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Geotechnical Laboratory
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(865) 482-6497

CERTIFICATE OF ANALYSIS

Stephen Trent
Fluor Hanford, Inc.
825 Jadwin Avenue
Richland, Washington 99352

March 17, 2005

This is the Certificate of Analysis for the following samples:

| | |
|---------------------------|---------------------------|
| Shaw Project ID: | Eberline - Hanford |
| Shaw Project Number: | 100846.55000000 |
| Client Sample Data Group: | H2994 |
| Date Received by Lab: | February 1, 2005 |
| Number of Samples: | One (1) |
| Sample Type: | Soil |

I. Introduction/Case Narrative

One soil sample was received by the Shaw Geotechnical Laboratory on February 1, 2005. The sample was submitted for determination of moisture content, bulk density, sieve analysis, hydraulic conductivity, specific gravity, and calcium carbonate content. The sample number received was B19ND7.

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:

Ralph Cole
Laboratory Manager, Geotechnical Services



00000001

II. Analytical Results/Methodology

REFERENCES: 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)*, 2005. Shaw Environmental and infrastructure, Standard Operating Procedures.

| | |
|---|----------------|
| Moisture Content of Soil and Rock..... | ASTM D 2216 |
| Bulk Density of Soils | EM 1110-2-1906 |
| Particle-size Analysis of Soils | ASTM D 422 |
| Hydraulic Conductivity of Porous Materials Using a Flexible Wall Permeameter | ASTM D 5084 |
| Specific Gravity of Soil..... | ASTM D 854 |
| Bulk Specific Gravity of Coarse Aggregate | ASTM C127 |
| Calcium Carbonate Content..... | ASTM D 4373 |

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 certified by the National Institute for Certification of Engineering Technicians (NICET) in geotechnical soil testing, and 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 12
March 17, 2005
Stephen Trent
Fluor Hanford, Inc.
Shaw Project Name: Eberline Hanford
Shaw Project No. 100846.55000000
SDG No. H2994

**Shaw Geotechnical
Laboratory
Oak Ridge TN
(865) 482-6497**

SAMPLE NUMBER CROSS-REFERENCE LIST

| LAB SAMPLE NO. | CLIENT SAMPLE NO. | MATRIX |
|-----------------------|--------------------------|---------------|
|-----------------------|--------------------------|---------------|

| | | |
|--------------|--------------|------|
| BC0525 | B19ND7 | Soil |
|--------------|--------------|------|

Appendix B
Sample Test Results

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**PARTICLE-SIZE DISTRIBUTION
 ASTM D 422**

Project Name Eberline Hanford

Field Sample No. B19ND7

Project No. 100846.55000000

Lab Sample No. BC0525

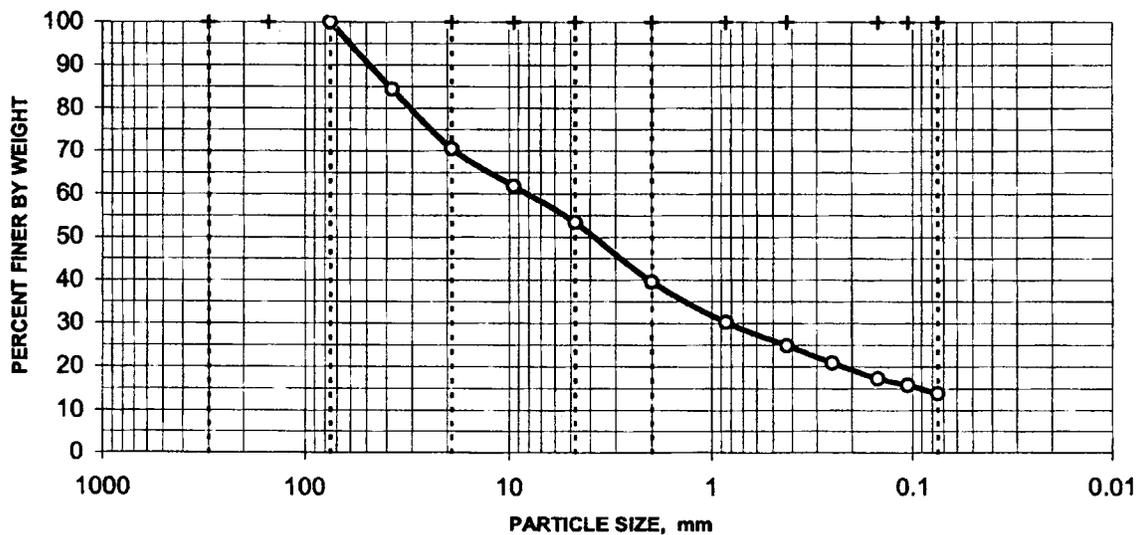
Moisture Content = 26.6%
 based on dry sample weight

SIEVE ANALYSIS

| C O A R S E | Sieve No. | Diameter mm | Percent Finer |
|----------------------------|-----------|-------------|---------------|
| | 3" | 75.000 | 100.0% |
| | 1.5" | 37.500 | 84.4% |
| | 0.75" | 19.000 | 70.4% |
| | 0.375" | 9.500 | 61.8% |
| | #4 | 4.750 | 53.4% |
| | #10 | 2.000 | 39.6% |

| F I N E | Sieve No. | Diameter mm | Percent Finer |
|------------------|-----------|-------------|---------------|
| | #20 | 0.850 | 30.2% |
| | #40 | 0.425 | 24.8% |
| | #60 | 0.250 | 20.9% |
| | #100 | 0.149 | 17.3% |
| | #140 | 0.106 | 15.8% |
| | #200 | 0.075 | 13.9% |

DISTRIBUTION CURVE



46.6% Gravel

39.5% Sand

13.9% Silt/Clay

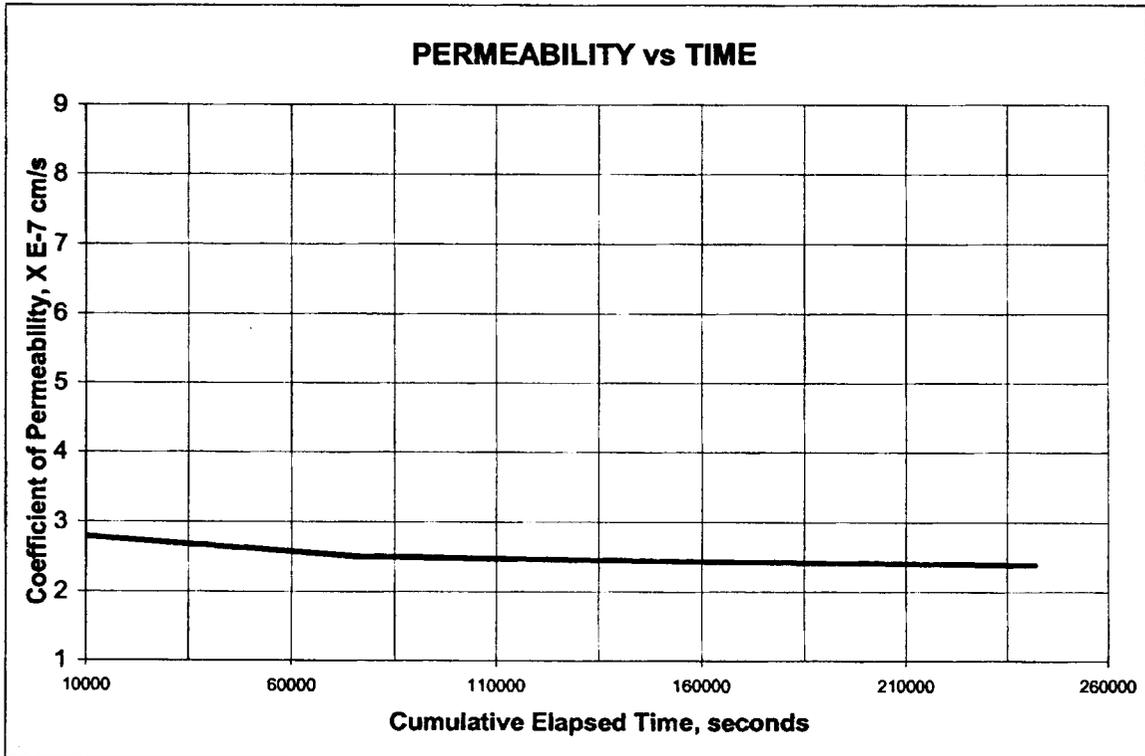
**HYDRAULIC CONDUCTIVITY / PERMEABILITY
 ASTM D 5084**

PROJECT NAME: Eberline Hanford
 PROJECT NO. 100846.55000000

CLIENT SAMPLE NO. B19ND7
 LAB SAMPLE NO. BC0525

| | INITIAL | FINAL | | |
|--|---------|-------|--------------------------------|------------------|
| Specimen diameter, cm | 6.86 | | | |
| Specimen length, cm | 6.26 | | Hydraulic gradient | 22.5 |
| Wet weight of specimen, g. | 557 | | Min. consolidation stress, psi | 2.0 |
| Specimen cross-sect. area, cm ² | 36.97 | | Max. consolidation stress, psi | 4.0 |
| Water content, % | 34.9 | 28.3 | Total backpressure, psi | 9.0 |
| Wet unit weight, pcf | 150.3 | | | |
| Dry unit weight, pcf | 111.4 | | Permeant Fluid | Deaired DI Water |
| Degree of saturation, % | 201.3 | | | |
| Specific gravity of solids | 2.59 | | | |

Coefficient of Permeability, cm/s 2.5E-07



00000009

Appendix C
Chain-of-Custody and Request-for-Analysis Records

| | | | | | |
|---|---|--|--|------------------|---|
| FLUOR Hanford Inc. | | CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST | | F03-018-150 | PAGE 1 OF 1 |
| COLLECTOR Pope/Prister/Wiberg/Tyra | COMPANY CONTACT Steve Trent | TELEPHONE NO. 373-5869 | PROJECT COORDINATOR TRENT, SJ | PRICE CODE 8N | DATA TURNAROUND 45 Days / 45 Days |
| SAMPLING LOCATION 216-Z-9/C3426 - Interval 2777-3237FT | PROJECT DESIGNATION 216-Z-9 Trench Characterization Borehole - Soil | FIELD LOGBOOK NO. HNF-N-360 1 | SAF NO. F03-018 | AIR QUALITY | |
| ICE CHEST NO. GFP-03-015 | COA 119325E510 | OFFSITE PROPERTY NO. SU PTL 14758 | METHOD OF SHIPMENT Federal Express | | |
| SHIPPED TO Shaw Group | | | BILL OF LADING/AIRBILL NO. SU PTL 14758 | | |
| MATRIX* A=Air DL=Drum L=Liquid DS=Drum S=Solids L=Liquid O=Oil S=Soil SE=Sediment T=Tissue V=Vegetation W=Washer WI=Wipe X=Other | POSSIBLE SAMPLE HAZARDS/REMARKS RADIOACTIVE TIE TO: TRUC TRUC BAGCO 1127105 SDG# H2994 | PRESERVATION None | TYPE OF CONTAINER Moisture Resistant Cont | | |
| SPECIAL HANDLING AND/OR STORAGE | | NO. OF CONTAINER(S) 1 | | | |
| | | VOLUME 200g | | | |
| | | SAMPLE ANALYSIS Moisture Content - 02216 #1 2898g #2 246g | | | |
| SAMPLE NO. | MATRIX* | SAMPLE DATE | SAMPLE TIME | | |
| B18ND7 | SOIL | 12105 | 1240 | X | X |
| | | | | | |
| | BC 0525 | | | | |
| CHAIN OF POSSESSION | | | | | |
| RELINQUISHED BY/REMOVED FROM J.S. POE 1/23/05 | DATE/TIME 1/23/05 | RECEIVED BY/STORED IN M.F. 126 A.S.C. #1 | DATE/TIME 1/27/05 | | |
| RELINQUISHED BY/REMOVED FROM M.P. 226 A.S.C. #1 | DATE/TIME 1/27/05 | RECEIVED BY/STORED IN M.F. 126 A.S.C. #1 | DATE/TIME 1/27/05 | | |
| RELINQUISHED BY/REMOVED FROM M.P. 226 A.S.C. #1 | DATE/TIME 1/27/05 | RECEIVED BY/STORED IN M.F. 126 A.S.C. #1 | DATE/TIME 1/27/05 | | |
| RELINQUISHED BY/REMOVED FROM FED EX | DATE/TIME 1/28/05 | RECEIVED BY/STORED IN 2/1/05 | DATE/TIME 1/28/05 | | |
| RELINQUISHED BY/REMOVED FROM FED EX | DATE/TIME 6/31/05 | RECEIVED BY/STORED IN FED EX | DATE/TIME 10/00 | | |
| 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 (1) Bulk Density - D2937; Particle Size (Dry Sieve) - D422; Saturated Hydraulic Conductivity; Particle Density - D854; Calcium Carbonate Content; SDG# H2994 Ship to SHAW LAB | | | | | |
| LABORATORY SECTION | RECEIVED BY Schubert | TITLE Shaw Envir. | DATE/TIME 2/1/05 | | DATE/TIME 1000 |
| FINAL SAMPLE DISPOSITION | DISPOSAL METHOD | | | | |

DDG # 12994

PAGE 1

Eberline Srvces

CHAIN OF CUSTODY

ORD # R5-01-234

01/28/05 15:21:17

WORK ID: SAF# F03-018 SDG H2994

RCVD: 01/28/05 DUE: 03/14/05

KEEP: 03/14/06 DISP: S

| DASH | SAMPLE IDENTIFICATION | STORED | TESTS | | | | | |
|-------|-----------------------|--------|--------|-------|-------|-------|-------|-------|
| 01A-S | B19ND7 | SHAW | DISPOS | E329S | E331S | E333S | E335S | E342S |

BC0525

| RELEASED BY | DATE | TRANSFERRED TO | DATE | RECEIVED BY | DATE |
|-------------------|----------|----------------|------|--------------------|---------|
| <i>Fred Jones</i> | 01/31/05 | SHAW LAB. | | <i>[Signature]</i> | 02-1-05 |
| | | | | | |
| | | | | | |
| | | | | | |