APPENDIX B

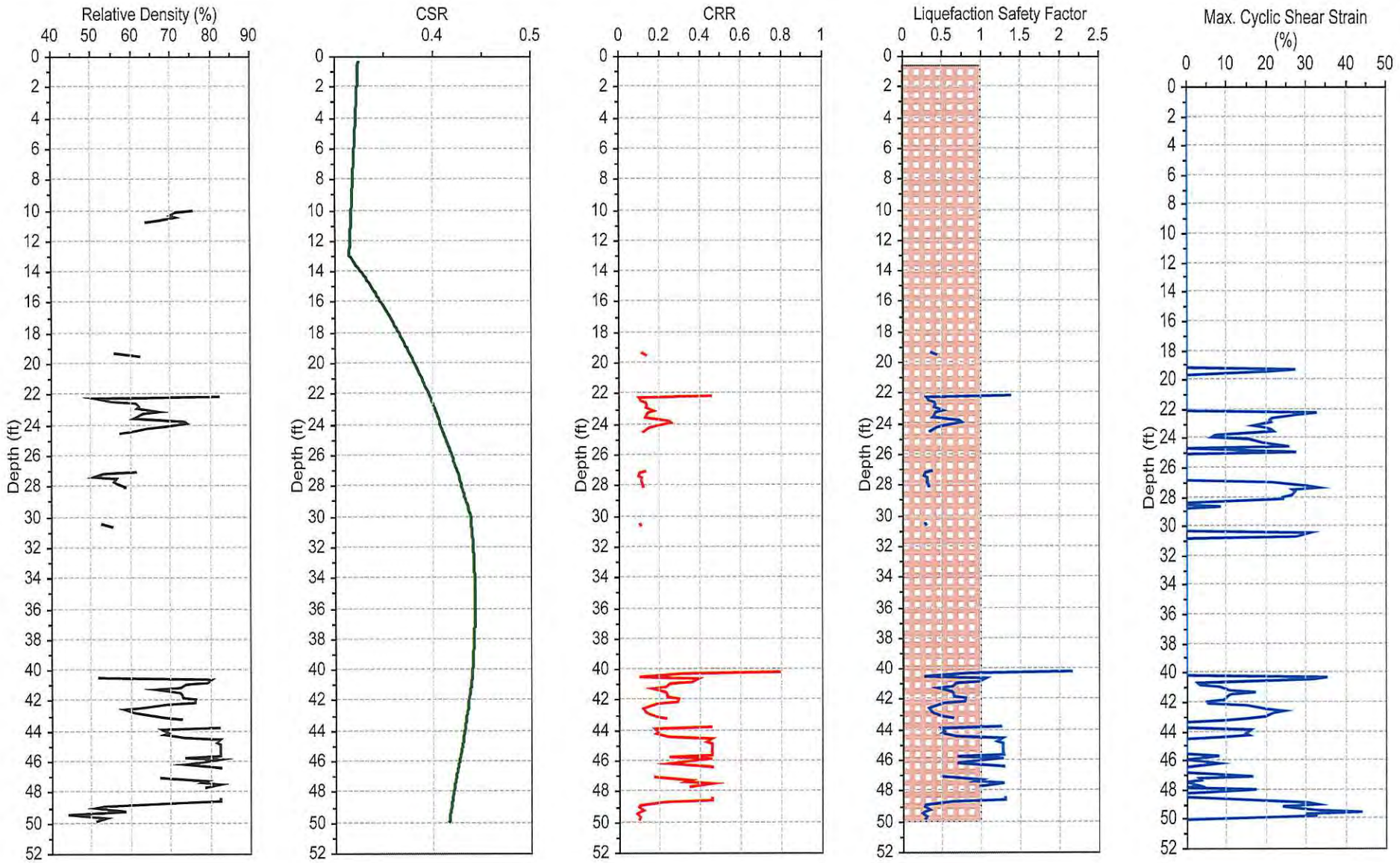
Liquefaction Analysis Results

LIQUEFACTION CPT ANALYSIS REPORT

Project : Dalidio - Commercial Structures
Project No. : SL08639-6
Client : Mr. Dave Daniels
Location : San Luis Ranch - Dalidio
Notes :

Borehole : CPT-1
Ground Water Level : 3.9624 ft
Co-ordinates : n.a.
Calculated By : AR
Checked By :

Ground Slope : Gently Sloped 0.2%
PGA = 0.5 gEq. Magnitude M = 7
Cone Area Ratio = 0.8
CPT Max. Depth = 50.2 ft

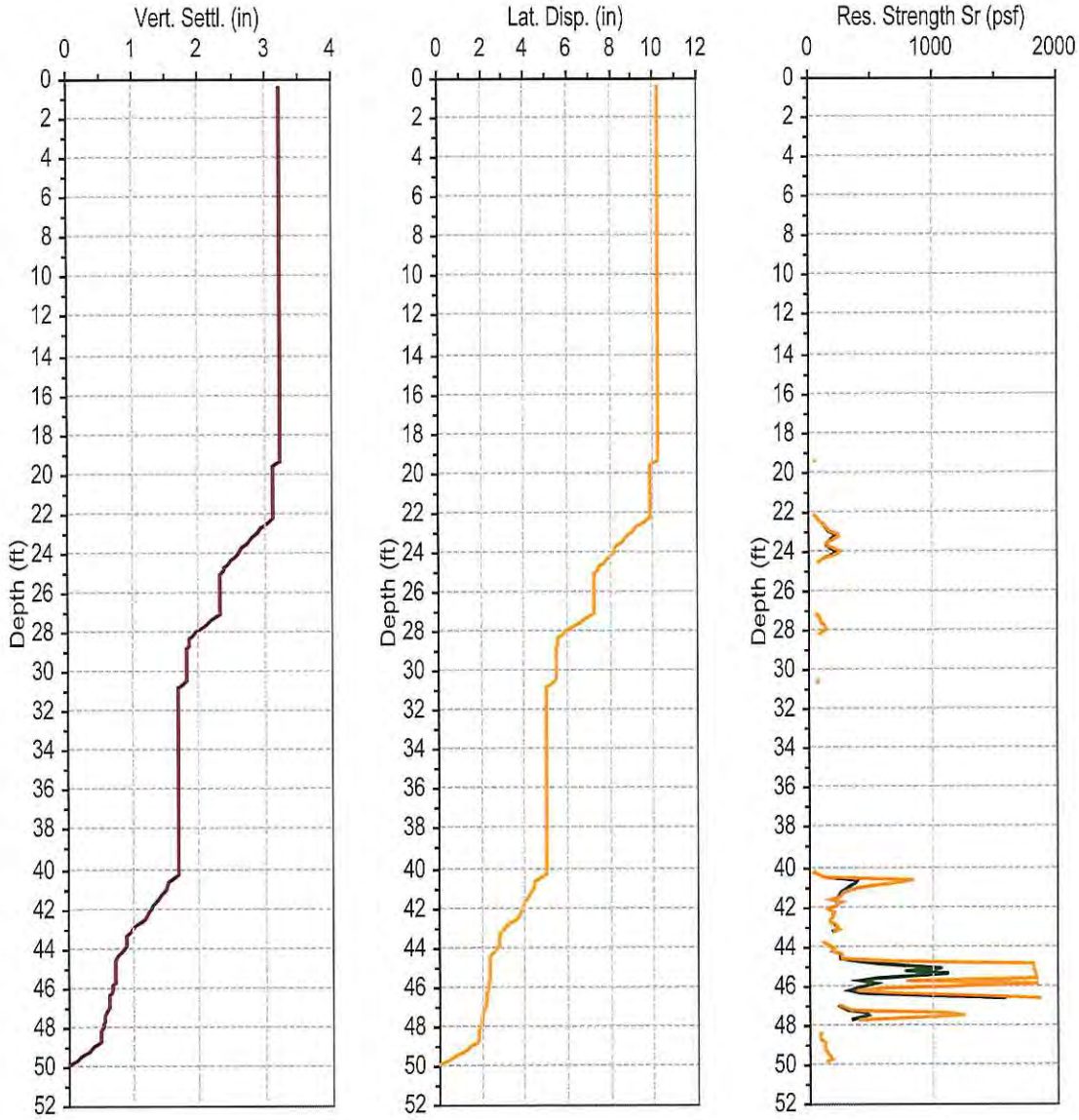


LIQUEFACTION CPT ANALYSIS REPORT

Project : Dalidio - Commercial Structures
Project No. : SL08639-6
Client : Mr. Dave Daniels
Location : San Luis Ranch - Dalidio
Notes :

Borehole : CPT-1
Ground Water Level : 3.9624 ft
Co-ordinates : n.a.
Calculated By : AR
Checked By :

Ground Slope : Gently Sloped 0.2%
PGA = 0.5 gEq. Magnitude M = 7
Cone Area Ratio = 0.8
CPT Max. Depth = 50.2 ft



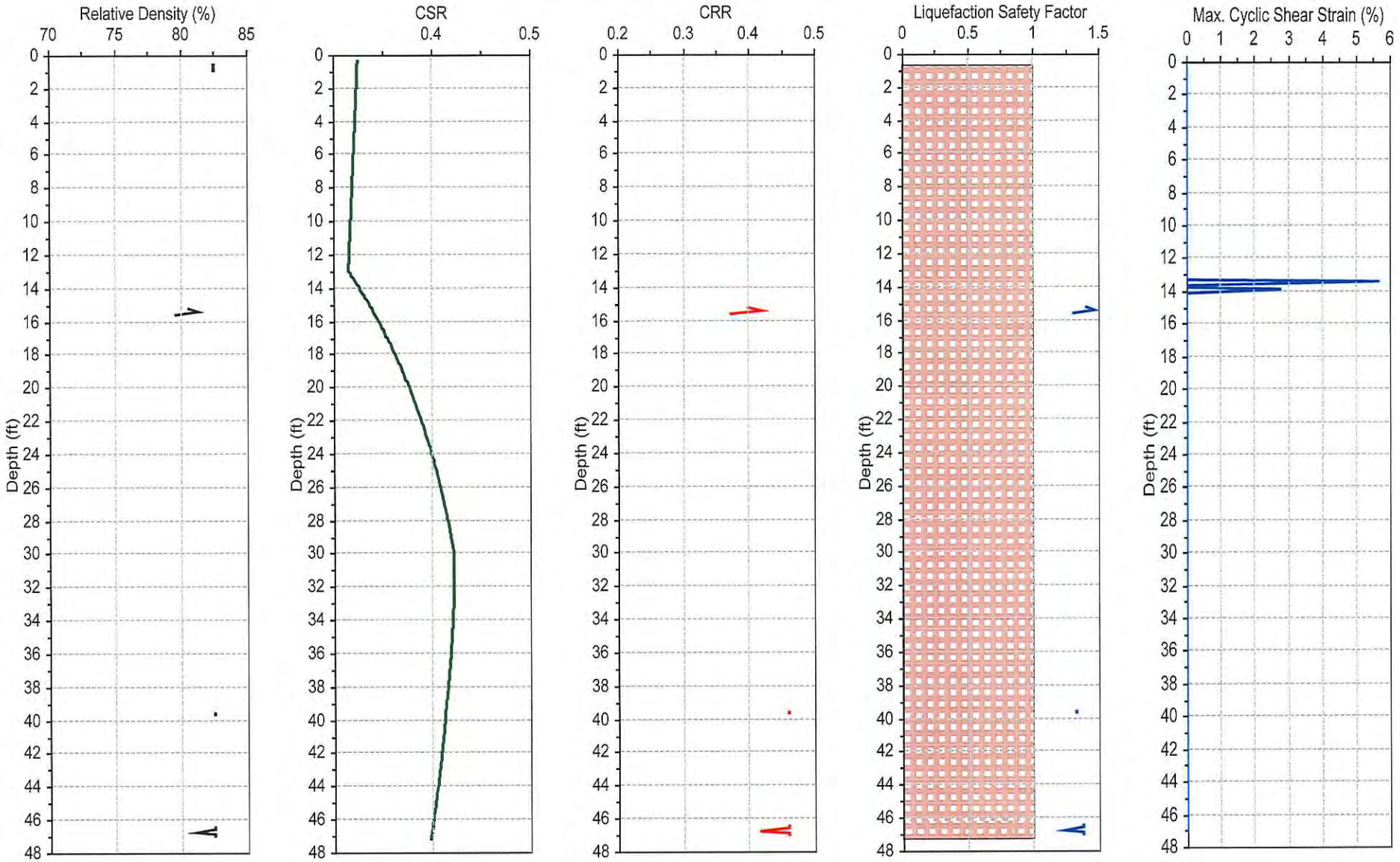
LIQUEFACTION CPT ANALYSIS REPORT

GeoSolutions, Inc.

Project : Dalidio - Multi-family Residences
Project No. : SL08639-6
Client : Mr. Dave Daniels
Location : San Luis Ranch - Dalidio
Notes :

Borehole : CPT-10
Ground Water Level : 3.9624 ft
Co-ordinates : n.a.
Calculated By : AR
Checked By :

Ground Slope : Gently Sloped 0.2%
PGA = 0.5 gEq. Magnitude M = 7
Cone Area Ratio = 0.8
CPT Max. Depth = 47.41 ft



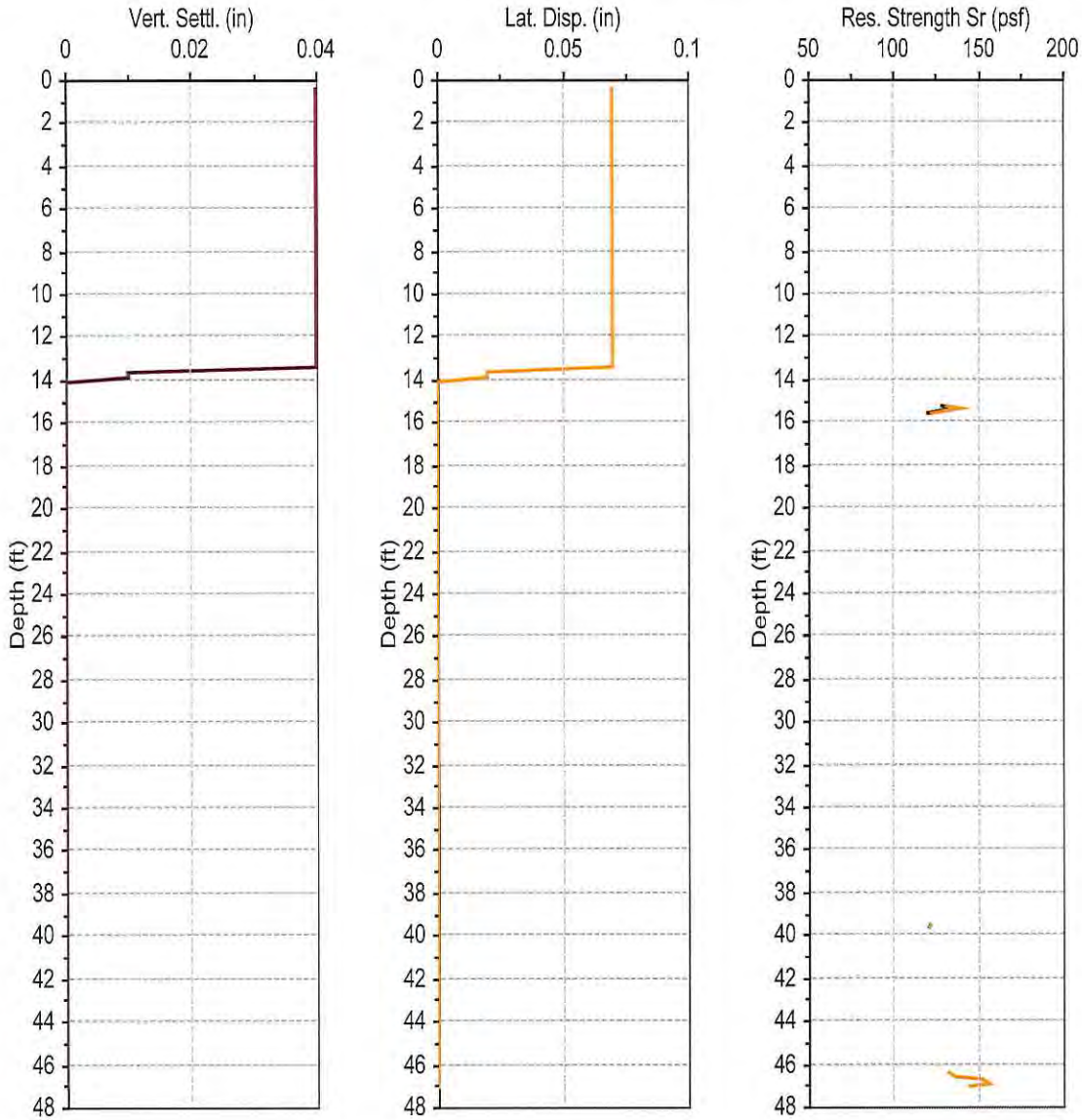
LIQUEFACTION CPT ANALYSIS REPORT

GeoSolutions, Inc.

Project : Dalidio - Multi-family Residences
Project No. : SL08639-6
Client : Mr. Dave Daniels
Location : San Luis Ranch - Dalidio
Notes :

Borehole : CPT-10
Ground Water Level : 3.9624 ft
Co-ordinates : n.a.
Calculated By : AR
Checked By :

Ground Slope : Gently Sloped 0.2%
PGA = 0.5 gEq. Magnitude M = 7
Cone Area Ratio = 0.8
CPT Max. Depth = 47.41 ft



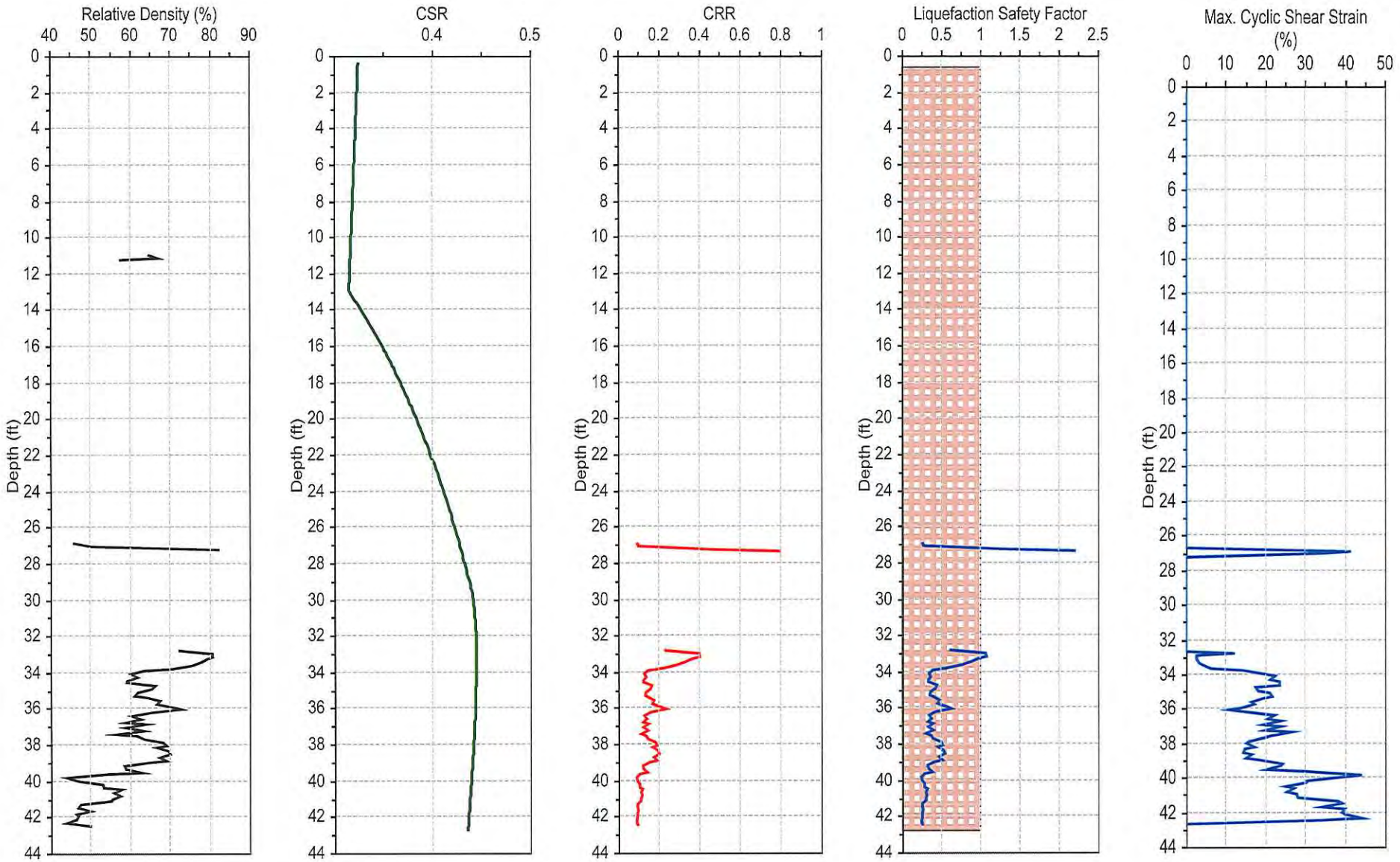
LIQUEFACTION CPT ANALYSIS REPORT

GeoSolutions, Inc.

Project : Dalidio - Single-family Residences
Project No. : SL08639-6
Client : Mr. Dave Daniels
Location : San Luis Ranch - Dalidio
Notes :

Borehole : CPT-4
Ground Water Level : 3.9624 ft
Co-ordinates : n.a.
Calculated By : AR
Checked By :

Ground Slope : Gently Sloped 0.2%
PGA = 0.5 gEq. Magnitude M = 7
Cone Area Ratio = 0.8
CPT Max. Depth = 42.98 ft



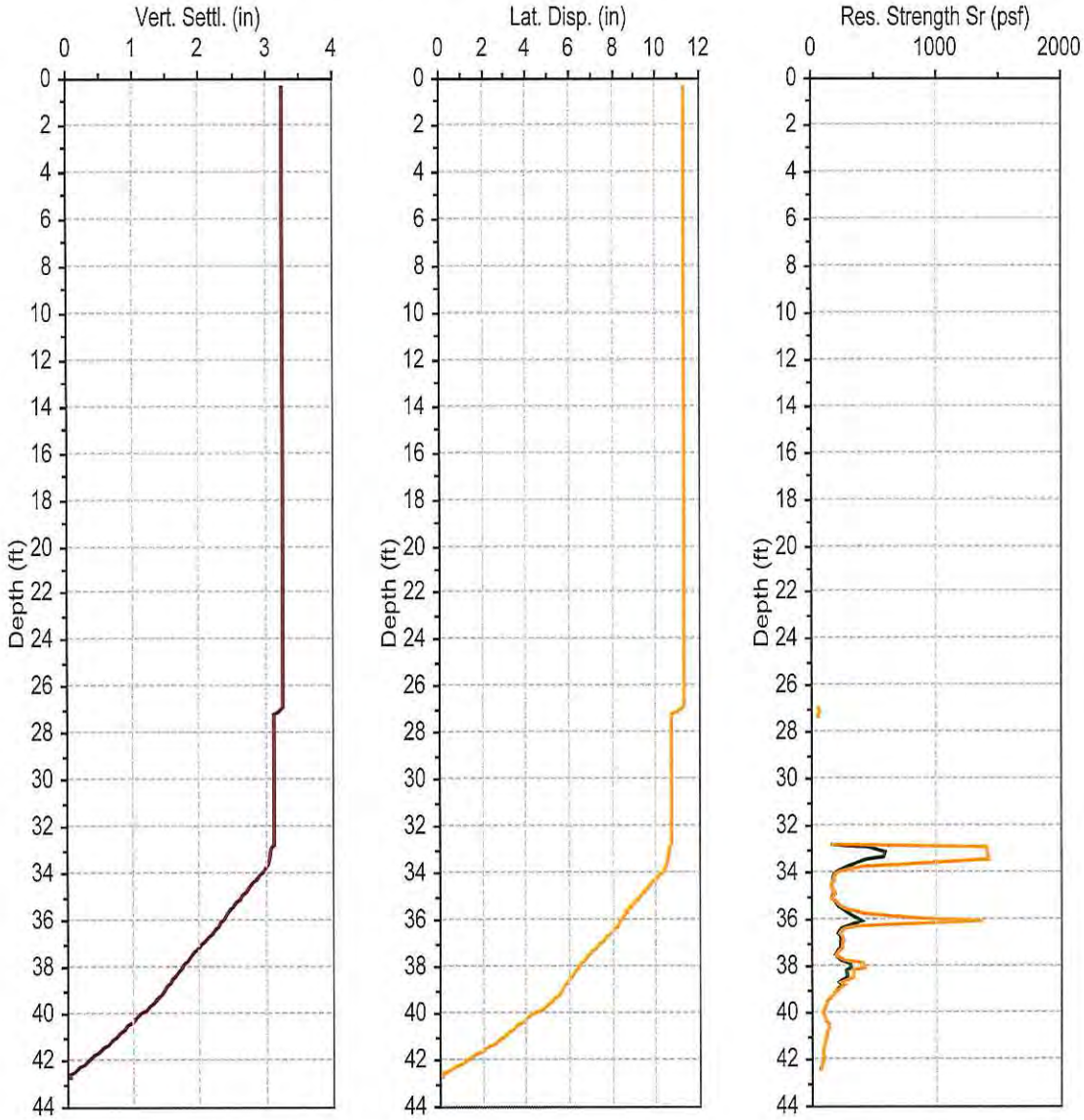
LIQUEFACTION CPT ANALYSIS REPORT

GeoSolutions, Inc.

Project : Dalidio - Single-family Residences
Project No. : SL08639-6
Client : Mr. Dave Daniels
Location : San Luis Ranch - Dalidio
Notes :

Borehole : CPT-4
Ground Water Level : 3.9624 ft
Co-ordinates : n.a.
Calculated By : AR
Checked By :

Ground Slope : Gently Sloped 0.2%
PGA = 0.5 gEq. Magnitude M = 7
Cone Area Ratio = 0.8
CPT Max. Depth = 42.98 ft



LIQUEFACTION CPT ANALYSIS REPORT

GeoSolutions, Inc.

Project : Dalidio - Single-family Residences
Project No. : SL08639-6
Client : Mr. Dave Daniels
Location : San Luis Ranch - Dalidio
Notes :

Borehole : CPT-4
Ground Water Level : 3.9624 ft
Co-ordinates : n.a.
Calculated By : AR
Checked By :

Ground Slope : Gently Sloped 0.2%
PGA = 0.5 gEq. Magnitude M = 7
Cone Area Ratio = 0.8
CPT Max. Depth = 42.98 ft

:: Current Analysis Settings and Correlations

Apply 2009 Robertson Normalization n :
No

N60 :
Jefferies & Davis 1993

Hydraulic Conductivity K :
Robertson et al. 1986 (SBT)

Unit Weight From Rf and qt :
Yes

Shear Wave Velocity Vs :
Mayne 2006c (all soils)

Undrained Shear Strength Su :
use Nk=12.5

Clay Overconsolidation Ratio OCR :
Powell et al. 1998

Sand Overconsolidation Ratio OCR :
Mayne 2005

Clay Friction Angle :
Sunneset et al., 1988 and 1989 (NTH solution)

Sand Friction Angle :
Robertson & Campanella 1983

Clay Young's Modulus Es :
Duncan & Buchihmami 1976

Sand Young's Modulus Es :
Bellotti et al. 1989

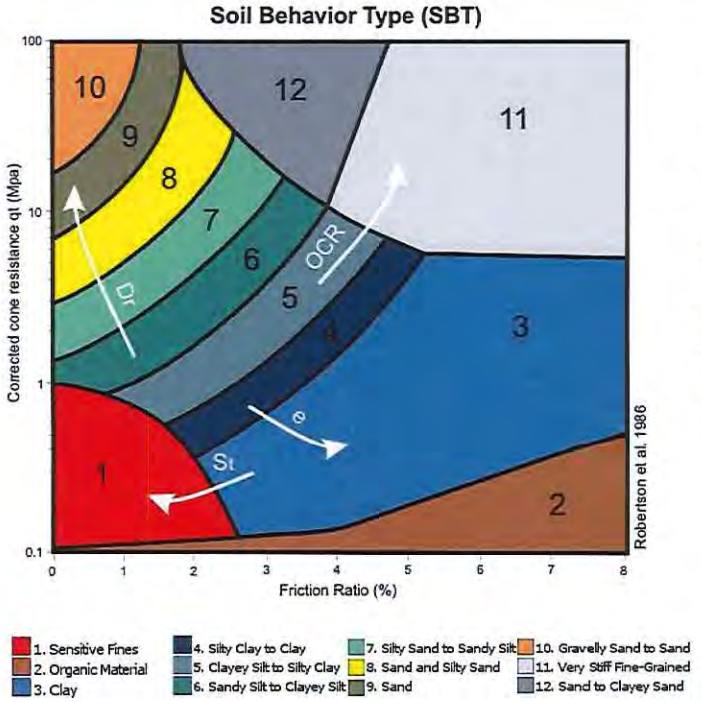
Sand Relative Density Dr :
Jamiolkowski et al. 2001

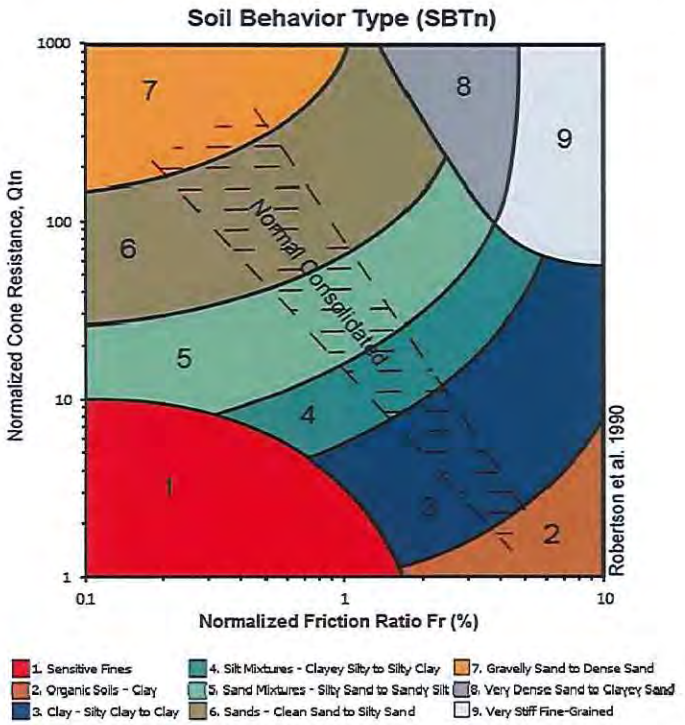
Clay Sensitivity St :
Robertson & Campanella 1988 Ns=6

Liquefaction MSF :
Youd et al. 2001 (NCEER 1997)

Stress Reduction Factor Rd :
NCEER, 1997 (Seed & Idriss 1971 tri-linear function)

Liquefaction Assessed For Following SBT:
6 7 8 9 10 12





APPENDIX C

Laboratory Testing

Soil Test Reports

LABORATORY TESTING

This appendix includes a discussion of the test procedures and the laboratory test results performed as part of this investigation. The purpose of the laboratory testing is to assess the engineering properties of the soil materials at the Site. The laboratory tests are performed using the currently accepted test methods, when applicable, of the American Society for Testing and Materials (ASTM).

Undisturbed and disturbed bulk samples used in the laboratory tests are obtained from various locations during the course of the field exploration, as discussed in **Appendix A** of this report. Each sample is identified by sample letter and depth. The Unified Soils Classification System is used to classify soils according to their engineering properties. The various laboratory tests performed are described below:

Expansion Index of Soils (ASTM D4829-08) is conducted in accordance with the ASTM test method and the California Building Code Standard, and are performed on representative bulk and undisturbed soil samples. The purpose of this test is to evaluate expansion potential of the site soils due to fluctuations in moisture content. The sample specimens are placed in a consolidometer, surcharged under a 144-psf vertical confining pressure, and then inundated with water. The amount of expansion is recorded over a 24-hour period with a dial indicator. The expansion index is calculated by determining the difference between final and initial height of the specimen divided by the initial height.

Laboratory Compaction Characteristics of Soil Using Modified Effort (ASTM D1557-07) is performed to determine the relationship between the moisture content and density of soils and soil-aggregate mixtures when compacted in a standard size mold with a 10-lbf hammer from a height of 18 inches. The test is performed on a representative bulk sample of bearing soil near the estimated footing depth. The procedure is repeated on the same soil sample at various moisture contents sufficient to establish a relationship between the maximum dry unit weight and the optimum water content for the soil. The data, when plotted, represents a curvilinear relationship known as the moisture density relations curve. The values of optimum water content and modified maximum dry unit weight can be determined from the plotted curve.

Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D4318-05) are the water contents at certain limiting or critical stages in cohesive soil behavior. The liquid limit (LL or W_L) is the lower limit of viscous flow, the plastic limit (PL or W_P) is the lower limit of the plastic stage of clay and plastic index (PI or I_P) is a range of water content where the soil is plastic. The Atterberg Limits are performed on samples that have been screened to remove any material retained on a No. 40 sieve. The liquid limit is determined by performing trials in which a portion of the sample is spread in a brass cup, divided in two by a grooving tool, and then allowed to flow together from the shocks caused by repeatedly dropping the cup in a standard mechanical device. To determine the Plastic Limit a small portion of plastic soil is alternately pressed together and rolled into a 1/8-inch diameter thread. This process is continued until the water content of the sample is reduced to a point at which the thread crumbles and can no longer be pressed together and re-rolled. The water content of the soil at this point is reported as the plastic limit. The plasticity index is calculated as the difference between the liquid limit and the plastic limit.

Particle Size Analysis of Soils (ASTM D422-07) is used to determine the particle-size distribution of fine and coarse aggregates. In the test method the sample is separated through a series of sieves of progressively smaller openings for determination of particle size distribution. The total percentage passing each sieve is reported and used to determine the distribution of fine and coarse aggregates in the sample.

Density of Soil in Place by the Drive-Cylinder Method (ASTM D2937-04) and **Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass** (ASTM D2216-05) are used to obtain values of in-place water content and in-place density. Undisturbed samples, brought from the field to the laboratory, are weighed, the volume is calculated, and they are placed in the oven to dry. Once the samples have been dried, they are weighed again to determine the water content, and the in-place density is then calculated. The moisture density tests allow the water content and in-place densities to be obtained at required depths.

One-Dimensional Consolidation Properties of Soils Using Incremental Loading (ASTM D2435-11) is used to determine the magnitude and rate of consolidation of a soil by applying a series of load increments to an undisturbed soil sample and recording sample deformation at selected time intervals. In this test method, a soil specimen is restrained laterally and drained axially while subjected to incrementally applied controlled-stress loading. Each stress increment is maintained until excess pore water pressures are completely dissipated. During the consolidation process, measurements are made of the change in the specimen height and this data is used to determine the relationship between the effective stress and void-ratio or strain, and the rate at which consolidation can occur by evaluating the coefficient of consolidation. The data from the consolidation test is used to estimate the magnitude and rate of both differential and total settlement of a structure or earth-fill.

GeoSolutions, Inc.	SOILS REPORT	(805) 543-8539

Project:	San Luis Ranch			Date Tested:	March 15, 2015
Client:				Project #:	SL08639-6
Sample:	A	Depth:	2.0 Feet	Lab #:	16051
Location:	B-1			Sample Date:	March 11, 2015
				Sampled By:	PM/SP

Soil Classification
ASTM D2487-06, D2488-06

Result: Black Sandy Fat CLAY

Specification: CH

Sieve Analysis
ASTM D422-63R02

Sieve Size	Percent Passing	Project Specifications
3"		
2"		
1 1/2"		
1"		
3/4"		
No. 4		
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		

Sand Equivalent Cal 217 (06/2011)

1		SE
2		
3		
4		

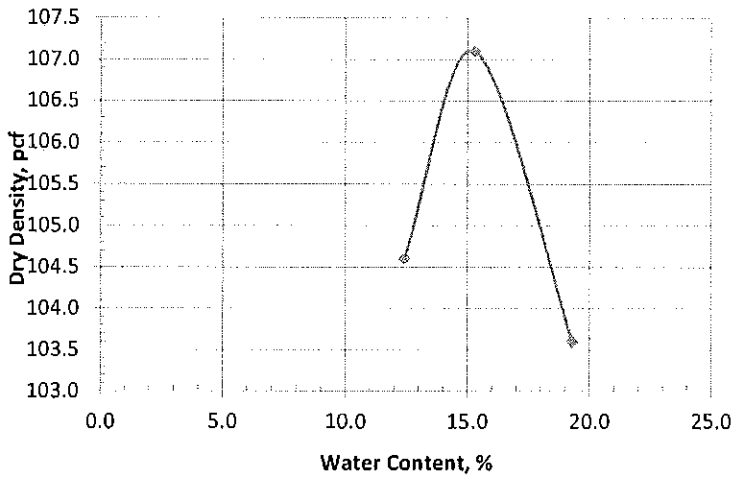
Plasticity Index
ASTM D4318-05

Liquid Limit:	55
Plastic Limit:	19
Plasticity Index:	**36**

Expansion Index
ASTM D4829-08

Expansion Index:	**69**
Expansion Potential:	Medium
Initial Saturation, %:	50

Laboratory Maximum Density
ASTM D1557-07



Mold ID	n/a	Mold Diameter, ins.	4.00
No. of Layers	5	Weight of Rammer, lbs.	10.00
No. of Blows	25		

Estimated Specific Gravity for 100% Saturation Curve = 2.45

Trial #	1	2	3	4
Water Content:	12.4	15.3	19.3	
Dry Density:	104.6	107.1	103.6	

Maximum Dry Density, pcf:	**107.1**
Optimum Water Content, %:	**15.2**

Moisture-Density ASTM D2937-04, **Moisture Content** ASTM D2216-05

Sample	Depth (ft)	Water Content (%)	Dry Density (pcf)	Relative Density	Sample Description

Report By: Aaron Eichman

GeoSolutions, Inc. **PARTICLE-SIZE ANALYSIS REPORT** **(805) 543-8539**

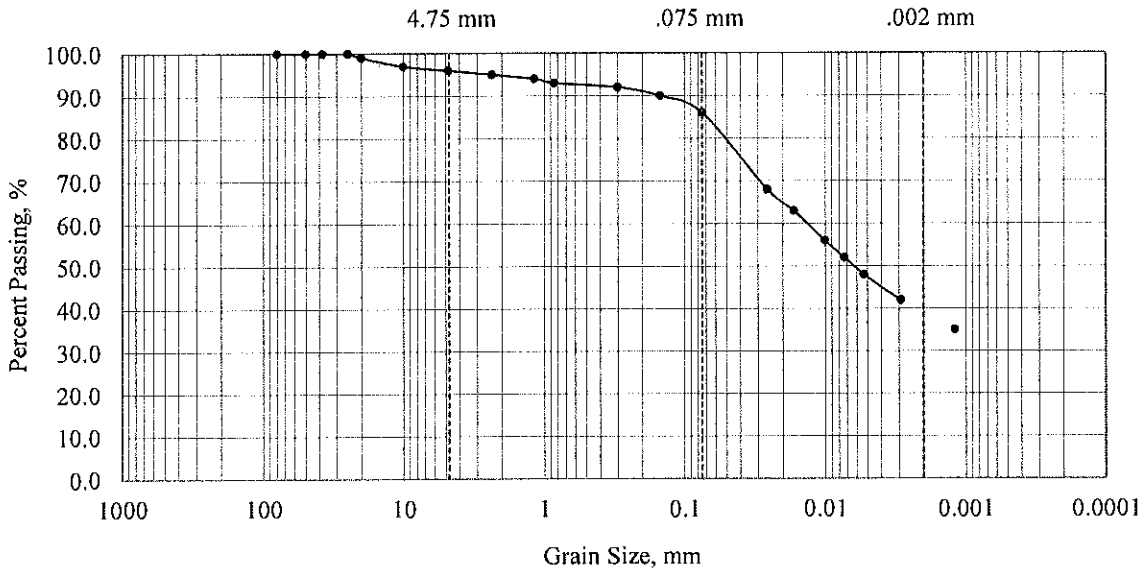
Project:	San Luis Ranch			Date Tested:	4/6/2015
Client:				Project #:	SL08639-6
Sample #:	A	Depth:	2.0 Feet	Lab #:	16051
Location:	B-1			Sample Date:	3/11/2015
Material:	Black Sandy Fat CLAY			Sampled By:	PM/SP

Sieve Analyis
ASTM D422-07

Sieve Size	Percent Passing	Project Specifications
2-in.	100	
1 1/2 in.	100	
1-in.	100	
3/4-in.	100	
1/2-in.	99	
3/8-in.	97	
No. 4 (4.75-mm)	96	
No. 8 (2.36-mm)	95	
No. 16 (1.18-mm)	94	
No. 30 (0.85-mm)	93	
No. 50 (0.300-mm)	92	
No. 100 (0.150-mm)	90	
No. 200 (0.075-mm)	86.0	

Hydrometer Analysis
ASTM D422-07

Sieve Size (mm)	Percent Passing	Project Specifications
0.0259	68.0	
0.0168	63.0	
0.0101	56.0	
0.0073	52.0	
0.0053	48.0	
0.0029	42.0	
0.0012	35.0	



Sand % = 10 **Silt % = 47** **Clay % = 39**

Cobbles	Gravel	Sand	Silt	Clay
75-300mm	4.75-75mm	.075mm - 4.75mm	.002-.075mm	< 0.002 mm

Report By: Aaron Eichman

GeoSolutions, Inc.	SOILS REPORT	(805) 543-8539

Project:	San Luis Ranch			Date Tested:	March 26, 2015
Client:				Project #:	SL08639-6
Sample:	B	Depth:	10.0 Feet	Lab #:	16051
Location:	B-1			Sample Date:	March 11, 2015
				Sampled By:	PM/SP

Soil Classification
ASTM D2487-06, D2488-06

Result: Dark Olive Brown Sandy CLAY

Specification: CL

Sieve Analysis
ASTM D422-63R02

Sieve Size	Percent Passing	Project Specifications
3"		
2"		
1 1/2"		
1"		
3/4"		
No. 4		
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		

Sand Equivalent Cal 217 (06/2011)

1		SE
2		
3		
4		

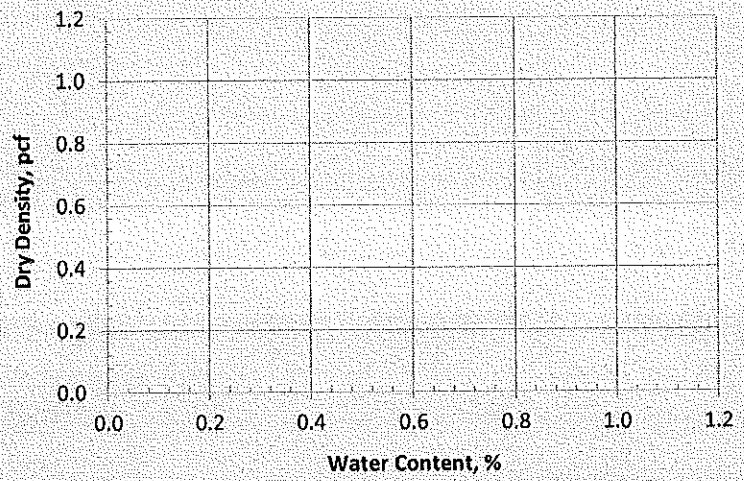
Plasticity Index
ASTM D4318-05

Liquid Limit:	42
Plastic Limit:	19
Plasticity Index:	23

Expansion Index
ASTM D4829-08

Expansion Index:	51
Expansion Potential:	Medium
Initial Saturation, %:	50

Laboratory Maximum Density
ASTM D1557-07



Mold ID	n/a	Mold Diameter, ins.	4.00
No. of Layers	5	Weight of Rammer, lbs.	10.00
No. of Blows	25		

Estimated Specific Gravity for 100% Saturation Curve =

Trial #	1	2	3	4
Water Content:				
Dry Density:				

Maximum Dry Density, pcf:	
Optimum Water Content, %:	

Moisture-Density ASTM D2937-04, **Moisture Content** ASTM D2216-05

Sample	Depth (ft)	Water Content (%)	Dry Density (pcf)	Relative Density	Sample Description

Report By: Aaron Eichman

GeoSolutions, Inc. **PARTICLE-SIZE ANALYSIS REPORT** **(805) 543-8539**

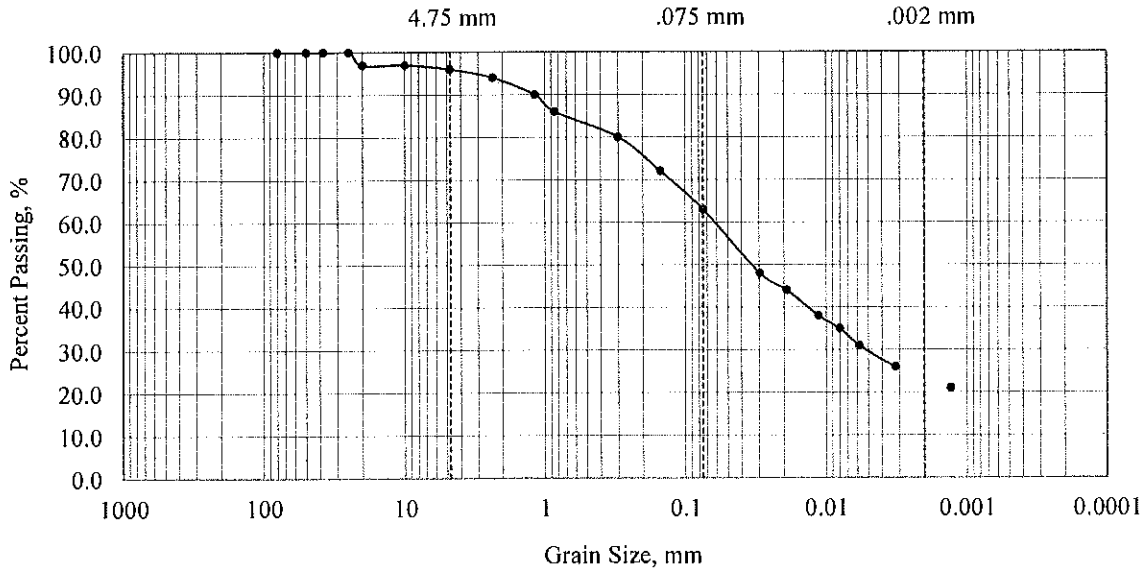
Project:	San Luis Ranch			Date Tested:	4/6/2015
Client:				Project #:	SL08639-6
Sample #:	B	Depth:	10.0 Feet	Lab #:	16051
Location:	B-1			Sample Date:	3/11/2015
Material:	Dark Olive Brown Sandy CLAY			Sampled By:	PM/SP

Sieve Analyis
ASTM D422-07

Sieve Size	Percent Passing	Project Specifications
2-in.	100	
1 1/2 in.	100	
1-in.	100	
3/4-in.	100	
1/2-in.	97	
3/8-in.	97	
No. 4 (4.75-mm)	96	
No. 8 (2.36-mm)	94	
No. 16 (1.18-mm)	90	
No. 30 (0.85-mm)	86	
No. 50 (0.300-mm)	80	
No. 100 (0.150-mm)	72	
No. 200 (0.075-mm)	63.0	

Hydrometer Analysis
ASTM D422-07

Sieve Size (mm)	Percent Passing	Project Specifications
0.0296	48.0	
0.0190	44.0	
0.0113	38.0	
0.0080	35.0	
0.0058	31.0	
0.0032	26.0	
0.0013	21.0	



Sand % = 33 **Silt % = 40** **Clay % = 23**

Cobbles	Gravel	Sand	Silt	Clay
75-300mm	4.75-75mm	.075mm - 4.75mm	.002-.075mm	< 0.002 mm

Report By: Aaron Eichman

GeoSolutions, Inc.	SOILS REPORT	(805) 543-8539

Project:	San Luis Ranch			Date Tested:	March 26, 2015
Client:				Project #:	SL08639-6
Sample:	C	Depth:	13.0 Feet	Lab #:	16051
Location:	B-2			Sample Date:	March 11, 2015
				Sampled By:	PM/SP

Soil Classification
ASTM D2487-06, D2488-06

Result: Dark Grayish Brown Sandy CLAY

Specification: CL

Sieve Analysis
ASTM D422-63R02

Sieve Size	Percent Passing	Project Specifications
3"		
2"		
1 1/2"		
1"		
3/4"		
No. 4		
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		

Sand Equivalent Cal 217 (06/2011)

1		SE
2		
3		
4		

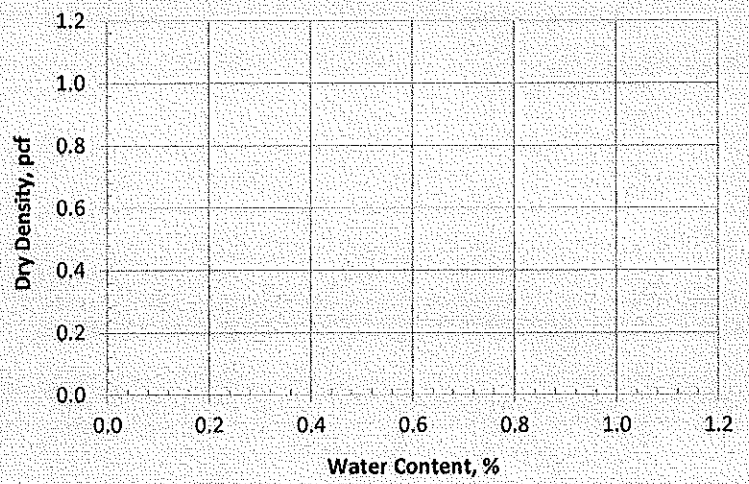
Plasticity Index
ASTM D4318-05

Liquid Limit:	38
Plastic Limit:	21
Plasticity Index:	17

Expansion Index
ASTM D4829-08

Expansion Index:	38
Expansion Potential:	Low
Initial Saturation, %:	50

Laboratory Maximum Density
ASTM D1557-07



Mold ID	n/a	Mold Diameter, ins.	4.00
No. of Layers	5	Weight of Rammer, lbs.	10.00
No. of Blows	25		

Estimated Specific Gravity for 100% Saturation Curve =

Trial #	1	2	3	4
Water Content:				
Dry Density:				

Maximum Dry Density, pcf:	
Optimum Water Content, %:	

Moisture-Density ASTM D2937-04, **Moisture Content** ASTM D2216-05

Sample	Depth (ft)	Water Content (%)	Dry Density (pcf)	Relative Density	Sample Description

Report By: Aaron Eichman

GeoSolutions, Inc. **PARTICLE-SIZE ANALYSIS REPORT** **(805) 543-8539**

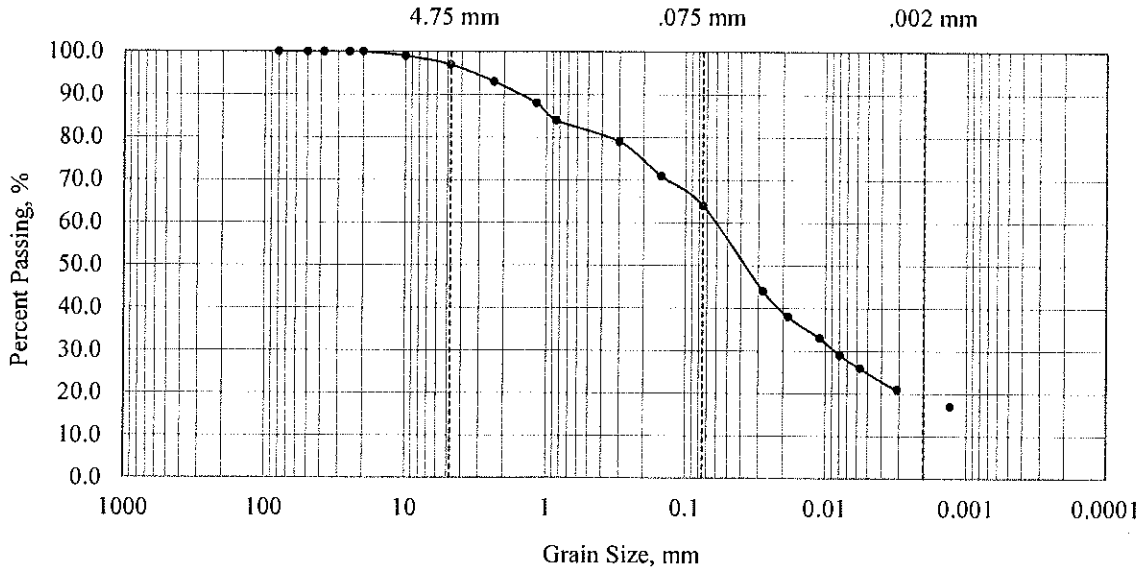
Project:	San Luis Ranch			Date Tested:	4/6/2015
Client:				Project #:	SL08639-6
Sample #:	C	Depth:	13.0 Feet	Lab #:	16051
Location:	B-2			Sample Date:	3/11/2015
Material:	Dark Grayish Brown Sandy CLAY			Sampled By:	PM/SP

Sieve Analyis
ASTM D422-07

Sieve Size	Percent Passing	Project Specifications
2-in.	100	
1 1/2 in.	100	
1-in.	100	
3/4-in.	100	
1/2-in.	100	
3/8-in.	99	
No. 4 (4.75-mm)	97	
No. 8 (2.36-mm)	93	
No. 16 (1.18-mm)	88	
No. 30 (0.85-mm)	84	
No. 50 (0.300-mm)	79	
No. 100 (0.150-mm)	71	
No. 200 (0.075-mm)	64.0	

Hydrometer Analysis
ASTM D422-07

Sieve Size (mm)	Percent Passing	Project Specifications
0.0278	44.0	
0.0184	38.0	
0.0110	33.0	
0.0079	29.0	
0.0057	26.0	
0.0031	21.0	
0.0013	17.0	



Sand % = 33 **Silt % = 45** **Clay % = 19**

Cobbles	Gravel	Sand	Silt	Clay
75-300mm	4.75-75mm	.075mm - 4.75mm	.002-.075mm	< 0.002 mm

Report By: Aaron Eichman

GeoSolutions, Inc.	SOILS REPORT	(805) 543-8539

Project:	San Luis Ranch			Date Tested:	March 26, 2015
Client:				Project #:	SL08639-6
Sample:	D	Depth:	8.0 Feet	Lab #:	16051
Location:	B-3			Sample Date:	March 11, 2015
				Sampled By:	PM/SP

Soil Classification
ASTM D2487-06, D2488-06

Result: Olive Brown Sandy CLAY

Specification: CL

Sieve Analysis
ASTM D422-63R02

Sieve Size	Percent Passing	Project Specifications
3"		
2"		
1 1/2"		
1"		
3/4"		
No. 4		
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		

Sand Equivalent Cal 217 (06/2011)

1		SE
2		
3		
4		

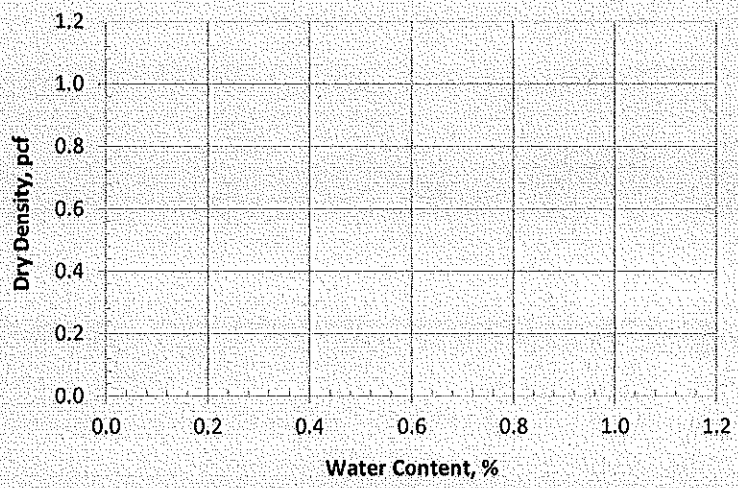
Plasticity Index
ASTM D4318-05

Liquid Limit:	43
Plastic Limit:	21
Plasticity Index:	**22**

Expansion Index
ASTM D4829-08

Expansion Index:	**62**
Expansion Potential:	Medium
Initial Saturation, %:	50

Laboratory Maximum Density
ASTM D1557-07



Mold ID	n/a	Mold Diameter, ins.	4.00
No. of Layers	5	Weight of Rammer, lbs.	10.00
No. of Blows	25		

Estimated Specific Gravity for 100% Saturation Curve =

Trial #	1	2	3	4
Water Content:				
Dry Density:				

Maximum Dry Density, pcf:	
Optimum Water Content, %:	

Moisture-Density ASTM D2937-04, **Moisture Content** ASTM D2216-05

Sample	Depth (ft)	Water Content (%)	Dry Density (pcf)	Relative Density	Sample Description

Report By: Aaron Eichman

GeoSolutions, Inc. **PARTICLE-SIZE ANALYSIS REPORT** **(805) 543-8539**

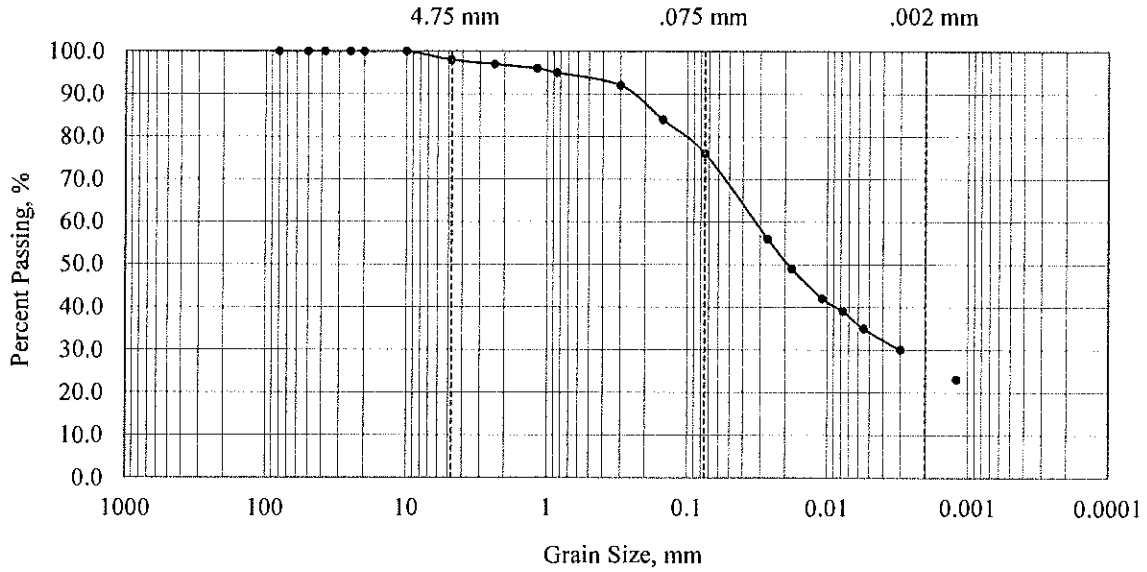
Project:	San Luis Ranch			Date Tested:	4/8/2015
Client:				Project #:	SL08639-6
Sample #:	D	Depth:	8.0 Feet	Lab #:	16051
Location:	B-3			Sample Date:	3/11/2015
Material:	Olive Brown Sandy CLAY			Sampled By:	PM/SP

Sieve Analysis
ASTM D422-07

Sieve Size	Percent Passing	Project Specifications
2-in.	100	
1 1/2 in.	100	
1-in.	100	
3/4-in.	100	
1/2-in.	100	
3/8-in.	100	
No. 4 (4.75-mm)	98	
No. 8 (2.36-mm)	97	
No. 16 (1.18-mm)	96	
No. 30 (0.85-mm)	95	
No. 50 (0.300-mm)	92	
No. 100 (0.150-mm)	84	
No. 200 (0.075-mm)	76.0	

Hydrometer Analysis
ASTM D422-07

Sieve Size (mm)	Percent Passing	Project Specifications
0.0266	56.0	
0.0179	49.0	
0.0108	42.0	
0.0077	39.0	
0.0055	35.0	
0.0030	30.0	
0.0012	23.0	



Sand % = 22 **Silt % = 50** **Clay % = 26**

Cobbles	Gravel	Sand	Silt	Clay
75-300mm	4.75-75mm	.075mm - 4.75mm	.002-.075mm	< 0.002 mm

Report By: Aaron Eichman

GeoSolutions, Inc.	SOILS REPORT	(805) 543-8539

Project:	San Luis Ranch			Date Tested:	April 7, 2015
Client:				Project #:	SL08639-6
Sample:	E	Depth:	6.0 Feet	Lab #:	16051
Location:	B-4			Sample Date:	March 11, 2015
				Sampled By:	PM/SP

Soil Classification
ASTM D2487-06, D2488-06

Result: Grayish Brown Sandy CLAY

Specification: CL

Sieve Analysis
ASTM D422-63R02

Sieve Size	Percent Passing	Project Specifications
3"		
2"		
1 1/2"		
1"		
3/4"		
No. 4		
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		

Sand Equivalent Cal 217 (06/2011)

1		SE
2		
3		
4		

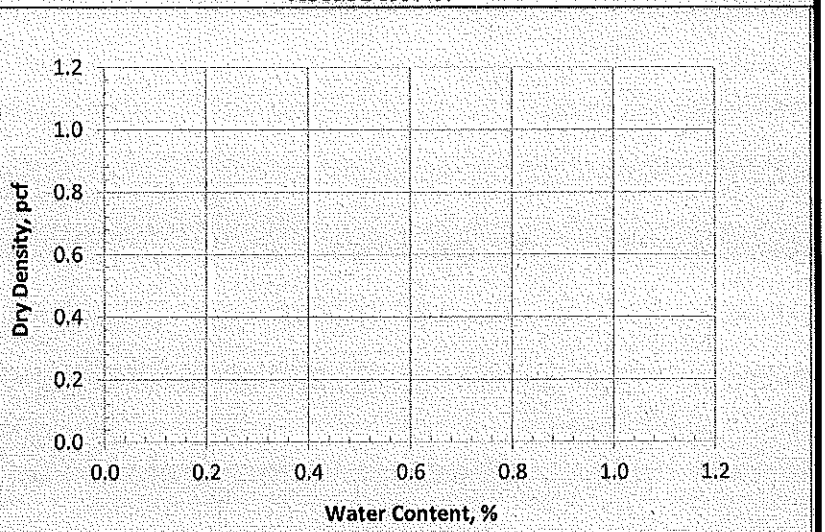
Plasticity Index
ASTM D4318-05

Liquid Limit:	43
Plastic Limit:	20
Plasticity Index:	23

Expansion Index
ASTM D4829-08

Expansion Index:	57
Expansion Potential:	Medium
Initial Saturation, %:	50

Laboratory Maximum Density
ASTM D1557-07



Mold ID	n/a	Mold Diameter, ins.	4.00
No. of Layers	5	Weight of Rammer, lbs.	10.00
No. of Blows	25		

Estimated Specific Gravity for 100% Saturation Curve =

Trial #	1	2	3	4
Water Content:				
Dry Density:				

Maximum Dry Density, pcf:	
Optimum Water Content, %:	

Moisture-Density ASTM D2937-04, **Moisture Content** ASTM D2216-05

Sample	Depth (ft)	Water Content (%)	Dry Density (pcf)	Relative Density	Sample Description

Report By: Aaron Eichman

GeoSolutions, Inc. **PARTICLE-SIZE ANALYSIS REPORT** **(805) 543-8539**

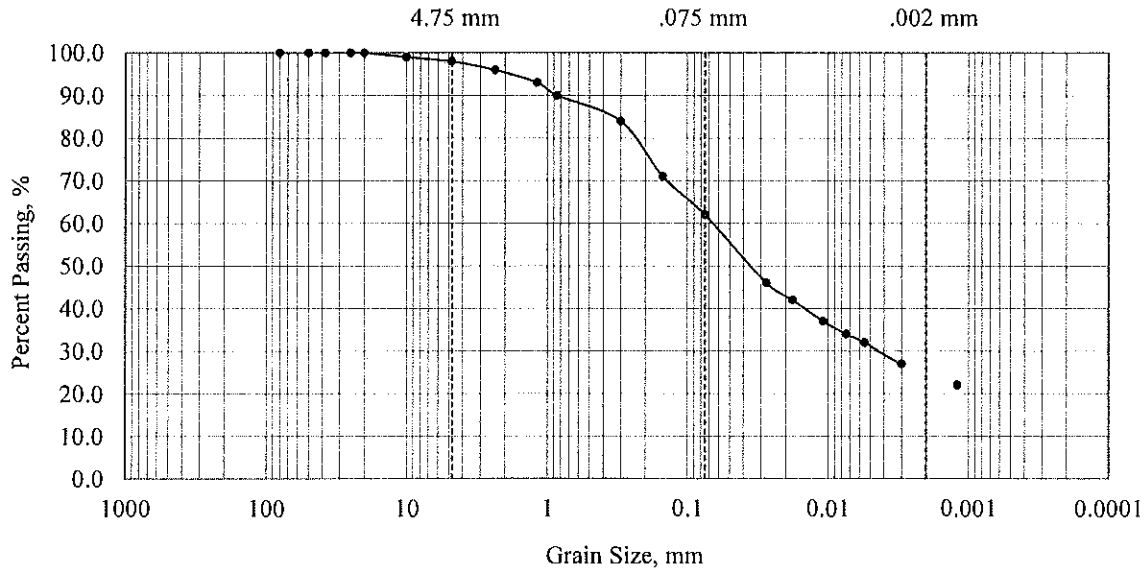
Project:	San Luis Ranch			Date Tested:	4/8/2015
Client:				Project #:	SL08639-6
Sample #:	E	Depth:	6.0 Feet	Lab #:	16051
Location:	B-4			Sample Date:	3/11/2015
Material:	Grayish Brown Sandy CLAY			Sampled By:	PM/SP

Sieve Analyis
ASTM D422-07

Sieve Size	Percent Passing	Project Specifications
2-in.	100	
1 1/2 in.	100	
1-in.	100	
3/4-in.	100	
1/2-in.	100	
3/8-in.	99	
No. 4 (4.75-mm)	98	
No. 8 (2.36-mm)	96	
No. 16 (1.18-mm)	93	
No. 30 (0.85-mm)	90	
No. 50 (0.300-mm)	84	
No. 100 (0.150-mm)	71	
No. 200 (0.075-mm)	62.0	

Hydrometer Analysis
ASTM D422-07

Sieve Size (mm)	Percent Passing	Project Specifications
0.0275	46.0	
0.0179	42.0	
0.0108	37.0	
0.0074	34.0	
0.0055	32.0	
0.0030	27.0	
0.0012	22.0	



Sand % = 36 **Silt % = 38** **Clay % = 24**

Cobbles	Gravel	Sand	Silt	Clay
75-300mm	4.75-75mm	.075mm - 4.75mm	.002-.075mm	< 0.002 mm

Report By: Aaron Eichman

GeoSolutions, Inc.	SOILS REPORT	(805) 543-8539

Project:	San Luis Ranch			Date Tested:	April 7, 2015
Client:				Project #:	SL08639-6
Sample:	F	Depth:	10.0 Feet	Lab #:	16051
Location:	B-4			Sample Date:	March 11, 2015
				Sampled By:	PM/SP

Soil Classification
ASTM D2487-06, D2488-06

Result: Dark Gray Sandy CLAY

Specification: CL

Sieve Analysis
ASTM D422-63R02

Sieve Size	Percent Passing	Project Specifications
3"		
2"		
1 1/2"		
1"		
3/4"		
No. 4		
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		

Sand Equivalent Cal 217 (06/2011)

1		SE
2		
3		
4		

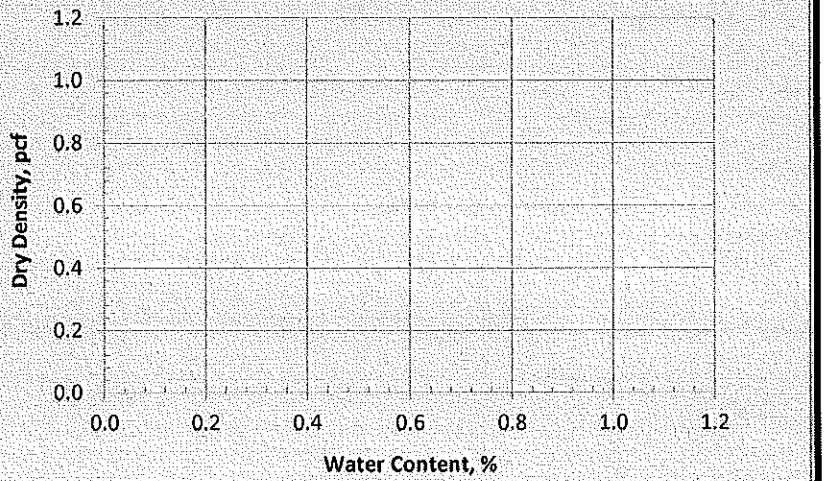
Plasticity Index
ASTM D4318-05

Liquid Limit:	36
Plastic Limit:	17
Plasticity Index:	**19**

Expansion Index
ASTM D4829-08

Expansion Index:	**52**
Expansion Potential:	Medium
Initial Saturation, %:	50

Laboratory Maximum Density
ASTM D1557-07



Mold ID	n/a	Mold Diameter, ins.	4.00
No. of Layers	5	Weight of Rammer, lbs.	10.00
No. of Blows	25		

Estimated Specific Gravity for 100% Saturation Curve =

Trial #	1	2	3	4
Water Content:				
Dry Density:				

Maximum Dry Density, pcf:	
Optimum Water Content, %:	

Moisture-Density ASTM D2937-04, **Moisture Content** ASTM D2216-05

Sample	Depth (ft)	Water Content (%)	Dry Density (pcf)	Relative Density	Sample Description

Report By: Aaron Eichman

GeoSolutions, Inc. **PARTICLE-SIZE ANALYSIS REPORT** **(805) 543-8539**

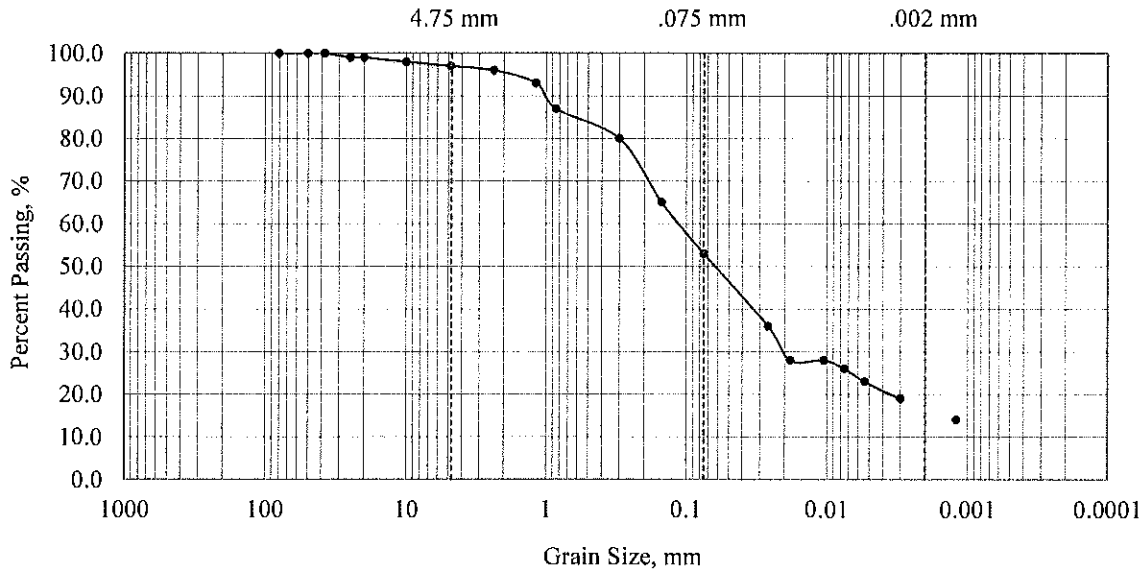
Project:	San Luis Ranch			Date Tested:	4/8/2015
Client:				Project #:	SL08639-6
Sample #:	F	Depth:	10.0 Feet	Lab #:	16051
Location:	B-4			Sample Date:	3/11/2015
Material:	Dark Gray Sandy CLAY			Sampled By:	PM/SP

Sieve Analysis
ASTM D422-07

Sieve Size	Percent Passing	Project Specifications
2-in.	100	
1 1/2 in.	100	
1-in.	100	
3/4-in.	99	
1/2-in.	99	
3/8-in.	98	
No. 4 (4.75-mm)	97	
No. 8 (2.36-mm)	96	
No. 16 (1.18-mm)	93	
No. 30 (0.85-mm)	87	
No. 50 (0.300-mm)	80	
No. 100 (0.150-mm)	65	
No. 200 (0.075-mm)	53.0	

Hydrometer Analysis
ASTM D422-07

Sieve Size (mm)	Percent Passing	Project Specifications
0.0261	36.0	
0.0182	28.0	
0.0105	28.0	
0.0075	26.0	
0.0054	23.0	
0.0030	19.0	
0.0012	14.0	



Sand % = 44 **Silt % = 37** **Clay % = 16**

Cobbles	Gravel	Sand	Silt	Clay
75-300mm	4.75-75mm	.075mm - 4.75mm	.002-.075mm	< 0.002 mm

Report By: Aaron Eichman

GeoSolutions, Inc.	SOILS REPORT	(805) 543-8539

Project:	San Luis Ranch			Date Tested:	April 7, 2015
Client:				Project #:	SL08639-6
Sample:	G	Depth:	2.0 Feet	Lab #:	16051
Location:	B-4			Sample Date:	March 11, 2015
				Sampled By:	PM/SP

Soil Classification
ASTM D2487-06, D2488-06

Result: Very Dark Gray Sandy Fat CLAY

Specification: CH

Sieve Analysis
ASTM D422-63R02

Sieve Size	Percent Passing	Project Specifications
3"		
2"		
1 1/2"		
1"		
3/4"		
No. 4		
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		

Sand Equivalent Cal 217 (06/2011)

1		SE
2		
3		
4		

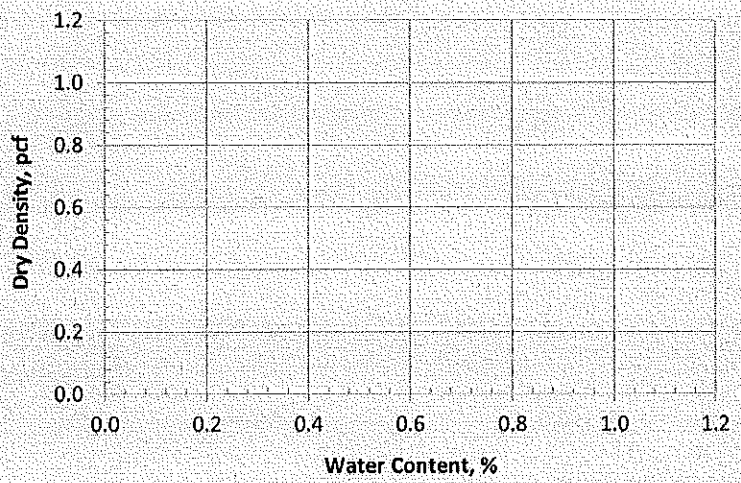
Plasticity Index
ASTM D4318-05

Liquid Limit:	58
Plastic Limit:	20
Plasticity Index:	**38**

Expansion Index
ASTM D4829-08

Expansion Index:	**73**
Expansion Potential:	Medium
Initial Saturation, %:	50

Laboratory Maximum Density
ASTM D1557-07



Mold ID	n/a	Mold Diameter, ins.	4.00
No. of Layers	5	Weight of Rammer, lbs.	10.00
No. of Blows	25		

Estimated Specific Gravity for 100% Saturation Curve =

Trial #	1	2	3	4
Water Content:				
Dry Density:				

Maximum Dry Density, pcf:	
Optimum Water Content, %:	

Moisture-Density ASTM D2937-04, **Moisture Content** ASTM D2216-05

Sample	Depth (ft)	Water Content (%)	Dry Density (pcf)	Relative Density	Sample Description

Report By: Aaron Eichman

GeoSolutions, Inc. **PARTICLE-SIZE ANALYSIS REPORT** **(805) 543-8539**

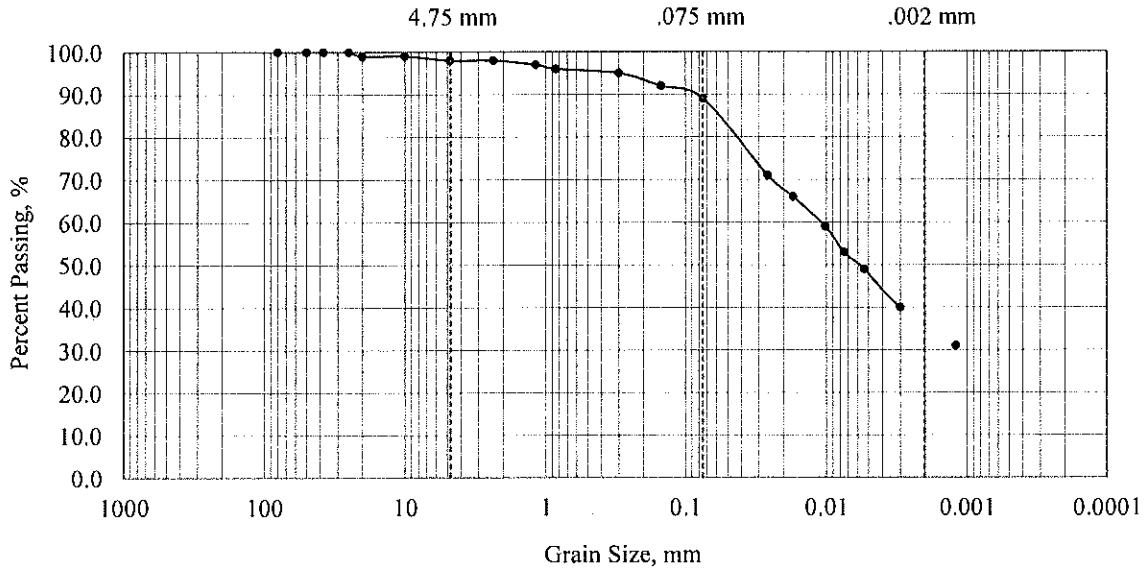
Project:	San Luis Ranch			Date Tested:	4/10/2015
Client:				Project #:	SL08639-6
Sample #:	G	Depth:	2.0 Feet	Lab #:	16051
Location:	B-4			Sample Date:	3/11/2015
Material:	Very Dark Gray Sandy Fat CLAY			Sampled By:	PM/SP

Sieve Analyis
ASTM D422-07

Sieve Size	Percent Passing	Project Specifications
2-in.	100	
1 1/2 in.	100	
1-in.	100	
3/4-in.	100	
1/2-in.	99	
3/8-in.	99	
No. 4 (4.75-mm)	98	
No. 8 (2.36-mm)	98	
No. 16 (1.18-mm)	97	
No. 30 (0.85-mm)	96	
No. 50 (0.300-mm)	95	
No. 100 (0.150-mm)	92	
No. 200 (0.075-mm)	89.0	

Hydrometer Analysis
ASTM D422-07

Sieve Size (mm)	Percent Passing	Project Specifications
0.0261	71.0	
0.0172	66.0	
0.0102	59.0	
0.0075	53.0	
0.0054	49.0	
0.0030	40.0	
0.0012	31.0	



Sand % = 9 **Silt % = 54** **Clay % = 35**

Cobbles	Gravel	Sand	Silt	Clay
75-300mm	4.75-75mm	.075mm - 4.75mm	.002-.075mm	< 0.002 mm

Report By: Aaron Eichman

GeoSolutions, Inc. **SOILS REPORT** **(805) 543-8539**

Project:	San Luis Ranch			Date Tested:	April 7, 2015
Client:				Project #:	SL08639-6
Sample:	H	Depth:	2.0 Feet	Lab #:	16051
Location:	B-5			Sample Date:	March 11, 2015
				Sampled By:	PM/SP

Soil Classification
ASTM D2487-06, D2488-06

Result: Dark Grayish Brown Sandy Fat CLAY

Specification: CH

Sieve Analysis
ASTM D422-63R02

Sieve Size	Percent Passing	Project Specifications
3"		
2"		
1 1/2"		
1"		
3/4"		
No. 4		
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		

Sand Equivalent Cal 217 (06/2011)

1		SE
2		
3		
4		

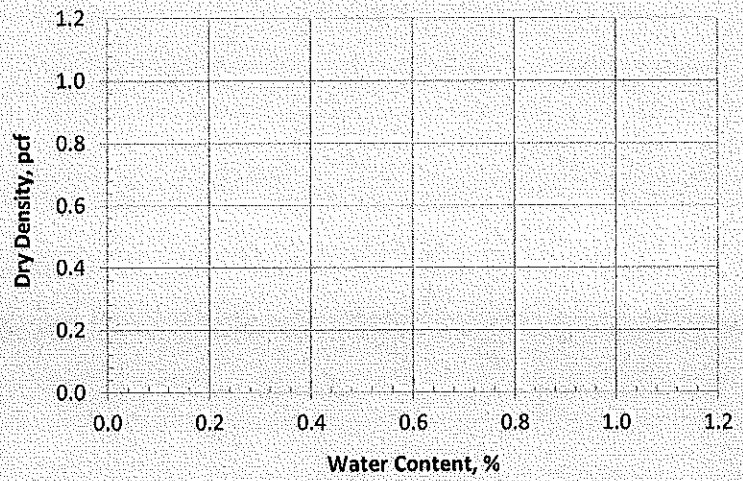
Plasticity Index
ASTM D4318-05

Liquid Limit:	51
Plastic Limit:	21
Plasticity Index:	**30**

Expansion Index
ASTM D4829-08

Expansion Index:	**79**
Expansion Potential:	Medium
Initial Saturation, %:	50

Laboratory Maximum Density
ASTM D1557-07



Mold ID	n/a	Mold Diameter, ins.	4.00
No. of Layers	5	Weight of Rammer, lbs.	10.00
No. of Blows	25		

Estimated Specific Gravity for 100% Saturation Curve =

Trial #	1	2	3	4
Water Content:				
Dry Density:				

Maximum Dry Density, pcf:	
Optimum Water Content, %:	

Moisture-Density ASTM D2937-04, **Moisture Content** ASTM D2216-05

Sample	Depth (ft)	Water Content (%)	Dry Density (pcf)	Relative Density	Sample Description

Report By: Aaron Eichman

GeoSolutions, Inc. **PARTICLE-SIZE ANALYSIS REPORT** **(805) 543-8539**

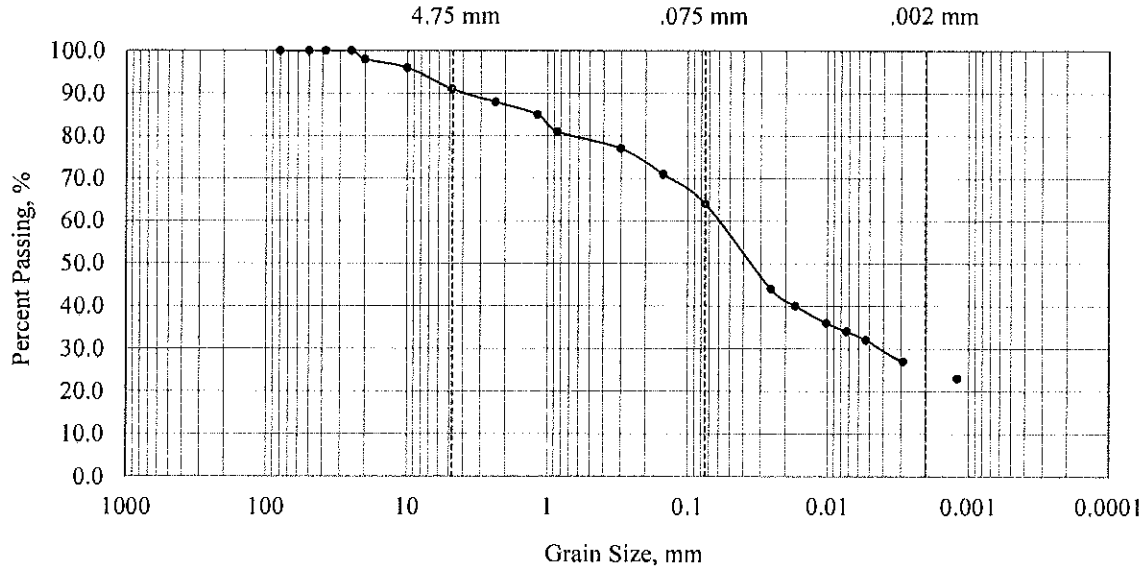
Project:	San Luis Ranch			Date Tested:	4/10/2015
Client:				Project #:	SL08639-6
Sample #:	H	Depth:	2.0 Feet	Lab #:	16051
Location:	B-5			Sample Date:	3/11/2015
Material:	Dark Grayish Brown Sandy Fat CLAY			Sampled By:	PM/SP

Sieve Analyis
ASTM D422-07

Sieve Size	Percent Passing	Project Specifications
2-in.	100	
1 1/2 in.	100	
1-in.	100	
3/4-in.	100	
1/2-in.	98	
3/8-in.	96	
No. 4 (4.75-mm)	91	
No. 8 (2.36-mm)	88	
No. 16 (1.18-mm)	85	
No. 30 (0.85-mm)	81	
No. 50 (0.300-mm)	77	
No. 100 (0.150-mm)	71	
No. 200 (0.075-mm)	64.0	

Hydrometer Analysis
ASTM D422-07

Sieve Size (mm)	Percent Passing	Project Specifications
0.0255	44.0	
0.0170	40.0	
0.0102	36.0	
0.0073	34.0	
0.0053	32.0	
0.0029	27.0	
0.0012	23.0	



Sand % = 27 **Silt % = 39** **Clay % = 25**

Cobbles	Gravel	Sand	Silt	Clay
75-300mm	4.75-75mm	.075mm - 4.75mm	.002-.075mm	< 0.002 mm

Report By: Aaron Eichman

GeoSolutions, Inc.	SOILS REPORT	(805) 543-8539

Project:	San Luis Ranch			Date Tested:	April 7, 2015
Client:				Project #:	SL08639-6
Sample:	I	Depth:	6.0 Feet	Lab #:	16051
Location:	B-5			Sample Date:	March 11, 2015
				Sampled By:	PM/SP

Soil Classification
ASTM D2487-06, D2488-06

Result: Olive Brown Sandy CLAY

Specification: CL

Sieve Analysis
ASTM D422-63R02

Sieve Size	Percent Passing	Project Specifications
3"		
2"		
1 1/2"		
1"		
3/4"		
No. 4		
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		

Sand Equivalent Cal 217 (06/2011)

1		SE
2		
3		
4		

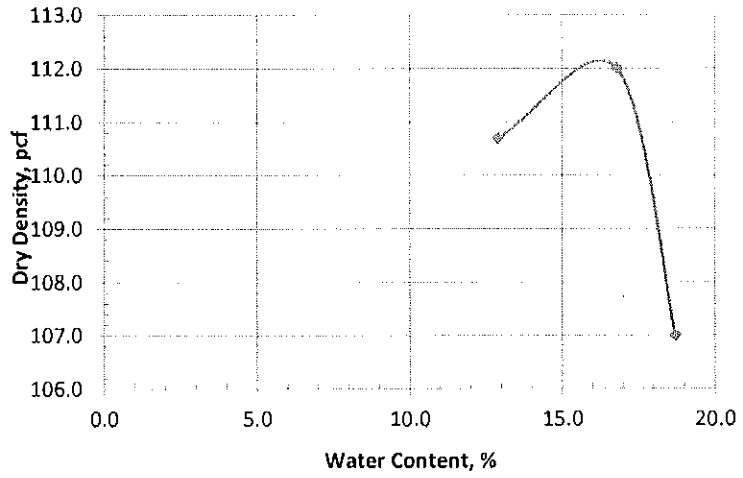
Plasticity Index
ASTM D4318-05

Liquid Limit:	48
Plastic Limit:	21
Plasticity Index:	27

Expansion Index
ASTM D4829-08

Expansion Index:	77
Expansion Potential:	Medium
Initial Saturation, %:	50

Laboratory Maximum Density
ASTM D1557-07



Mold ID	n/a	Mold Diameter, ins.	4.00
No. of Layers	5	Weight of Rammer, lbs.	10.00
No. of Blows	25		

Estimated Specific Gravity for 100% Saturation Curve = 2.6

Trial #	1	2	3	4
Water Content:	12.9	16.8	18.7	
Dry Density:	110.7	112.0	107.0	

Maximum Dry Density, pcf:	**112.2**
Optimum Water Content, %:	**16.3**

Moisture-Density ASTM D2937-04, **Moisture Content** ASTM D2216-05

Sample	Depth (ft)	Water Content (%)	Dry Density (pcf)	Relative Density	Sample Description

Report By: Aaron Eichman

GeoSolutions, Inc. **PARTICLE-SIZE ANALYSIS REPORT** **(805) 543-8539**

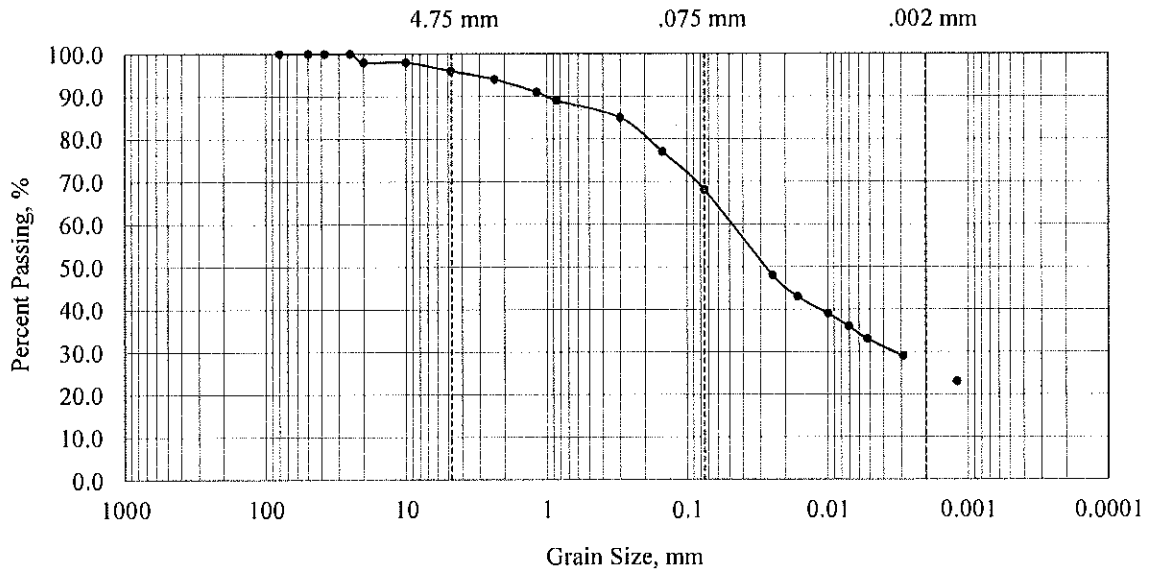
Project:	San Luis Ranch			Date Tested:	4/10/2015
Client:				Project #:	SL08639-6
Sample #:	1	Depth:	6.0 Feet	Lab #:	16051
Location:	B-5			Sample Date:	3/11/2015
Material:	Olive Brown Sandy CLAY			Sampled By:	PM/SP

Sieve Analysis
ASTM D422-07

Sieve Size	Percent Passing	Project Specifications
2-in.	100	
1 1/2 in.	100	
1-in.	100	
3/4-in.	100	
1/2-in.	98	
3/8-in.	98	
No. 4 (4.75-mm)	96	
No. 8 (2.36-mm)	94	
No. 16 (1.18-mm)	91	
No. 30 (0.85-mm)	89	
No. 50 (0.300-mm)	85	
No. 100 (0.150-mm)	77	
No. 200 (0.075-mm)	68.0	

Hydrometer Analysis
ASTM D422-07

Sieve Size (mm)	Percent Passing	Project Specifications
0.0246	48.0	
0.0163	43.0	
0.0099	39.0	
0.0071	36.0	
0.0052	33.0	
0.0029	29.0	
0.0012	23.0	



Sand % = 28 **Silt % = 43** **Clay % = 25**

Cobbles	Gravel	Sand	Silt	Clay
75-300mm	4.75-75mm	.075mm - 4.75mm	.002-.075mm	< 0.002 mm

Report By: Aaron Eichman

GeoSolutions, Inc.	MOISTURE-DENSITY, D2937-04 MOISTURE CONTENT, D2216-05	(805) 543-8539

Project:	San Luis Ranch	Date Tested:	March 11, 2015
Client:		Project #:	SL08639-6
Sample #:	Depth:	Lab #:	16051
Location:	B-1 to B-5	Sample Date:	March 11, 2015
		Sampled By:	PM/SP

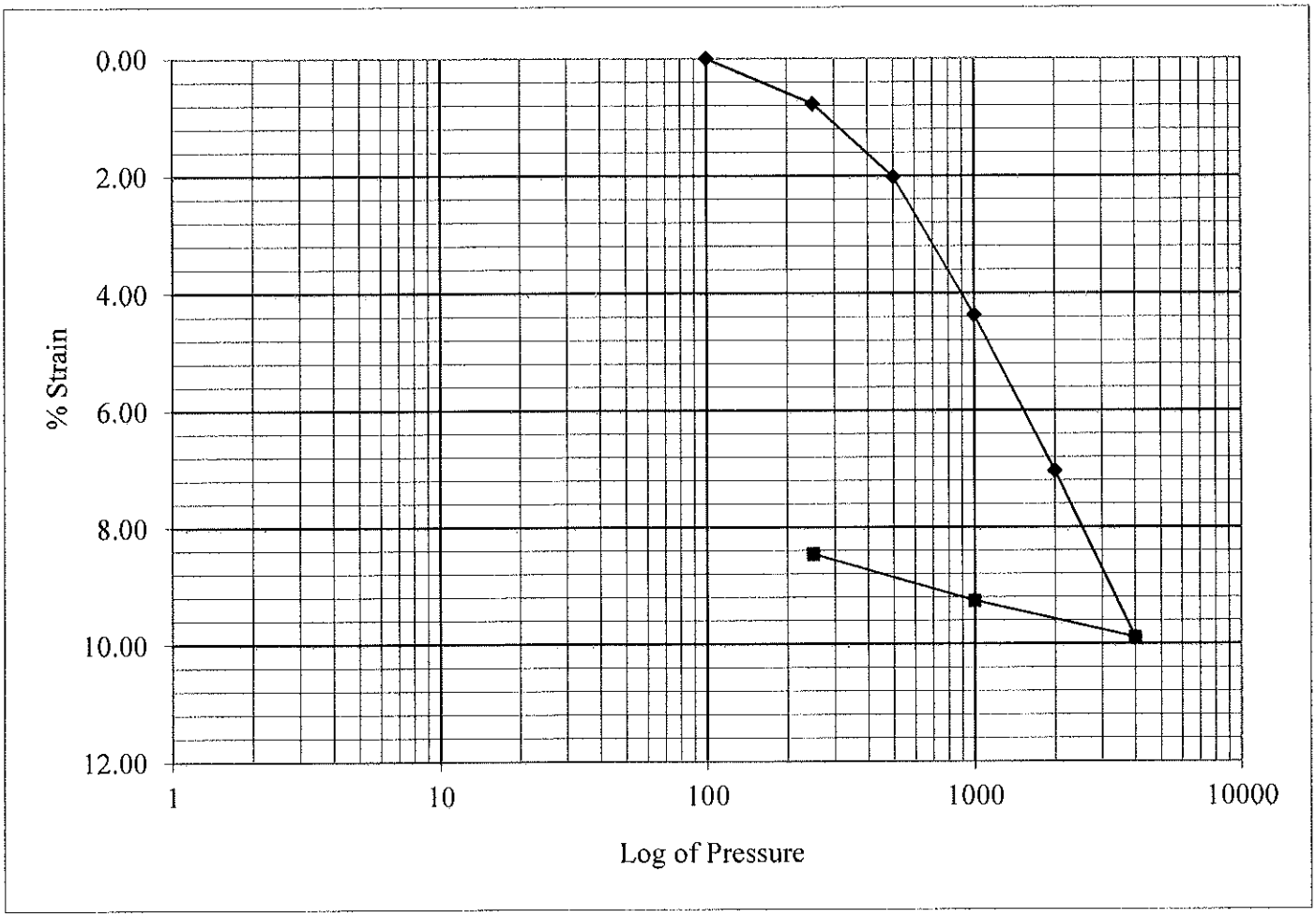
Sample	Depth Below Lowest Adjacent Grade	In-Situ Water Content	Optimum Water Content	Percent of Optimum Moisture	Soil Description
B-1	10	22.7%			Very Dark Sandy CLAY
B-1	15	21.4%			Very Dark Gray Sandy CLAY
B-2	10	26.0%			Very Dark Grayish Brown Sandy CLAY
B-2	15	23.8%			Dark Grayish Brown Sandy CLAY
B-3	10	13.1%			Dark Brown Clayey SAND
B-3	15	25.7%			Brown Sandy CLAY
B-4	10	24.0%			Very Dark Grayish Brown Sandy CLAY
B-4	15	25.5%			Dark Brown Clayey SAND
B-5	10	24.2%			Dark Yellowish Brown Clayey SAND
B-5	15	19.6%			Dark Clayey SAND

Comments:

Report By: Aaron Eichman

GeoSolutions, Inc. | **CONSOLIDATION REPORT D2435-11** | **(805) 543-8539**

Project:	San Luis Ranch			Date Tested:	3/18/2015
Client:				Project #:	SL08639-6
Sample:	B-1 @ 5'	Depth:	5.0 Feet	Lab #:	16051
Location:	B-1			Sample Date:	3/11/2015
Material:	Dark Olive Brown Sandy CLAY			Sampled By:	PM/SP



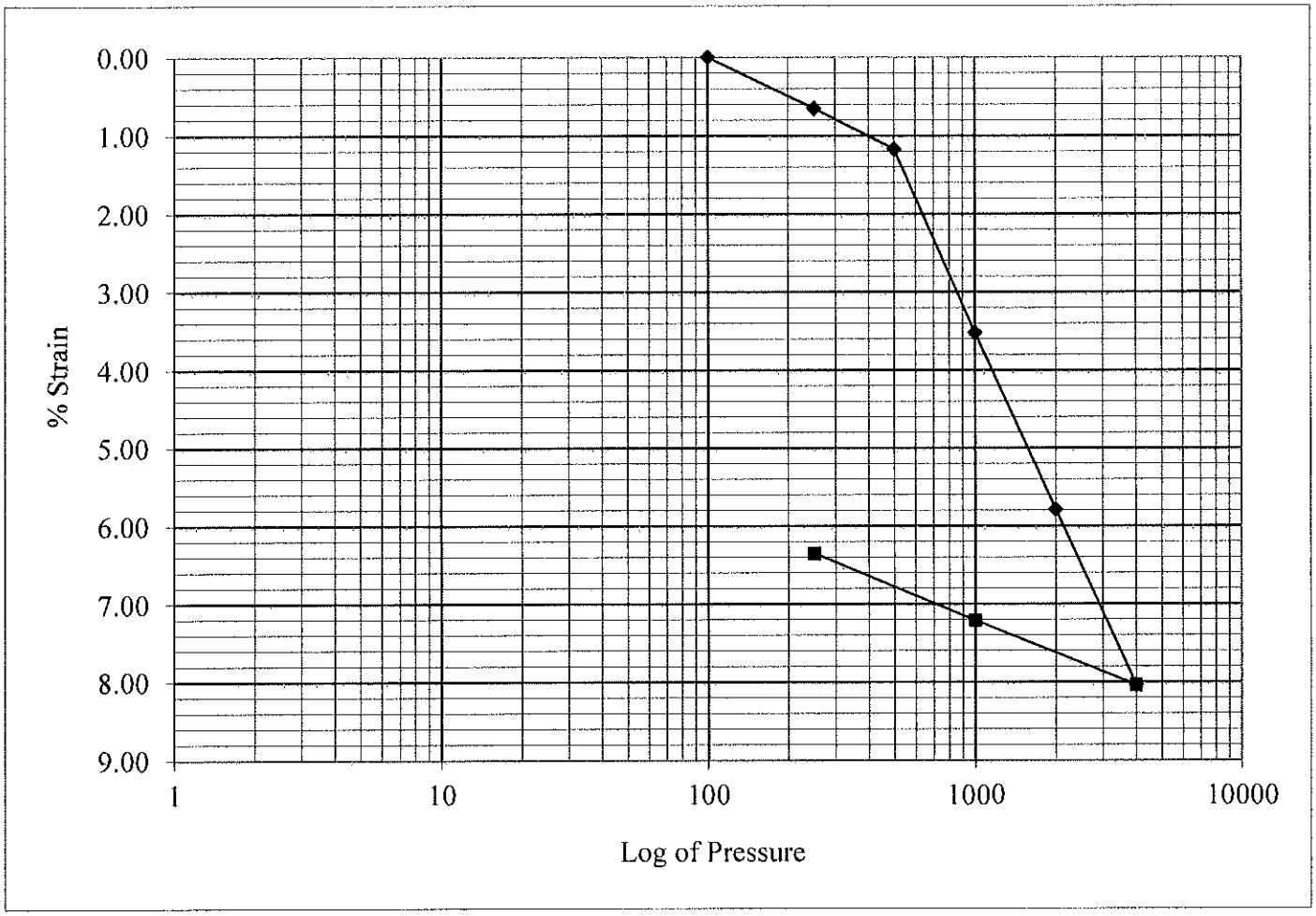
Applied Pressure (psf)	% Strain
100	-
250	0.77
500	2.02
1000	4.37
2000	7.04
4000	9.89
1000	9.26
250	8.46

Compression Index, Cc
0.083
Recompression Index, Cr
0.008

Report By: Aaron Eichman

GeoSolutions, Inc.	CONSOLIDATION REPORT D2435-11	(805) 543-8539

Project:	San Luis Ranch			Date Tested:	3/20/2015
Client:				Project #:	SL08639-6
Sample:	B-2 @ 5'	Depth:	5.0 Feet	Lab #:	16051
Location:	B-2			Sample Date:	3/11/2015
Material:	Very Dark Grayish Brown Sandy CLAY with Gravel			Sampled By:	PM/SP



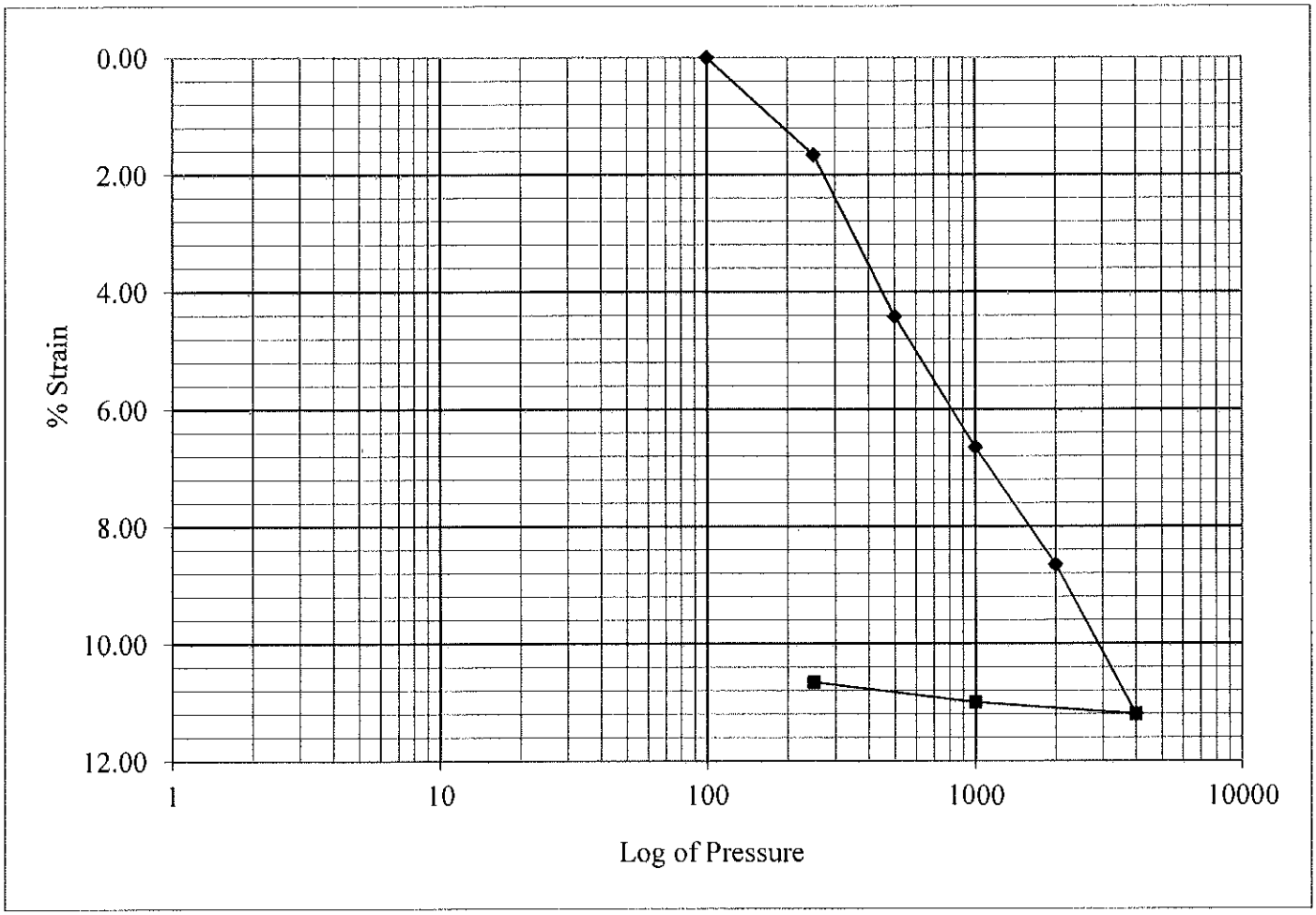
Applied Pressure (psf)	% Strain
100	-
250	0.65
500	1.17
1000	3.52
2000	5.79
4000	8.04
1000	7.21
250	6.35

Compression Index, Cc
0.070
Recompression Index, Cr
0.007

Report By: Aaron Eichman

GeoSolutions, Inc. | **CONSOLIDATION REPORT D2435-11** | **(805) 543-8539**

Project:	San Luis Ranch			Date Tested:	3/23/2015
Client:				Project #:	SL08639-6
Sample:	B-3 @ 5'	Depth:	5.0 Feet	Lab #:	16051
Location:	B-3			Sample Date:	3/11/2015
Material:	Very Dark Brown Sandy CLAY with Gravel			Sampled By:	PM/SP



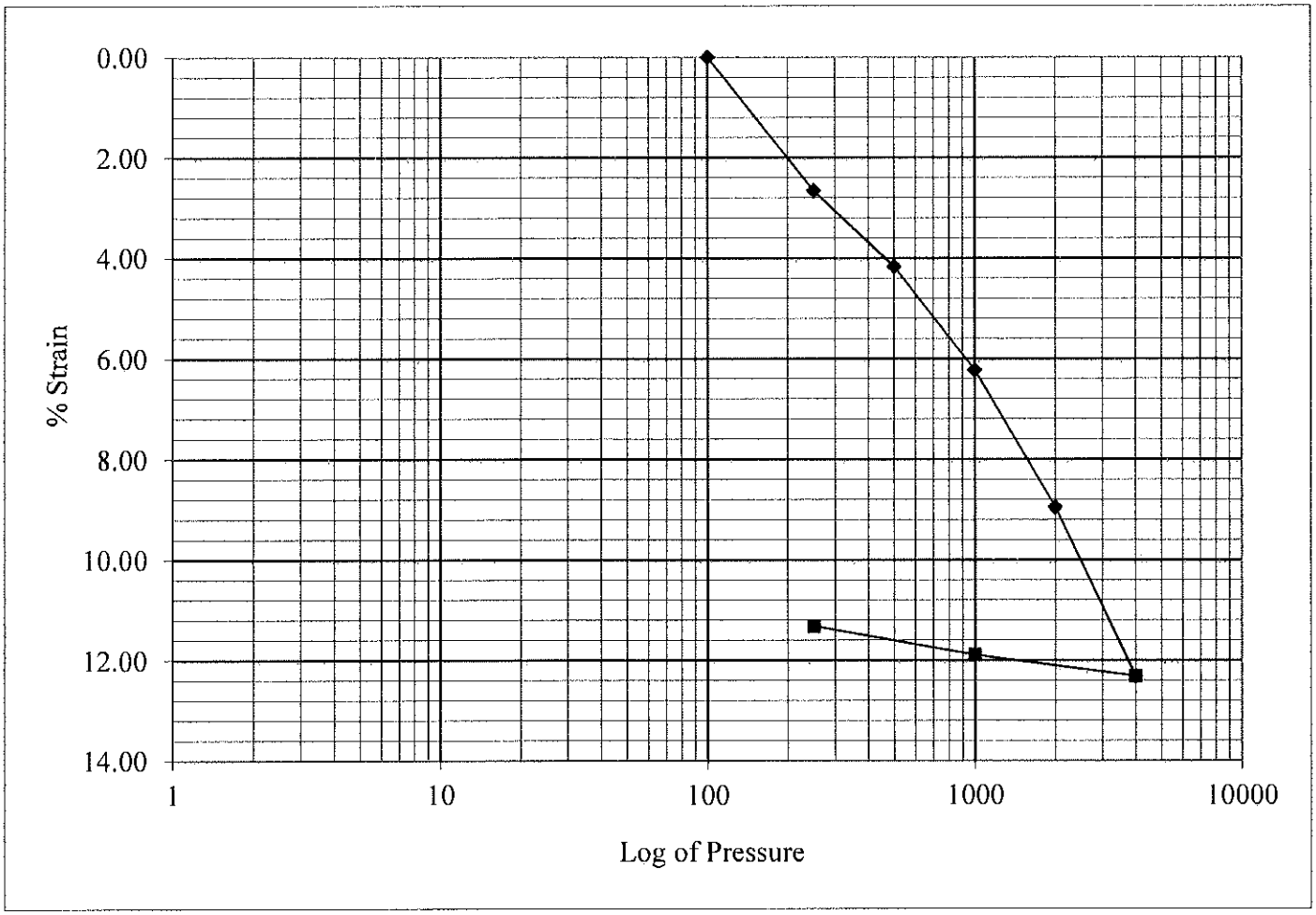
Applied Pressure (psf)	% Strain
100	-
250	1.66
500	4.42
1000	6.65
2000	8.65
4000	11.20
1000	11.00
250	10.66

Compression Index, Cc
0.077
Recompression Index, Cr
0.008

Report By: Aaron Eichman

GeoSolutions, Inc.	CONSOLIDATION REPORT D2435-11	(805) 543-8539

Project:	San Luis Ranch			Date Tested:	3/24/2015
Client:				Project #:	SL08639-6
Sample:	B-4 @ 5'	Depth:	5.0 Feet	Lab #:	16051
Location:	B-4			Sample Date:	3/11/2015
Material:	Dark Olive Brown Sandy CLAY with Gravel			Sampled By:	PM/SP



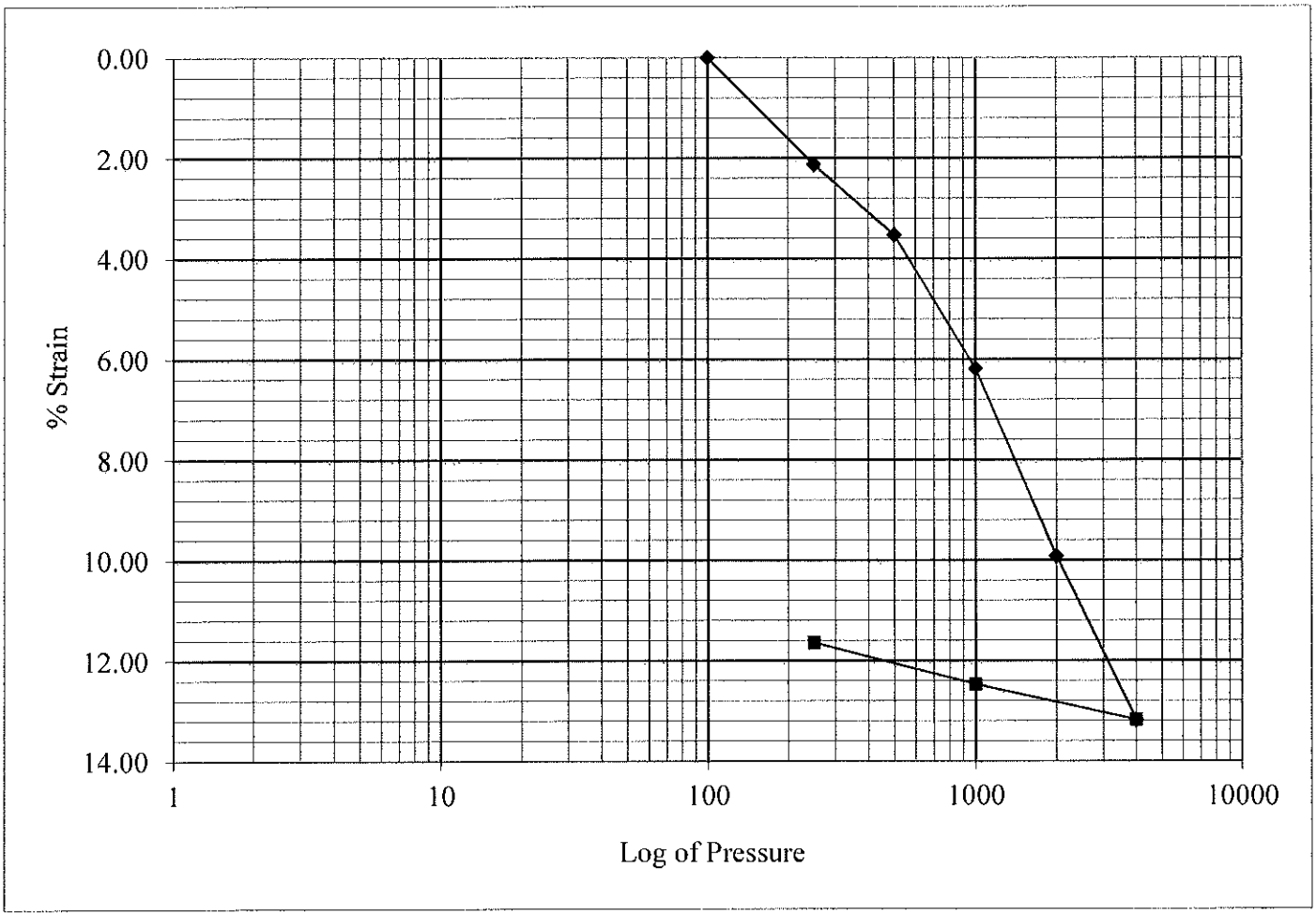
Applied Pressure (psf)	% Strain
100	-
250	2.66
500	4.17
1000	6.23
2000	8.95
4000	12.31
1000	11.89
250	11.32

Compression Index, Cc
0.086
Recompression Index, Cr
0.009

Report By: Aaron Eichman

GeoSolutions, Inc.	CONSOLIDATION REPORT D2435-11	(805) 543-8539

Project:	San Luis Ranch			Date Tested:	3/25/2015
Client:				Project #:	SL08639-6
Sample:	B-5 @ 5'	Depth:	5.0 Feet	Lab #:	16051
Location:	B-5			Sample Date:	3/11/2015
Material:	Dark Yellowish Brown Sandy CLAY			Sampled By:	PM/SP



Applied Pressure (psf)	% Strain
100	-
250	2.13
500	3.53
1000	6.19
2000	9.92
4000	13.18
1000	12.47
250	11.64

Compression Index, Cc
0.101
Recompression Index, Cr
0.010

Report By: Aaron Eichman

APPENDIX D

USGS Design Map Summary Report

USGS Design Map Detailed Report

USGS Design Maps Summary Report

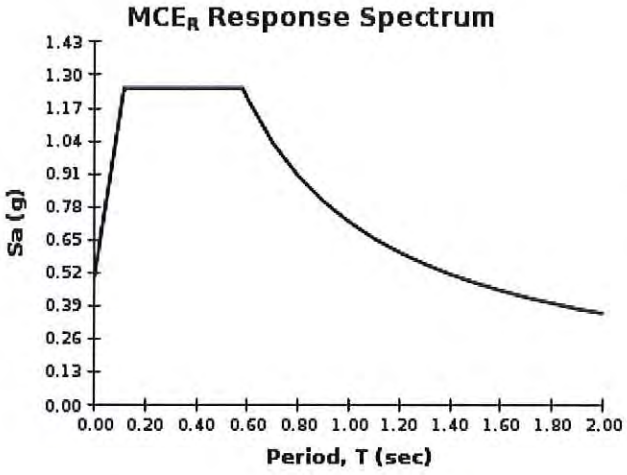
User–Specified Input

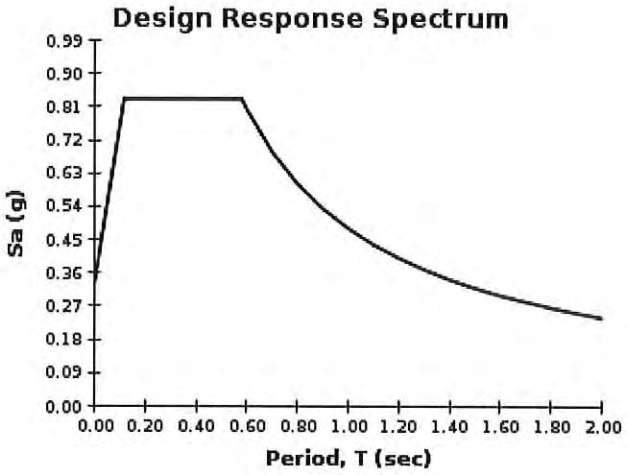
Report Title	San Luis Ranch -- Dalidio Fri April 3, 2015 18:18:03 UTC
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	35.25612°N, 120.6792°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

USGS–Provided Output

S_S =	1.245 g	S_{MS} =	1.248 g	S_{DS} =	0.832 g
S_1 =	0.472 g	S_{M1} =	0.721 g	S_{D1} =	0.481 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

USGS Design Maps Detailed Report

ASCE 7-10 Standard (35.25612°N, 120.6792°W)

Site Class D – "Stiff Soil", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1] $S_S = 1.245$ g

From Figure 22-2 [2] $S_1 = 0.472$ g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Chapter 20.

Table 20.3-1 Site Classification

Site Class	$\overline{v}_s$	$\overline{N}$ or $\overline{N}_{ch}$	$\overline{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index PI > 20, • Moisture content $w \geq 40\%$, and • Undrained shear strength $\overline{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4-1: Site Coefficient F_a

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at Short Period				
	$S_S \leq 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_S

For Site Class = D and S_S = 1.245 g, F_a = 1.002

Table 11.4-2: Site Coefficient F_v

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at 1-s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_1

For Site Class = D and S_1 = 0.472 g, F_v = 1.528

Equation (11.4–1): $S_{MS} = F_a S_S = 1.002 \times 1.245 = 1.248$ g

Equation (11.4–2): $S_{M1} = F_v S_1 = 1.528 \times 0.472 = 0.721$ g

Section 11.4.4 — Design Spectral Acceleration Parameters

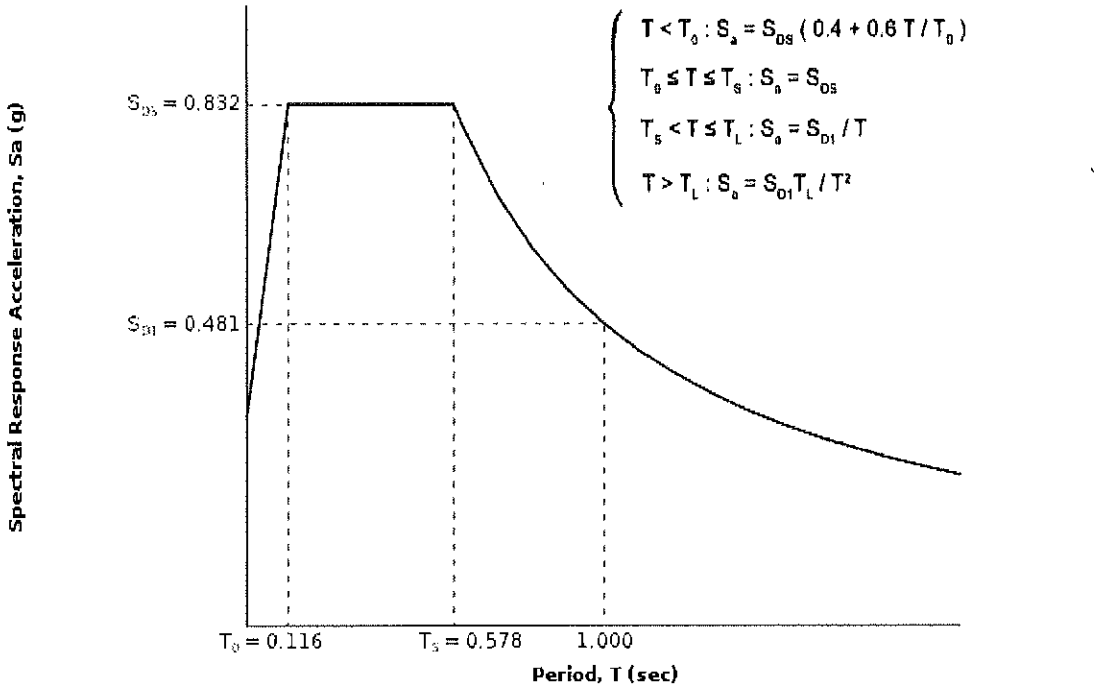
Equation (11.4–3): $S_{DS} = \frac{2}{3} S_{MS} = \frac{2}{3} \times 1.248 = 0.832$ g

Equation (11.4–4): $S_{D1} = \frac{2}{3} S_{M1} = \frac{2}{3} \times 0.721 = 0.481$ g

Section 11.4.5 — Design Response Spectrum

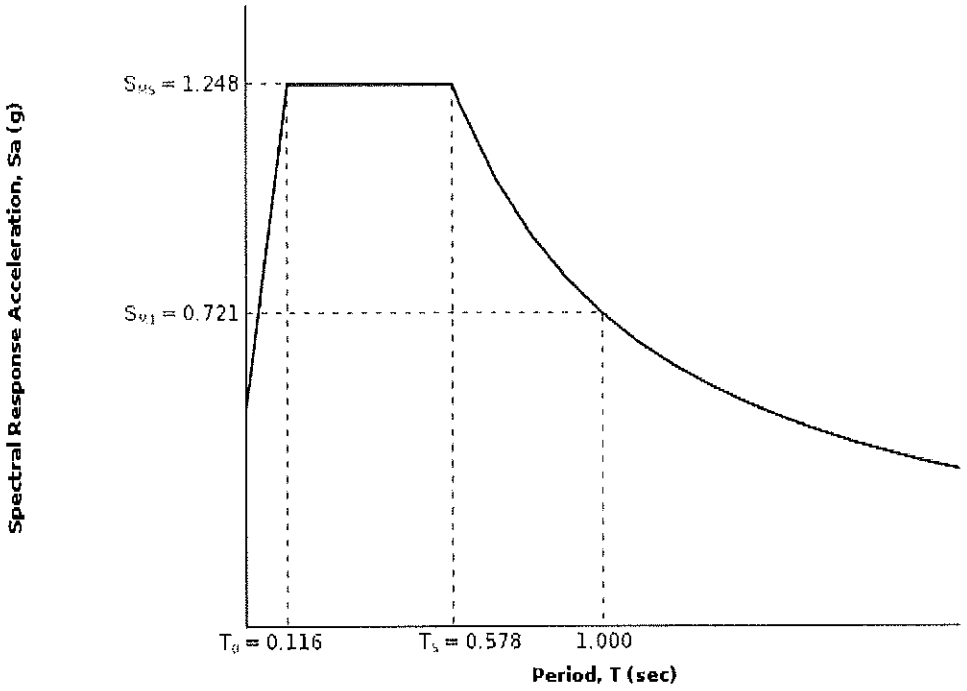
From Figure 22-12 [3] $T_L = 8$ seconds

Figure 11.4-1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4] PGA = 0.519

Equation (11.8-1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.519 = 0.519$ g

Table 11.8-1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of PGA

For Site Class = D and PGA = 0.519 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5] C_{RS} = 0.912

From Figure 22-18 [6] C_{R1} = 0.947

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 0.832 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.481 g, Seismic Design Category = D

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = D

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 22-1*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf

APPENDIX E

Preliminary Grading Specifications

PRELIMINARY GRADING SPECIFICATIONS

A. General

1. These preliminary specifications have been prepared for the subject site; GeoSolutions, Inc. should be consulted prior to the commencement of site work associated with site development to ensure compliance with these specifications.

2. GeoSolutions, Inc. should be notified at least 72 hours prior to site clearing or grading operations on the property in order to observe the stripping of surface materials and to coordinate the work with the grading contractor in the field.

3. These grading specifications may be modified and/or superseded by recommendations contained in the text of this report and/or subsequent reports.

4. If disputes arise out of the interpretation of these grading specifications, the Soils Engineer shall provide the governing interpretation.

B. Obligation of Parties

1. The Soils Engineer should provide observation and testing services and should make evaluations to advise the client on geotechnical matters. The Soils Engineer should report the findings and recommendations to the client or the authorized representative.

2. The client should be chiefly responsible for all aspects of the project. The client or authorized representative has the responsibility of reviewing the findings and recommendations of the Soils Engineer. During grading the client or the authorized representative should remain on-site or should remain reasonably accessible to all concerned parties in order to make decisions necessary to maintain the flow of the project.

3. The contractor is responsible for the safety of the project and satisfactory completion of all grading and other operations on construction projects, including, but not limited to, earthwork in accordance with project plans, specifications, and controlling agency requirements.

C. Site Preparation

1. The client, prior to any site preparation or grading, should arrange and attend a meeting which includes the grading contractor, the design Structural Engineer, the Soils Engineer, representatives of the local building department, as well as any other concerned parties. All parties should be given at least 72 hours notice.

2. All surface and sub-surface deleterious materials should be removed from the proposed building and pavement areas and disposed of off-site or as approved by the Soils Engineer. This includes, but is not limited to, any debris, organic materials, construction spoils, buried utility line, septic systems, building materials, and any other surface and subsurface structures within the proposed building areas. Trees designated for removal on the construction plans should be removed and their primary root systems grubbed under the observations of a representative of GeoSolutions, Inc. Voids left from site clearing should be cleaned and backfilled as recommended for structural fill.

3. Once the Site has been cleared, the exposed ground surface should be stripped to remove surface vegetation and organic soil. A representative of GeoSolutions, Inc. should determine the required depth of stripping at the time of work being completed. Strippings may either be disposed of off-site or stockpiled for future use in landscape areas, if approved by the landscape architect.

D. Site Protection

1. Protection of the Site during the period of grading and construction should be the responsibility of the contractor.

2. The contractor should be responsible for the stability of all temporary excavations.

3. During periods of rainfall, plastic sheeting should be kept reasonably accessible to prevent unprotected slopes from becoming saturated. Where necessary during periods of rainfall, the contractor should install check-dams, de-silting basins, sand bags, or other devices or methods necessary to control erosion and provide safe conditions.

E. Excavations

1. Materials that are unsuitable should be excavated under the observation and recommendations of the Soils Engineer. Unsuitable materials include, but may not be limited to: 1) dry, loose, soft, wet, organic, or compressible natural soils; 2) fractured, weathered, or soft bedrock; 3) non-engineered fill; 4) other deleterious materials; and 5) materials identified by the Soils Engineer or Engineering Geologist.

2. Unless otherwise recommended by the Soils Engineer and approved by the local building official, permanent cut slopes should not be steeper than 2:1 (horizontal to vertical). Final slope configurations should conform to section 1804 of the 2013 California Building Code unless specifically modified by the Soil Engineer/Engineering Geologist.

3. The Soil Engineer/Engineer Geologist should review cut slopes during excavations. The contractor should notify the Soils Engineer/Engineer Geologist prior to beginning slope excavations.

F. Structural Fill

1. Structural fill should not contain rocks larger than 3 inches in greatest dimension, and should have no more than 15 percent larger than 2.5 inches in greatest dimension.

2. Imported fill should be free of organic and other deleterious material and should have very low expansion potential, with a plasticity index of 12 or less. Before delivery to the Site, a sample of the proposed import should be tested in our laboratory to determine its suitability for use as structural fill.

G. Compacted Fill

1. Structural fill using approved import or native should be placed in horizontal layers, each approximately 8 inches in thickness before compaction. On-site inorganic soil or approved imported fill should be conditioned with water to produce a soil water content near optimum moisture and compacted to a minimum relative density of 90 percent based on ASTM D1557-07.

2. Fill slopes should not be constructed at gradients greater than 2-to-1 (horizontal to vertical). The contractor should notify the Soils Engineer/Engineer Geologist prior to beginning slope excavations.

3. If fill areas are constructed on slopes greater than 10-to-1 (horizontal to vertical), we recommend that benches be cut every 4 feet as fill is placed. Each bench shall be a minimum of 10 feet wide with a minimum of 2 percent gradient into the slope.

4. If fill areas are constructed on slopes greater than 5-to-1, we recommend that the toe of all areas to receive fill be keyed a minimum of 24 inches into underlying dense material. Key depths are to be observed and approved by a representative of GeoSolutions, Inc. Sub-drains shall be placed in the keyway and benches as required.

H. Drainage

1. During grading, a representative of GeoSolutions, Inc. should evaluate the need for a sub-drain or back-drain system. Areas of observed seepage should be provided with sub-surface drains to release the hydrostatic pressures. Sub-surface drainage facilities may include gravel blankets, rock filled trenches or Multi-Flow systems or equal. The drain system should discharge in a non-erosive manner into an approved drainage area.

2. All final grades should be provided with a positive drainage gradient away from foundations. Final grades should provide for rapid removal of surface water runoff. Ponding of water should not be allowed on building pads or adjacent to foundations. Final grading should be the responsibility of the contractor, general Civil Engineer, or architect.

3. Concentrated surface water runoff within or immediately adjacent to the Site should be conveyed in pipes or in lined channels to discharge areas that are relatively level or that are adequately protected against erosion.

4. Water from roof downspouts should be conveyed in solid pipes that discharge in controlled drainage localities. Surface drainage gradients should be planned to prevent ponding and promote drainage of surface water away from building foundations, edges of pavements and sidewalks. For soil areas we recommend that a minimum of 2 percent gradient be maintained.

5. Attention should be paid by the contractor to erosion protection of soil surfaces adjacent to the edges of roads, curbs and sidewalks, and in other areas where hard edges of structures may cause concentrated flow of surface water runoff. Erosion resistant matting such as Miramat, or other similar products, may be considered for lining drainage channels.

6. Sub-drains should be placed in established drainage courses and potential seepage areas. The location of sub-drains should be determined after a review of the grading plan. The sub-drain outlets should extend into suitable facilities or connect to the proposed storm drain system or existing drainage control facilities. The outlet pipe should consist of a non-perforated pipe the same diameter as the perforated pipe.

I. Maintenance

1. Maintenance of slopes is important to their long-term performance. Precautions that can be taken include planting with appropriate drought-resistant vegetation as recommended by a landscape architect, and not over-irrigating, a primary source of surficial failures.

2. Property owners should be made aware that over-watering of slopes is detrimental to long term stability of slopes.

J. Underground Facilities Construction

1. The attention of contractors, particularly the underground contractors, should be drawn to the State of California Construction Safety Orders for "Excavations, Trenches, Earthwork." Trenches or excavations greater than 5 feet in depth should be shored or sloped back in accordance with OSHA Regulations prior to entry.

2. Bedding is defined as material placed in a trench up to 1 foot above a utility pipe and backfill is all material placed in the trench above the bedding. Unless concrete bedding is required around utility pipes, free-draining sand should be used as bedding. Sand to be used as bedding should be tested in our laboratory to verify its suitability and to measure its compaction characteristics. Sand bedding should be compacted by mechanical means to achieve at least 90 percent relative density based on ASTM D1557-07.

3. On-site inorganic soils, or approved import, may be used as utility trench backfill. Proper compaction of trench backfill will be necessary under and adjacent to structural fill, building foundations, concrete slabs, and vehicle pavements. In these areas, backfill should be conditioned with water (or allowed to dry), to produce a soil water content of about 2 to 3 percent above the optimum value and placed in horizontal layers, each not exceeding 8 inches in thickness before compaction. Each layer should be compacted to at least 90 percent relative density based on ASTM D1557-07. The top lift of trench backfill under vehicle pavements should be compacted to the requirements given in report under Preparation of Paved Areas for vehicle pavement sub-grades. Trench walls must be kept moist prior to and during backfill placement.

K. Completion of Work

1. After the completion of work, a report should be prepared by the Soils Engineer retained to provide such services. The report should including locations and elevations of field density tests, summaries of field and laboratory tests, other substantiating data, and comments on any changes made during grading and their effect on the recommendations made in the approved Soils Engineering Report.

2. Soils Engineers shall submit a statement that, to the best of their knowledge, the work within their area of responsibilities is in accordance with the approved soils engineering report and applicable provisions within Chapter 18 of the 2013 CBC.

APPENDIX F

Volflo 1.5

VOLFLO 1.5

Geostructural Tool Kit, Inc.

Registered To : GeoSolutions, Inc

Serial Number : 200-100-281

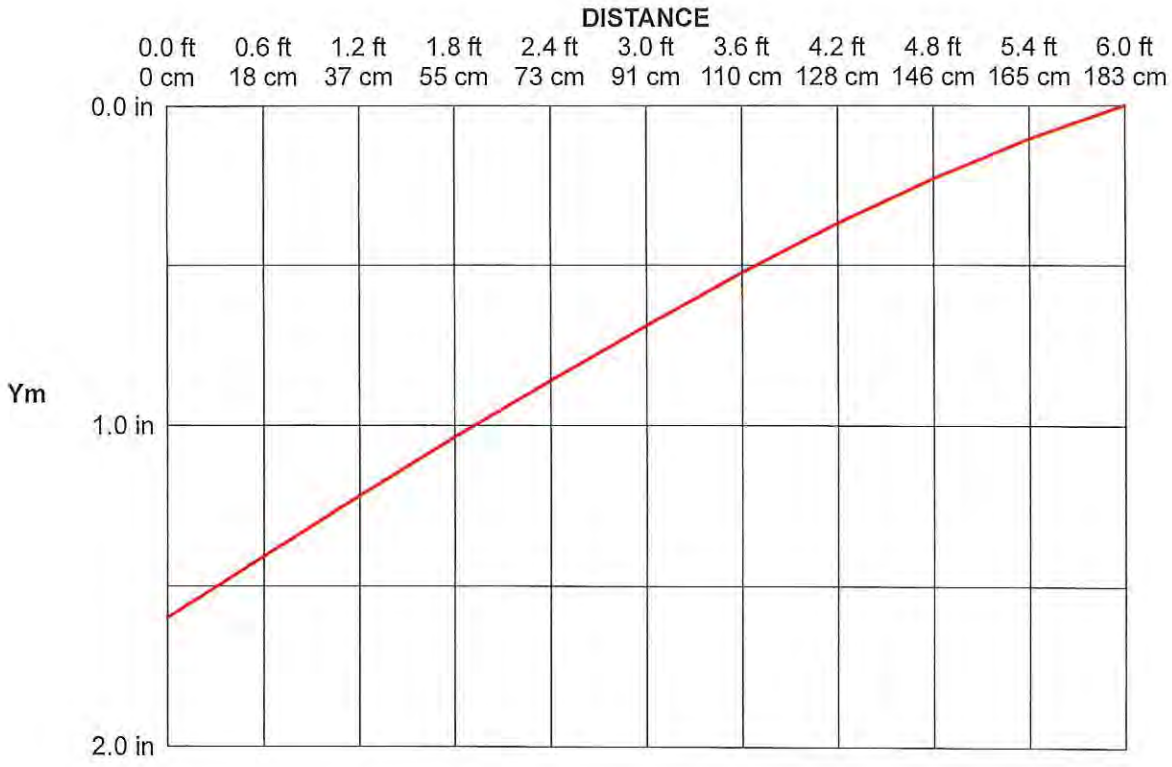
Project Title : Dalidio - Commercial Structures
Project Engineer : KRC

Geotechnical Report : San Luis Ranch - Dalidio

Project Number : SL08639-6
Project Date : April 21, 2015
Report Date :
Report Number :

SHRINK CALCULATION

Ym Center (Shrink) = -1.60 inches (-4.07 centimeters)
Em Center = 6.00 feet (182.88 centimeters)



	Shrink at Slab Edge	Shrink at distance X from edge of slab									Shrink at Em
	0.0 ft 0 cm	0.6 ft 18 cm	1.2 ft 37 cm	1.8 ft 55 cm	2.4 ft 73 cm	3.0 ft 91 cm	3.6 ft 110 cm	4.2 ft 128 cm	4.8 ft 146 cm	5.4 ft 165 cm	6.0 ft 183 cm
inches	-1.60	-1.41	-1.22	-1.04	-0.86	-0.69	-0.52	-0.37	-0.23	-0.10	0.00
cm	-4.07	-3.58	-3.10	-2.64	-2.19	-1.75	-1.33	-0.94	-0.58	-0.27	0.00

VOLFLO 1.5

Geostructural Tool Kit, Inc.

Registered To : GeoSolutions, Inc

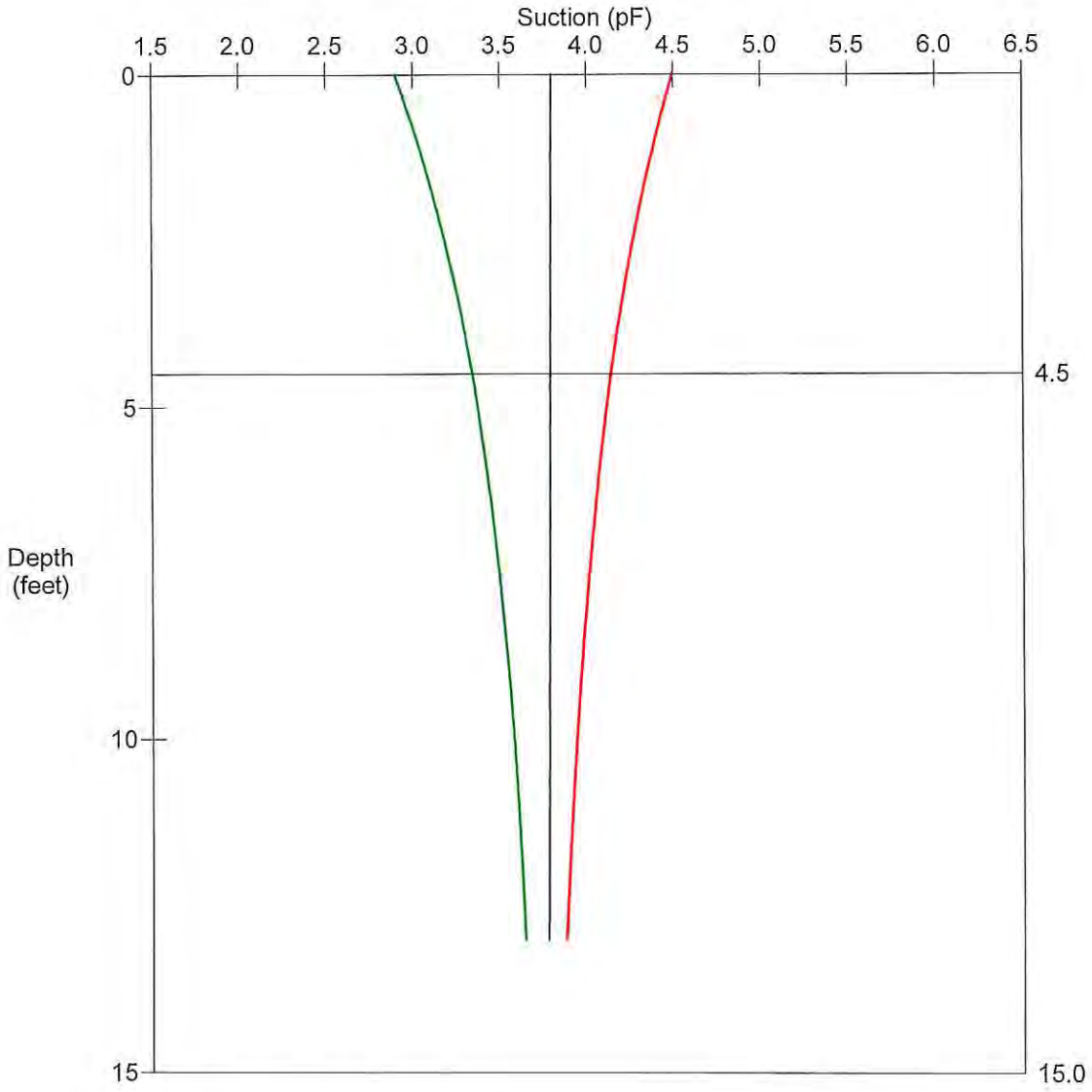
Serial Number : 200-100-281

Project Title : Dalidio - Commercial Structures
Project Engineer : KRC

Geotechnical Report : San Luis Ranch - Dalidio

Project Number : SL08639-6
Project Date : April 21, 2015
Report Date :
Report Number :

SUCTION PROFILES



Initial suction at edge of slab

Final suction at edge of slab

Constant Suction

VOLFLO 1.5

Geostructural Tool Kit, Inc.

Registered To : GeoSolutions, Inc

Serial Number : 200-100-281

Project Title : Dalidio - Commercial Structures
Project Engineer : KRC

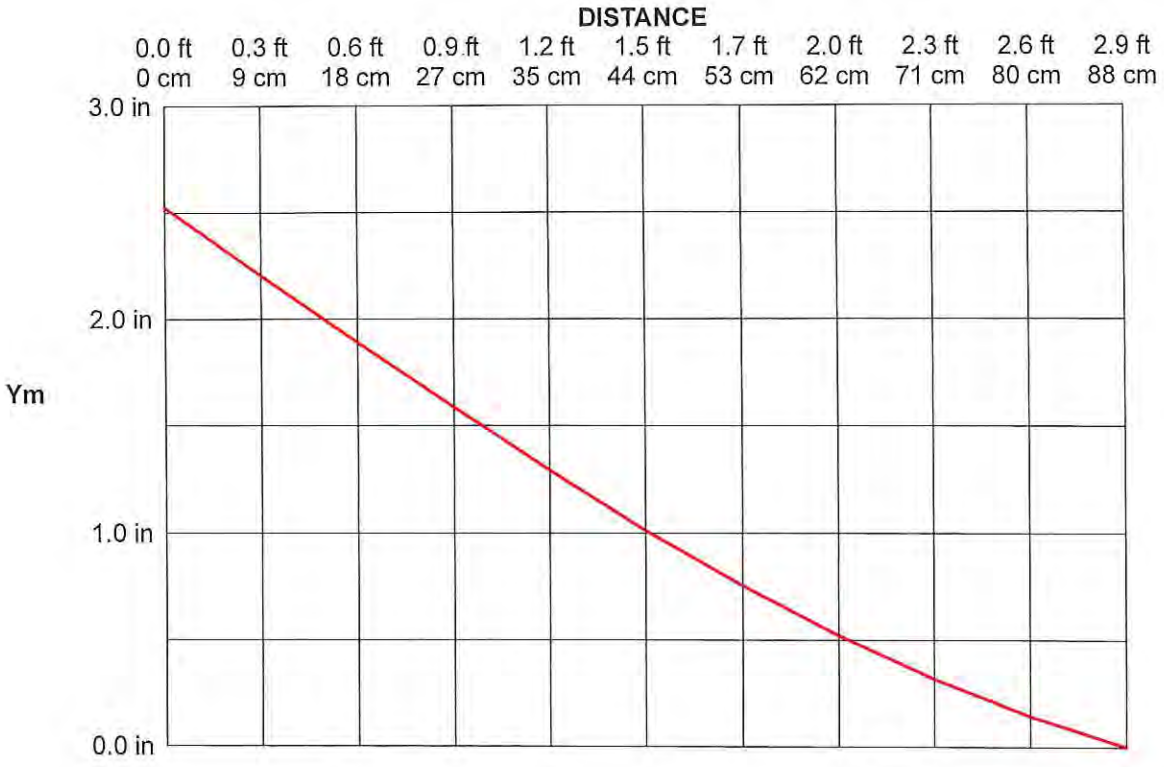
Geotechnical Report : San Luis Ranch - Dalidio

Project Number : SL08639-6
Project Date : April 21, 2015
Report Date :
Report Number :

SWELL CALCULATION

Ym Edge (Swell) = 2.52 inches (6.41 centimeters)

Em Edge = 2.90 feet (88.39 centimeters)



	Swell at Slab Edge	Swell at distance X from edge of slab								Swell at Em
	0.0 ft 0 cm	0.3 ft 9 cm	0.6 ft 18 cm	0.9 ft 27 cm	1.2 ft 35 cm	1.5 ft 44 cm	1.7 ft 53 cm	2.0 ft 62 cm	2.3 ft 71 cm	2.6 ft 80 cm	2.9 ft 88 cm
inches	2.52	2.20	1.89	1.58	1.29	1.01	0.75	0.52	0.31	0.14	0.00
cm	6.41	5.59	4.79	4.02	3.28	2.57	1.91	1.32	0.80	0.36	0.00

VOLFLO 1.5

Geostructural Tool Kit, Inc.

Registered To : GeoSolutions, Inc

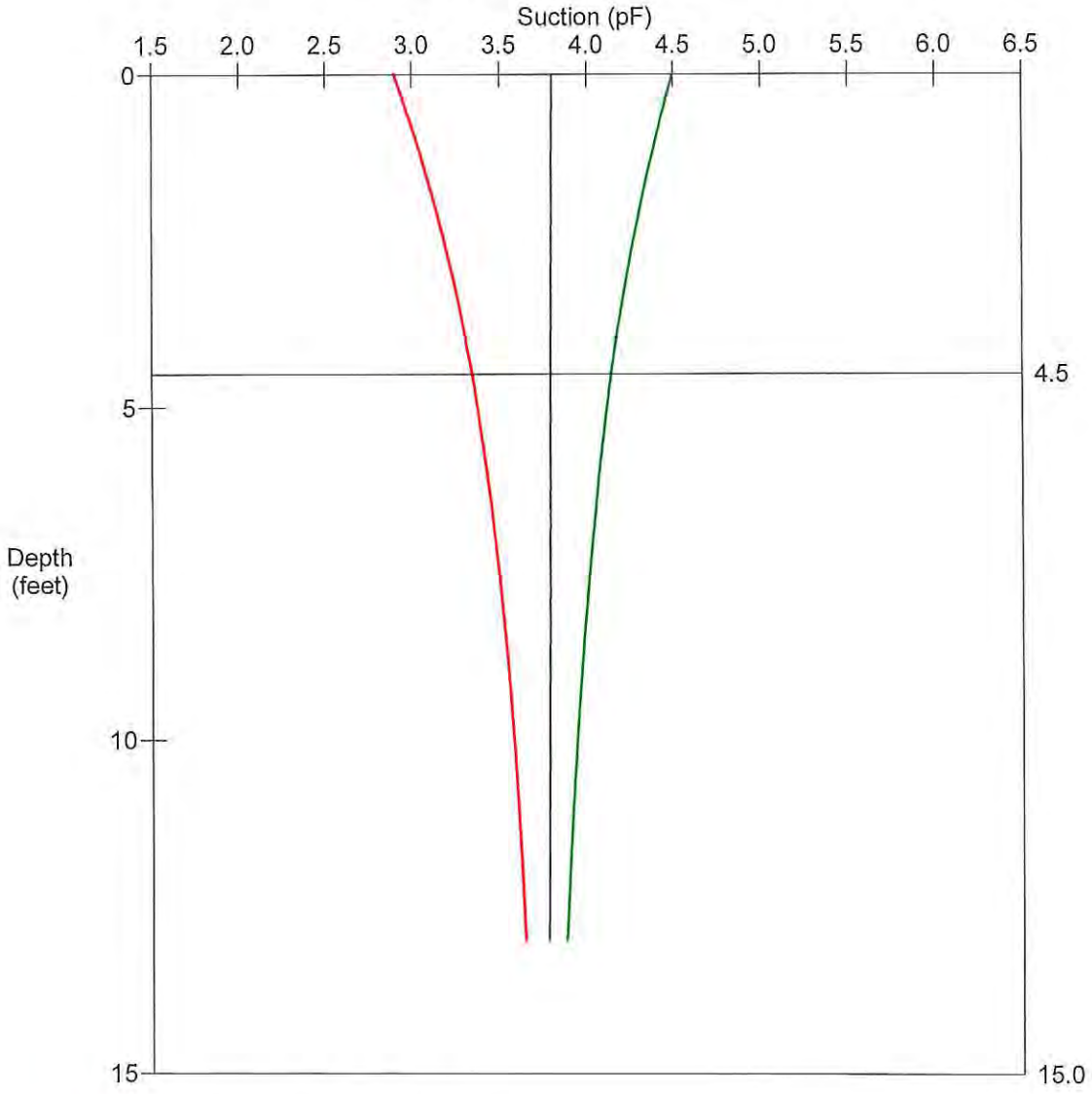
Serial Number : 200-100-281

Project Title : Dalidio - Commercial Structures
Project Engineer : KRC

Geotechnical Report : San Luis Ranch - Dalidio

Project Number : SL08639-6
Project Date : April 21, 2015
Report Date :
Report Number :

SUCTION PROFILES



Initial suction at edge of slab

Final suction at edge of slab

Constant Suction

VOLFLO 1.5

Geostructural Tool Kit, Inc.

Registered To : GeoSolutions, Inc

Serial Number : 200-100-281

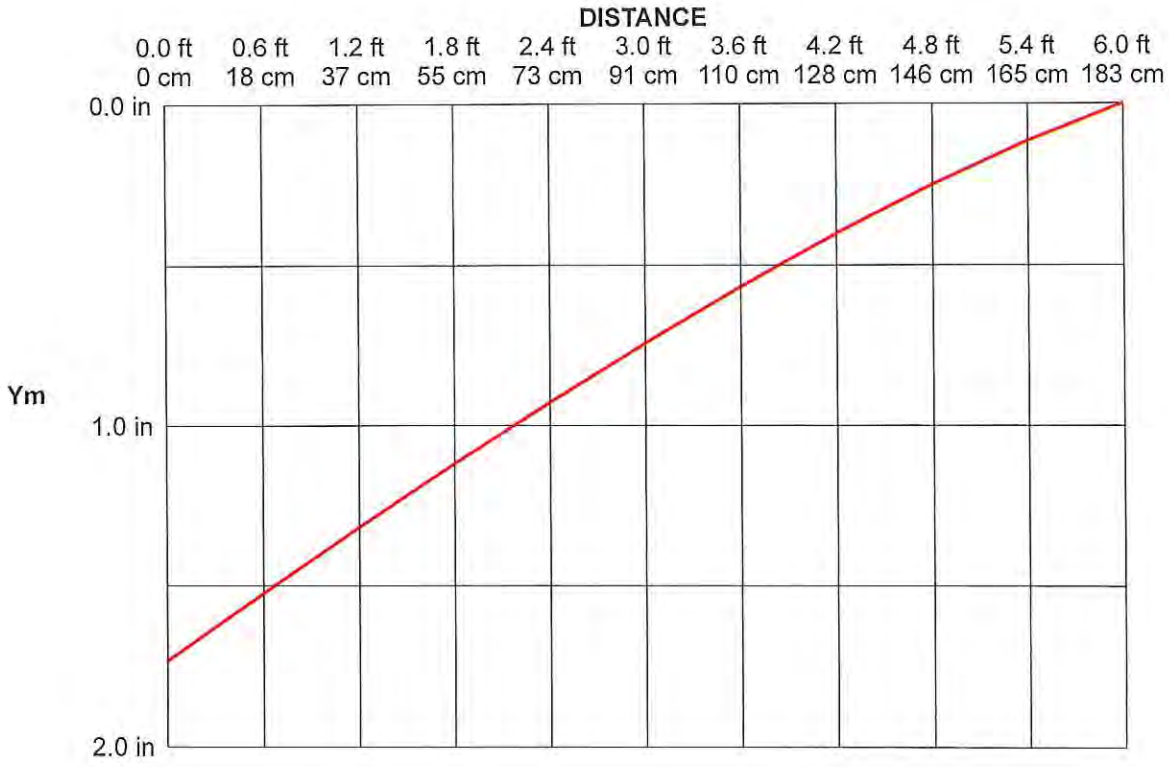
Project Title : Dalidio - Multi-family Residential Structures
Project Engineer : KRC

Geotechnical Report : San Luis Ranch - Dalidio

Project Number : SL08639-6
Project Date : April 21, 2015
Report Date :
Report Number :

SHRINK CALCULATION

Ym Center (Shrink) = -1.74 inches (-4.41 centimeters)
Em Center = 6.00 feet (182.88 centimeters)



	Shrink at Slab Edge	Shrink at distance X from edge of slab								Shrink at Em
	0.0 ft 0 cm	0.6 ft 18 cm	1.2 ft 37 cm	1.8 ft 55 cm	2.4 ft 73 cm	3.0 ft 91 cm	3.6 ft 110 cm	4.2 ft 128 cm	4.8 ft 146 cm	5.4 ft 165 cm	6.0 ft 183 cm
inches	-1.74	-1.53	-1.32	-1.12	-0.93	-0.74	-0.57	-0.40	-0.25	-0.12	0.00
cm	-4.41	-3.88	-3.35	-2.85	-2.36	-1.89	-1.44	-1.02	-0.64	-0.29	0.00

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Project Engineer : KRC

Project Number : SL08639-6
Project Date : April 21, 2015
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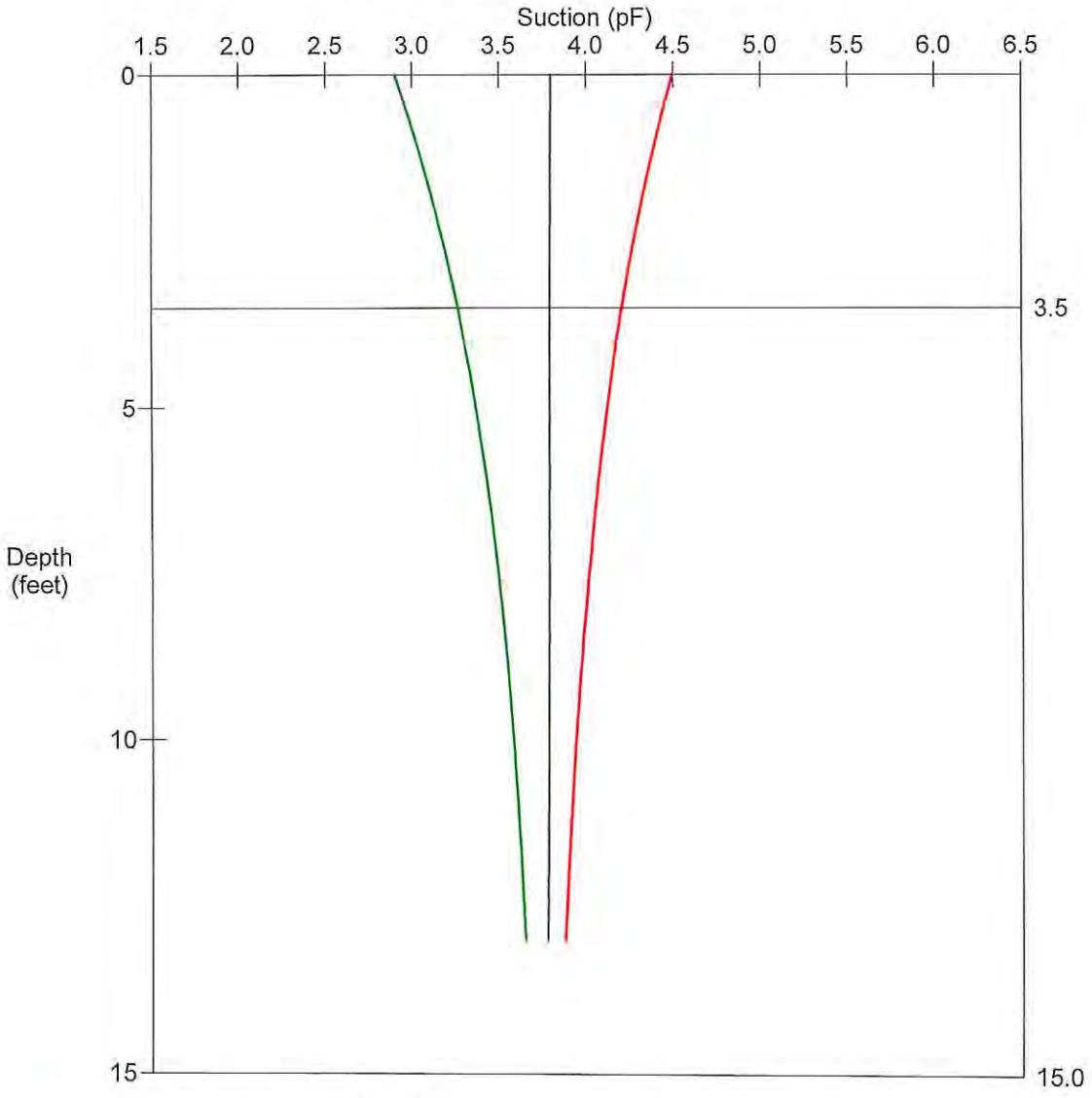
Geotechnical Report : San Luis Ranch - Dalidio

SUCTION PROFILES



Initial suction at edge of slab

Final suction at edge of slab

Constant Suction

VOLFLO 1.5

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Project Title : Dalidio - Multi-family Residential Structures
Project Engineer : KRC

Geotechnical Report : San Luis Ranch - Dalidio

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Project Date : April 21, 2015
Report Date :
Report Number :

SWELL CALCULATION

Ym Edge (Swell) = **2.75 inches** **(7.00 centimeters)**

Em Edge = **2.90 feet** **(88.39 centimeters)**

	Swell at Slab Edge	Swell at distance X from edge of slab								Swell at Em
	0.0 ft	0.3 ft	0.6 ft	0.9 ft	1.2 ft	1.5 ft	1.7 ft	2.0 ft	2.3 ft	2.6 ft	2.9 ft
	0 cm	9 cm	18 cm	27 cm	35 cm	44 cm	53 cm	62 cm	71 cm	80 cm	88 cm
inches	2.75	2.40	2.06	1.73	1.42	1.12	0.84	0.58	0.35	0.16	0.00
cm	7.00	6.10	5.23	4.40	3.60	2.84	2.12	1.47	0.89	0.40	0.00

VOLFLO 1.5

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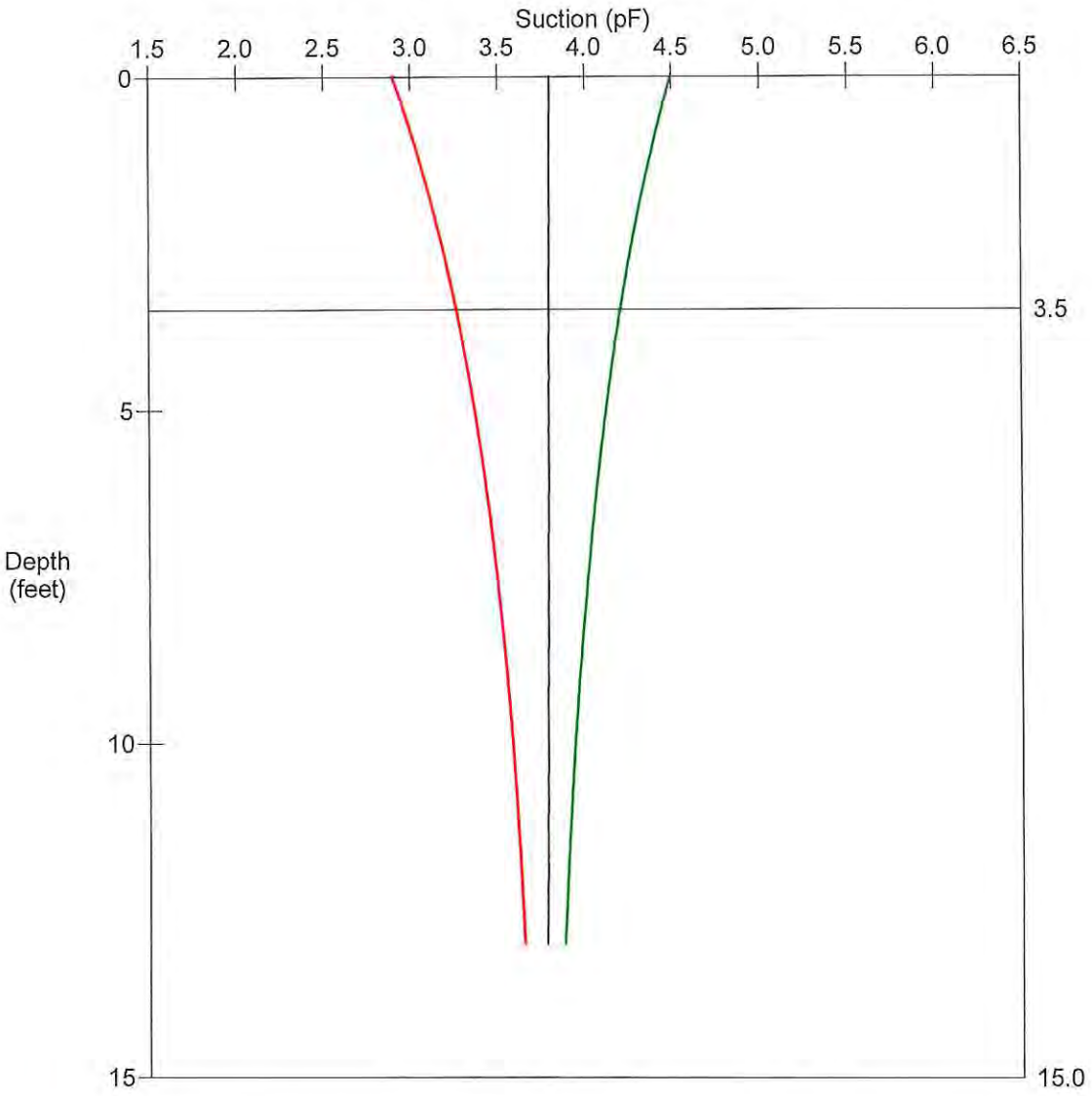
SUCTION PROFILES



Initial suction at edge of slab

Final suction at edge of slab

Constant Suction

VOLFLO 1.5

Geostructural Tool Kit, Inc.

Registered To : GeoSolutions, Inc

Serial Number : 200-100-281

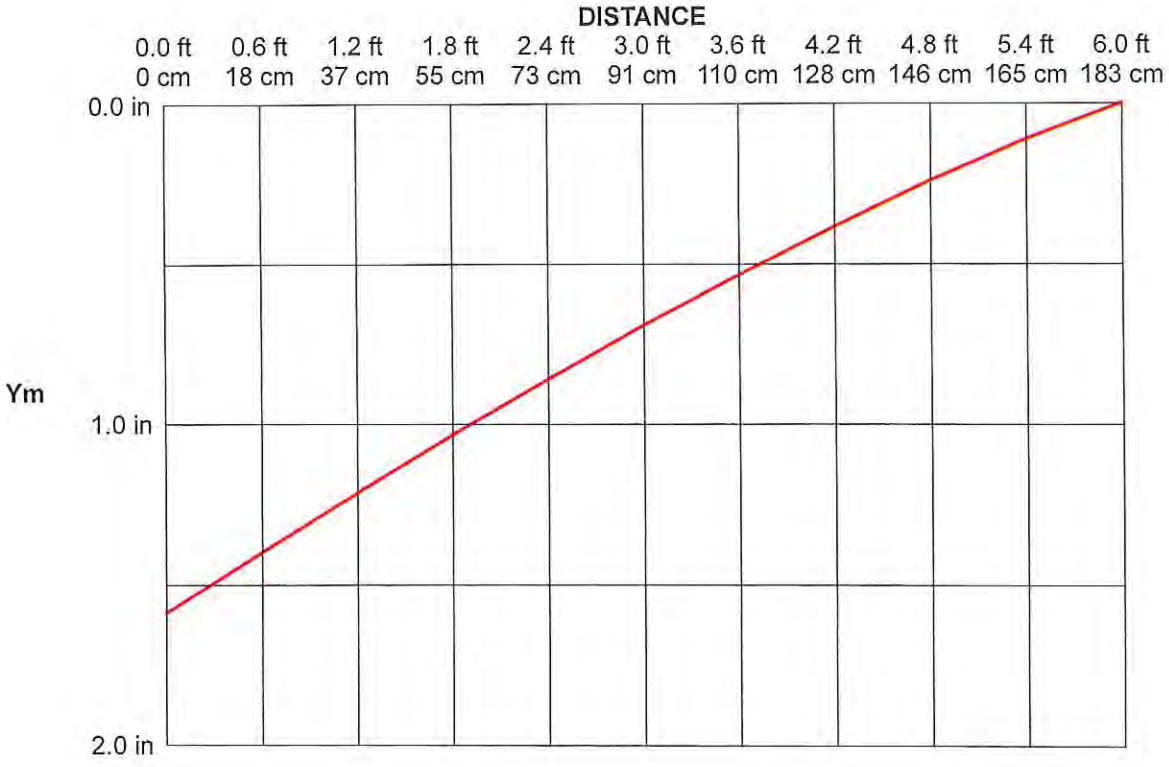
Project Title : Dalidio - Single-family Residential Structures
Project Engineer : KRC

Geotechnical Report : San Luis Ranch - Dalidio

Project Number : SL08639-6
Project Date : April 21, 2015
Report Date :
Report Number :

SHRINK CALCULATION

Ym Center (Shrink) = -1.59 inches (-4.04 centimeters)
Em Center = 6.00 feet (182.88 centimeters)



	Shrink at Slab Edge	Shrink at distance X from edge of slab								Shrink at Em
	0.0 ft	0.6 ft	1.2 ft	1.8 ft	2.4 ft	3.0 ft	3.6 ft	4.2 ft	4.8 ft	5.4 ft	6.0 ft
	0 cm	18 cm	37 cm	55 cm	73 cm	91 cm	110 cm	128 cm	146 cm	165 cm	183 cm
inches	-1.59	-1.40	-1.21	-1.03	-0.86	-0.69	-0.53	-0.38	-0.24	-0.11	0.00
cm	-4.04	-3.56	-3.08	-2.63	-2.19	-1.76	-1.35	-0.97	-0.61	-0.29	0.00

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Serial Number : 200-100-281

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Project Date : April 21, 2015
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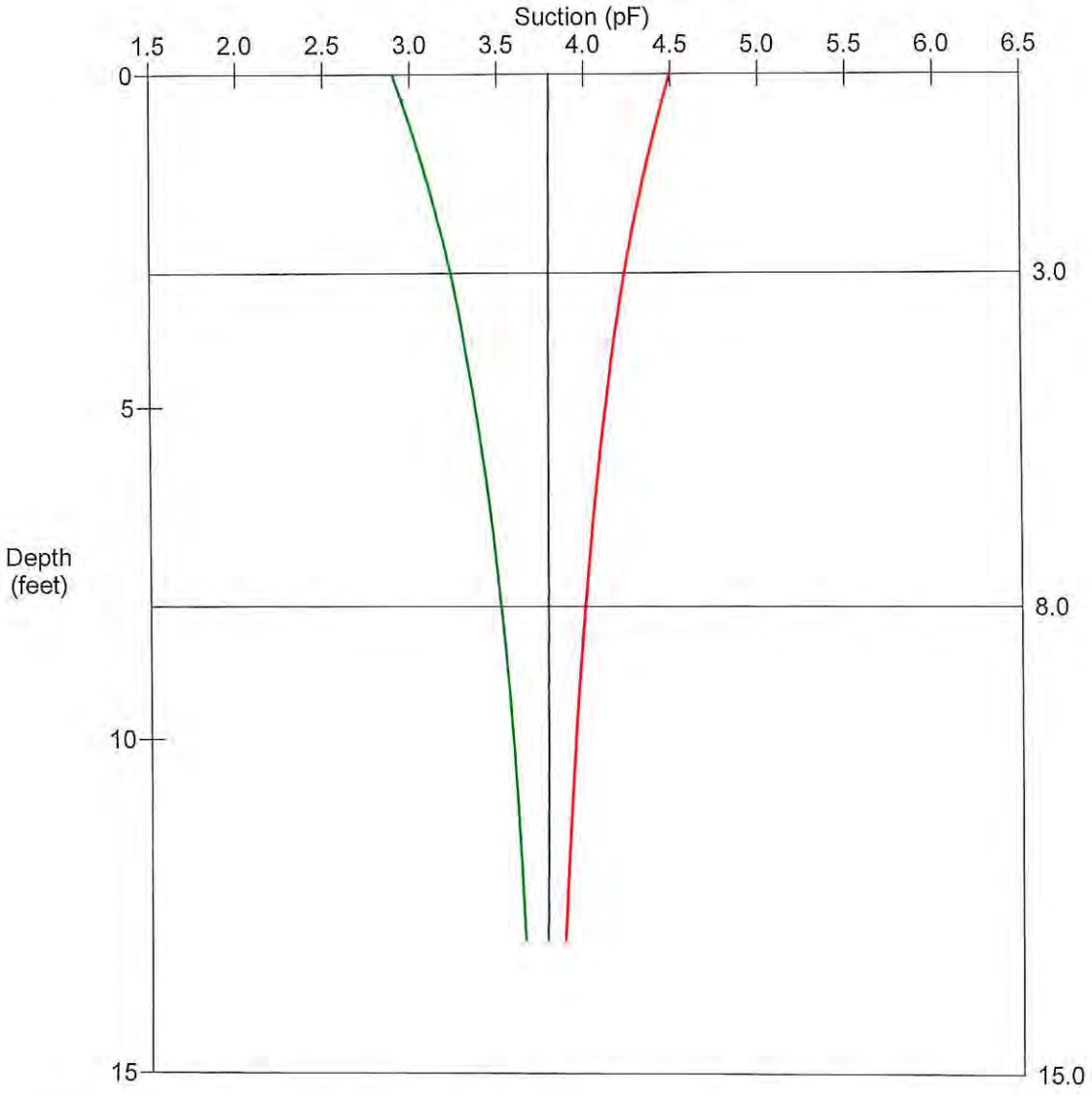
Report Number :

Geotechnical Report : San Luis Ranch - Dalidio

SUCTION PROFILES



Initial suction at edge of slab

Final suction at edge of slab

Constant Suction

VOLFLO 1.5

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Serial Number : 200-100-281

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Project Number : SL08639-6
Project Date : April 21, 2015
Report Date :
Report Number :

SWELL CALCULATION

Ym Edge (Swell) = 2.55 inches (6.47 centimeters)
Em Edge = 2.90 feet (88.39 centimeters)

	Swell at Slab Edge	Swell at distance X from edge of slab								Swell at Em
	0.0 ft 0 cm	0.3 ft 9 cm	0.6 ft 18 cm	0.9 ft 27 cm	1.2 ft 35 cm	1.5 ft 44 cm	1.7 ft 53 cm	2.0 ft 62 cm	2.3 ft 71 cm	2.6 ft 80 cm	2.9 ft 88 cm
inches	2.55	2.23	1.92	1.62	1.34	1.06	0.81	0.56	0.34	0.15	0.00
cm	6.47	5.66	4.88	4.12	3.40	2.70	2.05	1.43	0.87	0.39	0.00

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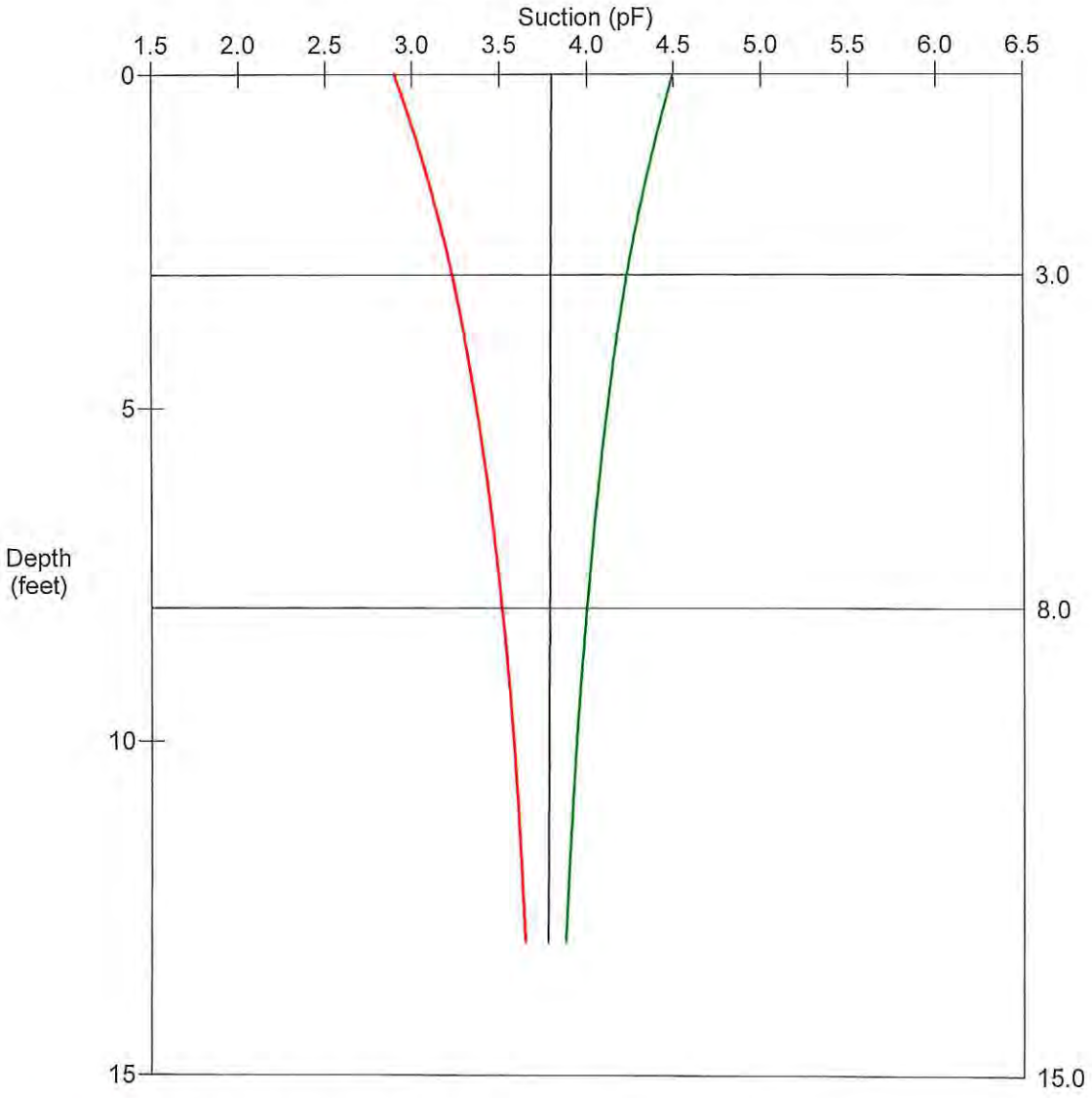
SUCTION PROFILES



Initial suction at edge of slab

Final suction at edge of slab

Constant Suction