



OCTOBER 5, 2017

October 5, 2017

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 # W708077, 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 #) W708077.

**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 # W708077, has been assigned a PBS Geotechnical Lab Sample number per the below table.

CHPRC Sample #	SDG #	Geotechnical Lab Sample #	Date Processed
B3BK20	W708077	H-0178	10/03/2017

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.

10/05/2017

Donald Smith  
 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 [don.smith@rjleegroup.com](mailto:don.smith@rjleegroup.com).

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Attachment 1

PBS Geotechnical Laboratory Testing Results, SDG #W708077,  
Dated October 5, 2017

OCTOBER 5, 2017



October 3, 2017

Mr. Larry Lockrem  
RJ Lee Group, Inc.  
2710 North 20th Avenue  
Pasco, Washington 99301

Via email: llockrem@rjleegroup.com

Regarding: Geotechnical Laboratory Testing Results  
CH2M HILL Plateau Remediation  
Sample Delivery Group No. W708077  
PBS Project No. 63797.000

Dear Mr. Lockrem:

PBS Engineering and Environmental Inc. (PBS) is pleased to present the results of our recent geotechnical laboratory testing in accordance with the request provided with Sample Delivery Group (SDG) number W708077.

PBS performed the following tests in general accordance with the relevant ASTM Standards:

- Grain Size Analysis (ASTM D422)
- Permeability of Granular Soils–Constant Head (ASTM D2434)

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,



10/03/2017

Adam M. Swenson, PE  
Project Geotechnical Engineer

Attachment(s): Report of Laboratory Testing – Grain-size Analysis  
Report of Laboratory Testing – Permeability of Granular Soils–Constant Head  
Chain of Custody

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**REPORT OF LABORATORY TESTING**

<b>Report to:</b> CH2M-Hill - Plateau Remediation 2420 Stevens Center Place PO Box 1600 Richland, WA 99354	<b>Date:</b> 10/3/2017
	<b>Sample Delivery Group No.:</b> W708077
	<b>Sample Authorization No.:</b> F16-040

<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> P. Brice

**Items Received:**

One sample was provided to us containing soil material obtained by you, the client.  
PBS 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. 10 sieve. The results of the mechanical grain size analyses and hydrometer testing are plotted on the attached Figure (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	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. 140	No. 200
B3BK20	H-0178	100	94.3	71.7	41.9	23.0	12.5	11.3	10.5	10.0	9.5	9.0	8.3

SHEET 1 OF 3

REVIEWED BY: A. Swenson, P.E.

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**REPORT OF LABORATORY TESTING**

<b>Report to:</b> CH2M-Hill - Plateau Remediation 2420 Stevens Center Place PO Box 1600 Richland, WA 99354	<b>Date:</b> 10/3/2017
	<b>Sample Delivery Group No.:</b> W708077
	<b>Sample Authorization No.:</b> F16-040

<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> P. Brice

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

See page 1 of 3

**LABORATORY TEST RESULTS****Particle Grain Size Analysis - Hydrometer (ASTM D422) - Hydrometer Portion**

Laboratory Sample Number	Hydrometer Readings													
	2 min		5min		15 min		30 min		60 min		250 min		1440 min	
	Dia. (mm)	Finer (%)	Dia. (mm)	Finer (%)	Dia. (mm)	Finer (%)	Dia. (mm)	Finer (%)	Dia. (mm)	Finer (%)	Dia. (mm)	Finer (%)	Dia. (mm)	Finer (%)
H-0178	0.029	5.3	0.019	4.5	0.012	3.4	0.009	2.9	0.006	2.3	0.003	2.0	0.001	1.0

SHEET 2 OF 3

REVIEWED BY: A. Swenson, P.E.



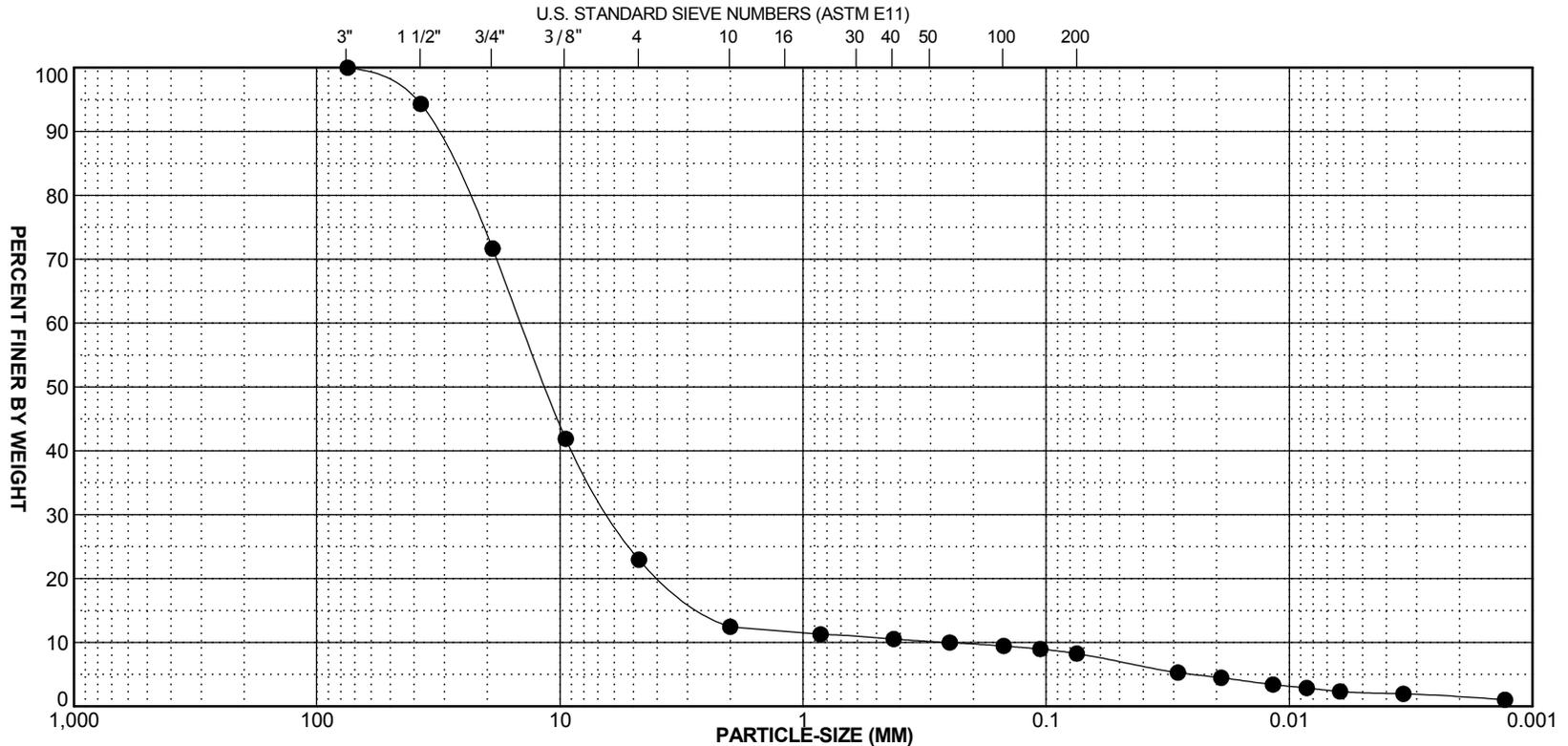
### PARTICLE-SIZE ANALYSIS TEST RESULTS

CHPRC - GEOTECHNICAL LABORATORY

PBS PROJECT NUMBER:  
63797

TEST METHOD: ASTM D422

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-178	B3BK20	157.3	29	14.5	11.5	6.1	0.2	0.02	77	15	8

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**REPORT OF LABORATORY TESTING**

**Report to:** CH2M-Hill - Plateau Remediation  
2420 Stevens Center Place  
PO Box 1600  
Richland, WA 99354

**Date:** 10/3/2017  
**Sample Delivery Group No.:** W708077  
**Sample Authorization No.:** F16-040

**Project:** CHPRC Laboratory

**Project No.:** 63797.000

**Report of:** Permeability of Granular Soils - Constant Head (ASTM D2434)

**Lab Tech:** P. Brice

**Items Received:**

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

Permeability of Granular Soils - Constant Head (ASTM D2434).

The permeability of the representative soil was determined in the laboratory using the above referenced samples. The samples were prepared for the permeameter and all the required measures were taken. Air was evacuated from the samples and were then saturated with low mineral content water. The manometer system was attached and a stable head condition was attained. The quantity of flow, water temperature, water head and time were measured. This was repeated, if necessary, to establish an accurate region of laminar flow with velocity.

**LABORATORY TEST RESULTS****Permeability of Granular Soils - Constant Head (ASTM D2434)**

Customer Sample Number	Laboratory Sample Number	Date of Analysis	Quantity of flow discharged (cm <sup>3</sup> )	Dist. between manometers, L (cm)	Specimen area, A (cm <sup>2</sup> )	Total discharge time, t (sec)	Head diff. betw. manometers, h (cm)	Avg. Hydraulic Conductivity, k (cm/s)
B3BK20	H-0178	9/25/2017	14.0	7.62	45.84	420	3.3	1.69E-03

SHEET 1 OF 1

REVIEWED BY: A. Swenson, P.E.

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CH2MHill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST			F16-040-229	PAGE 1 OF 1
COLLECTOR Malcom Chum CHPRC		COMPANY CONTACT LYNCH, SA	TELEPHONE NO. 373-5586	PROJECT COORDINATOR LYNCH, SA	PRICE CODE 8H	DATA TURNAROUND 30 Days / 30 Days
SAMPLING LOCATION C9716, I-008		PROJECT DESIGNATION 100-HR-3 Long Term & Interim Action Monitoring - Soil		SAF NO. F16-040	AIR QUALITY <input type="checkbox"/>	
ICE CHEST NO. N/A		FIELD LOGBOOK NO. HNF-N-645-6	ACTUAL SAMPLE DEPTH 155.25 - 160.25'	COA 304343	METHOD OF SHIPMENT GOVERNMENT VEHICLE	<b>ORIGINAL</b>
SHIPPED TO RJ LEE - GEOTECHNICAL		OFFSITE PROPERTY NO. N/A	BILL OF LADING/AIR BILL NO. N/A			

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	<b>POSSIBLE SAMPLE HAZARDS/ REMARKS</b> *Contains Radioactive Material at concentrations that are not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.	PRESERVATION	None
		HOLDING TIME	None
		TYPE OF CONTAINER	Split Spoon Liner
		NO. OF CONTAINER(S)	1
	VOLUME	1000g	
<b>SPECIAL HANDLING AND/OR STORAGE</b> NA		<b>SAMPLE ANALYSIS</b> D5084_HYDRALIC ULIC CONDUCTIVITY : COMMON;	
SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME
B-25X57	SOIL	AUG 09 2017	0837 ✓

W708077

16.7°C

COPY

157.25 - 157.75'

pieces of plastic in sample

OCTOBER 5, 2017

CHAIN OF POSSESSION	SIGN/ PRINT NAMES	SPECIAL INSTRUCTIONS
RELINQUISHED BY/REMOVED FROM Malcom Chum CHPRC	RECEIVED BY/STORED IN SSU-1	TRVL-17-165; ** 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. ** Laboratory shall perform  <i>(Cancelled analysis not performed 11/10/17)</i>
DATE/TIME AUG 09 2017 1500	DATE/TIME AUG 09 2017 1500	
RELINQUISHED BY/REMOVED FROM SSU-1	RECEIVED BY/STORED IN Janelle Zunker CHPRC	
DATE/TIME AUG 10 2017 0700	DATE/TIME AUG 10 2017 0700	
RELINQUISHED BY/REMOVED FROM Janelle Zunker CHPRC	RECEIVED BY/STORED IN FEDEX	
DATE/TIME AUG 10 2017 1400	DATE/TIME AUG 10 2017 0700	
RELINQUISHED BY/REMOVED FROM CHPRC	RECEIVED BY/STORED IN CHPRC	
DATE/TIME AUG 10 2017 0935	DATE/TIME AUG 10 2017 0935	
RELINQUISHED BY/REMOVED FROM Mrs. Zolneri	RECEIVED BY/STORED IN Patrick Bruce	
DATE/TIME 09/06/17 10:40	DATE/TIME 9/6/17 1040	

LABORATORY SECTION	RECEIVED BY	TITLE	DATE/TIME
FINAL SAMPLE DISPOSITION	DISPOSAL METHOD	DISPOSED BY	DATE/TIME

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<b>CH2MHill Plateau Remediation Company</b>		<b>CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST</b>			<b>F16-040-195</b>	<b>PAGE 1 OF 1</b>
<b>COLLECTOR</b> Malcom Chunn CHPRC		<b>COMPANY CONTACT</b> LYNCH, SA	<b>TELEPHONE NO.</b> 373-5586	<b>PROJECT COORDINATOR</b> LYNCH, SA	<b>PRICE CODE</b> 8H	<b>DATA TURNAROUND</b> 30 Days / 30 Days
<b>SAMPLING LOCATION</b> C9716, I-008		<b>PROJECT DESIGNATION</b> 100-HR-3 Long Term & Interim Action Monitoring - Soil		<b>SAF NO.</b> F16-040	<b>AIR QUALITY</b> <input type="checkbox"/>	
<b>ICE CHEST NO.</b> N/A		<b>FIELD LOGBOOK NO.</b> HNF-N-145-6	<b>ACTUAL SAMPLE DEPTH</b> 155.25-160.25'	<b>COA</b> 304343	<b>METHOD OF SHIPMENT</b> GOVERNMENT VEHICLE	<b>ORIGINAL</b>
<b>SHIPPED TO</b> RJ LEE - GEOTECHNICAL		<b>OFFSITE PROPERTY NO.</b> N/A		<b>BILL OF LADING/AIR BILL NO.</b> N/A		

<b>MATRIX*</b> A=Air DL=Drum Liquids DS=Drum Solids L=Liquid O=Oil S=Soil SE=Sediment T=Tissue V=Vegetation W=Water Wt=Wipe X=Other	<b>POSSIBLE SAMPLE HAZARDS/ REMARKS</b> *Contains Radioactive Material at concentrations that are not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.	<b>PRESERVATION</b>	None
		<b>HOLDING TIME</b>	6 Months
		<b>TYPE OF CONTAINER</b>	Split Spoon Liner
		<b>NO. OF CONTAINER(S)</b>	1
		<b>VOLUME</b>	1000g
<b>SPECIAL HANDLING AND/OR STORAGE</b> NA		<b>SAMPLE ANALYSIS</b>	SEE ITEM (1) IN SPECIAL INSTRUCTIONS

~~W708077~~  
#08/21/17  
W708077

16.9.C

COPY

x I-155.75-156.25'  
Pieces of plastic in sample

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME	
B3BK20	SOIL	AUG 09 2017	0837	✓

CHAIN OF POSSESSION	SIGN/ PRINT NAMES	SPECIAL INSTRUCTIONS
RELINQUISHED BY/REMOVED FROM Malcom Chunn DATE/TIME AUG 09 2017 15:00	RECEIVED BY/STORED IN SSU-1 DATE/TIME AUG 09 2017 15:00	<b>SPECIAL INSTRUCTIONS</b> TRVL-17-165; ** 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.** Laboratory shall perform (1) D2434_PERMEABILITY: COMMON; D422_PARTICLE SIZE (Dry Sieve): COMMON;
RELINQUISHED BY/REMOVED FROM SSU-1 DATE/TIME AUG 10 2017 07:00	RECEIVED BY/STORED IN Janelle Zunker CHPRC DATE/TIME AUG 10 2017 07:00	
RELINQUISHED BY/REMOVED FROM Janelle Zunker CHPRC DATE/TIME AUG 10 2017 14:00	RECEIVED BY/STORED IN 928-1017 FEDEX DATE/TIME AUG 10 2017 07:00	
RELINQUISHED BY/REMOVED FROM DATE/TIME 928-1017	RECEIVED BY/STORED IN DATE/TIME AUG 10 2017 07:00	
RELINQUISHED BY/REMOVED FROM CHPRC DATE/TIME AUG 10 2017 09:35	RECEIVED BY/STORED IN Anna Weibel DATE/TIME AUG 10 2017 09:35	
RELINQUISHED BY/REMOVED FROM W. J. Baker DATE/TIME 09/05/17 10:40	RECEIVED BY/STORED IN Patricia Bria PB DATE/TIME 9/6/17 1040	

<b>LABORATORY SECTION</b>	<b>RECEIVED BY</b>	<b>TITLE</b>	<b>DATE/TIME</b>
<b>FINAL SAMPLE DISPOSITION</b>	<b>DISPOSAL METHOD</b>	<b>DISPOSED BY</b>	<b>DATE/TIME</b>

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