



June 12, 2017

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

Re: CHPRC SAF S17-005  
Work Order: 423564  
SDG: GEL423564

Dear Mr. Fitzgerald:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on May 19, 2017. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4505.

Sincerely,

*B Luthman*  
Brielle Luthman for  
Heather Shaffer  
Project Manager

Purchase Order: 300071 - 7H  
Chain of Custody: S17-005-149, S17-005-152, S17-005-153, S17-005-161 and S17-005-162  
Enclosures



<b>SAMPLE ISSUE RESOLUTION (SIR) REPORT</b>		<b>SIR Number:</b> SIR17-0834 <b>Rev. Number:</b> 0 <b>Date Initiated:</b> 07/18/2017
<b><u>SAMPLE EVENT INFORMATION</u></b>		
<b>SAF NUM(S):</b>	S17-005	
<b>LABORATORY:</b>	GEL	
<b><u>SAMPLING INFORMATION</u></b>		
<b>NUMBER OF SAMPLES:</b>	4	
<b>SAMPLE NUMBERS:</b>	B39C44, B39C45, B39C47, B39C75	
<b>SAMPLE MATRIX:</b>	WATER	
<b>SDG NUM(S):</b>	GEL423564	
<b><u>ISSUE BACKGROUND</u></b>		
<b>CLASS:</b>	Chain of Custody Issue (Field)	
<b>TYPE:</b>	No Receipt Date	
<b>DESCRIPTION:</b>	COC S17-005-153, COC S17-005-161, & COC S17-005-152, missing date in the first Received by box	
<b><u>RESOLUTION</u></b>		
<b>PROPOSED RESOLUTION:</b>	DOCUMENT AND CLOSE	
<b>FINAL RESOLUTION:</b>	DOCUMENT AND CLOSE	
<b>SUBMITTED BY:</b>		
CALIXTO, SE	_____	06/14/2017 _____
<b>ACCEPTED BY:</b>		
KILLAND, KE	_____	07/18/2017 _____

## Table of Contents

Case Narrative.....	1
Chain of Custody and Supporting Documentation.....	7
Data Review Qualifier Definitions.....	14
Laboratory Certifications.....	16
Metals Analysis.....	18
Case Narrative.....	19
Sample Data Summary.....	22
Quality Control Summary.....	25
General Chem Analysis.....	30
Case Narrative.....	31
Sample Data Summary.....	35
Quality Control Summary.....	39
Radiological Analysis.....	43
Case Narrative.....	44
Sample Data Summary.....	48
Quality Control Summary.....	52

# Case Narrative

**General Narrative  
for  
CH2MHill Plateau Remediation Company  
CHPRC SAF S17-005  
SDG: GEL423564**

**June 12, 2017**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary**

**Sample receipt**

The sample(s) arrived at GEL Laboratories, LLC, Charleston, South Carolina on May 19, 2017, for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Items of Note** All efforts were made by the lab to meet any short hold times. Samples that were analyzed outside of the initial hold time but still within 2X hold time will be noted in the lab case narrative.

**Sample Identification**

The laboratory received the following samples:

<b><u>Laboratory Identification</u></b>	<b><u>Sample Description</u></b>
423564001	B39C45
423564002	B39C75
423564003	B39C36
423564004	B39C47
423564005	B39C44
423564006	B39C79

**Case Narrative**

Sample analyses were conducted using methodology as outlined in GEL Laboratories, LLC (GEL) Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

**Data Package**

The enclosed data package contains the following sections: General Narrative, Chain of Custody and Supporting Documentation, and data from the following fractions: General Chemistry, Metals and Radiochemistry.

We certify that this package is in compliance with the SOW, both technically and for completeness, including a full description of, explanation of, and corrective actions for, any and all deviations, from either the analyses requested or the case narrative requested. Release of the data contained in this hard copy data package has been authorized by the Laboratory Analytical Manager (or designee) and the laboratory's client services representative as verified by their signatures on this report.

  
Brielle Luthman for  
Heather Shaffer  
Project Manager

**Technical Case Narrative**  
**CH2MHill Plateau Remediation Company (CPRC)**  
**SDG #: GEL423564**  
**Work Order #: 423564**

## Metals

### **Determination of Metals by ICP**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

### **Determination of Metals by ICP-MS**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

## General Chemistry

### **Ion Chromatography**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

### **Technical Information**

#### **Sample Dilutions**

The following samples 1203793518 (B39C75DUP), 1203793519 (B39C75PS), 423564001 (B39C45) and 423564002 (B39C75) were diluted because target analyte concentrations exceeded the calibration range.

Analyte	423564	
	001	002
Chloride	5X	10X
Sulfate	5X	10X

### **Miscellaneous Information**

#### **Manual Integrations**

Samples 1203793518 (B39C75DUP), 1203793519 (B39C75PS), 423564001 (B39C45) and 423564002

(B39C75) were manually integrated to correctly position the baseline as set in the calibration standards.

### **Alkalinity**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

## **Radiochemistry**

### **9310\_ALPHABETA\_GPC: Gross Beta**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

#### **Quality Control (QC) Information**

##### **QC Information**

The matrix spike and matrix spike duplicate, 1203797126 (B39CL2MS) and 1203797127 (B39CL2MSD), did not meet the beta relative percent difference requirement/relative error ratio requirement; however, they do meet the recovery requirement.

#### **Technical Information**

##### **Gross Alpha/Beta Preparation Information**

High hygroscopic salt content in evaporated samples can cause the sample mass to fluctuate due to moisture absorption. To minimize this interference, the salts are converted to oxides by heating the sample under a flame until a dull red color is obtained. The conversion to oxides stabilizes the sample weight and ensures that proper alpha/beta efficiencies are assigned for each sample. Volatile radioisotopes of carbon, hydrogen, technetium, polonium and cesium may be lost during sample heating.

##### **Recounts**

Sample 1203797126 (B39CL2MS) was recounted due to low recovery. The recount is reported.

#### **Miscellaneous Information**

##### **Additional Comments**

The matrix spike and matrix spike duplicate, 1203797126 (B39CL2MS) and 1203797127 (B39CL2MSD), aliquots were reduced to conserve sample volume.

### **TRITIUM\_DIST\_LSC: COMMON**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information****Additional Comments**

The matrix spike, 1203797312 (Non SDG 423007001MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

# **Chain of Custody and Supporting Documentation**

**CH2M Hill Plateau Remediation Company**

**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**

C.O.C.# **S17-005-153**  
Page 1 of 1

Collector: Lesly Wall CHPRC  
 SAF No. S17-005  
 Project Title: SURV, MAY 2017  
 Shipped To (Lab): **GEL Laboratories, LLC**  
 Protocol: SURV

Contact/Requester: Karen Waters-Husted  
 Telephone No. 509-376-4650  
 Purchase Order/Charge Code: 300071  
 Ice Chest No. **6W5389**  
 Bill of Lading/Air Bill No. **1791 7802 1074**  
 Offsite Property No. **7925**

Logbook No. HNF-N-50692/77  
 Method of Shipment: Commercial Carrier  
 Priority: **30 Days**

**PRIORITY**

**POSSIBLE SAMPLE HAZARDS/REMARKS**  
 \*\*\* Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1

SPECIAL INSTRUCTIONS: N/A  
 Hold Time: \_\_\_\_\_  
 Total Activity Exemption: Yes  No

Sample No. B39C45  
 Filter: N W  
 Date: 5/18/17 0858  
 No/Type Container: 1x125-mL G/P  
 9056\_ANIONS\_IC: COMMON

Sample Analysis: \_\_\_\_\_  
 Holding Time: 48 Hours  
 Preservative: Cool <=6C

Relinquished By Lesly Wall CHPRC	Print 	Date/Time MAY 18 2017 1020	Received By Janelle Zunker CHPRC	Print 	Date/Time 1020	Matrix * S = Soil DS = Drum Solids SE = Sediment DL = Drum Liquids SO = Solid T = Tissue SL = Sludge WI = Wipe W = Water L = Liquid O = Oil V = Vegetation A = Air X = Other
Relinquished By Janelle Zunker CHPRC	Print 	Date/Time MAY 18 2017 1400	Received By FEDEX	Print FEDEX	Date/Time	
Relinquished By CHPRC	Print 	Date/Time MAY 19 2017 1400	Received By Stacy Boone	Print STACY BOONE	Date/Time 5/19/17 9:05	
Relinquished By	Print	Date/Time	Received By	Print	Date/Time	
FINAL SAMPLE DISPOSITION			Disposal Method (e.g., Return to customer, per lab procedure, used in process)			Date/Time

PRINTED ON 3/27/2017 FSR ID = FSR36872 A-6004-842 (REV 2)

**CH2M Hill Plateau Remediation Company**

**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**

C.O.C. # **S17-005-161**  
Page 1 of 1

Collector: **Lesly Wall CHPRC**      Contact/Requester: **Karen Waters-Husted**      Telephone No. **509-376-4650**

SAF No. **S17-005**      Sampling Origin: **Hanford Site**      Purchase Order/Charge Code: **300071**

Project Title: **SURV, MAY 2017**      Logbook No. **HNF-N-50692177**      Ice Chest No. **GWS-389**

Shipped To (Lab): **GEL Laboratories, LLC**      Method of Shipment: **Commercial Carrier**      Bill of Lading/Air Bill No. **77917802 1074**

Protocol: **SURV**      Priority: **30 Days**      Priority: **PRIORITY**      Offsite Property No. **7925**

**POSSIBLE SAMPLE HAZARDS/REMARKS**  
\*\*\* Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1

**SPECIAL INSTRUCTIONS**      Hold Time      Total Activity Exemption: Yes  No   
N/A

Sample No.	Filter	*	Date	Time	No/Type Container	Sample Analysis	Holding Time	Preservative
B39C75	N	W	5/18/17	0837	1x125-mL G/P	9056_ANIONS_IC: COMMON	48 Hours	Cool <=6C

Relinquished By	Print	Sign	Received By	Print	Sign	Date/Time	Matrix *
Lesly Wall CHPRC			Janelle Zunker CHPRC			10:00	S = Soil DS = Drum Solids SE = Sediment DL = Drum Liquids SO = Solid T = Tissue SL = Sludge WI = Wipe W = Water L = Liquid O = Oil V = Vegetation A = Air X = Other
Janelle Zunker CHPRC							
			STACY BOONE			5/19/17 9:05	

**FINAL SAMPLE DISPOSITION**      Disposal Method (e.g., Return to customer, per lab procedure, used in process)      Disposed By      Date/Time

PRINTED ON 3/27/2017      FSR ID = FSR42772      A-6004-842 (REV 2)

CH2M Hill Plateau Remediation Company		C.O.C. # S17-005-149	
Collector: Lesly Wall CHPRC		Page 1 of 1	
SAF No. S17-005	Contact/Requester: Karen Waters-Husted	Telephone No. 509-376-4650	
Project Title: SURV, MAY 2017	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 300071	
Shipped To (Lab): GEL Laboratories, LLC	Logbook No. HNF-N-50692177	Ice Chest No. GWS-389	
Protocol: SURV	Method of Shipment: Commercial Carrier	Bill of Lading/Air Bill No. 77917802-1074	
Priority: 30 Days		Offsite Property No. 7925	
SPECIAL INSTRUCTIONS: N/A		Hold Time	Total Activity Exemption: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
POSSIBLE SAMPLE HAZARDS/REMARKS: *** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1			
Sample No. B39C36	Filter: N	No/Type Container: 1x1-LP	Sample Analysis: Gross Beta
Date: 5/18/17	Time: 1244	Holding Time: 6 Months	Preservative: HNO3 to pH <2

Relinquished By: Lesly Wall CHPRC	Print: Lesly Wall	Sign: [Signature]	Received By: Troy Bacon CHPRC	Print: Troy Bacon	Sign: [Signature]	Date/Time: MAY 18 2017 1315	Date/Time: MAY 19 2017 1315	Matrix * DS = Drum Solids
Relinquished By: Troy Bacon CHPRC	Print: Troy Bacon	Sign: [Signature]	Received By: FEDEX	Print: FEDEX	Sign: [Signature]	Date/Time: MAY 18 2017 1700	Date/Time: 5-18-17 MAY 18 2017	DL = Drum Liquids
Relinquished By: [Signature]	Print: [Signature]	Sign: [Signature]	Received By: STACY BOONE	Print: STACY BOONE	Sign: [Signature]	Date/Time: FED EX	Date/Time: 5-19-17 9:05	T = Tissue
Relinquished By: [Signature]	Print: [Signature]	Sign: [Signature]	Received By: [Signature]	Print: [Signature]	Sign: [Signature]	Date/Time: [Signature]	Date/Time: [Signature]	WI = Wipe
								L = Liquid
								V = Vegetation
								X = Other
FINAL SAMPLE DISPOSITION		Disposal Method (e.g., Return to customer, per lab procedure, used in process)		Disposed By		Date/Time		
PRINTED ON 3/27/2017		FSR ID = FSR31778		A-6004-842 (REV 2)				

C.O.C.# S17-005-152  
Page 1 of 1

# CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

423564

Telephone No. 509-376-4650  
 Purchase Order/Charge Code 300071  
 Ice Chest No. 625-389  
 Bill of Lading/Air Bill No. 7791 7862 1074  
 Offsite Property No. 725

Total Activity Exemption: Yes  No   
 SPECIAL INSTRUCTIONS N/A  
 Hold Time  
 Priority: 30 Days **PRIORITY**

Sample No.	Filter	*	Date	Time	No/Type Container	Sample Analysis	Holding Time	Preservative
B39C47	Y	W	5/18/17	0858	1x500-mL G/P	6010_METALS_ICP: GW 04; 6020_METALS_ICPMS: Chromium (1)	6 Months	HNO3 to pH <2
B39C44	N	W			1x250-mL G/P	2320_ALKALINITY: GW 01	14 Days	Cool <=6C
B39C44	N	W			1x500-mL G/P	6010_METALS_ICP: GW 04; 6020_METALS_ICPMS: Chromium (1)	6 Months	HNO3 to pH <2
B39C44	N	W			1x250-mL P	TRITIUM_DIST_LSC: COMMON	6 Months	None

**POSSIBLE SAMPLE HAZARDS/REMARKS**  
 \*\*\* Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1

Relinquished By Lesly Wall CHPRC	Print <i>Lesly Wall</i> Sign	Date/Time MAY 18 2017 10:20	Received By Janelle Zunker CHPRC	Print <i>Janelle Zunker</i> Sign	Date/Time 10:20	Matrix *
Relinquished By Janelle Zunker CHPRC	Print <i>Janelle Zunker</i> Sign	Date/Time MAY 18 2017 14:00	Received By FEDEX	Print Sign	Date/Time	S = Soil DS = Drum Solids SE = Sediment DL = Drum Liquids SO = Solid T = Tissue SL = Sludge WI = Wipe W = Water L = Liquid O = Oil V = Vegetation A = Air X = Other
Relinquished By	Print Sign	Date/Time MAY 18 2017 14:00	Received By STACY DOONE	Print Sign	Date/Time 5-19-17 9:05	
Relinquished By	Print Sign	Date/Time	Received By	Print Sign	Date/Time	

Disposal Method (e.g., Return to customer, per lab procedure, used in process)

Disposed By

Date/Time

**CH2M Hill Plateau Remediation Company** *8/3/16*

**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST** *423564*

C.O.C.# **S17-005-162** Page 1 of 1

Collector: **Lesly Wall CHPRC** Telephone No.: **509-376-4650**

SAF No.: **S17-005** Purchase Order/Charge Code: **300071**

Project Title: **SURV, MAY 2017** Logbook No.: **HNF-N-506 92177**

Shipped To (Lab): **GEL Laboratories, LLC** Method of Shipment: **Commercial Carrier**

Protocol: **SURV** Priority: **30 Days** SPECIAL INSTRUCTIONS: **PRIORITY**

**POSSIBLE SAMPLE HAZARDS/REMARKS**

\*\*\* Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1

SPECIAL INSTRUCTIONS: **N/A**

Hold Time: **6 Months** Holding Time: **6 Months** Preservative: **None**

Bill of Lading/Air Bill No.: **779178621071**

Offsite Property No.: **7925** Total Activity Exemption: Yes  No

Sample No.: **B39C79** Filter: **N** Date: **5/18/17** Time: **12:13** No./Type Container: **1/250 mL P** Sample Analysis: **TRITIUM\_DIST\_LSC: COMMON**

Relinquished By <b>Lesly Wall CHPRC</b>	Print <i>[Signature]</i>	Sign	Date/Time <b>MAY 18 2017 1315</b>	Received By <b>Troy Bacon CHPRC</b>	Print <i>[Signature]</i>	Sign	Date/Time <b>MAY 19 2017 1315</b>	Matrix *
Relinquished By <b>Troy Bacon CHPRC</b>	Print <i>[Signature]</i>	Sign	Date/Time <b>MAY 19 2017 1400</b>	Received By <b>FEDEX</b>	Print <b>FEDEX</b>	Sign	Date/Time <b>MAY 19 2017 7:28</b>	S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air
Relinquished By <b>FEDEX</b>	Print <b>FEDEX</b>	Sign	Date/Time <b>MAY 19 2017 1400</b>	Received By <b>179 Bm STACY BOONE</b>	Print <b>STACY BOONE</b>	Sign	Date/Time <b>5/19/17 9:05</b>	DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other
Relinquished By	Print	Sign	Date/Time	Received By	Print	Sign	Date/Time	

Disposal Method (e.g., Return to customer, per lab procedure, used in process)

Disposed By

Disposal Date/Time

PRINTED ON 3/27/2017

FSR ID = FSR40395

A-6004-842 (REV 2)



# **Data Review Qualifier Definitions**

## Project Specific Qualifier Definitions for GEL Client Code: CPRC

Qualifier	Qualifier Definition	Department	Fraction
U	Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.		
J	The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate). Value is estimated	Organics	
P	Aroclor target analyte with greater than 25% difference between column analyses.	Organics	
C	Analyte has been confirmed by GC/MS analysis	Organics	Pesticide
B	The analyte was detected in both the associated QC blank and in the sample.	Organics	
E	Concentration exceeds the calibration range of the instrument	Organics	
A	The TIC is a suspected aldol-condensation product	Organics	Semi-Volatile
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier		
N	Spike Sample recovery is outside control limits.		
*	Duplicate analysis not within control limits	Inorganics	
>	Result greater than quantifiable range or greater than upper limit of the analysis range	General Chemistry	
Z	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier		
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).	Inorganics	Metals
D	Results are reported from a diluted aliquot of sample.		
E	Reported value is estimated due to interferences. See comment in narrative.	Inorganics	Metals
M	Duplicate precision not met.	Inorganics	Metals
o	Analyte failed to recover within LCS limits (Organics only)	Organics	
S	Reported value determined by the Method of Standard Additions (MSA)	Inorganics	
T	Spike and/or spike duplicate sample recovery is outside control limits.	Organics	
W	Post-digestion spike recovery for GFAA out of control limit. Sample absorbency < 50% of spike absorbency.	Inorganics	
B	The associated QC sample blank has a result $\geq 2X$ the MDA and, after corrections, result is $\geq$ MDA for this sample	Radiological	
Y	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier		
+	Correlation coefficient for Method of Standard Additions (MSA) is < 0.995	Inorganics	
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).	General Chemistry	
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.	Inorganics	Metals
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.	General Chemistry	
<	Sample is below the EPA guidance level for Reactive Releasable Cyanide and/or Reactive Releasable Sulfide	General Chemistry	
UX	Gamma Spectroscopy--Uncertain identification	Radiological	

# Laboratory Certifications

**List of current GEL Certifications as of 12 June 2017**

<b>State</b>	<b>Certification</b>
Alaska	UST-0110
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
Delaware	SC00012
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA170010
Maryland	270
Massachusetts	M-SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122017-1
New Hampshire NELAP	205415
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	9904
Pennsylvania NELAP	68-00485
S.Carolina Radchem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-17-12
Utah NELAP	SC000122017-22
Vermont	VT87156
Virginia NELAP	460202
Washington	C780
West Virginia	997404

# Metals Analysis

# Case Narrative

**Metals**  
**Technical Case Narrative**  
**CH2MHill Plateau Remediation Company (CPRC)**  
**SDG #: GEL423564**  
**Work Order #: 423564**

**Product: Determination of Metals by ICP****Analytical Method:** SW846 3005A/6010D**Analytical Procedure:** GL-MA-E-013 REV# 28**Analytical Batch:** 1666752**Product: Determination of Metals by ICP-MS****Analytical Method:** SW846 3005A/6020B**Analytical Procedure:** GL-MA-E-014 REV# 29**Analytical Batch:** 1666760**Preparation Method:** SW846 3005A**Preparation Procedure:** GL-MA-E-006 REV# 13**Preparation Batches:** 1666750 and 1666759

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
423564004	B39C47
423564005	B39C44
1203793455	Method Blank (MB) <b>ICP</b>
1203793456	Laboratory Control Sample (LCS)
1203793459	423564004(B39C47L) Serial Dilution (SD)
1203793457	423564004(B39C47S) Matrix Spike (MS)
1203793458	423564004(B39C47SD) Matrix Spike Duplicate (MSD)
1203793475	Method Blank (MB) <b>ICP-MS</b>
1203793476	Laboratory Control Sample (LCS)
1203793479	423564004(B39C47L) Serial Dilution (SD)
1203793477	423564004(B39C47S) Matrix Spike (MS)
1203793478	423564004(B39C47SD) Matrix Spike Duplicate (MSD)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

**GEL LABORATORIES LLC**

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

**Qualifier Definition Report  
for**

CPRC001 CH2MHill Plateau Remediation Company

Client SDG: GEL423564 GEL Work Order: 423564

**The Qualifiers in this report are defined as follows:**

- \* Duplicate analysis not within control limits
- 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).
- 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.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

**Signature:** **Name: Nik-Cole Elmore****Date: 12 JUN 2017****Title: Data Validator**

# Sample Data Summary

**METALS**  
-1-  
**INORGANICS ANALYSIS DATA PACKAGE**

SDG No: GEL423564

CONTRACT: CPRC0S17005

METHOD TYPE: SW846

SAMPLE ID: 423564004

BASIS: As Received

DATE COLLECTED 18-MAY-17

CLIENT ID: B39C47

LEVEL: Low

DATE RECEIVED 19-MAY-17

MATRIX: WATER

%SOLIDS: 0

CAS No.	Analyte	Result	Units	Qual	MDL	PQL	CRDL	DF	M*	Analyst	Run Date	Analytical Run	Analytical Batch
7440-42-8	Boron	15	ug/L	U	15	50	50	1	P	JWJ	05/23/17 20:51	052317A-1	1666752
7440-70-2	Calcium	51300	ug/L		50	200	200	1	P	JWJ	05/23/17 20:51	052317A-1	1666752
7440-47-3	Chromium	28.8	ug/L		3	10	10	1	MS	BAJ	05/31/17 19:27	170531-2	1666760
7439-89-6	Iron	30	ug/L	U	30	100	100	1	P	JWJ	05/23/17 20:51	052317A-1	1666752
7439-95-4	Magnesium	11700	ug/L		110	300	300	1	P	JWJ	05/23/17 20:51	052317A-1	1666752
7440-09-7	Potassium	4340	ug/L		50	150	150	1	P	JWJ	05/23/17 20:51	052317A-1	1666752
7440-23-5	Sodium	8750	ug/L		100	300	300	1	P	JWJ	05/23/17 20:51	052317A-1	1666752
7440-62-2	Vanadium	7	ug/L		1	5	5	1	P	JWJ	05/23/17 20:51	052317A-1	1666752

**Prep Information:**

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1666752	1666750	SW846 3005A	50	mL	50	mL	05/19/17	CXW4
1666760	1666759	SW846 3005A	50	mL	50	mL	05/19/17	CXW4

**\*Analytical Methods:**

P SW846 3005A/6010D  
MS SW846 3005A/6020B

**METALS**  
-1-  
**INORGANICS ANALYSIS DATA PACKAGE**

SDG No: GEL423564

CONTRACT: CPRC0S17005

METHOD TYPE: SW846

SAMPLE ID: 423564005

BASIS: As Received

DATE COLLECTED 18-MAY-17

CLIENT ID: B39C44

LEVEL: Low

DATE RECEIVED 19-MAY-17

MATRIX: WATER

%SOLIDS: 0

CAS No.	Analyte	Result	Units	Qual	MDL	PQL	CRDL	DF	M*	Analyst	Run Date	Analytical Run	Analytical Batch
7440-42-8	Boron	15	ug/L	U	15	50	50	1	P	JWJ	05/23/17 21:02	052317A-1	1666752
7440-70-2	Calcium	50600	ug/L		50	200	200	1	P	JWJ	05/23/17 21:02	052317A-1	1666752
7440-47-3	Chromium	28.4	ug/L		3	10	10	1	MS	BAJ	05/31/17 19:43	170531-2	1666760
7439-89-6	Iron	30	ug/L	U	30	100	100	1	P	JWJ	05/23/17 21:02	052317A-1	1666752
7439-95-4	Magnesium	11700	ug/L		110	300	300	1	P	JWJ	05/23/17 21:02	052317A-1	1666752
7440-09-7	Potassium	4290	ug/L		50	150	150	1	P	JWJ	05/23/17 21:02	052317A-1	1666752
7440-23-5	Sodium	8630	ug/L		100	300	300	1	P	JWJ	05/23/17 21:02	052317A-1	1666752
7440-62-2	Vanadium	7.16	ug/L		1	5	5	1	P	JWJ	05/23/17 21:02	052317A-1	1666752

**Prep Information:**

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1666752	1666750	SW846 3005A	50	mL	50	mL	05/19/17	CXW4
1666760	1666759	SW846 3005A	50	mL	50	mL	05/19/17	CXW4

**\*Analytical Methods:**

P SW846 3005A/6010D  
MS SW846 3005A/6020B

# Quality Control Summary

**GEL LABORATORIES LLC**

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

**QC Summary**

Report Date: June 12, 2017

Page 1 of 4

CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 423564

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis - ICPMS</b>											
Batch	1666760										
QC1203793476	LCS										
Chromium	50.0			48.9	ug/L		97.7	(80%-120%)	BAJ	05/31/17	19:00
QC1203793475	MB										
Chromium			U	3.00	ug/L					05/31/17	18:57
QC1203793477	423564004	MS									
Chromium	50.0	28.8		77.3	ug/L		97.1	(75%-125%)		05/31/17	19:30
QC1203793478	423564004	MSD									
Chromium	50.0	28.8		76.4	ug/L	1.29	95.1	(0%-20%)		05/31/17	19:33
QC1203793479	423564004	SDILT									
Chromium		28.8	BD	5.75	ug/L	.191		(0%-20%)		05/31/17	19:40
<b>Metals Analysis-ICP</b>											
Batch	1666752										
QC1203793456	LCS										
Boron	500			483	ug/L		96.6	(80%-120%)	JWJ	05/23/17	20:27
Calcium	5000			5120	ug/L		102	(80%-120%)			
Iron	5000			5130	ug/L		103	(80%-120%)			
Magnesium	5000			4990	ug/L		99.8	(80%-120%)			
Potassium	5000			4970	ug/L		99.3	(80%-120%)			
Sodium	5000			5010	ug/L		100	(80%-120%)			

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**QC Summary**

Workorder: 423564

Page 2 of 4

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1666752										
Vanadium	500			497	ug/L		99.3	(80%-120%)	JWJ	05/23/17	20:27
QC1203793455	MB										
Boron			U	15.0	ug/L					05/23/17	20:23
Calcium			U	50.0	ug/L						
Iron			U	30.0	ug/L						
Magnesium			U	110	ug/L						
Potassium			U	50.0	ug/L						
Sodium			U	100	ug/L						
Vanadium			U	1.00	ug/L						
QC1203793457	423564004 MS										
Boron	500	U	15.0	515	ug/L		101	(75%-125%)		05/23/17	20:54
Calcium	5000		51300	57300	ug/L		N/A	(75%-125%)			
Iron	5000	U	30.0	5150	ug/L		103	(75%-125%)			
Magnesium	5000		11700	17000	ug/L		105	(75%-125%)			
Potassium	5000		4340	9000	ug/L		93.2	(75%-125%)			
Sodium	5000		8750	13700	ug/L		98.7	(75%-125%)			

**GEL LABORATORIES LLC**

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**QC Summary**

Workorder: 423564

Page 3 of 4

Parname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1666752										
Vanadium	500	7.00		517	ug/L		102	(75%-125%)	JWJ	05/23/17	20:54
QC1203793458 423564004 MSD											
Boron	500	U	15.0	509	ug/L	1.19	100	(0%-20%)		05/23/17	20:57
Calcium	5000	51300		54900	ug/L	4.35	N/A	(0%-20%)			
Iron	5000	U	30.0	5120	ug/L	0.516	102	(0%-20%)			
Magnesium	5000	11700		16700	ug/L	1.85	99	(0%-20%)			
Potassium	5000	4340		9000	ug/L	0.0533	93.3	(0%-20%)			
Sodium	5000	8750		13400	ug/L	2.15	92.9	(0%-20%)			
Vanadium	500	7.00		511	ug/L	1.12	101	(0%-20%)			
QC1203793459 423564004 SDILT											
Boron		U	8.69	DU	75.0	ug/L	N/A	(0%-20%)		05/23/17	20:59
Calcium			51300	D	10600	ug/L	3.7	(0%-20%)			
Iron		U	1.16	DU	150	ug/L	N/A	(0%-20%)			
Magnesium			11700	D	2580	ug/L	10.2	(0%-20%)			
Potassium			4340	D	895	ug/L	3.14	(0%-20%)			
Sodium			8750	D	1890	ug/L	8.11	(0%-20%)			

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**QC Summary**

Workorder: 423564

Page 4 of 4

Parname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1666752										
Vanadium		7.00	BD	1.48	ug/L	5.96		(0%-20%)	JWJ	05/23/17	20:59

**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.

# General Chem Analysis

# Case Narrative

**General Chemistry  
Technical Case Narrative  
CH2MHill Plateau Remediation Company (CPRC)  
SDG #: GEL423564  
Work Order #: 423564**

**Product: Ion Chromatography****Analytical Method:** 9056\_ANIONS\_IC**Analytical Procedure:** GL-GC-E-086 REV# 25**Analytical Batch:** 1666775

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
423564001	B39C45
423564002	B39C75
1203793516	Method Blank (MB)
1203793517	Laboratory Control Sample (LCS)
1203793518	423564002(B39C75) Sample Duplicate (DUP)
1203793519	423564002(B39C75) Post Spike (PS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Technical Information****Sample Dilutions**

The following samples 1203793518 (B39C75DUP), 1203793519 (B39C75PS), 423564001 (B39C45) and 423564002 (B39C75) were diluted because target analyte concentrations exceeded the calibration range. Dilutions may be required for many reasons, including to minimize matrix interferences or to bring over range target analyte concentrations into the linear calibration range.

Analyte	423564	
	001	002
Chloride	5X	10X
Sulfate	5X	10X

**Miscellaneous Information****Manual Integrations**

Samples 1203793518 (B39C75DUP), 1203793519 (B39C75PS), 423564001 (B39C45) and 423564002 (B39C75) were manually integrated to correctly position the baseline as set in the calibration standards.

**Product: Alkalinity****Analytical Method:** 2320\_ALKALINITY**Analytical Procedure:** GL-GC-E-033 REV# 13**Analytical Batch:** 1669819

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
423564005	B39C44
1203801084	Laboratory Control Sample (LCS)
1203801087	423564005(B39C44) Sample Duplicate (DUP)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

**GEL LABORATORIES LLC**

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

**Qualifier Definition Report  
for**

CPRC001 CH2MHill Plateau Remediation Company

Client SDG: GEL423564 GEL Work Order: 423564

**The Qualifiers in this report are defined as follows:**

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).

D Results are reported from a diluted aliquot of sample.

U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

**Signature:****Name: Kristen Mizzell****Date: 06 JUN 2017****Title: Analyst I**

# Sample Data Summary

**GEL LABORATORIES LLC**

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

**Certificate of Analysis**

Report Date: June 6, 2017

Company : CH2MHill Plateau Remediation Company  
 Address : MSIN R3-50 CHPRC  
 PO Box 1600  
 Richland, Washington 99352  
 Contact: Mr. Scot Fitzgerald  
 Project: CHPRC SAF S17-005

Client Sample ID: B39C45 Project: CPRC0S17005  
 Sample ID: 423564001 Client ID: CPRC001  
 Matrix: WATER  
 Collect Date: 18-MAY-17 08:58  
 Receive Date: 19-MAY-17  
 Collector: Client

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Ion Chromatography												
9056_ANIONS_IC: COMMON "As Received"												
Fluoride	B	163	33.0	500	ug/L		1	MXL2	05/19/17	1148	1666775	1
Nitrate-N		3770	33.0	250	ug/L		1					
Nitrite-N	U	33.0	33.0	250	ug/L		1					
Chloride	D	10800	335	1000	ug/L		5	MXL2	05/19/17	1833	1666775	2
Sulfate	D	72600	665	2000	ug/L		5					

The following Analytical Methods were performed:

Method	Description	Analyst	Comments
1	9056_ANIONS_IC		
2	9056_ANIONS_IC		

**Notes:**

Column headers are defined as follows:

DF: Dilution Factor                      Lc/LC: Critical Level  
 DL: Detection Limit                      PF: Prep Factor  
 MDA: Minimum Detectable Activity      RL: Reporting Limit  
 MDC: Minimum Detectable Concentration      SQL: Sample Quantitation Limit



**GEL LABORATORIES LLC**

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

**Certificate of Analysis**

Report Date: June 6, 2017

Company : CH2MHill Plateau Remediation Company  
 Address : MSIN R3-50 CHPRC  
 PO Box 1600  
 Richland, Washington 99352  
 Contact: Mr. Scot Fitzgerald  
 Project: CHPRC SAF S17-005

Client Sample ID: B39C44 Project: CPRC0S17005  
 Sample ID: 423564005 Client ID: CPRC001  
 Matrix: WATER  
 Collect Date: 18-MAY-17 08:58  
 Receive Date: 19-MAY-17  
 Collector: Client

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Titration and Ion Analysis												
2320_ALKALINITY: GW 01 "As Received"												
Alkalinity, Total as CaCO3		105000	1450	4000	ug/L			RXB5	06/01/17	1837	1669819	1
Bicarbonate alkalinity (CaCO3)		105000	1450	4000	ug/L							
Carbonate alkalinity (CaCO3)	U	1450	1450	4000	ug/L							
Hydroxide alkalinity as CaCO3	U	1450	1450	4000	ug/L							

The following Analytical Methods were performed:

Method	Description	Analyst	Comments
1	2320_ALKALINITY		

**Notes:**

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level  
 DL: Detection Limit PF: Prep Factor  
 MDA: Minimum Detectable Activity RL: Reporting Limit  
 MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

# Quality Control Summary

**GEL LABORATORIES LLC**

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

**QC Summary**

Report Date: June 6, 2017

Page 1 of 3

CH2MHill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 423564

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Ion Chromatography</b>											
Batch	1666775										
QC1203793518	423564002	DUP									
Chloride	D	16000	D	16000	ug/L	0.231		(0%-20%)	MXL2	05/19/17	19:31
Fluoride	B	148	B	150	ug/L	1.01	^	(+/-500)		05/19/17	12:46
Nitrate-N		2330		2330	ug/L	0.0129		(0%-20%)			
Nitrite-N	U	33.0	U	33.0	ug/L	N/A					
Sulfate	D	123000	D	123000	ug/L	0.094		(0%-20%)		05/19/17	19:31
QC1203793517	LCS										
Chloride	5000			4990	ug/L		99.8	(80%-120%)		05/19/17	11:19
Fluoride	2500			2560	ug/L		102	(80%-120%)			
Nitrate-N	2500			2520	ug/L		101	(80%-120%)			
Nitrite-N	2500			2510	ug/L		101	(80%-120%)			
Sulfate	10000			10200	ug/L		102	(80%-120%)			
QC1203793516	MB										
Chloride			U	67.0	ug/L					05/19/17	10:51
Fluoride			U	33.0	ug/L						
Nitrate-N			U	33.0	ug/L						

**GEL LABORATORIES LLC**

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**QC Summary**

Workorder: 423564

Page 2 of 3

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Ion Chromatography</b>											
Batch	1666775										
Nitrite-N			U	33.0	ug/L				MXL2	05/19/17	10:51
Sulfate			U	133	ug/L						
QC1203793519 423564002 PS											
Chloride	5.00	D	1.60	D	6.88	mg/L	106	(75%-125%)		05/19/17	20:00
Fluoride	2.50	B	0.148		2.71	mg/L	103	(75%-125%)		05/19/17	13:15
Nitrate-N	2.50		2.33		5.06	mg/L	109	(75%-125%)			
Nitrite-N	2.50	U	0.00		2.57	mg/L	103	(75%-125%)			
Sulfate	10.0	D	12.3	D	23.8	mg/L	114	(75%-125%)		05/19/17	20:00

**Titration and Ion Analysis**

Batch	1669819										
QC1203801087 423564005 DUP											
Alkalinity, Total as CaCO3			105000		105000	ug/L	0	(0%-20%)	RXB5	06/01/17	18:38
Bicarbonate alkalinity (CaCO3)			105000		105000	ug/L	0	(0%-20%)			
Carbonate alkalinity (CaCO3)		U	1450	U	1450	ug/L	N/A				
Hydroxide alkalinity as CaCO3		U	1450	U	1450	ug/L	N/A				
QC1203801084 LCS											
Alkalinity, Total as CaCO3	100000				106000	ug/L	106	(80%-120%)		06/01/17	18:37

**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

**GEL LABORATORIES LLC**

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

**QC Summary**

Workorder: 423564

Page 3 of 3

<b>Parmname</b>	<b>NOM</b>	<b>Sample</b>	<b>Qual</b>	<b>QC</b>	<b>Units</b>	<b>RPD%</b>	<b>REC%</b>	<b>Range</b>	<b>Anlst</b>	<b>Date</b>	<b>Time</b>
>											
B											
C											
D											
N											
U											
X											
Y											
Z											

> 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

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.

# Radiological Analysis

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
CH2MHill Plateau Remediation Company (CPRC)  
SDG #: GEL423564  
Work Order #: 423564**

**Product:** 9310\_ALPHABETA\_GPC: Gross Beta  
**Analytical Method:** 9310\_ALPHABETA\_GPC  
**Analytical Procedure:** GL-RAD-A-001 REV# 19  
**Analytical Batch:** 1668250

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
423564003	B39C36
1203797124	Method Blank (MB)
1203797125	422153006(B39CL2) Sample Duplicate (DUP)
1203797126	422153006(B39CL2) Matrix Spike (MS)
1203797127	422153006(B39CL2) Matrix Spike Duplicate (MSD)
1203797128	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**QC Information**

All of the QC samples meet the required acceptance limits with the following exceptions: The matrix spike and matrix spike duplicate, 1203797126 (B39CL2MS) and 1203797127 (B39CL2MSD), did not meet the beta relative percent difference requirement/relative error ratio requirement; however, they do meet the recovery requirement.

**Technical Information**

**Gross Alpha/Beta Preparation Information**

High hygroscopic salt content in evaporated samples can cause the sample mass to fluctuate due to moisture absorption. To minimize this interference, the salts are converted to oxides by heating the sample under a flame until a dull red color is obtained. The conversion to oxides stabilizes the sample weight and ensures that proper alpha/beta efficiencies are assigned for each sample. Volatile radioisotopes of carbon, hydrogen, technetium, polonium and cesium may be lost during sample heating.

**Recounts**

Sample 1203797126 (B39CL2MS) was recounted due to low recovery. The recount is reported.

**Miscellaneous Information**

**Additional Comments**

The matrix spike and matrix spike duplicate, 1203797126 (B39CL2MS) and 1203797127 (B39CL2MSD),

aliquots were reduced to conserve sample volume.

**Product:** TRITIUM\_DIST\_LSC: COMMON

**Analytical Method:** TRITIUM\_DIST\_LSC

**Analytical Procedure:** GL-RAD-A-002 REV# 22

**Analytical Batch:** 1668334

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
423564005	B39C44
423564006	B39C79
1203797310	Method Blank (MB)
1203797311	423007001(NonSDG) Sample Duplicate (DUP)
1203797312	423007001(NonSDG) Matrix Spike (MS)
1203797313	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1203797312 (Non SDG 423007001MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

**GEL LABORATORIES LLC**

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**Qualifier Definition Report  
for**

CPRC001 CH2MHill Plateau Remediation Company

Client SDG: GEL423564 GEL Work Order: 423564

**The Qualifiers in this report are defined as follows:**

U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

**Signature:** **Name:** Theresa Austin**Date:** 09 JUN 2017**Title:** Group Leader

# Sample Data Summary

**Rad**  
**Certificate of Analysis**  
**Sample Summary**

SDG Number: GEL423564	Client: CPRC001	Project: CPRC0S17005
Lab Sample ID: 423564003	Date Collected: 05/18/2017 12:44	Matrix: WATER
	Date Received: 05/19/2017 09:05	
Client ID: B39C36		Prep Basis: "As Received"
Batch ID: 1668250	Method: 9310_ALPHABETA_GPC	SOP Ref: GL-RAD-A-001
Run Date: 05/25/2017 17:57	Analyst: LXB3	Instrument: LB4100A1
Data File: AB1668250r2.xls	Aliquot: 125 mL	Count Time: 500 min
Prep Batch: 1668250	Prep Method: EPA 900.0/SW846 9310	
Prep Date: 05/25/2017 06:30		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
12587-47-2	Beta BETA		4.06	pCi/L	+/-1.09	1.29	1.69	4.00

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits

**Comments:**

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

The MDC is a sample specific MDC.

**Rad**  
**Certificate of Analysis**  
**Sample Summary**

SDG Number: GEL423564	Client: CPRC001	Project: CPRC0S17005
Lab Sample ID: 423564005	Date Collected: 05/18/2017 08:58	Matrix: WATER
	Date Received: 05/19/2017 09:05	
Client ID: B39C44	Method: TRITIUM_DIST_LSC	Prep Basis: "As Received"
Batch ID: 1668334	Analyst: BXM4	SOP Ref: GL-RAD-A-002
Run Date: 06/02/2017 19:55	Aliquot: 50 mL	Instrument: LSCBROWN
Data File: T1668334.xls	Prep Method: EPA 906.0 Modified	Count Time: 45 min
Prep Batch: 1668334		
Prep Date: 06/02/2017 10:15		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
10028-17-8	Tritium		4830	pCi/L	+/-383	1010	363	400

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits

**Comments:**

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).  
 The MDC is a sample specific MDC.

**Rad**  
**Certificate of Analysis**  
**Sample Summary**

SDG Number: GEL423564	Client: CPRC001	Project: CPRC0S17005
Lab Sample ID: 423564006	Date Collected: 05/18/2017 12:13	Matrix: WATER
	Date Received: 05/19/2017 09:05	
Client ID: B39C79	Method: TRITIUM_DIST_LSC	Prep Basis: "As Received"
Batch ID: 1668334	Analyst: BXM4	SOP Ref: GL-RAD-A-002
Run Date: 06/02/2017 20:42	Aliquot: 50 mL	Instrument: LSCBROWN
Data File: T1668334.xls	Prep Method: EPA 906.0 Modified	Count Time: 45 min
Prep Batch: 1668334		
Prep Date: 06/02/2017 10:15		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
10028-17-8	Tritium		1100	pCi/L	+/-251	329	351	400

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits

**Comments:**

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).  
 The MDC is a sample specific MDC.

# Quality Control Summary

## GEL LABORATORIES LLC

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QC Summary

Report Date: June 9, 2017

Page 1 of 2

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

Contact: Mr. Scot Fitzgerald

Workorder: 423564

Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Gas Flow</b>									
Batch	1668250								
QC1203797124	MB								
Beta			U	-1.11	pCi/L			LXB3	05/25/1717:40
				Uncert: +/-0.840					
				TPU: +/-0.840					
QC1203797125	422153006	DUP							
Beta		4.49		4.06	pCi/L				05/25/1717:40
				Uncert: +/-0.799		RPD: 10 (0% - 100%)			
				TPU: +/-1.09		RER: 0.521 (0-2)			
QC1203797126	422153006	MS							
Beta		876	4.49	718	pCi/L	REC: 81 (75%-125%)			05/26/1712:07
				Uncert: +/-0.799					
				TPU: +/-1.09					
QC1203797127	422153006	MSD							
Beta		876	4.49	923	pCi/L	REC: 105 (75%-125%)			05/25/1717:40
				Uncert: +/-0.799		RPD: 25* (0%-20%)			
				TPU: +/-1.09		RER: 2.04* (0-2)			
QC1203797128	LCS								
Beta		292		293	pCi/L	REC: 100 (80%-120%)			
				Uncert: +/-10.6					
				TPU: +/-48.7					
<b>Rad Liquid Scintillation</b>									
Batch	1668334								
QC1203797310	MB								
Tritium			U	26.0	pCi/L			BXM4	06/03/1704:55
				Uncert: +/-208					
				TPU: +/-208					
QC1203797311	423007001	DUP							
Tritium		1780		1710	pCi/L				06/03/1705:42
				Uncert: +/-277		RPD: 4 (0% - 20%)			
				TPU: +/-442		RER: 0.219 (0-2)			
QC1203797312	423007001	MS							
Tritium		4500	1780	5710	pCi/L	REC: 87 (75%-125%)			06/03/1706:29
				Uncert: +/-277					
				TPU: +/-442					
QC1203797313	LCS								
Tritium		2240		2260	pCi/L	REC: 101 (80%-120%)			06/03/1707:16
				Uncert: +/-300					
				TPU: +/-530					

**Notes:**

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

The Qualifiers in this report are defined as follows:

\* Duplicate analysis not within control limits

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**QC Summary**

Workorder: 423564

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date	Time
+						Correlation coefficient for Method of Standard Additions (MSA) is < 0.995				
<						Sample is below the EPA guidance level for Reactive Releasable Cyanide and/or Reactive Releasable Sulfide				
>						Result greater than quantifiable range or greater than upper limit of the analysis range				
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).				
B						The associated QC sample blank has a result $\geq 2X$ the MDA and, after corrections, result is $\geq$ MDA for this sample				
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.				
UX						Gamma Spectroscopy--Uncertain identification				
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.

\*\* Indicates analyte is a surrogate compound.

^ 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.

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.