CHPRC - REVIEW COMMENT RECORD (RCR)

1. Date	2. Review No.
04/16/2018	
3. Project No.	Page 1 of 1

5. Document Number(s)/Title(s)	6. Program/Project/Building Number	7. Reviewer	8. Organization/Group	9. Location/Phone
VSR18-009		Scot Fitzgerald	Sample Management and Reporting	MO277/373-7495

17. Comment Submittal Approval

04/16/2018 (Date)

Scot Fitzgerald (Organization Manager (optional) (print and sign))

10. Agreement With Indicated Comment Disposition(s)

(Date)

(Reviewer/Point of Contact (print and sign))

(Author/Originator (print and sign))

11. CLOSED

04/16/2018 (Date)

(Reviewer/Point of Contact (print and sign))

Scot Fitzgerald (Author/Originator (print and sign))

12. Item	13a. Comments	13b. Basis	13c. Recommendation	14. Reviewer Concurrence Required (Y or N)	15. Disposition (provide justification if **NOT** accepted)	16. Status
1.	No issues noted					

CHPRC - REVIEW COMMENT RECORD (RCR)

1. Date	2. Review No.
4/19/2018	
3. Project No.	Page 1 of 1

5. Document Number(s)/Title(s)	6. Program/Project/Building Number	7. Reviewer	8. Organization/Group	9. Location/Phone
VSR18-009		Jadie Kaas	SGRP QA	MO2216 / 376-2949

17. Comment Submittal Approval

Jadie Kaas

4/19/2018 (Date) — Jadie Kaas (Organization Manager (optional) (print and sign))

10. Agreement With Indicated Comment Disposition(s)

Date

Reviewer/Point of Contact (print and sign)

Author/Originator (print and sign)

11. CLOSED

4/26/2018 (Date)

Jadie Kaas

Author/Originator (print and sign)

12. Item	13a. Comments	13b. Basis	13c. Recommendation	14. Reviewer Concurrence Required (Y or N)	15. Disposition (provide justification if **NOT accepted**)	16. Status
1	On page 28 a J+ flag is discussed for Zn on samples B3BT07 and B3BT09, on page 29 a J- is discussed for Zn on the same two samples. No reconciliation for the conflicting bias is discussed and ultimately a J+ is applied.		Discuss bias conflict, recommend flagging these two results as J	Y		CLOSED

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Data Validation Report for CH2M Hill
Plateau Remediation Company

VSR18-009
Project CERC18, SURV17, CERC17, PA17

Chemical and Radiochemical Validation - Level C

Validation Performed By: Eyda Hergenreder **Date:** 03-29-2018

Eyda Hergenreder

Technical Review By: Ellen McEntee **Date:** 03-30-2018

Ellen McEntee

Quality Review By: Mary A. Donivan **Date:** 04-20-2018

Mary Donivan
Quality Assurance Manager

TABLE OF CONTENTS

Date: 29 March 2018
To: CH2M Hill (technical representative)
From: Analytical Quality Associates, Inc.
Project: CERC18, SURV17, CERC17, PA17
Subject: Volatile Organics - Sample Data Group (SDG) GEL433750

INTRODUCTION

This memorandum presents the results of data validation for SDG GEL433750 prepared by GEL Laboratories LLC. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B3BRY2	09/27/17	Water	C	8260C
B3BRY9	09/27/17	Water	C	8260C
B3BT00	09/27/17	Water	C	8260C
B3BT12	09/27/17	Water	C	8260C
B3BT19	09/27/17	Water	C	8260C
B3BT20	09/27/17	Water	C	8260C

Data validation was conducted in accordance with the CHPRC validation statement of work and the Groundwater Protection Plan for the Environmental Restoration Disposal Facility, WCH-198, Rev. 1 (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 volatile organics are analysis within 14 days of sample collection. Sample preservation requires chilling to ≤6 degrees Celsius and acid preservation with hydrochloric or sulfuric acid to pH <2.

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

- **Blanks**

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

Laboratory Blanks

All laboratory blank results were acceptable.

Trip Blanks

All trip blank results were acceptable with the following exception. The methylene chloride result for trip blank sample B3BRY9 was > the practical quantitation limit (PQL). All associated sample results were non-detects and should not be qualified as a result.

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 matrix spike and laboratory control sample accuracy limits are 70% to 130% which are the statistical limits established by the analytical laboratory.

Surrogates

All surrogate recoveries were acceptable.

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

All MS/MSD recoveries were acceptable with the following exceptions. The MS and MSD recoveries for acetone were < the lower acceptance limit but ≥20%. All associated sample results were non-detects and should be qualified as estimates and flagged "UJ."

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 ≤20%, which is the statistical limit established by the analytical laboratory.

MS/MSD Samples

All MS/MSD relative percent difference values were acceptable.

Field Duplicate Samples

All field duplicate results were acceptable.

Field Split Samples

No field splits were submitted for validation.

- **Internal Standards**

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

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

- **Detection Limits**

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

CRDLs for VOCs except for carbon tetrachloride were not provided in the SAP.

- **Completeness**

SDG GEL433750 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

Minor deficiencies leading to qualification of sample results as estimates were due to low matrix-spike recoveries. See the table in Appendix 2 for a listing of all affected sample results.

REFERENCES

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

WCH-198, Rev. 1, *Groundwater Protection Plan for the Environmental Restoration Disposal Facility*, March 2016.

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

Volatile Organics Data Qualification Summary			
SDG: GEL433750	Reviewer: AQA	Project(s): CERC18, SURV17, CERC17, PA17	Page 1 of 1
Analyte(s)	**Qualifier**	**Samples Affected**	**Reason**
Acetone	UJ	B3BRY2, B3BRY9, B3BT00, B3BT12, B3BT19, B3BT20	Low matrix spike recoveries

Comments: None

Appendix 3

Data Validation Supporting Documentation

Appendix A - Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	(C)	D	E
PROJECT: CERC18, SURV17, CERC17, PA17			DATA PACKAGE: VSR18-009		
VALIDATOR: Eyda Hergenreder		LAB: GEL		DATE: 03/29/18	
			SDG: GEL433750		
ANALYSES PERFORMED					
SW-846 8260 X		SW-846 8260 (TCLP)	SW-846 8270		SW-846 8270 (TCLP)
SAMPLES/MATRIX Water					
SDG GEL433750: B3BRY2, B3BRY9, B3BT00, B3BT12, B3BT19, B3BT20					

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

Technical verification documentation present?	(Yes) No N/A

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

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

GC/MS tuning/performance check acceptable?	Yes No (N/A)
Initial calibrations acceptable?	Yes No (N/A)
Continuing calibrations acceptable?	Yes No (N/A)
Standards traceable?	Yes No (N/A)
Standards expired?	Yes No (N/A)
Calculation check acceptable?	Yes No (N/A)

Comments:

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

Calibration blanks analyzed? (Levels D, E)	Yes No (N/A)
Calibration blank results acceptable? (Levels D, E)	Yes No (N/A)
Laboratory blanks analyzed?	(Yes) No N/A
Laboratory blank results acceptable?	(Yes) No N/A
Field/trip blanks analyzed? (Levels C, D, E)	(Yes) No N/A
Field/trip blank results acceptable? (Levels C, D, E)	Yes (No) N/A
Transcription/calculation errors? (Levels D, E)	Yes No (N/A)

Comments:

SDG GEL433750: Trip blank sample B3BRY9 methlylene chloride 15.3 ug/L

Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

SDG GEL433750: MS/MSD acetone 62%/60% (non-SDG sample)

Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

6. SYSTEM PERFORMANCE (Levels D and E)

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

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

7. HOLDING TIMES (all levels)

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

Comments:

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

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

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

9. SAMPLE CLEANUP (Levels D and E)

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

Comments (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 24, 2017

CH2MHill Plateau Remediation Company
MSIN R3-50 CHPRC
PO Box 1600
Richland, Washington

Contact: **Mr. Scot Fitzgerald**

Workorder: **433750**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 1706836										
QC1203889686 LCS										
1,1,1-Trichloroethane	50.0			53.5	ug/L		107	(70%-130%)	JEB	10/05/17 09:57
1,1,2-Trichloroethane	50.0			50.7	ug/L		101	(70%-130%)		
1,1-Dichloroethane	50.0			52.8	ug/L		106	(70%-130%)		
1,1-Dichloroethylene	50.0			53.3	ug/L		107	(70%-130%)		
1,2-Dichloroethane	50.0			53.3	ug/L		107	(70%-130%)		
2-Butanone	250			301	ug/L		120	(70%-130%)		
4-Methyl-2-pentanone	250			248	ug/L		99	(70%-130%)		
Acetone	250			287	ug/L		115	(70%-130%)		
Benzene	50.0			52.0	ug/L		104	(70%-130%)		
Carbon disulfide	250			261	ug/L		105	(70%-130%)		
Carbon tetrachloride	50.0			55.5	ug/L		111	(70%-130%)		
Chlorobenzene	50.0			50.7	ug/L		101	(70%-130%)		
Chloroform	50.0			52.1	ug/L		104	(70%-130%)		

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QC Summary

Workorder: **433750**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 1706836										
Ethylbenzene	50.0			51.2	ug/L		102	(70%-130%)	JEB	10/05/17 09:57
Methylene chloride	50.0			49.9	ug/L		100	(70%-130%)		
Tetrachloroethylene	50.0			52.6	ug/L		105	(70%-130%)		
Toluene	50.0			50.3	ug/L		101	(70%-130%)		
Trichloroethylene	50.0			54.6	ug/L		109	(70%-130%)		
Vinyl chloride	50.0			42.7	ug/L		85	(70%-130%)		
Xylenes (total)	150			154	ug/L		102	(70%-130%)		
**1,2-Dichloroethane-d4	50.0			50.5	ug/L		101	(70%-130%)		
**Bromofluorobenzene	50.0			49.7	ug/L		99	(70%-130%)		
**Toluene-d8	50.0			48.9	ug/L		98	(70%-130%)		
QC1203889685 MB										
1,1,1-Trichloroethane			U	0.300	ug/L					10/05/17 11:35
1,1,2-Trichloroethane			U	0.300	ug/L					
1,1-Dichloroethane			U	0.300	ug/L					
1,1-Dichloroethylene			U	0.300	ug/L					
1,2-Dichloroethane			U	0.300	ug/L					

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QC Summary

Workorder: **433750**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Volatile-GC/MS											
Batch 1706836											
2-Butanone			U	3.00	ug/L				JEB	10/05/17	11:35
4-Methyl-2-pentanone			U	3.00	ug/L						
Acetone			U	3.00	ug/L						
Benzene			U	0.300	ug/L						
Carbon disulfide			U	1.60	ug/L						
Carbon tetrachloride			U	0.300	ug/L						
Chlorobenzene			U	0.300	ug/L						
Chloroform			U	0.300	ug/L						
Ethylbenzene			U	0.300	ug/L						
Methylene chloride			U	1.60	ug/L						
Tetrachloroethylene			U	0.300	ug/L						
Toluene			U	0.300	ug/L						
Trichloroethylene			U	0.300	ug/L						
Vinyl chloride			U	0.300	ug/L						
Xylenes (total)			U	0.300	ug/L						

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QC Summary

Workorder: **433750**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 1706836										
**1,2-Dichloroethane-d4	50.0			48.5	ug/L		97	(70%-130%)	JEB	10/05/17 11:35
**Bromofluorobenzene	50.0			49.7	ug/L		99	(70%-130%)		
**Toluene-d8	50.0			50.4	ug/L		101	(70%-130%)		
QC1203889687 433632006 PS										
1,1,1-Trichloroethane	50.0	U	0.00	53.3	ug/L		107	(70%-130%)		10/05/17 18:00
1,1,2-Trichloroethane	50.0	U	0.00	49.4	ug/L		99	(70%-130%)		
1,1-Dichloroethane	50.0	U	0.00	53.2	ug/L		106	(70%-130%)		
1,1-Dichloroethylene	50.0	U	0.00	52.7	ug/L		105	(70%-130%)		
1,2-Dichloroethane	50.0	U	0.00	53.9	ug/L		108	(70%-130%)		
2-Butanone	250	U	0.00	219	ug/L		88	(70%-130%)		
4-Methyl-2-pentanone	250	U	0.00	255	ug/L		102	(70%-130%)		
Acetone	250	TU	0.00	T 156	ug/L		62*	(70%-130%)		
Benzene	50.0	U	0.00	51.4	ug/L		103	(70%-130%)		
Carbon disulfide	250	U	0.00	262	ug/L		105	(70%-130%)		
Carbon tetrachloride	50.0	U	0.00	55.4	ug/L		111	(70%-130%)		
Chlorobenzene	50.0	U	0.00	47.7	ug/L		95	(70%-130%)		

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QC Summary

Workorder: **433750**

Parmname	NOM		Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Volatile-GC/MS											
Batch 1706836											
Chloroform	50.0	U	0.00		52.2	ug/L		104	(70%-130%)	JEB	10/05/17 18:00
Ethylbenzene	50.0	U	0.00		48.4	ug/L		97	(70%-130%)		
Methylene chloride	50.0	J	1.78		49.4	ug/L		95	(70%-130%)		
Tetrachloroethylene	50.0	U	0.00		48.7	ug/L		97	(70%-130%)		
Toluene	50.0	U	0.00		48.7	ug/L		97	(70%-130%)		
Trichloroethylene	50.0	U	0.00		52.7	ug/L		105	(70%-130%)		
Vinyl chloride	50.0	U	0.00		55.7	ug/L		111	(70%-130%)		
Xylenes (total)	150	U	0.00		144	ug/L		96	(70%-130%)		
**1,2-Dichloroethane-d4	50.0		52.8		52.3	ug/L		105	(70%-130%)		
**Bromofluorobenzene	50.0		50.6		49.4	ug/L		99	(70%-130%)		
**Toluene-d8	50.0		49.0		49.5	ug/L		99	(70%-130%)		
QC1203889688 433632006 PSD											
1,1,1-Trichloroethane	50.0	U	0.00		51.4	ug/L	4	103	(0%-20%)		10/05/17 18:23
1,1,2-Trichloroethane	50.0	U	0.00		48.6	ug/L	2	97	(0%-20%)		
1,1-Dichloroethane	50.0	U	0.00		51.6	ug/L	3	103	(0%-20%)		
1,1-Dichloroethylene	50.0	U	0.00		50.5	ug/L	4	101	(0%-20%)		

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QC Summary

Workorder: **433750**

Parmname	NOM		Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Volatile-GC/MS											
Batch 1706836											
1,2-Dichloroethane	50.0	U	0.00		52.6	ug/L	2	105	(0%-20%)	JEB	10/05/17 18:23
2-Butanone	250	U	0.00		207	ug/L	6	83	(0%-20%)		
4-Methyl-2-pentanone	250	U	0.00		244	ug/L	4	98	(0%-20%)		
Acetone	250	TU	0.00	T	150	ug/L	4	60*	(0%-20%)		
Benzene	50.0	U	0.00		50.1	ug/L	3	100	(0%-20%)		
Carbon disulfide	250	U	0.00		253	ug/L	3	101	(0%-20%)		
Carbon tetrachloride	50.0	U	0.00		53.2	ug/L	4	106	(0%-20%)		
Chlorobenzene	50.0	U	0.00		47.0	ug/L	2	94	(0%-20%)		
Chloroform	50.0	U	0.00		50.7	ug/L	3	101	(0%-20%)		
Ethylbenzene	50.0	U	0.00		47.4	ug/L	2	95	(0%-20%)		
Methylene chloride	50.0	J	1.78		48.5	ug/L	2	93	(0%-20%)		
Tetrachloroethylene	50.0	U	0.00		47.1	ug/L	3	94	(0%-20%)		
Toluene	50.0	U	0.00		47.6	ug/L	2	95	(0%-20%)		
Trichloroethylene	50.0	U	0.00		51.0	ug/L	3	102	(0%-20%)		
Vinyl chloride	50.0	U	0.00		53.2	ug/L	5	106	(0%-20%)		

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QC Summary

Workorder: **433750**

Parmname	NOM		Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Volatile-GC/MS											
Batch 1706836											
Xylenes (total)	150	U	0.00		141	ug/L	2	94	(0%-20%)	JEB	10/05/17 18:23
**1,2-Dichloroethane-d4	50.0		52.8		51.6	ug/L		103	(70%-130%)		
**Bromofluorobenzene	50.0		50.6		49.4	ug/L		99	(70%-130%)		
**Toluene-d8	50.0		49.0		49.4	ug/L		99	(70%-130%)		

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 (0rganics only)

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

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

Surrogate Recovery Report

SDG Number: GEL433750

Matrix Type: LIQUID

Sample ID	Client ID	DCED4 %REC	TOL %REC	BFB %REC
1203889686	LCS for batch 1706836	101	98	99
1203889685	MB for batch 1706836	97	101	99
433750007	B3BRY2	102	99	98
433750009	B3BRY9	101	99	98
433750010	B3BT00	102	98	97
433750011	B3BT12	104	99	98
433750013	B3BT19	104	100	100
433750016	B3BT20	102	99	97
1203889687	B3CW41PS	105	99	99
1203889688	B3CW41PSD	103	99	99

Surrogate		Acceptance Limits
DCED4	= 1,2-Dichloroethane-d4	(70%-130%)
TOL	= Toluene-d8	(70%-130%)
BFB	= Bromofluorobenzene	(70%-130%)

* Recovery outside Acceptance Limits

Column to be used to flag recovery values

D Sample Diluted

Date: 20 April 2018
To: CH2M Hill (technical representative)
From: Analytical Quality Associates, Inc.
Project(s): CERC18, SURV17, CERC17, PA17
Subject: Inorganics - Sample Data Groups (SDGs) DN0227 and GEL433750

INTRODUCTION

This memorandum presents the results of data validation for SDG DN0227 prepared by TestAmerica Laboratories, Inc and SDG GEL433750 prepared by GEL Laboratories LLC. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B3BT09	09/27/17	Water	C	6010D, 6020B
B3BT07	09/27/17	Water	C	6010D, 6020B
B3BT08	09/27/17	Water	C	6010D, 6020B
B3BT10	09/27/17	Water	C	6010D, 6020B
B3BRY2	09/27/17	Water	C	6010D, 6020B
B3BRY7	09/27/17	Water	C	6010D, 6020B
B3BT12	09/27/17	Water	C	6010D, 6020B
B3BT17	09/27/17	Water	C	6010D, 6020B
B3BT19	09/27/17	Water	C	6010D, 6020B
B3BT29	09/27/17	Water	C	6010D, 6020B
B3BT30	09/27/17	Water	C	6010D, 6020B
B3BT20	09/27/17	Water	C	6010D, 6020B

Data validation was conducted in accordance with the CHPRC validation statement of work and the Groundwater Protection Plan for the Environmental Restoration Disposal Facility, WCH-198, Rev. 1. 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. Sample preservation requires acid preservation with nitric acid to pH <2.

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 DN0227
(Associated with samples B3BT07 & B3BT08)

The Na, Tl and Zn laboratory blank results were detects > the method detection limits (MDLs) but < the reporting limits (RLs). The Na result for sample B3BT07 and the Tl result for sample B3BT08 were detects ≥ MDLs but ≤ the RLs and should be qualified as estimates and flagged "J+." The Zn result for sample B3BT07 was a detect > the RL but ≤ 20X the blank value and should be qualified as an estimate and would be flagged J+, but was flagged "J" due to other QC infraction. All other Na, Tl and Zn sample results were either non-detects or detects >20X the blank values and should not be qualified as a result.

(Associated with samples B3BT09 & B3BT10)

The Na, Fe, Co, Tl, Zn, Ba and U laboratory blank results were detects > the MDLs but < the RLs. The Na and Zn results for sample B3BT09 and the Co and Tl results for sample B3BT10 were detects ≥ the MDLs but ≤ the RLs, and should be qualified as estimates and except for Zn associated with sample B3BT09 were flagged "J+." The Zn result for sample B3BT09 would be flagged J+, but was flagged "J" due to other QC infractions. All other Na, Fe, Co, Tl, Zn, Ba and U sample results were either non-detects or detects >20X the blank values and should not be qualified as a result.

For SDG GEL433750, the Na laboratory blank result was a detect > the MDL but < the RL. All Na sample results were detects >20X the blank value and should not be qualified as a result.

Trip Blanks

All trip blank results were acceptable with the following exceptions.

For SDG DN0227, Fe, Mg, K, Na, Be and Zn were detected in trip blank B3BT07 and Na and Zn were detected in trip blank sample B3BT09.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results, laboratory control sample results, and ICP-AES interference check sample results. According to the SAP, the matrix spike sample and the laboratory control sample limits are 80% to 120%. 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 exceptions.

For SDG DN0227, the MS and MSD recoveries for Zn associated with all samples were < the lower acceptance limit but ≥30% and no post-digestion spike were analyzed. The Zn results for samples B3BT07 and B3BT09 were detects and should be qualified as estimates and would be flagged J-, but were flagged "J" due to other QC infractions. The Zn results for samples B3BT08 and B3BT10 were non-detects and should be qualified as estimates and flagged "UJ."

For SDG GEL433750, the MS and MSD recoveries were above the acceptance limit; however, the parent sample result for Ca was >4X the spike concentration. Data should not be qualified as a result.

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, 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 ±20%. The limits for reported analytes not listed in the SAP are specified by the DV procedure.

MS/MSD Samples

All MS/MSD RPD values were acceptable.

Field Duplicate Samples

All field duplicate results were acceptable.

Field Split Samples

No field splits were submitted for validation.

ICP Serial Dilution Samples

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

- **ICP-MS Internal Standards**

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

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

- **Detection Limits**

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

All reported sample MDLs were below the CRDLs.

- **Completeness**

SDGs DN0227 and GEL433750 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 laboratory blank infractions and low matrix spike recoveries. See the table in Appendix 2 for a listing of all affected sample results.

REFERENCES

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

WCH-198, Rev. 1, *Groundwater Protection Plan for the Environmental Restoration Disposal Facility*, March 2016.

Appendix 1

Glossary of Data Reporting Qualifiers

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

- **U** — The constituent was analyzed for, but was not detected. The data should be considered usable for decision-making purposes.

- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the RL. The data should be considered usable for decision-making purposes.

- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **N** — The analysis indicates the presence of an analyte that has been tentatively identified.

- **NJ** — The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

- **NJ+** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation.

- **NJ-** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation.

- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

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

Appendix 2

Summary of Data Qualification

Inorganic Data Qualification Summary			
SDG: DN0277, GEL433750	Reviewer: AQA	Project(s): CERC18, SURV17, CERC17, PA17	Page 1 of 1
Analyte(s)	**Qualifier**	**Samples Affected**	**Reason**
Na	J+	B3BT07, B3BT09	Laboratory blank contamination
Tl	J+	B3BT08, B3BT10	Laboratory blank contamination
Zn	J	B3BT07, B3BT09	Laboratory blank contamination and low matrix spike recoveries
Co	J+	B3BT10	Laboratory blank contamination
Zn	UJ	B3BT08, B3BT10	Low matrix spike recoveries

Comments: None

Appendix 3

Data Validation Supporting Documentation

Appendix A - (Cont.) Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	(C)	D	E
PROJECT: CERC18, SURV17, CERC17, PA17			DATA PACKAGE: VSR18-009		
VALIDATOR: Eyda Hergenreder		LAB: TestAmerica, GEL		DATE: 03/29/18	
			SDG: DN0227, GEL433750		
ANALYSES PERFORMED					
SW-846/ICP X	SW-846/GFAA	SW-846/Hg	SW-846 Cyanide	SW-846/ICP-MS X	
SAMPLES/MATRIX Water					
SDG DN0227: B3BT09, B3BT07, B3BT08, B3BT10					
SDG GEL433750: B3BRY2, B3BRY7, B3BT12, B3BT17, B3BT19, B3BT29, B3BT30, B3BT20					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present?	(Yes) No N/A

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

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

Initial calibrations performed on all instruments?	Yes No (N/A)
Initial calibrations acceptable?	Yes No (N/A)
ICP interference checks acceptable?	Yes No (N/A)
ICV and CCV checks performed on all instruments?	Yes No (N/A)
ICV and CCV checks acceptable?	Yes No (N/A)
Standards traceable?	Yes No (N/A)
Standards expired?	Yes No (N/A)
Calculation check acceptable?	Yes No (N/A)

Comments:

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

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

Comments:

SDG DN0227:MB (Tot) Na 170.7ug/L, Tl 0.062 ug/L, Zn 3.14 ug/L;
(Dis)Na 206.6 ug/L, Fe 53.01 ug/L, Co 0.072 ug/L, Tl 0.351 ug/L Zn 8.09 ug/L, Ba 0.43 ug/L, U 0.093 ug/L
Trip blank B3BT07: Fe, 34.6 ug/L, Mg 13.8 ug/L, K 333 ug/L, Na 156 ug/L, Be 0.091 ug/L, Zn 15.1 ug/L
Trip blank B3BT09: Na 237 ug/L, Zn 9.9 ug/L

SDG GEL433750: MB Na 102 ug/L

Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

SDG DN0227: (Tot) Zn MS/MSD 52%/52%; (Dis) Zn MS/MSD 68%/72%

SDG GEL433750: Ca MS/MSD 154%/144% (parent sample result >4X spike concentration).

Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

6. **ICP QUALITY CONTROL (Levels D and E)**

ICP serial dilution samples analyzed?	Yes No (N/A)
ICP serial dilution %D values acceptable?	Yes No (N/A)
ICP post digestion spike required?	Yes No (N/A)
ICP post digestion spike values acceptable?	Yes No (N/A)
Standards traceable?	Yes No (N/A)
Standards expired?	Yes No (N/A)
Transcription/calculation errors?	Yes No (N/A)

Comments:

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

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

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

8. **RESULT QUANTITATION AND DETECTION LIMITS (all levels)**

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

Comments (attach additional sheets as necessary):

Appendix 4

Additional Documentation Requested By Client

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: I17-010

TestAmerica Job ID: 280-101689-1
SDG: DN0227

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 280-389529/1-A
Matrix: Water
Analysis Batch: 390025

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 389529

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	34.5	U	200	34.5	ug/L		10/02/17 14:15	10/03/17 22:24	1
Iron	22.0	U	100	22.0	ug/L		10/02/17 14:15	10/03/17 22:24	1
Potassium	237	U	3000	237	ug/L		10/02/17 14:15	10/03/17 22:24	1
Sodium	170.7	B	1000	117	ug/L		10/02/17 14:15	10/03/17 22:24	1

Lab Sample ID: MB 280-389529/1-A
Matrix: Water
Analysis Batch: 390101

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 389529

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	4.4	U	100	4.4	ug/L		10/02/17 14:15	10/05/17 04:23	1
Magnesium	10.7	U	200	10.7	ug/L		10/02/17 14:15	10/05/17 04:23	1
Vanadium	1.1	U	10.0	1.1	ug/L		10/02/17 14:15	10/05/17 04:23	1

Lab Sample ID: LCS 280-389529/2-A
Matrix: Water
Analysis Batch: 390025

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 389529

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Calcium	50000	48320		ug/L		97	80 - 120
Iron	1000	980.1		ug/L		98	80 - 120
Potassium	50000	50000		ug/L		100	80 - 120
Sodium	50000	52310		ug/L		105	80 - 120

Lab Sample ID: LCS 280-389529/2-A
Matrix: Water
Analysis Batch: 390101

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 389529

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1000	902.3		ug/L		90	80 - 120
Magnesium	50000	45200		ug/L		90	80 - 120
Vanadium	500	462.7		ug/L		93	80 - 120

Lab Sample ID: 280-101689-2 MS
Matrix: Water
Analysis Batch: 390025

Client Sample ID: B3BT07
Prep Type: Total/NA
Prep Batch: 389529

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Calcium	34.5	U	50000	47900		ug/L		96	75 - 125
Iron	34.6	B	1000	968.8		ug/L		93	75 - 125
Potassium	333	B	50000	49550		ug/L		98	75 - 125
Sodium	156	B C	50000	51940		ug/L		104	75 - 125

Lab Sample ID: 280-101689-2 MS
Matrix: Water
Analysis Batch: 390101

Client Sample ID: B3BT07
Prep Type: Total/NA
Prep Batch: 389529

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	4.4	U	1000	942.3		ug/L		94	75 - 125

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: I17-010

TestAmerica Job ID: 280-101689-1
SDG: DN0227

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

Lab Sample ID: 280-101689-2 MS
Matrix: Water
Analysis Batch: 390101

Client Sample ID: B3BT07
Prep Type: Total/NA
Prep Batch: 389529

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Magnesium	13.8	B	50000	47000		ug/L		94	75 - 125
Vanadium	1.1	U	500	481.5		ug/L		96	75 - 125

Lab Sample ID: 280-101689-2 MSD
Matrix: Water
Analysis Batch: 390025

Client Sample ID: B3BT07
Prep Type: Total/NA
Prep Batch: 389529

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Calcium	34.5	U	50000	50030		ug/L		100	75 - 125	4	20
Iron	34.6	B	1000	1013		ug/L		98	75 - 125	4	20
Potassium	333	B	50000	51630		ug/L		103	75 - 125	4	20
Sodium	156	B C	50000	54110		ug/L		108	75 - 125	4	20

Lab Sample ID: 280-101689-2 MSD
Matrix: Water
Analysis Batch: 390101

Client Sample ID: B3BT07
Prep Type: Total/NA
Prep Batch: 389529

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Boron	4.4	U	1000	864.2		ug/L		86	75 - 125	9	20
Magnesium	13.8	B	50000	43140		ug/L		86	75 - 125	9	20
Vanadium	1.1	U	500	441.9		ug/L		88	75 - 125	9	20

Lab Sample ID: MB 280-389530/1-A
Matrix: Water
Analysis Batch: 390025

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 389530

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	4.4	U	100	4.4	ug/L		10/02/17 14:15	10/03/17 21:48	1
Calcium	34.5	U	200	34.5	ug/L		10/02/17 14:15	10/03/17 21:48	1
Iron	53.01	B	100	22.0	ug/L		10/02/17 14:15	10/03/17 21:48	1
Magnesium	10.7	U	200	10.7	ug/L		10/02/17 14:15	10/03/17 21:48	1
Potassium	237	U	3000	237	ug/L		10/02/17 14:15	10/03/17 21:48	1
Sodium	206.6	B	1000	117	ug/L		10/02/17 14:15	10/03/17 21:48	1
Vanadium	1.1	U	10.0	1.1	ug/L		10/02/17 14:15	10/03/17 21:48	1

Lab Sample ID: LCS 280-389530/2-A
Matrix: Water
Analysis Batch: 390025

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 389530

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1000	947.6		ug/L		95	80 - 120
Calcium	50000	48890		ug/L		98	80 - 120
Iron	1000	1005		ug/L		101	80 - 120
Magnesium	50000	47390		ug/L		95	80 - 120
Potassium	50000	50390		ug/L		101	80 - 120
Sodium	50000	52970		ug/L		106	80 - 120
Vanadium	500	481.0		ug/L		96	80 - 120

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: I17-010

TestAmerica Job ID: 280-101689-1
SDG: DN0227

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

Lab Sample ID: 280-101689-1 MS
Matrix: Water
Analysis Batch: 390025

Client Sample ID: B3BT09
Prep Type: Dissolved
Prep Batch: 389530

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	4.4	U	1000	999.5		ug/L		100	75 - 125
Calcium	34.5	U	50000	48270		ug/L		97	75 - 125
Iron	22.0	U	1000	967.9		ug/L		97	75 - 125
Magnesium	10.7	U	50000	50000		ug/L		100	75 - 125
Potassium	237	U	50000	50030		ug/L		100	75 - 125
Sodium	237	B C	50000	52330		ug/L		104	75 - 125
Vanadium	1.1	U	500	507.1		ug/L		101	75 - 125

Lab Sample ID: 280-101689-1 MSD
Matrix: Water
Analysis Batch: 390025

Client Sample ID: B3BT09
Prep Type: Dissolved
Prep Batch: 389530

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Boron	4.4	U	1000	931.2		ug/L		93	75 - 125	7	20
Calcium	34.5	U	50000	47230		ug/L		94	75 - 125	2	20
Iron	22.0	U	1000	960.7		ug/L		96	75 - 125	1	20
Magnesium	10.7	U	50000	46560		ug/L		93	75 - 125	7	20
Potassium	237	U	50000	48800		ug/L		98	75 - 125	2	20
Sodium	237	B C	50000	51160		ug/L		102	75 - 125	2	20
Vanadium	1.1	U	500	471.8		ug/L		94	75 - 125	7	20

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 280-389532/1-A
Matrix: Water
Analysis Batch: 389814

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 389532

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	9.2	U	30.0	9.2	ug/L		09/29/17 14:15	10/03/17 03:40	1
Antimony	0.40	U	2.0	0.40	ug/L		09/29/17 14:15	10/03/17 03:40	1
Arsenic	0.33	U	5.0	0.33	ug/L		09/29/17 14:15	10/03/17 03:40	1
Beryllium	0.080	U	1.0	0.080	ug/L		09/29/17 14:15	10/03/17 03:40	1
Cadmium	0.27	U	1.0	0.27	ug/L		09/29/17 14:15	10/03/17 03:40	1
Chromium	0.50	U	2.0	0.50	ug/L		09/29/17 14:15	10/03/17 03:40	1
Cobalt	0.054	U	1.0	0.054	ug/L		09/29/17 14:15	10/03/17 03:40	1
Copper	0.56	U	2.0	0.56	ug/L		09/29/17 14:15	10/03/17 03:40	1
Lead	0.18	U	1.0	0.18	ug/L		09/29/17 14:15	10/03/17 03:40	1
Manganese	0.31	U	1.0	0.31	ug/L		09/29/17 14:15	10/03/17 03:40	1
Molybdenum	0.14	U	2.0	0.14	ug/L		09/29/17 14:15	10/03/17 03:40	1
Nickel	0.30	U	2.0	0.30	ug/L		09/29/17 14:15	10/03/17 03:40	1
Selenium	0.70	U	5.0	0.70	ug/L		09/29/17 14:15	10/03/17 03:40	1
Silver	0.033	U	5.0	0.033	ug/L		09/29/17 14:15	10/03/17 03:40	1
Strontium	0.30	U	10.0	0.30	ug/L		09/29/17 14:15	10/03/17 03:40	1
Thallium	0.0620	B	1.0	0.050	ug/L		09/29/17 14:15	10/03/17 03:40	1
Thorium	1.2	U	1.0	1.2	ug/L		09/29/17 14:15	10/03/17 03:40	1
Zinc	3.14	B	10.0	2.0	ug/L		09/29/17 14:15	10/03/17 03:40	1

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: I17-010

TestAmerica Job ID: 280-101689-1
SDG: DN0227

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

Lab Sample ID: MB 280-389532/1-A
Matrix: Water
Analysis Batch: 389927

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 389532

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Barium	0.29	U	1.0	0.29	ug/L		09/29/17 14:15	10/03/17 14:20	1
Tin	0.77	U	10.0	0.77	ug/L		09/29/17 14:15	10/03/17 14:20	1
Uranium	0.050	U	1.0	0.050	ug/L		09/29/17 14:15	10/03/17 14:20	1

Lab Sample ID: LCS 280-389532/2-A
Matrix: Water
Analysis Batch: 389814

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 389532

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	400	361.3		ug/L		90	80 - 120
Antimony	40.0	35.46		ug/L		89	80 - 120
Arsenic	40.0	37.46		ug/L		94	80 - 120
Beryllium	40.0	40.64		ug/L		102	80 - 120
Cadmium	40.0	36.92		ug/L		92	80 - 120
Chromium	40.0	37.65		ug/L		94	80 - 120
Cobalt	40.0	38.15		ug/L		95	80 - 120
Copper	40.0	36.59		ug/L		91	80 - 120
Lead	40.0	36.41		ug/L		91	80 - 120
Manganese	40.0	37.10		ug/L		93	80 - 120
Molybdenum	40.0	36.40		ug/L		91	80 - 120
Nickel	40.0	36.10		ug/L		90	80 - 120
Selenium	40.0	39.92		ug/L		100	80 - 120
Silver	40.0	37.38		ug/L		93	80 - 120
Strontium	40.0	37.35		ug/L		93	80 - 120
Thallium	40.0	36.41		ug/L		91	80 - 120
Thorium	40.0	34.87		ug/L		87	80 - 120
Zinc	40.0	37.38		ug/L		93	80 - 120

Lab Sample ID: LCS 280-389532/2-A
Matrix: Water
Analysis Batch: 389927

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 389532

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Barium	40.0	39.99		ug/L		100	80 - 120
Tin	40.0	40.98		ug/L		102	80 - 120
Uranium	40.0	39.29		ug/L		98	80 - 120

Lab Sample ID: 280-101689-2 MS
Matrix: Water
Analysis Batch: 389814

Client Sample ID: B3BT07
Prep Type: Total/NA
Prep Batch: 389532

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	9.2	U	400	375.3		ug/L		94	75 - 125
Antimony	0.40	U	40.0	35.69		ug/L		89	75 - 125
Arsenic	0.33	U	40.0	36.56		ug/L		91	75 - 125
Beryllium	0.091	B	40.0	40.26		ug/L		100	75 - 125
Cadmium	0.27	U	40.0	35.79		ug/L		89	75 - 125
Chromium	0.50	U	40.0	37.34		ug/L		93	75 - 125
Cobalt	0.054	U	40.0	37.96		ug/L		95	75 - 125

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: I17-010

TestAmerica Job ID: 280-101689-1
SDG: DN0227

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

Lab Sample ID: 280-101689-2 MS
Matrix: Water
Analysis Batch: 389814

Client Sample ID: B3BT07
Prep Type: Total/NA
Prep Batch: 389532

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Copper	0.56	U	40.0	36.32		ug/L		91	75 - 125
Lead	0.18	U	40.0	36.37		ug/L		91	75 - 125
Manganese	0.31	U	40.0	36.36		ug/L		91	75 - 125
Molybdenum	0.14	U	40.0	36.03		ug/L		90	75 - 125
Nickel	0.30	U	40.0	37.59		ug/L		94	75 - 125
Selenium	0.70	U	40.0	39.94		ug/L		100	75 - 125
Silver	0.033	U	40.0	39.06		ug/L		98	75 - 125
Strontium	0.30	U	40.0	37.13		ug/L		93	75 - 125
Thallium	0.050	U	40.0	36.36		ug/L		91	75 - 125
Thorium	1.2	U	40.0	35.20		ug/L		88	75 - 125
Zinc	15.1	N C	40.0	35.91	N	ug/L		52	75 - 125

Lab Sample ID: 280-101689-2 MS
Matrix: Water
Analysis Batch: 389927

Client Sample ID: B3BT07
Prep Type: Total/NA
Prep Batch: 389532

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Barium	0.29	U	40.0	40.99		ug/L		102	75 - 125
Tin	0.77	U	40.0	40.77		ug/L		102	75 - 125
Uranium	0.050	U	40.0	40.58		ug/L		101	75 - 125

Lab Sample ID: 280-101689-2 MSD
Matrix: Water
Analysis Batch: 389814

Client Sample ID: B3BT07
Prep Type: Total/NA
Prep Batch: 389532

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Aluminum	9.2	U	400	364.8		ug/L		91	75 - 125	3	20
Antimony	0.40	U	40.0	36.12		ug/L		90	75 - 125	1	20
Arsenic	0.33	U	40.0	36.63		ug/L		92	75 - 125	0	20
Beryllium	0.091	B	40.0	39.43		ug/L		98	75 - 125	2	20
Cadmium	0.27	U	40.0	35.49		ug/L		89	75 - 125	1	20
Chromium	0.50	U	40.0	36.22		ug/L		91	75 - 125	3	20
Cobalt	0.054	U	40.0	36.95		ug/L		92	75 - 125	3	20
Copper	0.56	U	40.0	35.46		ug/L		89	75 - 125	2	20
Lead	0.18	U	40.0	35.69		ug/L		89	75 - 125	2	20
Manganese	0.31	U	40.0	36.32		ug/L		91	75 - 125	0	20
Molybdenum	0.14	U	40.0	36.16		ug/L		90	75 - 125	0	20
Nickel	0.30	U	40.0	36.68		ug/L		92	75 - 125	2	20
Selenium	0.70	U	40.0	38.19		ug/L		95	75 - 125	4	20
Silver	0.033	U	40.0	38.06		ug/L		95	75 - 125	3	20
Strontium	0.30	U	40.0	35.67		ug/L		89	75 - 125	4	20
Thallium	0.050	U	40.0	35.36		ug/L		88	75 - 125	3	20
Thorium	1.2	U	40.0	34.14		ug/L		85	75 - 125	3	20
Zinc	15.1	N C	40.0	35.87	N	ug/L		52	75 - 125	0	20

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: I17-010

TestAmerica Job ID: 280-101689-1
SDG: DN0227

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

Lab Sample ID: 280-101689-2 MSD
Matrix: Water
Analysis Batch: 389927

Client Sample ID: B3BT07
Prep Type: Total/NA
Prep Batch: 389532

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Barium	0.29	U	40.0	42.78		ug/L		107	75 - 125	4	20
Tin	0.77	U	40.0	40.63		ug/L		102	75 - 125	0	20
Uranium	0.050	U	40.0	39.54		ug/L		99	75 - 125	3	20

Lab Sample ID: MB 280-389533/1-A
Matrix: Water
Analysis Batch: 389814

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 389533

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	9.2	U	30.0	9.2	ug/L		10/02/17 14:15	10/03/17 03:07	1
Antimony	0.40	U	2.0	0.40	ug/L		10/02/17 14:15	10/03/17 03:07	1
Arsenic	0.33	U	5.0	0.33	ug/L		10/02/17 14:15	10/03/17 03:07	1
Beryllium	0.080	U	1.0	0.080	ug/L		10/02/17 14:15	10/03/17 03:07	1
Cadmium	0.27	U	1.0	0.27	ug/L		10/02/17 14:15	10/03/17 03:07	1
Chromium	0.50	U	2.0	0.50	ug/L		10/02/17 14:15	10/03/17 03:07	1
Cobalt	0.0720	B	1.0	0.054	ug/L		10/02/17 14:15	10/03/17 03:07	1
Copper	0.56	U	2.0	0.56	ug/L		10/02/17 14:15	10/03/17 03:07	1
Lead	0.18	U	1.0	0.18	ug/L		10/02/17 14:15	10/03/17 03:07	1
Manganese	0.31	U	1.0	0.31	ug/L		10/02/17 14:15	10/03/17 03:07	1
Molybdenum	0.14	U	2.0	0.14	ug/L		10/02/17 14:15	10/03/17 03:07	1
Nickel	0.30	U	2.0	0.30	ug/L		10/02/17 14:15	10/03/17 03:07	1
Selenium	0.70	U	5.0	0.70	ug/L		10/02/17 14:15	10/03/17 03:07	1
Silver	0.033	U	5.0	0.033	ug/L		10/02/17 14:15	10/03/17 03:07	1
Strontium	0.30	U	10.0	0.30	ug/L		10/02/17 14:15	10/03/17 03:07	1
Thallium	0.351	B	1.0	0.050	ug/L		10/02/17 14:15	10/03/17 03:07	1
Thorium	1.2	U	1.0	1.2	ug/L		10/02/17 14:15	10/03/17 03:07	1
Tin	0.77	U	10.0	0.77	ug/L		10/02/17 14:15	10/03/17 03:07	1
Zinc	8.09	B	10.0	2.0	ug/L		10/02/17 14:15	10/03/17 03:07	1

Lab Sample ID: MB 280-389533/1-A
Matrix: Water
Analysis Batch: 389927

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 389533

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Barium	0.431	B	1.0	0.29	ug/L		10/02/17 14:15	10/03/17 13:46	1
Uranium	0.0930	B	1.0	0.050	ug/L		10/02/17 14:15	10/03/17 13:46	1

Lab Sample ID: LCS 280-389533/2-A
Matrix: Water
Analysis Batch: 389814

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 389533

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	400	355.4		ug/L		89	80 - 120
Antimony	40.0	35.56		ug/L		89	80 - 120
Arsenic	40.0	36.26		ug/L		91	80 - 120
Beryllium	40.0	40.23		ug/L		101	80 - 120
Cadmium	40.0	35.00		ug/L		87	80 - 120
Chromium	40.0	36.17		ug/L		90	80 - 120
Cobalt	40.0	37.47		ug/L		94	80 - 120

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: I17-010

TestAmerica Job ID: 280-101689-1
SDG: DN0227

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

Lab Sample ID: LCS 280-389533/2-A
Matrix: Water
Analysis Batch: 389814

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 389533

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Copper	40.0	35.20		ug/L		88	80 - 120
Lead	40.0	36.54		ug/L		91	80 - 120
Manganese	40.0	35.29		ug/L		88	80 - 120
Molybdenum	40.0	35.34		ug/L		88	80 - 120
Nickel	40.0	35.91		ug/L		90	80 - 120
Selenium	40.0	40.06		ug/L		100	80 - 120
Silver	40.0	38.46		ug/L		96	80 - 120
Strontium	40.0	35.98		ug/L		90	80 - 120
Thallium	40.0	36.05		ug/L		90	80 - 120
Thorium	40.0	35.69		ug/L		89	80 - 120
Tin	40.0	35.20		ug/L		88	80 - 120
Zinc	40.0	45.18		ug/L		113	80 - 120

Lab Sample ID: LCS 280-389533/2-A
Matrix: Water
Analysis Batch: 389927

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 389533

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Barium	40.0	39.13		ug/L		98	80 - 120
Uranium	40.0	39.27		ug/L		98	80 - 120

Lab Sample ID: 280-101689-1 MS
Matrix: Water
Analysis Batch: 389814

Client Sample ID: B3BT09
Prep Type: Dissolved
Prep Batch: 389533

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	9.2	U	400	366.7		ug/L		92	75 - 125
Antimony	0.40	U	40.0	34.24		ug/L		86	75 - 125
Arsenic	0.33	U	40.0	36.79		ug/L		92	75 - 125
Beryllium	0.080	U	40.0	41.74		ug/L		104	75 - 125
Cadmium	0.27	U	40.0	35.96		ug/L		90	75 - 125
Chromium	0.50	U	40.0	37.24		ug/L		93	75 - 125
Cobalt	0.054	U	40.0	37.37		ug/L		93	75 - 125
Copper	0.56	U	40.0	37.24		ug/L		93	75 - 125
Lead	0.18	U	40.0	36.73		ug/L		92	75 - 125
Manganese	0.31	U	40.0	37.15		ug/L		93	75 - 125
Molybdenum	0.14	U	40.0	36.64		ug/L		92	75 - 125
Nickel	0.30	U	40.0	38.52		ug/L		96	75 - 125
Selenium	0.70	U	40.0	40.15		ug/L		100	75 - 125
Silver	0.033	U	40.0	37.80		ug/L		94	75 - 125
Strontium	0.30	U	40.0	36.68		ug/L		92	75 - 125
Thallium	0.050	U	40.0	36.37		ug/L		91	75 - 125
Thorium	1.2	U	40.0	35.68		ug/L		89	75 - 125
Tin	0.77	U	40.0	34.47		ug/L		86	75 - 125
Zinc	9.9	B N C	40.0	37.09	C N	ug/L		68	75 - 125

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: I17-010

TestAmerica Job ID: 280-101689-1
SDG: DN0227

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

Lab Sample ID: 280-101689-1 MS
Matrix: Water
Analysis Batch: 389927

Client Sample ID: B3BT09
Prep Type: Dissolved
Prep Batch: 389533

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Barium	0.29	U	40.0	41.63		ug/L		104	75 - 125		
Uranium	0.050	U	40.0	39.63		ug/L		99	75 - 125		

Lab Sample ID: 280-101689-1 MSD
Matrix: Water
Analysis Batch: 389814

Client Sample ID: B3BT09
Prep Type: Dissolved
Prep Batch: 389533

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Aluminum	9.2	U	400	376.4		ug/L		94	75 - 125	3	20
Antimony	0.40	U	40.0	36.30		ug/L		91	75 - 125	6	20
Arsenic	0.33	U	40.0	37.91		ug/L		95	75 - 125	3	20
Beryllium	0.080	U	40.0	40.77		ug/L		102	75 - 125	2	20
Cadmium	0.27	U	40.0	37.51		ug/L		94	75 - 125	4	20
Chromium	0.50	U	40.0	38.25		ug/L		96	75 - 125	3	20
Cobalt	0.054	U	40.0	38.83		ug/L		97	75 - 125	4	20
Copper	0.56	U	40.0	36.99		ug/L		92	75 - 125	1	20
Lead	0.18	U	40.0	37.69		ug/L		94	75 - 125	3	20
Manganese	0.31	U	40.0	38.68		ug/L		97	75 - 125	4	20
Molybdenum	0.14	U	40.0	36.36		ug/L		91	75 - 125	1	20
Nickel	0.30	U	40.0	37.45		ug/L		94	75 - 125	3	20
Selenium	0.70	U	40.0	40.41		ug/L		101	75 - 125	1	20
Silver	0.033	U	40.0	39.70		ug/L		99	75 - 125	5	20
Strontium	0.30	U	40.0	37.21		ug/L		93	75 - 125	1	20
Thallium	0.050	U	40.0	37.96		ug/L		95	75 - 125	4	20
Thorium	1.2	U	40.0	36.97		ug/L		92	75 - 125	4	20
Tin	0.77	U	40.0	36.18		ug/L		90	75 - 125	5	20
Zinc	9.9	B N C	40.0	38.85	C N	ug/L		72	75 - 125	5	20

Lab Sample ID: 280-101689-1 MSD
Matrix: Water
Analysis Batch: 389927

Client Sample ID: B3BT09
Prep Type: Dissolved
Prep Batch: 389533

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Barium	0.29	U	40.0	40.00		ug/L		100	75 - 125	4	20
Uranium	0.050	U	40.0	40.09		ug/L		100	75 - 125	1	20

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

QC Summary

Report Date: October 25, 2017

CH2MHill Plateau Remediation Company
MSIN R3-50 CHPRC
PO Box 1600
Richland, Washington

Contact: **Mr. Scot Fitzgerald**

Workorder: **433750**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Metals Analysis - ICPMS										
Batch 1704748										
QC1203884927 LCS										
Aluminum	2000			2180	ug/L		109	(80%-120%)	BAJ	10/18/17 20:58
Antimony	50.0			51.5	ug/L		103	(80%-120%)		
Arsenic	50.0			53.6	ug/L		107	(80%-120%)		
Barium	50.0			49.2	ug/L		98.5	(80%-120%)		
Beryllium	50.0			53.5	ug/L		107	(80%-120%)		10/19/17 07:45
Cadmium	50.0			53.5	ug/L		107	(80%-120%)		10/18/17 20:58
Chromium	50.0			51.1	ug/L		102	(80%-120%)		
Cobalt	50.0			52.9	ug/L		106	(80%-120%)		
Copper	50.0			52.8	ug/L		106	(80%-120%)		
Lead	50.0			51.9	ug/L		104	(80%-120%)		
Manganese	50.0			52.4	ug/L		105	(80%-120%)		
Molybdenum	50.0			53.1	ug/L		106	(80%-120%)		
Nickel	50.0			52.3	ug/L		105	(80%-120%)		

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QC Summary

Workorder: **433750**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Metals Analysis - ICPMS										
Batch 1704748										
Selenium	50.0			53.0	ug/L		106	(80%-120%)	BAJ	10/18/17 20:58
Silver	50.0			54.2	ug/L		108	(80%-120%)		
Strontium	50.0			52.6	ug/L		105	(80%-120%)		
Thallium	50.0			50.2	ug/L		100	(80%-120%)		
Thorium	50.0			49.4	ug/L		98.8	(80%-120%)		
Tin	50.0			52.9	ug/L		106	(80%-120%)		
Uranium	50.0			50.5	ug/L		101	(80%-120%)		
Zinc	50.0			54.2	ug/L		108	(80%-120%)		
QC1203884926 MB										
Aluminum			U	19.3	ug/L					10/18/17 20:55
Antimony			U	1.00	ug/L					
Arsenic			U	2.00	ug/L					
Barium			U	0.670	ug/L					
Beryllium			U	0.200	ug/L					10/19/17 07:44
Cadmium			U	0.300	ug/L					10/18/17 20:55
Chromium			U	3.00	ug/L					

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QC Summary

Workorder: **433750**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Metals Analysis - ICPMS										
Batch 1704748										
Cobalt			U	0.300	ug/L				BAJ	10/18/17 20:55
Copper			U	0.300	ug/L					
Lead			U	0.500	ug/L					
Manganese			U	1.00	ug/L					
Molybdenum			U	0.200	ug/L					
Nickel			U	0.600	ug/L					
Selenium			U	2.00	ug/L					
Silver			U	0.300	ug/L					
Strontium			U	2.00	ug/L					
Thallium			U	0.600	ug/L					
Thorium			U	0.700	ug/L					
Tin			U	1.00	ug/L					
Uranium			U	0.067	ug/L					
Zinc			U	3.30	ug/L					
QC1203884928 433750007 MS										
Aluminum	2000	U	19.3	2210	ug/L		109	(75%-125%)		10/18/17 21:11

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QC Summary

Workorder: **433750**

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Metals Analysis - ICPMS											
Batch 1704748											
Antimony	50.0	U	1.00		49.7	ug/L		99.3	(75%-125%)	BAJ	10/18/17 21:11
Arsenic	50.0	B	3.25		55.2	ug/L		104	(75%-125%)		
Barium	50.0		33.7		82.0	ug/L		96.6	(75%-125%)		
Beryllium	50.0	U	0.200		52.3	ug/L		105	(75%-125%)		10/19/17 07:48
Cadmium	50.0	U	0.300		51.4	ug/L		103	(75%-125%)		10/18/17 21:11
Chromium	50.0		19.2		69.5	ug/L		101	(75%-125%)		
Cobalt	50.0	U	0.300		51.5	ug/L		103	(75%-125%)		
Copper	50.0	B	0.665		51.1	ug/L		101	(75%-125%)		
Lead	50.0	U	0.500		48.9	ug/L		97.7	(75%-125%)		
Manganese	50.0		27.5		79.6	ug/L		104	(75%-125%)		
Molybdenum	50.0		7.94		61.7	ug/L		107	(75%-125%)		
Nickel	50.0	B	1.11		51.8	ug/L		101	(75%-125%)		
Selenium	50.0	B	4.44		56.9	ug/L		105	(75%-125%)		
Silver	50.0	U	0.300		51.4	ug/L		103	(75%-125%)		
Strontium	50.0		186		240	ug/L		109	(75%-125%)		

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QC Summary

Workorder: **433750**

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Metals Analysis - ICPMS											
Batch 1704748											
Thallium	50.0	U	0.600		48.6	ug/L		97.3	(75%-125%)	BAJ	10/18/17 21:11
Thorium	50.0	U	0.700		49.8	ug/L		99.7	(75%-125%)		
Tin	50.0	U	1.00		52.9	ug/L		105	(75%-125%)		
Uranium	50.0		1.89		50.9	ug/L		98.1	(75%-125%)		
Zinc	50.0	U	3.30		53.1	ug/L		101	(75%-125%)		
QC1203884929 433750007 MSD											
Aluminum	2000	U	19.3		2060	ug/L	7.16	102	(0%-20%)		10/18/17 21:15
Antimony	50.0	U	1.00		49.5	ug/L	0.423	98.8	(0%-20%)		
Arsenic	50.0	B	3.25		53.9	ug/L	2.47	101	(0%-20%)		
Barium	50.0		33.7		78.9	ug/L	3.79	90.5	(0%-20%)		
Beryllium	50.0	U	0.200		49.8	ug/L	5.08	99.5	(0%-20%)		10/19/17 07:49
Cadmium	50.0	U	0.300		48.9	ug/L	5.01	97.8	(0%-20%)		10/18/17 21:15
Chromium	50.0		19.2		68.6	ug/L	1.27	98.7	(0%-20%)		
Cobalt	50.0	U	0.300		49.0	ug/L	4.97	97.7	(0%-20%)		
Copper	50.0	B	0.665		49.8	ug/L	2.68	98.2	(0%-20%)		
Lead	50.0	U	0.500		47.7	ug/L	2.48	95.3	(0%-20%)		

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QC Summary

Workorder: **433750**

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Metals Analysis - ICPMS											
Batch 1704748											
Manganese	50.0		27.5		76.5	ug/L	4	98	(0%-20%)	BAJ	10/18/17 21:15
Molybdenum	50.0		7.94		58.6	ug/L	5.09	101	(0%-20%)		
Nickel	50.0	B	1.11		49.7	ug/L	4.1	97.2	(0%-20%)		
Selenium	50.0	B	4.44		56.3	ug/L	1.16	104	(0%-20%)		
Silver	50.0	U	0.300		49.7	ug/L	3.32	99.4	(0%-20%)		
Strontium	50.0		186		227	ug/L	5.75	81.7	(0%-20%)		
Thallium	50.0	U	0.600		46.5	ug/L	4.57	92.9	(0%-20%)		
Thorium	50.0	U	0.700		47.5	ug/L	4.79	95	(0%-20%)		
Tin	50.0	U	1.00		50.8	ug/L	4.01	101	(0%-20%)		
Uranium	50.0		1.89		49.1	ug/L	3.6	94.5	(0%-20%)		
Zinc	50.0	U	3.30		53.1	ug/L	0.0867	101	(0%-20%)		
QC1203884930 433750007 SDILT											
Aluminum		U	19.2	DU	96.5	ug/L	N/A		(0%-20%)		10/18/17 21:21
Antimony		U	0.109	DU	5.00	ug/L	N/A		(0%-20%)		
Arsenic		B	3.25	DU	10.0	ug/L	N/A		(0%-20%)		
Barium			33.7	D	6.73	ug/L	.116		(0%-20%)		

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QC Summary

Workorder: **433750**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Metals Analysis - ICPMS										
Batch 1704748										
Beryllium	U	-0.001	DU	1.00	ug/L	N/A		(0%-20%)	BAJ	10/19/17 07:52
Cadmium	U	-0.002	DU	1.50	ug/L	N/A		(0%-20%)		10/18/17 21:21
Chromium		19.2	BD	3.65	ug/L	5.06		(0%-20%)		
Cobalt	U	0.132	DU	1.50	ug/L	N/A		(0%-20%)		
Copper	B	0.665	DU	1.50	ug/L	N/A		(0%-20%)		
Lead	U	0.067	DU	2.50	ug/L	N/A		(0%-20%)		
Manganese		27.5	D	5.54	ug/L	.79		(0%-20%)		
Molybdenum		7.94	D	1.43	ug/L	9.97		(0%-20%)		
Nickel	B	1.11	DU	3.00	ug/L	N/A		(0%-20%)		
Selenium	B	4.44	DU	10.0	ug/L	N/A		(0%-20%)		
Silver	U	0.015	DU	1.50	ug/L	N/A		(0%-20%)		
Strontium		186	D	33.6	ug/L	9.58		(0%-20%)		
Thallium	U	0.001	DU	3.00	ug/L	N/A		(0%-20%)		
Thorium	U	-0.074	DU	3.50	ug/L	N/A		(0%-20%)		
Tin	U	0.164	DU	5.00	ug/L	N/A		(0%-20%)		

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QC Summary

Workorder: **433750**

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Metals Analysis - ICPMS											
Batch 1704748											
Uranium			1.89	D	0.384	ug/L	1.8		(0%-20%)	BAJ	10/18/17 21:21
Zinc		U	2.56	BD	3.58	ug/L	N/A		(0%-20%)		
Metals Analysis-ICP											
Batch 1704761											
QC1203884957 LCS											
Boron	500				514	ug/L		103	(80%-120%)	HSC	09/29/17 15:18
Calcium	5000				5150	ug/L		103	(80%-120%)		
Iron	5000				5110	ug/L		102	(80%-120%)		
Magnesium	5000				5330	ug/L		107	(80%-120%)		
Potassium	5000				5020	ug/L		100	(80%-120%)		
Sodium	5000				5160	ug/L		103	(80%-120%)		
Vanadium	500				501	ug/L		100	(80%-120%)		
QC1203884956 MB											
Boron				U	15.0	ug/L					09/29/17 15:15
Calcium				U	50.0	ug/L					
Iron				U	30.0	ug/L					
Magnesium				U	110	ug/L					
Potassium				U	50.0	ug/L					

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QC Summary

Workorder: **433750**

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Metals Analysis-ICP											
Batch 1704761											
Sodium				B	102	ug/L				HSC	09/29/17 15:15
Vanadium				U	1.00	ug/L					
QC1203884958 433750007 MS											
Boron	500	B	16.8		537	ug/L		104	(75%-125%)		09/29/17 15:24
Calcium	5000		37900		45600	ug/L		N/A	(75%-125%)		
Iron	5000		158		5040	ug/L		97.6	(75%-125%)		
Magnesium	5000		11300		16900	ug/L		113	(75%-125%)		
Potassium	5000		4770		9910	ug/L		103	(75%-125%)		
Sodium	5000		17600		22700	ug/L		101	(75%-125%)		
Vanadium	500		23.5		520	ug/L		99.2	(75%-125%)		
QC1203884959 433750007 MSD											
Boron	500	B	16.8		538	ug/L	0.218	104	(0%-20%)		09/29/17 15:27
Calcium	5000		37900		45100	ug/L	1.15	N/A	(0%-20%)		
Iron	5000		158		5020	ug/L	0.477	97.1	(0%-20%)		
Magnesium	5000		11300		16700	ug/L	1.33	108	(0%-20%)		
Potassium	5000		4770		9910	ug/L	0.0495	103	(0%-20%)		
Sodium	5000		17600		22200	ug/L	1.91	92.1	(0%-20%)		

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QC Summary

Workorder: **433750**

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP												
Batch 1704761												
Vanadium	500		23.5		521	ug/L	0.242	99.5	(0%-20%)	HSC	09/29/17	15:27
QC1203884960 433750007 SDILT												
Boron		B	16.8	DU	75.0	ug/L	N/A		(0%-20%)		09/29/17	15:31
Calcium			37900	D	7770	ug/L	2.64		(0%-20%)			
Iron			158	BD	31.6	ug/L	.0506		(0%-20%)			
Magnesium			11300	D	2370	ug/L	5.08		(0%-20%)			
Potassium			4770	D	1050	ug/L	10.3		(0%-20%)			
Sodium			17600	D	3430	ug/L	2.72		(0%-20%)			
Vanadium			23.5	BD	4.72	ug/L	.597		(0%-20%)			

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

Date: 29 March 2018
To: CH2M Hill (technical representative)
From: Analytical Quality Associates, Inc.
Project: CERC18, SURV17, CERC17, PA17
Subject: General Chemistry - Sample Data Group (SDG) GEL433750

INTRODUCTION

This memorandum presents the results of data validation for SDG GEL433750 prepared by GEL Laboratories LLC. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B3BRY4	09/27/17	Water	C	SW9056
B3BT04	09/27/17	Water	C	SW9056
B3BT03	09/27/17	Water	C	SW9056
B3BT14	09/27/17	Water	C	SW9056
B3BT23	09/27/17	Water	C	SW9056
B3BT24	09/27/17	Water	C	SW9056
B3BRY2	09/27/17	Water	C	SW9020, EPA353.2, SM2540C, SM2320
B3BRY9	09/27/17	Water	C	SW9020, EPA353.2, SM2540C, SM2320
B3BT00	09/27/17	Water	C	SW9020, EPA353.2, SM2540C, SM2320
B3BT12	09/27/17	Water	C	SW9020, EPA353.2, SM2540C, SM2320
B3BT19	09/27/17	Water	C	SW9020, EPA353.2, SM2540C, SM2320
B3BT20	09/27/17	Water	C	SW9020, EPA353.2, SM2540C, SM2320

Data validation was conducted in accordance with the CHPRC validation statement of work and the Groundwater Protection Plan for the Environmental Restoration Disposal Facility, WCH-198, Rev. 1 (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:

- All anions except nitrate, nitrite, and phosphate – analysis within 28 days of sample collection
- Nitrate, nitrite, and phosphate – analysis within 48 hours of sample collection
- Total Organic Halogens (TOX) and Nitrate/Nitrite as N – analysis within 28 days of sample collection
- Total Dissolved Solids (TDS) – analysis within 7 days of sample collection.
- Alkalinity – analysis within 14 days of sample collection

Sample preservation for the above analyses requires chilling to <6 degrees Celsius. In addition, nitrate/nitrite as N and TOX are brought to pH<2 with sulfuric acid.

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.

Trip Blanks

All trip blank results were acceptable with the following exceptions.

For SDG GEL433750, chloride was detected in field blank sample B3BT03 and TOX was detected in field blank sample B3BRY9.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results and laboratory control sample results. According to the SAP, the matrix spike and laboratory control sample accuracy limits are 80% to 120%. The limits for reported analytes not listed in the SAP are specified by the DV procedure.

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

All MS/MSD recoveries were acceptable.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

- **Precision**

Precision is evaluated by reviewing 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 ±20%. The RPD limits for reported analytes not listed in the SAP are specified by the DV procedure.

Laboratory Duplicate Samples

All laboratory duplicate results were acceptable.

Field Duplicate Samples

All field duplicate results were acceptable.

Field Split Samples

No field splits were submitted for validation.

- **Detection Limits**

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

All reported sample MDLs were below the CRDLs.

- **Completeness**

SDG GEL433750 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

None found.

REFERENCES

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

WCH-198, Rev. 1, *Groundwater Protection Plan for the Environmental Restoration Disposal Facility*, March 2016.

Appendix 1

Glossary of Data Reporting Qualifiers

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

- **U** — The constituent was analyzed for, but was not detected. The data should be considered usable for decision-making purposes.

- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the RL. The data should be considered usable for decision-making purposes.

- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **N** — The analysis indicates the presence of an analyte that has been tentatively identified.

- **NJ** — The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

- **NJ+** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation.

- **NJ-** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation.

- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

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

Appendix 2

Summary of Data Qualification

General Chemistry Data Qualification Summary			
SDG: GEL433750	Reviewer: AQA	Project: CERC18, SURV17, CERC17, PA17	Page 1 of 1
Analyte(s)	**Qualifier**	**Samples Affected**	**Reason**
GenChem	None	N/A	N/A

Comments: None

Appendix 3

Data Validation Supporting Documentation

Appendix A - (Cont.) Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	(C)	D	E
PROJECT: CERC18, SURV17, CERC17, PA17			DATA PACKAGE: VSR18-009		
VALIDATOR: Eyda Hergenreder		LAB: GEL		DATE:	
			SDG: GEL433750		

ANALYSES PERFORMED					
Anions/IC X	TOC	TOX X	TPH-418.1	Oil and Grease	Alkalinity X
Ammonia	BOD/COD	Chloride	Chromium-VI	pH	NO_3/NO_2 X
Sulfate	TDS X	TKN	Phosphate		

SAMPLES/MATRIX Water

SDG433750: B3BRY4, B3BT04, B3BT03, B3BT14, B3BT23, B3BT24, B3BRY2, B3BRY9, B3BT00, B3BT12, B3BT19, B3BT20

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present?	(Yes) No N/A

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

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

Initial calibrations performed on all instruments?	Yes No (N/A)
Initial calibrations acceptable?	Yes No (N/A)
ICV and CCV checks performed on all instruments?	Yes No (N/A)
ICV and CCV checks acceptable?	Yes No (N/A)
Standards traceable?	Yes No (N/A)
Standards expired?	Yes No (N/A)
Calculation check acceptable?	Yes No (N/A)

Comments:

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

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

Comments:

SDG GEL433750: Field blank B3BT03 chloride 73.2 ug/L: field blank B3BRY9 TOX 3.98 ug/L

Appendix A - (Cont.) Chemical Data Validation Checklist

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

Spike samples analyzed?	(Yes) No N/A
Spike recoveries acceptable?	(Yes) No N/A
Spike standards NIST traceable? (Levels D, E)	Yes No (N/A)
Spike standards expired? (Levels D, E)	Yes No (N/A)
LCS/BSS samples analyzed?	(Yes) No N/A
LCS/BSS results acceptable?	(Yes) No N/A
Standards traceable? (Levels D, E)	Yes No (N/A)
Standards expired? (Levels D, E)	Yes No (N/A)
Transcription/calculation errors? (Levels D, E)	Yes No (N/A)
Performance audit sample(s) analyzed?	Yes No (N/A)
Performance audit sample results acceptable?	Yes No (N/A)

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

6. HOLDING TIMES (all levels)

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

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

7. RESULT QUANTITATION AND DETECTION LIMITS (all levels)

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

Comments (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 13, 2017

CH2MHill Plateau Remediation Company
MSIN R3-50 CHPRC
PO Box 1600
Richland, Washington

Contact: **Mr. Scot Fitzgerald**

Workorder: **433750**

Parmname	NOM		Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Halogen Analysis												
Batch 1705064												
QC1203885637 433750007 DUP												
Total Organic Halogens		B	4.06	U	3.33	ug/L	61.1 ^		(+/-10.0)	RMJ	10/04/17	16:19
QC1203885636 LCS												
Total Organic Halogens	100				102	ug/L		102	(80%-120%)		10/04/17	15:41
QC1203885635 MB												
Total Organic Halogens				U	3.33	ug/L					10/04/17	15:20
QC1203885638 433750007 PS												
Total Organic Halogens	100	B	4.06		108	ug/L		104	(75%-125%)		10/04/17	17:00
Ion Chromatography												
Batch 1704634												
QC1203884694 433750006 DUP												
Bromide		B	83.6	B	84.2	ug/L	0.715 ^		(+/-250)	MXL2	09/28/17	14:28
Chloride		D	16700	D	16700	ug/L	0.311		(0%-20%)		09/28/17	19:23
Fluoride		B	253	B	253	ug/L	0.079 ^		(+/-500)		09/28/17	14:28
Nitrate-N		D	30300	D	30400	ug/L	0.382		(0%-20%)		09/28/17	19:23
Nitrite-N		U	33.0	U	33.0	ug/L	N/A				09/28/17	14:28
Phosphorus in phosphate		U	67.0	U	67.0	ug/L	N/A					
Sulfate		D	26700	D	26800	ug/L	0.31		(0%-20%)		09/28/17	19:23

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

QC Summary

Workorder: **433750**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Ion Chromatography										
Batch 1704634										
QC1203884693 LCS										
Bromide	1250			1220	ug/L		97.6	(80%-120%)	MXL2	09/28/17 10:33
Chloride	5000			4540	ug/L		90.9	(80%-120%)		
Fluoride	2500			2480	ug/L		99	(80%-120%)		
Nitrate-N	2500			2310	ug/L		92.4	(80%-120%)		
Nitrite-N	2500			2350	ug/L		93.9	(80%-120%)		
Phosphorus in phosphate	1250			1280	ug/L		103	(80%-120%)		
Sulfate	10000			9360	ug/L		93.6	(80%-120%)		
QC1203884692 MB										
Bromide			U	67.0	ug/L					09/28/17 10:04
Chloride			U	67.0	ug/L					
Fluoride			U	33.0	ug/L					
Nitrate-N			U	33.0	ug/L					
Nitrite-N			U	33.0	ug/L					
Phosphorus in phosphate			U	67.0	ug/L					
Sulfate			U	133	ug/L					

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

QC Summary

Workorder: **433750**

Parmname	NOM		Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Ion Chromatography											
Batch 1704634											
QC1203884695 433750006 PS											
Bromide	1.25	B	0.0836		1.27	mg/L		94.7	(75%-125%)	MXL2	09/28/17 15:56
Chloride	5.00	D	1.67	D	6.50	mg/L		96.6	(75%-125%)		09/28/17 19:52
Fluoride	2.50	B	0.253		2.72	mg/L		98.8	(75%-125%)		09/28/17 15:56
Nitrate-N	2.50	D	3.03	D	5.71	mg/L		107	(75%-125%)		09/28/17 19:52
Nitrite-N	2.50	U	0.00		2.35	mg/L		94.2	(75%-125%)		09/28/17 15:56
Phosphorus in phosphate	1.25	U	0.0178		1.30	mg/L		102	(75%-125%)		
Sulfate	10.0	D	2.67	D	12.4	mg/L		96.9	(75%-125%)		09/28/17 19:52
Nutrient Analysis											
Batch 1705050											
QC1203885578 433750007 DUP											
Nitrogen, Nitrate/Nitrite		D	6060	D	5910	ug/L	2.51		(0%-20%)	KLP1	10/02/17 11:57
QC1203885576 LCS											
Nitrogen, Nitrate/Nitrite	1000				1090	ug/L		109	(90%-110%)		10/02/17 11:45
QC1203885575 MB											
Nitrogen, Nitrate/Nitrite				U	17.0	ug/L					10/02/17 11:44
QC1203885580 433750007 PS											
Nitrogen, Nitrate/Nitrite	1.00	D	0.606	D	1.75	mg/L		114*	(90%-110%)		10/02/17 11:58
Solids Analysis											
Batch 1705418											
QC1203886454 433750016 DUP											
Total Dissolved Solids			334000		400000	ug/L	17.9		(0%-20%)	KLP1	10/03/17 12:44

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

QC Summary

Workorder: **433750**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Solids Analysis										
Batch 1705418										
QC1203886453 LCS										
Total Dissolved Solids	300000			287000	ug/L		95.7	(80%-120%)	KLP1	10/03/17 12:44
QC1203886452 MB										
Total Dissolved Solids			U	3400	ug/L					10/03/17 12:44
Titration and Ion Analysis										
Batch 1706553										
QC1203889058 433750007 DUP										
Alkalinity, Total as CaCO3		132000		131000	ug/L	0.91		(0%-20%)	RXB5	10/05/17 17:05
QC1203889057 LCS										
Alkalinity, Total as CaCO3	100000			106000	ug/L		106	(80%-120%)		10/05/17 17:02

Notes:

The Qualifiers in this report are defined as follows:

- < 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
- 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.
- N Spike 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

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

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

Date: 29 March 2018
To: CH2M Hill (technical representative)
From: Analytical Quality Associates, Inc.
Project: CERC18, SURV17, CERC17, PA17
Subject: Radiochemical - Sample Data Groups (SDGs) GEL433750, SL2689, SwRI621022, W07912

INTRODUCTION

This memorandum presents the results of data validation for SDG GEL433750 prepared by GEL Laboratories LLC, SDGs SL2689 and W07912 prepared by TestAmerica Laboratories, Inc and SwRI621022 prepared by Southwest Research Institute. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B3C116	09/27/17	Water	C	Alpha, Beta
B3C117	09/27/17	Water	C	Alpha, Beta
B3BRY5	09/27/17	Water	C	C-14, Tc-99
B3BT05	09/27/17	Water	C	C-14, Tc-99
B3BT06	09/27/17	Water	C	C-14, Tc-99
B3BT25	09/27/17	Water	C	C-14, Tc-99
B3BT26	09/27/17	Water	C	C-14, Tc-99
B3BT15	09/27/17	Water	C	C-14
B3C115	09/27/17	Water	C	Tc-99
B3BPK0	09/13/17	Water	C	Tritium, I-129, Tc-99
B3BPK5	09/13/17	Water	C	I-129, Tc-99
B3BWX7	09/15/17	Water	C	Tritium
B3C013	09/15/17	Water	C	Pu238, P239/240, Sr-90, Tc-99
B3C0D0	09/15/17	Water	C	Tritium
B3BX13	09/18/17	Water	C	I-129, Tritium
B3CWD2	09/20/17	Water	C	Tritium, Sr-90
B3D061	09/20/17	Water	C	Tritium
B3D169	09/20/17	Water	C	Sr-90
B3BVY9	09/25/17	Water	C	Sr-90, Tritium
B3BW03	09/25/17	Water	C	Sr-90, Tritium
B3C0B2	09/22/17	Water	C	Sr-90, Tritium
B3D066	09/26/17	Water	C	Sr-90
B3BRY6	09/27/17	Water	C	I-129
B3BT16	09/27/17	Water	C	I-129
B3BT27	09/27/17	Water	C	I-129
B3BT28	09/27/17	Water	C	I-129
B3C041	09/27/17	Water	C	Sr-90
B3C113	09/27/17	Water	C	I-129
B3C114	09/27/17	Water	C	I-129
B3BRY3	09/27/17	Water	C	Alpha, Beta, T-alpha radium

B3BT01	09/27/17	Water	C	Alpha, Beta, T-alpha radium
B3BT02	09/27/17	Water	C	Alpha, Beta, T-alpha radium
B3BT13	09/27/17	Water	C	Alpha, Beta, T-alpha radium
B3BT21	09/27/17	Water	C	T-alpha radium
B3BT22	09/27/17	Water	C	T-alpha radium

Data validation was conducted in accordance with the CHPRC validation statement of work and the Groundwater Protection Plan for the Environmental Restoration Disposal Facility, WCH-198, Rev. 1 (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. Sample preservation for water samples for all analyses except tritium, C-14 and I-129 requires acid preservation with nitric acid to pH <2.

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

- **Blanks**

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

Laboratory Blanks

All laboratory blank results were acceptable.

Trip Blanks

All trip blank results were acceptable.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing 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 matrix spike sample and the laboratory control sample accuracy limits are 80% to 120%. The limits for reported analytes not listed in the SAP are specified by the DV procedure.

Matrix Spike (MS) Samples

All MS recoveries were acceptable.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

Carrier/Tracer Recovery Factors

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

For SDG SL2689, the Tc-99m tracer recoveries for samples B3BT06, B3BT26 and the LCS were above the acceptance limit. The Tc-99 recovery for sample B3BT26 was above the MDC and should be qualified as an estimate and flagged "J-." The Tc-99 result for sample B3BT06 was < the MDC and the LCS was a QC sample; therefore, data should not be qualified as a result.

- **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 ±25%. The RPD limits for reported analytes not listed in the SAP are specified by the DV procedure. When duplicate RPDs exceed the limits and have associated results <5X the MDCs, the precision limits are ones specified by the DV procedure.

Laboratory Duplicate Samples

All laboratory duplicate results were acceptable.

Field Duplicate Samples

All field duplicate results were acceptable.

Field Split Samples

No field splits were submitted for validation.

- **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 were below the CRDLs.

- **Completeness**

SDGs GEL433750, SL2689, SwRI621022 and W07912 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 deficiency leading to qualification of the Tc-99 result for sample B3BT26 as an estimate was due to high tracer recovery.

REFERENCES

GRP-GD-002, Rev. 2, Change 0, *Data Validation for Radiochemical Analyses*, September 2016.

WCH-198, Rev. 1, *Groundwater Protection Plan for the Environmental Restoration Disposal Facility*, March 2016.

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

Radiochemical Data Qualification Summary			
SDGs: GEL433750, SL2689, SwRI621022, W07912	Reviewer: AQA	Project: CERC18, SURV17, CERC17, PA17	Page 1 of 1
Analyte(s)	**Qualifier**	**Samples Affected**	**Reason**
Tc-99	J-	B3BT26	High tracer recovery

Comments: None

Appendix 3

Data Validation Supporting Documentation

Appendix B - Radiochemical Data Validation Checklist

Validation Level:	A	B	(C)	D	E

Project: CERC18, SURV17, CERC17, PA17	Data Package: VSR18-009	
Validator: Eyda Hergenreder	Lab: GEL, TestAmerica, SwRI	Date: 03/29/18
	SDG: GEL433750, SL2689, SwRI621022, W07912	

Analyses Performed

X Gross Alpha/Beta	X Strontium-90	☐ Technetium-99	X Alpha Spectroscopy	☐ Gamma Spectroscopy	X Tritium
☐ Total Uranium	☐ Radium-22	X C-14	X Tc-99	X T-Alpha Radium	X I-129

Samples/Matrix Water SDG GEL433750: B3C116. B3C117
SDG SL2689: B3BRY5, B3BT05, B3BT06, B3BT25, B3BT26, B3BT15, B3C115
SDG SwRI621022: B3BPK0, B3BPK5, B3BWX7, B3C013, B3C0D0, B3BX13, B3CWD2, B3D061, B3D169, B3BVY9,B3BW03, B3C0B2, B3D066, B3BRY6, B3BT16, B3BT27, B3BT28, B3C041, B3C113, B3C114
SDG W07912: B3BRY3, B3BT01, B3BT02, B3BT13, B3BT21, B3BT22

1. Completeness and Case Narrative	☐ N/A
Technical verification forms present?	(Yes) No N/A

Comments:

2. Initial Calibration (Levels D, E)	☒ N/A
Instruments/detectors calibrated?	Yes No (N/A)
Initial calibration acceptable?	Yes No (N/A)
Standards NIST traceable?	Yes No (N/A)
Standards expired?	Yes No (N/A)
Calculation check acceptable?	Yes No (N/A)

Comments:

Appendix B - (Cont.) Radiochemical Data Validation Checklist

3. Continuing Calibration (Levels D, E)	☒ N/A
Calibration checked within required frequency?	Yes No (N/A)
Calibration check acceptable?	Yes No (N/A)
Calibration check standards traceable?	Yes No (N/A)
Calibration check standards expired?	Yes No (N/A)
Calculation check acceptable?	Yes No (N/A)

Comments:

4. Background Counts (Levels D, E)	☒ N/A
Background counts checked within required frequency?	Yes No (N/A)
Background counts acceptable?	Yes No (N/A)
Calculation check acceptable?	Yes No (N/A)

Comments:

Appendix B - (Cont.) Radiochemical Data Validation Checklist

5. Blanks (Levels B, C, D, E)	☐ N/A
Method blank analyzed within required frequency?	(Yes) No N/A
Method blank results acceptable?	(Yes) No N/A
Analytes detected in method blank?	Yes (No) N/A
Field blank(s) analyzed?	(Yes) No N/A
Field blank results acceptable?	(Yes) No N/A
Analytes detected in field blank(s)?	Yes (No) N/A
Transcription/Calculation Errors? (Levels D, E)	Yes No (N/A)

Comments:

6. Laboratory Control Samples or Blank Spike Samples (Levels C, D, E)	☐ N/A
LCS /BSS analyzed within required frequency?	(Yes) No N/A
LCS/BSS recoveries acceptable?	(Yes) No N/A
LCS/BSS traceable? (Levels D,E)	Yes No (N/A)
LCS/BSS expired? (Levels D,E)	Yes No (N/A)
LCS/BSS levels correct? (Levels D,E)	Yes No (N/A)
Transcription/Calculation errors? (Levels D, E)	Yes No (N/A)

Comments:

Appendix B - (Cont.) Radiochemical Data Validation Checklist

7. Chemical Carrier Recovery (Levels C, D, E)	☐ N/A
Chemical carrier added?	(Yes) No N/A
Chemical recovery acceptable?	(Yes) No N/A
Chemical carrier traceable? (Levels D, E)	Yes No (N/A)
Chemical carrier expired? (Levels D, E)	Yes No (N/A)
Transcription/Calculation errors? (Levels D, E)	Yes No (N/A)

Comments:

8. Tracer Recovery (Levels C, D, E)	☐ N/A
Tracer added?	(Yes) No N/A
Tracer recovery acceptable?	Yes (No) N/A
Tracer traceable? (Levels D, E)	Yes No (N/A)
Tracer expired? (Levels D, E)	Yes No (N/A)
Transcription/Calculation errors? (Levels D, E)	Yes No (N/A)

Comments:

SDG SL2689: Tc-99m tracer sample B3BT06 107%. B3BT26 108%, LCS 108%

Appendix B - (Cont.) Radiochemical Data Validation Checklist

9. Matrix Spikes (Levels C, D, E)	☐ N/A
Matrix spike analyzed?	(Yes) No N/A
Spike recoveries acceptable?	(Yes) No N/A
Spike source traceable? (Levels D, E)	Yes No (N/A)
Spike source expired? (Levels D, E)	Yes No (N/A)
Transcription/Calculation errors? (Levels D, E)	Yes No (N/A)

Comments:

10. Duplicates (Levels C, D, E)	☐ N/A
Duplicates analyzed at required frequency?	(Yes) No N/A
RPD values acceptable?	(Yes) No N/A
Transcription/Calculation errors? (Levels D, E)	Yes No (N/A)

Comments:

Appendix B - (Cont.) Radiochemical Data Validation Checklist

11. Field QC Samples (Levels C, D, E)	☐ N/A
Field duplicate sample(s) analyzed?	(Yes) No N/A
Field duplicate RPD values acceptable?	(Yes) No N/A
Field split sample(s) analyzed?	Yes (No) N/A
Field split RPD values acceptable?	Yes No (N/A)
Performance audit sample(s) analyzed?	Yes No (N/A)
Performance audit sample results acceptable?	Yes No (N/A)

Comments:

12. Holding Times (All levels)	☐ N/A
Are sample holding times acceptable?	(Yes) No N/A

Comments:

13. Results and MDCs (All Levels)	☐ N/A
Results reported for all required sample analyses?	(Yes) No N/A
Results supported in raw data?(Levels D, E)	Yes No (N/A)
Results acceptable? (Levels D, E)	Yes No (N/A)
MDC's meet required reporting limits?	(Yes) No N/A
Transcription/Calculation errors? (Levels D, E)	Yes No (N/A)

Comments:

Appendix 4

Additional Documentation Requested By Client

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

QC Summary

Report Date: October 24, 2017

Client : **CH2MHill Plateau Remediation Company**
MSIN R3-50 CHPRC
PO Box 1600
Richland, Washington **99352**
Contact: **Mr. Scot Fitzgerald**

Workorder: **433750**

Parmname	NOM		Sample	Qual	QC	Units	QC Criteria		Range	Analyst	Date Time
Rad Gas Flow											
Batch 1705580											
QC1203886860 MB											
Alpha				U	0.132	pCi/L				BXG2	10/05/1712:37
Uncert:					+/-1.00						
TPU:					+/-1.00						
Beta				U	1.12	pCi/L					
Uncert:					+/-1.37						
TPU:					+/-1.38						
QC1203886861 433758005 DUP											
Alpha		U	-0.613	U	-8.35	pCi/L					10/05/1712:46
Uncert:			+/-3.18		+/-5.14		RPD:	0	N/A		
TPU:			+/-3.36		+/-6.27		RER:	2.13	(0-2)		
Beta			2910		2890	pCi/L					
Uncert:			+/-34.0		+/-33.9		RPD:	1	(0%-20%)		
TPU:			+/-470		+/-489		RER:	0.0514	(0-2)		
QC1203886862 433758005 MS											
Alpha	483	U	-0.613		400	pCi/L	REC:	83	(75%-125%)		10/06/1707:26
Uncert:			+/-3.18		+/-41.9						
TPU:			+/-3.36		+/-78.6						
Beta	1900		2910		4930	pCi/L	REC:	107	(75%-125%)		
Uncert:			+/-34.0		+/-108						
TPU:			+/-470		+/-827						
QC1203886863 433758005 MSD											
Alpha	483	U	-0.613		420	pCi/L	REC:	87	(75%-125%)		10/05/1712:47
Uncert:			+/-3.18		+/-42.7		RPD:	5	(0%-20%)		
TPU:			+/-3.36		+/-81.3		RER:	0.348	(0-2)		
Beta	1900		2910		5020	pCi/L	REC:	111	(75%-125%)		
Uncert:			+/-34.0		+/-112		RPD:	2	(0%-20%)		
TPU:			+/-470		+/-823		RER:	0.144	(0-2)		
QC1203886864 LCS											
Alpha	80.6				77.5	pCi/L	REC:	96	(80%-120%)		10/05/1712:47
Uncert:					+/-7.29						
TPU:					+/-14.8						
Beta	317				341	pCi/L	REC:	108	(80%-120%)		
Uncert:					+/-12.0						
TPU:					+/-58.2						

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: I17-010

TestAmerica Job ID: 160-24732-1
SDG: SL2689

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Lab Sample ID: MB 160-333475/1-A
Matrix: Water
Analysis Batch: 333899

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 333475

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	1.441	U	5.90	5.90	20.0	9.91	pCi/L	10/24/17 07:47	10/24/17 21:17	1

Lab Sample ID: LCS 160-333475/2-A
Matrix: Water
Analysis Batch: 333899

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 333475

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Carbon-14			1130	1167		128	20.0	9.92	pCi/L	104	80 - 120		

Lab Sample ID: 160-24732-1 MS
Matrix: Water
Analysis Batch: 333899

Client Sample ID: B3BRY5
Prep Type: Total/NA
Prep Batch: 333475

Analyte	Sample Result	Sample Qual	Spike Added	MS Result	MS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Carbon-14	19.6		1120	918.7		102	20.0	9.88	pCi/L	80	75 - 125		

Lab Sample ID: 160-24732-1 MSD
Matrix: Water
Analysis Batch: 333899

Client Sample ID: B3BRY5
Prep Type: Total/NA
Prep Batch: 333475

Analyte	Sample Result	Sample Qual	Spike Added	MSD Result	MSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Carbon-14	19.6		1130	1145		126	20.0	9.96	pCi/L	100	75 - 125	0.99	1

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

Lab Sample ID: MB 160-332162/1-A
Matrix: Water
Analysis Batch: 333380

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 332162

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium-99	-0.942	U	1.18	1.18	3.00	2.07	pCi/L	10/16/17 18:41	10/20/17 17:47	1

Tracer	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tc-99m	*93.8*		*30 - 105*	*10/16/17 18:41*	*10/20/17 17:47*	*1*

Lab Sample ID: LCS 160-332162/2-A
Matrix: Water
Analysis Batch: 333380

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 332162

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Technetium-99			30.9	29.07		3.41	3.00	1.94	pCi/L	94	80 - 120		

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: I17-010

TestAmerica Job ID: 160-24732-1
SDG: SL2689

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

Lab Sample ID: LCS 160-332162/2-A
Matrix: Water
Analysis Batch: 333380

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 332162

Tracer	*LCS %Yield*	*LCS Qualifier*	*Limits*
Tc-99m	*108*	*X*	*30 - 105*

Lab Sample ID: LCSD 160-332162/3-A
Matrix: Water
Analysis Batch: 333380

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 332162

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Technetium-99			30.9	31.23		3.61	3.00	1.95	pCi/L	101	80 - 120	0.31	1

Tracer	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Tc-99m	*99.7*		*30 - 105*

Tracer/Carrier Summary

Client: CH2M Hill Plateau Remediation Company
Project/Site: I17-010

TestAmerica Job ID: 160-24732-1
SDG: SL2689

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

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	Client Sample ID	Tc-99m (30-105)
160-24732-1	B3BRY5	96.9
160-24732-2	B3BT05	107 X
160-24732-3	B3BT06	101
160-24732-4	B3C115	101
160-24732-5	B3BT25	97.9
160-24732-6	B3BT26	108 X
LCS 160-332162/2-A	Lab Control Sample	108 X
LCSD 160-332162/3-A	Lab Control Sample Dup	99.7
MB 160-332162/1-A	Method Blank	93.8

Tracer/Carrier Legend

Tc-99m = Tc-99m

SOUTHWEST RESEARCH INSTITUTE

LIQUID SCINTILLATION COUNTING DATA SHEET

Lab Name: Southwest Research Institute

Client: CH2M Hill Plateau Remediation

Lab Code: SwRI

Project No.: 20859.01.00X

Matrix: Water

SRR #: 60394, 60425, 60478

Date Received: 09/14/17, 09/20/17, 09/28/17

SDG: 621022

Task Order #: 170914-5, 170920-5, 170929-4

SAF #: A17-009, S17-009, I17-010

IODINE-129

Sample ID	Lab System ID	Analyte	Results (pCi/L)	Q	TPU (2s) (pCi/L)	MDA (pCi/L)	Counting Error (2s)	PdI_2 Tracer Rec.	Date Analyzed
Prep Blank	pbwk03sd1	^{129}I	-9.13E-01	U	2.91E-01	9.96E-01	2.88E-01	92.09%	10/21/17
Lab Control	lcswk03sd1	^{129}I	1.03E+03		4.62E+01	9.87E-01	2.47E+00	92.87%	10/21/17
True Value	-----	^{129}I	1.05E+03		-----	-----	-----	-----	-----
Recovery	-----	^{129}I	97.4%		-----	-----	-----	-----	-----
B3BPK0	621022	^{129}I	-1.31E-01	U	2.81E-01	9.45E-01	2.81E-01	97.05%	10/21/17
B3BPK5	621023	^{129}I	3.86E-01	U	2.96E-01	9.75E-01	2.95E-01	94.07%	10/21/17
Duplicate result	621023D	^{129}I	3.99E-01	U	2.90E-01	9.55E-01	2.89E-01	95.99%	10/21/17
RPD	-----	^{129}I	3.3%		-----	-----	-----	-----	-----
B3BX13	621389	^{129}I	1.00E+00		3.04E-01	9.73E-01	3.00E-01	94.29%	10/21/17
B3BRY6	621742	^{129}I	3.73E+00		3.62E-01	9.55E-01	3.20E-01	95.99%	10/21/17
B3BT16	621743	^{129}I	1.17E+01		6.53E-01	9.58E-01	3.85E-01	95.77%	10/21/17
B3BT27	621744	^{129}I	1.29E+00		3.09E-01	9.75E-01	3.04E-01	94.07%	10/21/17
B3BT28	621745	^{129}I	6.26E-01	U	2.91E-01	9.48E-01	2.89E-01	96.69%	10/21/17
B3C113	621747	^{129}I	5.94E+00		4.32E-01	9.54E-01	3.39E-01	96.13%	10/22/17
B3C114	621748	^{129}I	-9.28E-02	U	2.87E-01	9.64E-01	2.87E-01	95.14%	10/22/17

Q - Data Qualifier. U - Less than MDA. MDA - Minimum Detectable Activity. TPU - Total Propagated Uncertainty. MDAs are sample specific.

SOUTHWEST RESEARCH INSTITUTE

LIQUID SCINTILLATION COUNTING DATA SHEET

Lab Name: Southwest Research Institute

Client: CH2M Hill Plateau Remediation

Lab Code: SwRI

Project No.: 20859.01.00X

Matrix: Water

SRR #: 60394, 60421

Date Received: 09/14/17, 09/19/17

SDG: 621022

Task Order #: 170914-5, 170919-9

SAF #: A17-009, S17-009

TECHNETIUM-99

Sample ID	Lab System ID	Analyte	Results (pCi/L)	Q	TPU (2s) (pCi/L)	MDA (pCi/L)	Counting Error (2s)	Date Analyzed
Prep Blank	pbwj29sm4	^{99}Tc	3.99E+00	U	2.77E+00	4.44E+00	2.74E+00	10/04/17
Lab Control	lcswj29sm5	^{99}Tc	1.02E+02		1.20E+01	4.44E+00	4.69E+00	10/04/17
True Value	-----	^{99}Tc	9.99E+01		-----	-----	-----	-----
Recovery	-----	^{99}Tc	102.0%		-----	-----	-----	-----
Lab Control	lcswj29sm6	^{99}Tc	1.05E+02		1.23E+01	4.42E+00	4.72E+00	10/04/17
True Value	-----	^{99}Tc	9.99E+01		-----	-----	-----	-----
Recovery	-----	^{99}Tc	104.7%		-----	-----	-----	-----
RPD	-----	^{99}Tc	2.6%		-----	-----	-----	-----
B3BPK0	621022	^{99}Tc	4.55E+00		2.80E+00	4.44E+00	2.76E+00	10/04/17
Spike result	621022MS	^{99}Tc	1.01E+02		1.19E+01	4.42E+00	4.66E+00	10/04/17
True Value	-----	^{99}Tc	9.99E+01		-----	-----	-----	-----
Recovery	-----	^{99}Tc	96.0%		-----	-----	-----	-----
B3BPK5	621023	^{99}Tc	2.31E+01		4.08E+00	4.44E+00	3.22E+00	10/04/17
B3C013	621360	^{99}Tc	4.14E+00	U	2.78E+00	4.43E+00	2.74E+00	10/04/17
Duplicate result	621360D	^{99}Tc	5.31E+00		2.83E+00	4.42E+00	2.77E+00	10/04/17
RPD	-----	^{99}Tc	24.7%		-----	-----	-----	-----

Q - Data Qualifier. U - Less than MDA. MDA - Minimum Detectable Activity. TPU - Total Propagated Uncertainty. MDAs are sample specific.

SOUTHWEST RESEARCH INSTITUTE

LIQUID SCINTILLATION COUNTING DATA SHEET

Lab Name: Southwest Research Institute

Client: CH2M Hill Plateau Remediation

Lab Code: SwRI

Project No.: 20859.01.00X

Matrix: Water

SRR #: 60394, 60421, 60425

Date Received: 09/14/17, 09/19/17, 09/20/17

SDG: 621022

Task Order #: 170914-5, 170919-9, 170920-5

SAF #: A17-009, S17-009

TRITIUM

Sample ID	Lab System ID	Analyte	Results (pCi/L)	Q	TPU (2s) (pCi/L)	MDA (pCi/L)	Counting Error (2s)	Date Analyzed
Prep Blank	pbwj21sd1	^{3}H	-2.77E+01	U	1.14E+02	1.96E+02	1.14E+02	09/22/17
Lab Control	lcsj21sd1	^{3}H	9.78E+03		1.19E+03	1.97E+02	3.40E+02	09/23/17
True Value	-----	^{3}H	1.14E+04		-----	-----	-----	-----
Recovery	-----	^{3}H	85.9%		-----	-----	-----	-----
B3BPK0	621022	^{3}H	1.77E+02	U	1.34E+02	2.16E+02	1.32E+02	09/23/17
Duplicate result	621022D	^{3}H	4.85E+01	U	1.26E+02	2.14E+02	1.26E+02	09/24/17
RPD	-----	^{3}H	114.0%		-----	-----	-----	-----
Spike result	621022MS	^{3}H	1.16E+04		1.41E+03	2.17E+02	3.87E+02	09/24/17
True Value	-----	^{3}H	1.14E+04		-----	-----	-----	-----
Recovery	-----	^{3}H	100.6%		-----	-----	-----	-----
B3BWX7	621359	^{3}H	1.42E+02	U	1.33E+02	2.18E+02	1.32E+02	09/24/17
B3C0D0	621361	^{3}H	1.27E+02	U	1.23E+02	1.98E+02	1.22E+02	09/24/17
B3BX13	621389	^{3}H	1.05E+05		1.23E+04	2.18E+02	1.11E+03	09/24/17

Q - Data Qualifier. U - Less than MDA. MDA - Minimum Detectable Activity. TPU - Total Propagated Uncertainty. MDAs are sample specific.

SOUTHWEST RESEARCH INSTITUTE

LIQUID SCINTILLATION COUNTING DATA SHEET

Lab Name: Southwest Research Institute

Client: CH2M Hill Plateau Remediation

Lab Code: SwRI

Project No.: 20859.01.00X

Matrix: Water

SRR #: 60462, 60469

Date Received: 09/26/17, 09/27/17

SDG: 621022

Task Order #: 170927-5, 170927-10

SAF #: S17-009, X18-001

TRITIUM

Sample ID	Lab System ID	Analyte	Results (pCi/L)	Q	TPU (2s) (pCi/L)	MDA (pCi/L)	Counting Error (2s)	Date Analyzed
Prep Blank	pbwk02sd1	^{3}H	1.37E+02	U	1.39E+02	2.26E+02	1.38E+02	10/03/17
Lab Control	lcsk02sd1	^{3}H	1.03E+04		1.26E+03	1.93E+02	3.56E+02	10/03/17
True Value	-----	^{3}H	1.14E+04		-----	-----	-----	-----
Recovery	-----	^{3}H	90.8%		-----	-----	-----	-----
B3CWD2	621638	^{3}H	6.18E+01	U	1.16E+02	1.84E+02	1.16E+02	10/03/17
B3D061	621639	^{3}H	-2.02E+01	U	1.17E+02	1.96E+02	1.17E+02	10/03/17
B3BVY9	621685	^{3}H	7.79E+03		9.62E+02	1.95E+02	3.17E+02	10/03/17
B3BW03	621686	^{3}H	5.42E+03		6.90E+02	2.02E+02	2.77E+02	10/03/17
B3C0B2	621687	^{3}H	1.08E+03		2.09E+02	2.08E+02	1.67E+02	10/03/17

Q - Data Qualifier. U - Less than MDA. MDA - Minimum Detectable Activity. TPU - Total Propagated Uncertainty. MDAs are sample specific.

SOUTHWEST RESEARCH INSTITUTE

ALPHA SPECTROMETRY ANALYSIS DATA SHEET

Lab Name: Southwest Research Institute

Client: CH2M Hill Plateau Remediation

Lab Code: SwRI

Project No.: 20859.01.00X

Matrix: Water

SRR #: 60421

Date Received: 09/19/17

SDG: 621022

Task Order #: 170919-9

SAF #: S17-009

PLUTONIUM-238, 239/240

Sample ID	Lab System ID	Analyte	Results (pCi/L)	Q	TPU (2s) (pCi/L)	MDA (pCi/L)	Counting Error (2s)	^{242}Pu Tracer Rec.	Date Analyzed
Prep Blank	pbwj29sm1	^{238}Pu	0.00E+00	U	7.80E-02	2.64E-01	7.80E-02	77.0%	10/03/17
	pbwj29sm1	$^{239/240}$Pu	0.00E+00	U	7.80E-02	2.11E-01	7.80E-02	77.0%	10/03/17
Lab Control	lcswj29sm1	^{238}Pu	0.00E+00	U	1.72E-01	4.80E-01	1.72E-01	79.3%	10/03/17
	lcswj29sm1	$^{239/240}$Pu	1.07E+01		1.72E+00	2.08E-01	1.08E+00	79.3%	10/03/17
True Value	-----	^{238}Pu	-----		-----	-----	-----	-----	-----
	-----	$^{239/240}$Pu	1.00E+01		-----	-----	-----	-----	-----
Recovery	-----	^{238}Pu	-----		-----	-----	-----	-----	-----
	-----	$^{239/240}$Pu	107.3%		-----	-----	-----	-----	-----
B3C013	621360	^{238}Pu	0.00E+00	U	7.10E-02	1.92E-01	7.10E-02	84.0%	10/03/17
	621360	$^{239/240}$Pu	2.51E-02	U	7.11E-02	1.92E-01	7.10E-02	84.0%	10/03/17
Duplicate result	621360D	^{238}Pu	-2.75E-02	U	7.79E-02	2.63E-01	7.78E-02	76.3%	10/03/17
	621360D	$^{239/240}$Pu	-2.75E-02	U	9.54E-02	3.39E-01	9.53E-02	76.3%	10/03/17
RPD	-----	^{238}Pu	200%		-----	-----	-----	-----	-----
	-----	$^{239/240}$Pu	4334.9%		-----	-----	-----	-----	-----

Q - Data Qualifier. U - Less than MDA. MDA - Minimum Detectable Activity. TPU - Total Propagated Uncertainty. MDAs are sample specific.

SOUTHWEST RESEARCH INSTITUTE

GAS FLOW PROPORTIONAL COUNTING DATA SHEET

Lab Name: Southwest Research Institute

Client: CH2M Hill Plateau Remediation

Lab Code: SwRI

Project No.: 20859.01.00X

Matrix: Water

SRR #: 60421, 60462, 60469, 60478

Date Received: 09/19/17, 09/26/17, 09/27/17, 09/28/17

SDG: 621022

Task Order #: 170919-9, 170927-5, 170927-10, 170929-4

SAF #: S17-009, X18-001, I17-009

STRONTIUM-90

Sample ID	Lab System ID	Analyte	Results (pCi/L)	Q	TPU (2s) (pCi/L)	MDA (pCi/L)	Counting Error (2s)	Sr Tracer Rec.	Date Analyzed
Prep Blank	pbwk23sd1	^{90}Sr	2.67E-01	U	7.28E-01	1.24E+00	7.28E-01	97.3%	10/27/17
Lab Control	lcswk23sd1	^{90}Sr	1.37E+02		1.76E+01	1.23E+00	7.81E+00	98.2%	10/27/17
True Value	-----	^{90}Sr	1.51E+02		-----	-----	-----	-----	-----
Recovery	-----	^{90}Sr	90.8%		-----	-----	-----	-----	-----
B3C013	621360	^{90}Sr	1.60E-02	U	6.45E-01	1.26E+00	6.45E-01	96.3%	10/28/17
Duplicate result	621360D	^{90}Sr	-3.10E-02	U	6.23E-01	1.25E+00	6.23E-01	97.0%	10/28/17
RPD	-----	^{90}Sr	*624.9%*		-----	-----	-----	-----	-----
B3CWD2	621638	^{90}Sr	1.54E-02	U	6.24E-01	1.22E+00	6.24E-01	99.5%	10/28/17
B3D169	621640	^{90}Sr	8.58E-02	U	6.55E-01	1.25E+00	6.55E-01	97.1%	10/28/17
B3BVY9	621685	^{90}Sr	3.10E+01		5.25E+00	1.27E+00	3.84E+00	95.2%	10/28/17
B3BW03	621686	^{90}Sr	2.04E+02		2.54E+01	1.27E+00	9.73E+00	95.5%	10/28/17
B3C0B2	621687	^{90}Sr	9.10E-02	U	6.65E-01	1.24E+00	6.65E-01	97.9%	10/28/17
B3D066	621688	^{90}Sr	1.18E-01	U	6.71E-01	1.25E+00	6.71E-01	97.5%	10/28/17
B3C041	621746	^{90}Sr	8.32E+02		9.79E+01	1.25E+00	1.96E+01	96.9%	10/28/17

Q - Data Qualifier. U - Less than MDA. MDA - Minimum Detectable Activity. TPU - Total Propagated Uncertainty. MDAs are sample specific.

FORM II

Date: 23-Oct-17

DUPLICATE RESULTS

Lab Name:	**TestAmerica Inc**	**SDG:**	W07911	**Collection Date:**	9/26/2017 10:15:00 AM
Lot-Sample No.:	**J7I260404-2**	**Report No. :**	71931	**Received Date:**	9/26/2017 2:55:00 PM
Client Sample ID:	**B3BPT4 DUP**	**COC No. :**	S17-009-214	**Matrix:**	WATER

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
Batch: 7279032	9310_ALPHABETA_GPC		**Work Order:**	NAF9N1AD		**Report DB ID:**	NAF9N1DR		**Orig Sa DB ID:**	9NAF9N10		
Beta	1.10E+02		3.7E+00	1.5E+01	1.96E+00	pCi/L	100%	(56.)	10/16/17 08:41 p		0.20069	GPC26D
	1.08E+02		**RPD**	**1.8**		4.00E+00		(15.2)			L	

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

TestAmerica Inc **RPD - Relative Percent Difference.**

rptSTLRchDupV5.8.5 A2002 **MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.**

FORM II

Date: 23-Oct-17

DUPLICATE RESULTS

Lab Name: TestAmerica Inc | **SDG:** W07911 | **Collection Date:** 9/27/2017 9:26:00 AM

Lot-Sample No.: J7I270405-1 | **Report No. :** 71931 | **Received Date:** 9/27/2017 2:40:00 PM

Client Sample ID: B3BPW4 DUP | **COC No. :** I17-009-220 | **Matrix:** WATER

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
Batch: 7279034	9310_ALPHABETA_GPC		**Work Order:**	NAGAA1AD		**Report DB ID:**	NAGAA1DR		**Orig Sa DB ID:**	9NAGAA10		
Alpha	9.14E-01	U	1.0E+00	1.1E+00	1.71E+00	pCi/L	100%	0.54	10/13/17 11:30 p		0.20065	GPC24B
	7.64E-01	U	**RPD**	**17.9**		3.00E+00		(1.7)			L	

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

RPD - Relative Percent Difference.

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.

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: 23-Oct-17

DUPLICATE RESULTS

Lab Name:	**TestAmerica Inc**	**SDG:**	W07912	**Collection Date:**	9/27/2017 10:26:00 AM
Lot-Sample No.:	**J7I270404-1**	**Report No. :**	71931	**Received Date:**	9/27/2017 2:40:00 PM
Client Sample ID:	**B3BRY3 DUP**	**COC No. :**	I17-010-011	**Matrix:**	WATER

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
Batch: 7279033	RATOT_AEAGEA			**Work Order:**	NAF941AE	**Report DB ID:**	NAF941ER		**Orig Sa DB ID:**	9NAF9410		
TOTAL ALPHA RA	1.13E-02	U	3.9E-01	3.9E-01	8.36E-01	pCi/L	77%	0.01	10/19/17 06:16 a		0.50056	GPC21B
	1.39E-01	U	**RPD**	**169.8**		3.00E+00		0.06			L	

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

RPD - Relative Percent Difference.

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.

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

BLANK RESULTS

Date: 23-Oct-17

Lab Name: TestAmerica Inc **SDG:** W07907

Matrix: WATER **Report No. :** 71931

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
Batch: 7279034	9310_ALPHABETA_GPC			**Work Order:**	NAGNH1AA		**Report DB ID:**	NAGNH1AB				
Alpha	-5.98E-02	U	3.7E-01	3.7E-01	7.07E-01	pCi/L	100%	-0.08	10/13/17 11:30 p		0.2062	GPC23C
					3.13E-01	3.00E+00		-0.32			L	
Batch: 7279032	9310_ALPHABETA_GPC			**Work Order:**	NAGNF1AA		**Report DB ID:**	NAGNF1AB				
Beta	1.30E+00	U	9.8E-01	9.9E-01	1.57E+00	pCi/L	100%	0.82	10/17/17 07:51 a		0.20314	GPC26C
					7.48E-01	4.00E+00		(2.6)			L	
Batch: 7279033	RATOT_AEAGEA			**Work Order:**	NAGNG1AA		**Report DB ID:**	NAGNG1AB				
TOTAL ALPHA RA	1.23E-01	U	3.8E-01	3.8E-01	7.41E-01	pCi/L	81%	0.17	10/19/17 06:16 a		0.50944	GPC22D
					2.70E-01	3.00E+00		0.65			L	

No. of Results: 3 **Comments:**

TestAmerica Inc
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MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
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: 23-Oct-17

LCS RESULTS

Lab Name: TestAmerica Inc **SDG:** W07907

Matrix: WATER **Report No. :** 71931

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: 7279034	9310_ALPHABETA_GPC			**Work Order:**	NAGNH1AC		**Report DB ID:**	NAGNH1CS					
Alpha	2.17E+01		1.6E+00	5.6E+00	8.83E-01	pCi/L	100%	2.14E+01	2.1E-01	101%	10/13/17 11:30 p	0.21133	GPC23D
							Rec Limits:	80	120	0.0		L	
Batch: 7279032	9310_ALPHABETA_GPC			**Work Order:**	NAGNF1AC		**Report DB ID:**	NAGNF1CS					
Beta	2.08E+01		1.7E+00	3.1E+00	1.59E+00	pCi/L	100%	2.20E+01	1.6E-01	94%	10/17/17 07:51 a	0.20546	GPC26D
							Rec Limits:	80	120	-0.1		L	
Batch: 7279033	RATOT_AEAGEA			**Work Order:**	NAGNG1AC		**Report DB ID:**	NAGNG1CS					
TOTAL ALPHA RA	4.94E+00		1.2E+00	1.6E+00	8.32E-01	pCi/L	78%	6.11E+00	6.2E-02	81%	10/19/17 06:16 a	0.51248	GPC23A
							Rec Limits:	80	120	-0.2		L	

No. of Results: 3 **Comments:**

TestAmerica Inc **Bias** **- (Result/Expected)-1 as defined by ANSI N13.30.**

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FORM II

Date: 14-Sep-17

MATRIX SPIKE RESULTS

Lab Name: TestAmerica Inc **SDG:** 54021

Lot-Sample No.: J7G130402-2, B3BN07 **Report No. :** 71675 **Matrix:** WATER

Parameter	SpikeResult, Orig Rst	Qual	Count Error (2 s)	CSU (2 s)	MDC|MDA	Rpt Unit	Yield	Rec-overy	Expected, Uncert	Analysis, Prep Date	Aliquot Size	Analy Method, Primary Detector
Batch: 7206017	**Work Order:** NAADQ1AC			**Report DB ID:** NAADQ1CW			**Orig Sa DB ID:** 9NAADQ10					
H-3	1.45E+03		1.6E+02	2.0E+02	2.80E+02	pCi/L	100%	95.76%	1.52E+03	8/30/17 05:57 a	0.00431	TRITIUM_DIST_LSC
	2.31E+02								4.55E+01		L	LSC9

Number of Results: 1

Comments:

TestAmerica Inc

rptSTLRchMs V5.8.5 A2002

RER - Replicate Error Ratio = (S-D)/[sqrt(sq(TPUs)+sq(TPUd))] as defined by ICPT BOA.

Bias - (Result/Expected)-1 as defined by ANSI N13.30.