

CHPRC - REVIEW COMMENT RECORD (RCR)

		1. Date 05/03/2017	2. Review No.	Page 1 of 2
		3. Project No.		
5. Document Number(s)/Title(s) VSR17-005	6. Program/Project/Building Number	7. Reviewer Scot Fitzgerald	8. Organization/Group Sample Management and Reporting	9. Location/Phone MO277/373-7495
17. Comment Submittal Approval		11. CLOSED		
Date: 05/03/2017 Scot Fitzgerald Organization Manager (optional) (print and sign)	Date: _____ Reviewer/Point of Contact (print and sign)	Date: 05/17/2017 Scot Fitzgerald Author/Originator (print and sign)	Reviewer/Point of Contact (print and sign) 	
10. Agreement With Indicated Comment Disposition(s)				
12. Item	13a. Comments	13b. Basis	13c. Recommendation	14. Reviewer Concurrence Required (Y or N)
1	Page 23 of 108; narrative states sample MDLs were below CRDLs. Checklist section 8 has NA for this item and for results reported for all requested analysis.		Correct discrepancy	
2	Page 59 under holding time section flags all analytes in SDG WC1680 for temperature excursion. Samples arrived on ice but did not have time to cool completely between packing for shipment and arrival at the laboratory (30 minute drive).	This is a common occurrence for samples received at TARL. Because of the proximity of the lab, samples do not have enough time on ice to cool below 6 degrees. Exercise professional judgment criteria and remove flagging due to temperature excursion. Update all related sections		
3	Page 83 MS recovery discussion. The sample result is greater than 4x the spike level so no flag is needed for the spike excursion	Remove J flag and update all related sections.		
				15. Disposition (provide justification if NOT accepted)
				16. Status
				Closed
				Closed
				Closed

Data Validation Report for CH2M Hill Plateau Remediation Company

VSR17-005 Project ERDF Leachate

Chemical and Radiochemical Validation - Level C

Validation Performed By:


Eyda Hergenreder

Date: 05-01-2017

Technical Review By:


Ellen McEntee

Date: 05-01-2017

Quality Review By:


Mary Donovan
Quality Assurance Manager

Date: 05-08-2017

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Date: 01 May 2017
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: ERDF Leachate
 Subject: Volatile Organics - Sample Data Group (SDG) DN0054

INTRODUCTION

This memorandum presents the results of data validation for SDG DN0054 prepared by TestAmerica Laboratories, Inc. 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
B37NM1	11/15/16	Water	C	8260B
B37NM0	11/15/16	Water	C	8260B
B37NM4	11/15/16	Water	C	8260B

Data validation was conducted in accordance with the CHPRC validation statement of work and the Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan, WCH-173, Rev. 2 (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

No trip blanks were submitted for validation.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing surrogate results, matrix spike sample results, and laboratory control sample results. According to the SAP, the matrix spike and laboratory control sample accuracy limits should be within the DV procedure established limit of 70% to 130%.

Surrogates

All surrogate recoveries were acceptable.

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

All MS/MSD recoveries were acceptable.

Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)

All LCS/LCSD recoveries were acceptable.

- **Precision**

Precision is evaluated by reviewing MS/MSD results, LCS/LCSD 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 should be within the DV procedure established limit of $\leq 20\%$.

MS/MSD Samples

All MS/MSD RPD values were acceptable.

LCS/LCSD Samples

All LCS/LCSD RPD 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.

All reported sample MDLs were below the CRDLs.

- **Completeness**

SDG DN0054 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-173, Rev. 2, *Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan*, November 2015.

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: DN0054	Reviewer: AQA	Project: ERDF Leachate	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
VOCs	None	N/A	N/A

Comments: None

Appendix 3

Data Validation Supporting Documentation

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	<input checked="" type="radio"/> C	D	E
PROJECT: ERDF Leachate			DATA PACKAGE: VSR17-005		
VALIDATOR: Eyda Hergenreder		LAB: TestAmerica		DATE: 05/05/17	
			SDG: DN0054		
ANALYSES PERFORMED					
SW-846 8260 X		SW-846 8260 (TCLP)	SW-846 8270		SW-846 8270 (TCLP)
SAMPLES/MATRIX Water					
SDG DN0054 - B37NM1, B37NM0, B37NM4					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

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

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

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

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

Comments:

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

6. SYSTEM PERFORMANCE (Levels D and E)

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

Comments:

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

7. HOLDING TIMES (all levels)

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

Comments:

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

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

Comments:

Appendix 4

Additional Documentation Requested By Client

Page 1 of 7
QC Sample Results

Client: CH2M Hill Plateau Remediation Company
 Project/Site: FRC16-03

TestAmerica Job ID: 280-91078-1
 SDG: DN0054

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 280-353605/6
Matrix: Water
Analysis Batch: 353605

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Carbon tetrachloride	0.19	U	1.0	0.19	ug/L			11/29/16 21:28	1
Trichloroethene	0.16	U	1.0	0.16	ug/L			11/29/16 21:28	1

Tentatively Identified Compound	MB Est. Result	MB Qualifier	Unit	D	RT	CAS No.	Prepared	Analyzed	Dil Fac
Acetic acid, 2-ethylhexyl ester	1.94	N J	ug/L		13.05	103-09-3		11/29/16 21:28	1
Guaifenesin di-tms derivative	1.79	N J	ug/L		14.55	1000137-06-7		11/29/16 21:28	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	103		70 - 130		11/29/16 21:28	1
4-Bromofluorobenzene (Surr)	104		70 - 130		11/29/16 21:28	1
Dibromofluoromethane (Surr)	98		70 - 130		11/29/16 21:28	1
Toluene-d8 (Surr)	100		70 - 130		11/29/16 21:28	1

Lab Sample ID: LCS 280-353605/4
Matrix: Water
Analysis Batch: 353605

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Carbon tetrachloride	5.00	4.03		ug/L		81	65 - 135
Trichloroethene	5.00	4.44		ug/L		89	65 - 135

Surrogate	LCS %Recovery	LCS Qualifier	Limits
1,2-Dichloroethane-d4 (Surr)	94		70 - 130
4-Bromofluorobenzene (Surr)	106		70 - 130
Dibromofluoromethane (Surr)	93		70 - 130
Toluene-d8 (Surr)	100		70 - 130

Lab Sample ID: LCSD 280-353605/5
Matrix: Water
Analysis Batch: 353605

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Carbon tetrachloride	5.00	4.69		ug/L		94	65 - 135	15	21
Trichloroethene	5.00	4.70		ug/L		94	65 - 135	6	20

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
1,2-Dichloroethane-d4 (Surr)	94		70 - 130
4-Bromofluorobenzene (Surr)	100		70 - 130
Dibromofluoromethane (Surr)	95		70 - 130
Toluene-d8 (Surr)	98		70 - 130

Page 1 of 7
QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: FRC16-03

TestAmerica Job ID: 280-91078-1
SDG: DN0054

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 280-91078-2 MS
Matrix: Water
Analysis Batch: 353605

Client Sample ID: B37NM0
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Carbon tetrachloride	0.19	U	5.00	4.46		ug/L		89	65 - 135
Trichloroethene	0.16	U	5.00	4.26		ug/L		85	65 - 135
Surrogate		MS %Recovery	MS Qualifier	Limits					
1,2-Dichloroethane-d4 (Surr)		105		70 - 130					
4-Bromofluorobenzene (Surr)		102		70 - 130					
Dibromofluoromethane (Surr)		95		70 - 130					
Toluene-d8 (Surr)		100		70 - 130					

Lab Sample ID: 280-91078-2 MSD
Matrix: Water
Analysis Batch: 353605

Client Sample ID: B37NM0
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Carbon tetrachloride	0.19	U	5.00	4.29		ug/L		86	65 - 135	4	21
Trichloroethene	0.16	U	5.00	3.96		ug/L		79	65 - 135	7	20
Surrogate		MSD %Recovery	MSD Qualifier	Limits							
1,2-Dichloroethane-d4 (Surr)		100		70 - 130							
4-Bromofluorobenzene (Surr)		105		70 - 130							
Dibromofluoromethane (Surr)		96		70 - 130							
Toluene-d8 (Surr)		95		70 - 130							

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

Lab Sample ID: MB 280-352405/1-A
Matrix: Water
Analysis Batch: 353355

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 352405

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
1,2-Diphenylhydrazine	0.23	U	10	0.23	ug/L		11/21/16 10:23	11/28/16 17:29	1	
Tentatively Identified Compound		MB Est. Result	MB Qualifier	Unit	D	RT	CAS No.	Prepared	Analyzed	Dil Fac
Butane, 2-methoxy-2-methyl-		79.2	N J	ug/L		1.59	994-05-8	11/21/16 10:23	11/28/16 17:29	1
Ethyl Acetate		5.19	N J	ug/L		2.45	141-78-6	11/21/16 10:23	11/28/16 17:29	1
2-Pentanone, 4-hydroxy-4-methyl-		45.7	N J	ug/L		2.95	123-42-2	11/21/16 10:23	11/28/16 17:29	1
Surrogate		MB %Recovery	MB Qualifier	Limits		Prepared	Analyzed	Dil Fac		
2-Fluorobiphenyl (Surr)		92		48 - 130		11/21/16 10:23	11/28/16 17:29	1		
2-Fluorophenol (Surr)		92		41 - 130		11/21/16 10:23	11/28/16 17:29	1		
2,4,6-Tribromophenol (Surr)		100		42 - 130		11/21/16 10:23	11/28/16 17:29	1		
Nitrobenzene-d5 (Surr)		91		42 - 130		11/21/16 10:23	11/28/16 17:29	1		
Phenol-d5 (Surr)		91		45 - 130		11/21/16 10:23	11/28/16 17:29	1		
Terphenyl-d14 (Surr)		103		20 - 130		11/21/16 10:23	11/28/16 17:29	1		

TestAmerica Denver

Surrogate Summary

Client: CH2M Hill Plateau Remediation Company
 Project/Site: FRC16-03

TestAmerica Job ID: 280-91078-1
 SDG: DN0054

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Water

Prep Type: Total/NA

Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	12DCE (70-130)	BFB (70-130)	DBFM (70-130)	TOL (70-130)
280-91078-1	B37NM1	101	109	94	103
280-91078-2	B37NM0	103	108	94	101
280-91078-2 MS	B37NM0	105	102	95	100
280-91078-2 MSD	B37NM0	100	105	96	95
280-91078-3	B37NM4	97	104	93	104
LCS 280-353605/4	Lab Control Sample	94	106	93	100
LCSD 280-353605/5	Lab Control Sample Dup	94	100	95	98
MB 280-353605/6	Method Blank	103	104	98	100

Surrogate Legend

12DCE = 1,2-Dichloroethane-d4 (Surr)
 BFB = 4-Bromofluorobenzene (Surr)
 DBFM = Dibromofluoromethane (Surr)
 TOL = Toluene-d8 (Surr)

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

Matrix: Water

Prep Type: Total/NA

Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	FBP (48-130)	2FP (41-130)	TBP (42-130)	NBZ (42-130)	PHL (45-130)	TPH (20-130)
280-91078-2	B37NM0	79	70	95	70	74	78
280-91078-2 MS	B37NM0	87	75	99	75	77	75
280-91078-2 MSD	B37NM0	85	70	97	74	74	57
280-91078-3	B37NM4	82	69	98	71	73	92
LCS 280-352405/2-A	Lab Control Sample	96	83	103	84	84	91
MB 280-352405/1-A	Method Blank	92	92	100	91	91	103

Surrogate Legend

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

Date: 01 May 2017
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: ERDF Leachate
 Subject: Semivolatile Organics - Sample Data Group (SDG) DN0054

INTRODUCTION

This memorandum presents the results of data validation for SDG DN0054 prepared by TestAmerica Laboratories, Inc. A list of samples validated along with the analytical method is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B37NM0	11/15/16	Water	C	8270D
B37NM4	11/15/16	Water	C	8270D

Data validation was conducted in accordance with the CHPRC validation statement of work and the Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan, WCH-173, Rev. 2, (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 semivolatile organics in water are extraction within 7 days of sample collection and analysis within 40 days of sample extraction. Sample preservation requires chilling to ≤ 6 degrees Celsius.

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

- **Blanks**

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

Laboratory Blanks

All laboratory blank results were acceptable.

Trip Blanks

No trip blanks were submitted for validation.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing surrogate results, matrix spike sample results, and laboratory control sample results. According to the SAP, the matrix spike and laboratory control sample accuracy limits should be within the DV procedure established limit of 70% to 130%.

Surrogates

All surrogate recoveries were acceptable with the following exception.

The terphenyl-d14 surrogate recovery for sample B37NM0 MSD was < the lower acceptance limit but $\geq 20\%$. Since the sample was a QC sample, data should not be qualified.

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

All MS/MSD recoveries were acceptable.

Laboratory Control Samples (LCSs)

The LCS recovery was 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) limit should be within the DV procedure established limit of $\leq 20\%$.

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.

All reported sample MDLs were below the CRDLs.

- **Completeness**

SDG DN0054 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

There were no minor deficiencies leading to qualification of sample results as estimates.

REFERENCES

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

WCH-173, Rev. 2, *Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan*, November 2015.

Appendix 1

Glossary of Data Reporting Qualifiers

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

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

Appendix 2
Summary of Data Qualification

Semivolatile Organics Data Qualification Summary			
SDG: DN0054	Reviewer: AQA	Project: ERDF Leachate	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
SVOC	None	N/A	N/A

Comments: None

Appendix 3

Data Validation Supporting Documentation

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	<input checked="" type="radio"/> C	D	E
PROJECT: ERDF Leachate			DATA PACKAGE: VSR17-005		
VALIDATOR: Eyda Hergenreder		LAB: TestAmerica		DATE: 05/05/17	
			SDG: DN0054		
ANALYSES PERFORMED					
SW-846 8260		SW-846 8260 (TCLP)	SW-846 8270 X		SW-846 8270 (TCLP)
SAMPLES/MATRIX Water					
SDG DN0054: B37NM0, B37NM4					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

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

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

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

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

Comments:

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

Sample B37NM0 MSD: Terphenyl-d14 57%

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

6. SYSTEM PERFORMANCE (Levels D and E)

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

Comments:

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

7. HOLDING TIMES (all levels)

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

Comments:

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

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

Comments:

Appendix 4

Additional Documentation Requested By Client

Page 22 of 77
QC Sample Results

Client: CH2M Hill Plateau Remediation Company
 Project/Site: FRC16-03

TestAmerica Job ID: 280-91078-1
 SDG: DN0054

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 280-91078-2 MS

Matrix: Water

Analysis Batch: 353605

Client Sample ID: B37NM0

Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits	
Carbon tetrachloride	0.19	U	5.00	4.46		ug/L		89	65 - 135	
Trichloroethene	0.16	U	5.00	4.26		ug/L		85	65 - 135	
Surrogate	%Recovery	MS Qualifier	MS Limits							
1,2-Dichloroethane-d4 (Surr)	105		70 - 130							
4-Bromofluorobenzene (Surr)	102		70 - 130							
Dibromofluoromethane (Surr)	95		70 - 130							
Toluene-d8 (Surr)	100		70 - 130							

Lab Sample ID: 280-91078-2 MSD

Matrix: Water

Analysis Batch: 353605

Client Sample ID: B37NM0

Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Carbon tetrachloride	0.19	U	5.00	4.29		ug/L		86	65 - 135	4	21
Trichloroethene	0.16	U	5.00	3.96		ug/L		79	65 - 135	7	20
Surrogate	%Recovery	MSD Qualifier	MSD Limits								
1,2-Dichloroethane-d4 (Surr)	100		70 - 130								
4-Bromofluorobenzene (Surr)	105		70 - 130								
Dibromofluoromethane (Surr)	96		70 - 130								
Toluene-d8 (Surr)	95		70 - 130								

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

Lab Sample ID: MB 280-352405/1-A

Matrix: Water

Analysis Batch: 353355

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 352405

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Diphenylhydrazine	0.23	U	10	0.23	ug/L		11/21/16 10:23	11/28/16 17:29	1
Tentatively Identified Compound	Est. Result	MB Qualifier	Unit	D	RT	CAS No.	Prepared	Analyzed	Dil Fac
Butane, 2-methoxy-2-methyl-	79.2	N J	ug/L		1.59	994-05-8	11/21/16 10:23	11/28/16 17:29	1
Ethyl Acetate	5.19	N J	ug/L		2.45	141-78-6	11/21/16 10:23	11/28/16 17:29	1
2-Pentanone, 4-hydroxy-4-methyl-	45.7	N J	ug/L		2.95	123-42-2	11/21/16 10:23	11/28/16 17:29	1
Surrogate	%Recovery	MB Qualifier	Limits						
2-Fluorobiphenyl (Surr)	92		48 - 130						
2-Fluorophenol (Surr)	92		41 - 130						
2,4,6-Tribromophenol (Surr)	100		42 - 130						
Nitrobenzene-d5 (Surr)	91		42 - 130						
Phenol-d5 (Surr)	91		45 - 130						
Terphenyl-d14 (Surr)	103		20 - 130						

TestAmerica Denver

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
 Project/Site: FRC16-03

TestAmerica Job ID: 280-91078-1
 SDG: DN0054

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

Lab Sample ID: LCS 280-352405/2-A

Matrix: Water

Analysis Batch: 353355

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 352405

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
1,2-Diphenylhydrazine	80.9	77.2		ug/L		95	55 - 130

Surrogate	LCS %Recovery	LCS Qualifier	Limits
2-Fluorobiphenyl (Surr)	96		48 - 130
2-Fluorophenol (Surr)	83		41 - 130
2,4,6-Tribromophenol (Surr)	103		42 - 130
Nitrobenzene-d5 (Surr)	84		42 - 130
Phenol-d5 (Surr)	84		45 - 130
Terphenyl-d14 (Surr)	91		20 - 130

Lab Sample ID: 280-91078-2 MS

Matrix: Water

Analysis Batch: 353355

Client Sample ID: B37NM0

Prep Type: Total/NA

Prep Batch: 352405

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
1,2-Diphenylhydrazine	0.22	U	77.6	70.5		ug/L		91	55 - 120

Surrogate	MS %Recovery	MS Qualifier	Limits
2-Fluorobiphenyl (Surr)	87		48 - 130
2-Fluorophenol (Surr)	75		41 - 130
2,4,6-Tribromophenol (Surr)	99		42 - 130
Nitrobenzene-d5 (Surr)	75		42 - 130
Phenol-d5 (Surr)	77		45 - 130
Terphenyl-d14 (Surr)	75		20 - 130

Lab Sample ID: 280-91078-2 MSD

Matrix: Water

Analysis Batch: 353355

Client Sample ID: B37NM0

Prep Type: Total/NA

Prep Batch: 352405

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
1,2-Diphenylhydrazine	0.22	U	76.5	67.8		ug/L		89	55 - 120	4	30

Surrogate	MSD %Recovery	MSD Qualifier	Limits
2-Fluorobiphenyl (Surr)	85		48 - 130
2-Fluorophenol (Surr)	70		41 - 130
2,4,6-Tribromophenol (Surr)	97		42 - 130
Nitrobenzene-d5 (Surr)	74		42 - 130
Phenol-d5 (Surr)	74		45 - 130
Terphenyl-d14 (Surr)	57		20 - 130

Surrogate Summary

Client: CH2M Hill Plateau Remediation Company
 Project/Site: FRC16-03

TestAmerica Job ID: 280-91078-1
 SDG: DN0054

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Water

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Surrogate Recovery (Acceptance Limits)			
		12DCE (70-130)	BFB (70-130)	DBFM (70-130)	TOL (70-130)
280-91078-1	B37NM1	101	109	94	103
280-91078-2	B37NM0	103	108	94	101
280-91078-2 MS	B37NM0	105	102	95	100
280-91078-2 MSD	B37NM0	100	105	96	95
280-91078-3	B37NM4	97	104	93	104
LCS 280-353605/4	Lab Control Sample	94	106	93	100
LCSD 280-353605/5	Lab Control Sample Dup	94	100	95	98
MB 280-353605/6	Method Blank	103	104	98	100

Surrogate Legend

12DCE = 1,2-Dichloroethane-d4 (Surr)
 BFB = 4-Bromofluorobenzene (Surr)
 DBFM = Dibromofluoromethane (Surr)
 TOL = Toluene-d8 (Surr)

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

Matrix: Water

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Surrogate Recovery (Acceptance Limits)					
		FBP (48-130)	2FP (41-130)	TBP (42-130)	NBZ (42-130)	PHL (45-130)	TPH (20-130)
280-91078-2	B37NM0	79	70	95	70	74	78
280-91078-2 MS	B37NM0	87	75	99	75	77	75
280-91078-2 MSD	B37NM0	85	70	97	74	74	57
280-91078-3	B37NM4	82	69	98	71	73	92
LCS 280-352405/2-A	Lab Control Sample	96	83	103	84	84	91
MB 280-352405/1-A	Method Blank	92	92	100	91	91	103

Surrogate Legend

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

Date: 05 May 2017
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: ERDF Leachate
 Subject: Inorganics - Sample Data Group (SDG) DN0054

INTRODUCTION

This memorandum presents the results of data validation for SDG DN0054 prepared by TestAmerica Laboratories, Inc. 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
B37NM0	11/15/16	Water	C	6010C & 6020A
B37NM4	11/15/16	Water	C	6010C & 6020A

Data validation was conducted in accordance with the CHPRC validation statement of work and the Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan, WCH-173, Rev. 2 (SAP). Appendices 1 through 4 provide the following information as indicated below:

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

DATA QUALITY OBJECTIVES

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The holding time requirement for metals is 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 exception.

For SDG DN0054, the Na laboratory blank result was > the method detection limit (MDL) but < the reporting limit (RL). The Na sample results were $\geq 20X$ the blank value and should not be qualified.

Trip Blanks

No trip blanks were submitted for validation.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results, laboratory control sample results, and ICP-AES interference check sample results. According to the SAP, the matrix spike sample accuracy limits are 75% to 125% and the laboratory control sample accuracy limits are 80% to 120% which are specified by the DV procedure.

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

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

For SDG DN0054, the MSD recovery for U was $\geq 125\%$ and no post digestion spike was analyzed. The U parent sample result was $>4X$ the spike concentration and 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 should be within the DV procedure established limit of $\leq 20\%$.

MS/MSD Samples

All MS/MSD RPD values were acceptable.

Field Duplicate Samples

All field duplicate results were acceptable with the following exception.

For SDG DN0054, the Zn result for sample B37NM0 was $< \text{MDL}$ and the result for duplicate sample B37NM4 was $> \text{PQL}$.

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 with the exception of silicon. The reported MDL was $>$ the CRDL.

- **Completeness**

SDG DN0054 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

There were no minor deficiencies leading to qualification of sample results as estimates.

REFERENCES

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

WCH-173, Rev. 2, *Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan*, November 2015.

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: DN0054	Reviewer: AQA	Project: ERDF Leachate	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
All Metals	None	N/A	N/A

Comments: None

Appendix 3

Data Validation Supporting Documentation

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	<input checked="" type="radio"/> C	D	E
PROJECT: ERDF Leachate			DATA PACKAGE: VSR17-005		
VALIDATOR: Eyda Hergenreder		LAB: TestAmerica		DATE: 05/01/17	
			SDG: DN0054		
ANALYSES PERFORMED					
SW-846/ICP X	SW-846/GFAA	SW-846/Hg	SW-846 Cyanide	SW-846/ICPMS X	
SAMPLES/MATRIX Water					
SDG DN0054: B37NM0, B37NM4					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

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

Comments:

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

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

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

Comments:

SDG DN0054: Na 180.1 ug/L

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

6. ICP QUALITY CONTROL (Levels D and E)

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

Comments:

7. HOLDING TIMES (all levels)

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

Comments:

Appendix 4

Additional Documentation Requested By Client

Page 5 of 7
QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: FRC16-03

TestAmerica Job ID: 280-91078-1
SDG: DN0054

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 280-352076/1-A
Matrix: Water
Analysis Batch: 353166

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 352076

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Potassium	237	U	3000	237	ug/L		11/17/16 23:07	11/26/16 01:10	1
Sodium	180.1	B	1000	91.6	ug/L		11/17/16 23:07	11/26/16 01:10	1
Silicon	34.7	U	500	34.7	ug/L		11/17/16 23:07	11/26/16 01:10	1

Lab Sample ID: MB 280-352076/1-A
Matrix: Water
Analysis Batch: 353460

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 352076

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	34.5	U	200	34.5	ug/L		11/17/16 23:07	11/28/16 18:04	1

Lab Sample ID: LCS 280-352076/2-A
Matrix: Water
Analysis Batch: 353166

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 352076

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Potassium	50000	48920		ug/L		98	80 - 120
Sodium	50000	50780		ug/L		102	80 - 120
Silicon	10000	9495		ug/L		95	80 - 120

Lab Sample ID: LCS 280-352076/2-A
Matrix: Water
Analysis Batch: 353460

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 352076

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Calcium	50000	50210		ug/L		100	80 - 120

Lab Sample ID: 280-91078-2 MS
Matrix: Water
Analysis Batch: 353166

Client Sample ID: B37NM0
Prep Type: Total/NA
Prep Batch: 352076

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Potassium	20300		50000	72520		ug/L		105	75 - 125
Sodium	212000		50000	263900	X	ug/L		104	75 - 125
Silicon	20200		10000	29960		ug/L		98	75 - 125

Lab Sample ID: 280-91078-2 MS
Matrix: Water
Analysis Batch: 353460

Client Sample ID: B37NM0
Prep Type: Total/NA
Prep Batch: 352076

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Calcium	299000		50000	346300	X	ug/L		94	75 - 125

Lab Sample ID: 280-91078-2 MSD
Matrix: Water
Analysis Batch: 353166

Client Sample ID: B37NM0
Prep Type: Total/NA
Prep Batch: 352076

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Potassium	20300		50000	70590		ug/L		101	75 - 125	3	20

TestAmerica Denver

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QC Sample Results

Client: CH2M Hill Plateau Remediation Company
 Project/Site: FRC16-03

TestAmerica Job ID: 280-91078-1
 SDG: DN0054

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

Lab Sample ID: 280-91078-2 MSD
 Matrix: Water
 Analysis Batch: 353166

Client Sample ID: B37NM0
 Prep Type: Total/NA
 Prep Batch: 352076

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Sodium	212000		50000	260400	X	ug/L		97	75 - 125	1	20
Silicon	20200		10000	29430		ug/L		92	75 - 125	2	20

Lab Sample ID: 280-91078-2 MSD
 Matrix: Water
 Analysis Batch: 353460

Client Sample ID: B37NM0
 Prep Type: Total/NA
 Prep Batch: 352076

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Calcium	299000		50000	341300	X	ug/L		84	75 - 125	1	20

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 280-352080/1-A
 Matrix: Water
 Analysis Batch: 352603

Client Sample ID: Method Blank
 Prep Type: Total/NA
 Prep Batch: 352080

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.33	U	5.0	0.33	ug/L		11/21/16 07:10	11/21/16 18:54	1
Barium	0.29	U	1.0	0.29	ug/L		11/21/16 07:10	11/21/16 18:54	1
Beryllium	0.080	U	1.0	0.080	ug/L		11/21/16 07:10	11/21/16 18:54	1
Chromium	0.50	U	2.0	0.50	ug/L		11/21/16 07:10	11/21/16 18:54	1
Lead	0.18	U	1.0	0.18	ug/L		11/21/16 07:10	11/21/16 18:54	1
Selenium	0.70	U	5.0	0.70	ug/L		11/21/16 07:10	11/21/16 18:54	1
Thallium	0.050	U	1.0	0.050	ug/L		11/21/16 07:10	11/21/16 18:54	1
Tin	0.77	U	10.0	0.77	ug/L		11/21/16 07:10	11/21/16 18:54	1
Tungsten	0.20	U	5.0	0.20	ug/L		11/21/16 07:10	11/21/16 18:54	1
Uranium	0.050	U	1.0	0.050	ug/L		11/21/16 07:10	11/21/16 18:54	1
Vanadium	0.50	U	5.0	0.50	ug/L		11/21/16 07:10	11/21/16 18:54	1
Zinc	2.0	U	10.0	2.0	ug/L		11/21/16 07:10	11/21/16 18:54	1

Lab Sample ID: LCS 280-352080/2-A
 Matrix: Water
 Analysis Batch: 352603

Client Sample ID: Lab Control Sample
 Prep Type: Total/NA
 Prep Batch: 352080

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	40.0	38.42		ug/L		96	80 - 120
Barium	40.0	40.40		ug/L		101	80 - 120
Beryllium	40.0	37.78		ug/L		94	80 - 120
Chromium	40.0	39.34		ug/L		98	80 - 120
Lead	40.0	40.46		ug/L		101	80 - 120
Selenium	40.0	37.57		ug/L		94	80 - 120
Thallium	40.0	39.48		ug/L		99	80 - 120
Tin	40.0	40.26		ug/L		101	80 - 120
Tungsten	40.0	38.95		ug/L		97	80 - 120
Uranium	40.0	39.03		ug/L		98	80 - 120
Vanadium	40.0	40.54		ug/L		101	80 - 120
Zinc	40.0	39.85		ug/L		100	80 - 120

TestAmerica Denver

Page 5 of 7
QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: FRC16-03

TestAmerica Job ID: 280-91078-1
SDG: DN0054

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

Lab Sample ID: 280-91078-2 MS
Matrix: Water
Analysis Batch: 352603

Client Sample ID: B37NM0
Prep Type: Total/NA
Prep Batch: 352080
%Rec.

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Arsenic	5.2		40.0	45.32		ug/L		100	75 - 125
Barium	80.1		40.0	119.0		ug/L		97	75 - 125
Beryllium	0.080	U	40.0	39.77		ug/L		99	75 - 125
Chromium	120		40.0	159.8		ug/L		100	75 - 125
Lead	0.18	U	40.0	37.85		ug/L		95	75 - 125
Selenium	2.3	B	40.0	40.19		ug/L		95	75 - 125
Thallium	0.050	U	40.0	37.30		ug/L		93	75 - 125
Tin	0.77	U	40.0	39.85		ug/L		100	75 - 125
Tungsten	0.27	B	40.0	38.92		ug/L		97	75 - 125
Uranium	1040		40.0	1080	X	ug/L		105	75 - 125
Vanadium	20.8		40.0	61.53		ug/L		102	75 - 125
Zinc	2.0	U	40.0	38.32		ug/L		96	75 - 125

Lab Sample ID: 280-91078-2 MSD
Matrix: Water
Analysis Batch: 352603

Client Sample ID: B37NM0
Prep Type: Total/NA
Prep Batch: 352080
%Rec.

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	5.2		40.0	44.21		ug/L		98	75 - 125	2	20
Barium	80.1		40.0	124.9		ug/L		112	75 - 125	5	20
Beryllium	0.080	U	40.0	38.83		ug/L		97	75 - 125	2	20
Chromium	120		40.0	158.3		ug/L		96	75 - 125	1	20
Lead	0.18	U	40.0	37.77		ug/L		94	75 - 125	0	20
Selenium	2.3	B	40.0	40.36		ug/L		95	75 - 125	0	20
Thallium	0.050	U	40.0	37.27		ug/L		93	75 - 125	0	20
Tin	0.77	U	40.0	39.79		ug/L		99	75 - 125	0	20
Tungsten	0.27	B	40.0	39.18		ug/L		97	75 - 125	1	30
Uranium	1040		40.0	1090	X	ug/L		129	75 - 125	1	20
Vanadium	20.8		40.0	58.72		ug/L		95	75 - 125	5	20
Zinc	2.0	U	40.0	38.40		ug/L		96	75 - 125	0	20

Method: 350.1 - Nitrogen, Ammonia

Lab Sample ID: MB 280-352215/20
Matrix: Water
Analysis Batch: 352215

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ammonia as N	22.0	U	100	22.0	ug/L			11/18/16 14:26	1

Lab Sample ID: LCS 280-352215/18
Matrix: Water
Analysis Batch: 352215

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Ammonia as N	2500	2542		ug/L		102	80 - 120

TestAmerica Denver

Date: 05 May 2017
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: ERDF Leachate
 Subject: General Chemistry - Sample Data Groups (SDGs) DN0054 and WC1680

INTRODUCTION

This memorandum presents the results of data validation for SDGs DN0054 and WC1680 prepared by TestAmerica Laboratories, Inc. 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
B37NM0	11/15/16	Water	C	See note 1
B37NM4	11/15/16	Water	C	See note 1
B37NL8	11/15/16	Water	C	300.0 & 7196A
B37NM2	11/15/16	Water	C	300.0 & 7196A

1 – EPA 350.1 (Ammonia as nitrogen), EPA 353.2 (Nitrate/nitrite as nitrogen), EPA 410.4 (Chemical Oxygen Demand (COD)), SW9020B (Total Organic Halides (TOX)), SW9040C (pH), SW9050A (Specific Conductance), SM2320B (Alkalinity), SM2540C (Total Dissolved Solids) and SM2540D (Total Suspended Solids).

Data validation was conducted in accordance with the CHPRC validation statement of work and the Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan, WCH-173, Rev. 2 (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 and hexavalent chromium – analysis within 24 hours of sample collection
- Ammonia, nitrate/nitrite, COD, TOX, pH, specific conductance – analysis within 28 days of sample collection
- Alkalinity, TDS and TSS – analysis within 7 days of sample collection

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

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

For SDG WC1680, the cooler temperature upon receipt at the laboratory was 7.4 degree C which is above the required ≤ 6 degree C. However the samples were received at the laboratory within seven hours after sample collection, therefore based on professional judgment, data should not be qualified as a result.

- **Blanks**

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

Laboratory Blanks

All laboratory blank results were acceptable with the following exception.

For SDG DN0054, the COD laboratory blank result was $>$ the method detection limit (MDL) but $<$ the reporting limit (RL). The COD results for samples B37NM0 and B37NM4 were detects $>$ the RL but $<$ 20X the blank value and should be qualified as estimates and flagged "J+."

Trip Blanks

No trip blanks were submitted for validation.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results and laboratory control sample results. According to the SAP, the matrix spike sample accuracy limits are 75% to 125% and the laboratory control sample accuracy limits are 80% to 120% which are specified by the DV procedure.

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

All MS/MSD recoveries were acceptable.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

- **Precision**

Precision is evaluated by reviewing MS/MSD results, laboratory duplicate sample results, field duplicate sample results, and field split sample results. These QC results provide information on the laboratory reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limits should be within the DV procedure limit of $\leq 20\%$.

MS/MSD Samples

All MS/MSD RPD values were acceptable.

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**

SDGs DN0054 and WC1680 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 percentages for all remaining analyses were 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

A minor deficiency leading to qualification of the COD result for samples B37NM0 and B37NM4 as an estimate was due to laboratory blank contamination.

REFERENCES

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

WCH-173, Rev. 2, *Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan*, November 2015.

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: DN0054, WC1680	Reviewer: AQA	Project: ERDF Leachate	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
COD	J+	B37NM0, B37NM4	Laboratory blank contamination

Comments: None

Appendix 3

Data Validation Supporting Documentation

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	C	D	E
PROJECT: ERDF Leachate			DATA PACKAGE: VSR17-005		
VALIDATOR: Eyda Hergenreder		LAB: TestAmerica		DATE: 05/01/17	
			SDG: DN0054, WC1680		
ANALYSES PERFORMED					
Anions/IC X	TOC	TOX X	TPH-418.1	Oil and Grease	Alkalinity X
Ammonia X	BOD COD X	Chloride	Chromium-VI X	pH X	NO ₃ /NO ₂ X
Sulfate	TDS X	TKN	Phosphate	TSS X	Specific Conductance X
SAMPLES/MATRIX Water					
SDG DN0054: B37NM0, B37NM4					
SDG WC1680: B37NL8, B37NM2					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

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

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

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

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

Comments:

SDG DN0054: COD 7921 ug/L

Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

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

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

Comments:

6. HOLDING TIMES (all levels)

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

Comments:

SDG WC1680: Cooler temperature 7.4 degree C

Appendix 4

Additional Documentation Requested By Client

Page 7 of 7
QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: FRC16-03

TestAmerica Job ID: 280-91078-1
SDG: DN0054

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

Lab Sample ID: 280-91078-2 MS
Matrix: Water
Analysis Batch: 352603

Client Sample ID: B37NM0
Prep Type: Total/NA
Prep Batch: 352080
%Rec.

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Arsenic	5.2		40.0	45.32		ug/L		100	75 - 125
Barium	80.1		40.0	119.0		ug/L		97	75 - 125
Beryllium	0.080	U	40.0	39.77		ug/L		99	75 - 125
Chromium	120		40.0	159.8		ug/L		100	75 - 125
Lead	0.18	U	40.0	37.85		ug/L		95	75 - 125
Selenium	2.3	B	40.0	40.19		ug/L		95	75 - 125
Thallium	0.050	U	40.0	37.30		ug/L		93	75 - 125
Tin	0.77	U	40.0	39.85		ug/L		100	75 - 125
Tungsten	0.27	B	40.0	38.92		ug/L		97	75 - 125
Uranium	1040		40.0	1080	X	ug/L		105	75 - 125
Vanadium	20.8		40.0	61.53		ug/L		102	75 - 125
Zinc	2.0	U	40.0	38.32		ug/L		96	75 - 125

Lab Sample ID: 280-91078-2 MSD
Matrix: Water
Analysis Batch: 352603

Client Sample ID: B37NM0
Prep Type: Total/NA
Prep Batch: 352080
%Rec.

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	5.2		40.0	44.21		ug/L		98	75 - 125	2	20
Barium	80.1		40.0	124.9		ug/L		112	75 - 125	5	20
Beryllium	0.080	U	40.0	38.83		ug/L		97	75 - 125	2	20
Chromium	120		40.0	158.3		ug/L		96	75 - 125	1	20
Lead	0.18	U	40.0	37.77		ug/L		94	75 - 125	0	20
Selenium	2.3	B	40.0	40.36		ug/L		95	75 - 125	0	20
Thallium	0.050	U	40.0	37.27		ug/L		93	75 - 125	0	20
Tin	0.77	U	40.0	39.79		ug/L		99	75 - 125	0	20
Tungsten	0.27	B	40.0	39.18		ug/L		97	75 - 125	1	30
Uranium	1040		40.0	1090	X	ug/L		129	75 - 125	1	20
Vanadium	20.8		40.0	58.72		ug/L		95	75 - 125	5	20
Zinc	2.0	U	40.0	38.40		ug/L		96	75 - 125	0	20

Method: 350.1 - Nitrogen, Ammonia

Lab Sample ID: MB 280-352215/20
Matrix: Water
Analysis Batch: 352215

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ammonia as N	22.0	U	100	22.0	ug/L			11/18/16 14:26	1

Lab Sample ID: LCS 280-352215/18
Matrix: Water
Analysis Batch: 352215

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Ammonia as N	2500	2542		ug/L		102	80 - 120

TestAmerica Denver

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
 Project/Site: FRC16-03

TestAmerica Job ID: 280-91078-1
 SDG: DN0054

Method: 350.1 - Nitrogen, Ammonia (Continued)

Lab Sample ID: LCSD 280-352215/19
 Matrix: Water
 Analysis Batch: 352215

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Ammonia as N	2500	2543		ug/L		102	80 - 120	0	20

Lab Sample ID: 280-91078-2 MS
 Matrix: Water
 Analysis Batch: 352215

Client Sample ID: B37NM0
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Ammonia as N	22.0	U	1000	1025		ug/L		102	75 - 125

Lab Sample ID: 280-91078-2 MSD
 Matrix: Water
 Analysis Batch: 352215

Client Sample ID: B37NM0
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Ammonia as N	22.0	U	1000	1052		ug/L		105	75 - 125	3	20

Method: 353.2 - Nitrogen, Nitrate-Nitrite

Lab Sample ID: MB 280-352220/23
 Matrix: Water
 Analysis Batch: 352220

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate Nitrite as N	19.0	U	100	19.0	ug/L			11/18/16 15:07	1

Lab Sample ID: LCS 280-352220/22
 Matrix: Water
 Analysis Batch: 352220

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate Nitrite as N	5000	5195		ug/L		104	80 - 120

Lab Sample ID: MRL 280-352220/21
 Matrix: Water
 Analysis Batch: 352220

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

Analyte	Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate Nitrite as N	0.100	0.0722	B	mg/L		72	50 - 150

Lab Sample ID: 280-91078-2 MS
 Matrix: Water
 Analysis Batch: 352220

Client Sample ID: B37NM0
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate Nitrite as N	61500	D	40000	97330		ug/L		89	75 - 125

TestAmerica Denver

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
 Project/Site: FRC16-03

TestAmerica Job ID: 280-91078-1
 SDG: DN0054

Method: 353.2 - Nitrogen, Nitrate-Nitrite (Continued)

Lab Sample ID: 280-91078-2 MSD
 Matrix: Water
 Analysis Batch: 352220

Client Sample ID: B37NM0
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Nitrate Nitrite as N	61500	D	40000	96190		ug/L		87	75 - 125	1	20

Method: 410.4 - COD

Lab Sample ID: MB 280-352845/5
 Matrix: Water
 Analysis Batch: 352845

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chemical Oxygen Demand	7921	B	20000	4060	ug/L			11/23/16 08:57	1

Lab Sample ID: LCS 280-352845/3
 Matrix: Water
 Analysis Batch: 352845

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chemical Oxygen Demand	100000	96060		ug/L		96	80 - 120

Lab Sample ID: LCSD 280-352845/4
 Matrix: Water
 Analysis Batch: 352845

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chemical Oxygen Demand	100000	99900		ug/L		100	80 - 120	4	20

Lab Sample ID: 280-91078-2 MS
 Matrix: Water
 Analysis Batch: 352845

Client Sample ID: B37NM0
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chemical Oxygen Demand	32300	C	50000	77790		ug/L		91	75 - 125

Lab Sample ID: 280-91078-2 MSD
 Matrix: Water
 Analysis Batch: 352845

Client Sample ID: B37NM0
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chemical Oxygen Demand	32300	C	50000	72660		ug/L		81	75 - 125	7	20

Method: 9020B - Organic Halides, Total (TOX)

Lab Sample ID: MB 280-354420/2
 Matrix: Water
 Analysis Batch: 354420

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Halogens - Dup	7.7	U	30.0	7.7	ug/L			12/05/16 10:05	1

TestAmerica Denver

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
 Project/Site: FRC16-03

TestAmerica Job ID: 280-91078-1
 SDG: DN0054

Method: 9020B - Organic Halides, Total (TOX) (Continued)

Lab Sample ID: LCS 280-354420/4
 Matrix: Water
 Analysis Batch: 354420

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Organic Halogens - Dup	100	110.7		ug/L		111	80 - 120

Lab Sample ID: LCSD 280-354420/5
 Matrix: Water
 Analysis Batch: 354420

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Organic Halogens - Dup	100	90.78		ug/L		91	80 - 120	20	23

Lab Sample ID: 280-91078-2 MS
 Matrix: Water
 Analysis Batch: 354420

Client Sample ID: B37NM0
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Organic Halogens - Dup	770	U D	5000	4700		ug/L		94	75 - 125

Lab Sample ID: 280-91078-2 MSD
 Matrix: Water
 Analysis Batch: 354420

Client Sample ID: B37NM0
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Organic Halogens - Dup	770	U D	5000	4655		ug/L		93	75 - 125	1	23

Method: 9040C - pH

Lab Sample ID: LCS 280-352485/4
 Matrix: Water
 Analysis Batch: 352485

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH	7.00	7.010		SU		100	99 - 101

Lab Sample ID: 280-91078-2 DU
 Matrix: Water
 Analysis Batch: 352485

Client Sample ID: B37NM0
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
pH	8.01		8.020		SU		0.1	5

Method: 9050A - Specific Conductance

Lab Sample ID: MB 280-352083/4
 Matrix: Water
 Analysis Batch: 352083

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Specific Conductance	2.00	U	2.00	2.00	umhos/cm			11/17/16 23:50	1

TestAmerica Denver

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
 Project/Site: FRC16-03

TestAmerica Job ID: 280-91078-1
 SDG: DN0054

Method: 9050A - Specific Conductance (Continued)

Lab Sample ID: LCS 280-352083/3
 Matrix: Water
 Analysis Batch: 352083

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Specific Conductance	1410	1379		umhos/cm		98	90 - 110

Lab Sample ID: 280-91078-2 DU
 Matrix: Water
 Analysis Batch: 352083

Client Sample ID: B37NM0
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Specific Conductance	2350		2321		umhos/cm		1	10

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 280-352831/5
 Matrix: Water
 Analysis Batch: 352831

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3	1070	U	5000	1070	ug/L			11/22/16 13:15	1

Lab Sample ID: LCS 280-352831/4
 Matrix: Water
 Analysis Batch: 352831

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Alkalinity as CaCO3	200000	200200		ug/L		100	80 - 120

Lab Sample ID: 280-91078-2 DU
 Matrix: Water
 Analysis Batch: 352831

Client Sample ID: B37NM0
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Alkalinity as CaCO3	261000		261700		ug/L		0.5	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 280-352630/1
 Matrix: Water
 Analysis Batch: 352630

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	4700	U	10000	4700	ug/L			11/22/16 10:52	1

Lab Sample ID: LCS 280-352630/2
 Matrix: Water
 Analysis Batch: 352630

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	500000	473000		ug/L		95	80 - 120

TestAmerica Denver

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QC Sample Results

Client: CH2M Hill Plateau Remediation Company
 Project/Site: FRC16-03

TestAmerica Job ID: 280-91078-1
 SDG: DN0054

Method: SM 2540C - Solids, Total Dissolved (TDS) (Continued)

Lab Sample ID: LCSD 280-352630/3
 Matrix: Water
 Analysis Batch: 352630

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Dissolved Solids	500000	489000		ug/L		98	80 - 120	3	20

Lab Sample ID: 280-91078-2 DU
 Matrix: Water
 Analysis Batch: 352630

Client Sample ID: B37NM0
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	1970000		1956000		ug/L		0.5	20

Method: SM 2540D - Solids, Total Suspended (TSS)

Lab Sample ID: MB 280-352718/2
 Matrix: Water
 Analysis Batch: 352718

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids	1100	U	4000	1100	ug/L			11/22/16 16:39	1

Lab Sample ID: LCS 280-352718/1
 Matrix: Water
 Analysis Batch: 352718

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Suspended Solids	100000	93600		ug/L		94	80 - 120

Lab Sample ID: 280-91078-2 DU
 Matrix: Water
 Analysis Batch: 352718

Client Sample ID: B37NM0
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Suspended Solids	1100	U	1100	U	ug/L		NC	20

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QC Sample Results

Client: CH2M Hill Plateau Remediation Company
 Project/Site: FRC16-03

TestAmerica Job ID: 300-4480-1
 SDG: WC1680

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 300-6425/23
 Matrix: Water
 Analysis Batch: 6425

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	0.014	U	0.028	0.014	mg/L			11/15/16 19:36	1
Nitrite as N	0.019	U	0.038	0.019	mg/L			11/15/16 19:36	1
Orthophosphate as P	0.041	U	0.082	0.041	mg/L			11/15/16 19:36	1

Lab Sample ID: LCS 300-6425/24
 Matrix: Water
 Analysis Batch: 6425

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate as N	2.26	2.30		mg/L		102	80 - 120
Nitrite as N	3.04	3.14		mg/L		103	80 - 120
Orthophosphate as P	6.53	6.64		mg/L		102	80 - 120

Lab Sample ID: 300-4477-A-9 MS
 Matrix: Water
 Analysis Batch: 6425

Client Sample ID: Matrix Spike
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate as N	2.9	D	0.452	3.43	D	mg/L		111	75 - 125
Nitrite as N	0.038	U D	0.609	0.545	D	mg/L		90	75 - 125
Orthophosphate as P	0.082	U D	1.31	1.14	D	mg/L		88	75 - 125

Lab Sample ID: 300-4477-A-9 DU
 Matrix: Water
 Analysis Batch: 6425

Client Sample ID: Duplicate
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Nitrate as N	2.9	D	2.93	D	mg/L		0.08	20
Nitrite as N	0.038	U D	0.038	U D	mg/L		NC	20
Orthophosphate as P	0.082	U D	0.082	U D	mg/L		NC	20

Lab Sample ID: MB 300-6426/23
 Matrix: Water
 Analysis Batch: 6426

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	0.10	U	0.20	0.10	mg/L			11/15/16 19:36	1
Fluoride	0.025	U	0.050	0.025	mg/L			11/15/16 19:36	1
Sulfate	0.13	U	0.25	0.13	mg/L			11/15/16 19:36	1
Bromide	0.063	U	0.13	0.063	mg/L			11/15/16 19:36	1

Lab Sample ID: LCS 300-6426/24
 Matrix: Water
 Analysis Batch: 6426

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	16.0	16.1		mg/L		101	80 - 120
Fluoride	4.00	4.06		mg/L		102	80 - 120
Sulfate	20.0	20.2		mg/L		101	80 - 120

TestAmerica Richland

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QC Sample Results

Client: CH2M Hill Plateau Remediation Company
 Project/Site: FRC16-03

TestAmerica Job ID: 300-4480-1
 SDG: WC1680

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 300-6426/24
 Matrix: Water
 Analysis Batch: 6426

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Bromide	10.0	10.2		mg/L		102	80 - 120

Lab Sample ID: 300-4477-A-9 MS
 Matrix: Water
 Analysis Batch: 6426

Client Sample ID: Matrix Spike
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	6.5	D	3.20	9.85	D	mg/L		104	75 - 125
Fluoride	0.32	D	0.800	1.09	D	mg/L		97	75 - 125
Sulfate	41	D	4.00	45.2	D	mg/L		110	75 - 125
Bromide	0.16	B D	2.00	1.88	D	mg/L		86	75 - 125

Lab Sample ID: 300-4477-A-9 DU
 Matrix: Water
 Analysis Batch: 6426

Client Sample ID: Duplicate
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Chloride	6.5	D	6.54	D	mg/L		0.1	20
Fluoride	0.32	D	0.322	D	mg/L		0	20
Sulfate	41	D	40.8	D	mg/L		0	20
Bromide	0.16	B D	0.157	B D	mg/L		0.3	20

Method: 7196A - Chromium, Hexavalent

Lab Sample ID: MB 300-6441/3
 Matrix: Water
 Analysis Batch: 6441

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cr (VI)	0.0015	U	0.0040	0.0015	mg/L			11/15/16 16:49	1

Lab Sample ID: LCS 300-6441/4
 Matrix: Water
 Analysis Batch: 6441

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cr (VI)	0.250	0.248		mg/L		99	80 - 120

Lab Sample ID: 300-4480-1 MS
 Matrix: Water
 Analysis Batch: 6441

Client Sample ID: B37NL8
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cr (VI)	0.12		0.0500	0.165		mg/L		98	75 - 125

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QC Sample Results

Client: CH2M Hill Plateau Remediation Company
 Project/Site: FRC16-03

TestAmerica Job ID: 300-4480-1
 SDG: WC1680

Method: 7196A - Chromium, Hexavalent (Continued)

Lab Sample ID: 300-4480-1 DU
 Matrix: Water
 Analysis Batch: 6441

Client Sample ID: B37NL8
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Cr (VI)	0.12		0.119		mg/L		2	20

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13

Date: 05 May 2017
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: ERDF Leachate
 Subject: Radiochemical - Sample Data Group (SDG) W07703

INTRODUCTION

This memorandum presents the results of data validation for SDG W07703 prepared by TestAmerica Laboratories, Inc. 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
B37NL9	11/15/16	Water	C	Alpha, Beta, C-14, Gamma, I-129, Total alpha Ra, Sr, Tc-99, Tritium
B37NM3	11/15/16	Water	C	Alpha, Beta, C-14, Gamma, I-129, Total alpha Ra, Sr, Tc-99, Tritium

Data validation was conducted in accordance with the CHPRC validation statement of work and the Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan, WCH-173, Rev. 2 (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 all analyses except tritium, C-14, I-129 and Tc-99 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

No trip blanks were submitted for validation.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results, laboratory control sample results, and chemical recovery factors. Chemical recovery factors are determined through use of a carrier or tracer and provide assessment of the chemical separation process that is affected by the laboratory procedure, sample matrix, and/or interference. Chemical recovery factors are used to correct sample concentration, uncertainty, and MDC results. According to the SAP, the matrix spike sample accuracy limits are 75% to 125% and the laboratory control sample accuracy limits are 80% to 120% which are specified by the DV procedure.

Matrix Spike (MS) Samples

All MS recoveries were acceptable with the following exception.

For SDG W07703, the MS recovery for tritium was >125%. The tritium result for parent sample B37NL9 was >4X the spike concentration; therefore data should not be qualified as a result.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

Carrier/Tracer Recovery Factors

All carrier/tracer recovery factors were acceptable.

- **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 $\leq 20\%$ which is 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 with associated non-detected sample results were below the CRDLs with the following exceptions.

The I-129 MDC for sample B37NL9 was $>$ the CRDL.

• Completeness

SDGs W07703 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-002, Rev. 2, Change 0, *Data Validation for Radiochemical Analyses*, September 2016.

WCH-173, Rev. 2, *Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan*, November 2015.

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: W07703	Reviewer: AQA	Project: ERDF Leachate	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
Radiochemical	None	N/A	N/A

Comments: None

Appendix 3

Data Validation Supporting Documentation

Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

Appendix B - Radiochemical Data Validation Checklist

Validation Level:	A	B	C	D	E
Project: ERDF Leachate			Data Package: VSR17-005		
Validator: Eyda Hergenreder		Lab: TestAmerica		Date: 05/01/17	
			SDG: W07703		
Analyses Performed					
<input checked="" type="checkbox"/> Gross Alpha/Beta	<input checked="" type="checkbox"/> Strontium-90	<input checked="" type="checkbox"/> Technetium-99	<input type="checkbox"/> Alpha Spectroscopy	<input checked="" type="checkbox"/> Gamma Spectroscopy	<input checked="" type="checkbox"/> Tritium
<input type="checkbox"/> Total Uranium	<input type="checkbox"/> Radium-22	<input checked="" type="checkbox"/> I129	<input checked="" type="checkbox"/> C14		
Samples/Matrix Water					
SDG W07703: B37NL9, B37NM3					

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:**

Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

Appendix B - (Cont.) Radiochemical Data Validation Checklist

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

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

Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

Appendix B - (Cont.) Radiochemical Data Validation Checklist

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

Comments:

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

Comments:

Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

Appendix B - (Cont.) Radiochemical Data Validation Checklist

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

Comments:

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

Comments:

Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

Appendix B - (Cont.) Radiochemical Data Validation Checklist

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

Comments:

SDG W07703: tritium MS 159%; however parent sample result >4X spike concentration

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

Comments:

Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

Appendix B - (Cont.) Radiochemical Data Validation Checklist

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

Comments:

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

Comments:

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

Comments:

MDCs for Am-241 >CRDL for sample B37NL9

Appendix 4

Additional Documentation Requested By Client

FORM II

Date: 15-Mar-17

DUPLICATE RESULTS

Lab Name: TestAmerica Inc
 Lot-Sample No.: J6K170408-2
 Client Sample ID: B37NL9 DUP

SDG: W07703
 Report No.: 70107
 COC No.: FRC16-03-002
 Matrix: WATER

Collection Date: 11/15/2016 8:15:00 AM
 Received Date: 11/15/2016 2:30:00 PM

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: 6326031	1129LL_SEP_LEPS_GS											
1129	2.14E-01	U	6.9E-01	6.9E-01	9.53E-01	pCi/L	85%	M9KHG1AN	Orig Sa DB ID: 9M9KHG10 12/7/16 11:49 p		1.20072	LEP4\$1
	-3.65E-01	U	RPD -770.4			1.00E+00	0.62				L	
Batch: 6326033	SRTOT_SEP_PRECIP_GPC											
STRONTIUM	2.01E+01		2.5E+00	5.2E+00	1.87E+00	pCi/L	58%	M9KHG1AP	Orig Sa DB ID: 9M9KHG10 12/5/16 09:50 p		0.50975	GPC32C
	1.91E+01		RPD 5.1			2.00E+00	(7.7)				L	
Batch: 6326029	9310_ALPHABETA_GPC											
Beta	5.21E+02		1.8E+01	6.9E+01	1.01E+01	pCi/L	100%	M9KHG3AL	Orig Sa DB ID: 9M9KHG30 1/5/17 02:32 p		0.04076	GPC26C9
	4.54E+02		RPD 13.7			4.00E+00	(15.1)				L	

No. of Results: 3 Comments:

TestAmerica Inc RPD - Relative Percent Difference.
 rptSTLrchDupV5. MDC(MDA)_Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
 8.2 A2002 U Qual - Analyzed for but not detected above limiting criteria, Mdc/Mda/Mdl, Total Uncert, RDL or not identified by gamma scan software.

Date: 15-Mar-17

FORM II

DUPLICATE RESULTS

Lab Name: TestAmerica Inc SDG: W07703 Collection Date: 11/15/2016 8:15:00 AM
 Lot-Sample No.: J6K170408-1 Report No.: 70107 Received Date: 11/15/2016 2:30:00 PM
 Client Sample ID: B37NM3 DUP COC No.: FRC16-03-004 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: 6326027	9310_ALPHABETA_GPC								Orig Sa DB ID: 9M9KHF10			
Alpha	6.21E+02	U	4.0E+01	1.6E+02	1.67E+01	pCi/L	100%	(37.2)	12/15/16 07:54 p		0.01369	GPC24C
	5.77E+02		RPD 7.4			3.00E+00		(7.9)			L	

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: 6326030	GAMMA_GS								Orig Sa DB ID: 9M9KHF10			
AMERICIUM 241	3.52E-01	U	1.9E+00	1.9E+00	3.28E+00	pCi/L		0.11	12/6/16 12:29 p		1.70427	GER18\$1
	-1.18E+01	U	RPD -212.3			1.00E+00		0.37			L	
CO-60	2.31E+00	U	2.1E+00	2.1E+00	4.35E+00	pCi/L		0.53	12/6/16 12:29 p		1.70427	GER18\$1
	2.29E+00	U	RPD 1.2			2.50E+01		(2.2)			L	
CS-137	6.58E-01	U	1.6E+00	1.6E+00	3.02E+00	pCi/L		0.22	12/6/16 12:29 p		1.70427	GER18\$1
	-5.14E-01	U	RPD 1633.0			1.50E+01		0.81			L	
EU-152	4.60E-01	U	3.5E+00	3.5E+00	6.33E+00	pCi/L		0.07	12/6/16 12:29 p		1.70427	GER18\$1
	-2.49E+00	U	RPD -290.6			5.00E+01		0.26			L	
EU-154	-3.91E-01	U	3.5E+00	3.5E+00	6.81E+00	pCi/L		-0.06	12/6/16 12:29 p		1.70427	GER18\$1
	-4.18E-03	U	RPD -195.8			5.00E+01		-0.22			L	
EU-155	2.31E+00	U	2.8E+00	2.8E+00	5.07E+00	pCi/L		0.46	12/6/16 12:29 p		1.70427	GER18\$1
	-3.97E-01	U	RPD 282.9			5.00E+01		(1.7)			L	

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: 6326032	RATOT_AEAGEA								Orig Sa DB ID: 9M9KHF10			
TOTAL ALPHA RA	4.78E-01	U	5.2E-01	5.3E-01	8.19E-01	pCi/L	80%	0.58	12/15/16 09:45 a		0.50794	GPC21C
	-1.26E-01	U	RPD 343.5			1.00E+00		(1.8)			L	

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: 6326034	TC99_ETVDSK_LSC								Orig Sa DB ID: 9M9KHF10			

TestAmerica Inc RPD - Relative Percent Difference.
 rptSTLrchDupV5. MDC(MDA)Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
 8.2 A2002 U Qual - Analyzed for but not detected above limiting criteria, Mdc/Mda/Mdl, Total Uncert, RDL or not identified by gamma scan software.

Date: 15-Mar-17

FORM II

DUPLICATE RESULTS

Lab Name: TestAmerica Inc
 Lot-Sample No.: J6K170408-1
 Client Sample ID: B37NM3 DUP

SDG: W07703
 Report No.: 70107
 COC No.: FRC16-03-004
 Matrix: WATER

Collection Date: 11/15/2016 8:15:00 AM

Received Date: 11/15/2016 2:30:00 PM

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
Tc-99	2.11E+02		1.5E+01	1.6E+01	1.82E+01	pCi/L	100%	(11.6)	12/14/16 05:14 p	0.12555	L	LSC9
	2.11E+02		RPD 0.2			5.00E+01		(25.7)				

Batch: 6326035 TRITIUM_DIST_LSC

Work Order:	M9KHF1AR	Report DB ID:	M9KHF1RR	Orig Sa DB ID:	M9KHF10					
H-3	7.82E+04	1.4E+03	3.2E+03	5.16E+02	pCi/L	100%	(151.6)	12/14/16 12:13 a	0.00503	LSC10
	8.03E+04	RPD 2.7			7.00E+02		(48.6)			

Batch: 6356020 C14_LSC

Work Order:	M9KHF1AT	Report DB ID:	M9KHF1TR	Orig Sa DB ID:	9m9khf10					
C-14	1.64E+02	1.7E+01	2.0E+01	2.57E+01	pCi/L	100%	(6.4)	12/30/16 12:11 p	0.1	LSC4
	1.70E+02	RPD 3.7			5.00E+01		(16.2)			

No. of Results: 11 Comments:

FORM II

Date: 15-Mar-17

BLANK RESULTS

Lab Name: TestAmerica Inc

SDG: W07703

Matrix: WATER

Report No.: 70107

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: 6326029 C14_LSC												
C-14	1.48E+00	U	3.9E+00	4.5E+00	9.42E+00	pCi/L	100%	0.16	12/14/16 04:22 a		0.25	LSC4
					4.41E+00	5.00E+01		0.66			L	
Work Order: M9K1N1AA Report DB ID: m9k1n1aB												
Batch: 6356020 C14_LSC												
C-14	-1.28E+01	U	9.9E+00	1.2E+01	2.59E+01	pCi/L	100%	-0.49	12/30/16 12:57 p		0.1	LSC4
					1.22E+01	5.00E+01		-(2.2)			L	
Work Order: M9N9G1AA Report DB ID: M9N9G1AB												
Batch: 6326035 TRITIUM_DIST_LSC												
H-3	7.36E+01	U	2.1E+02	2.4E+02	5.25E+02	pCi/L	100%	0.14	12/14/16 02:26 a		0.00502	LSC10
					2.43E+02	7.00E+02		0.6			L	
Work Order: M9K1W1AA Report DB ID: M9K1W1AB												
Batch: 6326030 GAMMA_GS												
AMERICIUM 241	-6.05E-01	U	1.2E+00	1.2E+00	2.04E+00	pCi/L		-0.3	12/6/16 12:31 p		2.05869	GER19\$1
					1.00E+00			-(1.)			L	
CO-60	5.75E-01	U	1.6E+00	1.6E+00	3.10E+00	pCi/L		0.19	12/6/16 12:31 p		2.05869	GER19\$1
					2.50E+01			0.74			L	
CS-137	5.38E-01	U	1.3E+00	1.3E+00	2.48E+00	pCi/L		0.22	12/6/16 12:31 p		2.05869	GER19\$1
					1.50E+01			0.83			L	
EU-152	1.87E+00	U	3.4E+00	3.4E+00	6.18E+00	pCi/L		0.3	12/6/16 12:31 p		2.05869	GER19\$1
					5.00E+01			(1.1)			L	
EU-154	-2.32E-01	U	4.4E+00	4.4E+00	8.24E+00	pCi/L		-0.03	12/6/16 12:31 p		2.05869	GER19\$1
					5.00E+01			-0.1			L	
EU-155	4.09E-01	U	2.3E+00	2.3E+00	4.03E+00	pCi/L		0.1	12/6/16 12:31 p		2.05869	GER19\$1
					5.00E+01			0.35			L	
Work Order: M9K1P1AA Report DB ID: M9K1P1AB												
Batch: 6326027 9310_ALPHABETA_GPC												

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

rptSTLRchBlank 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: 15-Mar-17

BLANK RESULTS

Lab Name: TestAmerica Inc

SDG: W07703

Matrix: WATER

Report No.: 70107

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
Alpha	-2.27E-01	U	5.1E-01	5.1E-01	9.74E-01	pCi/L	100%	-0.23	12/15/16 08:21 p	0.20016	L	GPC21B
Batch: 6365029 9310_ALPHABETA_GPC Work Order: M9K1M2AA Report DB ID: M9K1M2AB												
Beta	4.00E-01	U	9.5E-01	9.5E-01	1.60E+00	pCi/L	100%	0.25	1/5/17 02:32 p	0.2	L	GPC26D
Batch: 6326031 I129LL_SEP_LEPS_GS Work Order: M9K1Q1AA Report DB ID: M9K1Q1AB												
I129	-3.04E-01	U	4.9E-01	4.9E-01	7.46E-01	pCi/L	93%	-0.41	12/8/16 09:03 a	2.04161	L	LEP4\$1
Batch: 6326032 RATOT_AEAGEA Work Order: M9K1R1AA Report DB ID: M9K1R1AB												
TOTAL ALPHA RA	-1.75E-01	U	3.8E-01	3.8E-01	9.33E-01	pCi/L	76%	-0.19	12/15/16 09:45 a	0.50193	L	GPC22A07
Batch: 6326033 SRTOT_SEP_PRECIP_GPC Work Order: M9K1T1AA Report DB ID: M9K1T1AB												
STRONTIUM	-5.26E-01	U	6.9E-01	7.0E-01	1.38E+00	pCi/L	87%	-0.38	12/5/16 09:50 p	0.50713	L	GPC32D
Batch: 6326034 TC99_ETVDSK_LSC Work Order: M9K1V1AA Report DB ID: M9K1V1AB												
Tc-99	-1.99E-01	U	6.9E+00	7.7E+00	1.73E+01	pCi/L	100%	-0.01	12/14/16 06:20 p	0.13051	L	LSC9

No. of Results: 15 Comments:

FORM II

Date: 15-Mar-17

LCS RESULTS

Lab Name: TestAmerica Inc

SDG: W07703

Matrix: WATER

Report No.: 70107

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: 6326029 C14_LSC													
C-14	1.44E+02		8.6E+00	1.2E+01	9.48E+00	pCi/L	100%	1.45E+02	2.90E+00	99%	12/14/16 04:46 a	0.25	LSC4
Work Order: M9K1N1AC Report DB ID: m9k1n1ac Rec Limits: 80 120 0.0													
Batch: 6356020 C14_LSC													
C-14	3.60E+02		2.2E+01	3.1E+01	2.58E+01	pCi/L	100%	3.64E+02	7.29E+00	99%	12/30/16 01:20 p	0.1	LSC4
Work Order: M9N9G1AC Report DB ID: M9N9G1CS Rec Limits: 80 120 0.0													
Batch: 6326035 TRITIUM_DIST_LSC													
H-3	2.85E+03		3.4E+02	3.9E+02	5.23E+02	pCi/L	100%	2.71E+03	8.14E+01	105%	12/14/16 03:10 a	0.00501	LSC10
Work Order: M9K1W1AC Report DB ID: M9K1W1CS Rec Limits: 80 120 0.0													
Batch: 6326030 GAMMA_GS													
CO-60	3.80E+01		6.4E+00	6.4E+00	2.51E+00	pCi/L		3.72E+01	3.18E-01	102%	12/6/16 11:54 p	2.05118	GER18\$1
CS-137	5.42E+01		9.2E+00	9.2E+00	3.10E+00	pCi/L		4.87E+01	4.99E-01	111%	12/6/16 11:54 p	2.05118	GER18\$1
EU-152	7.21E+01		1.3E+01	1.3E+01	6.19E+00	pCi/L		7.55E+01	1.08E+00	95%	12/6/16 11:54 p	2.05118	GER18\$1
Work Order: M9K1P1AC Report DB ID: M9K1P1CS Rec Limits: 80 120 0.0													
Batch: 6326027 9310_ALPHABETA_GPC													
Alpha	2.23E+01		1.7E+00	5.7E+00	8.41E-01	pCi/L	100%	2.25E+01	2.26E-01	99%	12/15/16 08:21 p	0.20256	GPC21C
Work Order: M9K1M2AC Report DB ID: M9K1M2CS Rec Limits: 80 120 0.0													
Batch: 6365029 9310_ALPHABETA_GPC													
Beta	2.49E+01		1.8E+00	3.6E+00	1.63E+00	pCi/L	100%	2.27E+01	1.63E-01	110%	1/5/17 02:32 p	0.20002	GPC27A
Work Order: M9K1Q1AC Report DB ID: M9K1Q1CS Rec Limits: 80 120 0.1													
Batch: 6326031 1129LL_SEP_LEPS_GS													
Work Order: M9K1Q1AC Report DB ID: M9K1Q1CS													

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

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FORM II

Date: 15-Mar-17

LCS RESULTS

Lab Name: TestAmerica Inc

SDG: W07703

Matrix: WATER

Report No.: 70107

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
1129	1.78E+01		2.4E+00	2.4E+00	4.87E-01	pCi/L	97%	1.90E+01	3.06E-01	94%	12/8/16 09:05 a	2.01912	LEP5\$1
							Rec Limits:	80	120	-0.1		L	
Batch: 6326032 RATOT_AEAGEA Work Order: M9K1R1AC Report DB ID: M9K1R1CS													
TOTAL ALPHA RA	6.19E+00		1.4E+00	1.9E+00	9.84E-01	pCi/L	75%	6.17E+00	6.96E-02	100%	12/15/16 09:45 a	0.51279	GPC22B
							Rec Limits:	80	120	0.0		L	
Batch: 6326033 SRTOT_SEP_PRECIP_GPC Work Order: M9K1T1AC Report DB ID: M9K1T1CS													
STRONTIUM	1.55E+01		1.9E+00	4.0E+00	1.38E+00	pCi/L	83%	1.36E+01	9.68E-02	114%	12/5/16 10:43 p	0.50787	GPC32A
							Rec Limits:	80	120	0.1		L	
Batch: 6326034 TC99_ETVDSK_LSC Work Order: M9K1V1AC Report DB ID: M9K1V1CS													
Tc-99	9.74E+01		1.2E+01	1.2E+01	1.78E+01	pCi/L	100%	1.07E+02	6.14E-01	91%	12/14/16 06:42 p	0.12663	LSC9
							Rec Limits:	80	120	-0.1		L	

No. of Results: 12 Comments:

FORM II

Date: 15-Mar-17

MATRIX SPIKE RESULTS

Lab Name: TestAmerica Inc SDG: W07703 Report No.: 70107 Matrix: WATER
 Lot-Sample No.: J6K170408-2, B37NL9

Parameter	SpikeResult, Orig Rst	Count Error (2 s)	CSU (2 s)	MDC MDA	Rpt Unit	Yield	Recovery	Expected, Uncert	Analysis, Prep Date	Aliquot Size	Analy Method, Primary Detector
Batch: 6326029	Work Order: M9KHG1AM	Report DB ID: m9khg1mW	Report DB ID: 2.6E+01	9.41E+00	pCi/L	100%	82.33%	1.47E+02	12/14/16 03:58 a	0.25	C14_LSC
C-14	1.21E+02	1.2E+01	2.6E+01	9.41E+00	pCi/L	100%	82.33%	2.94E+00		L	LSC4
Batch: 6326034	Work Order: M9KHG1AQ	Report DB ID: M9KHG1QW	Report DB ID: 3.4E+01	1.80E+01	pCi/L	100%	90.87%	5.33E+02	12/14/16 05:58 p	0.12736	TC99_ETVDSK_LSC
Tc-99	4.84E+02	2.6E+01	3.4E+01	1.80E+01	pCi/L	100%	90.87%	3.05E+00		L	LSC9
Batch: 6326035	Work Order: M9KHG1AR	Report DB ID: M9KHG1RW	Report DB ID: 4.7E+03	5.97E+02	pCi/L	100%	159.15%	1.51E+03	12/14/16 01:42 a	0.0043	TRITIUM_DIST_LSC
H-3	2.40E+03	1.6E+03	4.7E+03	5.97E+02	pCi/L	100%	159.15%	4.52E+01		L	LSC10

Number of Results: 3

Comments:

TestAmerica Inc RER - Replicate Error Ratio = (S-D)/[sqrt((sq(TPUs)+sq(TPUd)))] as defined by ICPT BOA.
 rptSTLRchMs Bias - (Result/Expected)-1 as defined by ANSI N13.30.
 V5.8.2 A2002

Sample Results Summary

Date: 09-Mar-17

TestAmerica Inc TARL

Ordered by Method, Batch No., Client Sample ID.

Report No. : 70107

SDG No: W07703

Batch	Client Id Work Order	Parameter	Result +- CSU (2 s)	Qual	Units	Tracer Yield	MDL	CRDL	RPD
6326033	SRTOT_SEP_PRECIP_GPC								
	B37NL9								
	M9KHG1AJ	STRONTIUM	1.91E+01 +- 5.0E+00		pCi/L	59%	1.79E+00	2.00E+00	
	B37NL9 DUP								
	M9KHG1AP	STRONTIUM	2.01E+01 +- 5.2E+00		pCi/L	58%	1.87E+00	2.00E+00	5.1
	B37NM3								
	M9KHF1AJ	STRONTIUM	1.78E+01 +- 4.8E+00		pCi/L	57%	2.01E+00	2.00E+00	
6326030	GAMMA_GS								
	B37NL9								
	M9KHG1AF	AMERICIUM 241	-1.97E+01 +- 1.3E+01	U	pCi/L		2.11E+01	1.00E+00	
		CO-60	2.50E+00 +- 3.0E+00	U	pCi/L		5.95E+00	2.50E+01	
		CS-137	-1.56E+00 +- 3.3E+00	U	pCi/L		5.50E+00	1.50E+01	
		EU-152	2.24E+00 +- 9.0E+00	U	pCi/L		1.58E+01	5.00E+01	
		EU-154	-5.52E+00 +- 8.3E+00	U	pCi/L		1.38E+01	5.00E+01	
		EU-155	-1.33E+01 +- 8.9E+00	U	pCi/L		1.40E+01	5.00E+01	
	B37NM3								
	M9KHF1AF	AMERICIUM 241	-1.18E+01 +- 9.0E+00	U	pCi/L		1.45E+01	1.00E+00	
		CO-60	2.29E+00 +- 2.3E+00	U	pCi/L		4.58E+00	2.50E+01	
		CS-137	-5.14E-01 +- 2.3E+00	U	pCi/L		4.08E+00	1.50E+01	
		EU-152	-2.49E+00 +- 6.3E+00	U	pCi/L		1.05E+01	5.00E+01	
		EU-154	-4.18E-03 +- 6.6E+00	U	pCi/L		1.19E+01	5.00E+01	
		EU-155	-3.97E-01 +- 6.1E+00	U	pCi/L		1.04E+01	5.00E+01	
	B37NM3 DUP								
	M9KHF1AN	AMERICIUM 241	3.52E-01 +- 1.9E+00	U	pCi/L		3.28E+00	1.00E+00	-212.3
		CO-60	2.31E+00 +- 2.1E+00	U	pCi/L		4.35E+00	2.50E+01	1.2
		CS-137	6.58E-01 +- 1.6E+00	U	pCi/L		3.02E+00	1.50E+01	1633.0
		EU-152	4.60E-01 +- 3.5E+00	U	pCi/L		6.33E+00	5.00E+01	-290.6
		EU-154	-3.91E-01 +- 3.5E+00	U	pCi/L		6.81E+00	5.00E+01	-195.8
		EU-155	2.31E+00 +- 2.8E+00	U	pCi/L		5.07E+00	5.00E+01	282.9
6326031	I129LL_SEP_LEPS_GS								
	B37NL9								
	M9KHG1AG	I129	-3.65E-01 +- 7.5E-01	U	pCi/L	79%	1.35E+00	1.00E+00	
	B37NL9 DUP								
	M9KHG1AN	I129	2.14E-01 +- 6.9E-01	U	pCi/L	85%	9.53E-01	1.00E+00	-770.4
	B37NM3								
	M9KHF1AG	I129	8.25E-02 +- 5.1E-01	U	pCi/L	95%	9.64E-01	1.00E+00	
6326027	9310_ALPHABETA_GPC								
	B37NL9								
	M9KHG1AC	Alpha	5.53E+02 +- 1.4E+02		pCi/L	100%	1.54E+01	3.00E+00	

TestAmerica Inc RPD - Relative Percent Difference.

rptTALRchSaSummary2 V5.8.2 U Qual - Analyzed for but not detected above limiting criteria, Mdc/Mda/Mdl, Total Uncert, RDL or not identified by gamma scan software.

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Sample Results Summary

Date: 09-Mar-17

TestAmerica Inc TARL

Ordered by Method, Batch No., Client Sample ID.

Report No. : 70107

SDG No: W07703

Batch	Client Id Work Order	Parameter	Result +- CSU (2 s)	Qual	Units	Tracer Yield	MDL	CRDL	RPD
6326027	9310_ALPHABETA_GPC								
	B37NM3								
	M9KHF1AC	Alpha	5.77E+02 +- 1.4E+02		pCi/L	100%	1.71E+01	3.00E+00	
	B37NM3 DUP								
	M9KHF1AL	Alpha	6.21E+02 +- 1.6E+02		pCi/L	100%	1.67E+01	3.00E+00	7.4
6326032	RATOT_AEAGEA								
	B37NL9								
	M9KHG1AH	TOTAL ALPHA RA	-3.30E-02 +- 3.8E-01	U	pCi/L	75%	8.41E-01	1.00E+00	
	B37NM3								
	M9KHF1AH	TOTAL ALPHA RA	-1.26E-01 +- 4.0E-01	U	pCi/L	76%	9.33E-01	1.00E+00	
	B37NM3 DUP								
	M9KHF1AP	TOTAL ALPHA RA	4.78E-01 +- 5.3E-01	U	pCi/L	80%	8.19E-01	1.00E+00	343.5
6365029	9310_ALPHABETA_GPC								
	B37NL9								
	M9KHG3AD	Beta	4.54E+02 +- 5.8E+01		pCi/L	100%	8.62E+00	4.00E+00	
	B37NL9 DUP								
	M9KHG3AL	Beta	5.21E+02 +- 6.9E+01		pCi/L	100%	1.01E+01	4.00E+00	13.7
	B37NM3								
	M9KHF2AD	Beta	4.55E+02 +- 5.8E+01		pCi/L	100%	9.35E+00	4.00E+00	
6326029	C14_LSC								
	B37NL9								
	M9KHG1AE	C-14	1.95E+02 +- 1.5E+01		pCi/L	100%	9.50E+00	5.00E+01	
6326034	TC99_ETVDSK_LSC								
	B37NL9								
	M9KHG1AK	Tc-99	2.24E+02 +- 1.7E+01		pCi/L	100%	1.82E+01	5.00E+01	
	B37NM3								
	M9KHF1AK	Tc-99	2.11E+02 +- 1.6E+01		pCi/L	100%	1.78E+01	5.00E+01	
	B37NM3 DUP								
	M9KHF1AQ	Tc-99	2.11E+02 +- 1.6E+01		pCi/L	100%	1.82E+01	5.00E+01	0.2
6326035	TRITIUM_DIST_LSC								
	B37NL9								
	M9KHG1AA	H-3	7.81E+04 +- 3.2E+03		pCi/L	100%	5.09E+02	7.00E+02	
	B37NM3								
	M9KHF1AA	H-3	8.03E+04 +- 3.3E+03		pCi/L	100%	5.16E+02	7.00E+02	
	B37NM3 DUP								
	M9KHF1AR	H-3	7.82E+04 +- 3.2E+03		pCi/L	100%	5.16E+02	7.00E+02	2.7
6356020	C14_LSC								
	B37NM3								
	M9KHF3AE	C-14	1.84E+02 +- 2.1E+01		pCi/L	100%	2.58E+01	5.00E+01	
	B37NM3 DUP								

TestAmerica Inc RPD - Relative Percent Difference.

rptTALRchSaSummary2 V5.8.2 U Qual - Analyzed for but not detected above limiting criteria, Mdc/Mda/Mdl, Total Uncert, RDL or not identified by gamma scan software.

A2002

Sample Results Summary

Date: 09-Mar-17

TestAmerica Inc TARL

Ordered by Method, Batch No., Client Sample ID.

Report No. : 70107

SDG No: W07703

Batch	Client Id Work Order	Parameter	Result +- CSU (2 s)	Qual	Units	Tracer Yield	MDL	CRDL	RPD
6356020	C14_LSC								
	B37NM3 DUP								
	M9KHF1AT	C-14	1.64E+02 +- 2.0E+01		pCi/L	100%	2.57E+01	5.00E+01	3.7
	No. of Results:	42							

 TestAmerica Inc RPD - Relative Percent Difference.

 rptTALRchSaSum
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