

RECEIVED FEBRUARY 01, 2011



Shaw Environmental &amp; Infrastructure, Inc.

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

## CERTIFICATE OF ANALYSIS

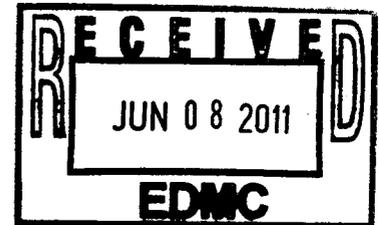
Mr. Michael Neely  
 CH2M Hill Plateau Remediation Company  
 P.O. Box 1600  
 Mail Stop – B6-06  
 Richland, WA 99352

February 1, 2011

EBER1210039  
 KB  
 2-8-11

This is the Certificate of Analysis for the following samples:

Shaw Project ID: Eberline Analytical  
 Shaw Project Number: 139736  
 Date Received by Lab: 12-09-11  
 Number of Samples: Three (3)  
 Sample Type: Soil



### I. Introduction/Case Narrative

Three (3) soil samples were received by the Shaw Geotechnical Laboratory on December 9, 2010. The samples were submitted for determination of bulk density, moisture content, particle size, and saturated hydraulic conductivity/ permeability as listed on the Chain of Custody/Sample Analysis Request. The sample numbers received were B27NB2, B27NB6, and B27NC0.

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 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  
Moisture Content of Soil and Rock .....ASTM D 2216  
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.

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Report No.: EBER1210039  
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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- 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

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Report No.: EBER1210039  
Mr. Michael Neely  
Client: CH2M Hill Plateau Remediation Company  
Shaw Project Name: Eberline Analytical  
Shaw Project No.: 139736

**Shaw**  
**Geotechnical Laboratory**  
**Knoxville, TN**  
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**SAMPLE NUMBER CROSS-REFERENCE LIST**

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<b>Lab Sample ID</b>	<b>Client Sample ID</b>	<b>MATRIX</b>
<b>SEK 5208</b>	<b>B27NB2</b>	<b>SOIL</b>
<b>SEK 5209</b>	<b>B27NB6</b>	<b>SOIL</b>
<b>SEK 5210</b>	<b>B27NC0</b>	<b>SOIL</b>





**PARTICLE-SIZE DISTRIBUTION**  
**ASTM D 422**

Project Name Eberine

Field Sample No. B27NB2

Project No. 139736.10800000

Lab Sample No. SEK 5208

Moisture Content = 21.3%

**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	99.9%
	#40	0.425	99.7%
	#60	0.250	99.4%
	#100	0.149	97.5%
	#140	0.106	93.6%
	#200	0.075	88.2%

0.0% Gravel

11.8% Sand

88.2% Silt/Clay



**PARTICLE-SIZE DISTRIBUTION**  
**ASTM D 422**

Project Name Eberine

Field Sample No. B27NC0

Project No. 139736.10800000

Lab Sample No. SEK 5210

Moisture Content = 14.2%

**SIEVE ANALYSIS**

C O A R S E	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	90.3%
	0.75"	19.000	64.3%
	0.375"	9.500	51.6%
	#4	4.750	49.2%
	#10	2.000	47.8%

F I N E	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	46.8%
	#40	0.425	44.6%
	#60	0.250	29.0%
	#100	0.149	12.8%
	#140	0.106	8.7%
	#200	0.075	6.6%

50.8% Gravel

42.5% Sand

6.6% Silt/Clay

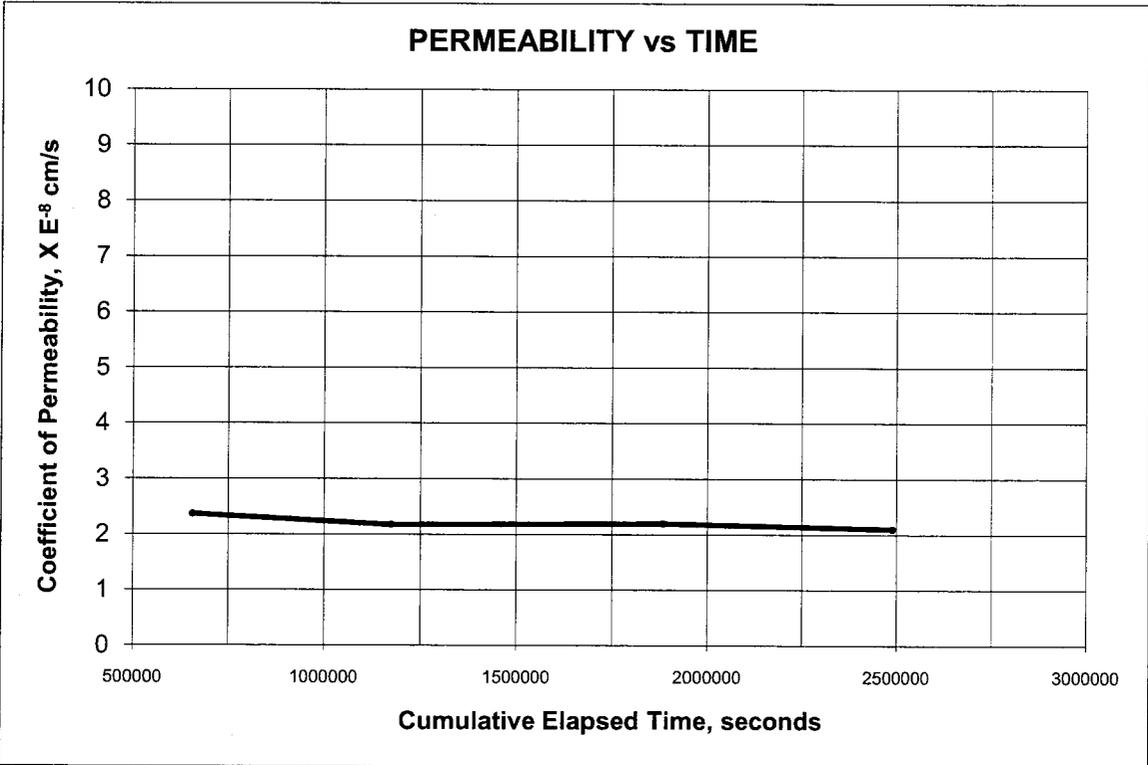
**HYDRAULIC CONDUCTIVITY / PERMEABILITY  
 ASTM D 5084**

PROJECT NAME:	Eberline	CLIENT SAMPLE NO.	B27NB2
PROJECT NO.	139736.10800000	LAB SAMPLE NO.	SEK 5208

	INITIAL	FINAL		
Specimen diameter, cm	7.32			
Specimen length, cm	11.85		Hydraulic gradient	23.8
Wet weight of specimen, g.	1040.08		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm <sup>2</sup>	42.03		Max. consolidation stress, psi	6.0
Water content, %	21.3		Total backpressure, psi	56.0
Wet unit weight, pcf	130.3			
Dry unit weight, pcf	107.5		Permeant Fluid	Deaired DI Water
Est. degree of saturation, %	104.5	104.5		
Specific gravity of solids, assumed	2.65			

**Coefficient of Permeability, cm/s      2.2E-08**



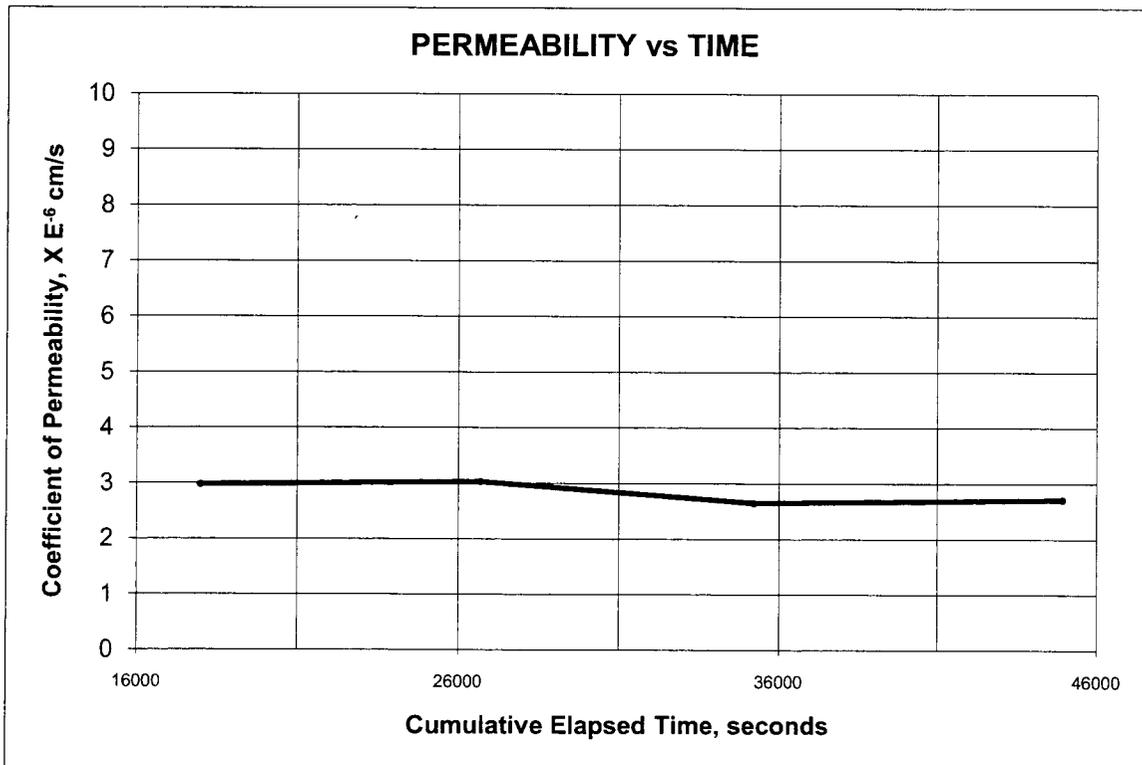
**HYDRAULIC CONDUCTIVITY / PERMEABILITY  
 ASTM D 5084**

PROJECT NAME: Eberline  
 PROJECT NO. 139736.10800000

CLIENT SAMPLE NO. B27NB6  
 LAB SAMPLE NO. SEK 5209

	INITIAL	FINAL		
Specimen diameter, cm	7.31		Hydraulic gradient	10.5
Specimen length, cm	13.36		Min. consolidation stress, psi	2.0
Wet weight of specimen, g.	1085.42		Max. consolidation stress, psi	4.0
Specimen cross-sect. area, cm <sup>2</sup>	41.92		Total backpressure, psi	56.0
Water content, %	24.5		Permeant Fluid	Deaired DI Water
Wet unit weight, pcf	121.0			
Dry unit weight, pcf	97.2			
Est. degree of saturation, %	92.4	92.4		
Specific gravity of solids, assumed	2.65			

**Coefficient of Permeability, cm/s 2.8E-06**



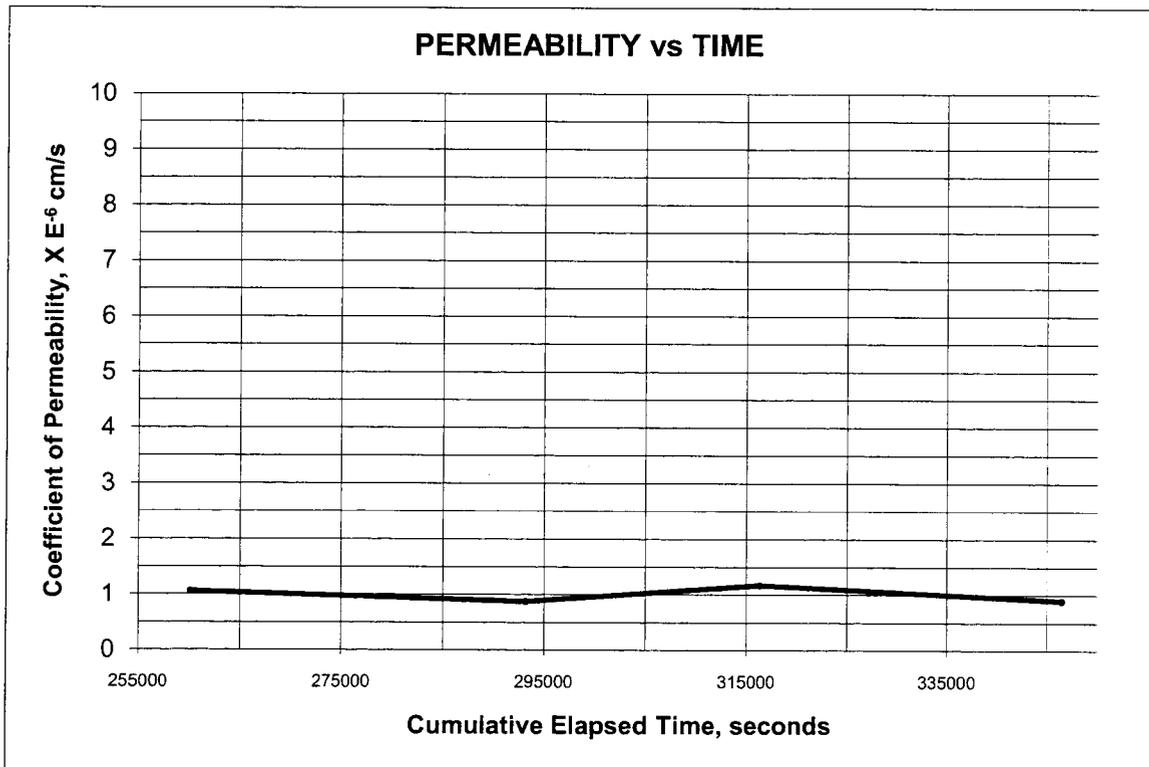
**HYDRAULIC CONDUCTIVITY / PERMEABILITY  
 ASTM D 5084**

PROJECT NAME: Eberline  
 PROJECT NO. 139736.10800000

CLIENT SAMPLE NO. B27NC0  
 LAB SAMPLE NO. SEK 5210

	INITIAL	FINAL		
Specimen diameter, cm	5.13			
Specimen length, cm	7.05		Hydraulic gradient	20.0
Wet weight of specimen, g.	291.79		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm <sup>2</sup>	20.69		Max. consolidation stress, psi	4.0
Water content, %	14.2		Total backpressure, psi	56.0
Wet unit weight, pcf	124.9			
Dry unit weight, pcf	109.3		Permeant Fluid	Deaired DI Water
Est. degree of saturation, %	73.4	73.4		
Specific gravity of solids, assumed	2.65			

**Coefficient of Permeability, cm/s      1.0E-06**



**CH2M Hill Plateau Remediation Company**

**COLLECTOR**  
*Farris Higueras, Junker*

**SAMPLING LOCATION**  
 C7783 (199-82-15); I-002

**ICE CHEST NO.**  
 GWS-107

**SHIPPED TO**  
 Shaw Group

**COMPANY CONTACT**  
 DALE DYKEMAN

**TELEPHONE NO.**  
 (509) 373-2530

**PROJECT COORDINATOR**  
 DYKEMAN, DL

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

**FIELD LOGBOOK NO.**  
 HMF-N-585-15 #17 151-1535 ft

**OFFSITE PROPERTY NO.**  
 SEE PTR

**SAF NO.**  
 F10-225

**COA**  
 300078ES10

**BILL OF LADING/AIR BILL NO.**  
 SEE PTR 794529951357

**F10-225-049**

**PRICE CODE**  
 8N

**AIR QUALITY**

**METHOD OF SHIPMENT**  
 FEDERAL EXPRESS

**PAGE 1 OF 1**

**DATA TURNAROUND**  
 45 Days / 45 Days

PRESERVATION	None	None	None
<b>HOLDING TIME</b>	None	6 Months	None
<b>TYPE OF CONTAINER</b>	Liner		Moisture Resistant <input type="checkbox"/>
<b>NO. OF CONTAINER(S)</b>	1		1
<b>VOLUME</b>	1000g		200g
<b>SAMPLE ANALYSIS</b>	SEE ITEM (1) IN SPECIAL INSTRUCTIONS		Moisture Content - D2216; <input type="checkbox"/>
<b>SAMPLE DATE</b>	12-6-10		
<b>SAMPLE TIME</b>	1245		

**SEK 5208**

Disposal weight 3062(g)

**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**

**CHAIN OF POSSESSION**

RELINQUISHED BY/REMOVED FROM	DATE/TIME	SIGN/PRINT NAMES	RECEIVED BY/STORED IN	DATE/TIME
<i>Carvin Farris/Calle Jones</i>	12-6-10 1600		SSU-RI	DEC 06 2010
SSU-RI	DEC 08 2010 0900		RECEIVED BY/STORED IN	DATE/TIME
<i>J.R. Aquino</i>	DEC 08 2010 0900		FEDEX	DEC 08 2010 0902
<i>J.R. Aquino</i>	DEC 08 2010 0900		RECEIVED BY/STORED IN	DATE/TIME
			<i>M. Boggin</i>	12-9-10/10:30
			RECEIVED BY/STORED IN	DATE/TIME
			RECEIVED BY/STORED IN	DATE/TIME
			RECEIVED BY/STORED IN	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.  \*\* Physical Properties laboratory: Conduct the hydraulic conductivity test (ASTM 5084 or 2434) as appropriate to the sample matrix.

(1) Permeability - D2434 {Hydraulic Conductivity}; Bulk Density - D2937; Particle Size (Dry Sieve) - D422; Saturated Hydraulic Conductivity {Hydraulic Conductivity};

**ORIGINAL**

**LABORATORY SECTION**  
 RECEIVED BY

**FINAL SAMPLE DISPOSITION**  
 DISPOSAL METHOD

**TITLE**

**DISPOSED BY**

**DATE/TIME**

**CH2MHill Plateau Remediation Company**

**COLLECTOR**  
*Fox, J. S. / Higueras, Z. / Kler*

**SAMPLING LOCATION**  
 C7783 (199-B2-15); I-003

**ICE CHEST NO.**  
 GWS-107

**CHAIN OF CUSTODY / SAMPLE ANALYSIS REQUEST**

**COMPANY CONTACT**  
 DALE DYEKMAN  
 (509) 373-2530

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

**FIELD LOGBOOK NO.**  
 HNF-N-535-15 #17155-V - 58.387

**OFFSITE PROPERTY NO.**  
 SEE PTR

**PROJECT COORDINATOR**  
 RADLOFF, AW

**SAF NO.**  
 F10-225

**COA**  
 300078E510

**BILL OF LADING / AIR BILL NO.**  
 796529951357

**F10-225-052**

**PRICE CODE** 8N

**AIR QUALITY**

**METHOD OF SHIPMENT**  
 FEDERAL EXPRESS

**PAGE 1 OF 1**

**DATA TURNAROUND**  
 45 Days / 45 Days

PRELIMINARY	PRESERVATION	HOLDING TIME	TYPE OF CONTAINER	NO. OF CONTAINER(S)	VOLUME	SAMPLE ANALYSIS	SAMPLE DATE	SAMPLE TIME
None	None	None	Moisture Resistant Cont	1	200g	Moisture Content - D216;	12-6-10	1435
None	6 Months	Liner	1	1000g	SEE ITEM (1) IN SPECIAL INSTRUCTIONS			

**SEK 5209**

Disposal weight 2849(g)

**CH2MHill Plateau Remediation Company**

**CHAIN OF POSSESSION**

RELINQUISHED BY / REMOVED FROM	DATE/TIME	RECEIVED BY / STORED IN	DATE/TIME
<i>Calc. in favor of Collins / Jones</i>	12/6/2010	SSU-RI	DEC 06 2010
SSU-RI	DEC 08 2010 0900	AR Aquiles	DEC 08 2010 0900
AR Aquiles	DEC 08 2010 0900	FEDEX	12-9-10 / 10:30
		M. Bologna	

**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 5084 or 2434) as appropriate to the sample matrix.

(1) Permeability - D2434 {Hydraulic Conductivity}; Bulk Density - D2937; Particle Size (Dry Sieve) - D422; Saturated Hydraulic Conductivity {Hydraulic Conductivity};

**LABORATORY SECTION**

**FINAL SAMPLE DISPOSITION**

**TITLE**

**DISPOSED BY**

**DATE/TIME**

**CH2MHill Plateau Remediation Company**

**COLLECTOR**  
Farr, S., Higueras, Zunker

**SAMPLING LOCATION**  
C7783 (199-82-15); I-004

**ICE CHEST NO.**  
GWS-107

**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**

**COMPANY CONTACT**  
DALE DYKMAN  
TELEPHONE NO. (509) 373-2530

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

**FIELD LOGBOOK NO.**  
HWF-12-585-15 #19 100, 5-163 g/g

**OFFSITE PROPERTY NO.**  
SEE PTR

**PROJECT COORDINATOR**  
DYEKMAN, DL

**SAF NO.**  
F10-225

**COA**  
300078ES10

**BILL OF LADING/AIR BILL NO.**  
SEE PTR 7965299551357

**F10-225-055**

**PRICE CODE**  
8N

**ATR QUALITY**

**METHOD OF SHIPMENT**  
FEDERAL EXPRESS

**PAGE 1 OF 1**

**DATA TURNAROUND**  
45 Days / 45 Days

PRESERVATION	None	None	None
<b>HOLDING TIME</b>	None	6 Months	None
<b>TYPE OF CONTAINER</b>	Liner		Moisture Resistant Cont
<b>NO. OF CONTAINER(S)</b>	1	1	1
<b>VOLUME</b>	1000g	200g	
<b>SAMPLE ANALYSIS</b>	SEE ITEM (1) IN SPECIAL INSTRUCTIONS D2216;		Moisture Content D2216;

Disposal weight 3075(g)

29

SEK 5210

**SAMPLE NO.** 15 of 15

**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)

**SPECIAL HANDLING AND/OR STORAGE**

**CHAIN OF POSSESSION**

RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME
Calvin Farr/S. Higueras/Zunker	12-7-10 1325	M.S. 213	12-7-10 1325
SSU-R	DEC 08 2010	J.R. Aquiles	DEC 08 2010
J.R. Aquiles	DEC 08 2010	FEDEX	12-9-10 10:50
FEDEX	12-9-10 10:50	M. Bergin	

**SPECIAL INSTRUCTIONS**  
\*\* The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GK1 applies to this SAF.  \*\* Physical Properties laboratory: Conduct the hydraulic conductivity test (ASTM 5084 or 2434) as appropriate to the sample matrix.  
(1) Permeability - D2434 {Hydraulic Conductivity}; Bulk Density - D2937; Particle Size (Dry Sieve) - D422; Saturated Hydraulic Conductivity {Hydraulic Conductivity};

23 ORIGINAL

**LABORATORY SECTION**

**FINAL SAMPLE DISPOSITION**

**RECEIVED BY**

**DISPOSAL METHOD**

**DATE/TIME**

**DATE/TIME**

A-6003-618(01/06)