

CHPRC - REVIEW COMMENT RECORD (RCR)

1. Date 12/19/2016	2. Review No.
3. Project No.	Page 1 of 1
5. Document Number(s)/Title(s) VSR17-001	6. Program/Project/Building Number
7. Reviewer Scot Fitzgerald	8. Organization/Group Sample Management and Reporting
9. Location/Phone MO277/373-7495	10. Agreement With Indicated Comment Disposition(s) 11. CLOSED

12. Item	13a. Comments	13b. Basis	13c. Recommendation	14. Reviewer Concurrency Required (Y or N)	15. Disposition (provide justification if NOT accepted)	16. Status
1	On Page 58 the hold time narration discusses extraction within 14 days and analysis within 40 days. We define the hold time as 1 year to extraction.		Correct narrative.	Y		Closed
2	On page 107 the hold time for nitrate is listed as 48 hours. For soil samples the hold time is 28 days with analysis within 48 hours after extraction.		Correct the narrative and remove R flags were applicable. Also revise the completeness section as appropriate	Y		Closed

17. Comment Submittal Approval
 Scot Fitzgerald
 Date 12/19/2016
 Organization Manager (optional) (print and sign)
 Reviewer/Point of Contact (print and sign)
 Scot Fitzgerald
 Date 01/03/17
 Author/Organizer (print and sign)
 Scot Fitzgerald



PO Box 21987
Albuquerque, NM 87154
1-888-678-5447
www.aqainc.net

Data Validation Report for CH2M Hill Plateau Remediation Company

VSR17-001
Project 100-KE FSB

Chemical Validation - Level C

Validation Performed By: *Eyda Hergenreder* Date: 12-15-2016
Eyda Hergenreder

Technical Review By: *Ellen McEntee* Date: 12-15-2016
Ellen McEntee

Quality Review By: *Mary A. Donovan* Date: 01-04-2016
Mary Donovan
Quality Assurance Manager

TABLE OF CONTENTS

Semi-Volatile Organic Compounds

Memorandum	3
Appendix 1 – Glossary of Data Reporting Qualifiers	7
Appendix 2 – Summary of Data Qualification	9
Appendix 3 – Data Validation Supporting Documentation	12
Appendix 4 – Additional Documentation Requested By Client	26

PAH Compounds

Memorandum	35
Appendix 1 – Glossary of Data Reporting Qualifiers	39
Appendix 2 – Summary of Data Qualification	41
Appendix 3 – Data Validation Supporting Documentation	44
Appendix 4 – Additional Documentation Requested By Client	52

PCBs

Memorandum	58
Appendix 1 – Glossary of Data Reporting Qualifiers	62
Appendix 2 – Summary of Data Qualification	65
Appendix 3 – Data Validation Supporting Documentation	67
Appendix 4 – Additional Documentation Requested By Client	75

Metals

Memorandum	79
Appendix 1 – Glossary of Data Reporting Qualifiers	83
Appendix 2 – Summary of Data Qualification	85
Appendix 3 – Data Validation Supporting Documentation	87
Appendix 4 – Additional Documentation Requested By Client	95

General Chemistry

Memorandum	106
Appendix 1 – Glossary of Data Reporting Qualifiers	110
Appendix 2 – Summary of Data Qualification	112
Appendix 3 – Data Validation Supporting Documentation	114
Appendix 4 – Additional Documentation Requested By Client	121

Date: 13 December 2016
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: 100-KE FSB
 Subject: Semivolatile Organics - Sample Data Group (SDG) GEL408778

INTRODUCTION

This memorandum presents the results of data validation for SDG GEL408778 prepared by GEL Laboratories. 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
B37H66	10/19/16	Solid	C	WTPH-D
B37H67	10/19/16	Solid	C	WTPH-D
B37H68	10/19/16	Solid	C	WTPH-D
B37H69	10/19/16	Solid	C	8270D, WTPH-D
B37H70	10/19/16	Solid	C	WTPH-D
B37H71	10/19/16	Solid	C	8270D, WTPH-D
B37H72	10/19/16	Solid	C	WTPH-D
B37H73	10/19/16	Solid	C	WTPH-D
B37H74	10/19/16	Solid	C	WTPH-D
B37H75	10/19/16	Solid	C	WTPH-D
B37H76	10/19/16	Solid	C	WTPH-D
B37H77	10/19/16	Solid	C	WTPH-D
B37H78	10/19/16	Solid	C	WTPH-D
B37H79	10/19/16	Solid	C	8270D, WTPH-D

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 methods 8270D and WTPH-D 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 with the following exceptions.

The cooler received with tracking number 777515559892 was >6 degrees Celsius at 14 degrees Celsius. All other coolers were within the temperature. Based on professional judgment, data should not be qualified as a result.

For method 8270D, samples B37H69, B37H71 and B37H79 were extracted beyond but within 2X the holding time. All sample results should be qualified as estimated, therefore all non-detects sample results should be flagged "UJ" and detect sample results should be flagged "J."

- **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

No trip blanks were submitted for validation.

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 and matrix spike accuracy limits are 50% to 150%. The limits for reported analytes not listed in the SAP are 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 fluoranthene were below the lower acceptance limits but $\geq 20\%$. The associated results for samples B37H69, B37H71 and B37H79 were detects and should be qualified as estimates and flagged "J."

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

- **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 $\pm 30\%$. The limits for reported analytes not listed in the SAP are specified by the DV procedure.

MS/MSD Samples

All MS/MSD relative percent difference values were acceptable.

Field Duplicate Samples

No field duplicates were submitted for validation.

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 GEL408778 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 missed extraction holding time and low MS/MSD recoveries associated with method 8270D. See the table in Appendix 2 for a listing of all affected sample results.

REFERENCES

GRP-GD-003, Rev. 1, Change 0, *Data Validation for Chemical Analyses*, July 2012.

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: GEL408778	Reviewer: AQA	Project: 100-KE FSB	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
Acenaphthene Anthracene Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(ghi)perylene Benzo(k)fluoranthene Chrysene Dibenzo(a,h)anthracene Fluorene Indeno(1,2,3-cd)pyrene Phenanthrene Pyrene	J	B37H69	Extracted beyond the holding time but within 2X the holding time.
Acenaphthylene Naphthalene	UJ	B37H69	Extracted beyond the holding time but within 2X the holding time
Acenaphthene Acenaphthylene Anthracene Benzo(a)pyrene Benzo(ghi)perylene Benzo(k)fluoranthene Chrysene Dibenzo(a,h)anthracene Fluorene Indeno(1,2,3-cd)pyrene Naphthalene	UJ	B37H71	Extracted beyond the holding time but within 2X the holding time.
Benzo(a)anthracene Benzo(b)fluoranthene Phenanthrene Pyrene	J	B37H71	Extracted beyond the holding time but within 2X the holding time.
Acenaphthene Acenaphthylene Anthracene Benzo(ghi)perylene Dibenzo(a,h)anthracene Fluorene Indeno(1,2,3-cd)pyrene	UJ	B37H79	Extracted beyond the holding time but within 2X the holding time.

Naphthalene			
Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Chrysene Phenanthrene Pyrene	J	B37H79	Extracted beyond the holding time but within 2X the holding time.
Fluoranthene	J	B37H69, B37H71, B37H79	Extracted beyond the holding time but within 2X the holding time and low MS and MSD recoveries.

Comments: None

Appendix 3

Data Validation Supporting Documentation

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

Appendix A - Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	Ⓒ	D	E
PROJECT: 100-KE FSB			DATA PACKAGE: VSR17-001		
VALIDATOR: Eyda Hergenreder		LAB: GEL		DATE: 12/13/16	
			SDG: GEL408778		
ANALYSES PERFORMED					
SW-846 8260		SW-846 8260 (TCLP)	SW-846 8270 X		SW-846 8270 (TCLP)
SAMPLES/MATRIX Soil					
SDG GEL408778: B37H69, B37H71, B37H79					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present? **Yes** No N/A

Comments: _____

According to the COC samples B37H69, B37H71 and B37H79 were to be analyzed by method 8310; however, due to matrix interference, samples were analyzed by method 8270D.

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

GC/MS tuning/performance check acceptable?Yes No **N/A**

Initial calibrations acceptable?Yes No **N/A**

Continuing calibrations acceptable?Yes No **N/A**

Standards traceable?Yes No **N/A**

Standards expired?Yes No **N/A**

Calculation check acceptable?Yes No **N/A**

Comments: _____

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

Calibration blanks analyzed? (Levels D, E).....Yes No **N/A**

Calibration blank results acceptable? (Levels D, E).....Yes No **N/A**

Laboratory blanks analyzed?**Yes** No **N/A**

Laboratory blank results acceptable?**Yes** No **N/A**

Field/trip blanks analyzed? (Levels C, D, E).....Yes No **N/A**

Field/trip blank results acceptable? (Levels C, D, E).....Yes No **N/A**

Transcription/calculation errors? (Levels D, E).....Yes No **N/A**

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

- Surrogates/system monitoring compounds analyzed?..... Yes No N/A
- Surrogate/system monitoring compound recoveries acceptable? Yes No N/A
- Surrogates traceable? (Levels D, E)..... Yes No N/A
- Surrogates expired? (Levels D, E)..... Yes No N/A
- MS/MSD samples analyzed?..... Yes No N/A
- MS/MSD results acceptable? Yes No N/A
- MS/MSD standards NIST traceable? (Levels D, E) Yes No N/A
- MS/MSD standards? (Levels D, E)..... Yes No N/A
- LCS/BSS samples analyzed?..... Yes No N/A
- LCS/BSS results acceptable?..... Yes No N/A
- Standards traceable? (Levels D, E)..... Yes No N/A
- Standards expired? (Levels D, E)..... Yes No N/A
- Transcription/calculation errors? (Levels D, E)..... Yes No N/A
- Performance audit sample(s) analyzed? Yes No N/A
- Performance audit sample results acceptable?..... Yes No N/A

Comments: _____

Fluoranthene: MS 33%, MSD 48%

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

- MS/MSD samples analyzed?..... Yes No N/A
- MS/MSD RPD values acceptable? Yes No N/A
- MS/MSD standards NIST traceable? (Levels D, E) Yes No N/A
- MS/MSD standards expired? (Levels D, E)..... Yes No N/A
- LCS/LCSD duplicates run due to insufficient sample material?..... Yes No N/A
- Field duplicate RPD values acceptable? Yes No N/A
- Field split RPD values acceptable? Yes No N/A
- Transcription/calculation errors? (Levels D, E)..... Yes No N/A

Comments: _____

6. SYSTEM PERFORMANCE (Levels D and E)

- Internal standards analyzed?..... Yes No N/A
- Internal standard areas acceptable? Yes No N/A
- Internal standard retention times acceptable?..... Yes No N/A
- Standards traceable?..... Yes No N/A
- Standards expired? Yes No N/A
- Transcription/calculation errors?..... Yes No N/A

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

7. HOLDING TIMES (all levels)

Samples properly preserved? Yes No N/A
Sample holding times acceptable? Yes No N/A

Comments: _____

Samples were extracted beyond the 14 day HT.

Cooler with tracking number 777515559892 was >6 degree C.

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

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

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

9. SAMPLE CLEANUP (Levels D and E)

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: _____

Comments (attach additional sheets as necessary): _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

VALIDATION LEVEL:	A	B	Ⓒ	D	E
PROJECT: 100-KE FSB			DATA PACKAGE: VSR17-001		
VALIDATOR: Eyda Hergenreder		LAB: GEL		DATE: 12/13/16	
			SDG: GEL408778		
ANALYSES PERFORMED					
8015	8021	8141	8151	8315	
		WTPH-HCID	WTPH-G	WTPH-D X	
SAMPLES/MATRIX: Soil					
GEL408778: B37H66, B37H67, B37H68, B37H69, B37H70, B37H71, B37H72, B37H73, B37H74, B37H75, B37H76, B37H77, B37H78, B37H79					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present? Yes No N/A

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

Initial calibrations acceptable? Yes No **N/A**

Continuing calibrations acceptable? Yes No **N/A**

Standards traceable? Yes No **N/A**

Standards expired? Yes No **N/A**

Calculation check acceptable? Yes No **N/A**

Comments: _____

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

Calibration blanks analyzed? (Levels D, E) Yes No **N/A**

Calibration blank results acceptable? (Levels D, E) Yes No **N/A**

Laboratory blanks analyzed? **Yes** No N/A

Laboratory blank results acceptable? **Yes** No N/A

Field/trip blanks analyzed? (Levels C, D, E) Yes **No** N/A

Field/trip blank results acceptable? (Levels C, D, E) Yes No **N/A**

Transcription/calculation errors? (Levels D, E) Yes No **N/A**

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

Surrogates/system monitoring compounds analyzed?..... Yes No N/A

Surrogate/system monitoring compound recoveries acceptable? Yes No N/A

Surrogates traceable? (Levels D, E)..... Yes No N/A

Surrogates expired? (Levels D, E)..... Yes No N/A

MS/MSD samples analyzed?..... Yes No N/A

MS/MSD results acceptable? Yes No N/A

MS/MSD standards NIST traceable? (Levels D, E) Yes No N/A

MS/MSD standards expired? (Levels D, E)..... Yes No N/A

LCS/BSS samples analyzed?..... Yes No N/A

LCS/BSS results acceptable?..... Yes No N/A

Standards traceable? (Levels D, E)..... Yes No N/A

Standards expired? (Levels D, E)..... Yes No N/A

Transcription/calculation errors? (Levels D, E)..... Yes No N/A

Performance audit sample(s) analyzed? Yes No N/A

Performance audit sample results acceptable?..... Yes No N/A

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

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

Comments: _____

6. HOLDING TIMES (all levels)

- Samples properly preserved? Yes No N/A
- Sample holding times acceptable? Yes No N/A

Comments: _____

The temperature for cooler associated with tracking number 777515559892 was >6 degree C.

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

Results reported for all requested analyses? ... Yes No N/A
Results supported in the raw data? (Levels D, E) ... Yes No N/A
Samples properly prepared? (Levels D, E) ... Yes No N/A
Detection limits meet RDL? ... Yes No N/A
Transcription/calculation errors? (Levels D, E) ... Yes No N/A

Comments:

8. 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
Check materials traceable? ... Yes No N/A
Check materials Expired? ... Yes No N/A
Analytical batch QC given similar cleanup? ... Yes No N/A
Transcription/Calculation Errors? ... 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 11, 2016

Page 1 of 4

CH2MHill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 408778

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1615021										
QC1203667161	LCS										
Acenaphthene	333			276	ug/kg		83	(70%-130%)	JLD1	11/10/16	21:41
Acenaphthylene	333			261	ug/kg		78	(70%-130%)			
Anthracene	333			285	ug/kg		85	(70%-130%)			
Benzo(a)anthracene	333			292	ug/kg		88	(70%-130%)			
Benzo(a)pyrene	333			287	ug/kg		86	(70%-130%)			
Benzo(b)fluoranthene	333			287	ug/kg		86	(70%-130%)			
Benzo(ghi)perylene	333			334	ug/kg		100	(70%-130%)			
Benzo(k)fluoranthene	333			295	ug/kg		88	(70%-130%)			
Chrysene	333			305	ug/kg		92	(70%-130%)			
Dibenzo(a,h)anthracene	333			387	ug/kg		116	(70%-130%)			
Fluoranthene	333			239	ug/kg		72	(70%-130%)			
Fluorene	333			281	ug/kg		84	(70%-130%)			
Indeno(1,2,3-cd)pyrene	333			343	ug/kg		103	(70%-130%)			
Naphthalene	333			286	ug/kg		86	(70%-130%)			
Phenanthrene	333			267	ug/kg		80	(70%-130%)			
Pyrene	333			254	ug/kg		76	(70%-130%)			
**5-alpha-Androstane	167			121	ug/kg		72	(25%-129%)			
QC1203667160	MB										
Acenaphthene			U	1.67	ug/kg					11/10/16	21:10
Acenaphthylene			U	1.67	ug/kg						

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408778

Page 2 of 4

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1615021										
Anthracene			U	1.67	ug/kg						
Benzo(a)anthracene			U	1.67	ug/kg				JLD1	11/10/16	21:10
Benzo(a)pyrene			U	1.67	ug/kg						
Benzo(b)fluoranthene			U	1.67	ug/kg						
Benzo(ghi)perylene			U	1.67	ug/kg						
Benzo(k)fluoranthene			U	1.67	ug/kg						
Chrysene			U	1.67	ug/kg						
Dibenzo(a,h)anthracene			U	1.67	ug/kg						
Fluoranthene			U	1.67	ug/kg						
Fluorene			U	1.67	ug/kg						
Indeno(1,2,3-cd)pyrene			U	1.67	ug/kg						
Naphthalene			U	1.00	ug/kg						
Phenanthrene			U	1.67	ug/kg						
Pyrene			U	1.67	ug/kg						
**5-alpha-Androstane	167			130	ug/kg		78	(25%-129%)			
QC1203667162 408778004 MS											
Acenaphthene	391	X	7.82	X	338	ug/kg	84	(18%-115%)		11/10/16	22:44
Acenaphthylene	391	UX	1.95	X	318	ug/kg	81	(19%-116%)			
Anthracene	391	X	42.6	X	384	ug/kg	87	(23%-115%)			
Benzo(a)anthracene	391	X	169	X	455	ug/kg	73	(23%-124%)			
Benzo(a)pyrene	391	X	107	X	420	ug/kg	80	(20%-130%)			
Benzo(b)fluoranthene	391	X	181	X	459	ug/kg	71	(20%-134%)			
Benzo(ghi)perylene	391	X	53.9	X	347	ug/kg	75	(18%-118%)			

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408778

Page 3 of 4

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1615021										
Benzo(k)fluoranthene	391	X	68.4	X	428	ug/kg	92	(23%-128%)	JLD1	11/10/16	22:44
Chrysene	391	X	208	X	489	ug/kg	72	(18%-121%)			
Dibenzo(a,h)anthracene	391	X	30.1	X	444	ug/kg	106	(12%-132%)			
Fluoranthene	391	X	225	X	355	ug/kg	33	(21%-124%)			
Fluorene	391	X	12.1	X	351	ug/kg	87	(21%-118%)			
Indeno(1,2,3-cd)pyrene	391	X	70.3	X	390	ug/kg	82	(11%-130%)			
Naphthalene	391	UX	1.17	X	313	ug/kg	80	(14%-114%)			
Phenanthrene	391	X	123	X	369	ug/kg	63	(24%-106%)			
Pyrene	391	X	223	X	451	ug/kg	58	(16%-122%)			
**5-alpha-Androstane	196		150		150	ug/kg	77	(25%-129%)			
QC1203667163 408778004 MSD											
Acenaphthene	391	X	7.82	X	351	ug/kg	4	88	(0%-30%)		11/10/16 23:15
Acenaphthylene	391	UX	1.95	X	330	ug/kg	4	84	(0%-30%)		
Anthracene	391	X	42.6	X	389	ug/kg	1	88	(0%-30%)		
Benzo(a)anthracene	391	X	169	X	479	ug/kg	5	79	(0%-30%)		
Benzo(a)pyrene	391	X	107	X	426	ug/kg	1	81	(0%-30%)		
Benzo(b)fluoranthene	391	X	181	X	475	ug/kg	3	75	(0%-30%)		
Benzo(ghi)perylene	391	X	53.9	X	364	ug/kg	5	79	(0%-30%)		
Benzo(k)fluoranthene	391	X	68.4	X	427	ug/kg	0	92	(0%-30%)		
Chrysene	391	X	208	X	513	ug/kg	5	78	(0%-30%)		
Dibenzo(a,h)anthracene	391	X	30.1	X	462	ug/kg	4	111	(0%-30%)		
Fluoranthene	391	X	225	X	413	ug/kg	15	48	(0%-30%)		

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408778

Page 4 of 4

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1615021										
Fluorene	391	X	12.1	X	364	ug/kg	4	90	(0%-30%)	JLD1	11/10/16 23:15
Indeno(1,2,3-cd)pyrene	391	X	70.3	X	410	ug/kg	5	87	(0%-30%)		
Naphthalene	391	UX	1.17	X	356	ug/kg	13	91	(0%-30%)		
Phenanthrene	391	X	123	X	404	ug/kg	9	72	(0%-30%)		
Pyrene	391	X	223	X	473	ug/kg	5	64	(0%-30%)		
*5-alpha-Androstane	196		150		143	ug/kg		73	(25%-129%)		

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)

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: GEL408778

Matrix Type: SOLID

Sample ID	Client ID	5-alpha %REC
1203667160	MB for batch 1615020	78
1203667161	LCS for batch 1615020	72
408778004	B37H69	77
1203667162	B37H69MS	77
1203667163	B37H69MSD	73
408778006	B37H71	82 D
408778014	B37H79	76

Surrogate

5-alpha- = 5-alpha-Androstane

Acceptance Limits

(25%-129%)

* Recovery outside Acceptance Limits

Column to be used to flag recovery values

D Sample Diluted

GEL LABORATORIES LLC

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

QC Summary

Report Date: November 7, 2016

Page 1 of 2

CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 408778

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Diesel Range Organics											
Batch	1610829										
QC1203656854	LCS										
Diesel Range Organics	66600			46800	ug/kg		70	(70%-130%)	LXA1	10/31/16	14:19
**o-Terphenyl	666			505	ug/kg		76	(60%-140%)			
QC1203656853	MB										
Diesel Range Organics			U	2160	ug/kg					10/31/16	13:40
**o-Terphenyl	666			378	ug/kg		57*	(60%-140%)			
QC1203656855	408778002	MS									
Diesel Range Organics	71700	JT	6020	T	43800	ug/kg		53*	(70%-130%)	10/31/16	16:14
**o-Terphenyl	717		426		424	ug/kg		59*	(60%-140%)		
QC1203656856	408778002	MSD									
Diesel Range Organics	71700	JT	6020	T	55400	ug/kg	23*	69*	(0%-20%)	10/31/16	16:53
**o-Terphenyl	717		426		527	ug/kg		73	(60%-140%)		

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

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408778

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
-----------------	------------	---------------	-------------	-----------	--------------	-------------	-------------	--------------	--------------	-------------	-------------

- o Analyte failed to recover within LCS limits (Organics only)

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.

FID Diesel Range Organics
Surrogate Recovery Report

Page 1 of 1

SDG Number: GEL408778

Matrix Type: SOLID

Sample ID	Client ID	OTP %REC
1203656853	MB for batch 1610828	57 *
1203656854	LCS for batch 1610828	76
408778001	B37H66	52 *
408778002	B37H67	59 *
1203656855	B37H67MS	59 *
1203656856	B37H67MSD	73
408778003	B37H68	68
408778004	B37H69	78
408778005	B37H70	77
408778006	B37H71	69
408778007	B37H72	61
408778008	B37H73	72
408778009	B37H74	60
408778010	B37H75	62
408778011	B37H76	64
408778012	B37H77	57 *
408778013	B37H78	55 *
408778014	B37H79	55 *

Surrogate

OTP = o-Terphenyl

Acceptance Limits

(60%-140%)

* Recovery outside Acceptance Limits

Column to be used to flag recovery values

D Sample Diluted

Date: 13 December 2016
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: 100-KE FSB
 Subject: PAHs - Sample Data Group (SDG) GEL408778

INTRODUCTION

This memorandum presents the results of data validation for SDG GEL408778 prepared by GEL Laboratories. 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
B37H66	10/19/16	Solid	C	8310
B37H67	10/19/16	Solid	C	8310
B37H68	10/19/16	Solid	C	8310
B37H70	10/19/16	Solid	C	8310
B37H72	10/19/16	Solid	C	8310
B37H73	10/19/16	Solid	C	8310
B37H74	10/19/16	Solid	C	8310
B37H75	10/19/16	Solid	C	8310
B37H76	10/19/16	Solid	C	8310
B37H77	10/19/16	Solid	C	8310
B37H78	10/19/16	Solid	C	8310

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 PAH 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 sample was extracted and analyzed within the prescribed holding times and properly preserved with the following exception.

The cooler with tracking number 777515559892 was >6 degree C. Based on professional judgment, data should not be qualified as a result.

- **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

No trip blanks were submitted for validation.

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 and matrix spike accuracy limits are 50% to 150%. The limits for reported analytes not listed in the SAP are specified by the DV procedure.

Surrogates

All surrogate recoveries were acceptable with the following exception. The decafluorobiphenyl surrogate recoveries for samples B37H68, B37H77 and B37H78 were below the lower acceptance limit but $\geq 10\%$. All associated sample results should be qualified as estimates and flagged "UJ" for non-detects and "J" for detects.

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

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

The MSD recoveries for benzo(a)anthracene, benzo(b)fluoranthene, fluoranthene and pyrene were >150%. All benzo(a)anthracene, benzo(b)fluoranthene, fluoranthene and pyrene sample results that were detects should be qualified as estimates and flagged "J." See the table in Appendix 2 for a listing of all sample results.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

- **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 $\pm 30\%$. The RPD limits for reported analytes not listed in the SAP are specified by the DV procedure.

MS/MSD Samples

All MS/MSD relative percent difference values were acceptable with the following exceptions.

The MS/MSD RPDs for benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene and pyrene were above the acceptance limit. All sample results for these analytes 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 sample results.

Field Duplicate Samples

No field duplicates were submitted for validation.

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 GEL408778 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

Multiple minor deficiencies leading to qualification of sample results as estimates occurred. See the table in Appendix 2 for a listing of all affected sample results.

REFERENCES

GRP-GD-003, Rev. 1, Change 0, *Data Validation for Chemical Analyses*, July 2012.

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).
- **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

PAHs Data Qualification Summary			
SDG: GEL408778	Reviewer: AQA	Project: 100-KE FSB	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
Benzo(a)anthracene Benzo(b)fluoranthene Fluoranthene Pyrene	J	B37H66, B37H67,	High MSD recovery and poor MS/MSD precision
Fluoranthene Pyrene	J	B37H73, B37H74, B37H76	High MSD recovery and poor MS/MSD precision
Benzo(b)fluoranthene	J	B37H74, B37H76	High MSD recovery and poor MS/MSD precision
Benzo(k)fluoranthene Chrysene	J	B37H66, B37H67	Poor MS/MSD precision
Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene Chrysene Fluoranthene Pyrene	UJ	B37H70, B37H72, B37H75,	Poor MS/MSD precision
Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene	UJ	B37H73	Poor MS/MSD precision
Chrysene	J	B37H73	Poor MS/MSD precision
Benzo(a)anthracene Benzo(k)fluoranthene Chrysene	UJ	B37H74, B37H76	Poor MS/MSD precision
Acenaphthene Acenaphthylene Anthracene Benzo(ghi)perylene Dibenzo(a,h)anthracene Fluorene Indeno(1,2,3-cd)pyrene Naphthalene Phenanthrene	UJ	B37H68, B37H77, B37H78	Low surrogate recovery
Benzo(a)pyrene	J	B37H68, B37H78	Low surrogate recovery
Benzo(a)anthracene Benzo(b)fluoranthene Fluoranthene Pyrene	J	B37H68, B37H78	High MSD recovery, poor MS/MSD precision and low surrogate recovery
Benzo(k)fluoranthene	J	B37H68, B37H78	Poor MS/MSD precision,

Chrysene			and low surrogate recovery
Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene Chrysene Fluoranthene Pyrene	UJ	B37H77	Poor MS/MSD precision and low surrogate recovery
Benzo(a)pyrene	UJ	B37H77	Low surrogate recovery.

Comments: None

Appendix 3

Data Validation Supporting Documentation

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

VALIDATION LEVEL:	A	B	Ⓒ	D	E
PROJECT: 100-KE FSB			DATA PACKAGE: VSR17-001		
VALIDATOR: Eyda Hergenreder		LAB:		DATE: 12/13/16	
			SDG: GEL408778		
ANALYSES PERFORMED					
SW-846 8081	SW-846 8081 (TCLP)	SW-846 8082	SW-846 8082 (TCLP)	SW8310-SVOA X	
SAMPLES/MATRIX Soil					
GEL408778: B37H66, B37H67, B37H68, B37H70, B37H72, B37H73, B37H74, B37H75, B37H76, B37H77, B37H78					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present? Yes No N/A

Comments: _____

According to the COC samples B37H69, B37H71 and B37H79 were to be analyzed by method 8310; however, due to matrix interference, samples were analyzed by method 8270D.

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

Initial calibrations acceptable? Yes No N/A

Continuing calibrations acceptable? Yes No N/A

Standards traceable? Yes No N/A

Standards expired? Yes No N/A

Calculation check acceptable? Yes No N/A

DDT and endrin breakdowns acceptable? Yes No N/A

Comments: _____

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

Calibration blanks analyzed? (Levels D, E) Yes No N/A

Calibration blank results acceptable? (Levels D, E) Yes No N/A

Laboratory blanks analyzed? Yes No N/A

Laboratory blank results acceptable? Yes No N/A

Field/trip blanks analyzed? (Levels C, D, E) Yes No N/A

Field/trip blank results acceptable? (Levels C, D, E) Yes No N/A

Transcription/calculation errors? (Levels D, E) Yes No N/A

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

Surrogates analyzed? Yes No N/A

Surrogate recoveries acceptable? Yes No N/A

Surrogates traceable? (Levels D, E)..... Yes No N/A

Surrogates expired? (Levels D, E)..... Yes No N/A

MS/MSD samples analyzed? Yes No N/A

MS/MSD results acceptable? Yes No N/A

MS/MSD standards NIST traceable? (Levels D, E) Yes No N/A

MS/MSD standards expired? (Levels D, E)..... Yes No N/A

LCS/BSS samples analyzed? Yes No N/A

LCS/BSS results acceptable?..... Yes No N/A

Standards traceable? (Levels D, E)..... Yes No N/A

Standards expired? (Levels D, E)..... Yes No N/A

Transcription/calculation errors? (Levels D, E)..... Yes No N/A

Performance audit sample(s) analyzed? Yes No N/A

Performance audit sample results acceptable?..... Yes No N/A

Comments: _____

Surrogate: B37H68, 48%; B37H77 46%, B37H78 49%

MSD %Rs: Benzo(a)anthracene 157%; benzo(b)fluoranthene 157%; fluoranthene 208%; pyrene 181%

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

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

Comments: _____

RPDs :Benzo(a)anthracene 54%; benzo(b)fluoranthene 47%; benzo(k)fluoranthene 42%, chrysene 42%; fluoranthene 65%, pyrene 56%

6. SYSTEM PERFORMANCE (Levels D and E)

- Chromatographic performance acceptable? Yes No N/A
- Positive results resolved acceptably? Yes No N/A

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

7. HOLDING TIMES (all levels)

Samples properly preserved? Yes No N/A
Sample holding times acceptable? Yes No N/A

Comments: _____

Cooler with tracking number 777515559892 was >6 degree C.

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

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

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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: _____

Appendix 4

Additional Documentation Requested By Client

Surrogate Recovery Report

SDG Number: GEL408778

Matrix Type: SOLID

PACK Column (1) : C-18, DAD/FLD

Sample ID	Client ID	DFBF %REC
1203656849	MB for batch 1610826	63
1203656850	LCS for batch 1610826	82
408778001	B37H66	54
1203656851	B37H66MS	60
1203656852	B37H66MSD	52
408778002	B37H67	51
408778003	B37H68	48
408778005	B37H70	79
408778007	B37H72	70
408778008	B37H73	51
408778009	B37H74	51
408778010	B37H75	64
408778011	B37H76	67
408778012	B37H77	46
408778013	B37H78	49

Surrogate

DFBF = Decafluorobiphenyl

Acceptance Limits

(46%-101%)

* Recovery outside Acceptance Limits

Column to be used to flag recovery values

D Sample Diluted

GEL LABORATORIES LLC

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

QC Summary

Report Date: November 11, 2016

Page 1 of 4

CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 408778

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
HPLC-PAH											
Batch	1610827										
QC1203656850	LCS										
Acenaphthene	1660			1390	ug/kg		84	(64%-105%)	CWW	10/29/16	13:33
Acenaphthylene	1660			1360	ug/kg		82	(60%-100%)			
Anthracene	1660			1380	ug/kg		83	(63%-112%)			
Benzo(a)anthracene	166			133	ug/kg		80	(61%-109%)			
Benzo(a)pyrene	166			134	ug/kg		80	(58%-101%)			
Benzo(b)fluoranthene	166			135	ug/kg		81	(60%-107%)			
Benzo(ghi)perylene	166			138	ug/kg		83	(59%-105%)			
Benzo(k)fluoranthene	83.2			75.2	ug/kg		90	(65%-115%)			
Chrysene	166			134	ug/kg		81	(58%-113%)			
Dibenzo(a,h)anthracene	166			137	ug/kg		82	(56%-126%)			
Fluoranthene	166			137	ug/kg		82	(60%-105%)			
Fluorene	1660			1450	ug/kg		87	(64%-105%)			
Indeno(1,2,3-cd)pyrene	166			137	ug/kg		82	(62%-113%)			
Naphthalene	1660			1280	ug/kg		77	(57%-95%)			
Phenanthrene	1660			1360	ug/kg		82	(64%-104%)			
Pyrene	166			137	ug/kg		82	(56%-108%)			
**Decafluorobiphenyl	8320			6830	ug/kg		82	(46%-101%)			
QC1203656849	MB										
Acenaphthene			U	ND	ug/kg					10/29/16	12:46
Acenaphthylene			U	ND	ug/kg						

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408778

Page 2 of 4

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
HPLC-PAH											
Batch	1610827										
Anthracene			U	ND	ug/kg						
Benzo(a)anthracene			U	ND	ug/kg				CWW	10/29/16	12:46
Benzo(a)pyrene			U	ND	ug/kg						
Benzo(b)fluoranthene			U	ND	ug/kg						
Benzo(ghi)perylene			U	ND	ug/kg						
Benzo(k)fluoranthene			U	ND	ug/kg						
Chrysene			U	ND	ug/kg						
Dibenzo(a,h)anthracene			U	ND	ug/kg						
Fluoranthene			U	ND	ug/kg						
Fluorene			U	ND	ug/kg						
Indeno(1,2,3-cd)pyrene			U	ND	ug/kg						
Naphthalene			U	ND	ug/kg						
Phenanthrene			U	ND	ug/kg						
Pyrene			U	ND	ug/kg						
**Decafluorobiphenyl	8330			5240	ug/kg		63	(46%-101%)			
QC1203656851 408778001 MS											
Acenaphthene	1850	U	ND	1350	ug/kg		73	(50%-110%)		10/29/16	15:08
Acenaphthylene	1850	U	ND	1280	ug/kg		69	(45%-106%)			
Anthracene	1850	J	12.0	1390	ug/kg		75	(56%-113%)			
Benzo(a)anthracene	185	T	84.8	214	ug/kg		70	(50%-113%)			
Benzo(a)pyrene	185		51.1	174	ug/kg		66	(47%-107%)			
Benzo(b)fluoranthene	185	T	70.3	216	ug/kg		79	(46%-112%)			
Benzo(ghi)perylene	185	U	ND	146	ug/kg		79	(37%-115%)			

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408778

Page 3 of 4

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
HPLC-PAH											
Batch	1610827										
Benzo(k)fluoranthene	92.3	T	38.2		113	ug/kg	81	(51%-122%)	CWW	10/29/16	15:08
Chrysene	185	T	77.4		191	ug/kg	61	(39%-121%)			
Dibenzo(a,h)anthracene	185	U	ND		135	ug/kg	73	(50%-121%)			
Fluoranthene	185	T	107		249	ug/kg	77	(49%-110%)			
Fluorene	1850	U	ND		1390	ug/kg	75	(51%-110%)			
Indeno(1,2,3-cd)pyrene	185	U	ND	P	138	ug/kg	75	(46%-118%)			
Naphthalene	1850	U	ND		1170	ug/kg	63	(38%-102%)			
Phenanthrene	1850		45.3		1380	ug/kg	72	(53%-111%)			
Pyrene	185	T	90.6		238	ug/kg	80	(49%-110%)			
**Decafluorobiphenyl	9230		4990		5550	ug/kg	60	(46%-101%)			
QC1203656852 408778001 MSD											
Acenaphthene	1840	U	ND		1390	ug/kg	4	76	(0%-30%)		10/29/16 15:55
Acenaphthylene	1840	U	ND		1240	ug/kg	3	67	(0%-30%)		
Anthracene	1840	J	12.0		1480	ug/kg	6	80	(0%-30%)		
Benzo(a)anthracene	184	T	84.8	T	373	ug/kg	54*	157*	(0%-34%)		
Benzo(a)pyrene	184		51.1		242	ug/kg	33	104	(0%-38%)		
Benzo(b)fluoranthene	184	T	70.3	T	348	ug/kg	47*	151*	(0%-39%)		
Benzo(ghi)perylene	184	U	ND		168	ug/kg	14	91	(0%-35%)		
Benzo(k)fluoranthene	92.0	T	38.2	T	172	ug/kg	42*	145*	(0%-38%)		
Chrysene	184	T	77.4	T	304	ug/kg	46*	123*	(0%-35%)		
Dibenzo(a,h)anthracene	184	U	ND		146	ug/kg	8	79	(0%-36%)		
Fluoranthene	184	T	107	T	490	ug/kg	65*	208*	(0%-34%)		

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408778

Page 4 of 4

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
HPLC-PAH											
Batch	1610827										
Fluorene	1840	U	ND		1460	ug/kg	5	80	(0%-33%)	CWW	10/29/16 15:55
Indeno(1,2,3-cd)pyrene	184	U	ND	P	155	ug/kg	11	84	(0%-36%)		
Naphthalene	1840	U	ND		1100	ug/kg	6	60	(0%-34%)		
Phenanthrene	1840		45.3		1570	ug/kg	13	83	(0%-32%)		
Pyrene	184	T	90.6	T	424	ug/kg	56*	181*	(0%-33%)		
*Decafluorobiphenyl	9200		4990		4820	ug/kg		52	(46%-101%)		

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)

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.

Date: 20 December 2016
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: 100-KE FSB
 Subject: PCBs - Sample Data Group (SDG) GEL408778

INTRODUCTION

This memorandum presents the results of data validation for SDG GEL408778 prepared by GEL Laboratories. 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
B37H66	10/19/16	Soil	C	8082
B37H67	10/19/16	Soil	C	8082
B37H68	10/19/16	Soil	C	8082
B37H69	10/19/16	Soil	C	8082
B37H70	10/19/16	Soil	C	8082
B37H71	10/19/16	Soil	C	8082
B37H72	10/19/16	Soil	C	8082
B37H73	10/19/16	Soil	C	8082
B37H74	10/19/16	Soil	C	8082
B37H75	10/19/16	Soil	C	8082
B37H76	10/19/16	Soil	C	8082
B37H77	10/19/16	Soil	C	8082
B37H78	10/19/16	Soil	C	8082
B37H79	10/19/16	Soil	C	8082

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 PCBs are extraction and analysis within one year of sample collection. Sample preservation requires chilling to <6 degrees Celsius.

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

The cooler associated with tracking number 777515559892 was >6 degree C. Based on professional judgment, data should not be qualified as a result.

- **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

No trip blanks were submitted for validation.

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 and matrix spike accuracy limits are 50% to 150%. The limits for reported analytes not listed in the SAP are specified by the DV procedure.

Surrogates

All surrogate recoveries were acceptable with the following exception.

The decachlorobiphenyl surrogate recoveries for either the front column and/or back column for samples B37H66, B37H67 B37H73, B37H74, B37H75, B37H78, B37H69MS and B37H69MSD and the 4cmx surrogate recovery for either the front column and/or both columns for samples B37H75, B37H76, MB, B37H69MS and B37H69MSD were <50% but \geq 10%. All results for these samples should be qualified as estimates and flagged "UJ" for non-detects and "J" for detects.

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

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

The aroclor-1260 MS and MSD recoveries were below the lower acceptance limit. All associated aroclor-1260 sample results should be qualified as estimate and flagged “UJ” for non-detects and “J” for detects.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

- **Precision**

Precision is evaluated by reviewing MS/MSD results, field duplicate sample results, 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.

Field Duplicate Samples

No field duplicates were submitted for validation.

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 GEL408778 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 low surrogate recoveries and low MS/MSD recoveries. See the table in Appendix 2 for a listing of all affected sample results.

REFERENCES

GRP-GD-003, Rev. 1, Change 0, *Data Validation for Chemical Analyses*, July 2012.

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

PCB Data Qualification Summary			
SDG: GEL408778	Reviewer: AQA	Project: 100-KE FSB	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
Aroclor-1016, -1221, -1232, -1242, -1248 and -1254	UJ	B37H66, B37H73, B37H74, B37H75, B37H76, B37H78	Low surrogate recovery
Aroclor-1016, -1221, -1232, -1242 and -1248	UJ	B37H67	Low surrogate recovery
Aroclor-1254	J	B37H67	Low surrogate recovery
Aroclor-1260	J	B37H73	Low surrogate recovery and low matrix spike recoveries
Aroclor-1260	UJ	B37H66, B37H67, B37H74, B37H75, B37H76, B37H78	Low surrogate recovery and low matrix spike recoveries
Aroclor-1260	J	B37H68, B37H69	Low matrix spike recoveries
Aroclor-1260	UJ	B37H70, B37H71, B37H72, B37H77, B37H79	Low matrix spike recoveries

Comments: None

Appendix 3

Data Validation Supporting Documentation

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

VALIDATION LEVEL:	A	B	Ⓒ	D	E
PROJECT: 100-KE FSB			DATA PACKAGE: VSR17-001		
VALIDATOR: Eyda Hergenreder		LAB: GEL		DATE: 12/13/16	
			SDG: GEL408778		
ANALYSES PERFORMED					
SW-846 8081	SW-846 8081 (TCLP)	SW-846 8082 X	SW-846 8082 (TCLP)		
SAMPLES/MATRIX Soil					
GEL408778: B37H66, B37H67, B37H68, B37H69, B37H70, B37H71, B37H72, B37H73, B37H74, B37H75, B37H76, B37H77, B37H78, B37H79					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present? Yes No N/A

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

Initial calibrations acceptable? Yes No N/A

Continuing calibrations acceptable? Yes No N/A

Standards traceable? Yes No N/A

Standards expired? Yes No N/A

Calculation check acceptable? Yes No N/A

DDT and endrin breakdowns acceptable? Yes No N/A

Comments: _____

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

Calibration blanks analyzed? (Levels D, E) Yes No N/A

Calibration blank results acceptable? (Levels D, E) Yes No N/A

Laboratory blanks analyzed? Yes No N/A

Laboratory blank results acceptable? Yes No N/A

Field/trip blanks analyzed? (Levels C, D, E) Yes No N/A

Field/trip blank results acceptable? (Levels C, D, E) Yes No N/A

Transcription/calculation errors? (Levels D, E) Yes No N/A

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

Surrogates analyzed? Yes No N/A

Surrogate recoveries acceptable? Yes No N/A

Surrogates traceable? (Levels D, E)..... Yes No N/A

Surrogates expired? (Levels D, E)..... Yes No N/A

MS/MSD samples analyzed? Yes No N/A

MS/MSD results acceptable? Yes No N/A

MS/MSD standards NIST traceable? (Levels D, E) Yes No N/A

MS/MSD standards expired? (Levels D, E)..... Yes No N/A

LCS/BSS samples analyzed? Yes No N/A

LCS/BSS results acceptable?..... Yes No N/A

Standards traceable? (Levels D, E)..... Yes No N/A

Standards expired? (Levels D, E)..... Yes No N/A

Transcription/calculation errors? (Levels D, E)..... Yes No N/A

Performance audit sample(s) analyzed? Yes No N/A

Performance audit sample results acceptable?..... Yes No N/A

Comments: _____

Surrogate: B37H66 DCB1 44%; B37H67 DCB1/2 40%/48%, B37H73 DCB1 45%; B37H74 DCB1 39%,
 B37H75 4CMX1 48%, DCB1/2 44%/46%; B37H76 4CMX1/2 36%/38%,
 B37H78 DCB1/2 46%/49%; MB 4CMX1 49%, B37H69MS CMX1 49%; DCB1/2 44%/46%,
 B37H69MSD 4CMX1 49%, DCB1 44%

MS/MSD: Aroclor-1260 MS/MSD 43%/47%

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

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

Comments: _____

6. SYSTEM PERFORMANCE (Levels D and E)

- Chromatographic performance acceptable? Yes No N/A
- Positive results resolved acceptably? Yes No N/A

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

7. HOLDING TIMES (all levels)

Samples properly preserved? Yes No N/A
Sample holding times acceptable? Yes No N/A

Comments: _____

Cooler with tracking number 777515559892 was >6 degree C.

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

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

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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: _____

Appendix 4

Additional Documentation Requested By Client

PCB

Surrogate Recovery Report

SDG Number: GEL408778

Matrix Type: SOLID

Sample ID	Client ID	4CMX 1 %REC #	4CMX 2 %REC #	DCB 1 %REC #	DCB 2 %REC #
1203657546	MB for batch 1611093	49	53	62	62
1203657547	LCS for batch 1611093	56	60	71	72
408778001	B37H66	53	56	44	50
408778002	B37H67	50	55	40	48
408778003	B37H68	63	67	54	57
408778004	B37H69	62	66	52	54
1203657550	B37H69MS	49	52	44	46
1203657551	B37H69MSD	49	52	44	50
408778005	B37H70	62	65	63	66
408778006	B37H71	60 D	62 D	53 D	58 D
408778007	B37H72	53	56	57	56
408778008	B37H73	57	60	45	65
408778009	B37H74	55	59	39	59
408778010	B37H75	48	51	44	46
408778011	B37H76	36	38	57	56
408778012	B37H77	59	63	55	57
408778013	B37H78	55	59	46	49
408778014	B37H79	52	55	51	53

Surrogate

Acceptance Limits

4CMX = 4cmx (30%-120%)
 DCB = Decachlorobiphenyl (32%-139%)

* Recovery outside Acceptance Limits
 # Column to be used to flag recovery values
 D Sample Diluted

GEL LABORATORIES LLC

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

QC Summary

Report Date: November 2, 2016

Page 1 of 2

CH2MHill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 408778

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-PCB											
Batch	1611097										
QC1203657547	LCS										
Aroclor-1016	33.3			21.5	ug/kg		65 *	(70%-130%)	JXM	11/01/16	07:47
Aroclor-1260	33.3			22.5	ug/kg		67 *	(70%-130%)			
**4cmx	6.67			3.76	ug/kg		56	(30%-120%)			
**Decachlorobiphenyl	6.67			4.71	ug/kg		71	(32%-139%)			
QC1203657546	MB										
Aroclor-1016			U	1.11	ug/kg					11/01/16	07:35
Aroclor-1221			U	1.11	ug/kg						
Aroclor-1232			U	1.11	ug/kg						
Aroclor-1242			U	1.11	ug/kg						
Aroclor-1248			U	1.11	ug/kg						
Aroclor-1254			U	1.11	ug/kg						
Aroclor-1260			U	1.11	ug/kg						
**4cmx	6.66			3.30	ug/kg		49	(30%-120%)			
**Decachlorobiphenyl	6.66			4.16	ug/kg		62	(32%-139%)			
QC1203657550	408778004 MS										
Aroclor-1016	39.1	U	1.30	21.5	ug/kg		55	(23%-121%)		11/01/16	08:57
Aroclor-1260	39.1	J	3.06	19.8	ug/kg		43	(35%-135%)			
**4cmx	7.81		4.81	3.84	ug/kg		49	(30%-120%)			
**Decachlorobiphenyl	7.81		4.07	3.44	ug/kg		44	(32%-139%)			
QC1203657551	408778004 MSD										
Aroclor-1016	39.1	U	1.30	23.5	ug/kg	9	60	(0%-30%)		11/01/16	09:11

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408778

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-PCB											
Batch	1611097										
Aroclor-1260	39.1	J	3.06	21.3	ug/kg	7	47	(0%-30%)			
**4cmx	7.83		4.81	3.87	ug/kg		49	(30%-120%)	JXM	11/01/16	09:11
**Decachlorobiphenyl	7.83		4.07	3.47	ug/kg		44	(32%-139%)			

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)

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.

Date: 13 December 2016
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: 100-KE FSB
 Subject: Inorganics - Sample Data Groups (SDGs) GEL408772 and GEL408778

INTRODUCTION

This memorandum presents the results of data validation for SDG GEL408772 and GEL408778 prepared by GEL Laboratories. 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
B37H52	10/19/16	Soil	C	6010 & 7174
B37H53	10/19/16	Soil	C	6010 & 7174
B37H54	10/19/16	Soil	C	6010 & 7174
B37H55	10/19/16	Soil	C	6010 & 7174
B37H56	10/19/16	Soil	C	6010 & 7174
B37H57	10/19/16	Soil	C	6010 & 7174
B37H58	10/19/16	Soil	C	6010 & 7174
B37H59	10/19/16	Soil	C	6010 & 7174
B37H60	10/19/16	Soil	C	6010 & 7174
B37H61	10/19/16	Soil	C	6010 & 7174
B37H62	10/19/16	Soil	C	6010 & 7174
B37H63	10/19/16	Soil	C	6010 & 7174
B37H64	10/19/16	Soil	C	6010 & 7174
B37H65	10/19/16	Soil	C	6010 & 7174
B37H66	10/19/16	Soil	C	6010 & 7174
B37H67	10/19/16	Soil	C	6010 & 7174
B37H68	10/19/16	Soil	C	6010 & 7174
B37H69	10/19/16	Soil	C	6010 & 7174
B37H70	10/19/16	Soil	C	6010 & 7174
B37H71	10/19/16	Soil	C	6010 & 7174
B37H72	10/19/16	Soil	C	6010 & 7174
B37H73	10/19/16	Soil	C	6010 & 7174
B37H74	10/19/16	Soil	C	6010 & 7174
B37H75	10/19/16	Soil	C	6010 & 7174
B37H76	10/19/16	Soil	C	6010 & 7174
B37H77	10/19/16	Soil	C	6010 & 7174
B37H78	10/19/16	Soil	C	6010 & 7174
B37H79	10/19/16	Soil	C	6010 & 7174

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 requires chilling to <6 degrees Celsius.

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

The cooler with tracking number 777515559892 was >6 degree C. Based on professional judgment, data should not be qualified as a result.

- **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

No trip blanks were submitted for validation.

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 and laboratory control sample accuracy limits are 70% to 130%. 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. When duplicate RPDs exceed the limits and have associated results $< 5X$ the SAP required detection limits (or $< 5X$ the laboratory reporting limits for analytes not listed in the SAP) with differences $< 2X$ the required detection limits no precision infraction occurred. The

Laboratory Duplicate Samples

All laboratory duplicate results were acceptable with the following exceptions.

SDG GEL408772, the parent and duplicate sample results for Sb were $\leq 5X$ the reporting limit and the duplicate difference was $> 2X$ the RL. 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.

SDG GEL408778, the RPD for Ni was $>$ the 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

No field duplicates were submitted for validation.

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.

- **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**

SDGs GEL408772 and GEL408778 were 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 a poor duplicate precision for Sb and Ni. See the table in Appendix 2 for a listing of all affected sample results.

REFERENCES

GRP-GD-003, Rev. 1, Change 0, *Data Validation for Chemical Analyses*, July 2012.

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			
SDGs: GEL408772, GEL408778	Reviewer: AQA	Project: 100-KE FSB	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
Sb	J	B37H52, B37H53, B37H54, B37H55, B37H56, B37H57, B37H58, B37H59, B37H60, B37H61, B37H63, B37H64, B37H65	Poor duplicate precision
Sb	UJ	B37H62,	Poor duplicate precision
Ni	J	B37H66, B37H67, B37H68, B37H69, B37H71, B37H72, B37H73, B37H74, B37H75, B37H76, B37H77, B37H78, B37H79	Poor duplicate precision
Ni	UJ	B37H70,	Poor duplicate precision

Comments: None

Appendix 3

Data Validation Supporting Documentation

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

VALIDATION LEVEL:	A	B	Ⓒ	D	E
PROJECT: 100-KE FSB			DATA PACKAGE: VSR17-001		
VALIDATOR: Eyda Hergenreder		LAB: GEL		DATE: 12/13/16	
			SDG: GEL408772, GEL408778		
ANALYSES PERFORMED					
SW-846/ICP X	SW-846/GFAA	SW-846/Hg X	SW-846 Cyanide		
SAMPLES/MATRIX Soil					
GEL408772: B37H52, B37H53, B37H54, B37H55, B37H56, B37H57, B37H58, B37H59, B37H60 B37H61, B37H62, B37H63, B37H64, B37H65					
GEL408778: B37H66, B37H67, B37H68, B37H69, B37H70, B37H71, B37H72, B37H73, B37H74, B37H75, B37H76, B37H77, B37H78, B37H79					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present? Yes No N/A

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

Initial calibrations performed on all instruments?Yes No **N/A**

Initial calibrations acceptable?Yes No **N/A**

ICP interference checks acceptable?Yes No **N/A**

ICV and CCV checks performed on all instruments?Yes No **N/A**

ICV and CCV checks acceptable?.....Yes No **N/A**

Standards traceable?.....Yes No **N/A**

Standards expired?.....Yes No **N/A**

Calculation check acceptable?Yes No **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 **N/A**

ICB and CCB results acceptable? (Levels D, E)Yes No **N/A**

Laboratory blanks analyzed?**Yes** No **N/A**

Laboratory blank results acceptable?**Yes** No **N/A**

Field blanks analyzed? (Levels C, D, E).....Yes **No** **N/A**

Field blank results acceptable? (Levels C, D, E).....Yes No **N/A**

Transcription/calculation errors? (Levels D, E).....Yes No **N/A**

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

MS/MSD samples analyzed?..... Yes No N/A

MS/MSD results acceptable? Yes No N/A

MS/MSD standards NIST traceable? (Levels D, E) Yes No N/A

MS/MSD standards expired? (Levels D, E)..... Yes No N/A

LCS/BSS samples analyzed?..... Yes No N/A

LCS/BSS results acceptable?..... Yes No N/A

Standards traceable? (Levels D, E)..... Yes No N/A

Standards expired? (Levels D, E)..... Yes No N/A

Transcription/calculation errors? (Levels D, E)..... Yes No N/A

Performance audit sample(s) analyzed? Yes No N/A

Performance audit sample results acceptable?..... Yes No N/A

Comments: _____

SDGs GEL408772 and GEL408778: Parent sample results for Mn were >4X spike concentration.

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

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

Comments: _____

SDG GEL408772: Duplicate difference for Sb >2X RL

SDG GEL408778: Duplicate RPD Ni 43%

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

6. ICP QUALITY CONTROL (Levels D and E)

ICP serial dilution samples analyzed?Yes No N/A

ICP serial dilution %D values acceptable?Yes No N/A

ICP post digestion spike required?Yes No N/A

ICP post digestion spike values acceptable?Yes No N/A

Standards traceable?Yes No N/A

Standards expired?Yes No N/A

Transcription/calculation errors?Yes No N/A

Comments: _____

7. HOLDING TIMES (all levels)

Samples properly preserved?(Yes) No N/A

Sample holding times acceptable?(Yes) No N/A

Comments: _____

Cooler with tracking number 777515559892 was >6 degree C.

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 3, 2016

Page 1 of 6

CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 408772

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1609085										
QC1203652416	408772001	DUP									
Antimony	BD	2460	BD	4550	ug/kg	59.8	^	(+/-5000)	HSC	11/01/16	08:22
Arsenic	U	532	B	773	ug/kg	61.5	^	(+/-3000)		10/31/16	16:49
Barium		45900		47800	ug/kg	4.02		(0%-20%)			
Beryllium		1280		1370	ug/kg	7.25	^	(+/-500)			
Boron		6450		7190	ug/kg	10.8	^	(+/-5000)			
Cadmium	DU	532	DU	500	ug/kg	N/A				11/01/16	08:22
Chromium		1930		2200	ug/kg	13	^	(+/-500)		10/31/16	16:49
Cobalt	D	7960	D	7800	ug/kg	2.03	^	(+/-2500)		11/01/16	08:22
Copper		14500		14800	ug/kg	2.15		(0%-20%)		10/31/16	16:49
Lead		3370		3620	ug/kg	7.17	^	(+/-1000)			
Manganese		286000		283000	ug/kg	1.06		(0%-20%)			
Molybdenum	B	416	B	510	ug/kg	20.4	^	(+/-1000)			
Nickel		4010		4000	ug/kg	0.198		(0%-20%)			
Selenium	U	532	B	814	ug/kg	125	^	(+/-3000)			
Silver		612		652	ug/kg	6.41	^	(+/-500)			
Vanadium	D	75800	D	82200	ug/kg	8.19		(0%-20%)		11/01/16	08:22
Zinc		42200		44500	ug/kg	5.35		(0%-20%)		10/31/16	16:49
QC1203652415	LCS										
Antimony		49800		49200	ug/kg			98.9	(80%-120%)	11/01/16	08:16
Arsenic		49800		49300	ug/kg			98.9	(80%-120%)	10/31/16	16:42

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408772

Page 2 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1609085										
Barium	49800			49900	ug/kg		100	(80%-120%)			
Beryllium	49800			51300	ug/kg		103	(80%-120%)	HSC	10/31/16	16:42
Boron	49800			52400	ug/kg		105	(80%-120%)			
Cadmium	49800			50400	ug/kg		101	(80%-120%)		11/01/16	08:16
Chromium	49800			48600	ug/kg		97.5	(80%-120%)		10/31/16	16:42
Cobalt	49800			49200	ug/kg		98.8	(80%-120%)		11/01/16	08:16
Copper	49800			50800	ug/kg		102	(80%-120%)		10/31/16	16:42
Lead	49800			50100	ug/kg		101	(80%-120%)			
Manganese	49800			49700	ug/kg		99.7	(80%-120%)			
Molybdenum	49800			49600	ug/kg		99.5	(80%-120%)			
Nickel	49800			48800	ug/kg		97.9	(80%-120%)			
Selenium	49800			49700	ug/kg		99.9	(80%-120%)			
Silver	49800			49600	ug/kg		99.6	(80%-120%)			
Vanadium	49800			49100	ug/kg		98.5	(80%-120%)		11/01/16	08:16
Zinc	49800			49000	ug/kg		98.4	(80%-120%)		10/31/16	16:42
QC1203652414	MB										
Antimony			U	308	ug/kg					11/01/16	08:13
Arsenic			U	466	ug/kg					10/31/16	16:39
Barium			U	93.3	ug/kg						
Beryllium			U	93.3	ug/kg						
Boron			U	933	ug/kg						
Cadmium			U	93.3	ug/kg					11/01/16	08:13
Chromium			U	140	ug/kg					10/31/16	16:39

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408772

Page 3 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1609085										
Cobalt			U	140	ug/kg				HSC	11/01/16	08:13
Copper			U	280	ug/kg					10/31/16	16:39
Lead			U	308	ug/kg						
Manganese			U	187	ug/kg						
Molybdenum			U	187	ug/kg						
Nickel			U	140	ug/kg						
Selenium			U	466	ug/kg						
Silver			U	93.3	ug/kg						
Vanadium			U	93.3	ug/kg					11/01/16	08:13
Zinc			U	373	ug/kg					10/31/16	16:39
QC1203652417 408772001 MS											
Antimony	54700	BD	2460	D	52600	ug/kg	91.6	(75%-125%)		11/01/16	08:26
Arsenic	54700	U	532		51500	ug/kg	93.3	(75%-125%)		10/31/16	16:53
Barium	54700		45900		99700	ug/kg	98.3	(75%-125%)			
Beryllium	54700		1280		53900	ug/kg	96.3	(75%-125%)			
Boron	54700		6450		62000	ug/kg	102	(75%-125%)			
Cadmium	54700	DU	532	D	55100	ug/kg	100	(75%-125%)		11/01/16	08:26
Chromium	54700		1930		50900	ug/kg	89.5	(75%-125%)		10/31/16	16:53
Cobalt	54700	D	7960	D	62200	ug/kg	99.1	(75%-125%)		11/01/16	08:26
Copper	54700		14500		70500	ug/kg	102	(75%-125%)		10/31/16	16:53
Lead	54700		3370		54000	ug/kg	92.6	(75%-125%)			
Manganese	54700		286000		362000	ug/kg	N/A	(75%-125%)			

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408772

Page 4 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1609085										
Molybdenum	54700	B	416	51600	ug/kg		93.5	(75%-125%)	HSC	10/31/16	16:53
Nickel	54700		4010	52000	ug/kg		87.7	(75%-125%)			
Selenium	54700	U	532	49800	ug/kg		90.7	(75%-125%)			
Silver	54700		612	52900	ug/kg		95.5	(75%-125%)			
Vanadium	54700	D	75800	D 140000	ug/kg		118	(75%-125%)		11/01/16	08:26
Zinc	54700		42200	94700	ug/kg		96	(75%-125%)		10/31/16	16:53
QC1203652418 408772001 SDILT											
Antimony		BD	4.61	DU 8780	ug/L	N/A		(0%-10%)		11/01/16	08:29
Arsenic		U	3.85	DU 2660	ug/L	N/A		(0%-10%)		10/31/16	16:56
Barium			431	D 86.8	ug/L	.669		(0%-10%)			
Beryllium			12.0	BD 2.45	ug/L	2.38		(0%-10%)			
Boron			60.6	BD 17.0	ug/L	39.9		(0%-10%)			
Cadmium		DU	0.500	DU 2660	ug/L	N/A		(0%-10%)		11/01/16	08:29
Chromium			18.1	BD 3.69	ug/L	1.81		(0%-10%)		10/31/16	16:56
Cobalt		D	15.0	BD 3.05	ug/L	2.01		(0%-10%)		11/01/16	08:29
Copper			137	D 26.2	ug/L	3.99		(0%-10%)		10/31/16	16:56
Lead			31.6	BD 5.98	ug/L	5.59		(0%-10%)			
Manganese			2680	D 556	ug/L	3.64		(0%-10%)			
Molybdenum		B	3.91	DU 1060	ug/L	N/A		(0%-10%)			
Nickel			37.6	D 7.40	ug/L	1.65		(0%-10%)			
Selenium		U	1.77	DU 2660	ug/L	N/A		(0%-10%)			
Silver			5.75	BD 1.24	ug/L	8.17		(0%-10%)			

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408772

Page 5 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1609085										
Vanadium	D	142	D	28.5	ug/L	.00351		(0%-10%)	HSC	11/01/16	08:29
Zinc		397	D	78.0	ug/L	1.64		(0%-10%)		10/31/16	16:56
Metals Analysis-Mercury											
Batch	1610973										
QC1203657183	408772001	DUP									
Mercury	B	5.73	U	4.36	ug/kg	68.8	^	(+/-13.0)	MTM1	10/28/16	11:16
QC1203657182	LCS										
Mercury		112		111	ug/kg			99.4	(80%-120%)		10/28/16 11:11
QC1203657181	MB										
Mercury			U	3.60	ug/kg						10/28/16 10:58
QC1203657184	408772001	MS									
Mercury		121	B	5.73	ug/kg			98	(80%-120%)		10/28/16 11:17
QC1203657185	408772001	SDILT									
Mercury	B	0.094	DU	20.4	ug/L	N/A		(0%-10%)		10/28/16	11:19

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

GEL LABORATORIES LLC

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

QC Summary

Report Date: November 3, 2016

Page 1 of 6

CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 408778

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1609087										
QC1203652421 408778001 DUP											
Antimony	DU	1810	DU	1800	ug/kg	N/A			HSC	11/01/16	14:33
Arsenic		4100		4100	ug/kg	0.0741	^	(+/-3270)		10/31/16	18:17
Barium		64700		71100	ug/kg	9.44		(0%-20%)			
Beryllium		1150		1180	ug/kg	2.77	^	(+/-544)			
Boron		7180		7710	ug/kg	7.1	^	(+/-5440)			
Cadmium	DU	548	DU	544	ug/kg	N/A				11/01/16	14:33
Chromium		9990		10700	ug/kg	7.29		(0%-20%)		10/31/16	18:17
Cobalt	D	7370	D	8020	ug/kg	8.33	^	(+/-2720)		11/01/16	14:33
Copper		20700		21700	ug/kg	4.41		(0%-20%)		10/31/16	18:17
Lead		7490		8670	ug/kg	14.6		(0%-20%)			
Manganese		357000		378000	ug/kg	5.73		(0%-20%)			
Molybdenum	B	477	B	581	ug/kg	19.5	^	(+/-1090)			
Nickel	*	10700	*	16700	ug/kg	43.4*		(0%-20%)			
Selenium	U	548	B	886	ug/kg	51.6	^	(+/-3270)			
Silver	B	260	B	351	ug/kg	29.5	^	(+/-544)			
Vanadium	D	57800	D	62000	ug/kg	7.04		(0%-20%)		11/01/16	14:33
Zinc		44000		46500	ug/kg	5.61		(0%-20%)		10/31/16	18:17
QC1203652420 LCS											
Antimony		47600		44500	ug/kg			93.4 (80%-120%)		11/01/16	14:27
Arsenic		47600		46800	ug/kg			98.2 (80%-120%)		10/31/16	18:10

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408778

Page 2 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1609087										
Barium	47600			47200	ug/kg		99.2	(80%-120%)			
Beryllium	47600			48300	ug/kg		101	(80%-120%)	HSC	10/31/16	18:10
Boron	47600			49400	ug/kg		104	(80%-120%)			
Cadmium	47600			43600	ug/kg		91.5	(80%-120%)		11/01/16	14:27
Chromium	47600			46000	ug/kg		96.6	(80%-120%)		10/31/16	18:10
Cobalt	47600			42900	ug/kg		90	(80%-120%)		11/01/16	14:27
Copper	47600			47900	ug/kg		101	(80%-120%)		10/31/16	18:10
Lead	47600			47200	ug/kg		99.1	(80%-120%)			
Manganese	47600			47000	ug/kg		98.6	(80%-120%)			
Molybdenum	47600			46800	ug/kg		98.4	(80%-120%)			
Nickel	47600			46100	ug/kg		96.8	(80%-120%)			
Selenium	47600			47000	ug/kg		98.6	(80%-120%)			
Silver	47600			46900	ug/kg		98.4	(80%-120%)			
Vanadium	47600			43700	ug/kg		91.7	(80%-120%)		11/01/16	14:27
Zinc	47600			46100	ug/kg		96.8	(80%-120%)		10/31/16	18:10
QC1203652419	MB										
Antimony			U	326	ug/kg					11/01/16	14:24
Arsenic			U	494	ug/kg					10/31/16	18:07
Barium			U	98.8	ug/kg						
Beryllium			U	98.8	ug/kg						
Boron			U	988	ug/kg						
Cadmium			U	98.8	ug/kg					11/01/16	14:24
Chromium			U	148	ug/kg					10/31/16	18:07

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408778

Page 3 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1609087										
Cobalt			U	148	ug/kg				HSC	11/01/16	14:24
Copper			U	296	ug/kg					10/31/16	18:07
Lead			U	326	ug/kg						
Manganese			U	198	ug/kg						
Molybdenum			U	198	ug/kg						
Nickel			U	148	ug/kg						
Selenium			U	494	ug/kg						
Silver			U	98.8	ug/kg						
Vanadium			U	98.8	ug/kg					11/01/16	14:24
Zinc			U	395	ug/kg					10/31/16	18:07
QC1203652422 408778001 MS											
Antimony	53500	DU	1810	D	41700	ug/kg	77.3	(75%-125%)		11/01/16	14:36
Arsenic	53500		4100		56700	ug/kg	98.3	(75%-125%)		10/31/16	18:20
Barium	53500		64700		125000	ug/kg	113	(75%-125%)			
Beryllium	53500		1150		54100	ug/kg	99	(75%-125%)			
Boron	53500		7180		64700	ug/kg	107	(75%-125%)			
Cadmium	53500	DU	548	D	47900	ug/kg	89.5	(75%-125%)		11/01/16	14:36
Chromium	53500		9990		61600	ug/kg	96.5	(75%-125%)		10/31/16	18:20
Cobalt	53500	D	7370	D	56200	ug/kg	91.2	(75%-125%)		11/01/16	14:36
Copper	53500		20700		77400	ug/kg	106	(75%-125%)		10/31/16	18:20
Lead	53500		7490		57400	ug/kg	93.3	(75%-125%)			
Manganese	53500		357000		438000	ug/kg	N/A	(75%-125%)			

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408778

Page 4 of 6

Parname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1609087										
Molybdenum	53500	B	477	52400	ug/kg		97	(75%-125%)	HSC	10/31/16	18:20
Nickel	53500	*	10700	60200	ug/kg		92.5	(75%-125%)			
Selenium	53500	U	548	51000	ug/kg		94.4	(75%-125%)			
Silver	53500	B	260	53900	ug/kg		100	(75%-125%)			
Vanadium	53500	D	57800	D 109000	ug/kg		96.1	(75%-125%)		11/01/16	14:36
Zinc	53500		44000	96200	ug/kg		97.6	(75%-125%)		10/31/16	18:20
QC1203652423 408778001 SDILT											
Antimony		DU	0.684	DU 9040	ug/L	N/A		(0%-10%)		11/01/16	14:39
Arsenic			37.4	BD 7.57	ug/L	1.12		(0%-10%)		10/31/16	18:24
Barium			590	D 125	ug/L	5.53		(0%-10%)			
Beryllium			10.5	BD 2.18	ug/L	4.44		(0%-10%)			
Boron			65.6	BD 20.7	ug/L	57.6		(0%-10%)			
Cadmium		DU	-0.0666	DU 2740	ug/L	N/A		(0%-10%)		11/01/16	14:39
Chromium			91.2	D 18.9	ug/L	3.72		(0%-10%)		10/31/16	18:24
Cobalt		D	13.5	BD 2.76	ug/L	2.5		(0%-10%)		11/01/16	14:39
Copper			189	D 38.4	ug/L	1.34		(0%-10%)		10/31/16	18:24
Lead			68.4	D 10.7	ug/L	22		(0%-10%)			
Manganese			3260	D 700	ug/L	7.37		(0%-10%)			
Molybdenum		B	4.36	DU 1100	ug/L	N/A		(0%-10%)			
Nickel		*	97.9	D 20.5	ug/L	4.77		(0%-10%)			
Selenium		U	4.77	DU 2740	ug/L	N/A		(0%-10%)			
Silver		B	2.38	DU 548	ug/L	N/A		(0%-10%)			

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408778

Page 5 of 6

Parname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1609087										
Vanadium	D	106	D	20.3	ug/L	3.74		(0%-10%)	HSC	11/01/16	14:39
Zinc		402	D	84.4	ug/L	5.12		(0%-10%)		10/31/16	18:24
Metals Analysis-Mercury											
Batch	1611297										
QC1203657948	408778001	DUP									
Mercury		50.4		55.1	ug/kg	8.85	^	(+/-12.9)	MTM1	10/31/16	10:34
QC1203657941	LCS										
Mercury	7100		D	7290	ug/kg			(80%-120%)		10/31/16	10:31
QC1203657940	MB										
Mercury			U	4.02	ug/kg					10/31/16	10:29
QC1203657949	408778001	MS									
Mercury	129	50.4		181	ug/kg			(80%-120%)		10/31/16	10:35
QC1203657950	408778001	SDILT									
Mercury		0.825	BD	0.164	ug/L	.606		(0%-10%)		10/31/16	10:37

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: 20 December 2016
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: 100-KE FSB
 Subject: General Chemistry - Sample Data Groups (SDGs) GEL408772 and GEL408778

INTRODUCTION

This memorandum presents the results of data validation for SDG GEL408772 and GEL408778 prepared by GEL Laboratories. 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
B37H52	10/19/16	Soil	C	9056 & 7196
B37H53	10/19/16	Soil	C	9056 & 7196
B37H54	10/19/16	Soil	C	9056 & 7196
B37H55	10/19/16	Soil	C	9056 & 7196
B37H56	10/19/16	Soil	C	9056 & 7196
B37H57	10/19/16	Soil	C	9056 & 7196
B37H58	10/19/16	Soil	C	9056 & 7196
B37H59	10/19/16	Soil	C	9056 & 7196
B37H60	10/19/16	Soil	C	9056 & 7196
B37H61	10/19/16	Soil	C	9056 & 7196
B37H62	10/19/16	Soil	C	9056 & 7196
B37H63	10/19/16	Soil	C	9056 & 7196
B37H64	10/19/16	Soil	C	9056 & 7196
B37H65	10/19/16	Soil	C	9056 & 7196
B37H66	10/19/16	Soil	C	9056 & 7196
B37H67	10/19/16	Soil	C	9056 & 7196
B37H68	10/19/16	Soil	C	9056 & 7196
B37H69	10/19/16	Soil	C	9056 & 7196
B37H70	10/19/16	Soil	C	9056 & 7196
B37H71	10/19/16	Soil	C	9056 & 7196
B37H72	10/19/16	Soil	C	9056 & 7196
B37H73	10/19/16	Soil	C	9056 & 7196
B37H74	10/19/16	Soil	C	9056 & 7196
B37H75	10/19/16	Soil	C	9056 & 7196
B37H76	10/19/16	Soil	C	9056 & 7196
B37H77	10/19/16	Soil	C	9056 & 7196
B37H78	10/19/16	Soil	C	9056 & 7196
B37H79	10/19/16	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 and sulfate – analysis within 28 days of sample collection
- Nitrate – extraction within 28 days of sample collection and analysis within 48 hours of sample extraction.
- Hexavalent chromium – analysis within 30 days of sample collection

Sample preservation for the above analyses requires chilling to <6 degrees Celsius.

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

The cooler with tracking number 777515559892 was >6 degree C. Based on professional judgment data should not be qualified.

• 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

No trip blanks were submitted for validation.

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 and laboratory control sample accuracy limits are 70% to 130%. The limits for reported analytes not listed in the SAP are specified by the DV procedure.

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

All MS/MSD recoveries were acceptable.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

- **Precision**

Precision is evaluated by reviewing MS/MSD results, 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. When duplicate RPDs for soils exceed the limits and have associated results $< 5X$ the SAP required detection limits (or $< 5X$ the laboratory reporting limits for analytes not listed in the SAP) with differences $< 2X$ the required detection limits no precision infraction occurred.

MS/MSD Samples

All MS/MSD RPD values were acceptable.

Laboratory Duplicate Samples

All laboratory duplicate results were acceptable.

Field Duplicate Samples

No field duplicates were submitted for validation.

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**

SDGs GEL408772 and GEL408778 were 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. 1, Change 0, *Data Validation for Chemical Analyses*, July 2012.

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			
SDGs: GEL408772, GEL408778	Reviewer: AQA	Project: 100-KE FSB	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
Anions; Cr ⁺⁶	None	N/A	N/A

Comments: None

Appendix 3

Data Validation Supporting Documentation

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

VALIDATION LEVEL:	A	B	©	D	E
PROJECT: 100-KE FSB			DATA PACKAGE: VSR17-001		
VALIDATOR: Eyda Hergenreder		LAB: GEL		DATE: 12/13/16	
			SDG: GEL408772, GEL408778		
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					
GEL408772: B37H52, B37H53, B37H54, B37H55, B37H56, B37H57, B37H58, B37H59, B37H60, B37H61, B37H62, B37H63, B37H64, B37H65					
GEL408778: B37H66, B37H67, B37H68, B37H69, B37H70, B37H71, B37H72, B37H73, B37H74, B37H75, B37H76, B37H77, B37H78, B37H79					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present? Yes No N/A

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

Initial calibrations performed on all instruments?Yes No **N/A**

Initial calibrations acceptable?Yes No **N/A**

ICV and CCV checks performed on all instruments?Yes No **N/A**

ICV and CCV checks acceptable?.....Yes No **N/A**

Standards traceable?Yes No **N/A**

Standards expired?Yes No **N/A**

Calculation check acceptable?Yes No **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 **N/A**

ICB and CCB results acceptable? (Levels D, E)Yes No **N/A**

Laboratory blanks analyzed?**Yes** No N/A

Laboratory blank results acceptable?**Yes** No N/A

Field blanks analyzed? (Levels C, D, E).....Yes **No** N/A

Field blank results acceptable? (Levels C, D, E).....Yes **No** N/A

Transcription/calculation errors? (Levels D, E).....Yes No **N/A**

Comments: _____

Data Validation for Chemical Analyses

Published Date: 07/31/12

SGRP-GD-SMP-50117

Effective Date: 07/31/12

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

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

Comments: _____

6. HOLDING TIMES (all levels)

- Samples properly preserved? Yes No N/A
- Sample holding times acceptable? Yes No N/A

Comments: _____

All samples were analyzed beyond 48 hours for Nitrate-N.

Cooler with tracking number 777515559892 was >6 degree C.

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 2, 2016

Page 1 of 3

CH2MHill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 408772

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Ion Chromatography											
Batch	1610064										
QC1203655058	408772010	DUP									
Chloride		2550		2570	ug/Kg	0.87	^	(+/-2120)	MAR1	10/27/16	19:43
Nitrate-N	B	502	B	493	ug/Kg	1.84	^	(+/-1060)			
Sulfate		8440		7870	ug/Kg	6.97	^	(+/-4240)			
QC1203655057	LCS										
Chloride	50000			47600	ug/Kg			95.2	(80%-120%)	10/27/16	12:49
Nitrate-N	25000			24000	ug/Kg			95.9	(80%-120%)		
Sulfate	100000			97700	ug/Kg			97.7	(80%-120%)		
QC1203655056	MB										
Chloride			U	720	ug/Kg					10/27/16	12:17
Nitrate-N			U	330	ug/Kg						
Sulfate			U	1330	ug/Kg						
QC1203655064	408772010	MS									
Chloride	53000	2550		51600	ug/Kg			92.5	(48%-145%)	10/27/16	20:15
Nitrate-N	26500	B	502	24900	ug/Kg			92.1	(70%-125%)		
Sulfate	106000	8440		109000	ug/Kg			94.5	(45%-162%)		
Batch	1610066										
QC1203655062	408778005	DUP									
Chloride		2830		2870	ug/Kg	1.18	^	(+/-2100)	MAR1	10/28/16	04:46
Nitrate-N	B	413	B	421	ug/Kg	2.02	^	(+/-1050)			
Sulfate	B	3130	B	3160	ug/Kg	0.769	^	(+/-4200)			
QC1203655061	LCS										
Chloride	50000			48700	ug/Kg			97.4	(80%-120%)	10/27/16	22:23
Nitrate-N	25000			24700	ug/Kg			98.7	(80%-120%)		

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408772

Page 2 of 3

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Ion Chromatography											
Batch	1610066										
Sulfate	100000			100000	ug/Kg		100	(80%-120%)			
QC1203655060	MB										
Chloride			U	720	ug/Kg				MAR1	10/27/16	21:51
Nitrate-N			U	330	ug/Kg						
Sulfate			U	1330	ug/Kg						
QC1203655063	408778005	MS									
Chloride	52800	2830		52500	ug/Kg		94.1	(48%-145%)		10/28/16	05:18
Nitrate-N	26400	B	413	25200	ug/Kg		93.8	(70%-125%)			
Sulfate	106000	B	3130	106000	ug/Kg		97.2	(45%-162%)			
Spectrometric Analysis											
Batch	1609483										
QC1203653276	408772001	DUP									
Hexavalent Chromium		U	174	U	173	ug/Kg	N/A		VH1	10/26/16	11:36
QC1203653277	408772014	DUP									
Hexavalent Chromium		U	164	U	168	ug/Kg	N/A			10/26/16	11:44
QC1203653275	ILCS										
Hexavalent Chromium	8080			6560	ug/Kg		81.1	(80%-120%)		10/26/16	11:33
QC1203653274	LCS										
Hexavalent Chromium	3970			3990	ug/Kg		100	(80%-120%)		10/26/16	11:32
QC1203653273	MB										
Hexavalent Chromium			U	160	ug/Kg					10/26/16	11:32
QC1203653278	408772001	MS									
Hexavalent Chromium	4290	U	174	3960	ug/Kg		92.3	(75%-125%)		10/26/16	11:37
QC1203653279	408772014	MS									
Hexavalent Chromium	4150	U	164	4090	ug/Kg		98.4	(75%-125%)		10/26/16	11:45
QC1203653280	408772001	MSD									
Hexavalent Chromium	4330	U	174	4030	ug/Kg	1.74	93.1	(0%-35%)		10/26/16	11:37
QC1203653281	408772014	MSD									
Hexavalent Chromium	4220	U	164	4230	ug/Kg	3.44	100	(0%-35%)		10/26/16	11:45

Notes:

GEL LABORATORIES LLC

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

QC Summary

Report Date: November 3, 2016

Page 1 of 3

CH2MHill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 408778

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Ion Chromatography											
Batch	1610066										
QC1203655062	408778005	DUP									
Chloride		2830		2870	ug/Kg	1.18	^	(+/-2100)	MAR1	10/28/16	04:46
Nitrate-N	B	413	B	421	ug/Kg	2.02	^	(+/-1050)			
Sulfate	B	3130	B	3160	ug/Kg	0.769	^	(+/-4200)			
QC1203655061	LCS										
Chloride	50000			48700	ug/Kg			97.4	(80%-120%)		10/27/16 22:23
Nitrate-N	25000			24700	ug/Kg			98.7	(80%-120%)		
Sulfate	100000			100000	ug/Kg			100	(80%-120%)		
QC1203655060	MB										
Chloride			U	720	ug/Kg						10/27/16 21:51
Nitrate-N			U	330	ug/Kg						
Sulfate			U	1330	ug/Kg						
QC1203655063	408778005	MS									
Chloride	52800	2830		52500	ug/Kg			94.1	(48%-145%)		10/28/16 05:18
Nitrate-N	26400	B	413	25200	ug/Kg			93.8	(70%-125%)		
Sulfate	106000	B	3130	106000	ug/Kg			97.2	(45%-162%)		
Batch	1610072										
QC1203655068	408778014	DUP									
Chloride		B	1180	B	1160	ug/Kg	1.64	^	(+/-2140)	MAR1	10/28/16 13:48
Nitrate-N		B	566	B	547	ug/Kg	3.45	^	(+/-1070)		
Sulfate		B	2810	B	2240	ug/Kg	22.4	^	(+/-4270)		
QC1203655067	LCS										
Chloride	50000			48000	ug/Kg			96.1	(80%-120%)		10/28/16 07:25
Nitrate-N	25000			24200	ug/Kg			96.9	(80%-120%)		

GEL LABORATORIES LLC

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

QC Summary

Workorder: 408778

Page 2 of 3

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Ion Chromatography											
Batch	1610072										
Sulfate	100000			98800	ug/Kg		98.8	(80%-120%)			
QC1203655066 MB											
Chloride			U	720	ug/Kg				MAR1	10/28/16	06:53
Nitrate-N			U	330	ug/Kg						
Sulfate			U	1330	ug/Kg						
QC1203655069 408778014 MS											
Chloride	53200	B	1180	54000	ug/Kg		99.3	(48%-145%)		10/28/16	14:20
Nitrate-N	26600	B	566	26900	ug/Kg		99.2	(70%-125%)			
Sulfate	106000	B	2810	111000	ug/Kg		102	(45%-162%)			
Spectrometric Analysis											
Batch	1609549										
QC1203653469 408778001 DUP											
Hexavalent Chromium		NU	176	U	177	ug/Kg	N/A		RXB5	10/26/16	20:00
QC1203653470 408778014 DUP											
Hexavalent Chromium		NU	168	U	168	ug/Kg	N/A			10/26/16	20:28
QC1203653468 ILCS											
Hexavalent Chromium	7940				6490	ug/Kg		81.8	(80%-120%)		10/26/16 19:58
QC1203653467 LCS											
Hexavalent Chromium	3950				4720	ug/Kg		119	(80%-120%)		10/26/16 19:56
QC1203653466 MB											
Hexavalent Chromium			U	158	ug/Kg						10/26/16 19:56
QC1203653471 408778001 MS											
Hexavalent Chromium	4400	NU	176		3390	ug/Kg		77.1	(75%-125%)		10/26/16 20:02
QC1203653472 408778014 MS											
Hexavalent Chromium	4190	NU	168		5140	ug/Kg		123	(75%-125%)		10/26/16 20:28
QC1203653473 408778001 MSD											
Hexavalent Chromium	4410	NU	176		3370	ug/Kg	0.627	76.3	(0%-35%)		10/26/16 20:04
QC1203653474 408778014 MSD											
Hexavalent Chromium	4260	NU	168	N	5370	ug/Kg	4.34	126*	(0%-35%)		10/26/16 20:29

Notes: