RECEIVED APRIL 20, 2011

0099260

Shaw Environmental & Infrastructure, Inc.

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

EBER0311084

CERTIFICATE OF ANALYSIS

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

April 18, 2011

This is the Certificate of Analysis for the following samples:

Shaw Project ID: Eberline Analytical
Shaw Project Number: 139736
Date Received by Lab: 03/24/11
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 24, 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 B2C499.

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

Shaw
Geotechnical Laboratory
Knoxville, TN
(865) 690-3211

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.

Shaw
Geotechnical Laboratory
Knoxville, TN
(865) 690-3211

- 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.: EBER0311084
Mr. Michael Neely
Client: CH2M Hill Plateau Remediation Company
Shaw Project Name: Eberline Analytical
Shaw Project No.: 139736

Shaw
Geotechnical Laboratory
Knoxville, TN
(865) 690-3211

SAMPLE NUMBER CROSS-REFERENCE LIST

Lab Sample ID	Client Sample ID	MATRIX
SEK 5635	**B2C499**	**SOIL**

Appendix B
Data Results

Report No.: EBER0311084
Mr. Michael Neely
Client: CH2M Hill Plateau Remediation Company
Shaw Project Name: Eberline Analytical
Shaw Project No.: 139736

Shaw
Geotechnical Laboratory
Knoxville, TN
(865) 690-3211

BULK DENSITY/DRY DENSITY
ASTM D 2937

PROJECT NAME: **Eberline**

PROJECT NUMBER: **139736.14800000**

LAB SAMPLE NUMBER	CLIENT SAMPLE NUMBER	AVERAGE LENGTH, inches	AVERAGE DIAMETER, inches*	WET WEIGHT, grams	MOISTURE CONTENT, %	BULK DENSITY, pcf	DRY DENSITY, pcf
SEK 5635	B2C499	5.6653	3.8712	2469.34	9.7	141.1	128.7

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.

Report No.: EBER0311084
Mr. Michael Neely
Client: CH2M Hill Plateau Remediation Company
Shaw Project Name: Eberline Analytical
Shaw Project No.: 139736

Shaw
Geotechnical Laboratory
Knoxville, TN
(865) 690-3211

PARTICLE-SIZE DISTRIBUTION
ASTM D 422

Project Name Eberine
Project No. 139736.14800000
Field Sample No. B2C499
Lab Sample No. SEK 5635
Moisture Content = 9.7%

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	77.4%
	0.75"	19.000	65.1%
	0.375"	9.500	55.2%
	#4	4.750	47.8%
	#10	2.000	43.7%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	41.9%
	#40	0.425	39.9%
	#60	0.250	27.7%
	#100	0.149	6.8%
	#140	0.106	4.0%
	#200	0.075	3.0%

52.2% Gravel 44.9% Sand 3.0% Silt/Clay

Report No.: EBER0311084
Mr. Michael Neely
Client: CH2M Hill Plateau Remediation Company
Shaw Project Name: Eberline Analytical
Shaw Project No.: 139736

Shaw
Geotechnical Laboratory
Knoxville, TN
(865) 690-3211

HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 2434

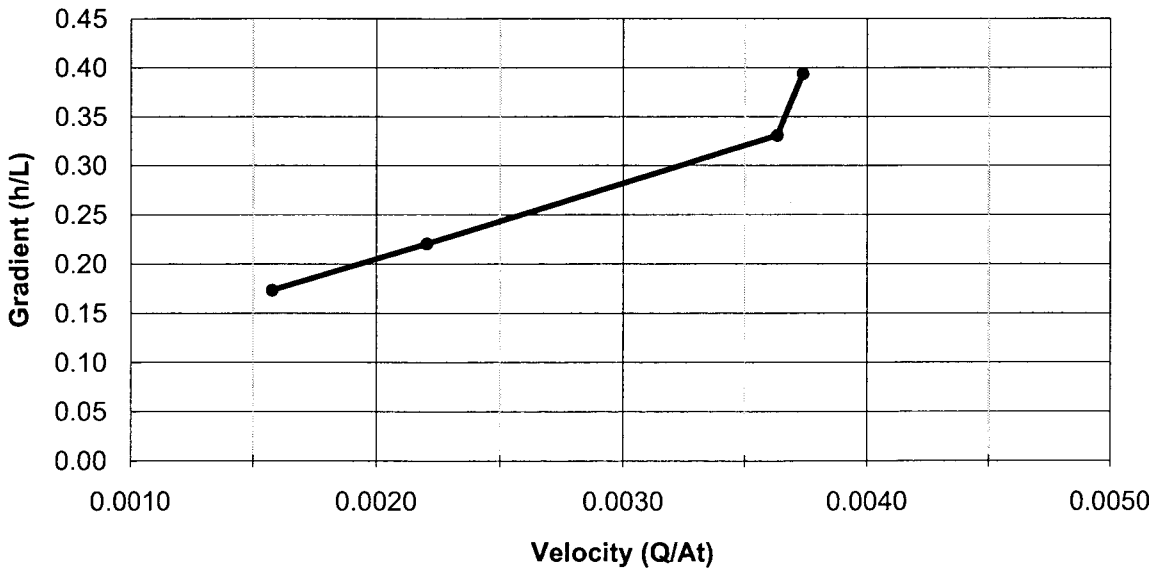
PROJECT NAME:	Eberline	CLIENT SAMPLE NO.	B2C499
PROJECT NO.	139736	LAB SAMPLE NO.	SEK 5635

Specimen diameter, cm	6.35	Void ratio	0.73
Specimen length, cm	12.80		
Wet weight of specimen, g.	658.90	Specific gravity of solids, assumed	2.80
Specimen cross-sect. area, cm^2	31.67		
Water content, %	0.22	Permeant Fluid	Tap Water
Wet unit weight, pcf	101.5	Material Used	-3/8 inch
Dry unit weight, pcf	101.2		

Trial no.	Head, h	Q, cm3	Time, sec	Q/At	h/L	Temp, °C	k, cm/s
1	1.1	42	840	0.00158	0.1732	23.5	8.39E-03
2	1.4	88	1260	0.00221	0.2205	23.0	9.31E-03
3	2.1	69	600	0.00363	0.3307	23.0	1.02E-02
4	2.5	71	600	0.00374	0.3937	23.0	8.84E-03

Coefficient of Permeability, cm/s	**1.02E-02**

Velocity vs. Hydraulic Gradient



Appendix C
Chain of Custody Records

CH2MHill Plateau Remediation Company | **CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST** | **F11-057-051** | **PAGE 1 OF 1**

COLLECTOR Turner	**COMPANY CONTACT** RADLOFF, AW	**TELEPHONE NO.** 376-4554	**PROJECT COORDINATOR** RADLOFF, AW
SAMPLING LOCATION C8187 (199-N-185); I-010	**PROJECT DESIGNATION** 100 Area Remedial Investigation/Feasibility Analysis - 100-NR-2 - Sediment		**SAF NO.** F11-057
ICE CHEST NO. GWS - 202	**FIELD LOGBOOK NO.** HNF-N-486 / pg 31	**ACTUAL SAMPLE DEPTH** 20-22.5 FT	**COA** 300104ES10
SHIPPED TO Shaw Group	**OFFSITE PROPERTY NO.** SEE PTR		**BILL OF LADING/AIR BILL NO.** SEE PTR 796902223845

PRICE CODE 8N **DATA TURNAROUND** 45 Days / 45 Days **AIR QUALITY** ☐ **METHOD OF SHIPMENT** FEDERAL EXPRESS **ORIGINAL**

(15)

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

Disposal weight: 6.85lb

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME	
B2C499	SOIL	3-22-11	1245	X

SEK 5635

11 of 11

CHAIN OF POSSESSION

RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME
A-Turner	3-22-11 1510	M04135S4 MOSS	1510
SSU-R1	MAR 23 2011 0800	J.R. Aguilar	MAR 23 2011 0800
J.R. Aguilar	MAR 23 2011 0800	FEDEX	

SPECIAL INSTRUCTIONS

** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF.☐☐** Physical Properties laboratory: Conduct the hydraulic conductivity test (ASTM D5084 or D2434) as appropriate to the sample matrix.
(1) Bulk Density - D2937; Particle Size (Dry Sieve) - D422; Permeability - D2434; Saturated Hydraulic Conductivity {Hydraulic Conductivity};

LABORATORY SECTION **RECEIVED BY** [signature]

FINAL SAMPLE DISPOSITION **DISPOSAL METHOD**

TITLE Scientist **DISPOSED BY**

DATE/TIME 3/24/11 1045 **DATE/TIME**

PRINTED ON 3/7/2011

A-6003-618 (REV 2)