

APPENDIX F
DATA VALIDATION REPORT

DATA VALIDATION REPORT

Analytical results for Sites 2 and 12, consisting of 22 Sample Delivery Groups (SDGs 073523, 074345, 074540, 071837, 072674, 072928, 073597, 074019, 074043, 074097, 074201, 074200, 074301, 074447, 074708, 071838, 072047, 072121, 072459, 072600, and 072975) were validated according to procedures specified in the Fort Ord QAPP (HLA, 1991), Revisions to the QAPP (HLA, 1992k), and Part 2 of the *Draft Site Characterization, Site 34 - Fritzsche Army Airfield Fueling Facility*, dated June 12, 1992. Because of the geographic proximity of these two sites, samples from both sites were batched and analyzed by the laboratory in the same SDGs. The quality of the data were evaluated with respect to a set of quality control (QC) criteria, including precision, accuracy, and completeness. The QC samples used to assess data quality consisted of laboratory duplicate samples, matrix spike/matrix spike duplicates (MS/MSDs), blank spike/blank spike duplicates (BS/BSDs), also known as laboratory control samples [LCS]), laboratory blanks, source water blanks, trip blanks, equipment rinsate blanks, and field duplicate samples. Holding times and laboratory surrogate spike recoveries were also evaluated. In addition, SDGs 071837 and 074301 underwent a detailed validation in which calibrations, internal standards, gas chromatography/mass spectrometry (GC/MS) tuning records, inductively coupled plasma (ICP) interference check samples (ICS), ICP serial dilution analysis, graphite furnace atomic absorption (GFAA), GFAA post-digestion spikes, and compound quantifications were evaluated. Results of the data validation are presented below.

F1.0 ANALYTICAL SUMMARY

During the 1993-1994 sampling event, 137 soil samples and 81 water samples, including associated field QC samples, were collected and submitted to Enseco for analysis. Table F-1 lists identifiers for the samples collected from Sites 2 and 12 between September 29, 1993 and March 15, 1994 and analyzed by Enseco between September 30, 1993 and April 14, 1994.

Analytical methods used for the samples included one or more of the following test methods. Not all samples were analyzed for the same set of parameters.

Organics:	EPA Test method 8010 - Halogenated Volatile Organics
	EPA Test method 8020 - Aromatic Volatile Organics
	EPA Test Method 8240 - Volatile Organic Compounds (VOCs)
	EPA Test Method 8270 - Semivolatile Organic Compounds (SOCs)
	Modified EPA Test Method 8080 - Polychlorinated Biphenyls (PCBs)
	Modified EPA Test Method 8015 - Total Petroleum Hydrocarbons (TPH) as Gasoline
	Modified EPA test Method 8015 - Total Petroleum Hydrocarbons (TPH) as Diesel
	EPA Test Method 415.1 - Total Organic Carbon
Inorganics:	EPA Test Method 6010/7000 - Metals
	EPA Test Method 6010 - Toxicity Characteristic Leaching Procedure (TCLP) Lead
	EPA Test Method 7196 - Hexavalent Chromium (CrVI)
	EPA Test Method 300.0 - Anions
	EPA Test Method SM2320 - Alkalinity
	EPA Test Method SM314A - Hardness
	EPA Test Method 160.1 - Total Dissolved Solids
	EPA Test Method 160.2 - Total Suspended Solids
	EPA Test Method 150.1/9045 - pH
	EPA Test Method 9081 - Cation Exchange Capacity
	EPA Test Method SM9221 - Fecal Coliform

F2.0 ORGANIC ANALYSES

This section summarizes the findings of the evaluation of the QC samples, including the detailed validation of SDGs 071837 and 074301.

F2.1 EPA Test Method 8010 - Halogenated Volatile Organics

- Holding times: Holding time criteria were met for all samples.
- Blanks: No analytes were detected in the laboratory method blanks. Three equipment blanks, one source water blank, and 15 trip blanks were collected. Chloroform was detected in an equipment blank associated with SDG 074345 and in a source water blank associated with SDG 074301. 1,1-Dichloroethene was detected in a trip blank associated with SDG 071838. Detected

results for these analytes were qualified as nondetected (U2) if they were reported at concentrations less than or equal to five times the concentration observed in the associated blank. The following sample results were affected:

- Chloroform in Samples 9408J12102F, 9408J02108F, and 9408J02108D.

- 1,1-Dichloroethene in Sample 9340S012053F.

- Surrogate recovery: The bromochloromethane surrogate recovery in Samples 9347S002247F and 9347G002008F were below the control limits, but above 30 percent. Therefore, the detected and nondetected results for these samples are qualified as estimated (J3) due to noncompliance with spike recovery criteria. The recovery in Sample 9341D12042F was above the control limits. Detected results for this sample are qualified as estimated (J3).

- BS/BSD: The recovery for trichloroethene in the BSD associated with SDG 072121 was above the control limit. Therefore, the following detected result is qualified as estimated due to noncompliance with BS/BSD recovery criteria:.
 - Trichloroethene in Sample 9342D12044F.

The relative percent difference (RPD) values were within control limits.

- MS/MSD: The recoveries for 1,1-dichloroethane and trichloroethene in the MS/MSD associated with SDG 074301 were below the control limits. The relative percent difference (RPD) values were within control limits. No qualification is necessary based on organic MS/MSD data alone.

- Field duplicates: Four field duplicate pairs were analyzed. The values were within control limits.

- Calibration: The instrument calibration was reviewed for SDG 074301 only. The initial calibrations were acceptable. The continuing calibration percent difference (%D) values (between -15 and -30 percent) were below the control limits for vinyl chloride, bromomethane, 1,1-dichloroethene, methylene chloride, Freon 113, carbon tetrachloride, trans-1,3-dichloropropene, dibromochloromethane, 1,2-dibromoethane, chlorobenzene, bromoform, cis-1,2-dichloroethene, tetrachloroethene, 1,1,1-trichloroethane, 1,2-dichloropropane, and chloroethane. Therefore the following detected and nondetected results are qualified as estimated (J7) due to noncompliance with continuing calibration criteria:
 - Bromomethane, 1,1-dichloroethene, methylene chloride, carbon tetrachloride, trans-1,3-dichloropropene, dibromochloromethane, 1,2-dibromoethane, chlorobenzene, and bromoform in Samples 9408I12001F, 9408I12002B, 9408I12003F, 9408I12005F, 9408I02006F, 9408I02007F, 9408I02008C, and 9408I02009F.

 - Cis-1,2-dichloroethene and tetrachloroethene in Samples 9408I12002B, 9408I12003F, 9408I12005F, 9408I02006F, 9408I02007F, 9408I02008C, and 9408I02009F.

 - Bromomethane and Freon 113 in Samples 9408J12096F, 9408J12097F, 9408J12099F, 9408J12100F, 9408J12101F, 9408I12001F, 9408I12002B, 9408I12003F, 9408I12004A, 9408I02010D, and 9408I02012A.

 - 1,1-dichloroethene, 1,1,1-trichloroethane, carbon tetrachloride, 1,2-dichloropropane, dibromochloromethane, 1,2-dibromoethane, tetrachloroethene, and chlorobenzene in Sample 9408J02102F.

- Chloroethane in Samples 9408I02009F, and 9408J12094D.
- Vinyl chloride in Samples 9408I12001F, 9408I12002B, 9408I12003F, 9408I12005F, 9408I12006F, 9408I12007F, 9408I12008C, 9408I12009F, and 9408J12094D.

The continuing calibration %D values (between +15 and +88 percent) were above the control limits for 1,1,1-trichloroethane, chloromethane, trans-1,2-dichloroethene, and cis-1,2-dichloroethene. Therefore the following detected results are qualified as estimated (J7) due to noncompliance with continuing calibration criteria:

- 1,1,1-trichloroethane in Samples 9408I12001F, 9408I12002B, 9408I12003F, 9408I12005F, 9408I02006F, 9408I02007F, 9408I02008C, and 9408I02009F.
- Chloromethane in Samples 9408J12096F and 9408I12004A.
- Trans-1,2-dichloroethene, and cis-1,2-dichloroethene in Sample 9408J02102F.

The continuing calibration %D values (between -30 and -50 percent) were below the control limits for Freon 113 and chloromethane. Therefore the following detected results are qualified as estimated (J7) and the nondetected results are qualified as rejected (R7) due to noncompliance with continuing calibration criteria:

- Freon 113 in Samples 9408I12001F, 9408I12002B, 9408I12003F, 9408I12005F, 9408I02006F, 9408I02007F, 9408I02008C, 9408I02009F, and 9408J02102F
- Chloromethane in Samples 9408I02009F, 9408I02010D, 9408I02012A, 9408J12099F, 9408J12100F, 9408J12101F, and 9408J12094D.

- Second column confirmation: Second column confirmation was reviewed for SDG 074301 only. Detected and nondetected compound results were equivalent on both primary and secondary column analyses.
- Result verification: This was reviewed for SDG 074301 only. No errors in quantification were encountered.

F2.2 EPA Test Method 8020 - Aromatic Volatile Organics

- Holding Times: Holding time criteria were met for all samples.
- Blanks: No analytes were detected in the laboratory method blanks. Three equipment blanks, 1 source water blank, and 13 trip blanks were collected. Toluene was detected in trip blanks associated with SDGs 071838, 072121, 072674, 072928, 073597, 074043, and 074201. Detected results for toluene were qualified as nondetected (U2) if they were reported at concentrations less than or equal to five times the concentration observed in the associated blank. The following sample results were affected:
 - Toluene in Samples 9342D12048F, 9347D02062F, 9347D02064F, and 9406G012051A.
- Surrogate recovery: The trifluorotoluene surrogate recovery in Samples 9341D12042F, 9346C002125F, 9347D02062F, 9408J12096F, 9408J12097F, 9408I12003F, 9408I02012A, 9408J02108F, 9408J02108D, 9406G012040D, and 9406G012050F were above the control limits. Therefore, the detected results for these samples are qualified as estimated (J3) due to noncompliance with spike recovery criteria.
- BS/BSD: The recoveries and RPD values were within control limits.

- MS/MSD: The recovery for toluene in the MSD associated with SDG 074301 was below the control limits. The recoveries for toluene in the MS/MSD associated with SDG 072674 was above the control limits. The RPD values were within control limits. No qualification is necessary based on organic MS/MSD data alone.
- Field duplicates: Four field duplicate pairs were analyzed. The values were within control limits.
- Calibration: The instrument calibration was reviewed for SDG 074301 only. The initial and continuing calibrations were acceptable.
- Second column confirmation: Second column confirmation was reviewed for SDG 074301 only. Detected and nondetected compound results were equivalent on both primary and secondary column analyses.
- Result verification: This was reviewed for SDG 074301 only. No errors in quantification were encountered.

F2.3 EPA Test Method 8240 - Volatile Organic Compounds (VOCs)

- Holding times: Holding time criteria were met for all samples.
- Blanks: Acetone was detected at less than five times the reporting limit in the method blanks associated with SDGs 071837, 072047, 072459, 072975, 074019, 074097, 074200, and 074708. Methylene chloride was detected at less than five times the reporting limit in the method blanks associated with SDGs 071837, 072047, 072459, 072600, 072975, 073523, 074019, 074097, 074200, and 074708. Acetone and methylene chloride are recognized as common laboratory contaminants. Methyl isobutyl ketone and 2-hexanone were detected below the reporting limit in

the method blanks associated with SDGs 074097 and 074200. Detected results for common laboratory contaminants were qualified as nondetected (U1) if they were reported at concentrations less than or equal to ten times the concentration observed in the associated blank. Detected results for the other analytes were qualified as nondetected (U1) if they were reported at concentrations less than or equal to five times the concentration observed in the associated blank. The following sample results were affected:

- Acetone in Samples 9339S12003F, 9339S12004F, 9339S12005F, 9339S012018F, 9339S012022F, 9339S012026F, 9341L012001F, 9341L012002F, 9341L012004F, 9344Z001202F, 9344Z001203F, 9348C012126F, 9406G012022F, 9406G012025F, 9406G012029F, 9406G012031F, 9406G012034F, 9406G012035F, 9406G012044F, 9406G012045F, 9406G012060F, 9406G012062F, 9411D012221F, 9411D012222F, 9411D012225F, 9411D012227F, and 9411D012230F.

- Methylene chloride in Samples 9341L012001F, 9341L012002F, 9341L012003F, 9341L012004F, 9341L012005F, 9344Z001203F, 9344Z001204F, 9344Z001205F, 9344Z001206F, 9345D12058F, 9348C012126F, 9348C012128F, 9348C012131F, 9348C012136F, 9348C012141F, 9348C012145F, 9348C012149F, 9348S12013F, 9348S12014F, 9348S12015F, 9349D12070F, 9349W012001F, 9349W012002F, 9349W012004F, 9349W012006F, 9402C012002D, 9402C012004B, 9402C012005F, 9402C012006F, 9402C000207F, 9402C002008F, 9402C002009A, 9402C002013F, 9402C002014A, 9402C002011F, 9402C002015F, 9402C002017B, 9402C012018F, 9406G012022F, 9406G012024F, 9406G012025F, 9406G012027F, 9406G012029F, 9406G012031F, 9406G012034F, 9406G012037F, 9406G012042F, 9406G012044F, 9406G012045F, 9406G012047F, 9406G012054F, 9406G012055F, 9406G012059F, 9406G012062F, 9406G012063F, 9406G012067F, 9407G012069F, 9407G012071F, 9407G012072F, 9407G012074F, 9407G012076F,

9411D012221F, 9411D012222F, 9411D012224F, 9411D012225F, 9411D012226F,

9411D012227F, 9411D012228F, 9411D012229F, and 9411D012230F.

Sample data for the other analytes were not affected, because the results were either nondetected or above five times the highest blank concentration.

Four equipment blanks, two source water blanks, and six trip blanks were collected.

Methylene chloride was detected in the equipment blank associated with SDG 071838 and in the source water blank and trip blank associated with SDG 073597. Detected results for methylene chloride were qualified as nondetected (U2) if they were reported at concentrations less than or equal to ten times the concentration observed in the associated blank. The following sample results were affected:

- Methylene chloride in Samples 9402C012021F, 9402C012023F, 9402C012024F, 9403D002012F, 9403D002014D, and 9403D002015F.
- Surrogate recovery: The bromofluorobenzene surrogate recovery in Sample 9341L012003F and the 1,2-dichloroethane-d4 recovery in Sample 9406G012055F were below the control limits but above 30%. Therefore, the detected and nondetected results for these samples are qualified as estimated (J3) due to noncompliance with spike recovery criteria.
- BS/BSD: The recoveries and RPD values were within control limits.
- MS/MSD: The recoveries and RPD values were within control limits.
- Field duplicates: One field duplicate pair was analyzed. The values were within control limits.

- Calibration: The instrument calibration was reviewed for SDG 071837 only. The initial calibrations were acceptable. The continuing calibration %D values (between +25 and +50 percent) were above the control limits for chloroethane, 1,2-dichloroethene, 1,1,1-trichloroethane, methyl isobutyl ketone, 1,1,2,2-tetrachloroethane, methyl ethyl ketone, and 2-hexanone. Therefore the following detected results are qualified as estimated (J7) due to noncompliance with continuing calibration criteria:

- Chloroethane, 1,2-dichloroethene, 1,1,1-trichloroethane, methyl isobutyl ketone, 1,1,2,2-tetrachloroethane in Samples 9339S12003F, 9339S12004F, 9339S12005F, 9339S12006F, 9339S012015F, 9339S012016F, 9339S012017F, 9339S012018F, 9339S012022F, 9339S012026F, 9339S012029F, and 9340S012052F.

The continuing calibration %D values (between +50 and +66 percent) were above the control limits for acetone. Therefore the following detected and nondetected results are qualified as estimated (J7) due to noncompliance with continuing calibration criteria:

- Acetone in Samples 9339S12003F, 9339S12004F, 9339S12005F, 9339S12006F, 9339S012015F, 9339S012016F, 9339S012017F, 9339S012018F, 9339S012022F, 9339S012026F, 9339S012029F, 9340S012052F, and 9339S012021F

The continuing calibration response factor (RF) value (0.026) was below the control limits for vinyl acetate. Therefore the following detected results are qualified as estimated (J7) and the nondetected results are qualified as rejected (R7) due to noncompliance with continuing calibration criteria:

- Vinyl acetate in Samples 9339S12003F, 9339S12004F, 9339S12005F, 9339S12006F, 9339S012015F, 9339S012016F, 9339S012017F, 9339S012018F, 9339S012022F, 9339S012026F, 9339S012029F, and 9340S012052F.
- GC/MS instrument performance: This was reviewed for SDG 071837 only. The ion abundances for the GC/MS instrument performance check were within control limits.
- Internal standards: This was reviewed for SDG 071837 only. The internal standard area counts and retention times were within the control limits.
- Result verification: This was reviewed for SDG 071837 only. No errors in quantification were encountered.

F2.4 EPA Test Method 8270 - Semivolatile Organic Compounds (SOCs)

- Holding times: Holding time criteria were met for all samples.
- Blanks: Diethylphthalate was detected at less than five times the reporting limit in the method blank associated with SDG 074019. Diethylphthalate is recognized as a common laboratory contaminant. Detected results for common laboratory contaminants were qualified as nondetected (U1) if they were reported at concentrations less than or equal to ten times the concentration observed in the associated blank. The following sample results were affected:
 - Diethylphthalate in Sample 9406G012029F.

No field-generated blanks were collected.

- Surrogate recovery: The nitrobenzene-d5 surrogate recovery in Sample 9345D12058F was below the control limits and below 10%. It was noted in the case narrative for SDG 072600 that problems with emulsification were encountered during the extraction of this sample. Therefore, the detected results for the base/neutral fraction of this sample are qualified as estimated (J3) and the nondetected results are qualified as rejected (R2) due to noncompliance with spike recovery criteria.
- BS/BSD: The BS/BSD recoveries for 2,4-dinitrotoluene and pentachlorophenol in SDG 072459, for pyrene in SDG 072600, for nitrosodipropylamine in SDG 072975, and for 1,4-dichlorobenzene and 2,4-dinitrotoluene in SDG 074708 were above the control limits. The RPD value for 4-chloro-3-methylphenol in SDG 074708 was above the control limit. Because all associated sample results were nondetected, no qualification is necessary.
- MS/MSD: The recovery for pentachlorophenol in the MS associated with SDG 072459 was above the control limit. The RPD values were within control limits. No qualification is necessary based on organic MS/MSD data alone.
- Field Duplicates: No field duplicates were collected.
- Calibration: The instrument calibration was reviewed for SDG 071837 only. The initial calibrations were acceptable. The continuing calibration %D values (between +25 and +50 percent) were above the control limits for 2,2'-oxybis(1-chloropropane), N-nitroso-di-n-propylamine, 2-nitroaniline, dimethylphthalate, 3-nitroaniline, dibenzofuran, diethylphthalate, fluorene, 4-nitroaniline, 4-chlorophenyl phenyl ether, hexachlorocyclopentadiene, benzo(b)fluoranthene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene. Since all associated results were nondetected, no qualification of results is necessary.

The continuing calibration %D values (between ± 50 and $+76$ percent) were above the control limits for 4-nitrophenol and benzo(g,h,i)perylene. Therefore the following detected and nondetected results are qualified as estimated (J7) due to noncompliance with continuing calibration criteria:

- 4-Nitrophenol in Sample 9339S012015F.
- Benzo(g,h,i)perylene in Sample 9339S12003F.
- GC/MS instrument performance: This was reviewed for SDG 071837 only. The ion abundances for the GC/MS instrument performance check were within control limits.
- Internal standards: This was reviewed for SDG 071837 only. The internal standard area counts and retention times were within the control limits.
- Result verification: This was reviewed for SDG 071837 only. No errors in quantification were encountered.

F2.5 Modified EPA Test Method 8080 - Organochlorine Pesticides and Polychlorinated Biphenyls (PCBs)

- Holding times: Holding time criteria were met for all samples.
- Blanks: No analytes were detected in the laboratory method blanks. No field-generated blanks were collected.

- Surrogate recovery: The decachlorobiphenyl surrogate recovery in Sample 9345D12058F was below the control limits but above 10 percent. Therefore, the detected and nondetected results for this sample are qualified as estimated (J3) due to noncompliance with spike recovery criteria.
- BS/BSD: The recoveries and RPD values were within control limits.
- MS/MSD: The recoveries and RPD values were within control limits.
- Field duplicates: No field duplicates were collected.

F2.6 Modified EPA Test Method 8015 - TPH as Gasoline

- Holding times: Holding time criteria were met for all samples.
- Blanks: No analytes were detected in the laboratory method blanks. One equipment blank, two source water blanks, and three trip blanks were collected. No analytes were detected in any of these field-generated blanks.
- Surrogate recovery: The bromofluorobenzene surrogate recovery in Samples 9339S012015F, 9339S012021F, 9341L012003F, 9341L012004F, 9348C012126F, 9406G012024F, and 9411D012221F were below the control limit but above 30 percent. Therefore, the detected and nondetected results for these samples are qualified as estimated (J3) due to noncompliance with spike recovery criteria.
- BS/BSD: The recovery for TPH as gasoline in the BS associated with SDG 074200 was above the control limit. Because all associated sample results were nondetected, no qualification is necessary.

- MS/MSD: The recoveries in the MS/MSD associated with SDGs 071837, 072047, 072975, and 074708 were below the control limits. The RPD value in SDG 074708 was above the control limit. No qualification is necessary based on organic MS/MSD data alone.
- Field duplicates: One field duplicate pair was analyzed. The values were within control limits.
- Calibration: The instrument calibration was reviewed for SDGs 071837 and 074301 only. The initial and continuing calibrations were acceptable.
- Result verification: This was reviewed for SDGs 071837 and 074301 only. No errors in quantification were encountered.

F2.7 Modified EPA Test Method 8015 - TPH as Diesel

- Holding times: Holding time criteria were met for all samples.
- Blanks: No analytes were detected in the laboratory method blanks. Two equipment blanks and two source water blanks were collected. No analytes were detected in any of these field-generated blanks.
- Surrogate recovery: The trifluorotoluene surrogate recoveries in Samples 9341L012002F, 9341L012003F, 9341L012005F, 9345D12058F, 9406G012025F, and 9406G012044F were above the control limits. Therefore, the detected results for these samples are qualified as estimated (J3) due to noncompliance with spike recovery criteria.

- BS/BSD: The recovery for TPH as diesel in the BS associated with SDG 072459 was above the control limit. Because all associated sample results were nondetected, no qualification is necessary.
- MS/MSD: The recoveries in the MS/MSD associated with SDG 072975 were above the control limits. No qualification is necessary based on organic MS/MSD data alone.
- Field duplicates: One field duplicate pair was analyzed. The values were within control limits.
- Calibration: The instrument calibration was reviewed for SDGs 071837 and 074301 only. The initial and continuing calibrations were acceptable.
- Result verification: This was reviewed for SDGs 071837 and 074301 only. No errors in quantification were encountered.

F2.8 EPA Test Method 415.1 - Total Organic Carbon

- Holding times: Holding time criteria were met for all samples.
- Blanks: No analytes were detected in the laboratory method blank. No field-generated blanks were collected.
- BS/BSD: The recoveries and RPD values were within control limits.
- MS/MSD: The recovery in the MS associated with SDG 072975 was below the control limit. No qualification is necessary based on organic MS/MSD data alone.

- Field duplicates: No field duplicates were collected.
- Calibration: The instrument calibration was reviewed for SDG 071837 only. The initial and continuing calibrations were acceptable.
- Result verification: This was reviewed for SDG 071837 only. No errors in quantification were encountered.

F3.0 INORGANIC ANALYSES

This section summarizes the findings of the evaluation of the QC samples, including the detailed validation of the SDGs 71837 and 074301.

F3.1 EPA Test Method 6010/7000 - Metals

- Holding times: Holding time criteria were met for all samples.
- Blanks: Aluminum, antimony, arsenic, beryllium, calcium, chromium, copper, iron, lead, magnesium, sodium, selenium, silver, and zinc were detected in laboratory calibration or method blanks. The metals were present below the reporting limit. Detected results for these metals were qualified as nondetected (U1) if they were reported at concentrations less than or equal to five times the highest concentration observed in any laboratory blank associated with the same SDG. The following sample results were affected:
 - Antimony in Samples 9408J02103F, 9408J02106F, and 9408J02107F.

- Arsenic in Samples 9339S12003F, 9339S12004F, 9339S12005F, 9339S12006F, 9339S012015F, 9339S012016F, 9339S012017F, 9339S012018F, 9339S02010F, 9339S02011F, 9339S02012F, 9339S012021F, 9339S012022F, 9339S012026F, 9339S012029F, and 9340S012052F.

- Beryllium in Samples 9341L012001F, 9341L012003F, 9341L012004F, 9341L012005F, 9406G012022F, 9406G012024F, 9406G012025F, 9406G012027F, 9406G012029F, 9406G012031F, 9406G012033F, 9406G012034F, 9406G012035F, 9406G012037F, 9406G012042F, 9406G012044F, 9406G012045F, 9406G012047F, and 9406G012049F.

- Calcium in Sample 9402C012022B.

- Copper in Samples 9402C012001F, 9402C012002D, 9402C012003B, 9402C012004B, 9402C012005F, 9402C012006F, 9402C002018F, 9402C012023F, 9402C012024F, 9403C012006F, 9403C012008F, 9403C012009F, 9403D002013F, 9403D002014D, 9403D002015F, 9406G012022F, 9406G012024F, 9406G012027F, 9406G012029F, 9406G012031F, 9406G012034F, 9406G012035F, 9406G012037F, 9406G012042F, 9406G012045F, 9406G012047F, 9406G012052F, 9406G012057F, 9406G012059F, 9406G012060F, 9406G012065F, 9406G012067F, 9407G012069F, 9407G012071F, 9407G012072F, 9407G012074F, 9407G012076F, 9408J12094F, 9408J12094D, 9408J12095F, 9408J12096F, 9408J12097F, 9408I12001F, 9408I12002B, 9408I12003F, 9408I12005F, 9408I02006F, 9408I02007F, 9408I02008C, 9408I02009F, 9408I02010D, 9408J12099F, 9408J12100F, 9408J12101F, 9408J02102F, 9408J02103F, 9408J02104B, 9408J02105F, 9408J02106F, 9408J02107F, 9408J02108F, 9408J02108D, 9408J02109F, and 9408J02110B.

- Iron in Samples 9402C012021F, 9402C012023F, 9403C012007B, 9403C012008F, 9403C012009F, and 9403D002015F.

- Lead in Samples 9339S12003F, 9339S12004F, 9339S12005F, 9339S12006F, 9339S012015F, 9339S012016F, 9339S012017F, 9339S012018F, 9339S02010F, 9339S02011F, 9339S012021F, 9339S012022F, 9339S012026F, 9339S012029F, and 9340S012052F.

- Selenium in Samples 9339S012016F, 9339S012029F, 9339S012022F, 9339S02012F, and 9339S12003F.

- Sodium in Samples 9402C012022B, 9403C012007B, 9403C012010C, and 9403D002011B.

- Zinc in Samples 9402C012003B, 9402C012004B, 9402C012005F, 9402C002007F, 9402C002008F, 9402C002010F, 9402C012021F, 9402C012023F, 9402C012024F, 9403C012006F, 9403C012007B, 9403C012008F, 9403C012010C, 9403D002011B, 9403D002012F, 9403D002013F, 9403D002014D, 9406G012027F, 9406G012029F, 9406G012031F, 9406G012034F, 9406G012037F, 9406G012042F, 9406G012044F, 9406G012045F, 9406G012047F, 9406G012049F, 9407G012076F, 9411D012229F, and 9411D012230F.

Sample data for the other metals were not affected, because the results were either nondetected or above five times the highest blank concentration.

Six equipment blanks and two source water blanks were collected. Antimony, calcium, chromium, magnesium, sodium, and zinc were detected in these field-generated blanks below the reporting limit. Detected results for these metals were qualified as nondetected (U2) if they were reported at concentrations less than or equal to five times the highest concentration observed in any laboratory blank associated with the same SDG. The following sample results were affected:

- Antimony in Samples 9408I12001F, 9408I12003F, 9408I12005F, 9408I02006F, 9408I02007F, 9408I02008C, 9408J12099F, 9408J02102F, 9402C012021F, 9402C012023F, 9402C012024F, 9403C012006F, 9403C012008F, 9403C012009F, 9403D002013F, 9403D002014D, and 9403D002015F.
- Calcium in Samples 9402C012003B, and 9402C002012B.
- Chromium in Samples 9402C012001F, 9402C012004B, and 9402C002007F
- Sodium in Samples 9402C012004B and 9402C002017B.
- Zinc in samples 9408J12094F, 9408J12094D, 9408J12095F, 9408J12096F, 9408J12097F, 9408I12001F, 9408I12002B, 9408I12003F, 9408I02006F, 9408I02007F, 9408I02009F, 9408I02010D, 9408J12099F, 9408J12100F, and 9408J02102F.

Sample data for the other metals were not affected, because the results were either nondetected or above five times the highest blank concentration.

- BS: The recoveries for the following blank spikes were high: antimony in SDGs 074019, 074097, 074200, and 074708; nickel, selenium, and zinc in SDGs 074097 and 074200; and cadmium in SDG 074097. The following detected results are qualified as estimated (J3) due to noncompliance with BS recovery criteria:
 - Antimony in Samples 9406G012022F, 9406G012025F, 9406G012033F, 9406G012044F, 9406G012054F, 9411D012221F, and 9411D012223F.

- Nickel in Samples 9406G012052F, 9406G012054F, 9406G012055F, 9406G012057F, 9406G012059F, 9406G012060F, 9406G012062F, 9406G012063F, 9406G012065F, 9406G012067F, 9407G012069F, 9407G012071F, 9407G012072F, 9407G012074F, and 9407G012076F.

- Zinc in Samples 9406G012052F, 9406G012054F, 9406G012055F, 9406G012057F, 9406G012059F, 9406G012060F, 9406G012062F, 9406G012063F, 9406G012065F, 9406G012067F, 9407G012069F, 9407G012071F, 9407G012072F, 9407G012074F, and 9407G012076F.

Because all affected cadmium and selenium results were nondetected, no qualification is necessary.

The recovery for the following blank spike was low, but above 30 percent: arsenic in SDG 074200. The following detected and nondetected results are qualified as estimated (J3) due to noncompliance with BS recovery criteria:

- Arsenic in Samples 9407G012069F, 9407G012071F, 9407G012072F, 9407G012074F, and 9407G012076F.

- MS: The recoveries for the following matrix spikes were high: selenium in SDGs 072459 and 074200. Because all affected selenium results were nondetected, no qualification is necessary.

The recoveries for the following matrix spikes were low, but above 30 percent: arsenic in SDG 074708; selenium in SDGs 072975, 073597, and 074345; silver in SDG 074345; and thallium in SDGs 073597, 074019, 074301, and 074345. The following detected and nondetected results are qualified as estimated (J3) due to noncompliance with MS recovery criteria:

- Arsenic in Samples 9411D012221F, 9411D012222F, 9411D012223F, 9411D012224F, 9411D012225F, 9411D012226F, 9411D012227F, 9411D012228F, 9411D012229F, and 9411D012230F.

- Selenium in Samples 9348C012126F, 9348C012128F, 9348C012131F, 9348C012136F, 9348C012141F, 9348C012143F, 9348C012145F, 9348C012149F, 9348S12013F, 9348S12014F, 9348S12015F, 9349D12070F, 9349W012001F, 9349W012002F, 9349W012004F, 9349W012006F, 9402C012021F, 9402C012022B, 9402C012023F, 9402C012024F, 9403D002011B, 9403D002012F, 9403D002013F, 9403D002014D, 9403D002015F, 9403C012006F, 9403C012007B, 9403C012008F, 9403C012009F, 9403C012010C, 9408J02103F, 9408J02104B, 9408J02105F, 9408J02106F, 9408J02107F, 9408J02108F, 9408J02108D, 9408J02109F, and 9408J02110B.

- Silver in Samples 9408J02103F, 9408J02104B, 9408J02105F, 9408J02106F, 9408J02107F, 9408J02108F, 9408J02108D, 9408J02109F, and 9408J02110B.

- Thallium in Samples 9402C012021F, 9402C012022B, 9402C012023F, 9402C012024F, 9403D002011B, 9403D002012F, 9403D002013F, 9403D002014D, 9403D002015F, 9403C012006F, 9403C012007B, 9403C012008F, 9403C012009F, 9403C012010C, 9406G012022F, 9406G012024F, 9406G012025F, 9406G012027F, 9406G012029F, 9406G012031F, 9406G012033F, 9406G012034F, 9406G012035F, 9406G012037F, 9406G012042F, 9406G012044F, 9406G012045F, 9406G012047F, 9406G012049F, 9408J12094F, 9408J12094D, 9408J12095F, 9408J12096F, 9408J12097F, 9408I12001F, 9408I12002B, 9408I12003F, 9408I12005F, 9408I02006F, 9408I02007F, 9408I02008C, 9408I02009F, 9408I02010D, 9408J12099F, 9408J12100F, 9408J12101F, 9408J02102F, 9408J02103F, 9408J02104B, 9408J02105F, 9408J02106F, 9408J02107F, 9408J02108F, 9408J02108D, 9408J02109F, and 9408J02110B.

The recoveries for the following matrix spike was low, and below 30 percent: lead in SDG 072975. The following detected results are qualified as estimated (J3) and the nondetected results are qualified as rejected (R2) due to noncompliance with MS recovery criteria:

- Lead in Samples 9348C012126F, 9348C012128F, 9348C012131F, 9348C012136F, 9348C012141F, 9348C012143F, 9348C012145F, 9348C012149F, 9348S12013F, 9348S12014F, 9348S12015F, 9349D12070F, 9349W012001F, 9349W012002F, 9349W012004F, 9349W012006F.

The recovery for the MS analysis of chromium and lead in SDG 072047 were poor. This was due to insufficient spike amounts added compared to the native sample concentration. No qualification is necessary based on these outliers.

- Laboratory duplicates: The RPD values or the absolute differences for the following duplicate samples were not within control limits: chromium in SDGs 071837 and 072047, lead in SDG 072047. The following detected results are qualified as estimated (J2) due to noncompliance with duplicate precision criteria:

- Chromium in Samples 9339S12003F, 9339S12004F, 9339S12005F, 9339S12006F, 9339S012015F, 9339S012016F, 9339S012017F, 9339S012018F, 9339S02009F, 9339S02010F, 9339S02011F, 9339S02012F, 9339S012021F, 9339S012022F, 9339S012026F, 9339S012029F, 9340S012052F, 9341L012001F, 9341L012002F, 9341L012003F, 9341L012004F, and 9341L012005F.

- Lead in Samples 9341L012001F, 9341L012002F, 9341L012003F, and 9341L012004F.

- Field duplicates: Four field duplicate pairs were analyzed. The values were within control limits.

- Calibration: The instrument calibrations were reviewed for SDGs 071837 and 074301 only. The initial and continuing calibrations were acceptable.
- Inductively coupled plasma (ICP) interference check sample (ICS): The ICS was reviewed for SDGs 071837 and 074301 only. The recoveries were within control limits.
- ICP serial dilution analysis: Serial dilutions were reviewed for SDGs 071837 and 074301 only. The serial dilution %D values were within the control limits.
- Graphite furnace atomic absorption (GFAA) post-digestion spikes: Post-digestion spikes were reviewed for SDGs 071837 and 074301 only. The recoveries for arsenic, selenium, and thallium in some samples were above the control limits. The following detected results are qualified as estimated (J3) due to noncompliance with spike recovery criteria:
 - Arsenic in Samples 9339S012016F, 9339S012017F, 9339S02012F,
 - Selenium in Samples 9339S12004F, 9339S12005F, 9339S12006F, 9339S012015F, 9339S012017F, 9339S02010F, 9408J12094F, 9408I12001F, 9408I12003F, 9408I12005F, 9408I02008C, and 9408J12101F.
 - Thallium in Samples 9408I12002B and 9408I02008C.

The recoveries for lead and thallium in some samples were below the control limits. The following detected and nondetected results are qualified as estimated (J3) due to noncompliance with spike recovery criteria:

- Lead in Sample 9408J12094F.

- Thallium in Samples 9339S02009F, 9408J12095F, 9408J12096F, 9408J12097F, 9408I12001F, 9408I12003F, 9408I02006F, 9408I02007F, 9408I02009F, 9408I02010D, 9408J12100F, and 9408J12102F.

- Result verification: This was reviewed for SDGs 071837 and 074301 only. No errors in quantification were encountered.

F3.2 EPA Test Method 6010 - TCLP Lead

- Holding times: Holding time criteria were met for all samples.
- Blanks: No analytes were detected in the laboratory method blanks. No field-generated blanks were collected.
- BS/BSD: The recoveries and RPD values were within control limits.
- MS: The recoveries were within control limits.
- Laboratory duplicates: Laboratory duplicates were not analyzed.
- Field duplicates: No field duplicates were collected.

F3.3 EPA Test Method 7196 - Hexavalent Chromium

- Holding times: Holding time criteria were met for all samples.

- Blanks: No analytes were detected in the laboratory method blanks. No field-generated blanks were collected.
- BS/BSD: The recoveries and RPD values were within control limits.
- MS: The recoveries for hexavalent chromium (CrVI) matrix spikes associated with SDGs 072047, 072975, and 074708 were below 30 percent. The recovery for the CrVI matrix spike associated with SDG 071837 was low but above 30 percent. Matrix spike samples were reanalyzed and similar recoveries were obtained. BS/BSD data were acceptable, which indicate that the method was in control. MS data indicates that the method as applied to the sample matrix produces unreliable results. CrVI analysis is unique with respect to the stability of the analyte in the matrix; under most field and laboratory analytical conditions, CrVI in soil will be reduced to trivalent chromium (Cr³⁺) so rapidly that it is very difficult to obtain acceptable CrVI matrix spike recoveries. Neither data validation guidelines nor data qualification protocol provide for an appropriate mechanism to address data quality under these unique circumstances. Therefore, the N2 (Not Qualified) code has been applied to the CrVI results. Data usability for CrVI results is addressed in further detail in Section 4.5.2 of this report.
- Laboratory duplicates: The laboratory duplicate results were nondetected.
- Field duplicates: No field duplicates were collected.
- Calibration: The instrument calibration was reviewed for SDG 071837 only. The initial and continuing calibrations were acceptable.
- Result verification: This was reviewed for SDG 071837 only. No errors in quantification were encountered.

F3.4 EPA Test Method 300.0 - Anions

- Holding times: Holding time criteria were met for all samples.
- Blanks: No analytes were detected in the laboratory method blanks. Ten equipment blanks and two source water blanks were collected. Nitrate was detected in equipment blanks associated with SDGs 073523 and 074301. Because all sample results were either nondetected or greater than five times the blank result, no qualification of sample results is necessary.
- BS/BSD: The recoveries and RPD values were within control limits.
- MS: The recoveries were within control limits.
- Laboratory duplicates: The values were within control limits.
- Field duplicates: Four field duplicate pairs were analyzed. The values were within control limits.
- Calibration: The instrument calibration was reviewed for SDG 074301 only. The initial and continuing calibrations were acceptable.
- Result verification: This was reviewed for SDG 074301 only. No errors in quantification were encountered.

F3.5 Test Method SM2320 - Alkalinity

- Holding times: Holding time criteria were met for all samples.

- Blanks: No analytes were detected in the laboratory method blanks. Seven equipment blanks and one source water blank were collected. No analytes were detected in any of these field-generated blanks.
- BS/BSD: The recoveries and RPD values were within control limits.
- MS: No matrix spikes were analyzed.
- Laboratory duplicates: The values were within control limits.
- Field duplicates: Two field duplicate pairs were analyzed. The values were within control limits.
- Result verification: This was reviewed for SDG 074301 only. No errors in quantification were encountered.

F3.6 EPA Test Method 314A - Hardness

- Holding times: Holding time criteria were met for all samples.
- Blanks: No laboratory method blanks were analyzed. Seven equipment blanks and one source water blank were collected. No analytes were detected in any of these field-generated blanks.
- Field duplicates: Two field duplicate pairs were analyzed. The values were within control limits.
- Result verification: This was reviewed for SDG 074301 only. No errors in quantification were encountered.

F3.7 EPA Test Method 160.1 - Total Dissolved Solids

- Holding times: Holding time criteria were met for all samples.
- Blanks: No analytes were detected in the laboratory method blanks. Seven equipment blanks and one source water blank were collected. TDS were detected in the equipment blank associated with SDG 073523. Because all sample results were greater than five times the blank result, no qualification of sample results is necessary.
- BS/BSD: The recoveries and RPD values were within control limits.
- MS: The recoveries were within control limits.
- Laboratory duplicates: The values were within control limits.

- **Field duplicates:** Two field duplicate pairs were analyzed. The values were within control limits.
- **Result verification:** This was reviewed for SDG 074301 only. No errors in quantification were encountered.

F3.8 EPA Test Method 160.2 - Total Suspended Solids

- **Holding times:** Holding time criteria were met for all samples.
- **Blanks:** No analytes were detected in the laboratory method blanks. Seven equipment blanks and one source water blank were collected. No analytes were detected in any of these field-generated blanks.
- **BS/BSD:** The recoveries and RPD values were within control limits.
- **MS:** The recoveries were within control limits.
- **Laboratory duplicates:** The values were within control limits.
- **Field duplicates:** Two field duplicate pairs were analyzed. The values were within control limits.
- **Result verification:** This was reviewed for SDG 074301 only. No errors in quantification were encountered.

F3.9 EPA Test Method 150.1/9045 - pH

- **Holding times:** Holding time criteria were met for all samples.

- Laboratory duplicates: The values were within control limits.
- Field duplicates: No field duplicates were collected.
- Result verification: This was reviewed for SDG 074301 only. No errors in quantification were encountered.

F3.10 EPA Test Method 120.1 - Specific Conductivity

- Holding times: Holding time criteria were met for all samples.
- Blanks: No analytes were detected in the laboratory method blanks. No field-generated blanks were collected.
- BS/BSD: The recoveries and RPD values were within control limits.
- MS: No matrix spike was analyzed.
- Laboratory duplicates: The values were within control limits.
- Field duplicates: No field duplicates were collected.
- Result verification: This was reviewed for SDG 074301 only. No errors in quantification were encountered.

F3.11 EPA Test Method 9081 - Cation Exchange Capacity

- Holding times: Holding time criteria were met for all samples.
- Field duplicates: No field duplicates were collected.
- Calibration: The instrument calibration was reviewed for SDG 071387 only. The initial and continuing calibrations were acceptable.
- Result verification: This was reviewed for SDG 071387 only. No errors in quantification were found.

F3.12 Test Method SM9221 - Fecal Coliform

- Holding times: Holding time criteria were met for all samples.
- Blanks: No fecal coliform were detected in the laboratory sterile dilution water blanks. Three equipment blanks and one source water blank were collected. No fecal coliform were detected in any of these field-generated blanks.
- Laboratory duplicates: The values were within control limits.
- Field duplicates: One field duplicate pair was analyzed. The values were within control limits.

F4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) SUMMARY**F4.1 Laboratory QC Summary**

The case narrative for SDG 071838 indicates that the following EPA 8010 analytes had a continuing calibration which was above the control limits: chloromethane, vinyl chloride, bromomethane, chloroethane, Freon 113, 1,2-dibromoethane, and 1,1,2,2-tetrachloroethane. The case narrative for SDG 072121 indicate that the following EPA 8010 analytes had a continuing calibration which was above the control limits: vinyl chloride and bromomethane. Because the analytes were responding high, a positive would easily have been detected in the analyses. Because the associated samples were nondetected, the laboratory did not reanalyze the affected samples, and no HLA validation qualifiers were applied.

The case narrative for SDG 072928 indicates that the following EPA 8010 analytes had a continuing calibration which was below the control limits: chloromethane and chloroethane. Therefore, the nondetected results for Samples 9349D12068F and 9349W012011F are qualified as estimated (J7) due to noncompliance with continuing calibration criteria. It was noted by the laboratory that since the continuing calibration standard concentration was at the reporting limit, there was adequate instrument sensitivity to make the reporting of false negatives unlikely.

The case narrative for SDG 72975 indicates that many of the samples analyzed for TPH as diesel contained a large single peak which eluted slightly beyond the range of diesel fuel. Since this peak is not typical of any hydrocarbon mixture, it was not included in the quantification of unknown hydrocarbons.

Footnotes to the laboratory report indicated that the reported results for 1,2-dichloroethene and trichloroethene in Sample 9347D02062F and for 1,2-dichloroethene in Sample 9408J12102F were

above the calibration range. Therefore, these results are qualified as estimated (J8) due to the exceedance of the calibration range. The laboratory diluted and reanalyzed these samples beyond the 14-day holding time for EPA Test Method 8010. Data generated from the initial analysis and the reanalysis are comparable. Therefore, the results which were generated within the holding time will be used.

F4.2 Completeness

The completeness calculation was performed for each test method. Completeness is defined as the ratio of the number of acceptable data points to the total number of data points reported. The following criteria were used to assess whether or not a data point is acceptable in the completeness calculation. Completeness was not calculated for hexavalent chromium due to sample matrix effects and QC circumstances.

- The data points in a sample for which the holding time criterion was not met will not be counted as acceptable in the completeness calculation.
- The data points which received an R-qualifier in the data validation will not be counted as acceptable in the completeness calculation.

For Sites 2 and 12, completeness of the data for the requested test methods are as follows.

EPA Test Method 8010 - Halogenated Volatile Organics	99.3%
EPA Test Method 8020 - Aromatic Volatile Organics	100%
EPA Test Method 8240 - VOCs	99.6%
EPA Test Method 8270 - SOCs	96.4%
Modified EPA Test Method 8080 - PCBs	100%

Modified EPA Test Method 8015 - TPH as Gasoline	100%
Modified EPA Test Method 8015 - TPH as Diesel	100%
EPA Test Method 415.1 - Total Organic Carbon	100%
EPA Test Method 6010/7000 - Metals	99.9%
EPA Test Method 6010 - TCLP Lead	100%
EPA Test Method 7196 - Hexavalent Chromium	NA
EPA Test Method 300.0 - Anions	100%
EPA Test Method 310/SM2320 - Alkalinity	100%
EPA Test Method SM314A - Hardness	100%
EPA Test Method 160.1 - Total Dissolved Solids	100%
EPA Test Method 160.2 - Total Suspended Solids	100%
EPA Test Method 120.1 - Specific Conductivity	100%
EPA Test Method 150.1/9045 - pH	100%
EPA Test Method 9081 - Cation Exchange Capacity	100%
EPA Test Method SM9221 - Fecal Coliform	100%

F4.3 Data Quality

Results of the data validation indicate that the data are useable when the data quality objectives of the project are considered. Data quality objectives are presented in Section 4.5 of this report. The completeness goal of 80 percent was also met for all test methods except hexavalent chromium for which completeness was not calculated. Although some results have been qualified, a large majority of the qualifiers do not significantly impact the intended use of the data.

Nine samples analyzed for EPA Test Methods 8010 and 8240 and 8015 modified TPH as gasoline were qualified due to low surrogate recoveries. The samples had surrogate recoveries of at least 30 percent. Typically, the laboratory instrument detection limits for these methods are at least one-fifth

of the reporting limit. Therefore, false negatives are unlikely when the surrogate recovery is above 30 percent.

One sample analyzed for Modified EPA Test Method 8080 was qualified due to a low surrogate recovery (24 percent). All analytes were reported as nondetected. Because the instrument detection limits for polychlorinated biphenyls (PCBs) are less than one-tenth the reporting limit, false negatives are unlikely to have been reported.

One sample analyzed for EPA Test Method 8270 had a base/neutral fraction surrogate recovery of 0%. The laboratory indicated that emulsification of the sample was observed during the extraction. It is not possible to determine whether target analytes were lost during the extraction, but the potential for the reporting of false negatives exists. Therefore, the nondetected results have been qualified as rejected.

Eighteen samples analyzed for EPA Test Methods 8010, 8020, and modified 8015 were qualified due to high surrogate recoveries. High surrogate recoveries can indicate a sample matrix effect which could result in the overestimation of the true amount of analyte in the samples.

Many sample results for various EPA Test Method 8010, 8240, and 8270 compounds were qualified due to continuing calibrations not meeting the QA/QC criteria. Samples that were qualified as estimated for calibrations had continuing calibration percent difference (%D) results that were either above the control limit; or below the control limits by at least -30 percent. Sixteen sample results for Freon 113 and chloromethane were qualified as rejected because the %D values were greater than -30 percent. Twelve sample results for vinyl acetate were qualified as rejected because the continuing calibration response factor (RF) value was 0.026. Because laboratory instrument detection limits are at least one-fifth of the reporting limit for these methods, false negatives are unlikely when the continuing calibration %D is less than -30 percent or the RF is above 0.020. However, continuing

calibration acceptance criteria are more stringent compared to other QA/QC parameters because of the uncertainty in the analytical measuring system indicated by the %D and RF values and the potential for propagation of analytical bias when other QC exceedances are present.

Fifty-four sample results for arsenic, nickel, selenium, thallium, and zinc were qualified as estimated due to high blank spike or graphite furnace atomic absorption (GFAA) post-digestion spike recovery. A high spike recovery can indicate either a sample matrix effect or measurement bias in the analytical system. This could result in the overestimation of the true amount of these metals in the associated samples.

One hundred thirty-four sample results for arsenic, lead, selenium, silver, and thallium were qualified as estimated due to low blank spike, matrix spike, or GFAA post-digestion spike recovery. A low spike recovery can indicate either a sample matrix effect or measurement bias in the analytical system. This could result in the underestimation of the true amount of these metals in the associated samples. Because the spike recoveries were above 30 percent, and the instrument detection limits are at least one-third of the reporting limits, the possibility of false negatives is low.

Sixteen sample results for lead were qualified as rejected due to very low matrix spike recovery. A low spike recovery can indicate either a sample matrix effect or measurement bias in the analytical system. This could result in a significant underestimation of the true amount of these metals present in the associated samples. Because the spike recovery was below 30 percent, the possibility of false negatives is significant enough to justify rejection of the data.

Although 26 sample results for chromium and lead were qualified as estimated due to laboratory duplicate precision criteria not being met, data were considered usable. Duplicate precision criteria are a measure of the stability of the analytical system and sample homogeneity, which indicate reproducibility of the analytical measurement. They do not indicate that the instrument sensitivity is

affected, and the potential for false negatives or false positives is not directly affected by laboratory precision criteria exceedances.

Four SDGs had hexavalent chromium (CrVI) matrix spike recoveries below the control limits; three of the spike recoveries were below 30 percent. Matrix spike samples were reanalyzed and similar recoveries obtained. BS/BSD data indicate that the method was in control. MS data indicate that the method, as applied to the sample matrix produces unreliable results. CrVI analysis is unique with respect to the stability of the analyte in the matrix; under most field and laboratory analytical conditions. CrVI in soil will be rapidly reduced to trivalent chromium (CrIII), rendering CrVI spike data inconclusive. Therefore the N2 (Not Qualified) code has been applied to the CrVI results. The Army believes that the CrVI data are usable for qualitative purposes when assessing the potential for the presence of CrVI at the sites. Matrix spike data indicate that soil conditions at the site do not favor the formation or stability of CrVI. Further discussion of the CrVI validation results can be found in Section 4.5.2 of this report.

F4.4 Recommendations

The following recommendation was made to Enseco concerning future analytical work:

- Provide more detail in the case narratives concerning any anomaly encountered in the course of the sample analysis. Include descriptive notations made by the bench chemists concerning the interpretation and deconvolution of QC information. This can be of great value to reviewers in the data validation effort in qualifying the data.

When samples are not identified in the field as requiring QC analyses (specifically MS/MSD), the laboratory chooses the sample on which QC is to be performed. In some instances, perhaps unknowingly, they have chosen field-related blank samples. QC analyses should not be run on

field-related blanks. A possible solution to this problem would be either to have the laboratory check with HLA prior to analysis (which could cause time delays) or for HLA to set a policy whereby MS/MSD analyses are only to be run on samples with suffixes of "F" or "D".

TABLES

**Table F-1. Samples Collected from Sites 2 and 12
Volume II - Remedial Investigation, Basewide RI/FS
Fort Ord, California**

Lab Number	Station Number	Sample Type	Sample Number
071837-0001	SB-12-26 at 5.5	Soil	9339S12003F
071837-0002	SB-12-26 at 15.5	Soil	9339S12004F
071837-0003	SB-12-26 at 30.5	Soil	9339S12005F
071837-0004	SB-12-26 at 50	Soil	9339S12006F
071837-0005	SB-12-24 at 0.5	Soil	9339S012015F
071837-0006	SB-12-24 at 10.5	Soil	9339S012016F
071837-0007	SB-12-24 at 20.5	Soil	9339S012017F
071837-0008	SB-12-24 at 40.5	Soil	9339S012018F
071837-0009	SB-02-09 at 0.0	Soil	9339S02009F
071837-0010	SB-02-09 at 5.5	Soil	9339S02010F
071837-0011	SB-02-10 at 1.5	Soil	9339S02011F
071837-0012	SB-02-10 at 5.5	Soil	9339S02012F
071837-0013	PB-02-02 at 24.5	Soil	9339D02026F
071837-0014	PB-02-02 at 138	Soil	9339D02027F
071837-0015	PB-02-02 at 198	Soil	9339D02028F
071837-0016	SB-12-23 at 0.6	Soil	9339S012021F
071837-0017	SB-12-23 at 5.5	Soil	9339S012022F
071837-0018	SB-12-23 at 30.5	Soil	9339S012026F
071837-0019	SB-12-23 at 60.5	Soil	9339S012029F
071837-0020	SB-12-25 at 60	Soil	9340S012052F
071838-0001	Trip Blank	Trip Blank	9339S012020A
071838-0002	Trip Blank	Trip Blank	9340S012041A
071838-0003	Source Water Blank	Source Water Blank	9340S012042C
071838-0004	Equipment Blank	Equipment Blank	9340S012043B
071838-0005	SB-12-25 at 71	HydroPunch	9340S012053F
071838-0006	Trip Blank	Trip Blank	9340S012067A
072047-0001	SS-12-01	Surface Soil	9341L012001F
072047-0002	SS-12-04	Surface Soil	9341L012002F
072047-0003	SS-12-02	Surface Soil	9341L012003F
072047-0004	SS-12-03	Surface Soil	9341L012004F
072047-0005	SS-12-05	Surface Soil	9341L012005F
072047-0006	PB-12-03 at 9.5	Soil	9341D12039F
072047-0007	PB-12-03 at 56	Soil	9341D12040F
072047-0008	PB-12-03 at 78	Soil	9341D12041F
072047-0009	PB-12-03 at 148	Soil	9341D12045F
072047-0010	PB-12-03 at 198	Soil	9341D12049F

Table F-1. Samples Collected from Sites 2 and 12
Volume II - Remedial Investigation, Basewide RI/FS
Fort Ord, California

Lab Number	Station Number	Sample Type	Sample Number
072121-0001	PB-12-03 at 88.5	HydroPunch	9341D12042F
072121-0002	PB-12-03 at 113	HydroPunch	9341D12043F
072121-0003	PB-12-03 at 131	HydroPunch	9342D12044F
072121-0004	Trip Blank	Trip Blank	9342C00013A
072121-0005	PB-12-03 at 156.5	HydroPunch	9342D12046F
072121-0006	PB-12-03 at 175.7	HydroPunch	9342D12047F
072121-0007	PB-12-03 at 180.5	HydroPunch	9342D12048F
072121-0008	Trip Blank	Trip Blank	9342C000022A
072459-0001	TR-12-07 at 3.5	Soil	9344Z001201F
072459-0002	TR-12-07 at 3.5	Soil	9344Z001202F
072459-0003	TR-12-07 at 2.0	Soil	9344Z001203F
072459-0004	TR-12-07 at 4.0	Soil	9344Z001204F
072459-0005	TR-12-07 at 3.5	Soil	9344Z001205F
072459-0006	TR-12-07 at 3.0	Soil	9344Z001206F
072600-0001	Muffler Tank	Liquid	9345D12058F
072600-0002	HP-02-07	HydroPunch	9345B002123F
072674-0001	HP-02-04 at 65.5	HydroPunch	9345D02059F
072674-0002	HP-02-05 at 58	HydroPunch	9345B002125F
072674-0003	HP-12-01 at 80	HydroPunch	9346C012120F
072674-0004	HP-12-03 at 80	HydroPunch	9346G012001F
072674-0005	HP-02-07 at 90	HydroPunch	9346C012123F
072674-0006	HP-12-05 at 81	HydroPunch	9346G012004F
072674-0007	HP-02-11 at 66	HydroPunch	9346C012125F
072674-0008	HP-12-10 at 70	HydroPunch	9347G012006F
072674-0009	HP-02-09 at 51	HydroPunch	9347S002231F
072674-0010	Trip Blank	Trip Blank	9347S002234A
072674-0011	HP-02-09 at 71.5	HydroPunch	9347S002235F
072674-0012	Trip Blank	Trip Blank	9347S002238A
072674-0013	HP-02-08 at 86	HydroPunch	9347D02062F
072674-0014	HP-02-08 at 127	HydroPunch	9347D02064F
072674-0015	HP-02-09 at 111	HydroPunch	9347S00224F
072674-0016	Trip Blank	Trip Blank	9347S002244A
072674-0017	HP-02-09 at 136	HydroPunch	9347S002247F
072674-0018	HP-02-12 at 45	HydroPunch	9347G002008F
072928-0001	HP-02-08 at 166.5	HydroPunch	9347D02066F
072928-0002	HP-12-08 at 86	HydroPunch	9348S012251F
072928-0003	Trip Blank	Trip Blank	9348S012254A
072928-0004	HP-12-08 at 106	HydroPunch	9348S012255F
072928-0005	HP-12-08 at 171.5	HydroPunch	9348S012259F
072928-0006	Trip Blank	Trip Blank	9348S012261A

**Table F-1. Samples Collected from Sites 2 and 12
Volume II - Remedial Investigation, Basewide RI/FS
Fort Ord, California**

Lab Number	Station Number	Sample Type	Sample Number
072928-0007	SB-12-29 at 76	HydroPunch	9348C012139F
072928-0008	HP-02-13 at 31	HydroPunch	9348A002002F
072928-0009	SB-12-28 at 81.25	HydroPunch	9348C012153F
072928-0010	SB-12-27 at 83.5	HydroPunch	9349D12068F
072928-0011	SB-12-30 at 82	HydroPunch	9349W012011F
072975-0001	SB-12-29 at 2	Soil	9348C012126F
072975-0002	SB-12-29 at 11	Soil	9348C012128F
072975-0003	SB-12-29 at 22	Soil	9348C012131F
072975-0004	SB-12-29 at 71	Soil	9348C012136F
072975-0005	SB-12-28 at 6	Soil	9348C012141F
072975-0006	SB-12-28 at 16	Soil	9348C012143F
072975-0007	SB-12-28 at 22	Soil	9348C012145F
072975-0008	SB-12-28 at 61	Soil	9348C012149F
072975-0009	SB-12-27 at 11	Soil	9348S12013F
072975-0010	SB-12-27 at 20	Soil	9348S12014F
072975-0011	SB-12-27 at 41	Soil	9348S12015F
072975-0012	SB-12-27 at 70.5	Soil	9349D12070F
072975-0013	SB-12-30 at 5.5	Soil	9349W012001F
072975-0014	SB-12-30 at 10.5	Soil	9349W012002F
072975-0015	SB-12-30 at 20.5	Soil	9349W012004F
072975-0016	SB-12-30 at 40.5	Soil	9349W012006F
073523-0001	MW-12-03-180	Monitoring Well	9402C012001F
073523-0003	MW-12-03-180 Dup	Monitoring Well	9402C012002D
073523-0005	Equipment Blank	Equipment Blank	9402C012003B
073523-0006	Trip Blank	Trip Blank	9402C012004A
073523-0007	Equipment Blank	Equipment Blank	9402C012004B
073523-0008	MW-12-01-180	Monitoring Well	9402C012005F
073523-0009	MW-12-02-180	Monitoring Well	9402C012006F
073523-0010	MW-02-01-180	Monitoring Well	9402C012007F
073523-0011	MW-02-02-180	Monitoring Well	9402C012008F
073523-0012	Trip Blank	Trip Blank	9402C012009A
073523-0013	MW-02-03-180	Monitoring Well	9402C012010F
073523-0014	Equipment Blank	Equipment Blank	9402C012012B
073523-0015	MW-02-08-180	Monitoring Well	9402C012013F
073523-0016	Trip Blank	Trip Blank	9402C012014A
073523-0017	MW-02-04-180	Monitoring Well	9402C012011F
073523-0018	MW-02-05-180	Monitoring Well	9402C012015F
073523-0019	Equipment Blank	Equipment Blank	9402C012017B
073523-0020	MW-02-07-180	Monitoring Well	9402C012018F

**Table F-1. Samples Collected from Sites 2 and 12
Volume II - Remedial Investigation, Basewide RI/FS
Fort Ord, California**

Lab Number	Station Number	Sample Type	Sample Number
073597-0001	Trip Blank	Trip Blank	9402C002019A
073597-0002	MW-12-04-180	Monitoring Well	9402C012021F
073597-0003	Equipment Blank	Equipment Blank	9402C012022B
073597-0004	MW-12-07-180	Monitoring Well	9402C012023F
073597-0005	MW-12-08-180	Monitoring Well	9402C012024F
073597-0006	Trip Blank	Trip Blank	9402C012025A
073597-0007	Equipment Blank	Equipment Blank	9403D002011B
073597-0008	MW-02-06-180	Monitoring Well	9403D002012F
073597-0009	MW-02-09-180	Monitoring Well	9403D002013F
073597-0010	MW-02-09-180 Dup	Monitoring Well	9403D002014D
073597-0011	MW-02-10-180	Monitoring Well	9403D002015F
073597-0012	Trip Blank	Trip Blank	9403D002016A
073597-0013	MW-12-06-180	Monitoring Well	9403C012006F
073597-0014	Equipment Blank	Equipment Blank	9403C012007B
073597-0015	MW-12-09-180	Monitoring Well	9403C012008F
073597-0016	MW-12-05-180	Monitoring Well	9403C012009F
073597-0017	Source Water Blank	Source Water Blank	9403C012010C
073597-0018	Trip Blank	Trip Blank	9403C012012A
074019-0001	SB-12-17 at 2	Soil	9406G012022F
074019-0002	SB-12-17 at 10	Soil	9406G012024F
074019-0003	SB-12-17 at 15	Soil	9406G012025F
074019-0004	SB-12-17 at 30	Soil	9406G012027F
074019-0005	SB-12-17 at 50	Soil	9406G012029F
074019-0006	SB-12-18 at 2	Soil	9406G012031F
074019-0007	SB-12-18 at 10	Soil	9406G012033F
074019-0008	SB-12-18 at 15	Soil	9406G012034F
074019-0009	SB-12-18 at 20	Soil	9406G012035F
074019-0010	SB-12-18 at 40	Soil	9406G012037F
074019-0011	SB-12-15 at 2	Soil	9406G012042F
074019-0012	SB-12-15 at 10	Soil	9406G012044F
074019-0013	SB-12-15 at 15	Soil	9406G012045F
074019-0014	SB-12-15 at 33	Soil	9406G012047F
074019-0015	SB-12-15 at 50	Soil	9406G012049F
074043-0001	SB-12-18 at 61.5	HydroPunch	9406G012039F
074043-0002	SB-12-18 Dup	HydroPunch	9406G012040D
074043-0003	Trip Blank	Trip Blank	9406G012041A
074043-0004	SB-12-15 at 61.5	HydroPunch	9406G012050F
074043-0005	Trip Blank	Trip Blank	9406G012051A
074097-0001	SB-12-19 at 2	Soil	9406G012052F
074097-0002	SB-12-19 at 10	Soil	9406G012054F

**Table F-1. Samples Collected from Sites 2 and 12
Volume II - Remedial Investigation, Basewide RI/FS
Fort Ord, California**

Lab Number	Station Number	Sample Type	Sample Number
074097-0003	SB-12-19 at 15	Soil	9406G012055F
074097-0004	SB-12-19 at 30	Soil	9406G012057F
074097-0005	SB-12-19 at 50	Soil	9406G012059F
074097-0006	SB-12-20 at 2	Soil	9406G012060F
074097-0007	SB-12-20 at 10	Soil	9406G012062F
074097-0008	SB-12-20 at 15	Soil	9406G012063F
074097-0009	SB-12-20 at 30	Soil	9406G012065F
074097-0010	SB-12-20 at 50	Soil	9406G012067F
074200-0001	SB-12-16A	Soil	9407G012069F
074200-0002	MW-12-10-180	Soil	9407G012071F
074200-0003	MW-12-10-180	Soil	9407G012072F
074200-0004	MW-12-10-180	Soil	9407G012074F
074200-0005	MW-12-10-180	Soil	9407G012076F
074201-0001	MW-12-10-180 at 77	HydroPunch	9407G012077F
074201-0002	Trip Blank	Trip Blank	9407G012078A
074301-0001	MW-12-01-180	Monitoring Well	9408J12094F
074301-0002	MW-12-01-180 Dup	Monitoring Well	9408J12094D
074301-0003	MW-12-02-180	Monitoring Well	9408J12095F
074301-0004	MW-12-03-180	Monitoring Well	9408J12096F
074301-0005	MW-12-04-180	Monitoring Well	9408J12097F
074301-0006	MW-12-05-180	Monitoring Well	9408I12001F
074301-0007	Equipment Blank	Equipment Blank	9408I12002B
074301-0008	MW-12-07-180	Monitoring Well	9408I12003F
074301-0009	Trip Blank	Trip Blank	9408I12004A
074301-0010	MW-12-06-180	Monitoring Well	9408I12005F
074301-0011	MW-02-04-180	Monitoring Well	9408I02006F
074301-0012	MW-02-05-180	Monitoring Well	9408I02007F
074301-0013	Source Water Blank	Source Water Blank	9408I02008C
074301-0014	MW-02-06-180	Monitoring Well	9408I02009F
074301-0015	MW-02-06-180 Dup	Monitoring Well	9408I02010D
074301-0016	Trip Blank	Trip Blank	9408I02012A
074301-0017	MW-12-08-180	Monitoring Well	9408J12099F
074301-0018	MW-12-09-180	Monitoring Well	9408J12100F
074301-0019	MW-12-10-180	Monitoring Well	9408J12101F
074301-0020	MW-02-01-180	Monitoring Well	9408J02102F
074345-0001	MW-02-02-180	Monitoring Well	9408J02103F
074345-0002	Equipment Blank	Equipment Blank	9408J02104B
074345-0003	MW-02-03-180	Monitoring Well	9408J02105F
074345-0004	MW-02-07-180	Monitoring Well	9408J02106F

**Table F-1. Samples Collected from Sites 2 and 12
Volume II - Remedial Investigation, Basewide RI/FS
Fort Ord, California**

Lab Number	Station Number	Sample Type	Sample Number
074345-0005	MW-02-08-180	Monitoring Well	9408J02107F
074345-0006	MW-02-09-180	Monitoring Well	9408J02108F
074345-0007	MW-02-09-180 Dup	Monitoring Well	9408J02108D
074345-0008	MW-02-10-180	Monitoring Well	9408J02109F
074345-0009	Equipment Blank	Equipment Blank	9408J02110B
074345-0010	Trip Blank	Trip Blank	9408J02112A
074447-0001	MW-12-06-180	Monitoring Well	9408I012024F
074447-0002	MW-12-06-180	Monitoring Well	9408I012025F
074447-0003	MW-12-06-180	Monitoring Well	9408I012026F
074447-0004	Trip Blank	Trip Blank	9408I012027A
074540-0001	MW-02-09-180	Monitoring Well	9409O002001F
074540-0002	MW-02-09-180	Monitoring Well	9409O002002F
074540-0003	MW-02-09-180	Monitoring Well	9409O002003F
074540-0004	MW-02-09-180	Monitoring Well	9409O002004F
074540-0005	Trip Blank	Trip Blank	9409O002005A
074708-0001	SB-12-32 at 0.5	Soil	9411D012221F
074708-0002	SB-12-32 at 5.0	Soil	9411D012222F
074708-0003	SB-12-31 at 0.5	Soil	9411D012223F
074708-0004	SB-12-31 at 5.0	Soil	9411D012224F
074708-0005	SB-12-33 at 0.5	Soil	9411D012225F
074708-0006	SB-12-33 at 5.0	Soil	9411D012226F
074708-0007	SB-12-34 at 0.5	Soil	9411D012227F
074708-0008	SB-12-34 at 5.0	Soil	9411D012228F
074708-0009	SB-12-35 at 0.5	Soil	9411D012229F
074708-0010	SB-12-35 at 5.0	Soil	9411D012230F