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Data Validation Report for CH2M Hill Plateau Remediation Company

VSR18-002
Project 100-K AA

Chemical Validation - Level C

Validation Performed By:

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Date: 12-01-2017

Technical Review By:

Ellen McEntee
Ellen McEntee

Date: 12-01-2017

Quality Review By:

Mary A. Donovan
Mary Donovan
Quality Assurance Manager

Date: 12-06-2017

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Date: 30 November 2017
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: 100-K AA
 Subject: Semivolatile Organics - Sample Data Group (SDG) GEL438004

INTRODUCTION

This memorandum presents the results of data validation for SDG GEL438004 prepared by GEL Laboratories LLC. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B3FNH2	11/14/17	Soil	C	8270, 8270D SIM
B3FNH4	11/14/17	Soil	C	8270, 8270D SIM
B3FNH6	11/14/17	Soil	C	8270, 8270D SIM
B3FNH8	11/14/17	Soil	C	8270, 8270D SIM
B3FNJ0	11/14/17	Soil	C	8270, 8270D SIM
B3FNJ2	11/14/17	Soil	C	8270, 8270D SIM
B3FNJ4	11/14/17	Soil	C	8270, 8270D SIM
B3FNJ6	11/14/17	Soil	C	8270, 8270D SIM
B3FNJ8	11/14/17	Soil	C	8270, 8270D SIM
B3FNK0	11/14/17	Soil	C	8270, 8270D SIM

Data validation was conducted in accordance with the CHPRC validation statement of work and the 100 Area Remedial Action Sampling and Analysis Plan, DOE/RL-96-22, Rev. 5 (SAP). Appendices 1 through 4 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Data Validation Supporting Documentation
- Appendix 4. Additional Documentation Requested by Client

DATA QUALITY OBJECTIVES

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The holding time requirements for SVOC in soil are extraction within 14 days of sample collection and analysis within 40 days of sample extraction. Sample preservation requires chilling to ≤ 6 degrees Celsius.

The samples were extracted and analyzed within the prescribed holding times and properly preserved.

- **Blanks**

The blank data results are reviewed to assess the extent of contamination introduced through sampling, sample preparation, and analysis.

Laboratory Blanks

All laboratory blank results were acceptable.

Trip Blanks

All trip blank results were acceptable.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing surrogate results, matrix spike sample results, and laboratory control sample results. According to the SAP, the laboratory control sample accuracy limits are 50% to 150% and the matrix spike sample accuracy limits are ones specified by the DV procedure.

Surrogates

All surrogate recoveries were acceptable with the following exceptions.

The 2-fluorophenol, phenol-d5 and 2,4,6-tribromophenol recoveries for sample B3FNH2 were below the lower acceptance limits but $\geq 20\%$. The class of reported sample results associated with these surrogates were non-detects and should be qualified as estimates and flagged "UJ." See the table in Appendix 2 for a listing of all affected sample results.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples

All MS/MSD recoveries were acceptable.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable with the following exceptions.

The 4-chloroaniline LCS recovery was below the lower acceptance limit but $\geq 40\%$. All associated sample results were non-detects and should be qualified as estimates and flagged “UJ.”

The LCS recovery for hexachlorocyclopentadiene was $< 40\%$. All associated sample results were non-detects and should be qualified as unusable and flagged “UR.”

- **Precision**

Precision is evaluated by reviewing MS/MSD results, field duplicate sample results and field split sample results. These QC results provide information on the laboratory reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limits are $\pm 30\%$.

MS/MSD Samples

All MS/MSD RPD values were acceptable with the following exceptions.

The MS/MSD RPD for hexachlorocyclopentadiene was above the upper acceptance limits. All associated sample results were non-detects and would be qualified as estimates and flagged UJ; however due to very low LCS recovery, the results were qualified as unusable and flagged “UR.”

Field Duplicate Samples

All field duplicate results were acceptable.

Field Split Samples

No field splits were submitted for validation.

- **Internal Standards**

Internal standard performance criteria ensure that GC/MS sensitivity and response are stable during each analysis. Internal standards are added to all samples, including QC samples, prior to analysis.

Internal standards data was not included in the data package. Sample results should not be qualified based on this.

- **Detection Limits**

Reported MDLs are compared against the contractually required detection limits (CRDLs) to ensure that laboratory detection limits meet the required criteria.

All reported sample MDLs were below the CRDLs.

- **Completeness**

SDG GEL438004 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 98.4%.

MAJOR DEFICIENCIES

A major deficiency leading to qualification of hexachlorocyclopentadiene results as unusable was due to a very low LCS recovery.

MINOR DEFICIENCIES

Minor deficiencies leading to qualification of sample results as estimates were due to low surrogate recoveries and low LCS recovery. See the table in Appendix 2 for a listing of all affected sample results.

REFERENCES

GRP-GD-003, Rev. 2, Change 0, *Data Validation for Chemical Analyses*, October 2016.

DOE/RL-96-22, Rev. 5, *100 Area Remedial Action Sampling and Analysis Plan*, September 2009.

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers that may be applied by data validators in compliance with the CHPRC statement of work are as follows:

- **U** — The constituent was analyzed for, but was not detected. The data should be considered usable for decision-making purposes.
- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the RL. The data should be considered usable for decision-making purposes.
- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **N** — The analysis indicates the presence of an analyte that has been tentatively identified.
- **NJ** — The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.
- **NJ+** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation.
- **NJ-** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation.
- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.
- **R** — Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

Appendix 2
Summary of Data Qualification

Semivolatile Organics Data Qualification Summary			
SDG: GEL438004	Reviewer: AQA	Project: 100-K AA	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
2,4,5-trichlorophenol, 2,4,6-trichlorophenol, 2,4-dichlorophenol, 2,4-dimethylphenol, 2,4-dinitrophenol, 2-chlorophenol, 2-methyl-4,6-dinitrophenol, 2-nitrophenol, 4-chloro-3-methylphenol, 4-nitrophenol, pentachlorophenol, phenol,	UJ	B3FNH2	Low surrogate recoveries
4-chloroaniline	UJ	B3FNH2, B3FNH4, B3FNH6, B3FNH8, B3FNJ0, B3FNJ2, B3FNJ4, B3FNJ6, B3FNJ8, B3FNK0	Low LCS recovery
hexachlorocyclopentadiene	UR	B3FNH2, B3FNH4, B3FNH6, B3FNH8, B3FNJ0, B3FNJ2, B3FNJ4, B3FNJ6, B3FNJ8, B3FNK0	Very low LCS recovery and poor MS/MSD precision

Comments: None

Appendix 3

Data Validation Supporting Documentation

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	<input checked="" type="radio"/> C	D	E
PROJECT: 100-K AA			DATA PACKAGE: VSR18-002		
VALIDATOR: Eyda Hergenreder		LAB: GEL		DATE: 11/30/17	
			SDG: GEL438004		
ANALYSES PERFORMED					
SW-846 8260		SW-846 8260 (TCLP)	SW-846 8270 X		SW-846 8270 (TCLP)
SAMPLES/MATRIX Soil					
SDG GEL438004: B3FNH2, B3FNH4, B3FNH6, B3FNH8, B3FNJ0, B3FNJ2, B3FNJ4, B3FNJ6, B3FNJ8, B3FNK0					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present?	Yes <input type="radio"/> No <input checked="" type="radio"/> N/A
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Comments:

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

2. INSTRUMENT TUNING AND CALIBRATION (Levels D and E)

GC/MS tuning/performance check acceptable?	Yes No <input type="radio"/> N/A
Initial calibrations acceptable?	Yes No <input type="radio"/> N/A
Continuing calibrations acceptable?	Yes No <input type="radio"/> N/A
Standards traceable?	Yes No <input type="radio"/> N/A
Standards expired?	Yes No <input type="radio"/> N/A
Calculation check acceptable?	Yes No <input type="radio"/> N/A

Comments:

3. BLANKS (Levels B, C, D, and E)

Calibration blanks analyzed? (Levels D, E)	Yes No <input type="radio"/> N/A
Calibration blank results acceptable? (Levels D, E)	Yes No <input type="radio"/> N/A
Laboratory blanks analyzed?	<input checked="" type="radio"/> Yes No N/A
Laboratory blank results acceptable?	<input checked="" type="radio"/> Yes No N/A
Field/trip blanks analyzed? (Levels C, D, E)	<input checked="" type="radio"/> Yes No N/A
Field/trip blank results acceptable? (Levels C, D, E)	<input checked="" type="radio"/> Yes No N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input type="radio"/> N/A

Comments:

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

4. ACCURACY (Levels C, D, and E)

Surrogates/system monitoring compounds analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Surrogate/system monitoring compound recoveries acceptable?	Yes <input type="radio"/> No <input checked="" type="radio"/> N/A
Surrogates traceable? (Levels D, E)	Yes No <input type="radio"/> N/A
Surrogates expired? (Levels D, E)	Yes No <input type="radio"/> N/A
MS/MSD samples analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
MS/MSD results acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
MS/MSD standards NIST traceable? (Levels D, E)	Yes No <input type="radio"/> N/A
MS/MSD standards? (Levels D, E)	Yes No <input type="radio"/> N/A
LCS/BSS samples analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
LCS/BSS results acceptable?	Yes <input type="radio"/> No <input checked="" type="radio"/> N/A
Standards traceable? (Levels D, E)	Yes No <input type="radio"/> N/A
Standards expired? (Levels D, E)	Yes No <input type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input type="radio"/> N/A
Performance audit sample(s) analyzed?	Yes No <input type="radio"/> N/A
Performance audit sample results acceptable?	Yes No <input type="radio"/> N/A

Comments:

 Surrogate: Sample B3FNH2: 2-fluorophenol 34%; phenol-d5 35%; 2,4,6-tribromophenol 35%

 LCS: 4-chloroaniline 49%; hexachlorocyclopentadiene 36%

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

5. PRECISION (Levels C, D, and E)

MS/MSD samples analyzed?	<input checked="" type="radio"/> Yes No N/A
MS/MSD RPD values acceptable?	Yes <input type="radio"/> No N/A
MS/MSD standards NIST traceable? (Levels D, E)	Yes No <input type="radio"/> N/A
MS/MSD standards expired? (Levels D, E)	Yes No <input type="radio"/> N/A
LCS/LCSD duplicates run due to insufficient sample material?	Yes <input type="radio"/> No N/A
Field duplicate RPD values acceptable?	<input checked="" type="radio"/> Yes No N/A
Field split RPD values acceptable?	Yes No <input type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input type="radio"/> N/A

Comments:

MS/MSD RPD: hexachlorocyclopentadiene 45%

6. SYSTEM PERFORMANCE (Levels D and E)

Internal standards analyzed?	Yes No <input type="radio"/> N/A
Internal standard areas acceptable?	Yes No <input type="radio"/> N/A
Internal standard retention times acceptable?	Yes No <input type="radio"/> N/A
Standards traceable?	Yes No <input type="radio"/> N/A
Standards expired?	Yes No <input type="radio"/> N/A
Transcription/calculation errors?	Yes No <input type="radio"/> N/A

Comments:

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

7. HOLDING TIMES (all levels)

Samples properly preserved?	<input checked="" type="radio"/> Yes No N/A
Sample holding times acceptable?	<input checked="" type="radio"/> Yes No N/A

Comments:

8. COMPOUND IDENTIFICATION, QUANTITATION, AND DETECTION LIMITS (all levels)

Compound identification acceptable? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Compound quantitation acceptable? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Results reported for all requested analyses?	<input checked="" type="radio"/> Yes No N/A
Results supported in the raw data? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Samples properly prepared? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Laboratory properly identified and coded all TIC? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Detection limits meet RDL?	<input checked="" type="radio"/> Yes No N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

Comments:

Appendix 4

Additional Documentation Requested By Client

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QC Summary

Report Date: November 22, 2017

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CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 438004

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719891										
QC1203921856	LCS										
1,2,4-Trichlorobenzene	1670			1100	ug/kg		66 *	(70%-130%)	JLD1	11/17/17	15:15
1,2-Dichlorobenzene	1670			1080	ug/kg		65 *	(70%-130%)			
1,3-Dichlorobenzene	1670			1040	ug/kg		62 *	(70%-130%)			
1,4-Dichlorobenzene	1670			1010	ug/kg		61 *	(70%-130%)			
2,4,5-Trichlorophenol	1670			1140	ug/kg		68 *	(70%-130%)			
2,4,6-Trichlorophenol	1670			1110	ug/kg		67 *	(70%-130%)			
2,4-Dichlorophenol	1670			1170	ug/kg		70	(70%-130%)			
2,4-Dimethylphenol	1670			966	ug/kg		58 *	(70%-130%)			
2,4-Dinitrophenol	1670			872	ug/kg		52 *	(70%-130%)			
2,4-Dinitrotoluene	1670			1120	ug/kg		67 *	(70%-130%)			
2,6-Dinitrotoluene	1670			1210	ug/kg		73	(70%-130%)			
2-Chloronaphthalene	1670			1040	ug/kg		62 *	(70%-130%)			
2-Chlorophenol	1670			1130	ug/kg		68 *	(70%-130%)			

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QC Summary

Workorder: 438004

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719891										
2-Methyl-4,6-dinitrophenol	1670			904	ug/kg		54 *	(70%-130%)	JLD1	11/17/17	15:15
2-Methylnaphthalene	1670			1080	ug/kg		65 *	(70%-130%)			
2-Nitrophenol	1670			1240	ug/kg		74	(70%-130%)			
3,3'-Dichlorobenzidine	1670			1050	ug/kg		63 *	(70%-130%)			
4-Bromophenylphenylether	1670			1160	ug/kg		70	(70%-130%)			
4-Chloro-3-methylphenol	1670			1230	ug/kg		74	(70%-130%)			
4-Chloroaniline	1670			821	ug/kg		49 *	(70%-130%)			
4-Chlorophenylphenylether	1670			1070	ug/kg		64 *	(70%-130%)			
4-Nitrophenol	1670			1030	ug/kg		62 *	(70%-130%)			
Butylbenzylphthalate	1670			1200	ug/kg		72	(70%-130%)			
Carbazole	1670			1140	ug/kg		69 *	(70%-130%)			
Di-n-butylphthalate	1670			1110	ug/kg		67 *	(70%-130%)			
Di-n-octylphthalate	1670			912	ug/kg		55 *	(70%-130%)			
Dibenzofuran	1670			1100	ug/kg		66 *	(70%-130%)			
Diethylphthalate	1670			1140	ug/kg		68 *	(70%-130%)			

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QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719891										
Dimethylphthalate	1670			1170	ug/kg		70	(70%-130%)	JLD1	11/17/17	15:15
Hexachlorobenzene	1670			1080	ug/kg		65 *	(70%-130%)			
Hexachlorobutadiene	1670			971	ug/kg		58 *	(70%-130%)			
Hexachlorocyclopentadiene	1670			599	ug/kg		36 *	(70%-130%)			
Hexachloroethane	1670			1060	ug/kg		64 *	(70%-130%)			
Isophorone	1670			1180	ug/kg		71	(70%-130%)			
N-Nitrosodipropylamine	1670			1190	ug/kg		71	(70%-130%)			
Nitrobenzene	1670			1330	ug/kg		80	(70%-130%)			
Pentachlorophenol	1670			1100	ug/kg		66 *	(70%-130%)			
Phenol	1670			1160	ug/kg		70	(70%-130%)			
bis(2-Chloro-1-methylethyl)ether	1670			1620	ug/kg		97	(70%-130%)			
bis(2-Chloroethoxy)methane	1670			1260	ug/kg		75	(70%-130%)			
bis(2-Chloroethyl) ether	1670			1280	ug/kg		77	(70%-130%)			
bis(2-Ethylhexyl)phthalate	1670			1030	ug/kg		62 *	(70%-130%)			
m-Nitroaniline	1670			1130	ug/kg		68 *	(70%-130%)			

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QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719891										
o-Cresol	1670			1220	ug/kg		73	(70%-130%)	JLD1	11/17/17	15:15
o-Nitroaniline	1670			1400	ug/kg		84	(70%-130%)			
p-Nitroaniline	1670			1110	ug/kg		67*	(70%-130%)			
**2,4,6-Tribromophenol	3330			2130	ug/kg		64	(39%-115%)			
**2-Fluorobiphenyl	1670			1140	ug/kg		68	(35%-107%)			
**2-Fluorophenol	3330			2400	ug/kg		72	(36%-104%)			
**Nitrobenzene-d5	1670			1300	ug/kg		78	(34%-109%)			
**Phenol-d5	3330			2530	ug/kg		76	(39%-106%)			
**p-Terphenyl-d14	1670			1430	ug/kg		86	(45%-119%)			
QC1203921855 MB											
1,2,4-Trichlorobenzene			U	100	ug/kg					11/17/17	14:44
1,2-Dichlorobenzene			U	100	ug/kg						
1,3-Dichlorobenzene			U	100	ug/kg						
1,4-Dichlorobenzene			U	100	ug/kg						
2,4,5-Trichlorophenol			U	100	ug/kg						
2,4,6-Trichlorophenol			U	100	ug/kg						

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QC Summary

Workorder: 438004

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719891										
2,4-Dichlorophenol			U	100	ug/kg				JLD1	11/17/17	14:44
2,4-Dimethylphenol			U	100	ug/kg						
2,4-Dinitrophenol			U	100	ug/kg						
2,4-Dinitrotoluene			U	100	ug/kg						
2,6-Dinitrotoluene			U	100	ug/kg						
2-Chloronaphthalene			U	10.0	ug/kg						
2-Chlorophenol			U	100	ug/kg						
2-Methyl-4,6-dinitrophenol			U	100	ug/kg						
2-Methylnaphthalene			U	10.0	ug/kg						
2-Nitrophenol			U	100	ug/kg						
3,3'-Dichlorobenzidine			U	100	ug/kg						
4-Bromophenylphenylether			U	100	ug/kg						
4-Chloro-3-methylphenol			U	133	ug/kg						
4-Chloroaniline			U	100	ug/kg						
4-Chlorophenylphenylether			U	100	ug/kg						

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QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719891										
4-Nitrophenol			U	100	ug/kg				JLD1	11/17/17	14:44
Butylbenzylphthalate			U	100	ug/kg						
Carbazole			U	10.0	ug/kg						
Di-n-butylphthalate			U	100	ug/kg						
Di-n-octylphthalate			U	100	ug/kg						
Dibenzofuran			U	100	ug/kg						
Diethylphthalate			U	100	ug/kg						
Dimethylphthalate			U	100	ug/kg						
Hexachlorobenzene			U	100	ug/kg						
Hexachlorobutadiene			U	100	ug/kg						
Hexachlorocyclopentadiene			U	100	ug/kg						
Hexachloroethane			U	100	ug/kg						
Isophorone			U	100	ug/kg						
N-Nitrosodipropylamine			U	100	ug/kg						
Nitrobenzene			U	100	ug/kg						

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719891										
Pentachlorophenol			U	100	ug/kg				JLD1	11/17/17	14:44
Phenol			U	100	ug/kg						
bis(2-Chloro-1-methylethyl)ether			U	100	ug/kg						
bis(2-Chloroethoxy)methane			U	100	ug/kg						
bis(2-Chloroethyl) ether			U	100	ug/kg						
bis(2-Ethylhexyl)phthalate			U	100	ug/kg						
m-Nitroaniline			U	100	ug/kg						
o-Cresol			U	100	ug/kg						
o-Nitroaniline			U	110	ug/kg						
p-Nitroaniline			U	100	ug/kg						
**2,4,6-Tribromophenol	3330			2080	ug/kg		62	(39%-115%)			
**2-Fluorobiphenyl	1670			1200	ug/kg		72	(35%-107%)			
**2-Fluorophenol	3330			2200	ug/kg		66	(36%-104%)			
**Nitrobenzene-d5	1670			1350	ug/kg		81	(34%-109%)			
**Phenol-d5	3330			2350	ug/kg		71	(39%-106%)			

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719891										
**p-Terphenyl-d14	1670			1430	ug/kg		86	(45%-119%)	JLD1	11/17/17	14:44
QC1203921858 438004001 MS											
1,2,4-Trichlorobenzene	1810	U	108	1210	ug/kg		67	(26%-104%)		11/17/17	16:17
1,2-Dichlorobenzene	1810	U	108	1150	ug/kg		64	(26%-98%)			
1,3-Dichlorobenzene	1810	U	108	1100	ug/kg		61	(27%-92%)			
1,4-Dichlorobenzene	1810	U	108	1090	ug/kg		60	(27%-95%)			
2,4,5-Trichlorophenol	1810	U	108	1310	ug/kg		72	(26%-120%)			
2,4,6-Trichlorophenol	1810	U	108	1250	ug/kg		69	(25%-117%)			
2,4-Dichlorophenol	1810	U	108	1290	ug/kg		71	(21%-119%)			
2,4-Dimethylphenol	1810	U	108	1080	ug/kg		60	(27%-111%)			
2,4-Dinitrophenol	1810	U	108	1130	ug/kg		63	(12%-112%)			
2,4-Dinitrotoluene	1810	U	108	1310	ug/kg		72	(32%-118%)			
2,6-Dinitrotoluene	1810	U	108	1300	ug/kg		72	(32%-114%)			
2-Chloronaphthalene	1810	U	10.8	1160	ug/kg		64	(25%-111%)			
2-Chlorophenol	1810	U	108	1260	ug/kg		70	(20%-114%)			
2-Methyl-4,6-dinitrophenol	1810	U	108	1240	ug/kg		69	(17%-115%)			

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719891										
2-Methylnaphthalene	1810	U	10.8	1190	ug/kg		66	(25%-112%)	JLD1	11/17/17	16:17
2-Nitrophenol	1810	U	108	1380	ug/kg		76	(23%-115%)			
3,3'-Dichlorobenzidine	1810	U	108	1120	ug/kg		62	(21%-107%)			
4-Bromophenylphenylether	1810	U	108	1340	ug/kg		74	(29%-121%)			
4-Chloro-3-methylphenol	1810	U	144	1390	ug/kg		77	(29%-119%)			
4-Chloroaniline	1810	U	108	932	ug/kg		52	(22%-120%)			
4-Chlorophenylphenylether	1810	U	108	1210	ug/kg		67	(29%-119%)			
4-Nitrophenol	1810	U	108	1270	ug/kg		70	(20%-120%)			
Butylbenzylphthalate	1810	U	108	1300	ug/kg		72	(26%-133%)			
Carbazole	1810	U	10.8	1320	ug/kg		73	(27%-123%)			
Di-n-butylphthalate	1810	U	108	1260	ug/kg		70	(26%-126%)			
Di-n-octylphthalate	1810	U	108	1080	ug/kg		60	(29%-130%)			
Dibenzofuran	1810	U	108	1260	ug/kg		70	(30%-119%)			
Diethylphthalate	1810	U	108	1270	ug/kg		70	(26%-124%)			
Dimethylphthalate	1810	U	108	1320	ug/kg		73	(27%-120%)			

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719891										
Hexachlorobenzene	1810	U	108	1230	ug/kg		68	(30%-113%)	JLD1	11/17/17	16:17
Hexachlorobutadiene	1810	U	108	1060	ug/kg		59	(25%-109%)			
Hexachlorocyclopentadiene	1810	U	108	696	ug/kg		39	(10%-100%)			
Hexachloroethane	1810	U	108	1130	ug/kg		62	(23%-98%)			
Isophorone	1810	U	108	1280	ug/kg		71	(29%-107%)			
N-Nitrosodipropylamine	1810	U	108	1280	ug/kg		71	(25%-113%)			
Nitrobenzene	1810	U	108	1440	ug/kg		80	(26%-109%)			
Pentachlorophenol	1810	U	108	1250	ug/kg		69	(17%-119%)			
Phenol	1810	U	108	1300	ug/kg		72	(28%-111%)			
bis(2-Chloro-1-methylethyl)ether	1810	U	108	1730	ug/kg		96	(21%-116%)			
bis(2-Chloroethoxy)methane	1810	U	108	1390	ug/kg		77	(30%-111%)			
bis(2-Chloroethyl) ether	1810	U	108	1360	ug/kg		75	(27%-110%)			
bis(2-Ethylhexyl)phthalate	1810	U	108	1170	ug/kg		64	(27%-131%)			
m-Nitroaniline	1810	U	108	1330	ug/kg		73	(24%-137%)			
o-Cresol	1810	U	108	1320	ug/kg		73	(28%-114%)			

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719891										
o-Nitroaniline	1810	U	119	1620	ug/kg		90	(27%-120%)	JLD1	11/17/17	16:17
p-Nitroaniline	1810	U	108	1220	ug/kg		67	(19%-140%)			
**2,4,6-Tribromophenol	3610		1270	2220	ug/kg		62	(39%-115%)			
**2-Fluorobiphenyl	1810		654	1140	ug/kg		63	(35%-107%)			
**2-Fluorophenol	3610		1220	2440	ug/kg		67	(36%-104%)			
**Nitrobenzene-d5	1810		660	1310	ug/kg		72	(34%-109%)			
**Phenol-d5	3610		1280	2560	ug/kg		71	(39%-106%)			
**p-Terphenyl-d14	1810		853	1360	ug/kg		76	(45%-119%)			
QC1203921860 438004001 MSD											
1,2,4-Trichlorobenzene	1800	U	108	945	ug/kg	25	52	(0%-30%)		11/17/17	16:48
1,2-Dichlorobenzene	1800	U	108	934	ug/kg	21	52	(0%-30%)			
1,3-Dichlorobenzene	1800	U	108	896	ug/kg	21	50	(0%-30%)			
1,4-Dichlorobenzene	1800	U	108	876	ug/kg	22	49	(0%-30%)			
2,4,5-Trichlorophenol	1800	U	108	1160	ug/kg	11	65	(0%-30%)			
2,4,6-Trichlorophenol	1800	U	108	1100	ug/kg	13	61	(0%-30%)			
2,4-Dichlorophenol	1800	U	108	1040	ug/kg	21	58	(0%-30%)			

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719891										
2,4-Dimethylphenol	1800	U	108	904	ug/kg	18	50	(0%-30%)	JLD1	11/17/17	16:48
2,4-Dinitrophenol	1800	U	108	975	ug/kg	15	54	(0%-30%)			
2,4-Dinitrotoluene	1800	U	108	1140	ug/kg	13	63	(0%-30%)			
2,6-Dinitrotoluene	1800	U	108	1160	ug/kg	11	64	(0%-30%)			
2-Chloronaphthalene	1800	U	10.8	963	ug/kg	18	53	(0%-30%)			
2-Chlorophenol	1800	U	108	1010	ug/kg	22	56	(0%-30%)			
2-Methyl-4,6-dinitrophenol	1800	U	108	1060	ug/kg	16	59	(0%-30%)			
2-Methylnaphthalene	1800	U	10.8	979	ug/kg	19	54	(0%-30%)			
2-Nitrophenol	1800	U	108	1090	ug/kg	23	61	(0%-30%)			
3,3'-Dichlorobenzidine	1800	U	108	967	ug/kg	15	54	(0%-30%)			
4-Bromophenylphenylether	1800	U	108	1200	ug/kg	11	67	(0%-30%)			
4-Chloro-3-methylphenol	1800	U	144	1210	ug/kg	14	67	(0%-30%)			
4-Chloroaniline	1800	U	108	795	ug/kg	16	44	(0%-30%)			
4-Chlorophenylphenylether	1800	U	108	1050	ug/kg	15	58	(0%-30%)			
4-Nitrophenol	1800	U	108	1110	ug/kg	13	62	(0%-30%)			

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Parmname	NOM		Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS												
Batch	1719891											
Butylbenzylphthalate	1800	U	108		1150	ug/kg	12	64	(0%-30%)	JLD1	11/17/17	16:48
Carbazole	1800	U	10.8		1130	ug/kg	15	63	(0%-30%)			
Di-n-butylphthalate	1800	U	108		1100	ug/kg	14	61	(0%-30%)			
Di-n-octylphthalate	1800	U	108		925	ug/kg	15	51	(0%-30%)			
Dibenzofuran	1800	U	108		1090	ug/kg	15	60	(0%-30%)			
Diethylphthalate	1800	U	108		1100	ug/kg	14	61	(0%-30%)			
Dimethylphthalate	1800	U	108		1150	ug/kg	14	64	(0%-30%)			
Hexachlorobenzene	1800	U	108		1080	ug/kg	13	60	(0%-30%)			
Hexachlorobutadiene	1800	U	108		839	ug/kg	23	47	(0%-30%)			
Hexachlorocyclopentadiene	1800	U	108		438	ug/kg	45*	24	(0%-30%)			
Hexachloroethane	1800	U	108		879	ug/kg	25	49	(0%-30%)			
Isophorone	1800	U	108		1030	ug/kg	22	57	(0%-30%)			
N-Nitrosodipropylamine	1800	U	108		1020	ug/kg	23	56	(0%-30%)			
Nitrobenzene	1800	U	108		1170	ug/kg	21	65	(0%-30%)			
Pentachlorophenol	1800	U	108		1200	ug/kg	4	67	(0%-30%)			

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719891										
Phenol	1800	U	108	1050	ug/kg	21	58	(0%-30%)	JLD1	11/17/17	16:48
bis(2-Chloro-1-methylethyl)ether	1800	U	108	1380	ug/kg	22	77	(0%-30%)			
bis(2-Chloroethoxy)methane	1800	U	108	1070	ug/kg	26	59	(0%-30%)			
bis(2-Chloroethyl) ether	1800	U	108	1110	ug/kg	20	61	(0%-30%)			
bis(2-Ethylhexyl)phthalate	1800	U	108	1040	ug/kg	12	57	(0%-30%)			
m-Nitroaniline	1800	U	108	1090	ug/kg	20	60	(0%-30%)			
o-Cresol	1800	U	108	1080	ug/kg	20	60	(0%-30%)			
o-Nitroaniline	1800	U	119	1390	ug/kg	15	77	(0%-30%)			
p-Nitroaniline	1800	U	108	960	ug/kg	24	53	(0%-30%)			
**2,4,6-Tribromophenol	3610		1270	1860	ug/kg		52	(39%-115%)			
**2-Fluorobiphenyl	1800		654	917	ug/kg		51	(35%-107%)			
**2-Fluorophenol	3610		1220	1870	ug/kg		52	(36%-104%)			
**Nitrobenzene-d5	1800		660	1010	ug/kg		56	(34%-109%)			
**Phenol-d5	3610		1280	2010	ug/kg		56	(39%-106%)			
**p-Terphenyl-d14	1800		853	1210	ug/kg		67	(45%-119%)			

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719897										
QC1203922191	LCS										
Acenaphthene	333			214	ug/kg		64 *	(70%-130%)	JLD1	11/20/17	15:54
Acenaphthylene	333			192	ug/kg		58 *	(70%-130%)			
Anthracene	333			238	ug/kg		72	(70%-130%)			
Benzo(a)anthracene	333			239	ug/kg		72	(70%-130%)			
Benzo(a)pyrene	333			231	ug/kg		69 *	(70%-130%)			
Benzo(b)fluoranthene	333			232	ug/kg		70	(70%-130%)			
Benzo(ghi)perylene	333			255	ug/kg		77	(70%-130%)			
Benzo(k)fluoranthene	333			248	ug/kg		74	(70%-130%)			
Chrysene	333			258	ug/kg		77	(70%-130%)			
Dibenzo(a,h)anthracene	333			276	ug/kg		83	(70%-130%)			
Fluoranthene	333			214	ug/kg		64 *	(70%-130%)			
Fluorene	333			206	ug/kg		62 *	(70%-130%)			
Indeno(1,2,3-cd)pyrene	333			258	ug/kg		77	(70%-130%)			
Naphthalene	333			230	ug/kg		69 *	(70%-130%)			
Phenanthrene	333			248	ug/kg		74	(70%-130%)			

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719897										
Pyrene	333			208	ug/kg		62*	(70%-130%)	JLD1	11/20/17	15:54
**5-alpha-Androstane	167			128	ug/kg		77	(30%-118%)			
QC1203922190	MB										
Acenaphthene			U	1.10	ug/kg					11/20/17	15:22
Acenaphthylene			U	1.10	ug/kg						
Anthracene			U	1.10	ug/kg						
Benzo(a)anthracene			U	1.10	ug/kg						
Benzo(a)pyrene			U	1.10	ug/kg						
Benzo(b)fluoranthene			U	1.10	ug/kg						
Benzo(ghi)perylene			U	1.10	ug/kg						
Benzo(k)fluoranthene			U	1.10	ug/kg						
Chrysene			U	1.10	ug/kg						
Dibenzo(a,h)anthracene			U	1.10	ug/kg						
Fluoranthene			U	1.10	ug/kg						
Fluorene			U	1.10	ug/kg						
Indeno(1,2,3-cd)pyrene			U	1.10	ug/kg						

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719897										
Naphthalene			U	1.10	ug/kg				JLD1	11/20/17	15:22
Phenanthrene			U	1.10	ug/kg						
Pyrene			U	1.10	ug/kg						
**5- α -Androstane	167			125	ug/kg		75	(30%-118%)			
QC1203922192	438004001 MS										
Acenaphthene	361	U	1.81	204	ug/kg		56	(18%-115%)		11/17/17	16:01
Acenaphthylene	361	U	1.81	180	ug/kg		50	(19%-116%)			
Anthracene	361	U	1.81	214	ug/kg		59	(23%-115%)			
Benzo(a)anthracene	361	J	2.53	249	ug/kg		68	(23%-124%)			
Benzo(a)pyrene	361	J	2.53	250	ug/kg		69	(20%-130%)			
Benzo(b)fluoranthene	361		3.61	261	ug/kg		71	(20%-134%)			
Benzo(ghi)perylene	361	U	1.81	204	ug/kg		57	(18%-118%)			
Benzo(k)fluoranthene	361	U	1.81	292	ug/kg		81	(23%-128%)			
Chrysene	361		3.61	272	ug/kg		74	(18%-121%)			
Dibenzo(a,h)anthracene	361	U	1.81	258	ug/kg		71	(12%-132%)			
Fluoranthene	361		3.97	175	ug/kg		47	(21%-124%)			

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719897										
Fluorene	361	U	1.81	202	ug/kg		56	(21%-118%)	JLD1	11/17/17	16:01
Indeno(1,2,3-cd)pyrene	361	U	1.81	217	ug/kg		60	(11%-130%)			
Naphthalene	361	U	1.08	205	ug/kg		57	(14%-114%)			
Phenanthrene	361		3.61	221	ug/kg		60	(24%-106%)			
Pyrene	361		5.78	314	ug/kg		85	(16%-122%)			
**5-alpha-Androstane	181		69.0	98.2	ug/kg		54	(30%-118%)			
QC1203922193 438004001 MSD											
Acenaphthene	361	U	1.81	238	ug/kg	16	66	(0%-30%)		11/17/17	16:33
Acenaphthylene	361	U	1.81	209	ug/kg	15	58	(0%-30%)			
Anthracene	361	U	1.81	271	ug/kg	24	75	(0%-30%)			
Benzo(a)anthracene	361	J	2.53	275	ug/kg	10	75	(0%-30%)			
Benzo(a)pyrene	361	J	2.53	272	ug/kg	8	75	(0%-30%)			
Benzo(b)fluoranthene	361		3.61	285	ug/kg	9	78	(0%-30%)			
Benzo(ghi)perylene	361	U	1.81	222	ug/kg	8	62	(0%-30%)			
Benzo(k)fluoranthene	361	U	1.81	322	ug/kg	10	89	(0%-30%)			
Chrysene	361		3.61	298	ug/kg	9	81	(0%-30%)			

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1719897										
Dibenzo(a,h)anthracene	361	U	1.81		277	ug/kg	7	77	(0%-30%)	JLD1	11/17/17 16:33
Fluoranthene	361		3.97		215	ug/kg	20	58	(0%-30%)		
Fluorene	361	U	1.81		231	ug/kg	13	64	(0%-30%)		
Indeno(1,2,3-cd)pyrene	361	U	1.81		232	ug/kg	7	64	(0%-30%)		
Naphthalene	361	U	1.08		240	ug/kg	16	67	(0%-30%)		
Phenanthrene	361		3.61		280	ug/kg	24	76	(0%-30%)		
Pyrene	361		5.78		343	ug/kg	9	93	(0%-30%)		
**5-alpha-Androstane	180		69.0		125	ug/kg		69	(30%-118%)		

Notes:

The Qualifiers in this report are defined as follows:

- A The TIC is a suspected aldol-condensation product
- B The analyte was detected in both the associated QC blank and in the sample.
- C Analyte has been confirmed by GC/MS analysis
- D Results are reported from a diluted aliquot of sample.
- E Concentration exceeds the calibration range of the instrument
- J The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate). Value is estimated
- N Spike Sample recovery is outside control limits.
- P Aroclor target analyte with greater than 25% difference between column analyses.
- T Spike and/or spike duplicate sample recovery is outside control limits.
- U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Y Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Z Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- o Analyte failed to recover within LCS limits (Organics only)

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
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N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Surrogate Recovery Report

SDG Number: GEL438004

Matrix Type: SOLID

Sample ID	Client ID	5-alpha %REC
438004001	B3FNH2	38
1203922192	B3FNH2MS	54
1203922193	B3FNH2MSD	69
1203922190	MB for batch 1719894	75
1203922191	LCS for batch 1719894	77
438004002	B3FNH4	67
438004003	B3FNH6	73
438004004	B3FNH8	82
438004005	B3FNJ0	73
438004006	B3FNJ2	77
438004007	B3FNJ4	71
438004008	B3FNJ6	90
438004009	B3FNJ8	76
438004010	B3FNK0	76

Surrogate

5-alpha- = 5-alpha-Androstane

Acceptance Limits

(30%-118%)

* Recovery outside Acceptance Limits

Column to be used to flag recovery values

D Sample Diluted

Surrogate Recovery Report

SDG Number: GEL438004

Matrix Type: SOLID

Sample ID	Client ID	2FP %REC	PHL %REC	NBZ %REC	FBP %REC	TBP %REC	TPH %REC
1203921855	MB for batch 1719749	66	71	81	72	62	86
1203921856	LCS for batch 1719749	72	76	78	68	64	86
438004001	B3FNH2	34 *	35 *	37	36	35 *	47
1203921858	B3FNH2MS	67	71	72	63	62	76
1203921860	B3FNH2MSD	52	56	56	51	52	67
438004002	B3FNH4	56	58	65	60	53	67
438004003	B3FNH6	69	74	85	77	59	89
438004004	B3FNH8	69	75	86	76	61	84
438004005	B3FNJ0	61	66	75	68	54	77
438004006	B3FNJ2	61	65	74	67	48	73
438004007	B3FNJ4	70	76	84	76	57	82
438004008	B3FNJ6	63	69	81	71	53	82
438004009	B3FNJ8	57	63	73	66	48	73
438004010	B3FNK0	60	65	75	67	51	77

Surrogate

Acceptance Limits

2FP	= 2-Fluorophenol	(36%-104%)
PHL	= Phenol-d5	(39%-106%)
NBZ	= Nitrobenzene-d5	(34%-109%)
FBP	= 2-Fluorobiphenyl	(35%-107%)
TBP	= 2,4,6-Tribromophenol	(39%-115%)
TPH	= p-Terphenyl-d14	(45%-119%)

* Recovery outside Acceptance Limits

Column to be used to flag recovery values

D Sample Diluted

Date: 30 November 2017
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: 100-K AA
 Subject: Pesticides - Sample Data Group (SDG) GEL438004

INTRODUCTION

This memorandum presents the results of data validation for SDG GEL438004 prepared by GEL Laboratories LLC. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Method
B3FNH2	11/14/17	Soil	C	8081B
B3FNH4	11/14/17	Soil	C	8081B
B3FNH6	11/14/17	Soil	C	8081B
B3FNH8	11/14/17	Soil	C	8081B
B3FNJ0	11/14/17	Soil	C	8081B
B3FNJ2	11/14/17	Soil	C	8081B
B3FNJ4	11/14/17	Soil	C	8081B
B3FNJ6	11/14/17	Soil	C	8081B
B3FNJ8	11/14/17	Soil	C	8081B
B3FNK0	11/14/17	Soil	C	8081B

Data validation was conducted in accordance with the CHPRC validation statement of work and 100 Area Remedial Action Sampling and Analysis Plan, DOE/RL-96-22, Rev. 5 (SAP). Appendices 1 through 4 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Data Validation Supporting Documentation
- Appendix 4. Additional Documentation Requested by Client

DATA QUALITY OBJECTIVES

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The holding time requirements for pesticides on soil samples are extraction within 14 days of sample collection and analysis within 40 days of sample extraction. Sample preservation requires chilling to <6 degrees Celsius.

The samples were extracted and analyzed within the prescribed holding times and properly preserved.

- **Blanks**

The blank data results are reviewed to assess the extent of contamination introduced through sampling, sample preparation, and analysis.

Laboratory Blanks

All laboratory blank results were acceptable.

Trip Blanks

All trip blank results were acceptable.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing surrogate results, matrix spike sample results, and laboratory control sample results. According to the SAP, the laboratory control sample accuracy limits are 50% to 150% and the matrix spike sample accuracy limits are ones specified by the DV procedure.

Surrogates

All surrogate recoveries were acceptable.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples

All MS/MSD recoveries were acceptable with the following exceptions.

The MS and MSD recoveries for 4,4'-DDD, 4,4'-DDE, 4,4'-DDT and the MS recovery for endrin were above the upper acceptance limit. All associated detected sample results should be qualified as estimates and flagged "J." See the table in Appendix 2 for a listing of all affected sample results.

It should be mentioned that MS/MSD analyses was not performed for the multi-component analyte toxaphene. No sample data are qualified as a result.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

It should be mentioned that LCS analysis was not performed for multi-component analyte toxaphene. No sample data are qualified as a result.

- **Precision**

Precision is evaluated by reviewing MS/MSD results, field duplicate sample results, and field split sample results. These QC results provide information on the laboratory reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limits are $\pm 30\%$.

MS/MSD Samples

All MS/MSD RPDs were acceptable.

Field Duplicate Samples

All field duplicate results were acceptable.

Field Split Samples

No field splits were submitted for validation.

- **Detection Limits**

Reported MDLs are compared against the contractually required detection limits (CRDLs) to ensure that laboratory detection limits meet the required criteria.

All reported sample MDLs were below the CRDLs.

- **Completeness**

SDG GEL438004 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

A minor deficiency leading to qualification of sample results were due to high matrix spike recoveries. See the table in Appendix 2 for a listing of all affected sample results.

REFERENCES

GRP-GD-003, Rev. 2, Change 0, *Data Validation for Chemical Analyses*, October 2016.

DOE/RL-96-22, Rev. 5, *100 Area Remedial Action Sampling and Analysis Plan*, September 2009.

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers that may be applied by data validators in compliance with the CHPRC statement of work are as follows:

- **U** — The constituent was analyzed for, but was not detected. The data should be considered usable for decision-making purposes.
- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the RL. The data should be considered usable for decision-making purposes.
- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **N** — The analysis indicates the presence of an analyte that has been tentatively identified.
- **NJ** — The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.
- **NJ+** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation.
- **NJ-** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation.
- **C** — This qualifier applies to pesticide and Aroclor results when the identification has been confirmed by Gas Chromatograph/Mass Spectrometer (GC/MS).
- **X** — This qualifier applies to pesticide and Aroclor results when GC/MS analysis was attempted but was unsuccessful. The data should be considered unusable for decision-making purposes.
- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

- **R** — Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

Appendix 2
Summary of Data Qualification

Pesticides Data Qualification Summary			
SDG: GEL438004	Reviewer: AQA	Project: 100-K AA	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
4,4'-DDE	J	B3FNH2, B3FNJ0	High matrix spike recoveries
4,4'-DDD, 4,4'-DDT,	J	B3FNJ0	High matrix spike recoveries
Endrin	J	B3FNK0	High matrix spike recovery

Comments: None

Appendix 3

Data Validation Supporting Documentation

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	C	D	E
PROJECT: 100-K AA			DATA PACKAGE: VSR18-002		
VALIDATOR: Eyda Hergenreder		LAB: GEL		DATE: 11/30/17	
			SDG: GEL438004		
ANALYSES PERFORMED					
SW-846 8081 X	SW-846 8081 (TCLP)	SW-846 8082	SW-846 8082 (TCLP)		
SAMPLES/MATRIX Soil					
GEL438004: B3FNH2, B3FNH4, B3FNH6, B3FNH8, B3FNJ0, B3FNJ2, B3FNJ4, B3FNJ6, B3FNJ8, B3FNK0					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present?	Yes No N/A
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Comments:

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

2. INSTRUMENT PERFORMANCE AND CALIBRATIONS (Levels D and E)

Initial calibrations acceptable?	Yes No <input type="radio"/> N/A
Continuing calibrations acceptable?	Yes No <input type="radio"/> N/A
Standards traceable?	Yes No <input type="radio"/> N/A
Standards expired?	Yes No <input type="radio"/> N/A
Calculation check acceptable?	Yes No <input type="radio"/> N/A
DDT and endrin breakdowns acceptable?	Yes No <input type="radio"/> N/A

Comments:

3. BLANKS (Levels B, C, D, and E)

Calibration blanks analyzed? (Levels D, E)	Yes No <input type="radio"/> N/A
Calibration blank results acceptable? (Levels D, E)	Yes No <input type="radio"/> N/A
Laboratory blanks analyzed?	<input checked="" type="radio"/> Yes No N/A
Laboratory blank results acceptable?	<input checked="" type="radio"/> Yes No N/A
Field/trip blanks analyzed? (Levels C, D, E)	<input checked="" type="radio"/> Yes No N/A
Field/trip blank results acceptable? (Levels C, D, E)	<input checked="" type="radio"/> Yes No N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input type="radio"/> N/A

Comments:

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

4. ACCURACY (Levels C, D, and E)

Surrogates analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Surrogate recoveries acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Surrogates traceable? (Levels D, E)	Yes No <input type="radio"/> N/A
Surrogates expired? (Levels D, E)	Yes No <input type="radio"/> N/A
MS/MSD samples analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
MS/MSD results acceptable?	Yes <input type="radio"/> No <input type="radio"/> N/A
MS/MSD standards NIST traceable? (Levels D, E)	Yes No <input type="radio"/> N/A
MS/MSD standards expired? (Levels D, E)	Yes No <input type="radio"/> N/A
LCS/BSS samples analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
LCS/BSS results acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Standards traceable? (Levels D, E)	Yes No <input type="radio"/> N/A
Standards expired? (Levels D, E)	Yes No <input type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input type="radio"/> N/A
Performance audit sample(s) analyzed?	Yes No <input type="radio"/> N/A
Performance audit sample results acceptable?	Yes No <input type="radio"/> N/A

Comments:

MS %R: 4,4-DDD 159%; 4,4-DDE 164%, 4,4-DDT 164%; Endrin 156%

MSD %R: 4,4-DDD 153%; 4,4-DDE 160%; 4,4-DDT 164%

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

5. PRECISION (Levels C, D, and E)

Duplicate RPD values acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Duplicate results acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
MS/MSD standards NIST traceable? (Levels D, E)	Yes No <input type="radio"/> N/A
MS/MSD standards expired? (Levels D, E)	Yes No <input type="radio"/> N/A
LCS/LCSD duplicates run due to insufficient sample material?	Yes <input type="radio"/> No <input checked="" type="radio"/> N/A
Field duplicate RPD values acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Field split RPD values acceptable?	Yes No <input type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input type="radio"/> N/A

Comments:

6. SYSTEM PERFORMANCE (Levels D and E)

Chromatographic performance acceptable?	Yes No <input type="radio"/> N/A
Positive results resolved acceptably?	Yes No <input type="radio"/> N/A

Comments:

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

7. HOLDING TIMES (all levels)

Samples properly preserved?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Sample holding times acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A

Comments:

8. COMPOUND IDENTIFICATION, QUANTITATION, AND DETECTION LIMITS (all levels)

Compound identification acceptable? (Levels D, E)	Yes No <input type="radio"/> N/A
Compound quantitation acceptable? (Levels D, E)	Yes No <input type="radio"/> N/A
Results reported for all requested analyses?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Results supported in the raw data? (Levels D, E)	Yes No <input type="radio"/> N/A
Samples properly prepared? (Levels D, E)	Yes No <input type="radio"/> N/A
Detection limits meet RDL?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input type="radio"/> N/A

Comments:

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

9. SAMPLE CLEANUP (Levels D and E)

Fluorisil ® (or other absorbent) cleanup performed?	Yes No (N/A)
Lot check performed?	Yes No (N/A)
Check recoveries acceptable?	Yes No (N/A)
GPC cleanup performed?	Yes No (N/A)
GPC check performed?	Yes No (N/A)
GPC check recoveries acceptable?	Yes No (N/A)
GPC calibration performed?	Yes No (N/A)
GPC calibration check performed?	Yes No (N/A)
GPC calibration check retention times acceptable?	Yes No (N/A)
Check/calibration materials traceable?	Yes No (N/A)
Check/calibration materials Expired?	Yes No (N/A)
Analytical batch QC given similar cleanup?	Yes No (N/A)
Transcription/Calculation Errors?	Yes No (N/A)

Comments (attach additional sheets as necessary):

Appendix 4

Additional Documentation Requested By Client

Surrogate Recovery Report

SDG Number: GEL438004

Matrix Type: SOLID

Sample ID	Client ID	4CMX 1 %REC #	4CMX 2 %REC #	DCB 1 %REC #	DCB 2 %REC #
1203924195	MB for batch 1720617	79	77	84	83
1203924196	LCS for batch 1720617	85	87	89	86
438004001	B3FNH2	83	82	99	98
438004002	B3FNH4	75	71	86	89
1203924197	B3FNH4MS	74	83	97	118
1203924198	B3FNH4MSD	76	82	95	117
438004003	B3FNH6	89	90	111	127
438004004	B3FNH8	72	70	83	81
438004006	B3FNJ2	71	70	84	78
438004007	B3FNJ4	68	67	80	76
438004008	B3FNJ6	79	75	87	84
438004009	B3FNJ8	42	43	50	46
438004005	B3FNJ0	67	73	73	70
438004010	B3FNK0	73	74	75	74

Surrogate

4CMX = 4cmx

DCB = Decachlorobiphenyl

Acceptance Limits

(27%-121%)

(30%-136%)

* Recovery outside Acceptance Limits

Column to be used to flag recovery values

D Sample Diluted

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QC Summary

Report Date: November 22, 2017

Page 1 of 6

CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 438004

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-Pesticide											
Batch	1720619										
QC1203924196	LCS										
4,4'-DDD	41.6			43.5	ug/kg		105	(70%-130%)	RXE1	11/21/17	21:11
4,4'-DDE	41.6			40.5	ug/kg		97	(70%-130%)			
4,4'-DDT	41.6			43.6	ug/kg		105	(70%-130%)			
Aldrin	16.7			15.1	ug/kg		91	(70%-130%)			
Dieldrin	41.6			40.2	ug/kg		97	(70%-130%)			
Endosulfan I	16.7			15.4	ug/kg		93	(70%-130%)			
Endosulfan II	41.6			39.7	ug/kg		95	(70%-130%)			
Endosulfan sulfate	41.6			53.3	ug/kg		128	(70%-130%)			
Endrin	41.6			41.4	ug/kg		100	(70%-130%)			
Endrin aldehyde	41.6			39.6	ug/kg		95	(70%-130%)			
Heptachlor epoxide	16.7			15.3	ug/kg		92	(70%-130%)			
Methoxychlor	167			176	ug/kg		106	(70%-130%)			
alpha-BHC	16.7			15.8	ug/kg		95	(70%-130%)			

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QC Summary

Workorder: 438004

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-Pesticide											
Batch	1720619										
beta-BHC	16.7			16.2	ug/kg		97	(70%-130%)	RXE1	11/21/17	21:11
delta-BHC	16.7			18.2	ug/kg		109	(70%-130%)			
gamma-BHC (Lindane)	16.7			15.7	ug/kg		94	(70%-130%)			
**4cmx	33.3			28.2	ug/kg		85	(27%-121%)			
**Decachlorobiphenyl	33.3			28.7	ug/kg		86	(30%-136%)			
QC1203924195	MB										
4,4'-DDD			U	0.333	ug/kg					11/21/17	20:54
4,4'-DDE			U	0.333	ug/kg						
4,4'-DDT			U	0.333	ug/kg						
Aldrin			U	0.167	ug/kg						
Dieldrin			U	0.333	ug/kg						
Endosulfan I			U	0.167	ug/kg						
Endosulfan II			U	0.333	ug/kg						
Endosulfan sulfate			U	0.333	ug/kg						
Endrin			U	0.333	ug/kg						
Endrin aldehyde			U	0.333	ug/kg						

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QC Summary

Workorder: 438004

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-Pesticide											
Batch	1720619										
Heptachlor epoxide			U	0.167	ug/kg				RXE1	11/21/17	20:54
Methoxychlor			U	1.67	ug/kg						
Toxaphene			U	5.55	ug/kg						
alpha-BHC			U	0.167	ug/kg						
beta-BHC			U	0.167	ug/kg						
delta-BHC			U	0.167	ug/kg						
gamma-BHC (Lindane)			U	0.167	ug/kg						
**4cmx	33.3			25.6	ug/kg		77	(27%-121%)			
**Decachlorobiphenyl	33.3			27.6	ug/kg		83	(30%-136%)			
QC1203924197 438004002 MS											
4,4'-DDD	46.6	TU	0.373	T	74.3	ug/kg	159*	(17%-156%)		11/21/17	21:59
4,4'-DDE	46.6	TU	0.373	ET	76.5	ug/kg	164*	(15%-139%)			
4,4'-DDT	46.6	TU	0.373	ET	76.4	ug/kg	164*	(11%-137%)			
Aldrin	18.6	U	0.186		22.0	ug/kg	118	(21%-119%)			
Dieldrin	46.6	TU	0.373	T	65.4	ug/kg	140*	(22%-134%)			
Endosulfan I	18.6	U	0.186		16.7	ug/kg	90	(15%-126%)			

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QC Summary

Workorder: 438004

Page 4 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-Pesticide											
Batch	1720619										
Endosulfan II	46.6	U	0.373		55.7	ug/kg	120	(20%-132%)	RXE1	11/21/17	21:59
Endosulfan sulfate	46.6	TU	0.373	T	68.2	ug/kg	146*	(17%-138%)			
Endrin	46.6	TU	0.373	T	72.5	ug/kg	156*	(24%-148%)			
Endrin aldehyde	46.6	U	0.373		51.5	ug/kg	111	(18%-132%)			
Heptachlor epoxide	18.6	U	0.186		22.5	ug/kg	121	(14%-133%)			
Methoxychlor	186		10.7		219	ug/kg	112	(15%-156%)			
alpha-BHC	18.6	U	0.186		19.6	ug/kg	105	(14%-126%)			
beta-BHC	18.6	U	0.186		20.4	ug/kg	110	(14%-143%)			
delta-BHC	18.6	U	0.186		21.6	ug/kg	116	(17%-138%)			
gamma-BHC (Lindane)	18.6	J	0.412		18.3	ug/kg	96	(16%-126%)			
**4cmx	37.3		26.5		30.9	ug/kg	83	(27%-121%)			
**Decachlorobiphenyl	37.3		32.1		36.1	ug/kg	97	(30%-136%)			
QC1203924198 438004002 MSD											
4,4'-DDD	46.6	TU	0.373		71.2	ug/kg	4	153	(0%-30%)		11/21/17 22:15
4,4'-DDE	46.6	TU	0.373	T	74.5	ug/kg	3	160*	(0%-30%)		
4,4'-DDT	46.6	TU	0.373	ET	76.5	ug/kg	0	164*	(0%-30%)		

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QC Summary

Workorder: 438004

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-Pesticide											
Batch	1720619										
Aldrin	18.7	U	0.186		21.4	ug/kg	3	115	(0%-30%)	RXE1	11/21/17 22:15
Dieldrin	46.6	TU	0.373	T	66.3	ug/kg	2	142*	(0%-30%)		
Endosulfan I	18.7	U	0.186		16.4	ug/kg	2	88	(0%-30%)		
Endosulfan II	46.6	U	0.373		52.6	ug/kg	6	113	(0%-30%)		
Endosulfan sulfate	46.6	TU	0.373		61.5	ug/kg	10	132	(0%-30%)		
Endrin	46.6	TU	0.373	T	69.8	ug/kg	4	150*	(0%-30%)		
Endrin aldehyde	46.6	U	0.373		47.3	ug/kg	8	101	(0%-30%)		
Heptachlor epoxide	18.7	U	0.186		21.6	ug/kg	4	116	(0%-30%)		
Methoxychlor	187		10.7		209	ug/kg	5	106	(0%-30%)		
alpha-BHC	18.7	U	0.186		18.5	ug/kg	6	99	(0%-30%)		
beta-BHC	18.7	U	0.186		19.1	ug/kg	7	102	(0%-30%)		
delta-BHC	18.7	U	0.186		19.7	ug/kg	9	106	(0%-30%)		
gamma-BHC (Lindane)	18.7	J	0.412		16.6	ug/kg	10	87	(0%-30%)		
**4cmx	37.3		26.5		30.5	ug/kg		82	(27%-121%)		
**Decachlorobiphenyl	37.3		32.1		35.3	ug/kg		95	(30%-136%)		

Notes:

Date: 30 November 2017
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: 100-K AA
 Subject: Inorganics - Sample Data Group (SDG) GEL438004

INTRODUCTION

This memorandum presents the results of data validation for SDG GEL438004 prepared by GEL Laboratories LLC. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B3FNH2	11/14/17	Soil	C	6010D, 7471
B3FNH4	11/14/17	Soil	C	6010D, 7471
B3FNH6	11/14/17	Soil	C	6010D, 7471
B3FNH8	11/14/17	Soil	C	6010D, 7471
B3FNJ0	11/14/17	Soil	C	6010D, 7471
B3FNJ2	11/14/17	Soil	C	6010D, 7471
B3FNJ4	11/14/17	Soil	C	6010D, 7471
B3FNJ6	11/14/17	Soil	C	6010D, 7471
B3FNJ8	11/14/17	Soil	C	6010D, 7471
B3FNK0	11/14/17	Soil	C	6010D, 7471

Data validation was conducted in accordance with the CHPRC validation statement of work and the 100 Area Remedial Action Sampling and Analysis Plan, DOE/RL-96-22, Rev. 5 (SAP). Appendices 1 through 4 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Data Validation Supporting Documentation
- Appendix 4. Additional Documentation Requested by Client

DATA QUALITY OBJECTIVES

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The holding time requirement for ICP metals are analysis within 180 days of sample collection, and the holding time requirement for mercury is analysis within 28 days of sample collection. Sample preservation for soil samples require chilling to ≤ 6 degree Celsius.

The samples were analyzed within the prescribed holding times and properly preserved.

- **Blanks**

The blank data results are reviewed to assess the extent of contamination introduced through sampling, sample preparation, and analysis.

Laboratory Blanks

All laboratory blank results were acceptable with the following exceptions.

The Cr and Se laboratory blank results were detects > the method detection limits (MDLs) but < the practical quantitation limits (PQLs). The Cr result for sample B3FNJ4 was a detect > the PQL but < 20X the method blank value and should be qualified as an estimate and flagged “J+.”

The Se results for samples B3FNH2, B3FNH4, B3FNH6, B3FNH8, B3FNJ2, B3FNJ6 and B3FNK0 were detects \geq MDL but \leq the PQL and should be qualified as estimates and flagged “J+.”

Trip Blanks

All trip blank results were acceptable with the following exceptions. Ba, Cr, Mn, Ni and V were detected in trip blank sample B3FNJ4.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results, laboratory control sample results, and ICP-AES interference check sample results. According to the SAP, the matrix spike sample accuracy limits are 70% to 130% and the laboratory control sample accuracy limits are ones specified by the DV procedure. The limits for reported analytes not listed in the SAP are specified by the DV procedure. The interference check sample limits are ones specified by the DV procedure.

Matrix Spike (MS) Samples

All MS recoveries were acceptable.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

ICP-AES Interference Check Samples (ICSs)

ICS data was not included in the data package. Sample results should not be qualified based on this.

- **Precision**

Precision is evaluated by reviewing laboratory duplicate sample results, field duplicate sample results, field split sample results, and ICP serial dilution results. These QC results provide information on the laboratory reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limits are $\pm 30\%$. The limits for reported analytes not listed in the SAP are specified by the DV procedure.

Laboratory Duplicate Samples

All laboratory duplicate RPD values were acceptable with the following exceptions.

The RPDs for Cr and Pb were above the upper acceptance limit. All associated sample results should be qualified as estimates and flagged “UJ” for non-detects and “J” for detects. See the table in Appendix 2 for a listing of all affected sample results.

Field Duplicate Samples

All field duplicate results were acceptable.

Field Split Samples

No field splits were submitted for validation.

ICP Serial Dilution Samples

ICS serial dilution data was not included in the data package. Sample results should not be qualified based on this.

- **ICP-MS Internal Standards**

The analysis of ICP-MS internal standards is used to determine the existences and magnitude of instrument drift and physical interferences. The criteria for evaluation of internal standard results apply to all samples (including QC) analyzed during the analytical run, beginning with the calibration.

ICP-MS internal standards data was not included in the data package. Sample results should not be qualified based on this.

- **Detection Limits**

Reported MDLs are compared against the contractually required detection limits (CRDLs) to ensure that laboratory detection limits meet the required criteria.

All reported sample MDLs with associated non-detected sample results were below the CRDLs with the following exceptions. The Ag for samples B3FNH2, B3FNH4, B3FNH6, B3FNH8, B3FNJ0, B3FNJ6, B3FNJ8 and B3FNK0; the Cd and Sb for all samples except for sample B3FNJ4, the Se for samples B3FNJ0, B3FNJ4 and B3FNJ8, the Pb for samples B3FNH6, B3FNH8 and B3FNJ2 and Zn for sample B3FNJ4.

- **Completeness**

SDG GEL438004 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

Minor deficiencies leading to qualification of sample results as estimates were due to laboratory blank infractions for Cr and Se and poor laboratory precision for Cr and Pb. See the table in Appendix 2 for a listing of all affected sample results.

REFERENCES

GRP-GD-003, Rev. 2, Change 0, *Data Validation for Chemical Analyses*, October 2016.

DOE/RL-96-22, Rev. 5, *100 Area Remedial Action Sampling and Analysis Plan*, September 2009.

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers that may be applied by data validators in compliance with the CHPRC statement of work are as follows:

- **U** — The constituent was analyzed for, but was not detected. The data should be considered usable for decision-making purposes.
- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the RL. The data should be considered usable for decision-making purposes.
- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **N** — The analysis indicates the presence of an analyte that has been tentatively identified.
- **NJ** — The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.
- **NJ+** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation.
- **NJ-** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation.
- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.
- **R** — Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

Appendix 2
Summary of Data Qualification

Inorganic Data Qualification Summary			
SDG: GEL438004	Reviewer: AQA	Project: 100-K AA	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
Cr	J+	B3FNJ4	Laboratory blank contamination and poor laboratory duplicate precision
Se	J+	B3FNH2, B3FNH4, B3FNH6, B3FNH8, B3FNJ2, B3FNJ6, B3FNK0	Laboratory blank contamination
Cr	J	B3FNH2, B3FNH4, B3FNH6, B3FNH8, B3FNJ0, B3FNJ2, B3FNJ6, B3FNJ8, B3FNK0	Poor laboratory duplicate precision
Pb	UJ	B3FNH6, B3FNH8, B3FNJ2, B3FNJ4, B3FNJ6	Poor laboratory duplicate precision
Pb	J	B3FNH2, B3FNH4, B3FNJ0, B3FNJ8, B3FNK0	Poor laboratory duplicate precision

Comments: None

Appendix 3

Data Validation Supporting Documentation

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	<input checked="" type="radio"/> C	D	E
PROJECT: 100-K AA			DATA PACKAGE: VSR18-002		
VALIDATOR: Eyda Hergenreder		LAB: GEL		DATE: 11/30/17	
			SDG: GEL438004		
ANALYSES PERFORMED					
SW-846/ICP X	SW-846/GFAA	SW-846/Hg X	SW-846 Cyanide		
SAMPLES/MATRIX Soil					
GEL438004: B3FNH2, B3FNH4, B3FNH6, B3FNH8, B3FNJ0, B3FNJ2, B3FNJ4, B3FNJ6, B3FNJ8, B3FNK0					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present?	Yes <input checked="" type="radio"/> No <input type="radio"/> N/A
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Comments:

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

2. INSTRUMENT PERFORMANCE AND CALIBRATIONS (Levels D and E)

Initial calibrations performed on all instruments?	Yes No <input checked="" type="radio"/> N/A
Initial calibrations acceptable?	Yes No <input checked="" type="radio"/> N/A
ICP interference checks acceptable?	Yes No <input checked="" type="radio"/> N/A
ICV and CCV checks performed on all instruments?	Yes No <input checked="" type="radio"/> N/A
ICV and CCV checks acceptable?	Yes No <input checked="" type="radio"/> N/A
Standards traceable?	Yes No <input checked="" type="radio"/> N/A
Standards expired?	Yes No <input checked="" type="radio"/> N/A
Calculation check acceptable?	Yes No <input checked="" type="radio"/> N/A

Comments:

3. BLANKS (Levels B, C, D, and E)

ICB and CCB checks performed for all applicable analyses? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
ICB and CCB results acceptable? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Laboratory blanks analyzed?	<input checked="" type="radio"/> Yes No N/A
Laboratory blank results acceptable?	Yes <input checked="" type="radio"/> No N/A
Field blanks analyzed? (Levels C, D, E)	<input checked="" type="radio"/> Yes No N/A
Field blank results acceptable? (Levels C, D, E)	Yes <input checked="" type="radio"/> No N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

Comments:

Laboratory blank: Cr 174 ug/kg; Se 615 ug/kg

Trip blank sample B3FNJ4: Ba 1310 ug/kg; Cr 481 ug/kg; Mn 10600 ug/kg; Ni 193 ug/kg; V 231 ug/kg

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

4. ACCURACY (Levels C, D, and E)

MS/MSD samples analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
MS/MSD results acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
MS/MSD standards NIST traceable? (Levels D, E)	Yes No <input type="radio"/> N/A
MS/MSD standards expired? (Levels D, E)	Yes No <input type="radio"/> N/A
LCS/BSS samples analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
LCS/BSS results acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Standards traceable? (Levels D, E)	Yes No <input type="radio"/> N/A
Standards expired? (Levels D, E)	Yes No <input type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input type="radio"/> N/A
Performance audit sample(s) analyzed?	Yes No <input type="radio"/> N/A
Performance audit sample results acceptable?	Yes No <input type="radio"/> N/A

Comments:

Parent result for Mn >4X spike concentration

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

6. ICP QUALITY CONTROL (Levels D and E)

ICP serial dilution samples analyzed?	Yes No <input checked="" type="radio"/> N/A
ICP serial dilution %D values acceptable?	Yes No <input checked="" type="radio"/> N/A
ICP post digestion spike required?	Yes No <input checked="" type="radio"/> N/A
ICP post digestion spike values acceptable?	Yes No <input checked="" type="radio"/> N/A
Standards traceable?	Yes No <input checked="" type="radio"/> N/A
Standards expired?	Yes No <input checked="" type="radio"/> N/A
Transcription/calculation errors?	Yes No <input checked="" type="radio"/> N/A

Comments:

7. HOLDING TIMES (all levels)

Samples properly preserved?	<input checked="" type="radio"/> Yes No N/A
Sample holding times acceptable?	<input checked="" type="radio"/> Yes No N/A

Comments:

Appendix 4

Additional Documentation Requested By Client

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: November 22, 2017

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CH2MHill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 438004

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1719645										
QC1203921593 438004001 DUP											
Antimony	BD	-3120	DU	1740	ug/kg	160	^	(+/-5260)	HSC	11/21/17	16:51
Arsenic	B	2370	B	1710	ug/kg	32.4	^	(+/-3160)		11/17/17	19:15
Barium		70000		64200	ug/kg	8.67		(0%-35%)			
Beryllium		849		855	ug/kg	0.694	^	(+/-526)			
Boron	B	-1240	U	1050	ug/kg	20	^	(+/-5260)			
Cadmium	DU	536	DU	526	ug/kg	N/A				11/21/17	16:51
Chromium	*	12200	*	8860	ug/kg	31.6		(0%-35%)		11/17/17	19:15
Cobalt	D	7290	D	7420	ug/kg	1.81	^	(+/-2630)		11/21/17	16:51
Copper		21600		19500	ug/kg	10		(0%-35%)		11/17/17	19:15
Lead	*	3210	*	1620	ug/kg	65.5*	^	(+/-1050)		11/22/17	09:12
Manganese		282000		264000	ug/kg	6.39		(0%-35%)		11/17/17	19:15
Molybdenum	B	542	B	429	ug/kg	23.2	^	(+/-1050)			
Nickel	*	10700	*	8690	ug/kg	20.4		(0%-35%)			

GEL LABORATORIES LLC

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QC Summary

Workorder: 438004

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Parname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1719645										
Selenium	BC	1510	B	628	ug/kg	82.7 ^		(+/-3160)	HSC	11/17/17	19:15
Silver	DU	536	DU	526	ug/kg	N/A				11/21/17	16:51
Vanadium	D	55800	D	58300	ug/kg	4.39		(0%-35%)			
Zinc	D	90900	D	82400	ug/kg	9.84		(0%-35%)		11/20/17	19:05
QC1203921592	LCS										
Antimony	47500			43700	ug/kg		91.9	(80%-120%)		11/21/17	16:45
Arsenic	47500			45800	ug/kg		96.3	(80%-120%)		11/17/17	19:09
Barium	47500			45600	ug/kg		96	(80%-120%)			
Beryllium	47500			46000	ug/kg		96.9	(80%-120%)			
Boron	47500			47200	ug/kg		99.2	(80%-120%)			
Cadmium	47500			43500	ug/kg		91.4	(80%-120%)		11/21/17	16:45
Chromium	47500			45200	ug/kg		95.1	(80%-120%)		11/17/17	19:09
Cobalt	47500			44100	ug/kg		92.7	(80%-120%)		11/21/17	16:45
Copper	47500			46300	ug/kg		97.5	(80%-120%)		11/17/17	19:09
Lead	47500			43900	ug/kg		92.3	(80%-120%)		11/21/17	16:45
Manganese	47500			46200	ug/kg		97.2	(80%-120%)		11/17/17	19:09

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QC Summary

Workorder: 438004

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1719645										
Molybdenum	47500			45700	ug/kg		96.2	(80%-120%)	HSC	11/17/17	19:09
Nickel	47500			45100	ug/kg		94.9	(80%-120%)			
Selenium	47500			46500	ug/kg		97.7	(80%-120%)			
Silver	47500			44800	ug/kg		94.3	(80%-120%)		11/21/17	16:45
Vanadium	47500			44400	ug/kg		93.4	(80%-120%)			
Zinc	47500			47300	ug/kg		99.5	(80%-120%)		11/20/17	18:59
QC1203921591	MB										
Antimony			U	317	ug/kg					11/21/17	16:41
Arsenic			U	481	ug/kg					11/17/17	19:05
Barium			U	96.2	ug/kg						
Beryllium			U	96.2	ug/kg						
Boron			U	962	ug/kg						
Cadmium			U	96.2	ug/kg					11/21/17	16:41
Chromium			B	174	ug/kg					11/17/17	19:05
Cobalt			U	144	ug/kg					11/21/17	16:41
Copper			U	288	ug/kg					11/17/17	19:05

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QC Summary

Workorder: 438004

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1719645										
Lead			U	317	ug/kg				HSC	11/21/17	16:41
Manganese			U	192	ug/kg					11/17/17	19:05
Molybdenum			U	192	ug/kg						
Nickel			U	144	ug/kg						
Selenium			B	615	ug/kg						
Silver			U	96.2	ug/kg					11/21/17	16:41
Vanadium			U	96.2	ug/kg						
Zinc			U	385	ug/kg					11/20/17	18:56
QC1203921594 438004001 MS											
Antimony	51800	BD	-3120	D	47500	ug/kg	91.7	(75%-125%)		11/21/17	16:54
Arsenic	51800	B	2370		49100	ug/kg	90.1	(75%-125%)		11/17/17	19:19
Barium	51800		70000		110000	ug/kg	76.6	(75%-125%)			
Beryllium	51800		849		48600	ug/kg	92.1	(75%-125%)			
Boron	51800	B	-1240		46700	ug/kg	90.2	(75%-125%)			
Cadmium	51800	DU	536	D	47600	ug/kg	91.7	(75%-125%)		11/21/17	16:54
Chromium	51800	*	12200		56000	ug/kg	84.6	(75%-125%)		11/17/17	19:19

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QC Summary

Workorder: 438004

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1719645										
Cobalt	51800	D	7290	D	56700	ug/kg	95.4	(75%-125%)	HSC	11/21/17	16:54
Copper	51800		21600		70300	ug/kg	94.1	(75%-125%)		11/17/17	19:19
Lead	51800	*	3210		49600	ug/kg	89.5	(75%-125%)		11/22/17	09:15
Manganese	51800		282000		320000	ug/kg	N/A	(75%-125%)		11/17/17	19:19
Molybdenum	51800	B	542		49000	ug/kg	93.5	(75%-125%)			
Nickel	51800	*	10700		55100	ug/kg	85.7	(75%-125%)			
Selenium	51800	BC	1510		47900	ug/kg	89.5	(75%-125%)			
Silver	51800	DU	536	D	49300	ug/kg	95.1	(75%-125%)		11/21/17	16:54
Vanadium	51800	D	55800	D	113000	ug/kg	109	(75%-125%)			
Zinc	51800	D	90900	D	135000	ug/kg	84.4	(75%-125%)		11/20/17	19:08
QC1203925751 438004001 PS											
Zinc	500	D	170	D	659	ug/L	98.1	(75%-125%)		11/22/17	09:39
QC1203921595 438004001 SDILT											
Antimony		BD	-5.82	DU	8840	ug/L	N/A	(0%-10%)		11/21/17	16:57
Arsenic		B	22.1	DU	2680	ug/L	N/A	(0%-10%)		11/17/17	19:22
Barium			653	D	126	ug/L	3.84	(0%-10%)			
Beryllium			7.93	BD	1.60	ug/L	1.09	(0%-10%)			

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QC Summary

Workorder: 438004

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1719645										
Boron	B	-11.5	DU	5360	ug/L	N/A		(0%-10%)	HSC	11/17/17	19:22
Cadmium	DU	0.147	DU	2680	ug/L	N/A		(0%-10%)		11/21/17	16:57
Chromium	*	114	D	20.4	ug/L	10.1		(0%-10%)		11/17/17	19:22
Cobalt	D	13.6	BD	2.80	ug/L	2.75		(0%-10%)		11/21/17	16:57
Copper		201	D	36.5	ug/L	9.4		(0%-10%)		11/17/17	19:22
Lead	*	29.9	B	4.45	ug/L	25.8		(0%-10%)		11/22/17	09:19
Manganese		2630	D	518	ug/L	1.53		(0%-10%)		11/17/17	19:22
Molybdenum	B	5.06	DU	1070	ug/L	N/A		(0%-10%)			
Nickel	*	99.6	D	19.2	ug/L	3.45		(0%-10%)			
Selenium	BC	14.1	DU	2680	ug/L	N/A		(0%-10%)			
Silver	DU	-0.905	DU	2680	ug/L	N/A		(0%-10%)		11/21/17	16:57
Vanadium	D	104	D	20.4	ug/L	2.13		(0%-10%)			
Zinc	D	170	D	31.7	ug/L	6.57		(0%-10%)		11/20/17	19:12
Metals Analysis-Mercury											
Batch	1720130										
QC1203922868	438004001	DUP									
Mercury		141		129	ug/kg	9.22		(0%-35%)	MTM1	11/20/17	11:20

QC Summary

Workorder: 438004

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-Mercury											
Batch	1720130										
QC1203922860		LCS									
Mercury	111			113	ug/kg		102	(80%-120%)	MTM1	11/20/17	11:12
QC1203922859		MB									
Mercury			U	3.93	ug/kg					11/20/17	11:10
QC1203922869		438004001	MS								
Mercury	127		141	261	ug/kg		94.3	(75%-125%)		11/20/17	11:22
QC1203922870		438004001	SDILT								
Mercury			2.56 D	0.500	ug/L	2.23		(0%-10%)		11/20/17	11:23

Notes:

The Qualifiers in this report are defined as follows:

- * Duplicate analysis not within control limits
- + Correlation coefficient for Method of Standard Additions (MSA) is < 0.995
- B The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate).
- C Target analyte was detected in the sample and the associated blank. The associated blank concentration is >= EQL or is > 5% of the measured concentration and/or decision level for associated samples.
- D Results are reported from a diluted aliquot of sample.
- E Reported value is estimated due to interferences. See comment in narrative.
- M Duplicate precision not met.
- N Spike Sample recovery is outside control limits.
- S Reported value determined by the Method of Standard Additions (MSA)
- U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
- W Post-digestion spike recovery for GFAA out of control limit. Sample absorbency < 50% of spike absorbency.
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Y Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Z Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier

Date: 30 November 2017
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: 100-K AA
 Subject: General Chemistry - Sample Data Group (SDG) GEL438004

INTRODUCTION

This memorandum presents the results of data validation for SDG GEL438004 prepared by GEL Laboratories LLC. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B3FNH2	11/14/17	Soil	C	9056, 7196
B3FNH4	11/14/17	Soil	C	9056, 7196
B3FNH6	11/14/17	Soil	C	9056, 7196
B3FNH8	11/14/17	Soil	C	9056, 7196
B3FNJ0	11/14/17	Soil	C	9056, 7196
B3FNJ2	11/14/17	Soil	C	9056, 7196
B3FNJ4	11/14/17	Soil	C	9056, 7196
B3FNJ6	11/14/17	Soil	C	9056, 7196
B3FNJ8	11/14/17	Soil	C	9056, 7196
B3FNK0	11/14/17	Soil	C	9056, 7196

Data validation was conducted in accordance with the CHPRC validation statement of work and the 100 Area Remedial Action Sampling and Analysis Plan, DOE/RL-96-22, Rev. 5 (SAP). Appendices 1 through 4 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Data Validation Supporting Documentation
- Appendix 4. Additional Documentation Requested by Client

DATA QUALITY OBJECTIVES

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The holding time requirements are as follows:

- Chloride, fluoride and sulfate – analysis within 28 days of sample collection
- Nitrate and nitrite – extraction within 28 days of sample collection and analysis within 48 hours of extraction
- Hexavalent chromium – extraction within 30 days of sample collection and analysis within seven days of extraction

Sample preservation requires chilling to <6 degrees Celsius.

The samples were extracted and analyzed within the prescribed holding times and properly preserved.

- **Blanks**

The blank data results are reviewed to assess the extent of contamination introduced through sampling, sample preparation, and analysis.

Laboratory Blanks

All laboratory blank results were acceptable.

Trip Blanks

All trip blank results were acceptable with the following exceptions. Chloride, nitrate and sulfate were detected in trip blank sample B3FNJ4.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results and laboratory control sample results. According to the SAP, the matrix spike sample accuracy limits are 70% to 130% and the laboratory control sample accuracy limits are ones specified by the DV procedure. The limits for reported analytes not listed in the SAP are specified by the DV procedure.

Matrix Spike (MS) Samples

All MS recoveries were acceptable.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

- **Precision**

Precision is evaluated by reviewing laboratory duplicate sample results, field duplicate sample results, and field split sample results. These QC results provide information on the laboratory

reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limits are $\pm 30\%$. The RPD limits for reported analytes not listed in the SAP are specified by the DV procedure.

Laboratory Duplicate Samples

All laboratory duplicate results were acceptable.

Field Duplicate Samples

All field duplicate results were acceptable with the following exception.

Samples B3FNH6 and B3FNH8 had a chloride RPD $> 30\%$. The hexavalent chromium result for sample B3FNH6 was a non-detect and the result for sample B3FNH8 was $>$ the PQL.

Field Split Samples

No field splits were submitted for validation.

- **Detection Limits**

Reported MDLs are compared against the contractually required detection limits (CRDLs) to ensure that laboratory detection limits meet the required criteria.

All reported sample MDLs were below the CRDLs.

- **Completeness**

SDG GEL438004 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

None found.

REFERENCES

GRP-GD-003, Rev. 2, Change 0, *Data Validation for Chemical Analyses*, October 2016.

DOE/RL-96-22, Rev. 5, *100 Area Remedial Action Sampling and Analysis Plan*, September 2009.

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers that may be applied by data validators in compliance with the CHPRC statement of work are as follows:

- **U** — The constituent was analyzed for, but was not detected. The data should be considered usable for decision-making purposes.
- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the RL. The data should be considered usable for decision-making purposes.
- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **N** — The analysis indicates the presence of an analyte that has been tentatively identified.
- **NJ** — The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.
- **NJ+** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation.
- **NJ-** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation.
- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.
- **R** — Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

Appendix 2
Summary of Data Qualification

General Chemistry Data Qualification Summary			
SDG: GEL438004	Reviewer: AQA	Project: 100-K AA	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
Cr(VI), Anions	None	N/A	N/A

Comments: None

Appendix 3

Data Validation Supporting Documentation

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	<input checked="" type="radio"/> C	D	E
PROJECT: 100-K AA			DATA PACKAGE: VSR18-002		
VALIDATOR: Eyda Hergenreder		LAB: GEL		DATE: 11/30/17	
			SDG: GEL438004		
ANALYSES PERFORMED					
Anions/IC X	TOC	TOX	TPH-418.1	Oil and Grease	Alkalinity
Ammonia	BOD/COD	Chloride	Chromium-VI X	pH	NO ₃ /NO ₂
Sulfate	TDS	TKN	Phosphate		
SAMPLES/MATRIX Soil					
GEL438004: B3FNH2, B3FNH4, B3FNH6, B3FNH8, B3FNJ0, B3FNJ2, B3FNJ4, B3FNJ6, B3FNJ8, B3FNK0					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present?	Yes <input type="radio"/> No <input checked="" type="radio"/> N/A
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Comments:

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

2. INSTRUMENT PERFORMANCE AND CALIBRATIONS (Levels D and E)

Initial calibrations performed on all instruments?	Yes No <input type="radio"/> N/A
Initial calibrations acceptable?	Yes No <input type="radio"/> N/A
ICV and CCV checks performed on all instruments?	Yes No <input type="radio"/> N/A
ICV and CCV checks acceptable?	Yes No <input type="radio"/> N/A
Standards traceable?	Yes No <input type="radio"/> N/A
Standards expired?	Yes No <input type="radio"/> N/A
Calculation check acceptable?	Yes No <input type="radio"/> N/A

Comments:

3. BLANKS (Levels B, C, D, and E)

ICB and CCB checks performed for all applicable analyses? (Levels D, E)	Yes No <input type="radio"/> N/A
ICB and CCB results acceptable? (Levels D, E)	Yes No <input type="radio"/> N/A
Laboratory blanks analyzed?	<input checked="" type="radio"/> Yes No N/A
Laboratory blank results acceptable?	<input checked="" type="radio"/> Yes No N/A
Field blanks analyzed? (Levels C, D, E)	<input checked="" type="radio"/> Yes No N/A
Field blank results acceptable? (Levels C, D, E)	Yes <input type="radio"/> No N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input type="radio"/> N/A

Comments:

Trip blank sample B3FNJ4: Cl 3500 ug/kg, NO3 435 ug/kg, SO4 2700 ug/kg

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

5. PRECISION (Levels C, D, and E)

Duplicate RPD values acceptable?	<input checked="" type="radio"/> Yes No N/A
Duplicate results acceptable?	<input checked="" type="radio"/> Yes No N/A
MS/MSD standards NIST traceable? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
MS/MSD standards expired? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
LCS/LCSD duplicates run due to insufficient sample material?	Yes <input checked="" type="radio"/> No N/A
Field duplicate RPD values acceptable?	Yes <input checked="" type="radio"/> No N/A
Field split RPD values acceptable?	Yes No <input checked="" type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

Comments:

Parent sample B3FNH6/duplicate sample B3FNH8: CI 35%: Cr+6. B3FNH6 ND/B3FNH8 620 ua/ka

6. HOLDING TIMES (all levels)

Samples properly preserved?	<input checked="" type="radio"/> Yes No N/A
Sample holding times acceptable?	<input checked="" type="radio"/> Yes No N/A

Comments:

Appendix 4

Additional Documentation Requested By Client

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: November 21, 2017

Page 1 of 3

CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 438004

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Ion Chromatography											
Batch	1719879										
QC1203922156	438004010	DUP									
Chloride	B	1790	B	1710	ug/Kg	4.18	^	(+/-2120)	MXL2	11/18/17	02:41
Fluoride	B	775	B	791	ug/Kg	2.07	^	(+/-1060)			
Nitrate-N		1220		1260	ug/Kg	2.93	^	(+/-1060)			
Nitrite-N	U	351	U	350	ug/Kg	N/A					
Sulfate	B	3880	B	3780	ug/Kg	2.79	^	(+/-4240)			
QC1203922155	LCS										
Chloride	49800			47000	ug/Kg			94.4	(80%-120%)	11/17/17	20:25
Fluoride	24900			24100	ug/Kg			96.8	(80%-120%)		
Nitrate-N	24900			23300	ug/Kg			93.6	(80%-120%)		
Nitrite-N	24900			23500	ug/Kg			94.6	(80%-120%)		
Sulfate	99500			94100	ug/Kg			94.6	(80%-120%)		
QC1203922154	MB										
Chloride			U	718	ug/Kg					11/17/17	19:56
Fluoride			U	339	ug/Kg						
Nitrate-N			U	329	ug/Kg						

QC Summary

Workorder: 438004

Page 2 of 3

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Ion Chromatography											
Batch	1719879										
Nitrite-N			U	329	ug/Kg				MXL2	11/17/17	19:56
Sulfate			U	1330	ug/Kg						
QC1203922157 438004010 MS											
Chloride	53000	B	1790	49900	ug/Kg		90.8	(75%-125%)		11/18/17	03:10
Fluoride	26500	B	775	25300	ug/Kg		92.5	(75%-125%)			
Nitrate-N	26500		1220	26200	ug/Kg		94.1	(75%-125%)			
Nitrite-N	26500	U	351	25400	ug/Kg		96	(75%-125%)			
Sulfate	106000	B	3880	104000	ug/Kg		94.2	(75%-125%)			
Spectrometric Analysis											
Batch	1719728										
QC1203921801 438004001 DUP											
Hexavalent Chromium			971	1010	ug/Kg	4.26 ^		(+/-401)	VH1	11/20/17	09:09
QC1203921800 ILCS											
Hexavalent Chromium	7830			6670	ug/Kg		85.2	(80%-120%)		11/20/17	09:08
QC1203921799 LCS											
Hexavalent Chromium	3820			3940	ug/Kg		103	(80%-120%)		11/20/17	09:08
QC1203921798 MB											
Hexavalent Chromium			U	157	ug/Kg					11/20/17	09:08
QC1203921803 438004001 MS											
Hexavalent Chromium	3270		971	3890	ug/Kg		119	(75%-125%)		11/20/17	09:09

Notes: