

**SAF-RC-234**  
**100-IU-2 & 100-IU-6 Remaining**  
**Waste Sites – Other**  
**FINAL DATA PACKAGE**

**COMPLETE COPY OF DATA PACKAGE TO:**

Kathy Wendt

H4-21

KW 8/26/13  
INITIAL/DATE

**COMMENTS:**

**SDG X0015**

**SAF-RC-234**

Rad only

Chem only

Rad & Chem

Complete

Partial

**Sample Location:     Confirmatory Test Pits Pipe contents**



August 20, 2013

Joan Kessner  
WC-Hanford, Inc.  
2620 Fermi Avenue  
MSIN H4-21  
Richland, Washington 99354

Re: RC-234 Other Solid  
Work Order: 330707  
SDG: X0015

Dear Joan Kessner:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 01, 2013. 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. 1616.

Sincerely,

Orlette Johnson  
Project Manager

Purchase Order: 1510  
Chain of Custody: RC-234-014  
Enclosures

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# Case Narrative

**Receipt Narrative  
for  
WC-HANFORD, INC.  
SDG: X0015  
Work Order: 330707**

**August 20, 2013**

**Laboratory Identification:**

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

**Summary:**

**Sample receipt:** The sample arrived at GEL Laboratories LLC, Charleston, South Carolina on August 01, 2013 for analysis.

**Sample Identification:** The laboratory received the following sample:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
330707001	J1RV36

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's 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.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: General Chemistry and Metals.



Orlette Johnson  
Project Manager

# **Chain of Custody and Supporting Documentation**

**Washington Closure Hanford**  
 Collector: *wf JACKSON*  
 Project Designation: 100-IU-2 & 100-IU-6 Remaining Waste Sites  
 Ice Chest No.: *WGL-12-023*  
 Shipped To: Eberline - GEL

**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**  
 Company Contact: Joan Kessner  
 Telephone No.: 375-4688  
 Project Coordinator: KESSNER, JH  
 SAF No.: RC-234  
 Method of Shipment: *fed ex*  
 Bill of Lading/Air Bill No.: *See OSPC*

Field Logbook No.: *COA*  
 EL-1667 - 01 *MSB* 7-30-13  
 Offsite Property No.: *A120898*

RC-234-014  
 Price Code: 9L  
 Data Turnaround: 24 Days  
 15 *MSB* 7-30-13

Sample No.	Matrix	Sample Date	Sample Time	Preservation	Cool 4C	None	Cool 4C	None	Cool 4C	Cool 4C	Cool 4C
J1RV36	OTHER	7-30-13	0856								
J1RV37	OTHER										
J1RV38	OTHER										
J1RV39	OTHER										
J1RV40	OTHER										

**POSSIBLE SAMPLE HAZARDS/REMARKS**  
 None  
**Special Handling and/or Storage**  
 Cool 4C  
*330707*

Sample No.	Matrix	Sample Date	Sample Time	Preservation	Cool 4C	None	Cool 4C	None	Cool 4C	Cool 4C	Cool 4C
J1RV36	OTHER	7-30-13	0856								
J1RV37	OTHER										
J1RV38	OTHER										
J1RV39	OTHER										
J1RV40	OTHER										

**CHAIN OF POSSESSION**

Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
<i>W. Jackson</i>	7-30-13 1435	<i>MA Bamberger</i>	7-30-13 1435
<i>W. Jackson</i>	7-30-13 1500	<i>MA Bamberger</i>	7-30-13 1500
<i>W. Jackson</i>	7-30-13 1610	<i>R. Fehlbauer</i>	7-30-13 1610
<i>R. Fehlbauer</i>	7-30-13 1611	<i>J. Garcia</i>	7-30-13 1611
<i>J. Garcia</i>	7-30-13 0900	<i>1060 BATELLE</i>	7-30-13 0900
<i>J. Garcia</i>	7-31-13 0901	<i>John Garcia</i>	7-31-13 0901
<i>J. Garcia</i>	7-31-13 0901	<i>fed ex</i>	
<i>H. Taylor</i>	7-31-13 0901	<i>fed ex</i>	

**SPECIAL INSTRUCTIONS**  
 (1) ICP Metals - 6010TR (Client List) (Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Silicon, Silver, Sodium, Vanadium, Zinc); Mercury - 7471 - (CV) (Mercury)  
 (2) IC Anions - 9056 (Bromide, Chloride, Fluoride, Nitrate, Nitrite, Nitrogen in Nitrate, Phosphate, Sulfate); NO2/NO3 - 353.1 (Nitrogen in Nitrite and Nitrate); pH (Water) - 9040 (pH Measurement)



Client: <u>WCHN</u>		SDG/AR/COC/Work Order: <u>330705 330707</u>	
Received By: <u>H. Taylor</u>		Date Received: <u>080113</u>	
Suspected Hazard Information		Yes	No
COC/Samples marked as radioactive?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Classified Radioactive II or III by RSO?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
COC/Samples marked containing PCBs?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Package, COC, and/or Samples marked as beryllium or asbestos containing?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Samples identified as Foreign Soil?		<input checked="" type="checkbox"/>	<input type="checkbox"/>

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Preservation Method: <u>Ice bags</u> Blue ice Dry ice None Other (describe) <u>4</u> *all temperatures are recorded in Celsius
2a Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <u>51050004</u> Secondary Temperature Device Serial # (if applicable):
3 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
5 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's, containers affected and observed pH: If Preservation added, Lot#:
6 VOA vials free of headspace (defined as < 6mm bubble)?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and containers affected:
7 Are Encore containers present?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	(If yes, immediately deliver to Volatiles laboratory)
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and containers affected:
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's affected:
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's affected:
12 Are sample containers identifiable as GEL provided?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
14 Carrier and tracking number.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: FedEx Air FedEx Ground UPS Field Services Courier Other <u>7963 5899 9168-4</u>

Comments (Use Continuation Form if needed):

# **Laboratory Certifications**

**List of current GEL Certifications as of 20 August 2013**

<b>State</b>	<b>Certification</b>
Alaska	UST-110
Arkansas	88-0651
CLIA	42D0904046
California NELAP	01151CA
Colorado	SC00012
Connecticut	PH-0169
Delaware	SC00012
DoD ELAP A2LA ISO 17025	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-12-00283, P330-12-00284
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA130005
Maryland	270
Massachusetts	M-SC012
Nevada	SC000122011-1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
Oklahoma	9904
Pennsylvania NELAP	68-00485
Plant Material Permit	PDEP-12-00260
South Carolina Chemistry	10120001
South Carolina Radiochemi	10120002
Tennessee	TN 02934
Texas NELAP	T104704235-13-8
Utah NELAP	SC000122013-8
Vermont	VT87156
Virginia NELAP	460202
Washington	C780-12
Wisconsin	999887790

# **Metals Analysis**

# Case Narrative

**Metals Fractional Narrative  
WC-HANFORD, INC. (WCHN)  
SDG X0015**

**Sample Analysis**

<b>Sample ID</b>	<b>Client ID</b>
330707001	J1RV36
1202924830	Method Blank (MB) <b>ICP</b>
1202924831	Laboratory Control Sample (LCS)
1202924834	330707001(J1RV36L) Serial Dilution (SD)
1202924832	330707001(J1RV36D) Sample Duplicate (DUP)
1202924833	330707001(J1RV36S) Matrix Spike (MS)
1202929678	330707001(J1RV36PS) Post Spike (PS)
1202929129	Method Blank (MB) <b>ICP-MS</b>
1202929157	Laboratory Control Sample (LCS)
1202929141	330707001(J1RV36L) Serial Dilution (SD)
1202929132	330707001(J1RV36D) Sample Duplicate (DUP)
1202929150	330707001(J1RV36S) Matrix Spike (MS)
1202929694	330707001(J1RV36PS) Post Spike (PS)
1202923910	Method Blank (MB) <b>CVAA</b>
1202923911	Laboratory Control Sample (LCS)
1202923920	330707001(J1RV36L) Serial Dilution (SD)
1202923918	330707001(J1RV36D) Sample Duplicate (DUP)
1202923919	330707001(J1RV36S) Matrix Spike (MS)

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

**Method/Analysis Information**

<b>Analytical Batch:</b>	1321450, 1323141 and 1321065
<b>Prep Batch :</b>	1321448, 1323139 and 1321064
<b>Standard Operating Procedures:</b>	GL-MA-E-013 REV# 22, GL-MA-E-009 REV# 22, GL-MA-E-014 REV# 25 and GL-MA-E-010 REV# 26
<b>Analytical Method:</b>	SW846 3050B/6010C, SW846 3050B/6020A and SW846

7471B

**Prep Method :** SW846 3050B and SW846 7471B Prep

### **Preparation/Analytical Method Verification**

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

### **System Configuration**

The Metals analysis-ICP was performed on a P E 5300 Optima radial/axial-viewing inductively coupled plasma atomic emission spectrometer. The instrument is equipped with a Burgener nebulizer, cyclonic spray chamber, and yttrium or scandium internal standard. Operating conditions for the ICP are set at a power level of 1500 watts. The instrument has a peristaltic pump flow rate of 1.4L/min, argon gas flows of 15 L/min and 0.2 L/min for the torch and auxiliary gases, and a flow setting of 0.65L/min for the nebulizer.

The Metals analysis-ICP was performed on a PE 7300 Optima radial/axial-viewing inductively coupled plasma atomic emission spectrometer. The instrument is equipped with a Burgener nebulizer, cyclonic spray chamber, and yttrium or scandium internal standard. Operating conditions for the ICP are set at a power level of 1500 watts. The instrument has a peristaltic pump flow rate of 1.4L/min, argon gas flows of 15 L/min and 0.2 L/min for the torch and auxiliary gases, and a flow setting of 0.65L/min for the nebulizer.

The Metals analysis - ICPMS was performed on a Perkin Elmer ELAN 9000 inductively coupled plasma mass spectrometer (ICP-MS). The instrument is equipped with a cross-flow nebulizer, quadruple mass spectrometer, and dual mode electron multiplier detector. Internal standards of scandium, germanium, indium, tantalum, and/or lutetium were utilized to cover the mass spectrum. Operating conditions are set at 1400W power and combined argon pressures of 360+/-7 kPa for the plasma and auxiliary gases, and 0.85 L/min carrier gas flow, and an initial lens voltage of 5.2.

The Metals analysis-Mercury was performed on a Perkin-Elmer Flow Injection Mercury System (FIMS-100) automated mercury analyzer. The instrument consists of a cold vapor atomic absorption spectrometer set to detect mercury at a wavelength of 253.7 nm. Sample introduction through the flow injection system is performed via a peristaltic pump at 9 mL/min and nitrogen carrier gas rate of 80 mL/min.

### **Calibration Information**

#### **Instrument Calibration**

All initial calibration requirements have been met for this sample delivery group (SDG).

**CRDL Requirements**

All CRDL standards met the advisory control limits with the exception of aluminum and potassium. PQL01 (analyzed at 12:47 on 08/17/13) recovered low for aluminum and PQL03 (analyzed at 14:44 on 08/17/13) recovered high for aluminum; however, the sample result more than 2 times the PQL, therefore the data is reported. PQL05 (analyzed at 14:04 on 08/20/13) recovered high for potassium; however, the sample result was not less than the MDL or 2x greater than the PQL. The samples were analyzed on 3 separate passing calibrations. The closing PQL recovered high for potassium in all 3 analyses due to possible matrix interactions. The data is being reported.

**ICSA/ICSAB Statement**

All interference check samples (ICSA and ICSAB) associated with this SDG met the established acceptance criteria.

**Continuing Calibration Blank (CCB) Requirements**

All continuing calibration blanks (CCB) bracketing this batch met the established acceptance criteria.

**Continuing Calibration Verification (CCV) Requirements**

All continuing calibration verifications (CCV) bracketing this SDG met the acceptance criteria.

**Quality Control (QC) Information****Method Blank (MB) Statement**

The MBs analyzed with this SDG met the acceptance criteria.

**Laboratory Control Sample (LCS) Recovery**

The LCS spike recoveries met the acceptance limits.

**Quality Control (QC) Sample Statement**

The following sample was selected as the quality control (QC) sample for this SDG: 330707001 (J1RV36).

**Matrix Spike (MS) Recovery Statement**

The percent recoveries (%R) obtained from the MS analyses are evaluated when the sample concentration is less than four times (4X) the spike concentration added. The MS met the recommended quality control acceptance criteria for percent recoveries for all applicable analytes with the exception of selenium, aluminum, arsenic, boron, chromium, magnesium, silicon, and zinc.

**Duplicate Relative Percent Difference (RPD) Statement**

The relative percent difference (RPD) obtained from the designated sample duplicate (DUP) is evaluated based on acceptance criteria of 20% when the sample is >5X the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the contract required detection limit (RL), a control of +/-RL is used to

evaluate the DUP results. All applicable analytes met these requirements with the exception of aluminum.

### **Post Spike (PS) Recovery Statement**

The percent recoveries (%R) obtained from the PS analyses are evaluated when the sample concentration is less than four times (4X) the spike concentration added. The PS met the recommended quality control acceptance criteria for percent recoveries for all applicable analytes and verifies the presence of matrix interferences with the exception of selenium.

### **Serial Dilution % Difference Statement**

The serial dilution is used to assess matrix suppression or enhancement. Raw element concentrations that are 25X the IDL/MDL for CVAA, 50X the IDL/MDL for ICP, and 100X the IDL/MDL for ICP-MS analyses are applicable for serial dilution assessment. All applicable analytes met the acceptance criteria of less than 10% difference (%D).

### **Technical Information**

#### **Holding Time Specifications**

GEL assigns holding times based on the associated methodology, which assigns the date and time from sample collection of sample receipt. Those holding times expressed in hours are calculated in the AlphaLIMS system. Those holding times expressed as days expire at midnight on the day of expiration. All samples in this SDG met the specified holding time.

#### **Preparation/Analytical Method Verification**

All procedures were performed as stated in the SOP. Method SW-846 3050B is not a total digestion technique for most samples. It is a very strong acid digestion that will dissolve almost all elements that could become environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

#### **Sample Dilutions**

Dilutions are performed to minimize matrix interferences resulting from elevated mineral element concentrations present in solid samples and/or to bring over range target analyte concentrations into the linear calibration range of the instrument. Sample 330707001 required dilutions in order to bring raw values of iron within the linear range of the instrument, and for the analytes antimony, arsenic, barium, boron, cadmium, chromium, cobalt, copper, lead, magnesium, manganese, molybdenum, nickel, silicon, silver, vanadium, zinc, and potassium that iron interferes with, in order to ensure that the inter-element correction factors were valid on the ICP. Samples in this SDG were diluted the standard 2x for solids on the ICPMS.

#### **Preparation Information**

The samples in this SDG were prepared exactly according to the cited SOP.

**Miscellaneous Information**

**Electronic Packaging Comment**

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. An electronic signature page inserted after the case narrative will include the data validator's signature and title. The signature page also includes the data qualifiers used in the fractional package. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

**Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. The following DERs were generated for this SDG: 1212681 and 1213231. A copy of each DER is included in the Miscellaneous Data section of this package.

**Additional Comments**

Additional comments were not required for this SDG.

**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.

**Review Validation:**

GEL requires all analytical data to be verified by a qualified data validator. In addition, all data designated for CLP or CLP-like packaging will receive a third level validation upon completion of the data package.

**The following data validator verified the information presented in this case narrative:**

Reviewer:  Date: 08 | 20 | 13

**DATA EXCEPTION REPORT**

<b>Mo.Day Yr.</b> 19-AUG-13	<b>Division:</b> Industrial	<b>Quality Criteria:</b> Specifications	<b>Type:</b> Process
<b>Instrument Type:</b> ICP/MS	<b>Test / Method:</b> SW846 3050B/6020A	<b>Matrix Type:</b> Solid	<b>Client Code:</b> WCHN
<b>Batch ID:</b> 1323141	<b>Sample Numbers:</b> See Below		
<p><b>Potentially affected work order(s)(SDG): 330624(X0013),330705(X0014),330707(X0015),330790(X0016),331001(X0017),331136(X0018),331422(X0019),331425(XP0006)</b></p> <p><b>Application Issues:</b></p> <p>Failed Recovery for MS/PS Container scanning event for custody missed</p>			
<b>Specification and Requirements Exception Description:</b>		<b>DER Disposition:</b>	
<p>1. Failed Recovery for MS/PS:</p> <p>QC 1202929150MS,1202929154MS, 1202929694PS</p> <p>2. Container scanning event for custody missed:</p> <p>331250 001</p>		<p>The matrix spike (1202929150MS and 1202929154MS) recovery failed outside of the control limits for Se. The post spike failed outside the required control limits for Se in 1202929694PS but passed in all other PS's. This verifies the presence of a matrix interference for Se in sample 330707001 and verifies the absence of a matrix interference for all the other samples. Per GEL's accredited methods and SOPs, a corrective action is not required and the data is qualified and reported.</p> <p>The samples were in the custody of the ICPMS lab during analysis. The data is reported as is.</p>	

**Originator's Name:**

Paul Boyd 19-AUG-13

**Data Validator/Group Leader:**

Aubrey Kingsbury 20-AUG-13

**DATA EXCEPTION REPORT**

<b>Mo.Day Yr.</b> 20-AUG-13	<b>Division:</b> Industrial	<b>Quality Criteria:</b> Specifications	<b>Type:</b> Process
<b>Instrument Type:</b> ICP	<b>Test / Method:</b> SW846 3050B/6010C	<b>Matrix Type:</b> Solid	<b>Client Code:</b> WCHN
<b>Batch ID:</b> 1321450	<b>Sample Numbers:</b> See Below		

**Potentially affected work order(s)(SDG): 330707(X0015)**

**Application Issues:**

Failed Recovery for MS/PS

Failed RPD for DUP

Other

<b>Specification and Requirements Exception Description:</b>	<b>DER Disposition:</b>
<p>1. Failed Recovery for MS/PS: QC 1202924833MS</p> <p>2. Failed RPD for DUP: QC 1202924832DUP</p> <p>3. Low level PQL recovered high for potassium.</p>	<p>1. The matrix spike recovery failed outside the the control limits for aluminum,arsenic,boron,chromium,magnesium,silicon and zinc. The post spike passed the required control limits for all analytes. This verifies the absence of a matrix interference. Per GEL's accredited methods and SOPs, a corrective action is not required and the data is qualified and reported.</p> <p>2. The sample and sample duplicate % RPD failed outside the control limits for aluminum due to possible sample non-homogeneity and/or matrix interference. Per GEL's accredited methods and SOPs, a corrective action is not required and the data is qualified and reported.</p> <p>3. The samples were analyzed on 3 separate passing calibrations. The closing PQL recovered high for potassium in all 3 analyses due to possible matrix interactions. Sample #330707001 was not less than the MDL or 2x greater than the PQL. The data is being reported.</p>

**Originator's Name:**

Helen Camello 20-AUG-13

**Data Validator/Group Leader:**

Jerry Wigfall 20-AUG-13

# **Sample Data Summary**

## GEL LABORATORIES LLC

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

### Qualifier Definition Report for

WCHN001 WC-HANFORD, INC.

Client SDG: X0015 GEL Work Order: 330707 Project: RC-234 Other Solid

**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).

C Target analyte was detected in the sample and the associated blank, and the sample concentration was  $\leq 5$  times the blank concentration.

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.

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 Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the limit as defined in the 'U' qualifier above.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Orlette Johnson.

Reviewed by



OB | 20 | 13

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: August 20, 2013

Company : WC-Hanford, Inc.  
 Address : 2620 Fermi Avenue  
 MSIN H4-21  
 Richland, Washington 99354  
 Contact: Joan Kessner  
 Project: RC-234 Other Solid

Client SDG: X0015

Client Sample ID: J1RV36	Project: WCHN00413
Sample ID: 330707001	Client ID: WCHN001
Matrix: Solid	
Collect Date: 30-JUL-13 08:50	
Receive Date: 01-AUG-13	
Collector: Client	

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Mercury Analysis-CVAA</b>											
<b>SW846 7471B Mercury in Solid "As Received"</b>											
Mercury	B	0.00631	0.00399	0.0119	mg/kg	1	NOR1	08/11/13	1044	1321065	1
<b>Metals Analysis-ICP</b>											
<b>ICP METALS 6010TR Client List "As Received"</b>											
Aluminum	*N	154	6.65	19.6	mg/kg	1	HSC	08/17/13	1418	1321450	2
Beryllium	U	0.0978	0.0978	0.489	mg/kg	1					
Calcium		5310	7.83	24.5	mg/kg	1					
Sodium	B	17.4	6.85	24.5	mg/kg	1					
Antimony	DU	16.1	16.1	48.9	mg/kg	50	HSC	08/20/13	1049	1321450	3
Arsenic	BDN	102	24.5	147	mg/kg	50					
Barium	BD	17.4	4.89	24.5	mg/kg	50					
Boron	BDN	179	48.9	245	mg/kg	50					
Cadmium	DU	4.89	4.89	24.5	mg/kg	50					
Chromium	DN	98.9	7.34	24.5	mg/kg	50					
Cobalt	BD	21.5	7.34	24.5	mg/kg	50					
Copper	D	111	14.7	48.9	mg/kg	50					
Iron	D	567000	391	1220	mg/kg	50					
Lead	DU	16.1	16.1	48.9	mg/kg	50					
Magnesium	DNU	416	416	1470	mg/kg	50					
Manganese	D	2250	9.78	48.9	mg/kg	50					
Molybdenum	BD	13.0	9.78	48.9	mg/kg	50					
Nickel	D	45.7	7.34	24.5	mg/kg	50					
Silicon	DN	1140	73.4	489	mg/kg	50					
Silver	DU	4.89	4.89	24.5	mg/kg	50					
Vanadium	DU	4.89	4.89	24.5	mg/kg	50					
Zinc	DN	77.8	19.6	48.9	mg/kg	50					
Potassium	BD	429	313	1220	mg/kg	50	HSC	08/20/13	1339	1321450	4
<b>Metals Analysis-ICP-MS</b>											
<b>SW846 3050B/6020A Selenium "As Received"</b>											
Selenium	DNU	0.311	0.311	1.00	mg/kg	2	PRB	08/19/13	0211	1323141	5

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3050B	ICP-MS 3050BS PREP	BCD1	08/17/13	0926	1323139
SW846 3050B	SW846 3050B Prep for 6010C	BCD1	08/16/13	0800	1321448
SW846 7471B Prep	SW846 7471B Mercury Prep Soil	AXS5	08/09/13	1605	1321064

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## Certificate of Analysis

Report Date: August 20, 2013

Company : WC-Hanford, Inc.  
Address : 2620 Fermi Avenue  
MSIN H4-21  
Richland, Washington 99354  
Contact: Joan Kessner  
Project: RC-234 Other Solid

Client SDG: X0015

Client Sample ID: J1RV36  
Sample ID: 330707001

Project: WCHN00413  
Client ID: WCHN001

---

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 7471B	
2	SW846 3050B/6010C	
3	SW846 3050B/6010C	
4	SW846 3050B/6010C	
5	SW846 3050B/6020A	

**Notes:**

# **Quality Control Summary**

# GEL LABORATORIES LLC

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## QC Summary

Report Date: August 20, 2013

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**WC-Hanford, Inc.**  
**2620 Fermi Avenue**  
**MSIN H4-21**  
**Richland, Washington**  
**Contact: Joan Kessner**

**Workorder: 330707**

**Client SDG: X0015**

**Project Description: RC-234 Other Solid**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis - ICPMS</b>											
Batch	1323141										
QC1202929132	330707001	DUP									
Selenium	DNU	0.311	DU	0.327	mg/kg	N/A	^		PRB	08/19/13	02:16
QC1202929157	LCS										
Selenium	4.65		D	4.42	mg/kg			95.2 (80%-120%)		08/19/13	00:19
QC1202929129	MB										
Selenium			DU	0.289	mg/kg					08/19/13	00:14
QC1202929150	330707001	MS									
Selenium	4.95 DNU	0.311	BDN	0.678	mg/kg			13.7* (75%-125%)		08/19/13	02:22
QC1202929694	330707001	PS									
Selenium	25.0 DNU	-0.054	D	16.7	ug/L			66.6* (80%-120%)		08/19/13	02:28
QC1202929141	330707001	SDILT									
Selenium	DNU	-0.054	DU	1.55	ug/L	N/A		(0%-10%)		08/19/13	02:33
<b>Metals Analysis-ICP</b>											
Batch	1321450										
QC1202924832	330707001	DUP									
Aluminum	*N	154	*	204	mg/kg	27.9*		(0%-20%)	HSC	08/17/13	14:20
Antimony	DU	16.1	DU	14.6	mg/kg	N/A	^			08/20/13	10:52
Arsenic	BDN	102	BD	67.8	mg/kg	40.2	^	(+/-133)			
Barium	BD	17.4	D	22.7	mg/kg	26.9	^	(+/-22.2)			
Beryllium	U	0.0978	U	0.0887	mg/kg	N/A	^			08/17/13	14:20
Boron	BDN	179	BD	138	mg/kg	25.9	^	(+/-222)		08/20/13	10:52
Cadmium	DU	4.89	DU	4.43	mg/kg	N/A	^				
Calcium		5310		4710	mg/kg	12.0		(0%-20%)		08/17/13	14:20
Chromium	DN	98.9	D	102	mg/kg	2.58	^	(+/-22.2)		08/20/13	10:52
Cobalt	BD	21.5	BD	20.1	mg/kg	6.88	^	(+/-22.2)			

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## QC Summary

Workorder: 330707

Client SDG: X0015

Project Description: RC-234 Other Solid

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1321450										
Copper	D	111	D	94.4	mg/kg	16.5	^	(+/-44.3)			
Iron	D	567000	D	592000	mg/kg	4.25		(0%-20%)	HSC	08/20/13	10:52
Lead	DU	16.1	DU	14.6	mg/kg	N/A	^				
Magnesium	DNU	416	DU	377	mg/kg	N/A	^				
Manganese	D	2250	D	2230	mg/kg	1.09		(0%-20%)			
Molybdenum	BD	13.0	BD	15.8	mg/kg	19.5	^	(+/-44.3)			
Nickel	D	45.7	D	44.8	mg/kg	1.90	^	(+/-22.2)			
Potassium	BD	429	BD	526	mg/kg	20.3	^	(+/-1110)		08/20/13	13:43
Silicon	DN	1140	D	1210	mg/kg	5.80	^	(+/-443)		08/20/13	10:52
Silver	DU	4.89	BD	5.04	mg/kg	21.9	^	(+/-22.2)			
Sodium	B	17.4	B	20.2	mg/kg	14.7	^	(+/-22.2)		08/17/13	14:20
Vanadium	DU	4.89	DU	4.43	mg/kg	N/A	^			08/20/13	10:52
Zinc	DN	77.8	D	86.5	mg/kg	10.6	^	(+/-44.3)			
QC1202924831	LCS										
Aluminum	460			458	mg/kg			99.5 (80%-120%)		08/17/13	14:15
Antimony	46.0			45.3	mg/kg			98.3 (80%-120%)		08/20/13	10:46
Arsenic	46.0			48.0	mg/kg			104 (80%-120%)			
Barium	46.0			47.6	mg/kg			103 (80%-120%)			
Beryllium	46.0			44.8	mg/kg			97.3 (80%-120%)		08/17/13	14:15
Boron	46.0			45.1	mg/kg			97.9 (80%-120%)		08/20/13	10:46
Cadmium	46.0			49.4	mg/kg			107 (80%-120%)			
Calcium	460			497	mg/kg			108 (80%-120%)			
Chromium	46.0			45.1	mg/kg			98 (80%-120%)			

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## QC Summary

Workorder: 330707

Client SDG: X0015

Project Description: RC-234 Other Solid

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1321450										
Cobalt	46.0			47.5	mg/kg		103	(80%-120%)	HSC	08/20/13	10:46
Copper	46.0			46.0	mg/kg		99.9	(80%-120%)			
Iron	460			497	mg/kg		108	(80%-120%)			
Lead	46.0			48.7	mg/kg		106	(80%-120%)			
Magnesium	460			506	mg/kg		110	(80%-120%)			
Manganese	46.0			45.5	mg/kg		98.8	(80%-120%)			
Molybdenum	46.0			44.3	mg/kg		96.2	(80%-120%)			
Nickel	46.0			45.8	mg/kg		99.5	(80%-120%)			
Potassium	460			484	mg/kg		105	(80%-120%)		08/20/13	13:36
Silicon	460			414	mg/kg		90	(80%-120%)		08/20/13	10:46
Silver	46.0			47.0	mg/kg		102	(80%-120%)			
Sodium	460			473	mg/kg		103	(80%-120%)		08/17/13	14:15
Vanadium	46.0			46.0	mg/kg		100	(80%-120%)		08/20/13	10:46
Zinc	46.0			46.1	mg/kg		100	(80%-120%)			
QC1202924830	MB										
Aluminum			U	6.55	mg/kg					08/17/13	14:12
Antimony			U	0.318	mg/kg					08/20/13	10:43
Arsenic			U	0.482	mg/kg						
Barium			U	0.0963	mg/kg						
Beryllium			U	0.0963	mg/kg					08/17/13	14:12
Boron			U	0.963	mg/kg					08/20/13	10:43
Cadmium			U	0.0963	mg/kg						

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## QC Summary

Workorder: 330707

Client SDG: X0015

Project Description: RC-234 Other Solid

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1321450										
Calcium			U	7.71	mg/kg				HSC	08/17/13	14:12
Chromium			B	0.207	mg/kg					08/20/13	10:43
Cobalt			U	0.145	mg/kg						
Copper			B	-0.417	mg/kg						
Iron			U	7.71	mg/kg						
Lead			U	0.318	mg/kg						
Magnesium			U	8.19	mg/kg						
Manganese			U	0.193	mg/kg						
Molybdenum			U	0.193	mg/kg						
Nickel			U	0.145	mg/kg						
Potassium			B	6.90	mg/kg					08/20/13	13:33
Silicon			B	1.68	mg/kg					08/20/13	10:43
Silver			U	0.0963	mg/kg						
Sodium			B	-8.54	mg/kg					08/17/13	14:12
Vanadium			U	0.0963	mg/kg					08/20/13	10:43
Zinc			U	0.385	mg/kg						
QC1202924833 330707001 MS											
Aluminum	465	*N	154	N	763	mg/kg		131 * (75%-125%)		08/17/13	14:23
Antimony	46.5	DU	16.1	BD	42.1	mg/kg		90.7 (75%-125%)		08/20/13	10:55
Arsenic	46.5	BDN	102	DN	171	mg/kg		149 * (75%-125%)			
Barium	46.5	BD	17.4	D	73.2	mg/kg		120 (75%-125%)			
Beryllium	46.5	U	0.0978		42.7	mg/kg		91.9 (75%-125%)		08/17/13	14:23

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## QC Summary

Workorder: 330707

Client SDG: X0015

Project Description: RC-234 Other Solid

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1321450										
Boron	46.5	BDN	179	BDN	175	mg/kg	0*	(75%-125%)	HSC	08/20/13	10:55
Cadmium	46.5	DU	4.89	D	48.1	mg/kg	104	(75%-125%)			
Calcium	465		5310		4580	mg/kg	N/A	(75%-125%)		08/17/13	14:23
Chromium	46.5	DN	98.9	DN	166	mg/kg	145*	(75%-125%)		08/20/13	10:55
Cobalt	46.5	BD	21.5	D	73.2	mg/kg	111	(75%-125%)			
Copper	46.5	D	111	D	158	mg/kg	99.5	(75%-125%)			
Iron	465	D	567000	D	586000	mg/kg	N/A	(75%-125%)			
Lead	46.5	DU	16.1	D	53.7	mg/kg	81.7	(75%-125%)			
Magnesium	465	DNU	416	BDN	969	mg/kg	145*	(75%-125%)			
Manganese	46.5	D	2250	D	2220	mg/kg	N/A	(75%-125%)			
Molybdenum	46.5	BD	13.0	D	61.3	mg/kg	104	(75%-125%)			
Nickel	46.5	D	45.7	D	99.0	mg/kg	115	(75%-125%)			
Potassium	465	BD	429	BD	818	mg/kg	83.6	(75%-125%)		08/20/13	13:46
Silicon	465	DN	1140	DN	913	mg/kg	0*	(75%-125%)		08/20/13	10:55
Silver	46.5	DU	4.89	D	53.5	mg/kg	106	(75%-125%)			
Sodium	465	B	17.4		559	mg/kg	117	(75%-125%)		08/17/13	14:23
Vanadium	46.5	DU	4.89	D	52.8	mg/kg	105	(75%-125%)		08/20/13	10:55
Zinc	46.5	DN	77.8	DN	143	mg/kg	141*	(75%-125%)			
QC1202929678 330707001 PS											
Aluminum	5000	*N	1570		7140	ug/L	111	(80%-120%)		08/17/13	15:23
Arsenic	500	BDN	20.8	D	513	ug/L	98.5	(80%-120%)		08/20/13	10:58
Boron	500	BDN	36.6	D	502	ug/L	93.1	(80%-120%)			

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## QC Summary

Workorder: 330707

Client SDG: X0015

Project Description: RC-234 Other Solid

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1321450										
Chromium	500	DN	20.2	CD	536	ug/L	103	(80%-120%)	HSC	08/20/13	10:58
Magnesium	5000	DNU	60.2	D	5390	ug/L	107	(80%-120%)			
Silicon	5000	DN	234	CD	5300	ug/L	101	(80%-120%)			
Zinc	500	DN	15.9	D	548	ug/L	106	(80%-120%)			
QC1202924834 330707001 SDILT											
Aluminum		*N	1570	D	272	ug/L	13.5	(0%-10%)		08/17/13	14:25
Antimony		DU	-2.6	DU	80.7	ug/L	N/A	(0%-10%)		08/20/13	11:02
Arsenic		BDN	20.8	D	5.96	ug/L	43.1	(0%-10%)			
Barium		BD	3.55	DU	24.5	ug/L	N/A	(0%-10%)			
Beryllium		U	0.468	DU	0.489	ug/L	N/A	(0%-10%)		08/17/13	14:25
Boron		BDN	36.6	DU	245	ug/L	N/A	(0%-10%)		08/20/13	11:02
Cadmium		DU	-0.356	DU	24.5	ug/L	N/A	(0%-10%)			
Calcium		D	1170	D	240	ug/L	2.38	(0%-10%)			
Chromium		DN	20.2	CD	3.94	ug/L	2.59	(0%-10%)			
Cobalt		BD	4.40	DU	36.7	ug/L	N/A	(0%-10%)			
Copper		D	22.8	D	4.93	ug/L	8.32	(0%-10%)			
Iron		D	116000	D	23600	ug/L	1.92	(0%-10%)			
Lead		DU	3.22	DU	80.7	ug/L	N/A	(0%-10%)			
Magnesium		DNU	60.2	DU	2080	ug/L	N/A	(0%-10%)			
Manganese		D	461	D	93.0	ug/L	.998	(0%-10%)			
Molybdenum		BD	2.66	DU	48.9	ug/L	N/A	(0%-10%)			
Nickel		D	9.33	D	1.85	ug/L	.901	(0%-10%)			

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## QC Summary

Workorder: 330707

Client SDG: X0015

Project Description: RC-234 Other Solid

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1321450										
Potassium	BD	87.7	DU	1570	ug/L	N/A		(0%-10%)	HSC	08/20/13	13:52
Silicon	DN	234	CD	48.7	ug/L	4.23		(0%-10%)		08/20/13	11:02
Silver	DU	0.827	DU	24.5	ug/L	N/A		(0%-10%)			
Sodium	B	178	DU	34.2	ug/L	N/A		(0%-10%)		08/17/13	14:25
Vanadium	DU	0.785	DU	24.5	ug/L	N/A		(0%-10%)		08/20/13	11:02
Zinc	DN	15.9	DU	97.8	ug/L	N/A		(0%-10%)			
<b>Metals Analysis-Mercury</b>											
Batch	1321065										
QC1202923918	330707001	DUP									
Mercury	B	0.00631	B	0.00646	mg/kg	2.38	^	(+/-0.0115)	NOR1	08/11/13	10:46
QC1202923911	LCS										
Mercury		0.120		0.126	mg/kg			105	(80%-120%)		08/11/13 10:34
QC1202923910	MB										
Mercury			U	0.0039	mg/kg						08/11/13 10:32
QC1202923919	330707001	MS									
Mercury		0.119	B	0.00631	mg/kg			106	(80%-120%)		08/11/13 10:47
QC1202923920	330707001	SDILT									
Mercury	B	0.106	DU	0.0199	ug/L	N/A		(0%-10%)		08/11/13	10:52

**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, and the sample concentration was <= 5 times the blank concentration.
- 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.

# GEL LABORATORIES LLC

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## QC Summary

Workorder: 330707

Client SDG: X0015

Project Description: RC-234 Other Solid

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
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.

^ 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 Narrative  
WC-HANFORD, INC. (WCHN)  
SDG X0015**

**Method/Analysis Information**

**Product:** pH  
**Analytical Batch:** 1320493    **Method:** SW9045D pH

**Sample Analysis**

The following samples were analyzed using the analytical protocol as established in SW846 9045D:

<b>Sample ID</b>	<b>Client ID</b>
330707001	J1RV36
1202922461	330707001(J1RV36) Sample Duplicate (DUP)
1202922462	Laboratory Control Sample (LCS)

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

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-008 REV# 21.

**Preparation/Analytical Method Verification**

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

**Calibration Information**

The Electrode analysis was performed on a PerpHect pH Meter Orion 370.

**Initial Calibration**

All initial calibration requirements have been met for this SDG.

**Calibration Verification Information (CCV)**

All continuing calibration verification standards (CCVs) associated with reported data from this batch were within acceptance limits.

**Quality Control (QC) Information**

**Laboratory Control Sample (LCS) Recovery**

The LCS spike recovery met the acceptance limits.

**Quality Control (QC) Designation**

The following sample was selected for QC analysis: 330707001 (J1RV36).

**Duplicate Relative Percent Difference (RPD) Statement**

The RPD between the sample and its duplicate met the acceptance limits.

**Technical Information**

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

**Holding Times**

The following samples from this sample group were received by the lab outside of the method specified holding time: 1202922461 (J1RV36) and 330707001 (J1RV36).

**Sample Dilutions**

The samples in this SDG did not require dilutions.

**Sample Re-analysis**

The samples in this SDG did not require re-analysis.

**Miscellaneous Information**

**Data Exception (DER) Documentation**

The following DER was generated for this SDG: 1209143 1202922461 (J1RV36) and 330707001 (J1RV36).

**Additional Comments**

Additional comments were not required for this SDG.

**Electronic Packaging Comment**

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. The data validator will always sign and date the case narrative. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

**Method/Analysis Information**

**Product:** Ion Chromatography  
**Analytical Batch:** 1320638 **Method:** SW846 9056A Anions  
**Prep Batch :** 1320637 **Method:** SW846 9056A

**Sample Analysis**

The following samples were analyzed using the analytical protocol as established in SW846 9056A:

<b>Sample ID</b>	<b>Client ID</b>
330707001	J1RV36
1202922860	Method Blank (MB)
1202922861	330707001(J1RV36) Sample Duplicate (DUP)
1202922862	330707001(J1RV36) Matrix Spike (MS)
1202922863	Laboratory Control Sample (LCS)

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

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-086 REV# 22.

**Preparation/Analytical Method Verification**

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

**Calibration Information**

The Ion Chromatography analysis was performed on a Dionex ICS-3000 Ion Chromatograph.

**Initial Calibration**

All initial calibration requirements have been met for this SDG.

**Continuing Calibration Blanks**

All continuing calibration blanks (CCBs) associated with reported data from this batch were within acceptance limits.

**Calibration Verification Information (CCV)**

All continuing calibration verification standards (CCVs) associated with reported data from this batch were within acceptance limits.

**Y Intercept Rule**

The absolute value of the intercept is less than 3 times the MDL.

**Quality Control (QC) Information****Method Blank (MB) Statement**

The MB analyzed with this SDG met the acceptance criteria.

**Laboratory Control Sample (LCS) Recovery**

The LCS spike recovery met the acceptance limits.

**Quality Control (QC) Designation**

The following sample was selected for QC analysis: 330707001 (J1RV36).

**Matrix Spike (MS)/Post Spike (PS) Recovery Statement**

The spike recovery falls outside of the established acceptance limits due to matrix interference: 1202922862 (J1RV36).

**Duplicate Relative Percent Difference (RPD) Statement**

The RPD between the sample and its duplicate met the acceptance limits.

**Technical Information**

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

**Holding Times**

All samples in this SDG met the specified holding time.

**Sample Dilutions**

The samples in this SDG did not require dilutions.

**Sample Re-analysis**

The samples in this SDG did not require re-analysis.

**Miscellaneous Information****Data Exception (DER) Documentation**

The following DER was generated for this SDG: 1211253 1202922862 (J1RV36).

**Manual Integrations**

The following samples from this sample group had to be manually integrated due to errors in the instrument software peak integration: 1202922861 (J1RV36) and 330707001 (J1RV36).

**Additional Comments**

Additional comments were not required for this SDG.

**Electronic Packaging Comment**

This data package was generated using an electronic data processing program referred to as virtual packaging. In an

effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. The data validator will always sign and date the case narrative. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

**Method/Analysis Information**

**Product:** Nitrate + Nitrite  
**Analytical Batch:** 1320037      **Method:** EPA 353.2 Nitrogen and Nitrate/Nitrite  
**Prep Batch :** 1320036      **Method:** EEPA 353.2 Modified

**Sample Analysis**

The following samples were analyzed using the analytical protocol as established in EPA 353.2 Modified:

<b>Sample ID</b>	<b>Client ID</b>
330707001	J1RV36
1202921411	Method Blank (MB)
1202921413	330707001(J1RV36) Sample Duplicate (DUP)
1202921416	330707001(J1RV36) Matrix Spike (MS)
1202921418	Laboratory Control Sample (LCS)

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

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-128 REV# 8.

**Preparation/Analytical Method Verification**

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

**Calibration Information**

The Nutrient analysis was performed on a Lachat QuickChem FIA+ 8500 Series.

**Calibration Verification Information**

All associated calibration verification standard(s) (ICV or CCV) met the acceptance criteria.

**Continuing Calibration Blanks**

All continuing calibration blanks (CCBs) associated with reported data from this batch were within acceptance limits.

**Y Intercept Rule**

The absolute value of the intercept is less than 3 times the MDL.

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

#### **Method Blank (MB) Statement**

The MB analyzed with this SDG met the acceptance criteria.

#### **Laboratory Control Sample (LCS) Recovery**

The LCS spike recovery met the acceptance limits.

#### **Quality Control (QC) Designation**

The following sample was selected for QC analysis: 330707001 (J1RV36).

#### **Matrix Spike (MS)/Post Spike (PS) Recovery Statement**

The spike recovery falls outside of the established acceptance limits due to matrix interference: 1202921416 (J1RV36).

#### **Duplicate Relative Percent Difference (RPD) Statement**

The RPD between the sample and its duplicate met the acceptance limits.

### **Technical Information**

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

#### **Holding Times**

All samples in this SDG met the specified holding time.

#### **Sample Dilutions**

The samples in this SDG did not require dilutions.

#### **Sample Re-analysis**

The samples in this SDG did not require re-analysis.

### **Miscellaneous Information**

#### **Data Exception (DER) Documentation**

The following DER was generated for this SDG: 1211959 1202921416 (J1RV36).

#### **Additional Comments**

Additional comments were not required for this SDG.

#### **Electronic Packaging Comment**

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. The data validator will always sign and date the case narrative. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

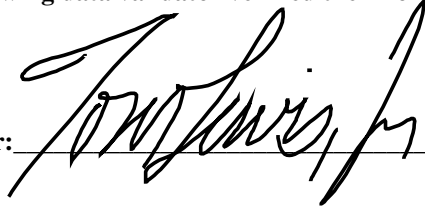
**Certification Statement**

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.

**Review Validation:**

GEL requires all analytical data to be verified by a qualified data validator. In addition, all data designated for CLP or CLP-like packaging will receive a third level validation upon completion of the data package.

**The following data validator verified the information presented in this case narrative:**

Reviewer:  Date: 15Aug13

**DATA EXCEPTION REPORT**

<b>Mo.Day Yr.</b> 07-AUG-13	<b>Division:</b> Industrial	<b>Quality Criteria:</b> Specifications	<b>Type:</b> Process
<b>Instrument Type:</b> ELECTRODE	<b>Test / Method:</b> SW846 9045D	<b>Matrix Type:</b> Solid	<b>Client Code:</b> THCG, WCHN
<b>Batch ID:</b> 1320493	<b>Sample Numbers:</b> See Below		
<b>Potentially affected work order(s)(SDG):</b> 330494(X0012),330624(X0013),330705(X0014),330707(X0015),330790(X0016),330819,330841,330842			
<b>Application Issues:</b> Sample received out of holding			
<b>Specification and Requirements Exception Description:</b>		<b>DER Disposition:</b>	
<p>1. Sample received out of holding:</p> <p>330494 001,002,003</p> <p>330624 001,002,003</p> <p>330705 001,002</p> <p>330707 001</p> <p>330790 001</p> <p>330819 001</p> <p>330841 001</p> <p>330842 001</p> <p>QC 1202922460DUP,1202922461DUP, 1202922590DUP, 1202922591DUP, 1202922592DUP</p>		<p>1. Sample received out of holding</p>	

**Originator's Name:**

Lisa Gregory 07-AUG-13

**Data Validator/Group Leader:**

Thomas Lewis 10-AUG-13

**DATA EXCEPTION REPORT**

<b>Mo.Day Yr.</b> 14-AUG-13	<b>Division:</b> Industrial	<b>Quality Criteria:</b> Specifications	<b>Type:</b> Process
<b>Instrument Type:</b> IC	<b>Test / Method:</b> SW846 9056A	<b>Matrix Type:</b> Solid	<b>Client Code:</b> WCHN
<b>Batch ID:</b> 1320638	<b>Sample Numbers:</b> See Below		
<b>Potentially affected work order(s)(SDG): 330707(X0015)</b>			
<b>Application Issues:</b> Failed Recovery for MS/PS			
<b>Specification and Requirements Exception Description:</b>		<b>DER Disposition:</b>	
<p>1. Failed Recovery for MS/PS:</p> <p>QC 1202922862MS</p>		<p>1. The MS/PS mixture contains seven anions of interest. Of those, all requested anions except ortho-phosphate met normal acceptance criteria for recovery (90 - 110%). This failure is attributed to the matrix of the sample because the successful recovery of the other compounds indicate that the laboratory process was in control. This variance is judged to have no negative impact on the data. The deviation is noted in the Case Narrative and DER, and the data has been reported.</p>	

**Originator's Name:**  
Mary Sherwood 14-AUG-13

**Data Validator/Group Leader:**  
Virginia Winger 14-AUG-13

**DATA EXCEPTION REPORT**

<b>Mo.Day Yr.</b> 15-AUG-13	<b>Division:</b> Industrial	<b>Quality Criteria:</b> Specifications	<b>Type:</b> Process
<b>Instrument Type:</b> LACHAT Flow Injection Analyzer	<b>Test / Method:</b> EPA 353.2 Modified	<b>Matrix Type:</b> Solid	<b>Client Code:</b> WCHN
<b>Batch ID:</b> 1320037	<b>Sample Numbers:</b> See below.		
<b>Potentially affected work order(s)(SDG): 330705(X0014),330707(X0015),330790(X0016),331136(X0018),331217,331231</b>			
<b>Application Issues:</b> Failed Recovery for MS/PS			
<b>Specification and Requirements Exception Description:</b>		<b>DER Disposition:</b>	
1. Failed Recovery for MS:  QC 1202921416MS		1. The spike recovery falls outside of the established acceptance limits due to matrix interference.	

**Originator's Name:**  
Kristen Parson 15-AUG-13

**Data Validator/Group Leader:**  
Julia Hamilton 15-AUG-13

# **Sample Data Summary**

# GEL LABORATORIES LLC

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## Certificate of Analysis Report for

WCHN001 WC-HANFORD, INC.

Client SDG: X0015 GEL Work Order: 330707 Project: RC-234 Other Solid

**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.

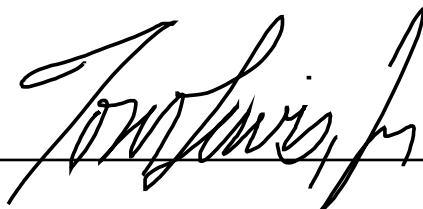
X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier

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 Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the limit as defined in the 'U' qualifier above.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Orlette Johnson.

Reviewed by



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# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: August 15, 2013

Company : WC-Hanford, Inc.  
 Address : 2620 Fermi Avenue  
 MSIN H4-21  
 Richland, Washington 99354  
 Contact: Joan Kessner  
 Project: RC-234 Other Solid

Client SDG: X0015

Client Sample ID: J1RV36	Project: WCHN00413
Sample ID: 330707001	Client ID: WCHN001
Matrix: Solid	
Collect Date: 30-JUL-13 08:50	
Receive Date: 01-AUG-13	
Collector: Client	

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Electrode Analysis</b>											
<b>SW9045D pH "As Received"</b>											
pH at Temp 20.7C		7.64	0.010	0.100	pH	1	LYG1	08/07/13	0946	1320493	1
<b>Ion Chromatography</b>											
<b>SW846 9056A Anions "As Received"</b>											
Bromide	U	0.670	0.670	2.00	mg/kg	1	MAR1	08/09/13	2103	1320638	2
Chloride		5.82	0.670	2.00	mg/kg	1					
Fluoride	U	0.330	0.330	1.00	mg/kg	1					
Nitrate-N		31.5	0.330	1.00	mg/kg	1					
Nitrite-N	U	0.330	0.330	1.00	mg/kg	1					
O-Phosphate as P	U	0.670	0.670	2.00	mg/kg	1					
Sulfate		51.1	1.33	4.00	mg/kg	1					
<b>Nutrient Analysis</b>											
<b>EPA 353.2 Nitrogen, Nitrate/Nitrite "As Received"</b>											
Nitrogen, Nitrate/Nitrite		12.8	0.168	0.495	mg/kg	1	KLP1	08/15/13	1329	1320037	3

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
EPA 353.2 Modified	EPA 353.2 Modified Nitrate/Nitrite	KLP1	08/15/13	1130	1320036
SW846 9056A	SW846 9056A Total Anions in Soil	MAR1	08/09/13	0815	1320637

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 9045D	
2	SW846 9056A	
3	EPA 353.2 Modified	

**Notes:**

# **Quality Control Summary**

# GEL LABORATORIES LLC

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## QC Summary

Report Date: August 15, 2013

Page 1 of 3

**WC-Hanford, Inc.**  
**2620 Fermi Avenue**  
**MSIN H4-21**  
**Richland, Washington**  
**Contact: Joan Kessner**

**Workorder: 330707**

**Client SDG: X0015**

**Project Description: RC-234 Other Solid**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Electrode Analysis</b>											
Batch	1320493										
QC1202922461	330707001	DUP									
pH		7.64		7.71	pH	0.912		(0%-10%)	LYG1	08/07/13	09:46
QC1202922462	LCS										
pH	7.00			7.02	pH		100	(99%-101%)		08/07/13	09:23
<b>Ion Chromatography</b>											
Batch	1320638										
QC1202922861	330707001	DUP									
Bromide	U	0.670	U	0.670	mg/kg	N/A	^		MAR1	08/09/13	21:36
Chloride		5.82		5.77	mg/kg	0.811	^	(+/-2.00)			
Fluoride	U	0.330	U	0.330	mg/kg	N/A	^				
Nitrate-N		31.5		31.5	mg/kg	0.111		(0%-20%)			
Nitrite-N	U	0.330	U	0.330	mg/kg	N/A	^				
O-Phosphate as P	U	0.670	U	0.670	mg/kg	N/A	^				
Sulfate		51.1		50.9	mg/kg	0.286		(0%-20%)			
QC1202922863	LCS										
Bromide	12.5			13.0	mg/kg		104	(90%-110%)		08/09/13	20:30
Chloride	50.0			49.6	mg/kg		99.2	(90%-110%)			
Fluoride	25.0			25.7	mg/kg		103	(90%-110%)			
Nitrate-N	25.0			25.5	mg/kg		102	(90%-110%)			
Nitrite-N	25.0			25.6	mg/kg		102	(90%-110%)			
O-Phosphate as P	12.5			13.5	mg/kg		108	(90%-110%)			
Sulfate	100			102	mg/kg		102	(90%-110%)			
QC1202922860	MB										
Bromide			U	0.670	mg/kg					08/09/13	19:57

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## QC Summary

**Workorder:** 330707

**Client SDG:** X0015

**Project Description:** RC-234 Other Solid

**Page 2 of 3**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Ion Chromatography</b>											
Batch	1320638										
Chloride			U	0.670	mg/kg				MAR1	08/09/13	19:57
Fluoride			U	0.330	mg/kg						
Nitrate-N			U	0.330	mg/kg						
Nitrite-N			U	0.330	mg/kg						
O-Phosphate as P			U	0.670	mg/kg						
Sulfate			U	1.33	mg/kg						
QC1202922862	330707001 MS										
Bromide	12.5	U	0.670	12.6	mg/kg		101	(70%-134%)		08/09/13	22:09
Chloride	50.0		5.82	53.6	mg/kg		95.6	(46%-150%)			
Fluoride	25.0	U	0.330	20.3	mg/kg		80.3	(34%-134%)			
Nitrate-N	25.0		31.5	58.6	mg/kg		109	(68%-129%)			
Nitrite-N	25.0	U	0.330	24.5	mg/kg		97.8	(68%-130%)			
O-Phosphate as P	12.5	U	0.670	U	0.670	mg/kg		0* (26%-124%)			
Sulfate	100		51.1	121	mg/kg		69.6	(50%-151%)			
<b>Nutrient Analysis</b>											
Batch	1320037										
QC1202921413	330707001 DUP										
Nitrogen, Nitrate/Nitrite			12.8	10.5	mg/kg	19.5		(0%-20%)	KLP1	08/15/13	13:30
QC1202921418	LCS										
Nitrogen, Nitrate/Nitrite	10.0			10.0	mg/kg		100	(90%-110%)		08/15/13	13:23
QC1202921411	MB										
Nitrogen, Nitrate/Nitrite			U	0.170	mg/kg					08/15/13	13:21
QC1202921416	330707001 MS										
Nitrogen, Nitrate/Nitrite	10.0		12.8	17.1	mg/kg		43.3*	(75%-125%)		08/15/13	13:31

**Notes:**

# GEL LABORATORIES LLC

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## QC Summary

Workorder: 330707

Client SDG: X0015

Project Description: RC-234 Other Solid

Page 3 of 3

<u>Parmname</u>	<u>NOM</u>	<u>Sample</u>	<u>Qual</u>	<u>QC</u>	<u>Units</u>	<u>RPD%</u>	<u>REC%</u>	<u>Range</u>	<u>Anlst</u>	<u>Date</u>	<u>Time</u>
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The Qualifiers in this report are defined as follows:

- > 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, and the sample concentration was  $\leq 5$  times the blank concentration.
- 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.
- 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.

^ 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.