



August 4, 2016

CH2M HILL Plateau Remediation Company  
 2420 Stevens Center Place  
 P.O. Box 1600  
 Richland, WA 99354  
 Attn.: Tracey A. Burch

**Subject: Geotechnical Laboratory Testing Services, Data Deliverable for SDG # W606077, Rev. 0**

Enclosed is the final report on geotechnical analyses performed by RJ Lee Group in conjunction with PBS Engineering and Environmental, Inc. (PBS) for Sample Delivery Group number (SDG #) W606077.

**General Set Comments**

RJ Lee Group received from CH2M-Hill Plateau Remediation Company (CHPRC) 1 sample to be tested for geotechnical analysis at the Columbia Basin Analytical Laboratories. There are no SIRs associated with this SDG.

The CHPRC sample, in SDG # W606077, has been assigned a PBS Geotechnical Lab Sample number per the below table.

CHPRC Sample #	SDG #	Geotechnical Lab Sample #	Date Processed
B35YB9	W606077	H-0077	07/11/2016

This project deliverable, provided in Attachment 1, contains the reports of the requested analytical results and a copy of the associated chain of custody for the sample listed above.

The analytical results provided in this deliverable relate only to the items tested. The sample was received in acceptable condition unless otherwise noted in the attached report(s).

I certify that this analytical report is in compliance with the Hanford SOW, both technically and for completeness. Release of the data contained in this hard copy report has been authorized by the Laboratory Director or a designee as verified by the following signature.

08/04/2016

Richard Westberg  
 Laboratory Director, Columbia Basin Analytical Laboratories

Date

If you have any questions, please feel free to contact us at 509-545-4989 or email at [rwestberg@rjleegroup.com](mailto:rwestberg@rjleegroup.com).

## Attachment 1

PBS Geotechnical Laboratory Testing Results, SDG # W606077,  
dated August 4, 2016



Engineering +  
Environmental

July 21, 2016

RJ Lee Group, Inc.  
Attn: Mr. Larry Lockrem  
Columbia Basin Analytical Laboratories  
2710 North 20th Avenue  
Pasco, Washington 93301

Re: Geotechnical Laboratory Testing Results  
Sample Delivery Group No. W606077  
PBS Project No. 63797.000

Dear Mr. Lockrem:

In accordance with your request, PBS Engineering and Environmental Inc. (PBS) is providing you with the results of our recent geotechnical laboratory testing. Our services were provided in accordance with the request provided with Sample Delivery Group (SDG) number W606077.

We performed the following tests:

- Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass (ASTM D2216)
- Density of Soil in Place by the Drive-Cylinder Method (ASTM D2937)
- Grain Size Analysis - Hydrometer (ASTM D422)

The tests were performed in general accordance with the above-mentioned ASTM Standards, except for the following case:

- **Density of Soil in Place by the Drive-Cylinder Method (ASTM D2937):** The sample was received in a disturbed condition, which may not accurately represent in-situ soil conditions. The requested test was performed as-received, per the direction of RJ Lee and CHPRC.

400 Bradley Boulevard, Suite 300, Richland, WA 99352  
509.942.1600 Main  
866.727.0140 Fax  
www.pbsenv.com

Bend | Boise | Coos Bay | Eugene | Portland | Seattle | Tri-Cities | Vancouver | Walla Walla

Mr. Larry Lockrem  
Re: Geotechnical Laboratory Testing Results – W606077  
July 21, 2016  
Page 2 of 2

We trust this letter meets your current needs. If you have any questions, or wish to further discuss our observations, conclusions, and recommendations, please contact us at 509.942.1600.

Sincerely,  
PBS Engineering and Environmental, Inc.



7/21/2016

A handwritten signature in black ink, appearing to read "Adam M. Swenson".

Adam M. Swenson, P.E.  
Project Geotechnical Engineer

AS/rg

Attachments:      Report of Laboratory Testing – Density by Drive Cylinder and Moisture Contents  
                         Report of Laboratory Testing – Grain-size Analysis - Hydrometer  
                         Chain of Custody

<b>SAMPLE ISSUE RESOLUTION</b>	<b>SIR NUM</b>	SIR16-574
	<b>REV NUM</b>	0
	<b>DATE INITIATED</b>	8/22/2016

**SAMPLE EVENT INFORMATION**

**SAF NUM(S)** F16-043  
**OPERABLE UNIT(S)** 100-NR-2  
**PROJECT(S)** 100-NR-2 GW  
**SAMPLE EVENT TITLE(S)** 100-NR-2 Well Drilling and Installation of Wells  
**LABORATORY** RJ LEE - GEOTECHNICAL

**SAMPLING INFORMATION**

**NUMBER OF SAMPLES** 1  
**SAMPLE NUMBERS** B35YB9  
**SAMPLE MATRIX** SOIL  
**COLLECTION DATE** 6/14/2016 - 6/14/2016  
**SDG NUM** W606077

**ISSUE BACKGROUND**

**CLASS** Field Sampling Issue  
**TYPE** Sample Collection Issue  
**DESCRIPTION** Soil samples were delivered in 1L bottles, and not core liners. This showed that the samples had been previously disturbed. Could not perform an accurate density test.

**DISPOSITION**

**DESCRIPTION** Cancel the density test.  
**JUSTIFICATION** Final Disposition: Accept proposed resolution.  
 SUBMITTED BY: Antonio Jaimes DATE: 08/22/2016  
 ACCEPTED BY: Dave Todak DATE: 08/22/2016



**REPORT OF LABORATORY TESTING**

<b>Report to:</b> CH2M-Hill - Plateau Remediation 2420 Stevens Center Place P.O. Box 1600 Richland, WA 99354	<b>Date:</b> 7/21/2016
	<b>Sample Delivery Group No.:</b> W606077
	<b>Sample Authorization No.:</b> F16-043
<b>Project:</b> CHPRC Laboratory	<b>Project No.:</b> 63797.000
<b>Report of:</b> Density by Drive Cylinder (ASTM D2937) Moisture Content (ASTM D2216)	<b>Lab Technician:</b> A. Jaimes

**Items Received:**

One sample was provided to us containing soil material obtained by you, the client. PBS performed the following tests:

Density by Drive Cylinder (ASTM D2937).

The dry densities (dry unit weight) of representative soils were determined in the laboratory using the relatively undisturbed soil samples.\* The dimensions of the specimen were carefully measured, the volume calculated, and the specimen weighed. A representative sample was obtained from the specimen, weighed, and placed in the oven to dry. After oven drying, the representative sample was reweighed and the water content calculated. The dry density was then computed. The results of tests are included in the table below.

\*The sample was received in a disturbed condition and may not be representative of in-situ soil conditons

Moisture Content (ASTM D2216).

Natural moisture content determinations were made on the samples of the fine-grained soils (that is, silts, clays, and silty sands). The natural moisture content is defined as the ratio of the weight of water to dry weight of soil, expressed as a percentage.

**LABORATORY TEST RESULTS**

**Density by Drive Cylinder (ASTM D2937)**

**Moisture Content (ASTM D2216)**

Customer Sample Number	Laboratory Sample Number	Wet Density (lbs/ft <sup>3</sup> )	Water Content (%)	Dry Density (lbs/ft <sup>3</sup> )
B35YB9	H-0077	93.5	5.3	88.7



**REPORT OF LABORATORY TESTING**

<b>Report to:</b> CH2M-Hill - Plateau Remediation 2420 Stevens Center Place P.O. Box 1600 Richland, WA 99354	<b>Date:</b> 7/21/2016 <b>Sample Delivery Group No.:</b> W606077 <b>Sample Authorization No.:</b> F16-043
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<b>Project:</b> CHPRC Laboratory	<b>Project No.:</b> 63797.000
<b>Report of:</b> Grain Size Analysis - Hydrometer (ASTM D422)	<b>Lab Technician:</b> A. Jaimes

**Items Received:**

One sample was provided to us containing soil material obtained by you, the client. We performed the following test:

Particle/Grain Size Analysis - Hydrometer (ASTM D422):

Mechanical Grain Size Analyses (wet sieve) were conducted on each of the soil samples to determine their grain size distribution. In addition, hydrometer tests were conducted on portions of the soil samples passing the No. 40 sieve. The results of the mechanical grain size analyses and hydrometer testing are plotted on the attached Figures (Particle Size Analysis Test Results - Hydrometer - Pages 1 through 3).

**LABORATORY TEST RESULTS**

**Particle Grain Size Analysis - Hydrometer (ASTM D422) - Sieve Portion**

Customer Sample Number	Laboratory Sample Number	Date of Analysis	Percent Passing by Sieve Size										
			3-in.	1½-in.	¾-in.	½-in.	No. 4	No. 10	No. 20	No. 40	No. 60	No. 100	No. 200
B35YB9	H-0077	7/11/2016	100.0	100.0	99.2	95.7	87.0	57.0	22.2	6.8	4.9	4.3	3.7





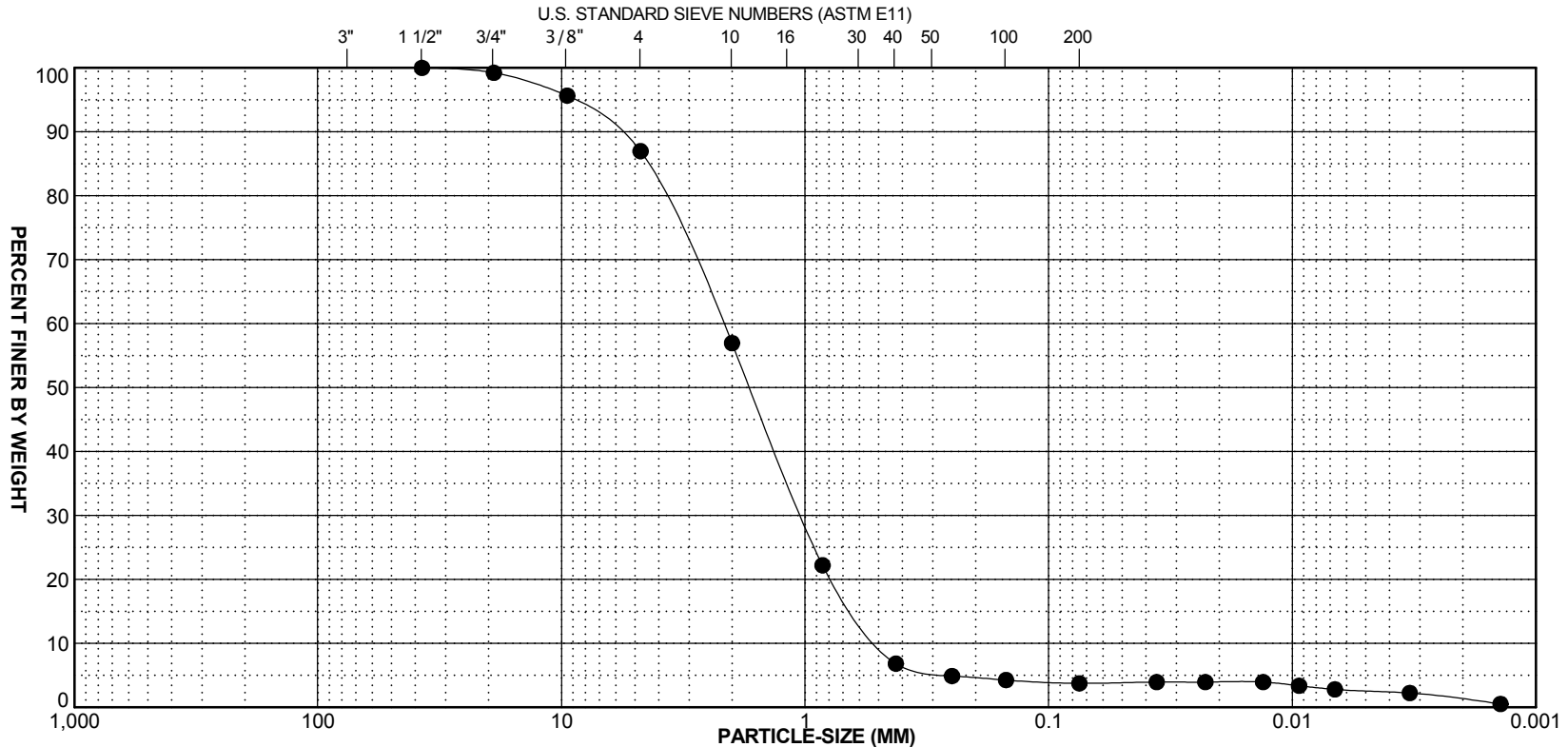
**PARTICLE-SIZE ANALYSIS TEST RESULTS**

CHPRC - GEOTECHNICAL LABORATORY

PBS PROJECT NUMBER:  
63797

TEST METHOD: ASTM C136

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY



KEY	EXPLORATION NUMBER	SAMPLE NUMBER	SAMPLE DEPTH (FEET)	MOISTURE CONTENT (PERCENT)	D60 (MM)	D50 (MM)	D30 (MM)	D10 (MM)	D5 (MM)	GRAVEL (PERCENT)	SAND (PERCENT)	FINES (PERCENT)
●	H-077	B35YB9	30.2	5	2.2	1.7	1.0	0.5	0.3	13	83	4

REV 1

10/11/2016

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		PAGE 1 OF 2	
COLLECTOR E.L. Kauer/CHPRC	COMPANY CONTACT TODAK, D	TELEPHONE NO. 376-6427	PROJECT COORDINATOR TODAK, D	F16-043-066	
SAMPLING LOCATION C9402, I-002	PROJECT DESIGNATION 100-NR-2 Drilling - Soil	FIELD LOGBOOK NO. HNF-N-645	SAF NO. F16-043	PRICE CODE 8H	DATA TURNAROUND 30 Days / 30 Days
ICE CHEST NO. 6005-472	FIELD LOGBOOK NO. HNF-N-645	ACTUAL SAMPLE DEPTH 30.2 - 32.7	COA 304070	AIR QUALITY <input type="checkbox"/>	METHOD OF SHIPMENT GOVERNMENT VEHICLE
SHIPPED TO RJ LEE - GEOTECHNICAL	OFFSITE PROPERTY NO. N/A	BILL OF LADING/AIR BILL NO. N/A			<b>ORIGINAL</b>

MATRIX* A=Air DL=Drum Liquids DS=Drum Solids L=Liquid O=Oil S=Soil SE=Sediment T=Tissue V=Vegetation W=Water WI=Wipe X=Other	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. NA	PRESERVATION None	HOLDING TIME None	TYPE OF CONTAINER G/P	NO. OF CONTAINER(S) 1	VOLUME 1000g	SPECIAL HANDLING AND/OR STORAGE	SEE ITEM (1) IN SPECIAL INSTRUCTIONS
SAMPLE NO. B35VB9	MATRIX* SOIL	SAMPLE DATE 6-14-16	SAMPLE TIME 1120					

W606077

CHAIN OF POSSESSION		SIGN/ PRINT NAMES		SPECIAL INSTRUCTIONS	
RELINQUISHED BY/REMOVED FROM E.L. Kauer/CHPRC	DATE/TIME JUN 14 2016	RECEIVED BY/STORED IN SSU-1	DATE/TIME JUN 14 2016	SEE PAGE 2 FOR ALL SPECIAL INSTRUCTIONS	
RELINQUISHED BY/REMOVED FROM [Signature]	DATE/TIME JUN 15 2016 0900	RECEIVED BY/STORED IN [Signature]	DATE/TIME JUN 15 2016 0900		
RELINQUISHED BY/REMOVED FROM [Signature]	DATE/TIME JUN 15 2016 1511	RECEIVED BY/STORED IN [Signature]	DATE/TIME JUN 15 2016 1511		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
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LABORATORY SECTION	RECEIVED BY	TITLE	DATE/TIME
FINAL SAMPLE DISPOSITION	DISPOSAL METHOD		

PRINTED ON 6/8/2016 FSR ID = FSR33110 TRVL NUM = TRVL-16-168 A-6003-618 (REV 2)

CH2MHill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		F16-043-066	PAGE 2 OF 2
COLLECTOR E.L. Kauer/CHPRC	COMPANY CONTACT TODAK, D	TELEPHONE NO. 376-6427	PROJECT COORDINATOR TODAK, D	PRICE CODE 8H	DATA TURNAROUND 30 Days / 30 Days
SAMPLING LOCATION C9402, I-002	PROJECT DESIGNATION 100-NR-2 Drilling - Soil	ACTUAL SAMPLE DEPTH 30.2 - 32.7	SAF NO. F16-043	AIR QUALITY <input type="checkbox"/>	<b>ORIGINAL</b>
ICE CHEST NO. 6005-472	FIELD LOGBOOK NO. HNF-N-645		COA 304070	METHOD OF SHIPMENT GOVERNMENT VEHICLE	
SHIPPED TO RJ LEE - GEOTECHNICAL	OFFSITE PROPERTY NO. N/A		BILL OF LADING/AIR BILL NO. N/A		

**SPECIAL INSTRUCTIONS**

SAMPLE B35YB9 WILL BE SAMPLED FROM SPLIT SPOON PORTION C OR D BASED ON WHICHEVER LINER HAS BETTER PERCENT RECOVERY;\*\* All requests for Geotechnical Parameters will be given a unique HEIS sample number and be assigned to a separate COC. In addition, all split spoon sleeves will be properly stored until authorized for shipment.

(1) D2937\_ DENSITY: COMMON {Bulk density - dry, Bulk density - wet}; D422 PARTICLE SIZE (Dry Sieve): COMMON {Percent passing 1.5 inch sieve, Percent passing 3 inch sieve, Percent passing 3/4 inch sieve, Percent passing 3/8 inch sieve, Percent passing No.10 sieve, Percent passing No.100 sieve, Percent passing No.140 sieve, Percent passing No.20 sieve, Percent passing No.200 sieve, Percent passing No.4 sieve, Percent passing No.40 sieve};