duplicate precision does not adversely affect project objectives for this method.

All of the PE sample results were within the project accuracy control limits specified in Table 3.2-3 of the QAPP.

Results for pesticides by EPA Method SW8081A are valid and usable for decision-making purposes, with the exception of rejected results for one equipment blank. The small numbers and types of qualifications for the pesticides data are within normal parameters for the method, and do not significantly affect the project objectives for these methods.

#### **4.6.6 Data Quality Summary for EPA Method SW8082 for PCBs**

Analyses were performed according to the method and requirements specified in the QAPP. Approximately 2.6 percent of the PCB data were qualified as rejected (results for one equipment blank) and 38.4 percent were qualified as estimated (J/UJ) due to QC parameters.

One cooler with one equipment blank was received at 21°C. The associated non-detected results were qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected. In addition, PCBs are extremely stable and are not likely to dissipate due to storage at the reported temperature, so the non-detected results may be considered to indicate that PCBs are not present in this blank.

All technical holding time requirements were met, with the exceptions presented in Table 4.4-1G. The samples were initially analyzed within the holding time, but required re-extraction and reanalysis due to QC failure (see MS/MSD and LCS comments below). The QC for the reanalyses were acceptable. All results in the original and reanalyses were non-detected. Due to the stability of PCBs in preserved samples, the exceeded holding times do not adversely affect project objectives.

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less-than or equal-to 20%RSD or correlation coefficient greater than or equal to 0.995 criteria, and all %Ds for the CCVs met the  $\pm 15\%$ D criterion.

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits with the following exceptions. Results for PCBs in two equipment blanks were qualified as estimated (UJ) for low surrogate recoveries. The project objectives are not affected.

MS/MSD and LCS/LCSD analyses were performed according to method requirements. The comment in LDC DVR 4962A3b presented in Table 4.4-6C is not applicable to any reported results. The specified samples were initially analyzed on 6/22-23/00; however, the SW8081A spiking solution was used for the LCS/LCSD and MS/MSD instead of the SW8082 spiking solution. The samples were re-extracted and reanalyzed with an LCS/LCSD and MS/MSD on 6/26/00. All QC results were acceptable for the reanalyses, and the results from the reanalyses were reported. All results were non-detected for both sets of analyses. There is no effect on the project objectives.

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits with the following exceptions. The results for Aroclor 1260 in two equipment blanks were estimated (J-/UJ) due to LCS/LCSD RPDs greater than 20 percent. There is no effect on the project objectives.

For SW8082 for PCBs, all compounds met specified project PQLs. All PQLs for SW8082 met project objectives.

Field replicate results were within specified criteria. All results for this method were non-detected or within specified criteria. Field duplicate precision does not adversely affect project objectives for this method.

All of the PE sample results were within the project accuracy control limits specified in Table 3.2-3 of the QAPP.

Results for PCBs by EPA Method SW8082 are valid and usable for decision-making purposes with the exception of the rejected results for one equipment blank. With the exception of estimated results for equipment blanks, the only qualifications were due to holding time exceedances. PCBs are extremely stable and holding times are not expected to affect levels of PCBs in the samples. Due to the stability of PCBs, the exceeded holding times do not adversely affect project objectives.

#### **4.6.7 Data Quality Summary for EPA Method SW8260B for VOCs**

Analyses were performed according to the method and requirements specified in the QAPP. Approximately 2.2 percent of the VOC data were qualified as rejected (results for one equipment blank) and 19.8 percent were qualified as estimated (J-/UJ) due to QC parameters.

One cooler with one equipment blank was received at 21°C. The associated non-detected results were qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected. The temperature measured in another cooler received at the laboratory with four soils samples for SW8260B was recorded at 13°C, with a temperature blank measured at 10°C. The associated data were qualified as estimated (J-/UJ). Estimated data are usable in decision-making for project objectives. The effect on the project objectives is not expected to be significant.

All technical holding time requirements were met. No field sample data used for reporting purposes were qualified due to holding time requirements.

Initial calibrations were performed according to method requirements within validation criteria, with the exceptions noted in Table 4.4-2C. Average 6.6% were within validation criteria, with the exceptions noted in Table 4.4-2D. Continuing calibration was performed at the required frequencies within validation criteria, with the exceptions noted in Table 4.4-2E. All of the continuing calibration RRF values within validation criteria, with the exceptions noted in Table 4.4-2F. Initial and continuing calibration was not reported for 2-chloroethylvinyl ether in many of the soils samples. The SW5035 methanol preservation destroys this compound. Therefore, there were no recoveries for any QC analysis of this compound. For reporting purposes, the results for 2-chloroethylvinyl ether in all of the soils samples have been qualified as rejected (R) and unusable wherever they are reported. As 2-chloroethylvinyl ether is not a contaminant of concern at the project site, there is no effect on the project objectives.

Approximately 3.0 percent of the SW8260B results were qualified as estimated due to exceeded calibration criteria, which is within normal parameters for this method. With the exception of 2-chloroethylvinylether in soils, the VOC data are usable in decision-making for project objectives. The small number of estimated results does not significantly affect the project objectives.

Method blanks were analyzed for each matrix as applicable. Approximately 1.3 percent of the VOC data were blank-qualified. Results for acetone in 28 soil samples and MEK in seven soil samples by EPA Method SW8260B were blank-qualified due to laboratory blank results. Low level results for methylene chloride in one soil sample and acetone in three soil samples were blank-qualified as common laboratory contaminants. No results for other VOCs were blank-qualified. The reported concentrations of the blank-qualified compounds for SW8260B were all significantly lower (2-6 orders of magnitude) than the action levels specified in the DQOs. Blank contamination does not affect the quality of the data for this analytical method.

Acetone and methylene chloride are demonstrated common laboratory contaminants. Due to the prevalence of acetone in method and equipment blanks, all results for acetone, which were at low concentrations, were blank-qualified. In addition, MEK is generally considered to be a common laboratory contaminant according to EPA Region IX data validation guidelines. Results for MEK were not blank-qualified for common laboratory contamination by the validators for this project. However, QES/STL has determined that the glue used to bind the septum to the teflon caps to the Encore™ soils preservation vials used for SW5035 preparation may produce low levels of MEK upon heating during sample purge. This type of Encore™ preservation vial cap was used for the samples in this project. Method blanks were not generally placed in the Encore™ preservation vials, and equipment blanks and trip blanks did not undergo SW5035 preparation, so MEK detections would not be expected in these blanks, even if laboratory contamination were affecting project samples. Therefore, the unqualified low level results reported for MEK should be considered as potential laboratory artifacts. These MEK results were significantly lower (5 orders of magnitude) than the action level specified in the DQOs.

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

All internal standard peak areas and retention times were within QC limits, with the exceptions presented in Table 4.4-5A. Results for one internal standard outside of control limits resulted in the estimation (J-/UJ) of approximately one-third of the target analytes in six of 34 soil samples. Approximately 1.6 percent of the SW8260B results were qualified as estimated (J/UJ) and no data were rejected for internal standard problems. Estimated data are usable in decision-making for project objectives. The effect on the project objectives is not significant.

MS/MSD analyses were performed according to method requirements, with the exception presented in Table 4.4-6D. MS/MSD analyses were not analyzed for VOCs in the batch associated with the two water samples and 17 soil samples specified. No MS/MSDs were analyzed for the two grab water samples. Additional volume for the MS/MSDs was not provided due to minimal volume of standing water in the two sampling pits with water. MS/MSD analysis was performed on one of the 34 soil samples for this sampling event. There was inadequate soil sample for additional MS/MSDs as the required additional Encore samplers were not collected for any samples in the respective batches. LCS/LCSD analyses were performed instead. Although one additional MS/MSD was required to meet the minimum of 1:20 for soils, interference was not indicated as a significant problem for this method in the MS/MSD that was performed for this sampling event or for samples in other sampling events for this project. The effect on the quality of the data is not expected to be significant.

MS/MSD analyses were performed on one soil sample and for the aqueous matrix according to method requirements. Percent recoveries and RPDs were within QC limits with the following exceptions. The results for two compounds were estimated (UJ) in the specified QC soil sample due to high RPDs between the MS/MSD recoveries, which were within QC limits. The compounds are not chemicals of potential concern, no low recoveries were reported, and the results were non-detected. The effect on the project objectives is not significant.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits, with the exception of recoveries greater than the UCL, and the associated results were non-detected. No data were qualified and there is no effect on the project objectives.

Level III review of the summary forms and Level IV review of the raw data and summary forms for GC/MS analyses by EPA Method SW8260B did not show any problems associated with correct analyte identification.

All PQLs for VOCs met the requirements specified in the QAPP, with the exceptions specified in Table 4.4-11A. For all water samples, the 1,1,2-trichloro-1,2,2-trifluoroethane PQL was reported at 2.0 µg/L, whereas the PQL is specified as 1.0 µg/L in the QAPP. The MDL of 1 µg/L is at the PQL. For all water samples, the vinyl acetate PQL was reported at 10 µg/L, whereas the PQL is specified as 5 µg/L in the QAPP. The MDL of 1 µg/L is less than one half the PQL, so the laboratory could have reported results using the specified PQL. The low concentration calibration standard for both compounds was analyzed at 1 µg/L, demonstrating acceptable sensitivity and linearity at 1 µg/L. Vinyl acetate is not a chemical of potential concern at the project site. As results are reported down to the MDL and the action levels (see Table 2.4-11) for this project exceed the reported PQLs by several orders of magnitude for these compounds, there is no effect on the project objectives.

For all soil samples, the MTBE and 1,1,2-trichloro-1,2,2-trifluoroethane PQLs were reported at 0.010 mg/kg, whereas the PQLs are specified as 0.005 mg/kg in the QAPP. The MDLs of 0.006 mg/kg marginally exceed the PQLs. The low concentration calibration standard for both compounds was analyzed at 0.010 mg/kg. For MTBE, there is no action level specified for soils. As results are reported down to the MDL and the action level (see Table 2.4-11) for 1,1,2-trichloro-1,2,2-trifluoroethane for this project exceeds the reported PQL by five orders of magnitude, there is no significant effect on the project objectives.

Field replicate results were within specified criteria. All results for this method were non-detected or within specified criteria. Detected results for VOCs were all at low concentrations, and none of the detected compounds were confirmed in the duplicate or replicate sample, with the exception of 2-butanone in collocated replicate samples LFP-29-S2-2.0' and LFP-29-S1-2.5', which were both detected at trace levels but blank qualified as non-detected and estimated (UJ) due to method blank results. Field duplicate precision does not adversely affect project objectives for this method.

Results for VOCs by EPA Method SW8260B are valid and usable for decision-making purposes, with the exception of 2-chloroethylvinyl ether in soils and rejected results for one equipment blank. Most of the estimations were for five samples received with slightly elevated temperatures, and six samples with one internal standard outside QC limits. Non-conformances for PQLs do not affect the project objectives. The numbers and types of qualifications for the VOC data do not significantly affect the project objectives for this method.

#### **4.6.8 Data Quality Summary for EPA Method SW8270C for Pentachlorophenol**

Analyses were performed according to the method and requirements specified in the QAPP. Approximately 7.9 percent of the PCP data (results for three samples) were qualified as estimated (UJ) due to QC parameters. No results were rejected.

All technical holding time requirements were met, with the exception of one water sample qualified as estimated (UJ) as the analysis exceeded the holding time by one day. The effect on the quality of the data is not significant.

Initial calibrations were performed according to method requirements. All %RSDs for the 6.6%*s* met the less-than or equal-to 20%RSD or correlation coefficient greater than or equal to 0.995 criteria, and all %Ds for the CCVs met the  $\pm 15\%$ D criterion.

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits, with the exception of the result for pentachlorophenol in one of 33 soil samples analyzed by this method which was qualified as estimated (UJ) for a low surrogate recovery. No data were rejected. The single estimation for surrogate recovery does not significantly affect the project objectives.

All internal standard peak areas and retention times were within QC limits, with the exception of one internal standard outside of control limits in one equipment blank that resulted in the estimation (UJ) of pentachlorophenol. No results were rejected. The project objectives are not affected.

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

Laboratory duplicate precision was acceptable.

For SW8270C for PCP, all PQLs met project objectives.

Field replicate results were within specified criteria. All results for PCP were non-detected. Field duplicate precision does not adversely affect project objectives for this method.

Level III review of the summary forms and Level IV review of the raw data and summary forms for GC/MS analyses by EPA Method SW8270C did not show any problems associated with correct analyte identification.

PE sample results were not evaluated for PCP.

Results for PCP by EPA Method SW8270C are valid and usable for decision-making purposes. The small numbers and types of qualifications for the PCP data do not significantly affect the project objectives.

#### **4.6.9 Data Quality Summary for EPA Method SW8270CWM for Chloropicrin**

Analyses were performed according to the method and requirements specified in the QAPP. Approximately 2.6 percent of the chloropicrin data were qualified as rejected (results for one equipment blank) and no results were qualified as estimated (J/UJ) due to QC parameters.

One cooler with one equipment blank was received at 21 °C. The associated non-detected result was qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected.

All technical holding time requirements were met. No data were qualified due to holding time requirements.

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less-than or equal-to 20%RSD or correlation coefficient greater than or equal to 0.995 criteria, and all %Ds for the CCVs met the  $\pm 15\%D$  criterion.

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

All internal standard peak areas and retention times were within QC limits.

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

Laboratory duplicate precision was acceptable.

For SW8270CWM for chloropicrin, all PQLs met project objectives.

Field replicate results were within specified criteria. All results for chloropicrin were non-detected. Field duplicate precision does not adversely affect project objectives for this method.

The PE sample result was within the project accuracy control limits specified in Table 3.2-3 of the QAPP.

Results for chloropicrin by Modified Method SW8270CWM are valid and usable for decision-making purposes. The only qualification for chloropicrin was for an equipment blank.

#### **4.6.10 Data Quality Summary for EPA Method SW8290 for Dioxins/Furans**

Analyses were performed according to the method and requirements specified in the QAPP. Approximately 6.2 percent of the dioxins/furan data were qualified as rejected (results for one equipment blank) and 0.7 percent were qualified as estimated (J/UJ) due to QC parameters.

One cooler with one equipment blank was received at 21°C. The associated non-detected results were qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected.

All technical holding time requirements were met. No data were qualified due to holding time requirements.

Initial calibrations were performed with a five point initial calibration according to method requirements and met validation criteria. Routine (continuing) calibration was performed at the required frequencies and met validation criteria, with the following exceptions. The 20.2%D between the initial calibration RRF and the routine calibration RRF internal standard for OCDF marginally exceeded the 20%D control limit. The detected results for OCDF in two soil samples were qualified as estimated (J+). The effect on the quality of the data is not significant.

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

All internal standard peak areas and retention times were within QC limits.

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs for all LCS/LCSD analyses performed were within QC limits.

Laboratory duplicate precision was acceptable.

Level III review of the summary forms and Level IV review of the raw data and summary forms for HRGC/MS analyses by SW8290 did not show any problems associated with correct analyte identification.

For the QES/STL analyses of SW8290, the MDLs for all compounds met specified project PQLs. All PQLs for SW8290 met project objectives.

Precision assessment for detected field replicate results is presented in Table 4.4-13D. Detected results for two dioxins and two furans in replicate sample LFP-24-S1A-8.0' were not detected in sample LFP-24-S1-8.0'. Localized concentration of contamination related to the landfill is the expected cause of the difference between the replicate sample results. The detected results are not considered compromised by the non-detected results in the collocated sample, and vice-versa, due to the landfill origin of the samples. Analytical integrity is not considered to be affected. The effect on the project objectives is to document the localized nature of potential contamination in the landfill.

PE samples were not available for this method.

Results for dioxins/furans by EPA Method SW8290 are valid and usable for decision-making purposes with the exception of the rejected results for one equipment blank. The detected results for OCDF in two soil samples were qualified as estimated (J+) due to a marginally exceeded continuing calibration control limit. Analytical integrity is not considered to be affected by field replicate results in one sample pair exceeding field precision criteria due to the landfill origin of the samples. The effect of qualified data on the project objectives is not significant.

#### **4.6.11 Data Quality Summary for EPA Method SW8310 for PAHs**

Analyses were performed according to the method and requirements specified in the QAPP. Approximately 2.4 percent of the dioxins/furan data were qualified as rejected (results for one equipment blank) and 14.3 percent were qualified as estimated (J/UJ) due to QC parameters.

One cooler with one equipment blank was received at 21°C. The associated non-detected results were qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected.

All technical holding time requirements were met. No field sample data used for reporting purposes were qualified due to holding time requirements.

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less-than or equal-to 20%RSD or correlation coefficient greater than 0.995 criteria. Calibration verification was performed at required frequencies. The percent recoveries of amounts in continuing standard mixtures were within the 85-115 percent QC limits.

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method, with the exceptions presented in Table 4.4-3J. No data were qualified, and there is no effect on the quality of the data.

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits with the following exceptions. Non-detected results for all target compounds in two of 34 soil samples, one of two water samples, and two of three equipment blanks were qualified as estimated (J-/UJ) for low surrogate recoveries. In addition, the detected and non-detected results for PAHs in one aqueous PE sample were qualified as estimated. All of the soil samples with surrogate recoveries outside of QC limits were re-extracted and reanalyzed as required, with acceptable recoveries for all except the qualified samples. Results for original analyses were confirmed in the reanalyses. Although corrective action was performed, the recoveries remained low, and re-extractions were out of holding times. For the water sample, the low recovery indicates the possibility of slightly low bias for the reporting limits for the non-detected results. For the soils, the small number of qualifications for surrogate recoveries does not significantly affect the project objectives.

MS/MSD analyses were performed according to method requirements, with the exceptions presented in Table 4.4-6G. For the two associated aqueous environmental field samples collected from two open pits, inadequate sample volume was provided due to low volumes of water in the pits. LCS/LCSD analyses were performed instead. Surrogate recoveries must be used to evaluate potential matrix interference in these samples, for which the matrix could not be characterized. All other samples referenced in the table were field QC samples, or the MS/MSDs were extracted and analyzed.

MS/MSD analyses were performed for the soils matrix as applicable. Percent recoveries and RPDs were within QC limits, with the exceptions presented in Table 4.4-6G. The non-detected results for ten compounds were estimated in one QC soil sample for MS/MSD RPDs that exceeded specified criteria, generally resulting from high recoveries in the MSD. The effect of the small number of qualifications on the project objectives is not significant.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits for all LCS/LCSD analyses performed, with the following exceptions. The results for four compounds in two water samples, two equipment blanks, and a PE sample were estimated (J-/UJ) due to LCS/LCSD results outside of QC limits. Estimated data are usable in decision-making for project objectives. The effect of the small number of estimations on the project objectives is not significant.

MS/MSD RPD exceedances were intermittent and generally marginally exceeded control limits. No distinct trends were apparent. The results for three compounds in two water samples, two equipment blanks, and a PE sample were estimated (J-/UJ) due to low LCS recoveries with RPDs of 31 to 34 percent between the LCS/LCSD that exceeded the 30 RPD criteria. Laboratory duplicate precision is not expected to adversely affect project objectives.

Level III review of the summary forms and Level IV review of the raw data and summary forms for HPLC analysis by EPA Method SW8310 did not show any problems associated with correct analyte identification.

For SW8310 for PAHs, all compounds met specified project PQLs. All PQLs for SW8310 met project objectives.

All results for PAHs in field replicate samples were non-detected. Field replicate precision does not adversely affect project objectives for this method.

For EPA Method SW8310, an aqueous double blind PE sample was provided to the laboratory on March 30, 2000 with samples for the data gaps investigation, and an aqueous double blind PE sample and a soil PE sample were provided to the laboratory on May 30, 2000 with samples for the RAW investigation. All results were acceptable for the data gaps aqueous PE sample and for the soil PE sample. For the RAW investigation aqueous PE sample, a false negative was reported for acenaphthene. All other analytes were acceptable. As the 34 percent surrogate recovery was low for this PE sample, the PE sample was re-extracted past the extraction hold time and reanalyzed with an acceptable surrogate recovery. All results were acceptable with the exception of another false negative for acenaphthene. Acenaphthene was spiked slightly above the PQL. As the aqueous action level specified in the DQOs of the Work Plan for acenaphthene is 37 times the PQL and 28.5 times the spike concentration in the PE sample, the possibility of a false negative near the action limit is not implied for this compound and is not expected to have a significant impact on the project objectives. The 94 percent compliance for one PE sample and 100 percent compliance for two others for this laboratory (vs 95 percent goal), demonstrate acceptable laboratory accuracy for this method.

Results for PAHs by EPA Method SW8310 are valid and usable for decision-making purposes. Approximately 14 percent of the PAH data were estimated, mostly for low surrogate recoveries, of which half the qualified samples were equipment blanks and PE samples. Estimated data are usable in decision-making for project objectives. The two aqueous environmental field samples were grab water samples from standing water found in the bottom of two sampling pits. Due to low volumes of water in the pits, the triple volumes necessary to perform MS/MSD analyses and secondary volume for re-extractions and reanalyses could not be provided. For these water samples, low recoveries indicate the possibility of slightly low bias for the reporting limits for the non-detected results. For the soils, the small number of qualifications for surrogate recoveries does not significantly affect the project objectives.

#### **4.6.12 Data Quality Summary for EPA Method SW8330 for Explosives**

Analyses were performed according to the method and requirements specified in the QAPP. Approximately 1.4 percent of the explosives data were qualified as estimated (UJ) due to QC parameters. No results were rejected.

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

Initial calibrations were performed for the primary (quantitation) column and confirmation column according to method requirements. All %RSDs for the RFs met the less-than or equal-to 20%RSD or correlation coefficient greater than 0.995 criteria. Calibration verification was performed at the required frequencies. The %Ds for the CCVs met the less-than or equal-to 15%D criterion, with the following exception. The result for 4-amino-2,6-dinitrotoluene in one soil sample was qualified as estimated (UJ) due to a continuing calibration result that exceeded the control limits. The sample was not a planned sample for the RAW investigation, and the project objectives are not affected.

No contaminant concentrations were found above the reporting limit in the laboratory preparation blanks for this method. No contaminant concentrations were found above the reporting limit in the equipment blanks for this method, with one exception presented. The trace result for 1,3,5-trinitrobenzene in one water sample was blank-qualified. The effect on the project objectives is not significant.

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits with the following exceptions. The result for 4-amino-2,6-dinitrotoluene in one soil sample was

estimated (UJ) for a high RPD in the MS/MSD and the result for tetryl in another soil sample was estimated (UJ) for a marginally low MS recovery. The effect of the small number of qualifications for marginally exceeding control limits on the project objectives is not significant.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits for all LCS analyses performed, with the following exceptions. The results for two-to-three compounds in both water samples, three equipment blanks, and an aqueous PE sample were estimated (J-/UJ) due to LCS/LCSD results outside of QC limits. Recoveries for the specified compounds were generally below the LCL for the LCSD, within QC limits for the LCS, and the RPDs exceeded specified criteria. Although corrective action was performed, the re-extractions were out of holding times. No soils data were qualified. Estimated data are usable in decision-making for project objectives. The effect of the small number of estimations on the project objectives is not significant.

All results for explosives in field replicate samples were non-detected. Field replicate precision does not adversely affect project objectives for this method.

MS/MSD and LCS/LCSD RPD exceedances were intermittent and generally marginally exceeded control limits. No distinct trends were apparent. Laboratory duplicate precision is not expected to adversely affect project objectives.

Level III review of the summary forms and Level IV review of the raw data and summary forms for HPLC analysis by EPA Method SW8330 did not show any problems associated with correct analyte identification.

For SW8330 for explosives and SW8330M for PETN/nitroglycerin, all compounds met specified project PQLs. All PQLs for SW8310 met project objectives.

All results for explosives in field replicate samples were non-detected. Field replicate precision does not adversely affect project objectives for this method.

For EPA Method SW8330, PE sample results for all analytes were very good with the exception of tetryl with a 36%R. The true value for tetryl was below the PQL. A low level of TNT was accurately reported. Follow-up PE samples of one double blind aqueous and one single blind soil samples were provided to the laboratory. All results were acceptable for the soil PE sample. For the aqueous PE sample, all results were acceptable with the exception of a marginally low 61%R for 2,6-dinitrotoluene (vs 65%R LCL) for which the true value was one-fifth of the PQL. The results indicate acceptable performance by the laboratory for these analyses, especially at the PQL.

Results for explosives by EPA Method SW8330 are valid and usable for decision-making purposes. Approximately 1.4 percent of the explosives data were estimated for various QC parameters, mostly for LCS/LCSD results outside of QC limits. The small numbers and types of qualifications for the explosives data do not significantly affect the project objectives.

#### **4.6.13 Data Quality Summary for EPA Method SW8330M for PETN and Nitroglycerin**

Analyses were performed according to the method and requirements specified in the QAPP. None of the PETN/nitroglycerin data were qualified as estimated or rejected.

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less-than or equal-to 20%RSD or correlation coefficient greater than 0.995 criteria, and all %Ds for the CCVs met the less-than or equal-to 15%D criterion.

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

Laboratory precision was acceptable.

For SW8330 for explosives and SW8330M for PETN/nitroglycerin, all compounds met specified project PQLs. All PQLs for SW8310 met project objectives.

All results for PETN and nitroglycerin in field duplicate and replicate samples were non-detected. Field duplicate precision does not adversely affect project objectives for this method.

Results for PETN and nitroglycerin by EPA Method SW8330M are valid and usable for decision-making purposes. None of the PETN/nitroglycerin data were qualified as estimated or rejected.

#### **4.7 COMPLETENESS SUMMARY**

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under correct, normal conditions. The overall assessment of completeness is the extent to which the database resulting from a measurement effort fulfills objectives for the amount of data required. Completeness is generally defined as the valid data percentage of the total tests requested.

Valid analyses are defined as those where the sample arrived at the laboratory intact, properly preserved, in sufficient quantity to perform the requested analyses, and accompanied by a completed COC form. Furthermore, the sample must be analyzed within the specified holding time and in such a manner that analytical QC acceptance criteria are met to the degree that the result is usable for decision-making purposes.

Completeness for the entire project also involves completeness of field and laboratory documentation, whether all samples and analyses specified in the FSP have been processed, and whether they were processed according to the procedures specified in the Work Plan and laboratory standard operating procedures (SOPs). Therefore, completeness is evaluated in terms of four goals which are discussed with regard to project goals in this section: field sampling completeness, contractual completeness, analytical completeness, and technical completeness. Field completeness is calculated for each method using the information presented in Table 4.3-1. The remaining completeness results are presented in Table 4.7-1.

The completeness goals are evaluated qualitatively as well as quantitatively. The quantitative evaluation of completeness is determined according to the foregoing definitions. The qualitative evaluation of

completeness evaluates the impacts of each of the completeness goals on the DQOs for the project, including all events contributing to the sampling event and the effects of incomplete data.

A summary of completeness assessment for each analytical method is provided in the following subsections.

#### 4.7.1 Field Sampling Completeness

Field sampling completeness is defined as the ratio of collected samples to the total number of samples planned. The goal for field completeness is 100 percent.

Results for samples planned, sampled, collected, and analyzed are presented in Table 4.3-1. All samples included in the RAW, collected from May 30 through June 8, 2000 for this phase of the RI, known as the removal action investigation, are included. All field samples are marked with a "1" in the column for each method analyzed. Field QC samples are marked with an "X." Samples not successfully collected and analyzed are marked with a bold "M." In some cases, samples marked with an "M" were not required, as discussed below.

Additional samples collected at locations TNT-R6 through TNT-R15 on May 24, 2000, and TNT-R16 through TNT-R20 on June 5 through 7, 2000 were not planned in the RAW, are not included in Table 4.3-1, and are not included in the field sampling completeness calculations for the RAW. Field completeness for these samples was 100 percent.

Field completeness for the RAW was 100 percent for all methods, with the following exceptions.

For soil sample LFM-1, analyses for SW8270C for PCP, SW8270CWM for chloropicrin, and 300.0 for nitrate-N and nitrite-N were not analyzed because the sample sleeve was not full and ran out of sample after the other analyses were performed. The field completeness for these methods is 97.2 percent, 97.2 percent, and 97.4 percent, respectively. The landfill mounds were adequately characterized for the respective analytes by the analyses that were performed for samples LFM-2 through LFM-5, and the effect on the project objectives is not expected to be significant. Resampling is not considered necessary.

For EPA Method SW8290, one planned sample for soil sample LFP-12-S2-6.0 was missed. An additional sample marked with the "M" in Table 4.3-1 is field replicate sample LFP-12-S1A/4. As sample LFP-12-S1-4.0 was successfully analyzed for this location, this sample is not included in the project field completion calculation. The field completeness for this method is 92.9 percent. A sample was analyzed for dioxins/furans at a location two feet above the missed sample, and the effect on the project objectives is not expected to be significant.

For CADHS Method 300.0M for perchlorate, two planned samples (LFP-12-S1-4.0 and LFP-12-S2-6.0) were missed. Two additional samples marked with the "M" in Table 4.3-1 include field replicate samples LFP-12-S1A/4 and LFP-24-S1A-8.0. Sample LFP-24-S1-8.0 was successfully analyzed for the specified location. No sample was analyzed for location LFP-12-S1-4.0. As field replicate samples, these samples are not included in the project field completion calculations. In addition, two water samples are marked with the "M" in Table 4.3-1. The sample plan in the RAW specifies that water samples be analyzed for all analyses when water is found in the sampling pits. However, due to the low volumes of water in the two pits where standing water was encountered, not all analyses could be performed. As perchlorate was not found anywhere at the project site, the samples for perchlorate were not collected at the expense of other methods, and no field duplicate or MS/MSD samples for any method could be collected. The sample plan allows for water samples not to be collected in the event water flow is inadequate, so the missed water samples are not included in the project field completion calculations. The field completeness for this

method is 92.9 percent. Adequate samples were collected project-wide to determine that perchlorate is not a contaminant at the project site, and the effect on the project objectives is not considered to be significant. Resampling is not considered necessary.

Field completeness for this sampling event is acceptable for all methods. No further sampling is required to meet the project objectives for this stage of the investigation.

#### 4.7.2 Contractual Completeness

Contractual completeness is defined as the ratio of contractually compliant sample analyses to the total number of tests requested of the laboratories. The goal for contractual completeness is 100 percent. In addition, the goal for sample analyses within maximum holding time is 100 percent. All samples identified as critical to project decision-making objectives must meet 100-percent completeness.

Contractual completeness, as calculated by the LDC validators, is presented in column four of Table 4.7-1. Contractual non-compliances, noted in the LDC DVR tables with a "P" qualifier, are discussed below.

Contractual completeness for CADHS Method 300.0M (perchlorate), and EPA Methods SW6010B, SW7470A, SW7471A, SW8081A, SW8270CWM (chloropicrin), SW8310, and SW8330M (nitroglycerin/PETN) were 100 percent. No samples were identified as critical with less than 100 percent contractual completeness.

Contractual completeness for EPA Method 300.0 was calculated by LDC to be 24.4 percent. The following contractual non-compliance was noted. Two results for nitrite-N were rejected (R) in soil samples, and results for nitrate-N and nitrite-N were estimated in 33 soil samples and two aqueous field samples and an equipment blank due to holding time exceedance. The holding time for these analytes is 48 hours, and in some cases it is not possible to get samples to the laboratory and analyzed within the specified time frame. The exceedances were generally due to analyses less than 12 hours past the 48 hour holding time. For the estimated results for nitrate-N and nitrite-N, the potential impact of the holding time qualifications would be for nitrite-N to convert to nitrate-N, with marginal effect on the sum of the two analytes. The effect on project objectives is minimal, and corrective action was not required.

Contractual completeness for EPA Method SW8015B for TEPH was calculated by LDC to be 94.7 percent. The following contractual non-compliance was noted. The results for TEPH as diesel in 11 soil samples, two water samples, and three equipment blanks; and for TEPH as motor oil in one equipment blank were estimated (J-UJ) due to low LCS/LCSD recoveries. The LCSs and the soil samples qualified for low LCS recoveries underwent SGC. Although the data are qualified as estimated according to the guidelines in the QAPP tables, the QAPP recognizes that SGC will result in recoveries below the 65%R LCL for all analyses by this method (refer to discussion in Section 4.4.1.8.4). As all of the LCS recoveries were above the 30 percent LCL specified in the QAPP as acceptable for samples having undergone SGC, recoveries in the 30-65 percent range are expected, and the effect on the project objectives is not expected to be significant.

Contractual completeness for EPA Method SW8082 for PCBs was calculated by LDC to be 72.2 percent. The following contractual non-compliances were noted. LCS/LCSD analyses were performed according to method requirements. The comment in LDC DVR 4962A3b presented in Table 4.4-6C is not applicable to any reported results, although they were counted in the LDC calculations for completeness. The specified samples were initially analyzed on 6/22-23/00; however, the SW8081A spiking solution was used for the LCS/LCSD and MS/MSD instead of the SW8082 spiking solution. The samples were re-extracted and reanalyzed with an LCS/LCSD and MS/MSD on 6/26/00. All QC results were acceptable for the reanalyses, and the results from the reanalyses were reported. All results were non-detected for both sets of analyses. In addition, the results for Aroclor 1260 in two equipment blanks were estimated (J-UJ) due to

LCS/LCSD RPDs greater than 20 percent. There is no effect on the project objectives. Contractual completeness for PCBs does not affect project objectives.

Contractual completeness for EPA Method SW8260B for VOCs was calculated by LDC to be 99.4 percent. The following contractual non-compliances were noted.

MS/MSD analyses were not analyzed for VOCs in the batch associated with the two water samples and 17 soil samples specified in Table 4.4-6D. No MS/MSDs were analyzed for the two grab water samples. Additional volume for the MS/MSDs was not provided due to minimal volume of standing water in the two sampling pits with water. MS/MSD analysis was performed on one of the 34 soil samples for this sampling event. There was inadequate soil sample for additional MS/MSDs as the required additional Encore samplers were not collected for any samples in the respective batches. LCS/LCSD analyses were performed instead. Although one additional MS/MSD was required to meet the minimum of 1:20 for soils, interference was not indicated as a significant problem for this method in the MS/MSD that was performed for this sampling event or for samples in other sampling events for this project. The effect on the project objectives is not expected to be significant.

Contractual completeness for EPA Method SW8270C for PCP was calculated by LDC to be 97.4 percent. The following contractual non-compliance was noted. The result for PCP in one water sample qualified as estimated (UJ) as the analysis exceeded the holding time by one day. The effect on the quality of the data is not significant.

Contractual completeness for EPA Method SW8290 for dioxins/furans was calculated by LDC to be 99.3 percent. The following contractual non-compliance was noted. The 20.2%D between the initial calibration RRF and the routine calibration RRF internal standard for OCDF marginally exceeded the 20%D control limit. The detected results for OCDF in two soil samples were qualified as estimated (J+). The project objectives are not affected.

Contractual completeness for EPA Method SW8330 for explosives was calculated by LDC to be 97.1 percent. The following contractual non-compliances were noted. The results for two-to-three compounds in two water samples, three equipment blanks, and a PE sample were estimated (J-/UJ) due to LCS/LCSD results outside of QC limits. Recoveries for the specified compounds were generally below the LCL for the LCSD, within QC limits for the LCS, and the RPDs exceeded specified criteria. No soils data were qualified. Estimated data are usable in decision-making for project objectives. The effect of the small number of estimations on the project objectives is not significant.

Overall, contractual completeness is considered to be acceptable for this phase of the investigation. When assessing contractual completeness for methods that did not meet the 100 percent goal, the nature of the non-compliances, the resultant qualifications (if applicable), and the impact on the ability of the data to meet the requirements for decision-making with respect to the project objectives must be considered. In general, contractual non-compliances were limited to problems such as minor holding time exceedances, low surrogate results, lack of MS/MSDs for every preparation and analytical batch, and some low LCS recoveries. Many of these contractual non-compliances calculated into the contractual completeness percentages are not non-compliant with the contractual requirements of the QAPP. Examples include when non-compliant analyses were not used for reporting purposes, low surrogate recoveries when re-extraction and/or reanalyses were performed as required, or low LCS recoveries when SGC was performed.

In addition, the two aqueous environmental field samples were grab water samples from standing water found in the bottom of two sampling pits. Due to low volumes of water in the pits, the triple volumes necessary to perform MS/MSD analyses and secondary volume normally provided for re-extractions and

reanalyses could not be provided. Therefore, corrective actions could not be performed for the non-compliances related to these water samples.

The effects of the individual non-compliances have been assessed in detail in the sections for QC assessment of each analytical QC parameter, and unless otherwise specified, the effects are considered not to be significant.

Thus, although the contractual completeness was not 100 percent for some methods, the data are usable as assessed in validation for decision-making purposes. No samples with severely impacted (rejected) data were found to be critical to the project objectives. The effects of the contractual completeness issues did not significantly affect the ability of the data set to meet the requirements for decision-making with respect to the project objectives.

#### **4.7.3 Analytical Completeness**

Analytical completeness is defined as the ratio of unqualified sample results to all sample results. Qualified results include both rejected and estimated results. The goal for analytical completeness is 90 percent. Analytical completeness is presented in column seven of Table 4.7-1 and is discussed below.

Analytical completeness of 90 percent or greater was achieved for CADHS Method 300.0M (perchlorate), and EPA Methods SW7470A, SW7471A, SW8081A, SW8270C (PCP), SW8270CWM (chloropicrin), SW8290, SW8330, and SW8330M (nitroglycerin/PETN).

Analytical completeness for EPA Method 300.0 for anions was calculated to be 11.0 percent. Two results for nitrite-N were rejected in soil samples, and results for nitrate-N and nitrite-N were estimated in 33 soil samples and 2 aqueous field samples and an equipment blank due to holding time exceedance. The exceedances were generally due to analyses less than 12 hours past the 48-hour holding time. Therefore, although 85 percent of the nitrate-N/nitrite-N data were estimated, the qualifications are not expected to significantly affect the project objectives. Nitrate-N in twenty-one soil samples required blank qualification due to equipment blank results. Field sample results for nitrate-N less than 5 times the equipment blank concentration but detected at concentrations above 0.20 mg/kg have been qualified as estimated (J) instead of non-detected and estimated (UJ) using professional judgement at the request of the project chemist. With the exception of two rejected nitrite-N results, the data are usable for decision-making purposes. The types of estimations do not significantly affect the project objectives for this method.

Analytical completeness for EPA Method SW6010B, SW7470A, and SW7471A for metals was calculated to be 78.4 percent. Results were qualified as estimated mostly due to MS/MSD, sample duplicate, and serial dilution results, all of which are matrix-related QC parameters. The numbers and types of qualifications do not significantly affect the project objectives for this method.

Analytical completeness for EPA Method SW8015B for TEPH was calculated to be 57.9 percent. Results were qualified as estimated mostly due to LCS and surrogate recoveries which were either marginally low, or within 30-60%R for SGC-extracted LCSs. Additional qualifications were made for one equipment blank received at 21 °C. Estimated data are usable in decision-making for project objectives. Analytical completeness for TEPH does not significantly affect project objectives.

Analytical completeness for EPA Method SW8082 for PCBs was calculated to be 59.0 percent. With the exception of estimated results for equipment blanks due to surrogate, LCS, and MS/MSD results, the only qualifications were due to holding time exceedances. Results for PCBs in one equipment blank were rejected and PCBs in 11 samples were estimated due to holding time exceedances. The samples were initially analyzed within the holding time, but required re-extraction and reanalysis due to QC failure. The QC for the reanalyses were acceptable. Due to the stability of PCBs, the exceeded holding times do not

adversely affect project objectives. PCBs are extremely stable and holding times are not expected to affect levels of PCBs in the samples. Estimated data are usable in decision-making for project objectives. Analytical completeness for PCBs does not affect project objectives.

Analytical completeness for EPA Method SW8260B for VOCs was calculated to be 78.4 percent. The non-detected results in one equipment blank were rejected (R) as the cooler was received at 21°C. As the only sample involved was an equipment blank, the project objectives are not affected. The temperature measured in another cooler received at the laboratory with four soils samples for SW8260B was recorded at 13°C, with a temperature blank measured at 10°C. The associated data were qualified as estimated (J-/UJ). Approximately 3.0 percent of the SW8260B results were qualified as estimated due to exceeded calibration criteria, which is within normal parameters for this method. Results for acetone in 28 soil samples and MEK in seven soil samples by EPA Method SW8260B were blank-qualified due to laboratory blank results. Low level results for methylene chloride in one soil sample and acetone in three soil samples were blank-qualified as common laboratory contaminants. Results for MEK were not blank-qualified for common laboratory contamination by the validators for this project. Results for one internal standard outside of control limits resulted in the estimation (J-/UJ) of approximately one-third of the target analytes in six soil samples. The results for two compounds were estimated (UJ) in the specified QC soil sample due to high RPDs between the MS/MSD recoveries, which were within QC limits. For reporting purposes, the results for 2-chloroethylvinyl ether in all of the soils samples have been qualified as rejected (R) and unusable wherever they are reported due to destruction by methanol during SW5035 sample preparation, and are not included in the completeness calculations. Analyses for 34 soil samples were performed by this method. The numbers and types of qualifications for the VOC data do not significantly affect the project objectives for this method.

Analytical completeness for EPA Method SW8310 for PAHs was calculated to be 83.2 percent. The non-detected results in one equipment blank were rejected (R) as the cooler was received at 21°C. As the only sample involved was an equipment blank, the project objectives are not affected. Results for all target compounds in two soil samples, one water sample, one PE sample, and two equipment blanks were qualified as estimated (J-/UJ) for low surrogate recoveries. The results for ten compounds were estimated in one soil sample for MS recoveries and/or MS/MSD RPDs above the UCL. The results for four compounds in two water samples, two equipment blanks, and a PE sample were estimated (J-/UJ) due to LCS/LCSD results outside of QC limits. The only rejected results were for one equipment blank. Approximately 14 percent of the PAH data were estimated, mostly for low surrogate recoveries, of which half the qualified samples were equipment blanks and PE samples. Estimated data are usable in decision-making for project objectives. For the water samples, the low recoveries indicate the possibility of slightly low bias for the reporting limits for the non-detected results. For the soils, the small number of qualifications for surrogate recoveries does not significantly affect the project objectives.

Overall, analytical completeness is considered to be acceptable for this phase of the investigation. When assessing analytical completeness for methods that did not meet the 90 percent goal, the nature of the qualifications and the impact on the ability of the data set to meet the requirements for decision-making with respect to the project objectives must be considered. In general, data qualifications were not severe, and the resultant data are usable for decision-making purposes unless rejected. No samples with severely impacted (rejected) data were found to be critical to the project objectives. The effects of the analytical completeness issues did not significantly affect the project objectives.

#### **4.7.4 Technical Completeness**

Technical completeness is defined as the ratio of usable sample results to all sample results. The goal for technical completeness is 95 percent. Usable results are results that are not rejected. Results qualified as

estimated are considered usable unless the qualification compromises the ability of the result to be used for decision-making purposes.

Technical completeness is presented in column seven of Table 4.7-1. Technical completeness of 95 percent or greater was achieved for all methods except EPA Method SW8290 for dioxins/furans. All rejected results are summarized in Table 4.7-2.

Analytical completeness for EPA Method SW8290 was calculated to be 93.3 percent. All of the rejected results were due to one cooler with one equipment blank that was received at 21 °C. The associated non-detected results were qualified as rejected (R). As the only sample involved was an equipment blank, the project objectives are not affected.

Technical completeness for this phase of the project is acceptable.

#### **4.8 CONCLUSIONS AND RECOMMENDATIONS**

For the RAW investigation, approximately two percent of the definitive-level data were qualified as rejected and 13.1 percent of the definitive-level data were qualified as estimated for exceeding data quality criteria which include accuracy, precision, completeness, representativeness, comparability, and sensitivity. None of the rejected data points were critical to the project objectives. The remaining definitive-level data met the data quality criteria.

Of the rejected data, approximately 85 percent were for temperature problems in several field blanks for various methods. These rejections have no effect on project objectives. Of the estimated data, almost half of the qualifications were for marginal holding time exceedances, holding time exceedance for extremely stable compounds (PCBs), or for field blank samples. In general, data qualifications were not severe, and the resultant data are usable for decision-making purposes. The data are considered to meet project objectives.

Data qualified as "R" are rejected and considered unusable. Data qualified with the "J" qualifier are considered estimated and usable as assessed in validation for decision-making purposes. "J+" indicates the possibility that the result may be biased high, and that the actual chemical level may be lower than the reported result. "J-" indicates the possibility that the result may be biased low, and that the actual chemical level may be higher than the reported result or detection limit reported for a non-detected result. The "U" qualifier indicates that the result is non-detected at or above the detection limit specified, and is applied to all non-detected results.

The results of this data assessment indicate the definitive-level data collected for this project meet project objectives except where specified. When project objectives were determined not to have been met for specific analytes or specific samples, the results were assessed and found not to be critical to the project objectives.

The following recommendations should be considered for future sampling events.

The LCL for LCS/LCSD recoveries of sample extracts that have undergone SGC extraction prior to analysis by EPA Methods SW8015B for TEPH or SW8310 for PAHs should be changed to 30%R to be consistent with the LCLs specified in the QAPP for MS/MSDs and surrogates (refer to Footnote 6 of Table 3.2-2 and Footnote 2 of Table 3.2-4 of the QAPP). Table 3.2-3 of the QAPP does not have the footnote allowing recoveries between 30%R and the lower control limit (LCL) for samples and extracts not cleaned up by SGC. Therefore, all SW8015B and SW8310 data with LCS recoveries between 30 percent and 65 percent were qualified as estimated, strictly according to the tables in the QAPP. Section 3.2.4.2 [Laboratory Analytical Procedures] of the QAPP, subsection for the method description for EPA Method SW3630C -

Silica Gel Cleanup, specifies "All surrogate, LCS, or MS/MSD recoveries for samples undergoing silica gel cleanup will have a lower control limit of 30-percent recovery." Thus, the QAPP recognizes that analytically there is no difference between an extract for an LCS, a sample, or an MS/MSD that would indicate an expectation of greater recovery for an LCS, since the extraction is the same for all samples. The QAPP should be modified to add LCS/LCSDs to MS/MSDs and surrogates in all references specifying that samples undergoing SGC will have an LCL of 30%R.

The requirement that an MS/MSD be included in every preparation and analytical batch for this project was requested to be added to the QAPP by the reviewer for the USACE Sacramento district. The standard requirement for MS/MSD frequency is generally considered to be 1:20 samples to adequately characterize the potential for matrix interference for RI/FS projects. Although the more stringent requirement of one MS/MSD per batch is ideal, achievement of this frequency is not always possible, especially for water samples for this project due to limited availability of sample volume.

To perform MS/MSD analyses, triple volume of sample must be available to the samplers as well as to the laboratory. For soils collected in sample sleeves, this was generally not a problem, as there was adequate sample in the sample sleeve, or an additional sleeve was provided. With the exception of VOCs by SW8260B, the MS/MSD requirement for MS/MSDs was generally met project-wide for soils. For soils by SW8260B, a minimum of five Encore samplers must be collected for MS/MSD analyses to be performed. When small numbers of samples are collected daily, sometimes the additional Encore samplers were not collected. For water samples, a minimum of four sample containers must be collected for MS/MSDs to be performed for each analytical method, and five to nine containers is better so re-extractions and reanalyses can be performed if required. With as many as nine analyses requiring one liter of aqueous sample, plus additional methods requiring smaller volumes, between 27 and 36 liters may be required from a sample location to provide adequate volume to perform an MS/MSD. For the RAW sampling event, small volumes of standing water were found and sampled in two of the sampling pits, preventing the collection of the additional volumes required for MS/MSD analysis. Thus, the laboratory was unable to perform an MS/MSD in every extraction and analytical batch due to the small numbers and volumes of water samples received and logged daily.

Note that the analysis of MS/MSDs is a matrix-specific QC parameter. Batch extraction efficiency and laboratory accuracy and precision are measured with LCS/LCSDs, and sample-specific matrix information is measured by surrogate recoveries. With careful planning, MS/MSDs can be performed at frequencies better than 1:20 for any method even when limited sample volumes prevent MS/MSDs from being analyzed with every batch, thus adequately characterizing the matrix. Therefore, it is recommended that the one MS/MSD per preparation and analytical batch be made a goal, with a minimum requirement of 1:20 as a requirement.

Whenever possible, PQLs reported by the laboratory should meet the PQLs specified in the QAPP. In some cases, the laboratories reported results with PQLs that did not meet the QAPP, but did meet project objectives. Due to the rapid pace of this project, variances were not requested for the affected analytes. It is recommended that for future sampling events, variances be requested for such PQLs, or for other modifications to requirements, instead of providing technical assessments and justifications after the data are reported.

#### 4.9 REFERENCES

Environmental Data Quality Management Program Specifications, United States Army Corps of Engineers (USACE), Sacramento District, Draft Version 1.08 (1999)

Methods for Chemical Analysis of Water and Wastes, EPA Manual 600/4-79-020 (EPA, 1983 with additions)

Physical/Chemical Methods, SW-846 3rd edition (EPA, 1986a), and Updates I, II, IIA, and III

US EPA Contract Laboratory Program National Functional Guidelines For Organic Data Review (EPA-540/R-94/012, February 1994)

National Functional Guidelines For Inorganic Data Review (EPA-540/R-94-013, February 1994).

**Table 4.1-1. Removal Action Workplan: Samples and Analyses Performed**  
(Page 1 of 13)

EPA Method	Sample ID	Matrix	Sampling Date	Lab Code	SDG
E300-PCATE	LFP-1-S1/6.5	Soil	31-May-00	BABK	L70099
E300-PCATE	LFP-1-S2/8.5	Soil	31-May-00	BABK	L70099
E300-PCATE	LFP-10-S1/4.5	Soil	01-Jun-00	BABK	L70099
E300-PCATE	LFP-10-S2/6.5	Soil	01-Jun-00	BABK	L70099
E300-PCATE	LFP-11-S1/3	Soil	01-Jun-00	BABK	L70099
E300-PCATE	LFP-11-S2/5	Soil	01-Jun-00	BABK	L70099
E300-PCATE	LFP-14-S1/5	Soil	30-May-00	BABK	L70099
E300-PCATE	LFP-14-S2/7	Soil	30-May-00	BABK	L70099
E300-PCATE	LFP-16-S1/3.5	Soil	30-May-00	BABK	L70099
E300-PCATE	LFP-16-S2/5.5	Soil	30-May-00	BABK	L70099
E300-PCATE	LFP-20-S1/2	Soil	30-May-00	BABK	L70099
E300-PCATE	LFP-20-S2/4	Soil	30-May-00	BABK	L70099
E300-PCATE	LFP-22-S1/2	Soil	30-May-00	BABK	L70099
E300-PCATE	LFP-22-S2/4	Soil	30-May-00	BABK	L70099
E300-PCATE	LFP-24-S1/8	Soil	31-May-00	BABK	L70099
E300-PCATE	LFP-27-S1/1	Soil	01-Jun-00	BABK	L70099
E300-PCATE	LFP-27-S2/3	Soil	01-Jun-00	BABK	L70099
E300-PCATE	LFP-29-S1/2.5	Soil	31-May-00	BABK	L70099
E300-PCATE	LFP-3-S1/4.5	Soil	31-May-00	BABK	L70099
E300-PCATE	LFP-3-S2/6.5	Soil	31-May-00	BABK	L70099
E300-PCATE	LFP-5-S1/2.5	Soil	31-May-00	BABK	L70099
E300-PCATE	LFP-5-S2/4.5	Soil	31-May-00	BABK	L70099
E300-PCATE	LFP-7-S1/2.5	Soil	31-May-00	BABK	L70099
E300-PCATE	LFP-7-S2/4.5	Soil	31-May-00	BABK	L70099
E300-PCATE	LFP-9-S1/3.5	Soil	31-May-00	BABK	L70099
E300-PCATE	EB-5-30	Water QC Matrix	30-May-00	BABK	L69984
E300-PCATE	EB-5-31	Water QC Matrix	31-May-00	BABK	L70102
E300-PCATE	EB-6-01	Water QC Matrix	01-Jun-00	BABK	L70098
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFM-2	Soil	01-Jun-00	QESS	G0F010290
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFM-3	Soil	01-Jun-00	QESS	G0F010290
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFM-4	Soil	01-Jun-00	QESS	G0F010290
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-1-S1/6.5	Soil	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-1-S2/8.5	Soil	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-10-S1/4.5	Soil	01-Jun-00	QESS	G0F010290
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-10-S2/6.5	Soil	01-Jun-00	QESS	G0F010290
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-11-S1/3	Soil	01-Jun-00	QESS	G0F010290
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-11-S2/5	Soil	01-Jun-00	QESS	G0F010290
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-12-S1/4	Soil	30-May-00	QESS	G0E310175
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-12-S1A/4	Soil	30-May-00	QESS	G0E310175
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-12-S2/6	Soil	30-May-00	QESS	G0E310175
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-14-S1/5	Soil	30-May-00	QESS	G0E310175
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-14-S2/7	Soil	30-May-00	QESS	G0E310175
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-16-S1/3.5	Soil	30-May-00	QESS	G0E310175
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-16-S2/5.5	Soil	30-May-00	QESS	G0E310175
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-20-S1/2	Soil	30-May-00	QESS	G0E310175
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-20-S2/4	Soil	30-May-00	QESS	G0E310175

**Table 4.1-1. Removal Action Workplan: Samples and Analyses Performed**  
(Page 2 of 13)

EPA Method	Sample ID	Matrix	Sampling Date	Lab Code	SDG
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-22-S1/2	Soil	30-May-00	QESS	G0E310175
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-22-S2/4	Soil	30-May-00	QESS	G0E310175
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-24-S1/8	Soil	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-24-S1A/8	Soil	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-27-S1/1	Soil	01-Jun-00	QESS	G0F010290
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-27-S2/3	Soil	01-Jun-00	QESS	G0F010290
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-29-S1/2.5	Soil	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-29-S2/2	Soil	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-3-S1/4.5	Soil	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-3-S2/6.5	Soil	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-5-S1/2.5	Soil	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-5-S2/4.5	Soil	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-7-S1/2.5	Soil	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-7-S2/4.5	Soil	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-9-S1/3.5	Soil	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	R1-E	Soil	02-Jun-00	QESS	G0E310175
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	R1-F	Soil	02-Jun-00	QESS	G0E310175
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	R1-G	Soil	02-Jun-00	QESS	G0E310175
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-24-W1	Groundwater	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	LFP-9-W1	Groundwater	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	EB-5-30	Water QC Matrix	30-May-00	QESS	G0E310175
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	EB-5-31	Water QC Matrix	31-May-00	QESS	G0F010289
E300 (NO <sub>3</sub> -N, NO <sub>2</sub> -N)	EB-6-01	Water QC Matrix	01-Jun-00	QESS	G0F010290
M8015DB	LFM-1	Soil	01-Jun-00	QESS	G0F010290
M8015DB	LFM-2	Soil	01-Jun-00	QESS	G0F010290
M8015DB	LFM-3	Soil	01-Jun-00	QESS	G0F010290
M8015DB	LFM-4	Soil	01-Jun-00	QESS	G0F010290
M8015DB	LFP-1-S1/6.5	Soil	31-May-00	QESS	G0F010289
M8015DB	LFP-1-S2/8.5	Soil	31-May-00	QESS	G0F010289
M8015DB	LFP-10-S1/4.5	Soil	01-Jun-00	QESS	G0F010290
M8015DB	LFP-10-S2/6.5	Soil	01-Jun-00	QESS	G0F010290
M8015DB	LFP-11-S1/3	Soil	01-Jun-00	QESS	G0F010290
M8015DB	LFP-11-S2/5	Soil	01-Jun-00	QESS	G0F010290
M8015DB	LFP-12-S1/4	Soil	30-May-00	QESS	G0E310175
M8015DB	LFP-12-S1A/4	Soil	30-May-00	QESS	G0E310175
M8015DB	LFP-12-S2/6	Soil	30-May-00	QESS	G0E310175
M8015DB	LFP-14-S1/5	Soil	30-May-00	QESS	G0E310175
M8015DB	LFP-14-S2/7	Soil	30-May-00	QESS	G0E310175
M8015DB	LFP-16-S1/3.5	Soil	30-May-00	QESS	G0E310175
M8015DB	LFP-16-S2/5.5	Soil	30-May-00	QESS	G0E310175
M8015DB	LFP-20-S1/2	Soil	30-May-00	QESS	G0E310175
M8015DB	LFP-20-S2/4	Soil	30-May-00	QESS	G0E310175
M8015DB	LFP-22-S1/2	Soil	30-May-00	QESS	G0E310175
M8015DB	LFP-22-S2/4	Soil	30-May-00	QESS	G0E310175
M8015DB	LFP-24-S1/8	Soil	31-May-00	QESS	G0F010289
M8015DB	LFP-24-S1A/8	Soil	31-May-00	QESS	G0F010289

**Table 4.1-1. Removal Action Workplan: Samples and Analyses Performed**  
(Page 3 of 13)

EPA Method	Sample ID	Matrix	Sampling Date	Lab Code	SDG
MB015DB	LFP-27-S1/1	Soil	01-Jun-00	QESS	G0F010290
MB015DB	LFP-27-S2/3	Soil	01-Jun-00	QESS	G0F010290
MB015DB	LFP-29-S1/2.5	Soil	31-May-00	QESS	G0F010289
MB015DB	LFP-29-S2/2	Soil	31-May-00	QESS	G0F010289
MB015DB	LFP-3-S1/4.5	Soil	31-May-00	QESS	G0F010289
MB015DB	LFP-3-S2/6.5	Soil	31-May-00	QESS	G0F010289
MB015DB	LFP-5-S1/2.5	Soil	31-May-00	QESS	G0F010289
MB015DB	LFP-5-S2/4.5	Soil	31-May-00	QESS	G0F010289
MB015DB	LFP-7-S1/2.5	Soil	31-May-00	QESS	G0F010289
MB015DB	LFP-7-S2/4.5	Soil	31-May-00	QESS	G0F010289
MB015DB	LFP-9-S1/3.5	Soil	31-May-00	QESS	G0F010289
MB015DB	LFP-24-W1	Groundwater	31-May-00	QESS	G0F010289
MB015DB	LFP-9-W1	Groundwater	31-May-00	QESS	G0F010289
MB015DB	EB-5-30	Water QC Matrix	30-May-00	QESS	G0E310175
MB015DB	EB-5-31	Water QC Matrix	31-May-00	QESS	G0F010289
MB015DB	EB-6-01	Water QC Matrix	01-Jun-00	QESS	G0F010290
SW6010B	LFM-1	Soil	01-Jun-00	QESS	G0F010290
SW6010B	LFM-2	Soil	01-Jun-00	QESS	G0F010290
SW6010B	LFM-3	Soil	01-Jun-00	QESS	G0F010290
SW6010B	LFM-4	Soil	01-Jun-00	QESS	G0F010290
SW6010B	LFP-1-S1/6.5	Soil	31-May-00	QESS	G0F010289
SW6010B	LFP-1-S2/8.5	Soil	31-May-00	QESS	G0F010289
SW6010B	LFP-10-S1/4.5	Soil	01-Jun-00	QESS	G0F010290
SW6010B	LFP-10-S2/6.5	Soil	01-Jun-00	QESS	G0F010290
SW6010B	LFP-11-S1/3	Soil	01-Jun-00	QESS	G0F010290
SW6010B	LFP-11-S2/5	Soil	01-Jun-00	QESS	G0F010290
SW6010B	LFP-12-S1/4	Soil	30-May-00	QESS	G0E310175
SW6010B	LFP-12-S1A/4	Soil	30-May-00	QESS	G0E310175
SW6010B	LFP-12-S2/6	Soil	30-May-00	QESS	G0E310175
SW6010B	LFP-14-S1/5	Soil	30-May-00	QESS	G0E310175
SW6010B	LFP-14-S2/7	Soil	30-May-00	QESS	G0E310175
SW6010B	LFP-16-S1/3.5	Soil	30-May-00	QESS	G0E310175
SW6010B	LFP-16-S2/5.5	Soil	30-May-00	QESS	G0E310175
SW6010B	LFP-20-S1/2	Soil	30-May-00	QESS	G0E310175
SW6010B	LFP-20-S2/4	Soil	30-May-00	QESS	G0E310175
SW6010B	LFP-22-S1/2	Soil	30-May-00	QESS	G0E310175
SW6010B	LFP-22-S2/4	Soil	30-May-00	QESS	G0E310175
SW6010B	LFP-24-S1/8	Soil	31-May-00	QESS	G0F010289
SW6010B	LFP-24-S1A/8	Soil	31-May-00	QESS	G0F010289
SW6010B	LFP-27-S1/1	Soil	01-Jun-00	QESS	G0F010290
SW6010B	LFP-27-S2/3	Soil	01-Jun-00	QESS	G0F010290
SW6010B	LFP-29-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW6010B	LFP-29-S2/2	Soil	31-May-00	QESS	G0F010289
SW6010B	LFP-3-S1/4.5	Soil	31-May-00	QESS	G0F010289
SW6010B	LFP-3-S2/6.5	Soil	31-May-00	QESS	G0F010289
SW6010B	LFP-5-S1/2.5	Soil	31-May-00	QESS	G0F010289

**Table 4.1-1. Removal Action Workplan: Samples and Analyses Performed**  
(Page 4 of 13)

EPA Method	Sample ID	Matrix	Sampling Date	Lab Code	SDG
SW6010B	LFP-5-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW6010B	LFP-7-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW6010B	LFP-7-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW6010B	LFP-9-S1/3.5	Soil	31-May-00	QESS	G0F010289
SW6010B	LFP-24-W1	Groundwater	31-May-00	QESS	G0F010289
SW6010B	LFP-9-W1	Groundwater	31-May-00	QESS	G0F010289
SW6010B	EB-5-30	Water QC Matrix	30-May-00	QESS	G0E310175
SW6010B	EB-5-31	Water QC Matrix	31-May-00	QESS	G0F010289
SW6010B	EB-6-01	Water QC Matrix	01-Jun-00	QESS	G0F010290
SW7470A	LFP-24-W1	Groundwater	31-May-00	QESS	G0F010289
SW7470A	LFP-9-W1	Groundwater	31-May-00	QESS	G0F010289
SW7470A	EB-5-30	Water QC Matrix	30-May-00	QESS	G0E310175
SW7470A	EB-5-31	Water QC Matrix	31-May-00	QESS	G0F010289
SW7470A	EB-6-01	Water QC Matrix	01-Jun-00	QESS	G0F010290
SW7471A	LFM-1	Soil	01-Jun-00	QESS	G0F010290
SW7471A	LFM-2	Soil	01-Jun-00	QESS	G0F010290
SW7471A	LFM-3	Soil	01-Jun-00	QESS	G0F010290
SW7471A	LFM-4	Soil	01-Jun-00	QESS	G0F010290
SW7471A	LFP-1-S1/6.5	Soil	31-May-00	QESS	G0F010289
SW7471A	LFP-1-S2/8.5	Soil	31-May-00	QESS	G0F010289
SW7471A	LFP-10-S1/4.5	Soil	01-Jun-00	QESS	G0F010290
SW7471A	LFP-10-S2/6.5	Soil	01-Jun-00	QESS	G0F010290
SW7471A	LFP-11-S1/3	Soil	01-Jun-00	QESS	G0F010290
SW7471A	LFP-11-S2/5	Soil	01-Jun-00	QESS	G0F010290
SW7471A	LFP-12-S1/4	Soil	30-May-00	QESS	G0E310175
SW7471A	LFP-12-S1A/4	Soil	30-May-00	QESS	G0E310175
SW7471A	LFP-12-S2/6	Soil	30-May-00	QESS	G0E310175
SW7471A	LFP-14-S1/5	Soil	30-May-00	QESS	G0E310175
SW7471A	LFP-14-S2/7	Soil	30-May-00	QESS	G0E310175
SW7471A	LFP-16-S1/3.5	Soil	30-May-00	QESS	G0E310175
SW7471A	LFP-16-S2/5.5	Soil	30-May-00	QESS	G0E310175
SW7471A	LFP-20-S1/2	Soil	30-May-00	QESS	G0E310175
SW7471A	LFP-20-S2/4	Soil	30-May-00	QESS	G0E310175
SW7471A	LFP-22-S1/2	Soil	30-May-00	QESS	G0E310175
SW7471A	LFP-22-S2/4	Soil	30-May-00	QESS	G0E310175
SW7471A	LFP-24-S1/8	Soil	31-May-00	QESS	G0F010289
SW7471A	LFP-24-S1A/8	Soil	31-May-00	QESS	G0F010289
SW7471A	LFP-27-S1/1	Soil	01-Jun-00	QESS	G0F010290
SW7471A	LFP-27-S2/3	Soil	01-Jun-00	QESS	G0F010290
SW7471A	LFP-29-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW7471A	LFP-29-S2/2	Soil	31-May-00	QESS	G0F010289
SW7471A	LFP-3-S1/4.5	Soil	31-May-00	QESS	G0F010289
SW7471A	LFP-3-S2/6.5	Soil	31-May-00	QESS	G0F010289
SW7471A	LFP-5-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW7471A	LFP-5-S2/4.5	Soil	31-May-00	QESS	G0F010289

**Table 4.1-1. Removal Action Workplan: Samples and Analyses Performed**  
(Page 5 of 13)

EPA Method	Sample ID	Matrix	Sampling Date	Lab Code	SDG
SW7471A	LFP-7-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW7471A	LFP-7-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW7471A	LFP-9-S1/3.5	Soil	31-May-00	QESS	G0F010289
SW8081A	LFM-1	Soil	01-Jun-00	QESS	G0F010290
SW8081A	LFM-2	Soil	01-Jun-00	QESS	G0F010290
SW8081A	LFM-3	Soil	01-Jun-00	QESS	G0F010290
SW8081A	LFM-4	Soil	01-Jun-00	QESS	G0F010290
SW8081A	LFP-1-S1/6.5	Soil	31-May-00	QESS	G0F010289
SW8081A	LFP-1-S2/8.5	Soil	31-May-00	QESS	G0F010289
SW8081A	LFP-10-S1/4.5	Soil	01-Jun-00	QESS	G0F010290
SW8081A	LFP-10-S2/6.5	Soil	01-Jun-00	QESS	G0F010290
SW8081A	LFP-11-S1/3	Soil	01-Jun-00	QESS	G0F010290
SW8081A	LFP-11-S2/5	Soil	01-Jun-00	QESS	G0F010290
SW8081A	LFP-12-S1/4	Soil	30-May-00	QESS	G0E310175
SW8081A	LFP-12-S1A/4	Soil	30-May-00	QESS	G0E310175
SW8081A	LFP-12-S2/6	Soil	30-May-00	QESS	G0E310175
SW8081A	LFP-14-S1/5	Soil	30-May-00	QESS	G0E310175
SW8081A	LFP-14-S2/7	Soil	30-May-00	QESS	G0E310175
SW8081A	LFP-16-S1/3.5	Soil	30-May-00	QESS	G0E310175
SW8081A	LFP-16-S2/5.5	Soil	30-May-00	QESS	G0E310175
SW8081A	LFP-20-S1/2	Soil	30-May-00	QESS	G0E310175
SW8081A	LFP-20-S2/4	Soil	30-May-00	QESS	G0E310175
SW8081A	LFP-22-S1/2	Soil	30-May-00	QESS	G0E310175
SW8081A	LFP-22-S2/4	Soil	30-May-00	QESS	G0E310175
SW8081A	LFP-24-S1/8	Soil	31-May-00	QESS	G0F010289
SW8081A	LFP-24-S1A/8	Soil	31-May-00	QESS	G0F010289
SW8081A	LFP-27-S1/1	Soil	01-Jun-00	QESS	G0F010290
SW8081A	LFP-27-S2/3	Soil	01-Jun-00	QESS	G0F010290
SW8081A	LFP-29-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8081A	LFP-29-S2/2	Soil	31-May-00	QESS	G0F010289
SW8081A	LFP-3-S1/4.5	Soil	31-May-00	QESS	G0F010289
SW8081A	LFP-3-S2/6.5	Soil	31-May-00	QESS	G0F010289
SW8081A	LFP-5-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8081A	LFP-5-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8081A	LFP-7-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8081A	LFP-7-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8081A	LFP-9-S1/3.5	Soil	31-May-00	QESS	G0F010289
SW8081A	LFP-24-W1	Groundwater	31-May-00	QESS	G0F010289
SW8081A	LFP-9-W1	Groundwater	31-May-00	QESS	G0F010289
SW8081A	EB-5-30	Water QC Matrix	30-May-00	QESS	G0E310175
SW8081A	EB-5-31	Water QC Matrix	31-May-00	QESS	G0F010289
SW8081A	EB-6-01	Water QC Matrix	01-Jun-00	QESS	G0F010290
SW8082	LFM-1	Soil	01-Jun-00	QESS	G0F010290
SW8082	LFM-2	Soil	01-Jun-00	QESS	G0F010290
SW8082	LFM-3	Soil	01-Jun-00	QESS	G0F010290

**Table 4.1-1. Removal Action Workplan: Samples and Analyses Performed**  
(Page 6 of 13)

EPA Method	Sample ID	Matrix	Sampling Date	Lab Code	SDG
SW8082	LFM-4	Soil	01-Jun-00	QESS	G0F010290
SW8082	LFP-1-S1/6.5	Soil	31-May-00	QESS	G0F010289
SW8082	LFP-1-S2/8.5	Soil	31-May-00	QESS	G0F010289
SW8082	LFP-10-S1/4.5	Soil	01-Jun-00	QESS	G0F010290
SW8082	LFP-10-S2/6.5	Soil	01-Jun-00	QESS	G0F010290
SW8082	LFP-11-S1/3	Soil	01-Jun-00	QESS	G0F010290
SW8082	LFP-11-S2/5	Soil	01-Jun-00	QESS	G0F010290
SW8082	LFP-12-S1/4	Soil	30-May-00	QESS	G0E310175
SW8082	LFP-12-S1A/4	Soil	30-May-00	QESS	G0E310175
SW8082	LFP-12-S2/6	Soil	30-May-00	QESS	G0E310175
SW8082	LFP-14-S1/5	Soil	30-May-00	QESS	G0E310175
SW8082	LFP-14-S2/7	Soil	30-May-00	QESS	G0E310175
SW8082	LFP-16-S1/3.5	Soil	30-May-00	QESS	G0E310175
SW8082	LFP-16-S2/5.5	Soil	30-May-00	QESS	G0E310175
SW8082	LFP-20-S1/2	Soil	30-May-00	QESS	G0E310175
SW8082	LFP-20-S2/4	Soil	30-May-00	QESS	G0E310175
SW8082	LFP-22-S1/2	Soil	30-May-00	QESS	G0E310175
SW8082	LFP-22-S2/4	Soil	30-May-00	QESS	G0E310175
SW8082	LFP-24-S1/8	Soil	31-May-00	QESS	G0F010289
SW8082	LFP-24-S1A/8	Soil	31-May-00	QESS	G0F010289
SW8082	LFP-27-S1/1	Soil	01-Jun-00	QESS	G0F010290
SW8082	LFP-27-S2/3	Soil	01-Jun-00	QESS	G0F010290
SW8082	LFP-29-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8082	LFP-29-S2/2	Soil	31-May-00	QESS	G0F010289
SW8082	LFP-3-S1/4.5	Soil	31-May-00	QESS	G0F010289
SW8082	LFP-3-S2/6.5	Soil	31-May-00	QESS	G0F010289
SW8082	LFP-5-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8082	LFP-5-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8082	LFP-7-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8082	LFP-7-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8082	LFP-9-S1/3.5	Soil	31-May-00	QESS	G0F010289
SW8082	LFP-24-W1	Groundwater	31-May-00	QESS	G0F010289
SW8082	LFP-9-W1	Groundwater	31-May-00	QESS	G0F010289
SW8082	EB-5-30	Water QC Matrix	30-May-00	QESS	G0E310175
SW8082	EB-5-31	Water QC Matrix	31-May-00	QESS	G0F010289
SW8082	EB-6-01	Water QC Matrix	01-Jun-00	QESS	G0F010290
SW8260B	LFM-1	Soil	08-Jun-00	QESS	G0F090283
SW8260B	LFM-2	Soil	08-Jun-00	QESS	G0F090283
SW8260B	LFM-3	Soil	08-Jun-00	QESS	G0F090283
SW8260B	LFM-4	Soil	08-Jun-00	QESS	G0F090283
SW8260B	LFP-1-S1/6.5	Soil	31-May-00	QESS	G0F010289
SW8260B	LFP-1-S2/8.5	Soil	31-May-00	QESS	G0F010289
SW8260B	LFP-10-S1/4.5	Soil	01-Jun-00	QESS	G0F010290
SW8260B	LFP-10-S2/6.5	Soil	01-Jun-00	QESS	G0F010290
SW8260B	LFP-11-S1/3	Soil	01-Jun-00	QESS	G0F010290
SW8260B	LFP-11-S2/5	Soil	01-Jun-00	QESS	G0F010290

**Table 4.1-1. Removal Action Workplan: Samples and Analyses Performed**  
(Page 7 of 13)

EPA Method	Sample ID	Matrix	Sampling Date	Lab Code	SDG
SW8260B	LFP-12-S1/4	Soil	30-May-00	QESS	G0E310175
SW8260B	LFP-12-S1A/4	Soil	30-May-00	QESS	G0E310175
SW8260B	LFP-12-S2/6	Soil	30-May-00	QESS	G0E310175
SW8260B	LFP-14-S1/5	Soil	30-May-00	QESS	G0E310175
SW8260B	LFP-14-S2/7	Soil	30-May-00	QESS	G0E310175
SW8260B	LFP-16-S1/3.5	Soil	30-May-00	QESS	G0E310175
SW8260B	LFP-16-S2/5.5	Soil	30-May-00	QESS	G0E310175
SW8260B	LFP-20-S1/2	Soil	30-May-00	QESS	G0E310175
SW8260B	LFP-20-S2/4	Soil	30-May-00	QESS	G0E310175
SW8260B	LFP-22-S1/2	Soil	30-May-00	QESS	G0E310175
SW8260B	LFP-22-S2/4	Soil	30-May-00	QESS	G0E310175
SW8260B	LFP-24-S1/8	Soil	31-May-00	QESS	G0F010289
SW8260B	LFP-24-S1A/8	Soil	31-May-00	QESS	G0F010289
SW8260B	LFP-27-S1/1	Soil	01-Jun-00	QESS	G0F010290
SW8260B	LFP-27-S2/3	Soil	01-Jun-00	QESS	G0F010290
SW8260B	LFP-29-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8260B	LFP-29-S2/2	Soil	31-May-00	QESS	G0F010289
SW8260B	LFP-3-S1/4.5	Soil	31-May-00	QESS	G0F010289
SW8260B	LFP-3-S2/6.5	Soil	31-May-00	QESS	G0F010289
SW8260B	LFP-5-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8260B	LFP-5-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8260B	LFP-7-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8260B	LFP-7-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8260B	LFP-9-S1/3.5	Soil	31-May-00	QESS	G0F010289
SW8260B	LFP-24-W1	Groundwater	31-May-00	QESS	G0F010289
SW8260B	LFP-9-W1	Groundwater	31-May-00	QESS	G0F010289
SW8260B	EB-5-30	Water QC Matrix	30-May-00	QESS	G0E310175
SW8260B	EB-5-31	Water QC Matrix	31-May-00	QESS	G0F010289
SW8260B	EB-6-01	Water QC Matrix	01-Jun-00	QESS	G0F010290
SW8260B	TB-5-31	Water QC Matrix	31-May-00	QESS	G0F010289
SW8260B	TB-6-1	Water QC Matrix	01-Jun-00	QESS	G0F010290
SW8260B	TB-6-2	Water QC Matrix	02-Jun-00	QESS	G0E310175
SW8260B	TB2-5-30	Water QC Matrix	30-May-00	QESS	G0E310175
SW8260B	TRIP-B-1	Water QC Matrix	08-Jun-00	QESS	G0F090283
SW8270	LFM-2	Soil	01-Jun-00	QESS	G0F010290
SW8270	LFM-3	Soil	01-Jun-00	QESS	G0F010290
SW8270	LFM-4	Soil	01-Jun-00	QESS	G0F010290
SW8270	LFP-1-S1/6.5	Soil	31-May-00	QESS	G0F010289
SW8270	LFP-1-S2/8.5	Soil	31-May-00	QESS	G0F010289
SW8270	LFP-10-S1/4.5	Soil	01-Jun-00	QESS	G0F010290
SW8270	LFP-10-S2/6.5	Soil	01-Jun-00	QESS	G0F010290
SW8270	LFP-11-S1/3	Soil	01-Jun-00	QESS	G0F010290
SW8270	LFP-11-S2/5	Soil	01-Jun-00	QESS	G0F010290
SW8270	LFP-12-S1/4	Soil	30-May-00	QESS	G0E310175
SW8270	LFP-12-S1A/4	Soil	30-May-00	QESS	G0E310175
SW8270	LFP-12-S2/6	Soil	30-May-00	QESS	G0E310175

**Table 4.1-1. Removal Action Workplan: Samples and Analyses Performed**  
(Page 8 of 13)

EPA Method	Sample ID	Matrix	Sampling Date	Lab Code	SDG
SW8270	LFP-14-S1/5	Soil	30-May-00	QESS	G0E310175
SW8270	LFP-14-S2/7	Soil	30-May-00	QESS	G0E310175
SW8270	LFP-16-S1/3.5	Soil	30-May-00	QESS	G0E310175
SW8270	LFP-16-S2/5.5	Soil	30-May-00	QESS	G0E310175
SW8270	LFP-20-S1/2	Soil	30-May-00	QESS	G0E310175
SW8270	LFP-20-S2/4	Soil	30-May-00	QESS	G0E310175
SW8270	LFP-22-S1/2	Soil	30-May-00	QESS	G0E310175
SW8270	LFP-22-S2/4	Soil	30-May-00	QESS	G0E310175
SW8270	LFP-24-S1/8	Soil	31-May-00	QESS	G0F010289
SW8270	LFP-24-S1A/8	Soil	31-May-00	QESS	G0F010289
SW8270	LFP-27-S1/1	Soil	01-Jun-00	QESS	G0F010290
SW8270	LFP-27-S2/3	Soil	01-Jun-00	QESS	G0F010290
SW8270	LFP-29-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8270	LFP-29-S2/2	Soil	31-May-00	QESS	G0F010289
SW8270	LFP-3-S1/4.5	Soil	31-May-00	QESS	G0F010289
SW8270	LFP-3-S2/6.5	Soil	31-May-00	QESS	G0F010289
SW8270	LFP-5-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8270	LFP-5-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8270	LFP-7-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8270	LFP-7-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8270	LFP-9-S1/3.5	Soil	31-May-00	QESS	G0F010289
SW8270	LFP-24-W1	Groundwater	31-May-00	QESS	G0F010289
SW8270	LFP-9-W1	Groundwater	31-May-00	QESS	G0F010289
SW8270	EB-5-30	Water QC Matrix	30-May-00	QESS	G0E310175
SW8270	EB-5-31	Water QC Matrix	31-May-00	QESS	G0F010289
SW8270	EB-6-01	Water QC Matrix	01-Jun-00	QESS	G0F010290
SW8270C	LFM-2	Soil	01-Jun-00	QESS	G0F010290
SW8270C	LFM-3	Soil	01-Jun-00	QESS	G0F010290
SW8270C	LFM-4	Soil	01-Jun-00	QESS	G0F010290
SW8270C	LFP-1-S1/6.5	Soil	31-May-00	QESS	G0F010289
SW8270C	LFP-1-S2/8.5	Soil	31-May-00	QESS	G0F010289
SW8270C	LFP-10-S1/4.5	Soil	01-Jun-00	QESS	G0F010290
SW8270C	LFP-10-S2/6.5	Soil	01-Jun-00	QESS	G0F010290
SW8270C	LFP-11-S1/3	Soil	01-Jun-00	QESS	G0F010290
SW8270C	LFP-11-S2/5	Soil	01-Jun-00	QESS	G0F010290
SW8270C	LFP-12-S1/4	Soil	30-May-00	QESS	G0E310175
SW8270C	LFP-12-S1A/4	Soil	30-May-00	QESS	G0E310175
SW8270C	LFP-12-S2/6	Soil	30-May-00	QESS	G0E310175
SW8270C	LFP-14-S1/5	Soil	30-May-00	QESS	G0E310175
SW8270C	LFP-14-S2/7	Soil	30-May-00	QESS	G0E310175
SW8270C	LFP-16-S1/3.5	Soil	30-May-00	QESS	G0E310175
SW8270C	LFP-16-S2/5.5	Soil	30-May-00	QESS	G0E310175
SW8270C	LFP-20-S1/2	Soil	30-May-00	QESS	G0E310175
SW8270C	LFP-20-S2/4	Soil	30-May-00	QESS	G0E310175
SW8270C	LFP-22-S1/2	Soil	30-May-00	QESS	G0E310175
SW8270C	LFP-22-S2/4	Soil	30-May-00	QESS	G0E310175

**Table 4.1-1. Removal Action Workplan: Samples and Analyses Performed**  
(Page 9 of 13)

EPA Method	Sample ID	Matrix	Sampling Date	Lab Code	SDG
SW8270C	LFP-24-S1/8	Soil	31-May-00	QESS	G0F010289
SW8270C	LFP-24-S1A/8	Soil	31-May-00	QESS	G0F010289
SW8270C	LFP-27-S1/1	Soil	01-Jun-00	QESS	G0F010290
SW8270C	LFP-27-S2/3	Soil	01-Jun-00	QESS	G0F010290
SW8270C	LFP-29-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8270C	LFP-29-S2/2	Soil	31-May-00	QESS	G0F010289
SW8270C	LFP-3-S1/4.5	Soil	31-May-00	QESS	G0F010289
SW8270C	LFP-3-S2/6.5	Soil	31-May-00	QESS	G0F010289
SW8270C	LFP-5-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8270C	LFP-5-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8270C	LFP-7-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8270C	LFP-7-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8270C	LFP-9-S1/3.5	Soil	31-May-00	QESS	G0F010289
SW8270C	LFP-24-W1	Groundwater	31-May-00	QESS	G0F010289
SW8270C	LFP-9-W1	Groundwater	31-May-00	QESS	G0F010289
SW8270C	EB-5-30	Water QC Matrix	30-May-00	QESS	G0E310175
SW8270C	EB-5-31	Water QC Matrix	31-May-00	QESS	G0F010289
SW8270C	EB-6-01	Water QC Matrix	01-Jun-00	QESS	G0F010290
SW8290	LFM-1	Soil	01-Jun-00	QESS	G0F010290
SW8290	LFM-2	Soil	01-Jun-00	QESS	G0F010290
SW8290	LFM-3	Soil	01-Jun-00	QESS	G0F010290
SW8290	LFM-4	Soil	01-Jun-00	QESS	G0F010290
SW8290	LFP-1-S1/6.5	Soil	31-May-00	QESS	G0F010289
SW8290	LFP-10-S1/4.5	Soil	01-Jun-00	QESS	G0F010290
SW8290	LFP-12-S1/4	Soil	30-May-00	QESS	G0E310175
SW8290	LFP-22-S1/2	Soil	30-May-00	QESS	G0E310175
SW8290	LFP-24-S1/8	Soil	31-May-00	QESS	G0F010289
SW8290	LFP-24-S1A/8	Soil	31-May-00	QESS	G0F010289
SW8290	LFP-7-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8290	LFP-24-W1	Groundwater	31-May-00	QESS	G0F010289
SW8290	LFP-9-W1	Groundwater	31-May-00	QESS	G0F010289
SW8290	EB-5-30	Water QC Matrix	30-May-00	QESS	G0E310175
SW8290	EB-5-31	Water QC Matrix	31-May-00	QESS	G0F010289
SW8290	EB-6-01	Water QC Matrix	01-Jun-00	QESS	G0F010290
SW8310	LFM-1	Soil	01-Jun-00	QESS	G0F010290
SW8310	LFM-2	Soil	01-Jun-00	QESS	G0F010290
SW8310	LFM-3	Soil	01-Jun-00	QESS	G0F010290
SW8310	LFM-4	Soil	01-Jun-00	QESS	G0F010290
SW8310	LFP-1-S1/6.5	Soil	31-May-00	QESS	G0F010289
SW8310	LFP-1-S2/8.5	Soil	31-May-00	QESS	G0F010289
SW8310	LFP-10-S1/4.5	Soil	01-Jun-00	QESS	G0F010290
SW8310	LFP-10-S2/6.5	Soil	01-Jun-00	QESS	G0F010290
SW8310	LFP-11-S1/3	Soil	01-Jun-00	QESS	G0F010290
SW8310	LFP-11-S2/5	Soil	01-Jun-00	QESS	G0F010290

**Table 4.1-1. Removal Action Workplan: Samples and Analyses Performed**  
(Page 10 of 13)

EPA Method	Sample ID	Matrix	Sampling Date	Lab Code	SDG
SW8310	LFP-12-S1/4	Soil	30-May-00	QESS	G0E310175
SW8310	LFP-12-S1A/4	Soil	30-May-00	QESS	G0E310175
SW8310	LFP-12-S2/6	Soil	30-May-00	QESS	G0E310175
SW8310	LFP-14-S1/5	Soil	30-May-00	QESS	G0E310175
SW8310	LFP-14-S2/7	Soil	30-May-00	QESS	G0E310175
SW8310	LFP-16-S1/3.5	Soil	30-May-00	QESS	G0E310175
SW8310	LFP-16-S2/5.5	Soil	30-May-00	QESS	G0E310175
SW8310	LFP-20-S1/2	Soil	30-May-00	QESS	G0E310175
SW8310	LFP-20-S2/4	Soil	30-May-00	QESS	G0E310175
SW8310	LFP-22-S1/2	Soil	30-May-00	QESS	G0E310175
SW8310	LFP-22-S2/4	Soil	30-May-00	QESS	G0E310175
SW8310	LFP-24-S1/8	Soil	31-May-00	QESS	G0F010289
SW8310	LFP-24-S1A/8	Soil	31-May-00	QESS	G0F010289
SW8310	LFP-27-S1/1	Soil	01-Jun-00	QESS	G0F010290
SW8310	LFP-27-S2/3	Soil	01-Jun-00	QESS	G0F010290
SW8310	LFP-29-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8310	LFP-29-S2/2	Soil	31-May-00	QESS	G0F010289
SW8310	LFP-3-S1/4.5	Soil	31-May-00	QESS	G0F010289
SW8310	LFP-3-S2/6.5	Soil	31-May-00	QESS	G0F010289
SW8310	LFP-5-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8310	LFP-5-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8310	LFP-7-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8310	LFP-7-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8310	LFP-9-S1/3.5	Soil	31-May-00	QESS	G0F010289
SW8310	PE-8310-S	Soil QC Matrix	30-May-00	QESS	G0F010289
SW8310	LFP-24-W1	Groundwater	31-May-00	QESS	G0F010289
SW8310	LFP-9-W1	Groundwater	31-May-00	QESS	G0F010289
SW8310	EB-5-30	Water QC Matrix	30-May-00	QESS	G0E310175
SW8310	EB-5-31	Water QC Matrix	31-May-00	QESS	G0F010289
SW8310	EB-6-01	Water QC Matrix	01-Jun-00	QESS	G0F010290
SW8310	WV-S-6	Water QC Matrix	30-May-00	QESS	G0F010289
SW8330	LFM-1	Soil	01-Jun-00	QESS	G0F010290
SW8330	LFM-2	Soil	01-Jun-00	QESS	G0F010290
SW8330	LFM-3	Soil	01-Jun-00	QESS	G0F010290
SW8330	LFM-4	Soil	01-Jun-00	QESS	G0F010290
SW8330	LFP-1-S1/6.5	Soil	31-May-00	QESS	G0F010289
SW8330	LFP-1-S2/8.5	Soil	31-May-00	QESS	G0F010289
SW8330	LFP-10-S1/4.5	Soil	01-Jun-00	QESS	G0F010290
SW8330	LFP-10-S2/6.5	Soil	01-Jun-00	QESS	G0F010290
SW8330	LFP-11-S1/3	Soil	01-Jun-00	QESS	G0F010290
SW8330	LFP-11-S2/5	Soil	01-Jun-00	QESS	G0F010290
SW8330	LFP-12-S1/4	Soil	30-May-00	QESS	G0E310175
SW8330	LFP-12-S1A/4	Soil	30-May-00	QESS	G0E310175
SW8330	LFP-12-S2/6	Soil	30-May-00	QESS	G0E310175
SW8330	LFP-14-S1/5	Soil	30-May-00	QESS	G0E310175
SW8330	LFP-14-S2/7	Soil	30-May-00	QESS	G0E310175

**Table 4.1-1. Removal Action Workplan: Samples and Analyses Performed**  
(Page 11 of 13)

EPA Method	Sample ID	Matrix	Sampling Date	Lab Code	SDG
SW8330	LFP-16-S1/3.5	Soil	30-May-00	QESS	G0E310175
SW8330	LFP-16-S2/5.5	Soil	30-May-00	QESS	G0E310175
SW8330	LFP-20-S1/2	Soil	30-May-00	QESS	G0E310175
SW8330	LFP-20-S2/4	Soil	30-May-00	QESS	G0E310175
SW8330	LFP-22-S1/2	Soil	30-May-00	QESS	G0E310175
SW8330	LFP-22-S2/4	Soil	30-May-00	QESS	G0E310175
SW8330	LFP-24-S1/8	Soil	31-May-00	QESS	G0F010289
SW8330	LFP-24-S1A/8	Soil	31-May-00	QESS	G0F010289
SW8330	LFP-27-S1/1	Soil	01-Jun-00	QESS	G0F010290
SW8330	LFP-27-S2/3	Soil	01-Jun-00	QESS	G0F010290
SW8330	LFP-29-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8330	LFP-29-S2/2	Soil	31-May-00	QESS	G0F010289
SW8330	LFP-3-S1/4.5	Soil	31-May-00	QESS	G0F010289
SW8330	LFP-3-S2/6.5	Soil	31-May-00	QESS	G0F010289
SW8330	LFP-5-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8330	LFP-5-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8330	LFP-7-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8330	LFP-7-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8330	LFP-9-S1/3.5	Soil	31-May-00	QESS	G0F010289
SW8330	PE-8330-S-2	Soil QC Matrix	30-May-00	QESS	G0F010289
SW8330	LFP-24-W1	Groundwater	31-May-00	QESS	G0F010289
SW8330	LFP-9-W1	Groundwater	31-May-00	QESS	G0F010289
SW8330	EB-5-30	Water QC Matrix	30-May-00	QESS	G0E310175
SW8330	EB-5-31	Water QC Matrix	31-May-00	QESS	G0F010289
SW8330	EB-6-01	Water QC Matrix	01-Jun-00	QESS	G0F010290
SW8330	WV-S-7	Water QC Matrix	30-May-00	QESS	G0F010289
SW8330M	LFM-1	Soil	01-Jun-00	QESS	G0F010290
SW8330M	LFM-2	Soil	01-Jun-00	QESS	G0F010290
SW8330M	LFM-3	Soil	01-Jun-00	QESS	G0F010290
SW8330M	LFM-4	Soil	01-Jun-00	QESS	G0F010290
SW8330M	LFP-1-S1/6.5	Soil	31-May-00	QESS	G0F010289
SW8330M	LFP-1-S2/8.5	Soil	31-May-00	QESS	G0F010289
SW8330M	LFP-10-S1/4.5	Soil	01-Jun-00	QESS	G0F010290
SW8330M	LFP-10-S2/6.5	Soil	01-Jun-00	QESS	G0F010290
SW8330M	LFP-11-S1/3	Soil	01-Jun-00	QESS	G0F010290
SW8330M	LFP-11-S2/5	Soil	01-Jun-00	QESS	G0F010290
SW8330M	LFP-12-S1/4	Soil	30-May-00	QESS	G0E310175
SW8330M	LFP-12-S1A/4	Soil	30-May-00	QESS	G0E310175
SW8330M	LFP-12-S2/6	Soil	30-May-00	QESS	G0E310175
SW8330M	LFP-14-S1/5	Soil	30-May-00	QESS	G0E310175
SW8330M	LFP-14-S2/7	Soil	30-May-00	QESS	G0E310175
SW8330M	LFP-16-S1/3.5	Soil	30-May-00	QESS	G0E310175
SW8330M	LFP-16-S2/5.5	Soil	30-May-00	QESS	G0E310175
SW8330M	LFP-20-S1/2	Soil	30-May-00	QESS	G0E310175
SW8330M	LFP-20-S2/4	Soil	30-May-00	QESS	G0E310175
SW8330M	LFP-22-S1/2	Soil	30-May-00	QESS	G0E310175

**Table 4.1-1. Removal Action Workplan: Samples and Analyses Performed**  
(Page 12 of 13)

EPA Method	Sample ID	Matrix	Sampling Date	Lab Code	SDG
SW8330M	LFP-22-S2/4	Soil	30-May-00	QESS	G0E310175
SW8330M	LFP-24-S1/8	Soil	31-May-00	QESS	G0F010289
SW8330M	LFP-24-S1A/8	Soil	31-May-00	QESS	G0F010289
SW8330M	LFP-27-S1/1	Soil	01-Jun-00	QESS	G0F010290
SW8330M	LFP-27-S2/3	Soil	01-Jun-00	QESS	G0F010290
SW8330M	LFP-29-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8330M	LFP-29-S2/2	Soil	31-May-00	QESS	G0F010289
SW8330M	LFP-3-S1/4.5	Soil	31-May-00	QESS	G0F010289
SW8330M	LFP-3-S2/6.5	Soil	31-May-00	QESS	G0F010289
SW8330M	LFP-5-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8330M	LFP-5-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8330M	LFP-7-S1/2.5	Soil	31-May-00	QESS	G0F010289
SW8330M	LFP-7-S2/4.5	Soil	31-May-00	QESS	G0F010289
SW8330M	LFP-9-S1/3.5	Soil	31-May-00	QESS	G0F010289
SW8330M	R1-E	Soil	02-Jun-00	QESS	G0E310175
SW8330M	R1-F	Soil	02-Jun-00	QESS	G0E310175
SW8330M	R1-G	Soil	02-Jun-00	QESS	G0E310175
SW8330M	PE-8330-S-2	Soil QC Matrix	30-May-00	QESS	G0F010289
SW8330M	LFP-24-W1	Groundwater	31-May-00	QESS	G0F010289
SW8330M	LFP-9-W1	Groundwater	31-May-00	QESS	G0F010289
SW8330M	EB-5-30	Water QC Matrix	30-May-00	QESS	G0E310175
SW8330M	EB-5-31	Water QC Matrix	31-May-00	QESS	G0F010289
SW8330M	EB-6-01	Water QC Matrix	01-Jun-00	QESS	G0F010290
SW8330M	WV-S-7	Water QC Matrix	30-May-00	QESS	G0F010289
SW8330	TNT-R6A	Soil	24-May-00	CTN	A050623
SW8330	TNT-R6B	Soil	24-May-00	CTN	A050623
SW8330	TNT-R7A	Soil	24-May-00	CTN	A050623
SW8330	TNT-R7B	Soil	24-May-00	CTN	A050623
SW8330	TNT-R8A	Soil	24-May-00	CTN	A050623
SW8330	TNT-R8B	Soil	24-May-00	CTN	A050623
SW8330	TNT-R9A	Soil	24-May-00	CTN	A050623
SW8330	TNT-R9B	Soil	24-May-00	CTN	A050623
SW8330	TNT-R10A	Soil	24-May-00	CTN	A050623
SW8330	TNT-R10B	Soil	24-May-00	CTN	A050623
SW8330	TNT-R11A	Soil	24-May-00	CTN	A050623
SW8330	TNT-R11B	Soil	24-May-00	CTN	A050623
SW8330	TNT-R12A	Soil	24-May-00	CTN	A050623
SW8330	TNT-R12B	Soil	24-May-00	CTN	A050623
SW8330	TNT-R13A	Soil	24-May-00	CTN	A050623
SW8330	TNT-R13B	Soil	24-May-00	CTN	A050623
SW8330	TNT-R14A	Soil	24-May-00	CTN	A050623
SW8330	TNT-R14B	Soil	24-May-00	CTN	A050623
SW8330	TNT-R15A	Soil	24-May-00	CTN	A050623
SW8330	TNT-R15B	Soil	24-May-00	CTN	A050623
SW8330	TNT-R16/1	Soil	07-Jun-00	CTN	A060212

**Table 4.1-1. Removal Action Workplan: Samples and Analyses Performed**  
(Page 13 of 13)

EPA Method	Sample ID	Matrix	Sampling Date	Lab Code	SDG
SW8330	TNT-R16/4	Soil	07-Jun-00	CTN	A060212
SW8330	TNT-R16/8	Soil	07-Jun-00	CTN	A060212
SW8330	TNT-R16/12	Soil	07-Jun-00	CTN	A060212
SW8330	TNT-R16/16	Soil	07-Jun-00	CTN	A060212
SW8330	TNT-R17/1	Soil	07-Jun-00	CTN	A060212
SW8330	TNT-R17/4	Soil	07-Jun-00	CTN	A060212
SW8330	TNT-R17/8	Soil	07-Jun-00	CTN	A060212
SW8330	TNT-R17/12	Soil	07-Jun-00	CTN	A060212
SW8330	TNT-R17/16	Soil	07-Jun-00	CTN	A060212
SW8330	TNT-R18/0	Soil	05-Jun-00	CTN	A060212
SW8330	TNT-R18/2	Soil	05-Jun-00	CTN	A060212
SW8330	TNT-R18/6	Soil	05-Jun-00	CTN	A060212
SW8330	TNT-R18/10	Soil	05-Jun-00	CTN	A060212
SW8330	TNT-R18/14	Soil	05-Jun-00	CTN	A060212
SW8330	TNT-R19/1	Soil	06-Jun-00	CTN	A060212
SW8330	TNT-R19/4	Soil	06-Jun-00	CTN	A060212
SW8330	TNT-R19/8	Soil	06-Jun-00	CTN	A060212
SW8330	TNT-R19/12	Soil	06-Jun-00	CTN	A060212
SW8330	TNT-R19/16	Soil	06-Jun-00	CTN	A060212
SW8330	TNT-R19/20	Soil	06-Jun-00	CTN	A060212
SW8330	TNT-R20/1	Soil	06-Jun-00	CTN	A060212
SW8330	TNT-R20/4	Soil	06-Jun-00	CTN	A060212
SW8330	TNT-R20/8	Soil	06-Jun-00	CTN	A060212
SW8330	TNT-R20/12	Soil	06-Jun-00	CTN	A060212

**Table 4.3-1. Removal Action Workplan  
Field Sampling Plan Samples Collected and Analyzed**  
(Page 1 of 2)

Result Sample ID*	Depth	Matrix	LAB	QUANTERRA (QES) LAB													BAB	
				Metals SW6010B, SW7470A, SW7471A	TEPH-D/MO LUFT Mod. SW8015	TEPH-K LUFT Mod. SW8015	Pesticides SW8081A	PCBs SW8082	VOCs SW8260B	Chloropicrin SW8270CWM	Dioxins/Furans SW8290	Explosives SW8330	Nitroglycerin, PETN SW8330	PAHs SW8310	Nitrate, Nitrite E300.0	Pentachlorophenol SW8270C		Perchlorate CADOHS Mod. E300.0
EB-5-30	-	Water QC	QES/BABK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
EB-5-31	-	Water QC	QES/BABK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
EB-6-01	-	Water QC	QES/BABK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
LFM-1		Soil	QES	1	1	1	1	1	1	M	1	1	1	1	M	M		
LFM-2		Soil	QES	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
LFM-3		Soil	QES	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
LFM-4		Soil	QES	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
LFP-10-S1-4.5	4.5-5.0	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-10-S2-6.5	6.5-7.0	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-11-S1-3.0	3.0-3.5	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-11-S2-5.0	5.0-5.5	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-12-S1-4.0	4.0-4.5	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	M
LFP-12-S2-6.0	6.0-6.5	Soil	QES/BABK	1	1	1	1	1	1	1	M	1	1	1	1	1	1	M
LFP-12-S1A/4	4.0-4.5	Soil	QES/BABK	1	1	1	1	1	1	1	M	1	1	1	1	1	1	M
LFP-14-S1-5.0	5.5-6.0	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-14-S2-7.0	7.0-7.5	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-16-S1-3.5	3.5-4.0	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-16-S2-5.5	5.5-6.0	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-1-S1-6.5	6.5,7.0	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-1-S2-8.5	8.5,9.0	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-20-S1-2.0	2.0-2.5	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-20-S2-4.0	4.0-4.5	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-22-S1-2.0	2.0-2.5	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-22-S2-4.0	4.0-4.5	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-24-S1-8.0	8.0,8.5	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-24-S1A-8.0	8.0,8.5	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	M
LFP-24-W1	-	Water	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	M
LFP-27-S1-1.0	1.0-1.5	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-27-S2-3.0	3.0-3.5	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-29-S1-2.5	2.5,3.0	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-29-S2-2.0	2.0,2.5	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-3-S1-4.5	4.5,5.0	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-3-S2-6.5	6.5,7.0	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-5-S1-2.5	2.5,3.0	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-5-S2-4.5	4.5,5.0	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-7-S1-2.5	2.5,3.0	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-7-S2-4.5	4.5,5.0	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-9-S1-3.5	3.5,4.0	Soil	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LFP-9-W1	-	Water	QES/BABK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	M
PE-8310-S	-	Soil PE	QES												X			
PE-8330-S-2	-	Soil PE	QES									X	X					
R1-E	-	Soil	QES										1		1			
R1-F	-	Soil	QES										1		1			



**Table 4.4-1. Technical Holding Time Tables**  
 Summary of QC Outliers (Page 1 of 10)

**Table 4.4-1A. Technical Holding Times for General Chemistry Methods**

Sample	EPA Method 300.0 Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
LFP-22-S1-2'	Nitrate as N	55 hours	48 hours	J- (all detects)	P
	Nitrite as N			UJ (all non-detects)	
LFP-22-S2-4'	Nitrate as N	57 hours	48 hours	J- (all detects)	P
	Nitrite as N			UJ (all non-detects)	
LFP-20-S1-2'	Nitrate as N	54.5 hours	48 hours	UJ (all non-detects)	P
	Nitrite as N			UJ (all non-detects)	
LFP-20-S2-4'	Nitrate as N	54 hours	48 hours	J- (all detects)	P
	Nitrite as N			UJ (all non-detects)	
LFP-16-S1-3.5'	Nitrate as N	53 hours	48 hours	J- (all detects)	P
	Nitrite as N			UJ (all non-detects)	
LFP-16-S2-5.5'	Nitrate as N	52.5 hours	48 hours	J- (all detects)	P
	Nitrite as N			UJ (all non-detects)	
LFP-14-S1-5.0' LFP-14-S2-7.0'	Nitrate as N	52 hours	48 hours	J- (all detects)	P
	Nitrite as N			UJ (all non-detects)	
LFP-12-S1-4.0' LFP-12-S2-6.0' LFP-12-S1A-4.0'	Nitrate as N	51 hours	48 hours	J- (all detects)	P
	Nitrite as N			UJ (all non-detects)	
LDC Report# 4934A6a					

**Table 4.4-1. Technical Holding Time Tables**  
 Summary of QC Outliers (Page 2 of 10)

**Table 4.4-1A. Technical Holding Times for General Chemistry Methods**

Sample	EPA Method 300.0 Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
LFP-1-S1-6.5' LFP-3-S1-4.5' LFP-3-S2-6.5' LFP-7-S2-4.5' LFP-29-S2-2.0'	Nitrate as N	3 days	48 hours	J- (all detects)	P
LFP-1-S2-8.5' LFP-9-S1-3.5' LFP-5-S1-2.5' LFP-5-S2-4.5' LFP-7-S1-2.5' LFP-29-S1-2.5' LFP-24-S1-8.0' LFP-24-S1A-8.0'	Nitrate as N			UJ (all non-detects)	
LFP-1-S1-6.5 LFP-1-S2-8.5' LFP-3-S1-4.5' LFP-3-S2-6.5' LFP-5-S1-2.5' LFP-5-S2-4.5' LFP-7-S1-2.5' LFP-7-S2-4.5' LFP-9-S1-3.5' LFP-24-S1-8.0' LFP-24-S1A-8.0' LFP-29-S2-2.0' LFP-29-S1-2.5'	Nitrite as N			UJ (all non-detects)	
LFP-24-W1	Nitrate as N Nitrite as N	53.5 hours	48 hours	UJ (all non-detects) UJ (all non-detects)	P
LFP-9-W1	Nitrate as N Nitrite as N	59 hours	48 hours	J- (all detects) UJ (all non-detects)	P
EB-5-31	Nitrate as N	51.5 hours	48 hours	J- (all detects)	P
LDC Report# 4962A6	Nitrite as N			UJ (all non-detects)	

**Table 4.4-1. Technical Holding Time Tables**  
 Summary of QC Outliers (Page 3 of 10)

**Table 4.4-1A. Technical Holding Times for General Chemistry Methods**

Sample	EPA Method 300.0 Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
LFP-10-S1-4.5'	Nitrate as N	55.5 hours	48 hours	UJ (all non-detects)	P
	Nitrite as N			UJ (all non-detects)	
LFP-10-S2-6.5'	Nitrate as N	55 hours	48 hours	UJ (all non-detects)	P
	Nitrite as N			UJ (all non-detects)	
LFP-11-S1-3.0'	Nitrate as N	55 hours	55 hours	J- (all detects)	P
	Nitrite as N			UJ (all non-detects)	
LFP-11-S2-5.0'	Nitrate as N	60.5 hours	48 hours	UJ (all non-detects)	P
	Nitrite as N			UJ (all non-detects)	
LFP-27-S1-1.0'	Nitrate as N	60 hours	48 hours	J- (all detects)	P
	Nitrite as N			UJ (all non-detects)	
LFP-27-S2-3.0'	Nitrate as N	60 hours	48 hours	UJ (all non-detects)	P
	Nitrite as N			UJ (all non-detects)	
LFM-2 LFM-4	Nitrate as N	15 days	48 hours	J- (all detects)	P
	Nitrite as N			R (all non-detects)	
LFM-3	Nitrate as N	15 days	48 hours	J- (all detects)	P
	Nitrite as N			J- (all detects)	
LDC Report# 4962B6a					

**Note:**  
**Bold highlight** indicates that associated sample results were qualified for this analyte.

**Table 4.4-1. Technical Holding Time Tables**  
Summary of QC Outliers (Page 4 of 10)

**Table 4.4-1B. Technical Preservation Criteria for SW8015B - TEPH**

Sample	TEPH: EPA Method SW8015B Compound	Finding	Criteria	Flag	A or P
EB-6-1 EB-6-1RE (NOT USED)  LDC Report# 4962B8	TPH as extractables	Cooler temperature was reported at 21 °C upon receipt by the laboratory.	Cooler temperature must be 4±2 °C .	R (all non-detects)	A

**Note:** Bold highlight indicates that associated sample results were qualified for this analyte.

**Table 4.4-1C. Technical Holding Times for SW8015B - TEPH**

Sample	TEPH: EPA Method SW8015B Compound	Total Days From Sample Collection Until Extraction	Required Holding Time (in Days) From Sample Collection Until Extraction	Flag	A or P
LFP-22-S1-2'RE (NOT USED) LFP-22-S2-4'RE (NOT USED) LFP-20-S1-2'RE (NOT USED) LFP-20-S2-4'RE (NOT USED) LFP-16-S1-3.5'RE (NOT USED) LFP-16-S2-5.5'RE (NOT USED) LFP-14-S1-5.0-5.5'RE (NOT USED) LFP-14-S2-7.0-7.5'RE (NOT USED) LFP-12-S1-4.0-4.5'RE (NOT USED) LFP-12-S2-6.0-6.5'RE (NOT USED) LFP-12-S1A-4.0'RE (NOT USED)	TPH as extractables	21	14	J- (all detects) UJ (all non-detects)	A
EB-5-30RE (NOT USED)  LDC Report# 4934A8	TPH as extractables	20	7	J- (all detects) R (all non-detects)	A
LFP-1-S1-6.5-7.0'RE (NOT USED) LFP-1-S2-8.5-9.0'RE (NOT USED) LFP-3-S2-6.5-7.0'RE (NOT USED) LFP-9-S1-3.5-4.0'RE (NOT USED) LFP-5-S1-2.5-3.0'RE (NOT USED) LFP-5-S2-4.5-5.0'RE (NOT USED) LFP-7-S1-2.5-3.0'RE (NOT USED) LFP-7-S2-4.5-5.0'RE (NOT USED) LFP-29-S2-2.0-2.5'RE (NOT USED) LFP-29-S1-2.5-3.0'RE (NOT USED) LFP-24-S1-8.0-8.5'RE (NOT USED) LFP-24-S1A-8.0-8.5'RE (NOT USED) LFP-3-S1-4.5-5.0'RE (NOT USED)	TPH as extractables	20	14	J- (all detects) UJ (all non-detects)	A

**Table 4.4-1. Technical Holding Time Tables**  
 Summary of QC Outliers (Page 5 of 10)

**Table 4.4-1C. Technical Holding Times for SW8015B - TEPH**

Sample	TEPH: EPA Method SW8015B Compound	Total Days From Sample Collection Until Extraction	Required Holding Time (in Days) From Sample Collection Until Extraction	Flag	A or P
LFP-24-W1RE * LFP-9-W1RE (NOT USED) EB-5-31RE (NOT USED)	TPH as extractables	19	7	J- (all detects) * R (all non- detects)	A
EB-5-31RE2 (NOT USED) LDC Report# 4962A8	TPH as extractables	26	14	J- (all detects) UJ (all non- detects)	A
EB-6-1RE (NOT USED)	TPH as extractables	18	7	J- (all detects) R (all non- detects)	A
LFP-10-S1-4.5-5.0'RE (NOT USED) LFP-10-S2-6.5-7.0'RE * LFP-11-S1-3.0-3.5'RE (NOT USED) LFP-11-S2-5.0-5.5'RE (NOT USED) LFP-27-S1-1.0-1.5'RE (NOT USED) LFP-27-S2-3.0-3.5'RE (NOT USED) LDC Report# 4962B8	TPH as extractables	21	14	J- (all detects) * UJ (all non- detects)	A

**Note:** Bold highlight indicates that associated sample results were qualified for this analyte.

\* Used for reported result for unknown hydrocarbon. Not used for all reported fuel hydrocarbons.

**Table 4.4-1. Technical Holding Time Tables**  
**Summary of QC Outliers (Page 6 of 10)**

**Table 4.4-1D. Technical Preservation Criteria for SW8081 - Pesticides**

Sample	Pesticides: EPA Method SW8081 Compound	Finding	Criteria	Flag	A or P
EB-6-1  LDC Report# 4962B3a	All TCL compounds	Cooler temperature was reported at 21°C upon receipt by the laboratory.	Cooler temperature must be 4±2°C .	R (all non-detects)	A

**Note:** **Bold highlight** indicates that associated sample results were qualified for this analyte.

**Table 4.4-1E. Technical Holding Times for SW8081 - Pesticides**

Sample	Pesticides: EPA Method SW8081 Compound	Total Days From Sample Collection Until Extraction	Required Holding Time (in Days) From Sample Collection Until Extraction	Flag	A or P
EB-5-30RE (NOT USED)  LDC Report# 4934B3a	All TCL compounds	22	7	J- (all detects) R (all non-detects)	A
LFP-1-S1-6.5-7.0'RE (NOT USED) LFP-1-S2-8.5-9.0'RE (NOT USED) LFP-3-S1-4.5-5.0'RE (NOT USED) LFP-3-S2-6.5-7.0'RE (NOT USED) LFP-9-S1-3.5-4.0'RE (NOT USED) LFP-29-S1-2.5-3.0'RE (NOT USED)  LDC Report# 4962A3a	All TCL compounds	27	14	J- (all detects) UJ (all non-detects)	A
LFP-5-S1-2.5-3.0'RE (NOT USED) LFP-5-S2-4.5-5.0'RE (NOT USED) LFP-7-S1-2.5-3.0'RE (NOT USED) LFP-7-S2-4.5-5.0'RE (NOT USED) LFP-29-S2-2.0-2.5'RE (NOT USED) LFP-24-S1-8.0-8.5'RE (NOT USED) LFP-24-S1A-8.0-8.5'RE (NOT USED)	All TCL compounds	27	14	J- (all detects) UJ (all non-detects)	A
LFP-24-W1RE (NOT USED) LFP-9-W1RE (NOT USED) EB-5-31RE (NOT USED)	All TCL compounds	22	7	J- (all detects) R (all non-detects)	A
EB-6-1RE (NOT USED)  LDC Report# 4962B3a	All TCL compounds	22	7	J- (all detects) R (all non-detects)	A

**Note:** No reported data were qualified.

**Table 4.4-1. Technical Holding Time Tables**  
 Summary of QC Outliers (Page 7 of 10)

**Table 4.4-1F. Technical Preservation Criteria for SW8082 - PCBs**

Sample	PCBs: EPA Method SW8082 Compound	Finding	Criteria	Flag	A or P
<b>EB-6-1</b>  LDC Report# 4962B3b	<b>All TCL compounds</b>	Cooler temperature was reported at 21 °C upon receipt by the laboratory.	Cooler temperature must be 4±2°C .	R (all non-detects)	A

**Note:** Bold highlight indicates that associated sample results were qualified for this analyte.

**Table 4.4-1G. Technical Holding Times for SW8082 - PCBs**

Sample	PCBs: EPA Method SW8082 Compound	Total Days From Sample Collection Until Extraction	Required Holding Time (in Days) From Sample Collection Until Extraction	Flag	A or P
LFP-1-S2-8.5-9.0'RE LFP-3-S2-6.5-7.0'RE LFP-9-S1-3.5-4.0'RE LFP-5-S1-2.5-3.0'RE LFP-5-S2-4.5-5.0'RE LFP-29-S1-2.5-3.0'RE LFP-24-S1-8.0-8.5'RE LFP-24-S1A-8.0-8.5'RE LFP-5-S2-4.5-5.0'RE LFP-1-S1-6.5-7.0'RE LFP-3-S1-4.5-5.0'RE LFP-29-S2-2.0-2.5'RE LFP-7-S1-2.5-3.0'RE	<b>All TCL compounds</b>	22	14	<b>UJ (all non-detects)</b>	<b>A</b>
LFP-24-W1RE (NOT USED) EB-5-31RE (NOT USED)  LDC Report# 4962A3b	All TCL compounds	22	7	R (all non-detects)	A

**Note:** Bold highlight indicates that associated sample results were qualified for this analyte.

**Table 4.4-1. Technical Holding Time Tables**  
 Summary of QC Outliers (Page 8 of 10)

**Table 4.4-1H. Technical Preservation Criteria for SW8260B -VOCs**

Sample	VOCs: EPA Method SW8260B Compound	Finding	Criteria	Flag	A or P
<b>EB-6-1</b> LDC Report# 4962B1	<b>All TCL compounds</b>	Cooler temperature was reported at 21°C upon receipt by the laboratory.	Cooler temperature must be 4±2°C .	<b>J- (all detects) R (all non-detects)</b>	<b>A</b>
<b>LFM-1</b> <b>LFM-2</b> <b>LFM-3</b> <b>LFM-4</b> <b>TRIP-B-1</b>  LDC Report# 5037A1	<b>All TCL compounds</b>	Cooler temperature was reported at 13°C upon receipt by the laboratory.	Cooler temperature must be 4±2°C .	<b>J- (all detects) UJ (all non-detects)</b>	<b>A</b>

**Note:** **Bold highlight** indicates that associated sample results were qualified for this analyte.

**Table 4.4-1I. Technical Holding Times for SW8260B -VOCs**

Sample	VOCs: EPA Method SW8260B Compound	Total Days From Sample Collection Until Extraction	Required Holding Time (in Days) From Sample Collection Until Extraction	Flag	A or P
LFP-20-S2-4'RE ( <i>NOT USED</i> ) LDC Report# 4934A1	All TCL compounds	20	14	J- (all detects) UJ (all non-detects)	A

**Note:** No reported data were qualified.

**Table 4.4-1. Technical Holding Time Tables**  
 Summary of QC Outliers (Page 9 of 10)

**Table 4.4-1J. Technical Holding Times for SW8270 -SVOCs**

Sample	SVOCs: EPA Method SW8270C Compound	Total Days From Sample Collection Until Extraction	Required Holding Time (in Days) From Sample Collection Until Extraction	Flag	A or P
LFP-24-W1 LDC Report# 4962A2b	Pentachlorophenol	8	7	UJ (all non-detects)	P

Note: **Bold highlight** indicates that associated sample results were qualified for this analyte.

**Table 4.4-1K. Technical Preservation Criteria for SW8270CWM-Chloropicrin**

Sample	EPA Method SW8270CWM Compound	Finding	Criteria	Flag	A or P
EB-6-1 LDC Report# 4962B2a	Chloropicrin	Cooler temperature was reported at 21°C upon receipt by the laboratory.	Cooler temperature must be 4±2°C.	R (all non-detects)	A

Note: **Bold highlight** indicates that associated sample results were qualified for this analyte.

**Table 4.4-1L. Technical Holding Times for SW8290 -Dioxins/Furans**

Sample	EPA Method SW8290 Compound	Finding	Criteria	Flag	A or P
EB-6-1 LDC Report# 4962B21	All TCL compounds	Cooler temperature was reported at 21°C upon receipt by the laboratory.	Cooler temperature must be 4±2°C.	R (all non-detects)	A

Note: **Bold highlight** indicates that associated sample results were qualified for this analyte.

**Table 4.4-1. Technical Holding Time Tables**  
 Summary of QC Outliers (Page 10 of 10)

**Table 4.4-1M. Technical Holding Times for SW8310 - PAHs**

Sample	Compound	Finding	Criteria	Flag	A or P
EB-6-1	All TCL compounds	Cooler temperature was reported at 21°C upon receipt by the laboratory.	Cooler temperature must be 4±2°C .	R (all non-detects)	A

**Table 4.4-1N. Technical Holding Times for SW8310 - PAHs**

Sample	PAHs: EPA Method SW8310 Compound	Total Days From Sample Collection Until Extraction	Required Holding Time (in Days) From Sample Collection Until Extraction	Flag	A or P
EB-5-30RE (NOT USED) LDC Report# 4934A9	All TCL compounds	15	7	J- (all detects) R (all non-detects)	A
WV-S-6RE (NOT USED)	All TCL compounds	15	7	J- (all detects) R (all non-detects)	A
LFP-24-W1RE (NOT USED) FP-9-W1RE (NOT USED) LDC Report# 4962A9	All TCL compounds	14	7	J- (all detects) UJ (all non-detects)	A

**Note:** No reported data were qualified.

**Table 4.4-2. Calibration Tables**  
**Summary of QC Outliers (Page 1 of 8)**

**Table 4.4-2A Continuing Calibration for CADHS 300.0M - Perchlorate**

Sample	Perchlorate CADOHS 300.0M Analyte	Finding	Criteria	Flag	A or P
All samples in SDG G0E310175 EB-5-30  LDC Report# 4934A6b	Perchlorate	A blank was not used to establish the calibration curve.	A blank must be used to establish the calibration curve.	None	P
All samples in SDG G0F010290 EB-6-1  LDC Report# 4962B6b	Perchlorate	A blank was not used to establish the calibration curve.	A blank must be used to establish the calibration curve.	None	P

**Note:**

The calibrations were compliant with USEPA Method 314.0 and there is no effect on the quality of the data.

**Table 4.4-2. Calibration Tables**  
**Summary of QC Outliers (Page 2 of 8)**

**Table 4.4-2B Continuing Calibration for SW8081A - Pesticides**

Date	Standard	Column	Pesticides: EPA Method SW8081 Compound	%D	Associated Samples	Flag	A or P
6/7/00	INDA 4x	DB 1701	Endrin aldehyde	18	LFP-24-W1 LFP-9-W1 EB-5-31 LDC Report# 4962A3a and EB-6-1 LDC Report# 4962B3a	NA (J+ all detects) No samples qualified, all ND	A
6-14-00 (9:48)	INDA 4x	DB 1701	<b>4,4'-DDT</b>	19	<b>LFP-22-S1-2'</b>	<b>UJ (all non-detects)</b>	A
6-14-00 (10:26)	INDB 4x	DB 1701	<b>Endrin aldehyde</b>	25	LDC Report# 4934A3a	<b>UJ (all non-detects)</b>	A
6-14-00 (19:24)	INDA 4x	DB 1701	<b>4,4'-DDT</b>	16	<b>LFP-22-S2-4'</b>	<b>UJ (all non-detects)</b>	A
			<b>Methoxychlor</b>	16	<b>LFP-20-S1-2'</b>	<b>UJ (all non-detects)</b>	
					<b>LFP-20-S2-4'</b>		
					<b>LFP-16-S1-3.5'</b>		
					<b>LFP-16-S2-5.5'</b>		
					<b>LFP-14-S1-5.0-5.5'</b>		
					<b>LFP-14-S2-7.0-7.5'</b>		
6-14-00 (20:02)	INDB 4x	DB 1701	<b>Endrin aldehyde</b>	29	<b>LFP-12-S1-4.0-4.5'</b>	<b>UJ (all non-detects)</b>	A
					<b>LFP-12-S2-6.0-6.5'</b>		
					<b>LFP-12-S1A-4.0'</b>		
					LDC Report# 4934A3a		
6/28/00	INDA 4x	DB 1701	4,4'-DDD	21. 0	LFP-1-S1-6.5-7.0'RE (NOT USED) LFP-1-S2-8.5-9.0'RE (NOT USED) LFP-5-S1-2.5-3.0'RE (NOT USED) LFP-7-S1-2.5-3.0'RE (NOT USED) LFP-29-S2-2.0-2.5'RE (NOT USED) LDC Report# 4962A3a	NA (J+ all detects) No samples qualified, all ND	A
6/29/00	INDA 4x	DB 1701	4,4'-DDD	34	LFP-3-S1-4.5-5.0'RE (NOT USED) LFP-3-S2-6.5-7.0'RE (NOT USED) LFP-9-S1-3.5-4.0'RE (NOT USED) LFP-7-S2-4.5-5.0'RE (NOT USED) LFP-29-S2-2.0-2.5'RE (NOT USED) LFP-29-S1-2.5-3.0'RE (NOT USED) LFP-24-S1-8.0-8.5'RE (NOT USED) LFP-24-S1A-8.0-8.5'RE (NOT USED) LDC Report# 4962A3a	NA (J+ all detects) No samples qualified, all ND	A

**Note:** Bold highlight indicates that associated sample results were qualified for this compound.

**Table 4.4-2. Calibration Tables**  
**Summary of QC Outliers (Page 3 of 8)**

**Table 4.4-2C Initial Calibration for SW8260B - VOCs**

Date	VOCs: EPA Method SW8260B Compound	%RSD or r <sup>2</sup>	Associated Samples	Flag	A or P
6/5/00	<b>Acetone</b>	36.292	All water samples in SDG G0E310175: <b>EB-5-30</b> <b>TB2-5-30</b> <b>TB-6-2</b>  LDC Report# 4934A1	<b>UJ (all non-detects)</b>	<b>A</b>
6/14/00	<b>Acetone</b>  <b>Vinyl acetate</b>	44.048  38.827	All water samples in SDG G0F090283: <b>TRIP-B-1</b>  LDC Report# 5037A1	<b>UJ (all non-detects)</b>  <b>UJ (all non-detects)</b>	<b>A</b>
6/9/00	<b>Acetone</b>  <b>2-Butanone</b>	37.604  31.143	LFP-20-S2-4'RE ( <i>NOT USED</i> ) LDC Report# 4934A1 and <b>LFP-7-S1-2.5-3.0'</b> <b>LFP-7-S2-4.5-5.0'</b> LDC Report# 4962A1 and <b>LFP-11-S1-3.0-3.5'</b> <b>LFP-27-S1-1.0-1.5'</b> <b>LFP-27-S2-30.-3.5'</b> LDC Report# 4962B1 and All soil samples in SDG G0F090283 <b>LFM-1</b> <b>LFM-2</b> <b>LFM-3</b> <b>LFM-4</b> LDC Report# 5037A1	<b>UJ (all non-detects)</b>  <b>J (all detects)</b>	<b>A</b>

**Note:** **Bold highlight** indicates that associated sample results were qualified for this compound.

**Table 4.4-2. Calibration Tables**  
**Summary of QC Outliers (Page 4 of 8)**

**Table 4.4-2D Initial Calibration RRFs for SW8260B - VOCs**

Date	Compound	RRF (Limits)	Associated Samples	Flag	A or P
5/10/00	<b>Acetone</b>  <b>2-Butanone</b>	0.02680 (≥0.05)  0.03562 (≥0.05)	All water samples in SDG G0F010289: <b>TB-5-31</b> <b>LFP-24-W1</b> <b>LFP-9-W1</b> <b>EB-5-31</b> LDC Report# 4962A1 and All water samples in SDG G0F010290: <b>TB-6-1</b> <b>EB-6-1</b> LDC Report# 4962B1	<b>J (all detects)</b> <b>UJ (all non-detects)</b>  <b>UJ (all non-detects)</b>	A
6/5/00	<b>Acetone</b> <b>2-Butanone</b> <b>2-Chloroethylvinyl ether</b> <b>4-Methyl-2-pentanone</b> <b>2-Hexanone</b>	0.02486 (≥0.05) 0.03157 (≥0.05) 0.02493 (≥0.05) 0.04644 (≥0.05) 0.04176 (≥0.05)	All water samples in SDG G0E310175: <b>EB-5-30</b> <b>TB2-5-30</b> <b>TB-6-2</b>  LDC Report# 4934A1	<b>UJ (all non-detects)</b>	A
6/14/00	<b>Acetone</b> <b>2-Butanone</b> <b>2-Chloroethylvinyl ether</b>	0.03044 (≥0.05) 0.02739 (≥0.05) 0.02544 (≥0.05)	All water samples in SDG G0F090283: <b>TRIP-B-1</b>  LDC Report# 5037A1	<b>UJ (all non-detects)</b>	A
5/10/00	<b>Acetone</b>	0.03749 (≥0.05)	<b>LFP-16-S2-5.5'</b> <b>LFP-12-S1-4.0-4.5'</b>  LDC Report# 4934A1	<b>UJ (all non-detects)</b>	A
5/12/00	2-Chloroethylvinyl ether	0.02844 (≥0.05)	LFP-22-S1-2' LFP-20-S1-2' LFP-20-S2-4'  LDC Report# 4934A1	<b>NA* UJ (all non-detects)</b>	A

**Notes:**

**Bold highlight** indicates that associated sample results were qualified for this compound.

\* NA = Not Applicable. For reporting purposes, the results for 2-chloroethylvinylether in all of the soils samples have been qualified as rejected (R) and unusable for reporting purposes as the methanol preservation required for preparation method SW5035 destroys this compound.

**Table 4.4-2. Calibration Tables**  
Summary of QC Outliers (Page 5 of 8)

**Table 4.4-2E Continuing Calibrations for SW8260B - VOCs**

Date	VOCs: EPA Method SW8260B Compound	%D	Associated Samples	Flag	A or P
6/9/00	<b>4-Methyl-2-pentanone</b>  Vinyl acetate	28.9  81.7	All water samples in SDG G0E310175: <b>EB-5-30</b> <b>TB2-5-30</b> <b>TB-6-2</b>  LDC Report# 4934A1	<b>UJ (all non-detects)</b>   <i>NA (J+ all detects)</i> <i>No samples qualified, all ND</i>	A
6/13/00	1,2,3-Trichloropropane	26.8	All water samples in SDG G0F010289: TB-5-31 LFP-24-W1 LFP-9-W1 EB-5-31 LDC Report# 4962A1 and All water samples in SDG G0F010290 TB-6-1 EB-6-1 LDC Report# 4962B1	<i>NA (J+ all detects)</i> <i>No samples qualified, all ND</i>	A
6/19/00	Vinyl acetate 2-Chloroethylvinyl ether Dibromochloromethane Bromoform	30.7 30.2 32.4 44.2	All water samples in SDG G0F090283: TRIP-B-1  LDC Report# 5037A1	<i>NA (J+ all detects)</i> <i>NA (J+ all detects)</i> <i>NA (J+ all detects)</i> <i>NA (J+ all detects)</i> <i>No samples qualified, all ND</i>	A
5/31/00 (V7186)	Trichlorofluoromethane	27.4	LFP-16-S2-5.5' LFP-12-S1-4.0-4.5'  LDC Report# 4934A1	<i>NA (J+ all detects)</i> <i>No samples qualified, all ND</i>	A
5/31/00 (V7186)	<b>Carbon disulfide</b> <b>Methyl-tert-butyl ether</b>  2-Chloroethylvinyl ether	26.5 26.1 39.0	LFP-16-S2-5.5' LFP-12-S1-4.0-4.5'  LDC Report# 4934A1	<b>UJ (all non-detects)</b> <b>UJ (all non-detects)</b>  <i>NA* UJ (all non-detects)</i>	A
5/31/00 (V2386)	<b>1,1,2-Trichloro-1,2,2-trifluoroethane</b> <b>Carbon disulfide</b>  2-Chloroethylvinyl ether	25.1 38.3 71.0	LFP-22-S1-2' LFP-20-S1-2' LFP-20-S2-4'  LDC Report# 4934A1	<b>UJ (all non-detects)</b> <b>UJ (all non-detects)</b>  <i>NA* UJ (all non-detects)</i>	A
6/5/00	<b>2-Butanone</b> <b>4-Methyl-2-pentanone</b> <b>2-Hexanone</b>	29.5 39.0 37.6	LFP-16-S1-3.5' LFP-14-S1-5.0-5.5' LFP-14-S2-7.0-7.5' LFP-12-S2-6.0-6.5' LFP-12-S1A-4.0'  LDC Report# 4934A1	<b>J- (all detects)</b> <b>UJ (all non-detects)</b>	A

**Table 4.4-2. Calibration Tables**  
Summary of QC Outliers (Page 6 of 8)

**Table 4.4-2E Continuing Calibrations for SW8260B - VOCs**

Date	VOCs: EPA Method SW8260B Compound	%D	Associated Samples	Flag	A or P
6/5/00	Dichlorodifluoromethane 1,1,2-Trichloro-1,2,2-trifluoroethane Carbon disulfide	59.6 30.4 42.6	LFP-16-S1-3.5' LFP-14-S1-5.0-5.5' LFP-14-S2-7.0-7.5' LFP-12-S2-6.0-6.5' LFP-12-S1A-4.0'  LDC Report# 4934A1	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <b>No samples qualified, all ND</b>	A
6/7/00	<b>Chloroethane</b>  <b>4-Methyl-2-pentanone</b>  Dichlorodifluoromethane Trichlorofluoromethane 1,1,2-Trichloro-1,2,2-trifluoroethane Carbon disulfide Vinyl acetate	26.8  29.1  58.2 25.8 38.8 47.0 29.2	LFP-1-S1-6.5-7.0' LFP-1-S2-8.5-9.0' LFP-3-S1-4.5-5.0' LFP-9-S1-3.5-4.0' LFP-5-S1-2.5-3.0'  LDC Report# 4962A1	UJ (all non-detects)  UJ (all non-detects)  NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <b>No samples qualified, all ND</b>	A
6/8/00	<b>Chloroethane</b>  <b>4-Methyl-2-pentanone</b>  Dichlorodifluoromethane Trichlorofluoromethane 1,1,2-Trichloro-1,2,2-trifluoroethane Carbon disulfide Vinyl acetate	26.0  27.6  55.6 25.4 38.7 48.1 29.3	LFP-22-S2-4' LDC Report# 4934A1 and LFP-3-S2-6.5-7.0' LFP-5-S2-4.5-5.0' LFP-29-S2-2.0-2.5' LFP-29-S1-2.5-3.0' LFP-24-S1-8.0-8.5' LDC Report# 4962A1 and LFP-10-S1-4.5-5.0*** LFP-10-S2-6.5-7.0' LFP-11-S2-5.0-5.5*** LDC Report# 4962B1	UJ (all non-detects)  UJ (all non-detects)  NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <b>No samples qualified, all ND</b>	A
6/9/00	<b>Acetone</b>	26.3	LFP-24-S1A-8.0'  LDC Report# 4962A1	UJ (all non-detects)	A
6/19/00	Acetone  4-Methyl-2-pentanone 2-Hexanone	25.3  33.1 36.8	LFP-20-S2-4'RE (NOT USED)  LDC Report# 4934A1	J+ (all detects)  NA (J+ all detects) NA (J+ all detects) <b>No samples qualified, all ND</b>	A

**Notes:**

**Bold highlight** indicates that associated sample results were qualified for this compound.

\* NA = Not Applicable. For reporting purposes, the results for 2-chloroethylvinylether in all of the soils samples have been qualified as rejected (R) and unusable for reporting purposes as the methanol preservation required for preparation method SW5035 destroys this compound.

**Table 4.4-2. Calibration Tables**  
 Summary of QC Outliers (Page 7 of 8)

**Table 4.4-2F Continuing Calibration RRFs for SW8260B - VOCs**

Date	VOCs: EPA Method SW8260B Compound	RRF (Limits)	Associated Samples	Flag	A or P
6/9/00	<b>Acetone</b> <b>2-Butanone</b> <b>2-Chloroethylvinyl ether</b> <b>4-Methyl-2-pentanone</b> <b>2-Hexanone</b>	0.020 ( $\geq 0.05$ ) 0.029 ( $\geq 0.05$ ) 0.0208 ( $\geq 0.05$ ) 0.033 ( $\geq 0.05$ ) 0.038 ( $\geq 0.05$ )	All water samples in SDG G0E310175: <b>EB-5-30</b> <b>TB2-5-30</b> <b>TB-6-2</b>  LDC Report# 4934A1	<b>UJ (all non-detects)</b>	<b>A</b>
6/13/00	<b>Acetone</b>  <b>2-Butanone</b>	0.024 ( $\geq 0.05$ )  0.041 ( $\geq 0.05$ )	All water samples in SDG G0F010289: <b>LFP-9-W1</b> <b>TB-5-31</b> <b>LFP-24-W1</b> <b>EB-5-31</b> LDC Report# 4962A1 and All water samples in SDG G0F010290: <b>TB-6-1</b> <b>EB-6-1</b> LDC Report# 4962B1	<b>J (all detects)</b> <b>UJ (all non-detects)</b>  <b>UJ (all non-detects)</b>	<b>A</b>
6/19/00	<b>Acetone</b> <b>2-Butanone</b> <b>2-Chloroethylvinyl ether</b>	0.028 ( $\geq 0.05$ ) 0.029 ( $\geq 0.05$ ) 0.033 ( $\geq 0.05$ )	All water samples in SDG G0F090283: <b>TRIP-B-1</b>  LDC Report# 5037A1	<b>UJ (all non-detects)</b>	<b>A</b>
5/31/00 (V7186)	<b>Acetone</b>	0.037 ( $\geq 0.05$ )	<b>LFP-16-S2-5.5'</b> <b>LFP-12-S1-4.0-4.5'</b>  LDC Report# 4934A1	<b>UJ (all non-detects)</b>	<b>A</b>
5/31/00 (V2386)	2-Chloroethylvinyl ether	0.008 ( $\geq 0.05$ )	<b>LFP-22-S1-2'</b> <b>LFP-20-S1-2'</b> <b>LFP-20-S2-4'</b>  LDC Report# 4934A1	<b>NA* R (all non-detects)</b>	<b>A</b>
6/9/00	<b>Acetone</b>	0.041 ( $\geq 0.05$ )	<b>LFP-24-S1A-8.0'</b>  LDC Report# 4962A1	<b>UJ (all non-detects)</b>	<b>A</b>

**Note:** Bold highlight indicates that associated sample results were qualified for this compound.

\* NA = Not Applicable. For reporting purposes, the results for 2-chloroethylvinylether in all of the soils samples have been qualified as rejected (R) and unusable for reporting purposes as the methanol preservation required for preparation method SW5035 destroys this compound.

**Table 4.4-2. Calibration Tables**  
Summary of QC Outliers (Page 8 of 8)

**Table 4.4-2G Routine (Continuing) Calibration for SW8290 - Dioxin/Furans**

Date	Dioxins/Furans: EPA Method SW8290 Compound	%D	Associated Samples	Flag	A or P
6/14/00	1,2,3,4,7,8-HxCDD	22.4 ( $\leq 20$ )	All samples in SDG G0E310175 LFP-22-S1-2' LFP-12-S1-4.0-4.5' EB-5-30 LDC Report# 4934A21 and LFP-10-S1-4.5-5.0** LFM-1** LDC Report# 4962B21	NA (J+ all detects) <i>No samples qualified, all ND</i>	P
6/15/00	<b>OCDF</b>	20.2 ( $\leq 20$ )	All soil samples in SDG G0F010289 LFP-24-S1A-8.0-8.5' LDC Report# 4962A21 and <b>LFM-3**</b> <b>LFM-4**</b> LDC Report# 4962B21	NA (J+ all detects) <i>No samples qualified, all ND</i> <b>J+ (all detects)</b> <b>J+ (all detects)</b>	P
	OCDF	20.2 ( $\leq 20$ )	LFP-1-S1-6.5-7.0' LFP-7-S1-2.5-3.0' LFP-24-S1-8.0-8.5' LFP-24-W1 EB-5-31 LFP-9-W1 LDC Report# 4962A21 and LFM-2** LDC Report# 4962B21	NA (J+ all detects) <i>No samples qualified, all ND</i>	

Note: **Bold highlight** indicates that associated sample results were qualified for this compound.

**Table 4.4-2H Continuing Calibrations for SW8330-Explosives**

Date	Column	Explosives: EPA Method SW8330 Compound	%D	Associated Samples	Flag	A or P
6/5/00	Not applicable	<b>4-Amino-2,6-dinitrotoluene</b>	23	<b>TNT-R15A</b>  LDC Report# 4886A40	UJ (all non-detects)	A

Note: **Bold highlight** indicates that associated sample results were qualified for this compound.

These tables were reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only QC outliers were included. Notes and highlights were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation. The "A" and "P" designations are LDC DVR designations that indicate the LDC validator determined that the finding was based upon technical validation criteria (A) or that the validation finding was related to a protocol/contractual deviation (P).

**Table 4.4-3. Field and Laboratory Blank Tables**  
Summary of QC Outliers (Page 1 of 13)

**Table 4.4-3A Field Blanks for General Chemistry Methods**

Equipment Blank ID	Sampling Date	GENERAL CHEMISTRY: EPA Methods 160.1/160.2/300.0/415.1/SW9060 Analyte	Concentration	Associated Samples
EB-5-30  LDC Report# 4934A6a	5/30/00	Nitrate as N	0.046 mg/L	LFP-22-S1-2' LFP-22-S2-4' LFP-20-S1-2' LFP-20-S2-4' LFP-16-S1-3.5' LFP-16-S2-5.5' LFP-14-S1-5.0-5.5' LFP-14-S2-7.0-7.5' LFP-12-S1-4.0-4.5' LFP-12-S2-6.0-6.5' LFP-12-S1A-4.0' R1-E R1-F R1-G
EB-6-1  LDC Report# 4962B6a	6/1/00	Nitrate as N	0.057 mg/L	LFP-10-S1-4.5-5.0' LFP-10-S2-6.5-7.0' LFP-11-S1-3.0-3.5' LFP-11-S2-5.0-5.5' LFP-27-S1-1.0-1.5' LFP-27-S2-30.-3.5' LFM-2 LFM-3 LFM-4
EB-5-31  LDC Report# 4962A6	5/31/00	Nitrate as N	0.045 mg/L	LFP-1-S1-6.5-7.0' LFP-1-S2-8.5-9.0' LFP-3-S1-4.5-5.0' LFP-3-S2-6.5-7.0' LFP-9-S1-3.5-4.0' LFP-5-S1-2.5-3.0' LFP-5-S2-4.5-5.0' LFP-7-S1-2.5-3.0' LFP-7-S2-4.5-5.0' LFP-29-S2-2.0-2.5' LFP-29-S1-2.5-3.0' LFP-24-S1-8.0-8.5' LFP-24-S1A-8.0-8.5' LFP-24-W1 LFP-9-W1

**Note:** Bold highlight indicates that associated non-blank field sample results were blank qualified for this element.

**Table 4.4-3. Field and Laboratory Blank Tables**  
 Summary of QC Outliers (Page 2 of 13)

**Table 4.4-3B Blank Qualifications for General Chemistry Methods**

Sample	GENERAL CHEMISTRY: EPA Methods 160.1/160.2/300.0/415.1/SW9060 Analyte	Reported Concentration	Modified Final Concentration
LFP-22-S1-2'	Nitrate as N	0.69 mg/Kg	0.69J mg/Kg *
LFP-22-S2-4'	Nitrate as N	0.49 mg/Kg	0.49J mg/Kg *
LFP-20-S2-4'	Nitrate as N	0.28 mg/Kg	0.28J mg/Kg *
LFP-16-S1-3.5'	Nitrate as N	0.41 mg/Kg	0.41J mg/Kg *
LFP-16-S2-5.5'	Nitrate as N	0.86 mg/Kg	0.86J mg/Kg *
LFP-14-S1-5.0-5.5'	Nitrate as N	0.66 mg/Kg	0.66J mg/Kg *
LFP-14-S2-7.0-7.5'	Nitrate as N	0.73 mg/Kg	0.73J mg/Kg *
LFP-12-S1-4.0-4.5'	Nitrate as N	0.36 mg/Kg	0.36J mg/Kg *
LFP-12-S1A-4.0'	Nitrate as N	0.40 mg/Kg	0.40J mg/Kg *
R1-E	Nitrate as N	0.40 mg/Kg	0.40J mg/Kg *
R1-G	Nitrate as N	0.36 mg/Kg	0.36J mg/Kg *
LDC Report# 4934A6a			
LFP-1-S1-6.5-7.0'	Nitrate as N	1.0 mg/Kg	1.0J mg/Kg *
LFP-3-S1-4.5-5.0'	Nitrate as N	0.66 mg/Kg	0.66J mg/Kg *
LFP-3-S2-6.5-7.0'	Nitrate as N	0.35 mg/Kg	0.35J mg/Kg *
LFP-7-S2-4.5-5.0'	Nitrate as N	0.31 mg/Kg	0.31J mg/Kg *
LFP-29-S2-2.0-2.5'	Nitrate as N	0.30 mg/Kg	0.30J mg/Kg *
LFP-9-W1	Nitrate as N	0.084 mg/L	0.084J mg/L
LDC Report# 4962A6			
LFP-11-S1-3.0-3.5'	Nitrate as N	0.31 mg/Kg	0.31J mg/Kg *
LFP-27-S1-1.0-1.5'	Nitrate as N	0.28 mg/Kg	0.28J mg/Kg *
LFM-2	Nitrate as N	0.32 mg/Kg	0.32J mg/Kg *
LFM-4	Nitrate as N	0.29 mg/Kg	0.29J mg/Kg *
LDC Report# 4962B6a			

**Table 4.4-3. Field and Laboratory Blank Tables**  
 Summary of QC Outliers (Page 3 of 13)

**Table 4.4-3B Blank Qualifications for General Chemistry Methods**

Sample	GENERAL CHEMISTRY: EPA Methods 160.1/160.2/300.0/415.1/SW9060 Analyte	Reported Concentration	Modified Final Concentration
--------	---	---------------------------	---------------------------------

**Notes:**

**Bold highlight** indicates that non-blank field sample results were qualified for this analyte.

\* Field sample results for nitrate-N less than 5 times the blank qualification but present at levels above 20 mg/Kg have been qualified as estimated (J) instead of non-detected and estimated (UJ) using professional judgement at the request of the project chemist. Such results were not qualifiable due to levels of nitrate in the method blanks. The consistent levels of nitrate-N in the equipment blanks were also present in the source water, and are thus not representative of contamination from the sampling equipment. The levels of nitrate-N in the associated field samples are expected to be due to environmental nitrate, but are qualified as estimated (J) due to the levels of nitrate-N reported in the equipment blanks.

**Table 4.4-3C Laboratory Blanks for Metals**

Method Blank ID	Metals: EPA Methods SW6010B/SW7470ASW/7471A Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Aluminum Barium Calcium Copper Iron Magnesium Nickel Sodium	2.5 mg/Kg 0.12 mg/Kg 11.0 mg/Kg 0.43 mg/Kg 3.0 mg/Kg 4.4 mg/Kg 0.13 mg/Kg 10.8 mg/Kg	All soil samples in SDG G0E310175: LFP-22-S1-2' LFP-22-S2-4' LFP-20-S1-2' LFP-20-S2-4' LFP-16-S1-3.5' LFP-16-S2-5.5' LFP-14-S1-5.0-5.5' LFP-14-S2-7.0-7.5' LFP-12-S1-4.0-4.5' LFP-12-S2-6.0-6.5' LFP-12-S1A-4.0'
ICB/CCB1	Barium Chromium Iron Manganese	0.0070 mg/L 0.00597 mg/L 0.114 mg/L 0.00685 mg/L	LDC Report# 4934A4
ICB/CCB2	Chromium Cobalt Thallium	0.00586 mg/L 0.00569 mg/L 0.00971 mg/L	EB-5-30 LDC Report# 4934A4

**Table 4.4-3. Field and Laboratory Blank Tables**  
 Summary of QC Outliers (Page 4 of 13)

**Table 4.4-3C Laboratory Blanks for Metals**

Method Blank ID	Metals: EPA Methods SW6010B/SW7470ASW/7471A Analyte	Maximum Concentration	Associated Samples
PB (prep blank) ICB/CCB	Calcium  Chromium Cobalt Thallium	15.7 mg/Kg  0.00586 ug/L 0.00569 ug/L 0.00971 ug/L	All samples in SDG G0F010289 LFP-1-S1-6.5-7.0' LFP-1-S2-8.5-9.0' LFP-3-S1-4.5-5.0' LFP-3-S2-6.5-7.0' LFP-9-S1-3.5-4.0' LFP-5-S1-2.5-3.0' LFP-5-S2-4.5-5.0' LFP-7-S1-2.5-3.0' LFP-7-S2-4.5-5.0' LFP-29-S2-2.0-2.5' LFP-29-S1-2.5-3.0' LFP-24-S1-8.0-8.5' LFP-24-S1A-8.0-8.5' <b>LFP-24-W1</b> <b>LFP-9-W1</b> EB-5-31  LDC Report# 4962A4
PB1 (prep blank) ICB/CCB1	Iron Sodium Zinc  Chromium Thallium	0.016 mg/L 0.10 mg/L 0.0044 mg/L  0.0052 mg/L 0.00971 mg/L	All water samples in SDG G0F010290: EB-6-1  LDC Report# 4962B4
PB2 (prep blank) ICB/CCB2	Calcium Iron Magnesium Sodium  Chromium Cobalt	15.8 mg/Kg 2.8 mg/Kg 5.1 mg/Kg 19.0 mg/Kg  0.00586 mg/L 0.00569 mg/L	All soil samples in SDG G0F010290: LFP-10-S1-4.5-5.0' LFP-10-S2-6.5-7.0' LFP-11-S1-3.0-3.5' LFP-11-S2-5.0-5.5' LFP-27-S1-1.0-1.5' LFP-27-S2-3.0-3.5' LFM-1 LFM-2 LFM-3 LFM-4 EB-6-1  LDC Report# 4962B4

**Note:**

**Bold highlight** indicates that associated non-blank field sample results were blank qualified for this element.

**Table 4.4-3. Field and Laboratory Blank Tables**  
 Summary of QC Outliers (Page 5 of 13)

**Table 4.4-3D Field Blanks for Metals**

Equipment Blank ID	Sampling Date	Metals: EPA Methods SW6010B/SW7470ASW/7471A Analyte	Concentration	Associated Samples
EB-5-30	5/30/00	Calcium Iron Sodium	0.035 mg/L 0.0052 mg/L 0.064 mg/L	All soil samples in SDG G0E310175: LFP-22-S1-2' LFP-22-S2-4' LFP-20-S1-2' LFP-20-S2-4' LFP-16-S1-3.5' LFP-16-S2-5.5' LFP-14-S1-5.0' LFP-14-S2-7.0' LFP-12-S1-4.0' LFP-12-S2-6.0' LFP-12-S1A-4.0'  LDC Report# 4934A4
EB-5-31	5/31/00	Calcium Iron Sodium Zinc	0.064 mg/L 0.020 mg/L 0.071 mg/L 0.0022 mg/L	All soil samples in SDG G0F010289: LFP-1-S1-6.5-7.0' LFP-1-S2-8.5-9.0' LFP-3-S1-4.5-5.0' LFP-3-S2-6.5-7.0' LFP-9-S1-3.5-4.0' LFP-5-S1-2.5-3.0' LFP-5-S2-4.5-5.0' LFP-7-S1-2.5-3.0' LFP-7-S2-4.5-5.0' LFP-29-S2-2.0-2.5' LFP-29-S1-2.5-3.0' LFP-24-S1-8.0-8.5' LFP-24-S1A-8.0-8.5'  LDC Report# 4962A4
EB-6-1	6/1/00	Iron Zinc	0.0055 mg/L 0.0039 mg/L	All soil samples in SDG G0F010290: LFP-10-S1-4.5-5.0' LFP-10-S2-6.5-7.0' LFP-11-S1-3.0-3.5' LFP-11-S2-5.0-5.5' LFP-27-S1-1.0-1.5' LFP-27-S2-3.0-3.5'  LDC Report# 4962B4

**Note:**  
 No non-blank field sample results were qualified due to equipment blank results.

**Table 4.4-3. Field and Laboratory Blank Tables**  
 Summary of QC Outliers (Page 6 of 13)

**Table 4.4-3E Blank Qualifications for Metals**

Sample	Metals: EPA Methods SW6010B/SW7470ASW/7471A Analyte	Reported Concentration	Modified Final Concentration
LFP-24-W1 LDC Report# 4962A4	<b>Chromium</b>	0.0047 mg/L	<b>0.0047UJ mg/L</b>
LFP-9-W1 LDC Report# 4962A4	<b>Cobalt</b>	0.027 mg/L	<b>0.027UJ mg/L</b>
EB-6-1* LDC Report# 4962B4	Iron Zinc  <i>* Samples identified as field blanks should not be blank-qualified.</i>	0.0055 mg/L 0.0039 mg/L	0.0055UJ mg/L 0.0039UJ mg/L

**Notes:**

**Bold highlight** indicates that non-blank field sample results were qualified for this analyte.

\* Equipment blanks were qualified by the validation sub-contractor, LDC, as non-detected and estimated (UJ) according to validation protocols followed by LDC. However, according to the Functional Guidelines and USEPA Region IX validation protocols, field, equipment and trip blanks cannot be blank-qualified according to the blank qualification rules as these samples are blanks, not environmental field samples. The results for all field blanks should be considered as detected at the reported concentrations for the purpose of evaluating potential field contamination.

**Table 4.4-3. Field and Laboratory Blank Tables**  
 Summary of QC Outliers (Page 7 of 13)

**Table 4.4-3F Laboratory Blanks for SW8260B - VOCs**

Method Blank ID	Analysis Date	VOCs: EPA Method SW8260B Compound	Concentration	Associated Samples
0160445-BLK	6/5/00	Acetone	0.0087 mg/Kg	LFP-16-S1-3.5' LFP-14-S1-5.0' LFP-14-S2-7.0' LFP-12-S2-6.0' LFP-12-S1A-4.0'  LDC Report# 4934A1
0160324-BLK	6/7/00	Acetone	0.0078 mg/Kg	LFP-1-S1-6.5' LFP-1-S2-8.5' LFP-3-S1-4.5' LFP-9-S1-3.5' LFP-5-S1-2.5'  LDC Report# 4962A1
0171275-BLK	6/8/00	Acetone 2-Butanone	0.0077 mg/Kg 0.0068 mg/Kg	LFP-22-S2-4' LDC Report# 4934A1 and LFP-3-S2-6.5-7.0' LFP-5-S2-4.5-5.0' LFP-29-S2-2.0-2.5' LFP-29-S1-2.5-3.0' LFP-24-S1-8.0-8.5' LDC Report# 4962A1 and LFP-10-S1-4.5-5.0' LFP-10-S2-6.5-7.0' LFP-11-S2-5.0-5.5' LDC Report# 4962B1
0171287-BLK	6/9/00	Acetone	0.0099 mg/Kg	LFP-7-S1-2.5-3.0' LFP-7-S2-4.5-5.0' LDC Report# 4962A1 and LFP-11-S1-3.0-3.5' LFP-27-S2-30.-3.5' LDC Report# 4962B1
0171346-BLK	6/10/00	Acetone	0.0099 mg/Kg	LFP-27-S1-1.0-1.5'  LDC Report# 4962B1
0172284-BLK	6/19/00	Acetone	0.012 mg/Kg	LFP-20-S2-4'RE (NOT USED)  LDC Report# 4934A1
0180545-BLK	6/19/00	Acetone	1.6 ug/L	All water samples in SDG G0F090283: TRIP-B-1  LDC Report# 5037A1

**Table 4.4-3. Field and Laboratory Blank Tables**  
 Summary of QC Outliers (Page 8 of 13)

**Table 4.4-3F Laboratory Blanks for SW8260B - VOCs**

Method Blank ID	Analysis Date	VOCs: EPA Method SW8260B Compound	Concentration	Associated Samples
0180555-BLK	6/20/00	Acetone	0.0088 mg/Kg	All soil samples in SDG G0F090283: <b>LFM-1</b> <b>LFM-2</b> <b>LFM-3</b> <b>LFM-4</b> LDC Report# 5037A1

**Note:**

**Bold highlight** indicates that associated non-blank field sample results were blank qualified for this analyte.

**Table 4.4-3G Field Blanks for SW8260B - VOCs**

Trip Blank ID	Sampling Date	VOCs: EPA Method SW8260B Compound	Concentration	Associated Samples
TB-6-2	6/2/00	Methylene chloride	3.8 ug/L	No associated samples in this SDG LDC Report# 4934A1
TB-6-1	6/1/00	Methylene chloride	3.7 ug/L	LFP-10-S1-4.5-5.0' LFP-10-S2-6.5-7.0' LFP-11-S1-3.0-3.5' LFP-11-S2-5.0-5.5' LFP-27-S1-1.0-1.5' LFP-27-S2-30.-3.5' LDC Report# 4962B1
Equipment Blank ID	Sampling Date	VOCs: EPA Method SW8260B Compound	Concentration	Associated Samples
EB-6-1	6/1/00	Methylene chloride	3.9 ug/L	LFP-10-S1-4.5-5.0' LFP-10-S2-6.5-7.0' LFP-11-S1-3.0-3.5' LFP-11-S2-5.0-5.5' LFP-27-S1-1.0-1.5' LFP-27-S2-30.-3.5' LDC Report# 4962B1

**Note:** No VOC data were qualified as a result of field blank results.

**Table 4.4-3. Field and Laboratory Blank Tables**  
 Summary of QC Outliers (Page 9 of 13)

**Table 4.4-3H Blank Qualifications for SW8260B - VOCs**

Sample	VOCs: EPA Method SW8260B Compound	Reported Concentration	Modified Final Concentration
LFP-22-S2-4'	Acetone	0.022 mg/Kg	0.022UJ mg/Kg
LFP-20-S2-4'RE (NOT USED)	Acetone	0.026 mg/Kg	0.026UJ mg/Kg
LFP-16-S1-3.5'	Acetone	0.022 mg/Kg	0.022UJ mg/Kg
LFP-14-S1-5.0-5.5'	Acetone	0.052 mg/Kg	0.052UJ mg/Kg
LFP-14-S2-7.0-7.5'	Acetone	0.017 mg/Kg	0.017UJ mg/Kg
LFP-12-S2-6.0-6.5'	Acetone	0.020 mg/Kg	0.020UJ mg/Kg
LFP-12-S1A-4.0'	Acetone	0.037 mg/Kg	0.037UJ mg/Kg
LDC Report# 4934A1			
LFP-1-S1-6.5-7.0'	Acetone	0.021 mg/Kg	0.021UJ mg/Kg
LFP-1-S2-8.5-9.0'	Acetone	0.028 mg/Kg	0.028UJ mg/Kg
LFP-3-S1-4.5-5.0'	Acetone	0.065 mg/Kg	0.065UJ mg/Kg
LFP-9-S1-3.5-4.0'	Acetone	0.011 mg/Kg	0.011UJ mg/Kg
LFP-5-S1-2.5-3.0'	Acetone	0.018 mg/Kg	0.018UJ mg/Kg
LFP-3-S2-6.5-7.0'	Acetone 2-Butanone	0.041 mg/Kg 0.0085 mg/Kg	0.041UJ mg/Kg 0.0085UJ mg/Kg
LFP-5-S2-4.5-5.0'	Acetone 2-Butanone	0.046 mg/Kg 0.010 mg/Kg	0.046UJ mg/Kg 0.010UJ mg/Kg
LFP-29-S2-2.0-2.5'	Acetone 2-Butanone	0.065 mg/Kg 0.015 mg/Kg	0.065UJ mg/Kg 0.015UJ mg/Kg
LFP-29-S1-2.5-3.0'	Acetone 2-Butanone	0.030 mg/Kg 0.0077 mg/Kg	0.030UJ mg/Kg 0.0077UJ mg/Kg
LFP-24-S1-8.0-8.5'	Acetone 2-Butanone	0.030 mg/Kg 0.0089 mg/Kg	0.030UJ mg/Kg 0.0089UJ mg/Kg
LFP-7-S1-2.5-3.0'	Acetone	0.039 mg/Kg	0.039UJ mg/Kg
LFP-7-S2-4.5-5.0'	Acetone	0.051 mg/Kg	0.051UJ mg/Kg
LDC Report# 4962A1			

**Table 4.4-3. Field and Laboratory Blank Tables**  
 Summary of QC Outliers (Page 10 of 13)

**Table 4.4-3H Blank Qualifications for SW8260B - VOCs**

Sample	VOCs: EPA Method SW8260B Compound	Reported Concentration	Modified Final Concentration
LFP-10-S1-4.5-5.0'	Acetone 2-Butanone	0.021 mg/Kg 0.0072 mg/Kg	<b>0.021UJ mg/Kg</b> <b>0.0072UJ mg/Kg</b>
LFP-10-S2-6.5-7.0'	Acetone	0.014 mg/Kg	<b>0.014UJ mg/Kg</b>
LFP-11-S2-5.0-5.5'	Acetone 2-Butanone	0.029 mg/Kg 0.0074 mg/Kg	<b>0.029UJ mg/Kg</b> <b>0.0074UJ mg/Kg</b>
LFP-11-S1-3.0-3.5'	Acetone	0.055 mg/Kg	<b>0.055UJ mg/Kg</b>
LFP-27-S2-30.-3.5'	Acetone	0.031 mg/Kg	<b>0.031UJ mg/Kg</b>
LFP-27-S1-1.0-1.5'	Acetone	0.058 mg/Kg	<b>0.058UJ mg/Kg</b>
LDC Report# 4962B1			
LFM-1	Acetone	0.051 mg/Kg	<b>0.051UJ mg/Kg</b>
LFM-2*	Acetone	0.020 mg/Kg	<b>0.020UJ mg/Kg</b>
LFM-3**	Acetone	0.012 mg/Kg	<b>0.012UJ mg/Kg</b>
LFM-4**	Acetone	0.016 mg/Kg	<b>0.016UJ mg/Kg</b>
LDC Report# 5037A1			

**Notes:**

**Bold highlight** indicates that non-blank field sample results were qualified for this analyte.

\* LDC Report# 5037A1 did not include this sample in the table of qualified samples, but the result was qualified in the database and should be qualified for the method blank result for acetone.

\*\* LDC Report# 5037A1 included these samples as due to common laboratory contamination, but the results should be qualified for the method blank result for acetone.

**Table 4.4-3. Field and Laboratory Blank Tables**  
 Summary of QC Outliers (Page 11 of 13)

**Table 4.4-3I Common Laboratory Contaminant Qualifications for SW8260B - VOCs**

Sample	VOCs: EPA Method SW8260B Compound Compound	Reported Concentration	Modified Final Concentration
TB-6-2 LDC Report# 4934A1	Methylene chloride  <i>* Samples identified as trip blanks should not be blank-qualified.</i>	3.8 ug/L	3.8UJ ug/L
LFP-22-S1-2' LDC Report# 4934A1	Acetone	0.013 mg/Kg	0.013UJ mg/Kg
LFP-20-S1-2' LDC Report# 4934A1	Acetone	0.014 mg/Kg	0.014UJ mg/Kg
LFP-20-S2-4' LDC Report# 4934A1	Acetone	0.014 mg/Kg	0.014UJ mg/Kg
LFP-24-S1A-8.0-8.5' LDC Report# 4962A1	Methylene chloride	0.0026 mg/Kg	0.0026UJ mg/Kg
TB-6-1 LDC Report# 4962B1	Methylene chloride  <i>* Samples identified as trip blanks should not be blank-qualified.</i>	3.7 ug/L	3.7UJ mg/Kg
EB-6-1 LDC Report# 4962B1	Methylene chloride  <i>* Samples identified as equipment blanks should not be blank-qualified.</i>	3.9 ug/L	3.9UJ mg/Kg

**Note:** \* The results listed above were qualified according to the requirements specified in the Functional Guidelines and US EPA Region IX data validation protocols. Trace levels of acetone and methylene chloride are considered to be common laboratory contaminants for this analytical method and are known, demonstrated system contaminants at QES/STL.

\* Trip blanks and equipment blanks were qualified by the validation sub-contractor, LDC, as non-detected and estimated (UJ) according to validation protocols followed by LDC. However, according to the Functional Guidelines and USEPA Region IX validation protocols, field, equipment and trip blanks cannot be blank-qualified according to the blank qualification rules as these samples are blanks, not environmental field samples. The results for all field blanks should be considered as detected at the reported concentrations for the purpose of evaluating potential field contamination.

**Table 4.4-3. Field and Laboratory Blank Tables**  
 Summary of QC Outliers (Page 12 of 13)

**Table 4.4-3J Field Blanks for SW8310 - PAHs**

Method Blank ID	Extraction Date	PAHs: EPA Method SW8310 Compound	Concentration	Associated Samples
0153295-BLK	6/1/00	Benzo(b)fluoranthene Benzo(k)fluoranthene	0.0073 mg/Kg 0.0091 mg/Kg	LFP-22-S1-2' LFP-22-S2-4' LFP-20-S1-2' LFP-20-S2-4' LFP-16-S1-3.5' LFP-16-S2-5.5' LFP-14-S1-5.0' LFP-14-S2-7.0' LFP-12-S1-4.0' LFP-12-S2-6.0' LFP-12-S1A-4.0'  LDC Report# 4934A9

**Note:**  
 No data used for reporting purposes were qualified.

**Table 4.4-3K Blank Qualifications for SW8310 - PAHs**

Sample	PAHs: EPA Method SW8310 Compound	Reported Concentration	Modified Final Concentration
LFP-12-S2-6.0-6.5' (NOT USED)  LDC Report# 4934A9	Benzo(b)fluoranthene Benzo(k)fluoranthene	0.018 mg/Kg 0.018 mg/Kg	0.018UJ mg/Kg 0.018UJ mg/Kg

**Note:**  
 No data used for reporting purposes were qualified.

**Table 4.4-3. Field and Laboratory Blank Tables**  
 Summary of QC Outliers (Page 13 of 13)

**Table 4.4-3L Field Blanks for SW8330 - Explosives**

Equipment Blank ID	Sampling Date	Explosives: EPA Method SW8330 Compound	Concentration	Associated Samples
EB-5-31	5/31/00	1,3,5-Trinitrobenzene	0.10 ug/L	LFP-1-S1-6.5-7.0' LFP-1-S2-8.5-9.0' LFP-3-S1-4.5-5.0' LFP-3-S2-6.5-7.0' LFP-9-S1-3.5-4.0' LFP-5-S1-2.5-3.0' LFP-5-S2-4.5-5.0' LFP-7-S1-2.5-3.0' LFP-7-S2-4.5-5.0' LFP-29-S2-2.0-2.5' LFP-29-S1-2.5-3.0' LFP-24-S1-8.0-8.5' LFP-24-S1A-8.0-8.5' LFP-24-W1 <b>LFP-9-W1</b>  LDC Report# 4962A40

**Note:**

**Bold highlight** indicates that associated non-blank field sample results were blank qualified for this analyte.

**Table 4.4-3M Blank Qualifications for SW8330 - Explosives**

Sample	Compound	Reported Concentration	Modified Final Concentration
<b>LFP-9-W1</b> LDC Report# 4962A40	1,3,5-Trinitrobenzene	0.13 ug/L	<b>0.13UJ ug/L</b>

**Note:**

**Bold highlight** indicates that non-blank field sample results were qualified for this analyte.

These tables were reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only QC outliers were included. Notes and highlights were added were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation. The "A" and "P" designations are LDC DVR designations that indicate the LDC validator determined that the finding was based upon technical validation criteria (A) or that the validation finding was related to a protocol/contractual deviation (P).

**Table 4.4-4. Surrogate Recovery Tables**  
Summary of QC Outliers (Page 1 of 3)

**Table 4.4-4A Surrogate Recoveries for SW8015B - TEPH**

Sample	Surrogate	%R (Limits)	TEPH: EPA Method SW8015B Compound	Flag	A or P
LFP-22-S2-4'	o-Terphenyl	23 (30-120)	<b>TPH as extractables</b>	<b>UJ (all non-detects)</b>	A
LFP-16-S1-3.5'	o-Terphenyl	29 (30-120)	<b>TPH as extractables</b>	<b>UJ (all non-detects)</b>	A
LFP-14-S2-7.0'	o-Terphenyl	29 (30-120)	<b>TPH as extractables</b>	<b>UJ (all non-detects)</b>	A
LFP-12-S1-4.0'	o-Terphenyl	26 (30-120)	<b>TPH as extractables</b>	<b>UJ (all non-detects)</b>	A
LFP-12-S1A-4.0'	o-Terphenyl	26 (30-120)	<b>TPH as extractables</b>	<b>UJ (all non-detects)</b>	A
LFP-22-S1-2'	o-Terphenyl	27 (30-120)	<b>TPH as extractables</b>	<b>UJ (all non-detects)</b>	A
LDC Report# 4934A8					
LFP-1-S2-8.5-9.0'RE (NOT USED)	o-Terphenyl	29 (60-120)	TPH as extractables	UJ (all non-detects)	P
LFP-29-S1-2.5-3.0'RE (NOT USED)	o-Terphenyl	24 (30-120)	TPH as extractables	UJ (all non-detects)	P
LFP-24-S1A-8.0-8.5'RE (NOT USED)	o-Terphenyl	28 (60-120)	TPH as extractables	UJ (all non-detects)	P
LDC Report# 4962A8					
LFP-10-S1-4.5-5.0**	o-Terphenyl	43 (60-120)	<b>All TCL compounds</b>	<b>UJ (all non-detects)</b>	A
LFP-10-S1-4.5-5.0'RE**(NOT USED)	o-Terphenyl	53 (60-120)	All TCL compounds	UJ (all non-detects)	P
LFP-10-S2-6.5-7.0'	o-Terphenyl	57 (60-120)	<b>All TCL compounds</b>	<b>J- (all detects)</b> <b>UJ (all non-detects)</b>	A
LFP-11-S1-3.0-3.5'	o-Terphenyl	39 (60-120)	<b>All TCL compounds</b>	<b>UJ (all non-detects)</b>	A
LFP-11-S1-3.0-3.5'RE (NOT USED)	o-Terphenyl	42 (60-120)	All TCL compounds	J- (all detects) UJ (all non-detects)	P
LFP-11-S2-5.0-5.5'	o-Terphenyl	52 (60-120)	<b>All TCL compounds</b>	<b>UJ (all non-detects)</b>	A
LFP-11-S2-5.0-5.5'RE (NOT USED)	o-Terphenyl	38 (60-120)	All TCL compounds	UJ (all non-detects)	P
LFP-27-S1-1.0-1.5'	o-Terphenyl	47 (60-120)	<b>All TCL compounds</b>	<b>J- (all detects)</b> <b>UJ (all non-detects)</b>	A
LFP-27-S1-1.0-1.5'RE (NOT USED)	o-Terphenyl	55 (60-120)	All TCL compounds	J- (all detects) UJ (all non-detects)	P
LFP-27-S2-3.0-3.5'	o-Terphenyl	31 (60-120)	<b>All TCL compounds</b>	<b>UJ (all non-detects)</b>	A
LFP-27-S2-3.0-3.5'RE(NOT USED)	o-Terphenyl	41 (60-120)	All TCL compounds	UJ (all non-detects)	P
LDC Report# 4962B8					

**Note:** **Bold highlight** indicates that associated sample results were blank qualified for this compound.

**Table 4.4-4. Surrogate Recovery Tables**  
 Summary of QC Outliers (Page 2 of 3)

**Table 4.4-4B Surrogate Recoveries for SW8082-PCBs**

Sample	Column	Surrogate	%R (Limits)	PCBs: EPA Method SW8082 Compound	Flag	A or P
EB-5-30 LDC Report# 4934A3b	Not specified	Tetrachloro-m-xylene	32 (40-140)	All TCL compounds	UJ (all non-detects)	P
EB-5-31 LDC Report# 4962A3b	Not specified	Decachlorobiphenyl	36 (40-140)	All TCL compounds	UJ (all non-detects)	P

**Note:**

**Bold highlight** indicates that associated sample results were blank qualified for this compound.

**Table 4.4-4C Surrogate Recoveries for SW8270 - PCP**

Sample	Surrogate	%R (Limits)	VOCs: EPA Method SW8260B Compound	Flag	A or P
LFP-14-S2-7.0-7.5' LDC Report# 4934A2b	2-Fluorophenol Phenol-d5 2,4,6-Tribromophenol	38 (45-115) 39 (44-117) 33 (41-122)	Pentachlorophenol	UJ (all non-detects)	A

**Note:**

**Bold highlight** indicates that associated sample results were blank qualified for this compound.

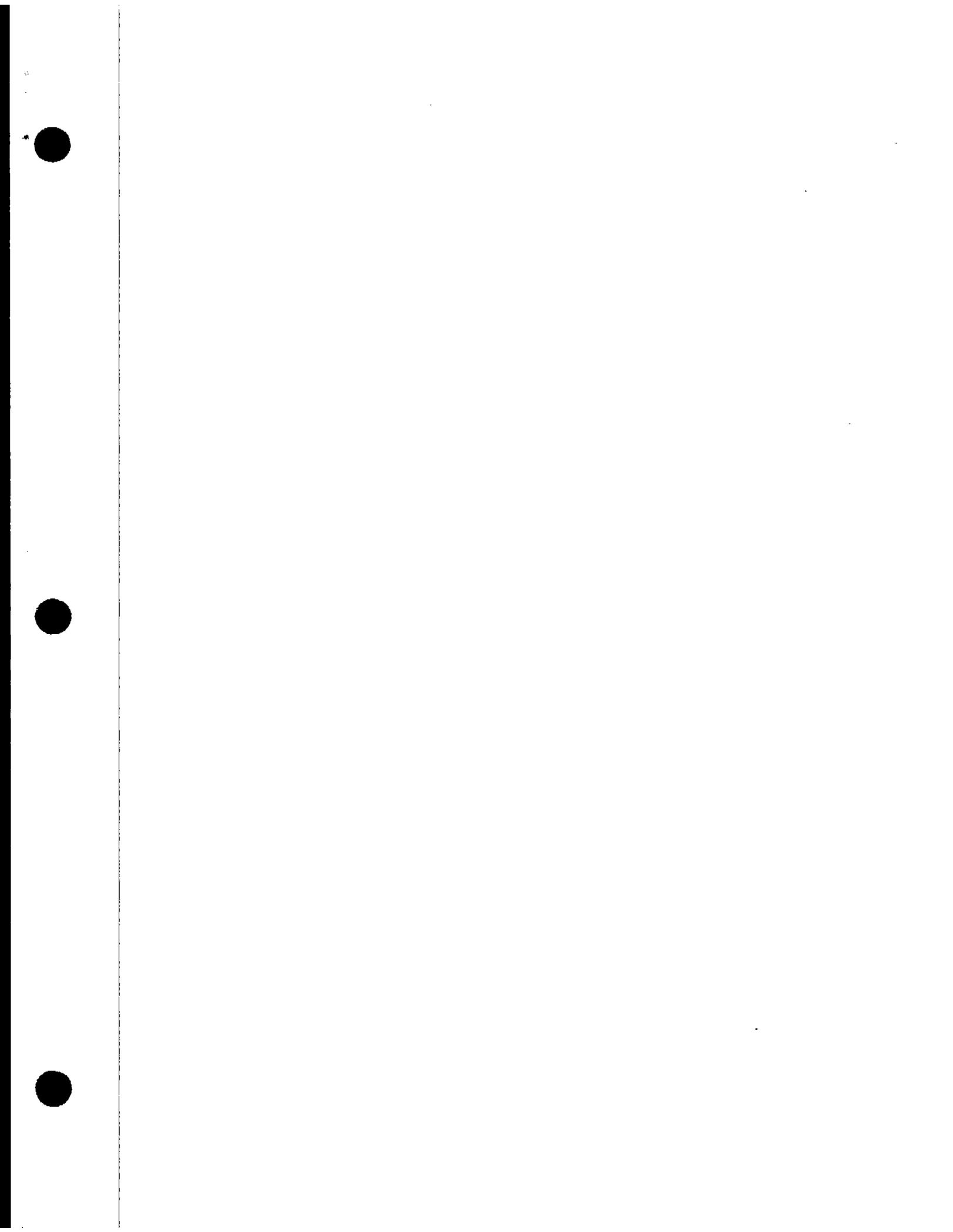
**Table 4.4-4. Surrogate Recovery Tables**  
**Summary of QC Outliers (Page 3 of 3)**

**Table 4.4-4D Surrogate Recoveries for SW8310 - PAHs**

Sample	Surrogate	%R (Limits)	PAHs: EPA Method SW8310 Compound	Flag	A or P
LFP-22-S1-2' (NOT USED)	1-Methylnaphthalene	40 (65-135)	All TCL compounds	UJ (all non-detects)	A
LFP-22-S2-4' (NOT USED)	1-Methylnaphthalene	53 (65-135)	All TCL compounds	UJ (all non-detects)	A
LFP-20-S1-2' (NOT USED)	1-Methylnaphthalene	55 (65-135)	All TCL compounds	UJ (all non-detects)	A
LFP-20-S2-4' (NOT USED)	1-Methylnaphthalene	46 (65-135)	All TCL compounds	UJ (all non-detects)	A
LFP-16-S1-3.5' (NOT USED)	1-Methylnaphthalene	62 (65-135)	All TCL compounds	UJ (all non-detects)	A
LFP-16-S2-5.5' (NOT USED)	1-Methylnaphthalene	59 (65-135)	All TCL compounds	J- (all detects) UJ (all non-detects)	A
LFP-16-S2-5.5'RE	1-Methylnaphthalene	21 (65-135)	<b>All TCL compounds</b>	<b>UJ (all non-detects)</b>	A
LFP-14-S2-7.0-7.5' (NOT USED)	1-Methylnaphthalene	39 (65-135)	All TCL compounds	UJ (all non-detects)	A
LFP-12-S1-4.0-4.5' (NOT USED)	1-Methylnaphthalene	56 (65-135)	All TCL compounds	J- (all detects) UJ (all non-detects)	A
LFP-12-S1-4.0-4.5'RE	1-Methylnaphthalene	61 (65-135)	<b>All TCL compounds</b>	<b>UJ (all non-detects)</b>	A
LFP-12-S1A-4.0' (NOT USED) LDC Report# 4934A9	1-Methylnaphthalene	28 (65-135)	All TCL compounds	UJ (all non-detects)	A
LFP-24-W1	1-Methylnaphthalene	48 (65-135)	<b>All TCL compounds</b>	<b>UJ (all non-detects)</b>	A
EB-5-31	1-Methylnaphthalene	42 (65-135)	<b>All TCL compounds</b>	<b>UJ (all non-detects)</b>	A
WV-S-6 LDC Report# 4962A9	1-Methylnaphthalene	34 (65-135)	<b>All TCL compounds</b>	J- (all detects) <b>UJ (all non-detects)</b>	A
EB-6-1 LDC Report# 4962B9	1-Methylnaphthalene	49 (65-135)	<b>All TCL compounds</b>	<b>UJ (all non-detects)</b>	P

**Note:** **Bold highlight** indicates that associated sample results were blank qualified for this compound.

These tables were reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only QC outliers were included. Notes and highlights were added were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation. The "A" and "P" designations are LDC DVR designations that indicate the LDC validator determined that the finding was based upon technical validation criteria (A) or that the validation finding was related to a protocol/contractual deviation (P).



**Table 4.4-5. Internal Standard Tables**  
**Summary of QC Outliers (Page 1 of 1)**

**Table 4.4-5A Internal Standards for SW8260B - VOCs**

Sample	Internal Standards	Area (Limits)	VOCs: EPA Method SW8260B Compound	Flag	A or P
LFP-16-S2-5.5'	1,4-Dichlorobenzene-d4	683670 (715942-2863768)	<b>Bromobenzene</b> <b>n-Butylbenzene</b> <b>sec-Butylbenzene</b> <b>tert-Butylbenzene</b> <b>2-Chlorotoluene</b> <b>4-Chlorotoluene</b> <b>1,2-Dibromo-3-chloropropane</b> <b>1,2-Dichlorobenzene</b> <b>1,3-Dichlorobenzene</b> <b>1,4-Dichlorobenzene</b> <b>Hexachlorobutadiene</b> <b>p-isopropyltoluene</b> <b>Naphthalene</b> <b>n-Propylbenzene</b> <b>1,1,2,2-Tetrachloroethane</b> <b>1,2,3-Trichlorobenzene</b> <b>1,2,4-Trichlorobenzene</b> <b>1,2,3-Trichloropropane</b> <b>1,2,4-Trimethylbenzene</b> <b>1,3,5-Trimethylbenzene</b>	<b>J-(All detects)</b> <b>UJ (all non-detects)</b>  <i>(All ND except 1,4-dichlorobenzene for LFP-24-S1A-8.0)</i>	A
LFP-12-S1-4.0'	1,4-Dichlorobenzene-d4	598774 (715942-2863768)			
LFP-14-S1-5.0'	1,4-Dichlorobenzene-d4	380393 (499098-1996392)			
LFP-12-S1A-4.0'	1,4-Dichlorobenzene-d4	392658 (499098-1996392)			
LDC Report# 4934A1					
LFP-24-S1A-8.0'	1,4-Dichlorobenzene-d4	585524 (730583-2922330)			
LDC Report# 4962A1					
LFP-11-S2-5.0'	1,4-Dichlorobenzene-d4	418331 (453206-1812822)			
LDC Report# 4962B1					

**Note:**

**Bold highlight** indicates that associated non-blank field sample results were blank qualified for this analyte.

**Table 4.4-5B Internal Standards for SW8270C - SVOCs**

Sample	Internal Standards	Area (Limits)	SVOCs: EPA Method SW8270C Compound	Flag	A or P
EB-5-30	Phenanthrene-d10	409262 (416745-1666978)	<b>Pentachlorophenol</b>	<b>UJ (all non-detects)</b>	A
LDC Report# 4934A2b					

**Note:**

**Bold highlight** indicates that associated non-blank field sample results were blank qualified for this analyte.

These tables were reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only QC outliers were included. Notes and highlights were added were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation. The "A" and "P" designations are LDC DVR designations that indicate the LDC validator determined that the finding was based upon technical validation criteria (A) or that the validation finding was related to a protocol/contractual deviation (P).



**Table 4.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
Summary of QC Outliers (Page 1 of 6)

**Table 4.4-6A MS/MSD Issues for Metals - EPA Methods SW6010B/SW7470A/SW7471A**

Sample	Metals: EPA Methods SW6010B/SW7470A/SW7471A Analyte	Finding	Criteria	Flag	A or P
EB-5-30  LDC Report# 4962A4	All TAL metals	No MS associated with these samples.  <i>Sample EB-5-30 is an equipment blank</i>	MS required.  <i>Incorrect Assessment: MS not required for equipment blanks.</i>	None	P

**Note:** The referenced sample is an equipment blank. MS/MSD analyses are not required for equipment blanks.

**Table 4.4-6B MS/MSD for Metals - EPA Methods SW6010B/SW7470A/SW7471A**

Spike ID (Associated Samples)	Metals: EPA Methods SW6010B/SW7470A/SW7471A Analyte	%R (Limits)	Flag	A or P
LFP-22-S1-2'MS/DUP (All soil samples in SDG G0E310175) LFP-22-S1-2' LFP-22-S2-4' LFP-20-S1-2' LFP-20-S2-4' LFP-16-S1-3.5' LFP-16-S2-5.5' LFP-14-S1-5.0-5.5' LFP-14-S2-7.0-7.5' LFP-12-S1-4.0-4.5' LFP-12-S2-6.0-6.5' LFP-12-S1A-4.0'  LDC Report# 4934A4	Antimony	34 (75-125)	J- (all detects) UJ (all non-detects)	A
LFP-10-S2-6.5-7.0'MS (All soil samples in SDG G0F010290)  LFP-10-S1-4.5-5.0' LFP-10-S2-6.5-7.0' LFP-11-S1-3.0-3.5' LFP-11-S2-5.0-5.5' LFP-27-S1-1.0-1.5' LFP-27-S2-30-.3.5' LFM-1 LFM-2 LFM-3 LFM-4  LDC Report# 4962B4	Antimony         Calcium Chromium Magnesium Vanadium	25 (75-125)       446 (75-125) 148 (75-125) 130 (75-125) 128 (75-125)	J- (all detects) R (all non-detects)  (All ND except LFM-3 and LFM-4)  J+ (all detects) J+ (all detects) J+ (all detects) J+ (all detects)	A

**Table 4.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 2 of 6)

**Table 4.4-6B MS/MSD for Metals - EPA Methods SW6010B/SW7470A/SW7471A**

Spike ID (Associated Samples)	Metals: EPA Methods SW6010B/SW7470A/SW7471A Analyte	%R (Limits)	Flag	A or P
LFP-1-S1-6.5-7.0' MS (All soil samples in SDG G0F010289)  LFP-1-S1-6.5-7.0' LFP-1-S2-8.5-9.0' LFP-3-S1-4.5-5.0' LFP-3-S2-6.5-7.0' LFP-9-S1-3.5-4.0' LFP-5-S1-2.5-3.0' LFP-5-S2-4.5-5.0' LFP-7-S1-2.5-3.0' LFP-7-S2-4.5-5.0' LFP-29-S2-2.0-2.5' LFP-29-S1-2.5-3.0' LFP-24-S1-8.0-8.5' LFP-24-S1A-8.0-8.5'  LDC Report# 4962A4	Antimony  Barium Cobalt  Arsenic Chromium	28 (75-125)  75 (75-125) 75 (75-125)  149 (75-125) 130 (75-125)	R (all non-detects)  J- (all detects) J- (all detects)  J+ (all detects) J+ (all detects)	A
LFP-24-W1MS All samples in SDG G0F010289 LFP-24-W1 LFP-9-W1 EB-5-31 (Iron Only)  LDC Report# 4962A4	Aluminum Iron	171 (75-125) 131 (75-125)	J+ (all detects) J+ (all detects)	A

**Note:**

**Bold highlight** indicates that associated sample results were qualified for this element.

**Table 4.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 3 of 6)

**Table 4.4-6C MS/MSD Issues for SW8082 - PCBs**

Sample	PCBs: EPA Method SW8082 Analyte	Finding	Criteria	Flag	A or P
LFP-1-S2-8.5-9.0' (NOT USED) LFP-3-S2-6.5-7.0' (NOT USED) LFP-9-S1-3.5-4.0' (NOT USED) LFP-5-S1-2.5-3.0' (NOT USED) LFP-5-S2-4.5-5.0' (NOT USED) LFP-7-S1-2.5-3.0' (NOT USED) LFP-7-S2-4.5-5.0' (NOT USED) LFP-29-S1-2.5-3.0' (NOT USED) LFP-24-S1-8.0-8.5' (NOT USED) LFP-24-S1A-8.0-8.5' (NOT USED) LFP-1-S1-6.5-7.0' (NOT USED) LFP-3-S1-4.5-5.0' (NOT USED) LFP-29-S2-2.0-2.5'6 (NOT USED)	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P
LDC Report# 4962A3b  These samples were initially analyzed 6/22-23/00, however, the SW8081 spiking solution was used for the LCS/LCSD and MS/MSD. The samples were re-extracted and reanalyzed with an LCS/LCSD and MS/MSD on 6/26/00. All QC results were acceptable for the reanalyses, and the results from the reanalyses were reported. All results were non-detected for both sets of analyses.					

**Table 4.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
 Summary of QC Outliers (Page 4 of 6)

**Table 4.4-6D MS/MSD Issues for SW8260B - VOCs**

Sample	VOCs: EPA Method SW8260B Compound	Finding	Criteria	Flag	A or P
All water samples in SDG G0F010289: LFP-24-W1 LFP-9-W1 LDC Report# 4962A1 and All soil samples in SDG G0F010289: LFP-1-S1-6.5-7.0' LFP-1-S2-8.5-9.0' LFP-3-S1-4.5-5.0' LFP-3-S2-6.5-7.0' LFP-9-S1-3.5-4.0' LFP-5-S1-2.5-3.0' LFP-5-S2-4.5-5.0' LFP-7-S1-2.5-3.0' LFP-7-S2-4.5-5.0' LFP-29-S2-2.0-2.5' LFP-29-S1-2.5-3.0' LFP-24-S1-8.0-8.5' LFP-24-S1A-8.0-8.5' LDC Report# 4962A1 and All soil samples in SDG G0F090283: LFM-1 LFM-2 LFM-3 LFM-4 LDC Report# 5037A1	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P
<p><b>Note:</b> MS/MSD analysis for VOCs by EPA Method SW8260B was performed on one of the 34 soil samples for this sampling event. There was inadequate soil sample for any additional MS/MSDs to be performed, as the required additional Encore samplers were not collected for any of the samples. Although one additional MS/MSD was required to meet the minimum of 1:20, interference was not indicated as a significant problem for this method in the MS/MSD that was performed for this sampling event or for samples in other sampling events for this project. No MS/MSDs were analyzed for the two grab water samples. Additional volume for the MS/MSDs was not provided due to minimal volume of standing water in the two sampling pits with water.</p>					

**Table 4.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
Summary of QC Outliers (Page 5 of 6)

**Table 4.4-6E MS/MSD for SW8260B - VOCs**

Spike ID (Associated Samples)	VOCs: EPA Method SW8260B Compound	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
LFP-10-S2-6.5- 7.0'MS/MSD (LFP-10-S2-6.5-7.0')	<b>Hexachlorobutadiene</b> <b>4-Methyl-2-pentanone</b>	- -	- -	36 ( $\leq 35$ ) 40 ( $\leq 35$ )	<b>UJ (all non-detects)</b> <b>UJ (all non-detects)</b>	A
LDC Report# 4962B1	Carbon disulfide Dichlorodifluoromethane 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	172 (65-135) 181 (65-135) 156 (65-135) 164 (65-135)	- - - -	- - - -	<i>NA (J+ all detects)</i> <i>NA (J+ all detects)</i> <i>NA (J+ all detects)</i> <i>NA (J+ all detects)</i> <b>No samples qualified, all ND</b>	A

**Note:** Bold highlight indicates that associated sample results were qualified for this analyte.

**Table 4.4-6F MS/MSD Issues for SW8310 - PAHs**

Sample	PAHs: EPA Method SW8310 Compound	Finding	Criteria	Flag	A or P
All samples in SDG G0F010289 LFP-24-W1 LFP-24-W1RE (NOT USED) LFP-9-W1 LFP-9-W1RE (NOT USED) EB-5-31 EB-5-31RE (NOT USED) WV-S-6 WV-S-6RE (NOT USED) LDC Report# 4962A9	All TCL compounds	No MS/MSD associated with these samples.	MS/MSD required.	None	P
<p><b>Note:</b> MS/MSD analyses were not extracted and analyzed for PAHs by EPA Method SW8310 in the batch associated with both field water samples. These two aqueous environmental field samples were grab water samples from standing water found in the bottom of two sampling pits. Due to low volume of water in the pits, triple volumes for MS/MSD analyses could not be provided.</p>					
LFP-1-S1-6.5-7.0' LFP-1-S2-8.5-9.0' LFP-3-S1-4.5-5.0' LFP-3-S2-6.5-7.0' LFP-9-S1-3.5-4.0' LFP-5-S1-2.5-3.0' LFP-5-S2-4.5-5.0' LFP-7-S1-2.5-3.0' LFP-7-S2-4.5-5.0' LFP-29-S2-2.0-2.5' LFP-29-S1-2.5-3.0' LFP-24-S1-8.0-8.5' LFP-24-S1A-8.0-8.5' PE-8310-S LDC Report# 4962A9	All TCL compounds  <b>MS/MSD was extracted and analyzed with the samples listed to left.</b>	No MS/MSD associated with these samples.  <b>Incorrect Assessment: MS/MSD analyses were performed on sample LFP-1-S1-6.5-7.0</b>	MS/MSD required.	None	P
<p><b>Note:</b> MS/MSD analyses were performed as required. The referenced comments in the DVRs are incorrect and do not affect the technical or contractual quality of the data.</p>					

**Table 4.4-6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Tables**  
Summary of QC Outliers (Page 6 of 6)

**Table 4.4-6G MS/MSD for SW8310 - PAHs**

Spike ID (Associated Samples)	PAHs: EPA Method SW8310 Compound	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
LFP-22-S1-2' MS/MSD (LFP-22-S1-2')  LDC Report# 4934A9	<b>Anthracene</b>	157 (65-135)	-	79 ( $\leq 35$ )	<b>UJ (all non-detects)</b>	<b>A</b>
	<b>Benzo(a)anthracene</b>	183 (65-135)	-	83 ( $\leq 35$ )		
	<b>Benzo(a)pyrene</b>	171 (50-150)	-	80 ( $\leq 35$ )		
	<b>Benzo(b)fluoranthene</b>	385 (65-135)	-	114 ( $\leq 35$ )		
	<b>Benzo(k)fluoranthene</b>	393 (65-135)	-	116 ( $\leq 35$ )		
	<b>Chrysene</b>	194 (65-135)	-	79 ( $\leq 35$ )		
	<b>Fluoranthene</b>	138 (65-135)	-	65 ( $\leq 35$ )		
	<b>Dibenzo(a,h)anthracene</b>	197 (65-135)	-	81 ( $\leq 35$ )		
	<b>Phenanthrene</b>	-	-	38 ( $\leq 35$ )		
	<b>Pyrene</b>	-	-	38 ( $\leq 35$ )		

**Note:**

**Bold highlight** indicates that associated sample results were qualified for this analyte.

**Table 4.4-6H MS/MSD for SW8330 - Explosives**

Spike ID (Associated Samples)	Explosives: EPA Method SW8330 Compound	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
LFP-10-S2-6.5-7.0' MS/MSD (LFP-10-S2-6.5-7.0') LDC Report# 4962B40	<b>4-Amino-2,6-dinitrotoluene</b>	-	-	42 ( $\leq 35$ )	<b>UJ (all non-detects)</b>	<b>A</b>
TNT-R17/16' MS/MSD (TNT-R17/16'*) LDC Report# 4951A44	<b>Tetryl</b>	45 (50-150)	-	-	<b>UJ (all non-detects)</b>	<b>A</b>

**Note:**

**Bold highlight** indicates that associated sample results were qualified for this analyte.

These tables were reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only QC outliers were included. Notes and highlights were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation. The "A" and "P" designations are LDC DVR designations that indicate the LDC validator determined that the finding was based upon technical validation criteria (A) or that the validation finding was related to a protocol/contractual deviation (P).

**Table 4.4-7. Laboratory Control Samples (LCS) Tables**  
 Summary of QC Outliers (Page 1 of 5)

**Table 4.4-7A LCS/LCSD for SW8015B - TEPH**

LCS ID (Associated Samples)	TEPH: EPA Method SW8015B Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
0159402LCS (LFP-22-S2-4' LFP-20-S1-2' LFP-20-S2-4' LFP-16-S1-3.5' LFP-16-S2-5.5' LFP-14-S1-5.0-5.5' LFP-14-S2-7.0-7.5' LFP-12-S1-4.0-4.5' LFP-12-S2-6.0-6.5' LFP-12-S1A-4.0' LFP-22-S1-2')	TPH as diesel	54 (60-117)	-	-	UJ (all non-detects)	P
LDC Report# 4934A8						
0157382LCS/LCSD (EB-5-30)	TPH as diesel	44 (60-117)	45 (60-117)	-	UJ (all non-detects)	A
LDC Report# 4934A8	TPH as motor oil	55 (60-117)	-	56 (≤35)	UJ (all non-detects)	
(LFP-24-W1 LFP-9-W1 EB-5-31)	TPH as diesel	44 (60-117)	45 (60-117)	-	UJ (all non-detects)	A
LDC Report# 4962A8 and (EB-6-1) LDC Report# 4962B8						
0179279LCS/LCSD (EB-5-31RE2 <i>NOT USED</i> )	TPH as diesel	-	54 (60-117)	-	UJ (all non-detects)	A
LDC Report# 4962A8						
0174447LCS/LCSD LFP-10-S1-4.5-5.0'RE ( <i>NOT USED</i> ) LFP-10-S2-6.5-7.0'RE ( <i>NOT USED</i> ) LFP-11-S1-3.0-3.5'RE ( <i>NOT USED</i> ) LFP-11-S2-5.0-5.5'RE ( <i>NOT USED</i> ) LFP-27-S1-1.0-1.5'RE ( <i>NOT USED</i> ) LFP-27-S2-3.0-3.5'RE ( <i>NOT USED</i> )	TPH as motor oil	-	120 (60-117)	-	J+ (all detects)	P
LDC Report# 4962B8						

**Note:**

**Bold highlight** indicates that associated sample results were qualified for this compound.

**Table 4.4-7. Laboratory Control Samples (LCS) Tables**  
 Summary of QC Outliers (Page 2 of 5)

**Table 4.4-7B LCS/LCSD Issues for SW8082-PCBs**

Sample	PCBs: EPA Method SW8082 Compound	Finding	Criteria	Flag	A or P
LFP-1-S2-8.5-9.0' (NOT USED) LFP-3-S2-6.5-7.0' (NOT USED) LFP-9-S1-3.5-4.0' (NOT USED) LFP-5-S1-2.5-3.0' (NOT USED) LFP-5-S2-4.5-5.0' (NOT USED) LFP-7-S1-2.5-3.0' (NOT USED) LFP-7-S2-4.5-5.0' (NOT USED) LFP-29-S1-2.5-3.0' (NOT USED) LFP-24-S1-8.0-8.5' (NOT USED) LFP-24-S1A-8.0-8.5' (NOT USED) LFP-1-S1-6.5-7.0' (NOT USED) LFP-3-S1-4.5-5.0' (NOT USED) LFP-29-S2-2.0-2.5'6 (NOT USED)  LDC Report# 4962A3b	All TCL compounds	No LCS analysis associated with these samples.	LCS analysis required.	UJ (all non-detects)	P

**Note:**

**Bold highlight** indicates that associated sample results were qualified for this compound.

These samples were initially analyzed 6/22-23/00, however, the SW8081 spiking solution was used for the LCS/LCSD and MS/MSD. The samples were re-extracted and reanalyzed with an LCS/LCSD and MS/MSD on 6/26/00. All QC results were acceptable for the reanalyses, and the results from the reanalyses were reported. All results were non-detects for both sets of analyses.

**Table 4.4-7C LCS/LCSD for SW8082-PCBs**

LCS ID (Associated Samples)	PCBs: EPA Method SW8082 Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
015737LCS/LCSD (All water samples in SDG G0E310175) <b>EB-5-30</b>  LDC Report# 4934A3b	<b>Aroclor-1260</b>	-	-	24 (≤20)	<b>UJ (all non-detects)</b>	P
015737LCS/LCSD (All water samples in SDG G0F010290) <b>EB-6-1</b>  LDC Report# 4962B3b	<b>Aroclor-1260</b>	-	-	24 (≤20)	<b>UJ (all non-detects)</b>	P

**Note:** **Bold highlight** indicates that associated sample results were qualified for this compound.

**Table 4.4-7. Laboratory Control Samples (LCS) Tables**  
 Summary of QC Outliers (Page 3 of 5)

**Table 4.4-7D LCS/LCSD for SW8260B - VOCs**

LCS ID (Associated Samples)	VOCs: EPA Method SW8260B Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
0170119-LCS/LCSD (LFP-16-S2-5.5' LFP-12-S1-4.0-4.5') LDC Report# 4934A1	Acetone Bromomethane Chloroethane Dichlorodifluoromethane Trichlorofluoromethane Vinyl acetate	140 (65-135) - - 143 (65-135) 142 (65-135) -	- 137 (65-135) 136 (65-135) 155 (65-135) 144 (65-135) 136 (65-135)	- - - - - -	NA (J+ all detects) NA (J+ all detects) <b>No samples qualified, all ND</b>	P
0160445-LCS/LCSD (LFP-16-S1-3.5' LFP-14-S1-5.0-5.5' LFP-14-S2-7.0-7.5' LFP-12-S2-6.0-6.5' LFP-12-S1A-4.0') LDC Report# 4934A1	Carbon disulfide Dichlorodifluoromethane Trichlorofluoromethane 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	172 (65-135) 177 (65-135) - 160 (65-135) 159 (65-135)	180 (65-135) 180 (65-135) 136 (65-135) 167 (65-135) 161 (65-135)	- - - - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <b>No samples qualified, all ND</b>	P
0171275-LCS/LCSD (LFP-22-S2-4' LDC Report# 4934A1 and (LFP-3-S2-6.5-7.0' LFP-5-S2-4.5-5.0' LFP-29-S2-2.0-2.5' LFP-29-S1-2.5-3.0' LFP-24-S1-8.0-8.5') LDC Report# 4962A1 and (LFP-10-S1-4.5-5.0' LFP-10-S2-6.5-7.0' LFP-11-S2-5.0-5.5') LDC Report# 4962B1	Carbon disulfide Dichlorodifluoromethane 1,1,2-Trichloro-1,2,2- trifluoroethane Vinyl acetate	171 (65-135) 177 (65-135) 166 (65-135) 157 (65-135)	170 (65-135) 171 (65-135) 161 (65-135) 152 (65-135)	- - - -	NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) NA (J+ all detects) <b>No samples qualified, all ND</b>	P
0173180-LCS/LCSD (All water samples in SDG G0F010289) TB-5-31 LFP-24-W1 LFP-9-W1 EB-5-31 LDC Report# 4962A1 and (All water samples in SDG G0F010290) TB-6-1 EB-6-1 LDC Report# 4962B1	Dichlorodifluoromethane 1,2,3-Trichloropropane	149 (65-135) 146 (65-135)	154 (65-135) 140 (65-135)	- -	NA (J+ all detects) NA (J+ all detects) <b>No samples qualified, all ND</b>	P

**Table 4.4-7. Laboratory Control Samples (LCS) Tables**  
**Summary of QC Outliers (Page 4 of 5)**

**Table 4.4-7D LCS/LCSD for SW8260B - VOCs**

LCS ID (Associated Samples)	VOCs: EPA Method SW8260B Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
0160324-LCS/LCSD (LFP-1-S1-6.5-7.0' LFP-1-S2-8.5-9.0' LFP-3-S1-4.5-5.0' LFP-9-S1-3.5-4.0' LFP-5-S1-2.5-3.0') LDC Report# 4962A1	Carbon disulfide Carbon tetrachloride Dichlorodifluoromethane Hexachlorobutadiene Trichlorofluoromethane 1,1,2-Trichloro-1,2,2-trifluoroethane Vinyl acetate	184 (65-135) 137 (65-135) 190 (65-135) 139 (65-135) 140 (65-135) 173 (65-135) 168 (65-135)	176 (65-135) - 177 (65-135) - - 166 (65-135) 159 (65-135)	- - - - - - -	NA (J+ all detects) NA (J+ all detects) <i>No samples qualified, all ND</i>	P
0180545-LCS/LCSD (All water samples in SDG G0F090283) TRIP-B-1 LDC Report# 5037A1	Dichlorodifluoromethane Vinyl acetate	153 (65-135) 143 (65-135)	155 (65-135) -	- -	NA (J+ all detects) NA (J+ all detects) <i>No samples qualified, all ND</i>	P

**Note:**

**Bold highlight** indicates that associated sample results were qualified for this compound. No data were qualified.

**Table 4.4-7E LCS/LCSD for SW8310 - PAHs**

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
0157363LCS/LCSD (LFP-24-W1 LFP-9-W1 EB-5-31 WV-S-6) LDC Report# 4962A9 and (All water samples in SDG G0F010290) EB-6-1 LDC Report# 4962B9	<b>Acenaphthene</b> <b>Acenaphthylene</b>  <b>Naphthalene</b>  <b>Dibenz(a,h)anthracene</b>	49 (55-135) 50 (55-135)  40 (55-135)  31 (55-135)	- -  -  39 (55-135)	34 ( $\leq 30$ ) 31 ( $\leq 30$ )  33 ( $\leq 30$ )  -	<b>UJ (all non-detects)</b> <b>UJ (all non-detects)</b>  <b>J- (all detects)</b> <b>UJ (all non-detects)</b> <b>J- (all detects)</b> <b>UJ (all non-detects)</b>	P

**Note:**

**Bold highlight** indicates that associated sample results were qualified for this compound.

**Table 4.4-7. Laboratory Control Samples (LCS) Tables**  
Summary of QC Outliers (Page 5 of 5)

**Table 4.4-7F LCS/LCSD Issues for SW8330 - Explosives**

LCS ID (Associated Samples)	Explosives: EPA Method SW8330 Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
0153323-LCS/LCSD (All water samples in SDG G0E310173) EB-5-30  LDC Report# 4934A40	2-Nitrotoluene 3-Nitrotoluene 4-Nitrotoluene	- - -	140 (65-135) 142 (65-135) 147 (65-135)	33 ( $\leq 20$ ) 22 ( $\leq 20$ ) 21 ( $\leq 20$ )	UJ (all non-detects)	P
0158183-LCS/LCSD (All water samples in SDG G0F010289) LFP-24-W1 LFP-9-W1 EB-5-31 WV-S-7  LDC Report# 4962A40	3-Nitrotoluene  4-Nitrotoluene	-  -	-  146 (65-135)	21 ( $\leq 20$ )  21 ( $\leq 20$ )	J (all detects) UJ (all non-detects)  J (all detects) UJ (all non-detects)	P
0158183-LCS/LCSD (All water samples in SDG G0F010290) EB-6-1  LDC Report# 4962B40	3-Nitrotoluene  4-Nitrotoluene	-  -	-  146 (65-135)	21 ( $\leq 20$ )  21 ( $\leq 20$ )	UJ (all non-detects)  UJ (all non-detects)	P
0161349-LCS (All soil samples in SDG G0F010290) LFP-10-S1-4.5-5.0** LFP-10-S2-6.5-7.0' LFP-11-S1-3.0-3.5' LFP-11-S2-5.0-5.5' LFP-27-S1-1.0-1.5' LFP-27-S2-3.0-3.5' LFM-1** LFM-2** LFM-3** LFM-4**  LDC Report# 4962B40	4-Amino-2,6-dinitrotoluene	144 (65-135)	-	-	NA (J+ all detects) <b>No samples qualified, all ND</b>	P

**Note:**

**Bold highlight** indicates that associated sample results were qualified for this compound.

These tables were reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only QC outliers were included. Notes and highlights were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation. The "A" and "P" designations are LDC DVR designations that indicate the LDC validator determined that the finding was based upon technical validation criteria (A) or that the validation finding was related to a protocol/contractual deviation (P).



**Table 4.4-8. Duplicate Sample Analysis Tables**  
 Summary of QC Outliers (Page 1 of 1)

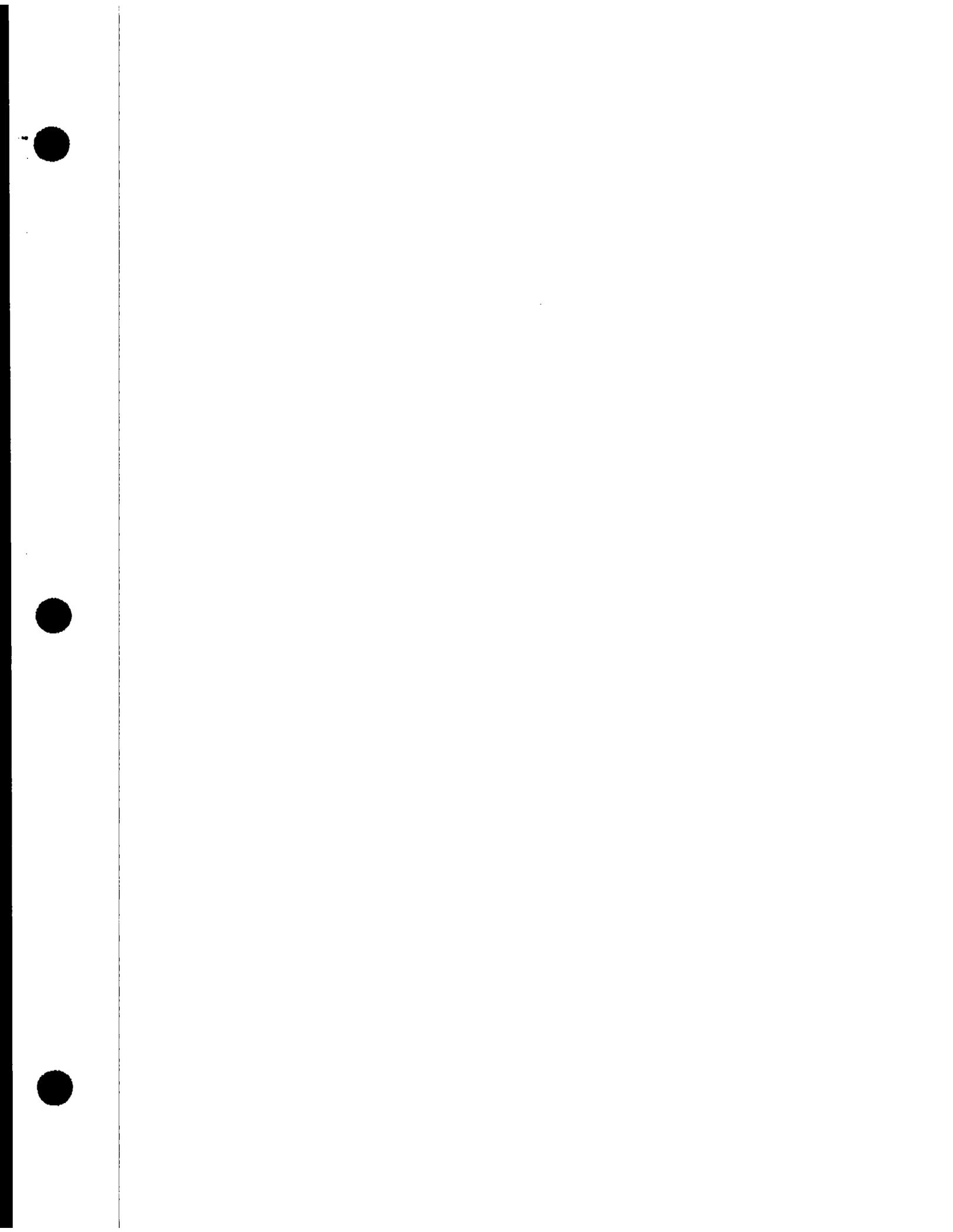
**Table 4.4-8A. Duplicate Sample Analysis for SW6010B/7470A/7471A - Metals**

DUP ID (Associated Samples)	Metals: EPA Methods SW6010B/SW7470A/SW7471A Analyte	RPD (Limits)	Difference (Limits)	Flag	A or P
LFP-10-S2-6.5-7.0'DUP (All soil samples in SDG G0F010290)	<b>Chromium</b>	54 ( $\leq 35$ )	-	<b>J (all detects)</b>	A
	<b>Aluminum</b>	38 ( $\leq 35$ )	-		
	<b>Barium</b>	38 ( $\leq 35$ )	-		
	<b>Calcium</b>	42 ( $\leq 35$ )	-		
	<b>Manganese</b>	50 ( $\leq 35$ )	-		
	<b>Vanadium</b>	38 ( $\leq 35$ )	-		
<b>LFP-10-S1-4.5-5.0</b> **					
<b>LFP-10-S2-6.5-7.0</b>					
<b>LFP-11-S1-3.0-3.5</b>					
<b>LFP-11-S2-5.0-5.5</b>					
<b>LFP-27-S1-1.0-1.5</b>					
<b>LFP-27-S2-30.-3.5</b>					
<b>LFM-1</b> **					
<b>LFM-2</b> **					
<b>LFM-3</b> **					
<b>LFM-4</b> **					
LDC Report# 4962B4					

**Note:**

**Bold highlight** indicates that associated sample results were qualified for this compound.

These tables were reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only QC outliers were included. Notes and highlights were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation. The "A" and "P" designations are LDC DVR designations that indicate the LDC validator determined that the finding was based upon technical validation criteria (A) or that the validation finding was related to a protocol/contractual deviation (P).



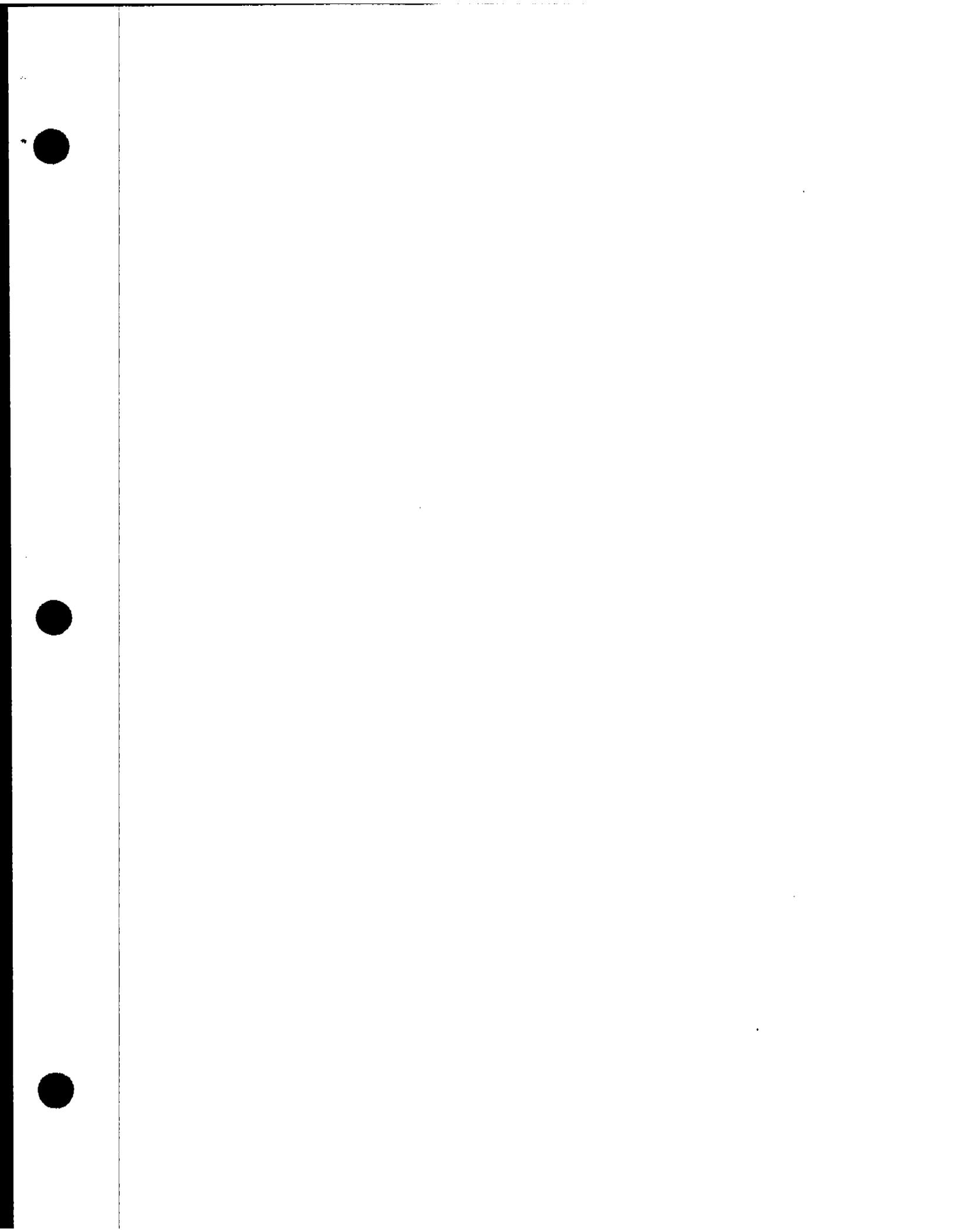
**Table 4.4-9. ICP Serial Dilution Tables for SW6010B - Metals**  
 Summary of QC Outliers (Page 1 of 1)

Diluted Sample	Metals: EPA Method SW6010B Analyte	%D (Limits)	Associated Samples	Flag	A or P
LFP-22-S1-2'L	<b>Lead</b> <b>Cadmium</b> <b>Nickel</b>	12.5 ( $\leq 10$ ) 10.6 ( $\leq 10$ ) 13.6 ( $\leq 10$ )	All soil samples in SDG G0E310175: LFP-22-S1-2' LFP-22-S2-4' LFP-20-S1-2' LFP-20-S2-4' LFP-16-S1-3.5' LFP-16-S2-5.5' LFP-14-S1-5.0-6.5' LFP-14-S2-7.0-7.5' LFP-12-S1-4.0-4.5' LFP-12-S2-6.0-6.5' LFP-12-S1A-4.0'  LDC Report# 4934A4	<b>J (all detects)</b> <b>UJ (all non-detects)</b>	<b>A</b>
LFP-10-S2-6.5-7.0'L	<b>Lead</b> <b>Nickel</b>	13.7 ( $\leq 10$ ) 13.1 ( $\leq 10$ )	All soil samples in SDG G0F010290: LFP-10-S1-4.5-5.0' LFP-10-S2-6.5-7.0' LFP-11-S1-3.0-3.5' LFP-11-S2-5.0-5.5' LFP-27-S1-1.0-1.5' LFP-27-S2-30.-3.5' LFM-1 LFM-2 LFM-3 LFM-4  LDC Report# 4962B4	<b>J (all detects)</b> <b>J (all detects)</b>	<b>A</b>
LFP-24-W1L	<b>Aluminum</b>	17.4 ( $\leq 10$ )	All water samples in SDG G0F010289: LFP-24-W1 LFP-9-W1 EB-5-31  LDC Report# 4962A4	<b>J (all detects)</b> <b>UJ (all non-detects)</b>	<b>A</b>

**Note:**

**Bold highlight** indicates that associated sample results were qualified for this compound.

These tables were reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only QC outliers were included. Notes and highlights were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation. The "A" and "P" designations are LDC DVR designations that indicate the LDC validator determined that the finding was based upon technical validation criteria (A) or that the validation finding was related to a protocol/contractual deviation (P).



**Table 4.4.10. TEPH Target Compound Identification Tables**  
(Page 1 of 3)

Sample	TEPH: EPA Method SW8015B Hydrocarbon Pattern
EB-6-1	ND
EB-6-1RE	ND
LFP-10-S1-4.5-5.0'	ND
LFP-10-S1-4.5-5.0'RE (NOT USED)	ND
LFP-10-S2-6.5-7.0' (USED FOR FUELS ONLY)	ND
LFP-10-S2-6.5-7.0'RE (USED FOR UNKNOWN HYDROCARBON ONLY)	Pattern resembles an unknown hydrocarbon eluting within the TPH as diesel and TPH as motor oil range.
LFP-11-S1-3.0-3.5'	ND
LFP-11-S1-3.0-3.5'RE (NOT USED)	ND
LFP-11-S2-5.0-5.5'	ND
LFP-11-S2-5.0-5.5'RE (NOT USED)	ND
LFP-27-S1-1.0-1.5'	Pattern resembles an unknown hydrocarbon eluting within the TPH as diesel and TPH as motor oil range.
LFP-27-S1-1.0-1.5'RE (NOT USED)	ND
LFP-27-S2-3.0-3.5'	ND
LFP-27-S2-3.0-3.5'RE (NOT USED)	ND
LFM-1	Pattern resembles an unknown hydrocarbon eluting throughout the entire hydrocarbon range.
LFM-2	Pattern resembles an unknown hydrocarbon eluting throughout the entire hydrocarbon range.
LFM-3	Pattern resembles an unknown hydrocarbon eluting within the TPH as diesel and TPH as motor oil range.
LFM-4	Pattern resembles an unknown hydrocarbon eluting within the TPH as diesel and TPH as motor oil range.
LDC Report# 4962B8	
LFP-1-S1-6.5-7.0'	ND
LFP-1-S1-6.5-7.0'RE (NOT USED)	ND
LFP-1-S2-8.5-9.0'	ND
LFP-1-S2-8.5-9.0'RE (NOT USED)	ND
LFP-3-S1-4.5-5.0'	ND
LFP-3-S2-6.5-7.0'	ND
LFP-3-S2-6.5-7.0'RE (NOT USED)	ND
LFP-9-S1-3.5-4.0'	ND

**Table 4.4.10. TEPH Target Compound Identification Tables**  
(Page 2 of 3)

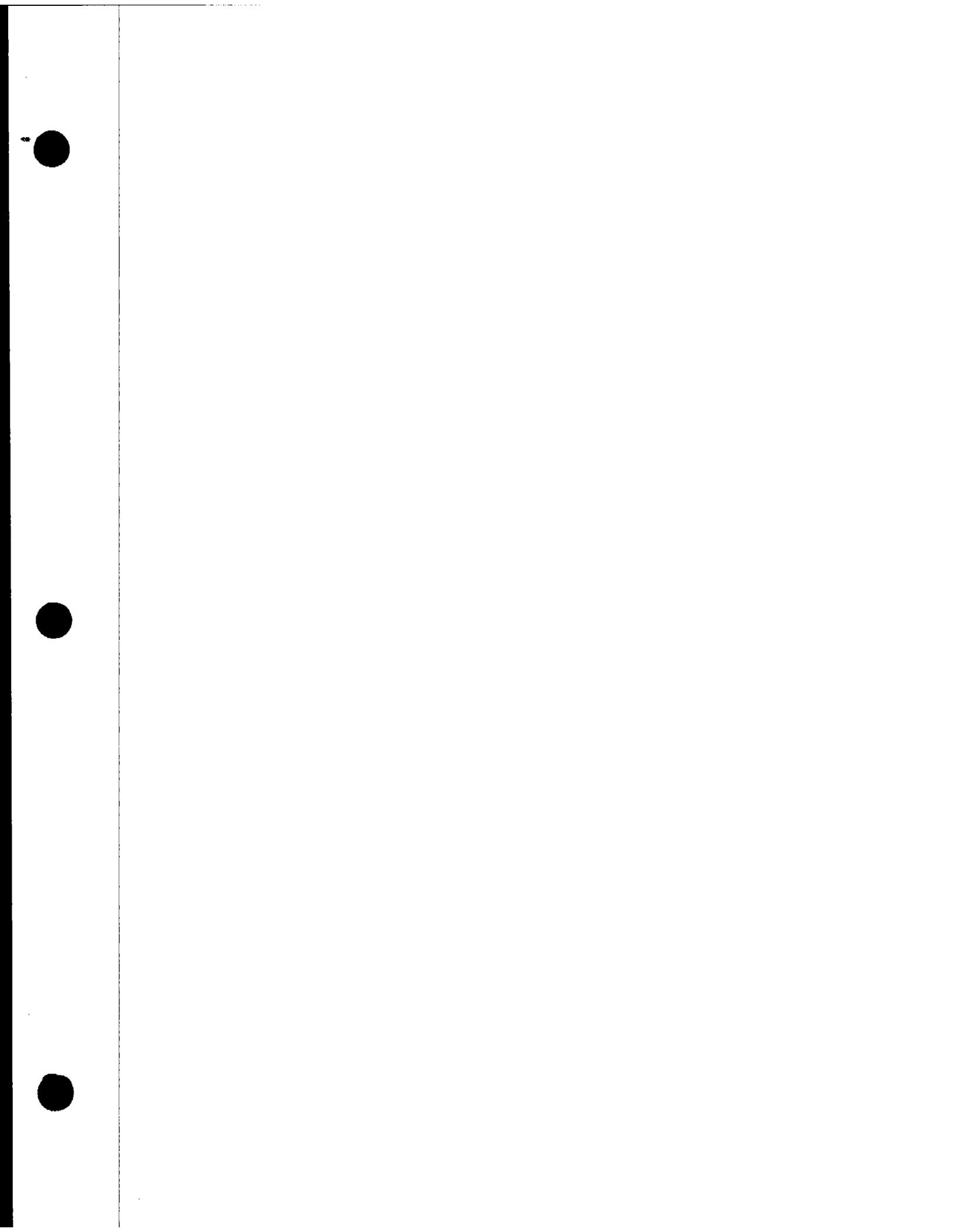
Sample	TEPH: EPA Method SW8015B Hydrocarbon Pattern
LFP-9-S1-3.5-4.0'RE (NOT USED)	ND
LFP-5-S1-2.5-3.0'	ND
LFP-5-S1-2.5-3.0'RE (NOT USED)	ND
LFP-5-S2-4.5-5.0'	ND
LFP-5-S2-4.5-5.0'RE (NOT USED)	ND
LFP-7-S1-2.5-3.0'	ND
LFP-7-S1-2.5-3.0'RE (NOT USED)	ND
LFP-7-S2-4.5-5.0'	ND
LFP-7-S2-4.5-5.0'RE (NOT USED)	ND
LFP-29-S2-2.0-2.5'	ND
LFP-29-S2-2.0-2.5'RE (NOT USED)	ND
LFP-29-S1-2.5-3.0'	ND
LFP-29-S1-2.5-3.0'RE (NOT USED)	ND
LFP-24-S1-8.0-8.5'	ND
LFP-24-S1-8.0-8.5'RE (NOT USED)	Pattern resembles an unknown hydrocarbon eluting within the TPH as Diesel and TPH as Motor Oil range.
LFP-24-S1A-8.0-8.5'	ND
LFP-24-S1A-8.0-8.5'RE (NOT USED)	ND
LFP-24-W1	ND
LFP-24-W1RE (NOT USED)	Pattern resembles an unknown hydrocarbon eluting throughout the entire hydrocarbon range.
LFP-9-W1	Pattern resembles an unknown hydrocarbon eluting within the TPH as Diesel and TPH as Motor Oil range.
EB-5-31	Pattern resembles an unknown hydrocarbon eluting throughout the entire hydrocarbon range.
EB-5-31	ND
EB-5-31RE (NOT USED)	ND
EB-5-31RE2 (NOT USED)	ND
*LFP-3-S1-4.5-5.0'RE (NOT USED)	ND
LDC Report# 4962A8	

**Table 4.4.10. TEPH Target Compound Identification Tables**  
(Page 3 of 3)

Sample	TEPH: EPA Method SW8015B Hydrocarbon Pattern
LFP-22-S1-2'RE (NOT USED)	ND
LFP-22-S2-4'	ND
LFP-22-S2-4'RE (NOT USED)	ND
LFP-20-S1-2'	ND
LFP-20-S1-2'RE (NOT USED)	ND
LFP-20-S2-4'	ND
LFP-20-S2-4'RE (NOT USED)	ND
LFP-16-S1-3.5'	ND
LFP-16-S1-3.5'RE (NOT USED)	ND
LFP-16-S2-5.5'	ND
LFP-16-S2-5.5'RE (NOT USED)	ND
LFP-14-S1-5.0-5.5'	ND
LFP-14-S1-5.0-5.5'RE (NOT USED)	ND
LFP-14-S2-7.0-7.5'	ND
LFP-14-S2-7.0-7.5'RE (NOT USED)	ND
LFP-12-S1-4.0-4.5'	ND
LFP-12-S1-4.0-4.5'RE (NOT USED)	ND
LFP-12-S2-6.0-6.5'	Pattern resembles an unknown hydrocarbon eluting within the TPH as Diesel and TPH as Motor Oil range.
LFP-12-S2-6.0-6.5'RE (NOT USED)	ND
LFP-12-S1A-4.0'	ND
LFP-12-S1A-4.0'RE (NOT USED)	ND
EB-5-30	ND
EB-5-30RE (NOT USED)	ND
LFP-22-S1-2'	ND
LDC Report# 4934A8	

ND = Not Detected, Chromatographic Pattern Identification Not Applicable

This table was reproduced from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. All TEPH chromatograms were reviewed and characterized by the laboratory, LDC, and Earth Tech chemists, as presented in the findings in this table. All results reported as detections for specific TEPH fuels represent a characteristic match to the specified chromatographic fuel patterns, and may include inexact matches such as weathered fuel or additional peaks in the pattern.



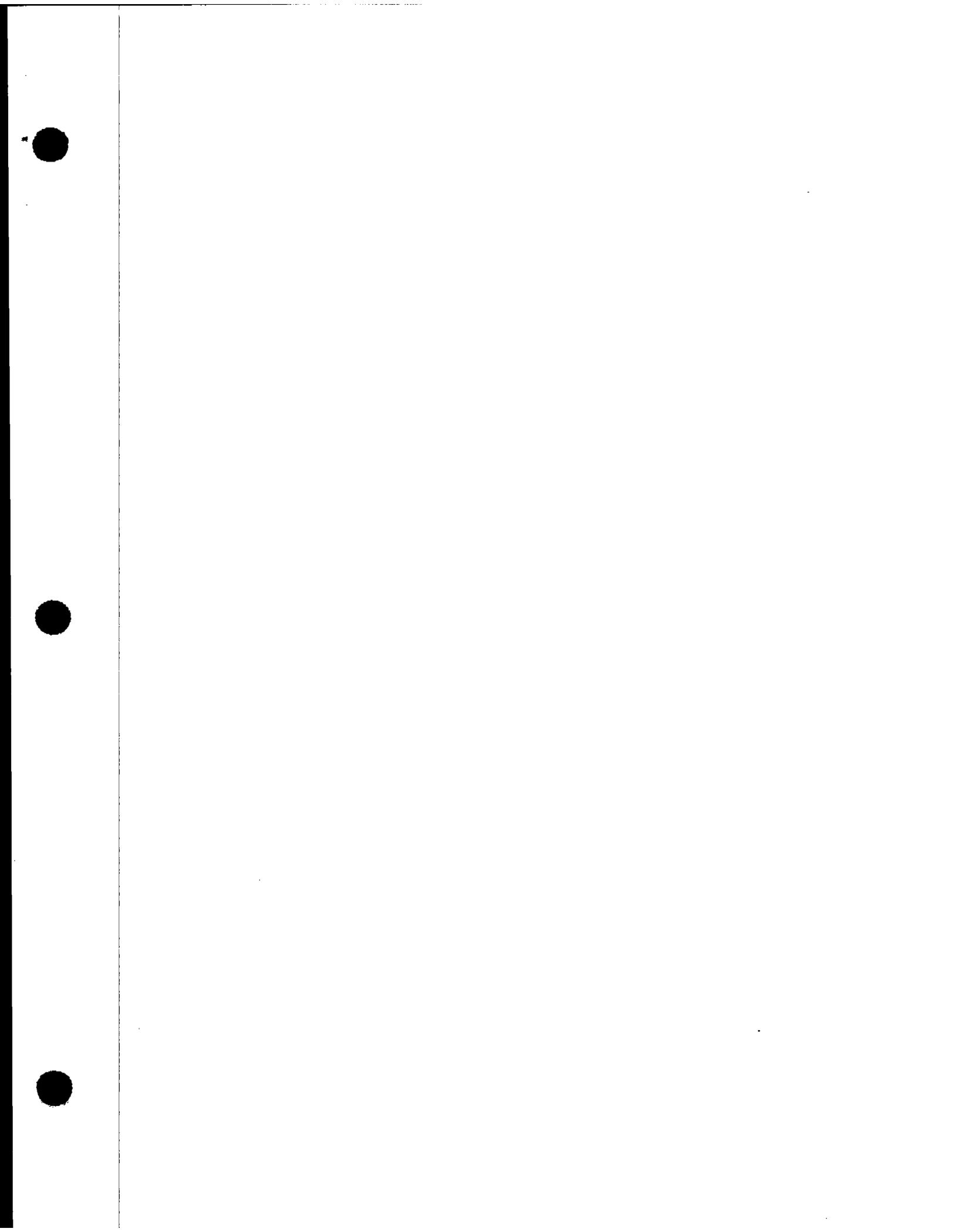
### Table 4.4-11. Elevated PQL Tables

(Page 1 of 1)

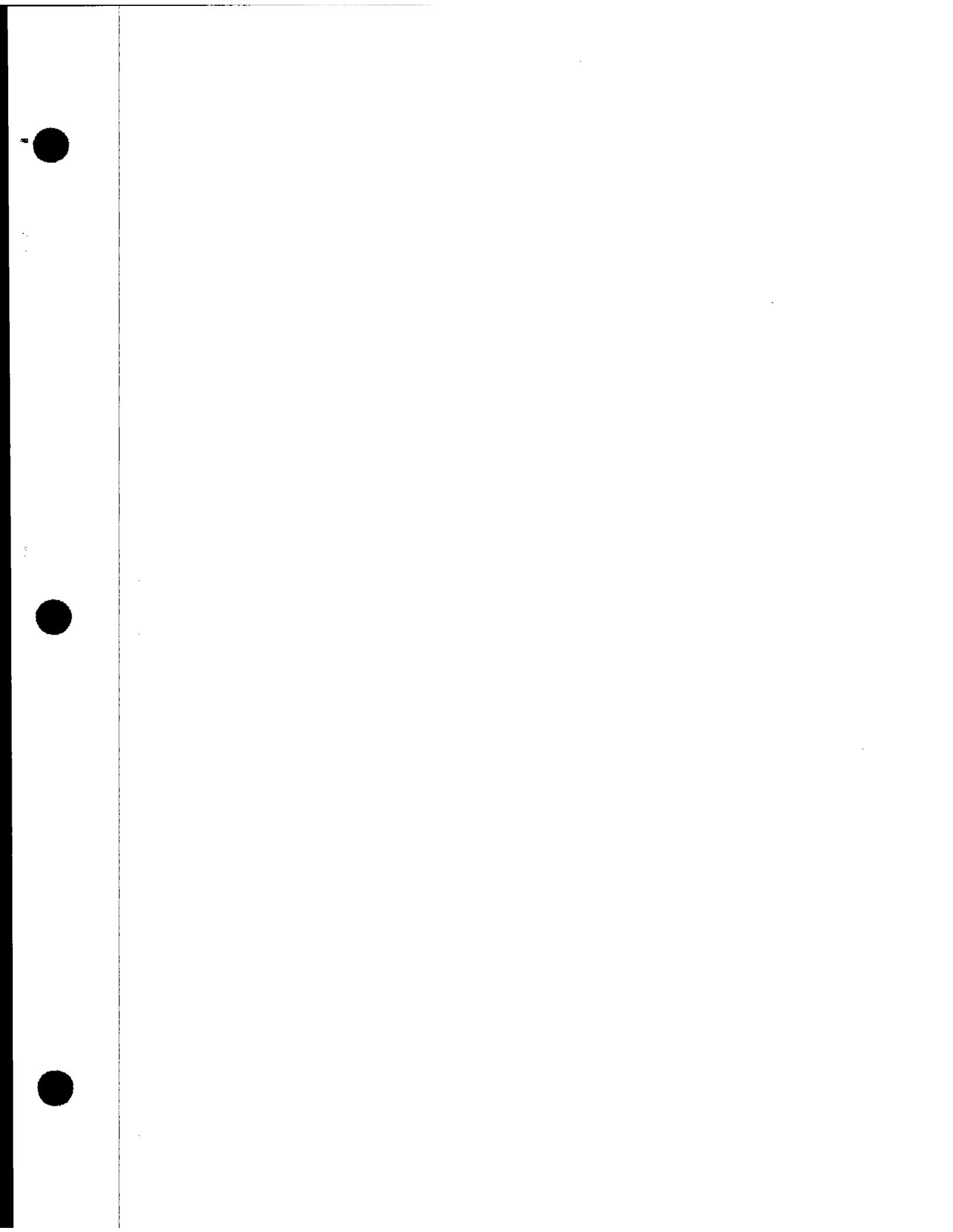
Table 4.4-11A Elevated PQLs for SW8260B - VOCs

Sample	Compound	Finding	Criteria	Flag	A or P
All water samples	Vinyl acetate	Laboratory reporting limit reported at 10 ug/L.	Reporting limit should be reported at 5.0 ug/L per the QAPP.	None	P
	1,1,2-Trichloro-1,2,2-trifluoroethane	Laboratory reporting limit reported at 2.0 ug/L.	Reporting limit should be reported at 1.0 ug/L per the QAPP.	None	P
All soil samples	1,1,2-Trichloro-1,2,2-trifluoroethane Methyl-tert-butyl ether	Laboratory reporting limit reported at 0.01 mg/Kg.	Reporting limit should be reported at 0.005 mg/Kg per the QAPP.	None None	P

This table was reproduced in part from the tables in the Laboratory Data Consultants (LDC) data validation reports (DVRs) to present the findings of the third party data validation. Only QC outliers were included. Notes and highlights were added were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation. The "A" and "P" designations are LDC DVR designations that indicate the LDC validator determined that the finding was based upon technical validation criteria (A) or that the validation finding was related to a protocol/contractual deviation (P).







**Table 4.4-13. Field Duplicate/Replicate Detected Results Precision Tables**  
(Page 1 of 5)

**Table 4.4-13A. Field Duplicate/Replicate Detected Results Precision for General Chemistry**  
**Methods: EPA Methods 160.1, 160.2, 300.0 and 415.1/SW9060**

Analyte	Concentration (mg/L)		Difference (Limits)
	LFP-12-S1-4.0-4.5'	LFP-12-S1A-4.0'	
Nitrate as N LDC Report# 4934A6a	0.36	0.40	0.04 mg/Kg ( $\leq 1.0$ )
Analyte	Concentration (mg/L)		Difference (Limits)
	LFP-29-S1/2.5'	LFP-29-S2/2.0'	
Nitrate as N LDC Report# 4934A6a	0.030	0.30	0.27 mg/kg ( $< 1.2$ )

**Note:** All field duplicate and replicate results were within specified criteria.

**Table 4.4-13. Field Duplicate/Replicate Detected Results Precision Tables**  
(Page 2 of 5)

**Table 4.4-13B. Field Duplicate/Replicate Detected Results Precision for Metals: EPA Methods SW6010B/SW7470A/SW7471A**

Analyte	Concentration (mg/Kg)		RPD (Limits)	Difference (Limits)
	LFP-12-S1-4.0-4.5'	LFP-12-S1A-4.0'		
Aluminum	30000	29600	1 ( $\leq 35$ )*	-
Arsenic	13.4	12.7	5 ( $\leq 35$ )*	-
Barium	321	378	16 ( $\leq 35$ )*	-
Beryllium	0.76	0.71	-	0.05 ( $\leq 0.8$ )
Cadmium	0.074U	0.18	-	0.1 ( $\leq 4.0$ )
Calcium	4730	5840	21 ( $\leq 35$ )*	-
Chromium	58.5	56.5	3 ( $\leq 35$ )*	-
Cobalt	18.9	21.9	15 ( $\leq 35$ )*	-
Copper	61.4	59.7	3 ( $\leq 35$ )*	-
Iron	48100	44100	9 ( $\leq 35$ )*	-
Lead	14.8	11.0	29 ( $\leq 35$ )*	-
Magnesium	8430	8110	4 ( $\leq 35$ )*	-
<b>Manganese</b>	<b>1160</b>	<b>1760</b>	<b>41 (<math>\leq 35</math>)*</b>	-
Mercury	0.049	0.038	-	0.011 ( $\leq 0.2$ )
<b>Nickel</b>	<b>78.4</b>	<b>47.8</b>	<b>48 (<math>\leq 35</math>)*</b>	-
Potassium	2610	2380	9 ( $\leq 35$ )*	-
Selenium	0.72U	0.38	-	0.34 ( $\leq 4.0$ )
Sodium	259	239	8 ( $\leq 35$ )*	-
Vanadium	96.6	88.5	9 ( $\leq 35$ )*	-
Zinc	90.6	57.8	3 ( $\leq 35$ )*	-
Phosphorus	245	239	2 ( $\leq 35$ )*	-
Molybdenum	0.40U	0.45	-	0.05 ( $\leq 8.0$ )
LDC Report# 4934A4				

**Table 4.4-13. Field Duplicate/Replicate Detected Results Precision Tables**  
(Page 3 of 5)

**Table 4.4-13B. Field Duplicate/Replicate Detected Results Precision for Metals: EPA Methods SW6010B/SW7470A/SW7471A**

Analyte	Concentration (mg/Kg)		RPD (Limits)	Difference (Limits)
	LFP-24-S1-8.0-8.5'	LFP-24-S1A-8.0-8.5'		
Aluminum	31900	30300	5 ( $\leq 35$ )*	-
Arsenic	14.8	14.4	3 ( $\leq 35$ )*	-
Barium	436	348	22 ( $\leq 35$ )*	-
Beryllium	0.88	0.81	-	0.07 ( $\leq 0.8$ )
Calcium	4010	3950	2 ( $\leq 35$ )*	-
Chromium	63.6	61.7	3 ( $\leq 35$ )*	-
<b>Cobalt</b>	<b>36.3</b>	<b>14.8</b>	<b>84 (<math>\leq 35</math>)*</b>	-
Copper	64.0	59.2	8 ( $\leq 35$ )*	-
Iron	47400	47100	0.6 ( $\leq 35$ )*	-
Lead	11.2	10.3	8 ( $\leq 35$ )*	-
Magnesium	6820	6330	7 ( $\leq 35$ )*	-
<b>Manganese</b>	<b>1310</b>	<b>786</b>	<b>50 (<math>\leq 35</math>)*</b>	-
Mercury	0.020	0.014	-	0.006 ( $\leq 0.2$ )
Nickel	52.2	49.1	6 ( $\leq 35$ )*	-
Potassium	2390	2230	-	160 ( $\leq 1000$ )
Selenium	2.9	1.3	-	1.6 ( $\leq 4.0$ )
Sodium	403	352	-	51 ( $\leq 400$ )
Vanadium	108	102	6 ( $\leq 35$ )*	-
Zinc	82.9	77.0	7 ( $\leq 35$ )*	-
Molybdenum	0.80	0.79	-	0.01 ( $\leq 8.0$ )
Phosphorus	202	189	7 ( $\leq 35$ )*	-
LDC Report# 4962A4				

**Table 4.4-13. Field Duplicate/Replicate Detected Results Precision Tables**  
(Page 4 of 5)

**Table 4.4-13B. Field Duplicate/Replicate Detected Results Precision for Metals: EPA Methods SW6010B/SW7470A/SW7471A**

Analyte	Concentration (mg/Kg)		RPD (Limits)	Difference (Limits)
	LFP-29-S1-2.5'	LFP-29-S2-2.0'		
Aluminum	29400	28900	1.7 (<35)	
Arsenic	12.6	14.0	10.5 (<35)	
Barium	225	265	16.3 (<35)	
Beryllium	0.79	0.96		0.01 mg/kg (<1.0)
Calcium	6190	5740	7.5 (<35)	
Chromium	59.7	60.7	1.7 (<35)	
Cobalt	23.9	21.2	12.0 (<35)	
Copper	73.6	63.5	14.8 (<35)	
Iron	48000	41200	15.2 (<35)	
Lead	10.8	12.4	13.8 (<35)	
Magnesium	10600	8800	18.6 (<35)	
Manganese	1210	1430	16.7 (<35)	
Mercury	0.032	0.019		0.013 mg/kg (<0.1)
Nickel	63.3	73.1	14.4 (<35)	
Potassium	2050	2050	0 (<35)	
Selenium	1.9	1.1		0.8 mg/kg (<5)
Sodium	302	204		102 mg/kg (<504)
Vanadium	87.7	67.7	25.7 (<35)	
Zinc	102	86.5	16.4 (<35)	
Molybdenum	0.48	0.67		0.19 mg/kg (<10)
<b>Phosphorus</b>	<b>228</b>	<b>157</b>	<b>36.9 (&lt;35)</b>	
LDC Report# 4962A4				

**Notes:**

Results exceeding field precision criteria are highlighted in **bold**. Results are not qualified for field precision.

\* The control limits listed in the LDC DVRs were incorrect. The correct control limits for field duplicate precision specified in table 3.2-2 of the QAPP have been inserted for each method.

**Table 4.4-13. Field Duplicate/Replicate Detected Results Precision Tables**  
(Page 5 of 5)

**Table 4.4-13C. Field Duplicate/Replicate Detected Results Precision for VOCs: EPA Method SW8260B**

Compound	Concentration (mg/Kg)		Difference (Limits)
	LFP-24-S1-8.0-8.5'	LFP-24-S1A-8.0-8.5'	
Acetone	0.030	0.025U	0.05 ( $\leq 0.050$ )
2-Butanone	0.0089	0.025U	0.016 ( $\leq 0.050$ )
1,4-Dichlorobenzene	0.0064U	0.0014	0.0050 ( $\leq 0.013$ )
Methylene chloride	0.0064U	0.0026	0.0038 ( $\leq 0.013$ )
Naphthalene	0.013U	0.0013	0.012 ( $\leq 0.026$ )
LDC Report# 4962A1			
Compound	Concentration (mg/Kg)		Difference (Limits)
	LFP-29-S1-2.5'	LFP-29-S2-2.0'	
2-Butanone	0.0077	0.015	0.007 mg/kg ( $< 0.012$ )

**Note:**  
All field duplicate and replicate results were within specified criteria.

**Table 4.4-13D. Field Duplicate/Replicate Detected Results Precision for Dioxins/Furans: EPA Method SW8290**

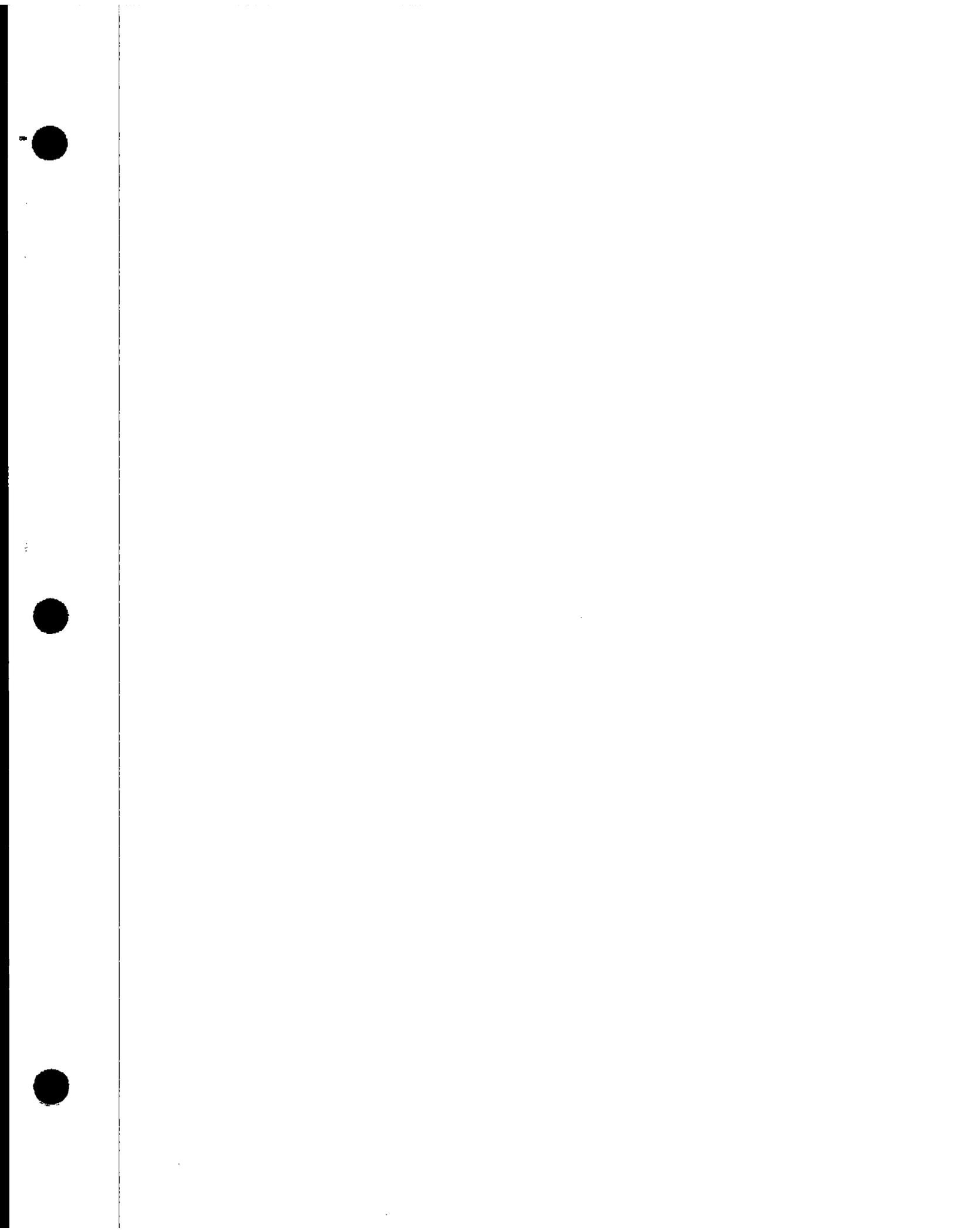
Compound	Concentration (pg/g)		Difference (Limits)
	LFP-24-S1-8.0-8.5'	LFP-24-S1A-8.0-8.5'	
1,2,3,4,6,7,8-HpCDD	0.075U	89	88.9 pg/g ( $\leq 0.15$ )
OCDD	0.43U	1200	1199.6 pg/g ( $\leq 0.86$ )
1,2,3,4,6,7,8-HpCDF	0.077U	110	109.9 pg/g ( $\leq 0.154$ )
OCDF	0.15U	89	88.8 pg/g ( $\leq 0.3$ )
LDC Report# 4962A21			

**Note:**  
Results exceeding field precision criteria are highlighted in **bold**. Results are not qualified for field precision.



Table 4.7-1. Completeness Table for Removal Action Investigation, May-June 2000

Analysis	Total Samples	Total analytes	(P)		Completeness Analytical		Completeness Technical	
			Contract	%	Analytical	%	Completeness	%
Volatiles	44	2992	24	99.4	645	78.4	66	97.8
Chloropicrin	38	38	0	100.0	1	97.4	1	97.4
Pentachlorophenol	38	38	1	97.4	3	92.1	0	100.0
Dioxins	16	272	2	99.3	19	93.0	17	93.8
Explosives	86	1204	38	97.1	17	98.6	0	100.0
NO3, NO2	41	82	62	24.4	73	11.0	2	97.6
Perchlorate	28	28	0	100.0	0	100.0	0	100.0
PAHs	40	656	0	100.0	110	83.2	16	97.6
Pesticides	39	819	0	100.0	53	93.5	21	97.4
PCBs	39	273	105	72.2	112	59.0	7	97.4
Metals	39	975	0	100.0	211	78.4	21	97.8
TPH Extractables	39	156	16	94.7	64	57.9	4	97.4
PET/NG	44	88	0	100.0	0	100.0	0	100.0



**Table 4.7-2. Rejected Results for the Removal Action Investigation, May-June, 2000**  
(1 of 4)

EPA Method	Sample ID	Matrix	ANALYTE	Qualifier	Sampling Date	Lab Code	SDG
E300-NO2N	LFM-4	Soil	nitrogen, nitrite (as N)	UR	01-Jun-00	QESS	G0F010290
E300-NO2N	LFM-2	Soil	nitrogen, nitrite (as N)	UR	01-Jun-00	QESS	G0F010290
M8015DB	EB-6-01	Water QC Matrix	unknown extract. hydrocarbon	UR	01-Jun-00	QESS	G0F010290
M8015DB	EB-6-01	Water QC Matrix	motor oils	UR	01-Jun-00	QESS	G0F010290
M8015DB	EB-6-01	Water QC Matrix	diesel fuel #2	UR	01-Jun-00	QESS	G0F010290
M8015DB	EB-6-01	Water QC Matrix	kerosene	UR	01-Jun-00	QESS	G0F010290
SW6010B	LFP-11-S2/5	Soil	antimony	UR	01-Jun-00	QESS	G0F010290
SW6010B	LFP-1-S1/6.5	Soil	antimony	UR	31-May-00	QESS	G0F010289
SW6010B	LFM-2	Soil	antimony	UR	01-Jun-00	QESS	G0F010290
SW6010B	LFM-1	Soil	antimony	UR	01-Jun-00	QESS	G0F010290
SW6010B	LFP-27-S1/1	Soil	antimony	UR	01-Jun-00	QESS	G0F010290
SW6010B	LFP-11-S1/3	Soil	antimony	UR	01-Jun-00	QESS	G0F010290
SW6010B	LFP-10-S2/6.5	Soil	antimony	UR	01-Jun-00	QESS	G0F010290
SW6010B	LFP-5-S1/2.5	Soil	antimony	UR	31-May-00	QESS	G0F010289
SW6010B	LFP-1-S2/8.5	Soil	antimony	UR	31-May-00	QESS	G0F010289
SW6010B	LFP-3-S1/4.5	Soil	antimony	UR	31-May-00	QESS	G0F010289
SW6010B	LFP-27-S2/3	Soil	antimony	UR	01-Jun-00	QESS	G0F010290
SW6010B	LFP-9-S1/3.5	Soil	antimony	UR	31-May-00	QESS	G0F010289
SW6010B	LFP-10-S1/4.5	Soil	antimony	UR	01-Jun-00	QESS	G0F010290
SW6010B	LFP-5-S2/4.5	Soil	antimony	UR	31-May-00	QESS	G0F010289
SW6010B	LFP-7-S1/2.5	Soil	antimony	UR	31-May-00	QESS	G0F010289
SW6010B	LFP-7-S2/4.5	Soil	antimony	UR	31-May-00	QESS	G0F010289
SW6010B	LFP-29-S2/2	Soil	antimony	UR	31-May-00	QESS	G0F010289
SW6010B	LFP-29-S1/2.5	Soil	antimony	UR	31-May-00	QESS	G0F010289
SW6010B	LFP-24-S1/8	Soil	antimony	UR	31-May-00	QESS	G0F010289
SW6010B	LFP-24-S1A/8	Soil	antimony	UR	31-May-00	QESS	G0F010289
SW6010B	LFP-3-S2/6.5	Soil	antimony	UR	31-May-00	QESS	G0F010289
SW8081A	EB-6-01	Water QC Matrix	endosulfan sulfate	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	aldrin	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	methoxychlor	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	heptachlor	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	heptachlor epoxide	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	endrin ketone	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	endrin aldehyde	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	endrin	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	beta endosulfan	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	alpha endosulfan	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	dieldrin	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	p,p'-DDT	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	p,p'-DDE	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	p,p'-DDD	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	gamma-chlordane	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	alpha-chlordane	UR	01-Jun-00	QESS	G0F010290

**Table 4.7-2. Rejected Results for the Removal Action Investigation, May-June, 2000**  
(2 of 4)

EPA Method	Sample ID	Matrix	ANALYTE	Qualifier	Sampling Date	Lab Code	SDG
SW8081A	EB-6-01	Water QC Matrix	gamma BHC (lindane)	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	delta BHC	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	alpha BHC	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	toxaphene	UR	01-Jun-00	QESS	G0F010290
SW8081A	EB-6-01	Water QC Matrix	beta BHC	UR	01-Jun-00	QESS	G0F010290
SW8082	EB-6-01	Water QC Matrix	PCB-1260 (Arochlor 1260)	UR	01-Jun-00	QESS	G0F010290
SW8082	EB-6-01	Water QC Matrix	PCB-1254 (Arochlor 1254)	UR	01-Jun-00	QESS	G0F010290
SW8082	EB-6-01	Water QC Matrix	PCB-1248 (Arochlor 1248)	UR	01-Jun-00	QESS	G0F010290
SW8082	EB-6-01	Water QC Matrix	PCB-1242 (Arochlor 1242)	UR	01-Jun-00	QESS	G0F010290
SW8082	EB-6-01	Water QC Matrix	PCB-1232 (Arochlor 1232)	UR	01-Jun-00	QESS	G0F010290
SW8082	EB-6-01	Water QC Matrix	PCB-1221 (Arochlor 1221)	UR	01-Jun-00	QESS	G0F010290
SW8082	EB-6-01	Water QC Matrix	PCB-1016 (Arochlor 1016)	UR	01-Jun-00	QESS	G0F010290
SW8260B	LFP-20-S1/2	Soil	2-chloroethyl vinyl ether	UR	30-May-00	QESS	G0E310175
SW8260B	LFP-22-S1/2	Soil	2-chloroethyl vinyl ether	UR	30-May-00	QESS	G0E310175
SW8260B	LFP-20-S2/4	Soil	2-chloroethyl vinyl ether	UR	30-May-00	QESS	G0E310175
SW8260B	EB-6-01	Water QC Matrix	xylene (m,p)	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	isopropylbenzene (cumene)	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	2-hexanone	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,3-dichloropropane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	p-cymene (p-isopropyltoluene)	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	dichlorodifluoromethane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	trichlorofluoromethane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	ethylene dibromide	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	ethylbenzene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	2,2-dichloropropane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	vinyl acetate	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	vinyl chloride	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	2-butanone	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,1,1,2-tetrachloroethane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	tert-butyl methyl ether	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	bromoform	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	styrene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	tetrachloroethene (PCE)	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,1,2,2-tetrachloroethane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	n-propylbenzene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,3,5-trimethylbenzene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	4-methyl-2-pentanone	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,2,4-trimethylbenzene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,1,1-trichloroethane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,1,2-trichloroethane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,2,3-trichlorobenzene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,2,4-trichlorobenzene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	trichloroethene (TCE)	UR	01-Jun-00	QESS	G0F010290

**Table 4.7-2. Rejected Results for the Removal Action Investigation, May-June, 2000**  
(3 of 4)

EPA Method	Sample ID	Matrix	ANALYTE	Qualifier	Sampling Date	Lab Code	SDG
SW8260B	EB-6-01	Water QC Matrix	chloroform	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,2,3-trichloropropane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	Freon 113	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	naphthalene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	chloroethane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	bromobenzene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	bromomethane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	n-butylbenzene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	sec-butylbenzene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	t-butylbenzene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,2-dichloropropane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	acetone	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	hexachlorobutadiene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	bromodichloromethane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	4-chlorotoluene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	2-chlorotoluene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	chlorobenzene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	2-chloroethyl vinyl ether	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	carbon disulfide	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	toluene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	benzene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	chloromethane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,3-dichlorobenzene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	trans-1,3-dichloropropene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	cis-1,3-dichloropropene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,1-dichloropropene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	trans-1,2-dichloroethene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	carbon tetrachloride	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	cis-1,2-dichloroethene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	bromochloromethane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,4-dichlorobenzene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,2-dichlorobenzene	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,2-dichloroethane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	xylene (o)	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,1-dichloroethane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	dibromomethane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,2-dibromo-3-chloropropane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	dibromochloromethane	UR	01-Jun-00	QESS	G0F010290
SW8260B	EB-6-01	Water QC Matrix	1,1-dichloroethene	UR	01-Jun-00	QESS	G0F010290
SW8270	EB-6-01	Water QC Matrix	chloropicrin	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	1,2,3,4,7,8,9-HpCDF	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	2,3,7,8-TCDF	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	1,2,3,4,6,7,8-HpCDD	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	1,2,3,4,6,7,8-HpCDF	UR	01-Jun-00	QESS	G0F010290

**Table 4.7-2. Rejected Results for the Removal Action Investigation, May-June, 2000**  
(4 of 4)

EPA Method	Sample ID	Matrix	ANALYTE	Qualifier	Sampling Date	Lab Code	SDG
SW8290	EB-6-01	Water QC Matrix	1,2,3,4,7,8-HxCDD	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	1,2,3,6,7,8-HxCDD	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	1,2,3,7,8,9-HxCDD	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	1,2,3,4,7,8-HxCDF	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	1,2,3,6,7,8-HxCDF	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	1,2,3,7,8,9-HxCDF	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	2,3,4,6,7,8-HxCDF	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	OCDD	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	OCDF	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	1,2,3,7,8-PeCDD	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	1,2,3,7,8-PeCDF	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	2,3,7,8-TCDD	UR	01-Jun-00	QESS	G0F010290
SW8290	EB-6-01	Water QC Matrix	2,3,4,7,8-PeCDF	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	naphthalene	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	acenaphthene	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	acenaphthylene	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	anthracene	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	benzo(a)anthracene	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	benzo(a)pyrene	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	benzo(b)fluoranthene	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	benzo(g,h,i)perylene	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	benzo(k)fluoranthene	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	chrysene	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	dibenz(a,h)anthracene	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	fluorene	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	indeno(1,2,3-c,d)pyrene	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	phenanthrene	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	pyrene	UR	01-Jun-00	QESS	G0F010290
SW8310	EB-6-01	Water QC Matrix	fluoranthene	UR	01-Jun-00	QESS	G0F010290

## 5.0. QUALITY CONTROL SUMMARY REPORT FOR THE DATA GAPS 3 INVESTIGATION SAMPLING EVENT AUGUST - SEPTEMBER 2000

### EXECUTIVE SUMMARY

This Quality Control Summary Report (QCSR) was prepared in accordance with Section 5.8 of the Environmental Data Quality Management Program Specifications, United States Army Corps of Engineers (USACE) - Sacramento District, Draft Version 1.08 (1999) for work conducted from August 3 through September 8, 2000 at the Tourtelot Property (Project Site) in Benicia, California. Quality assurance/quality control (QA/QC) activities for field, sampling, analytical, and data management for this project were performed according to the *Technical Memorandum for Remedial Investigation*, dated March 2, 2000 (the "Tech Memo"), which updates plans and requirements specified in the *Final Non-Ordnance and Explosives Remedial Investigation (RI)/Feasibility Study (FS) Work Plan, Tourtelot Cleanup Project, Benicia, California*, dated February 15, 2000 (the "Final Work Plan"). Samples were collected as specified in the *Proposed Supplemental Sampling of South Valley Wetland Area and Site Groundwater* memorandum dated July 31, 2000.

This QCSR discusses the quality and usability of the definitive-level analytical data for all samples collected from August 3 through September 1, 2000 for this phase of the non-ordnance and explosives remedial investigation (non-OE RI), known as the data gaps 3 investigation (referred to hereafter as the data gaps 3 investigation sampling event). The QCSR includes discussion of deviations from procedures specified in the Sampling and Analysis Plan (SAP), Chapter 2.0 of the Final Work Plan and Section 6.0 of the Tech Memo; and the Quality Assurance Project Plan, Chapter 3.0 of the Final Work Plan (QAPP), with Addendum to the Quality Assurance Project Plan, Appendix A of the Tech Memo, referred to collectively as "the QAPP." Discussions of usability of data with respect to decision-making for project objectives are based on the data quality objectives (DQOs) presented in Chapter 2.0 of the Final Work Plan.

Data review and validation were performed on the entire definitive-level data set, including evaluation of results for performance evaluation (PE) samples analyzed by the laboratories receiving the samples for this sampling event. The results indicate the definitive-level data collected for this project meet project objectives. There were no samples with severely impacted (rejected) data. Quality control (QC) results for each QC parameter are summarized in Section 5.4.1 of this QCSR. Data quality and completeness for each method are summarized in Sections 5.6 and 5.7. PE results demonstrated acceptable accuracy for each method, and are discussed in Section 5.4.3. Completeness goals are discussed in Section 5.7.

Approximately 9.9 percent of the definitive-level data were qualified as estimated and no data were qualified as rejected for exceeding data quality criteria which include accuracy, precision, completeness, representativeness, comparability, and sensitivity. The remaining definitive-level data met the data quality criteria.

Definitive-level laboratory analyses of standardized analytical methods for the data gaps 3 sampling event were performed by Severn Trent Laboratories in West Sacramento, California (STL), formerly Quanterra Environmental Services (QES), according to the methods and requirements specified in the QAPP. The methods include United States Environmental Protection Agency (EPA) Methods SW6010B (metals), SW7470A (mercury - waters), SW7471A (mercury - soils), SW8015B for total extractable petroleum hydrocarbons (TEPH) by gas chromatography (GC), SW8081A for organochlorine pesticides by GC, SW8260B for volatile organic compounds (VOCs) by gas chromatography/mass spectrometry (GC/MS), SW8310 for polynuclear aromatic hydrocarbons (PAHs) by high performance liquid chromatography (HPLC), SW8330 for nitroaromatics/nitramines by HPLC, and modified SW8330M for Nitroglycerin/PETN by HPLC. QES/STL is certified by the California Environmental Laboratories Accreditation Program (ELAP)

and the USACE to perform the analyses included in the scope of work for this site. Note that QES was acquired by STL in February of 2000. All references to Severn Trent Laboratories in this report will be to QES/STL.

Special analytical services for the analysis of methyl mercury were performed by Frontier Geosciences (FGS) of Seattle, Washington according to the proprietary method FGS-070.1. Definitive-level laboratory analyses for special analytical services were performed according to the methods and requirements specified in the QAPP.

All analyses were performed according to the requirements for these methods in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA SW-846, Third Edition, Third Update, December 1996), *Methods for Chemical Analysis of Water and Wastes*, EPA Manual 600/4-79-020 (EPA, 1983 with additions), or modifications to the specified methods presented in the QAPP. The testing methods used, parameters and analytes reported, and practical quantitation limits (PQLs) required for the analytical program are listed in Table 3.1-1; holding time and sample container and preservation requirements are specified in Table 3.1-2; QA/QC requirements, control limits, and corrective actions are specified in Tables 3.2-1 through 3.2-5; and data validation flagging conventions are specified in Table 3.4-1 of the QAPP.

Approximately 90 percent of the definitive-level analytical data were provided by the project laboratories in EPA Level III format. This included the case narratives, completed chain-of-custody (COC) documentation, laboratory analysis results reporting forms, and QC summary forms. Greater than 10 percent of the definitive-level analytical data provided by QES/STL and all of the definitive-level data for special analytical services were reported in EPA Level IV format, which included the raw data generated from each analytical method performed in addition to the information provided under Level III format. Raw data consists of sample preparation sheets, instrument run logs, calibration data, chromatograms, mass spectra, calculation sheets, and instrument generated quantitation reports and printouts.

Data validation was performed by Laboratory Data Consultants (LDC) of Carlsbad, California. The QC summary tables and discussions of the QC results are based upon the tables and findings presented in the LDC data validation reports (DVRs), with further review by Earth Tech chemists in San Jose, California. All data qualifiers reported in the results tables presented in Tables 5-1 through 5-24E are a result of this third party validation and Earth Tech review. Complete data packages from the analytical laboratories and LDC DVRs have been submitted to the California Department of Toxic Substances Control (DTSC) and USACE, Sacramento District for technical review.

## 5.1 PROJECT SCOPE

The overall objective of non-OE RI was to evaluate the nature and extent of chemicals of potential concern (excluding OE) which may have impacted either the soil, sediment, surface, and/or groundwater as a result of Department of Defense (DOD)-related activities at the Project Site so appropriate remedial action alternatives could be fully evaluated in the FS; the ultimate goal being to remediate the Project Site to levels acceptable for residential land use.

Non-OE RI data collection was achieved during four phases of field work conducted between May 1999 and September 2000. The four phases of field work are identified in this RI/FS as follows: the interim investigation; the remedial investigation; the data gaps 1, 2, and 3 investigations; and the removal action investigation. Collectively, these investigations are referred to as the non-OE RI. This QCSR summarizes the chemical data quality of the sample analyses performed for the data gaps 3 investigation conducted from August 3 through September 1, 2000. A complete list of the samples and analyses performed is presented in Table 5.1-1.

Detailed descriptions of the scope of work associated with each phase of field work are presented in Sections 4.2.1, 4.2.2, 4.2.3, and 4.2.4 and summarized in Tables 4-4, 4-5, 4-6, and 4-7 of the RI/FS.

## 5.2 PROJECT DESCRIPTION

A detailed description of the Project Site, including environmental setting, regional geology and hydrogeology/hydrology, and site history is presented in Chapter 2.0 of the RI/FS.

## 5.3 SAMPLING PROCEDURES

With the exception of the interim investigation, all field investigation activities were conducted in accordance with the protocols and procedures presented in Chapter 2.0 of the Final Work Plan, Chapter 6.0 of the Tech Memo and Chapter 8.0 of the *Removal Action Work Plan*, dated May 9, 2000 (the "RAW"), as described in Appendix C of the RI/FS. It should be noted that the interim investigation was conducted prior to the development of a formal work plan; however, samples collected during the interim investigation were collected in accordance with industry standard protocols and procedures as described in Appendix C. This QCSR summarizes the chemical data quality for the data gaps 3 investigation conducted from August 3 through September 1, 2000.

Protocols and procedures used for the collection of samples during the non-OE RI are described in the following sections of Appendix C:

Soil and bedrock sample collection, including discrete sampling and continuous coring: see Section C.6.1

Groundwater sample collection, including purging and sample withdrawal: see Section C.8.4

Sediment, surface water and seep sample collection: see Section C.9

Stockpile sample collection: see Section C.10

Sample handling and shipment, including sample sealing, sample identification, sample labeling, and sample packaging and shipment: see Section C.15.

Samples were taken as specified in the *Proposed Supplemental Sampling of South Valley Wetland Area and Site Groundwater* memorandum (July 31, 2000), as presented in Tables 5.3-1A, 5.3-1B, and 5.3-1C. Deviations from the sampling plan are presented in the table and are discussed individually in Section 5.7.1 of this QCSR and in the sections of this RI/FS for each site. Field completeness with respect to the sampling plan was 99 percent.

## 5.4 QUALITY CONTROL ACTIVITIES

QA/QC activities were performed as specified in the FSP and QAPP, and are summarized in the following sections.

### 5.4.1 Laboratory Quality Control: Data Validation Assessment

Data validation is a systematic and independent process of reviewing and qualifying the definitive-level analytical data presented against an established set of criteria. Validation is performed to ensure the quality of the definitive-level data collected; and to assess limitations on usability based on the accuracy,

precision, completeness, representativeness, comparability, and sensitivity parameters defined in the QAPP, as well as to evaluate laboratory compliance with specified methods and protocols.

Laboratory QC was evaluated in the data validation process. The definitive-level analytical data for all samples collected at the project site during the data gaps 3 sampling event were validated according to the QC requirements and control limits specified in the QAPP, consistent with guidelines and procedures outlined in the *EPA Contract Laboratory Program National Functional Guidelines For Organic Data Review* (EPA-540/R-94/012, February 1994) and *National Functional Guidelines For Inorganic Data Review* (EPA-540/R-94-013, February 1994), referred to collectively as the "Functional Guidelines." The reviewer's professional judgment was used to evaluate data quality when called for in the Functional Guidelines and in instances with no clear policy or conflicting guidance on how the data should be qualified.

The data validation process was performed by Laboratory Data Consultants (LDC) in Carlsbad, California. The data were validated at EPA Level IV for a minimum of 10 percent of the samples for each matrix for each method for the non-OE RI as a whole. The remainder were validated at Level III. LDC data validation project summaries which specify the levels of validation are presented in Attachment 1. Validated results with data validation qualifiers are presented in Tables 5-1 through 5-24E of the RI/FS.

The results of the data validation are summarized and discussed for each QC parameter in the following subsections. Summary tables presenting validation qualifications and findings presented in Tables 5.4-1 through 5.4-10 were compiled from the LDC DVRs with further review by the Earth Tech project chemists. Only QC outliers were included. Notes and highlights were added by Earth Tech. Any changes to the LDC DVR tables determined by the Earth Tech project chemist were highlighted in italics. Bold highlight specifies sample results qualified due to validation.

Whenever QC criteria were exceeded, re-extractions and/or reanalyses were performed as required in the QAPP unless otherwise specified in the subsections for each QC parameter, and both sets of data were reported by the laboratory and validated by the validators. The data which most closely met the QAPP requirements and DQOs were selected by the validators and reviewed by the project chemist, and used for project reporting and decision-making purposes. All data qualified but not used for reporting purposes are included in the QC summary tables with a "Not Used" designation and were not included in completeness calculations. LDC findings in the QC summary tables based upon technical validation criteria are indicated in the tables with an "A" and findings related to a protocol/contractual deviation are indicated with a "P."

Qualifiers were assigned by the reviewer to all definitive-level data which failed to meet specified analytical and quality control criteria. Data qualified as "R" are rejected and considered unusable. Data qualified with the "J" qualifier are considered estimated and usable for limited purposes. "J+" indicates the possibility that the result may be biased high, and that the actual chemical concentration may be lower than the reported result. "J-" indicates the possibility that the result may be biased low, and that the actual chemical concentration may be higher than the reported result or detection limit reported for a non-detected result. The "U" qualifier indicates that the result is non-detected at or above the reporting limit specified, and is applied to all non-detected results.

#### **5.4.1.1 CHAIN-OF-CUSTODY, SAMPLE PRESERVATION, AND HOLDING TIMES**

The quality of the analytical data collected is highly dependent on the integrity of the samples from collection at the site to laboratory receipt and eventual analysis. The COC records are an integral link in the legal documentation intended to ensure this integrity. Review of the completed COC records includes all entries for custody signatures and dates, sample description, sample collection times and dates, sample container types and preservatives, analyses requested, and condition of the sample containers upon receipt at the laboratory. COC records were properly signed and dated.

Samples were collected in appropriate containers with correct preservatives. The COCs were reviewed for documentation of cooler temperatures. The sample coolers and containers used in this project were received cold (2 to 6 degrees Celsius), sealed, and intact by FGS and QES/STL.

Technical holding times are the maximum allowable times between sample collection and sample preparation or extraction (if applicable), and analysis. Technical holding time criteria are derived from requirements specified for the analytical methods used, and are specified for both aqueous and solid samples in Table 3.1-2 of the QAPP.

Holding times were evaluated by comparing the sample collection dates on the COC forms with the sample preparation, extraction, and analysis dates shown on the laboratory summary reports, extraction logs, or analysis run logs. When holding times were exceeded, all detected results were qualified as estimated (J or J-). When holding times were exceeded by two times or less, all non-detected results were qualified as estimated (UJ). When holding times were grossly exceeded (factor of two or more), all non-detected results were qualified as rejected (R).

All technical holding time requirements were met, with the exceptions presented in Table 5.4-1.

Approximately 0.02 percent of the data were estimated and no data were rejected due to exceeded holding time.

A summary and tables for the qualification of data by each analytical method due to holding times are presented in the following sub-sections.

#### **5.4.1.1.1      *Holding Times for Methyl Mercury: Method FGS-070.1***

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

#### **5.4.1.1.2      *Holding Times for EPA Methods SW6010B (Metals), and SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils)***

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

#### **5.4.1.1.3      *Holding Times for EPA Method SW8015 for TEPH***

All technical holding time requirements were met, with the exceptions presented in Table 5.4-1A. One detected result reported as "Unknown Extractable Hydrocarbons" that was used for reporting purposes was qualified as estimated (J-) due to holding time exceedance. The initial analysis of this sample, which was re-extracted and reanalyzed due to a low diesel LCS recovery, was non-detected. The remaining results from the original analyses of the specified samples were used for reporting purposes, so the results specified in the table were not used. No other data used for reporting purposes were qualified due to holding time or preservation requirements. The single qualification does not adversely affect project objectives.

#### **5.4.1.1.4      *Holding Times for EPA Method SW8081A for Pesticides***

All technical holding time requirements were met, with the exceptions presented in Table 5.4-1B. The original analyses for the specified samples were used for reporting purposes, so the affected results were

not used. No data used for reporting purposes were qualified due to holding time or preservation requirements.

**5.4.1.1.5 Holding Times for EPA Method SW8260B for VOCs**

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

**5.4.1.1.6 Holding Times for EPA Method SW8310 for PAHs**

All technical holding time requirements were met, with the exceptions presented in Table 5.4-1C. The original analyses for the specified samples were used for reporting purposes, so the affected results were not used. No data used for reporting purposes were qualified due to holding time or preservation requirements.

**5.4.1.1.7 Holding Times for EPA Method SW8330 for Explosives**

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

**5.4.1.1.8 Holding Times for EPA Method SW8330M for PETN and Nitroglycerin**

The analyses of PETN and nitroglycerin were included in the analyses of explosives by EPA Method SW8330. All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

**5.4.1.2 INSTRUMENT PERFORMANCE CRITERIA**

In order to ensure the validity of data generated, several analytical methods specify instrument performance criteria that must be met before sample analysis can proceed. GC/MS analyses of VOCs by EPA Method SW8260B requires verification of proper instrument performance criteria.

The GC/MS performance checks are performed to ensure acceptable mass resolution, correct identification and relative abundance of ions, and acceptable instrument sensitivity. Footnote 'a' of Table 3.2-5 of the QAPP shows the instrument performance criteria for EPA Method SW8260B. For each analytical method, conformance is demonstrated by analyzing a standard material and meeting specified criteria. Failure to meet the GC/MS instrument performance criteria results in the qualification of the data as either estimated (J/UJ) or rejected and considered unusable (R), depending on the severity of the problem.

Conformance with the instrument performance criteria was verified by reviewing the appropriate quality assurance summary forms. There were no data qualified as estimated due to GC/MS instrument performance results for EPA Method SW8260B.

**5.4.1.3 CALIBRATION**

Calibration criteria ensure that the analytical instruments are capable of producing accurate and reproducible data. The QAPP specifies the calibration procedures that must be followed, the calibration frequency requirements, and the acceptance criteria that must be met to demonstrate satisfactory conformance based on requirements in the methods and other guidance documents. Table 3.1-5 of the QAPP summarizes the calibration procedures and criteria used by the laboratories.

For both organic and inorganic analyses, the initial calibration demonstrates that the system is capable of producing acceptable data at the beginning of the analytical sequence utilizing linear response with an acceptable correlation coefficient ( $r$ ) or non-linear coefficient of determination ( $r^2$ ) for the calibration curve. For GC/MS analyses, review of the initial calibration also includes evaluation of the response factor (RF), percent relative standard deviation (%RSD) of the RFs, and retention times for each analyte in the target list.

When the initial calibration correlation coefficient or the %RSD was not within control limits for an analyte or compound, associated results were qualified as estimated (J/UJ). If the correlation coefficient or the %RSD was grossly outside of control limits ( $r$  less than 0.990,  $r^2$  less than 0.980, or RSD greater than two times the control limit), or if the RF did not meet the minimum criterion of 0.05 specified in Table 3.4-1 of the QAPP, associated non-detected results were qualified as rejected (R). Note that compounds with RFs between 0.01 and 0.05 are considered usable by EPA, and that if the detection limits are raised for these compounds such that the lowest standard used has an absolute response that demonstrates acceptable ability to determine detection at that level, the results should be estimated (UJ) not rejected (R), with the following exception. Compounds with RFs between 0.01 and 0.05 are considered usable by EPA, and non-detected results are estimated (UJ) according to the Functional Guidelines and EPA Region IX data validation protocols instead of rejected (R). For compounds with detection limits raised such that the lowest standard used has an absolute response that demonstrates acceptable sensitivity at the reported PQL, non-detected results were qualified as estimated (UJ) not rejected (R). For the data set included in this QCSR, this exception applies to non-detected compounds with RFs between 0.01 and 0.05. The calibrations for these data demonstrate acceptable instrument response at the reported PQLs, and are defensible and usable for decision-making purposes. Therefore, the DQOs are not adversely affected by the use of this data.

Initial calibration verification (ICV) samples for inorganic methods and continuing calibration verification (CCV) standards for all methods are performed by analyzing standards of known concentration at the frequency specified for each analytical method used. Acceptable recoveries of the ICV and CCVs indicate conformance with the analytical requirements. For GC/MS analyses, continuing calibration review includes the evaluation of the RF and the percent difference (%D) between the RF of the continuing calibration standard and the average RF of the initial calibration curve, or the percent drift (also referred to as %D) between the true and reported concentrations of the CCV. Results associated with ICVs or CCVs outside of specified control limits were qualified as estimated (J/UJ) if marginally outside of QC limits, or qualified as rejected (R) if non-detected and grossly outside of QC limits (greater than two times the control limit), according to EPA guidelines.

Approximately 6.5 percent of the data were qualified as estimated (J/UJ) due to calibration problems. No data were rejected. A summary and tables for the qualification of data by each analytical method due to calibration criteria are presented in the following sub-sections.

#### **5.4.1.3.1 Calibration for Methyl Mercury: Method FGS-070.1**

Initial calibrations for method FGS-070.1 were performed according to method requirements. All correlation coefficients exceeded the 0.995 criterion, and all %Rs for the ICVs and CCVs met the 90-110%R criteria.

#### **5.4.1.3.2 Calibration for EPA Methods SW6010B (Metals), SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils)**

Initial calibrations for EPA Method SW6010B were performed according to method requirements. All %RSDs met the less than 5 percent criteria, and all %Rs for the ICVs and CCVs met the 90-110%R criteria.

Initial calibrations for EPA Methods SW7470A for waters and SW7471A for soils were performed according to method requirements. All correlation coefficients exceeded the 0.995 criterion, and all %Rs for the ICVs and CCVs met the 80-120%R criteria.

#### **5.4.1.3.3 Calibration for EPA Method SW8015 for TEPH**

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less than or equal to 20%RSD or correlation coefficient greater than or equal to 0.995 criteria, and all %Ds for the CCVs met the  $\pm 15\%D$  criterion.

#### **5.4.1.3.4 Calibration for EPA Method SW8081A for Pesticides**

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less than or equal to 20%RSD or correlation coefficient greater than or equal to 0.995 criteria, and all %Ds for the CCVs met the  $\pm 15\%D$  criterion. All results presented in Table 5.4-1A as qualified due to calibration reasons were not used for reporting purposes.

#### **5.4.1.3.5 Calibration for EPA Method SW8260B for VOCs**

Initial calibrations were performed according to method requirements using required standard concentrations. A curve fit, based on the initial calibration, was established for quantitation for selected compounds. Average relative response factors (RRFs) for all volatile target compounds and system monitoring compounds were within validation criteria. Percent RSDs for RRFs were less than or equal to 30.0 percent, or for selected compounds the coefficient of determination ( $r^2$ ) was greater than or equal to 0.990, with the exceptions noted in Table 5.4-2B. Average RRFs were within validation criteria, with the exceptions noted in Table 5.4-2C.

Continuing calibration was performed at the required frequencies. All of the continuing calibration %Ds between the initial calibration RRF and the continuing calibration RRF were less than or equal to 25.0 percent, with the exceptions noted in Table 5.4-2D. All of the continuing calibration RRF values were within validation criteria, with the exceptions noted in Table 5.4-2E.

Data qualification for initial calibrations resulted in the estimation (J/UJ) of results for acetone and vinyl acetate in all of the samples (16 groundwater samples, 18 trip blanks, two equipment blanks, and one source water blank) for %RSDs above 30 percent. Results for acetone, 2-butanone (MEK), and, 2-chloroethylvinyl ether in all of the samples were qualified as estimated due to RRFs less than 0.05 but greater than 0.01.

Data qualification for continuing calibrations resulted in the estimation (J/UJ) of results for dichlorodifluoromethane in 5 groundwater samples, 6 trip blanks, and one source water blank; and for acetone in one water sample, one equipment blank, and one trip blank for %Ds above 25 percent. Results were qualified as estimated (J/UJ) for 2-hexanone in two groundwater samples, one source water sample, and three trip blanks, and for the same compounds in the same samples as in the initial calibrations due to low RRFs in the continuing calibrations.

Approximately 6.6 percent of the SW8260B results were qualified as estimated and no data were rejected due to exceeded calibration criteria. More than half of the estimated data were for field blanks. Estimated data are usable in decision-making for project objectives. The effect of the estimations for the small number of affected results on the project objectives is not significant.

#### **5.4.1.3.6 Calibration for EPA Method SW8310 for PAHs**

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less than or equal to 20%RSD or correlation coefficient greater than 0.995 criteria. Calibration verification was performed at required frequencies. Percent recoveries of amounts in continuing standard mixtures were within the 85-115 percent QC limits.

#### **5.4.1.3.7 Calibration for EPA Method SW8330 for Explosives**

Initial calibrations were performed for the primary (quantitation) column and confirmation column according to method requirements. All %RSDs for the RFs met the less than or equal to 20%RSD or correlation coefficient greater than 0.995 criteria. Calibration verification was performed at the required frequencies. The %Ds for the CCVs met the less than or equal to 15%D criterion.

#### **5.4.1.3.8 Calibration for EPA Method SW8330M for PETN and Nitroglycerin**

The analyses of PETN and nitroglycerin were included in the analyses of explosives by EPA Method SW8330. Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less than or equal to 20%RSD or correlation coefficient greater than 0.995 criteria, and all %Ds for the CCVs met the less than or equal to 15%D criterion.

#### **5.4.1.4 FIELD AND LABORATORY BLANKS**

Contamination may occur in various stages of the sample collection and laboratory analytical processes, and affect the validity of the data collected. The results from the analyses of field and laboratory blanks indicate the presence and magnitude of the contamination. The blanks collected during the data gaps 3 investigation field sampling program consisted of equipment blanks and trip blanks. The QC requirements for these blanks and their frequency of collection are summarized in Table 3.2-1 of the QAPP.

Equipment blanks are used to evaluate the cleanliness of the sampling devices used, and reflect the efficiency of the decontamination procedures employed in the field. They are prepared by collecting analyte-free (Type II) reagent water poured over or through the sampling device into an appropriate sample container. One set of equipment blanks was prepared for each day of soil sampling per sampling crew. For water samples collected with reusable (Teflon™) bailers, one equipment blank per day was collected. For water samples pumped through a sampling device (except for metal filtration chambers, which require a filtration blank), one equipment blank was collected per pump each day of sampling. Each set of equipment blanks was analyzed for the same parameters requested for the associated samples. Source water blanks were also analyzed for the same parameters requested for the associated samples.

Trip blanks are used to evaluate sample VOC contamination that may occur while the samples are in transit from the sampling site to the laboratory. They are prepared in the laboratory and are shipped to the sampling site where they remained unopened. Trip blanks are then returned to the laboratory with each shipment of samples requiring VOC analysis.

Blanks used to evaluate laboratory contamination consisted of method or preparation blanks and continuing calibration blanks. Method or preparation blanks are analyte-free (Type II) reagent water prepared and analyzed in exactly the same manner as the samples. One method or preparation blank is extracted and analyzed with each analytical batch of twenty samples or less. Calibration blanks are analyte-free solutions used to evaluate the cleanliness of the analytical instruments during the analytical runs. One calibration blank is analyzed with each analytical sequence according to frequency requirements specified in Table 3.2-1 of the QAPP for the analytical method used.

Whenever blank contamination was detected, the analytical data for the associated samples were evaluated to determine if data needed to be qualified. Sample results less than five times the maximum level found in the associated blanks or ten times the level of contamination for the common laboratory contaminants methylene chloride, acetone, and common phthalate esters were qualified according to the blank qualification rules. Results for common laboratory contaminants were qualified at concentrations less than ten times the PQL even when not found in associated blanks. The only results qualified by the LDC validators for common laboratory contamination were for field blanks. 2-Butanone (methyl ethyl ketone [MEK]) is generally considered to be a common laboratory contaminant according to EPA Region IX data validation guidelines. Results for MEK were not blank-qualified for common laboratory contamination by the validators for this project.

Blank qualified results are considered to be non-detected (ND) at the reported level, therefore, the "U" qualifier is included with the "J" qualifier according to the blank qualification rules. If, in the data reviewer's professional judgment, a result for an analyte less than five times the level reported in an associated blank or less than ten times the PQL for a common laboratory contaminant was above the concentrations normally seen in blanks and was judged to be actually representative of the concentration of that compound in the sample, the result would be blank-qualified as "J" without the "U" qualifier.

Equipment blanks were qualified by the validation sub-contractor, LDC, as non-detected and estimated (UJ) according to validation protocols followed by LDC. However, according to the Functional Guidelines and EPA Region IX data validation protocols, field blanks (equipment, source-water, and trip blanks) cannot be blank-qualified according to the blank qualification rules as these samples are blanks, not environmental field samples. Blank-qualified results for all field blanks should be considered as detected at the reported concentrations for the purpose of evaluating potential field contamination.

Approximately 0.5 percent of the data were qualified due to blank contamination. Seventeen low concentration results were blank-qualified for metals by EPA Method SW6010B, and one result was blank-qualified for acetone by EPA Method SW8260B.

Laboratory and field contamination did not significantly affect the quality of the data. A summary and tables for the qualification of data by each analytical method due to blanks are presented in the following sub-sections.

#### **5.4.1.4.1      *Blank Results for Methyl Mercury: Method FGS-070.1***

Method blanks were analyzed for each matrix as applicable. No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

#### **5.4.1.4.2      *Blank Results for EPA Methods SW6010B (Metals), SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils),***

Data qualification by the initial, continuing and preparation blanks (ICB/CCB/PBs) was based on the maximum contaminant concentration in the ICB/CCB/PBs in the analysis of each analyte. No contaminant concentrations were found above the reporting limit in the initial, continuing, and preparation blanks, with the exceptions presented in Table 5.4-3A. No contaminant concentrations were found in the equipment and source water blanks, with the exceptions presented in Table 5.4-3B. Bold highlight in the tables indicates that associated non-blank field sample results were blank-qualified for this element. All other field sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated blanks. Samples with the suffix "K" were identified as equipment blanks.

Sample concentrations were compared to the maximum contaminant concentrations detected in the ICB/CCB/PBs and field blanks. Sample results qualified due to ICB/CCB/PB contamination are specified in Table 5.4-3C.

The results for total and dissolved thallium were blank-qualified in one sample, total chromium was blank-qualified in one sample, total iron was blank-qualified in one sample, dissolved iron was blank-qualified in three samples, dissolved manganese was blank-qualified in two samples, and total zinc was blank-qualified in eight samples.

Approximately 2.1 percent of metals data were estimated due to blank qualification. As the affected results were all below the action levels specified in the Final Work Plan for this project for metals in water, blank contamination is not expected to significantly affect the project objectives for metals.

#### **5.4.1.4.3 Blank Results for EPA Method SW8015 for TEPH**

Method blanks were analyzed for each matrix as applicable. No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

#### **5.4.1.4.4 Blank Results for EPA Method SW8081A for Pesticides**

Method blanks were analyzed for each matrix as applicable. No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

#### **5.4.1.4.5 Blank Results for EPA Method SW8260B for VOCs**

Method blanks were analyzed for each matrix as applicable. No volatile contaminants were found in the method blanks, with the exceptions presented in Table 5.4-3D. No contaminant concentrations were found in the trip, equipment, and source water blanks, with the exceptions presented in Table 5.4-3E. Bold highlight in the tables indicates that associated non-blank field sample results were blank-qualified for this compound. All other field sample concentrations were either not detected or were significantly greater (>5X blank contaminants, >10X for common contaminants) than the concentrations found in the associated blanks. Trip blanks were either identified by use of the prefix "TB." Samples were identified as equipment blanks by use of the suffix "K." Sample SRC-4 was a source water sample. All other associated samples are field samples.

Sample concentrations were compared to the maximum contaminant concentrations detected in the blanks. Sample results qualified due to blank contamination are specified in Table 5.4-3F. Results for acetone in one groundwater sample were blank-qualified due to laboratory blank results. Low level results for methylene chloride in two equipment blank samples and one source water sample were blank-qualified as common laboratory contaminants, as presented in Table 5.4-3G. Samples identified as field blanks should not be blank-qualified. No other results for VOCs were blank-qualified.

Results for MEK, generally considered to be a common laboratory contaminant according to EPA Region IX data validation guidelines, have not been blank-qualified for common laboratory contamination by the validators for this project. MEK was reported in one equipment blank, and MEK was reported in samples MW-4A and MW-4A/A at concentrations less than 10 times the concentration in the equipment blank. However, the results were not blank-qualified as the equipment blank was from the preceding date, and was not technically associated with the specified field samples. Although not qualified for common laboratory contamination, the low concentration results for MEK in samples MW-4A and MW-4A/A should be considered as potential laboratory artifacts.

Approximately 0.04 percent of the VOC data were blank-qualified. The reported concentration of acetone blank-qualified in one water sample was 320 times lower than the action level specified in the DQOs. Therefore, blank contamination does not significantly affect the project objectives for this analytical method.

#### **5.4.1.4.6 Blank Results for EPA Method SW8310 for PAHs**

Method blanks were analyzed for each matrix as applicable. No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

#### **5.4.1.4.7 Blank Results for EPA Method SW8330 for Explosives**

Method blanks were analyzed for each matrix as applicable. No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

#### **5.4.1.4.8 Blank Results for EPA Method SW8330M for PETN and Nitroglycerin**

The analyses of PETN and nitroglycerin were included in the analyses of explosives by EPA Method SW8330. Method blanks were analyzed for each matrix as applicable. No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

#### **5.4.1.5 SYSTEM MONITORING COMPOUNDS (SURROGATES)**

Surrogate standards are used in most organic analyses to help evaluate the accuracy of the data collected. Surrogates are compounds that are not included in the target analyte list and are not expected to be present in environmental samples. A known concentration of the surrogate compound is added to all standards, blanks, and samples (including field and laboratory QC samples) before preparation and analysis, and the recovery of the compound is compared to control limits specified in the QAPP for each organic method to evaluate the performance of the analytical system and determine if there is any matrix interference affecting the method performance. The surrogate compounds and acceptance criteria for each method and matrix are shown in Table 3.2-4 of the QAPP. Samples with unacceptable surrogate recoveries were reanalyzed, and if the results of the reanalysis were still outside the limits, the problem was attributed to matrix effects if acceptable surrogate recoveries were obtained in the method blank and laboratory control sample (LCS) analyses.

If surrogate recoveries did not meet the specified criteria, the data were qualified as follows. Non-detected results for samples with surrogate recoveries less than 10 percent were qualified as rejected (R) and detected results for samples with surrogate recoveries less than 10 percent were qualified as estimated (J-). Results for samples with surrogate recoveries less than the lower control limit (LCL) but greater than 10 percent were qualified as estimated (J/UJ) and detected results for samples with surrogate recoveries greater than the upper control limit (UCL) were qualified as (J+).

No data were qualified due to surrogate recoveries outside of specified control limits.

#### **5.4.1.5.1 Surrogate Recoveries for EPA Method SW8015 for TEPH**

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

#### **5.4.1.5.2 Surrogate Recoveries for EPA Method SW8081A for Pesticides**

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

#### **5.4.1.5.3 Surrogate Recoveries for EPA Method SW8260B for VOCs**

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

#### **5.4.1.5.4 Surrogate Recoveries for EPA Method SW8310 for PAHs**

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits, with the exceptions presented in Table 5.4-4A. The original analyses for the specified samples were used for reporting purposes, so the affected results were not used. No data used for reporting purposes were qualified due to surrogate recoveries.

#### **5.4.1.5.5 Surrogate Recoveries for EPA Method SW8330 for Explosives**

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

#### **5.4.1.5.6 Surrogate Recoveries for EPA Method SW8330M for PETN/Nitroglycerin**

The analyses of PETN and nitroglycerin were included in the analyses of explosives by EPA Method SW8330. Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

#### **5.4.1.6 INTERNAL STANDARDS**

For GC/MS analyses by EPA Method SW8260B, internal standard area counts were monitored to ensure that GC/MS sensitivity and response were stable during the analysis. For EPA Methods SW8260B, the area counts of the internal standards in the sample must fall within 50 to 200 percent of the internal standard area counts in the calibration verification standard for the 12 hour tune period. In addition, the retention times of the internal standards in the sample must be within  $\pm 30$  seconds of the retention times in the calibration standard. Non-detected results associated with extremely low internal standard area counts (less than 25 percent) or internal area counts abruptly dropping off indicating severe loss of sensitivity were qualified as rejected (R). Results associated with area counts not within the 50 to 200 percent control limits were qualified as estimated (J/UJ).

No data were qualified due to internal standard problems, as presented in the following sub-section.

##### **5.4.1.6.1 Internal Standards for EPA Method SW8260B for VOCs**

All internal standard peak areas and retention times were within QC limits

#### **5.4.1.7 MATRIX SPIKE/MATRIX SPIKE DUPLICATES**

Matrix-specific accuracy was evaluated using matrix spike/matrix spike duplicate (MS/MSD) recoveries. Matrix spike samples are actual environmental samples spiked with known concentrations of analytes

which are processed like regular samples. The MS/MSD recoveries are indicators of interference specific to the sample matrix. Such interference includes the possibility of instrument response suppression or enhancement due to chemical or physical interference and digestion or extraction efficiency for the sample matrix. When MS/MSD recoveries are outside the control limits and LCS results are acceptable, matrix related interference is indicated. Acceptance criteria for MS/MSD recoveries were established for each method by matrix, and are shown in Table 3.2-2 of the QAPP.

Organic data are not generally qualified for MS/MSD results alone according to the Functional Guidelines and EPA Region IX data validation protocols. For this project, organic results were qualified in the parent QC sample for analytes with recoveries not within QC limits, as specified in the QAPP. If MS/MSD recoveries did not meet the specified criteria, the data were qualified as follows. Non-detected organic results in the QC sample were qualified as rejected (R) for MS and/or MSD recoveries less than 10 percent. Non-detected inorganic results associated with MS/MSD recoveries less than 30 percent were qualified as rejected (R). Non-detected results associated with MS/MSD recoveries less than the LCL but greater than 10 percent for organics or 30 percent for inorganics were qualified as estimated (UJ). Detected results associated with MS/MSD recoveries less than the LCL were qualified as estimated (J-). Detected results associated with MS/MSD recoveries greater than the UCL were qualified as estimated (J+).

MS/MSDs were performed for every preparation and analytical batch for all of the soil and sediment analyses, and for the aqueous metals analyses, as adequate volumes of sample were available. MS/MSDs were performed for the soil samples analyzed by SW8330 at a frequency of 1:18; for the sediment samples analyzed for methyl mercury by FGS-070.1 and total mercury by SW7471A at frequencies of 2:20; for the metals analyses of groundwater samples by SW6010B and SW7470A at frequencies of 5:16 and 6:16, respectively (including field duplicate and replicate samples). However, for those aqueous organic analyses for which MS/MSDs required the collection of additional containers, the triple volumes of sample necessary to perform MS/MSD analyses could not be provided due to low productivity of the wells. As the emphasis was on collecting enough water to analyze for each method, MS/MSDs could not be performed for every preparation and analytical batch. MS/MSDs were performed for the organic aqueous methods at a frequency of one per 13 field samples and three field duplicate samples.

Approximately 0.2 percent of the data were estimated (J/UJ) and no data were rejected due to MS/MSD results outside of QC limits.

A summary and tables for the qualification of data by each analytical method due to MS/MSD recovery criteria are presented in the following sub-sections.

#### **5.4.1.7.1 MS/MSD for Methyl Mercury: Method FGS-070.1**

MS/MSD analyses were performed for each matrix as applicable. Percent recoveries were within QC limits.

#### **5.4.1.7.2 MS/MSD for EPA Methods SW6010B (Metals), and SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils)**

MS analyses were performed for each matrix as applicable. Percent recoveries were within QC limits, with the exceptions presented in bold in Table 5.4-5A. Detected results for aluminum in seven of 17 groundwater samples were estimated (J+) for recoveries greater than 125 percent. Approximately 0.7 percent of the metals data that were estimated and no data were rejected for matrix effects for MS recoveries. The possibility of high bias for aluminum does not adversely affect project objectives.

Duplicate sample analyses were performed for each matrix as applicable. RPDs were within QC limits, with the exception presented in Table 5.4-7 (refer to Section 5.4.1.9.1, below).

#### **5.4.1.7.3 MS/MSD for EPA Method SW8015 for TEPH**

MS/MSD analyses were performed according to method requirements, with the exceptions presented in Table 5.4-5B. Sample MW-1/K was an equipment blank. MS/MSD analyses are not required for equipment blanks as they do not represent an environmental matrix. For the remaining 14 groundwater samples specified in the table, there was no batch-specific MS/MSD. LCS/LCSD analyses were performed instead. MS/MSD was performed at a frequency of one per 13 field samples and three field duplicate samples with no qualification of data, exceeding the minimum of 1:20 samples specified in the QAPP. Inadequate sample volume in the wells prevented collection of the triple volumes required for MS/MSD analyses of more samples. The effect of no MS/MSD for every batch is not expected to significantly affect the quality of the data, as the MS/MSD performed adequately characterized the matrix.

MS/MSD analysis was performed for TEPH in sample MW-4A according to method requirements. MS/MSD recoveries were within specified criteria for the initial analysis of this MS/MSD, but were above the specified limits in the re-extraction and reanalysis, as presented in table 5.4-5C. As the original analyses were used for project reporting purposes and no data were qualified, there is no effect on the data.

#### **5.4.1.7.4 MS/MSD for EPA Method SW8081A for Pesticides**

MS/MSD analyses were performed according to method requirements, with the exceptions presented in Table 5.4-5D. With regard to the referenced comments from LDC DVRs 5341A3 and 5341B3, the initial analyses of the MS/MSD for QC sample MW-4A indicate that the sample was not spiked with target analytes. All recoveries for the associated LCS were acceptable, and the surrogate recoveries for the MS/MSD, as well as for the LCS, method blank, and all of the affected samples were within specified limits, indicating acceptable overall batch extraction efficiency and also indicating that the 0 percent MS/MSD recoveries were due to spiking failure, not to extraction or analytical deficiencies. Although the MS/MSD and all of the associated samples were re-extracted and reanalyzed with all QC results within specified control limits, the holding times were grossly exceeded (>2X). The acceptable re-extraction and reanalyses of the MS/MSD for sample MW-4A indicates no matrix interference, and no data were qualified for MS/MSD recoveries. As the batch extraction efficiency and analytical batch accuracy were demonstrated to be acceptable and the results for the reanalyses of these samples were the same as in the original analyses, the original results have been used for reporting purposes and are considered usable for decision-making purposes.

With regard to the remaining comments in Table 5.4-5D, samples MW-2/K and MW-1/K were equipment blanks and SRC-4 was a source water blank. MS/MSD analyses are not required for field blanks as they do not represent an environmental matrix. For the remaining 13 groundwater samples specified in the table, there was no batch-specific MS/MSD. LCS/LCSD analyses were performed instead. MS/MSD was performed at a frequency of one per 13 field samples and three field duplicate samples with no qualification of data, exceeding the minimum of 1:20 samples specified in the QAPP. Inadequate sample volume in the wells prevented collection of the triple volumes required for MS/MSD analyses of more samples. The effect of no MS/MSD for every batch is not expected to significantly affect the quality of the data, as the MS/MSD performed adequately characterized the matrix.

#### **5.4.1.7.5 MS/MSD for EPA Method SW8260B for VOCs**

MS/MSD analyses were performed according to method requirements, with the exceptions presented in Table 5.4-5E. Sample MW-1/K was an equipment blank, and samples with the prefix "TB" were trip blanks. MS/MSD analyses are not required for field blanks as they do not represent an environmental matrix. For the remaining 13 groundwater samples specified in the table, there was no batch-specific MS/MSD. LCS/LCSD analyses were performed instead. MS/MSD was performed at a frequency of one per 13 field

samples and three field duplicate samples with few outliers, exceeding the minimum of 1:20 samples specified in the QAPP. Inadequate sample volume in the wells prevented collection of the triple volumes required for MS/MSD analyses of more samples. The effect of no MS/MSD for every batch is not expected to significantly affect the quality of the data, as the MS/MSD performed adequately characterized the matrix.

MS/MSD analysis was performed for VOCs in sample MW-4A according to method requirements. All MS/MSD recoveries for this QC sample were within specified criteria, with the exceptions presented in Table 5.4-5F. The result for 2-butanone (MEK) in sample MW-4A was qualified as estimated (J+) in the specified QC groundwater sample due to high MS/MSD recoveries. Note that MEK is a potential laboratory contaminant, and the MS/MSD results for MEK in this sample may indicate high bias or the possibility of a false positive.

#### **5.4.1.7.6 MS/MSD for EPA Method SW8310 for PAHs**

MS/MSD analyses were performed according to method requirements, with the exceptions presented in Table 5.4-5G. Sample MW-1/K was an equipment blank. MS/MSD analyses are not required for field blanks as they do not represent an environmental matrix. For the remaining 11 groundwater samples specified in the table, there was no batch-specific MS/MSD. LCS/LCSD analyses were performed instead. MS/MSD was performed at a frequency of one per 13 field samples and three field duplicate samples with no qualification of data, exceeding the minimum of 1:20 samples specified in the QAPP. Inadequate sample volume in the wells prevented collection of the triple volumes required for MS/MSD analyses of more samples. The effect of no MS/MSD for every batch is not expected to significantly affect the quality of the data, as the MS/MSD performed adequately characterized the matrix.

MS/MSD analysis was performed for PAHs in sample MW-4A according to method requirements. All MS/MSD recoveries for this QC sample were within specified criteria.

#### **5.4.1.7.7 MS/MSD for EPA Method SW8330 for Explosives**

MS/MSD analyses were performed according to method requirements, with the exceptions presented in Table 5.4-5H. Sample MW-1/K was an equipment blank. MS/MSD analyses are not required for field blanks as they do not represent an environmental matrix. For the remaining 13 groundwater samples specified in the table, there was no batch-specific MS/MSD. LCS/LCSD analyses were performed instead. MS/MSD was performed at a frequency of one per 13 field samples and three field duplicate samples with few outliers, exceeding the minimum of 1:20 samples specified in the QAPP. Inadequate sample volume in the wells prevented collection of the triple volumes required for MS/MSD analyses of more samples. The effect of no MS/MSD for every batch of water samples is not expected to significantly affect the quality of the data, as the MS/MSD performed adequately characterized the matrix.

MS/MSD analysis was performed for explosives in groundwater sample MW-4A according to method requirements. All MS/MSD recoveries for this QC sample were within specified criteria, with the exceptions presented in Table 5.4-5I. The non-detected results for nitrobenzene, 2,6-dinitrobenzene, and 3-nitrotoluene in one groundwater sample were estimated (UJ) for high RPDs between the MS and MSD. The MS recovery for 3-nitrotoluene was higher than the UCL, all other MS/MSD recoveries were within specified criteria. The small number of qualifications of non-detected aqueous results for MS/MSD RPDs of 29-33 percent does not significantly affect project objectives.

The 18 soils samples analyzed by SW8330 were shipped, logged-in, batched, extracted, and analyzed together. There was one MS/MSD per 18 soil samples, and the 1:18 frequency meets all requirements in the QAPP. No soils data were qualified for MS/MSD recoveries.

#### **5.4.1.7.8 MS/MSD for EPA Method SW8330M for PETN and Nitroglycerin**

The analyses of PETN and nitroglycerin were included in the analyses of explosives by EPA Method SW8330. Please refer to Section 5.4.1.7.7. MS/MSD analyses were performed for each method according to method requirements. All MS/MSD recoveries were within specified criteria.

#### **5.4.1.8 LABORATORY CONTROL SAMPLE/LABORATORY CONTROL SAMPLE DUPLICATES (LCS/LCSD)**

Laboratory accuracy was evaluated using LCS recoveries. Laboratory control samples are reagent water or contamination-free soil or sand spiked with known concentrations of analytes which are processed like regular samples. Since LCSs are free of matrix interference, they are indicators of laboratory and method performance. Acceptance criteria for LCS recoveries were established for each method by matrix, and are shown in Table 3.2-3 of the QAPP.

When LCS/LCSD recoveries did not meet the specified criteria, the data were qualified as follows. Non-detected results associated with LCS recoveries less than 10 percent for organic analyses or less than 50 percent for metals analyses were qualified as rejected (R). Non-detected results associated with LCS recoveries less than the LCL but greater than 10 percent for organic analyses or 50 percent for metals were qualified as estimated (UJ). Detected results associated with LCS recoveries less than the LCL were qualified as estimated (J-). Detected results associated with LCS recoveries greater than the UCL were qualified as estimated (J+).

Approximately 3 percent of the data were qualified as estimated (J/UJ) due to LCS/LCSD results outside of QC limits. No results were rejected for LCS recoveries.

A summary and tables for the qualification of data by each analytical method due to LCS recovery criteria are presented in the following sub-sections.

##### **5.4.1.8.1 LCS for Methyl Mercury: Method FGS-070.1**

LCS analyses were performed for each matrix as applicable. Percent recoveries were within QC limits.

##### **5.4.1.8.2 LCS/LCSD for EPA Methods SW6010B (Metals), and SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils)**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries were within QC limits.

##### **5.4.1.8.3 LCS/LCSD for EPA Method SW8015 for TEPH**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits, with the exceptions presented in Table 5.4-6A. The results for TEPH as diesel, kerosene and unknown hydrocarbons in all 16 water samples, 2 equipment blanks, and one source water blank were estimated (J-/UJ) due to LCS/LCSD recoveries for diesel that were less than the LCL. Approximately 75 percent of the TEPH data were estimated. No results were rejected.

The LCS/LCSD results for motor oil in the same batches were acceptable, therefore, accuracy and precision were demonstrated to be acceptable for motor oil, and the motor oil results were not qualified. Results for kerosene and unknown hydrocarbons were qualified as estimated (UJ) in addition to diesel by the validation sub-contractor, LDC, due to the low diesel LCS recoveries, according to validation protocols followed by LDC. However, according to the Functional Guidelines and EPA Region IX data validation

protocols, LCSs for TEPH analysis are compound-specific. Therefore, only TPH as diesel should be qualified for diesel LCS recoveries outside of acceptance criteria. Using these criteria, the total qualifications for TEPH due to low LCS recoveries would be reduced from 75 percent to 25 percent.

The laboratory was contacted and asked to explain the non-compliance, and a non-conformance memorandum (NCM) was provided. According to the laboratory, the low recoveries for diesel were due to a deficiency in the diesel LCS spiking technique. The diesel spike was placed too high up the walls of the separatory funnel, and was not immediately mixed into the LCS. Thus, the diesel was allowed to sit on the surface and creep up the sides of the vessel, resulting in the loss of the more volatile diesel components. The less volatile motor oil components were not lost. The process does not apply to matrix spiking of samples, which are spiked in the sample containers prior to transfer to separatory funnels. Analysis of a series of LCSs subsequent to resolution of the problem demonstrated that changes in technique have brought the diesel recoveries into the acceptable range. For further details, please refer to the NCM presented in Attachment 7.

Although all of the samples were re-extracted and reanalyzed, the associated LCS/LCSDs for diesel in the first re-extracted batches were still non-compliant due to the spiking problem, which was not isolated and corrected until the last few re-extracted batches. All of the re-extractions grossly exceeded the holding time, so the results from the original analyses were used for project reporting purposes, with one exception. All of the results for TEPH were non-detected in both the original analyses and reanalyses, with the exception of one low concentration result for Unknown Extractable Hydrocarbons, which was reported in the reanalysis of sample MW-4, and was used for project reporting purposes.

It is unlikely that TEPH hydrocarbon recoveries would be significantly different for motor oil and diesel range hydrocarbons as a result of the extraction process, so although the diesel LCS/LCSD recoveries of 33-59%R were below the 60%LCL, the acceptable motor oil recoveries in the same batches demonstrate acceptable accuracy and precision for the TEPH analyses of these samples, and, together with the acceptable surrogate recoveries in the LCSs and samples, indicate that the low recoveries most likely were due to the spiking technique problem, as explained in the NCM. Therefore, the low LCS/LCSD recoveries for diesel and the high percentage of estimated TEPH data are usable in decision-making for project objectives, and are not expected to significantly affect the project objectives for these samples.

#### **5.4.1.8.4 LCS/LCSD for EPA Method SW8081A for Pesticides**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits, with the exceptions presented in Table 5.4-6B.

The non-detected results for six compounds in three of 16 groundwater samples were estimated (UJ) due to LCS/LCSD results outside of QC limits. Recoveries for these compounds were within QC limits for the LCS and LCSD, but the RPDs exceeded specified criteria. Estimated data are usable in decision-making for project objectives. The nature and number of the qualifications do not significantly affect project objectives.

#### **5.4.1.8.5 LCS/LCSD for EPA Method SW8260B for VOCs**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits, with the exceptions presented in bold in Table 5.4-6C. Non-detected results for vinyl acetate were qualified as estimated (UJ) in five groundwater samples, one equipment blank, and five trip blanks for a marginally high RPD between the LCS/LCSD recoveries, which were above the UCL. Non-detected results for dichlorodifluoromethane in three groundwater samples and three trip blanks were qualified as estimated (UJ) for LCS/LCSD recoveries marginally below the LCL. Vinyl acetate is not a chemical of potential concern at the project site. The small number of qualifications for dichlorodifluoromethane do not significantly affect project objectives.

#### **5.4.1.8.6 LCS/LCSD for EPA Method SW8310 for PAHs**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits, with the exceptions presented in Table 5.4-6D. The non-detected results for dibenz(a,h)anthracene in ten of 16 groundwater samples and one equipment blank were qualified as estimated (UJ) due to LCS/LCSD results outside of QC limits. The 53%Rs were marginally below the 55%R LCL. Estimated data are usable in decision-making for project objectives. The small number of qualifications for marginally low recoveries do not significantly affect project objectives.

#### **5.4.1.8.7 LCS/LCSD for EPA Method SW8330 for Explosives**

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits for all LCS analyses performed, with the exceptions presented in Table 5.4-6E.

Approximately 4.8 percent of the explosives data were qualified as estimated, and no data were rejected. The non-detected results for six compounds in six groundwater samples were qualified as estimated (UJ) due to LCS/LCSD %Rs that were within the acceptable range with RPDs of 21-31 percent that exceeded the 20 RPD criterion. Estimated data are usable in decision-making for project objectives. The small number and types of qualifications do not significantly affect project objectives.

#### **5.4.1.8.8 LCS/LCSD for EPA Method SW8330M for PETN and Nitroglycerin**

The analyses of PETN and nitroglycerin were included in the analyses of explosives by EPA Method SW8330. LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

#### **5.4.1.9 LABORATORY DUPLICATE PRECISION**

Laboratory precision was evaluated using the RPDs between results for the analysis of laboratory duplicate samples for inorganic analyses, and of MS/MSD results for organic analyses. In the event that MS/MSD analyses were not performed, LCS/LCSD results were evaluated. The RPDs were compared to the acceptance criteria specified for each method, analyte, and matrix in Table 3.2-2 of the QAPP for laboratory duplicate samples and MS/MSDs and Table 3.2-3 of the QAPP for LCS/LCSDs. If the RPDs did not meet the specified criteria, the data were qualified as estimated (J/UJ).

A summary and tables for the qualification of data by each analytical method due to laboratory precision criteria are presented in the following sub-sections.

##### **5.4.1.9.1 Laboratory Duplicate Precision for Inorganic Methods**

Duplicate sample analyses were performed for each matrix as applicable. RPDs were within QC limits for all laboratory duplicate analyses performed, with the exceptions presented in Table 5.4-7A. Results for aluminum were qualified as estimated (J/UJ) in three of 17 groundwater samples and two field blanks due to a 23 RPD that marginally exceeded the 20 RPD control limit. The possibility of precision marginally outside of project limits for aluminum does not significantly affect project objectives.

##### **5.4.1.9.2 Laboratory Duplicate Precision for Organic Methods**

For MS/MSD or LCS/LCSD RPDs outside of control limits, data qualification information is presented in Tables 5.4-5 and 5.4-6, respectively. The following non-compliance was noted for RPDs.

The SW8081 results for six compounds in three groundwater samples were estimated (J-/UJ) due to RPDs greater than 35 percent between the LCS/LCSD recoveries, which were within QC limits.

Non-detected results for vinyl acetate were qualified as estimated (UJ) in five groundwater samples, one equipment blank, and five trip blanks for a marginally high RPD between the LCS/LCSD recoveries, which were above the UCL. Vinyl acetate is not a chemical of potential concern at the project site.

The non-detected SW8330 results for six compounds in six groundwater samples were qualified as estimated (UJ) due to LCS/LCSD %Rs that were within the acceptable range with RPDs of 21-31 percent that exceeded the 20 RPD criterion.

The RPD exceedances were intermittent and generally marginally exceeded control limits. No distinct trends were apparent. Laboratory duplicate precision is not expected to adversely affect project objectives.

#### **5.4.1.10 ICP SERIAL DILUTION**

For inductively coupled plasma (ICP) analyses of metals by EPA Method SW6010B, a five-fold serial dilution of a representative sample was evaluated to determine if significant matrix interferences may be affecting the quality of the data. For analyte concentrations at least 50 times the instrument detection limit (IDL) in the undiluted QC sample used for serial dilution, the diluted and undiluted results must agree within  $\pm 10\%D$ . When analytes failed to meet this criterion, associated results are qualified as estimated (J/UJ). No data were qualified for serial dilution problems.

#### **5.4.1.11 ICP INTERFERENCE CHECK SAMPLE**

The ICP analysis of trace metals by EPA Method SW6010B requires the verification of the interelement and background correction factors by analysis of an ICP interference check sample (ICS) at the beginning and end of the analytical sequence or after every 8 hours, whichever is more frequent. Results for the analytes in the ICSA and ICSAB solutions must fall within  $\pm 20$  percent of their true values to demonstrate conformance. In addition, results for analytes not actually spiked into the ICSAB solution must be below the reporting detection limits (RDLs). Failure to meet the ICSA and ICSAB performance criteria results in the qualification of the data as estimated (J/UJ). No results were qualified for ICP interference.

#### **5.4.1.12 ANALYTE IDENTIFICATION**

Qualitative criteria for identifying target analytes have been established to minimize the possibility of reporting false positives and false negatives. Most of the identification criteria are directed toward ensuring that a compound is positively identified, and thus toward preventing false positives.

For GC/MS EPA Method SW8260B, compound identification is made based on comparison of the relative retention times (RRTs) of the chromatographic peaks for the sample and calibration standards, then on comparison of the sample mass spectra against reference mass spectra for each potential target compound. Positive identification is made when all of the following criteria are met: a) all ions present in the standard mass spectra at a relative intensity greater than 10 percent are also present in the sample mass spectra; b) the relative intensities of these ions in the standard and sample mass spectra agree to within 20 percent; c) all ions greater than 10 percent in the sample mass spectrum but not in the standard mass spectrum are accounted for; and d) the compound elutes within  $\pm 0.06$  RRT units of the RRT for that target compound in the calibration standards. Mass spectra for up to 10 peaks for SW8260B with RRTs not matching target compounds areas and with chromatographic peaks greater than 10 percent of the nearest internal standard peak areas are quantitated and compared to a computerized library of mass spectra. No TICs were reported for any sample.

Results for which compound or analyte identification is considered to be questionable were estimated and were qualified as estimated (J). Examples may include retention times for either column in GC methods not within specified limits, percent differences greater than 50 percent between primary and confirmation column results for GC, or other reasons a compound or analyte is believed to be misidentified.

The characterization of TEPH fuels by chromatographic pattern matching is a subjective process for environmental samples. Patterns may range from an excellent match with a calibration fuel to a mix of different fuels, weathered fuels, or random hydrocarbons. TEPH chromatograms for every sample were reviewed and characterized by the laboratory, LDC (the third party validators), and Earth Tech chemists in San Jose. A summary of the interpretations of the chromatographic patterns is presented in Table 5.4-8. All results reported as detections for specific TEPH fuels represent a reasonable characteristic match to the specified chromatographic fuel patterns, and may include inexact matches such as weathered fuels or additional peaks in the pattern. TEPH results that did not adequately match the fuel patterns of the standards were reported as Unknown Diesel or Motor Oil Range Hydrocarbons. These results do not represent kerosene, diesel, motor oil or other petroleum fuels as the chromatographic patterns indicate individual peaks or series of peaks not indicative of fuels.

#### **5.4.1.13 ANALYTE QUANTITATION**

Data validation for Level II data also includes a review of the quantitation performed by the laboratory to ensure the accuracy of all concentrations and detection limits reported. The raw data reviewed includes instrument generated quantitation reports, instrument logs, sample preparation sheets, extraction cleanup records, and chromatograms. Calculations for the RF, RRT, %RSD, %D, RPD, r, concentrations, detection limits, percent dry weight, and percent recoveries of surrogates and spikes, are verified for approximately 10 percent of the Level II data.

Results for which compound or analyte quantitation is considered to be questionable are qualified as estimated (J) indicating that the results may be quantitatively uncertain. Examples may include unaccountable differences in results between dilutions, related results which do not add up, percent differences greater than 25 between primary and confirmation column results for GC, results quantitated and reported from above the demonstrated calibration range of an instrument, or other reasons for quantitative uncertainty. None of the data were qualified due to quantitation results.

#### **5.4.1.14 REPORTING OF RESULTS AND DETECTION LIMITS**

All analytical results and reporting limits for the samples collected in this project were adjusted for dilutions resulting from the preparation procedures required by the method or to get the result for a compound or analyte within the calibration range of the instrument. The PQLs and MDLs were raised by the dilution factor when reported for diluted analyses.

The laboratories reported analytical results that were above the MDL but below the PQL. Such results were qualified as estimated (J) due to possible quantitative or qualitative uncertainty near the limits of detection, and do not indicate analytical problems or adversely affect project objectives.

For some analytes, the PQLs specified in Table 3.1-1 of the QAPP were not met, as presented in Table 5.4-9.

All PQLs for the inorganic methods met the requirements specified in the QAPP. All PQLs for the inorganic methods met project objectives.

All PQLs for the organic methods met the requirements specified in the QAPP, with the exceptions discussed below. The PQLs for two analytes for waters exceeded the PQLs specified in the QAPP for SW8260B.

A summary and tables for the PQLs and MDLS for each analytical method are presented in the following sub-sections.

**5.4.1.14.1 PQLs for Methyl Mercury: Method FGS-070.1**

All PQLs for methyl mercury met the requirements specified in the QAPP. The PQLs for methyl mercury met project objectives.

**5.4.1.14.2 PQLs for Inorganic Methods: SW6010B (Metals), SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils)**

All PQLs for the metals methods met the requirements specified in the QAPP. The metals PQLs met project objectives.

**5.4.1.14.3 PQLs for Organic Methods: EPA Method SW8015B (TEPH)**

For SW8015B for TEPH, all compounds met specified project PQLs. All PQLs for SW8015B met project objectives.

**5.4.1.14.4 PQLs for Organic Methods: EPA Method SW8081A for Pesticides**

For SW8081A for pesticides, all compounds met specified project PQLs. All PQLs for SW8081 met project objectives.

**5.4.1.14.5 PQLs for Organic Methods: EPA Method SW8260B (VOCs)**

All PQLs for VOCs met the requirements specified in the QAPP, with the exceptions specified in Table 5.4-9A. For SW8260B in water samples, the PQLs for vinyl acetate and 1,1,2-trichloro-1,2,2-trifluoroethane did not meet the PQLs specified in the QAPP.

For all water samples, the 1,1,2-trichloro-1,2,2-trifluoroethane PQL was reported at 2.0 ug/L, whereas the PQL is specified as 1.0 ug/L in the QAPP. The MDL of 1ug/L is at the PQL. For all water samples, the vinyl acetate PQL was reported at 10 ug/L, whereas the PQL is specified as 5 ug/L in the QAPP. The MDL of 1 ug/L is less than one half the PQL, so the laboratory could have reported results using the specified PQL. Vinyl acetate is not a chemical of potential concern at the project site. As results are reported down to the MDL, and the action levels specified in the Final Work Plan for this project (see Table 2.4-11) exceed the reported PQLs by a factor of 59,000 for 1,1,2-trichloro-1,2,2-trifluoroethane and a factor of 80 for vinyl acetate, there is no effect on the project objectives.

**5.4.1.14.6 PQLs for Organic Methods: EPA Method SW8310 (PAHs)**

For SW8310 for PAHs, all compounds met specified project PQLs. All PQLs for SW8310 met project objectives.

**5.4.1.14.7 PQLs for Organic Methods: EPA Methods SW8330 (Explosives) and SW8330M (PETN/Nitroglycerin)**

For SW8330M for PETN/nitroglycerin, all compounds met specified project PQLs. All PQLs for SW8330M met project objectives.

**5.4.1.15 METHOD COMPLIANCE AND ANALYTICAL PERFORMANCE**

In addition to the QC parameters discussed above, additional method and QC parameters were evaluated as part of the full data validation process. These parameters were used to assess the laboratories' performance and compliance with the analytical method requirements.

The laboratories met the performance criteria specified for each method, with the exceptions discussed for each QC parameter in subsections 5.4.1.1 through 5.4.1.14, above. As discussed in each subsection, data were qualified if the non-compliance adversely affected the sample results. In general, these non-compliances did not significantly affect the project objectives. The majority of the non-compliances were due to lack of MS/MSD analyses for individual analytical batches of groundwater samples, and to low LCS/LCSD recoveries of diesel. The non-compliances for LCS/LCSDs and MS/MSDs with respect to project environmental field samples are summarized below.

MS/MSDs were performed for every preparation and analytical batch for all of the soil and sediment analyses, and for the aqueous metals analyses, as adequate volumes of sample were available. MS/MSDs were performed for the soil samples analyzed by SW8330 at a frequency of 1:18; for the sediment samples analyzed for methyl mercury by FGS-070.1 and total mercury by SW7471A at frequencies of 2:20; for the metals analyses of groundwater samples by SW6010B and SW7470A at frequencies of 5:16 and 6:16, respectively (including field duplicate and replicate samples).

MS/MSDs were performed for the organic aqueous methods at a frequency of one per 13 field samples and three field duplicate samples. For these aqueous organic analyses, MS/MSDs require the collection of additional containers, and the triple volumes of sample necessary to perform MS/MSD analyses could not be provided due to low productivity of the wells. As the emphasis was on collecting enough water to analyze for each method, MS/MSDs could not be performed for every preparation and analytical batch. LCS/LCSDs were analyzed for the batches without MS/MSDs, therefore laboratory analytical accuracy and precision were adequately characterized for these batches. MS/MSD analyses were performed at a frequency in excess of 1:20 samples for each matrix, therefore, adequate MS/MSDs were performed to characterize the groundwater matrix. Surrogate recoveries were used to evaluate potential matrix interference in individual samples.

Note that the analysis of MS/MSDs is a matrix-specific QC parameter. Batch extraction efficiency and laboratory accuracy and precision are measured with LCS/LCSDs, which were performed for all of the specified batches, and the sample-specific information is measured by surrogate recoveries. The numbers of MS/MSDs allowed for the adequate characterization of matrix effects, and the MS/MSD non-compliances are not expected to affect data quality or project objectives. For further detail regarding MS/MSD frequencies, refer to Section 5.4.1.7.

The results for TEPH as diesel, kerosene and unknown hydrocarbons in all 16 water samples, 2 equipment blanks, and one source water blank were estimated (J-/UJ) due to LCS/LCSD recoveries for diesel that were less than the LCL. Approximately 75 percent of the TEPH data were estimated. No results were rejected. The LCS/LCSD results for motor oil in the same batches were acceptable, therefore, accuracy and precision were demonstrated to be acceptable for motor oil, and the motor oil results were not qualified. Results for kerosene and unknown hydrocarbons were qualified as estimated (UJ) in addition to diesel by

the validation sub-contractor, LDC, due to the low diesel LCS recoveries. Corrective actions were performed, including an investigation into the non-compliance and the generation of an NCM. For detailed discussion of the non-compliance, refer to Section 5.4.1.8.3.

Although the diesel LCS/LCSD recoveries of 33-59%R were below the 60%LCL, the acceptable motor oil recoveries in the same batches demonstrate acceptable accuracy and precision for the TEPH analyses of these samples, and, together with the acceptable surrogate recoveries in the LCSs and samples, indicate that the low recoveries most likely were due to the spiking technique problem, as explained in the NCM. Therefore, the low LCS/LCSD recoveries for diesel and the high percentage of estimated TEPH data are usable in decision-making for project objectives, and are not expected to significantly affect the project objectives for these samples.

These deviations from specified performance criteria affect the contractual completeness calculations. Refer to Section 5.7.2 for further discussion of contractual compliance.

#### **5.4.2 Field Quality Control**

Field QC samples specified in Sections 2 and 3 of the Work Plan include equipment blanks, source water samples, and field duplicate samples. In addition, split samples to be sent for analysis through different laboratories and by different agencies were collected for this project; however, none of the split samples were analyzed by the agencies.

The field quality control samples were collected during the non-OE RI as described in the following sections of Appendix C.

Replicate and duplicate samples: see Section C.13.1

Source water sampling: see Section C.13.2

Trip blanks, equipment blanks, filter blanks, and temperature blanks: see Section C.13.3

Field-designated matrix spike & matrix spike duplicate samples: see Section C.13.4.

The following field test equipment was used to obtain field groundwater data during the non-OE RI in the following sections of Appendix C.

Beckman pH/Temperature Meter: see Sections C.18.1 and C.18.3

YSI Model 33 Conductivity Meter: see Section C.18.2

HF Scientific DRT-15C Turbidimeter: see Section C.18.4.

In addition to the field test equipment listed above, a water level meter was used to collect water level measurements as described in Section C.18.5 of Appendix C.

Field instruments were calibrated at the beginning and end of each sampling day. The calibration information was recorded in the logbooks that accompanied each field instrument.

Decontamination procedures were implemented during drilling, well installation, and soil/sediment and water sample collection to prevent foreign contamination of samples and cross-contamination between sampling locations. Field equipment and personnel decontamination procedures implemented during the non-OE RI are discussed in Section C.19 of Appendix C.

Evaluation of the field QC samples for each parameter are presented in the following sub-sections.

#### 5.4.2.1 FIELD DUPLICATE SAMPLE PRECISION

Field duplicate and replicate samples were collected at an approximate frequency of 10 percent. The duplicate samples for waters were true field duplicates, collected from the same bailers at the same locations at the same times whenever possible. The duplicate samples for soils are considered to be field replicate samples, as defined in the QAPP. These samples were collocated samples, taken from adjacent borings or at consecutive depths. A summary of field duplicate and replicate samples for the data gaps 3 sampling event with frequency summaries is presented in Table 5.4-10.

In addition, the RI/FS project-wide goal for field duplicate and replicate samples was 10 percent. The frequencies for all methods for the interim, remedial, RAW, and data gaps 1, 2, and 3 investigations are presented in Table 5.4-11. The 10 percent goal was met for all methods and matrices with the minor exceptions of field replicate soil samples for PAHs by SW8270C and perchlorate by CADHS 300.0M. Seven samples were analyzed for PAHs by SW8270B in the interim investigation sampling event when the SW8310 analyses could not be reported due to severe interference. The analyses were rejected due to grossly exceeded holding times and the data were not used for reporting purposes. Samples were re-collected at eight locations, and analyzed for this method in the data gaps sampling event. Only the results for the eight recollected samples were used for project reporting purposes. Two field replicate samples for perchlorate planned for the RAW sampling event were not collected as planned. As perchlorate was not found anywhere at the project site and there is no evidence that perchlorate was used at the project site, the effect on the project objectives is not significant.

Field duplicate and replicate samples for the data gaps 3 sampling event were analyzed by all methods. RPD values were calculated, where possible, and compared to established acceptance criteria specified for each method, analyte, and matrix, as presented in Tables 3.2-2 and 3.2-3 of the QAPP. The RPD value is not defined for duplicate pairs for which one or both results are below PQL. For values less than five times the PQL, RPDs were not calculated. In these cases, results within one PQL for waters, or within two PQL for soils, are considered acceptable. RPDs below 40 percent for soils and 30 percent for waters generally represent good agreement. Data were evaluated but not qualified for field duplicate results.

Results for field duplicate and replicate samples were generally in agreement with each other, with the exceptions presented in the following sub-sections. For higher RPDs or otherwise notable disagreement between replicates, soil sample heterogeneity is generally the cause. Most of the outliers are within normal parameters for the methods, and the quality of the data is not expected to be affected. Precision assessment for detected field duplicate and replicate results is presented in Table 5.4-12.

A summary and tables with detected results for field replicate pairs by each analytical method are presented in the following sub-sections. Results for samples for which all results were non-detected are not included in the tables as such results are within specified limits.

##### 5.4.2.1.1 *Field Duplicates for Methyl Mercury: Method FGS-070.1*

Precision assessment for detected field replicate results is presented in Table 5.4-12A. Results exceeding duplicate precision criteria are highlighted in bold in the table. Although field replicate results for both replicate pairs exceeded 40 RPD, the results for each replicate pair were within 0.75 µg/kg (less than one part per billion). The method is extremely sensitive, and the concentrations reported are so low that very slight changes in the make-up of the collocated sediment samples can account for such minor variations in concentration. Field duplicate precision is not expected to adversely affect project objectives for this method.

**5.4.2.1.2 Field Duplicates for EPA Methods SW6010B (Metals), SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils)**

Precision assessment for detected field duplicate and replicate results is presented in Table 5.4-12B. Results exceeding duplicate precision criteria are highlighted in bold in the table. Field duplicate results for aluminum and iron exceeded the 20 RPD criterion in two field duplicate groundwater sample pairs. Field duplicate precision is not expected to adversely affect project objectives for these methods.

**5.4.2.1.3 Field Duplicates for EPA Method SW8015 for TEPH**

Precision assessment for detected field duplicate results is presented in Table 5.4-12C. Field replicate results for all compounds met the specified criteria. Although the results for kerosene in the reanalysis of field duplicate pair MW-4A and MW-4A/A had a difference greater than the PQL, the results for the initial analyses, which were used for project reporting purposes, had a difference less than the PQL. The results for the four analyses demonstrate overall consistent low concentration results at three-to-five times the PQL for this duplicate pair, indicating acceptable field and method precision.

**5.4.2.1.4 Field Duplicates for EPA Method SW8081A for Pesticides**

Field duplicate results were within specified criteria. All results for pesticides were non-detected. Field duplicate precision is not expected to adversely affect project objectives for this method.

**5.4.2.1.5 Field Duplicates for EPA Method SW8260B for VOCs**

Field replicate results were within specified criteria. All results for this method were non-detected or within specified criteria (see Table 5.4-12D). Field duplicate precision is not expected to adversely affect project objectives for this method.

**5.4.2.1.6 Field Duplicates for EPA Method SW8310 for PAHs**

All results for PAHs in field replicate samples were non-detected. Field replicate precision is not expected to adversely affect project objectives for this method.

**5.4.2.1.7 Field Duplicates for EPA Method SW8330 for Explosives**

All results for explosives in field replicate samples were non-detected. Field replicate precision is not expected to adversely affect project objectives for this method.

**5.4.2.1.8 Field Duplicates for EPA Method SW8330/8332 (SW8330M) for PETN and Nitroglycerin**

All results for PETN and nitroglycerin in field replicate samples were non-detected. Field duplicate precision is not expected to adversely affect project objectives for this method.

**5.4.2.2 TRIP AND EQUIPMENT BLANKS**

Review of the results for trip and equipment blanks (including source water blanks) indicates no detections greater than the PQL, with the exceptions presented in Table 5.4-3. Most equipment blank detections are either non-detected or less than one half the practical quantitation limits (PQLs). Results for potassium and thallium were blank-qualified in one of 16 groundwater samples and zinc was blank-qualified in three dissolved metals and two total metals groundwater samples. Methylene chloride, acetone, and 2-butanone (MEK) were reported in three, two, and one field blank, respectively. All three are considered to be

common laboratory contaminants. No associated data were qualified. Discussion of all blank results is presented in Section 5.4.1.4 of this QCSR.

Trip, equipment, and source water samples were collected and analyzed according to the requirements specified in Sections 2 and 3 of the Work Plan and in the RAW. Trip, equipment, and source water blank contamination is not expected to adversely affect the project objectives as no significant contamination was reported.

#### **5.4.2.3 QUALITY ASSURANCE SPLIT SAMPLES**

Split samples to be sent for analysis through different laboratories and by different agencies were not planned or collected for the data gaps 3 investigation.

#### **5.4.3 PE Samples**

PE samples were provided to the analytical laboratories as specified in Section 3.3.2.3 of the QAPP. PE samples are samples of known concentrations of project target analytes provided to the laboratory to assess laboratory accuracy. PE samples are provided in a manner such that the laboratory knows the samples are for evaluation purposes but does not know the concentrations (single blind), or disguised as a project field sample so the laboratory is not aware the sample is for evaluation and does not know the concentrations (double blind). PE samples of a solid matrix were used to evaluate analyses for some methods. Such samples were submitted single blind, as soil samples cannot be readily submitted double blind. Otherwise, double blind aqueous PE samples were used to evaluate the ability of the laboratory to accurately perform analytical methods. The results for all PE samples for all phases of the project are presented in Attachment 2.

For QES/STL, solid PE samples were provided at the start of the remedial investigation sampling event for EPA Methods SW6010B, SW7471A, SW9060, and 300.0. All PE sample results for QES/STL were within specified criteria. In addition, Earth Tech provides QES/STL with double blind aqueous PE samples for many methods on a semi-annual basis. All QES/STL PE sample results were acceptable in 1999. Earth Tech provided additional PE samples to QES/STL for the remedial, data gaps, and RAW investigations as this laboratory was performing additional analyses. The methods for which aqueous PE samples were provided included EPA Methods SW6010B, SW7470A, SW8015 (diesel), SW8081A, SW8260B, SW8270CWM (chloropicrin), SW8310, and SW8330. Solid PE samples was provided for SW8015B (motor oil) and SW8082. All of the PE sample results were within the project accuracy control limits specified in Table 3.2-3 of the QAPP, with the following exceptions.

For EPA Method SW8310, an aqueous double blind PE sample was provided to the laboratory on March 30, 2000 with samples for the data gaps investigation, and an aqueous double blind PE sample and a soil PE sample were provided to the laboratory on May 30, 2000 with samples for the RAW investigation. All results were acceptable for the data gaps aqueous PE sample and for the soil PE sample. For the RAW investigation aqueous PE sample, a false negative was reported for acenaphthene. All other analytes were acceptable. As the 34 percent surrogate recovery was low for this PE sample, the PE sample was re-extracted past the extraction hold time and reanalyzed with an acceptable surrogate recovery. All results were acceptable with the exception of another false negative for acenaphthene. Acenaphthene was listed by the vendor as having been spiked slightly above the PQL. As the aqueous action level specified in the DQOs of the Work Plan for acenaphthene is 37 times the PQL and 28.5 times the spike concentration in the PE sample, the possibility of a false negative near the action limit is not implied for this compound and the PE result is not expected to have a significant impact on the project objectives. The 94 percent compliance for one PE sample and 100 percent compliance for two others for this laboratory (versus goal of 95 percent), demonstrate acceptable laboratory accuracy for this method.

For EPA Method SW8330, results for the March 30, 2000 aqueous double blind PE sample for all analytes were very good with the exception of tetryl with a 36%R. The true value for tetryl was below the PQL. A low concentration of TNT was accurately reported. Follow-up PE samples of one double blind aqueous sample and one single blind soil sample were provided to the laboratory on May 30, 2000. All results were acceptable for the soil PE sample. For the aqueous PE sample, all results were acceptable with the exception of a marginally low 61%R for 2,6-dinitrotoluene (vs 65%R LCL) for which the true value was one-fifth of the PQL. The results indicate acceptable performance by the laboratory for these analyses, especially at the PQL.

Although Caltest was not tested with PE samples prior to or during the data gaps 3 investigation sampling event for the Benicia project, documentation of excellent PE results for other projects performed in 1999 indicate acceptable performance by Caltest. In March, May, and December of 1999, Caltest had undergone extensive PE testings from institutions such as CA ELAP, USACE, and American Association for Laboratory Accreditation as part of the accreditation program with excellent results. Refer to Attachment 4. Note that the samples analyzed by Cal Test during the data gaps 3 investigation were not part of the data gaps 3 sampling plan.

No PE samples were available for methyl mercury. FGS is considered to be a leader in the field of low concentration analysis research for speciated mercury and provides their own reference standards as commercial standards are not available. FGS analyzed well-characterized fish tissue samples with every analytical run. The recoveries for these analyses were within specified project criteria.

The PE sample results for the remedial investigation analyses indicate acceptable accuracy by the participating analytical laboratories.

#### **5.4.4 Audits**

Audits were performed as specified in Section 3.3.2.3 of the QAPP. Discussion of field and laboratory audits are presented in the following subsections.

##### **5.4.4.1 FIELD AUDITS**

A field QA audit of the sampling activities at the project site was not conducted during the data gaps 3 investigation. Field QA audits of the sampling activities at the project site were conducted in accordance with the requirements of Section 3.3.2.3 of the Work Plan on December 9, 1999 and March 30, 2000 by William Knight, P.E. Mr. Knight is an Earth Tech project manager not associated with the project team. The field auditor observed that procedures and techniques were in accordance with the Work Plan and best professional standards. Specific issues identified during the audits were discussed with the Field Team Leader (FTL) during the audits. Responses for each issue were implemented by the FTL during the same day as the audits. More details are provided in the Field QA Audit Memoranda dated December 20, 1999 and March 30, 2000 included in Attachment 3.

##### **5.4.4.2 LABORATORY AUDITS AND CERTIFICATIONS**

Special analytical services for the analysis of methyl mercury was performed by Frontier Geosciences of Seattle, Washington according to proprietary Method FGS-070.1. Analytical services for all other methods were provided by Quanterra Incorporated (Quanterra) in West Sacramento, CA (QES/STL). Laboratory audits of the primary project laborator, QES/STL, were performed in accordance with the requirements of Section 3.3.2.3 of the Work Plan.

#### **5.4.4.2.1 Laboratory Audit of Quanterra Inc., West Sacramento, CA (QES/STL)**

Quanterra West Sacramento (QES/STL) is CA ELAP and USACE certified for the analyses performed for this project. See Attachment 4.

Earth Tech maintains an ongoing QA program for analytical work integral to all federal and DOD programs, including an annual audit program. The Earth Tech federal program audit team based in Long Beach, California performed an in-depth audit of the Quanterra West Sacramento facility, the primary fixed-base laboratory identified for this project, in September 1999, and again in June 2000. The audits were primarily performed for an Air Force Center for Environmental Excellence (AFCEE) project, and the audit team was accompanied by an AFCEE representative. The audits include a full report with response items and full closure of all action items, which have been filed with the EPA, and are included in Attachment 5.

As specified in Section 3.3.2.3 of the Work Plan, a follow-on project-specific cursory audit of QES/STL was performed by Debbie Masonheimer, an Earth Tech chemist and laboratory audit team member, while samples from this project were in-house. The audit focused on project-specific QC requirements, and found the laboratory to be meeting the requirements of the QAPP, with one exception. The laboratory implemented the finding, and the quality of the data is not expected to be affected. More details are provided in the Audit Report for Quanterra West Sacramento dated December 27, 1999, included in Attachment 5.

#### **5.4.4.2.2 Laboratory Audit of Frontier Geosciences, Seattle, Washington**

Frontier Geosciences is certified for proprietary method FGS-070.1 for the determination of methyl mercury by the State of Washington, which certifies proprietary methods; and for the determination of total mercury in wastewater by CA ELAP, which will only certify standardized US EPA methods. See Attachment 4.

Earth Tech was not able to audit FGS for the methyl mercury analyses of the 20 sediment samples for this project. FGS undergoes independent audits on an ongoing basis, including audits by Environmental Standards, Inc. for private evaluation, and the United States Department of Energy for federal evaluation. Please refer to Attachment 5.

Please note that the author of Method FGS-070.1, Nicolas Bloom, is the author and developer of EPA Draft Method 1630 for the determination of methyl mercury in water, and that FGS is in the forefront of method research and development for speciated mercury analyses.

### **5.5 ANALYTICAL PROCEDURES**

All analyses for this project were performed according to the analytical procedures and methods specified in Section 3.2.4.2 of the QAPP, with exceptions specified in the evaluations for each QC parameter in Section 4.4 of this QCSR. The analytical procedures fulfill the requirements for decision-making with respect to the project objectives.

### **5.6 CHEMICAL DATA QUALITY ASSESSMENT**

The data review and validation performed on the entire definitive-level data set, as well as the acceptable results for the PE samples, indicate the overall acceptability of the definitive-level data collected for this project. No data were qualified as rejected (R), and approximately 9.9 percent of the data were qualified as estimated (J/UJ). The remaining data met the data quality assurance objectives for accuracy, precision, sensitivity, and completeness specified in the QAPP. Data qualified with the "J" qualifier solely for reported

values less than the PQL but greater than the MDL are not included in the completeness calculations. These qualifiers are not related to the QC parameters, and do not affect the usability of the data.

The data review includes assessment for compliance with the data quality assurance objectives specified throughout the QAPP. This includes achievement of quality assurance objectives related to sample collection, handling, labeling, and custody; analytical methods and procedures; laboratory data reduction, validation, reporting, and management; data package and electronic deliverables verification, validation, and assessment; and documentation and reporting. The compliance with the quality assurance elements of the DQOs indicates a high level of confidence in the data, allowing the data to be used for its intended purposes within the constraints of the data qualifiers.

No data were qualified as "R" (rejected and considered unusable). Data qualified with the "J" qualifier are considered estimated and usable for limited purposes. The definitive-level data as presented are of acceptable quality and can be used to support the environmental decision-making and RI project objectives.

A summary of the data quality assessment for each analytical method is provided in the following subsections.

#### **5.6.1 Data Quality Summary for Method FGS-070.1**

Analyses were performed according to the method and requirements specified in the QAPP. None of the methyl mercury data were qualified as estimated or rejected.

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

Initial calibrations for method FGS-070.1 were performed according to method requirements. All correlation coefficients exceeded the 0.995 criterion, and all %Rs for the ICVs and CCVs met the 90-110 %R criteria.

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

MS/MSD analyses were performed as applicable. Percent recoveries and RPDs were within QC limits.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

Laboratory precision was acceptable.

Analysis met project specific PQLs.

Precision assessment for detected field replicate results is presented in Table 5.4-12A. Results exceeding duplicate precision criteria are highlighted in bold in the table. Although field replicate results for both replicate pairs exceeded 40 RPD, the results for each replicate pair were within 0.75 µg/kg (less than one part per billion). The method is extremely sensitive, and the concentrations reported are so low that very slight changes in the make-up of the collocated sediment samples can account for such minor variations in concentration. Note that similar variations in total mercury were noted in the field replicate samples from the same location. Field duplicate precision is not expected to adversely affect project objectives for this method.

Results for methyl mercury by Method FGS-070.1 are valid and usable for decision-making purposes. None of the methyl mercury data were qualified as estimated or rejected.

**5.6.2 Data Quality Summary for EPA Methods SW6010B (Metals), SW7470A (Mercury - Waters), and SW7471A (Mercury - Soils)**

Analyses were performed according to the methods and requirements specified in the QAPP. Approximately 2.6 percent of the metals data were qualified as estimated (J/UJ) and no data rejected (R) due to QC parameters.

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

Initial and continuing calibrations for EPA Methods SW6010B, and SW7470A for waters were performed according to method requirements, and met specified criteria.

The results for total and dissolved thallium were blank-qualified in one sample, total chromium was blank-qualified in one sample, total iron was blank-qualified in one sample, dissolved iron was blank-qualified in three samples, dissolved manganese was blank-qualified in two samples, and total zinc was blank-qualified in eight samples. Approximately 2.1 percent of metals data were estimated due to blank qualification. As the affected results were all below the action levels specified in the Final Work Plan for this project for metals in water, blank contamination is not expected to significantly affect the project objectives for metals.

MS analyses were performed for each matrix as applicable. Detected results for aluminum in seven of 17 groundwater samples were estimated (J+) for recoveries greater than 125 percent. The possibility of high bias for aluminum does not adversely affect project objectives.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries were within QC limits.

Duplicate sample analyses were performed for each matrix as applicable. RPDs were within QC limits for all laboratory duplicate analyses performed, with one exception. The results for aluminum were qualified as estimated (J/UJ) in three of 17 groundwater samples and two field blanks due to a 23 RPD that marginally exceeded the 20 RPD control limit. The possibility of precision marginally outside of project limits for aluminum does not significantly affect project objectives.

Serial dilution was performed according to method requirements and met specified criteria. No data were qualified due to serial dilution.

No results were qualified for ICP ICS results.

All PQLs for the metals methods met the requirements specified in the QAPP. The metals PQLs met project objectives.

Field duplicate results for aluminum and iron exceeded the 20 RPD criterion in two field duplicate groundwater sample pairs. All other field duplicate and replicate results were within specified criteria. Field duplicate precision is not expected to adversely affect project objectives for these methods.

All of the PE sample results were within the project accuracy control limits specified in Table 3.2-3 of the QAPP.

Results for metals by EPA Method SW6010B, SW7470A, and SW7471A are valid and usable for decision-making purposes. The numbers and types of qualifications for the metals data are not unusual for the methods and matrices involved. Estimated data are usable in decision-making for project objectives.

The estimation of 2.6 percent of the metals data is not expected to significantly affect the project objectives.

### **5.6.3 Data Quality Summary for EPA Method SW8015B for TEPH**

Analyses were performed according to the method and requirements specified in the QAPP. Approximately 75 percent of the TEPH data were qualified as estimated (J/UJ) and no data were qualified as rejected due to QC parameters.

All technical holding time requirements were met, with the exceptions presented in Table 5.4-1A. One detected result reported as "Unknown Extractable Hydrocarbons" that was used for reporting purposes was qualified as estimated (J-) due to holding time exceedance. The initial analysis of this sample, which was re-extracted and reanalyzed due to a low diesel LCS recovery, was non-detected. The remaining results from the original analyses of the specified samples were used for reporting purposes, so the results specified in the table were not used. No other data used for reporting purposes were qualified due to holding time or preservation requirements. The single qualification does not adversely affect project objectives.

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less than or equal to 20%RSD or correlation coefficient greater than or equal to 0.995 criteria, and all %Ds for the CCVs met the  $\pm 15\%D$  criterion.

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

MS/MSD analyses were performed according to method requirements; however, MS/MSDs could not be performed for every preparation and analytical batch. LCS/LCSD analyses were performed instead. MS/MSD was performed at a frequency of one per 13 field samples and three field duplicate samples with no qualification of data, exceeding the minimum of 1:20 samples specified in the QAPP. Inadequate sample volume in the wells prevented collection of the triple volumes required for MS/MSD analyses of more samples. The effect of no MS/MSD for every batch is not expected to significantly affect the quality of the data, as the MS/MSD performed adequately characterized the matrix.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits, with the exceptions presented in Table 5.4-6A. The results for TEPH as diesel, kerosene and unknown hydrocarbons in all 16 water samples, 2 equipment blanks, and one source water blank were estimated (J-/UJ) due to LCS/LCSD recoveries for diesel that were less than the LCL. Approximately 75 percent of the TEPH data were estimated. No results were rejected. The LCS/LCSD results for motor oil in the same batches were acceptable, therefore, accuracy and precision were demonstrated to be acceptable for motor oil, and the motor oil results were not qualified. Results for kerosene and unknown hydrocarbons were qualified as estimated (UJ) in addition to diesel by the validation sub-contractor, LDC, due to the low diesel LCS recoveries, according to validation protocols followed by LDC. However, according to the Functional Guidelines and EPA Region IX data validation protocols, LCSs for TEPH analysis are compound-specific. Therefore, only TPH as diesel should be qualified for diesel LCS recoveries outside of acceptance criteria. Using these criteria, the total qualifications for TEPH due to low LCS recoveries would be reduced from 75 percent to 25 percent.

The laboratory was contacted and asked to explain the non-compliance, and an NCM was provided. According to the laboratory, the low recoveries for diesel were due to a deficiency in the diesel LCS spiking technique. For further details, please refer to Section 3.4.1.8.3, and the NCM presented in Attachment 7.

Although all of the samples were re-extracted and reanalyzed, the results from the original analyses were used for project reporting purposes, with the exception of one low concentration result for Unknown Extractable Hydrocarbons, which was reported in the reanalysis of sample MW-4, and was used for project reporting purposes. It is unlikely that TEPH hydrocarbon recoveries would be significantly different for motor oil and diesel range hydrocarbons as a result of the extraction process, so although the diesel LCS/LCSD recoveries of 33-59%R were below the 60%LCL, the acceptable motor oil recoveries in the same batches demonstrate acceptable accuracy and precision for the TEPH analyses of these samples. Together with the acceptable surrogate recoveries in the LCSs and samples, and other acceptable QC for the initial analyses, the data indicate that the low diesel LCS recoveries most likely were due to the spiking technique problem, as explained in the NCM. Therefore, the low LCS/LCSD recoveries for diesel and the high percentage of estimated TEPH data are usable in decision-making for project objectives, and are not expected to significantly affect the project objectives for these samples.

For SW8015B for TEPH, all compounds met specified project PQLs. All PQLs for SW8015B met project objectives.

Field replicate results were within specified criteria. Field duplicate precision is not expected to adversely affect project objectives for this method.

TEPH chromatograms were reviewed for every sample by the LDC validators and by Earth Tech chemists in San Jose, and a summary of the interpretations of the chromatographic patterns is presented in Table 5.4-10. All results reported as detections for specific TEPH fuels represent a reasonable characteristic match to the specified chromatographic fuel patterns, and may include inexact matches such as weathered fuels or additional peaks in the pattern. TEPH results that did not adequately match the fuel patterns of the standards were reported as Unknown Diesel or Motor Oil Range Hydrocarbons. These results do not represent kerosene, diesel, motor oil or other petroleum fuels as the chromatographic patterns indicate individual peaks or series of peaks not indicative of fuels.

Results for TEPH by EPA Method SW8015B are valid and usable for decision-making purposes. Although 75 percent of the data for TEPH as diesel, kerosene and unknown hydrocarbon were estimated due to low LCS recoveries for diesel, it appears that the recoveries were due to a spiking technique error that would not affect the extraction and recovery of TEPH in samples. Refer to Section 5.4.1.8.3 for detailed discussion. The estimated TEPH data are usable in decision-making for project objectives, and are not expected to significantly affect the project objectives for these samples.

#### **5.6.4 Data Quality Summary for EPA Method SW8081A for Pesticides**

Analyses were performed according to the method and requirements specified in the QAPP. Approximately 4.5 percent of the pesticide data were qualified as estimated (J/UJ), and no data were rejected due to QC parameters.

All technical holding time requirements were met. No data used for reporting purposes were qualified due to holding time or preservation requirements.

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less than or equal to 20%RSD or correlation coefficient greater than or equal to 0.995 criteria, and all %Ds for the CCVs met the  $\pm 15\%$ D criterion.

MS/MSD analyses were performed according to method requirements; however, the initial MS/MSD for QC sample MW-4A was not spiked with target analytes. All recoveries for the associated LCS were acceptable, and the surrogate recoveries for the MS/MSD, as well as for the LCS, method blank, and all of the affected samples were within specified limits, indicating acceptable overall batch extraction efficiency and also indicating that the 0 percent MS/MSD recoveries were due to spiking failure, not to extraction or analytical deficiencies. The MS/MSD and all of the associated samples were re-extracted and reanalyzed beyond the extraction holding time. The acceptable re-extraction and reanalyses of the MS/MSD for sample MW-4A indicates no matrix interference, and no data were qualified for MS/MSD recoveries. As the batch extraction efficiency and analytical batch accuracy were demonstrated to be acceptable and the results for the reanalyses of these samples were the same as in the original analyses, the original results have been used for reporting purposes and are considered usable for decision-making purposes. MS/MSDs could not be performed for every preparation and analytical batch. LCS/LCSD analyses were performed instead. MS/MSD was performed at a frequency of one per 13 field samples and three field duplicate samples with no qualification of data, exceeding the minimum of 1:20 samples specified in the QAPP. Inadequate sample volume in the wells prevented collection of the triple volumes required for MS/MSD analyses of more samples. The effect of no MS/MSD for every batch is not expected to significantly affect the quality of the data, as the MS/MSD performed adequately characterized the matrix.

LCS/LCSD analyses were performed for each matrix for each matrix as applicable. Percent recoveries and RPDs were within QC limits, with the exceptions presented in Table 5.4-6B. The non-detected results for six compounds in three of 16 groundwater samples were estimated (UJ) due to 41-53 percent LCS/LCSD RPDs that exceeded the 35 RPD control limit. Recoveries for these compounds were within QC limits for the LCS and LCSD, but the RPDs exceeded specified criteria. Estimated data are usable in decision-making for project objectives. The nature and number of the qualifications do not significantly affect project objectives.

Laboratory duplicate precision was marginally exceeded for three samples for LCS/LCSD analysis. The small precision exceedance is not expected to significantly affect project objectives for this method.

For SW8081A for pesticides, all compounds met specified project PQLs. All PQLs for SW8081 met project objectives.

Field replicate results were within specified criteria. All results for this method were non-detected. Field duplicate precision is not expected to adversely affect project objectives for this method.

All of the PE sample results were within the project accuracy control limits specified in Table 3.2-3 of the QAPP.

Results for pesticides by EPA Method SW8081A are valid and usable for decision-making. The small numbers of qualifications for pesticides due to LCS/LCSD RPDs greater than 35 percent do not significantly affect the project objectives for these methods.

#### **5.6.5 Data Quality Summary for EPA Method SW8260B for VOCs**

Analyses were performed according to the method and requirements specified in the QAPP. Approximately 6.7 percent of the VOC data were qualified as estimated (J/UJ), and no data were rejected due to QC parameters.

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

Data qualification for initial calibrations resulted in the estimation (J/UJ) of results for acetone and vinyl acetate in all of the samples (16 groundwater samples, 18 trip blanks, two equipment blanks, and one source water blank). Results for acetone, 2-butanone (MEK), and, 2-chloroethylvinyl ether in all of the samples were qualified as estimated due to RRFs less than 0.05 but greater than 0.01. Data qualification for continuing calibrations resulted in the estimation (J/UJ) of results for dichlorodifluoromethane in five groundwater samples, six trip blanks, and one source water blank; and for acetone in one water sample, one equipment blank, and one trip blank. Results were qualified as estimated (J/UJ) for 2-hexanone in two groundwater samples, one source water sample, and three trip blanks, and for the same compounds in the same samples as in the initial calibrations due to low RRFs in the continuing calibrations. Approximately 6.6 percent of the SW8260B results were qualified as estimated and no data were rejected due to exceeded calibration criteria. More than half of the estimated data were for field blanks. Vinyl acetate and 2-chloroethylvinyl ether are not chemicals of potential concern at the project site. Estimated data are usable in decision-making for project objectives. The effect of the estimations for the small number of affected results on the project objectives is not significant.

Method blanks and field blanks were analyzed as applicable. The result for acetone in one groundwater sample was blank-qualified due to laboratory blank results. No other field sample results for VOCs were blank-qualified. Acetone is a demonstrated common laboratory contaminant, and the reported concentration of acetone in the blank-qualified sample was 320 times lower than the action level specified in the DQOs. Therefore, blank contamination does not significantly affect the project objectives for this analytical method.

Results for MEK, generally considered to be a common laboratory contaminant according to EPA Region IX data validation guidelines, have not been blank-qualified for common laboratory contamination by the validators for this project. MEK was reported in one equipment blank, and MEK was reported in samples MW-4A and MW-4A/A at concentrations less than 10 times the concentration in the equipment blank. However, the results were not blank-qualified as the equipment blank was from the preceding date, and was not technically associated with the specified field samples. Although not qualified for common laboratory contamination, the low concentration results for MEK in samples MW-4A and MW-4A/A should be considered as potential laboratory artifacts. Note that MEK was qualified for possible high bias due to high MS/MSD recoveries in QC sample MW-4A, further indicating possible laboratory contamination of this compound.

Surrogates were added to all samples and blanks, as required by the method. All surrogate recoveries were within QC limits.

All internal standard peak areas and retention times were within QC limits.

MS/MSD analyses were performed according to method requirements; however, MS/MSDs could not be performed for every preparation and analytical batch. LCS/LCSD analyses were performed instead. MS/MSD was performed at a frequency of one per 13 field samples and three field duplicate samples with few outliers, exceeding the minimum of 1:20 samples specified in the QAPP. Inadequate sample volume in the wells prevented collection of the triple volumes required for MS/MSD analyses of more samples. The effect of no MS/MSD for every batch is not expected to significantly affect the quality of the data, as the MS/MSD performed adequately characterized the matrix. MS/MSD analysis was performed for VOCs in sample MW-4A according to method requirements. All MS/MSD recoveries for this QC sample were within specified criteria, with the following exception. The result for 2-butanone (MEK) in sample MW-4A was qualified as estimated (J+) in the specified QC groundwater sample due to high MS/MSD recoveries. Note that MEK is a potential laboratory contaminant, and the MS/MSD results for MEK in this sample may indicate high bias or the possibility of a false positive.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits, with the following exceptions. Non-detected results for vinyl acetate were qualified as estimated (UJ) in 5 groundwater samples, one equipment blank, and 5 trip blanks for a marginally high RPD between the LCS/LCSD recoveries, which were above the UCL. Non-detected results for dichlorodifluoromethane in 3 groundwater samples and 3 trip blanks were qualified as estimated (UJ) for LCS/LCSD recoveries marginally below the LCL. Vinyl acetate is not a chemical of potential concern at the project site. The small number of qualifications for dichlorodifluoromethane do not significantly affect project objectives.

Level III review of the summary forms and Level IV review of the raw data and summary forms for GC/MS analyses by EPA Method SW8260B did not show any problems associated with correct analyte identification.

All PQLs for VOCs met the requirements specified in the QAPP, with the exceptions specified in Table 5.4-9B. For all water samples, the 1,1,2-trichloro-1,2,2-trifluoroethane PQL was reported at 2.0 ug/L, whereas the PQL is specified as 1.0 ug/L in the QAPP. The MDL of 1ug/L is at the PQL. For all water samples, the vinyl acetate PQL was reported at 10 ug/L, whereas the PQL is specified as 5 ug/L in the QAPP. The MDL of 1 ug/L is less than one half the PQL, so the laboratory could have reported results using the specified PQL. Vinyl acetate is not a chemical of potential concern at the project site. As results are reported down to the MDL, and the action levels specified in the Final Work Plan for this project (see Table 2.4-11) exceed the reported PQLs by a factor of 59,000 for 1,1,2-trichloro-1,2,2-trifluoroethane and a factor of 80 for vinyl acetate, there is no effect on the project objectives.

Field replicate results were within specified criteria. All results for this method were non-detected or within specified criteria.

Results for VOCs by EPA Method SW8260B are valid and usable for decision-making purposes. Approximately 6.6 percent of the SW8260B results were qualified as estimated due to exceeded calibration criteria, with small numbers of results qualified for MS/MSD and LCS/LCSD results (generally already qualified for the calibrations). More than half of the estimated data were for field blanks, and approximately half were for vinyl acetate and 2-chloroethylvinyl ether, which are not chemicals of potential concern at the project site. Non-conformances for PQLs do not affect the project objectives. Estimated data are usable in decision-making for project objectives. The effect of the estimations for the small number of affected results on the project objectives is not significant.

#### **5.6.6 Data Quality Summary for EPA Method SW8310 for PAHs**

Analyses were performed according to the method and requirements specified in the QAPP. Approximately 3.6 percent of the PAHs data were qualified as estimated (J/UJ) and no data were rejected due to QC parameters.

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less than or equal to 20%RSD or correlation coefficient greater than 0.995 criteria. Calibration verification was performed at required frequencies. Percent recoveries of amounts in continuing standard mixtures were within the 85-115 percent QC limits.

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

Surrogates were added to all samples and blanks as required by the method. No data used for reporting purposes were qualified due to surrogate recoveries.

MS/MSD analyses were performed according to method requirements; however, MS/MSDs could not be performed for every preparation and analytical batch. LCS/LCSD analyses were performed instead. MS/MSD was performed at a frequency of one per 13 field samples and three field duplicate samples with no qualification of data, exceeding the minimum of 1:20 samples specified in the QAPP. Inadequate sample volume in the wells prevented collection of the triple volumes required for MS/MSD analyses of more samples. The effect of no MS/MSD for every batch is not expected to significantly affect the quality of the data, as the MS/MSD performed adequately characterized the matrix. MS/MSD analysis was performed for PAHs in sample MW-4A according to method requirements. All MS/MSD recoveries for this QC sample were within specified criteria.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits, with the following exceptions. The non-detected results for dibenz(a,h)anthracene in ten of 16 groundwater samples and one equipment blank were qualified as estimated (UJ) due to 53%Rs that were marginally below the 55%R LCL. The small number of qualifications for marginally low recoveries do not significantly affect project objectives.

MS/MSD RPD exceedances were intermittent and generally marginally exceeded control limits. No distinct trends were apparent. Laboratory duplicate precision is not expected to adversely affect project objectives.

Level III review of the summary forms and Level IV review of the raw data and summary forms for HPLC analysis by EPA Method SW8310 did not show any problems associated with correct analyte identification.

For SW8310 for PAHs, all compounds met specified project PQLs. All PQLs for SW8310 met project objectives.

All results for PAHs in field replicate samples were non-detected. Field replicate precision is not expected to adversely affect project objectives for this method.

Results for PAHs by EPA Method SW8310 are valid and usable for decision-making purposes. Approximately 3.6 percent of the PAH data were estimated due to marginally low LCS/LCSD recoveries. Estimated data are usable in decision-making for project objectives. The small number of qualifications do not significantly affect project objectives.

#### **5.6.7 Data Quality Summary for EPA Method SW8330 for Explosives**

Analyses were performed according to the method and requirements specified in the QAPP. Approximately 7.6 percent of the explosives data were qualified as estimated (UJ) due to QC parameters. No results were rejected.

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

Initial calibrations were performed for the primary (quantitation) column and confirmation column according to method requirements. All %RSDs for the RFs met the less than or equal to 20%RSD or correlation coefficient greater than 0.995 criteria. Calibration verification was performed at the required frequencies. The %Ds for the CCVs met the less than or equal to 15%D criterion.

No contaminant concentrations were found above the reporting limit in the laboratory preparation blanks for this method. No contaminant concentrations were found above the reporting limit in the equipment blanks for this method.

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

MS/MSD analyses were performed according to method requirements; however, MS/MSDs could not be performed for every preparation and analytical batch for the groundwater samples. LCS/LCSD analyses were performed instead. MS/MSD was performed at a frequency of one per 13 field samples and three field duplicate samples with no qualification of data, exceeding the minimum of 1:20 samples specified in the QAPP. Inadequate sample volume in the wells prevented collection of the triple volumes required for MS/MSD analyses of more samples. The effect of no MS/MSD for every batch is not expected to significantly affect the quality of the data, as the MS/MSD performed adequately characterized the matrix. MS/MSD analysis was performed for explosives in groundwater sample MW-4A according to method requirements. All MS/MSD recoveries for this QC sample were within specified criteria, with the following exceptions. The non-detected results for nitrobenzene, 2,6-dinitrobenzene, and 3-nitrotoluene in one groundwater sample were estimated (UJ) for high RPDs between the MS and MSD. The MS recovery for 3-nitrotoluene was higher than the UCL, all other MS/MSD recoveries were within specified criteria. For the 18 soils samples analyzed by SW8330, the samples were shipped, logged-in, batched, extracted and analyzed together. There was one MS/MSD per 18 soil samples, and the 1:18 frequency meets all requirements in the QAPP. No soils data were qualified for MS/MSD recoveries. The small number of qualifications of non-detected aqueous results for MS/MSD RPDs of 29-33 percent does not significantly affect project objectives.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits for all LCS analyses performed, with the exceptions presented in Table 5.4-6E. Approximately 4.8 percent of the explosives data were qualified as estimated, and no data were rejected. The non-detected results for six compounds in six groundwater samples were qualified as estimated (UJ) due to LCS/LCSD %Rs that were within the acceptable range with RPDs of 21-31 percent that exceeded the 20 RPD criterion. Estimated data are usable in decision-making for project objectives. The small number of qualifications of non-detected aqueous results for LCS/LCSD RPDs of 21-31 percent does not significantly affect project objectives.

MS/MSD and LCS/LCSD RPD exceedances were intermittent and generally marginally exceeded control limits. No distinct trends were apparent. Laboratory duplicate precision is not expected to adversely affect project objectives.

Level III review of the summary forms and Level IV review of the raw data and summary forms for HPLC analysis by EPA Method SW8330 did not show any problems associated with correct analyte identification.

For SW8330 for explosives, all compounds met specified project PQLs. All PQLs for SW8330 met project objectives.

All results for explosives in field replicate samples were non-detected. Field replicate precision is not expected to adversely affect project objectives for this method.

For EPA Method SW8330, PE sample results for all analytes were very good with the exception of tetryl with a 36%R. The true value for tetryl was below the PQL. A low level of TNT was accurately reported. Follow-up PE samples of one double blind aqueous and one single blind soil samples were provided to the laboratory. All results were acceptable for the soil PE sample. For the aqueous PE sample, all results

were acceptable with the exception of a marginally low 61%R for 2,6-dinitrotoluene (vs 65%R LCL) for which the true value was one-fifth of the PQL. The results indicate acceptable performance by the laboratory for these analyses, especially at the PQL.

Results for explosives by EPA Method SW8330 are valid and usable for decision-making purposes. Approximately 7.6 percent of the explosives data were estimated for MS/MSD RPDs of 29-33 percent and LCS/LCSD RPDs of 21-31 percent. The small numbers of qualifications for explosives due to RPDs greater than 20 percent do not significantly affect the project objectives for this method.

#### **5.6.8 Data Quality Summary for EPA Method SW8330M for PETN and Nitroglycerin**

The analyses of PETN and nitroglycerin were included in the analyses of explosives by EPA Method SW8330. Analyses were performed according to the method and requirements specified in the QAPP. None of the PETN/nitroglycerin data were qualified as estimated or rejected.

All technical holding time requirements were met. No data were qualified due to holding time or preservation requirements.

Initial calibrations were performed according to method requirements. All %RSDs for the RFs met the less than or equal to 20%RSD or correlation coefficient greater than 0.995 criteria, and all %Ds for the CCVs met the less than or equal to 15%D criterion.

No contaminant concentrations were found above the reporting limit in the laboratory preparation and equipment blanks for this method.

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were within QC limits.

MS/MSD analyses were performed as applicable. Percent recoveries and RPDs were within QC limits.

LCS/LCSD analyses were performed for each matrix as applicable. Percent recoveries and RPDs were within QC limits.

Laboratory precision was acceptable.

For SW8330 for explosives and SW8330M for PETN/nitroglycerin, all compounds met specified project PQLs. All PQLs for SW8310 met project objectives.

All results for PETN and nitroglycerin in field duplicate and replicate samples were non-detected. Field duplicate precision adversely affect project objectives for this method.

Results for PETN and nitroglycerin by EPA Method SW8330M are valid and usable for decision-making purposes. None of the PETN/nitroglycerin data were qualified as estimated or rejected.

#### **5.7 COMPLETENESS SUMMARY**

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under correct, normal conditions. The overall assessment of completeness is the extent to which the database resulting from a measurement effort fulfills objectives for the amount of data required. Completeness is generally defined as the valid data percentage of the total tests requested.

Valid analyses are defined as those where the sample arrived at the laboratory intact, properly preserved, in sufficient quantity to perform the requested analyses, and accompanied by a completed COC form. Furthermore, the sample must be analyzed within the specified holding time and in such a manner that analytical QC acceptance criteria are met to the degree that the result is usable for decision-making purposes.

Completeness for the entire project also involves completeness of field and laboratory documentation, whether all samples and analyses specified in the FSP have been processed, and whether they were processed according to the procedures specified in the Work Plan and laboratory standard operating procedures (SOPs). Therefore, completeness is evaluated in terms of four goals which are discussed with regard to project goals in this section: field sampling completeness, contractual completeness, analytical completeness, and technical completeness. Field completeness is calculated for each method using the information presented in Table 5.3-1A, Table 5.3-1B, and Table 5.3-1C. The remaining completeness results are presented in Table 5.7-1.

The completeness goals are evaluated qualitatively as well as quantitatively. The quantitative evaluation of completeness is determined according to the foregoing definitions. The qualitative evaluation of completeness evaluates the impacts of each of the completeness goals on the DQOs for the project, including all events contributing to the sampling event and the effects of incomplete data.

A summary of completeness assessment for each analytical method is provided in the following subsections.

#### **5.7.1 Field Sampling Completeness**

Field sampling completeness is defined as the ratio of collected samples to the total number of samples planned. The goal for field completeness is 100 percent.

Results for samples planned, sampled, collected, and analyzed are presented in Table 5.3-1A, 5.3-1B, and 5.3-1C. All samples collected from August 3 through September 1, 2000 for this phase of the RI, known as the data gaps 3, are included. All field samples are marked with a "1" in the column for each method analyzed. Field QC samples are marked with an "X." Samples not successfully collected and analyzed are marked with a bold "M." In some cases, samples marked with an "M" were not required, as discussed below.

Field completeness for the data gaps 3 sampling event was 100 percent for all methods and matrices.

Note that for EPA method SW7471A for mercury, and Method FGS-070.1 for methyl mercury, two planned sediment samples WET-3/5 and WET-6/5 were marked with an "M" in Table 5.3-1C, as the samples could not be collected. The sampling crew experienced refusal due to bedrock when trying to advance the auger; therefore, the samples at five foot depth could not be collected. As the sediment matrix did not exist for these sample depths, and all other planned samples were collected and analyzed for these methods, field sampling completion is considered to be 100 percent.

Field completeness for this sampling event is acceptable for all methods. No further sampling is required to meet the project objectives for this stage of the investigation.

#### **5.7.2 Contractual Completeness**

Contractual completeness is defined as the ratio of contractually compliant sample analyses to the total number of tests requested of the laboratories. The goal for contractual completeness is 100 percent. In

addition, the goal for sample analyses within maximum holding time is 100 percent. All samples identified as critical to project decision-making objectives must meet 100-percent completeness.

Contractual completeness, as calculated by the LDC validators, is presented in column four of Table 5.7-1. Contractual non-compliances, noted in the LDC DVR tables with a "P" qualifier, are discussed below:

Contractual completeness for Method FGS-070.1, and EPA Methods SW6010B, SW7470A, SW7471A, SW8330M (nitroglycerin/PETN) were 100 percent. No samples were identified as critical.

Contractual completeness for EPA Method SW8015B for TEPH was calculated by LDC to be 31.6 percent. The following contractual non-compliances were noted. The results for TEPH as diesel, kerosene and unknown hydrocarbons in all 16 water samples, 2 equipment blanks, and one source water blank were estimated (J-UJ) due to LCS/LCSD recoveries for diesel that were less than the LCL. No results were rejected. The LCS/LCSD results for motor oil in the same batches were acceptable, therefore, accuracy and precision were demonstrated to be acceptable for motor oil, and the motor oil results were not qualified. Results for kerosene and unknown hydrocarbons were qualified as estimated (UJ) in addition to diesel by the validation sub-contractor due to the low diesel LCS recoveries. Although all of the samples were re-extracted and reanalyzed, the results from the original analyses were used for project reporting purposes, with the exception of one low concentration result for Unknown Extractable Hydrocarbons. It is unlikely that TEPH hydrocarbon recoveries would be significantly different for motor oil and diesel range hydrocarbons as a result of the extraction process, so although the diesel LCS/LCSD recoveries of 33-59%R were below the 60%LCL, the acceptable motor oil recoveries in the same batches demonstrate acceptable accuracy and precision for the TEPH analyses of these samples. Together with the acceptable surrogate recoveries in the LCSs and field samples, and other acceptable QC for the initial analyses, the data indicate that the low diesel LCS recoveries most likely were due to the spiking technique problem, as explained in the NCM. Therefore, the low LCS/LCSD recoveries for diesel and the high percentage of estimated TEPH data are usable in decision-making for project objectives, and are not expected to significantly affect the project objectives for these samples. For further details, please refer to Section 3.4.1.8.3, and the NCM presented in Attachment 7.

Contractual completeness for EPA Method SW8081 for pesticides was calculated by LDC to be 95.5 percent. The following contractual non-compliances were noted. The non-detected results for six compounds in three of 16 groundwater samples were estimated (UJ) due to 41-53% LCS/LCSD RPDs that exceeded the 35 RPD control limit. Recoveries for these compounds were within QC limits for the LCS and LCSD, but the RPDs exceeded specified criteria. The samples were re-extracted and reanalyzed past the extraction holding time, so the results from the original analyses were used for project reporting purposes. Estimated data are usable in decision-making for project objectives. The small number of qualifications do not significantly affect project objectives.

Contractual completeness for EPA Method SW8260B for VOCs was calculated by LDC to be 99.1 percent. The following contractual non-compliances were noted. Non-detected results for vinyl acetate were qualified as estimated (UJ) in 5 groundwater samples, one equipment blank, and 5 trip blanks for a marginally high RPD between the LCS/LCSD recoveries, which were above the UCL. Non-detected results for dichlorodifluoromethane in 3 groundwater samples and 3 trip blanks were qualified as estimated (UJ) for LCS/LCSD recoveries marginally below the LCL. Vinyl acetate is not a chemical of potential concern at the project site. Vinyl acetate and dichlorodifluoromethane are not specified in Table 3.2-3 of the QAPP as a controlling compounds, therefore, the analyses were not actually non-compliant. The small number of qualifications for dichlorodifluoromethane do not significantly affect project objectives. The aqueous PQL for 1,1,2-trichloro-1,2,2-trifluoroethane was reported at 2.0 ug/L, whereas the PQL is specified as 1.0 ug/L in the QAPP. The MDL of 1ug/L is at the PQL. The aqueous PQL for vinyl acetate was reported at 10 ug/L, whereas the PQL is specified as 5 ug/L in the QAPP. The MDL of 1 ug/L is less than one half the PQL, so

the laboratory could have reported results using the specified PQL. As results are reported down to the MDL, and the action levels specified in the Final Work Plan for this project (see Table 2.4-11) exceed the reported PQLs by a factor of 59,000 for 1,1,2-trichloro-1,2,2-trifluoroethane and a factor of 80 for vinyl acetate, there is no effect on the project objectives.

Contractual completeness for EPA Method SW8310 for PAHs was calculated by LDC to be 95.4 percent. The following contractual non-compliances were noted. The non-detected results for dibenz(a,h)anthracene in ten of 16 groundwater samples and one equipment blank were qualified as estimated (UJ) due to 53%Rs that were marginally below the 55%R LCL. Dibenz(a,h)anthracene is not specified in Table 3.2-3 of the QAPP as a controlling compound, therefore, the analyses were not actually non-compliant. The small number of qualifications for marginally low recoveries do not significantly affect project objectives.

Contractual completeness for EPA Method SW8330 for explosives was calculated by LDC to be 95.4 percent. The following contractual non-compliances were noted. The non-detected results for six compounds in six groundwater samples were qualified as estimated (UJ) due to LCS/LCSD RPDs of 21-31 percent that exceeded the 20 RPD criterion, although the %Rs were acceptable. Estimated data are usable in decision-making for project objectives. The small number of qualifications of non-detected aqueous results for LCS/LCSD RPDs of 21-31 percent does not significantly affect project objectives.

In addition, MS/MSDs could not be performed for every preparation and analytical batch for the aqueous organic analyses. LCS/LCSD analyses were performed instead. MS/MSD was performed at a frequency of one per 13 field samples and three field duplicate samples with no qualification of data, exceeding the minimum of 1:20 samples specified in the QAPP. Inadequate sample volume in the wells prevented collection of the triple volumes required for MS/MSD analyses of more samples. The effect of no MS/MSD for every batch is not expected to significantly affect the quality of the data, as the MS/MSD performed adequately characterized the matrix.

Overall, contractual completeness is considered to be acceptable for this phase of the investigation, as the resulting data qualifications allow for use of the qualified data in project decision-making. When assessing contractual completeness for methods that did not meet the 100 percent goal, the nature of the non-compliances, the resultant qualifications (if applicable), and the impact on the ability of the data set to meet the requirements for decision-making with respect to the project objectives must be considered. In general, contractual non-compliances were limited to problems such as lack of MS/MSDs for every preparation and analytical batch, and LCS %Rs or RPDs that exceeded specified criteria. Many of these contractual non-compliances calculated into the contractual completeness percentages are not non-compliant with the contractual requirements of the QAPP. Examples include when non-compliant analyses were not used for reporting purposes, low surrogate recoveries when re-extraction and/or reanalyses were performed as required, or qualified compounds not specified in Table 3.2-3 of the QAPP as controlling compounds. The effects of the individual non-compliances have been assessed in detail in the sections for QC assessment of each analytical QC parameter, and the effects have been determined not to be significant.

Thus, although the contractual completeness was not 100 percent for some methods, the data are usable for decision-making purposes. There were no samples with severely impacted (rejected) data. The effects of the contractual completeness issues did not significantly affect the ability of the data set to meet the requirements for decision-making with respect to the project objectives.

### **5.7.3 Analytical Completeness**

Analytical completeness is defined as the ratio of unqualified sample results to all sample results. Qualified results include both rejected and estimated results. The goal for analytical completeness is 90 percent. Analytical completeness is presented in column seven of Table 5.7-1 and is discussed below.

Analytical completeness of 90 percent or greater was achieved for Method FGS-070.1, EPA Methods SW6010B, SW7470A, SW7471A, SW8081A, SW8260, SW8310, SW8330, and SW8330M (nitroglycerin/PETN).

Analytical completeness for EPA Method SW8015B for TEPH was calculated to be 25 percent. The results for TEPH as diesel, kerosene and unknown hydrocarbons in all 16 water samples, 2 equipment blanks, and one source water blank were estimated (J-/UJ) due to LCS/LCSD recoveries for diesel that were less than the LCL. No results were rejected. The LCS/LCSD results for motor oil in the same batches were acceptable, therefore, accuracy and precision were demonstrated to be acceptable for motor oil, and the motor oil results were not qualified. Results for kerosene and unknown hydrocarbons were qualified as estimated (UJ) in addition to diesel by the validation sub-contractor due to the low diesel LCS recoveries. However, according to the Functional Guidelines and EPA Region IX data validation protocols, LCSs for TEPH analysis are compound-specific. Therefore, only TPH as diesel should be qualified for diesel LCS recoveries outside of acceptance criteria. Using these criteria, the total qualifications for TEPH due to low LCS recoveries would be reduced from 75 percent to 25 percent. Although the diesel LCS/LCSD recoveries of 33-59%R were below the 60%LCL, the acceptable motor oil recoveries in the same batches demonstrate acceptable accuracy and precision for the TEPH analyses of these samples. Together with the acceptable surrogate recoveries in the LCSs and samples, and other acceptable QC for the initial analyses, the data indicate that the low diesel LCS recoveries most likely were due to the spiking technique problem, as explained in the NCM. Therefore, the low LCS/LCSD recoveries for diesel and the high percentage of estimated TEPH data are usable in decision-making for project objectives, and are not expected to significantly affect the project objectives for these samples. For further details, please refer to Section 3.4.1.8.3, and the NCM presented in Attachment 7.

Overall, analytical completeness is considered to be acceptable for this phase of the investigation. When assessing analytical completeness for the method that did not meet the 90 percent goal, the nature of the qualifications and the impact on the ability of the data to meet the requirements for decision-making with respect to the project objectives must be considered. In general, data qualifications were not severe, and the resultant data are usable for decision-making purposes. There were no samples with severely impacted (rejected) data. The effects of the analytical completeness issues did not significantly affect the project objectives.

#### **5.7.4 Technical Completeness**

Technical completeness is defined as the ratio of usable sample results to all sample results. The goal for technical completeness is 95 percent. Usable results are results that are not rejected. Results qualified as estimated are considered usable unless the qualification compromises the ability of the result to be used for decision-making purposes.

Technical completeness is presented in column seven of Table 5.7-1. Technical completeness of 100 percent was achieved for all methods.

Technical completeness for this phase of the project is acceptable.

### **5.8 CONCLUSIONS AND RECOMMENDATIONS**

For the data gaps 3 investigation, approximately 9.9 percent of the definitive-level data were qualified as estimated and no definitive-level data were qualified as rejected for exceeding data quality criteria which include accuracy, precision, completeness, representativeness, comparability, and sensitivity. The remaining definitive-level data met the data quality criteria.

Of the estimated data, almost 50 percent of the qualifications were for field blank samples. In general, data qualifications were not severe, and the resultant data are usable for decision-making purposes. The data are considered to meet project objectives.

Data qualified with the "J" qualifier are considered estimated and usable for limited purposes. "J+" indicates the possibility that the result may be biased high, and that the actual chemical concentration may be lower than the reported result. "J-" indicates the possibility that the result may be biased low, and that the actual chemical concentration may be higher than the reported result or detection limit reported for a non-detected result. The "U" qualifier indicates that the result is non-detected at or above the detection limit specified, and is applied to all non-detected results.

The results of this data assessment indicate the definitive-level data collected for this project meet project objectives. The following recommendations should be considered for future sampling events.

The requirement that an MS/MSD be included in every preparation and analytical batch for this project was requested to be added to the QAPP by the reviewer for the USACE Sacramento District. The standard requirement for MS/MSD frequency is generally considered to be 1:20 samples to adequately characterize the potential for matrix interference for RI/FS projects. Although the more stringent requirement of one MS/MSD per batch is ideal, achievement of this frequency is not always possible, especially for water samples for this project due to limited availability of sample volume.

To perform MS/MSD analyses, triple volume of sample must be available to the samplers as well as to the laboratory. For water samples, a minimum of four sample containers must be collected for MS/MSDs to be performed for each analytical method, and five to nine containers is better so re-extractions and reanalyses can be performed if required. With as many as six analyses for this sampling event requiring one liter of aqueous sample, plus an additional method requiring smaller volumes, between 24 and 36 liters may be required from a sample location to provide adequate volume to perform an MS/MSD. Due to low productivity of the wells for this project, many wells had to be sampled on multiple days just to provide enough sample for each method. Thus, the laboratory was unable to perform an MS/MSD in every extraction and analytical batch due to the small numbers and volumes of water samples received and logged daily.

Note that the analysis of MS/MSDs is a matrix-specific QC parameter. Batch extraction efficiency and laboratory accuracy and precision are measured with LCS/LCSDs, and sample-specific matrix information is measured by surrogate recoveries. With careful planning, MS/MSDs can be performed at frequencies better than 1:20 for any method even when limited sample volumes prevent MS/MSDs from being analyzed with every batch, thus adequately characterizing the matrix. Therefore, it is recommended that the one MS/MSD per preparation and analytical batch be made a goal, with an overall minimum of 1:20 as a requirement.

Whenever possible, PQLs reported by the laboratory should meet the PQLs specified in the QAPP. In some cases, the laboratories reported results with PQLs that did not meet the QAPP, but did meet project objectives. Due to the rapid pace of this project, variances were not requested for the affected analytes. It is recommended that for future sampling events, variances be requested for such PQLs, or for other modifications to requirements, instead of providing technical assessments and justifications after the data are reported.

## 5.9 REFERENCES

Environmental Data Quality Management Program Specifications, United States Army Corps of Engineers (USACE) - Sacramento District, Draft Version 1.08 (1999)