

# CHPRC - REVIEW COMMENT RECORD (RCR)

1. Date <b>12/05/2017</b>		2. Review No.	
3. Project No.		Page 1 of 2	
5. Document Number(s)/Title(s) VSR18-004		6. Program/Project/Building Number	
7. Reviewer Sarah Nagel		8. Organization/Group Sample Management and Reporting	
9. Location/Phone MO277/373-5869		10. Agreement With Indicated Comment Disposition(s)	
11. Reviewer/Point of Contact (print and sign)  Sarah Nagel Date: 01/09/2018 Organization Manager (optional) (print and sign)		12. Author/Originator (print and sign) Sarah Nagel	

  

12. Item	13a. Comments	13b. Basis	13c. Recommendation	14. Reviewer Concurrence Required (Y or N)	15. Disposition (provide justification if NOT accepted)	16. Status
1	Page 19 of 44 shows the Selenium duplicate agreement at 42.8% which is greater than acceptance criteria. This is not mentioned in the narrative or Appendix 2 table on page 10.		Sample should be flagged UJ.	Y		Closed
2	On page 27 of 44 in the General Chemistry holding time discussion an 'R' flag was applied to all samples.		Based on professional knowledge of the project, the sample should be flagged 'J' not 'R'.	Y		Closed
3	Page 43 of 44 shows the Chloride duplicate agreement at 104% which is greater than acceptance criteria. This is not mentioned in the narrative or Appendix 2 table on page 33.		Sample should be flagged J.	Y		Closed





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## Data Validation Report for CH2M Hill Plateau Remediation Company

**VSR18-004**  
**Project 618-10\_618-11**

### Chemical Validation - Level C

Validation Performed By: *Eyda Hergenreder* Date: 12-21-2017  
Eyda Hergenreder

Technical Review By: *Ellen McEntee* Date: 12-21-2017  
Ellen McEntee

Quality Review By: *Mary A. Donovan* Date: 02-23-2018  
Mary Donovan  
Quality Assurance Manager

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### **General Chemistry**

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Date: 22 February 2018  
 To: CH2M Hill (technical representative)  
 From: Analytical Quality Associates, Inc.  
 Project: 618-10\_618-11  
 Subject: Inorganics - Sample Data Groups (SDGs) GEL432973 and SL2665

## **INTRODUCTION**

This memorandum presents the results of data validation for SDG GEL432973 prepared by GEL Laboratories LLC and SDG SL2665 prepared by TestAmerica Laboratories, Inc. A list of samples validated along with the analytical methods is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation Level</b>	<b>Analytical Methods</b>
B3DCC4	09/14/17	Soil	C	6010D, 7471B
B3DCB9	09/14/17	Soil	C	6010C, 7471B
B3DCC0	09/14/17	Soil	C	6010C, 7471B
B3DCC1	09/14/17	Soil	C	6010C, 7471B
B3DCC2	09/14/17	Soil	C	6010C, 7471B
B3DCC3	09/14/17	Soil	C	6010C, 7471B

Data validation was conducted in accordance with the CHPRC validation statement of work and the 300 Area Remedial Action Sampling and Analysis Plan, DOE/RL-2001-48, Rev. 4 (SAP). Appendices 1 through 4 provide the following information as indicated below:

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

## **DATA QUALITY OBJECTIVES**

- **Holding Times and Sample Preservation**

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

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

- **Blanks**

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

### **Laboratory Blanks**

All laboratory blank results were acceptable with the following exception.

For SDG GEL432973, the Se laboratory blank result was negative with an absolute value > the method detection limit (MDL) but < the practical quantitation limit (PQL). The Se result for sample B3DCC4 was a non-detect and based on professional judgment, should be qualified as an estimate and flagged "UJ."

### **Trip Blanks**

No trip blanks were submitted for validation.

### **Field Blanks**

No field blanks were submitted for validation.

### **Equipment Blanks**

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results, laboratory control sample results, and ICP-AES interference check sample results. According to the SAP, the matrix spike sample accuracy limits are 70% to 130% and the laboratory control sample accuracy limits are ones specified by the DV procedure. The interference check sample limits are ones specified by the DV procedure.

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

All MS/MSD recoveries were acceptable.

### **Laboratory Control Samples (LCSs)**

All LCS recoveries were acceptable.

### **ICP-AES Interference Check Samples (ICSs)**

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

- **Precision**

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

### **MS/MSD Samples**

All MS/MSD RPD values were acceptable.

### **Laboratory Duplicate Samples**

All laboratory duplicate results were acceptable with the following exception.

For SDG GEL432973, the RPD for Se was  $>$  the acceptance limit. The Se result for sample B3DCC4 was a non-detect and should be qualified as an estimate and flagged "UJ."

### **Field Duplicate Samples**

No field duplicates were submitted for validation.

### **Field Split Samples**

No field splits were submitted for validation.

### **ICP Serial Dilution Samples**

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

- **ICP-MS Internal Standards**

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

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

- **Detection Limits**

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

All reported sample MDLs with associated non-detected sample results were below the CRDLs with the following exception. The Ag MDLs for samples B3DCB9, B3DCC0, B3DCC1, B3DCC2 and B3DCC3 were slightly greater than the CRDL.

- **Completeness**

SDGs GEL432973 and SL2665 were submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

### **MAJOR DEFICIENCIES**

None found.

### **MINOR DEFICIENCIES**

A minor deficiency leading to qualification of the Se result for sample B3DCC4 was due to an associated negative laboratory blank result and poor duplicate precision.

### **REFERENCES**

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

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

## **Appendix 1**

### **Glossary of Data Reporting Qualifiers**

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

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

**Appendix 2**  
**Summary of Data Qualification**

<b>Inorganic Data Qualification Summary</b>			
SDGs: GEL432973, SL2665	Reviewer: AQA	Project: 618-10 618-11	Page 1 of 1
<b>Analyte(s)</b>	<b>Qualifier</b>	<b>Samples Affected</b>	<b>Reason</b>
Se	UJ	B3DCC4	Negative laboratory blank result and poor duplicate precision

Comments: None

## **Appendix 3**

### **Data Validation Supporting Documentation**

**Data Validation for Chemical Analyses**

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

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

VALIDATION LEVEL:	A	B	<b>C</b>	D	E
PROJECT: 618-10_618-11			DATA PACKAGE: VSR18-004		
VALIDATOR: Eyda Hergenreder		LAB: GEL, TestAmerica		DATE: 2/22/2018	
			SDG: GEL432973, SL2665		
ANALYSES PERFORMED					
SW-846/ICP X	SW-846/GFAA	SW-846/Hg X	SW-846 Cyanide		
SAMPLES/MATRIX Soil					
GEL432973: B3DCC4					
SL2665: B3DCB9, B3DCC0, B3DCC1, B3DCC2, B3DCC3					

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

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

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

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

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

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

Comments:

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

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

Comments:

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SDG GEL432973: Se MB -471 ug/kg

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Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

Appendix A - (Cont.) Chemical Data Validation Checklist

6. ICP QUALITY CONTROL (Levels D and E)

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

Comments:

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7. HOLDING TIMES (all levels)

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

Comments:

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## **Appendix 4**

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

**GEL LABORATORIES LLC**

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

**QC Summary**

Report Date: September 29, 2017

CH2MHill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 432973

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1701181										
QC1203876461	432951001	DUP									
Arsenic	B	1240	B	849	ug/kg	37.1	^	(+/-2960)	HSC	09/25/17	11:35
Barium		68300		75100	ug/kg	9.55		(0%-35%)			
Cadmium	U	95.4	U	98.6	ug/kg	N/A					
Chromium		5390		5780	ug/kg	6.85		(0%-35%)			
Lead		1380		1190	ug/kg	14.4	^	(+/-986)			
Selenium	B	2570		3980	ug/kg	42.8	^	(+/-2960)			
Silver		766		820	ug/kg	6.74	^	(+/-493)			
QC1203876460	LCS										
Arsenic		46200		47000	ug/kg			102 (80%-120%)		09/25/17	11:25
Barium		46200		46700	ug/kg			101 (80%-120%)			
Cadmium		46200		46600	ug/kg			101 (80%-120%)			
Chromium		46200		44900	ug/kg			97.1 (80%-120%)			
Lead		46200		46100	ug/kg			99.8 (80%-120%)			
Selenium		46200		46900	ug/kg			101 (80%-120%)			

**GEL LABORATORIES LLC**

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

**QC Summary**

Workorder: 432973

Page 2 of 4

Parname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1701181										
Silver	46200			46100	ug/kg		99.8	(80%-120%)	HSC	09/25/17	11:25
QC1203876459	MB										
Arsenic			U	456	ug/kg					09/25/17	11:28
Barium			U	91.2	ug/kg						
Cadmium			U	91.2	ug/kg						
Chromium			U	137	ug/kg						
Lead			U	301	ug/kg						
Selenium			B	-471	ug/kg						
Silver			U	91.2	ug/kg						
QC1203876462	432951001 MS										
Arsenic	47700	B	1240	47400	ug/kg		96.8	(75%-125%)		09/25/17	11:39
Barium	47700		68300	114000	ug/kg		96.7	(75%-125%)			
Cadmium	47700	U	95.4	46100	ug/kg		96.6	(75%-125%)			
Chromium	47700		5390	56900	ug/kg		108	(75%-125%)			
Lead	47700		1380	47000	ug/kg		95.7	(75%-125%)			
Selenium	47700	B	2570	50300	ug/kg		100	(75%-125%)			

## QC Summary

Workorder: 432973

Page 3 of 4

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1701181										
Silver	47700	766		47500	ug/kg		98	(75%-125%)	HSC	09/25/17	11:39
QC1203876463 432951001 SDILT											
Arsenic		13.0	BD	5.65	ug/L	118		(0%-10%)		09/25/17	11:42
Barium		716	D	131	ug/L	8.75		(0%-10%)			
Cadmium		-0.225	DU	477	ug/L	N/A		(0%-10%)			
Chromium		56.5	D	11.2	ug/L	.661		(0%-10%)			
Lead		14.5	DU	1570	ug/L	N/A		(0%-10%)			
Selenium		27.0	DU	2390	ug/L	N/A		(0%-10%)			
Silver		8.03	BD	1.71	ug/L	6.2		(0%-10%)			
<b>Metals Analysis-Mercury</b>											
Batch	1701423										
QC1203877048 432973001 DUP											
Mercury		1010	D	1010	ug/kg	0.482		(0%-35%)	MTM1	09/19/17	13:21
QC1203877043 LCS											
Mercury	117			117	ug/kg		101	(80%-120%)		09/19/17	09:58
QC1203877042 MB											
Mercury			U	3.81	ug/kg					09/19/17	09:56
QC1203877049 432973001 MS											
Mercury	107	D	1010	D	1160	ug/kg	N/A	(75%-125%)		09/19/17	13:23

## QC Summary

Workorder: 432973

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-Mercury</b>											
Batch	1701423										
	QC1203877050 432973001 SDILT										
Mercury	D	1.73	D	0.340	ug/L	1.45		(0%-10%)	MTM1	09/19/17	13:24

**Notes:**

The Qualifiers in this report are defined as follows:

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

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.  
 ^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.  
 For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

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

# QC Sample Results

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-08

TestAmerica Job ID: 160-24502-1  
 SDG: SL2665

## Method: 300.0 - Anions, Ion Chromatography

**Lab Sample ID: MB 160-328921/1-A**  
**Matrix: Solid**  
**Analysis Batch: 328884**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 328921**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	0.14	U	0.99	0.14	mg/Kg		09/25/17 15:40	09/25/17 16:09	1
Nitrate as N	0.054	U	0.20	0.054	mg/Kg		09/25/17 15:40	09/25/17 16:09	1
Nitrite as N	0.055	U	0.20	0.055	mg/Kg		09/25/17 15:40	09/25/17 16:09	1
Sulfate	0.50	U	5.0	0.50	mg/Kg		09/25/17 15:40	09/25/17 16:09	1
Chloride	0.20	U	2.0	0.20	mg/Kg		09/25/17 15:40	09/25/17 16:09	1

**Lab Sample ID: LCS 160-328921/2-A**  
**Matrix: Solid**  
**Analysis Batch: 328884**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 328921**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Fluoride	9.96	9.87		mg/Kg		99	90 - 110
Nitrate as N	3.99	3.95		mg/Kg		99	90 - 110
Nitrite as N	1.59	1.55		mg/Kg		97	90 - 110
Sulfate	79.7	75.8		mg/Kg		95	90 - 110
Chloride	19.9	19.1		mg/Kg		96	90 - 110

**Lab Sample ID: 160-24502-1 MS**  
**Matrix: Soil**  
**Analysis Batch: 328884**

**Client Sample ID: B3DCB9**  
**Prep Type: Total/NA**  
**Prep Batch: 328921**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Fluoride	0.48	B	20.2	20.3		mg/Kg	☼	98	90 - 110
Nitrate as N	1.8		4.03	5.78		mg/Kg	☼	98	90 - 110
Nitrite as N	0.055	U	1.01	0.974		mg/Kg	☼	97	90 - 110
Sulfate	1.8	B	40.3	39.3		mg/Kg	☼	93	90 - 110
Chloride	1.4	B y	20.2	20.8		mg/Kg	☼	97	90 - 110

**Lab Sample ID: 160-24502-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 328884**

**Client Sample ID: B3DCB9**  
**Prep Type: Total/NA**  
**Prep Batch: 328921**

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	Limit
Fluoride	0.48	B	0.431	B	mg/Kg	☼	12	20
Nitrate as N	1.8		1.67		mg/Kg	☼	9	20
Nitrite as N	0.055	U	0.055	U	mg/Kg	☼	NC	20
Sulfate	1.8	B	1.63	B	mg/Kg	☼	9	20
Chloride	1.4	B y	4.35	y	mg/Kg	☼	104	20

## Method: 6010C - Metals (ICP)

**Lab Sample ID: MB 160-327675/1-A**  
**Matrix: Solid**  
**Analysis Batch: 328366**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 327675**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.24	U	0.98	0.24	mg/Kg		09/18/17 15:05	09/21/17 18:06	1
Barium	1.5	U	4.9	1.5	mg/Kg		09/18/17 15:05	09/21/17 18:06	1
Cadmium	0.15	U	0.49	0.15	mg/Kg		09/18/17 15:05	09/21/17 18:06	1

TestAmerica St. Louis

Page 21 of 24  
**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-08

TestAmerica Job ID: 160-24502-1  
 SDG: SL2665

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

**Lab Sample ID: MB 160-327675/1-A**  
**Matrix: Solid**  
**Analysis Batch: 328366**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 327675**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	0.24	U	0.98	0.24	mg/Kg		09/18/17 15:05	09/21/17 18:06	1
Lead	0.24	U	0.98	0.24	mg/Kg		09/18/17 15:05	09/21/17 18:06	1
Selenium	0.24	U	1.5	0.24	mg/Kg		09/18/17 15:05	09/21/17 18:06	1
Silver	0.24	U	0.98	0.24	mg/Kg		09/18/17 15:05	09/21/17 18:06	1

**Lab Sample ID: LCSSRM 160-327675/2-A**  
**Matrix: Solid**  
**Analysis Batch: 328366**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 327675**

Analyte	Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	Limits
Arsenic	145	124.9	D	mg/Kg		86.2	70.3 - 136.6
Barium	209	183.7	D	mg/Kg		87.9	73.7 - 126.8
Cadmium	87.6	71.70	D	mg/Kg		81.8	73.3 - 126.7
Chromium	143	118.5	D	mg/Kg		82.9	69.9 - 129.4
Lead	146	130.0	D	mg/Kg		89.0	73.3 - 126.7
Selenium	178	148.3	D	mg/Kg		83.3	68.0 - 131.5
Silver	31.3	26.26	D	mg/Kg		83.9	65.2 - 134.5

**Lab Sample ID: 160-24502-1 MS**  
**Matrix: Soil**  
**Analysis Batch: 328366**

**Client Sample ID: B3DCB9**  
**Prep Type: Total/NA**  
**Prep Batch: 327675**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Arsenic	1.3	B D	94.9	86.47	D	mg/Kg		90	75 - 125
Barium	73.0	D	94.9	168.5	D	mg/Kg		101	75 - 125
Cadmium	3.2	D	94.9	87.65	D	mg/Kg		89	75 - 125
Chromium	8.9	D	94.9	96.48	D	mg/Kg		92	75 - 125
Lead	5.2	D	94.9	91.59	D	mg/Kg		91	75 - 125
Selenium	1.2	U D	47.5	43.66	D	mg/Kg		92	75 - 125
Silver	1.2	U D	19.0	17.65	D	mg/Kg		93	75 - 125

**Lab Sample ID: 160-24502-1 MSD**  
**Matrix: Soil**  
**Analysis Batch: 328366**

**Client Sample ID: B3DCB9**  
**Prep Type: Total/NA**  
**Prep Batch: 327675**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	1.3	B D	92.3	81.78	D	mg/Kg		87	75 - 125	6	30
Barium	73.0	D	92.3	159.9	D	mg/Kg		94	75 - 125	5	30
Cadmium	3.2	D	92.3	83.63	D	mg/Kg		87	75 - 125	5	30
Chromium	8.9	D	92.3	92.49	D	mg/Kg		91	75 - 125	4	30
Lead	5.2	D	92.3	87.83	D	mg/Kg		90	75 - 125	4	30
Selenium	1.2	U D	46.2	41.35	D	mg/Kg		90	75 - 125	5	30
Silver	1.2	U D	18.5	17.17	D	mg/Kg		93	75 - 125	3	30

TestAmerica St. Louis

# QC Sample Results

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-08

TestAmerica Job ID: 160-24502-1  
 SDG: SL2665

## Method: 7471B - Mercury (CVAA)

Lab Sample ID: MB 160-327698/1-A  
 Matrix: Solid  
 Analysis Batch: 327957

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 327698

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.011	U	0.032	0.011	mg/Kg		09/19/17 08:01	09/19/17 13:21	1

Lab Sample ID: LCSSRM 160-327698/2-A  
 Matrix: Solid  
 Analysis Batch: 327957

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA  
 Prep Batch: 327698

Analyte	Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	Limits
Mercury	12.3	9.88	D	mg/Kg		80.4	51.4 - 148.8

Lab Sample ID: 160-24502-1 MS  
 Matrix: Soil  
 Analysis Batch: 327957

Client Sample ID: B3DCB9  
 Prep Type: Total/NA  
 Prep Batch: 327698

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Mercury	0.090		0.810	0.908		mg/Kg	☼	101	80 - 120

Lab Sample ID: 160-24502-1 MSD  
 Matrix: Soil  
 Analysis Batch: 327957

Client Sample ID: B3DCB9  
 Prep Type: Total/NA  
 Prep Batch: 327698

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Mercury	0.090		0.792	0.864		mg/Kg	☼	98	80 - 120	5	30

## Method: 9045D - pH

Lab Sample ID: 160-24502-1 DU  
 Matrix: Soil  
 Analysis Batch: 328357

Client Sample ID: B3DCB9  
 Prep Type: Total/NA  
 Prep Batch: 328351

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	Limit
pH	5.88		5.832		SU		0.9	5

Lab Sample ID: LCS 160-328357/6  
 Matrix: Solid  
 Analysis Batch: 328357

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
pH	7.00	7.030		SU		100	99.0 - 101.0

Date: 22 February 2018  
 To: CH2M Hill (technical representative)  
 From: Analytical Quality Associates, Inc.  
 Project: 618-10\_618-11  
 Subject: General Chemistry - Sample Data Groups (SDGs) GEL432973 and SL2665

## **INTRODUCTION**

This memorandum presents the results of data validation for SDG GEL432973 prepared by GEL Laboratories LLC and SDG SL2665 prepared by TestAmerica Laboratories Inc. A list of samples validated along with the analytical methods is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation Level</b>	<b>Analytical Methods</b>
B3DCC4	09/14/17	Soil	C	9056, 9045D
B3DCB9	09/14/17	Soil	C	300.0, 9045D
B3DCC0	09/14/17	Soil	C	300.0, 9045D
B3DCC1	09/14/17	Soil	C	300.0, 9045D
B3DCC2	09/14/17	Soil	C	300.0, 9045D
B3DCC3	09/14/17	Soil	C	300.0, 9045D

Data validation was conducted in accordance with the CHPRC validation statement of work and the 300 Area Remedial Action Sampling and Analysis Plan, DOE/RL-2001-48, Rev. 4 (SAP). Appendices 1 through 4 provide the following information as indicated below:

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

## **DATA QUALITY OBJECTIVES**

### **• Holding Times and Sample Preservation**

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

- Chloride, fluoride and sulfate – analysis within 28 days of sample collection
- Nitrate and nitrite – extraction within 28 days of sample collection and analysis within 48 hours of extraction
- pH – analysis as soon as possible after sample collection

Sample preservation requires chilling to <6 degrees Celsius.

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

All samples were analyzed for pH seven days after sample collection. Based on professional judgment the pH results should be qualified as estimates and flagged “J.”

- **Blanks**

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

### **Laboratory Blanks**

All laboratory blank results were acceptable with the following exception.

For SDG GEL432973, the sulfate laboratory blank result was > the method detection limit (MDL) but < the practical quantitation limit (PQL). The sulfate result for sample B3DCC4 was a detect > the PQL but <20X the blank value and should be qualified as an estimate and flagged “J+.”

### **Trip Blanks**

No trip blanks were submitted for validation.

### **Field Blanks**

No field blanks were submitted for validation.

### **Equipment Blanks**

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results and laboratory control sample results. According to the SAP, the matrix spike sample accuracy limits are 70% to 130% and the laboratory control sample accuracy limits are ones specified by the DV procedure.

### **Matrix Spike (MS) Samples**

All MS recoveries were acceptable.

### **Laboratory Control Samples (LCSs)**

All LCS recoveries were acceptable.

- **Precision**

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

### **Laboratory Duplicate Samples**

All laboratory duplicate results were acceptable with the following exception.

For SDG SL2665, the RPD for chloride was  $>$  the acceptance limit. All sample results were detects and should be qualified as estimates and flagged “J.” See the table in Appendix 2 for a listing of all affected sample results.

### **Field Duplicate Samples**

No field duplicates were submitted for validation.

### **Field Split Samples**

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 GEL432973 and SL2665 were submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 83%.

### **MAJOR DEFICIENCIES**

None found.

### **MINOR DEFICIENCIES**

Minor deficiencies leading to qualification of sample results were due to analysis beyond the holding time for pH, blank contamination for sulfate and poor duplicate precision for chloride. See the table in Appendix 2 for a listing of all affected sample results.

**REFERENCES**

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

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

## **Appendix 1**

### **Glossary of Data Reporting Qualifiers**

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

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

**Appendix 2**  
**Summary of Data Qualification**

<b>General Chemistry Data Qualification Summary</b>			
SDGs: GEL432973, SL2665	Reviewer: AQA	Project: 618-10 618-11	Page 1 of 1
<b>Analyte(s)</b>	<b>Qualifier</b>	<b>Samples Affected</b>	<b>Reason</b>
pH	J	All samples	Analyzed beyond 2X holding time.
Sulfate	J+	B3DCC4	Laboratory blank contamination
Chloride	J	B3DCB9, B3DCC0, B3DCC1, B3DCC2, B3DCC3	Poor duplicate precision

Comments: None

## **Appendix 3**

### **Data Validation Supporting Documentation**

**Data Validation for Chemical Analyses**

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

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

VALIDATION LEVEL:	A	B	<input checked="" type="radio"/> C	D	E
PROJECT: 618-10_618-11			DATA PACKAGE: VSR18-004		
VALIDATOR: Eyda Hergenreder		LAB: GEL, TestAmerica		DATE: 02/22/2018	
			SDG: GEL432973, SL2665		
ANALYSES PERFORMED					
Anions/IC X	TOC	TOX	TPH-418.1	Oil and Grease	Alkalinity
Ammonia	BOD/COD	Chloride	Chromium-VI	pH X	NO <sub>3</sub> /NO <sub>2</sub>
Sulfate	TDS	TKN	Phosphate		
SAMPLES/MATRIX Soil					
GEL432973: B3DCC4					
SL2665: B3DCB9, B3DCC0, B3DCC1, B3DCC2, B3DCC3					

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

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

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

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

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

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

Comments:

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

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

Comments:

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SDG GEL432973: Sulfate MB 1690 ug/kg

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

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

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

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

Comments:

SDG SL2665 chloride RPD 104% (sample < PQL, duplicate sample >PQL)

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

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

Comments:

SDG GEL432973: pH analyzed 7 days after collection

SDG SL2665: pH analyzed 7 days after collection



## **Appendix 4**

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

# GEL LABORATORIES LLC

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

## QC Summary

Report Date: September 26, 2017

Page 1 of 3

CH2MHill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 432973

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Ion Chromatography</b>											
Batch	1702148										
QC1203878816	433007009	DUP									
Chloride		13700		13700	ug/Kg	0.31		(0%-35%)	MAR1	09/20/17	19:06
Fluoride		1290		1260	ug/Kg	2.56	^	(+/-1030)			
Nitrate-N	D	284000	D	286000	ug/Kg	0.617		(0%-35%)		09/21/17	15:50
Nitrite-N	U	339	U	340	ug/Kg	N/A				09/20/17	19:06
Sulfate	C	9690		9120	ug/Kg	6.14	^	(+/-4130)			
QC1203878815	LCS										
Chloride	50000			47900	ug/Kg		95.8	(80%-120%)		09/20/17	16:12
Fluoride	25000			24600	ug/Kg		98.6	(80%-120%)			
Nitrate-N	25000			23900	ug/Kg		95.7	(80%-120%)			
Nitrite-N	25000			24600	ug/Kg		98.2	(80%-120%)			
Sulfate	100000			97800	ug/Kg		97.8	(80%-120%)			
QC1203878814	MB										
Chloride			U	720	ug/Kg					09/20/17	15:43
Fluoride			U	340	ug/Kg						
Nitrate-N			U	330	ug/Kg						

## QC Summary

Workorder: 432973

Page 2 of 3

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Ion Chromatography</b>											
Batch	1702148										
Nitrite-N			U	330	ug/Kg				MAR1	09/20/17	15:43
Sulfate			B	1690	ug/Kg						
QC1203878817 433007009 MS											
Chloride	51400	13700		63100	ug/Kg		96	(75%-125%)		09/20/17	19:35
Fluoride	25700	1290		24900	ug/Kg		91.7	(75%-125%)			
Nitrate-N	25700	D 284000	D	310000	ug/Kg		N/A	(75%-125%)		09/21/17	16:18
Nitrite-N	25700	U 339		24800	ug/Kg		95.1	(75%-125%)		09/20/17	19:35
Sulfate	103000	C 9690		109000	ug/Kg		96.2	(75%-125%)			

**Titration and Ion Analysis**

Batch	1702717										
QC1203880045 432973001 DUP											
pH		X	6.37	X	6.36	SU	0.157	(0%-30%)	RXB5	09/21/17	14:59
QC1203880043 LCS											
pH	7.00				6.99	SU	99.9	(70%-130%)		09/21/17	14:51

**Notes:**

The Qualifiers in this report are defined as follows:

- < Sample is below the EPA guidance level for Reactive Releasable Cyanide and/or Reactive Releasable Sulfide
- > Result greater than quantifiable range or greater than upper limit of the analysis range
- B The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate).
- C Target analyte was detected in the sample and the associated blank. The associated blank concentration is  $\geq$  EQL or is  $>$  5% of the measured concentration and/or decision level for associated samples.
- D Results are reported from a diluted aliquot of sample.
- N Spike Sample recovery is outside control limits.
- U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier

# QC Sample Results

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-08

TestAmerica Job ID: 160-24502-1  
 SDG: SL2665

## Method: 300.0 - Anions, Ion Chromatography

**Lab Sample ID: MB 160-328921/1-A**  
**Matrix: Solid**  
**Analysis Batch: 328884**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 328921**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	0.14	U	0.99	0.14	mg/Kg		09/25/17 15:40	09/25/17 16:09	1
Nitrate as N	0.054	U	0.20	0.054	mg/Kg		09/25/17 15:40	09/25/17 16:09	1
Nitrite as N	0.055	U	0.20	0.055	mg/Kg		09/25/17 15:40	09/25/17 16:09	1
Sulfate	0.50	U	5.0	0.50	mg/Kg		09/25/17 15:40	09/25/17 16:09	1
Chloride	0.20	U	2.0	0.20	mg/Kg		09/25/17 15:40	09/25/17 16:09	1

**Lab Sample ID: LCS 160-328921/2-A**  
**Matrix: Solid**  
**Analysis Batch: 328884**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 328921**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Fluoride	9.96	9.87		mg/Kg		99	90 - 110
Nitrate as N	3.99	3.95		mg/Kg		99	90 - 110
Nitrite as N	1.59	1.55		mg/Kg		97	90 - 110
Sulfate	79.7	75.8		mg/Kg		95	90 - 110
Chloride	19.9	19.1		mg/Kg		96	90 - 110

**Lab Sample ID: 160-24502-1 MS**  
**Matrix: Soil**  
**Analysis Batch: 328884**

**Client Sample ID: B3DCB9**  
**Prep Type: Total/NA**  
**Prep Batch: 328921**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Fluoride	0.48	B	20.2	20.3		mg/Kg	☼	98	90 - 110
Nitrate as N	1.8		4.03	5.78		mg/Kg	☼	98	90 - 110
Nitrite as N	0.055	U	1.01	0.974		mg/Kg	☼	97	90 - 110
Sulfate	1.8	B	40.3	39.3		mg/Kg	☼	93	90 - 110
Chloride	1.4	B y	20.2	20.8		mg/Kg	☼	97	90 - 110

**Lab Sample ID: 160-24502-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 328884**

**Client Sample ID: B3DCB9**  
**Prep Type: Total/NA**  
**Prep Batch: 328921**

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Fluoride	0.48	B	0.431	B	mg/Kg	☼	12	20
Nitrate as N	1.8		1.67		mg/Kg	☼	9	20
Nitrite as N	0.055	U	0.055	U	mg/Kg	☼	NC	20
Sulfate	1.8	B	1.63	B	mg/Kg	☼	9	20
Chloride	1.4	B y	4.35	y	mg/Kg	☼	104	20

## Method: 6010C - Metals (ICP)

**Lab Sample ID: MB 160-327675/1-A**  
**Matrix: Solid**  
**Analysis Batch: 328366**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 327675**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.24	U	0.98	0.24	mg/Kg		09/18/17 15:05	09/21/17 18:06	1
Barium	1.5	U	4.9	1.5	mg/Kg		09/18/17 15:05	09/21/17 18:06	1
Cadmium	0.15	U	0.49	0.15	mg/Kg		09/18/17 15:05	09/21/17 18:06	1

TestAmerica St. Louis

Page 4 of 4  
**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-08

TestAmerica Job ID: 160-24502-1  
 SDG: SL2665

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

Lab Sample ID: MB 160-327698/1-A  
 Matrix: Solid  
 Analysis Batch: 327957

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 327698

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.011	U	0.032	0.011	mg/Kg		09/19/17 08:01	09/19/17 13:21	1

Lab Sample ID: LCSSRM 160-327698/2-A  
 Matrix: Solid  
 Analysis Batch: 327957

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA  
 Prep Batch: 327698

Analyte	Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	Limits
Mercury	12.3	9.88	D	mg/Kg		80.4	51.4 - 148.8

Lab Sample ID: 160-24502-1 MS  
 Matrix: Soil  
 Analysis Batch: 327957

Client Sample ID: B3DCB9  
 Prep Type: Total/NA  
 Prep Batch: 327698

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Mercury	0.090		0.810	0.908		mg/Kg	☼	101	80 - 120

Lab Sample ID: 160-24502-1 MSD  
 Matrix: Soil  
 Analysis Batch: 327957

Client Sample ID: B3DCB9  
 Prep Type: Total/NA  
 Prep Batch: 327698

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	RPD Limit
Mercury	0.090		0.792	0.864		mg/Kg	☼	98	80 - 120	5	30

**Method: 9045D - pH**

Lab Sample ID: 160-24502-1 DU  
 Matrix: Soil  
 Analysis Batch: 328357

Client Sample ID: B3DCB9  
 Prep Type: Total/NA  
 Prep Batch: 328351

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	Limit
pH	5.88		5.832		SU		0.9	5

Lab Sample ID: LCS 160-328357/6  
 Matrix: Solid  
 Analysis Batch: 328357

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
pH	7.00	7.030		SU		100	99.0 - 101.0