Safety Factor Assessment
Ash Water Transport Ponds
San Miguel Electric Cooperative Power Plant
Atascosa County Texas

Project # 3716160039

Prepared for:

San Miguel Electric Cooperative, Inc.

P.O. Box 280, Jourdanton, Texas 78026

November 14, 2018

wood.

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www.woodplc.com

November 14, 2018
Wood Project No.: 3716160039

San Miguel Electric Cooperative, Inc.
P.O. Box 280
Jourdanton, Texas 78026

Attn: Mr. Dan Cates, Plant Manager

Subject: Factor of Safety Assessment
Ash Water Transport Ponds
San Miguel Electric Cooperative Power Plant
Atascosa County Texas

Dear Mr. Cates:

Wood Environment & Infrastructure Solutions, Inc. (Wood) was contracted by San Miguel Electric Cooperative Inc. (SMECI), to observe certain priority repairs to their Ash Water Transport Ponds, and to perform stability analyses pursuant to applicable provisions of the Coal Combustion Residuals (CCR) Rules as codified in Rule 40 Code of Federal Regulations 257.73(e)(1)(i) through (iv). The repairs performed to the Ash Water Transport Ponds were implemented pursuant to recommendations made by Arias Geoprofessionals Inc. in their Geotechnical Engineering Study report (Arias Job No. 2016-581) dated October 11, 2016.

Should any questions arise concerning this report, we would be pleased to discuss them with you.

Respectfully submitted,

Wood Environment & Infrastructure Solutions, Inc.
Texas Registered Engineering Firm F-0012
Texas Registered Geoscience Firm 50184

Mark J. Breithauer, P.E.
Senior Engineer

STATE OF TEXAS
Mark J. Breitnauer
83085
LICENSED
PROFESSIONAL ENGINEER
11-14-2018

Reviewed by:

John C. Lommler, Ph.D., P.E. (New Mexico), D.GE.
Principal Geotechnical Engineer

Copies: Addressee (1)

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CERTIFICATION

Professional Engineer Certification Statement

I hereby certify that, having reviewed the attached document and being familiar with the provisions of Title 40 of the Code of Federal Regulations 40 CFR 257.73(e), I attest that this Safety Factor Assessment with the stated assumptions and reliance on previous information for Cross Sections 1B and 9A is accurate and to the best of my knowledge has been prepared in accordance with good engineering practices, including the considerations of applicable industry standards, and with the requirements of 40 CFR 257.73(e).

Wood Environment & Infrastructure Solutions, Inc.
Texas Registered Engineering Firm F-0012

Mark J. Breitnauer, P.E.
Senior Engineer
Texas Certificate #83085

11-14-2018

1.0 INTRODUCTION

Wood Environment & Infrastructure Solutions, Inc. (Wood) was tasked to observe the priority remedial actions performed on select downstream slopes of the Ash Water Transport Ponds as identified in the ARIAS Geoprofessionals Geotechnical Study dated October 11, 2016. Following the repairs, Wood performed a Safety Factor assessment of the slopes for Cross Sections 1B and 9A in accordance with coal combustion residuals (CCR) Rule 40 CFR 257.73(e)(1)(i) through (iv). The methods and results of the stability analyses are described herein.

2.0 BACKGROUND

The Geotechnical Engineering Study (Arias Job No. 2016-581) prepared by Arias Geoprofessionals dated October 11, 2016 identified certain priority repairs needed for the Ash Water Transport Pond west downstream slope in the area of Cross Section 1B and the east downstream slope in the area of Cross Section 9A (refer to the Arias Geoprofessionals October 11, 2016 report). The remedial action requirements for Cross Section 1B, as stated in the ARIAS report, were required due primarily to the presence of a wet area (i.e., area of cattails) which Arias interpreted as seepage from the pond. Accordingly, Arias described repairs for Cross Section 1B involved removing the softened soils at the toe, placing a crushed limestone toe drain at a 3.5H:1V slope, and placing a topsoil cover. Arias' remedial action described for Cross Section 9A involved raising the top of embankment elevation to 316 feet above mean sea level (amsl), removing bushes and long grass, and flattening the downstream slope to 3.5H:1V or flatter.

3.0 INSPECTION OF REPAIRS

Western Downstream Slope-Cross-Section 1B:

As part of the initial construction activities at Cross Section 1B, Wood performed a focused inspection of the area previously interpreted by Arias to be suspected as pond seepage. The area was excavated to expose subsurface soils and it was determined the wet area (and presence of cattails) was not due to pond seepage. Rather, the wet area was caused by a large vein of gravel that had washed down the slope from the crest surface. The gravel vein terminated in the observed wet area and was acting to hold significant amounts of rainwater in storage. After removing the gravel vein, the wetness and soft soils were observed to quickly dry up, confirming the wet area was not due to pond seepage.

Based on the above findings, Wood performed preliminary stability analyses and determined the repairs specified by Arias were not needed for purposes of establishing berm stability in accordance with the CCR Rules. The stability analyses for Cross Section 1B is described in Section 4.0

Eastern Downstream Slope Cross-Section 9A:

The eastern downstream slope of the Ash Water Transport Ponds was surveyed by SMECI's construction contractor MSI, Inc. on September 24, 2018 to establish the limits of the trench (i.e. key) to be installed at the base of the slope in order to construct a 3.5H:1V slope using a crest elevation of 316 ft asml. Stakes were set to mark the outside limits. The key and the slopes were then cleared of vegetation using a D5K2 bulldozer. The area along the slope that was cleared was approximately 300 feet long beginning from the south corner of Pond A toward Pond B. After grubbing, the slope was inspected for wet spots/seepage and none was observed.

Beginning on September 25, 2018, the key was excavated to a depth of approximately 18 inches into the existing clay soils. The upper approximately 6 inches of topsoil were stockpiled to the east of the excavated key to be used

later to cover the key and the slope. Throughout the key excavation activities, there was no water observed in the key excavation or along the slope.

Following the excavation of the key, the base of the excavation was compacted using a CS56 roller compactor. Sandy clay material was transported from the mine and was staged near the cooling towers. The material was then transported to the Ash Water Transport Ponds downstream slope with smaller end-dump trucks as the material was needed. The dump trucks were used to place the material into the excavated key and then the D5K2 bulldozer was used to spread and compact the material in 8-inch lifts. Following the placement of the materials in each lift, the roller compactor made repeated passes over the material to accomplish final compaction. This process was repeated until the key excavation was backfilled to grade.

After installing the key, the dozer was used to cut 18-inch benches into the side slope and new sandy clay material was added in 8-inch lifts following the same placement, spreading, and compaction procedures described previously.

The benching and backfilling/compaction process continued up the slope of the berm until the slope of the existing berm and the adjusted berm were nearly the same angle. An approximately 8-inches of material corrected the slope. After the placement of this material to correct the slope to a 3.5H:V1, the entire slope was further compacted using the roller compactor. The compactor followed a pattern up and down the slope at an angle of 90 degrees to the crest of the berm. The final compaction and placement of top soils on the eastern downstream slope of the Ash Water Transport Ponds was completed on October 4. 2018 Following the final compaction of the slope materials and placement of the top soil, the slope was seeded using a hand-held broadcast seeder during the weekend of October 6-7, 2018.

4.0 GLOBAL SLOPE STABILITY ANALYSIS

An evaluation of the stability of the existing embankment at Cross Section 1B, and after repair of the embankment at Cross Section 9A, was conducted using SLOPE/W, an analytical slope stability software, produced by GEO-SLOPE International, to determine Factors of Safety for probable failure planes, under a static condition. In accordance with the CCR Rules, the Factors of Safety were evaluated under maximum storage pool level and maximum surcharge pool level. The soil properties used in the analysis were obtained from the ARIAS Geoprofessionals Geotechnical Study dated October 11, 2016 and include the moist unit weight (γ_m), in pounds per cubic foot (pcf); the saturated unit weight (γ_{sat}), in pounds per cubic foot (pcf); cohesive strength (c'), in pounds per square foot (psf); and angle of internal friction (ϕ'), in degrees.

Methods of evaluation used within SLOPE/W are considered limit equilibrium methods of analysis, meaning that each individual shear plane is evaluated to determine the resulting shear stress at the point of failure. Factors of Safety for slope stability analyses are computed as a ratio of the total resisting shear strength of the soil mass and the mobilized shear stress acting on the failing soil mass. For the purposes of this evaluation the Spencer Method was used. This method considers both normal and shear interslice side forces as well as moments. Therefore, the Spencer Method is theoretically more rigorous than most other methods of analysis.

A cross section of the embankment as defined in the ARIAS Geoprofessionals Geotechnical Study dated October 11, 2016 was inputted as the model geometry and Factor of Safety was calculated for existing Cross Section 1B, and modified to a 3.5H:1V slope in Cross Section 9A. The critical failure surfaces were determined for the slopes analysed and data output files are presented in ***Appendix B***.

5.0 SUMMARY OF FINDINGS

The Factors of Safety determined by the Spencer Method are compared to the CCR Rule 40 CFR 257.73(e)(2)(i) and (ii), minimum Factors of Safety of 1.40 for the maximum surcharge pool level and 1.50 for the maximum storage pool level., as shown below. Graphical representations of each analysis are included in ***Appendix B***.

Based on the results of the stability analysis as described herein, calculated Factors of Safety exceed the minimum requirements listed by CCR Rule 40 CFR 257.73(e)(2)(i) and (ii) for surface impoundments.

Stability Criteria	Pool Water Elevation	Downstream Groundwater Elevation (feet)	Section Analysed	Computed Factor of Safety	Minimum Factor of Safety
Maximum Storage Pool Steady-State Seepage Long-Term (Drained)	314.5	Toe of Downstream Slope	1B	1.528	1.50
			9A	1.598	
Maximum Surcharge Pool Steady-State Seepage Long-Term (Drained)	316.0	Toe of Downstream Slope	1B	1.534	1.40
			9A	1.598	

Notes:

1. The downstream water elevation for the Ash Water Transport Ponds is assumed to be at the toe of the embankment for Cross Section 1B and Cross Section 9A.

Periodic safety factor assessments. (1) The owner or operator must conduct an initial and periodic safety factor assessments for each CCR unit and document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors specified in paragraphs (e)(1)(i) through (iv) of this section for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations.

(i) The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.

(ii) The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.

Based on slope stability analyses performed on the current embankments at locations of Cross Section 1B and 9A, the factors of safety exceed the CCR Rule required values and are considered safe.

APPENDIX A

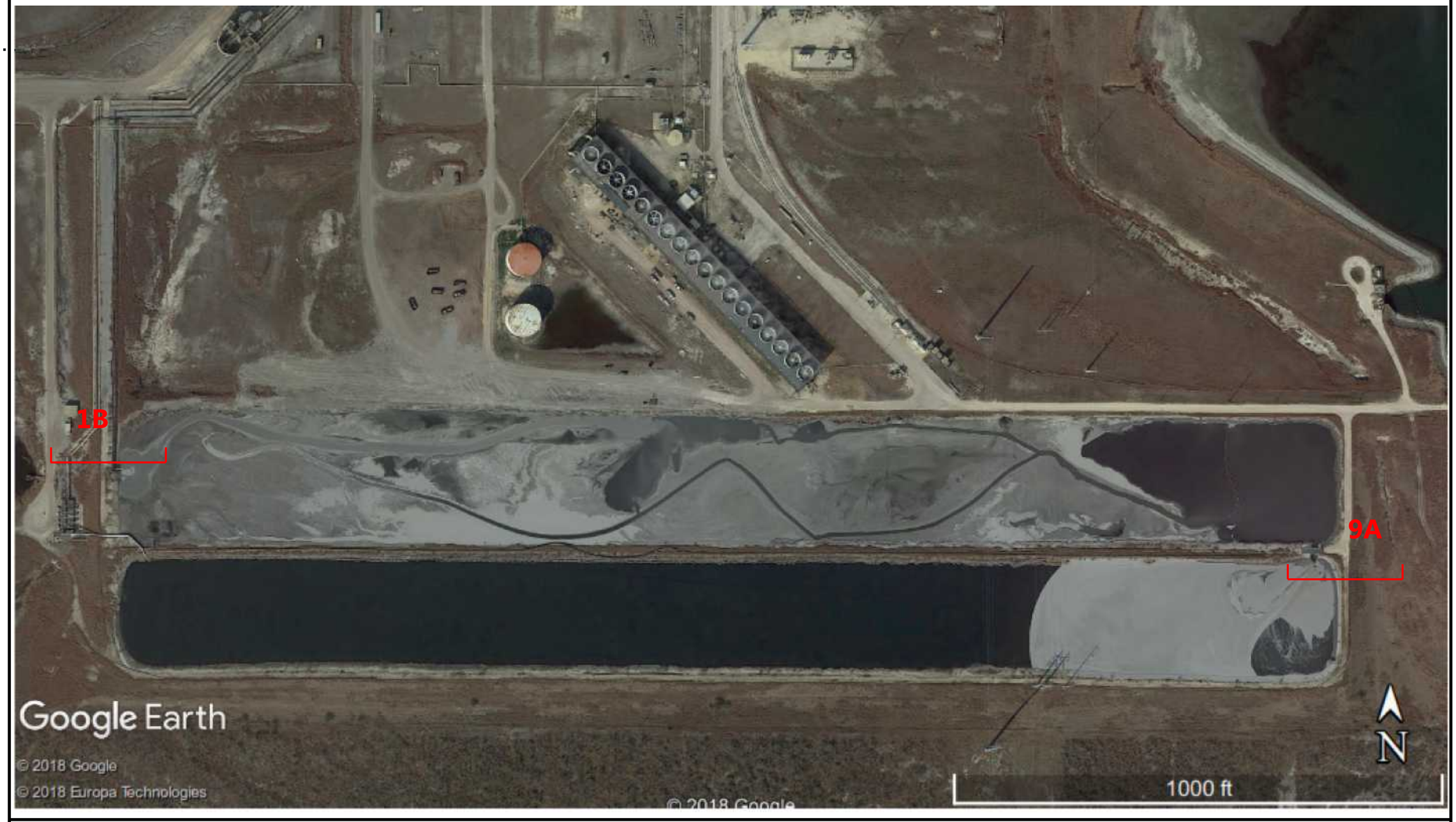


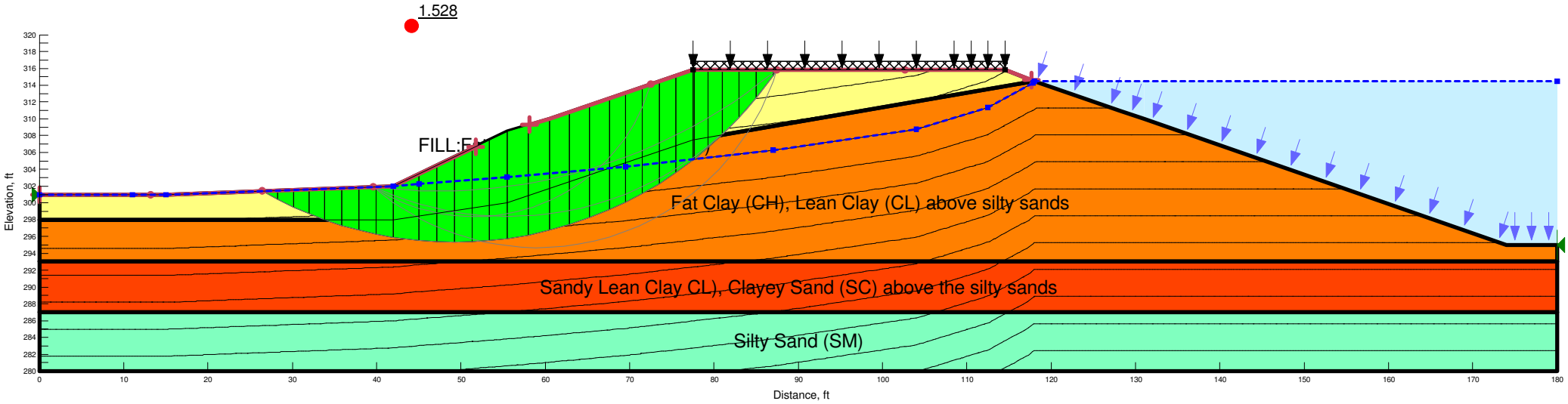
FIGURE 1
Site Plan
Inspection of Repair and Geotechnical Analysis
Ash Water Transport Ponds
San Miguel Electric Cooperative Power Plant
Atascosa County Texas
Wood Project No. 6706160039

wood.

Drawn By:	Date:
mjb	11/7/2018
Checked By:	Drawing No.:
	6706160039

APPENDIX B

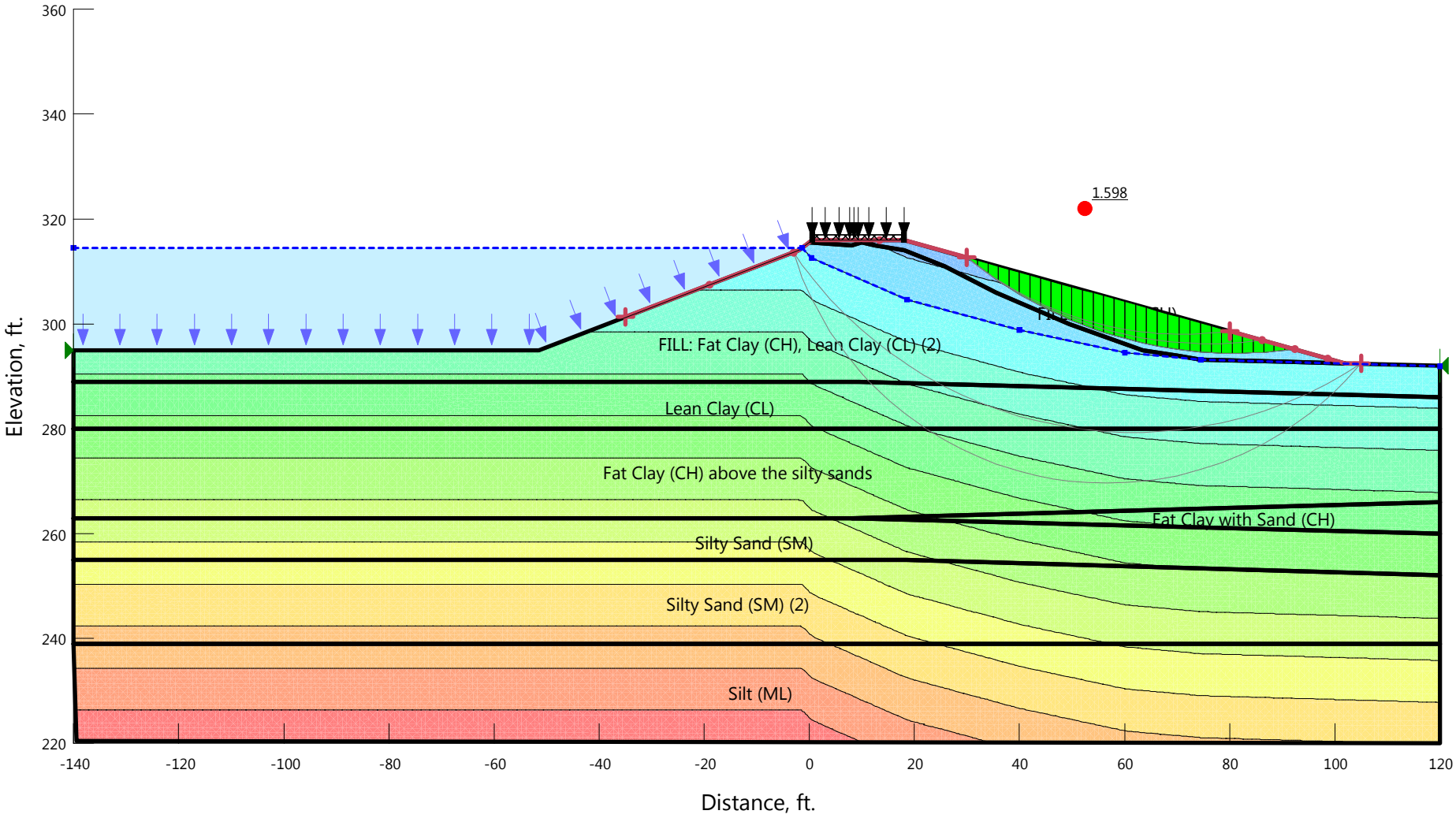
Cross Section 1B - Maximum Storage Pool Steady-State Seepage Long-Term (Drained)



Arias 2016 report: Used soil profile and parameters. Phreatic surface assumed through the toe of the slope. Spencer Method

FILL:Fat Clay (CH), Lean Clay (CL) 112 pcf 100 psf 21 °
Fat Clay (CH), Lean Clay (CL) above silty sands 120 pcf 150 psf 18 °
Sandy Lean Clay CL), Clayey Sand (SC) above the silty sands 120 pcf 200 psf 24 °
Silty Sand (SM) 120 pcf 0 psf 30 °

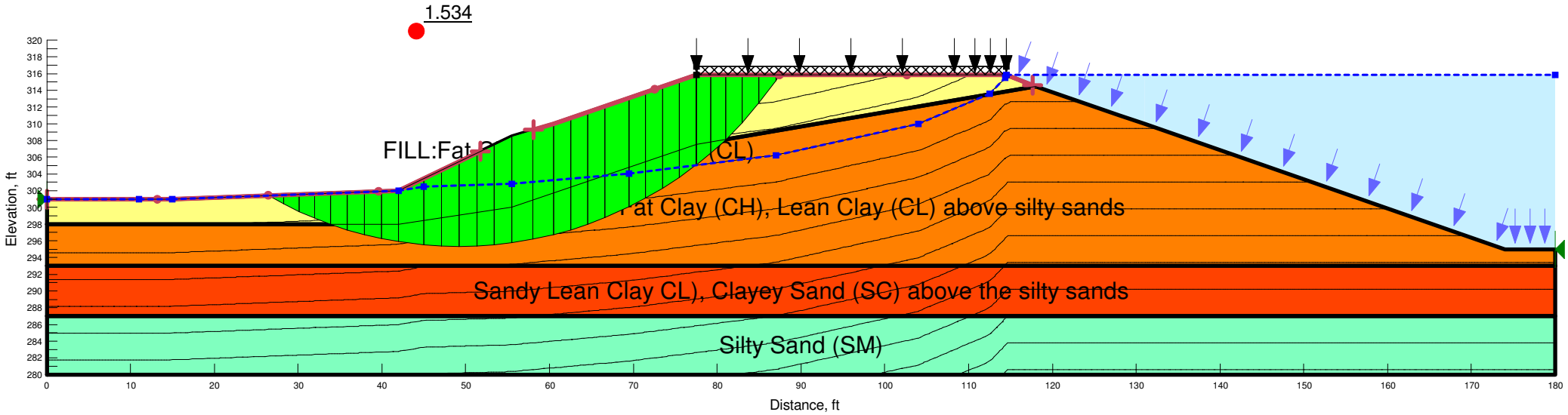
Cross-Section 9A - Maximum Storage Pool Steady-State Seepage Long-Term (Drained)



Arias 2016 report: Used soil profile and parameters. Phreatic surface assumed through the toe of the slope. Spencer Method

FILL: Fat Clay (CH), Lean Clay (CL) (2) 112 pcf 288 psf 20.3 °
Lean Clay (CL) 120 pcf 250 psf 18 °
Fat Clay (CH) above the silty sands 120 pcf 250 psf 15 °
Fat Clay with Sand (CH) 120 pcf 150 psf 24 °
Silty Sand (SM) 120 pcf 0 psf 30 °
Silty Sand (SM) (2) 120 pcf 0 psf 28 °
Silt (ML) 120 pcf 250 psf 21 °
FILL: Fat Clay (CH) 100 pcf 5 psf 22 °

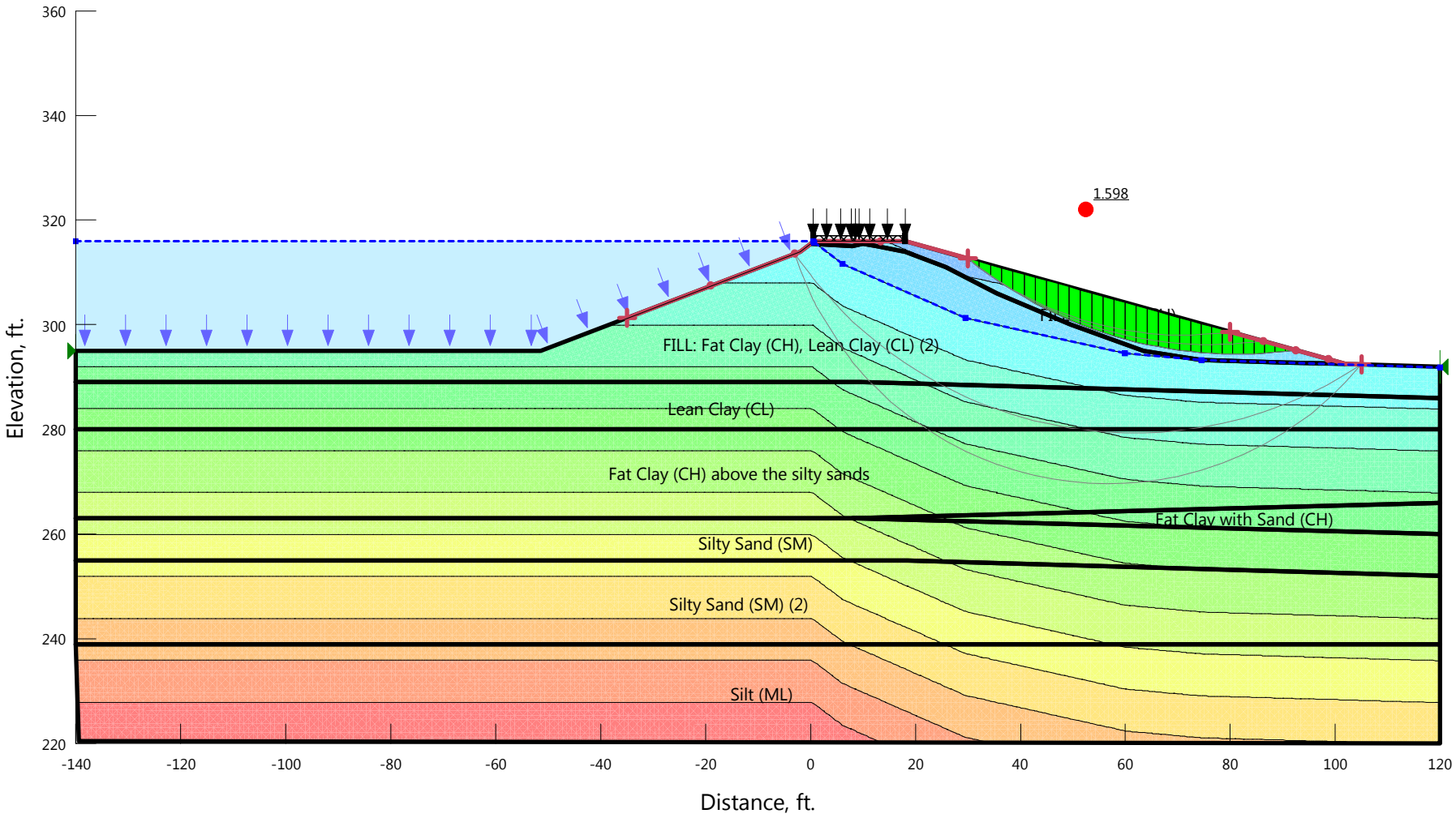
Cross Section 1B - Maximum Surcharge Pool Steady-State Seepage Long-Term (Drained)



Comments: Arias 2016 report: Used soil profile and parameters. Phreatic surface assumed through the toe of the slope. Spenser Method

FILL:Fat Clay (CH), Lean Clay (CL) 112 pcf 100 psf 21 °
Fat Clay (CH), Lean Clay (CL) above silty sands 120 pcf 150 psf 18 °
Sandy Lean Clay CL), Clayey Sand (SC) above the silty sands 120 pcf 200 psf 24 °
Silty Sand (SM) 120 pcf 0 psf 30 °

Cross-Section 9A - Maximum Surcharge Pool Steady-State Seepage Long-Term (Drained)



Arias 2016 report: Used soil profile and parameters. Phreatic surface assumed through the toe of the slope. Spencer Method

FILL: Fat Clay (CH), Lean Clay (CL) (2) 112 pcf 288 psf 20.3 °
Lean Clay (CL) 120 pcf 250 psf 18 °
Fat Clay (CH) above the silty sands 120 pcf 250 psf 15 °
Fat Clay with Sand (CH) 120 pcf 150 psf 24 °
Silty Sand (SM) 120 pcf 0 psf 30 °
Silty Sand (SM) (2) 120 pcf 0 psf 28 °
Silt (ML) 120 pcf 250 psf 21 °
FILL: Fat Clay (CH) 100 pcf 5 psf 22 °

Section 1B

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File Information

Title: Cross Section 1B - Maximum Storage Pool Steady-State Seepage Long-Term (Drained)
Comments: Arias 2016 report: Used soil profile and parameters. Phreatic surface assumed through the toe of the slope. Spencer Method
Created By: Breitnauer, Mark
Last Edited By: Breitnauer, Mark
Revision Number: 31
File Version: 8.2
Tool Version: 8.12.3.7901
Date: 11/9/2018
Time: 7:52:46 AM
File Name: Cross Section 1B_11-8-2018.gsz
Directory: P:\ENG_data\2018 Geo Jobs\6706160039 San Miguel Electric Cooperative\Slope Stability\
Last Solved Date: 11/9/2018
Last Solved Time: 7:52:53 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

Section 1B

Description: Existing Condition Using Soil Data from Arias' 2012 Report
Kind: SLOPE/W
Method: Spencer
Settings
Lambda
Lambda 1: -1
Lambda 2: -0.8
Lambda 3: -0.6
Lambda 4: -0.4
Lambda 5: -0.2
Lambda 6: 0
Lambda 7: 0.2
Lambda 8: 0.4

Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: No
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

FILL:Fat Clay (CH), Lean Clay (CL)

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 100 psf
Phi': 21 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Fat Clay (CH), Lean Clay (CL) above silty sands

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 150 psf
Phi': 18 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sandy Lean Clay CL), Clayey Sand (SC) above the silty sands

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 200 psf
Phi': 24 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silty Sand (SM)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (0, 301) ft
Left-Zone Right Coordinate: (51.74449, 306.69179) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (58.11468, 309.2844) ft
Right-Zone Right Coordinate: (117.64905, 314.63637) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 301) ft
Right Coordinate: (180, 295) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	0	301
Coordinate 2	11	301
Coordinate 3	15	301
Coordinate 4	42	302
Coordinate 5	45	302.25
Coordinate 6	55.5	303.05

Coordinate 7	69.5	304.3
Coordinate 8	87	306.25
Coordinate 9	104	308.75
Coordinate 10	112.5	311.35
Coordinate 11	117.85	314.25
Coordinate 12	118	314.5
Coordinate 13	180	314.5

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 200 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	77.5	315.86
	77.5	316.86
	114.5	316.86
	114.5	315.86

Points

	X (ft)	Y (ft)
Point 1	42	302
Point 2	15	301
Point 3	55.5	308.5
Point 4	77.5	315.86
Point 5	109.5	315.86
Point 6	114.5	315.86
Point 7	118	314.5
Point 8	174	295
Point 9	180	295
Point 10	128	311
Point 11	60.5	310
Point 12	131	310
Point 13	0	293
Point 14	180	293
Point 15	180	287
Point 16	0	287
Point 17	0	280
Point 18	180	280
Point 19	0	298

Point 20	0	301
Point 21	77.5	307.5
Point 22	55.5	300
Point 23	42	298

Regions

	Material	Points	Area (ft²)
Region 1	Sandy Lean Clay CL), Clayey Sand (SC) above the silty sands	16,13,14,15	1,080
Region 2	Silty Sand (SM)	17,16,15,18	1,260
Region 3	FILL:Fat Clay (CH), Lean Clay (CL)	19,20,2,1,3,11,4,5,6,7,21,22,23	601.89
Region 4	Fat Clay (CH), Lean Clay (CL) above silty sands	13,19,23,22,21,7,10,12,8,9,14	1,927

Current Slip Surface

Slip Surface: 63
F of S: 1.528
Volume: 527.9254 ft³
Weight: 60,400.039 lbs
Resisting Moment: 1,147,776.8 lbs-ft
Activating Moment: 751,175.77 lbs-ft
Resisting Force: 22,425.322 lbs
Activating Force: 14,687.166 lbs
F of S Rank: 1
Exit: (26.40902, 301.42256) ft
Entry: (87.453218, 315.86) ft
Radius: 45.850132 ft
Center: (49.233611, 341.18778) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	27.337538	300.91769	33.649385	149.48592	44.465476	100
Slice 2	29.194574	299.9615	97.607589	283.18581	71.236803	100
Slice 3	31.051609	299.10897	155.09763	396.64662	92.721971	100
Slice 4	32.908645	298.35388	206.50681	492.67885	109.85115	100
Slice 5	34.857517	297.66298	254.12296	593.62746	110.3117	150

Slice 6	36.898226	297.04086	297.65979	669.55328	120.83552	150
Slice 7	38.938936	296.52059	334.84097	729.92852	128.37173	150
Slice 8	40.979645	296.09863	365.88704	776.05524	133.27173	150
Slice 9	43.5	295.72268	399.50449	897.69919	161.87327	150
Slice 10	46.05	295.46042	428.662	1,057.5868	204.35005	150
Slice 11	48.15	295.36249	444.75693	1,169.4007	235.45103	150
Slice 12	50.25	295.36094	454.83709	1,265.3271	263.34418	150
Slice 13	52.35	295.45578	458.90309	1,345.9851	288.23043	150
Slice 14	54.45	295.64761	456.91728	1,411.8325	310.27076	150
Slice 15	56.75	295.97569	448.4013	1,443.7987	323.42423	150
Slice 16	59.25	296.46345	431.89382	1,440.4844	327.71094	150
Slice 17	61.686882	297.07848	407.09239	1,425.6398	330.9461	150
Slice 18	64.060645	297.81935	374.08754	1,399.6331	333.21997	150
Slice 19	66.434409	298.70569	332.00515	1,356.3736	332.83746	150
Slice 20	68.560645	299.62304	286.60868	1,303.4125	330.37958	150
Slice 21	70.5	300.58358	238.85794	1,241.3417	325.72674	150
Slice 22	72.5	301.69648	183.31921	1,164.1796	318.70085	150
Slice 23	74.5	302.94634	119.23427	1,072.6467	309.78249	150
Slice 24	76.5	304.34716	45.729089	965.77168	298.93996	150
Slice 25	77.577145	305.14795	3.2494444	1,056.4594	342.20866	150
Slice 26	78.484269	305.89654	-37.155055	970.66796	315.38914	150
Slice 27	80.144228	307.34247	-115.83914	811.12147	263.54934	150
Slice 28	81.978506	309.12618	-214.38898	634.17424	243.43668	100
Slice 29	83.987103	311.32048	-337.34735	434.51528	166.79479	100

Slice 30	85.995701	313.83906	-480.54041	224.30944	86.104328	100
Slice 31	87.226609	315.52452	-576.65049	94.713252	36.357011	100

Slope Stability-Cross Section 9A

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File Information

Title: Cross-Section 9A - Maximum Storage Pool Steady-State Seepage Long-Term (Drained)
Comments: Arias 2016 report: Used soil profile and parameters. Phreatic surface assumed through the toe of the slope. Spencer Method
Created By: Breitnauer, Mark
Last Edited By: Breitnauer, Mark
Revision Number: 121
File Version: 8.2
Tool Version: 8.12.3.7901
Date: 11/9/2018
Time: 7:28:11 AM
File Name: Cross Section 9A_11-8-2018.gsz
Directory: P:\ENG_data\2018 Geo Jobs\6706160039 San Miguel Electric Cooperative\Slope Stability\
Last Solved Date: 11/9/2018
Last Solved Time: 7:28:17 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

Slope Stability-Cross Section 9A

Description: Spencer Method Soil Properties as per Arias Geoprofessionals report dated 2012.
Kind: SLOPE/W
Method: Spencer
Settings
Lambda
Lambda 1: -1
Lambda 2: -0.8
Lambda 3: -0.6
Lambda 4: -0.4
Lambda 5: -0.2
Lambda 6: 0
Lambda 7: 0.2
Lambda 8: 0.4

Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: No
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 5 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

FILL: Fat Clay (CH), Lean Clay (CL) (2)

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 288 psf
Phi': 20.3 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Lean Clay (CL)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 250 psf
Phi': 18 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Fat Clay (CH) above the silty sands

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 250 psf
Phi': 15 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Fat Clay with Sand (CH)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 150 psf
Phi': 24 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silty Sand (SM)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silty Sand (SM) (2)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silt (ML)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 250 psf
Phi': 21 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

FILL: Fat Clay (CH)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 5 psf
Phi': 22 °
Phi-B: 0 °

Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-35, 301.33333) ft
Left-Zone Right Coordinate: (30, 312.64286) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (80, 298.65476) ft
Right-Zone Right Coordinate: (105, 292.41667) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (-140, 295) ft
Right Coordinate: (120, 292) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	-140	314.5
Coordinate 2	-1.33	314.5
Coordinate 3	0.4	312.6
Coordinate 4	18.6	304.6
Coordinate 5	40	298.8
Coordinate 6	60	294.5
Coordinate 7	74.5	293.2
Coordinate 8	120	291.9

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 200 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	0.5	316

	0.5	317
	18	317
	18	316

Points

	X (ft)	Y (ft)
Point 1	-140	295
Point 2	-51.5	295
Point 3	-2	314
Point 4	0.5	316
Point 5	7.5	316
Point 6	9.5	316
Point 7	18	316
Point 8	25.75	311
Point 9	35.5	306
Point 10	49.5	300
Point 11	63.5	295
Point 12	70	294
Point 13	74.5	293.2
Point 14	90.5	292.8
Point 15	120	292
Point 16	-140	289
Point 17	9.5	289
Point 18	120	286
Point 19	-140	280
Point 20	120	280
Point 21	-140	263
Point 22	8	263
Point 23	120	266
Point 24	120	260
Point 25	-140	255
Point 26	18.5	255
Point 27	120	252
Point 28	-140	239
Point 29	120	239
Point 30	120	220
Point 31	-139.5	220.5
Point 32	8	315
Point 33	12.5	315
Point 34	18	314
Point 35	102	292.5
Point 36	0	315.5
Point 37	10	315.5

Regions

	Material	Points	Area (ft²)
Region 1	Lean Clay (CL)	16,17,18,20,19	2,174.3
Region 2	Fat Clay (CH) above the silty sands	19,20,23,22,21	4,252
Region 3	Fat Clay with Sand (CH)	22,23,24	336
Region 4	Silty Sand (SM)	21,22,24,27,26,25	2,064.3
Region 5	Silty Sand (SM) (2)	25,26,27,29,28	4,007.8
Region 6	Silt (ML)	28,29,30,31	4,870.3
Region 7	FILL: Fat Clay (CH), Lean Clay (CL) (2)	16,1,2,3,36,32,37,33,34,8,9,10,11,12,13,14,35,15,18,17	2,892.1
Region 8	FILL: Fat Clay (CH)	36,4,5,6,7,35,14,13,12,11,10,9,8,34,33,37,32	448.82

Current Slip Surface

Slip Surface: 112
F of S: 1.598
Volume: 294.60009 ft³
Weight: 29,460.009 lbs
Resisting Moment: 976,803.87 lbs-ft
Activating Moment: 611,341.07 lbs-ft
Resisting Force: 11,460.084 lbs
Activating Force: 7,173.4019 lbs
F of S Rank: 1
Exit: (92.445093, 295.1731) ft
Entry: (29.999999, 312.64286) ft
Radius: 81.08467 ft
Center: (81.245849, 375.48064) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	30.999999	311.85317	-662.3084	36.796248	14.866649	5
Slice 2	32.999999	310.32303	-600.65218	111.37598	44.998818	5
Slice 3	35	308.88812	-544.93817	181.26465	73.235673	5
Slice			-			

4	37	307.5424	494.78917	246.4517	99.572951	5
Slice 5	39	306.28064	-449.87996	306.92903	124.00738	5
Slice 6	41	305.09834	-406.43215	362.68851	146.53567	5
Slice 7	43	303.99153	-364.19944	413.72021	167.15381	5
Slice 8	45	302.95676	-326.462	460.01096	185.85649	5
Slice 9	47	301.99099	-293.02972	501.54329	202.63664	5
Slice 10	49	301.09152	-263.73474	538.29447	217.48508	5
Slice 11	51	300.25597	-238.42848	570.23579	230.39022	5
Slice 12	53	299.48223	-216.97928	597.33185	241.33773	5
Slice 13	55	298.76843	-199.27031	619.53985	250.31035	5
Slice 14	57	298.11292	-185.19795	636.80902	257.28754	5
Slice 15	59	297.51421	-174.67041	649.07989	262.2453	5
Slice 16	61.035714	296.96229	-159.44136	656.31892	265.17006	5
Slice 17	63.107143	296.45797	-139.56022	658.25803	265.95351	5
Slice 18	65.178571	296.01083	-123.24742	654.57468	264.46534	5
Slice 19	67.25	295.61992	-110.44296	645.15469	260.65942	5
Slice 20	69.321429	295.28441	-101.09551	629.86889	254.48355	5
Slice 21	71.392857	295.0036	-95.161794	608.57163	245.8789	5
Slice 22	73.464286	294.77693	-92.606161	581.09922	234.77932	5
Slice 23	75.49695	294.6062	-89.524161	548.01133	221.41095	5
Slice 24	77.490849	294.48911	-85.772652	509.36889	205.79839	5
Slice 25	79.484748	294.42123	-85.0917	464.44352	187.64736	5
Slice 26	81.478647	294.40243	-87.473588	413.00717	166.86573	5
Slice 27	83.472546	294.43268	-92.916183	354.80555	143.35075	5

Slice 28	85.466446	294.51204	-101.42292	289.55492	116.98778	5
Slice 29	87.460345	294.64065	-113.00282	216.93827	87.648751	5
Slice 30	89.454244	294.81874	-127.67061	136.60096	55.190369	5
Slice 31	91.448143	295.04665	-145.44679	48.14545	19.452024	5

Section 1B

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File Information

Title: Cross Section 1B - Maximum Surcharge Pool Steady-State Seepage Long-Term (Drained)
Comments: Arias 2016 report: Used soil profile and parameters. Phreatic surface assumed through the toe of the slope. Spenser Method
Created By: Breitnauer, Mark
Last Edited By: Breitnauer, Mark
Revision Number: 31
File Version: 8.2
Tool Version: 8.12.3.7901
Date: 11/9/2018
Time: 7:57:47 AM
File Name: Cross Section 1B_11-8-2018_Max Pool_new.gsz
Directory: P:\ENG_data\2018 Geo Jobs\6706160039 San Miguel Electric Cooperative\Slope Stability\
Last Solved Date: 11/9/2018
Last Solved Time: 7:57:53 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

Section 1B

Description: Existing Condition Using Soil Data from Arias' 2012 Report
Kind: SLOPE/W
Method: Spencer
Settings
Lambda
Lambda 1: -1
Lambda 2: -0.8
Lambda 3: -0.6
Lambda 4: -0.4
Lambda 5: -0.2
Lambda 6: 0
Lambda 7: 0.2
Lambda 8: 0.4

Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: No
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

FILL:Fat Clay (CH), Lean Clay (CL)

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 100 psf
Phi': 21 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Fat Clay (CH), Lean Clay (CL) above silty sands

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 150 psf
Phi': 18 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sandy Lean Clay CL), Clayey Sand (SC) above the silty sands

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 200 psf
Phi': 24 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silty Sand (SM)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (0, 301) ft
Left-Zone Right Coordinate: (51.74449, 306.69179) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (58.11468, 309.2844) ft
Right-Zone Right Coordinate: (117.64905, 314.63637) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 301) ft
Right Coordinate: (180, 295) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	0	301
Coordinate 2	11	301
Coordinate 3	15	301
Coordinate 4	42	302
Coordinate 5	45	302.5
Coordinate 6	55.5	302.8

Coordinate 7	69.5	304.05
Coordinate 8	87	306.25
Coordinate 9	104	310
Coordinate 10	112.5	313.6
Coordinate 11	114.35	315.5
Coordinate 12	114.5	315.86
Coordinate 13	180	315.86

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 200 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	77.5	315.86
	77.5	316.86
	114.5	316.86
	114.5	315.86

Points

	X (ft)	Y (ft)
Point 1	42	302
Point 2	15	301
Point 3	55.5	308.5
Point 4	77.5	315.86
Point 5	109.5	315.86
Point 6	114.5	315.86
Point 7	118	314.5
Point 8	174	295
Point 9	180	295
Point 10	128	311
Point 11	60.5	310
Point 12	131	310
Point 13	0	293
Point 14	180	293
Point 15	180	287
Point 16	0	287
Point 17	0	280
Point 18	180	280
Point 19	0	298

Point 20	0	301
Point 21	77.5	307.5
Point 22	55.5	300
Point 23	42	298

Regions

	Material	Points	Area (ft²)
Region 1	Sandy Lean Clay CL), Clayey Sand (SC) above the silty sands	16,13,14,15	1,080
Region 2	Silty Sand (SM)	17,16,15,18	1,260
Region 3	FILL:Fat Clay (CH), Lean Clay (CL)	19,20,2,1,3,11,4,5,6,7,21,22,23	601.89
Region 4	Fat Clay (CH), Lean Clay (CL) above silty sands	13,19,23,22,21,7,10,12,8,9,14	1,927

Current Slip Surface

Slip Surface: 63
F of S: 1.534
Volume: 527.91326 ft³
Weight: 60,398.581 lbs
Resisting Moment: 1,152,338.3 lbs-ft
Activating Moment: 751,155.41 lbs-ft
Resisting Force: 22,515.822 lbs
Activating Force: 14,687.971 lbs
F of S Rank: 1
Exit: (26.40902, 301.42256) ft
Entry: (87.453218, 315.86) ft
Radius: 45.850132 ft
Center: (49.233611, 341.18778) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	27.337538	300.91769	33.649385	149.20756	44.358626	100
Slice 2	29.194574	299.9615	97.607589	282.93391	71.140109	100
Slice 3	31.051609	299.10897	155.09763	396.42061	92.635213	100
Slice 4	32.908645	298.35388	206.50681	492.47735	109.7738	100
Slice 5	34.857517	297.66298	254.12296	593.40981	110.24098	150

Slice 6	36.898226	297.04086	297.65979	669.36506	120.77436	150
Slice 7	38.938936	296.52059	334.84097	729.76649	128.31908	150
Slice 8	40.979645	296.09863	365.88704	775.91667	133.2267	150
Slice 9	43.5	295.72268	407.30449	896.9515	159.09596	150
Slice 10	46.05	295.46042	441.142	1,056.6636	199.99508	150
Slice 11	48.15	295.36249	450.99693	1,168.9695	233.28341	150
Slice 12	50.25	295.36094	454.83709	1,265.2446	263.31736	150
Slice 13	52.35	295.45578	452.66309	1,346.1169	290.30073	150
Slice 14	54.45	295.64761	444.43728	1,412.0508	314.39669	150
Slice 15	56.75	295.97569	432.8013	1,443.9337	328.53683	150
Slice 16	59.25	296.46345	416.29382	1,440.4627	332.77265	150
Slice 17	61.52129	297.02757	393.74679	1,427.1782	335.78221	150
Slice 18	63.563871	297.64788	366.41934	1,406.7432	338.02174	150
Slice 19	65.606452	298.37459	332.45311	1,373.6065	338.29123	150
Slice 20	68.063871	299.41249	281.37924	1,314.8129	335.78295	150
Slice 21	70.493987	300.58024	224.31057	1,240.933	330.32064	150
Slice 22	72.481961	301.68564	170.92813	1,164.3271	322.77489	150
Slice 23	74.469936	302.92625	109.10926	1,073.5671	313.37136	150
Slice 24	76.45791	304.31576	37.998348	967.70412	302.07972	150
Slice 25	77.475948	305.06847	-0.98484136	909.71583	295.58459	150
Slice 26	78.368552	305.80241	-39.780499	981.71226	318.97765	150
Slice 27	80.105655	307.30901	-120.16552	815.12304	264.84953	150
Slice 28	81.978506	309.12618	-218.86528	634.52784	243.57242	100
Slice 29	83.987103	311.32048	-340.03313	434.84388	166.92092	100

Slice 30	85.995701	313.83906	-481.43567	224.59975	86.215765	100
Slice 31	87.226609	315.52452	-575.61076	94.97345	36.456892	100

Slope Stability-Cross Section 9A

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File Information

Title: Cross-Section 9A - Maximum Surcharge Pool Steady-State Seepage Long-Term (Drained)
Comments: Arias 2016 report: Used soil profile and parameters. Phreatic surface assumed through the toe of the slope. Spencer Method
Created By: Breitnauer, Mark
Last Edited By: Breitnauer, Mark
Revision Number: 125
File Version: 8.2
Tool Version: 8.12.3.7901
Date: 11/9/2018
Time: 7:22:15 AM
File Name: Cross Section 9A_11-8-2018_Max Pool.gsz
Directory: P:\ENG_data\2018 Geo Jobs\6706160039 San Miguel Electric Cooperative\Slope Stability\
Last Solved Date: 11/9/2018
Last Solved Time: 7:22:21 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

Slope Stability-Cross Section 9A

Description: Spencer Method Soil Properties as per Arias Geoprofessionals report dated 2012.
Kind: SLOPE/W
Method: Spencer
Settings
Lambda
Lambda 1: -1
Lambda 2: -0.8
Lambda 3: -0.6
Lambda 4: -0.4
Lambda 5: -0.2
Lambda 6: 0
Lambda 7: 0.2
Lambda 8: 0.4

Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: No
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 5 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

FILL: Fat Clay (CH), Lean Clay (CL) (2)

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 288 psf
Phi': 20.3 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Lean Clay (CL)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 250 psf
Phi': 18 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Fat Clay (CH) above the silty sands

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 250 psf
Phi': 15 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Fat Clay with Sand (CH)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 150 psf
Phi': 24 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silty Sand (SM)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silty Sand (SM) (2)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silt (ML)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 250 psf
Phi': 21 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

FILL: Fat Clay (CH)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 5 psf
Phi': 22 °
Phi-B: 0 °

Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-35, 301.33333) ft
Left-Zone Right Coordinate: (30, 312.64286) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (80, 298.65476) ft
Right-Zone Right Coordinate: (105, 292.41667) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (-140, 295) ft
Right Coordinate: (120, 292) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	-140	316
Coordinate 2	0.5	316
Coordinate 3	0.7	315.725
Coordinate 4	6.1	311.6
Coordinate 5	29.5	301.3
Coordinate 6	60	294.5
Coordinate 7	74.5	293.2
Coordinate 8	120	291.9

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 200 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	0.5	316

	0.5	317
	18	317
	18	316

Points

	X (ft)	Y (ft)
Point 1	-140	295
Point 2	-51.5	295
Point 3	-2	314
Point 4	0.5	316
Point 5	7.5	316
Point 6	9.5	316
Point 7	18	316
Point 8	25.75	311
Point 9	35.5	306
Point 10	49.5	300
Point 11	63.5	295
Point 12	70	294
Point 13	74.5	293.2
Point 14	90.5	292.8
Point 15	120	292
Point 16	-140	289
Point 17	9.5	289
Point 18	120	286
Point 19	-140	280
Point 20	120	280
Point 21	-140	263
Point 22	8	263
Point 23	120	266
Point 24	120	260
Point 25	-140	255
Point 26	18.5	255
Point 27	120	252
Point 28	-140	239
Point 29	120	239
Point 30	120	220
Point 31	-139.5	220.5
Point 32	8	315
Point 33	12.5	315
Point 34	18	314
Point 35	102	292.5
Point 36	0	315.5
Point 37	10	315.5

Regions

	Material	Points	Area (ft²)
Region 1	Lean Clay (CL)	16,17,18,20,19	2,174.3
Region 2	Fat Clay (CH) above the silty sands	19,20,23,22,21	4,252
Region 3	Fat Clay with Sand (CH)	22,23,24	336
Region 4	Silty Sand (SM)	21,22,24,27,26,25	2,064.3
Region 5	Silty Sand (SM) (2)	25,26,27,29,28	4,007.8
Region 6	Silt (ML)	28,29,30,31	4,870.3
Region 7	FILL: Fat Clay (CH), Lean Clay (CL) (2)	16,1,2,3,36,32,37,33,34,8,9,10,11,12,13,14,35,15,18,17	2,892.1
Region 8	FILL: Fat Clay (CH)	36,4,5,6,7,35,14,13,12,11,10,9,8,34,33,37,32	448.82

Current Slip Surface

Slip Surface: 112
F of S: 1.598
Volume: 294.57326 ft³
Weight: 29,457.326 lbs
Resisting Moment: 976,713.31 lbs-ft
Activating Moment: 611,274.12 lbs-ft
Resisting Force: 11,459.089 lbs
Activating Force: 7,172.6586 lbs
F of S Rank: 1
Exit: (92.445093, 295.1731) ft
Entry: (29.999999, 312.64286) ft
Radius: 81.08467 ft
Center: (81.245849, 375.48064) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	31.071428	311.79869	-676.98008	39.398966	15.918216	5
Slice 2	33.214285	310.1666	-604.94931	118.953	48.060131	5
Slice 3	35.357142	308.64306	-539.69252	193.11976	78.025446	5
Slice			-			

4	37.499999	307.2208	480.75518	261.88696	105.8092	5
Slice 5	39.642857	305.8936	-427.74908	325.2449	131.40747	5
Slice 6	41.785714	304.65609	-380.3402	383.18319	154.81606	5
Slice 7	43.928571	303.50364	-338.23939	435.68838	176.02953	5
Slice 8	46.071428	302.43223	-301.19508	482.74218	195.0405	5
Slice 9	48.214285	301.43833	-268.98746	524.32001	211.83903	5
Slice 10	50.357143	300.51886	-241.42392	560.38982	226.41218	5
Slice 11	52.5	299.67109	-218.33528	590.91109	238.74358	5
Slice 12	54.642857	298.89266	-199.57279	615.83387	248.81303	5
Slice 13	56.785714	298.18146	-185.00561	635.09787	256.59619	5
Slice 14	58.928571	297.53565	-174.51881	648.6315	262.06414	5
Slice 15	61.035714	296.96229	-159.44136	656.31889	265.17004	5
Slice 16	63.107143	296.45797	-139.56022	658.25878	265.95381	5
Slice 17	65.178571	296.01083	-123.24742	654.5762	264.46595	5
Slice 18	67.25	295.61992	-110.44296	645.15697	260.66033	5
Slice 19	69.321429	295.28441	-101.09551	629.87187	254.48476	5
Slice 20	71.392857	295.0036	-95.161794	608.57527	245.88037	5
Slice 21	73.464286	294.77693	-92.606161	581.10343	234.78103	5
Slice 22	75.49695	294.6062	-89.524161	548.016	221.41284	5
Slice 23	77.490849	294.48911	-85.772652	509.37388	205.80041	5
Slice 24	79.484748	294.42123	-85.0917	464.44868	187.64945	5
Slice 25	81.478647	294.40243	-87.473588	413.01232	166.86781	5
Slice 26	83.472546	294.43268	-92.916183	354.81048	143.35274	5
Slice 27	85.466446	294.51204	-101.42292	289.55936	116.98958	5

Slice 28	87.460345	294.64065	-113.00282	216.94195	87.650237	5
Slice 29	89.454244	294.81874	-127.67061	136.60353	55.191409	5
Slice 30	91.448143	295.04665	-145.44679	48.146527	19.45246	5