0099259

Shaw
Shaw Environmental & Infrastructure, Inc.

Geotechnical Laboratory
304 Directors Drive
Knoxville, TN 37923
(865) 690-3211

EBER0311085

CERTIFICATE OF ANALYSIS

Mr. Michael Neely
CH2M Hill Plateau Remediation Company
P.O. Box 1600
Mail Stop – B6-06
Richland, WA 99352

April 19, 2011

This is the Certificate of Analysis for the following samples:

Shaw Project ID: Eberline Analytical
Shaw Project Number: 139736
Date Received by Lab: 03/28/11
Number of Samples: One (1)
Sample Type: Soil

I. Introduction/Case Narrative

One (1) soil sample was received by the Shaw Geotechnical Laboratory on March 28, 2011. The sample was submitted for determination of bulk density, moisture content, particle size and hydraulic conductivity/permeability as listed on the Chain of Custody/Sample Analysis Request. The sample number for the received sample was B2C7X1.

Please see Appendix A, Sample Number Cross Reference List; Appendix B, Analysis Results; and Appendix C, Chain-of-Custody/Sample Receipt Records

"I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the laboratory manager or a designee, as verified by the following signature."

Reviewed and Approved:

R. Gregory Bennett
Geotechnical Laboratory Manager, Technology Applications Group

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II. Analytical Results/Methodology

REFERENCES: United Nations, *Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria*, third ed. New York, 1999. United States Army Corps of Engineers (USACE), Engineer Manual 1110-2-1906, *Laboratory Soils Testing*, appendix II, 1970; United States Environmental Protection Agency, SW846, *Test Methods for Examining Solid Waste, Physical/Chemical Methods*, 3rd ed., Nov 1986 (EPA SW-846). Annual Book of ASTM Standards, Section 4, Construction, Volume 04.08, *Soil and Rock (I)*, and Volume 04.09, *Soil and Rock (II)*, 2008. Shaw Environmental and Infrastructure, Standard Operating Procedures.

Bulk Density ..... **ASTM D 2937**
Particle Size (sieve only) ..... **ASTM D 422**
Permeability of Granular Soils ..... **ASTM D 2434**

III. Quality Control

Quality control checks such as duplicates and spikes (QC samples), are not normally applicable to geotechnical testing. This is due largely to the inability of obtaining samples with known characteristics, the heterogeneous nature of the samples, and quality control procedures built-in to the analytical method.

QC measures to ensure accuracy and precision of test results include the following:

- 100% verification of all numerical results - raw data entries, transcriptions and calculations entered by lab technicians are checked, recalculated and verified. Most data calculations are performed by computer programs.

- Data validation through test reasonableness - summaries of all test results for individual reports are reviewed to determine the overall reasonableness of data and to determine the presence of any data that may be considered outliers.

- Quality control procedures are built into most standardized geotechnical procedures. For example, liquid limit and plastic limit analyses call for re-analyses and specify acceptance criteria.

- Routine instrument calibration - instruments, gauges and equipment used in testing are calibrated on a routine basis. All instrument calibration follows ASTM or manufacturer guidelines.

- Maintenance of all past calibration records - calibration records and certification documents of all instruments, gauges and equipment are updated routinely and maintained in the Quality Control Coordinators Quality/Operations files.

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- Certified and trained personnel - all technicians are trained in the application of standard laboratory procedures for geotechnical analyses as well as the quality assurance measures implemented by Shaw.

- Quantitative analyses frequently used in geotechnical/physical testing programs do not use QC tools common to wet chemistry or radiochemistry laboratories. Measures not employed in the analysis of samples reported in this report include: laboratory control samples (LCS), blanks, matrix spikes (MS), duplicate analyses, dilutions, digestions, correction factors, surrogate sample analyses, detection limit determinations, control charts, and/or tentatively identified compounds (TICs).

IV. Data Qualification

None

Appendix A
Sample Cross-Reference List

Report No.: EBER0311085
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Client: CH2M Hill Plateau Remediation Company
Shaw Project Name: Eberline Analytical
Shaw Project No.: 139736

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SAMPLE NUMBER CROSS-REFERENCE LIST

Lab Sample ID	Client Sample ID	MATRIX
SEK 5641	**B2C7X1**	**SOIL**

Appendix B
Data Results

Report No.: EBER0311085
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BULK DENSITY/DRY DENSITY
ASTM D 2937

PROJECT NAME: **Eberline Analytical**

PROJECT NUMBER: **139736.14900000**

LAB SAMPLE NUMBER	CLIENT SAMPLE NUMBER	AVERAGE LENGTH, inches	AVERAGE DIAMETER, inches	WET WEIGHT, grams	MOISTURE CONTENT, %	BULK DENSITY, pcf	DRY DENSITY, pcf
SEK 5641	B2C7X1	6.0037	3.8668	2737.91	6.0	148.0	139.6

Moisture content calculated by ASTM D 2216 based on sample dry weight.

Bulk density is the weight of wet sample divided by the volume of the wet sample (as-received).

Dry density is the weight of the dry sample solids divided by the volume of the original sample.

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PARTICLE-SIZE DISTRIBUTION
ASTM D 422

Project Name Eberine

Project No. 139736.14900000

Field Sample No. B2C7X1

Lab Sample No. SEK 5641

Moisture Content = 6.0%

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	83.4%
	0.75"	19.000	65.4%
	0.375"	9.500	43.9%
	#4	4.750	27.6%
	#10	2.000	21.3%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	18.4%
	#40	0.425	16.7%
	#60	0.250	13.5%
	#100	0.149	8.4%
	#140	0.106	4.5%
	#200	0.075	3.3%

72.4% Gravel 24.2% Sand 3.3% Silt/Clay

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HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 2434

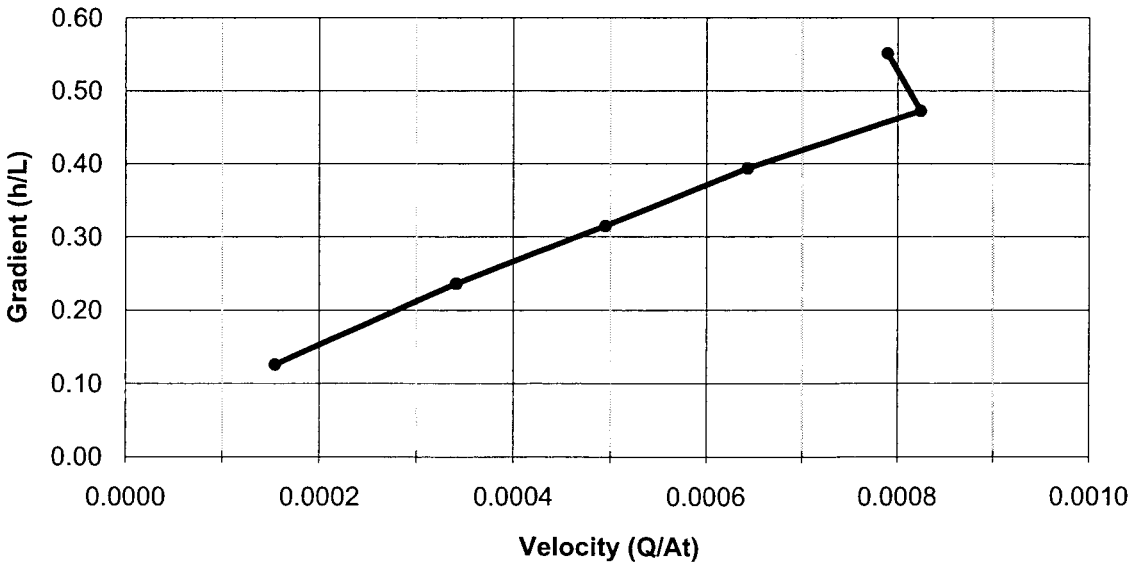
PROJECT NAME:	Eberline	CLIENT SAMPLE NO.	B2C7X1
PROJECT NO.	139736	LAB SAMPLE NO.	SEK 5641

Specimen diameter, cm	6.35	Void ratio	0.58
Specimen length, cm	12.45		
Wet weight of specimen, g.	703.04	Specific gravity of solids, assumed	2.80
Specimen cross-sect. area, cm^2	31.67		
Water content, %	0.48	Permeant Fluid	Tap Water
Wet unit weight, pcf	111.3	Material Used	-3/8 inch
Dry unit weight, pcf	110.8		

Trial no.	Head, h	Q, cm3	Time, sec	Q/At	h/L	Temp, °C	k, cm/s
1	0.8	12	2460	0.00015	0.1260	23.0	1.14E-03
2	1.5	22	2040	0.00034	0.2362	22.0	1.37E-03
3	2	47	3000	0.00049	0.3150	22.0	1.50E-03
4	2.5	55	2700	0.00064	0.3937	21.5	1.58E-03
5	3	36	1380	0.00082	0.4724	21.5	1.68E-03
6	3.5	42	1680	0.00079	0.5512	21.5	1.38E-03

Coefficient of Permeability, cm/s **1.68E-03**

Velocity vs. Hydraulic Gradient



Appendix C
Chain of Custody Records

CH2MHill Plateau Remediation Company	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST			F11-057-112	PAGE 1 OF 1
COLLECTOR Turner	**COMPANY CONTACT** RADLOFF, AW	**TELEPHONE NO.** 376-4554	**PROJECT COORDINATOR** RADLOFF, AW	**PRICE CODE** 8N	**DATA TURNAROUND** 45 Days / 45 Days
SAMPLING LOCATION C8187 (199-N-185); CONTENGENCY	**PROJECT DESIGNATION** 100 Area Remedial Investigation/Feasibility Analysis - 100-NR-2 - Sediment		**SAF NO.** F11-057	**AIR QUALITY** ☐	
ICE CHEST NO. GWS-237	**FIELD LOGBOOK NO.** HNF-N-486-1 pg 33	**ACTUAL SAMPLE DEPTH** 25.6-28.1 Ft	**COA** 300104ES10	**METHOD OF SHIPMENT** FEDERAL EXPRESS	**ORIGINAL**
SHIPPED TO Shaw Group	**OFFSITE PROPERTY NO.** SEE PTR		**BILL OF LADING/AIR BILL NO.** SEE PTR 796911757999		

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 may or may not be regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 5400.5 (1990/1993)

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

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME	
B2C7X1	SOIL	3-24-11	0905	X

12

Disposal weight: 7.6516

SEK 5641

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CHAIN OF POSSESSION		SIGN/ PRINT NAMES	
RELINQUISHED BY/REMOVED FROM	**DATE/TIME**	**RECEIVED BY/STORED IN**	**DATE/TIME**
A. Turner	3-24-11 1525	MO4/3554 R1	3-24-11 1525
RELINQUISHED BY/REMOVED FROM	**DATE/TIME**	**RECEIVED BY/STORED IN**	**DATE/TIME**
SSU-R1	MAR 25 2011 0720	J.R. Aguilar	MAR 25 2011 0720
RELINQUISHED BY/REMOVED FROM	**DATE/TIME**	**RECEIVED BY/STORED IN**	**DATE/TIME**
J.R. Aguilar	MAR 25 2011 0720	FEDEX	
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**

SPECIAL INSTRUCTIONS
** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF.
(1) Bulk Density - D2937; Particle Size (Dry Sieve) - D422; Permeability - D2434; Saturated Hydraulic Conductivity {Hydraulic Conductivity};

LABORATORY SECTION	**RECEIVED BY**	**TITLE** Scientist	**DATE/TIME** 3/28/11 9:30	
FINAL SAMPLE DISPOSITION	**DISPOSAL METHOD**	**DISPOSED BY**	**DATE/TIME**	

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