April 16, 2015

CH2M HILL Plateau Remediation Company
2420 Stevens Center Place
P.O. Box 1600
Richland, WA 99352
Attn.: Tracey A. Burch

Subject: Geotechnical Laboratory Testing Services, Data Deliverable for SDG # WA241120140002, 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 #) WA241120140002.

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 # WA241120140002, has been assigned a PBS Geotechnical Lab Sample number per the below table.

CHPRC Sample #	SDG #	Geotechnical Lab Sample #
B2XN95	WA241120140002	H-0020

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.

April 16, 2015

Dr. Heinz Huber — Date
Laboratory Manager, Columbia Basin Analytical Laboratories

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

Attachment 1

PBS Geotechnical laboratory Testing Results, SDG # WA241120140002,
dated March 13, 2015

April 16, 2015

PBS | Engineering + Environmental

March 13, 2015

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. WA241120140002
PBS Project No. 63737.000

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 WA241120140002.

We performed the following tests:

- Carbonate Content (ASTM D4373)
- Grain Size Analysis - Hydrometer (ASTM D422)
- Hydraulic Conductivity – Constant Head (ASTM D2434)

The appropriate permeability/hydraulic conductivity test (ASTM D2434 or D5084) was selected based on the texture characteristics of the sample received, per section 3.2.2 of the contract. The tests were performed in general accordance with the above-mentioned ASTM Standards, except for the following cases:

- **Grain Size Analysis - Hydrometer (ASTM D422):** The sample did not contain the designated approximate minimum mass of sample based on the nominal diameter of the largest soil particles. The test was performed on the sample mass available, per the direction of RJ Lee and CHPRC.

- **Hydraulic Conductivity – Constant Head (ASTM D2434):** The sample was not tested in a permeameter cylinder appropriately sized based on the maximum particle size of the soil due to the lack of adequate sample volumes provided. The test was performed in the closest appropriately sized cylinder available for the volume of sample provided, 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

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.

03/13/2015

Timothy J. North, P.E.
Project Geotechnical Engineer

Nathan A. Bowles, P.E.
Senior Engineer/Operations Manager

TN/NB

Attachments: Report of Laboratory Testing – Carbonate Content
Report of Laboratory Testing – Grain-size Analysis - Hydrometer
Report of Laboratory Testing – Hydraulic Conductivity – Constant Head
Chain of Custody

RJ LEE GROUP
DELIVERING SCIENTIFIC RESOLUTION

REPORT OF LABORATORY TESTING

Report to:	CH2M-Hill - Plateau Remidation 2420 Stevens Center Place P.O. Box 1600 Richland, WA 99352	**Date:** **Sample Delivery Group No.:** **Sample Authorization No.:**	3/13/2015 WA241120140002 F13-046

Project:	CHPRC Laboratory	**Project No.:**	63797.000
Report of:	Carbonate Content (ASTM D4373)	**Lab Technician:**	B. Russell

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

Rapid Determination of Carbonate Content (ASTM D4373).
The test specimen was dried and pulverized to pass the No. 40 sieve. One gram of the pulverized sample was placed into the reactor along with the acid solution and gently mixed to initiate reaction. If there was no pressure response, but a minor reaction, the trial was repeated with larger sample sizes. After 10 minutes of reaction time, the pressure value was read and recorded. If, necessary, the pressure was read over longer periods of time in accordance with ASTM D4373.

LABORATORY TEST RESULTS

Rapid Determination of Carbonate Content

Customer Sample Number	Laboratory Sample Number	Date of Analysis	Quantity of sample used, (g)	CO_2 Pressure (kPa)	Calcite Equivalent (%$CaCO_2$)
B2XN95	H-0020	2/2/2015	1.00	0.0	0.0

SHEET 1 OF 1 REVIEWED BY: T. North, P.E.

RJ LEE GROUP
DELIVERING SCIENTIFIC RESOLUTION

REPORT OF LABORATORY TESTING

Report to:	CH2M-Hill - Plateau Remediation	**Date:**	3/13/2015
	2420 Stevens Center Place	**Sample Delivery Group No.:**	WA241120140002
	P.O. Box 1600	**Sample Authorization No.:**	F13-046
	Richland, WA 99352		

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

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. 200 sieve. The results of the mechnical grain size analyses and hydrometer testing are plotted on the attached Figures (Particle Size Analysis Test Results - Hydrometer - Pages 1 through 4).

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.	⅜-in.	No. 4	No. 10	No. 20	No. 40	No. 100	No. 140	No. 200
B2XN95	H-0020	1/29/2015	100	68.1	63.6	55.5	49.9	44.6	41.3	32.4	13.7	8.2	5.5

REVIEWED BY: T. North, P.E.

RJ LEE GROUP
DELIVERING SCIENTIFIC RESOLUTION

REPORT OF LABORATORY TESTING

Report to:	CH2M-Hill - Plateau Remediation 2420 Stevens Center Place P.O. Box 1600 Richland, WA 99352	**Date:** **Sample Delivery Group No.:** **Sample Authorization No.:**	3/13/2015 WA241120140002 F13-046

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

Particle/Grain Size Analysis - Hydrometer (ASTM D422):
See sheet 1 of 3

LABORATORY TEST RESULTS

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

Customer Sample Number	Lab 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 (%)
B2XN95	H-0020	0.035	4.6	0.023	3.7	0.013	3.2	0.009	2.8	0.007	2.3	0.003	1.3	0.001	1.3

SHEET 2 OF 3

REVIEWED BY: T. North, P.E.

PARTICLE-SIZE ANALYSIS 63797_RESULTS.GPJ PBS_DATATMPL_GEO.GDT PRINT DATE: 3/4/15:TJN

RJ LEE GROUP
DELIVERING SCIENTIFIC RESOLUTION

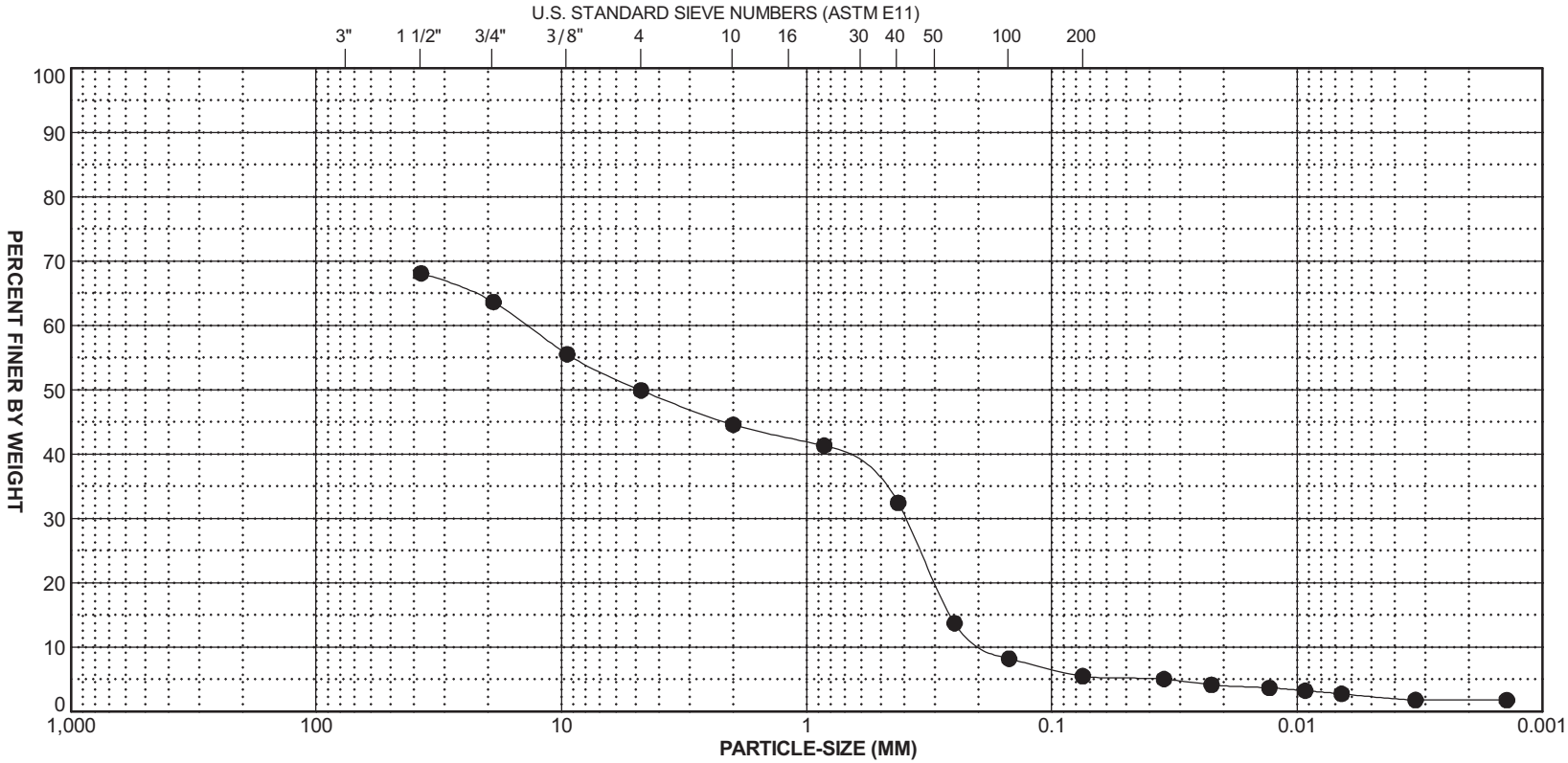
PARTICLE-SIZE ANALYSIS TEST RESULTS

CHPRC - GEOTECHNICAL LABORATORY

PBS PROJECT NUMBER: 63797

TEST METHOD: ASTM C136

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



KEY	LAB 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-020	B2XN95	150.4		13.9	4.8	0.4	0.2	0.03	18	44	5

RJ LEE GROUP
DELIVERING SCIENTIFIC RESOLUTION

REPORT OF LABORATORY TESTING

Report to:	CH2M-Hill - Plateau Remediation	**Date:**	3/13/2015
	2420 Stevens Center Place	**Sample Delivery Group No.:**	WA241120140002
	P.O. Box 1600	**Sample Authorization No.:**	F13-046
	Richland, WA 99352		

Project:	CHPRC Laboratory	**Project No.:**	63797.000
Report of:	Hydraulic Conductivity - Constant Head (ASTM D2434)	**Lab Tech:**	B. Russell

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

Hydraulic Conductivity - Constant Head (ASTM D2434).
The hydraulic conductivity 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

Hydraulic Conductivity - 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 dif. betw. manometers, h (cm)	Avg. Hydraulic Conductivity, k (cm/s)
B2XN95	H-0020	2/3/2015	237	7.62	45.843	300	61.3	2.27E-03

SHEET 1 OF 1

REVIEWED BY: T. North, P.E.

WA2411201400002

CH2MHill Plateau Remediation Company	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		F13-046-057	PAGE 1 OF 1
COLLECTOR R CROW	**COMPANY CONTACT** TODAK, D	**TELEPHONE NO.** 376-6427	**PROJECT COORDINATOR** TODAK, D	**PRICE CODE** 8H **AIR QUALITY** ☐ **DATA TURNAROUND** 30 Days / 30 Days
SAMPLING LOCATION C8290, I-005	**PROJECT DESIGNATION** 100-KR-4 Long Term & Interim Action Monitoring - Soil		**SAF NO.** F13-046	
ICE CHEST NO.	**FIELD LOGBOOK NO.** HNF-N-507-~~28~~-78	**ACTUAL SAMPLE DEPTH** 150.7 - 153.2	**COA** 300085ES10	**METHOD OF SHIPMENT** FEDERAL EXPRESS
SHIPPED TO ~~Shaw Group~~ RJ LEE JLH 11/7/14	**OFFSITE PROPERTY NO.** SEE PTR		**BILL OF LADING/AIR BILL NO.** SEE PTR	

ORIGINAL

10 of 11

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 be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.

SPECIAL HANDLING AND/OR STORAGE

PRESERVATION	None
HOLDING TIME	None
TYPE OF CONTAINER	Split Spoon Liner
NO. OF CONTAINER(S)	1
VOLUME	1000g
SAMPLE ANALYSIS	SEE ITEM (1) IN SPECIAL INSTRUCTIONS

WA2411201400002
H-0020

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME	
B2XN95	SOIL	NOV 18 2014	1300	✓

April 16 2015

CHAIN OF POSSESSION	SIGN/ PRINT NAMES	
RELINQUISHED BY/REMOVED FROM R CROW CHPRC	DATE/TIME NOV 18 2014 1450	RECEIVED BY/STORED IN SSU-1	DATE/TIME NOV 18 2014 1450
RELINQUISHED BY/REMOVED FROM SSU-1	DATE/TIME 11/21/14 0700	RECEIVED BY/STORED IN R.A. SHEPARD CHPRC	DATE/TIME 11/21/14 0700
RELINQUISHED BY/REMOVED FROM R.A. SHEPARD CHPRC	DATE/TIME 11/21/14 0710	RECEIVED BY/STORED IN SSU #1	DATE/TIME 11/21/14 0710
RELINQUISHED BY/REMOVED FROM SSU-1	DATE/TIME NOV 24 2014	RECEIVED BY/STORED IN L.D. Wall CHPRC	DATE/TIME NOV 24 2014
RELINQUISHED BY/REMOVED FROM L.D. Wall CHPRC	DATE/TIME NOV 24 2014 1335	RECEIVED BY/STORED IN R.A. Shepard/CHPRC	DATE/TIME NOV 24 2014 1335
RELINQUISHED BY/REMOVED FROM R.A. Shepard/CHPRC	DATE/TIME NOV 24 2014 1453	RECEIVED BY/STORED IN Lopez group	DATE/TIME NOV 24 2014 1453
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME

SPECIAL INSTRUCTIONS

** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF. 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. TRVL-14-137
(1) Particle Size (Dry Sieve) - D422; Permeability - D2434; Saturated Hydraulic Conductivity; Saturated Hydraulic Conductivity {Hydraulic Conductivity, No CAS}; Calcium Carbonate Content;

11/24/14

TRVL-14-137

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

PRINTED ON 8/6/2014

A-6003-618 (REV 2)

RJ LEE GROUP

Geotechnical Laboratory Sample Receipt

Date/Time Received: 11/24/14 2:53

SDG#: WA24112014 0002

Work Order Number: 300085ES10

SAF# F13-046-057

Shipping Container Identification: _____

1. Custody Seals on shipping container intact? Yes [✓] No [ ]
2. Custody Seals dated and signed? Yes [✓] No [ ]
3. Chain-of-Custody record present? Yes [✓] No [ ]
4. Cooler temperature NA
5. Vermiculite/packing materials is Wet [ ] Dry [X]
6. Number of samples in shipping container: 1
7. Samples have:
   - [✓] tape
   - [ ] hazard labels
   - [✓] custody seals
   - [✓] appropriate sample labels
8. Samples are:
   - [✓] in good condition for the geotechnical tests required
   - [ ] leaking/desiccated
   - [ ] broken or disaggregated
9. Were any anomalies identified in sample receipt? Yes [ ] No [X]
10. Description of anomalies (include sample numbers):
11. Rad Screen Performed: NA
12. Chain of Custody # F13-046-057

Comments: _____

Sample Custodian/Laboratory: Christina Lopez Date: 11/24/14

Telephoned to: _____ On _____ by _____