

January 11, 2018

REVISION 1

October 26, 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 # W709048, 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 #) W709048.

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 # W709048, has been assigned a PBS Geotechnical Lab Sample number per the below table.

CHPRC Sample #	SDG #	Geotechnical Lab Sample #	Date Processed
B3BJJ6	W709048	H-0188A	10/24/2017
B3BX69	W709048	H-0188B	10/24/2017

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.



Donald Smith
 Laboratory Director, Columbia Basin Analytical Laboratories

10/26/2017

Date

If you have any questions, please feel free to contact us at 509-545-4989 or email at don.smith@rjleegroup.com.

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Attachment 1

PBS Geotechnical Laboratory Testing Results, SDG # W709048,
Dated October 26, 2017

January 11, 2018



October 24, 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. W709048
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 W709048.

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,



10/24/2017

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**

Report to: CH2M-Hill - Plateau Remediation 2420 Stevens Center Place PO Box 1600 Richland, WA 99354	Date: 10/24/2017
	Sample Delivery Group No.: W709048
	Sample Authorization No.: F16-040

Project: CHPRC Laboratory	Project No.: 63797.000
Report of: Grain Size Analysis - Hydrometer (ASTM D422)	Lab Technician: P. Brice

Items Received:

Two samples were 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
B3BJJ6	H-0188A	100	100	100	98.4	94.6	93.5	88.3	83.4	65.0	34.1	14.2	6.2
B3BX69	H-0188B	100	100	100	96.8	92.5	91.1	91.1	88.1	68.9	39.4	17.1	6.2

SHEET 1 OF 3

REVIEWED BY: A. Swenson, P.E.

January 11, 2018

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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: 10/24/2017
Sample Delivery Group No.: W709048
Sample Authorization No.: F16-040

Project: CHPRC Laboratory

Project No.: 63797.000

Report of: Grain Size Analysis - Hydrometer (ASTM D422)

Lab Technician: 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-0188A	0.037	3.8	0.023	3.0	0.014	2.1	0.010	2.1	0.007	1.4	0.003	1.4	0.001	1.1
H-0188B	0.036	5.2	0.023	4.4	0.013	4.4	0.010	3.6	0.007	2.9	0.003	2.6	0.001	1.1

SHEET 2 OF 3

REVIEWED BY: A. Swenson, P.E.

January 11, 2018

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CHPRC - GEOTECHNICAL LABORATORY

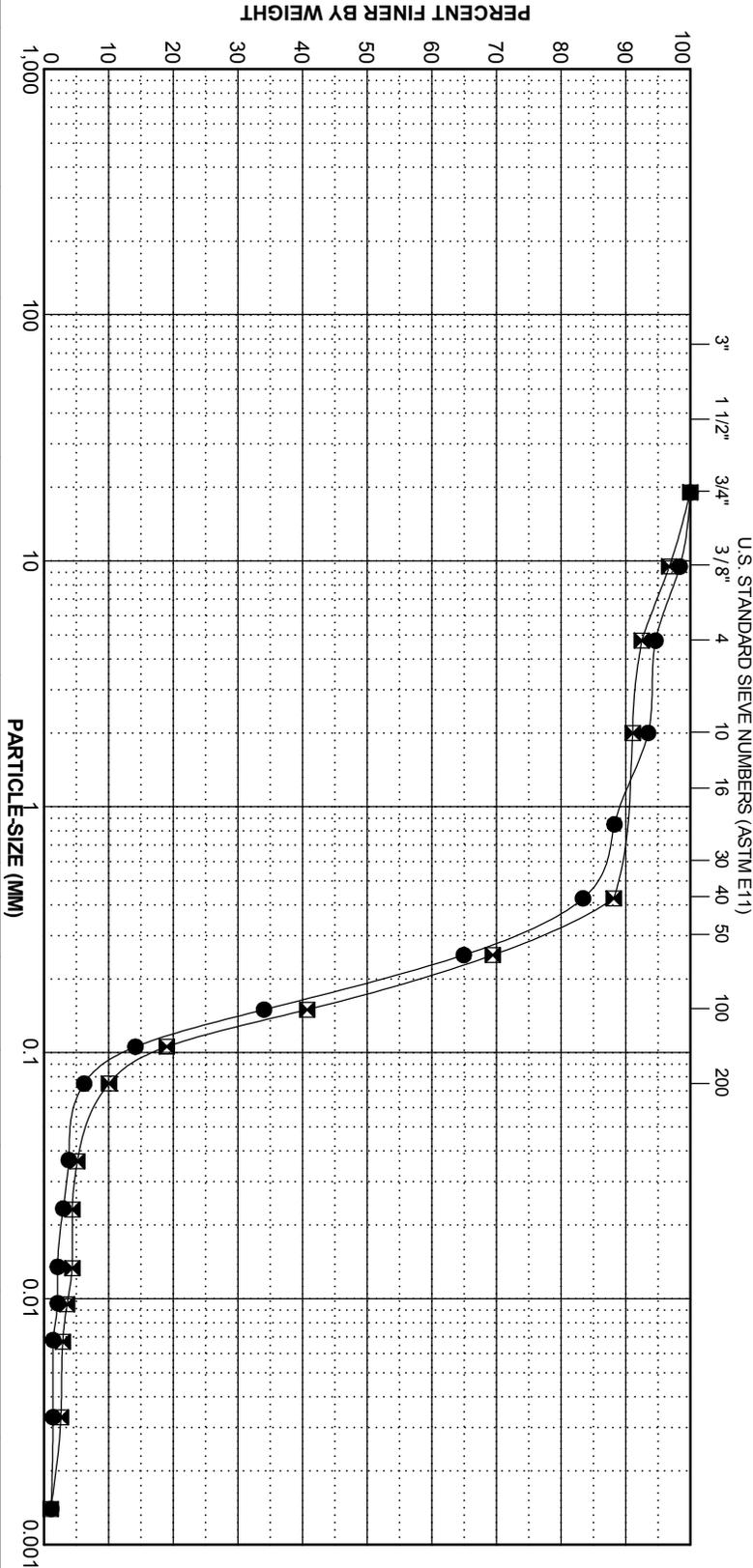
PARTICLE-SIZE ANALYSIS TEST RESULTS

PBS PROJECT NUMBER:
63797

PARTICLE-SIZE ANALYSIS-RJ LEE GRP 63797 RESULTS.GPJ PBS DATA\TMPL_GEO.GDT PRINT DATE: 10/24/17 8PG

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-1888A	B3BJJ6	92.7	18	0.2	0.2	0.1	0.09	0.05	5	88	6
☒	H-1888B	B3BX69	93.2	17	0.2	0.2	0.1	0.07	0.03	8	82	10

Columbia Basin Analytical Laboratories | 2710 North 20th Avenue, Pasco, WA 99301 | 509.545.4989

WWW.RJLEEGROUP.COM

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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: 10/24/2017
Sample Delivery Group No.: W709048
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 ³)	Dist. between manometers, L (cm)	Specimen area, A (cm ²)	Total discharge time, t (sec)	Head diff. betw. manometers, h (cm)	Avg. Hydraulic Conductivity, k (cm/s)
B3BX69	H-0188B	10/21/2017	48	7.62	45.84	420	63.0	3.15E-04

SHEET 1 OF 1

REVIEWED BY: A. Swenson, P.E.

SAMPLE ISSUE RESOLUTION (SIR) REPORT	SIR Number: SIR18-0367 Rev. Number: 0 Date Initiated: 01/11/2018
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SAMPLE EVENT INFORMATION

SAF NUM(S): F16-040
LABORATORY: RJL-GT

SAMPLING INFORMATION

NUMBER OF SAMPLES: 2
SAMPLE NUMBERS: B3BJJ6, B3BX69
SAMPLE MATRIX: SOIL
SDG NUM(S): W709048

ISSUE BACKGROUND

CLASS: Sample Management Issues
TYPE: Addition of Analyses
DESCRIPTION: D422_PARTICLE SIZE analysis indicated that D2434_PERMEABILITY should be run.

RESOLUTION

PROPOSED RESOLUTION: D5084_HYDRAULIC CONDUCTIVITY should be canceled from B3BX69.
 D2434_PERMEABILITY should be added to B3BX69
 D2434_PERMEABILITY should be canceled on sample B3BJJ6

FINAL RESOLUTION: Accept proposed resolution

SUBMITTED BY:

TOLE, KM 01/11/2018

ACCEPTED BY:

NAGEL, SE 01/11/2018

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		FIG-040-257	PAGE 1 OF 1
COLLECTOR	MIKE ESPARZA CHPRC	COMPANY CONTACT	LYNCH, SA 373-5586	PROJECT COORDINATOR	PRICE CODE 8H
SAMPLING LOCATION	C9715, I-005	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.	HWP-N-645-6-54	ACTUAL SAMPLE DEPTH	304343
SHIPPED TO	BJ LEE - GEOTECHNICAL	OFFSITE PROPERTY NO.	N/A	BILL OF LADING/AIR BILL NO.	N/A
MATRIX*	*Contains Radioactive Material at concentrations that are not be regulated for transportation per 49 CFR/DATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1. L=Air D=Drum L=Liquids DS=Drum Solids L=Liquid O=Oil S=Soil SE=Sediment T=Tissue V=Vegetation W=Water WI=Wipe X=Other	PRESERVATION	None	HOLDING TIME	None
		TYPE OF CONTAINER	Split Spoon Liner	NO. OF CONTAINER(S)	1
		VOLUME	1000g	SAMPLE ANALYSIS	D5084, HYDRDA ULC CONDUCTIVITY : COMMON;
SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME		
B3BX69	SOIL	09/11/17	1147	L.N & R B 93.23 to 94.23	

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CHAIN OF POSSESSION		SIGN/PRINT NAMES		SPECIAL INSTRUCTIONS	
REMOVED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	TRVL-17-163; ** 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 the Particle Size (Dry Sieve) analysis to determine if they should proceed with Permeability by D2434 or Hydraulic Conductive by D5084.	
CHPRC	09/11/17	SSU-1	09/11/17		
REMOVED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
SSU-1	SEP 12 2017 0700	Janelle Zunker CHPRC	SEP 12 2017 6:00		
REMOVED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
Janelle Zunker	SEP 12 2017 10:27	Janelle Zunker	SEP 12 2017 10:27		
REMOVED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
REMOVED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
REMOVED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
REMOVED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		

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

PRINTED ON 8/1/2017 FSR ID = FSR46342 TRVL NUM = TRVL-17-163 A-6003-618 (REV 2)

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY / SAMPLE ANALYSIS REQUEST		F16-040-164	PAGE 1 OF 1
COLLECTOR MAKE ESPARZA CHPRC	COMPANY CONTACT LYNCH, SA	TELEPHONE NO. 373-5586	PROJECT COORDINATOR LYNCH, SA	PRICE CODE 8H	DATA TURNAROUND 30 Days / 30 Days
SAMPLING LOCATION C9715, 1-005	PROJECT DESIGNATION 100-4R-3 Long Term & Interim Action Monitoring - Soil	FIELD LOGBOOK NO. HNF-N-645-6-54	ACTUAL SAMPLE DEPTH 89.23' to 94.23'	SAF NO. F16-040	METHOD OF SHIPMENT GOVERNMENT VEHICLE ORIGINAL
ICE CHEST NO. NA	OFFSITE PROPERTY NO. NA	NO. OF CONTAINER(S) 1			
SHIPPED TO RJ LEE - GEOTECHNICAL	PRESERVATION None	HOLDING TIME 6 Months			
	TYPE OF CONTAINER Split Spoon Liner				
	VOLUME 1000g				
	SAMPLE ANALYSIS SEE ITEM (1) IN SPECIAL INSTRUCTIONS				
	BILL OF LADING/AIR BILL NO. NA				

MATRIX*	POSSIBLE SAMPLE HAZARDS/ REMARKS	SPECIAL HANDLING AND/OR STORAGE
Air Drum DS-Drum Solids L=Liquid O=Oil S=Soil SF=Sediment T=Tissue V=Vegetation W=Water WI=Wipe X=Other	*Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR/JATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.	NA

LINE C
 92.73' to 93.23'
 10.9°C

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME
B3BJ16	SOIL	09/11/17	1147

CHAIN OF POSSESSION		SIGN/ PRINT NAMES		SPECIAL INSTRUCTIONS	
RELINQUISHED BY/REMOVED FROM CHPRC	DATE/TIME 09/11/17	RECEIVED BY/STORED IN SSU-1	DATE/TIME 09/11/17	TRVL-17-163; ** 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 SEP 12 2017 610	RECEIVED BY/STORED IN CHPRC	DATE/TIME SEP 12 2017 0710		
RELINQUISHED BY/REMOVED FROM Janaite Zuberg	DATE/TIME SEP 12 2017 1027	RECEIVED BY/STORED IN Janaite Zuberg	DATE/TIME SEP 12 2017 1027		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
LABORATORY SECTION	RECEIVED BY	TITLE	DATE/TIME		
FINAL SAMPLE DISPOSITION	DISPOSAL METHOD	DISPOSED BY	DATE/TIME		