Leighton and Associates, Inc.
A LEIGHTON GROUP COMPANY

DEL MAR BLUFFS STABILIZATION
PROJECT 2 – PRESERVING TRACKBED SUPPORT
SUPPLEMENTAL GEOTECHNICAL EVALUATION
AND
DETERMINATION OF SITE SPECIFIC CONCEPTUAL REPAIR ALTERNATIVES

APPENDICES B, C, D AND E

Prepared for:

North County Transit District
810 Mission Avenue
Oceanside, California 92054

Project No. 040151-009

September 15, 2003

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GEOTECHNICAL BORING LOG KEY

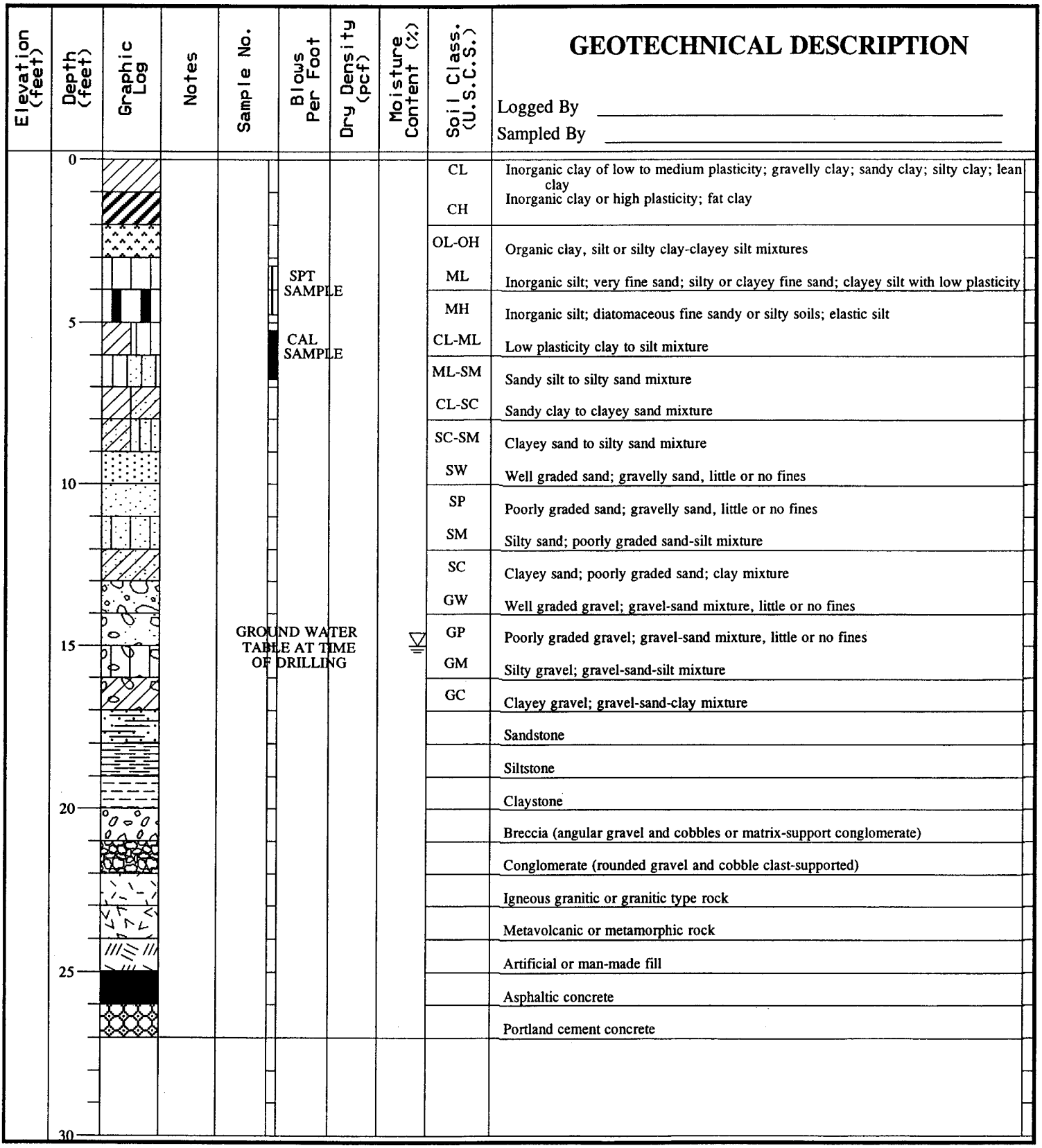
Date _____ Sheet 1 of 1

Project KEY TO BORING LOG GRAPHICS Project No. _____

Drilling Co. _____ Type of Rig _____

Hole Diameter _____ Drive Weight _____ Drop ___ in.

Elevation Top of Hole +/-_____ ft. Ref. or Datum _____



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Boring Logs - Geotechnical Investigation, 10th Street Retaining Wall (April 30, 2002)

GEOTECHNICAL BORING LOG HSA-1

Date 4-11-02 | Sheet 1 of 3
Project Del Mar Bluffs | Project No. 040151-007
Drilling Co. Cal Pac Drilling | Type of Rig Hollow-Stem Auger
Hole Diameter 8 in. | Drive Weight 140 pounds | Drop 30 in.
Elevation Top of Hole +/- 80 ft. | Ref. or Datum Mean Sea Level

Elevation (feet)	Depth (feet)	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
									Logged By GJM Sampled By GJM
80	0			Bag-1 @0'-5'				SM	QUATERNARY BAY POINT FORMATION (Qbp) @ 0': Silty fine to medium SAND: Red-brown, damp to moist, loose
75	5			2	13	106.0	5.2		@ 6': Silty fine to medium SAND: Red-brown, damp to moist, loose
70	10			3	18	111.4	6.3		@ 11': Silty fine to medium SAND: Red-brown, damp to moist, loose
65	15			4	35	113.5	8.9		@ 16': Silty fine to medium SAND: Orange-gray, damp to moist, medium dense
60	20			5	36	109.4	9.4		@ 21': Silty fine to medium SAND: Orange-brown, damp to moist, medium dense
55	25			6	75	119.9	12.0		@ 26': Silty fine to medium SAND: Dark orange-brown with some black grains, damp to moist, dense
50	30								

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GEOTECHNICAL BORING LOG HSA-1

Date 4-11-02 | Sheet 2 of 3

Project Del Mar Bluffs | Project No. 040151-007

Drilling Co. Cal Pac Drilling | Type of Rig Hollow-Stem Auger

Hole Diameter 8 in. | Drive Weight 140 pounds | Drop 30 in.

Elevation Top of Hole +/- 80 ft. | Ref. or Datum Mean Sea Level

Logged By GJM

Sampled By GJM

Elevation (feet)	Depth (feet)	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
50	30			7	50/5"	108.7	19.3	SM	@ 31': Medium to SAND: Light orange-brown, damp to moist, wet, dense to very dense
45	35			8	50/4"	112.8	18.4	CL	
								CL	TERTIARY DEL MAR FORMATION (Td) @ 36': Silty CLAYSTONE: Olive gray-green, damp to moist, dense to very dense
40	40			9 Bag-10 @40'-45	50/5"	114.5	16.0	SM	@ 41': Silty fine SANDSTONE: Green, damp to moist, dense to very dense
35	45			11	60/6"	114.9	12.7		@ 45': Silty fine to medium SANDSTONE: Green-gray green, very dense
30	50			12	55/6"	108.7	15.9	SM/SC	@ 50': Silty fine to medium slightly clayey SANDSTONE: Olive green-gray green, very dense
25	55			13	60/6"	108.0	15.3	CL	@ 55': Silty CLAYSTONE: Gray-green to olive-green, damp to very dense
20	60								

GEOTECHNICAL BORING LOG HSA-1

Date 4-11-02 Sheet 3 of 3
Project Del Mar Bluffs Project No. 040151-007
Drilling Co. Cal Pac Drilling Type of Rig Hollow-Stem Auger
Hole Diameter 8 in. Drive Weight 140 pounds Drop 30 in.
Elevation Top of Hole +/- 80 ft. Ref. or Datum Mean Sea Level

Elevation (feet)	Depth (feet)	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
									Logged By GJM Sampled By GJM
20	60			14	50/5"	101.9	19.2	CL	@ 60': Silty fine to sandy CLAYSTONE: Olive green-gray green, damp to very dense
									Total Depth = 61 Feet Ground water encountered at 29 feet at time of drilling Backfilled with soil cuttings on 4/11/02
15	65								
10	70								
5	75								
0	80								
-5	85								
-10	90								

GEOTECHNICAL BORING LOG HSA-2

Date 4-11-02 | Sheet 1 of 2

Project Del Mar Bluffs | Project No. 040151-007

Drilling Co. Cal Pac Drilling | Type of Rig Hollow-Stem Auger

Hole Diameter 8 in. | Drive Weight 140 pounds | Drop 30 in.

Elevation Top of Hole +/- 73 ft. | Ref. or Datum Mean Sea Level

Logged By GJM

Sampled By GJM

Elevation (feet)	Depth (feet)	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
	0							SM	ARTIFICIAL FILL (Af) @ 0': Silty fine to medium SAND: Brown, red-brown, damp to loose
70								SM	QUATERNARY BAY POINT FORMATION (Qbp)
	5			1	28	112.2	4.3		@ 6': Silty fine to medium SAND: Orange-brown to red-brown, damp to moist, medium dense
65									
	10			2	21	103.3	7.4		@ 11': Silty fine to medium SAND: Orange-brown to red-brown, damp to moist, medium dense
60									
	15			3	42	102.0	3.0		@ 16': Silty fine to medium SAND: Gray to orange-gray, damp to moist, medium dense
55									
	20			4	50/5"	122.3	10.2		@ 21': Silty fine to medium SAND: Dark orange-brown with some black grains, damp to moist, dense to very dense
50									
	25			5	80	107.9	20.0 ▽		@ 26': Medium to coarse SAND: Light gray to light orange-gray, wet to saturated, dense
45									
	30							SM	TERTIARY DEL MAR FORMATION (Td)

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GEOTECHNICAL BORING LOG HSA-2

Date 4-11-02 | Sheet 2 of 2

Project Del Mar Bluffs | Project No. 040151-007

Drilling Co. Cal Pac Drilling | Type of Rig Hollow-Stem Auger

Hole Diameter 8 in. | Drive Weight 140 pounds | Drop 30 in.

Elevation Top of Hole +/- 73 ft. | Ref. or Datum Mean Sea Level

Logged By GJM

Sampled By GJM

Elevation (feet)	Depth (feet)	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
	30			6	60/6"	106.8	15.6	SM	@ 31': Silty fine to medium SANDSTONE: Light gray, yellow-gray, damp to moist, medium dense
40									
	35			7	50/5"	104.4	20.5		@ 35': Medium to coarse SANDSTONE: Light gray to light yellow-gray, moist to wet, very dense
35									
	40								
30									
	45			8	50/6"	111.5	14.9	CL	@ 45': CLAYSTONE: Olive-green, damp to very stiff
25									
	50								
20									
	55				50/4"	116.5	15.8		@ 55': CLAYSTONE: Olive-green, damp to very stiff (little sample recovery)
15	60								Total Depth = 56 Feet Ground water encountered at 26 feet at time of drilling Backfilled with soil cuttings on 4/11/02

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Boring Logs – Supplemental Geotechnical Investigation, Project 1 - Drainage Improvement and Landslide Warning System (October 26, 2001)

GEOTECHNICAL BORING LOG LB-7

Date 8-28-01 Sheet 1 of 2
Project Del Mar Bluffs Project No. 040151-001
Drilling Co. San Diego Drilling Company Type of Rig Bucket Auger
Hole Diameter 30 Drive Weight ____ Drop ____ in
Elevation Top of Hole 53 ft. Ref. or Datum Mean Sea Level

Logged By GJM/MRS
Sampled By ____

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
0							SM	QUATERNARY TERRACE DEPOSITS (Qbp) @ 0': Reddish brown, fine to medium damp silty SAND (shear pin exposed in east side of boring to a depth of 14 feet)
5							SM/SC	@ 5': Mottled gray and reddish brown, fine to medium, moist, slightly clayey SAND
							SM/SW	@ 7': Gradation change to reddish brown, medium, very moist SAND, no clay; friable, horizontal
		standing water after 24 hours						
10							SW	@ 9.5': Gravel lag with 1/2"-2" pebbles and cobbles
							SM	@ 10': Sharp sloping contact to light and dark gray silty SAND on east side with inclusions and fractures (infilled) with very light gray clayey silt, contact appears erosional
		C:N/S 5W				50		@ 11.5': 2" thick layer of medium to coarse SAND with moderate to heavy seepage
							SM	TERTIARY DEL MAR FORMATION (Td) @ 12': Gray-green, fine silty SANDSTONE, very dense, unfractured, scattered inclusions of dark gray to black sandstone, orientated out of slope 4-5' west
							SM	@ 13': Yellow-brown, damp, very dense, silty SANDSTONE
15		B:horizontal					SM	@ 15': Becomes gray, slightly coarser SANDSTONE
		B:horizontal						
							SM/CL	@ 19': Interbedded dark gray CLAYSTONE, very hard, slightly fractured and orange-brown to gray, damp, silty SANDSTONE
20		C:horizontal						
							CL	@ 21': Sharp contact to gray-green CLAYSTONE, fractured, very hard
							CL	@ 24': Light gray to olive-green CLAYSTONE
25								
30								

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GEOTECHNICAL BORING LOG LB-7

Date 8-28-01 | Sheet 2 of 2
Project Del Mar Bluffs | Project No. 040151-001
Drilling Co. San Diego Drilling Company | Type of Rig Bucket Auger
Hole Diameter 30 | Drive Weight _____ Drop ___ in.
Elevation Top of Hole 53 ft. | Ref. or Datum Mean Sea Level

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
30								Logged By GJM/MRS Sampled By _____
								Total Depth = 30 Feet Downhole Logged to 24 Feet - Water at 27 feet 1 hour after drilling Moderate to Heavy Seepage at 11.5 Feet Backfilled with 2-sack cement slurry: 8/29/01 to within +/-5 feet of grade. Top of boring backfilled with soil. Water level after 24 hours was at a depth of 8 to 10 feet below surface.
35								
40								
45								
50								
55								
60								

GEOTECHNICAL BORING LOG LB-8

Date 8-29-01 | Sheet 1 of 2

Project Del Mar Bluffs | Project No. 040151-001

Drilling Co. San Diego Drilling Company | Type of Rig Bucket Auger

Hole Diameter 30 | Drive Weight ____ | Drop ____ in.

Elevation Top of Hole 47 ft. | Ref. or Datum Mean Sea Level

Logged By GJM/MRS

Sampled By ____

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
0							SM	ARTIFICIAL FILL (Af) @ 0': Brown, dark reddish brown, fine to medium silty SAND, damp to moist, medium dense to dense; some gravels
							SM/SW	QUATERNARY TERRACE DEPOSITS (Qt) @ 2': Sharp contact orange-reddish brown, medium SAND, damp, medium dense; friable, some gravels
5							SM	@ 6': Grades to orange-brown, fine to medium silty clayey SAND, mottled gray and orange-brown, damp, medium dense to dense
							SM	@ 8.5'-9': Yellow-brown, fine silty clayey SAND, damp, medium dense
10							SM	@ 13': Reddish orange-brown, medium SAND, very moist to wet, medium dense, light seepage
		C:N30E 30W					SM	TERTIARY DEL MAR FORMATION (Td) @ 14': Sharp contact, yellow-brown, fine to medium silty SANDSTONE, damp, dense
15							SM	@ 17': Grades to light gray, light yellow, fine to medium silty SANDSTONE, damp, dense
20							SM	@ 20': Grades into light gray, medium to coarse silty SANDSTONE, damp to moist, dense @ 21': Slightly coarser
								@ 22': Moderate to heavy seepage @ 22.5': Inclusions of claystone to 4"
							SM	@ 23': Grades to orange-brown SANDSTONE, dense
		F:horizontal					CL	@ 24': Irregular erosional contact, gray clayey SAND
25		F:N60W 20N F:N40W 25N					CL	@ 25': Irregular contact, greenish CLAYSTONE, fractured, polished surfaces randomly orientated; several steeply dipping fractures continuous around hole
							SM	@ 28': Gray-green silty SANDSTONE, fractured, becomes less fractured, very hard
30								

GEOTECHNICAL BORING LOG LB-8

Date 8-29-01 Sheet 2 of 2
Project Del Mar Bluffs Project No. 040151-001
Drilling Co. San Diego Drilling Company Type of Rig Bucket Auger
Hole Diameter 30 Drive Weight ____ Drop ____ in.
Elevation Top of Hole 47 ft. Ref. or Datum Mean Sea Level

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
30		F:N40W 20N					SM	@ 31': Olive-green, dark gray mottled, damp, very dense clay SANDSTONE
35								
40								
45								
50								Total Depth = 50 Feet Downhole Logged to 36 Feet - Standing water at 33 feet, 1 hour after drilling Moderate to Heavy Seepage at 13 and 24 feet Backfilled: 8/29/01
55								
60								

Logged By GJM/MRS
Sampled By

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GEOTECHNICAL BORING LOG LB-9

Date 8-29-01 | Sheet 1 of 2

Project Del Mar Bluffs | Project No. 040151-001

Drilling Co. San Diego Drilling Company | Type of Rig Bucket Auger

Hole Diameter 30 | Drive Weight _____ Drop ___ in.

Elevation Top of Hole 70 ft. | Ref. or Datum Mean Sea Level

Logged By GJM

Sampled By _____

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
0								@ 0-3": Asphalt Concrete
								QUATERNARY TERRACE DEPOSITS (Qt)
							SM	@ .5': Orange brown, fine to medium silty SAND, damp, dense
5							SM/SC	@ 6': Grades to reddish brown-gray brown, fine to medium clayey SAND, damp, dense, mottled
							SM	@ 8': Orange brown-gray, mottled, fine to medium silty SAND, damp to moist, dense
10								@ 11': Same as above
							SM	@ 12': Grades to light gray to gray, fine to medium silty SAND, damp, dense; friable
15							SM	@ 15': Grades to orange-brown, fine to medium silty SAND, damp, dense; mottled, orange-brown to gray-brown
20							SM	@ 21': Grades to orange-brown to yellow-brown, thinly laminated SAND, moist, dense; friable
							SM/SW	@ 22': Grades to yellow-brown, medium to coarse SAND, wet to saturated, dense; some gravels, moderate to heavy seepage
							SM	TERTIARY DEL MAR FORMATION (Td)
25								@ 23': Sharp wavy erosional contact, yellow-brown, fine to medium silty SANDSTONE, damp to wet, dense, fractured
							CL	@ 26': Irregular contact, greenish CLAYSTONE, hard, fractured
30								@ 29': Seepage from fracture

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GEOTECHNICAL BORING LOG LB-9

Date 8-29-01 Sheet 2 of 2
Project Del Mar Bluffs Project No. 040151-001
Drilling Co. San Diego Drilling Company Type of Rig Bucket Auger
Hole Diameter 30 Drive Weight ____ Drop ___ in.
Elevation Top of Hole 70 ft. Ref. or Datum Mean Sea Level

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
30								Logged By GJM Sampled By
35								
40								
45								
50								
55								Total Depth = 55 Feet Downhole Logged to 29 Feet Heavy Seepage at 23 Feet and 29 Feet, Standing water at 30 Feet 1 hour after drilling Backfilled: 8/30/01
60								

GEOTECHNICAL BORING LOG S.PIN#6

Date 6-13-01 | Sheet 1 of 2

Project Del Mar Bluff | Project No. 040151-004

Drilling Co. San Diego Drilling Company | Type of Rig E-120

Hole Diameter 36 | Drive Weight N/A | Drop -- in.

Elevation Top of Hole 62 ft. | Ref. or Datum See Geotechnical Map

Logged By KBC

Sampled By --

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
0								Steel casing from 0-10'
10		x-bedding sw dipping					SM	TERTIARY DEL MAR FORMATION (Td) @ 10'-15': Silty medium SANDSTONE: Yellow-brown, damp, dense to very dense; cross-bedding common dipping southwesterly Note: heavy seepage emitting from cased area, at approximately 10 feet
15		c: horizontal					CL	@ 15': Sharp, horizontal contact to fine sandy CLAYSTONE: Olive-gray, damp, hard
20								
		c: horizontal					SM	@ 23': Silty fine to medium SANDSTONE: Greenish gray, damp, dense to very dense
25								@ 27.3'-28': White cemented SANDSTONE concretionary layer: very dense @ 28': Silty fine to medium SANDSTONE: Dark gray, damp, dense to very dense; scattered black peat? lenses; few +/-6" diameter concretion nodules
30								

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GEOTECHNICAL BORING LOG S.PIN#6

Date 6-13-01 | Sheet 2 of 2

Project Del Mar Bluff | Project No. 040151-004

Drilling Co. San Diego Drilling Company | Type of Rig E-120

Hole Diameter 36 | Drive Weight N/A | Drop -- in.

Elevation Top of Hole 62 ft. | Ref. or Datum See Geotechnical Map

Logged By KBC

Sampled By --

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
30							CL	TERTIARY DEL MAR FORMATION (Continued) @ 30'-33': Silty sandy CLAYSTONE to clayey SANDSTONE: Olive-green, damp, hard to very dense
		c: horizontal						@ 33'-39': Approximately horizontal contact to fine sandy CLAYSTONE: Olive-green, damp, stiff to very stiff; upper 6" is tectonically sheared
35								
		c: horizontal						@ 39'-42': Approximately horizontal contact to sandy CLAYSTONE: Olive-green, damp, hard
40		c: horizontal						@ 42'-47': Approximately horizontal contact to fine sandy CLAYSTONE: Olive-green, damp, hard
45								
		c: horizontal					SC	@ 47'-49': Approximately horizontal contact to clayey SANDSTONE: Gray-green with rose-brown mottles commom, damp, dense
		c: horizontal						@ 49'-52': Approximately horizontal contact to clayey SANDSTONE: Dark gray, damp, dense to very dense
50								
		c: horizontal						@ 52'-54': Clayey SANDSTONE: Olive-green, damp, dense to very dense
		c: horizontal					SM	@ 54': Silty fine to medium SANDSTONE: light gray, damp, medium dense to dense; moderately friable
55								
								Total Depth = 57 Feet Cased from 0-10 feet; downhole logged to 55 feet Ground water seepage encountered at 10 feet at time of drilling Concrete and steel shear pin placed 6/14/01
60								

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Boring Logs – Del Mar Bluffs Geotechnical Study (January 31, 2001)

BORING LOGS FROM CURRENT INVESTIGATION

GEOTECHNICAL BORING LOG LB-1

Date 6-13-00 Sheet 1 of 3

Project HDR/Del Mar Project No. 040151-001

Drilling Co. San Diego Drilling Type of Rig E-120 Bucket

Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841#, 60'-90' 2,446# Drop 12 in.

Elevation Top of Hole 63 ft. Ref. or Datum See Map

Logged By KTS/RKW

Sampled By KTS

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
0								BAYPOINT FORMATION (Qbp)
								@ 0'-5': Light brown, mottled with reddish brown, moist to wet, medium dense, fine to medium SAND with few cobbles; caving, weakly cemented
			Bag-1 @2'-4'				SM	
5							ML	@ 5': Seepage at base of Baypoint Formation, very active
								DELMAR FORMATION (Td)
								@ 5': Light olive-gray, moist, slightly stiff, SILTSTONE
							SM-ML	@ 7': Blue-gray, very damp, slightly stiff to stiff, fine to medium sandy SILTSTONE
			Bag-2 @8'-10'					
							SM	@ 8.5': Blue-gray, very damp, stiff, silty CLAYSTONE; fractured; approximately 1/2' thick interbedded with gray medium SANDSTONE with subhorizontal laminations below
10			R-1	Push/8" 5/4"				@ 10': Bluish gray, damp, stiff to very stiff, silty CLAYSTONE
							ML/CL	@ 10.5': Silty CLAYSTONE becomes SILTSTONE
15								
							SM/ML	@ 19': Change in material to dark gray, very damp, dense, silty fine to medium SAND, interbedded with SILTSTONE between 19' and 20'
20			R-2	10			SM	@ 20'-23.5': Light maroon gray, very moist to wet at base, medium dense, medium SANDSTONE; thin clay lenses, subhorizontal laminations
			Bag-3 @21'-23'					@ 20': Light gray, moist, medium dense, silty fine to medium SANDSTONE; grades to slightly coarser sand at tip
								@ 21'-23': Material same as Sample R-2
								@ 23.5'-24.5': Interbed of dark gray, very damp, very stiff to hard, silty CLAYSTONE; 1' thick, subhorizontal contacts
25							ML/CL	@ 24.5'-26.5': Material same as between 20'-23.5' sand coarsens to base of unit, moisture increases to minor seepage at base. Rip-up clasts of blue-gray SILTSTONE within SANDSTONE
								@ 26': Blue-gray, very damp, slightly stiff, silty CLAYSTONE
							ML	@ 29'-33.5': Light blue/green-gray, damp, hard, very fine sandy SILTSTONE grades to coarse sandy SILTSTONE; iron-oxide mottled
30								

GEOTECHNICAL BORING LOG LB-1

Date 6-13-00 Sheet 2 of 3

Project HDR/Del Mar Project No. 040151-001

Drilling Co. San Diego Drilling Type of Rig E-120 Bucket

Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841#, 60'-90' 2,446# Drop 12 in.

Elevation Top of Hole 63 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KTS/RKW Sampled By KTS
30			R-3	14			ML-SM	@ 32': Light blue gray, very damp to slightly moist, stiff/dense, fine SANDSTONE
								@ 33.5': Planar subhorizontal contact to blue-gray silty CLAYSTONE, fractured, iron-oxide on surfaces, few waxy surfaces, spalling material, possible minor seepage from fractures
35								@ 37': Localized cemented zones
40			R-4	6	110.1	16.6	ML	@ 40': Dark blue-gray, damp, stiff to very stiff, clayey SILTSTONE
								@ 41.5': Increased cementation, mottled yellow and red-brown, oxide staining
								@ 42.5': Blue-gray to dark blue-gray, damp, hard/very dense, very fine sandy SILTSTONE, moderately cemented, reddish oxide staining
45								@ 47'-61': Light gray to dark blue gray, damp, very stiff, clayey SILTSTONE; fractured, lacks continuation
50			R-5	9	110.2	17.0	ML-SM	@ 50': Dark blue-gray, damp, stiff to very stiff, clayey SILTSTONE; massive
55								
60								

GEOTECHNICAL BORING LOG LB-1

Date 6-13-00 Sheet 3 of 3

Project HDR/Del Mar Project No. 040151-001

Drilling Co. San Diego Drilling Type of Rig E-120 Bucket

Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841#, 60'-90' 2,446# Drop 12 in.

Elevation Top of Hole 63 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KTS/RKW Sampled By KTS
60			R-6	28			ML-SM	@ 60': Light blue-gray, damp to very damp, stiff to very stiff, fine SANDSTONE
			Bag-4 @61'-63'				SM	@ 61': Light brown, medium SANDSTONE with subhorizontal laminations
								@ 62.5': Blue gray to dark blue-gray, damp, hard/very dense, very fine sandy SILTSTONE; moderately cemented
65							CL	@ 65': Light blue-gray, damp, hard silty CLAYSTONE; a few waxy, polished, fractured, surfaces; randomly oriented (Logged to 65')
							ML	
70			R-7	18	111.7	17.3		@ 70': Light blue gray, slightly damp, very stiff to slightly hard, clayey SILTSTONE; massive
								Total Depth = 70 Feet Backfilled/tamped 6/13/00 Upper 5 Feet slurry cap Active seepage at 5 Feet
75								
80								
85								
90								

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LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG LB-2

Date 6-14-00 | Sheet 1 of 3

Project HDR/Del Mar | Project No. 040151-001

Drilling Co. San Diego Drilling | Type of Rig E-120 Bucket

Hole Diameter 24 in. | Drive Weight 0'-30' 4,991#, 30'-60' 3,841# | Drop 12 in.

Elevation Top of Hole 58 ft. | Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KTS/MRS Sampled By KTS
0							SM	BAYPOINT FORMATION (Qbp) @ 0'-1-1/2': Light brown, very dry, loose, SAND @ 1-1/2': Reddish brown and blue-gray, mottled, very damp to moist, loose to slightly dense, silty SAND
			Bag-1 @3'-5'					
5			R-1				SM	@ 5': Reddish brown, very moist to wet, loose to slightly dense, clayey fine to medium SAND, weakly cemented
							SM	@ 9': Grade to light reddish brown, very moist to wet, loose to slightly dense, very fine to medium SAND, with SILT
10								
							SM	@ 14'-15': Contact at base of Baypoint Formation is extremely undulatory, black staining, scoured/rip-ups of Td in Qbp DELMAR FORMATION (Td) @ 14'-28': Yellow, moist to wet at base, stiff, grades to very dense, silty, very fine SANDSTONE; grades to silty coarse SANDSTONE; seepage at base
15								
20			Bag-2 @20'-22'					@ 20'-22': Light yellow, moist, slightly dense to dense, silty fine to medium SANDSTONE
		GB:N85E, 10N	R-2	8				@ 22': Light yellow, wet, dense, silty fine to coarse SANDSTONE; massive @ 23': General bedding attitude on 4" thick lense of dark brown SAND
25		GB:N10E, 9N						@ 26': Pebbly sand lense, 2" thick, heavy free-flowing seepage, general bedding attitude on faint subhorizontal laminations
							ML/CL	@ 28': Slightly undulatory, irregular erosional contact with iron-oxide along contact, material below is gray-brown, damp, stiff, silty CLAYSTONE; iron-oxide, joints, moderately fractured
30								

GEOTECHNICAL BORING LOG LB-2

Date 6-14-00 Sheet 2 of 3

Project HDR/Del Mar Project No. 040151-001

Drilling Co. San Diego Drilling Type of Rig E-120 Bucket

Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841# Drop 12 in.

Elevation Top of Hole 58 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
								Logged By KTS/MRS Sampled By KTS
30							ML	@ 30': Blue-gray, moist, stiff to very stiff, clayey SILTSTONE and siltstone; zones weak of cementation in SILTSTONE material
			Bag-3 @32'-34'					@ 32': Iron-oxide mottling (similar to staining above resistant beds seen in neighboring boreholes)
35								@ 35': Material becomes very hard and competent, cemented
		J:N60W, 33N					SM-ML	@ 39': Material change to blue-gray, very damp, very stiff to hard, clayey SILTSTONE to siltstone; randomly, fractured with waxy polished surfaces, non planar, slightly random, weakly cemented
40		J:N10E, 20S						@ 40': Generalized joint/fracture attitudes, decrease in fractures below, more competent
		J:N55W, 42S						
45			R-3	9				@ 45': Blue-gray, damp, stiff to very stiff, SILTSTONE with clay; massive
50								Downhole logged to 50'
						▽		All tailings to T.D. are blue-gray clays and silts with iron-oxide bands, and extremely wet due to seepage above
55								
60								

GEOTECHNICAL BORING LOG LB-2

Date 6-14-00 Sheet 3 of 3

Project HDR/Del Mar Project No. 040151-001

Drilling Co. San Diego Drilling Type of Rig E-120 Bucket

Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841# Drop 12 in.

Elevation Top of Hole 58 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
60								Logged By KTS/MRS Sampled By KTS Total Depth = 60 Feet Backfilled and tamped 6/14/00 5 feet slurry cap Water at 27 feet; standing water at 53 feet at time of backfill
65								
70								
75								
80								
85								
90								

GEOTECHNICAL BORING LOG LB-3

Date 6-14-00 | Sheet 1 of 3

Project HDR/Del Mar | Project No. 040151-001

Drilling Co. San Diego Drilling | Type of Rig E-120 Bucket

Hole Diameter 24 in. | Drive Weight 0'-30' 4,991#, 30'-60' 3,841# | Drop 12 in.

Elevation Top of Hole 59 ft. | Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KTS/MRS Sampled By KTS
0							SM	BAYPOINT FORMATION (Qbp) @ 0'-10': Reddish brown, damp to wet at base, slightly dense, clayey medium SAND grades to silty medium to coarse sand at base; seepage at base, boring is belling
5			R-1	Push	103.0	12.0	SM-SC	@ 5': Reddish brown, very moist to wet, loose to slightly dense, clayey SAND; lacks cementation
		CS:N50E, 14N						@ 9'-10': Zone of generally undulatory contact, rip-ups of Td within Qbp (8" diameter, dark brown, rip-up 1' above contact), few cobbles, dark brown staining
10							ML	@ 10': Clay seam attitude, paper thin, along contact DELMAR FORMATION (Td)
		J:N65W, 35S						@ 9.5'-10.5': Light yellow, very moist to wet, slightly stiff, SILTSTONE; very weakly cemented, mottled iron-oxide
		J:E-W, vertical						@ 10.5': Material change to green/blue-gray, very damp, soft to slightly stiff, silty CLAYSTONE; randomly oriented fractures, polished, waxy surfaces, iron-oxide on surfaces, seepage between fractures, material spalling, joint attitudes
15								@ 13.5': Gradual change to gray, damp, stiff, SILTSTONE
		J:N60W, 14S						
		S:N70E-60W, 25-35N					ML-CL	@ 18': Zone of CLAYSTONE with shears (remolded clay surfaces along similar orientation), iron-oxide on surfaces around portion of hole only, moisture in fractures, purple-brown staining (mottled), shear attitude, joint attitude
20		J:N34E, 38S					ML	@ 20': Blue-gray and yellowish gray, mottled SILTSTONE
		C:horizontal						@ 22': Horizontal contact to reddish brown, silty SAND, lenses of light sand at 25' and 27', 2" and 6" thick, respectively
25			R-2	8	117.4	11.5	ML-SM	@ 25': Blue-gray, damp, stiff to very stiff, SILTSTONE with very fine SAND; massive, weak to moderately cemented
								@ 26': Blue-green gray, damp, very stiff, silty CLAYSTONE; short, random non-planar; waxy fractures
		GB:N30E, 5N					SM	@ 28': General bedding attitude, blue-gray silty fine to medium SANDSTONE; 8" thick with dark green laminations
30							ML-CL	@ 29': Blue/green-gray very fine sandy SILTSTONE, grades to silty CLAYSTONE; randomly fractured with waxy, polished surfaces,

GEOTECHNICAL BORING LOG LB-3

Date 6-14-00 Sheet 2 of 3

Project HDR/Del Mar Project No. 040151-001

Drilling Co. San Diego Drilling Type of Rig E-120 Bucket

Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841# Drop 12 in.

Elevation Top of Hole 59 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KTS/MRS Sampled By KTS
30								iron-oxide, reddish mottled staining to 32.5'
							ML-SM	@ 32.5': Light blue-gray, moist to wet, hard, SILTSTONE; moderately cemented, dark blue streaks and random, discontinuous polished surfaces
35							ML	@ 36': Light blue-gray, moist, very stiff clayey SILTSTONE; iron oxide and waxy polished surfaces, short, randomly oriented fractures
							ML-CL	@ 38'-46': Blue-gray, very damp (to wet in fractures), very stiff to hard, SILTSTONE and silty CLAYSTONE, zones of random, waxy polished surfaces in clayier material, reddish brown mottled staining
40								
							SC	@ 44': Lense of sandy CLAYSTONE
45			R-3	12	124.7	9.8		@ 45': Blue-gray, damp, very stiff, fine SANDSTONE, minor iron-oxide mottling, weakly cemented
							SC-CL	@ 46': Blue-gray, very damp, stiff, CLAYSTONE, fractures with waxy, polished surfaces, iron-oxide
							SM	@ 47.5': Gray grades to blue/green-gray, moist to wet, dense to very dense, fine grades to coarse SANDSTONE; massive, weakly cemented
50								
							CL	@ 52': Dark gray silty CLAYSTONE, 7" thick, weakly cemented
							SM	@ 53': Brown, damp, slightly dense, fine to coarse SANDSTONE; non-planar, subhorizontal contacts
55							ML-CL	@ 54.5': Blue-gray, silty CLAYSTONE; waxy, polished fractures
							ML-SM	@ 56.5'-65': Gray and brown, mottled, damp, very stiff, sandy SILTSTONE; weakly cemented
60								

GEOTECHNICAL BORING LOG LB-3

Date 6-14-00 Sheet 3 of 3

Project HDR/Del Mar Project No. 040151-001

Drilling Co. San Diego Drilling Type of Rig E-120 Bucket

Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841# Drop 12 in.

Elevation Top of Hole 59 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
60								Logged By KTS/MRS Sampled By KTS
65			R-4	23	123.4	11.0		@ 65': Dark gray, dry to damp, hard, very fine SANDSTONE, moderately cemented
								Total Depth = 65 Feet Backfilled and Tamped 6/15/00 5 feet slurry cap Ground water encountered at 10, 12, 20, and 52 feet at time of drilling
70								
75								
80								
85								
90								

GEOTECHNICAL BORING LOG LB-4

Date 6-14-00 Sheet 1 of 3

Project HDR/Del Mar Project No. 040151-001

Drilling Co. San Diego Drilling Type of Rig E-120 Bucket

Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841#, 60'-90' 2,446# Drop 12 in.

Elevation Top of Hole 64 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KTS/MRS Sampled By KTS
0							SM-SC	BAYPOINT FORMATION (Qbp) @ 0'-14': Reddish brown, moist to wet at base, loose to slightly dense, SAND with CLAY; seepage at base
5								
10							SM	@ 12'-14': Moderate to active seepage and minor belling
15							SC-SM	DELMAR FORMATION (Td) @ 14'-64': Light yellowish gray, wet at top to moist with depth, soft at top grades to stiff, very fine sandy CLAY, grades to clayey, very fine SANDSTONE
							CL	@ 16': Light greenish gray; moist to wet (from fractures), slightly stiff, silty CLAYSTONE; randomly fractured, iron-oxide
							ML	@ 18': Material becomes cemented, yellowish gray, damp, hard SILTSTONE, mottled iron-oxide, lacks fractures
								@ 19'-20': Yellow-gray, wet, very dense, silty fine to medium SILTSTONE
20			R-1	6				@ 20': Blue-gray, damp, hard, clayey SILTSTONE; massive, moderately cemented, minor iron-oxide
								@ 20'-22': Mottled blue-gray CLAYSTONE and yellow-gray SANDSTONE; sheared zone (non-continuous), non-planar features, iron-oxide on surfaces, seepage from fractures
								@ 22'-25': Yellow-gray, moist to wet at base, dense, silty fine to medium SANDSTONE; weakly cemented, lense of dark gray clay, 2" thick, iron-oxide banding
							SM-ML	
25		J/S:N27W-40W, 32-40S J/S:N45W, 42N					CL	@ 25'-26.5': Greenish gray, very damp to moist, slightly stiff, CLAYSTONE; waxy, polished fractures with iron-oxide joint/shear attitudes on non-continuous features
		GB:N55W, 23S					SM	@ 26.5': Light gray, grades to blue-gray, moist to wet, very dense, very fine sandy SILTSTONE, cemented, general bedding attitude on yellow silt bed, lacks cementation, planar feature
30								

GEOTECHNICAL BORING LOG LB-4

Date 6-14-00 Sheet 2 of 3

Project HDR/Del Mar Project No. 040151-001

Drilling Co. San Diego Drilling Type of Rig E-120 Bucket

Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841#, 60'-90' 2,446# Drop 12 in.

Elevation Top of Hole 64 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KTS/MRS Sampled By KTS
30							CL-ML	@ 30': Clay lense in above unit, then coarse SAND at base of unit
		J:N45E, 35N						@ 31': Blue-gray CLAYSTONE with polished waxy surfaces, some iron-oxide, joint attitude, lacks visible voids
								@ 34': Mottled zones of increased SILT content and partial cementation
35								
		S:N62E, 31S						@ 36': Shear attitude on non-continuous, polished surface
							ML	@ 37'-40': Blue-gray, wet, very dense, SILTSTONE; weakly cemented
40			R-2	8	110.5	18.0		@ 40': Dark blue-gray and mottled reddish staining, damp, hard, CLAYSTONE and silty claystone; random waxy fracture, moderately cemented
								@ 42': Cemented SILTSTONE bed with reddish staining
							ML-CL	@ 44': Slightly fractured CLAYSTONE with polished non-planar surfaces, very weakly cemented
45								
		J:N20W, 65N						@ 46': Gray, moist to wet, very stiff to hard SILTSTONE; few joints with faint, non-continuous, polished surfaces, attitudes
		J:N20W, 77N						
50								
								@ 51': Color changes to light blue-gray
		S:N70W, 5-35S					CL	@ 52': Shear attitude, continuous around hole but 1/2 steepens, irregular paper-thin CLAY, fainty polished
55								
							ML-SM	@ 57': Blue-gray, moist, dense/hard, very fine sandy SILTSTONE; weakly to moderately cemented
								(Downhole logged to 59 feet)
60								

GEOTECHNICAL BORING LOG LB-4

Date 6-14-00 Sheet 3 of 3

Project HDR/Del Mar Project No. 040151-001

Drilling Co. San Diego Drilling Type of Rig E-120 Bucket

Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841#, 60'-90' 2,446# Drop 12 in.

Elevation Top of Hole 64 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
								Logged By KTS/MRS Sampled By KTS
60			R-3	20	112.7	16.4		@ 60': Blue-gray, damp, very stiff, silty CLAYSTONE
65								Total Depth = 64 Feet Backfilled and tamped 6/15/00 5 feet slurry cap Ground water encountered at 12 and 20 feet at time of drilling
70								
75								
80								
85								
90								

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LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG LB-5

Date 6-16-00 Sheet 1 of 3

Project HDR/Del Mar Project No. 040151-001

Drilling Co. San Diego Drilling Type of Rig E-120 Bucket

Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841# Drop 12 in.

Elevation Top of Hole 55 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KTS/MRS Sampled By KTS
0							SM	BAYPOINT FORMATION (Qbp) @ 0'-3.5': Reddish brown, moist (at base), loose to slightly dense, fine to medium SANDSTONE
		C:N40W, 4N					ML-SM	@ 3.5': Contact attitude, generalized non-planar, undulatory, rip-ups of clay in sandstone, light seepage
5								DELMAR FORMATION (Td) @ 3.5': Yellow-orange, very damp to slightly moist, stiff, silty very fine SANDSTONE (grades to silty medium to coarse sandy SILTSTONE), iron-oxide bands
		C:N7W, 6S						@ 6': Blue gray, damp, stiff to very stiff with depth, very fine sandy CLAYSTONE/SILTSTONE (zones); cementation increases with depth, very short, non-planar fractures, decrease at 10', iron-oxide in upper portions
10								
15								@ 14': Light brown, moist to wet, dense, very fine to medium SANDSTONE lense, subhorizontal, grades to material above
								@ 16': Dark blue-gray, very damp, stiff to very stiff, silty CLAYSTONE, few polished fracture surfaces, randomly oriented
		CS:N45E, 1N					ML-CL	@ 17.5': Clay seam attitude, paper thin clay seam, gently undulatory, material below is mottled (rip-ups?), dark gray CLAYSTONE and light gray, fine to medium SILTSTONE; very stiff
20								@ 19.5': Interbedded blue-gray, fine to coarse SILTSTONE; wet (light seepage), dense to very dense (slightly cemented at base)
							CL-ML	@ 20.5': Blue-gray, damp, very stiff to hard, silty CLAYSTONE and claystone; moderately fractured with polished, popouts (non-planar, short), zones of weak cementation
25								
		J/S:N10W, 37S						@ 28': Joint or shear attitude on non-continuous planar, polished surface within CLAYSTONE, black rootlet staining
30								

GEOTECHNICAL BORING LOG LB-5

Date 6-16-00 Sheet 2 of 3

Project HDR/Del Mar Project No. 040151-001

Drilling Co. San Diego Drilling Type of Rig E-120 Bucket

Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841# Drop 12 in.

Elevation Top of Hole 55 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KTS/MRS Sampled By KTS
30								
								@ 34': Moist zone, lacks continuation below, light seepage
35							ML	@ 35': Paleo-root, black charcoal branch, material below is blue-gray, very damp, slightly stiff, sandy SILTSTONE; massive
								@ 39': Dark gray lense of SILTSTONE with charcoal pieces
40								@ 40': 4" sand lense then organic banded interbedded very fine SAND and CLAY, some charcoal pods, subhorizontal, minor seepage
							ML-SM	@ 41.5'-44.5': Blue-gray, moist to wet at base, stiff, SILTSTONE, grades to very fine sandy SILTSTONE; zones of cementation, seepage
45							SM	@ 44.5'-45.5': Zone similar to 40'; organized banded lenses of SANDSTONE; slightly moist
							ML-SM	@ 45.5': Blue/green, slightly damp, stiff, sandy SILTSTONE
								@ 48.5': Blue-gray, damp, slightly stiff CLAYSTONE; iron-oxide fractures, waxy, polished surface, randomly oriented
50								@ 49': Blue/green, slightly damp, stiff, SILTSTONE
								@ 51.5': Blue-green gray, damp, stiff to hard, silty CLAYSTONE; few waxy fractures with iron-oxide, cemented
55								
60								

GEOTECHNICAL BORING LOG LB-5

Date 6-16-00 | Sheet 3 of 3

Project HDR/Del Mar | Project No. 040151-001

Drilling Co. San Diego Drilling | Type of Rig E-120 Bucket

Hole Diameter 24 in. | Drive Weight 0'-30' 4,991#, 30'-60' 3,841# | Drop 12 in.

Elevation Top of Hole 55 ft. | Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
60								Logged By KTS/MRS Sampled By KTS Total Depth = 60 Feet Backfilled and tamped 6/16/00 5 feet slurry cap Ground water encountered at 20, 34, 44 feet at time of drilling
65								
70								
75								
80								
85								
90								

GEOTECHNICAL BORING LOG LB-6

Date 6-19-00 | Sheet 1 of 3

Project HDR/Del Mar | Project No. 040151-001

Drilling Co. San Diego Drilling | Type of Rig E-120 Bucket

Hole Diameter 24 in. | Drive Weight 0'-30' 4,991#, 30'-60' 3,841#, | Drop 12 in.

Elevation Top of Hole 51 ft. | Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
								Logged By KTS/MRS Sampled By KTS
0							SM-SC	BAYPOINT FORMATION (Qbp) @ 0'-2': Reddish brown, damp, slightly dense, clayey fine to medium SANDSTONE; weakly cemented, non-planar, gradual contact with Td, rip-ups of SILTSTONE, iron-oxide pods, pods of CLAY
							ML	DELMAR FORMATION (Td) @ 2': Mottled gray and light brown in blocky pattern, very damp, slightly stiff, very fine sandy SILTSTONE; increase in cementation with depth
5							SM	@ 6': Mottled blue gray and light brown in blocky pattern, wet, dense, fine to medium SANDSTONE; iron-oxide staining in light brown portions, very minor seepage
		J:N10-50W, 36-43S					ML-CL	@ 8': Green/blue-gray, very damp to wet in fractures, slightly stiff CLAYSTONE with SILT; polished waxy fracture surfaces, non-planar, joint attitudes are range of typical fracture planes
10							SM	@ 9.5': Non-horizontal, non-planar contact with light gray and blue-gray, silty fine to medium SANDSTONE; weakly cemented
		S:N73W, 47N					ML-CL	@ 12': Shear contact attitude at base of 55', below is blue-green CLAYSTONE that immediately grades to gray, very damp, soft to slightly stiff SILT/SILTSTONE; grades to incresed cementation of stiffness below
15								@ 15': Reddish mottled staining
								@ 16': Blue-gray, very damp, slightly hard/dense, silty very fine SANDSTONE/very fine SILTSTONE; moderately cemented
20			R-1	9	120.3	7.1		@ 19.5'-20': Concretion, continuous @ 20': Yellowish gray, very damp, dense, silty fine to coarse SANDSTONE; massive, cemented @ 21': Undulatory contact between blue-gray material and yellowish gray material, weaker cementation at contact, slightly dense to dense, silty fine SANDSTONE, grades to fine to coarse SANDSTONE
25		GB:N30E, 16S						@ 26': General bedding attitude on pebble lense, mostly continuous, possibly offset in portion? minor seepage in lense
		S:N55E, 40S						@ 28': Shear attitude, material is blue-green CLAYSTONE with waxy polished fractures, partially discontinuous, random
30								

GEOTECHNICAL BORING LOG LB-6

Date 6-19-00 | Sheet 2 of 3

Project HDR/Del Mar | Project No. 040151-001

Drilling Co. San Diego Drilling | Type of Rig E-120 Bucket

Hole Diameter 24 in. | Drive Weight 0'-30' 4,991#, 30'-60' 3,841#, | Drop 12 in.

Elevation Top of Hole 51 ft. | Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
								Logged By KTS/MRS Sampled By KTS
30							ML-CL	@ 30': Blue and gray mottled, silty CLAYSTONE/SILTSTONE, very moist to wet, mottled, stiff and very stiff, iron-oxide, gradual increase in cementation to 35', some red staining, moderately fractured with few randomly oriented polished surfaces
35								@ 35': Dark blue/green-gray, SILTSTONE; wet, very stiff, reddish staining
							SM-ML	@ 36': Reddish brown, fine SANDSTONE @ 36.5': Same as at 35'
							SM	@ 39': Irregular contact to gray damp, very dense, silty fine to medium SANDSTONE
40			R-2	15	119.7	13.7		@ 40': Blue-gray, very damp, hard/dense, very fine SANDSTONE; massive, weakly to moderately cemented
							CL	@ 41': CLAYSTONE; few random polished surfaces
							CL	@ 44': Mottled red and blue-gray, very hard CLAYSTONE with few random polished surfaces
45								
							SC	@ 49': Very hard in areas, with sand, very few fractures
50								
							SC-SM	@ 51': Increase in sand, very dense, no fractures
55								
60								

GEOTECHNICAL BORING LOG LB-6

Date 6-19-00 Sheet 3 of 3

Project HDR/Del Mar Project No. 040151-001

Drilling Co. San Diego Drilling Type of Rig E-120 Bucket

Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841# Drop 12 in.

Elevation Top of Hole 51 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
								Logged By KTS/MRS Sampled By KTS
60			R-3	7/6" 27/12"	124.4	10.1		@ 60': Blue-gray, damp, hard, fine SANDSTONE Total Depth = 60 Feet Backfilled and Tamped 6/19/00 5 feet slurry cap Ground water encountered at 6, 8, 27 feet at time of drilling
65								
70								
75								
80								
85								
90								

PREVIOUS BORING LOGS BY LEIGHTON AND ASSOCIATES

GEOTECHNICAL BORING LOG

Date 1/20/78 Drill Hole No. P1 Sheet 1 of 2 -

Project Santa Fe Railroad Job No. 478008-1

Drilling Co. Pioneer Type of Rig B-53 Flite

Hole Diameter _____ Drive Weight 140 lb. Drop 30 in.

Elevation Top of Hole 63.0 Ref. or Datum

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged by WH - DLH Sampled by WH
0							SM-SC	Fill-cinders, silty-clayey sand.
			1	17/6" 29/6"	119.4	11.3	SM	Dark orange, moist, medium dense, silty medium grained sand.
5								Moist-wet.
								Fill?
			2	9/19	111.4	14.1		Loose, medium, dense, natural ground, wet, dark orange mottled with gray 200=15-20%.
10			3	20/3	108.2	14.1	SM	Dark orange, brown, wet-saturated, medium.
								Terrace Deposit (Qt)
			4	55/6"	102.2	12.7	SC	Pale yellow, moist, wet, dense, clayey coarse to medium sand - (Ted) Del Mar Formation bedrock.
15								
			5	41/6" 60/4"	106.0	21.3	ML	Light gray ground, clayey silt, moist, dense.
								@ 17.5': Increased density, very dense now light green color.
20								@ 17 - 22': Less dense, moist.
			6	61/6"	110.6	13.8		
25								@ 26': Less density, increased moisture.
			7	60/5"	96.3	20.5		@ 27.5': Clean fine sand in sample.
30								

GEOTECHNICAL BORING LOG

Date 1/20/78 Drill Hole No. P1 Sheet 2 of 2

Project Santa Fe Railroad Job No. 478008-1

Drilling Co. Pioneer Type of Rig B-53 Flite

Hole Diameter _____ Drive Weight 140 lb. Drop 30 in.

Elevation Top of Hole 63.0 Ref. or Datum

Logged by WH

Sampled by WH

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
30							ML	As above.
			8	60/5"	100.8	14.0		Coarse grained sand in sample tube.
35			①					@ 36': Very dense. @ 36.5': Less dense but still very hard.
			9	42/6" 60/4.5"	105.8	18.8		
40								
			10	63/6"	102.2	13.9		@ 43': Drilling becoming difficult moist material sticks to auger hard to clear cuttings from hole.
45			②					
			11	61/6"	99.3	18.2		
50								@ 53': Slight decrease in density.
55								T.D. 54' No water - No Caving
60								

GEOTECHNICAL BORING LOG

Date 1/20/78 Drill Hole No. P2 Sheet 1 of 1-

Project Santa Fe Railroad Job No. 478008-1

Drilling Co. Pioneer Type of Rig B-53 Flite

Hole Diameter _____ Drive Weight 140 lb. Drop 30 in.

Elevation Top of Hole 63.0 Ref. or Datum

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged by WH Sampled by WH
0							SW	Track Bed - Sandy gravel, medium brown, moist
			12	18/6" 27/6"	117.8	6.7	SM	Fill - Dark orange, silty sand, fine to coarse grained, pebbly, moist, dense. @ 3': Less pebble, very moist, orange brown to brown sand, somewhat silty.
5			13	16/6" 27/5"	122.6	7.8		
			14	20/6"	112.8	14.9	SM	@ 5.5': Orange brown, sand, fine-coarse grained (natural) very moist to wet, dense. Terrace Deposit (Qt)
			15	13/6" 34/6"	87.2	14.1		@ 8': Somewhat denser.
10			16	60/5"	103.4	13.3		
							SM	@ 12.7': Tan, sand, fine-medium grained, moist, dense, Del Mar Formation (Ted) bedrock.
15			17	30/6" 60/6"	105.3	22.4	ML	@ 16': Light gray grained, clayey silt, moist, dense (bedrock).
								T.D. 17' No Water - No Caving
20								
25								

GEOTECHNICAL BORING LOG

Date 1/20/78 Drill Hole No. P 3 Sheet 1 of 1

Project Santa Fe Railroad Job No. 478008-1

Drilling Co. Pioneer Type of Rig B-53 Flite

Hole Diameter ____ Drive Weight 140 lb. Drop 30 in.

Elevation Top of Hole 63.0 Ref. or Datum

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged by WH Sampled by WH
0			18	9/6"	107.2	14.0	SM/ SC	Fill-Grayish brown to orange brown, sand, fine-coarse grained, moist, pebbles in upper foot, with gravel.
				26/6"			SM	@ 2.8': Brown to orange brown sand, fine-coarse grained, moist, dense, terrace deposit (Qt)
5			19	18/6"				
				32/6"	109.5	15.6		
			20	23/6"				
				31/6"				
10			21	24/6"	109.1	16.4		
				42/6"				
15							SC	Tan, sand, fine-medium grained, moist, dense. Note: Upper contact approximate Del Mar Formation (Ted) bedrock.
				25/6"				
			22	60/5"	102.9	21.5	ML	Light gray grained, clayey silt, moist, dense.
20								T.D. 17.5' No Water - No Caving
25								
30								

GEOTECHNICAL BORING LOG

Date 1/20/78 Drill Hole No. P 4 Sheet 1 of 1

Project Santa Fe Railroad Job No. 478008-1

Drilling Co. Pioneer Type of Rig B-53 Flite

Hole Diameter _____ Drive Weight 140 lb. Drop 30 in.

Elevation Top of Hole 63.5 Ref. or Datum

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
								Logged by WH Sampled by WH
0							SM/SC	Fill-Brown, silty sand, fine-medium grain, very moist, medium dense.
			23	9/6" 18/6"	112.3	13.6		@ 2-3': Old road bed.
							SM	@ 3': Orange brown, sand, fine-coarse graine (natural) very moist, dense. Terrace Deposit (Qt)
5			24	17/6" 24/6"	111.1	13.2		
			25	11/6" 20/6"	109.0	14.4		
10			26	62/6"	104.5	13.6		
							SC	@ 12.7': Tan, sand, fine-coarse, moist, dens Del Mar Formation (Ted) bedrock.
15			27	29/6" 51/6"	103.7	11.2		
							ML	@ 16.7': Light gray grained, clayey silt, moist, dense, (bedrock).
20								T.D. 18' No Water - No Caving
25								
30								

PREVIOUS BORING LOGS BY OTHERS

APPENDIX A

Field Mapping and Subsurface Exploration Logs

Geologic Units and Feature Identification

The Site Plan and Geologic Map (in pocket) was prepared based upon information supplied by the client, or others, along with MAHG's field measurements and observations. Site geology including surficial units, bedrock units, measurement of bedrock structure, contacts, areas of notable seepage and springs as well as the approximate locations of exploratory borings and trenches associated with this field investigation are presented on the Geotechnical Map. In addition, ten geologic cross sections were prepared to enable the evaluation of slope stability at selected locations and these sections are presented in Appendix D.

General Field Procedures

The Boring and Trench Logs on the following pages depict or describe the subsurface (soil and water) conditions encountered at the specific exploration locations on the date that the exploration was performed. Subsurface conditions may differ between exploration locations and within areas of the site that were not explored. The subsurface conditions may also change at the exploration locations over the passage of time.

Boring and Test Trench Elevations

The ground surface elevations reported on the field logs were established from interpolation of elevations and contours illustrated on the Site Plan and Geologic Map.

Boring and Test Trench Locations

All subsurface exploration locations were located on-site based on visual observation and measurement from existing improvements. The locations are shown on the Geotechnical Map. Subsurface exploration locations reported for this study should be considered accurate only to the degree implied by the method used in determining them.

Water Level Measurement

The water levels reported on the Boring Logs represent the depth to the piezometric water surface measured at the conclusion of the drilling operation after a short wait, or in monitoring wells that were constructed within selected boreholes. Water levels are expected to show seasonal and long-term fluctuations consistent with historical trends in the area.

Field Sampling and Testing Procedures

Drilling was performed between April 27 and April 30, 1998, utilizing Mobile B-53 and B-61 truck-mounted rigs equipped with 8-inch-diameter, continuous-flight, hollow-stem augers. Trenches were excavated with a rubber tire mounted backhoe provided by the client.

The field operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) designation D 420 entitled "Standard Guide for Sampling Soil and Rock" and/or other relevant specifications. Soil samples were preserved and transported to our laboratory in general accordance with the procedures recommended by ASTM designation D 4220 entitled "Standard Practice for Preserving and Transporting Soil Samples". Brief descriptions of the sampling and testing procedures are presented below:

Ring-Lined Barrel Sampling - (ASTM D 3550)

In this procedure, a barrel sampler constructed to receive a stack of 1-inch-high brass rings is used to collect soil samples for classification and laboratory testing. Ring samples were collected from closely spaced intervals in all of the hollow-stem auger borings. Each hollow-stem rig was equipped with a 140-pound wireline downhole hammer, manually operated to fall an approximate distance of 30 inches. An 18-inch or 24-inch-long barrel fitted with 2.5-inch-diameter rings was subsequently driven a distance of 18 inches or to practical refusal (considered to be 50 blows for 6 inches).The method provides relatively undisturbed samples that fit directly into laboratory test instruments without additional handling and disturbance.

Raw blow count data were recorded for each 6-inch increment of the 18-inch drive. The sum of blows required to drive the sampler the final 12 inches, or fraction thereof, is noted on the Field Logs, presented in this Appendix, as an uncorrected N-value. Penetration resistance of the initial 6-inch seating interval is not shown, except in the instance of total penetration of 6 inches or less. The raw blow count values, presented as *N=XX*, do not have exact equivalency with Standard Penetration Test "N-values" as determined by ASTM D 1586. However, it is commonly accepted that general correlations can be applied to obtain approximately equivalent (uncorrected) Standard Penetration Test N-values and their respective consistency and relative density classifications according to the following tables.

Table A-1
Blow Count/Density Relationships for Granular Soils

Ring Sample Blow Count	SPT Blow Count	Description
0 - 5	0 - 4	Very loose
5 – 13	4 - 10	Loose
13 – 38	10 - 30	Medium dense
38 – 63	30 - 50	Dense
> 63	> 50	Very dense

Table A-2
Blow Count/Consistency Relationships for Fine-Grained Soils

Ring Sample Blow Count	SPT Blow Count	Description
0 - 3	0 - 2	Very soft
3 - 5	2 - 4	Soft
5 - 10	4 - 8	Firm/Medium stiff
10 - 19	8 - 15	Stiff
19 - 38	15 - 30	Very stiff
>38	>30	Hard

Bulk Sample

A relatively large volume of soil is collected with a shovel or trowel. The sample is transported to the materials laboratory in a sealed plastic bag or bucket.

Classification of Samples

Excavated soils and discrete soil samples were visually-manually classified, based on texture and plasticity, in general accordance with the Unified Soil Classification System (ASTM D 2488-75). The classifications are reported on the field logs. Plasticity noted on the field logs reflects soil conditions at field moisture contents, and may not correlate with achievable plasticity at differing moisture contents.

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 1P

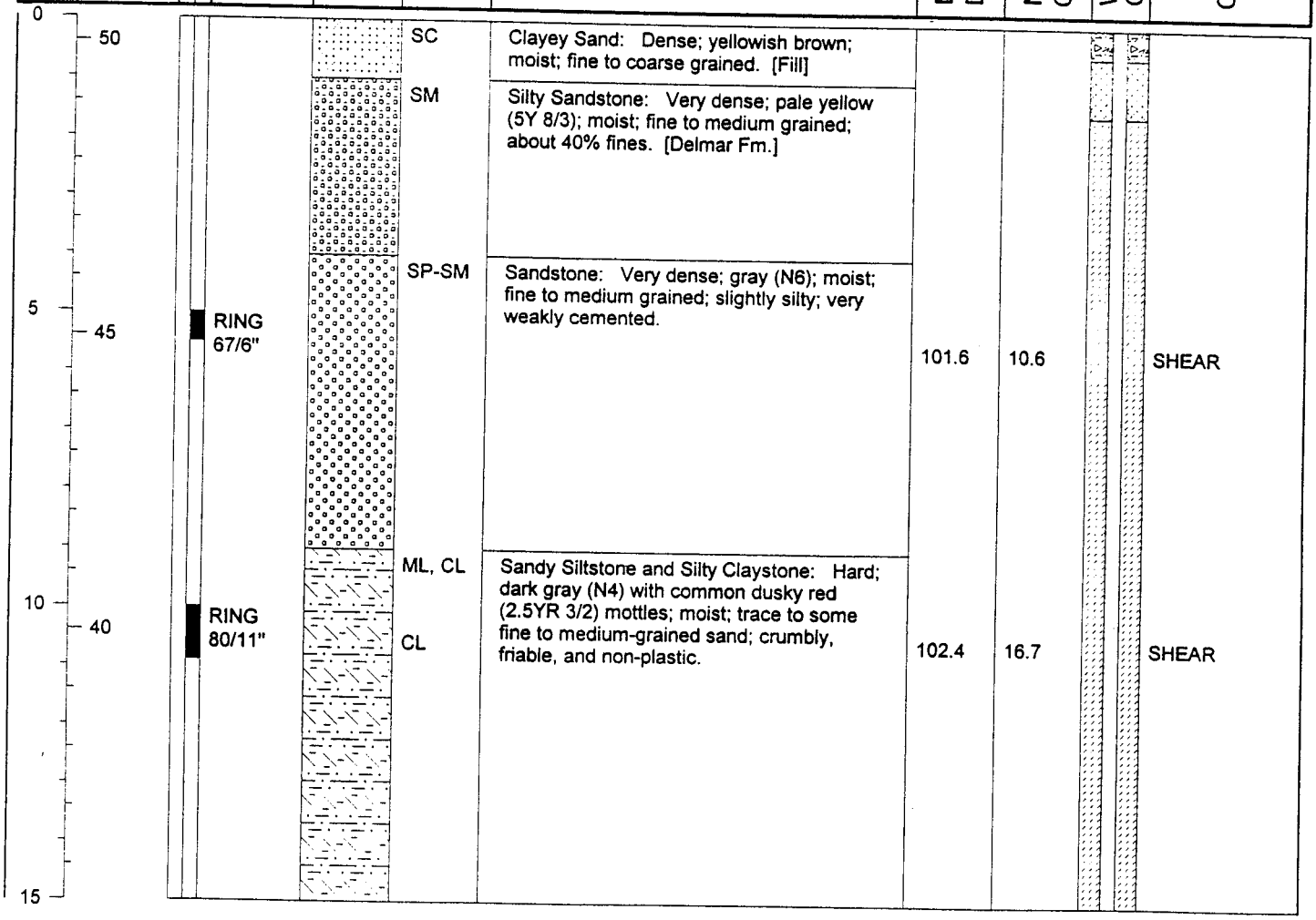
Sheet 1 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	**4/27/98**	Logged By:	**M. Doerschlag**
Drilled By:	**California-Pacific**	Total Depth:	**51.0 Ft.**
Rig Make/Model:	**Mobile B-61**	Hammer Type:	**Wireline downhole**
Drilling Method:	**Hollow-stem Auger**	Hammer Weight/Drop:	**140 Lb./±30 In.**
Hole Diameter:	**8 In.**	Surface Elevation:	**50.4 Ft.**

Comments: Located at south end of project alignment.



Continued on next sheet.

FIG. A-1

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 1P

Sheet 2 of 3

Project: ***NORTH COUNTY TRANSIT DISTRICT***

Location: ***DEL MAR, CALIFORNIA*** | Project No. ***3650-SF***

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
15	35	RING 83/6"		SM	Silty Sandstone and Siltstone: Very dense or hard; mostly gray (N6), with few small reddish FeO mottles; fine to medium grained sand; thinly bedded.	98.9	13.1		
				CL	Silty Claystone: Hard; dark gray (N4); moist; crumbly, friable, and non-plastic.				
20	30	RING 60/3"		SP-SM	Sandstone: Very dense; brownish yellow (10YR 6/6); moist; fine to coarse grained; uncemented. Much thinner than in adjacent bluff face.	99.5	9.8		SHEAR
				ML, CL	Sandy Siltstone and Silty Claystone: Hard; mostly gray (N5), with some reddish FeO mottles to 1" across; moist; sand proportion mostly fine-grained; faintly plane laminated.				
25	25	RING 76/6"		ML		98.3	14.4		
30	20	RING 59/6"		CL	— Silty claystone, as above; dark gray (N4).	101.9	17.5		SHEAR
35									

Continued on next sheet.

FIG. A-2

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 1P

Sheet 3 of 3

Project: ***NORTH COUNTY TRANSIT DISTRICT***

Location: ***DEL MAR, CALIFORNIA*** | Project No. ***3650-SF***

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
35	15	RING 80/6"		ML	Sandy Siltstone and Silty Claystone: Hard; mostly gray (N5), with some reddish FeO mottles to 1" across; moist; sand proportion mostly fine-grained; faintly plane laminated.	101.2	12.7		
				SP-SM	Sandstone: Very dense; dark gray (N4); moist; fine to medium grained; very weakly cemented with trace of clay.				
40	10	RING 80/6"		CL	← Sandy claystone, dark gray (N4), texture of small slickensided granules. Local lens.	108.4	14.3		
				CL	Silty Claystone: Hard; dark gray (N4), abundantly mottled with dusky red (2.5YR 3/2) iron oxides; moist; very silty, with occasional trace of fine-grained sand; massive and non-plastic. Harder drilling.				
45	5	RING 60/6"		CL	← Silty claystone, as above.	N/R	N/R		
50	0	RING 80/6"		CL	← Silty claystone, as above.	102.8	15.3		SHEAR

Bottom of boring at 51.0 feet.
No groundwater encountered.
Piezometer installed as depicted in well completion column..

FIG. A-3

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 2

Sheet 1 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	**4/27/98**	Logged By:	**M. Doerschlag**
Drilled By:	**California-Pacific**	Total Depth:	**40.5 Ft.**
Rig Make/Model:	**Mobile B-61**	Hammer Type:	**Wireline downhole**
Drilling Method:	**Hollow-stem Auger**	Hammer Weight/Drop:	**140 Lb./±30 In.**
Hole Diameter:	**8 In.**	Surface Elevation:	**51.4 Ft.**

Comments: Located at Andersen Canyon embankment fill.

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK	SAMPLE INTERVALS: DRIVE	SAMPLE INTERVALS: TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
0	50					SM	Gravelly Sand with Silt: Dense; dark brown (7.5YR 4/2); moist; fine to coarse grained; estimated 20-25% fine to coarse-grained gravel ballast; trace of clay. [Fill]				
5	45			RING N=47		SP-SC	Clayey Sand: Dense; dark yellowish brown (10YR 4/4); moist; mostly fine to medium grained, with trace of gravel and silt. [Fill]	100.3	7.4		
10	40			RING N=14		SP-SC	Becomes medium dense; very moist.	108.6	13.0		CONS
15											

Continued on next sheet.

FIG. A-4

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 2

Sheet 2 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
15	35	RING, N=13		SP-SC	Clayey Sand: Medium dense; dark yellowish brown (10YR 4/4); very moist; fine to medium grained; trace of silt. [Fill] — Trace FeO mottling.	114.6	12.9		CONS
20	30	RING, N=18		SP-SC	Becomes wet; slightly sticky.	115.0	14.5		
25	25	RING, N=17		SP-SC	Contains few yellowish siltstone fragments; moist.	114.1	10.2		CONS
30	20	RING, N=23		ML, CL	Clayey Siltstone and Sandy Claystone: Very stiff; mottled pale yellow, dark brown, and dark gray; wet; consists mostly of small intact sedimentary fragments in clayey silt matrix. [Fill]	94.6	24.2		
35				SP-SM	Abrupt contact. Sandstone: Very dense; pale brownish yellow (10YR 6/6); wet; fine to medium grained; massively bedded. [Delmar Fm.]				

Continued on next sheet.

FIG. A-5

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 2

Sheet 3 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK	SAMPLE INTERVALS: DRIVE	SAMPLE INTERVALS: TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
35			RING 62/6"			SP-SM	Sandstone: Very dense; pale brownish yellow (10YR 6/6); wet; fine to medium grained; massively bedded. [Delmar Fm.]	113.6	17.5		
15						ML	Clayey Silt: Hard; mottled dark gray (N4) and dusky red (2.5YR 2/3); moist; crumbly, friable, and non-plastic.				
40			RING 53/6"			ML		98.9	12.6		

Bottom of boring at 40.5 feet.
Perched groundwater encountered in zone from approximately 33.0 to 38.0 feet.
No groundwater encountered below 38.0 feet.
Boring backfilled with soil cuttings.

FIG. A-6

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 3

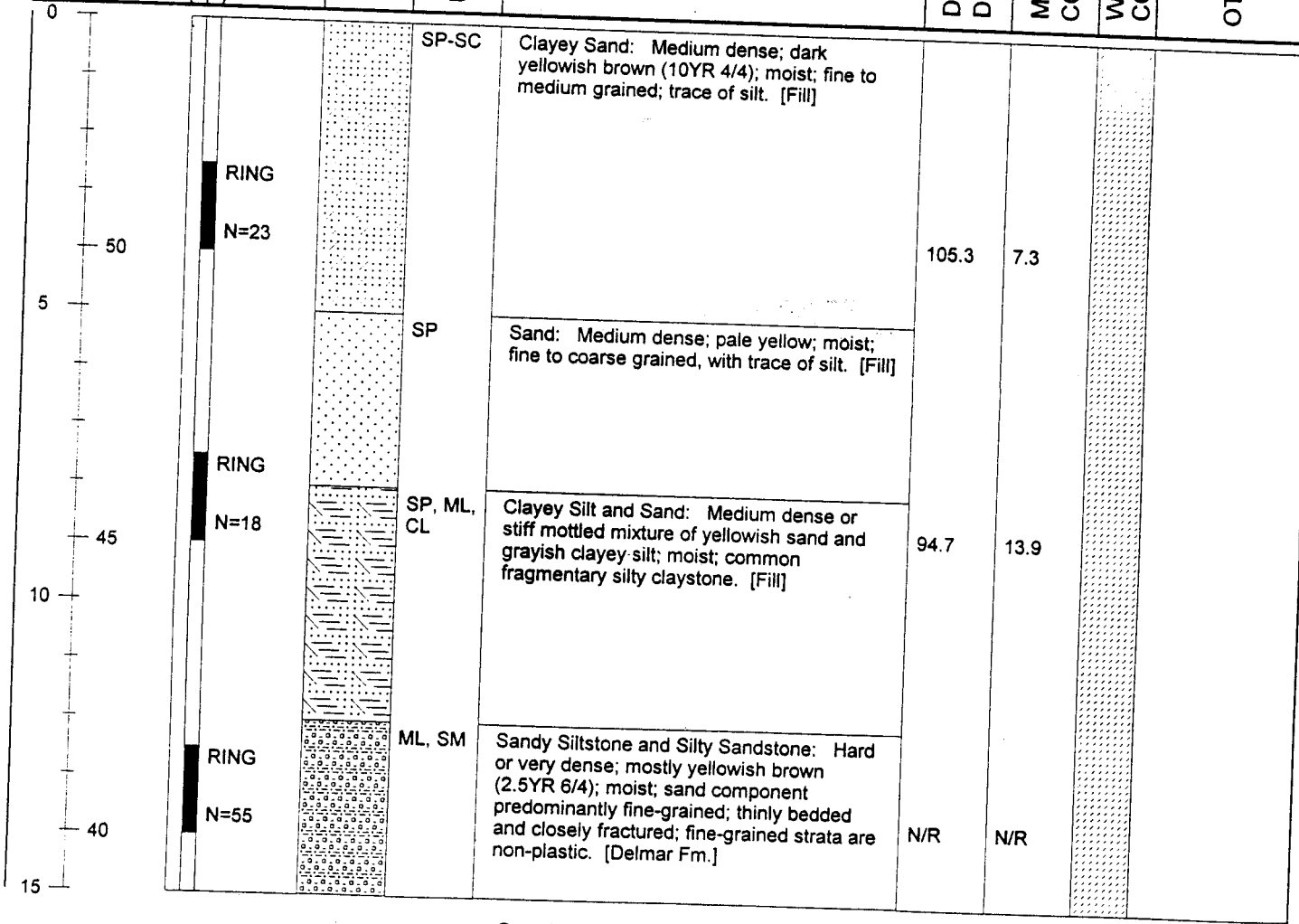
Sheet 1 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	4/27/98	Logged By:	M. Doerschlag
Drilled By:	California-Pacific	Total Depth:	35.5 Ft.
Rig Make/Model:	Mobile B-61	Hammer Type:	Wireline downhole
Drilling Method:	Hollow-stem Auger	Hammer Weight/Drop:	140 Lb./±30 In.
Hole Diameter:	8 In.	Surface Elevation:	54.0 Ft.

Comments: Located north of Andersen Canyon.



Continued on next sheet.

FIG. A-7

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 3

Sheet 2 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK	SAMPLE INTERVALS: DRIVE	SAMPLE INTERVALS: TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
15						ML, SM	Sandy Siltstone and Silty Sandstone: Hard or very dense; yellowish brown abruptly becoming dark gray (N4) at 16 feet; moist; sand mostly fine-grained; thinly bedded; fine-grained strata are non-plastic.				
	35		RING 55/6"			SM	— Silty sandstone, fine to medium grained, very silty.	108.2	13.2		
20											
			RING 56/6"			ML	— Clayey siltstone, gray (5Y 6/1), trace of fine-grained sand, friable and non-plastic.	98.6	16.0		
	30						Grades increasingly clayey.				
25											
			RING 65/6"			ML	← Clayey siltstone, dark gray (N4), trace of sand.	105.4	16.1		
	25										
30							Becomes harder drilling.				
			RING 62/6"			ML	— Siltstone, lacks clay. Trace of coal.	98.4	15.1		
	20										
35											

Continued on next sheet.

FIG. 3

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 3

Sheet 3 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK	SAMPLE INTERVALS: DRIVE	SAMPLE INTERVALS: TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
35						SP	Sandstone: Very dense; color and moisture undetermined; well-cemented with calcium carbonate. Bluff exposure is erosion-resistant, lenticular ledge about 14" thick. Very hard drilling.				

Refusal encountered at 35.5 feet.
No groundwater encountered.
Boring backfilled with soil cuttings.

FIG. A-9

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 4P

Sheet 1 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	**4/27/98**	Logged By:	**M. Doerschlag**
Drilled By:	**California-Pacific**	Total Depth:	**55.5 Ft.**
Rig Make/Model:	**Mobile B-61**	Hammer Type:	**Wireline downhole**
Drilling Method:	**Hollow-stem Auger**	Hammer Weight/Drop:	**140 Lb./±30 In.**
Hole Diameter:	**8 In.**	Surface Elevation:	**60.5 Ft.**

Comments: Groundwater seepage noted along nearby bluff face.

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
0	60			SP-SC	Clayey Sand: Dense; dark reddish brown (5YR 3/4); moist; fine to medium grained, with occasional trace of gravel to ~1". [Bay Point Fm.]				
					Sharp contact.				
				ML, SC, CL	Sandy Siltstone: Hard; olive yellow (2.5Y 6/6); moist; fine-grained sand. Includes few thin clayey sand lenses, and occasional olive silty clay rip-up clasts. [Delmar Fm.]	94.0	23.3		
5	55	RING N=51		CL	Silty Claystone: Hard; pale yellow (2.5YR 7/4); moist; slightly plastic.				
				SP-SC	Clayey Sandstone: Very dense; mottled pale yellow (2.5Y 8/4) to olive yellow (5Y 6/8); moist; fine to medium grained; massively bedded; very weakly cemented.				
10	50	RING 68/12"				107.3	21.3		SHEAR
15									

Continued on next sheet.

FIG. A-10

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 4P

Sheet 2 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE	SAMPLE INTERVALS: TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
15	45		RING 80/9"		ML, SP	Sandy Siltstone and Sandstone: Hard or very dense; siltstone light gray (2.5Y 7/2), and sandstone yellow (2.5Y 8/6); moist; fine to medium-grained sand; fine-grained strata contain trace of clay and are non-plastic.	100.5	18.0		SHEAR
						Abrupt contact.				
					CL	Silty Claystone: Hard; very dark gray (5YR 3/1); moist; friable and non-plastic, with granular texture.				
20	40		RING 50/6"				105.8	16.9		SHEAR
						Grades less clay; color lightens.				
25	35		RING 66/6"		ML, SM	Siltstone and Silty Sandstone: Hard or very dense; mostly light gray (2.5Y 8/1) to gray (N6), with local orange mottling; moist; sands fine to medium grained.	102.4	13.1		
30	30		RING 50/3"		SM	Very silty fine to medium-grained sandstone; gray (N5).	110.0	11.5		
35					CL, ML	Silty Claystone: Hard; gray (N5); moist; very silty; non-plastic and friable.				

Continued on next sheet.

FIG. A-11

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 4P

Sheet 3 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
35	25	RING 85/6"		CL	Silty Claystone: Hard; gray (N5); moist; very silty; non-plastic; becomes commonly mottled with dusky red iron oxide staining and small hematitic concretions.	92.0	18.6		SHEAR
40	20	RING 56/6"		CL	— Silty claystone, as above.	105.2	19.3		
				ML	Sandy Siltstone: Hard; gray (N6); moist; mostly fine-grained sand; generally massive in recovered samples.				
45	15	RING 100/6"		ML	← Sandy siltstone, as above.	116.2	10.3		
50	10	RING 50/3"		ML	← Sandy siltstone, as above.	107.3	13.7		
55									

Continued on next sheet.

FIG. A-12

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 4P

Sheet 4 of 4

Project: ***NORTH COUNTY TRANSIT DISTRICT***

Location: ***DEL MAR, CALIFORNIA*** Project No. ***3650-SF***

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK	SAMPLE INTERVALS: DRIVE	SAMPLE INTERVALS: TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
55											
5			57/6"			CL	Silty Claystone: Hard; dark gray (N4), abundantly mottled with dusky red (2.5YR 3/2) iron oxides; moist; very silty; massive and non-plastic.	102.1	17.5		SHEAR

Bottom of boring at 55.0 feet.
No groundwater encountered.
Piezometer installed as depicted in well completion column..

FIG. A-13

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 5

Sheet 1 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	**4/28/98**	Logged By:	**M. Doerschlag**
Drilled By:	**California-Pacific**	Total Depth:	**51.0 Ft.**
Rig Make/Model:	**Mobile B-61**	Hammer Type:	**Wireline downhole**
Drilling Method:	**Hollow-stem Auger**	Hammer Weight/Drop:	**140 Lb./±30 In.**
Hole Diameter:	**8 In.**	Surface Elevation:	**59.5 Ft.**

Comments:

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
0				SP-SC	Clayey Sand: Dense; dark reddish brown (5YR 3/2); moist; fine to coarse grained, with trace of gravel to ~2" diameter. [Bay Point Fm.]				
					Sharp contact.				
				ML, CL	Clayey Siltstone and Silty Claystone: Hard; dark to very dark gray (N4-N3), locally becoming black (N2), moist; friable and non-plastic, non-cemented. Bluff outcroppings contain common coal-bearing lenses to ~6" thick. [Delmar Fm.]				
5	55	RING 50/6"		ML	← Clayey siltstone, as above.	106.7	14.1		
10	50	RING 65/6"		CL	← Silty claystone, black (N2).	104.7	16.1		
15	45			SP-SM	Silty Sandstone: Very dense; dark gray (N5) apparently mottled with shades of yellow; moist to locally very moist; fine to coarse grained. Interval inferred from bluff exposure.				

Continued on next sheet.

FIG. A-14

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 5

Sheet 2 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
15		RING 70/6"		SP-SM	Silty Sandstone: Very dense; dark gray (N5); moist to locally very moist; fine to coarse grained. Locally contains sandy siltstone drapes and partings.	107.3	14.1		
	40			ML	Sandy Siltstone: Hard; gray (N5); moist; sand component fine to medium grained; apparently massively bedded; non-plastic and mostly lacks clay. Sample @ 20 ft. found to have plane and convolute lamination, with estimated 30-40% sand. Increasingly sandy with depth.				
20		RING 55/6"				111.2	12.2		
					Color becomes 10YR 5/1, possibly grading to silty sandstone.				
	35								
25		RING 67/6"		ML	Sandy siltstone, mottled with reddish brown (2.5YR 3/4) oxidation color.	101.9	15.0		
				ML	Clayey Siltstone: Hard; mottled gray (10YR 6/1) and yellow (10YR 7/6); moist; trace of fine-grained sand; non-plastic. Harder drilling.				
	30								
30		RING 62/6"		ML	Sandy siltstone, as above.	110.7	15.8		
	25								
35									

Continued on next sheet.

FIG. A-15

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 5

Sheet 3 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
35		RING 58/6"		ML	Clayey Siltstone: Hard; color mostly olive gray (5Y 5/2); moist.	96.6	17.1		
	20								
40		RING 80/6"		ML	Sandy Siltstone: Hard; dark gray (N5); moist; contains estimated 20-30% fine to medium-grained sand. Little or no clay; non-plastic.	117.4	10.6		
	15								
45		RING 55/6"		ML	Siltstone, trace of fine-grained sand.	102.0	17.2		
	10								
50		RING 112/12"		ML	Siltstone, as above.	108.8	18.6		

Bottom of boring at 51.0 feet.
Groundwater seepage reported by driller somewhere in upper 20 feet of boring; interpreted to be from basal portion of sandstone interval located from 13 to 19 feet.
Boring backfilled with soil cuttings.

FIG. A-16

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 6P

Sheet 1 of 2

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	**4/28/98**	Logged By:	**M. Doerschlag**
Drilled By:	**California-Pacific**	Total Depth:	**28.0 Ft.**
Rig Make/Model:	**Mobile B-61**	Hammer Type:	**Wireline downhole**
Drilling Method:	**Hollow-stem Auger**	Hammer Weight/Drop:	**140 Lb./±30 In.**
Hole Diameter:	**8 In.**	Surface Elevation:	**64.3 Ft.**

Comments: Groundwater seepage apparent from nearby bluff.

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK	SAMPLE INTERVALS: DRIVE	SAMPLE INTERVALS: TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
0						SP	Sand: Dense; dark yellowish brown (10YR 4/4); moist; fine to medium grained, with occasional trace of gravel; trace of clay and Fe-oxide binding agents. [Bay Point Fm.]				
	60			RING N=36				114.3	6.9		
5							Becomes wet.				
							Becomes medium to coarse grained, some fine gravel.				
	55			RING N=54		CL	Silty Claystone: Hard; pale olive (5Y 6/3); moist; very silty; slightly plastic to non-plastic. [Delmar Fm.]	102.0	18.8		
10											
	50			RING 70/12"		SC-SP, SP	Clayey Sandstone and Sandstone: Very dense; pale olive(5Y 6/4) becoming olive yellow (5Y 6/8); moist; fine to medium grained.	114.6	11.3		
15											

Continued on next sheet.

FIG. A-17

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 6P

Sheet 2 of 2

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
15				SP	Clayey Sandstone and Sandstone: As before; grades primarily SP classification.				
				ML	Sandy Siltstone: Hard; mostly gray (5Y 5/1); moist; fine to medium grained sand, and trace of clay; apparently massively bedded.				
		RING 50/6"		ML		110.7	16.6		
45									
20					Becomes harder drilling.				
		RING 76/6"		ML, SM	Sandy siltstone with clay, and some thinly bedded silty fine to medium-grained sandstone; color dark gray (N6) with abundant dusky red mottles; slightly sticky when wet.	117.7	14.3		
40									
25		RING 82/6"		ML	Sandy siltstone with clay.	110.9	15.4		

Boring terminated at 28.0 feet due to very slow progress.
Perched groundwater encountered in zone from approximately 6.0 to 8.0 feet (base of Bay Point Fm.).
Piezometer installed as depicted in well completion column..

FIG. A-18

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 7

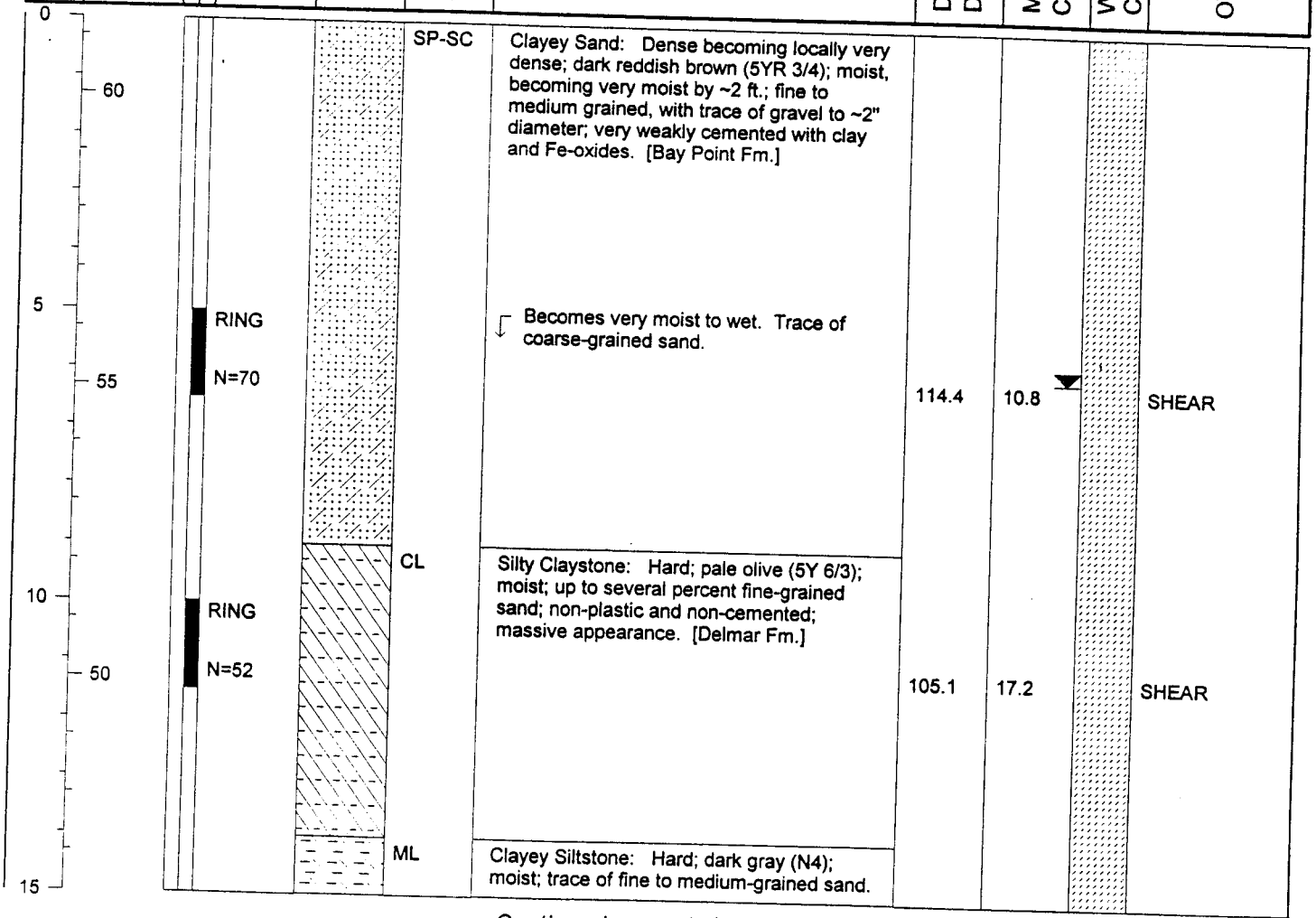
Sheet 1 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	**4/28/98**	Logged By:	**M. Doerschlag**
Drilled By:	**California-Pacific**	Total Depth:	**56.0 Ft.**
Rig Make/Model:	**Mobile B-61**	Hammer Type:	**Wireline downhole**
Drilling Method:	**Hollow-stem Auger**	Hammer Weight/Drop:	**140 Lb./±30 In.**
Hole Diameter:	**8 In.**	Surface Elevation:	**61.3 Ft.**

Comments:



Continued on next sheet.

FIG. A-19

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 7

Sheet 2 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
15	45	RING 80/12"		ML	Clayey Siltstone: Hard; dark gray (N4); moist; trace of fine to medium-grained sand; texture locally comprises small granules somewhat loosely bound together; non-plastic.	106.5	21.2		
20	40	RING 67/6"		ML	Sandy Siltstone: Hard; gray (N5); moist; sand component fine to medium grained; apparently massively bedded; non-plastic and mostly lacks clay. Increasingly sandy with depth.	108.1	12.8		SHEAR
25	35	RING 50/3"			Unit contains subordinate thin layers of silty, fine to medium-grained sandstone.	111.8	12.9		
30	30	RING 100/6"			← Very fine-grained silty sandstone.	105.9	12.1		SHEAR
					← 6-inch-thick well-cemented layer, hard drilling.				
35				SP	Sandstone: Very dense; very pale brown (10YR 7/4); wet; fine to coarse grained.				

Continued on next sheet.

FIG. A-20

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 7

Sheet 3 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE	SAMPLE INTERVALS: TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
35			RING 100/5"		SP	Sandstone: Very dense; very pale brown (10YR 7/4); wet; fine to coarse grained; massively bedded.	104.7	9.9		SHEAR
40	25		RING 90/6"		SP, SP-SM		N/R	N/R		
	20		RING 70/6"		SP-SM	— Color gray (N6). Abrupt lower contact.				
45			RING 66/6"		ML	Clayey Siltstone: Hard; gray (N5), with few dusky red mottles to about 1/2" across; moist; trace of fine-grained sand; non-plastic.	102.4	23.2		
	15						109.7	17.7		SHEAR
50			RING 90/10"		ML, SC	— Sample with some clayey sandstone layer(s) to 6-8" thick.	106.3	15.1		
	10									
55										

Continued on next sheet.

FIG. A-21

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 7

Sheet 4 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK	SAMPLE INTERVALS: DRIVE	SAMPLE INTERVALS: TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
55			RING 55/6"			ML, CL	Clayey Siltstone: As before; grading to silty claystone.	105.9	19.2		SHEAR

Bottom of boring at 56.0 feet.
Perched groundwater encountered in zone from approximately 6.0 to 9.0 feet (base of Bay Point Fm.); also, sandstone aquifer encountered from 34 to 43 feet.
Boring backfilled with soil cuttings.

FIG. A-22

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 8

Sheet 1 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	**4/29/98**	Logged By:	**M. Doerschlag**
Drilled By:	**California-Pacific**	Total Depth:	**61.0 Ft.**
Rig Make/Model:	**Mobile B-53**	Hammer Type:	**Wireline downhole**
Drilling Method:	**Hollow-stem Auger**	Hammer Weight/Drop:	**140 Lb./±30 In.**
Hole Diameter:	**8 In.**	Surface Elevation:	**60.5 Ft.**

Comments:

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
0	60			SP	Sand: Dense; strong brown (7.5YR 4/6); moist, becoming very moist by ~2 ft.; fine to medium grained; estimated 3-5% clay and Fe-oxide binder. [Bay Point Fm.]				
					Becomes wet.		▼		
5	55	RING 61/12"		CL	Knife-sharp contact. Silty Claystone: Hard; pale olive (5Y 6/4) to yellow (2.5Y 7/6); moist; up to several percent fine-grained sand; non-plastic and non-cemented; granulated appearance. [Delmar Fm.]	106.1	17.0		
10	50	RING 50/6"		SP-SM, ML	Silty Sandstone and Siltstone: Very dense or hard; mostly yellow (2.5Y 8/6); moist; apparently thinly bedded; siltstone beds with trace of clay; fine to medium-grained sandstone.	100.3	11.5		
15									

Continued on next sheet.

FIG. A-23

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 8

Sheet 2 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK	SAMPLE INTERVALS: DRIVE	SAMPLE INTERVALS: TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
15	45			RING 55/6"		ML	Clayey Siltstone: Hard; gray (N5); moist; trace of fine-grained sand; non-plastic; massively bedded.	112.7	12.4		
20	40			RING 62/6"		ML, SM ML	Sandy Siltstone: Hard; gray (N5); moist; sand component fine to medium grained; apparently massively bedded; non-plastic and mostly lacks clay. Increasingly sandy with depth. Sample @ 15 ft. classified as clayey siltstone with sand.	102.9	9.5		
25	35			RING 54/3"		ML	← Very sandy siltstone, trace of clay.	110.4	12.0		
						SM	Silty Sandstone: Very dense; dark gray (N4), with some small dusky red mottles; moist; fine to coarse grained. Inferred upper contact from harder drilling performance.				
30	30			RING 62/6"		ML, CL	Sandy Siltstone and Silty Claystone: Hard; dark gray (N4); moist; typically 5-10% fine to medium-grained sand; spotted with reddish Fe oxides along discontinuities. Mostly crumbly, friable, non-plastic, and often with granulated appearance.	102.3	9.2		
35											

Continued on next sheet.

FIG. A-24

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 8

Sheet 3 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
35	25	RING 50/5"		ML, CL	Sandy Siltstone and Silty Claystone: Hard; dark gray (N4), frequently spotted with reddish Fe oxides along discontinuities; moist; trace of mostly fine-grained sand; non-plastic, granulated appearance.	104.1	15.4		
40	20	RING 80/9"		CL	— Silty claystone, color very dark gray (5Y 3/1), crumbly texture.	102.3	16.2		
45	15	RING 50/6"		CL	← Silty claystone.	104.7	16.9		
50	10	RING 55/6"		CL	Silty Claystone: Hard; gray (5Y 5/1); moist; non-plastic. Near 50-ft. depth, contains some very thin (~1") layers of silty sandstone. Not mottled.	107.1	11.0		
55									

Continued on next sheet.

FIG. A-25

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 8

Sheet 4 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE	SAMPLE INTERVALS: TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
55	5		RING 85/7"		CL	Silty Claystone: Hard; gray (5Y 5/1); moist; non-plastic. Sample @ 55 ft. intensely fractured, with marble-size granules bounded by random slicks.	114.6	10.2		
60	0		RING 62/6"			— Trace of reddish FeO mottling; few traces of carbonized organic matter.	95.8	13.8		

Bottom of boring at 61.0 feet.
Perched groundwater encountered in zone from approximately 4.0 to 5.5 feet (base of Bay Point Fm.).
Boring backfilled with soil cuttings.

FIG. A-26

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 9P

Sheet 1 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	**4/29/98**	Logged By:	**M. Doerschlag**
Drilled By:	**California-Pacific**	Total Depth:	**45.5 Ft.**
Rig Make/Model:	**Mobile B-53**	Hammer Type:	**Wireline downhole**
Drilling Method:	**Hollow-stem Auger**	Hammer Weight/Drop:	**140 Lb./±30 In.**
Hole Diameter:	**8 In.**	Surface Elevation:	**59.3 Ft.**

Comments: Groundwater seepage and dense arundo cane at nearby bluff.

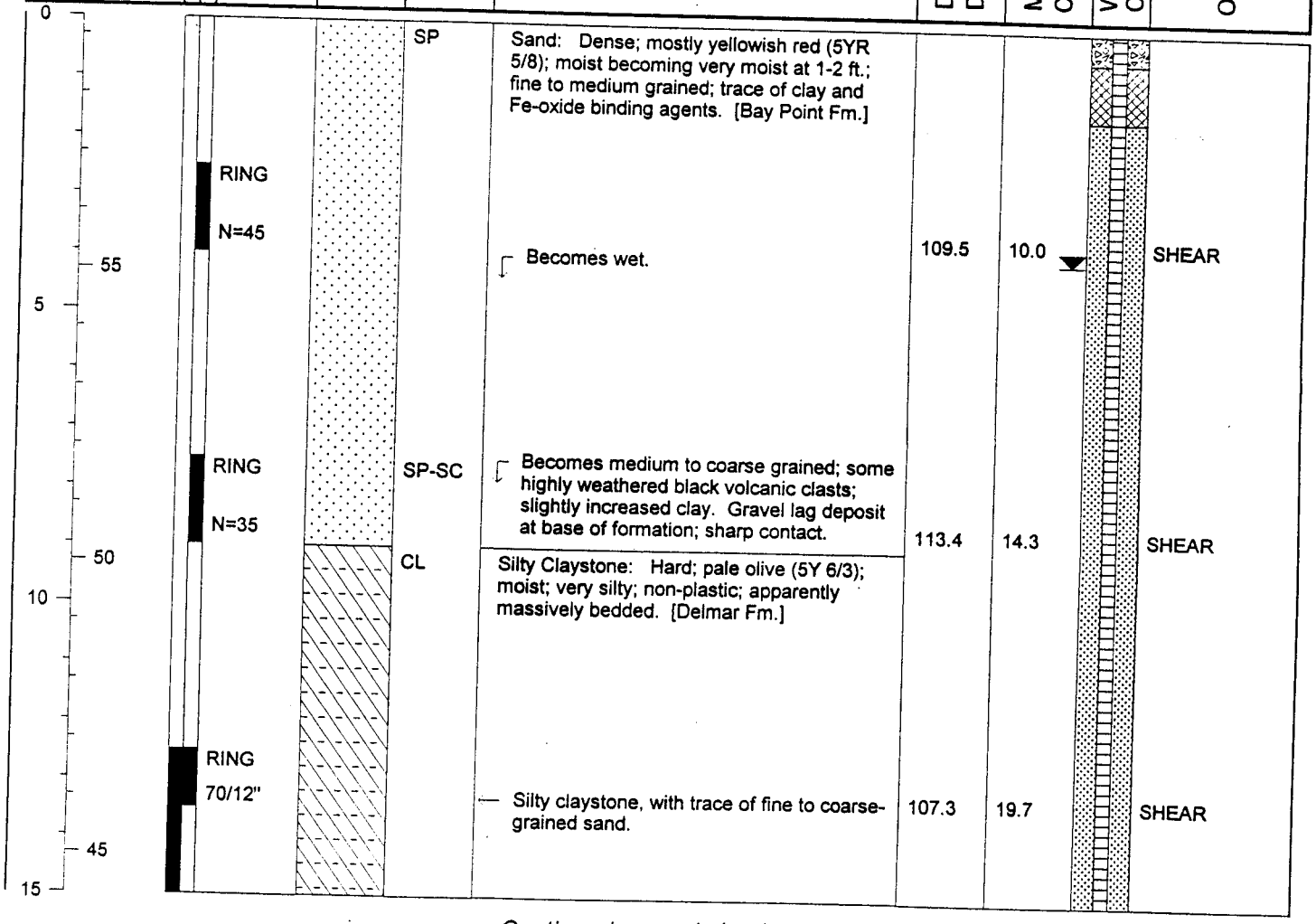


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FIG. A-27

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 9P

Sheet 2 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
15				CL	Silty Claystone: Hard; pale olive (5Y 6/3); moist; very silty; non-plastic. Trace of fine to coarse-grained sand.				
	40	RING 73/12"		ML, CL	Clayey Siltstone and Silty Claystone: Hard; pale yellow (5Y 7/4) and olive (5Y 6/3), with yellow (5Y 7/8) mottles and laminae; moist; non-plastic.	115.2	11.9		SHEAR
20									
		RING 75/12"		ML	— Clayey siltstone, with 1" wide, vertical clay-filled fracture (?) in sample.	117.4	10.4		
	35				Abruptly becomes dark gray (N5 to 5Y 5/1).				
25									
		RING 50/6"		SM	Silty Sandstone: Very dense; dark gray (N4); moist; fine to medium grained, with trace of clay; uncemented.	114.5	7.6		SHEAR
	30								
30				ML	Clayey Siltstone: Hard; dark gray (10YR 4/1); moist; non-plastic; texture of loosely bound granules. Hard drilling.				
		RING N=45				108.0	12.9		SHEAR
	25								
35									

Continued on next sheet.

FIG. A-28

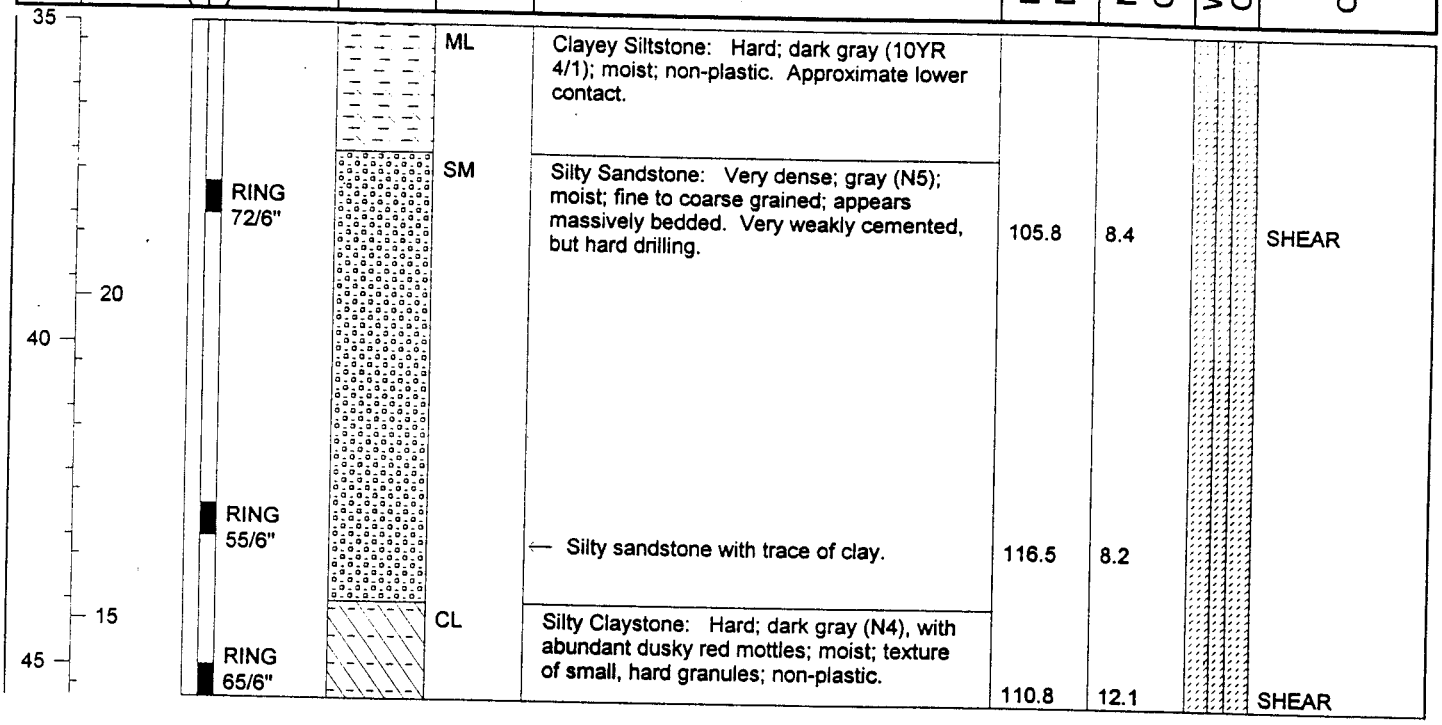
Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 9P

Sheet 3 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*



Boring terminated at 45.5 feet due to slow drilling progress and overheating equipment.
Perched groundwater encountered in zone from approximately 4.0 to 9.0 feet (base of Bay Point Fm.).
Piezometer installed as depicted in well completion column..

FIG. A-29

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 10

Sheet 1 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	**4/29/98**	Logged By:	**M. Doerschlag**
Drilled By:	**California-Pacific**	Total Depth:	**56.0 Ft.**
Rig Make/Model:	**Mobile B-53**	Hammer Type:	**Wireline downhole**
Drilling Method:	**Hollow-stem Auger**	Hammer Weight/Drop:	**140 Lb./±30 In.**
Hole Diameter:	**8 In.**	Surface Elevation:	**62.0 Ft.**

Comments: Groundwater seepage from nearby bluff exposures.

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
0	60	RING 13/12"		SP-SC	Clayey Sand with Gravel: Medium dense; brown (7.5YR 4/4); moist; fine to medium grained, with gravel and cobble-size rocks to ~4" diameter. [Fill]	106.5	6.6		
					Approximate contact.				
5	55			SP	Sand: Dense; yellowish red (5YR 5/8); moist becoming very moist near 8 ft.; fine to medium grained; trace of clay and Fe-oxide binding agents. [Bay Point Fm.]				
					Sharp contact.				
10	50	RING 43/6"		SP	Sandstone: Very dense; yellow (5Y 7/8); very moist; fine to medium grained; uncemented; apparently massively bedded. [Delmar Fm.]	104.9	14.4		SHEAR
15				ML, CL	Clayey Siltstone and Silty Claystone: Hard; olive brown (2.5Y 4/4); moist; generally trace of fine-grained sand.				

Continued on next sheet.

FIG. A-30

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 10

Sheet 2 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
15				ML, CL	Clayey Siltstone and Silty Claystone: Hard; pale olive (5Y 6/3); moist; non-plastic. Trace of fine-grained sand.				
	45				— Cuttings dusky red (2.5YR 3/2) from about 17-18 ft.				
				SP-SM	Silty Sandstone: Very dense; dark reddish brown (5YR 2.5/2); wet; fine-grained. Thinly bedded in bluff exposures.				
20		RING 73/6"				105.8	19.2		
	40								
25				ML	Siltstone and Silty Sandstone: Hard or very dense; dark gray (N4); moist; fine to medium grained sand; siltstones commonly with trace of clay; uncemented.				
	35								
30		RING 60/6"		SM	← Fine-grained, very silty sandstone.	107.6	11.9		
	30								
35									

Continued on next sheet.

FIG. A-31

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 10

Sheet 3 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
35				ML	Clayey Siltstone: Hard; mostly gray (5Y 5/1), occasionally mottled with dusky red Fe-oxide staining; moist; non-plastic.				
	25								
40		RING 40/6"		ML	Sandy siltstone, gray (5Y 5/1), slight granulated texture, some Fe-oxide mottling.	111.0	12.9		
	20								
45									
	15								
50		RING 65/6"		ML	Clayey siltstone with trace of sand, slight granulated texture, non-plastic.	103.1	15.5		
	10								
55									

Continued on next sheet.

FIG. A-32

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 10

Sheet 4 of 4

Project: ***NORTH COUNTY TRANSIT DISTRICT***

Location: ***DEL MAR, CALIFORNIA*** Project No. ***3650-SF***

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
55		RING 52/6"		ML	Sandy Siltstone: Hard; gray (N5); moist; fine-grained sand.	111.8	15.5		SHEAR

Bottom of boring at 56.0 feet.
Perched groundwater encountered in sandstone member from approximately 19.0 to 25.0 feet.
Boring backfilled with soil cuttings.

FIG. A-33

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 11P

Sheet 1 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	**4/29/98**	Logged By:	**M. Doerschlag**
Drilled By:	**California-Pacific**	Total Depth:	**51.0 Ft.**
Rig Make/Model:	**Mobile B-53**	Hammer Type:	**Wireline downhole**
Drilling Method:	**Hollow-stem Auger**	Hammer Weight/Drop:	**140 Lb./±30 In.**
Hole Diameter:	**8 In.**	Surface Elevation:	**60.2 Ft.**

Comments: Surface water in adjacent drainage.

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
0	60			SP	Sand: Mostly dense; mostly strong brown (7.5YR 4/6); moist; fine to medium grained, with trace of gravel; trace of clay and Fe-oxide binding agents. [Bay Point Fm.]				
		RING							
		N=34		SP		117.1	7.4		
5	55								
		RING							
		N=40		SP	← Color 10YR 5/6; includes some coarse-grained sand.	109.3	4.4		
10	50								
					Sharp contact.				
		RING		SP	Sandstone: Very dense; yellow (5Y 7/8); very moist becoming wet; fine to medium grained, with trace of silt; uncemented; massively bedded. [Delmar Fm.]				
		67/12"				106.8	10.0		
15									

Continued on next sheet.

FIG. A-3.1

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 11P

Sheet 2 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

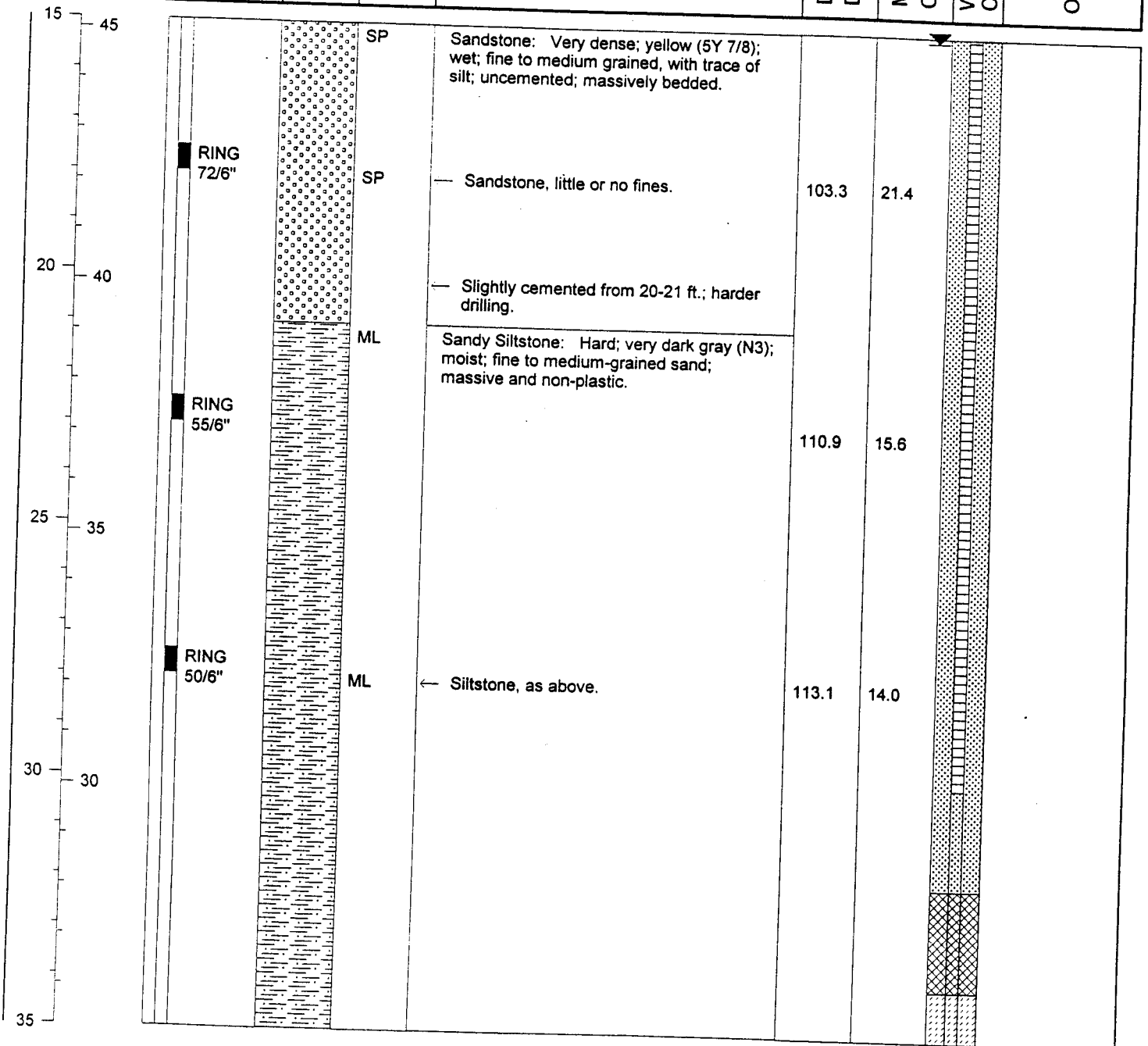


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FIG. A-35

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 11P

Sheet 3 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
35	25	RING 53/6"		ML, SM	Sandy Siltstone: As before; some very silty sandstone.	103.5	13.5		
				SP-SM	Silty Sandstone: Very dense; gray (N5); moist; fine to coarse grained; apparently massively bedded. Slightly cemented from 36 to 37 ft., and hard drilling. Becomes siltier with depth.				
40	20			SM	Becomes easier drilling; interpreted silty sandstone.				
					Approximate contact.				
				ML	Clayey Siltstone: Hard; olive gray (5Y 4/2); moist; trace of sand; non-plastic, with some granulated textures.				
45	15	RING 56/6"			← Clayey siltstone, as above.	107.4	15.8		
50	10	RING 58/6"		ML, SM	← Mixed clayey siltstone and thin silty sandstone, with common dusky red mottles	109.0	10.9		

Bottom of boring at 51.0 feet.
Perched groundwater encountered in zone from approximately 14.0 to 21.0 feet, measured depth of 15.1 feet after well installation. No groundwater encountered below 21.0 feet. Piezometer installed as depicted in well completion column..

FIG. A-38

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 12

Sheet 1 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	**4/30/98**	Logged By:	**M. Doerschlag**
Drilled By:	**California-Pacific**	Total Depth:	**50.0 Ft.**
Rig Make/Model:	**Mobile B-53**	Hammer Type:	**Wireline downhole**
Drilling Method:	**Hollow-stem Auger**	Hammer Weight/Drop:	**140 Lb./±30 In.**
Hole Diameter:	**8 In.**	Surface Elevation:	**60.5 Ft.**

Comments: Boring located in rail cut.

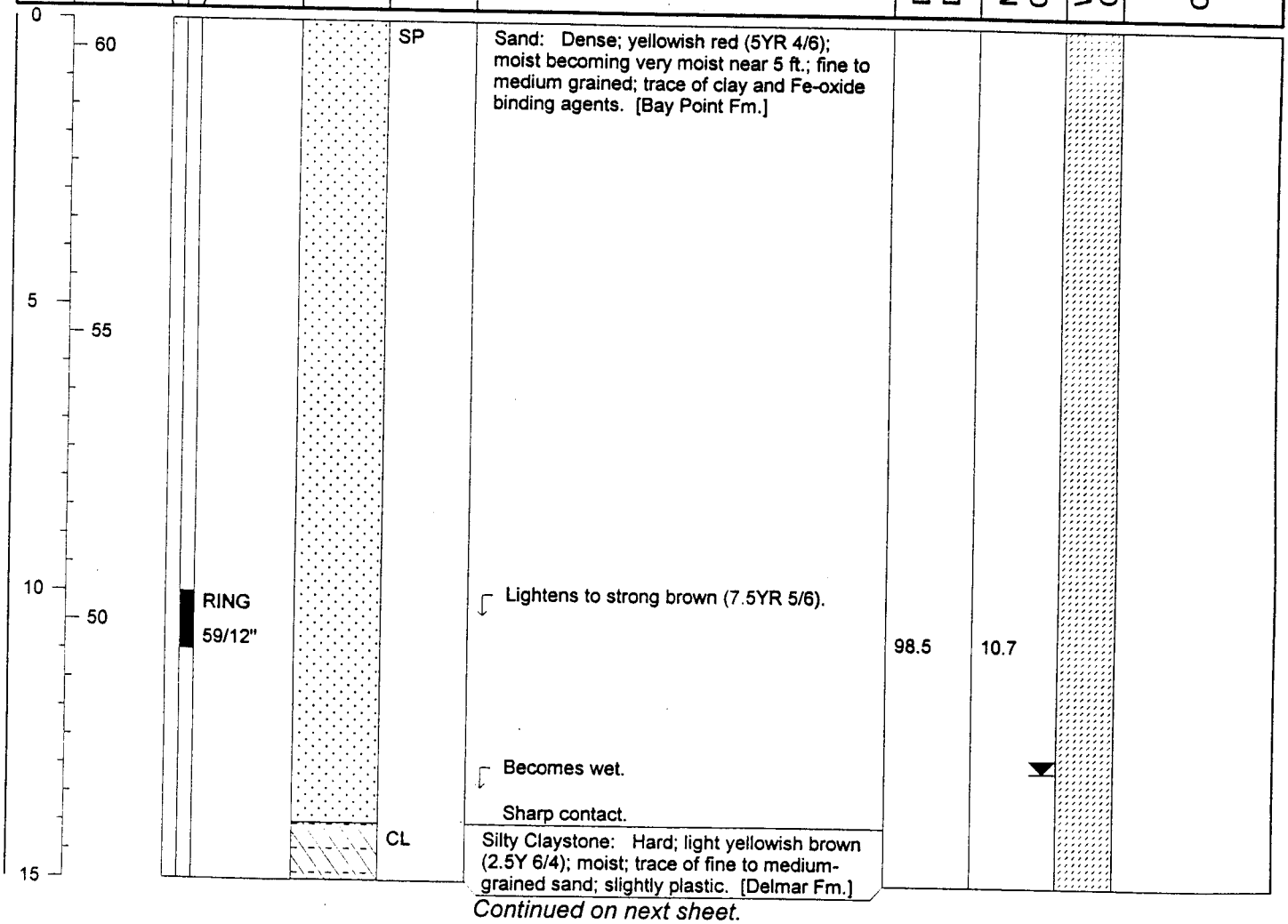

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FIG. A-37

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 12

Sheet 2 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
15	45			CL	Silty Claystone: Hard; light yellowish brown (2.5Y 6/4); moist; trace of fine to medium-grained sand; slightly plastic.				
				SM	Silty Sandstone: Very dense; dark gray (5YR 4/1); moist; fine to medium grained and very silty. Apparently massively bedded.				
20	40	RING 60/6"			← Silty sandstone, as above.	104.7	12.3		
				ML, CL	Clayey Siltstone and Silty Claystone: Hard; dark gray (N4); moist; occasional trace of fine to medium-grained sand; non-plastic. Increasing sand content with depth.				
25	35								
30	30	RING 60/6"		SM	← Local very fine-grained, very silty sandstone; light gray (5YR 6/1).	113.5	8.8		
					↓ Very clayey from about 33 to 35 feet.				
35									

Continued on next sheet.

FIG. A-33

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 12

Sheet 3 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK	SAMPLE INTERVALS: DRIVE	SAMPLE INTERVALS: TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
35	25					SM, SP-SM	Silty Sandstone: Very dense; gray (N5); moist; fine to medium grained. Inferred from cuttings.				
40	20			RING 91/9"		ML	← Sandy siltstone, gray (N5), trace of clay, massive texture. Thin, local layer.	95.3	9.2		
45	15					CL	Silty Claystone: Hard; dark gray (N4) and dusky red (10R 3/3); moist; non-plastic and friable, with pronounced granulated texture. Hard drilling.				
50				RING 56/6"		ML	← Grades to clayey siltstone, olive gray, slight granulated texture.	102.3	14.4		

Bottom of boring at 50.0 feet.
Slight groundwater seepage inferred to originate from approximately 13.0 to 14.0 feet (base of Bay Point Fm.).
Boring backfilled with soil cuttings.

FIG. A-39

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 13

Sheet 1 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	**4/30/98**	Logged By:	**M. Doerschlag**
Drilled By:	**California-Pacific**	Total Depth:	**56.0 Ft.**
Rig Make/Model:	**Mobile B-53**	Hammer Type:	**Wireline downhole**
Drilling Method:	**Hollow-stem Auger**	Hammer Weight/Drop:	**140 Lb./±30 In.**
Hole Diameter:	**8 In.**	Surface Elevation:	**57.6 Ft.**

Comments: Groundwater seepage visible at bluff face.

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK	SAMPLE INTERVALS: DRIVE	SAMPLE INTERVALS: TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
0	55					SP	Sand: Dense to very dense; red (2.5YR 4/8); slightly moist; fine to medium grained; trace of clay and Fe-oxide binding agents. [Bay Point Fm.]				
5	50						Lightens to strong brown (2.5YR 5/6) and yellowish brown (10YR 5/6).				
10	45			RING N=60				106.2	4.6		SHEAR
15							Sharp contact.				
						SP	Sandstone: Very dense; yellow (10YR 7/5) becoming very pale brown (10YR 7/4); moist to very moist; fine to coarse grained; massively bedded and essentially uncemented. [Delmar Fm.]				

Continued on next sheet.

FIG. A-40

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 13

Sheet 2 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
15		RING 55/6"		SP	Sandstone: Very dense; very pale brown (10YR 7/4); moist to very moist; fine to coarse grained; massively bedded.	118.4	11.9		SHEAR
	40								
20		RING 57/6"		SP	← Sandstone, as above.	111.3	11.8		
				ML	Clayey Silt: Hard; very pale brown (10YR 7/4); moist; non-plastic.				
	35							▼	
				SP	Sandstone: Very dense; very pale brown (10YR 7/4); moist; fine to coarse grained; uncemented.				
25		RING 65/6"		SP	← Sandstone, as above.	107.8	19.2		SHEAR
	30								
				CL	Silty Claystone: Hard; dark gray (10YR 4/1); moist; trace of fine-grained sand; non-plastic.				
30		RING 70/6"		CL	← Silty claystone, as above.	111.9	16.9		SHEAR
	25								
35									

Continued on next sheet.

FIG. A-41

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 13

Sheet 3 of 4

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
35		RING 60/6"		ML, CL	Clayey Siltstone and Silty Claystone: Hard; gray (10YR 6/1) at 35 feet becoming mostly dark gray (N4) at greater depths; moist; non-plastic. Variably granulated textures, ranging from massive to intensely fractured.	116.4	12.8		SHEAR
	20								
40		RING 59/9"		ML	← Clayey siltstone, dark gray (N4) with some dusky red Fe oxide mottling, trace of sand, granulated texture.	106.2	15.7		
	15								
45		RING 50/6"		ML	← Clayey siltstone, less clay than above, and only slightly granulated texture.	111.8	17.2		SHEAR
	10								
50		RING 65/6"		ML	← Very clayey siltstone, abundant dusky red mottles, intensely fractured.	107.7	19.9		
	5								
55									

Continued on next sheet.

FIG. A-42

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 13

Sheet 4 of 4

Project: ***NORTH COUNTY TRANSIT DISTRICT***

Location: ***DEL MAR, CALIFORNIA*** Project No. ***3650-SF***

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK	SAMPLE INTERVALS: DRIVE	SAMPLE INTERVALS: TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
55			RING 56/6"			ML	Clayey Siltstone and Silty Claystone: As before at 50 ft.	112.6	18.1		SHEAR

Bottom of boring at 56.0 feet.
Perched groundwater encountered in sandstone unit from approximately 23.0 to 28.0 feet; no groundwater encountered below 28.0 feet.
Boring backfilled with soil cuttings.

FIG. A-43

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 14P

Sheet 1 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	**4/30/98**	Logged By:	**M. Doerschlag**
Drilled By:	**California-Pacific**	Total Depth:	**51.0 Ft.**
Rig Make/Model:	**Mobile B-53**	Hammer Type:	**Wireline downhole**
Drilling Method:	**Hollow-stem Auger**	Hammer Weight/Drop:	**140 Lb./±30 In.**
Hole Diameter:	**8 In.**	Surface Elevation:	**52.8 Ft.**

Comments:

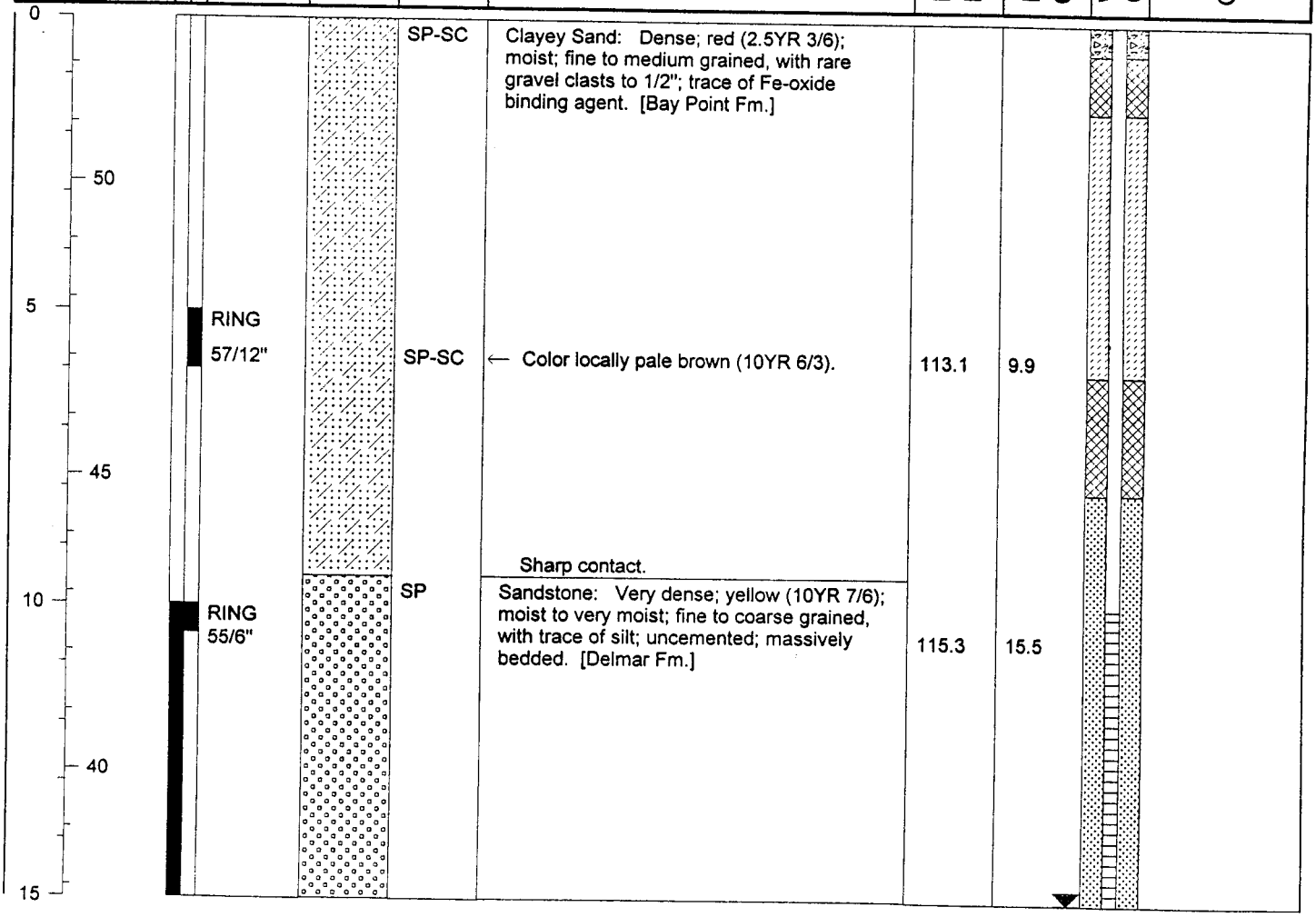

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FIG. A-44

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 14P

Sheet 2 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
15		RING 56/6"		SP	Sandstone: Very dense; color becoming pale brown (10YR 8/3); becomes wet at 15 feet; mostly medium to coarse grained, with trace of silt; uncemented; massively bedded.	108.3	17.5		
	35			SM	Grades silty, fine-grained.				
20		RING 50/6"		ML	Clayey Siltstone: Hard; dark gray (N4); moist; trace of fine to medium-grained sand; massive and non-plastic.	112.4	15.4		SHEAR
	30								
25		RING 43/6"		ML	← Clayey siltstone, as above.	99.3	17.6		
	25								
30		RING 50/6"		ML	← Siltstone, little to no clay, massively bedded.	111.8	15.5		SHEAR
	20								
35									

Continued on next sheet.

FIG. A-45

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 14P

Sheet 3 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
35		RING 60/6"		ML, SM	Siltstone and Silty Sandstone: Hard or very dense; dark to very dark gray (N3-N4); slightly moist to moist; sandy layers mostly fine to medium grained. Classified silty sandstone at 35 ft. depth.	99.3	11.6		SHEAR
	15								
40		RING 55/6"		ML	← Sandy siltstone, little to no clay, massive.	106.2	14.8		
	10								
				SM	Silty Sandstone: Very dense; dark gray (N4); moist; fine to medium grained; apparently massively bedded. Exposed at toe of bluffs.				
45		RING 72/6"				102.5	10.5		SHEAR
	5			ML	Clayey Siltstone: Hard; dark gray (N5) with common dusky red mottles; moist; local trace of sand; non-plastic, locally with some granulated textures.				
50		RING 42/6"			← Clayey siltstone, as above.	107.3	14.9		SHEAR

Bottom of boring at 51.0 feet.
Perched groundwater encountered in zone from approximately 15.0 to 17.0 feet, at base of sandstone member.
No groundwater encountered below 17.0 feet.
Piezometer installed as depicted in well completion column..

FIG. A-46

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 15

Sheet 1 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	**4/30/98**	Logged By:	**M. Doerschlag**
Drilled By:	**California-Pacific**	Total Depth:	**43.0 Ft.**
Rig Make/Model:	**Mobile B-53**	Hammer Type:	**Wireline downhole**
Drilling Method:	**Hollow-stem Auger**	Hammer Weight/Drop:	**140 Lb./±30 In.**
Hole Diameter:	**8 In.**	Surface Elevation:	**50.3 Ft.**

Comments:

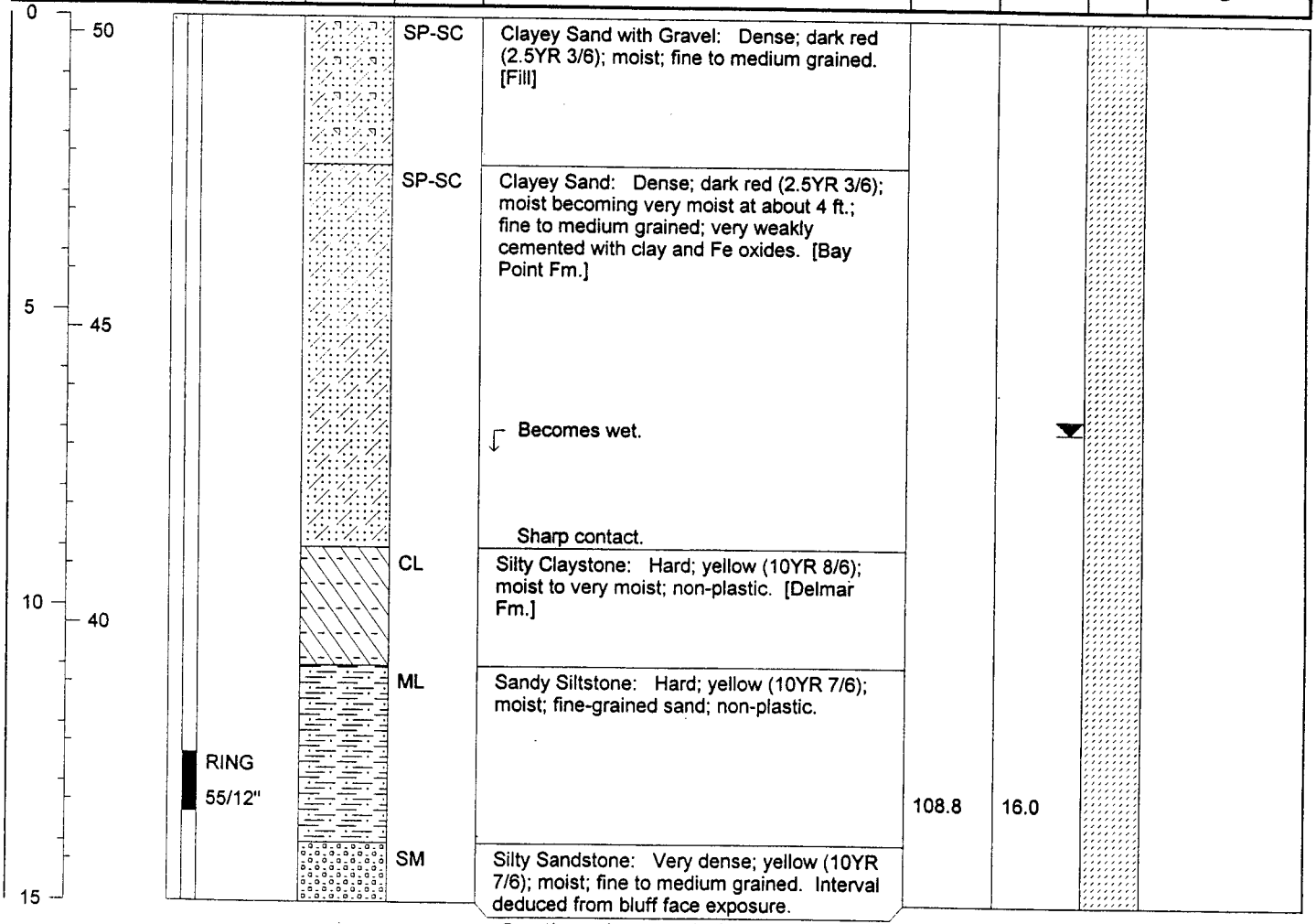

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FIG. A-47

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 15

Sheet 2 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
15	35			SM	Silty Sandstone: Very dense; yellow (10YR 7/6); moist; fine to medium grained. Interval deduced from bluff face exposure.				
		RING 74/12"		ML	Clayey Siltstone: Hard; mostly dark gray (N4) with frequent dusky red mottles; moist; small amounts of fine to medium-grained sand; variably massive to intensely fractured or granulated.	104.6	17.7		
20	30								
		RING 74/12"		ML	← Clayey siltstone, as above, granulated texture.	99.7	16.4		
25	25								
		RING N=27		ML	← Clayey siltstone with sand, olive gray (5Y 5/2) with red (10R 3/6) mottles.	97.6	18.8		
30	20				Siltstone: Hard; dark gray (5Y 4/1); moist; non-plastic; trace of clay and fine-grained sand. Mostly massive to lightly granular texture.				
35									

Continued on next sheet.

FIG. A-48

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 15

Sheet 3 of 3

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
35	15				Siltstone: Hard; dark gray (5Y 4/1) and gray (N5); moist; non-plastic; trace of clay; mostly massive and without granular texture.				
		RING 53/6"		ML	← Siltstone, as above.	107.8	16.0		
40	10								
		RING 72/6"		ML	← Very sandy siltstone, gray (N5), massive	103.8	15.8		

Bottom of boring at 43.0 feet.
Perched groundwater encountered in zone from approximately 7.0 to 9.0 feet (base of Bay Point Fm.).
Boring backfilled with soil cuttings.

FIG. A-49

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 16

Sheet 1 of 2

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

Dates(s) Drilled:	**4/30/98**	Logged By:	**M. Doerschlag**
Drilled By:	**California-Pacific**	Total Depth:	**29.5 Ft.**
Rig Make/Model:	**Mobile B-53**	Hammer Type:	**Wireline downhole**
Drilling Method:	**Hollow-stem Auger**	Hammer Weight/Drop:	**140 Lb./±30 In.**
Hole Diameter:	**8 In.**	Surface Elevation:	**46.5 Ft.**

Comments: Located at north end of project alignment.

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK	SAMPLE INTERVALS: DRIVE	SAMPLE INTERVALS: TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
0	45					SP-SC	Clayey Sand with Gravel: Dense; dark red (2.5YR 3/6); moist; fine to coarse grained. [Fill]				
						SP-SC	Clayey Sand: Dense; yellowish red (5YR 4/6); moist; fine to medium grained; very weakly cemented with clay and Fe oxides. [Bay Point Fm.]				
5	40					SP	Sharp contact. Sandstone: Very dense; yellow (5Y 8/6); moist; fine to coarse grained; local trace of silt; uncemented; massively bedded. [Delmar Fm.]				
10	35						Becomes yellow (5Y 7/7).				
15						CL, ML	Silty Claystone and Clayey Siltstone: Hard; yellow (10YR 8/6) to pale brown (10YR 7/3); moist; trace of fine to medium-grained sand; slightly plastic from 13-16 feet.				

Continued on next sheet.

FIG. A-50

Medall, Aragon, Higley Geotechnical, Inc.

FIELD LOG OF BORING B - 16

Sheet 2 of 2

Project: *NORTH COUNTY TRANSIT DISTRICT*

Location: *DEL MAR, CALIFORNIA* | Project No. *3650-SF*

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS: BULK / DRIVE / TYPE, N (Blows/ft.)	LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
15	30			ML	Clayey Siltstone: Hard; yellow (10YR 8/6) to pale brown (10YR 7/3); moist; trace of fine to medium-grained sand; non-plastic below about 16 feet.				
20	25	RING 69/12"		ML	Abruptly becomes gray (5Y 5/1). Clayey siltstone, non-plastic, slight granulated texture.	109.9	15.0		
25	20	RING 48/6"		ML	Clayey siltstone, very pale brown (10YR 7/4) with dusky red mottles, massively bedded.	101.3	20.8		

Bottom of boring at 29.5 feet.
No groundwater encountered.
Boring backfilled with soil cuttings.

FIG. A-51

EXPLANATION OF GEOTECHNICAL BORING LOG

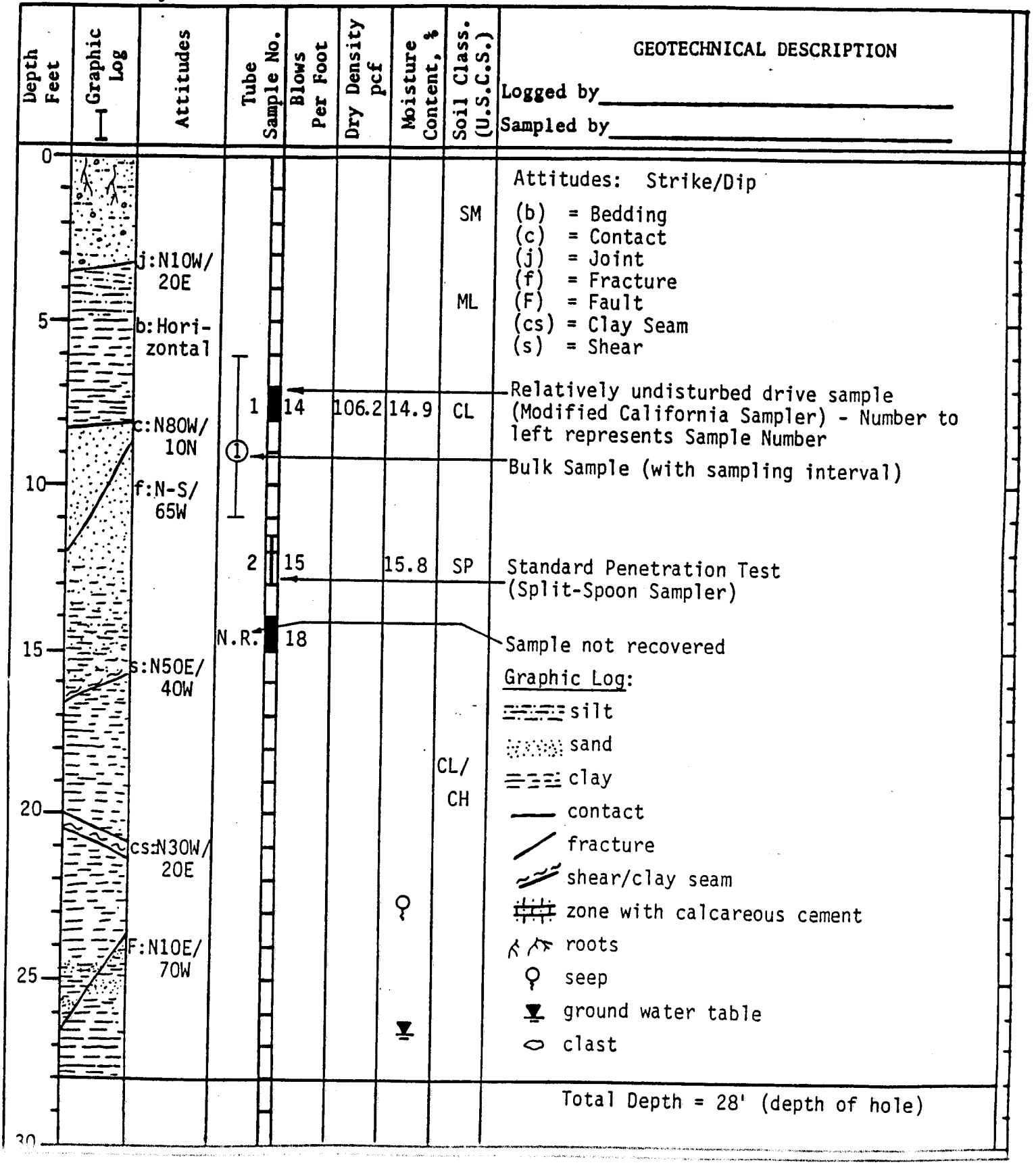
Date _____ Drill Hole No. _____ Sheet ___ of ___

Project _____ Job No. _____

Drilling Co. _____ Type of Rig _____

Hole Diameter _____ Drive Weight _____ Drop _____ in.

Elevation Top of Hole _____ Ref. or Datum _____



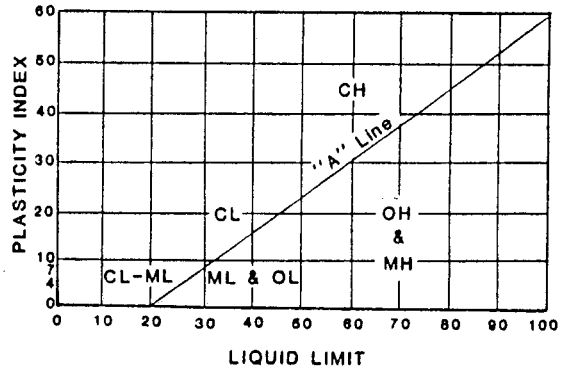
Leighton & Associates

MAJOR DIVISIONS		SOIL CLASS.	TYPICAL NAMES
COARSE GRAINED SOILS (More than 1/2 of soil > no. 200 sieve size)	GRAVELS (More than 1/2 of coarse fraction > no. 4 sieve size)	GW	Well graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 1/2 of coarse fraction < no. 4 sieve size)	SW	Well graded sands or gravelly sands, little or no fines
		SP	Poorly graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS (More than 1/2 of soil < no. 200 sieve size)	SILTS & CLAYS LL < 50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LL > 50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils

CLASSIFICATION CHART
(Unified Soil Classification System)

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL	3" to No. 4	76.2 to 4.76
coarse	3" to 3/4"	76.2 to 19.1
fine	3/4" to No. 4	19.1 to 4.76
SAND	No. 4 to No. 200	4.76 to 0.074
coarse	No. 4 to No. 10	4.76 to 2.00
medium	No. 10 to No. 40	2.00 to 0.420
fine	No. 40 to No. 200	0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

GRAIN SIZE CHART



PLASTICITY CHART

METHOD OF SOIL CLASSIFICATION

APPENDIX C

Laboratory Testing Procedures and Test Results

Chloride Content: Chloride content was tested in accordance with Caltrans Test Method CT422. The results are presented below:

Sample Location	Sample Description	Chloride Content (ppm)	Chloride Attack Potential*
B-1 @ 0'-5'	Red-brown silty SAND	303	Threshold
B-1 @ 40'-45'	Dark Olive silty clayey SAND	489	Positive

* per City of San Diego Program Guidelines for Design Consultant, 1992.

Direct Shear Tests: A Direct shear test was performed on a selected remolded samples which were soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box and reloading of the sample, the pore pressures set up in the sample (due to the transfer) were allowed to dissipate for a period of approximately 1 hour prior to application of shearing force. The samples were tested under various normal loads utilizing a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of 0.005 inches per minute. After a shear strain of 0.2 inches, the motor was stopped and the sample was allowed to "relax" for approximately 15 minutes. The stress drop during the relaxation period was recorded. It is anticipated that, in a majority of samples tested, the 15 minutes relaxing of the samples is sufficient to allow dissipation of pore pressures that may have set up in the samples due to shearing. The drained peak strength was estimated by deducting the shear force reduction during the relaxation period from the peak shear values. The shear values at the end of shearing are considered to be ultimate values and are shown in parenthesis.

Sample Location	Sample Description	Friction Angle (degrees)	Apparent Cohesion (psf)
B-1, 16 Feet	Dark brown silty SAND	36 (34)	300 (300)

APPENDIX C (Continued)

Maximum Dry Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM Test Method D1557. The results of these tests are presented in the table below:

Sample Location	Sample Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-1 @ 0'-5'	Red-brown silty SAND	128.0	7.5

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests were performed in general accordance with Caltrans Test Method CT643 for Steel or CT532 for concrete and standard geochemical methods. The results are presented in the table below:

Sample Location	Sample Description	pH	Minimum Resistivity (ohms-cm)
B-1 @ 0'-5'	Red-brown silty SAND	8.77	2336

Soluble Sulfates: The soluble sulfate contents of selected samples were determined by standard geochemical methods (Caltrans Test Method CT417). The test results are presented in the table below:

Sample Location	Sample Description	Soluble Sulfate Content (ppm)	Potential Degree of Sulfate Attack*
B-1 @ 0'-5'	Red-brown silty SAND	<150	Negligible
B-1 @ 40'-45'	Dark Olive silty clayey SAND	<150	Negligible

* Based on the 1997 edition of the Uniform Building Code, Table No. 19-A-4, prepared by the International Conference of Building Officials (ICBO, 1997).

Laboratory Testing - Geotechnical Investigation, 10th Street Retaining Wall (April 30,2002)

APPENDIX C

Laboratory Testing Procedures and Test Results

Chloride Content: Chloride content was tested in accordance with Caltrans Test Method CT422. The results are presented below:

Sample Location	Sample Description	Chloride Content (ppm)	Chloride Attack Potential*
B-1 @ 0'-5'	Red-brown silty SAND	303	Threshold
B-1 @ 40'-45'	Dark Olive silty clayey SAND	489	Positive

* per City of San Diego Program Guidelines for Design Consultant, 1992.

Direct Shear Tests: A Direct shear test was performed on a selected remolded samples which were soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box and reloading of the sample, the pore pressures set up in the sample (due to the transfer) were allowed to dissipate for a period of approximately 1 hour prior to application of shearing force. The samples were tested under various normal loads utilizing a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of 0.005 inches per minute. After a shear strain of 0.2 inches, the motor was stopped and the sample was allowed to "relax" for approximately 15 minutes. The stress drop during the relaxation period was recorded. It is anticipated that, in a majority of samples tested, the 15 minutes relaxing of the samples is sufficient to allow dissipation of pore pressures that may have set up in the samples due to shearing. The drained peak strength was estimated by deducting the shear force reduction during the relaxation period from the peak shear values. The shear values at the end of shearing are considered to be ultimate values and are shown in parenthesis.

Sample Location	Sample Description	Friction Angle (degrees)	Apparent Cohesion (psf)
B-1, 16 Feet	Dark brown silty SAND	36 (34)	300 (300)

Maximum Dry Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM Test Method D1557. The results of these tests are presented in the table below:

Sample Location	Sample Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-1 @ 0'-5'	Red-brown silty SAND	128.0	7.5

Laboratory Testing Procedures and Test Results (Continued)

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests were performed in general accordance with Caltrans Test Method CT643 for Steel or CT532 for concrete and standard geochemical methods. The results are presented in the table below:

Sample Location	Sample Description	pH	Minimum Resistivity (ohms-cm)
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* Based on the 1997 edition of the Uniform Building Code, Table No. 19-A-4, prepared by the International Conference of Building Officials (ICBO, 1997).

TERATEST LABS

COMPACTION TEST
ASTM D 1557

Project Name: DEL MAR BLUFFS
Project Number: 040151-007
Boring Number: B-1
Sample Number: 1
Sample Description: SM, BROWN SILTY SAND

Tested By: MDR
Date: 4/18/02
Depth (ft.):

Scalp Fraction (%): +#4: 0.4 +3/8": +3/4":

Preparation Method: [ ] Moist [X] Dry
Mold Volume (ft.^{3}): 0.03344

Compaction Method: [X] Mechanical Ram [ ] Manual Ram
Ram Weight: 10 lbs. Drop: 18 inches

Water added (ml):	150	200	50	100		
TEST NUMBER:	1	2	3	4	5	6
Weight of Soil and Mold (g)	5523	5480	5361	5455		
Weight of Mold (g)	3432	3432	3432	3432		
Weight of Soil (g)	2091	2048	1929	2023		
Wet Soil and Tare (g)	186.9	213.2	191.6	197.0		
Dry Soil and Tare (g)	174.3	195.3	185.0	186.6		
Weight of Tare (g)	12.0	12.0	11.9	11.9		
Wet Density (pcf)	137.9	135.0	127.2	133.4		
Moisture Content (%)	7.8	9.8	3.8	6.0		
Dry Density (pcf)	127.9	123.0	122.5	125.9		

Maximum Dry Density (pcf) 128.0

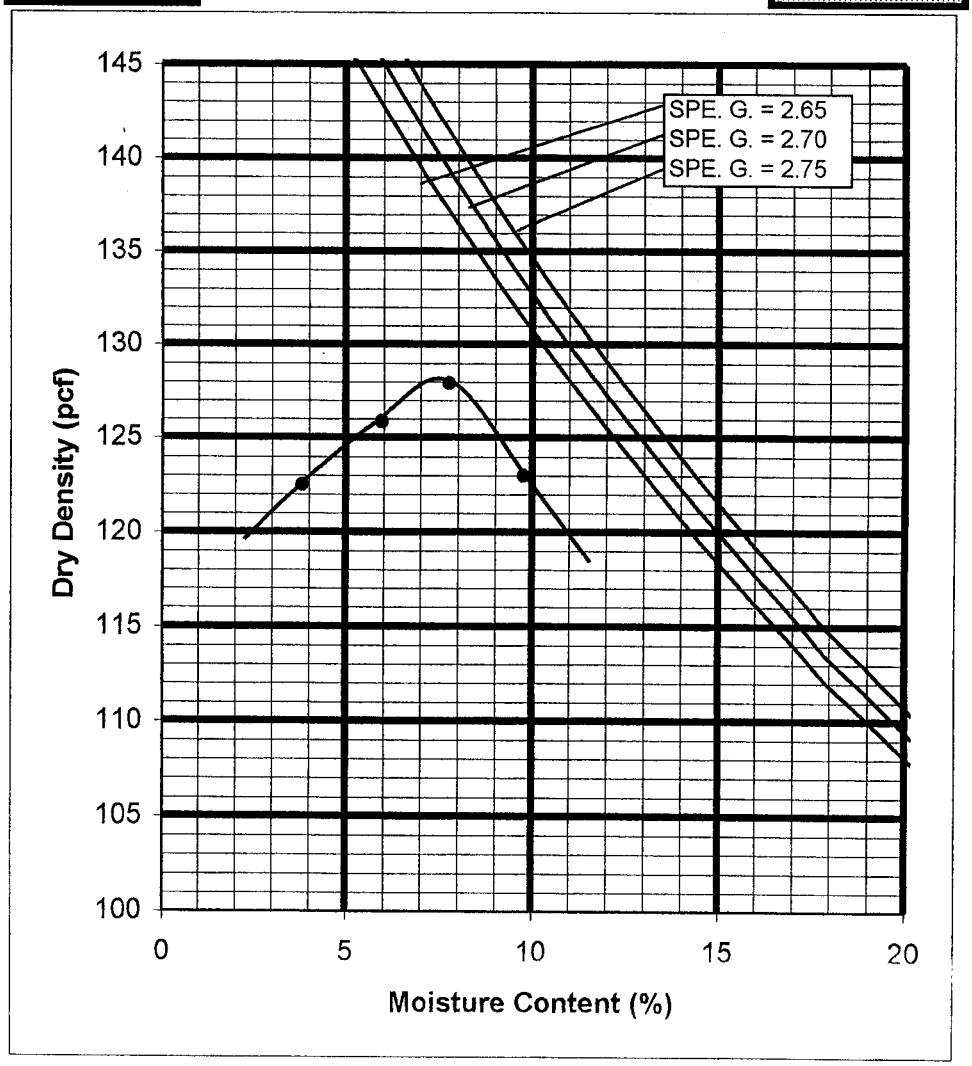
Optimum Moisture Content (%) 7.5

PROCEDURE

[X] **Procedure A**
Soil: Passing No. 4 (4.75mm) Sieve
Mold: 4 in. (101.6 mm) Diameter
Layers: 5 (five)
Blows per Layer: 25 (twenty-five)
May be used if 20% or less by weight of the material is retained on the No. 4 sieve.

[ ] **Procedure B**
Soil: Passing 3/8 in. (9.5 mm) Sieve
Mold: 4 in. (101.6 mm) Diameter
Layers: 5 (five)
Blows per Layer: 25 (twenty-five)
Shall be used if more than 20% by weight of the material is retained on the No. 4 sieve and 20% or less by weight is retained on the 3/8 in. sieve.

[ ] **Procedure C**
Soil: Passing 3/4 in. (19.0 mm) Sieve
Mold: 6 in. (152.4 mm) Diameter
Layers: 5 (five)
Blows per Layer: 56 (fifty-six)
Shall be used if more than 20% by weight of the material is retained on the 3/8 in. sieve and less than 30% by weight is retained on the 3/4 in. sieve.



TERATEST LABS

pH and Resistivity Sulfate Content Chloride Content

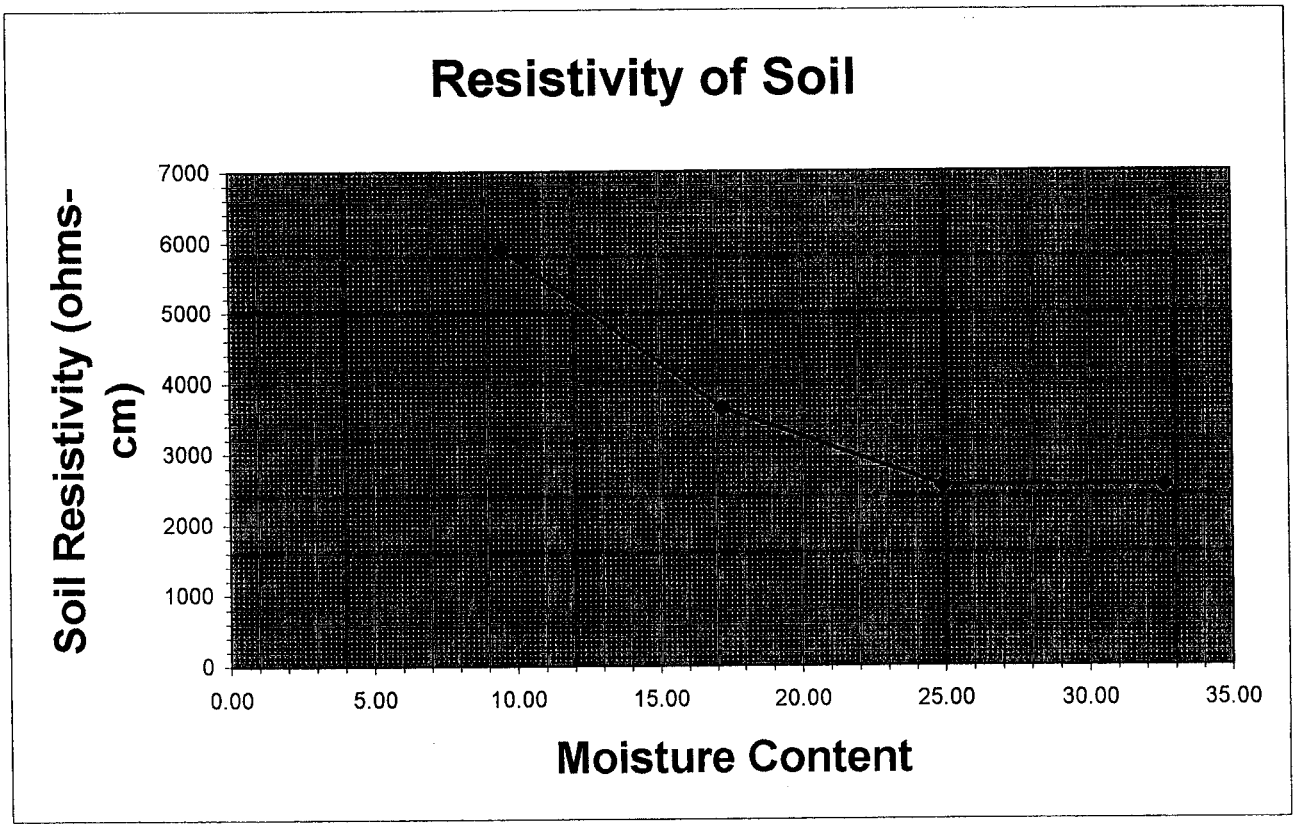
CT 532, CT 417, CT 422

Project Name:	DEL MAR BLUFFS	Date:	4/17/02
Project Number:	040151-007	Tested By:	MDR
Boring Number:	B-1	Checked By:	
Sample Number:	1	Depth (ft.):	0.0-5.
Sample Description:	SM, REDDISH BROWN SILTY SAND		

Initial Moisture Content	
Wet Wt. Soil+Container (g)	196.5
Dry Wt. Soil+Container (g)	193.2
Weight of Container (g)	12.0
Moisture Content (%)	1.8

Initial Sample Weight	1300
Box Constant	6.87
Soil pH	7.21
Sulfate Content (ppm)	<150
Chloride Content(ppm)	303

Water Added (ml)						
Moisture Content	9.51	17.21	24.90	32.59		
Spec. Cond.(uhm/cm)	860	530	370	370		
Resistivity (ohms-cm)	5908	3641	2542	2542		



TERATEST LABS

pH and Resistivity Content Sulfate Chloride Content

CT 532, CT 417, CT 422

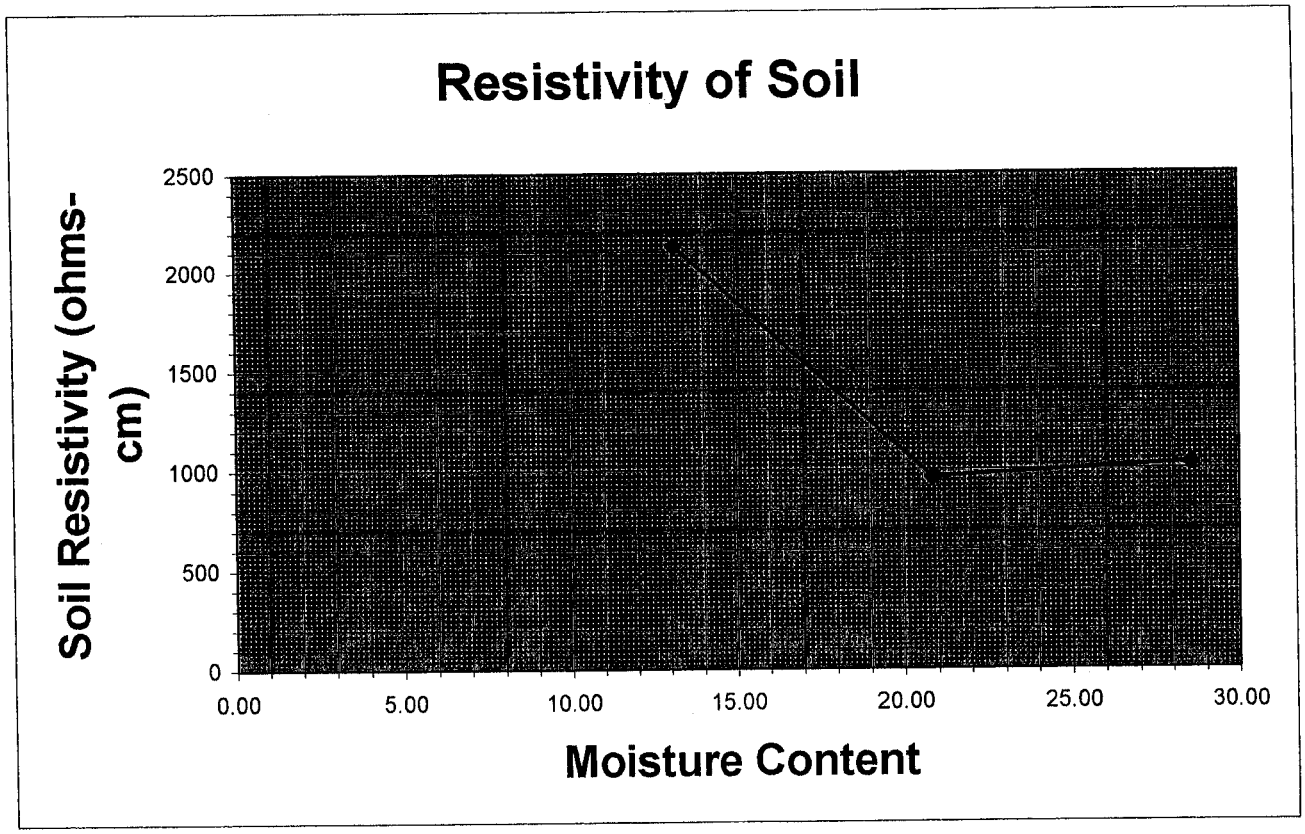
Project Name: DEL MAR BLUFFS
Project Number: 040157-007
Boring Number: B-1
Sample Number: 10
Sample Description: SC-SM, DARK OLIVE SILTY, CLAYEY SAND

Date: 4/17/02
Tested By: MDR
Checked By:
Depth (ft.): 40.0-45.0

Initial Moisture Content	
Wet Wt. Soil+Container (g)	189.5
Dry Wt. Soil+Container (g)	180.3
Weight of Container (g)	12.0
Moisture Content (%)	5.5

Initial Sample Weight	1300
Box Constant	6.87
Soil pH	8.93
Sulfate Content (ppm)	<150
Chloride Content(ppm)	489

Water Added (ml)						
Moisture Content	13.16	20.85	28.54			
Spec. Cond.(uhm/cm)	310	140	150			
Resistivity (ohms-cm)	2130	962	1031			



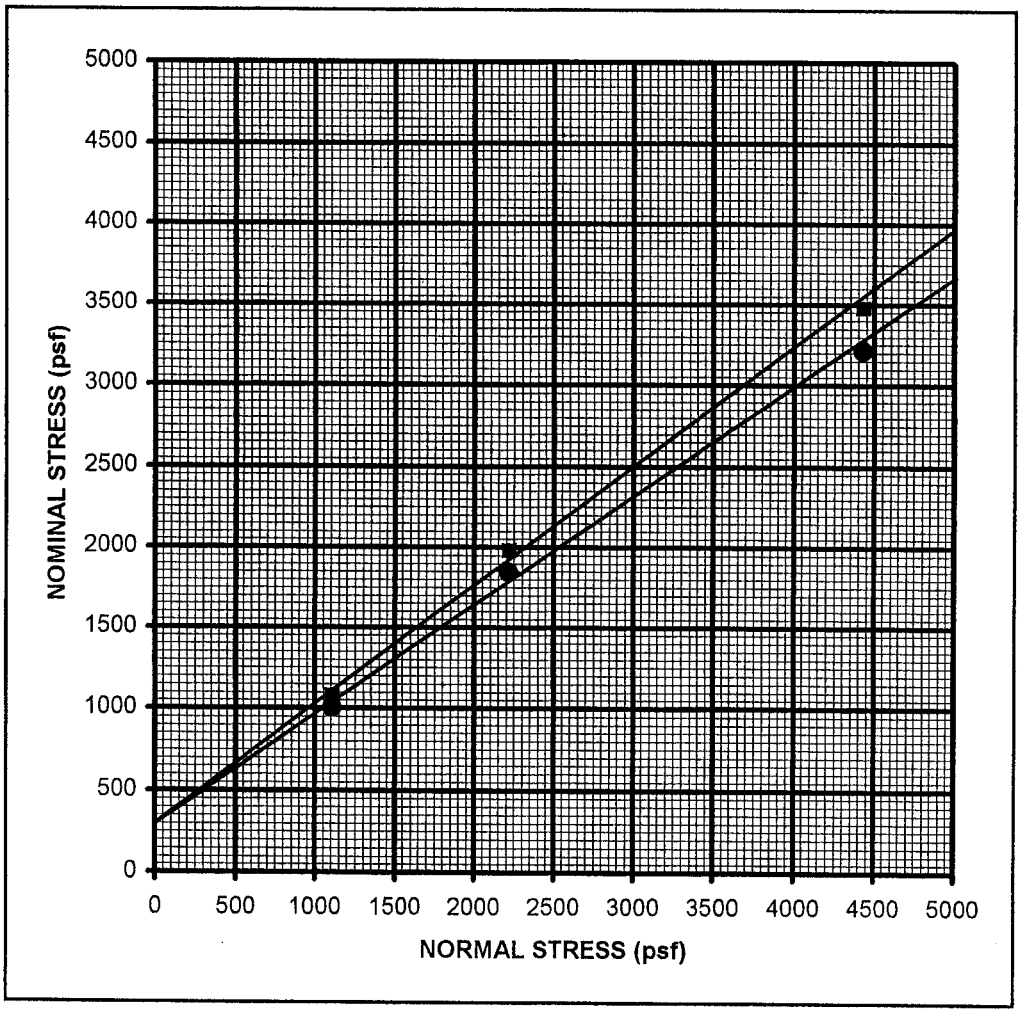
TERATEST LABS

DIRECT SHEAR TEST RESULT

ASTM D 3080

Project Name:	DEL MAR BLUFFS	Date:	4/16/02
Project Number:	040151-007	Tested By:	BCC
Boring Number:	B-1	Checked By:	
Sample Number:	4	Depth (ft.):	16.0
Soil Description:	SM, DARK BROWN SILTY SAND		

VERTICAL STRESS (psf)	PROVING RING DIAL READING		CONVERSION FACTOR	SHEAR STRESS (psf)	RELAXED STRESS (psf)	PEAK	
	PEAK ■	RELAXED ●				COHESION (psf)	300
						FRICTION (deg.)	36
1108	72	67	15	1080	1005	RELAXED	
2216	132	123	15	1980	1845	COHESION (psf)	300
4432	232	214	15	3480	3210	FRICTION (deg.)	34



Rev. 02-02

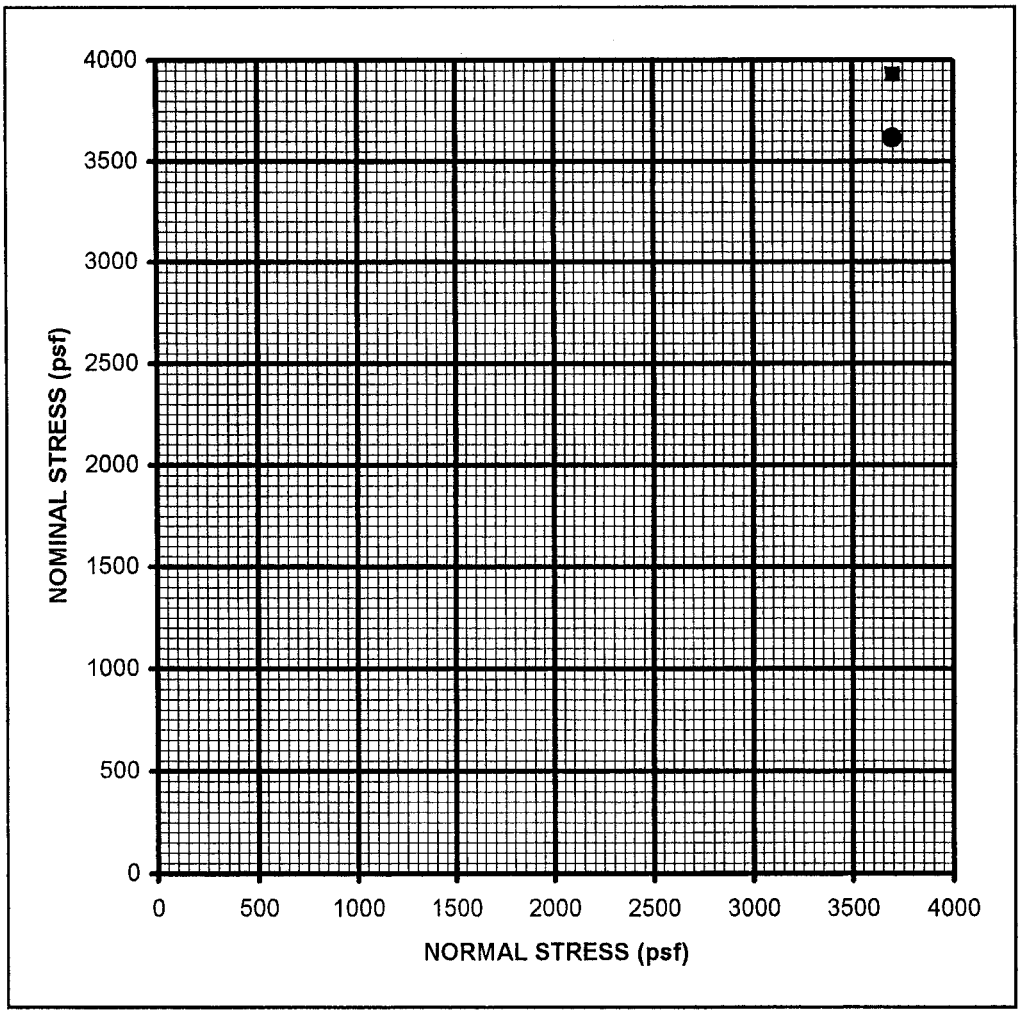
TERATEST LABS

DIRECT SHEAR TEST RESULT

ASTM D 3080

Project Name:	DEL MAR BLUFFS	Date:	4/16/02
Project Number:	040151-007	Tested By:	BCC
Boring Number:	B-1	Checked By:	
Sample Number:	7	Depth (ft.):	31.0
Soil Description:	SC, REDDISH-BROWN CLAYEY SAND		

VERTICAL STRESS (psf)	PROVING RING DIAL READING		CONVERSION FACTOR	SHEAR STRESS (psf)	RELAXED STRESS (psf)	PEAK	
						COHESION (psf)	
						FRICTION (deg.)	
	PEAK ■	RELAXED ●					
3700	262	241	15	3930	3615	RELAXED	
						COHESION (psf)	
						FRICTION (deg.)	



Rev. 02-02

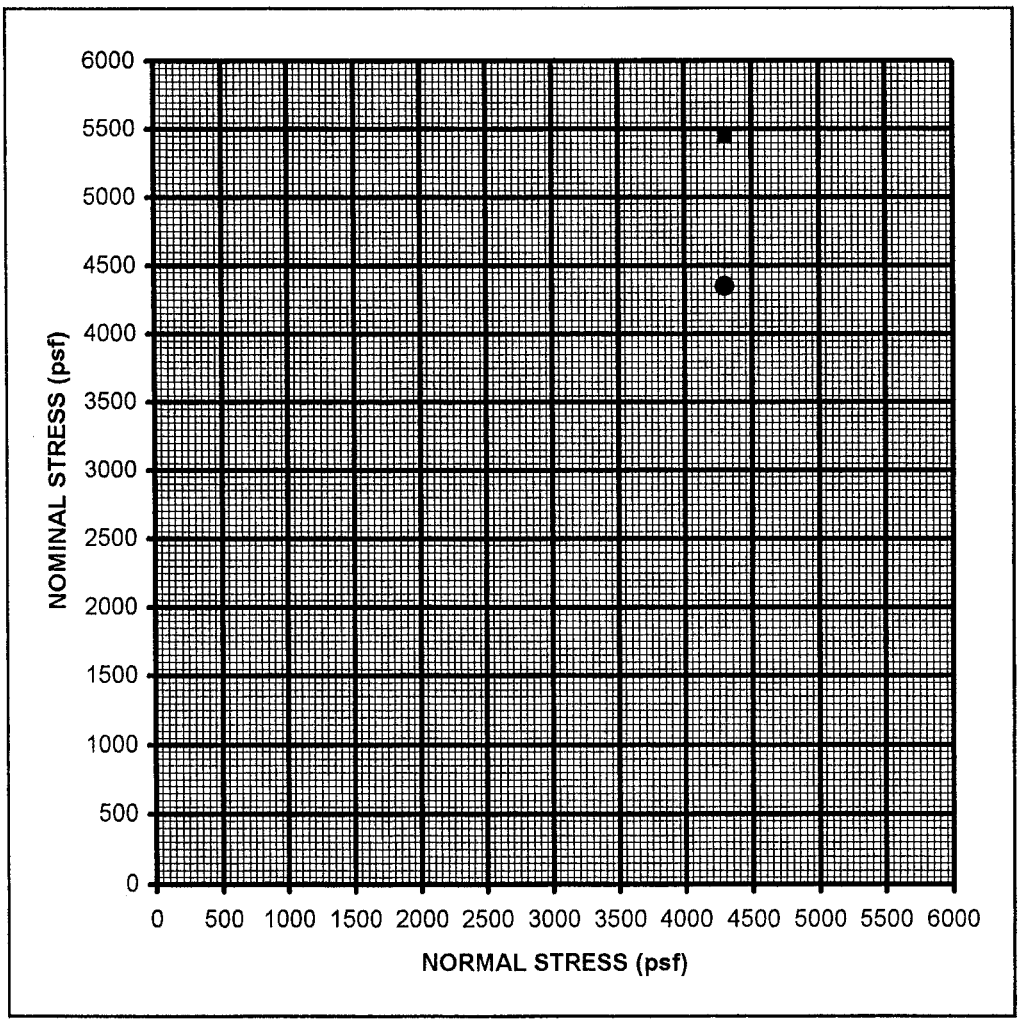
TERATEST LABS

DIRECT SHEAR TEST RESULT

ASTM D 3080

Project Name:	DEL MAR BLUFFS	Date:	4/16/02
Project Number:	040151-007	Tested By:	BCC
Boring Number:	B-1	Checked By:	
Sample Number:	8	Depth (ft.):	36.0
Soil Description:	SC, OLIVE CLAYEY SAND		

VERTICAL STRESS (psf)	PROVING RING DIAL READING		CONVERSION FACTOR	SHEAR STRESS (psf)	RELAXED STRESS (psf)	PEAK	
						COHESION (psf)	
						FRICTION (deg.)	
	PEAK ■	RELAXED ●					
4300	363	290	15	5445	4350	RELAXED	
						COHESION (psf)	
						FRICTION (deg.)	



Rev. 02-02

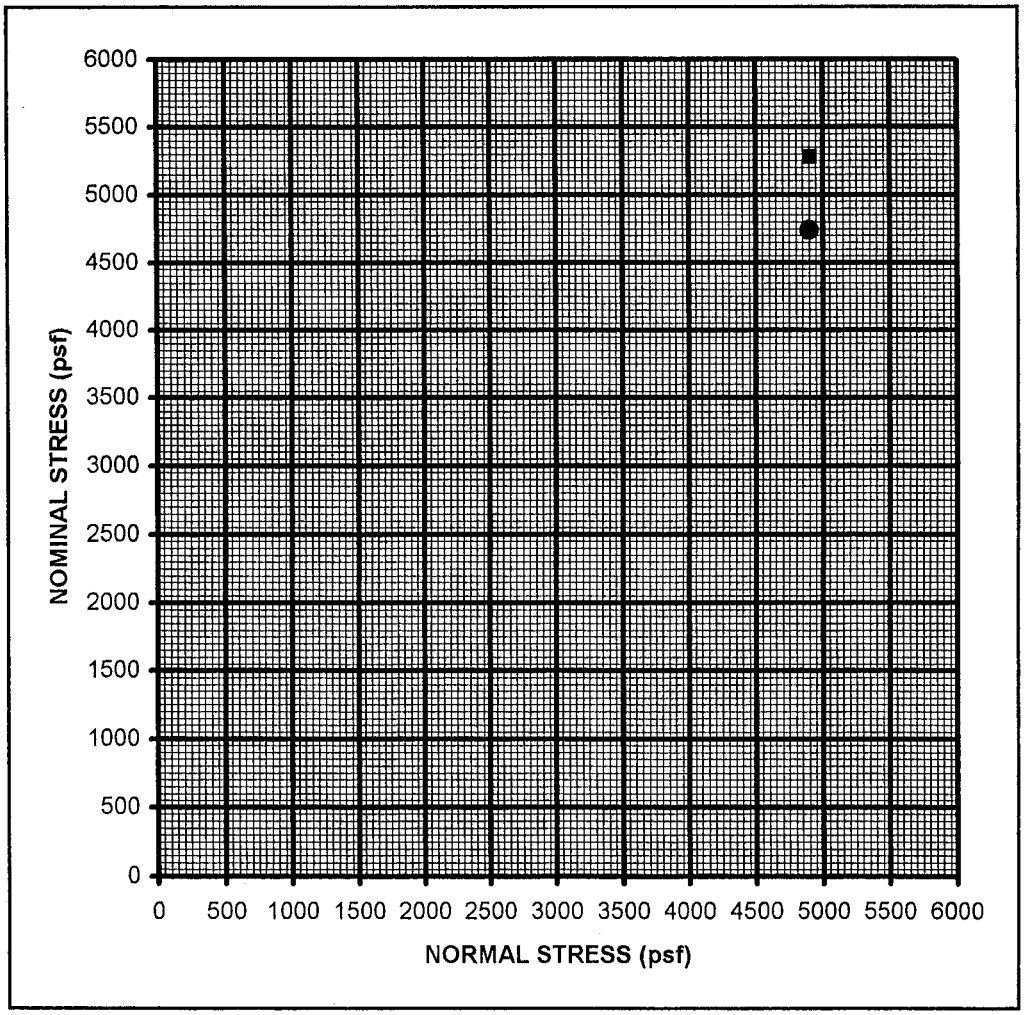
TERATEST LABS

DIRECT SHEAR TEST RESULT

ASTM D 3080

Project Name:	DEL MAR BLUFFS	Date:	4/16/02
Project Number:	040151-007	Tested By:	BCC
Boring Number:	B-1	Checked By:	
Sample Number:	9	Depth (ft.):	41.0
Soil Description:	SC, DARK BLUISH-GRAY CLAYEY SAND		

VERTICAL STRESS (psf)	PROVING RING DIAL READING		CONVERSION FACTOR	SHEAR STRESS (psf)	RELAXED STRESS (psf)	PEAK	
						COHESION (psf)	
						FRICTION (deg.)	
	PEAK ■	RELAXED ●					
4900	352	316	15	5280	4740	RELAXED	
						COHESION (psf)	
						FRICTION (deg.)	



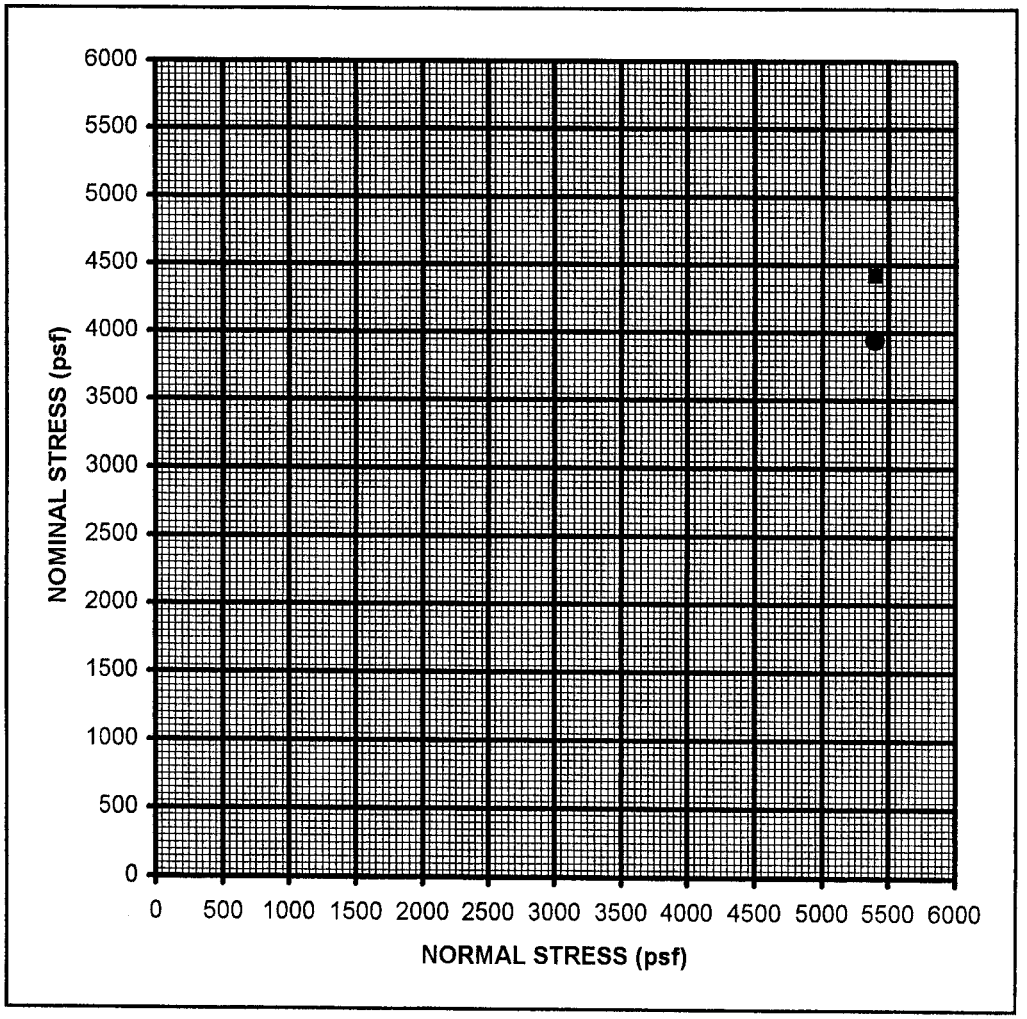
TERATEST LABS

DIRECT SHEAR TEST RESULT

ASTM D 3080

Project Name:	DEL MAR BLUFFS	Date:	4/17/02
Project Number:	040151-007	Tested By:	BCC
Boring Number:	B-1	Checked By:	
Sample Number:	11	Depth (ft.):	45
Soil Description:	SC, DARK BLUISH-GRAY CLAYEY SAND		

VERTICAL STRESS (psf)	PROVING RING DIAL READING		CONVERSION FACTOR	SHEAR STRESS (psf)	RELAXED STRESS (psf)	PEAK	
						COHESION (psf)	
						FRICTION (deg.)	
	PEAK ■	RELAXED ●					
5400	295	263	15	4425	3945	RELAXED	
						COHESION (psf)	
						FRICTION (deg.)	



Rev. 02-02

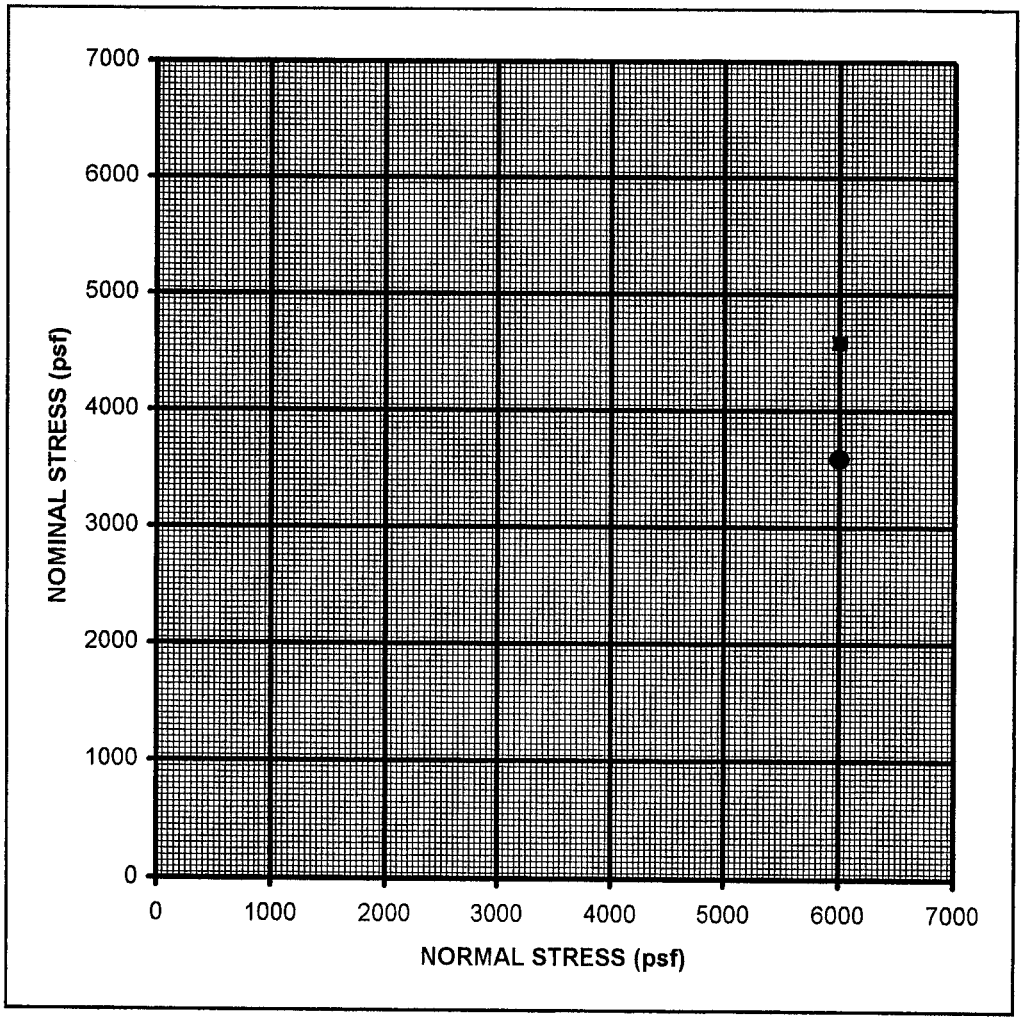
TERATEST LABS

DIRECT SHEAR TEST RESULT

ASTM D 3080

Project Name:	DEL MAR BLUFFS	Date:	4/17/02
Project Number:	040151-007	Tested By:	BCC
Boring Number:	B-1	Checked By:	
Sample Number:	12	Depth (ft.):	50.0
Soil Description:	SC, GRAY CLAYEY SAND		

VERTICAL STRESS (psf)	PROVING RING DIAL READING		CONVERSION FACTOR	SHEAR STRESS (psf)	RELAXED STRESS (psf)	PEAK	
						COHESION (psf)	
	PEAK ■	RELAXED ●				FRICTION (deg.)	
6000	306	239	15	4590	3585	RELAXED	
						COHESION (psf)	
						FRICTION (deg.)	



Rev. 02-02

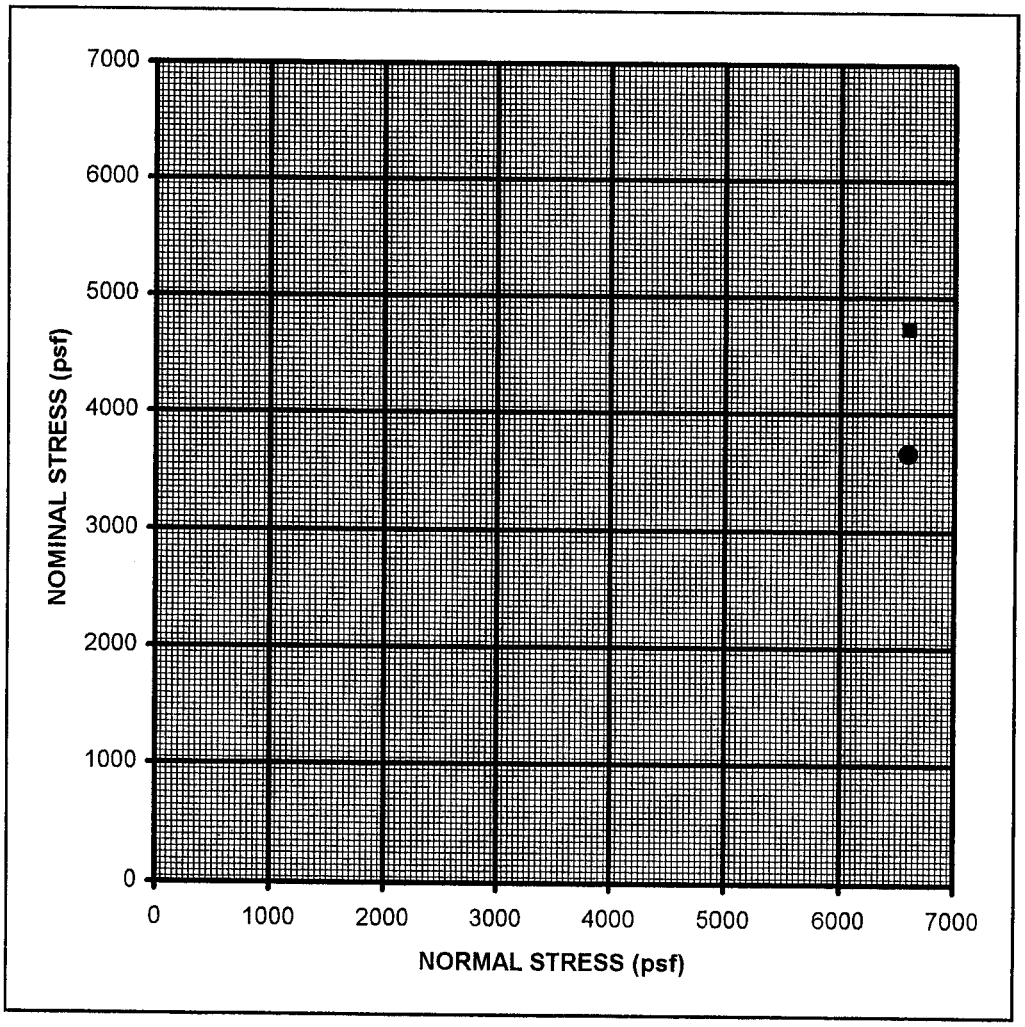
TERATEST LABS

DIRECT SHEAR TEST RESULT

ASTM D 3080

Project Name:	DEL MAR BLUFFS	Date:	4/17/02
Project Number:	040151-007	Tested By:	BCC
Boring Number:	B-1	Checked By:	
Sample Number:	13	Depth (ft.):	55.0
Soil Description:	s(CL), OLIVE GRAY SANDY LEAN CLAY		

VERTICAL STRESS (psf)	PROVING RING DIAL READING		CONVERSION FACTOR	SHEAR STRESS (psf)	RELAXED STRESS (psf)	PEAK	
	PEAK ■	RELAXED ●				COHESION (psf)	
						FRICTION (deg.)	
6600	316	244	15	4740	3660	RELAXED	
						COHESION (psf)	
						FRICTION (deg.)	



Rev. 02-02

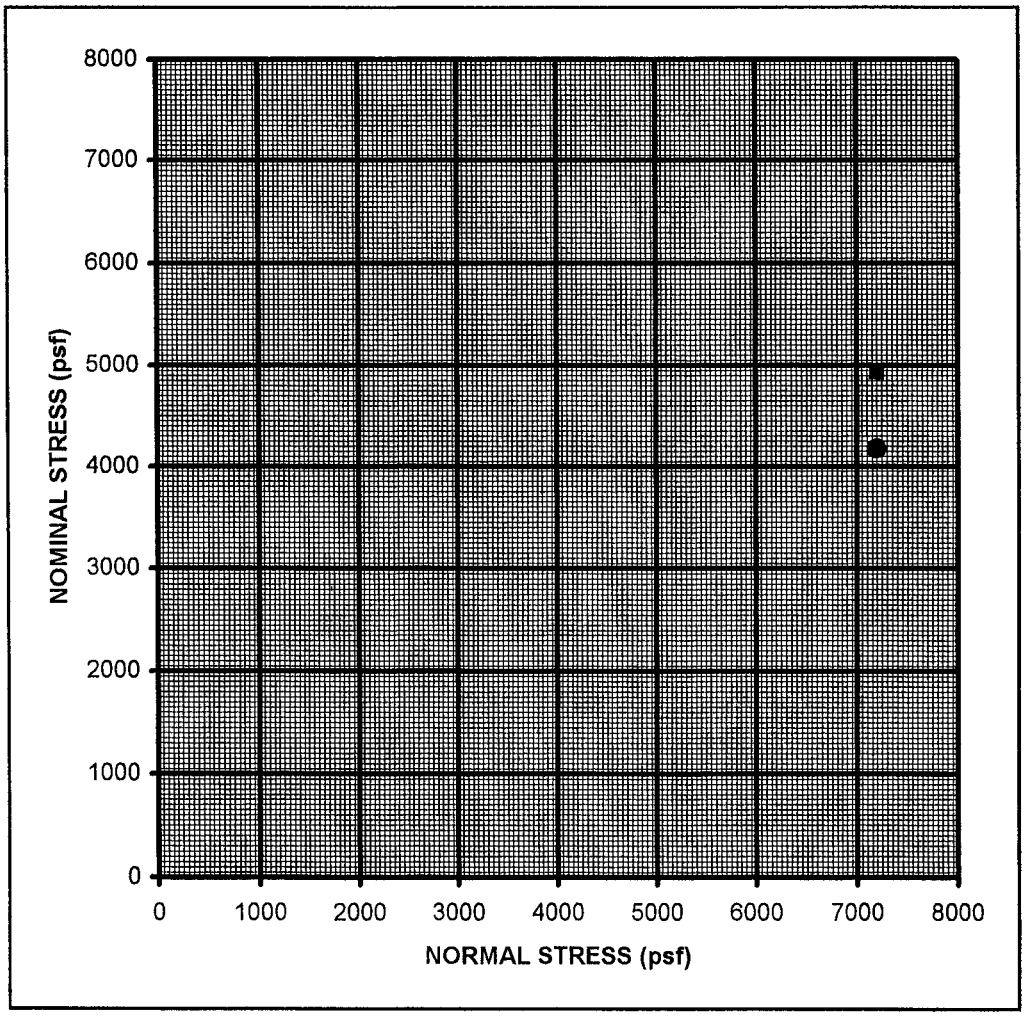
TERATEST LABS

DIRECT SHEAR TEST RESULT

ASTM D 3080

Project Name:	DEL MAR BLUFFS	Date:	4/18/02
Project Number:	040151-007	Tested By:	BCC
Boring Number:	B-1	Checked By:	
Sample Number:	14	Depth (ft.):	60
Soil Description:	CL, OLIVE CLAY		

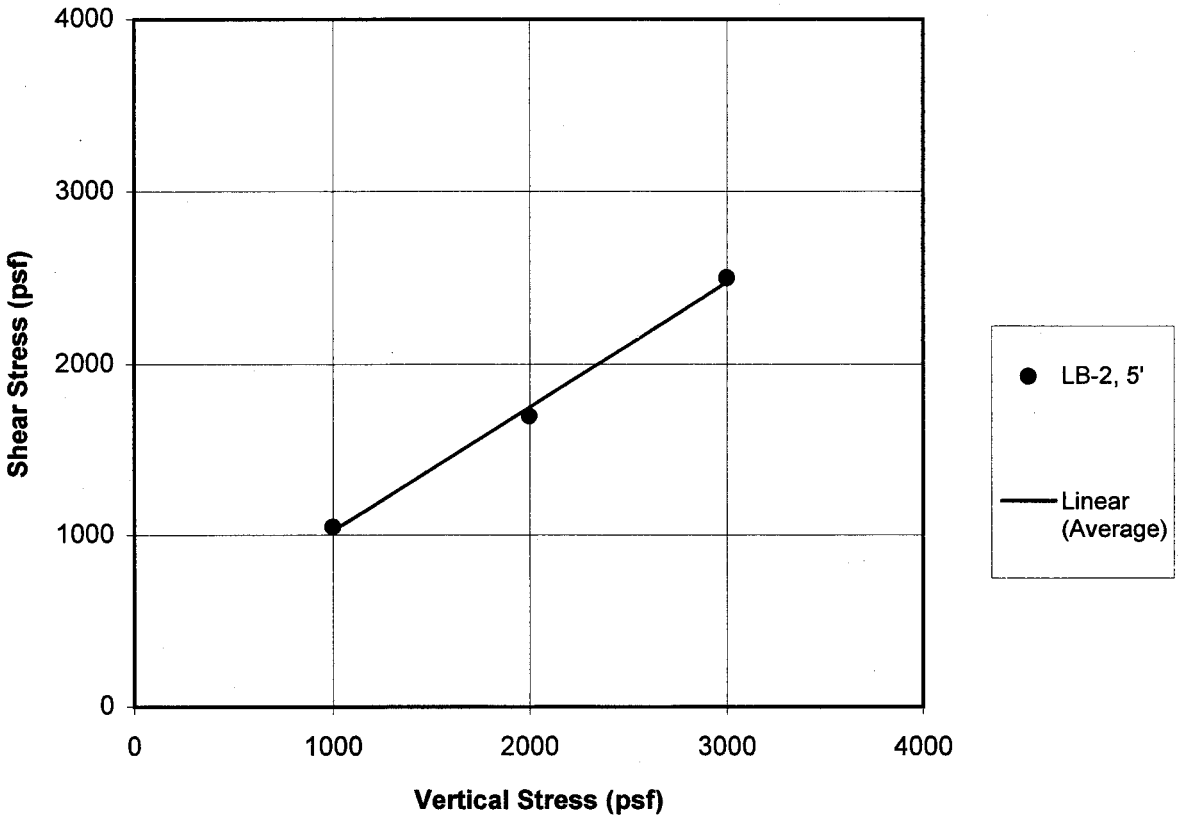
VERTICAL STRESS (psf)	PROVING RING DIAL READING		CONVERSION FACTOR	SHEAR STRESS (psf)	RELAXED STRESS (psf)	PEAK	
						COHESION (psf)	
						FRICTION (deg.)	
	PEAK ■	RELAXED ●					
7200	329	278	15	4935	4170	RELAXED	
						COHESION (psf)	
						FRICTION (deg.)	



Rev. 02-02

Laboratory Testing - Del Mar Bluffs Geotechnical Study (January 31, 2001)

Peak Direct Shear on Bay Point Samples by Leighton & Associates 2000



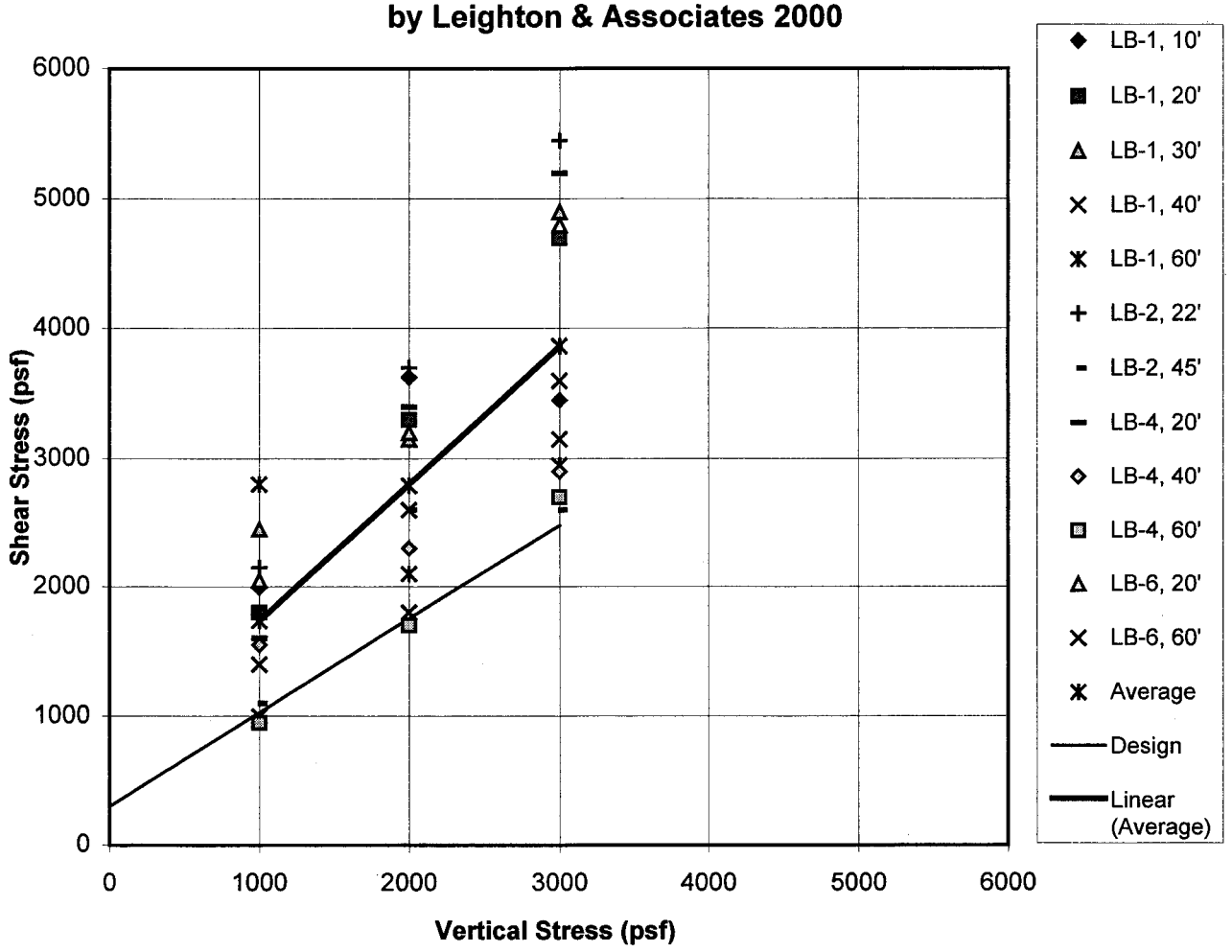
Average Strength Values

Friction Angle, ϕ (degrees)	**36**
Cohesion, c (psf)	**300**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**G-1**

Peak Direct Shear on Delmar Formation Samples by Leighton & Associates 2000



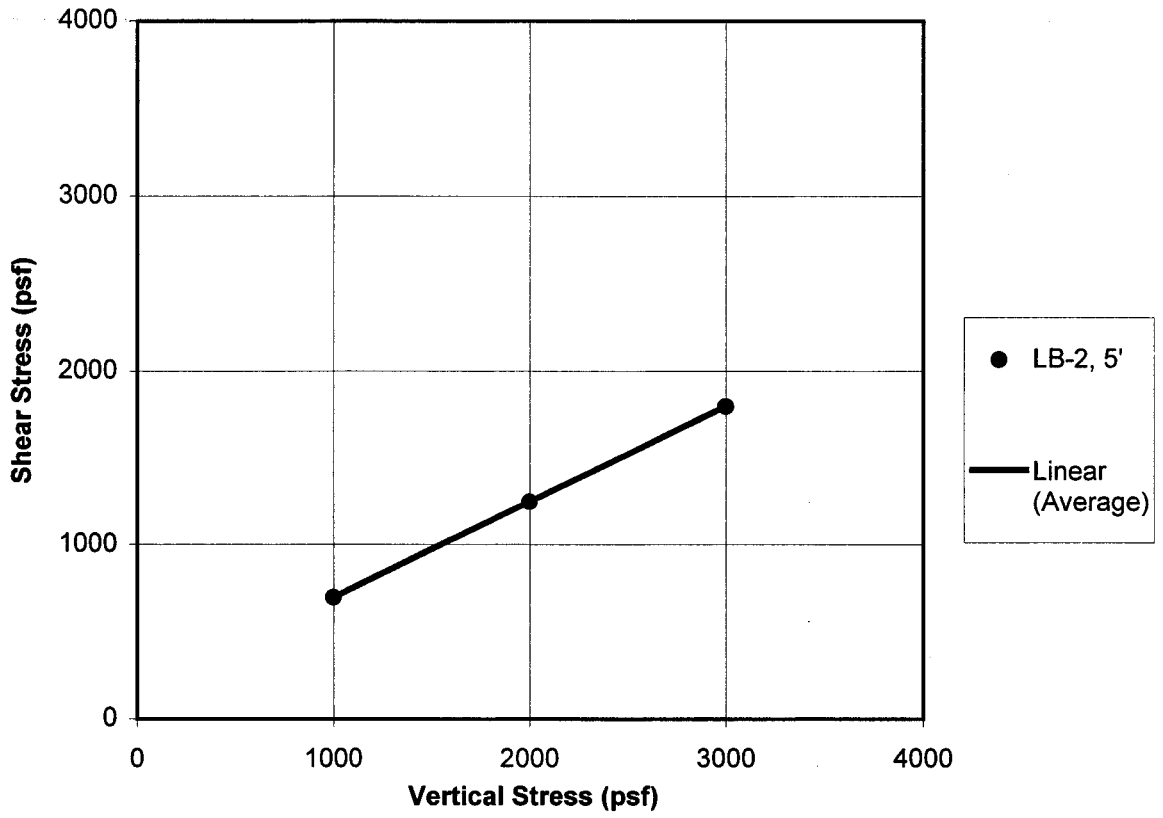
Average Strength Values

Friction Angle, ϕ (degrees)	**47**
Cohesion, c (psf)	**650**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**G-2**

Ultimate Direct Shear on Bay Point by Leighton & Associates 2000



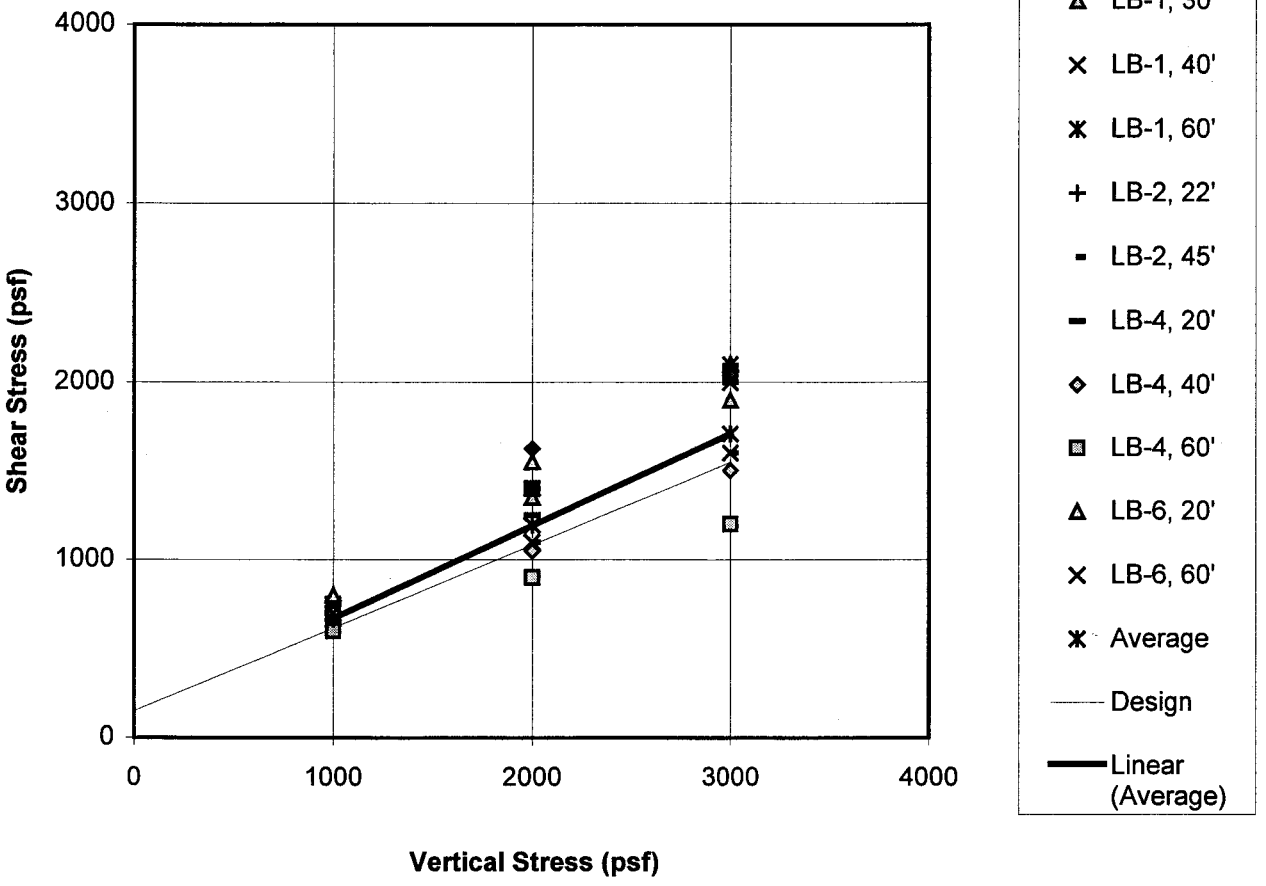
Average Strength Values

Friction Angle, ϕ (degrees)	**29**
Cohesion, c (psf)	**150**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**G-3**

Composite of Ultimate Direct Shear on Delmar Formation by Leighton & Associates 2000



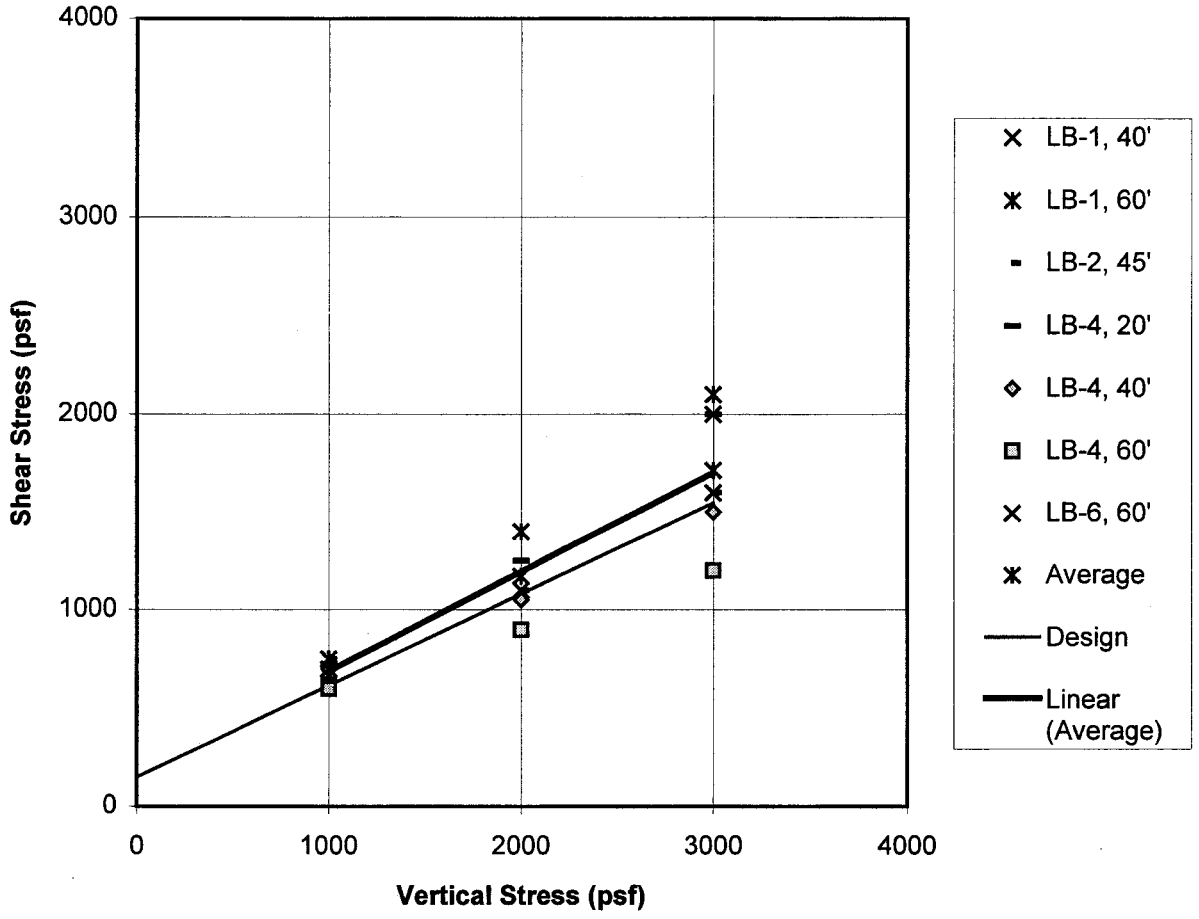
Average Strength Values

Friction Angle, ϕ (degrees)	**29**
Cohesion, c (psf)	**150**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**G-4**

Composite of Ultimate Direct Shear on Fine-Grained Samples of Delmar Formation by Leighton & Associates 2000



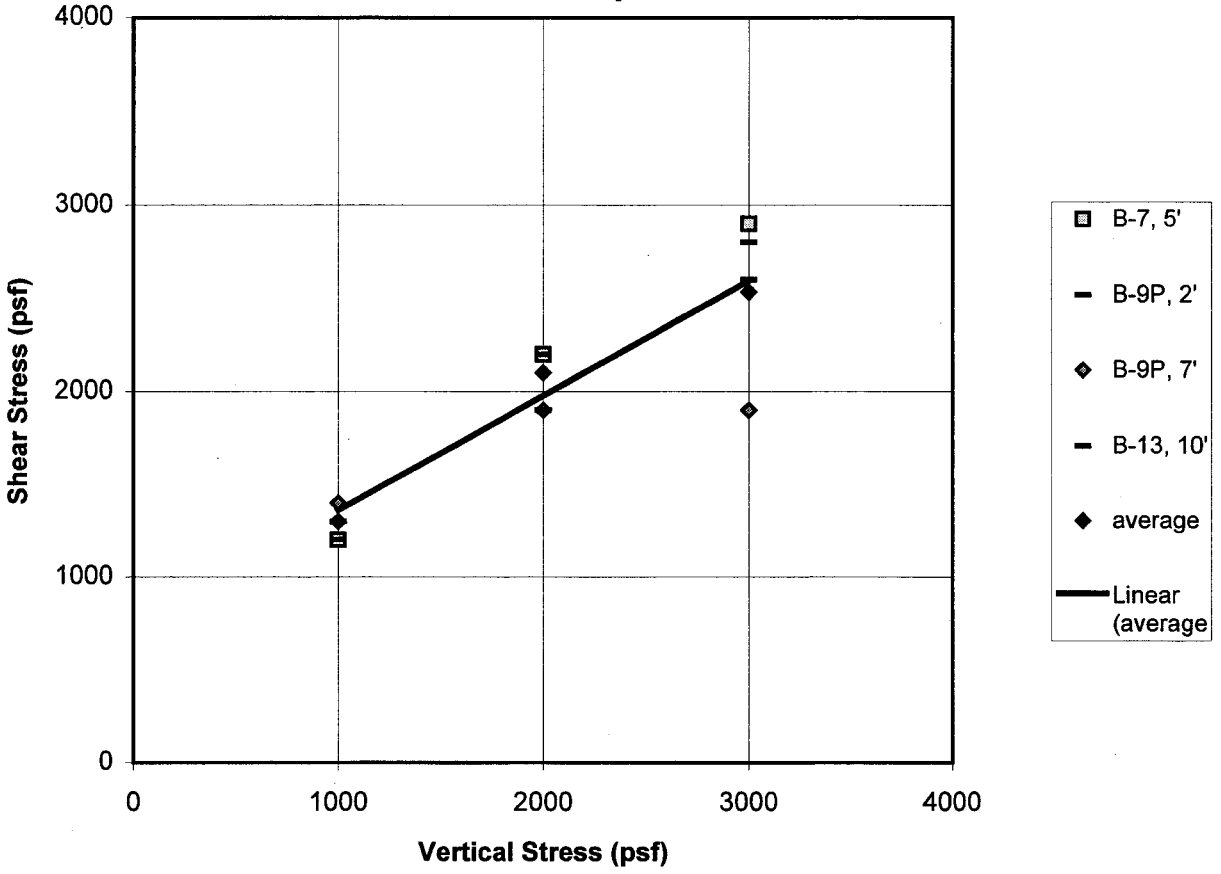
Average Strength Values

Friction Angle, ϕ (degrees)	**27**
Cohesion, c (psf)	**170**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**G-4a**

Composite of Peak Direct Shear Results Tested on Bay Point Formation at Field Moisture by MAH 1998



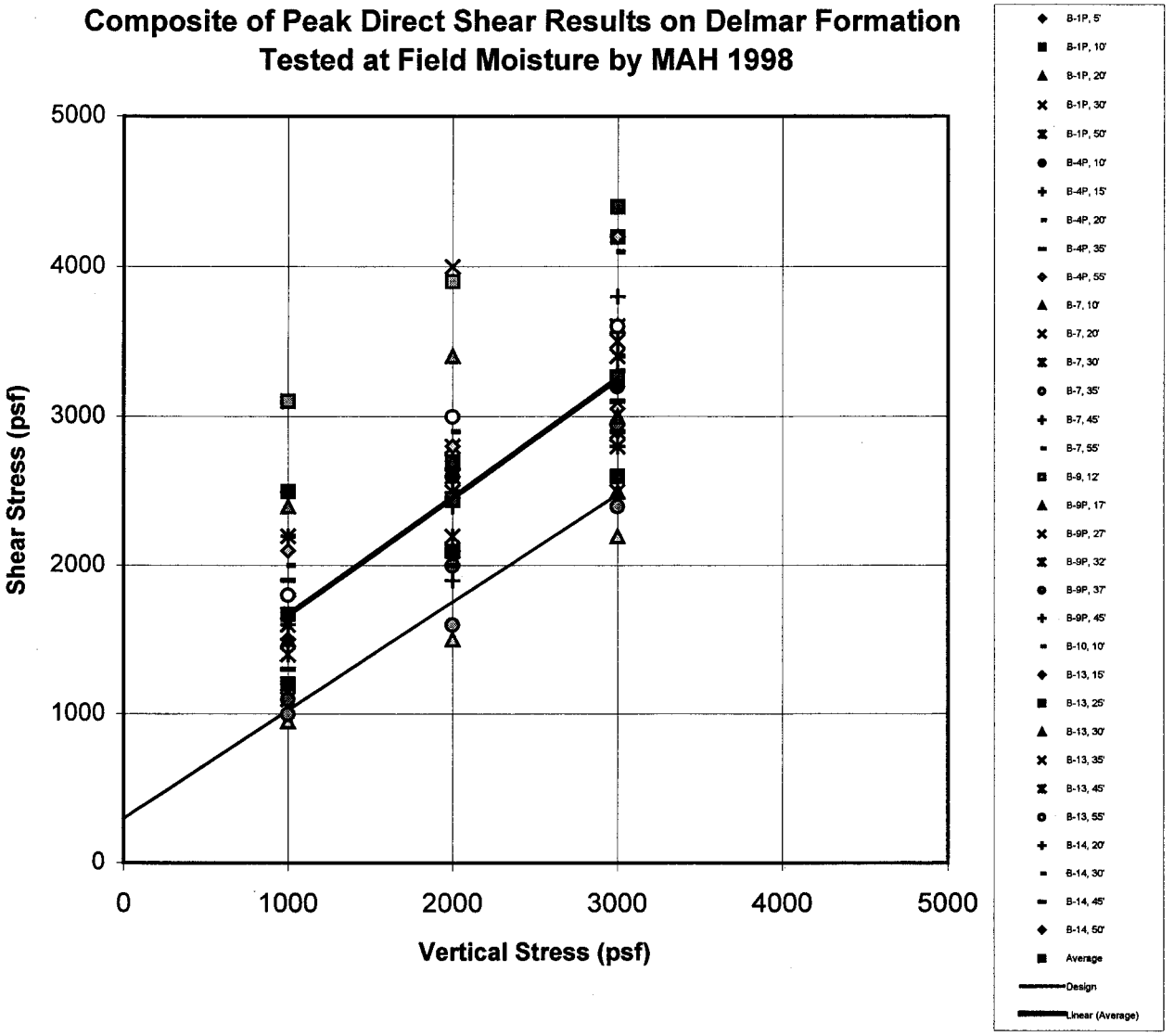
Average Strength Values

Friction Angle, ϕ (degrees)	**32**
Cohesion, c (psf)	**700**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**G-5**

Composite of Peak Direct Shear Results on Delmar Formation Tested at Field Moisture by MAH 1998



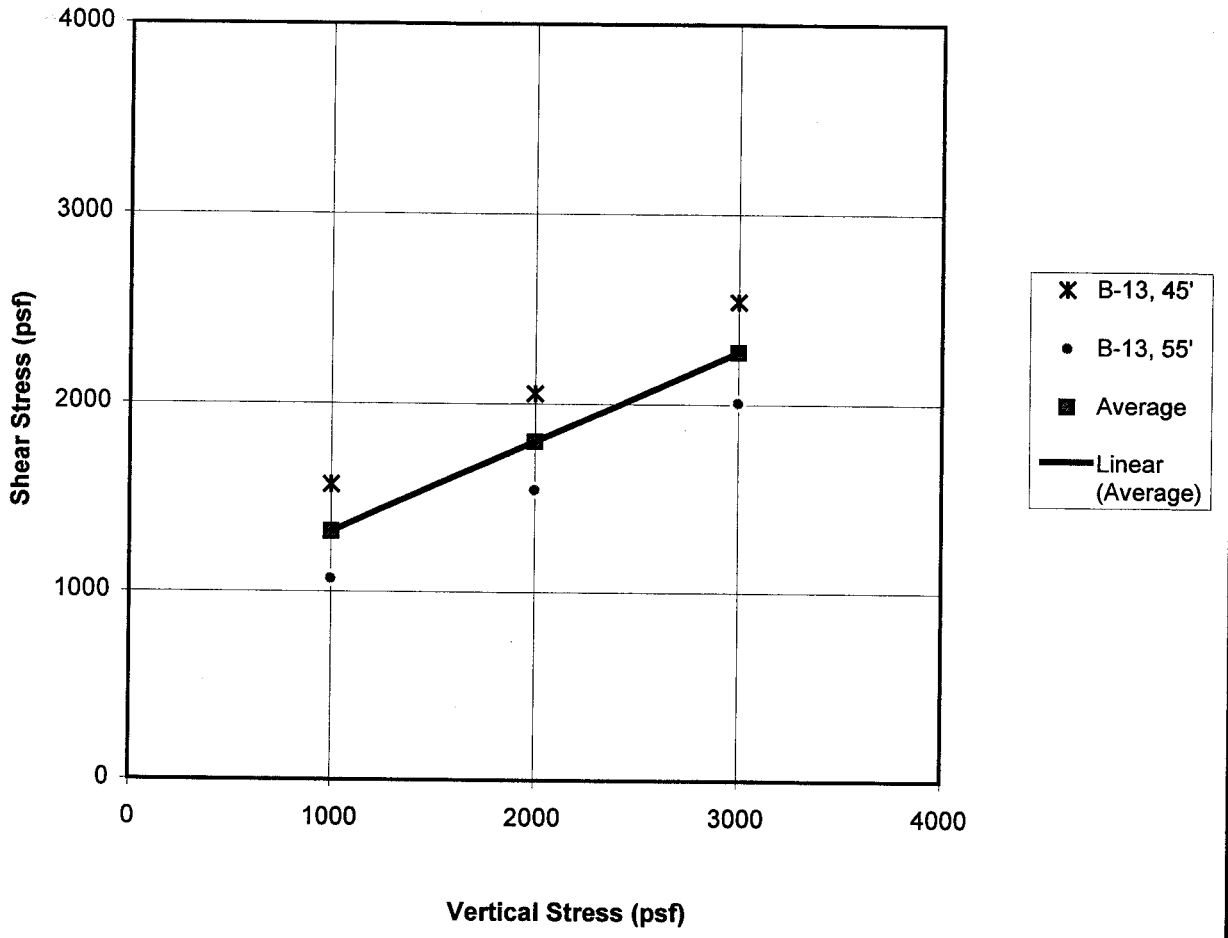
Average Strength Values

Friction Angle, ϕ (degrees)	**38**
Cohesion, c (psf)	**900**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**G-6**

Composite of Residual Direct Shear Results on Delmar Formation Tested at Field Moisture by MAH 1998



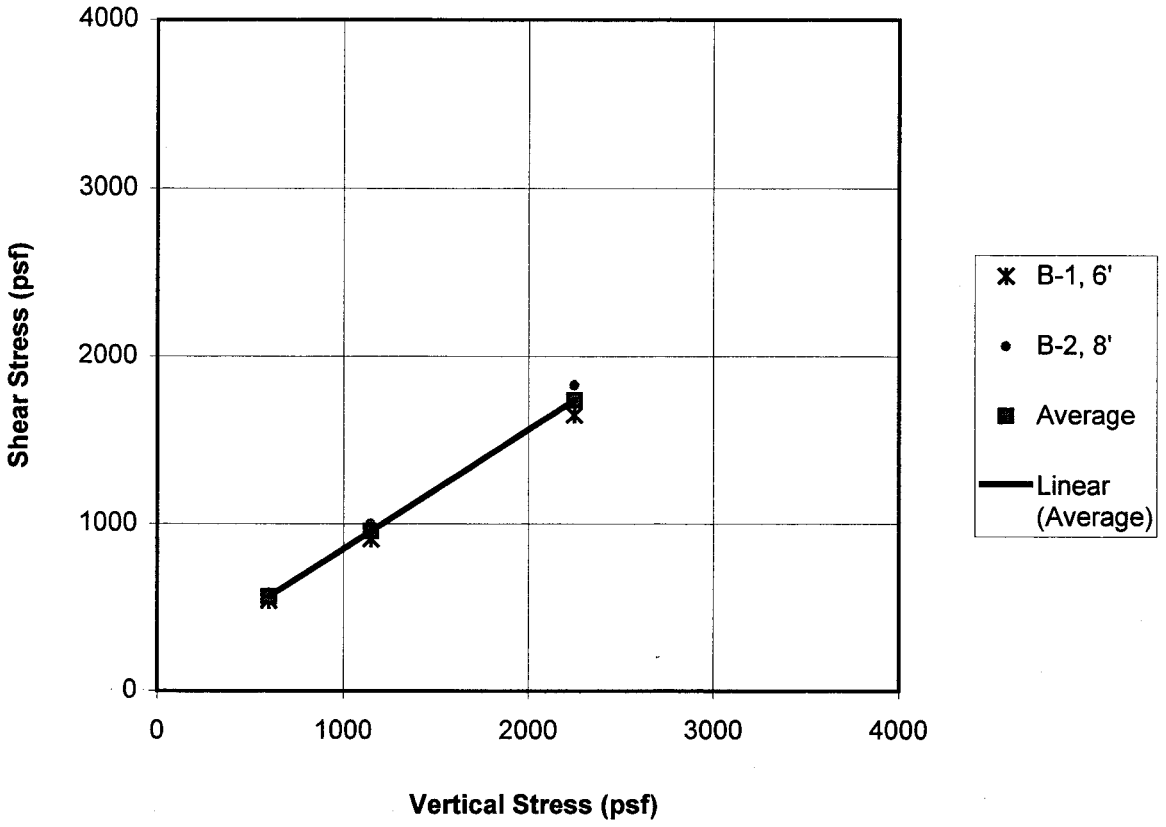
Average Strength Values

Friction Angle, ϕ (degrees)	**26**
Cohesion, c (psf)	**800**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**G-7**

Composite of Peak Direct Shear Results on Bay Point Formation Tested by Leighton & Associates 1978



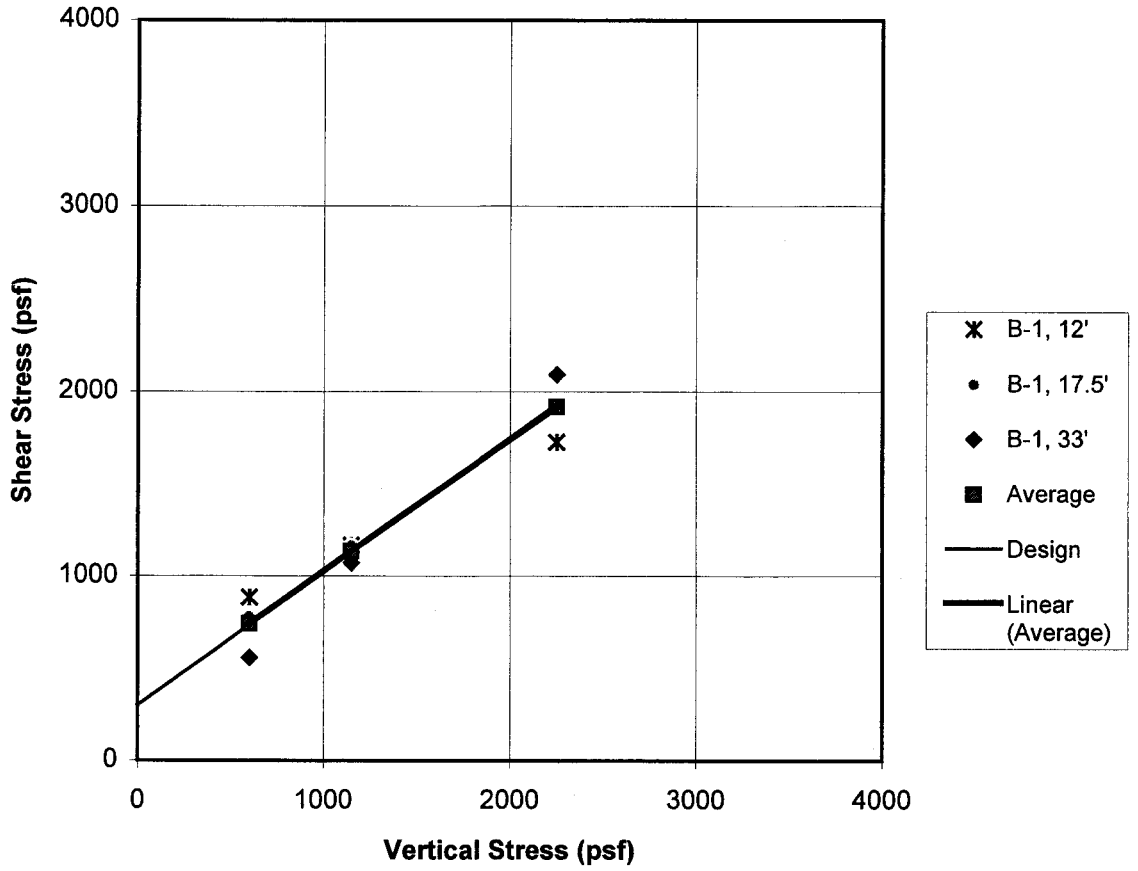
Average Strength Values

Friction Angle, ϕ (degrees)	**35**
Cohesion, c (psf)	**140**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**G-8**

Composite of Peak Direct Shear Results on Delmar Formation Tested by Leighton & Associates 1978



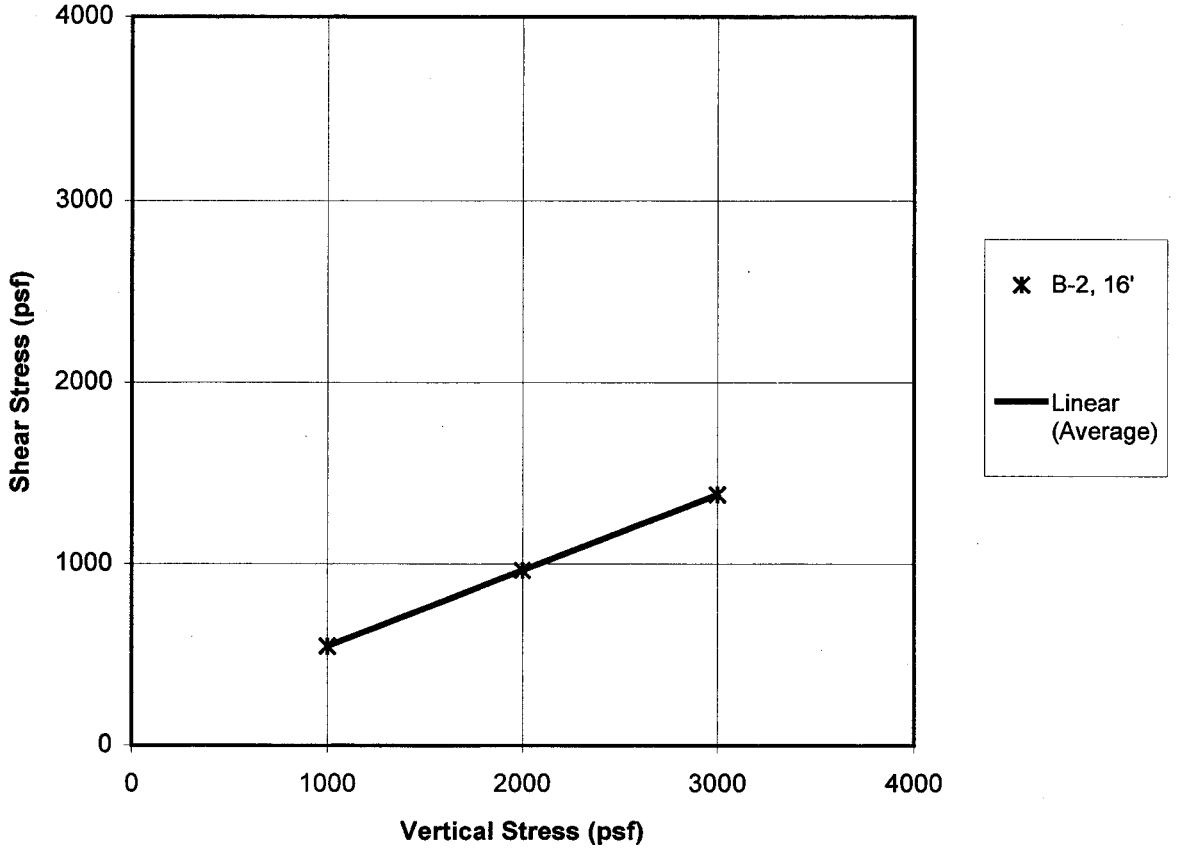
Average Strength Values

Friction Angle, ϕ (degrees)	**36**
Cohesion, c (psf)	**300**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**G-9**

Residual Direct Shear Results on Delmar Formation Tested by Leighton & Associates 1978



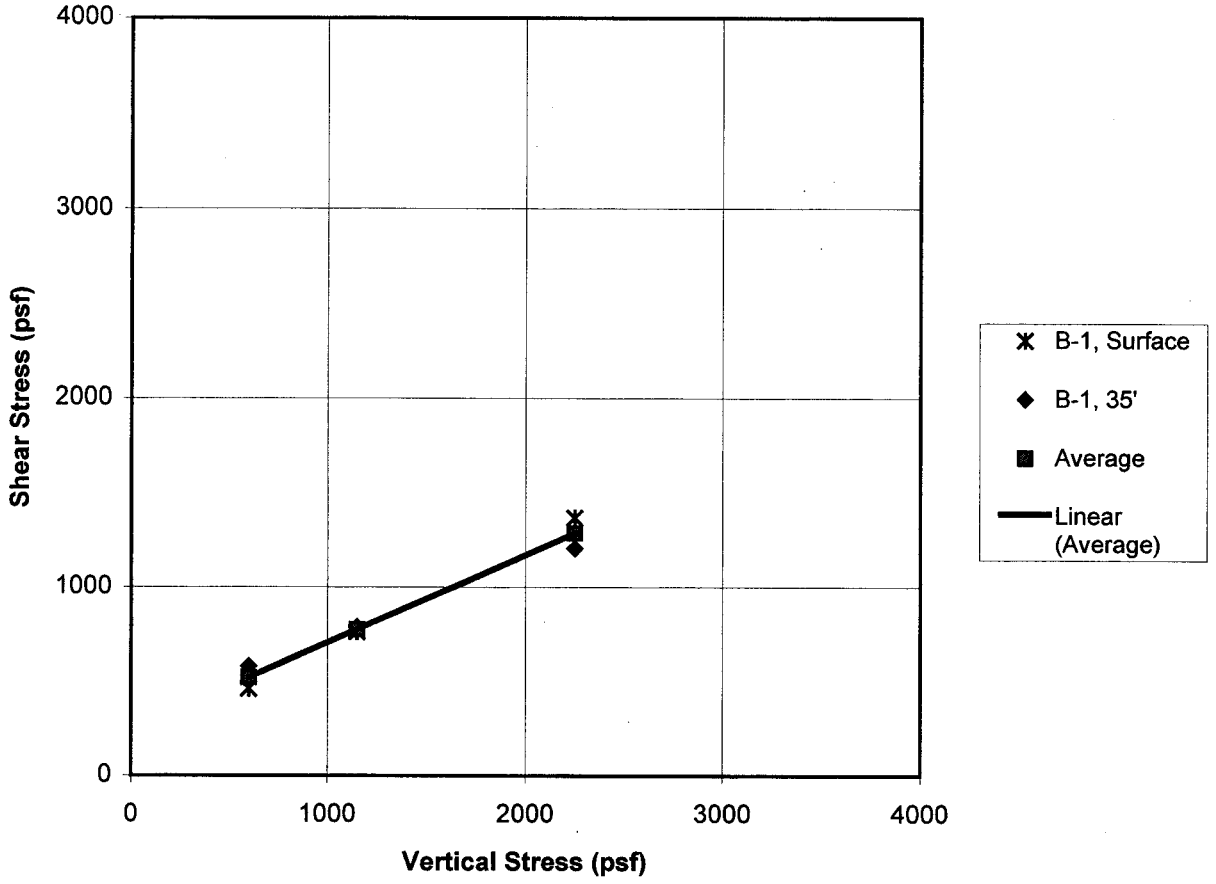
Average Strength Values

Friction Angle, ϕ (degrees)	**23**
Cohesion, c (psf)	**125**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**G-10**

Peak Direct Shear Results on Remolded Samples Tested by Leighton & Associates 1978



Average Strength Values

Friction Angle, ϕ (degrees)	**25**
Cohesion, c (psf)	**240**

DIRECT SHEAR SUMMARY

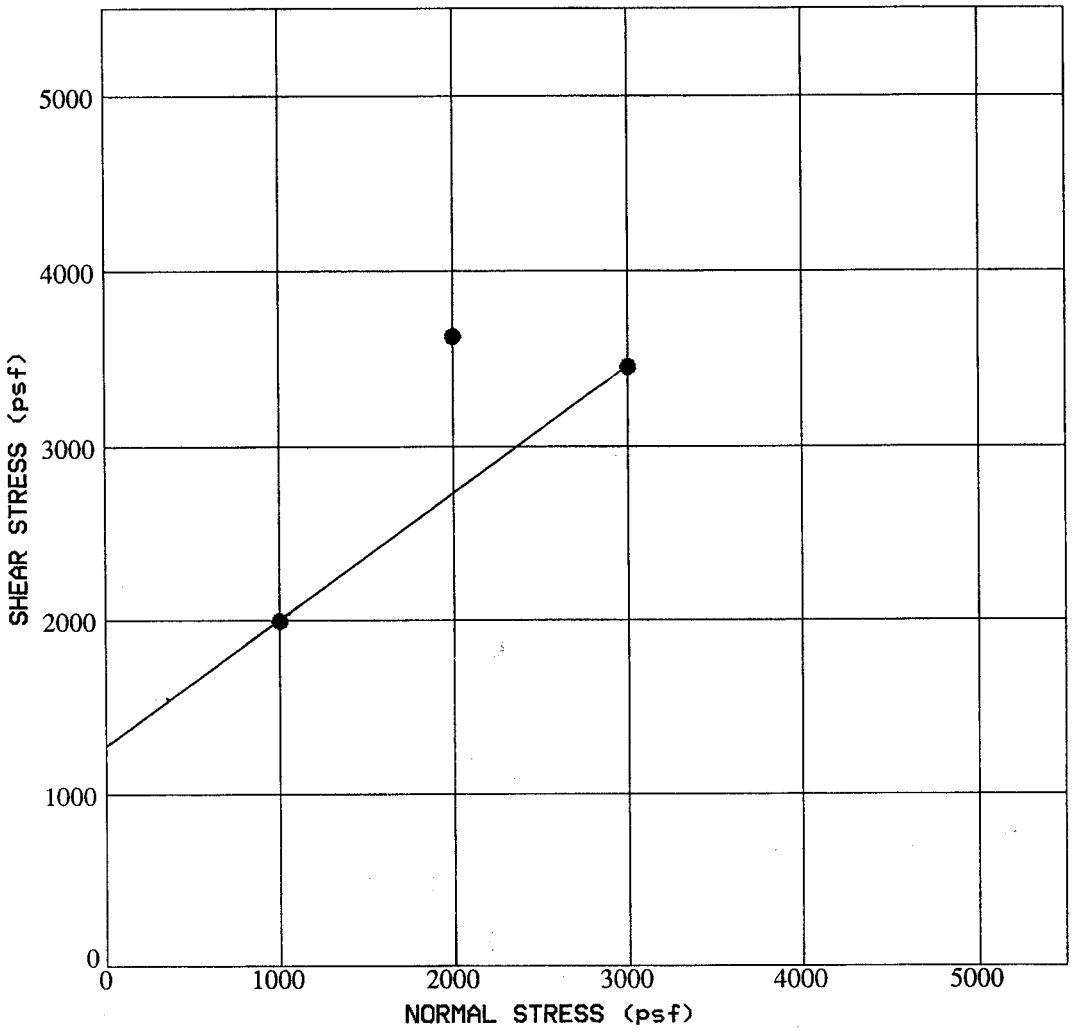
Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**G-11**

APPENDIX F

Laboratory Testing Procedures and Test Results

Moisture and Density Determination Tests: Moisture content and dry density determinations were performed on relatively undisturbed samples obtained from the test borings and/or trenches. The results of these tests are presented in the boring and/or trench logs. Where applicable, only moisture content was determined from "undisturbed" or disturbed samples.

Shear Tests: Direct shear tests were performed on selected undisturbed samples that were soaked under a surcharge equal to the applied normal force during testing. The samples were tested under various normal loads, a motor-driven, stain-controlled, direct-shear testing apparatus at a strain rate of 0.001 to 0.012 inches per minute. The "peak" shear resistance was obtained from the maximum recorded shear resistance.



Boring No.	LB-1	Depth (ft)	10.5
Sample No.	R-1	Soil Type	Siltst.
Type of Sample	Ring		

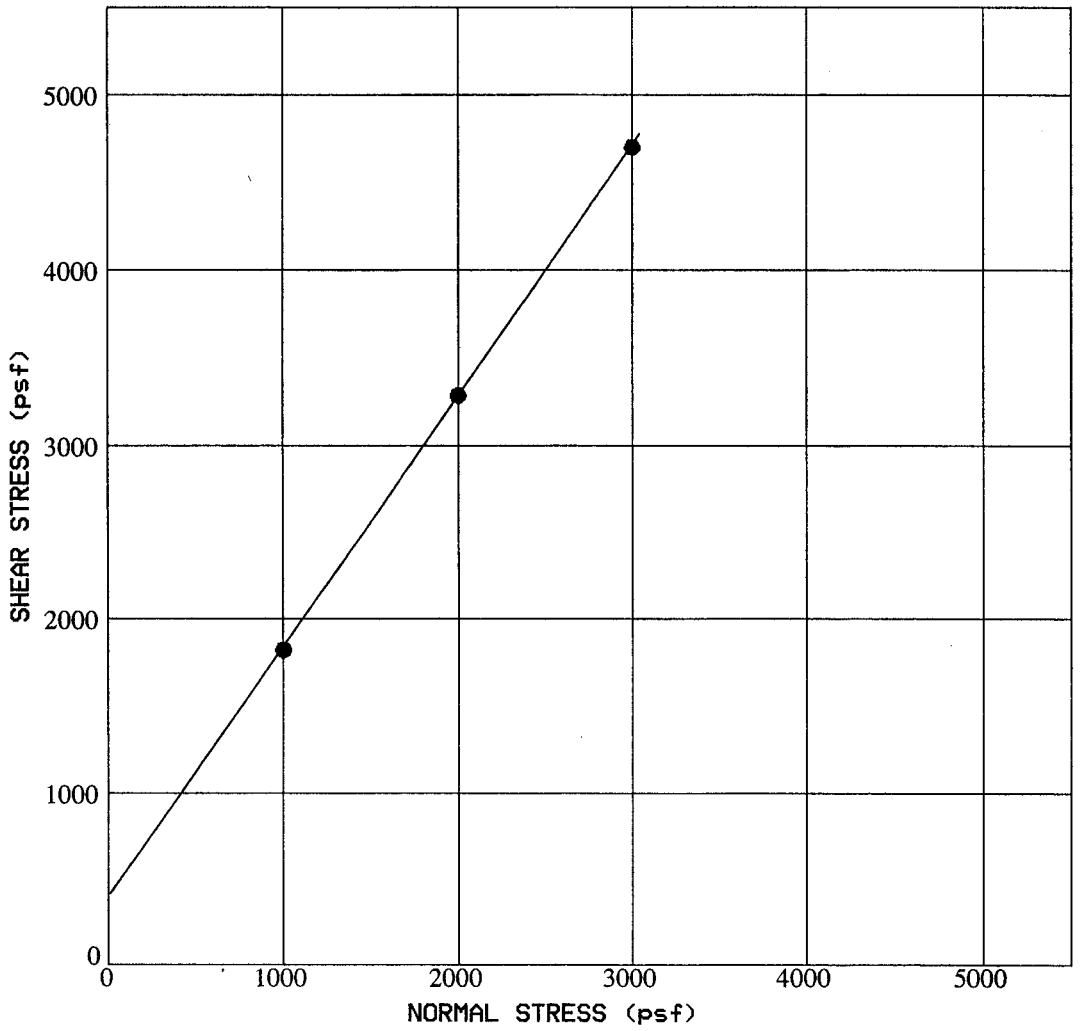
Friction Angle (deg.)	36
Cohesion (psf)	1250

DIRECT SHEAR TEST RESULTS

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-1



Boring No.	LB-1	Depth (ft)	20.5
Sample No.	R-2	Soil Type	Sandst.
Type of Sample	Ring		

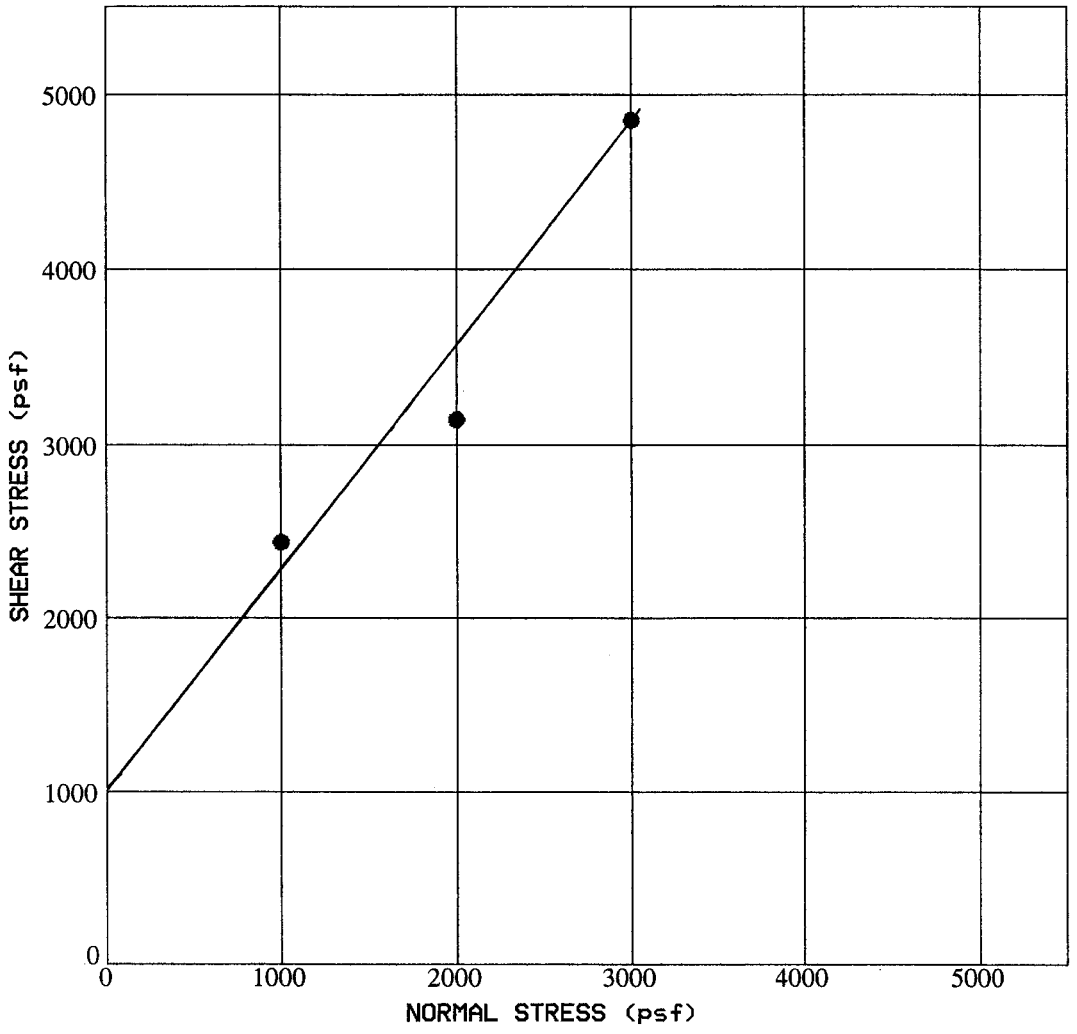
Friction Angle (deg.)	55.5
Cohesion (psf)	350

DIRECT SHEAR TEST RESULTS

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 **Figure No.** D-2



Boring No. LB-1 Depth (ft) 30.5

Sample No. R-3 Soil Type Sandst.

Type of Sample Ring

Friction Angle (deg.) 51

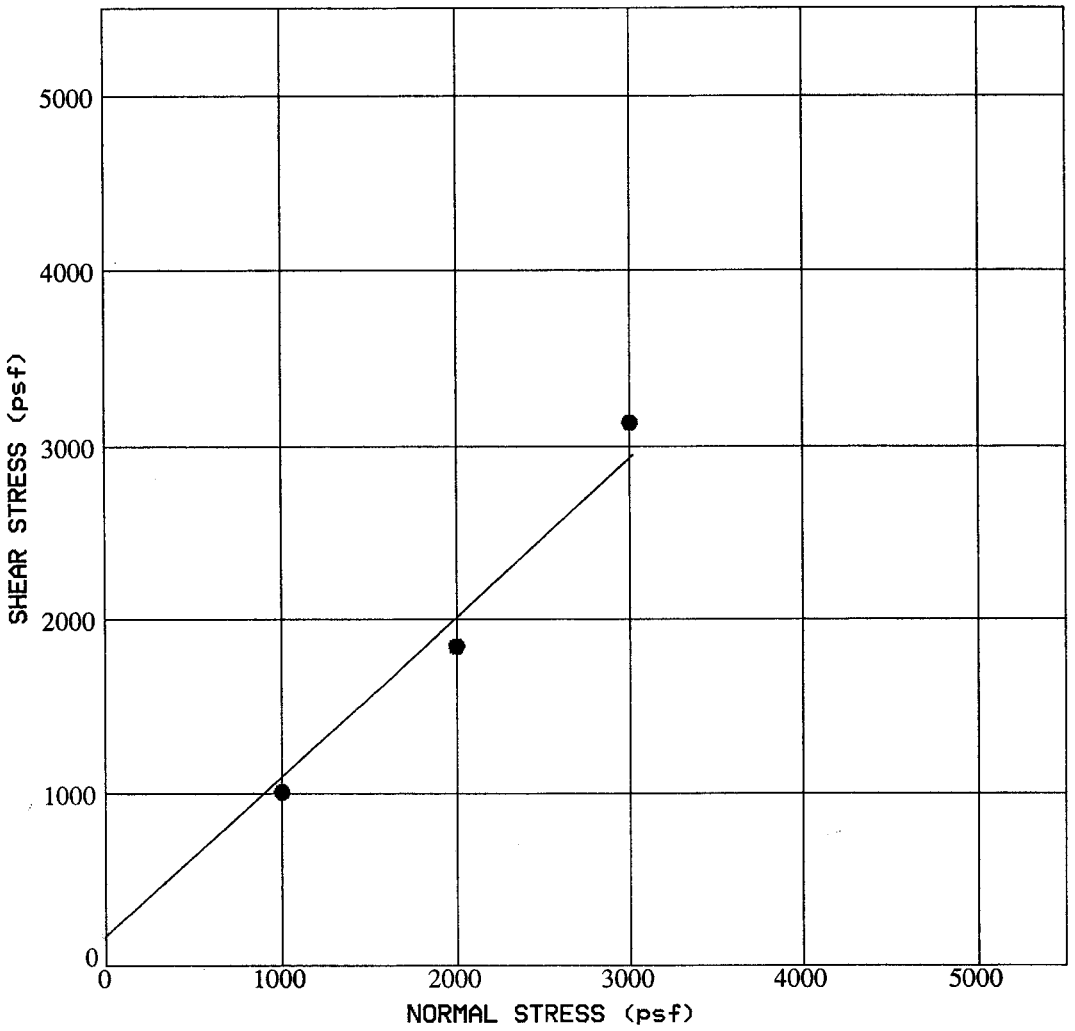
Cohesion (psf) 1000

DIRECT SHEAR TEST RESULTS

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-3



Boring No. LB-1 Depth (ft) 40.5

Sample No. R-4 Soil Type Clayst.

Type of Sample Ring

Friction Angle (deg.) 42

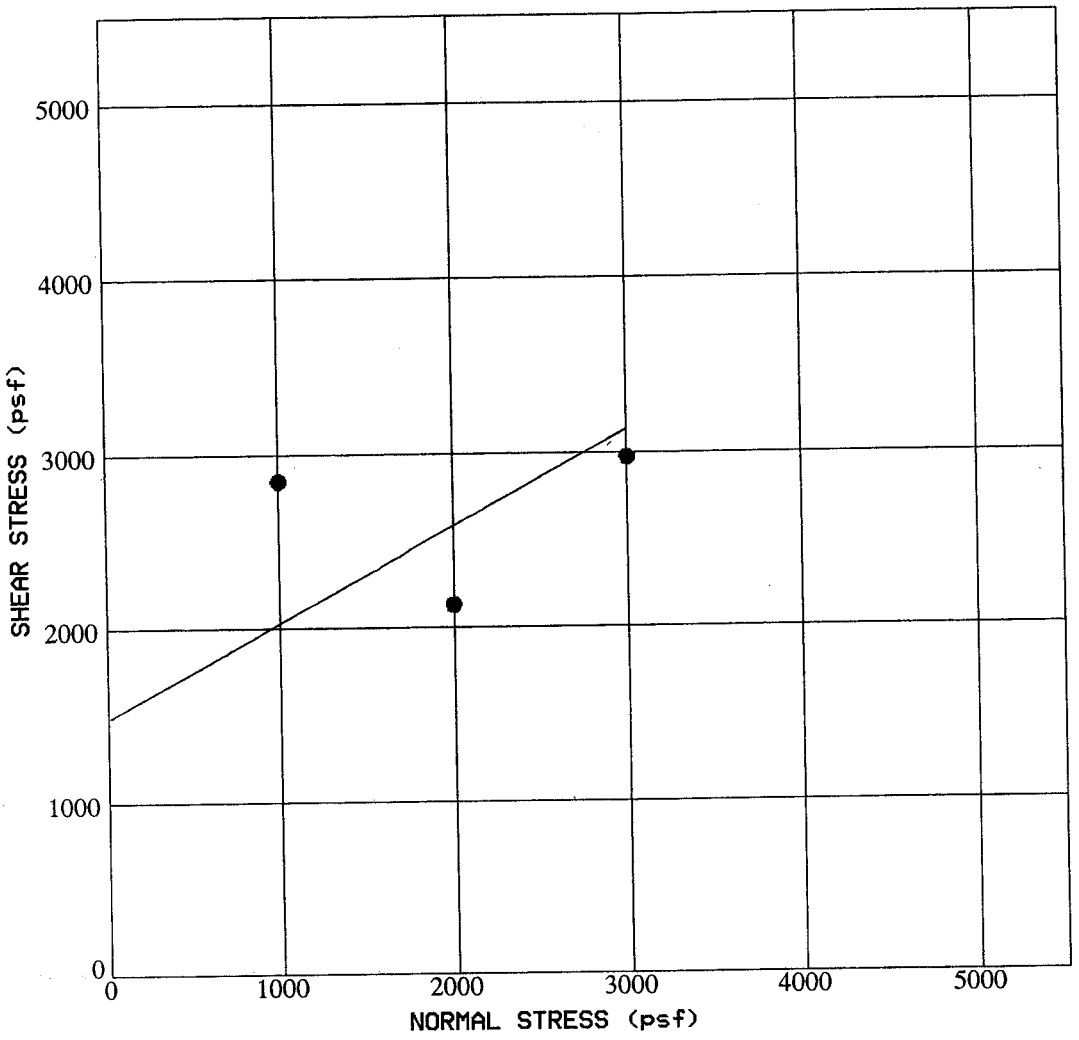
Cohesion (psf) 100

DIRECT SHEAR TEST RESULTS

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-4



Boring No. LB-1 Depth (ft) 60.5

Sample No. R-6 Soil Type Sandst.

Type of Sample Ring

Friction Angle (deg.) 28

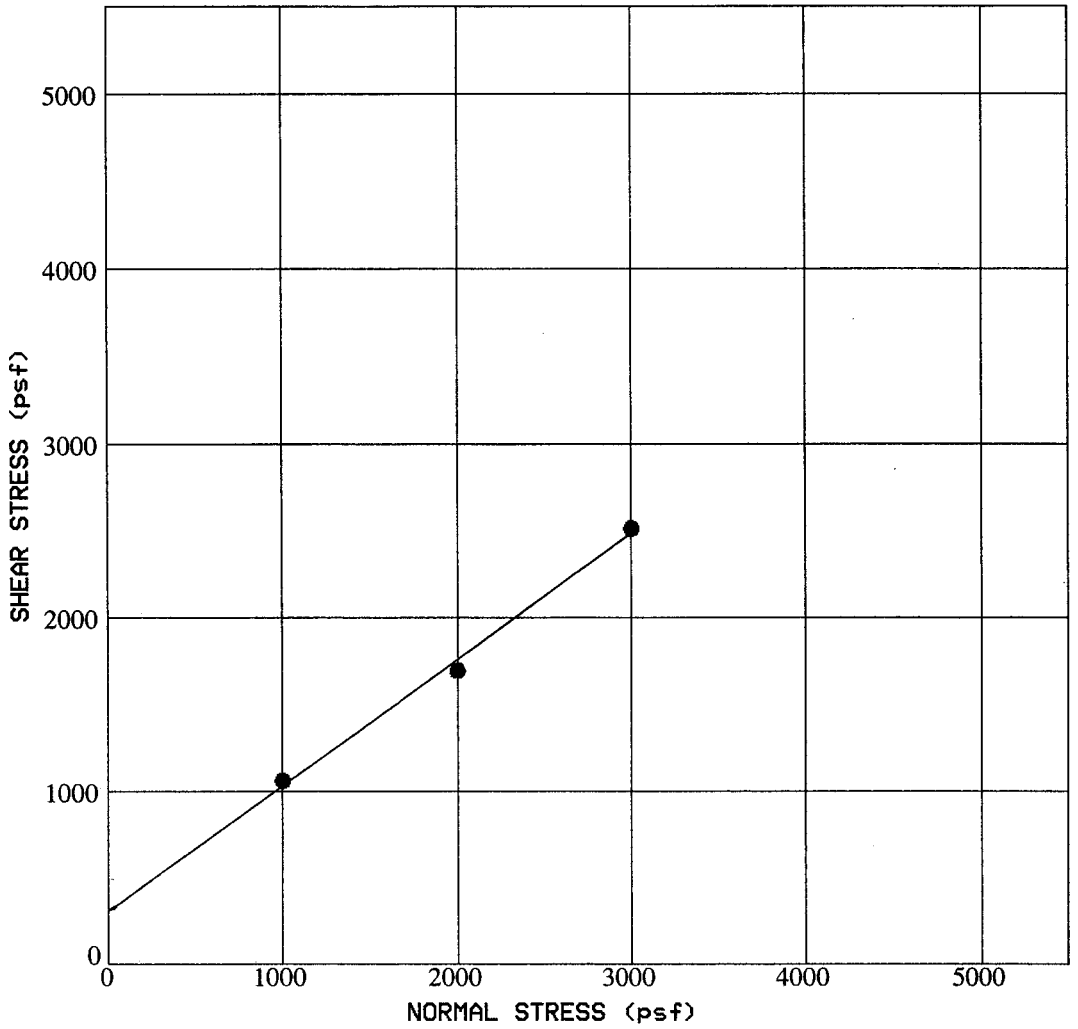
Cohesion (psf) 1500

DIRECT SHEAR TEST RESULTS

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-5



Boring No. LB-2 Depth (ft) 5.5

Sample No. R-1 Soil Type SP-SM

Type of Sample Ring

Friction Angle (deg.) 36

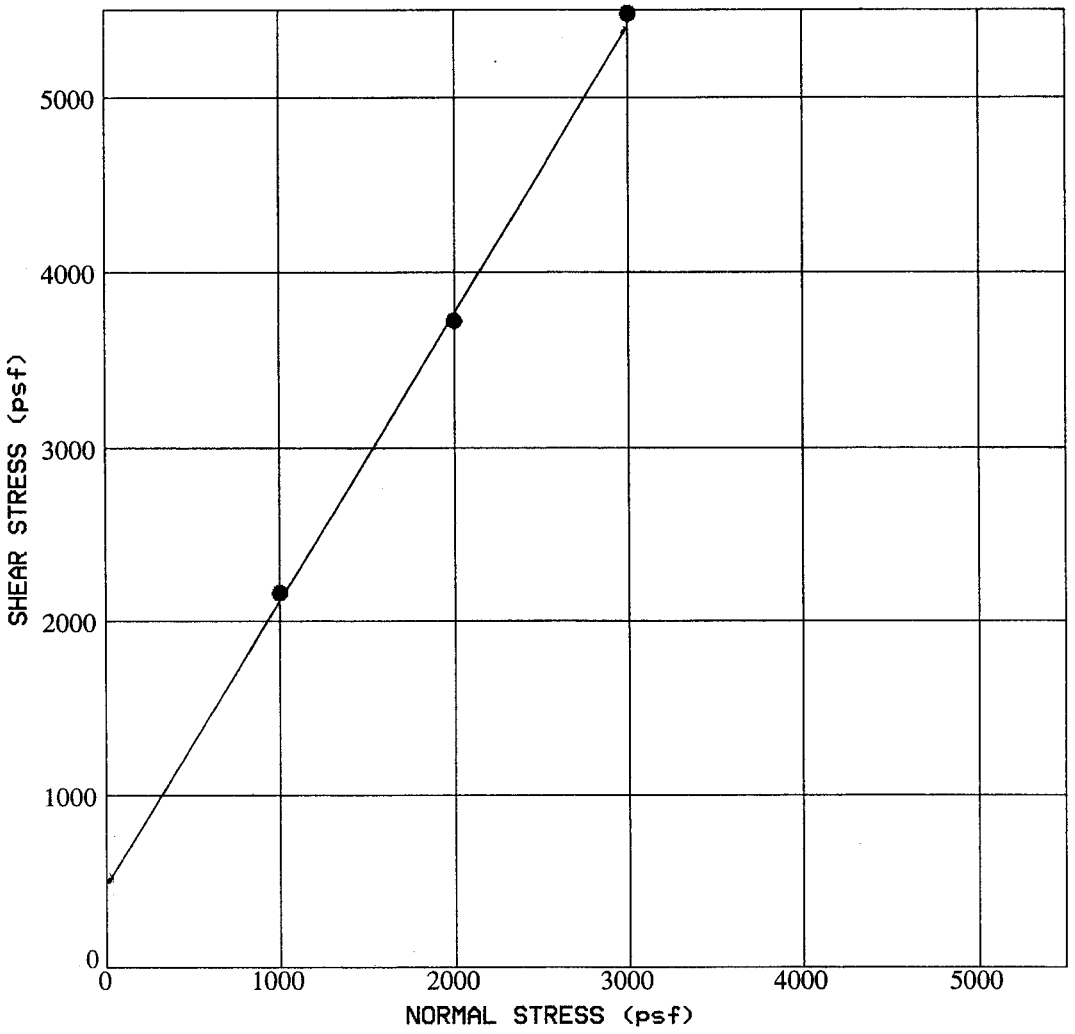
Cohesion (psf) 300

DIRECT SHEAR TEST RESULTS

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-6



Boring No. LB-2 Depth (ft) 22.5

Sample No. R-2 Soil Type Sandst.

Type of Sample Ring

Friction Angle (deg.) 58.5

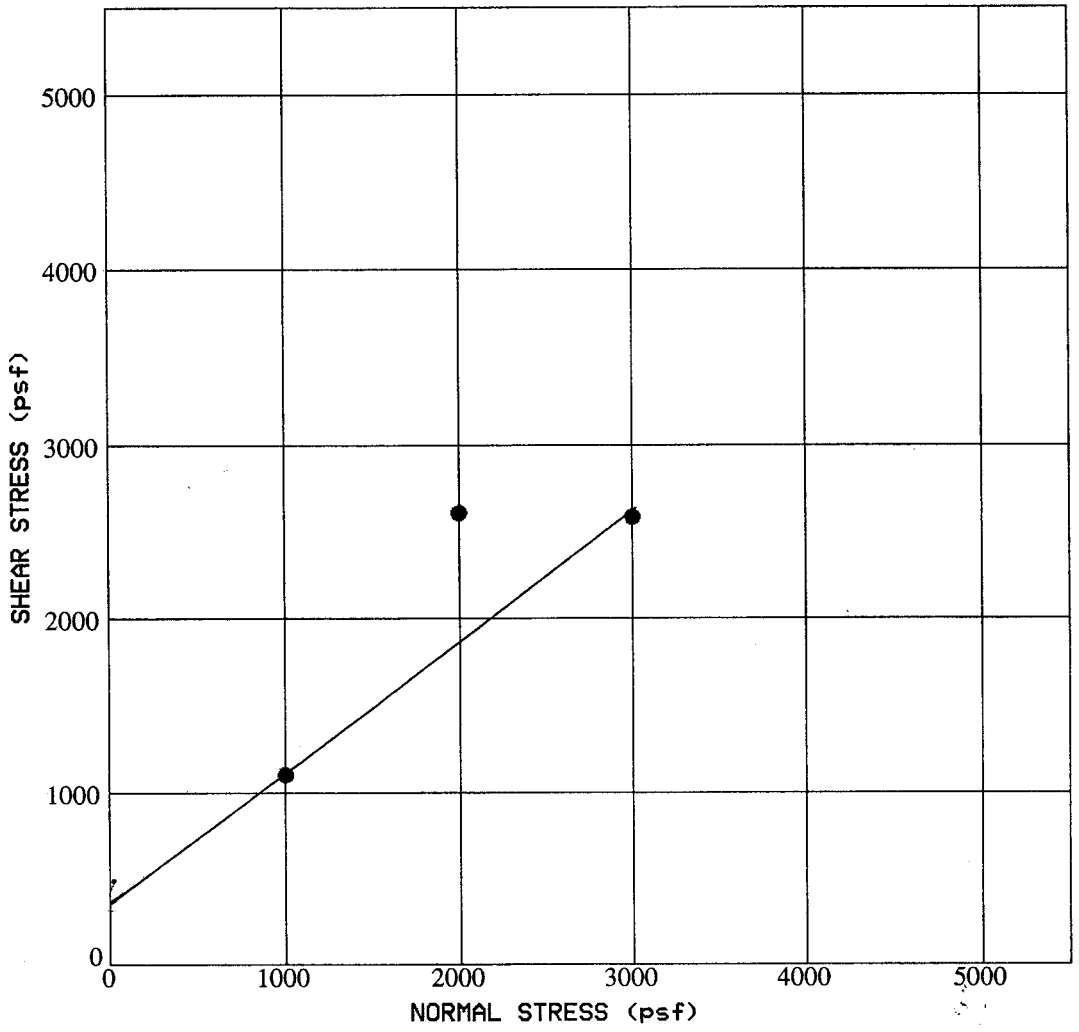
Cohesion (psf) 500

DIRECT SHEAR TEST RESULTS

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-7



Boring No. LB-2 Depth (ft) 45.5

Sample No. R-3 Soil Type Siltst.

Type of Sample Ring

Friction Angle (deg.) 37.5

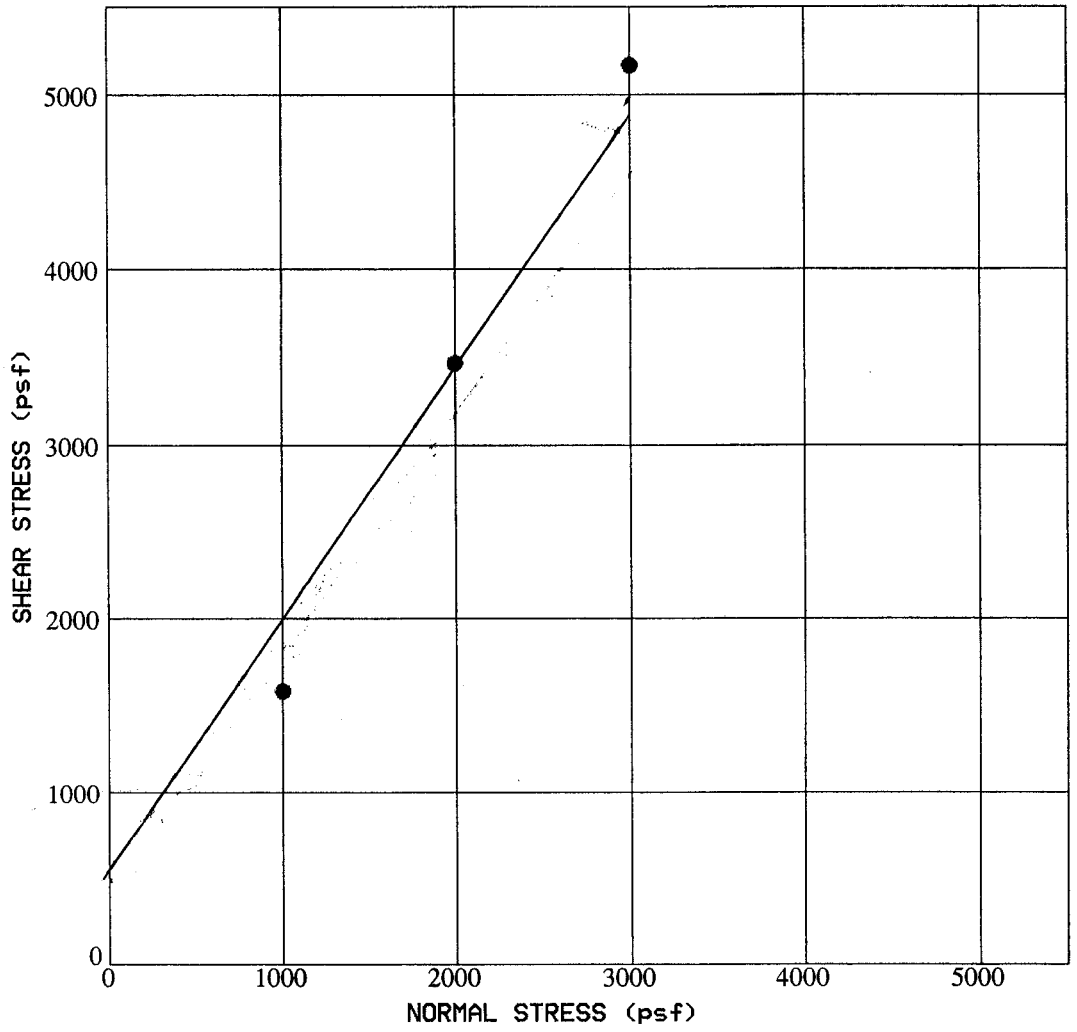
Cohesion (psf) 400

DIRECT SHEAR TEST RESULTS

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-8



Boring No. LB-4 Depth (ft) 20.5

Sample No. R-1 Soil Type Sandst.

Type of Sample Ring

Friction Angle (deg.) 54

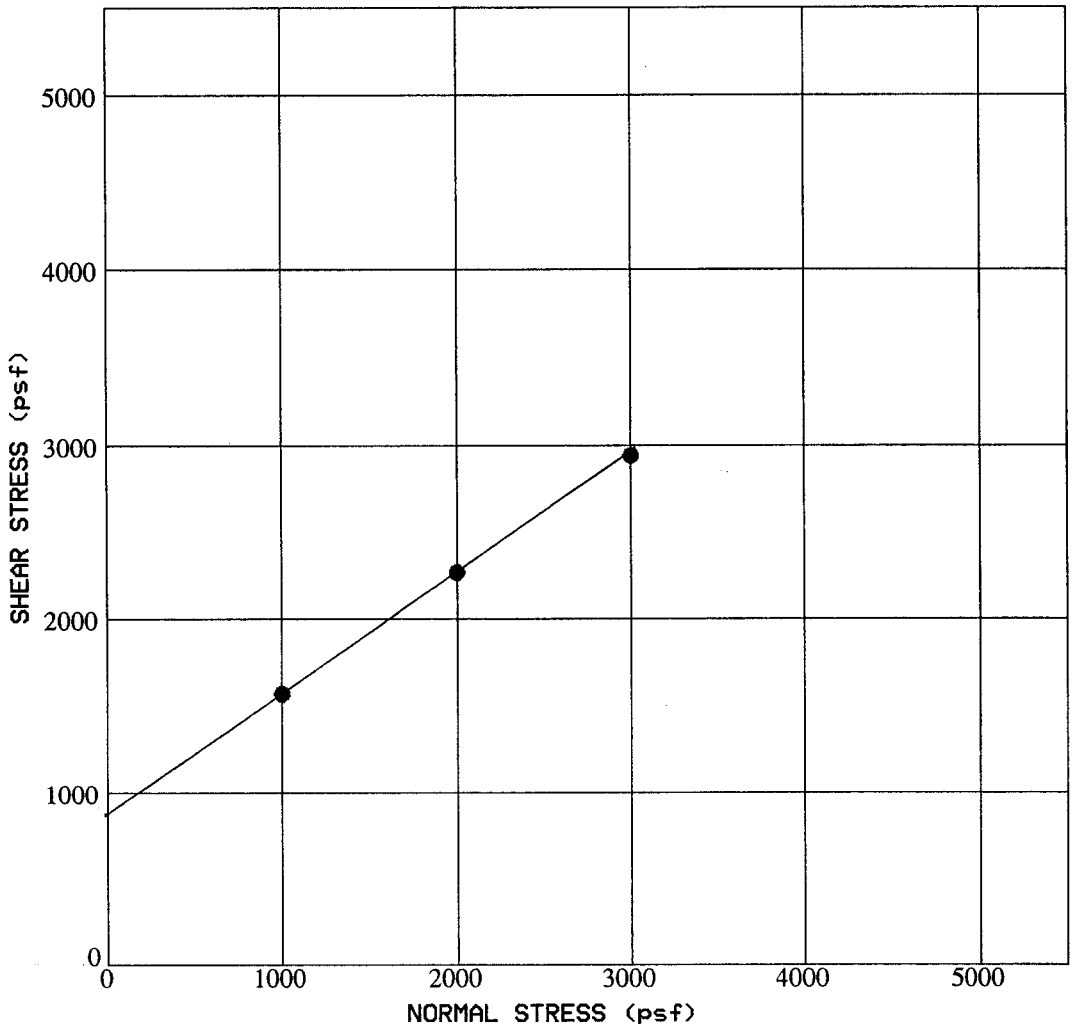
Cohesion (psf) 500

DIRECT SHEAR TEST RESULTS

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-9



Boring No. LB-4 Depth (ft) 40.5

Sample No. R-2 Soil Type Clayst.

Type of Sample Ring

Friction Angle (deg.) 34

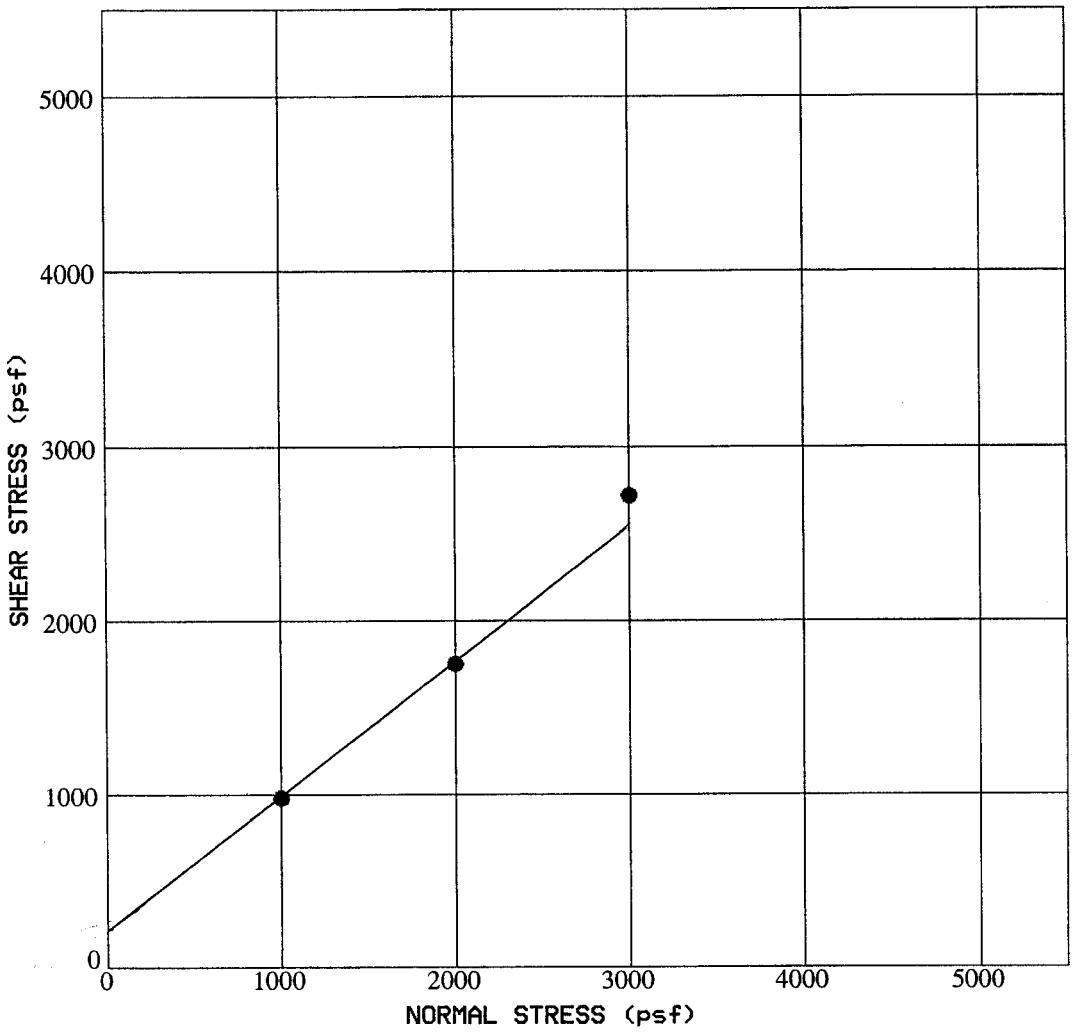
Cohesion (psf) 900

DIRECT SHEAR TEST RESULTS

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-10



Boring No. LB-4 Depth (ft) 60.5

Sample No. R-3 Soil Type Clayst.

Type of Sample Ring

Friction Angle (deg.) 38

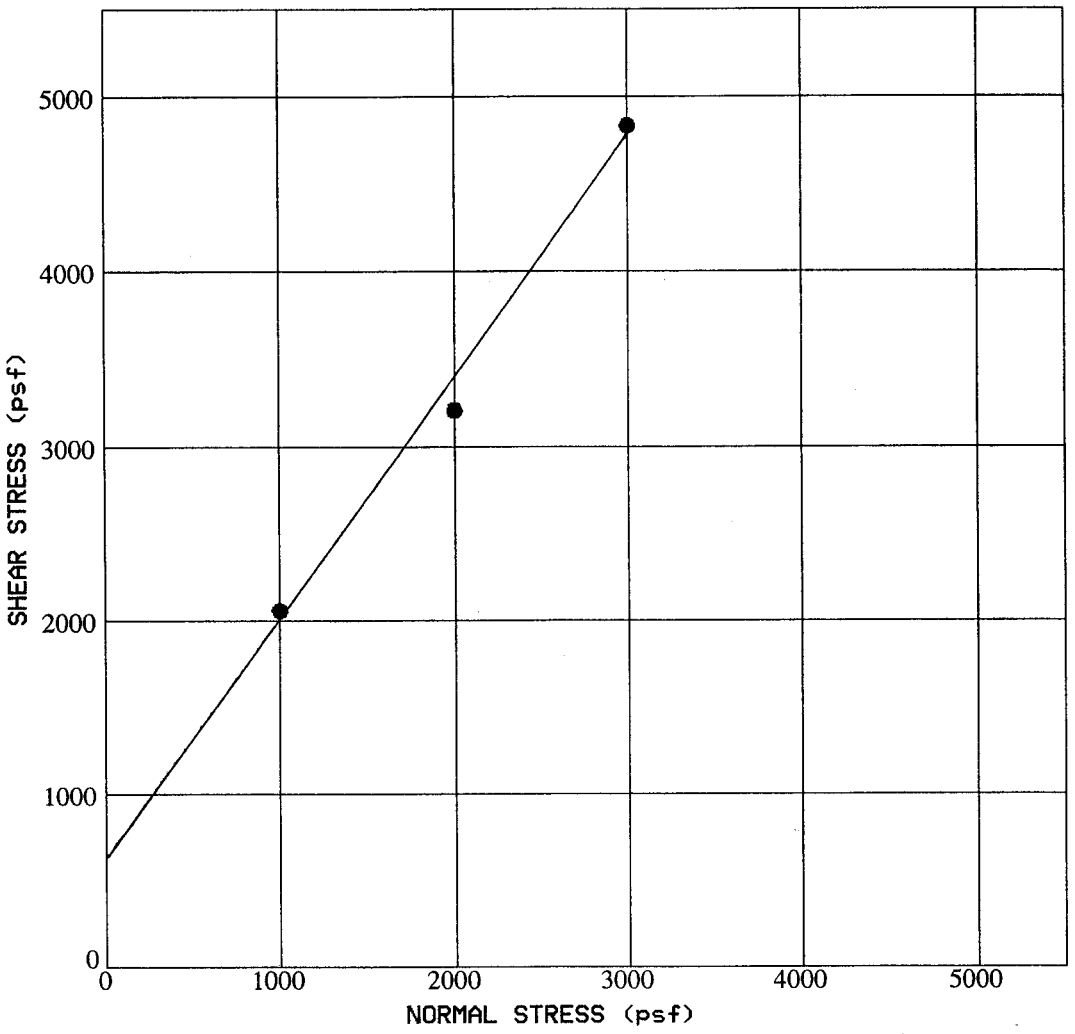
Cohesion (psf) 200

DIRECT SHEAR TEST RESULTS

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-11



Boring No. LB-6 Depth (ft) 20.5

Sample No. R-1 Soil Type Sandst.

Type of Sample Ring

Friction Angle (deg.) 54

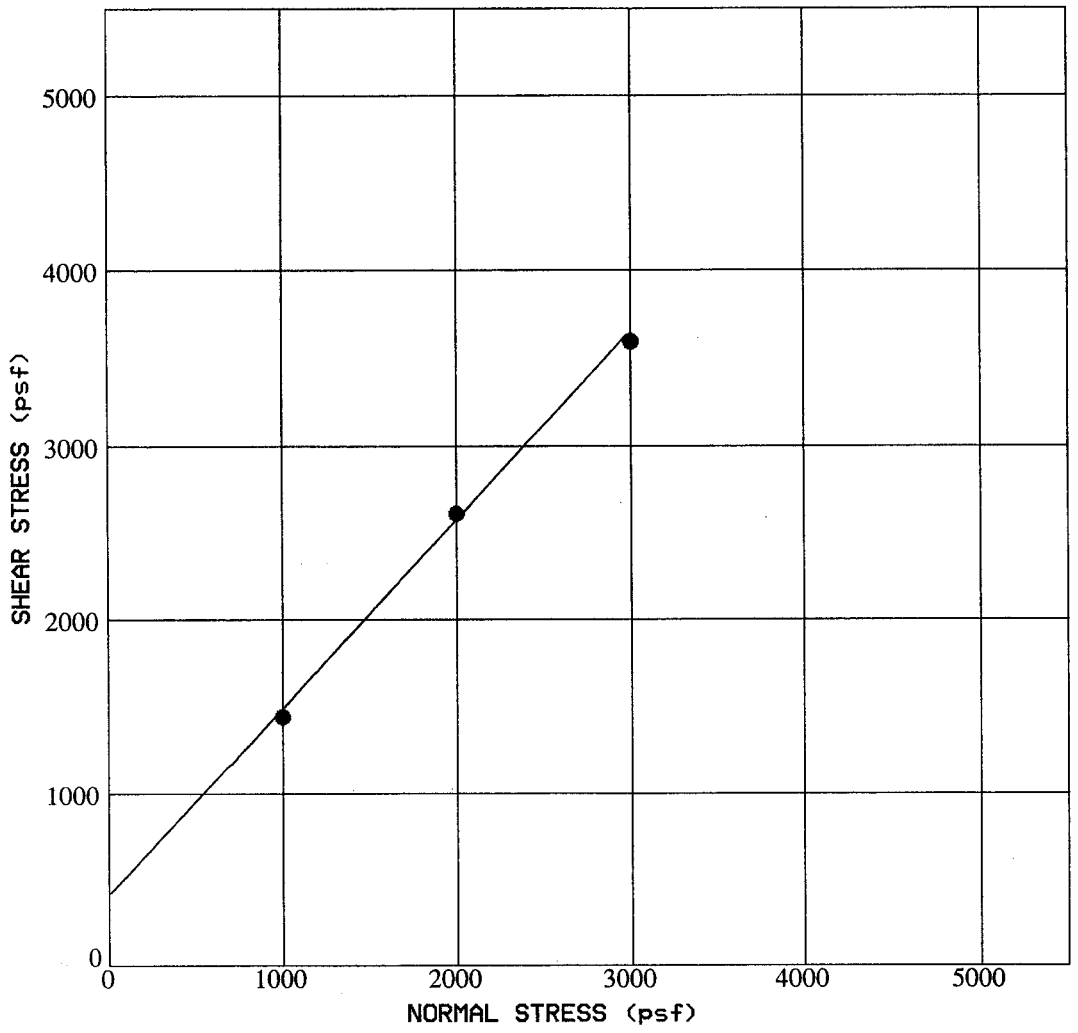
Cohesion (psf) 600

DIRECT SHEAR TEST RESULTS

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D12



Boring No. LB-6 Depth (ft) 60.5

Sample No. R-3 Soil Type Sandst.

Type of Sample Ring

Friction Angle (deg.) 46.5

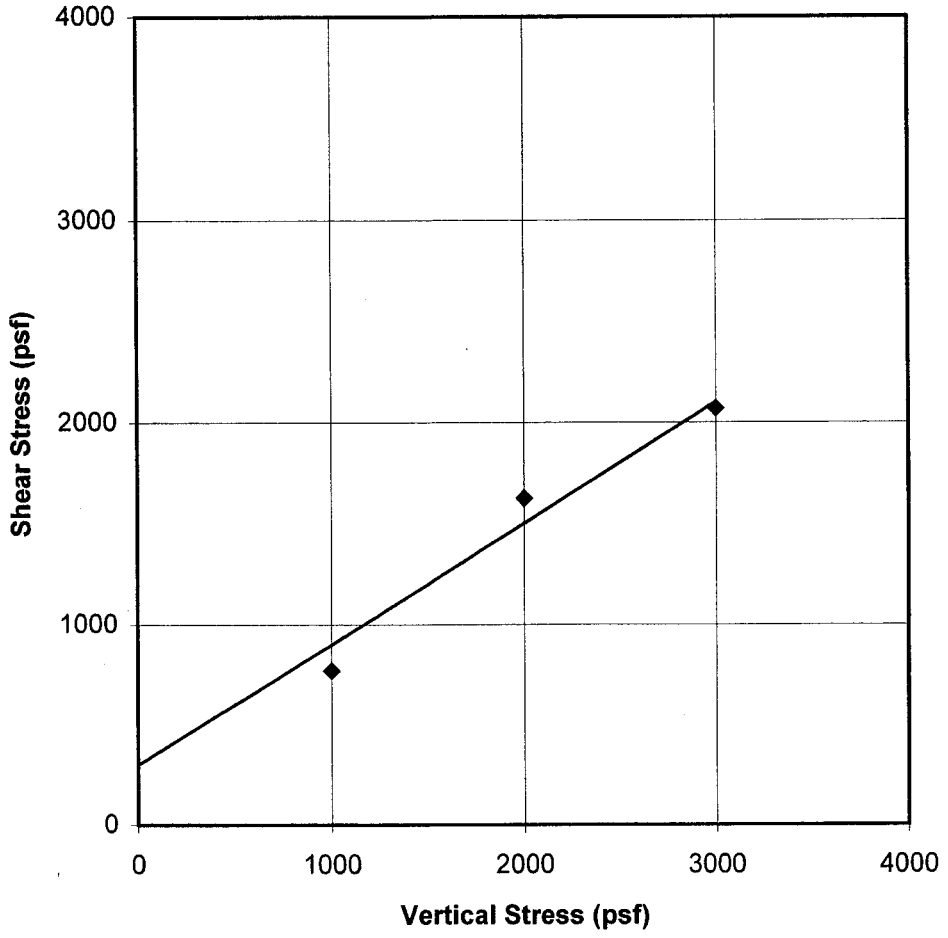
Cohesion (psf) 400

DIRECT SHEAR TEST RESULTS

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-13



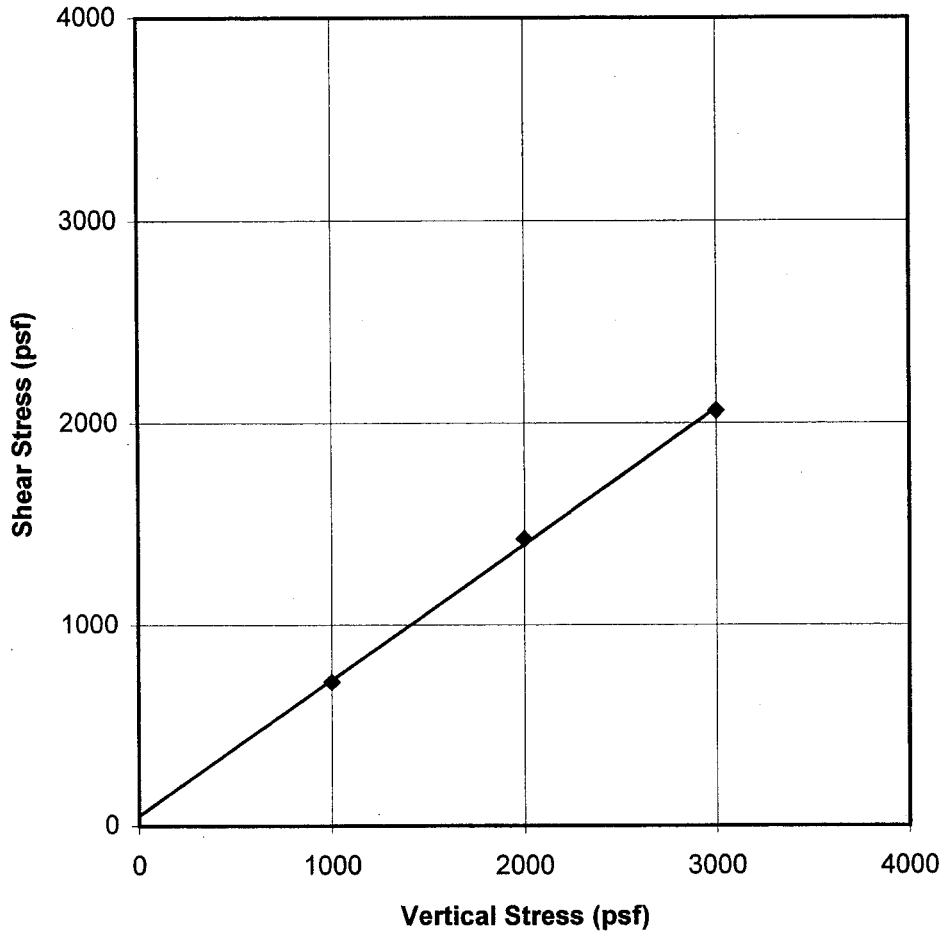
Boring Location	**LB-1**
Sample Depth (feet)	**10**

Average Ultimate Strength Values

Friction Angle, ϕ_{ult} (deg)	**31**
Cohesion, c_{ult} (psf)	**300**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**D-14**



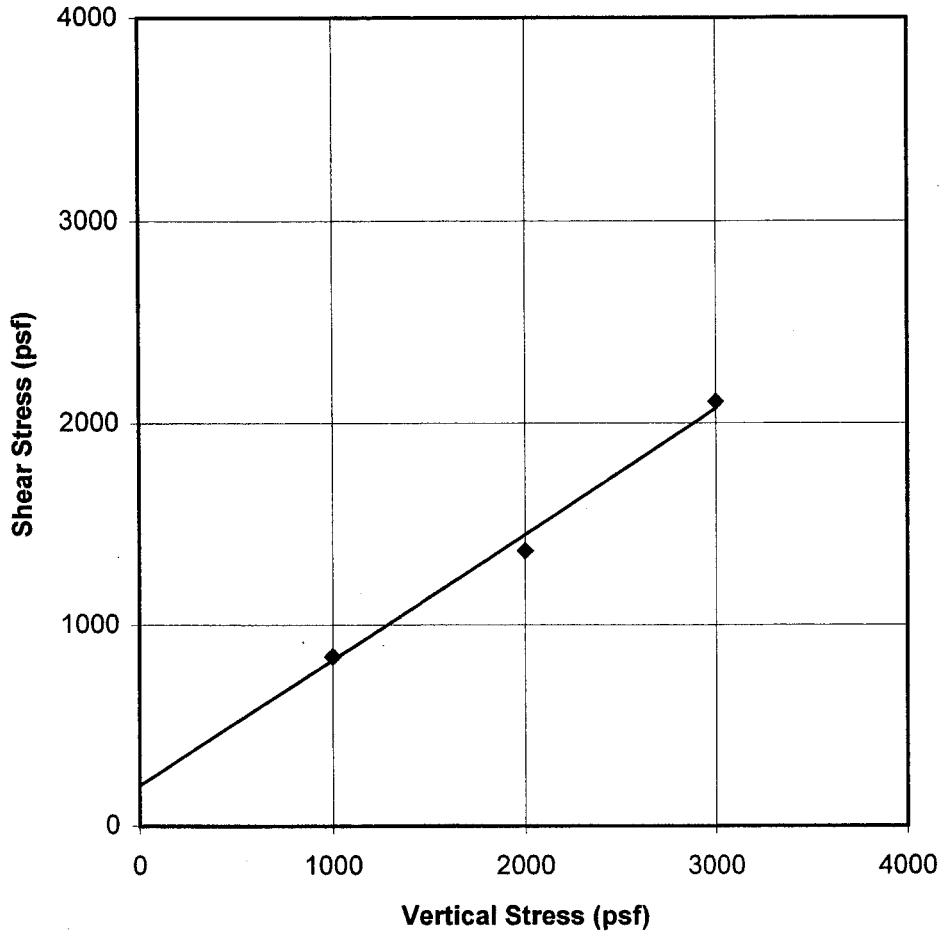
Boring Location	**LB-1**
Sample Depth (feet)	**20**

Average Ultimate Strength Values

Friction Angle, ϕ_{ult} (deg)	**34**
Cohesion, c_{ult} (psf)	**50**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**D-15**



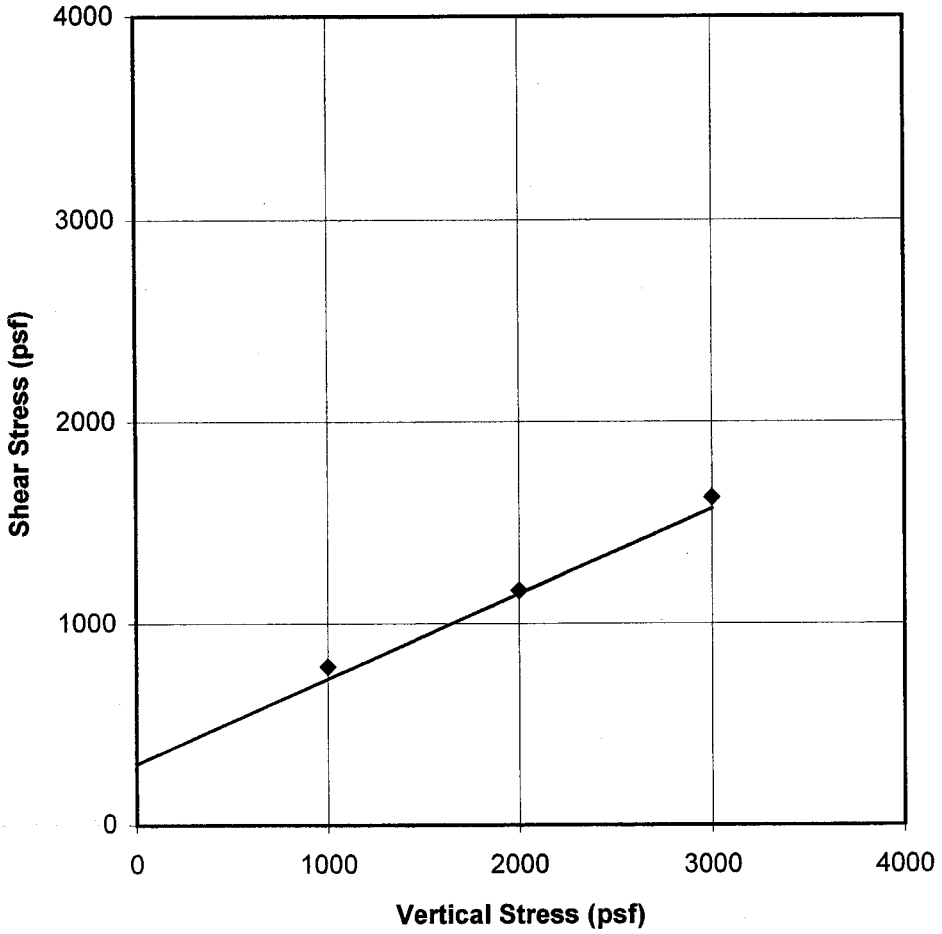
Boring Location	**LB-1**
Sample Depth (feet)	**30**

Average Ultimate Strength Values

Friction Angle, ϕ_{ult} (deg)	**32**
Cohesion, c_{ult} (psf)	**200**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**D-16**



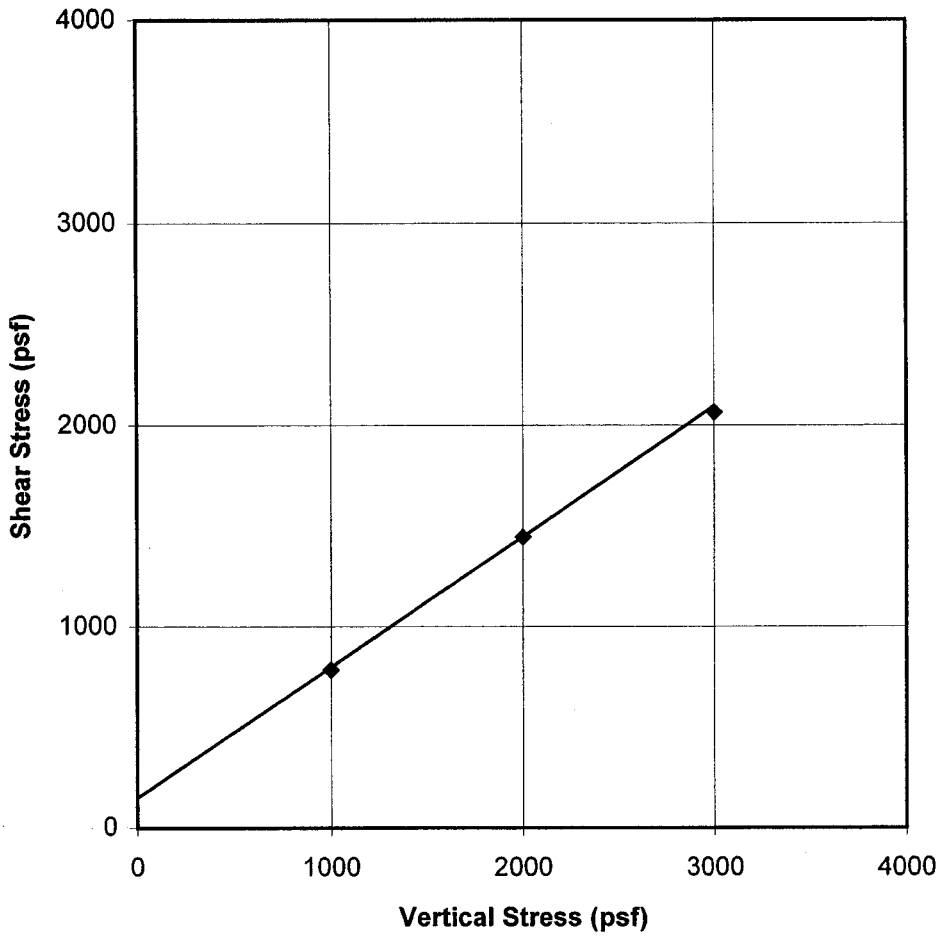
Boring Location	**LB-1**
Sample Depth (feet)	**40**

Average Ultimate Strength Values

Friction Angle, ϕ_{ult} (deg)	**23**
Cohesion, c_{ult} (psf)	**300**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**D-17**



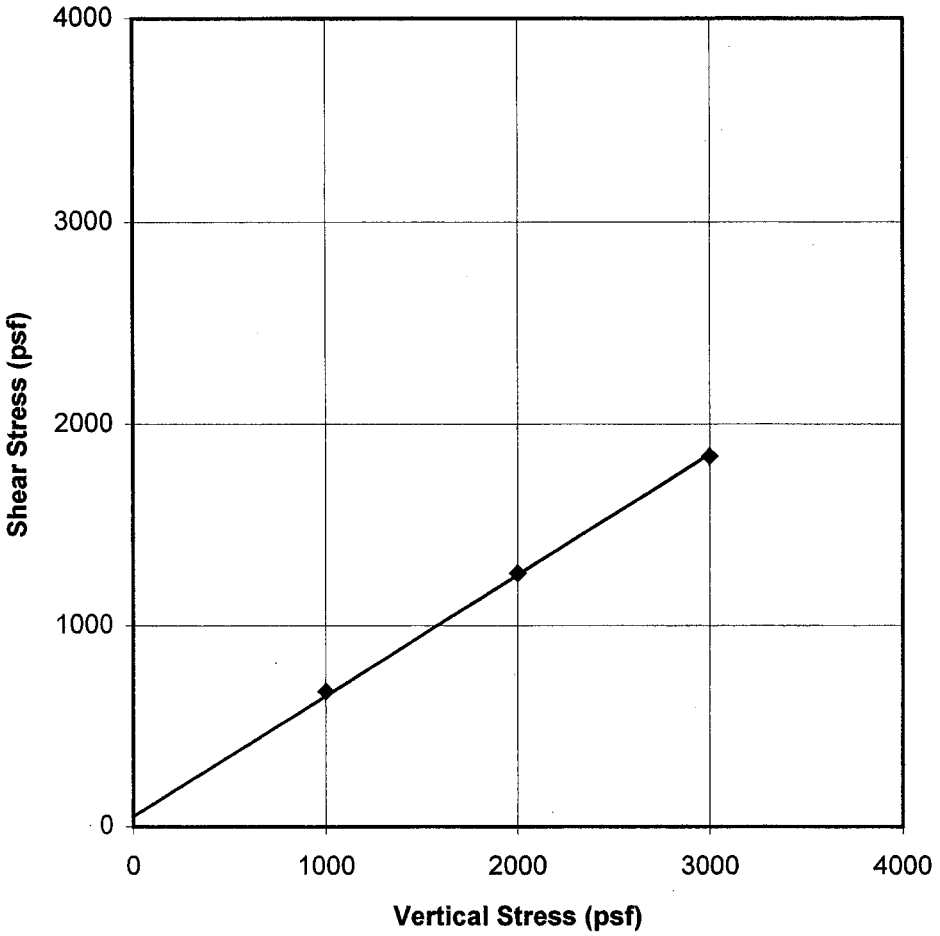
Boring Location	**LB-1**
Sample Depth (feet)	**60**

Average Ultimate Strength Values

Friction Angle, ϕ_{ult} (deg)	**33**
Cohesion, c_{ult} (psf)	**150**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**D-18**



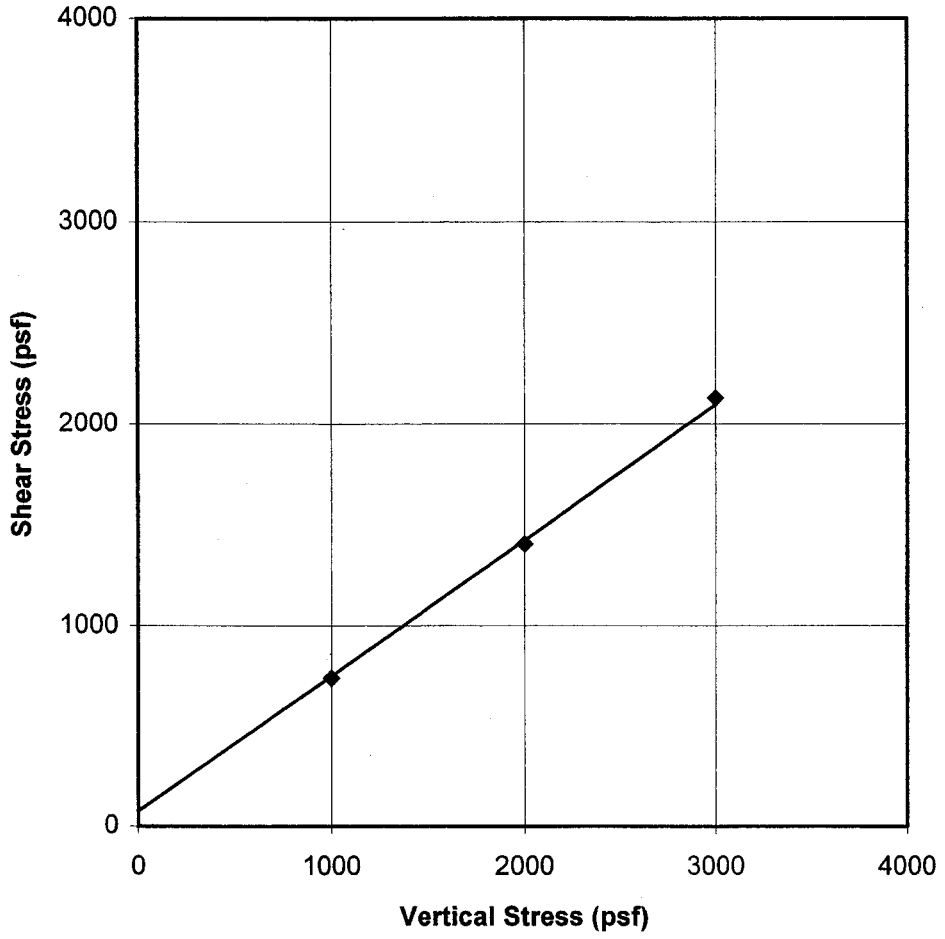
Boring Location	**LB-2**
Sample Depth (feet)	**5**

Average Ultimate Strength Values

Friction Angle, ϕ_{ult} (deg)	**31**
Cohesion, c_{ult} (psf)	**50**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**D-19**



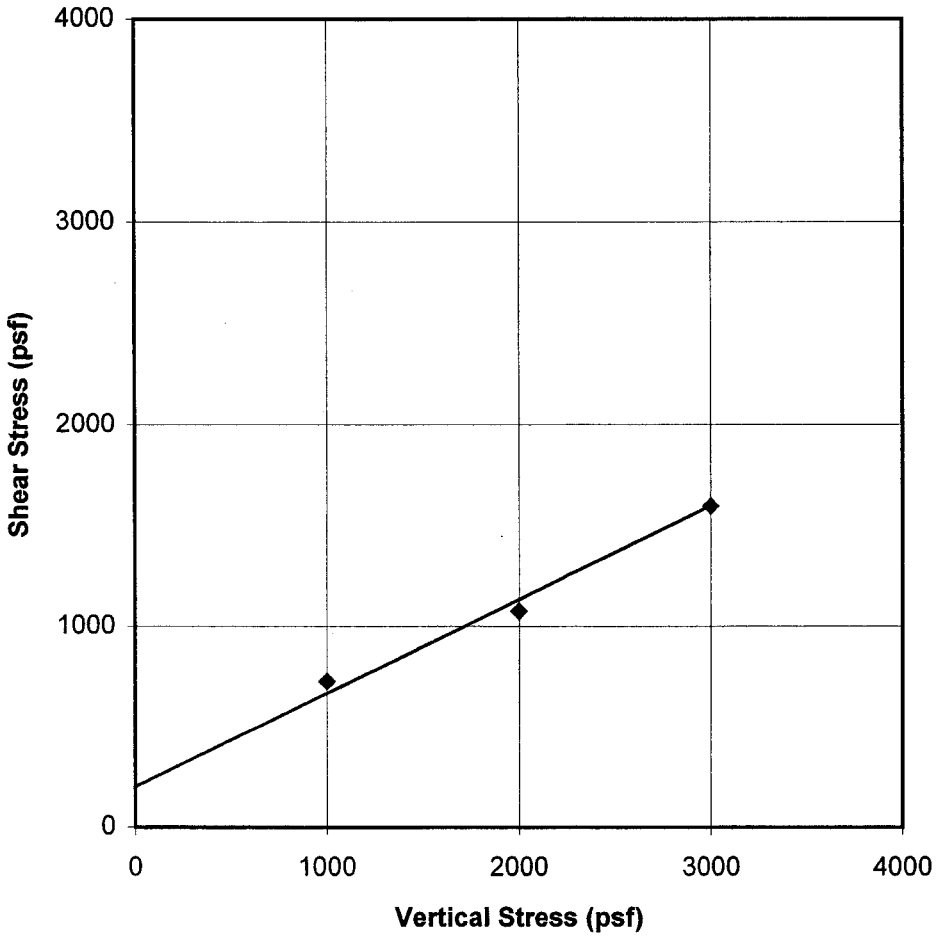
Boring Location	**LB-2**
Sample Depth (feet)	**22**

Average Ultimate Strength Values

Friction Angle, ϕ_{ult} (deg)	**34**
Cohesion, c_{ult} (psf)	**75**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**D-20**



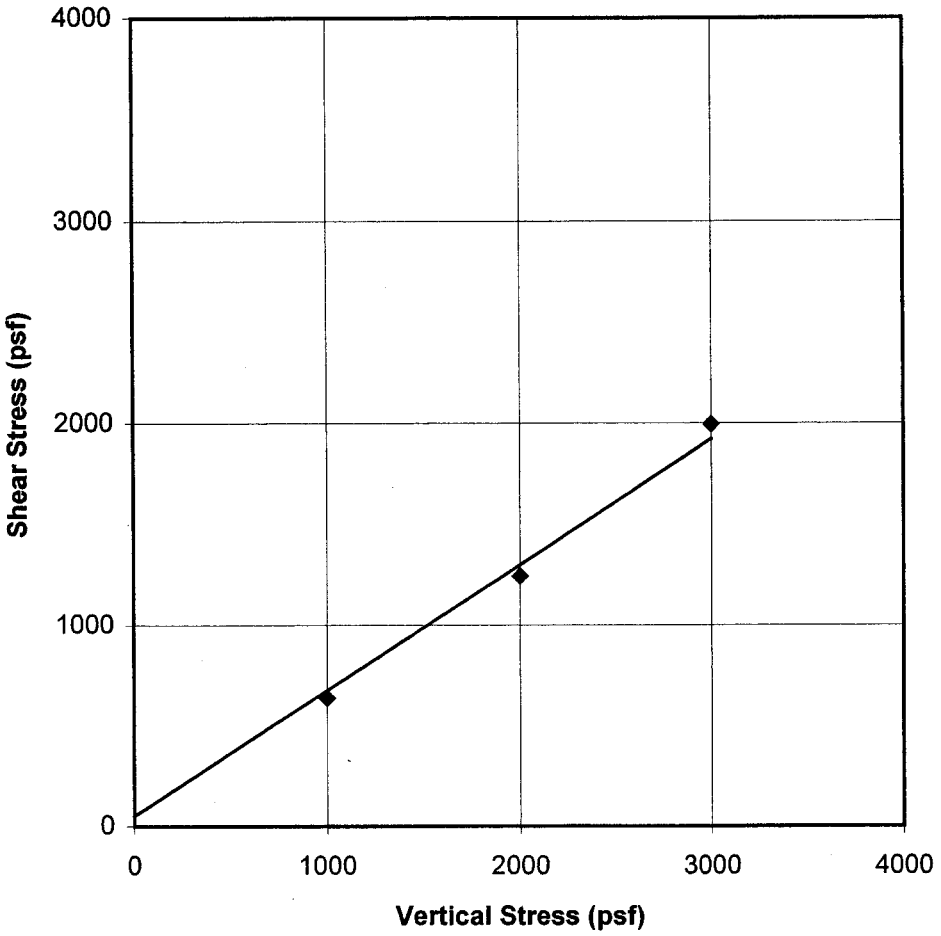
Boring Location	**LB-2**
Sample Depth (feet)	**45**

Average Ultimate Strength Values

Friction Angle, ϕ_{ult} (deg)	**25**
Cohesion, c_{ult} (psf)	**200**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**D-21**



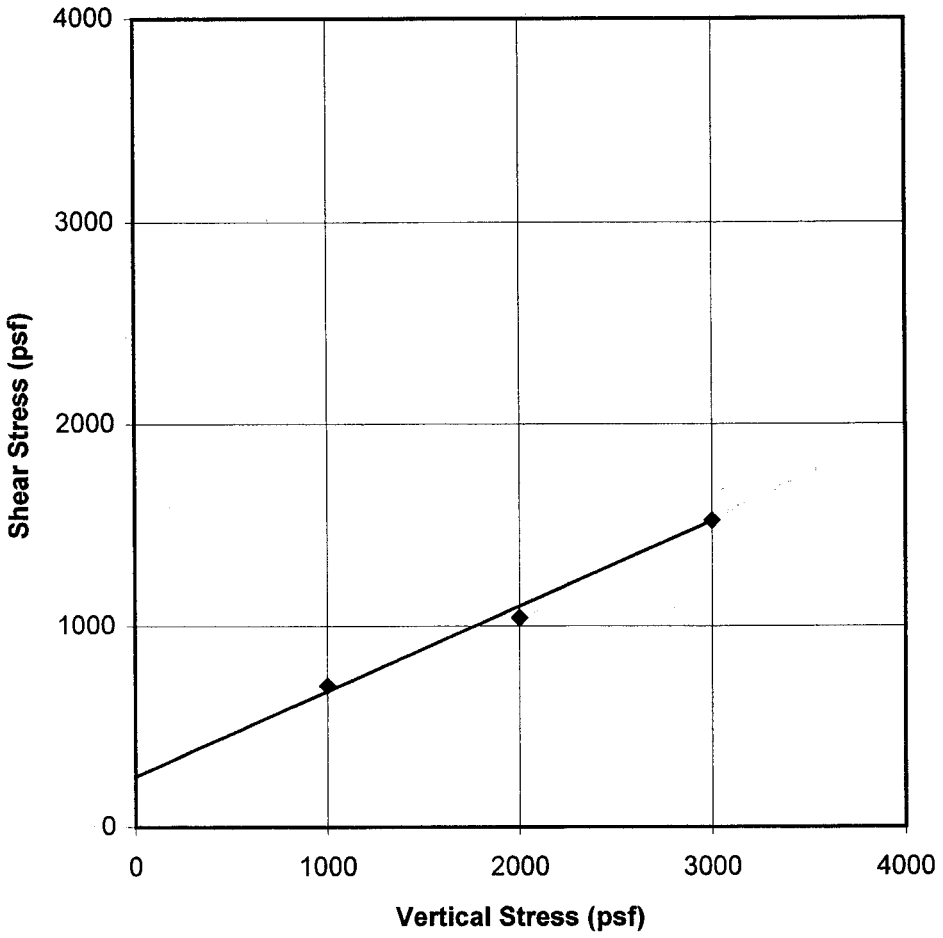
Boring Location	**LB-4**
Sample Depth (feet)	**20**

Average Ultimate Strength Values

Friction Angle, ϕ_{ult} (deg)	**32**
Cohesion, c_{ult} (psf)	**50**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**D-22**



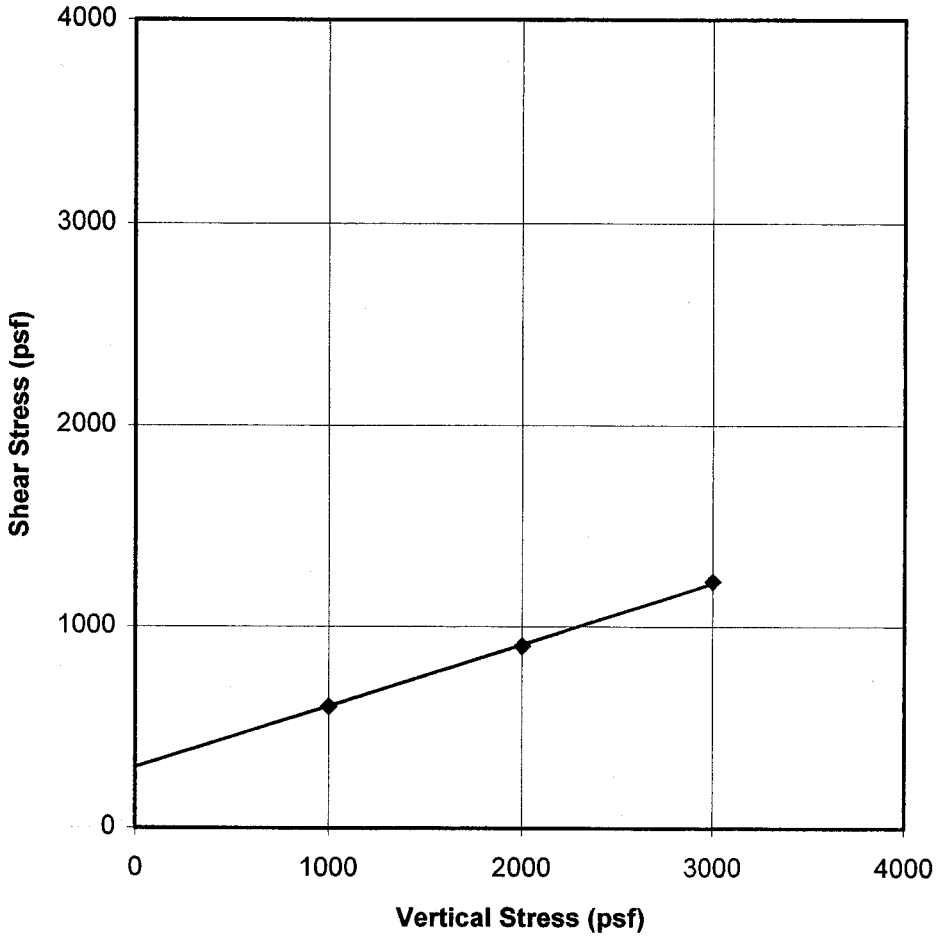
Boring Location	**LB-4**
Sample Depth (feet)	**40**

Average Ultimate Strength Values

Friction Angle, ϕ_{ult} (deg)	**23**
Cohesion, c_{ult} (psf)	**250**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**D-23**



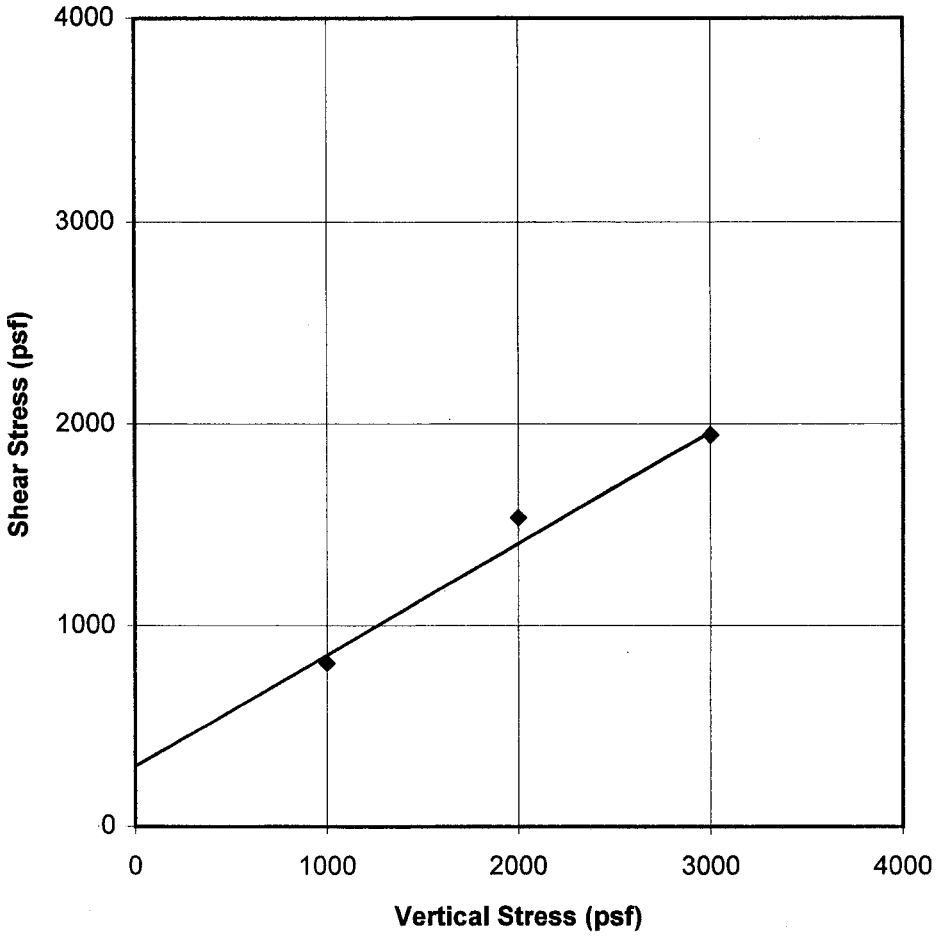
Boring Location	**LB-4**
Sample Depth (feet)	**60**

Average Ultimate Strength Values

Friction Angle, ϕ_{ult} (deg)	**17**
Cohesion, c_{ult} (psf)	**300**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**D-24**



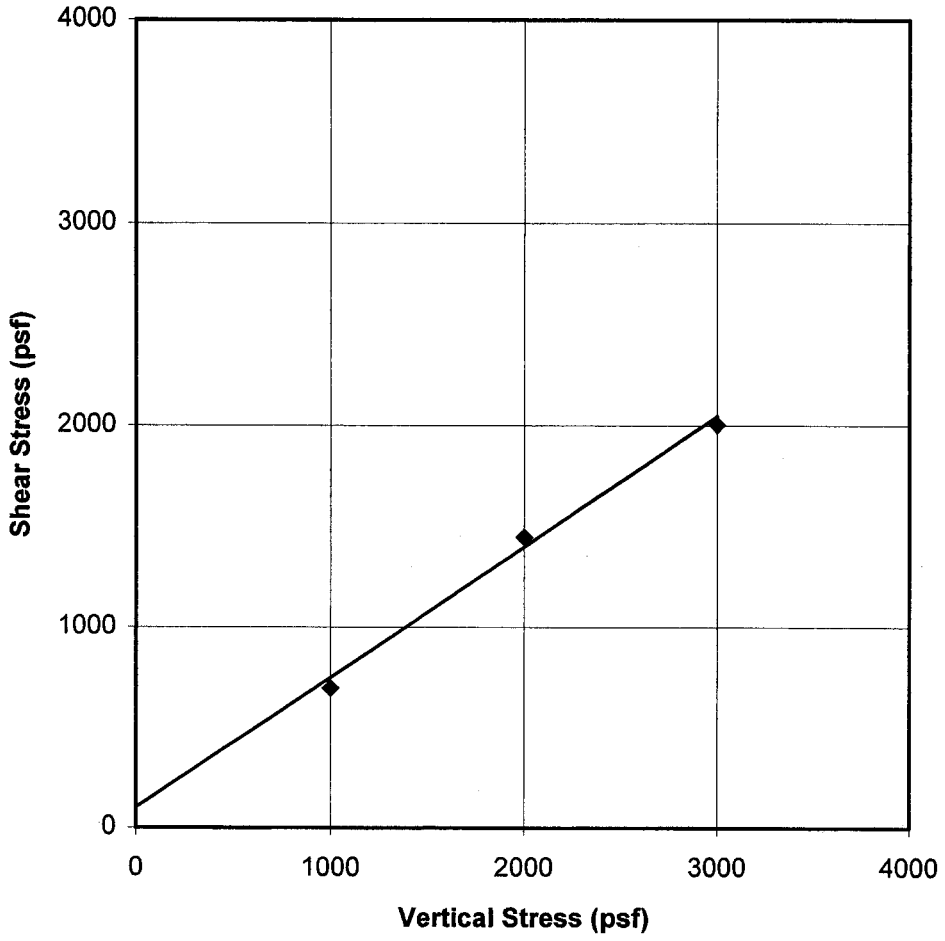
Boring Location	**LB-6**
Sample Depth (feet)	**20**

Average Ultimate Strength Values

Friction Angle, ϕ_{ult} (deg)	**29**
Cohesion, c_{ult} (psf)	**300**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**D-25**



Boring Location	**LB-6**
Sample Depth (feet)	**60**

Average Ultimate Strength Values

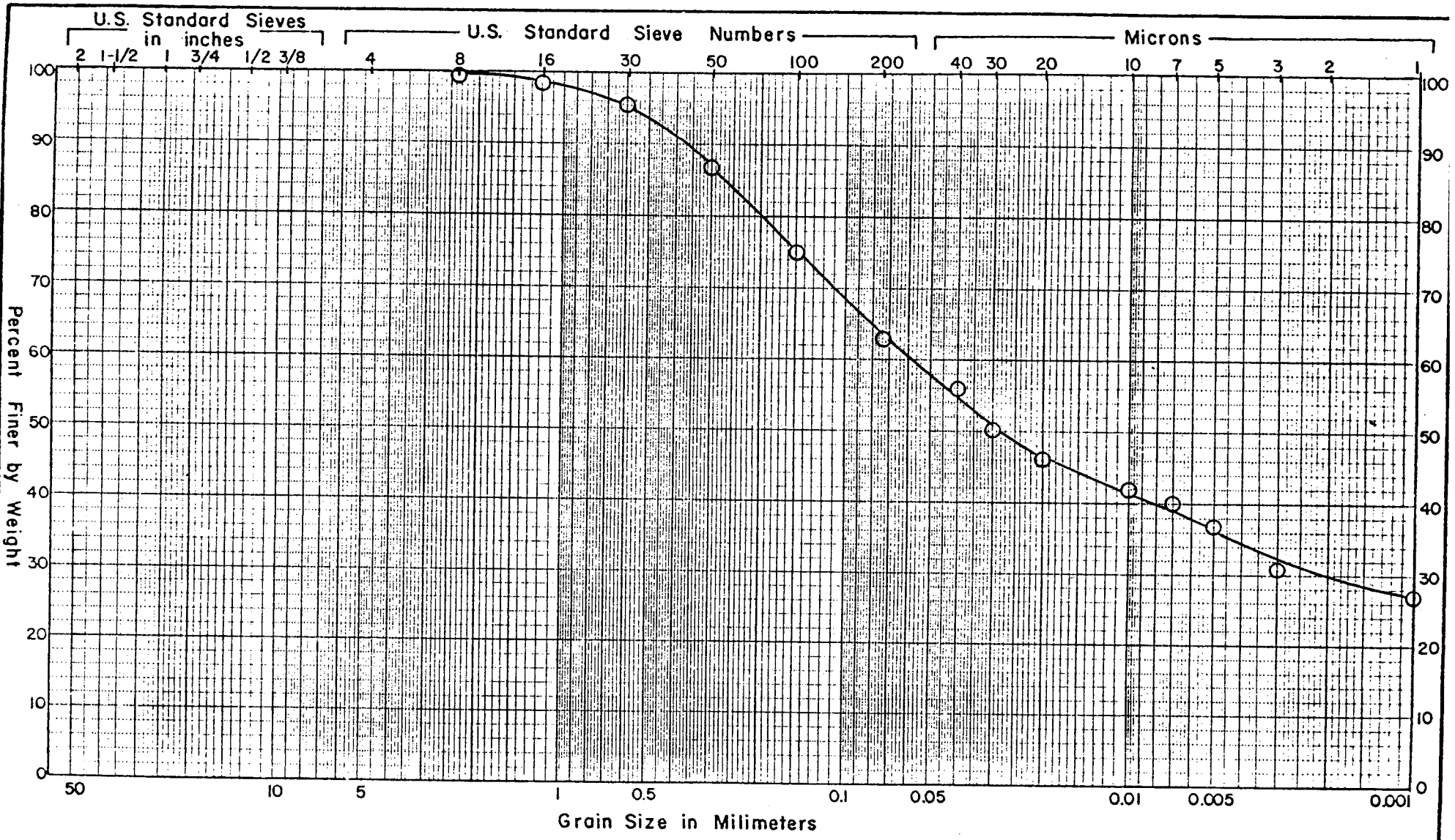
Friction Angle, ϕ_{ult} (deg)	**33**
Cohesion, c_{ult} (psf)	**100**

DIRECT SHEAR SUMMARY

Project No.	**040151-001**
Project Name	**HDR/Del Mar**
Figure No.	**D-26**

PREVIOUS LABORATORY TESTING BY LEIGHTON AND ASSOCIATES

Project No.: 4780081



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

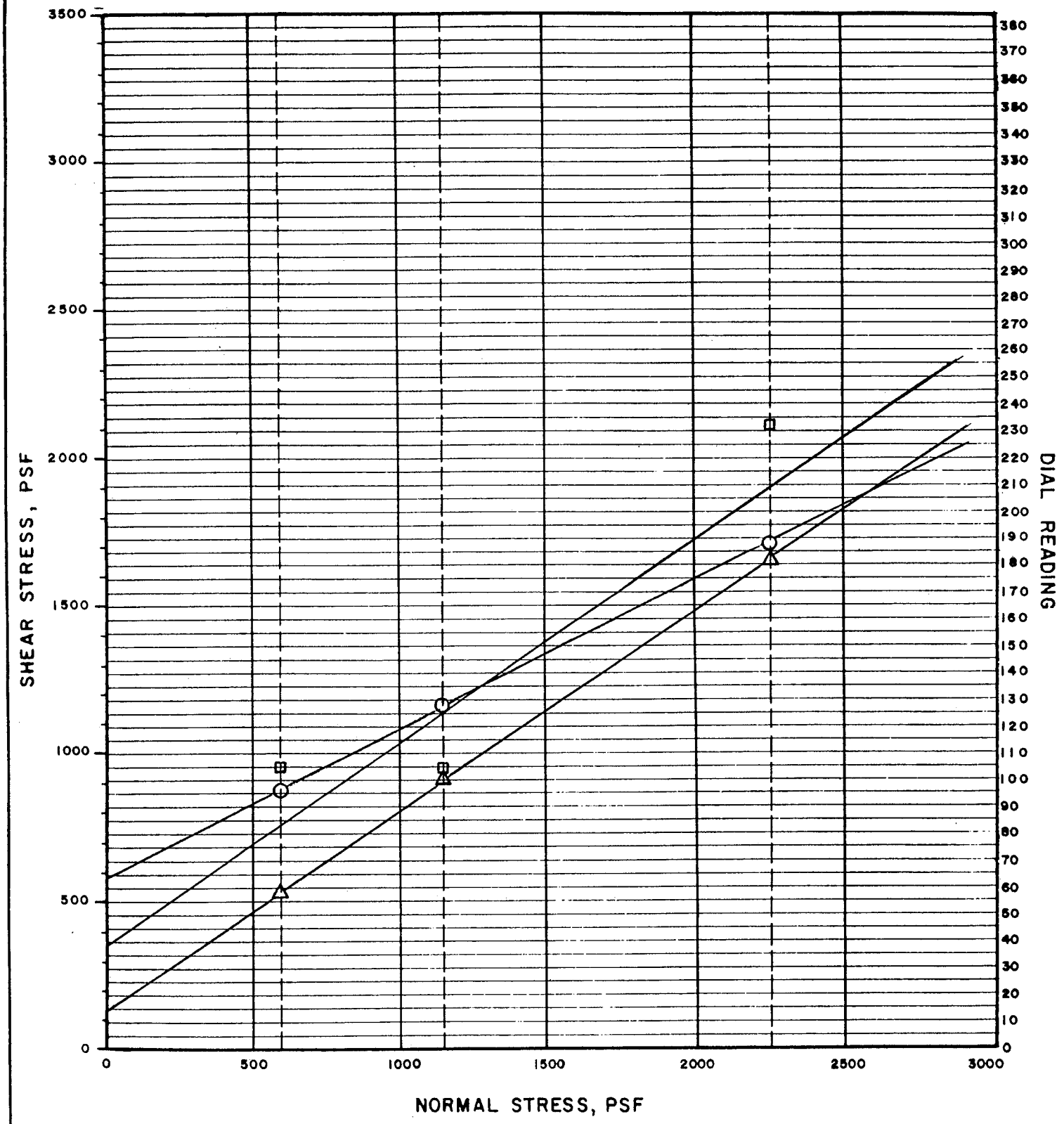
Symbol	Hole No.	Sample No.	Depth or Elev.	Field Moisture (%)	LL (%)	PI (%)	Activity PI/-2μ	Cu D_{60}/D_{10}	Cc $\frac{(D_{30})^2}{D10 \times D60}$	Percent Passing No. 200	Percent Passing 2μ	U.S.C.S.
○	1	1	35'		41	23						CL
	CLAY @ TOE OF SLOPE				47	15						ML

GRADATION TEST RESULTS

B-1
Leighton & Associates

Plate No.:

DIRECT SHEAR SUMMARY



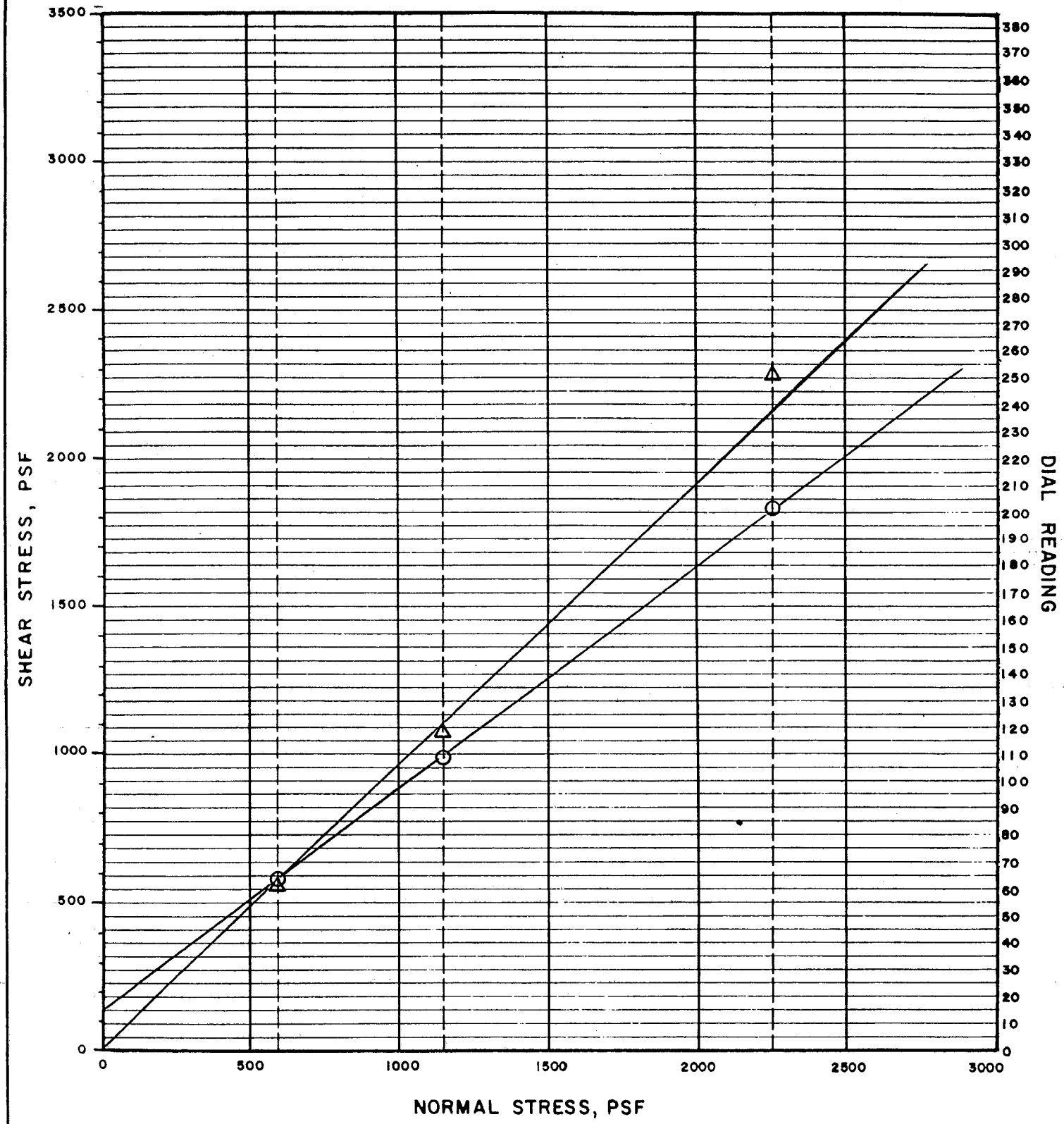
Boring	Depth	Symbol	Friction Angle	Cohesion	Remarks
1	6'	△	34°	140 psf	
1	12'	○	27°	580 psf	
1	17½'	□	35°	360 psf	

Project No.: 478008-1

Leighton & Associates

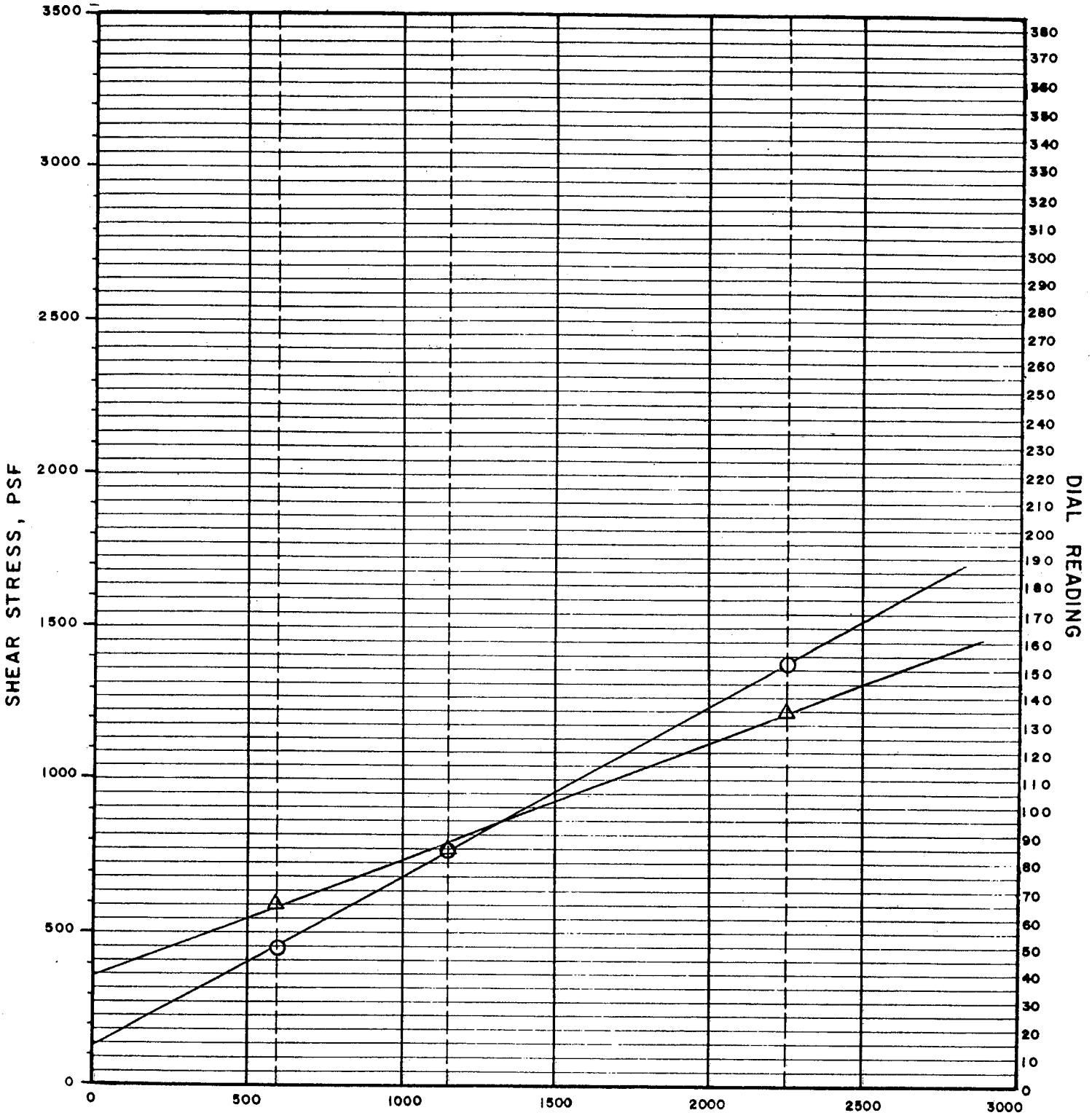
Plate No.:

DIRECT SHEAR SUMMARY



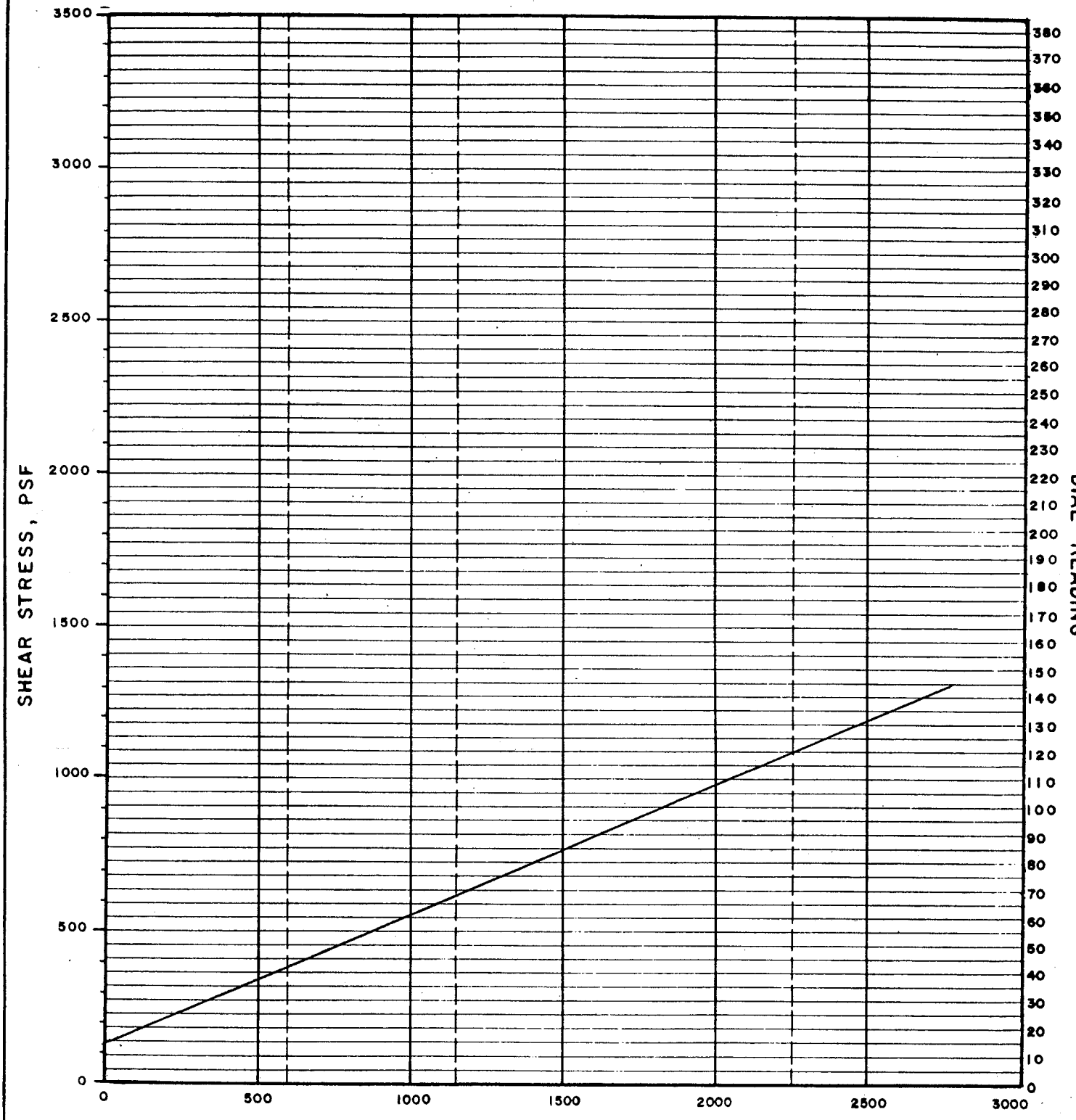
Boring	Depth	Symbol	Friction Angle	Cohesion	Remarks
1	33'	△	43°	0 psf	
2	8'	○	37°	140 psf	

DIRECT SHEAR SUMMARY



Boring	Depth	Symbol	Friction Angle	Cohesion	Remarks
1	35'	△	21°	350 psf	REMOLDED TO 90%
SURFACE SAMPLE	SURFACE	○	29°	130 psf	REMOLDED TO 90%

DIRECT SHEAR SUMMARY



Boring	Depth	Symbol	Friction Angle	Cohesion	Remarks
2	16°		23°	125 psf	RESIDUAL

Project No.: 478008-1

B-V

Leighton & Associates

Plate No.:

PREVIOUS LABORATORY TESTING BY OTHERS

APPENDIX B

Laboratory Testing

Moisture-Density Determinations

The dry unit weight and field moisture content were determined for each of the recovered barrel samples. The moisture-density information provides a gross indication of soil consistency and can assist in delineating local variations. The information can also be used to correlate soils or weakly lithified bedrock found on this site with soils on other sites in the general area. Sample locations and the corresponding test results are illustrated on the Boring Logs in Appendix A.

Compaction Tests

Representative bulk soil samples were tested to determine their maximum dry densities and optimum moisture contents per the ASTM D 1557-91 (Method A) procedure. The test method uses 25 blows of a 10-pound hammer falling 18 inches on each of 5 soil layers in a 1/30 cubic foot cylinder. Soil samples are tested at varying moisture contents to create a curve illustrating achieved dry density as a function of moisture content. The table in the following page presents the test results.

Table B-1
Maximum Density - Optimum Moisture Content Determinations

Soil Classification	*Location*	*Maximum Dry Density (pcf)*	*Optimum Moisture Content (%)*
Sandy Silt (ML)	B - 1P 20-30 ft.	120.5	10.0
Clayey Sand (SP-SC)	B - 2 5-10 ft.	130.0	8.5
Silty Clay (CL)	B - 6P 9-12½ ft.	119.5	13.0
Sandy Silt (ML)	B - 7 20-25 ft.	118.0	16.0
Silty Clay (CL)	B - 9P 12½-17½ ft	112.5	17.0
Sand (SP)	B - 11P	127.0	10.0

Soil Classification	Location	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
Clayey Sand (SP-SC)	0-5 ft. B - 14P 5-10 ft.	123.5	10.0

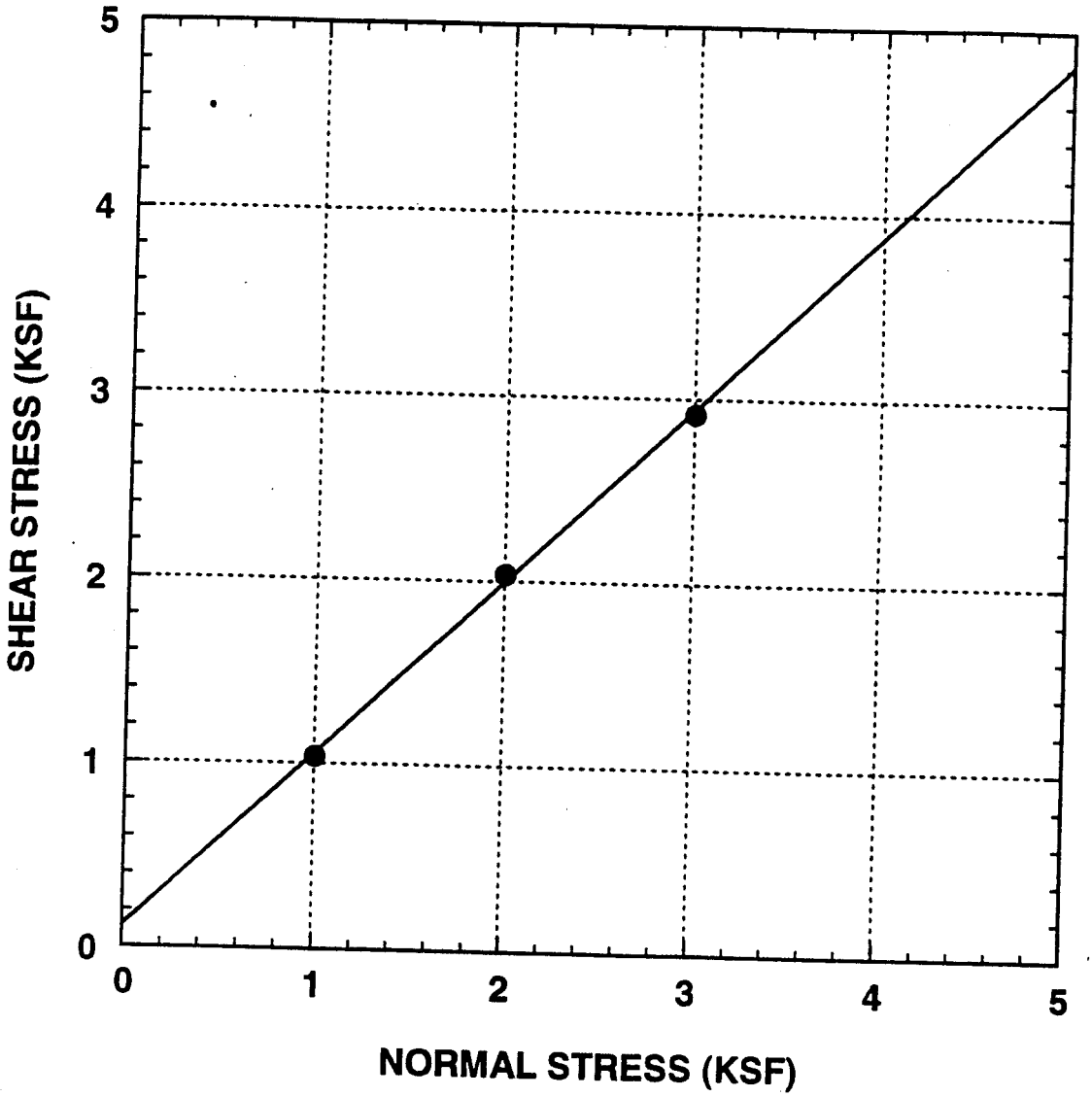
Strength Tests

Direct shear tests were performed on undisturbed samples collected from varying depths within representative Borings. The samples were tested at field moisture contents, and tested in a direct shear machine of the strain control type. Test samples are retained within standard one-inch-high brass rings. Samples were tested at increasing normal loads to determine the Mohr-Coulomb shear strength parameters presented on Figures B-1 through B-39.

Consolidation Tests - (ASTM D 2435)

In this procedure, a series of cumulative vertical loads are applied to a small, laterally confined soil sample. The apparatus is designed to accept a one-inch-high brass ring containing an undisturbed or remolded soil sample. During each load increment, vertical compression (consolidation) of the sample is measured and recorded at selected time intervals. Porous stones are placed in contact with both sides of the specimen to permit the ready addition or release of water. Undisturbed samples were initially at field moisture content, and were subsequently inundated at a load near the existing overburden pressure to determine soil behavior under saturated conditions. The test results are plotted graphically on Figures B-40 through B-42.

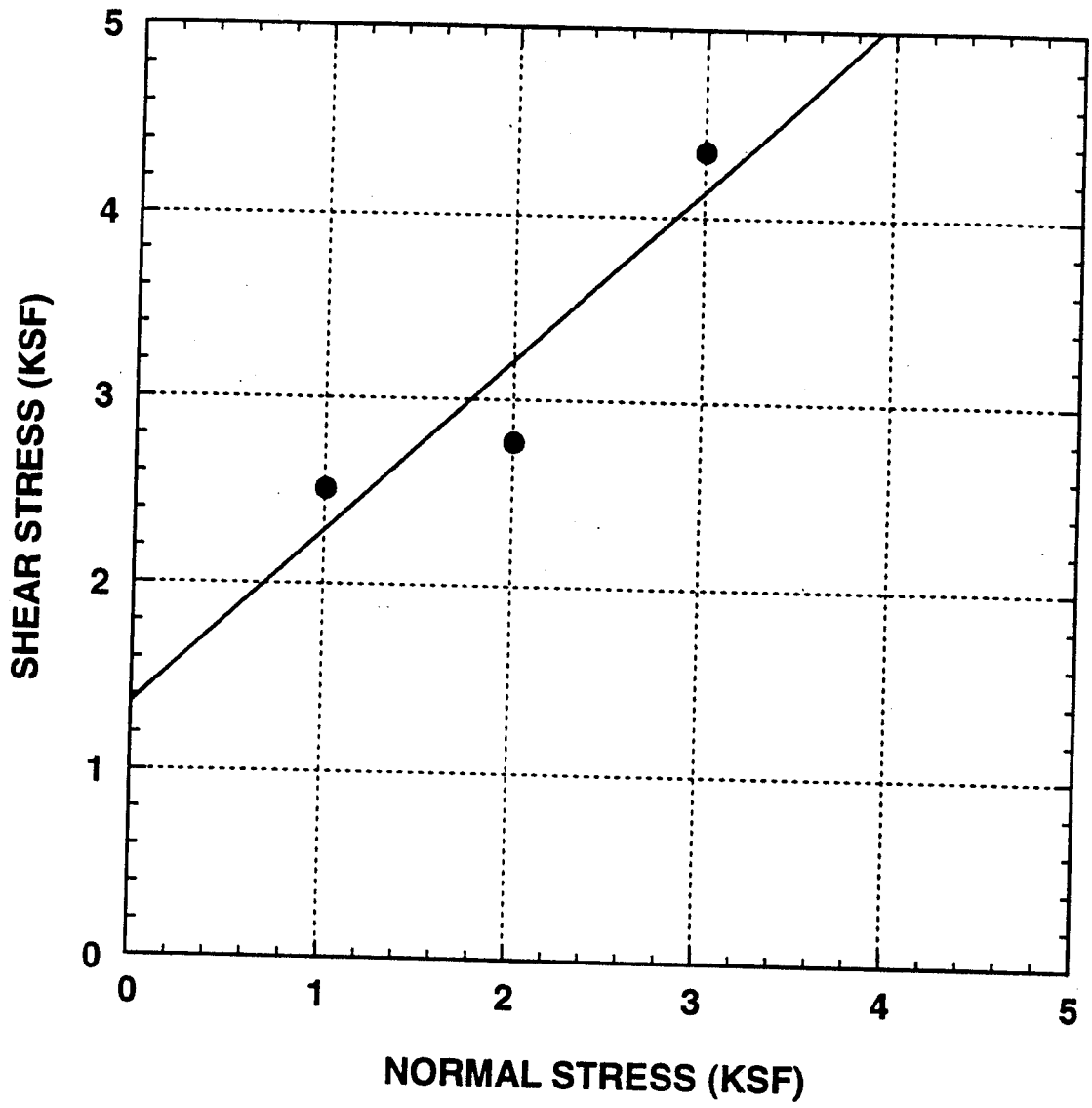
DIRECT SHEAR TEST DIAGRAM



C = 100 psf ϕ = 43°

Test Condition: Undisturbed at Field Moisture	Location: B - 1P	Depth: 5'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 1**	

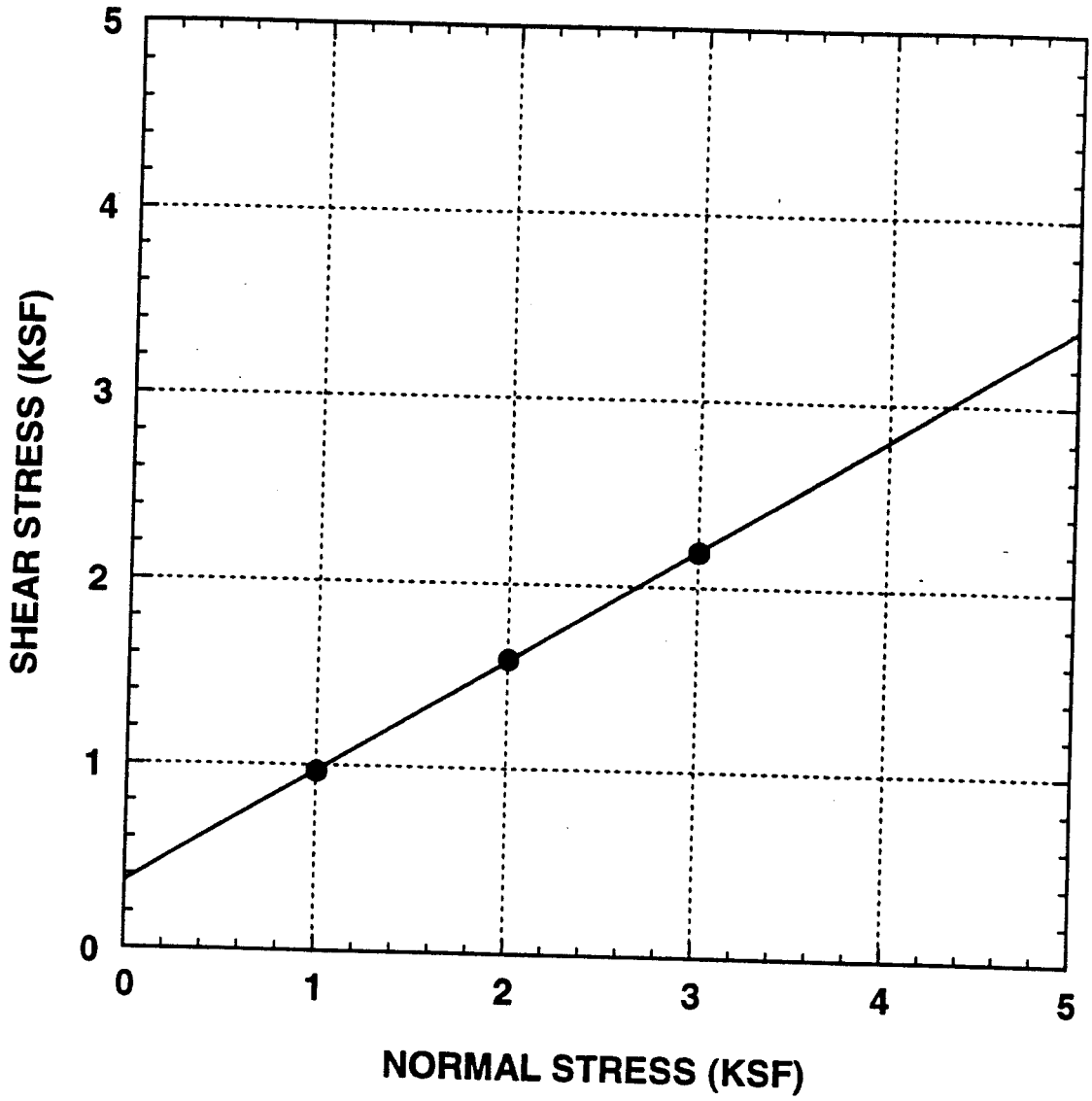
DIRECT SHEAR TEST DIAGRAM



C = 1400 psf $\phi = 42°$

Test Condition: Undisturbed at Field Moisture	Location: B - 1P	Depth: 10'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 2**	

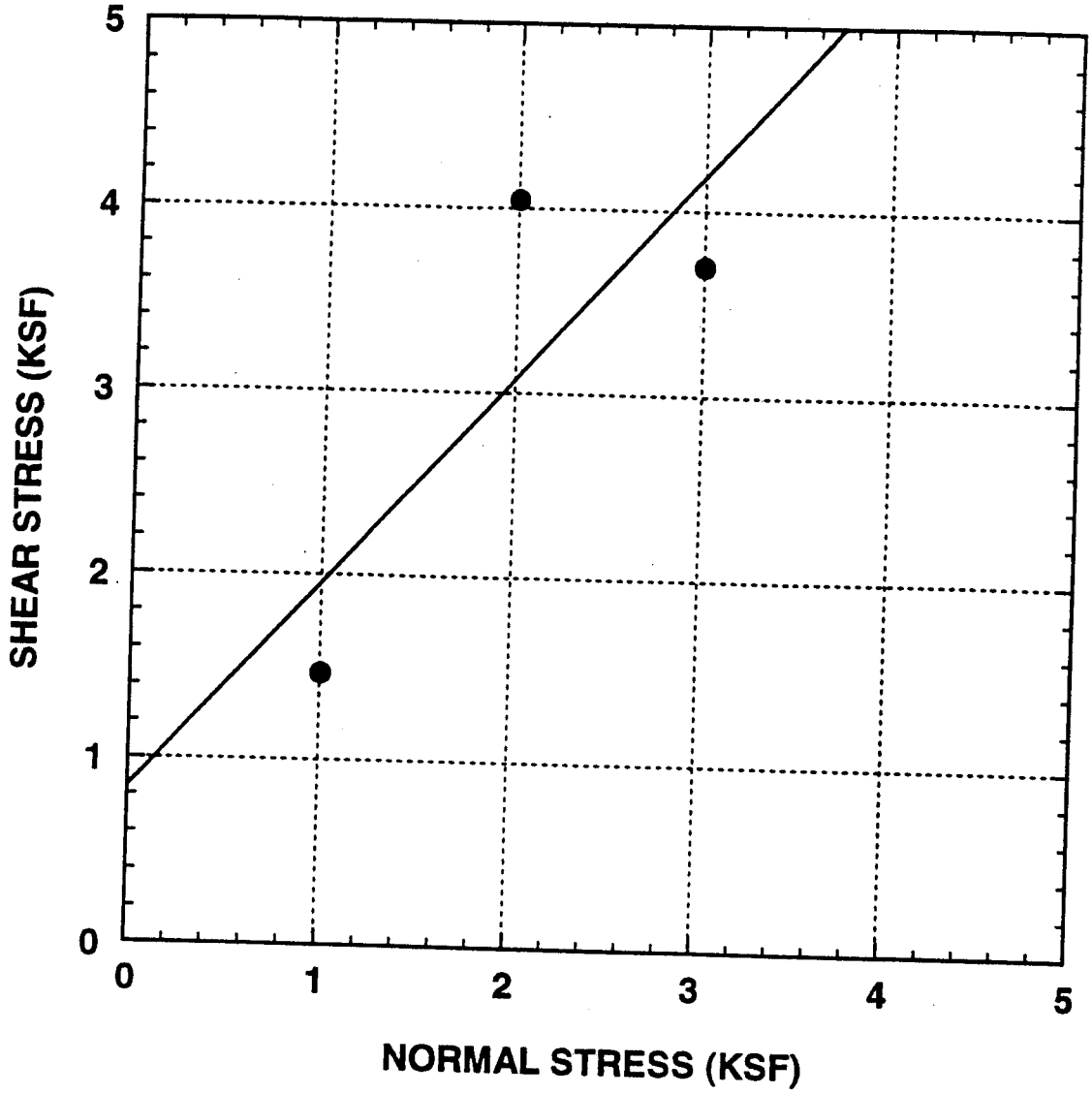
DIRECT SHEAR TEST DIAGRAM



C = 375 psf ϕ = 31°

Test Condition: Undisturbed at Field Moisture	Location: B - 1P	Depth: 20'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 3**	

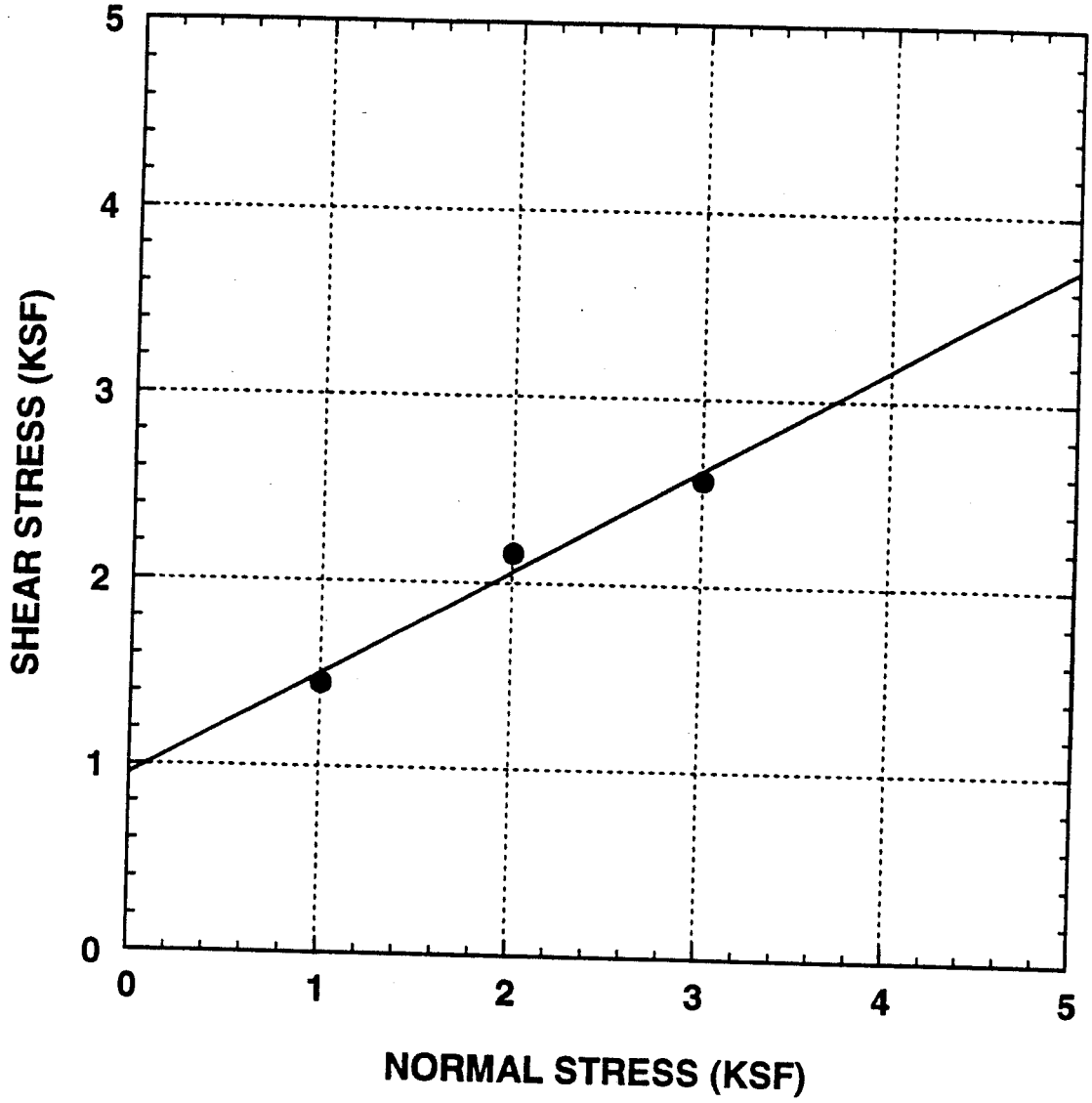
DIRECT SHEAR TEST DIAGRAM



C = 850 psf $\phi = 48°$

Test Condition: Undisturbed at Field Moisture	Location: B - 1P	Depth: 30'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 4**	

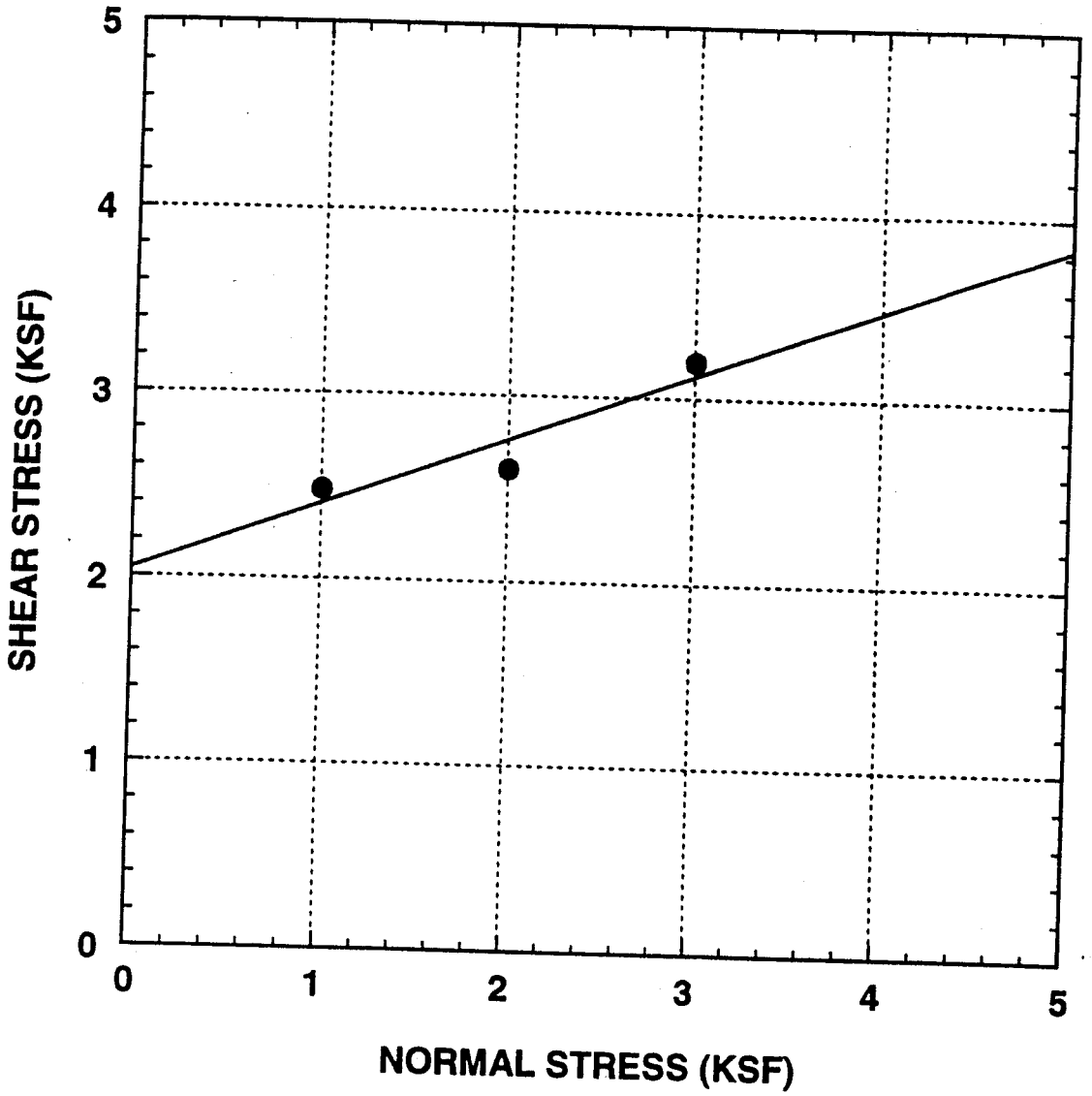
DIRECT SHEAR TEST DIAGRAM



C = 950 psf ϕ = 29°

Test Condition: Undisturbed at Field Moisture	Location: B - 1P	Depth: 50'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 5	

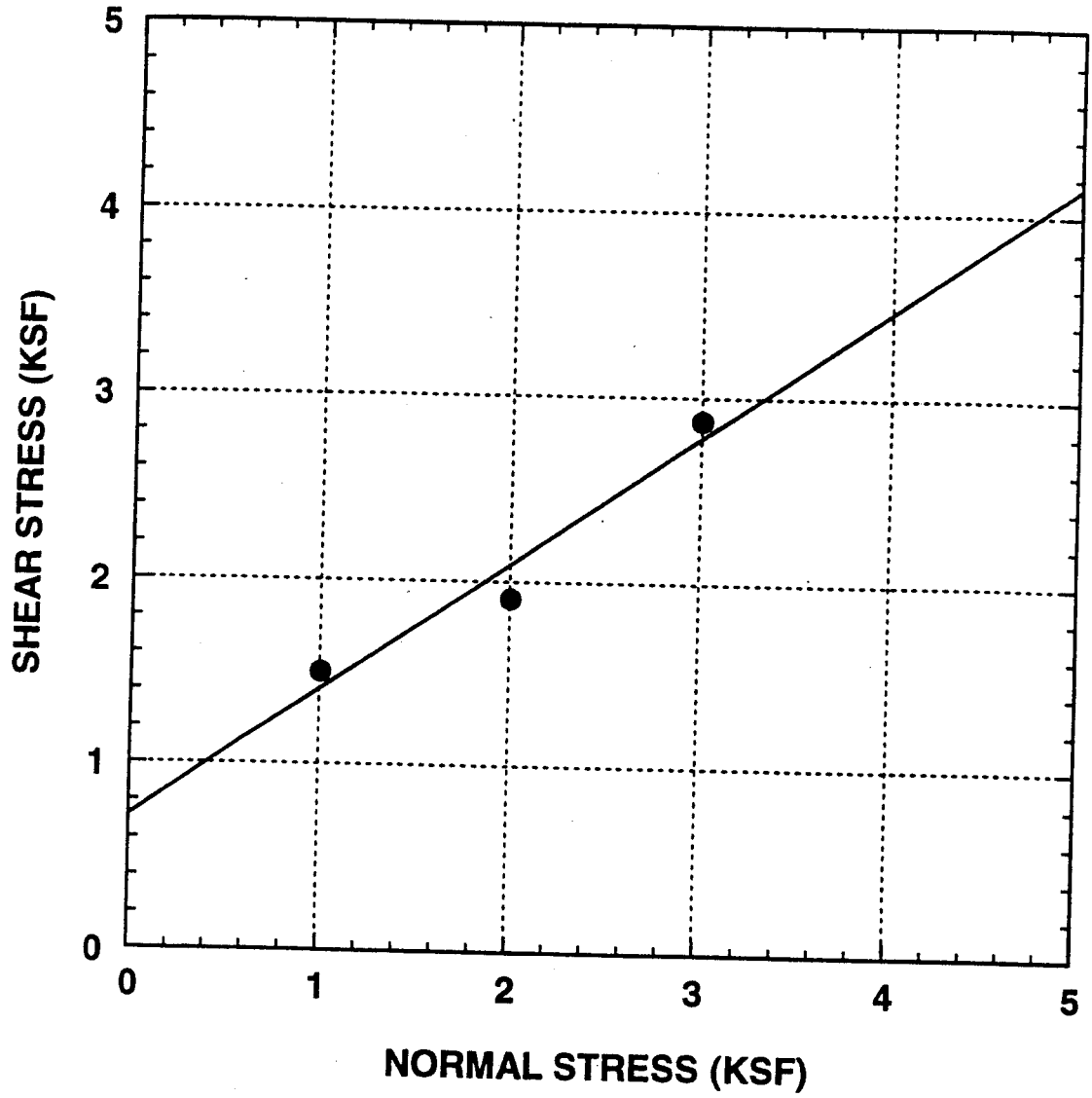
DIRECT SHEAR TEST DIAGRAM



C = 2050 psf ϕ = 20°

Test Condition: Undisturbed at Field Moisture	Location: B - 4P	Depth: 10'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 6**	

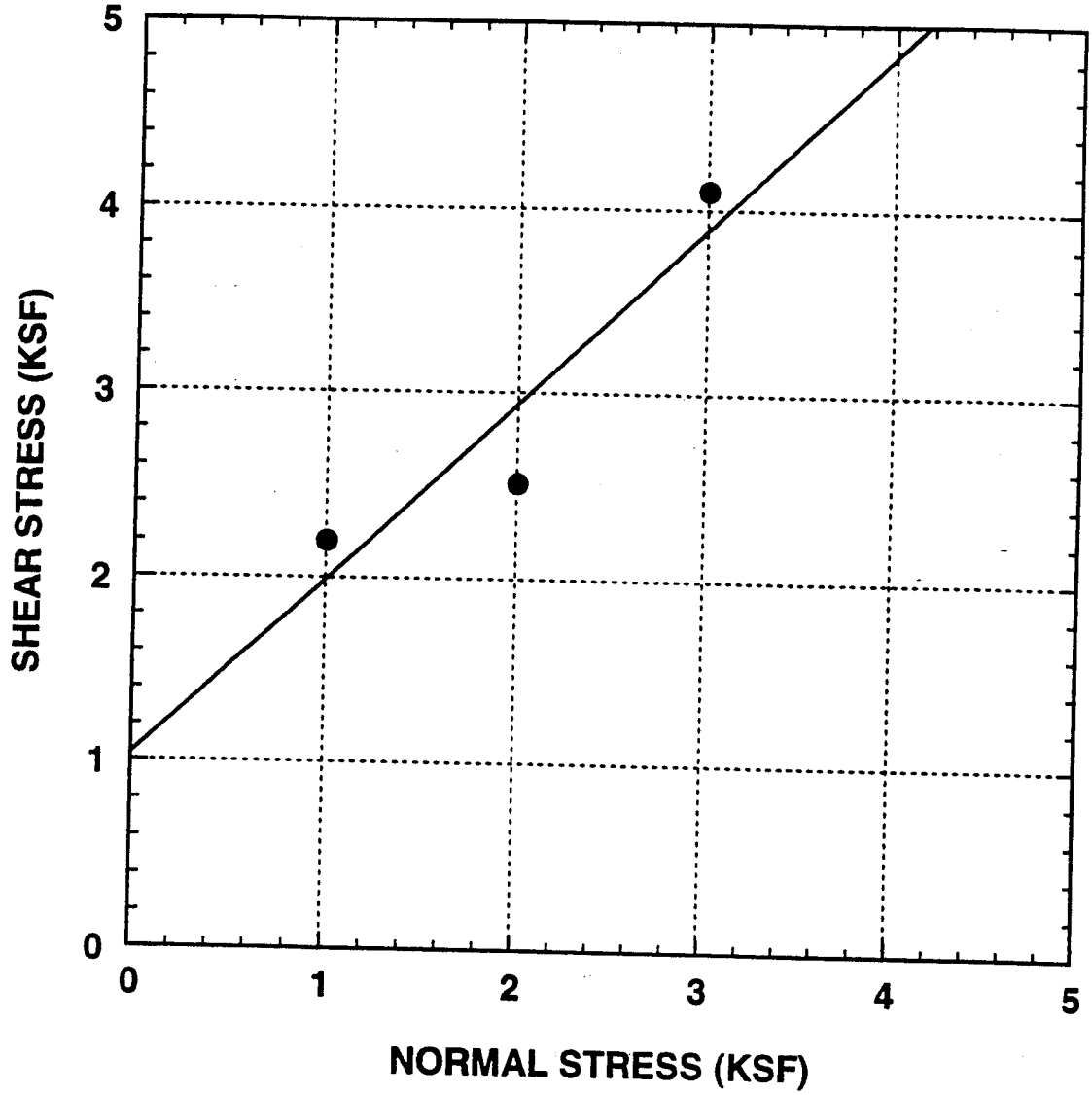
DIRECT SHEAR TEST DIAGRAM



C = 700 psf ϕ = 34°

Test Condition: Undisturbed at Field Moisture	Location: B - 4P	Depth: 15'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 7	

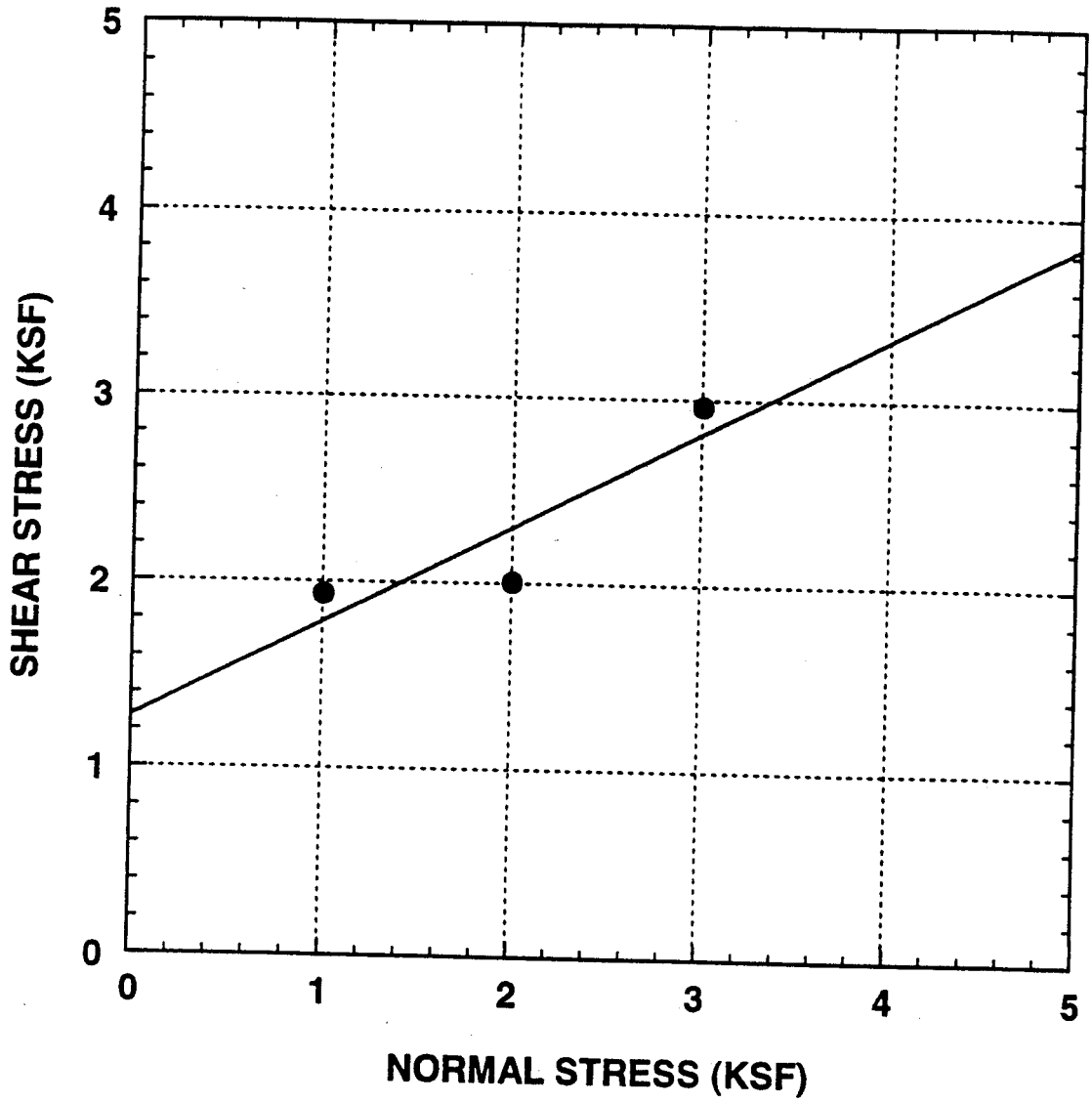
DIRECT SHEAR TEST DIAGRAM



C = 1050 psf ϕ = 43°

Test Condition: Undisturbed at Field Moisture	Location: B - 4P	Depth: 20'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 8**	

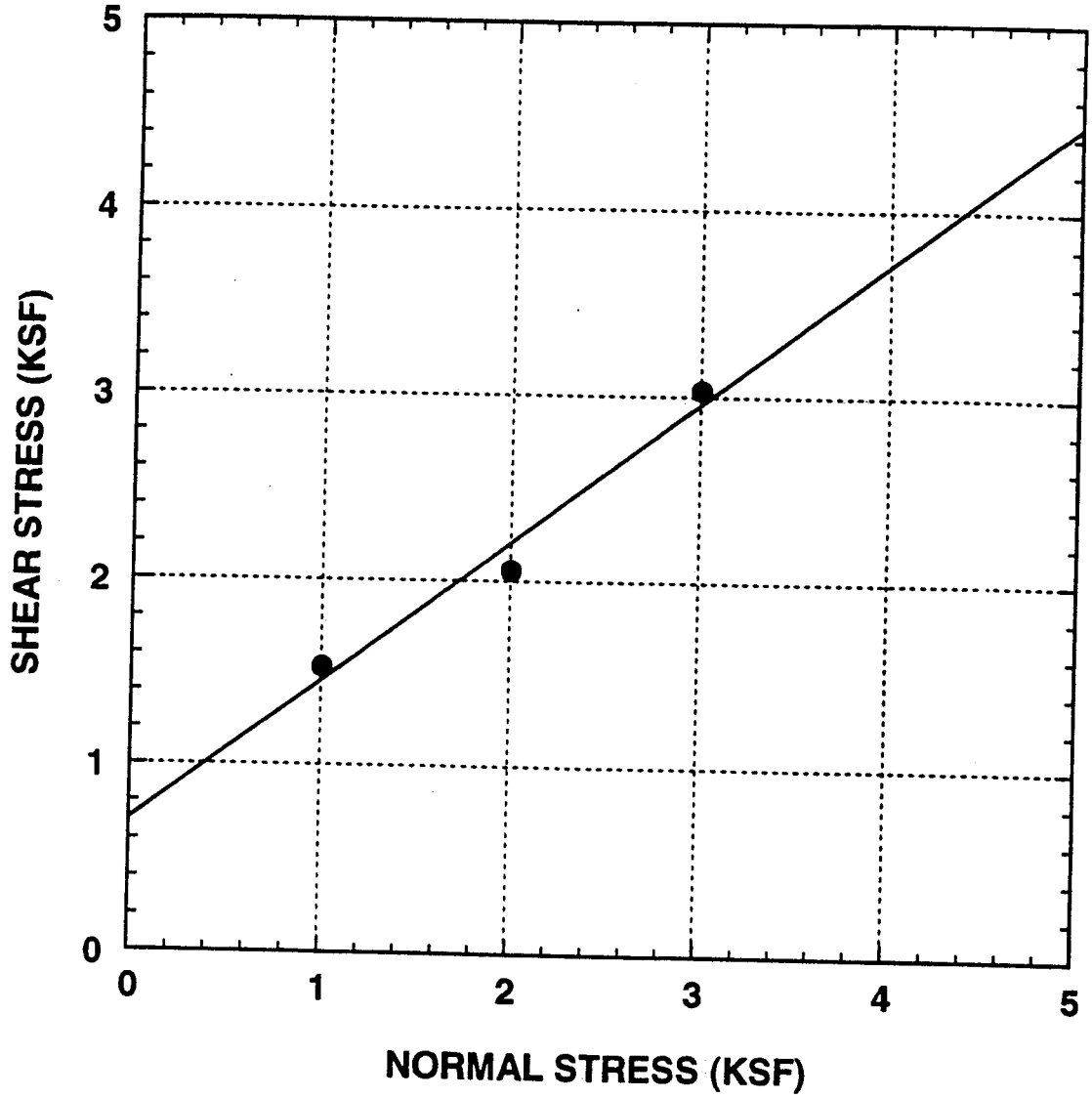
DIRECT SHEAR TEST DIAGRAM



C = 1250 psf ϕ = 27°

Test Condition: Undisturbed at Field Moisture	Location: B - 4P	Depth: 35'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 9**	

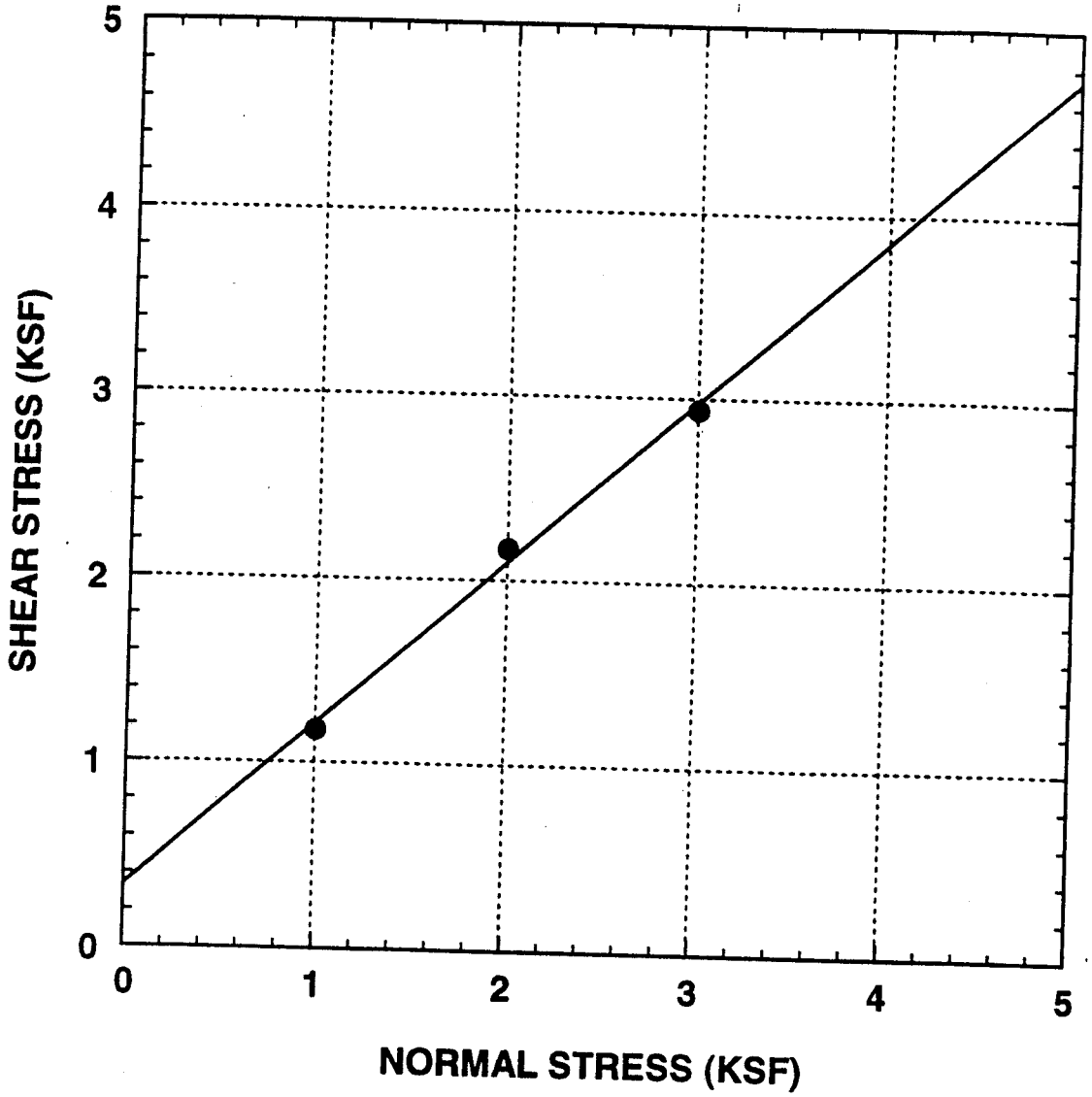
DIRECT SHEAR TEST DIAGRAM



C = 750 psf ϕ = 35°

Test Condition: Undisturbed at Field Moisture	Location: B - 4P	Depth: 55'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 10	

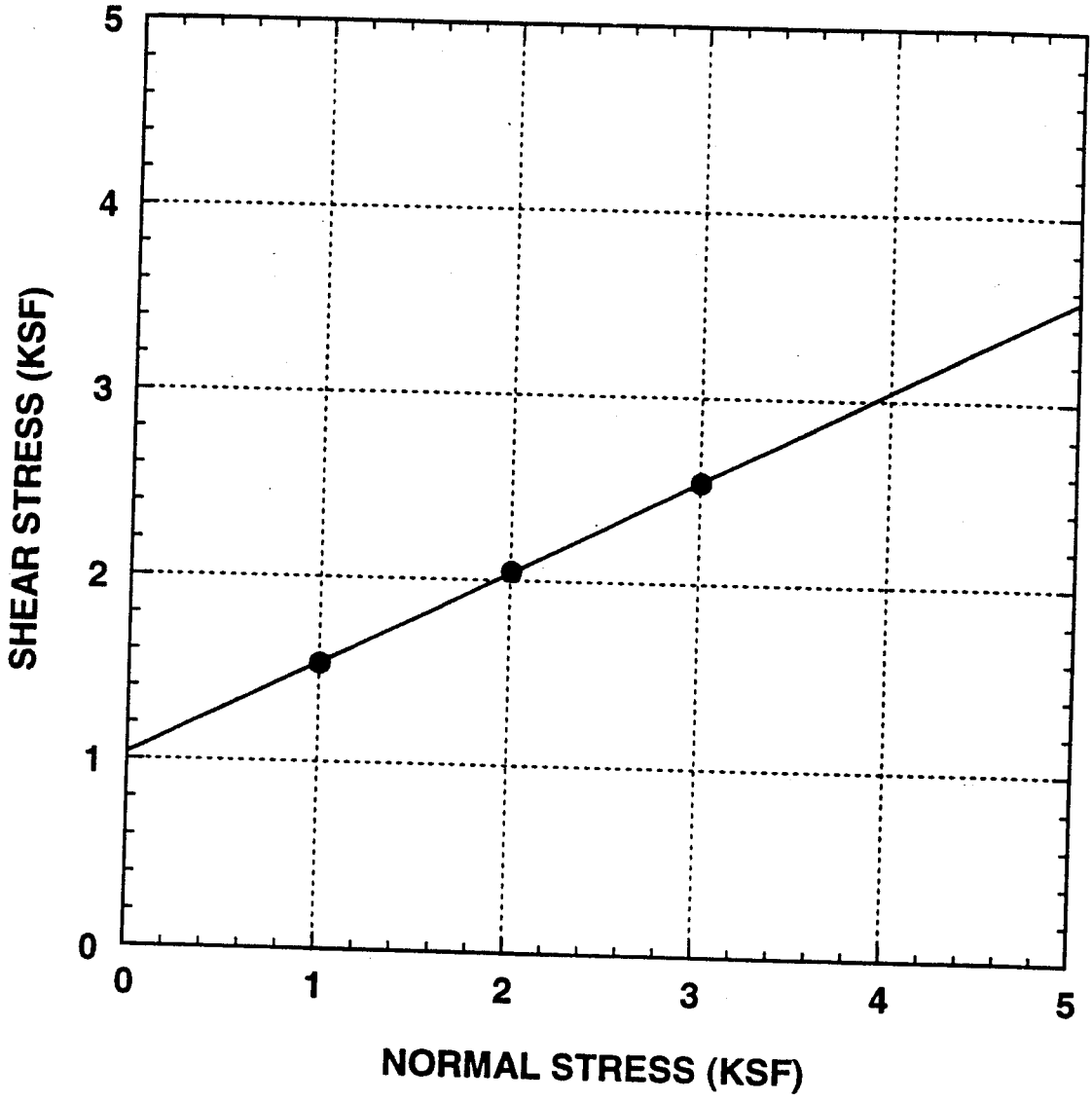
DIRECT SHEAR TEST DIAGRAM



C = 350 psf ϕ = 41°

Test Condition: Undisturbed at Field Moisture	Location: B - 7	Depth: 5'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 11**	

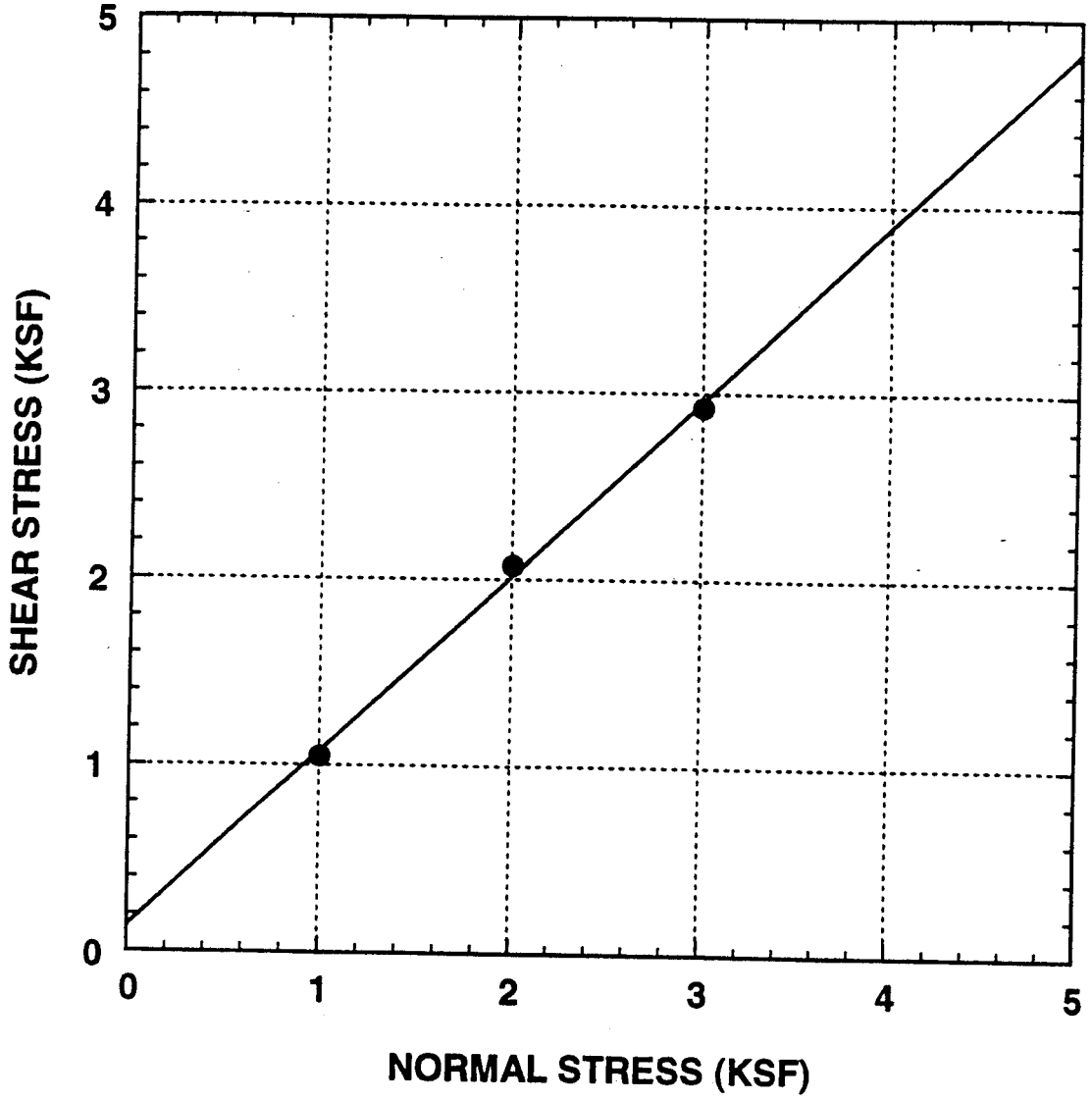
DIRECT SHEAR TEST DIAGRAM



C = 1025 psf ϕ = 27°

Test Condition: Undisturbed at Field Moisture	Location: B - 7	Depth: 10'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 12**	

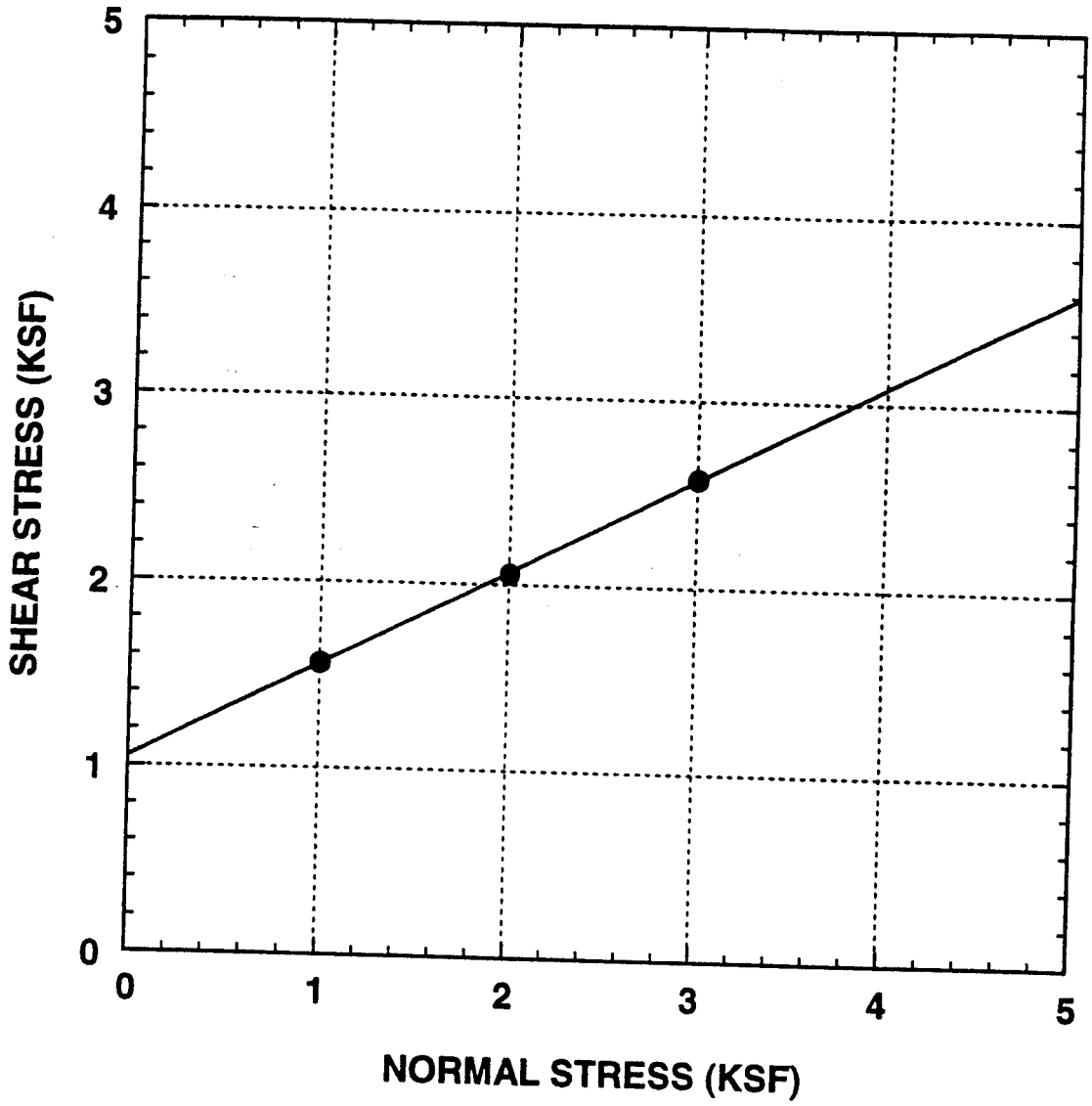
DIRECT SHEAR TEST DIAGRAM



C = 125 psf ϕ = 43°

Test Condition: Undisturbed at Field Moisture	Location: B - 7	Depth: 20'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 13	

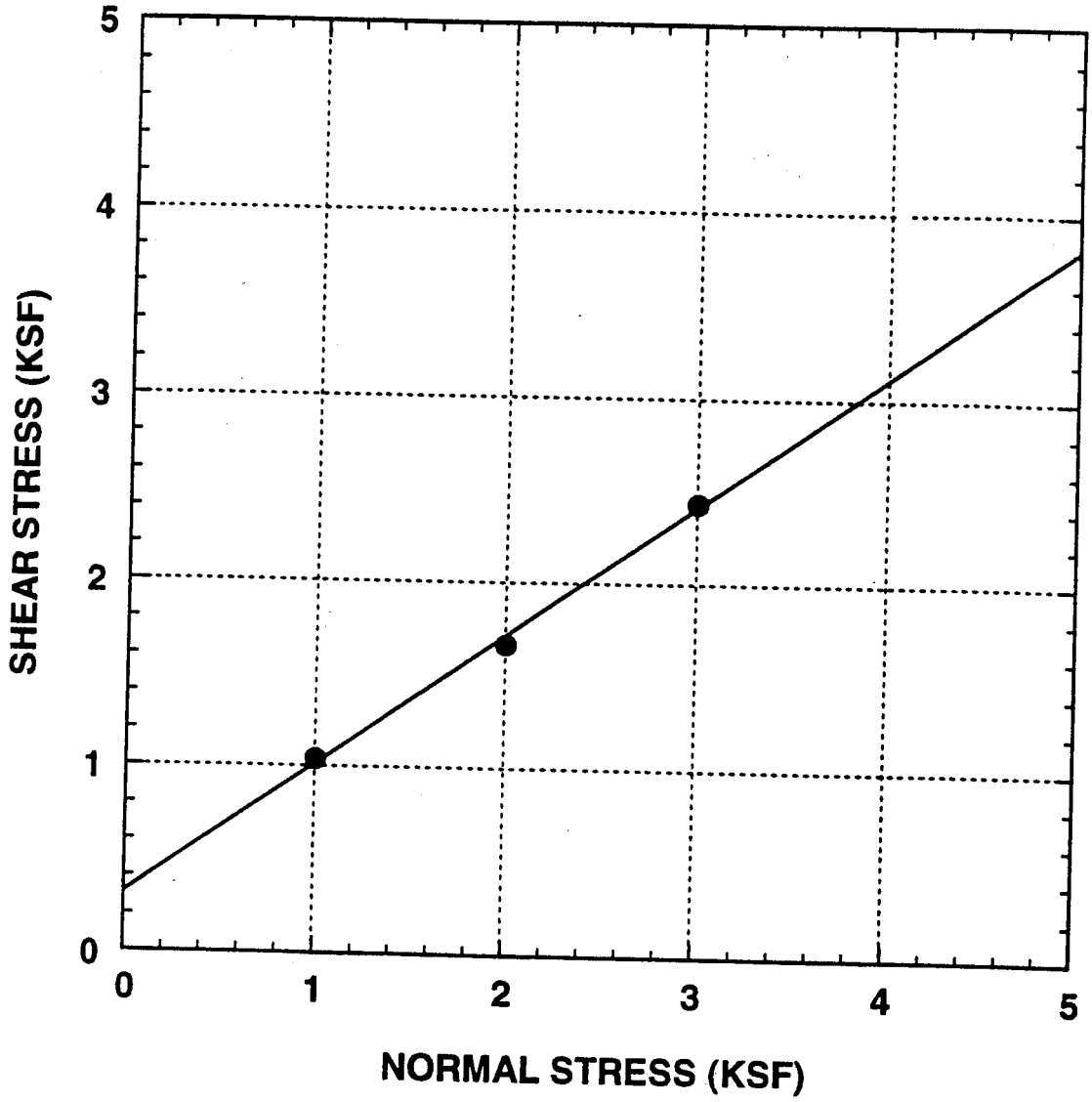
DIRECT SHEAR TEST DIAGRAM



C = 1050 psf ϕ = 27°

Test Condition: Undisturbed at Field Moisture	Location: B - 7	Depth: 30'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 14**	

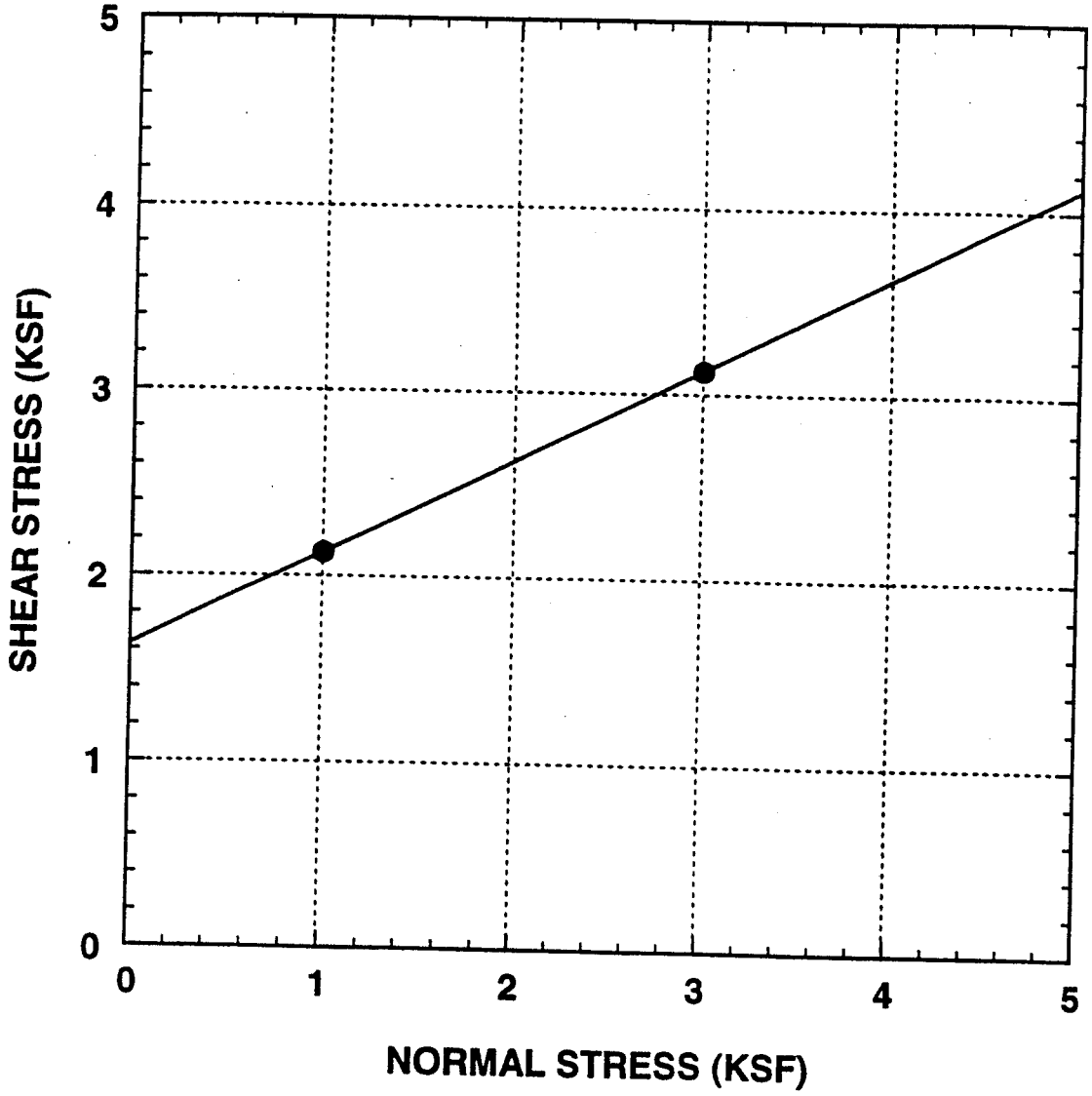
DIRECT SHEAR TEST DIAGRAM



C = 300 psf ϕ = 35°

Test Condition: Undisturbed at Field Moisture	Location: B - 7	Depth: 35'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 15**	

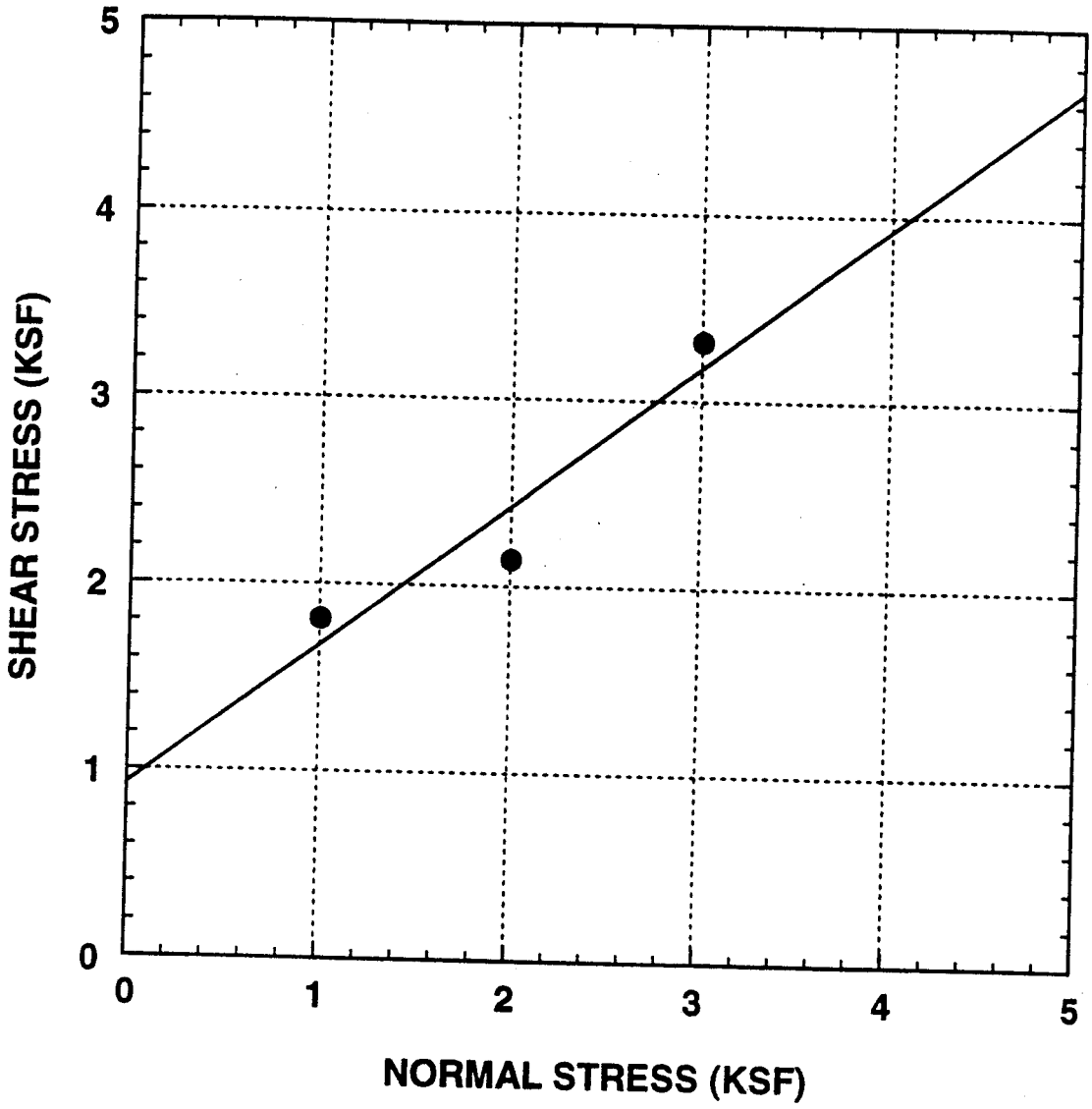
DIRECT SHEAR TEST DIAGRAM



C = 1625 psf ϕ = 26°

Test Condition: Undisturbed at Field Moisture	Location: B - 7	Depth: 45'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 16**	

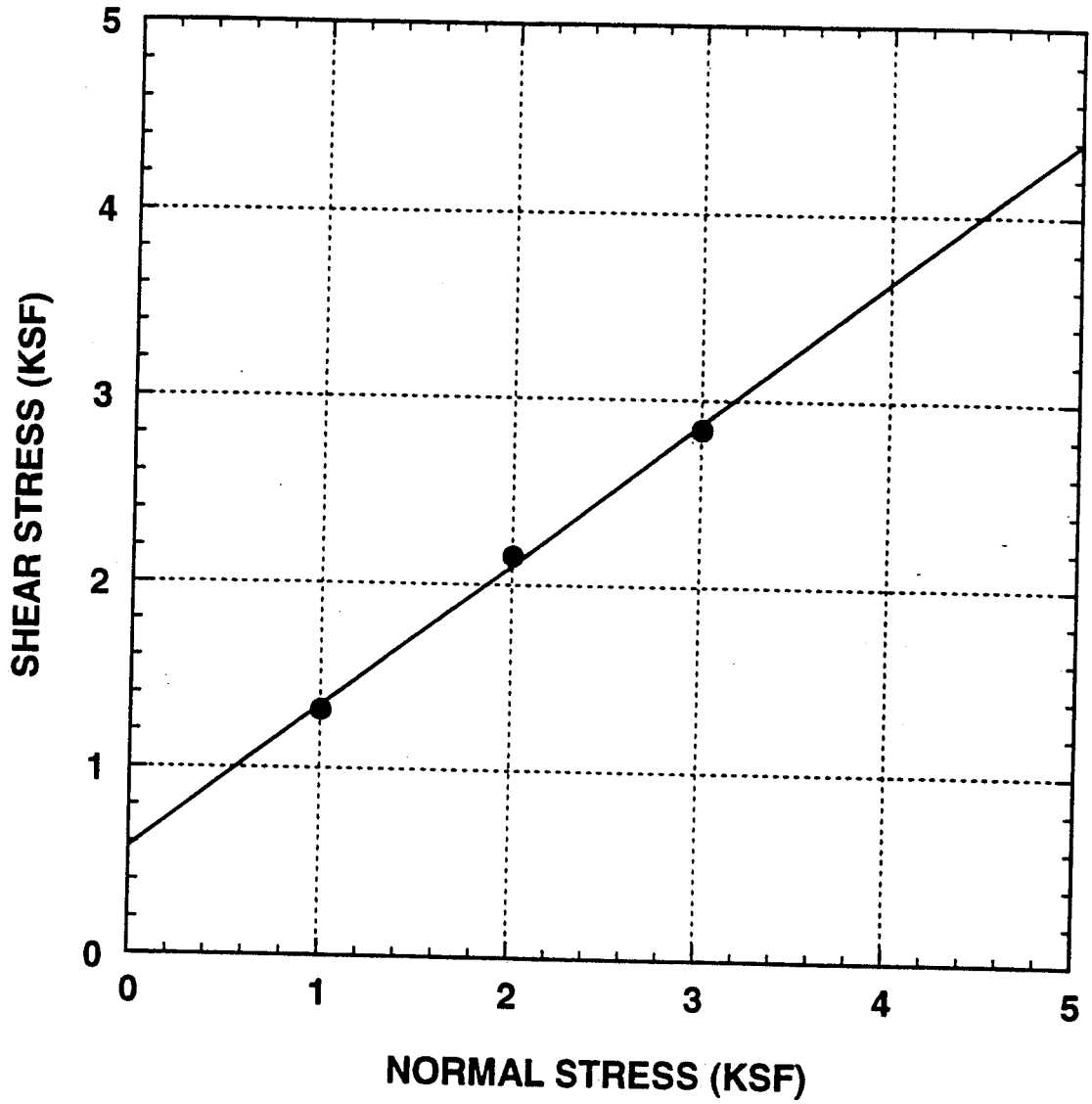
DIRECT SHEAR TEST DIAGRAM



C = 925 psf ϕ = 37°

Test Condition: Undisturbed at Field Moisture	Location: B - 7	Depth: 55'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 17**	

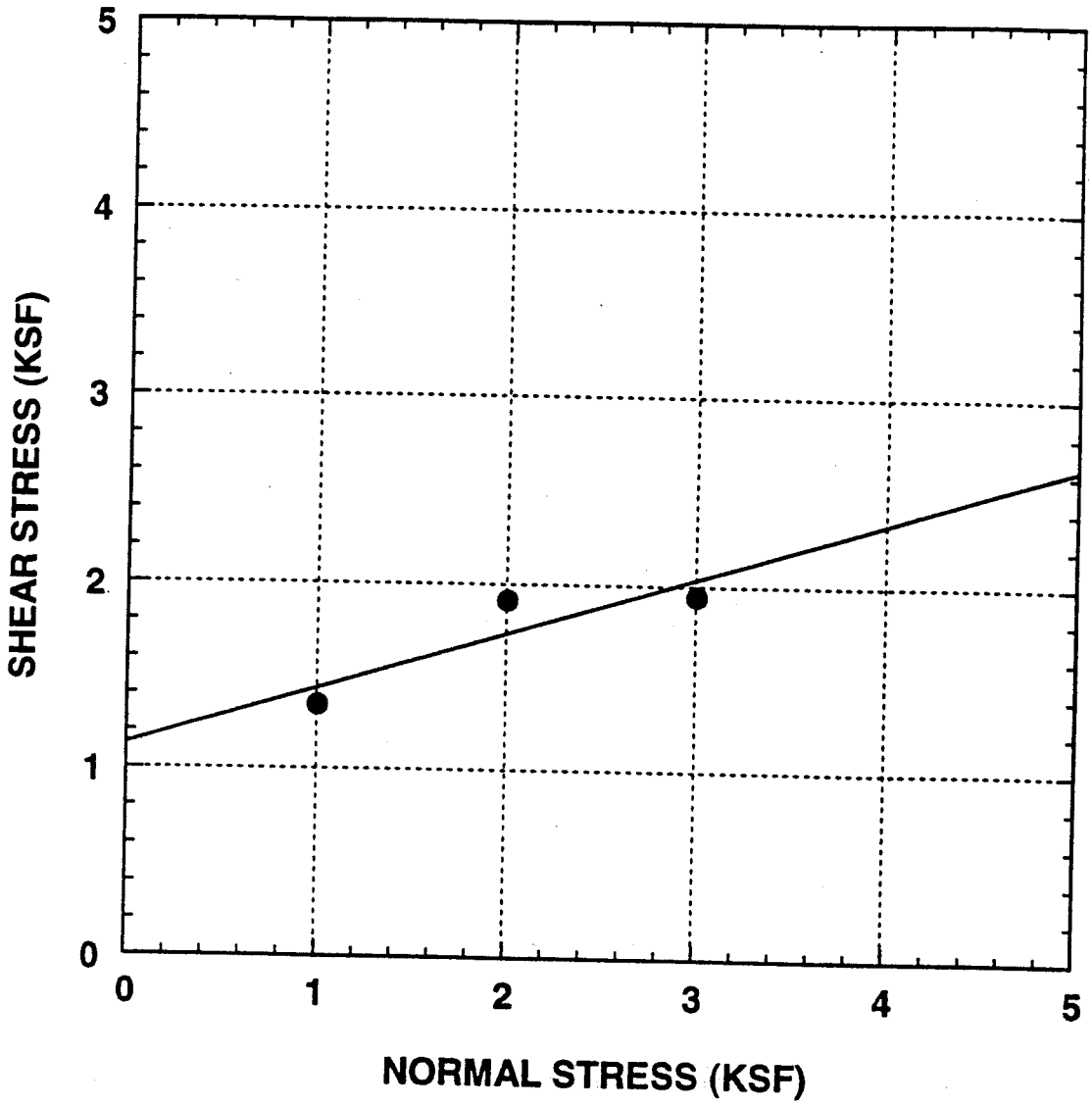
DIRECT SHEAR TEST DIAGRAM



C = 575 psf ϕ = 37°

Test Condition: Undisturbed at Field Moisture	Location: B - 9P	Depth: 2.5'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 13	

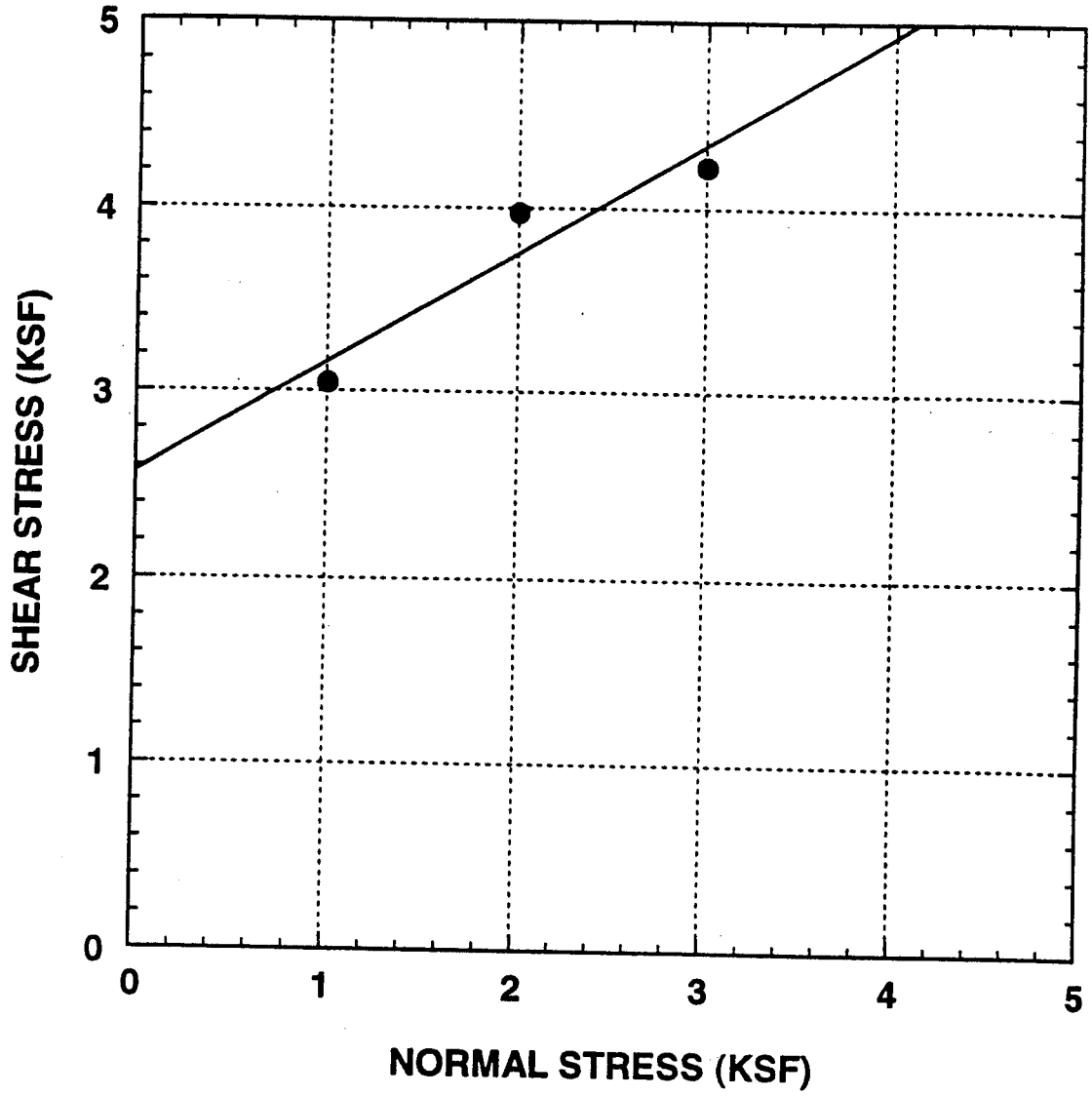
DIRECT SHEAR TEST DIAGRAM



C = 1125 psf $\phi = 17^{\circ}$

Test Condition: Undisturbed at Field Moisture	Location: B - 9P	Depth: 7.5'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 19	

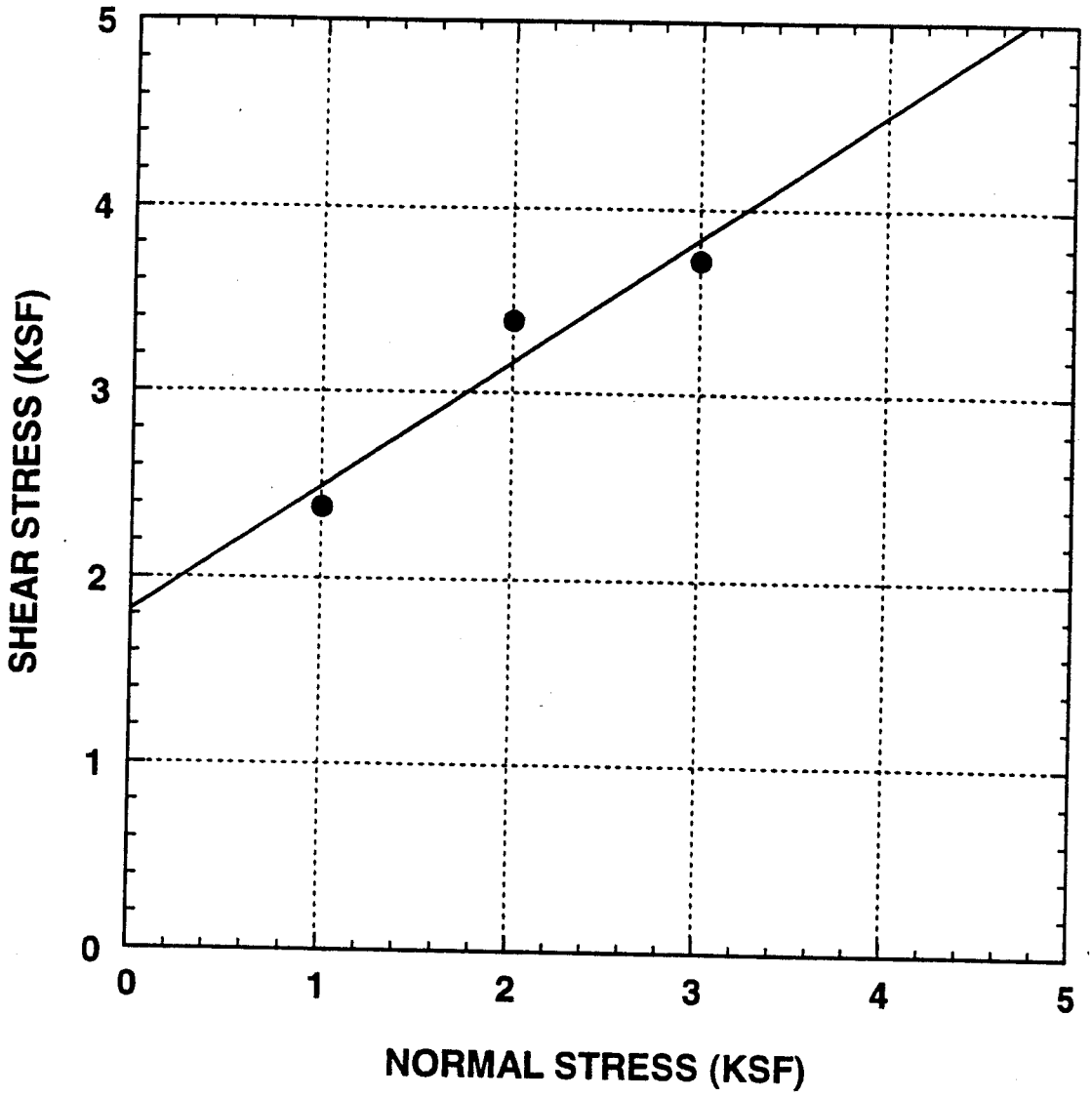
DIRECT SHEAR TEST DIAGRAM



C = 2575 psf $\phi = 30°$

Test Condition: Undisturbed at Field Moisture	Location: B - 9P	Depth: 12.5'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 20**	

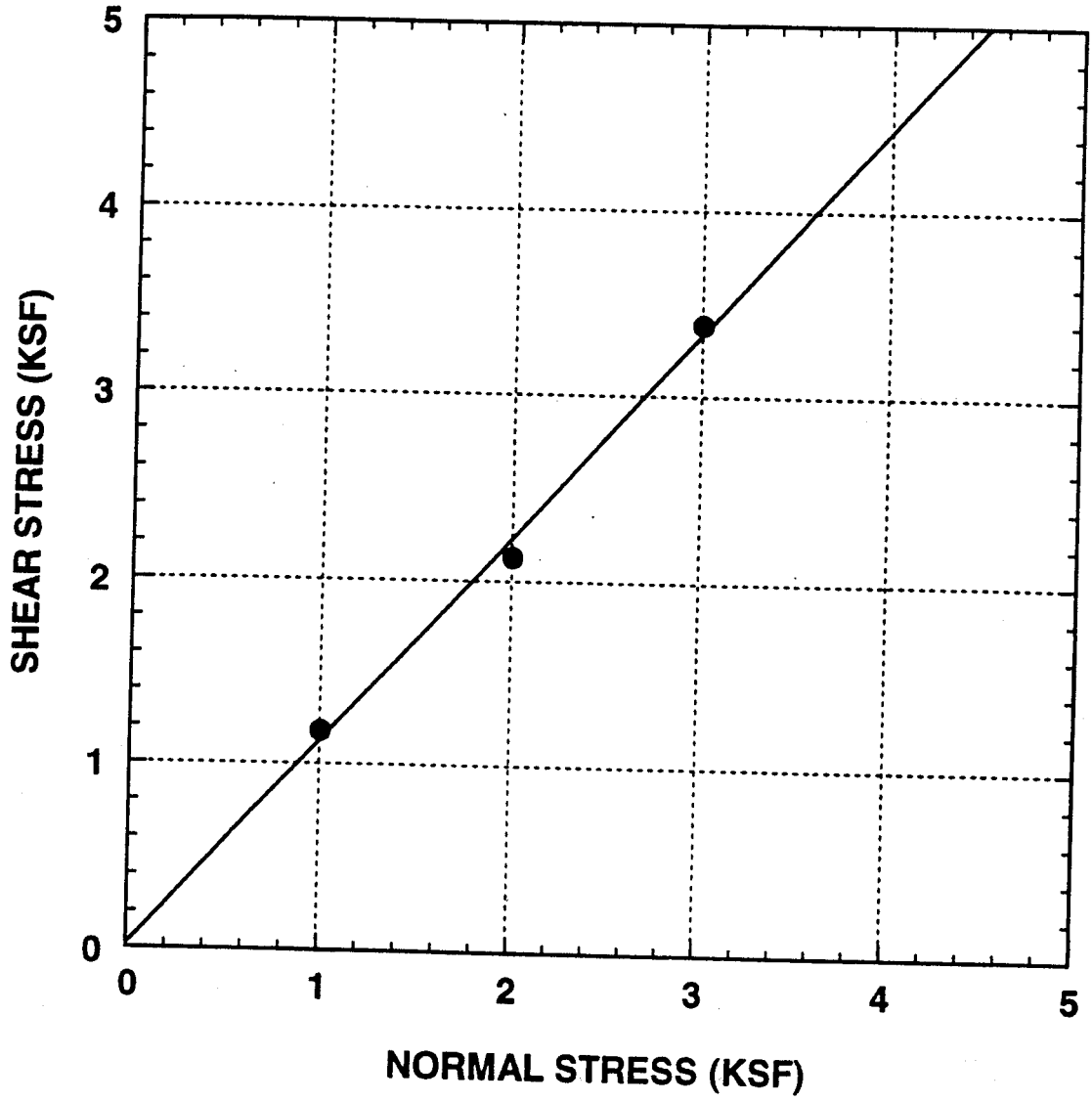
DIRECT SHEAR TEST DIAGRAM



C = 1825 psf ϕ = 34°

Test Condition: Undisturbed at Field Moisture	Location: B - 9P	Depth: 17.5'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 21**	

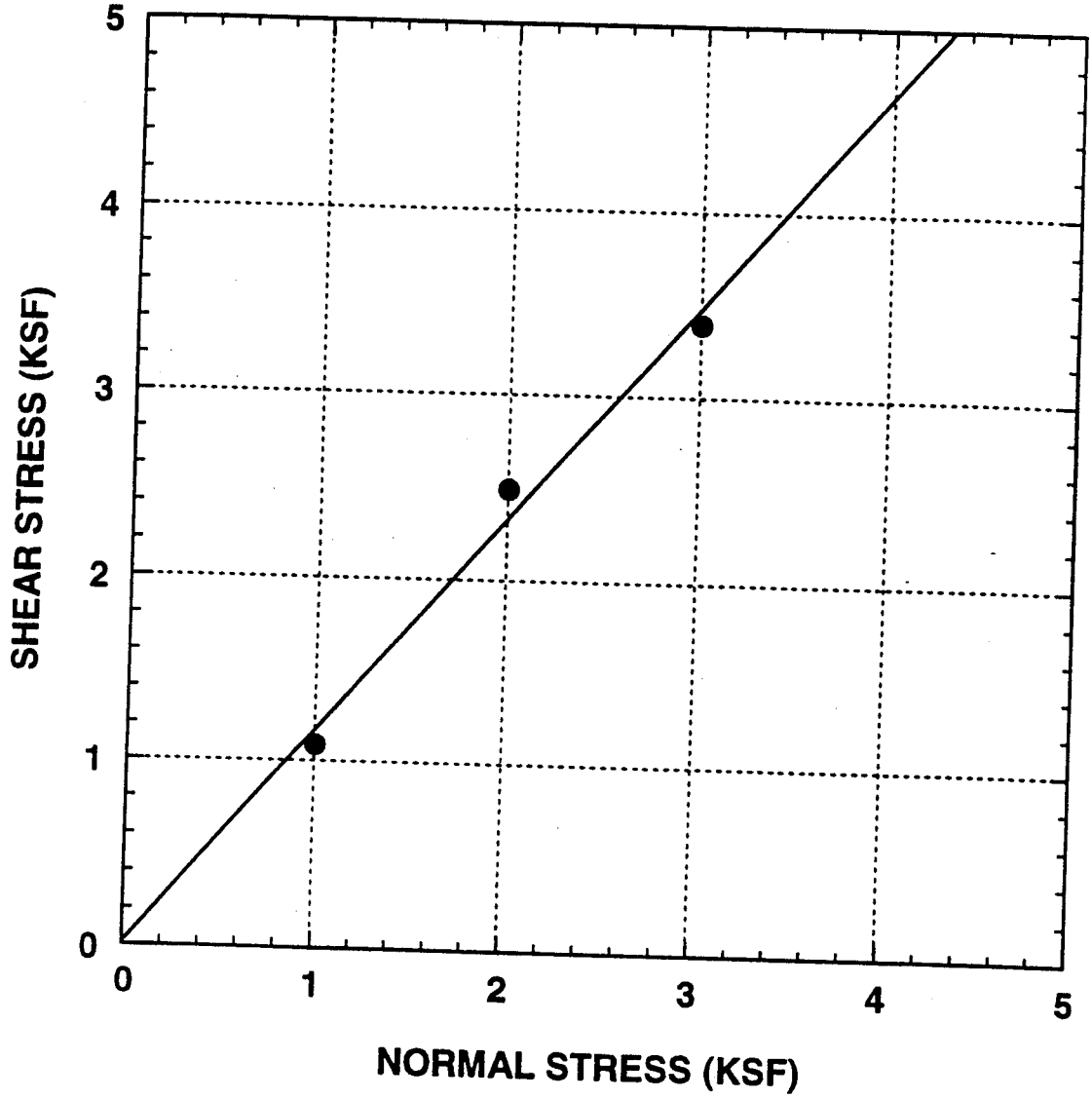
DIRECT SHEAR TEST DIAGRAM



C = 0 psf $\phi = 48°$

Test Condition: Undisturbed at Field Moisture	Location: B - 9P	Depth: 27.5'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 22**	

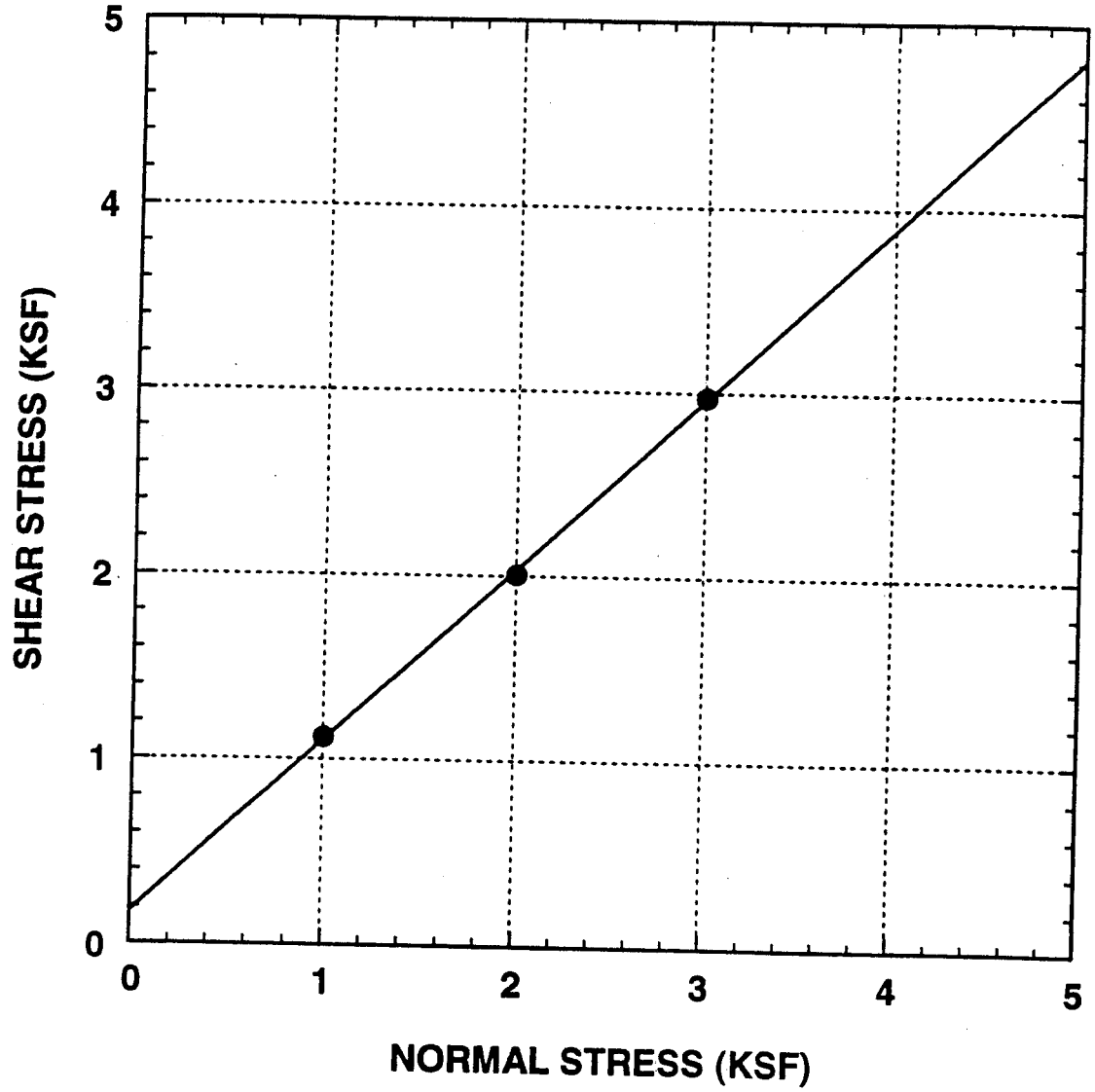
DIRECT SHEAR TEST DIAGRAM



C = 0 psf ϕ = 49°

Test Condition: Undisturbed at Field Moisture	Location: B - 9P	Depth: 32.5'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 23**	

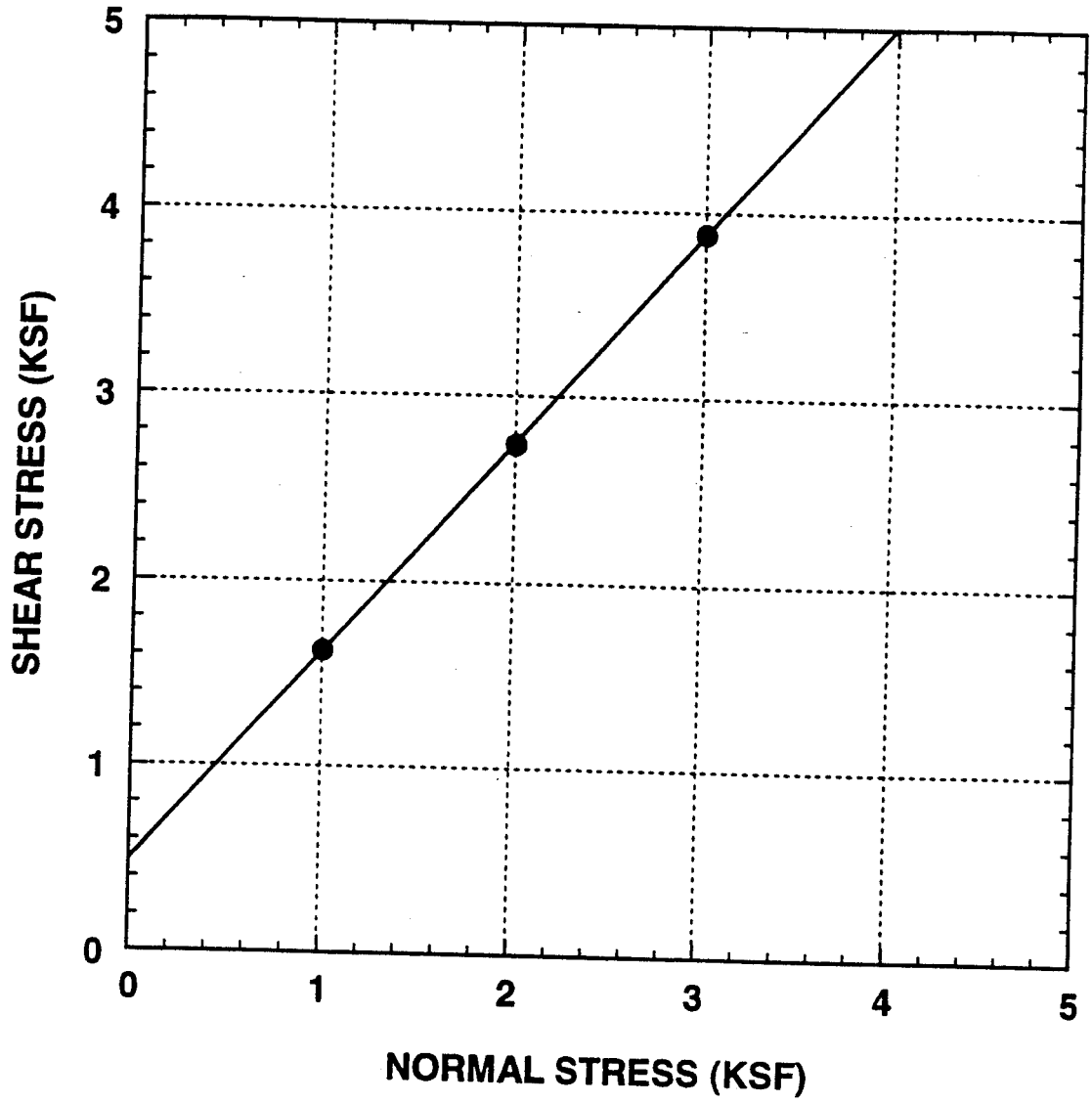
DIRECT SHEAR TEST DIAGRAM



C = 175 psf $\phi = 43°$

Test Condition: Undisturbed at Field Moisture	Location: B - 9P	Depth: 37.5'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 24	

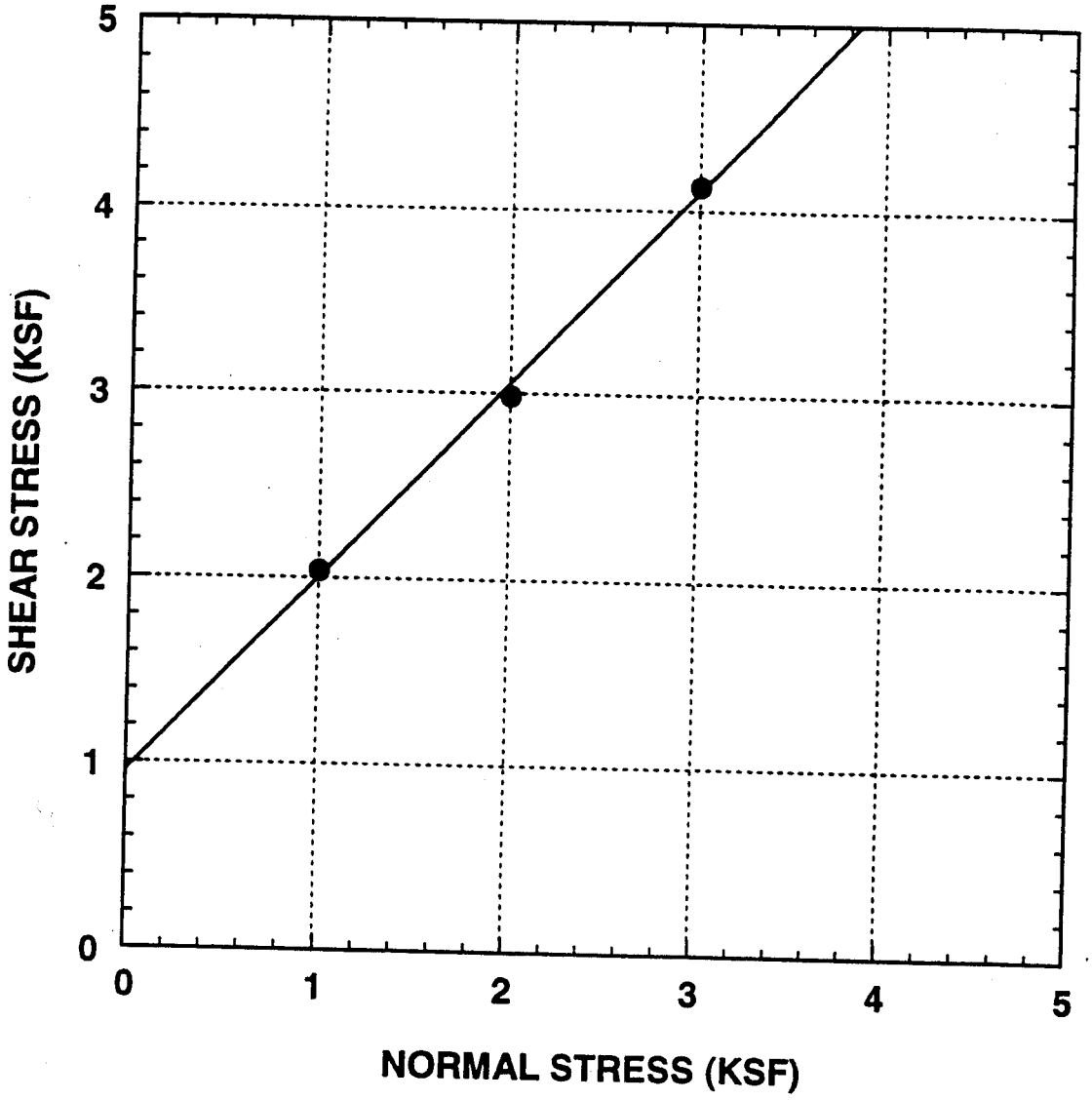
DIRECT SHEAR TEST DIAGRAM



C = 500 psf ϕ = 48°

Test Condition: Undisturbed at Field Moisture	Location: B - 9P	Depth: 45'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 25	

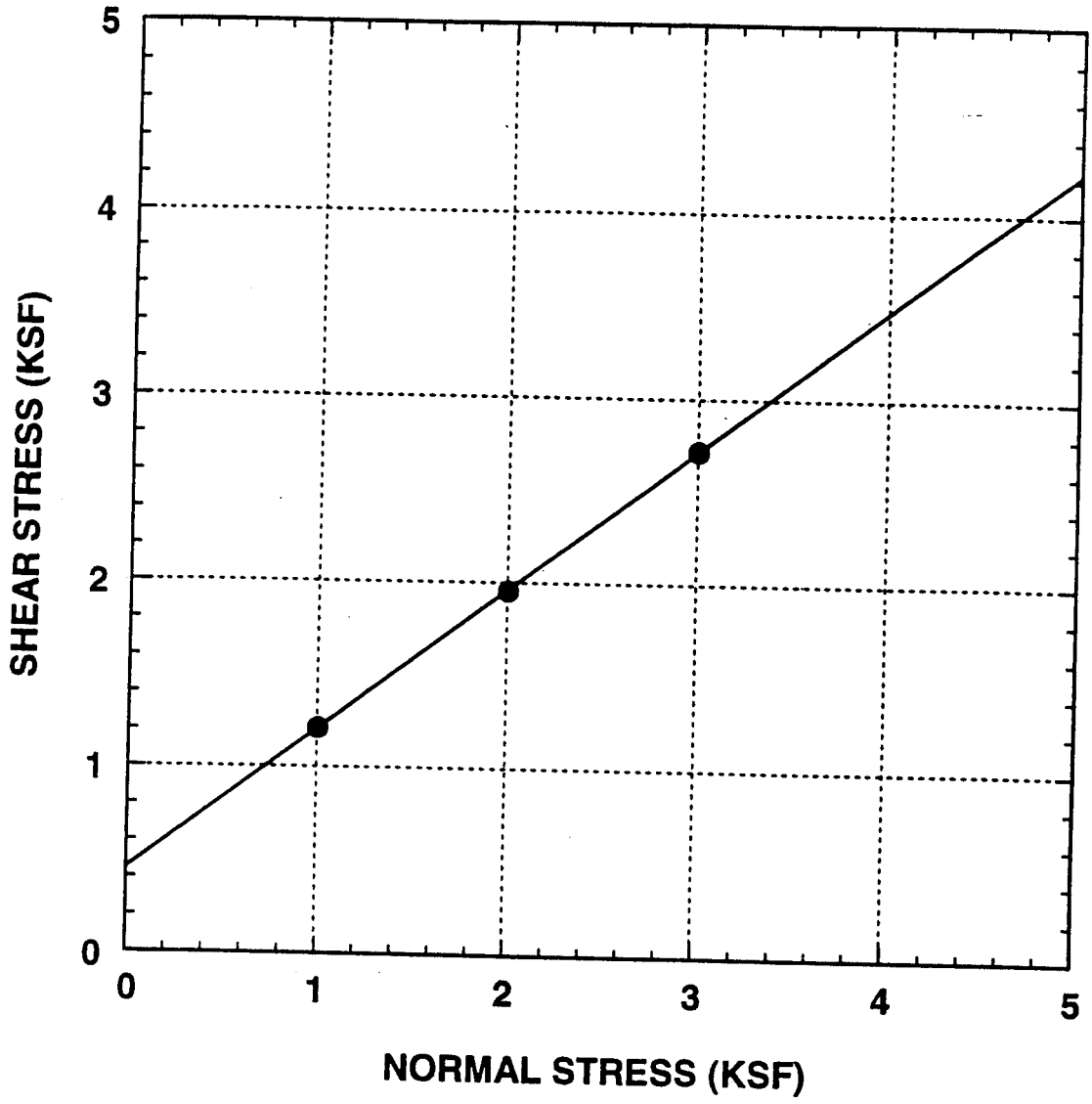
DIRECT SHEAR TEST DIAGRAM



C = 950 psf $\phi = 46°$

Test Condition: Undisturbed at Field Moisture	Location: B - 10	Depth: 10'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 26**	

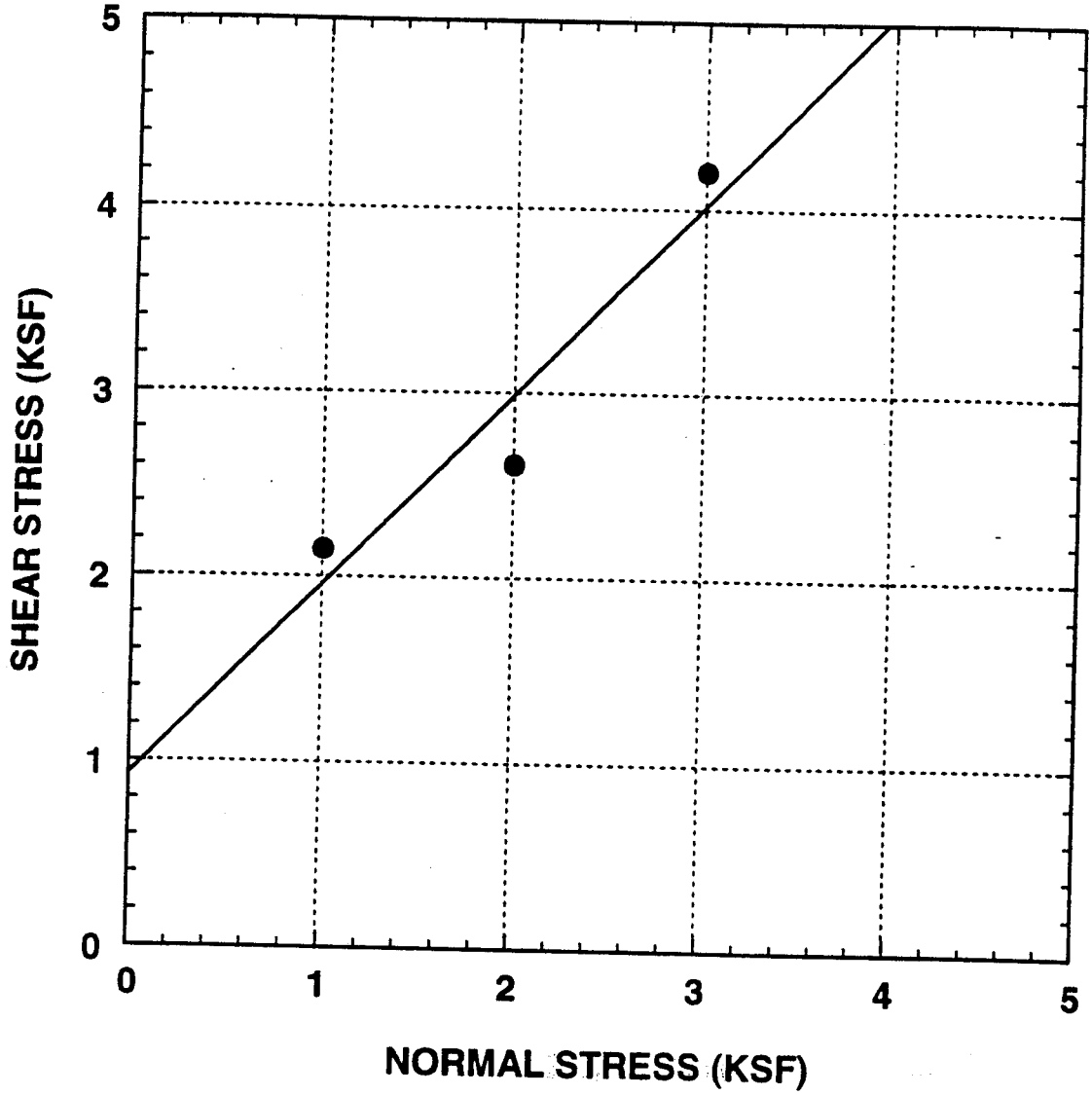
DIRECT SHEAR TEST DIAGRAM



C = 450 psf ϕ = 37°

Test Condition: Undisturbed at Field Moisture	Location: B - 13	Depth: 10'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 27**	

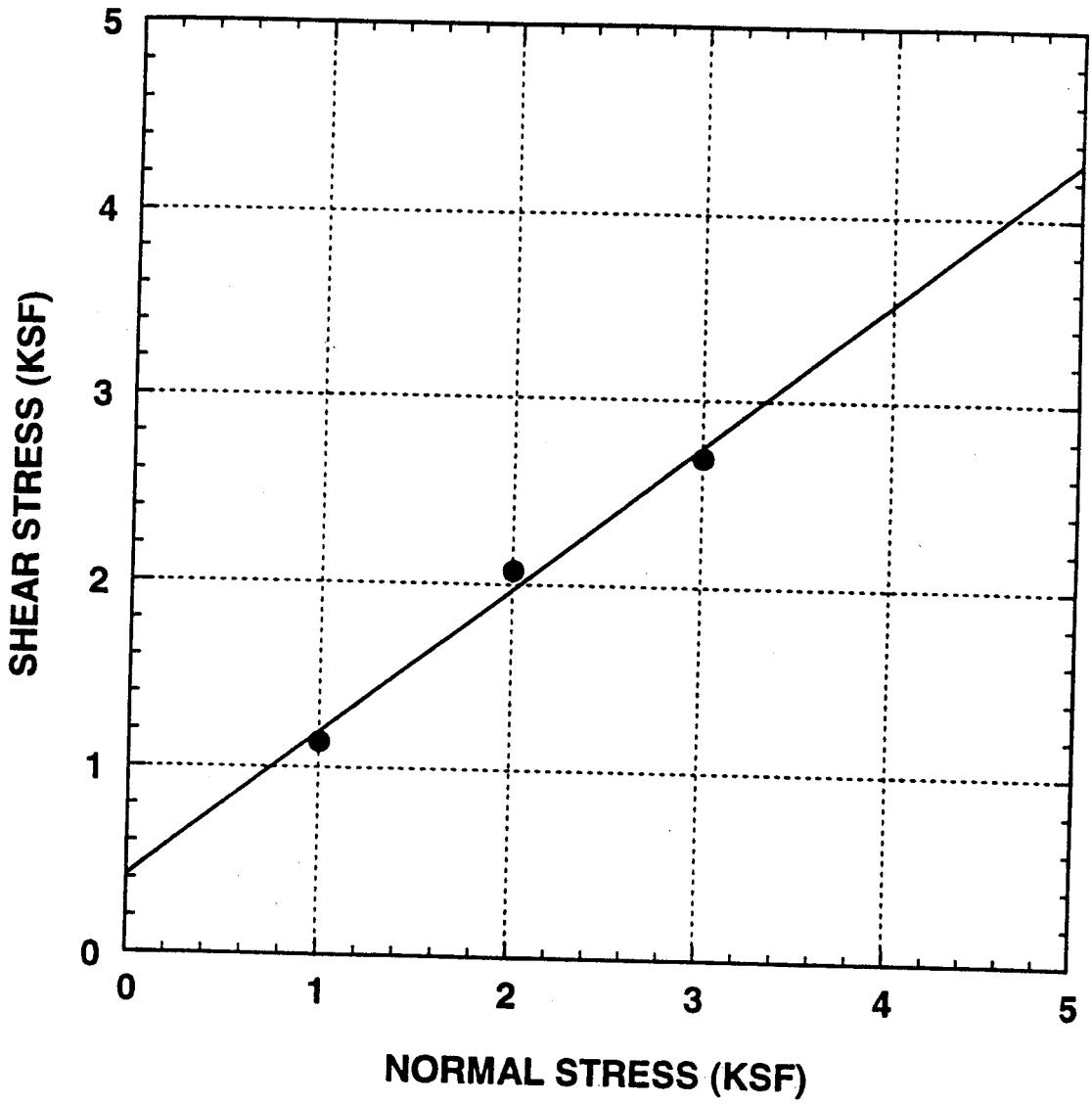
DIRECT SHEAR TEST DIAGRAM



C = 925 psf ϕ = 46°

Test Condition: Undisturbed at Field Moisture	Location: B - 13	Depth: 15'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 23	

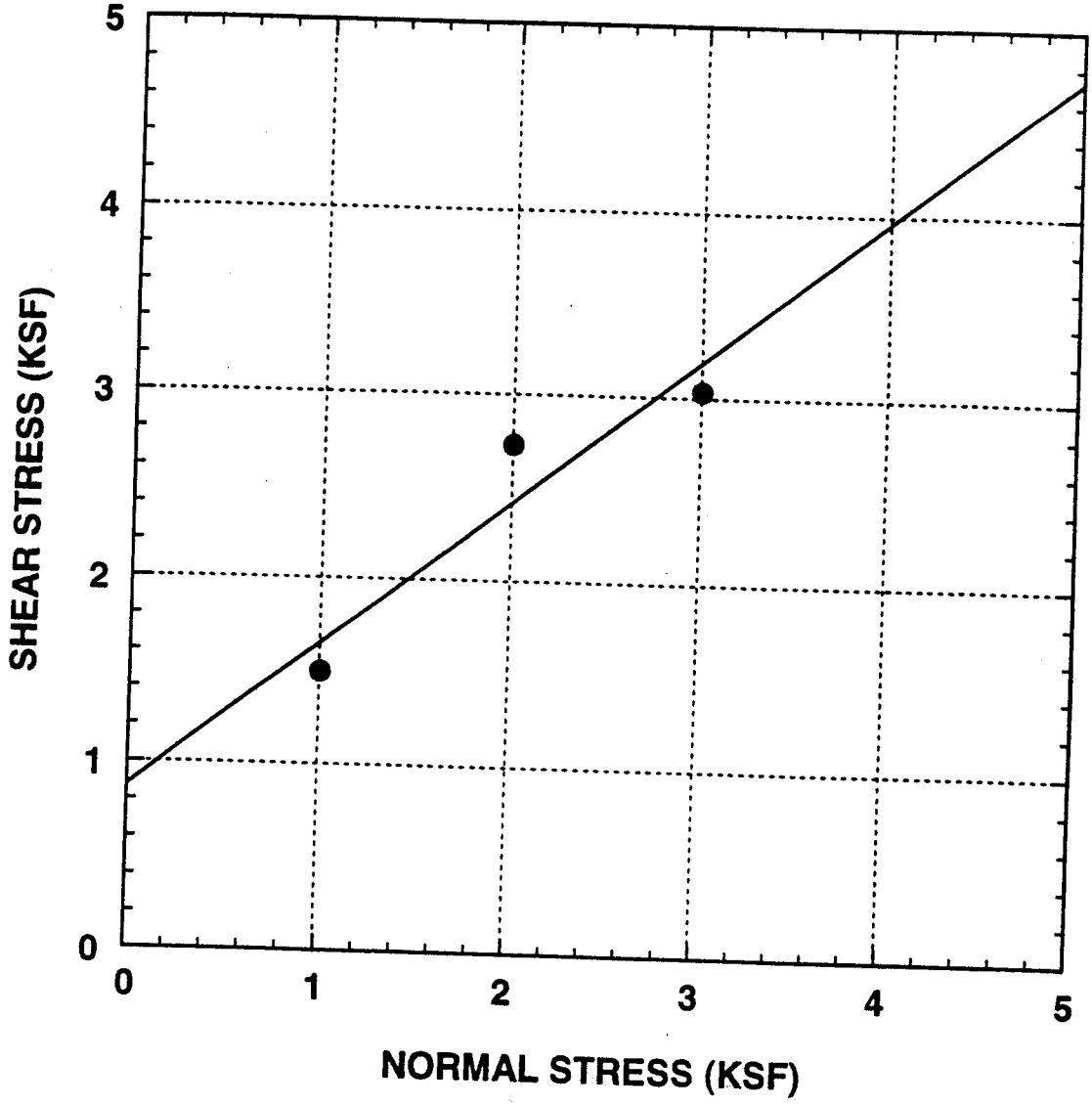
DIRECT SHEAR TEST DIAGRAM



C = 400 psf ϕ = 38°

Test Condition: Undisturbed at Field Moisture	Location: B - 13	Depth: 25'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 29**	

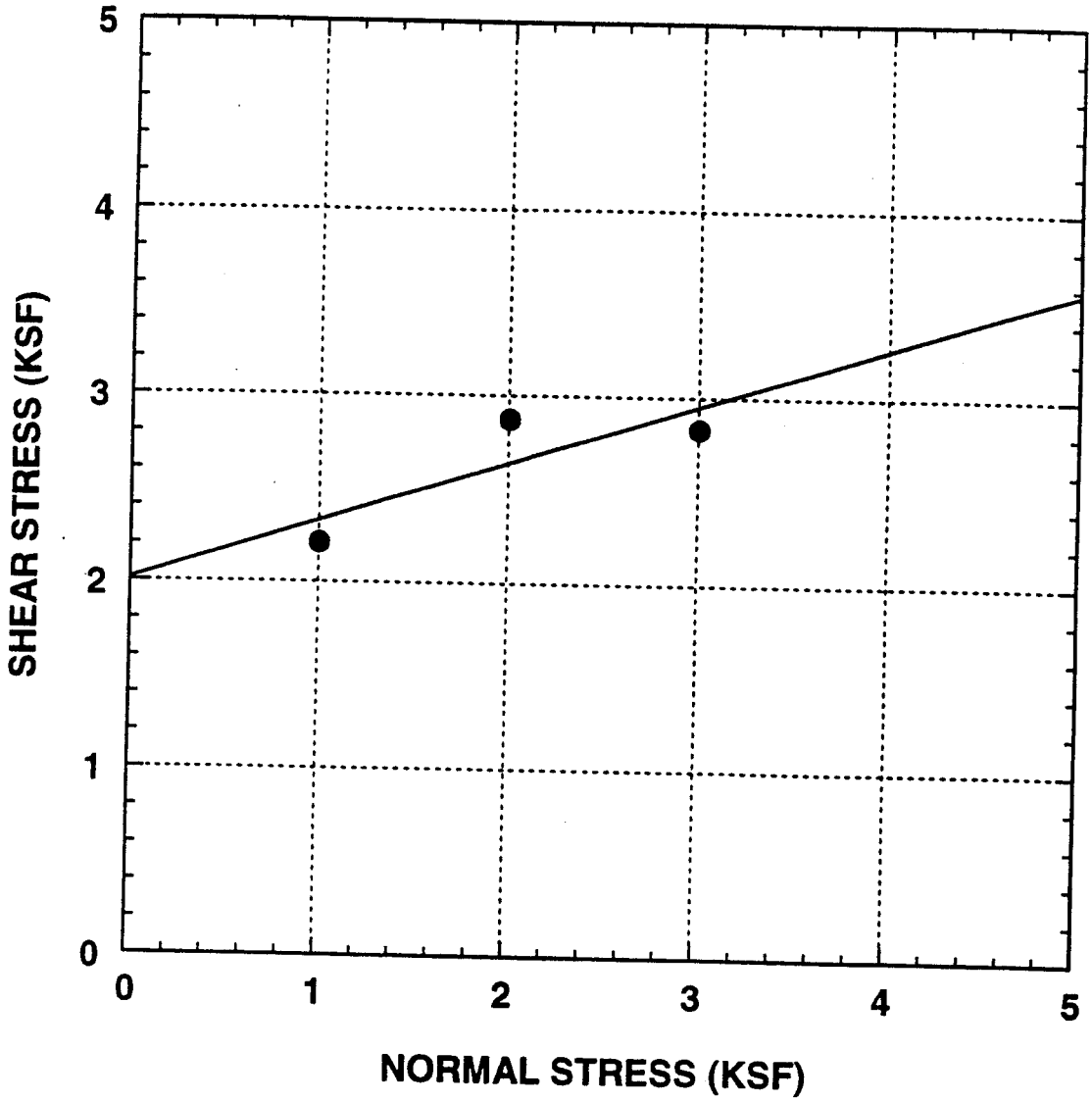
DIRECT SHEAR TEST DIAGRAM



C = 875 psf ϕ = 38°

Test Condition: Undisturbed at Field Moisture	Location: B - 13	Depth: 30'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 30	

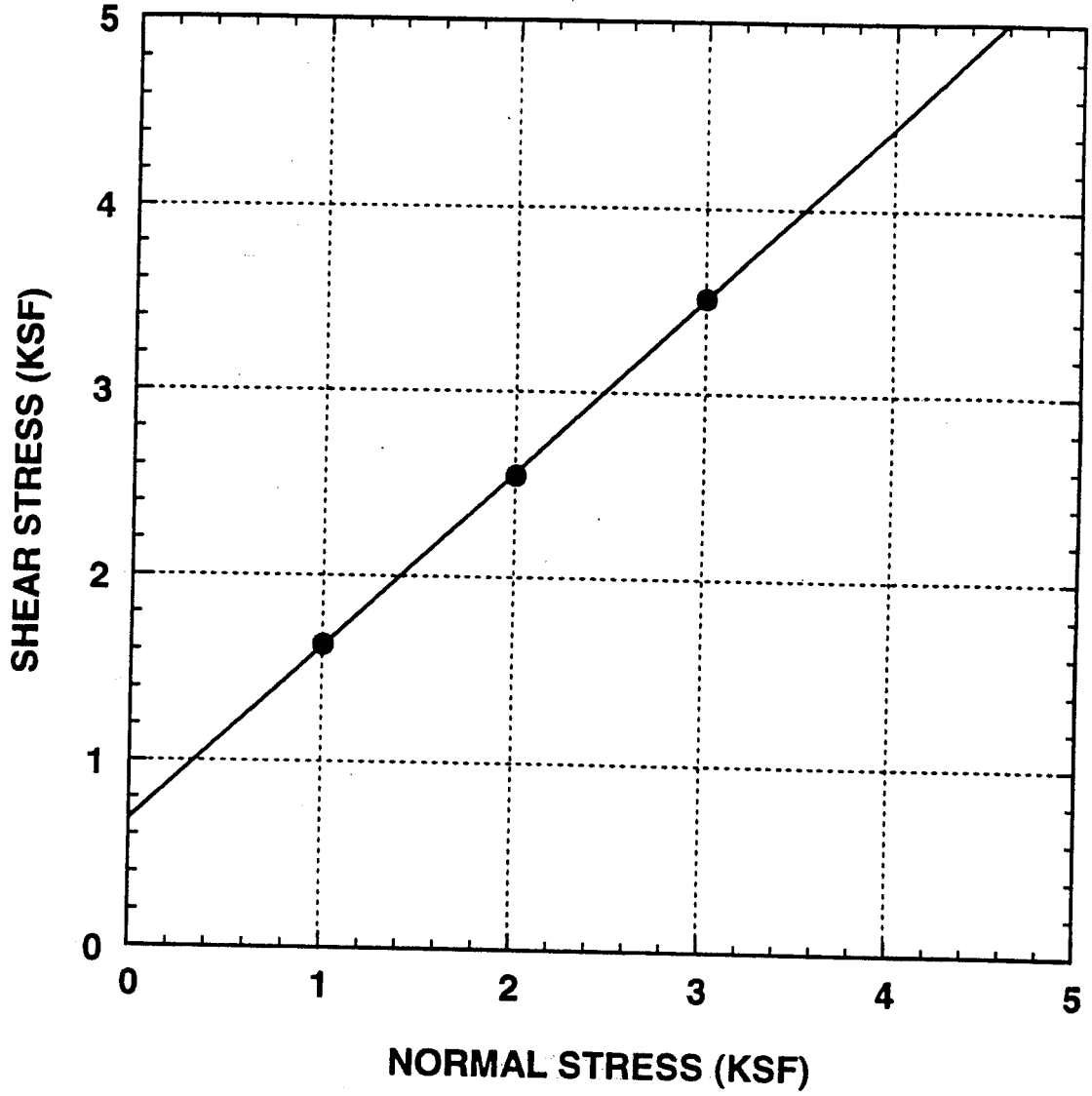
DIRECT SHEAR TEST DIAGRAM



C = 2000 psf ϕ = 17°

Test Condition: Undisturbed at Field Moisture	Location: B - 13	Depth: 35'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 31	

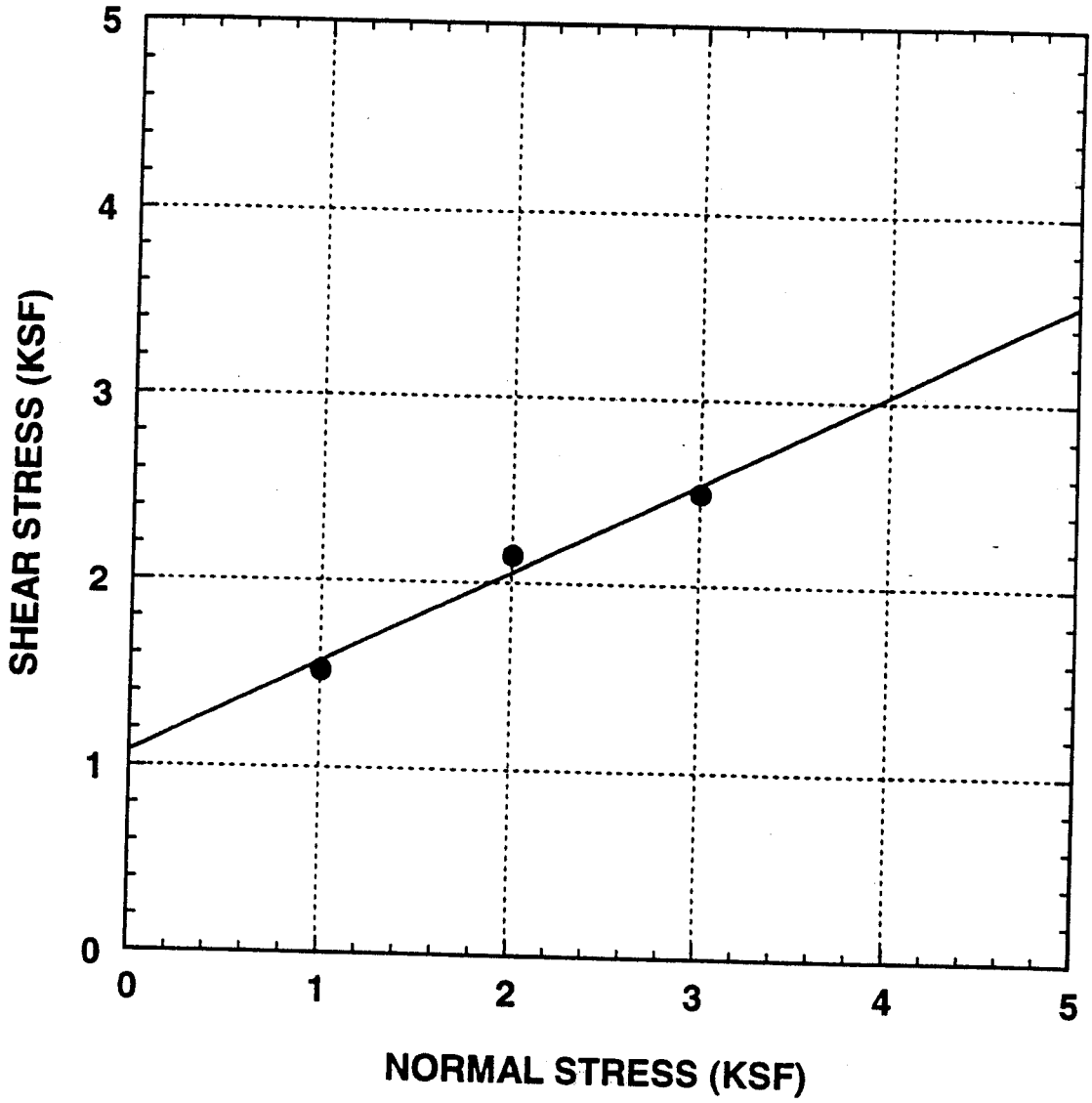
DIRECT SHEAR TEST DIAGRAM



C = 675 psf ϕ = 43°

Test Condition: Undisturbed at Field Moisture	Location: B - 13	Depth: 45'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 32**	

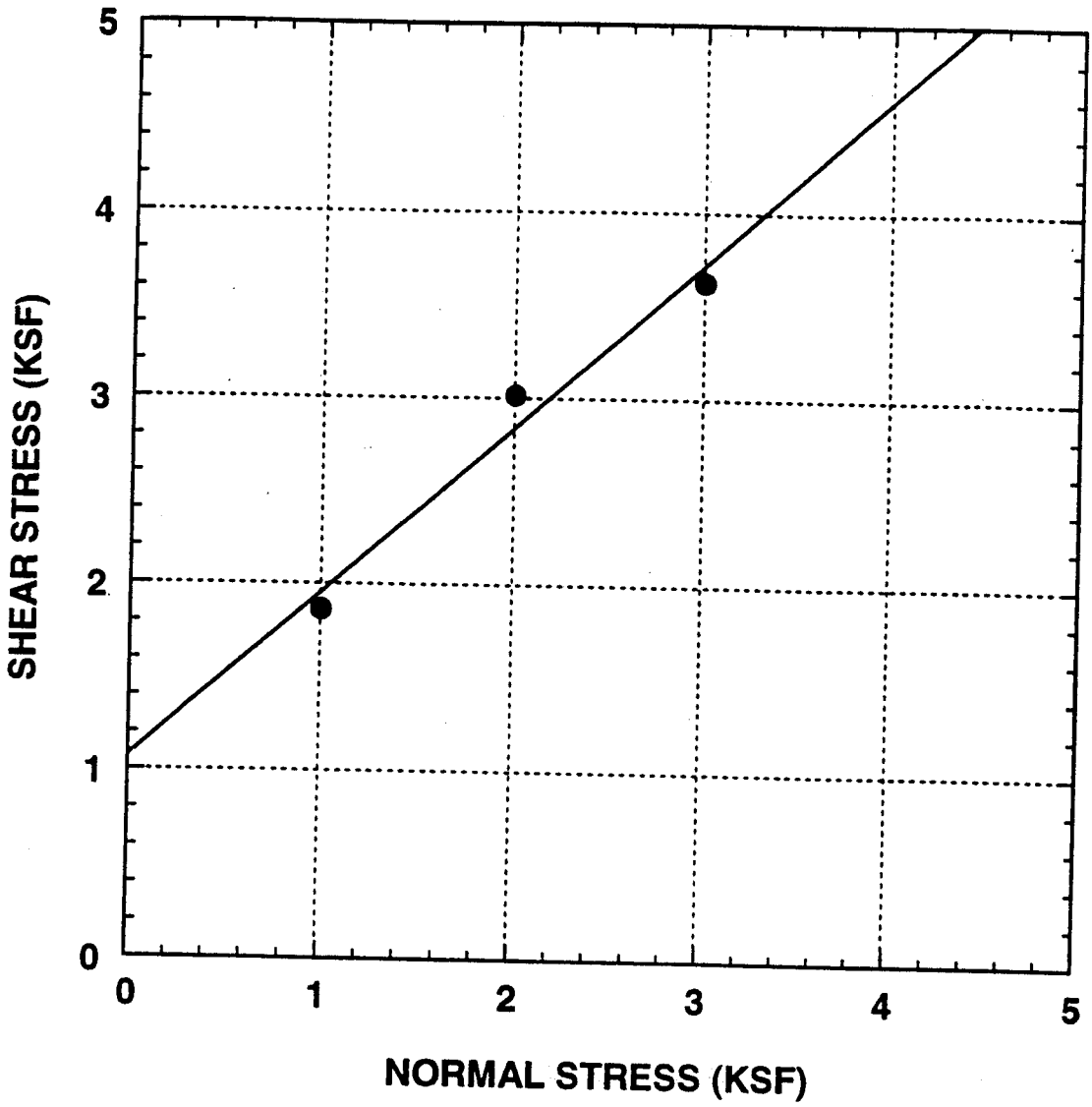
DIRECT SHEAR TEST DIAGRAM



C = 1075 psf ϕ = 26°

Test Condition: Undisturbed at Field Moisture - Residual	Location: B - 13	Depth: 45'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 33**	

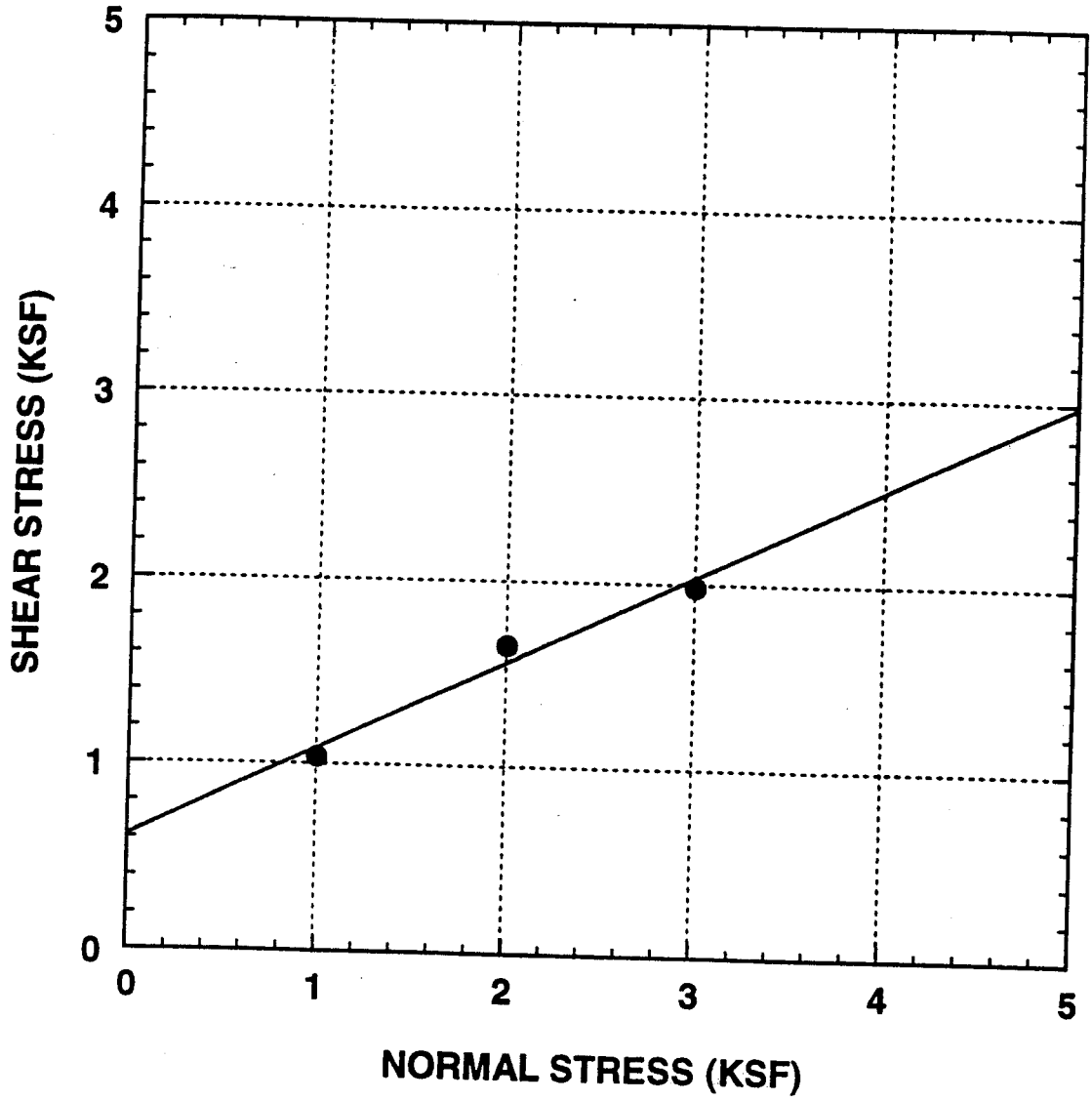
DIRECT SHEAR TEST DIAGRAM



C = 1075 psf $\phi = 41°$

Test Condition: Undisturbed at Field Moisture	Location: B - 13	Depth: 55'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 34**	

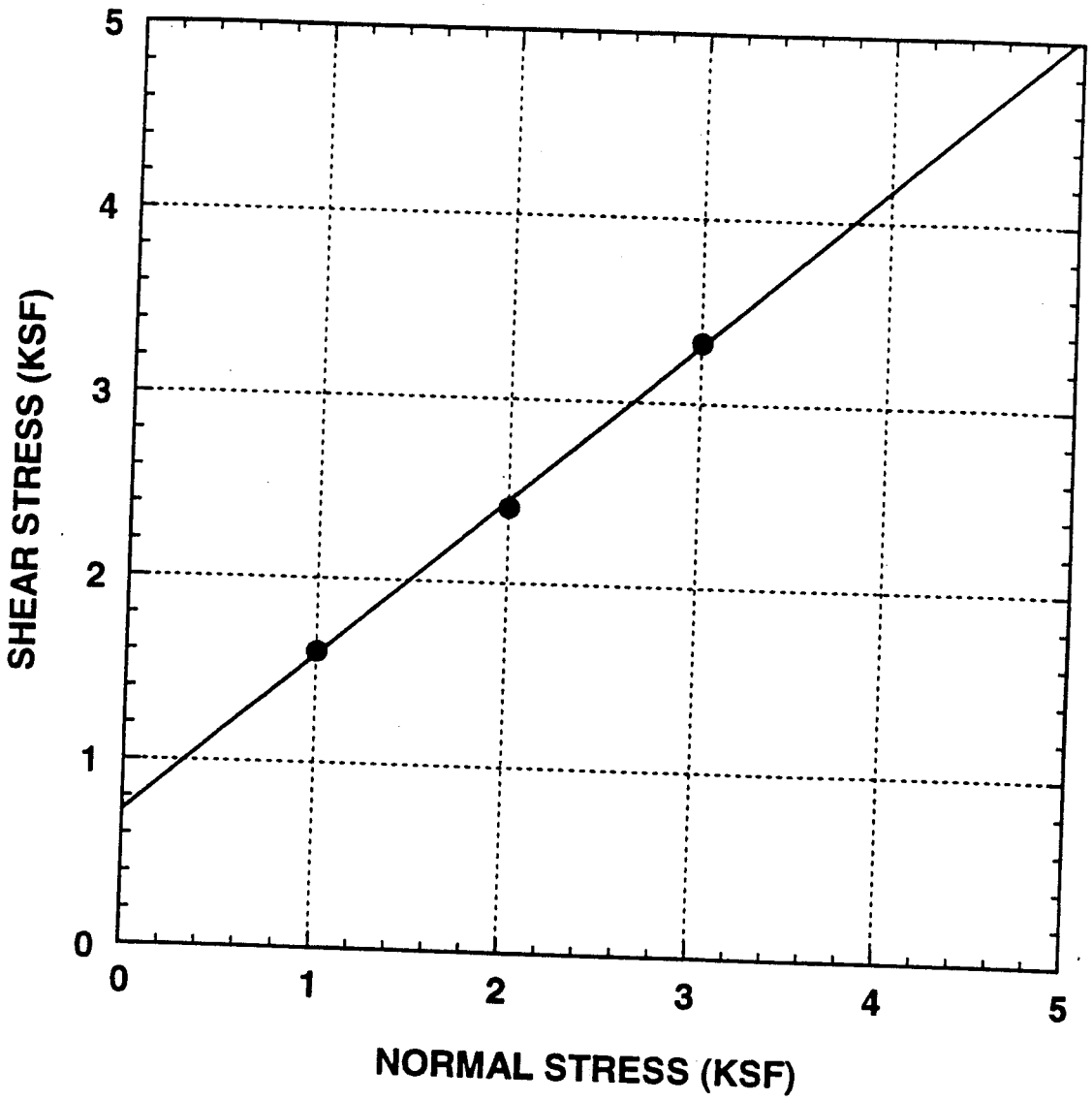
DIRECT SHEAR TEST DIAGRAM



C = 600 psf ϕ = 25°

Test Condition: Undisturbed at Field Moisture - Residual	Location: B - 13	Depth: 55'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 35	

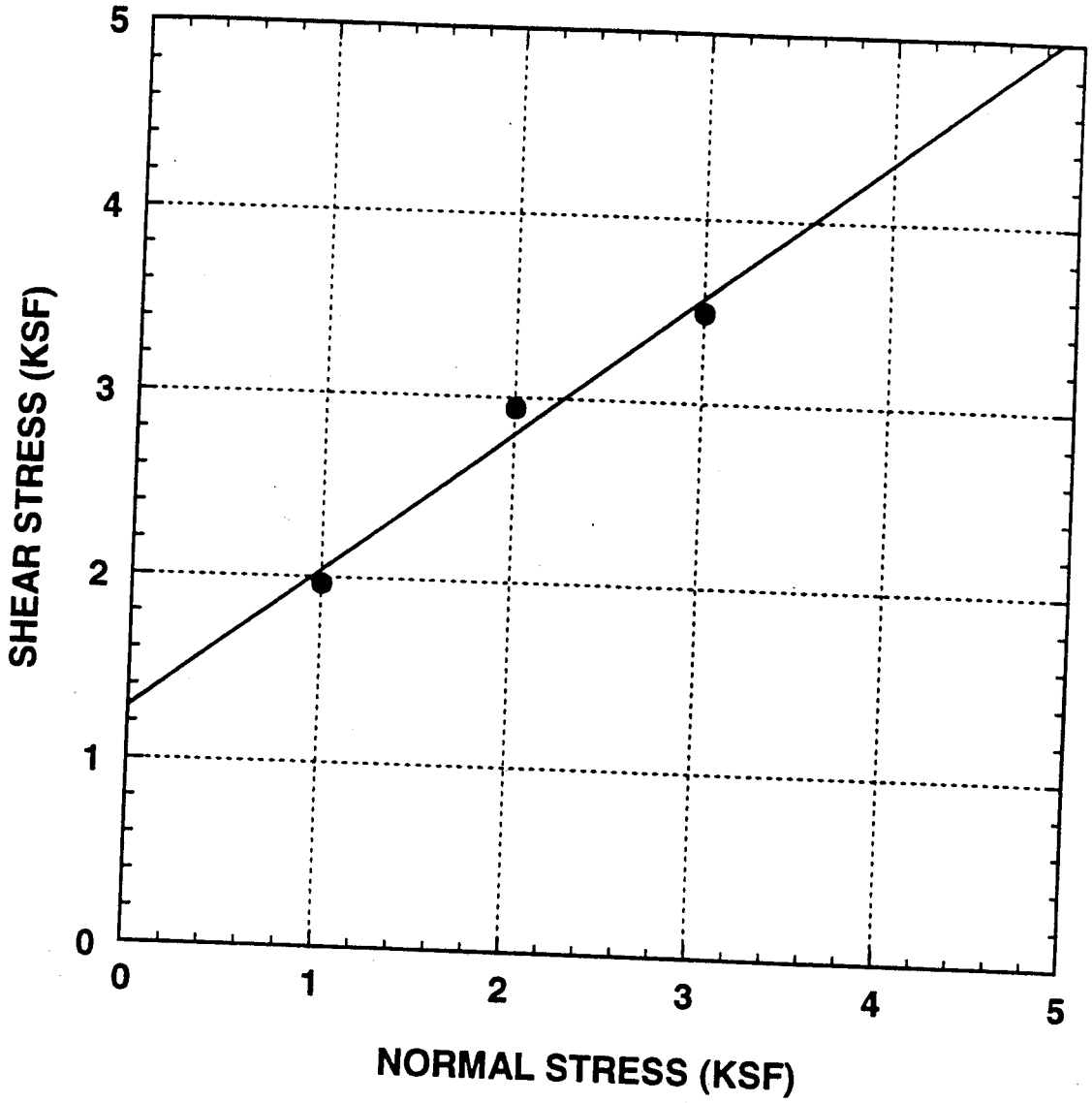
DIRECT SHEAR TEST DIAGRAM



C = 725 psf ϕ = 40°

Test Condition: Undisturbed at Field Moisture	Location: B - 14	Depth: 20'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 36	

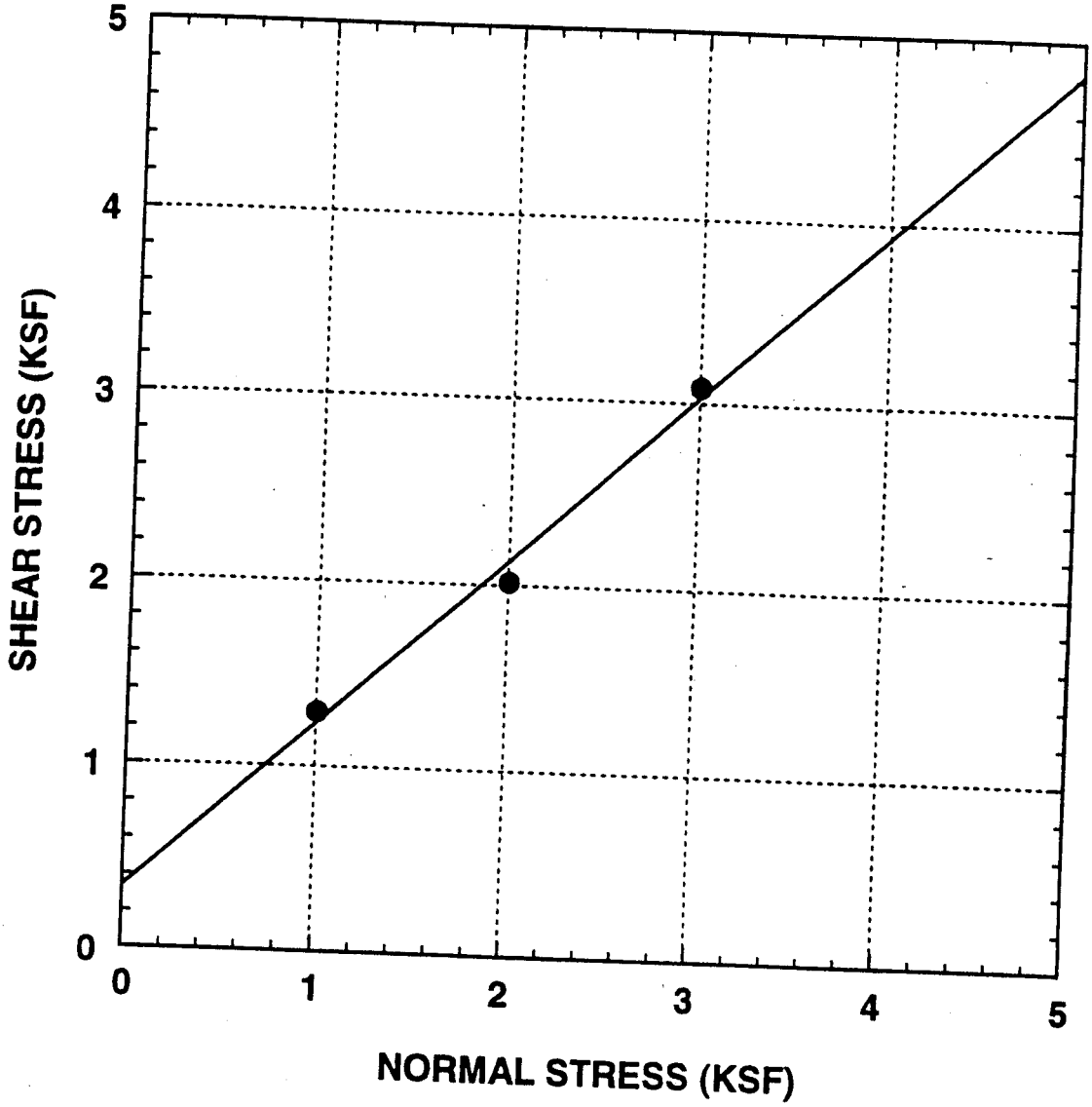
DIRECT SHEAR TEST DIAGRAM



C = 1275 psf ϕ = 37°

Test Condition: Undisturbed at Field Moisture	Location: B - 14	Depth: 30'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 37**	

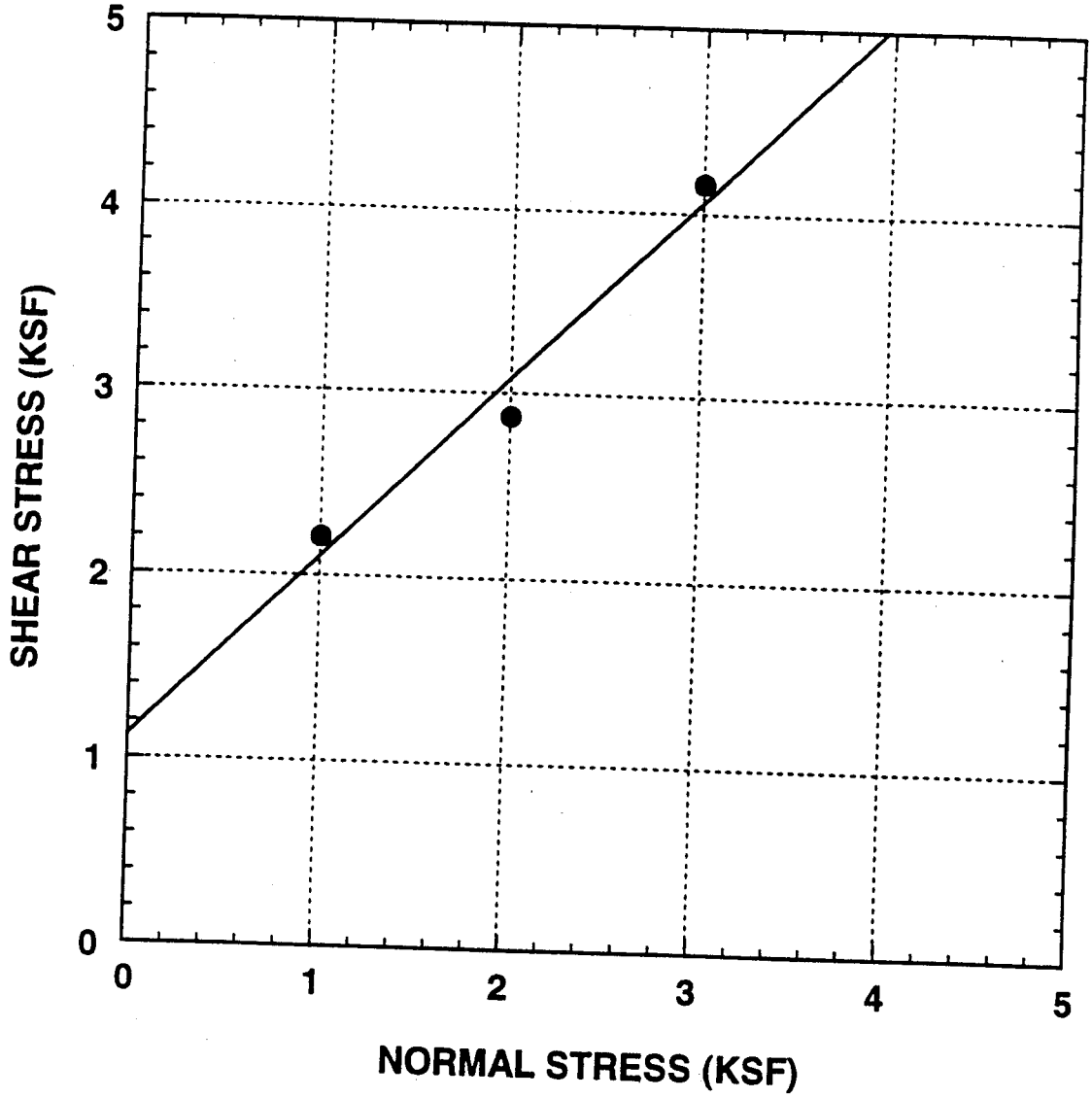
DIRECT SHEAR TEST DIAGRAM



C = 350 psf $\phi = 42°$

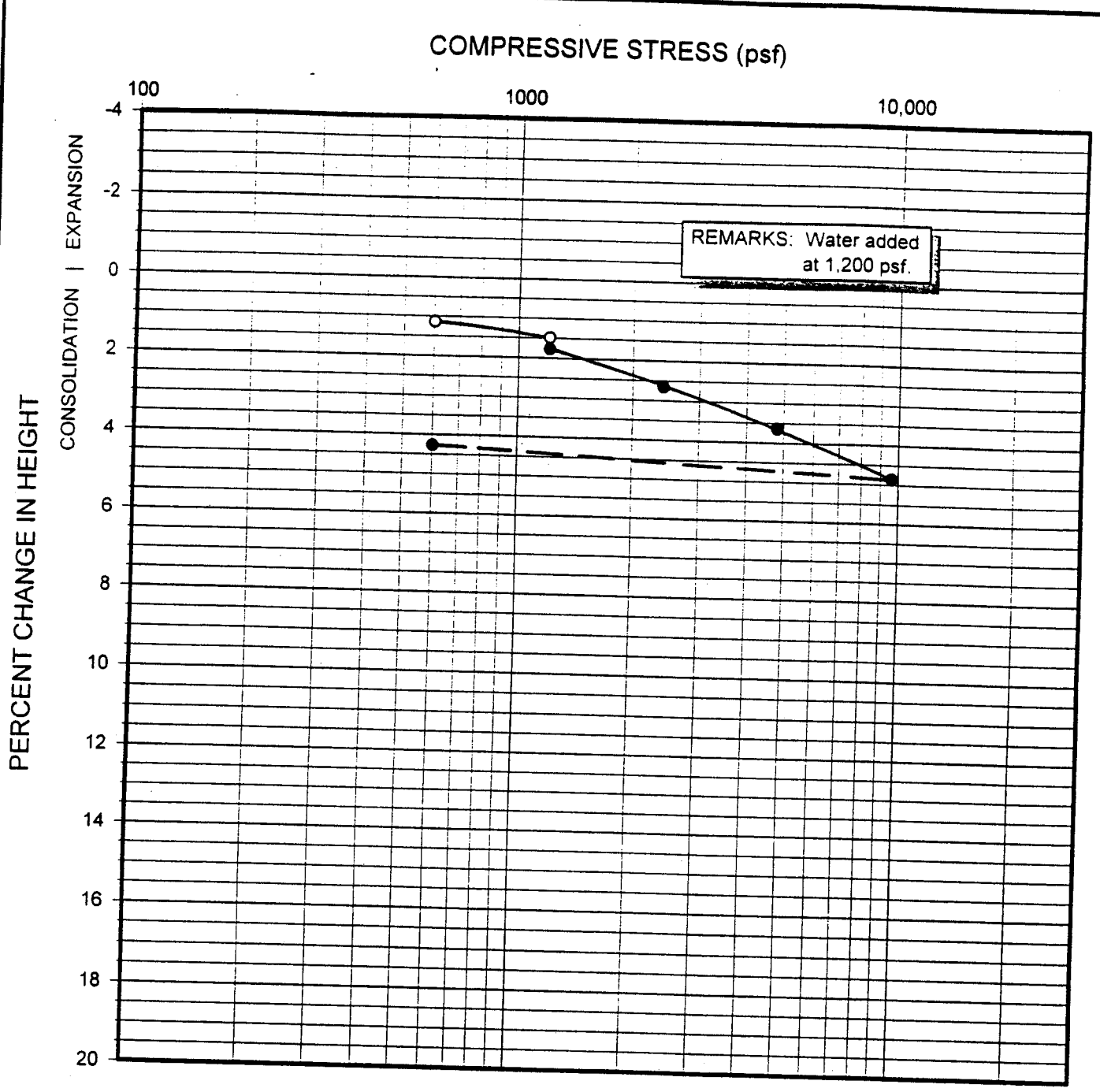
Test Condition: Undisturbed at Field Moisture	Location: B - 14	Depth: 45'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	**Figure: B - 38**	

DIRECT SHEAR TEST DIAGRAM



C = 1125 psf ϕ = 44°

Test Condition: Undisturbed at Field Moisture	Location: B - 14	Depth: 50'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 39	



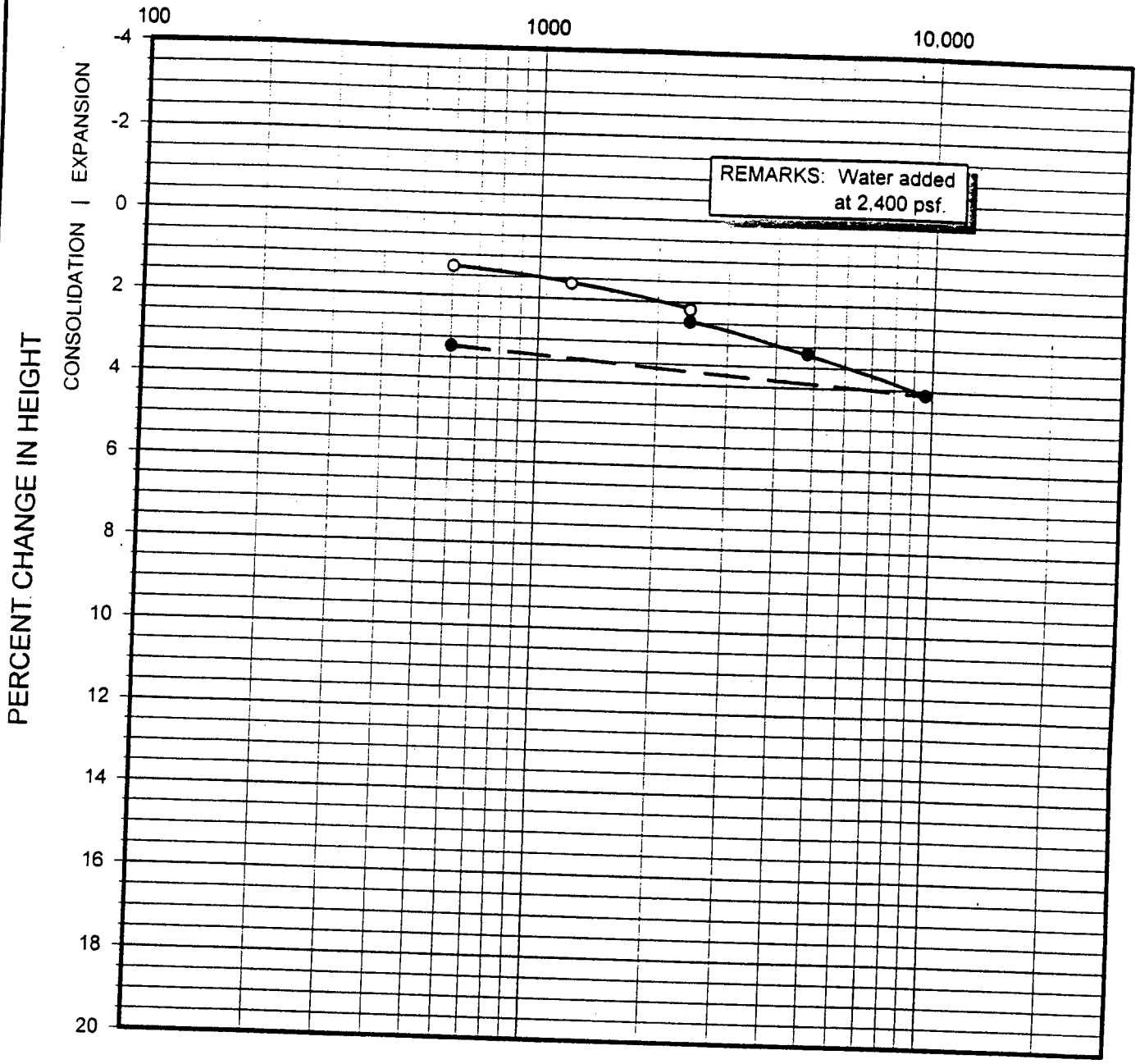
Boring: B - 2	Depth (ft.): 10.0	Dry Density (pcf): 108.6	Moisture (%): 13.0	Saturation (%): 66
Sample Description: Clayey Sand (SP-SC), fine to medium grained. [Fill]				

Medall, Aragon, Higley Geotechnical, Inc.

CONSOLIDATION CURVE

NORTH COUNTY TRANSIT DISTRICT, DEL MAR RAIL LINE

PROJECT NO. 3650-SF	DATE: 6/18/98	**FIG. B-40**



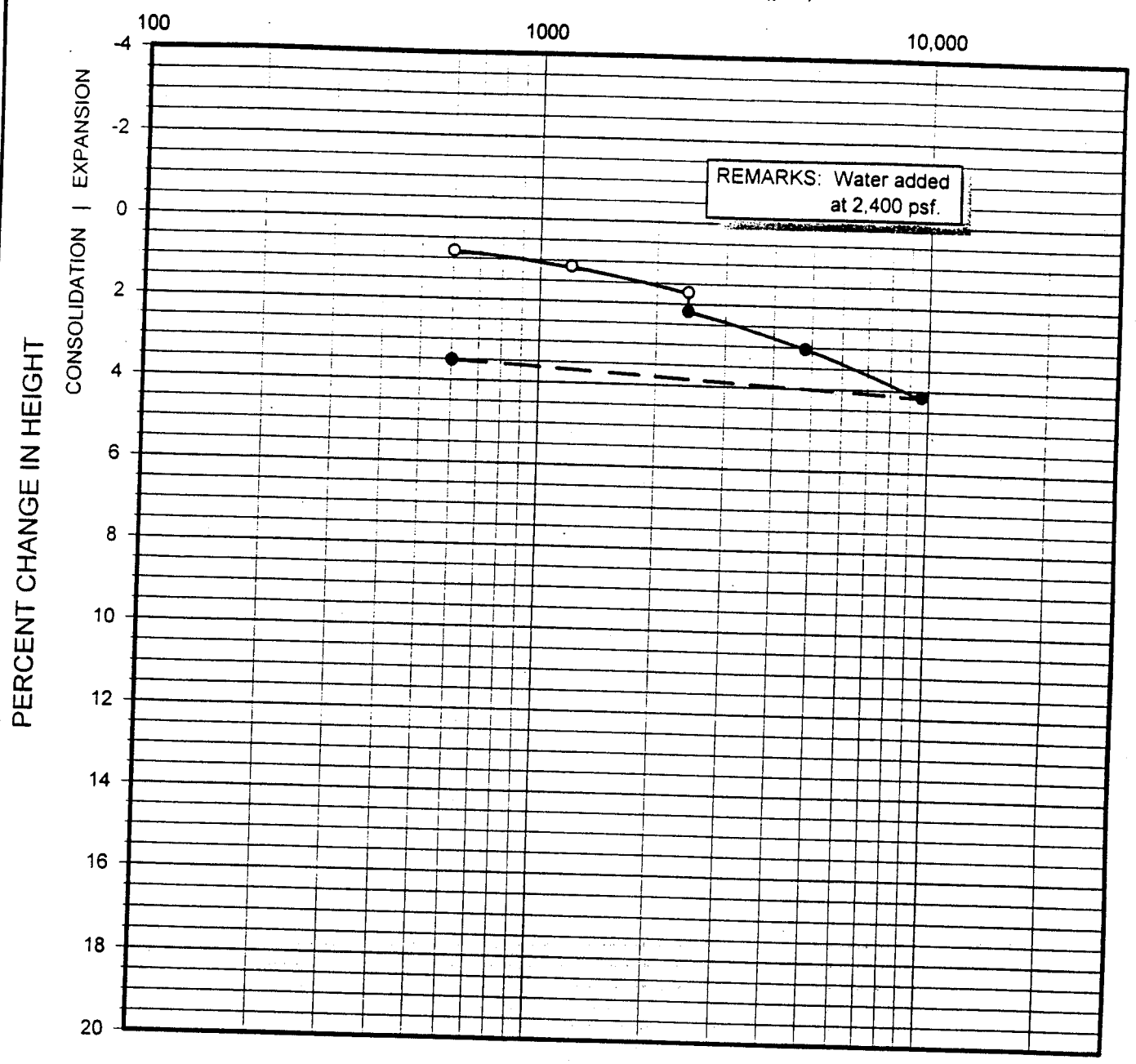
Boring: B - 2	Depth (ft.): 15.0	Dry Density (pcf):114.6	Moisture (%): 12.9	Saturation (%): 77
Sample Description: Clayey Sand (SP-SC), fine to medium grained. [Fill]				

Medall, Aragon, Higley Geotechnical, Inc.

CONSOLIDATION CURVE

NORTH COUNTY TRANSIT DISTRICT, DEL MAR RAIL LINE

PROJECT NO. 3650-SF	DATE: 6/18/98	FIG. B-41



Boring: B - 2	Depth (ft.): 25.0	Dry Density (pcf):114.1	Moisture (%): 10.2	Saturation (%): 60
Sample Description: Clayey Sand (SP-SC), fine to medium grained. [Fill]				

Medall, Aragon, Higley Geotechnical, Inc.

CONSOLIDATION CURVE

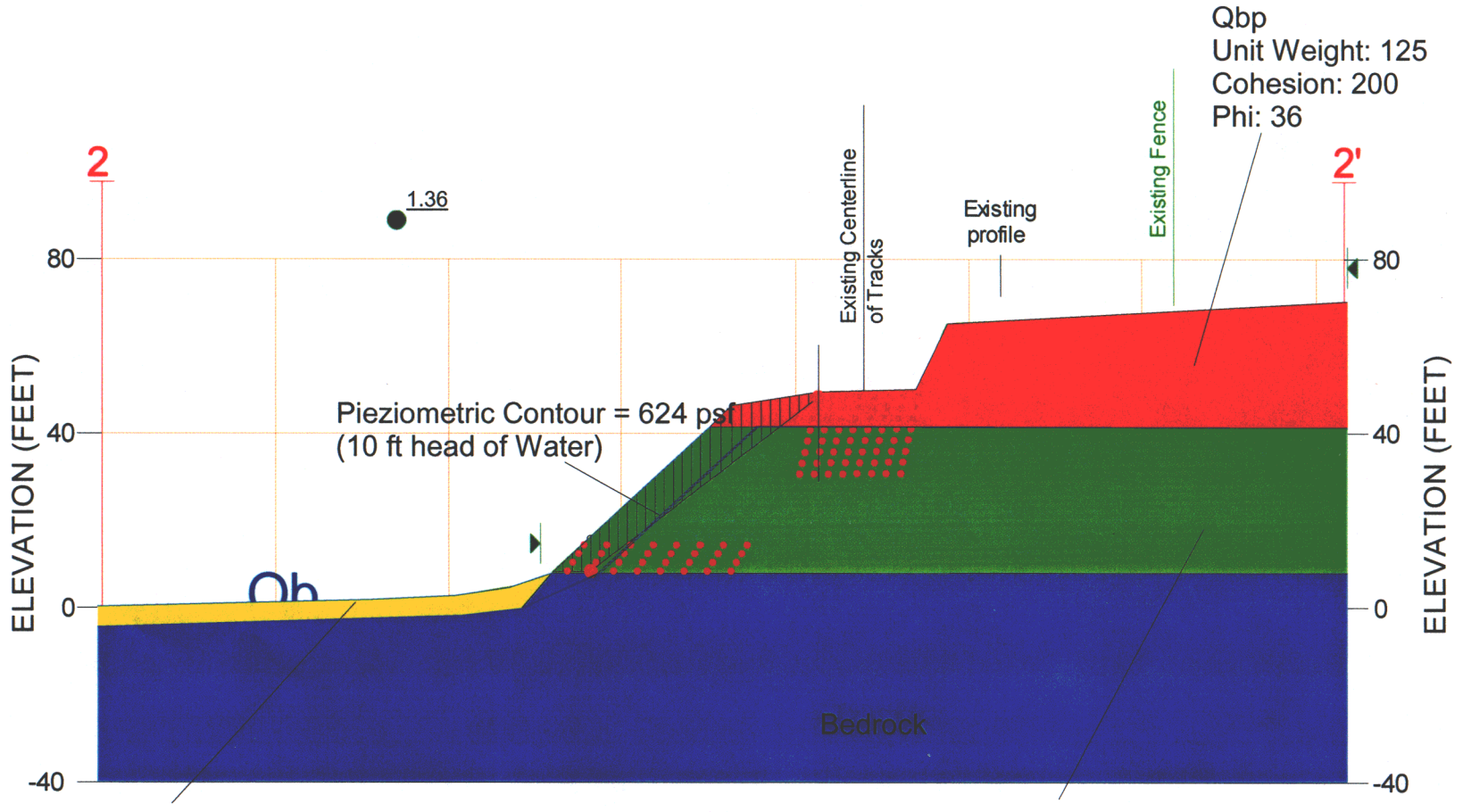
NORTH COUNTY TRANSIT DISTRICT, DEL MAR RAIL LINE

PROJECT NO. 3650-SF	DATE: 6/18/98	**FIG. B-42**

Increased Ground Water Profile Analysis

Del Mar Bluffs Cross Section 2-2'
Slope Stability Analysis
File Name: Section 22 10ft Water Static 1B.slz
Analysis Method: Spencer

Factor of Safety: 1.36



SECTION 2-2'

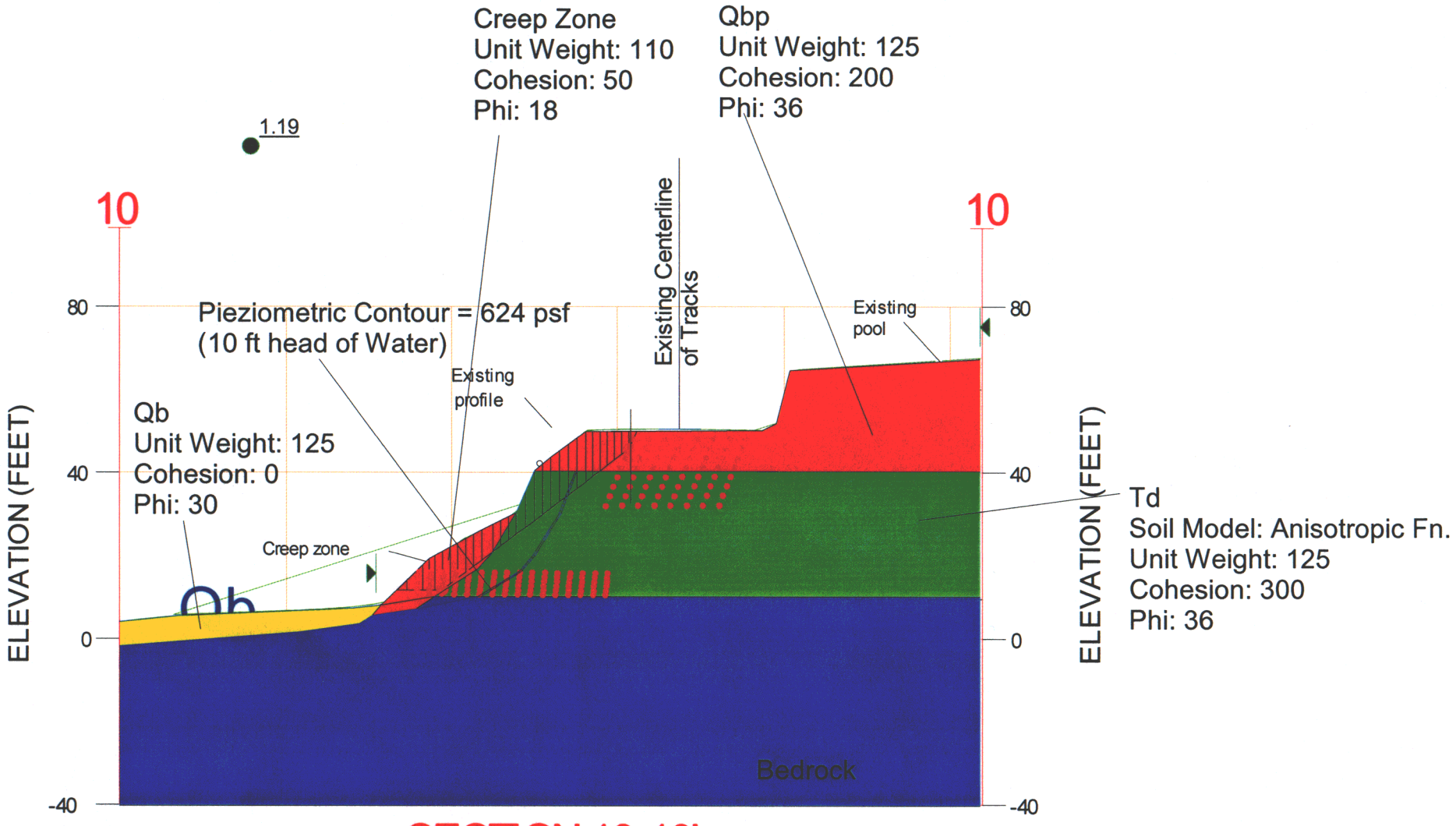
View north - M.P. 244.22 (STA. 1543+00)

Qb
Unit Weight: 125
Cohesion: 0
Phi: 30

Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Del Mar Bluffs Cross Section 10-10'
Slope Stability Analysis
File Name: Section 1010 10 ft Water Static 2B.slz
Analysis Method: Spencer

Factor of Safety: 1.19



SECTION 10-10'

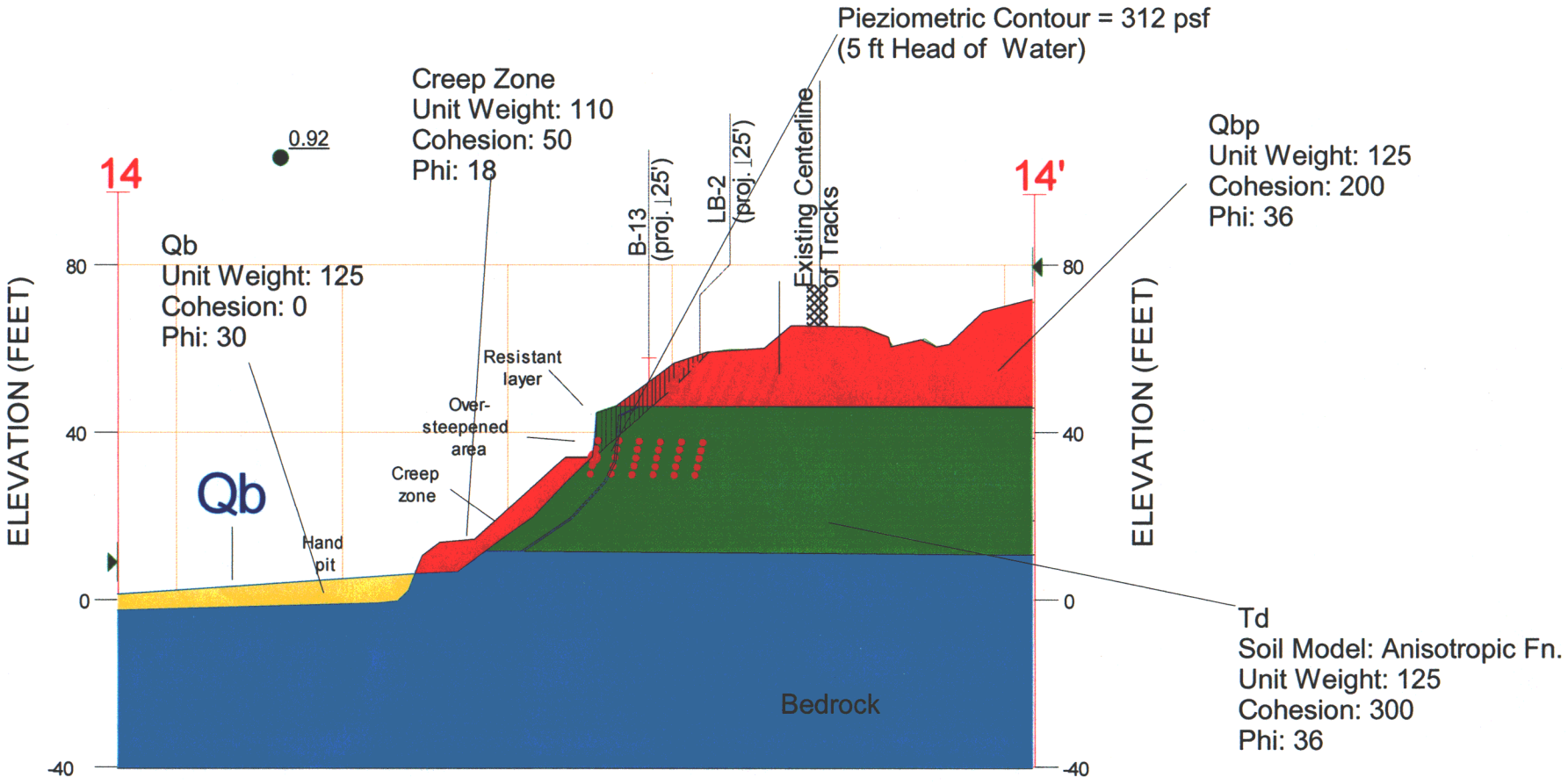
View north - M.P. 244.36 (STA.. 1535+69)

Back Calculation Analysis

Del Mar Bluffs Cross Section 14-14'
Slope Stability Analysis
File Name: Section 14 14 Failure 1.slz
Analysis Method: Spencer

Factor of Safety: 0.922

Surcharge = 3,000 psf



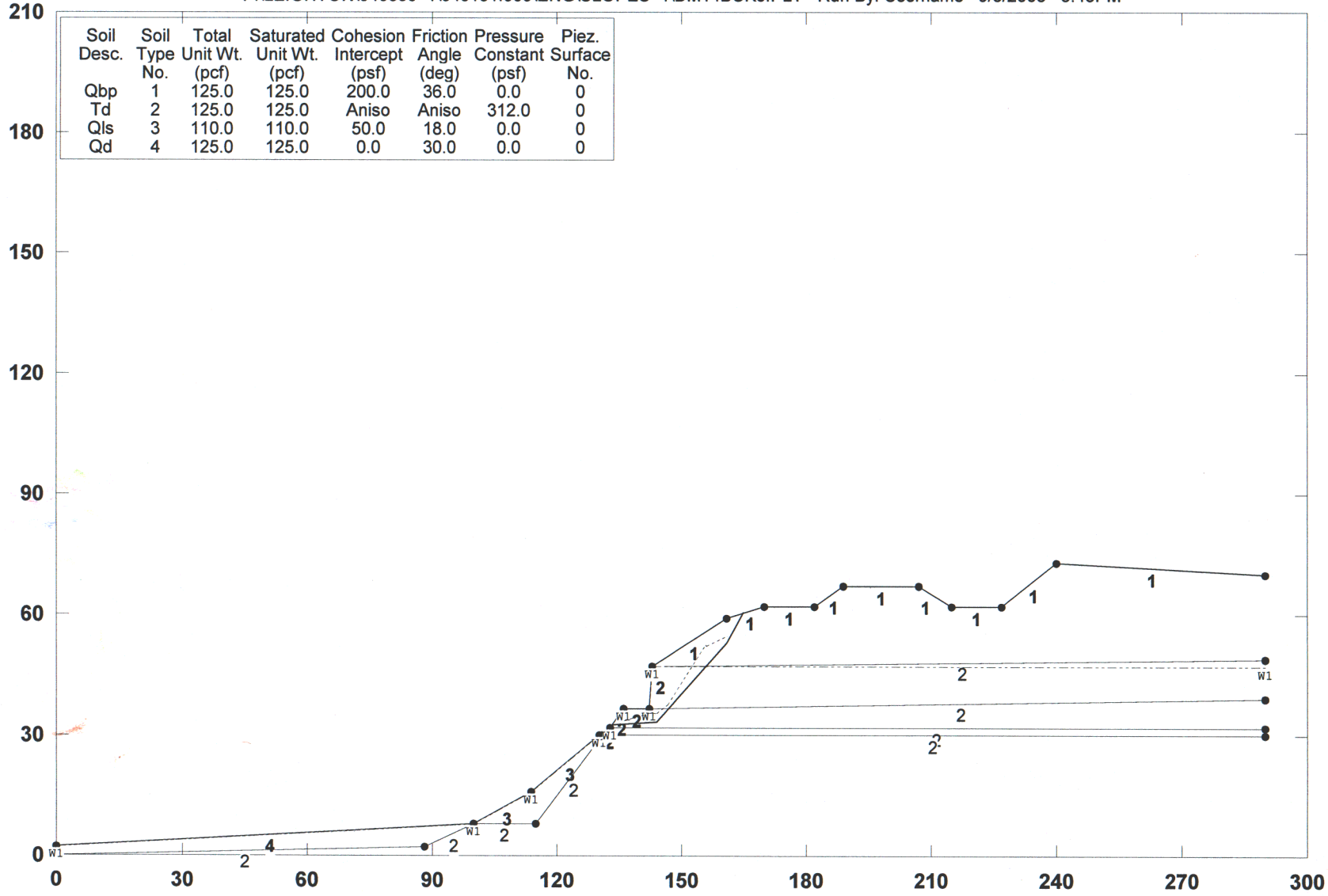
SECTION 14-14' (PREVIOUSLY H-H')

View north - M.P. 244.47 (STA. 1529+60)

Cross Section H-H' with Water Filled Tension Cracks in Cemented Units

P:\LEIGHTON\040000~1\040151.009\ENG\SLOPES~1\DM14BCK6.PLT Run By: Username 9/5/2003 3:43PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pressure Constant (psf)	Piez. Surface No.
Qbp	1	125.0	125.0	200.0	36.0	0.0	0
Td	2	125.0	125.0	Aniso	Aniso	312.0	0
Qls	3	110.0	110.0	50.0	18.0	0.0	0
Qd	4	125.0	125.0	0.0	30.0	0.0	0

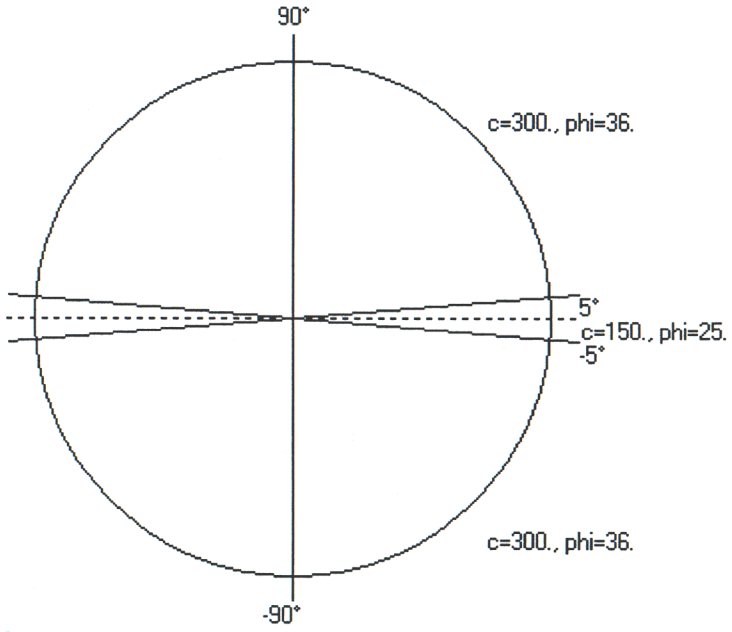


GSTABL7 v.2 FSmin=1.07

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Anisotropic Soil Definition

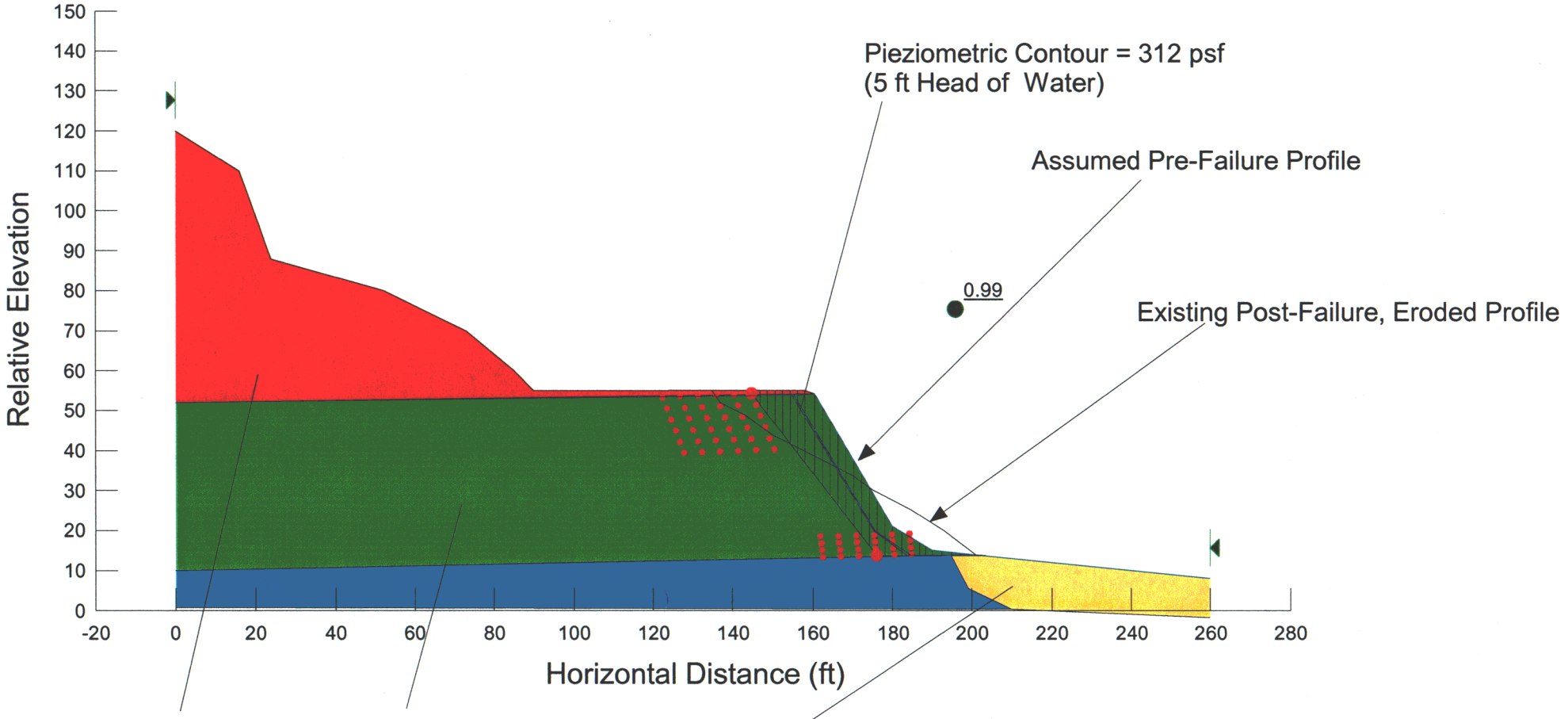


Soil2

Cross Section H-H' with Water Filled

Del Mar Bluffs Cross Section @ STA. 1488+85 (M.P. 245.27)
Back Claclulation, Slope Stability Analysis
File Name: STA. 1488+85 Section Back Calc 1.slz
Analysis Method: Spencer

Factor of Safety: 0.995



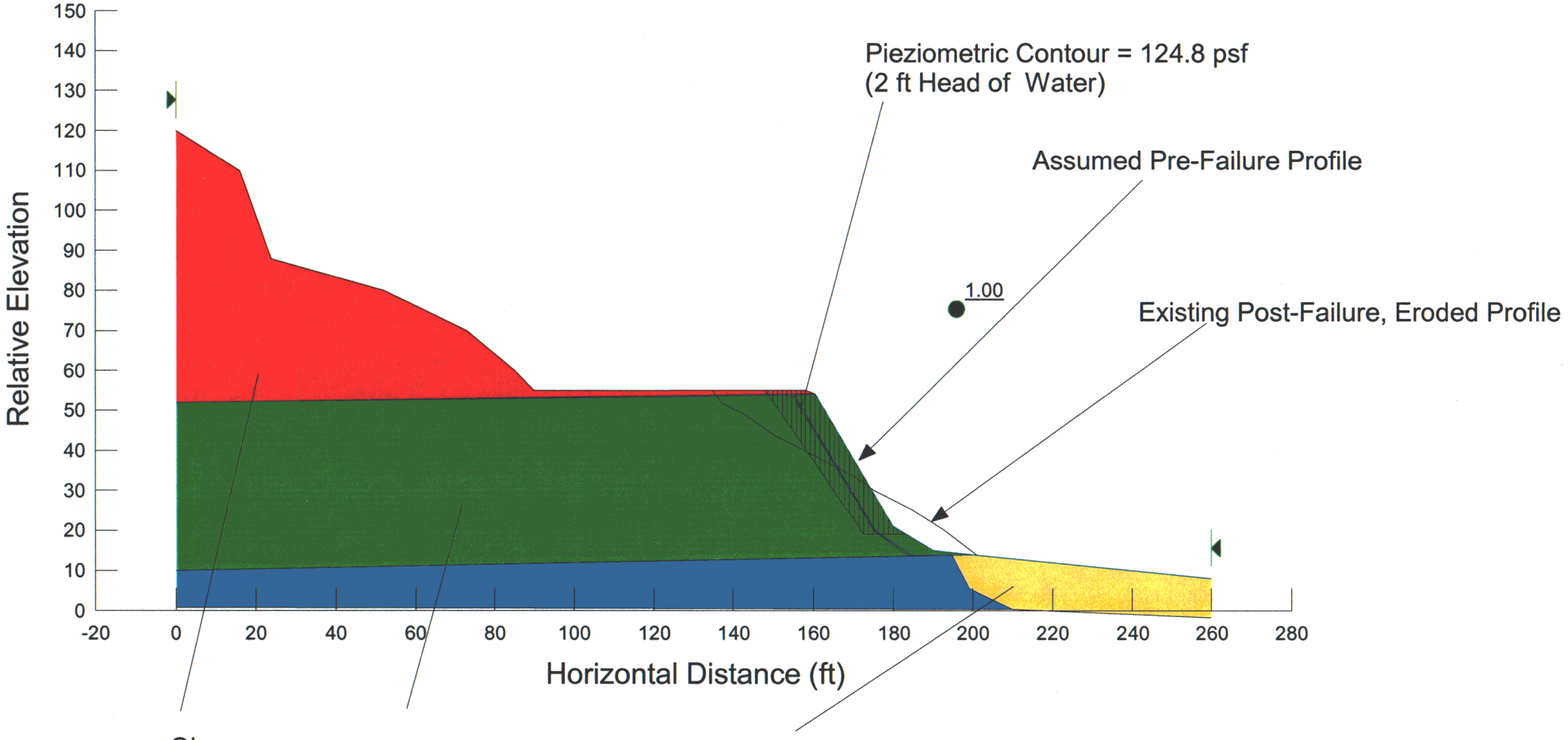
Qbp
Unit Weight: 125
Cohesion: 200
Phi: 36

Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Qb
Unit Weight: 125
Cohesion: 0
Phi: 30

Del Mar Bluffs Cross Section @ STA. 1488+85 (M.P. 245.27)
Back Claclulation, Slope Stability Analysis
File Name: STA. 1488+85 Section Back Calc 2.slz
Analysis Method: Spencer

Factor of Safety: 0.997



Qbp
Unit Weight: 125
Cohesion: 200
Phi: 36

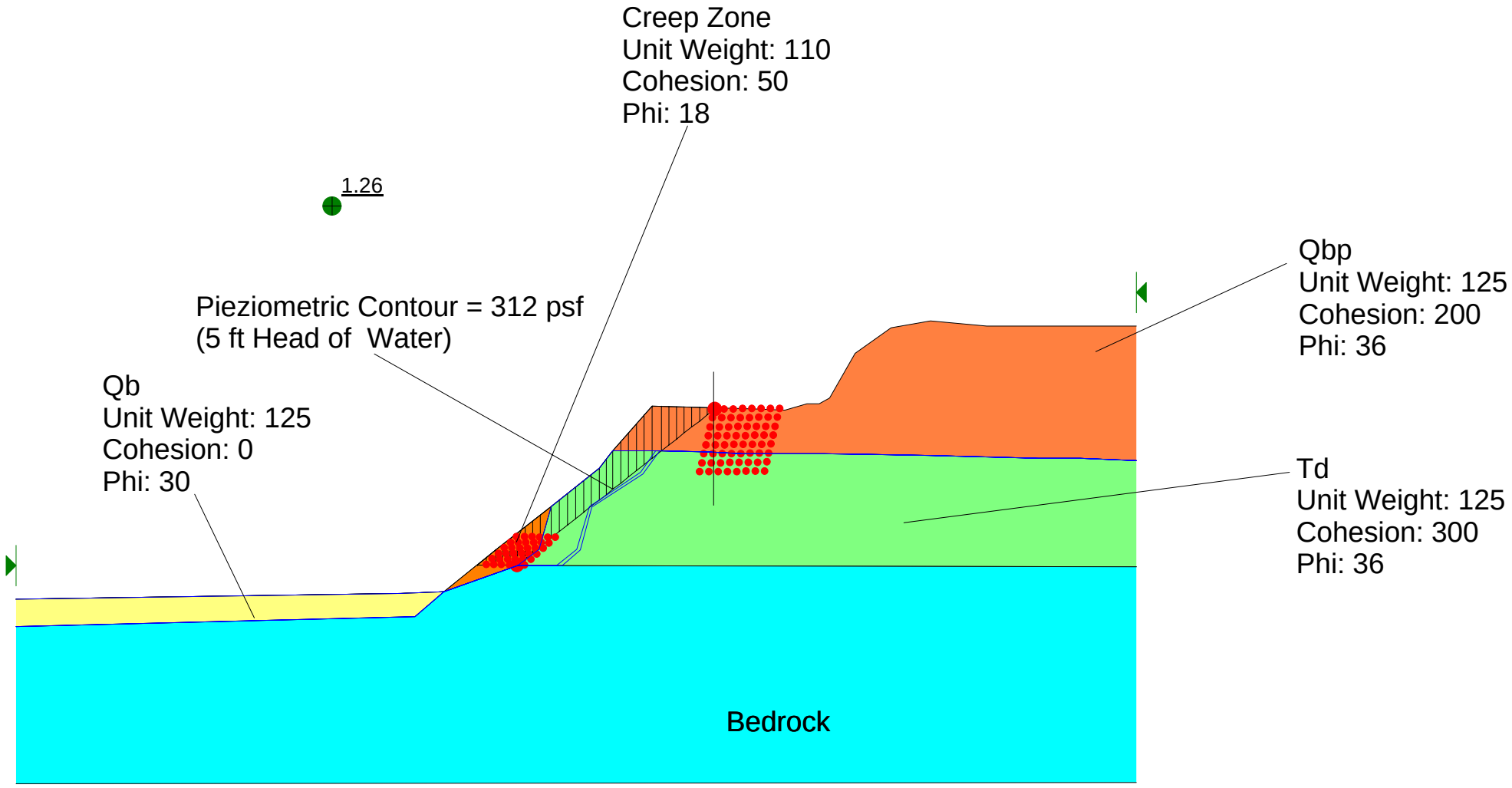
Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Qb
Unit Weight: 125
Cohesion: 0
Phi: 30

Cross Section 1-1’

Del Mar Bluffs Cross Section 1-1'
Slope Stability Analysis
File Name: Section 11 Static 1.slz
Analysis Method: Spencer

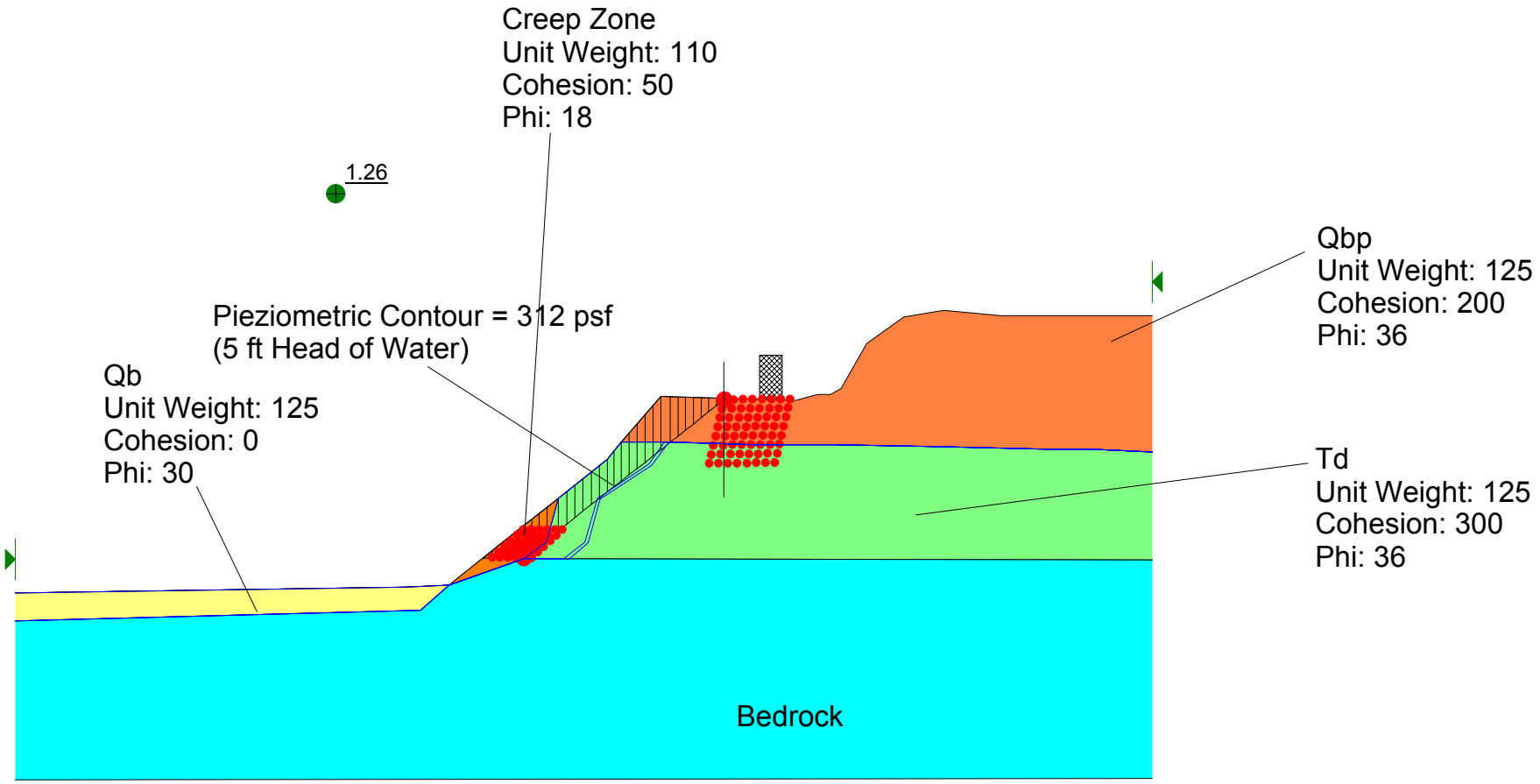
Factor of Safety: 1.26



Del Mar Bluffs Cross Section 1-1'
Slope Stability Analysis
File Name: Section 11 Static 2.slz
Analysis Method: Spencer

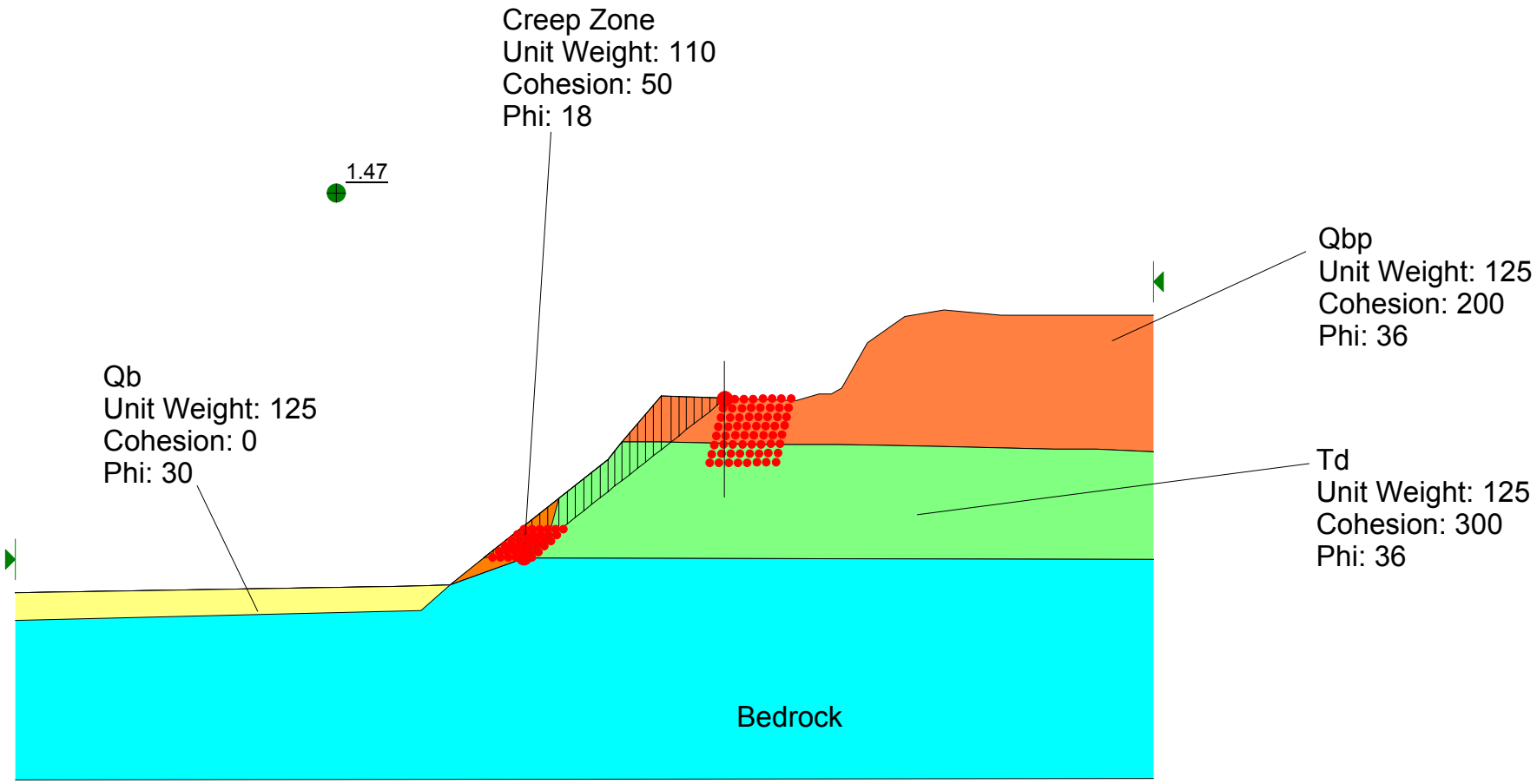
Factor of Safety: 1.26

Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 1-1'
Slope Stability Analysis, No Water
File Name: Section 11 Static 3.slz
Analysis Method: Spencer

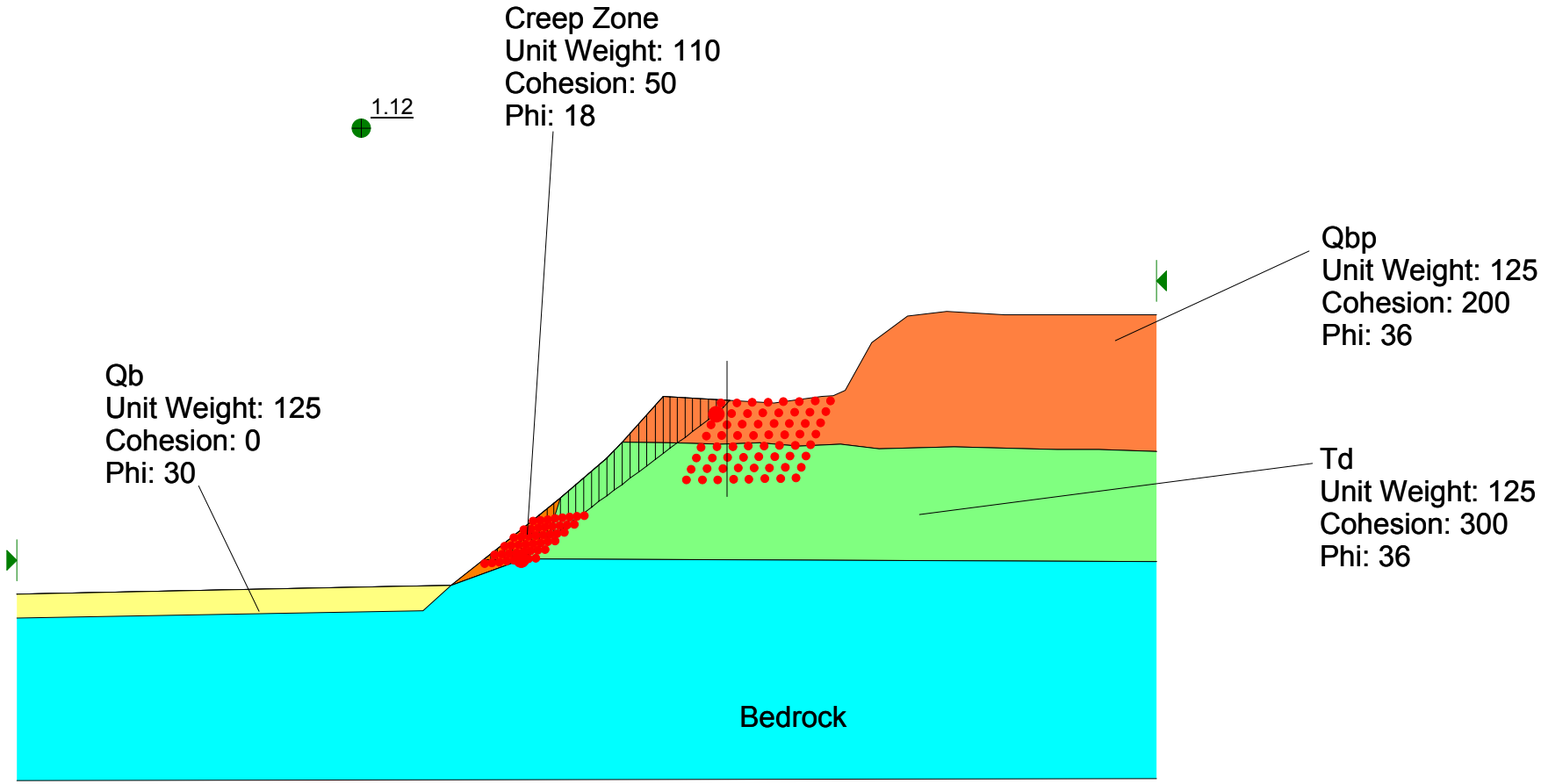
Factor of Safety: 1.47



Del Mar Bluffs Cross Section 1-1'
Slope Stability Analysis
File Name: Section 11 Pseudo Static 1.slz
Analysis Method: Spencer

Factor of Safety: 1.12

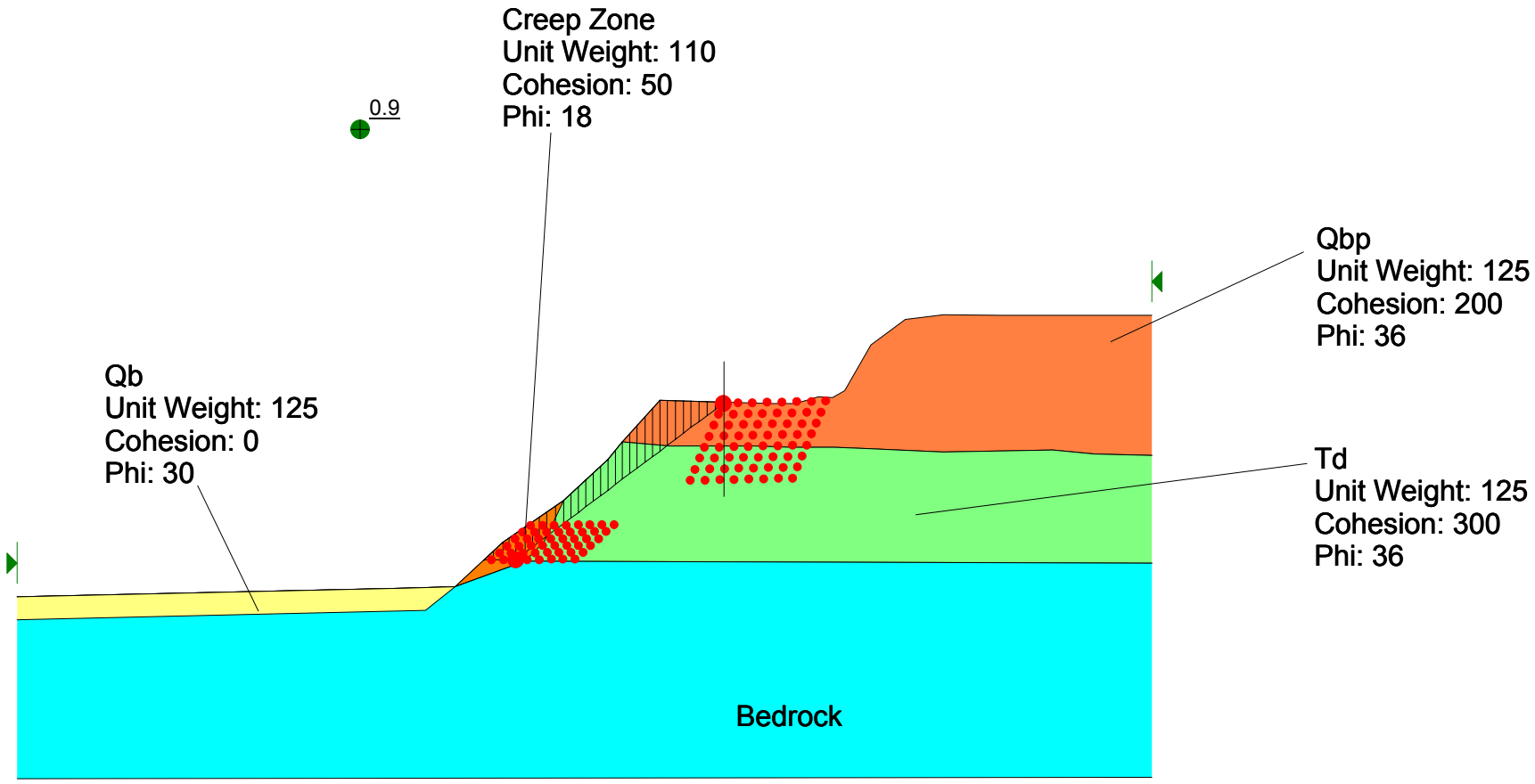
Sesimic Coefficient = 0.15



Del Mar Bluffs Cross Section 1-1'
Slope Stability Analysis
File Name: Section 11 Pseudo Static 2.slz
Analysis Method: Spencer

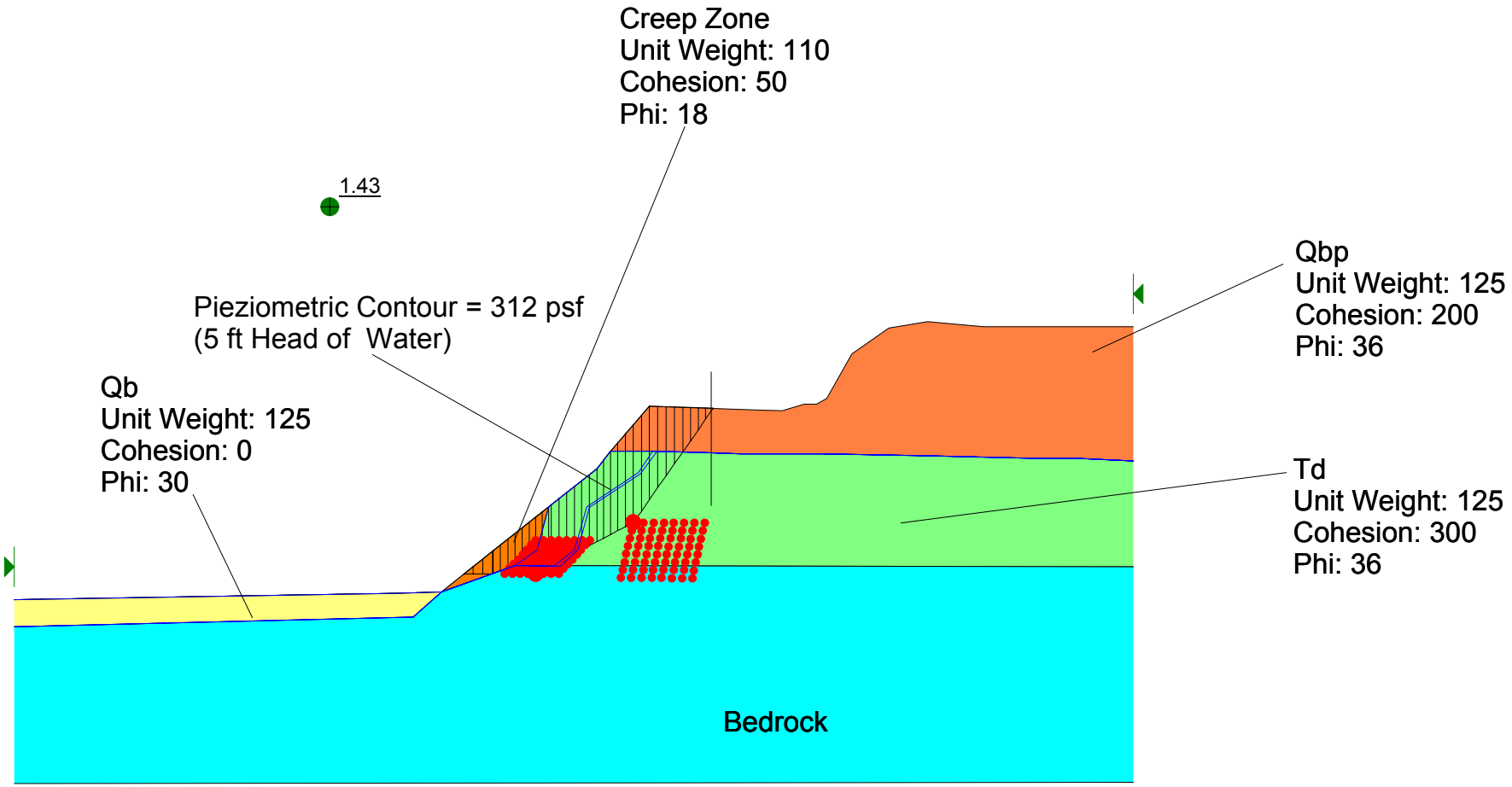
Factor of Safety: 0.95

Seismic Coefficient = 0.28



Del Mar Bluffs Cross Section 1-1'
Slope Stability Analysis
File Name: Section 11 Static 1B.slz
Analysis Method: Spencer

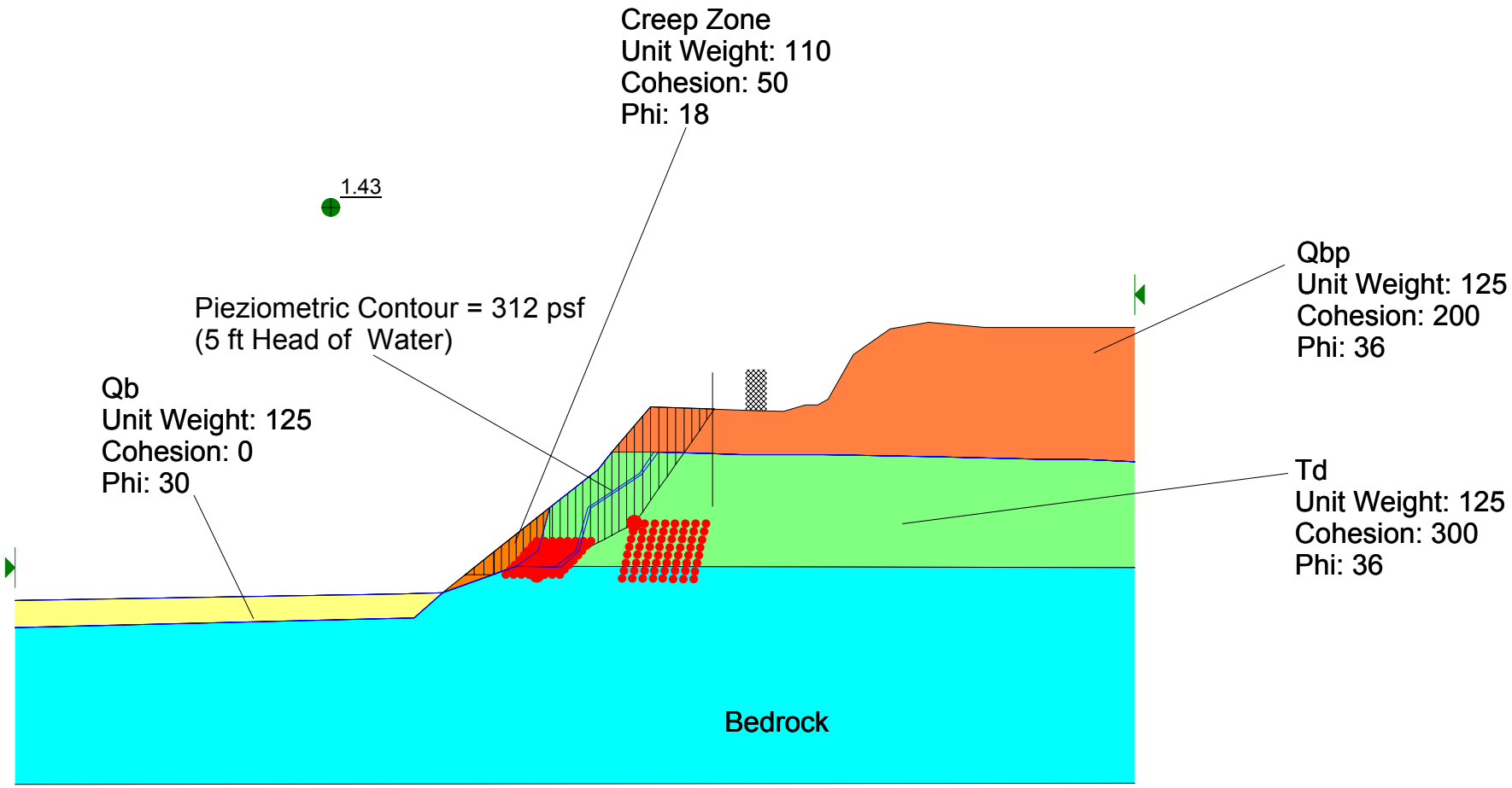
Factor of Safety: 1.43



Del Mar Bluffs Cross Section 1-1'
Slope Stability Analysis
File Name: Section 11 Static 2B.slz
Analysis Method: Spencer

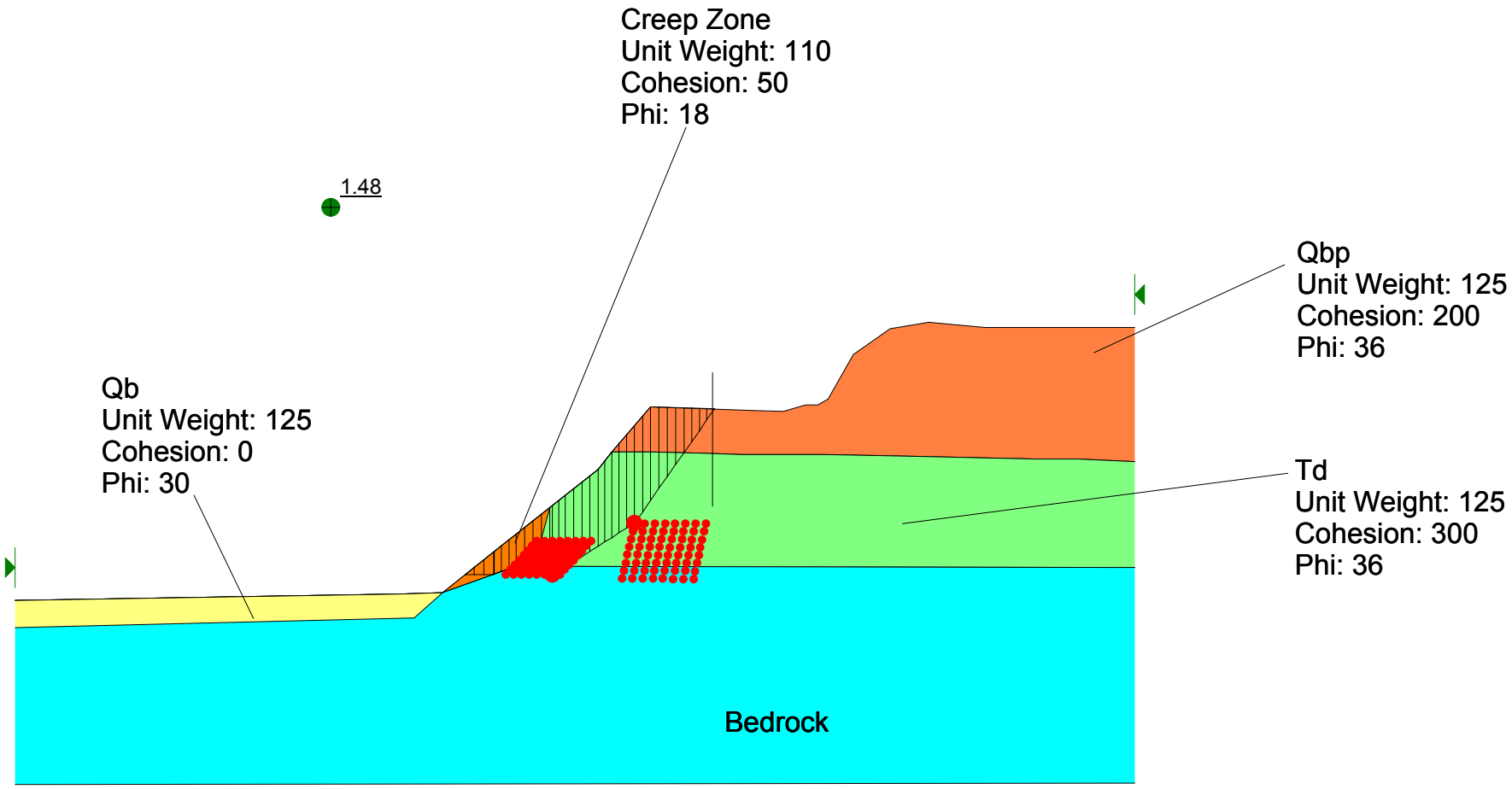
Factor of Safety: 1.43

Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 1-1'
Slope Stability Analysis, No Water
File Name: Section 11 Static 3B.slz
Analysis Method: Spencer

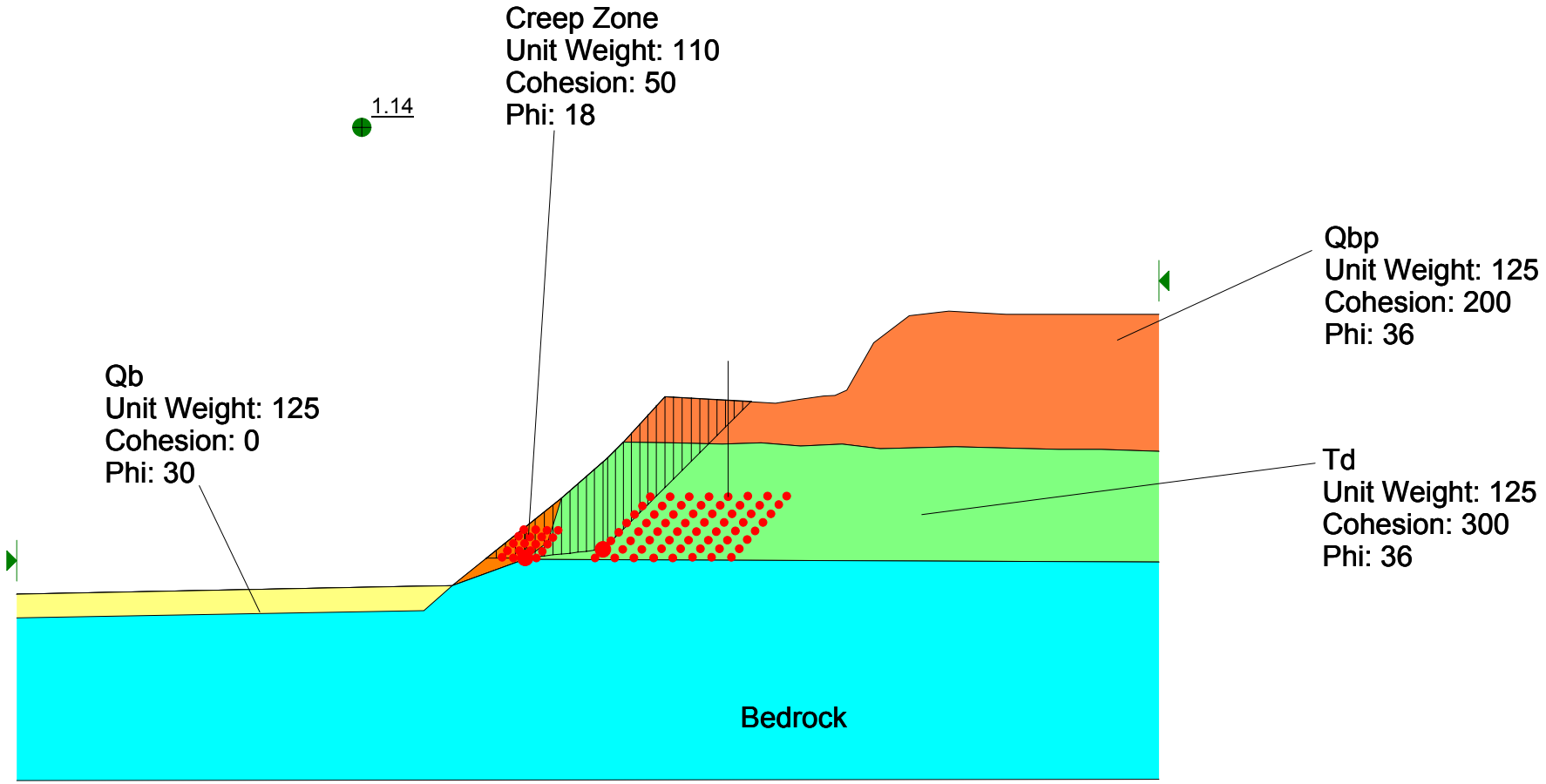
Factor of Safety: 1.48



Del Mar Bluffs Cross Section 1-1'
Slope Stability Analysis
File Name: Section 11 Pseudo Static 1B.slz
Analysis Method: Spencer

Factor of Safety: 1.14

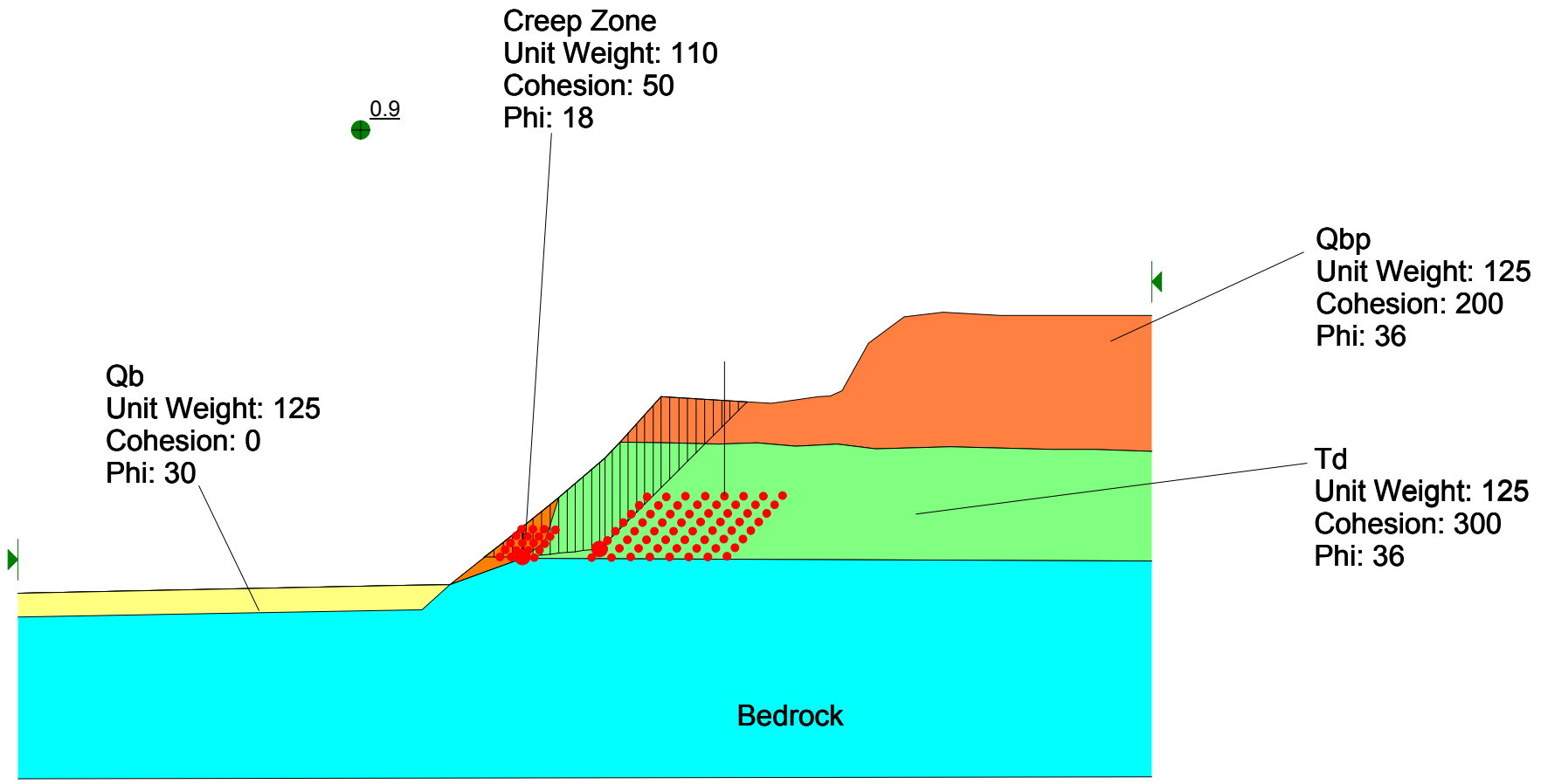
Sesimic Coefficient = 0.15



Del Mar Bluffs Cross Section 1-1'
Slope Stability Analysis
File Name: Section 11 Pseudo Static 2B.slz
Analysis Method: Spencer

Factor of Safety: 0.95

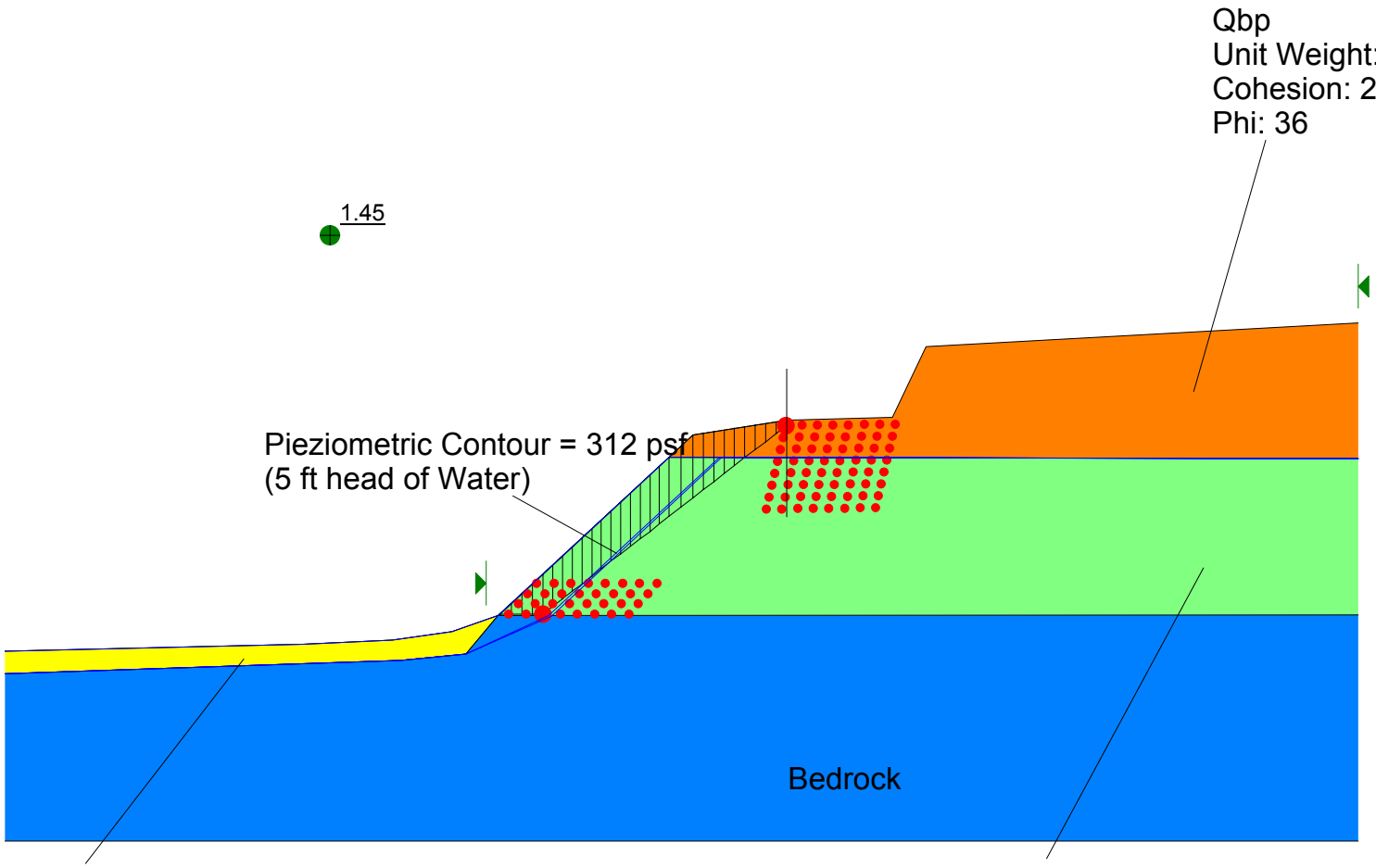
Sesimic Coefficient = 0.28



Cross Section 2-2’

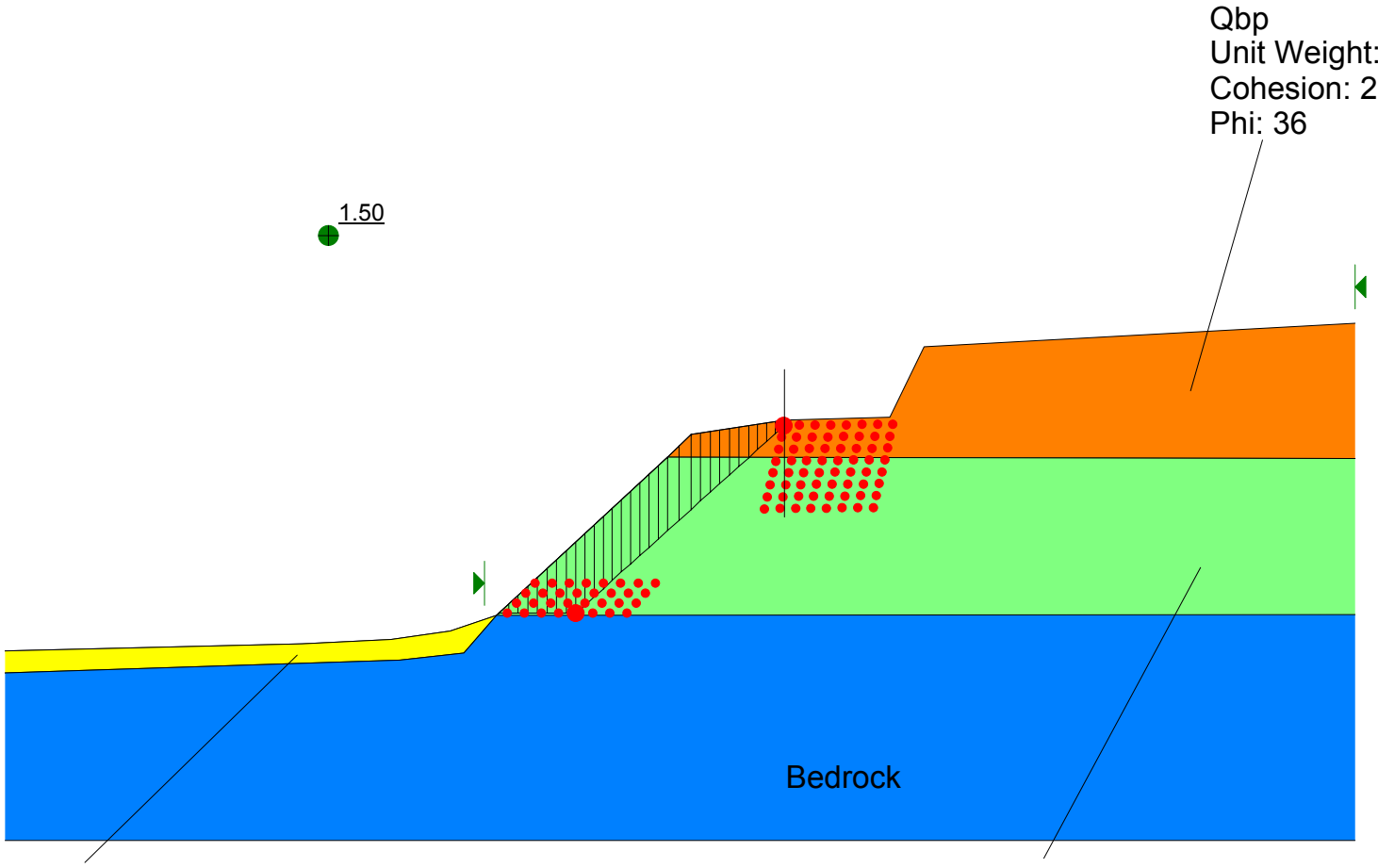
Del Mar Bluffs Cross Section 2-2'
Slope Stability Analysis
File Name: Section 22 5ft Water Static 2.slz
Analysis Method: Spencer

Factor of Safety: 1.45



Del Mar Bluffs Cross Section 2-2'
Slope Stability Analysis, No Water
File Name: Section 22 Static 3.slz
Analysis Method: Spencer

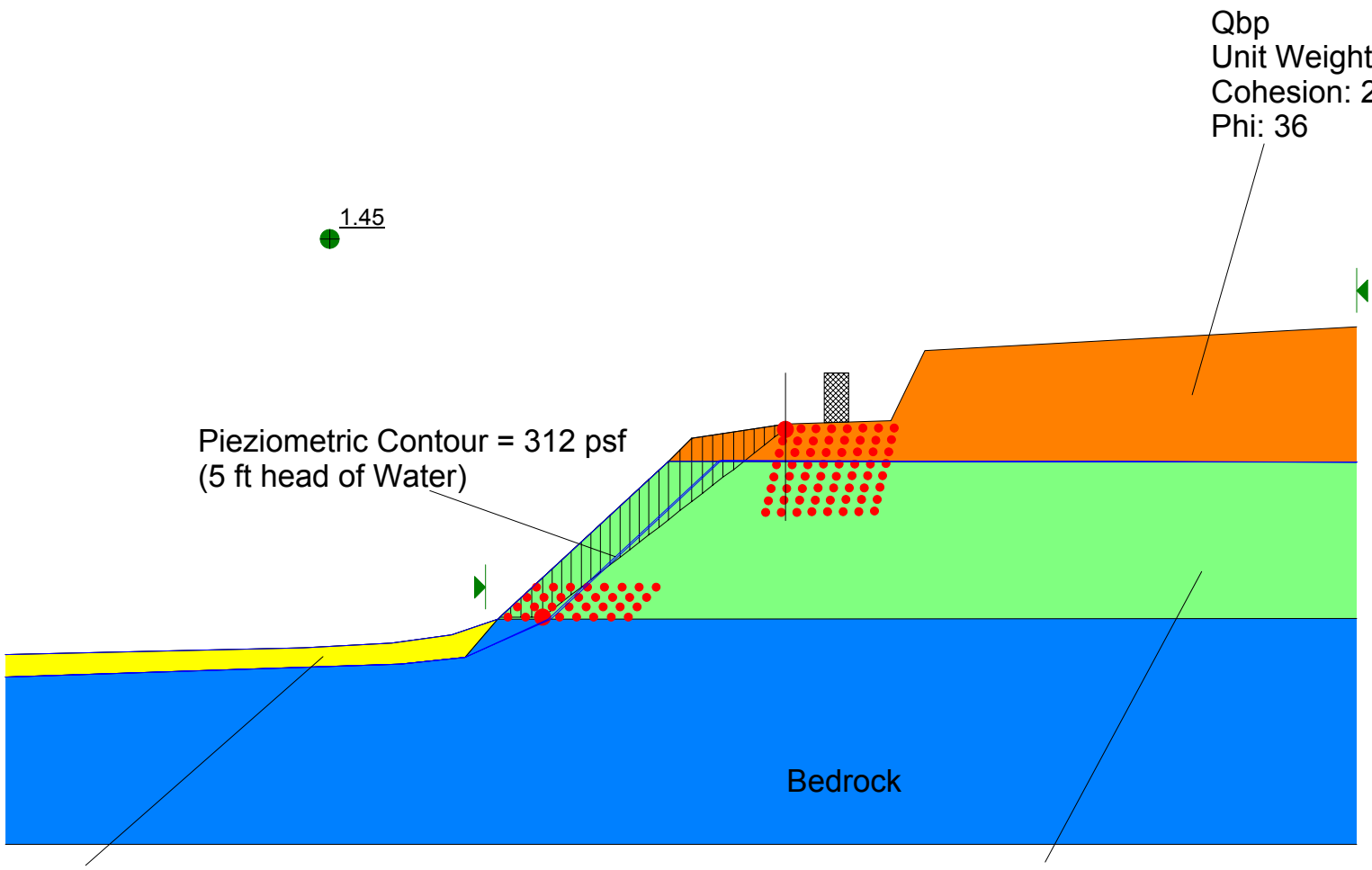
Factor of Safety: 1.5



Qb
Unit Weight: 125
Cohesion: 0
Phi: 30

Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Del Mar Bluffs Cross Section 2-2'
Slope Stability Analysis
File Name: Section 22 5ft Water Static 4.slz
Analysis Method: Spencer
Factor of Safety: 1.45
Surcharge = 3,000 psf

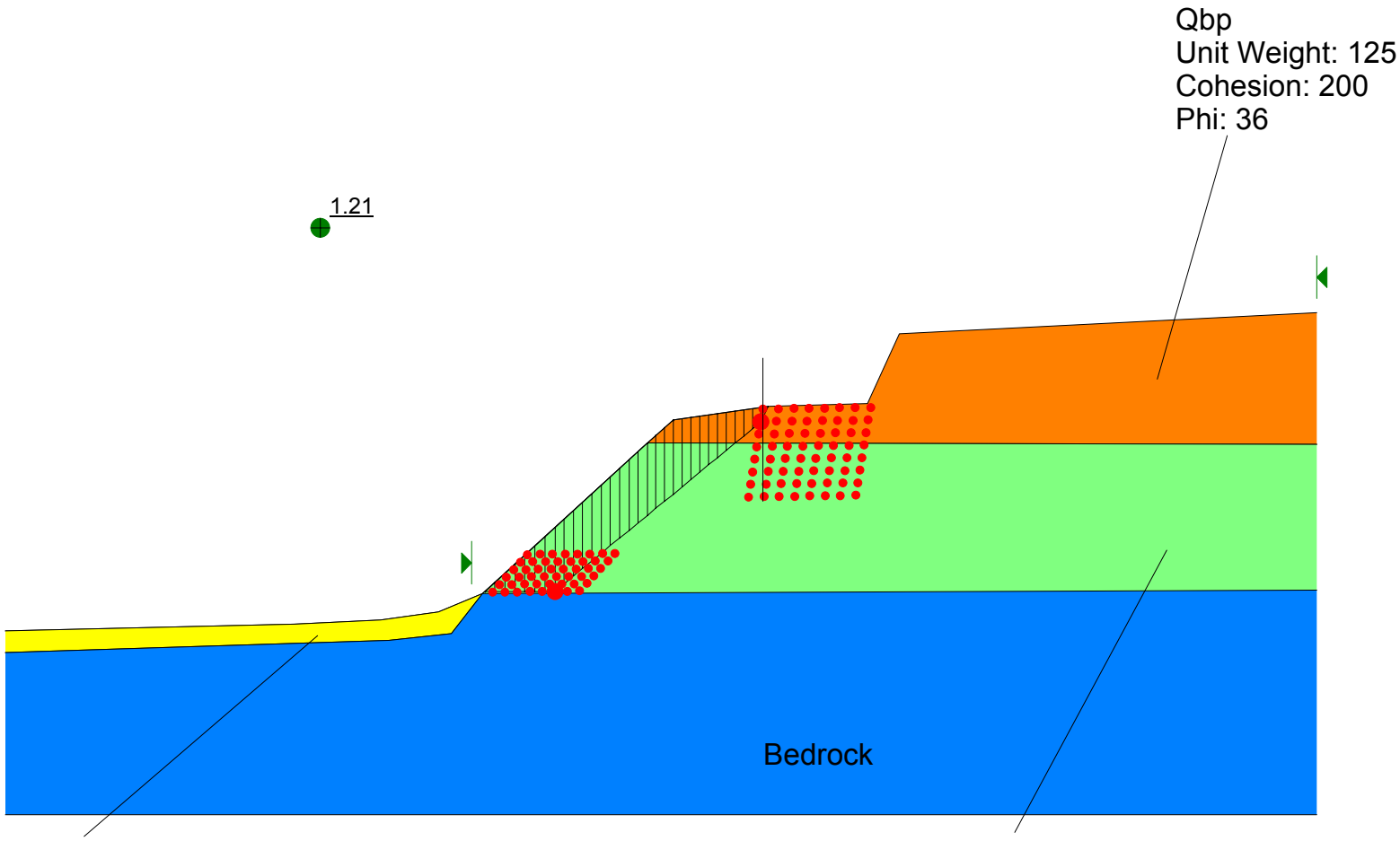


Qb
Unit Weight: 125
Cohesion: 0
Phi: 30

Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Del Mar Bluffs Cross Section 2-2'
Slope Stability Analysis
File Name: Section 22 Psuedo Static 2.slz
Analysis Method: Spencer

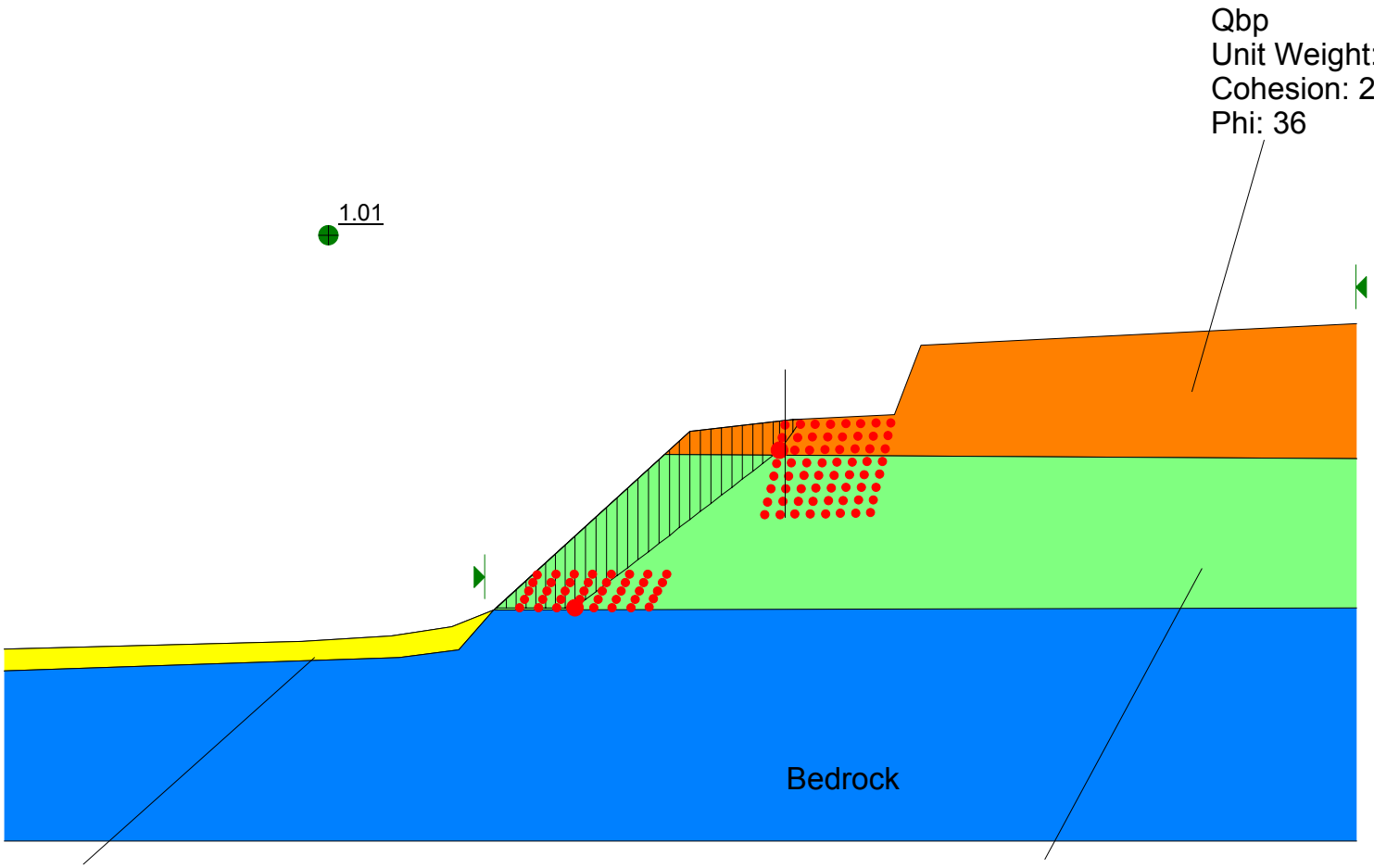
Factor of Safety: 1.21
Seismic Coeffiecient = 0.15



Del Mar Bluffs Cross Section 2-2'
Slope Stability Analysis
File Name: Section 22 Psuedo Static 3.slz
Analysis Method: Spencer

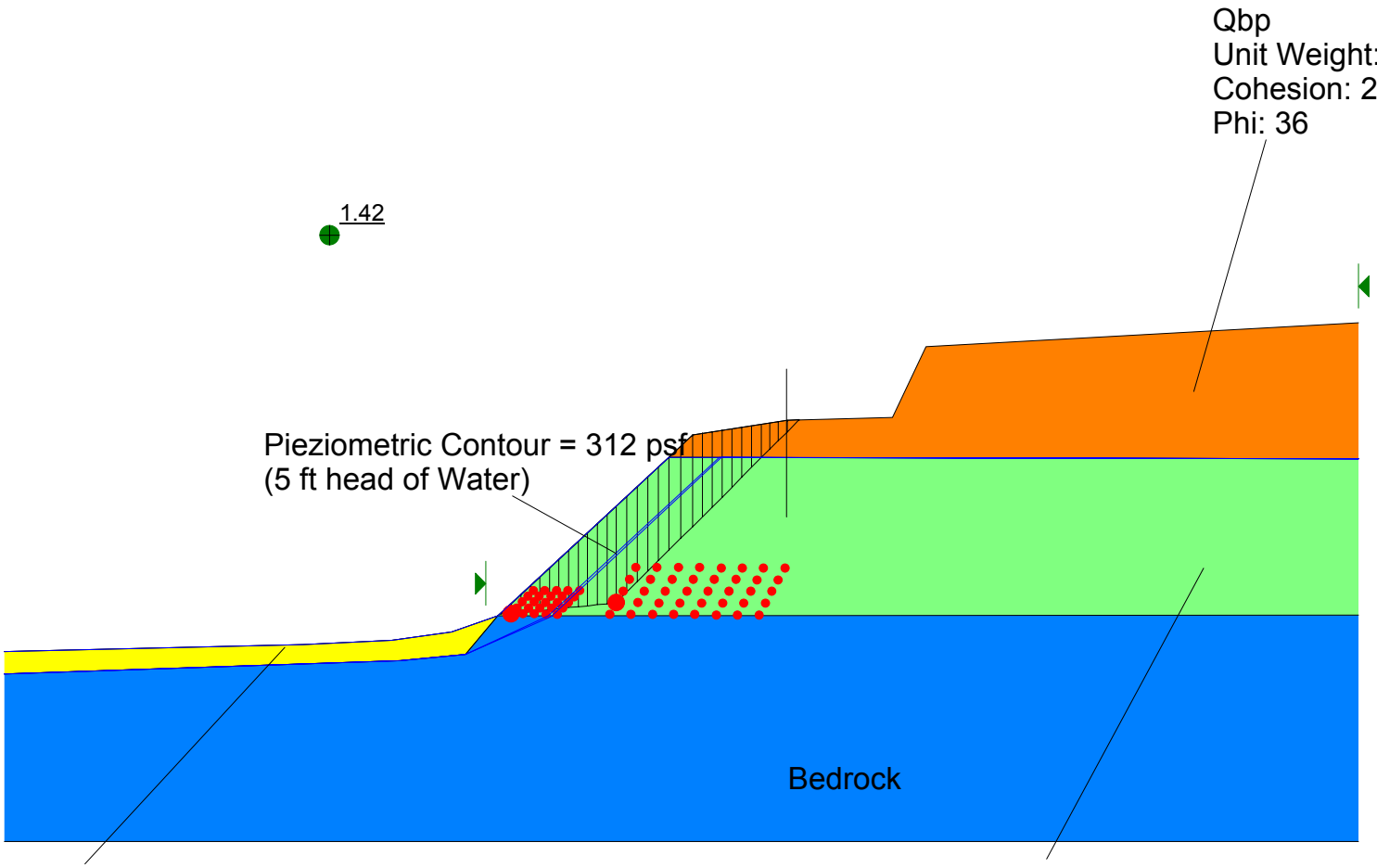
Factor of Safety: 1.01

Seismic Coefficient = 0.28



Del Mar Bluffs Cross Section 2-2'
Slope Stability Analysis
File Name: Section 22 5ft Water Static 2B.slz
Analysis Method: Spencer

Factor of Safety: 1.42

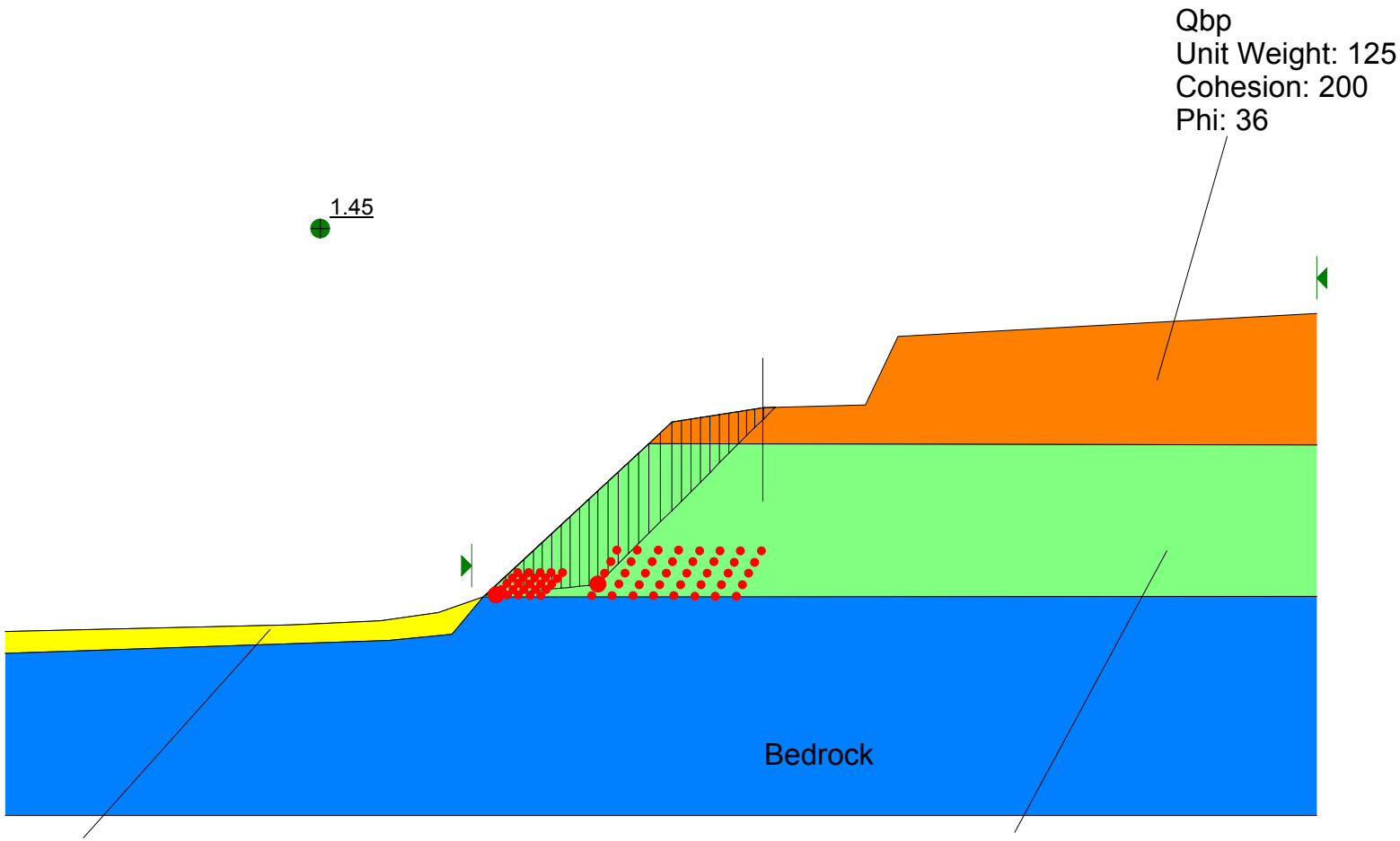


Qb
Unit Weight: 125
Cohesion: 0
Phi: 30

Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

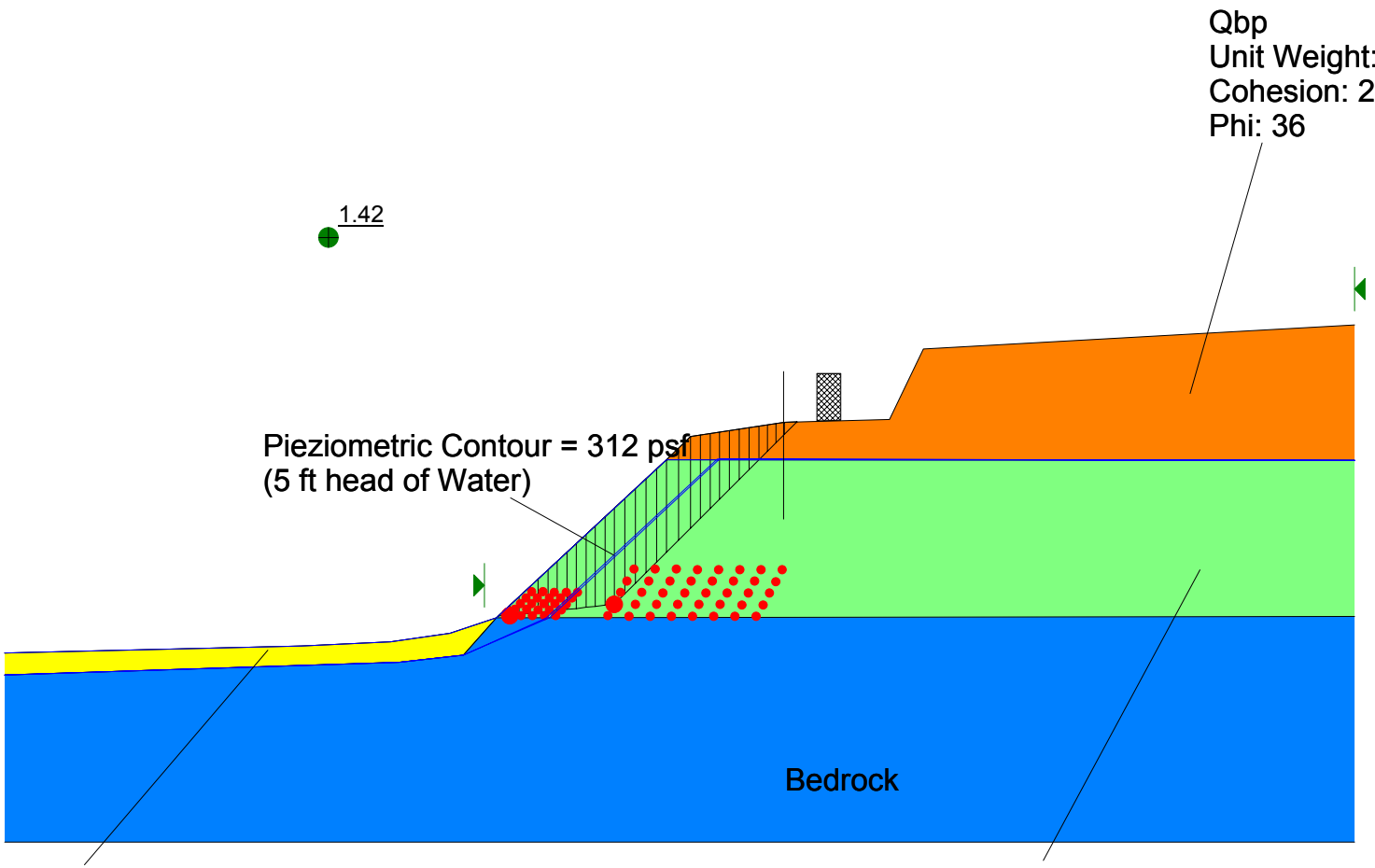
Del Mar Bluffs Cross Section 2-2'
Slope Stability Analysis, No Water
File Name: Section 22 Static 3B.slz
Analysis Method: Spencer

Factor of Safety: 1.45



Del Mar Bluffs Cross Section 2-2'
Slope Stability Analysis
File Name: Section 22 5ft Water Static 4B.slz
Analysis Method: Spencer

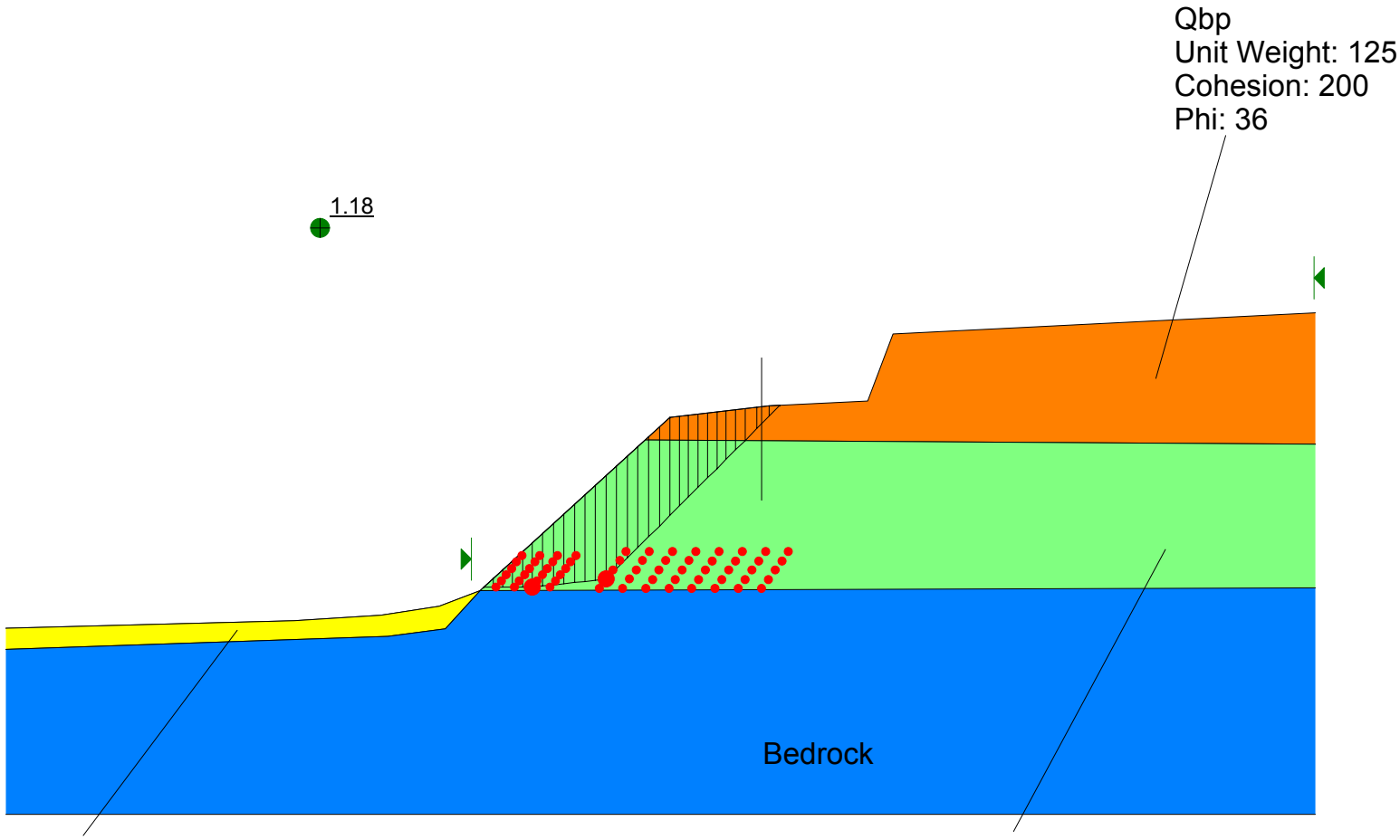
Factor of Safety: 1.42
Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 2-2'
Slope Stability Analysis
File Name: Section 22 Psuedo Static 2B.slz
Analysis Method: Spencer

Factor of Safety: 1.18

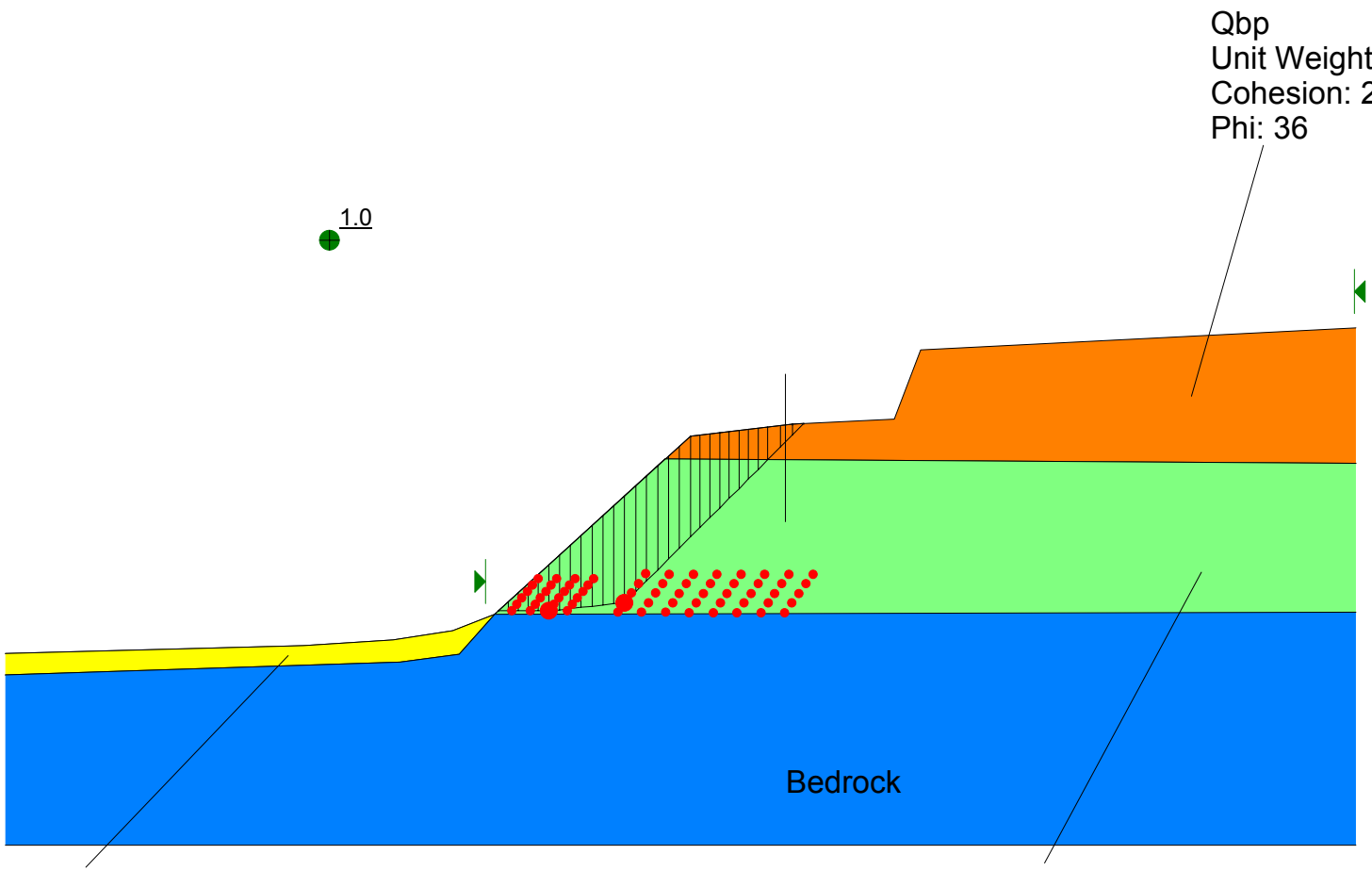
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 2-2'
Slope Stability Analysis
File Name: Section 22 Psuedo Static 4.slz
Analysis Method: Spencer

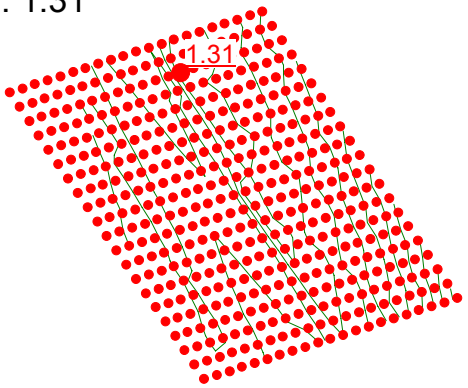
Factor of Safety: 0.98

Seismic Coefficient = 0.28



Cross Section 3-3’

Del Mar Bluffs Section 3-3'
Slope Stability Analysis
File Name: Section 33 5ft Water Static 1.slz
Analysis Method: Bishop
Factor of Safety: 1.31



Af
Unit Weight: 125
Cohesion: 100
Phi: 30

Qbp
Unit Weight: 125
Cohesion: 200
Phi: 36

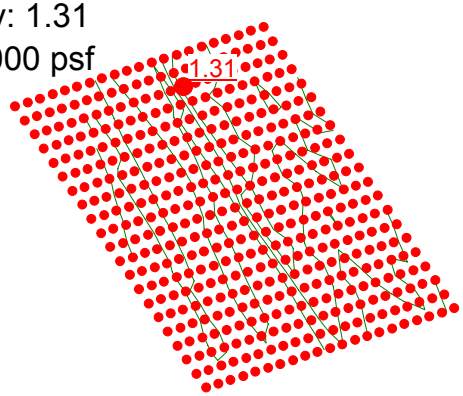
Pieziometric Pressure Contour = 312 psf
(5 ft head of Water)

Qb
Unit Weight: 125
Cohesion: 0
Phi: 30

Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Bedrock

Del Mar Bluffs Section 3-3'
Slope Stability Analysis
File Name: Section 33 5ft Water Static 3 703.slz
Analysis Method: Bishop
Factor of Safety: 1.31
Surcharge = 3,000 psf



Af
Unit Weight: 125
Cohesion: 100
Phi: 30

Qbp
Unit Weight: 125
Cohesion: 200
Phi: 36

Pieziometric Pressure Contour = 312 psf
(5 ft head of Water)

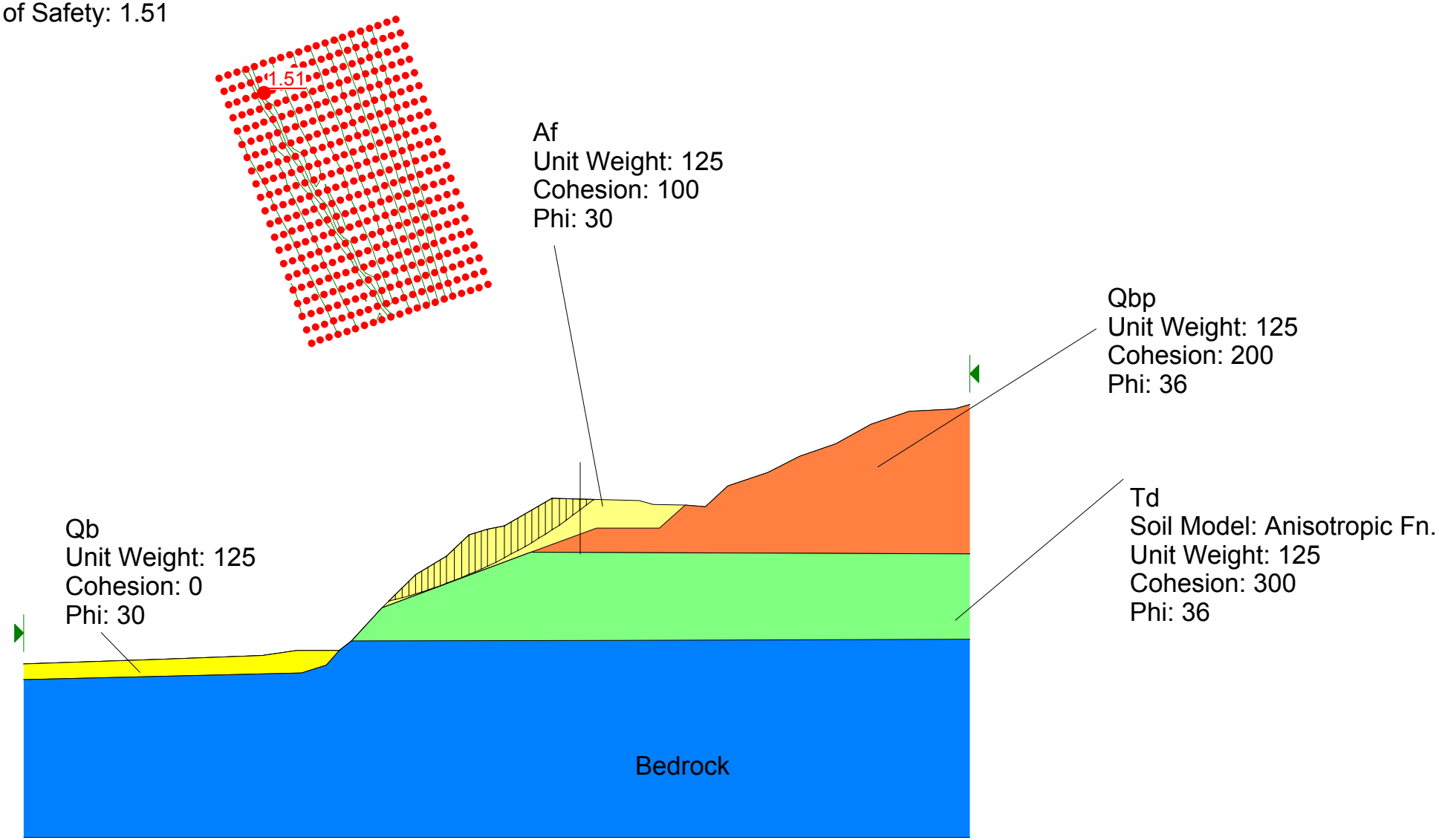
Qb
Unit Weight: 125
Cohesion: 0
Phi: 30

Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Bedrock

Del Mar Bluffs Section 3-3'
Slope Stability Analysis, No Water
File Name: Section 33 Static 5.slz
Analysis Method: Bishop

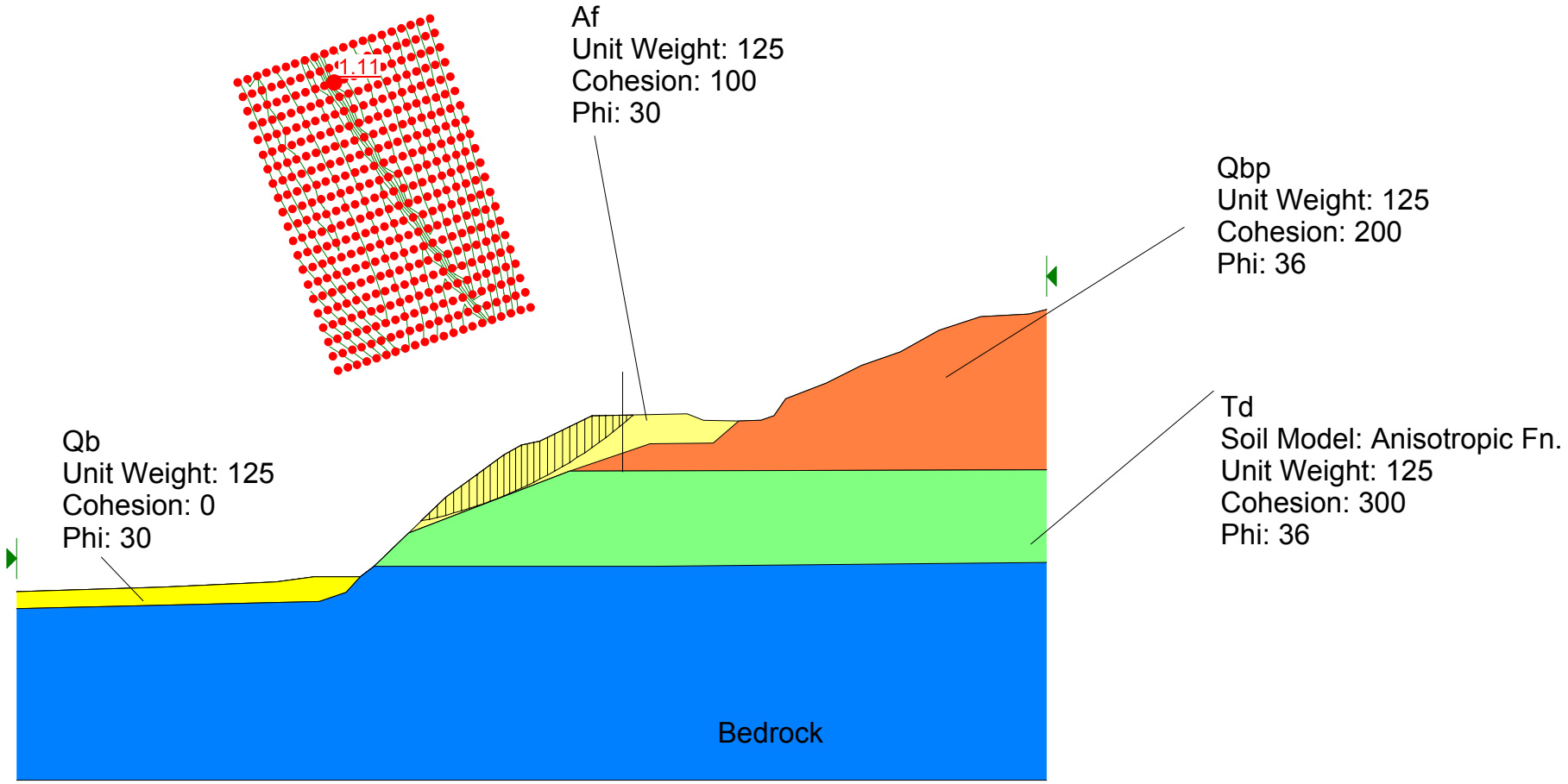
Factor of Safety: 1.51



Del Mar Bluffs Section 3-3'
Slope Stability Analysis
File Name: Section 33 Psuedo Static 1.slz
Analysis Method: Bishop

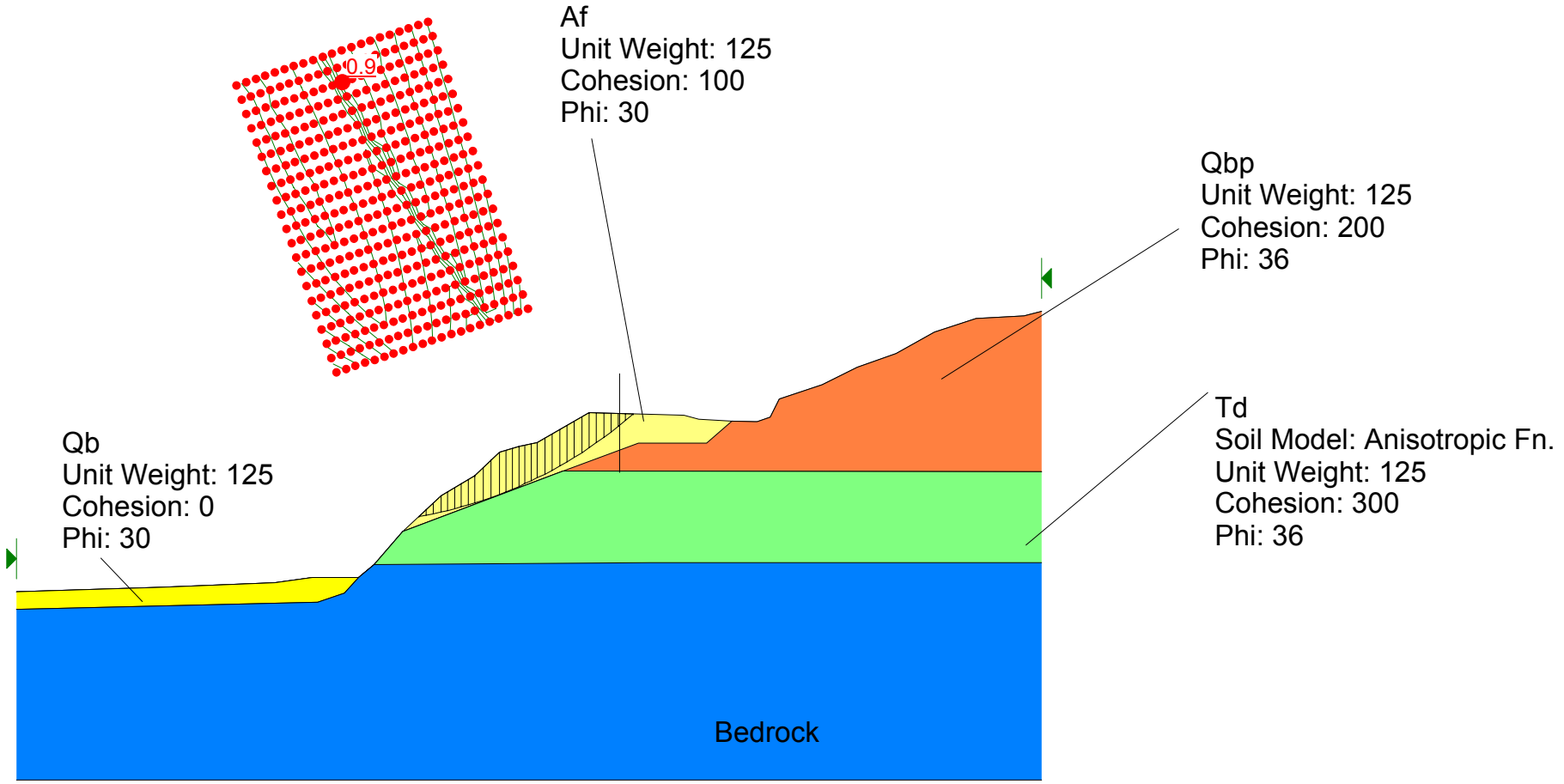
Factor of Safety: 1.11

Seismic Coefficient = 0.15

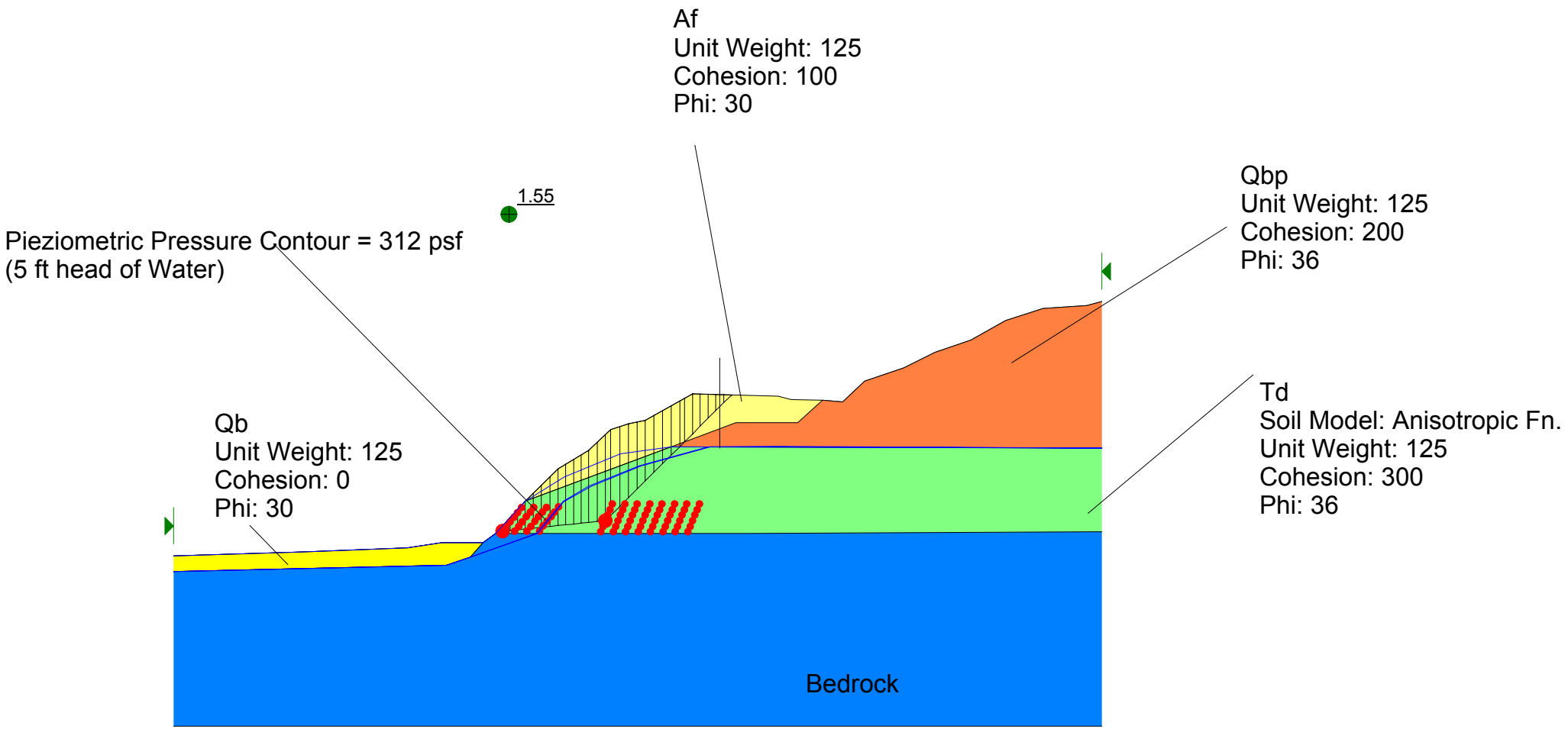


Del Mar Bluffs Section 3-3'
Slope Stability Analysis
File Name: Section 33 Psuedo Static 3.slz
Analysis Method: Bishop

Factor of Safety: 0.9
Seismic Coefficient = 0.28

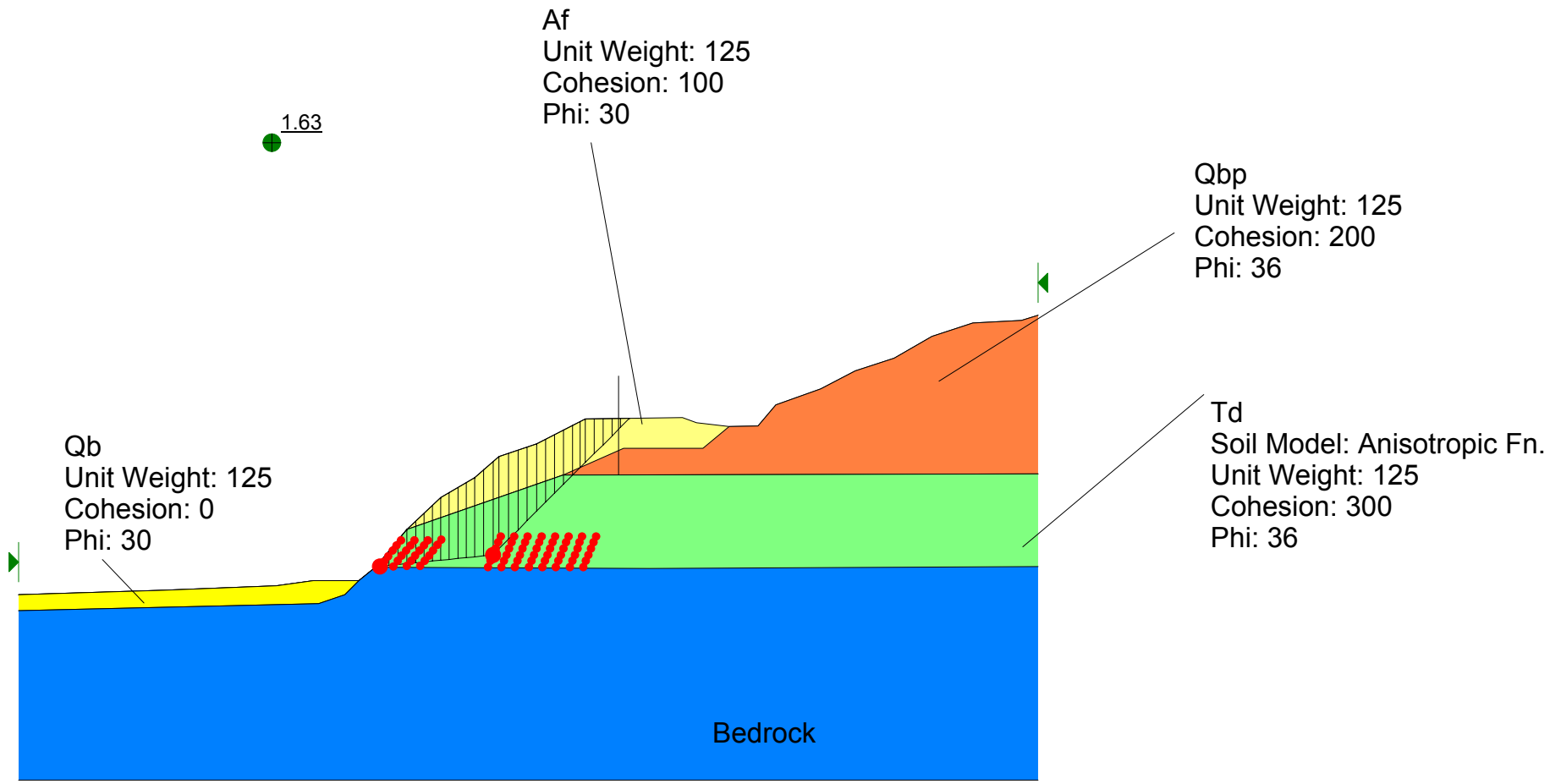


Del Mar Bluffs Section 3-3'
Slope Stability Analysis
File Name: Section 33 5ft Water Static 2 703.slz
Analysis Method: Spencer
Factor of Safety: 1.55

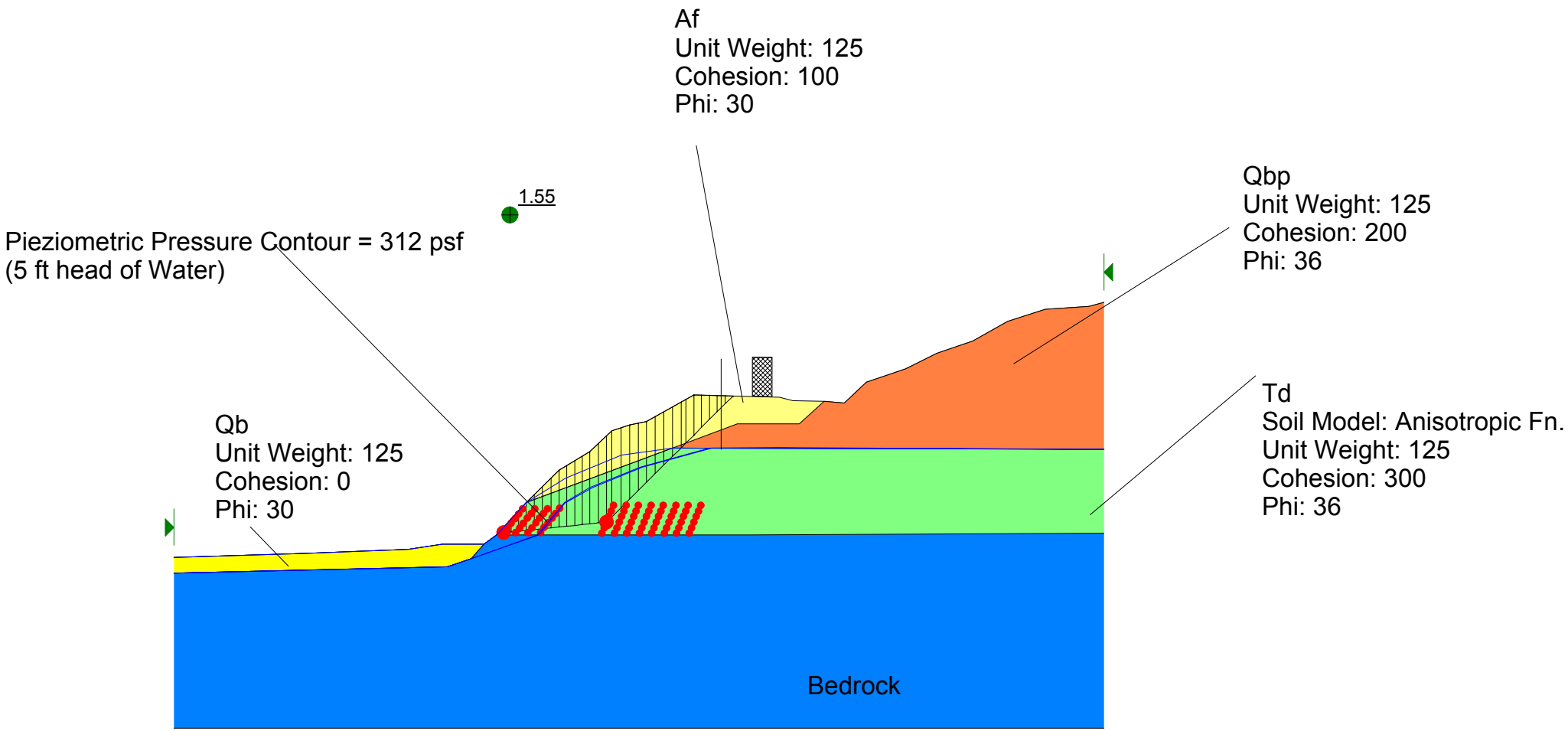


Del Mar Bluffs Section 3-3'
Slope Stability Analysis, No Water
File Name: Section 33 Static 6.slz
Analysis Method: Spencer

Factor of Safety: 1.63

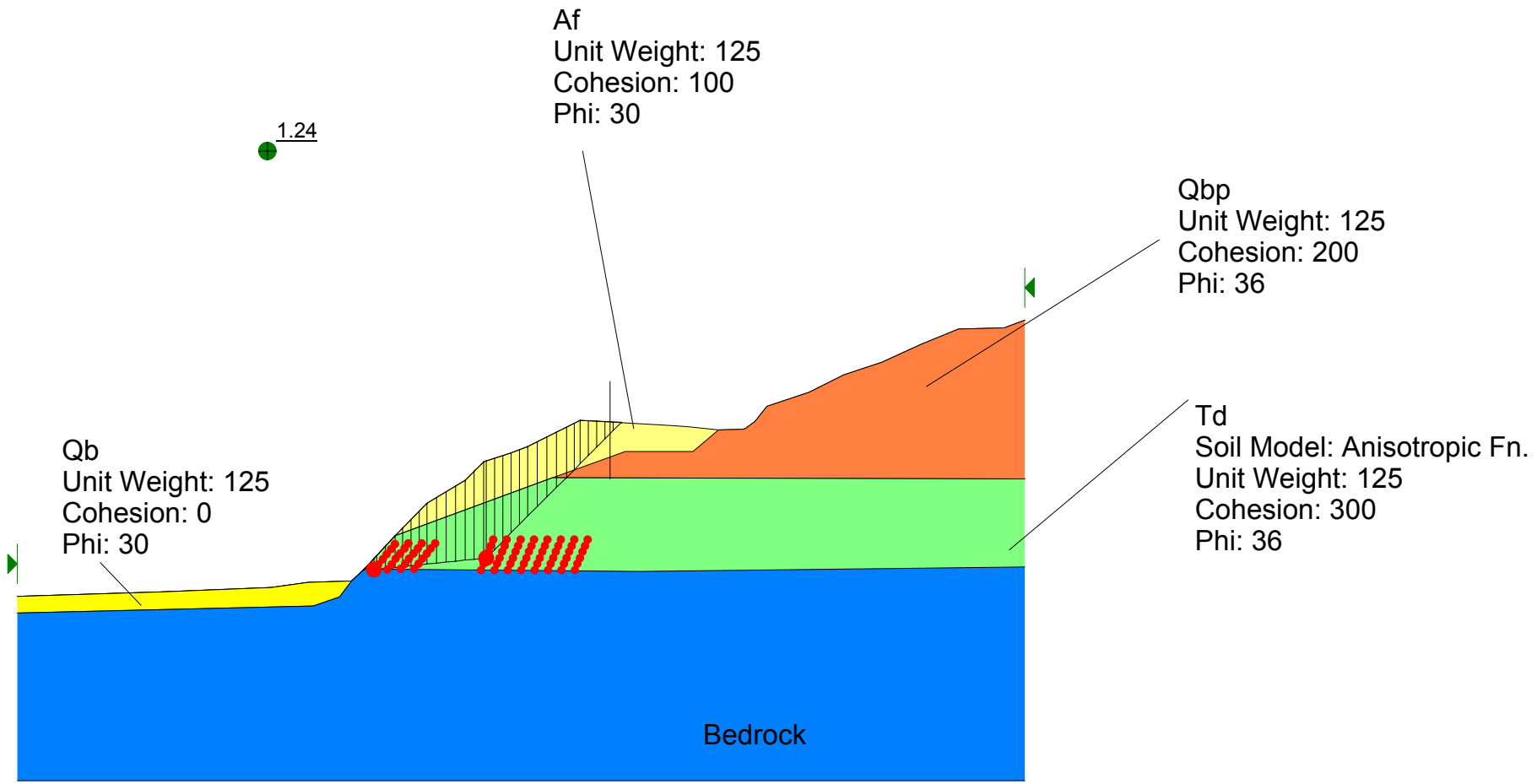


Del Mar Bluffs Section 3-3'
Slope Stability Analysis
File Name: Section 33 5ft Water Static 4 703.slz
Analysis Method: Spencer
Factor of Safety: 1.55
Surcharge = 3,000 psf



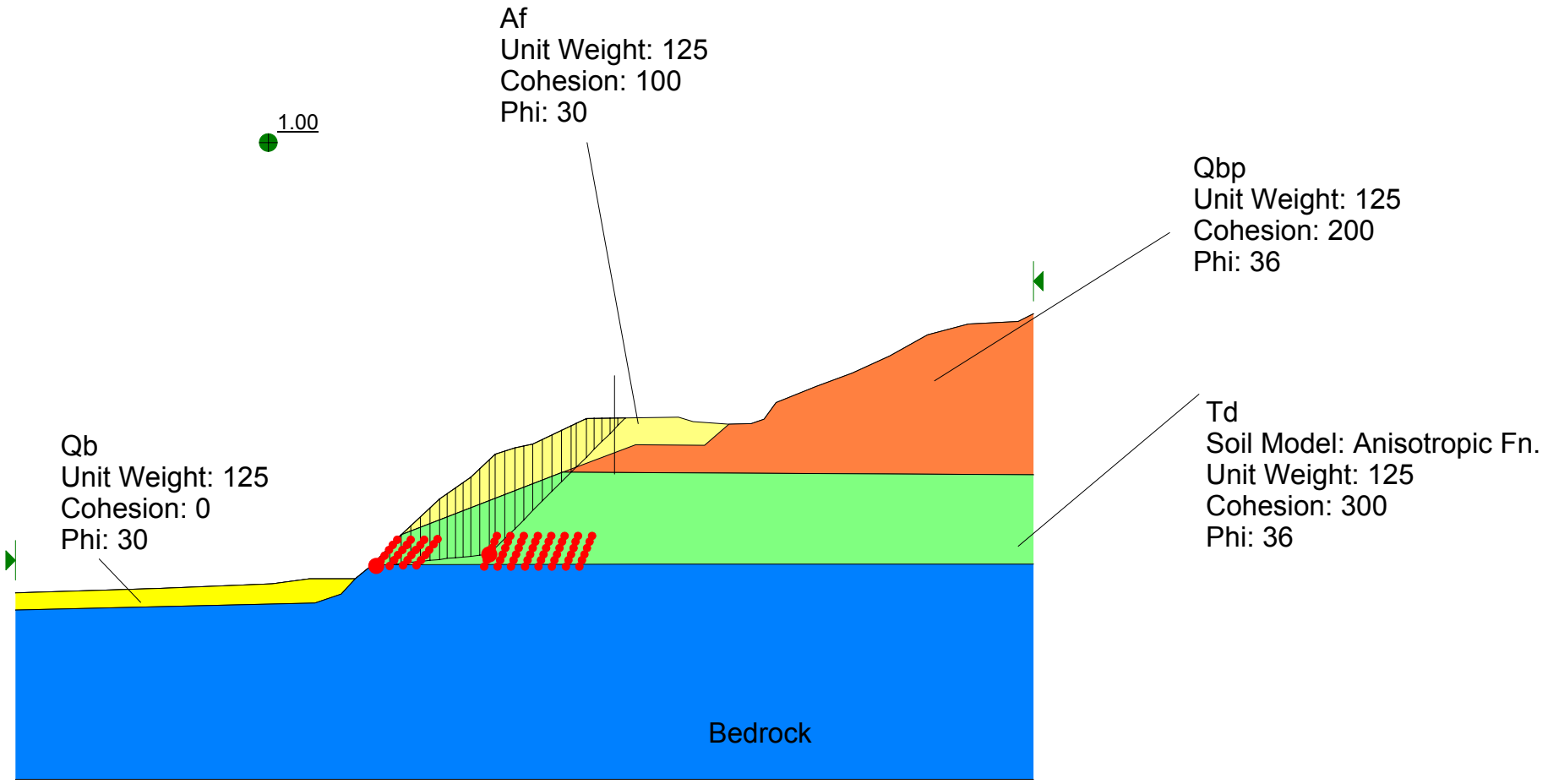
Del Mar Bluffs Section 3-3'
Slope Stability Analysis
File Name: Section 33 Psuedo Static 2.slz
Analysis Method: Spencer

Factor of Safety: 1.24
Seismic Coefficient = 0.15



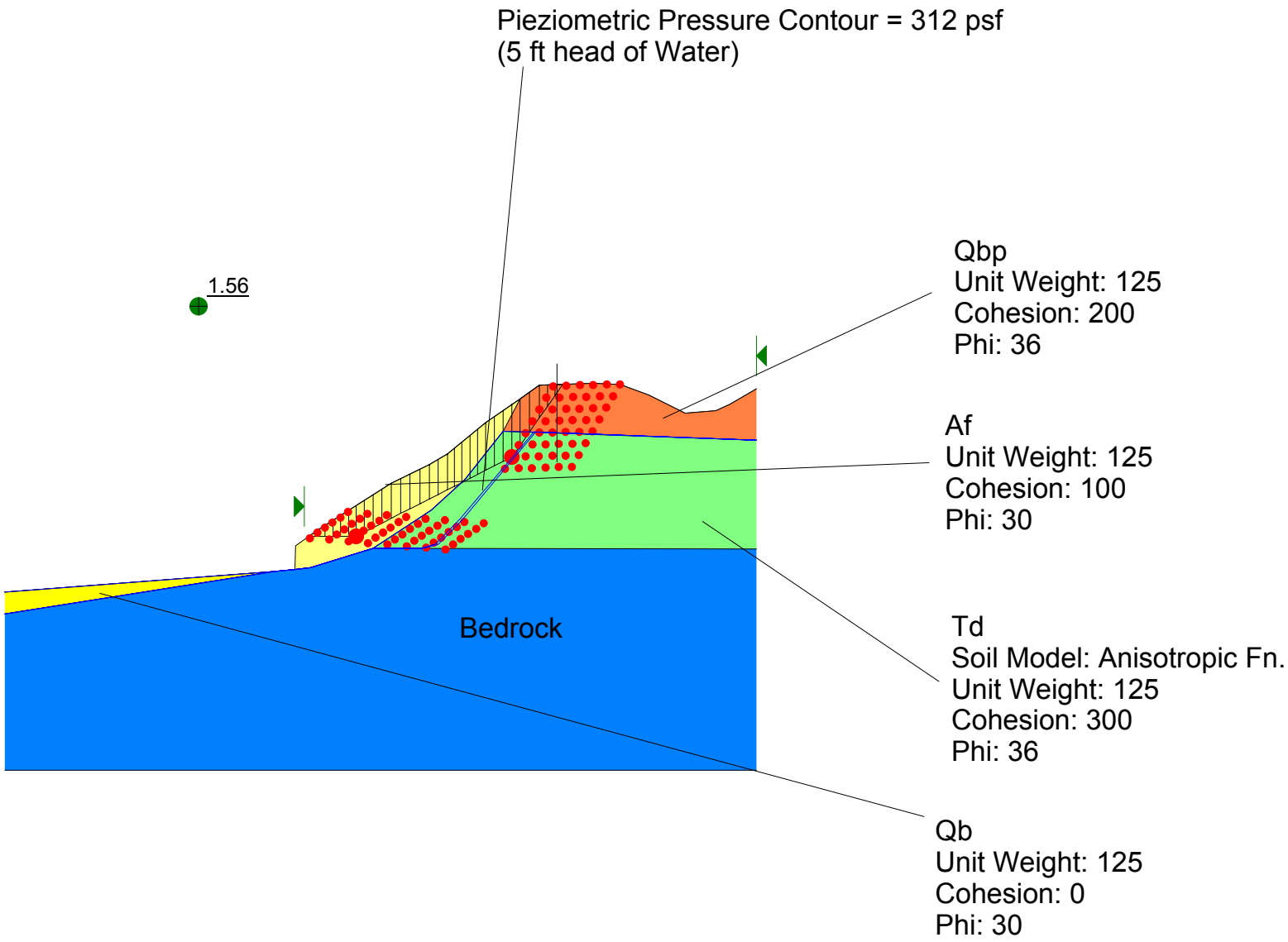
Del Mar Bluffs Section 3-3'
Slope Stability Analysis
File Name: Section 33 Psuedo Static 4.slz
Analysis Method: Spencer

Factor of Safety: 1
Seismic Coefficient = 0.28

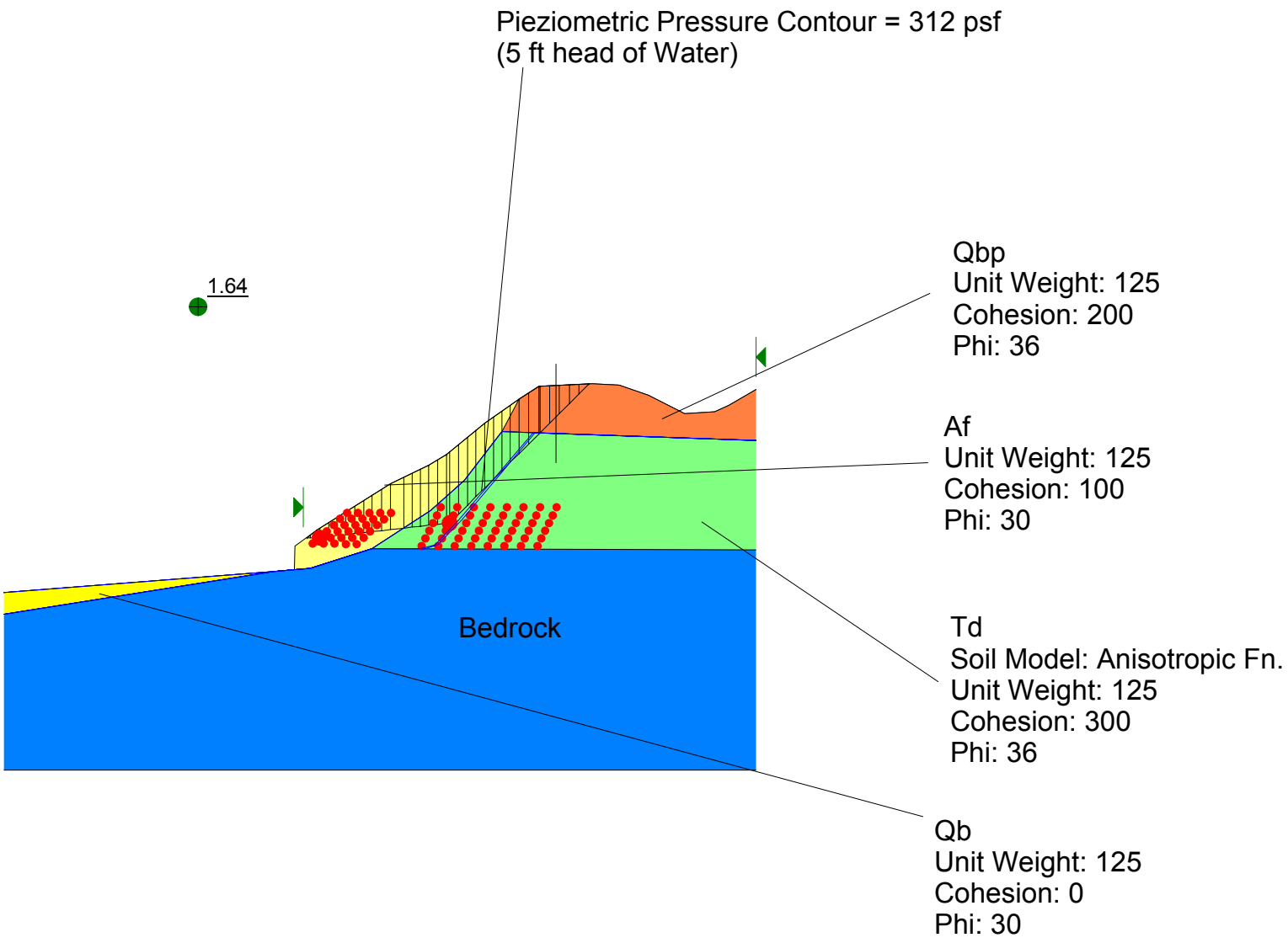


Cross Section 4-4’

Del Mar Bluffs Section 4-4'
Slope Stability Analysis
File Name: Section 44 5ft Water Static 1.slz
Analysis Method: Spencer
Factor of Safety: 1.56

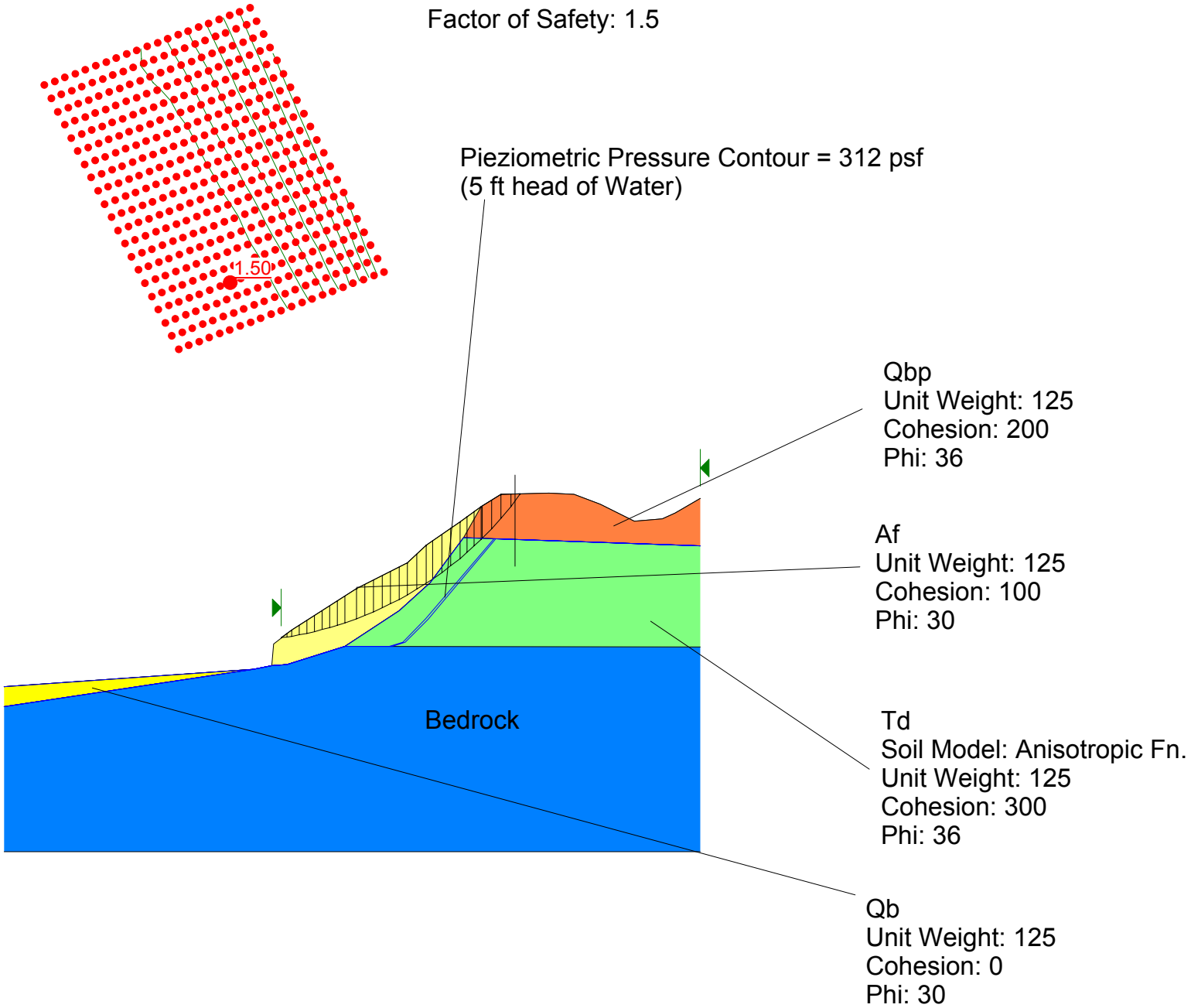


Del Mar Bluffs Section 4-4'
Slope Stability Analysis
File Name: Section 44 5ft Water Static 1B.slz
Analysis Method: Spencer
Factor of Safety: 1.64



Del Mar Bluffs Section 4-4'
Slope Stability Analysis
File Name: Section 44 5ft Water Static 2.slz
Analysis Method: Bishop

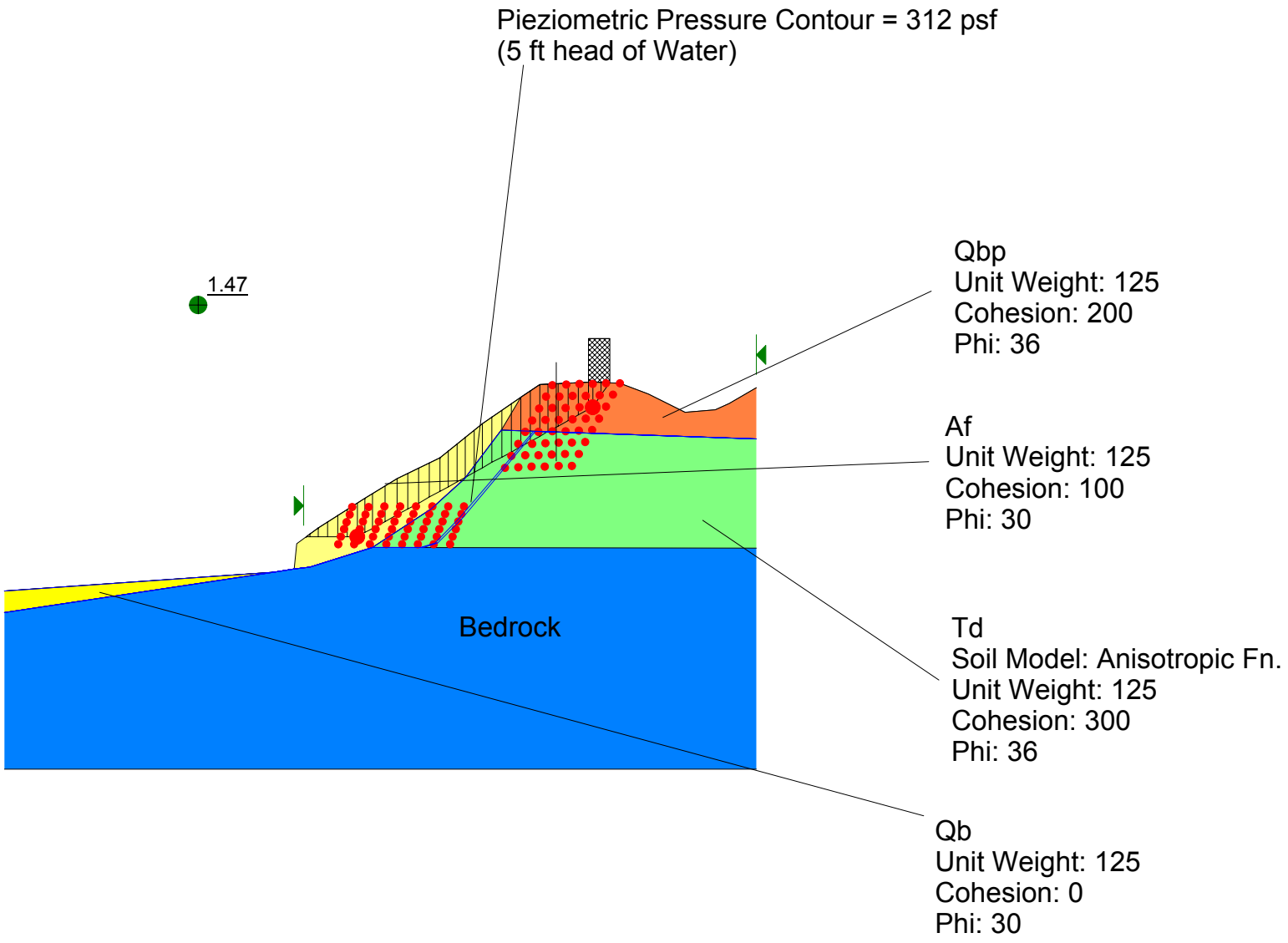
Factor of Safety: 1.5



Del Mar Bluffs Section 4-4'
Slope Stability Analysis
File Name: Section 44 5ft Water Static 3.slz
Analysis Method: Spencer

Factor of Safety: 1.47

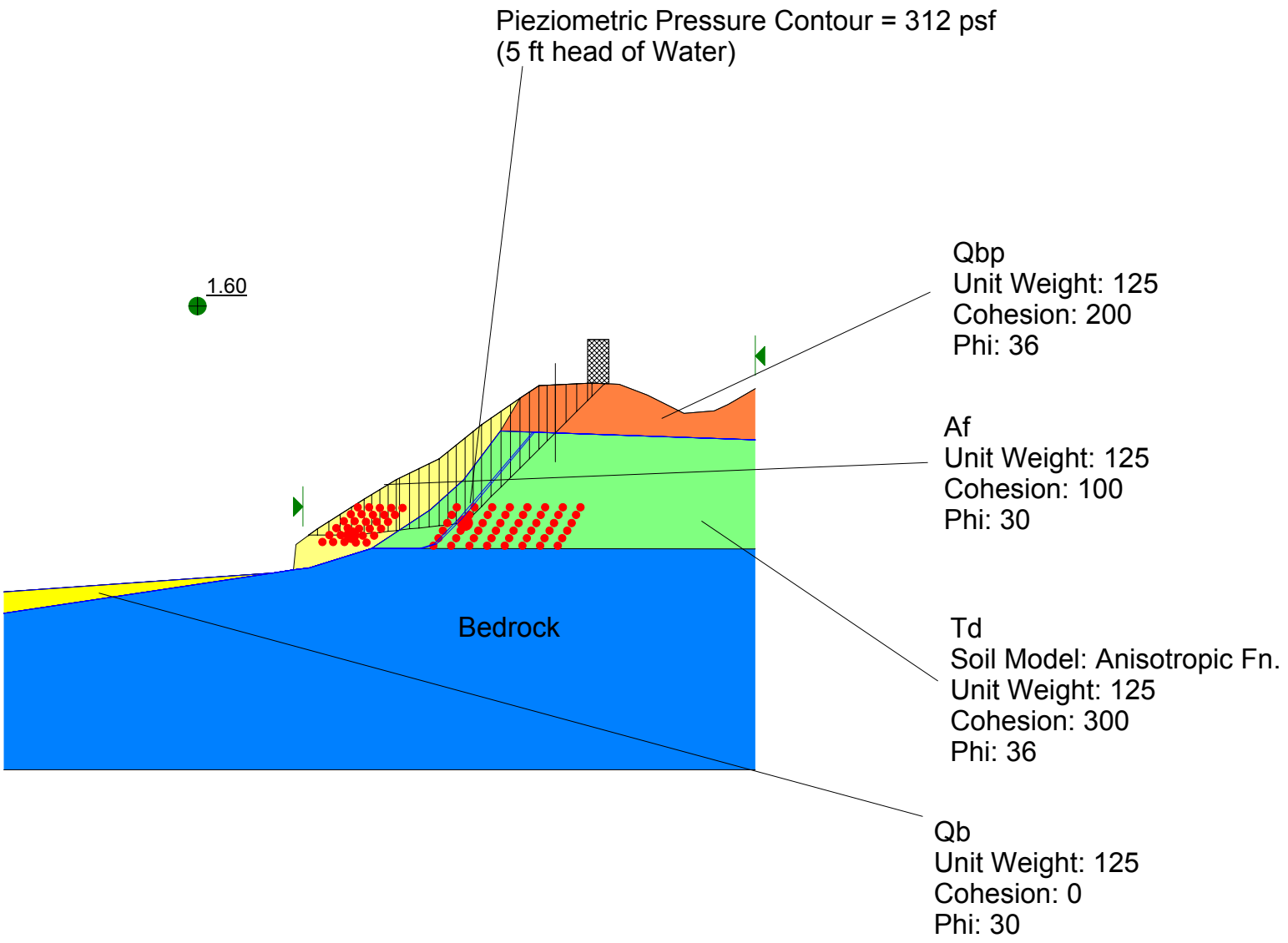
Surcharge = 3,000 psf

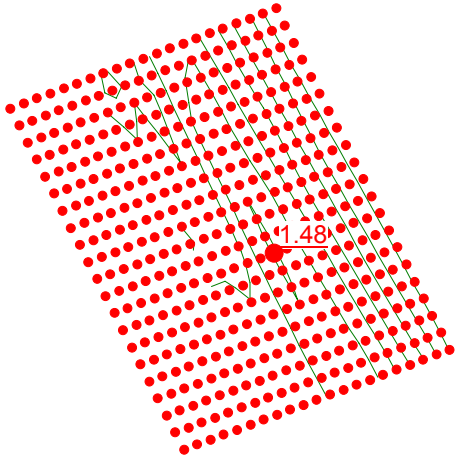


Del Mar Bluffs Section 4-4'
Slope Stability Analysis
File Name: Section 44 5ft Water Static 3B.slz
Analysis Method: Spencer

Factor of Safety: 1.6

Surcharge = 3,000 psf





Del Mar Bluffs Section 4-4'
Slope Stability Analysis
File Name: Section 44 5ft Water Static 4.slz
Analysis Method: Bishop
Factor of Safety: 1.48
Surcharge = 3,000 psf

Pieziometric Pressure Contour = 312 psf
(5 ft head of Water)

Qbp
Unit Weight: 125
Cohesion: 200
Phi: 36

Af
Unit Weight: 125
Cohesion: 100
Phi: 30

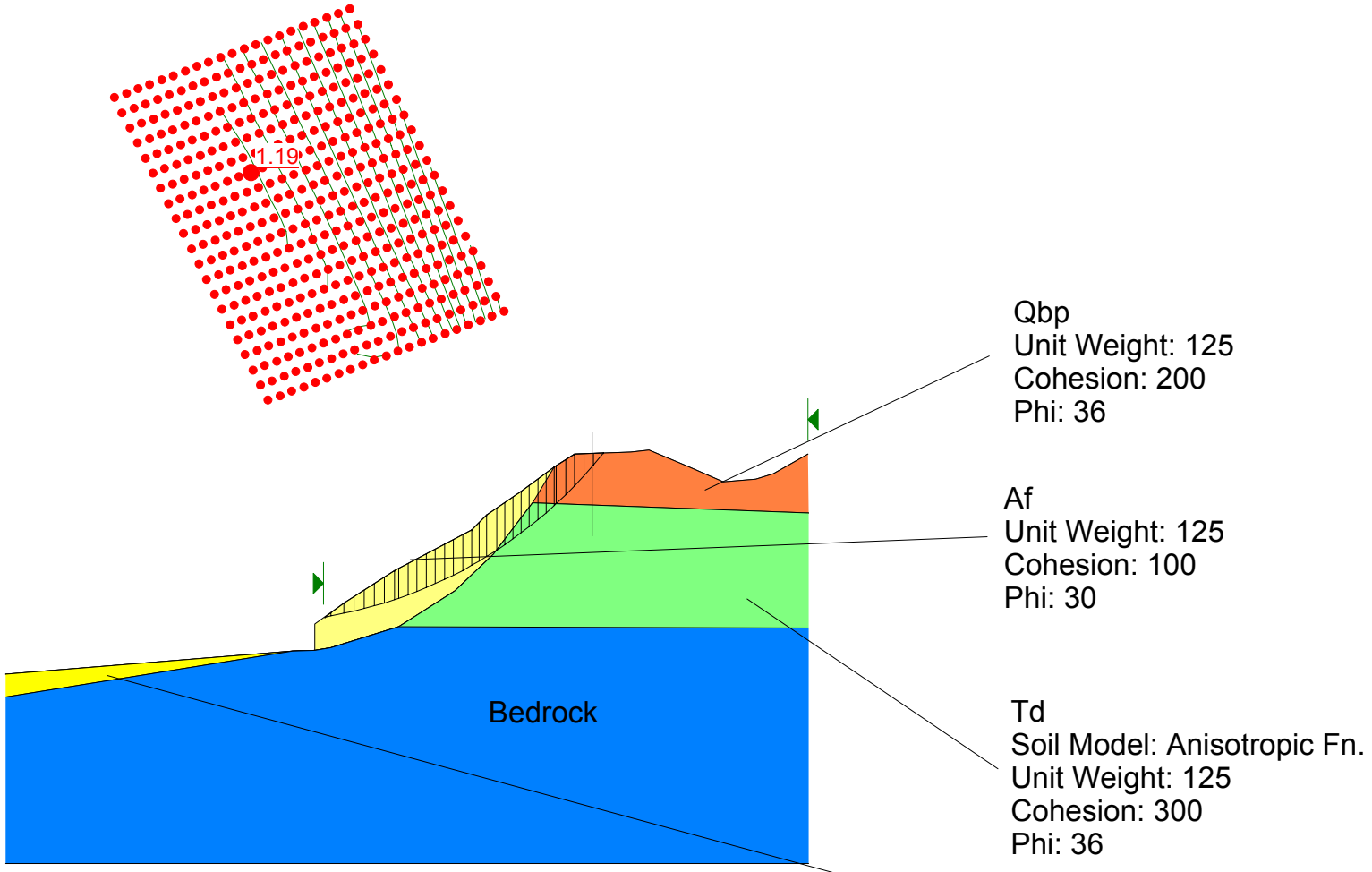
Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Qb
Unit Weight: 125
Cohesion: 0
Phi: 30

Bedrock

Del Mar Bluffs Section 4-4'
Slope Stability Analysis
File Name: Section 44 Pseudo Static 1.slz
Analysis Method: Bishop

Factor of Safety: 1.19
Seismic Coefficient = 0.15



Qbp
Unit Weight: 125
Cohesion: 200
Phi: 36

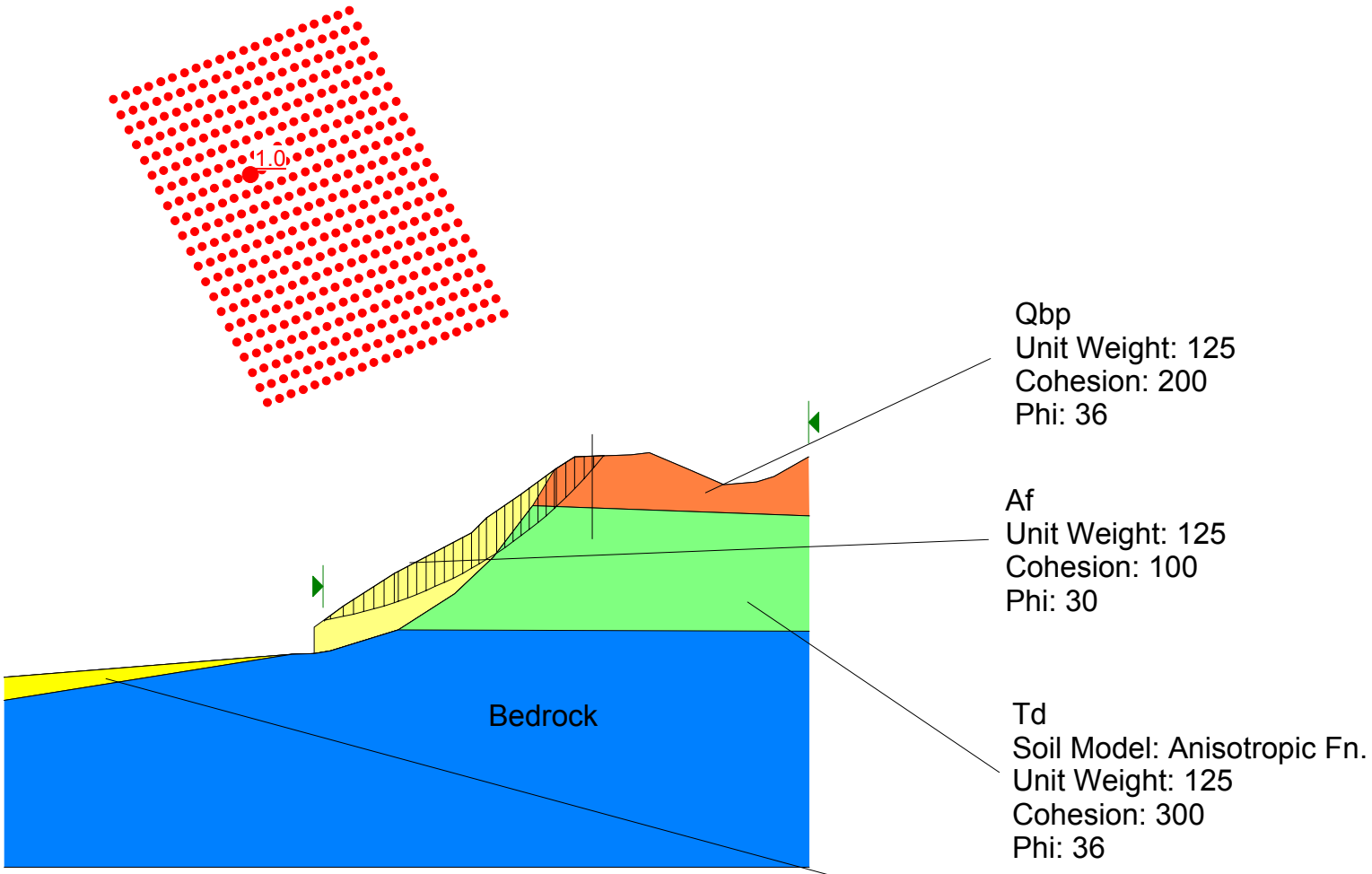
Af
Unit Weight: 125
Cohesion: 100
Phi: 30

Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

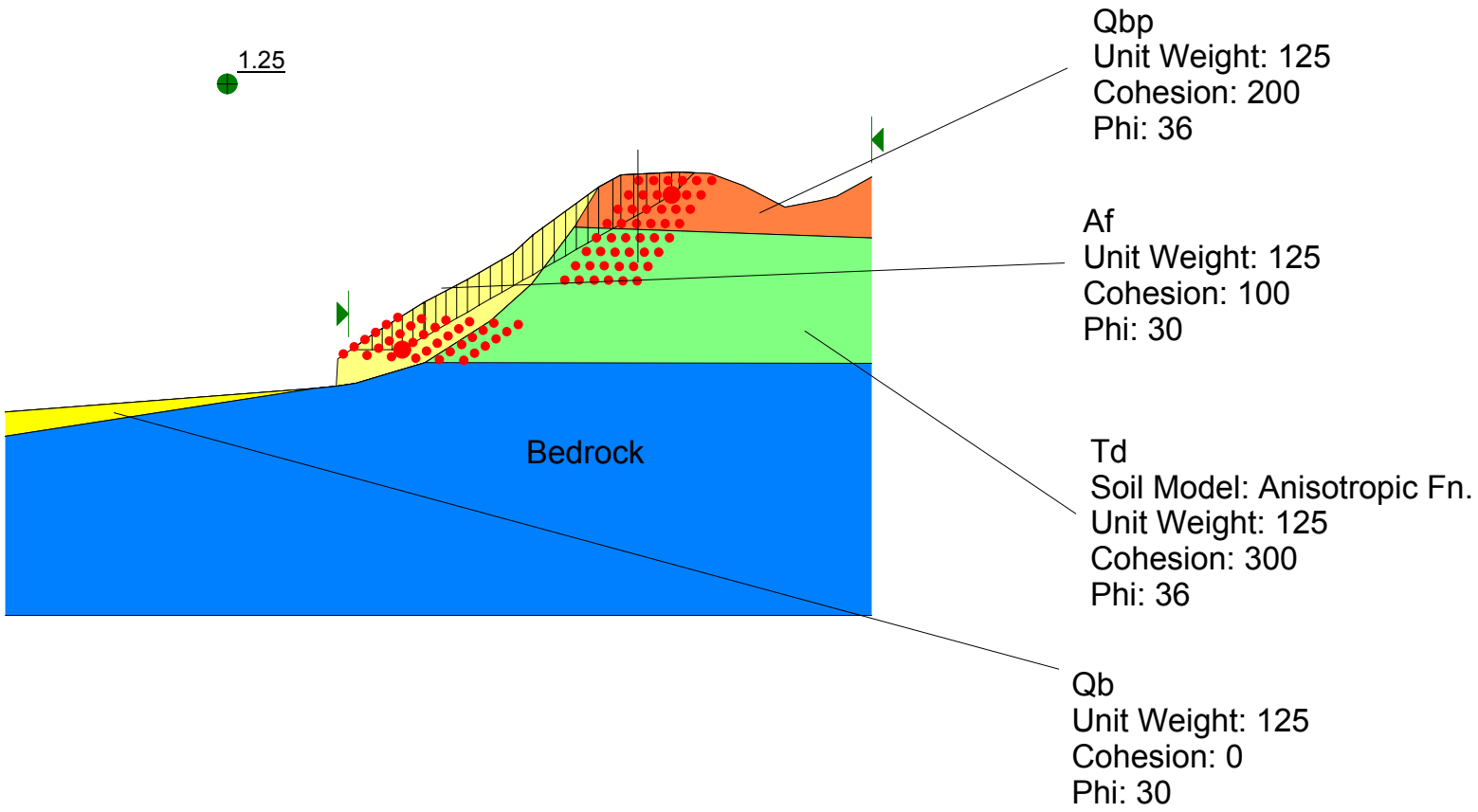
Qb
Unit Weight: 125
Cohesion: 0
Phi: 30

Del Mar Bluffs Section 4-4'
Slope Stability Analysis
File Name: Section 44 Pseudo Static 2.slz
Analysis Method: Bishop

Factor of Safety: 0.96
Seismic Coefficient = 0.28

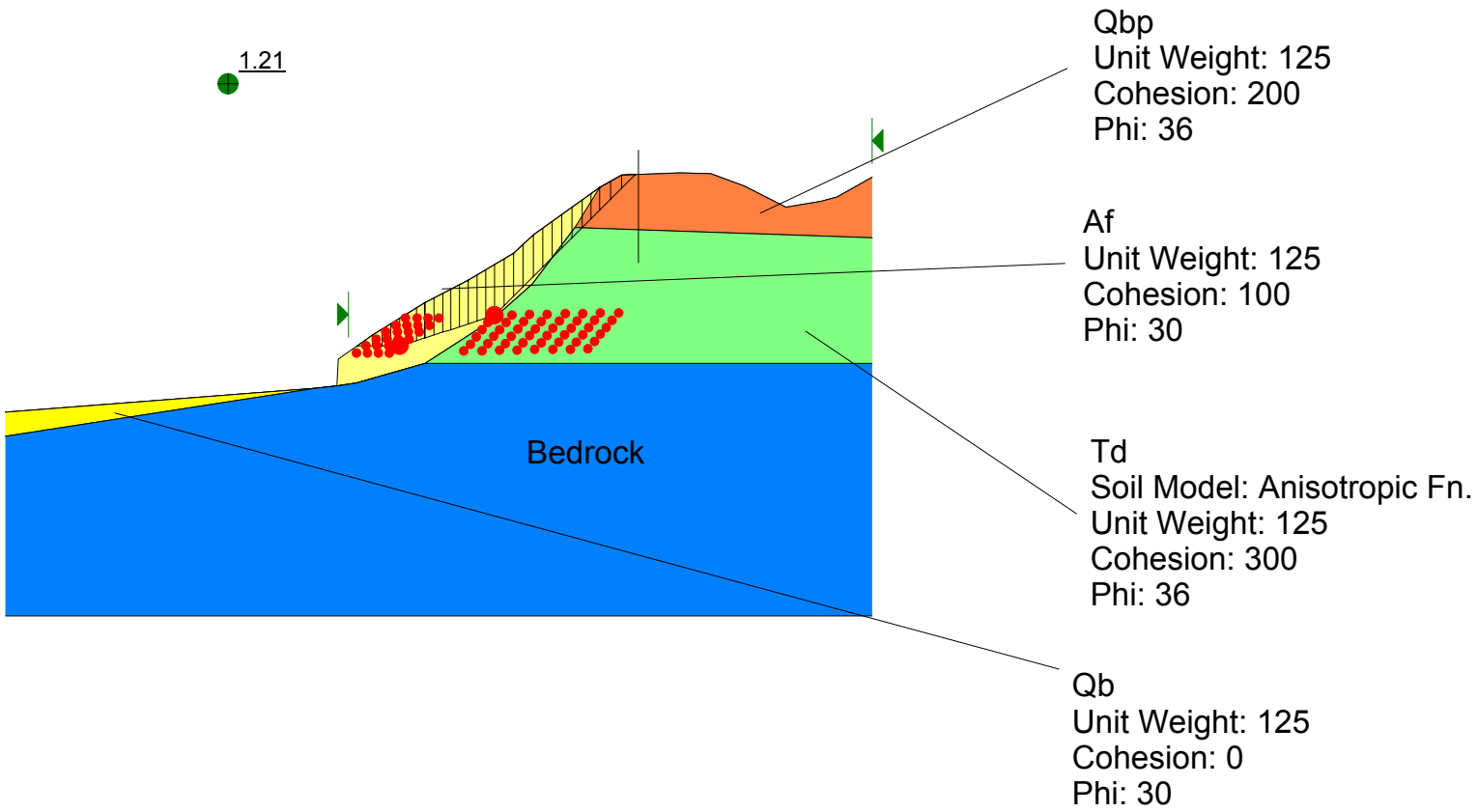


Del Mar Bluffs Section 4-4'
Slope Stability Analysis
File Name: Section 44 Pseudo Static 3.slz
Analysis Method: Spencer
Factor of Safety: 1.25
Seismic Coefficient = 0.15



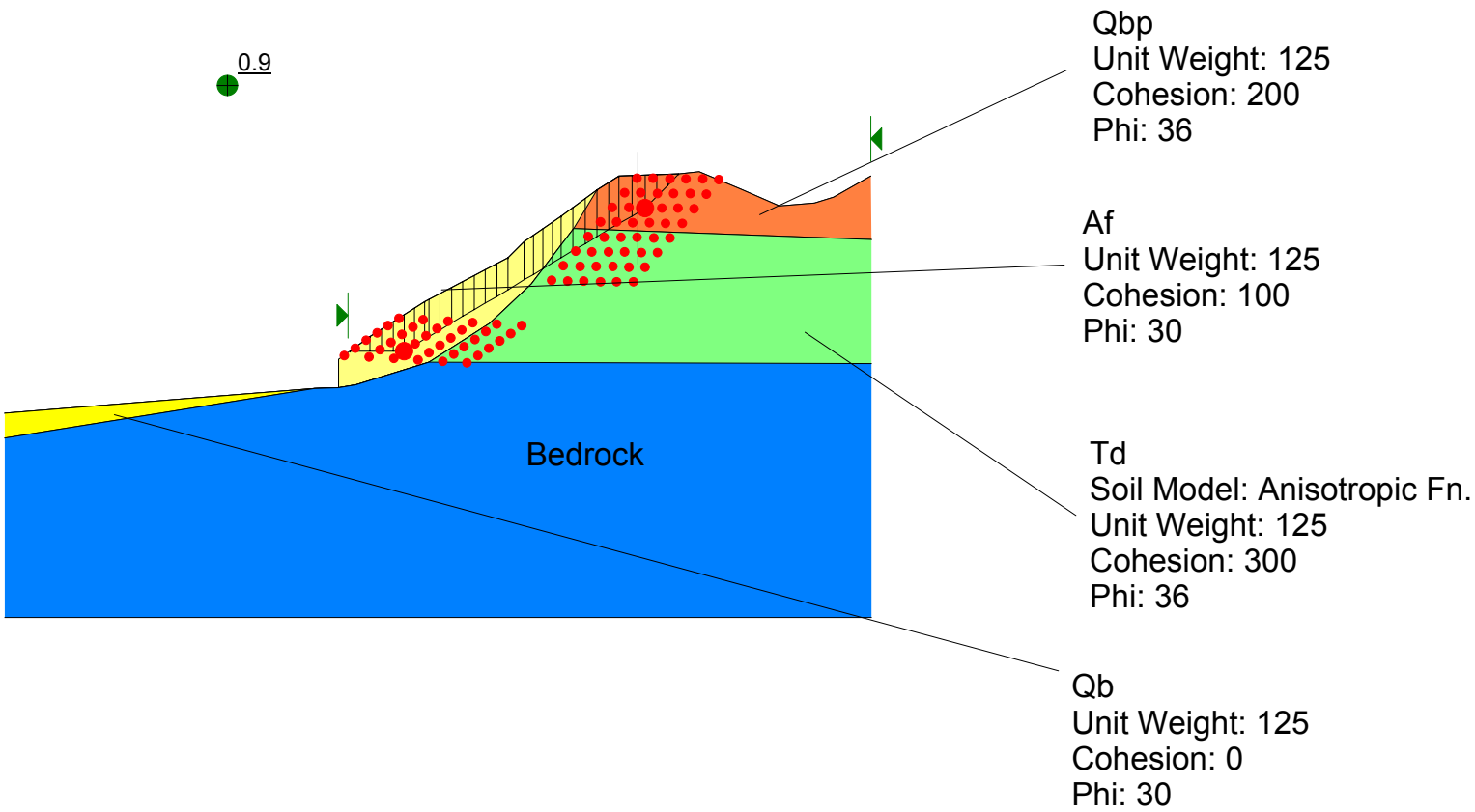
Del Mar Bluffs Section 4-4'
Slope Stability Analysis
File Name: Section 44 Pseudo Static 3B.slz
Analysis Method: Spencer

Factor of Safety: 1.21
Seismic Coefficient = 0.15



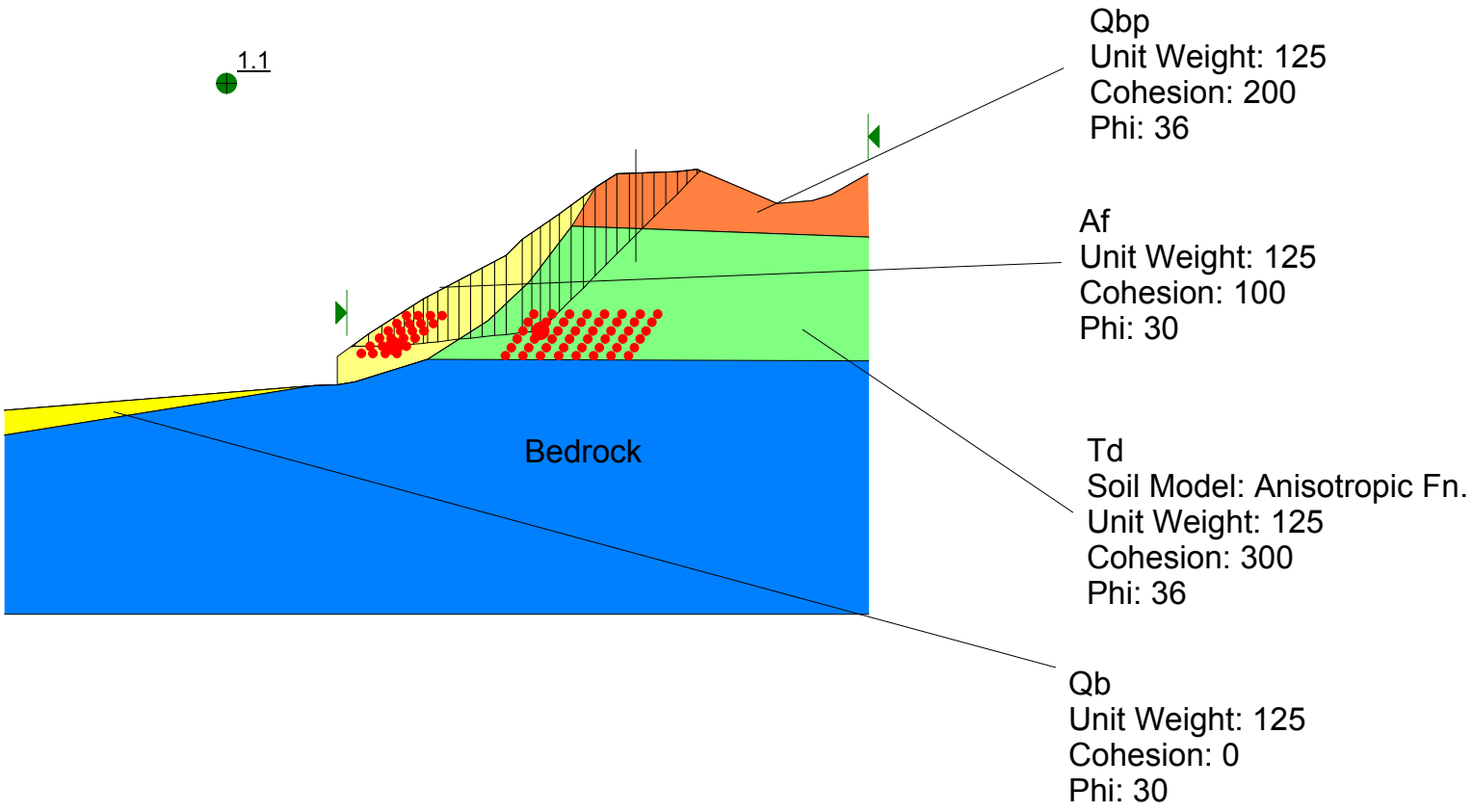
Del Mar Bluffs Section 4-4'
Slope Stability Analysis
File Name: Section 44 Pseudo Static 4.slz
Analysis Method: Spencer

Factor of Safety: 0.93
Seismic Coefficient = 0.28



Del Mar Bluffs Section 4-4'
Slope Stability Analysis
File Name: Section 44 Pseudo Static 4B.slz
Analysis Method: Spencer

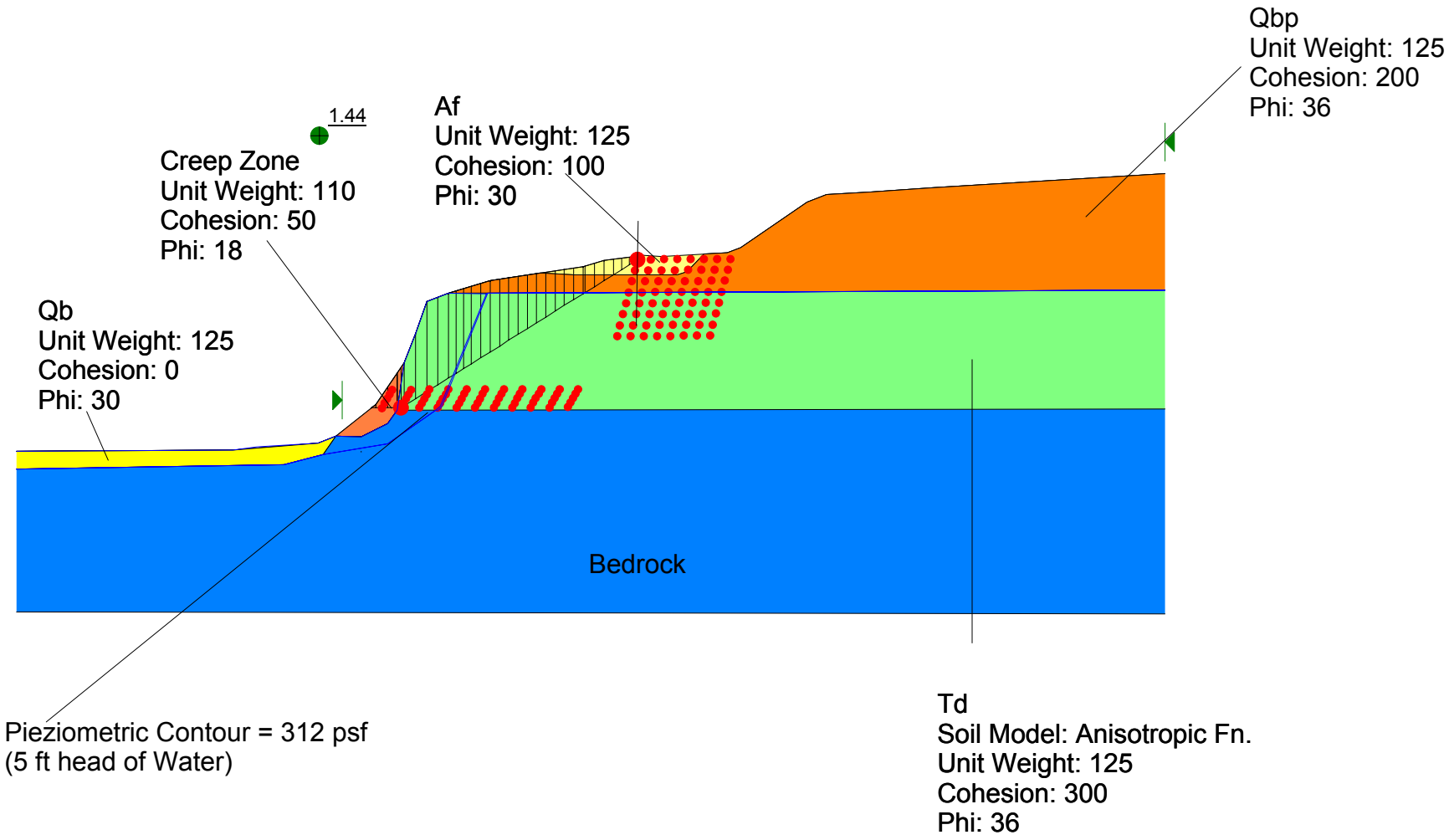
Factor of Safety: 1.1
Seismic Coefficient = 0.28



Cross Section 5-5’

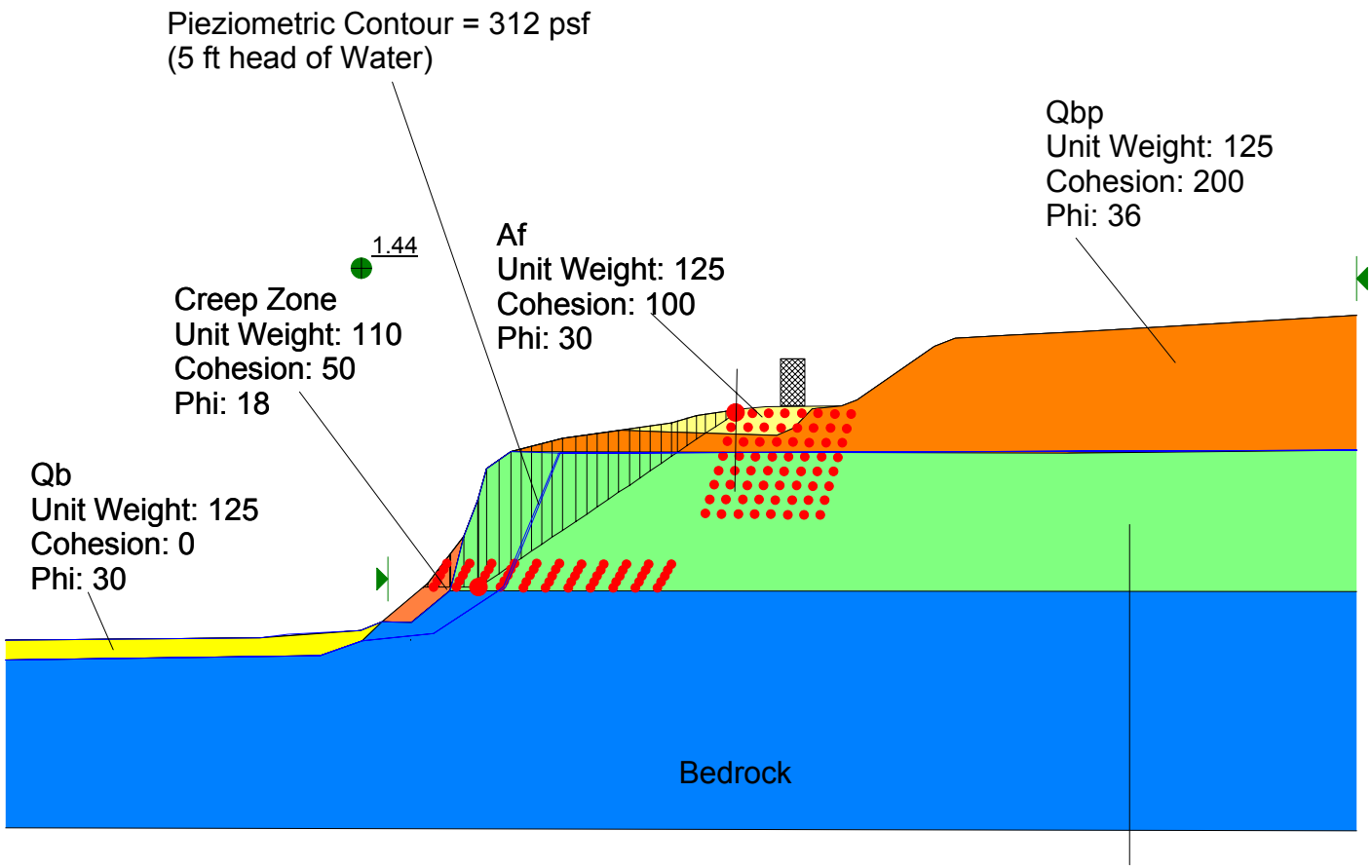
Del Mar Bluffs Cross Section 5-5'
Slope Stability Analysis
File Name: Section 55 5 ft Water Static 2.slz
Analysis Method: Spencer

Factor of Safety: 1.44



Del Mar Bluffs Cross Section 5-5'
Slope Stability Analysis
File Name: Section 55 5 ft Water Static 4.slz
Analysis Method: Spencer

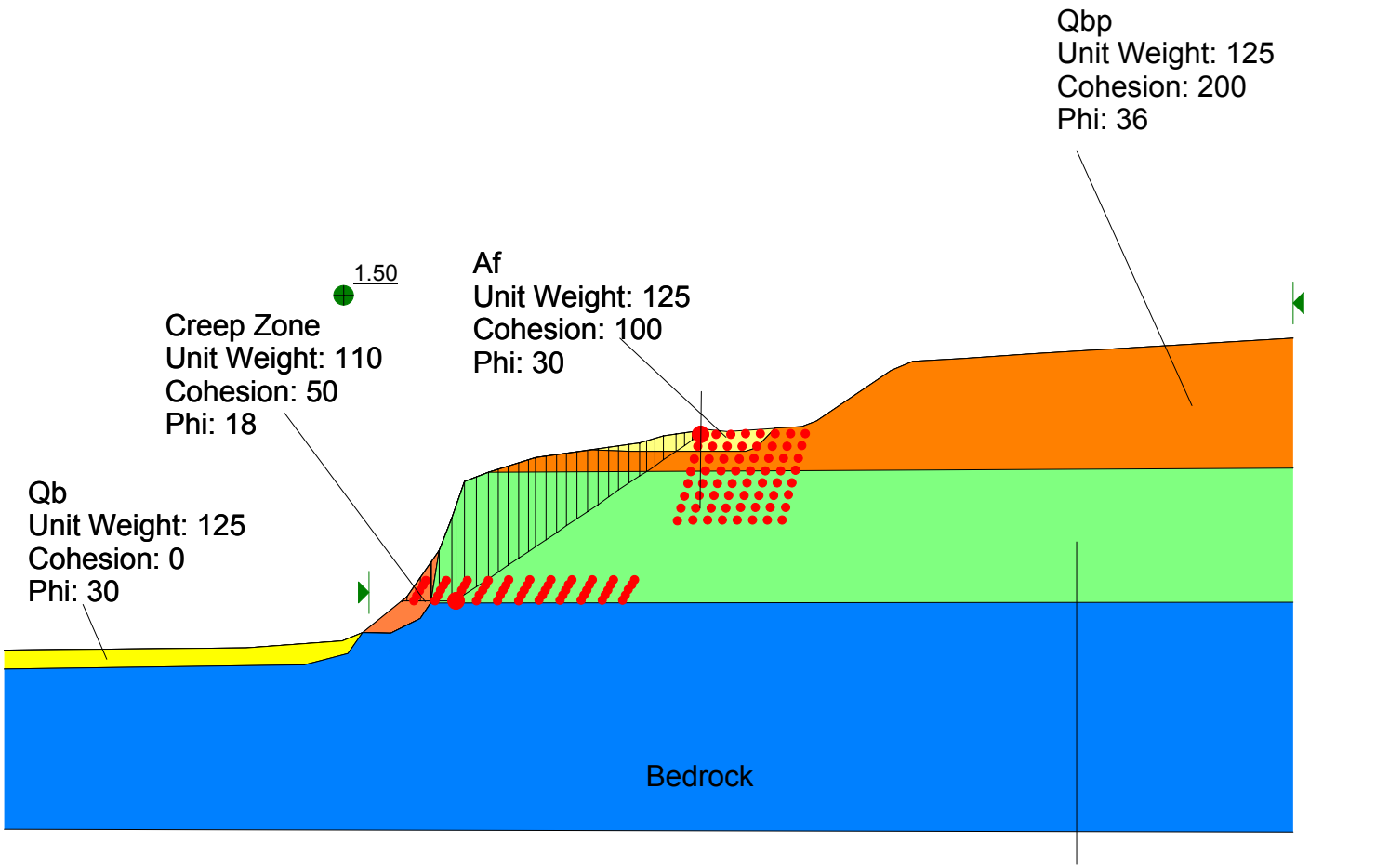
Factor of Safety: 1.44
Surcharge = 3,000 psf



Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Del Mar Bluffs Cross Section 5-5'
Slope Stability Analysis, No Water
File Name: Section 55 Static 5.slz
Analysis Method: Spencer

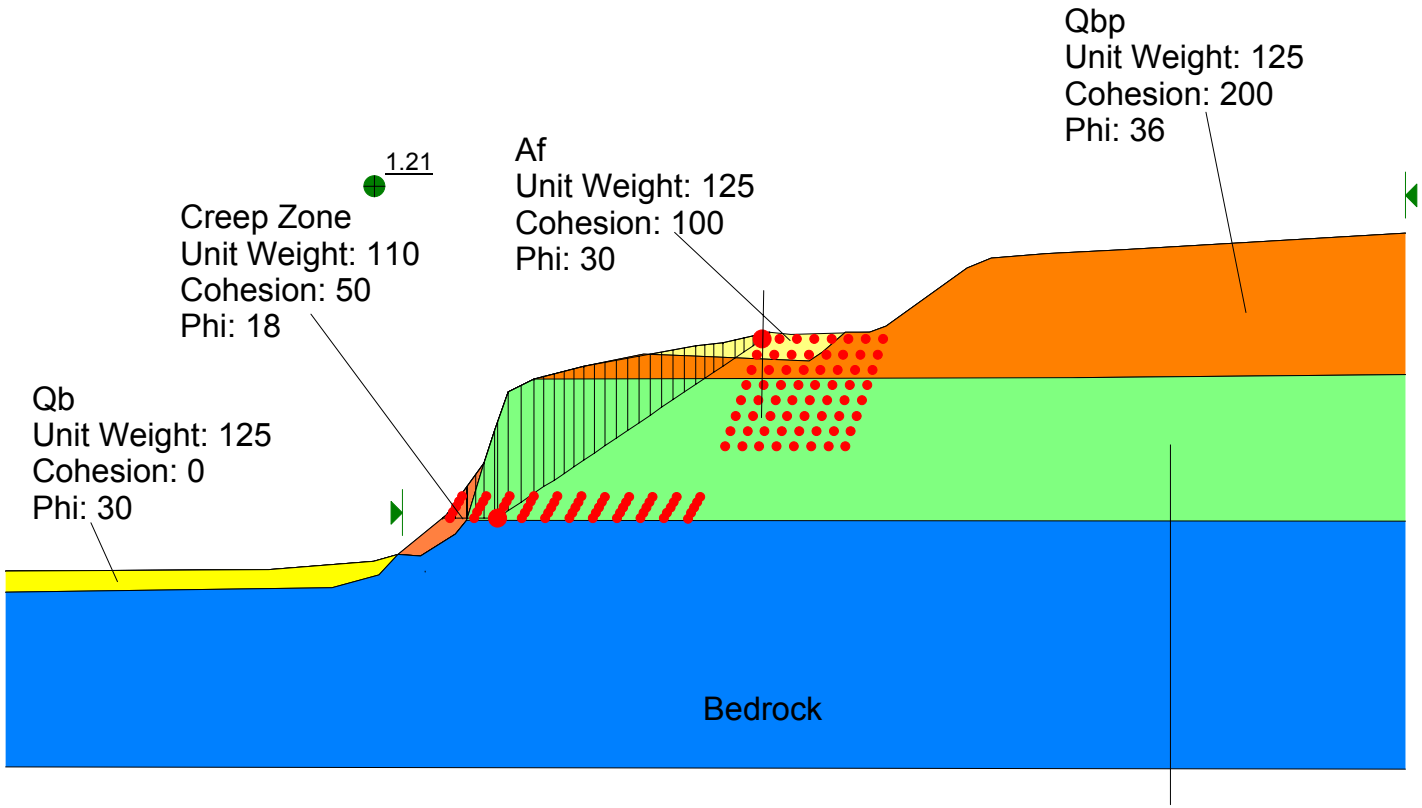
Factor of Safety: 1.5



Del Mar Bluffs Cross Section 5-5'
Slope Stability Analysis
File Name: Section 55 Psuedo Static 2.slz
Analysis Method: Spencer

Factor of Safety: 1.21

Seismic Coefficient =0.15

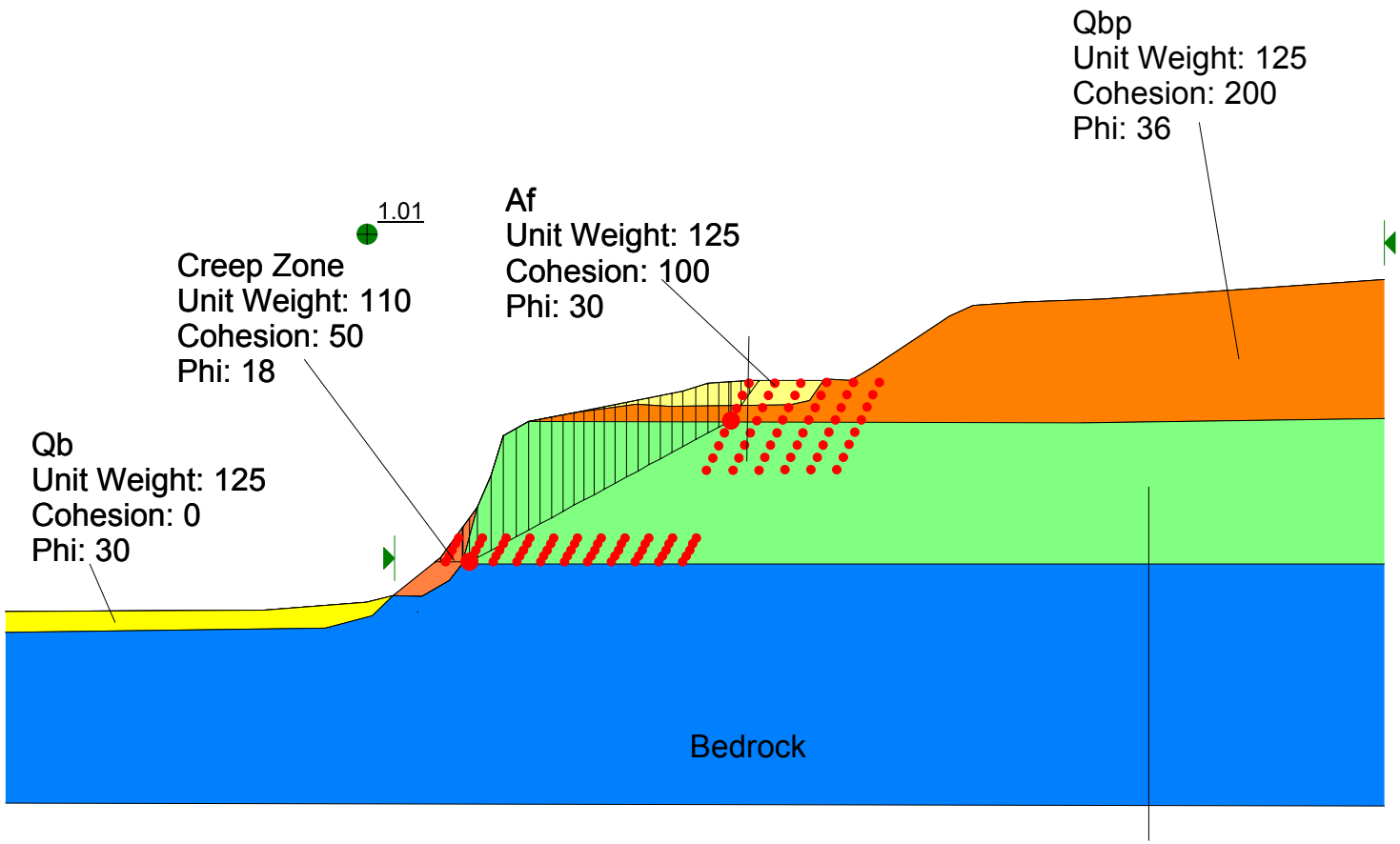


Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Del Mar Bluffs Cross Section 5-5'
Slope Stability Analysis
File Name: Section 55 Psuedo Static 4.slz
Analysis Method: Spencer

Factor of Safety: 1.01

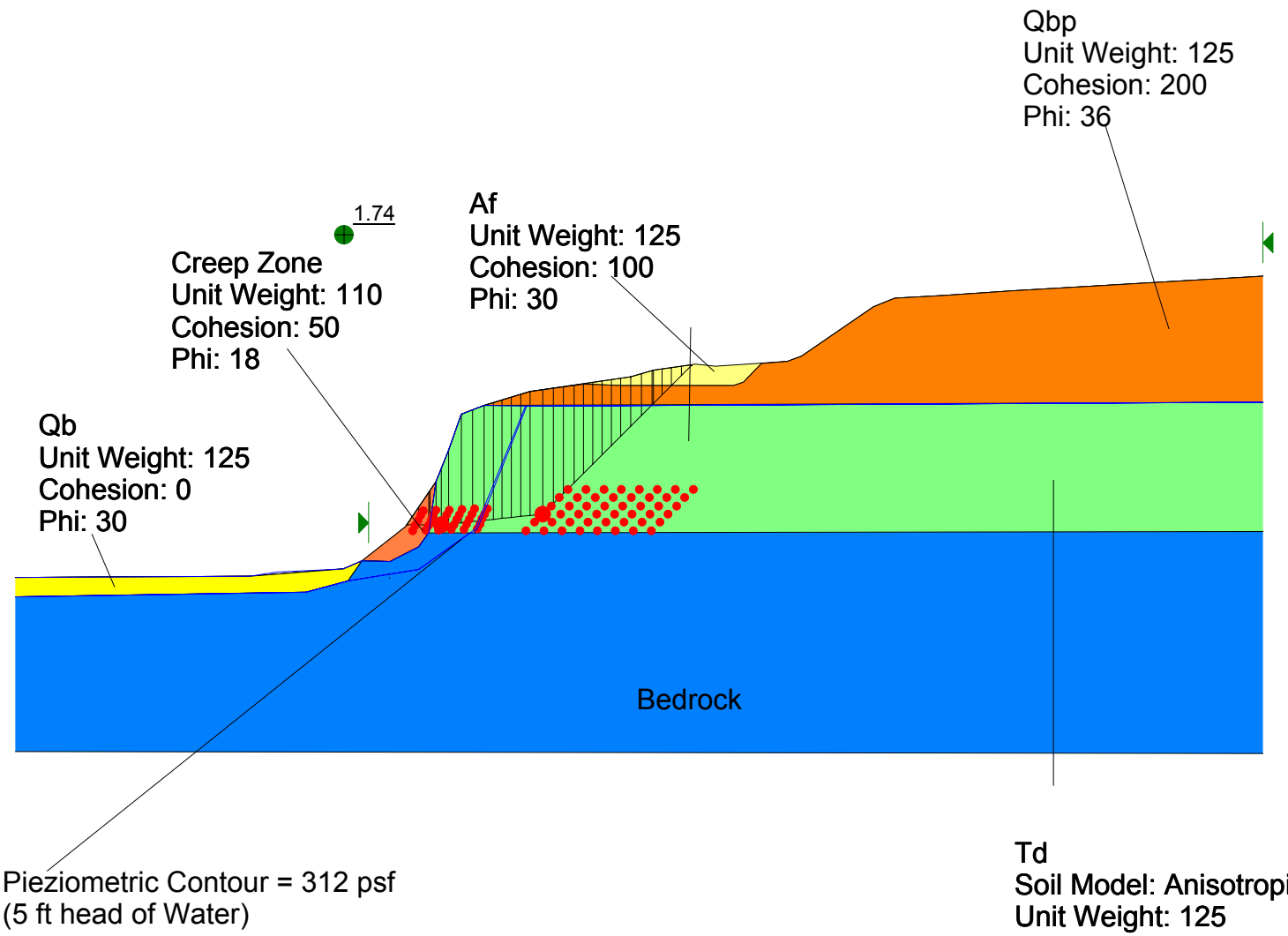
Seismic Coefficient =0.28



Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

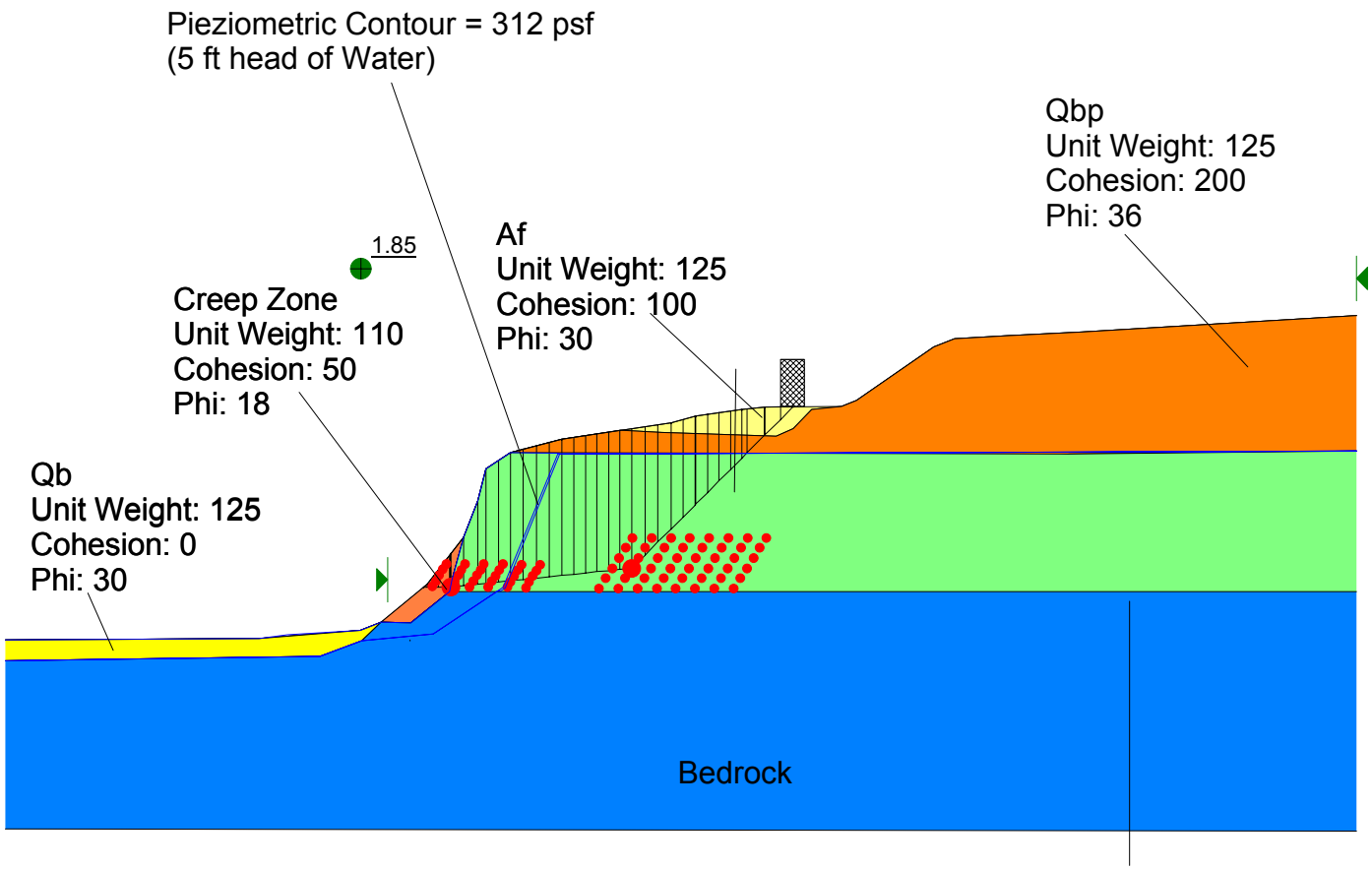
Del Mar Bluffs Cross Section 5-5'
Slope Stability Analysis
File Name: Section 55 5 ft Water Static 2B.slz
Analysis Method: Spencer

Factor of Safety: 1.74



Del Mar Bluffs Cross Section 5-5'
Slope Stability Analysis
File Name: Section 55 5 ft Water Static 4B.slz
Analysis Method: Spencer

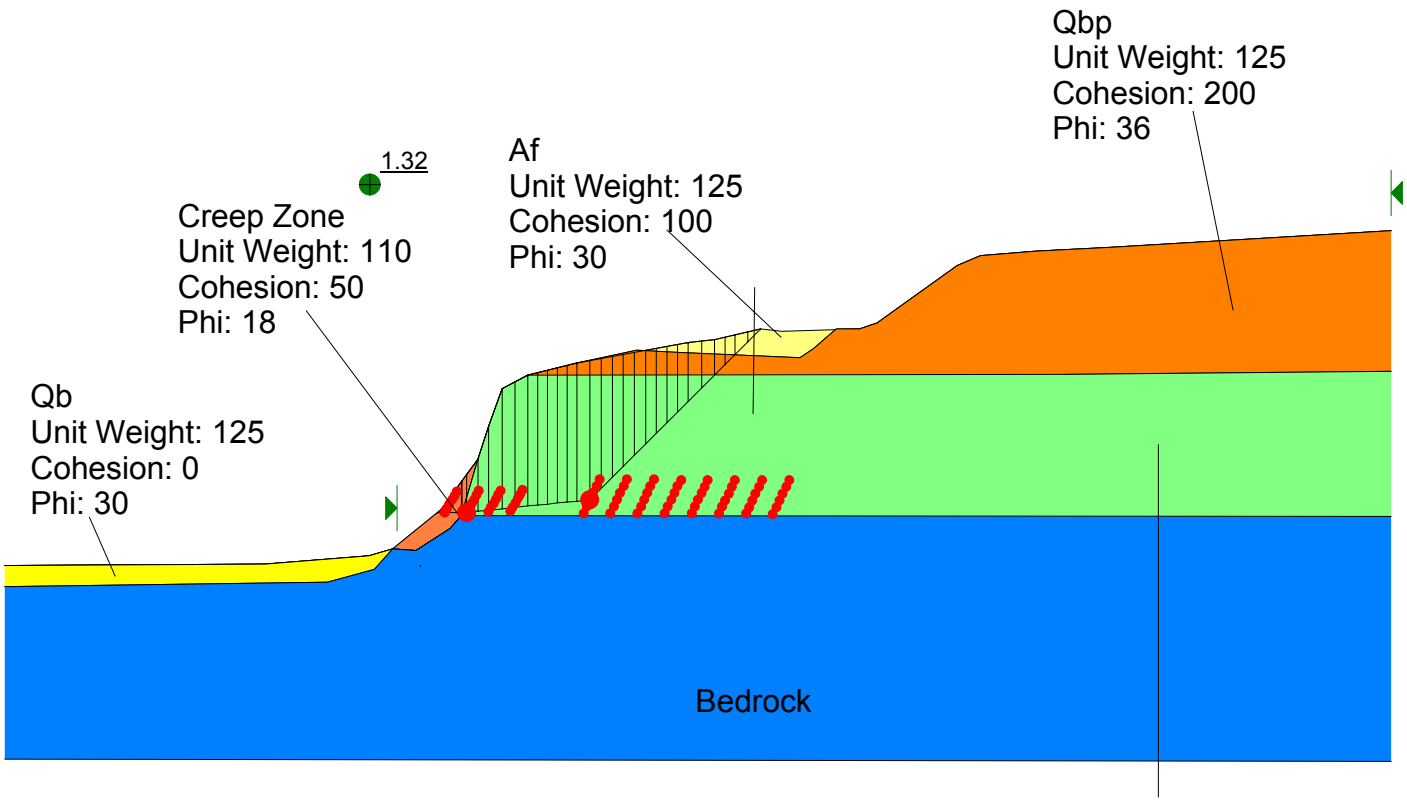
Factor of Safety: 1.85
Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 5-5'
Slope Stability Analysis
File Name: Section 55 Psuedo Static 2B.slz
Analysis Method: Spencer

Factor of Safety: 1.32

Seismic Coefficient =0.15

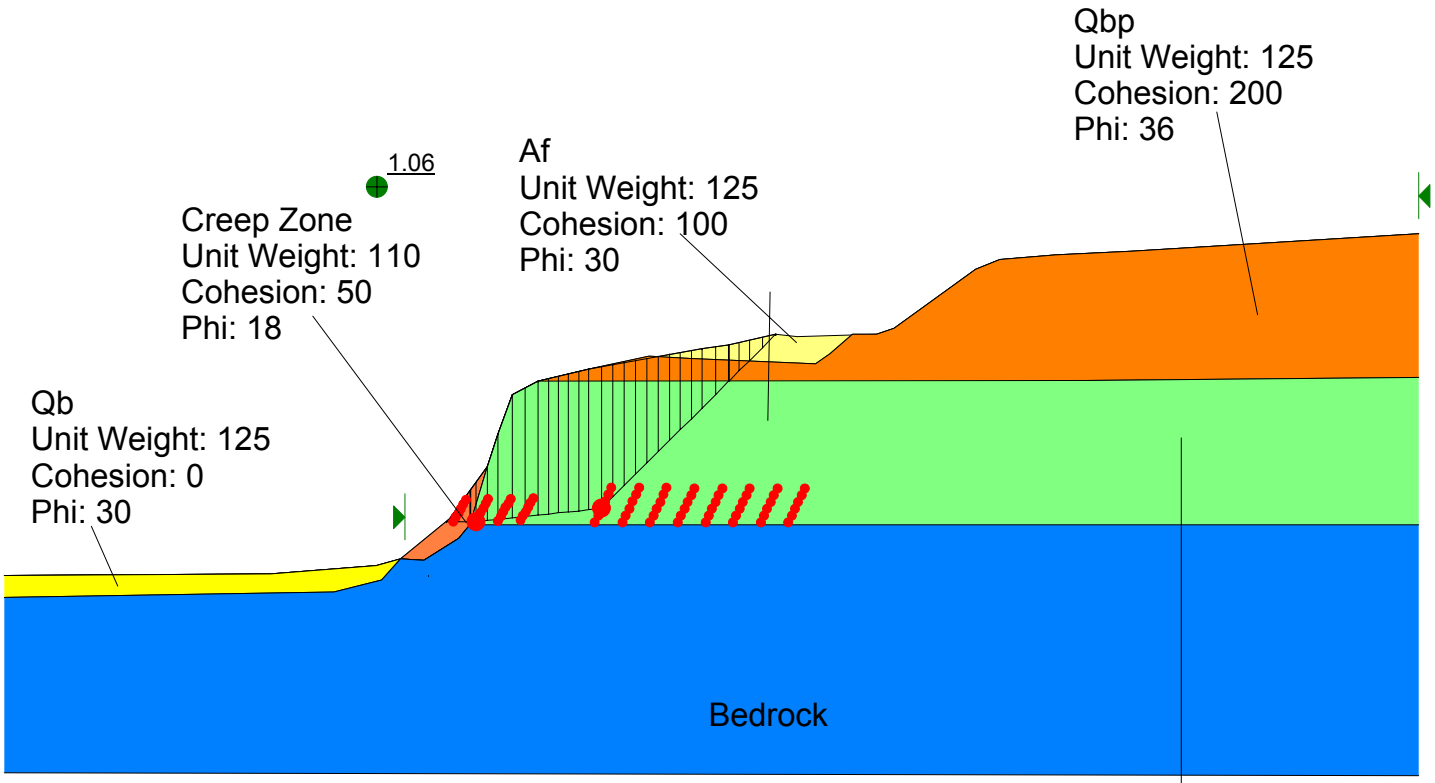


Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Del Mar Bluffs Cross Section 5-5'
Slope Stability Analysis
File Name: Section 55 Psuedo Static 4B.slz
Analysis Method: Spencer

Factor of Safety: 1.06

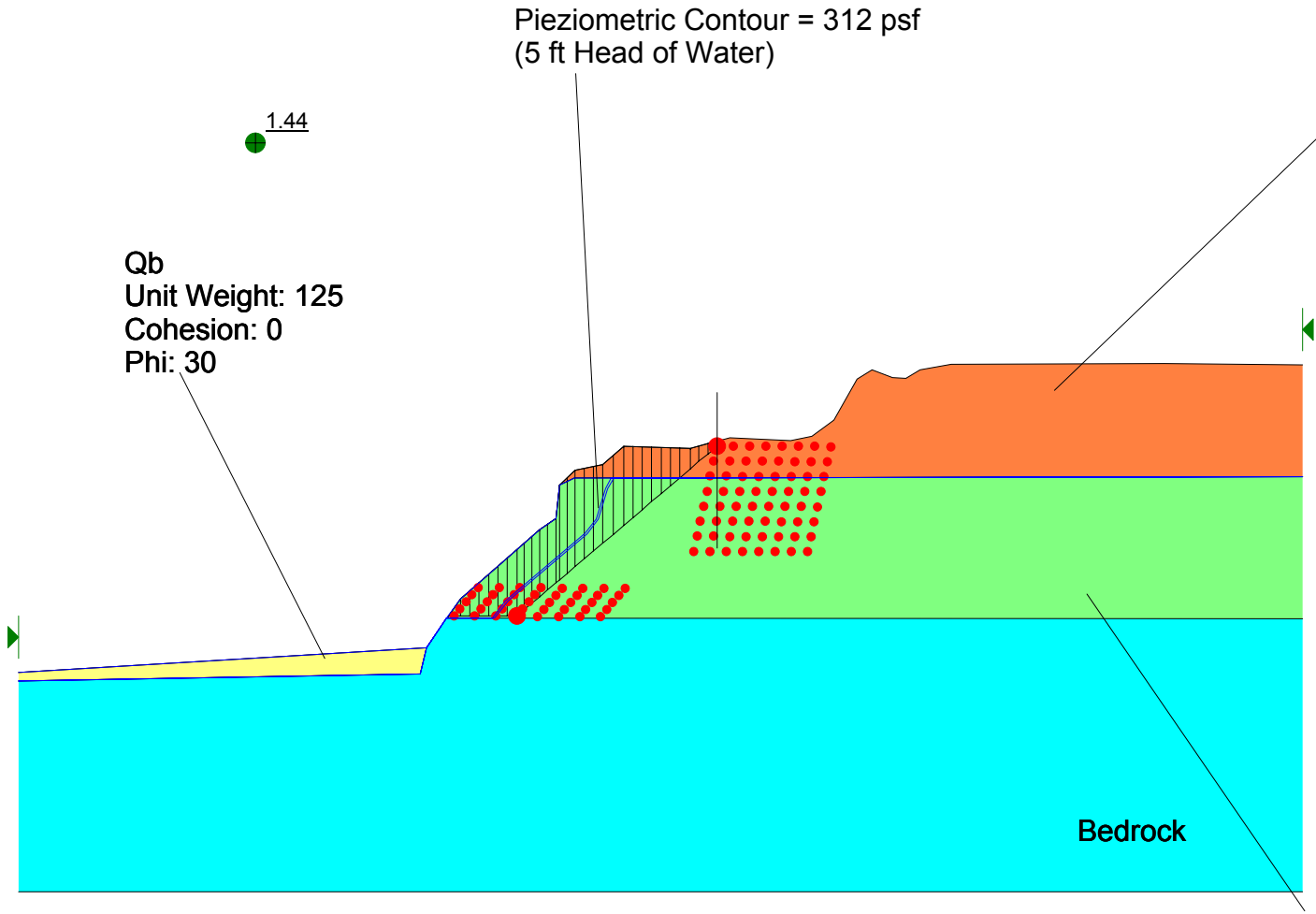
Seismic Coefficient =0.28



Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

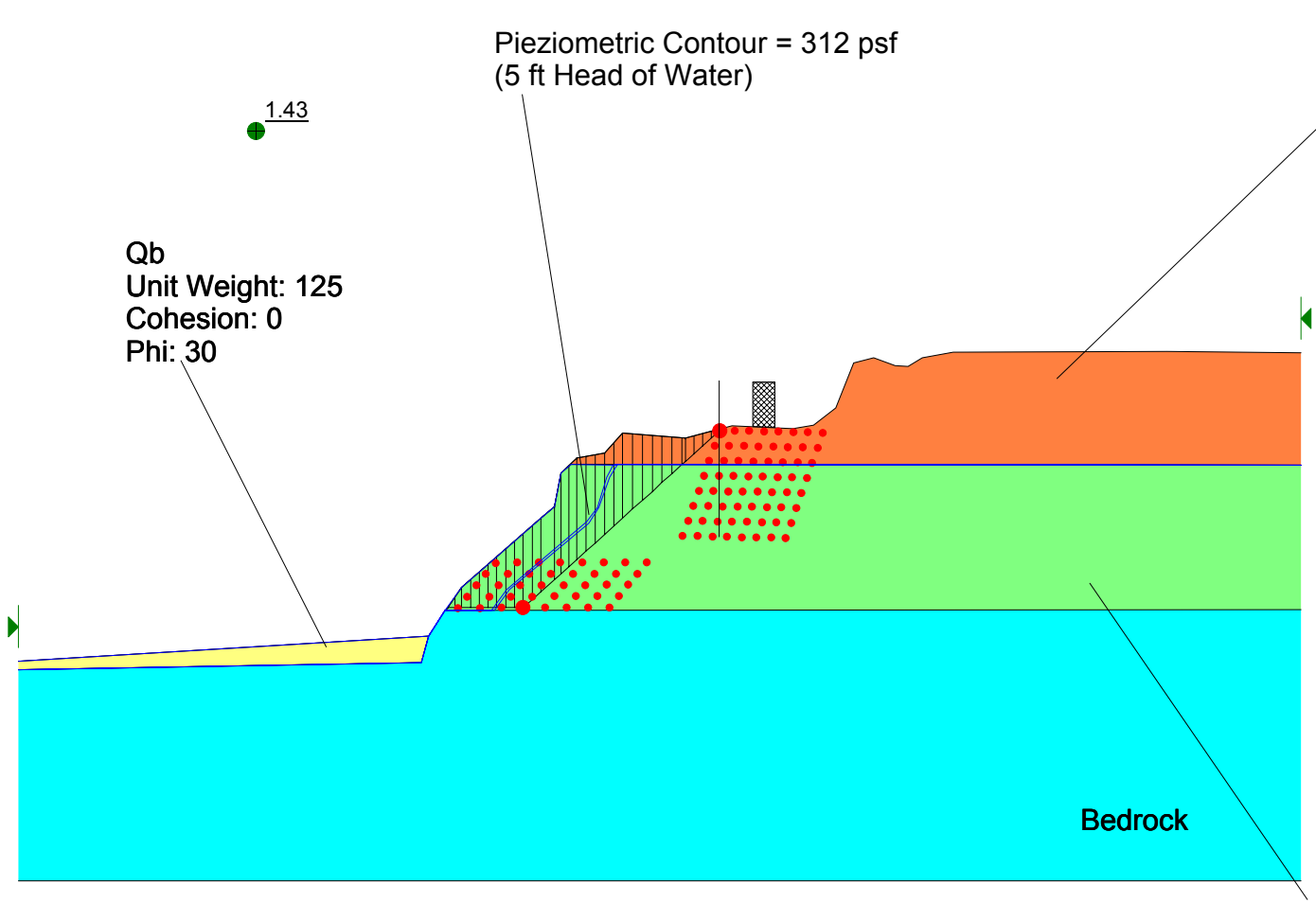
Cross Section 6-6’

Del Mar Bluffs Cross Section 6-6'
Slope Stability Analysis
File Name: Section 66 Static 2.slz
Analysis Method: Spencer
Factor of Safety: 1.44



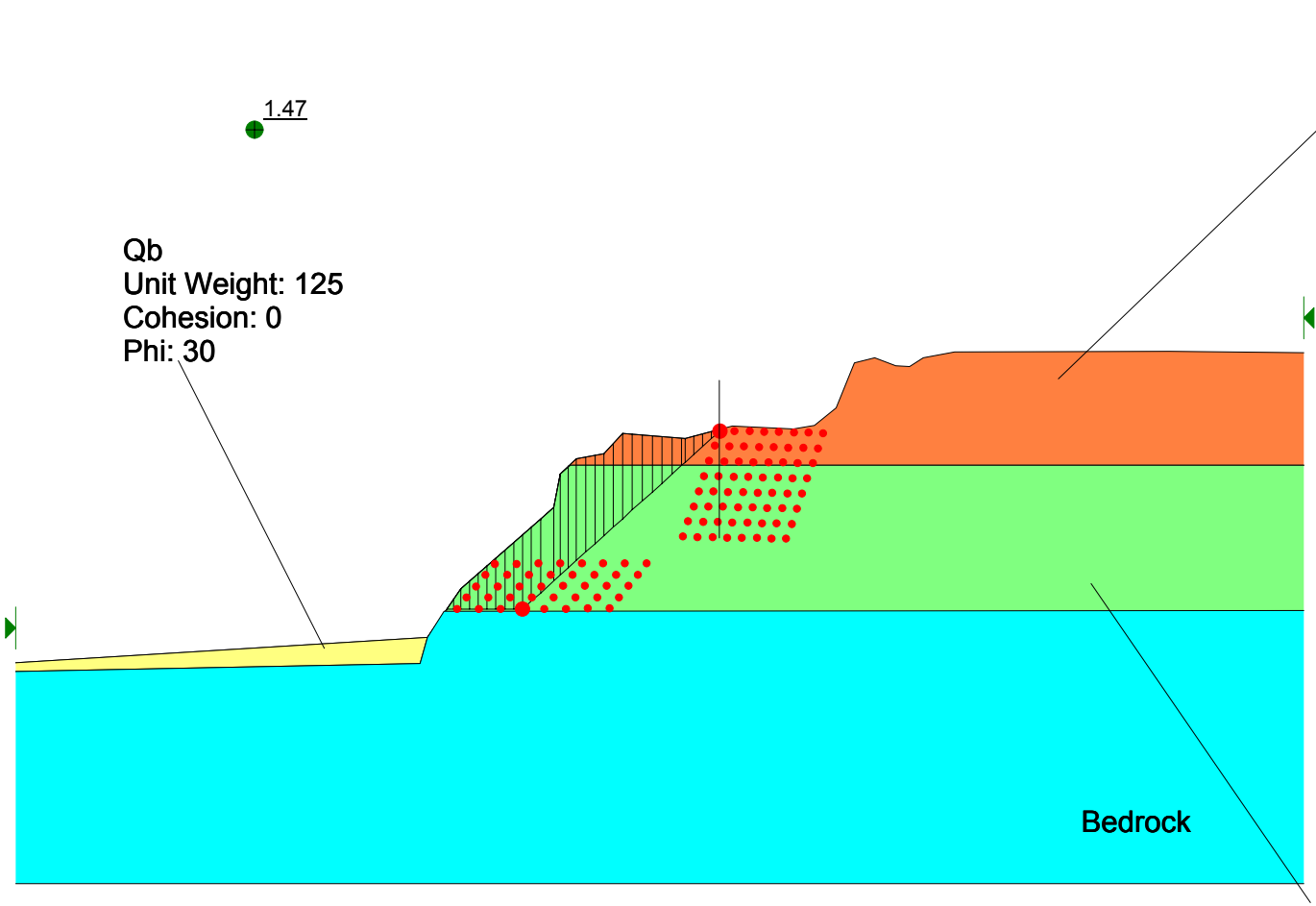
Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Del Mar Bluffs Cross Section 6-6'
Slope Stability Analysis
File Name: Section 66 Static 1.slz
Analysis Method: Spencer
Factor of Safety: 1.43
Surcharge = 3,000 psf



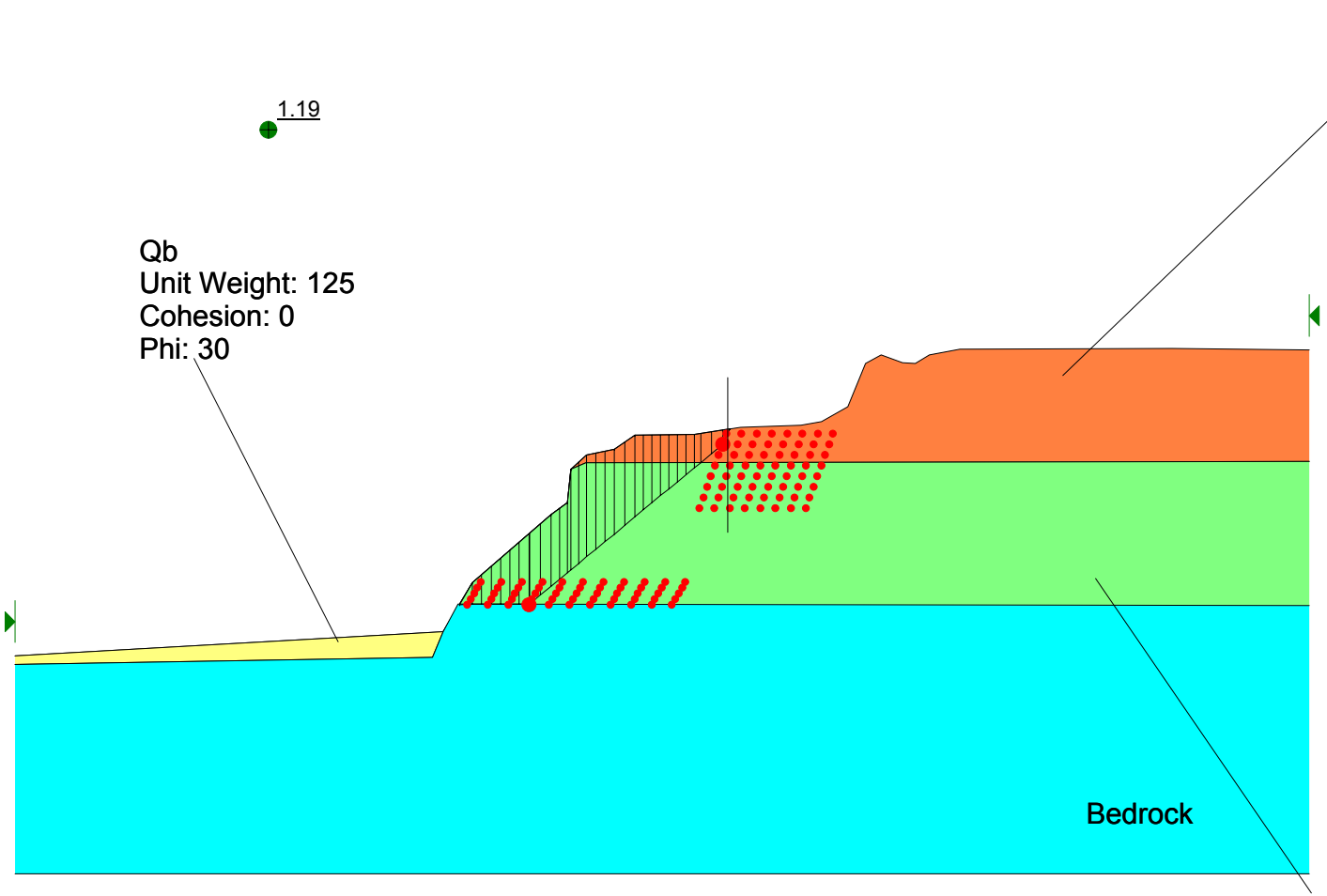
Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Del Mar Bluffs Cross Section 6-6'
Slope Stability Analysis, No Water
File Name: Section 66 Static 3.slz
Analysis Method: Spencer
Factor of Safety: 1.47

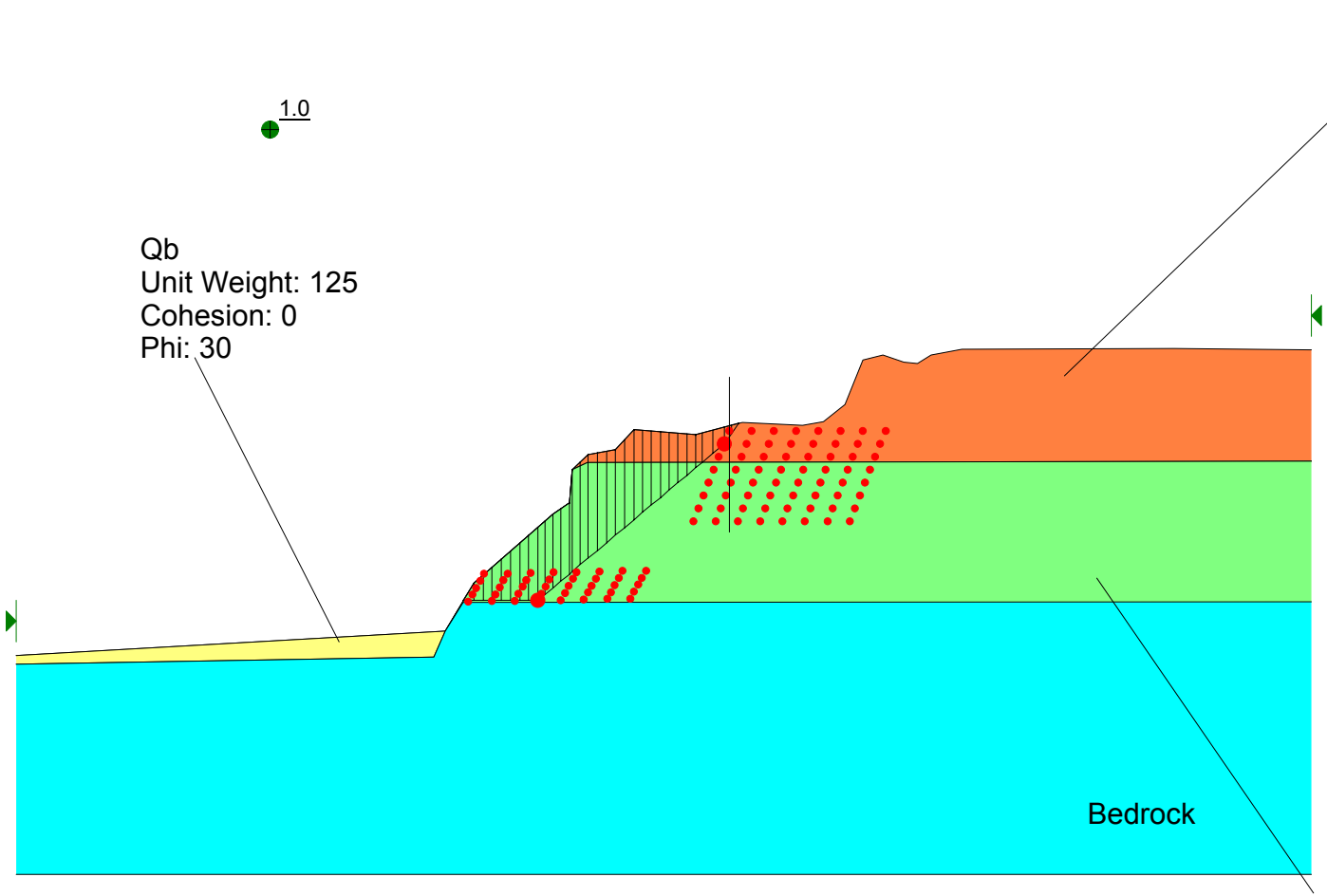


Del Mar Bluffs Cross Section 6-6'
Slope Stability Analysis
File Name: Section 66 Pseudo Static 2.slz
Analysis Method: Spencer

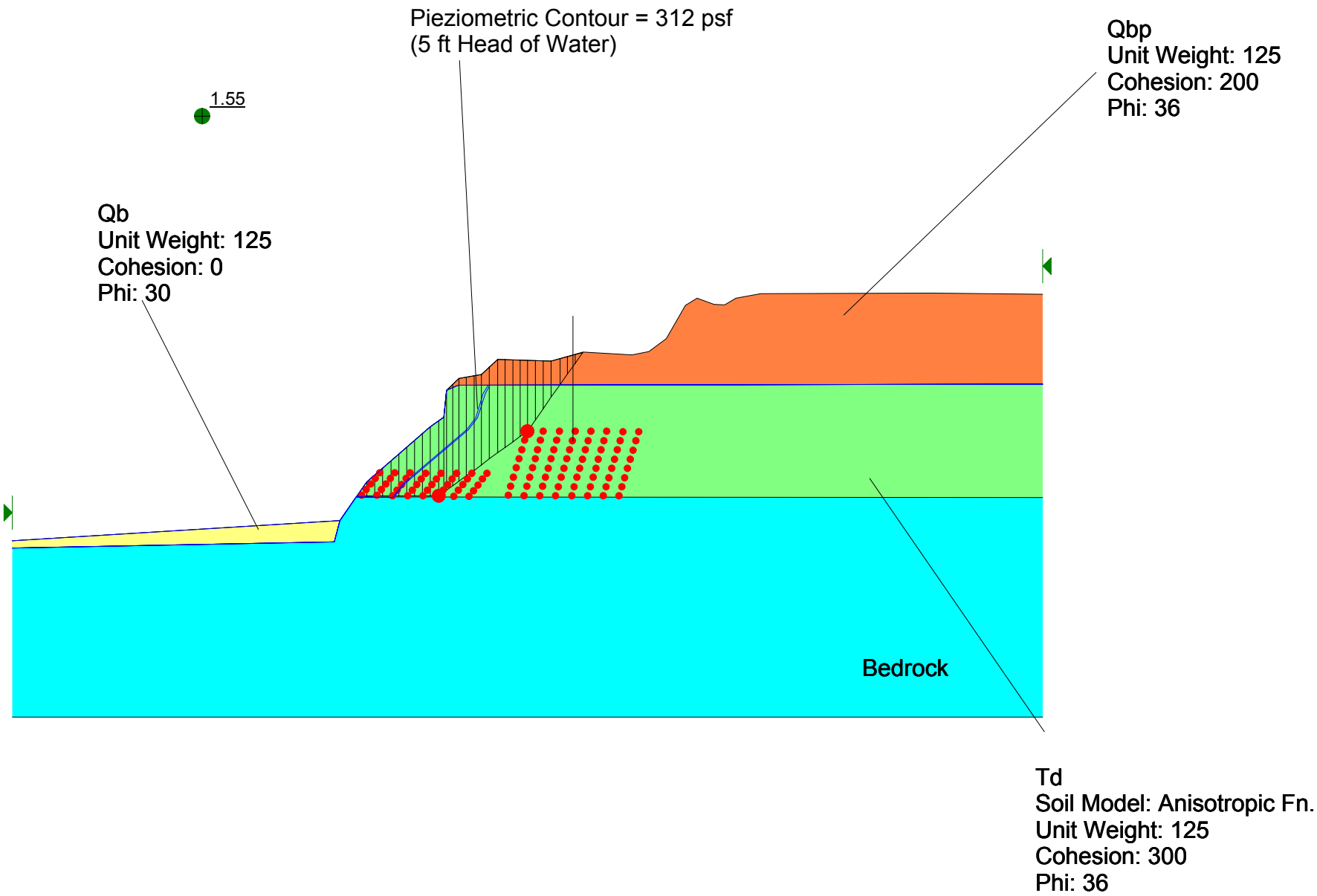
Factor of Safety: 1.19
Seismic coefficient=0.15



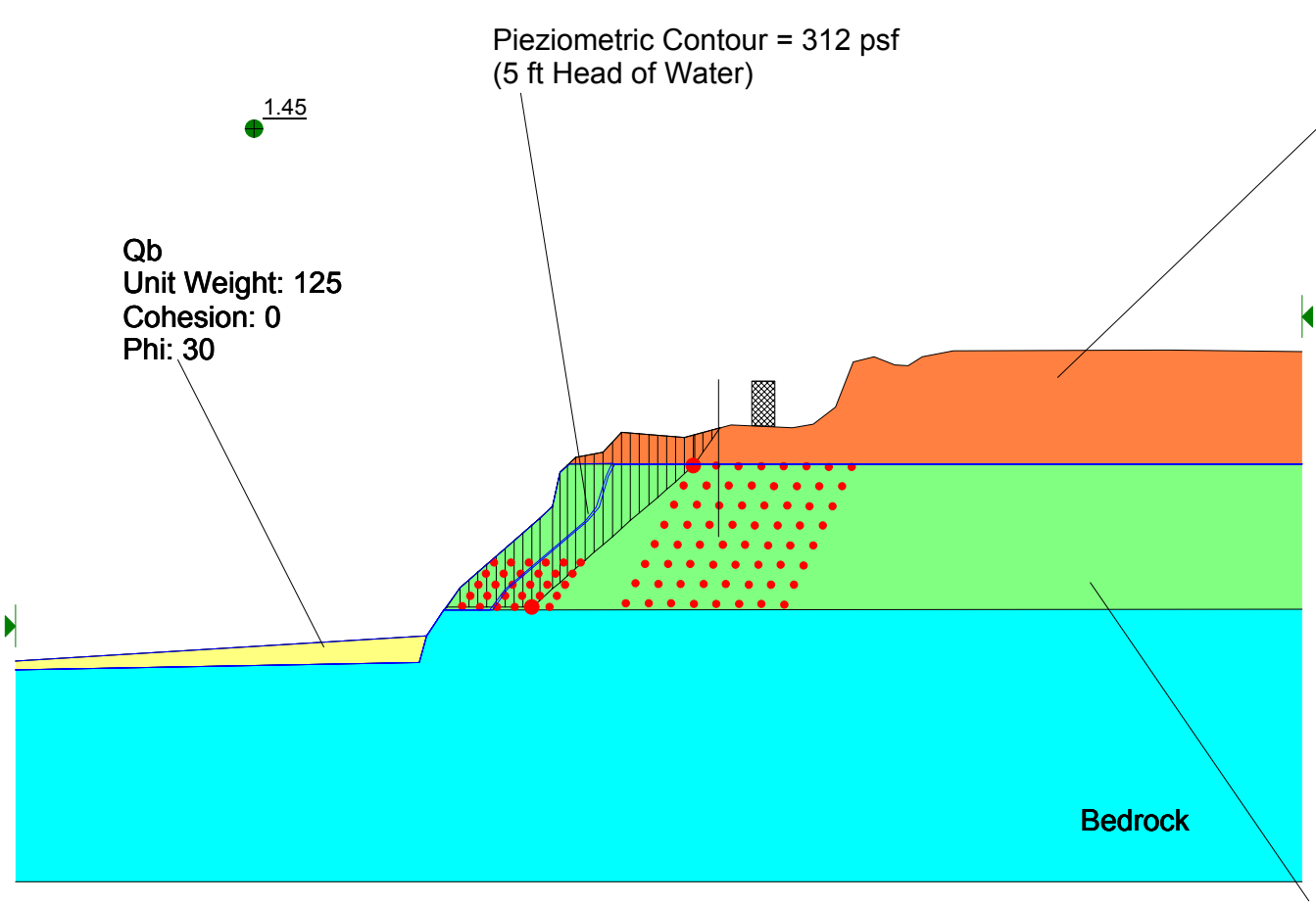
Del Mar Bluffs Cross Section 6-6'
Slope Stability Analysis
File Name: Section 66 Pseudo Static 1.slz
Analysis Method: Spencer
Factor of Safety: 0.99
Seismic coefficient=0.28



Del Mar Bluffs Cross Section 6-6'
Slope Stability Analysis
File Name: Section 66 Static 2B.slz
Analysis Method: Spencer
Factor of Safety: 1.55



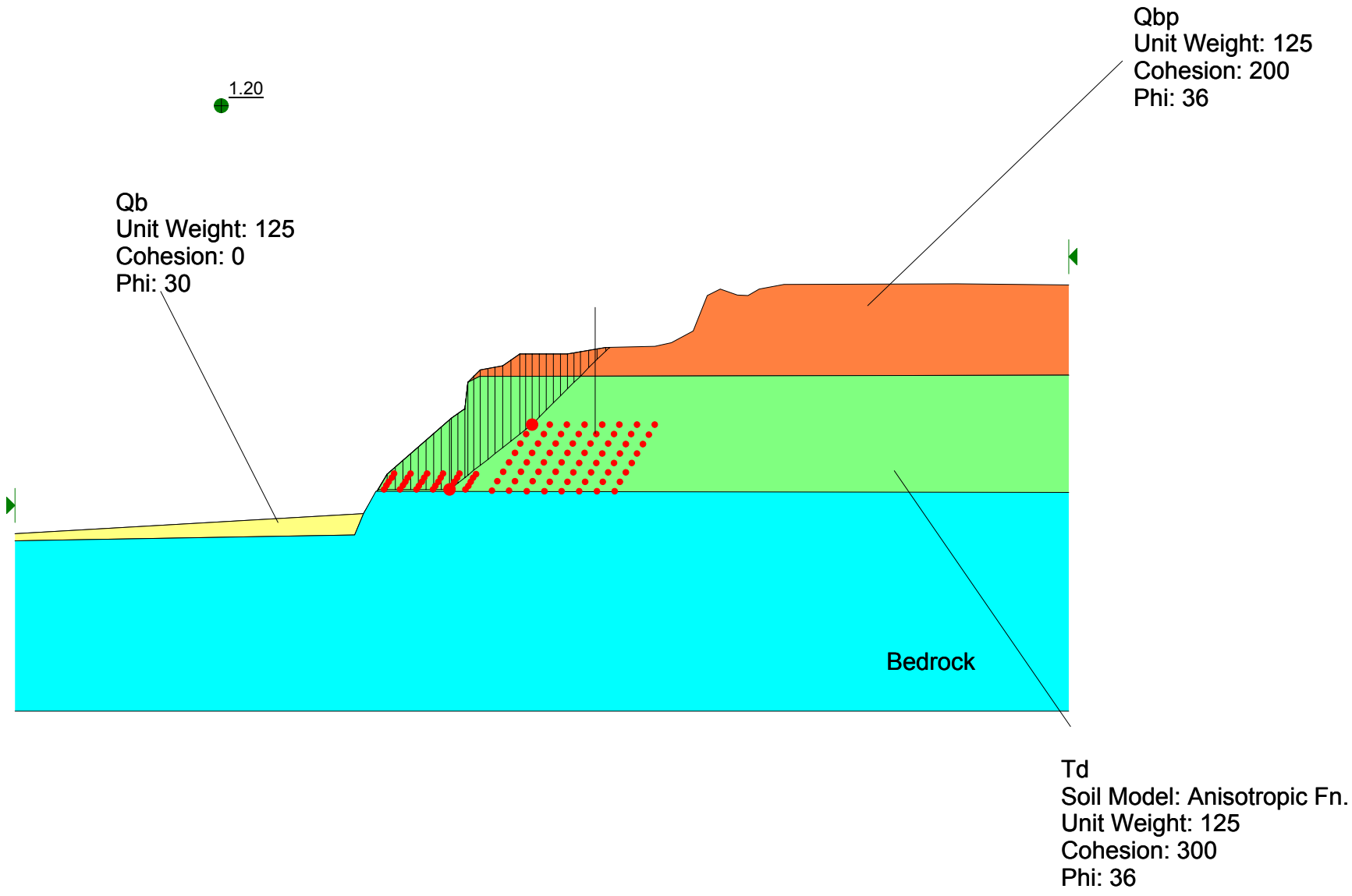
Del Mar Bluffs Cross Section 6-6'
Slope Stability Analysis
File Name: Section 66 Static 1B.slz
Analysis Method: Spencer
Factor of Safety: 1.45
Surcharge = 3,000 psf



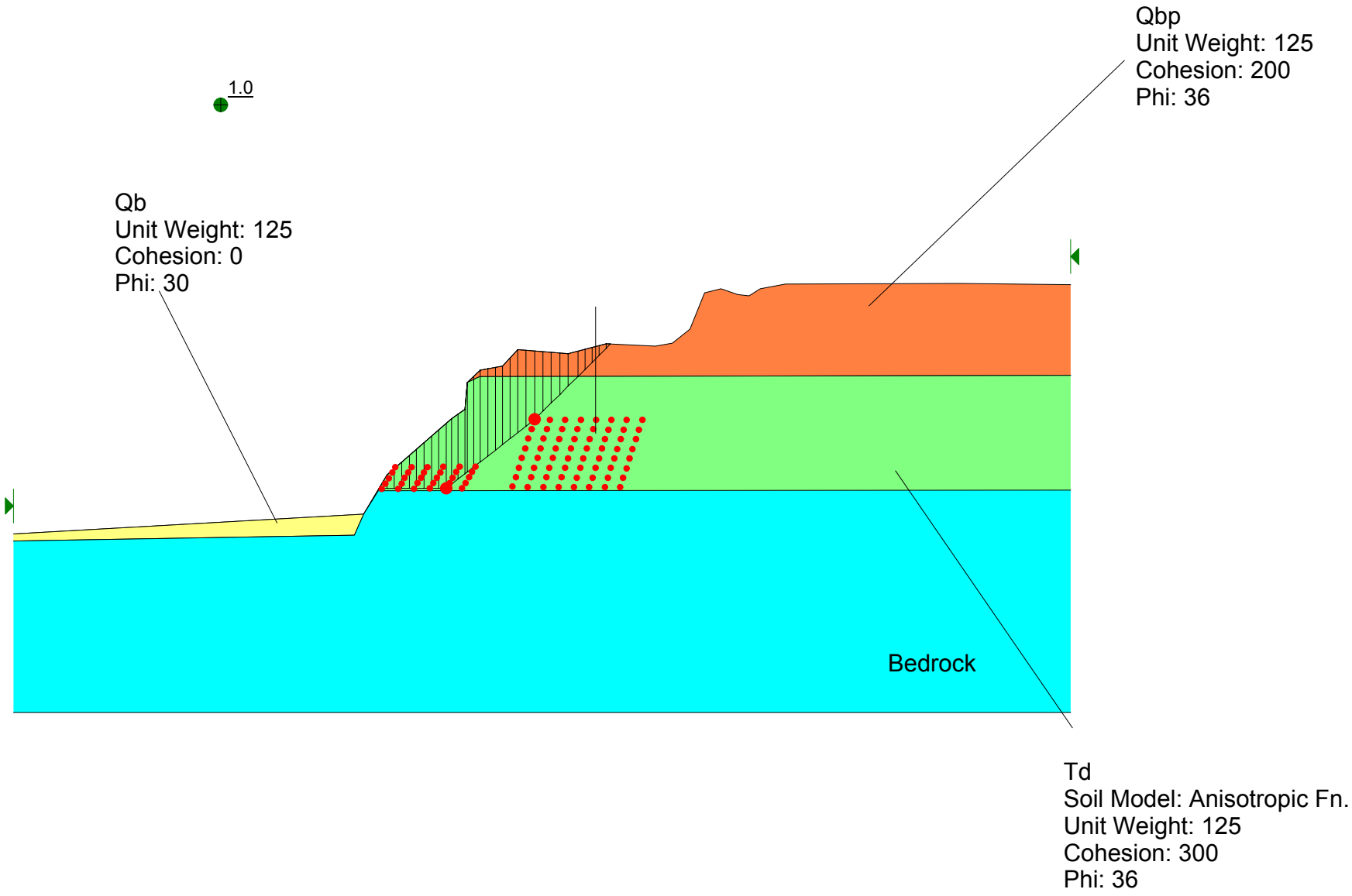
Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Del Mar Bluffs Cross Section 6-6'
Slope Stability Analysis
File Name: Section 66 Pseudo Static 2B.slz
Analysis Method: Spencer

Factor of Safety: 1.2
Seismic coefficient=0.15



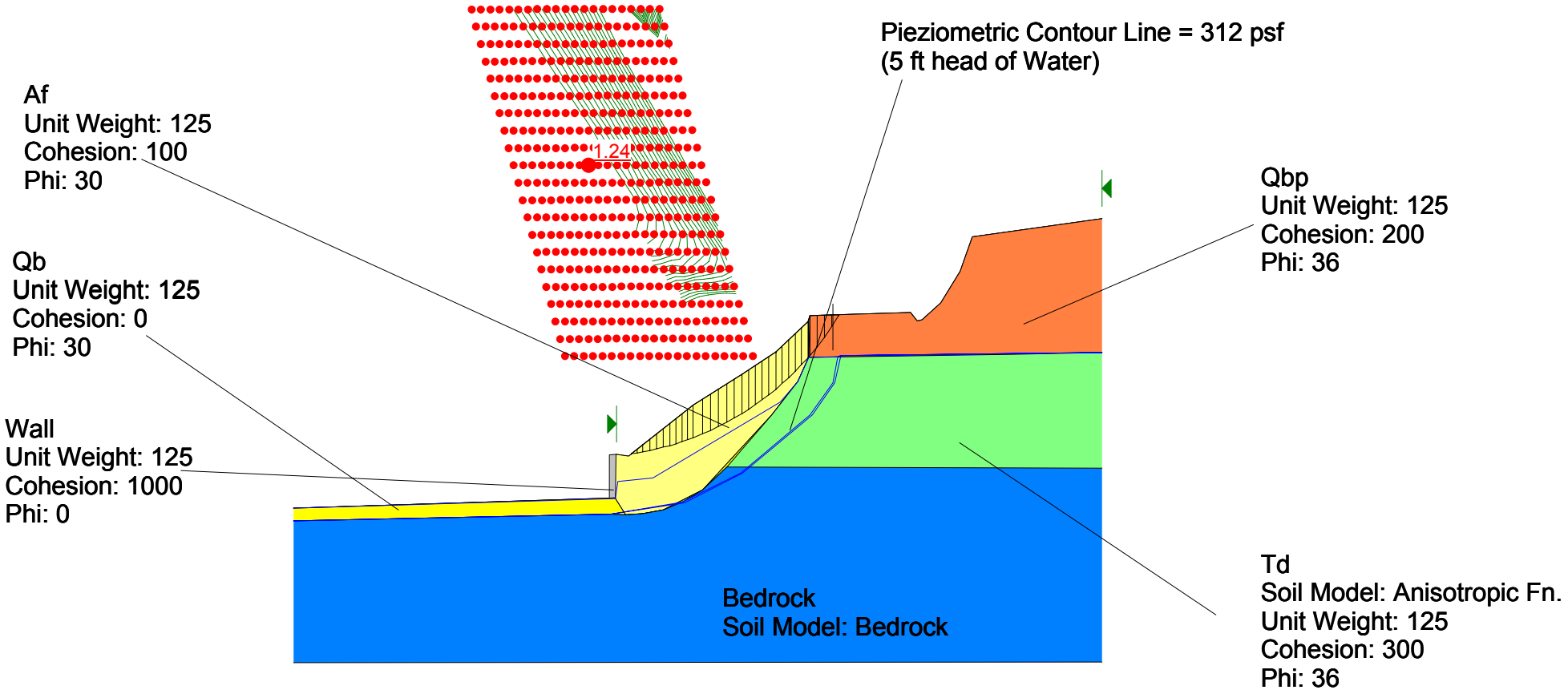
Del Mar Bluffs Cross Section 6-6'
Slope Stability Analysis
File Name: Section 66 Pseudo Static 1B.slz
Analysis Method: Spencer
Factor of Safety: 1
Seismic coefficient=0.28



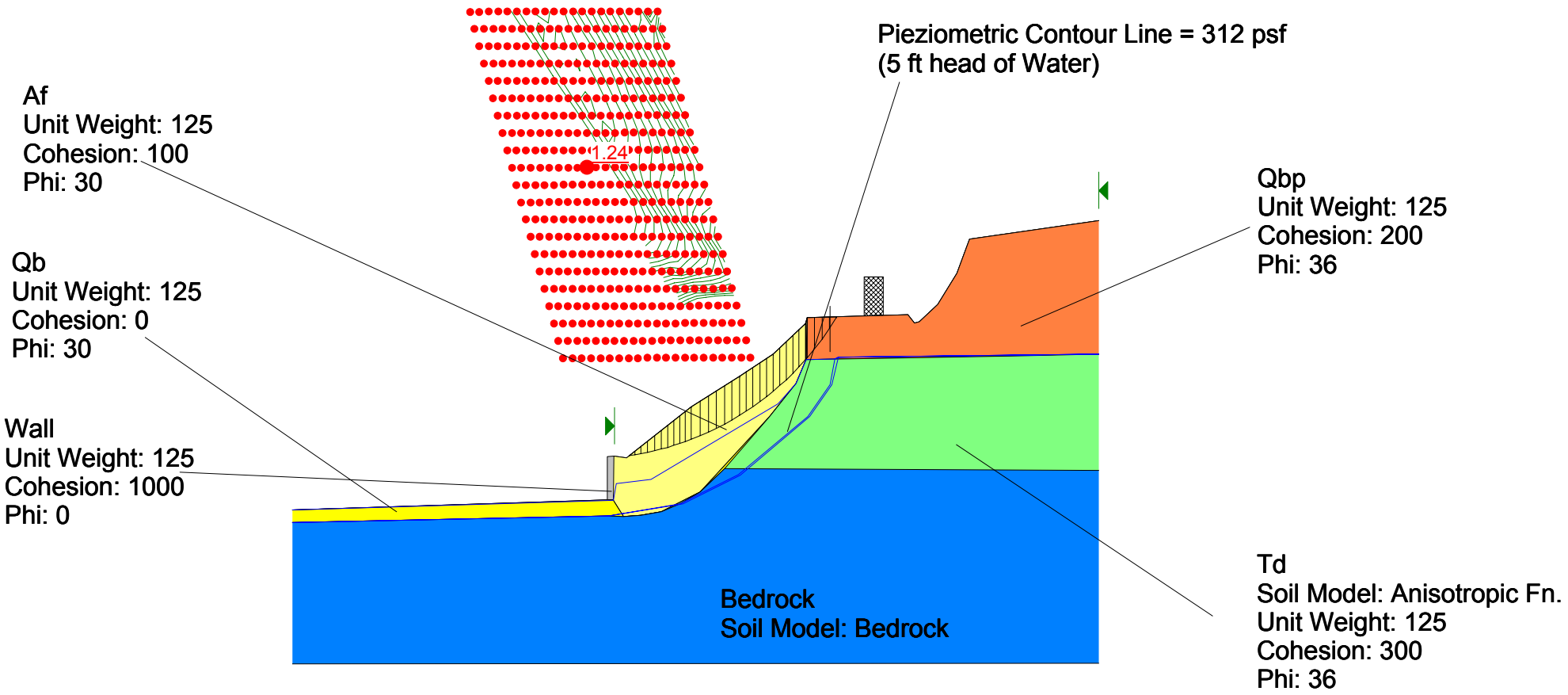
Cross Section 7-7’

Del Mar Bluffs Cross Section 7-7'
Slope Stability Analysis
File Name: Section 77 5 ft Water Static 1B.slz
Analysis Method: Bishop

Factor of Safety: 1.24

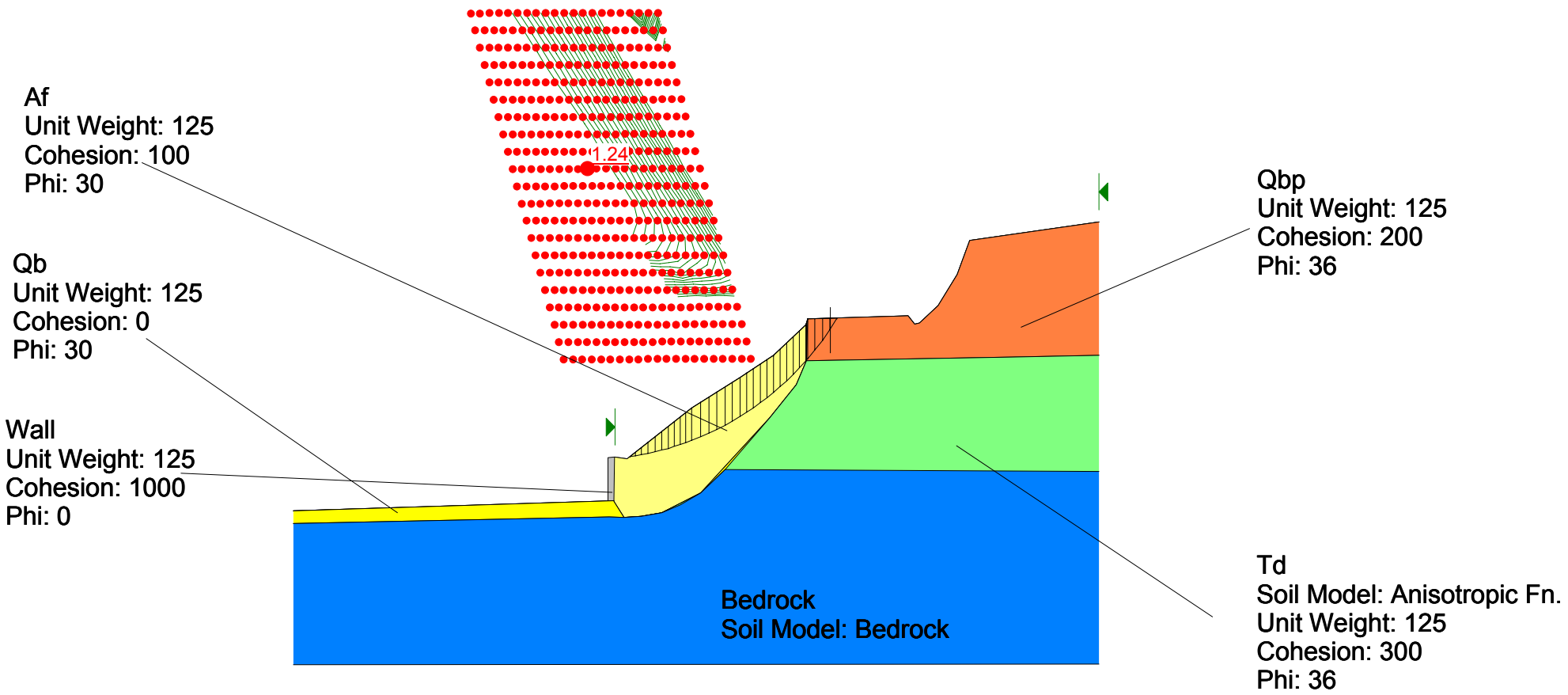


Del Mar Bluffs Cross Section 7-7'
Slope Stability Analysis
File Name: Section 77 5 ft Water Static 2.slz
Analysis Method: Bishop
Factor of Safety: 1.24
Surcharge = 3,000 psf



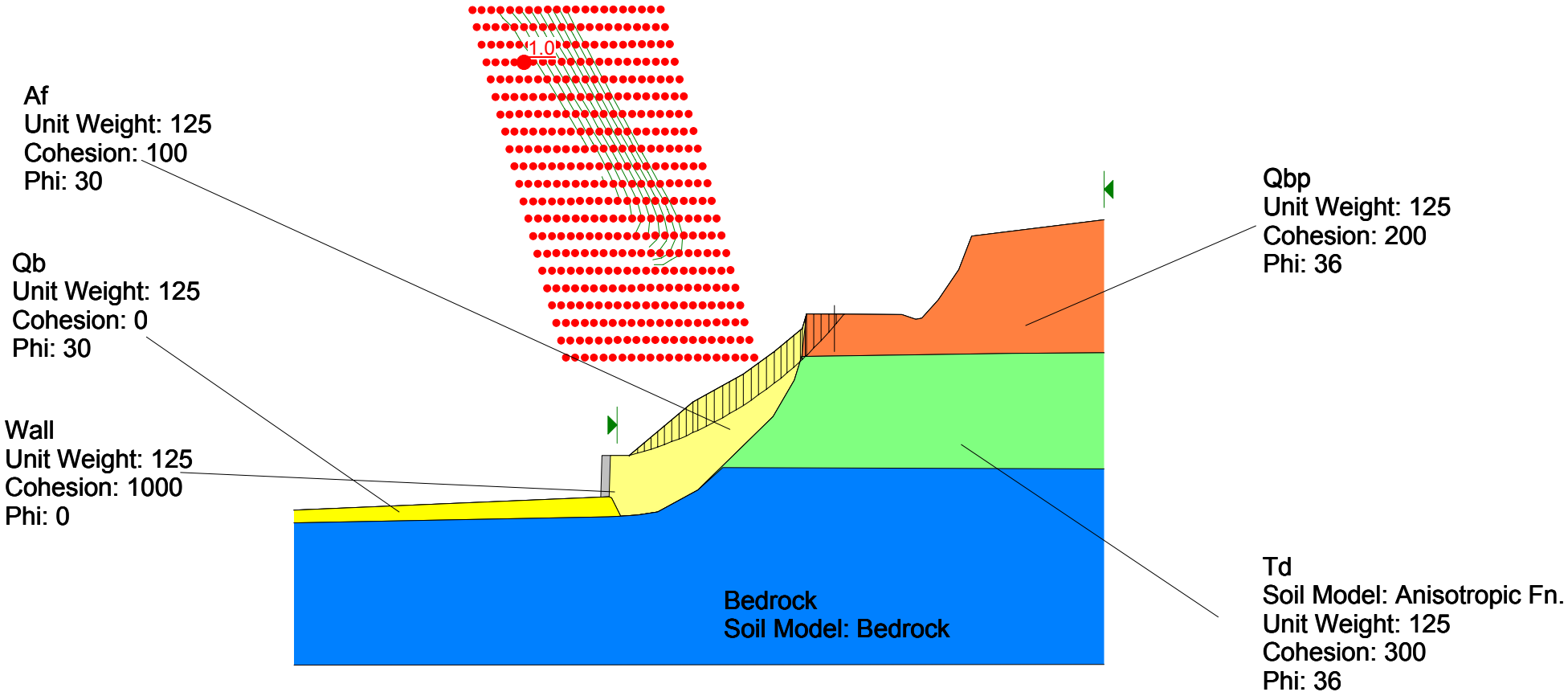
Del Mar Bluffs Cross Section 7-7'
Slope Stability Analysis, No Water
File Name: Section 77 Static 5B.slz
Analysis Method: Bishop

Factor of Safety: 1.24



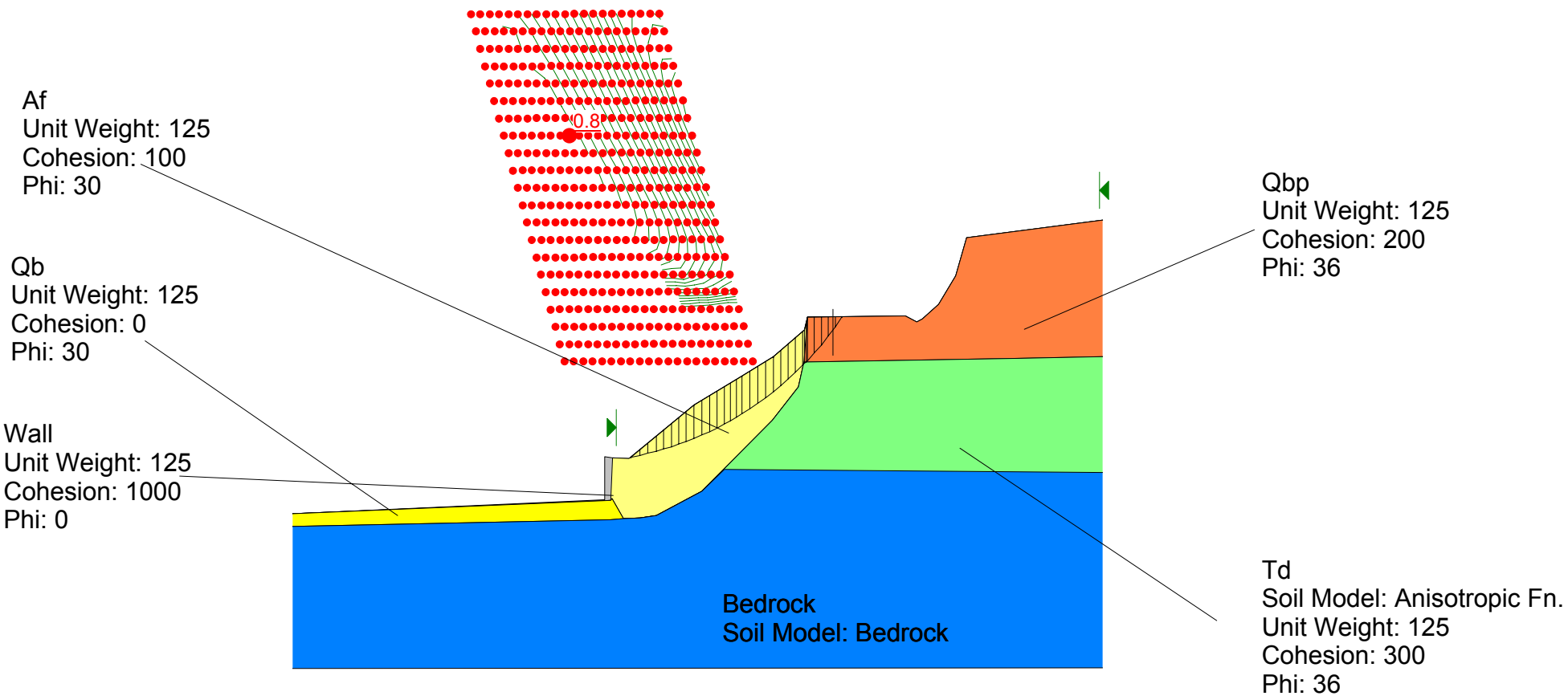
Del Mar Bluffs Cross Section 7-7'
Slope Stability Analysis
File Name: Section 77 Pseudo Static 1B.slz
Analysis Method: Bishop

Factor of Safety: 0.98
Seismic Coefficient = 0.15



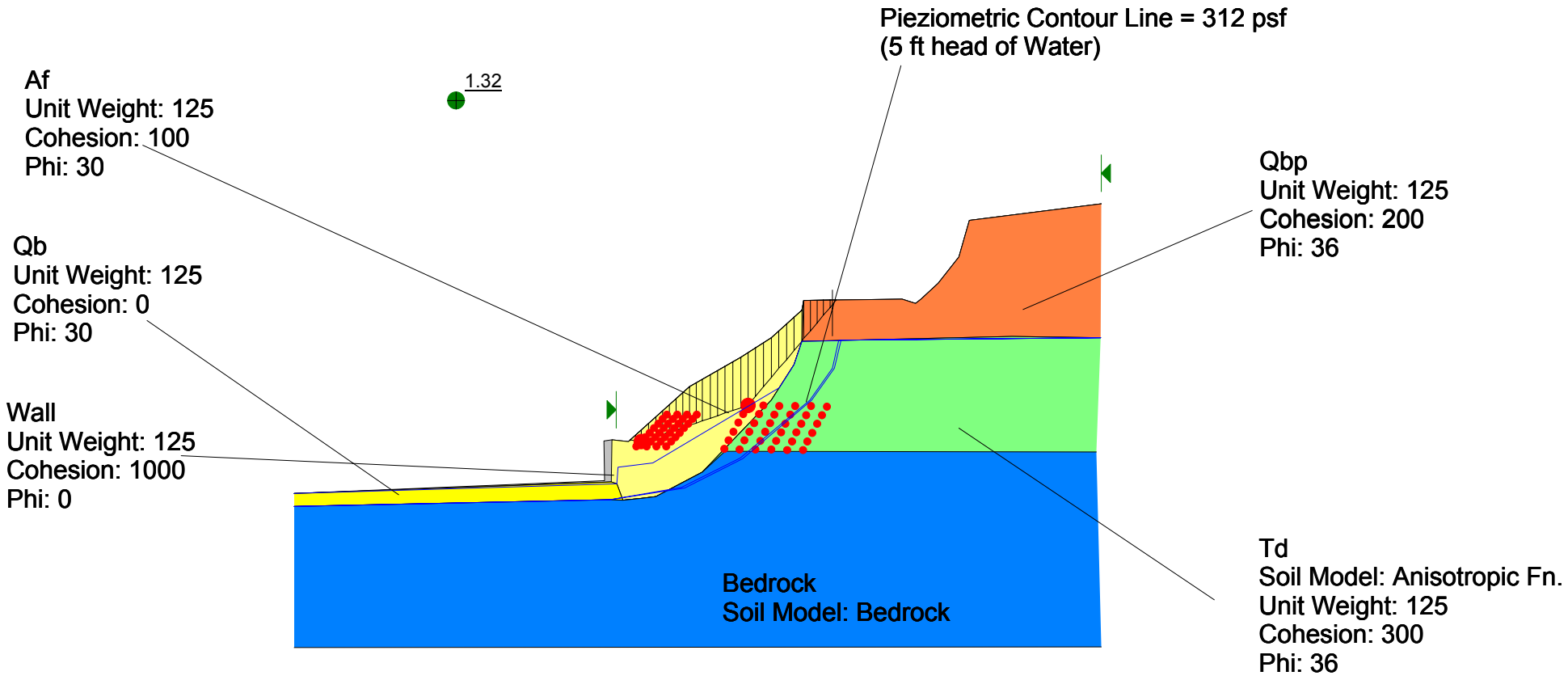
Del Mar Bluffs Cross Section 7-7'
Slope Stability Analysis
File Name: Section 77 Pseudo Static 2B.slz
Analysis Method: Bishop

Factor of Safety: 0.78
Seismic Coefficient = 0.28



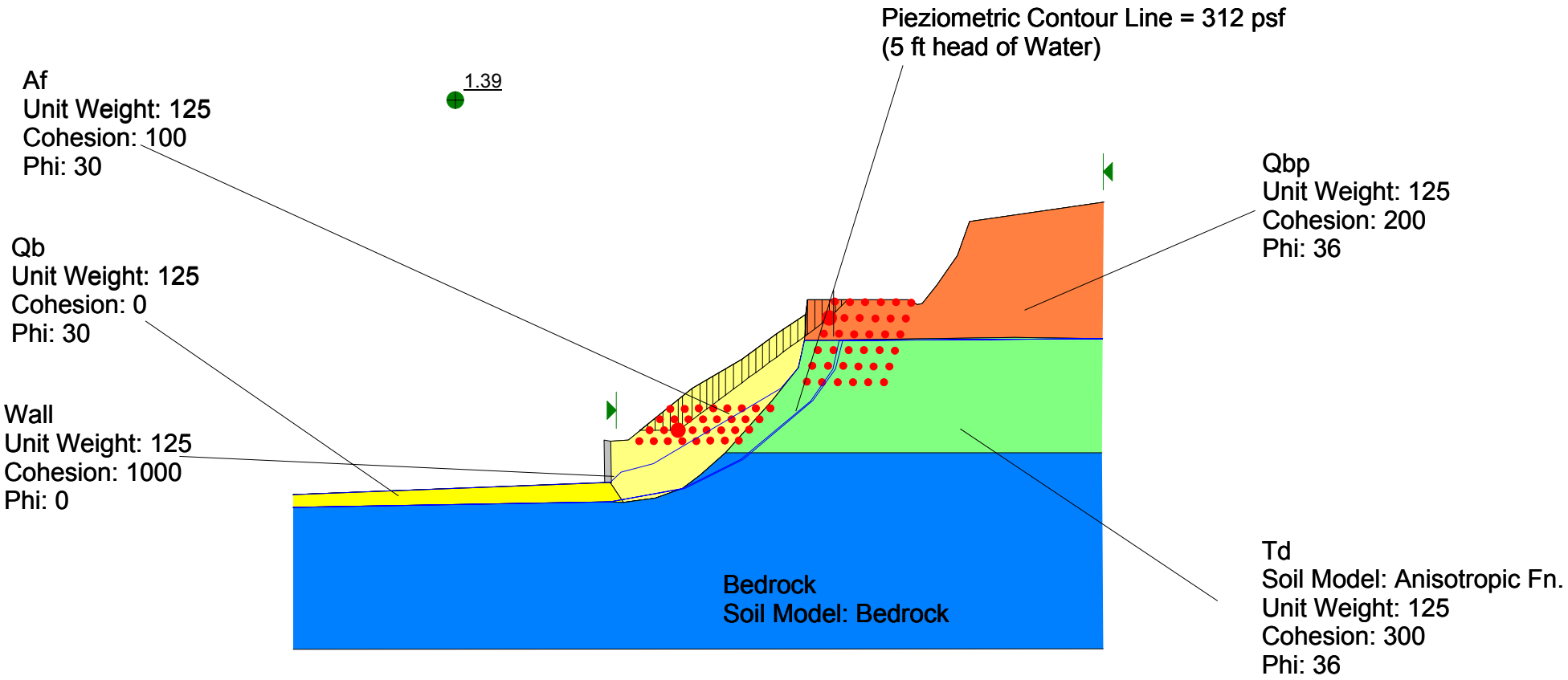
Del Mar Bluffs Cross Section 7-7'
Slope Stability Analysis
File Name: Section 77 5 ft Water Static 3B.slz
Analysis Method: Spencer

Factor of Safety: 1.32



Del Mar Bluffs Cross Section 7-7'
Slope Stability Analysis
File Name: Section 77 5 ft Water Static 3C.slz
Analysis Method: Spencer

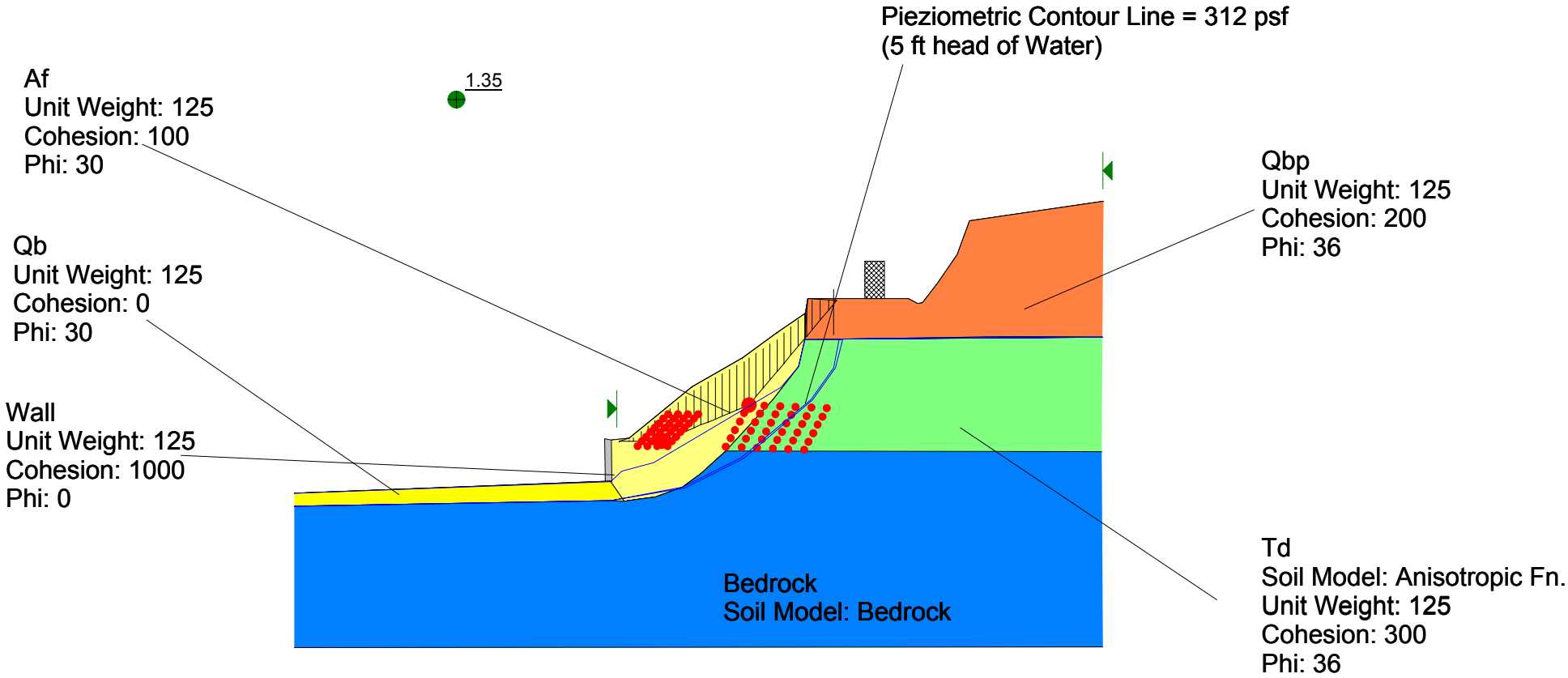
Factor of Safety: 1.39



Del Mar Bluffs Cross Section 7-7'
Slope Stability Analysis
File Name: Section 77 5 ft Water Static 4B.slz
Analysis Method: Spencer

Factor of Safety: 1.35

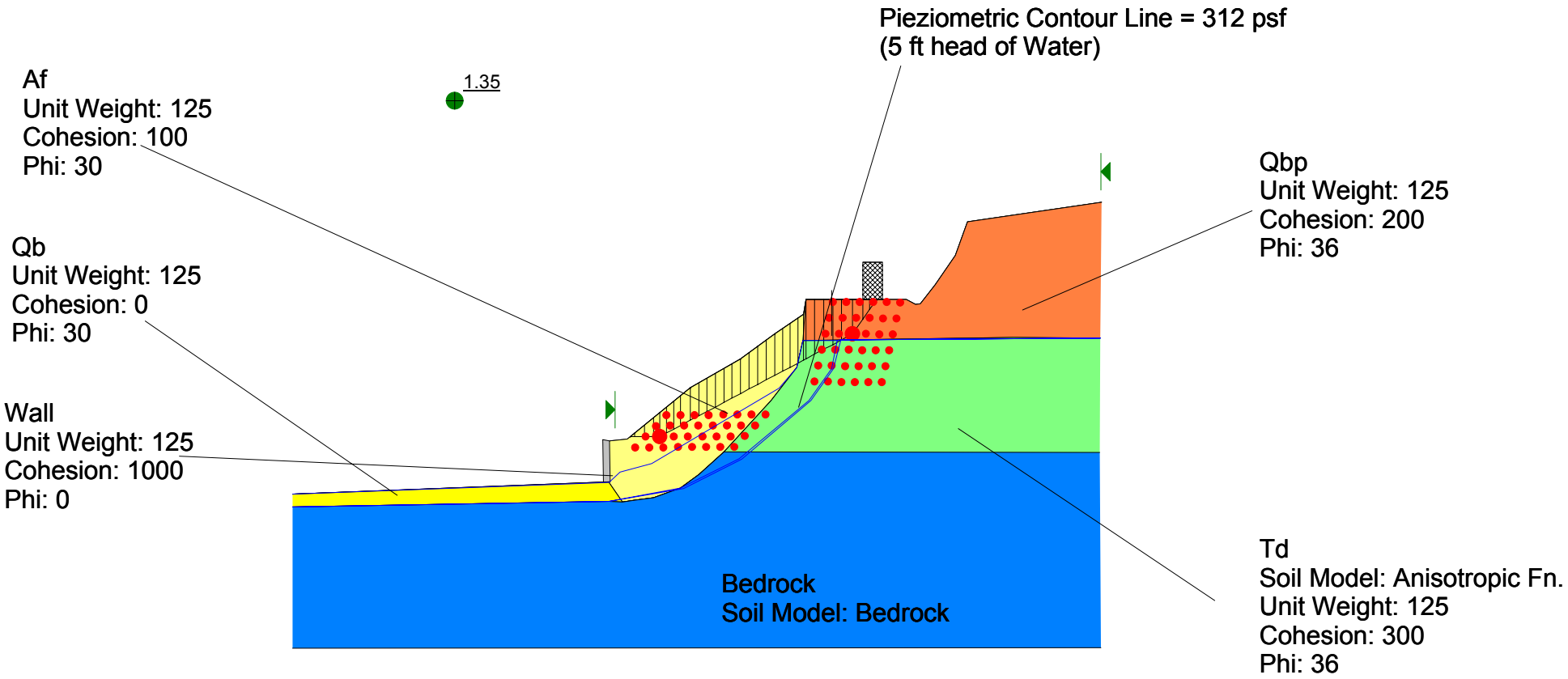
Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 7-7'
Slope Stability Analysis
File Name: Section 77 5 ft Water Static 4C.slz
Analysis Method: Spencer

Factor of Safety: 1.35

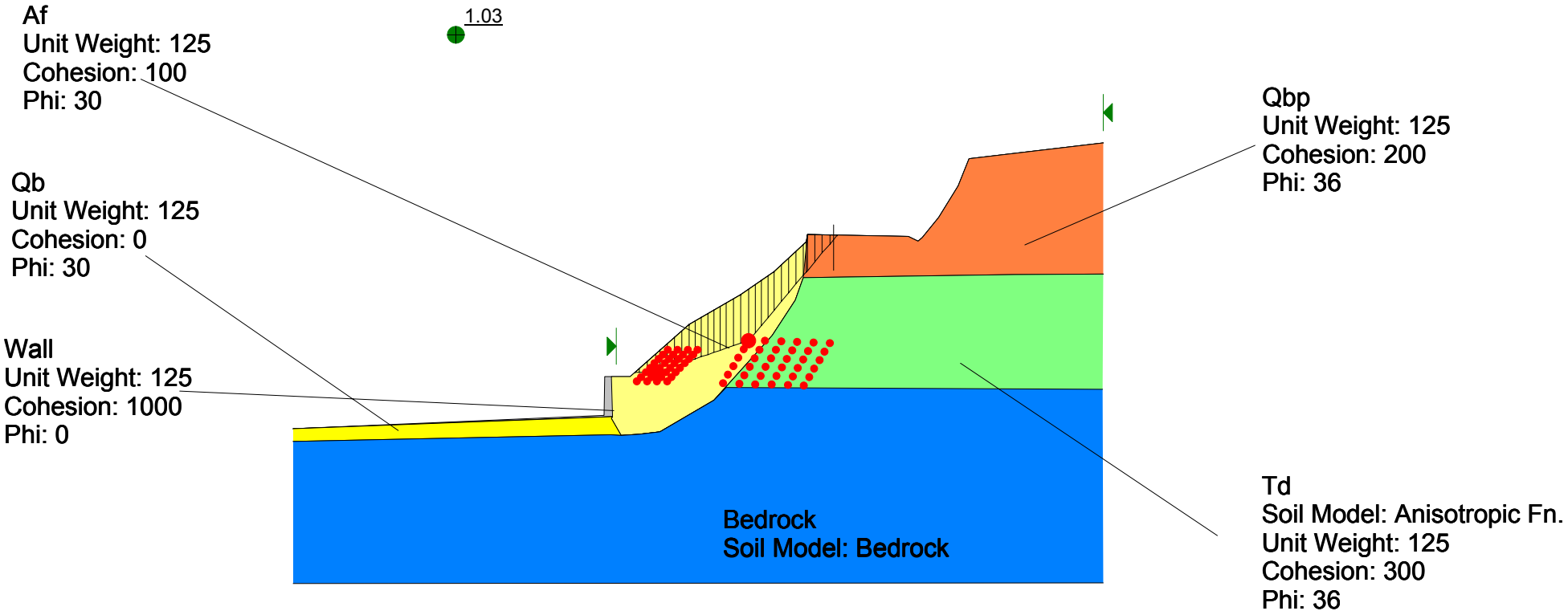
Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 7-7'
Slope Stability Analysis
File Name: Section 77 Pseudo Static 3B.slz
Analysis Method: Spencer

Factor of Safety: 1.03

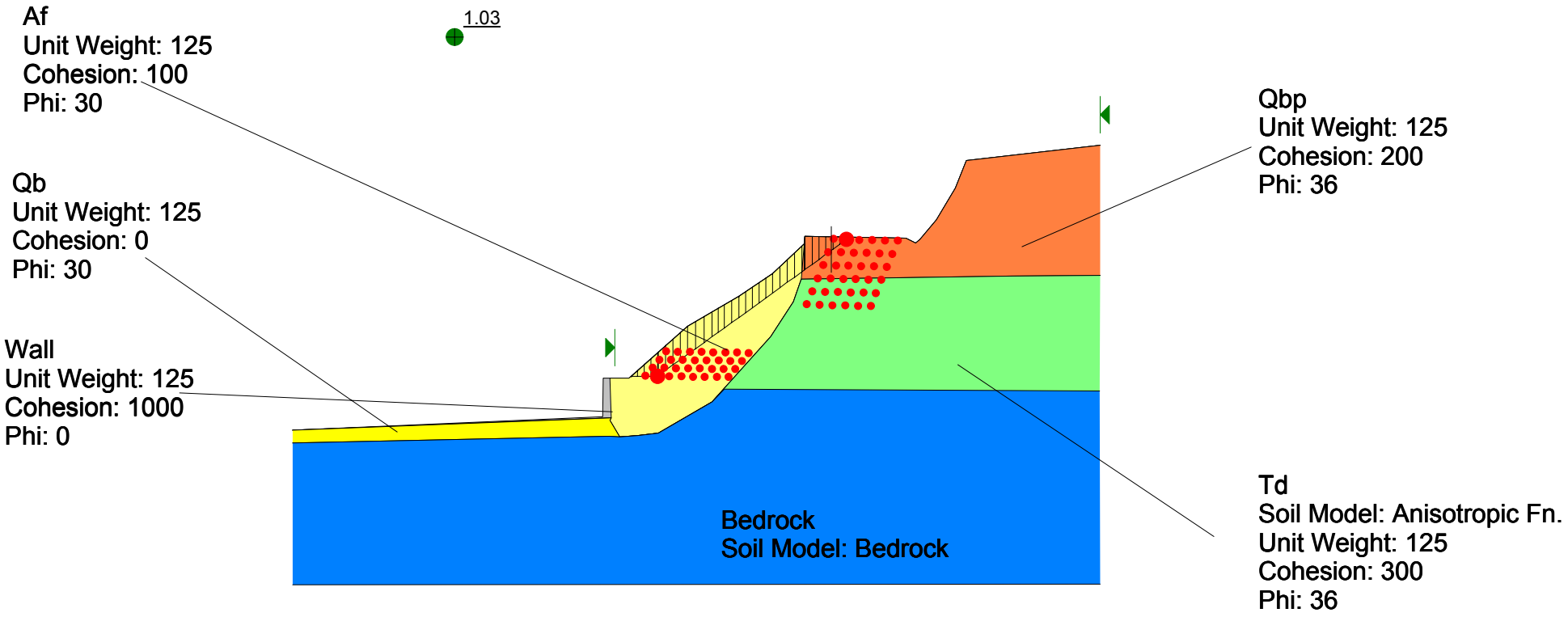
seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 7-7'
Slope Stability Analysis
File Name: Section 77 Pseudo Static 3C.slz
Analysis Method: Spencer

Factor of Safety: 1.03

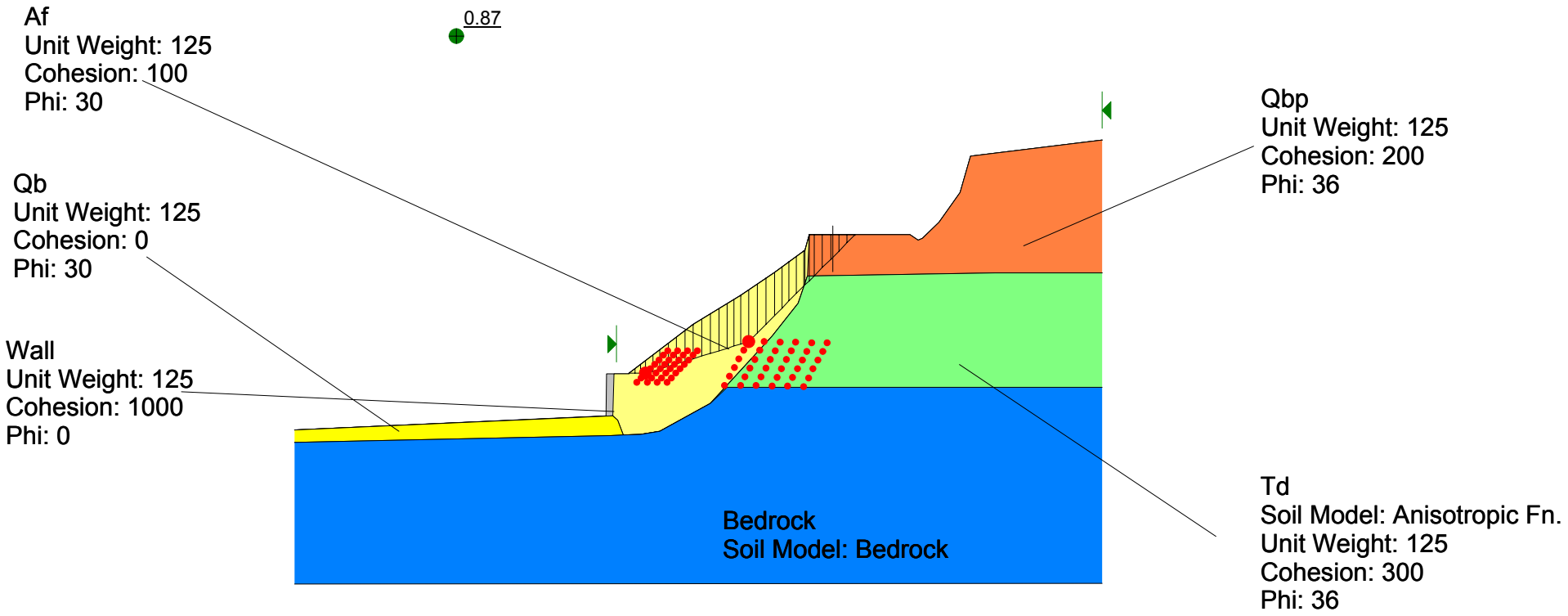
seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 7-7'
Slope Stability Analysis
File Name: Section 77 Pseudo Static 4B.slz
Analysis Method: Spencer

Factor of Safety: 0.869

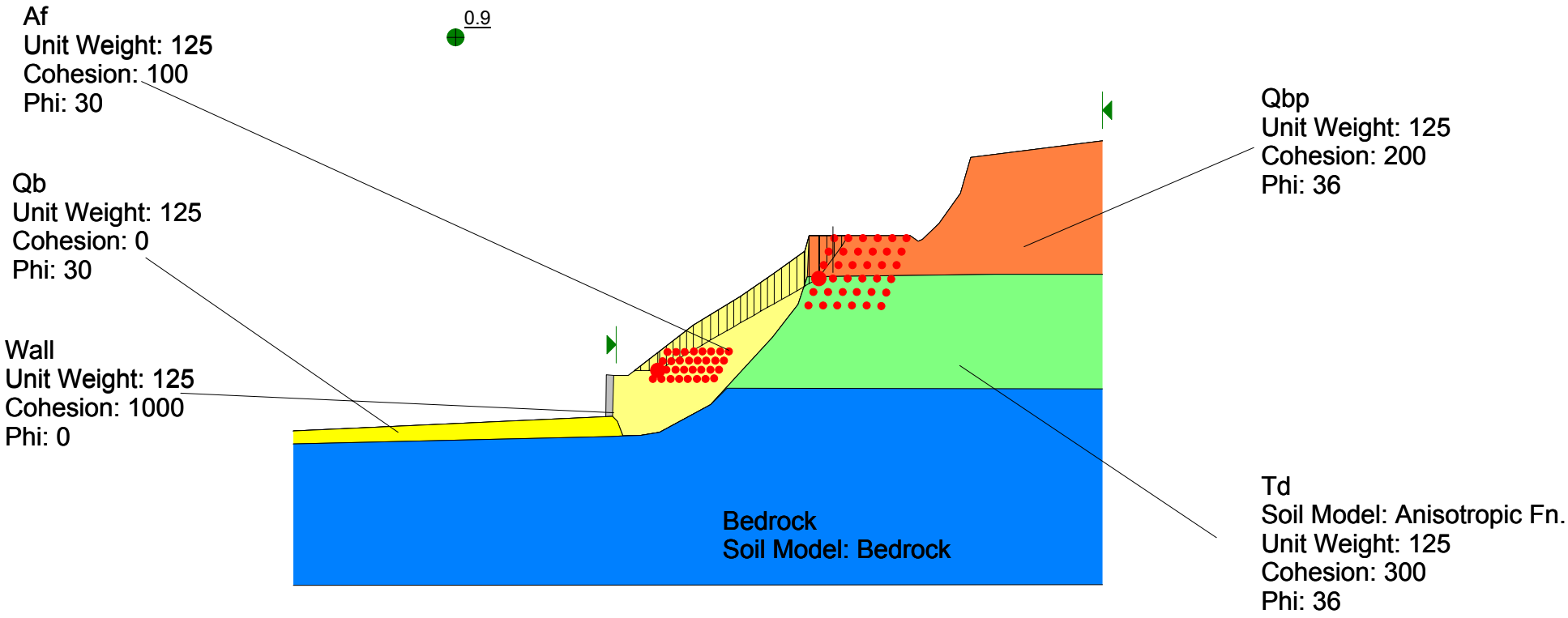
seismic Coefficient = 0.28



Del Mar Bluffs Cross Section 7-7'
Slope Stability Analysis
File Name: Section 77 Pseudo Static 4C.slz
Analysis Method: Spencer

Factor of Safety: 0.9

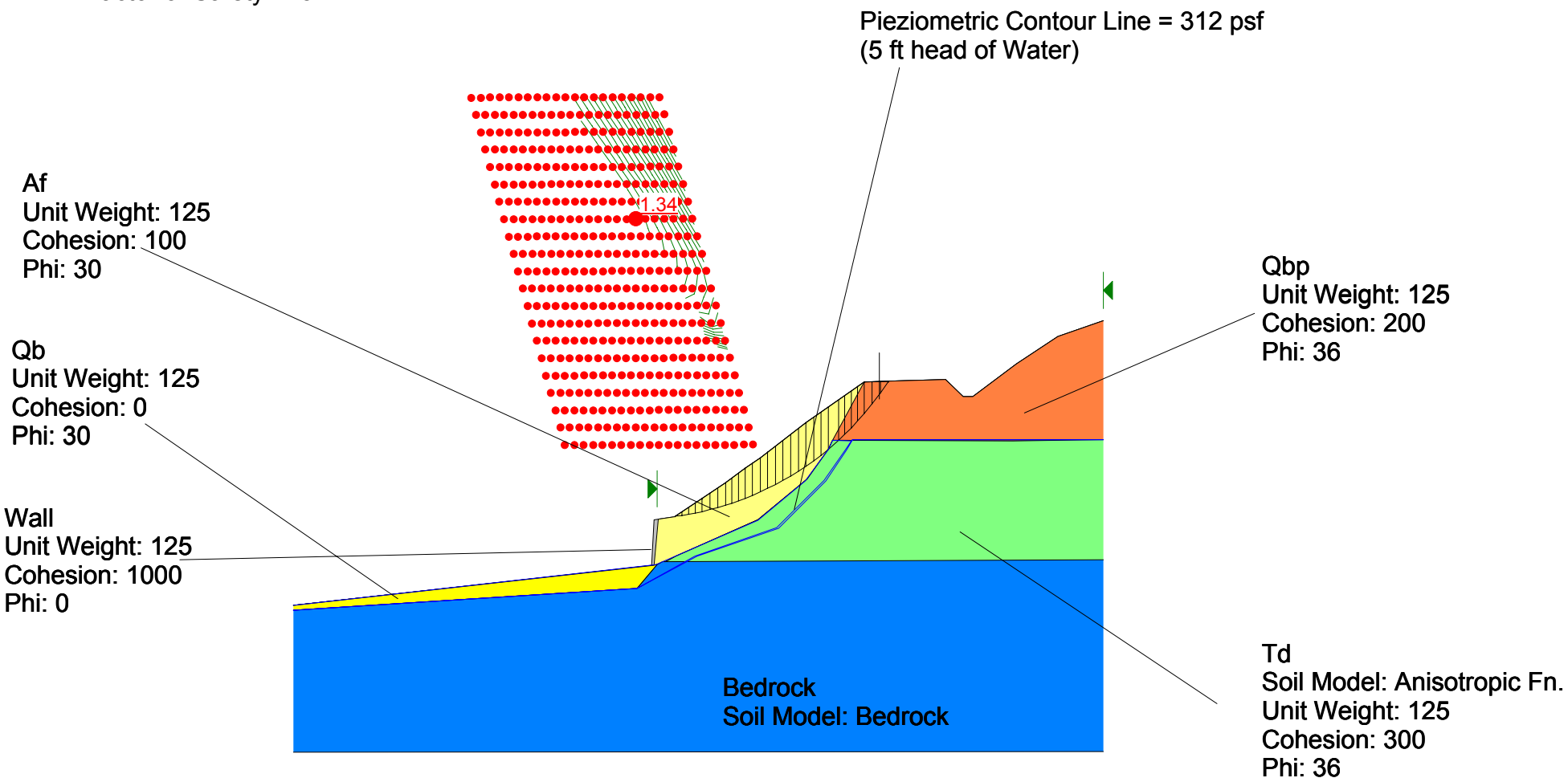
seismic Coefficient = 0.28



Cross Section 8-8’

Del Mar Bluffs Cross Section 8-8
Slope Stability Analysis
File Name: Section 88 5 ft Water Static 1C.slz
Analysis Method: Bishop

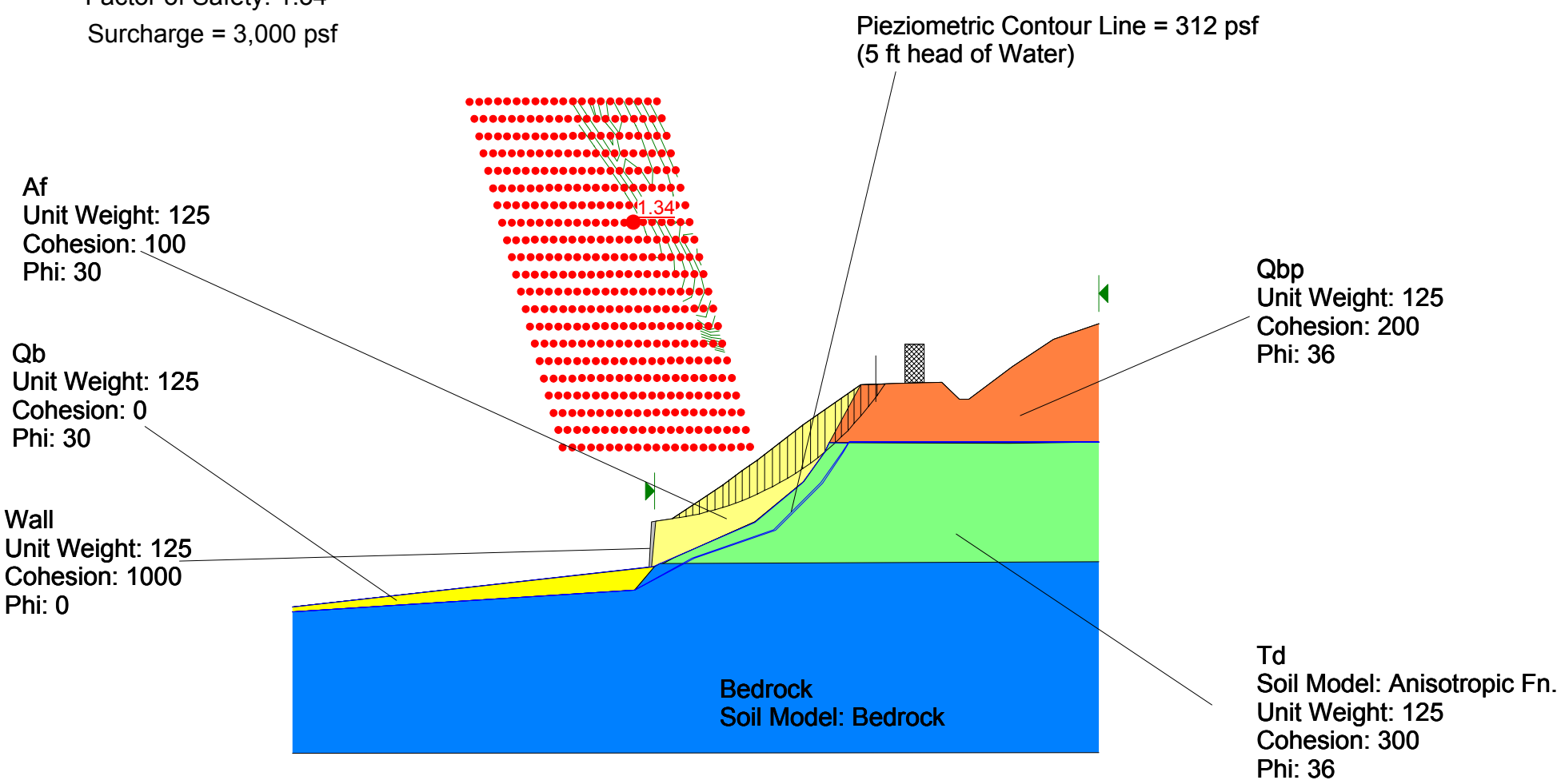
Factor of Safety: 1.34



Del Mar Bluffs Cross Section 8-8
Slope Stability Analysis
File Name: Section 88 5 ft Water Static 2.slz
Analysis Method: Bishop

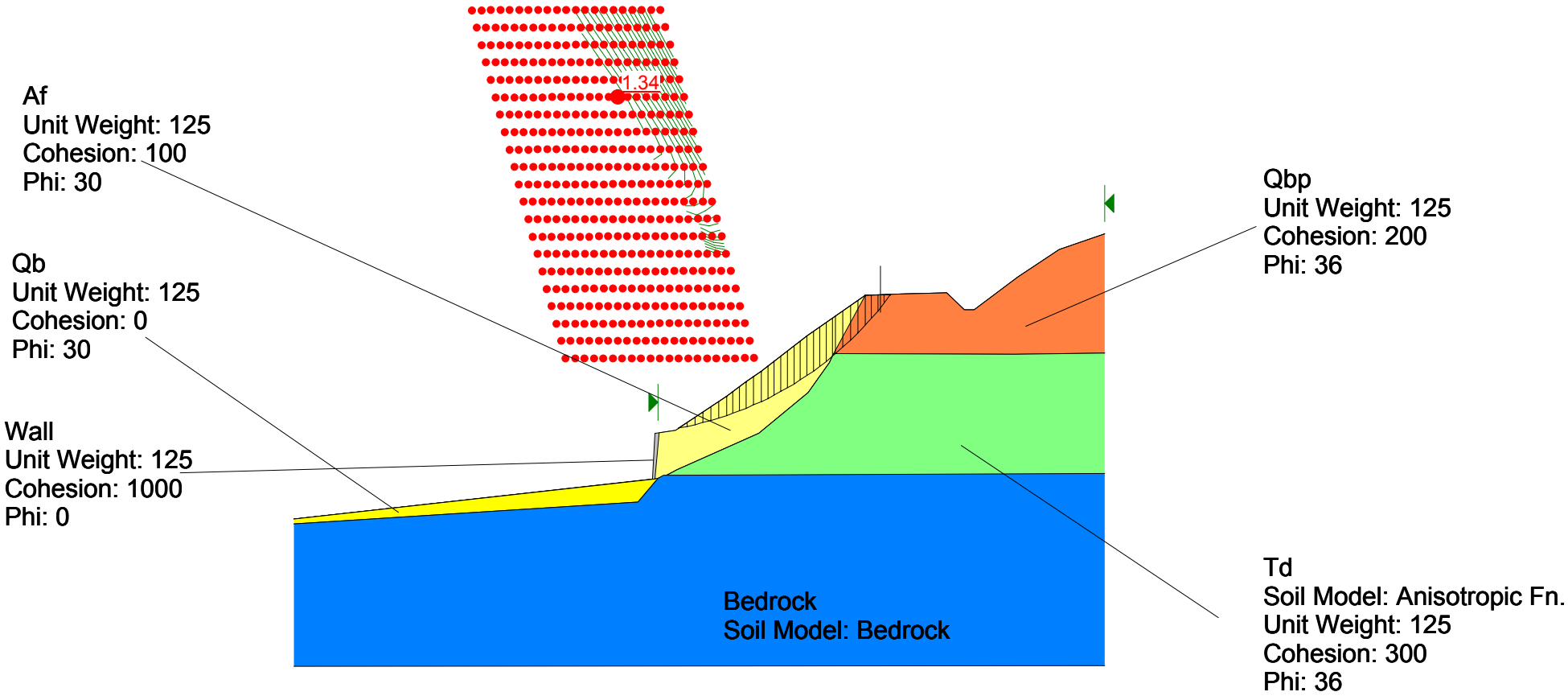
Factor of Safety: 1.34

Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 8-8
Slope Stability Analysis, No Water
File Name: Section 88 Static 3C.slz
Analysis Method: Bishop

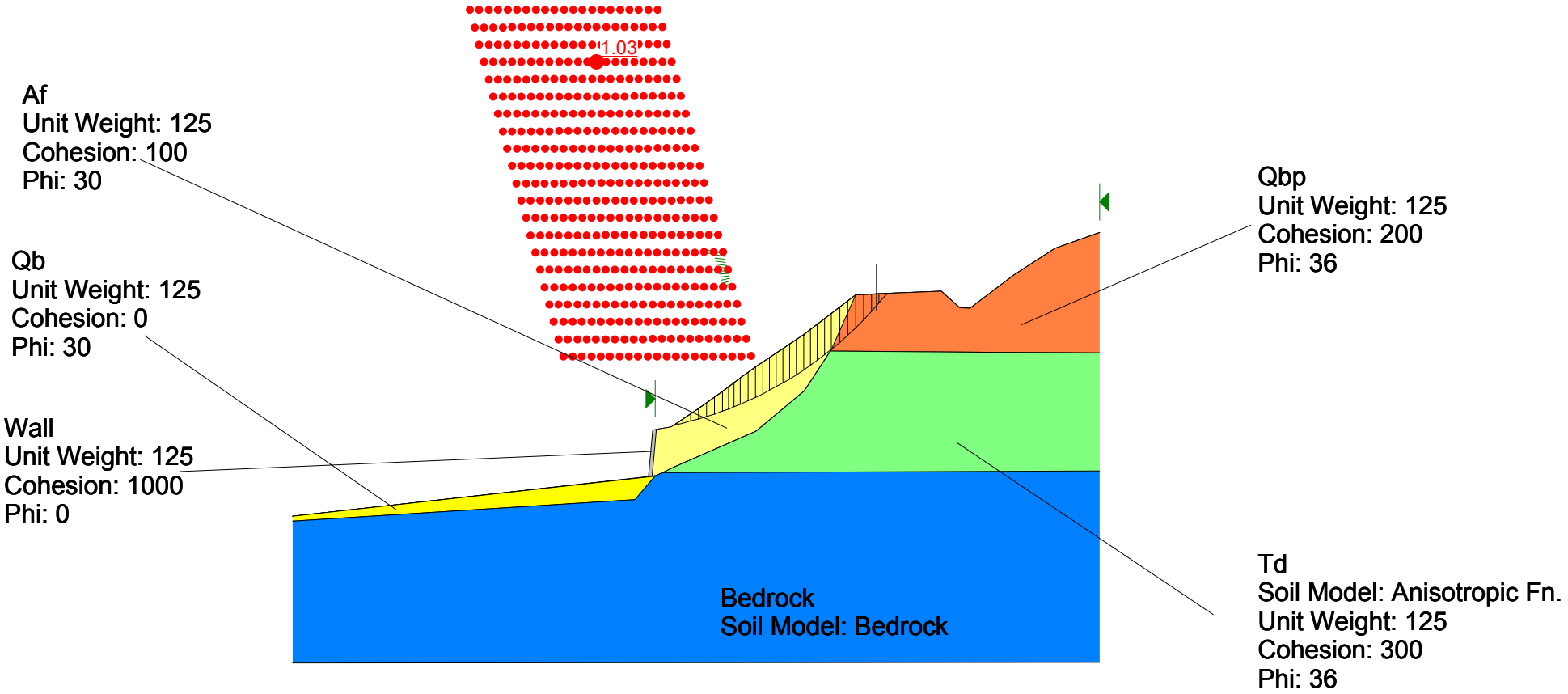
Factor of Safety: 1.34



Del Mar Bluffs Cross Section 8-8
Slope Stability Analysis
File Name: Section 88 Pseudo Static 1C.slz
Analysis Method: Bishop

Factor of Safety: 1.03

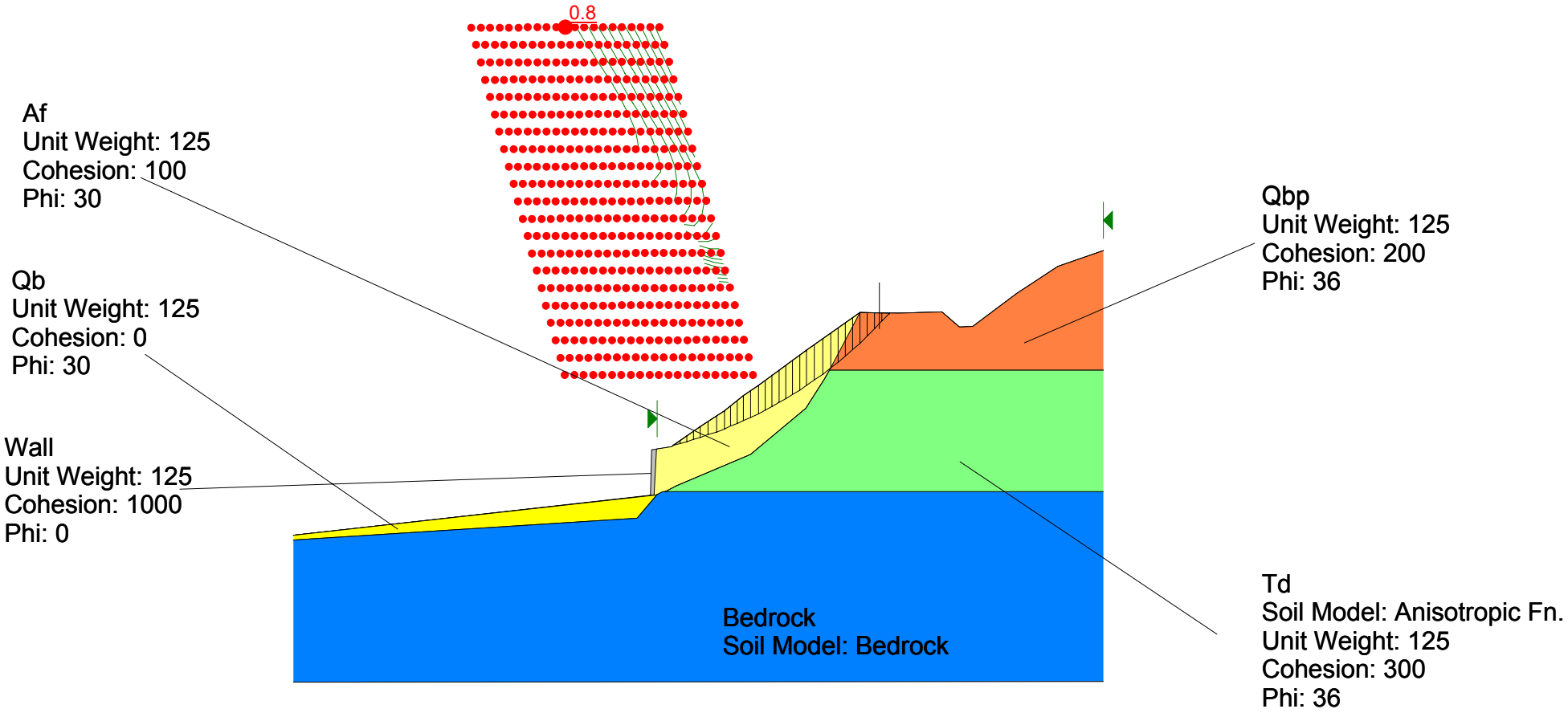
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 8-8
Slope Stability Analysis
File Name: Section 88 Pseudo Static 2C.slz
Analysis Method: Bishop

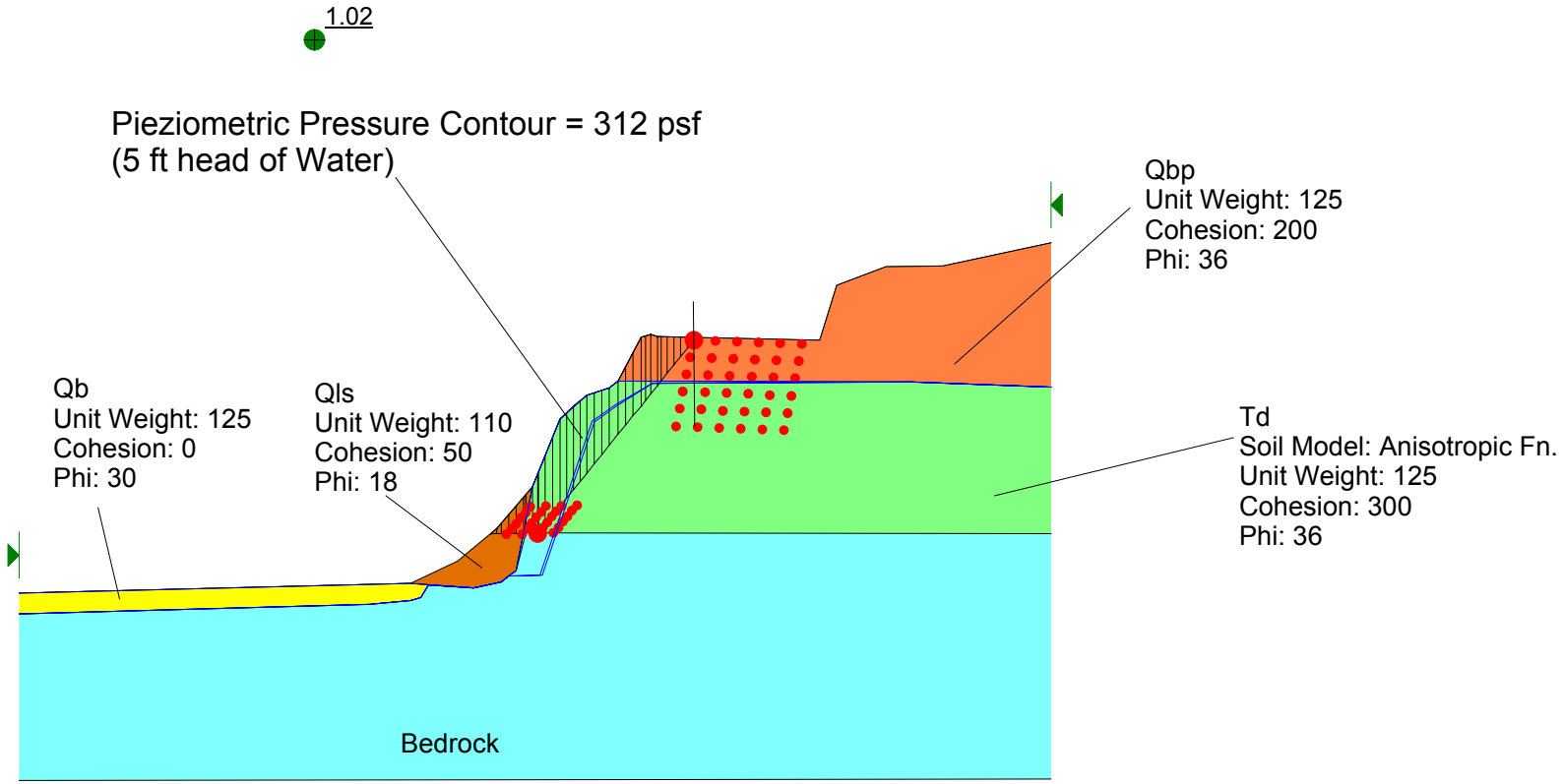
Factor of Safety: 0.84

Seismic Coefficient = 0.28



Cross Section 9-9’

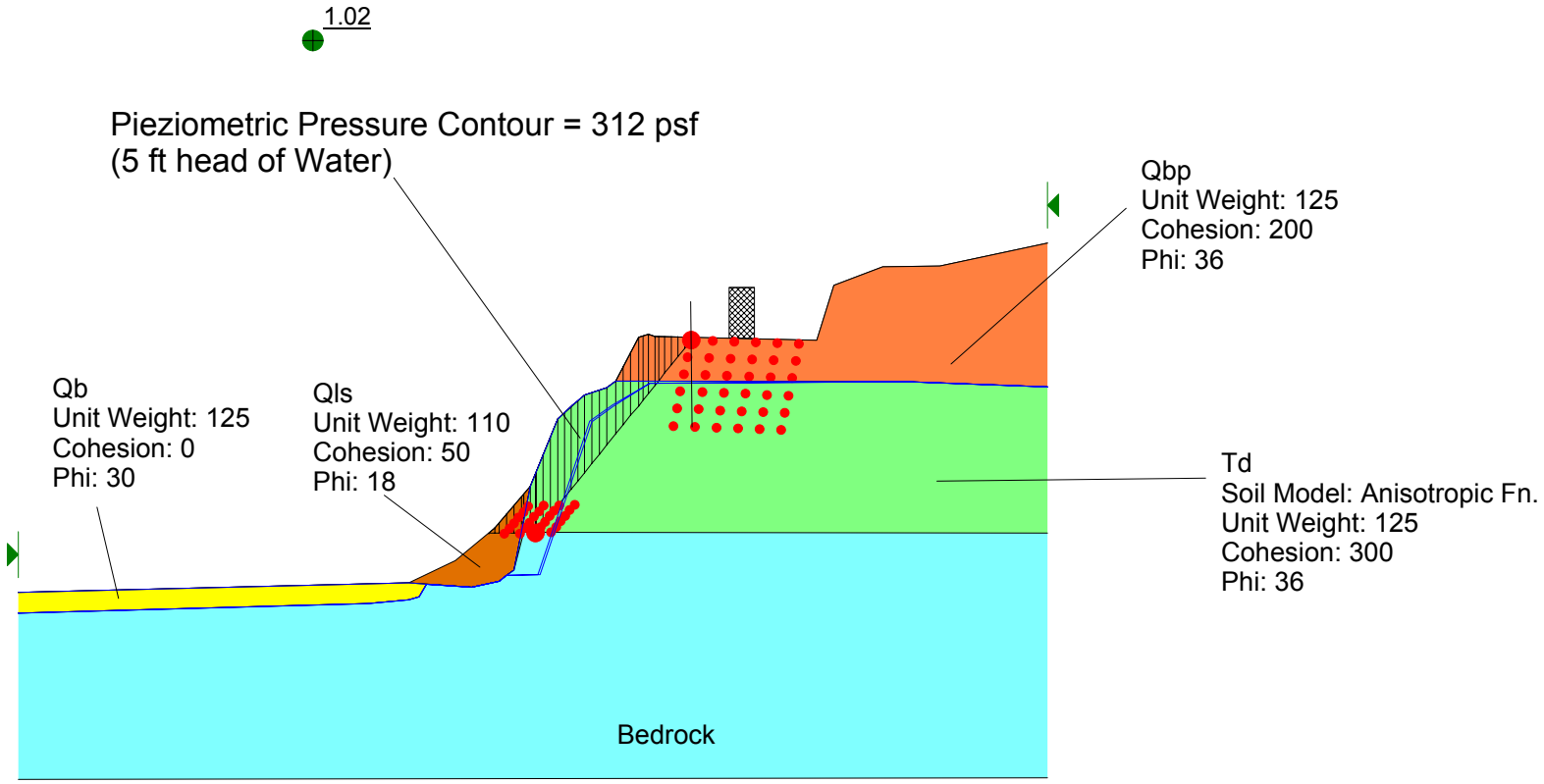
Del Mar Bluffs Cross Section 9-9'
Slope Stability Analysis
File Name: Section 99 Static With Water 2.slz
Analysis Method: Spencer
Factor of Safety: 1.02



Del Mar Bluffs Cross Section 9-9'
Slope Stability Analysis
File Name: Section 99 Static With Water 3.slz
Analysis Method: Spencer

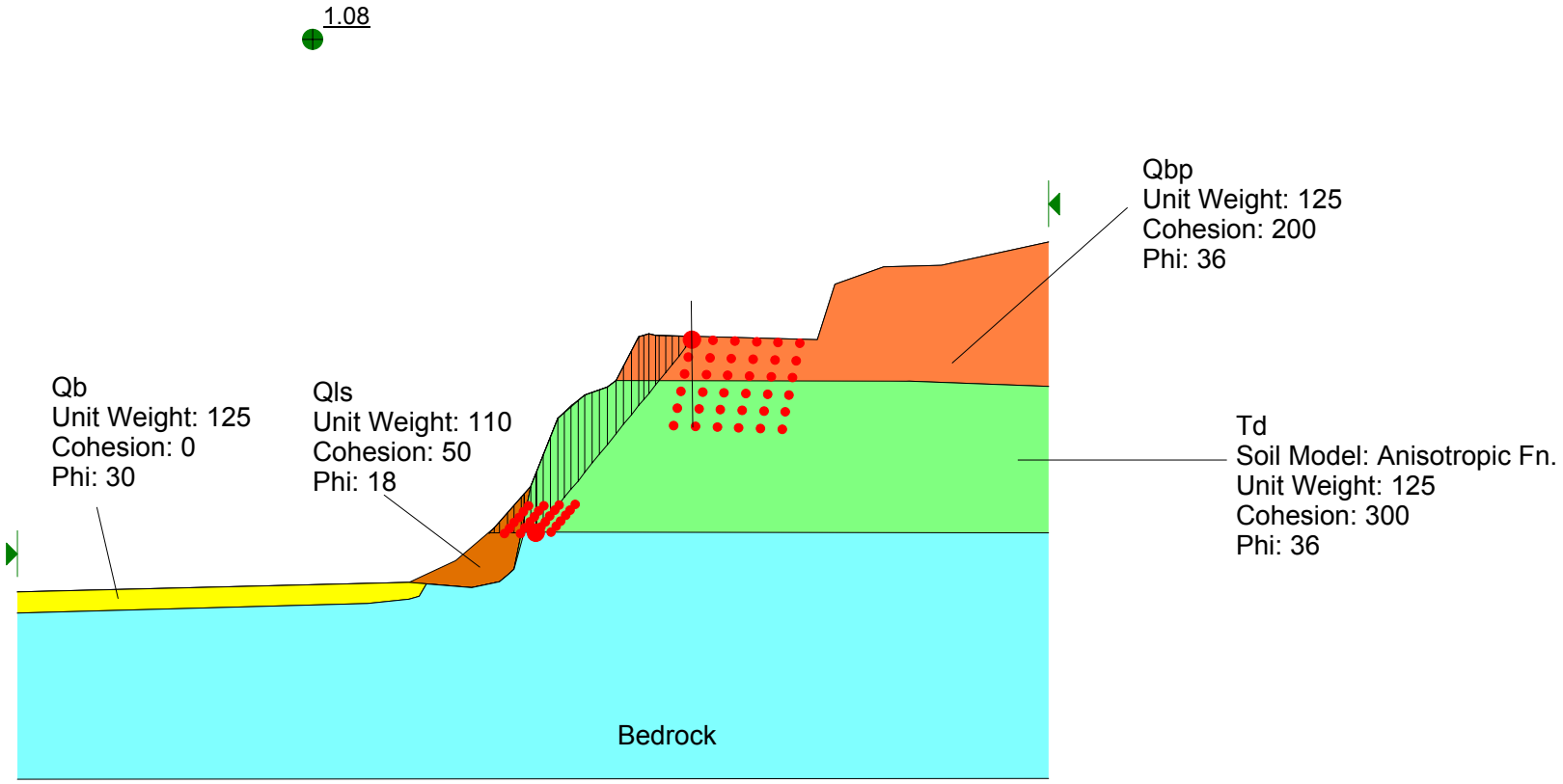
Factor of Safety: 1.02

Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 9-9'
Slope Stability Analysis, No Water
File Name: Section 99 Static 1.slz
Analysis Method: Spencer

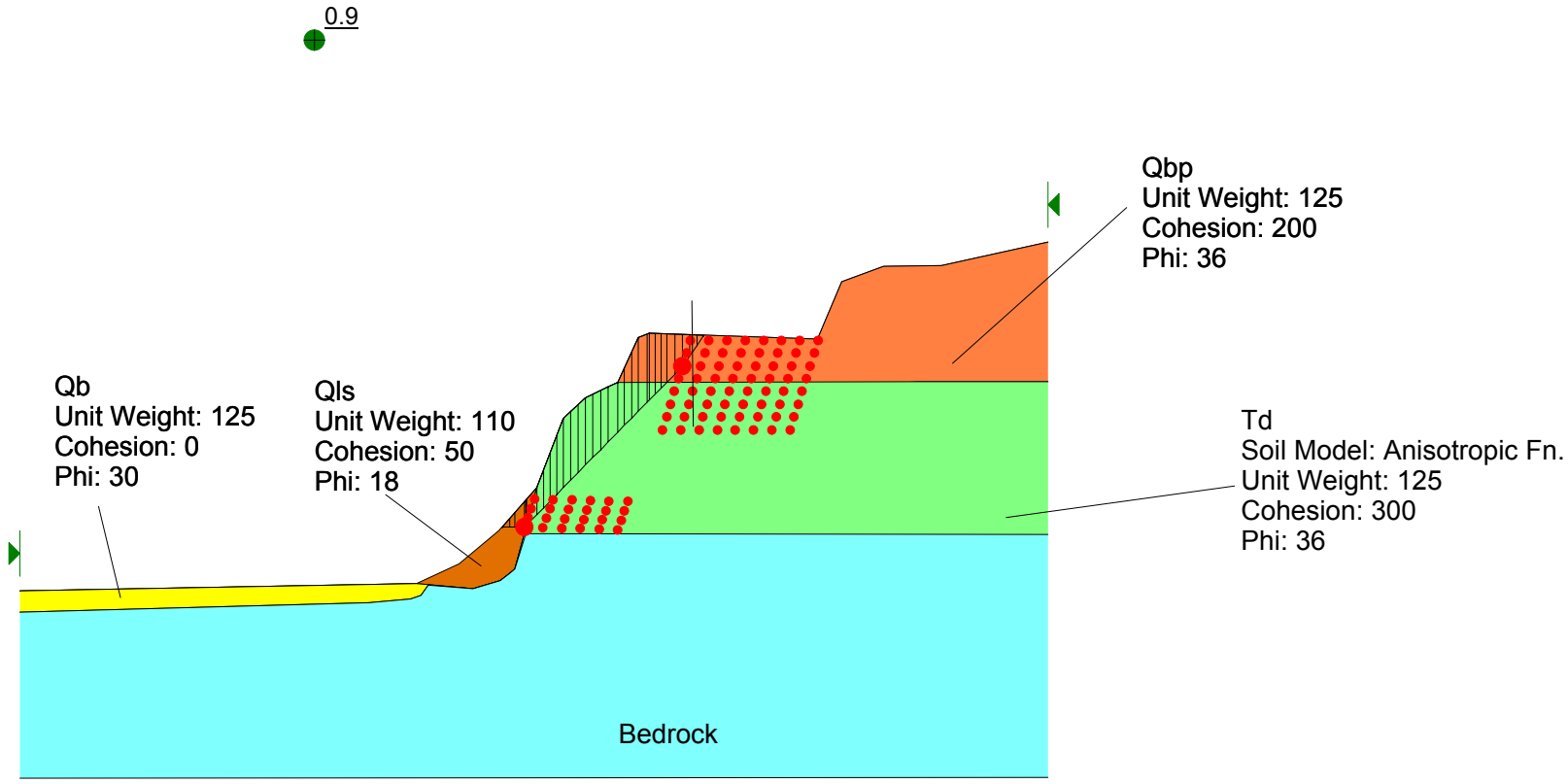
Factor of Safety: 1.08



Del Mar Bluffs Cross Section 9-9'
Slope Stability Analysis
File Name: Section 99 Psuedo Static 2.slz
Analysis Method: Spencer

Factor of Safety: 0.94

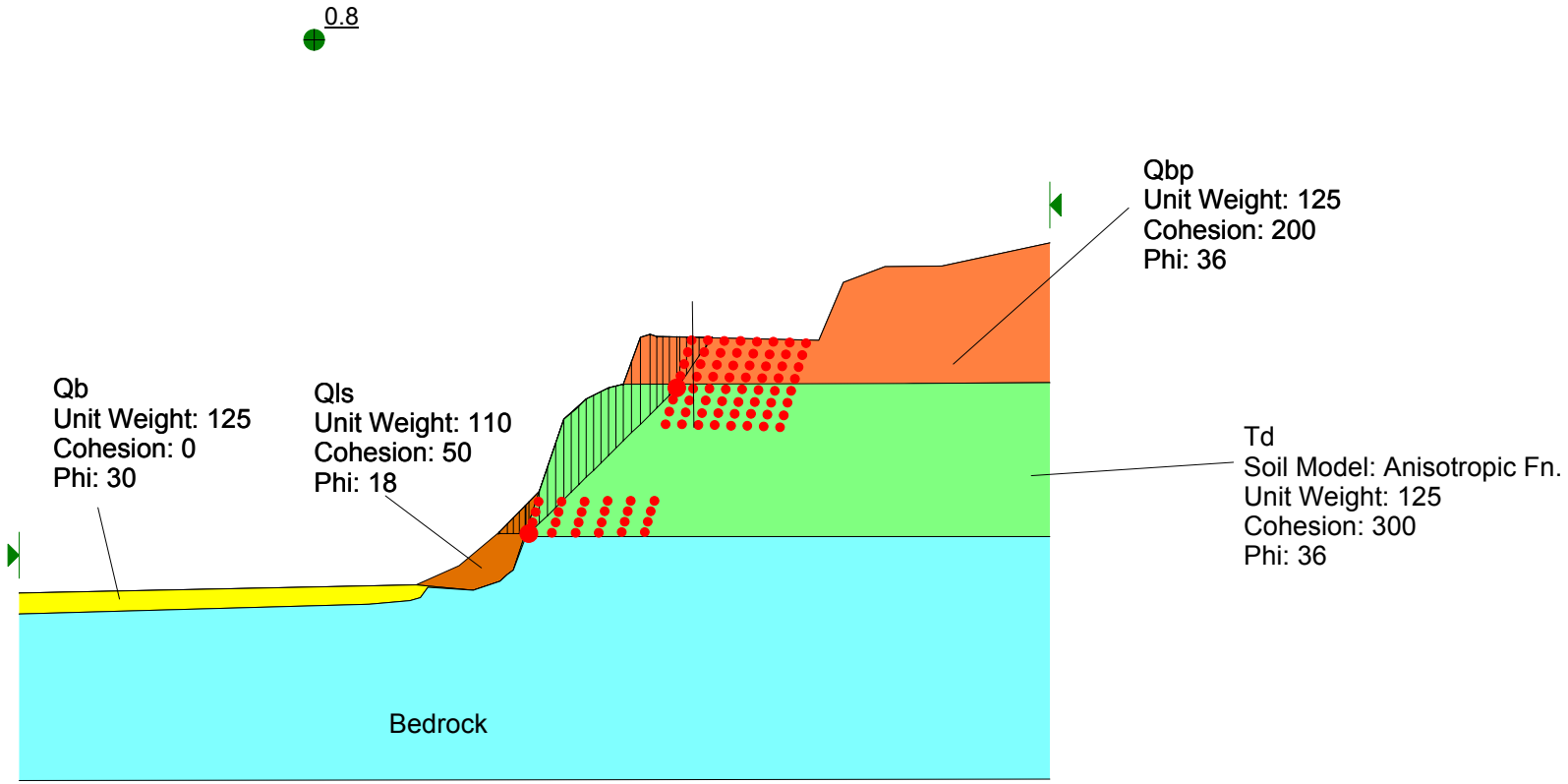
Seismic Coefficient = 0.15



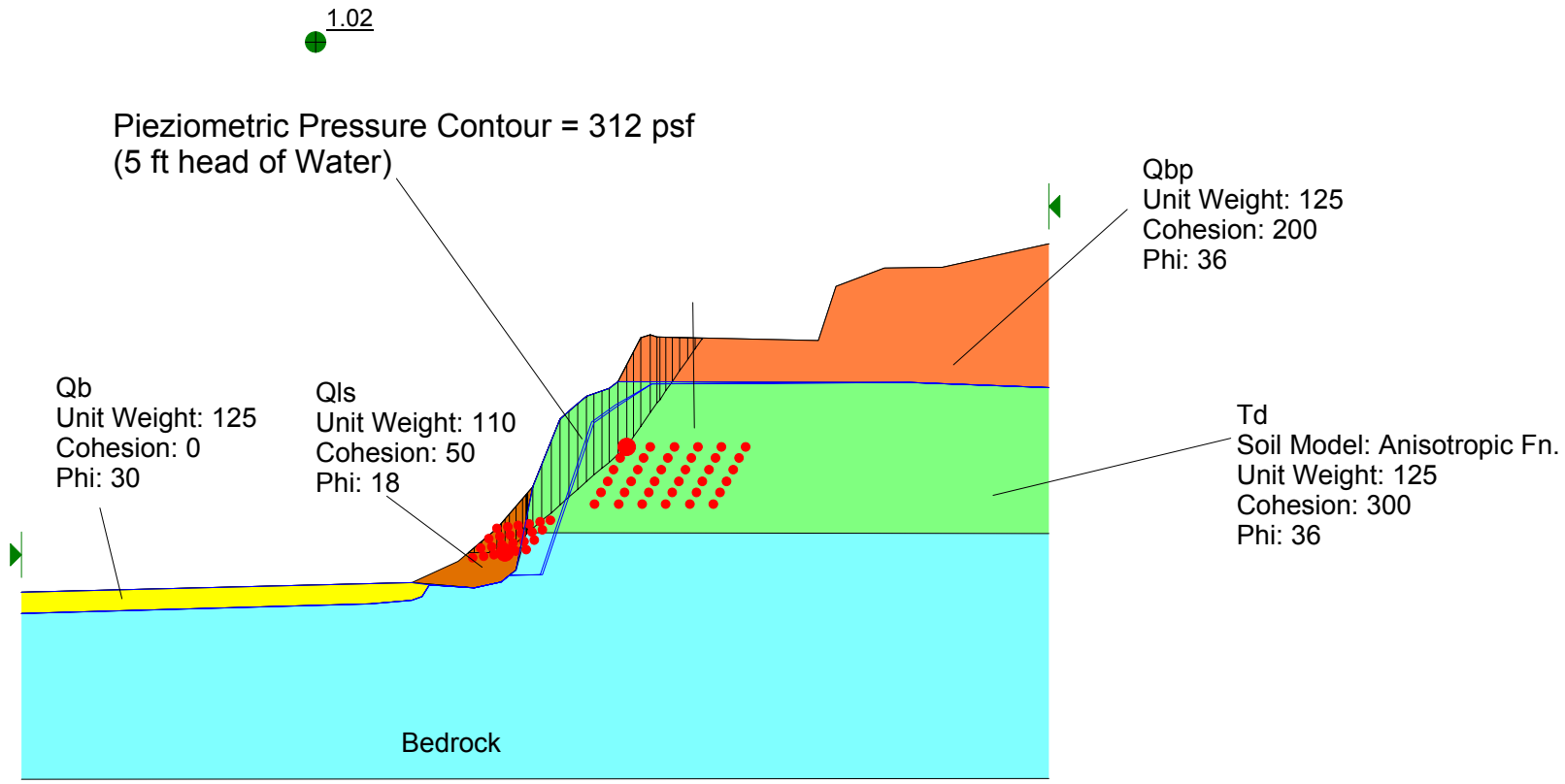
Del Mar Bluffs Cross Section 9-9'
Slope Stability Analysis
File Name: Section 99 Psuedo Static 3.slz
Analysis Method: Spencer

Factor of Safety: 0.79

Seismic Coefficient = 0.28



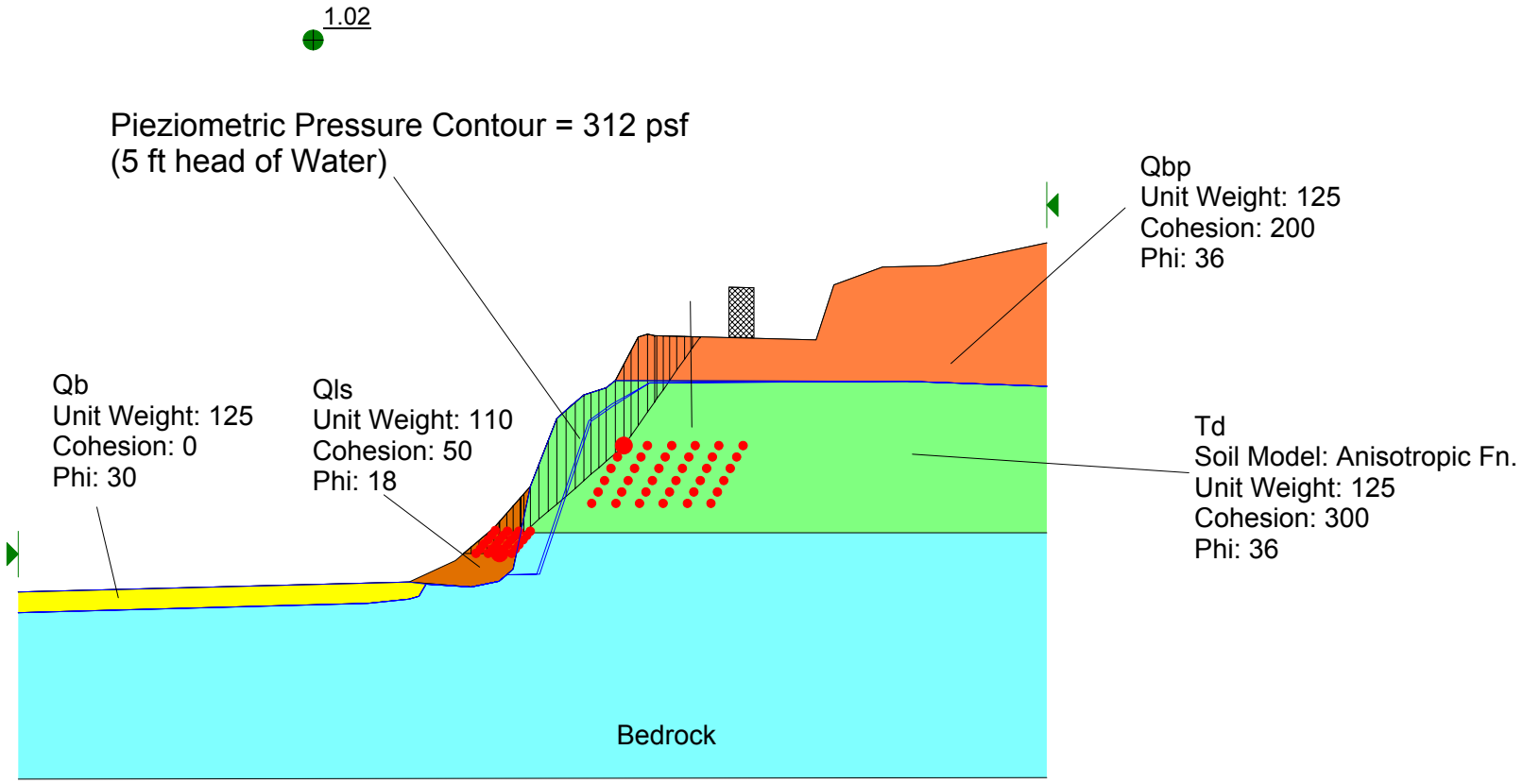
Del Mar Bluffs Cross Section 9-9'
Slope Stability Analysis
File Name: Section 99 Static With Water 2B.slz
Analysis Method: Spencer
Factor of Safety: 1.02



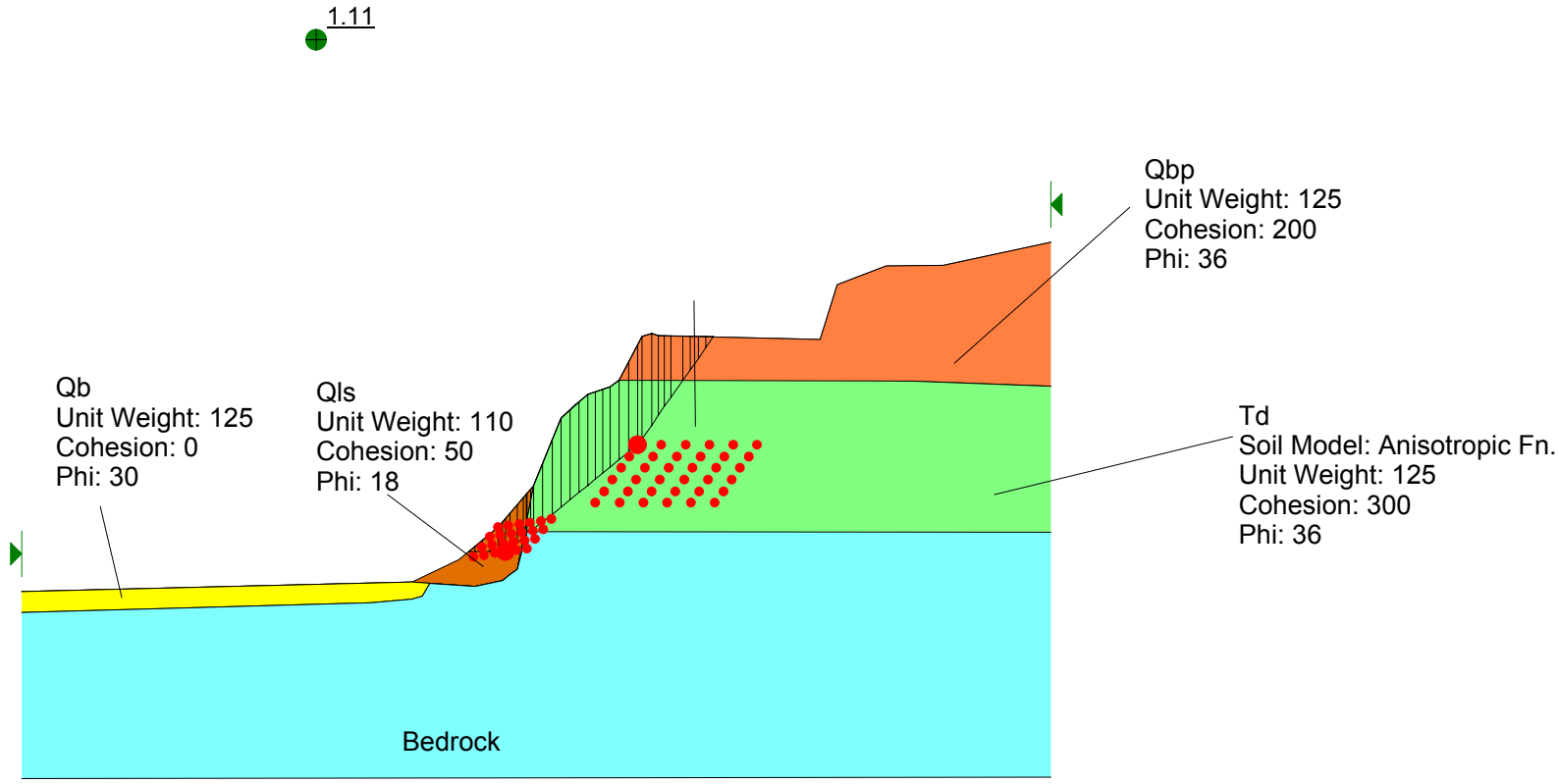
Del Mar Bluffs Cross Section 9-9'
Slope Stability Analysis
File Name: Section 99 Static With Water 3B.slz
Analysis Method: Spencer

Factor of Safety: 1.02

Surcharge = 3,000 psf



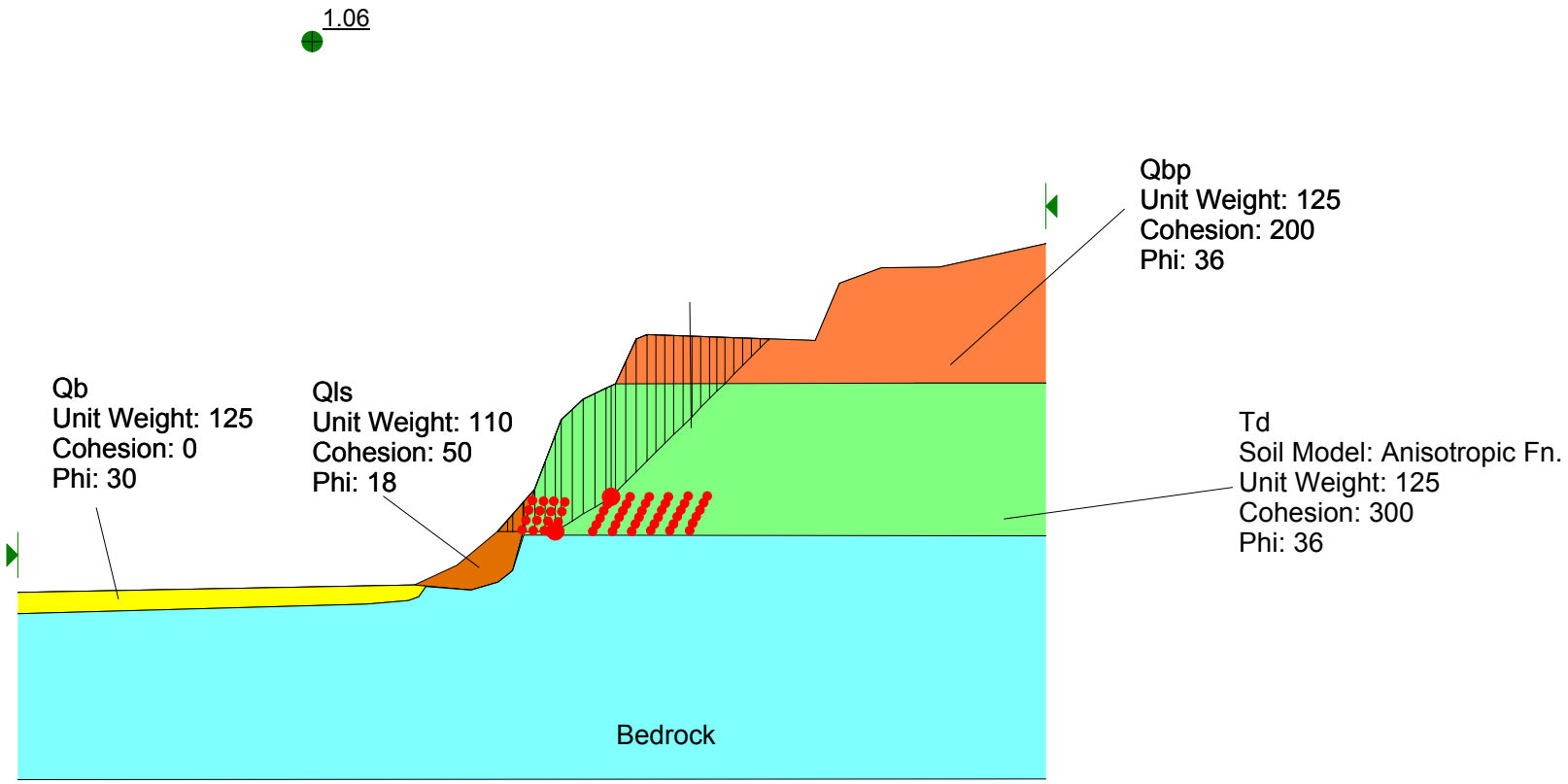
Del Mar Bluffs Cross Section 9-9'
Slope Stability Analysis, No Water
File Name: Section 99 Static 1B.slz
Analysis Method: Spencer
Factor of Safety: 1.11



Del Mar Bluffs Cross Section 9-9'
Slope Stability Analysis
File Name: Section 99 Psuedo Static 2B.slz
Analysis Method: Spencer

Factor of Safety: 1.06

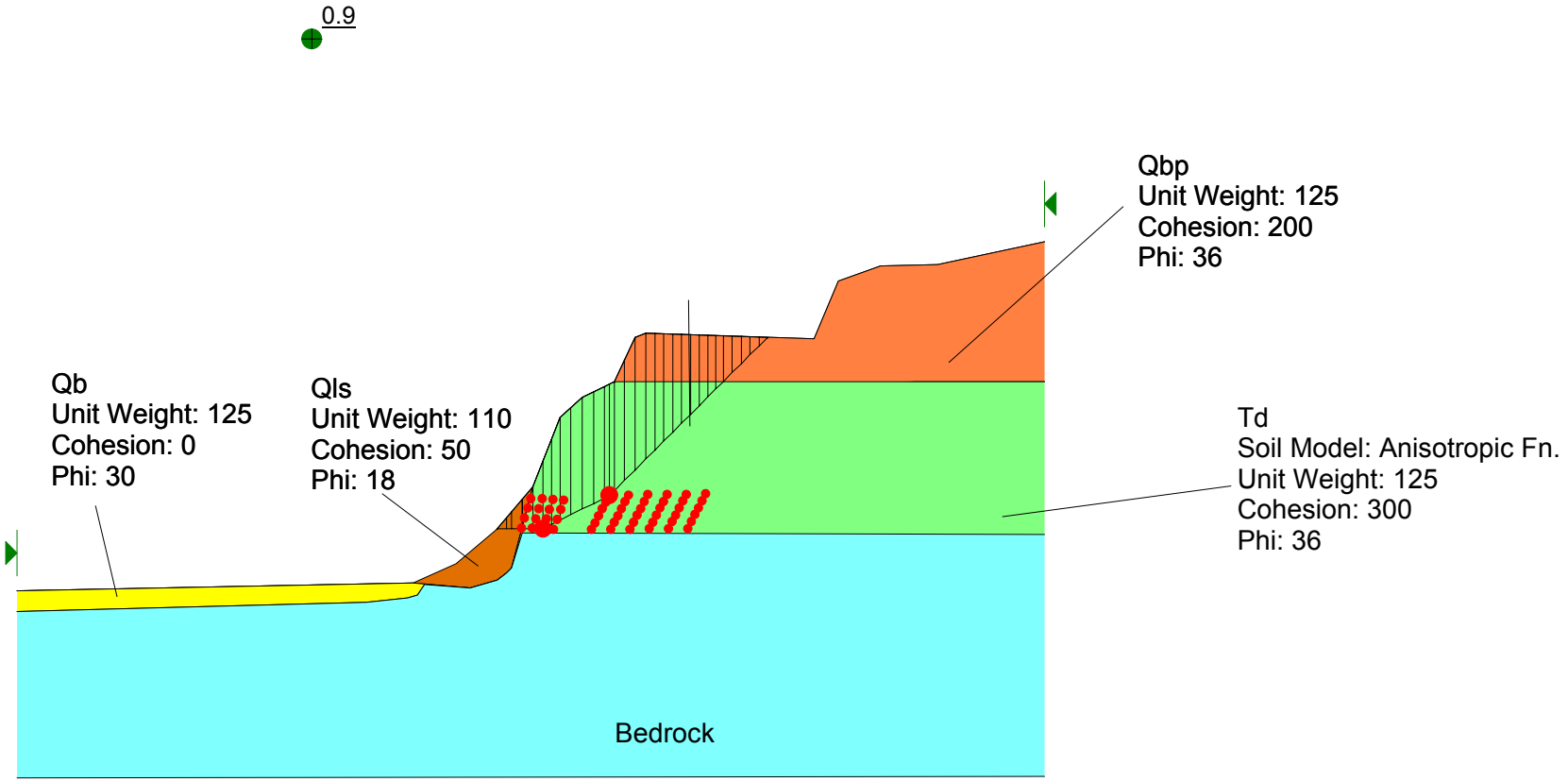
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 9-9'
Slope Stability Analysis
File Name: Section 99 Psuedo Static 3B.slz
Analysis Method: Spencer

Factor of Safety: 0.9

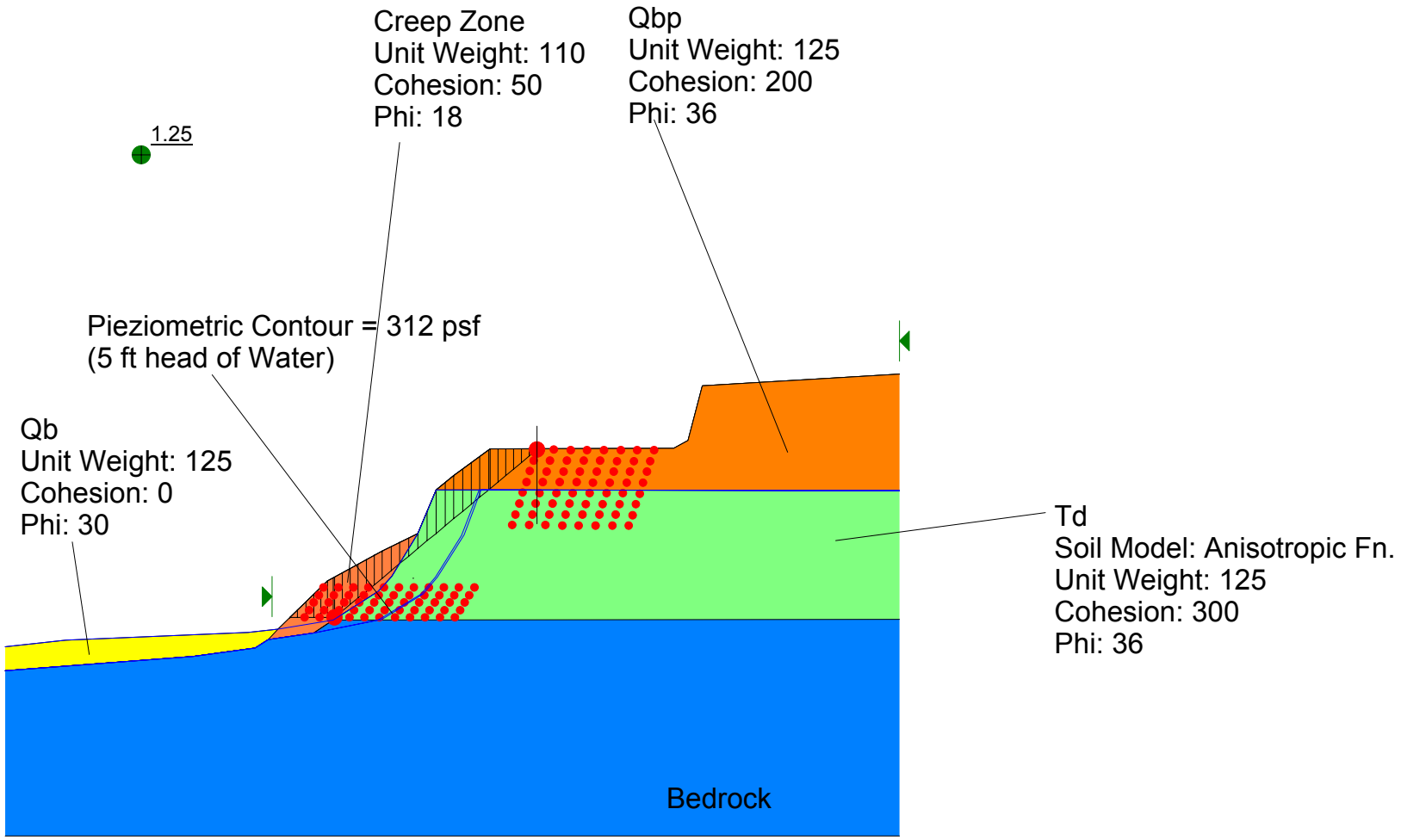
Seismic Coefficient = 0.28



Cross Section 10-10’

Del Mar Bluffs Cross Section 10-10'
Slope Stability Analysis
File Name: Section 1010 5 ft Water Static 2.slz
Analysis Method: Spencer

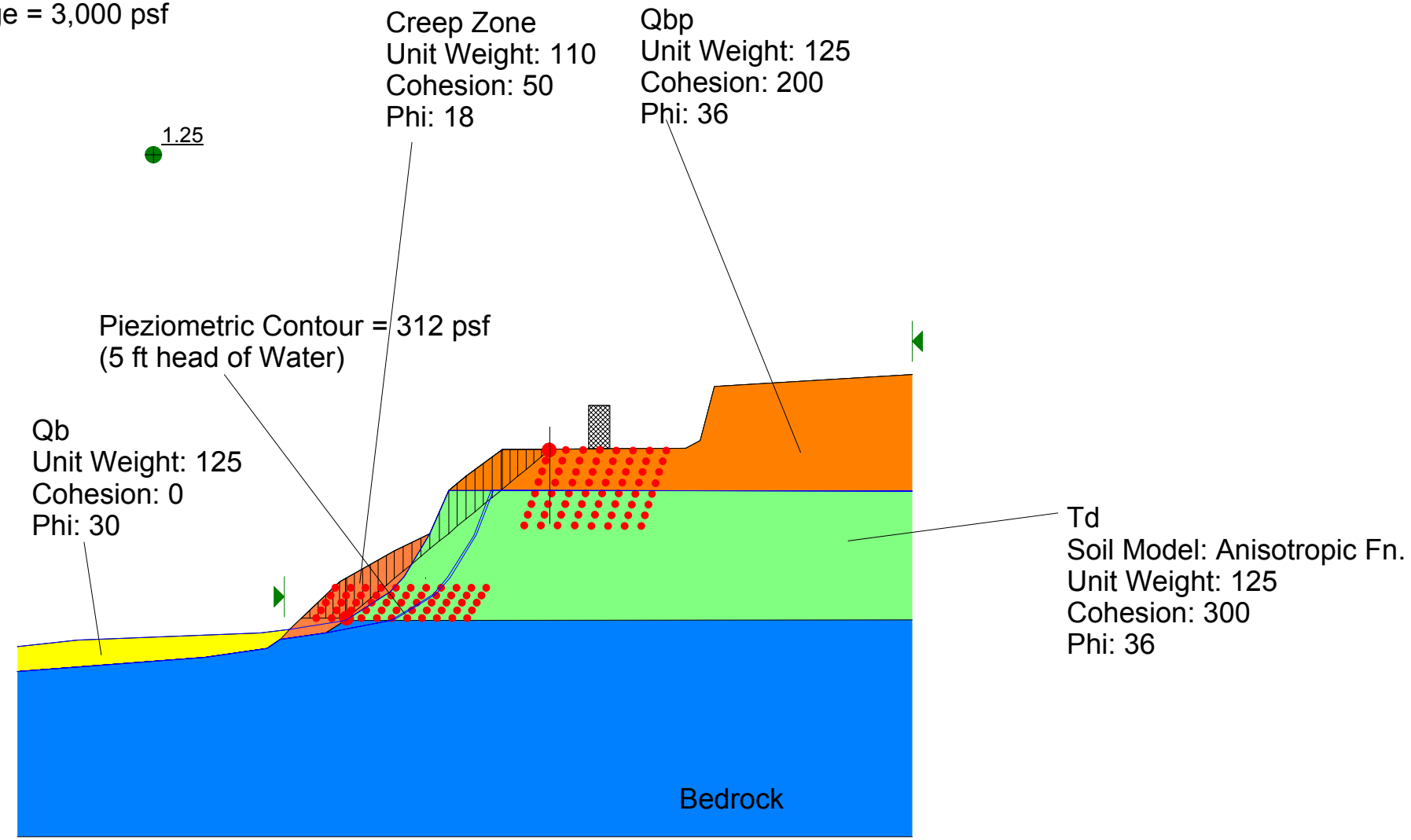
Factor of Safety: 1.25



Del Mar Bluffs Cross Section 10-10'
Slope Stability Analysis
File Name: Section 1010 5 ft Water Static 2C.slz
Analysis Method: Spencer

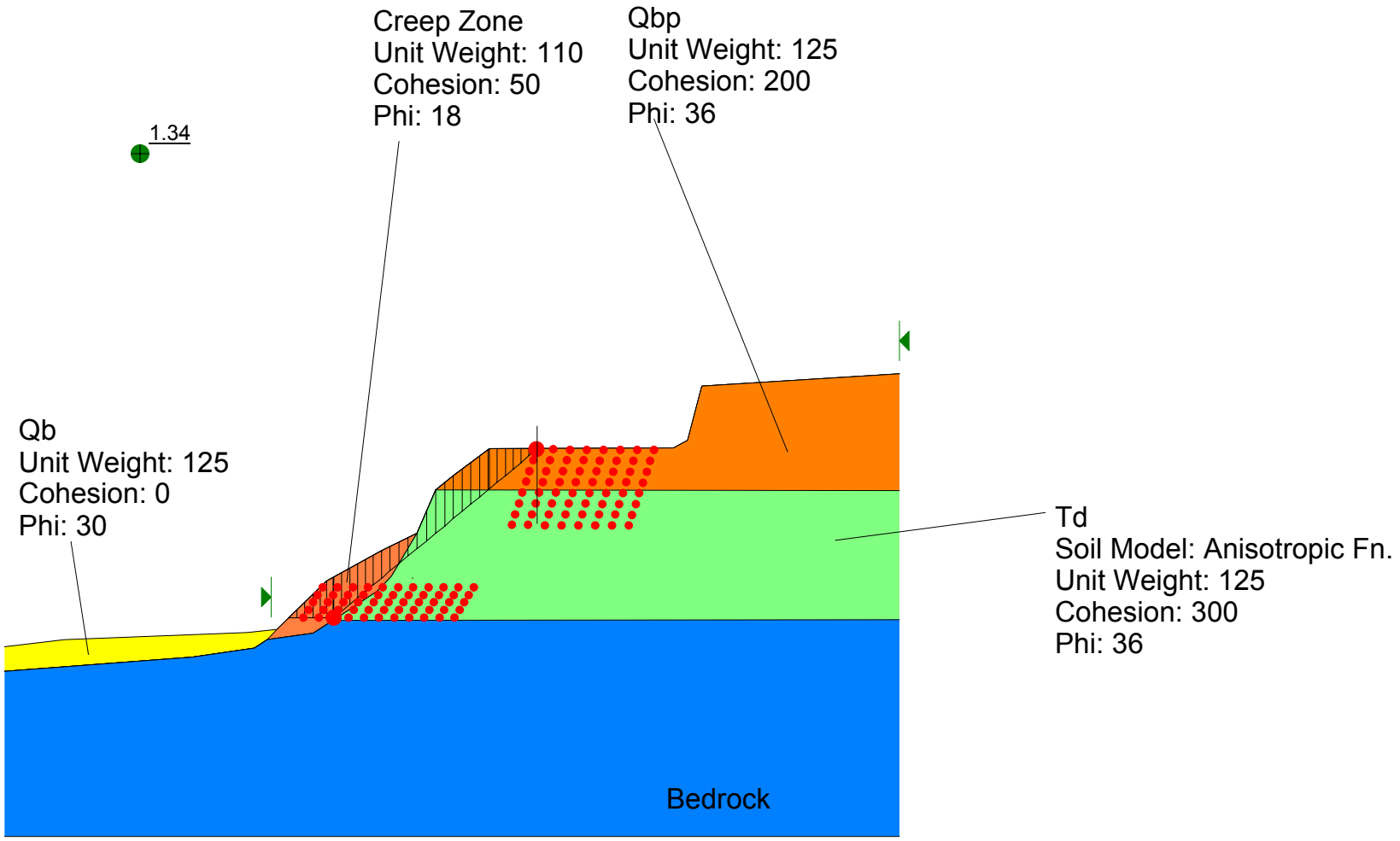
Factor of Safety: 1.25

Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 10-10'
Slope Stability Analysis, No Water
File Name: Section 1010 Static 3.slz
Analysis Method: Spencer

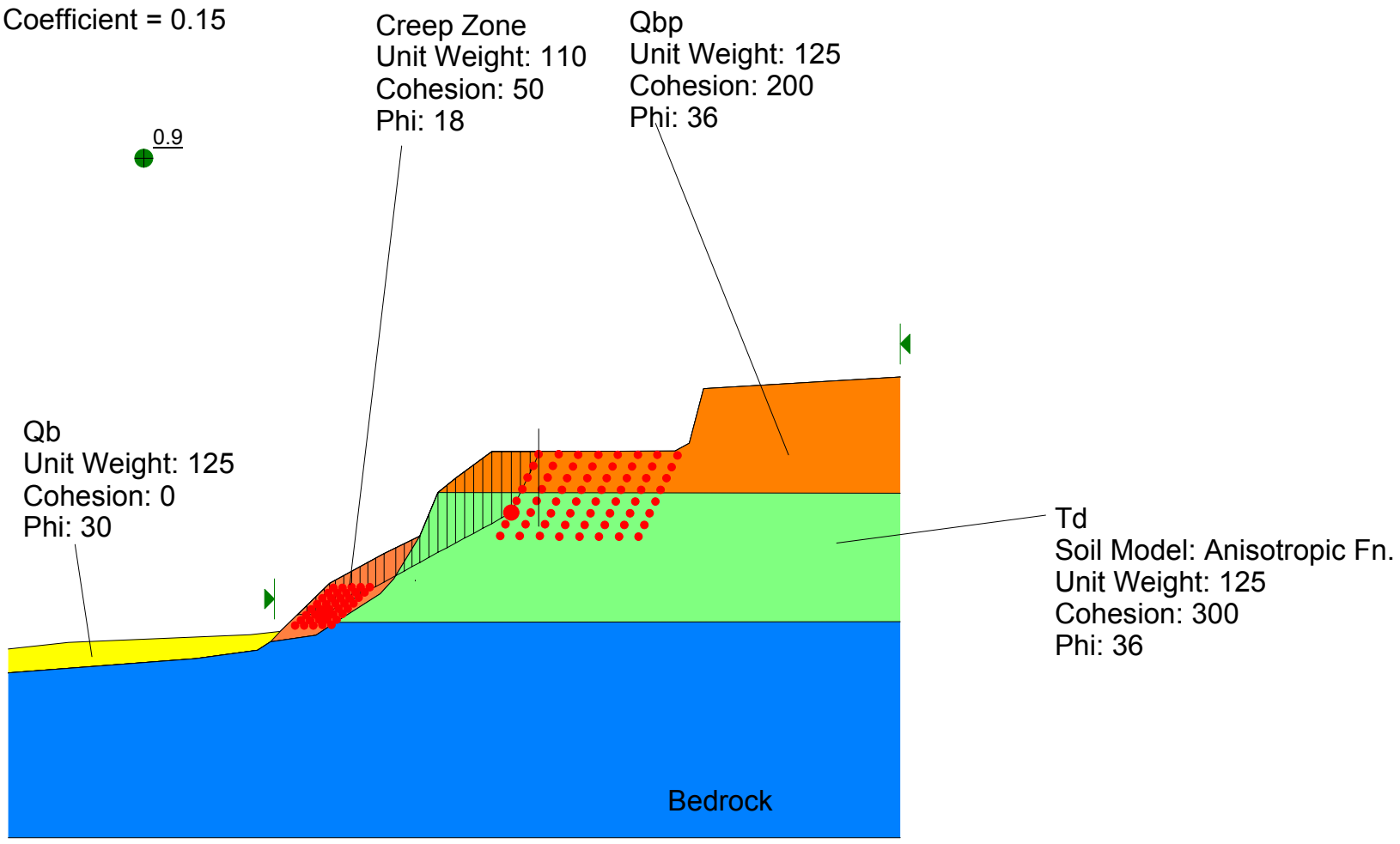
Factor of Safety: 1.34



Del Mar Bluffs Cross Section 10-10'
Slope Stability Analysis
File Name: Section 1010 Psuedo Static 2.slz
Analysis Method: Spencer

Factor of Safety: 0.89

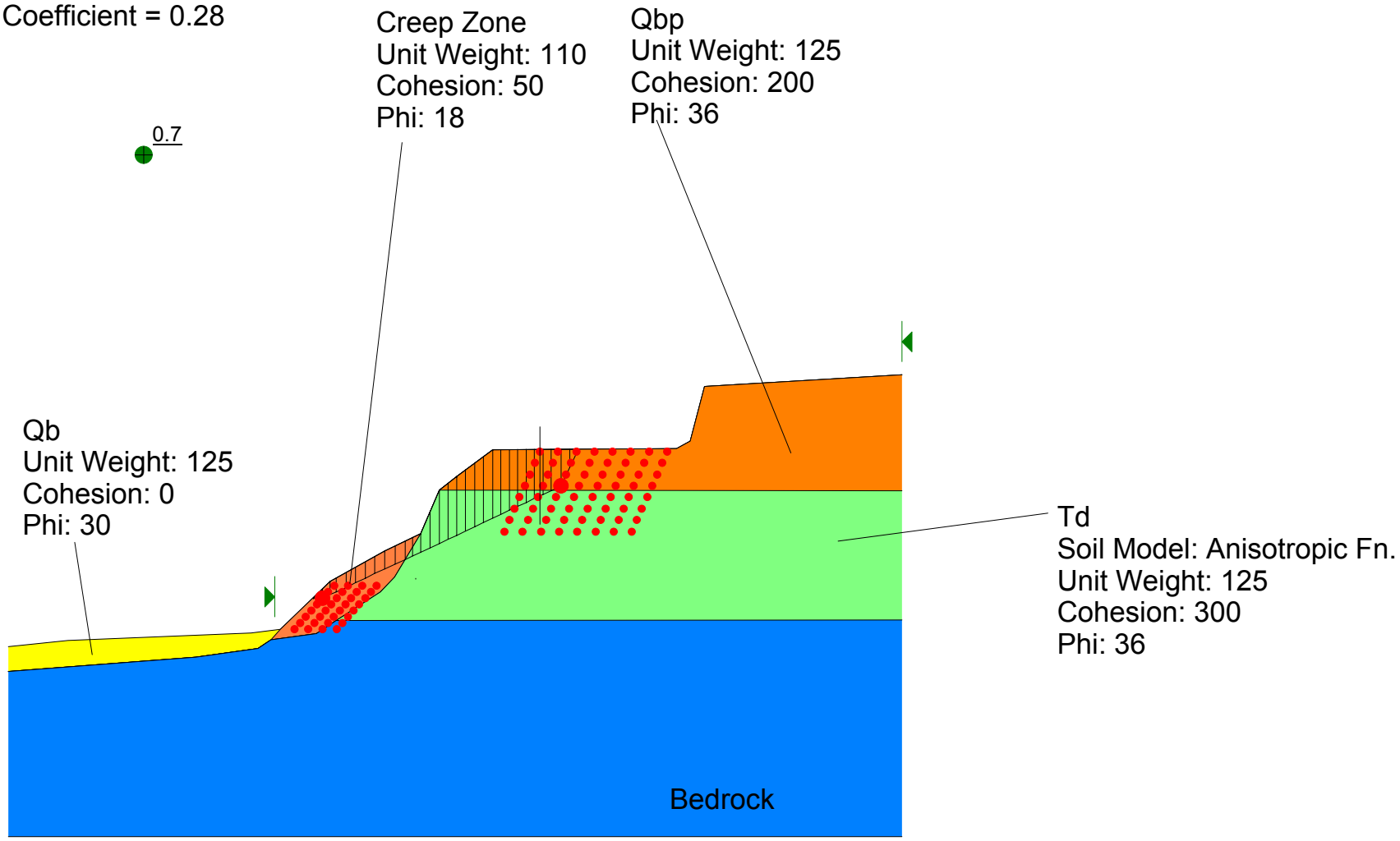
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 10-10'
Slope Stability Analysis
File Name: Section 1010 Psuedo Static 4.slz
Analysis Method: Spencer

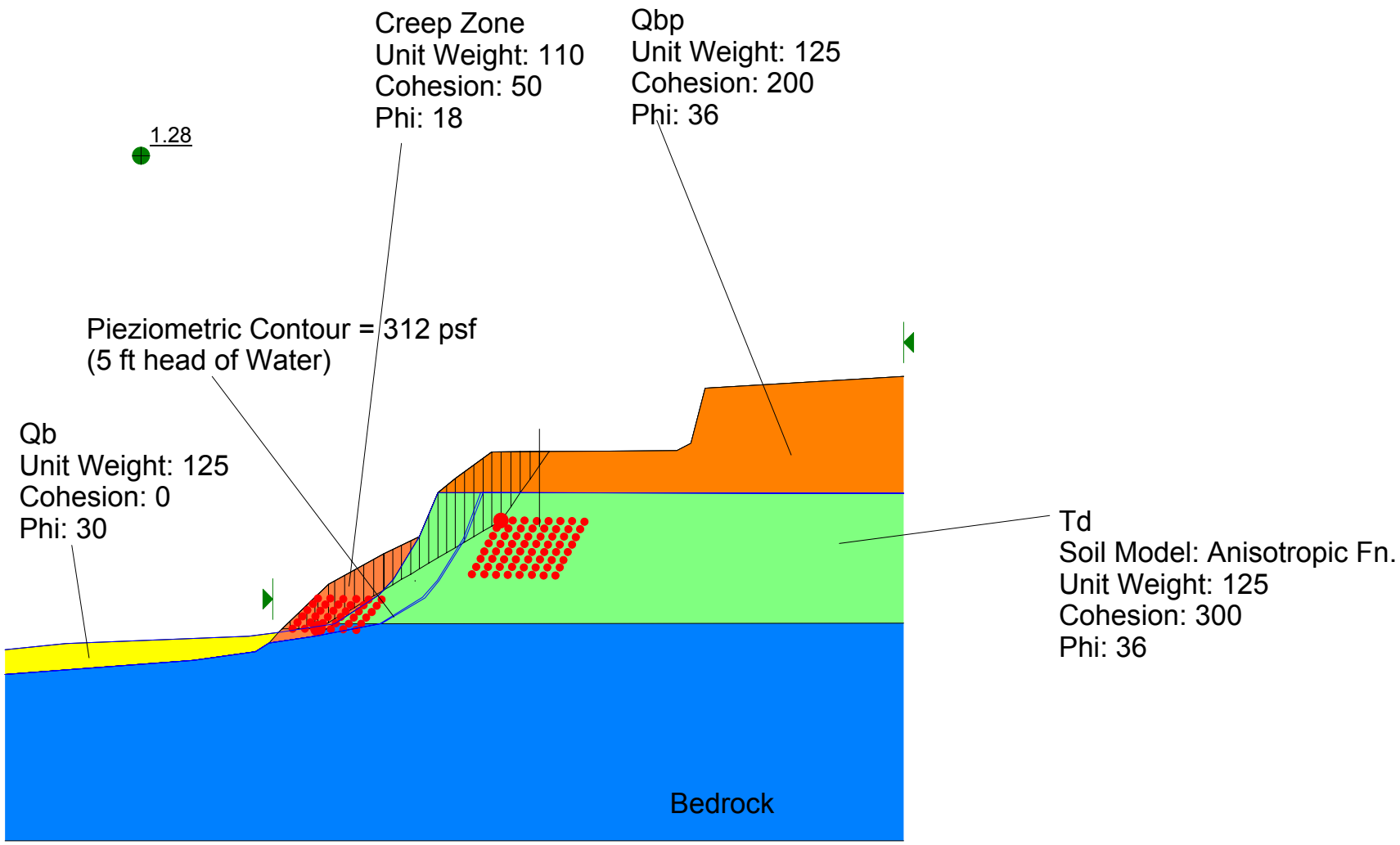
Factor of Safety: 0.69

Seismic Coefficient = 0.28



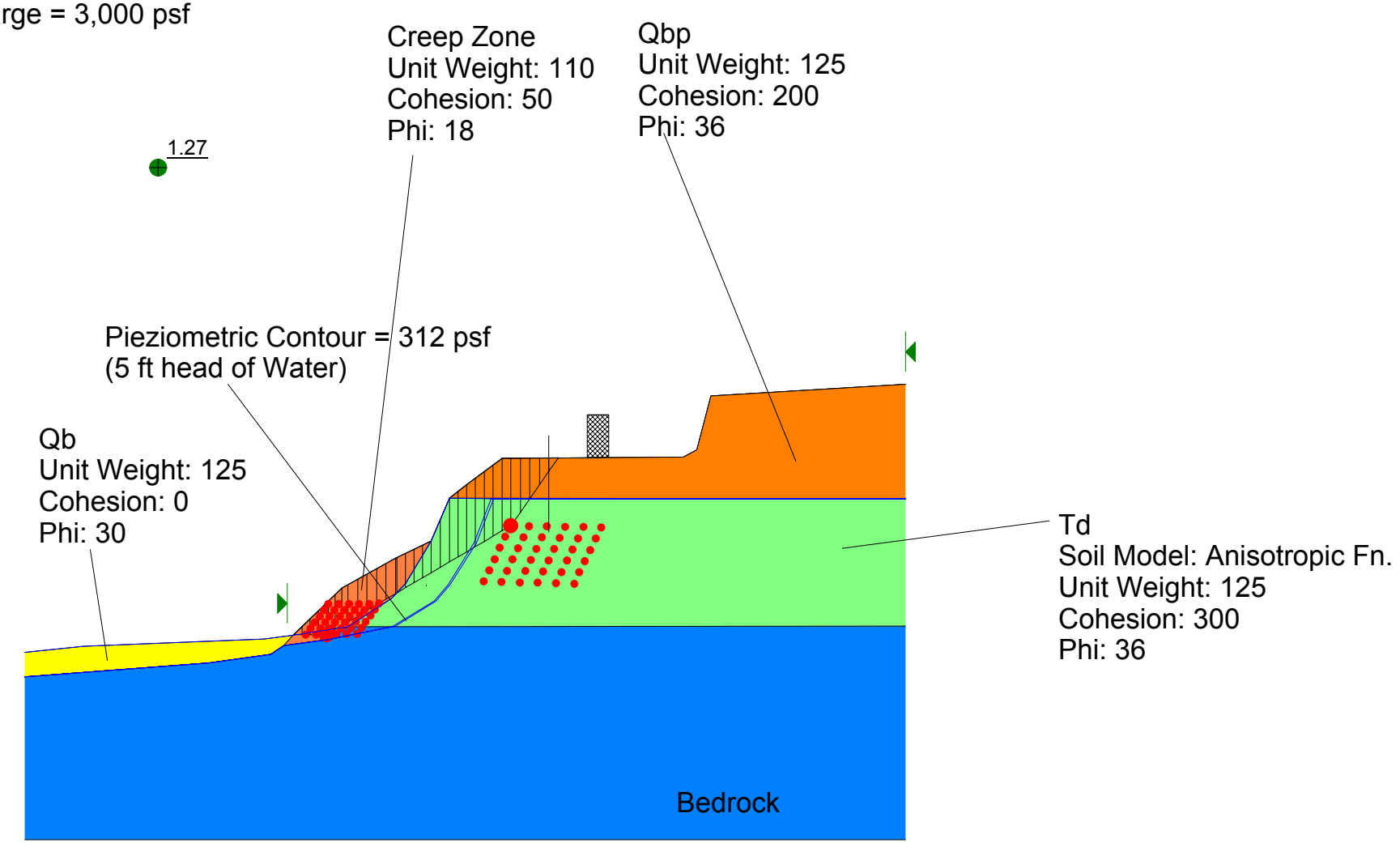
Del Mar Bluffs Cross Section 10-10'
Slope Stability Analysis
File Name: Section 1010 5 ft Water Static 2B.slz
Analysis Method: Spencer

Factor of Safety: 1.28



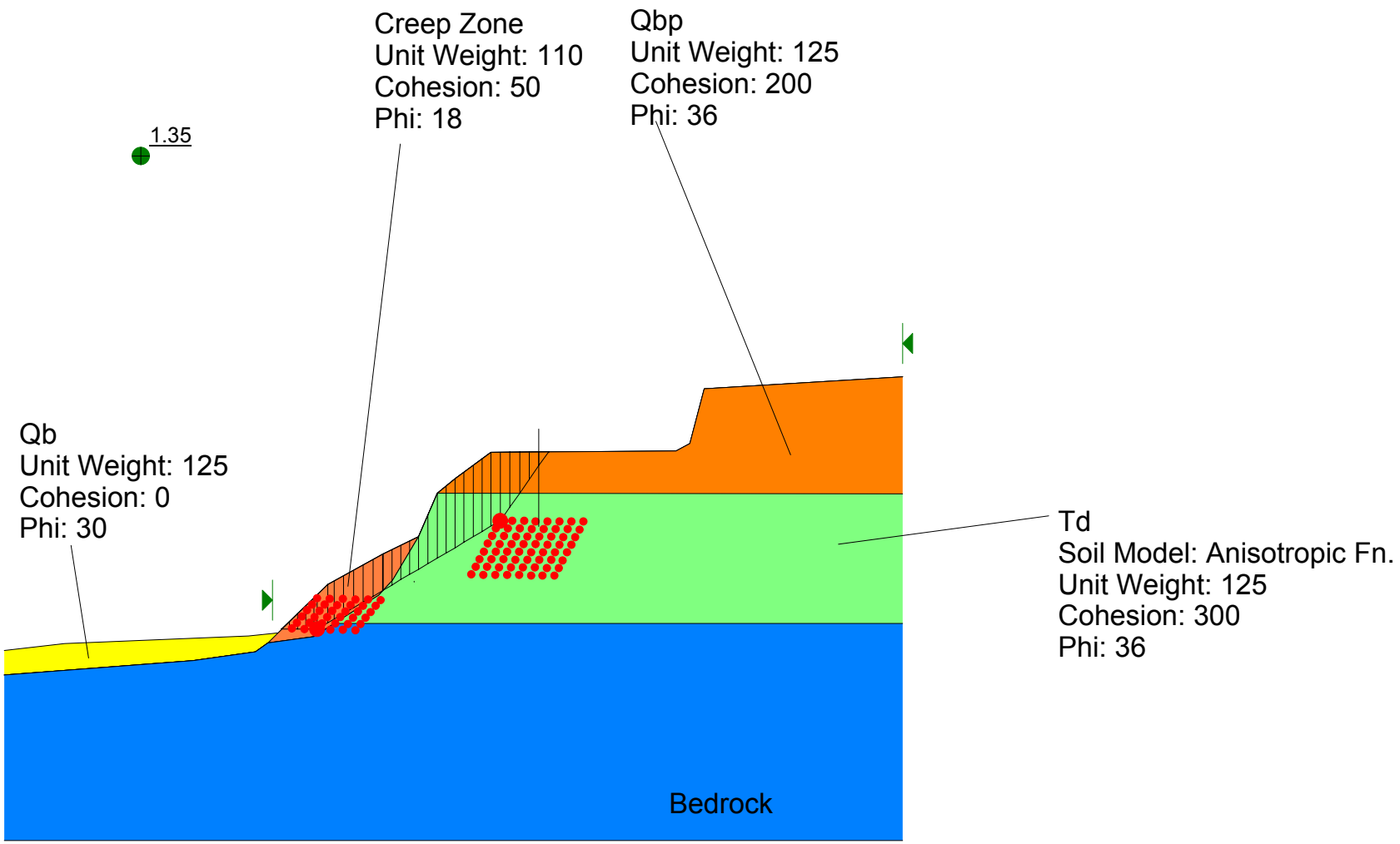
Del Mar Bluffs Cross Section 10-10'
Slope Stability Analysis
File Name: Section 1010 5 ft Water Static 4B.slz
Analysis Method: Spencer

Factor of Safety: 1.27
Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 10-10'
Slope Stability Analysis, No Water
File Name: Section 1010 Static 3B.slz
Analysis Method: Spencer

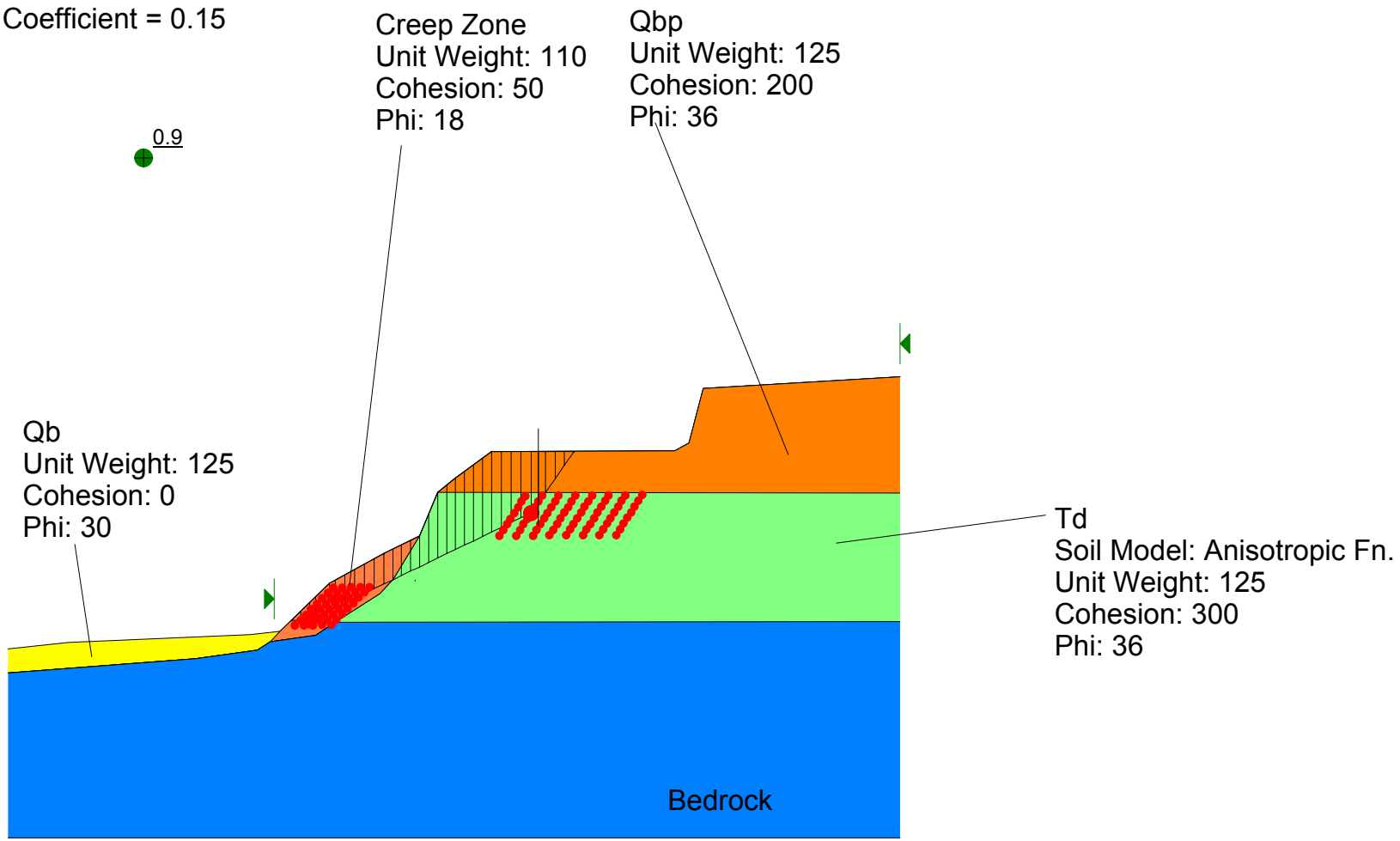
Factor of Safety: 1.35



Del Mar Bluffs Cross Section 10-10'
Slope Stability Analysis
File Name: Section 1010 Psuedo Static 2B.slz
Analysis Method: Spencer

Factor of Safety: 0.88

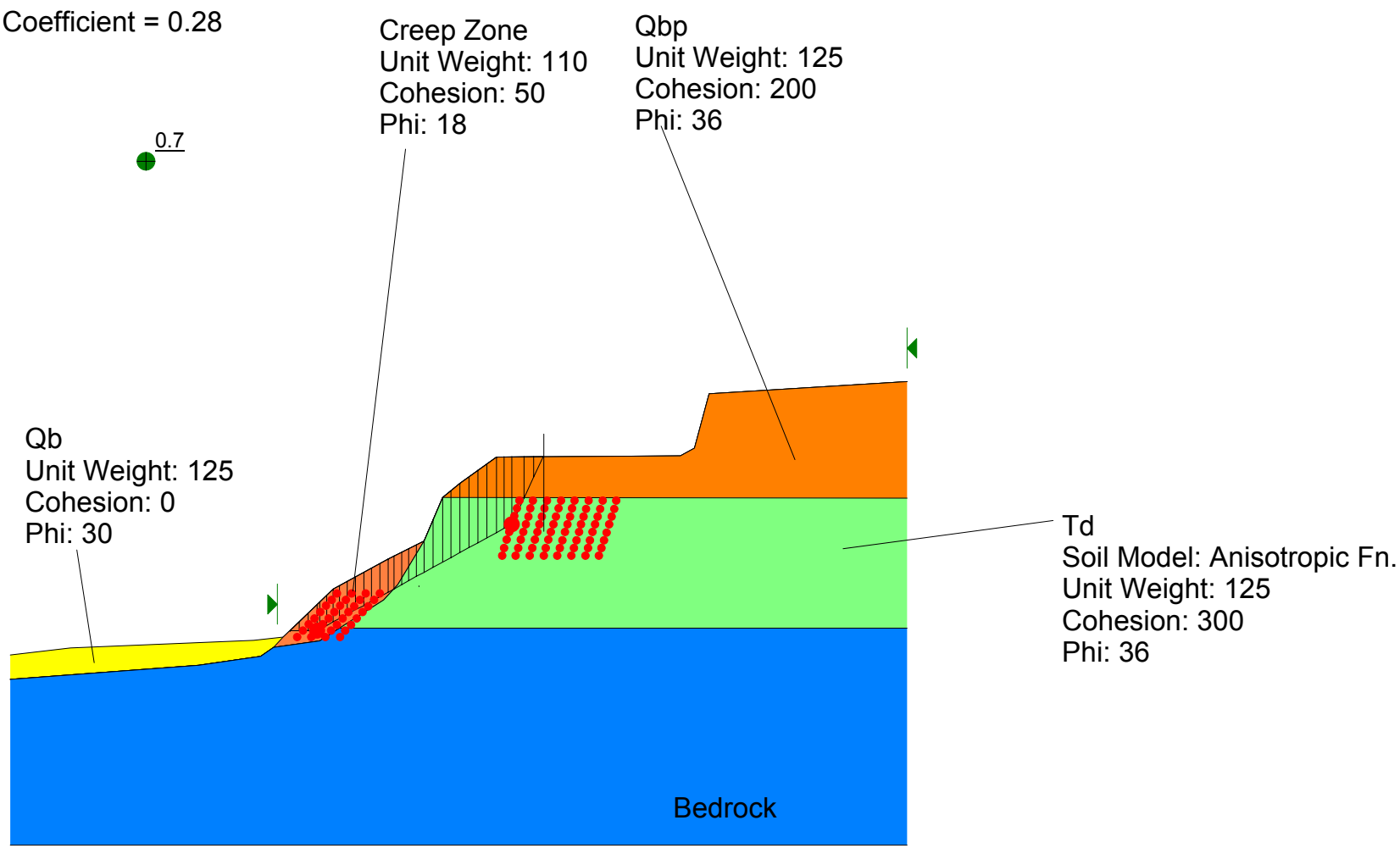
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 10-10'
Slope Stability Analysis
File Name: Section 1010 Psuedo Static 4B.slz
Analysis Method: Spencer

Factor of Safety: 0.7

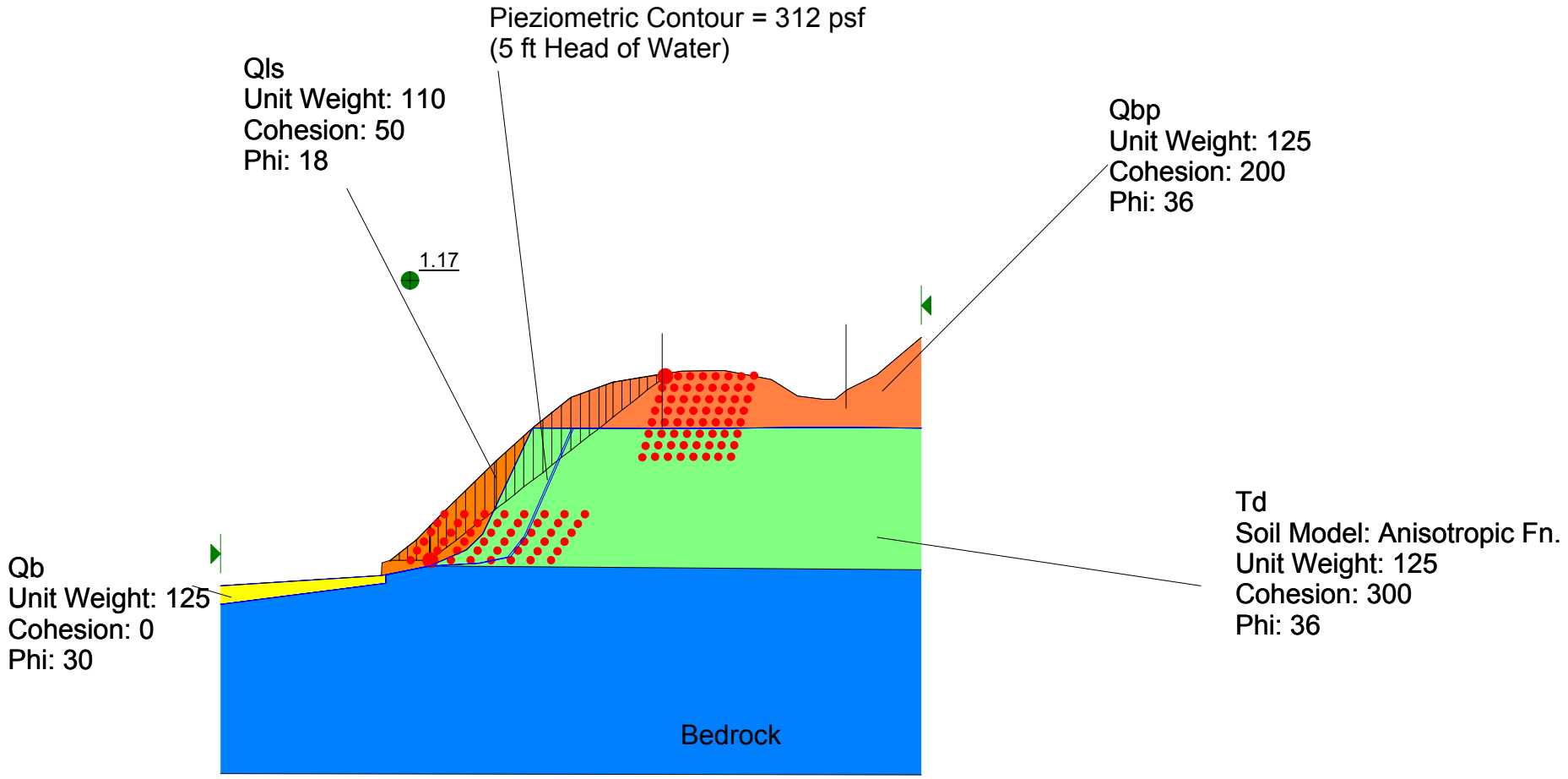
Seismic Coefficient = 0.28



Cross Section 11-11’

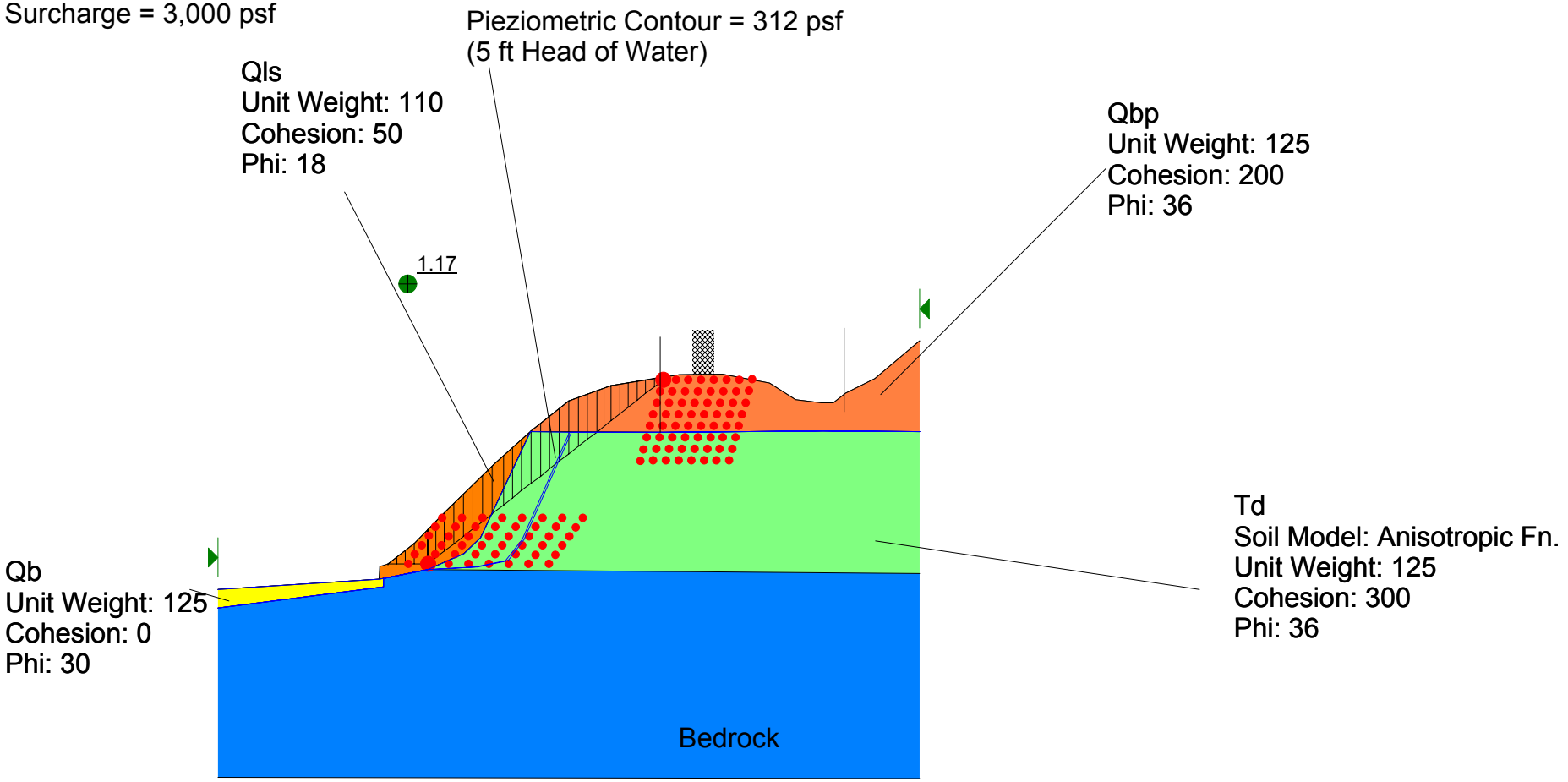
Del Mar Bluffs Cross Section 11-11'
Slope Stability Analysis
File Name: Section 1111 Static 1.slz
Analysis Method: Spencer

Factor of Safety: 1.17



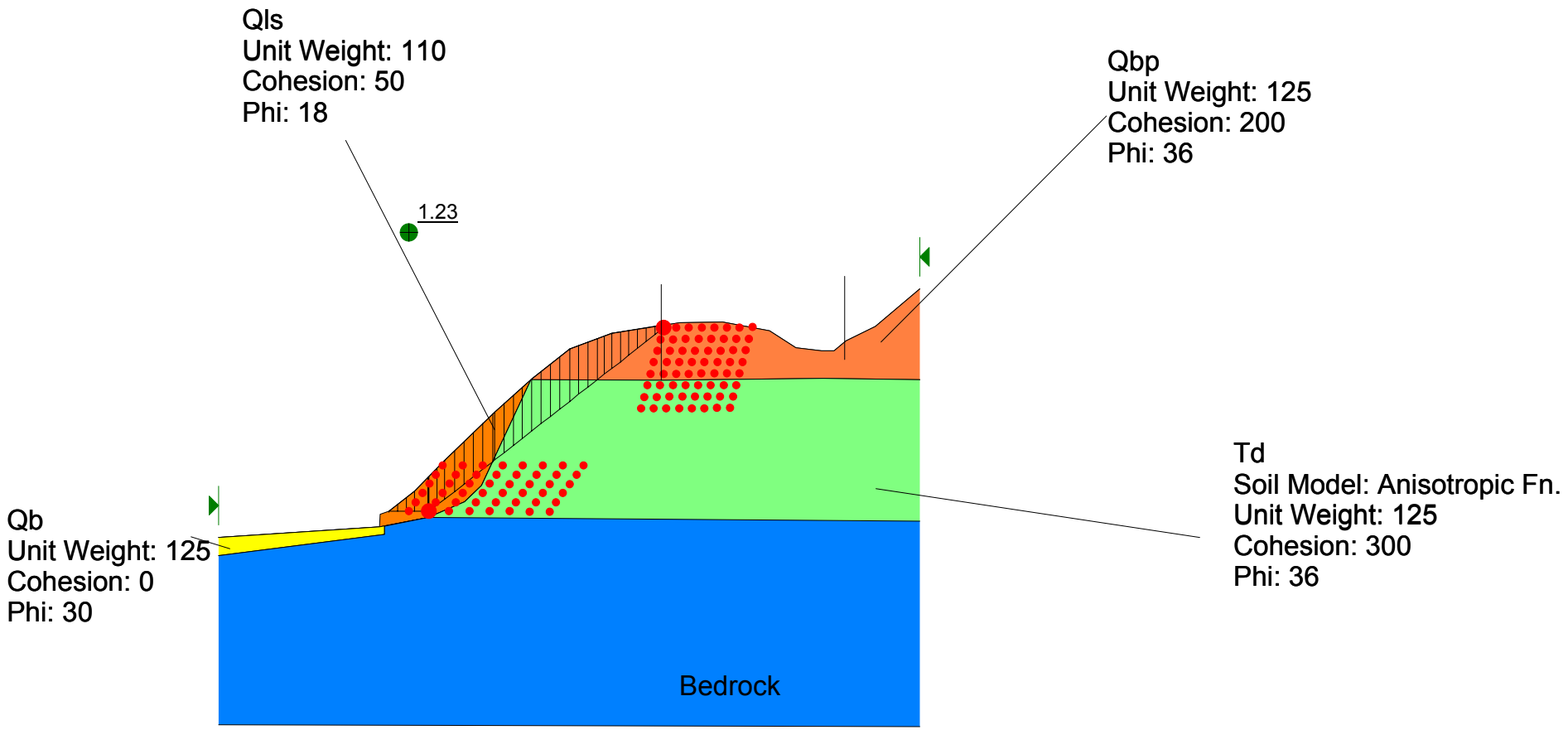
Del Mar Bluffs Cross Section 11-11'
Slope Stability Analysis
File Name: Section 1111 Static 2.slz
Analysis Method: Spencer

Factor of Safety: 1.17



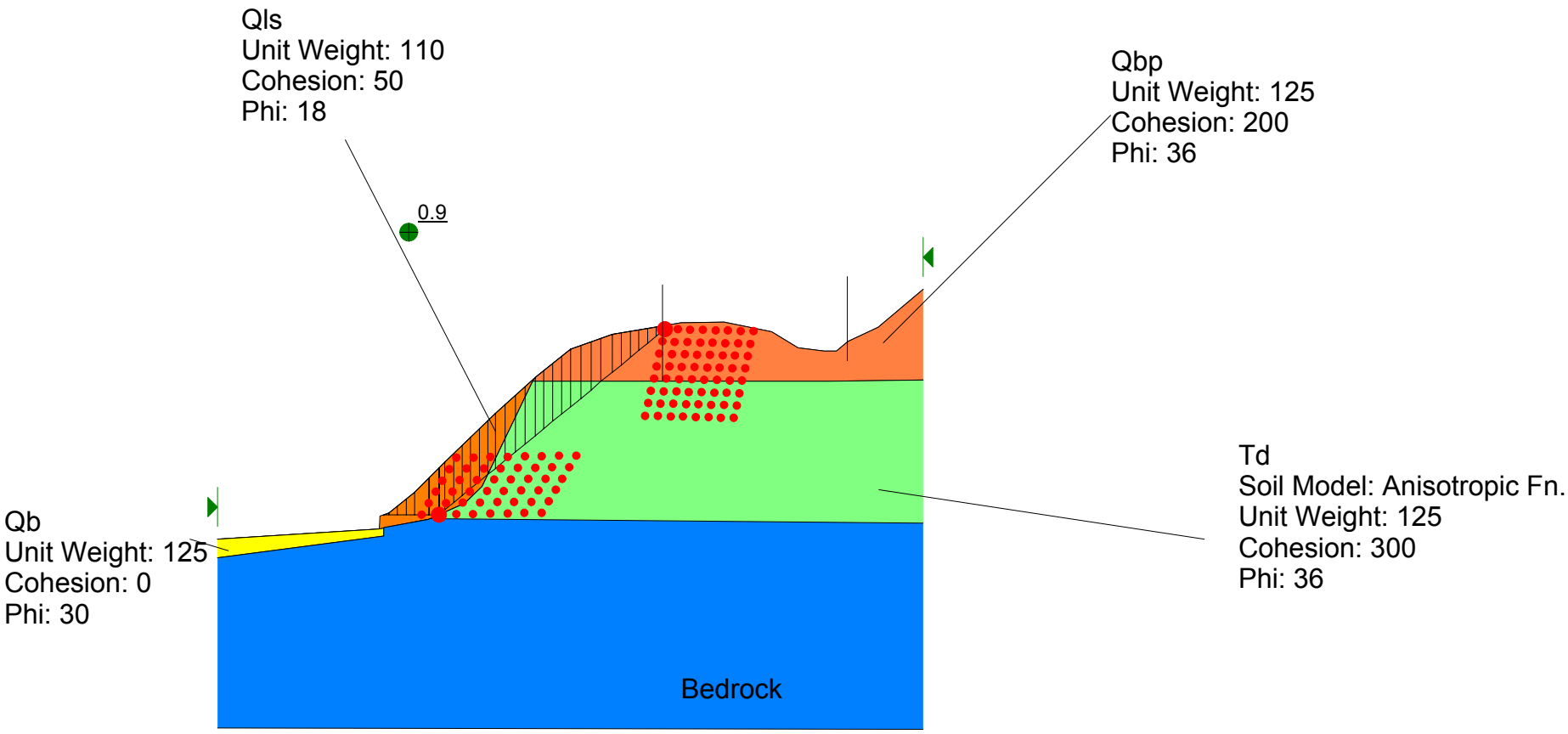
Del Mar Bluffs Cross Section 11-11'
Slope Stability Analysis, No Water
File Name: Section 1111 Static 3.slz
Analysis Method: Spencer

Factor of Safety: 1.23



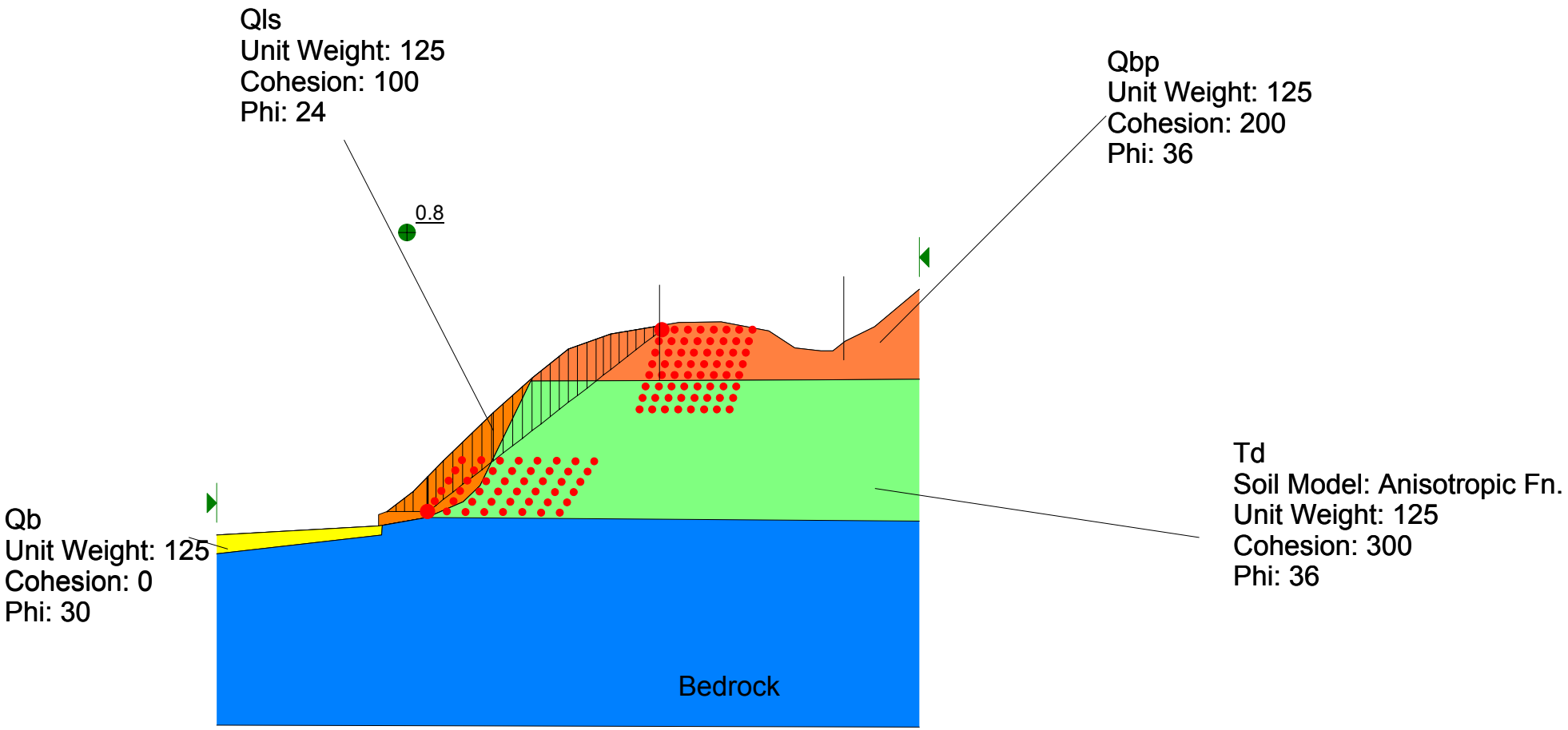
Del Mar Bluffs Cross Section 11-11'
Slope Stability Analysis
File Name: Section 1111 Pseudo Static 1.slz
Analysis Method: Spencer

Factor of Safety: 0.9
Seismic Coefficient = 0.15



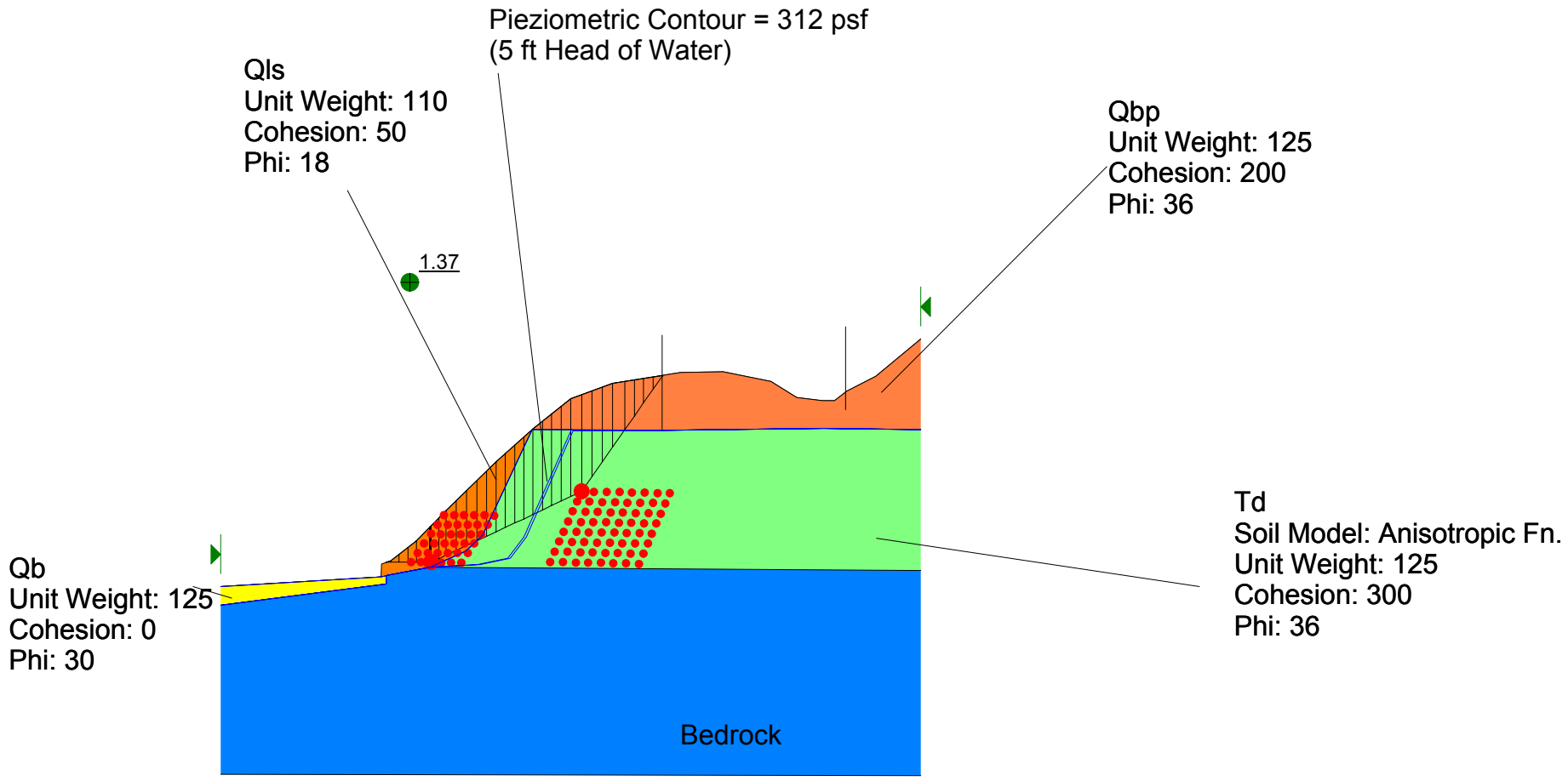
Del Mar Bluffs Cross Section 11-11'
Slope Stability Analysis
File Name: Section 1111 Pseudo Static 2.slz
Analysis Method: Spencer

Factor of Safety: 0.77
Seismic Coefficient = 0.28



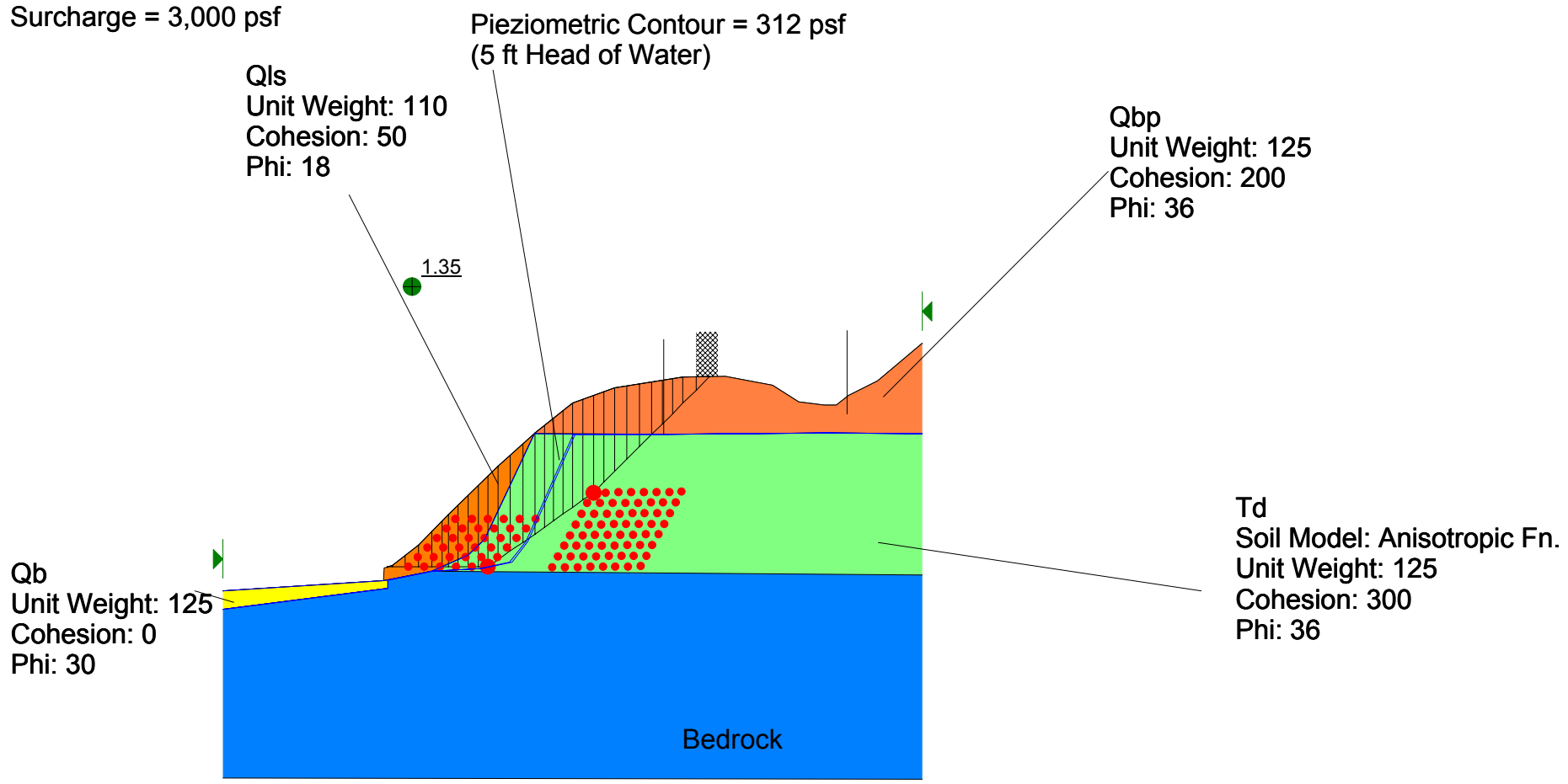
Del Mar Bluffs Cross Section 11-11'
Slope Stability Analysis
File Name: Section 1111 Static 1B.slz
Analysis Method: Spencer

Factor of Safety: 1.37



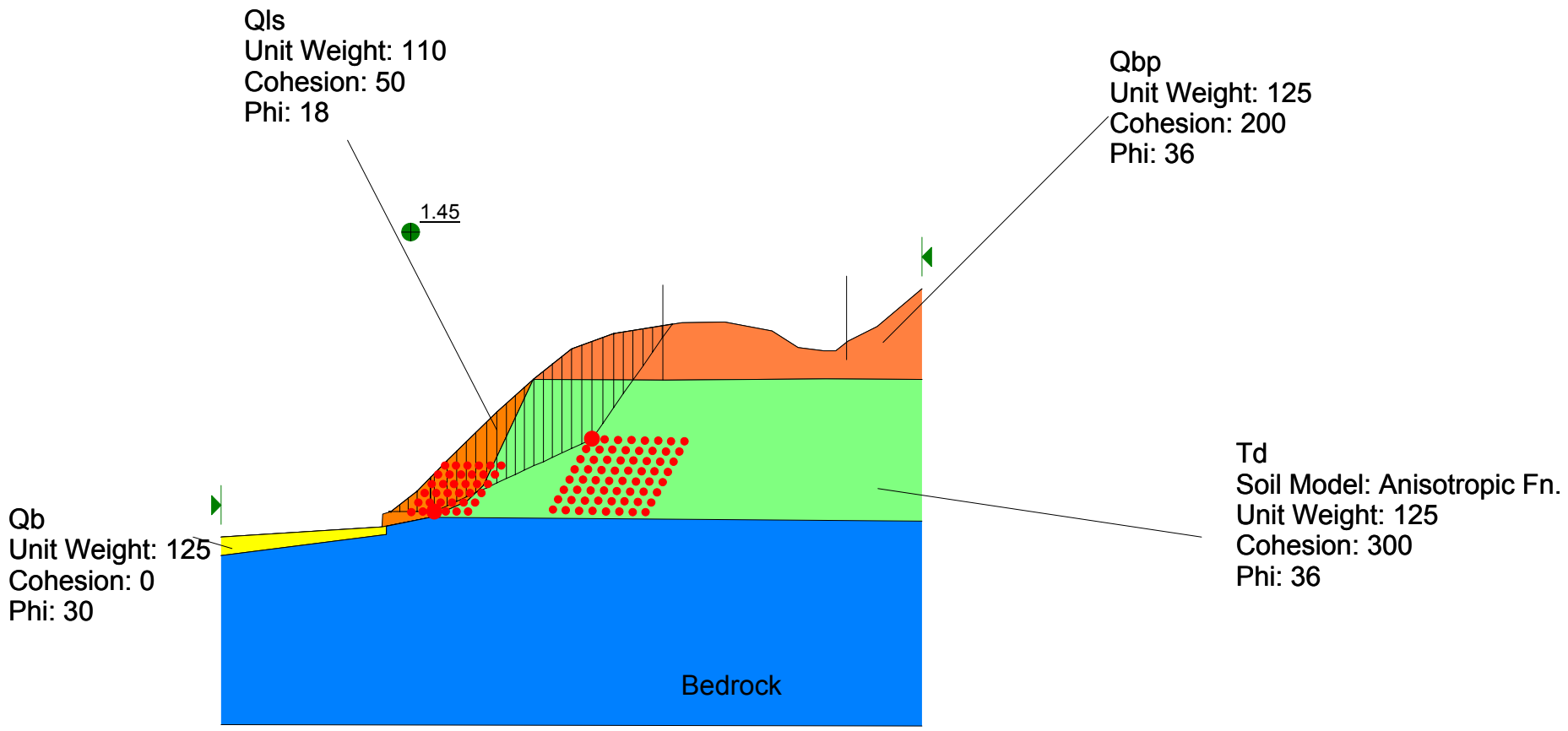
Del Mar Bluffs Cross Section 11-11'
Slope Stability Analysis
File Name: Section 1111 Static 2B.slz
Analysis Method: Spencer

Factor of Safety: 1.35



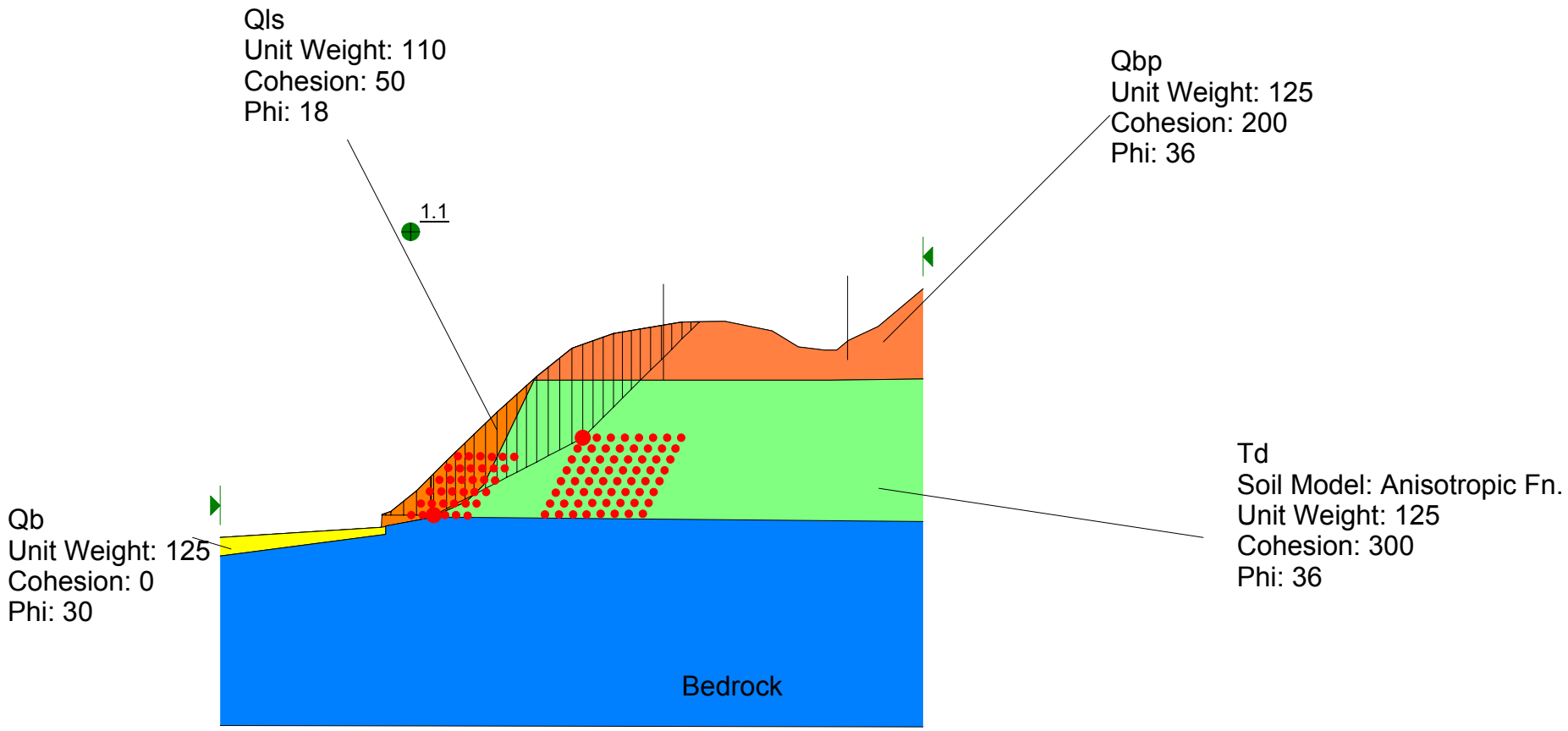
Del Mar Bluffs Cross Section 11-11'
Slope Stability Analysis, No Water
File Name: Section 1111 Static 3B.slz
Analysis Method: Spencer

Factor of Safety: 1.45



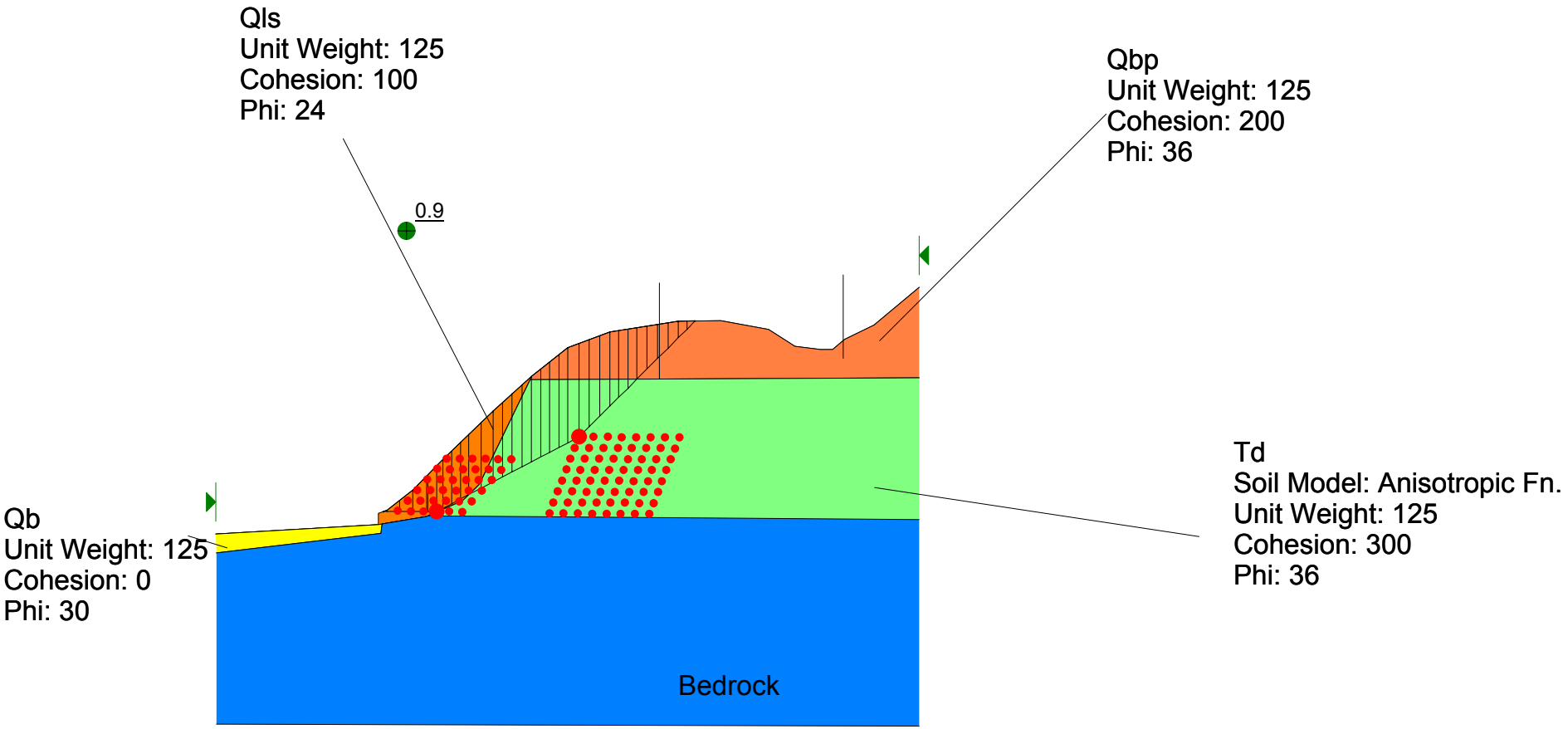
Del Mar Bluffs Cross Section 11-11'
Slope Stability Analysis
File Name: Section 1111 Pseudo Static 1B.slz
Analysis Method: Spencer

Factor of Safety: 1.1
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 11-11'
Slope Stability Analysis
File Name: Section 1111 Pseudo Static 2B.slz
Analysis Method: Spencer

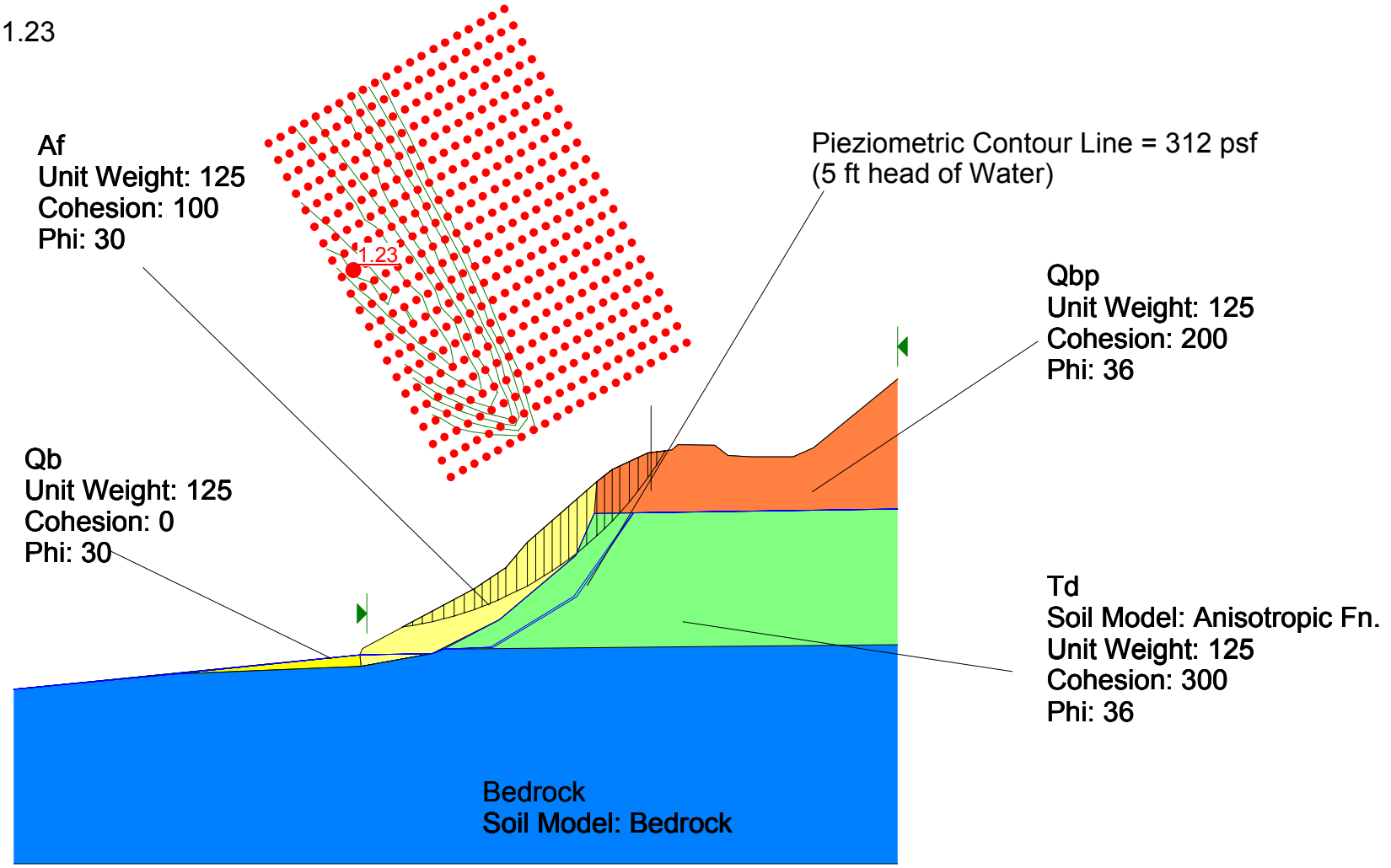
Factor of Safety: 0.94
Seismic Coefficient = 0.28



Cross Section 12-12’

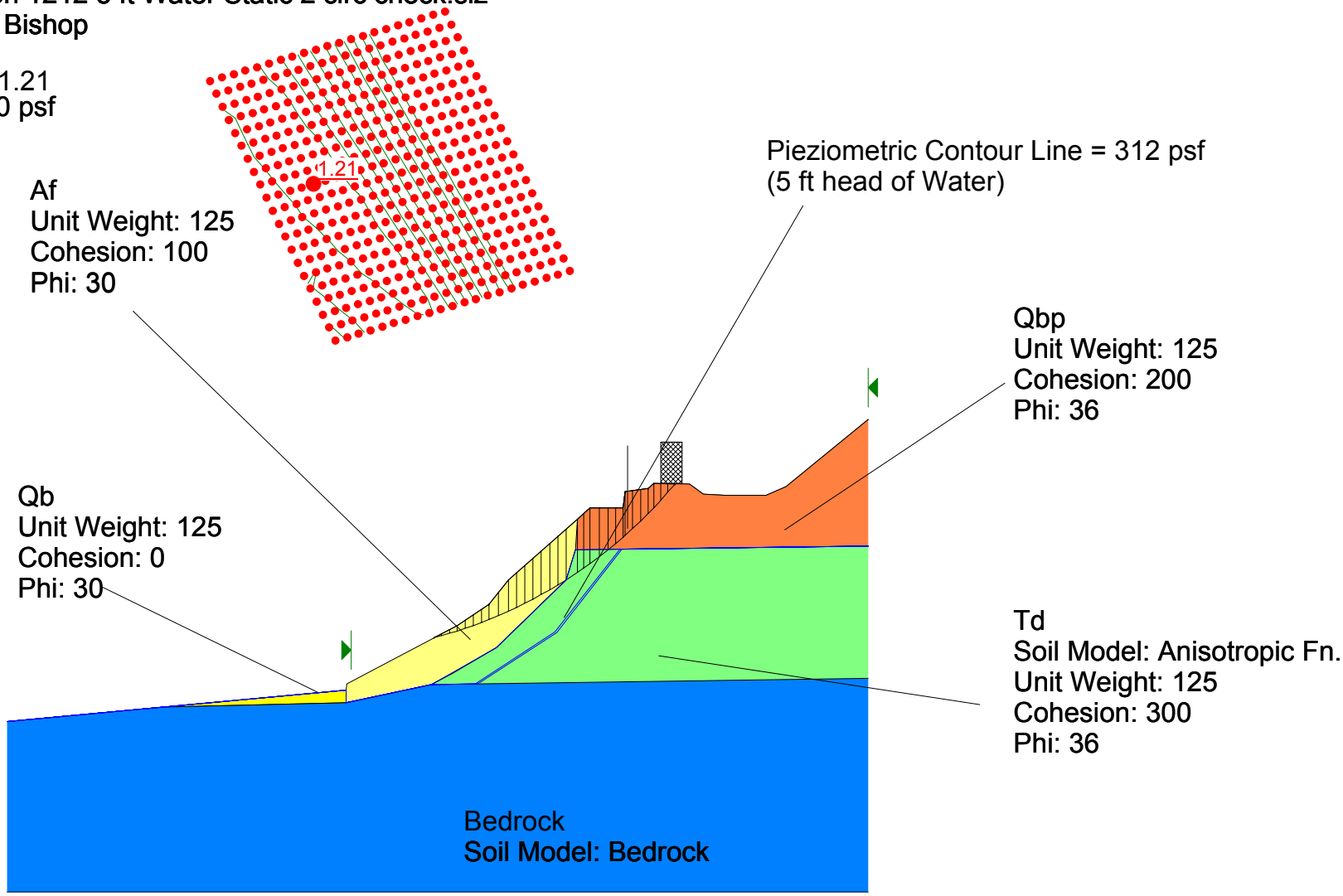
Del Mar Bluffs Cross Section 12-12'
Slope Stability Analysis
File Name: Section 1212 5 ft Water Static 1 circ check.slz
Analysis Method: Bishop

Factor of Safety: 1.23



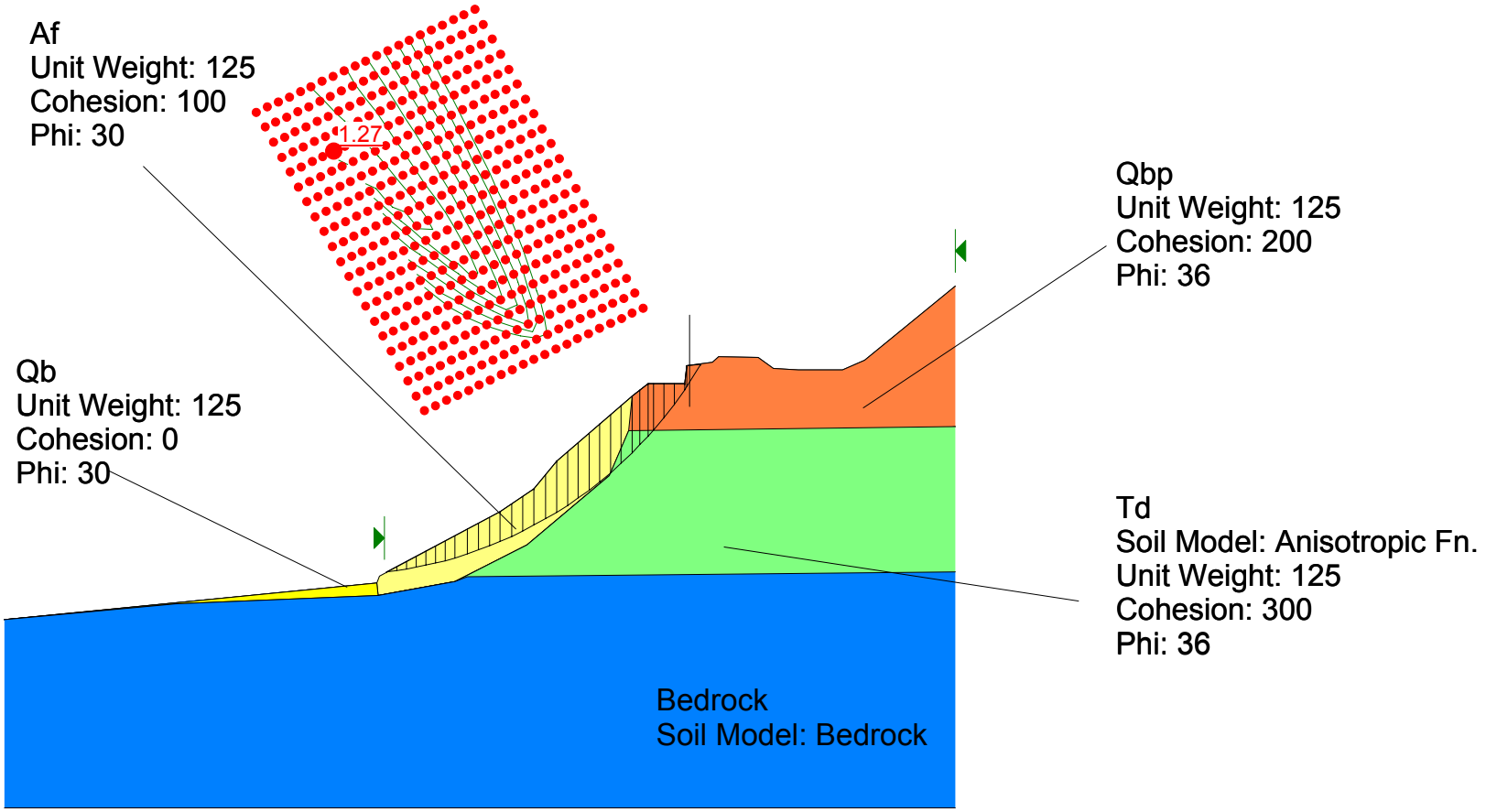
Del Mar Bluffs Cross Section 12-12'
Slope Stability Analysis
File Name: Section 1212 5 ft Water Static 2 circ check.slz
Analysis Method: Bishop

Factor of Safety: 1.21
Surcharge = 3,000 psf



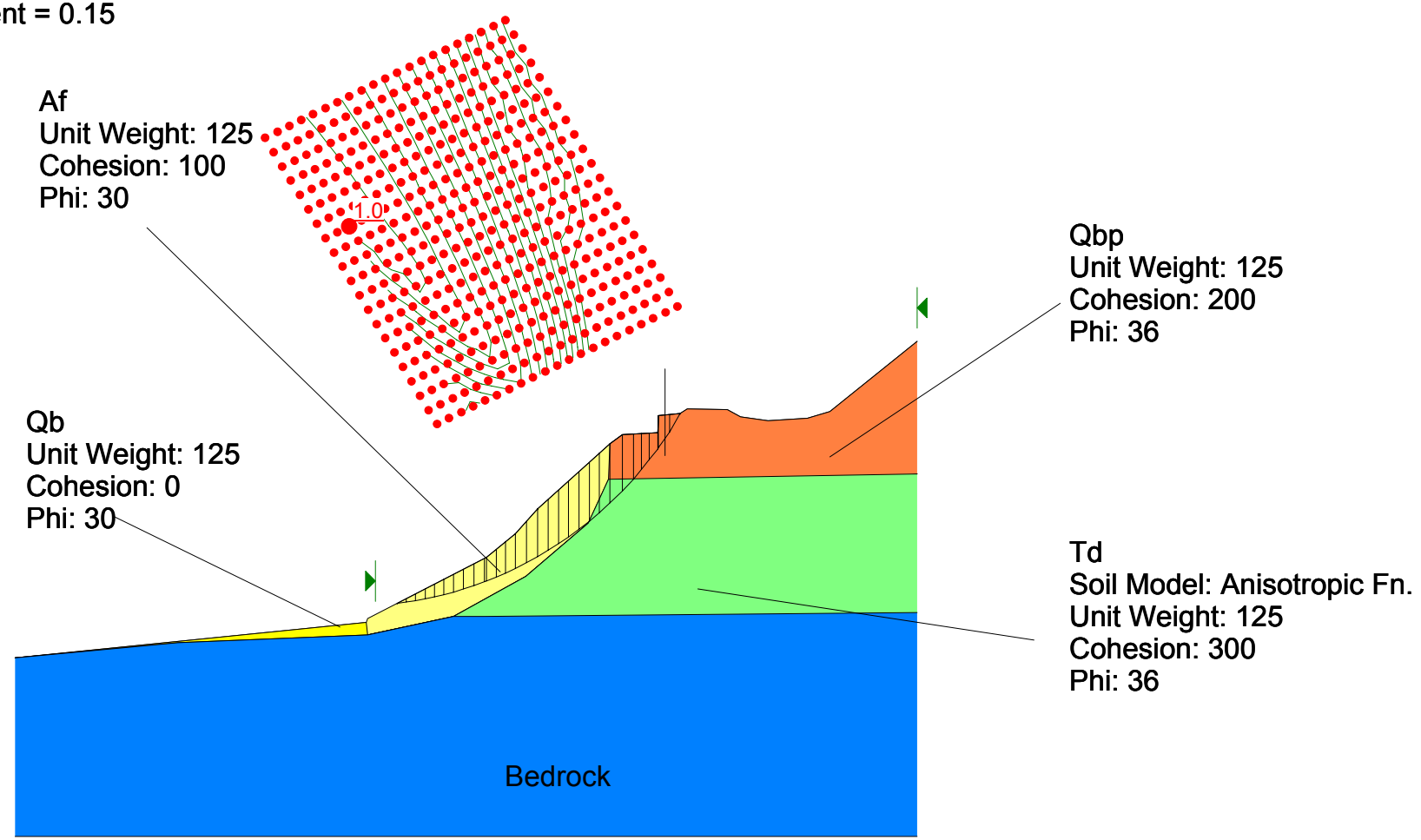
Del Mar Bluffs Cross Section 12-12'
Slope Stability Analysis, No Water
File Name: Section 1212 Static 3 circ check.slz
Analysis Method: Bishop

Factor of Safety: 1.27



Del Mar Bluffs Cross Section 12-12'
Slope Stability Analysis
File Name: Section 1212 Pseudo Static 1 circ check.slz
Analysis Method: Bishop

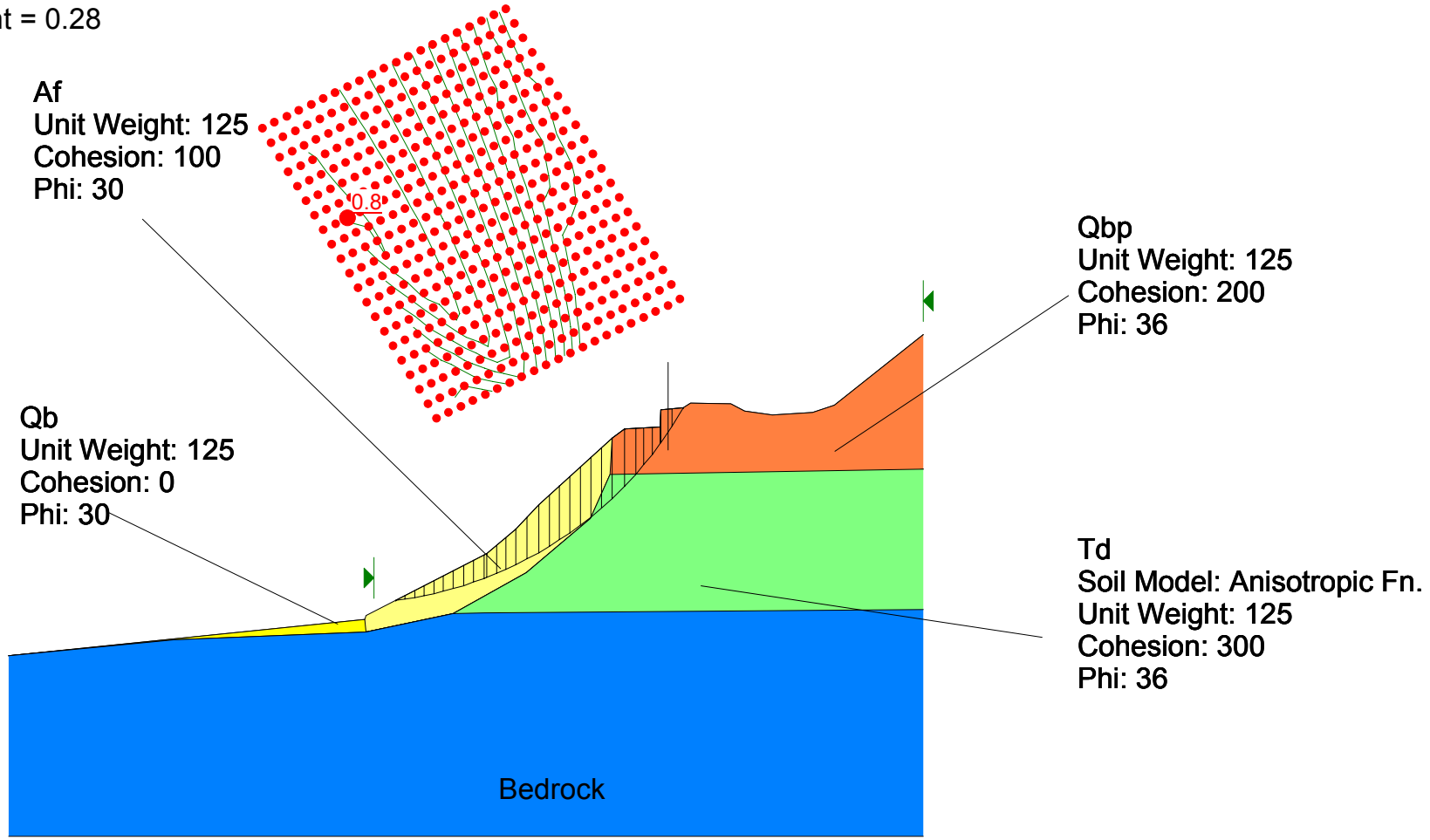
Factor of Safety: 0.97
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 12-12'
Slope Stability Analysis
File Name: Section 1212 Pseudo Static 2 circ check.slz
Analysis Method: Bishop

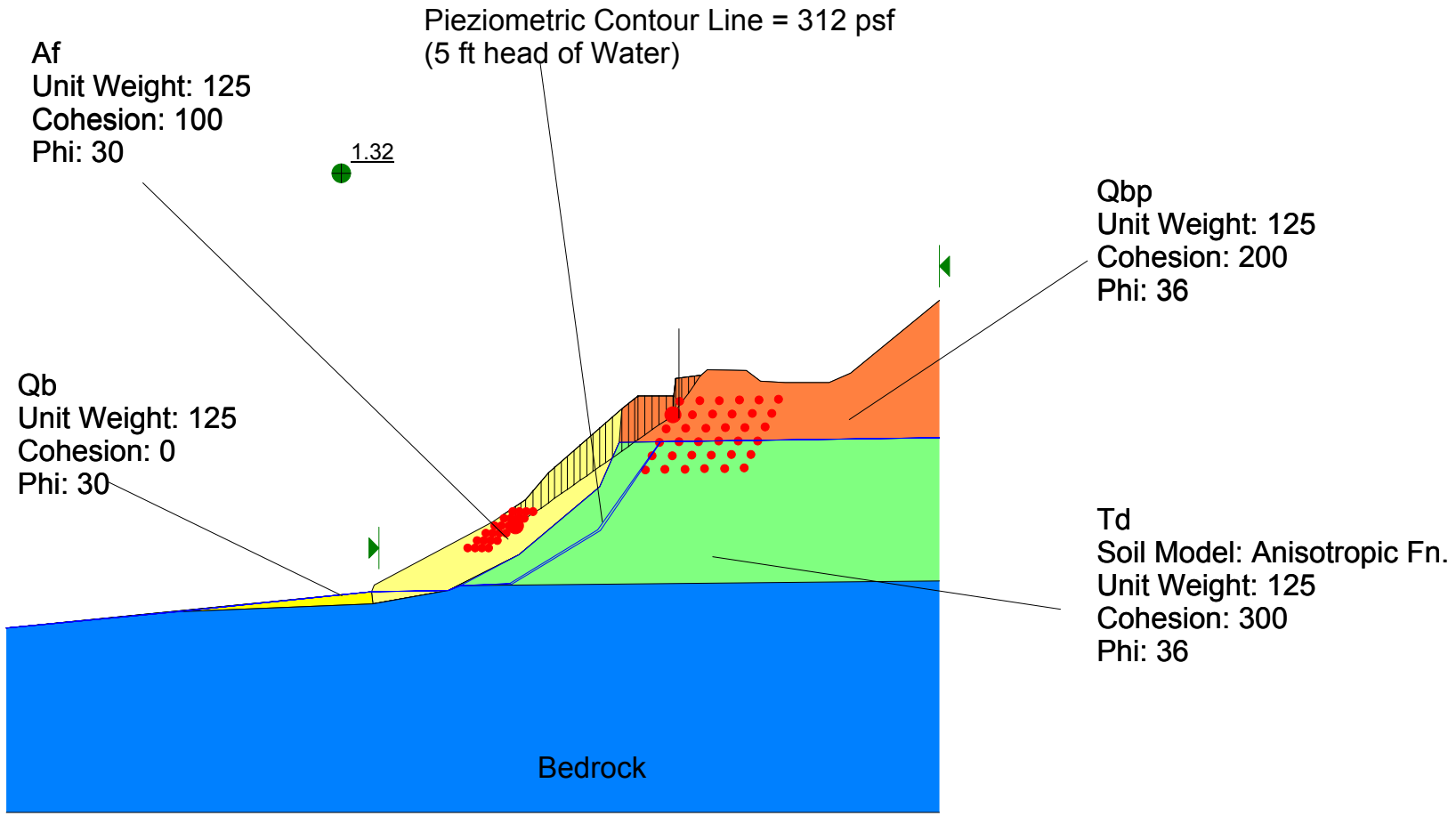
Factor of Safety: 0.79

Seismic Coefficient = 0.28



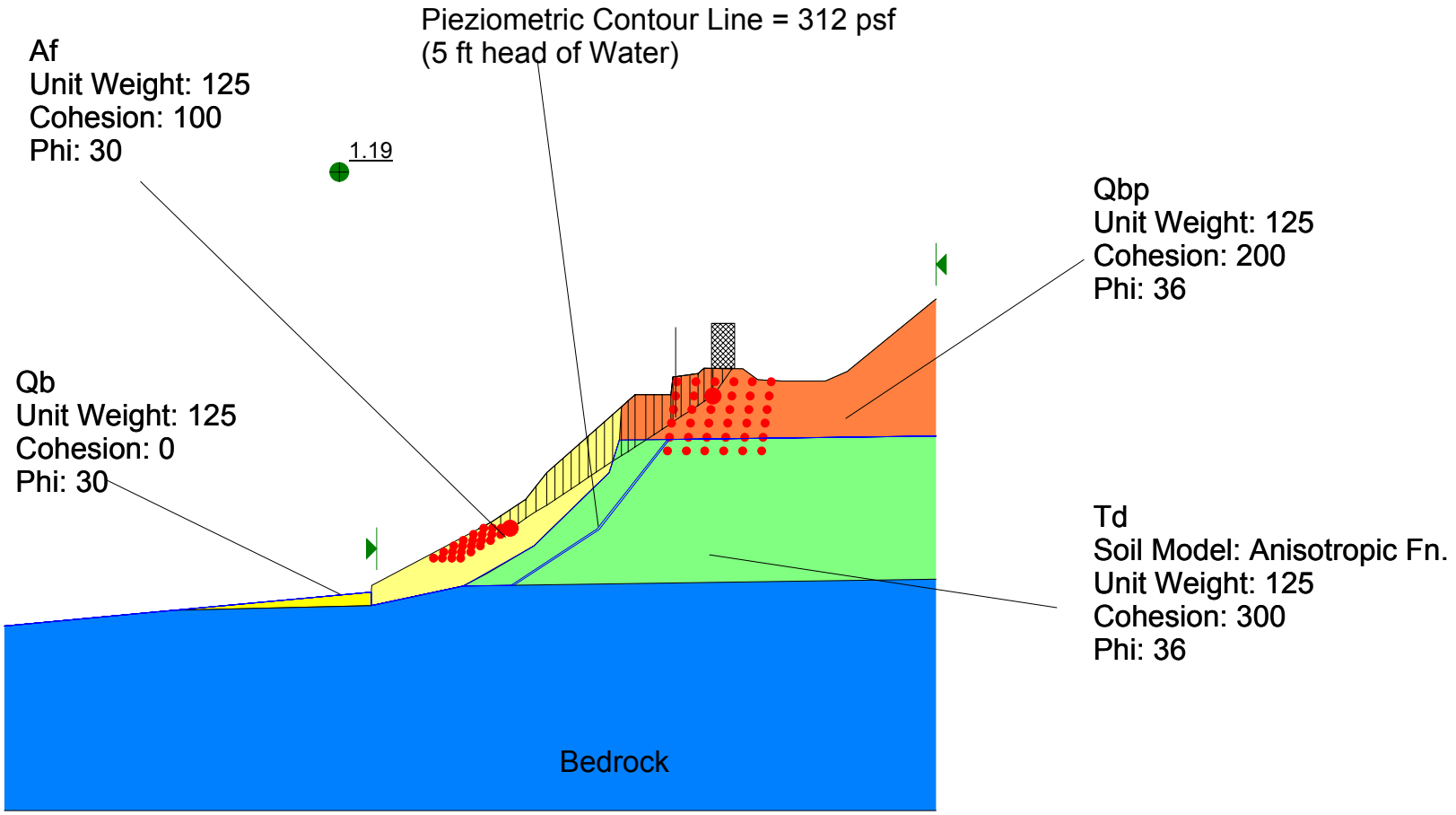
Del Mar Bluffs Cross Section 12-12'
Slope Stability Analysis
File Name: Section 1212 5 ft Water Static 1.slz
Analysis Method: Spencer

Factor of Safety: 1.32



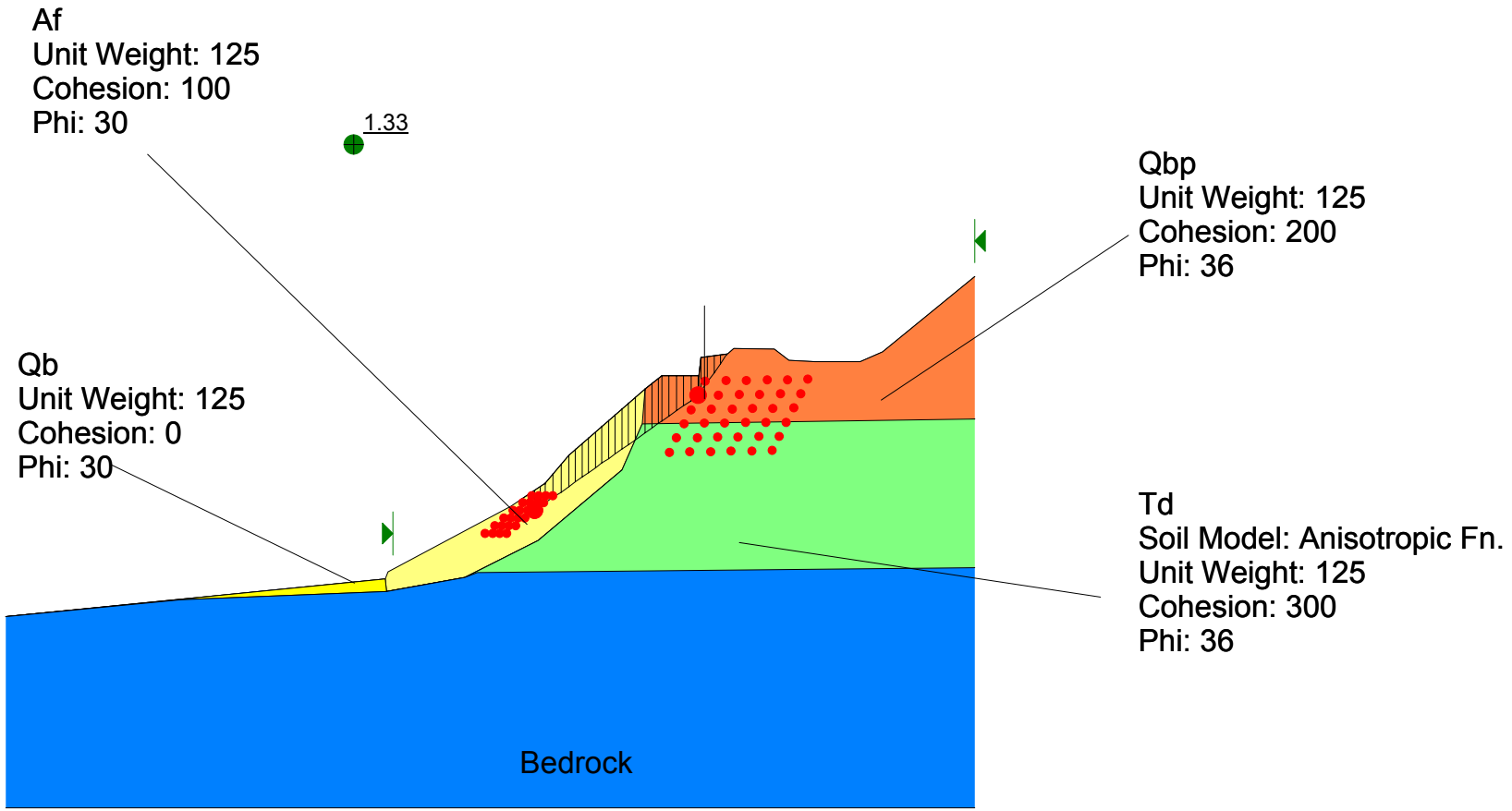
Del Mar Bluffs Cross Section 12-12'
Slope Stability Analysis
File Name: Section 1212 5 ft Water Static 2.slz
Analysis Method: Spencer

Factor of Safety: 1.19
Surcharge = 3,000 psf



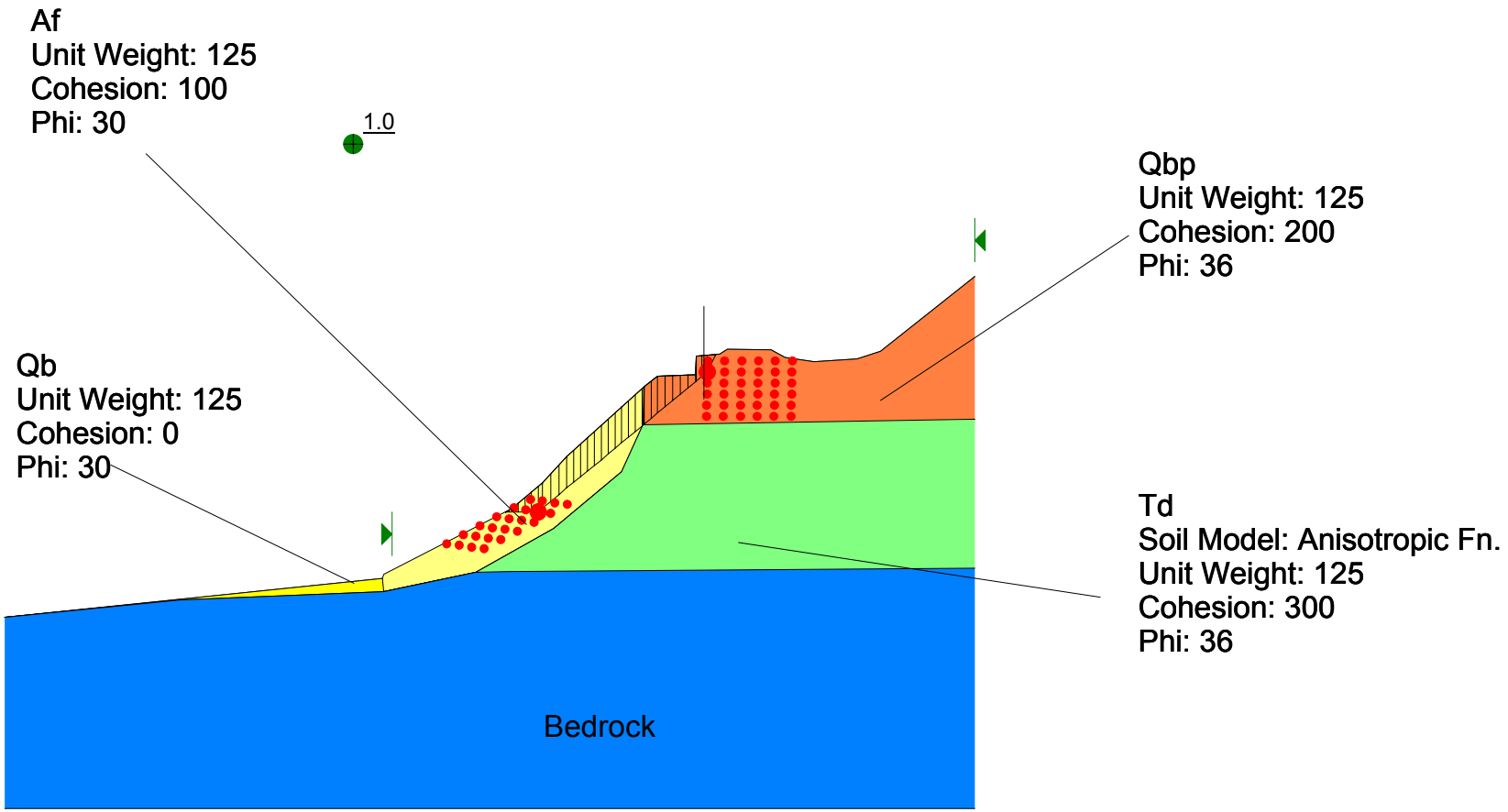
Del Mar Bluffs Cross Section 12-12'
Slope Stability Analysis, No Water
File Name: Section 1212 Static 3.slz
Analysis Method: Spencer

Factor of Safety: 1.33



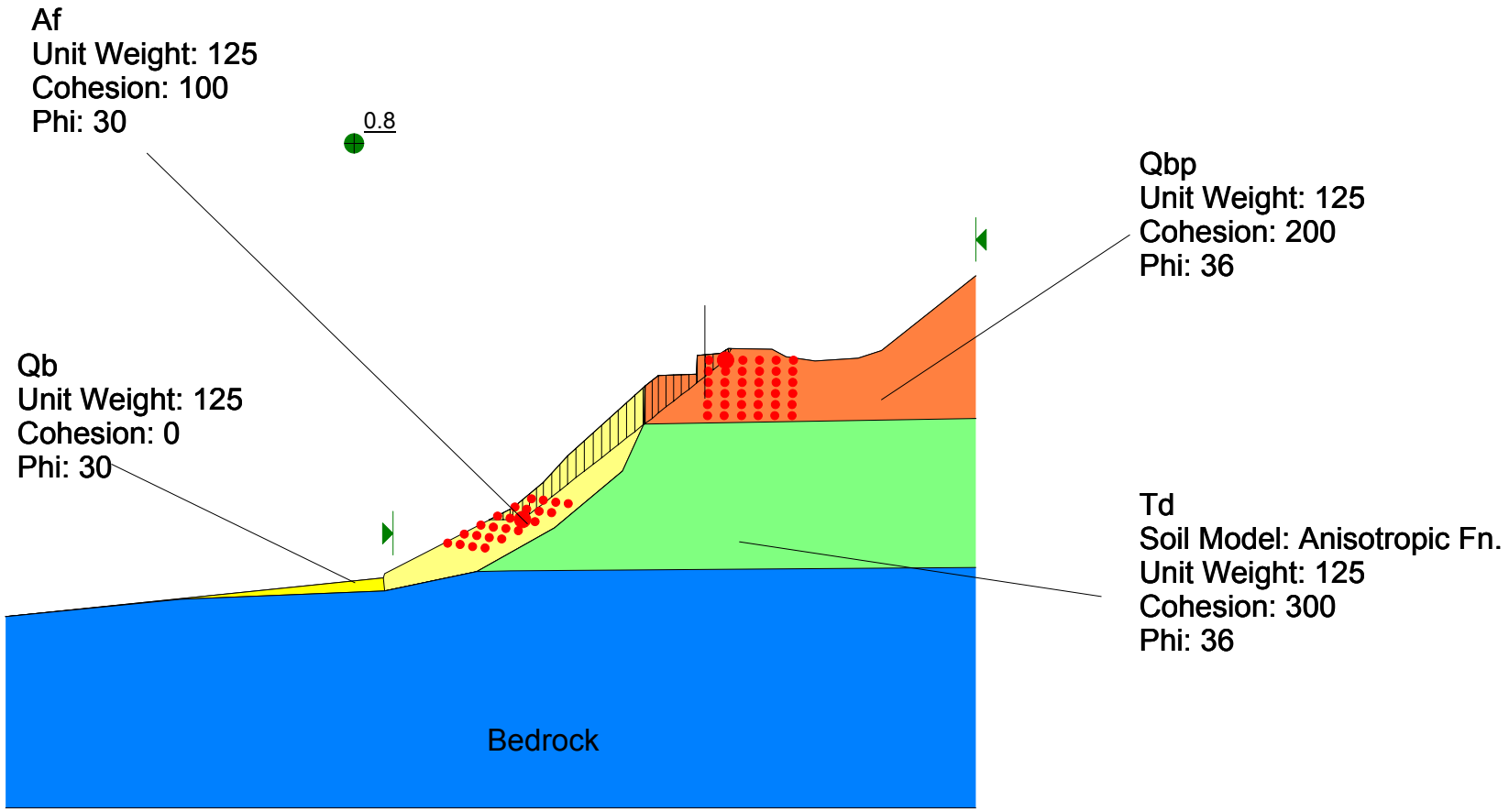
Del Mar Bluffs Cross Section 12-12'
Slope Stability Analysis
File Name: Section 1212 Pseudo Static 1.slz
Analysis Method: Spencer

Factor of Safety: 1
Seismic Coefficient = 0.15



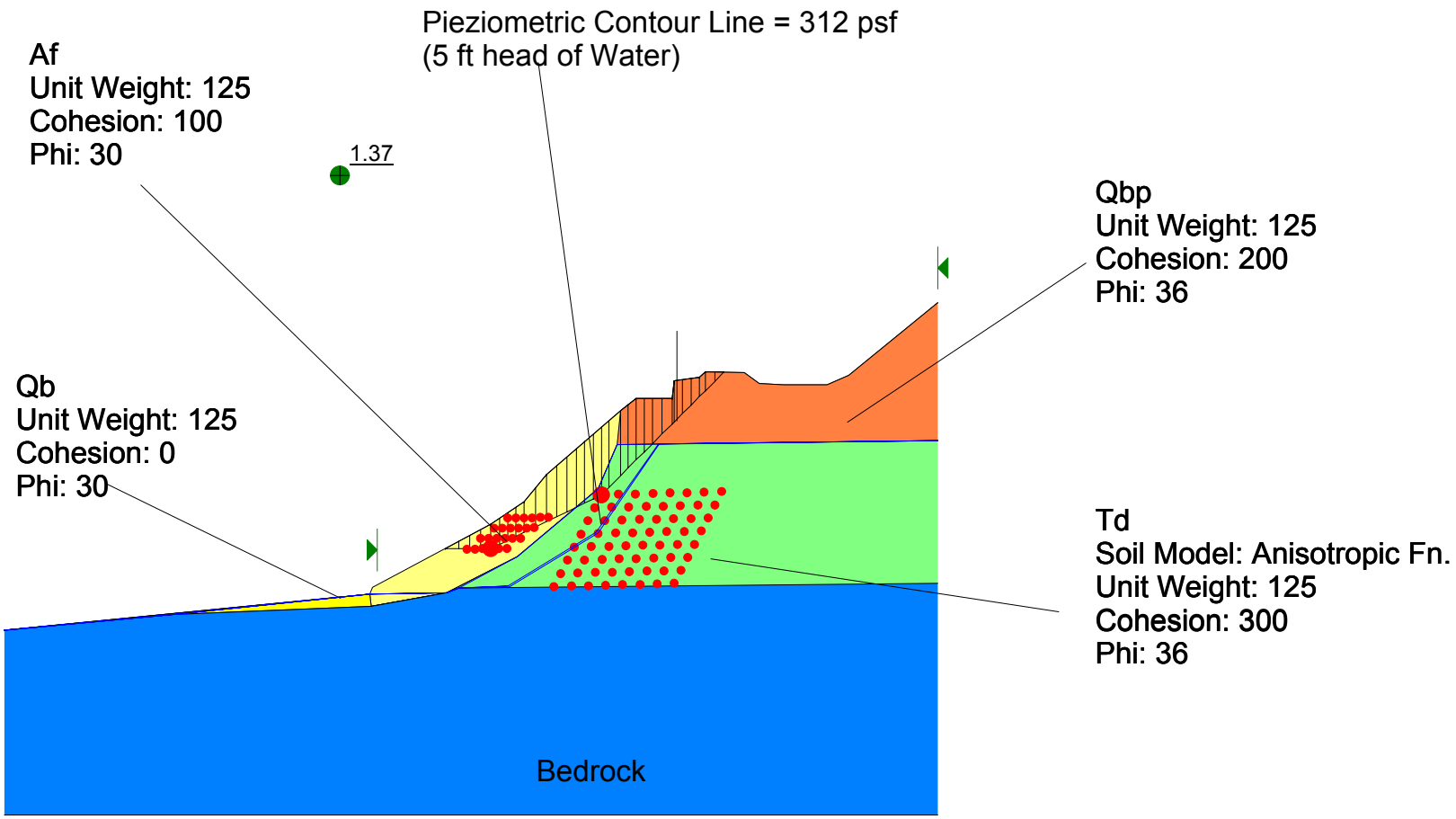
Del Mar Bluffs Cross Section 12-12'
Slope Stability Analysis
File Name: Section 1212 Pseudo Static 2.slz
Analysis Method: Spencer

Factor of Safety: 0.83
Seismic Coefficient = 0.28



Del Mar Bluffs Cross Section 12-12'
Slope Stability Analysis
File Name: Section 1212 5 ft Water Static 1B.slz
Analysis Method: Spencer

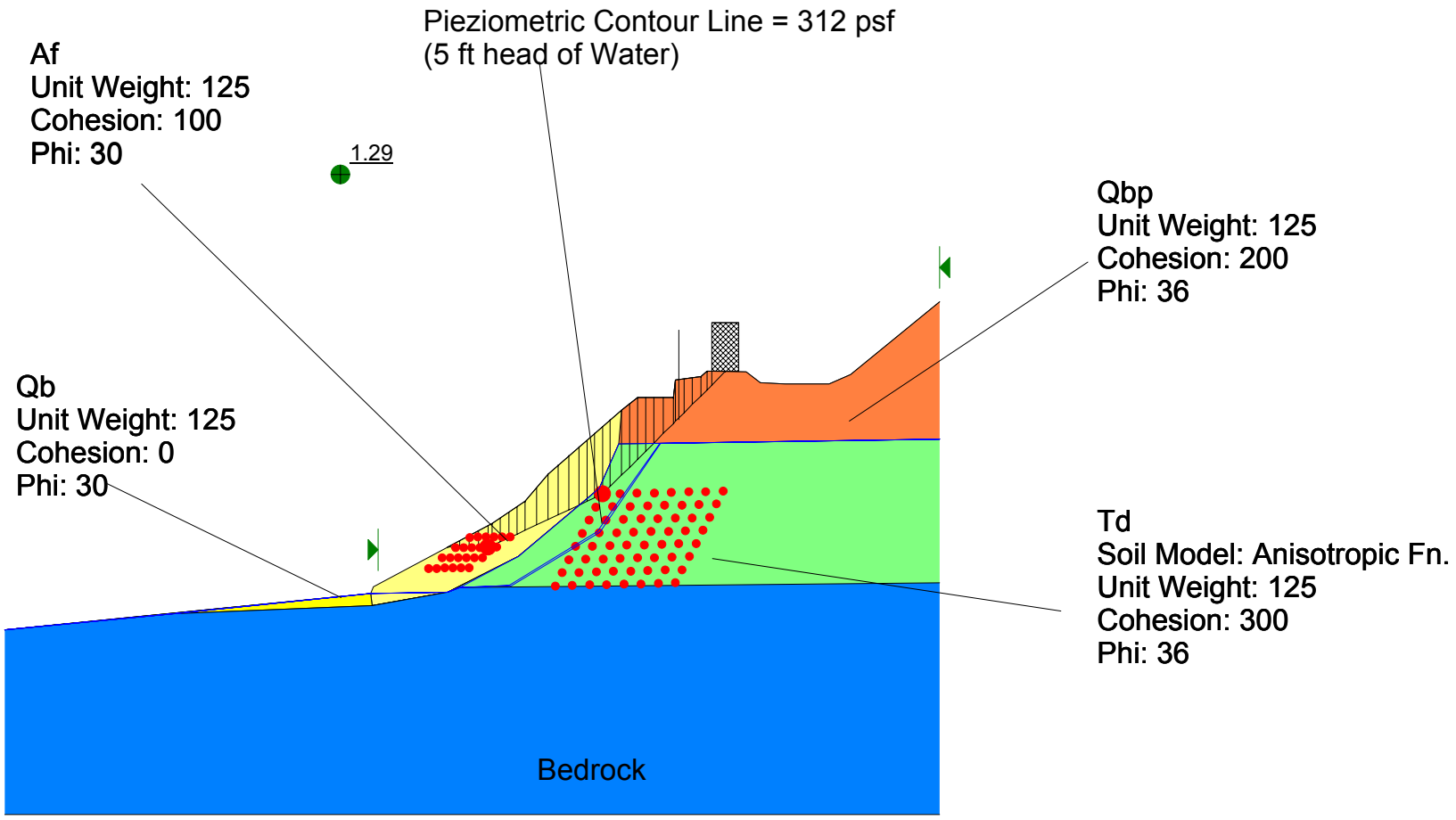
Factor of Safety: 1.37



Del Mar Bluffs Cross Section 12-12'
Slope Stability Analysis
File Name: Section 1212 5 ft Water Static 2B.slz
Analysis Method: Spencer

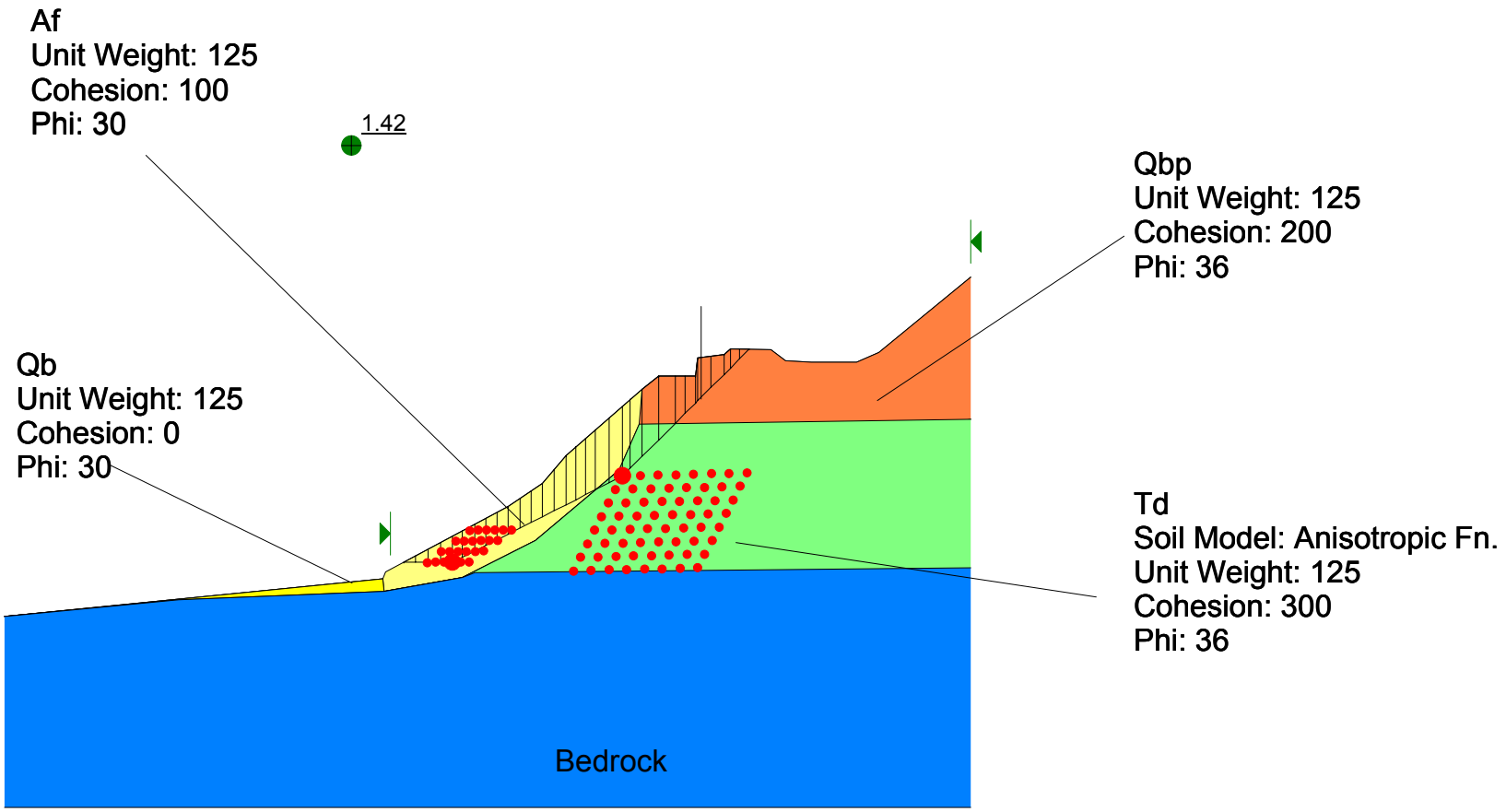
Factor of Safety: 1.29

Surcharge = 3,000 psf



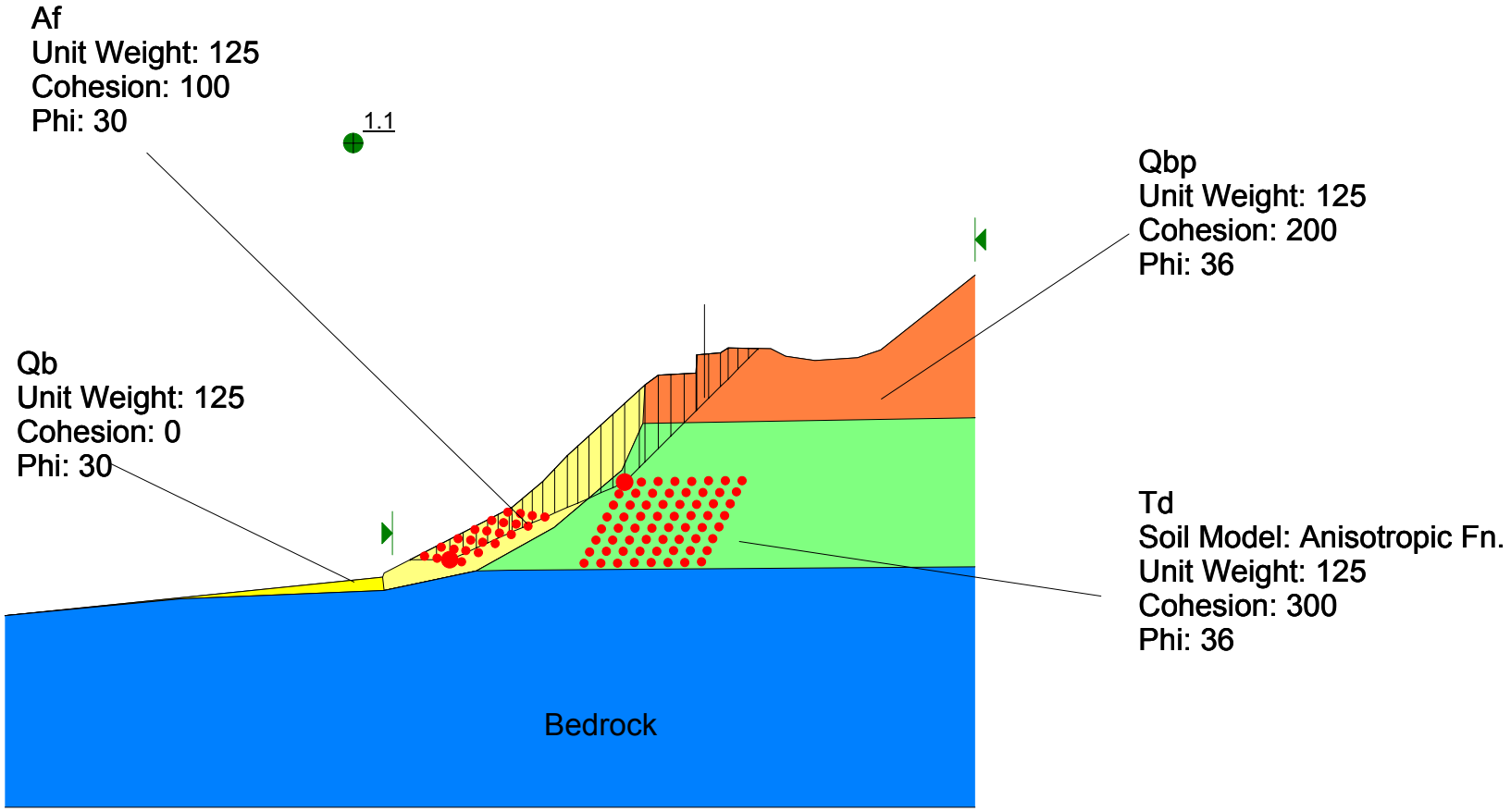
Del Mar Bluffs Cross Section 12-12'
Slope Stability Analysis, No Water
File Name: Section 1212 Static 3B.slz
Analysis Method: Spencer

Factor of Safety: 1.42



Del Mar Bluffs Cross Section 12-12'
Slope Stability Analysis
File Name: Section 1212 Pseudo Static 1B.slz
Analysis Method: Spencer

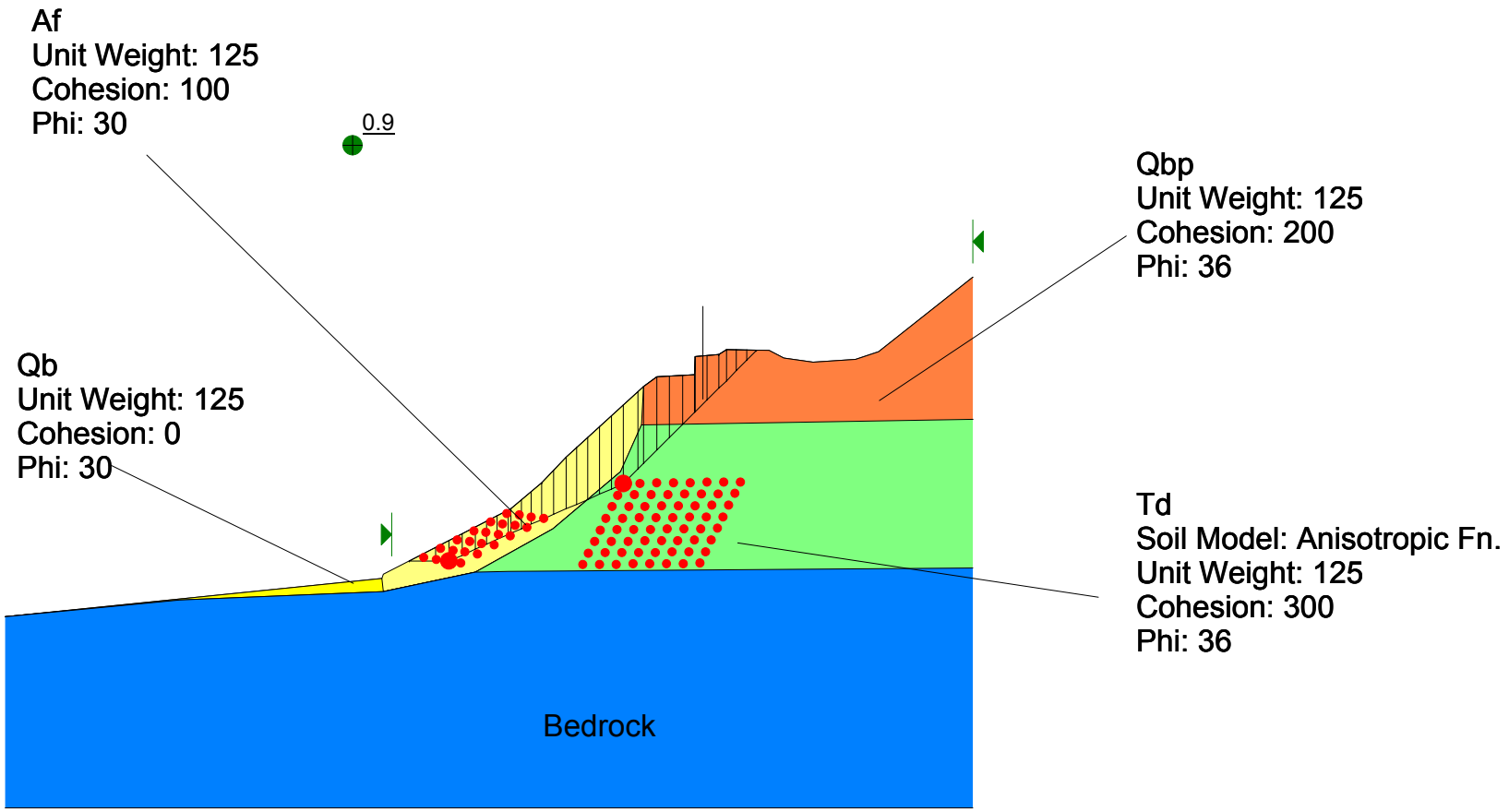
Factor of Safety: 1.1
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 12-12'
Slope Stability Analysis
File Name: Section 1212 Pseudo Static 2B.slz
Analysis Method: Spencer

Factor of Safety: 0.92

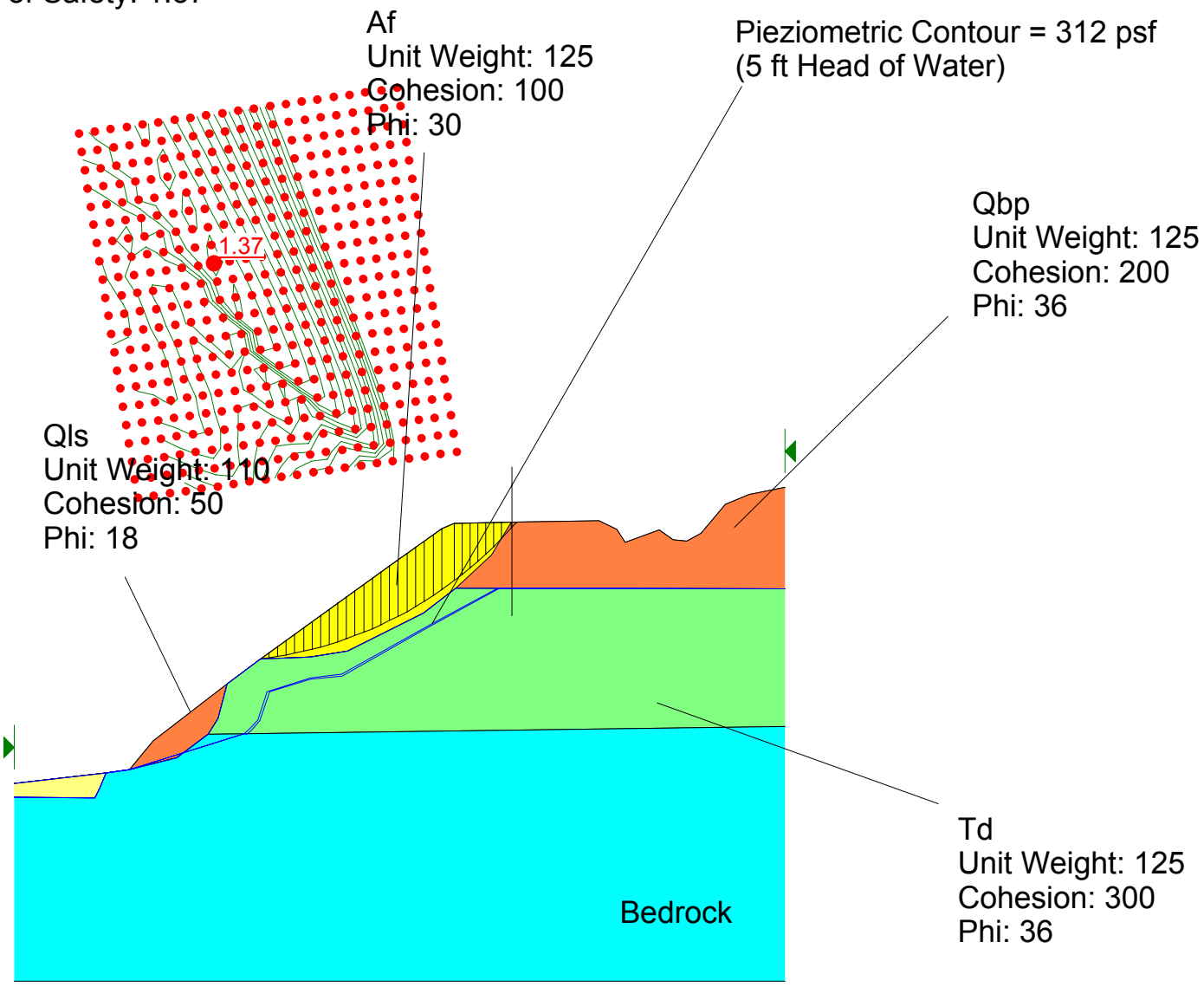
Seismic Coefficient = 0.28



Cross Section 13-13’

Del Mar Bluffs Cross Section 13-13'
Slope Stability Analysis
File Name: Section 13 13 Static 3.slz
Analysis Method: Bishop

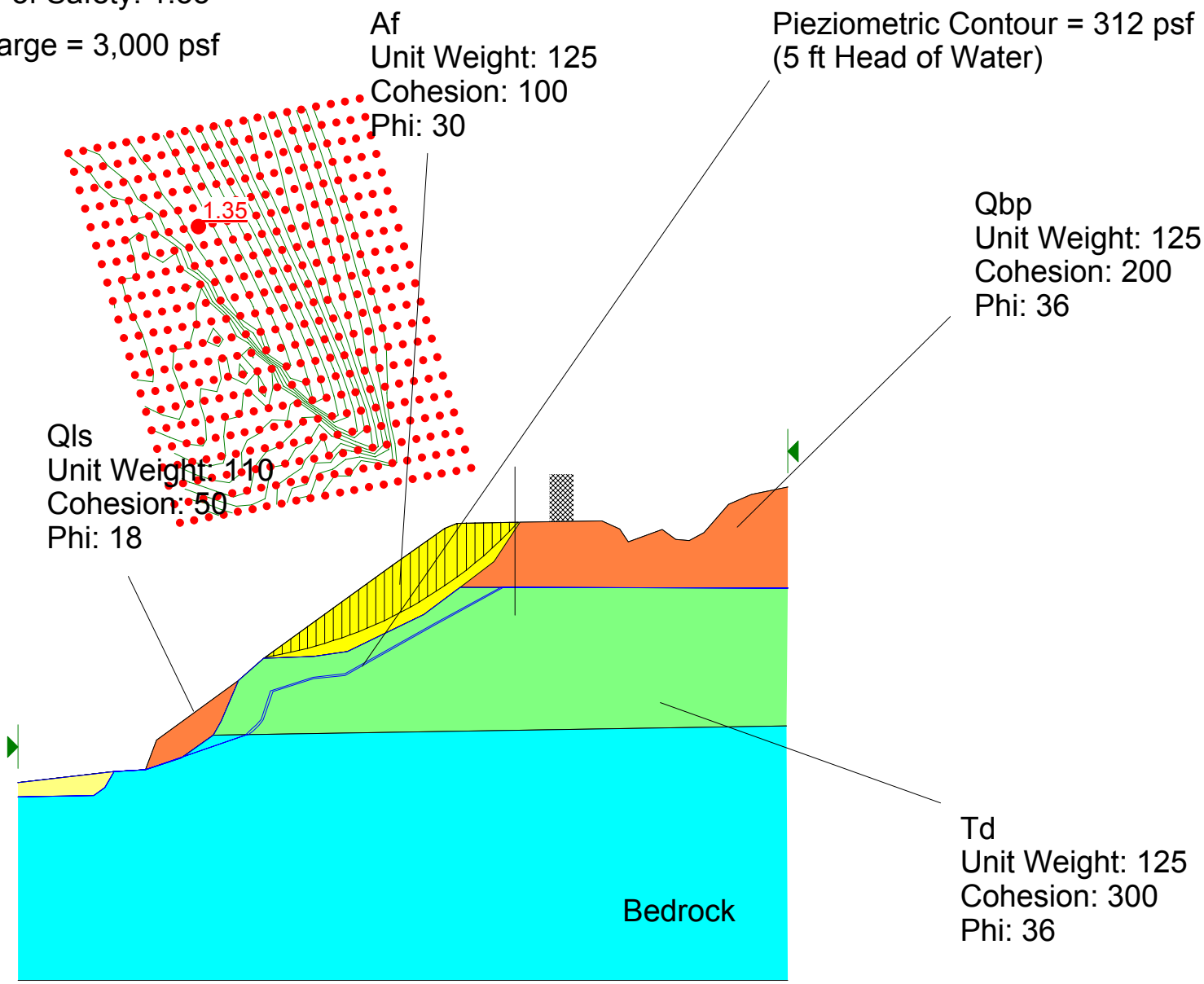
Factor of Safety: 1.37



Del Mar Bluffs Cross Section 13-13'
Slope Stability Analysis
File Name: Section 13 13 Static 4.slz
Analysis Method: Bishop

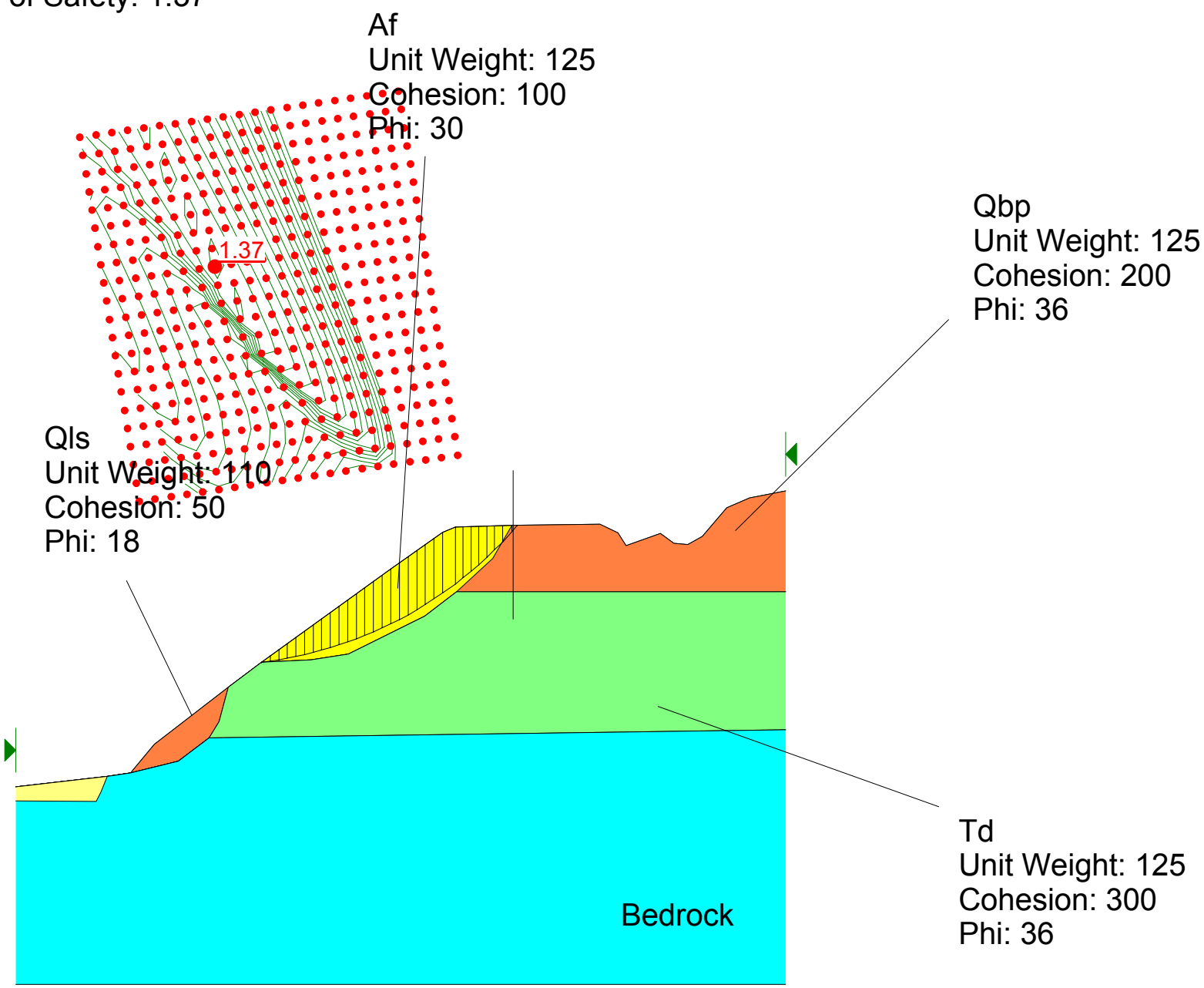
Factor of Safety: 1.35

Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 13-13'
Slope Stability Analysis, No Water
File Name: Section 13 13 Static 3 no water.slz
Analysis Method: Bishop

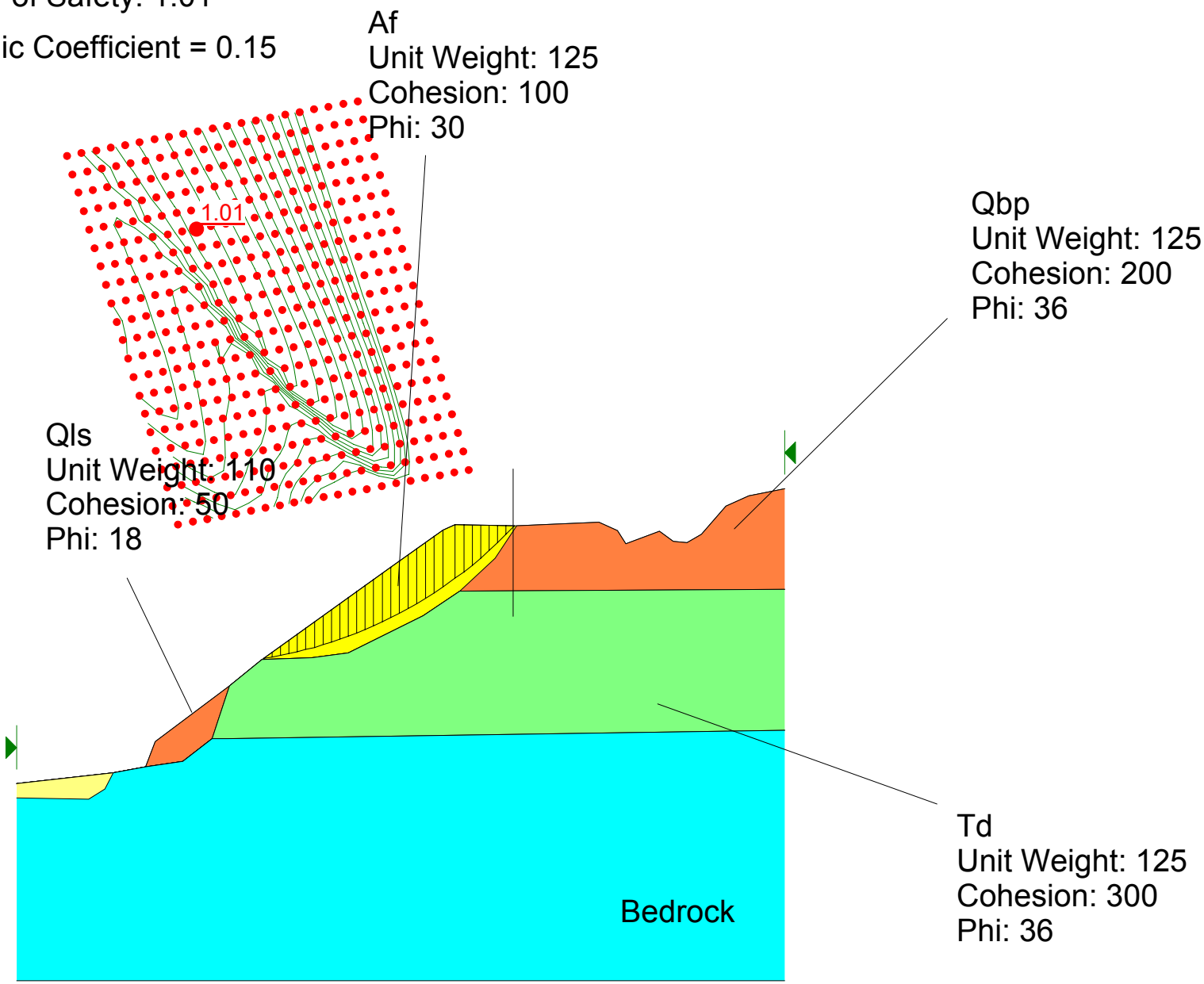
Factor of Safety: 1.37



Del Mar Bluffs Cross Section 13-13'
Slope Stability Analysis
File Name: Section 13 13 Pseudo Static 1.slz
Analysis Method: Bishop

Factor of Safety: 1.01

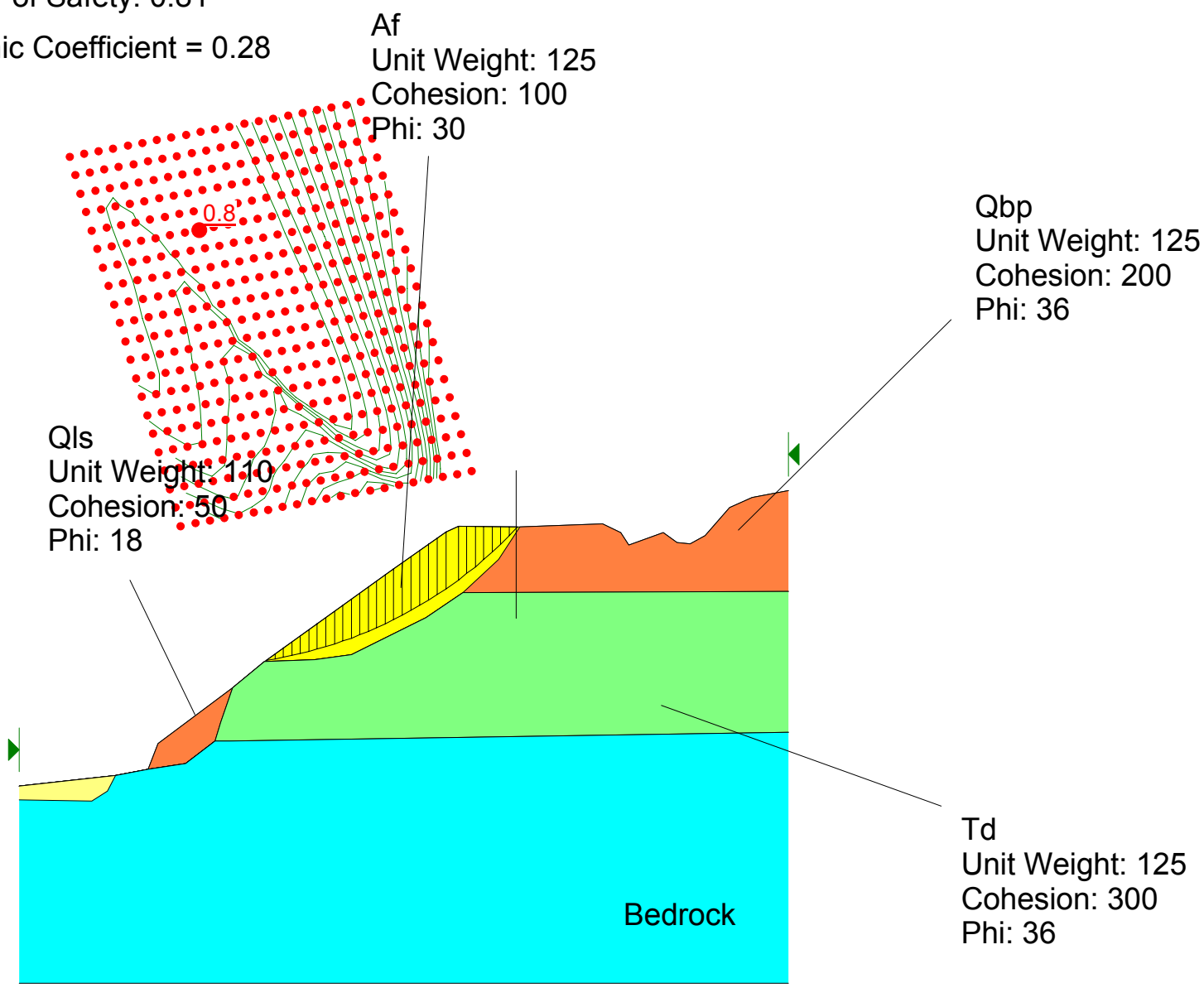
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 13-13'
Slope Stability Analysis
File Name: Section 13 13 Pseudo Static 3.slz
Analysis Method: Bishop

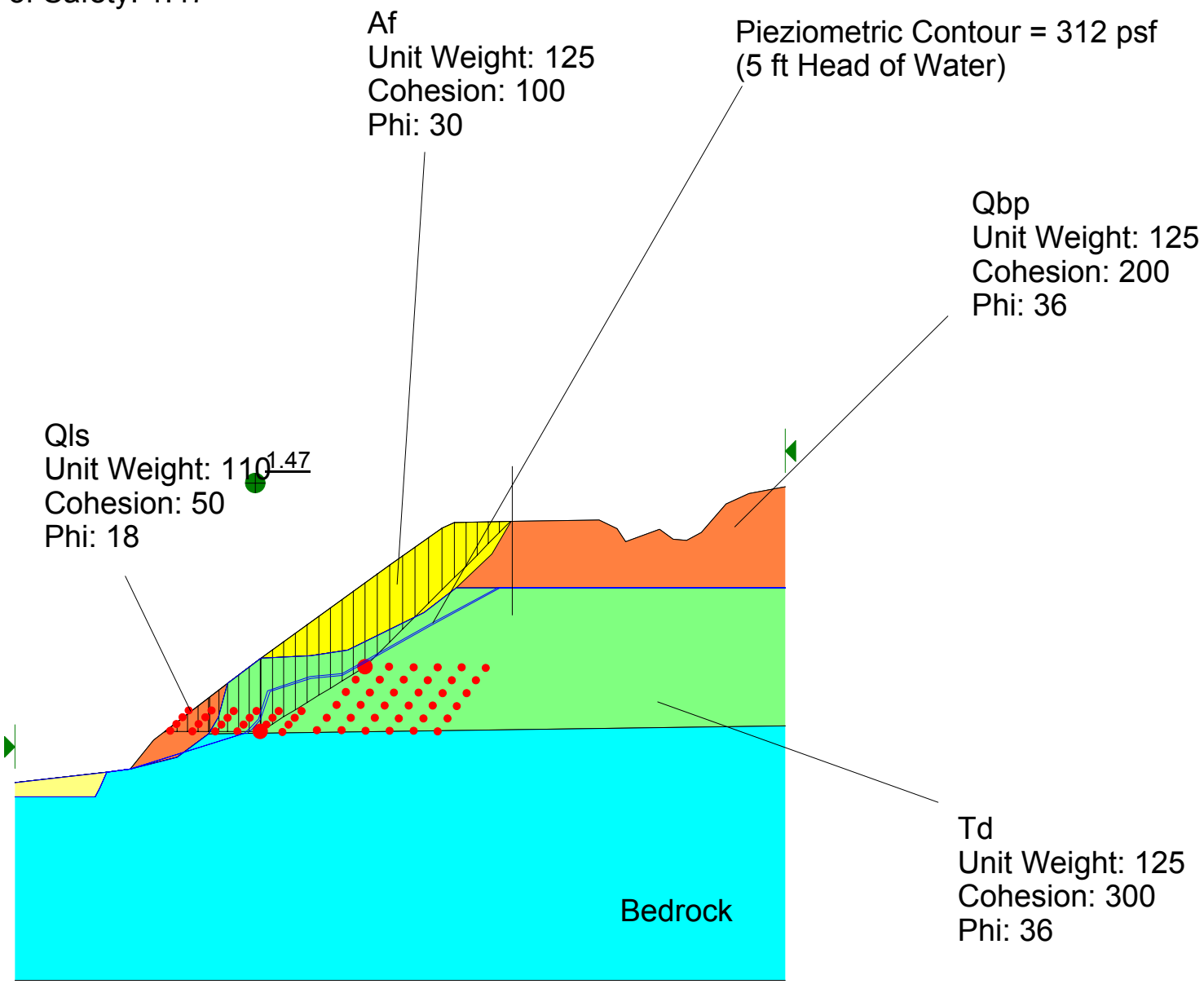
Factor of Safety: 0.81

Seismic Coefficient = 0.28



Del Mar Bluffs Cross Section 13-13'
Slope Stability Analysis
File Name: Section 13 13 Static 3B.slz
Analysis Method: Spencer

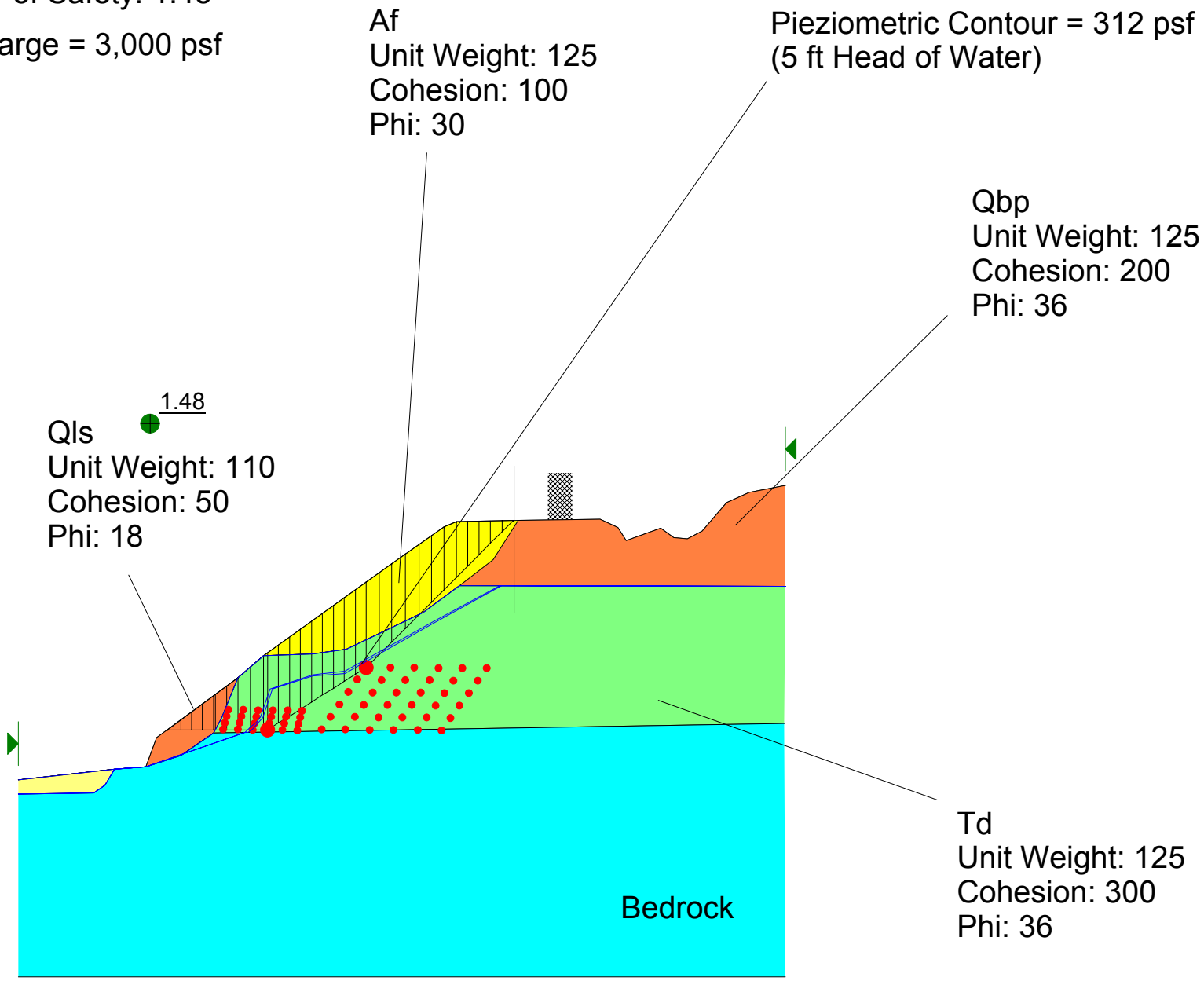
Factor of Safety: 1.47



Del Mar Bluffs Cross Section 13-13'
Slope Stability Analysis
File Name: Section 13 13 Static 4B.slz
Analysis Method: Spencer

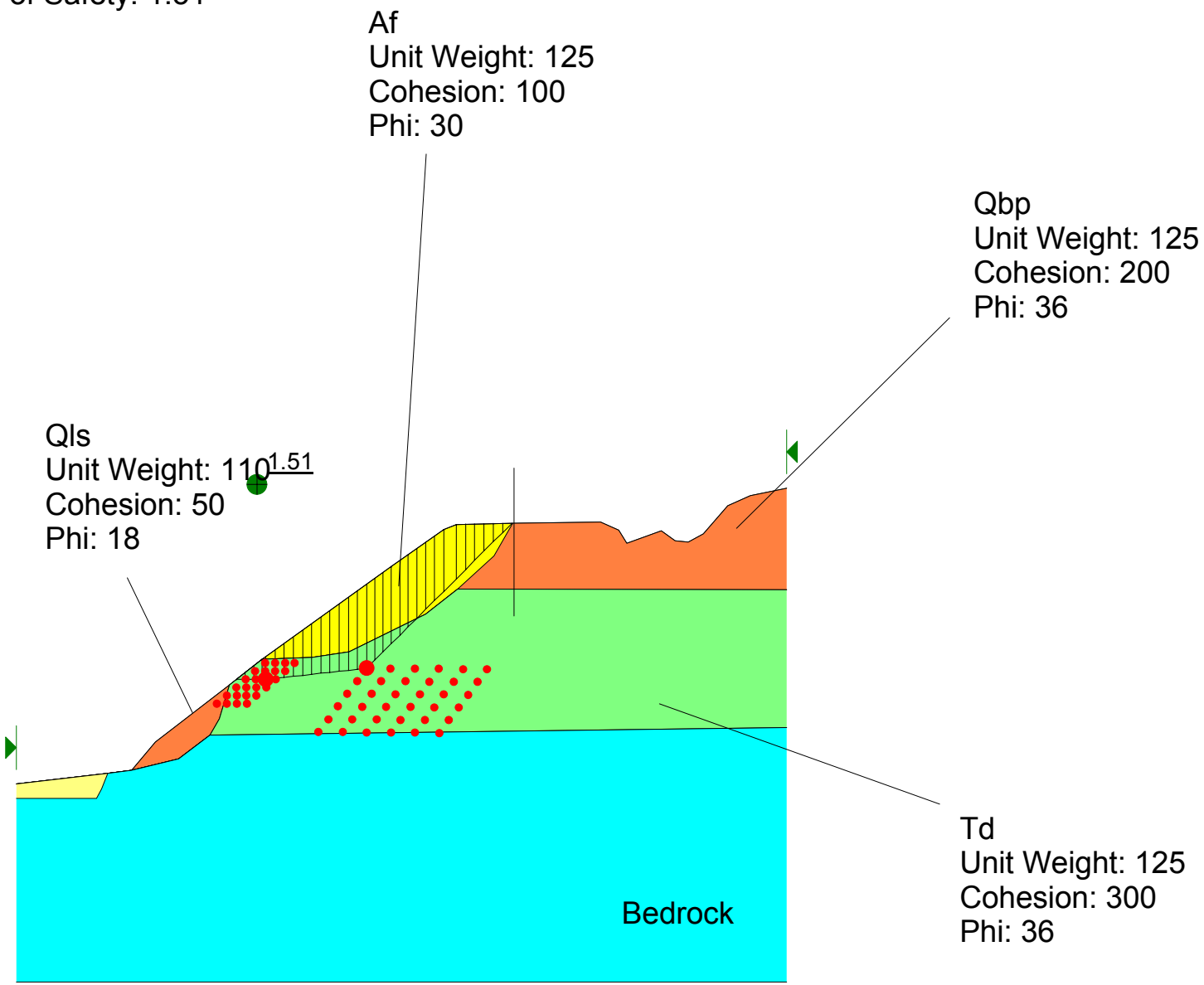
Factor of Safety: 1.48

Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 13-13'
Slope Stability Analysis, No Water
File Name: Section 13 13 Static 2B.slz
Analysis Method: Spencer

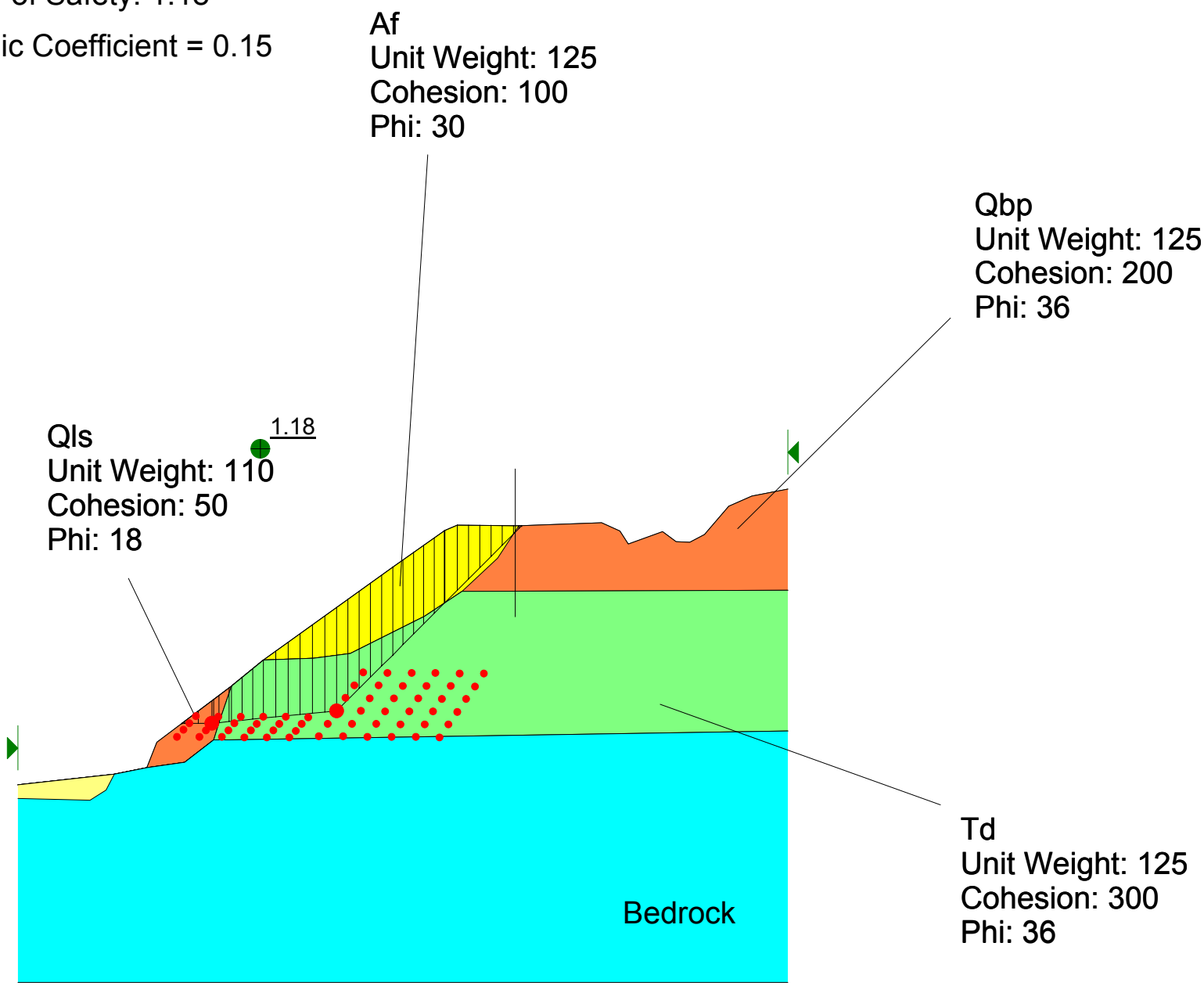
Factor of Safety: 1.51



Del Mar Bluffs Cross Section 13-13'
Slope Stability Analysis
File Name: Section 13 13 Pseudo Static 1B.slz
Analysis Method: Spencer

Factor of Safety: 1.18

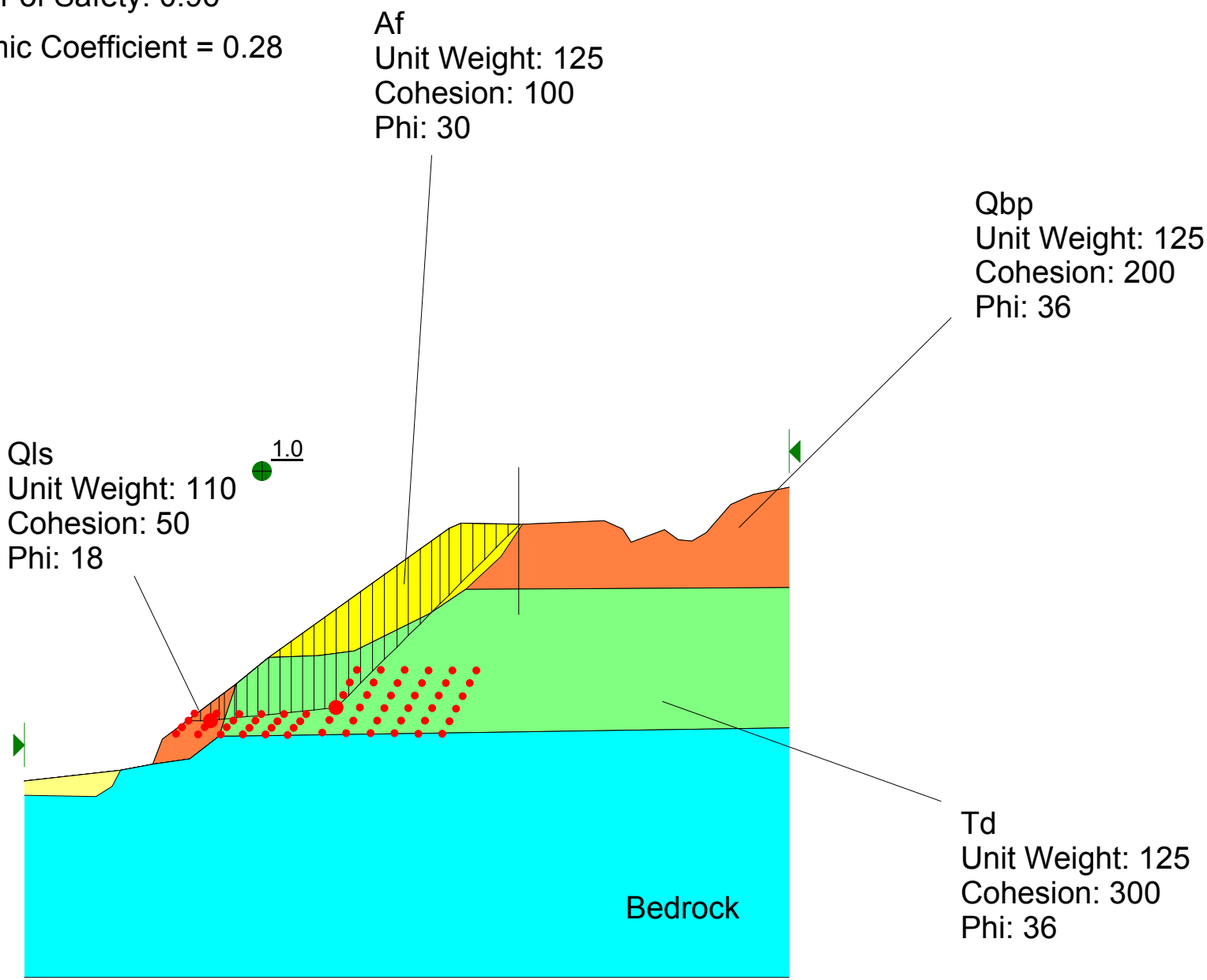
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 13-13'
Slope Stability Analysis
File Name: Section 13 13 Pseudo Static 3B.slz
Analysis Method: Spencer

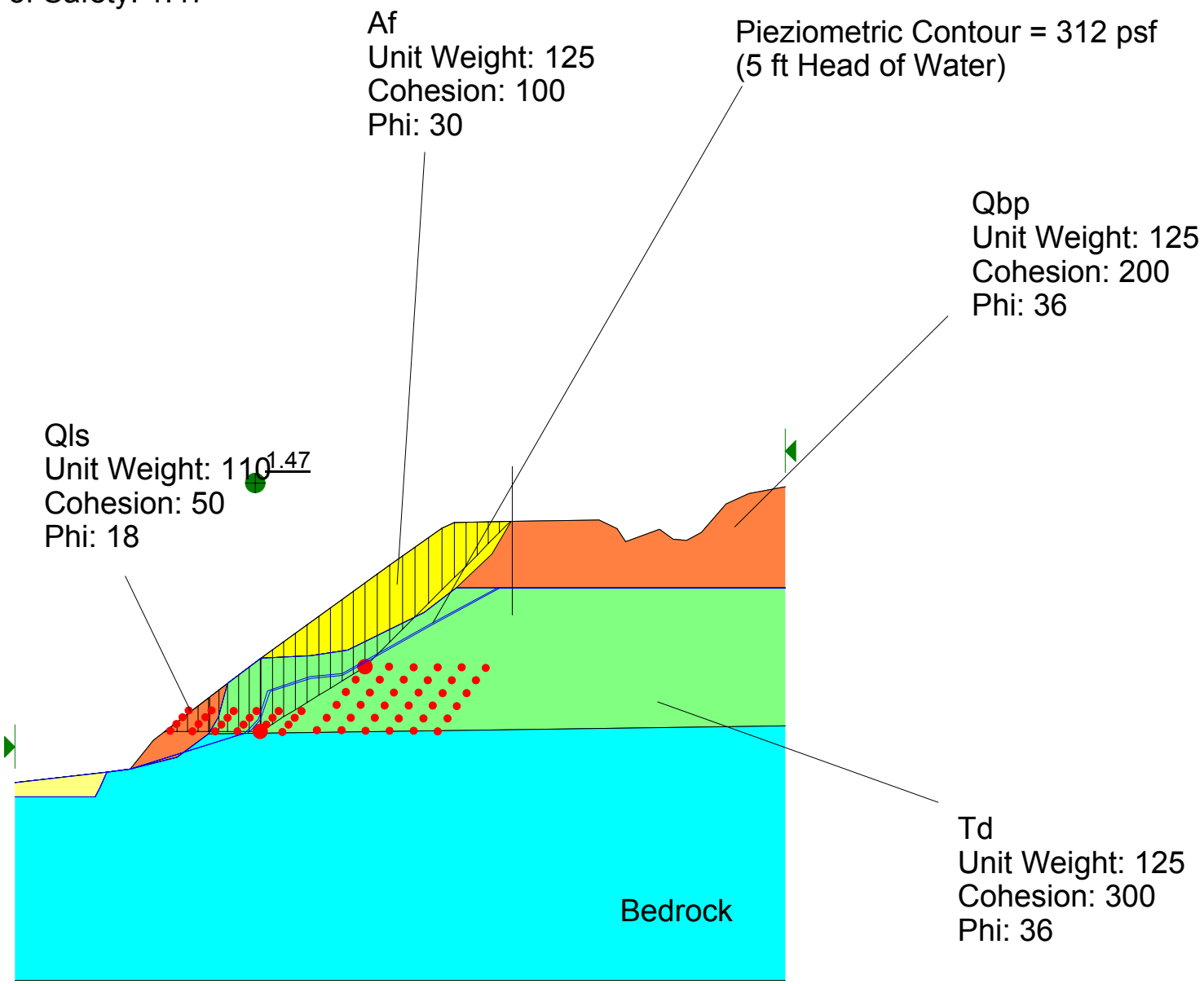
Factor of Safety: 0.96

Seismic Coefficient = 0.28



Del Mar Bluffs Cross Section 13-13'
Slope Stability Analysis
File Name: Section 13 13 Static 3B.slz
Analysis Method: Spencer

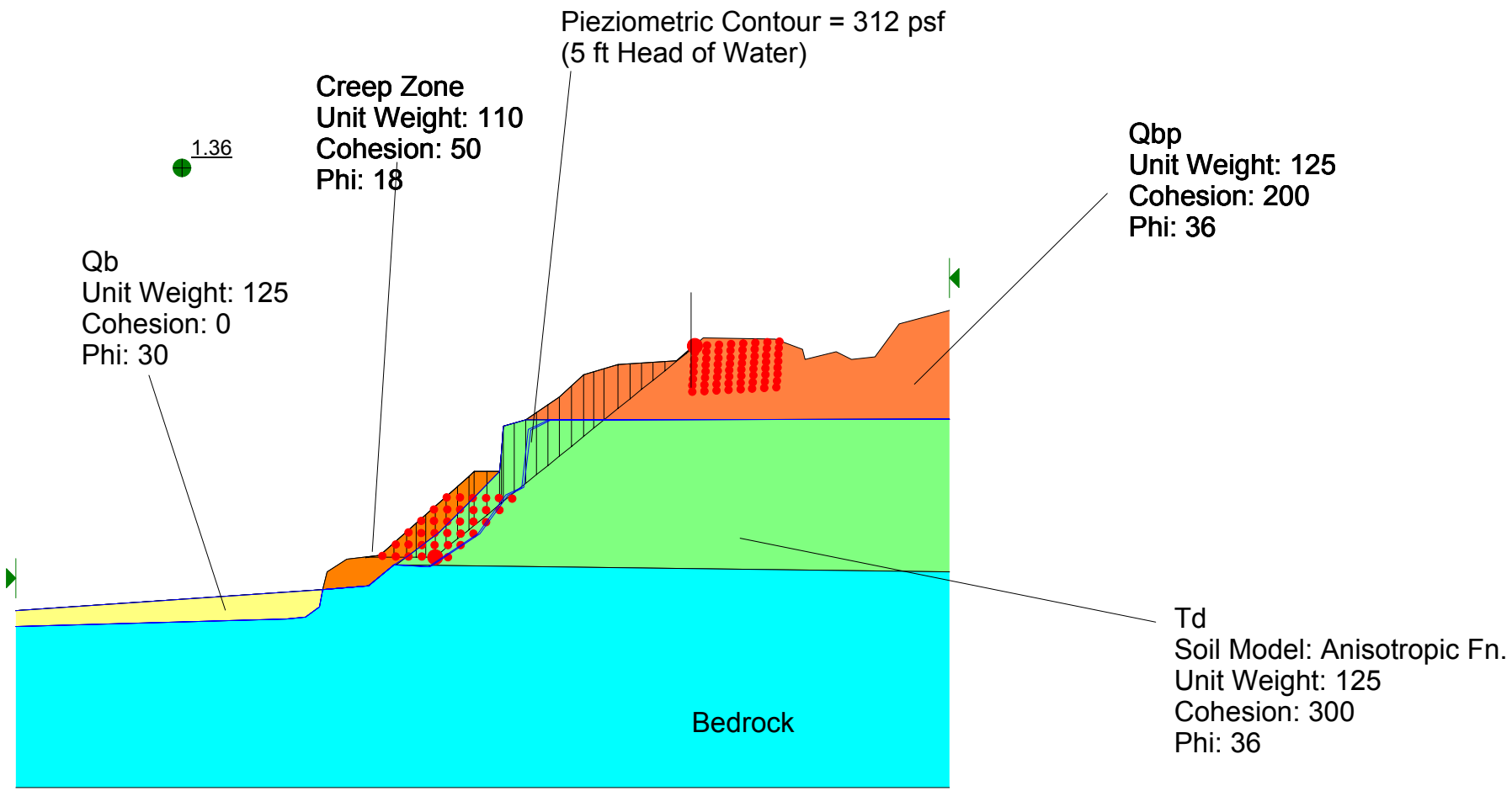
Factor of Safety: 1.47



Cross Section 14-14’

Del Mar Bluffs Cross Section 14-14'
Slope Stability Analysis
File Name: Section 14 14 Static 2.slz
Analysis Method: Spencer

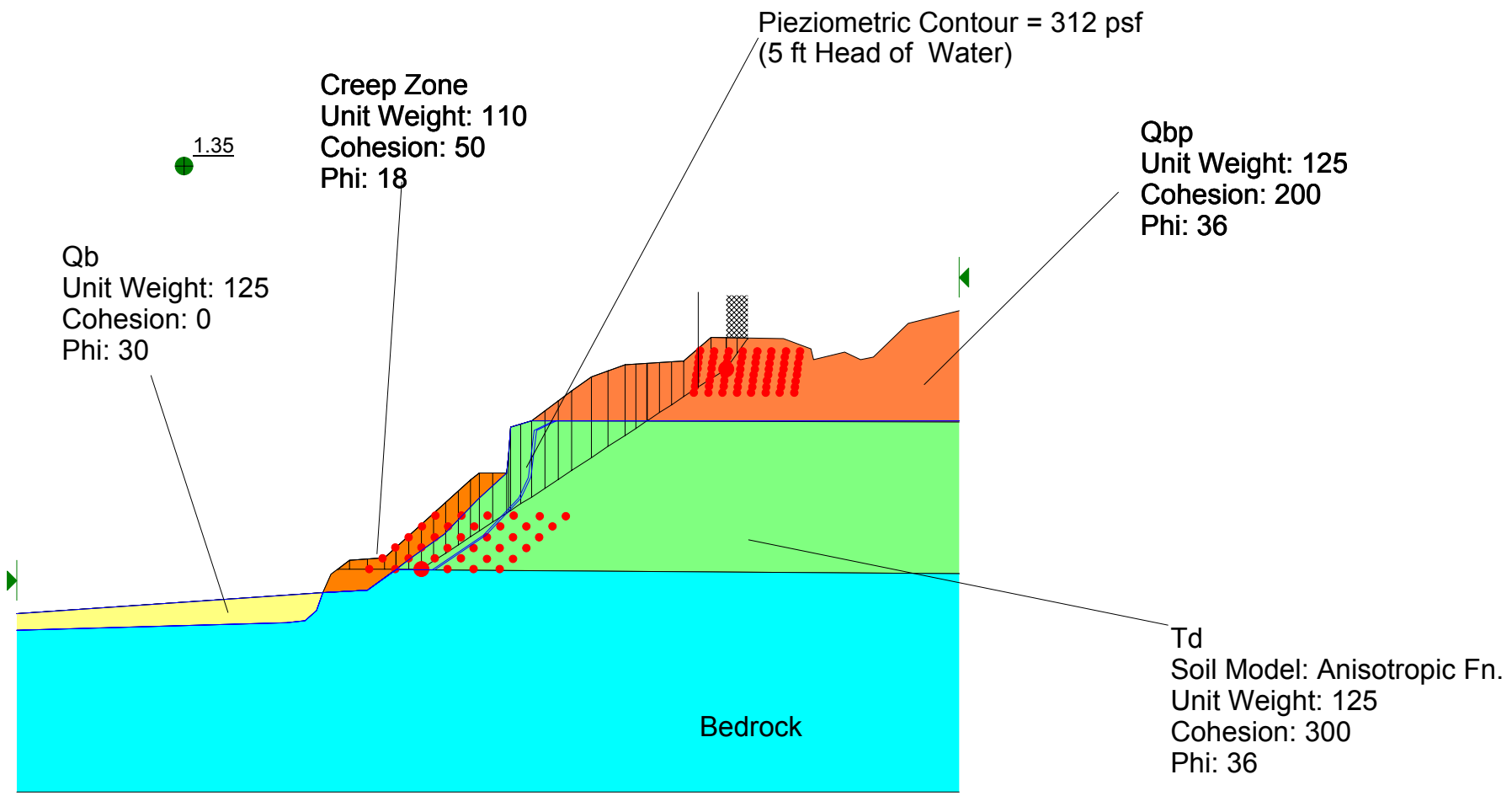
Factor of Safety: 1.36



Del Mar Bluffs Cross Section 14-14'
Slope Stability Analysis
File Name: Section 14 14 Static 1.slz
Analysis Method: Spencer

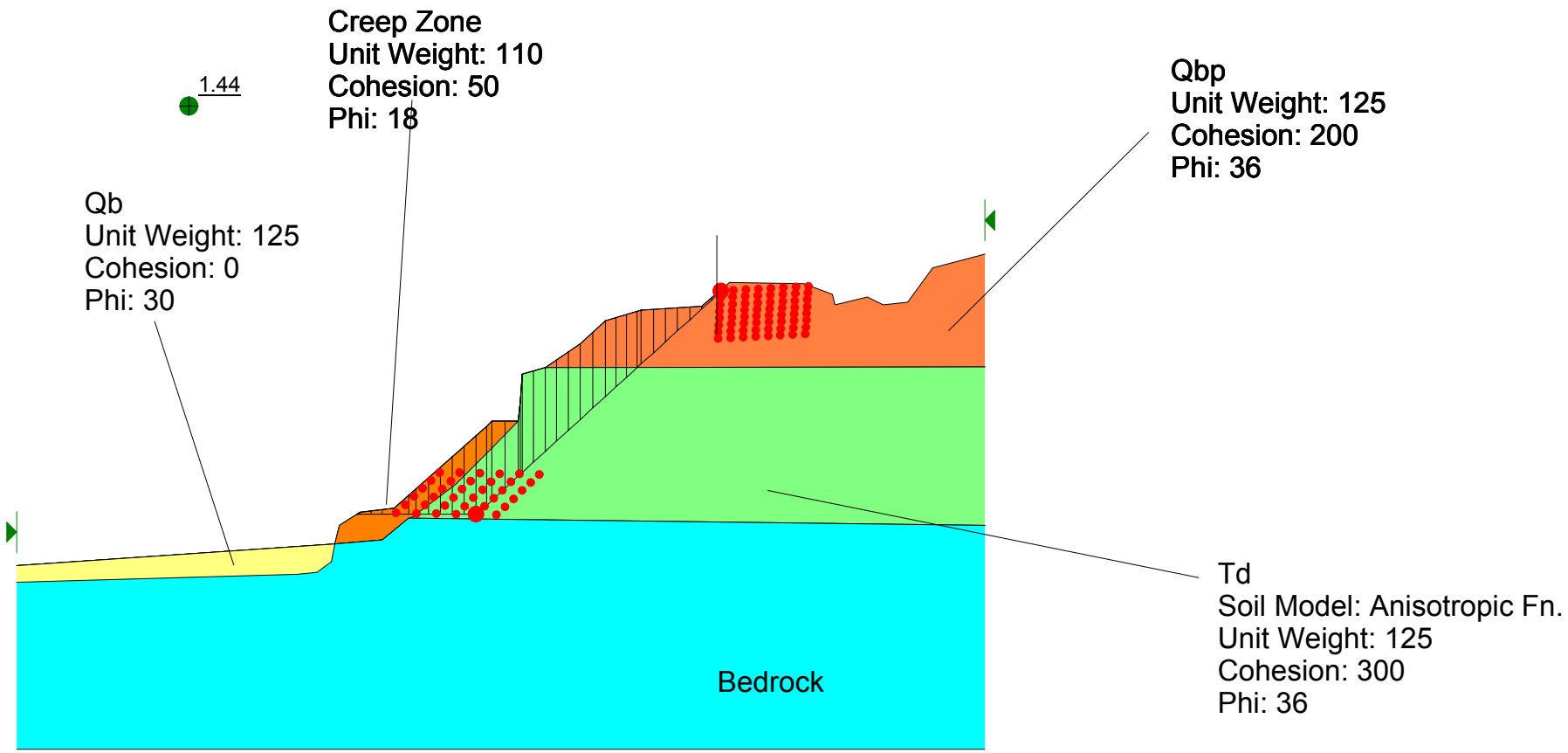
Factor of Safety: 1.35

Surcharge = 3,000 psf

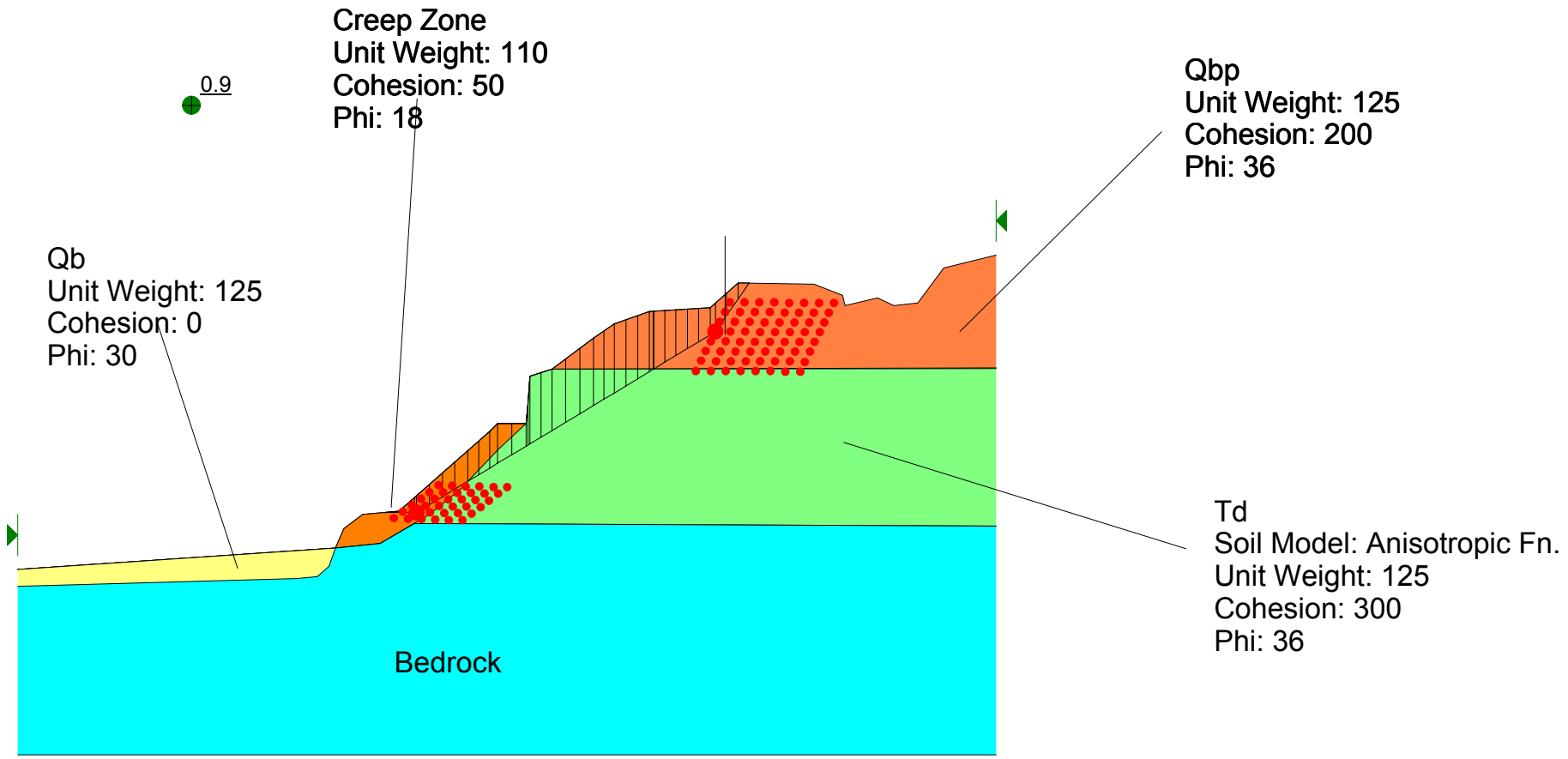


Del Mar Bluffs Cross Section 14-14'
Slope Stability Analysis, No Water
File Name: Section 14 14 Static 3 no water.slz
Analysis Method: Spencer

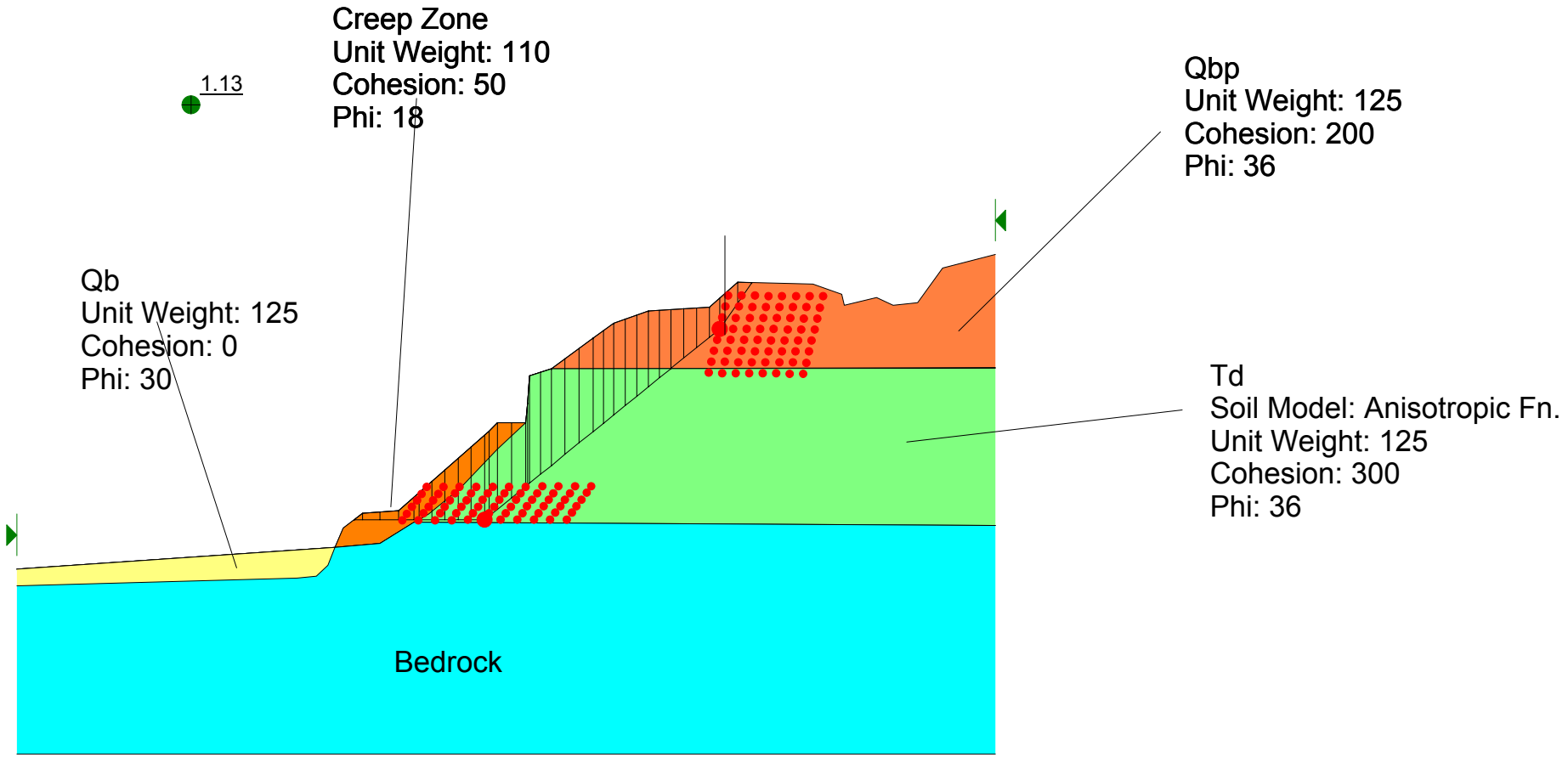
Factor of Safety: 1.44



Del Mar Bluffs Cross Section 14-14'
Slope Stability Analysis
File Name: Section 14 14 Pseudo Static 2.slz
Analysis Method: Spencer
Factor of Safety: 0.9
Seismic Coefficient = 0.28

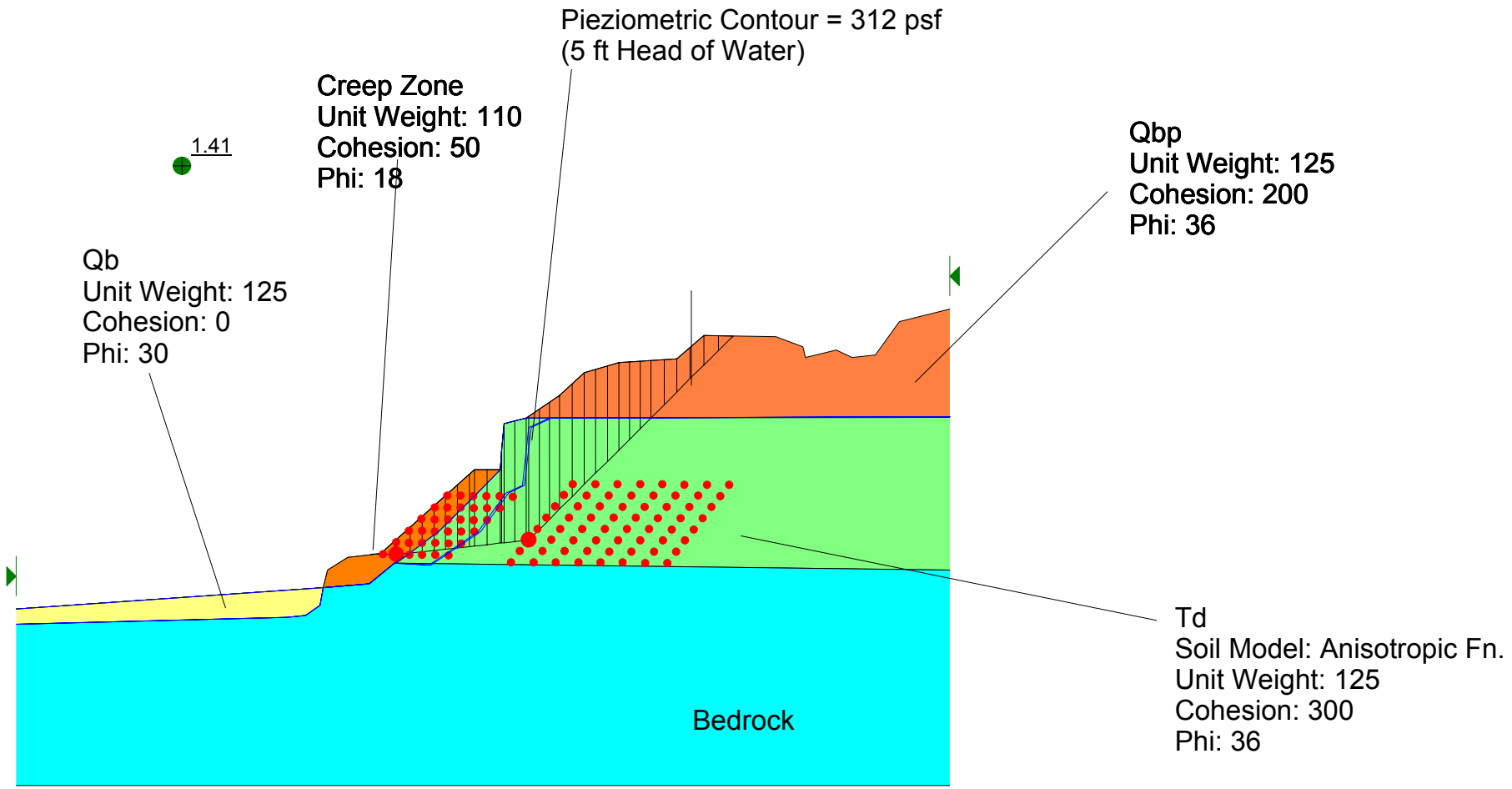


Del Mar Bluffs Cross Section 14-14'
Slope Stability Analysis
File Name: Section 14 14 Pseudo Static 1B.slz
Analysis Method: Spencer
Factor of Safety: 1.13
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 14-14'
Slope Stability Analysis
File Name: Section 14 14 Static 2B.slz
Analysis Method: Spencer

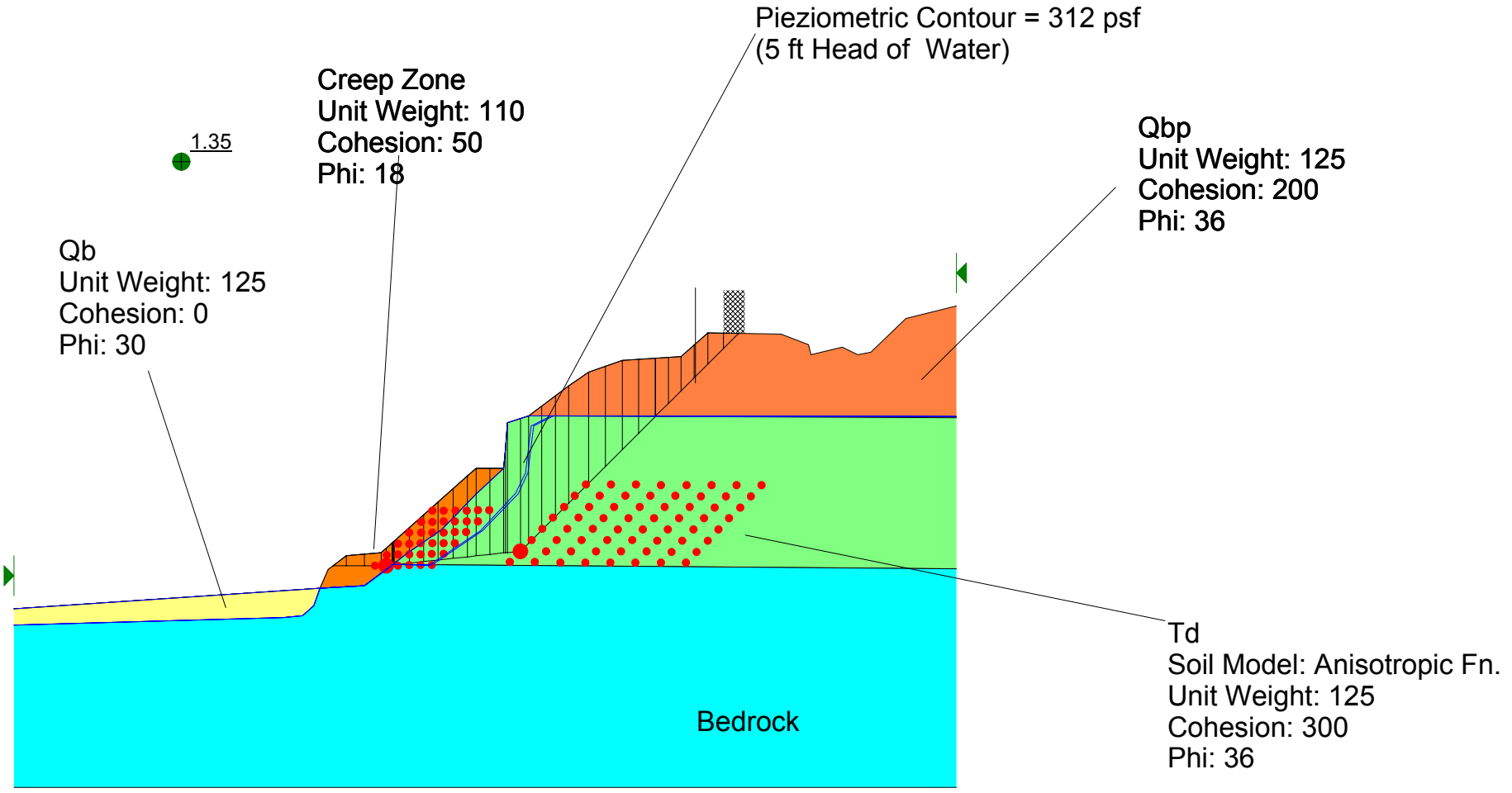
Factor of Safety: 1.41



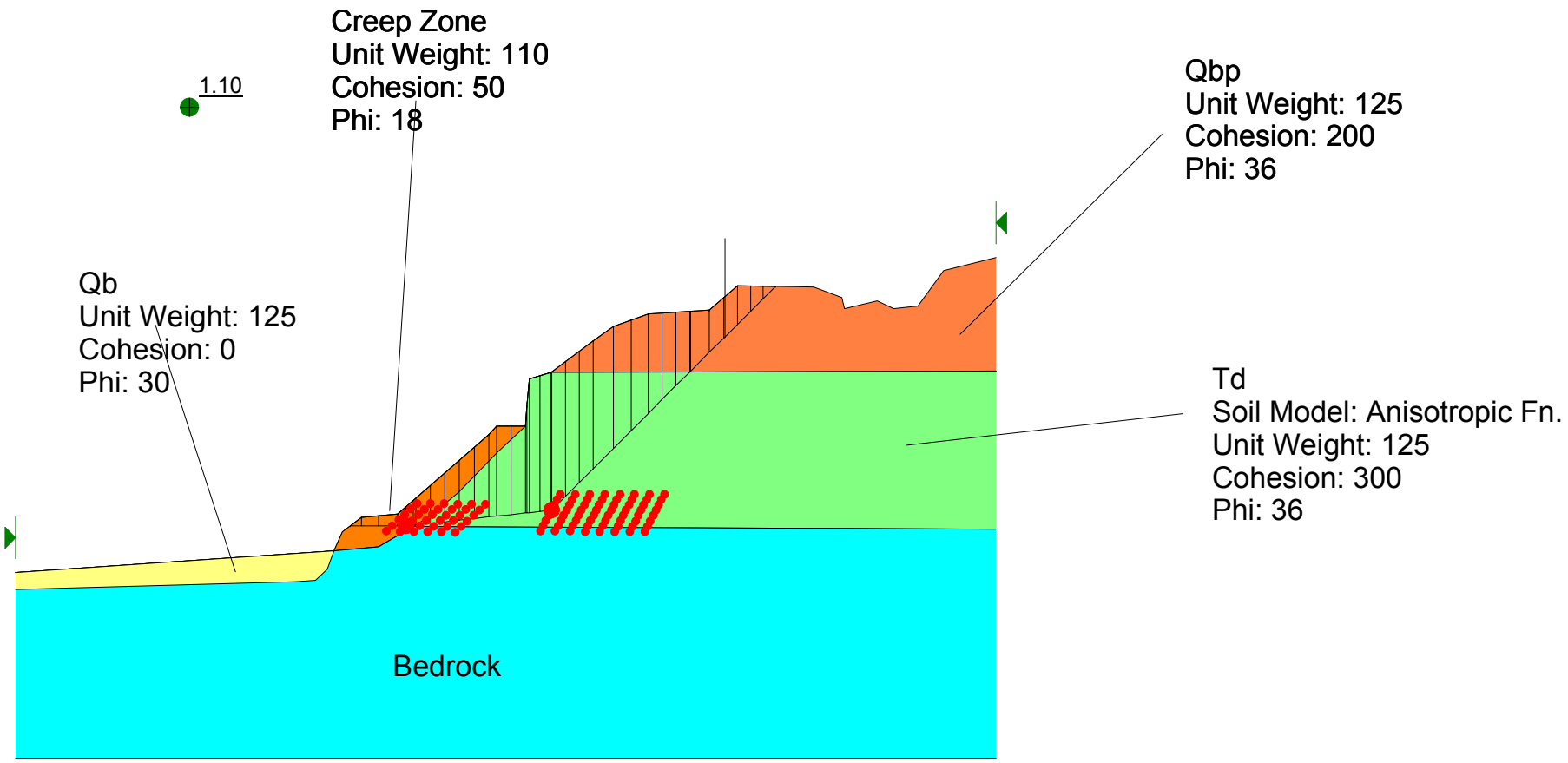
Del Mar Bluffs Cross Section 14-14'
Slope Stability Analysis
File Name: Section 14 14 Static 1B.slz
Analysis Method: Spencer

Factor of Safety: 1.35

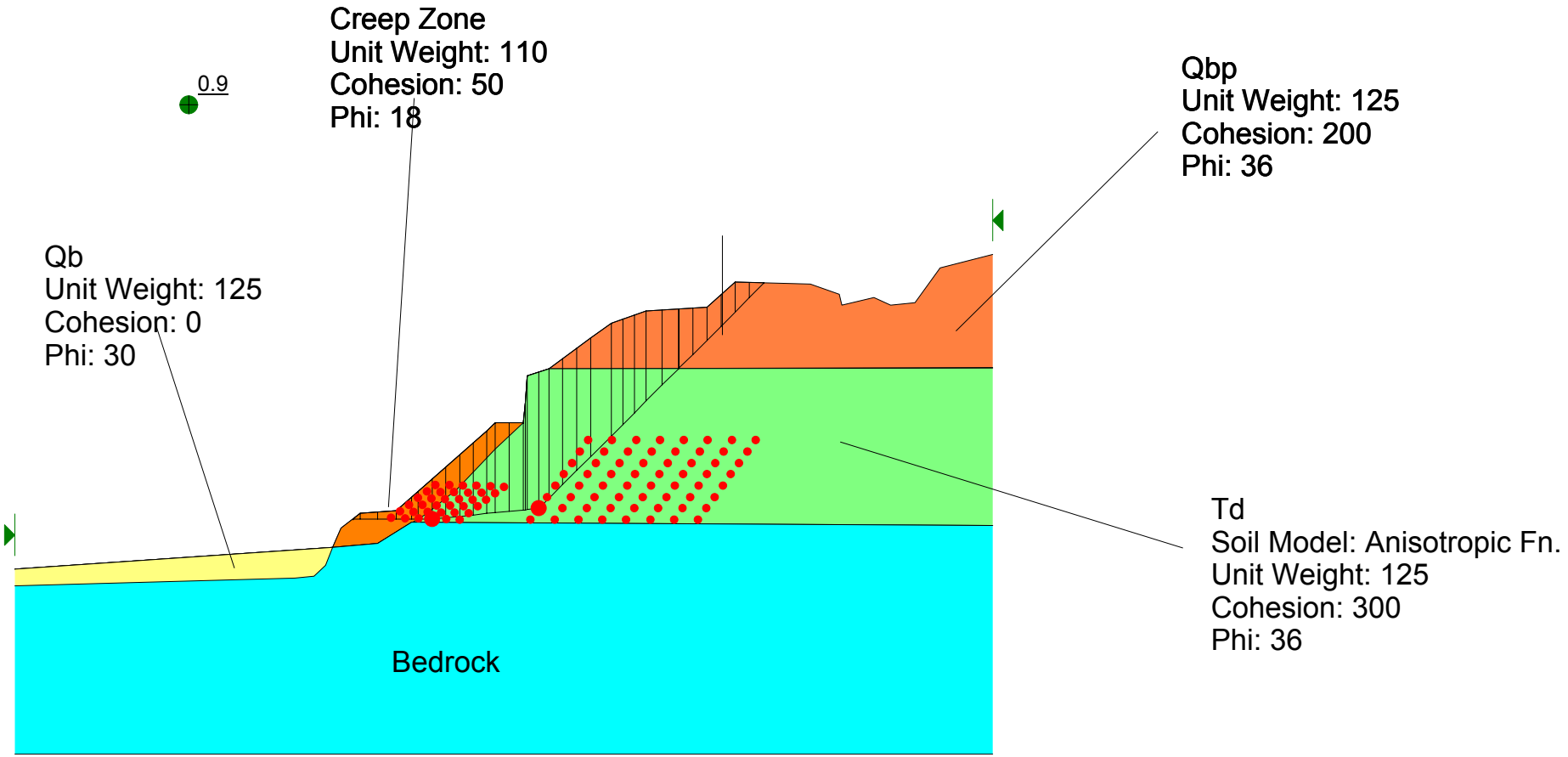
Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 14-14'
Slope Stability Analysis
File Name: Section 14 14 Pseudo Static 1.slz
Analysis Method: Spencer
Factor of Safety: 1.1
Seismic Coefficient = 0.15



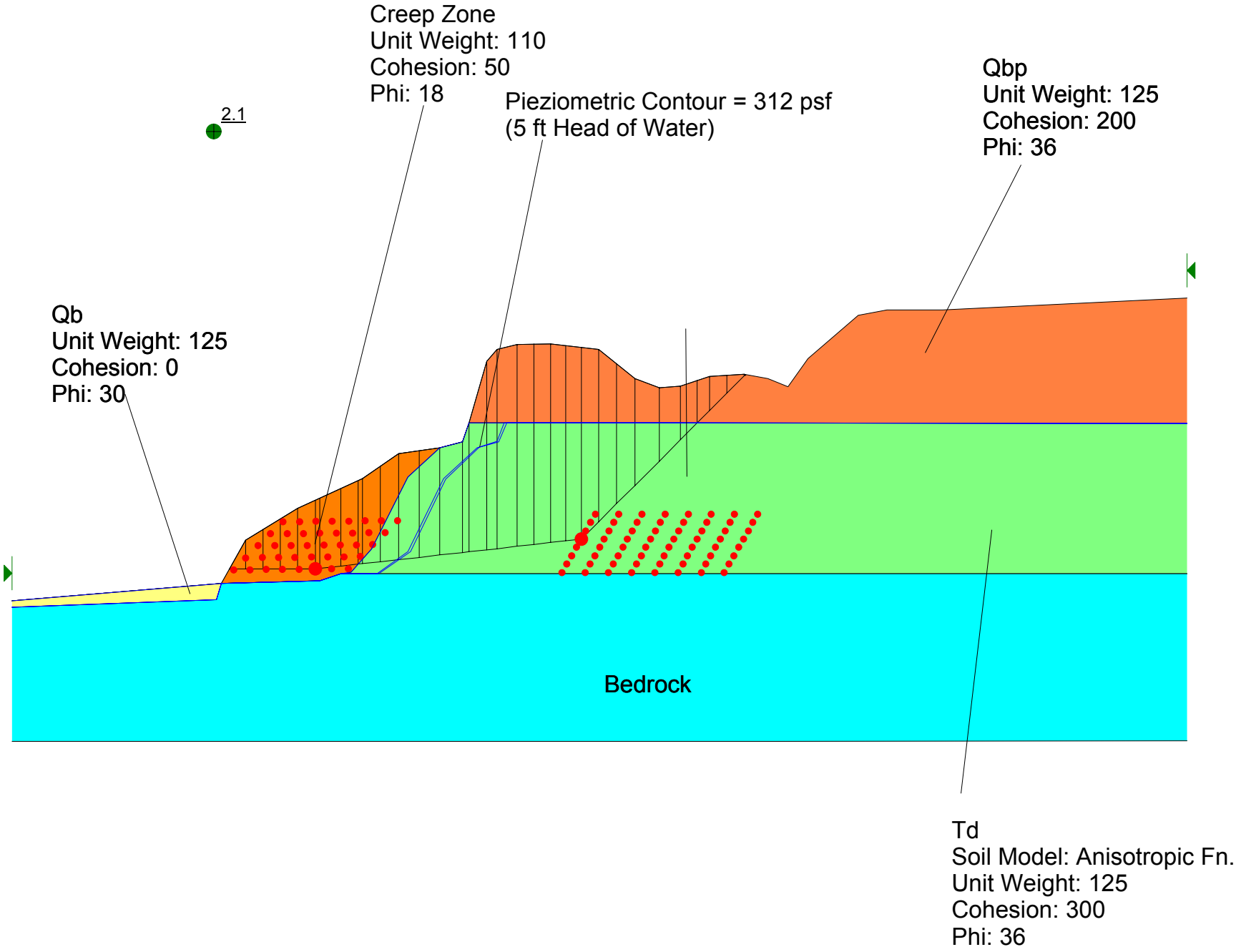
Del Mar Bluffs Cross Section 14-14'
Slope Stability Analysis
File Name: Section 14 14 Pseudo Static 2B.slz
Analysis Method: Spencer
Factor of Safety: 0.91
Seismic Coefficient = 0.28



Cross Section 15-15’

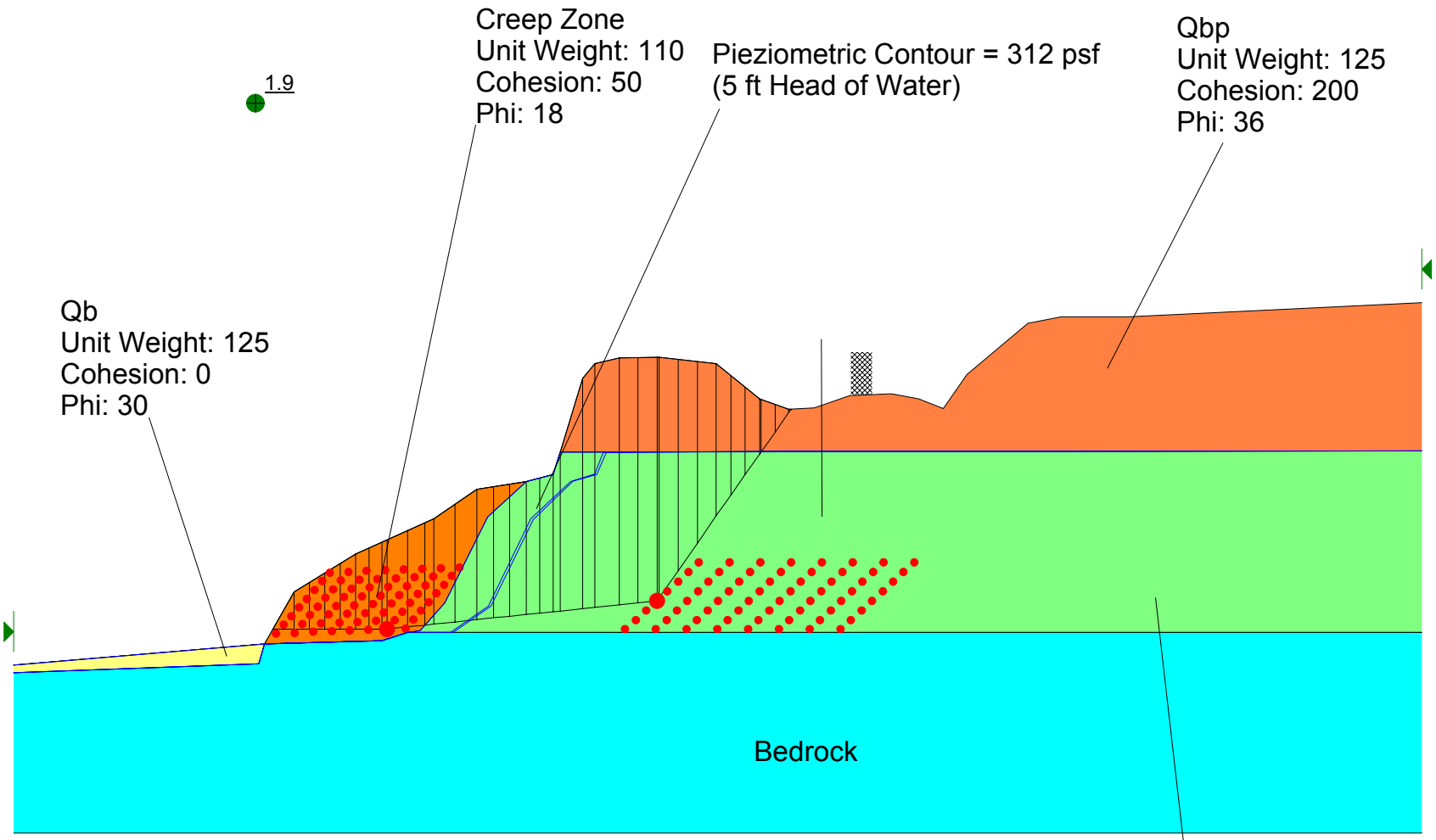
Del Mar Bluffs Cross Section 15-15'
Slope Stability Analysis
File Name: Section 15 15 Static 1B.slz
Analysis Method: Spencer

Factor of Safety: 2.1



Del Mar Bluffs Cross Section 15-15'
Slope Stability Analysis
File Name: Section 15 15 Static 2B.slz
Analysis Method: Spencer

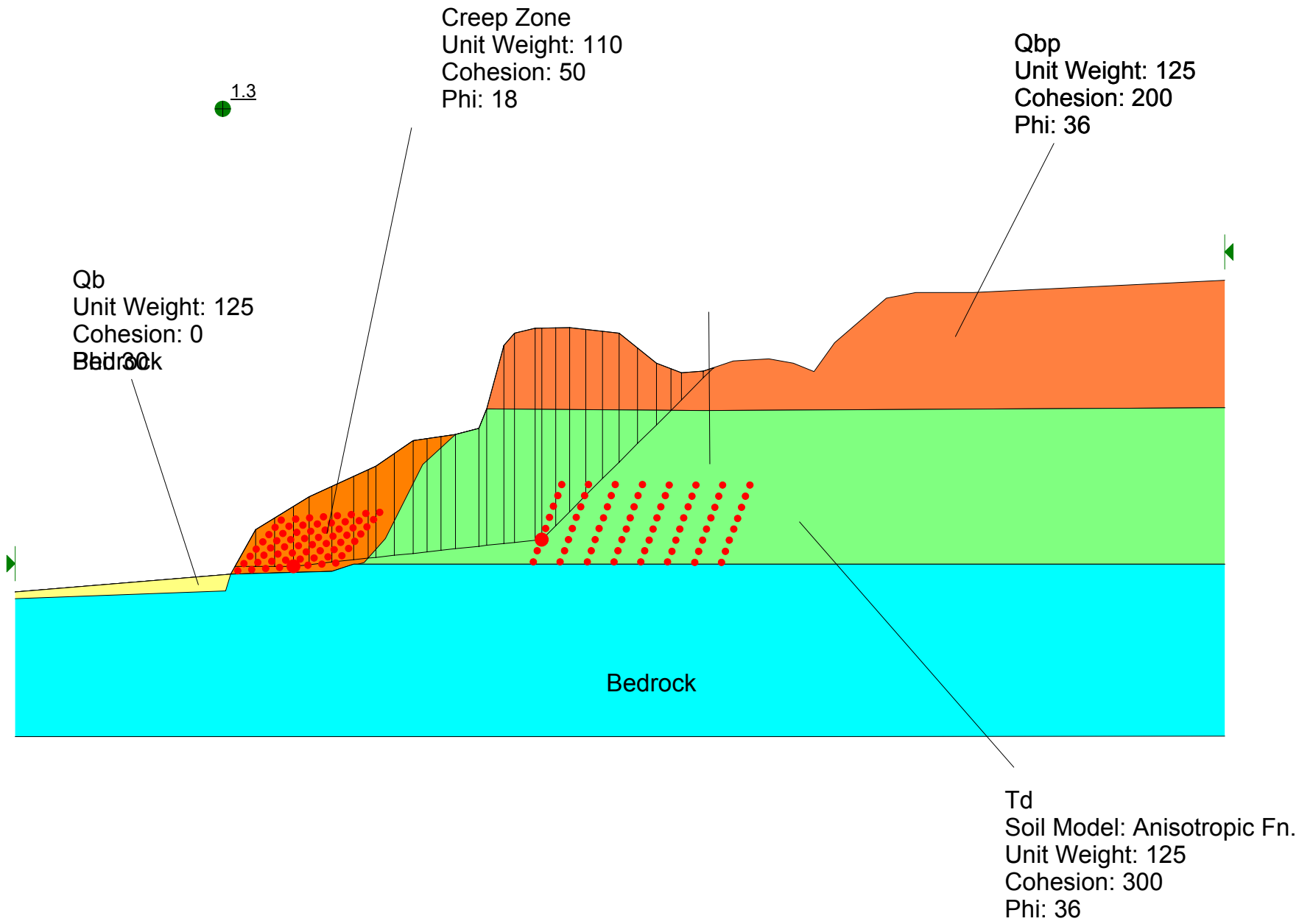
Factor of Safety: 1.9
Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 15-15'
Slope Stability Analysis
File Name: Section 15 15 Pseudo Static 1B.slz
Analysis Method: Spencer

Factor of Safety: 1.3

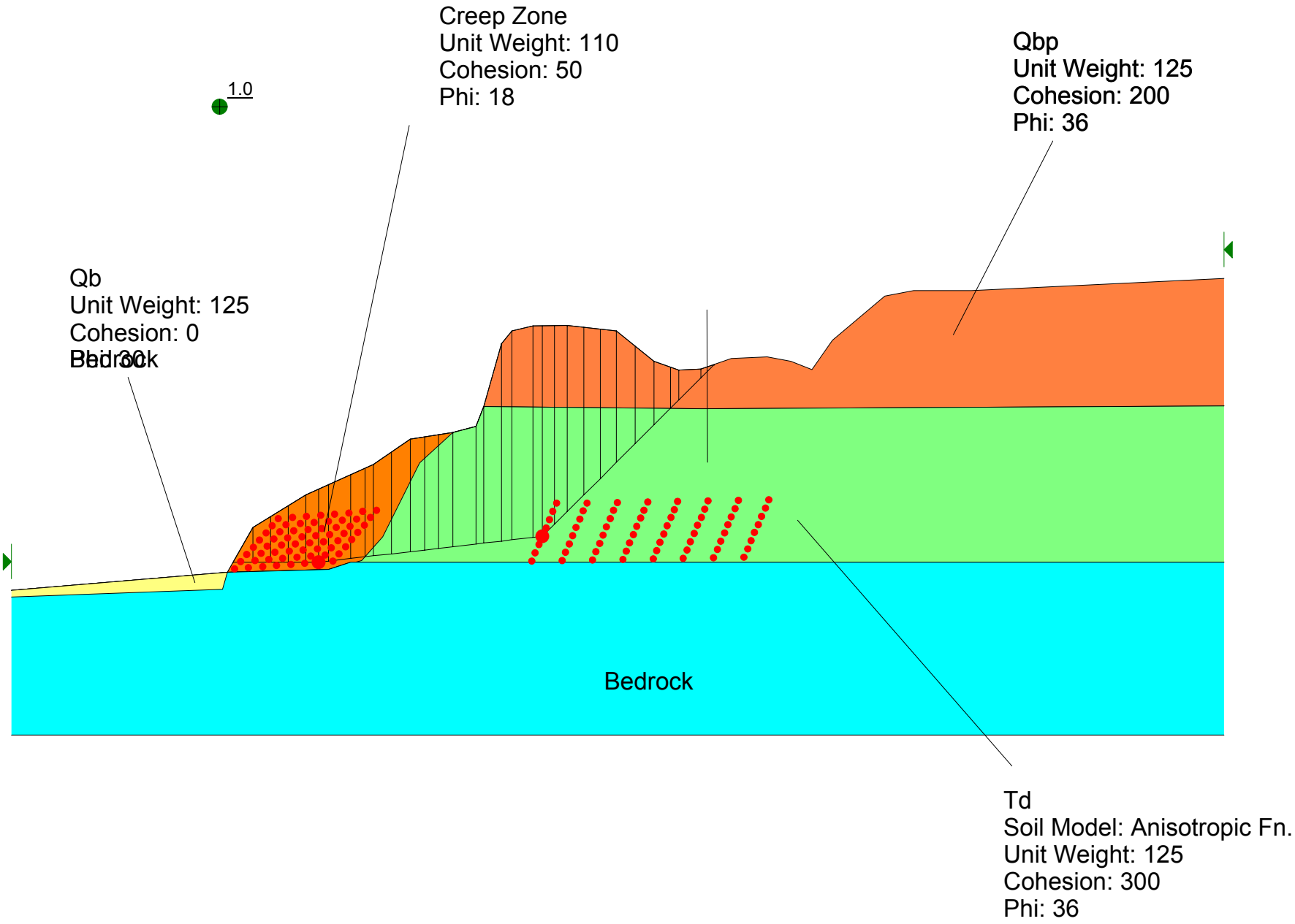
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 15-15'
Slope Stability Analysis
File Name: Section 15 15 Pseudo Static 2B.slz
Analysis Method: Spencer

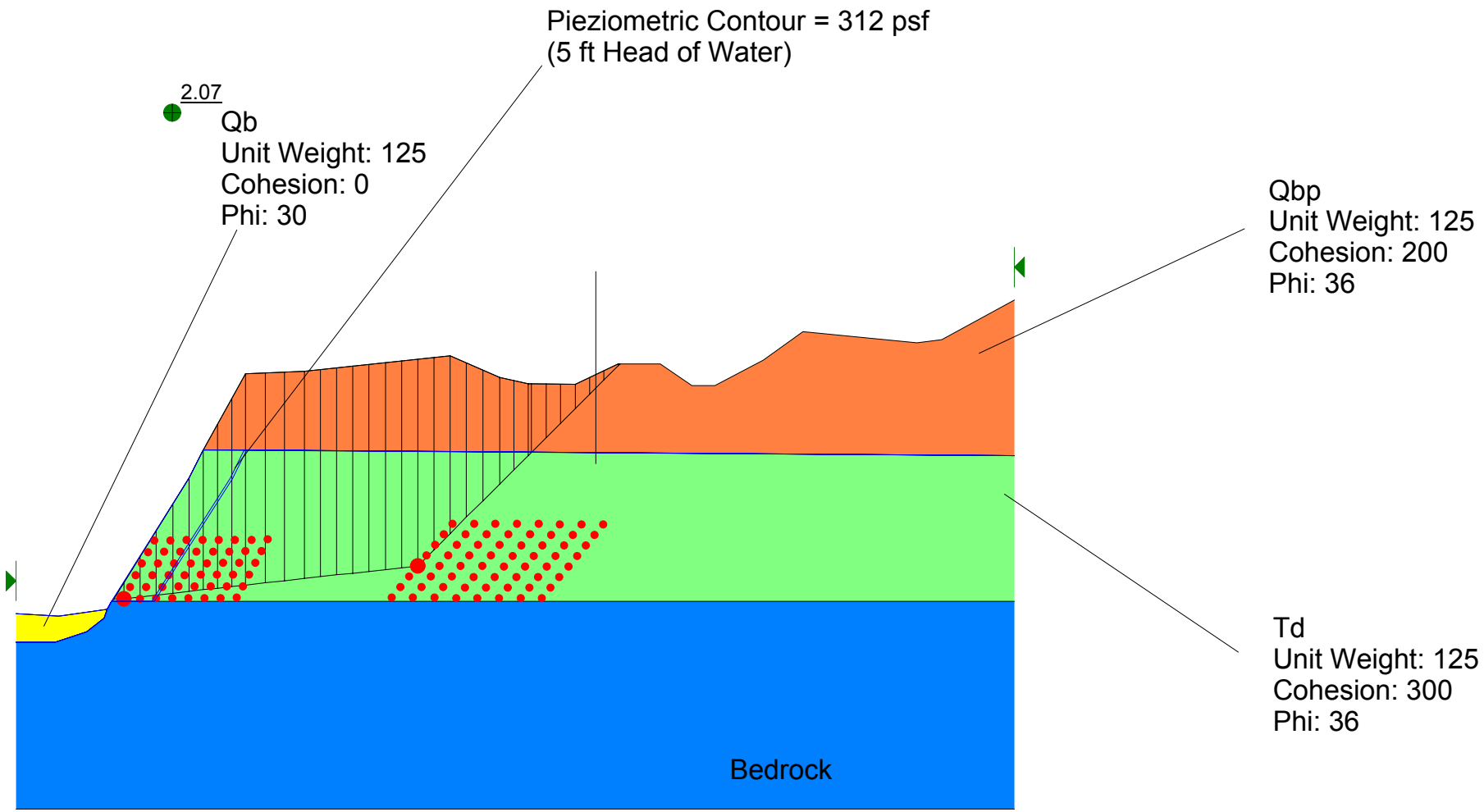
Factor of Safety: 1

Seismic Coefficient = 0.28

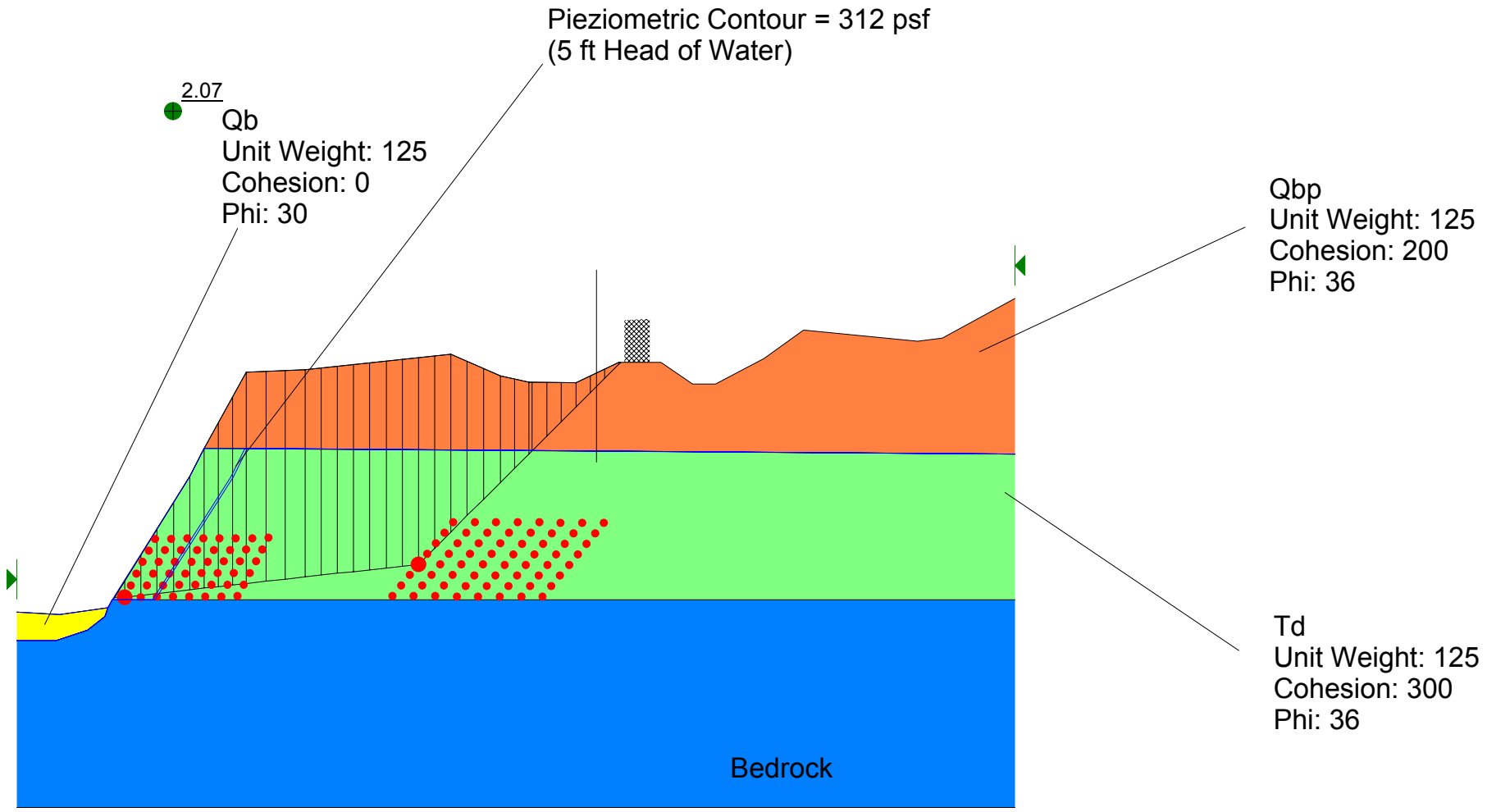


Cross Section 16-16’

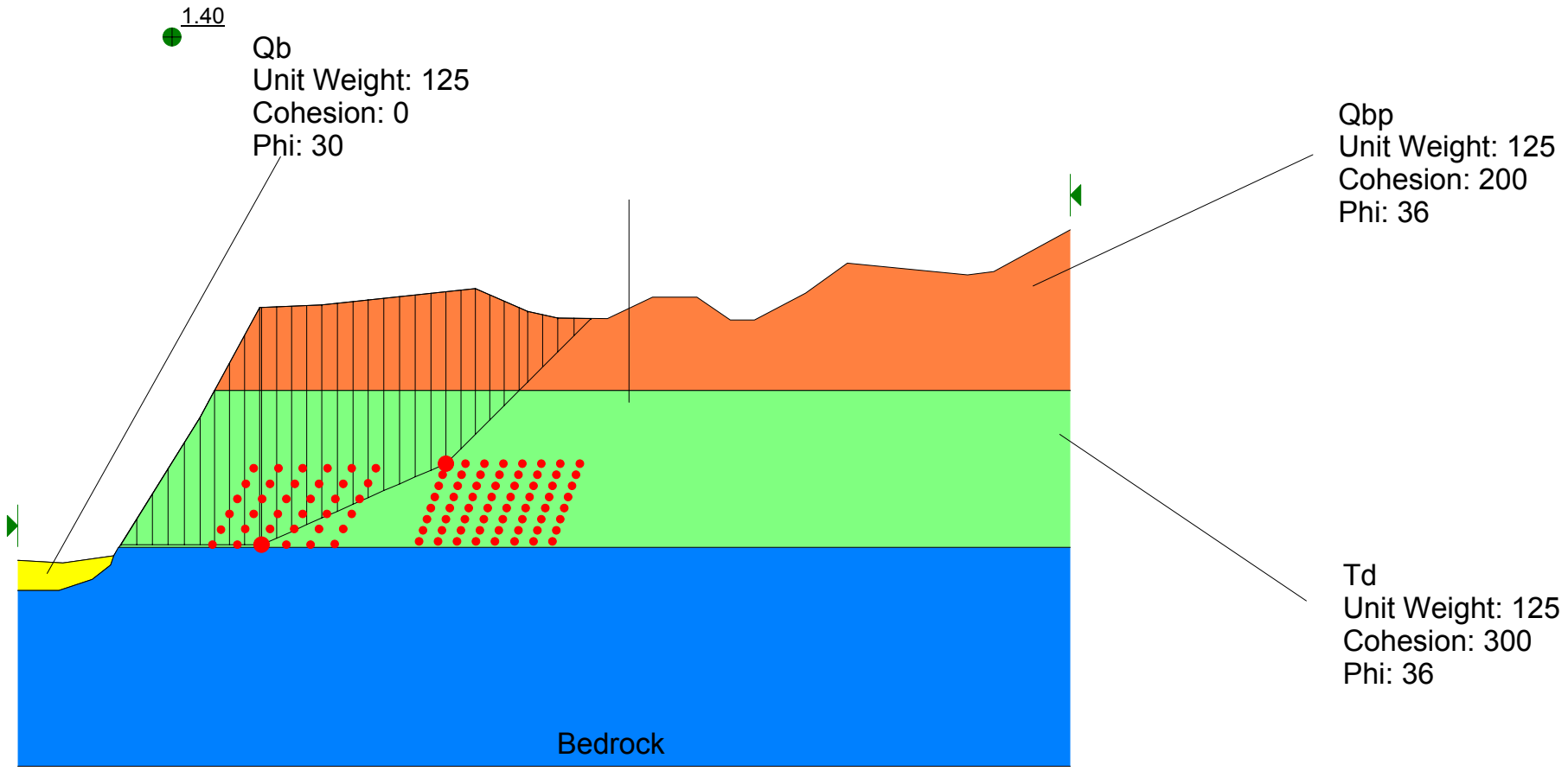
Del Mar Bluffs Section 16-16'
Slope Stability Analysis
File Name: Section 1616 Static 1B.slz
Analysis Method: Spencer
Factor of Safety: 2.07



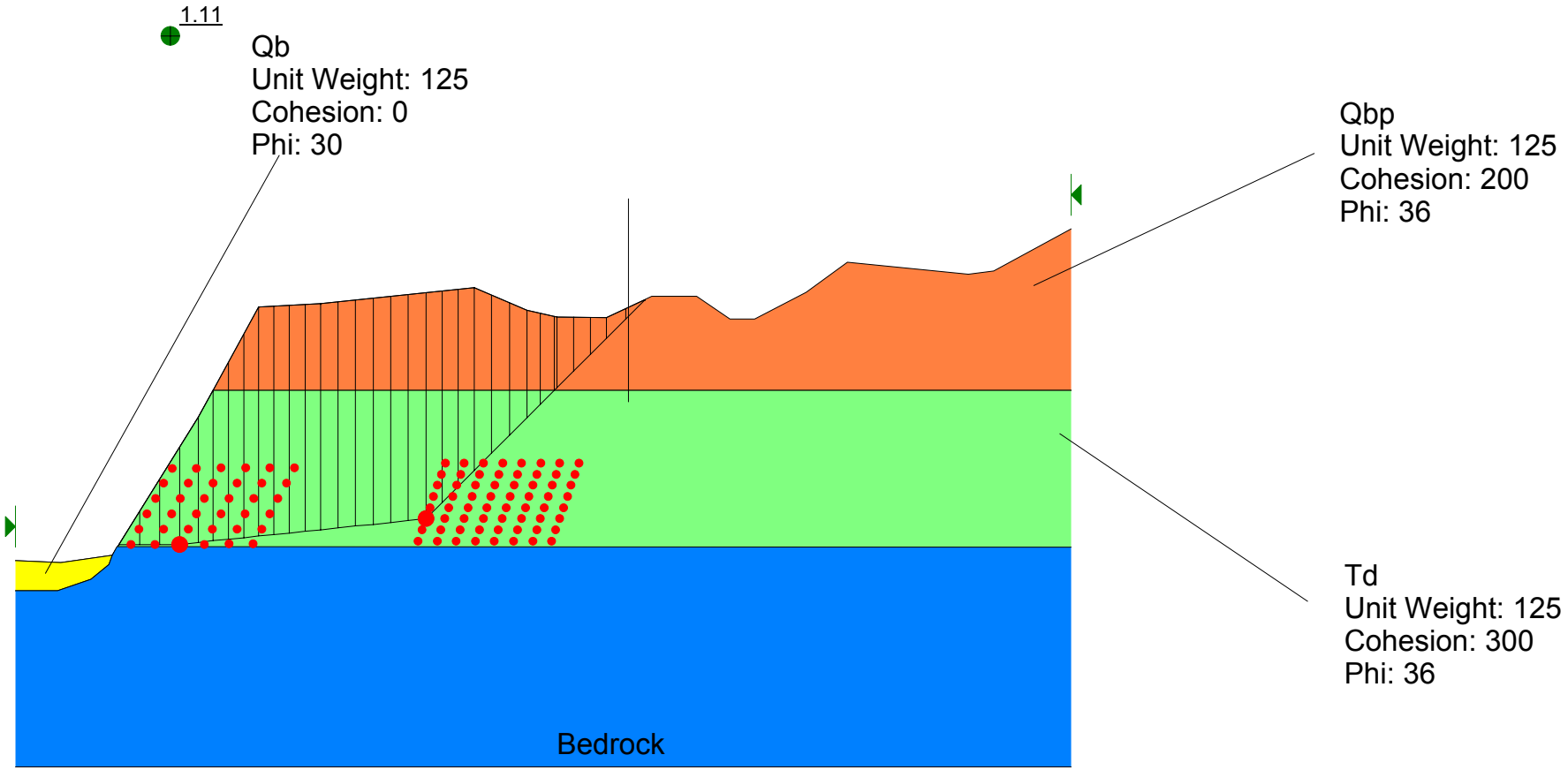
Del Mar Bluffs Section 16-16'
Slope Stability Analysis
File Name: Section 1616 Static 2B.slz
Analysis Method: Spencer
Factor of Safety: 2.07
Surcharge = 3,000 psf



Del Mar Bluffs Section 16-16'
Slope Stability Analysis
File Name: Section 1616 Pseudo Static 1B.slz
Analysis Method: Spencer
Factor of Safety: 1.4
Seismic Coefficient = 0.15



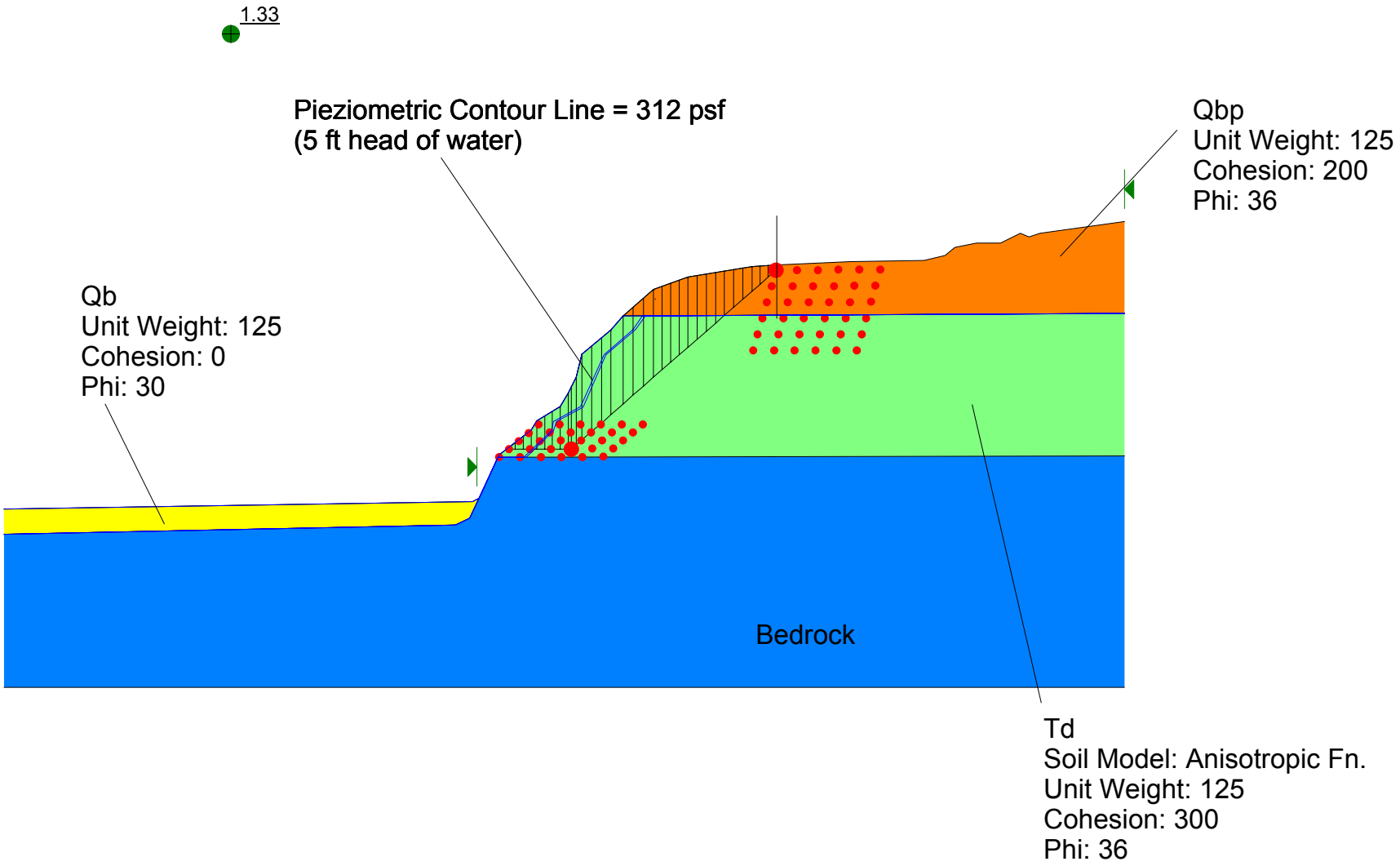
Del Mar Bluffs Section 16-16'
Slope Stability Analysis
File Name: Section 1616 Pseudo Static 2.slz
Analysis Method: Spencer
Factor of Safety: 1.11
Seismic Coefficient = 0.28



Cross Section 17-17’

Del Mar Bluffs Cross Section 17-17'
Slope Stability Analysis
File Name: Section 1717 5 ft water Static 2.slz
Analysis Method: Spencer

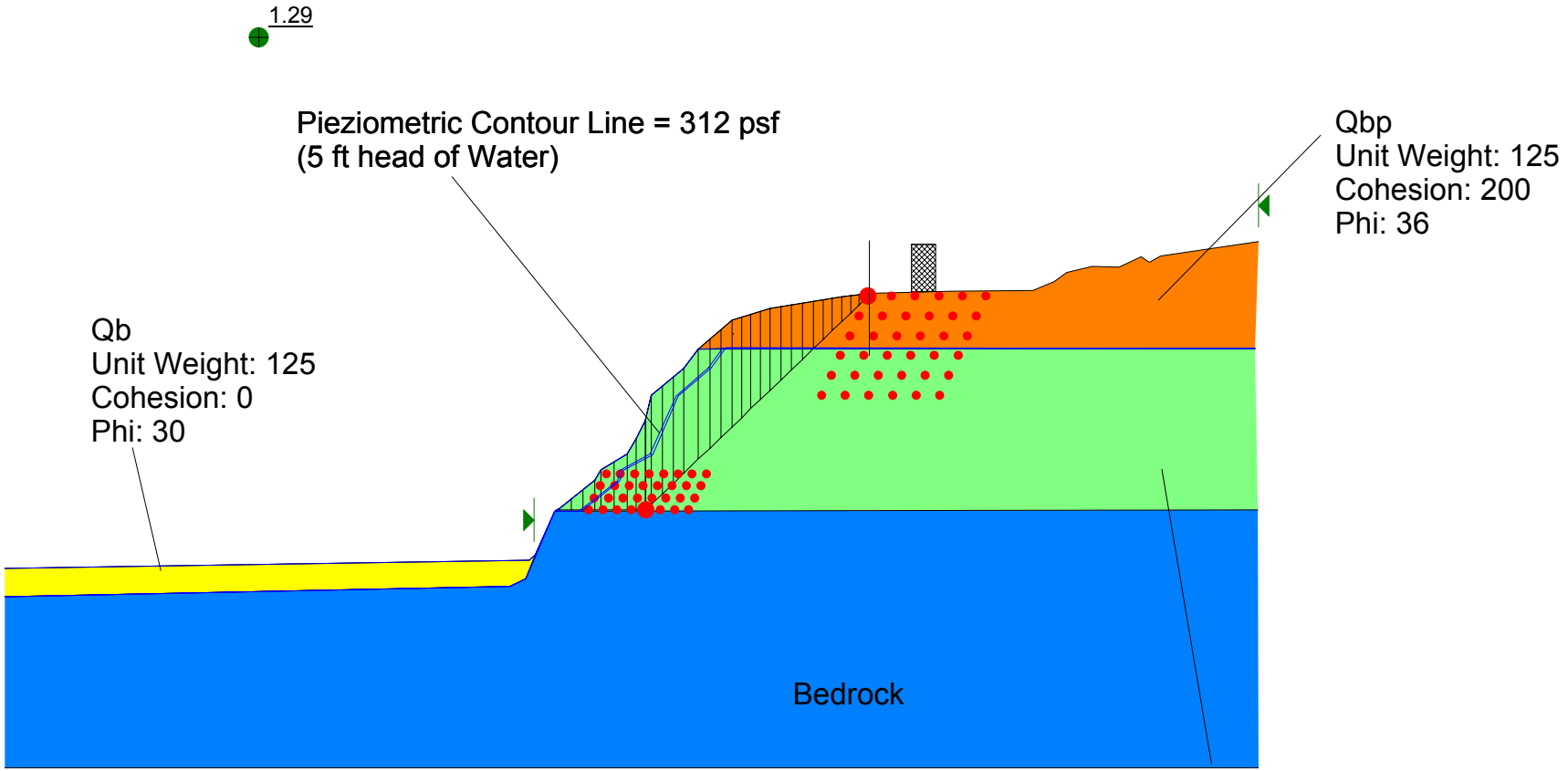
Factor of Safety: 1.33



Del Mar Bluffs Cross Section 17-17'
Slope Stability Analysis
File Name: Section 1717 5 ft water Static 4.slz
Analysis Method: Spencer

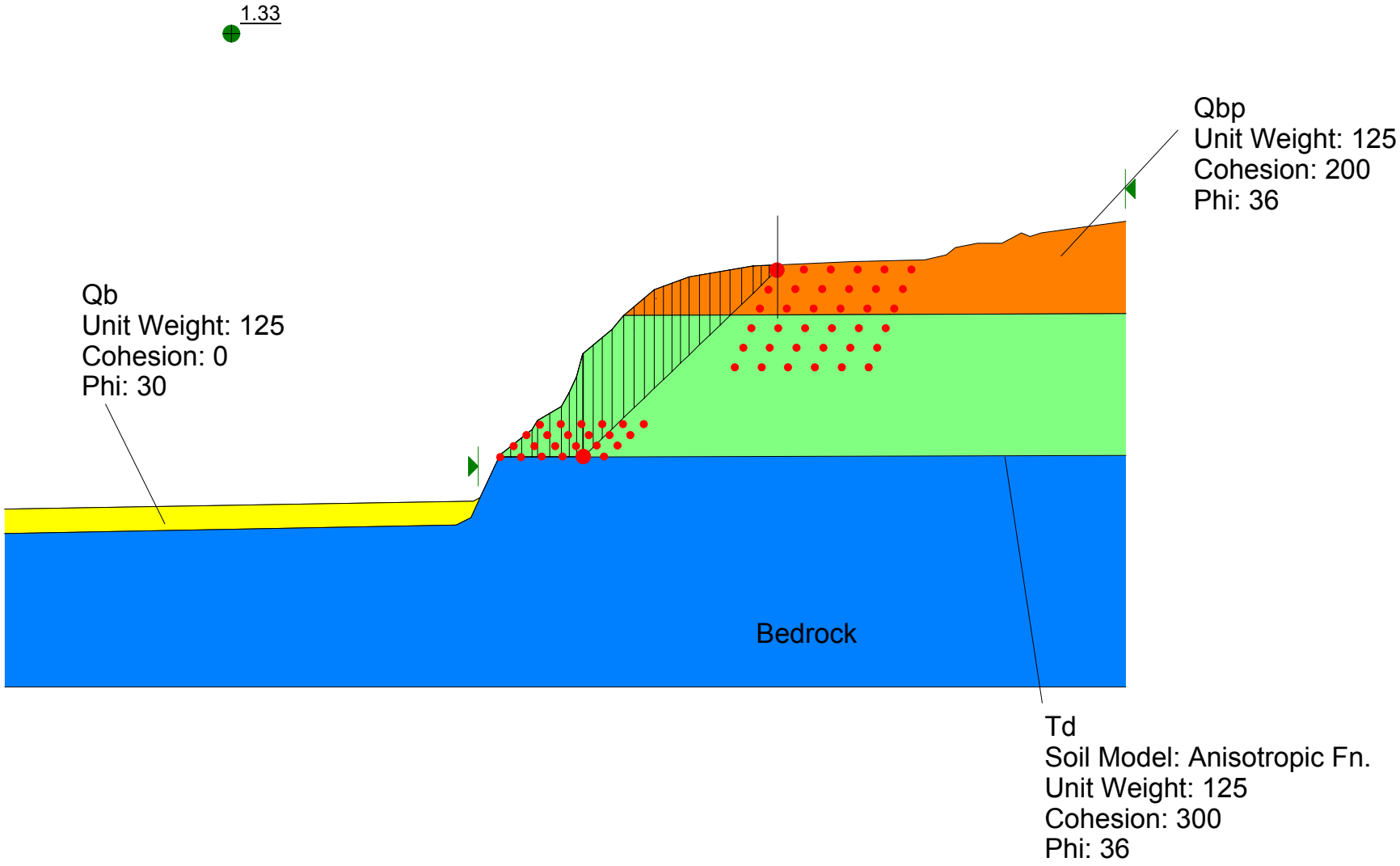
Factor of Safety: 1.29

Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 17-17'
Slope Stability Analysis, No Water
File Name: Section 1717 Static 3 no water.slz
Analysis Method: Spencer

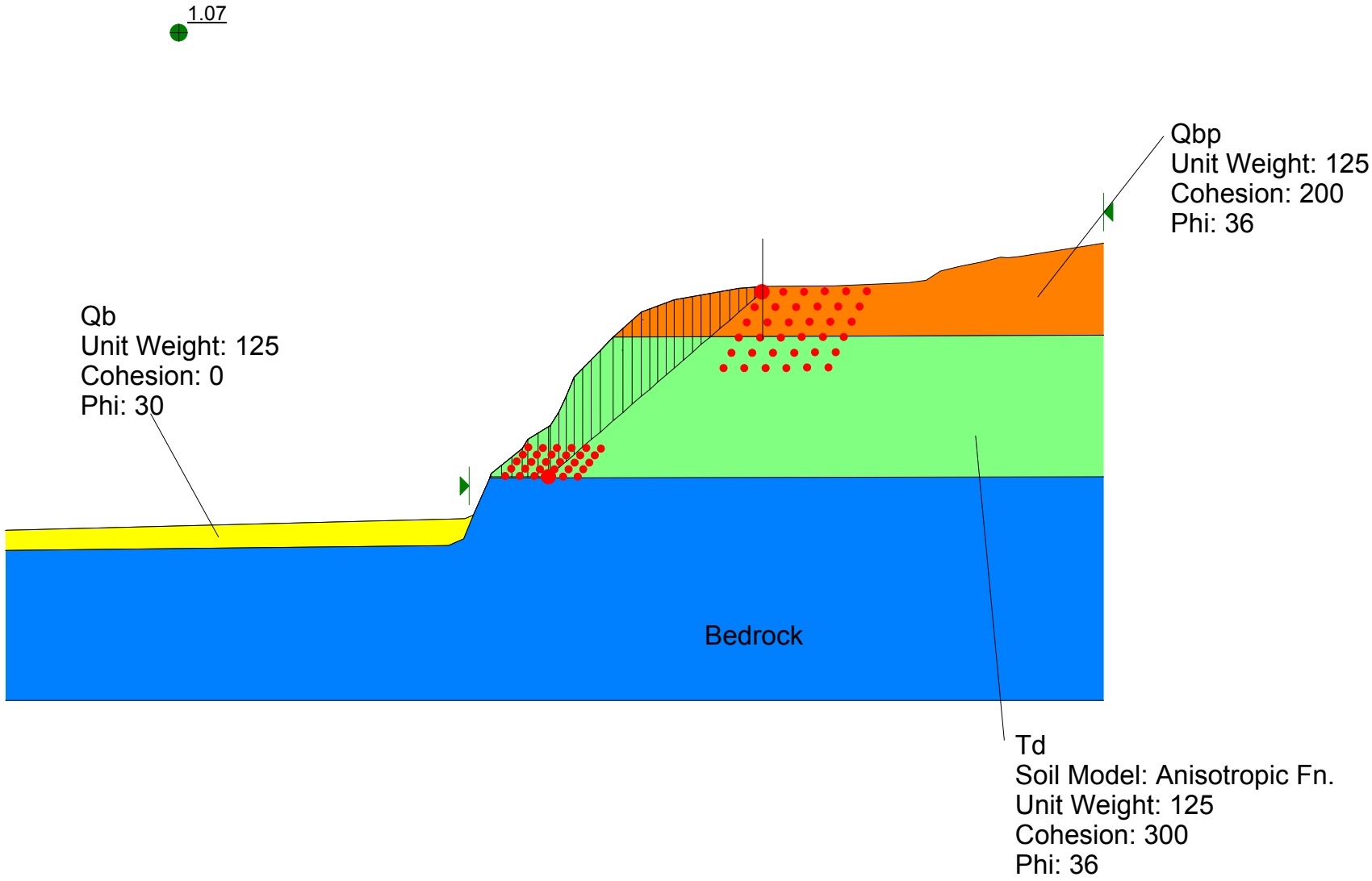
Factor of Safety: 1.33



Del Mar Bluffs Cross Section 17-17'
Slope Stability Analysis
File Name: Section 1717 Psuedo Static 2.slz
Analysis Method: Spencer

Factor of Safety: 1.07

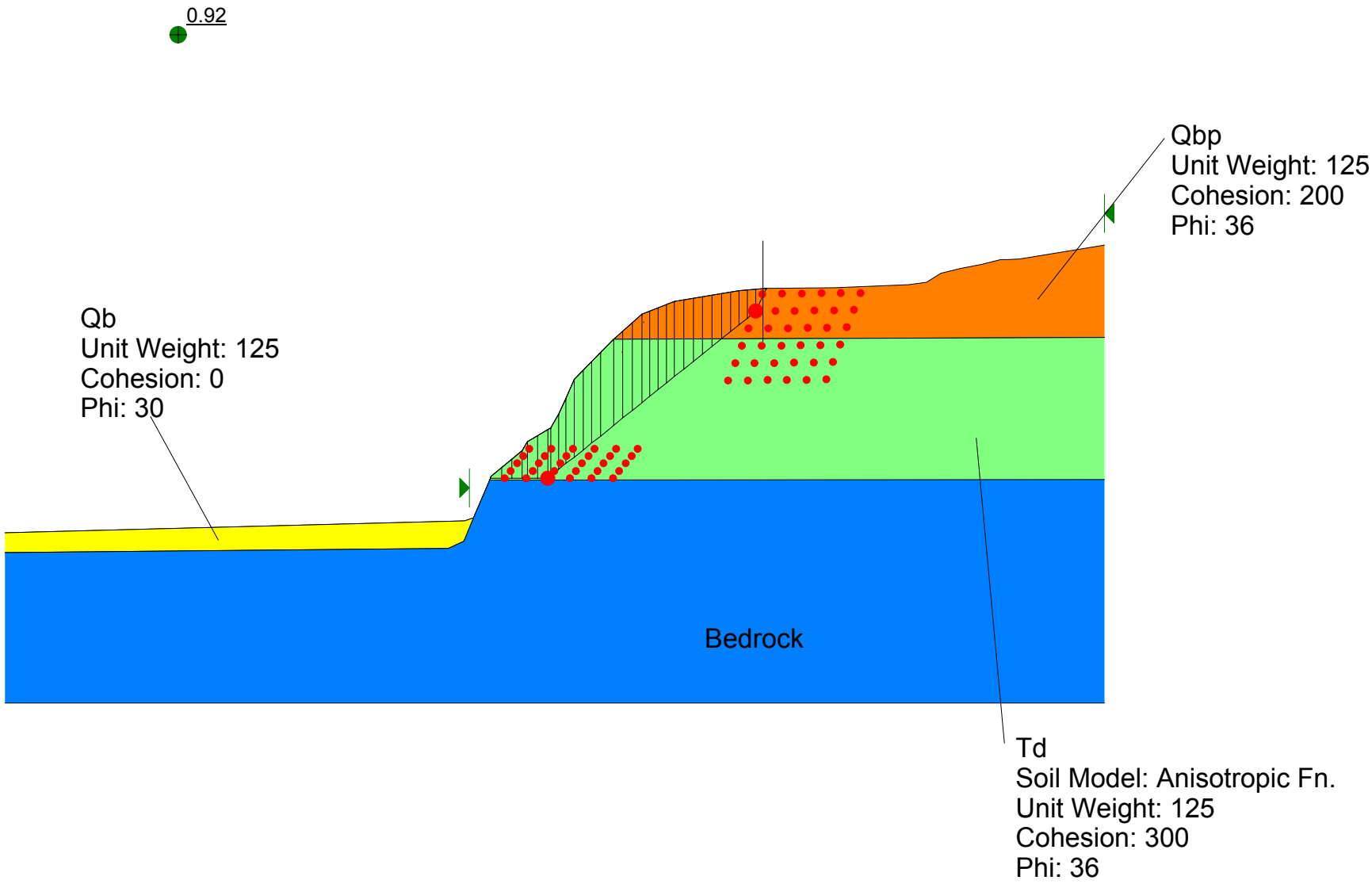
Seismic Coefficient - 0.15



Del Mar Bluffs Cross Section 17-17'
Slope Stability Analysis
File Name: Section 1717 Psuedo Static 4.slz
Analysis Method: Spencer

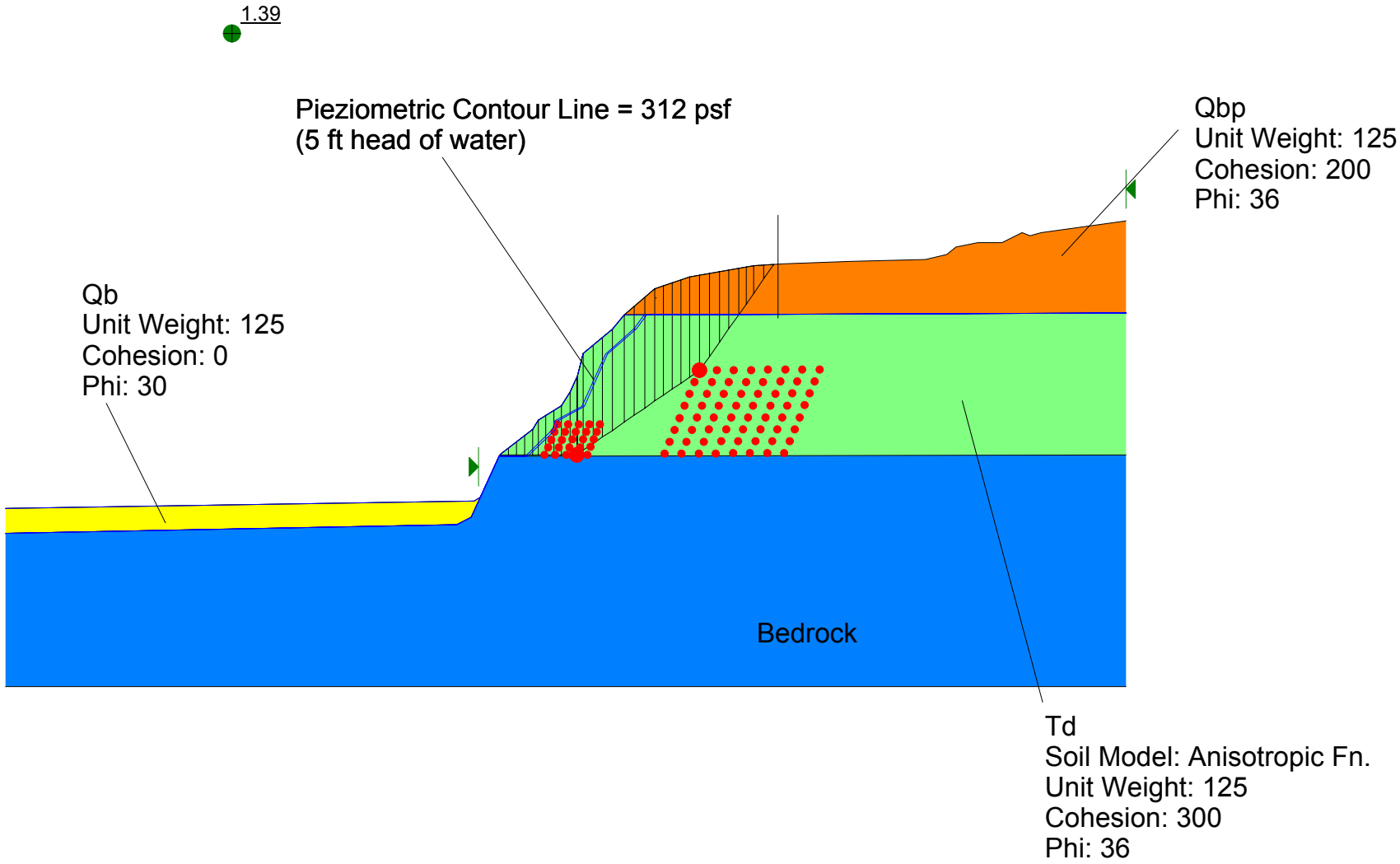
Factor of Safety: 0.92

Seismic Coefficient - 0.28



Del Mar Bluffs Cross Section 17-17'
Slope Stability Analysis
File Name: Section 1717 5 ft water Static 2B.slz
Analysis Method: Spencer

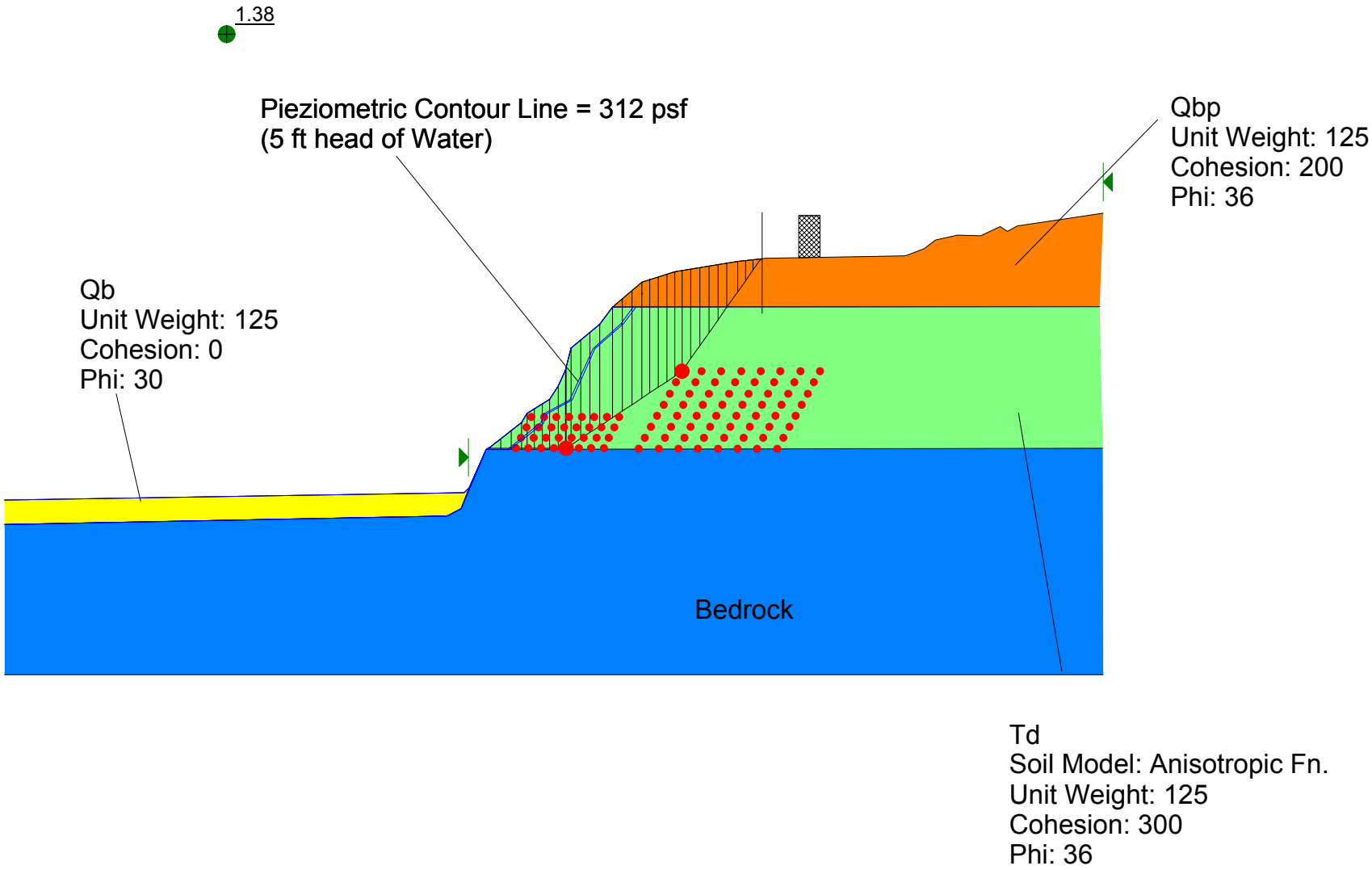
Factor of Safety: 1.39



Del Mar Bluffs Cross Section 17-17'
Slope Stability Analysis
File Name: Section 1717 5 ft water Static 4B.slz
Analysis Method: Spencer

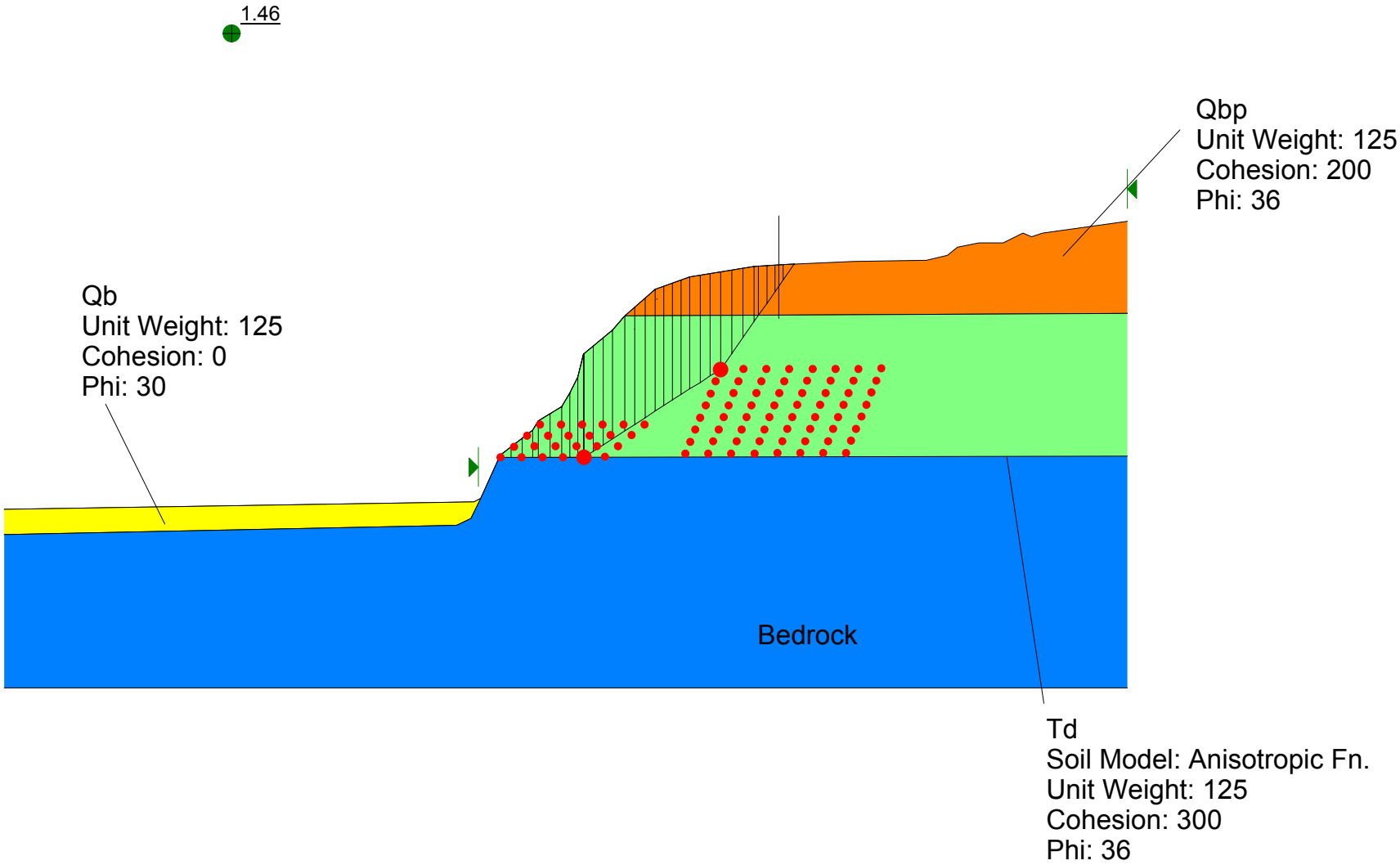
Factor of Safety: 1.38

Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 17-17'
Slope Stability Analysis, No Water
File Name: Section 1717 Static 3B no water.slz
Analysis Method: Spencer

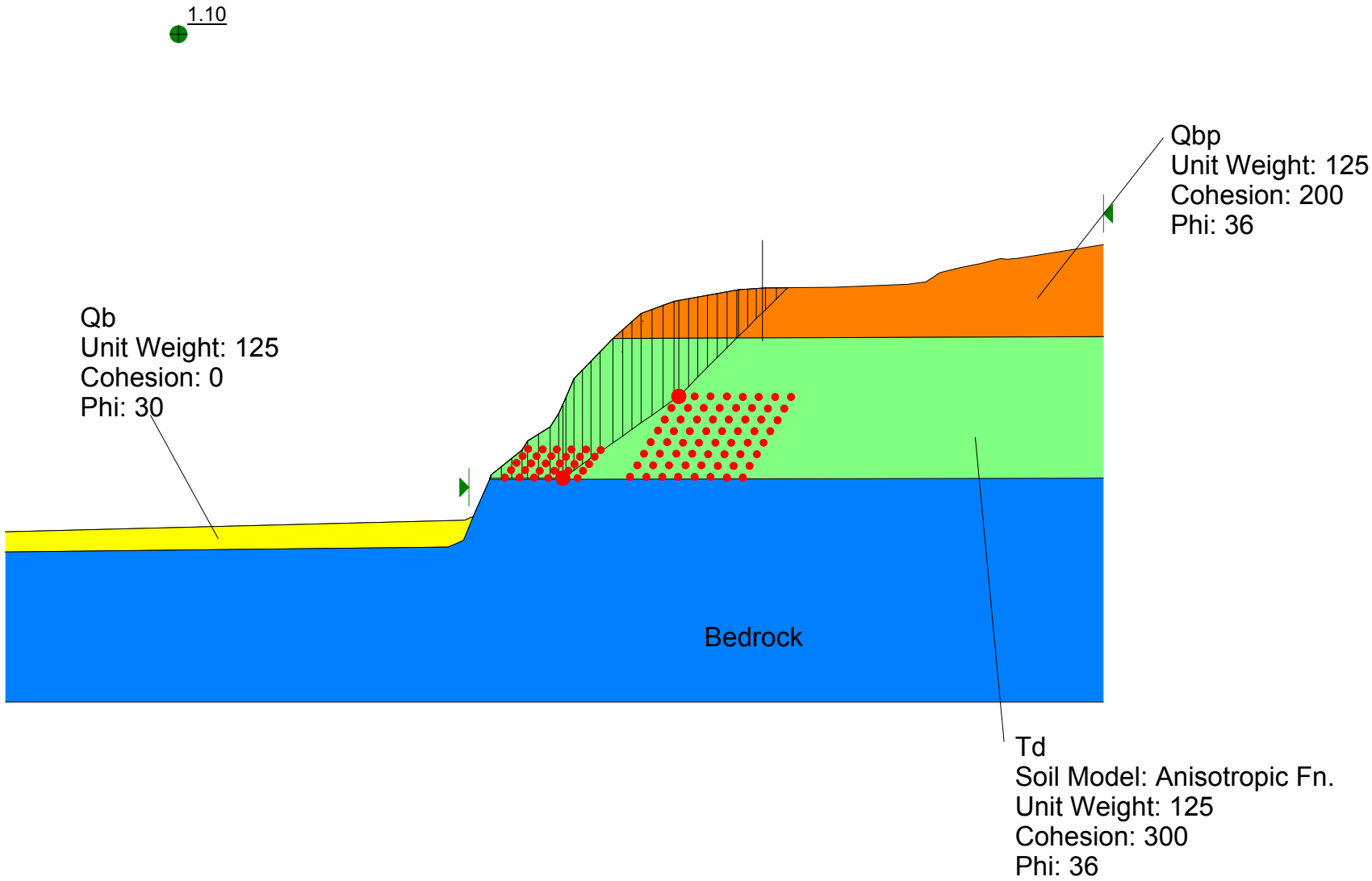
Factor of Safety: 1.46



Del Mar Bluffs Cross Section 17-17'
Slope Stability Analysis
File Name: Section 1717 Psuedo Static 2B.slz
Analysis Method: Spencer

Factor of Safety: 1.1

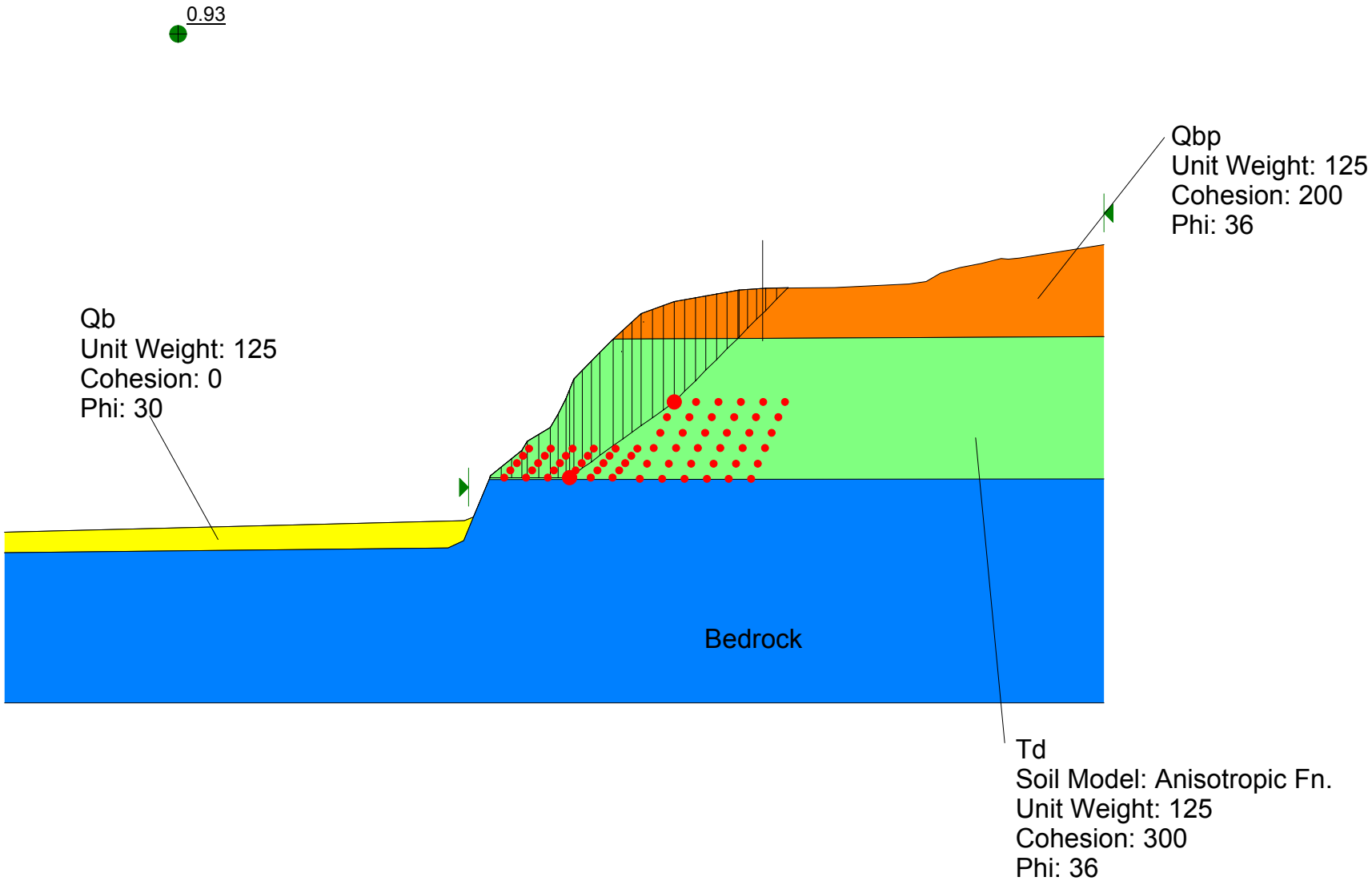
Seismic Coefficient - 0.15



Del Mar Bluffs Cross Section 17-17'
Slope Stability Analysis
File Name: Section 1717 Psuedo Static 4B.slz
Analysis Method: Spencer

Factor of Safety: 0.93

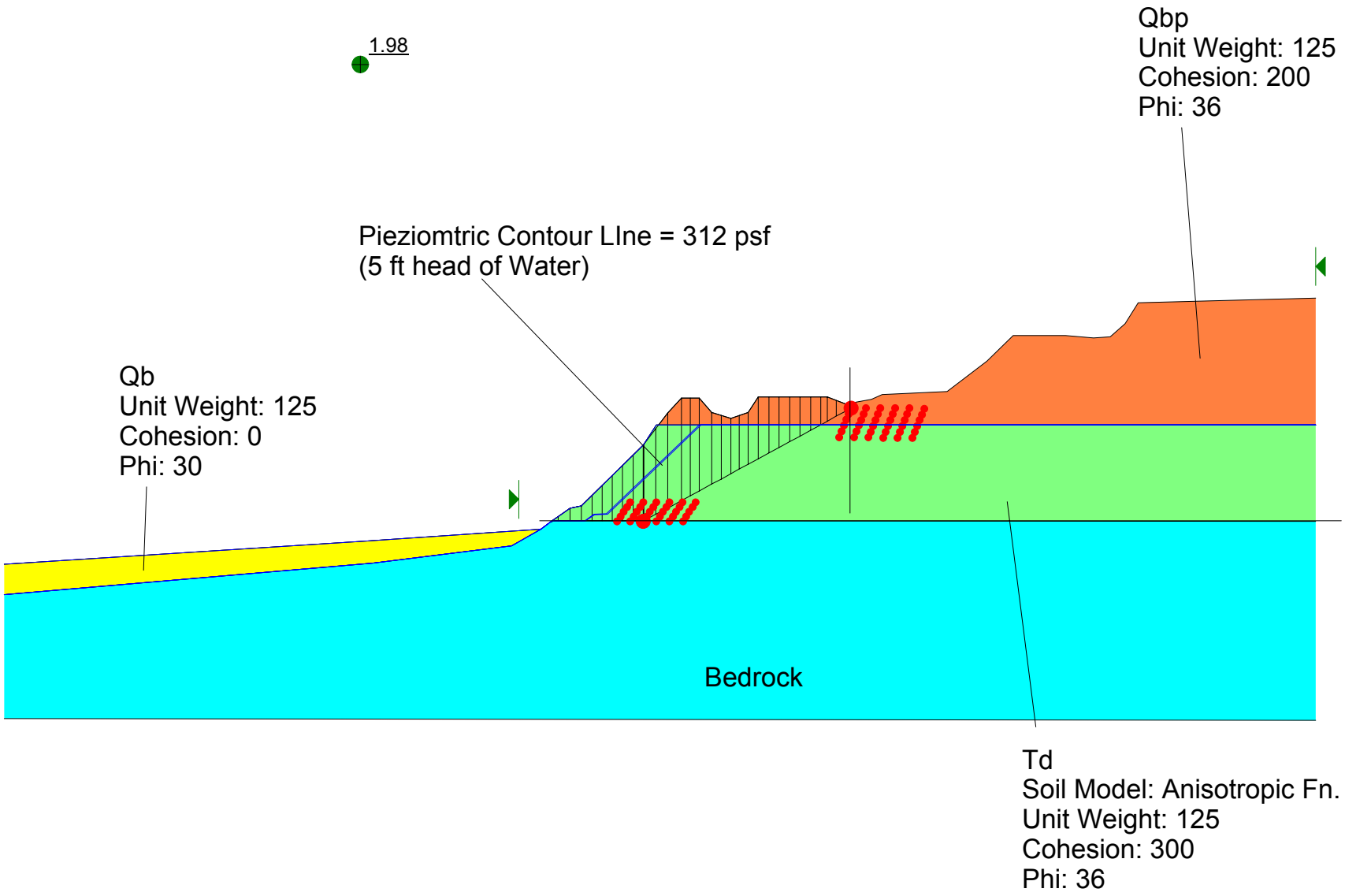
Seismic Coefficient - 0.28



Cross Section 18-18’

Del Mar Bluffs Cross Section 18-18'
Slope Stability Analysis
File Name: Section 1818 with 5 ft Water Static 2.slz
Analysis Method: Spencer

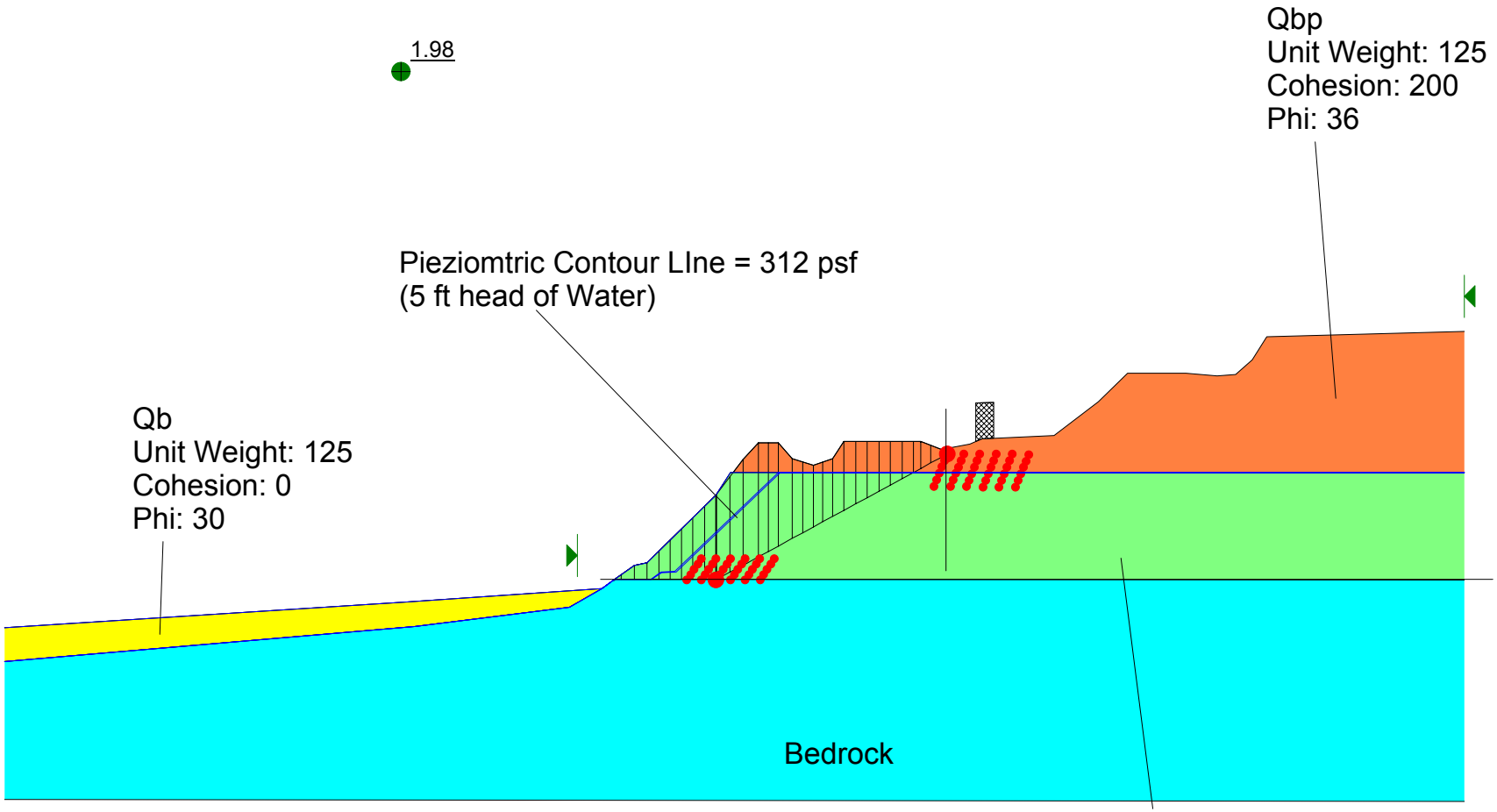
Factor of Safety: 1.98



Del Mar Bluffs Cross Section 18-18'
Slope Stability Analysis
File Name: Section 1818 with 5 ft Water Static 2C.slz
Analysis Method: Spencer

Factor of Safety: 1.98

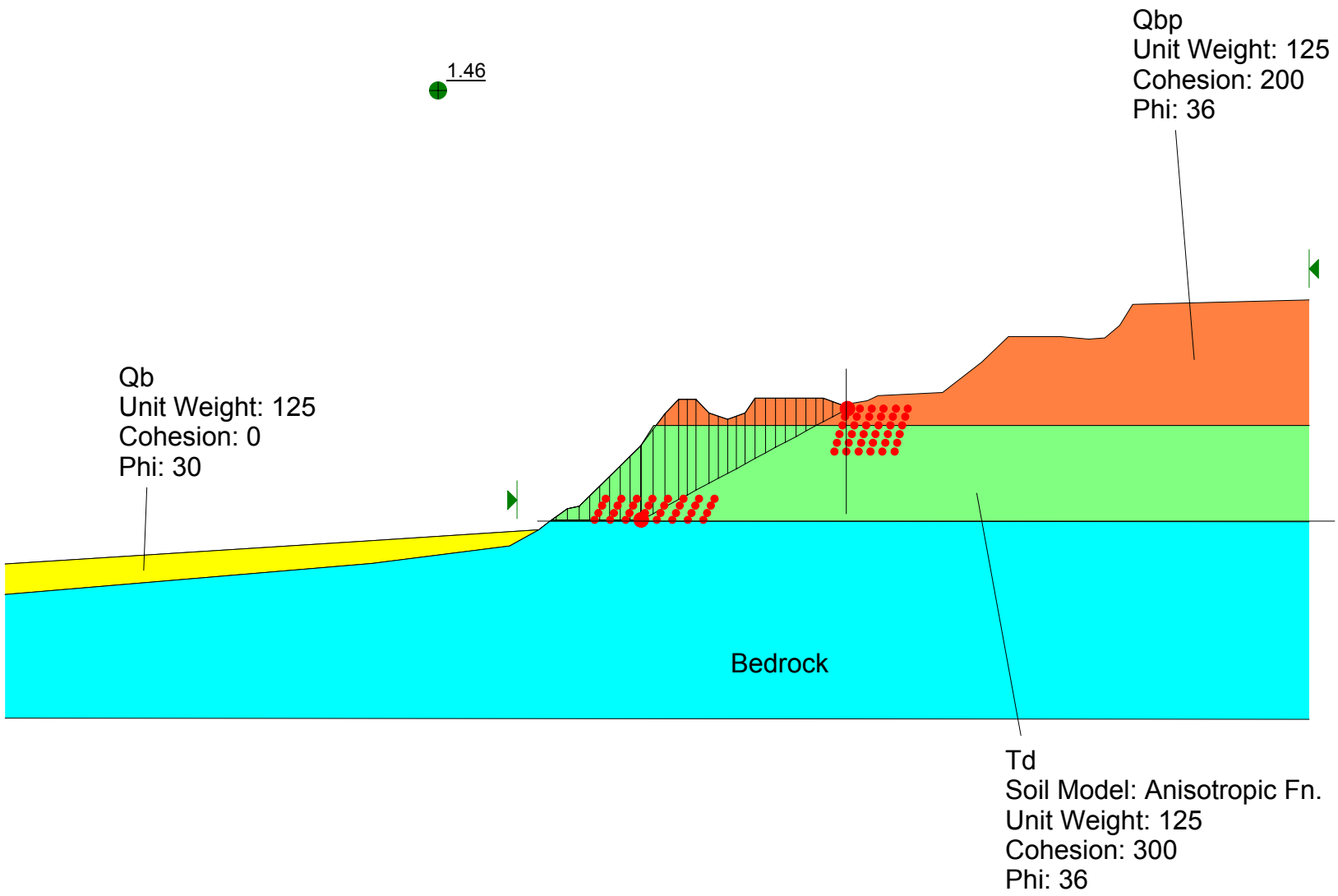
Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 18-18'
Slope Stability Analysis
File Name: Section1818 Psuedo Static 2.slz
Analysis Method: Spencer

Factor of Safety: 1.46

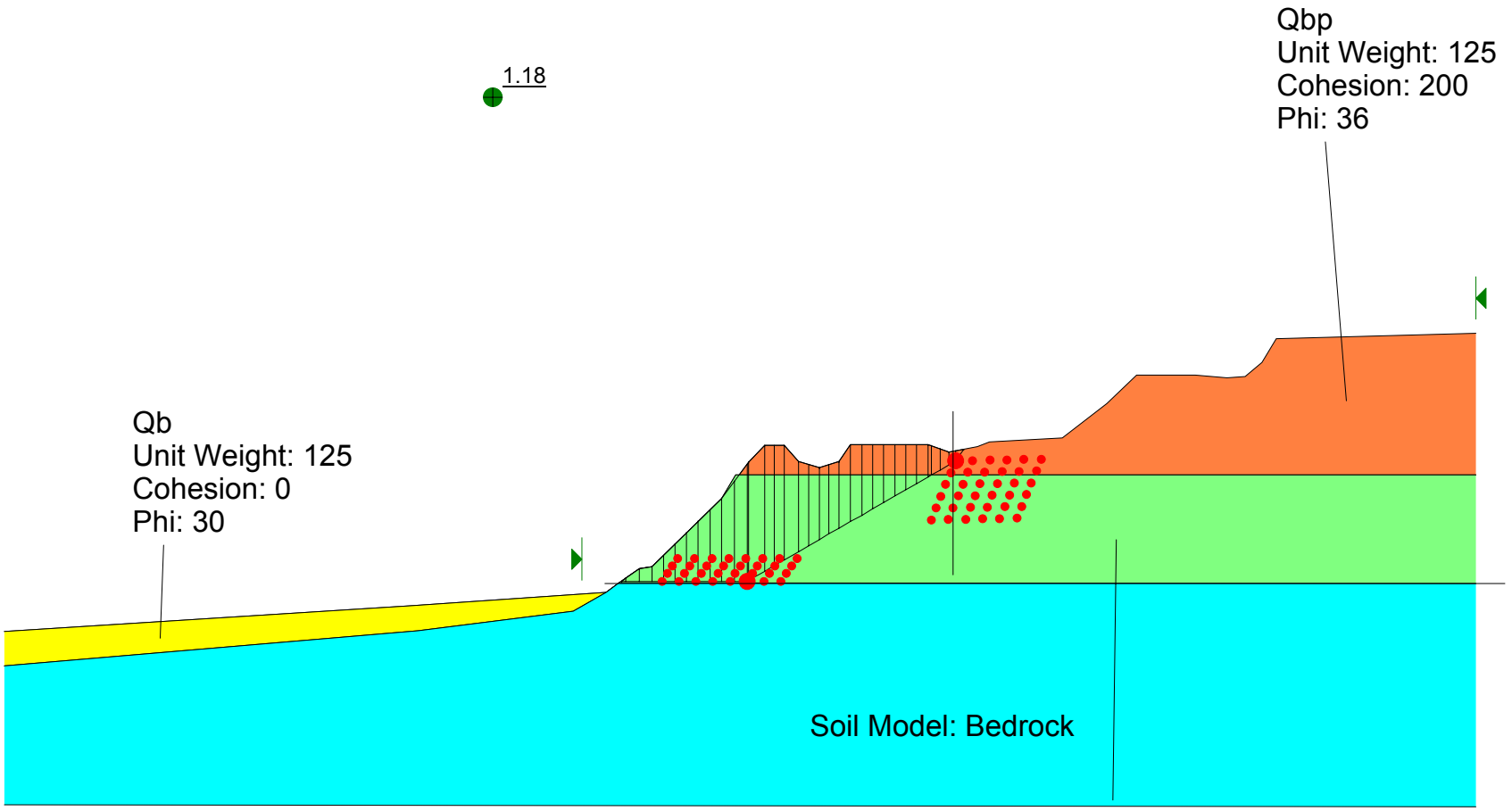
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 18-18'
Slope Stability Analysis
File Name: Section 1818 Psuedo Static 4.slz
Analysis Method: Spencer

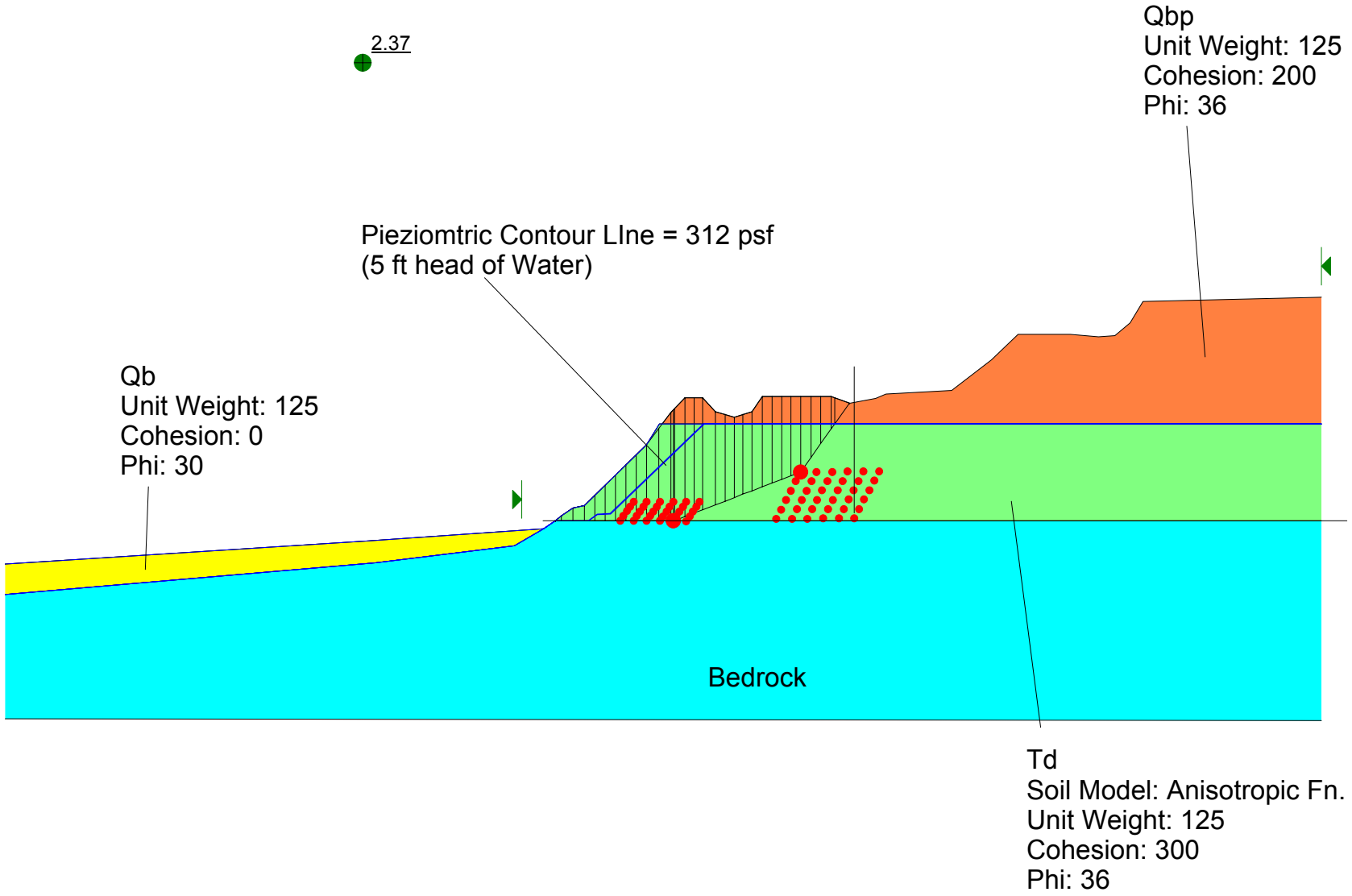
Factor of Safety: 1.18

Seismic Coefficient = 0.28



Del Mar Bluffs Cross Section 18-18'
Slope Stability Analysis
File Name: Section 1818 with 5 ft Water Static 2B.slz
Analysis Method: Spencer

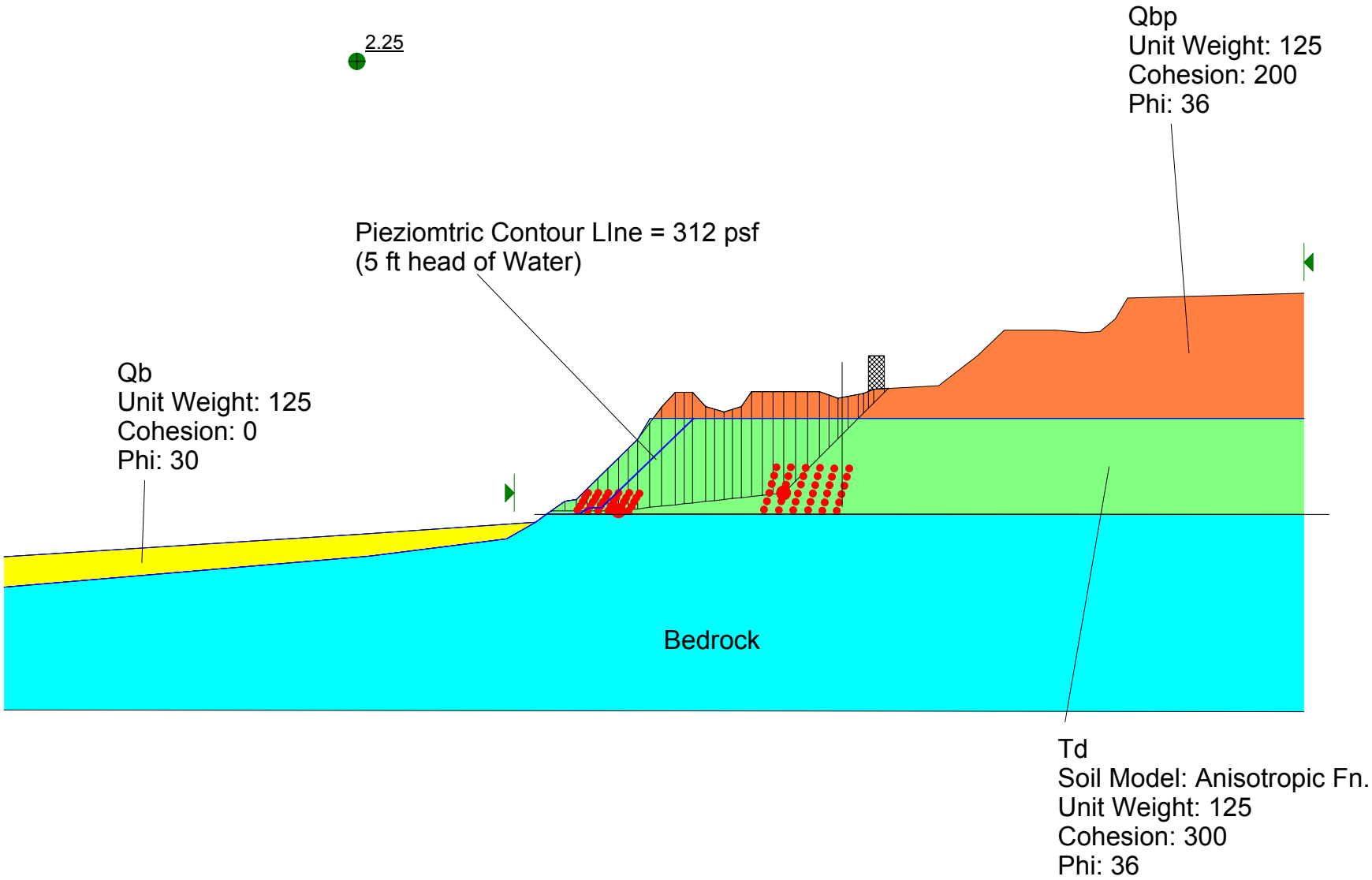
Factor of Safety: 2.37



Del Mar Bluffs Cross Section 18-18'
Slope Stability Analysis
File Name: Section 1818 with 5 ft Water Static 4B.slz
Analysis Method: Spencer

Factor of Safety: 2.25

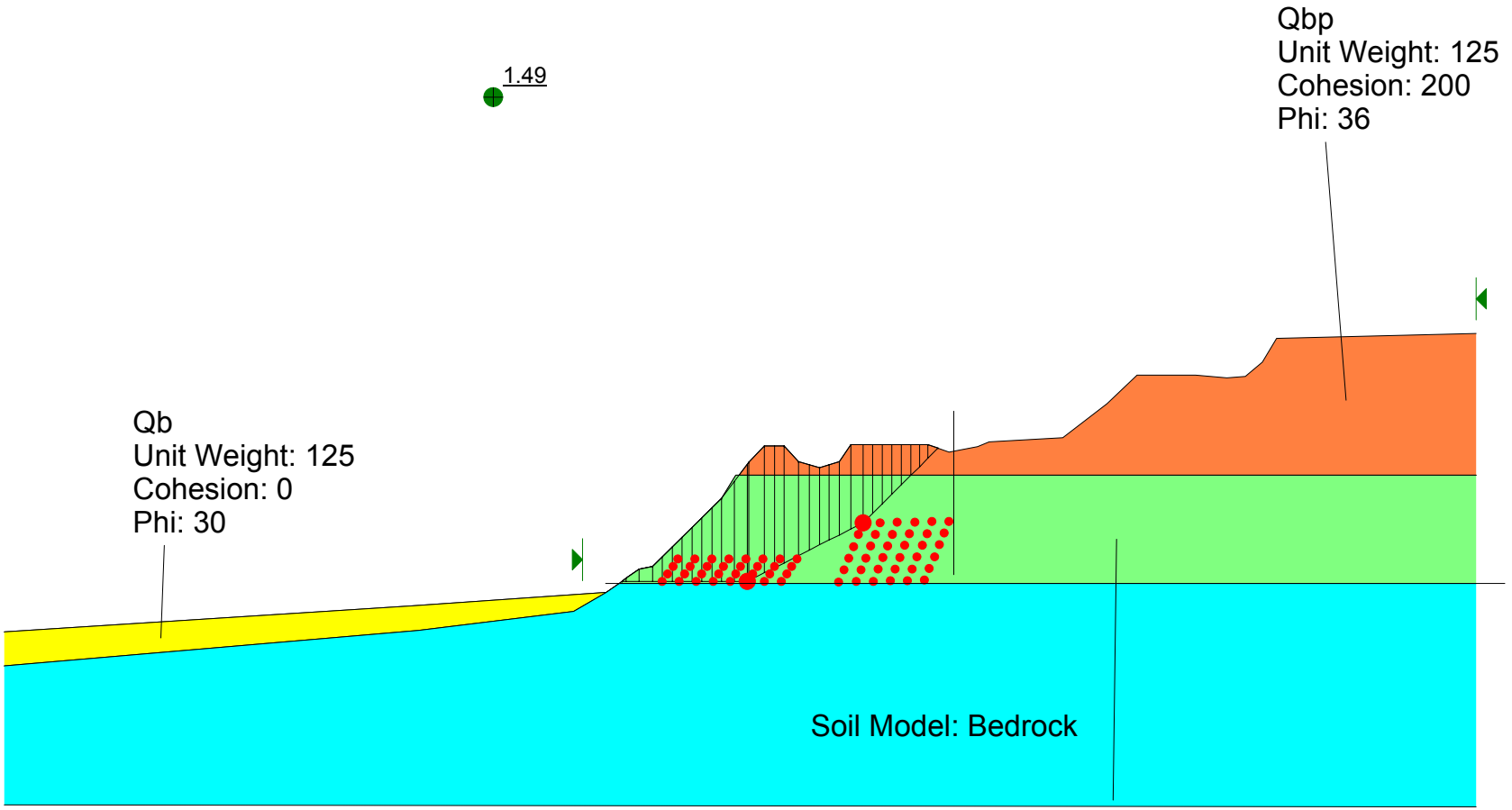
Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 18-18'
Slope Stability Analysis
File Name: Section 1818 Psuedo Static 2B.slz
Analysis Method: Spencer

Factor of Safety: 1.49

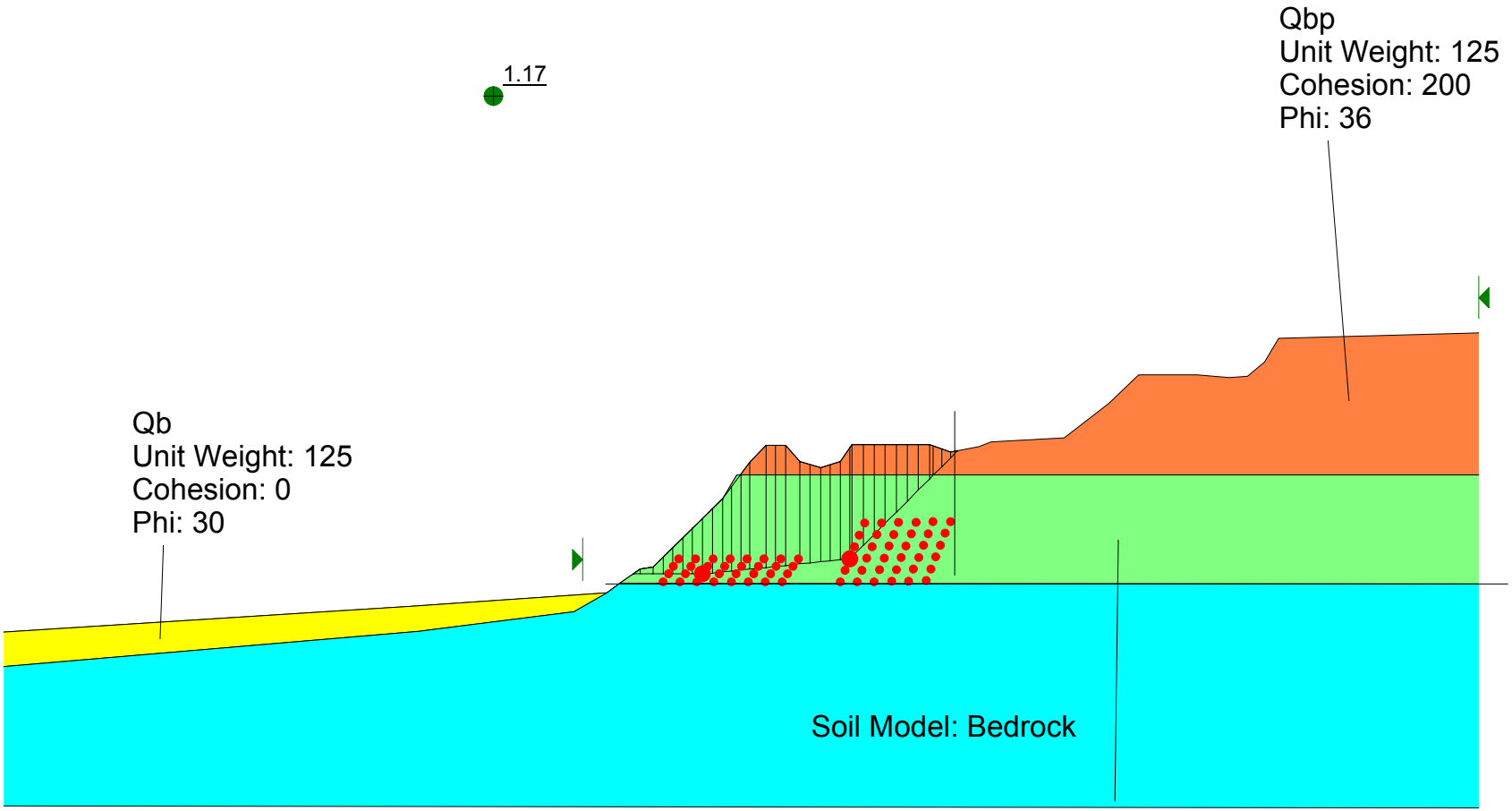
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 18-18'
Slope Stability Analysis
File Name: Section 1818 Psuedo Static 4B.slz
Analysis Method: Spencer

Factor of Safety: 1.17

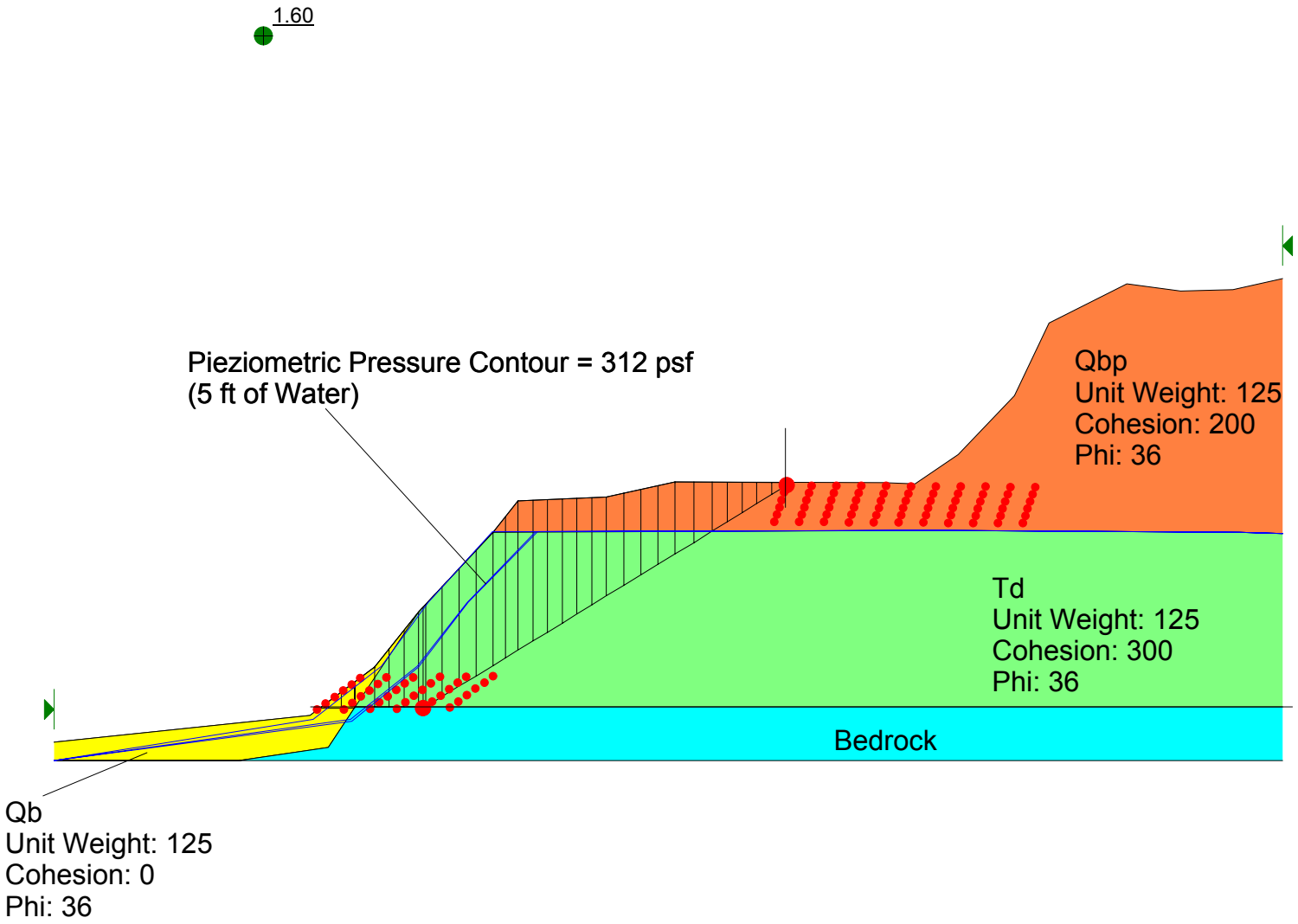
Seismic Coefficient = 0.28



Cross Section 19-19’

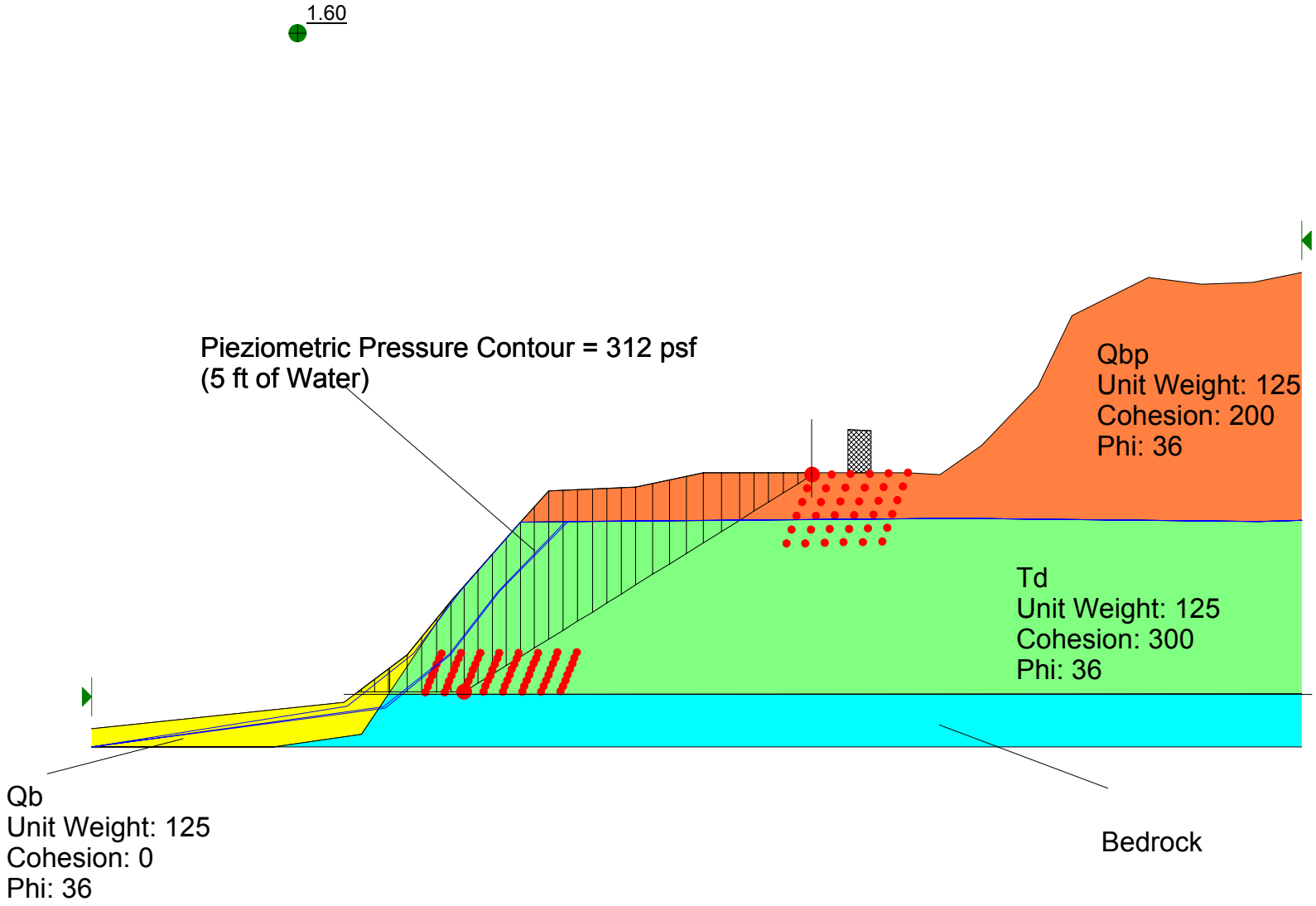
Del Mar Bluffs Cross Section 19-19'
Static Slope Analysis
File Name: Section 1919 Static With Water 3.slz
Analysis Method: Spencer

Factor of Safety: 1.6



Del Mar Bluffs Cross Section 19-19'
Static Slope Analysis
File Name: Section 1919 Static With Water 4.slz
Analysis Method: Spencer

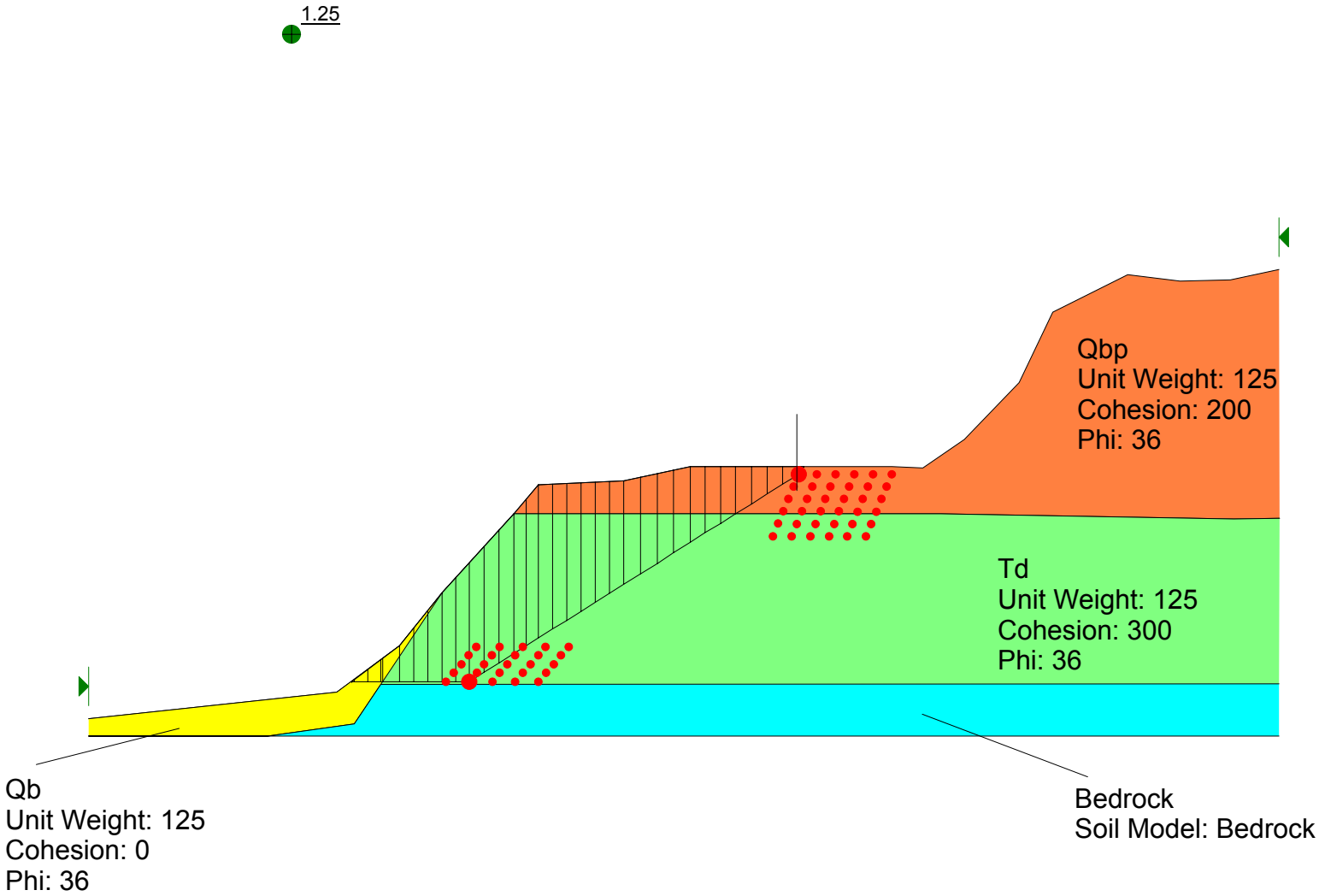
Factor of Safety: 1.6
Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 19-19'
Static Slope Analysis
File NameSection 1919 Psuedo Static 3.slz
Analysis MethodSpencer

Factor of Safety: 1.25

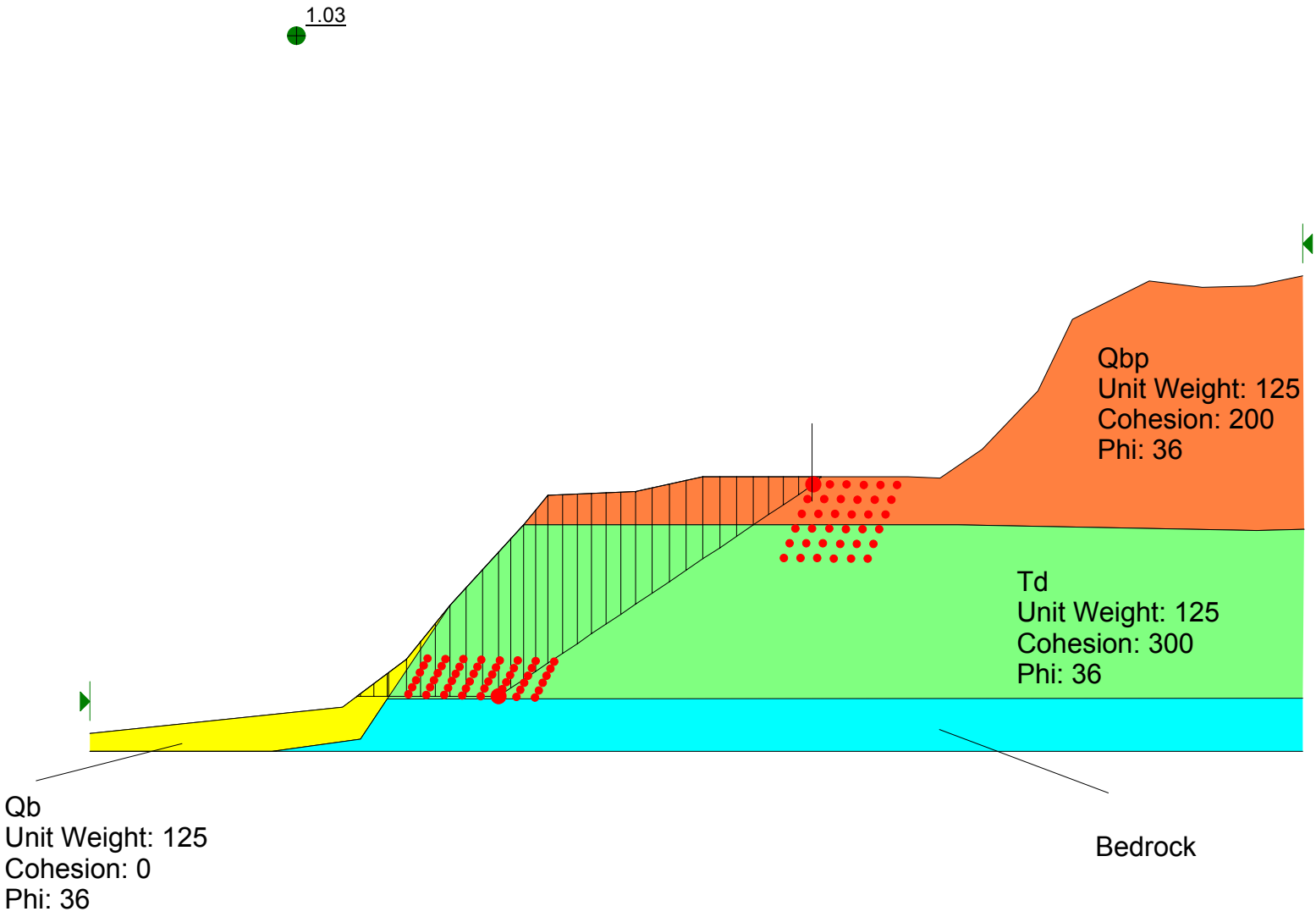
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 19-19'
Static Slope Analysis
File NameSection 1919 Psuedo Static 4.slz
Analysis MethodSpencer

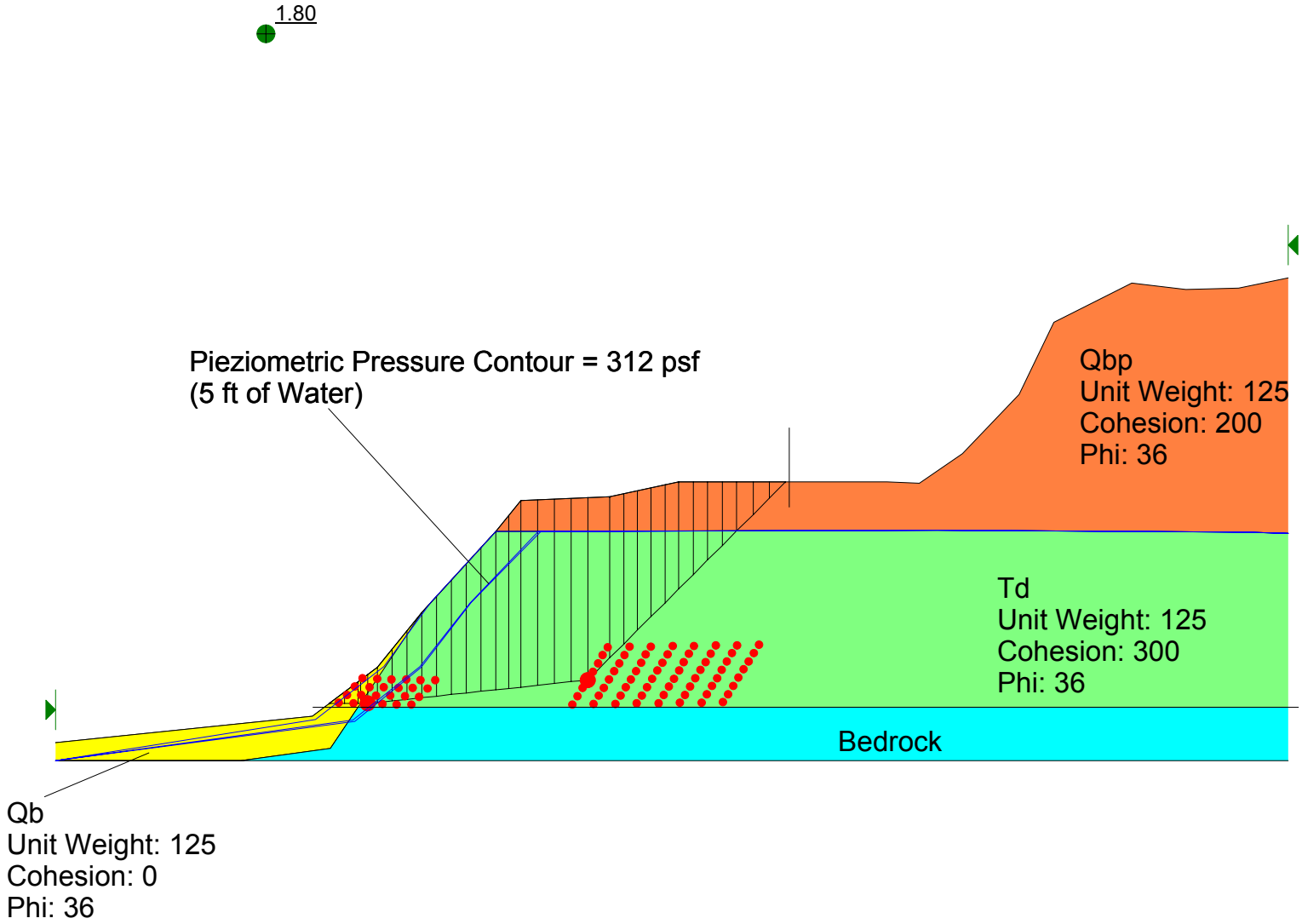
Factor of Safety: 1.03

Seismic Coefficient = 0.28



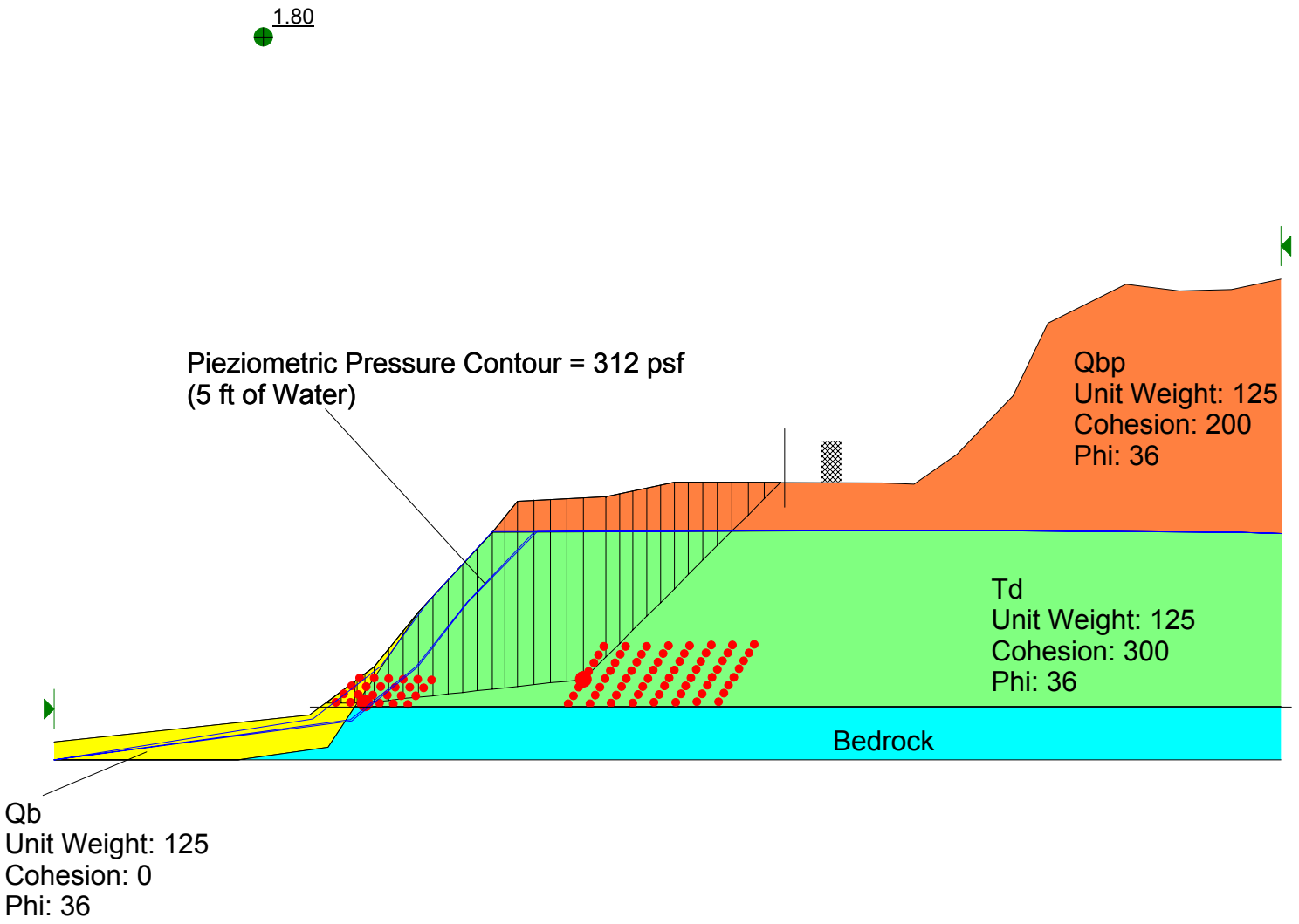
Del Mar Bluffs Cross Section 19-19'
Static Slope Analysis
File Name: Section 1919 Static With Water 3B.slz
Analysis Method: Spencer

Factor of Safety: 1.8



Del Mar Bluffs Cross Section 19-19'
Static Slope Analysis
File Name: Section 1919 Static With Water 4B.slz
Analysis Method: Spencer

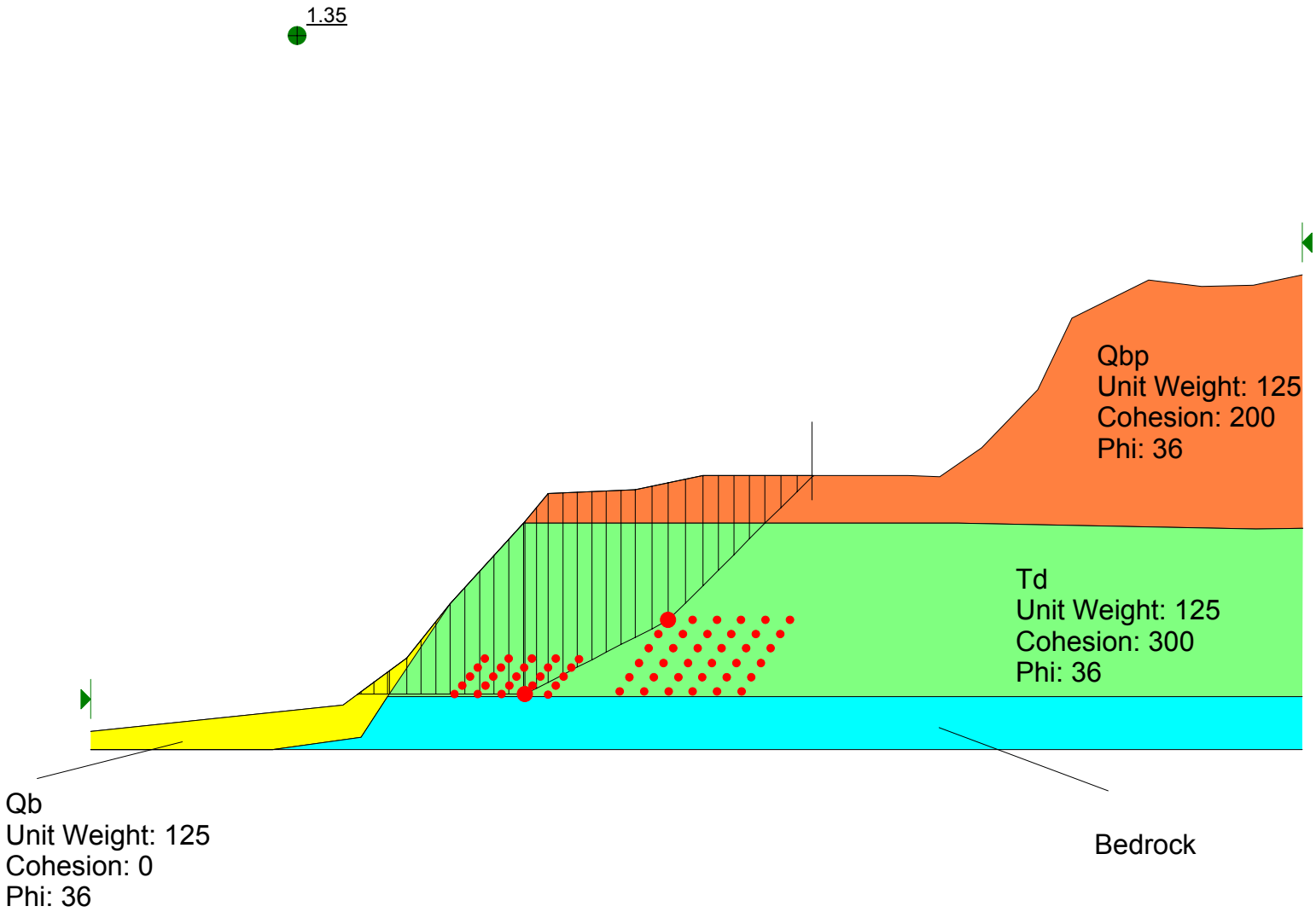
Factor of Safety: 1.8



Del Mar Bluffs Cross Section 19-19'
Static Slope Analysis
File NameSection 1919 Psuedo Static 3B.slz
Analysis MethodSpencer

Factor of Safety: 1.35

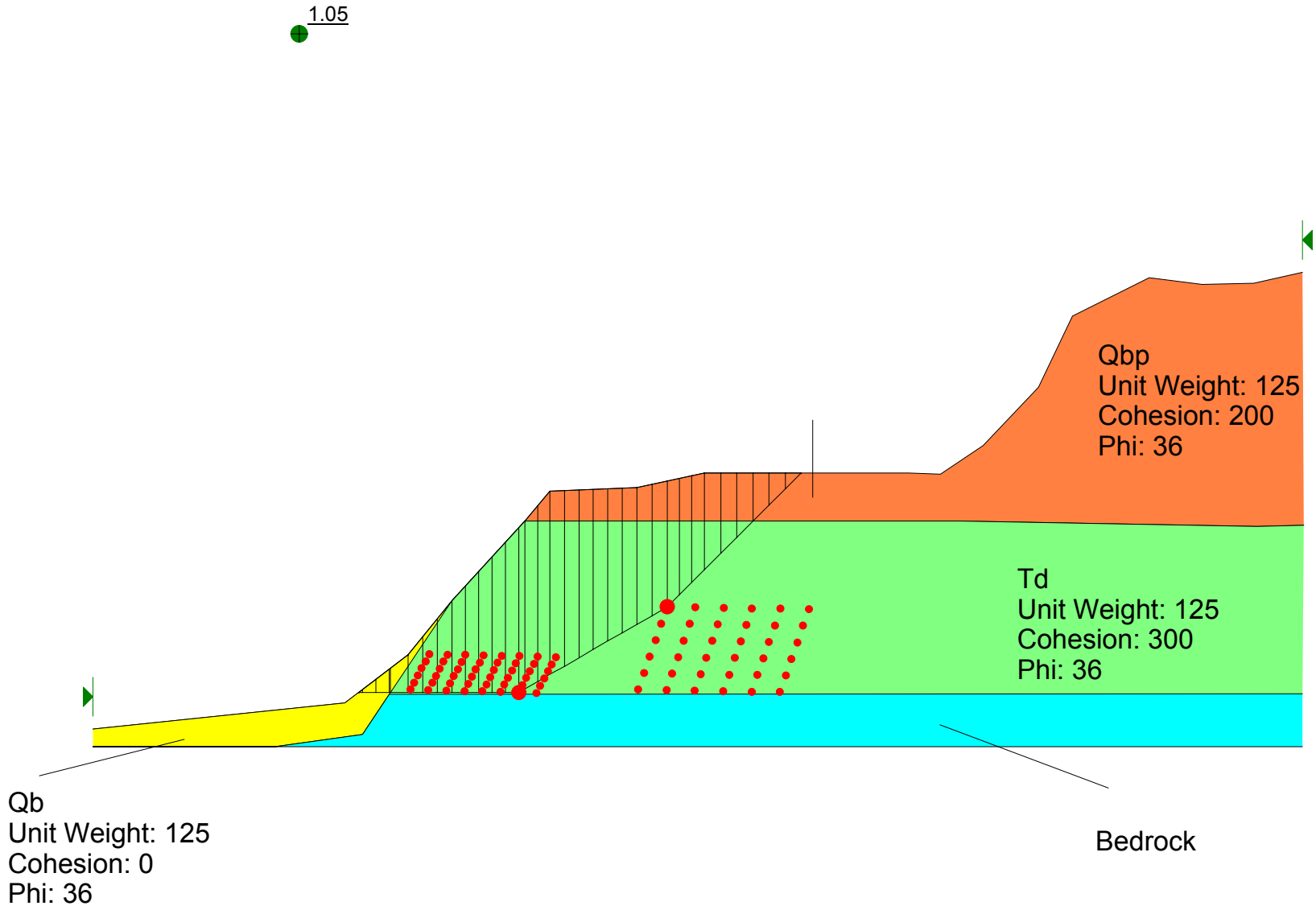
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 19-19'
Static Slope Analysis
File NameSection 1919 Psuedo Static 4B.slz
Analysis MethodSpencer

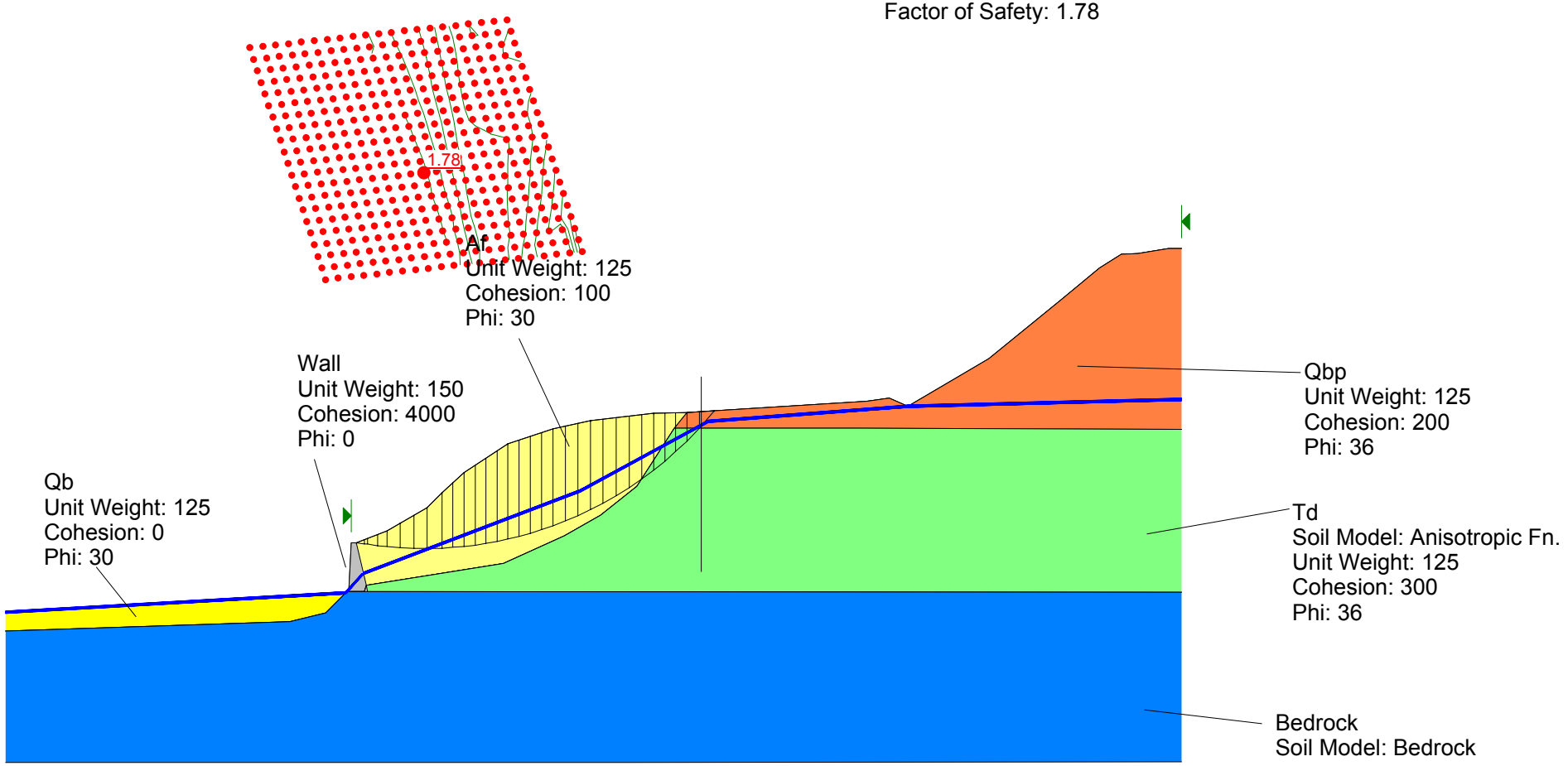
Factor of Safety: 1.05

Seismic Coefficient = 0.28

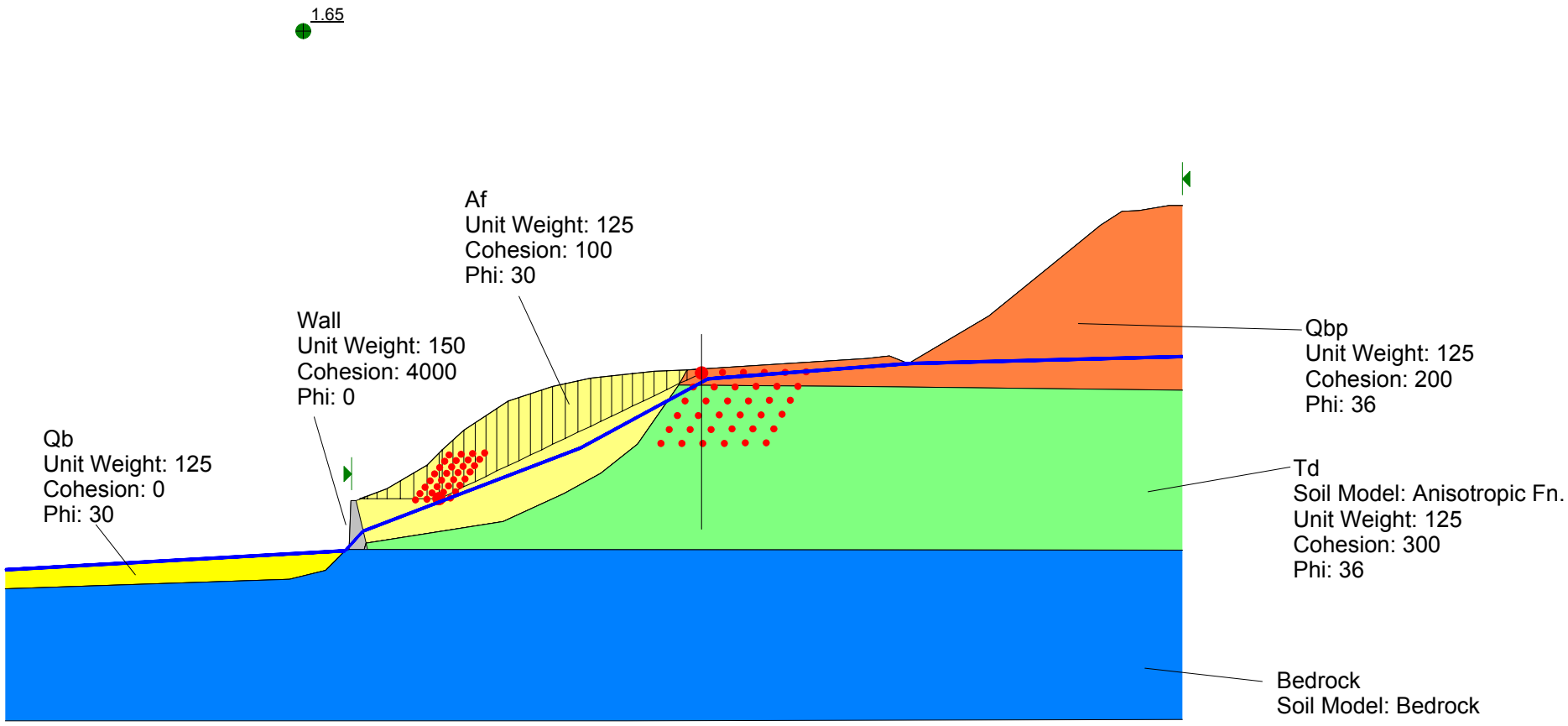


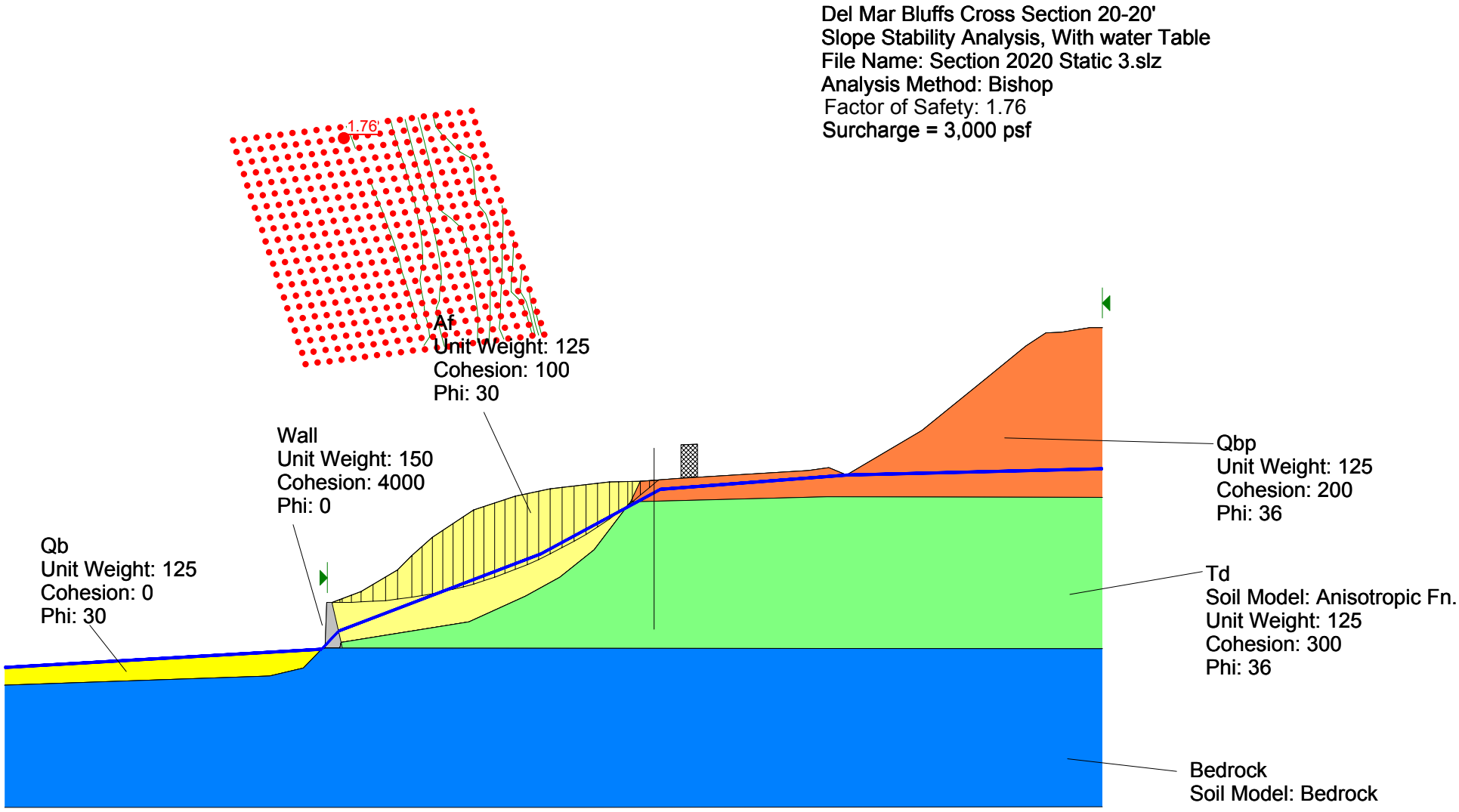
Cross Section 20-20’

Del Mar Bluffs Cross Section 20-20'
Slope Stability Analysis, With Water Table
File Name: Section 2020 Static 1.slz
Analysis Method: Bishop
Factor of Safety: 1.78



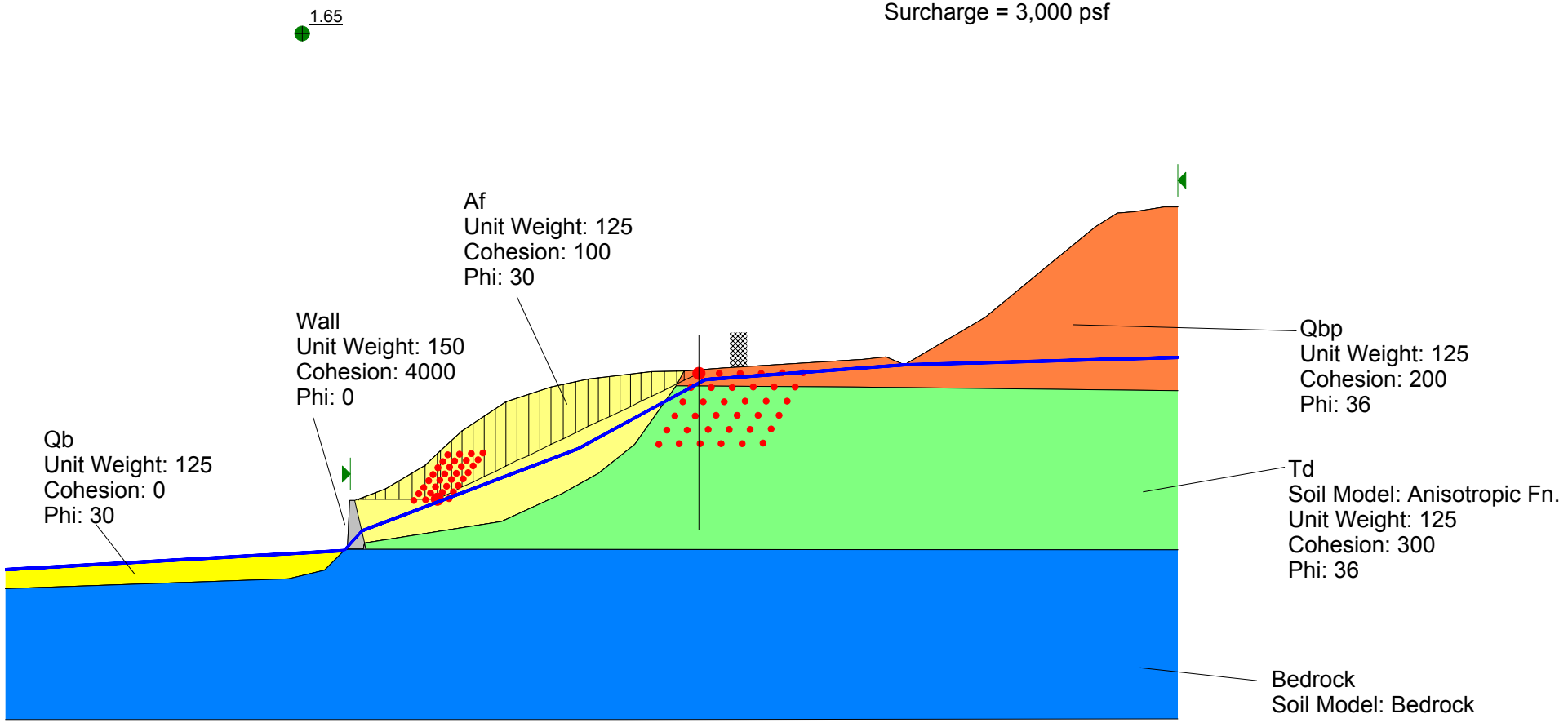
Del Mar Bluffs Cross Section 20-20'
Slope Stability Analysis, With Water Table
File Name: Section 2020 Static 2.slz
Analysis Method: Spencer
Factor of Safety: 1.65

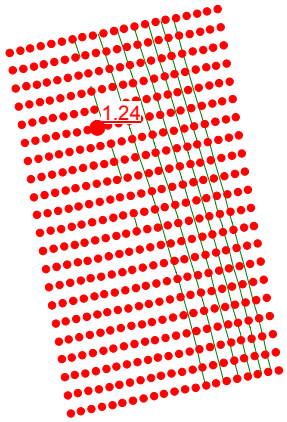



Del Mar Bluffs Cross Section 20-20'
Slope Stability Analysis, With water Table
File Name: Section 2020 Static 3.slz
Analysis Method: Bishop
Factor of Safety: 1.76
Surcharge = 3,000 psf
1.76
Af
Unit Weight: 125
Cohesion: 100
Phi: 30
Wall
Unit Weight: 150
Cohesion: 4000
Phi: 0
Qb
Unit Weight: 125
Cohesion: 0
Phi: 30
Qbp
Unit Weight: 125
Cohesion: 200
Phi: 36
Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36
Bedrock
Soil Model: Bedrock

Del Mar Bluffs Cross Section 20-20'
Slope Stability Analysis, With Water Table
File Name: Section 2020 Static 2B.slz
Analysis Method: Spencer
Factor of Safety: 1.65

Surcharge = 3,000 psf

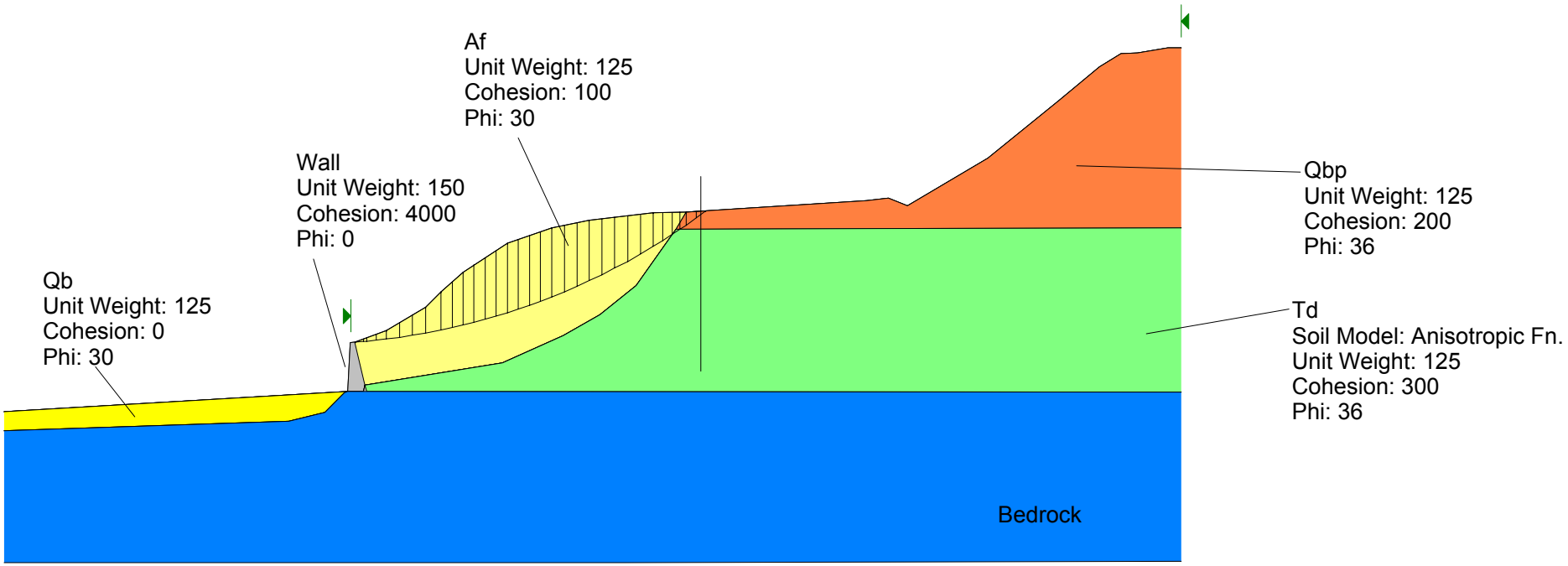




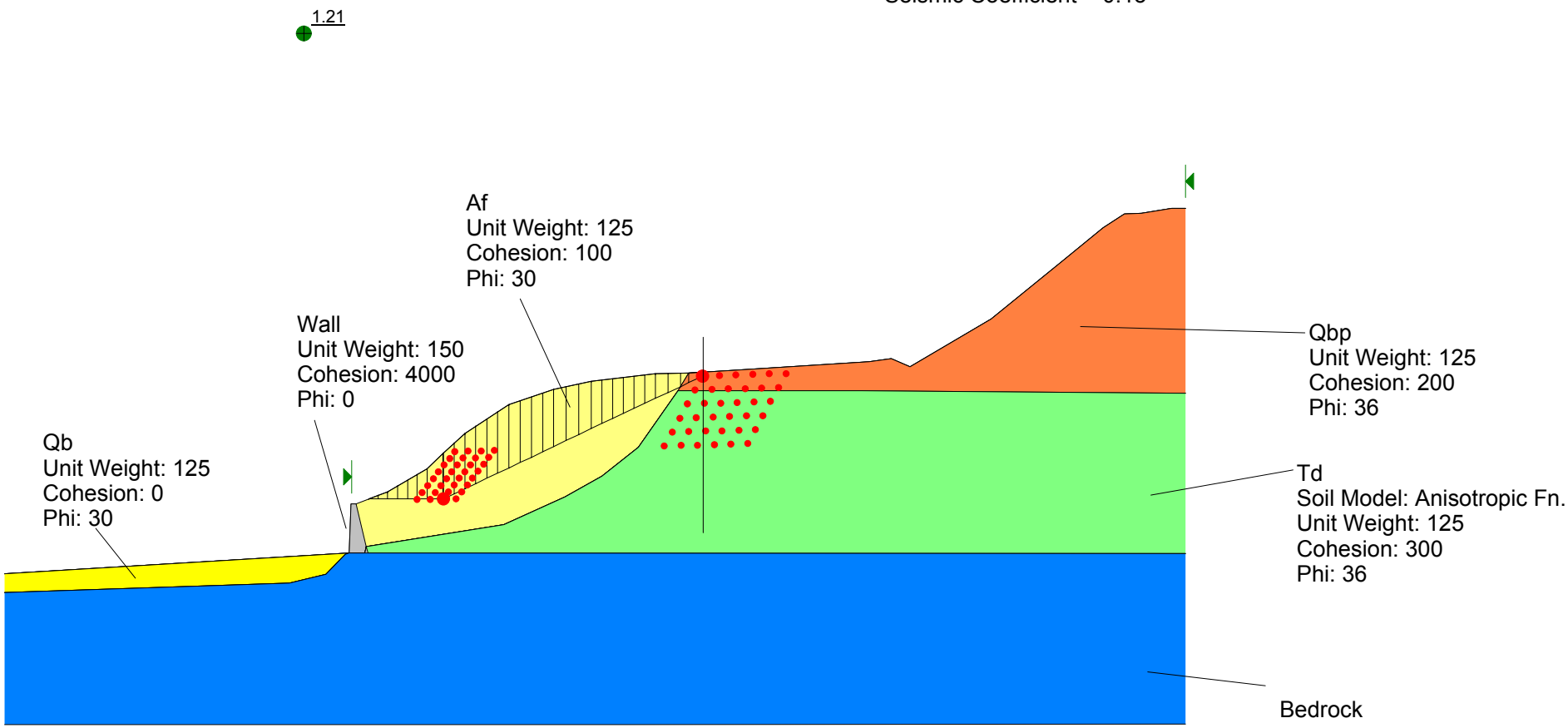
Del Mar Bluffs Cross Section 20-20'
Slope Stability Analysis
File Name: Section 2020 Psuedo Static 1.slz
Analysis Method: Bishop

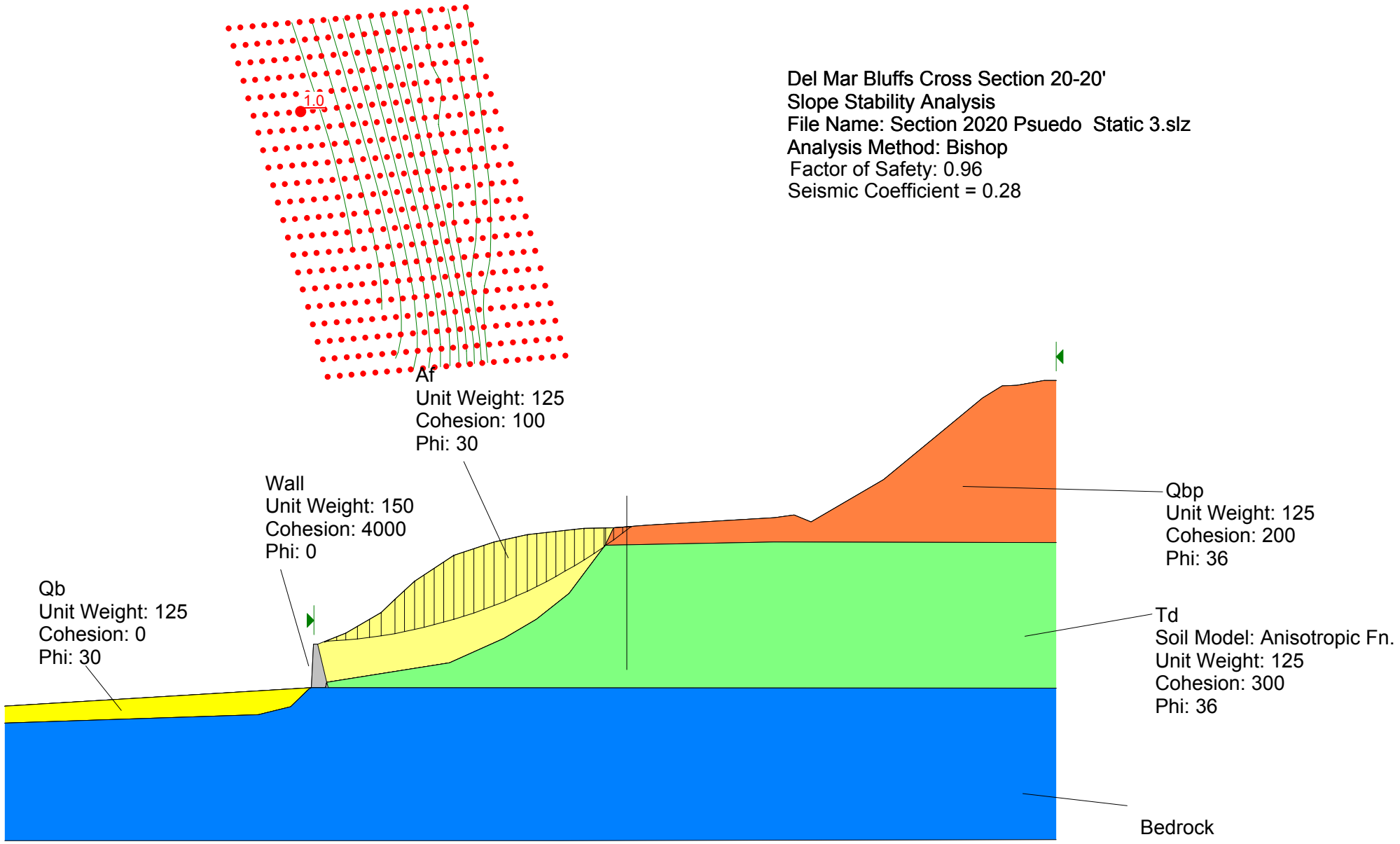
Factor of Safety: 1.24

Seismic Coefficient = 0.15

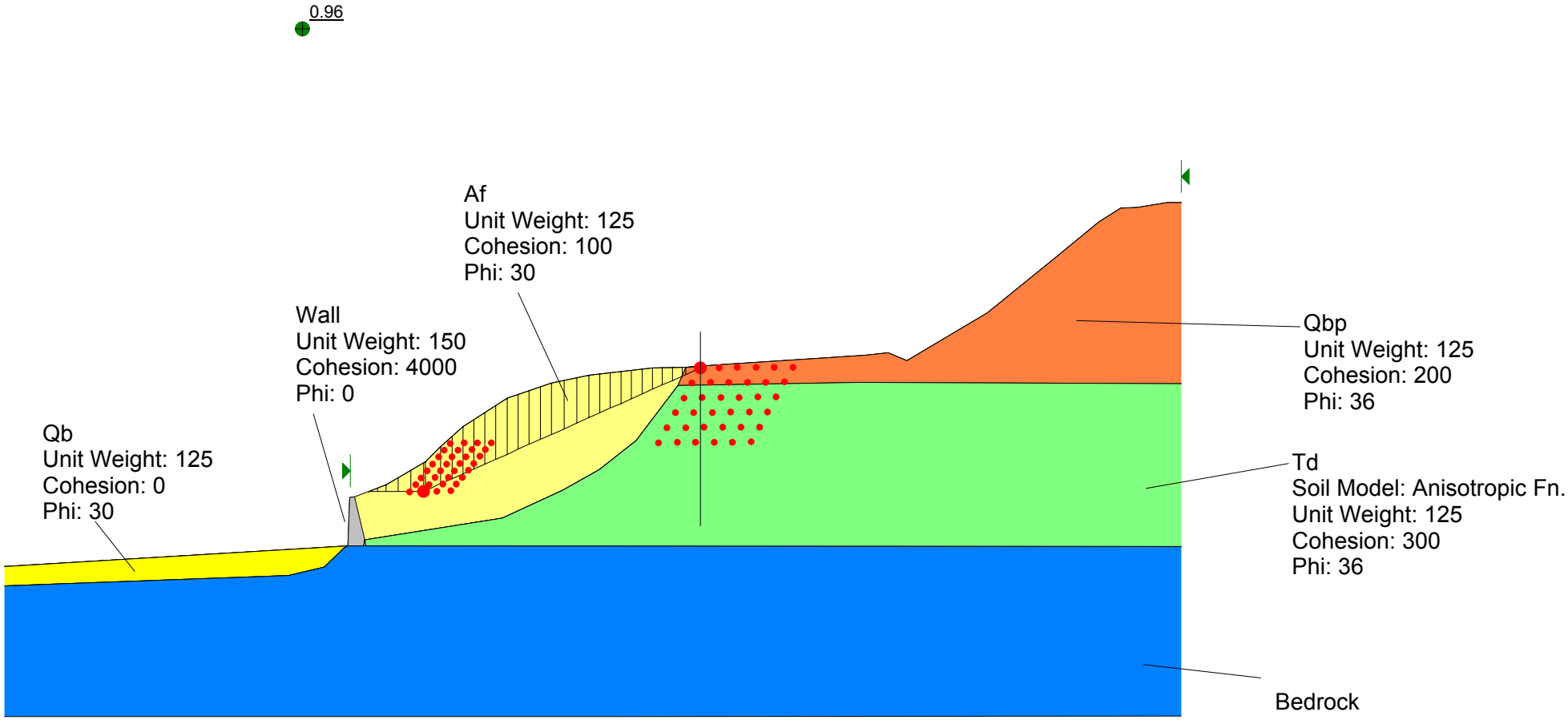


Del Mar Bluffs Cross Section 20-20'
Slope Stability Analysis
File Name: Section 2020 Psuedo Static 2.slz
Analysis Method: Spencer
Factor of Safety: 1.21
Seismic Coefficient = 0.15



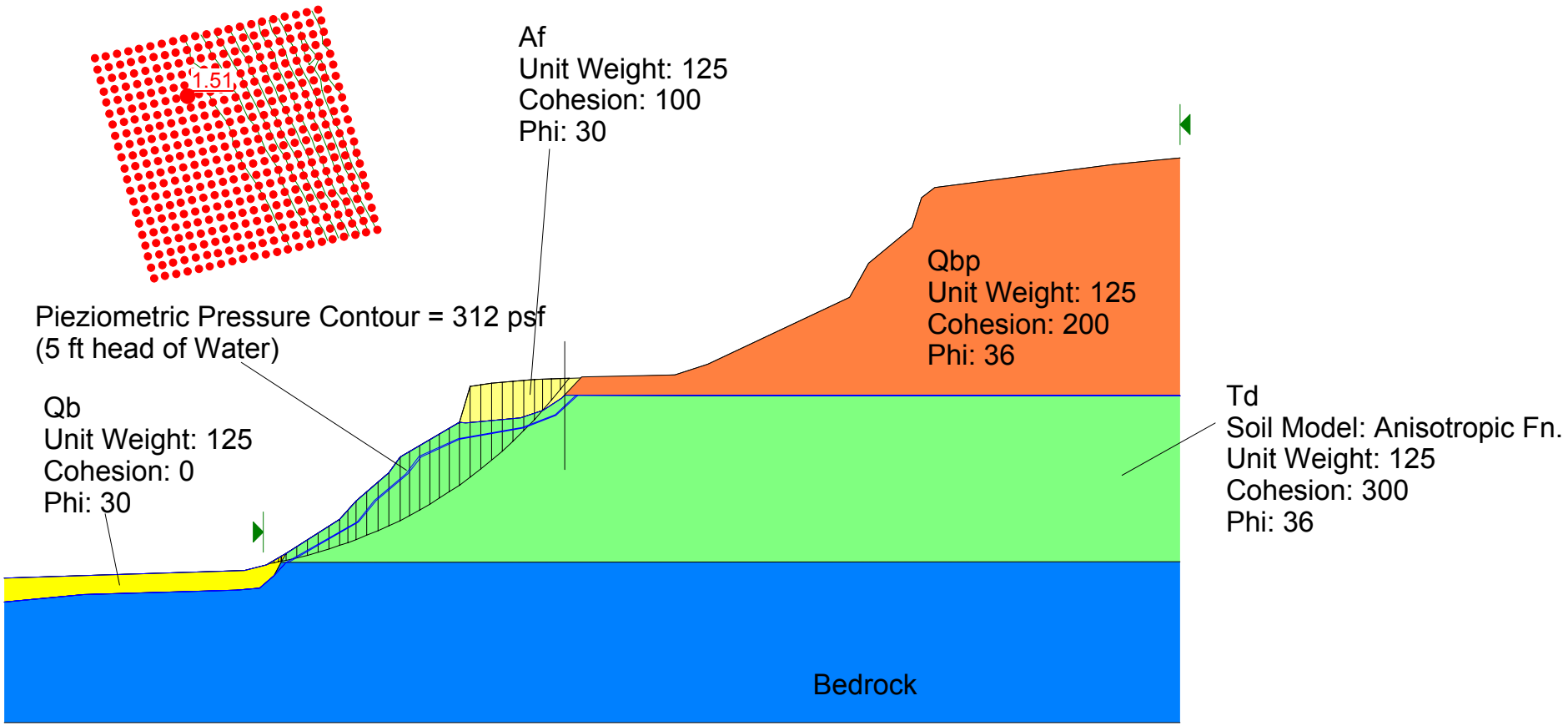

1.0
Del Mar Bluffs Cross Section 20-20'
Slope Stability Analysis
File Name: Section 2020 Psuedo Static 3.slz
Analysis Method: Bishop
Factor of Safety: 0.96
Seismic Coefficient = 0.28
Af
Unit Weight: 125
Cohesion: 100
Phi: 30
Wall
Unit Weight: 150
Cohesion: 4000
Phi: 0
Qb
Unit Weight: 125
Cohesion: 0
Phi: 30
Qbp
Unit Weight: 125
Cohesion: 200
Phi: 36
Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36
Bedrock

Del Mar Bluffs Cross Section 20-20'
Slope Stability Analysis
File Name: Section 2020 Psuedo Static 4.slz
Analysis Method: Spencer
Factor of Safety: 0.955
Seismic Coefficient = 0.28

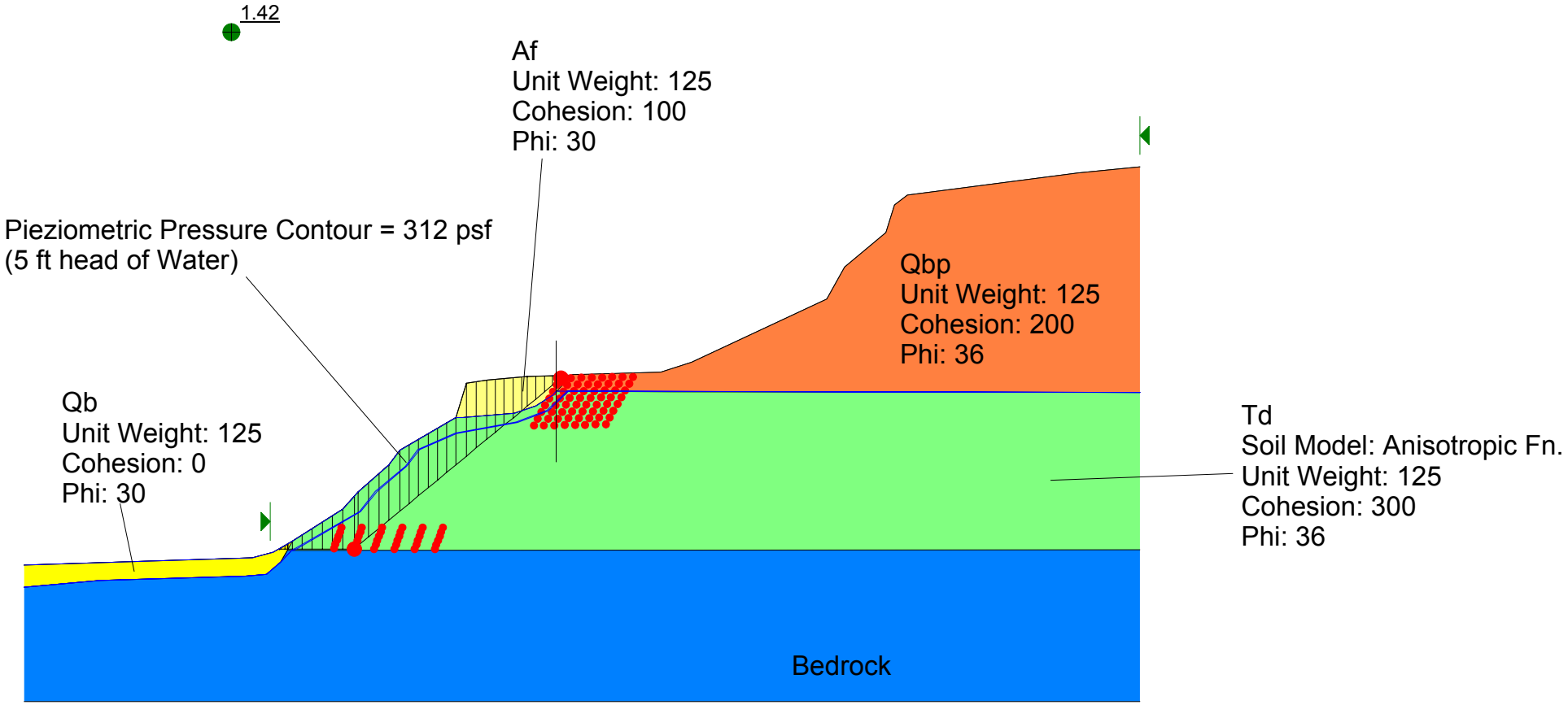


Cross Section 21-21’

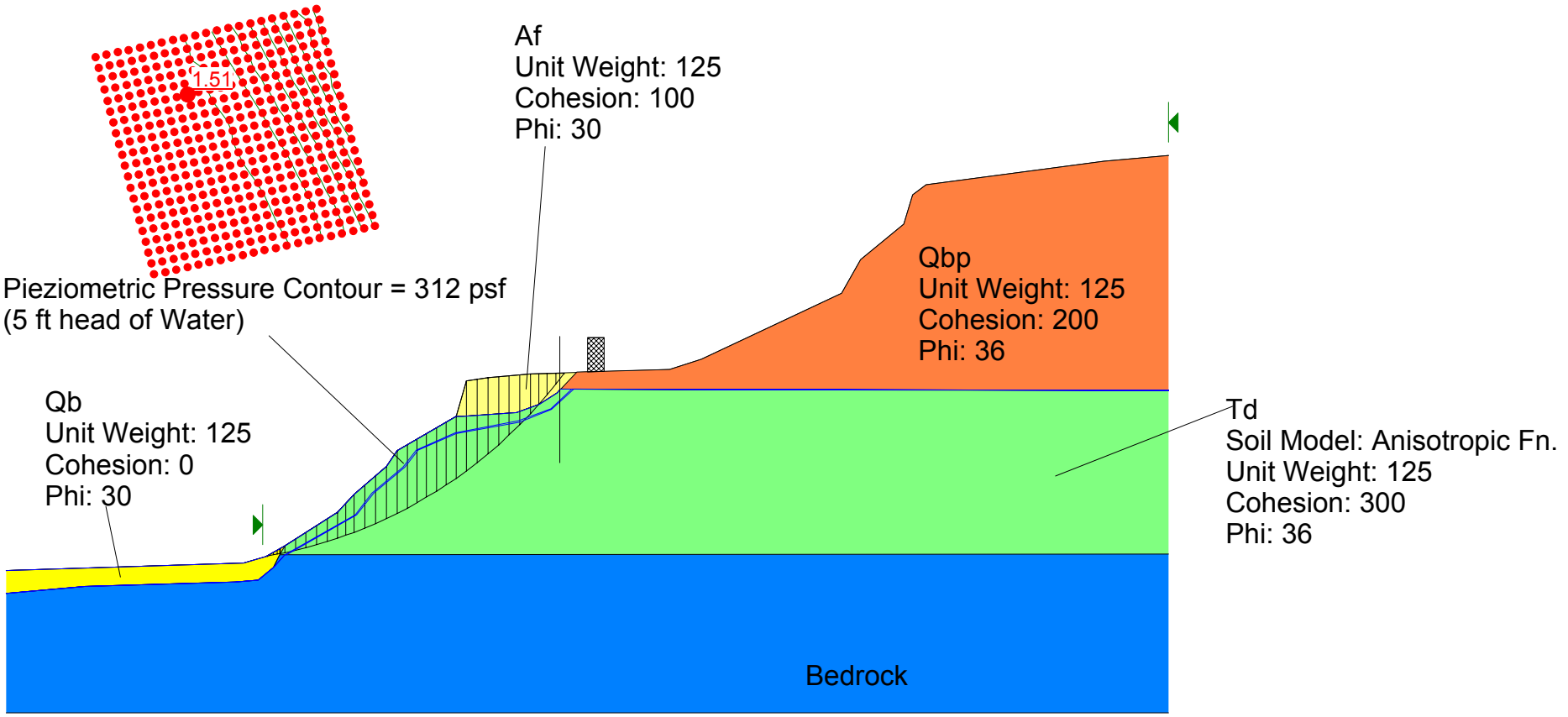
Del Mar Bluffs Cross Section 21-21'
C: Slope Stability Analysis
File Name: Section 2121 5 ft Water Static 1.slz
Analysis Method: Bishop
Factor of Safety: 1.51



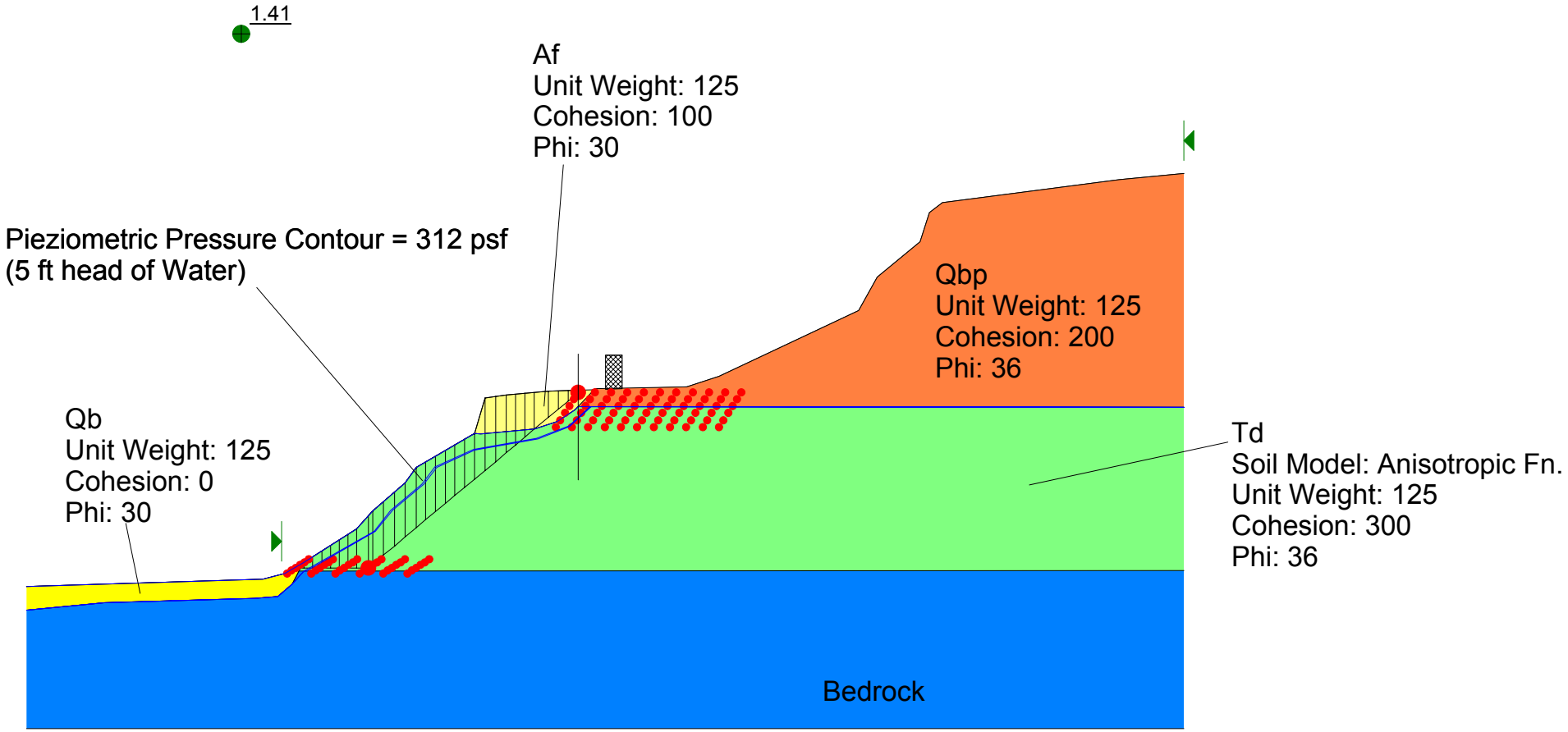
Del Mar Bluffs Cross Section 21-21'
C: Slope Stability Analysis
File Name: Section 2121 5 ft Water Static 2.slz
Analysis Method: Spencer
Factor of Safety: 1.42



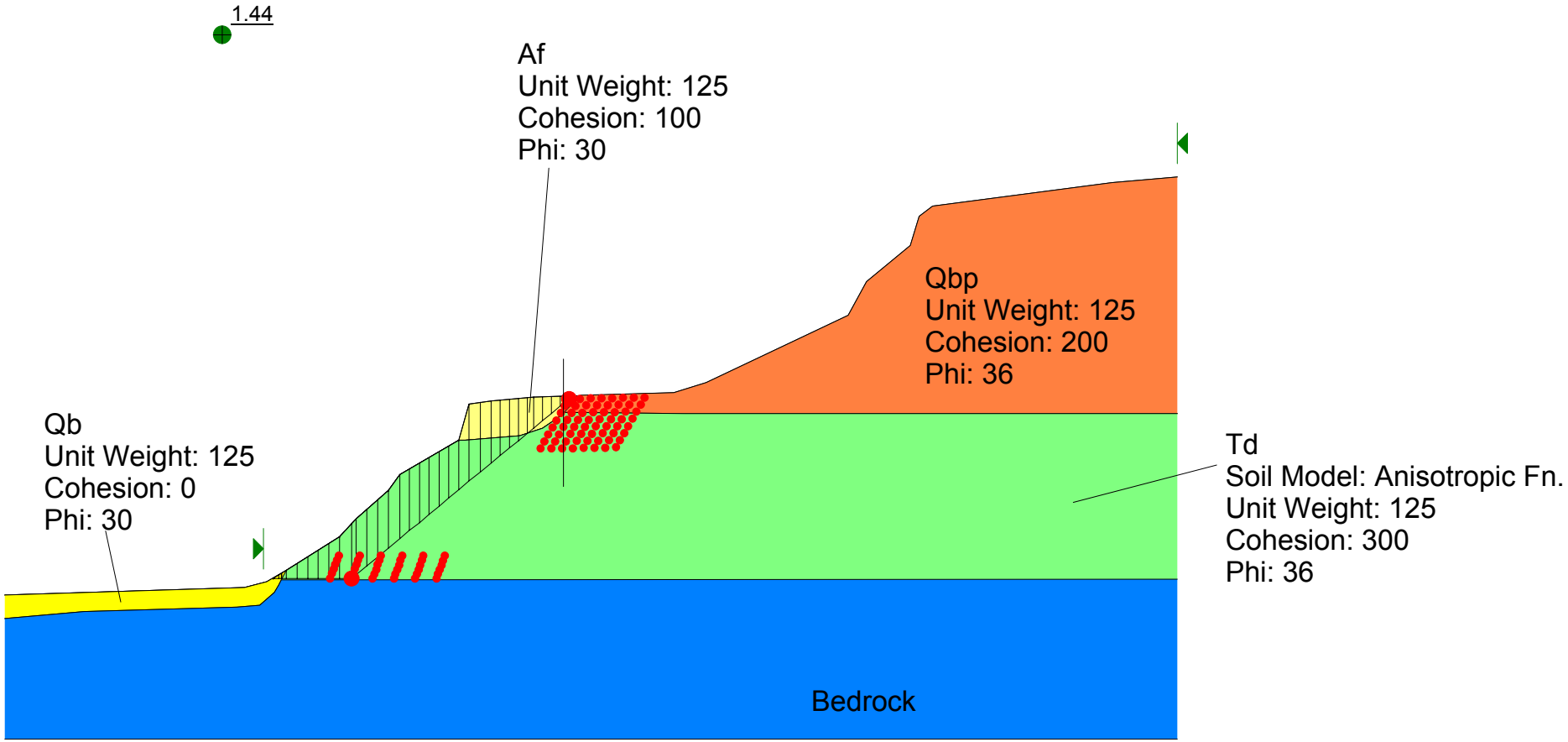
Del Mar Bluffs Cross Section 21-21'
C: Slope Stability Analysis
File Name: Section 2121 5 ft Water Static 3.slz
Analysis Method: Bishop
Factor of Safety: 1.51
Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 21-21'
C: Slope Stability Analysis
File Name: Section 2121 5 ft Water Static 4.slz
Analysis Method: Spencer
Factor of Safety: 1.41
Surcharge = 3,000 psf

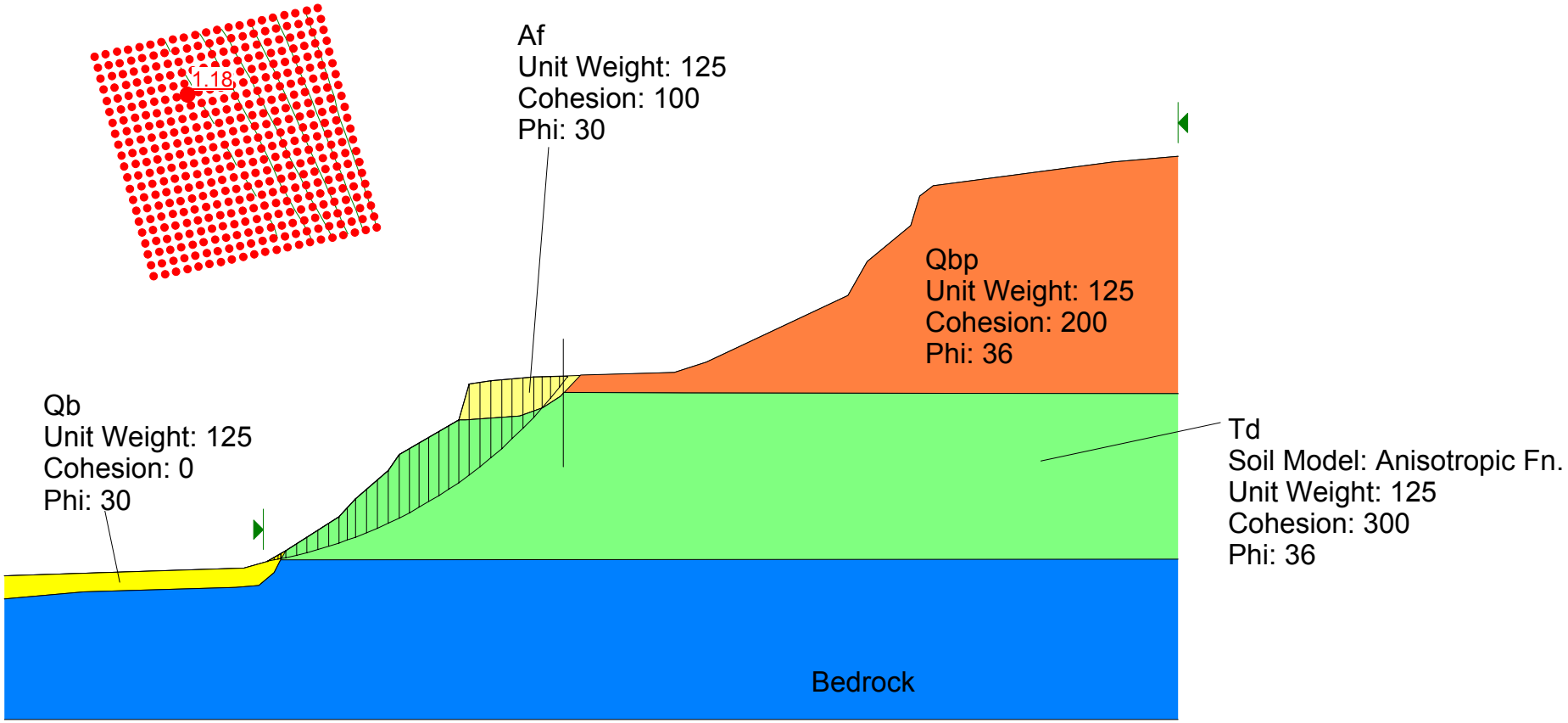


Del Mar Bluffs Cross Section 21-21'
C: Slope Stability Analysis, No Water
File Name: Section 2121 Static 2.slz
Analysis Method: Spencer
Factor of Safety: 1.44

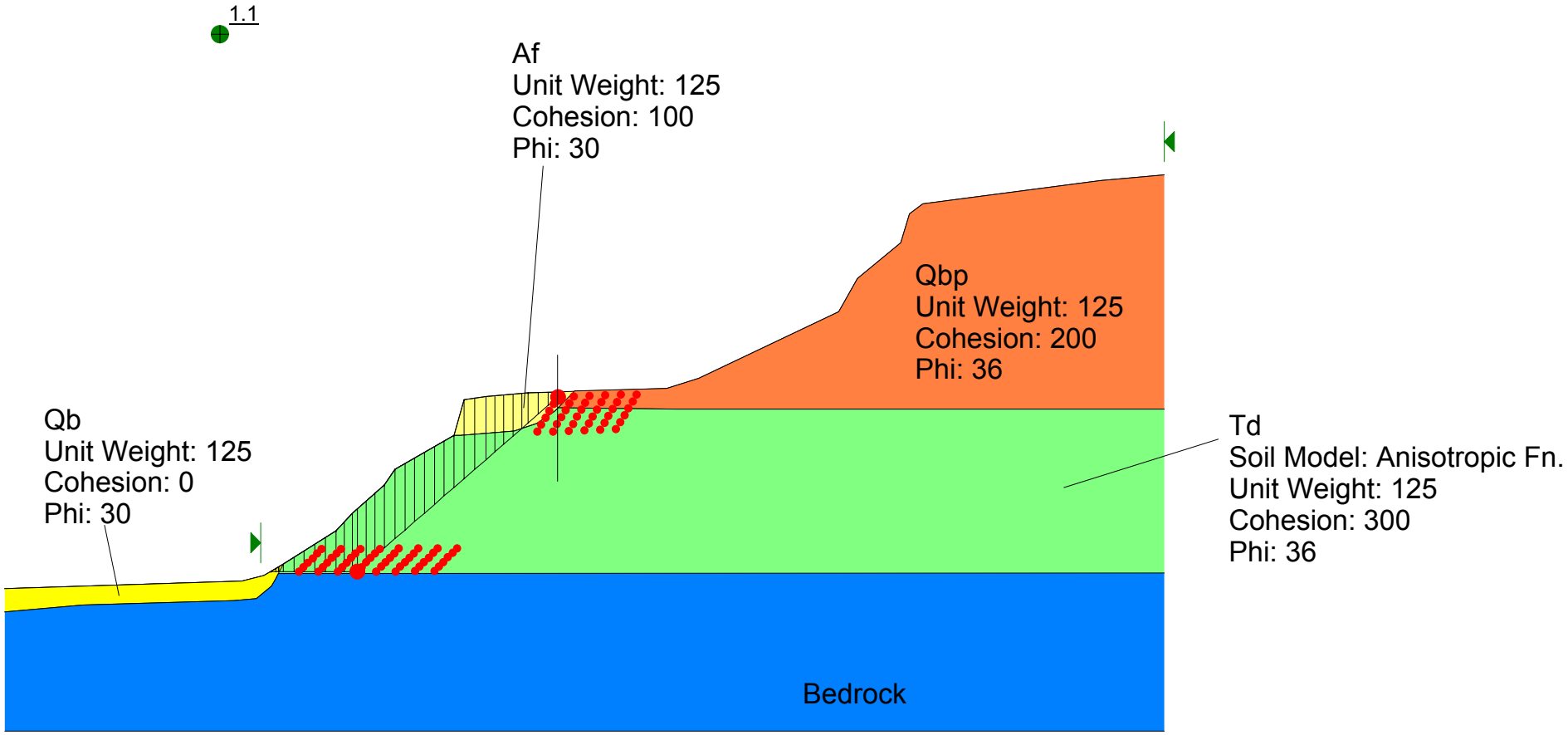


Del Mar Bluffs Cross Section 21-21'
C: Slope Stability Analysis
File Name: Section 2121 Psuedo Static 1.slz
Analysis Method: Bishop
Factor of Safety: 1.18

Seismic Coefficient = 0.15

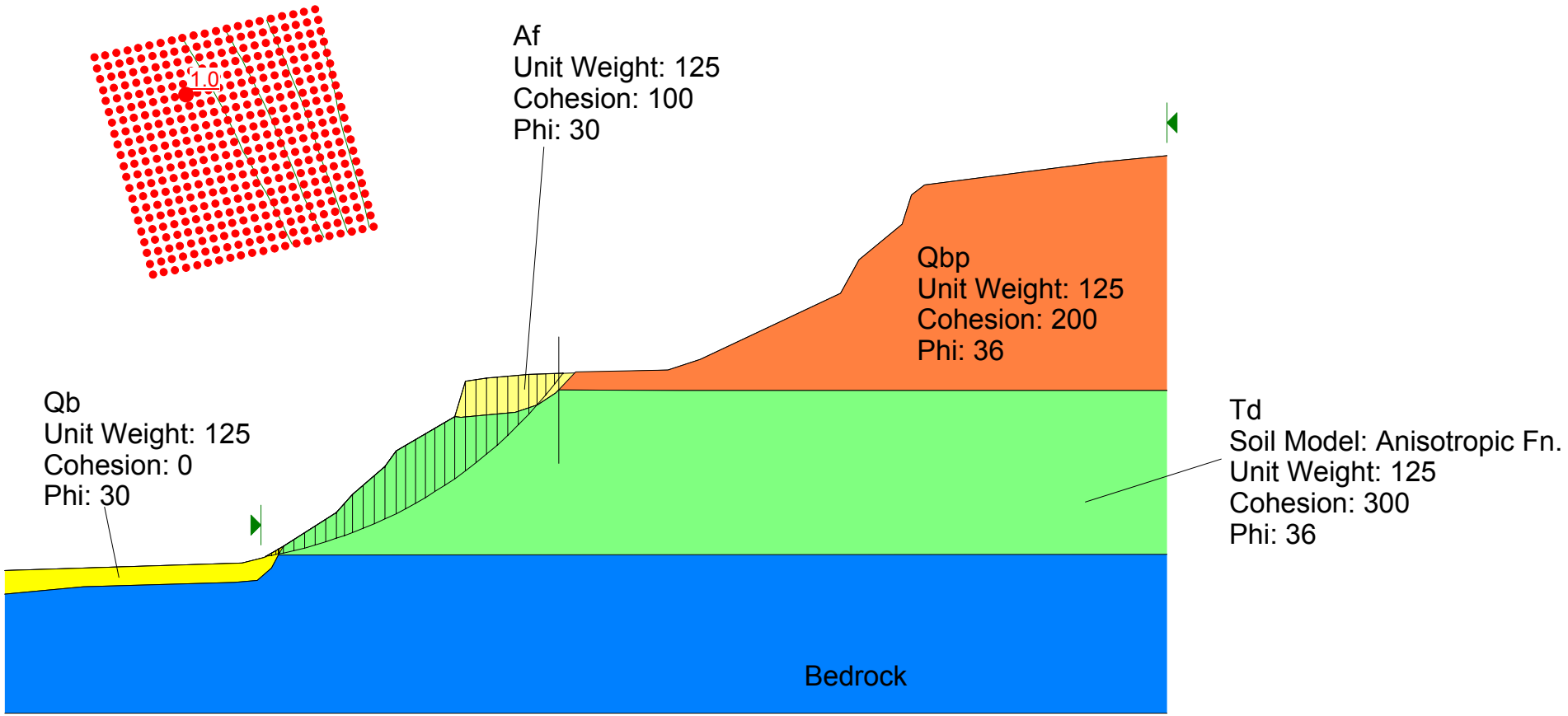


Del Mar Bluffs Cross Section 21-21'
C: Slope Stability Analysis
File Name: Section 2121 Psuedo Static 2.slz
Analysis Method: Spencer
Factor of Safety: 1.1
Seismic Coefficient = 0.15

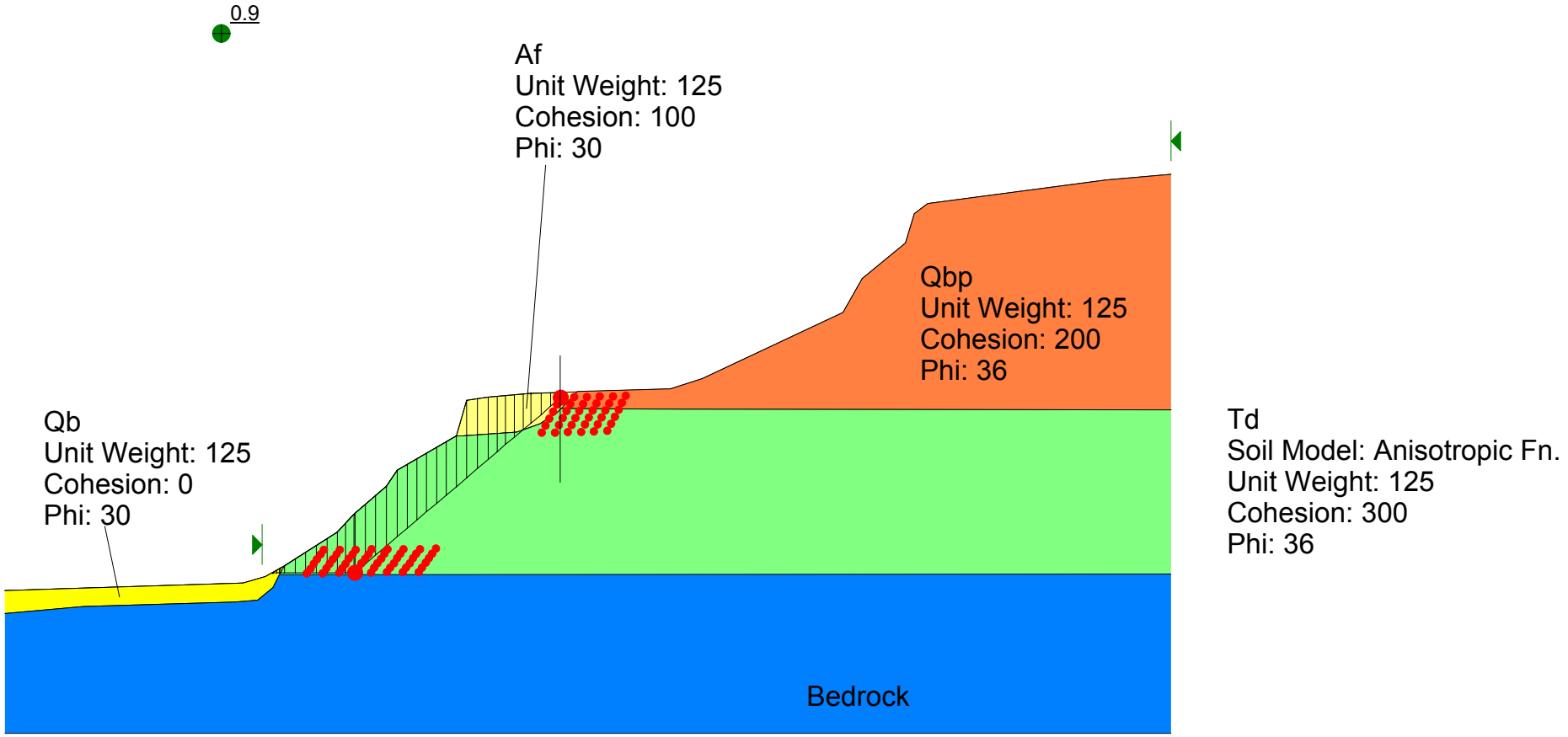


Del Mar Bluffs Cross Section 21-21'
C: Slope Stability Analysis
File Name: Section 2121 Psuedo Static 3.slz
Analysis Method: Bishop
Factor of Safety: 0.97

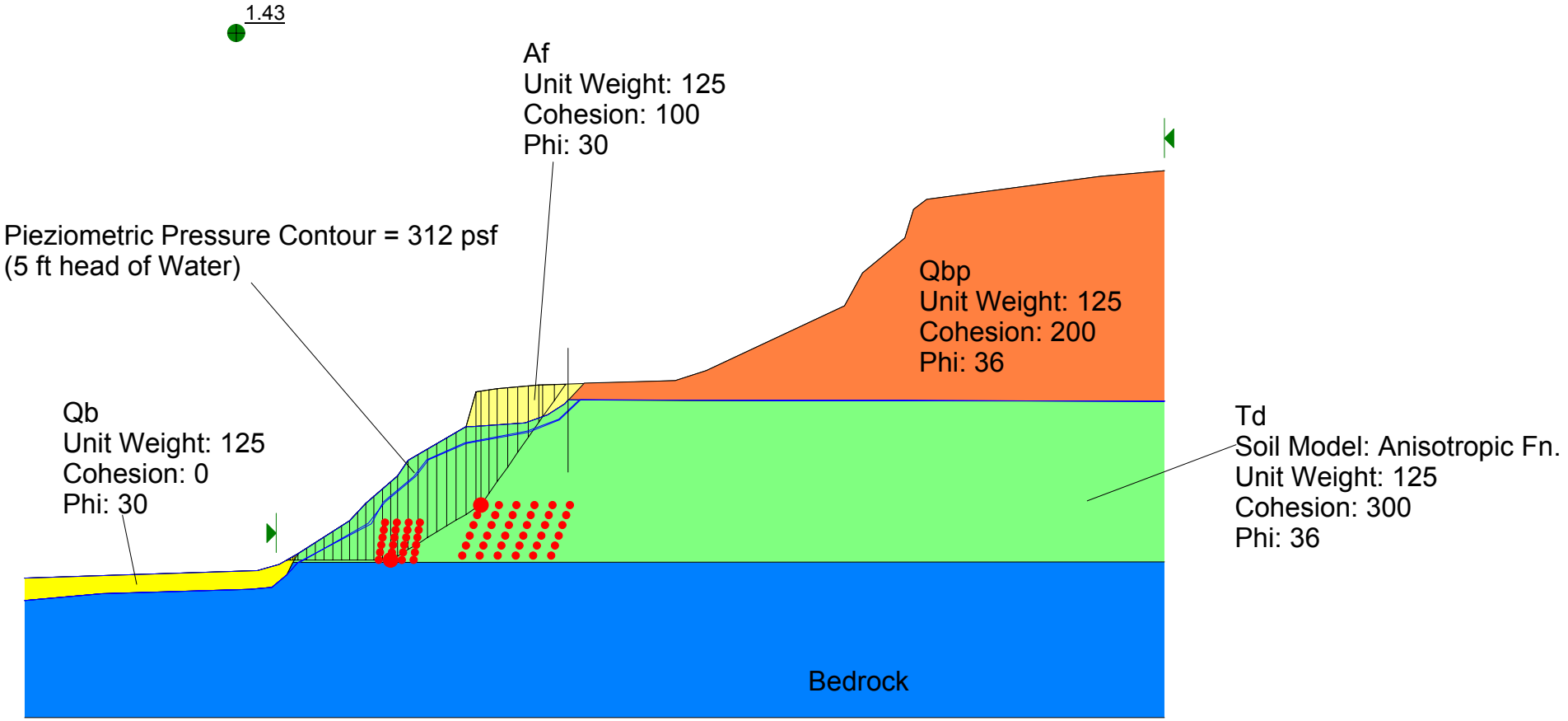
Seismic Coefficient = 0.28



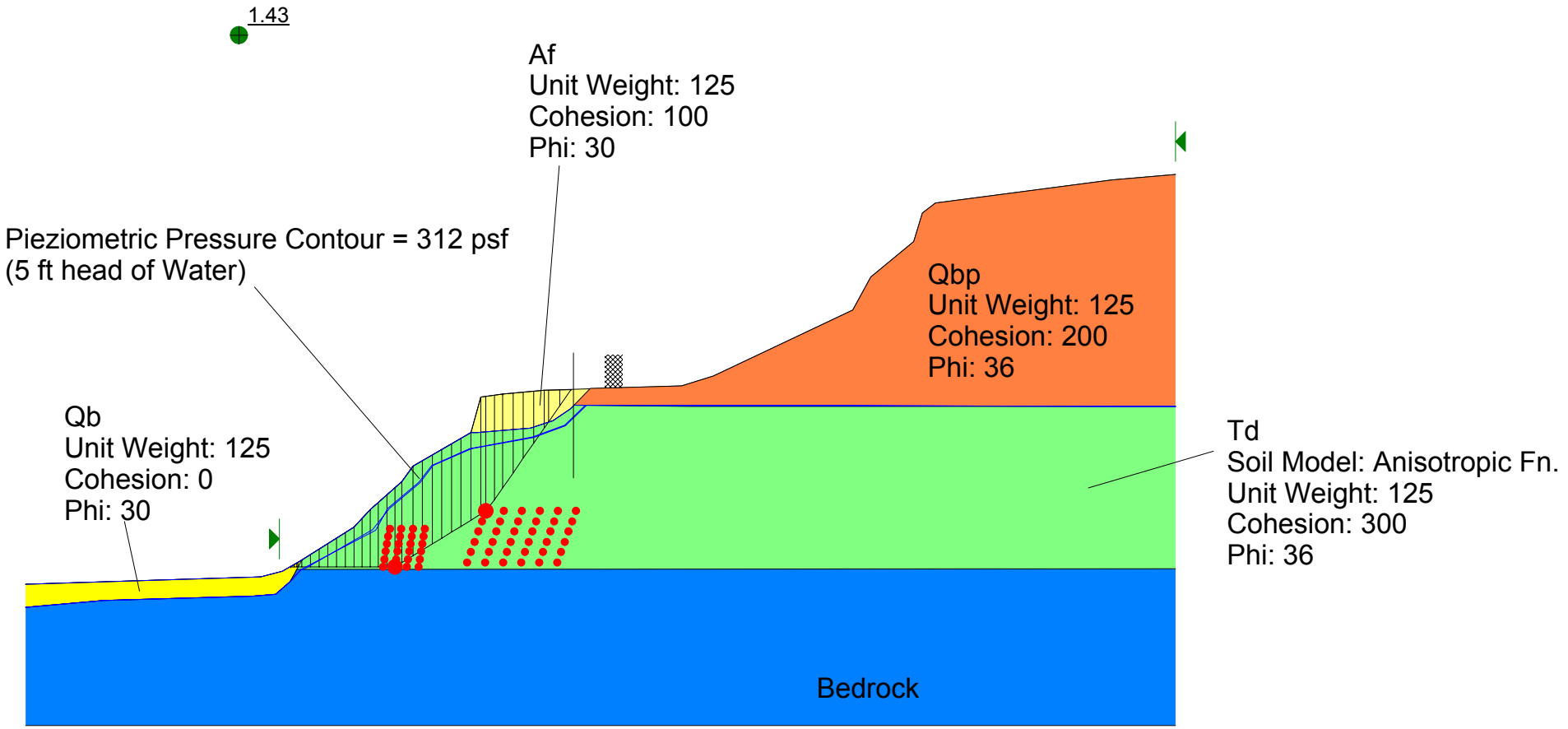
Del Mar Bluffs Cross Section 21-21'
C: Slope Stability Analysis
File Name: Section 2121 Psuedo Static 4.slz
Analysis Method: Spencer
Factor of Safety: 0.92
Seismic Coefficient = 0.28



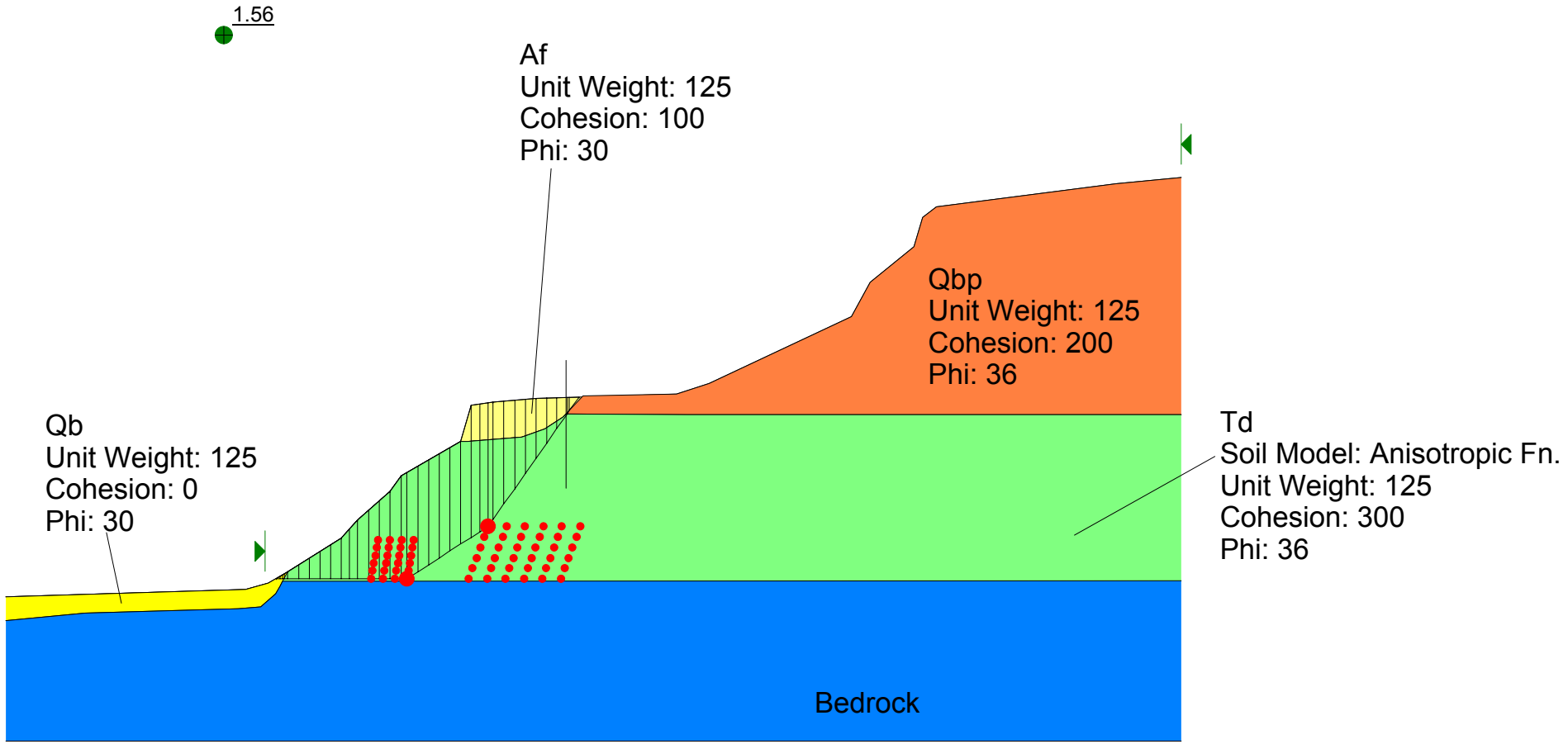
Del Mar Bluffs Cross Section 21-21'
C: Slope Stability Analysis
File Name: Section 2121 5 ft Water Static 2B.slz
Analysis Method: Spencer
Factor of Safety: 1.43



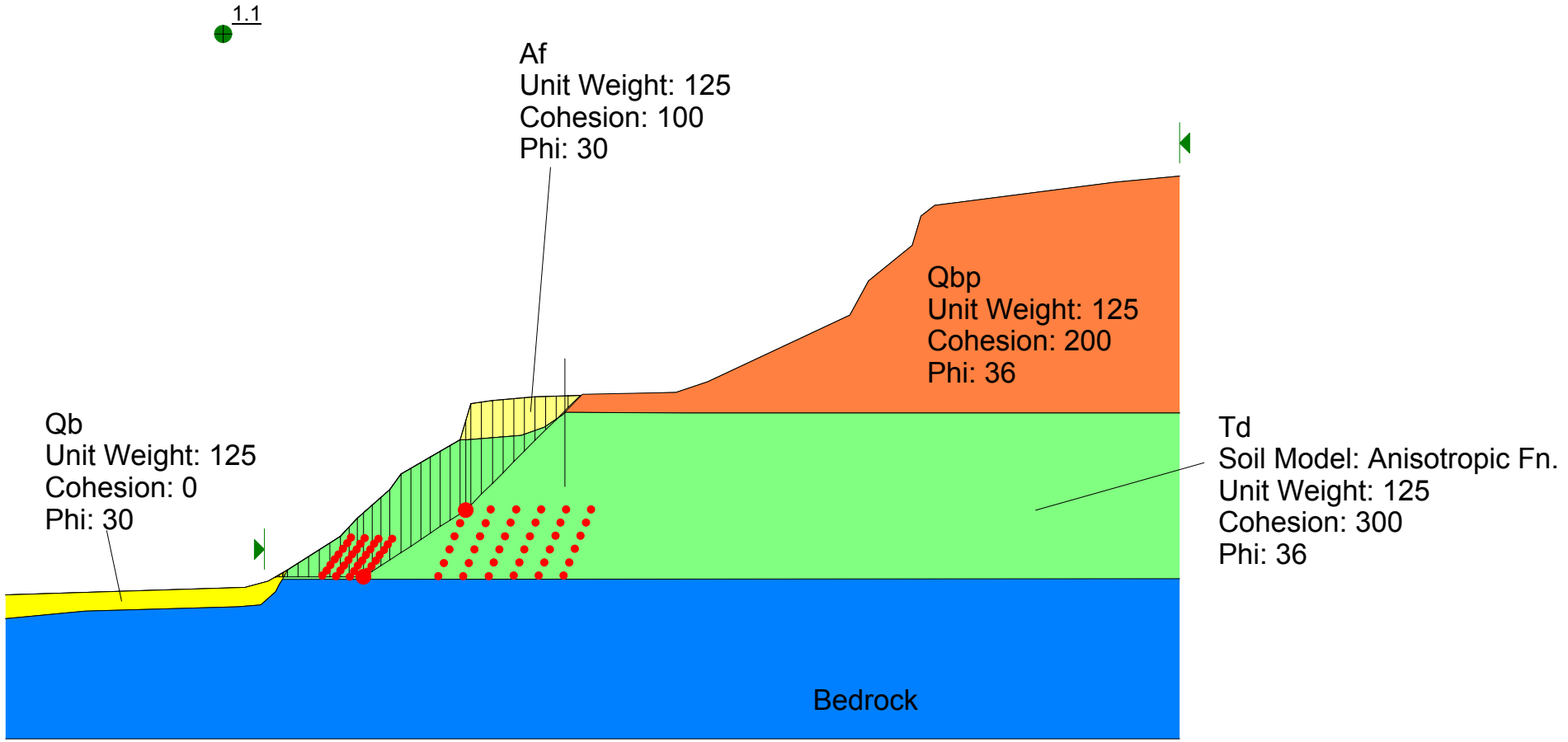
Del Mar Bluffs Cross Section 21-21'
C: Slope Stability Analysis
File Name: Section 2121 5 ft Water Static 4B.slz
Analysis Method: Spencer
Factor of Safety: 1.43
surcharge = 3,000 psf



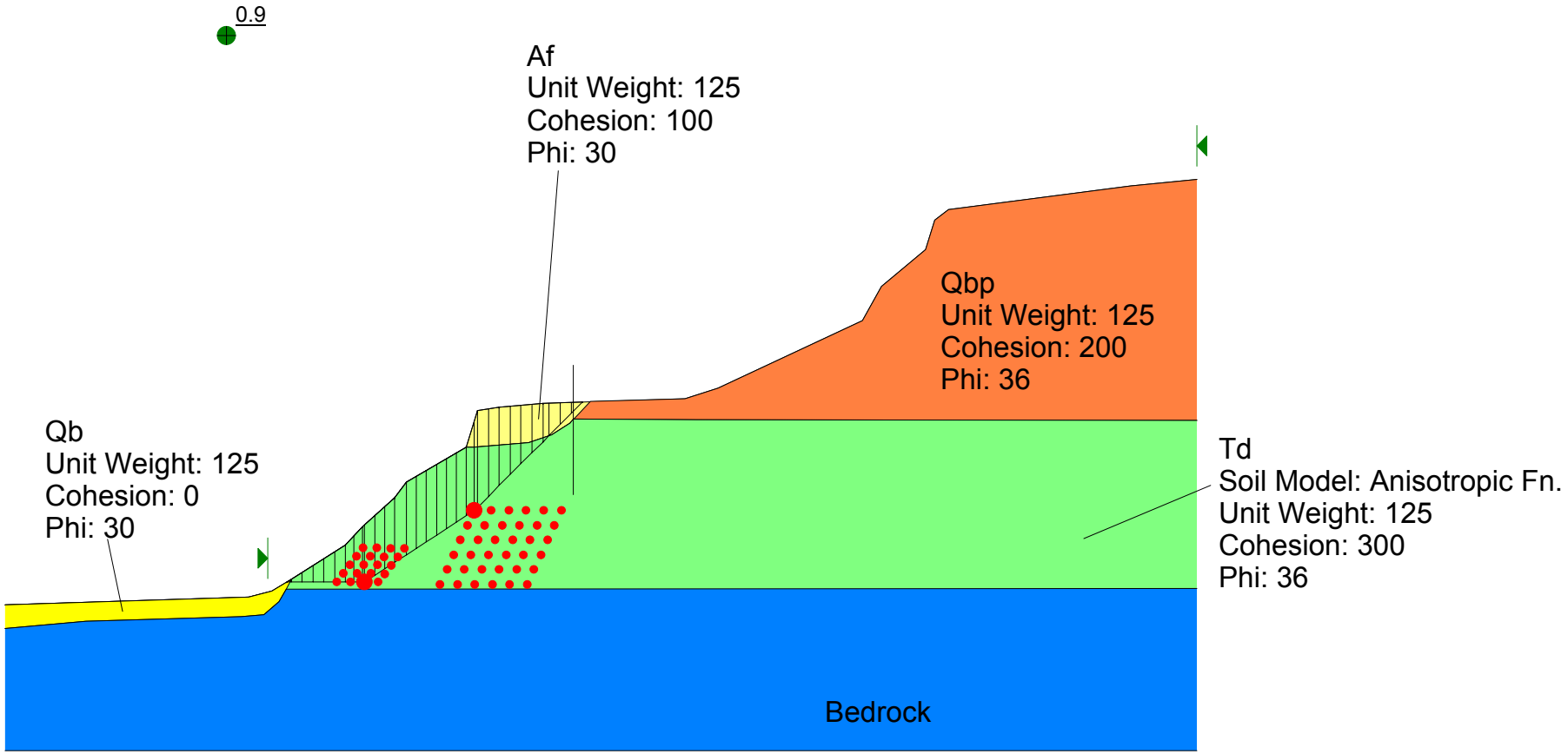
Del Mar Bluffs Cross Section 21-21'
C: Slope Stability Analysis, No Water
File Name: Section 2121 Static 2B.slz
Analysis Method: Spencer
Factor of Safety: 1.56



Del Mar Bluffs Cross Section 21-21'
C: Slope Stability Analysis
File Name: Section 2121 Psuedo Static 2B.slz
Analysis Method: Spencer
Factor of Safety: 1.1
Seismic Coefficient = 0.15

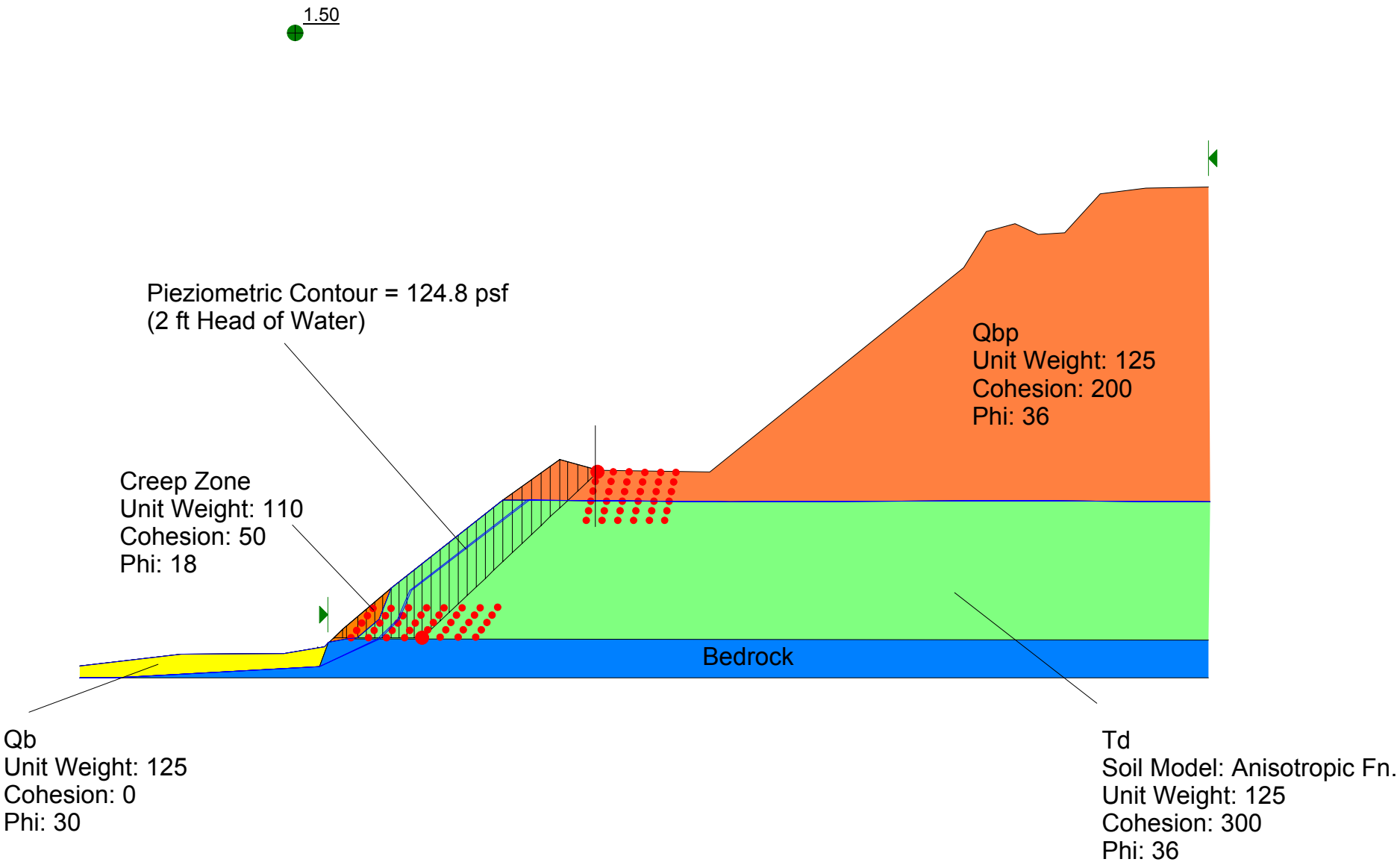


Del Mar Bluffs Cross Section 21-21'
C: Slope Stability Analysis
File Name: Section 2121 Psuedo Static 4B.slz
Analysis Method: Spencer
Factor of Safety: 0.91
Seismic Coefficient = 0.28

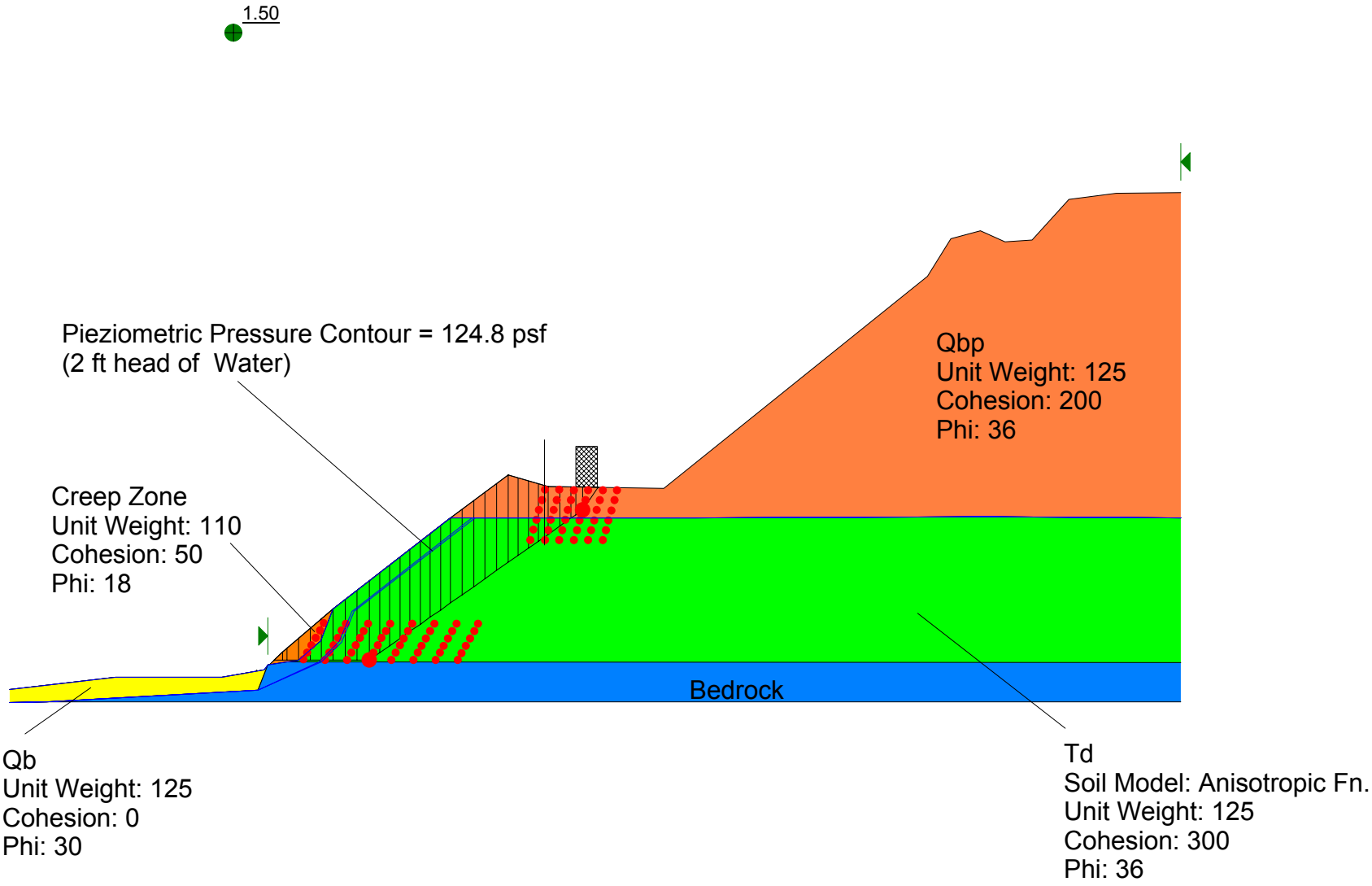


Cross Section 22-22’

Del Mar Bluffs Cross Section 22-22'
Slope Stability Analysis
File Name: Section 2222 Static 2.slz
Analysis Method: Spencer
Factor of Safety: 1.5

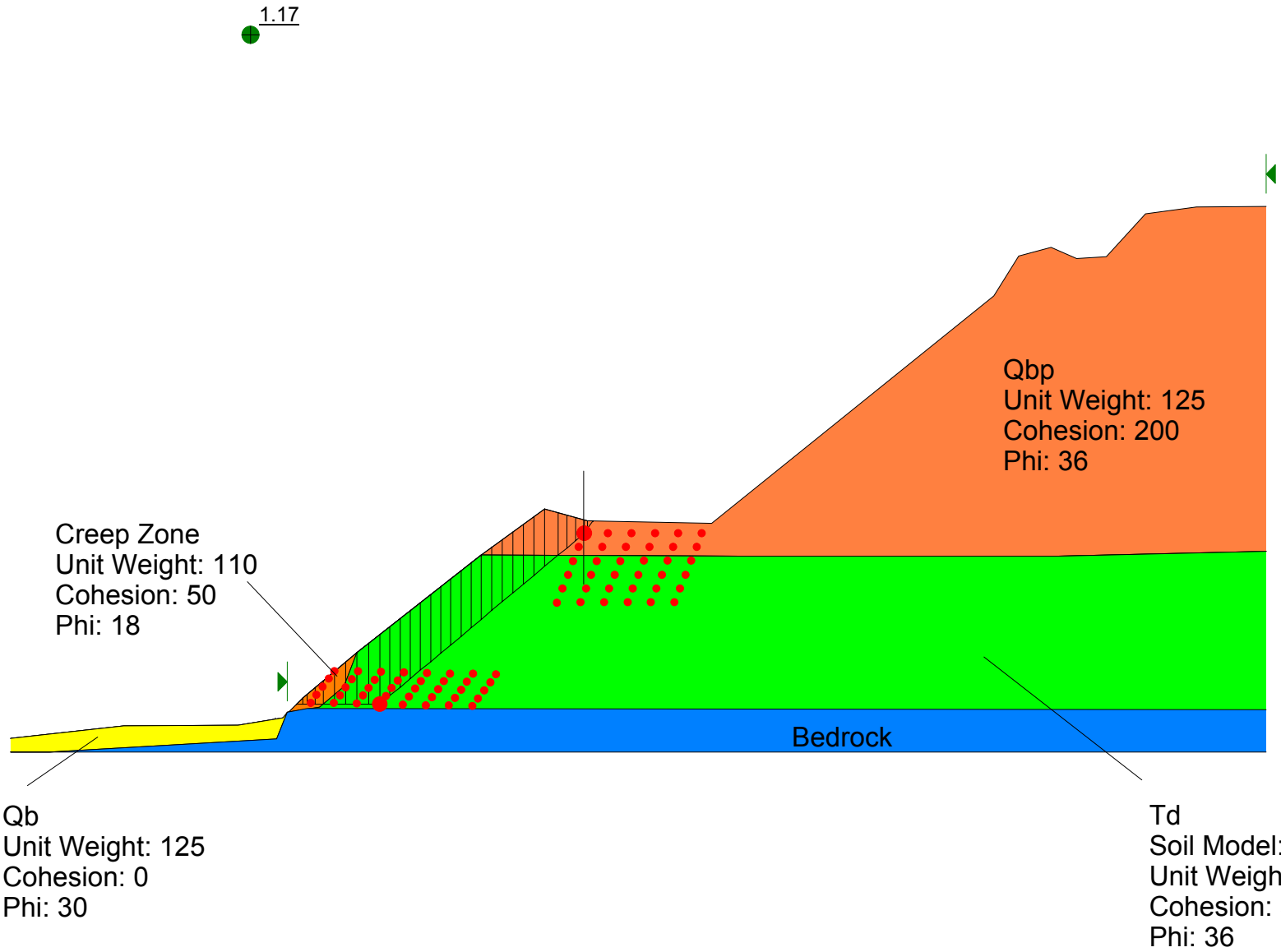


Del Mar Bluffs Cross Section 22-22'
Slope Stability Analysis
File Name: Section 2222 Static 4.slz
Analysis Method: Spencer
Factor of Safety: 1.5
Surcharge = 3,000 psf



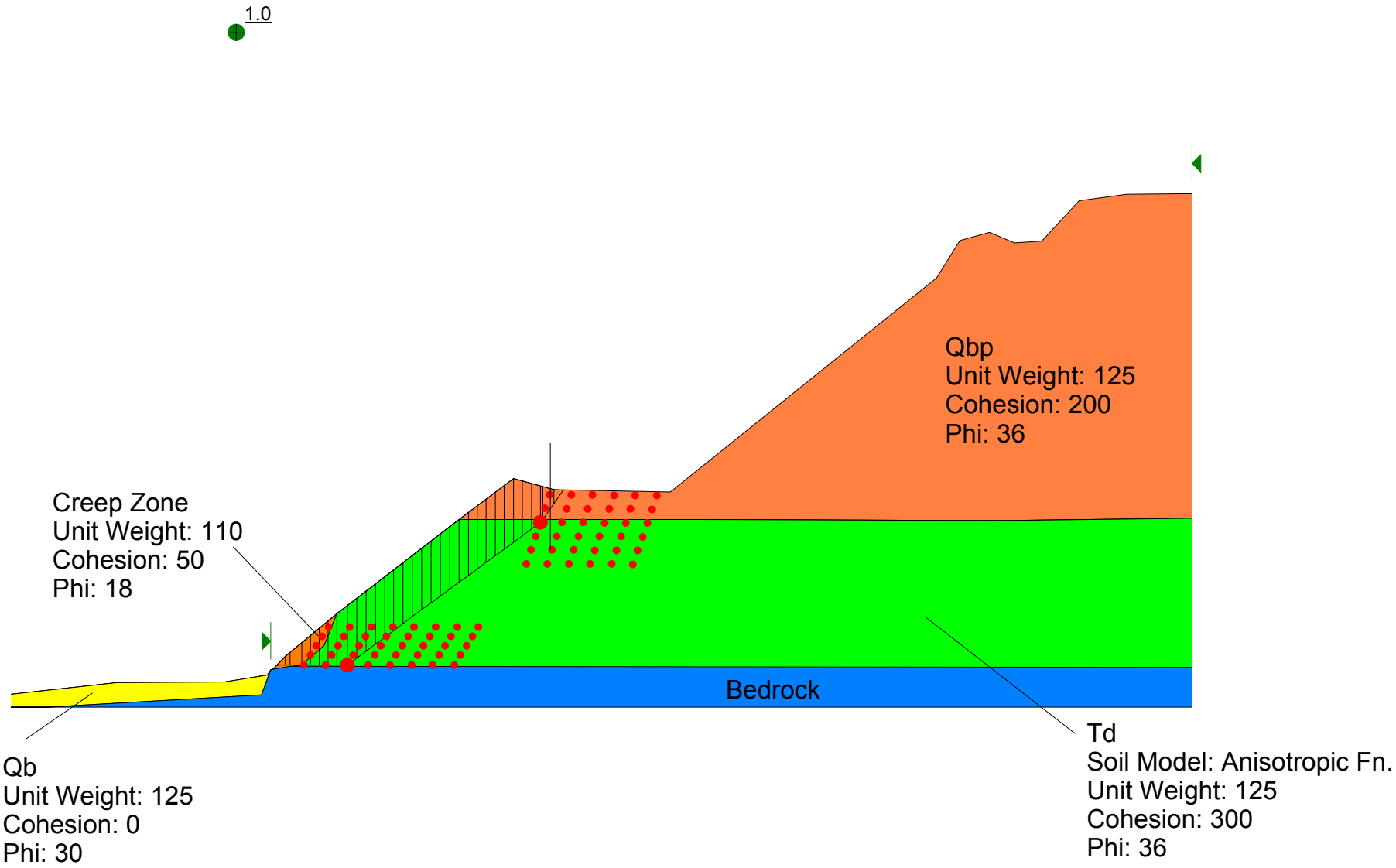
Del Mar Bluffs Cross Section 22-22'
Slope Stability Analysis
File Name: Section 2222 Psuedo Static 1.slz
Analysis Method: Spencer
Factor of Safety: 1.17

Seismic Coefficient = 0.15



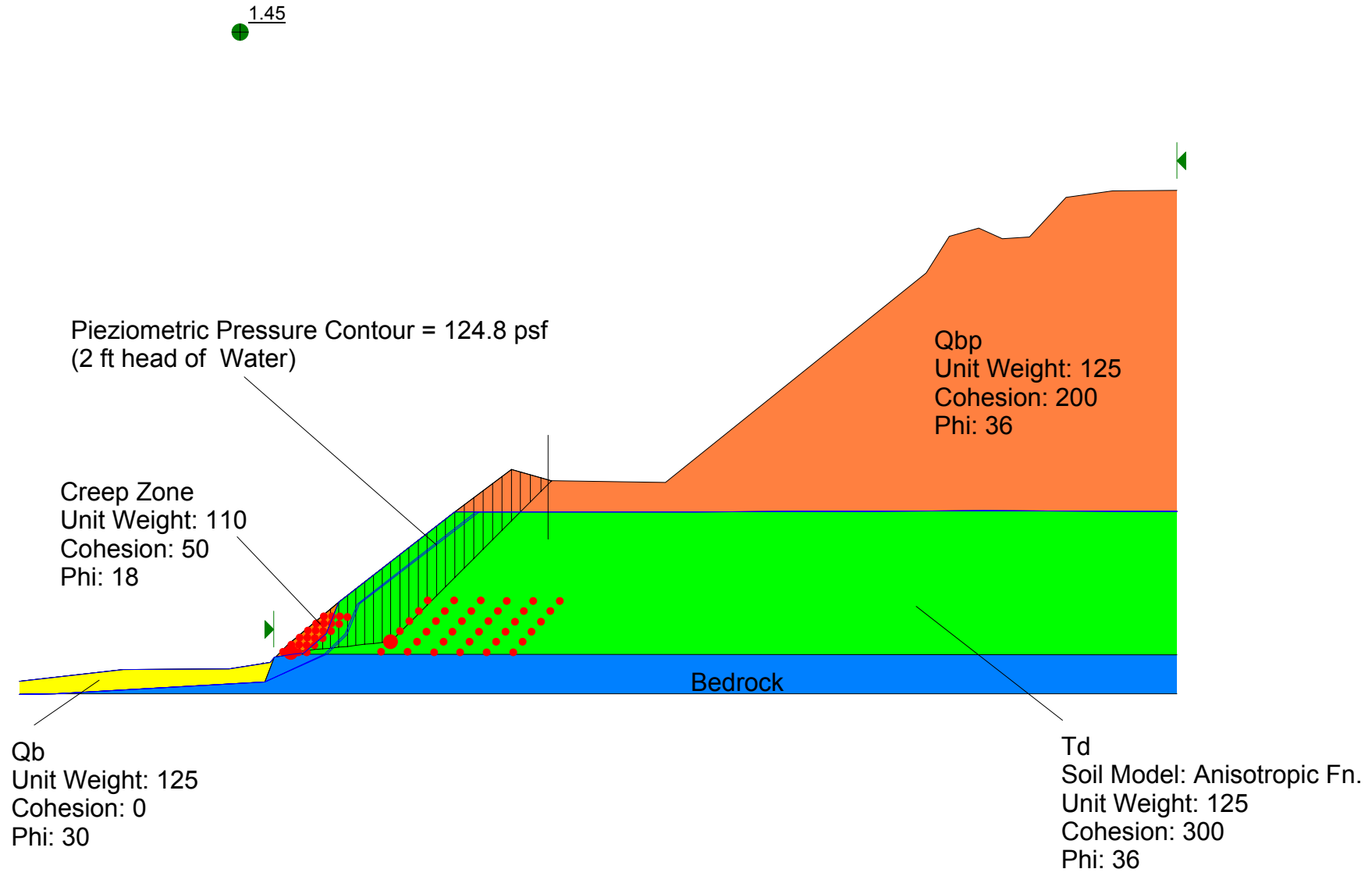
Del Mar Bluffs Cross Section 22-22'
Slope Stability Analysis
File Name: Section 2222 Psuedo Static 2.slz
Analysis Method: Spencer
Factor of Safety: 0.97

Siesmic Coefficient = 0.28



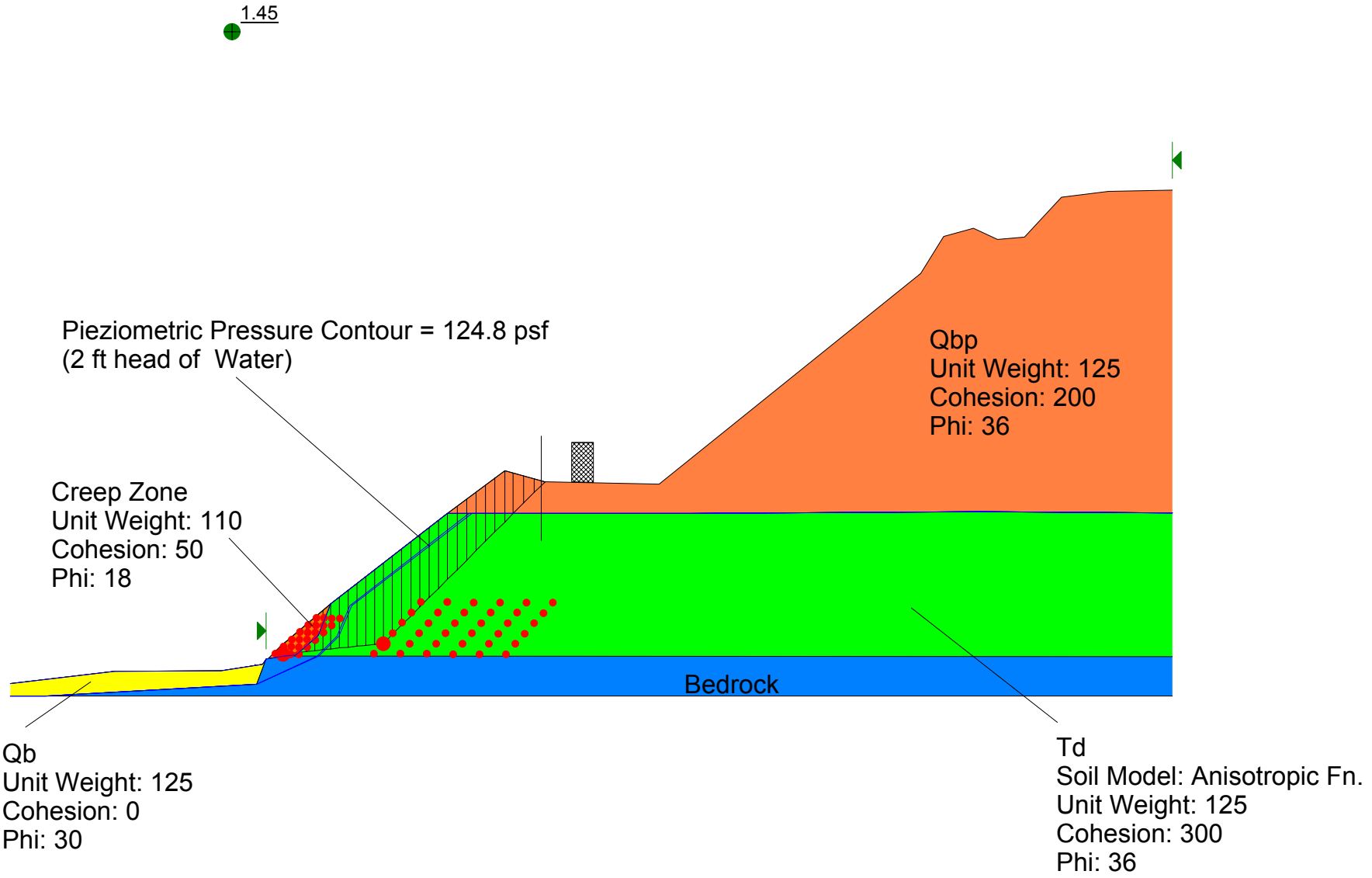
Del Mar Bluffs Cross Section 22-22'
Slope Stability Analysis
File Name: Section 2222 Static 2B.slz
Analysis Method: Spencer
Factor of Safety: 1.45

Surcharge = 3,000 psf



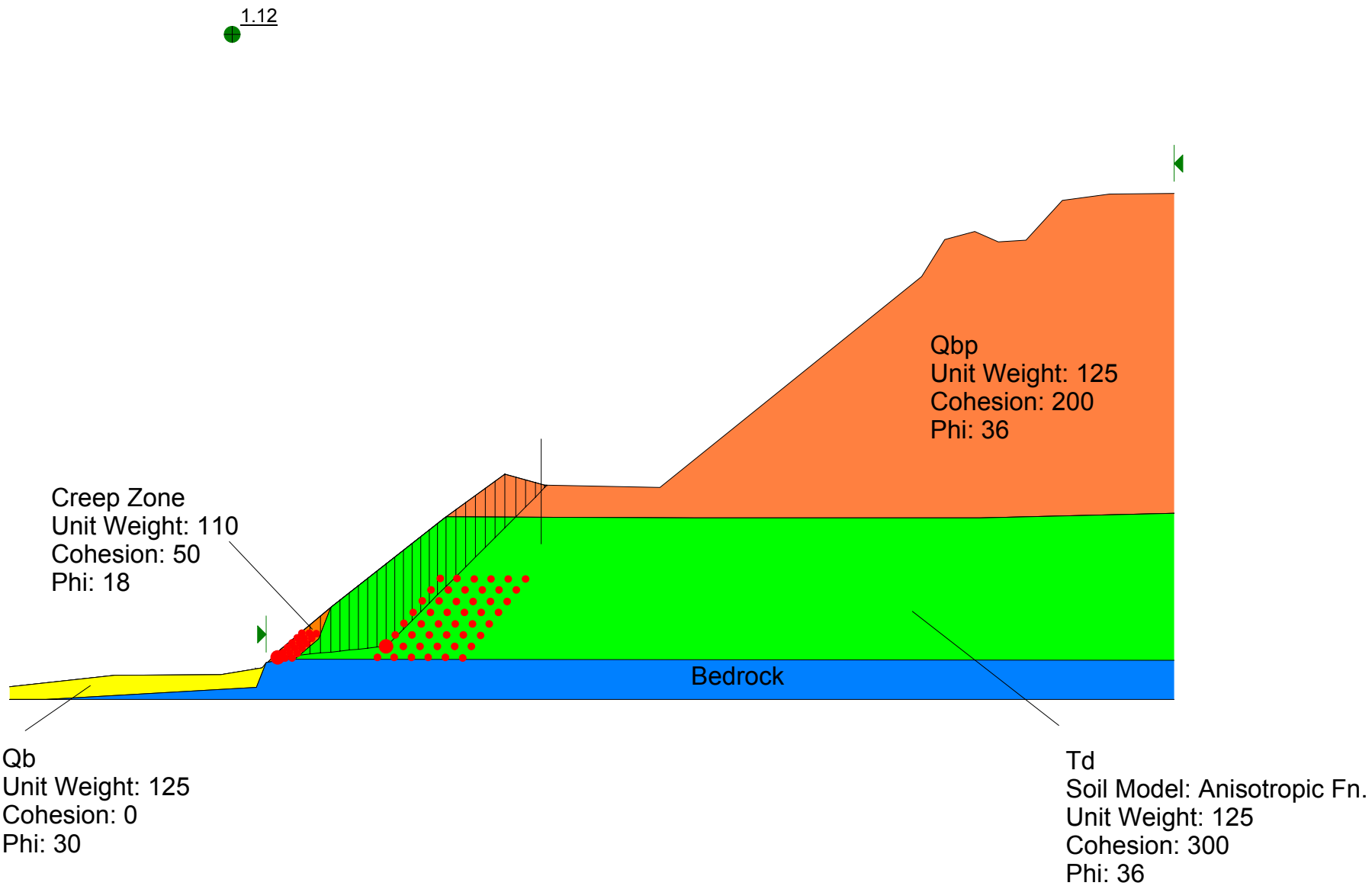
Del Mar Bluffs Cross Section 22-22'
Slope Stability Analysis
File Name: Section 2222 Static 4B.slz
Analysis Method: Spencer
Factor of Safety: 1.45

Surcharge = 3,000 psf



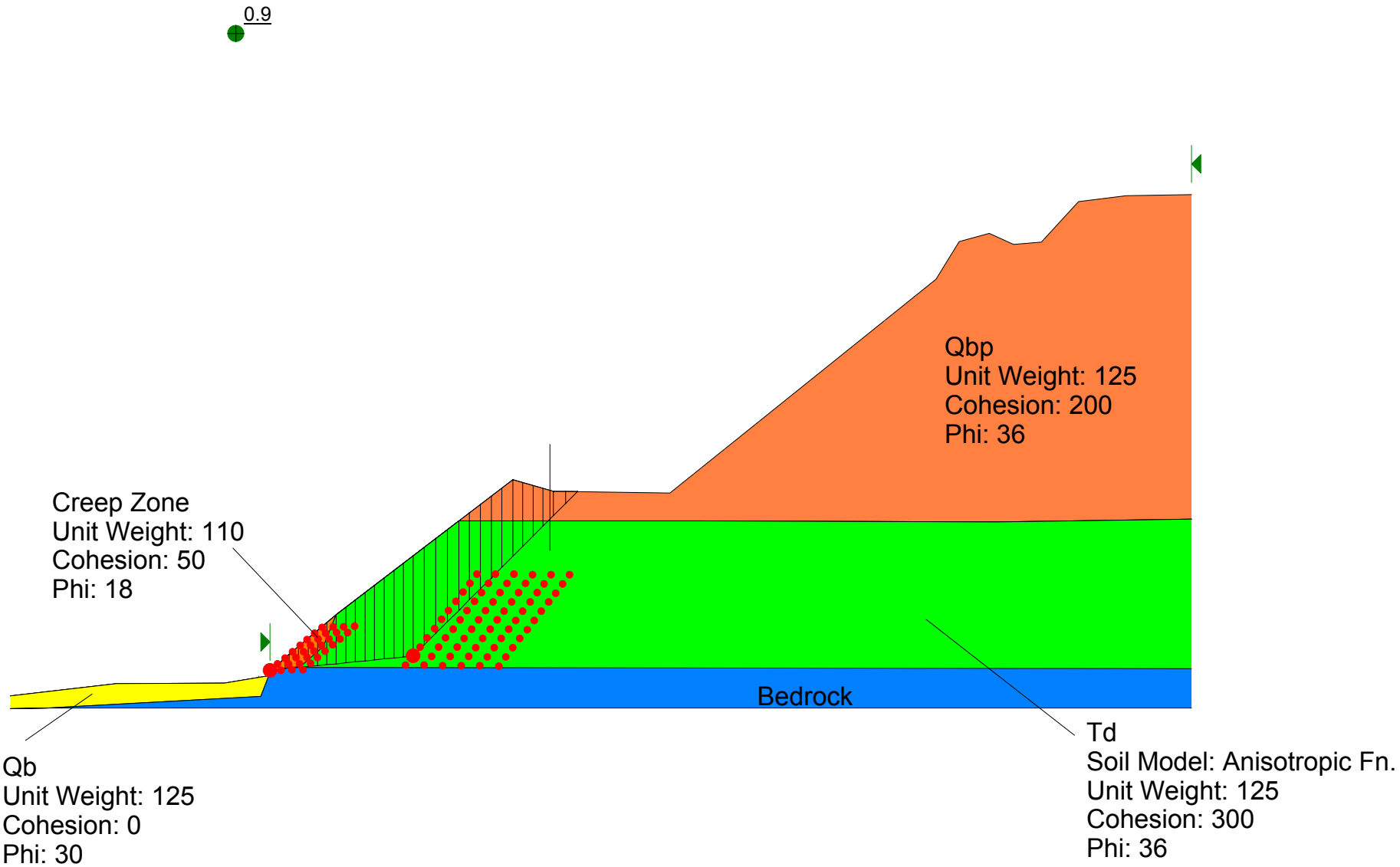
Del Mar Bluffs Cross Section 22-22'
Slope Stability Analysis
File Name: Section 2222 Psuedo Static 1B.slz
Analysis Method: Spencer
Factor of Safety: 1.12

Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 22-22'
Slope Stability Analysis
File Name: Section 2222 Psuedo Static 2B.slz
Analysis Method: Spencer
Factor of Safety: 0.94

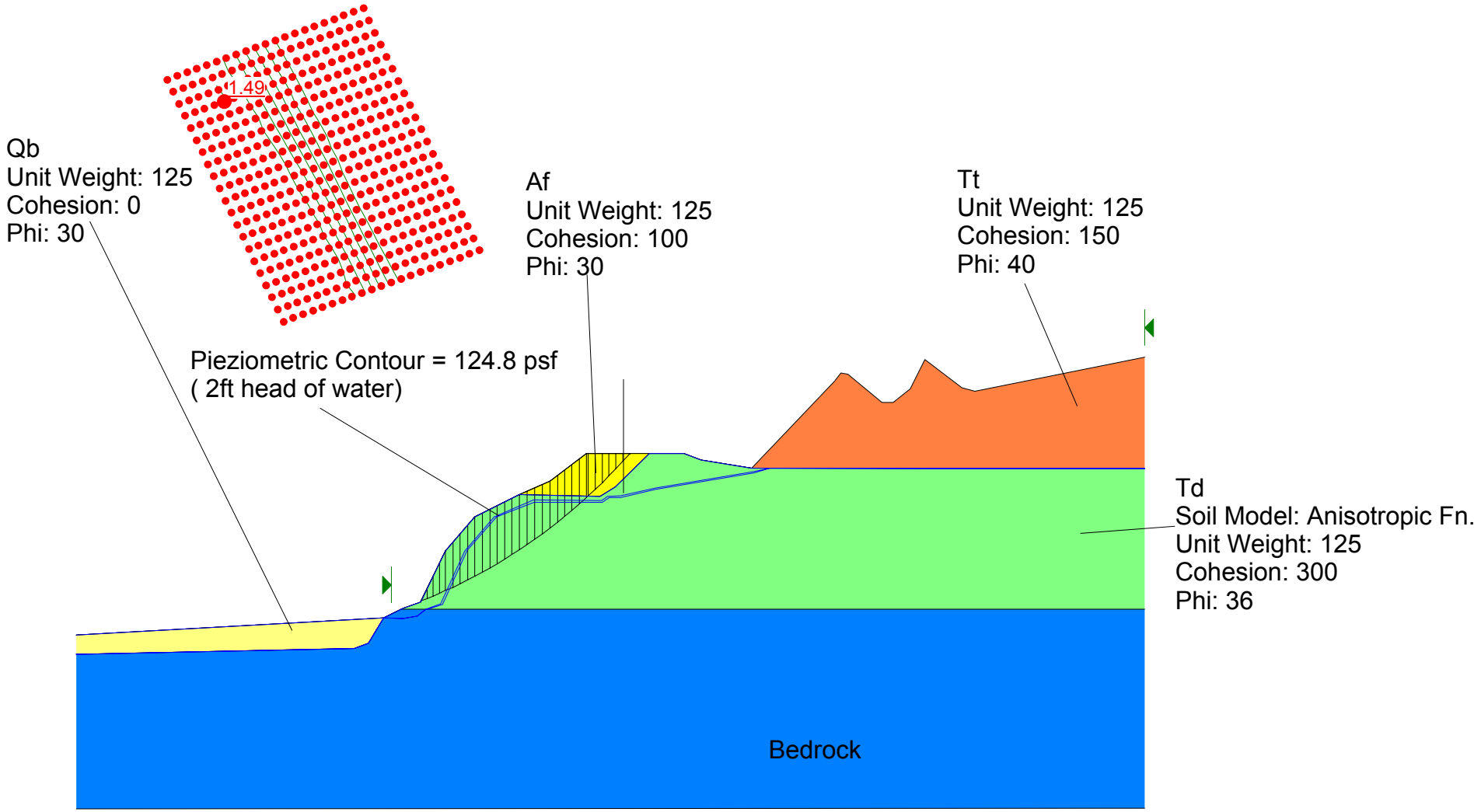
Siesmic Coefficient = 0.28



Cross Section 23-23’

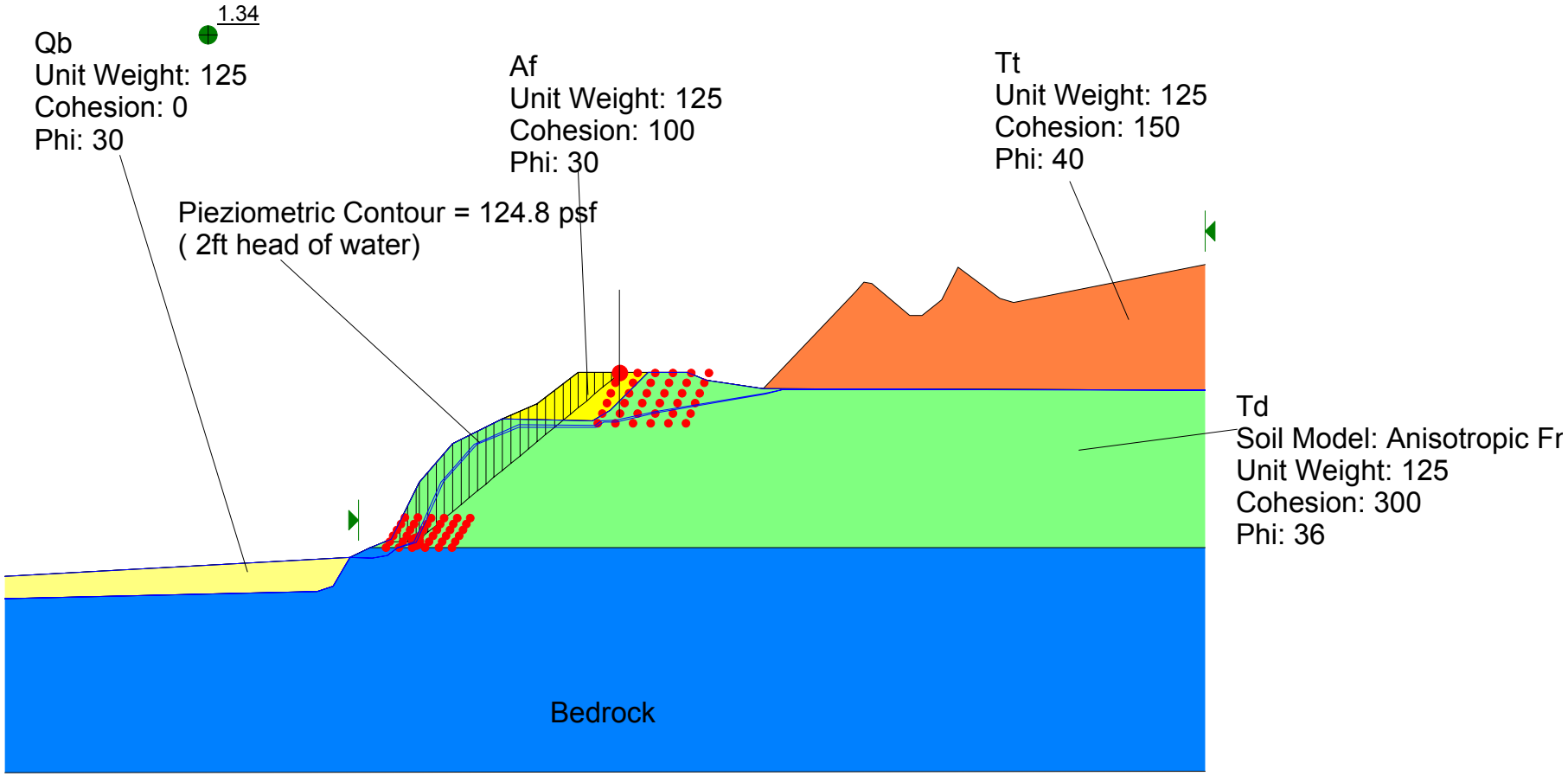
Del Mar Bluffs Cross Section 23-23'
Static Slope Stability Analysis
File Name: Section 2323 Static 1.slz
Analysis Method: Bishop

Factor of Safety: 1.49



Del Mar Bluffs Cross Section 23-23'
Static Slope Stability Analysis
File Name: Section 2323 Static 2.slz
Analysis Method: Spencer

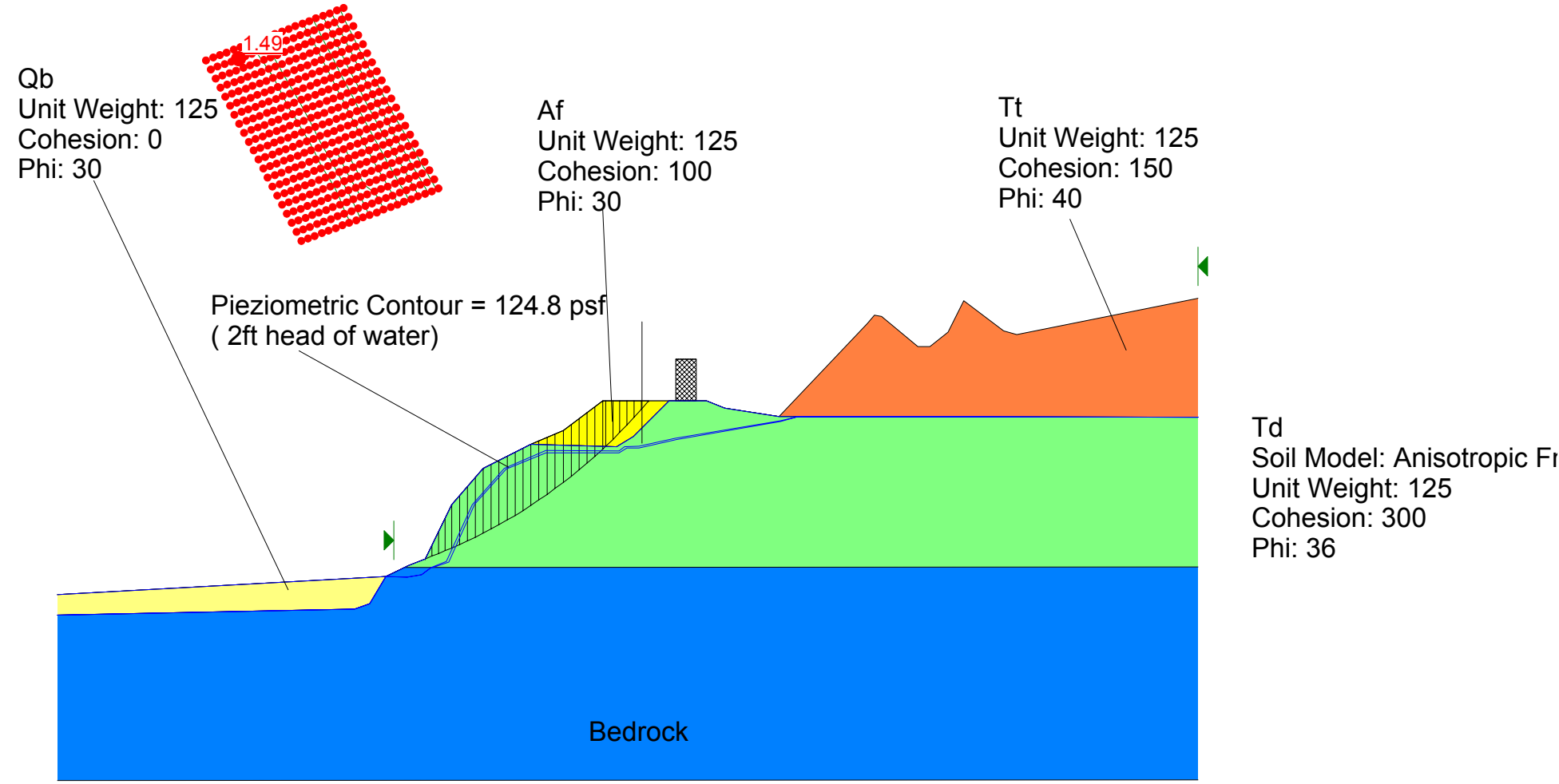
Factor of Safety: 1.34



Del Mar Bluffs Cross Section 23-23'
Static Slope Stability Analysis
File Name: Section 2323 Static 3.slz
Analysis Method: Bishop

Factor of Safety: 1.49

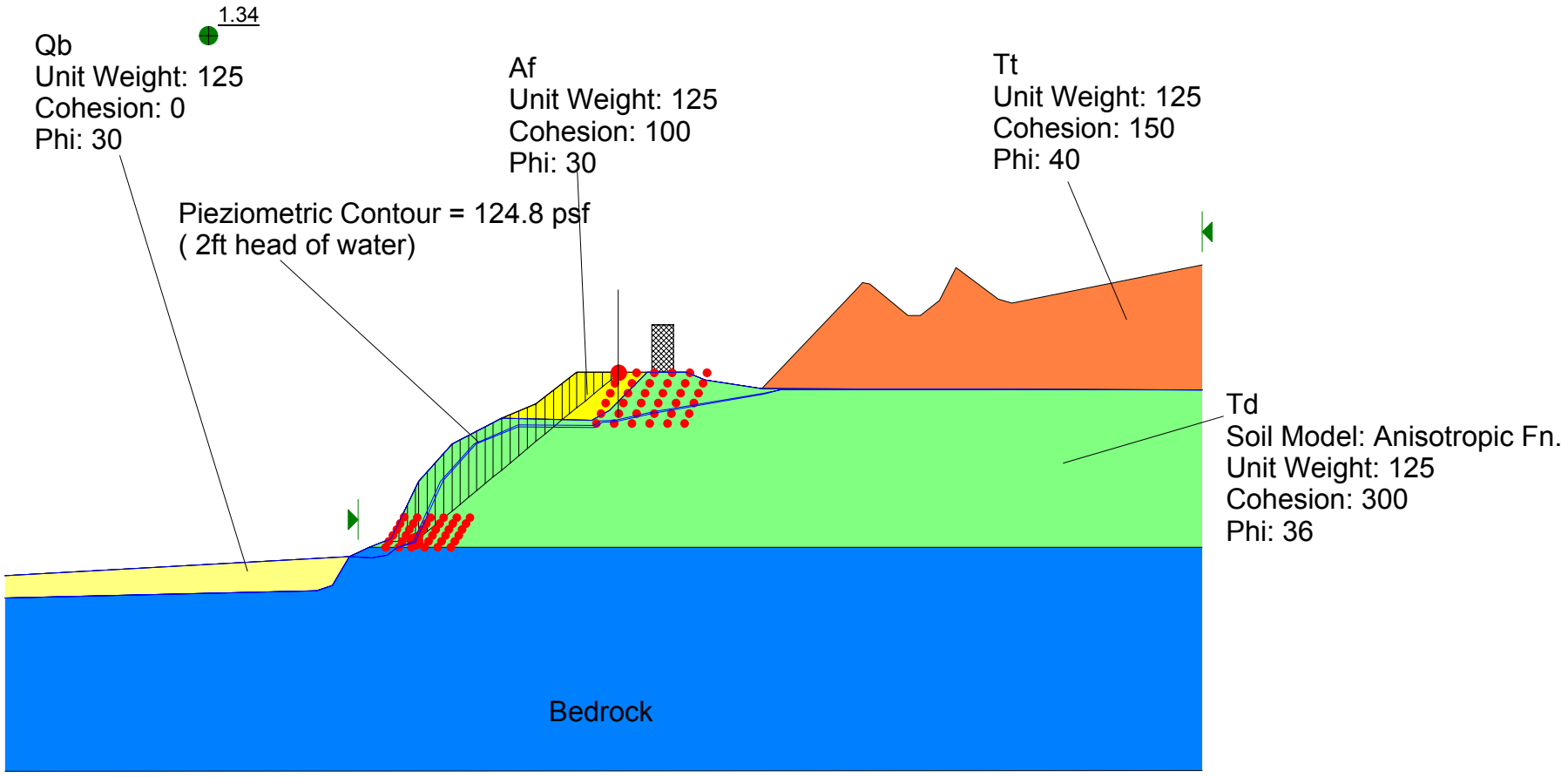
Surcharge = 3.000 psf



Del Mar Bluffs Cross Section 23-23'
Static Slope Stability Analysis
File Name: Section 2323 Static 4C.slz
Analysis Method: Spencer

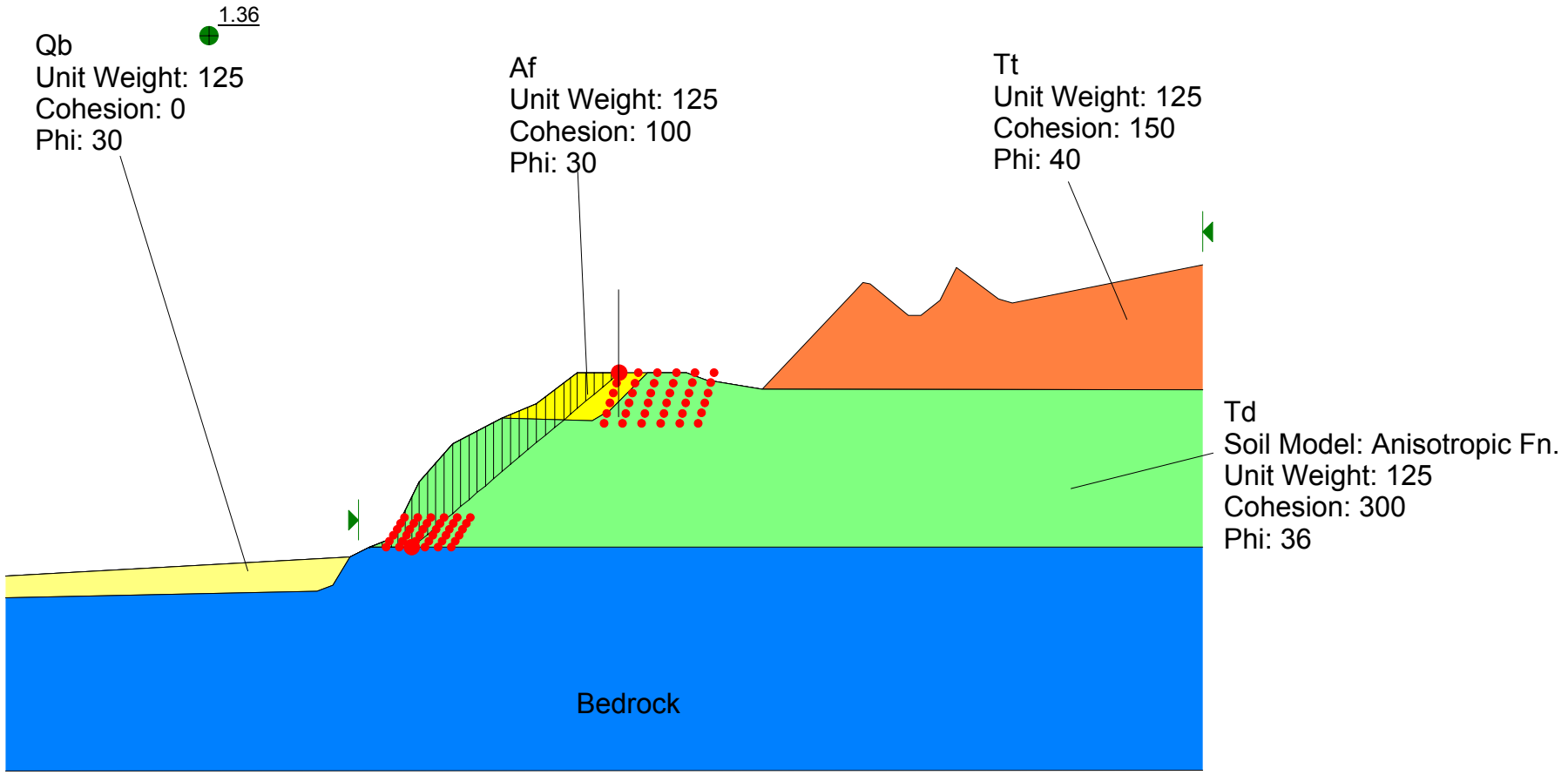
Factor of Safety: 1.34

Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 23-23'
Static Slope Stability Analysis, No Water
File Name: Section 2323 Static 2 no water.slz
Analysis Method: Spencer

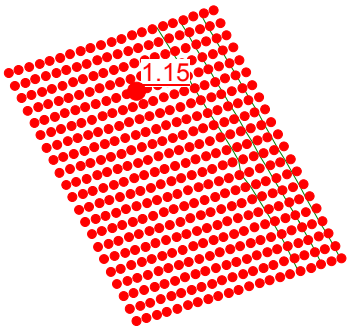
Factor of Safety: 1.36



Del Mar Bluffs Cross Section 23-23'
Static Slope Stability Analysis
File Name: Section 2323 Psuedo Static 1.slz
Analysis Method: Bishop

Factor of Safety: 1.15

Seismic Coefficient = 0.15



Qb
Unit Weight: 125
Cohesion: 0
Phi: 30

Af
Unit Weight: 125
Cohesion: 100
Phi: 30

Tt
Unit Weight: 125
Cohesion: 150
Phi: 40

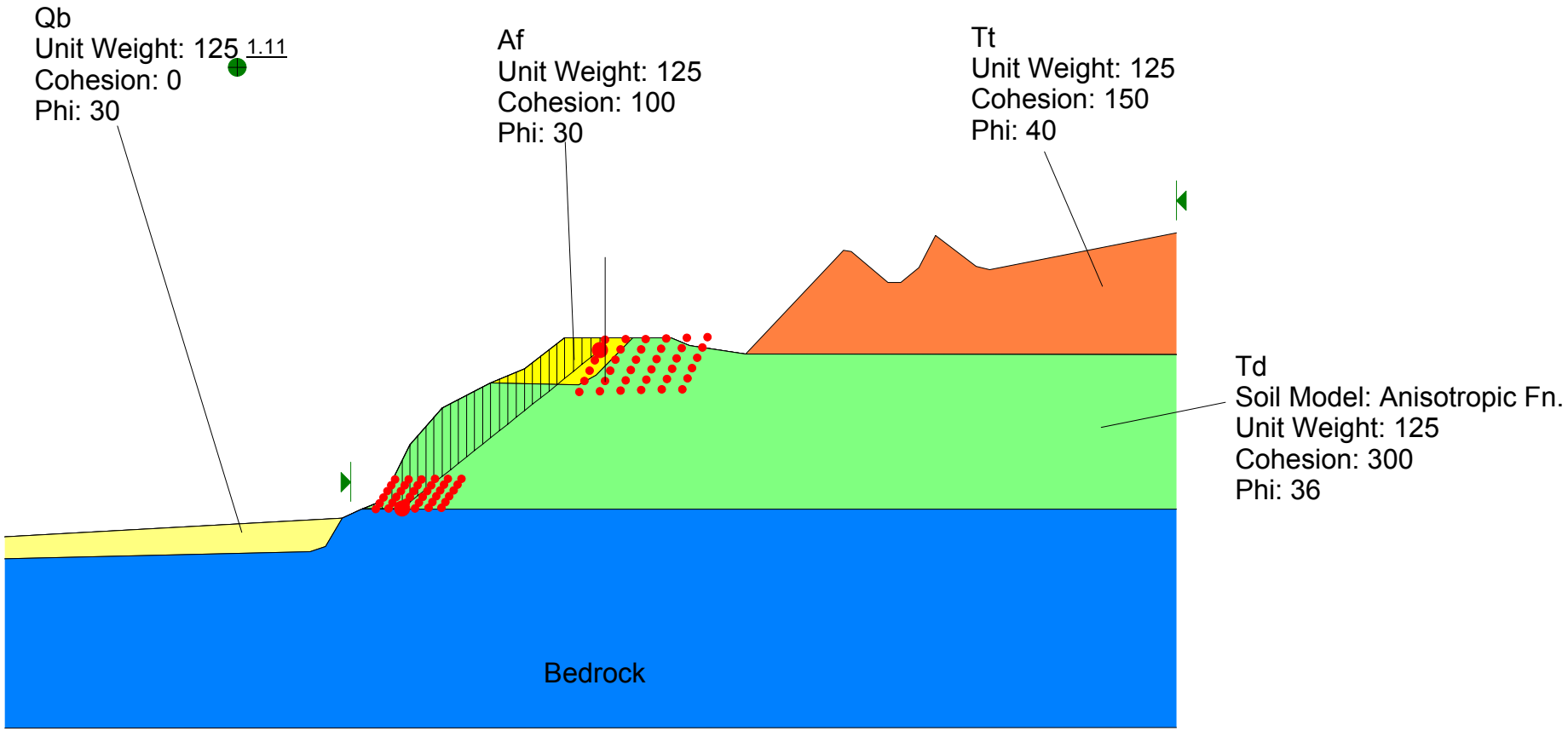
Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Bedrock

Del Mar Bluffs Cross Section 23-23'
Static Slope Stability Analysis
File Name: Section 2323 Psuedo Static 2.slz
Analysis Method: Spencer

Factor of Safety: 1.11

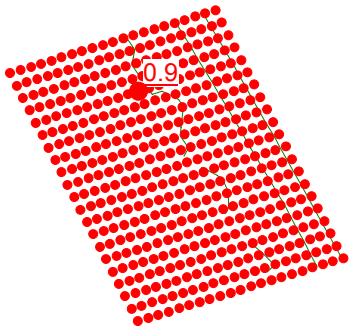
Seismic Coefficient = 0.15

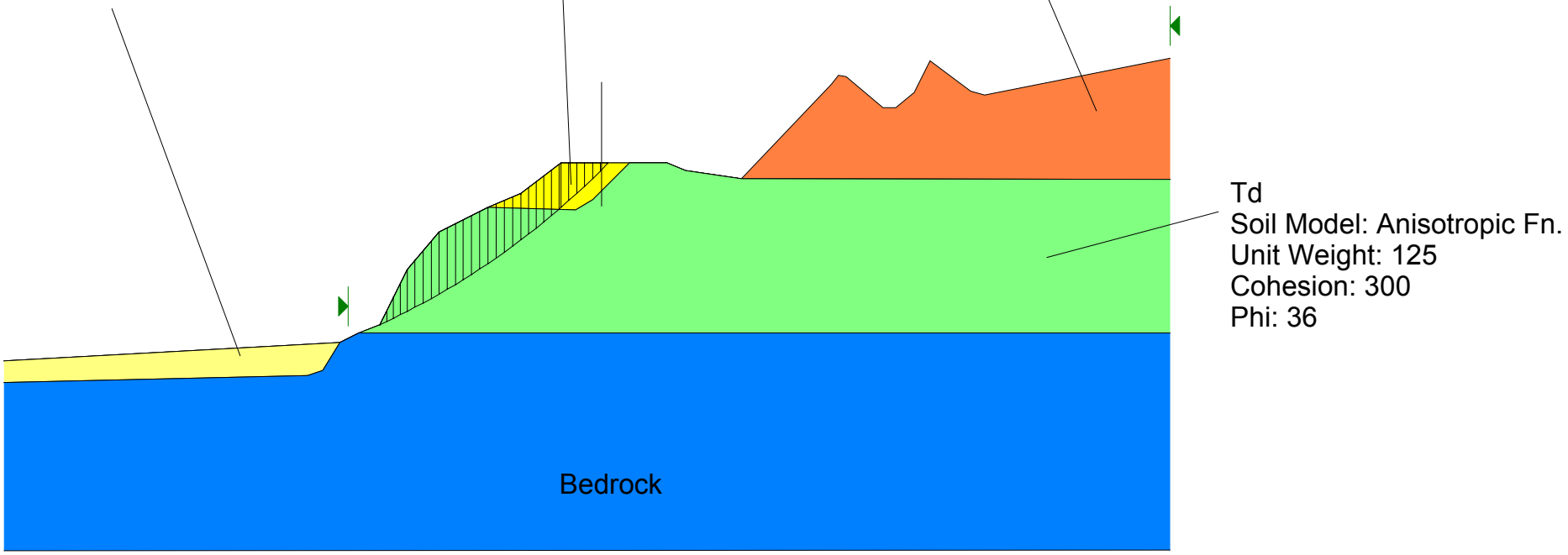


Del Mar Bluffs Cross Section 23-23'
Static Slope Stability Analysis
File Name: Section 2323 Psuedo Static 3.slz
Analysis Method: Bishop

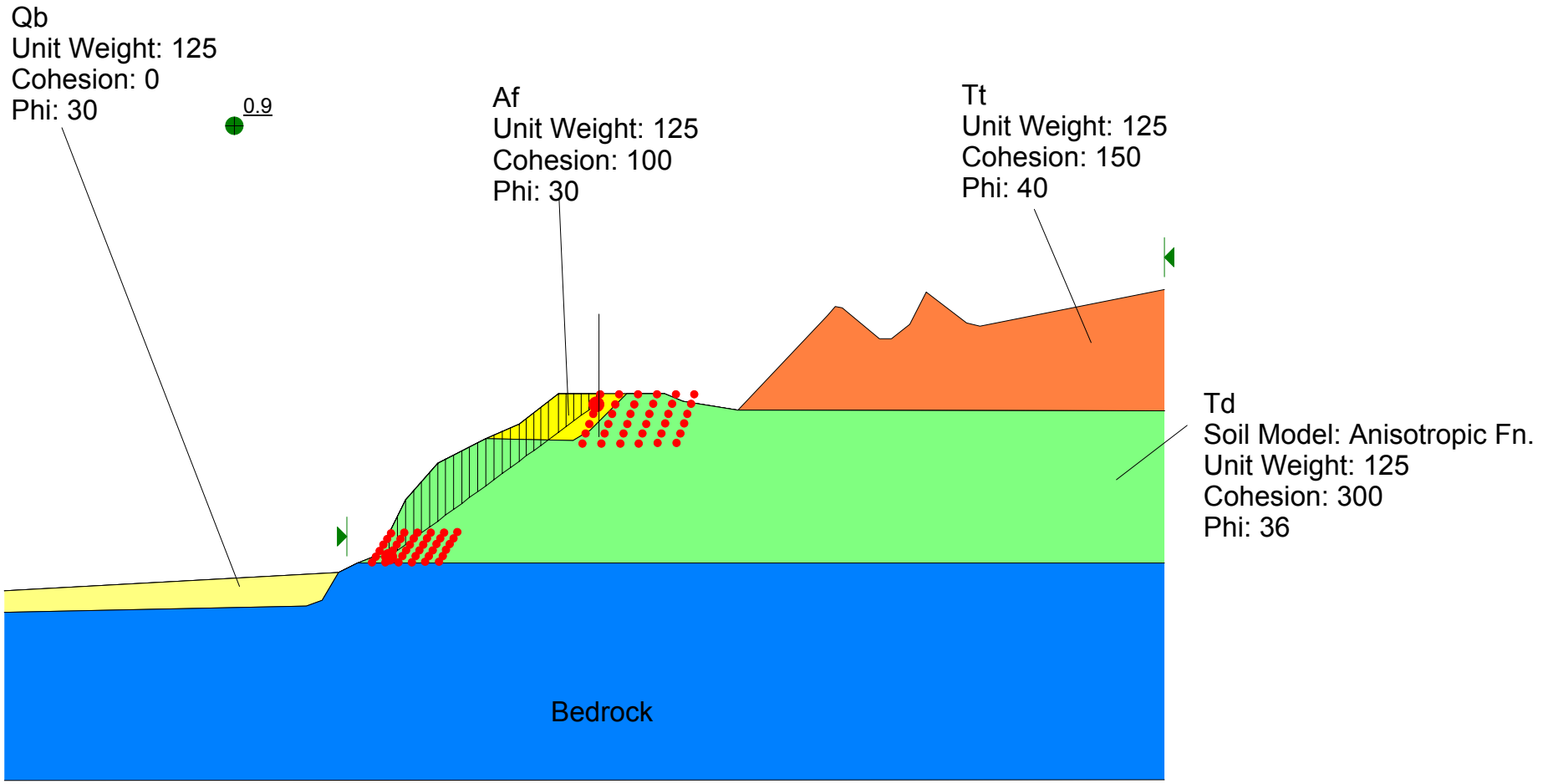
Factor of Safety: 0.93

Seismic Coefficient = 0.28





Del Mar Bluffs Cross Section 23-23'
Static Slope Stability Analysis
File Name: Section 2323 Psuedo Static 4.slz
Analysis Method: Spencer
Factor of Safety: 0.92
Seismic Coefficient = 0.28



Del Mar Bluffs Cross Section 23-23'
Static Slope Stability Analysis
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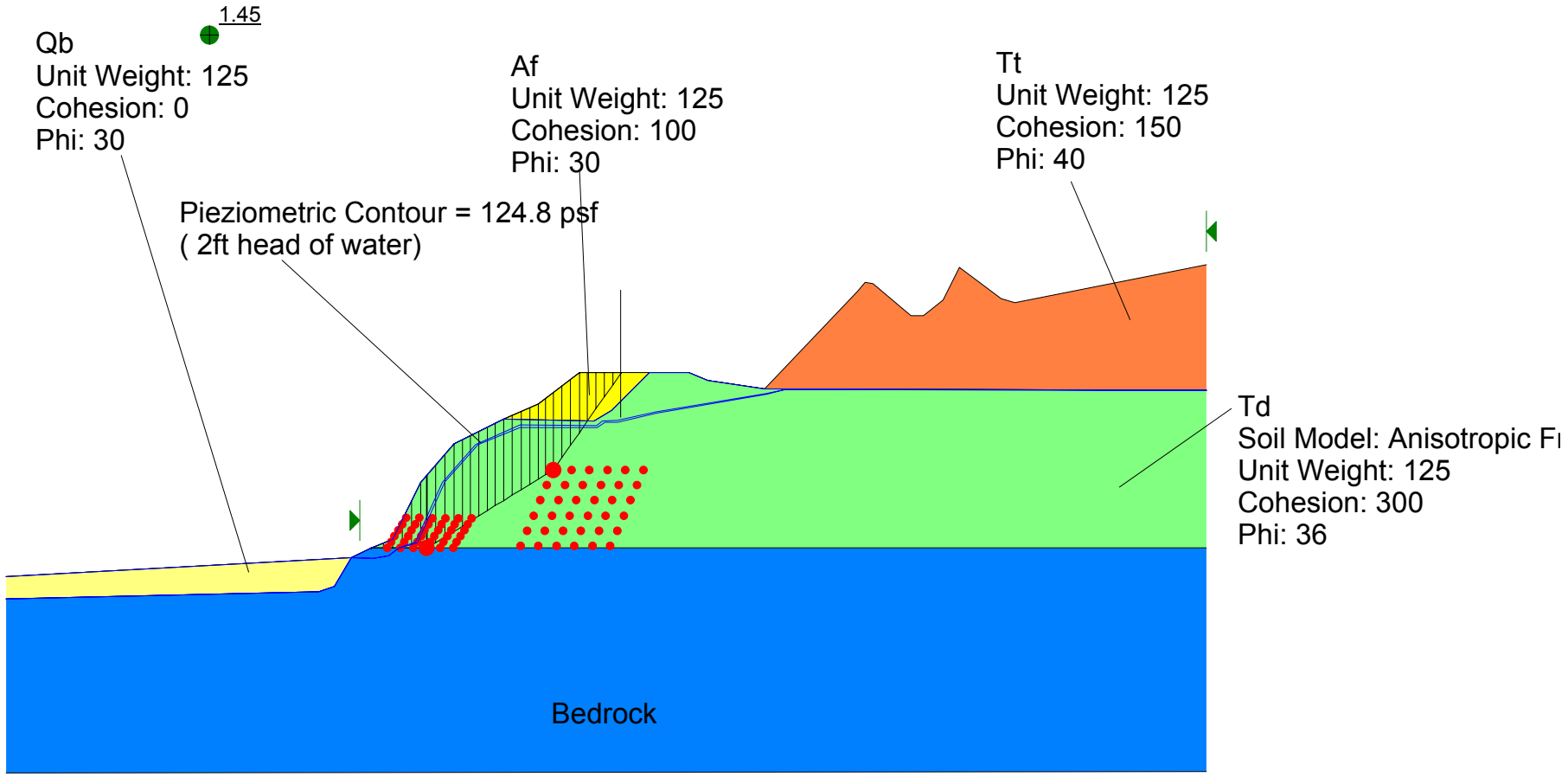
Analysis Method: Spencer

Factor of Safety: 1.45



Del Mar Bluffs Cross Section 23-23'
Static Slope Stability Analysis
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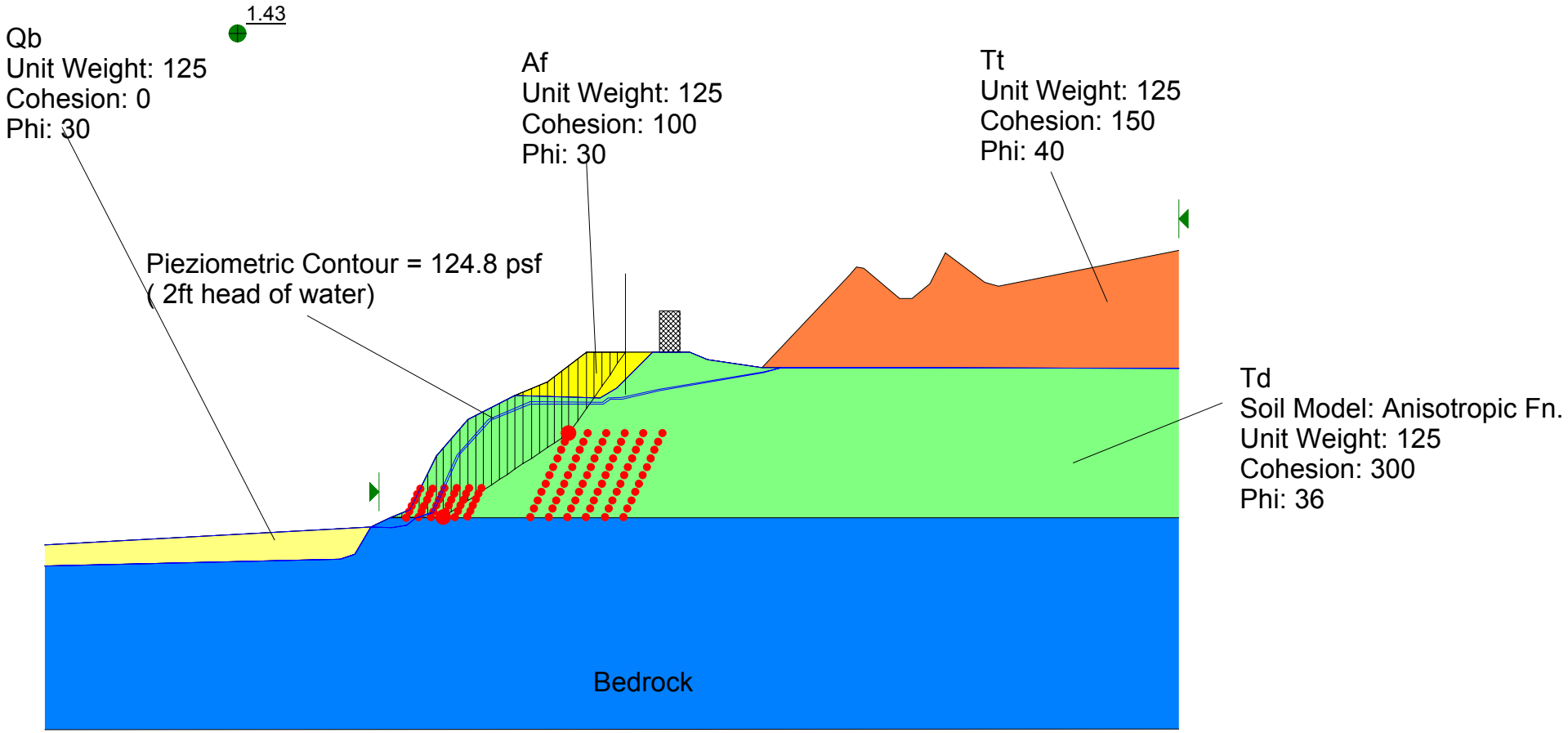
Analysis Method: Spencer

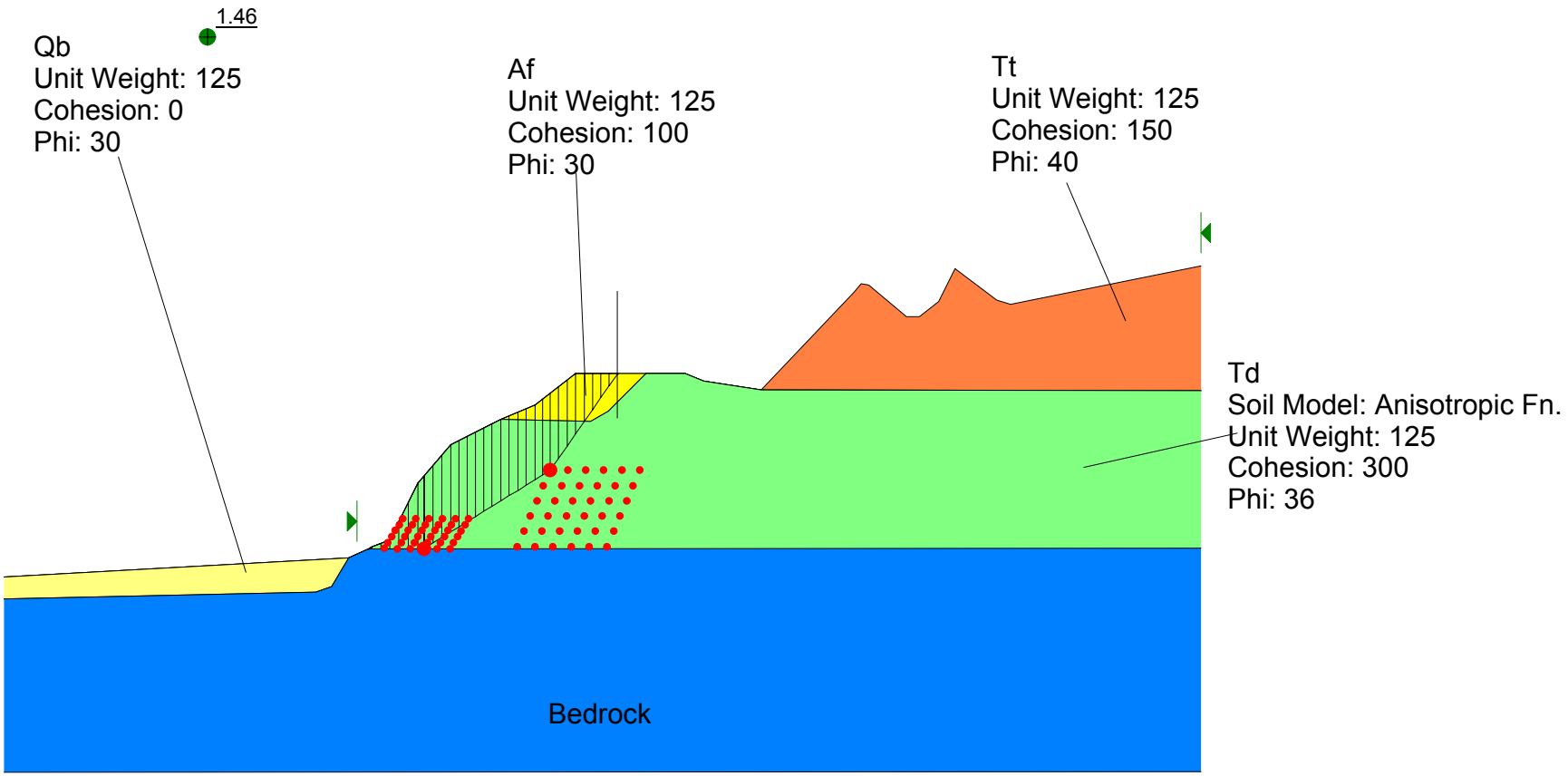
Factor of Safety: 1.43

Surcharge = 3.000 psf

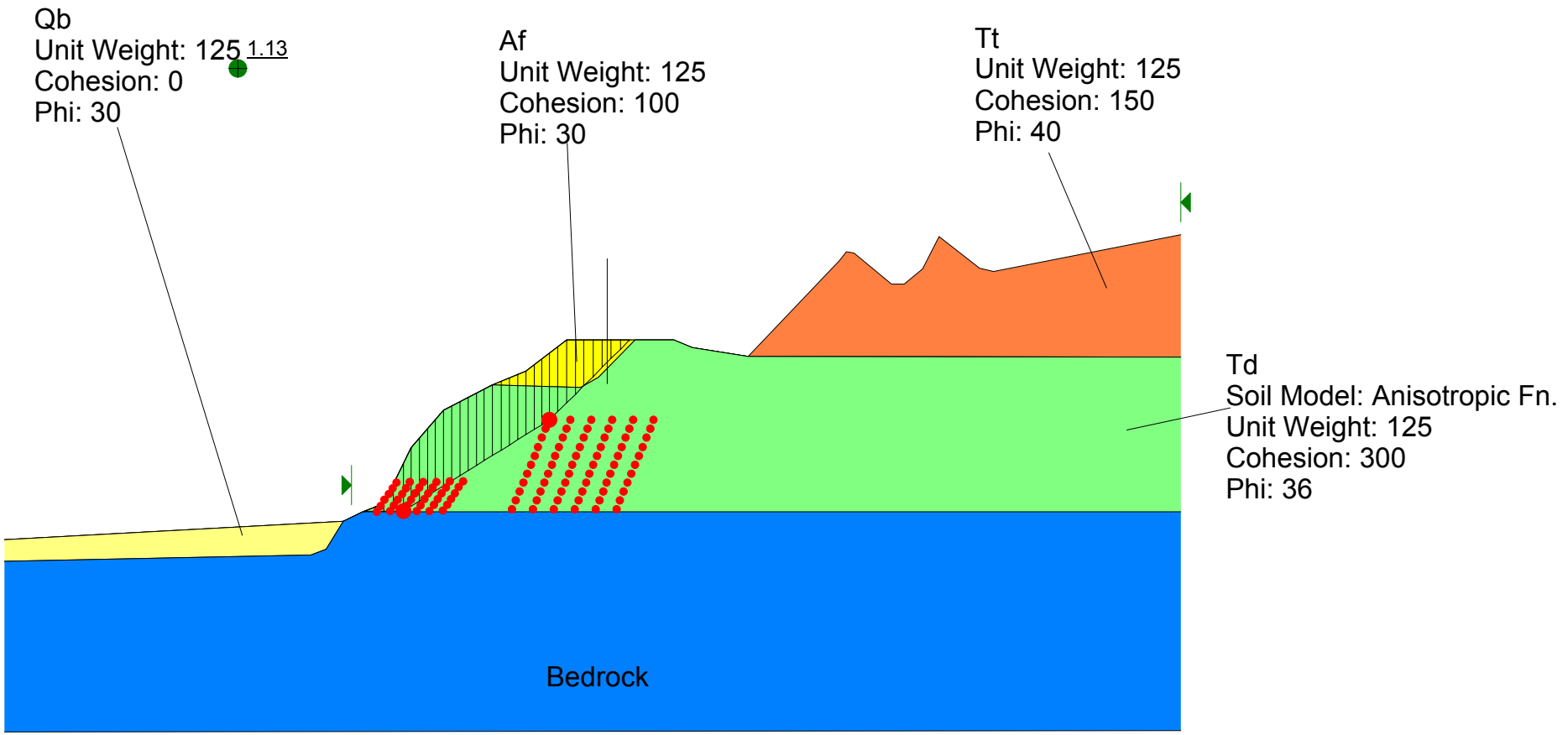


Del Mar Bluffs Cross Section 23-23'
Static Slope Stability Analysis, No Water
File Name: Section 2323 Static 2B No Water.slz
Analysis Method: Spencer

Factor of Safety: 1.46



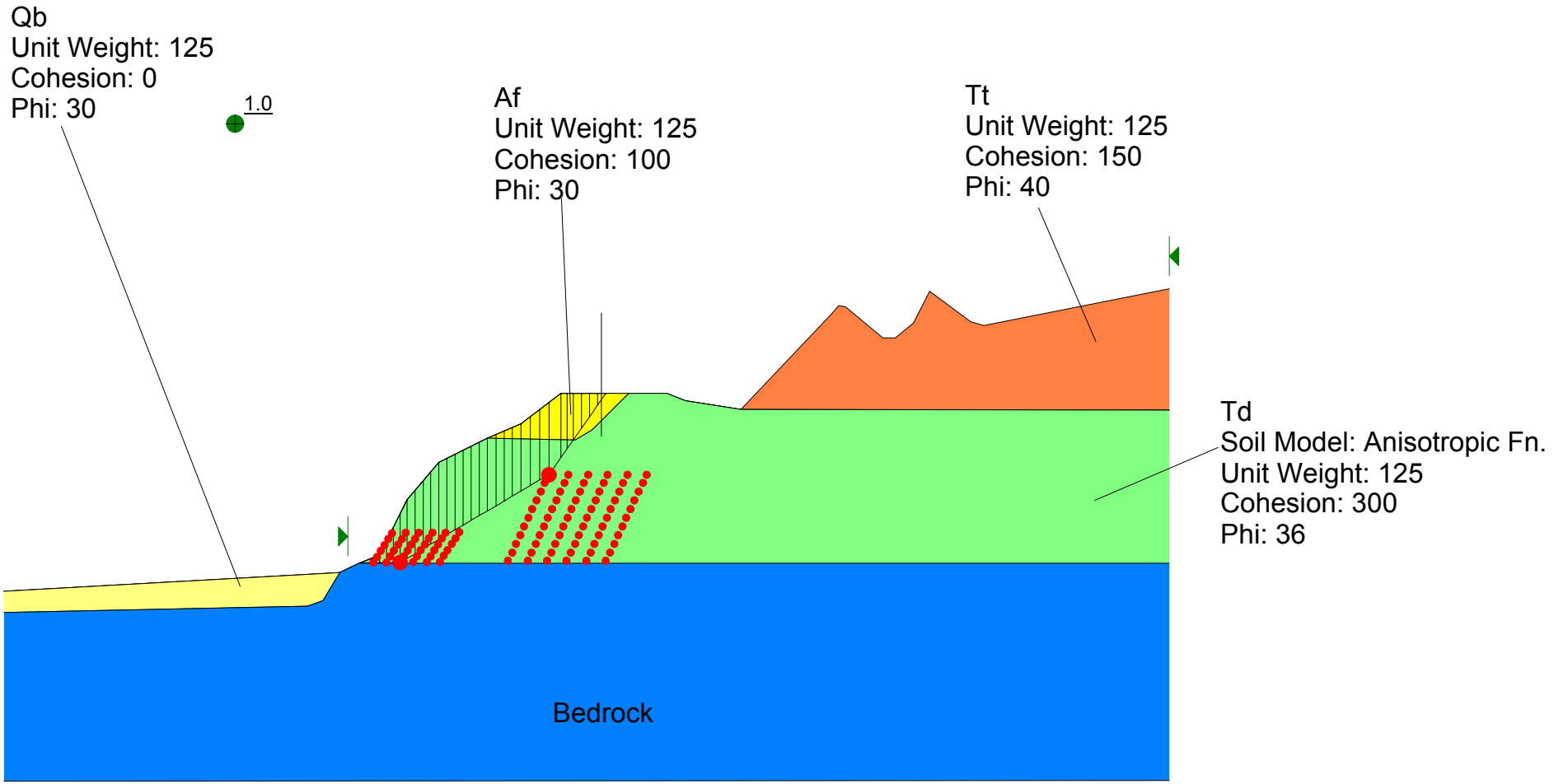
Del Mar Bluffs Cross Section 23-23'
Static Slope Stability Analysis
File Name: Section 2323 Psuedo Static 2B.slz
Analysis Method: Spencer
Factor of Safety: 1.13
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 23-23'
Static Slope Stability Analysis
File Name: Section 2323 Psuedo Static 4B.slz
Analysis Method: Spencer

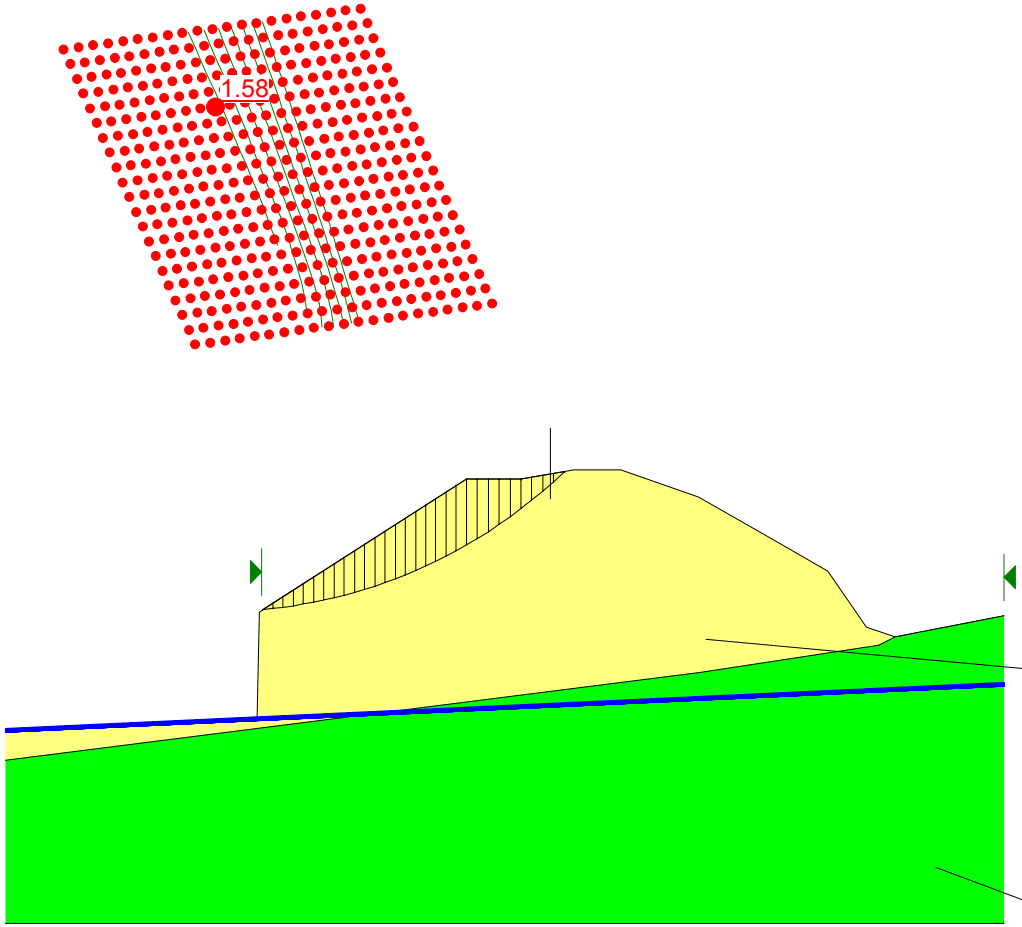
Factor of Safety: 0.96

Seismic Coefficient = 0.28



Cross Section 24-24’

Del Mar Bluffs Cross Section 24-24'
Slope Stability Analysis
File Name: Section 2424 Static 1.slz
Analysis Method: Bishop
Factor of Safety: 1.58



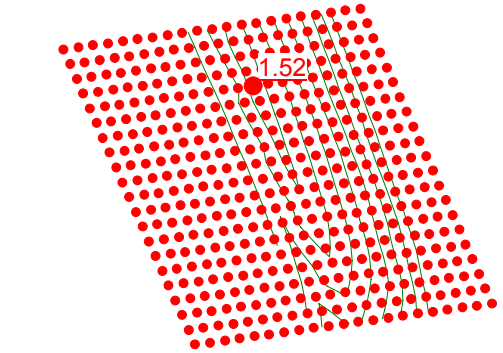
Af
Unit Weight: 125
Cohesion: 100
Phi: 30
Piezometric Line #: 1

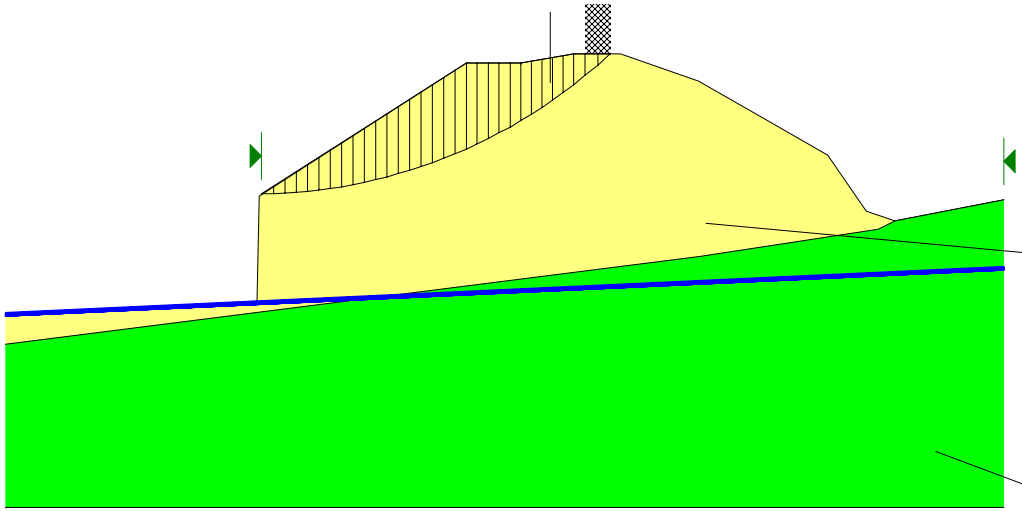
Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36
Piezometric Line #: 1

Del Mar Bluffs Cross Section 24-24'
Slope Stability Analysis
File Name: Section 2424 Static 2.slz
Analysis Method: Bishop

Factor of Safety: 1.52

Surcharge = 3,000 psf



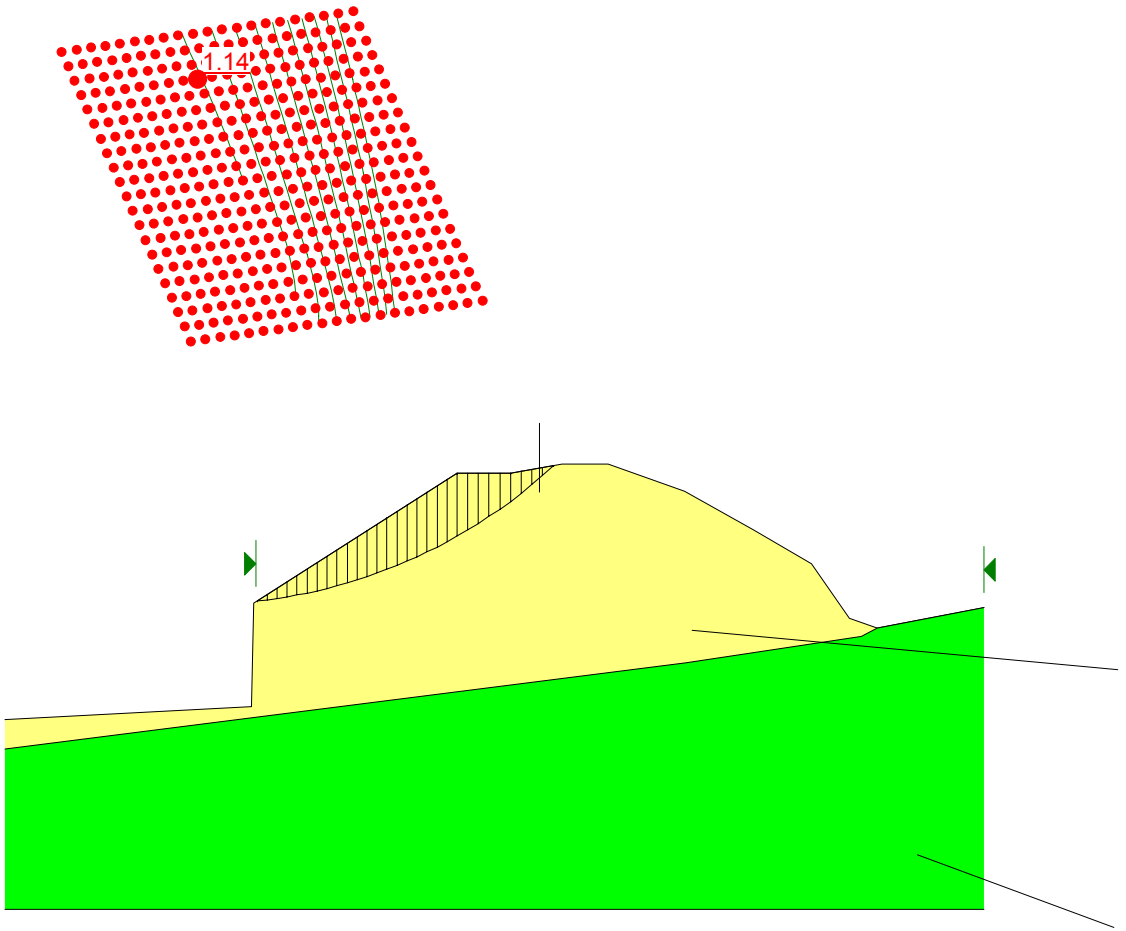


Af
Unit Weight: 125
Cohesion: 100
Phi: 30
Piezometric Line #: 1

Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36
Piezometric Line #: 1

Del Mar Bluffs Cross Section 24-24'
Slope Stability Analysis
File Name: Section 2424 Pseudo Static 1.slz
Analysis Method: Bishop
Factor of Safety: 1.14

Seismic Coefficient = 0.15

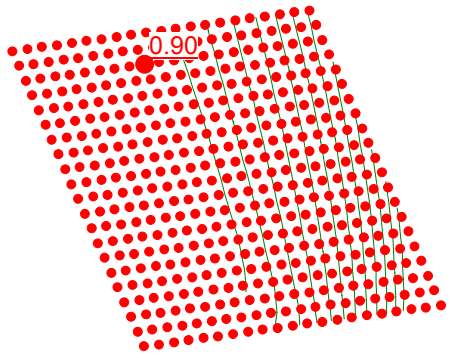


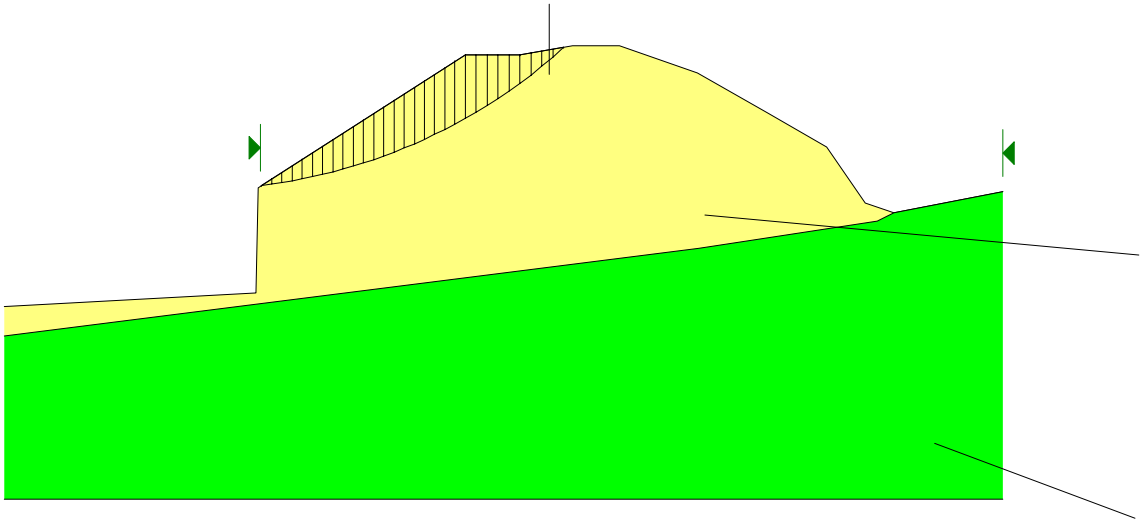
Af
Unit Weight: 125
Cohesion: 100
Phi: 30

Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Del Mar Bluffs Cross Section 24-24'
Slope Stability Analysis
File Name: Section 2424 Pseudo Static 2.slz
Analysis Method: Bishop
Factor of Safety: 0.904

Seismic Coefficient = 0.28





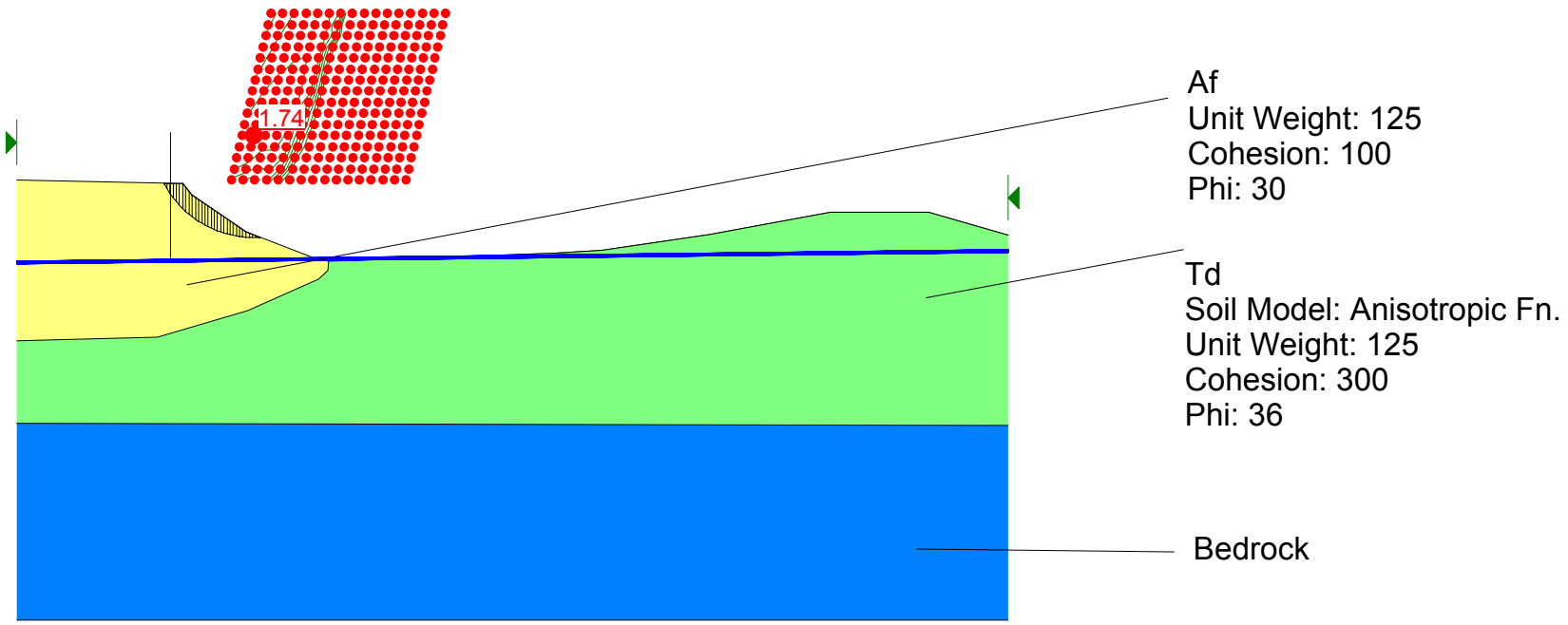
Af
Unit Weight: 125
Cohesion: 100
Phi: 30

Td
Soil Model: Anisotropic Fn.
Unit Weight: 125
Cohesion: 300
Phi: 36

Cross Section 25-25’

Del Mar Bluffs Cross Section 25-25'
Slope Stability Analysis
File Name: Section 2525 Water Static 1.slz
Analysis Method: Bishop

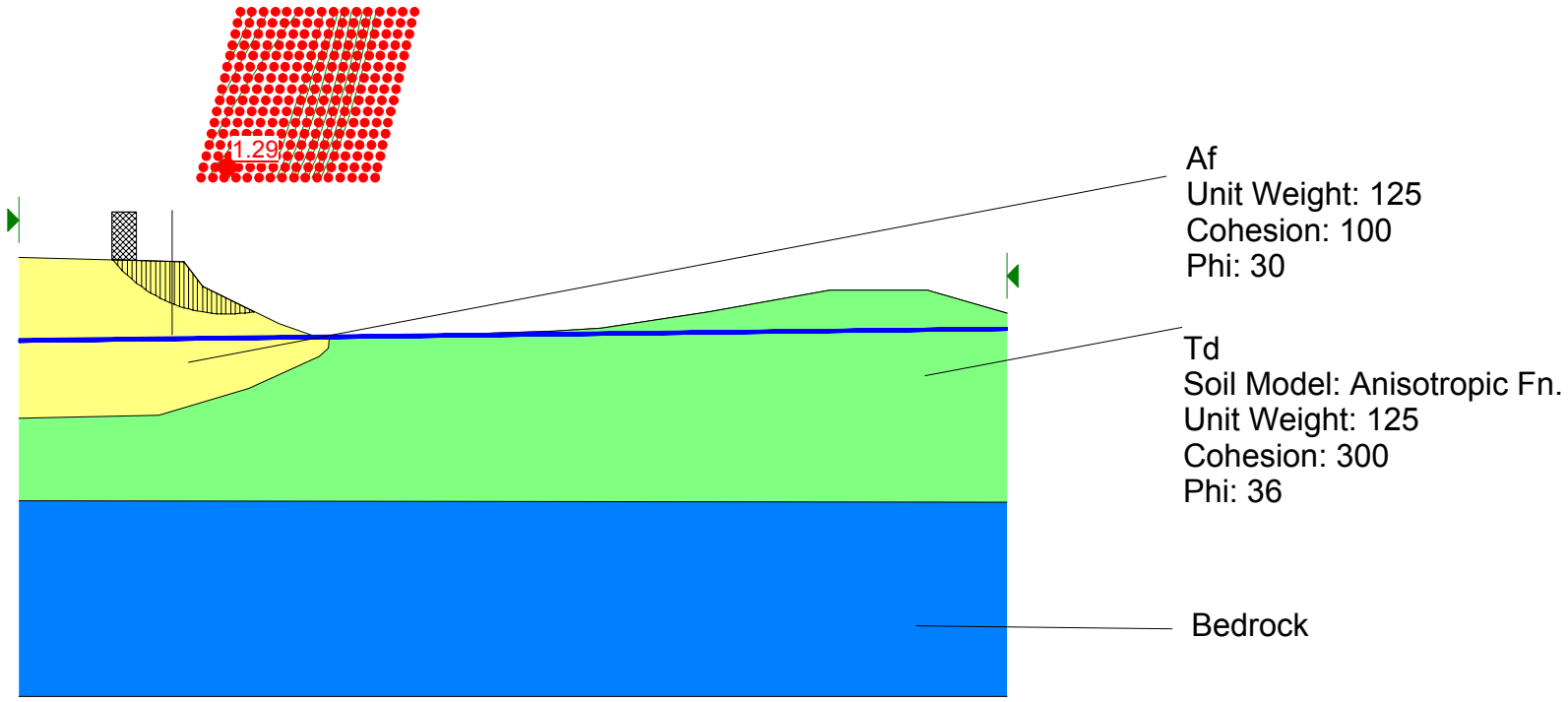
Factor of Safety: 1.74



Del Mar Bluffs Cross Section 25-25'
Slope Stability Analysis
File Name: Section 2525 Water Static 2.slz
Analysis Method: Bishop

Factor of Safety: 1.29

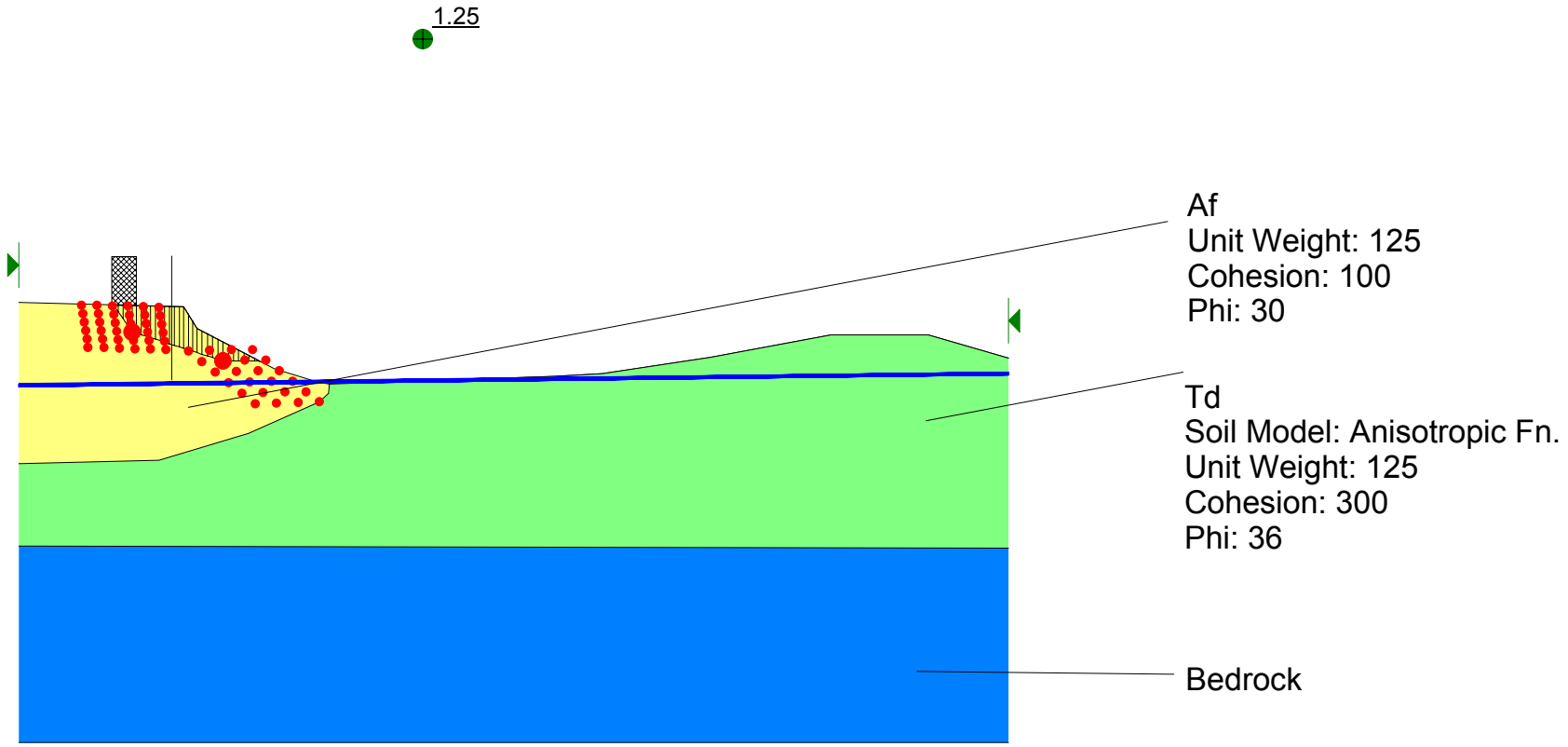
Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 25-25'
Slope Stability Analysis
File Name: Section 2525 Water Static 3.slz
Analysis Method: Spencer

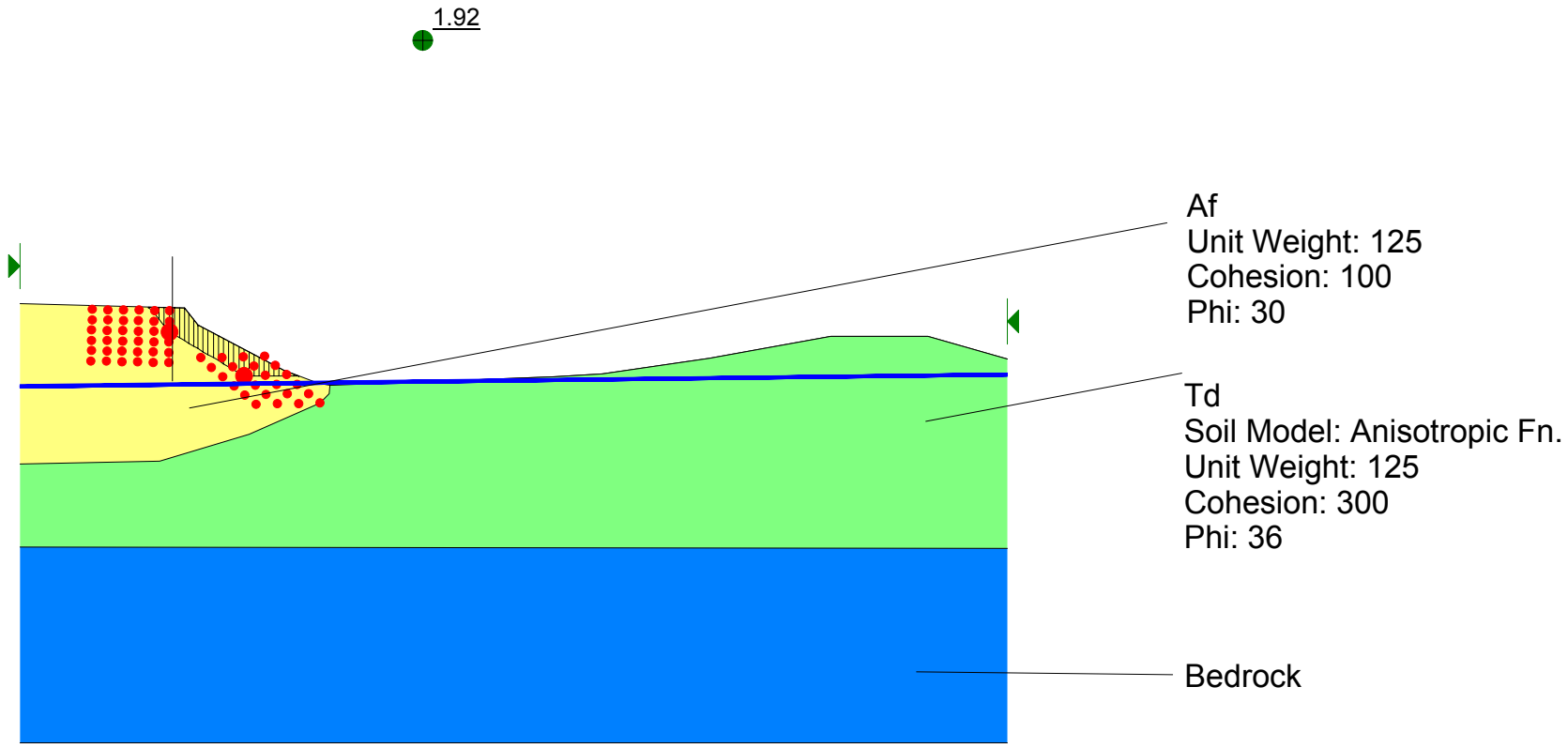
Factor of Safety: 1.25

Surcharge = 3,000 psf



Del Mar Bluffs Cross Section 25-25'
Slope Stability Analysis
File Name: Section 2525 Water Static 4.slz
Analysis Method: Spencer

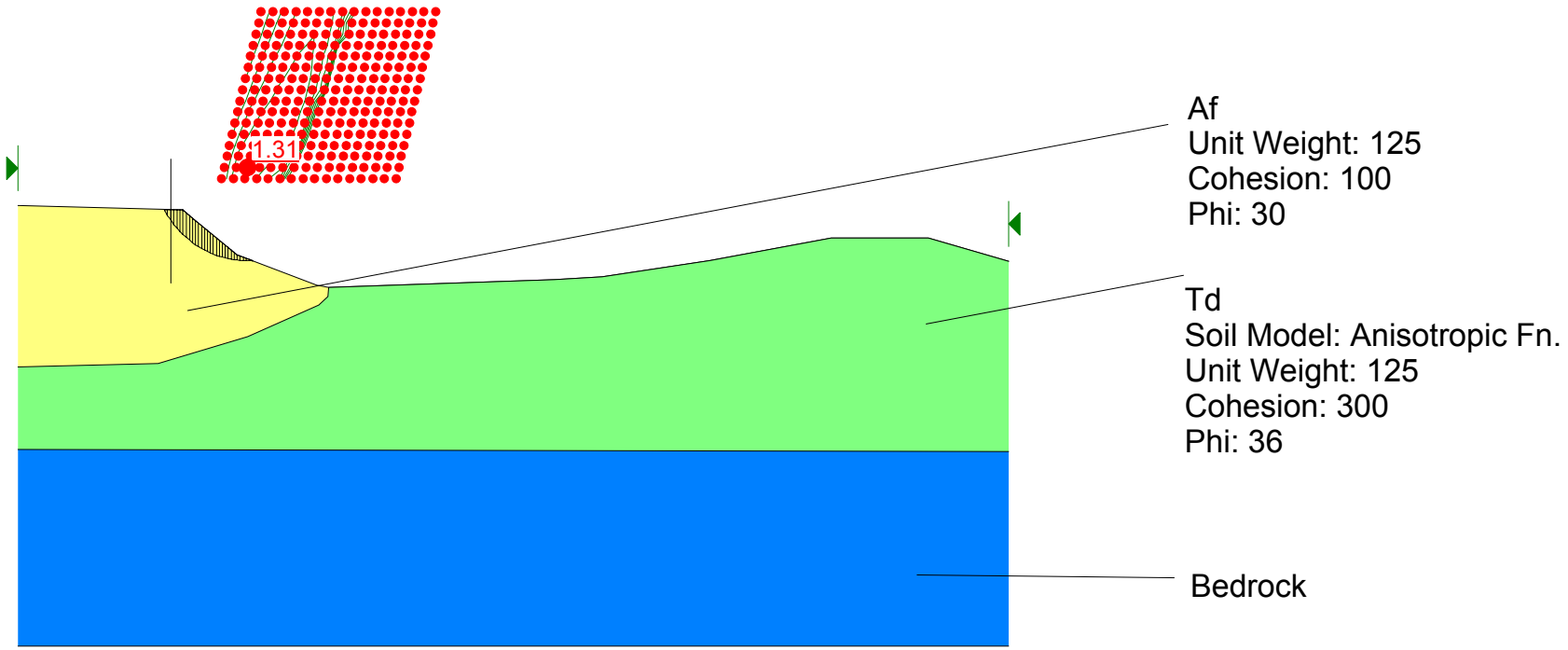
Factor of Safety: 1.92



Del Mar Bluffs Cross Section 25-25'
Slope Stability Analysis
File Name: Section 2525 Psuedo Static Static 1.slz
Analysis Method: Bishop

Factor of Safety: 1.31

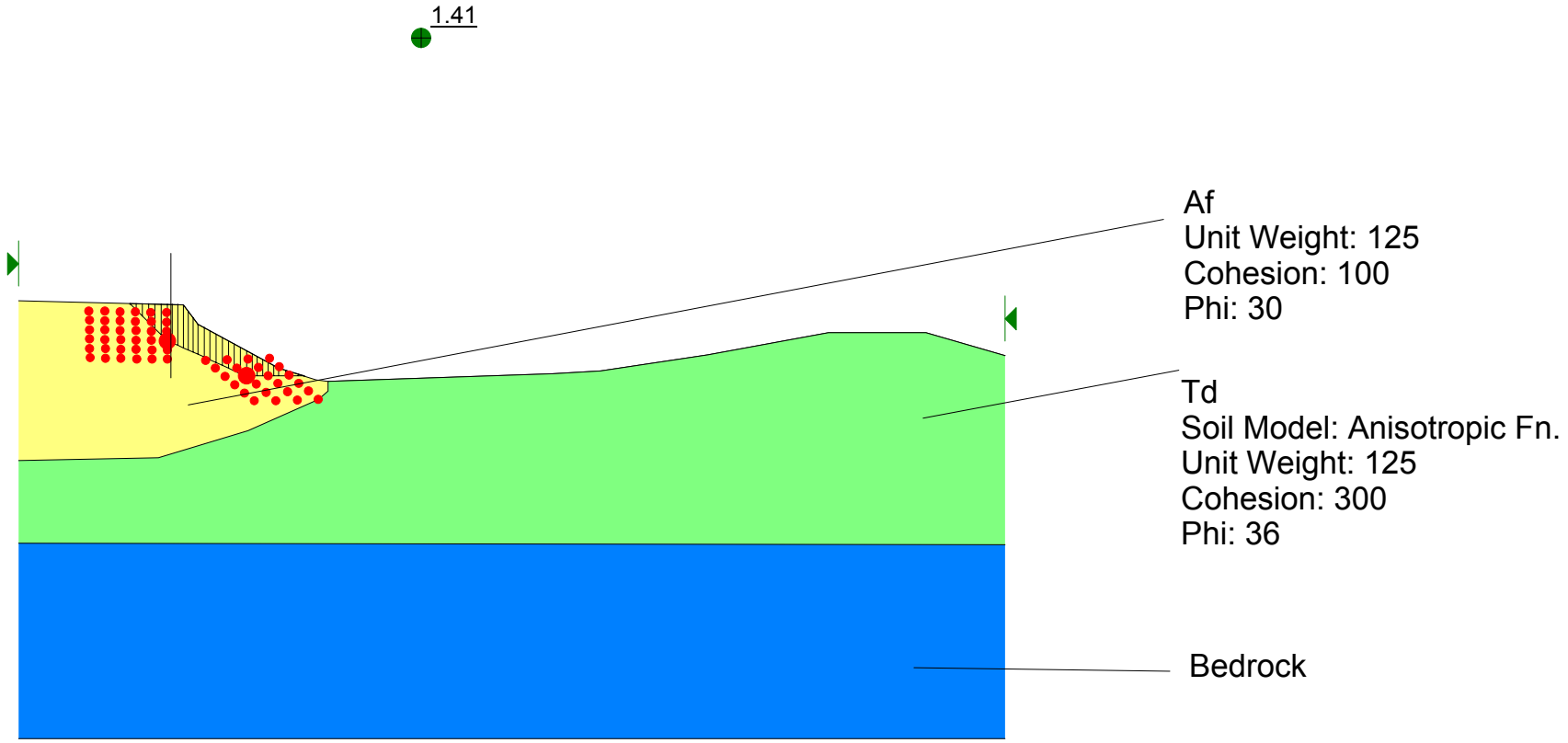
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 25-25'
Slope Stability Analysis
File Name: Section 2552 Psuedo Static Static 2.slz
Analysis Method: Spencer

Factor of Safety: 1.41

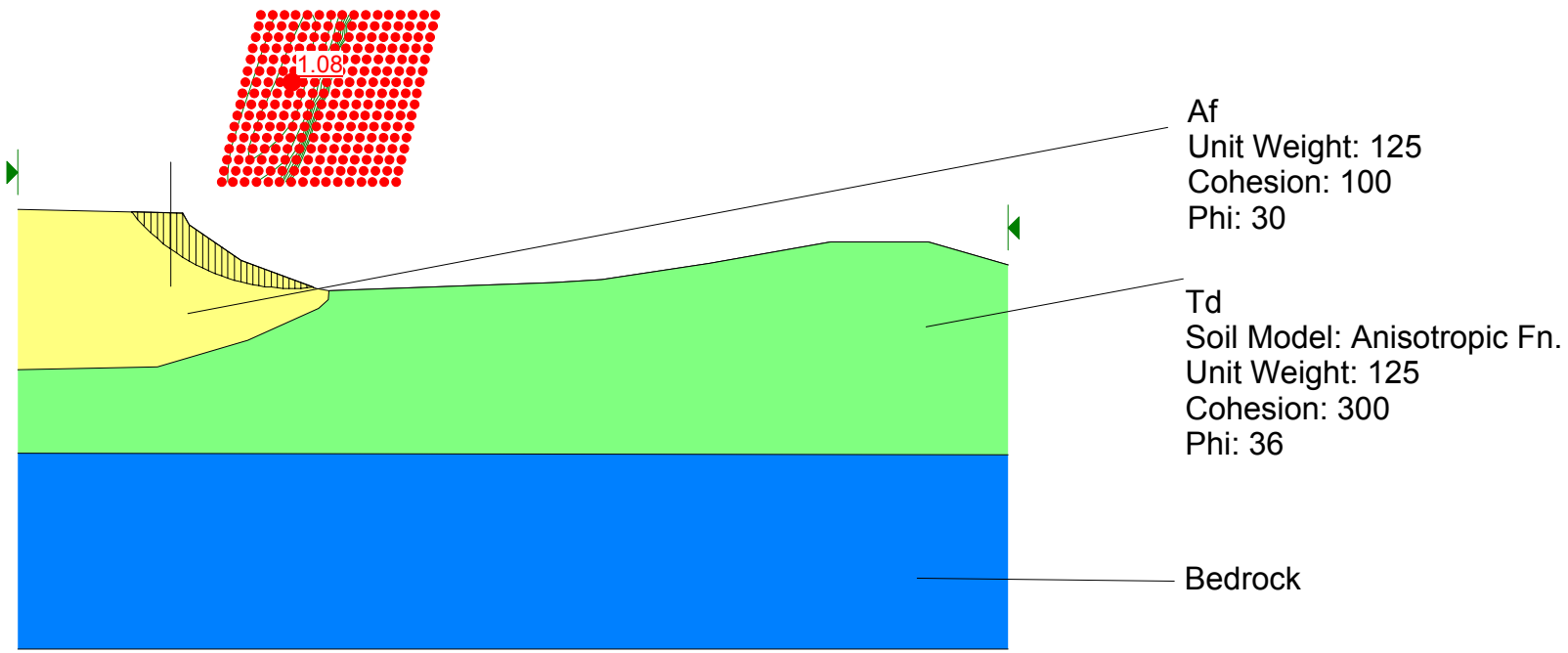
Seismic Coefficient = 0.15



Del Mar Bluffs Cross Section 25-25'
Slope Stability Analysis
File Name: Section 2525 Psuedo Static Static 3.slz
Analysis Method: Bishop

Factor of Safety: 1.08

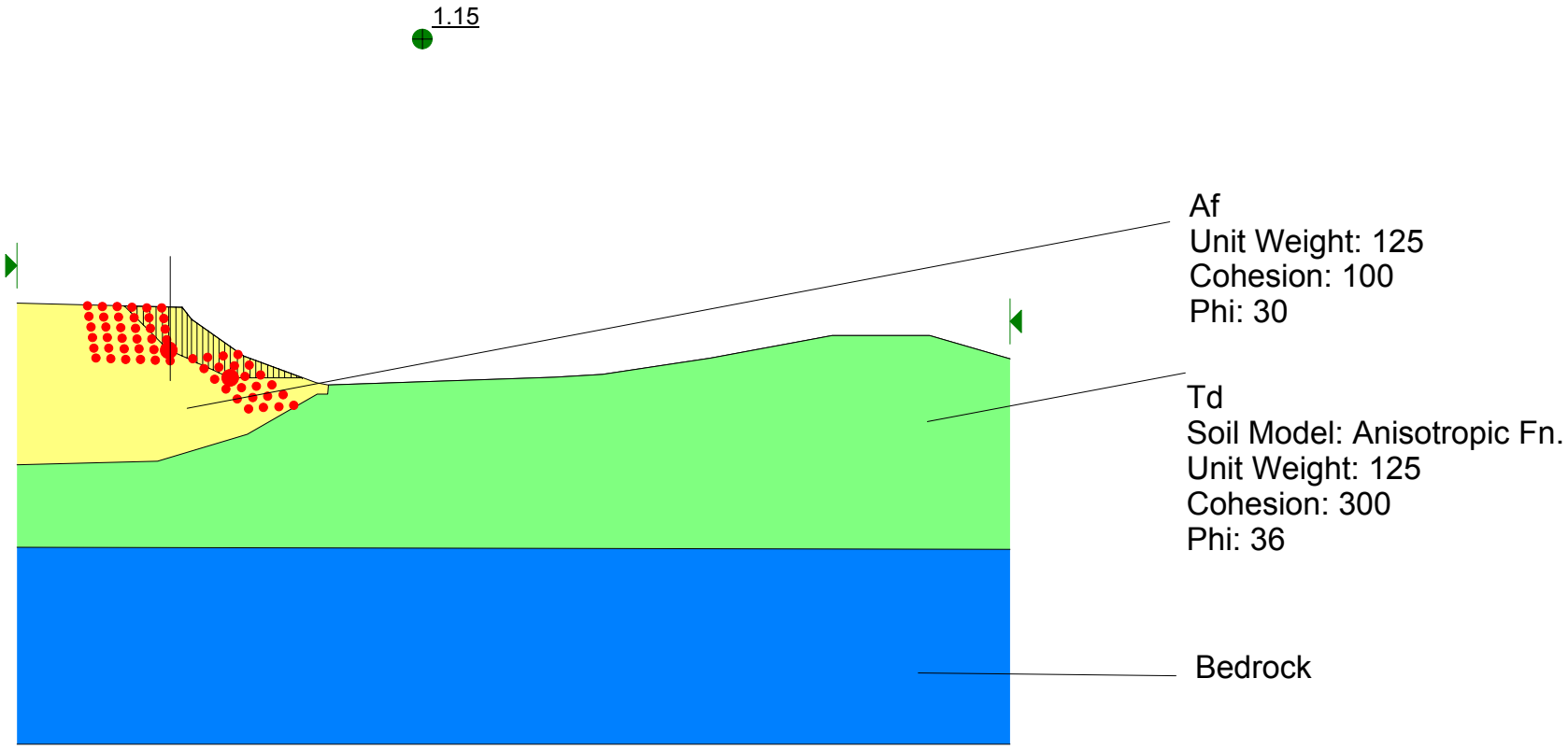
Seismic Coefficient = 0.28



Del Mar Bluffs Cross Section 25-25'
Slope Stability Analysis
File Name: Section 2525 Psuedo Static Static 4.slz
Analysis Method: Spencer

Factor of Safety: 1.15

Seismic Coefficient = 0.28

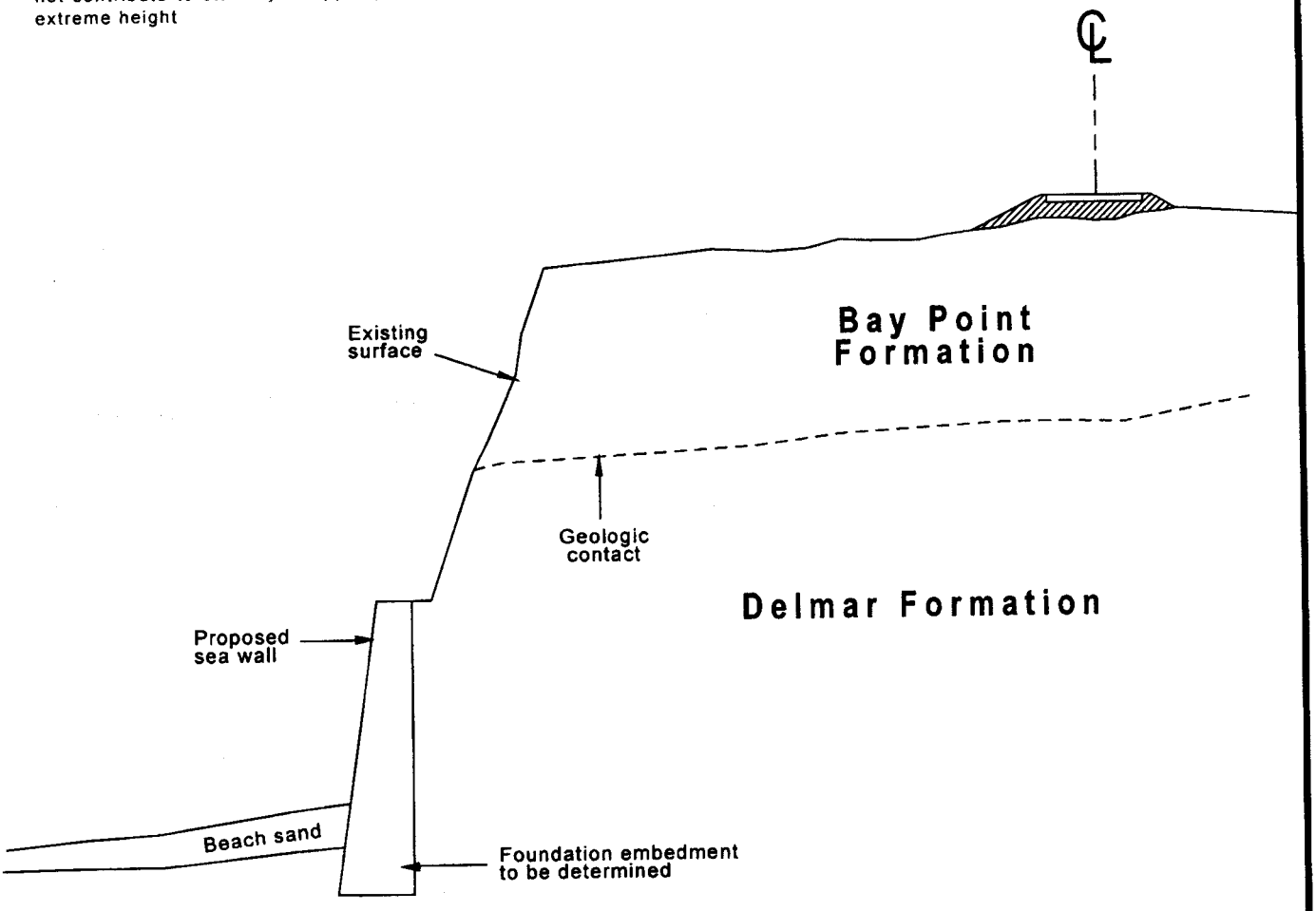


SEA WALL AND SETBACK

Wood or concrete seawalls at base of bluff to halt landward erosion. Walls to be embedded into competent bedrock. May require removal of wall if rail right of way is abandoned.

IMPROVEMENT

Will improve or maintain factor of safety for deep seated stability at toe; will improve surficial stability at lower portion of bluff; may not contribute to stability of upper portion of bluff unless wall is of extreme height



FORM OF MITIGATION

- ☒ Toe
- ☒ Surficial
- ☒ Deep-seated

FIGURE 1: SEA WALL AT BLUFF TOE

Source: *Del Mar Bluffs Geotechnical Study, Part 2: Conceptual Repair Alternatives*, Figure 3. Prepared by Leighton and Associates, Inc. for NCTD. January 2001.

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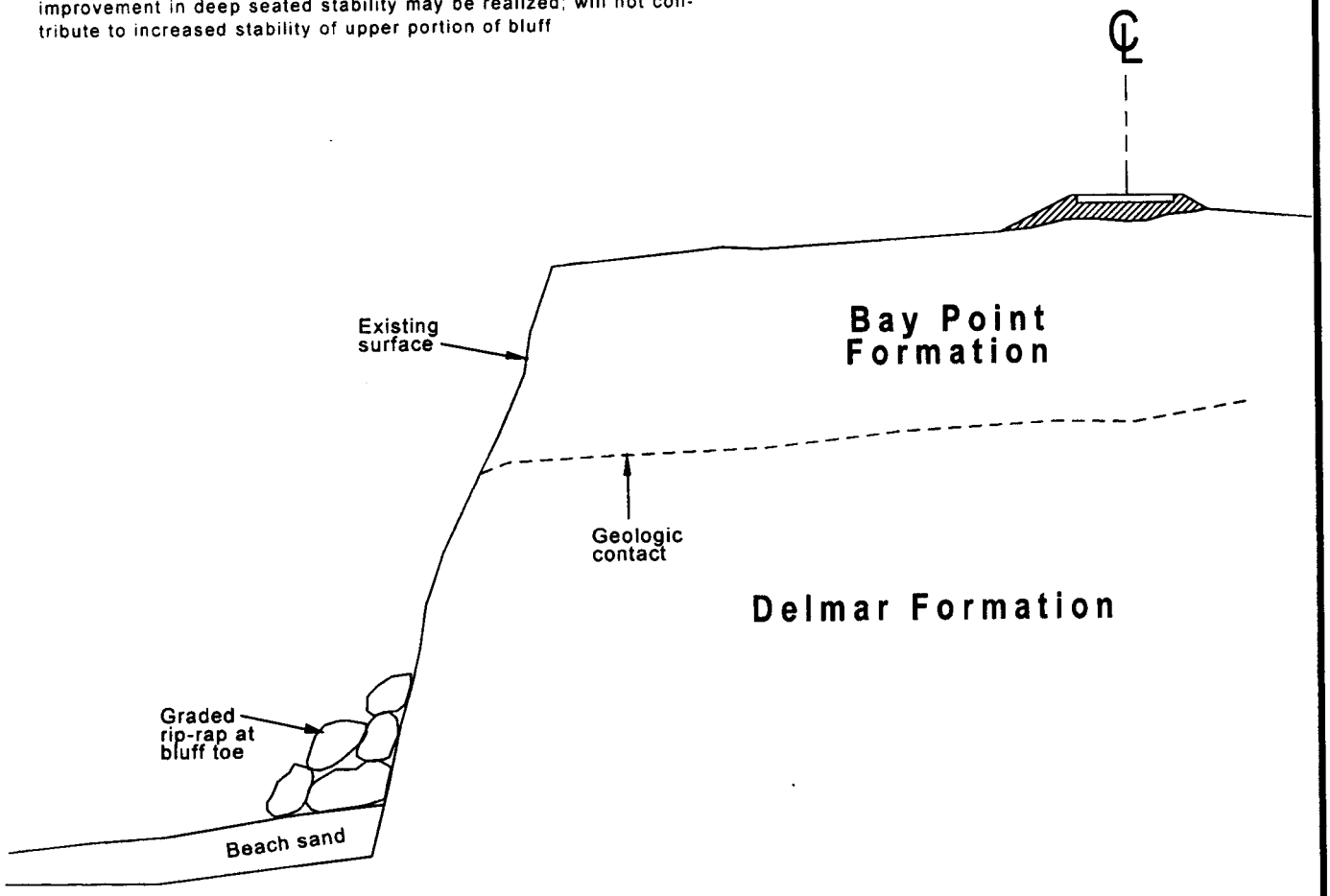
ROCK REVETMENT

Rock revetment at base of bluff to consist of large (2.8 ton) rock placed on geotextile fabric. Will reduce wave energy and bluff erosion. Some maintenance required.

IMPROVEMENT

Will increase surficial stability of toe area by reducing potential for continued erosion, with large amounts of rip-rap for a minor improvement in deep seated stability may be realized; will not contribute to increased stability of upper portion of bluff



FORM OF MITIGATION

- ☒ Toe
- ☒ Surficial
- ☐ Deep-seated

FIGURE 2: ROCK REVETMENT (RIP-RAP AT BLUFF TOE)

Source: *Del Mar Bluffs Geotechnical Study, Part 2: Conceptual Repair Alternatives*, Figure 4. Prepared by Leighton and Associates, Inc. for NCTD. January 2001.

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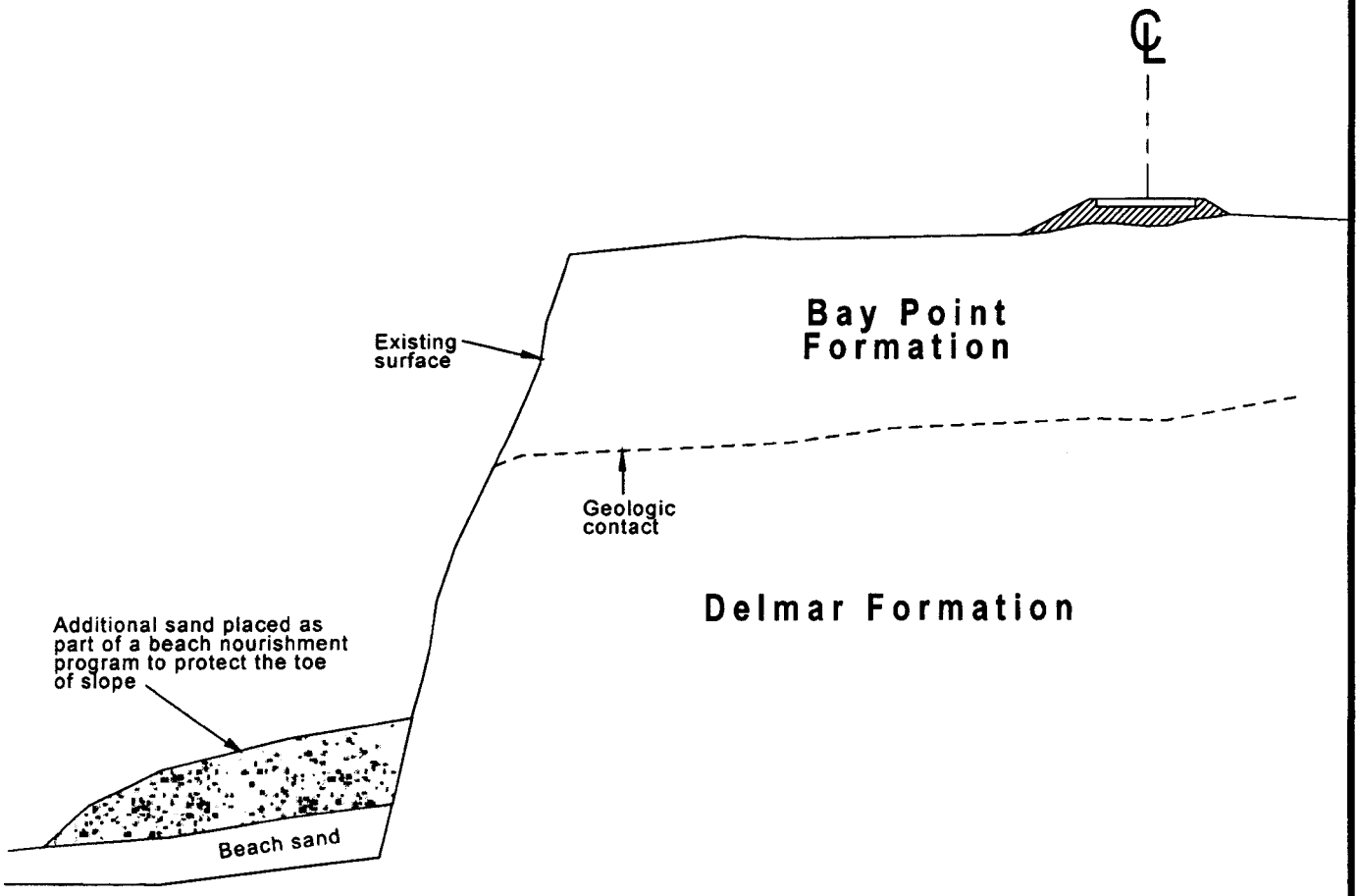
BEACH NOURISHMENT

Additional sand placed on beach to protect toe of slope. Sand placement will be subject to seasonal migration of sand and should be considered short term. Will require additional sand as erosion occurs.

IMPROVEMENT

Will add a buffer to erosion at toe; no measureable increase in factor of safety.



FORM OF MITIGATION

- [x] Toe
- [ ] Surficial
- [ ] Deep-seated

FIGURE 3: BEACH NOURISHMENT

Source: *Del Mar Bluffs Geotechnical Study, Part 2: Conceptual Repair Alternatives*, Figure 5. Prepared by Leighton and Associates, Inc. for NCTD. January 2001.

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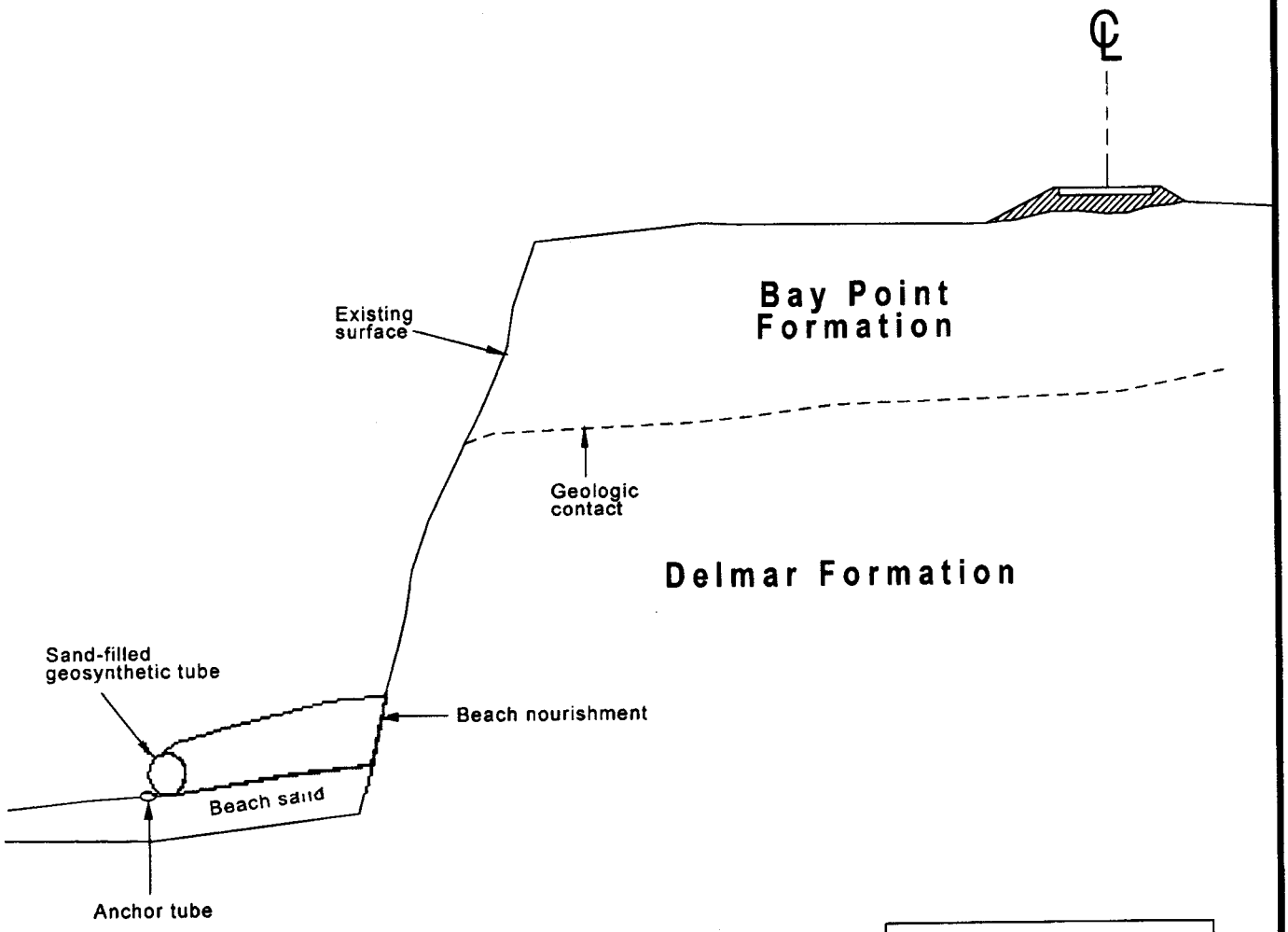
BEACH NOURISHMENT WITH GEOSYNTHETIC TUBE

Sand placed as toe protection as shown on Figure No. 5. Geosynthetic tube (longard tube) to protect minimize depletion of sand.

IMPROVEMENT

Will reduce potential for erosion at toe; no measurable increase in factor of safety.



FORM OF MITIGATION

- ☒ Toe
- ☐ Surficial
- ☐ Deep-seated

FIGURE 4: BEACH NOURISHMENT WITH GEOSYNTHETIC TUBE

Source: *Del Mar Bluffs Geotechnical Study, Part 2: Conceptual Repair Alternatives*, Figure 6. Prepared by Leighton and Associates, Inc. for NCTD. January 2001.

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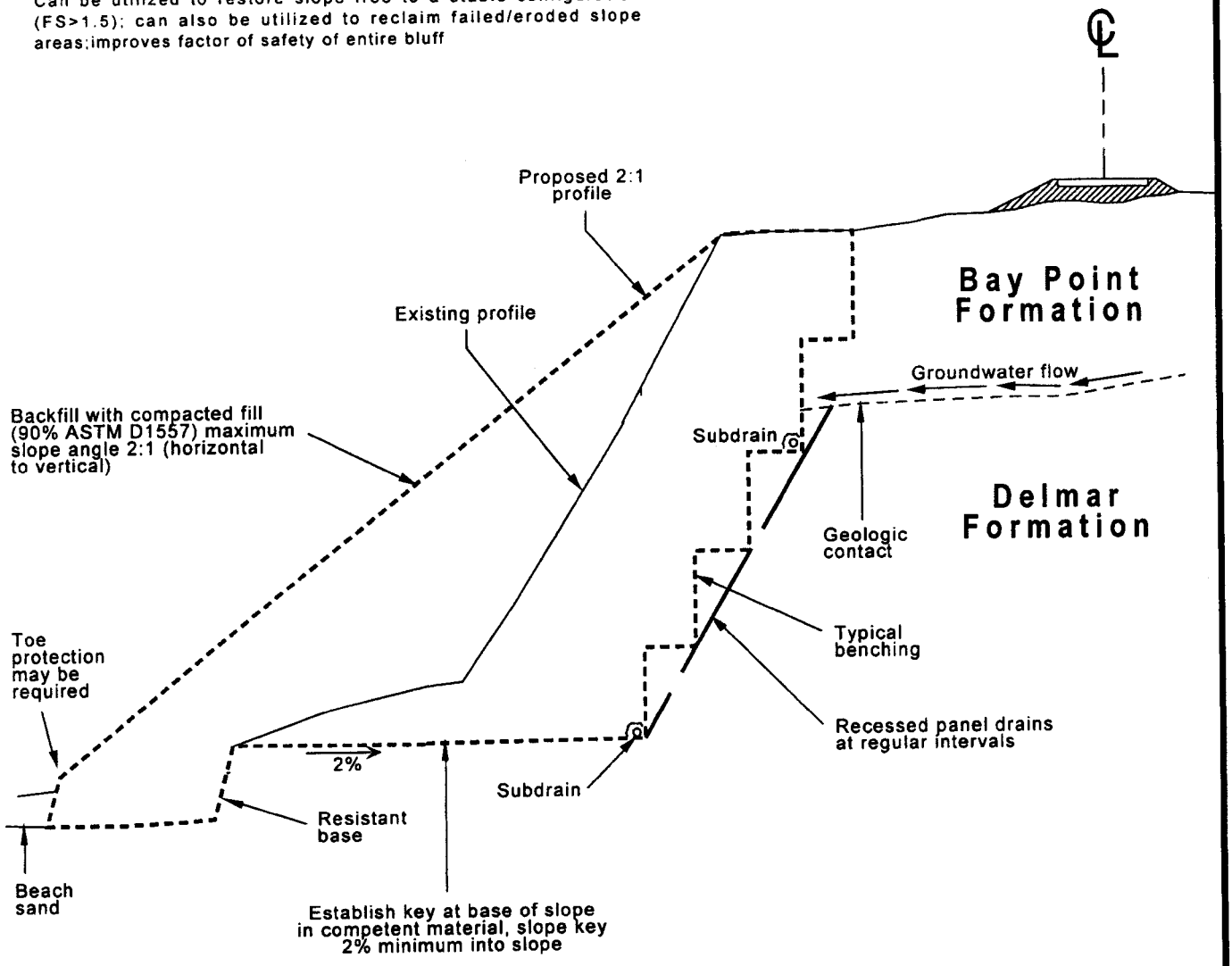
SLOPE GRADING

Regrade slope to flatter gradient to remove fractures and to provide support for oversteepened areas.

IMPROVEMENT

Can be utilized to restore slope free to a stable configuration (FS>1.5); can also be utilized to reclaim failed/eroded slope areas;improves factor of safety of entire bluff



FORM OF MITIGATION

- ☒ Toe
- ☒ Surficial
- ☒ Deep-seated

FIGURE 5: SLOPE GRADING

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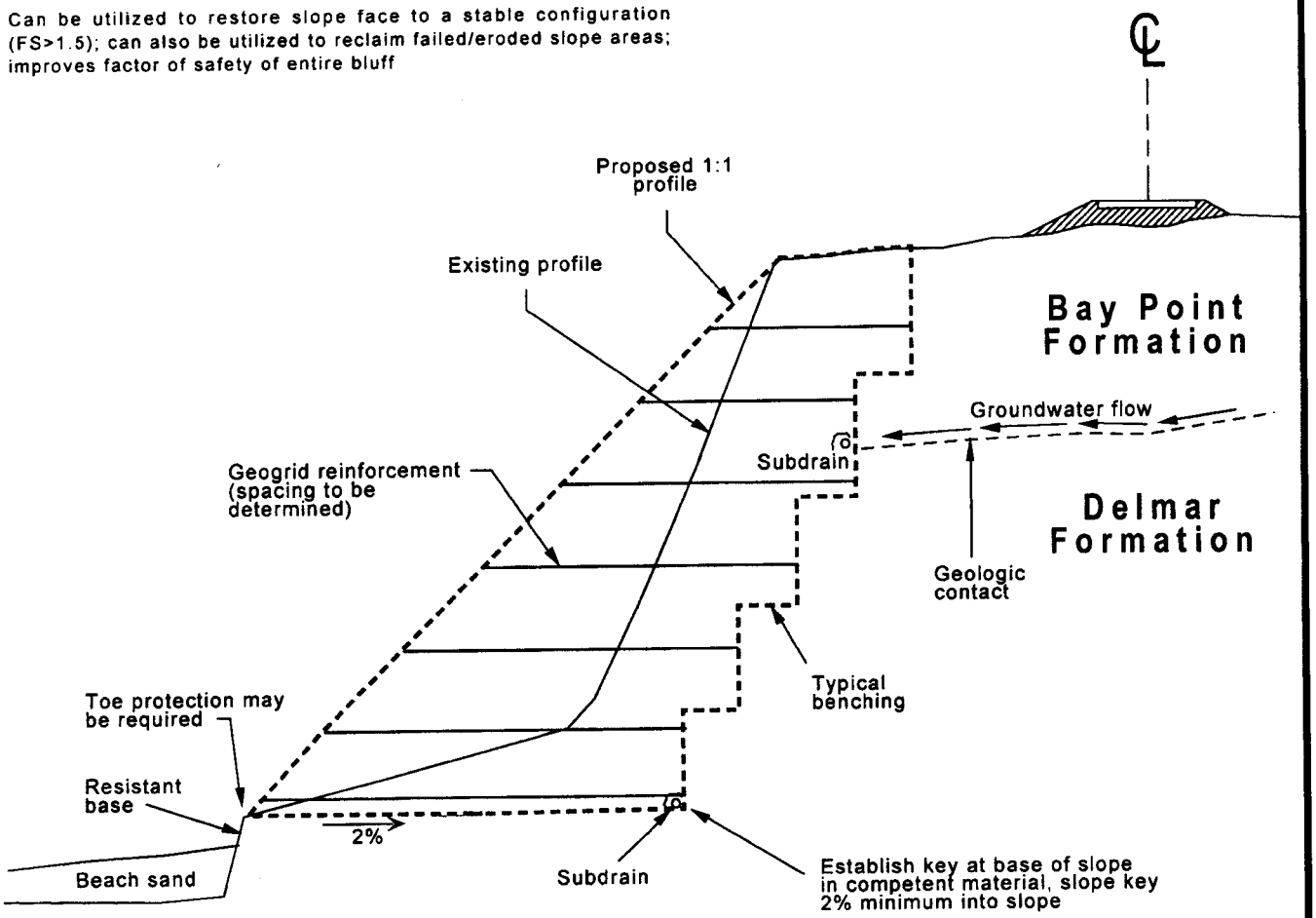
Source: *Del Mar Bluffs Geotechnical Study, Part 2: Conceptual Repair Alternatives*, Figure 7. Prepared by Leighton and Associates, Inc. for NCTD. January 2001.

SLOPE GRADING WITH GEOGRID

Backfill with geogrid reinforced soil 1:1 (horizontal to vertical) maximum slope angle.

IMPROVEMENT

Can be utilized to restore slope face to a stable configuration (FS>1.5); can also be utilized to reclaim failed/eroded slope areas; improves factor of safety of entire bluff



FORM OF MITIGATION

- ☒ Toe
- ☒ Surficial
- ☒ Deep-seated

FIGURE 6: SLOPE GRADING WITH GEOGRID

Source: *Del Mar Bluffs Geotechnical Study, Part 2: Conceptual Repair Alternatives*, Figure 8. Prepared by Leighton and Associates, Inc. for NCTD. January 2001.

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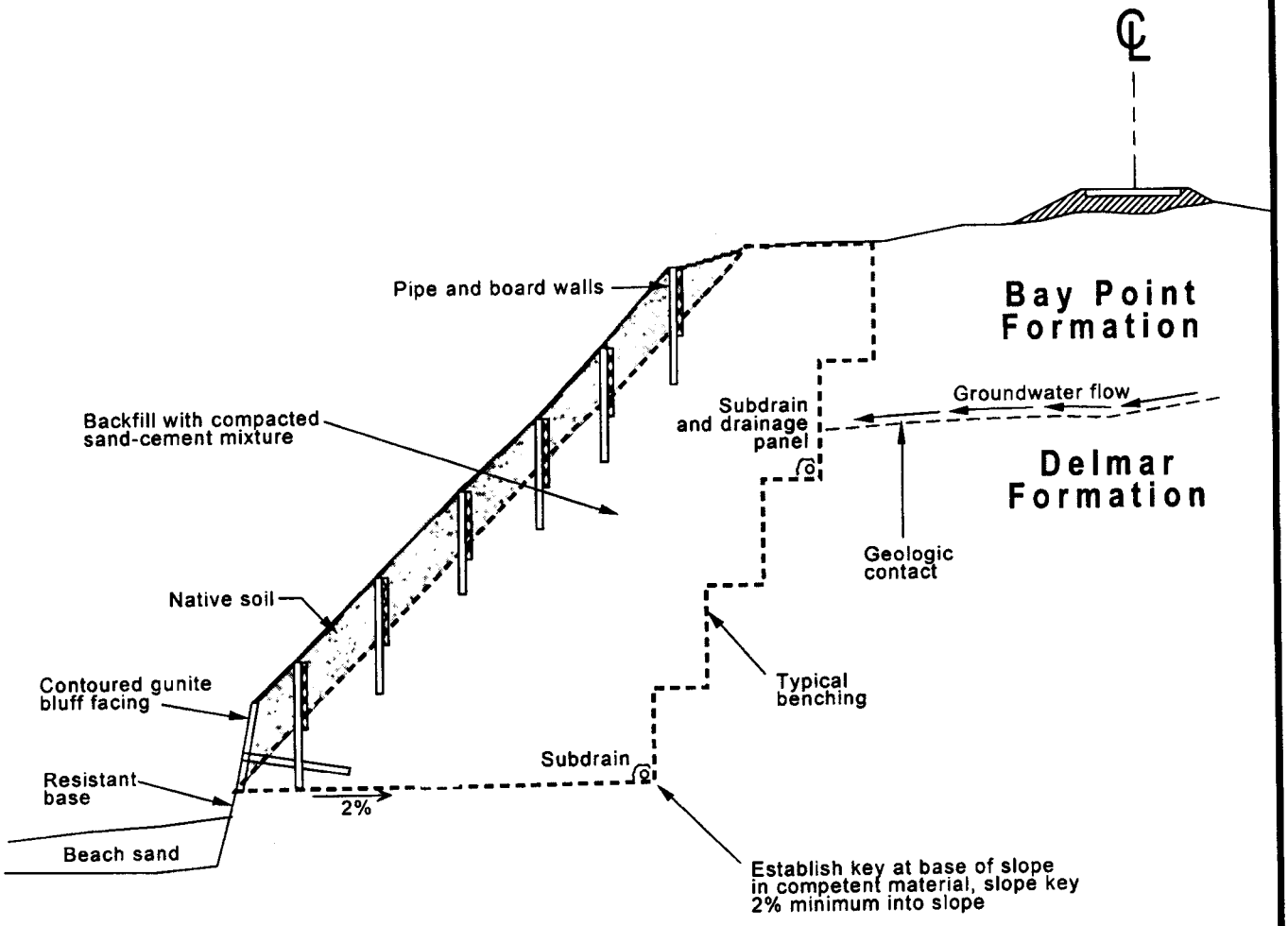
SLOPE GRADING WITH SOIL CEMENT

Backfill with soil-cement or sand-cement mixture, 1:1 (horizontal to vertical) maximum slope angle for soil cement mixture. Pipe and board walls to retain plantable soil on slope face are optional.

IMPROVEMENT

Can be utilized to restore slope face to a stable configuration (FS>1.5); can also be utilized to reclaim failed/eroded slope areas; improves factor of safety of entire bluff



FORM OF MITIGATION

- ☒ Toe
- ☒ Surficial
- ☒ Deep-seated

FIGURE 7: SLOPE GRADING WITH SOIL CEMENT

Source: *Del Mar Bluffs Geotechnical Study, Part 2: Conceptual Repair Alternatives*, Figure 9. Prepared by Leighton and Associates, Inc. for NCTD. January 2001.

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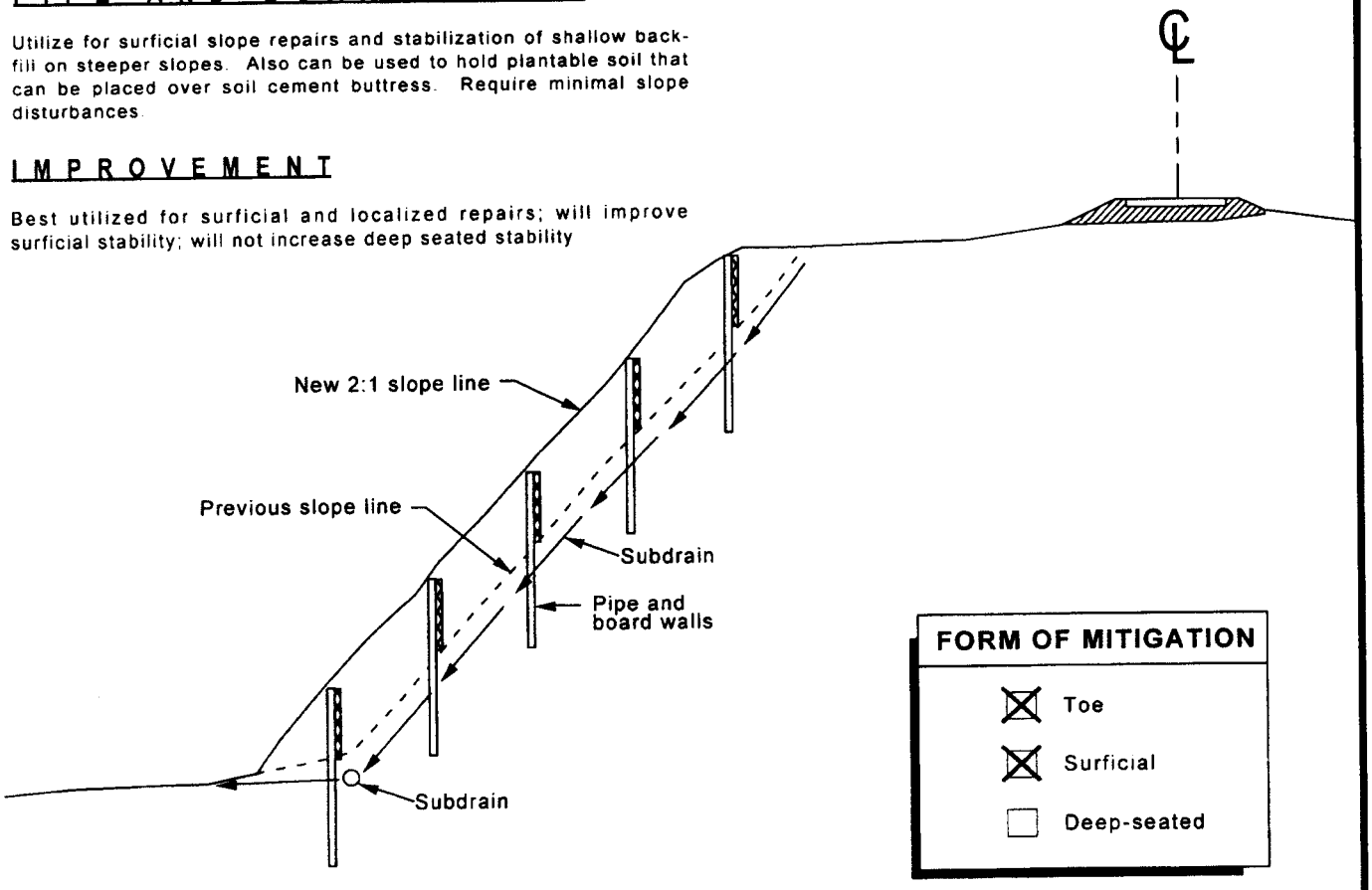
PIPE AND BOARD WALLS

Utilize for surficial slope repairs and stabilization of shallow backfill on steeper slopes. Also can be used to hold plantable soil that can be placed over soil cement buttress. Require minimal slope disturbances.

IMPROVEMENT

Best utilized for surficial and localized repairs; will improve surficial stability; will not increase deep seated stability



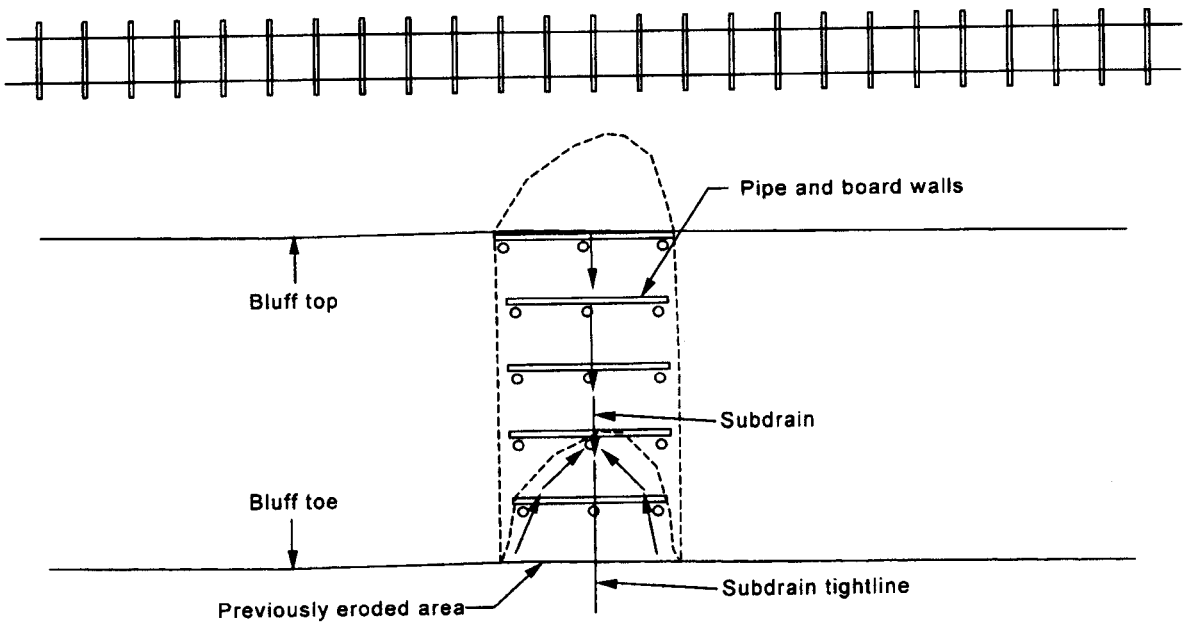


FIGURE 8: PIPE AND BOARD WALLS

Source: *Del Mar Bluffs Geotechnical Study, Part 2: Conceptual Repair Alternatives*, Figure 10. Prepared by Leighton and Associates, Inc. for NCTD. January 2001.

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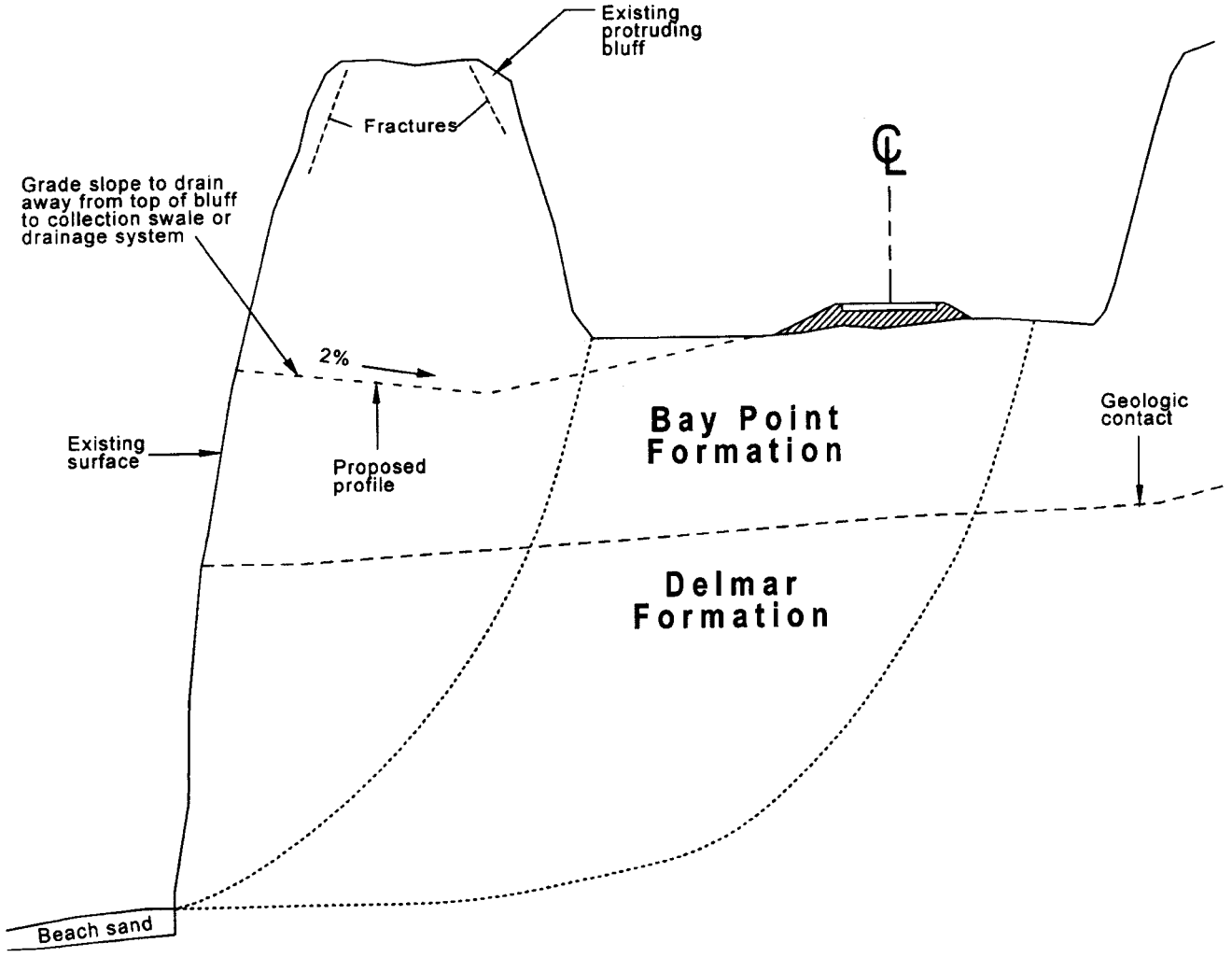
BLUFF TOP GRADING (CENTRAL PORTION OF BLUFF)

Improve stability of bluff face by reducing driving forces (weight). Generates material that can be used for slope repair/possible beach nourishment. Also reduces short term potential for block falls, improves views, provides possible source of beach nourishment and maintains positive drainage.



FORM OF MITIGATION

- ☐ Toe
- ☐ Surficial
- ☒ Deep-seated

IMPROVEMENT

Improves stability of bluff face by removing weight from bluff top; may not improve overall factor of safety for deep seated stability

FIGURE 9: BLUFF TOP GRADING (CENTRAL PORTION OF BLUFF)

Source: *Del Mar Bluffs Geotechnical Study, Part 2: Conceptual Repair Alternatives*, Figure 11. Prepared by Leighton and Associates, Inc. for NCTD. January 2001.

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SOLDIER PILE WALL

Can be utilized to support rail, where a projection from the tracks to the toe or local stability calculations indicate inadequate lateral support. Can be modified as needed for increased capacity. Can be constructed entirely within R.O.W.

IMPROVEMENT

Can be utilized to raise overall factor of safety.

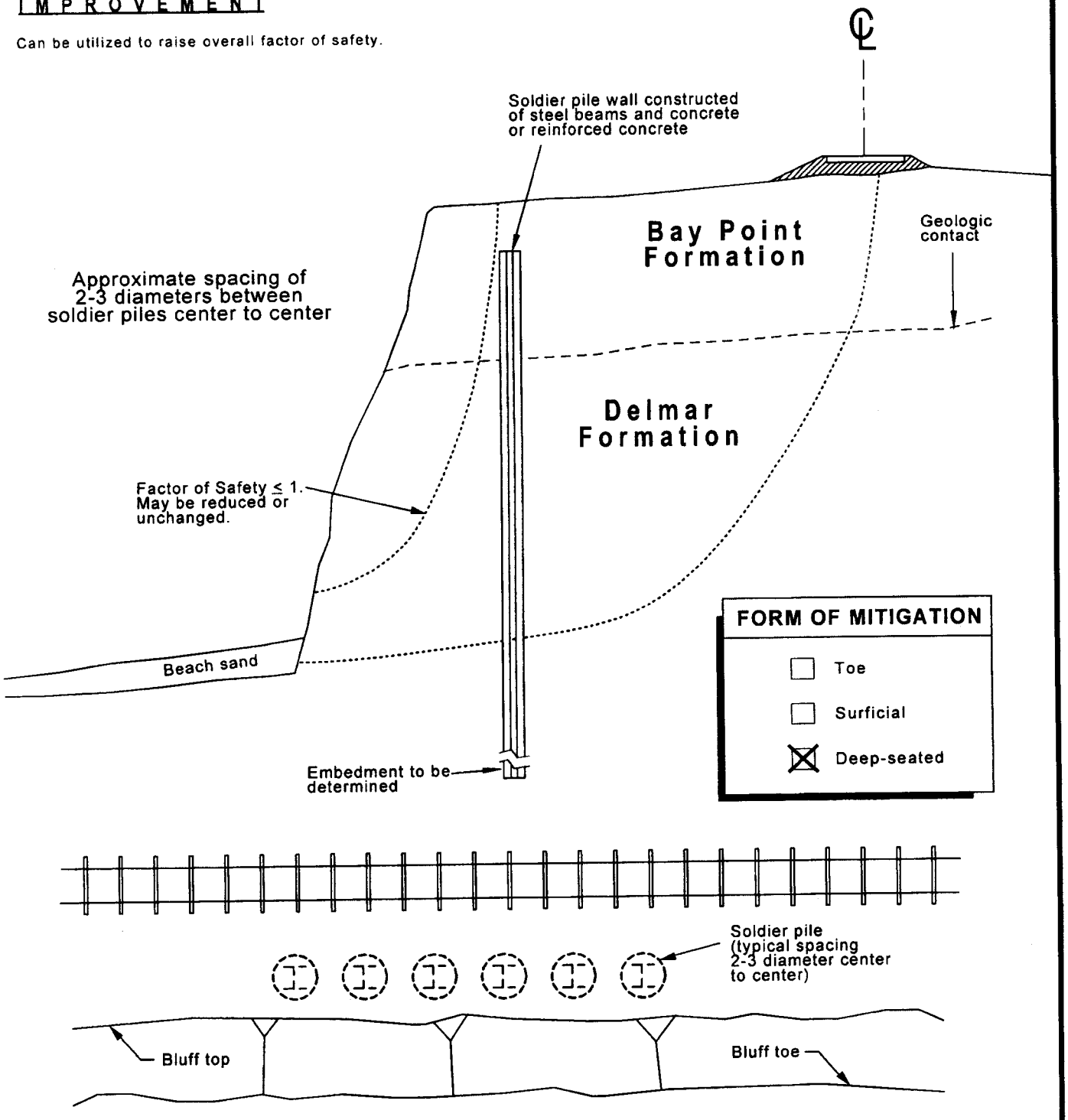

FIGURE 10: SOLDIER PILE STABILIZATION

Source: *Del Mar Bluffs Geotechnical Study, Part 2: Conceptual Repair Alternatives*, Figure 12. Prepared by Leighton and Associates, Inc. for NCTD. January 2001.

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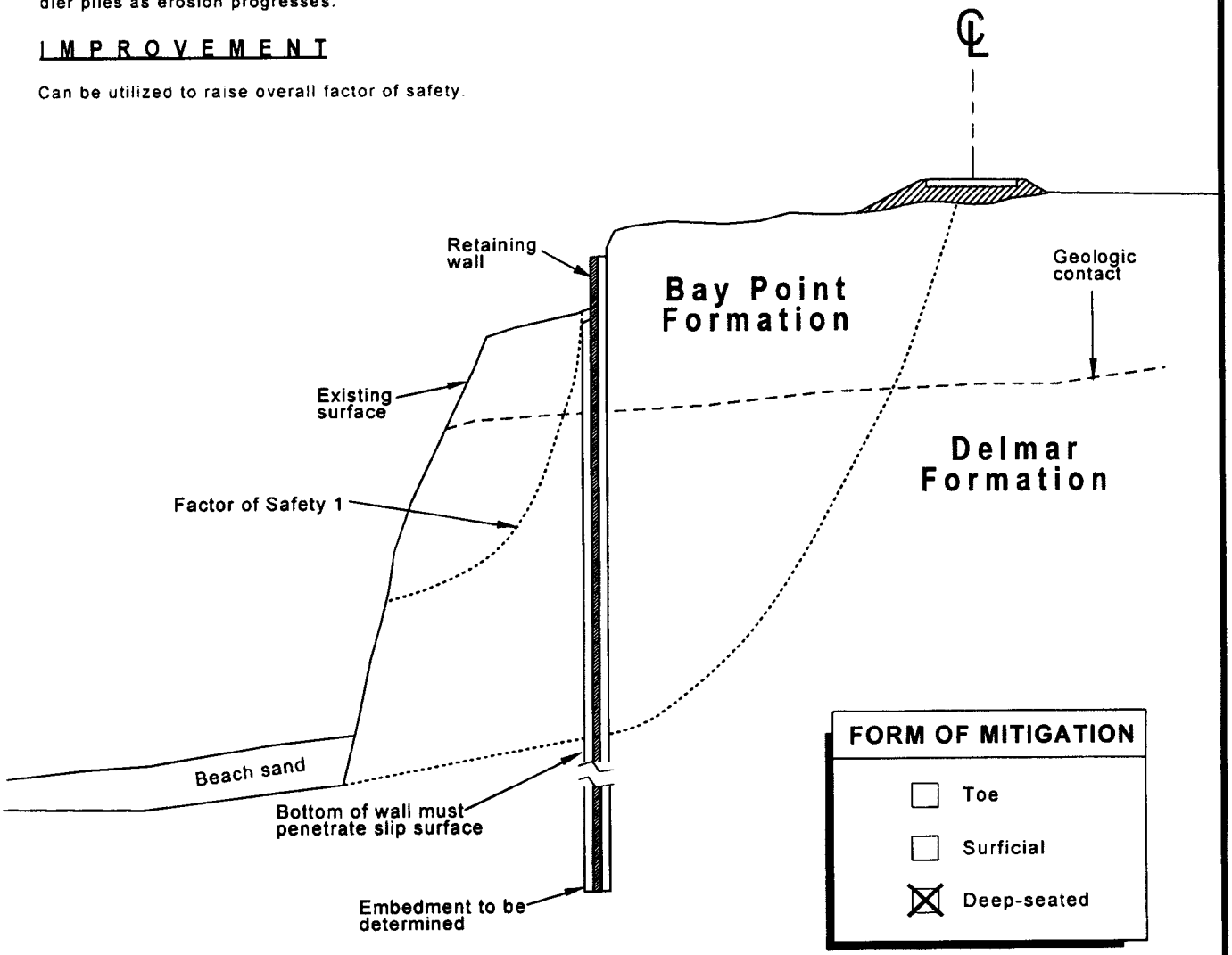
SOLDIER PILE WALL WITH LAGGING

Wall can be designed with lagging type wall or modified from soldier piles as erosion progresses.

IMPROVEMENT

Can be utilized to raise overall factor of safety.



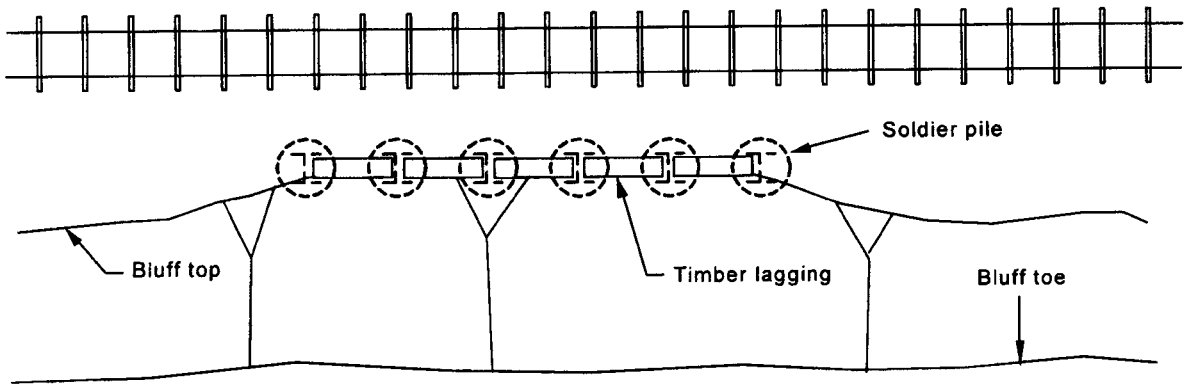


FIGURE 11: SOLDIER PILE WITH LAGGING

Source: *Del Mar Bluffs Geotechnical Study, Part 2: Conceptual Repair Alternatives*, Figure 13. Prepared by Leighton and Associates, Inc. for NCTD. January 2001.

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SOLDIER PILE WITH WALL AND TIEBACKS

Can be designed to support oversteepened areas, or modified from Figure No. 12 as erosion proceeds. Some bluff disturbance possible if utilized to stabilize oversteepened areas.

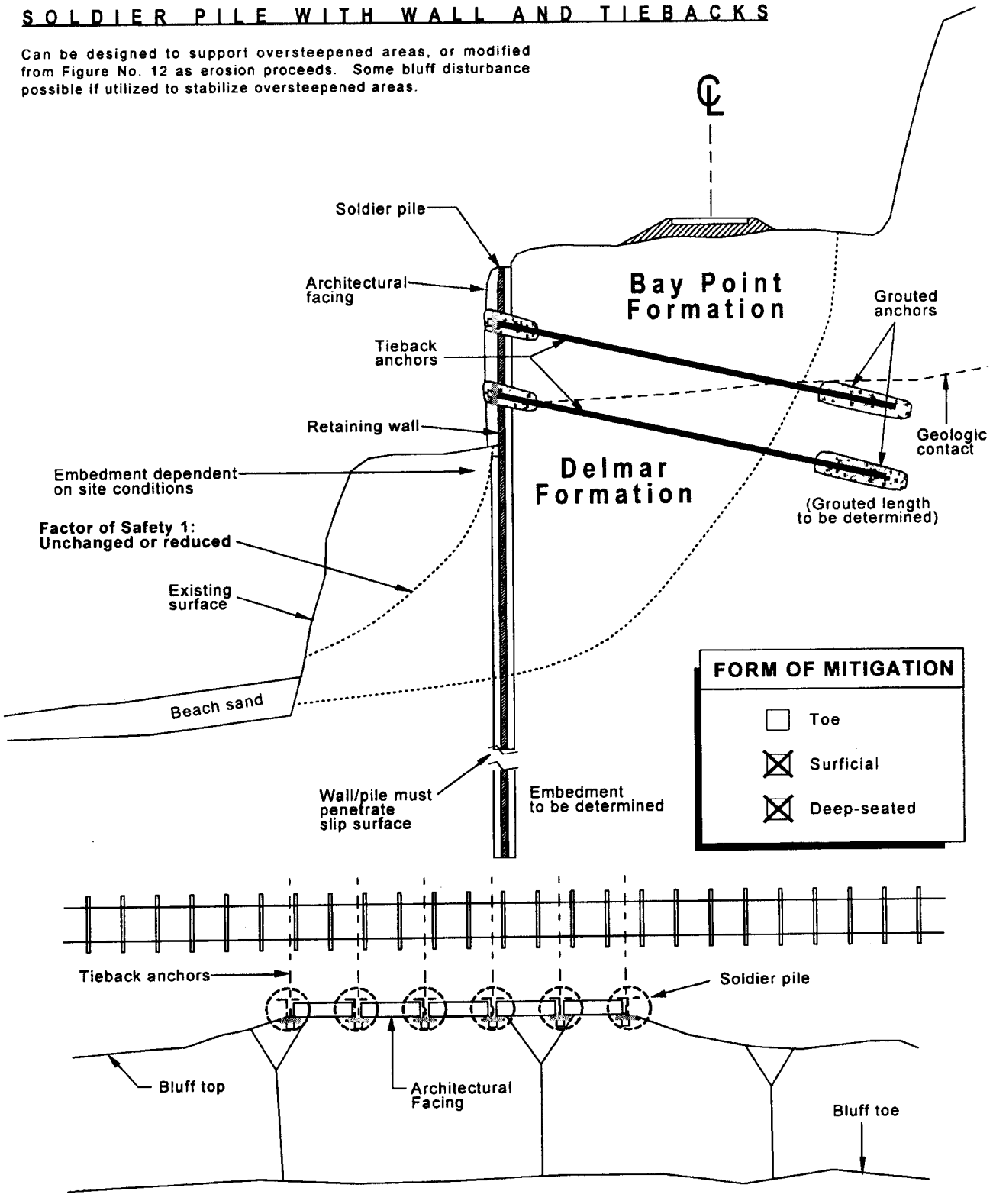

FIGURE 12: SOLDIER PILE WITH WALL AND TIEBACKS

Source: *Del Mar Bluffs Geotechnical Study, Part 2: Conceptual Repair Alternatives*, Figure 14. Prepared by Leighton and Associates, Inc. for NCTD. January 2001.

040151-001

January 2001

Leighton and Associates, Inc.

EMBEDDED SOLDIER PILE AND GRADE BEAM WITH TIEBACKS

Can be designed to support oversteepened areas, or modified from Figure No. 12 as erosion proceeds. Some bluff disturbance possible if utilized to stabilize oversteepened areas.

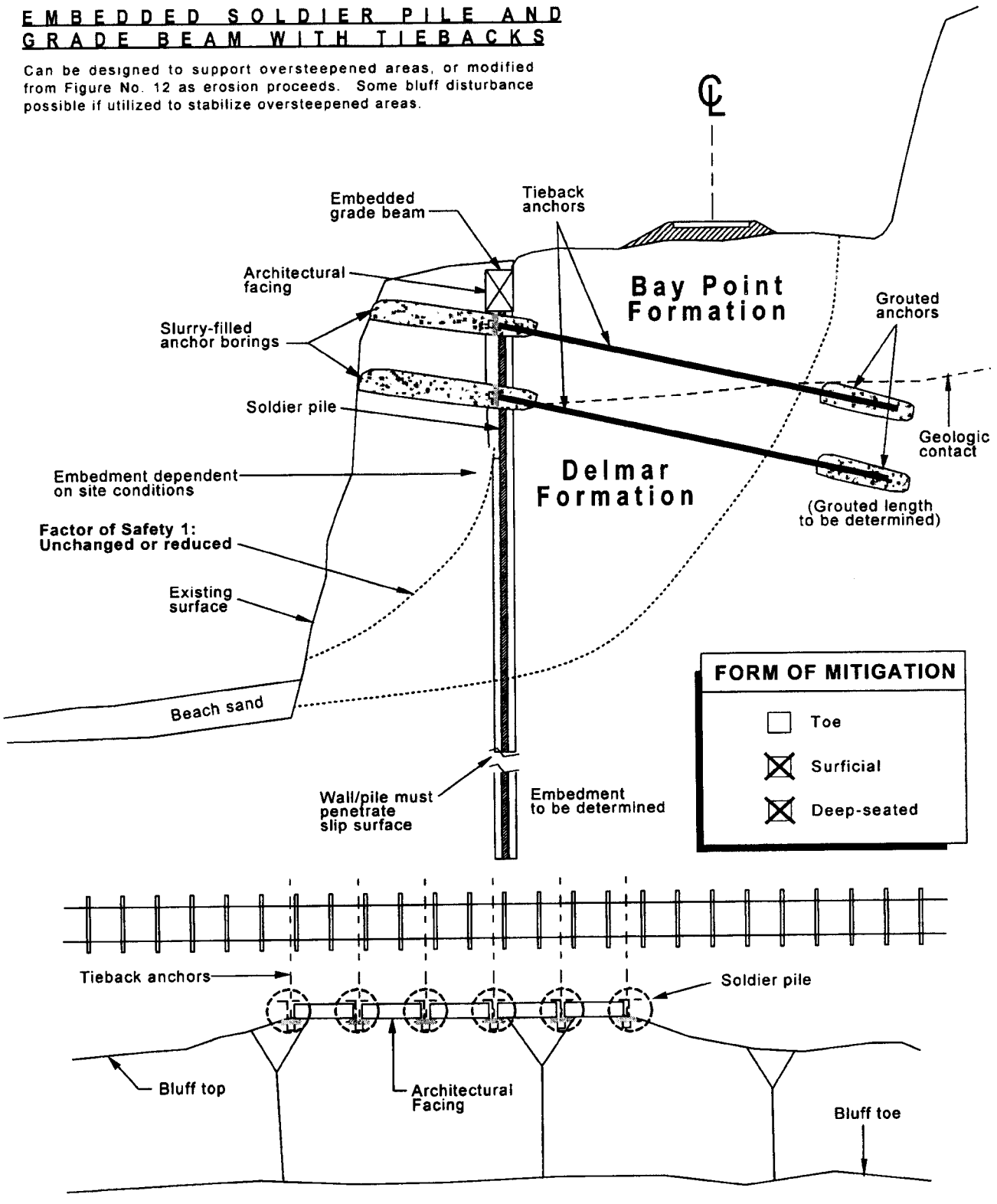

FIGURE 13: SOLDIER PILE WITH GRADE BEAM AND TIEBACKS

Source: *Del Mar Bluffs Geotechnical Study, Part 2: Conceptual Repair Alternatives*, Figure 22. Prepared by Leighton and Associates, Inc. for NCTD. January 2001.

040151-001

January 2001

Leighton and Associates, Inc.

EMBEDDED SOIL NAIL/MICROPILE REINFORCEMENT

Can improve deep-seated stability. Embedded portion may become exposed and require architectural facing.

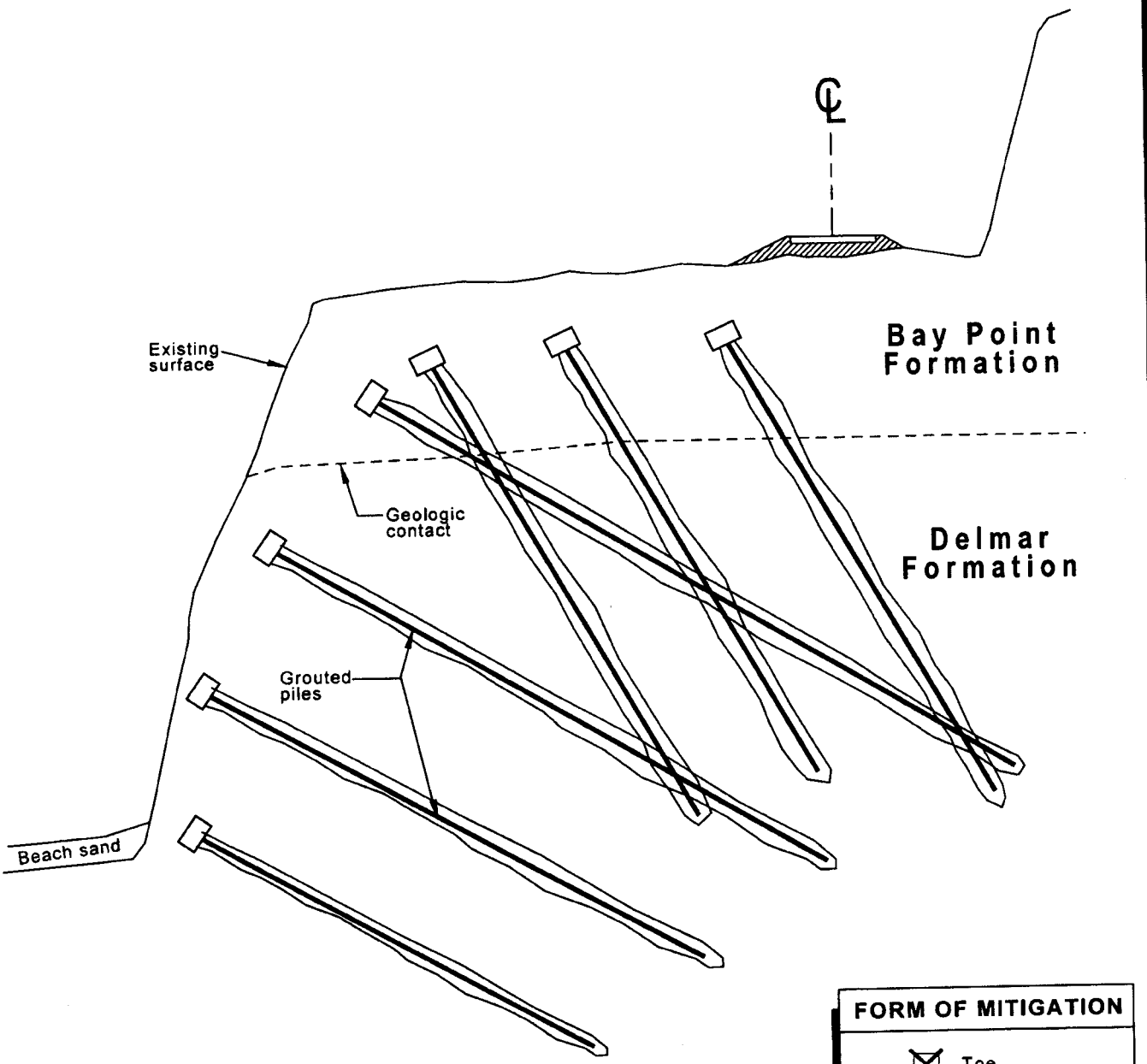

FIGURE 14: SOIL NAIL OR MICROPILE REINFORCEMENT

Source: *Del Mar Bluffs Geotechnical Study, Part 2: Conceptual Repair Alternatives*, Figure 23. Prepared by Leighton and Associates, Inc. for NCTD. January 2001.

040151-001

January 2001

Leighton and Associates, Inc.

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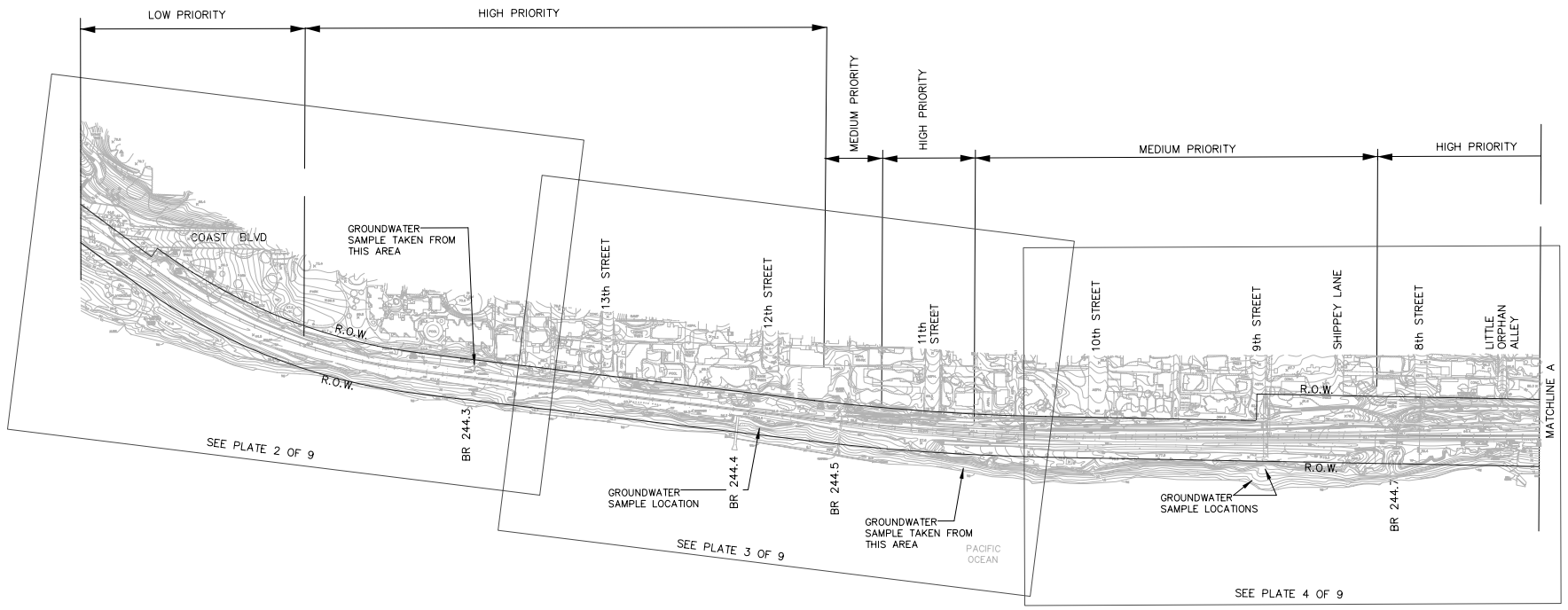
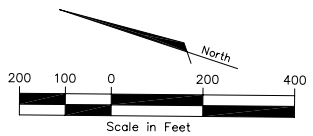
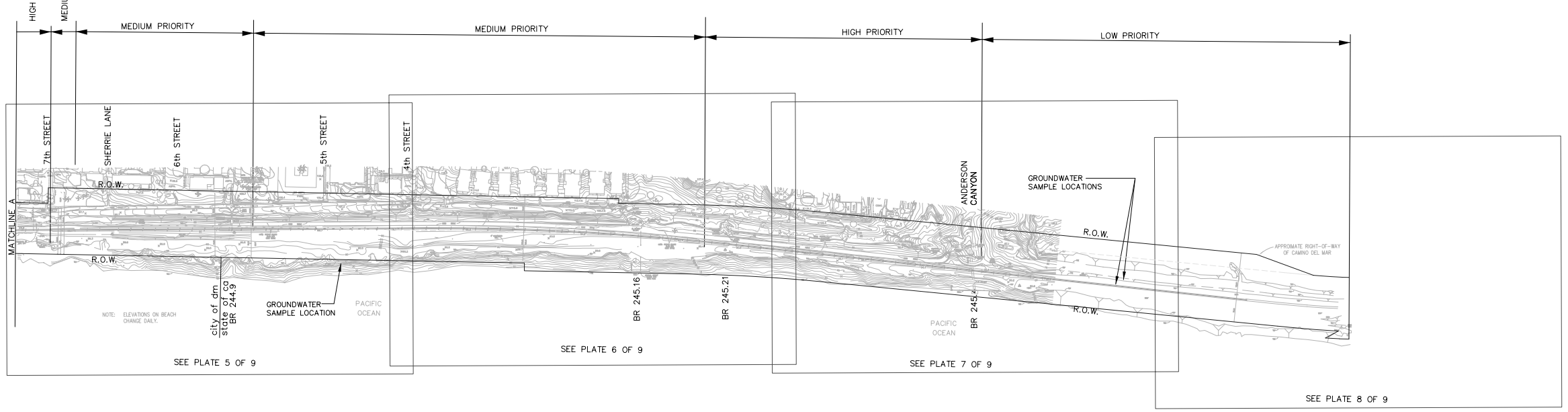
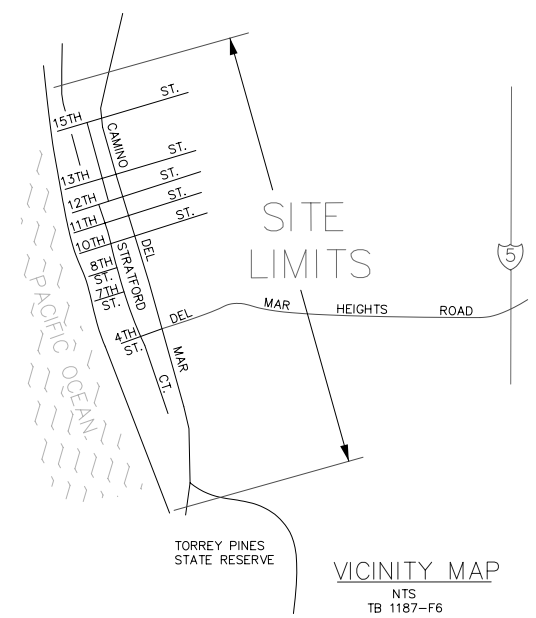






KEY MAP
DEL MAR BLUFFS
1" = 200'



VICINITY MAP
NTS
TB 1187-F6

REFERENCES

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_____, 2001B, SUMMARY OF OBSERVATIONS, PRELIMINARY ASSESSMENT OF RECENT FAILURE, 7TH–8TH ST, DEL MAR, CALIFORNIA, PROJECT NO. 040151–002, DATED APRIL 19, 2001.

_____, 2001C, PRELIMINARY RECOMMENDATIONS FOR EMERGENCY SLOPE STRENGTHENING, DEL MAR BLUFFS, BETWEEN 7TH AND 8TH STREETS, DEL MAR, CALIFORNIA, PROJECT NO. 040151–004, DATED APRIL 27, 2001.

_____, 2001D, LATERAL PIER ANALYSIS, EMERGENCY SLOPE STRENGTHENING, DEL MAR BLUFFS, BETWEEN 7TH AND 8TH STREETS, DEL MAR, CALIFORNIA, PROJECT NO. 040151–004, DATED MAY 9, 2001.

_____, 2001E, GROUND WATER SAMPLING ANALYSIS–DRAINAGE IMPROVEMENTS AND LANDSLIDE WARNING SYSTEM DEL MAR BLUFFS, DEL MAR, CALIFORNIA, PROJECT NO. 040151–003, DATED AUGUST 10, 2001.

_____, 2001F, ADDITIONAL GROUND WATER SAMPLING ANALYSIS–DRAINAGE IMPROVEMENTS AND LANDSLIDE WARNING SYSTEM DEL MAR BLUFFS, DEL MAR, CALIFORNIA, PROJECT NO. 040151–003, REVISED NOVEMBER 5, 2001.

PROJECT DESIGN CONSULTANTS, 2001, ENVIRONMENTAL CONTRAINTS REPORT FOR THE DEL MAR BLUFF STABILIZATION, PROJECT 1, DATED JULY 10, 2001.

PLATE INDEX

BASIS OF STATIONING:
STATION 1507+00.00 AT CL EXISTING TRACK AND CL CULVERT.
N 1926534.5308 E 6250426.6153

LEGEND

GEOLOGIC UNITS

Af	ARTIFICIAL FILL
Qls	LANDSLIDE DEPOSIT
Qb	BEACH DEPOSIT
Qbp	BAY POINT FORMATION
Td	DELMAR FORMATION

MAP SYMBOLS

?— — —? APPROX. LOCATION OF GEOLOGIC CONTACT
SEEPAGE
SOIL CREEP
APPROX. NCTD RIGHT–OF–WAY
CLEAN AND REHAB EXISTING 8" CMP SUBDRAIN
C.O. CLEANOUT

NOTES:

SUBDRAINS SHOWN ON MAP BASED ON REVIEW OF AT&SF DOCUMENTS (AT&SF, 1978); NOT ALL SUBDRAINS OBSERVED DURING FIELD MAPPING.

REFERENCED BORING LOGS CONTAINED WITHIN PART I, VOLUME II OF GEOTECHNICAL EVALUATION BY LEIGHTON AND ASSOCIATES, PROJECT NUMBER 040151–001, DATED JANUARY 31, 2001.

EASTERLY R.R. RIGHT–OF–WAY BETWEEN 7TH STREET AND 8TH STREET PLOTTED PER A.T. & S.F. RY. CO. RIGHT–OF–WAY SURVEY PLAT DATED 7–10–72 CECL DWG. NO. 20–31295 SHEET 4 OF 6 SHEETS. (PLOTTED PER EXISTING MANHOLES PER SURVEY PLAT)

THE RAILROAD RIGHT–OF–WAY IS PLOTTED PER RECORD INFORMATION PROVIDED BY BRUCE SMITH OF N.C.T.D. ON MAY 15, 2001.

ORIGINAL EXISTING CONTOURS ARE BASED ON 5–1995 AERIAL PHOTOGRAPHY BY AERO TECH WITH SUPPLEMENTARY SURVEYS ON 3–1995 BY ASSOCIATED ENGINEERS, INC.

SUPPLEMENTAL FIELD TOPOGRAPHIC SURVEY PROVIDED BETWEEN 4–30–01 AND 6–15–01, BY MLSI.

SEE (LEIGHTON, 2001E AND F) FOR GROUNDWATER SAMPLING RESULTS.

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APPROVED BY MRS
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LEIGHTON AND ASSOCIATES, INC.
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San Diego, CA 92131
(858) 566–3113

Job No. 518–109

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GEOTECHNICAL MAP AND SECTIONS DEL MAR BLUFFS PROJECT II DEL MAR, CALIFORNIA

PROJECT LAYOUT MAP AND NOTES

SCALE AS REFERENCED
CONTRACT NO.
DRAWING NO.
REV. PLATE NO. 1 OF 8

DATED SEPTEMBER 2003

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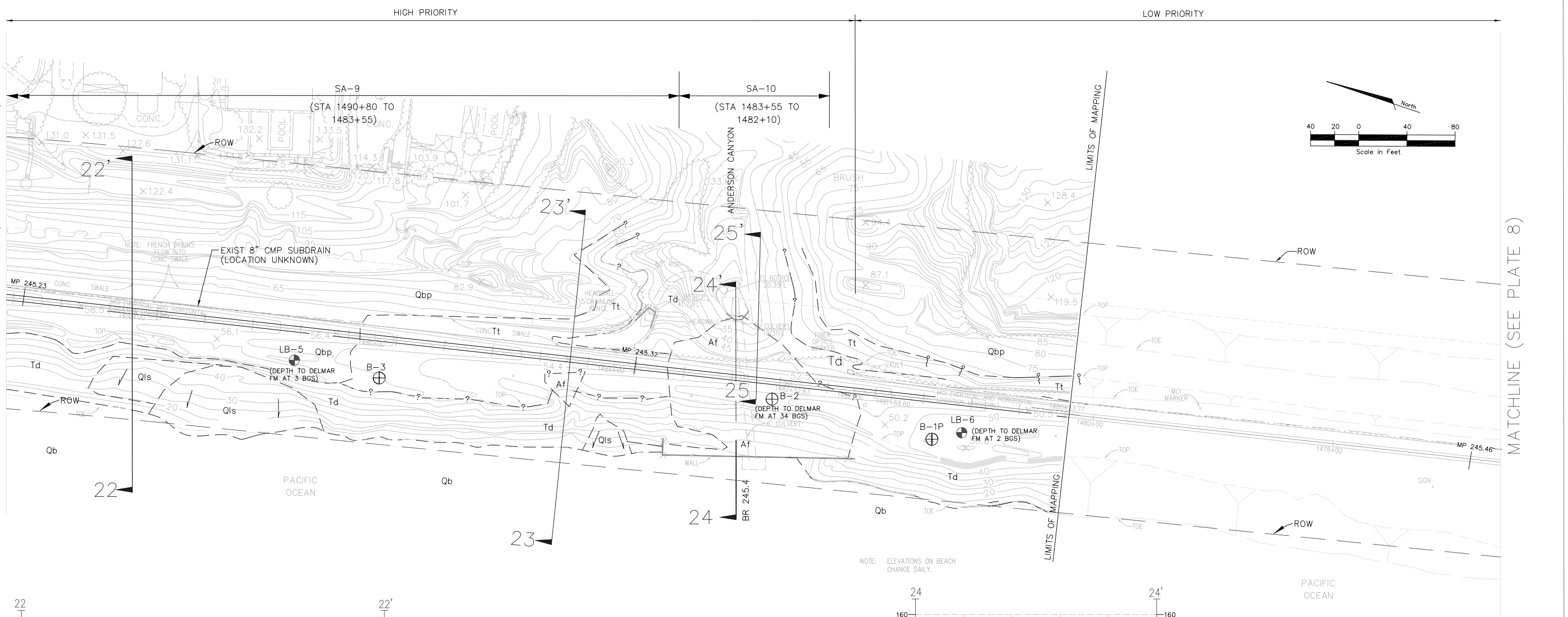
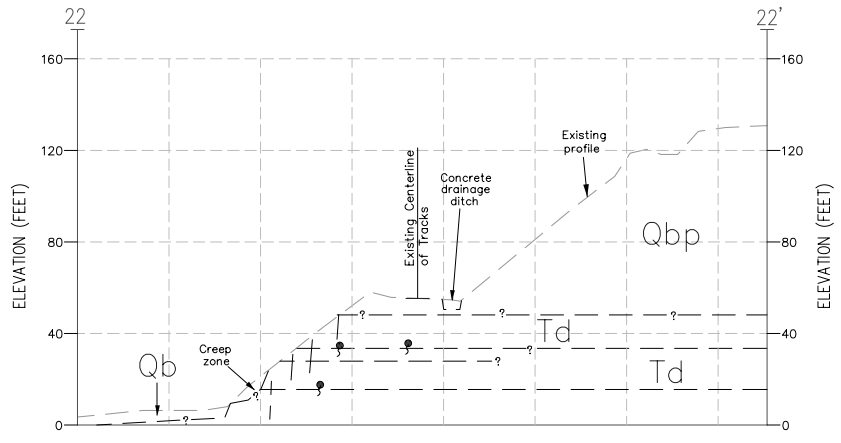
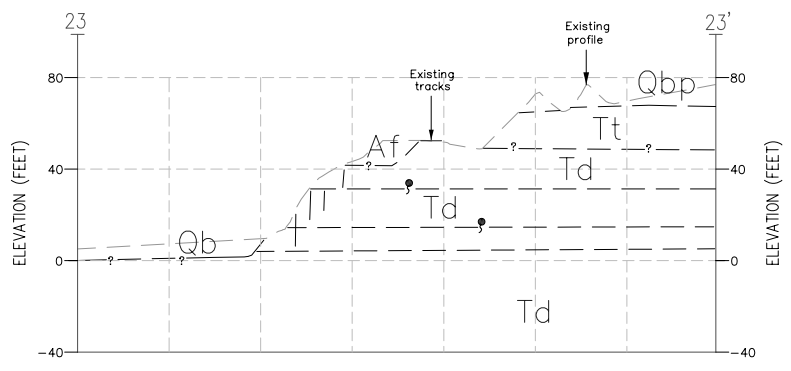
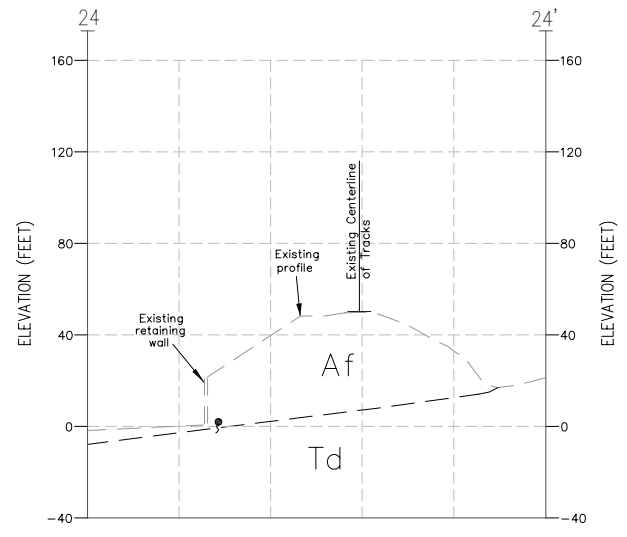




SECTION 22–22' (PREVIOUSLY B–B')
View north – M.P. 245.26 (STA. 1488+03)



SECTION 23–23'
View north – M.P. 245.3 (STA. 1484+37)



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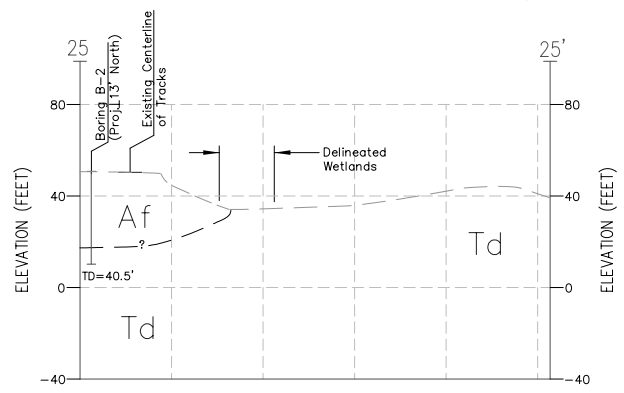
View north – M.P. 245.36 (STA. 1483+00)



SECTION 25–25'
View north – M.P. 245.4 (STA 1482+81)

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San Diego, CA 92123

NORTH SAN DIEGO COUNTY TRANSIT DEVELOPMENT BOARD
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GEOTECHNICAL MAP AND SECTIONS
DEL MAR BLUFFS PROJECT II
DEL MAR, CALIFORNIA

MILE POST 245.23 TO 245.46

SCALE AS REFERENCED
CONTRACT NO.
DRAWING NO.
REV. PLATE NO. 7 OF 8

DATED SEPTEMBER 2003

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MEDIUM PRIORITY

HIGH PRIORITY

MATCHLINE (SEE PLATE 5)

MATCHLINE (SEE PLATE 7)

4th STREET

ASPH.

ROW

19'

EXIST 8" CMP SUBDRAIN (LOCATION UNKNOWN)

MP 244.99

MCI (VERTICAL AND HORIZONTAL LOCATION UNKNOWN)

MILE POST 245.00 1497+52.60

MP 245.09

8" MONITORING WELL

B-6P (DEPTH OF DELMAR FM AT 8' BGS)

LB-1 (DEPTH OF DELMAR FM AT 5' BGS)

B-5 (DEPTH OF DELMAR FM AT 3' BGS)

B-4P (DEPTH OF DELMAR FM AT 3' BGS)

NOTE: ELEVATIONS ON BEACH CHANGE DAILY.

SA-8A (STA. 1494+05 TO 1493+33)

SA-8B (STA. 1491+15 TO 1490+80)

SA-9 (STA. 1490+80 TO 1483+55)

EXISTING WETLAND MITIGATION AREA

20'

OUTLET EXTENSION TO CONCRETE DITCH (SWALE)

DELINEATED WETLANDS

21'

FRESHWATER MARSH

NOTE: FRENCH DRAINS FLOW INTO CONC SWALE

ORIGINAL OUTLET CLOSED WITH CONC PLUG

BR 245.16

BR 245.21

MP 245.23

Td Qls Qb Qbp Af

North

40 20 0 40 80

Scale in Feet

SECTION 19-19' (PREVIOUSLY D-D')

View north – M.P. 245.04 (STA. 1499+61)

Resistant layer; Existing profile; Boring B-6P; Very hard; TD=28'; Existing tracks; Concrete drainage ditch; Qb; Td; Qbp

SECTION 20-20'

View north – M.P. 245.16 (STA. 1493+77)

Existing retaining wall; Existing profile; Existing Centerline of Tracks; Delineated Wetlands; Qb; Af; Td; Qbp

SECTION 21-21'

View north – M.P. 245.21 (STA. 1491+02)

Existing retaining wall; Existing Centerline of Tracks; Existing profile; Qb; Af; Td; Qbp

ELEVATION (FEET)

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GEOTECHNICAL MAP AND SECTIONS
DEL MAR BLUFFS PROJECT II
DEL MAR, CALIFORNIA

MILE POST 244.99 TO 245.23

SCALE AS REFERENCED

CONTRACT NO.

DRAWING NO.

REV. PLATE NO. 6 OF 8

DATED SEPTEMBER 2003

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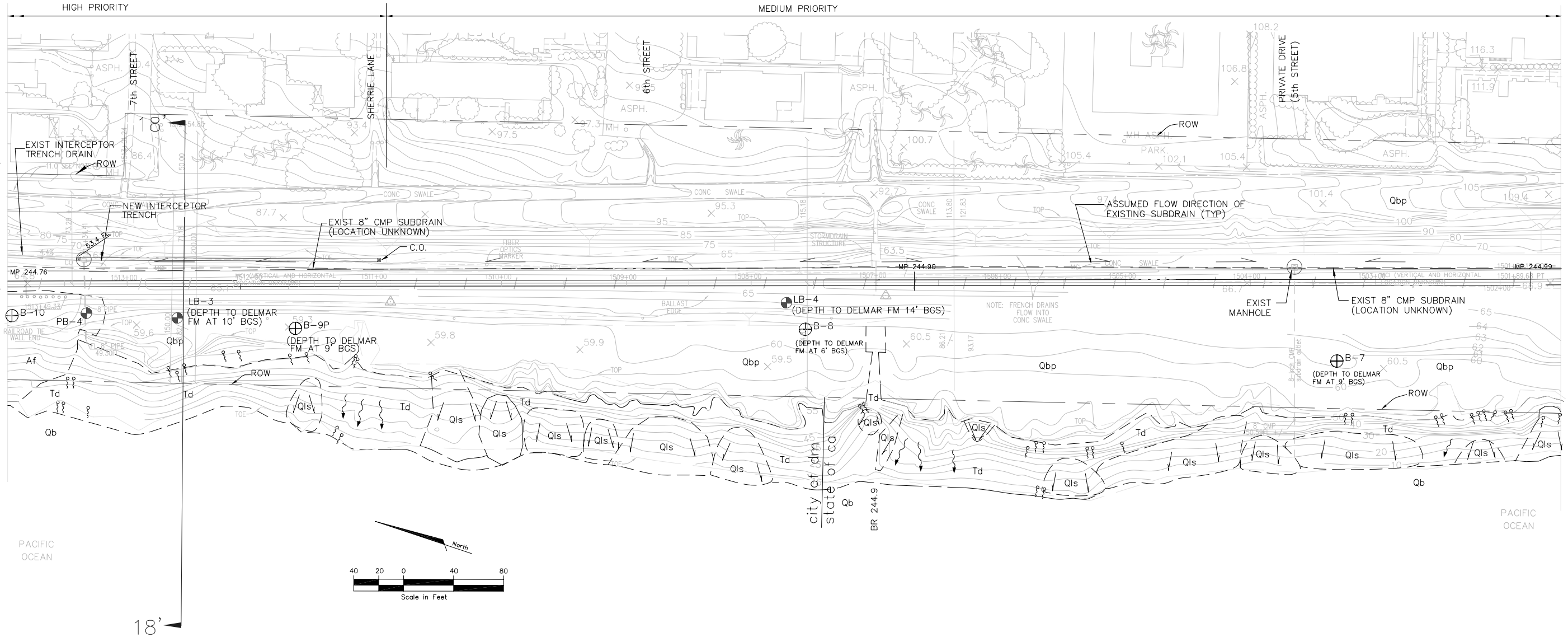

SECTION 18-18' (PREVIOUSLY M-M')

View north – M.P. 244.79 (STA. 1512+55)

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GEOTECHNICAL MAP AND SECTIONS
DEL MAR BLUFFS PROJECT II
DEL MAR. CALIFORNIA

MILE POST 244.76 TO 244.99

SCALE	AS REFERENCED
CONTRACT NO.	
DRAWING NO.	
REV.	PLATE NO. 5 OF 8

DATED SEPTEMBER 2003

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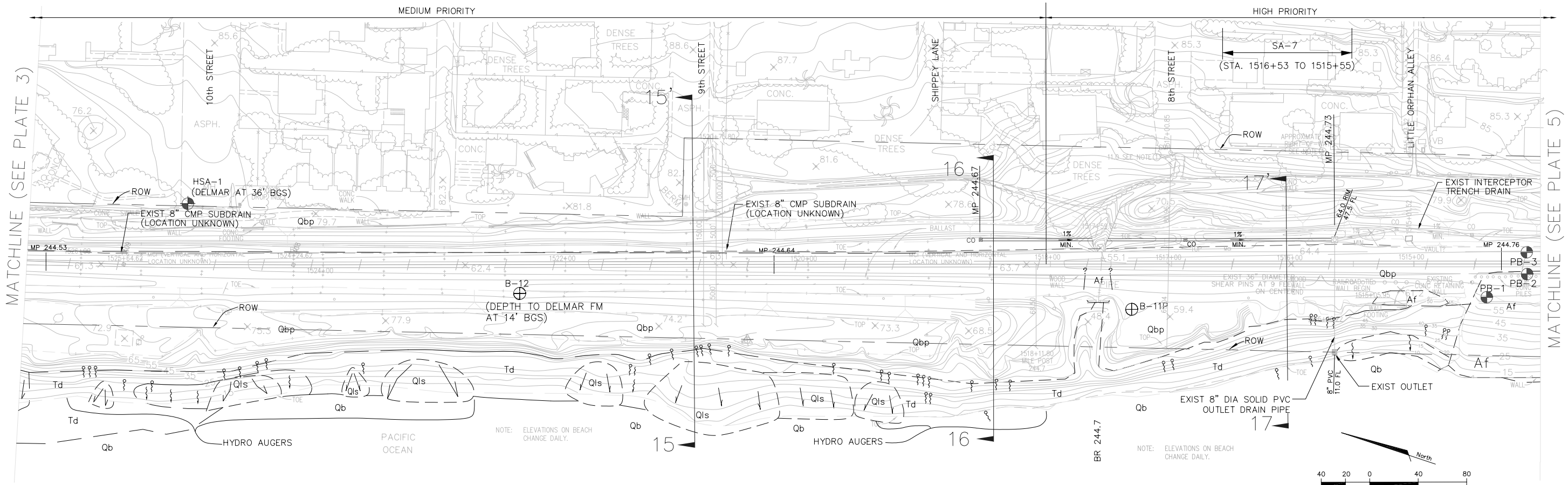
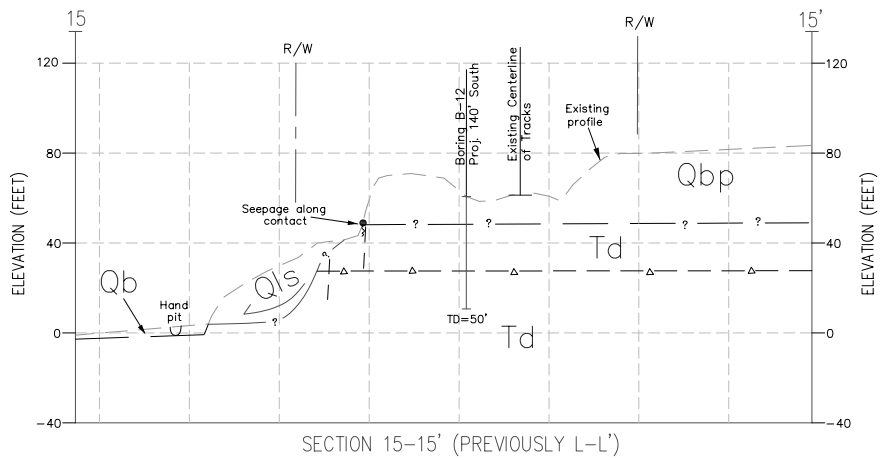
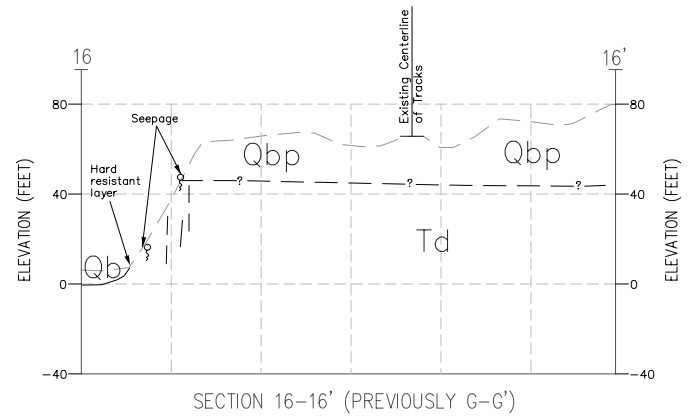




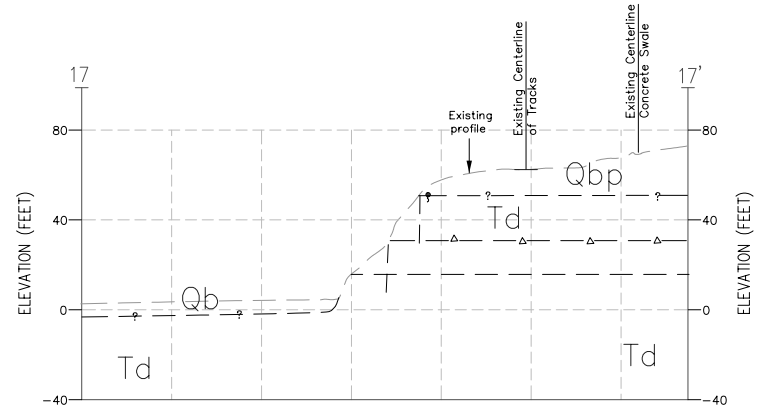
SECTION 15-15' (PREVIOUSLY L-L')

View north – M.P. 244.64 (STA. 1520+95)



SECTION 16-16' (PREVIOUSLY G-G')

View north – M.P. 244.68 (STA. 1518+47)



SECTION 17-17'

View north – M.P. 244.73 (STA. 1516+05)

REV.	DATE	DESCRIPTION	BY	SUB.	APP.

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APPROVED BY MRS
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Job No. 518-109

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GEOTECHNICAL MAP AND SECTIONS
DEL MAR BLUFFS PROJECT II
DEL MAR. CALIFORNIA

MILE POST 244.53 TO 244.76

SCALE AS REFERENCED
CONTRACT NO.
DRAWING NO.
REV. PLATE NO. 4 OF 8

DATED SEPTEMBER 2003

HIGH PRIORITY | MEDIUM PRIORITY | HIGH PRIORITY | MEDIUM PRIORITY

SA-3 | SA-4 (1538+85 TO 1536+90) | SA-5 (1536+90 TO 1532+50) | SA-6A (1532+50 TO 1531+65) | SA-6B (1530+25 TO 1529+10)

MATCHLINE (SEE PLATE 2)

MATCHLINE (SEE PLATE 4)

13th STREET | 12th STREET | 11th STREET

ASSUMED OF EXISTING SUBDRAIN (TYP) W/FLOW DIRECTION

EXIST GEOGRID SLOPE WITH SUBDRAIN OUTLETS INTO EXIST STORMDRAIN

ROW

MP 244.34

MP 244.30

NEW MANHOLE

MP 244.37

62.5 RIM
59.8 FL

INTERCEPTOR TRENCH DRAIN

1% MIN.

BR 244.4

MP 244.40

LB-9 (DELMAR AT 23' BGS)

EXIST. MANHOLE

EXIST 8" CMP SUBDRAIN (LOCATION UNKNOWN)

MP 244.39

MP 244.45

MP 244.53

LB-7 (DELMAR FM AT 12' BGS)

B-14P

EXISTING SHEAR PIN STABILIZATION

NEW 8" DIA DRAIN PIPE

8" PVC 10.0 FL

NEW OUTLET

HYDRO-AUGERS

GROUNDWATER AT 14.3' BELOW TOC (DELMAR FORMATION AT 9.5' BGS)

EXIST SOIL-CEMENT REPAIR AREA

LB-2 (DELMAR FORMATION AT 15' BGS)
B-13

HSA-2 (DELMAR AT 29' BGS)

MP 244.48

MP 244.50

HYDRO-AUGERS

PACIFIC OCEAN

North

NOTE: ELEVATIONS ON BEACH CHANGE DAILY.

Scale in Feet: 40 20 0 40 80

SECTION 7-7'
View north – M.P. 244.32 (STA. 1537+82)

SECTION 9-9'
View north – M.P. 244.34 (STA. 1536+69)

SECTION 11-11' (PREVIOUSLY S-S')
View north – M.P. 244.40 (STA. 1533+24)

SECTION 13-13'
View north – M.P. 244+45 (STA. 1530+31)

SECTION 8-8' (PREVIOUSLY Q-Q')
View north – M.P. 244.33 (STA. 1537+15)

SECTION 10-10'
View north – M.P. 244.36 (STA.. 1535+69)

SECTION 12-12' (PREVIOUSLY R-R')
View north – M.P. 244.42 (STA. 1532+25)

SECTION 14-14' (PREVIOUSLY H-H')
View north – M.P. 244.47 (STA. 1529+60)

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NORTH SAN DIEGO COUNTY TRANSIT DEVELOPMENT BOARD
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GEOTECHNICAL MAP AND SECTIONS
DEL MAR BLUFFS PROJECT II
DEL MAR. CALIFORNIA

MILE POST 244.30 TO 244.53

SCALE AS REFERENCED
CONTRACT NO.
DRAWING NO.
REV. PLATE NO. 3 OF 8

DATED SEPTEMBER 2003

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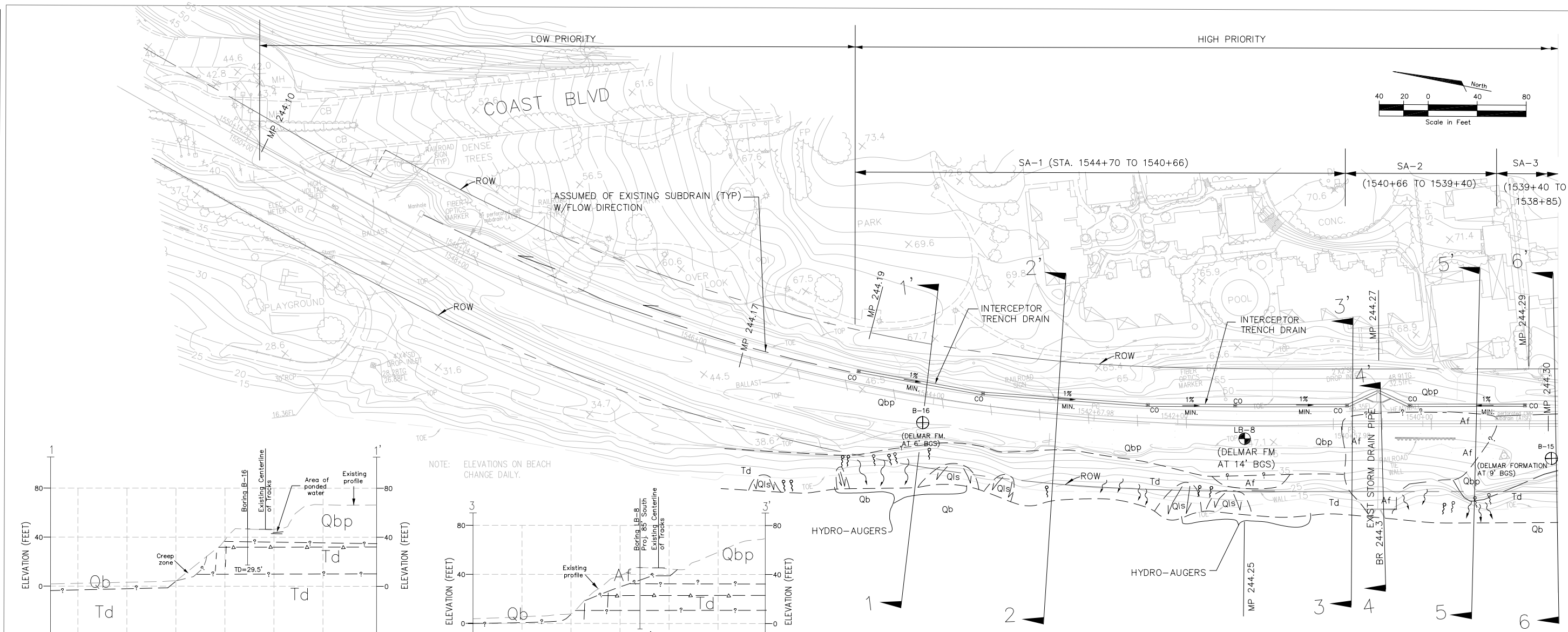

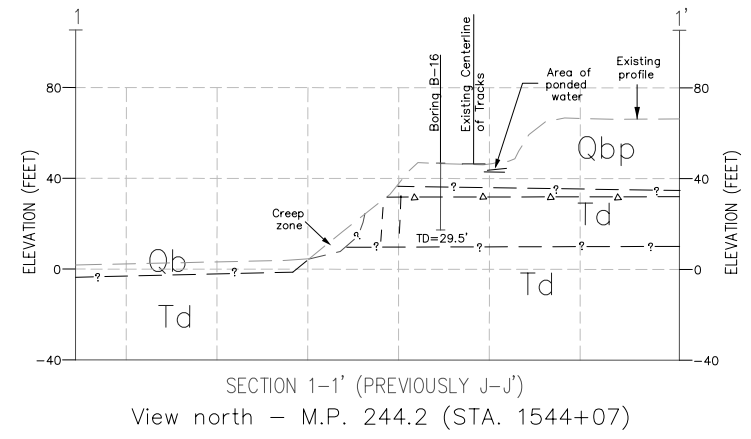

SECTION 1-1' (PREVIOUSLY J-J')
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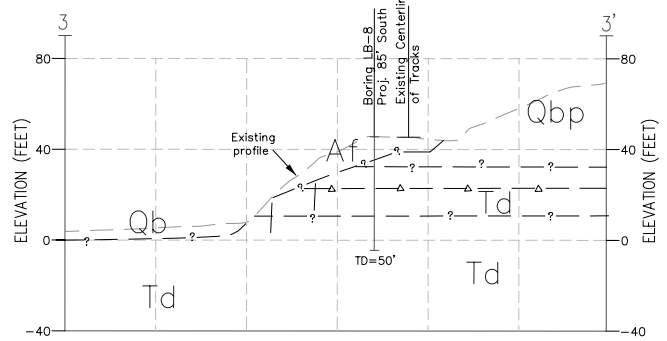
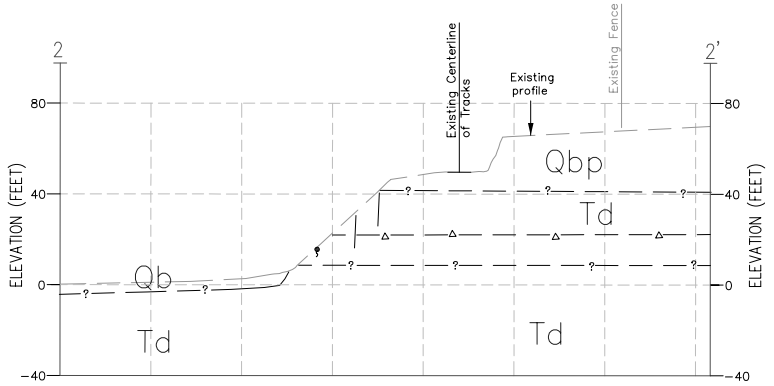
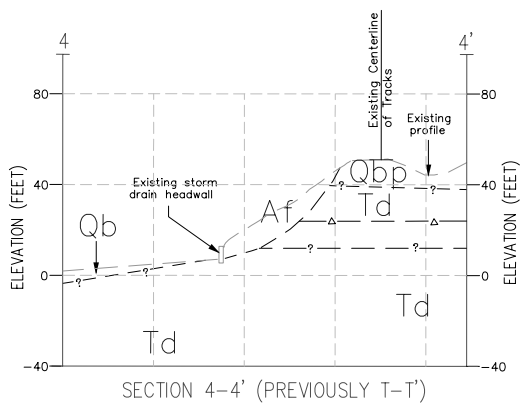


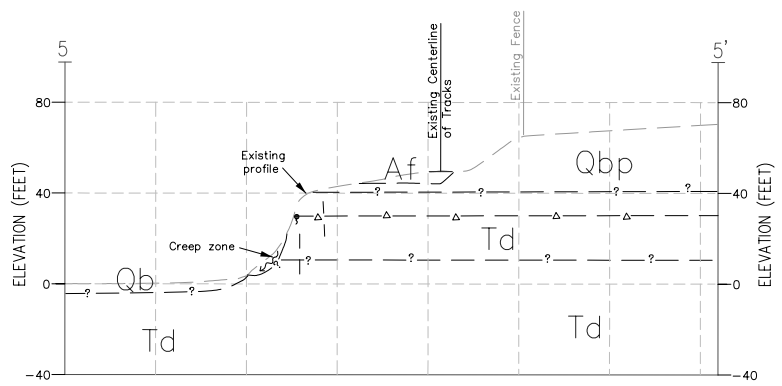
SECTION 3-3'
View north – M.P. 244.31 (STA. 1540+57)



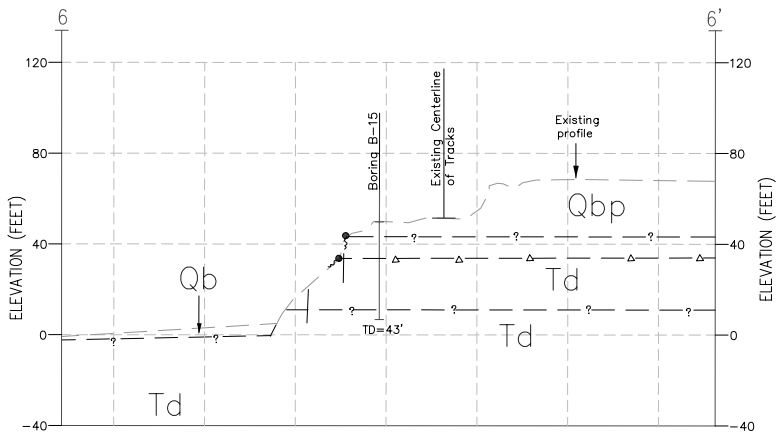
SECTION 2-2'
View north – M.P. 244.22 (STA. 1543+00)



SECTION 4-4' (PREVIOUSLY T-T')
View north – M.P. 244.27 (STA 1540+30)



SECTION 5-5'
View north – M.P. 244.31 (STA 1539+56)



SECTION 6-6' (PREVIOUSLY K-K')
View north – M.P. 244.3 (STA. 1538+92)

REV.	DATE	DESCRIPTION	BY	SUB.	APP.

INFORMATION CONFIDENTIAL:
All plans, drawings, specifications, and or information furnished herewith shall remain the property of the North San Diego County Transit Developement Board; shall be held confidential; and shall not be used for any purpose not provided for in agreements with the North San Diego County Transit Developement Board.

DESIGNED BY
DRAWN BY KRD
CHECKED BY WDO
APPROVED BY MRS
DATE

LEIGHTON AND ASSOCIATES, INC.
3934 Murphy Canyon Road
Suite B-205
San Diego, CA 92123

NORTH SAN DIEGO COUNTY TRANSIT DEVELOPMENT BOARD
N C T D
SIMON WONG ENGINEERING
STRUCTURAL AND BRIDGE ENGINEERS
9968 Hibert Street, Suite 202
San Diego, CA 92131
(858) 566-3113
Job No. 518-109
SUBMITTED: _____ APPROVED: _____

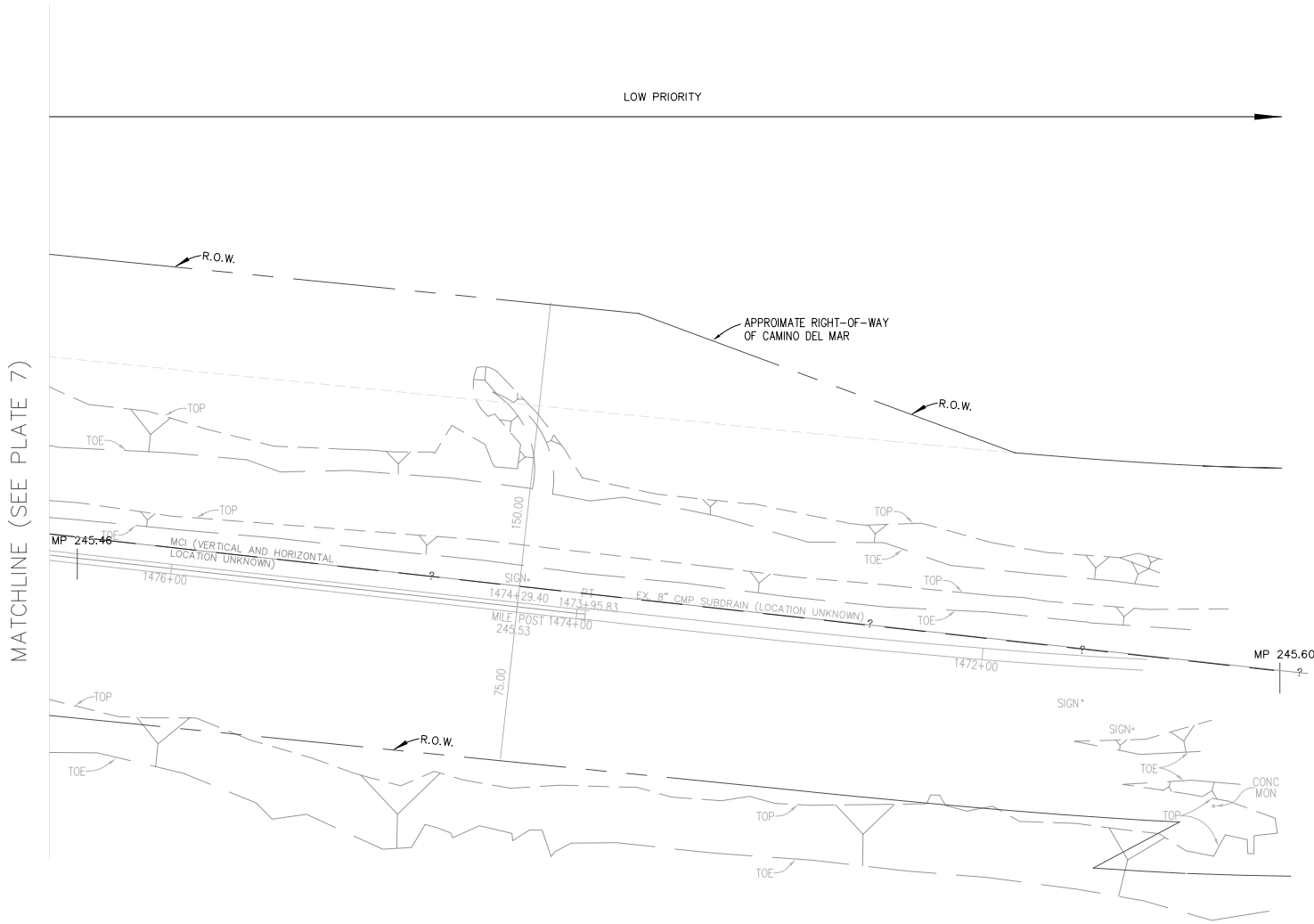
GEOTECHNICAL MAP AND SECTIONS
DEL MAR BLUFFS PROJECT II
DEL MAR, CALIFORNIA

MILE POST 244.10 TO 244.30

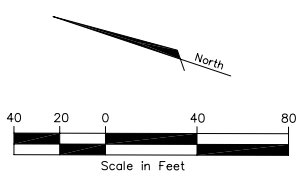
SCALE AS REFERENCED
CONTRACT NO.
DRAWING NO.
REV. PLATE NO. 2 OF 8

DATED SEPTEMBER 2003

CHECKING PRINT NO. _____ CHECKED BY: _____ CORRECTED BY: _____ B'CHECKED BY: _____ SIGNED BY: _____
DATE: _____ DATE: _____ DATE: _____ DATE: _____ DATE: _____



NOTE: ELEVATIONS ON BEACH CHANGE DAILY.



REV.	DATE	DESCRIPTION	BY	SUB.	APP.

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NORTH SAN DIEGO COUNTY TRANSIT DEVELOPMENT BOARD
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San Diego, CA 92131
(858) 566-3113

Job No. 518-109

SUBMITTED: _____ APPROVED: _____

GEOTECHNICAL MAP AND SECTIONS
DEL MAR BLUFFS PROJECT II
DEL MAR. CALIFORNIA

MILE POST 245.46 TO 245.60

SCALE AS REFERENCED
CONTRACT NO.
DRAWING NO.
REV. PLATE NO. 8 OF 8

DATED SEPTEMBER 2003