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## Data Validation Report for CH2M Hill Plateau Remediation Company

**VSR18-001**  
**Project 618-10\_618-11**

### Chemical and Radiochemical Validation - Level C

Validation Performed By: *Eyda Hergenreder* Date: 12-07-2017  
Eyda Hergenreder

Technical Review By: *Ellen McEntee* Date: 12-07-2017  
Ellen McEntee

Quality Review By: *Mary A. Donovan* Date: 01-15-2018  
Mary Donovan  
Quality Assurance Manager

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Date: 07 December 2017  
 To: CH2M Hill (technical representative)  
 From: Analytical Quality Associates, Inc.  
 Project: 618-10\_618-11  
 Subject: Semivolatile Organics - Sample Data Group (SDG) GEL434204, DN0231

## **INTRODUCTION**

This memorandum presents the results of data validation for SDG GEL434204 prepared by GEL Laboratories LLC and SDG DN0231 prepared by TestAmerica Laboratories, Inc. A list of samples validated along with the analytical methods is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation Level</b>	<b>Analytical Methods</b>
B3C1R7	10/03/17	Soil	C	8270, WTPH-D
B3C1R9	10/03/17	Soil	C	8270, WTPH-D
B3C1T1	10/03/17	Soil	C	8270, WTPH-D
B3C1T3	10/03/17	Soil	C	8270, WTPH-D
B3C1T5	10/03/17	Soil	C	8270, WTPH-D
B3C1T7	10/03/17	Soil	C	8270, WTPH-D
B3C1T9	10/03/17	Soil	C	8270, WTPH-D
B3C1V1	10/03/17	Soil	C	8270, WTPH-D
B3C1V3	10/03/17	Soil	C	8270, WTPH-D
B3C1V5	10/03/17	Soil	C	8270, WTPH-D
B3C1V7	10/03/17	Soil	C	8270, WTPH-D
B3C1V9	10/03/17	Soil	C	8270, WTPH-D
B3C1W1	10/03/17	Soil	C	8270, WTPH-D
B3C1W3	10/03/17	Soil	C	8270, WTPH-D
B3C1W9	10/03/17	Soil	C	8270, WTPH-D
B3C1X1	10/03/17	Soil	C	8270, WTPH-D

Data validation was conducted in accordance with the CHPRC validation statement of work and the 300 Area Remedial Action Sampling and Analysis Plan, DOE/RL-2001-48, Rev. 4, (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 method 8270 are extraction within 14 days of sample

collection and analysis within 40 days of sample extraction. The holding time requirement for WTPH-D is analysis within 14 days of sample collection. Sample preservation requires chilling to  $\leq 6$  degrees Celsius.

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

- **Blanks**

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

### **Laboratory Blanks**

All laboratory blank results were acceptable with the following exceptions.

For SDG GEL434204, the method blank result for motor oil was a detect  $>$  the method detection limit (MDL) but  $<$  the practical quantitation limit (PQL). All motor oil sample results that were detects  $>$  the MDL but  $\leq 20X$  the blank value should be qualified as estimates and flagged “J+.” See the table in Appendix 2 for a listing of all affected sample results.

For SDG DN0231, the method blank result for diesel was a detect  $>$  MDL but  $<$  the PQL. The diesel result for sample B3C1X1 was a detect  $>$  the PQL but  $\leq 20X$  the blank value and should be qualified as an estimate and flagged “J+.”

### **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 accuracy limits are 50% to 150%. The matrix spike sample accuracy limits are the ones established by the analytical laboratory. 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.

### **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  $\pm 30\%$ .

### **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**

All field split results were acceptable with the following exception.

The diesel result for parent sample B3C1R9 was a non-detect and the result for split sample B3C1X1 was 5100 ug/kg.

- **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 with associated non-detect sample results were below the CRDLs with the following exceptions.

SDG DN0231, the benzo(a)pyrene MDL for sample B3C1X1 was > the CRDL.

SDG GEL434204, the DRO MDL for sample B3C1T9 was > the CRDL

- **Completeness**

SDGs GEL434204 and DN0231 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 motor oil and diesel results as estimates were due to blank contamination. See the table in Appendix 2 for a listing of all affected sample results.

SDG DN0231: according to the COC, TestAmerica Denver is not certified for tributyl phosphate by method 8270D. The laboratory proceeded with the analysis as instructed by the client.

### **REFERENCES**

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

DOE/RL-2001-48, Rev. 4, *300 Area Remedial Action Sampling and Analysis Plan*, November 2014.

## **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**

<b>Semivolatile Organics Data Qualification Summary</b>			
SDGs: GEL434204, DN0231	Reviewer: AQA	Project: 618-10 618-11	Page 1 of 1
<b>Analyte(s)</b>	<b>Qualifier</b>	<b>Samples Affected</b>	<b>Reason</b>
8270 analytes	NA	NA	NA
Motor oil	J+	B3C1R7, B3C1R9, B3C1T3, B3C1T5, B3C1T7, B3C1V1, B3C1V3, B3C1V7, B3C1V9, B3C1W3, B3C1W9	Laboratory blank contamination
Diesel	J+	B3C1X1	Laboratory blank contamination

Comments: None

## **Appendix 3**

### **Data Validation Supporting Documentation**

**Data Validation for Chemical Analyses**

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

**Appendix A - Chemical Data Validation Checklist**

VALIDATION LEVEL:	A	B	<input checked="" type="radio"/> C	D	E
PROJECT: 618-10_618-11			DATA PACKAGE: VSR18-001		
VALIDATOR: Eyda Hergenreder		LAB: GEL, TestAmerica		DATE: 12/07/17	
			SDG:GEL434204, DN0231		
ANALYSES PERFORMED					
SW-846 8260		SW-846 8260 (TCLP)	SW-846 8270 X		SW-846 8270 (TCLP)
SAMPLES/MATRIX Soil					
GEL434204: B3C1R7, B3C1R9, B3C1T1, B3C1T3, B3C1T5, B3C1T7, B3C1T9, B3C1V1, B3C1V3, B3C1V5, B3C1V7, B3C1V9, B3C1W1, B3C1W3, B3C1W9					
DN0231: B3C1X1					

**1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE**

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

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

### Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

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

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

Comments:

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

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Effective Date: 10/03/16

## Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

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Effective Date: 10/03/16

### Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

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 SDG GEL434204 sample B3C1R9/split sample SDG DN0231 sample B3C1X1
 

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#### 6. SYSTEM PERFORMANCE (Levels D and E)

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

Comments:

## Data Validation for Chemical Analyses

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## Appendix A - (Cont.) Chemical Data Validation Checklist

## 7. HOLDING TIMES (all levels )

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

Comments:

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

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

Comments: MDL &gt;CRDL

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SDG DN0231: sample B3C1X1 for benzo(a)pyrene

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**Data Validation for Chemical Analyses**

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**Appendix A - (Cont.) Chemical Data Validation Checklist**

VALIDATION LEVEL:	A	B	<input checked="" type="radio"/> C	D	E
PROJECT: 618-10_618-11			DATA PACKAGE: VSR18-001		
VALIDATOR: Eyda Hergenreder		LAB: GEL, TestAmerica		DATE: 12/07/17	
			SDG: GEL434204, DN0231		
ANALYSES PERFORMED					
8015	8021	8141	8151	8315	
		WTPH-HCID	WTPH-G	WTPH-D	X
SAMPLES/MATRIX: Soil					
GEL434204: B3C1R7, B3C1R9, B3C1T1, B3C1T3, B3C1T5, B3C1T7, B3C1T9, B3C1V1, B3C1V3, B3C1V5, B3C1V7, B3C1V9, B3C1W1, B3C1W3, B3C1W9					
DN0231: B3C1X1					

**1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE**

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

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## Data Validation for Chemical Analyses

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### Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

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

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

Comments:

GEL434204: motor oil 4020 ug/kg

DN0231: diesel 1440 ug/kg

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## Data Validation for Chemical Analyses

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### Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

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Data Validation for Chemical Analyses

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Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

SDG GEL434204 parent sample B3C1R9 diesel result non-detect/SDG DN0231 split sample B3C1X1 5100 ug/kg

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6. HOLDING TIMES (all levels)

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

Comments:

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## Data Validation for Chemical Analyses

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### Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

SDG GEL434204: DRO MDL&gt;CRDL sample B3C1T9

#### 8. SAMPLE CLEANUP (Levels D and E)

Fluorisil ® (or other absorbent) cleanup performed?	Yes No <input type="radio"/> N/A
Lot check performed?	Yes No <input type="radio"/> N/A
Check recoveries acceptable?	Yes No <input type="radio"/> N/A
Check materials traceable?	Yes No <input type="radio"/> N/A
Check materials Expired?	Yes No <input type="radio"/> N/A
Analytical batch QC given similar cleanup?	Yes No <input type="radio"/> N/A
Transcription/Calculation Errors?	Yes No <input type="radio"/> N/A

Comments (attach additional sheets as necessary):

## **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: October 9, 2017

Page 1 of 4

CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 434204

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Semi-Volatile-GC/MS</b>											
Batch	1706788										
QC1203889597	LCS										
Benzo(a)pyrene	1670			1610	ug/kg		97	(70%-130%)	JMB3	10/06/17	14:40
Chrysene	1670			1640	ug/kg		98	(70%-130%)			
Tributylphosphate	1670			1800	ug/kg		108	(70%-130%)			
**2,4,6-Tribromophenol	3330			2720	ug/kg		82	(12%-129%)			
**2-Fluorobiphenyl	1670			431	ug/kg		26	(15%-110%)			
**2-Fluorophenol	3330			1610	ug/kg		48	(10%-115%)			
**Nitrobenzene-d5	1670			374	ug/kg		22	(13%-112%)			
**Phenol-d5	3330			2170	ug/kg		65	(15%-117%)			
**p-Terphenyl-d14	1670			1410	ug/kg		85	(24%-141%)			
QC1203889596	MB										
Benzo(a)pyrene			U	9.99	ug/kg					10/06/17	14:14
Chrysene			U	9.99	ug/kg						
Tributylphosphate			U	99.9	ug/kg						
**2,4,6-Tribromophenol	3330			2180	ug/kg		66	(12%-129%)			

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**QC Summary**

Workorder: 434204

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Semi-Volatile-GC/MS</b>											
Batch	1706788										
**2-Fluorobiphenyl	1670			461	ug/kg		28	(15%-110%)	JMB3	10/06/17	14:14
**2-Fluorophenol	3330			1360	ug/kg		41	(10%-115%)			
**Nitrobenzene-d5	1670			397	ug/kg		24	(13%-112%)			
**Phenol-d5	3330			1710	ug/kg		51	(15%-117%)			
**p-Terphenyl-d14	1670			1090	ug/kg		66	(24%-141%)			
QC1203889598	434204003	MS									
Benzo(a)pyrene	1690	U	10.2	1680	ug/kg		99	(28%-122%)		10/06/17	16:24
Chrysene	1690	U	10.2	1570	ug/kg		92	(26%-122%)			
Tributylphosphate	1690	U	102	1810	ug/kg		107	(25%-131%)			
**2,4,6-Tribromophenol	3390		2760	2270	ug/kg		67	(12%-129%)			
**2-Fluorobiphenyl	1690		624	519	ug/kg		31	(15%-110%)			
**2-Fluorophenol	3390		1720	1550	ug/kg		46	(10%-115%)			
**Nitrobenzene-d5	1690		571	452	ug/kg		27	(13%-112%)			
**Phenol-d5	3390		2140	2020	ug/kg		60	(15%-117%)			
**p-Terphenyl-d14	1690		1420	1390	ug/kg		82	(24%-141%)			
QC1203889599	434204003	MSD									
Benzo(a)pyrene	1690	U	10.2	1620	ug/kg	3	96	(0%-30%)		10/06/17	16:50

## QC Summary

Workorder: 434204

Page 3 of 4

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Semi-Volatile-GC/MS</b>											
Batch	1706788										
Chrysene	1690	U	10.2	1600	ug/kg	2	95	(0%-30%)	JMB3	10/06/17	16:50
Tributylphosphate	1690	U	102	1780	ug/kg	2	105	(0%-30%)			
**2,4,6-Tribromophenol	3380		2760	2820	ug/kg		83	(12%-129%)			
**2-Fluorobiphenyl	1690		624	821	ug/kg		49	(15%-110%)			
**2-Fluorophenol	3380		1720	2060	ug/kg		61	(10%-115%)			
**Nitrobenzene-d5	1690		571	753	ug/kg		45	(13%-112%)			
**Phenol-d5	3380		2140	2390	ug/kg		71	(15%-117%)			
**p-Terphenyl-d14	1690		1420	1570	ug/kg		93	(24%-141%)			

**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)

## Surrogate Recovery Report

SDG Number: GEL434204

Matrix Type: SOLID

Sample ID	Client ID	2FP %REC	PHL %REC	NBZ %REC	FBP %REC	TBP %REC	TPH %REC
1203889596	MB for batch 1706776	41	51	24	28	66	66
1203889597	LCS for batch 1706776	48	65	22	26	82	85
434204001	B3C1R7	46	59	28	34	74	78
434204002	B3C1R9	55	62	42	44	78	86
434204003	B3C1T1	51	63	34	37	82	84
1203889598	B3C1T1MS	46	60	27	31	67	82
1203889599	B3C1T1MSD	61	71	45	49	83	93
434204004	B3C1T3	42	58	24	30	71	92
434204005	B3C1T5	55	62	43	53	82	102
434204006	B3C1T7	61	64	62	71	78	102
434204007	B3C1T9	66	69	64	78	88	95
434204008	B3C1V1	75	80	62	69	88	100
434204009	B3C1V3	56	56	48	49	60	71
434204010	B3C1V5	73	76	66	70	83	103
434204011	B3C1V7	83	84	72	76	88	98
434204013	B3C1W1	76	79	70	77	90	97
434204014	B3C1W3	65	67	61	65	74	82
434204012	B3C1V9	68	72	64	70	73	95
434204015	B3C1W9	69	69	67	72	75	100

**Surrogate**

2FP = 2-Fluorophenol  
 PHL = Phenol-d5  
 NBZ = Nitrobenzene-d5  
 FBP = 2-Fluorobiphenyl  
 TBP = 2,4,6-Tribromophenol  
 TPH = p-Terphenyl-d14

**Acceptance Limits**

(10%-115%)  
 (15%-117%)  
 (13%-112%)  
 (15%-110%)  
 (12%-129%)  
 (24%-141%)

\* Recovery outside Acceptance Limits

# Column to be used to flag recovery values

D Sample Diluted

# QC Sample Results

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

## Method: 8270D - Semivolatile Organic Compounds (GC/MS)

**Lab Sample ID: MB 280-390608/1-A**

**Matrix: Solid**  
**Analysis Batch: 391638**

**Client Sample ID: Method Blank**

**Prep Type: Total/NA**  
**Prep Batch: 390608**

Analyte	MB MB		RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
Benzo[a]pyrene	20	U	320	20	ug/Kg		10/09/17 19:47	10/16/17 18:32	1
Chrysene	26	U	320	26	ug/Kg		10/09/17 19:47	10/16/17 18:32	1
Tributyl phosphate	57	U	1600	57	ug/Kg		10/09/17 19:47	10/16/17 18:32	1

Surrogate	MB MB		Limits	Prepared	Analyzed	Dil Fac
	%Recovery	Qualifier				
2,4,6-Tribromophenol (Surr)	63		35 - 120	10/09/17 19:47	10/16/17 18:32	1
2-Fluorobiphenyl (Surr)	60		46 - 120	10/09/17 19:47	10/16/17 18:32	1
2-Fluorophenol (Surr)	59		43 - 120	10/09/17 19:47	10/16/17 18:32	1
Nitrobenzene-d5 (Surr)	54		46 - 120	10/09/17 19:47	10/16/17 18:32	1
Phenol-d5 (Surr)	58		46 - 120	10/09/17 19:47	10/16/17 18:32	1
Terphenyl-d14 (Surr)	68		46 - 120	10/09/17 19:47	10/16/17 18:32	1

**Lab Sample ID: LCS 280-390608/2-A**

**Matrix: Solid**  
**Analysis Batch: 391638**

**Client Sample ID: Lab Control Sample**

**Prep Type: Total/NA**  
**Prep Batch: 390608**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chrysene	2560	1990		ug/Kg		78	70 - 130

Surrogate	LCS LCS		Limits
	%Recovery	Qualifier	
2,4,6-Tribromophenol (Surr)	85		35 - 120
2-Fluorobiphenyl (Surr)	75		46 - 120
2-Fluorophenol (Surr)	75		43 - 120
Nitrobenzene-d5 (Surr)	68		46 - 120
Phenol-d5 (Surr)	74		46 - 120
Terphenyl-d14 (Surr)	78		46 - 120

**Lab Sample ID: LCS 280-390608/3-A**

**Matrix: Solid**  
**Analysis Batch: 391638**

**Client Sample ID: Lab Control Sample**

**Prep Type: Total/NA**  
**Prep Batch: 390608**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits

Surrogate	LCS LCS		Limits
	%Recovery	Qualifier	
2,4,6-Tribromophenol (Surr)	77		35 - 120
2-Fluorobiphenyl (Surr)	73		46 - 120
2-Fluorophenol (Surr)	71		43 - 120
Nitrobenzene-d5 (Surr)	64		46 - 120
Phenol-d5 (Surr)	72		46 - 120
Terphenyl-d14 (Surr)	81		46 - 120

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

**Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)**

**Lab Sample ID: 280-101855-1 MS**  
**Matrix: Soil**  
**Analysis Batch: 391638**

**Client Sample ID: B3CVJ6**  
**Prep Type: Total/NA**  
**Prep Batch: 390608**

Analyte	Sample	Sample	Spike	MS	MS	Unit	D	%Rec	Limits
	Result	Qualifier		Result	Qualifier				
Benzo[a]pyrene	20	U	2600	1880		ug/Kg	☼	72	65 - 120
Chrysene	27	U	2600	1950		ug/Kg	☼	75	65 - 120
<b>MS MS</b>									
<b>Surrogate</b>	<b>%Recovery</b>	<b>Qualifier</b>	<b>Limits</b>						
2,4,6-Tribromophenol (Surr)	79		35 - 120						
2-Fluorobiphenyl (Surr)	72		46 - 120						
2-Fluorophenol (Surr)	75		43 - 120						
Nitrobenzene-d5 (Surr)	66		46 - 120						
Phenol-d5 (Surr)	75		46 - 120						
Terphenyl-d14 (Surr)	76		46 - 120						

**Lab Sample ID: 280-101855-1 MS**  
**Matrix: Soil**  
**Analysis Batch: 391638**

**Client Sample ID: B3CVJ6**  
**Prep Type: Total/NA**  
**Prep Batch: 390608**

Analyte	Sample	Sample	Spike	MS	MS	Unit	D	%Rec	Limits
	Result	Qualifier		Result	Qualifier				
Tributyl phosphate	58	U	1320	1000	J	ug/Kg	☼	76	30 - 150
<b>MS MS</b>									
<b>Surrogate</b>	<b>%Recovery</b>	<b>Qualifier</b>	<b>Limits</b>						
2,4,6-Tribromophenol (Surr)	76		35 - 120						
2-Fluorobiphenyl (Surr)	75		46 - 120						
2-Fluorophenol (Surr)	76		43 - 120						
Nitrobenzene-d5 (Surr)	67		46 - 120						
Phenol-d5 (Surr)	75		46 - 120						
Terphenyl-d14 (Surr)	80		46 - 120						

**Lab Sample ID: 280-101855-1 MSD**  
**Matrix: Soil**  
**Analysis Batch: 391638**

**Client Sample ID: B3CVJ6**  
**Prep Type: Total/NA**  
**Prep Batch: 390608**

Analyte	Sample	Sample	Spike	MSD	MSD	Unit	D	%Rec	Limits	RPD	
	Result	Qualifier		Result	Qualifier					RPD	Limit
Benzo[a]pyrene	20	U	2720	1860		ug/Kg	☼	68	65 - 120	1	30
Chrysene	27	U	2720	1910		ug/Kg	☼	70	65 - 120	2	30
<b>MSD MSD</b>											
<b>Surrogate</b>	<b>%Recovery</b>	<b>Qualifier</b>	<b>Limits</b>								
2,4,6-Tribromophenol (Surr)	76		35 - 120								
2-Fluorobiphenyl (Surr)	71		46 - 120								
2-Fluorophenol (Surr)	72		43 - 120								
Nitrobenzene-d5 (Surr)	64		46 - 120								
Phenol-d5 (Surr)	71		46 - 120								
Terphenyl-d14 (Surr)	72		46 - 120								

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

**Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)**

Lab Sample ID: 280-101855-1 MSD  
 Matrix: Soil  
 Analysis Batch: 391638

Client Sample ID: B3CVJ6  
 Prep Type: Total/NA  
 Prep Batch: 390608

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	RPD Limit
Tributyl phosphate	58	U	1360	1100	J	ug/Kg	☼	80	30 - 150	9	30
Surrogate	%Recovery	MSD Qualifier	MSD Limits								
2,4,6-Tribromophenol (Surr)	80		35 - 120								
2-Fluorobiphenyl (Surr)	76		46 - 120								
2-Fluorophenol (Surr)	75		43 - 120								
Nitrobenzene-d5 (Surr)	67		46 - 120								
Phenol-d5 (Surr)	74		46 - 120								
Terphenyl-d14 (Surr)	83		46 - 120								

**Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography**

Lab Sample ID: MB 280-391988/1-A  
 Matrix: Solid  
 Analysis Batch: 392072

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 391988

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Aroclor 1016	5.0	U	33	5.0	ug/Kg		10/19/17 15:57	10/20/17 09:41	1	
Aroclor 1221	15	U	46	15	ug/Kg		10/19/17 15:57	10/20/17 09:41	1	
Aroclor 1232	5.1	U	33	5.1	ug/Kg		10/19/17 15:57	10/20/17 09:41	1	
Aroclor 1242	9.0	U	33	9.0	ug/Kg		10/19/17 15:57	10/20/17 09:41	1	
Aroclor 1248	5.5	U	33	5.5	ug/Kg		10/19/17 15:57	10/20/17 09:41	1	
Aroclor 1254	5.4	U	33	5.4	ug/Kg		10/19/17 15:57	10/20/17 09:41	1	
Aroclor 1260	2.6	U	33	2.6	ug/Kg		10/19/17 15:57	10/20/17 09:41	1	
Surrogate	%Recovery	MB Qualifier	MB Limits	Prepared	Analyzed	Dil Fac				
Decachlorobiphenyl	94		59 - 130	10/19/17 15:57	10/20/17 09:41	1				
Tetrachloro-m-xylene	99		53 - 128	10/19/17 15:57	10/20/17 09:41	1				

Lab Sample ID: LCS 280-391988/2-A  
 Matrix: Solid  
 Analysis Batch: 392072

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA  
 Prep Batch: 391988

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Aroclor 1016	65.8	56.2		ug/Kg		85	70 - 130
Aroclor 1260	65.8	69.2		ug/Kg		105	70 - 130
Surrogate	%Recovery	LCS Qualifier	LCS Limits				
Decachlorobiphenyl	99		59 - 130				
Tetrachloro-m-xylene	105		53 - 128				

Lab Sample ID: 280-101904-1 MS  
 Matrix: Soil  
 Analysis Batch: 392072

Client Sample ID: B3C1X1  
 Prep Type: Total/NA  
 Prep Batch: 391988

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Aroclor 1016	4.9	U	67.5	53.6		ug/Kg	☼	79	54 - 132

TestAmerica Denver

# Surrogate Summary

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

## Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Matrix: Soil

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Surrogate Recovery (Acceptance Limits)					
		TBP (35-120)	FBP (46-120)	2FP (43-120)	NBZ (46-120)	PHL (46-120)	TPH (46-120)
280-101855-1	B3CVJ6	71	71	71	65	71	75
280-101855-1 MS	B3CVJ6	79	72	75	66	75	76
280-101855-1 MS	B3CVJ6	76	75	76	67	75	80
280-101855-1 MSD	B3CVJ6	76	71	72	64	71	72
280-101855-1 MSD	B3CVJ6	80	76	75	67	74	83
280-101904-1	B3C1X1	63	64	67	58	67	67
280-102039-1	B3C2F3	65	64	63	55	65	69

### Surrogate Legend

TBP = 2,4,6-Tribromophenol (Surr)  
 FBP = 2-Fluorobiphenyl (Surr)  
 2FP = 2-Fluorophenol (Surr)  
 NBZ = Nitrobenzene-d5 (Surr)  
 PHL = Phenol-d5 (Surr)  
 TPH = Terphenyl-d14 (Surr)

## Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Surrogate Recovery (Acceptance Limits)					
		TBP (35-120)	FBP (46-120)	2FP (43-120)	NBZ (46-120)	PHL (46-120)	TPH (46-120)
LCS 280-390608/2-A	Lab Control Sample	85	75	75	68	74	78
LCS 280-390608/3-A	Lab Control Sample	77	73	71	64	72	81
MB 280-390608/1-A	Method Blank	63	60	59	54	58	68

### Surrogate Legend

TBP = 2,4,6-Tribromophenol (Surr)  
 FBP = 2-Fluorobiphenyl (Surr)  
 2FP = 2-Fluorophenol (Surr)  
 NBZ = Nitrobenzene-d5 (Surr)  
 PHL = Phenol-d5 (Surr)  
 TPH = Terphenyl-d14 (Surr)

## Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Matrix: Soil

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Surrogate Recovery (Acceptance Limits)	
		DCB2 (59-130)	TCX2 (53-128)
280-101855-1	B3CVJ6	92	99
280-101904-1	B3C1X1	78	84
280-101904-1 MS	B3C1X1	83	93
280-101904-1 MSD	B3C1X1	88	95
280-102039-1	B3C2F3	66	74

### Surrogate Legend

DCB = Decachlorobiphenyl  
 TCX = Tetrachloro-m-xylene

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## QC Summary

Report Date: October 9, 2017

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CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 434204

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Diesel Range Organics</b>											
Batch	1706822										
QC1203889651	LCS										
Diesel Range Organics	66600			59500	UG/KG		89	(70%-130%)	LXA1	10/06/17	18:53
Motor Oil	66600		B	68500	UG/KG		103	(70%-130%)			
**o-Terphenyl	666			655	UG/KG		98	(60%-140%)			
QC1203889650	MB										
Diesel Range Organics			U	2160	UG/KG					10/06/17	18:13
Motor Oil			J	4020	UG/KG						
**o-Terphenyl	666			498	UG/KG		75	(60%-140%)			
QC1203889652	434204005	MS									
Diesel Range Organics	67800	U	2210	50800	UG/KG		75	(70%-130%)		10/06/17	22:51
Motor Oil	67800	B	48200	B	121000	UG/KG		107	(70%-130%)		
**o-Terphenyl	678		500	547	UG/KG		81	(60%-140%)			
QC1203889653	434204005	MSD									
Diesel Range Organics	67900	U	2210	55600	UG/KG	9	82	(0%-30%)		10/06/17	23:31
Motor Oil	67900	B	48200	B	105000	UG/KG	14	84	(0%-30%)		
**o-Terphenyl	679		500	589	UG/KG		87	(60%-140%)			

Notes:

**GEL LABORATORIES LLC**

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**QC Summary**

Workorder: 434204

Page 2 of 2

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

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.

FID Diesel Range Organics  
 Page 34 of 143  
**Surrogate Recovery Report**

SDG Number: GEL434204

Matrix Type: SOLID

Sample ID	Client ID	OTP %REC
1203889650	MB for batch 1706820	75
1203889651	LCS for batch 1706820	98
434204001	B3C1R7	77
434204002	B3C1R9	71
434204003	B3C1T1	79
434204004	B3C1T3	70
434204005	B3C1T5	74
1203889652	B3C1T5MS	81
1203889653	B3C1T5MSD	87
434204006	B3C1T7	82
434204009	B3C1V3	78
434204010	B3C1V5	73
434204011	B3C1V7	77
434204012	B3C1V9	75
434204013	B3C1W1	73
434204014	B3C1W3	69
434204015	B3C1W9	66
434204007	B3C1T9	67 D
434204008	B3C1V1	65

**Surrogate**

OTP = o-Terphenyl

**Acceptance Limits**

(60%-140%)

\* Recovery outside Acceptance Limits

# Column to be used to flag recovery values

D Sample Diluted

Page 2 of 5  
**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

**Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography (Continued)**

**Lab Sample ID: 280-101904-1 MS**  
**Matrix: Soil**  
**Analysis Batch: 392072**

**Client Sample ID: B3C1X1**  
**Prep Type: Total/NA**  
**Prep Batch: 391988**  
 %Rec.

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Aroclor 1260	2.6	U	67.5	59.2		ug/Kg	*	88	62 - 129
<b>Surrogate</b>	<b>%Recovery</b>	<b>MS Qualifier</b>	<b>Limits</b>						
Decachlorobiphenyl	83		59 - 130						
Tetrachloro-m-xylene	93		53 - 128						

**Lab Sample ID: 280-101904-1 MSD**  
**Matrix: Soil**  
**Analysis Batch: 392072**

**Client Sample ID: B3C1X1**  
**Prep Type: Total/NA**  
**Prep Batch: 391988**  
 %Rec. RPD

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Aroclor 1016	4.9	U	67.5	60.8		ug/Kg	*	90	54 - 132	13	30
Aroclor 1260	2.6	U	67.5	64.3		ug/Kg	*	95	62 - 129	8	30
<b>Surrogate</b>	<b>%Recovery</b>	<b>MSD Qualifier</b>	<b>Limits</b>								
Decachlorobiphenyl	88		59 - 130								
Tetrachloro-m-xylene	95		53 - 128								

**Method: NWTPH-Dx - Northwest - Semi-Volatile Petroleum Products (GC)**

**Lab Sample ID: MB 280-390605/1-A**  
**Matrix: Solid**  
**Analysis Batch: 391095**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 390605**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel (C10-C28)	1440	J	3900	670	ug/Kg		10/09/17 20:28	10/14/17 05:59	1
Motor Oil (C20-C38)	3800	U	12000	3800	ug/Kg		10/09/17 20:28	10/14/17 05:59	1
<b>Surrogate</b>	<b>%Recovery</b>	<b>MB Qualifier</b>	<b>Limits</b>				<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
o-Terphenyl	106		60 - 140				10/09/17 20:28	10/14/17 05:59	1

**Lab Sample ID: LCS 280-390605/2-A**  
**Matrix: Solid**  
**Analysis Batch: 391095**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 390605**  
 %Rec.

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Diesel (C10-C28)	65400	63000		ug/Kg		96	70 - 130
<b>Surrogate</b>	<b>%Recovery</b>	<b>LCS Qualifier</b>	<b>Limits</b>				
o-Terphenyl	109		60 - 140				

**Lab Sample ID: LCS 280-390605/3-A**  
**Matrix: Solid**  
**Analysis Batch: 391095**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 390605**  
 %Rec.

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Motor Oil (C20-C38)	166000	153000		ug/Kg		92	70 - 130

TestAmerica Denver

Page 29 of 55  
**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

Surrogate	LCS %Recovery	LCS Qualifier	Limits
<i>o</i> -Terphenyl	101		60 - 140

**Lab Sample ID: 280-101855-1 MS**  
**Matrix: Soil**  
**Analysis Batch: 391095**

**Client Sample ID: B3CVJ6**  
**Prep Type: Total/NA**  
**Prep Batch: 390605**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Diesel (C10-C28)	7600	B	67500	59400		ug/Kg	☼	77	70 - 130

Surrogate	MS %Recovery	MS Qualifier	Limits
<i>o</i> -Terphenyl	95		60 - 140

**Lab Sample ID: 280-101855-1 MS**  
**Matrix: Soil**  
**Analysis Batch: 391095**

**Client Sample ID: B3CVJ6**  
**Prep Type: Total/NA**  
**Prep Batch: 390605**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Motor Oil (C20-C38)	7200	J	167000	156000		ug/Kg	☼	89	70 - 130

**Lab Sample ID: 280-101855-1 MSD**  
**Matrix: Soil**  
**Analysis Batch: 391095**

**Client Sample ID: B3CVJ6**  
**Prep Type: Total/NA**  
**Prep Batch: 390605**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Diesel (C10-C28)	7600	B	69500	60000		ug/Kg	☼	75	70 - 130	1	30

Surrogate	MSD %Recovery	MSD Qualifier	Limits
<i>o</i> -Terphenyl	93		60 - 140

**Lab Sample ID: 280-101855-1 MSD**  
**Matrix: Soil**  
**Analysis Batch: 391095**

**Client Sample ID: B3CVJ6**  
**Prep Type: Total/NA**  
**Prep Batch: 390605**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Motor Oil (C20-C38)	7200	J	173000	163000		ug/Kg	☼	90	70 - 130	4	30

**Method: 6010D - Metals (ICP)**

**Lab Sample ID: MB 280-390557/1-A**  
**Matrix: Solid**  
**Analysis Batch: 391042**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 390557**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	733	U	1500	733	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Arsenic	665	U	2000	665	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Barium	104	U	1000	104	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Beryllium	33.0	U	500	33.0	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Cadmium	41.0	U	500	41.0	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Chromium	62.00	B	1500	58.0	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Cobalt	100	U	1000	100	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Copper	217	U	2000	217	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Lead	310	U	900	310	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Lithium	0.91	U	5.0	0.91	mg/Kg		10/10/17 07:37	10/11/17 17:11	1

TestAmerica Denver

# Surrogate Summary

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

## Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Matrix: Solid

Prep Type: Total/NA

### Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	DCB2 (59-130)	TCX2 (53-128)
LCS 280-391988/2-A	Lab Control Sample	99	105
MB 280-391988/1-A	Method Blank	94	99

#### Surrogate Legend

DCB = Decachlorobiphenyl  
 TCX = Tetrachloro-m-xylene

## Method: NWTPH-Dx - Northwest - Semi-Volatile Petroleum Products (GC)

Matrix: Soil

Prep Type: Total/NA

### Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	OTPH (60-140)
280-101855-1	B3CVJ6	93
280-101855-1 MS	B3CVJ6	95
280-101855-1 MSD	B3CVJ6	93
280-101904-1	B3C1X1	79
280-102039-1	B3C2F3	41 X

#### Surrogate Legend

OTPH = o-Terphenyl

## Method: NWTPH-Dx - Northwest - Semi-Volatile Petroleum Products (GC)

Matrix: Solid

Prep Type: Total/NA

### Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	OTPH (60-140)
LCS 280-390605/2-A	Lab Control Sample	109
LCS 280-390605/3-A	Lab Control Sample	101
MB 280-390605/1-A	Method Blank	106

#### Surrogate Legend

OTPH = o-Terphenyl

Date: 07 December 2017  
 To: CH2M Hill (technical representative)  
 From: Analytical Quality Associates, Inc.  
 Project: 618-10\_618-11  
 Subject: PCBs - Sample Data Groups (SDGs) GEL434204, DN0231

## **INTRODUCTION**

This memorandum presents the results of data validation for SDG GEL434204 prepared by GEL Laboratories LLC and SDG DN0231 prepared by TestAmerica Laboratories, Inc. A list of samples validated along with the analytical methods is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation Level</b>	<b>Analytical Method</b>
B3C1R7	10/03/17	Soil	C	8082
B3C1R9	10/03/17	Soil	C	8082
B3C1T1	10/03/17	Soil	C	8082
B3C1T3	10/03/17	Soil	C	8082
B3C1T5	10/03/17	Soil	C	8082
B3C1T7	10/03/17	Soil	C	8082
B3C1T9	10/03/17	Soil	C	8082
B3C1V1	10/03/17	Soil	C	8082
B3C1V3	10/03/17	Soil	C	8082
B3C1V5	10/03/17	Soil	C	8082
B3C1V7	10/03/17	Soil	C	8082
B3C1V9	10/03/17	Soil	C	8082
B3C1W1	10/03/17	Soil	C	8082
B3C1W3	10/03/17	Soil	C	8082
B3C1W9	10/03/17	Soil	C	8082
B3C1X1	10/03/17	Soil	C	8082A

Data validation was conducted in accordance with the CHPRC validation statement of work and the 300 Area Remedial Action Sampling and Analysis Plan, DOE/RL-2001-48, Rev. 4 (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 within one year of sample

collection and analysis within 40 days of sample extraction. Sample preservation requires chilling to <6 degrees Celsius.

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

- **Blanks**

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

**Laboratory Blanks**

All laboratory blank results were acceptable.

**Trip Blanks**

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 accuracy limits are 50% to 150%. The matrix spike sample accuracy limits are ones specified by the DV procedure.

**Surrogates**

All surrogate recoveries were acceptable.

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

All MS/MSD recoveries were acceptable.

**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  $\pm 30\%$ .

**MS/MSD Samples**

All MS/MSD RPD values were acceptable.

**Field Duplicate Samples**

No field duplicates were submitted for validation.

**Field Split Samples**

All field split results were acceptable.

- **Detection Limits**

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

All reported sample MDLs with associated non-detected sample results were below the CRDLs.

- **Completeness**

SDGs GEL434204 and DN0231 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. 2, Change 0, *Data Validation for Chemical Analyses*, October 2016.

DOE/RL-2001-48, Rev. 4, *300 Area Remedial Action Sampling and Analysis Plan*, November 2014.

## **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**

<b>PCB Data Qualification Summary</b>			
SDG: GEL434204, DN0231	Reviewer: AQA	Project: 618-10 618-11	Page 1 of 1
<b>Analyte(s)</b>	<b>Qualifier</b>	<b>Samples Affected</b>	<b>Reason</b>
PCBs	None	N/A	N/A

Comments: None

## **Appendix 3**

### **Data Validation Supporting Documentation**

**Data Validation for Chemical Analyses**

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

**Appendix A - (Cont.) Chemical Data Validation Checklist**

VALIDATION LEVEL:	A	B	<b>C</b>	D	E
PROJECT: 618-10_618-11			DATA PACKAGE: VSR18-001		
VALIDATOR: Eyda Hergenreder		LAB: GEL, TestAmerica		DATE: 12/07/17	
			SDG: GEL434204, DN0231		
ANALYSES PERFORMED					
SW-846 8081	SW-846 8081 (TCLP)	SW-846 8082 X	SW-846 8082 (TCLP)		
SAMPLES/MATRIX Soil					
GEL434204: B3C1R7, B3C1R9, B3C1T1, B3C1T3, B3C1T5, B3C1T7, B3C1T9, B3C1V1, B3C1V3, B3C1V5, B3C1V7, B3C1V9, B3C1W1, B3C1W3, B3C1W9					
DN0231: B3C1X1					

**1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE**

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

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

### Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

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

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

Comments:

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

## Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

### Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

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SDG GEL434204 parent sample B3C1R9/SDG DN0231 split sample B3C1X1

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#### 6. SYSTEM PERFORMANCE (Levels D and E)

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

Comments:

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

### Appendix A - (Cont.) Chemical Data Validation Checklist

#### 7. HOLDING TIMES (all levels)

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

Comments:

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

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

Comments:

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Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

9. SAMPLE CLEANUP (Levels D and E)

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

Comments (attach additional sheets as necessary):

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## **Appendix 4**

### **Additional Documentation Requested By Client**

**PCB  
Surrogate Recovery Report**

**SDG Number: GEL434204**

**Matrix Type: SOLID**

Sample ID	Client ID	4CMX 1 %REC #	4CMX 2 %REC #	DCB 1 %REC #	DCB 2 %REC #
1203889314	MB for batch 1706663	55	59	65	70
1203889315	LCS for batch 1706663	67	73	78	87
434204001	B3C1R7	67	74	83	91
1203889316	B3C1R7MS	68	74	86	93
1203889317	B3C1R7MSD	72	79	86	98
434204002	B3C1R9	70	76	84	96
434204003	B3C1T1	67	73	87	96
434204004	B3C1T3	71	78	88	96
434204005	B3C1T5	69	76	65	65
434204006	B3C1T7	69	78	87	92
434204007	B3C1T9	63	68	80	80
434204008	B3C1V1	66	76	69	75
434204009	B3C1V3	71	81	81	91
434204010	B3C1V5	68	75	90	99
434204011	B3C1V7	69	76	86	96
434204012	B3C1V9	67 D	71 D	73 D	79 D
434204013	B3C1W1	70	79	94	99
434204014	B3C1W3	68	77	92	102
434204015	B3C1W9	68	75	84	94

**Surrogate**

4CMX = 4cmx

DCB = Decachlorobiphenyl

**Acceptance Limits**

(30%-120%)

(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: October 6, 2017

Page 1 of 3

CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 434204

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Semi-Volatiles-PCB</b>											
Batch	1706664										
QC1203889315	LCS										
Aroclor-1016	33.3			24.4	ug/kg		73	(70%-130%)	JXM	10/06/17	07:27
Aroclor-1260	33.3			26.7	ug/kg		80	(70%-130%)			
**4cmx	6.66			4.49	ug/kg		67	(30%-120%)			
**Decachlorobiphenyl	6.66			5.21	ug/kg		78	(32%-139%)			
QC1203889314	MB										
Aroclor-1016			U	1.11	ug/kg					10/06/17	07:15
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			3.69	ug/kg		55	(30%-120%)			
**Decachlorobiphenyl	6.66			4.34	ug/kg		65	(32%-139%)			

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**QC Summary**

Workorder: 434204

Page 2 of 3

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Semi-Volatiles-PCB</b>											
Batch	1706664										
QC1203889316	434204001	MS									
Aroclor-1016	34.8	U	1.16	23.7	ug/kg		68	(23%-121%)	JXM	10/06/17	07:54
Aroclor-1260	34.8	U	1.16	27.9	ug/kg		80	(35%-135%)			
**4cmx	6.97		4.69	4.74	ug/kg		68	(30%-120%)			
**Decachlorobiphenyl	6.97		5.75	5.96	ug/kg		86	(32%-139%)			
QC1203889317	434204001	MSD									
Aroclor-1016	34.8	U	1.16	24.3	ug/kg	2	70	(0%-30%)		10/06/17	08:08
Aroclor-1260	34.8	U	1.16	28.7	ug/kg	3	82	(0%-30%)			
**4cmx	6.96		4.69	5.00	ug/kg		72	(30%-120%)			
**Decachlorobiphenyl	6.96		5.75	6.01	ug/kg		86	(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

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

**Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)**

**Lab Sample ID: 280-101855-1 MSD**  
**Matrix: Soil**  
**Analysis Batch: 391638**

**Client Sample ID: B3CVJ6**  
**Prep Type: Total/NA**  
**Prep Batch: 390608**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	RPD Limit
Tributyl phosphate	58	U	1360	1100	J	ug/Kg	☼	80	30 - 150	9	30
<b>Surrogate</b>	<b>%Recovery</b>	<b>MSD Qualifier</b>	<b>Limits</b>								
2,4,6-Tribromophenol (Surr)	80		35 - 120								
2-Fluorobiphenyl (Surr)	76		46 - 120								
2-Fluorophenol (Surr)	75		43 - 120								
Nitrobenzene-d5 (Surr)	67		46 - 120								
Phenol-d5 (Surr)	74		46 - 120								
Terphenyl-d14 (Surr)	83		46 - 120								

**Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography**

**Lab Sample ID: MB 280-391988/1-A**  
**Matrix: Solid**  
**Analysis Batch: 392072**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 391988**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aroclor 1016	5.0	U	33	5.0	ug/Kg		10/19/17 15:57	10/20/17 09:41	1
Aroclor 1221	15	U	46	15	ug/Kg		10/19/17 15:57	10/20/17 09:41	1
Aroclor 1232	5.1	U	33	5.1	ug/Kg		10/19/17 15:57	10/20/17 09:41	1
Aroclor 1242	9.0	U	33	9.0	ug/Kg		10/19/17 15:57	10/20/17 09:41	1
Aroclor 1248	5.5	U	33	5.5	ug/Kg		10/19/17 15:57	10/20/17 09:41	1
Aroclor 1254	5.4	U	33	5.4	ug/Kg		10/19/17 15:57	10/20/17 09:41	1
Aroclor 1260	2.6	U	33	2.6	ug/Kg		10/19/17 15:57	10/20/17 09:41	1
<b>Surrogate</b>	<b>%Recovery</b>	<b>MB Qualifier</b>	<b>Limits</b>				<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Decachlorobiphenyl	94		59 - 130				10/19/17 15:57	10/20/17 09:41	1
Tetrachloro-m-xylene	99		53 - 128				10/19/17 15:57	10/20/17 09:41	1

**Lab Sample ID: LCS 280-391988/2-A**  
**Matrix: Solid**  
**Analysis Batch: 392072**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 391988**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Aroclor 1016	65.8	56.2		ug/Kg		85	70 - 130
Aroclor 1260	65.8	69.2		ug/Kg		105	70 - 130
<b>Surrogate</b>	<b>%Recovery</b>	<b>LCS Qualifier</b>	<b>Limits</b>				
Decachlorobiphenyl	99		59 - 130				
Tetrachloro-m-xylene	105		53 - 128				

**Lab Sample ID: 280-101904-1 MS**  
**Matrix: Soil**  
**Analysis Batch: 392072**

**Client Sample ID: B3C1X1**  
**Prep Type: Total/NA**  
**Prep Batch: 391988**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Aroclor 1016	4.9	U	67.5	53.6		ug/Kg	☼	79	54 - 132

TestAmerica Denver

Page 5 of 15  
**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

**Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography (Continued)**

**Lab Sample ID: 280-101904-1 MS**  
**Matrix: Soil**  
**Analysis Batch: 392072**

**Client Sample ID: B3C1X1**  
**Prep Type: Total/NA**  
**Prep Batch: 391988**  
 %Rec.

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Aroclor 1260	2.6	U	67.5	59.2		ug/Kg	*	88	62 - 129
<b>Surrogate</b>	<b>%Recovery</b>	<b>MS Qualifier</b>	<b>Limits</b>						
Decachlorobiphenyl	83		59 - 130						
Tetrachloro-m-xylene	93		53 - 128						

**Lab Sample ID: 280-101904-1 MSD**  
**Matrix: Soil**  
**Analysis Batch: 392072**

**Client Sample ID: B3C1X1**  
**Prep Type: Total/NA**  
**Prep Batch: 391988**  
 %Rec. RPD

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Aroclor 1016	4.9	U	67.5	60.8		ug/Kg	*	90	54 - 132	13	30
Aroclor 1260	2.6	U	67.5	64.3		ug/Kg	*	95	62 - 129	8	30
<b>Surrogate</b>	<b>%Recovery</b>	<b>MSD Qualifier</b>	<b>Limits</b>								
Decachlorobiphenyl	88		59 - 130								
Tetrachloro-m-xylene	95		53 - 128								

**Method: NWTPH-Dx - Northwest - Semi-Volatile Petroleum Products (GC)**

**Lab Sample ID: MB 280-390605/1-A**  
**Matrix: Solid**  
**Analysis Batch: 391095**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 390605**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel (C10-C28)	1440	J	3900	670	ug/Kg		10/09/17 20:28	10/14/17 05:59	1
Motor Oil (C20-C38)	3800	U	12000	3800	ug/Kg		10/09/17 20:28	10/14/17 05:59	1
<b>Surrogate</b>	<b>%Recovery</b>	<b>MB Qualifier</b>	<b>Limits</b>				<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
o-Terphenyl	106		60 - 140				10/09/17 20:28	10/14/17 05:59	1

**Lab Sample ID: LCS 280-390605/2-A**  
**Matrix: Solid**  
**Analysis Batch: 391095**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 390605**  
 %Rec.

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Diesel (C10-C28)	65400	63000		ug/Kg		96	70 - 130
<b>Surrogate</b>	<b>%Recovery</b>	<b>LCS Qualifier</b>	<b>Limits</b>				
o-Terphenyl	109		60 - 140				

**Lab Sample ID: LCS 280-390605/3-A**  
**Matrix: Solid**  
**Analysis Batch: 391095**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 390605**  
 %Rec.

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Motor Oil (C20-C38)	166000	153000		ug/Kg		92	70 - 130

TestAmerica Denver

# Surrogate Summary

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

## Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Matrix: Soil

Prep Type: Total/NA

### Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	Percent Surrogate Recovery (Acceptance Limits)					
		TBP (35-120)	FBP (46-120)	2FP (43-120)	NBZ (46-120)	PHL (46-120)	TPH (46-120)
280-101855-1	B3CVJ6	71	71	71	65	71	75
280-101855-1 MS	B3CVJ6	79	72	75	66	75	76
280-101855-1 MS	B3CVJ6	76	75	76	67	75	80
280-101855-1 MSD	B3CVJ6	76	71	72	64	71	72
280-101855-1 MSD	B3CVJ6	80	76	75	67	74	83
280-101904-1	B3C1X1	63	64	67	58	67	67
280-102039-1	B3C2F3	65	64	63	55	65	69

#### Surrogate Legend

TBP = 2,4,6-Tribromophenol (Surr)  
 FBP = 2-Fluorobiphenyl (Surr)  
 2FP = 2-Fluorophenol (Surr)  
 NBZ = Nitrobenzene-d5 (Surr)  
 PHL = Phenol-d5 (Surr)  
 TPH = Terphenyl-d14 (Surr)

## Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Matrix: Solid

Prep Type: Total/NA

### Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	Percent Surrogate Recovery (Acceptance Limits)					
		TBP (35-120)	FBP (46-120)	2FP (43-120)	NBZ (46-120)	PHL (46-120)	TPH (46-120)
LCS 280-390608/2-A	Lab Control Sample	85	75	75	68	74	78
LCS 280-390608/3-A	Lab Control Sample	77	73	71	64	72	81
MB 280-390608/1-A	Method Blank	63	60	59	54	58	68

#### Surrogate Legend

TBP = 2,4,6-Tribromophenol (Surr)  
 FBP = 2-Fluorobiphenyl (Surr)  
 2FP = 2-Fluorophenol (Surr)  
 NBZ = Nitrobenzene-d5 (Surr)  
 PHL = Phenol-d5 (Surr)  
 TPH = Terphenyl-d14 (Surr)

## Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Matrix: Soil

Prep Type: Total/NA

### Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	Percent Surrogate Recovery (Acceptance Limits)	
		DCB2 (59-130)	TCX2 (53-128)
280-101855-1	B3CVJ6	92	99
280-101904-1	B3C1X1	78	84
280-101904-1 MS	B3C1X1	83	93
280-101904-1 MSD	B3C1X1	88	95
280-102039-1	B3C2F3	66	74

#### Surrogate Legend

DCB = Decachlorobiphenyl  
 TCX = Tetrachloro-m-xylene

# Surrogate Summary

Client: CH2M Hill Plateau Remediation Company  
Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
SDG: DN0231

## Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Matrix: Solid

Prep Type: Total/NA

### Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	DCB2 (59-130)	TCX2 (53-128)
LCS 280-391988/2-A	Lab Control Sample	99	105
MB 280-391988/1-A	Method Blank	94	99

#### Surrogate Legend

DCB = Decachlorobiphenyl

TCX = Tetrachloro-m-xylene

## Method: NWTPH-Dx - Northwest - Semi-Volatile Petroleum Products (GC)

Matrix: Soil

Prep Type: Total/NA

### Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	OTPH (60-140)
280-101855-1	B3CVJ6	93
280-101855-1 MS	B3CVJ6	95
280-101855-1 MSD	B3CVJ6	93
280-101904-1	B3C1X1	79
280-102039-1	B3C2F3	41 X

#### Surrogate Legend

OTPH = o-Terphenyl

## Method: NWTPH-Dx - Northwest - Semi-Volatile Petroleum Products (GC)

Matrix: Solid

Prep Type: Total/NA

### Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	OTPH (60-140)
LCS 280-390605/2-A	Lab Control Sample	109
LCS 280-390605/3-A	Lab Control Sample	101
MB 280-390605/1-A	Method Blank	106

#### Surrogate Legend

OTPH = o-Terphenyl

Date: 07 December 2017  
 To: CH2M Hill (technical representative)  
 From: Analytical Quality Associates, Inc.  
 Project: 618-10\_618-11  
 Subject: Inorganics - Sample Data Groups (SDGs) GEL434204 and DN0231

## **INTRODUCTION**

This memorandum presents the results of data validation for SDG GEL434204 prepared by GEL Laboratories LLC and SDG DN0231 prepared by TestAmerica Laboratories, Inc. A list of samples validated along with the analytical methods is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation Level</b>	<b>Analytical Methods</b>
B3C1R7	10/03/17	Soil	C	6010D, 6020B, 7471B
B3C1R9	10/03/17	Soil	C	6010D, 6020B, 7471B
B3C1T1	10/03/17	Soil	C	6010D, 6020B, 7471B
B3C1T3	10/03/17	Soil	C	6010D, 6020B, 7471B
B3C1T5	10/03/17	Soil	C	6010D, 6020B, 7471B
B3C1T7	10/03/17	Soil	C	6010D, 6020B, 7471B
B3C1T9	10/03/17	Soil	C	6010D, 6020B, 7471B
B3C1V1	10/03/17	Soil	C	6010D, 6020B, 7471B
B3C1V3	10/03/17	Soil	C	6010D, 6020B, 7471B
B3C1V5	10/03/17	Soil	C	6010D, 6020B, 7471B
B3C1V7	10/03/17	Soil	C	6010D, 6020B, 7471B
B3C1V9	10/03/17	Soil	C	6010D, 6020B, 7471B
B3C1W1	10/03/17	Soil	C	6010D, 6020B, 7471B
B3C1W3	10/03/17	Soil	C	6010D, 6020B, 7471B
B3C1W9	10/03/17	Soil	C	6010D, 6020B, 7471B
B3C1X1	10/03/17	Soil	C	6010D, 6020B, 7471B

Data validation was conducted in accordance with the CHPRC validation statement of work and the 300 Area Remedial Action Sampling and Analysis Plan, DOE/RL-2001-48, Rev. 4 (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  $\leq 6$  degrees Celsius.

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

- **Blanks**

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

### **Laboratory Blanks**

All laboratory blank results were acceptable with the following exceptions.

For SDG DN0231, the Cr, Sr and U laboratory blank results were detects  $>$  the method detection limits (MDLs) but  $<$  the practical quantitation limits (PQLs). The Cr, Sr and U results for sample B3C1X1 were detects  $>$  the PQLs and  $>20X$  the blank values and should not be qualified

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

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

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

For SDG DN0231, the MSD recovery for Sb was  $<$  the lower acceptance limit but  $\geq 30\%$ . The Sb result for sample B3C1X1 was a non-detect and should be qualified as estimated and flagged "UJ."

### **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 MS/MSD results, 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  $\pm 30\%$ .

### **MS/MSD Samples**

All MS/MSD RPD values were acceptable.

### **Laboratory Duplicate Samples**

All laboratory duplicate results were acceptable with the following exceptions.

For SDG GEL434204, the laboratory duplicate RPDs for Cr and Mn were above the acceptance limit. All Cr and Mn sample results were detects and should be qualified as estimates and flagged "J." 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**

The As and Be RPDs between field sample B3C1R9 and split sample B3C1X1 were  $>$  the acceptance limit.

### **ICP Serial Dilution Samples**

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

- **ICP-MS Internal Standards**

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

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

- **Detection Limits**

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

All reported sample MDLs with associated non-detected sample results were below the CRDLs.

- **Completeness**

SDGs GEL434204 and DN0231 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 low matrix spike recovery for Sb and poor laboratory duplicate precision for Cr and Mn. See the table in Appendix 2 for a listing of all affected sample results.

### **REFERENCES**

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

DOE/RL-2001-48, Rev. 4, *300 Area Remedial Action Sampling and Analysis Plan*, November 2014.

## **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**

<b>Inorganic Data Qualification Summary</b>			
SDG: GEL434204, DN0231	Reviewer: AQA	Project: 618-10 618-11	Page 1 of 1
<b>Analyte(s)</b>	<b>Qualifier</b>	<b>Samples Affected</b>	<b>Reason</b>
Sb	UJ	B3C1X1	Low matrix spike recovery
Cr, Mn	J	B3C1R7, B3C1R9, B3C1T1, B3C1T3, B3C1T5, B3C1T7, B3C1T9, B3C1V1, B3C1V3, B3C1V5, B3C1V7, B3C1V9, B3C1W1, B3C1W3, B3C1W9	Poor laboratory duplicate precision

Comments: None

## **Appendix 3**

### **Data Validation Supporting Documentation**

**Data Validation for Chemical Analyses**

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

**Appendix A - (Cont.) Chemical Data Validation Checklist**

VALIDATION LEVEL:	A	B	<b>C</b>	D	E
PROJECT: 618-10_618-11			DATA PACKAGE: VSR18-001		
VALIDATOR: Eyda Hergenreder		LAB: GEL, TestAmerica		DATE: 12/07/17	
			SDG: GEL434204, DN0231		
ANALYSES PERFORMED					
SW-846/ICP X	SW-846/GFAA	SW-846/Hg X	SW-846 Cyanide	SW-846/ICPMS X	
SAMPLES/MATRIX Soil					
GEL434204: B3C1R7, B3C1R9, B3C1T1, B3C1T3, B3C1T5, B3C1T7, B3C1T9, B3C1V1, B3C1V3, B3C1V5, B3C1V7, B3C1V9, B3C1W1, B3C1W3, B3C1W9					
DN0231: B3C1X1					

**1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE**

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

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

### Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

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

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

Comments:

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DN0231: MB Cr 62 ug/kg; Sr 0.05 mg/kg, U 1.80 ug/kg

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Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

SDG GEL434204: Mn parent sample result > spike concentration

SDG DN0231: Sb MSD 65%  
Mn parent sample result > spike concentration



Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

6. ICP QUALITY CONTROL (Levels D and E)

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

Comments:

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7. HOLDING TIMES (all levels)

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

Comments:

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## **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: October 10, 2017

Page 1 of 8

CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 434204

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis - ICPMS</b>											
Batch	1707576										
QC1203891470	434204001	DUP									
Lithium		D	6140	D	5360	ug/kg	13.7 ^	(+/-2060)	PRB	10/09/17	19:52
Uranium		D	447	D	429	ug/kg	4.13	(0%-35%)		10/10/17	08:45
QC1203891469	LCS										
Lithium	4840			D	4290	ug/kg	88.7	(80%-120%)		10/09/17	19:45
Uranium	4840			D	4260	ug/kg	88.2	(80%-120%)		10/10/17	08:42
QC1203891468	MB										
Lithium				DU	384	ug/kg				10/09/17	19:42
Uranium				DU	12.7	ug/kg				10/10/17	08:40
QC1203891471	434204001	MS									
Lithium	4840	D	6140	D	11000	ug/kg	99.4	(75%-125%)		10/09/17	19:55
Uranium	4840	D	447	D	5290	ug/kg	100	(75%-125%)		10/10/17	08:47
QC1203891472	434204001	SDILT									
Lithium		D	29.4	BD	6.13	ug/L	4.12	(0%-10%)		10/09/17	20:01
Uranium		D	2.14	D	0.433	ug/L	.979	(0%-10%)		10/10/17	08:50
<b>Metals Analysis-ICP</b>											
Batch	1706487										
QC1203888899	434204001	DUP									
Antimony		DU	1710	DU	1660	ug/kg	N/A		HSC	10/09/17	14:40

**GEL LABORATORIES LLC**

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**QC Summary**

Workorder: 434204

Page 2 of 8

Parname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1706487										
Arsenic	B	2370	B	1740	ug/kg	30.7	^	(+/-3010)	HSC	10/05/17	20:32
Barium		79600		71500	ug/kg	10.8		(0%-35%)			
Beryllium		1010		929	ug/kg	8.2	^	(+/-502)			
Cadmium	DU	520	DU	502	ug/kg	N/A				10/09/17	14:40
Chromium	*	6840	*	9820	ug/kg	35.8*		(0%-35%)		10/05/17	20:32
Cobalt	D	9420	D	9090	ug/kg	3.57	^	(+/-2510)		10/09/17	14:40
Copper	*	10900	*	13400	ug/kg	20.5		(0%-35%)		10/05/17	20:32
Lead	DU	1710	BD	-4010	ug/kg	134	^	(+/-5020)		10/09/17	14:40
Manganese	*	370000	*	230000	ug/kg	46.9*		(0%-35%)		10/05/17	20:32
Nickel		8270		8200	ug/kg	0.852		(0%-35%)			
Selenium	B	1910	B	1940	ug/kg	1.59	^	(+/-3010)			
Silver	B	-195	B	-274	ug/kg	33.7	^	(+/-502)			
Strontium		25600		26400	ug/kg	2.96		(0%-35%)			
Tin	DU	1560	DU	1500	ug/kg	N/A				10/09/17	14:40
Vanadium	D	58800	D	66500	ug/kg	12.4		(0%-35%)			

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**QC Summary**

Workorder: 434204

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Parname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1706487										
Zinc		D	46300	D	38900	ug/kg	17.4	(0%-35%)	HSC	10/09/17	14:40
QC1203888898	LCS										
Antimony	49200				45500	ug/kg		92.4	(80%-120%)		10/09/17 14:34
Arsenic	49200				45900	ug/kg		93.3	(80%-120%)		10/05/17 20:25
Barium	49200				46400	ug/kg		94.3	(80%-120%)		
Beryllium	49200				46800	ug/kg		95.2	(80%-120%)		
Cadmium	49200				46900	ug/kg		95.2	(80%-120%)		10/09/17 14:34
Chromium	49200				45000	ug/kg		91.5	(80%-120%)		10/05/17 20:25
Cobalt	49200				47700	ug/kg		96.9	(80%-120%)		10/09/17 14:34
Copper	49200				46400	ug/kg		94.3	(80%-120%)		10/05/17 20:25
Lead	49200				46900	ug/kg		95.2	(80%-120%)		10/09/17 14:34
Manganese	49200				46600	ug/kg		94.6	(80%-120%)		10/05/17 20:25
Nickel	49200				46100	ug/kg		93.7	(80%-120%)		
Selenium	49200				46200	ug/kg		94	(80%-120%)		
Silver	49200				45400	ug/kg		92.4	(80%-120%)		
Strontium	49200				48100	ug/kg		97.8	(80%-120%)		

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**QC Summary**

Workorder: 434204

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1706487										
Tin	49200			46700	ug/kg		95	(80%-120%)	HSC	10/09/17	14:34
Vanadium	49200			46000	ug/kg		93.4	(80%-120%)			
Zinc	49200			46200	ug/kg		93.9	(80%-120%)			
QC120388897	MB										
Antimony			U	319	ug/kg					10/09/17	14:31
Arsenic			U	484	ug/kg					10/05/17	20:22
Barium			U	96.7	ug/kg						
Beryllium			U	96.7	ug/kg						
Cadmium			U	96.7	ug/kg					10/09/17	14:31
Chromium			U	145	ug/kg					10/05/17	20:22
Cobalt			U	145	ug/kg					10/09/17	14:31
Copper			U	290	ug/kg					10/05/17	20:22
Lead			U	319	ug/kg					10/09/17	14:31
Manganese			U	193	ug/kg					10/05/17	20:22
Nickel			U	145	ug/kg						
Selenium			U	484	ug/kg						

**GEL LABORATORIES LLC**

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**QC Summary**

Workorder: 434204

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Parname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1706487										
Silver			U	96.7	ug/kg				HSC	10/05/17	20:22
Strontium			U	96.7	ug/kg						
Tin			U	290	ug/kg					10/09/17	14:31
Vanadium			U	96.7	ug/kg						
Zinc			U	387	ug/kg						
QC1203888900 434204001 MS											
Antimony	50700	DU	1710	D	49600	ug/kg	97.7	(75%-125%)		10/09/17	14:43
Arsenic	50700	B	2370		48500	ug/kg	90.9	(75%-125%)		10/05/17	20:35
Barium	50700		79600		123000	ug/kg	84.7	(75%-125%)			
Beryllium	50700		1010		48200	ug/kg	93	(75%-125%)			
Cadmium	50700	DU	520	D	49000	ug/kg	95.9	(75%-125%)		10/09/17	14:43
Chromium	50700	*	6840		49400	ug/kg	83.9	(75%-125%)		10/05/17	20:35
Cobalt	50700	D	9420	D	59500	ug/kg	98.7	(75%-125%)		10/09/17	14:43
Copper	50700	*	10900		61100	ug/kg	98.9	(75%-125%)		10/05/17	20:35
Lead	50700	DU	1710	D	48500	ug/kg	95.7	(75%-125%)		10/09/17	14:43
Manganese	50700	*	370000		312000	ug/kg	N/A	(75%-125%)		10/05/17	20:35

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**QC Summary**

Workorder: 434204

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1706487										
Nickel	50700	8270		52600	ug/kg		87.4	(75%-125%)	HSC	10/05/17	20:35
Selenium	50700	B	1910	47400	ug/kg		89.7	(75%-125%)			
Silver	50700	B	-195	46400	ug/kg		91.4	(75%-125%)			
Strontium	50700		25600	72800	ug/kg		93	(75%-125%)			
Tin	50700	DU	1560	D	50300	ug/kg	98.1	(75%-125%)		10/09/17	14:43
Vanadium	50700	D	58800	D	116000	ug/kg	112	(75%-125%)			
Zinc	50700	D	46300	D	86600	ug/kg	79.3	(75%-125%)			
QC1203888901 434204001 SDILT											
Antimony		DU	-0.619	DU	8570	ug/L	N/A	(0%-10%)		10/09/17	14:47
Arsenic		B	22.8	BD	5.43	ug/L	19	(0%-10%)		10/05/17	20:38
Barium			766	D	157	ug/L	2.68	(0%-10%)			
Beryllium			9.70	BD	2.14	ug/L	10.4	(0%-10%)			
Cadmium		DU	0.607	DU	2600	ug/L	N/A	(0%-10%)		10/09/17	14:47
Chromium		*	65.8	D	13.3	ug/L	1.04	(0%-10%)		10/05/17	20:38
Cobalt		D	18.1	BD	4.31	ug/L	18.9	(0%-10%)		10/09/17	14:47
Copper		*	105	D	19.5	ug/L	7.06	(0%-10%)		10/05/17	20:38

**GEL LABORATORIES LLC**

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**QC Summary**

Workorder: 434204

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1706487										
Lead	DU	-1.52	DU	8570	ug/L	N/A		(0%-10%)	HSC	10/09/17	14:47
Manganese	*	3560	D	745	ug/L	4.56		(0%-10%)		10/05/17	20:38
Nickel		79.6	D	17.0	ug/L	6.73		(0%-10%)			
Selenium	B	18.4	DU	2600	ug/L	N/A		(0%-10%)			
Silver	B	-1.88	BD	-1.35	ug/L	-260		(0%-10%)			
Strontium		246	D	49.6	ug/L	.716		(0%-10%)			
Tin	DU	1.06	DU	7790	ug/L	N/A		(0%-10%)		10/09/17	14:47
Vanadium	D	113	D	23.0	ug/L	1.61		(0%-10%)			
Zinc	D	89.2	D	14.5	ug/L	18.9		(0%-10%)			
<b>Metals Analysis-Mercury</b>											
Batch	1707256										
QC1203890638	434204001	DUP									
Mercury	U	3.77	U	3.83	ug/kg	N/A			MTM1	10/09/17	10:55
QC1203890637	LCS										
Mercury	114			115	ug/kg		101	(80%-120%)		10/09/17	10:48
QC1203890636	MB										
Mercury			U	3.54	ug/kg					10/09/17	10:47
QC1203890639	434204001	MS									
Mercury	107	U	3.77	111	ug/kg		101	(75%-125%)		10/09/17	10:57

## QC Summary

Workorder: 434204

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-Mercury</b>											
Batch	1707256										
	QC1203890641	434204001	SDILT								
Mercury	U	0.057	DU	18.8	ug/L	N/A		(0%-10%)	MTM1	10/09/17	10:58

**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

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.

Page 8 of 15  
**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

Surrogate	LCS %Recovery	LCS Qualifier	Limits
<i>o</i> -Terphenyl	101		60 - 140

Lab Sample ID: 280-101855-1 MS  
 Matrix: Soil  
 Analysis Batch: 391095

Client Sample ID: B3CVJ6  
 Prep Type: Total/NA  
 Prep Batch: 390605

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Diesel (C10-C28)	7600	B	67500	59400		ug/Kg	☼	77	70 - 130

Surrogate	MS %Recovery	MS Qualifier	Limits
<i>o</i> -Terphenyl	95		60 - 140

Lab Sample ID: 280-101855-1 MS  
 Matrix: Soil  
 Analysis Batch: 391095

Client Sample ID: B3CVJ6  
 Prep Type: Total/NA  
 Prep Batch: 390605

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Motor Oil (C20-C38)	7200	J	167000	156000		ug/Kg	☼	89	70 - 130

Lab Sample ID: 280-101855-1 MSD  
 Matrix: Soil  
 Analysis Batch: 391095

Client Sample ID: B3CVJ6  
 Prep Type: Total/NA  
 Prep Batch: 390605

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Diesel (C10-C28)	7600	B	69500	60000		ug/Kg	☼	75	70 - 130	1	30

Surrogate	MSD %Recovery	MSD Qualifier	Limits
<i>o</i> -Terphenyl	93		60 - 140

Lab Sample ID: 280-101855-1 MSD  
 Matrix: Soil  
 Analysis Batch: 391095

Client Sample ID: B3CVJ6  
 Prep Type: Total/NA  
 Prep Batch: 390605

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Motor Oil (C20-C38)	7200	J	173000	163000		ug/Kg	☼	90	70 - 130	4	30

**Method: 6010D - Metals (ICP)**

Lab Sample ID: MB 280-390557/1-A  
 Matrix: Solid  
 Analysis Batch: 391042

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 390557

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	733	U	1500	733	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Arsenic	665	U	2000	665	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Barium	104	U	1000	104	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Beryllium	33.0	U	500	33.0	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Cadmium	41.0	U	500	41.0	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Chromium	62.00	B	1500	58.0	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Cobalt	100	U	1000	100	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Copper	217	U	2000	217	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Lead	310	U	900	310	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Lithium	0.91	U	5.0	0.91	mg/Kg		10/10/17 07:37	10/11/17 17:11	1

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

**Method: 6010D - Metals (ICP) (Continued)**

Lab Sample ID: MB 280-390557/1-A  
 Matrix: Solid  
 Analysis Batch: 391042

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 390557

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	100	U	1000	100	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Nickel	132	U	4000	132	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Selenium	860	U	1500	860	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Silver	160	U	1000	160	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Strontium	0.0500	B	1.0	0.036	mg/Kg		10/10/17 07:37	10/11/17 17:11	1
Tin	0.91	U	10.0	0.91	mg/Kg		10/10/17 07:37	10/11/17 17:11	1
Vanadium	94.0	U	2000	94.0	ug/Kg		10/10/17 07:37	10/11/17 17:11	1
Zinc	398	U	3000	398	ug/Kg		10/10/17 07:37	10/11/17 17:11	1

Lab Sample ID: LCS 280-390557/2-A  
 Matrix: Solid  
 Analysis Batch: 391042

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA  
 Prep Batch: 390557

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Antimony	50000	49780		ug/Kg		100	80 - 120
Arsenic	100000	99000		ug/Kg		99	80 - 120
Barium	200000	199900		ug/Kg		100	80 - 120
Beryllium	5000	4916		ug/Kg		98	80 - 120
Cadmium	10000	10010		ug/Kg		100	80 - 120
Chromium	20000	19730		ug/Kg		99	80 - 120
Cobalt	50000	48750		ug/Kg		97	80 - 120
Copper	25000	24850		ug/Kg		99	80 - 120
Lead	50000	48870		ug/Kg		98	80 - 120
Lithium	100	101.0		mg/Kg		101	80 - 120
Manganese	50000	47790		ug/Kg		96	80 - 120
Nickel	50000	48280		ug/Kg		97	80 - 120
Selenium	200000	193800		ug/Kg		97	80 - 120
Silver	5000	5169		ug/Kg		103	80 - 120
Strontium	100	99.45		mg/Kg		99	80 - 120
Tin	200	192.7		mg/Kg		96	80 - 120
Vanadium	50000	48850		ug/Kg		98	80 - 120
Zinc	50000	45740		ug/Kg		91	80 - 120

Lab Sample ID: 280-101904-1 MS  
 Matrix: Soil  
 Analysis Batch: 391042

Client Sample ID: B3C1X1  
 Prep Type: Total/NA  
 Prep Batch: 390557

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Arsenic	2710		91800	77490		ug/Kg	☼	81	75 - 125
Barium	57700		184000	231200		ug/Kg	☼	94	75 - 125
Beryllium	132	B	4590	3982		ug/Kg	☼	84	75 - 125
Cadmium	110	B	9180	7962		ug/Kg	☼	86	75 - 125
Chromium	4680		18400	20820		ug/Kg	☼	88	75 - 125
Lithium	4.1	B	91.8	85.19		mg/Kg	☼	88	75 - 125
Manganese	309000		45900	404900	X	ug/Kg	☼	209	75 - 125
Nickel	7090		45900	43480		ug/Kg	☼	79	75 - 125
Selenium	746	U	184000	146400		ug/Kg	☼	80	75 - 125
Silver	139	U	4590	4280		ug/Kg	☼	93	75 - 125
Strontium	19.2		91.8	109.6		mg/Kg	☼	98	75 - 125

TestAmerica Denver

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

**Method: 6010D - Metals (ICP) (Continued)**

**Lab Sample ID: 280-101904-1 MS**  
**Matrix: Soil**  
**Analysis Batch: 391042**

**Client Sample ID: B3C1X1**  
**Prep Type: Total/NA**  
**Prep Batch: 390557**  
**%Rec.**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Zinc	43000		45900	82700		ug/Kg	☼	87	75 - 125

**Lab Sample ID: 280-101904-1 MS**  
**Matrix: Soil**  
**Analysis Batch: 391192**

**Client Sample ID: B3C1X1**  
**Prep Type: Total/NA**  
**Prep Batch: 390557**  
**%Rec.**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Antimony	3180	U N D	45900	31940	N D	ug/Kg	☼	70	75 - 125
Cobalt	11600	D	45900	57760	D	ug/Kg	☼	100	75 - 125
Copper	16700	D	23000	38100	D	ug/Kg	☼	93	75 - 125
Lead	2900	B D	45900	47940	D	ug/Kg	☼	98	75 - 125
Tin	4.0	U D	184	170.5	D	mg/Kg	☼	93	75 - 125
Vanadium	89200	D	45900	140800	D	ug/Kg	☼	112	75 - 125

**Lab Sample ID: 280-101904-1 MSD**  
**Matrix: Soil**  
**Analysis Batch: 391042**

**Client Sample ID: B3C1X1**  
**Prep Type: Total/NA**  
**Prep Batch: 390557**  
**%Rec.**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	2710		92100	75530		ug/Kg	☼	79	75 - 125	3	35
Barium	57700		184000	216000		ug/Kg	☼	86	75 - 125	7	35
Beryllium	132	B	4600	3886		ug/Kg	☼	82	75 - 125	2	35
Cadmium	110	B	9210	7793		ug/Kg	☼	83	75 - 125	2	35
Chromium	4680		18400	20330		ug/Kg	☼	85	75 - 125	2	35
Lithium	4.1	B	92.1	82.66		mg/Kg	☼	85	75 - 125	3	35
Manganese	309000		46000	420400	X	ug/Kg	☼	242	75 - 125	4	35
Nickel	7090		46000	42720		ug/Kg	☼	77	75 - 125	2	35
Selenium	746	U	184000	143000		ug/Kg	☼	78	75 - 125	2	35
Silver	139	U	4600	4142		ug/Kg	☼	90	75 - 125	3	35
Strontium	19.2		92.1	102.4		mg/Kg	☼	90	75 - 125	7	35
Zinc	43000		46000	82330		ug/Kg	☼	86	75 - 125	0	35

**Lab Sample ID: 280-101904-1 MSD**  
**Matrix: Soil**  
**Analysis Batch: 391192**

**Client Sample ID: B3C1X1**  
**Prep Type: Total/NA**  
**Prep Batch: 390557**  
**%Rec.**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Antimony	3180	U N D	46000	29870	D N	ug/Kg	☼	65	75 - 125	7	35
Cobalt	11600	D	46000	54700	D	ug/Kg	☼	94	75 - 125	5	35
Copper	16700	D	23000	37620	D	ug/Kg	☼	91	75 - 125	1	35
Lead	2900	B D	46000	45810	D	ug/Kg	☼	93	75 - 125	5	35
Tin	4.0	U D	184	169.1	D	mg/Kg	☼	92	75 - 125	1	35
Vanadium	89200	D	46000	138600	D	ug/Kg	☼	107	75 - 125	2	35

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

**Method: 6020B - Metals (ICP/MS)**

Lab Sample ID: MB 280-390559/1-A  
 Matrix: Solid  
 Analysis Batch: 390827

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 390559

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Uranium	1.80	B	100	1.6	ug/Kg		10/10/17 07:37	10/10/17 23:10	1

Lab Sample ID: LCS 280-390559/2-A  
 Matrix: Solid  
 Analysis Batch: 390827

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA  
 Prep Batch: 390559

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Uranium	20000	22210		ug/Kg		111	80 - 120

Lab Sample ID: 280-101904-1 MS  
 Matrix: Soil  
 Analysis Batch: 390999

Client Sample ID: B3C1X1  
 Prep Type: Total/NA  
 Prep Batch: 390559

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Uranium	372		17400	17550		ug/Kg	☼	99	75 - 125

Lab Sample ID: 280-101904-1 MSD  
 Matrix: Soil  
 Analysis Batch: 390999

Client Sample ID: B3C1X1  
 Prep Type: Total/NA  
 Prep Batch: 390559

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Uranium	372		17200	18470		ug/Kg	☼	105	75 - 125	5	35

**Method: 7471B - Mercury (CVAA)**

Lab Sample ID: MB 280-391050/1-A  
 Matrix: Solid  
 Analysis Batch: 391167

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 391050

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	5.5	U	17.0	5.5	ug/Kg		10/12/17 11:54	10/12/17 17:10	1

Lab Sample ID: LCS 280-391050/2-A  
 Matrix: Solid  
 Analysis Batch: 391167

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA  
 Prep Batch: 391050

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Mercury	333	332.2		ug/Kg		100	80 - 120

Lab Sample ID: 280-101855-1 MS  
 Matrix: Soil  
 Analysis Batch: 391167

Client Sample ID: B3CVJ6  
 Prep Type: Total/NA  
 Prep Batch: 391050

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Mercury	6.3	U	399	418.9		ug/Kg	☼	105	75 - 125

# QC Sample Results

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

## Method: 7471B - Mercury (CVAA) (Continued)

Lab Sample ID: 280-101855-1 MSD  
 Matrix: Soil  
 Analysis Batch: 391167

Client Sample ID: B3CVJ6  
 Prep Type: Total/NA  
 Prep Batch: 391050

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	6.3	U	358	334.4		ug/Kg	☼	93	75 - 125	22	35

## Method: 9045D - pH

Lab Sample ID: LCS 280-390740/1-A  
 Matrix: Solid  
 Analysis Batch: 390892

Client Sample ID: Lab Control Sample  
 Prep Type: Soluble

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH adj. to 25 deg C	7.00	7.000		SU		100	97 - 103

Lab Sample ID: 280-102039-1 DU  
 Matrix: Soil  
 Analysis Batch: 390892

Client Sample ID: B3C2F3  
 Prep Type: Soluble

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
pH adj. to 25 deg C	8.31		8.350		SU		0.5	5
Temperature	20.7		20.70		Degrees C		0	5

## Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MRL 280-391072/3  
 Matrix: Solid  
 Analysis Batch: 391072

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA

Analyte	Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate as N	0.200	0.198	B	mg/L		99	50 - 150

Lab Sample ID: MB 280-391134/1-A  
 Matrix: Solid  
 Analysis Batch: 391072

Client Sample ID: Method Blank  
 Prep Type: Soluble

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	313	U	4990	313	ug/Kg			10/12/17 19:59	1

Lab Sample ID: LCS 280-391134/2-A  
 Matrix: Solid  
 Analysis Batch: 391072

Client Sample ID: Lab Control Sample  
 Prep Type: Soluble

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate as N	50000	49110		ug/Kg		98	80 - 120

Lab Sample ID: LCSD 280-391134/3-A  
 Matrix: Solid  
 Analysis Batch: 391072

Client Sample ID: Lab Control Sample Dup  
 Prep Type: Soluble

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Nitrate as N	49900	48930		ug/Kg		98	80 - 120	0	35

TestAmerica Denver

Date: 03 January 2018  
 To: CH2M Hill (technical representative)  
 From: Analytical Quality Associates, Inc.  
 Project: 618-10\_618-11  
 Subject: General Chemistry - Sample Data Groups (SDGs) GEL434204 and DN0231

## **INTRODUCTION**

This memorandum presents the results of data validation for SDG GEL434204 prepared by GEL Laboratories LLC and for SDG DN0231 prepared by TestAmerica Laboratories, Inc. A list of samples validated along with the analytical methods is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation Level</b>	<b>Analytical Methods</b>
B3C1R7	10/03/17	Soil	C	300.0, 9045D
B3C1R9	10/03/17	Soil	C	300.0, 9045D
B3C1T1	10/03/17	Soil	C	300.0, 9045D
B3C1T3	10/03/17	Soil	C	300.0, 9045D
B3C1T5	10/03/17	Soil	C	300.0, 9045D
B3C1T7	10/03/17	Soil	C	300.0, 9045D
B3C1T9	10/03/17	Soil	C	300.0, 9045D
B3C1V1	10/03/17	Soil	C	300.0, 9045D
B3C1V3	10/03/17	Soil	C	300.0, 9045D
B3C1V5	10/03/17	Soil	C	300.0, 9045D
B3C1V7	10/03/17	Soil	C	300.0, 9045D
B3C1V9	10/03/17	Soil	C	300.0, 9045D
B3C1W1	10/03/17	Soil	C	300.0, 9045D
B3C1W3	10/03/17	Soil	C	300.0, 9045D
B3C1W9	10/03/17	Soil	C	300.0, 9045D
B3C1X1	10/03/17	Soil	C	9056A, 9045D

Data validation was conducted in accordance with the CHPRC validation statement of work and the 300 Area Remedial Sampling and Analysis Plan, DOE/RL-2001-48, Rev. 4 (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:

- Nitrate – extraction within 28 days of sample collection and analysis within 48 hours of extraction
- pH – analysis as soon as possible after sample collection

Sample preservation requires chilling to  $\leq 6$  degrees Celsius.

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

For SDG GEL434204, the samples were analyzed for pH 48 hours after sample collection. Based on professional judgment the pH results for all samples should be qualified as estimates and flagged “J.” See the table in Appendix 2 for a listing of all affected sample results.

For SDG DN0231, the sample was analyzed for pH eight days after sample collection. Based on professional judgment the pH result for sample B3C1X1 should be qualified as an estimate and 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 matrix spike sample results and laboratory control sample results. According to the SAP, the matrix spike sample accuracy limits are 70% to 130% and the laboratory control sample accuracy limits are ones specified by the DV procedure. The limits for reported analytes not listed in the SAP are specified by the DV procedure.

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

All MS/MSD recoveries were acceptable. It should be noted that MS analyses are not required for the pH analysis.

### **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  $\pm 30\%$ .

### **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**

All field split results were acceptable.

- **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 GEL434204 and DN0231 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 97%.

## **MAJOR DEFICIENCIES**

None found.

## **MINOR DEFICIENCIES**

A minor deficiency leading to qualification of the pH results as estimates were due to a holding time infraction. See the table in Appendix 2 for a listing of all affected sample results.

## **REFERENCES**

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

DOE/RL-2001-48, Rev. 4, *300 Area Remedial Action Sampling and Analysis Plan*, November 2014.

## **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**

<b>General Chemistry Data Qualification Summary</b>			
SDG: GEL434204, DN0231	Reviewer: AQA	Project: 618-10_618-11	Page 1 of 1
<b>Analyte(s)</b>	<b>Qualifier</b>	<b>Samples Affected</b>	<b>Reason</b>
pH	J	B3C1R7, B3C1R9, B3C1T1, B3C1T3, B3C1T5, B3C1T7, B3C1T9, B3C1V1, B3C1V3, B3C1V5, B3C1V7, B3C1V9, B3C1W1, B3C1W3, B3C1W9	Analysis beyond the holding time
pH	J	B3C1X1	Analysis beyond 2X the holding time

Comments: None

## **Appendix 3**

### **Data Validation Supporting Documentation**

**Data Validation for Chemical Analyses**

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

**Appendix A - (Cont.) Chemical Data Validation Checklist**

VALIDATION LEVEL:	A	B	<input checked="" type="radio"/> C	D	E
PROJECT: 618-10_618-11			DATA PACKAGE: VSR18-001		
VALIDATOR: Eyda Hergenreder		LAB: GEL, TestAmerica		DATE: 12/07/17	
			SDG: GEL434204, DN0231		
ANALYSES PERFORMED					
Anions/IC X	TOC	TOX	TPH-418.1	Oil and Grease	Alkalinity
Ammonia	BOD/COD	Chloride	Chromium-VI	pH X	NO <sub>3</sub> /NO <sub>2</sub>
Sulfate	TDS	TKN	Phosphate		
SAMPLES/MATRIX Soil					
GEL434204: B3C1R7, B3C1R9, B3C1T1, B3C1T3, B3C1T5, B3C1T7, B3C1T9, B3C1V1, B3C1V3, B3C1V5, B3C1V7, B3C1V9, B3C1W1, B3C1W3, B3C1W9					
DN0231: B3C1X1					

**1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE**

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

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

### Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

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

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

Comments:

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

### Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

SDG GEL434204 parent sample B3C1T9/SDG DN0231 split sample B3C1X1

#### 6. HOLDING TIMES (all levels)

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

Comments:

SDG GEL434204 pH analyzed 48 hours after collection

SDG DN0231 pH analyzed 8 days after collection



## **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: October 10, 2017

Page 1 of 2

CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 434204

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Ion Chromatography</b>											
Batch	1706619										
QC1203889221		434204001	DUP								
Nitrate-N		1740		1700	ug/kg	2.18	^	(+/-1020)	MXL2	10/05/17	21:50
QC1203889222		434204015	DUP								
Nitrate-N	B	505	B	524	ug/kg	3.54	^	(+/-971)		10/06/17	07:39
QC1203889220		LCS									
Nitrate-N	24900			23100	ug/kg			(80%-120%)		10/05/17	20:52
QC1203889219		MB									
Nitrate-N			U	314	ug/kg					10/05/17	20:22
QC1203889223		434204001	MS								
Nitrate-N	25500	1740		25800	ug/kg			(75%-125%)		10/05/17	22:20
QC1203889224		434204015	MS								
Nitrate-N	24300	B	505	23300	ug/kg			(75%-125%)		10/06/17	08:09

**Titration and Ion Analysis**

Batch	1706522										
QC1203888975		434204001	DUP								
pH	X	9.09	X	9.09	SU	0		(0%-30%)	RXB5	10/05/17	18:03
QC1203888976		434204002	DUP								
pH	X	9.20	X	9.20	SU	0		(0%-30%)		10/05/17	18:05
QC1203888974		LCS									
pH	7.00			6.99	SU			(70%-130%)		10/05/17	16:51

**Notes:**

The Qualifiers in this report are defined as follows:

# QC Sample Results

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

## Method: 7471B - Mercury (CVAA) (Continued)

Lab Sample ID: 280-101855-1 MSD  
 Matrix: Soil  
 Analysis Batch: 391167

Client Sample ID: B3CVJ6  
 Prep Type: Total/NA  
 Prep Batch: 391050

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Mercury	6.3	U	358	334.4		ug/Kg	☼	93	75 - 125	22	35

## Method: 9045D - pH

Lab Sample ID: LCS 280-390740/1-A  
 Matrix: Solid  
 Analysis Batch: 390892

Client Sample ID: Lab Control Sample  
 Prep Type: Soluble

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
pH adj. to 25 deg C	7.00	7.000		SU		100	97 - 103

Lab Sample ID: 280-102039-1 DU  
 Matrix: Soil  
 Analysis Batch: 390892

Client Sample ID: B3C2F3  
 Prep Type: Soluble

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	Limit
pH adj. to 25 deg C	8.31		8.350		SU		0.5	5
Temperature	20.7		20.70		Degrees C		0	5

## Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MRL 280-391072/3  
 Matrix: Solid  
 Analysis Batch: 391072

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA

Analyte	Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	Limits
Nitrate as N	0.200	0.198	B	mg/L		99	50 - 150

Lab Sample ID: MB 280-391134/1-A  
 Matrix: Solid  
 Analysis Batch: 391072

Client Sample ID: Method Blank  
 Prep Type: Soluble

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	313	U	4990	313	ug/Kg			10/12/17 19:59	1

Lab Sample ID: LCS 280-391134/2-A  
 Matrix: Solid  
 Analysis Batch: 391072

Client Sample ID: Lab Control Sample  
 Prep Type: Soluble

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Nitrate as N	50000	49110		ug/Kg		98	80 - 120

Lab Sample ID: LCSD 280-391134/3-A  
 Matrix: Solid  
 Analysis Batch: 391072

Client Sample ID: Lab Control Sample Dup  
 Prep Type: Soluble

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Nitrate as N	49900	48930		ug/Kg		98	80 - 120	0	35

TestAmerica Denver

Page 107 of 115  
**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 280-101855-1  
 SDG: DN0231

**Method: 9056A - Anions, Ion Chromatography (Continued)**

**Lab Sample ID: 280-101855-1 MS**  
**Matrix: Soil**  
**Analysis Batch: 391072**

**Client Sample ID: B3CVJ6**  
**Prep Type: Soluble**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate as N	328	U	49700	48930		ug/Kg	☼	99	75 - 125

**Lab Sample ID: 280-101855-1 MSD**  
**Matrix: Soil**  
**Analysis Batch: 391072**

**Client Sample ID: B3CVJ6**  
**Prep Type: Soluble**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Nitrate as N	328	U	49300	49340		ug/Kg	☼	100	75 - 125	1	35

**Lab Sample ID: 280-101855-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 391072**

**Client Sample ID: B3CVJ6**  
**Prep Type: Soluble**

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Nitrate as N	328	U	325	U	ug/Kg	☼	NC	15



Date: 07 December 2017  
 To: CH2M Hill (technical representative)  
 From: Analytical Quality Associates, Inc.  
 Project: 618-10\_618-11  
 Subject: Radiochemical - Sample Data Groups (SDGs) GEL434204, SL2694 and W07915

## **INTRODUCTION**

This memorandum presents the results of data validation for SDG GEL434204 prepared by GEL Laboratories LLC and SDGs SL2694 and W07915 prepared by TestAmerica Laboratories Inc. A list of samples validated along with the analytical methods is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation Level</b>	<b>Analytical Methods</b>
B3C1R7	10/03/17	Soil	C	See note 1
B3C1R9	10/03/17	Soil	C	See note 1
B3C1T1	10/03/17	Soil	C	See note 1
B3C1T3	10/03/17	Soil	C	See note 1
B3C1T5	10/03/17	Soil	C	See note 1
B3C1T7	10/03/17	Soil	C	See note 1
B3C1T9	10/03/17	Soil	C	See note 1
B3C1V1	10/03/17	Soil	C	See note 1
B3C1V3	10/03/17	Soil	C	See note 1
B3C1V5	10/03/17	Soil	C	See note 1
B3C1V7	10/03/17	Soil	C	See note 1
B3C1V9	10/03/17	Soil	C	See note 1
B3C1W1	10/03/17	Soil	C	See note 1
B3C1W3	10/03/17	Soil	C	See note 1
B3C1W9	10/03/17	Soil	C	See note 1
B3C1W8	10/03/17	Soil	C	I-129
B3C1X2	10/03/17	Soil	C	See note 2

- 1 – Pu-238, Pu-239/240, U-233/234, U-235/236, U-238, Pu-241, Am-241, Total Sr., Gamma, I-129, Tc-99, Tritium  
 2 – Tritium, Am-241, Pu-238, Pu-239/240, U-233/234, U-235, U-238, Gamma, Total Sr., Pu-241, Tc-99

Data validation was conducted in accordance with the CHPRC validation statement of work and the 300 Area Remedial Action Sampling and Analysis Plan, DOE/RL-2001-48, Rev. 4 (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 maximum holding time for radiochemical analysis is 180 days. There are no specific preservation requirements for radiochemical soil/solid analysis.

The samples were analyzed within the prescribed holding times.

- **Blanks**

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

### **Laboratory Blanks**

All laboratory blank results were acceptable with the following exception.

For SDG SL2694, the total beta strontium laboratory blank result was > the minimum detectable concentration (MDC). The total beta strontium result for sample B3C1X2 was a non-detect and should not be qualified.

### **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 chemical recovery factors. Chemical recovery factors are determined through use of a carrier or tracer and provide assessment of the chemical separation process that is affected by the laboratory procedure, sample matrix, and/or interference. Chemical recovery factors are used to correct sample concentration, uncertainty, and MDC results. According to the SAP, the laboratory control sample accuracy limits are 70% to 130%. The matrix spike sample accuracy 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.

### **Carrier/Tracer Recovery Factors**

All carrier/tracer recovery factors were acceptable with the following exception.

For SDG SL2694, the Am-243 tracer recoveries for sample B3C1X2 and the LCS were above the acceptance limit. The Am-241 result for sample B3C1X2 was a non-detect and should not be qualified. Since the LCS is a QC sample, data should not be qualified.

- **Precision**

Precision is evaluated by reviewing laboratory duplicate, field duplicate, 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  $\pm 30\%$ .

### **Laboratory Duplicate Samples**

All laboratory duplicate results were acceptable.

### **Field Duplicate Samples**

No field duplicates were submitted for validation.

### **Field Split Samples**

All field split results were acceptable with the following exceptions. The RPDs between parent sample B3C1R9 and split sample B3C1X2 were above the acceptance limit for U-238, U-235/236, total Sr and Cs-137.

- **Detection Limits**

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

All reported sample MDCs with associated non-detected sample results were below the CRDLs with the following exceptions.

Total Sr and Tc-99 for samples B3C1R7, B3C1T1, B3C1T3, B3C1T5, B3C1T9, B3C1V3, B3C1V5, and B3C1W9

Am-241 for sample B3C1R7

Co-60 for samples B3C1T3, B3C1V5 and B3C1X2

Tc-99 for samples B3C1R9, B3C1T7, B3C1V1, B3C1V7, B3C1V9, B3C1W1 and B3C1W3

Eu-152, Eu-154 and Eu-155 for sample B3C1X2

- **Completeness**

SDGs GEL434204, W07915 and SL2694 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-002, Rev. 2, Change 0, *Data Validation for Radiochemical Analyses*, September 2016.

DOE/RL-2001-48, Rev. 4, *300 Area Remedial Action Sampling and Analysis Plan*, November 2014.

## **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 and 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 MDC. 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.
- **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**

<b>Radiochemical Data Qualification Summary</b>			
SDGs: GEL434204, W07915, SL2694	Reviewer: AQA	Project: 618-10_618-11	Page 1 of 1
<b>Analyte(s)</b>	<b>Qualifier</b>	<b>Samples Affected</b>	<b>Reason</b>
Radiochemical	None	N/A	N/A

Comments: None

## **Appendix 3**

### **Data Validation Supporting Documentation**

## Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

## Appendix B - Radiochemical Data Validation Checklist

Validation Level:	A	B	<b>C</b>	D	E
Project: 618-10_618-11			Data Package: VSR18-001		
Validator: Eyda Hergenreder		Lab: GEL, TestAmerica		Date: 12/07/17	
			SDG: GEL434204, W07915, SL2694		
Analyses Performed					
<input type="checkbox"/> Gross Alpha/Beta	<input type="checkbox"/> Strontium-90	<input checked="" type="checkbox"/> Technetium-99	<input checked="" type="checkbox"/> Alpha Spectroscopy	<input checked="" type="checkbox"/> Gamma Spectroscopy	<input checked="" type="checkbox"/> Tritium
<input type="checkbox"/> Total Uranium	<input type="checkbox"/> Radium-22	<input checked="" type="checkbox"/> I-129	<input checked="" type="checkbox"/> Total Strontium		
Samples/Matrix Soil					
GEL434204: B3C1R7, B3C1R9, B3C1T1, B3C1T3, B3C1T5, B3C1T7, B3C1T9, B3C1V1, B3C1V3, B3C1V5, B3C1V7, B3C1V9, B3C1W1, B3C1W3, B3C1W9					
W07915: B3C1W8					
SL2694: B3C1X2					

1. Completeness and Case Narrative	<input type="checkbox"/> N/A
Technical verification forms present?	Yes <b>No</b> N/A

**Comments:**


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2. Initial Calibration (Levels D, E)	<input checked="" type="checkbox"/> N/A
Instruments/detectors calibrated?	Yes No <b>N/A</b>
Initial calibration acceptable?	Yes No <b>N/A</b>
Standards NIST traceable?	Yes No <b>N/A</b>
Standards expired?	Yes No <b>N/A</b>
Calculation check acceptable?	Yes No <b>N/A</b>

**Comments:**


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Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

Appendix B - (Cont.) Radiochemical Data Validation Checklist

3. Continuing Calibration (Levels D, E)	<input checked="" type="checkbox"/> N/A
Calibration checked within required frequency?	Yes No <input type="radio"/> N/A
Calibration check acceptable?	Yes No <input type="radio"/> N/A
Calibration check standards traceable?	Yes No <input type="radio"/> N/A
Calibration check standards expired?	Yes No <input type="radio"/> N/A
Calculation check acceptable?	Yes No <input type="radio"/> N/A
<b>Comments:</b>	

4. Background Counts (Levels D, E)	<input checked="" type="checkbox"/> N/A
Background counts checked within required frequency?	Yes No <input type="radio"/> N/A
Background counts acceptable?	Yes No <input type="radio"/> N/A
Calculation check acceptable?	Yes No <input type="radio"/> N/A
<b>Comments:</b>	

## Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

## Appendix B - (Cont.) Radiochemical Data Validation Checklist

5. Blanks (Levels B, C, D, E)	<input type="checkbox"/> N/A
Method blank analyzed within required frequency?	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="checkbox"/> N/A
Method blank results acceptable?	Yes <input checked="" type="radio"/> No <input type="checkbox"/> N/A
Analytes detected in method blank?	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="checkbox"/> N/A
Field blank(s) analyzed?	Yes <input checked="" type="radio"/> No <input type="checkbox"/> N/A
Field blank results acceptable?	Yes <input type="radio"/> No <input checked="" type="radio"/> N/A
Analytes detected in field blank(s)?	Yes <input type="radio"/> No <input checked="" type="radio"/> N/A
Transcription/Calculation Errors? (Levels D, E)	Yes <input type="radio"/> No <input checked="" type="radio"/> N/A

**Comments:**

SDG SL2694 MB total beta strontium 0.217 pCi/g

6. Laboratory Control Samples or Blank Spike Samples (Levels C, D, E)	<input type="checkbox"/> N/A
LCS /BSS analyzed within required frequency?	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="checkbox"/> N/A
LCS/BSS recoveries acceptable?	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="checkbox"/> N/A
LCS/BSS traceable? (Levels D,E)	Yes <input type="radio"/> No <input checked="" type="radio"/> N/A
LCS/BSS expired? (Levels D,E)	Yes <input type="radio"/> No <input checked="" type="radio"/> N/A
LCS/BSS levels correct? (Levels D,E)	Yes <input type="radio"/> No <input checked="" type="radio"/> N/A
Transcription/Calculation errors? (Levels D, E)	Yes <input type="radio"/> No <input checked="" type="radio"/> N/A

**Comments:**

## Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

## Appendix B - (Cont.) Radiochemical Data Validation Checklist

7. Chemical Carrier Recovery (Levels C, D, E)	<input type="checkbox"/> N/A
Chemical carrier added?	<input checked="" type="radio"/> Yes No N/A
Chemical recovery acceptable?	<input checked="" type="radio"/> Yes No N/A
Chemical carrier traceable? (Levels D, E )	Yes No <input checked="" type="radio"/> N/A
Chemical carrier expired? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Transcription/Calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

**Comments:**


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8. Tracer Recovery (Levels C, D, E )	<input type="checkbox"/> N/A
Tracer added?	<input checked="" type="radio"/> Yes No N/A
Tracer recovery acceptable?	Yes <input checked="" type="radio"/> No N/A
Tracer traceable? (Levels D, E )	Yes No <input checked="" type="radio"/> N/A
Tracer expired? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Transcription/Calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

**Comments:**

SDG SL2694; sample B3C1X2 tracer Am-243 108%; LCS Am-243 108%

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Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

Appendix B - (Cont.) Radiochemical Data Validation Checklist

9. Matrix Spikes (Levels C, D, E)	<input type="checkbox"/> N/A
Matrix spike analyzed?	<input checked="" type="radio"/> Yes No N/A
Spike recoveries acceptable?	<input checked="" type="radio"/> Yes No N/A
Spike source traceable? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Spike source expired? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Transcription/Calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

Comments:

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10. Duplicates (Levels C, D, E)	<input type="checkbox"/> N/A
Duplicates analyzed at required frequency?	<input checked="" type="radio"/> Yes No N/A
RPD values acceptable?	<input checked="" type="radio"/> Yes No N/A
Transcription/Calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

Comments:

SDG SL2694 - RPDs were not reported, RER were provided.

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## Data Validation for Radiochemical Analyses

Published Date: 09/13/16

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## Appendix B - (Cont.) Radiochemical Data Validation Checklist

11. Field QC Samples (Levels C, D, E)	<input type="checkbox"/> N/A
Field duplicate sample(s) analyzed?	Yes <input checked="" type="radio"/> No <input type="radio"/> N/A
Field duplicate RPD values acceptable?	Yes No <input checked="" type="radio"/> N/A
Field split sample(s) analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Field split RPD values acceptable?	Yes <input checked="" type="radio"/> No <input type="radio"/> N/A
Performance audit sample(s) analyzed?	Yes No <input checked="" type="radio"/> N/A
Performance audit sample results acceptable?	Yes No <input checked="" type="radio"/> N/A

**Comments:**

Parent sample B3C1R9/split sample B3C1X2: U-238 42%; U-235/236 91%; Total Sr 1.74 pCi/g/ND; Cs-137 67%

12. Holding Times (All levels)	<input type="checkbox"/> N/A
Are sample holding times acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A

**Comments:**

13. Results and MDCs (All Levels )	<input type="checkbox"/> N/A
Results reported for all required sample analyses?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Results supported in raw data?(Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Results acceptable? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
MDC's meet required reporting limits?	Yes <input checked="" type="radio"/> No <input type="radio"/> N/A
Transcription/Calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

**Comments:** MDCs > CRDL

SDG GEL434204: B3C1R7 Am-241, T-Sr, Tc-99; B3C1R9 Tc-99; B3C1T1 T-Sr, Tc-99; B3C1T3 T-Sr, Co-60, Tc-99; B3C1T5 T-Sr, Tc-99; B3C1T7 Tc-99; B3C1T9 T-Sr, Tc-99; B3C1V1 Tc-99; B3C1V3 T-Sr, Tc-99; B3C1V5 T-Sr, Co-60, Tc-99; B3C1V7 Tc-99; B3C1V9 Tc-99; B3C1W1 Tc-99; B3C1W3 Tc-99; B3C1W9 T-Sr, Tc-99

SDG SL2694; B3C1X2 Co-60, Eu-152, Eu-154, Eu-155

## **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: October 12, 2017

Page 1 of 6

Client : **CH2MHill Plateau Remediation Company**  
**MSIN R3-50 CHPRC**  
**PO Box 1600**  
**Richland, Washington 99352**

Contact: **Mr. Scot Fitzgerald**

Workorder: **434204**

Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Alpha Spec</b>									
Batch	1707933								
QC1203892393	MB								
Plutonium-238			U	0.0728	pCi/g			MXS2	10/10/1708:54
				Uncert: +/-0.0874					
				TPU: +/-0.088					
Plutonium-239/240			U	-0.0426	pCi/g				
				Uncert: +/-0.0442					
				TPU: +/-0.0442					
**Plutonium-236 Tracer	2.59			2.09	pCi/g	REC: 81	(30%-105%)		
				Uncert: +/-0.358					
				TPU: +/-0.525					
QC1203892394	434204001	DUP							
Plutonium-238		0.286	U	0.127	pCi/g				
				Uncert: +/-0.190		RPD: 23	(0% - 100%)		
				TPU: +/-0.197		RER: 1.27	(0-2)		
Plutonium-239/240		U	0.118	U	0.118	pCi/g			
				Uncert: +/-0.119		RPD: 0	N/A		
				TPU: +/-0.121		RER: 0.00612	(0-2)		
**Plutonium-236 Tracer	2.64	1.82		1.68	pCi/g	REC: 64	(30%-105%)		
				Uncert: +/-0.437					
				TPU: +/-0.634					
QC1203892395	LCS								
Plutonium-238				0.102	pCi/g				10/10/1714:24
				Uncert: +/-0.0558					
				TPU: +/-0.057					
Plutonium-239/240	3.82			3.83	pCi/g	REC: 100	(80%-120%)		
				Uncert: +/-0.315					
				TPU: +/-0.539					
**Plutonium-236 Tracer	2.59			2.08	pCi/g	REC: 80	(30%-105%)		
				Uncert: +/-0.259					
				TPU: +/-0.393					
Batch	1707935								
QC1203892402	MB								
Uranium-233/234			U	0.103	pCi/g			MXS2	10/11/1709:03
				Uncert: +/-0.161					
				TPU: +/-0.163					
Uranium-235/236			U	0.133	pCi/g				
				Uncert: +/-0.199					
				TPU: +/-0.201					
Uranium-238			U	0.185	pCi/g				
				Uncert: +/-0.197					
				TPU: +/-0.201					
**Uranium-232 Tracer	4.06			2.66	pCi/g	REC: 66	(30%-105%)		
				Uncert: +/-0.809					
				TPU: +/-1.19					
QC1203892403	434204001	DUP							

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## QC Summary

Workorder: 434204

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Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Alpha Spec</b>									
Batch	1707935								
Uranium-233/234		0.418		0.358	pCi/g				
	Uncert:	+/-0.164		+/-0.145		RPD:	15 (0% - 100%)		
	TPU:	+/-0.174		+/-0.153		RER:	0.506 (0-2)		
Uranium-235/236	U	0.0926	U	0.0441	pCi/g				
	Uncert:	+/-0.0943		+/-0.070		RPD:	0 N/A		
	TPU:	+/-0.0952		+/-0.0703		RER:	0.804 (0-2)		
Uranium-238		0.304		0.393	pCi/g				
	Uncert:	+/-0.142		+/-0.150		RPD:	26* (0%-20%)		
	TPU:	+/-0.149		+/-0.159		RER:	0.805 (0-2)		
**Uranium-232 Tracer	4.12	3.62		3.19	pCi/g	REC:	77 (30%-105%)		
	Uncert:	+/-0.505		+/-0.482					
	TPU:	+/-0.777		+/-0.748					
QC1203892404 LCS									
Uranium-233/234				5.44	pCi/g				
	Uncert:			+/-0.521					
	TPU:			+/-0.887					
Uranium-235/236				0.559	pCi/g				
	Uncert:			+/-0.188					
	TPU:			+/-0.202					
Uranium-238	5.22			4.72	pCi/g	REC:	90 (80%-120%)		
	Uncert:			+/-0.486					
	TPU:			+/-0.791					
**Uranium-232 Tracer	4.06			3.79	pCi/g	REC:	94 (30%-105%)		
	Uncert:			+/-0.454					
	TPU:			+/-0.710					
Batch	1707938								
QC1203892406 MB									
Plutonium-241			U	-3.95	pCi/g			MXS2	10/12/1707:55
	Uncert:			+/-4.64					
	TPU:			+/-4.64					
**Plutonium-236 Tracer	2.59			2.09	pCi/g	REC:	81 (30%-105%)		
	Uncert:			+/-0.358					
	TPU:			+/-0.525					
QC1203892407 434204001 DUP									
Plutonium-241	U	-3.22	U	-0.572	pCi/g				10/12/1709:26
	Uncert:	+/-5.48		+/-6.10		RPD:	0 N/A		
	TPU:	+/-5.48		+/-6.10		RER:	0.633 (0-2)		
**Plutonium-236 Tracer	2.64	1.82		1.68	pCi/g	REC:	64 (30%-105%)		
	Uncert:	+/-0.437		+/-0.450					
	TPU:	+/-0.634		+/-0.653					
QC1203892408 LCS									
Plutonium-241	140			152	pCi/g	REC:	109 (80%-120%)		10/12/1710:58
	Uncert:			+/-8.35					
	TPU:			+/-36.2					
**Plutonium-236 Tracer	2.59			1.86	pCi/g	REC:	72 (30%-105%)		
	Uncert:			+/-0.407					
	TPU:			+/-0.592					
Batch	1708379								
QC1203893489 MB									
Americium-241			U	0.140	pCi/g			MXS2	10/11/1708:57

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## QC Summary

Workorder: 434204

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Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Alpha Spec</b>									
Batch	1708379								
				Uncert:					
				TPU:					
**Americium-243 Tracer	18.7			18.0	pCi/g	REC: 96	(30%-105%)		
				Uncert:					
				TPU:					
QC1203893490	434204001	DUP							
Americium-241		U	0.279	U	-0.00599				10/11/1709:09
				Uncert:	+/-0.682			RPD: 0	N/A
				TPU:	+/-0.684			RER: 0.722	(0-2)
**Americium-243 Tracer	20.6	12.7		17.3	pCi/g	REC: 84	(30%-105%)		
				Uncert:	+/-2.56				
				TPU:	+/-3.84				
QC1203893491	LCS								
Americium-241		17.6		16.8	pCi/g	REC: 96	(80%-120%)		10/11/1709:23
				Uncert:	+/-2.15				
				TPU:	+/-3.16				
**Americium-243 Tracer	18.7			17.7	pCi/g	REC: 95	(30%-105%)		
				Uncert:	+/-2.25				
				TPU:	+/-3.43				
<b>Rad Gamma Spec</b>									
Batch	1706541								
QC1203889016	MB								
Cesium-137			U	-0.000686	pCi/g			MXR1	10/06/1712:55
				Uncert:	+/-0.0156				
				TPU:	+/-0.0156				
Cobalt-60			U	-0.000757	pCi/g				
				Uncert:	+/-0.0143				
				TPU:	+/-0.0143				
Europium-152			U	0.00704	pCi/g				
				Uncert:	+/-0.0303				
				TPU:	+/-0.0305				
Europium-154			U	-0.042	pCi/g				
				Uncert:	+/-0.0371				
				TPU:	+/-0.0418				
Europium-155			U	-0.0134	pCi/g				
				Uncert:	+/-0.022				
				TPU:	+/-0.0229				
QC1203889017	434204001	DUP							
Cesium-137		0.241		0.282	pCi/g				10/09/1706:37
				Uncert:	+/-0.0424			RPD: 16	(0%-30%)
				TPU:	+/-0.047			RER: 1.2	(0-2)
Cobalt-60	U	0.0284	U	0.00734	pCi/g				
				Uncert:	+/-0.0219			RPD: 0	N/A
				TPU:	+/-0.0255			RER: 1.32	(0-2)
Europium-152	U	-0.00506	U	0.0125	pCi/g				
				Uncert:	+/-0.0544			RPD: 0	N/A
				TPU:	+/-0.0545			RER: 0.513	(0-2)
Europium-154	U	0.0317	U	-0.0341	pCi/g				
				Uncert:	+/-0.062			RPD: 0	N/A
				TPU:	+/-0.0637			RER: 1.39	(0-2)

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## QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Gamma Spec</b>									
Batch	1706541								
Europium-155		U	0.00994	U	0.0323	pCi/g			
	Uncert:		+/-0.0548		+/-0.0359		RPD: 0	N/A	
	TPU:		+/-0.055		+/-0.0389		RER: 0.65	(0-2)	
QC1203889018	LCS								
Americium-241	488				484	pCi/g	REC: 99	(80%-120%)	10/06/1711:25
	Uncert:				+/-11.9				
	TPU:				+/-57.0				
Cesium-137	175				174	pCi/g	REC: 99	(80%-120%)	
	Uncert:				+/-3.45				
	TPU:				+/-19.1				
Cobalt-60	141				135	pCi/g	REC: 96	(80%-120%)	
	Uncert:				+/-3.53				
	TPU:				+/-11.9				
Europium-152				U	0.361	pCi/g			
	Uncert:				+/-1.45				
	TPU:				+/-1.46				
Europium-154				U	0.240	pCi/g			
	Uncert:				+/-0.819				
	TPU:				+/-0.827				
Europium-155				U	-0.0317	pCi/g			
	Uncert:				+/-1.44				
	TPU:				+/-1.44				
Batch	1706574								
QC1203889112	MB								
Iodine-129				U	0.0511	pCi/g			MJH1 10/09/1708:55
	Uncert:				+/-0.285				
	TPU:				+/-0.286				
QC1203889113	434204001	DUP							
Iodine-129		U	-0.224	U	-0.0762	pCi/g			10/09/1708:55
	Uncert:		+/-0.500		+/-0.364		RPD: 0	N/A	
	TPU:		+/-0.511		+/-0.366		RER: 0.462	(0-2)	
QC1203889114	434204001	MS							
Iodine-129	22.4	U	-0.224		22.4	pCi/g	REC: 101	(75%-125%)	10/09/1708:56
	Uncert:		+/-0.500		+/-2.42				
	TPU:		+/-0.511		+/-3.30				
QC1203889115	LCS								
Iodine-129	14.5				15.7	pCi/g	REC: 108	(80%-120%)	10/09/1708:57
	Uncert:				+/-1.97				
	TPU:				+/-2.52				
<b>Rad Gas Flow</b>									
Batch	1708105								
QC1203892805	MB								
Total Strontium				U	-1.29	pCi/g			AEA 10/10/1714:19
	Uncert:				+/-0.846				
	TPU:				+/-0.846				
**Strontium Carrier	7.85				8.10	mg	REC: 103	(40%-110%)	
QC1203892806	434204001	DUP							
Total Strontium		U	0.922	U	-1.19	pCi/g			10/10/1713:06
	Uncert:		+/-1.10		+/-0.888		RPD: 0	N/A	
	TPU:		+/-1.12		+/-0.888		RER: 2.89	(0-2)	

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## QC Summary

Workorder: 434204

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Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Gas Flow</b>									
Batch	1708105								
**Strontium Carrier	7.85	7.00		8.40	mg	REC: 107	(40%-110%)		
QC1203892807	LCS								
Total Strontium	81.6			84.8	pCi/g	REC: 104	(80%-120%)		10/10/1713:06
				Uncert: +/-4.63					
				TPU: +/-22.4					
**Strontium Carrier	7.85			7.40	mg	REC: 94	(40%-110%)		
<b>Rad Liquid Scintillation</b>									
Batch	1706544								
QC1203889025	MB								
Technetium-99			U	0.347	pCi/g			CXS7	10/10/1709:00
				Uncert: +/-1.28					
				TPU: +/-1.28					
**Technetium-99m Tracer	38700			38100	CPM	REC: 98	(30%-105%)		
QC1203889026	434204001 DUP								
Technetium-99		U	0.508	U	0.365	pCi/g			10/10/1706:24
			Uncert: +/-1.63			RPD: 0	N/A		
			TPU: +/-1.63			RER: 0.114	(0-2)		
**Technetium-99m Tracer	38700	36700		33300	CPM	REC: 86	(30%-105%)		
QC1203889027	LCS								
Technetium-99	45.3			39.2	pCi/g	REC: 87	(80%-120%)		10/10/1708:02
				Uncert: +/-2.36					
				TPU: +/-5.08					
**Technetium-99m Tracer	38700			37800	CPM	REC: 97	(30%-105%)		
Batch	1706548								
QC1203889041	MB								
Tritium			U	2.35	pCi/g			BXM4	10/06/1720:04
				Uncert: +/-10.5					
				TPU: +/-10.5					
QC1203889042	434204001 DUP								
Tritium		U	-1.21	U	-0.139	pCi/g			10/06/1720:36
			Uncert: +/-10.4			RPD: 0	N/A		
			TPU: +/-10.4			RER: 0.143	(0-2)		
QC1203889043	434204001 MS								
Tritium	126	U	-1.21		107	pCi/g	REC: 85	(75%-125%)	10/06/1721:07
			Uncert: +/-10.4						
			TPU: +/-10.4						
QC1203889044	LCS								
Tritium	85.7			76.3	pCi/g	REC: 89	(80%-120%)		10/06/1721:39
				Uncert: +/-14.3					
				TPU: +/-22.4					

**Notes:**

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

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
- < Sample is below the EPA guidance level for Reactive Releasable Cyanide and/or Reactive Releasable Sulfide
- > Result greater than quantifiable range or greater than upper limit of the analysis range

# QC Sample Results

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 160-24788-1  
 SDG: SL2694

## Method: 906.0 - Tritium, Total (LSC)

**Lab Sample ID: MB 160-330611/1-A**  
**Matrix: Solid**  
**Analysis Batch: 331172**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 330611**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tritium	0.0479	U	0.263	0.263	1.00	0.454	pCi/g	10/06/17 09:44	10/09/17 15:28	1

**Lab Sample ID: LCS 160-330611/2-A**  
**Matrix: Solid**  
**Analysis Batch: 331172**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 330611**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Tritium	9.47	8.351		0.974	1.00	0.450	pCi/g	88	80 - 120

**Lab Sample ID: 160-24833-1 MS**  
**Matrix: Soil**  
**Analysis Batch: 331172**

**Client Sample ID: B3C1X2**  
**Prep Type: Total/NA**  
**Prep Batch: 330611**

Analyte	Sample Result	Sample Qual	Spike Added	MS Result	MS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Tritium	-0.24	U	9.35	8.185		0.967	1.00	0.463	pCi/g	88	75 - 125

**Lab Sample ID: 160-24788-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 331172**

**Client Sample ID: B3CVJ7**  
**Prep Type: Total/NA**  
**Prep Batch: 330611**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Tritium	-0.018	U	0.149	U	0.280	1.00	0.471	pCi/g	0.31	1

## Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

**Lab Sample ID: MB 160-330336/1-A**  
**Matrix: Solid**  
**Analysis Batch: 331309**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 330336**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0188	U	0.0390	0.0390	1.00	0.0762	pCi/g	10/04/17 12:56	10/10/17 14:31	1
Uranium 235	0.000	U	0.00667	0.00667	1.00	0.0400	pCi/g	10/04/17 12:56	10/10/17 14:31	1
Uranium-238	0.0160	U	0.0312	0.0312	1.00	0.0599	pCi/g	10/04/17 12:56	10/10/17 14:31	1
Tracer	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	70.7		30 - 105					10/04/17 12:56	10/10/17 14:31	1

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
Project/Site: FRC17-06

TestAmerica Job ID: 160-24788-1  
SDG: SL2694

**Method: A-01-R - Isotopic Uranium (Alpha Spectrometry) (Continued)**

**Lab Sample ID: LCS 160-330336/2-A**  
**Matrix: Solid**  
**Analysis Batch: 331310**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 330336**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
Uranium-233/234	6.37	5.858		0.680	1.00	0.0628	pCi/g	92	80 - 120	
Uranium-238	6.51	6.087		0.700	1.00	0.0454	pCi/g	94	80 - 120	
<b>Tracer</b>	<b>%Yield</b>	<b>LCS Qualifier</b>	<b>LCS</b>	<b>Limits</b>						
Uranium-232	85.6			30 - 105						

**Lab Sample ID: 160-24788-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 331312**

**Client Sample ID: B3CVJ7**  
**Prep Type: Total/NA**  
**Prep Batch: 330336**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Uranium-233/234	0.288		0.228		0.0952	1.00	0.0521	pCi/g	0.29	1
Uranium 235	0.0344	U	0.0145	U	0.0343	1.00	0.0716	pCi/g	0.24	1
Uranium-238	0.482		0.404		0.128	1.00	0.0520	pCi/g	0.29	1
<b>Tracer</b>	<b>%Yield</b>	<b>DU Qualifier</b>	<b>DU</b>	<b>Limits</b>						
Uranium-232	84.0			30 - 105						

**Lab Sample ID: MB 160-330704/1-A**  
**Matrix: Solid**  
**Analysis Batch: 331724**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 330704**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0512	U	0.0575	0.0577	1.00	0.0888	pCi/g	10/06/17 09:58	10/12/17 18:14	1
Uranium 235	0.0121	U	0.0364	0.0364	1.00	0.0811	pCi/g	10/06/17 09:58	10/12/17 18:14	1
Uranium-238	-0.00974	U	0.00974	0.00977	1.00	0.0650	pCi/g	10/06/17 09:58	10/12/17 18:14	1
<b>Tracer</b>	<b>%Yield</b>	<b>MB Qualifier</b>	<b>Count Uncert. (2σ+/-)</b>	<b>Total Uncert. (2σ+/-)</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Uranium-232	85.6		30 - 105					10/06/17 09:58	10/12/17 18:14	1

**Lab Sample ID: LCS 160-330704/2-A**  
**Matrix: Solid**  
**Analysis Batch: 331725**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 330704**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
Uranium-233/234	6.37	5.407		0.638	1.00	0.0617	pCi/g	85	80 - 120	
Uranium-238	6.51	5.747		0.667	1.00	0.0277	pCi/g	88	80 - 120	
<b>Tracer</b>	<b>%Yield</b>	<b>LCS Qualifier</b>	<b>LCS</b>	<b>Limits</b>						
Uranium-232	78.9			30 - 105						

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 160-24788-1  
 SDG: SL2694

**Method: A-01-R - Isotopic Uranium (Alpha Spectrometry) (Continued)**

**Lab Sample ID: 160-24833-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 331728**

**Client Sample ID: B3C1X2**  
**Prep Type: Total/NA**  
**Prep Batch: 330704**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Uranium-233/234	0.412		0.389		0.129	1.00	0.0720	pCi/g	0.09	1
Uranium 235	0.0494		0.000	U	0.00597	1.00	0.0358	pCi/g	0.89	1
Uranium-238	0.371		0.345		0.120	1.00	0.0640	pCi/g	0.11	1
<b>Tracer</b>	<b>%Yield</b>	<b>DU Qualifier</b>	<b>DU</b>		<b>Limits</b>					
Uranium-232	88.6				30 - 105					

**Method: A-01-R - Isotopic Plutonium (Alpha Spectrometry)**

**Lab Sample ID: MB 160-330334/1-A**  
**Matrix: Solid**  
**Analysis Batch: 331483**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 330334**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Plutonium-238	0.00935	U	0.0221	0.0221	1.00	0.0463	pCi/g	10/04/17 12:56	10/11/17 16:27	1
Plutonium-239/240	0.0150	U	0.0270	0.0270	1.00	0.0500	pCi/g	10/04/17 12:56	10/11/17 16:27	1
<b>Tracer</b>	<b>%Yield</b>	<b>MB Qualifier</b>	<b>MB</b>		<b>Limits</b>		<b>Prepared</b>		<b>Analyzed</b>	<b>Dil Fac</b>
Pu-242 (T)	100				30 - 105		10/04/17 12:56		10/11/17 16:27	1

**Lab Sample ID: LCS 160-330334/2-A**  
**Matrix: Solid**  
**Analysis Batch: 331667**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 330334**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	
Plutonium-238	5.33	5.852		0.672	1.00	0.0552	pCi/g	110	80 - 120	
Plutonium-239/240	6.60	7.054		0.777	1.00	0.0597	pCi/g	107	80 - 120	
<b>Tracer</b>	<b>LCS %Yield</b>	<b>LCS Qualifier</b>	<b>LCS</b>		<b>Limits</b>					
Pu-242 (T)	84.2				30 - 105					

**Lab Sample ID: 160-24788-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 330966**

**Client Sample ID: B3CVJ7**  
**Prep Type: Total/NA**  
**Prep Batch: 330334**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Plutonium-238	0.0315	U	0.0279	U	0.0400	1.00	0.0674	pCi/g	0.05	1
Plutonium-239/240	0.0105	U	0.0214	U	0.0359	1.00	0.0644	pCi/g	0.18	1

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 160-24788-1  
 SDG: SL2694

**Method: A-01-R - Isotopic Plutonium (Alpha Spectrometry) (Continued)**

**Lab Sample ID: 160-24788-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 330966**

**Client Sample ID: B3CVJ7**  
**Prep Type: Total/NA**  
**Prep Batch: 330334**

Tracer	DU DU		Limits
	%Yield	Qualifier	
Pu-242 (T)	97.6		30 - 105

**Lab Sample ID: MB 160-330703/1-A**  
**Matrix: Solid**  
**Analysis Batch: 331518**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 330703**

Analyte	MB MB		Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier								
Plutonium-238	0.00204	U	0.0255	0.0255	1.00	0.0643	pCi/g	10/06/17 09:58	10/11/17 16:30	1
Plutonium-239/240	0.00818	U	0.0245	0.0246	1.00	0.0546	pCi/g	10/06/17 09:58	10/11/17 16:30	1

  

Tracer	MB MB		Limits	Prepared	Analyzed	Dil Fac
	%Yield	Qualifier				
Pu-242 (T)	104		30 - 105	10/06/17 09:58	10/11/17 16:30	1

**Lab Sample ID: LCS 160-330703/2-A**  
**Matrix: Solid**  
**Analysis Batch: 331890**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 330703**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
									Plutonium-238	5.33
Plutonium-239/240	6.60	7.317		0.780	1.00	0.0488	pCi/g	111	80 - 120	

  

Tracer	LCS LCS		Limits
	%Yield	Qualifier	
Pu-242 (T)	96.8		30 - 105

**Lab Sample ID: 160-24833-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 331708**

**Client Sample ID: B3C1X2**  
**Prep Type: Total/NA**  
**Prep Batch: 330703**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
										Plutonium-238
Plutonium-239/240	0.0272	U	0.0243	U	0.0335	1.00	0.0541	pCi/g	0.04	1

  

Tracer	DU DU		Limits
	%Yield	Qualifier	
Pu-242 (T)	105		30 - 105

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
Project/Site: FRC17-06

TestAmerica Job ID: 160-24788-1  
SDG: SL2694

**Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)**

**Lab Sample ID: MB 160-330332/1-A**  
**Matrix: Solid**  
**Analysis Batch: 331484**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 330332**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Americium-241	-0.00605	U	0.0236	0.0236	1.00	0.0731	pCi/g	10/04/17 12:56	10/11/17 16:31	1
Tracer	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Americium-243	47.2		30 - 105					10/04/17 12:56	10/11/17 16:31	1

**Lab Sample ID: LCS 160-330332/2-A**  
**Matrix: Solid**  
**Analysis Batch: 331485**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 330332**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	3.73	3.427		0.507	1.00	0.0253	pCi/g	92	80 - 120
Tracer	LCS %Yield	LCS Qualifier	Limits						
Americium-243	60.7		30 - 105						

**Lab Sample ID: 160-24788-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 331487**

**Client Sample ID: B3CVJ7**  
**Prep Type: Total/NA**  
**Prep Batch: 330332**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Americium-241	0.00508	U	0.00592	U	0.0254	1.00	0.0559	pCi/g	0.02	1
Tracer	DU %Yield	DU Qualifier	Limits							
Americium-243	73.2		30 - 105							

**Lab Sample ID: MB 160-330614/1-A**  
**Matrix: Solid**  
**Analysis Batch: 331855**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 330614**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Americium-241	0.00723	U	0.0217	0.0217	1.00	0.0483	pCi/g	10/06/17 09:58	10/13/17 13:41	1
Tracer	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Americium-243	98.6		30 - 105					10/06/17 09:58	10/13/17 13:41	1

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 160-24788-1  
 SDG: SL2694

**Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry) (Continued)**

**Lab Sample ID: LCS 160-330614/2-A**  
**Matrix: Solid**  
**Analysis Batch: 331682**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 330614**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	3.73	3.856		0.547	1.00	0.0376	pCi/g	104	80 - 120

Tracer	LCS %Yield	LCS Qualifier	Limits
Americium-241	108	X	30 - 105

**Lab Sample ID: 160-24833-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 331684**

**Client Sample ID: B3C1X2**  
**Prep Type: Total/NA**  
**Prep Batch: 330614**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Americium-241	0.00214	U	0.0136	U	0.0223	1.00	0.0376	pCi/g	0.28	1

Tracer	DU %Yield	DU Qualifier	Limits
Americium-241	101		30 - 105

**Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)**

**Lab Sample ID: MB 160-330370/1-A**  
**Matrix: Solid**  
**Analysis Batch: 330184**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 330370**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.0175	U	0.100	0.100	0.100	0.184	pCi/g	10/04/17 15:01	10/04/17 15:38	1
Cobalt-60	0.000	U	0.0187	0.0187		0.0689	pCi/g	10/04/17 15:01	10/04/17 15:38	1
Europium-152	0.159	U	0.100	0.102		0.336	pCi/g	10/04/17 15:01	10/04/17 15:38	1
Europium-154	0.0980	U	0.0693	0.0700		0.482	pCi/g	10/04/17 15:01	10/04/17 15:38	1
Europium-155	0.00352	U	0.0431	0.0431		0.214	pCi/g	10/04/17 15:01	10/04/17 15:38	1

**Lab Sample ID: LCS 160-330370/2-A**  
**Matrix: Solid**  
**Analysis Batch: 330185**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 330370**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	96.9	94.26		9.89		1.07	pCi/g	97	80 - 120
Cesium-137	28.8	27.56		2.94	0.100	0.259	pCi/g	96	80 - 120
Cobalt-60	14.4	14.00		1.46		0.110	pCi/g	97	80 - 120

QC Sample Results

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 160-24788-1  
 SDG: SL2694

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: 160-24788-1 DU  
 Matrix: Soil  
 Analysis Batch: 330184

Client Sample ID: B3CVJ7  
 Prep Type: Total/NA  
 Prep Batch: 330370

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	Limit
Cesium-137	-0.023	U	0.0174	U	0.0837	0.100	0.148	pCi/g	0.29	1
Cobalt-60	0.0504		0.0139	U	0.00995		0.142	pCi/g	0.91	1
Europium-152	0.122	U	0.149	U	0.288		0.425	pCi/g	0.05	1
Europium-154	-0.17	U	0.242	U	0.465		0.805	pCi/g	0.59	1
Europium-155	0.0521	U	-0.0902	U	0.156		0.418	pCi/g	0.42	1

Lab Sample ID: MB 160-330770/1-A  
 Matrix: Solid  
 Analysis Batch: 331052

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 330770

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.0537	U	0.0573	0.0575	0.100	0.0880	pCi/g	10/06/17 20:25	10/09/17 13:35	1
Cobalt-60	0.0169	U	0.0314	0.0314		0.0532	pCi/g	10/06/17 20:25	10/09/17 13:35	1
Europium-152	0.0846	U	0.151	0.152		0.294	pCi/g	10/06/17 20:25	10/09/17 13:35	1
Europium-154	0.170	U	0.0802	0.0821		0.597	pCi/g	10/06/17 20:25	10/09/17 13:35	1
Europium-155	-0.0553	U	0.102	0.103		0.353	pCi/g	10/06/17 20:25	10/09/17 13:35	1

Lab Sample ID: LCS 160-330770/2-A  
 Matrix: Solid  
 Analysis Batch: 331045

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA  
 Prep Batch: 330770

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits
Americium-241	96.9	96.26		10.0		0.667	pCi/g	99	80 - 120
Cesium-137	28.8	27.46		2.89	0.100	0.154	pCi/g	95	80 - 120
Cobalt-60	14.4	13.43		1.37		0.0661	pCi/g	93	80 - 120

Lab Sample ID: 160-24833-1 DU  
 Matrix: Soil  
 Analysis Batch: 331045

Client Sample ID: B3C1X2  
 Prep Type: Total/NA  
 Prep Batch: 330770

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	Limit
Cesium-137	0.877		0.880		0.120	0.100	0.0379	pCi/g	0.01	1
Cobalt-60	-0.00093	U	-0.0114	U	0.0652		0.0547	pCi/g	0.08	1
Europium-152	0.0456	U	0.0755	U	0.156		0.289	pCi/g	0.12	1
Europium-154	0.0179	U	0.0207	U	0.0735		0.379	pCi/g	0.03	1
Europium-155	-0.0026	U	-0.0602	U	0.173		0.288	pCi/g	0.22	1

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
Project/Site: FRC17-06

TestAmerica Job ID: 160-24788-1  
SDG: SL2694

**Method: SR-03-RC - Total Beta Strontium (GFPC)**

**Lab Sample ID: MB 160-330331/1-A**  
**Matrix: Solid**  
**Analysis Batch: 330594**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 330331**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.0321	U	0.117	0.117	2.00	0.204	pCi/g	10/04/17 12:56	10/06/17 13:57	1
Carrier	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	89.3		40 - 110					10/04/17 12:56	10/06/17 13:57	1

**Lab Sample ID: LCS 160-330331/2-A**  
**Matrix: Solid**  
**Analysis Batch: 330594**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 330331**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Total Beta Strontium	8.38	6.898		0.645	2.00	0.210	pCi/g	82	80 - 120
Carrier	LCS %Yield	LCS Qualifier	Limits						
Sr Carrier	87.5		40 - 110						

**Lab Sample ID: 160-24788-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 330594**

**Client Sample ID: B3CVJ7**  
**Prep Type: Total/NA**  
**Prep Batch: 330331**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	REP	RE Limit
Total Beta Strontium	0.0159	U	-0.0601	U	0.133	2.00	0.247	pCi/g	0.28	1
Carrier	DU %Yield	DU Qualifier	Limits							
Sr Carrier	82.2		40 - 110							

**Lab Sample ID: MB 160-330761/1-A**  
**Matrix: Solid**  
**Analysis Batch: 331354**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 330761**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.217	B	0.138	0.139	2.00	0.212	pCi/g	10/06/17 14:29	10/11/17 14:33	1
Carrier	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	86.8		40 - 110					10/06/17 14:29	10/11/17 14:33	1

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 160-24788-1  
 SDG: SL2694

**Method: SR-03-RC - Total Beta Strontium (GFPC) (Continued)**

**Lab Sample ID: LCS 160-330761/2-A**  
**Matrix: Solid**  
**Analysis Batch: 331354**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 330761**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Total Beta Strontium	8.37	6.849		0.638	2.00	0.219	pCi/g	82	80 - 120
<b>Carrier</b>	<b>%Yield</b>	<b>LCS Qualifier</b>	<b>LCS</b>	<b>Limits</b>					
Sr Carrier	87.5			40 - 110					

**Lab Sample ID: 160-24833-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 331354**

**Client Sample ID: B3C1X2**  
**Prep Type: Total/NA**  
**Prep Batch: 330761**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Total Beta Strontium	0.192	U	0.220		0.140	2.00	0.213	pCi/g	0.1	1
<b>Carrier</b>	<b>%Yield</b>	<b>DU Qualifier</b>	<b>DU</b>	<b>Limits</b>						
Sr Carrier	82.7			40 - 110						

**Method: ST-RC-0245 - Plutonium-241 (LSC)**

~~**Lab Sample ID: MB 160-330337/1-A**~~  
~~**Matrix: Solid**~~  
~~**Analysis Batch: 332198**~~

~~**Client Sample ID: Method Blank**~~  
~~**Prep Type: Total/NA**~~  
~~**Prep Batch: 330337**~~

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Plutonium-241	0.941	U	0.902	0.906	5.00	1.47	pCi/g	10/04/17 12:56	10/16/17 15:20	1
<b>Tracer</b>	<b>%Yield</b>	<b>MB Qualifier</b>	<b>MB</b>	<b>Limits</b>				<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Pu-242 (T)	100			30 - 105				10/04/17 12:56	10/16/17 15:20	1

~~**Lab Sample ID: LCS 160-330337/2-A**~~  
~~**Matrix: Solid**~~  
~~**Analysis Batch: 332198**~~

~~**Client Sample ID: Lab Control Sample**~~  
~~**Prep Type: Total/NA**~~  
~~**Prep Batch: 330337**~~

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Plutonium-241	9.61	9.196		1.66	5.00	1.74	pCi/g	96	80 - 120
<b>Tracer</b>	<b>%Yield</b>	<b>LCS Qualifier</b>	<b>LCS</b>	<b>Limits</b>					
Pu-242 (T)	84.2			30 - 105					

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 160-24788-1  
 SDG: SL2694

**Method: ST-RC-0245 - Plutonium-241 (LSC) (Continued)**

**Lab Sample ID: 160-24788-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 332473**

**Client Sample ID: B3CVJ7**  
**Prep Type: Total/NA**  
**Prep Batch: 330337**

Analyte	Sample	Sample	DU		Total	RL	MDC	Unit	RER	RER	Limit
	Result	Qual	Result	Qual	Uncert. (2σ+/-)						
Plutonium-241	0.298	U	-0.292	U	0.966	5.00	1.68	pCi/g	0.29		1
<b>Tracer</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>								
Pu-242 (T)	97.6		30 - 105								

**Lab Sample ID: MB 160-330706/1-A**  
**Matrix: Solid**  
**Analysis Batch: 332651**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 330706**

Analyte	MB	MB	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac	
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)							
Plutonium-241	0.217	U	0.847	0.847	5.00	1.46	pCi/g	10/06/17 09:58	10/18/17 16:29	1	
<b>Tracer</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>				<b>Prepared</b>		<b>Analyzed</b>		<b>Dil Fac</b>
Pu-242 (T)	104		30 - 105				10/06/17 09:58		10/18/17 16:29		1

**Lab Sample ID: LCS 160-330706/2-A**  
**Matrix: Solid**  
**Analysis Batch: 332651**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 330706**

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec Limits
				Uncert. (2σ+/-)					
Plutonium-241	9.61	9.539		1.56	5.00	1.48	pCi/g	99	80 - 120
<b>Tracer</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>						
Pu-242 (T)	96.8		30 - 105						

**Lab Sample ID: 160-24833-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 332651**

**Client Sample ID: B3C1X2**  
**Prep Type: Total/NA**  
**Prep Batch: 330706**

Analyte	Sample	Sample	DU		Total	RL	MDC	Unit	RER	RER	Limit
	Result	Qual	Result	Qual	Uncert. (2σ+/-)						
Plutonium-241	1.02	U	0.768	U	0.854	5.00	1.39	pCi/g	0.13		1
<b>Tracer</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>								
Pu-242 (T)	105		30 - 105								

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 160-24788-1  
 SDG: SL2694

**Method: TC-02-RC - Technetium-99 (LSC)**

**Lab Sample ID: MB 160-331140/1-A**  
**Matrix: Solid**  
**Analysis Batch: 332151**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 331140**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium-99	-0.0913	U	0.175	0.175	1.00	0.305	pCi/g	10/10/17 10:08	10/13/17 20:08	1
<b>Tracer</b>	<b>%Yield</b>	<b>MB Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Tc-99m	106		30 - 110					10/10/17 10:08	10/13/17 20:08	1

**Lab Sample ID: LCS 160-331140/2-A**  
**Matrix: Solid**  
**Analysis Batch: 332151**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 331140**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Technetium-99	10.3	9.261		0.970	1.00	0.292	pCi/g	90	80 - 120
<b>Tracer</b>	<b>%Yield</b>	<b>LCS Qualifier</b>	<b>Limits</b>						
Tc-99m	108		30 - 110						

**Lab Sample ID: 160-24833-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 332151**

**Client Sample ID: B3C1X2**  
**Prep Type: Total/NA**  
**Prep Batch: 331140**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Technetium-99	-0.067	U	-0.0461	U	0.221	1.00	0.381	pCi/g	0.05	1
<b>Tracer</b>	<b>%Yield</b>	<b>DU Qualifier</b>	<b>Limits</b>							
Tc-99m	84.9		30 - 110							

# Tracer/Carrier Summary

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 160-24788-1  
 SDG: SL2694

## Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)

Matrix: Soil

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Am-243 (30-105)	
160-24788-1	B3CVJ7	76.8	
160-24788-1 DU	B3CVJ7	73.2	
160-24833-1	B3C1X2	108 X	
160-24833-1 DU	B3C1X2	101	
<b>Tracer/Carrier Legend</b>			
Am-243 = Americium-243			

## Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Am-243 (30-105)	
LCS 160-330332/2-A	Lab Control Sample	60.7	
LCS 160-330614/2-A	Lab Control Sample	108 X	
MB 160-330332/1-A	Method Blank	47.2	
MB 160-330614/1-A	Method Blank	98.6	
<b>Tracer/Carrier Legend</b>			
Am-243 = Americium-243			

## Method: A-01-R - Isotopic Plutonium (Alpha Spectrometry)

Matrix: Soil

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Pu-242 (T) (30-105)	
160-24788-1	B3CVJ7	90.9	
160-24788-1 DU	B3CVJ7	97.6	
160-24833-1	B3C1X2	88.3	
160-24833-1 DU	B3C1X2	105	
<b>Tracer/Carrier Legend</b>			
Pu-242 (T) = Pu-242 (T)			

## Method: A-01-R - Isotopic Plutonium (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Pu-242 (T) (30-105)	
LCS 160-330334/2-A	Lab Control Sample	84.2	
LCS 160-330703/2-A	Lab Control Sample	96.8	
MB 160-330334/1-A	Method Blank	100	
MB 160-330703/1-A	Method Blank	104	
<b>Tracer/Carrier Legend</b>			
Pu-242 (T) = Pu-242 (T)			

# Tracer/Carrier Summary

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 160-24788-1  
 SDG: SL2694

## Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Matrix: Soil

Prep Type: Total/NA

### Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	U-232 (30-105)
160-24788-1	B3CVJ7	83.9
160-24788-1 DU	B3CVJ7	84.0
160-24833-1	B3C1X2	71.9
160-24833-1 DU	B3C1X2	88.6

**Tracer/Carrier Legend**

U-232 = Uranium-232

## Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

### Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	U-232 (30-105)
LCS 160-330336/2-A	Lab Control Sample	85.6
LCS 160-330704/2-A	Lab Control Sample	78.9
MB 160-330336/1-A	Method Blank	70.7
MB 160-330704/1-A	Method Blank	85.6

**Tracer/Carrier Legend**

U-232 = Uranium-232

## Method: SR-03-RC - Total Beta Strontium (GFPC)

Matrix: Soil

Prep Type: Total/NA

### Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Sr (C) (40-110)
160-24788-1	B3CVJ7	79.5
160-24788-1 DU	B3CVJ7	82.2
160-24833-1	B3C1X2	84.0
160-24833-1 DU	B3C1X2	82.7

**Tracer/Carrier Legend**

Sr (C) = Sr Carrier

## Method: SR-03-RC - Total Beta Strontium (GFPC)

Matrix: Solid

Prep Type: Total/NA

### Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Sr (C) (40-110)
LCS 160-330331/2-A	Lab Control Sample	87.5
LCS 160-330761/2-A	Lab Control Sample	87.5
MB 160-330331/1-A	Method Blank	89.3
MB 160-330761/1-A	Method Blank	86.8

**Tracer/Carrier Legend**

Sr (C) = Sr Carrier

# Tracer/Carrier Summary

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-06

TestAmerica Job ID: 160-24788-1  
 SDG: SL2694

## Method: ST-RC-0245 - Plutonium-241 (LSC)

Matrix: Soil

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Pu-242 (T) (30-105)	
160-24788-1	B3CVJ7	90.9	
160-24788-1 DU	B3CVJ7	97.6	
160-24833-1	B3C1X2	88.3	
160-24833-1 DU	B3C1X2	105	
<b>Tracer/Carrier Legend</b>			
Pu-242 (T) = Pu-242 (T)			

## Method: ST-RC-0245 - Plutonium-241 (LSC)

Matrix: Solid

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Pu-242 (T) (30-105)	
LCS 160-330337/2-A	Lab Control Sample	84.2	
LCS 160-330706/2-A	Lab Control Sample	96.8	
MB 160-330337/1-A	Method Blank	100	
MB 160-330706/1-A	Method Blank	104	
<b>Tracer/Carrier Legend</b>			
Pu-242 (T) = Pu-242 (T)			

## Method: TC-02-RC - Technetium-99 (LSC)

Matrix: Soil

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Tc-99m (30-110)	
160-24833-1	B3C1X2	104	
160-24833-1 DU	B3C1X2	84.9	
<b>Tracer/Carrier Legend</b>			
Tc-99m = Tc-99m			

## Method: TC-02-RC - Technetium-99 (LSC)

Matrix: Solid

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Tc-99m (30-110)	
LCS 160-331140/2-A	Lab Control Sample	108	
MB 160-331140/1-A	Method Blank	106	
<b>Tracer/Carrier Legend</b>			
Tc-99m = Tc-99m			

**FORM II**

**Date:** 18-Oct-17

**DUPLICATE RESULTS**

**Lab Name:** TestAmerica Inc

**SDG:** W07915

**Collection Date:** 10/3/2017 8:45:00 AM

**Lot-Sample No.:** J7J030404-1

**Report No. :** 71903

**Received Date:** 10/3/2017 3:35:00 PM

**Client Sample ID:** B3C1W8 DUP

**COC No. :** FRC17-006-03

**Matrix:** SOIL

Parameter	Result, Orig Rst	Qual	Count Error ( 2 s)	CSU ( 2 s)	MDL, Action Lev	Rpt Unit, CRDL	Yield	Rst/MDL, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
<b>Batch:</b> 7285010	I129_SEP_LEPS_GS		<b>Work Order:</b> NAGHK1AC		<b>Report DB ID:</b> NAGHK1CR			<b>Orig Sa DB ID:</b> 9NAGHK10				
I129	-2.59E-03	U	7.3E-02	7.3E-02	1.16E-01	pCi/g		-0.02	10/12/17 03:38 p		75.7	LEP4\$1
	-3.17E-02	U	<b>RPD -169.8</b>			1.00E+00		-0.07			g	

**No. of Results:** 1    **Comments:**

TestAmerica Inc    **RPD** - Relative Percent Difference.  
 rptSTLRchDupV5.    **MDC|MDA,Lc** - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.  
 8.5 A2002    **U Qual** - Analyzed for but not detected above limiting criteria, Mdc/Mda/Mdl, Total Uncert, RDL or not identified by gamma scan software.

**FORM II**

**Date:** 18-Oct-17

**BLANK RESULTS**

**Lab Name:** TestAmerica Inc

**SDG:** W07915

**Matrix:** SOIL

**Report No. :** 71903

Parameter	Result	Qual	Count Error ( 2 s)	CSU (2 s)	MDL, Lc	Rpt Unit, CRDL	Yield	Rst/MDL, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
<b>Batch:</b> 7285010	I129_SEP_LEPS_GS											
	I129	U	8.2E-02	8.2E-02	1.23E-01	pCi/g		0.71	10/12/17 05:45 p		52.0	LEP4\$1
					6.22E-02	1.00E+00		(2.1)			g	

**No. of Results:** 1      **Comments:**

**FORM II**  
**LCS RESULTS**

Date: 18-Oct-17

Lab Name: TestAmerica Inc

SDG: W07915

Matrix: SOIL

Report No. : 71903

Parameter	Result	Qual	Count Error ( 2 s)	CSU ( 2 s)	MDL	Report Unit	Yield	Expected	Expected Uncert	Recovery, Bias	Analysis, Prep Date	Aliquot Size	Primary Detector
Batch: 7285010	I129_SEP_LEPS_GS					Work Order: NAG3X1AC		Report DB ID: NAG3X1CS					
I129	2.19E+01		2.8E+00	2.8E+00	2.89E-01	pCi/g		1.98E+01		110%	10/12/17 03:39 p	64.95	LEP5\$1
							Rec Limits:	80	120	0.1		g	

No. of Results: 1      Comments: