APPENDIX C

LANDFILL BARRIER PROTECTION REPORT

Prepared for:

FIELD OPERATIONS
475 Tenth Ave, 10th Floor
New York, New York 10018

Results of

GEOTECHNICAL LABORATORY TESTING PROGRAM

Fresh Kills Park Development Project

Fresh Kills Landfill
Staten Island, New York

Prepared by

Geosyntec consultants

10015 OLD COLUMBIA ROAD
SUITE A-200
COLUMBIA, MARYLAND 21046

Geosyntec Project No.: ME0530

August 2008

TABLE OF CONTENTS

TABLE

FIGURE

APPENDICES

1. INTRODUCTION

1.1 Terms of Reference

This report was prepared by Geosyntec Consultants (Geosyntec) to present the test results of a geotechnical laboratory testing program performed as part of the Fresh Kills Park Development Project located at the Fresh Kills Landfill (FKLF) in Staten Island, New York City, New York. The work described in this report was prepared in partial fulfillment of Task 2.9 (East mound Soil Sampling) of the Phase 3A professional services contract between the New York City Department of Parks and Recreation (DPR) and the primary consultant for the Fresh Kills Park development project, Field Operations (FO).

The purpose of the geotechnical testing program is to characterize and investigate the suitability of fill material used for landfill final cover construction (i.e., Barrier Protection Material (BPM)) to perform as a pavement subgrade material. The material samples tested for this report are from the Fresh Kills Landfill Section 6/7 Closure Project, and the results presented herein are intended to support design of roadway pavement structures to be constructed on Fresh Kills Landfill Section 6/7.

The results of this laboratory investigation provide information necessary to generally comply with the New York State Department of Transportation (NYSDOT) requirements for pavement design.

This report was prepared by Lucas de Melo, Ph.D., and was reviewed by William Steier, P.E., both of Geosyntec, in accordance with Geosyntec's internal peer review policy.

1.2 Report Organization

In this report, results of laboratory tests, including resilient modulus tests, are presented; constitutive parameter analysis is provided; and, engineering recommendations for the use of BPM as a roadway subgrade are made.

The remainder of this report is organized as follows:

- Section 2 provides a description of the landfill cover system construction materials and BPM sampling procedures;
- Section 3 presents the laboratory test results and data analysis for BPM material;
- Section 4 contains a description of future testing which could be used to supplement the data presented in this report; and
- Section 5 presents a summary.

2. MATERIAL DESCRIPTION AND SAMPLING PROCESS

2.1 Introduction

The design of the Fresh Kills Landfill Section 6/7 Closure Project is presented in the document titled, *The Fresh Kills Landfill Section 6/7 Final Cover Design Report* (Final Closure Report), (Malcolm Pirnie, 2001). As defined in the Final Closure Report, the landfill final cover system consists of the following layers, listed from top to bottom:

- 6-inch thick, vegetative support layer (topsoil);
- 24-inch thick, BPM soil;
- 300-mil, double-sided, geocomposite infiltration water drainage layer/or geotextile drainage layer;
- 40-mil thick, textured, linear low-density polyethylene (LLDPE) hydraulic barrier;
- 300-mil, double-sided, geocomposite gas venting layer;
- variable thickness (minimum 6-inch), non-specified cover soil layer; and
- variable thickness, municipal solid waste (MSW) layer.

The laboratory investigations for this report were performed to specifically obtain values of resilient modulus of the BPM soil used to construct the final cover system on landfill Section 6/7.

The resilient modulus of the BPM layer is an important parameter that can be used for structural design of roadway pavements constructed overtop of the landfill final cover system.

2.2 Material Sampling

On 15 March 2008, Geosyntec field personnel collected five, five-gallon soil samples from BPM Stockpile G, located at the north side of FKLF Section 3/4. Samples were collected from the bottom third of the stockpile slope; prior to collection, the top two feet of stockpile material was removed. Samples were labeled as G-61 through G-65.

According to the New York City Department of Sanitation (DSNY) construction records, at the time of sampling, Stockpile G consisted of a mixture of soils obtained from the Mazza and the Onion Field borrow pits located in Tinton Falls, New Jersey. Tully Construction Company, Inc. , under contract to the DSNY was responsible for creating the BPM stockpile from which samples for this report were collected.

2.3 Material Description

According to the specification document, *Final Cover at Fresh Kills Landfill Detailed Specifications* (DSNY, 2005), as amended during construction, BPM shall be a certified clean fill, and shall meet the following requirements:

SOIL PROPERTY	REQUIREMENT
Coefficient of Hydraulic Conductivity	Between 1×10^{-5} cm/s and 5×10^{-3} cm/s
Internal Friction Angle	No less than 31 degrees
Plasticity Index	Less than 15
Particle Distribution	100% passing 4-inch square sieve 80% to 100% passing 3/4-inch square sieve Less than 30% passing No. 200 sieve

As part of the landfill cover construction quality assurance documentation, multiple tests to verify compliance with the requirements are performed. Selected quality control data, which demonstrates conformance with the preceding requirements, is provided in Appendix A.

3. LABORATORY TEST RESULTS AND DATA ANALYSIS

3.1 Engineering Classification

A laboratory testing program was conducted on the collected soil samples. The following tests were performed by the firm Burns Cooley Dennis, Inc. in order to provide the engineering classification of the collected soils.

- **Atterberg Limits.** Liquid limit (LL) and plastic limit (PL) were measured on each of the five collected samples using the procedure provided in ASTM D4318. The plasticity index (PI) was computed from these values using the expression PI = LL – PL.
- **Soil Gradation.** Sieve and hydrometer analyses were performed on each of the five collected samples to evaluate the soil particle size distribution; tests were performed using procedures provided in ASTM D422.

3.2 Resilient Modulus Test

Following review of the engineering classification test results, samples G-64 and G-65 were selected as being representative of the five samples collected. And consequently, the following additional tests were performed on samples G-64 and G-65 to determine resilient modulus of the samples:

- **Compaction Test.** Samples were compacted according to the Standard Proctor test (ASTM D698) in order to determine the maximum dry density and optimum moisture content of each sample.
- **Resilient Modulus.** Test specimens, compacted to the 100% of the maximum dry density at the optimum moisture content (Standard Proctor Test) were tested for resilient modulus according to the procedures provided in AASHTO T307.

Resilient modulus values are determined from cyclic triaxial tests performed on prepared samples. The test is typically replicated a minimum of three times to verify repeatability of the results. For this investigation, tests on BPM sample G-64 were replicated four times; tests on BPM sample G-65 were replicated three times. For the mechanistic-empirical pavement design method, the resilient modulus is estimated using a generalized constitutive model, as follows (NCHRP, 2004):

$$M_r = k_1 \, p_a \left(\frac{\theta}{p_a}\right)^{k_2} \left(\frac{\tau_{oct}}{p_a} + 1\right)^{k_3} \qquad (1)$$

where:

M_r = Resilient modulus, in pound per square inch (psi);

θ = first invariant of the stress tensor = $\sigma_1 + \sigma_2 + \sigma_3$;

σ_1 = major principal stress;

σ_2 = intermediate principal stress; for cylindrical specimens, $\sigma_2 = \sigma_3$;

σ_3 = minor principal stress = confining stress;

τ_{oct} = octahedral shear stress =

$$\frac{1}{3}\sqrt[2]{(\sigma_1 - \sigma_2)^2 + (\sigma_1 - \sigma_2)^2 + (\sigma_1 - \sigma_2)^2};$$

p_a = normalizing stress = atmospheric pressure; and

k_1, k_2, and k_3 = constitutive model parameters.

The parameters of the constitutive model were determined by using regression analyses to fit the model to the laboratory measured resilient modulus. As seen in Equation 1, M_r values are dependent of the stress state (applied loads) and each coefficient plays a different role on the resulting resilient modulus.

Coefficient k_1 is proportional to the elastic (Young) modulus; therefore, k_1 values are always positive. The values of k_2 are also always positive, for when the value of θ increases, the material response will be stiffer, and therefore, M_r will be higher. Parameter k_3 should always be negative, since the material will soften as τ_{oct} increases.

Laboratory test results for constitutive model parameters are summarized in Table 1 and individual laboratory reports for each resilient modulus test are presented in Appendix B.

3.3 Data Analysis

Analyses of the test results for the five collected samples revealed that the BPM is a clean granular fill material, classified under the American Association of State Highway and Transportation Officials (AASHTO) system as either A-2-4 or A-3, therefore, possessing an excellent to good general rating as a subgrade material, (AASHTO M 145).

Values of the resilient modulus constitutive model parameters did not vary significantly between the analyzed samples (G-64 and G-65), see Table 1; therefore, Geosyntec recommends using an average value of the parameters (i.e., k_1 = 1,271.4; k_2 = 1.028 and k_3 = -1.683) for future determination of the resilient modulus value for Landfill Section 6/7 final cover system BPM for a given state of stress (i.e., loading condition).

For confining pressures ranging between 1.9 psi and 11.9 psi, laboratory measured resilient modulus values ranged from 8,488 psi (58 MPa) to 33,626 psi (232 MPa) for BPM sample G-64 and from 9,982 psi (69 MPa) to 38,746 psi (267 MPa), for BPM sample G-65. It is noteworthy to mention that all test replicates for this investigation presented a correlation coefficient (r^2) above minimum desirable value of 0.90 (NCHRP, 2004).

Comparison of the minimum resilient modulus values measured in this study to guidance presented in the NYSDOT Comprehensive Pavement Design Manual (NYSDOT, 2002), reveals that the BPM materials investigated for this study exceeds the minimum NYSDOT recommended values (i.e., 28 MPa). Consequently, the BPM material used for construction of the landfill Section 6/7 Final Cover system can be considered a very good subgrade material.

4. FUTURE WORK

This report presents results specifically for BPM material. However, because of the relatively thin thickness of the BPM layer, a composite resilient modulus value considering both the resilient modulus of the BPM layer and underlying waste may be considered appropriate for design. To obtain a composite resilient modulus for in-place materials (i.e., BPM layer, geosynthetic layers, cover soil and municipal solid waste layer) a field test, such as the Falling Weight Deflectometer (FWD) test (ASTM D 4694) could be used. A combined analysis of the composite resilient modulus obtained from field tests, and BPM resilient modulus values obtained from laboratory tests presented in this report, could be used to back-calculate subgrade resilient modulus for any combination of design load, BPM and municipal solid waste layers thickness. This analysis could help to optimize the pavement design from a structural stability standpoint.

5. SUMMARY

An investigation was conducted with the BPM material used in final cover construction at the Fresh Kills Landfill Section 6/7. Laboratory tests were performed, to characterize the BPM as a pavement subgrade material. Based on the laboratory results presented in this report, the BPM is a suitable pavement subgrade material, meeting or exceeding NYSDOT requirements. Falling Weight Deflectometer field tests, which could be used to optimize the structural pavement design, are suggested.

6. REFERENCES

DSNY, *Final Cover at Fresh Kills Landfill – Detailed Specifications-Specific Provisions*, Volume 1, August 2005.

Malcolm Pirnie, Inc., *The Fresh Kills Landfill Section 6/7, Final Cover Design Report*, January 2001.

NCHRP, *Guide for Mechanistic-Empirical Design*, Part 2, Chapter 2. National Cooperative Highway Research Program, March 2004.

NYSDOT, *Comprehensive Pavement Design Manual*, Revision 1, New York, July 2002.

TABLE

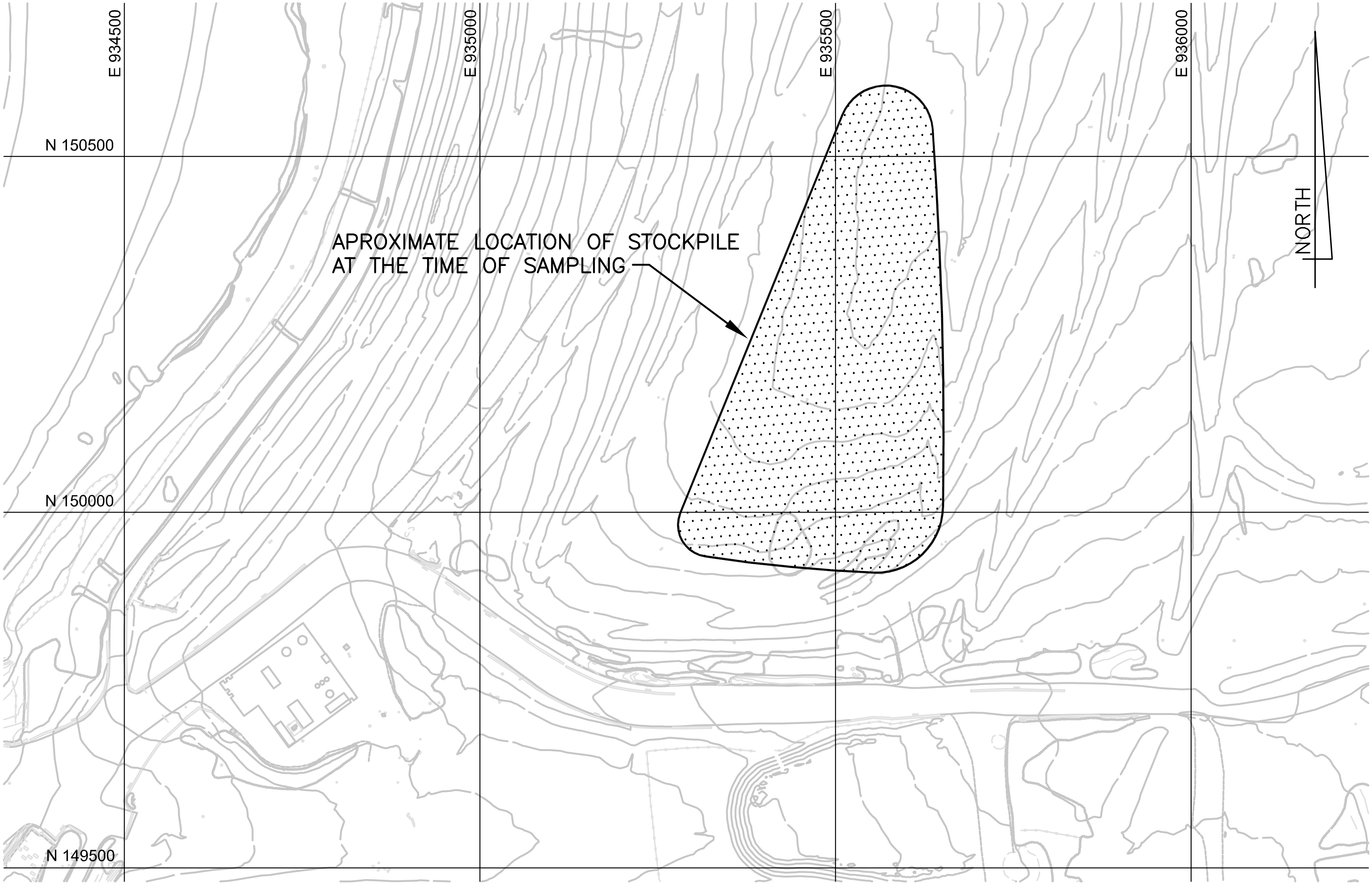
TABLE 1

Summary of Laboratory Test Results
Barrier Protection Material (BPM) – FKLF Section 6/7
Staten Island, New York, New York

Sample Identification	LL[1]	LP[1]	IP[1]	Fines Content (%)	USCS Classification	AASHTO Classification	Maximum dry density (pcf)	Optimum Moisture (%)	Resilient Modulus Model Parameter (average)					
									k_1		k_2		k_3	
									Replicates	Average	Replicates	Average	Replicates	Average
G-61	NP	NP	NP	9.9	SP-SM	A-3	-	-	-		-		-	
G-62	NP	NP	NP	10.2	SP	A-2-4	-	-	-		-		-	
G-63	NP	NP	NP	11.9	SP	A-2-4	-	-	-		-		-	
G-64	NP	NP	NP	8.0	SP-SM	A-3	111.3	7.9	1,129.9	1,217.9	1.108	1.013	-1.864	-1.682
									1,251.0		1.002		-1.655	
									1,234.2		0.964		-1.586	
									1,256.6		0.977		-1.623	
G-65	NP	NP	NP	10.4	SW-SM	A-2-4	115.5	10.7	1,392.2	1,325.0	1.002	1.042	-1.514	-1.683
									1,349.7		1.073		-1.862	
									1,233.0		1.051		-1.674	

[1] NP – Non plastic.

FIGURE



200 100 0 200

SCALE: 1" = 200'

STOCKPILE LOCATION PLAN

Geosyntec consultants

COLUMBIA, MARYLAND

DATE:	AUG 08
PROJECT NO.	
DOCUMENT NO.	
FILE NO.	0530D–004
FIGURE NO.	1

APPENDIX A

QUALITY CONTROL DATA FOR THE BARRIER PROTECTION MATERIAL

QC Data for Barrier Protection Material

(Grid) NO.	notes	DATE tested as BPM	No. 200 Sieve (%)	Rock-Corrected Max Dry Density (pcf)	Optimum Moisture (%)	Perm (cm/sec)	Internal Friction - Optimum Moisture (degrees)	Internal Friction - Saturated Moisture (degrees)	Interface Friction Angle, BPM vs. Geotextile		Interface Friction Angle, BPM vs. 300 mil Geocomposite	
									Peak Secant(100,300, 500)	Peak Secant(300,500, 1000)	Peak Secant(100,300, 500)	Peak Secant(300,500, 1000)
Tinton Falls, NJ - Mazza Borrow Source												
G-4	BPM	10/5/06	11.1	103.2	8.1	2.5E-04	34.0	n/a	42.1	58.3	40.4	38.2
H-4	BPM											
G-5	BPM		8.7									
H-5	BPM											
I-5	BPM		10.6	103.7	8.2	3.8E-04	39.2	n/a	41.6	40.6	39.9	39.6
J-5	BPM											
I-6	shipped to Other		9.8									
J-6	BPM											
J-7	BPM		8.7	103.2	7.6	4.6E-04	38.6	n/a	40.9	39.9	37.0	35.9
K-7	BPM											
J-8	BPM		12.1									
K-8	BPM											
L-7	BPM	11/14/06	14.0	106.2	8.8	2.6E-04	42.3	35.2	46.6	39.6	47.5	42.1
M-7	BPM											
L-8	BPM		9.8									
M-8	BPM											
J-9	BPM		10.9	106.0	7.9	2.9E-03	34.2	32.6	44.0	37.9	44.6	41.1
J-10	BPM											
K-9	BPM		10.0									
K-10	BPM											
H-9	shipped to Other	11/15/06	9.6	105.1	7.3	2.1E-03	35.2	33.7	42.9	38.4	44.2	39.8
I-9	BPM											
H-10	BPM		10.2									
I-10	BPM											
F-10	BPM		7.9	109.5	8.7	1.0E-03	44.0	34.5	42.6	39.0	45.4	40.2
G-10	BPM											
F-11	BPM		9.6									
G-11	BPM											
J-7a	BPM, second lift	11/16/06	6.6	105.6	6.4	1.9E-03	44.9	34.6	43.5	38.5	48.9	42.4
K-7a	BPM, second lift											
J-8a	BPM, second lift		7.2									
K-8a	BPM, second lift											
H-11	BPM		12.8	105.1	8.1	2.0E-03	42.2	32.1	45.5	39.7	49.5	46.1
I-11	BPM											
J-11	BPM		12.8									
K-11	BPM											
F-12	BPM	11/28/06	10.3	103.4	8.2	5.3E-04	40.7	34.9	43.9	38.9	44.3	38.4
G-12	BPM											
H-12	BPM		11.5									
I-12	BPM											
I-9a	BPM. second lift	11/30/06	20.5	104.4	11.9	3.5E-04	42.9	34.2	49.0	43.0	44.8	38.7
J-9a	BPM. second lift											
H-9a	BPM. second lift		22.0									
I-10a	BPM. second lift											

QC Data for Barrier Protection Material

(Grid) NO.	notes	DATE tested as BPM	No. 200 Sieve (%)	Rock-Corrected Max Dry Density (pcf)	Optimum Moisture (%)	Perm (cm/sec)	Internal Friction - Optimum Moisture (degrees)	Internal Friction - Saturated Moisture (degrees)	Interface Friction Angle, BPM vs. Geotextile		Interface Friction Angle, BPM vs. 300 mil Geocomposite	
G-10a	BPM. second lift	12/4/06	10.2	107.0	8.8	8.8E-04	38.0	35.6	40.0	38.0	48.0	42.2
H-10a	BPM. second lift											
G-11a	second lift (covered)		11.2									
H-11a	second lift (covered)											
J-12	BPM	2/7, new chem	15.3	104.1	8.3	1.4E-03	44.4	31.6	46.8	39.6	48.0	40.7
K-12	BPM											
J-13	BPM		15.7									
K-13	BPM											
L-10	BPM	12/14/06	10.7	102.9	8.8	1.3E-03	38.0	not performed as per GZA, 1 result	40.7	37.4	45.9	40.3
L-11	BPM											
L-12	BPM	2/7, new chem	11.5									
L-13	BPM											
M-10	BPM	12/19/06, original, 3/9/07 new chem	11.1	102.9	8.8	2.4E-03	35.9		39.0	38.0	40.0	39.0
M-11	BPM											
M-12	BPM	2/7, new chem	11.2									
M-13	BPM											
L-9	BPM	12/19/06	14.4	101.7	7.5	1.8E-03	42.2		40.0	39.0	40.0	38.0
M-9	BPM											
N-9	BPM		12.3									
O-9	BPM											
N-10	BPM	2/7, new chem	12.6	104.0	10.2	1.4E-03	40.6		38.0	38.0	40.0	39.0
O-10	BPM											
N-11	BPM		12.2									
O-11	BPM											
N-7	BPM	12/27/06	12.3	106.5	10.4	1.4E-03	40.5		38.0	38.0	40.0	39.0
O-7	BPM											
N-8	BPM		11.1									
O-8	BPM											
K-6	BPM	1/4/07	10.9	107.2	10.0	1.1E-03	36.9		39.0	39.0	40.0	39.0
L-6	BPM											
M-6	BPM		11.3									
N-6	BPM											
K-5	BPM		11.9	105.5	8.1	6.6E-04	41.8		41.0	39.0	41.0	40.0
L-5	BPM											
M-5	BPM		13.8									
N-5	BPM											
I-4	BPM	1/11/07	13.1	103.1	9.8	1.7E-03	32.0		40.0	39.0	40.0	39.0
J-4	BPM											
K-4	BPM		13.9									
L-4	BPM											
H-3	BPM	1/16/07	10.3	101.8	6.5	2.6E-03	40.7		40.0	37.0	40.0	39.0
I-3	BPM											
J-3	BPM		8.9									
K-3	BPM											
F-13	BPM	2/7/07	11.6	104.9	11.9	2.4E-03	36.2		38.0	37.0	40.0	39.0
G-13	BPM											
H-13	BPM		16.8									
I-13	BPM											

QC Data for Barrier Protection Material

(Grid) NO.	notes	DATE tested as BPM	No. 200 Sieve (%)	Rock-Corrected Max Dry Density (pcf)	Optimum Moisture (%)	Perm (cm/sec)	Internal Friction - Optimum Moisture (degrees)	Internal Friction - Saturated Moisture (degrees)	Interface Friction Angle, BPM vs. Geotextile		Interface Friction Angle, BPM vs. 300 mil Geocomposite	
N-12	BPM	3/1/07	29.1	101.2	8.4	1.7E-05	34.1		39.0	39.0	42.0	39.0
N-13	BPM											
O-12	BPM		21.1									
0-13	BPM											
F-1	BPM	3/14/07	18.7	100.3	7.8	2.4E-03	36.1		40.0	38.0	40.0	40.0
F-2	BPM											
G-1	BPM		15.0									
G-2	BPM											
F-1a	BPM, second lift	3/19/07	12.3	113.3	10.3	7.4E-04	38.1		41.0	39.0	40.0	40.0
F-2a	BPM, second lift											
G-1a	BPM, second lift		17.0									
G-2a	BPM, second lift											
H-1	BPM	3/19/07	12.5	114.0	10.0	7.7E-04	37.7		41.0	39.0	40.0	39.0
H-2	BPM											
I-1	BPM		14.1									
I-2	BPM											
H-1a	BPM, second lift	3/23/07	10.6	109.8	8.2	1.3E-03	38.4		40.0	38.0	41.0	40.0
H-2a	BPM, second lift											
I-1a	BPM, second lift		9.6									
I-2a	BPM, second lift											
J-1	BPM	3/26/07	8.4	110.5	8.4	1.3E-03	33.6		39.0	37.0	40.0	38.0
J-2	BPM											
K-1	BPM		9.5									
K-2	BPM											
D-1	BPM	4/11/07	12.2	114.7	7.2	1.9E-03	39.8		40.0	38.0	40.0	38.0
D-2	BPM											
E-1	BPM		9.9									
E-2	BPM											
F-1b	BPM, third lift	4/11/07	18.6	117.1	7.6	3.2E-04	40.4		40.0	38.0	40.0	39.0
F-2b	BPM, third lift											
G-1b	BPM, third lift		20.2									
G-2b	BPM, third lift											
Tinton Falls, NJ - Onion Fields Borrow Source												
A-3	BPM	4/19/07	11.3	106.2	8.0	3.5E-03	39.2		40.0	38.0	39.0	38.0
A-4	BPM											
B-3	BPM		11.1									
B-4	BPM											
C-3	BPM	4/19/07	14.3	101.9	10.3	1.2E-03	37.2		38.0	37.0	37.0	35.0
C-4	BPM											
D-3	BPM		9.8									
D-4	BPM											
E-3	BPM	4/19/07	9.1	103.1	10.1	3.2E-04	33.5		40.0	37.0	38.0	37.0
E-4	BPM											
F-3	BPM		11.2									
F-4	BPM											

QC Data for Barrier Protection Material

(Grid) NO.	notes	DATE tested as BPM	No. 200 Sieve (%)	Rock-Corrected Max Dry Density (pcf)	Optimum Moisture (%)	Perm (cm/sec)	Internal Friction - Optimum Moisture (degrees)	Internal Friction - Saturated Moisture (degrees)	Interface Friction Angle, BPM vs. Geotextile		Interface Friction Angle, BPM vs. 300 mil Geocomposite	
C-3a	BPM, second lift	5/7/07	8.5	107.5	8.8	3.8E-03	41.4		41.0	39.0	39.0	37.0
C-4a	BPM, second lift											
D-3a	BPM, second lift		8.0									
D-4a	BPM, second lift											
E-3a	BPM, second lift	5/7/07	9.5	107.0	9.6	3.2E-04	42.8		39.0	37.0	39.0	38.0
E-4a	BPM, second lift											
F-3a	BPM, second lift		9.8									
F-4a	BPM, second lift											
A-5	BPM	5/15/07	15.3	104.3	9.6	1.3E-03	38.1		40.0	38.0	38.0	37.0
A-6	BPM											
B-5	BPM		21.1									
B-6	BPM											
C-5	BPM	5/15/07	25.1	101.0	10.0	3.2E-04	38.0		40.0	37.0	38.0	35.0
C-6	BPM											
D-5	BPM		17.5									
D-6	BPM											
A-5a	BPM, second lift	5/21/07	7.8	108.5	10.6	1.9E-03	34.4		38.0	35.0	40.0	39.0
A-6a	BPM, second lift											
B-5a	BPM, second lift		8.8									
B-6a	BPM, second lift											
C-5a	BPM, second lift	5/21/07	10.5	107.9	9.7	1.8E-03	35.4		38.0	36.0	38.0	36.0
C-6a	BPM, second lift											
D-5a	BPM, second lift		9.7									
D-6a	BPM, second lift											
E-5	BPM	6/8/07	10.9	108.8	7.7	2.8E-03	38.3		38.0	36.0	38.0	36.0
E-6	BPM											
F-5	BPM		9.8									
F-6	BPM											
E-5a	BPM, second lift	6/22/07	11.2	109.5	8.4	2.1E-03	40.8		39.0	38.0	38.0	37.0
E-6a	BPM, second lift											
F-5a	BPM, second lift		15.5									
F-6a	BPM, second lift											
C-5b	BPM, third lift	6/22/07	11.0	109.4	7.3	1.7E-03	44.8		39.0	37.0	38.0	36.0
C-6b	BPM, third lift											
D-5b	BPM, third lift		12.8									
D-6b	BPM, third lift											
G-3	BPM	7/2/07	10.6	107.0	8.8	5.0E-03	41.8		40.0	38.0	38.0	36.0
G-4	BPM											
G-5	BPM		9.0									
G-6	BPM											
H-3	BPM	7/2/07	15.0	106.8	8.3	1.9E-03	44.7		40.0	39.0	39.0	37.0
H-4	BPM											
H-5	BPM		16.8									
H-6	BPM											
G-3a	BPM, second lift	7/31/07	13.4	105.8	8.7	2.1E-03	32.5		40.0	38.0	39.0	38.0
G-4a	BPM, second lift											
G-5a	BPM, second lift		13.3									
G-6a	BPM, second lift											

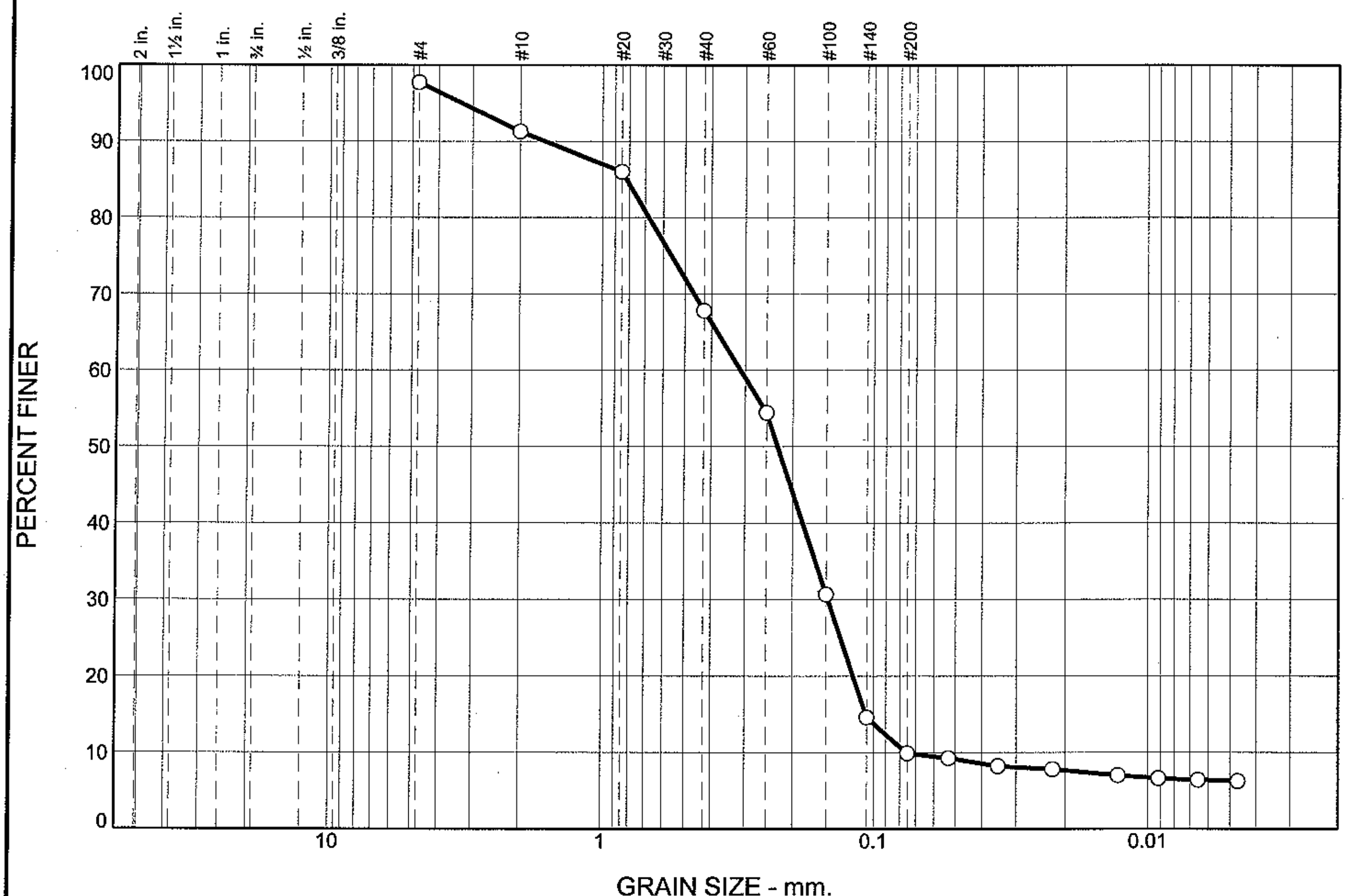
QC Data for Barrier Protection Material

(Grid) NO.	notes	DATE tested as BPM	No. 200 Sieve (%)	Rock-Corrected Max Dry Density (pcf)	Optimum Moisture (%)	Perm (cm/sec)	Internal Friction - Optimum Moisture (degrees)	Internal Friction - Saturated Moisture (degrees)	Interface Friction Angle, BPM vs. Geotextile		Interface Friction Angle, BPM vs. 300 mil Geocomposite	
H-3a	BPM, second lift	7/31/07	17.5	107.2	9.2	2.2E-03	40.5		40.0	39.0	39.0	38.0
H-4a	BPM, second lift											
H-5a	BPM, second lift		12.7									
H-6a	BPM, second lift											
G-3b	BPM, third lift	8/20/07	20.6	106.7	9.8	1.9E-03	32.3		40.0	39.0	39.0	39.0
G-4b	BPM, third lift											
G-5b	BPM, third lift		13.8									
G-6b	BPM, third lift											
H-3b	BPM, third lift	8/20/07	25.1	107.2	9.6	1.2E-03	42.2		41.0	38.0	39.0	38.0
H-4b	BPM, third lift											
H-5b	BPM, third lift		20.5									
H-6b	BPM, third lift											

APPENDIX B

RESULTS OF LABORATORY TESTS

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
		87.8	3.6	6.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	97.7		
#10	91.3		
#20	86.0		
#40	67.8		
#60	54.4		
#100	30.6		
#140	14.6		
#200	9.9		
#270	9.2		

* (no specification provided)

Material Description

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.8189 D_{60}= 0.3121 D_{50}= 0.2274
D_{30}= 0.1480 D_{15}= 0.1070 D_{10}= 0.0758
C_u= 4.12 C_c= 0.93

Classification

USCS= SP-SM AASHTO= A-3(0)

Remarks

Sample Number: 61
Location: Stockpile G

Date: 4/11/2008

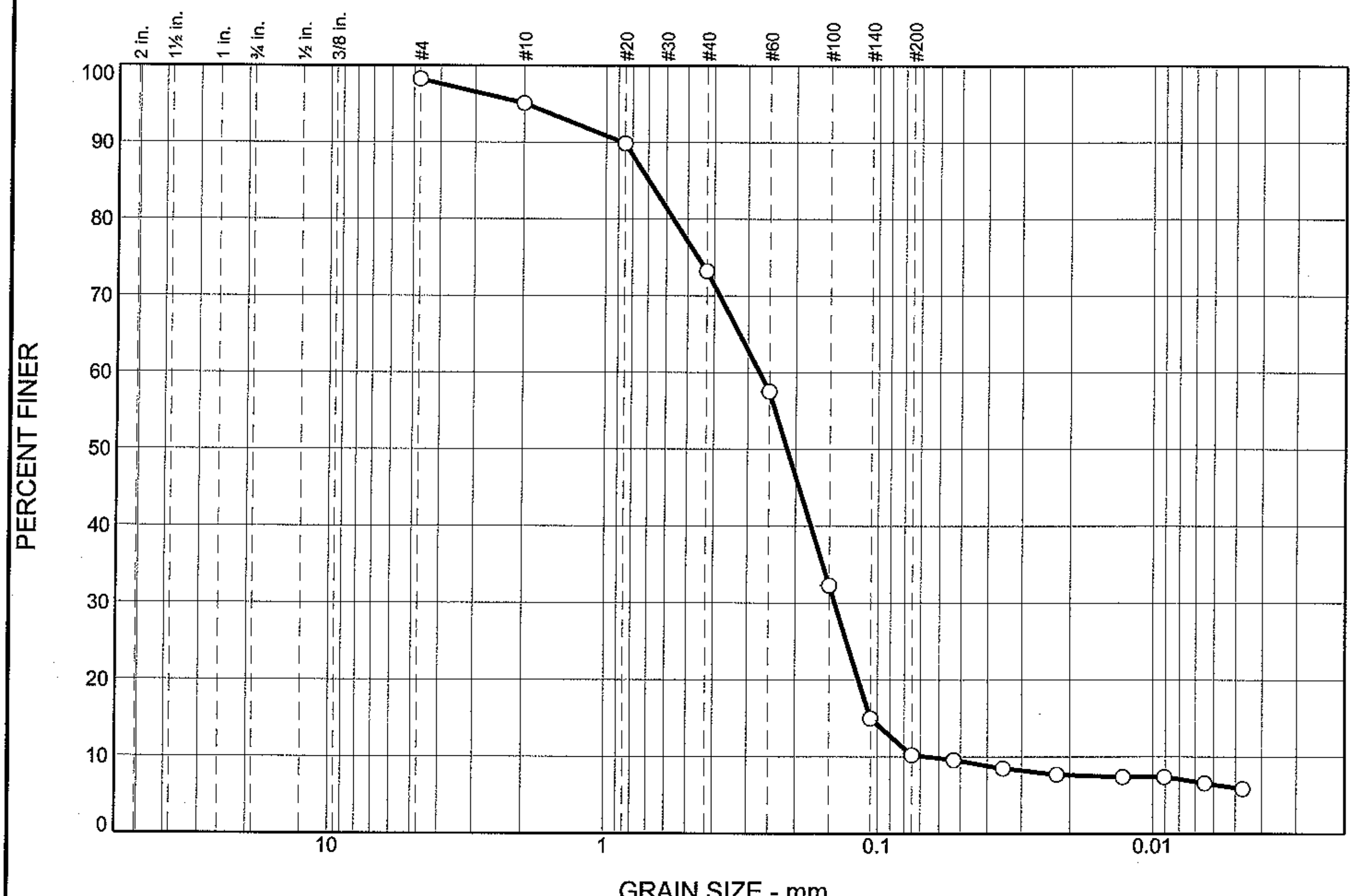
BURNS COOLEY DENNIS, INC.

Ridgeland, Mississippi

Client: Geosyntec Consultants, Incorporated
Project: Geosytec Materials Testing

Project No: 080204 **Figure** 1

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
		88.0	4.2	6.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	98.2		
#10	95.1		
#20	89.8		
#40	73.2		
#60	57.5		
#100	32.3		
#140	15.0		
#200	10.2		
#270	9.6		

* (no specification provided)

Material Description

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.6952 D_{60}= 0.2720 D_{50}= 0.2148
D_{30}= 0.1433 D_{15}= 0.1061 D_{10}= 0.0671
C_u= 4.06 C_c= 1.13

Classification

USCS= SP-SM AASHTO= A-2-4(0)

Remarks

Sample Number: 62
Location: Stockpile G

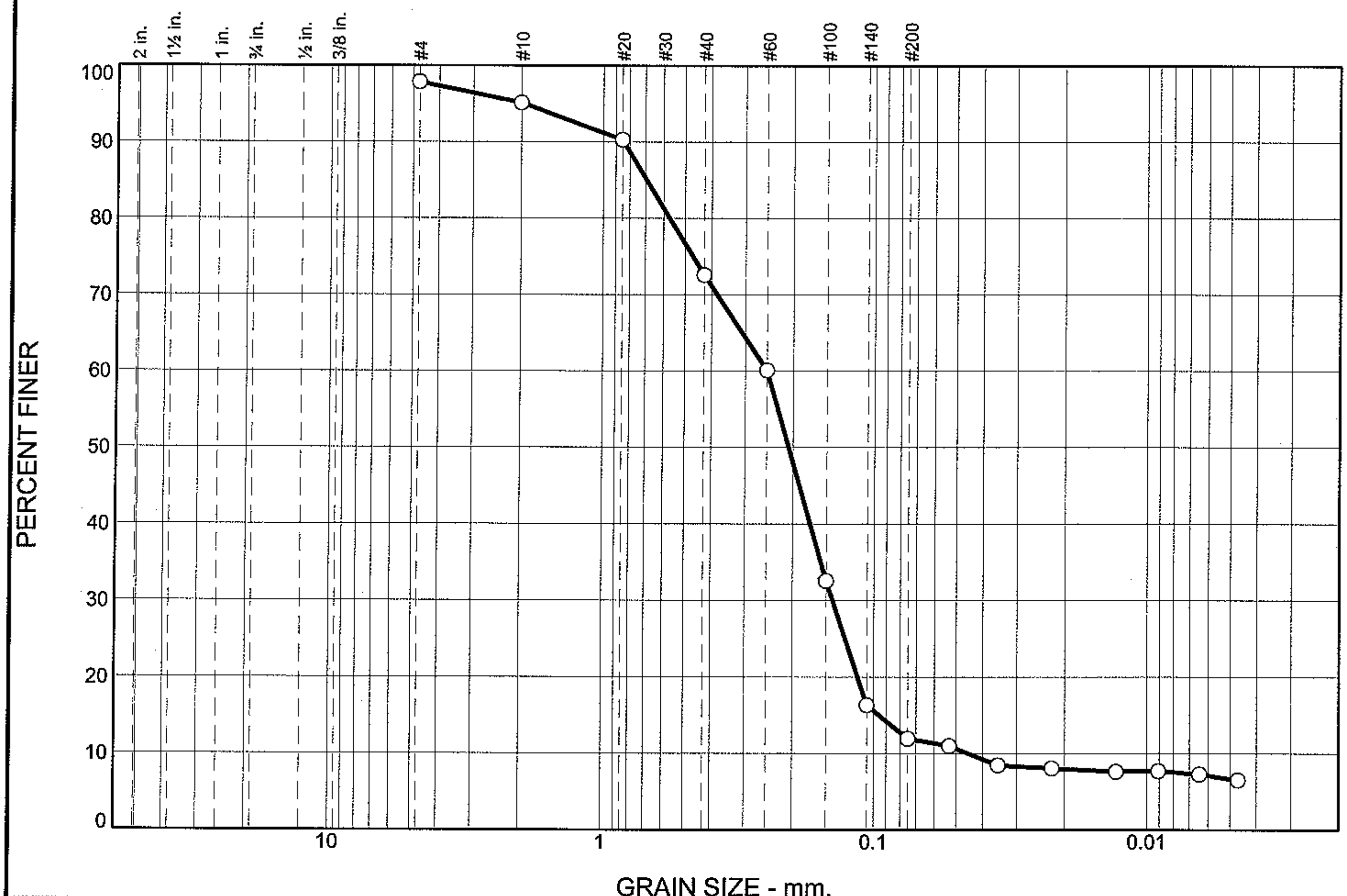
Date: 4/11/2008

BURNS COOLEY DENNIS, INC.

Ridgeland, Mississippi

Client: Geosyntec Consultants, Incorporated
Project: Geosytec Materials Testing
Project No: 080204 **Figure** 2

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
		85.9	5.2	6.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	97.8		
#10	95.1		
#20	90.3		
#40	72.6		
#60	60.1		
#100	32.5		
#140	16.3		
#200	11.9		
#270	11.0		

* (no specification provided)

Material Description

Atterberg Limits

PL= NP   LL= NP   PI= NP

Coefficients

D_{85}= 0.6919 D_{60}= 0.2497 D_{50}= 0.2074
D_{30}= 0.1421 D_{15}= 0.0957 D_{10}= 0.0452
C_u= 5.52 C_c= 1.79

Classification

USCS= SP-SM   AASHTO= A-2-4(0)

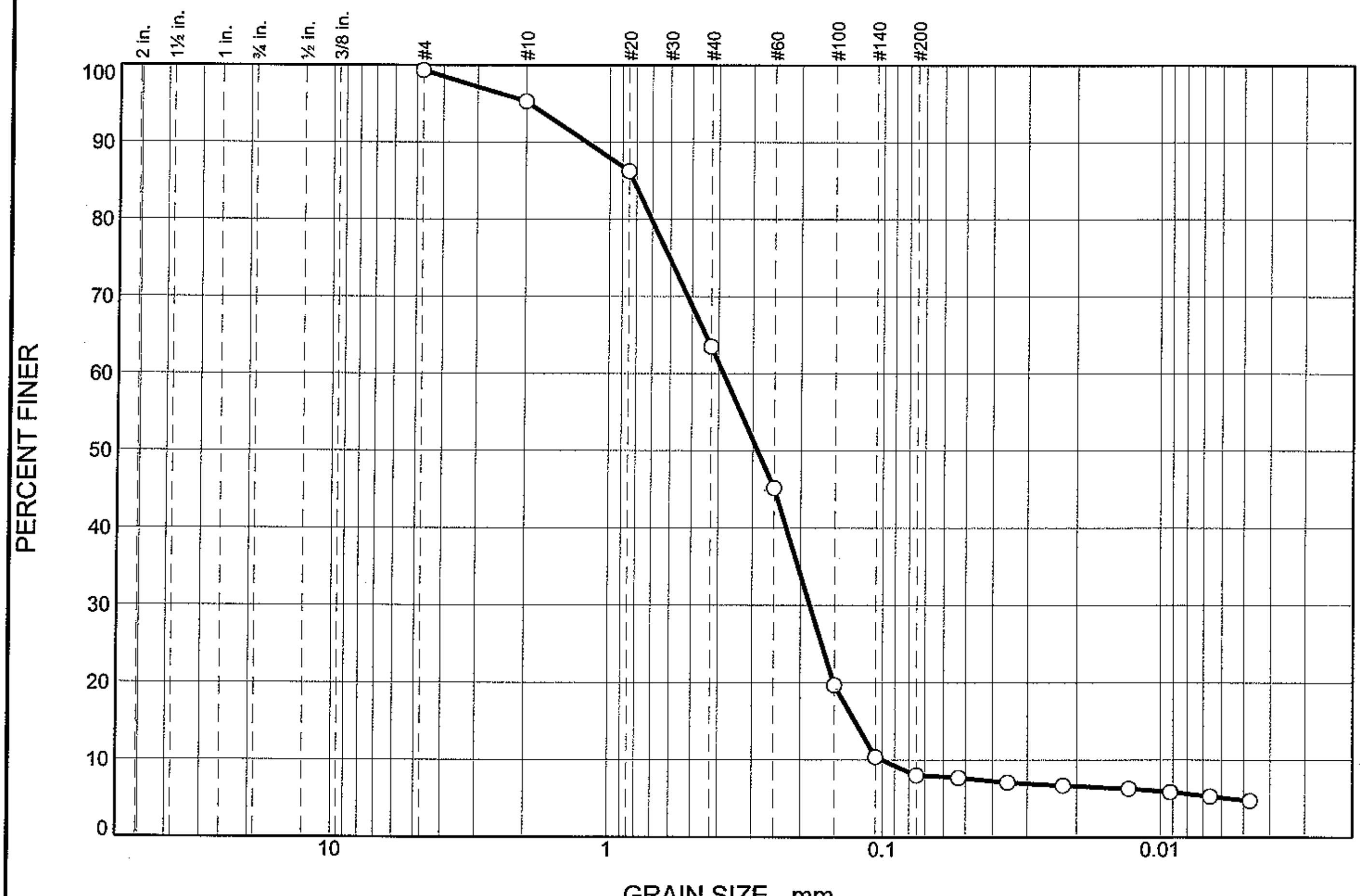
Remarks

Sample Number: 63
Location: Stockpile G

Date: 4/11/2008

BURNS COOLEY DENNIS, INC.	**Client:** Geosyntec Consultants, Incorporated **Project:** Geosytec Materials Testing
Ridgeland, Mississippi	**Project No:** 080204 **Figure** 3

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
		91.3	3.2	4.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	99.3		
#10	95.3		
#20	86.2		
#40	63.5		
#60	45.1		
#100	19.7		
#140	10.4		
#200	8.0		
#270	7.7		

* (no specification provided)

Material Description

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.8185 D_{60}= 0.3842 D_{50}= 0.2877
D_{30}= 0.1845 D_{15}= 0.1261 D_{10}= 0.1006
C_u= 3.82 C_c= 0.88

Classification

USCS= SP-SM AASHTO= A-3(0)

Remarks

Sample Number: 64
Location: Stockpile G

Date: 4/11/2008

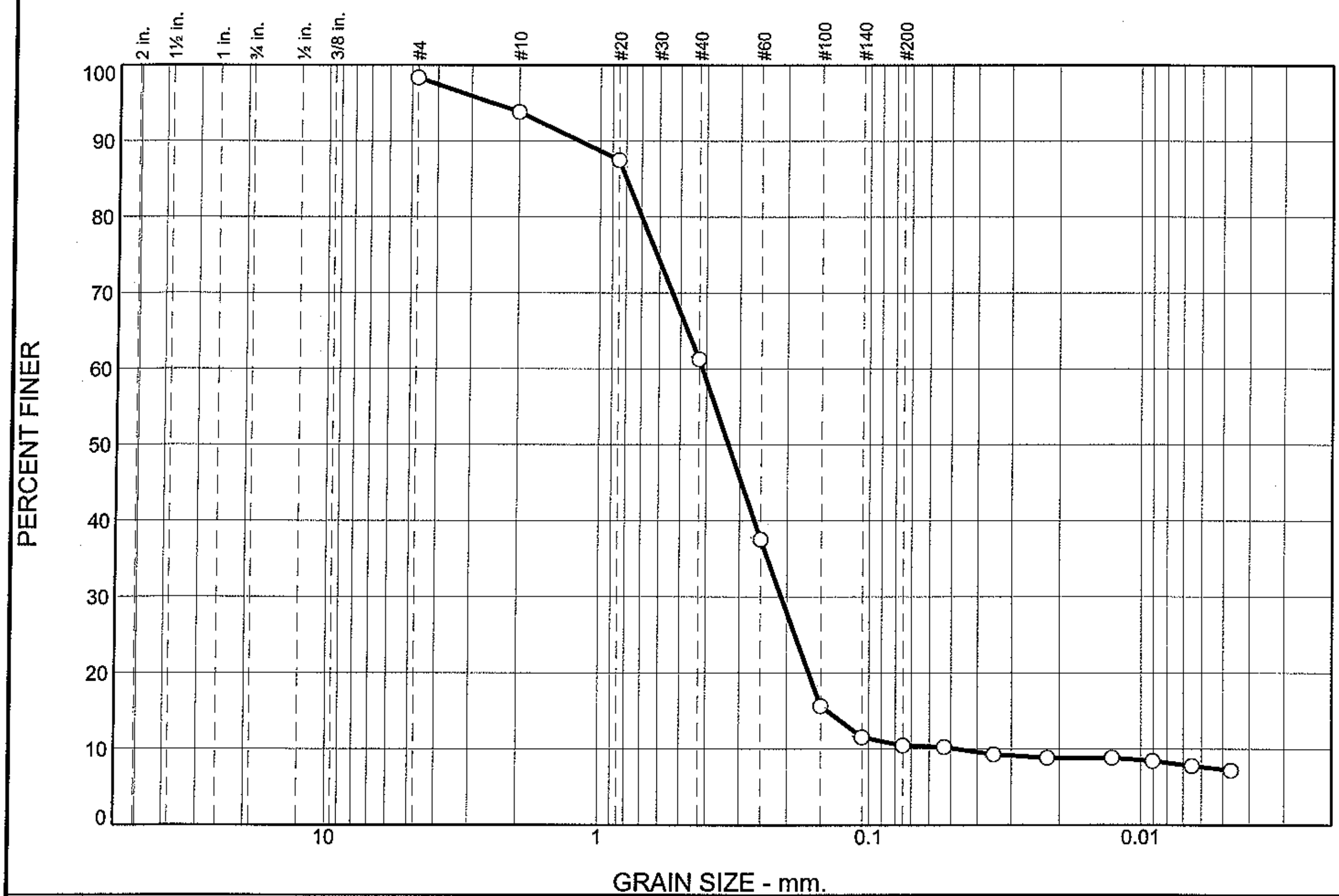
BURNS COOLEY DENNIS, INC.

Ridgeland, Mississippi

Client: Geosyntec Consultants, Incorporated
Project: Geosytec Materials Testing

Project No: 080204 **Figure** 4

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
		87.9	3.1	7.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	98.3		
#10	93.8		
#20	87.5		
#40	61.2		
#60	37.5		
#100	15.6		
#140	11.5		
#200	10.4		
#270	10.2		

* (no specification provided)

Material Description

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.7962 D_{60}= 0.4134 D_{50}= 0.3305
D_{30}= 0.2098 D_{15}= 0.1422 D_{10}= 0.0481
C_u= 8.59 C_c= 2.21

Classification

USCS= SW-SM AASHTO= A-2-4(0)

Remarks

Sample Number: 65
Location: Stockpile G

Date: 4/11/2008

BURNS COOLEY DENNIS, INC.

Ridgeland, Mississippi

Client: Geosyntec Consultants, Incorporated
Project: Geosytec Materials Testing

Project No: 080204 **Figure** 5

COMPACTION TEST REPORT

Curve No.: 1

Project No.: 080204 **Date:**

Project: Geosytec Materials Testing

Location: Stockpile G

Elev./Depth: **Sample No.** 64

Remarks:

MATERIAL DESCRIPTION

Description:

Classifications - **USCS:** SP-SM **AASHTO:** A-3(0)

Nat. Moist. = **Sp.G. =**

Liquid Limit = NP **Plasticity Index =** NP

% > No.4 = 0.7 % **% < No.200 =** 8.0 %

TEST RESULTS
Maximum dry density = 111.3 pcf
Optimum moisture = 7.9 %

Test specification:
ASTM D 698-00a Method A Standard

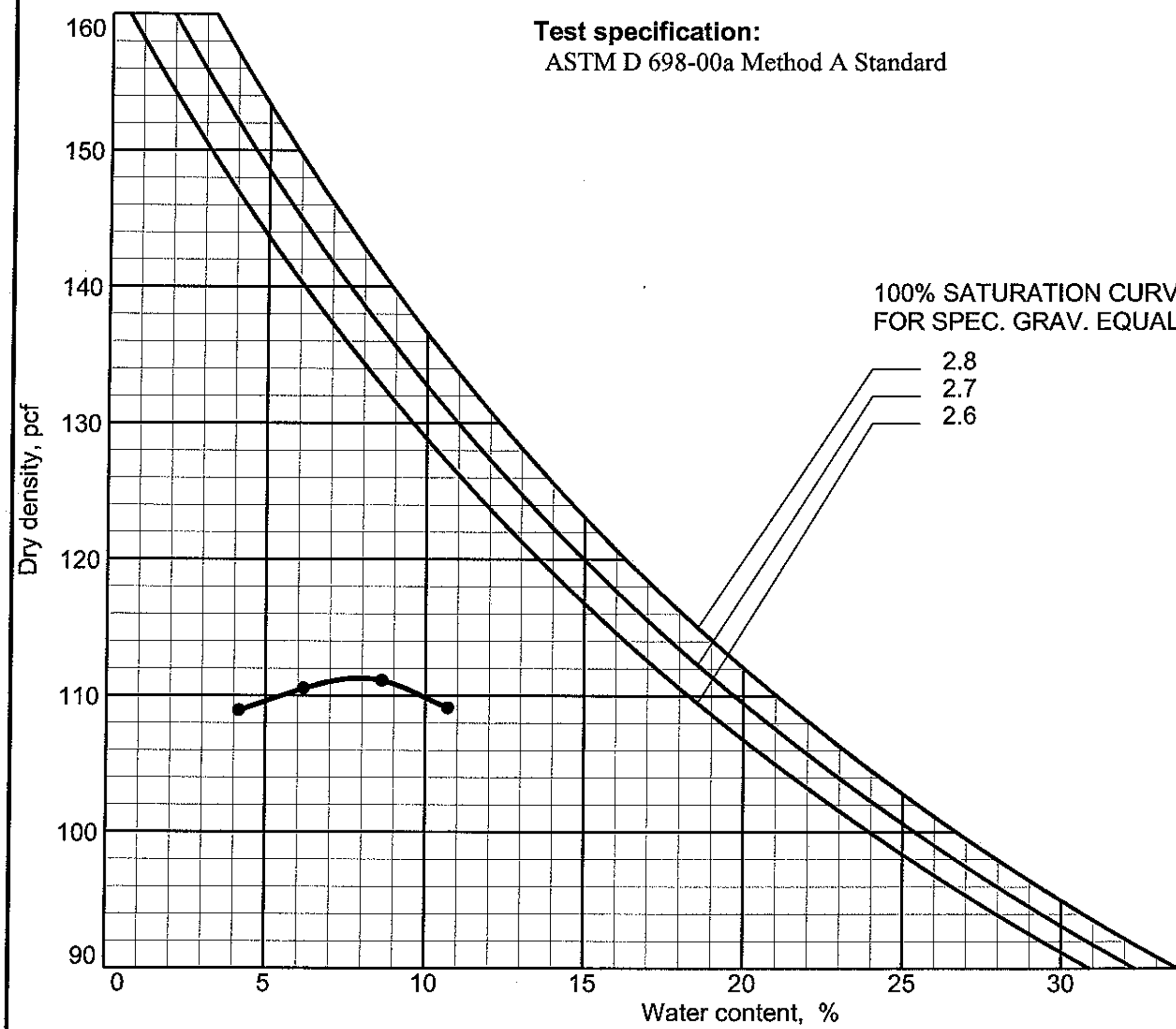


Figure 6

BURNS COOLEY DENNIS, INC.

COMPACTION TEST REPORT

Curve No.: 1

Project No.: 080204 **Date:** 4/17-08

Project: Geosytec Materials Testing

Location: Stockpile G

Elev./Depth: **Sample No.** 65

Remarks:

MATERIAL DESCRIPTION

Description: Tan and red sand, with silt

Classifications - **USCS:** SW-SM **AASHTO:** A-2-4(0)

Nat. Moist. = **Sp.G. =**

Liquid Limit = NP **Plasticity Index =** NP

% > No.4 = 1.7 % **% < No.200 =** 10.4 %

TEST RESULTS
Maximum dry density = 115.5 pcf
Optimum moisture = 10.7 %

Test specification:
ASTM D 698-00a Method A Standard

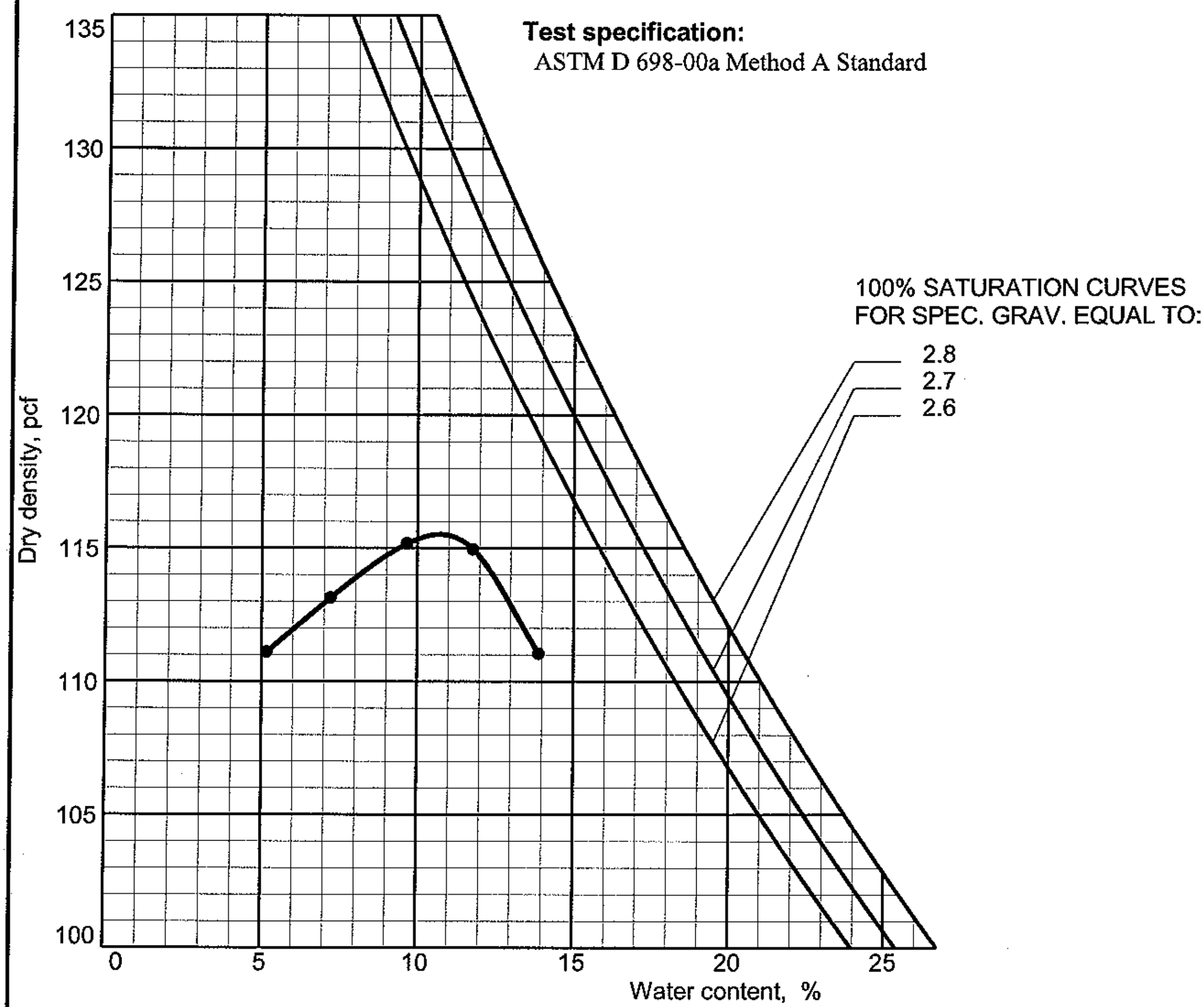


Figure 7

BURNS COOLEY DENNIS, INC.

Burns Cooley Dennis, Inc.

Determining the Resilient Modulus of Soils and Aggregates
(NCHRP 1-28A Protocols)

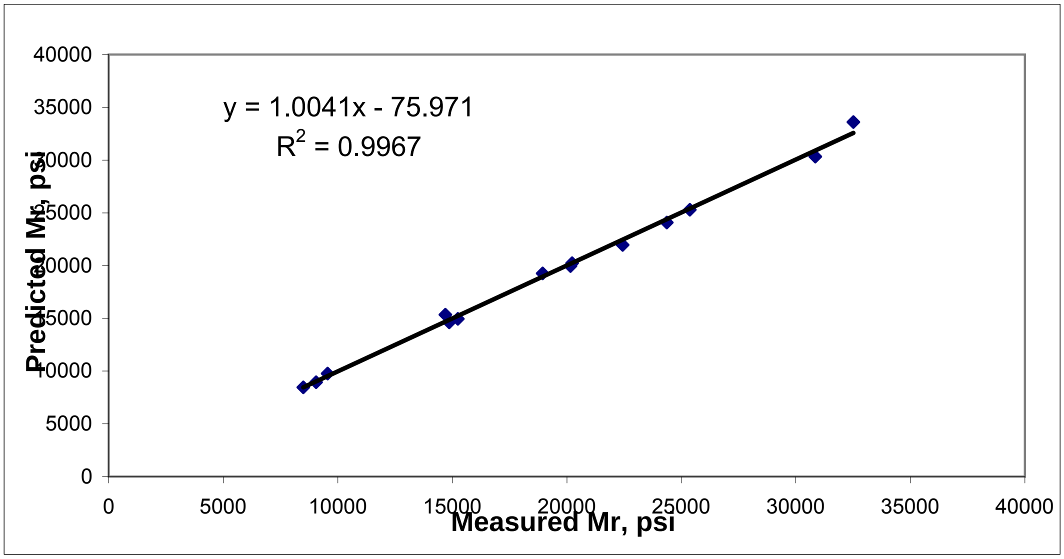
BCD Project:	080204
Client	Geosyntec Consultants
Project Name:	FKLF-BPM
Date:	4/23/2008
Sample I.D.:	64
Replicate Test:	Rep 1

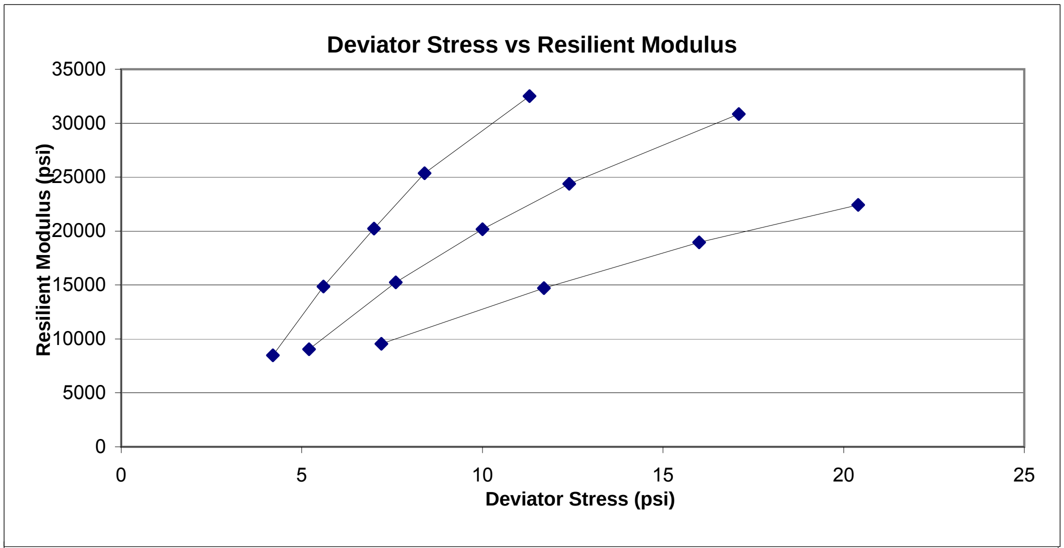
Sequence	σ_1 psi	σ_2 psi	σ_3 psi	θ psi	τ_{oct} psi	$\sigma_1 - \sigma_3$ psi	M_R psi	Pred. M_R psi
1	6.1	1.9	1.9	9.9	2.0	4.2	8488	8470
2	9.5	3.9	3.9	17.3	2.6	5.6	14866	14623
3	12.9	5.9	5.9	24.7	3.3	7.0	20228	20237
4	16.3	7.9	7.9	32.1	4.0	8.4	25366	25298
5	23.1	11.8	11.8	46.7	5.3	11.3	32510	33591
6	7.1	1.9	1.9	10.9	2.5	5.2	9052	8946
7	11.5	3.9	3.9	19.3	3.6	7.6	15237	14957
8	15.9	5.9	5.9	27.7	4.7	10.0	20160	19956
9	20.3	7.9	7.9	36.1	5.8	12.4	24373	24081
10	29.0	11.9	11.9	52.8	8.1	17.1	30849	30319
11	9.1	1.9	1.9	12.9	3.4	7.2	9562	9759
12	15.6	3.9	3.9	23.4	5.5	11.7	14700	15352
13	21.9	5.9	5.9	33.7	7.5	16.0	18944	19246
14	28.3	7.9	7.9	44.1	9.6	20.4	22437	21957

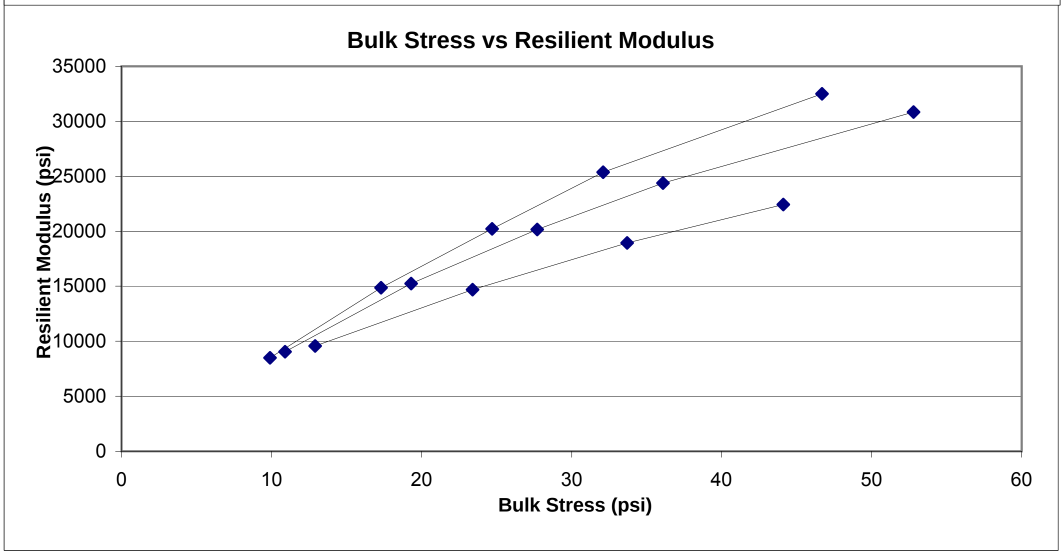
K_1 =	1,129.9	n =	14	Se =	0.010
K_2 =	1.108	SES =	0.001	Se/Sy =	0.051
K_3 =	-1.864	Sy =	0.189	R^2 =	0.997

Technician: Scott Bivens
Checked By: Allen Cooley

BCD Project:	080204	Date:	4/23/2008
Client	Geosyntec Consultants	Sample I.D.:	64
Project Name:	FKLF-BPM	Replicate Test:	Rep 1







Burns Cooley Dennis, Inc.

Determining the Resilient Modulus of Soils and Aggregates
(NCHRP 1-28A Protocols)

BCD Project:	080204
Client	Geosyntec Consultants
Project Name:	FKLF-BPM
Date:	4/23/2008
Sample I.D.:	64
Replicate Test:	Rep 2

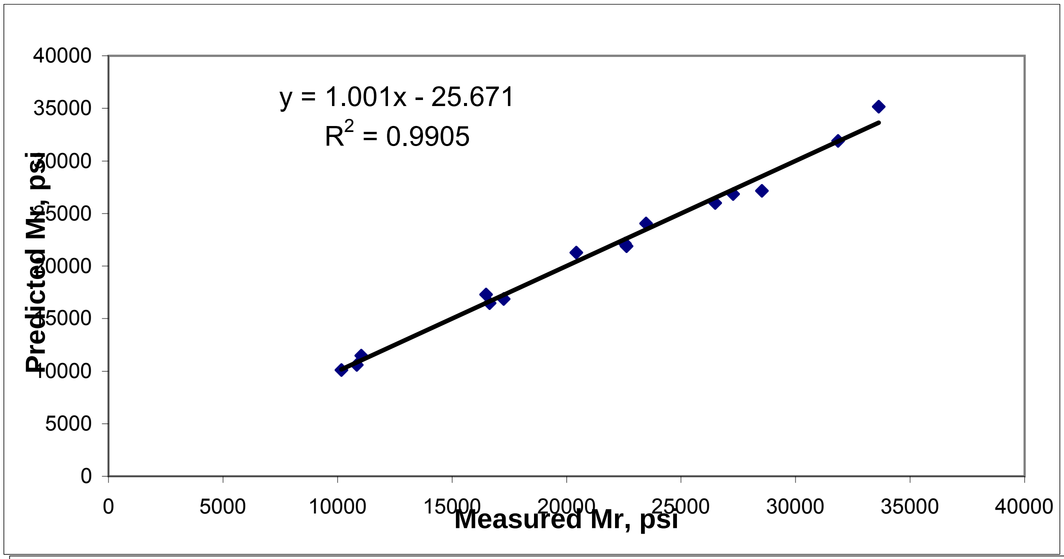
	σ_1	σ_2	σ_3	θ	τ_{oct}	$\sigma_1 - \sigma_3$	M_R	Pred. M_R
Sequence	psi	psi	psi	psi	psi	psi	psi	psi
1	6.2	1.9	1.9	10.0	2.0	4.3	10173	10094
2	9.5	3.9	3.9	17.3	2.6	5.6	16637	16472
3	13.0	5.9	5.9	24.8	3.3	7.1	22547	22119
4	16.2	7.8	7.8	31.8	4.0	8.4	27278	26852
5	23.0	11.8	11.8	46.6	5.3	11.2	33626	35169
6	7.2	1.9	1.9	11.0	2.5	5.3	10845	10607
7	11.6	3.9	3.9	19.4	3.6	7.7	17255	16854
8	16.0	5.9	5.9	27.8	4.8	10.1	22618	21890
9	20.3	7.9	7.9	36.1	5.8	12.4	26486	26001
10	29.0	11.8	11.8	52.6	8.1	17.2	31853	31895
11	9.2	1.9	1.9	13.0	3.4	7.3	11033	11480
12	15.5	3.9	3.9	23.3	5.5	11.6	16489	17288
13	21.8	5.9	5.9	33.6	7.5	15.9	20427	21293
14	28.3	7.9	7.9	44.1	9.6	20.4	23472	24043
15	41.0	11.8	11.8	64.6	13.8	29.2	28529	27160

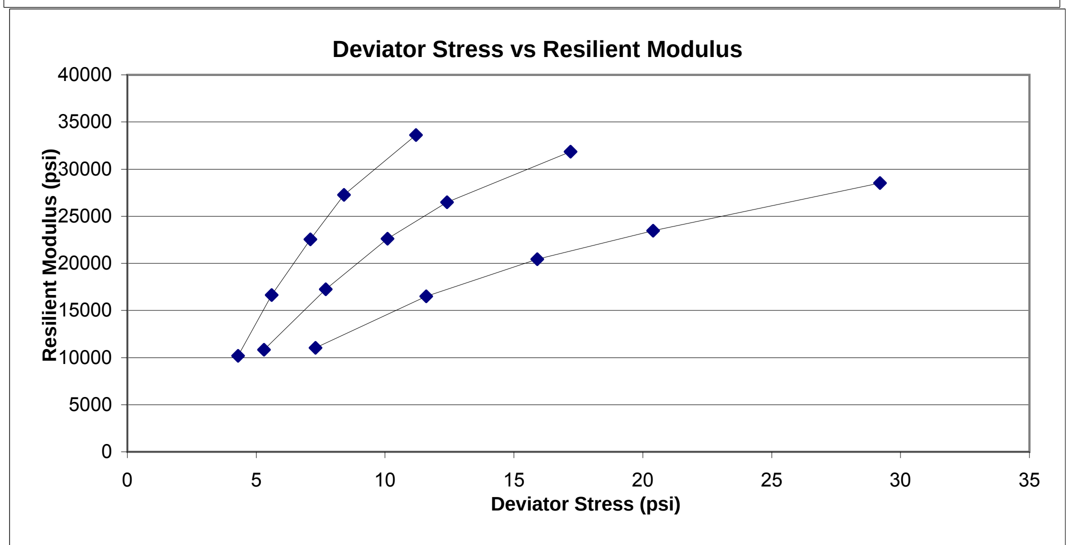
K_1 =	1,251.0	n =	15	Se =	0.015
K_2 =	1.002	SES =	0.003	Se/Sy =	0.087
K_3 =	-1.655	Sy =	0.169	R^2 =	0.992

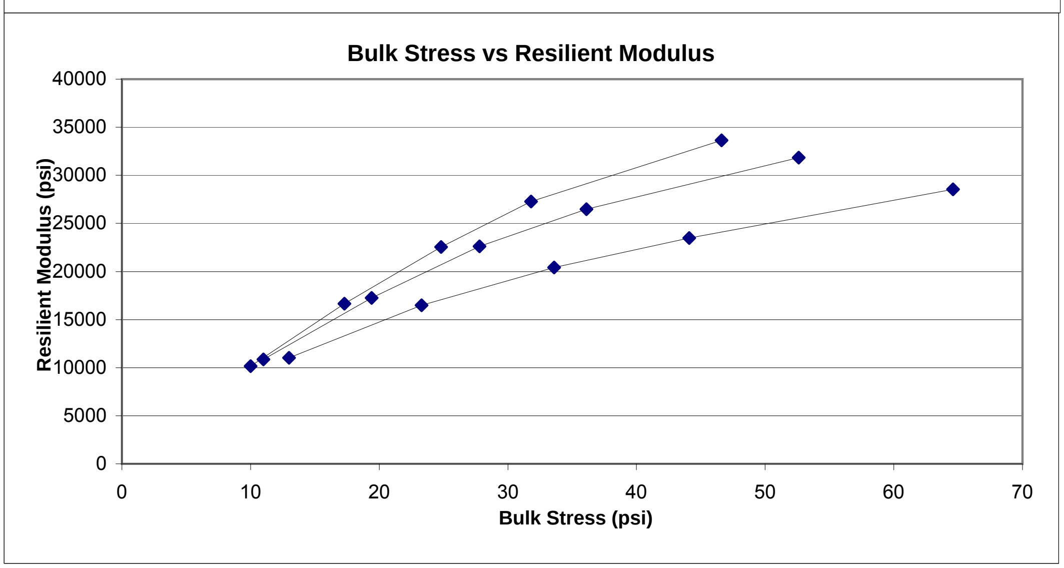
Technician: Scott Bivens

Checked By: Allen Cooley

BCD Project:	080204	Date:	4/23/2008
Client	Geosyntec Consultants	Sample I.D.:	64
Project Name:	FKLF-BPM	Replicate Test:	Rep 2







Burns Cooley Dennis, Inc.

Determining the Resilient Modulus of Soils and Aggregates
(NCHRP 1-28A Protocols)

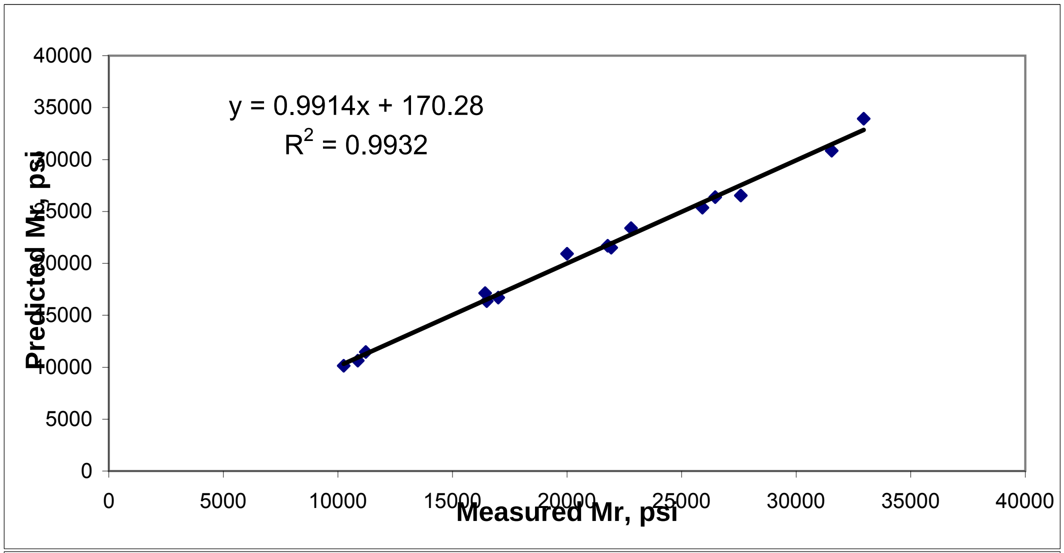
BCD Project:	080204
Client	Geosyntec Consultants
Project Name:	FKLF-BPM
Date:	4/23/2008
Sample I.D.:	64
Replicate Test:	Rep 3

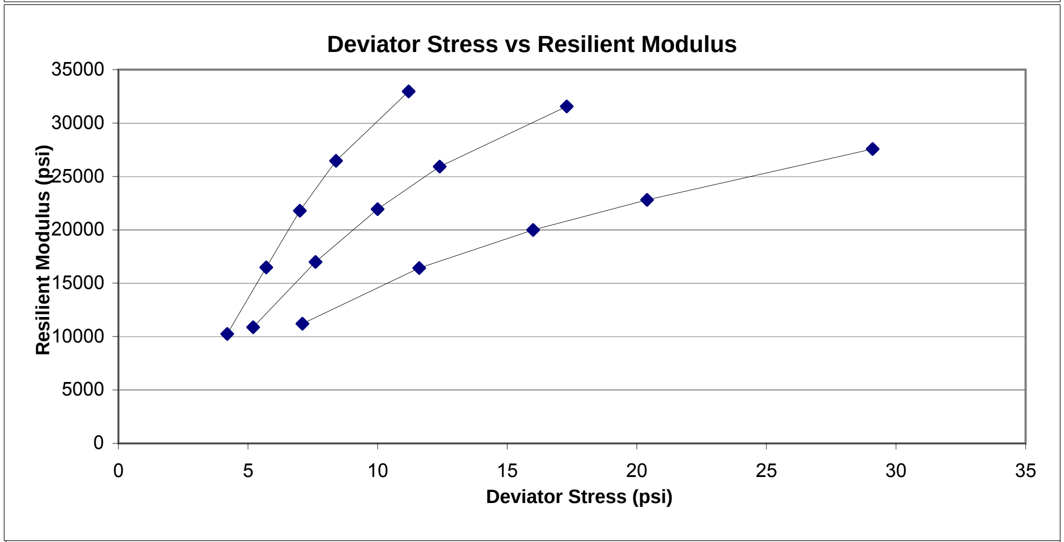
Sequence	σ_1 psi	σ_2 psi	σ_3 psi	θ psi	τ_{oct} psi	$\sigma_1 - \sigma_3$ psi	M_R psi	Pred. M_R psi
1	6.1	1.9	1.9	9.9	2.0	4.2	10246	10141
2	9.6	3.9	3.9	17.4	2.7	5.7	16493	16356
3	12.9	5.9	5.9	24.7	3.3	7.0	21773	21704
4	16.3	7.9	7.9	32.1	4.0	8.4	26465	26392
5	23.0	11.8	11.8	46.6	5.3	11.2	32952	33924
6	7.1	1.9	1.9	10.9	2.5	5.2	10866	10646
7	11.5	3.9	3.9	19.3	3.6	7.6	16999	16690
8	15.9	5.9	5.9	27.7	4.7	10.0	21926	21500
9	20.3	7.9	7.9	36.1	5.8	12.4	25914	25371
10	29.1	11.8	11.8	52.7	8.2	17.3	31548	30860
11	9.0	1.9	1.9	12.8	3.3	7.1	11222	11466
12	15.5	3.9	3.9	23.3	5.5	11.6	16419	17129
13	21.9	5.9	5.9	33.7	7.5	16.0	20000	20934
14	28.2	7.8	7.8	43.8	9.6	20.4	22799	23400
15	40.9	11.8	11.8	64.5	13.7	29.1	27581	26543

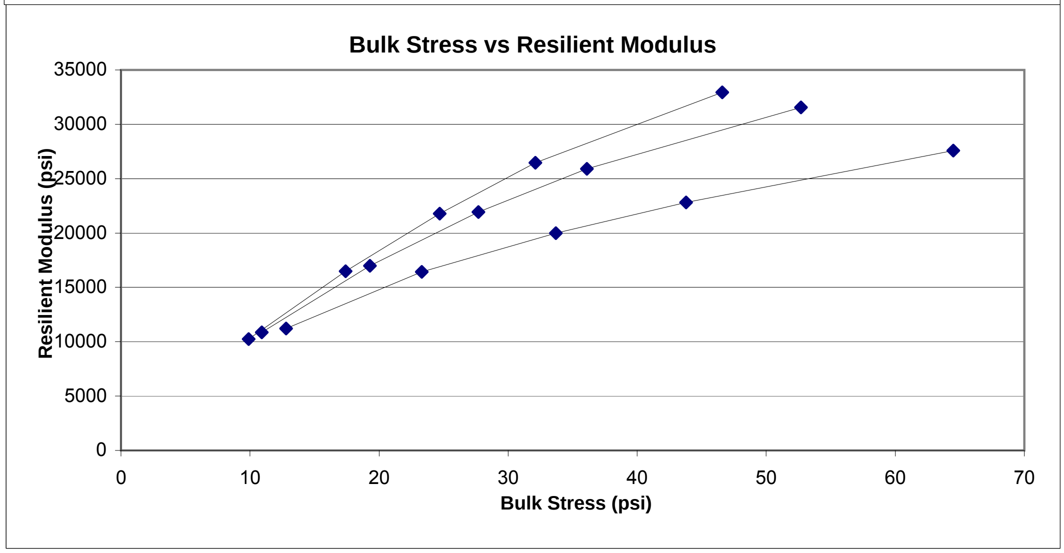
K_1 =	1,234.2	n =	15	Se =	0.012
K_2 =	0.964	SES =	0.002	Se/Sy =	0.075
K_3 =	-1.586	Sy =	0.164	R^2 =	0.994

Technician: Scott Bivens
Checked By: Allen Cooley

BCD Project:	080204	Date:	4/23/2008
Client	Geosyntec Consultants	Sample I.D.:	64
Project Name:	FKLF-BPM	Replicate Test:	Rep 3







Burns Cooley Dennis, Inc.

Determining the Resilient Modulus of Soils and Aggregates
(NCHRP 1-28A Protocols)

BCD Project:	080204
Client	Geosyntec Consultants
Project Name:	FKLF-BPM
Date:	4/23/2008
Sample I.D.:	64
Replicate Test:	Rep 4

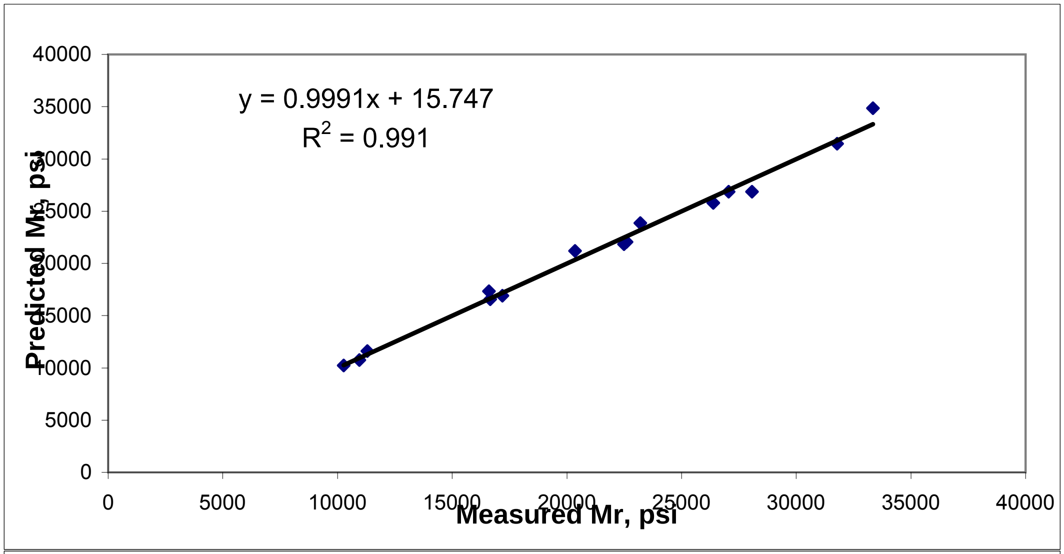
Sequence	σ_1 psi	σ_2 psi	σ_3 psi	θ psi	τ_{oct} psi	$\sigma_1 - \sigma_3$ psi	M_R psi	Pred. M_R psi
1	6.1	1.9	1.9	9.9	2.0	4.2	10265	10228
2	9.5	3.9	3.9	17.3	2.6	5.6	16661	16564
3	13.1	5.9	5.9	24.9	3.4	7.2	22597	22061
4	16.4	7.9	7.9	32.2	4.0	8.5	27051	26866
5	23.1	11.9	11.9	46.9	5.3	11.2	33343	34858
6	7.1	1.9	1.9	10.9	2.5	5.2	10958	10739
7	11.5	3.9	3.9	19.3	3.6	7.6	17188	16914
8	15.9	5.9	5.9	27.7	4.7	10.0	22488	21837
9	20.3	7.9	7.9	36.1	5.8	12.4	26387	25800
10	29.0	11.8	11.8	52.6	8.1	17.2	31788	31452
11	9.1	1.9	1.9	12.9	3.4	7.2	11307	11606
12	15.5	3.9	3.9	23.3	5.5	11.6	16601	17337
13	22.0	5.9	5.9	33.8	7.6	16.1	20350	21197
14	28.3	7.9	7.9	44.1	9.6	20.4	23195	23864
15	40.9	11.8	11.8	64.5	13.7	29.1	28072	26864

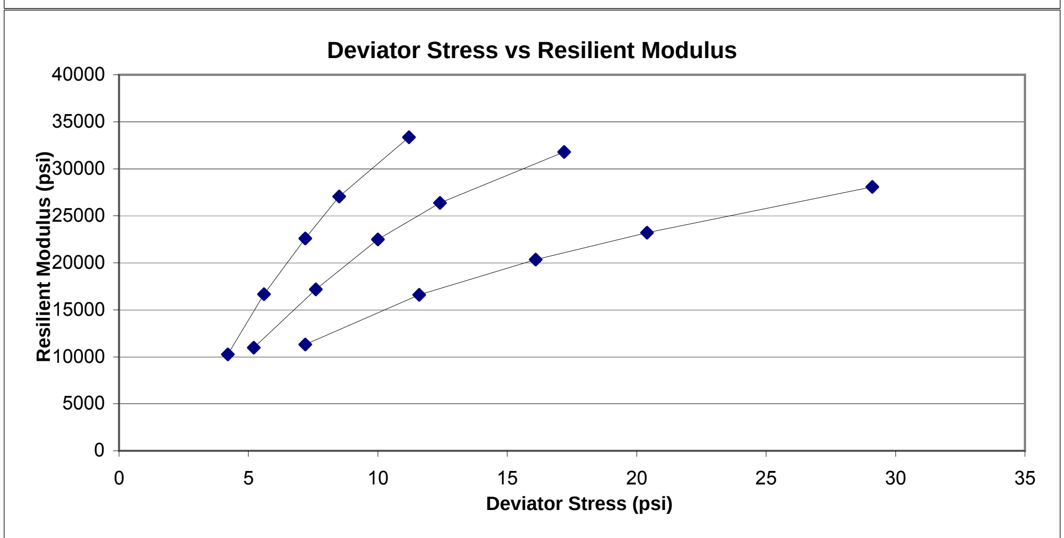
K_1 =	1,256.6	n =	15	Se =	0.014
K_2 =	0.977	SES =	0.002	Se/Sy =	0.082
K_3 =	-1.623	Sy =	0.165	R^2 =	0.993

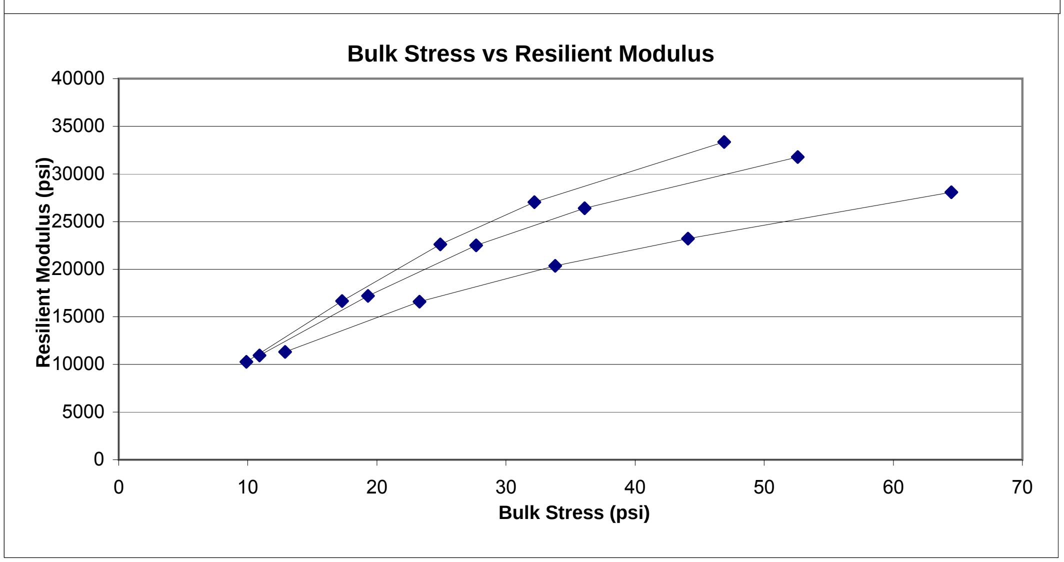
Technician: Scott Bivens

Checked By: Allen Cooley

BCD Project:	080204	Date:	4/23/2008
Client	Geosyntec Consultants	Sample I.D.:	64
Project Name:	FKLF-BPM	Replicate Test:	Rep 4







Burns Cooley Dennis, Inc.

Determining the Resilient Modulus of Soils and Aggregates
(NCHRP 1-28A Protocols)

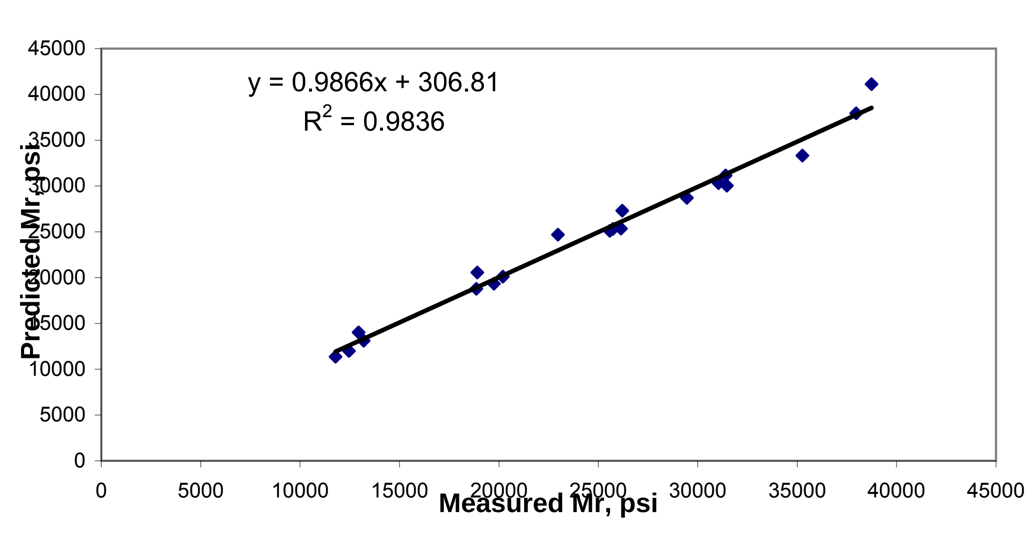
BCD Project:	080204
Client	Geosyntec Consultants
Project Name:	FKLF-BPM
Date:	4/24/2008
Sample I.D.:	65
Replicate Test:	Rep 1

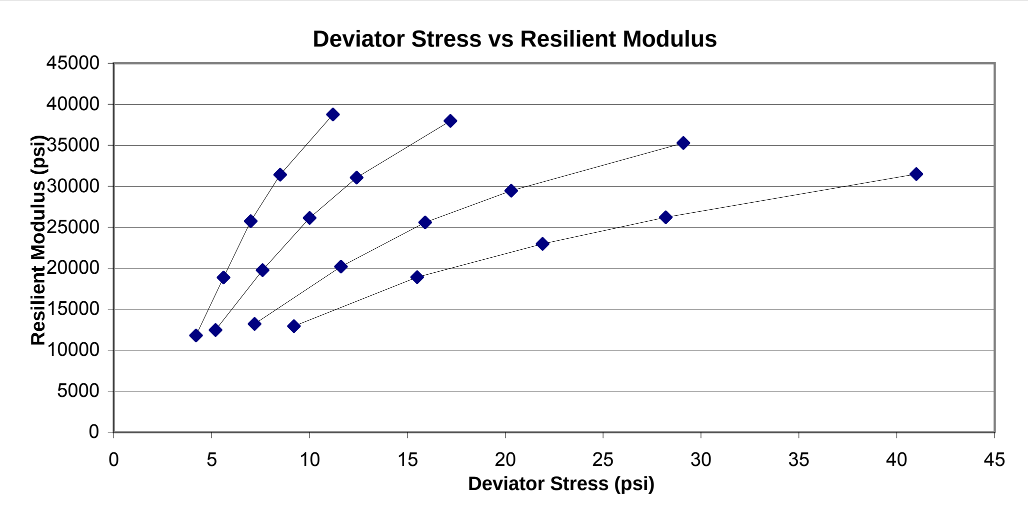
Sequence	σ_1 psi	σ_2 psi	σ_3 psi	θ psi	τ_{oct} psi	$\sigma_1 - \sigma_3$ psi	M_R psi	Pred. M_R psi
1	6.1	1.9	1.9	9.9	2.0	4.2	11780	11376
2	9.5	3.9	3.9	17.3	2.6	5.6	18864	18761
3	12.9	5.9	5.9	24.7	3.3	7.0	25735	25327
4	16.4	7.9	7.9	32.2	4.0	8.5	31394	31159
5	23.1	11.9	11.9	46.9	5.3	11.2	38746	41102
6	7.1	1.9	1.9	10.9	2.5	5.2	12450	12009
7	11.5	3.9	3.9	19.3	3.6	7.6	19750	19321
8	15.9	5.9	5.9	27.7	4.7	10.0	26134	25334
9	20.3	7.9	7.9	36.1	5.8	12.4	31053	30315
10	29.1	11.9	11.9	52.9	8.1	17.2	37967	37945
11	9.1	1.9	1.9	12.9	3.4	7.2	13196	13110
12	15.5	3.9	3.9	23.3	5.5	11.6	20206	20109
13	21.8	5.9	5.9	33.6	7.5	15.9	25578	25098
14	28.2	7.9	7.9	44.0	9.6	20.3	29452	28720
15	41.0	11.9	11.9	64.8	13.7	29.1	35266	33328
16	11.1	1.9	1.9	14.9	4.3	9.2	12940	14024
17	19.4	3.9	3.9	27.2	7.3	15.5	18912	20575
18	27.8	5.9	5.9	39.6	10.3	21.9	22971	24674
19	36.1	7.9	7.9	51.9	13.3	28.2	26204	27298
20	52.9	11.9	11.9	76.7	19.3	41.0	31470	30038

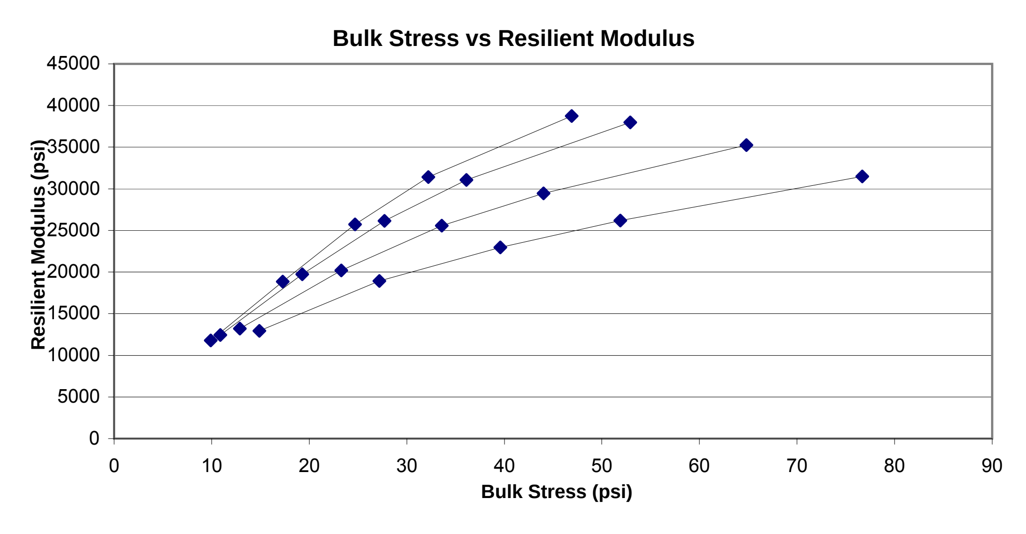
K_1 =	1,392.2	n =	20	Se =	0.020
K_2 =	1.002	SES =	0.007	Se/Sy =	0.121
K_3 =	-1.514	Sy =	0.163	R^2 =	0.985

Technician: Scott Bivens
Checked By: Allen Cooley

BCD Project:	080204	Date:	4/24/2008
Client	Geosyntec Consultants	Sample I.D.:	65
Project Name:	FKLF-BPM	Replicate Test:	Rep 1







Burns Cooley Dennis, Inc.

Determining the Resilient Modulus of Soils and Aggregates
(NCHRP 1-28A Protocols)

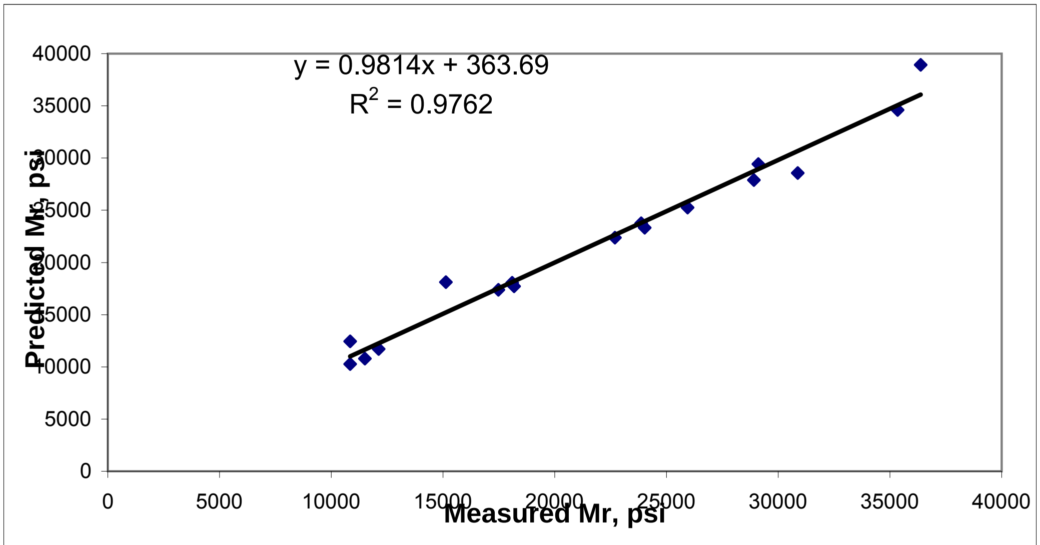
BCD Project:	080204
Client	Geosyntec Consultants
Project Name:	FKLF-BPM
Date:	4/24/2008
Sample I.D.:	65
Replicate Test:	Rep 2

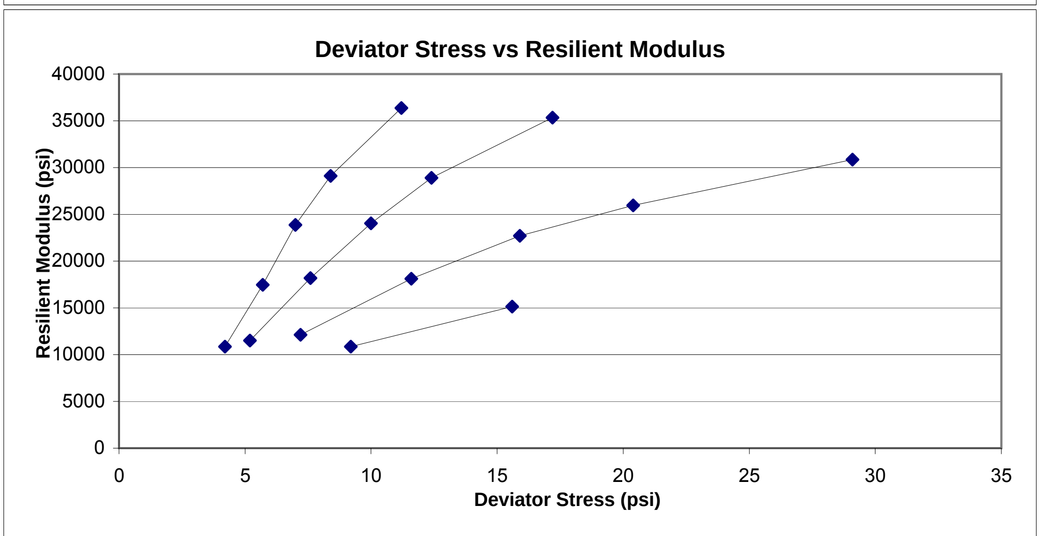
Sequence	σ_1 psi	σ_2 psi	σ_3 psi	θ psi	τ_{oct} psi	$\sigma_1 - \sigma_3$ psi	M_R psi	Pred. M_R psi
1	6.1	1.9	1.9	9.9	2.0	4.2	10840	10259
2	9.6	3.9	3.9	17.4	2.7	5.7	17472	17393
3	12.9	5.9	5.9	24.7	3.3	7.0	23873	23749
4	16.3	7.9	7.9	32.1	4.0	8.4	29109	29421
5	23.1	11.9	11.9	46.9	5.3	11.2	36378	38914
6	7.1	1.9	1.9	10.9	2.5	5.2	11501	10800
7	11.5	3.9	3.9	19.3	3.6	7.6	18174	17704
8	15.9	5.9	5.9	27.7	4.7	10.0	24024	23330
9	20.3	7.9	7.9	36.1	5.8	12.4	28913	27897
10	29.1	11.9	11.9	52.9	8.1	17.2	35338	34606
11	9.1	1.9	1.9	12.9	3.4	7.2	12125	11713
12	15.5	3.9	3.9	23.3	5.5	11.6	18100	18050
13	21.8	5.9	5.9	33.6	7.5	15.9	22692	22369
14	28.3	7.9	7.9	44.1	9.6	20.4	25949	25268
15	41.0	11.9	11.9	64.8	13.7	29.1	30868	28570
16	11.1	1.9	1.9	14.9	4.3	9.2	10848	12439
17	19.5	3.9	3.9	27.3	7.4	15.6	15123	18115

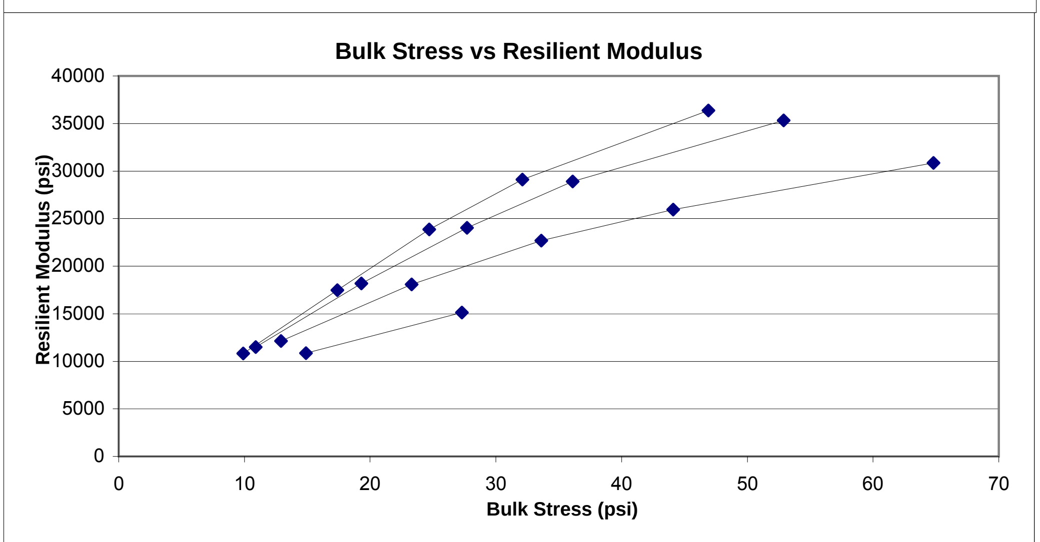
K_1 =	1,349.7	n =	17	Se =	0.032
K_2 =	1.073	SES =	0.014	Se/Sy =	0.177
K_3 =	-1.862	Sy =	0.179	R^2 =	0.969

Technician: Scott Bivens
Checked By: Allen Cooley

BCD Project:	080204	Date:	4/24/2008
Client	Geosyntec Consultants	Sample I.D.:	65
Project Name:	FKLF-BPM	Replicate Test:	Rep 2







Burns Cooley Dennis, Inc.

Determining the Resilient Modulus of Soils and Aggregates
(NCHRP 1-28A Protocols)

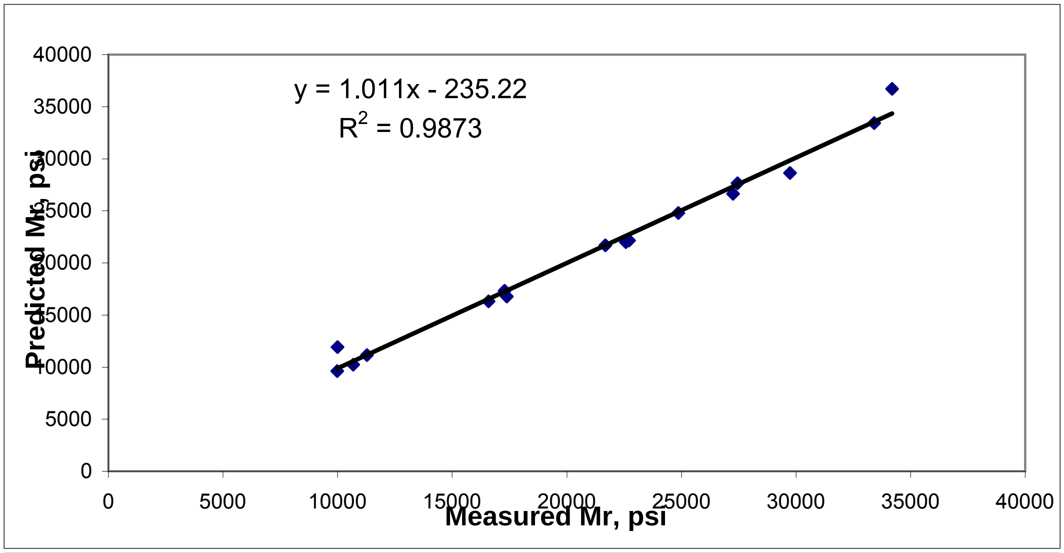
BCD Project:	080204
Client	Geosyntec Consultants
Project Name:	FKLF-BPM
Date:	4/24/2008
Sample I.D.:	65
Replicate Test:	Rep 3

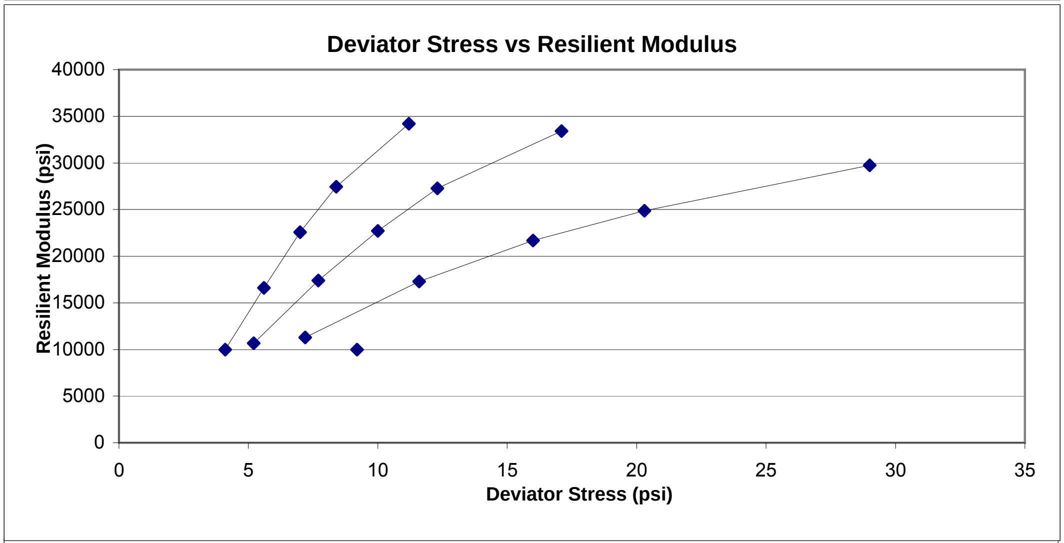
	σ_1	σ_2	σ_3	θ	τ_{oct}	$\sigma_1 - \sigma_3$	M_R	Pred. M_R
Sequence	psi	psi	psi	psi	psi	psi	psi	psi
1	6.0	1.9	1.9	9.8	1.9	4.1	9982	9625
2	9.5	3.9	3.9	17.3	2.6	5.6	16588	16315
3	12.8	5.8	5.8	24.4	3.3	7.0	22581	22000
4	16.3	7.9	7.9	32.1	4.0	8.4	27448	27635
5	23.1	11.9	11.9	46.9	5.3	11.2	34193	36718
6	7.1	1.9	1.9	10.9	2.5	5.2	10676	10225
7	11.6	3.9	3.9	19.4	3.6	7.7	17388	16770
8	15.9	5.9	5.9	27.7	4.7	10.0	22716	22149
9	20.2	7.9	7.9	36.0	5.8	12.3	27260	26638
10	29.0	11.9	11.9	52.8	8.1	17.1	33408	33437
11	9.1	1.9	1.9	12.9	3.4	7.2	11280	11160
12	15.5	3.9	3.9	23.3	5.5	11.6	17278	17325
13	21.9	5.9	5.9	33.7	7.5	16.0	21682	21677
14	28.2	7.9	7.9	44.0	9.6	20.3	24866	24794
15	40.9	11.9	11.9	64.7	13.7	29.0	29733	28634
16	11.1	1.9	1.9	14.9	4.3	9.2	9996	11927

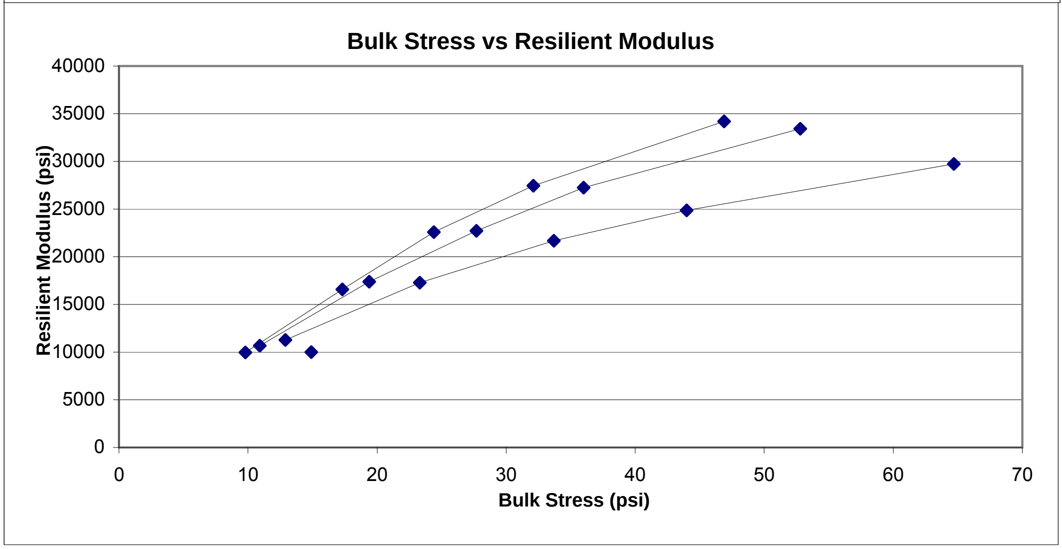
K_1 =	1,233.0	n =	16	Se =	0.025
K_2 =	1.051	SES =	0.008	Se/Sy =	0.137
K_3 =	-1.674	Sy =	0.186	R^2 =	0.981

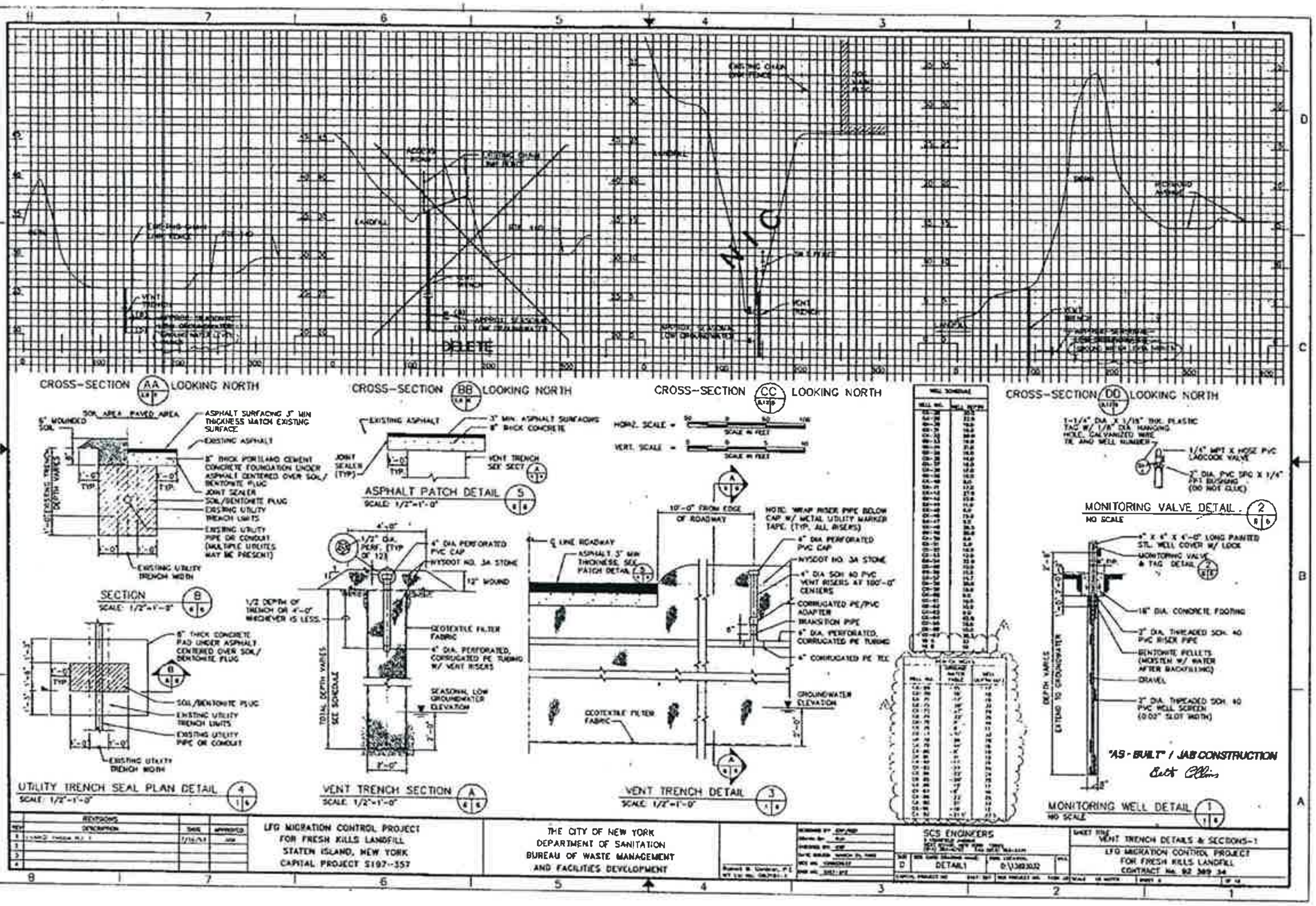
Technician: Scott Bivens
Checked By: Allen Cooley

BCD Project:	080204	Date:	4/24/2008
Client	Geosyntec Consultants	Sample I.D.:	65
Project Name:	FKLF-BPM	Replicate Test:	Rep 3








CROSS-SECTION AA LOOKING NORTH
CROSS-SECTION BB LOOKING NORTH
DELETE
CROSS-SECTION CC LOOKING NORTH
N I C
CROSS-SECTION DD LOOKING NORTH
HORIZ. SCALE
VERT. SCALE
SCALE IN FEET
ASPHALT PATCH DETAIL
SCALE: 1/2"=1'-0"
SECTION
SCALE: 1/2"=1'-0"
UTILITY TRENCH SEAL PLAN DETAIL
SCALE: 1/2"=1'-0"
VENT TRENCH SECTION
SCALE: 1/2"=1'-0"
VENT TRENCH DETAIL
SCALE: 1/2"=1'-0"
MONITORING VALVE DETAIL
NO SCALE
MONITORING WELL DETAIL
NO SCALE
"AS-BUILT" / JAB CONSTRUCTION
GEOTEXTILE FILTER FABRIC
GROUNDWATER ELEVATION
SEASONAL LOW GROUNDWATER ELEVATION
TOTAL DEPTH VARIES SEE SCHEDULE
DEPTH VARIES EXTEND TO GROUNDWATER
18" DIA. CONCRETE FOOTING
2" DIA. THREADED SCH. 40 PVC RISER PIPE
BENTONITE PELLETS (MOISTEN W/ WATER AFTER BACKFILLING)
GRAVEL
2" DIA. THREADED SCH. 40 PVC WELL SCREEN (0.02" SLOT WIDTH)
LFG MIGRATION CONTROL PROJECT
FOR FRESH KILLS LANDFILL
STATEN ISLAND, NEW YORK
CAPITAL PROJECT S197-357
THE CITY OF NEW YORK
DEPARTMENT OF SANITATION
BUREAU OF WASTE MANAGEMENT
AND FACILITIES DEVELOPMENT
SCS ENGINEERS
DETAIL1
VENT TRENCH DETAILS & SECTIONS-1
LFG MIGRATION CONTROL PROJECT
FOR FRESH KILLS LANDFILL