



Shaw Environmental & Infrastructure, Inc.

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

EBER0211060  
KB  
3-22-11

**CERTIFICATE OF ANALYSIS**

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

March 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: 02/18/11  
Number of Samples: Two (2)  
Sample Type: Soil

**I. Introduction/Case Narrative**

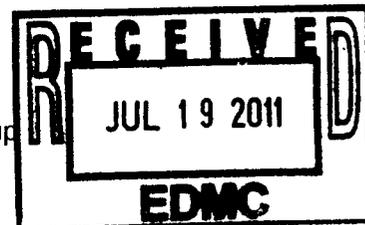
Two (2) soil samples were received by the Shaw Geotechnical Laboratory on February 18, 2011. The samples were submitted for determination of bulk density, moisture content, particle size, and hydraulic conductivity/permeability as listed on the Chain of Custody/Sample Analysis Requests. The sample numbers for the received samples were B29LX0 and B29HN8.

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



## 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.....	ASTM D 5084

## 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 heterogenous 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.

- 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**

Page 4 of 10  
Report No.: EBER0211060  
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**

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**SAMPLE NUMBER CROSS-REFERENCE LIST**

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Lab Sample ID	Client Sample ID	MATRIX
<b>SEK 5449</b>	<b>B29LX0</b>	<b>SOIL</b>
<b>SEK 5450</b>	<b>B29HN8</b>	<b>SOIL</b>

**Appendix B**  
**Data Results**



**PARTICLE-SIZE DISTRIBUTION  
 ASTM D 422**

Project Name Eberine

Field Sample No. B29HN8

Project No. 139736.12500000

Lab Sample No. SEK 5450

Moisture Content = 17.7%

**SIEVE ANALYSIS**

C O A R S E	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	100.0%

F I N E	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	98.4%
	#40	0.425	96.1%
	#60	0.250	92.7%
	#100	0.149	70.6%
	#140	0.106	50.8%
	#200	0.075	36.0%

0.0% Gravel

64.0% Sand

36.0% Silt/Clay

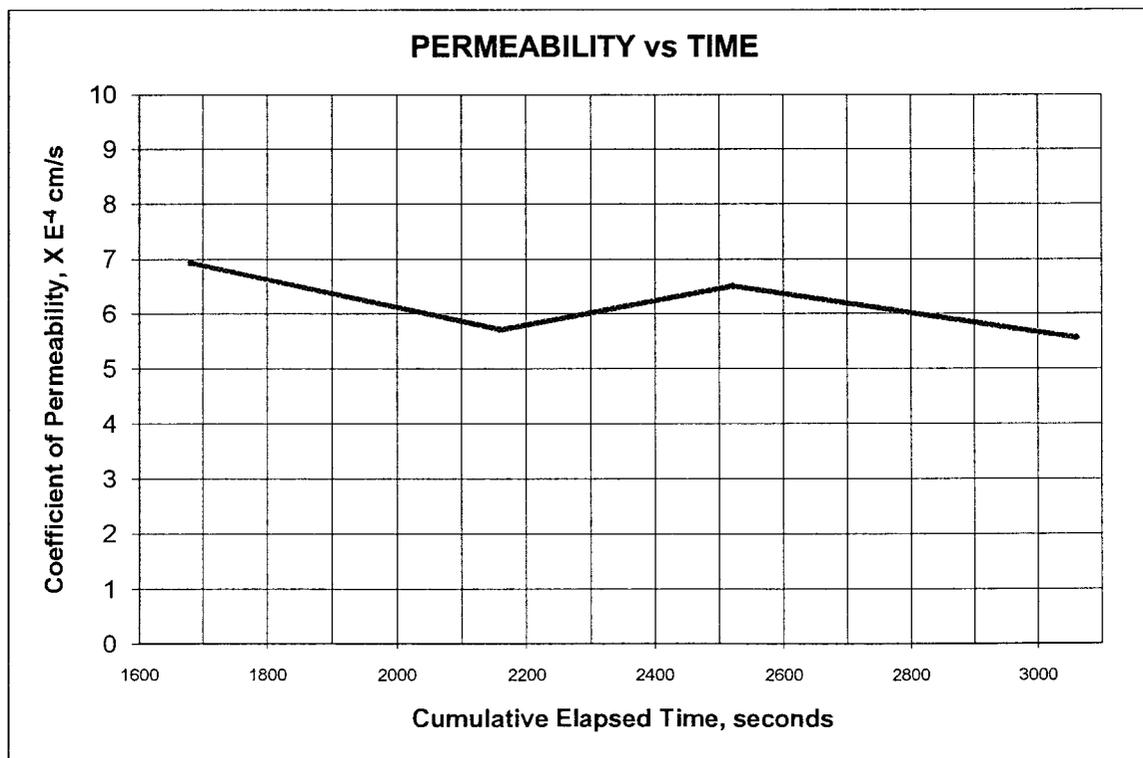
**HYDRAULIC CONDUCTIVITY / PERMEABILITY**  
**ASTM D 5084**

PROJECT NAME: Eberline  
 PROJECT NO. 139736.12500000

CLIENT SAMPLE NO. B29LX0  
 LAB SAMPLE NO. SEK 5449

	INITIAL	FINAL		
Specimen diameter, cm	4.89		Hydraulic gradient	4.1
Specimen length, cm	8.48		Min. consolidation stress, psi	2.0
Wet weight of specimen, g.	315.38		Max. consolidation stress, psi	2.5
Specimen cross-sect. area, cm <sup>2</sup>	18.78		Total backpressure, psi	69.5
Water content, %	6.5		Permeant Fluid	Deaired Tap Water
Wet unit weight, pcf	123.6			
Dry unit weight, pcf	116.0			
Est. degree of saturation, %	40.7	40.7		
Specific gravity of solids, assumed	2.65			

**Coefficient of Permeability, cm/s**      **6.2E-04**



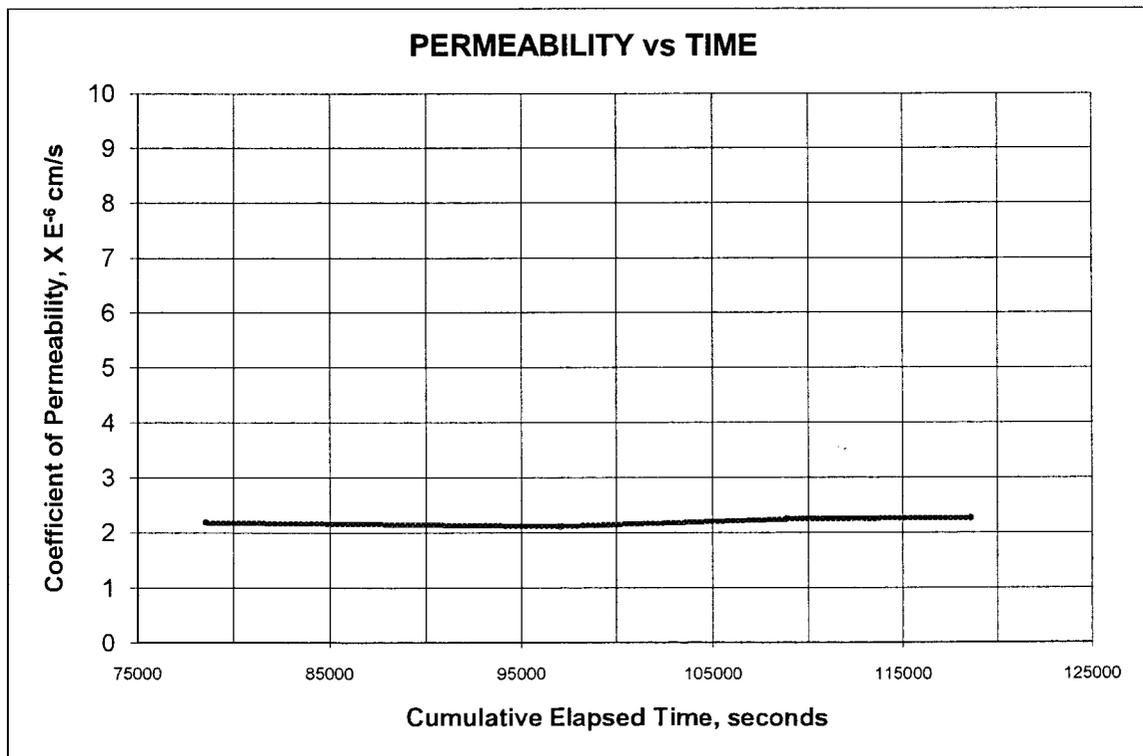
**HYDRAULIC CONDUCTIVITY / PERMEABILITY**  
**ASTM D 5084**

PROJECT NAME: Eberline  
 PROJECT NO. 139736.12500000

CLIENT SAMPLE NO. B29HN8  
 LAB SAMPLE NO. SEK 5450

	INITIAL	FINAL		
Specimen diameter, cm	7.34		Hydraulic gradient	19.3
Specimen length, cm	10.94		Min. consolidation stress, psi	2.0
Wet weight of specimen, g.	983.76		Max. consolidation stress, psi	4.0
Specimen cross-sect. area, cm <sup>2</sup>	42.31		Total backpressure, psi	31.0
Water content, %	17.7		Permeant Fluid	Deaired Tap Water
Wet unit weight, pcf	132.7			
Dry unit weight, pcf	112.7			
Est. degree of saturation, %	100.4	100.4		
Specific gravity of solids, assumed	2.65			

**Coefficient of Permeability, cm/s**      **2.2E-06**



**Appendix C**  
**Chain of Custody Records**

**CH2M Hill Plateau Remediation Company**

**COLLECTOR**  
D. Williams, J. H. ...

**SAMPLING LOCATION**  
C7686 (199-K-186), I-043

**ICE CHEST NO.**  
A203-139-04

**SHIPPED TO**  
Shaw Group

**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**

**COMPANY CONTACT**  
RADIOFF, A  
376-4554

**PROJECT COORDINATOR**  
RADIOFF, A W  
SAF NO. F10-207

**TELEPHONE NO.**  
376-4554

**PROJECT DESIGNATION**  
100 Area Remedial Investigation/Feasibility Analysis - 100-KR-4 Soils

**FIELD LOGBOOK NO.**  
A203-139-160

**ACTUAL SAMPLE DEPTH**  
100.0 to 100.5 ft

**COA**  
3024776510

**METHOD OF SHIPMENT**  
FEDERAL EXPRESS

**PRICE CODE**  
8N

**AIR QUALITY**

**DATA TURNAROUND**  
45 Days / 45 Days

**F10-207-111**

**PAGE 1 OF 1**

**OFFSITE PROPERTY NO.**  
SEE PTR

**BILL OF LADING/AIR BILL NO.**  
79677436091

**SEE PTR**  
7 lbs

**SEK 5440**

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

**SPECIAL HANDLING AND/OR STORAGE**

**SAMPLE NO.**  
B29LX0

**MATRIX\***  
SOIL

**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)

**CHAIN OF POSSESSION**

RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME
D. Williams	2-17-11 0700	M. Williams	2-17-11 0700
S. Williams	2-17-11 0700	em. Anwar	2-17-11 0700
em. Anwar	2-17-11 1400	FEALX	
FEALX			

**SPECIAL INSTRUCTIONS**

\*\* Physical Properties laboratory: Conduct the hydraulic conductivity test (ASTM 5084 or 2434) as appropriate to the sample matrix.  
(1) Bulk Density - D2937; Saturated Hydraulic Conductivity (Hydraulic Conductivity); Permeability - D2434 (Hydraulic Conductivity);

**ORIGINAL**

**LABORATORY SECTION**  
RECEIVED BY: [Signature]

**FINAL SAMPLE DISPOSITION**  
DISPOSAL METHOD: SCIENTIST

**RECEIVED BY**  
DATE/TIME: 2-18-11 / 11:00

**DISPOSED BY**  
DATE/TIME:

