Resilient Modulus Testing - US Customary Units

Date: March 22, 2010

Project: BL-10-00425

Client:
Mr. Harkanwal Brar
SRA
1201 New Road Suite 242
Linwood, NJ 08221

Project Description:
Resilient Modulus Test
AASHTO T307
Client ID: NAPTF Subgrade Soils
Station:

Sample Information

Braun Sample ID./ File Name:	345N	Sample Diameter, in.:	2.85	Sample M.C., % before, after:	30.1, 30.1
Sample Type:	Type 2	Sample Height, in.:	5.58	Sample Dry Den., pcf:	92.3
Test Date:	04-Mar-2010	Desired M.C., %:	30.1	Failed in Shear?:	YES
Comments:		Desired Dry Den., pcf:	92.3	Triaxial Shear Strength, psi:	27.4

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PARAMETER	Chamber Confining Pressure	Nominal Maximum Axial Stress	Cycle No.	Actual Applied Maximum Axial Load	Actual Applied Cyclic Load	Actual Applied Contact Load	Actual Applied Maximum Axial Stress	Actual Applied Cyclic Stress	Actual Applied Contact Stress	Recov Def. LVDT 1 Reading	Recov Def. LVDT 2 Reading	Average Recov Def. LVDT 1 and LVDT 2	Resilient Strain	Resilient Modulus
DESIGNATION	S3	Scyclic	c1	Pmax	Pcyclic	Pcontact	Smax	Scyclic	Scontact	H1	H2	H average		Mr
UNIT	psi	psi	---	lbs.	lbs.	lbs.	psi	psi	psi	inches	inches	inches	in/in	psi
PRECISION	- - -.-	- - -.-	-	- - - -.-	- - - -.-	- - -.-	- - -.-	- - -.-	- - -.-	-.- - - - -	-.- - - - -	-.- - - - -	-.- - - - -	- - -
SEQUENCE 1	6.0	2.0	1	12.4	11.2	1.1	1.9	1.8	0.2	0.00085	0.00085	0.00085	0.00015	11,611
			2	12.5	11.3	1.2	2.0	1.8	0.2	0.00084	0.00085	0.00084	0.00015	11,731
			3	12.5	11.3	1.2	2.0	1.8	0.2	0.00084	0.00085	0.00084	0.00015	11,769
			4	12.5	11.2	1.2	2.0	1.8	0.2	0.00084	0.00085	0.00084	0.00015	11,662
			5	12.5	11.3	1.2	2.0	1.8	0.2	0.00085	0.00085	0.00085	0.00015	11,650
	COLUMN AVERAGE			12.5	11.3	1.2	2.0	1.8	0.2	0.00084	0.00085	0.00084	0.00015	11,684
	STANDARD DEV.			0.06	0.04	0.03	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	64

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 2	6.0	4.0	1	25.4	22.9	2.5	4.0	3.6	0.4	0.00165	0.00164	0.00165	0.00030	12,161
			2	25.5	23.0	2.5	4.0	3.6	0.4	0.00165	0.00164	0.00165	0.00030	12,217
			3	25.4	22.9	2.5	4.0	3.6	0.4	0.00165	0.00164	0.00165	0.00030	12,176
			4	25.3	22.9	2.5	4.0	3.6	0.4	0.00165	0.00164	0.00164	0.00029	12,203
			5	25.4	22.9	2.5	4.0	3.6	0.4	0.00165	0.00164	0.00165	0.00030	12,171
	COLUMN AVERAGE			25.4	22.9	2.5	4.0	3.6	0.4	0.00165	0.00164	0.00165	0.00030	12,186
	STANDARD DEV.			0.04	0.04	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	23
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 3	6.0	6.0	1	38.3	34.6	3.7	6.0	5.4	0.6	0.00253	0.00251	0.00252	0.00045	11,987
			2	38.2	34.5	3.8	6.0	5.4	0.6	0.00254	0.00251	0.00252	0.00045	11,969
			3	38.2	34.5	3.8	6.0	5.4	0.6	0.00254	0.00251	0.00252	0.00045	11,965
			4	38.4	34.6	3.8	6.0	5.4	0.6	0.00254	0.00251	0.00252	0.00045	12,009
			5	38.3	34.6	3.7	6.0	5.4	0.6	0.00254	0.00251	0.00252	0.00045	11,997
	COLUMN AVERAGE			38.3	34.5	3.8	6.0	5.4	0.6	0.00254	0.00251	0.00252	0.00045	11,985
	STANDARD DEV.			0.05	0.06	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	19
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 4	6.0	8.0	1	50.9	46.0	4.9	8.0	7.2	0.8	0.00348	0.00344	0.00345	0.00062	11,645
			2	50.8	45.9	4.9	8.0	7.2	0.8	0.00348	0.00344	0.00345	0.00062	11,631
			3	50.8	45.8	4.9	8.0	7.2	0.8	0.00348	0.00344	0.00346	0.00062	11,607
			4	50.9	46.0	4.9	8.0	7.2	0.8	0.00348	0.00344	0.00346	0.00062	11,644
			5	50.9	46.0	4.9	8.0	7.2	0.8	0.00347	0.00343	0.00345	0.00062	11,657
	COLUMN AVERAGE			50.9	45.9	4.9	8.0	7.2	0.8	0.00348	0.00344	0.00346	0.00062	11,637
	STANDARD DEV.			0.06	0.06	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	19

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COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 5	6.0	10.0	1	63.8	57.5	6.2	10.0	9.0	1.0	0.00452	0.00448	0.00450	0.00081	11,199
			2	63.7	57.5	6.2	10.0	9.0	1.0	0.00452	0.00447	0.00449	0.00081	11,194
			3	63.6	57.4	6.2	10.0	9.0	1.0	0.00452	0.00447	0.00449	0.00081	11,188
			4	63.7	57.5	6.2	10.0	9.0	1.0	0.00452	0.00447	0.00449	0.00081	11,199
			5	63.8	57.5	6.2	10.0	9.0	1.0	0.00452	0.00447	0.00449	0.00081	11,212
	COLUMN AVERAGE			63.7	57.5	6.2	10.0	9.0	1.0	0.00452	0.00447	0.00449	0.00081	11,198
	STANDARD DEV.			0.06	0.04	0.02	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	9
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 6	4.0	2.1	1	13.1	11.5	1.6	2.1	1.8	0.3	0.00088	0.00090	0.00089	0.00016	11,308
			2	13.1	11.5	1.6	2.1	1.8	0.3	0.00088	0.00090	0.00089	0.00016	11,373
			3	13.1	11.5	1.6	2.1	1.8	0.3	0.00088	0.00090	0.00089	0.00016	11,308
			4	13.0	11.5	1.6	2.0	1.8	0.2	0.00087	0.00090	0.00088	0.00016	11,383
			5	13.1	11.5	1.6	2.1	1.8	0.3	0.00087	0.00090	0.00089	0.00016	11,345
	COLUMN AVERAGE			13.1	11.5	1.6	2.1	1.8	0.3	0.00088	0.00090	0.00089	0.00016	11,344
	STANDARD DEV.			0.03	0.02	0.03	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	35
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 7	4.0	4.0	1	25.4	22.9	2.5	4.0	3.6	0.4	0.00170	0.00170	0.00170	0.00030	11,787
			2	25.3	22.8	2.5	4.0	3.6	0.4	0.00170	0.00170	0.00170	0.00030	11,743
			3	25.3	22.8	2.5	4.0	3.6	0.4	0.00171	0.00171	0.00170	0.00031	11,707
			4	25.4	22.9	2.5	4.0	3.6	0.4	0.00171	0.00170	0.00170	0.00031	11,780
			5	25.3	22.9	2.5	4.0	3.6	0.4	0.00170	0.00171	0.00170	0.00031	11,756
	COLUMN AVERAGE			25.3	22.8	2.5	4.0	3.6	0.4	0.00170	0.00170	0.00170	0.00031	11,755
	STANDARD DEV.			0.04	0.04	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	32

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COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 8	4.0	6.0	1	38.0	34.2	3.8	6.0	5.4	0.6	0.00254	0.00253	0.00253	0.00045	11,828
			2	38.0	34.2	3.8	6.0	5.4	0.6	0.00255	0.00253	0.00254	0.00045	11,809
			3	38.1	34.3	3.8	6.0	5.4	0.6	0.00255	0.00253	0.00254	0.00045	11,828
			4	38.1	34.3	3.8	6.0	5.4	0.6	0.00255	0.00252	0.00253	0.00045	11,860
			5	38.1	34.3	3.8	6.0	5.4	0.6	0.00255	0.00253	0.00253	0.00045	11,831
	COLUMN AVERAGE			38.1	34.3	3.8	6.0	5.4	0.6	0.00255	0.00253	0.00254	0.00045	11,831
	STANDARD DEV.			0.05	0.05	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	18
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 9	4.0	8.0	1	50.8	45.8	5.0	8.0	7.2	0.8	0.00352	0.00348	0.00350	0.00063	11,463
			2	50.7	45.8	5.0	8.0	7.2	0.8	0.00352	0.00347	0.00349	0.00063	11,469
			3	50.8	45.9	4.9	8.0	7.2	0.8	0.00352	0.00347	0.00350	0.00063	11,482
			4	50.9	45.9	4.9	8.0	7.2	0.8	0.00352	0.00347	0.00349	0.00063	11,511
			5	50.8	45.8	5.0	8.0	7.2	0.8	0.00352	0.00348	0.00350	0.00063	11,470
	COLUMN AVERAGE			50.8	45.9	4.9	8.0	7.2	0.8	0.00352	0.00347	0.00350	0.00063	11,479
	STANDARD DEV.			0.05	0.05	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	19
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 10	4.0	10.0	1	63.5	57.2	6.2	10.0	9.0	1.0	0.00458	0.00452	0.00455	0.00082	11,020
			2	63.5	57.3	6.2	10.0	9.0	1.0	0.00457	0.00451	0.00454	0.00081	11,051
			3	63.4	57.2	6.2	10.0	9.0	1.0	0.00458	0.00451	0.00454	0.00081	11,018
			4	63.4	57.2	6.2	9.9	9.0	1.0	0.00458	0.00451	0.00454	0.00081	11,019
			5	63.5	57.2	6.2	10.0	9.0	1.0	0.00457	0.00452	0.00454	0.00081	11,027
	COLUMN AVERAGE			63.4	57.2	6.2	10.0	9.0	1.0	0.00458	0.00451	0.00454	0.00081	11,027
	STANDARD DEV.			0.05	0.05	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	14

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COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 11	2.0	2.1	1	13.3	11.3	2.0	2.1	1.8	0.3	0.00094	0.00096	0.00094	0.00017	10,470
			2	13.3	11.3	2.0	2.1	1.8	0.3	0.00094	0.00095	0.00094	0.00017	10,546
			3	13.4	11.4	2.0	2.1	1.8	0.3	0.00094	0.00096	0.00094	0.00017	10,555
			4	13.4	11.4	2.0	2.1	1.8	0.3	0.00094	0.00096	0.00095	0.00017	10,520
			5	13.3	11.3	2.0	2.1	1.8	0.3	0.00094	0.00096	0.00094	0.00017	10,487
	COLUMN AVERAGE			13.3	11.3	2.0	2.1	1.8	0.3	0.00094	0.00096	0.00094	0.00017	10,515
	STANDARD DEV.			0.04	0.04	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	37
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 12	2.0	4.0	1	25.3	22.8	2.5	4.0	3.6	0.4	0.00188	0.00186	0.00187	0.00034	10,684
			2	25.3	22.8	2.5	4.0	3.6	0.4	0.00188	0.00186	0.00186	0.00033	10,710
			3	25.3	22.8	2.5	4.0	3.6	0.4	0.00187	0.00186	0.00186	0.00033	10,714
			4	25.4	22.9	2.5	4.0	3.6	0.4	0.00188	0.00186	0.00187	0.00033	10,731
			5	25.3	22.8	2.5	4.0	3.6	0.4	0.00188	0.00186	0.00187	0.00034	10,679
	COLUMN AVERAGE			25.3	22.8	2.5	4.0	3.6	0.4	0.00188	0.00186	0.00187	0.00033	10,704
	STANDARD DEV.			0.03	0.03	0.01	0.01	0.00	0.00	0.00000	0.00000	0.00000	0.00000	22
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 13	2.0	6.0	1	38.1	34.3	3.8	6.0	5.4	0.6	0.00282	0.00277	0.00279	0.00050	10,762
			2	38.0	34.2	3.8	6.0	5.4	0.6	0.00281	0.00277	0.00279	0.00050	10,739
			3	38.0	34.2	3.8	6.0	5.4	0.6	0.00281	0.00277	0.00279	0.00050	10,713
			4	38.1	34.3	3.8	6.0	5.4	0.6	0.00281	0.00278	0.00280	0.00050	10,730
			5	38.1	34.3	3.8	6.0	5.4	0.6	0.00281	0.00277	0.00279	0.00050	10,762
	COLUMN AVERAGE			38.0	34.3	3.8	6.0	5.4	0.6	0.00281	0.00277	0.00279	0.00050	10,741
	STANDARD DEV.			0.06	0.06	0.00	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	21

Sample ID: 345N

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COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 14	2.0	8.0	1	50.9	45.9	5.1	8.0	7.2	0.8	0.00384	0.00377	0.00380	0.00068	10,556
			2	51.0	45.9	5.1	8.0	7.2	0.8	0.00384	0.00378	0.00381	0.00068	10,554
			3	50.9	45.8	5.1	8.0	7.2	0.8	0.00384	0.00378	0.00381	0.00068	10,535
			4	50.9	45.8	5.1	8.0	7.2	0.8	0.00384	0.00378	0.00380	0.00068	10,535
			5	51.0	45.9	5.1	8.0	7.2	0.8	0.00383	0.00378	0.00380	0.00068	10,560
	COLUMN AVERAGE			50.9	45.8	5.1	8.0	7.2	0.8	0.00384	0.00378	0.00380	0.00068	10,548
	STANDARD DEV.			0.05	0.05	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	12
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 15	2.0	10.0	1	63.5	57.2	6.2	10.0	9.0	1.0	0.00492	0.00486	0.00488	0.00088	10,259
			2	63.4	57.1	6.2	9.9	9.0	1.0	0.00491	0.00485	0.00488	0.00088	10,247
			3	63.4	57.1	6.3	9.9	9.0	1.0	0.00491	0.00485	0.00488	0.00088	10,238
			4	63.5	57.2	6.3	10.0	9.0	1.0	0.00491	0.00486	0.00488	0.00088	10,257
			5	63.5	57.2	6.3	10.0	9.0	1.0	0.00491	0.00486	0.00488	0.00088	10,264
	COLUMN AVERAGE			63.4	57.2	6.3	10.0	9.0	1.0	0.00491	0.00485	0.00488	0.00088	10,253
	STANDARD DEV.			0.07	0.07	0.02	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	10

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Project: BL-10-00425

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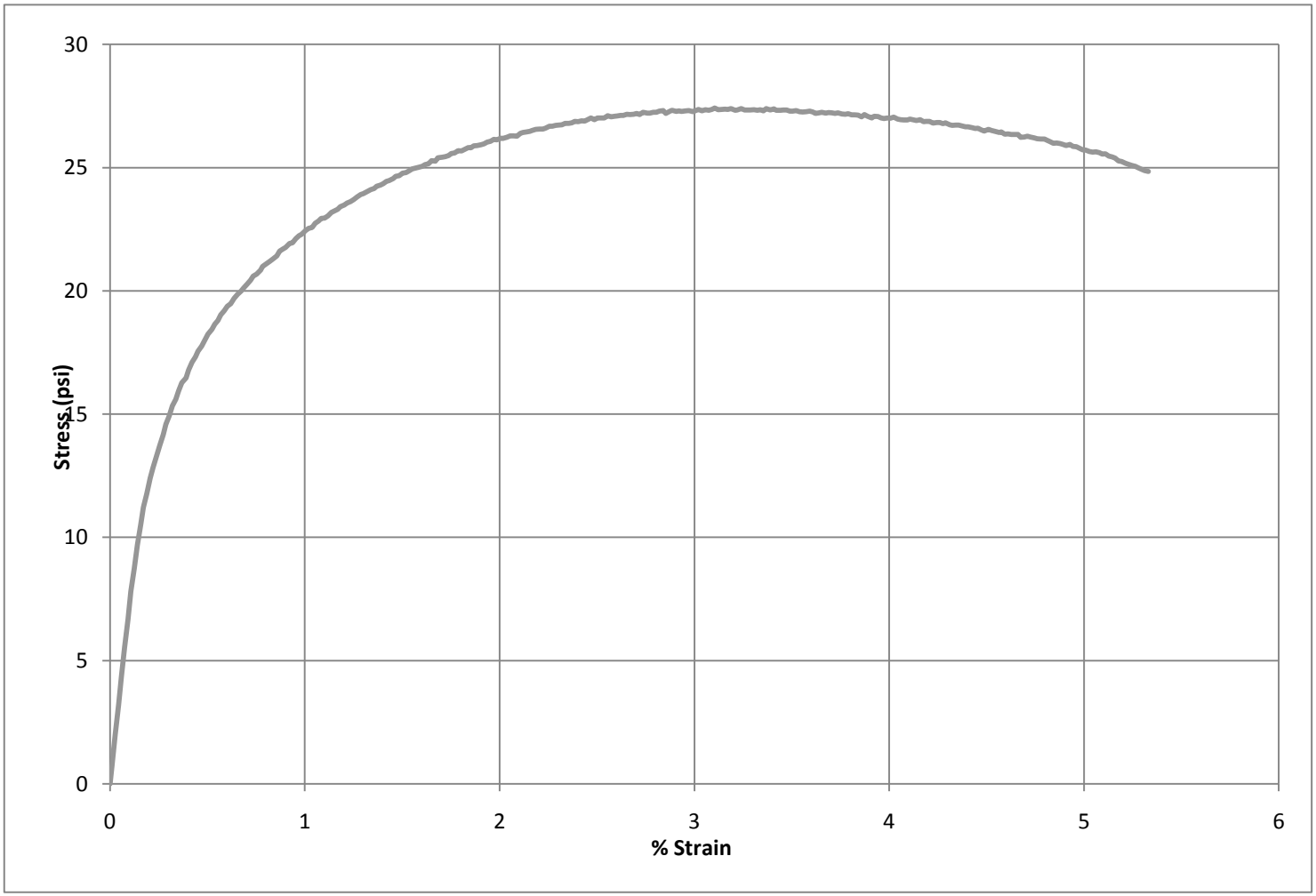
EJK

Laboratory Technician

Quick Shear

Confining Pressure 4 PSI

Peak Shear Stress (psi) = 27.41



Sample ID: 345N

Project: BL-10-00425

Sheet No. of

Resilient Modulus Testing - S. I. Units

Date: March 22, 2010

Project: BL-10-00425

Client:
Mr. Harkanwal Brar
SRA
1201 New Road Suite 242
Linwood, NJ 08221

Project Description:
Resilient Modulus Test
AASHTO T307
Client ID: NAPTF Subgrade Soils
Station:

Sample Information

Braun Sample ID./ File Name:	345N	Sample Diameter, mm:	72.3	Sample M.C., % before, after:	30.1, 30.1
Sample Type:	Type 2	Sample Height, mm:	141.6	Sample Dry Den., Kg/cu.m:	1478.0
Test Date:	04-Mar-2010	Desired M.C., %:	30.1	Failed in Shear?:	YES
Comments:		Desired Dry Den., Kg/cu.ı	1478.5	Triaxial Shear Strength, kPa:	189.0

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PARAMETER	Chamber Confining Pressure	Nominal Maximum Axial Stress	Cycle No.	Actual Applied Maximum Axial Load	Actual Applied Cyclic Load	Actual Applied Contact Load	Actual Applied Maximum Axial Stress	Actual Applied Cyclic Stress	Actual Applied Contact Stress	Recov Def. LVDT 1 Reading	Recov Def. LVDT 2 Reading	Average Recov Def. LVDT 1 and LVDT 2	Resilient Strain	Resilient Modulus
DESIGNATION	S3	Scyclic	c1	Pmax	Pcyclic	Pcontact	Smax	Scyclic	Scontact	H1	H2	H average		Mr
UNIT	kPa	kPa	---	N	N	N	kPa	kPa	kPa	mm	mm	mm	mm/mm	MPa
PRECISION	- - -.-	- - -.-	-	- - - -.-	- - - -.-	- - -.-	- - -.-	- - -.-	- - -.-	-.- - - - -	-.- - - - -	-.- - - - -	-.- - - - -	- - -
SEQUENCE 1	41.3	13.5	1	55.1	50.0	5.1	13.4	12.2	1.2	0.02147	0.02170	0.02151	0.00015	80
			2	55.4	50.2	5.2	13.5	12.2	1.3	0.02139	0.02147	0.02139	0.00015	81
			3	55.7	50.4	5.4	13.6	12.3	1.3	0.02132	0.02155	0.02139	0.00015	81
			4	55.4	50.0	5.4	13.5	12.2	1.3	0.02139	0.02163	0.02143	0.00015	80
			5	55.4	50.1	5.3	13.5	12.2	1.3	0.02147	0.02163	0.02147	0.00015	80
	COLUMN AVERAGE			55.4	50.1	5.3	13.5	12.2	1.3	0.02141	0.02159	0.02144	0.00015	81
	STANDARD DEV.			0.25	0.17	0.13	0.06	0.04	0.03	0.00007	0.00009	0.00005	0.00000	0

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 2	41.3	27.5	1	112.9	101.9	11.0	27.5	24.8	2.7	0.04201	0.04178	0.04186	0.00030	84
			2	113.2	102.2	11.0	27.5	24.9	2.7	0.04201	0.04178	0.04182	0.00030	84
			3	113.0	102.0	11.0	27.5	24.8	2.7	0.04201	0.04178	0.04186	0.00030	84
			4	112.7	101.7	11.0	27.4	24.8	2.7	0.04194	0.04155	0.04166	0.00029	84
			5	112.9	101.9	11.0	27.5	24.8	2.7	0.04201	0.04178	0.04186	0.00030	84
	COLUMN AVERAGE			113.0	101.9	11.0	27.5	24.8	2.7	0.04200	0.04173	0.04181	0.00030	84
	STANDARD DEV.			0.18	0.18	0.02	0.04	0.04	0.01	0.00003	0.00010	0.00008	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 3	41.4	41.4	1	170.4	153.7	16.6	41.5	37.4	4.1	0.06434	0.06387	0.06410	0.00045	83
			2	170.1	153.3	16.7	41.4	37.3	4.1	0.06442	0.06372	0.06403	0.00045	83
			3	170.1	153.4	16.8	41.4	37.3	4.1	0.06449	0.06372	0.06407	0.00045	82
			4	170.7	153.9	16.7	41.5	37.5	4.1	0.06441	0.06379	0.06407	0.00045	83
			5	170.4	153.8	16.6	41.5	37.4	4.1	0.06441	0.06387	0.06407	0.00045	83
	COLUMN AVERAGE			170.3	153.6	16.7	41.4	37.4	4.1	0.06441	0.06379	0.06407	0.00045	83
	STANDARD DEV.			0.24	0.27	0.05	0.06	0.07	0.01	0.00006	0.00008	0.00003	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 4	41.3	55.1	1	226.4	204.4	22.0	55.1	49.7	5.3	0.08829	0.08728	0.08775	0.00062	80
			2	226.1	204.2	21.9	55.0	49.7	5.3	0.08829	0.08744	0.08775	0.00062	80
			3	225.9	203.9	21.9	55.0	49.6	5.3	0.08829	0.08736	0.08782	0.00062	80
			4	226.5	204.6	21.9	55.1	49.8	5.3	0.08837	0.08744	0.08782	0.00062	80
			5	226.4	204.5	21.9	55.1	49.8	5.3	0.08813	0.08721	0.08767	0.00062	80
	COLUMN AVERAGE			226.3	204.3	21.9	55.1	49.7	5.3	0.08827	0.08734	0.08776	0.00062	80
	STANDARD DEV.			0.28	0.26	0.04	0.07	0.06	0.01	0.00009	0.00010	0.00006	0.00000	0

Sample ID: 345N

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Sheet No. 2 of

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 5	41.3	69.0	1	283.6	255.9	27.7	69.0	62.3	6.7	0.11480	0.11371	0.11422	0.00081	77
			2	283.4	255.6	27.7	68.9	62.2	6.7	0.11472	0.11364	0.11414	0.00081	77
			3	283.1	255.5	27.6	68.9	62.2	6.7	0.11480	0.11363	0.11414	0.00081	77
			4	283.2	255.7	27.6	68.9	62.2	6.7	0.11472	0.11363	0.11410	0.00081	77
			5	283.7	256.0	27.7	69.0	62.3	6.7	0.11472	0.11356	0.11410	0.00081	77
	COLUMN AVERAGE			283.4	255.7	27.7	69.0	62.2	6.7	0.11475	0.11364	0.11414	0.00081	77
	STANDARD DEV.			0.25	0.19	0.08	0.06	0.05	0.02	0.00004	0.00005	0.00005	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 6	27.6	14.2	1	58.1	50.9	7.2	14.1	12.4	1.8	0.02225	0.02287	0.02252	0.00016	78
			2	58.4	51.2	7.2	14.2	12.4	1.8	0.02232	0.02287	0.02248	0.00016	78
			3	58.2	50.9	7.2	14.2	12.4	1.8	0.02225	0.02287	0.02252	0.00016	78
			4	58.0	51.1	6.9	14.1	12.4	1.7	0.02217	0.02287	0.02244	0.00016	78
			5	58.2	51.0	7.2	14.2	12.4	1.8	0.02217	0.02294	0.02248	0.00016	78
	COLUMN AVERAGE			58.2	51.0	7.2	14.2	12.4	1.7	0.02223	0.02288	0.02249	0.00016	78
	STANDARD DEV.			0.12	0.09	0.13	0.03	0.02	0.03	0.00006	0.00003	0.00003	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 7	27.6	27.4	1	112.8	101.7	11.1	27.4	24.8	2.7	0.04317	0.04318	0.04314	0.00030	81
			2	112.5	101.4	11.1	27.4	24.7	2.7	0.04325	0.04325	0.04318	0.00030	81
			3	112.5	101.4	11.1	27.4	24.7	2.7	0.04333	0.04341	0.04329	0.00031	81
			4	112.9	101.9	11.1	27.5	24.8	2.7	0.04333	0.04325	0.04322	0.00031	81
			5	112.8	101.6	11.1	27.4	24.7	2.7	0.04325	0.04341	0.04321	0.00031	81
	COLUMN AVERAGE			112.7	101.6	11.1	27.4	24.7	2.7	0.04327	0.04330	0.04321	0.00031	81
	STANDARD DEV.			0.17	0.19	0.02	0.04	0.05	0.01	0.00007	0.00010	0.00006	0.00000	0

Sample ID: 345N

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Sheet No. 3 of

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 8	27.6	41.2	1	169.2	152.4	16.9	41.2	37.1	4.1	0.06457	0.06426	0.06438	0.00045	82
			2	169.1	152.2	16.9	41.1	37.0	4.1	0.06472	0.06418	0.06441	0.00045	81
			3	169.3	152.4	16.9	41.2	37.1	4.1	0.06472	0.06426	0.06441	0.00045	82
			4	169.6	152.8	16.9	41.3	37.2	4.1	0.06480	0.06410	0.06438	0.00045	82
			5	169.3	152.4	16.9	41.2	37.1	4.1	0.06465	0.06426	0.06438	0.00045	82
	COLUMN AVERAGE			169.3	152.4	16.9	41.2	37.1	4.1	0.06469	0.06421	0.06439	0.00045	82
	STANDARD DEV.			0.21	0.21	0.03	0.05	0.05	0.01	0.00009	0.00007	0.00002	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 9	27.6	55.0	1	226.0	203.9	22.1	55.0	49.6	5.4	0.08945	0.08837	0.08891	0.00063	79
			2	225.7	203.7	22.0	54.9	49.6	5.4	0.08953	0.08814	0.08875	0.00063	79
			3	226.0	204.1	21.9	55.0	49.7	5.3	0.08945	0.08821	0.08883	0.00063	79
			4	226.3	204.3	22.0	55.1	49.7	5.3	0.08953	0.08806	0.08871	0.00063	79
			5	226.0	203.9	22.1	55.0	49.6	5.4	0.08945	0.08829	0.08887	0.00063	79
	COLUMN AVERAGE			226.0	204.0	22.0	55.0	49.6	5.4	0.08948	0.08821	0.08882	0.00063	79
	STANDARD DEV.			0.22	0.24	0.05	0.05	0.06	0.01	0.00004	0.00012	0.00008	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 10	27.6	68.7	1	282.3	254.6	27.7	68.7	61.9	6.7	0.11627	0.11480	0.11546	0.00082	76
			2	282.5	254.9	27.6	68.7	62.0	6.7	0.11612	0.11457	0.11526	0.00081	76
			3	282.1	254.4	27.7	68.6	61.9	6.7	0.11627	0.11464	0.11538	0.00081	76
			4	281.9	254.3	27.6	68.6	61.9	6.7	0.11627	0.11465	0.11534	0.00081	76
			5	282.4	254.7	27.7	68.7	62.0	6.7	0.11619	0.11472	0.11542	0.00081	76
	COLUMN AVERAGE			282.2	254.5	27.7	68.7	61.9	6.7	0.11623	0.11468	0.11537	0.00081	76
	STANDARD DEV.			0.23	0.23	0.04	0.06	0.06	0.01	0.00007	0.00009	0.00007	0.00000	0

Sample ID: 345N

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Sheet No. 4 of

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 11	13.8	14.4	1	59.1	50.3	8.9	14.4	12.2	2.2	0.02380	0.02426	0.02399	0.00017	72
			2	59.3	50.5	8.9	14.4	12.3	2.2	0.02380	0.02419	0.02391	0.00017	73
			3	59.6	50.7	8.9	14.5	12.3	2.2	0.02380	0.02426	0.02399	0.00017	73
			4	59.4	50.6	8.8	14.5	12.3	2.1	0.02380	0.02426	0.02403	0.00017	73
			5	59.2	50.3	8.9	14.4	12.2	2.2	0.02380	0.02434	0.02399	0.00017	72
	COLUMN AVERAGE			59.3	50.5	8.9	14.4	12.3	2.2	0.02380	0.02426	0.02398	0.00017	73
	STANDARD DEV.			0.17	0.17	0.03	0.04	0.04	0.01	0.00000	0.00005	0.00004	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 12	13.8	27.4	1	112.7	101.5	11.2	27.4	24.7	2.7	0.04767	0.04736	0.04748	0.00034	74
			2	112.5	101.4	11.1	27.4	24.7	2.7	0.04767	0.04713	0.04732	0.00033	74
			3	112.7	101.5	11.2	27.4	24.7	2.7	0.04759	0.04728	0.04736	0.00033	74
			4	113.0	101.8	11.2	27.5	24.8	2.7	0.04767	0.04721	0.04740	0.00033	74
			5	112.7	101.5	11.2	27.4	24.7	2.7	0.04775	0.04736	0.04752	0.00034	74
	COLUMN AVERAGE			112.7	101.5	11.2	27.4	24.7	2.7	0.04767	0.04727	0.04742	0.00033	74
	STANDARD DEV.			0.15	0.14	0.03	0.04	0.03	0.01	0.00005	0.00010	0.00008	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 13	13.8	41.2	1	169.5	152.7	16.8	41.2	37.2	4.1	0.07154	0.07046	0.07092	0.00050	74
			2	169.0	152.2	16.8	41.1	37.0	4.1	0.07139	0.07038	0.07085	0.00050	74
			3	169.0	152.1	16.8	41.1	37.0	4.1	0.07147	0.07046	0.07096	0.00050	74
			4	169.3	152.5	16.8	41.2	37.1	4.1	0.07147	0.07062	0.07104	0.00050	74
			5	169.4	152.6	16.8	41.2	37.1	4.1	0.07147	0.07046	0.07089	0.00050	74
	COLUMN AVERAGE			169.3	152.4	16.8	41.2	37.1	4.1	0.07147	0.07048	0.07093	0.00050	74
	STANDARD DEV.			0.25	0.26	0.02	0.06	0.06	0.00	0.00005	0.00009	0.00008	0.00000	0

Sample ID: 345N

Project: BL-10-00425

Sheet No. 5 of

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 14	13.8	55.1	1	226.6	204.1	22.5	55.1	49.7	5.5	0.09751	0.09581	0.09662	0.00068	73
			2	226.7	204.1	22.6	55.2	49.7	5.5	0.09751	0.09596	0.09666	0.00068	73
			3	226.3	203.7	22.5	55.1	49.6	5.5	0.09751	0.09589	0.09666	0.00068	73
			4	226.3	203.7	22.6	55.1	49.6	5.5	0.09751	0.09589	0.09662	0.00068	73
			5	226.7	204.1	22.6	55.1	49.7	5.5	0.09736	0.09596	0.09658	0.00068	73
	COLUMN AVERAGE			226.5	203.9	22.6	55.1	49.6	5.5	0.09748	0.09590	0.09663	0.00068	73
	STANDARD DEV.			0.22	0.21	0.03	0.05	0.05	0.01	0.00007	0.00007	0.00003	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 15	13.8	68.7	1	282.4	254.7	27.7	68.7	62.0	6.7	0.12488	0.12332	0.12406	0.00088	71
			2	281.8	254.1	27.7	68.6	61.8	6.7	0.12480	0.12309	0.12395	0.00088	71
			3	281.9	254.0	27.9	68.6	61.8	6.8	0.12480	0.12325	0.12402	0.00088	71
			4	282.5	254.6	27.9	68.7	61.9	6.8	0.12480	0.12332	0.12406	0.00088	71
			5	282.5	254.6	27.9	68.7	61.9	6.8	0.12480	0.12332	0.12398	0.00088	71
	COLUMN AVERAGE			282.2	254.4	27.8	68.7	61.9	6.8	0.12481	0.12326	0.12401	0.00088	71
	STANDARD DEV.			0.32	0.30	0.09	0.08	0.07	0.02	0.00004	0.00010	0.00005	0.00000	0

Sample ID: 345N

Project: BL-10-00425

Sheet No. 6 of

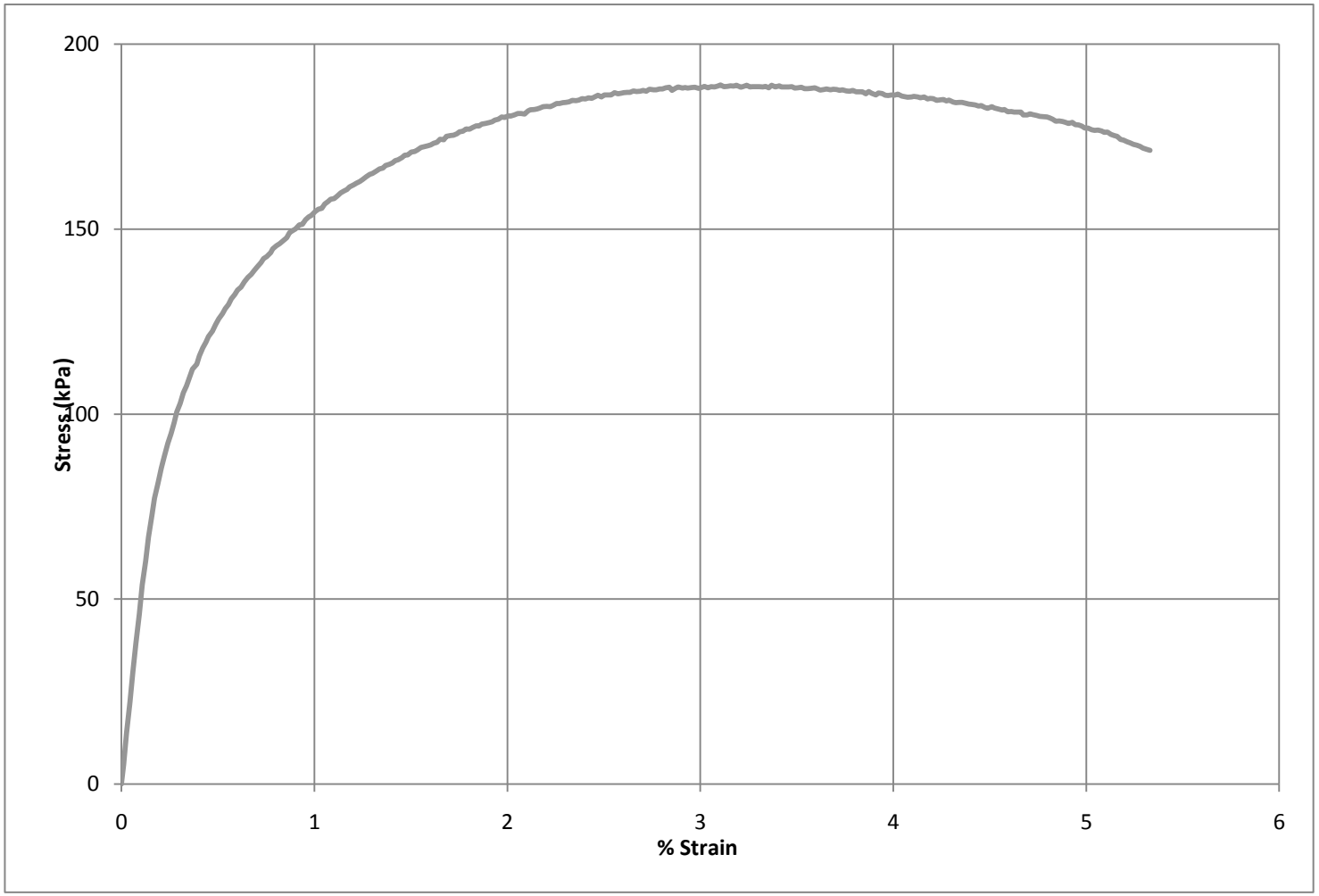
EJK

Laboratory Technician

Quick Shear

Confining Pressure 27.6 kPa

Peak Shear Stress (kPa) = 189.01



Sample ID: 345N

Project: BL-10-00425

Sheet No. of

Universal Model Calculations - US Customary Units

Braun Sample ID: 345N

Project: BL-10-00425

Station:

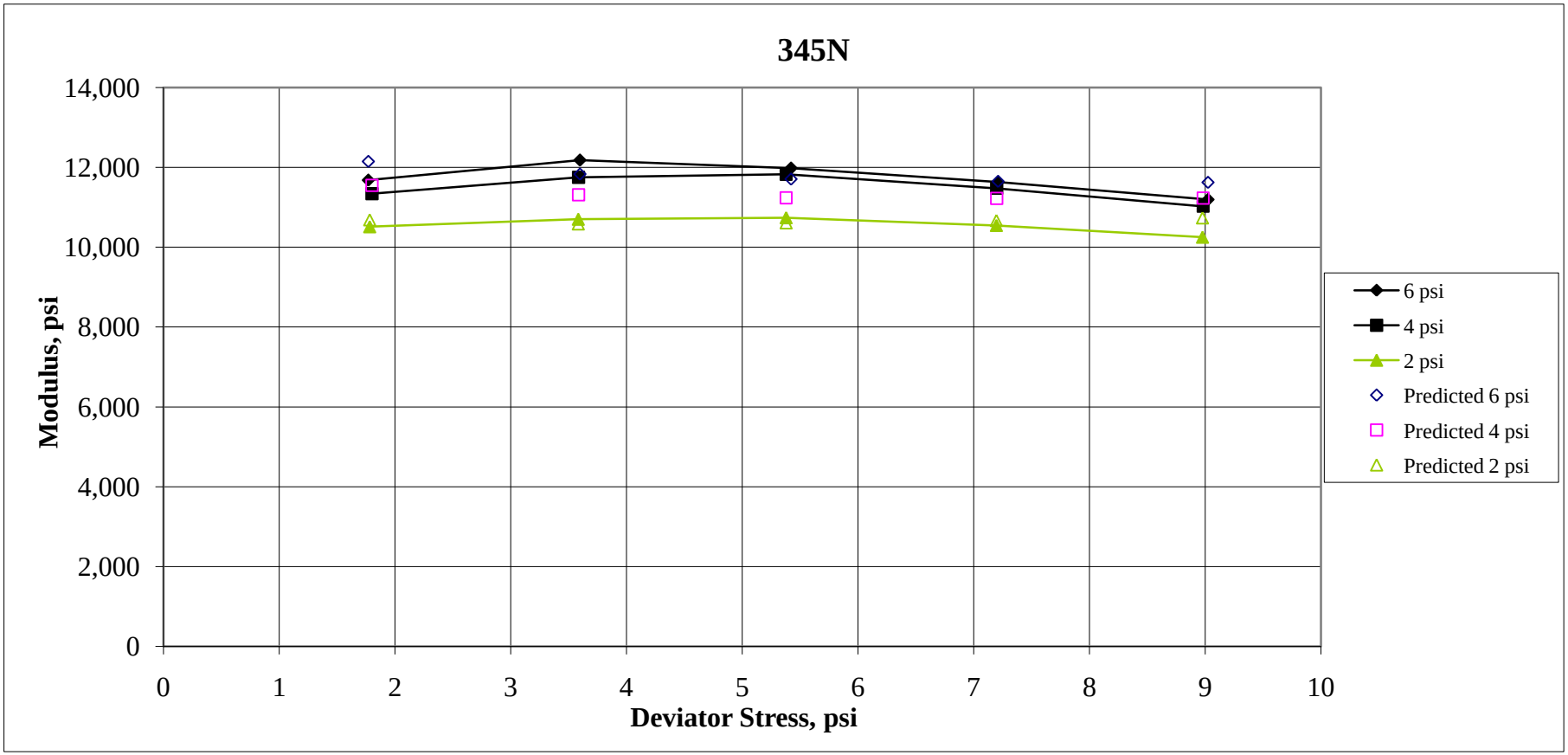
Seq.	Conf. psi	Axial Stress psi	Bulk psi	Deviator psi	M_r psi	Pred. Mr psi	Ln(Mr)	Ln(Bulk)	Ln(Dev)
1	6.0	2.0	19.9	1.8	11,684	12,152	9.366	2.993	0.570
2	6.0	4.0	22.0	3.6	12,186	11,833	9.408	3.090	1.280
3	6.0	6.0	24.0	5.4	11,985	11,708	9.391	3.178	1.690
4	6.0	8.0	26.0	7.2	11,637	11,649	9.362	3.257	1.976
5	6.0	10.0	28.0	9.0	11,198	11,624	9.324	3.332	2.200
6	4.0	2.1	14.0	1.8	11,344	11,550	9.336	2.642	0.588
7	4.0	4.0	16.0	3.6	11,755	11,314	9.372	2.772	1.277
8	4.0	6.0	18.0	5.4	11,831	11,241	9.378	2.889	1.682
9	4.0	8.0	20.0	7.2	11,479	11,224	9.348	2.994	1.974
10	4.0	10.0	22.0	9.0	11,027	11,234	9.308	3.089	2.195
11	2.0	2.1	8.1	1.8	10,515	10,687	9.261	2.090	0.577
12	2.0	4.0	10.0	3.6	10,704	10,584	9.278	2.301	1.276
13	2.0	6.0	12.0	5.4	10,741	10,611	9.282	2.482	1.683
14	2.0	8.0	14.0	7.2	10,548	10,670	9.264	2.638	1.974
15	2.0	10.0	15.9	9.0	10,253	10,736	9.235	2.769	2.195

Universal Model Graph - US Customary Units

Braun Sample ID: 345N

Station:

Project: BL-10-00425



Universal Model Calculations - US Customary Units

Braun Sample ID: 345N

Project: BL-10-00425

Station:

SUMMARY OUTPUT

	k1	k2	k3
Value	8,209	0.142	-0.057
t-Stat	128.47	5.10	-3.39
R-sqr Adj.	0.64116		
Std Err	0.03212	or 3.26%	

Regression Statistics	
Multiple R	0.832120892
R Square	0.69242518
Adjusted R Square	0.64116271
Standard Error	0.032124101
Observations	15

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	0.027878236	0.0139391	13.507449	0.000846651
Residual	12	0.012383494	0.001032		
Total	14	0.04026173			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	9.012950553	0.070155532	128.47099	3.319E-20	8.86009478	9.165806327	8.86009478	9.165806327
X Variable 1	0.141890347	0.027802528	5.1035051	0.0002603	0.081313841	0.202466852	0.081313841	0.202466852
X Variable 2	-0.05674663	0.016725252	-3.392872	0.0053396	-0.093187823	-0.020305437	-0.093187823	-0.020305437

Universal Model Calculations - S.I. Units

Braun Sample ID: 345N

Project: BL-10-00425

Station:

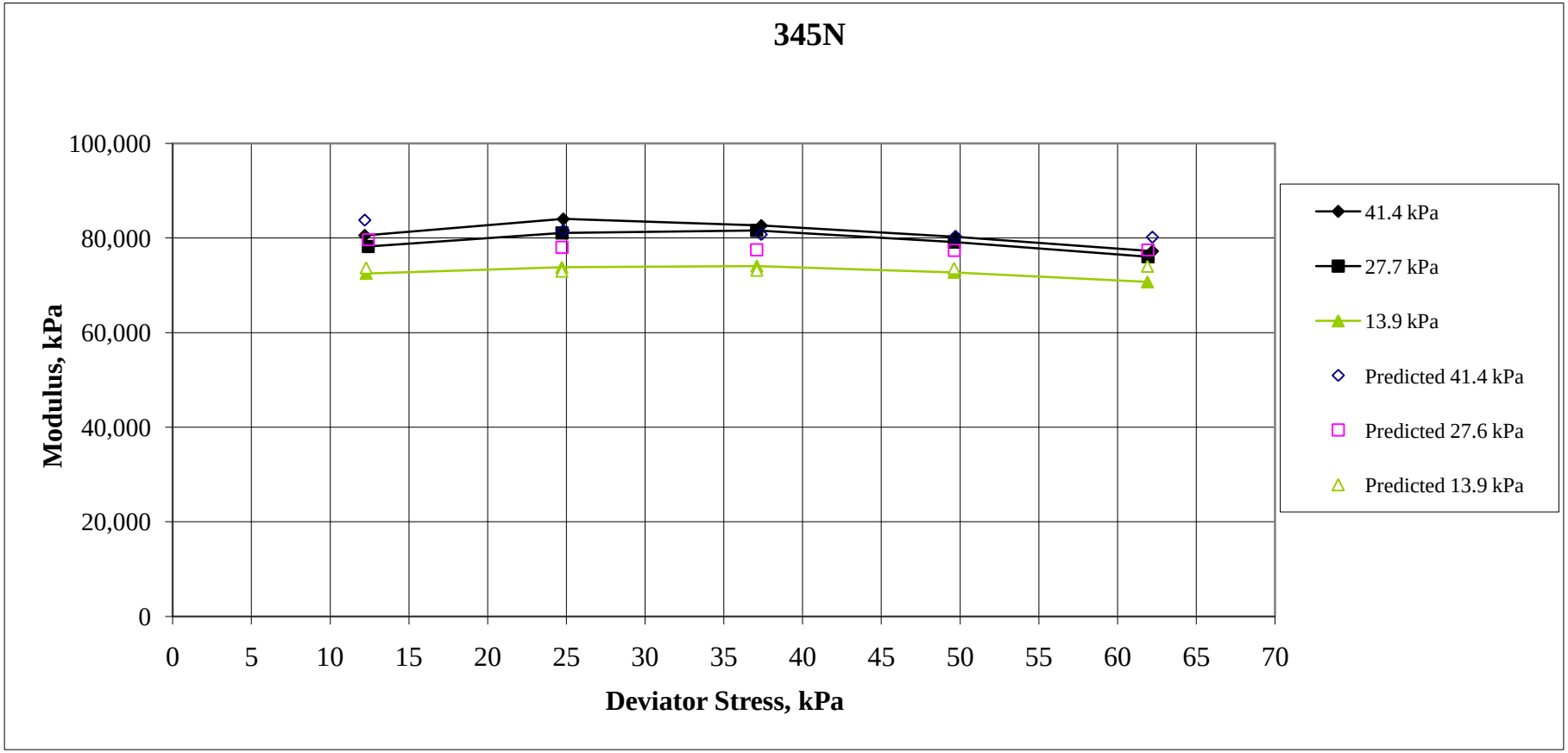
Seq.	Conf. kPa	Axial Stress kPa	Bulk kPa	Deviator kPa	M_r kPa	Pred. Mr kPa	Ln(Mr)	Ln(Bulk)	Ln(Dev)
1	41.3	13.5	137.5	12.2	80,561	83,784	11.297	4.924	2.501
2	41.3	27.5	151.5	24.8	84,018	81,589	11.339	5.020	3.211
3	41.4	41.4	165.5	37.4	82,635	80,723	11.322	5.109	3.621
4	41.3	55.1	179.1	49.7	80,232	80,318	11.293	5.188	3.906
5	41.3	69.0	193.0	62.2	77,210	80,147	11.254	5.263	4.131
6	27.6	14.2	96.8	12.4	78,211	79,635	11.267	4.573	2.519
7	27.6	27.4	110.2	24.7	81,045	78,006	11.303	4.703	3.208
8	27.6	41.2	123.9	37.1	81,573	77,506	11.309	4.819	3.613
9	27.6	55.0	137.7	49.6	79,144	77,387	11.279	4.925	3.905
10	27.6	68.7	151.4	61.9	76,029	77,458	11.239	5.020	4.126
11	13.8	14.4	55.7	12.3	72,501	73,684	11.191	4.021	2.508
12	13.8	27.4	68.9	24.7	73,799	72,971	11.209	4.232	3.207
13	13.8	41.2	82.5	37.1	74,058	73,162	11.213	4.413	3.613
14	13.8	55.1	96.4	49.6	72,727	73,570	11.194	4.569	3.904
15	13.8	68.7	110.0	61.9	70,693	74,021	11.166	4.700	4.126

Universal Model Graph - S.I. Units

Braun Sample ID: 345N

Station:

Project: BL-10-00425



Universal Model Calculations - S.I. Units

Braun Sample ID: 345N

Project: BL-10-00425

Station:

SUMMARY OUTPUT

	k1	k2	k3
Value	48,017	0.142	-0.057
t-Stat	93.33	5.10	-3.39
R-sqr Adj.	0.64116		
Std Err	0.03212	or 3.26%	

Regression Statistics	
Multiple R	0.832120892
R Square	0.69242518
Adjusted R Square	0.64116271
Standard Error	0.032124101
Observations	15

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	0.027878236	0.0139391	13.507449	0.000846651
Residual	12	0.012383494	0.001032		
Total	14	0.04026173			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	10.77931963	0.115491517	93.334298	1.53E-18	10.52768523	11.03095403	10.52768523	11.03095403
X Variable 1	0.141890347	0.027802528	5.1035051	0.0002603	0.081313841	0.202466852	0.081313841	0.202466852
X Variable 2	-0.05674663	0.016725252	-3.392872	0.0053396	-0.093187823	-0.020305437	-0.093187823	-0.020305437