LINER COMPATIBILITY REPORT

ENVIROCARE OF UTAH 11e.(2) BYPRODUCT MATERIAL DISPOSAL SITE SOUTH CLIVE, UTAH

Prepared for

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March 8, 1994

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EXECUTIVE SUMMARY

Physical and chemical analyses were performed on four individual soil samples originating from the proposed Envirocare Landfill Disposal Site. The four soil samples included 3 from composited brown clay samples taken from the upper 10 to 12 foot thick layer of soil identified as the material proposed for clay liner construction. The fourth sample was composited from a stockpile of material identified as white clay taken from the same upper 10 to 12 foot thick layer of material at the surface of the site. The stockpiled white clay material has been mixed with an additive. Testing of the white clay was selected to determine the additive mixture compatibility with the leachate.

The brown and white clay materials were compacted at a standard proctor at +2% optimal moisture content, for the four separate compaction permeability molds. Design specifications for the clay liner had previously been determined by correlating laboratory hydraulic conductivity testing on standard and modified proctors over a range of moistures. The moisture content of +2% optimal moisture for the standard proctor, demonstrated a hydraulic conductivity of approximately 5×10^8 cm/sec. Design performance specifications require a field hydraulic conductivity between 1.0×10^7 and 5×10^7 cm/sec. for the bottom liner.

These four compaction permeability mold samples were then tested to determine hydraulic conductivity values. The initial conductivity tests used groundwater taken from the site. The groundwater tests established the base line for the liner performance. The same permeameter molds were then tested for compatibility with tailings leachate by conducting hydraulic conductivity tests using a synthetic leachate solution. The leachate solution was specified by determining the upper range of concentrations of radionuclides, trace metals, ion concentrations and pH values which have been observed in leachate tests from 17 different sets of samples from 9 uranium tailings impoundments. The four hydraulic conductivity leachate solutions included 3 different pH values of 2,4 and 7.

The hydraulic conductivity of the liner material using the groundwater was performed for a period of 2 weeks to establish a baseline for liner hydraulic conductivity. The compatibility testing using the leachate was performed for a period of 3 months. During this 3 month period a total of 3 pore volumes were contacted with the clay liner material. Based on reported technical demonstration studies for the design performance of the disposal cell, on the same proposed liner material, the three pore volumes equate to a contact period of approximately 80 years.

The resulting hydraulic conductivity testing for both the groundwater and leachate shows no significant change due to the contact of leachate with the liner. The conclusion is that the leachate will not reduce the hydraulic conductivity performance of the proposed clay liner below the design specification of between $1.0x10^7$ and $5x10^7$ cm/sec.

SECTION 1

PROJECT DESCRIPTION

1.1 GENERAL OVERVIEW

The purpose of this project was to demonstrate the compatibility of a proposed clay liner with leachate typical of uranium mill tailings expected for disposal. The demonstration of compatibility is required by:

Code of Federal Regulations (CFR) 10 Part 40, Appendix A, Criterion 5E.

"Where clay liners are proposed or relatively thin, in-situ clay soils are to be relied upon for seepage control, tests must be conducted with representative tailings solutions and clay materials to confirm that no significant deterioration of permeability or stability properties will occur with continuous exposure of clay to tailings solutions."

The clay liner is proposed as a bottom liner to earthen disposal cells containing 11e.(2) byproduct material. The site is located near Clive, Utah. The Clive site is proposed for disposal of low activity uranium and thorium 11e.(2) byproduct material.

1.2 COMPATIBILITY TESTING FEATURES

The compatibility of the liner material with the leachate generated from the waste was demonstrated by performing falling head hydraulic conductivity testing on the proposed clay material using a high concentration synthetic leachate based on 11e.(2) byproduct material to be disposed of at the Envirocare landfill. The results from these leachate conductivity tests were compared to those performed in the development of the clay liner design specifications. Compatibility was demonstrated by achieving results from the leachate conductivity tests which did not significantly vary from the proposed conductivity specifications.

Design specifications have been developed for the proposed clay liner from previously tested clay material from the Clive site. These previous tests included laboratory testing of the hydraulic conductivity of the clay material. The hydraulic conductivity of the bottom liner is an important parameter for impeding leachate infiltration from entering the groundwater below the site. The lower the hydraulic conductivity, the better the performance of restricting leachate movement. Leachate may be generated by the 11e.(2) material contained in the disposal cell, if it comes into contact with water infiltrating into the cell due to precipitation. A clay cover system will significantly restrict precipitation from entering the cell. The bottom liner is designed to further impede the movement of infiltration to the groundwater.

The engineered disposal cell including the cover and bottom liner were designed utilizing the U.S. Department of Energy's Unsaturated Soil Water and Heat Flow Model (UNSAT-H) and the

Environmental Protection Agency's Low-Level Radioactive Waste Environmental Transport and Risk Assessment Code (PATHRAE) model. The results of this site specific detailed contaminant transport modeling provided the long term infiltration values for the disposal cell. These infiltration values resulted in a stabilized moisture flux of not more than 2.47 cm per year through the bottom liner. This value was used to determine the approximate exposure period for the liner in these tests. Section 2.2.2 "Compatibility Hydraulic Conductivity Testing" discusses these volumes and exposure periods.

The objective of the compatibility tests was to demonstrate that the leachate from the 11e.(2) material will not significantly effect the hydraulic conductivity properties. Previous conductivity testing was performed using distilled water and shallow site groundwater, which is the standard method for the test. The compatibility test utilized a permeant which is representative of the highest concentration leachate ever expected from waste disposed at the site. The permeant contained specified concentrations of radioisotopes, metals and minerals; a range of pH levels; and other minor water quality parameters representative of the leachate. The section on leachate generation (Section 3.1) describes the details involving leachate concentrations.

1.3 PROJECT DURATION

The project began in August of 1993 and was completed on March 7, 1994. The major portion of this work was the time necessary to demonstrate adequate exposure to the clay material with the leachate. This was initiated on October 28, 1993 and was completed on February 2, 1994 for a total of 3 months. Hydraulic conductivity testing of the liner utilizing groundwater was performed in August 1993 prior to the leachate exposure. Laboratory analysis of the leachate effluent from the tests was performed in February 1994.

1.4 PROJECT RESPONSIBILITIES

Bingham Engineering Material Laboratory located in Salt Lake City, Utah performed the compatibility testing, sample preparation for compatibility tests and related soil moisture density tests. Bingham Environmental supervised all the testing activities, reviewed the results, and prepare this summary report. Barringer Laboratories, located in Golden, Colorado prepared the leachate to the requested specifications and performed the analytical testing on the permeant effluent. Envirocare collected and delivered the clay liner material from the disposal site to the Bingham Engineering Material Laboratory.

SECTION 2

MATERIAL LABORATORY PROGRAM

2.1 CLAY LINER MATERIAL

2.1.1 Unit 4 Clay Material - Envirocare Disposal Landfill Site

The clay material proposed for the bottom liner is available at the Clive site. The clay material is from the upper 10 to 12 foot thick layer of soil material identified as Unit 4 Clay. Numerous clay samples have previously been collected and tested from the Unit 4 layer, for a wide range of soil and chemical compositions. The material collected for the leachate compatibility study was from the same material in the same general locations. Two different colored clay materials make up the Unit 4 layer. The upper and majority of the layer is identified as a brown silty clay. A lower layer of material within the Unit 4 layer is identified as a white silty clay. Both clay layers have very similar material properties. Tests for this compatibility study were performed on both samples. The brown samples were composited from 3 different locations within the Unit 4 clay layer. The material was collected by a backhoe from depths ranging between 3 and 6 feet below the ground surface. The white clay material was collected from a stockpile of material on site. The material was placed in sealed 5 gallon buckets and transported to the Bingham Material Laboratory by Envirocare personnel for use in the compatibility testing. The amount collected was approximately 75 kilograms (165 pounds) or 3 moderately packed 5 gallon buckets.

2.1.2 Soil Classification

The laboratory index testing identified the proposed clay liner materials to be a reddish brown and whitish low plastic inorganic clay. Grain size distribution tests have determined that both materials contain more than 97 percent passing the #200 sieve. This compares with 98 percent passing the #200 sieve in previously performed hydraulic conductivity testing utilizing water. Material laboratory test results are provided in Attachment 1.

2.1.3 Moisture Density Specifications

Standard (ASTM D-698) proctors were performed on the Unit 4 clay material. For the brown clay, the maximum dry density of the clay is 96.7 pounds per cubic foot (pcf) at an optimum moisture of 24.4%. For the white clay, the maximum dry density of the clay is 104.1 pcf at an optimum moisture of 20.9%.

Standard (ASTM D-698) and Modified (ASTM D1557) proctors have been previously performed on the Unit 4 clay material for design hydraulic conductivity modeling. For the standard proctor, the maximum dry density of the brown clay is 98.6 pounds per cubic foot (pcf) at an optimum moisture of 25%. The modified proctor was performed on the clay samples to determine the effects of higher densities on hydraulic conductivity. For the Modified proctor, the maximum dry density of the clay is 103 pcf at an optimum moisture of 22.2 %.

The compatibility testing was performed on clay material which is proposed for the cover and bottom

liner. The moisture density relationships will be a standard proctor at +2% of optimum moisture. The liner density moisture relationships for the 3 brown clay compatibility tests resulted in dry densities and moistures of: 97.3 pcf, +1.6% OMC; 96.1 pcf, +1.7% OMC; and 96.1 pcf, +1.8% OMC. The liner density moisture relationship for the white clay compatibility tests resulted in a dry density of 101.7 pcf and +2.5% OMC.

2.1.4 Mineralogy

Mineralogy testing was performed at the University of Utah Research Institute Earth Science Laboratory on a representative sample of the Unit 4 clay material from the disposal site. The weight percent analysis results are provided in Attachment 1 "Summary of X-Ray Diffraction Analysis". The mineralogy results indicate over 50% of the material is aragonite which is a calcium carbonate.

The compatibility testing included various leachate solutions which ranged in pH from 2 to 7. The analytical laboratory testing of the leachate effluent after the conductivity testing resulted in a pH value of approximately 7.5. The high calcium carbonate composition of the liner material is apparently buffering the low pH values of the leachate.

2.1.5 White Clay Additive

The white clay used included the addition of a deflocculent. The deflocculent used in processing the clay is tripolyphosphate (STP). STP provides 57.7 percent phosphorus pentoxide (P_2O_5) which is an effective clay deflocculent. The application rate of the sodium tripolyphospate at the Clive site is 3.5 pounds per 50 cubic feet.

The STP was added to the white clay for the testing to demonstrate leachate compatibility with the STP additive.

2.2 HYDRAULIC CONDUCTIVITY TESTING

2.2.1 Design Hydraulic Conductivity Specifications

Hydraulic conductivity is a function of porosity of the soil and the moisture content. The porosity is a function of the soils particle size and density. Uniform soils will exhibit a certain range of conductivity values based on their type and porosity. In general, clay soils will exhibit lower conductivities typically in the range of 1×10^{-5} to 1×10^{-8} cm/sec. To determine expected conductivity values for a soil of known parameters, it is important to perform a series of tests. Once the soil has been well defined by its particle size, porosity, density and water content, then the measured conductivity for the established set of soil values can be assumed to be relatively constant. Duplicating a exact set of soil values however is difficult and only a range of soil values is used to predict the resulting acceptable conductivity.

Testing of the hydraulic conductivities of the Unit 4 clay were previously run using both a distilled water permeant for the majority of the tests and groundwater samples from the site. The groundwater samples were included to correlate the effect of a higher specific gravity of permeant on the clay liner due to its high chloride content and potential solubility. The distilled water permeant results showed a solids loss due to solubility of approximately 2%. The results of the groundwater reduced the solids loss to approximately 0.2%. Both tests resulted in approximately the same hydraulic conductivity.

The results of the previous hydraulic conductivity testing indicated a hydraulic conductivity of approximately 5×10^{-8} cm/sec. for both the standard and modified proctor tests. The modified proctor achieved this result over a broad range of moisture from optimum to +5%, where the standard proctor achieved similar hydraulic conductivities at around +2%.

The engineered disposal cell design was modeled by utilizing the UNSAT-H and PATHRAE computer programs. The results of this modeling were based on liner hydraulic conductivities of 1×10^{-6} cm/sec. The model estimated long term infiltration values and were the basis for the disposal cell design. These infiltration values resulted in an estimated stabilized moisture flux of 2.47 cm per year through the bottom liner.

In addition to the previous hydraulic conductivity testing there were hydraulic conductivity tests performed on the actual permeameter molds containing the Unit 4 clay material used for the compatibility tests. These tests were performed to demonstrate comparison between hydraulic conductivities of the groundwater permeant and the hydraulic conductivities for the leachate on the exact same samples. Prior to introducing the leachate solution as the permeant, the tests using the site groundwater were run for approximately 2 weeks. The results are compared in Section 2.2.3 "Compatibility Hydraulic Conductivity Testing Results" and on Figures 2-5.

The testing apparatus used in the hydraulic conductivity tests was a closed sealed compaction permeameter mold. The compaction of material was performed in the molds and top covers were then locked in places. The hydraulic conductivity measuring cylinders and tubing was then attached for the performance of the conductivity tests. The testing apparatus is shown in Figure 5.

2.2.2 Compatibility Hydraulic Conductivity Testing

The compatibility testing was performed on 4 different samples. The combinations varied by 2 different parameters; pH, and the addition of a flocculent to the white clay. The tests were performed as indicated in the following table.

Test ID #	рН	Clay sample
pH 2	2	brown
pH 4 brown	4	brown
pH 7	7	brown
pH 4 white	4	white

TABLE 1 Hydraulic Conductivity Test Identification

The initial conductivity testing using the site groundwater on the liner material was performed for 2 weeks. The compatibility testing using the leachate was performed for 3 months. Within the 3 month time period for leachate compatibility the liner material was contacted by approximately 3 pore volumes of leachate. The 3 pore volumes of leachate equates to approximately 3 liters of leachate solution. The

exposure of 3 liters of solution is equivalent to approximately 80 years of exposure for a infiltration rate of 2.47 cm/yr. The 80 years is based on a 2.47 cm/yr infiltration rate for a 6 inch diameter permeameter mold, resulting in a 37 cm³ volume of leachate per year. The time to move over 3 liters of leachate through the material at a rate of 0.037 liter per year would be approximately 80 years.

2.2.3 Compatibility Hydraulic Conductivity Testing Results

The results of the compatibility testing indicate a stabilization at or just below $1x10^{-7}$ cm/sec for all of the 4 tests. Of the four different samples the pH 7 solution and the white clay sample stabilized slightly higher than the groundwater tests. These two samples exhibited lower groundwater conductivities of around $5x10^{-8}$ cm/sec. This compares to the stabilization of the groundwater conductivities of between $5x10^{-8}$ and $1x10^{-7}$ cm/sec. The pH 2 and pH 4 brown clay samples both exhibited similar results for the groundwater and leachate of around $1x10^{-7}$ cm/sec. The final conductivity of the pH sample was actually slightly lower than the groundwater tests.

These results compare closely to the previous conductivity testing on a range of liner specifications using distilled water. The results from these previous tests for similar dry densities and moistures was 5×10^{-8} cm/sec.

SECTION 3

ANALYTICAL LABORATORY PROGRAM

3.1 SYNTHETIC LEACHATE GENERATION

Leachate was produced by a EPA certified laboratory in accordance with conditions determined by Bingham to be representative of the upper range of leachate concentrations.

3.1.1 Leachate Constituents

Leachate was fabricated by Barringer Laboratories, an EPA certified laboratory, similar to leachate characteristics formed by percolation through the proposed 11e.(2) tailings. Characteristics of the leachate include:

- · pH
- Radionuclide concentrations
- Trace metals
- Cation/Anion concentrations

Uranium (natural)

3.1.2 Leachate Concentrations

The pH range is dependent on the particular site and processes used in the extraction and handling of the mine tailings. Research of literature indicates a large range of pH values for various mines tailing leachate. Because of the large variation in pH values, the synthetic leachate was prepared at several pH values over the pH range of possible disposal material. The pH values ranged from 2 to 7.

Radionuclide concentrations in the leachate depend on the concentration in the waste and the distribution coefficient (K_a) of the radionuclide. K_a's determine how much of the contaminant is disassociated from the waste and brought into suspension in the percolating water. The leachate concentrations are summarized below for all the contaminants expected in the waste.

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Contaminant	Leachate Concentration
Radium 226	2000 pCi/l
Thorium 230	2000 pCi/l
Thorium 232	6000 pCi/l

TABLE 2 **Radionuclide** Concentrations

Trace metal concentrations were determined from the Toxicity Characteristic Leaching Procedure

15 mg/1

(TCLP) results from various mine tailings. TCLP tests give the maximum concentrations of contaminates that are anticipated to leach from a particular soil. The maximum concentrations in the range of values given for each metal is specified as the concentration that the laboratory produced in the leachate. Refer to Table 3 below.

Trace Metal	Concentration (mg/l)
Arsenic	50
Barium	8,000
Cadmium	5
Chromium	5
Copper	100
Lead	30
Mercury	0.2
Selenium	1
Silver	40
Zinc	50

TABLE 3 Concentrations of Metals

Cation/anion concentrations are representative of mine tailing leachate from locations that have conditions similar to the waste expected for disposal in the South Clive site.

ANION	Concentration
Fluorine	25
Chloride	200
Sulfate	3000
CATION	
Calcium	600
Magnesium	150
otassium	30
Sodium	1000

TABLE 4 Anion/Cation Concentrations (mg/l)

3.2 ANALYTICAL TESTING

3.2.1 Number of Samples

A total of four (4) hydraulic conductivity samples were prepared and tested. This included 3 different pH values on clay compacted at 95% of standard and 1 test performed on clay amended with a flocculate additive. See Table 5 below.

Test ID #	pH	Radion uclides	Trace Metals	Cation/Anion	Clay sample
pH 2	2	A	в.	С	brown
pH 4 brown	4	A	В	С	brown
pH 7	7	A	В	С	brown
pH 4 white	4	A	В	С	brown

Table 5 Hydraulic Conductivity Test Specifications

A - Concentrations as shown in Table 2.

B - Concentrations as shown in Table 3.

C - Concentrations as shown in Table 4.

3.2.2 Sample Volumes

Compacted clay samples used in performing the hydraulic conductivity tests are 6.0 inches in diameter and 4 inches high. Leachate manufactured by the laboratory consisted of one gallon for each test, for a total of 4 gallons. The synthetic leachate solution was characterized by initial laboratory analysis. The total number pore volumes conducted through each sample was approximately 3. A final characterization was performed on the permeant after the completion of the test.

3.2.3 Sample Methods

Hydraulic conductivity tests were performed using the constant head ASTM D-2434 method. The clay samples were compacted to design densities in rigid wall permeameter molds and leachate was percolate through the clay. Hydraulic conductivity testing was continuous for approximately 13 weeks. The final reported hydraulic conductivity value was averaged over the values which had reached a steady state flux.

3.2.4 Analytical Testing Results

The leachate effluent from the conductivity testing was collected and analyzed. The same constituents which were originally specified in the synthetic leachate solution were analyzed. The results showed at dramatic decrease in the radionuclide concentrations. The original leachate solutions of 2000-6000 pCi/l for radium and thorium were less than 3 pCi/l in the effluent. The concentrations of uranium were

reduced from 15 mg/l to less than 0.02 mg/l. The metals concentrations in the leachate solutions were reduced from their original levels of 1-8000 mg/l to less than 1 mg/l and several not being detected at all. The ion concentrations in the effluent all showed concentrations typically of the groundwater at the site. This is attributed to the high levels of ion concentrations in the groundwater which were previously run on the clay molds. The most significant result of the analytical tests is the effluent pH results. The pH of the effluent for all four samples resulted in a near neutral pH. The range varied between 7.40-7.69. This is attributed to the high calcium carbonate concentrations in the clay material. The laboratory test results are provided in Attachment 2

SECTION 4

QUALITY ASSURANCE OBJECTIVES

The objective of the QA plan is to assure that results from liner compatibility tests are accurate and representative of site conditions. Quality assurance is two pronged in that quality controls must be in place for both; (1) materials - clay and leachate and, (2) testing procedures. Values that are used in design must be representative of actual hydraulic conductivity that will be seen in the field under leaching conditions.

4.1 METHODS AND THEIR DETECTION LIMITS, PRECISION, AND ACCURACY

The leachate was manufactured to Bingham's specifications for radionuclide concentrations, trace metals, pH, and cation/anion concentrations. Detection limits required for analysis of pH, radionuclides, metals, and cation/anions are:

PARAMETERS	REQUIRED EPA METHOD No.	REQUIRED DETECTION LIMITS (mg/l)	MAXIMUM HOLDING TIMES
pH	150,1	0,1	
RADIONUCLIDES			
Radium 226	903.1	0.6 pCl/1 ± 30%	6 Months
Thorium 230	3008	15 pCl/l ± 30%	6 Months
Thorium 232	3(8)8	15 pCl/1 ± 30%	6 Months
Uranium (total)	ASTM 2907-83B	0.7 pCi/(± 30%	6 Months
METALS		(mg/l)	
Armic	7060	0.005	6 Months
Barium	6010	0.002	6 Months
Cadmium	9010	0.004	6 Months
Chromium	6010	0.005	6 Months
Copper	6010	0.005	6 Months
Lead	7421	0.005	6 Months
Mercury	7470	0.0002	28 Days
Selenium	.7740	0.005	6 Months
Silver	6010	0.005	6 Months
Zinc	6010	0.002	6 Months
CATIONS/ANIONS	and the second	(mg/l)	1 - Ory Mart David - File James - OKON Martin Western, gas with Law
Chioride	325.2	1.0	28 Days
Fluorine			and a second
Sulfair	375.2	0.5	28 Days
Caiclum	6010	0.01	6 Months
Magnesium	6010	0.01	6 Months
Potuasium	6010	0.01	6 Months
Sodium	6010	0.01	6 Months

TABLE 6

SECTION 5

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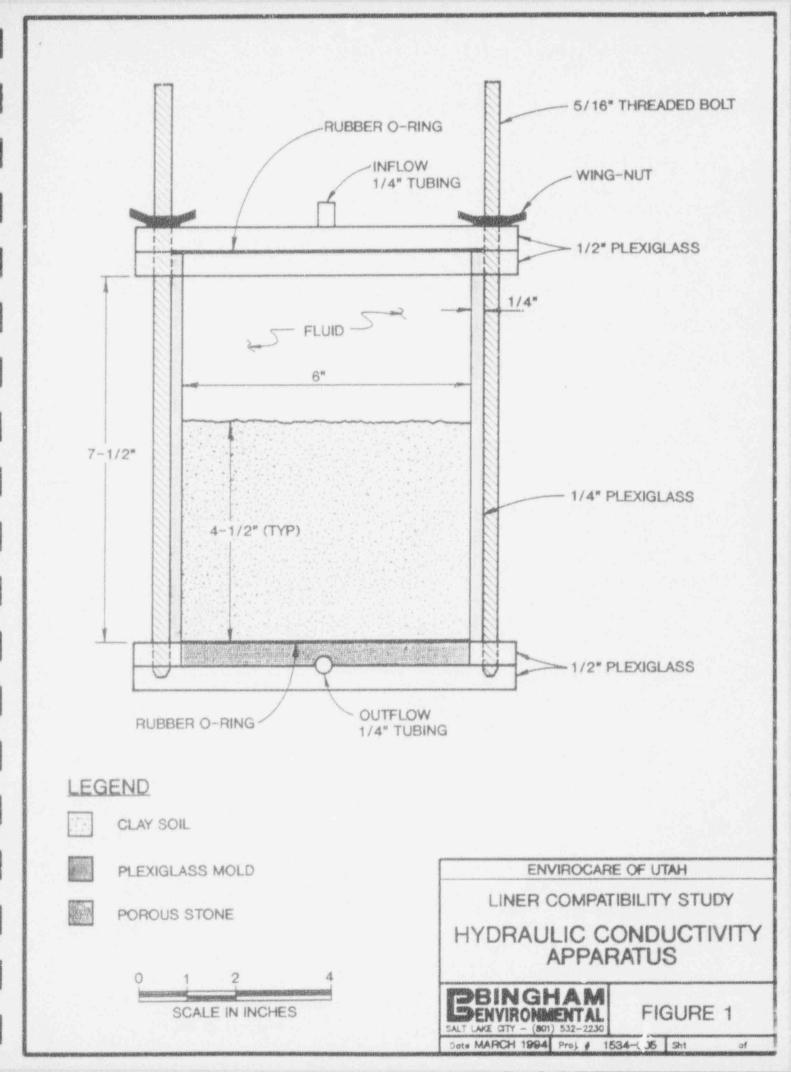
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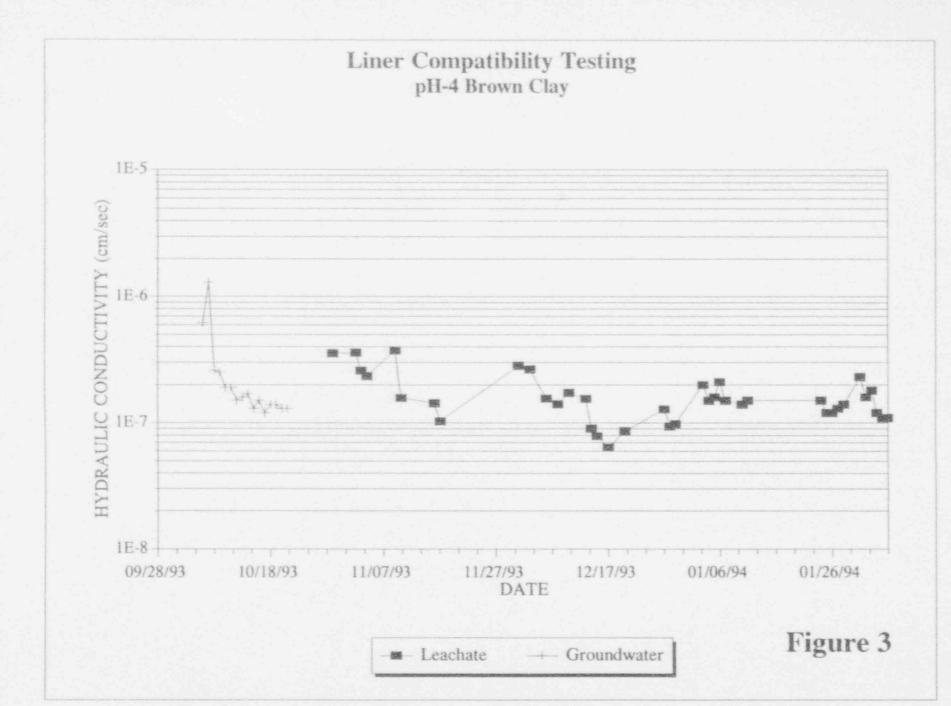
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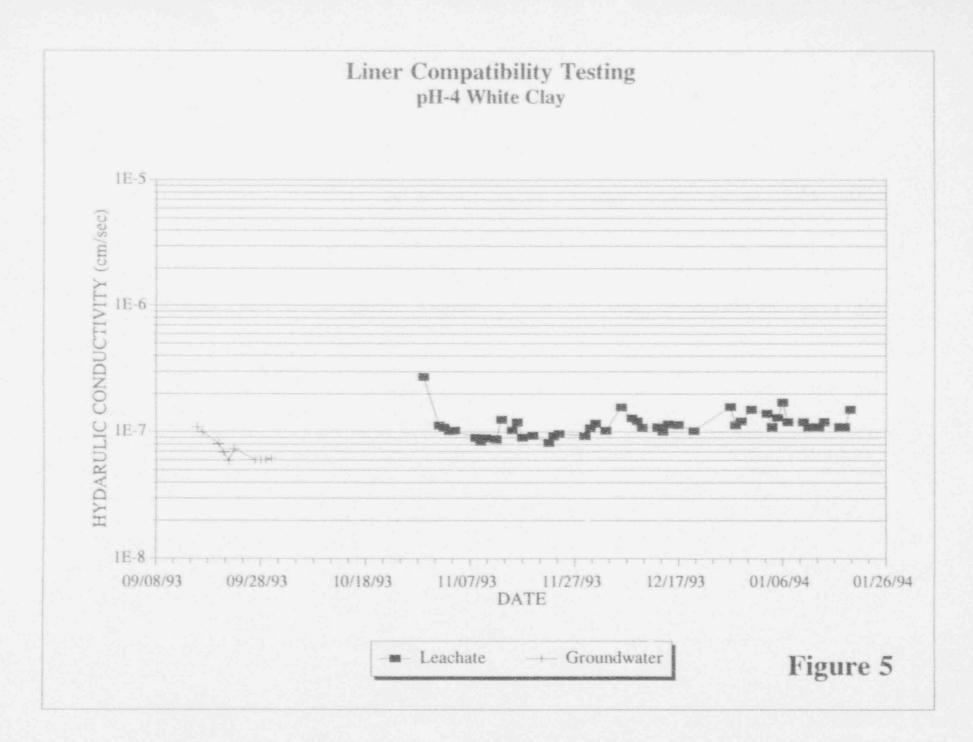
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Liner Compatibility Testing pH-2 Brown Clay 1E-5-CONDUCTIVITY (cm/sec) 1E-6 1++++++ 100 HYDRAULIC 1E-7 1E-8----09/28/93 10/18/93 11/07/93 11/27/93 12/17/93 01/06/94 01/26/94 DATE Figure 2 - Leachate ---- Groundwater



Liner Compatibility Testing pH-7 Brown Clay 1E-5 HYDRAULIC CONDUCTIVITY (cm/sec) 1E-6 1E-7 1E-8----1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 09/28/93 10/18/93 11/07/93 11/27/93 01/06/94 01/26/94 02/15/94 12/17/93 DATE ---- Groundwater - Leachate Figure 4



ATTACHMENT 1

PHYSICAL LABORATORY TESTING

SOIL SAMPLES FABRICATED TO PRE-DETERMINED DENSITY AND MOISTURE

PROJECT NO: 1534-00 PROJECT: Enviro Care of Utah

SAMPLE NO. & LOCATION: Brown Clay +1.8% OMC

创新

MOISTURE CONTENT	BEFORE	DURING	AFTER*	COMPACTIO			
PAN NO.	And a second second second			TARGET DRY D	ENSITY (PCF)		96.1
PAN TARE	527.1	527.1		TARGET SOIL N	ADISTURE (%)		26.2%
WET SOIL + PAN	1110.2	1110.2		NO. OF LAYERS	S		3
DRY SOIL + PAN	989.3	989.3		MOIST SOIL WI	. PER LAYER	(GMS)	1410.2
MOISTURE CONTENT	26.2%	26.2%	EAA	LAYER THICKN	ESS (IN)		1.57
' USE ENTIRE SAMPLE				ACTUAL DRY D			96.1
				ACTUAL MOIST	URE @ COMP	PACTION	26.2%
				FINAL DRY DEM	NSITY (PCF)		0.0
MOLD DIAMETER (IN):	6			ACTUAL % COM	MPACTION OF	TARGET	0
BEG SAMPLE LENGTH (IN):	4.7	FINAL LENGT	H (IN):	4.6			
STATIC HEAD 1, 0 ON PERM. T	O BOTTOM C	OF SAMPLE (IN	√):	26.2	Small Mold:	4" Dia x 4.584" H	
STATIC HEAD 2 DATA, 0 TO 50	O ON PERME	AMETER (IN):		50,75	Large Mold:	6" Dia x 7" H	
SAMPLE COMPRESSION DURI	NG PERMEA	BILITY TESTIN	IG:	2.1%	Permeamete	er Large Tube 25.0"	
PERMEAMETER NO:	#6 on F					Small Tube	475.0″

мо		DA			ŕR	TIME	RESERVOIR		PERMEABILIT	Υ, Κ	COMMENTS
							(ML)	(PSI)	(CM/SEC)	(FT/YR)	
10	1		6	۶.,	93	905	192				
10	1		6		93	2200	182		2.5E-07	0.3	
10	1		7		93	830	174	and a second second	2.3E-07	0.2	
10	1		7 -		93	1548	169		2.4E-07	0.3	
10	1		8	1	93	937	158		2.0E-07	0.2	
10	Ĭ		8	F_{-}	93	1825	154		1.5E-07	0.2	
10	1		9	1	93	730	147	sourcest starting areas	1.8E-07	0.2	
10	1		9	r i	93	1515	143	distant and the second second	1.8E-07	0.2	
10	7		0	Į.	93	915	134	and any side of	1.7E-07	0.2	
10	ł	14	a'.	1	93	830	123		1.7E-07	0.2	
10	1	1	t)		93	1633	120		1.3E-07	0.1	
10	1	23	2	£.,	93	755	113	And the second s	1.7E-07	0.2	
10	Ŧ		13		93	818	102		1.7E-07	0.2	
10	1	23	4	1	93	841	92		1.6E-07	0.2	and the second
10	1	14	15		93	825	82	and the surrouted	1.7E-07	0.2	
10	1		16	r	93	1500	69		1.8E-07	0.2	
10	1		7	1	93	1500	61		1.5E-07	0.2	
10	1		8	r i	93	818	55		1.5E-07	0.2	
10	1		19	1	93	1100	46		1.5E-07		
10	1		20	1	93	848	39		1.6E-07		
					93	903	31		1.5E-07		
1.1.1		2					61 Ye				

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SOIL SAMPLES FABRICATED TO PRE-DETERMINED DENSITY AND MOISTURE

PROJ	IECT N	D: 1	534-005	PROJECT:	Enviro Care o	of Utah			
SAMP	PLE NO	& LOC	ATION:	Brown Clay +	1.8% OMC F	PH of 2			
MOIS			ΨT	BEFORE	DURING	AFTER*		DENSITY DENSITY (PCF)	96.1
	PANT	ARE		527.1	527.1		TARGET SOIL	DENSITY (PCF) MOISTURE (%) RS	26.2%
	WETS	SOIL + P	AN	1110 2	1110.2	and the second strap is a second	NO. OF LAYER	RS	3
	DRY S	OIL + P	AN	989.3	989.3	1000 - 100 -	MOIST SOIL V	VT. PER LAYER (GMS)	1410.2
	MOIST	URE C	ONTENT	26.2%	26.2%	ERR	LAYER THICK	VT. PER LAYER (GMS) NESS (IN)	1.57
	* USE	ENTIRE	SAMPLE				ACTUAL DRY	DENSITY @ COMPACT	96.1
							FINAL DRY DE	STURE @ COMPACTIO ENSITY (PCF)	0.0
NOLE		TER (It	v0:	6			ACTUAL % CO	OMPACTION OF TARG	L
BEG	SAMPLI	E LENG	TH (IN):	4.7	FINAL LENG	TH (IN):	4.7		
STAT	IC HEA	D1.00	N PERM	TO BOTTOM	OF SAMPLE	(IN):	26.2	Small Mold: 4" Dia x 4 58	14" H
STAT	IC HEA	D 2 DAT	FA, 0 TO 50	DO ON PERME	EAMETER (IN):	50.75	OMPACTION OF TARG Small Mold 4" Dia x 4.58 Large Mold: 6" Dia x 7" H	1
SAMP	AF CO	MPRES	SION DUR	ING PERMEA	BILITY TEST	ING.	0.0%	Permeameter Large Tube Small Tube	3 25.0
- person					DEFECUET	DEDAACAD		COMMENTS	
un				LEVEL		PERMEAB	LIT, N	COMMEN IS	
¥15.2	UMI	115	nng		(PSI)	(CM/SEC)	(FT/YR)		
				(INIL)	(1.04)	(within when so)			
10 /	28 /			159					the second se
107	29 /		840	122	6	1.5E-07	0.2		
117		93	1227	41	4	8.4E-08	0.1		
117	2/	93	818	17	5	1.0E-07	0.1	anni ta anna inata atra ana antara ara mai adir ain	
/_	1			277					
11./	21				5	7.6E-08	0.4		
11/	3/	93 93	1237 1040		3	9.7E-08	0.1	na manana ara ana ini ini ini ini ana ana ana ana an	an a la seconda da la seconda a seconda da s
11/	8/	93	849	45Z	3	7.3E-08	0.1		
11/		100.000		125	3 5 4	9.65.08	0.1		
11.7	10 /	93	545 1240	103	м л	0 0E-00	0.1		alarsa tiri i ara manin manya anto i arti a di
117		93	1118	76	3	5.8E-08	0.1		
117		100 100	1138		6				
1	1								
11/	13 /	93		277					
111	15/	93	1039	208	5	1.2E-07	0.1	and the second way for many second second second by the	
117	16 /		1615	169	e,	1.0E-07	0.1		
117	17 1	93	1112		6	1.1E+07	Q.1 _	anne i e sance a spectrum and en	
117	19 /	93	1658			8.6E-08	0.1	and the second state of the second	the state of the second s
n j	22 /	93	948	0	6	8.9E-08	0.1 _		
11 / 11 /		93	950	276	5		-		
117	23 /	93	1257			1.1E-07	0.1	aler för som att förstande som att som att som för som ett förstande som ett för som ett för som ett förstande	
117	24 /	93	937			7.3E-08	0.1		a ana ana ang ina ang i
117	29 /	93	1433				0.1		
	30 /	93	809			9 9E-08	0.1		
	17	93	1526				0.1		
		93	1449				0.1	and a second data was not a second and a second	
127	37	30							Contraction and the second second second
12 / 12 /	37	30						sectors and the sector products and the sector of the sector of the	and the second
12 / 12 / /		93	1455	276	5		-		
11 / 12 / 12 / 12 / 12 / 12 /		93	1455 823			9.4E-08 7 2E-08	0.1		

-		97		1015	46	3	4.9E-07	0.5	
	12/		93	1422	113				
-	12/	10 / 13 /	93		25	6	1.3E-07	0.4	
	12/		93		9	4	5.6E-08	0.1	
	161	1 49 1	80				0.00.00	<i>V</i> , 1	n an
	12/	14/	93	1637	147	5			
	12/	15 /	93	820	128	4	1.3E-07	0.1	dan a constant and an
	12/		93		76	4	9.8E-08		Pushed 80 ML not Shown
	1	1	100.00						
	12/	20 /	93	940	259	5			
	72/	211	93	815	241	-4	7.8E-08	0.1	
	12 /	23 /	93	1300	180	4	1.0E-07	0.1	
	12 /	27 /	93	900	90	5	8.6E-08	0.1	
80	12/	28 /	93	840	70	5	7 1E-08	0.1	second when show the second in the second
	127	29 /	93	825	47	4	8.8E-08	0.1	
	/	materia I			and a state of the				
	12 /	31 /	93	855	275	5			
	11	37	94	810	188	5	1.1E-07	0.1	
-	11	4 /	94	1025	163	3	7.8E-08	0.1	
	1/	5 /	94	1030	139	5	8.8E-08	0.1	
		5 /	94	1100	279	5			
	11	61	94	1700	232	5	1.5E-07	0.2	
83	17	7/	94	945	208	4	1.2E-07	0.2	
	11	10 /	94	1430	116	4	1.1E-07	0.1	
6335	11	11.7	94	1015	94	5	1.1E-07	0.1	
	-17	13 /	94		44	4	1.0E-07	0.1	
		14 /	94			4	1.1E-07		
M		1	2.4	1.4.50			11-11-00-547		
A .	11	18 /	94	1322	279	5			
150	11	19/	94	1620	248	6	1.0E-07	0.1	
	31	21/	94	1645	178	4	1.1E-07	0.1	
CAS.	17	24 /	94	840	103	4	1.0E-07	0.1	
	17	25 /	94	940	73	6	1.1E-07		
680	11	26 /	94	1045	46	5	9.1E-08	0.1	
	17	27 /	94	829	21	5	1.0E-07	0.1	
635	in l		interesti (at a distance in the second				
		27 /	94	1524	278	5			
18		28 /		822	201	6	4.0E-07	0.4	
	17	317					1.4E-07	0.1	
	21	17	94	1212	31	4	1.1E-07	0.1	
(0)	and a	manage 1			4.5.5				
	21	1/	94	1220	196	6	1 11 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		and a set of the set of
100	21	2/	94	1449	146	6	1.7E-07	0.2	
	2/	3/	94	1449	117	5	9.0E-08	0.1	
100	2/	4/	94	924	86	6	1.3E-07	0.1	
	. 27	74	94	811	6	5	9.2E-08	U,1 .	

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SOIL SAMPLES FABRICATED TO PRE-DETERMINED DENSITY AND MOISTURE

PROJECT NO: 1534-00 PROJECT: Enviro Care of Utah

SAMPLE NO. & LOCATION: Brown Clay + 1.7% OMC

MC					ENT	BEFORE	DURING				96.1
		PANN				527.9		Construction and write a second second	TARGET SOIL M		26.1%
		PAN 1				1034.2			NO. OF LAYERS		5
				IL + P						PER LAYER (GMS)	841.8
				IL + P		929.3			LAYER THICKNI		0.94
		MOIS	TU	RECO	ONTENT	26.1%	26.1%	EAH	LATER THURN	COO (IIY)	0.34
		• USE	Ē	NTIRE	SAMPLI	Ē.				ENSITY @ COMPACTION (96.1 26.1%
										URE @ COMPACTION	0.0
									FINAL DRY DEN	IPACTION OF TARGET	0.0
				ER (IN		6		n carn.		IPACTION OF TARGET	v
						4.68			4.63	Small Mold: 4" Dia x 4.584" F	
						TO BOTTOM			30	Large Mold: 6" Dia x 7" H	
						00 ON PERME			50.75	Permeameter Large Tube 25.0	14
						RING PERMEA	BILITYTEST	NG	1.1%	Small Tube	
PE	RM	IEAM	1E	IEHI	10:	#5 on B				Sinai (ube	110.0
		DATE			TIME	RESERVOIR	PRESSURE	PERMEABIL	ITY, K	COMMENTS	
мс				YA	HRS	LEVEL	HEAD		down		
INIC		Lora I			11110	(ML)	(PSI)	(CM/SEC)	(FT/YR)		
						(may)	1. 20	(annear a)			
10	ſ	6	1	93	943	455	Concerns of the second s				
10	1	6	1	93	2200	415		6.2E-07	0.6		
10	1	7	1	93	827	391		4.6E-07	0.5		
	1	.7	1	93	1545	346		1.3E-06	1.3 _		and the formation of the second second
	1	8	1	93	936			3.1E-07	0.3 _		and the second section designs.
10		8	1	93	1825	311		2.6E-07	0.3		
	1			93	730			2.9E-07	0.3 _	and the state of the second	and an end of the second
	1	9		93	1515			2.5E-07	0.3		
	1	10	ł	93	915	273	The second s	1.9E-07	0.2		
	1	11	1	93	830	255		1.9E-07	0.2		
10	1	11	1	93	1633	249	and a second second	1.9E-07	0.2		
		12		93	755	240		1.5E-07	0.2		
	1	13		93	817			1.6E-07	0.2		
10	1	14	f.	93	840	210		1.7E-07	0.2		population for the parameter of the second
10	1	15		93	825	199		1.3E-07	0.1		
	1	16		93	1500			1.5E-07	0.2 _		
	1	17	1.	93	1500			1.2E-07	0.1		
	1	18		93	817			1.4E-07	0.1		
	1	19		93	1100			1.4E-07	0.1		
	Ŧ	20		93	848			1.3E-07	0.1	and a financial and the first of the state of the	
	T	21		93	903			1.3E-07	0.1		
in the second		-					and the second state of th				

SOIL	SAMPL	ES FAI	BRICATED	TO PRE-DETE	RMINED DEM	ISITY AND N	IOISTURE		
PRO.	JECT N	0:	1534-002	PROJECT.	Enviro Care o	of Utah			
SAME	PLE NO	& LOC	CATION:	Brown Clay •	1.7% OMC	PH of 4			
MÖIS			NT	BEFORE	DURING	AFTER*		N DENSITY	
	PANN	NO.		507 A	2757 13		TARGET DRY	DENSITY (PCF)	96.1
	PAN L	MPCE,	COAN	227.3	927.9		LA CUEL SUI	L MOISTURE (%) RS	20.1%
	DOVE	YOUL + I	DAN	020.2	030.3		NU. UF LATE	NT. PER LAYER (GMS)	0
	MOIST	URE C	ONTENT	26.1%	26.1%	ERR	LAYER THICK	(NESS (IN)	841.8 0.94
			E SAMPLE				ACTUAL MOR	DENSITY @ COMPACTI STURE @ COMPACTION ENSITY (PCF) OMPACTION OF TARGE	26.1%
MOLD	DIAME	TER (I	N):	6			ACTUAL % C	OMPACTION OF TARGE	0
BEG	SAMPLE	E LENG	STH (IN):	4.68	FINAL LENG	TH (IN);	4.68		
STAT	IC HEAD	21,00	DN PERM. T	O BOTTOM O	F SAMPLE (II	N():	30	Small Mold: 4" Dia x 4 58	NAT ST
STAT	IC HEAD	D 2 DAT	TA, 0 TO 50	O ON PERME	AMETER (IN):		50.75	Small Mold: 4" Dia x 4.58 Large Mold: 6" Dia x 7" r Permeameter Large Tub	
SAMP	LE COI	VIPRES	SION DURI	NG PERMEAE	BILITY TESTIN	IG:	0.0%	Permeameter Large Tube	e 25.0"
PERM	IEAMET	ER NO	Σ	#5 on E				Small Tub	e 475.0"
	DATE		TIME	DECEDUAL	DOCOCIOC	DEDMEADI	ITV K	COMMENTS	
18/5				LEVEL		PERMEABI	LUY, K	COMMENTS	
IND C	WM	1.12	nna		(PSI)	(CMICE/S)	(CTA/D)		
				(incr)	(1-31)	(Give Sec)			
107	28 /	93	950	163	6				
	29/		840	77	5	3.5E-07	0.4		
1									
117	1/	93	1227	273	5				
111	21	93	817	194	5	3.6E-07	0.4		
111	31	93	1237	99 35	-5	2.6E-07	0.3		
11.7	4 /	93	1040	35	5	2.4E-07	0.2		A CONTRACTOR OF
								eak on mold	
11 /	87	93	848	276	5				
	97		645		5	3.7E-07			
11/	10 /	93	1239	131	5	1.6E-07	0.2		
man	manage F							eak on Mold	
-117	15 /		1039	229	4				and the second of the second second second second
	16 /			188	5	1.4E-07		and we have the second seco	Contractory and the second second
117	17 /		1112	165	4	1.0E-07			
	-			The second se				aak on Mold	
11/	30 /	93	810	124	5				
12 /	1/	93	1526	32	6	2.88-07	0.3	entre destante en	Construction of the Constr
12/		93	1530	280	and the second sec				and the second secon
12/	3 /	93	1448	140	6	5.35.67	0.0		
12/	6/	93	823	8		2.8E-07	0.0		
147		9.9	020		5	1.6E-07	0.2		and the second
12/	51	93	828	242					
12/	8/	93	812	169	5	1.4E-07	64		
1			012	100		1.40.57	V.1 -		an a
12 /	97	93	1015	128	5				and the second
121	107	93	1422	76	6	1.7E-07	0.2		
1	1		a de las			and the second	× +		
12/	107	93	1433	270	5		-		and a second
127	13 /	93	1600	150	4	1.5E-07	0.2		
127	14.7		1630	124	4	9.1E-08	0.1		
								The second se	and the second

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12 /			820	110	4	7.9E-08	0.1
:21	17 /		850	75	- 4	6.4E-08	9.1
12 /	20 /	93	927	8	4	8.6E-08	0.1
			1000				
12 /			1300	222	5	1.00.07	
12 /			900	98	5	1.3E-07	0.1
12 /		93	840	71	5	9.4E-08	0.1
12 /	29 /	93	825	44	5	9.8E-08	0.1
12/	31 /	93	855	279	5		
11	3/	94	810	128	5	2.0E-07	0.2
17	41	94	1025	80	5	1.5E-07	0.2
11		94	1030	32	6	1.6E-07	0.2
1	1						0.2
11	51	94	1100	279	5		
11	6 /	94	1700	211	5	2.1E-07	0.2
17	71	94	945	178	5	1.5E-07	0.2
11	10/	94	1430	42	5	1.4E-07	0.1
17	11/	94	1015	8	5	1.5E-07	0.1 0.2
	1						
1/	21 /	94	1645	266	5		-
11	24 /	94	840	171	4	1.5E-07	0.2
1.11	25 /	94	940	136	4	1.2E-07	0.1
11	26 /	94	1045	102	4	1.2E-07	0.1
11	27 /	94	828	70	5	1.3E-07	0.1
11	28 /	94	821	32	5	1.4E-07	0.1
1	1						
11	28 /	94	1055	242	6		
11	317	94	821	64	5	2.3E-07	0.2
21	17	94	1212	8	5	1.6E-07	0.2
/	-						
21	1/	94	1220	135	5		
21	27	94	1449	86	5	1.8E-07	0.2
27	37	94	924	57	5	1.2E-07	0,1
27	47	94	811	26	5	1.1E-07	- W- 1
2/	57	94	800	1	0	1.1E-07	0.1

SOIL SAMPLES FABRICATED TO PRE-DETERMINED DENSITY AND MOISTURE

PROJECT NO: 1534-00 PROJECT: Enviro Care of Utah

SAMPLE NO. & LOCATION: Brown Clay +1.6% OMC

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МС					TENT	BEFORE	DURING	AFTER*			97.3
		PAN				182.5	100 5		TARGET SOIL N		26.0%
		PAN				829.7			NO. OF LAYERS		3
				IL + P		696.3	696.3			, PER LAYER (GMS)	1413.4
				11. + P					LAYER THICKN		1.55
	2	MOIS	in.	IRE CI	ONTENT	26.0%	26.0%	CHH	LATEN INICAN	ES 2 (IN)	1.55
		USE	EE	INTIRE	E SAMPLE					ENSITY @ COMPACTION (URE @ COMPACTION	97.3 26.0%
									FINAL DRY DEN		0.0
in						6				APACTION OF TARGET	0
				ER (IN	ч). ТН (IN):	4.66		TH (INI)-	4.63	ACTION OF TARGET	
						TO BOTTOM C			26.5	Small Mold: 4" Dla x 4.584"	н
						00 ON PERME			50.75	Large Mold: 6" Dia x 7" H	
						RING PERMEA			0.6%	Permeameter Large Tube 25.	0*
				TER		#1 on E	whatti i tagi ii	in str	0.070	Small Tub	
PEI	-1 IVI	C. PLIV	a 5	1 CM	vQ.	# I UN L				Unital 100	
	١,	DATE			TIME	RESERVOIR	PRESSURE	PERMEABIL	ITY.K	COMMENTS	
MO		DAY		YR	HRS	LEVEL	HEAD	2 But Division State			
IVIC2		un i		1.1.5	inite .	(ML)	(PSI)	(CM/SEC)	(FT/YR)		
						(mire)	(1.00)	(onnoco)	A. 11114		
10	1	6	ŀ	93	944	243					
10	1	6	1	93	2200	241		4.5E-08	0.0		
10	1	7	1	93	828	239		5.3E-08	0.1		
10	1	7	j.	93	1547	237		7.6E-08	0.1 _		
10	1	8	1	93	937	232		7.9E-08	- 0.1		
10	1	8	1	93	1825	225	5	1.3E-07	0.1 _		
10	ĩ	9	T	93	730	202	5	1.7E-07	0.2 _		
10	1	9	1	93	1515	194	5	7.9E-08	0.1		
10	1	10	1	93	915	178	5	6.7E-08	0.1		
10	I.	11	1	93	830	158	5	6.8E-08	0.1		
10	1	11	Ĩ.	93	1643	152	d.	6.0E-08	0.1		
10	1	12	1	93	755	140	5	6.8E-08	0.1 _		
10	1	13	Ŧ.	93	817	119	5	7.3E-08	0.1		
10	1	14	1	93	840	100	6	6.4E-08	0.1 _		
10	1	15	1	93	825	82	5	5.9E-08	0.1		
10	1	16	1	93	1500	59	5	5.9E-08	0.1	an dan sa ta sa	
10	1	17	1	93	1500	43	6	5.3E-08	0.1	a na an	
10	1	18	1	93	818	31	6	5.4E-08	0.1 _		
10	1	19	1	93	1100	1.4	5	4.9E-08	0.1		and a second
10				93	845	0	5	5.2E-08	0.1		
											and the second second second
	1 -			or other states of the second		And and a second s	and the set of the set of the				

	SAMPL	ES FABI	RICATED T	O PRE-DETS	RMINED DEN	ISITY AND N	IOISTURE		
PROJ	ECTN	5: 1	534-005	PROJECT	Enviro Care o	f Utah			
SAMP	LE NO	& LOCA	ATION:	Brown Clay -	-1.6% OMC	PH of 7			
MOIS	TURE C	ÓNTÉN	π	BEFORE	DURING	AFTER*	COMPACTIO	N DENSITY	07.0
	PANN	0.		155.5			TARGET DR	31.3	
	PANI	ARE	A.A.I	132.0	182.5		TARGET SU	IL MUISTURE (%)	20.076
	VVEIS	SOIL + P	AN	549.7 EGE 2	029.7		NO. OF LAT	NAT DEDIAVED (CMS)	1819 8
	MOIST	URE CO	ONTENT	26.0%	26.0%	ERR	LAYER THIC	Y DENSITY (PCF) IL MOISTURE (%) ERS WT. PER LAYER (GMS) KNESS (IN)	1.55
	* USE	ENTIRE	SAMPLE				ACTUAL DR ACTUAL MO FINAL DRY I	Y DENSITY @ COMPACTI ISTURE @ COMPACTION DENSITY (PCF) COMPACTION OF TARGE	97.3 26.0% 0.0
NULL	CARAD! 1	CIENC'	TEL ZIKIN	4.86		THE PINE	A RE	source interest	×
OCO C	DE LE AT		N DEDM T	O ROTTON C	TRAL DENG	site (insta	28 A	Small Mold: 4" Dip x 4.5	84" H
SAMP	IC HEAD	D 2 DAT	A, 0 TO 500 SION DURI) ON PERME NG PERMEA	AMETER (IN) BILITY TESTIN	iG	24.8 0.0%	Small Mold: 4" Die x 4.5 Large Mold: 6" Dia x 7" Permeameter Large Tut Small Tut	H be 25.0"
						PERMEABI	LITY, K	COMMENTS	
MO	DAY	YR	HRS	LEVEL (ML)	HEAD (PSI)	(CM/SEC)	(FT/YR)		
10 /	28 /	03	063	460					
10 /	29 /	93	830	427	6	1.4E-07	0.1		and a second
11/		93	1227	340	5	8 8E-08	0.1		
147	21	93	815	316	5	9.5E-08	0.1	summer and the second	
117	31	93	1237	285	5	8.7E-08	0.1		
	41	93	1040	261	6	8.6E-08	0.1		
								Repaired Leak	
117	8 /	93	848	165	5			- and the second second second second second	and the second of the second
111	97	93	645	140	6	1.1E-07	0.1		
111	10 /	93	1239	111	5	7.5E-08	0.1		
11/	12.7	93	1118	65	5	8.2E-08	0.1		
11/	13/	93	1138	.45	4	7.12-08	A 4		and the second
111	15 /	93	3,05,25,25				. U. j	factor and the second	
			1038	5	5	7.5E-08 8.2E-08 7.1E-08 7.6E-08	0.1		
11/	1						0.1		
	15 /		1045	575	5				
	15 /	93 93	1045	575 535 513	5 5 5	1.2E-07 8.5E-08			
117 117	15 / 16 /	93 93 93	1045 1615 1112	575 535 513	5 5 5	1.2E-07 8.5E-08	0.1 0.1		
117 117 117	15 / 16 / 17 / 19 /	93 93 93	1045 1615	575 535 513 451	5 5 5 5	1 2E-07 8.5E-08 8.4E-08	0.1 0.1 0.1		
11 / 11 / 11 / 11 /	15 / 16 / 17 / 19 / 22 /	93 93 93 93 93	1045 1615 1112 1352 948	575 535 513 451 387	5 5 5 5 4 4	1 2E-07 8.5E-08 8.4E-08 7.6E-08 8.5E-08	0.1 0.1 0.1 0.1 0.1		
11 / 11 / 11 / 11 / 11 /	15 / 16 / 17 / 19 /	93 93 93 93	1045 1615 1112 1352	575 535 513 451 387 360	5 5 5 5 4 4	1 2E-07 8.5E-08 8.4E-08 7.6E-08 8.5E-08	0.1 0.1 0.1 0.1 0.1		
11111111111111111111111111111111111111	15 / 16 / 17 / 19 / 22 / 23 /	93 93 93 93 93 93	1045 1615 1112 1352 948 1253	575 535 513 451 387 360 340	5 5 5 4 4	1 2E-07 8.5E-08 8.4E-08 7.6E-08 8.5E-08 8.5E-08	0.1 0.1 0.1 0.1 0.1 0.1		
11111111111111111111111111111111111111	15 / 16 / 17 / 19 / 22 / 23 / 24 /	93 93 93 93 93 93 93	1045 1615 1112 1352 948 1253 937	575 535 513 451 387 360 310 30	5 5 5 4 4 4 4	1 2E-07 8.5E-08 8.4E-08 7.6E-08 8.5E-08 8.5E-08 7.9E-08	0.1 0.1 0.1 0.1 0.1 0.1 0.1		
11 2 11 2 11 2 11 2 11 2 11 2 11 2 11 2	15 / 16 / 17 / 19 / 22 / 23 / 23 / 29 /	93 93 93 93 93 93 93 93	1045 1615 1112 1352 948 1253 937 1433	575 535 513 451 387 360 310 30 211	6 5 6 5 4 4 4 4 5	1 2E-07 8.5E-08 8.4E-08 7.6E-08 8.5E-08 8.5E-08 7.9E-08 9.8E-08 9.1E-08	0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
	15 / 16 / 17 / 19 / 22 / 23 / 24 / 29 / 30 /	93 93 93 93 93 93 93 93	1045 1615 1112 1352 948 1253 937 1433 808	575 535 513 451 387 360 340 340 30 211 178	6 5 6 5 4 4 4 5 5 5 5 5	1 2E-07 8.5E-08 8.4E-08 7.6E-08 8.5E-08 8.5E-08 7.9E-08 9.8E-08 9.1E-08 9.0E-08	0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
11 / / / / / / / / / / / / / / / / / /	15 / 16 / 17 / 19 / 22 / 23 / 23 / 29 / 30 / 1 /	93 93 93 93 93 93 93 93 93 93	1045 1615 1112 1352 948 1253 937 1433 808 1525	575 535 513 451 387 380 340 340 30 211 178	6 5 6 5 4 4 4 5 5 5 5 5	1 2E-07 8.5E-08 8.4E-08 7.6E-08 8.5E-08 8.5E-08 7.9E-08 9.8E-08 9.1E-08	0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
11111111111111111111111111111111111111	15 / 16 / 17 / 19 / 22 / 23 / 29 / 30 / 1 / 3 /		1045 1615 1112 1352 948 1253 937 1433 808 1525 1448	575 535 513 451 387 380 340 340 30 211 178 126	0 5 6 6 4 4 4 5 5 5 5 s	1 2E-07 8 5E-08 8 4E-08 7 6E-08 8 5E-08 8 5E-08 7 9E-08 9 8E-08 9 1E-08 9 0E-08 8 3E-08	0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
11111111111111111111111111111111111111	15 / / 16 / 17 19 / 22 / 29 / 29 / 30 / 1 / 3 / 6 /	93 93 93 93 93 93 93 93 93 93 93 93 93 9	1045 1615 1112 1352 948 1253 937 1433 808 1525 1448 822 812	575 535 513 451 387 360 310 30 211 178 126 60 12	0 5 6 6 4 4 4 5 6 6 6 5 5	1 2E-07 8 5E-08 8 4E-08 7 6E-08 8 5E-08 8 5E-08 7 9E-08 9 8E-08 9 1E-08 9 0E-08 8 3E-08	0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
11111111111111111111111111111111111111	15 / 15 / 15 / 19 / 19 / 19 / 19 / 19 /		1045 1615 1112 1352 948 1253 937 1433 808 1525 1448 822 812 815	575 535 513 451 387 380 340 340 340 340 340 340 340 340 340 34	0 5 6 6 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	1 2E-07 8 5E-08 8 4E-08 7 6E-08 8 5E-08 8 5E-08 9 8E-08 9 8E-08 9 1E-08 9 0E-08 8 3E-08 8 3E-08 8 7E-08	0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
111/1111111111111111111111111111111111	15 / 16 / 17 19 / 22 / 23 / 29 / 30 / 1 / 3 / 8 /		1045 1615 1112 1352 948 1253 937 1433 808 1525 1448 822 812	575 535 513 451 387 360 340 340 340 340 340 340 340 340 340 34	0 0 0 0 4 4 4 9 0 0 0 0 5 5 5	1 2E-07 8 5E-08 8 4E-08 7 6E-08 8 5E-08 8 5E-08 9 8E-08 9 8E-08 9 1E-08 9 0E-08 8 3E-08 8 3E-08 8 7E-08	0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		

8

		1.5							
	12 /	13 /	93	1600	413	5	8.92-08	0.1	
1	121	14 /	93	1630	375	4	1.3E-07	0.1	
	12/	15 /		820	356	4	1.0E-07	0.1	
-	12/	17 /		850	299	5	1.0E-07	0.1	
	127	20 /		925	219	5	8.9E-08	0.1	
10	12/	21/		815	194	4	9.2E-08	0.1	
	12 /	23 /		1300	131	5	1.1E-07	0.1	
-	12/	27 /				6	9 0E-08	0.1	
	1	1					100 March 100 Ma	And the second s	
100	12/	28 /	93	845	580	5		- Parameter and a second	
	12/	29 /	93	825	543	4	1.5E-07	0.2	
100	12/	31 /		855	473	5	1.2E-07	0.1	
	11	31		810	379	6	1.1E-07	0.1	ne na sense se s
1	22.2	1	1014	919			1.1.165.5961	Mr. 1 surrounders	n beide alle stationer einer einer alle setter sinder and der beiden stationer alle setter alle setter alle set
	41	4/	94	1025	368	5			al na gan ba na na mananana na mananana na manana na manana ana
655	11	5 /		1030	330	6	1.4E-07	A 4	
	1					×	1		
	1/	5 /	94	1100	579	5			and the second
	11	67		1700	533	5	1.5E-07	0.2	
4550	37	71		945	510	4	1.1E-07	0.1	
	17	10 /	34	1430	408	5	1.1E-07	17.4	
	1 42	117	94	1015	383	5	1.0E-07	0.1	
		13 /	94	900	327	3	1.0E-07	0.1	
280	- 17					4		0.1	and the second set of the second s
	. 17	14 /	94	1200 740	296	4	1.1E-07	V. 1	
题	1/		94		225		1.0E-07 1.2E-07	Q. 1 6. 4	
	17	18 /	94	1255	190	3		0.1	
085	17	197	94	1620	159	6	1.1E-07		an and a second seco
	17	21 /	94	1645	102	4	1.0E-07	0.1	
	17	24 /	94	840	29	4	1.0E-07	0.7	
		J			600				neres entres en la canada en la cala esta esta en cala canada en la cala cala de la cala de la cala de Cal
-	17	25 /	94	940	580	6	4 65 47	0.0	
	. 13	26 /	94	1045	536	5	1.5E-07	C.Z. simesimi	
18	14	27 /	94	828	504	4	1.15-07	0.1	
	1.1.7	28 /	94	822	460	5	1.5E-07	U.Z. manada	
-	17	31 /	94	821	341	4	1.4E-07	0.1	
	27	1./	94	1211	300	4	1.3E-07	U.1 strations	
1	2/	2/	94	1449	260	5	1.4E-07	Q.1	
L.	27	3/	94	924	233	4	1.3E-07	0.1	
-	21	47	94	811	189	5	1.7E-07	0.2	
	21	7/	94	802	85 51	5	1.2E-07	0.1	
	21	8 /	94			6	1.2E-07	0.1	an and a second
	21	9 /	94	1040	13	5	1.2E-07	0.1	
		man		contraction and and	and a state of the			and the second	
		9 /	94	1045	375	6		an all of the line	and the second section of a second
	21	10 /	94	934	334	5	1.7E-07	0.2	
	27	11/	94	919	298	5	1.2E-07	0.1	
-	21	14 /	94	1151	187	5	1.2E-07	Q.1	
	21	157	.94	848	155		1 2E-07	0.1	
	27	16 /	94	844	123	5	1.0E-07	0.1	
	27	18 /	94	1159	51	6	1.1E-07	No. 1	and the second
	27	20 /	94			0	1.1E-07	0.1	

SOIL SAMPLES FABRICATED TO PRE-DETERMINED DENSITY AND MOISTURE

PROJECT NO: 1534-00 PROJECT: Enviro Care of Utah

SAMPLE NO. & LOCATION: White Clay +2.5% OMC

		PAN		ONI	FENT	BEFORE	DURING	AFTER*	COMPACTION TARGET DRY D		101.7
		PAN				529.7	529.7		TARGET SOIL N		23.7%
		WET			AN	1287			NO. OF LAYERS		23.7%
		DRY				1141.9	1141.9			PER LAYER (GMS)	862.7
					ONTENT	23.7%	23.7%		LAYER THICKN		0.92
		MOIS	101		ONTENT	6.0.170	414217 779	Enn	LATER HIUNN	C33 (IN)	0.92
		· US	EEN	ITIRE	E SAMPLE				ACTUAL DRY D	ENSITY @ COMPACTION (101.7
									ACTUAL MOIST	URE @ COMPACTION	23.7%
									FINAL DRY DEN	ISITY (PCF)	0.0
101	D	DIAN	ETE	R (II	();	6			ACTUAL % CON	APACTION OF TARGET	0
EG	S.	AMP	EU	ENG	TH (IN):	4.62	FINAL LENGT	"H (IN):	4.62		
ATS AAS) HE) E CO	ND 2	DAT	A, 0 TO 50 SION DUR	TO BOTTOM O DO ON PERME ING PERMEAI	AMETER (IN):		17.25 25 0.0%	Small Mold: 4" Dia x 4.584" H Large Mold: 6" Dia x 7" H Permeameter Large Tube 25.0	0″
SE!	-Ni	EAN	IET	ERI	NQ:	4				Small Tube	a 475.0"
	1	DATE			TIME	RESERVOIR	PRESSURE	PERMEABIL	ITY, K	COMMENTS	
10		DATE DAY		R	TIME	RESERVOIR	PRESSURE HEAD	PERMEABIL	ITY, K	COMMENTS	
10				R				PERMEABIL (CM/SEC)	ITY, K (FT/YR)	COMMENTS	
		DAY	Y		HRS	LEVEL (ML)	HEAD (PSI)			COMMENTS	
9	1	DAY 15	¥ 1	93	HRS *608	LEVEL (ML) 280	HEAD (PSI) 4	(CM/SEC)	(FT/YR)		
9	1	DAY 15 16	Y 1 1	93 93	HRS 1608 824	LEVEL (ML) 280 267	HEAD (PSI) 4 3	(CM/SEC) 1.1E-07	(FT/YR)		
9 9	1 1 1	DAY 15 16 17	Y 1 1 1	93 93 93	HRS 1608 824 811	LEVEL (ML) 280 267 246	HEAD (PSI) 4 3 4	(CM/SEC) 1.1E-07 9.9E-08	(FT/YR) 0.1 0.1		
9 9 9 9	1 1 1	DAY 15 16 17 20	¥ 1 1 1	93 93 93 93	HRS 1608 824 811 1300	LEVEL (ML) 280 267 246 187	HEAD (PSI) 4 3 4 4	(CM/SEC) 1.1E-07 9.9E-08 8.1E-08	(FT/YR) 0.1 0.1 0.1		
00000	1 1 1 1 1	DAY 15 16 17 20 21	1 1 1 1	93 93 93 93 93	HRS 1608 824 811 1300 755	LEVEL (ML) 280 267 246 187 173	HEAD (PSI) 4 3 4 4 5	(CM/SEC) 1.1E-07 9.9E-08 8.1E-08 6.9E-08	(FT/YR) 0.1 0.1 0.1 0.1 0.1		
9 9 9 9 9 9		DAY 15 16 17 20 21 22	Y 1 1 1 1 1 1 1	93 93 93 93 93 93	HRS 1608 824 811 1300 755 840	LEVEL (ML) 280 267 246 187 173 157	HEAD (PSI) 4 3 4 4 5 4	(CM/SEC) 1.1E-07 9.9E-08 8.1E-08 6.9E-08 5.9E-08	(FT/YR) 0.1 0.1 0.1 0.1 0.1 0.1		
0 0 0 0 0 0		DAY 15 16 17 20 21 22 23	Y 1 1 1 1 1 1 1 1 1	93 93 93 93 93 93 93	HRS 1608 824 811 1300 755 840 1103	LEVEL (ML) 280 267 246 187 173 157 137	HEAD (PSI) 4 3 4 4 5 4 5	(CM/SEC) 1.1E-07 9.9E-08 8.1E-08 6.9E-08 5.9E-08 7.3E-08	(FT/YR) 0.1 0.1 0.1 0.1 0.1 0.1		
9 9 9 9 9 9 9 9 9		DAY 15 16 17 20 21 22 23 27	Y 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	93 93 93 93 93 93 93	HRS 1608 824 811 1300 755 840 1103 815	LEVEL (ML) 280 267 246 187 173 157 137 75	HEAD (PSI) 4 3 4 4 5 4 5 5	(CM/SEC) 1.1E-07 9.9E-08 8.1E-08 6.9E-08 5.9E-08 7.3E-08 6.0E-08	(FT/YR) 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
0 0 0 0 0 0 0 0		DAY 15 16 17 20 21 22 23 27 28	Y 1 1 1 1 1 1 1 1 1 1 1	93 93 93 93 93 93 93 93 93	HRS 1608 824 811 1300 755 840 1103 815 933	LEVEL (ML) 280 267 246 187 173 157 137 75 59	HEAD (PSI) 4 3 4 4 5 4 5 5 3	(CM/SEC) 1.1E-07 9.9E-08 8.1E-08 6.9E-08 5.9E-08 7.3E-08 6.0E-08 6.0E-08	(FT/YR) 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
9 9 9 9 9 9 9 9		DAY 15 16 17 20 21 22 23 27	Y 1 1 1 1 1 1 1 1 1 1 1	93 93 93 93 93 93 93	HRS 1608 824 811 1300 755 840 1103 815	LEVEL (ML) 280 267 246 187 173 157 137 75	HEAD (PSI) 4 3 4 4 5 4 5 5	(CM/SEC) 1.1E-07 9.9E-08 8.1E-08 6.9E-08 7.3E-08 6.0E-08 6.0E-08 6.0E-08	(FT/YR) 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1 1 1	DAY 15 16 17 20 21 22 23 27 28	Y 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	93 93 93 93 93 93 93 93 93	HRS 1608 824 811 1300 755 840 1103 815 933	LEVEL (ML) 280 267 246 187 173 157 137 75 59	HEAD (PSI) 4 3 4 4 5 4 5 5 3	(CM/SEC) 1.1E-07 9.9E-08 8.1E-08 6.9E-08 5.9E-08 7.3E-08 6.0E-08 6.0E-08	(FT/YR) 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
9999999999	1 1 1 1 1 1 1 1 1 1 1 1	15 16 17 20 21 22 23 27 28 29	Y 1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	93 93 93 93 93 93 93 93 93 93 93	HRS 1608 824 811 1300 755 840 1103 815 933 830	LEVEL (ML) 280 267 246 187 173 157 137 75 59 46	HEAD (PSI) 4 3 4 4 5 4 5 5 3 5 3	(CM/SEC) 1.1E-07 9.9E-08 8.1E-08 6.9E-08 7.3E-08 6.0E-08 6.0E-08 6.0E-08	(FT/YR) 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		

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SOIL SAMPLES FABRICATED TO PRE-DETERMINED DENSITY AND MOISTURE

	JECT NO			PROJECT:					
SAMI	PLE NO.	& LOC	ATION:	White Clay +	2.5% OMC				
MOIS	TURE C	ONTEN	IT	BEFORE	DURING	AFTER*			101.7
	PANT	ARE		529.7	529.7	528.1	TARGET SOIL	DENSITY (PCF) MOISTURE (%)	23.7%
	WET S	SC 111 - 4 - 24	AN.	1287	1287.00	48422	NO OF LAYER	96 2S	5
	DRY S	OIL + P	AN	1141.9	1141.9	3903.6	MOIST SOIL V	VT. PER LAYER (GMS)	862.7
	MOIST	URE CO	ONTENT	23,7%	23.7%	27.8%	LAYER THICK	VT. PER LAYER (GMS) NESS (IN)	0.92
	* USE	ENTIRE	SAMPLE				ACTUAL DRY	DENSITY @ COMPACTI	101.7
								TURE @ COMPACTION	
A Design of							FINAL DRY DE	ENSITY (PCF)	98.4
NOLI	D DIAME	TER (IN	():	6		T1.1 718.15	ACTUAL % GC	MPACTION OF TARGET	
EG.	SAMPLE	E LENG	IM (IN).	4.02	FINAL LENG	1 H (IN).	4.62	Small Mold: 4" Dia x 4.58	LAN 1.1
51 M I 57 A 7	IC HEAL	DI, UU	N PERM. I	O BOTTOM C	AMETED (N	(N):	17 20	Small Mold: 4 Ula x 4.50	14 11
SABAT	NE CON	VEREE	SIGN DUP	NG PERMEA	RILITY TESTIN	JG:	0.0%	Large Mold: 6" Dia x 7" H Permeameter Large Tube	25.01
			SIGN DORI		enerri regili		0.070	Small Tube	
	DATE		TIME	RESERVOI	PRESSURE	PERMEABI	LITY, K	COMMENTS	
ON	DAY		HRS	LEVEL	HEAD				
				(ML)	(PSI)	(CM/SEC)	(F*/YR)		
10.7	28 /	93	953	455	4				
107	29 /	93	839	396	6	2.7E-07	0.3	n de la companya de Recepciones de la companya de la comp	
11/	1.1	93	1225	291	5	1.1E-07	0.1		
117			315	265	5	1.1E-07	0.1		
117		93	1237	231	5 5 6	1.0E-07	0.1		
117			1040	204	6	1.0E-07	0.1		
11/			848	100	2	A 06-08	Q.1		
11/		93	645	77	6	84E-08	0.1 _		
317			1238			8.9E-08	0.1 -		e are conservation de réseau décares
11 /	12 /	93	1000	0	2	8.8E-08	0.1 -		en an an an anna an anna an
11/	12/	.93	1122				_		
117		93	1137	538	4	1.3E-07			
	15 /	93	1038		4	1.0E-07	0.1		
11/									
117		93	1614			1.2E-07	0.1	en e	
11 / 11 /	17.7	93	1111	421	5	9.1E-03	0.101		
11 / 11 / 11 /	17 / 19 /	93 93	1111 1648	421 356	5	9.1E-03 9.4E-08	0.1 0.1 0.1		
11 / 11 / 11 / 11 /	17 / 19 / 22 /	93 93 93	1111 1648 947	421 356 292	5 5 4	9.1E-03 9.4E-08 8.2E-08	0.1 0.1 0.1 0.1		
11 / 11 / 11 / 11 / 11 /	17 / 19 / 22 / 23 /	93 93 93 93	1111 1648 947 1250	421 356 292 265	5 6 4 4	9.1E-03 9.4E-08 8.2E-08 9.3E-08	0.1 0.1 0.1 0.1 0.1		
11 / / 11 / / 11 / / 11 / / 11 /	17 / 19 / 22 / 23 / 24 /	93 93 93 93 93	1111 1648 947 1250 936	421 356 292 265 244	5 5 4 4 4	9.1E-03 9.4E-08 8.2E-08 9.3E-08 9.7E-08	0.1 0.1 0.1 0.1 0.1 0.1		
******	17 / 19 / 22 / 23 / 24 / 29 /	93 93 93 93 93	1111 1648 947 1250 936 1433	421 356 292 265 244 124	5 5 4 4 4 4 4 4	9.1E-03 9.4E-08 8.2E-08 9.3E-08 9.7E-08 9.4E-08	0.1 0.1 0.1 0.1 0.1 0.1 0.1		
11111111111111111111111111111111111111	17 / 19 / 22 / 23 / 24 / 29 / 30 /	93 93 93 93 93 93 93	1111 1648 947 1250 936 1433 808	421 356 292 265 244 124 105	5 5 4 4 4 5 5	9.1E-03 9.4E-08 9.3E-08 9.7E-08 9.4E-08 1.1E-07	0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
オオオオオオオオオオオオオオオオオオオオオオオオオオオオオオオオオオオオ	17 / 19 / 22 / 23 / 24 / 29 /	93 93 93 93 93 93 93	1111 1648 947 1250 936 1433	421 356 292 265 244 124 105 66	5 8 4 4 4 9 5	9.1E-03 9.4E-08 8.2E-08 9.3E-08 9.7E-08 9.4E-08	0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
111111111122	17 / 19 / 22 / 23 / 24 / 30 / 1 / 3 /	93 93 93 93 93 93 93 93 93	1111 1648 947 1250 936 1433 808 1525 1449	421 356 292 265 244 124 105 66 11	5 8 4 4 4 5 15 45	9.1E-03 9.4E-08 9.3E-08 9.7E-08 9.4E-08 1.1E-07 1.2E-07	0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
11111111122	17 / 19 / 22 / 23 / 24 / 30 / 1 / 3 / 3 /		1111 1648 947 1250 936 1433 808 1525 1449 1500	421 356 292 265 244 124 105 66 11	5 8 4 4 4 4 5 5 6 0	9.1E-03 9.4E-08 9.3E-08 9.7E-08 9.4E-08 1.1E-07 1.2E-07 1.0E-07	0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
11111111112	17 / 19 / 22 / 23 / 24 / 30 / 3 / 3 / 3 / 6 /	93 93 93 93 93 93 93 93 93 93 93 93	1111 1648 947 1250 936 1433 808 1525 1449 1500 822	421 356 292 265 244 124 105 66 11 525 425	5 0 4 4 4 4 5 5 0 0 4	9.1E-03 9.4E-08 9.3E-08 9.7E-08 9.4E-08 1.1E-07 1.2E-07 1.0E-07 1.6E-07	0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
111111111112 12212	17 / 19 / 22 / 23 / 24 / 30 / 3 / 3 / 3 / 3 / 3 / 3 /	93 93 93 93 93 93 93 93 93 93 93 93 93 9	1111 1648 947 1250 936 1433 808 1525 1449 1500 822 811	421 356 292 265 244 124 105 66 11 525 425 356	5 0 4 4 4 4 5 5 5 0 4 5	9.1E-03 9.4E-08 9.3E-08 9.7E-08 9.4E-08 1.1E-07 1.2E-07 1.0E-07 1.6E-07 1.3E-07	0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
111111111112 12212 12212	17 / 19 / 22 / 23 / 29 / 30 / 3 / 3 / 3 / 3 / 3 / 3 / 9 /	93 93 93 93 93 93 93 93 93 93 93 93 93 9	1111 1648 947 1250 936 1433 808 1525 1449 1500 822 811 1015	421 356 292 265 244 124 105 66 11 525 425 356 320	5 0 4 4 4 4 5 5 5 5 0 4 5 0	9.1E-03 9.4E-08 9.3E-08 9.7E-08 9.4E-08 1.1E-07 1.2E-07 1.0E-07 1.3E-07 1.3E-07 1.2E-07	0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		
11111111111111111111111111111111111111	17 / 19 / 22 / 23 / 24 / 30 / 3 / 3 / 3 / 3 / 3 / 3 /	93 93 93 93 93 93 93 93 93 93 93 93 93 9	1111 1648 947 1250 936 1433 808 1525 1449 1500 822 811	421 356 292 265 244 124 105 66 11 525 425 356 320 285	5 0 4 4 4 4 5 5 5 0 4 5	9.1E-03 9.4E-08 9.3E-08 9.7E-08 9.4E-08 1.1E-07 1.2E-07 1.0E-07 1.6E-07 1.3E-07	0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1		

	12 / 12 / 12 /	15 / 17 / 20 /	93 93 93	820 850 919	149 91 9	4 5 5	1.2E-07 1.1E-07 1.0E-07	0.1	
	12/	23 /	93	1300	521	5			
1	12 /	27 /	93	900	375	6	1 3E+07	0.2	
	12/	28 /	93	840	341	5	1.1E-07	0.1	
	12/	29 /	93	825	307	4	1.25-07	0.1	
	12/	31 /	93	855	230	5	1.5E-07	0.2	and the second second
	11	3/	94	840	127	5	1.4E-07	0.1	
	1/	4 /	94	825	99	4	1.1E-07	0.1	
	17	5 /	94	1030	62	6	1.3E-07	0.1	
	1	1			and interaction and other	and the second se		and the second	and the second second second second
	17	51	94	1100	423	4		And and a second second second	
	11	6 /	94	1700	377	5	1.7E-07	0.2	
	17	71	94	945	355	4	1.2E-07	0.1	
-	11	10 /	94	1430	253	5	1.2E-07	0.1	
	11	117	94	1015	228	5	1.1E-07	0,1	
	1.17	13/	94	900	174	3	1.1E-07	0.1	
	11	14 /	94	1200	145	-4	1.2E-07	0.1	
-	- 17	17 /	94	740	7.4	4	1.1E-07	0.1	
	17	18 /	94	1255	44	3	1.1E-07	0.1	
N	11	19 /	94	1640	5	6	1.5E-07	0.2	

BINGHAM ENGINEERING SPECIFIC GRAVITY

PROJECT: SAMPLE LOCATION:

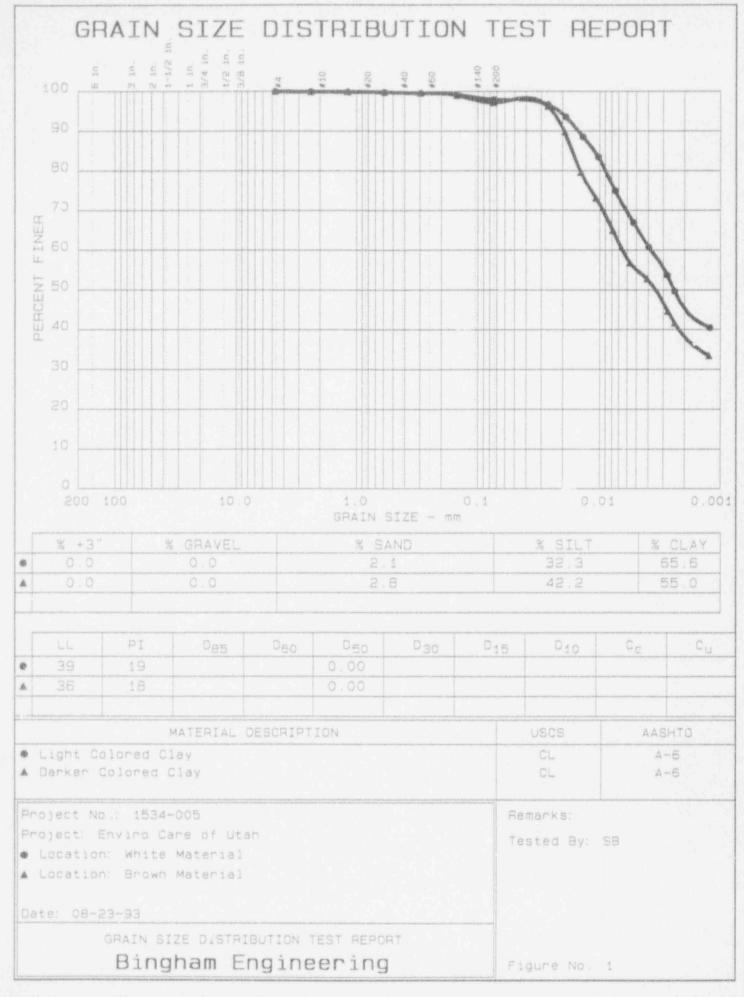
Enivrocare of Utah DATE: 09-24-93 PROJ. 1534-002

SPECIFIC GRAVITY OF SOLIDS (Gs)

Sample or Speciman No.		White	Brown			
Flask No.		A	5			
Temperature of Water and Soil		20.5	18.5			
Dish Number	1					
Dish and Dry Soil		and the standard standard strength of the standard standard strength of the standard strength of the standard st				
Dish						
Dry Soil	Ws	99.44	86.87	0.00	0.00	0.00
Flask and Water at Temp.	Wbw	675.23	670.39			
Ws + Wbw		774.67	757.26	0.00	0.00	0.00
Flask & Water & Immersed Soil	Wbws	738.85	725.24			
Displaced Water, (Ws+Wbw-Wb		35.82	32.02	0.00	0.00	0.00
Correction Factor	K	1.00	1.00			
(WsK)+(Ws+Wbw-Wbws)	Gs	2.77	2.71	ERR	ERR	ERA
	APPAR	RENT (Gs)	AND BLUK	(Gm) SPEC	IFIC GRAV	TY
Sample or Specimen No.						
Temperature of Water and Soil						
Tare						
Saturated Suface-Dry Soil	В	0.00	0.00	0.00	0.00	0.00
(Wire Basket & Soil) in Water						
Wire Basket in Water						
Saturated Soil in Water	C	0.00	0.00	0.00	0.00	0.00
Tare and Dry Soil						
Tare						
Dry Soil	A	0.00	0.00	0.00	0.00	0.00
Correction Factor	K					
(AK) / (A-C) (Apparent)	Ga	ERR	ERR	ERR	ERR	ERA
(AK) / (B-C) (Bulk)	Gm	ERR	ERR	ERR	ERR	ERR

Tested By:

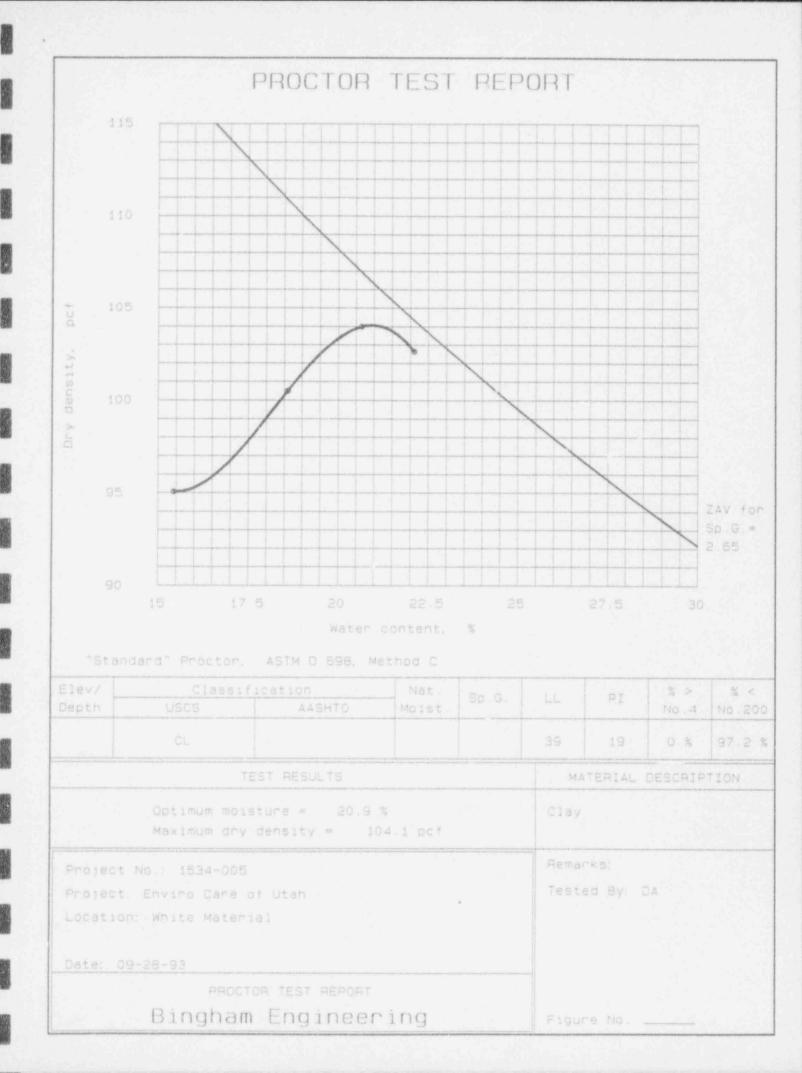
Checked By:

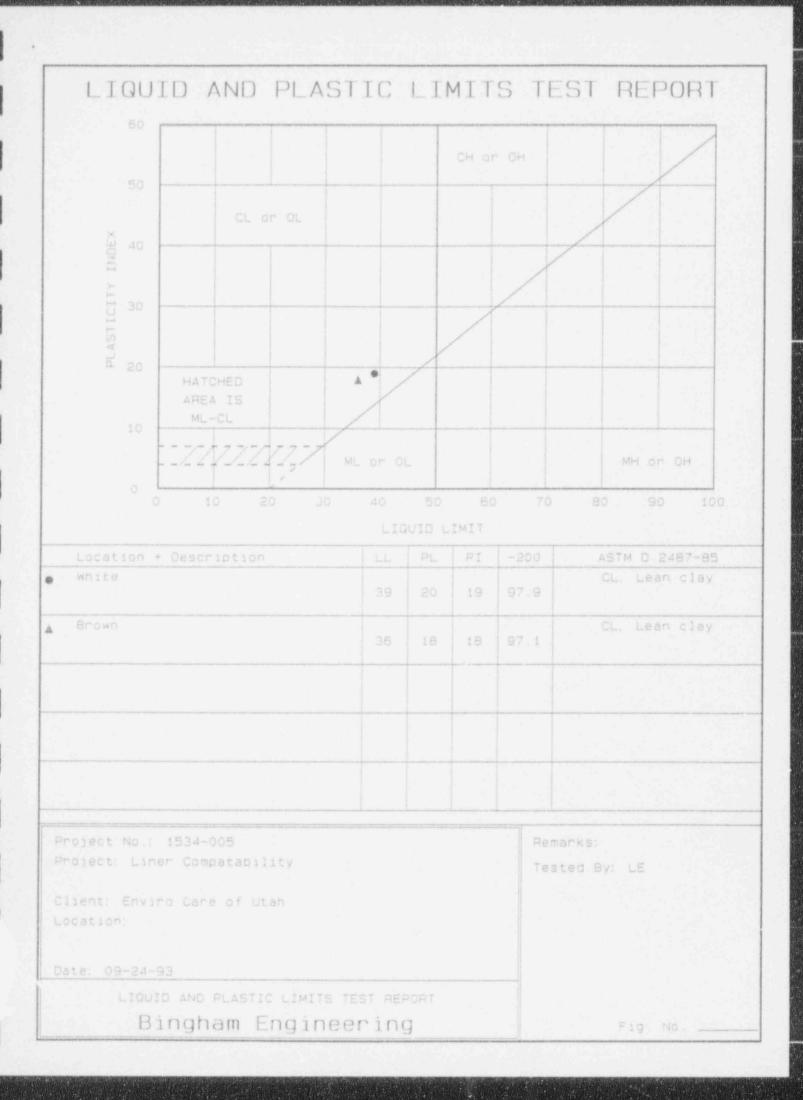


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		9 mm								
96					/		$\langle \rangle$			
40 95 00										
density. 0							\backslash			
93										2AV for 5p.G.= 2.65
92										
	23 dard" Proc	24 tor, 2		ater c	26 ontent.	27		28	29	
"Stan Elev/	dard" Proc Cla		WI ASTM D 69	ater c 38. Met	ontent.		L.L.	28	* *	% < No 20
"Stan Elev/	dard" Proc	tor, /	Wastm D 69 ation	ater c 38. Met	ontent. nod C Nat.	*		PI	* *	No 20
"Stan Elev/	dard" Proc Cla USCS	tor, /	Wastm D 69 ation	ater c 38. Met Q	ontent. nod C Nat.	*	LL 36	PI	% × No.4 0 %	No 20 97 9
"Stan Elev/	dard" Proc Cla USCS CL Optimum	tor, / assific TES	Wastm D 69 ation AASHT	ater c 38. Met 0. 5.	ontent. Inod C Nat Moist	*	LL 36	PI 18 ATERIAL	% × No.4 0 %	No 20 97 9
"Stan Elev/ Depth Project Project	dard" Proc Cla USCS CL Optimum	tor, 2 SSIFIC TES moist dry de -005 are of	Wa ASTM D 69 <u>ation</u> AASHT T RESULTS Ure = 3 ensity = Utan	ater c 38. Met 0. 5.	ontent. Inod C Nat Moist	*	LL 36 Mi Clay Rema	PI 18 ATERIAL	% > No 4 0 % DESCRIP	No 20 97 9
"Stan Elev/ Depth Project Project Locatio	dard" Proc Cla USCS CL Optimum Maximum No.: 1534 Enviro C	tor, 2 SSIFIC TES moist dry de -005 are of	Wa ASTM D 69 <u>ation</u> AASHT T RESULTS Ure = 3 ensity = Utan	ater c 38. Met 0. 5.	ontent. Inod C Nat Moist	*	LL 36 Mi Clay Rema	PI 18 ATERIAL	% > No 4 0 % DESCRIP	No 20 97 9
"Stan Elev/ Depth Project Project Locatio	dard' Proc Cla USCS CL Optimum Maximum No.: 1534 Enviro C n: Brown M 9-28-93	tor, 2 SSSIFIC TES moist dry de -005 are of aterial	Wa ASTM D 69 <u>ation</u> AASHT T RESULTS Ure = 3 ensity = Utan	ater c 38. Met 0 24.4 % 96.	ontent. inod C Nat Moist 7 pcf	*	LL 36 Mi Clay Rema	PI 18 ATERIAL	% > No 4 0 % DESCRIP	No 20 97 9

PROCTOR TEST REPORT

N- North





ediment and lock amples			125	Place /							-				r) Rel:	-	NUMBER OF STREET, STRE		nce		71
Bulk XRD Sample No.	/		and a	198/-1	A -Peloton		3/.	198	5/2			id-	/*	000/11	Sinces Ifica		Relay Davis	/	/	//	/
NAT sediment		12	2	3	4	8	53	Tr					2	1	15	-					
NRC rock		5	52			*3			8	1	15				*.1.1						*fine coating on rock From the XRD mineralogy and a binocular examinatio of the sample, the roc appears to be a pyroxene andesite, without clay alteration
MM = P	redo	mir	ant		M =	M	ajor	r	m	= N	lino	r	T	r = '	Trace		T = 7	'ent:	ativ	e Iden	tification

ATTACHMENT 2

CHEMICAL LABORATORY TESTING

SUMMARY OF WATER QUALITY DATA

LARW Compliance Monitor Wells (in mg/l unless noted otherwise)

PARAMETERS	SAMPLING DATE						
	GWPL	3rd Quarter (8-4-93)	4th Quarter (11-3-93)				
DISSOLVED METALS		province at a different sources to made a state and state of the	ter in a second s				
Arsenic	0.05	[0.021]JFD	[0,021]JS				
Barium	1	0.015	0.027				
Beryllium		ND	ND				
Cadmium	0.01	0.015	0.046				
Chromium	0.05	0.077	0.12				
Copper	1	[0.025]JFD	[0.033]JFD				
Lead	0.05	ND	NE				
Mercury	0.002	0.0002	0.0005				
Molybdenum		0.5	0.6				
Nickel	0.15	[0.072]JFD	0.15				
Selenium	0.01	ND	INDUS				
Silver	0.05	ND	NE				
Zinc	6.25	0.023	[0.029]JFD				
ANIONS			ter warmen and the second second				
Bicarbonate		180	160				
Carbonate		ND	NE				
Chloride		23000	24000				
Sulfate		5600	[4400]JFD				
CATIONS			An one of the second				
Calcium		810	680				
Magnesium		1200	910				
Potassium		520	460				
Sodium		16000	16000				
OTHER CHEMISTRIES	nen versten wich i die einen einen einen der beiden beiden beiden.						
Cyanide		ND	ND				
Fluoride	4.54	4.6	4.2				
Nitrate	a series de la case de la serie y la realidad de la se	ND	ND				
Nitrates (NO3-N + NO2-N)	10	ND	ND				
Total Dissolved Solids	52013	50000	53000				
Conductivity (umhos/cm)		66000	82000				
рН	6,5-8,5	7.4	7.3				
ORGANICS							
Total Organic Carbon (TOC)	13.15	ND	ND				
Fotal Organic Halogens (TOX)	0.03	ND	ND				
FIELD MEASUREMENTS							
H		7,25	7.0				
Conductivity (umhos/cm)		71800	76933				
Temperature (Deg. C)		12.7	12.0				

ND Not Detected

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SUMMARY OF WATER QUALITY DATA

LARW Compliance Monitor Wells (in pCi/l unless noted otherwise)

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PARAMETERS	SAMPLING DATE							
	GWPL	3rd Quarter (8-4-93)	4th Quarter (11-3-93)					
DISSOLVED RADIOLOGICS								
Gross Alpha	160	0+/-160	70+/-190					
Gross Beta	692	260+/-170	270+/-190					
Total Uranium (mg/l)	0.02	0.0008	0.0029					
Beryllium-7		<24	<16					
Cadmium-109		<47	<36					
Carbon-14	2133.00	[3+/-12]J	[18+/-14]J					
Cobalt-60		<2.8	<1.6					
Iodine-129	7	0.0+/-1,4	0.0+/-2.0					
Manganese-54		<2.4	<1.8					
Neptunium-237	8	[0,1+/+0,3]J	0.0+/-0.7					
Potassium-40	372	610+/-90	590+/-60					
Radium-226	(Ra-226+Ra-228) 5	0.5+/-0.4	[0,4+/-0,4]J					
Radium-228		[0.9+/-0.5]J	1.1+/-0.5					
Strontium-90	8	0.0+/-0.8	1.2+/-1.6					
Technetium-99	800	0.0+/-7.2	0.0+/-4.4					
Thorium-230	5.33	0.0+/+0.8	[0.4+/-2.3]J					
Thorium-232	5,33	0.0+/-1.5	0.0+/-2.4					
Tritium		[10+/-290]J	0+/-309					

Barringer Laboratories Inc. Golden, CO Pages: 7 Page# 1

FAXED ANALYTICAL REPORT

FROM: Barringer Laboratories, Inc. JOB : 941409 DATE: 8-Mar-94 TIME: 16:41

TO :

BINGHAM ENGINEERING COMPANY 5160 Wiley Post Way Salt Lake City, UT 84116

This is an electronically transferred fax of analytical results (preliminary or final, as designated on the report). The data contained in this report has been reviewed and approved by the laboratory managers and QA/QC personnel. The final report with all appropriate signatures and QA/QC will follow by mail. We do not assume any responsibility for the fax transmission. It is the client's responsibility to notify us of any changes in address and/or phone number.

Barringer Laboratories Inc. Golden, CO Pages: 7 Page# 2

8-Mar-94 Page: R-1 Copy: 1 of 2 Status: Final

BINGHAM ENGINEERING COMPANY

Sample Id: pH 4W Lab Id: 941409-1 Date Sampled: 24-Feb-94

Analyte Arsenic	Fraction Dissolved	Method 206.2	Concentr Ø. 32		MDL Ø. Ø1	Date Analyzed 4-Mar-94
Barium	Dissolved	200.7		mg/1	0.2	3-Mar-94
Cadmium	Dissolved	200.7		mg/1	Ø. 1	3-Mar-94
Chromium	Dissolved	200.7		mg/1	Ø.2	3-Mar-94
Copper	Dissolved	200.7		mg/l	0.2	3-Mar-94
Lead	Dissolved	239. Z		mg/l	0.05	4-Mar-94
Mercury	Dissolved	245.1		mg/l	0.003	3-Mar-94
Selenium	Dissolved	270.2	0.03		0.02	4-Mar-94
Silver	Dissolved	200.7		mg/1	0.2	3-Mar-94
Zinc	Dissolved	200.7		mg/1	Ø. 1	3-Mar-94
Magnesium	Dissolved	200.7	426	mg/1	1	3-Mar-94
Potassium	Dissolved	200.7		mg/1	10	3-Mar-94
Sodium	Dissolved	200.7	11300	mg/1	1	3-Mar-94
Chloride		300.0		mg/1	- 1	3-Mar-94
Sulfate		300.0	3830		1	3-Mar-94
Fluorine		340. Z		mg/1	Ø. 1	3-Mar-94
pН		150.1		unit	0.01	25-Feb-94
Calcium	Dissolved	200.7	604	mg/1	1	3-Mar-94

8-Mar-94 Page: R-2 Copy: 1 of 2 Status: Final

BINGHAM ENGINEERING COMPANY

Sample Id: pH 48 Lab Id: 941409-2 Date Sampled: 24-Feb-94

No. State

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Annalista	Fraction	Method	Concentrati	ion MDL	Analyzed
Analyte			Ø.47 mg/		4-Mar-94
Arsenic	Dissolved	206.2			
Barium	Dissolved	200.7	Ø.2 mg/		3-Mar-94
Cadmium	Dissolved	200.7	U mg/	/1 Ø.1	3-Mar-94
Chromium	Dissolved	200.7	U mg/	1 0.2	3-Mar-94
Copper	Dissolved	200.7	0.5 mg/	1 0.2	3-Mar-94
Lead	Dissolved	239. Z	U mg/	0.05	4-Mar-94
Mercury	Dissolved	245.1	U mg/		3-Mar-94
Selenium	Dissolved	270.Z	U mg/		4-Mar-94
Silver	Dissolved	200.7	U mg,	/1 0.2	3-Mar-94
Zinc	Dissolved	200.7	3.5 mg/	/1 Ø.1	3-Mar-94
Magnesium	Dissolved	200.7	391 mg/	/1 1	3-Mar-94
Potassium	Dissolved	200.7	297 mg/	1 10	3-Mar-94
Sodium	Dissolved	200.7	10000 mg/	/1 1	3-Mar-94
Chloride		300.0	10800 mg.	/1 1	3-Mar-94
Sulfate		300.0	1230 mg	/1 1	3-Mar-94
Fluorine		34Ø. 2	0.5 mg		3-Mar-94
pH		150.1	7.62 un		25-Feb-94
Calcium	Dissolved	200.7	553 mg.		3-Mar-94

8-Mar-94 Page: R-3 Copy: 1 of 2 Status: Final

BINGHAM ENGINEERING COMPANY

Sample Id: pH 7 Lab Id: 941409-3 Date Sampled: 24-Feb-54

Constant Constant

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						Date
Analyte	Fraction	Method	Concenti	ration	MDL	Analyzed
Arsenic	Dissolved	206.Z	0.02	mg/1	0.01	4-Mar-94
Barium	Dissolved	200.7	U	mg/1	0.2	3-Mar-94
Cadmium	Dissolved	200.7		mg/1	0.1	3-Mar-94
Chromium	Dissolved	200.7		mg/1	0.2	3-Mar-94
Copper	Dissolved	200.7		mg/1	0.2	3-Mar-94
Lead	Dissolved	239.2		mg/1	0.05	4-Mar-94
Mercury	Dissolved	245.1		mg/l	0.003	3-Mar-94
Selenium	Dissolved	270.2		mg/1	0.02	4-Mar-94
Silver	Dissolved	200.7		mg/1	0.2	3-Mar-94
Zinc	Dissolved	200.7		mg/1	Ø.1	3-Mar-94
Magnesium	Dissolved	200.7		mg/1	1	3-Mar-94
Potassium	Dissolved	200.7		mg/1	10	3-Mar-94
Sodium	Dissolved	200.7	11000		1	3-Mar-94
Chloride		300.0	14400		1	3-Mar-94
Sulfate		300.0		mg/1	1	3-Mar-94
Fluorine		340.2		mg/1	0.1	3-Mar-94
pH		150.1		unit	0.01	25-Feb-94
Calcium	Dissolved	200.7		mg/1	1	3-Mar-94

Barringer Laboratories Inc. Golden, CO Pages: 7 Page# 5

8-Mar-94 Page: R-4 Copy: 1 of 2 Status: Final

BINGHAM ENGINEERING COMPANY

Sample Id: pH 2 Lab Id: 941409-4 Date Sampled: 24-Feb-94

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Analyte	Fraction	Method	Concenti	ration	MDL	Date Analyzed
Arsenic	Dissolved	206.2	0.03		0.01	4-Mar-94
Barium	Dissolved	200.7		mg/1	Ø.2	3-Mar-94
Cadmium	Dissolved	200.7	U	mg/1	Ø. 1	3-Mar-94
Chromium	Dissolved	200.7		mg/1	0.2	3-Mar-94
Copper	Dissolved	200.7		mg/1	0.2	3-Mar-94
Lead	Dissolved	239.2		mg/1	0.05	4-Mar-94
Mercury	Dissolved	245.1		mg/1	0.003	3-Mar-94
Selenium	Dissolved	270.2		mg/1	0.02	4-Mar-94
Silver	Dissolved	200.7		mg/1	0.2	3-Mar-94
Zinc	Dissolved	200.7		mg/1	Ø. 1	3-Mar-94
Magnesium	Dissolved	200.7		mg/1	1	3-Mar-94
Potassium	Dissolved	200.7	344	mg/1	10	3-Mar-94
Sadium	Dissolved	200.7	12500	mg/1	1	3-Mar-94
Chloride		300.0	16100	mg/1	1	3-Mar-94
Sulfate		300.0	2980	mg/1	1	3-Mar-94
Fluorine		340.2		mg/1	Ø. 1	3-Mar-94
pH		150.1	7.57	unit	0.01	25-Feb-94
Calcium	Dissolved	200.7	526	mg/1	1	3-Mar-94

No.

B-Mar-94 Page: R-5 Copy: 1 of 2 Status: Final

BINGHAM ENGINEERING COMPANY

Sample Id: pH 4W Lab Id: 941409-1 Date Sampled: 24-Feb-94	Project: 1534-1 Matrix: Water	aas	D-1-
Ra-226 Total Th-228 Total Th-230 Total	Conc. ± 25 0.0±1.0 pCi/1 0.0±3.2 pCi/1 0.6±3.1 pCi/1 .0040 mg/1 0.0±2.5 pCi/1	LLD Ø.3 Ø.4 Ø.4 Ø.0003 Ø.4	Date Analyzed 03/01-03/04 03/03-03/04 03/03-03/04 03/01-03/03 03/03-03/04
Sample Id: pH 4B Lab Id: 941409-2 Date Sampled: 24-Feb-94	Project: 1534-1 Matrix: Water	205	Date
Ra-226 Total Th-228 Total Th-230 Total	Conc. ± 28 3.0±2.2 pCi/1 0.0±1.9 pCi/1 0.5±2.3 pCi/1 .0117 mg/1 0.0±2.5 pCi/1	LLD Ø.3 Ø.4 Ø.4 Ø.4 Ø.9003 Ø.4	Analyzed 03/01-03/04 03/03-03/04 03/03-03/04 03/01-03/03 03/03-03/04
Sample Id: pH 7 Lab Id: 941409-3 Date Sampled: 24-Feb-94	Projec : 1534- Matrix Water	005	Date
Ra-226 Total Th-228 Total Th-230 Total	Conc. ± 25 0.0±1.1 pCi/1 0.0±2.2 pCi/1 0.4±2.3 pCi/1 1.0145 mg/1 0.0±1.9 pCi/1	LLD Ø.3 Ø.4 Ø.4 Ø.9003 Ø.4	Analyzed 03/01-03/04 03/03-03/04 03/03-03/04 03/01-03/03 03/03-03/04
Sample Id: pH 2 Lab Id: 941409-4 Date Sampled: 24-Feb-94	Project: 1534- Matrix: Water	005	Date
Ra-226 Total Th-228 Total Th-230 Total	Conc. ± 28 Ø.6±1.5 pCi/1 Ø.0±2.5 pCi/1 Ø.6±3.1 pCi/1 1.0094 mg/1 Ø.1±3.6 pCi/1	LLD Ø.3 Ø.4 Ø.4 Ø.9003 Ø.4	Analyzed 03/01-03/04 03/03-03/04 03/03-03/04 03/01-03/03 03/03-03/04

Barringer Laboratories Inc. Golden, CU Pages: 7 Page# 7

BINGHAM ENGINEERING COMPANY 5160 Wiley Post Way Salt Lake City, UT 84116 8-Mar-94

Final

Page: R-6 Copy: 1 of Z

Received: 25-Feb-94 09:40

Status:

PO #:

Job: 941409E

Attn: Dave Cline

Project: 1534-005

Abbreviations:

Parameters:

Ra-226	: Radium-226
Th-228	: Thorium-228
Th-230	: Thorium-230
U	: Uranium
Th-232	: Thorium-232

Units:

mg/1 pCi/1 pCi/p		milligrams picoEuries picoEuries	per	liter	
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Quality codes:

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: Sample (5 times LLD : Undetected

cc: Vernon Andrews, ENVIROCARE OF UTAH