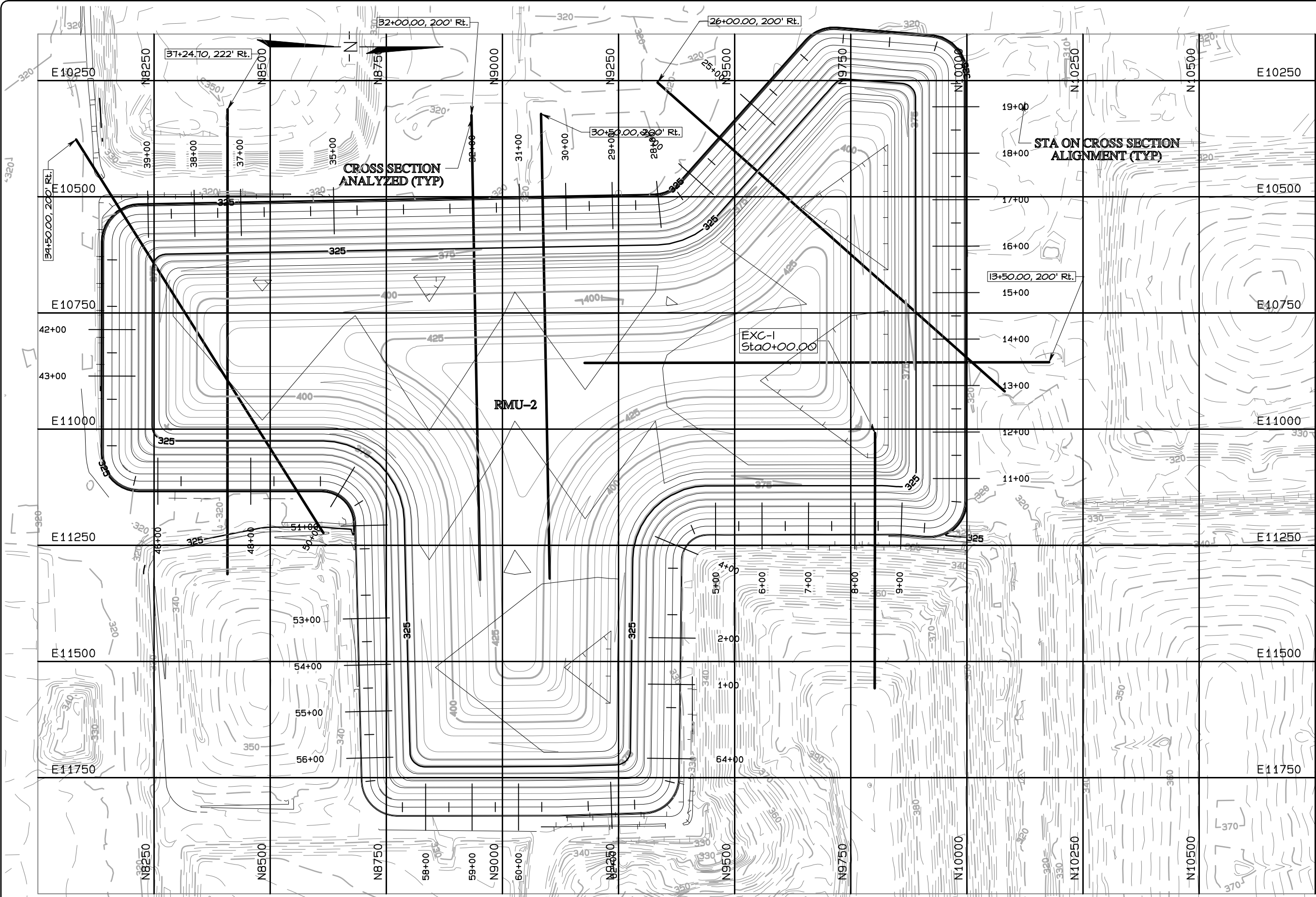

FIGURES



NOTES

SUBBASE AND FINAL GRADING IS DEPICTED WITHIN RMU-2
EXISTING TOPOGRAPHY IS SHOWN OUTSIDE RMU-2 LIMITS
STATIONING REFERS TO XS ALIGNMENT
STABILITY SECTIONS X VALUE IS 1000 + OFFSET - OFFSETS
ARE TO THE LEFT OF THE ALIGNMENT LOOKING UPSTATION

FIGURE 1
CROSS SECTION
LOCATION PLAN

RMU-2
GEOTECHNICAL
EVALUATION

P. J. CAREY & ASSOCIATES, P.C.
5878 VALINE WAY, SUGAR HILL, GA. 30518

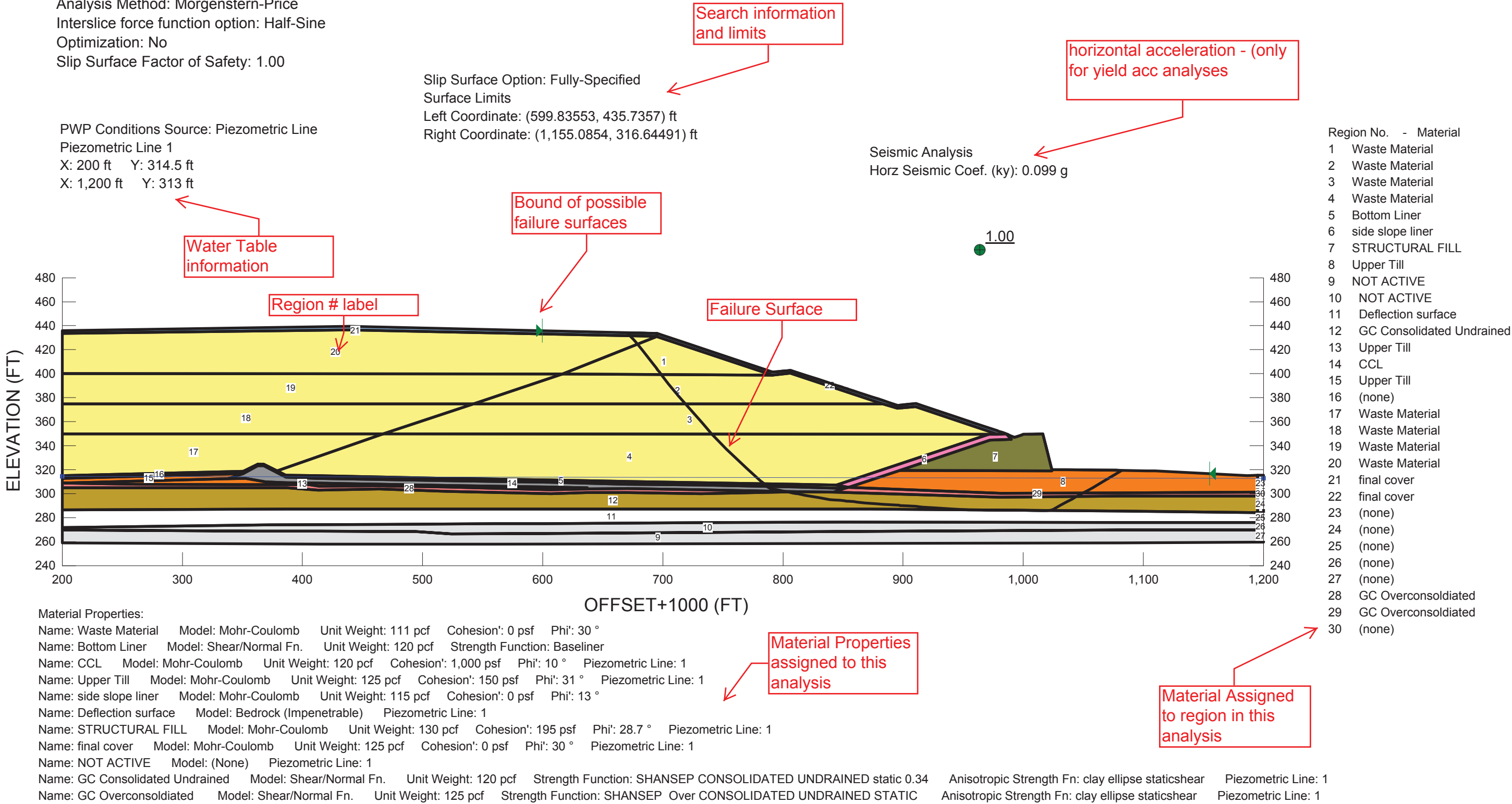
PROJ. NO.: 154.002
DATE: 2/20/2013
DRAWN BY: PJC/ALH
CHECKED BY: PJC/ALH
APPROVED BY: PJC

SECTION CALIBRES AND GRID
DATE: 2/13
REVISION
CWM
MODEL CITY, NY

SHEET
OF

Title: Model City - RMU-2 Sta 1350
Name: Consolidated Undrained-Seismic Yield
File Name: RMU2X1350.gsz
Date: 2/18/2013Time: 9:44:44 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: No
Slip Surface Factor of Safety: 1.00

PURPOSE:
To determine the seismic ky value for the deep-seated global failure for the final configuration of RMU-2 located at cross-section 13+50.

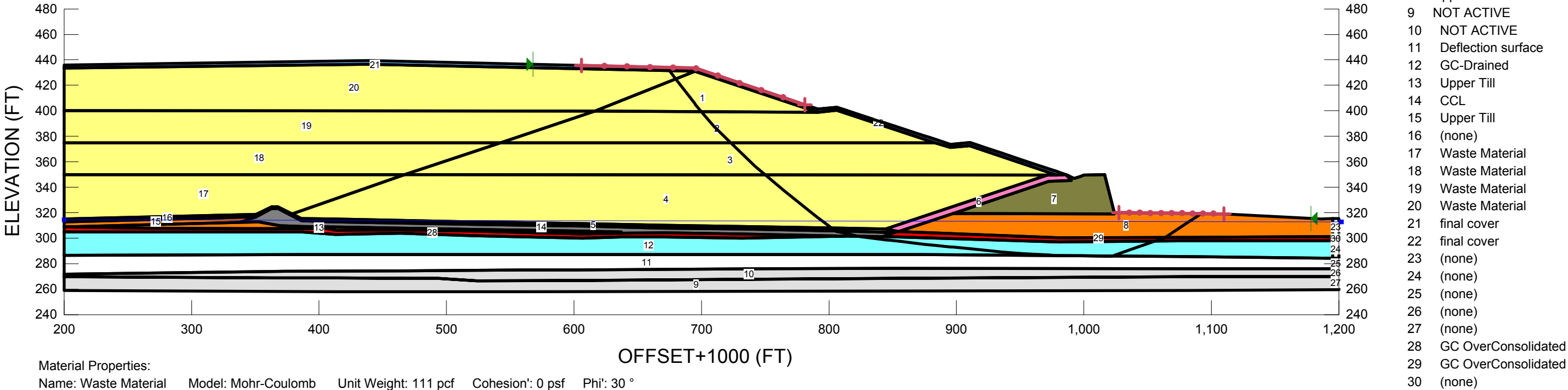


Title: Model City - RMU-2 Sta 1350
Name: Final Configuration Drain
File Name: RMU2X1350.gsz
Date: 2/19/2013Time: 9:32:07 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.62

PURPOSE:
To determine the critical long-term (fully consolidated)
static deep-seated (going into the subgrade) failure for
the final configuration of RMU-2 located at cross-section 13+50.

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 200 ft Y: 314.5 ft
X: 1,202 ft Y: 313 ft

Slip Surface Option: Entry and Exit
Surface Limits
Left Coordinate: (567.80061, 436.48593) ft
Right Coordinate: (1,178.0754, 315.45063) ft
Left-Zone Left Coordinate: (605.8643, 435.59451) ft
Left-Zone Right Coordinate: (781, 404.7847) ft
Left-Zone Increment: 10
Right-Zone Left Coordinate: (1,027.4437, 320) ft
Right-Zone Right Coordinate: (1,110, 318.98701) ft
Right-Zone Increment: 10
Radius Increments: 4



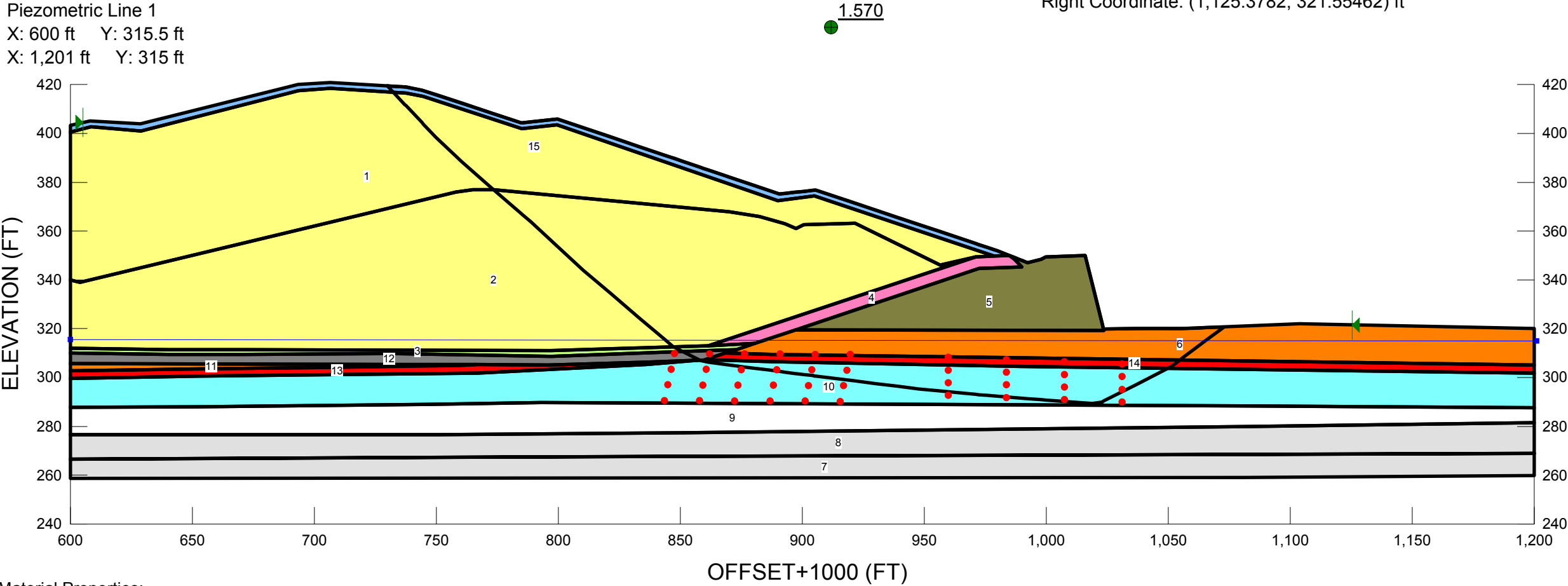
Material Properties:
Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 °
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 °
Name: GC-Drained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: normalized N^m Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: GC OverConsolidated Model: Shear/Normal Fn. Unit Weight: 125 pcf Strength Function: GC-hyper Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: side slope liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: STRUCTURAL FILL Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 195 psf Phi': 28.7 °
Name: final cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 °
Name: NOT ACTIVE Model: (None) Piezometric Line: 1

Title: Model City - RMU-2 XS 2600
Name: Long Term -Static Drained
File Name: RMU2X2600r1.gsz
Date: 2/13/2013Time: 4:52:57 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.570

PURPOSE:
To determine the critical long-term (fully consolidated) static
baseliner failure for the final configuration of RMU-2 located
located at cross-section 26+00 using block surface search routine.

Slip Surface Option: Block
Surface Limits
Left Coordinate: (605.06438, 404.48794) ft
Right Coordinate: (1,125.3782, 321.55462) ft

- Region No. - Material No.
- 1 - Waste Material
 - 2 - Waste Material
 - 3 - Bottom Liner
 - 4 - Side Slope Liner
 - 5 - Structural Fill
 - 6 - Upper Till
 - 7 - NOT ACTIVE
 - 8 - NOT ACTIVE
 - 9 - Deflection surface
 - 10 - GC-Drained
 - 11 - Upper Till
 - 12 - CCL
 - 13 - GC OverConsolidated
 - 14 - GC OverConsolidated
 - 15 - Final Cover



Material Properties:

Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseliner
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: GC-Drained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: normalized phi Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 ° Piezometric Line: 1
Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1
Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: NOT ACTIVE Model: (None) Piezometric Line: 1

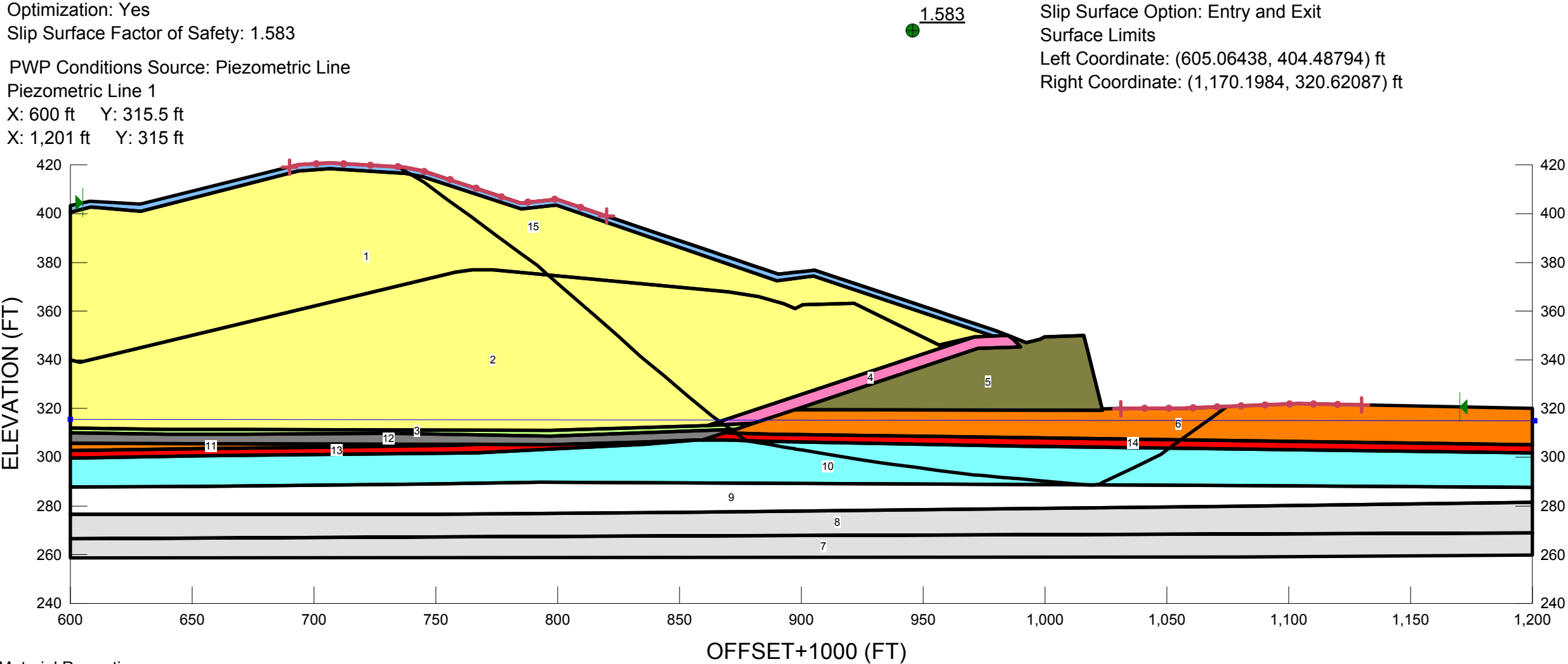
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Name: Long Term -Static Drained (2)
File Name: RMU2X2600r1.gsz
Date: 2/14/2013Time: 9:48:33 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.583

PURPOSE:
To determine the critical long-term (fully consolidated) static
baseliner failure for the final configuration of RMU-2 located
located at cross-section 26+00 using entry/exit surface search routine.

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 600 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft

Slip Surface Option: Entry and Exit
Surface Limits
Left Coordinate: (605.06438, 404.48794) ft
Right Coordinate: (1,170.1984, 320.62087) ft

- Region No. - Material No.
- 1 - Waste Material
 - 2 - Waste Material
 - 3 - Bottom Liner
 - 4 - Side Slope Liner
 - 5 - Structural Fill
 - 6 - Upper Till
 - 7 - NOT ACTIVE
 - 8 - NOT ACTIVE
 - 9 - Deflection surface
 - 10 - GC-Drained
 - 11 - Upper Till
 - 12 - CCL
 - 13 - GC OverConsolidated
 - 14 - GC OverConsolidated
 - 15 - Final Cover



Material Properties:

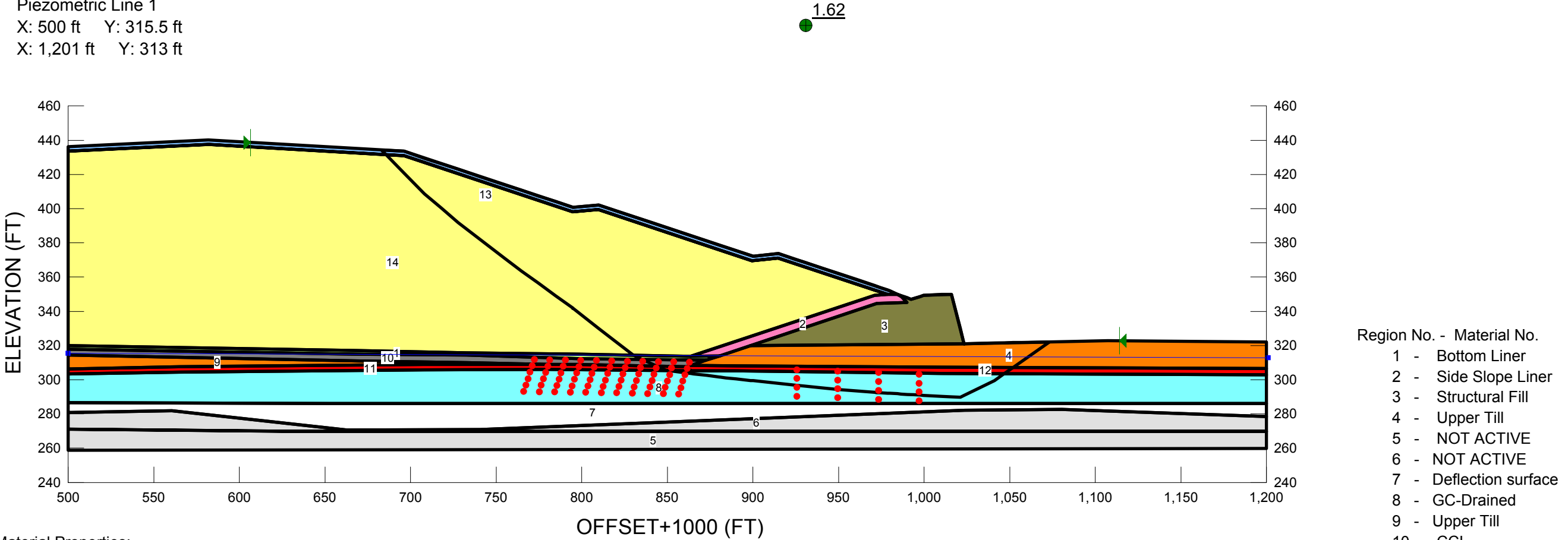
Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: GC-Drained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: normalized phi Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 ° Piezometric Line: 1
Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1
Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: NOT ACTIVE Model: (None) Piezometric Line: 1

Title: Model City - RMU-2 XS 3050
Name: Drained Final Grade
File Name: RMU2X3050r1.gsz
Date: 2/16/2013Time: 9:26:39 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.62

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 313 ft

PURPOSE:
To determine the seismic ky value for the critical long-term (drained analysis) static deep-seated (going into the subgrade) failure for the final configuration of RMU-2 located at cross-section 30+50.

Slip Surface Option: Block
Surface Limits
Left Coordinate: (606.47519, 438.67767) ft
Right Coordinate: (1,114.1689, 322.83421) ft



Material Properties:

Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °

Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline

Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1

Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1

Name: GC-Drained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: normalized phi Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 ° Piezometric Line: 1

Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °

Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1

Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1

Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1

Name: NOT ACTIVE Model: (None) Piezometric Line: 1

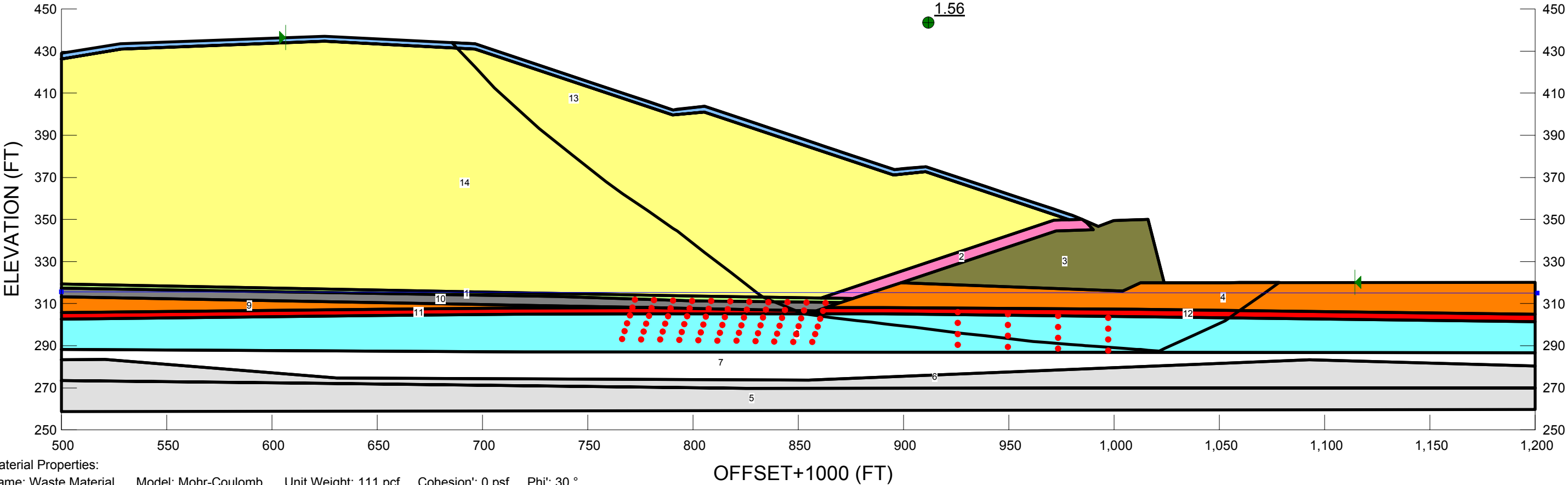
Title: Model City - RMU-2 XS3200
Name: Drained With no Grids
File Name: RMU2X3200r1.gsz
Date: 2/14/2013Time: 2:06:20 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.56

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft

PURPOSE:
To determine the critical long-term (fully consolidated) global static deep-seated (going into the subgrade) failure for the final configuration of RMU-2 located at cross-section 32+00.

Slip Surface Option: Block
Surface Limits
Left Coordinate: (606.35749, 436.40883) ft
Right Coordinate: (1,114.195, 320.05133) ft

- Region No. - Material No.
- 1 Bottom Liner
 - 2 Side Slope Liner
 - 3 Structural Fill
 - 4 Upper Till
 - 5 NOT ACTIVE
 - 6 NOT ACTIVE
 - 7 Deflection surface
 - 8 GC-Drained
 - 9 Upper Till
 - 10 CCL
 - 11 GC OverConsolidated
 - 12 GC OverConsolidated
 - 13 Final Cover
 - 14 Waste Material



Material Properties:

Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °

Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline

Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1

Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1

Name: GC-Drained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: normalized phi Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 ° Piezometric Line: 1

Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °

Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1

Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1

Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1

Name: NOT ACTIVE Model: (None) Piezometric Line: 1

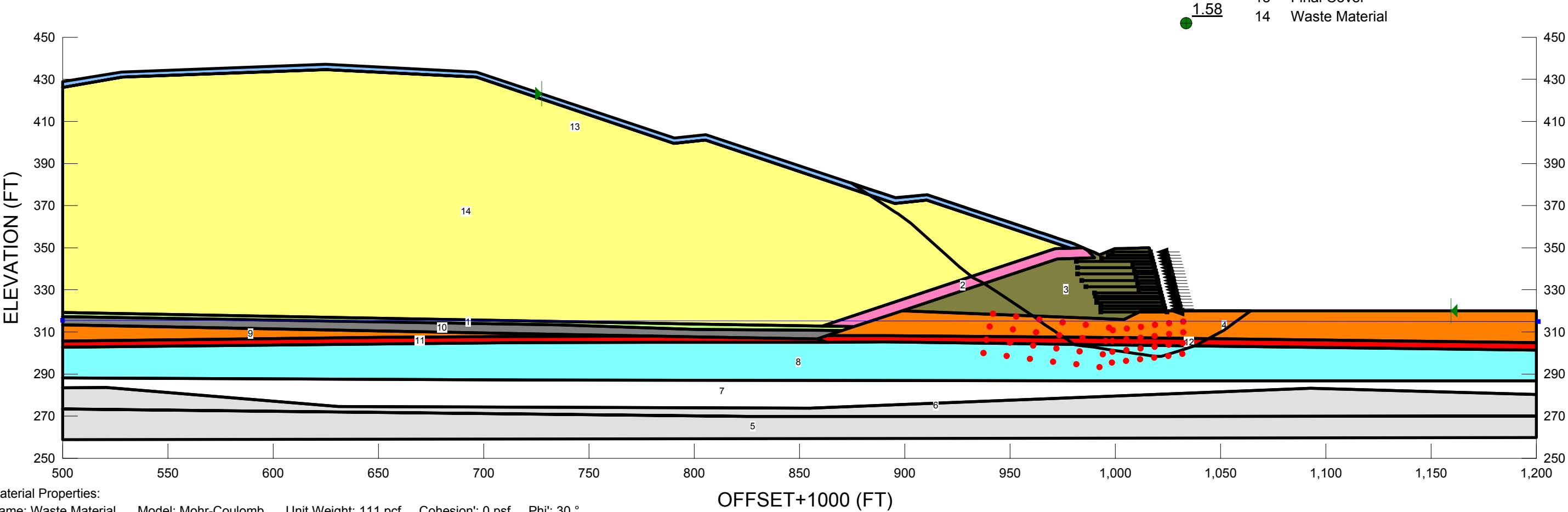
Title: Model City - RMU-2 XS3200
Name: Drained Final Grade
File Name: RMU2X3200r1.gsz
Date: 2/18/2013Time: 10:02:11 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.58

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft

PURPOSE:
To determine the critical long-term (fully consolidated)
static deep-seated (going into the subgrade) failure near the berm
for the final configuration of RMU-2 located at cross-section 32+00.

Slip Surface Option: Block
Surface Limits
Left Coordinate: (727.44, 423.12) ft
Right Coordinate: (1,159.3997, 320.07697) ft

- Region No. - Material No.
- 1 Bottom Liner
 - 2 Side Slope Liner
 - 3 Structural Fill
 - 4 Upper Till
 - 5 NOT ACTIVE
 - 6 NOT ACTIVE
 - 7 Deflection surface
 - 8 GC-Drained
 - 9 Upper Till
 - 10 CCL
 - 11 GC OverConsolidated
 - 12 GC OverConsolidated
 - 13 Final Cover
 - 14 Waste Material



Material Properties:

Name: Waste Material	Model: Mohr-Coulomb	Unit Weight: 111 pcf	Cohesion': 0 psf	Phi': 30 °	
Name: Bottom Liner	Model: Shear/Normal Fn.	Unit Weight: 120 pcf	Strength Function: Baseline		
Name: CCL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 1,000 psf	Phi': 10 °	Piezometric Line: 1
Name: Upper Till	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 150 psf	Phi': 31 °	Piezometric Line: 1
Name: GC-Drained	Model: Shear/Normal Fn.	Unit Weight: 118 pcf	Strength Function: normalized phi	Anisotropic Strength Fn: clay ellipse staticshear	Piezometric Line: 1
Name: GC OverConsolidated	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 100 psf	Phi': 30 °	Piezometric Line: 1
Name: Side Slope Liner	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 0 psf	Phi': 13 °	
Name: Deflection surface	Model: Bedrock (Impenetrable)				Piezometric Line: 1
Name: Structural Fill	Model: Mohr-Coulomb	Unit Weight: 130 pcf	Cohesion': 195 psf	Phi': 28.7 °	Piezometric Line: 1
Name: Final Cover	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 0 psf	Phi': 30 °	
Name: NOT ACTIVE	Model: (None)				Piezometric Line: 1

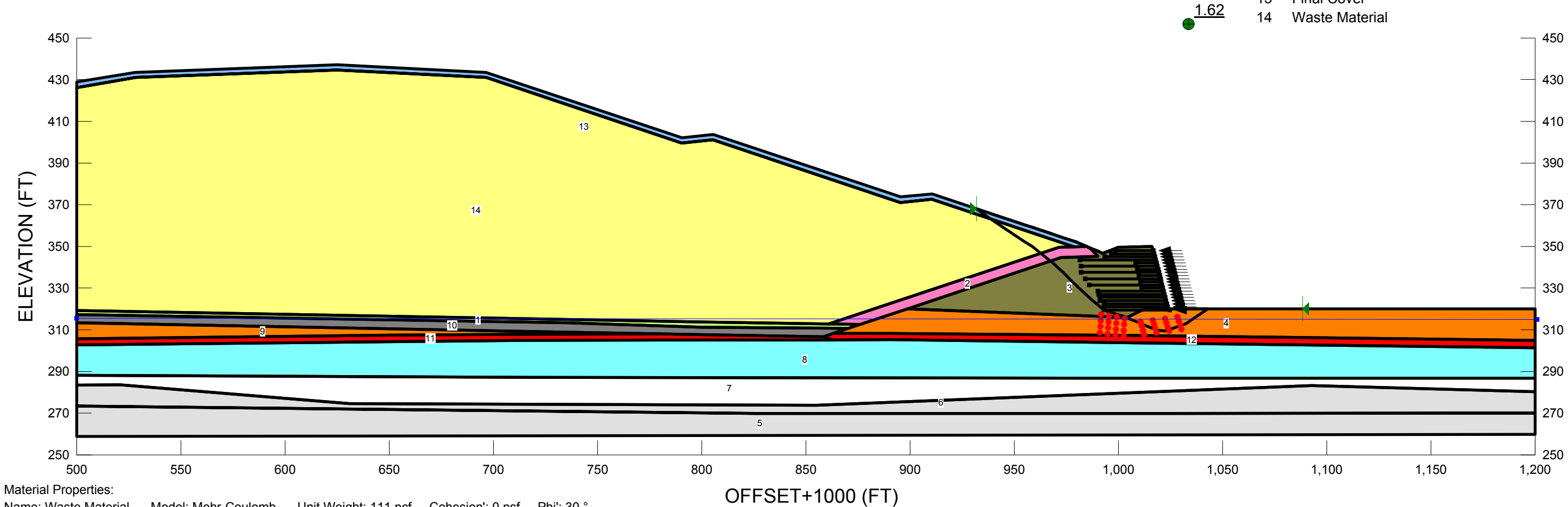
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Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.62

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft

PURPOSE:
To determine the critical long-term (fully consolidated)
static deep-seated (going into the subgrade) failure close
into the reinforcement grids for the final configuration of RMU-2
located at cross-section 32+00.

Slip Surface Option: Block
Surface Limits
Left Coordinate: (931.73033, 368.05373) ft
Right Coordinate: (1,088.3996, 320.0367) ft

- Region No. - Material No.
- 1 Bottom Liner
 - 2 Side Slope Liner
 - 3 Structural Fill
 - 4 Upper Till
 - 5 NOT ACTIVE
 - 6 NOT ACTIVE
 - 7 Deflection surface
 - 8 GC-Drained
 - 9 Upper Till
 - 10 CCL
 - 11 GC OverConsolidated
 - 12 GC OverConsolidated
 - 13 Final Cover
 - 14 Waste Material



Material Properties:

Name: Waste Material	Model: Mohr-Coulomb	Unit Weight: 111 pcf	Cohesion': 0 psf	Phi': 30 °
Name: Bottom Liner	Model: Shear/Normal Fn.	Unit Weight: 120 pcf	Strength Function: Baseline	
Name: CCL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 1,000 psf	Phi': 10 ° Piezometric Line: 1
Name: Upper Till	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 150 psf	Phi': 31 ° Piezometric Line: 1
Name: GC-Drained	Model: Shear/Normal Fn.	Unit Weight: 118 pcf	Strength Function: normalized phi	Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: GC OverConsolidated	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 100 psf	Phi': 30 ° Piezometric Line: 1
Name: Side Slope Liner	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 0 psf	Phi': 13 °
Name: Deflection surface	Model: Bedrock (Impenetrable)			Piezometric Line: 1
Name: Structural Fill	Model: Mohr-Coulomb	Unit Weight: 130 pcf	Cohesion': 195 psf	Phi': 28.7 ° Piezometric Line: 1
Name: Final Cover	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 0 psf	Phi': 30 °
Name: NOT ACTIVE	Model: (None)			Piezometric Line: 1

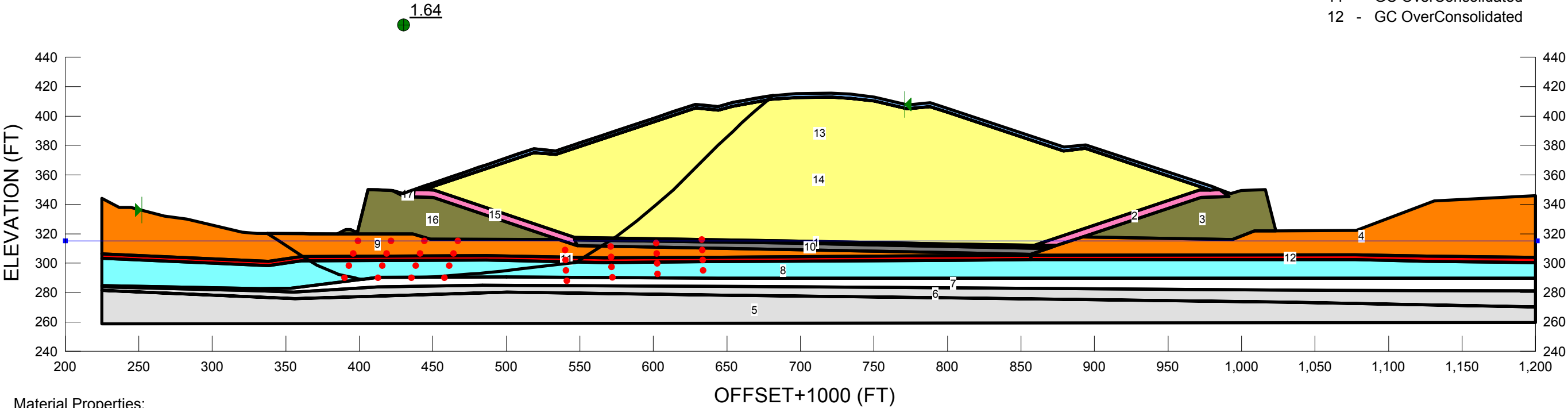
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Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.64

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 200 ft Y: 315 ft
X: 1,201 ft Y: 315 ft

PURPOSE:
To determine the critical long-term (fully consolidated)
static deep-seated (going into the subgrade) failure for
the final configuration of RMU-2 located at cross-section 37+28.

- Region No. - Material No.
- 1 - Bottom Liner
 - 2 - Side Slope Liner
 - 3 - Structural Fill
 - 4 - Upper Till
 - 5 - NOT ACTIVE
 - 6 - NOT ACTIVE
 - 7 - Deflection surface
 - 8 - GC-Drained
 - 9 - Upper Till
 - 10 - CCL
 - 13 - Final Cover
 - 14 - Waste Material
 - 11 - GC OverConsolidated
 - 12 - GC OverConsolidated

Slip Surface Option: Block
Surface Limits
Left Coordinate: (252.03542, 336.05185) ft
Right Coordinate: (770.84263, 407.9993) ft



Material Properties:

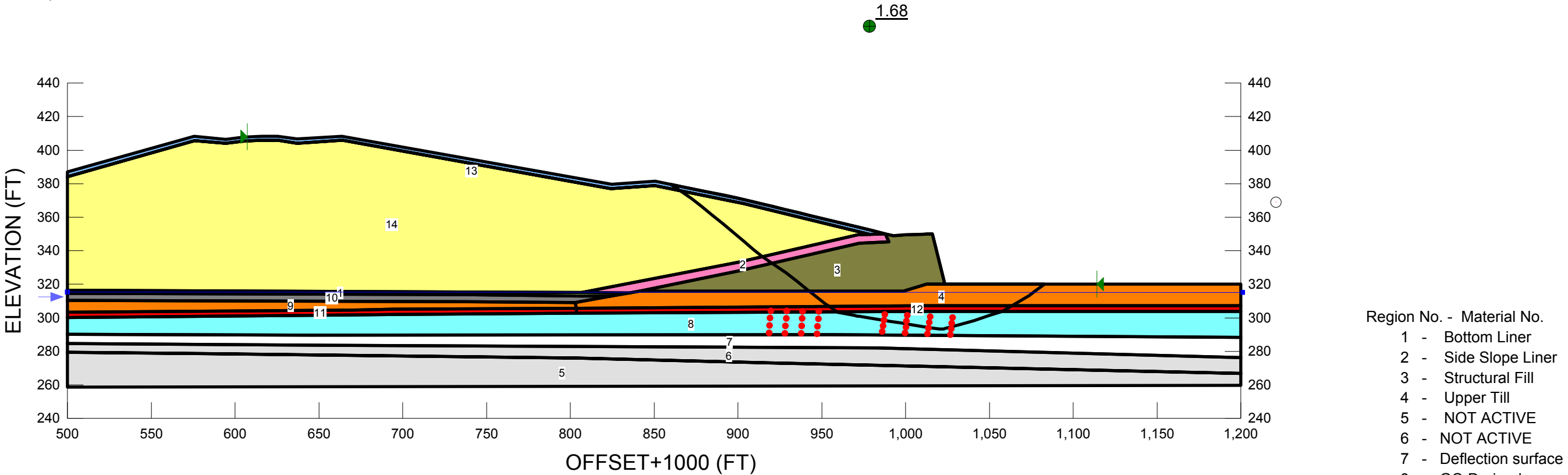
Name: Waste Material	Model: Mohr-Coulomb	Unit Weight: 111 pcf	Cohesion': 0 psf	Phi': 30 °
Name: Bottom Liner	Model: Shear/Normal Fn.	Unit Weight: 120 pcf	Strength Function: Baseline	
Name: CCL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 1,000 psf	Phi': 10 ° Piezometric Line: 1
Name: Upper Till	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 150 psf	Phi': 31 ° Piezometric Line: 1
Name: GC-Drained	Model: Shear/Normal Fn.	Unit Weight: 118 pcf	Strength Function: normalized phi	Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: GC OverConsolidated	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 100 psf	Phi': 30 ° Piezometric Line: 1
Name: Side Slope Liner	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 0 psf	Phi': 13 °
Name: Deflection surface	Model: Bedrock (Impenetrable)			Piezometric Line: 1
Name: Structural Fill	Model: Mohr-Coulomb	Unit Weight: 135 pcf	Cohesion': 195 psf	Phi': 28.7 ° Piezometric Line: 1
Name: Final Cover	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 0 psf	Phi': 30 ° Piezometric Line: 1
Name: NOT ACTIVE	Model: (None)			Piezometric Line: 1

Title: Model City - RMU-2 XS 3950
Name: DRAINED FINAL GRADE
File Name: RMU2X3950r1.gsz
Date: 2/16/2013Time: 7:54:03 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.68

PURPOSE:
To determine the critical long-term (fully consolidated)
static deep-seated (going into the subgrade) failure for
the final configuration of RMU-2 located at cross-section 39+50.

Slip Surface Option: Block
Surface Limits
Left Coordinate: (607.28187, 407.93415) ft
Right Coordinate: (1,114.195, 320.05144) ft

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft



Material Properties:

Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °

Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline

Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1

Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1

Name: GC-Drained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: normalized phi Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 ° Piezometric Line: 1

Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °

Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1

Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1

Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1

Name: NOT ACTIVE Model: (None) Piezometric Line: 1

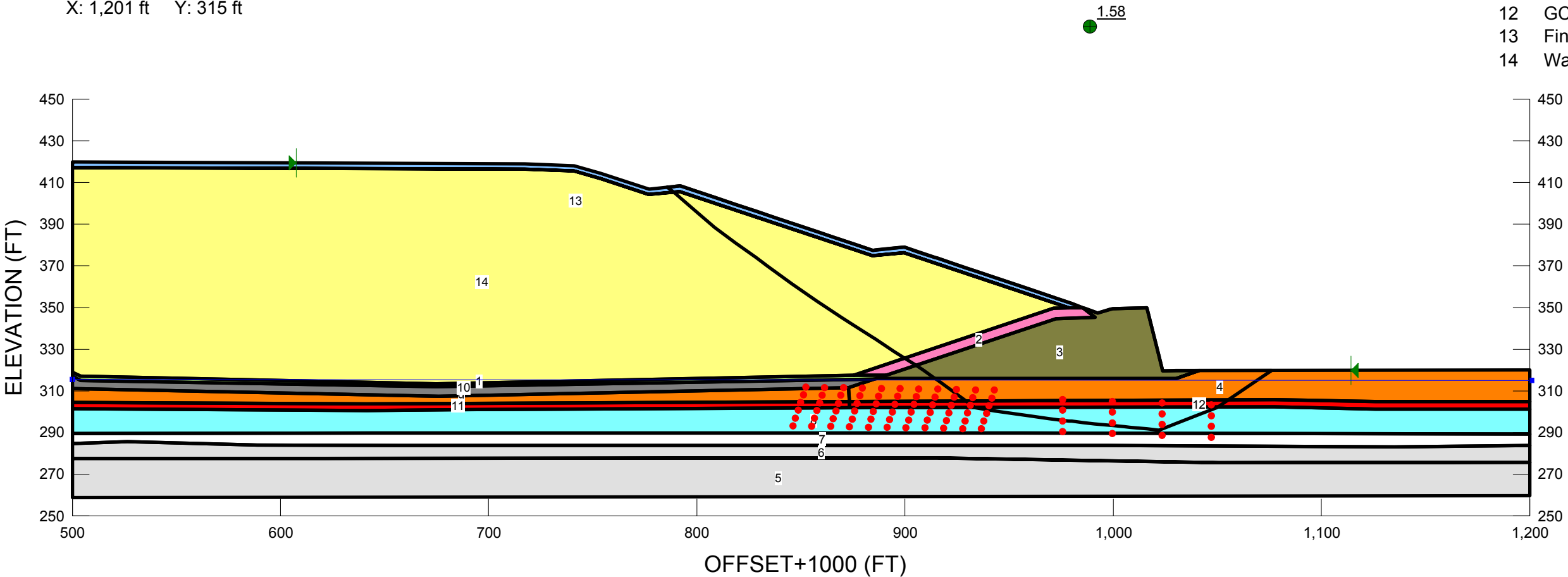
Title: Model City - RMU-2 XS 4250
Name: DRAINED FINAL GRADE
File Name: RMU2X4250r1.gsz
Date: 2/16/2013Time: 7:39:51 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.58

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft

PURPOSE:
To determine the critical long-term (fully consolidated) static deep-seated (going into the subgrade) failure for the final configuration of RMU-2 located at cross-section 42+50.

Slip Surface Option: Block
Surface Limits
Left Coordinate: (607.55022, 419.45476) ft
Right Coordinate: (1,114.1953, 319.9052) ft

Region No.	-	Material No.
1		Bottom Liner
2		Side Slope Liner
3		Structural Fill
4		Upper Till
5		NOT ACTIVE
6		NOT ACTIVE
7		Deflection surface
8		GC-Drained
9		Upper Till
10		CCL
11		GC OverConsolidated
12		GC OverConsolidated
13		Final Cover
14		Waste Material



Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: GC-Drained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: normalized phi Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 ° Piezometric Line: 1
Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1
Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: NOT ACTIVE Model: (None) Piezometric Line: 1

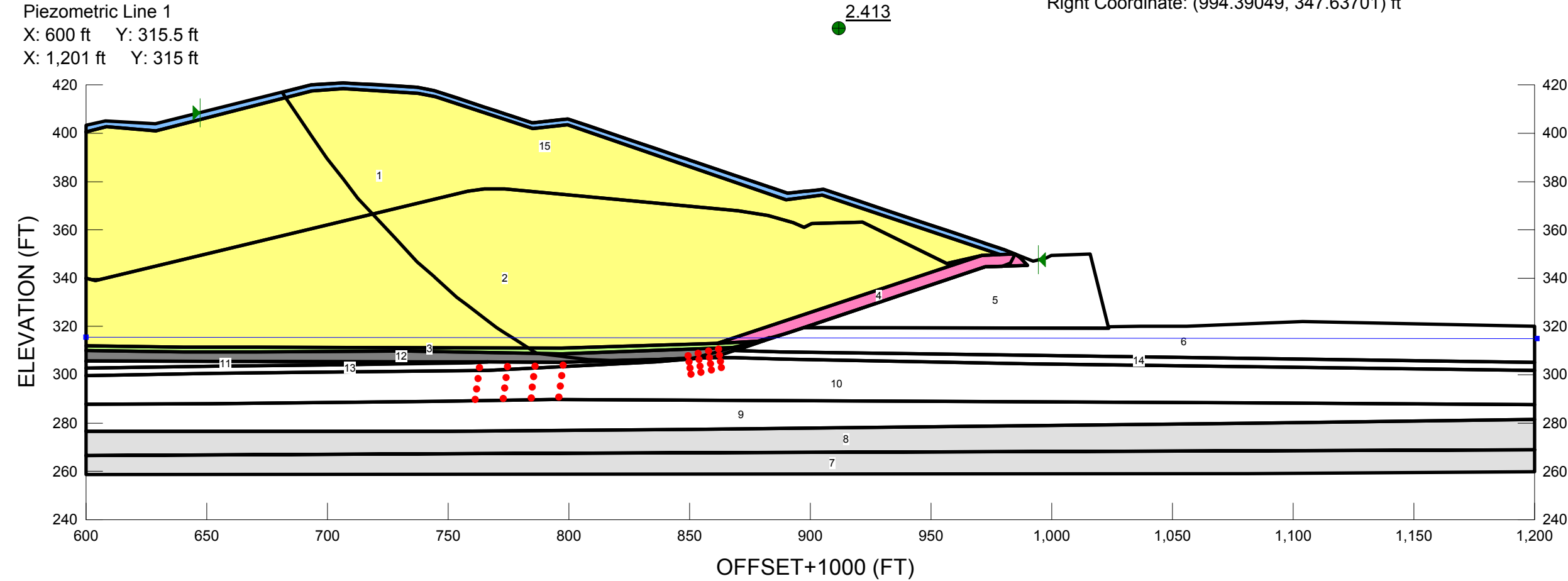
Title: Model City - RMU-2 XS 2600
Name: Baseline Failures (2) Block
File Name: RMU2X2600r1.gsz
Date: 2/17/2013Time: 4:22:49 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 2.413

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 600 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft

PURPOSE:
To determine the critical long-term (fully consolidated) static
baseliner failure for the final configuration of RMU-2 located
located at cross-section 26+00 using block surface search routine.

Slip Surface Option: Block
Surface Limits
Left Coordinate: (647.31746, 408.51503) ft
Right Coordinate: (994.39049, 347.63701) ft

- Region No. - Material No.
- 1 - Waste Material
 - 2 - Waste Material
 - 3 - Bottom Liner
 - 4 - Side Slope Liner
 - 5 - Deflection surface
 - 6 - Deflection surface
 - 7 - NOT ACTIVE
 - 8 - NOT ACTIVE
 - 9 - Deflection surface
 - 10 - Deflection surface
 - 11 - Deflection surface
 - 12 - CCL
 - 13 - Deflection surface
 - 14 - Deflection surface
 - 15 - Final Cover



Material Properties:

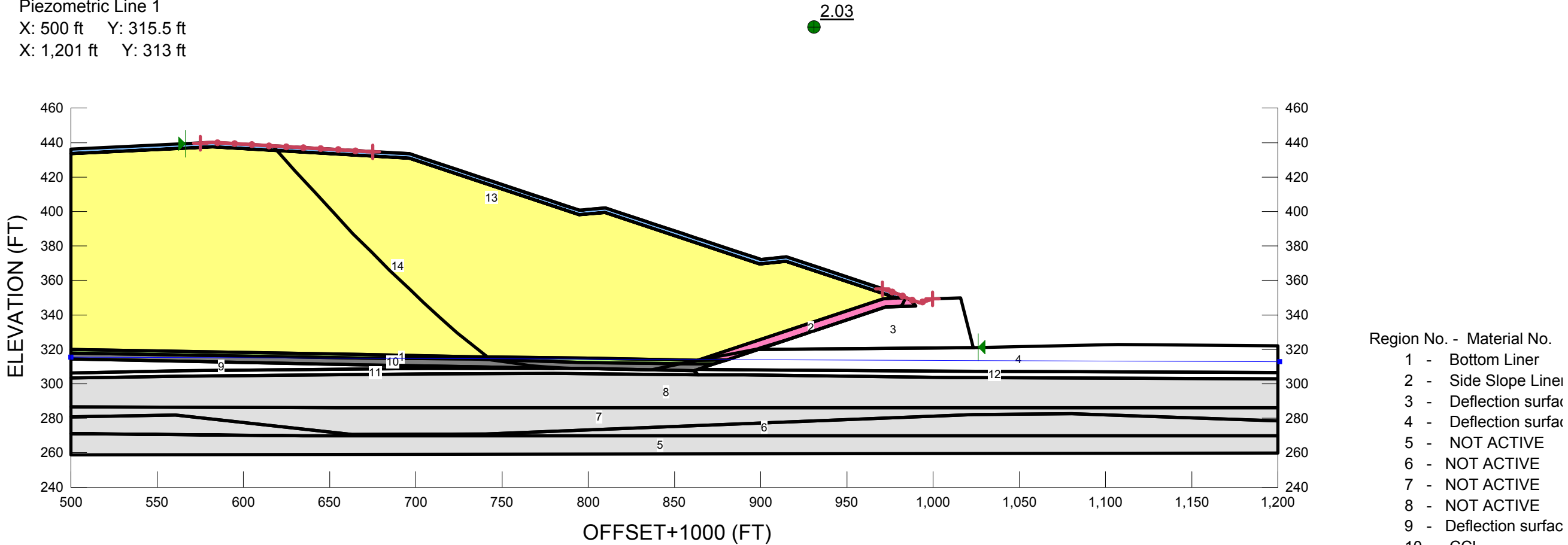
Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: NOT ACTIVE Model: (None) Piezometric Line: 1

Title: Model City - RMU-2 XS 3050
Name: Drained Final Grade -Baseliner static
File Name: RMU2X3050r1.gsz
Date: 2/15/2013Time: 8:32:07 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 2.03

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 313 ft

PURPOSE:
To determine the critical long-term (fully consolidated) static baseliner failure for the final configuration of RMU-2 located at cross-section 30+50 using entry/exit surface search routine.

Slip Surface Option: Entry and Exit
Surface Limits
Left Coordinate: (566.46829, 439.38777) ft
Right Coordinate: (1,026.2009, 321.16002) ft



Material Properties:

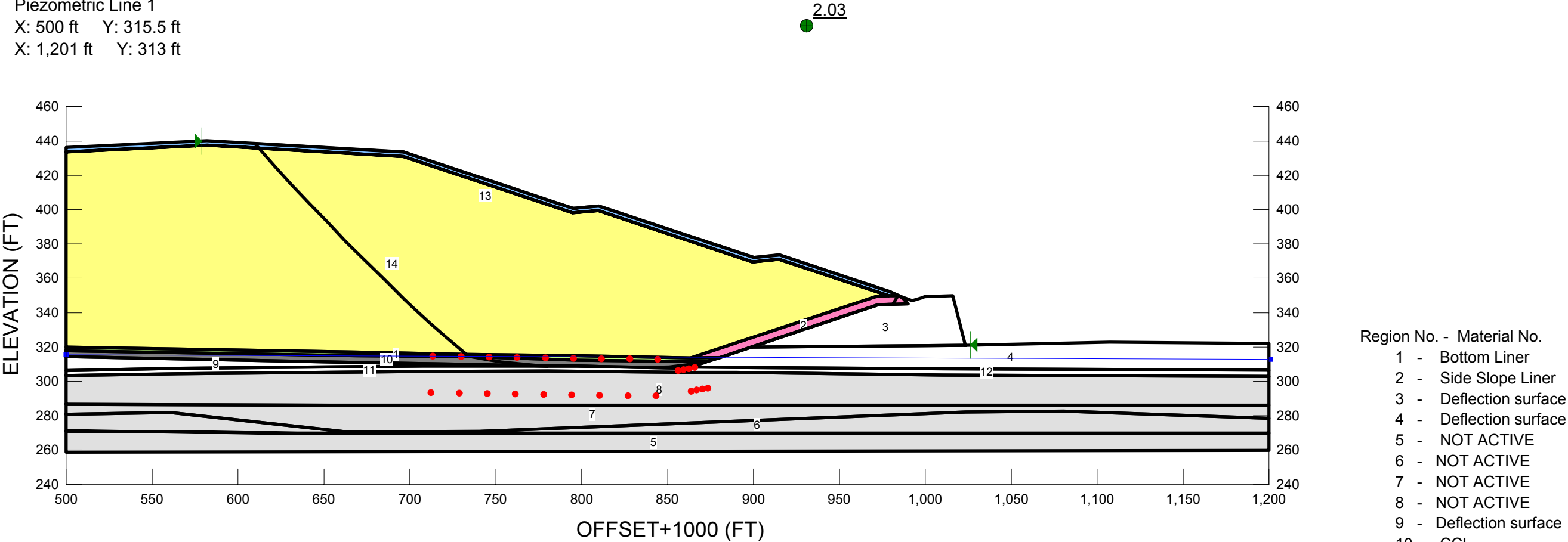
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Name: Bottom Liner	Model: Shear/Normal Fn.	Unit Weight: 120 pcf	Strength Function: Baseliner	
Name: CCL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 1,000 psf	Phi': 10 ° Piezometric Line: 1
Name: Side Slope Liner	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 0 psf	Phi': 13 °
Name: Deflection surface	Model: Bedrock (Impenetrable)	Piezometric Line: 1		
Name: Final Cover	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 0 psf	Phi': 30 ° Piezometric Line: 1
Name: NOT ACTIVE	Model: (None)	Piezometric Line: 1		

Title: Model City - RMU-2 XS 3050
Name: Drained Final Grade -Baseliner static (2)
File Name: RMU2X3050r1.gsz
Date: 2/14/2013Time: 6:20:31 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 2.03

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 313 ft

PURPOSE:
To determine the critical long-term (fully consolidated) static baseliner failure for the final configuration of RMU-2 located located at cross-section 30+50 using block surface search routine.

Slip Surface Option: Block
Surface Limits
Left Coordinate: (578.98724, 439.96933) ft
Right Coordinate: (1,026.2009, 321.16002) ft



Material Properties:

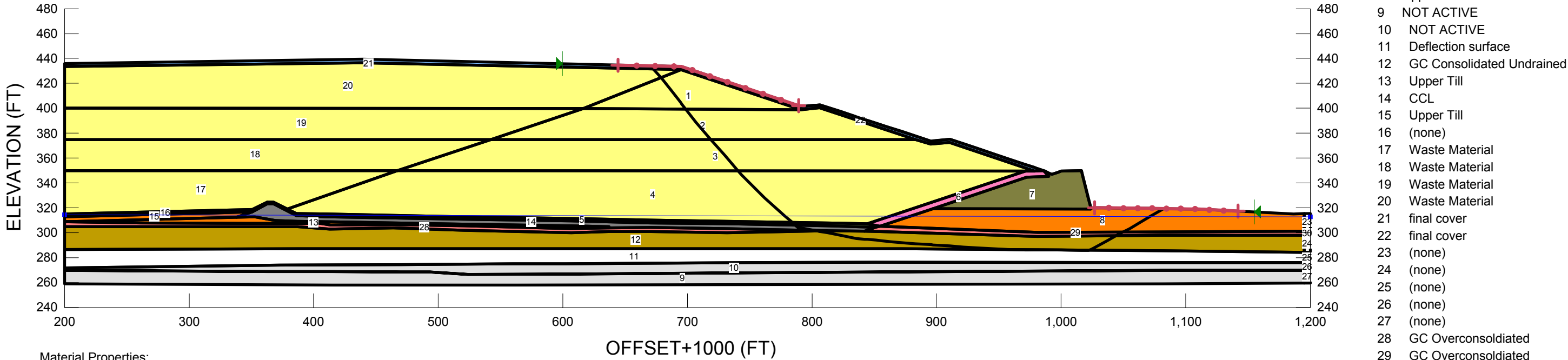
Name: Waste Material	Model: Mohr-Coulomb	Unit Weight: 111 pcf	Cohesion': 0 psf	Phi': 30 °
Name: Bottom Liner	Model: Shear/Normal Fn.	Unit Weight: 120 pcf	Strength Function: Baseliner	
Name: CCL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 1,000 psf	Phi': 10 ° Piezometric Line: 1
Name: Side Slope Liner	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 0 psf	Phi': 13 °
Name: Deflection surface	Model: Bedrock (Impenetrable)	Piezometric Line: 1		
Name: Final Cover	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 0 psf	Phi': 30 ° Piezometric Line: 1
Name: NOT ACTIVE	Model: (None)	Piezometric Line: 1		

Title: Model City - RMU-2 Sta 1350
Name: Consolidated Undrained Final Grade
File Name: RMU2X1350.gsz
Date: 2/18/2013Time: 9:07:57 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.40

PURPOSE:
To determine the critical static deep-seated (going into the subgrade) failure for the final configuration of RMU-2 located at cross-section 13+50.

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 200 ft Y: 314.5 ft
X: 1,200 ft Y: 313 ft

Slip Surface Option: Entry and Exit
Surface Limits
Left Coordinate: (599.83553, 435.7357) ft
Right Coordinate: (1,155.0854, 316.64491) ft
Left-Zone Left Coordinate: (644.2295, 434.69603) ft
Left-Zone Right Coordinate: (789.3109, 401.99999) ft
Left-Zone Increment: 10
Right-Zone Left Coordinate: (1,026.9725, 320) ft
Right-Zone Right Coordinate: (1,142, 317.32468) ft
Right-Zone Increment: 10
Radius Increments: 6



Material Properties:

Name: Waste Material	Model: Mohr-Coulomb	Unit Weight: 111 pcf	Cohesion': 0 psf	Phi': 30 °	
Name: Bottom Liner	Model: Shear/Normal Fn.	Unit Weight: 120 pcf	Strength Function: Baseline		
Name: CCL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 1,000 psf	Phi': 10 °	Piezometric Line: 1
Name: Upper Till	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 150 psf	Phi': 31 °	Piezometric Line: 1
Name: side slope liner	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 0 psf	Phi': 13 °	
Name: Deflection surface	Model: Bedrock (Impenetrable)				Piezometric Line: 1
Name: STRUCTURAL FILL	Model: Mohr-Coulomb	Unit Weight: 130 pcf	Cohesion': 195 psf	Phi': 28.7 °	Piezometric Line: 1
Name: final cover	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 0 psf	Phi': 30 °	Piezometric Line: 1
Name: NOT ACTIVE	Model: (None)				Piezometric Line: 1
Name: GC Consolidated Undrained	Model: Shear/Normal Fn.	Unit Weight: 120 pcf	Strength Function: SHANSEP CONSOLIDATED UNDRAINED static 0.34	Anisotropic Strength Fn: clay ellipse staticshear	Piezometric Line: 1
Name: GC Overconsolidated	Model: Shear/Normal Fn.	Unit Weight: 125 pcf	Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC	Anisotropic Strength Fn: clay ellipse staticshear	Piezometric Line: 1

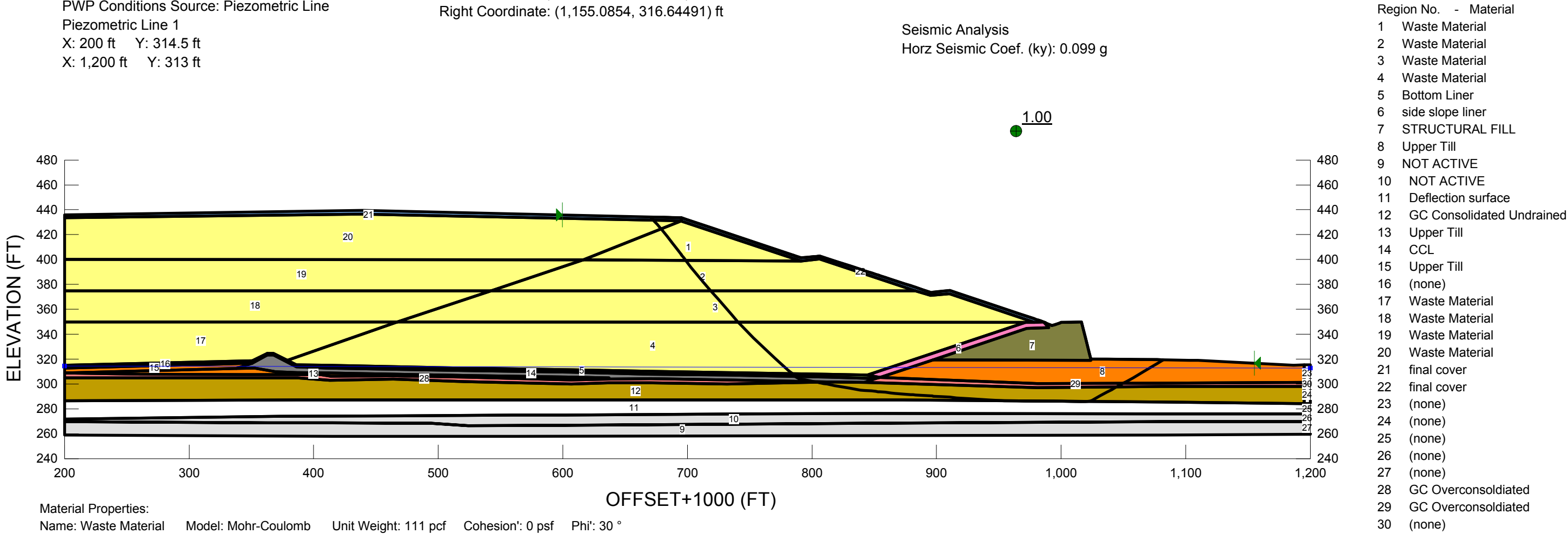
Title: Model City - RMU-2 Sta 1350
Name: Consolidated Undrained-Seismic Yield
File Name: RMU2X1350.gsz
Date: 2/18/2013Time: 9:44:44 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: No
Slip Surface Factor of Safety: 1.00

PURPOSE:
To determine the seismic ky value for the deep-seated global failure for the final configuration of RMU-2 located at cross-section 13+50.

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 200 ft Y: 314.5 ft
X: 1,200 ft Y: 313 ft

Slip Surface Option: Fully-Specified
Surface Limits
Left Coordinate: (599.83553, 435.7357) ft
Right Coordinate: (1,155.0854, 316.64491) ft

Seismic Analysis
Horz Seismic Coef. (ky): 0.099 g



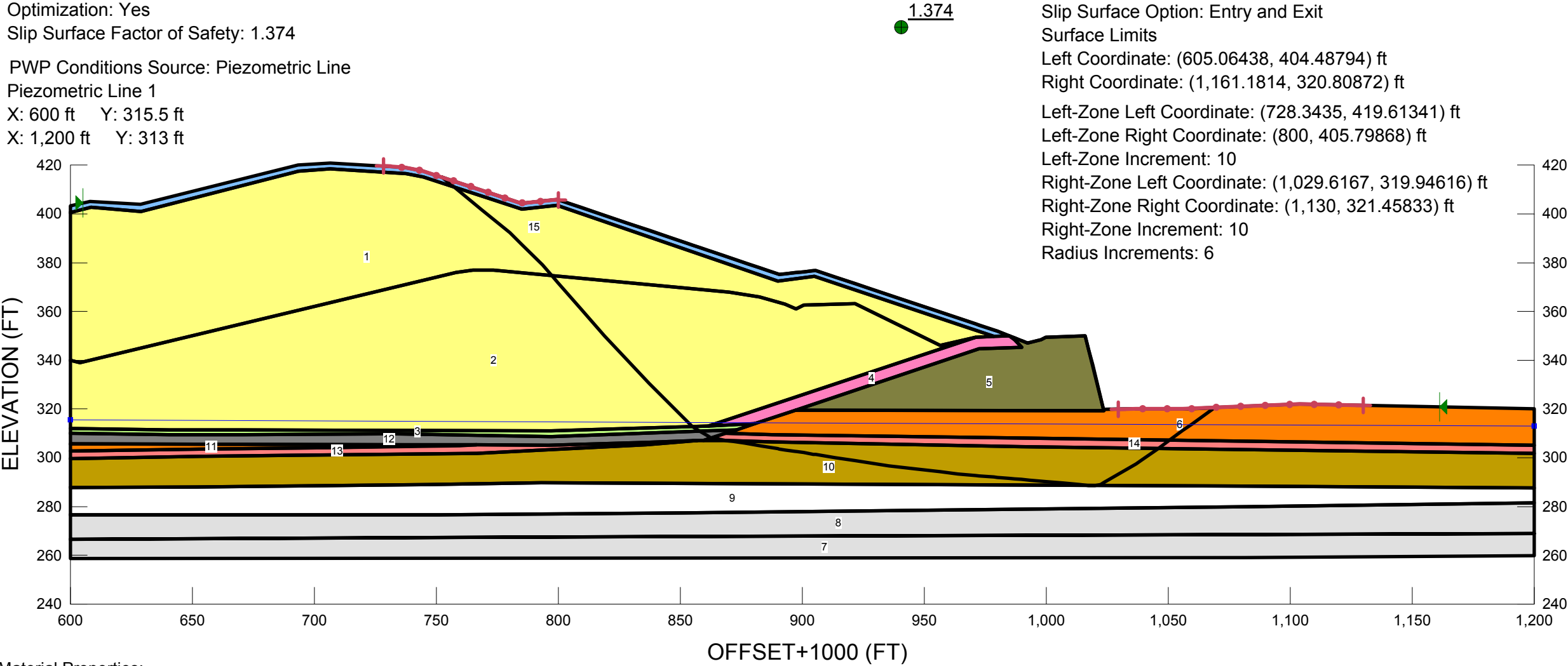
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Name: Consolidated Undrained-Static
File Name: RMU2X2600r1.gsz
Date: 2/14/2013Time: 10:45:04 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.374

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 600 ft Y: 315.5 ft
X: 1,200 ft Y: 313 ft

PURPOSE:
To determine the critical static deep-seated (going into the subgrade) failures for the final configuration of RMU-2 located at cross-section 26+00.

Slip Surface Option: Entry and Exit
Surface Limits
Left Coordinate: (605.06438, 404.48794) ft
Right Coordinate: (1,161.1814, 320.80872) ft
Left-Zone Left Coordinate: (728.3435, 419.61341) ft
Left-Zone Right Coordinate: (800, 405.79868) ft
Left-Zone Increment: 10
Right-Zone Left Coordinate: (1,029.6167, 319.94616) ft
Right-Zone Right Coordinate: (1,130, 321.45833) ft
Right-Zone Increment: 10
Radius Increments: 6

- Region No. - Material No.
- 1 - Waste Material
 - 2 - Waste Material
 - 3 - Bottom Liner
 - 4 - Side Slope Liner
 - 5 - Structural Fill
 - 6 - Upper Till
 - 7 - NOT ACTIVE
 - 8 - NOT ACTIVE
 - 9 - Deflection surface
 - 10 - GC-Consolidated Undrained
 - 11 - Upper Till
 - 12 - CCL
 - 13 - GC-Overconsolidated Undrained
 - 14 - GC-Overconsolidated Undrained
 - 15 - Final Cover



Material Properties:

Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1
Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: NOT ACTIVE Model: (None) Piezometric Line: 1
Name: GC-Consolidated Undrained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED static 0.34 Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: GC-Overconsolidated Undrained Model: Shear/Normal Fn. Unit Weight: 125 pcf Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

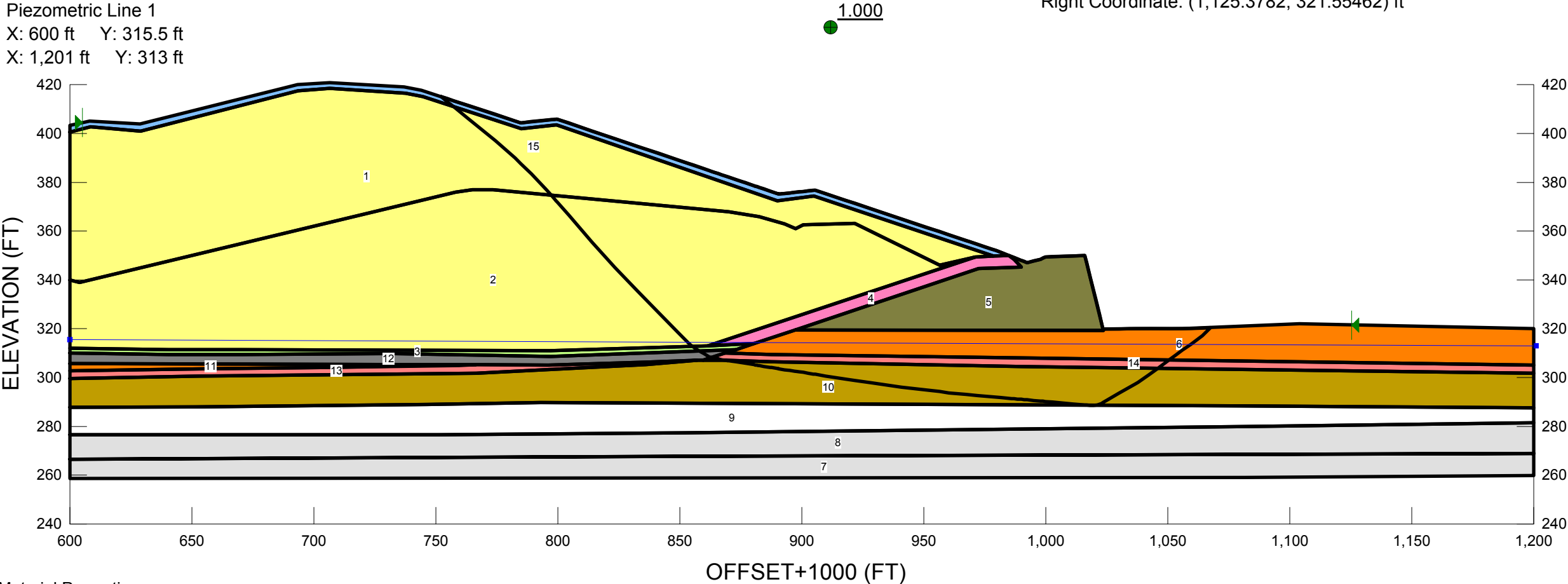
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Name: Consolidated Undrained-Seismic
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Date: 2/14/2013Time: 11:10:24 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: No
Slip Surface Factor of Safety: 1.000

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 600 ft Y: 315.5 ft
X: 1,201 ft Y: 313 ft

PURPOSE:
To determine the seismic ky value for the deep-seated global failure for the final configuration of RMU-2 located at cross-section 26+00.

Seismic Analysis
Horz Seismic Coef. (ky): 0.095 g
Slip Surface Option: Fully-Specified
Surface Limits
Left Coordinate: (605.06438, 404.48794) ft
Right Coordinate: (1,125.3782, 321.55462) ft

- Region No. - Material No.
- 1 - Waste Material
 - 2 - Waste Material
 - 3 - Bottom Liner
 - 4 - Side Slope Liner
 - 5 - Structural Fill
 - 6 - Upper Till
 - 7 - NOT ACTIVE
 - 8 - NOT ACTIVE
 - 9 - Deflection surface
 - 10 - GC-Consolidated Undrained
 - 11 - Upper Till
 - 12 - CCL
 - 13 - GC-Overconsolidated Undrained
 - 14 - GC-Overconsolidated Undrained
 - 15 - Final Cover



Material Properties:

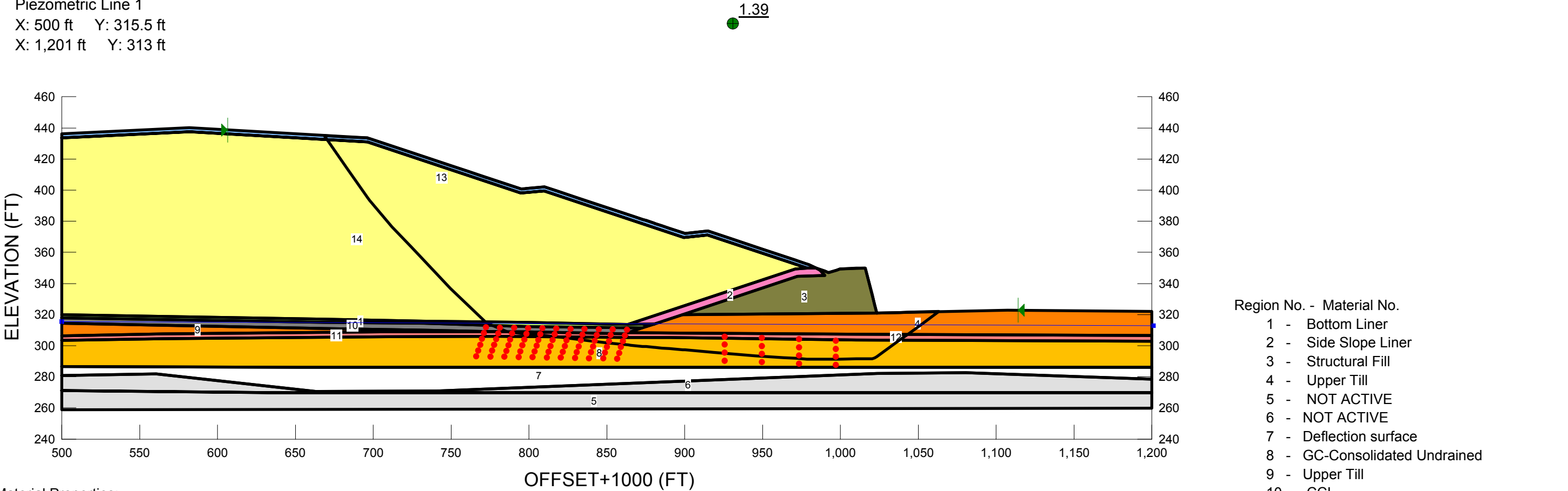
Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1
Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: NOT ACTIVE Model: (None) Piezometric Line: 1
Name: GC-Consolidated Undrained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED static 0.34 Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: GC-Overconsolidated Undrained Model: Shear/Normal Fn. Unit Weight: 125 pcf Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

Title: Model City - RMU-2 XS 3050
Name: Consolidated Undrained -Static CS
File Name: RMU2X3050r1.gsz
Date: 2/14/2013Time: 6:20:31 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.39

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 313 ft

PURPOSE:
To determine the critical static deep-seated (going into the subgrade) failures for the final configuration of RMU-2 located at cross-section 30+50.

Slip Surface Option: Block
Surface Limits
Left Coordinate: (606.47519, 438.67767) ft
Right Coordinate: (1,114.1689, 322.83421) ft



Material Properties:

Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1
Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: NOT ACTIVE Model: (None) Piezometric Line: 1
Name: GC-Consolidated Undrained Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED static Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: GC-Overconsolidated Undrained Model: Shear/Normal Fn. Unit Weight: 125 pcf Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

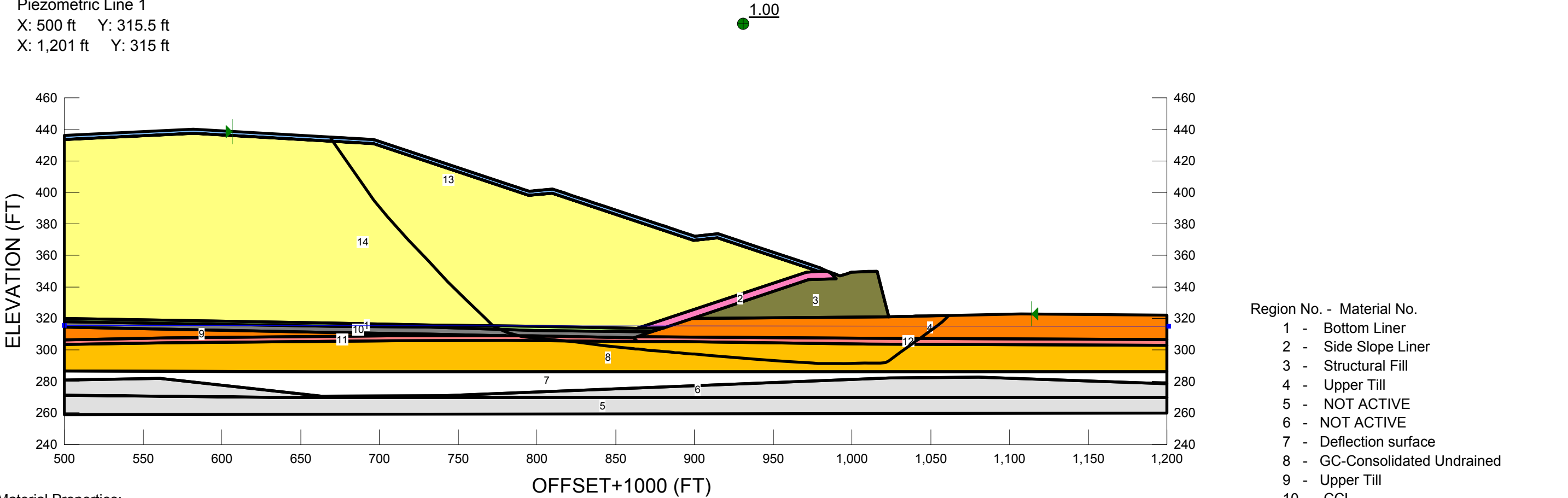
Title: Model City - RMU-2 XS 3050
Name: Consolidated Undrained -Yield Acc
File Name: RMU2X3050r1.gsz
Date: 2/15/2013Time: 9:00:02 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\Kathy\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: No
Slip Surface Factor of Safety: 1.00

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft

PURPOSE:
To determine the seismic ky value for the critical static deep-seated (going into the subgrade) failure for the final configuration of RMU-2 located at cross-section 30+50.

Seismic Analysis
Horz Seismic Coef. (ky): 0.09 g

Slip Surface Option: Fully-Specified
Surface Limits
Left Coordinate: (606.47519, 438.67767) ft
Right Coordinate: (1,114.1689, 322.83421) ft



Material Properties:

Name: Waste Material	Model: Mohr-Coulomb	Unit Weight: 111 pcf	Cohesion': 0 psf	Phi': 30 °	
Name: Bottom Liner	Model: Shear/Normal Fn.	Unit Weight: 120 pcf	Strength Function: Baseline		
Name: CCL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 1,000 psf	Phi': 10 °	Piezometric Line: 1
Name: Upper Till	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 150 psf	Phi': 31 °	Piezometric Line: 1
Name: Side Slope Liner	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 0 psf	Phi': 13 °	
Name: Deflection surface	Model: Bedrock (Impenetrable)				Piezometric Line: 1
Name: Structural Fill	Model: Mohr-Coulomb	Unit Weight: 128 pcf	Cohesion': 195 psf	Phi': 28.7 °	Piezometric Line: 1
Name: Final Cover	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 0 psf	Phi': 30 °	Piezometric Line: 1
Name: NOT ACTIVE	Model: (None)				Piezometric Line: 1
Name: GC-Consolidated Undrained	Model: Shear/Normal Fn.	Unit Weight: 120 pcf	Strength Function: SHANSEP CONSOLIDATED UNDRAINED static	Anisotropic Strength Fn: clay ellipse staticshear	Piezometric Line: 1
Name: GC-Overconsolidated Undrained	Model: Shear/Normal Fn.	Unit Weight: 125 pcf	Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC	Anisotropic Strength Fn: clay ellipse staticshear	Piezometric Line: 1

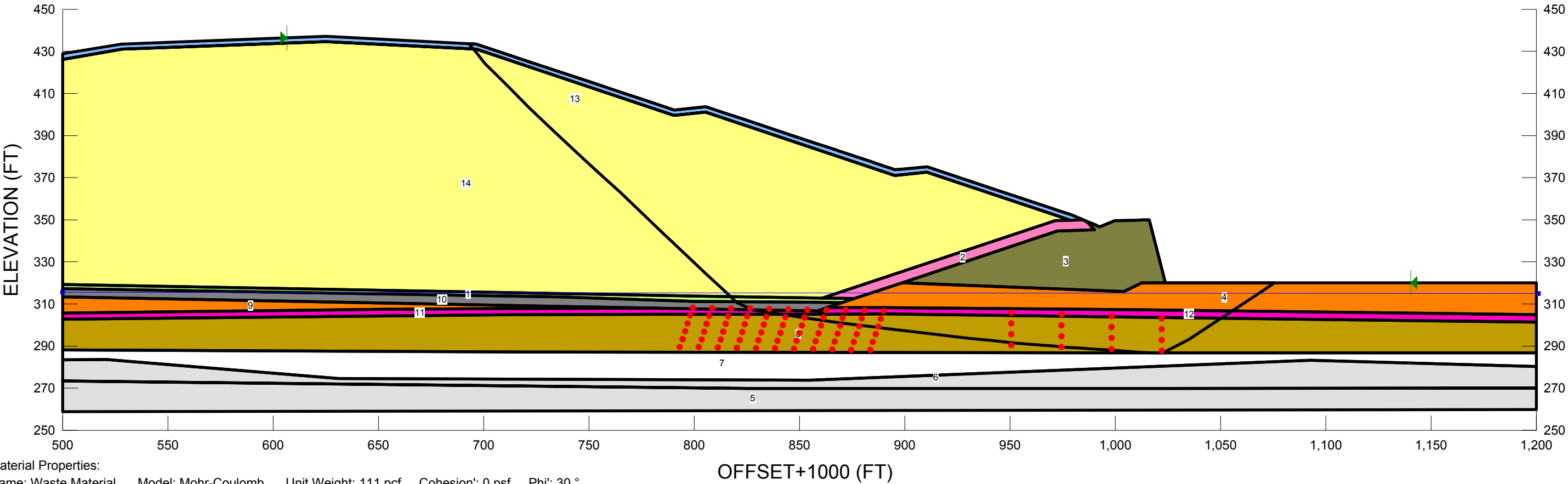
Title: Model City - RMU-2 XS3200
Name: Consolidated Undrained for Critical Surface
File Name: RMU2X3200r1.gsz
Date: 2/18/2013Time: 10:02:11 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.35

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft

PURPOSE:
To determine the critical static deep-seated (going into the subgrade) global failure for the final configuration of RMU-2 located at cross-section 32+00.

Slip Surface Option: Block
Surface Limits
Left Coordinate: (606.35749, 436.40883) ft
Right Coordinate: (1,140.3, 320.06614) ft

- Region No. - Material No.
- 1 Bottom Liner
 - 2 Side Slope Liner
 - 3 Structural Fill
 - 4 Upper Till
 - 5 NOT ACTIVE
 - 6 NOT ACTIVE
 - 7 Deflection surface
 - 8 GC-Consolidated Undrained
 - 9 Upper Till
 - 10 CCL
 - 11 GC Overconsolidated Undrained
 - 12 GC Overconsolidated Undrained
 - 13 Final Cover
 - 14 Waste Material



Material Properties:

Name: Waste Material	Model: Mohr-Coulomb	Unit Weight: 111 pcf	Cohesion': 0 psf	Phi': 30 °	
Name: Bottom Liner	Model: Shear/Normal Fn.	Unit Weight: 120 pcf	Strength Function: Baseline		
Name: CCL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 1,000 psf	Phi': 10 °	Piezometric Line: 1
Name: Upper Till	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 150 psf	Phi': 31 °	Piezometric Line: 1
Name: Side Slope Liner	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 0 psf	Phi': 13 °	
Name: Deflection surface	Model: Bedrock (Impenetrable)	Piezometric Line: 1			
Name: Structural Fill	Model: Mohr-Coulomb	Unit Weight: 130 pcf	Cohesion': 195 psf	Phi': 28.7 °	Piezometric Line: 1
Name: Final Cover	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 0 psf	Phi': 30 °	Piezometric Line: 1
Name: NOT ACTIVE	Model: (None)	Piezometric Line: 1			
Name: GC-Consolidated Undrained	Model: Shear/Normal Fn.	Unit Weight: 120 pcf	Strength Function: SHANSEP CONSOLIDATED UNDRAINED static 0.34	Anisotropic Strength Fn: clay ellipse staticshear	Piezometric Line: 1
Name: GC Overconsolidated Undrained	Model: Shear/Normal Fn.	Unit Weight: 125 pcf	Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC	Anisotropic Strength Fn: clay ellipse staticshear	Piezometric Line: 1

Title: Model City - RMU-2 XS3200
Name: Consolidated Undrained-Seismic Yield acc
File Name: RMU2X3200r1.gsz
Date: 2/14/2013Time: 5:45:37 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: No
Slip Surface Factor of Safety: 1.00

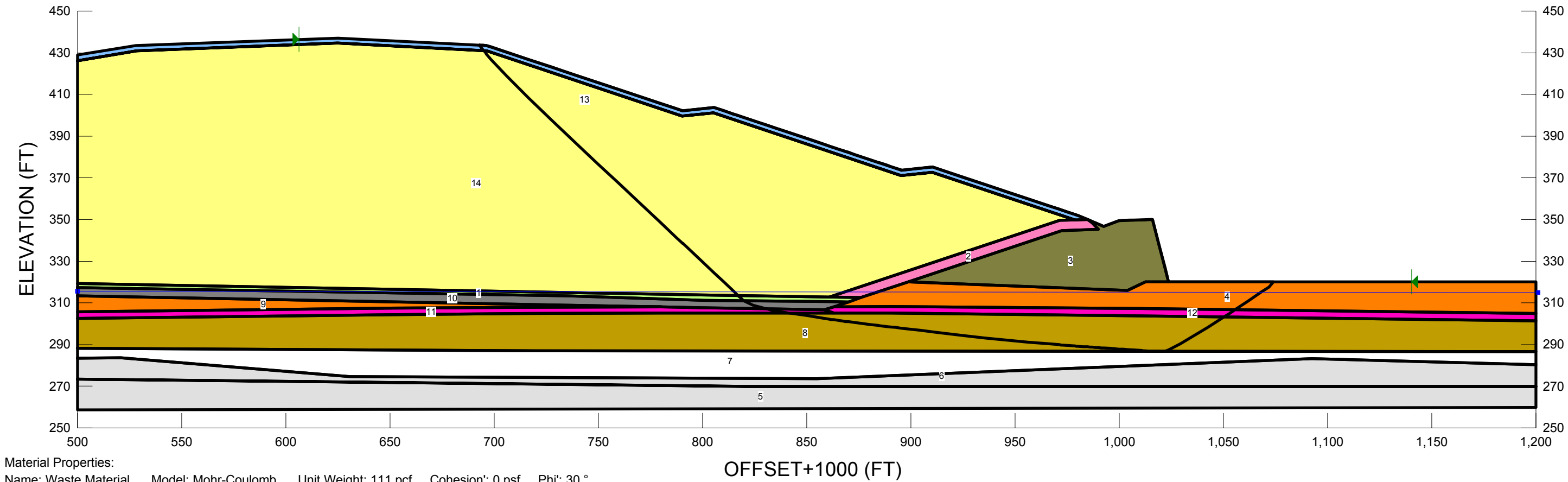
PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft

PURPOSE:
To determine the seismic ky value for the critical static deep-seated (going into the subgrade) failure for the final configuration of RMU-2 located at cross-section 32+00.

Seismic Analysis
Horz Seismic Coef. (ky): 0.091 g

Slip Surface Option: Fully-Specified
Surface Limits
Left Coordinate: (606.35749, 436.40883) ft
Right Coordinate: (1,140.3, 320.06614) ft

- Region No. - Material No.
- 1 - Bottom Liner
 - 2 - Side Slope Liner
 - 3 - Structural Fill
 - 4 - Upper Till
 - 5 - NOT ACTIVE
 - 6 - NOT ACTIVE
 - 7 - Deflection surface
 - 8 - GC-Consolidated Undrained
 - 9 - Upper Till
 - 10 - CCL
 - 11 - GC Overconsolidated Undrained
 - 12 - GC Overconsolidated Undrained
 - 13 - Final Cover
 - 14 - Waste Material



Material Properties:

Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °

Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline

Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1

Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1

Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °

Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1

Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1

Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1

Name: NOT ACTIVE Model: (None) Piezometric Line: 1

Name: GC-Consolidated Undrained Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED static 0.34 Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

Name: GC Overconsolidated Undrained Model: Shear/Normal Fn. Unit Weight: 125 pcf Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

Name: Consolidated Undrained w Grids
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\RMU2X3200r1.gsz
Date: 2/18/2013Time: 10:02:11 AM
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.93

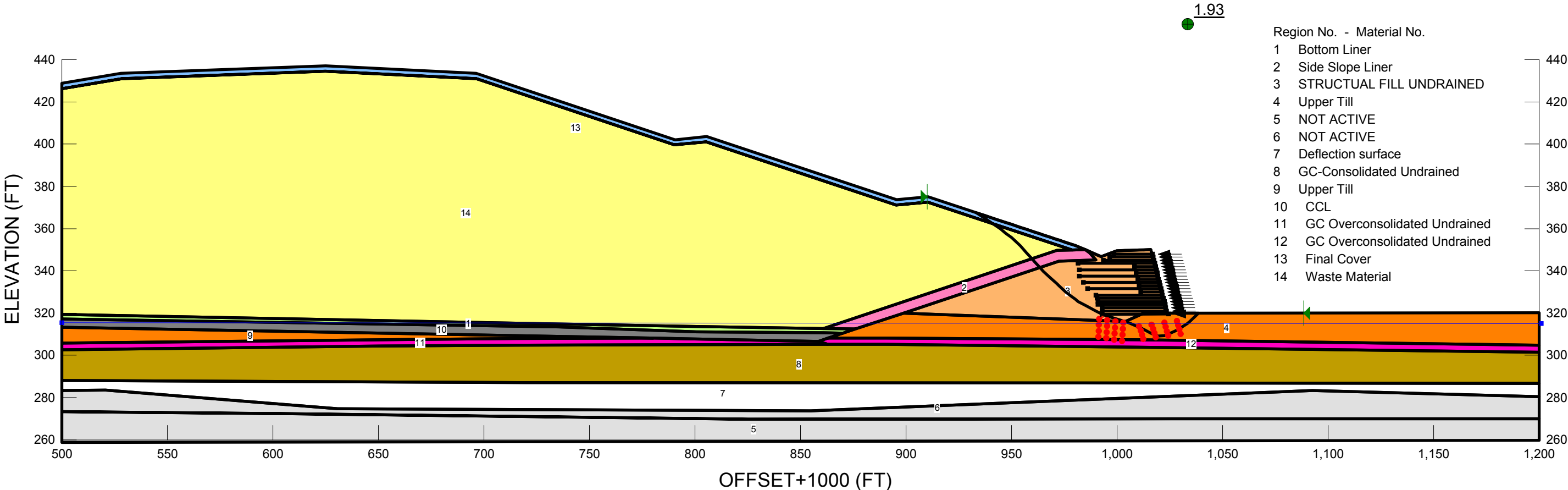
Slip Surface Option: Block
Surface Limits
Left Coordinate: (909.97127, 375.05065) ft
Right Coordinate: (1,088.3996, 320.0367) ft

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft

PURPOSE:
To determine the critical static deep-seated (going into the subgrade) failure with reinforcement grids for the final configuration of RMU-2 located at cross-section 32+00.

Material Properties:

Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 °
Name: NOT ACTIVE Model: (None) Piezometric Line: 1
Name: GC-Consolidated Undrained Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED static 0.34 Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: STRUCTUAL FILL UNDRAINED Model: Bilinear Unit Weight: 128 pcf Cohesion': 2,000 psf Phi 1: 5 ° Phi 2: 2 ° Bilinear Normal: 2,000 psf Piezometric Line: 1
Name: GC Overconsolidated Undrained Model: Shear/Normal Fn. Unit Weight: 125 pcf Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1



Grid #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Type:	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic
Outside Point:	(1,024.5, 319.5) ft	(1,023.5, 321) ft	(1,023.125, 322.5) ft	(1,022.75, 324) ft	(1,022.375, 325.5) ft	(1,022, 327) ft	(1,021.5, 328.5) ft	(1,021.25, 330) ft	(1,020.875, 331.5) ft	(1,020.5, 333) ft	(1,020.125, 334.5) ft	(1,019.75, 336) ft	(1,019.375, 337.5) ft	(1,019, 339) ft	(1,018.625, 340.5) ft	(1,018.25, 342) ft	(1,017.875, 343.5) ft	(1,017.5, 345) ft	(1,017.125, 346.5) ft	(1,016.75, 348) ft
Inside Point:	(993, 319.3918) ft	(993, 321) ft	(993, 322.5) ft	(991, 324) ft	(991, 325.5) ft	(990.5, 327) ft	(990, 328.5) ft	(1,011.25, 330) ft	(985.9975, 331.5) ft	(1,010.5, 333) ft	(984, 334.5) ft	(1,009.75, 336) ft	(982, 337.5) ft	(1,009, 339) ft	(982, 340.5) ft	(1,008.25, 342) ft	(981.5, 343.5) ft	(993.5, 345) ft	(996.5, 346.5) ft	(998.5, 348) ft
Slip Surface Intersection:	(993.23207, 319.3926) ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft
Total Length:	31.500186 ft	30.5 ft	30.125 ft	31.75 ft	31.375 ft	31.5 ft	31.5 ft	10 ft	34.8775 ft	10 ft	36.125 ft	10 ft	37.375 ft	10 ft	36.625 ft	10 ft	36.375 ft	24 ft	20.625 ft	18.25 ft
Reinforcement Direction:	0.19681 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °
F of S Dependent:	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interface Adhesion:	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf
Interface Shear Angle:	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °
Surface Area Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Resistance Reduction Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Force Distribution:	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated
Tensile Capacity:	6,800 lbs	6,800 lbs	5,900 lbs	5,900 lbs	5,900 lbs	4,900 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	3,000 lbs	1,000 lbs	2,300 lbs	2,300 lbs	3,000 lbs	3,000 lbs
Reduction Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Force Orientation:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Max. Pullout Force:	6,800 lbs	6,800 lbs	5,900 lbs	5,900 lbs	5,900 lbs	4,900 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	3,000 lbs	1,000 lbs	2,300 lbs	2,300 lbs	3,000 lbs	3,000 lbs
Pullout Force:	251.5521 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs
Pullout Force per Length:	1,083.9412 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft
Available Length:	0.23207172 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Required Length:	0.23207172 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Governing Component:	Pullout Resistance	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)

Name: GC Overconsolidated Undrained Model: Shear/Normal Fn. Unit Weight: 125 pcf Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

Horz Seismic Coef. (ky): 0.3 g

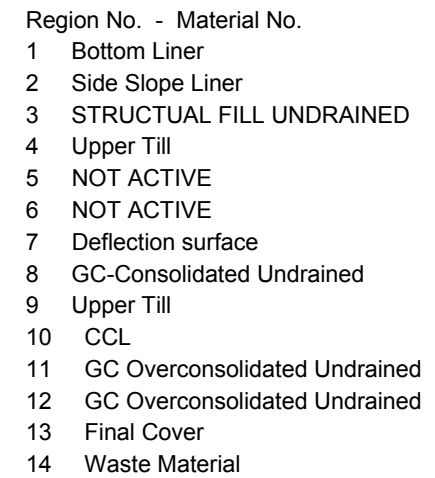


Figure 25

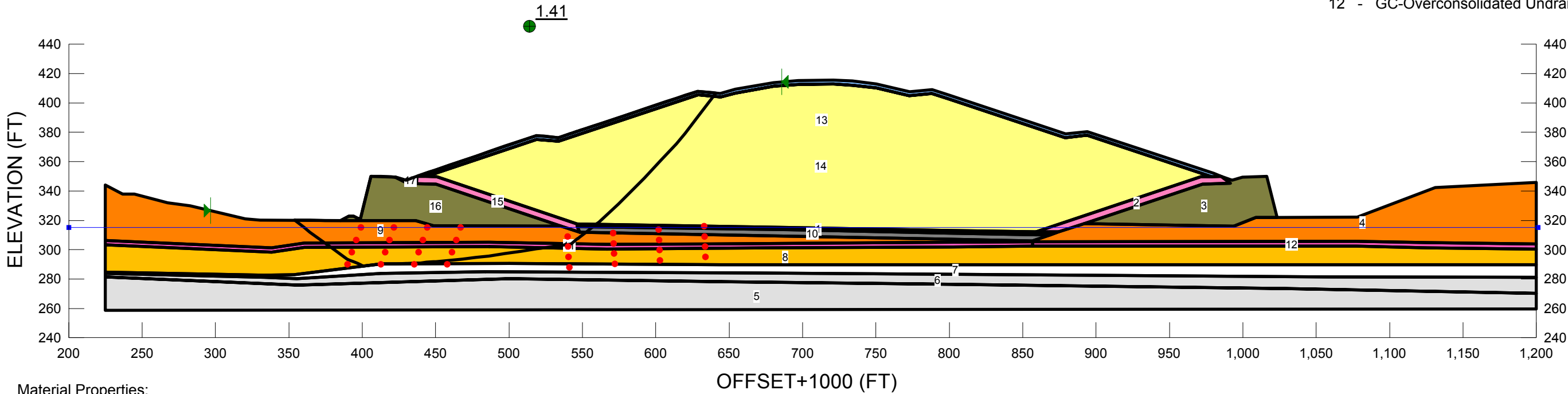
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Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.41

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 200 ft Y: 315 ft
X: 1,201 ft Y: 315 ft

PURPOSE:
To determine the critical static deep-seated (going into the subgrade) failure for the final configuration of RMU-2 located at cross-section 37+28.

- Region No. - Material No.
- 1 - Bottom Liner
 - 2 - Side Slope Liner
 - 3 - Structural Fill
 - 4 - Upper Till
 - 5 - NOT ACTIVE
 - 6 - NOT ACTIVE
 - 7 - Deflection surface
 - 8 - GC-Consolidated Undrained
 - 9 - Upper Till
 - 10 - CCL
 - 13 - Final Cover
 - 14 - Waste Material
 - 11 - GC-Overconsolidated Undrained
 - 12 - GC-Overconsolidated Undrained

Slip Surface Option: Block
Surface Limits
Left Coordinate: (296.77888, 326.65399) ft
Right Coordinate: (685.88621, 414.36552) ft



Material Properties:

Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 135 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1
Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: NOT ACTIVE Model: (None) Piezometric Line: 1
Name: GC-Consolidated Undrained Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED static 0.34 Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: GC-Overconsolidated Undrained Model: Shear/Normal Fn. Unit Weight: 125 pcf Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

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Interslice force function option: Half-Sine
Optimization: No
Slip Surface Factor of Safety: 1.00

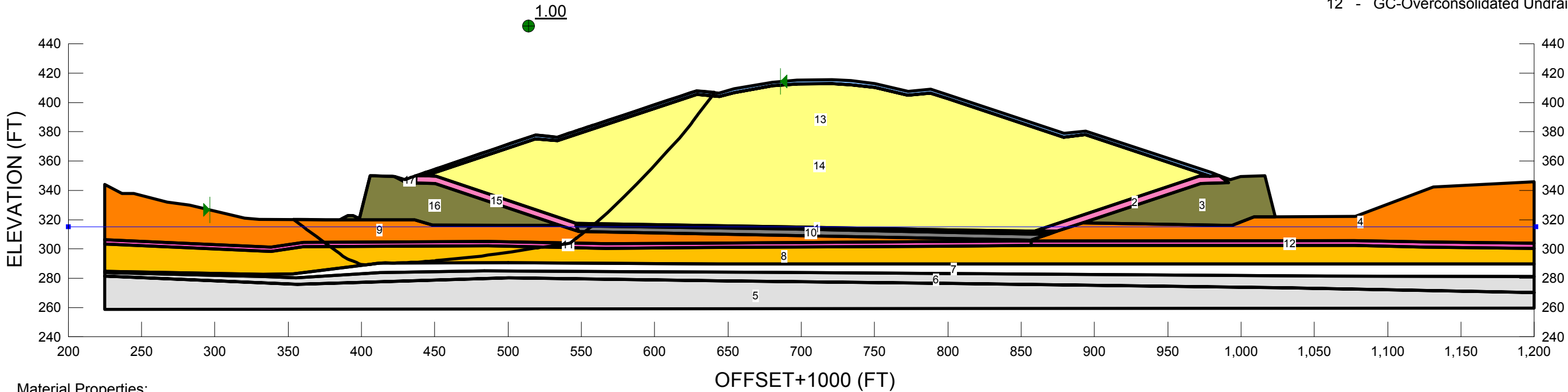
PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 200 ft Y: 315 ft
X: 1,201 ft Y: 315 ft

PURPOSE:
To determine the seismic ky value for the deep-seated global failure for the final configuration of RMU-2 located at cross-section 37+28.

Seismic Analysis
Horz Seismic Coef. (ky): 0.106 g

Slip Surface Option: Fully-Specified
Surface Limits
Left Coordinate: (296.77888, 326.65399) ft
Right Coordinate: (685.88621, 414.36552) ft

- Region No. - Material No.
- 1 - Bottom Liner
 - 2 - Side Slope Liner
 - 3 - Structural Fill
 - 4 - Upper Till
 - 5 - NOT ACTIVE
 - 6 - NOT ACTIVE
 - 7 - Deflection surface
 - 8 - GC-Consolidated Undrained
 - 9 - Upper Till
 - 10 - CCL
 - 13 - Final Cover
 - 14 - Waste Material
 - 11 - GC-Overconsolidated Undrained
 - 12 - GC-Overconsolidated Undrained



Material Properties:

Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °

Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline

Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1

Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1

Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °

Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1

Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 135 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1

Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1

Name: NOT ACTIVE Model: (None) Piezometric Line: 1

Name: GC-Consolidated Undrained Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED static 0.34 Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

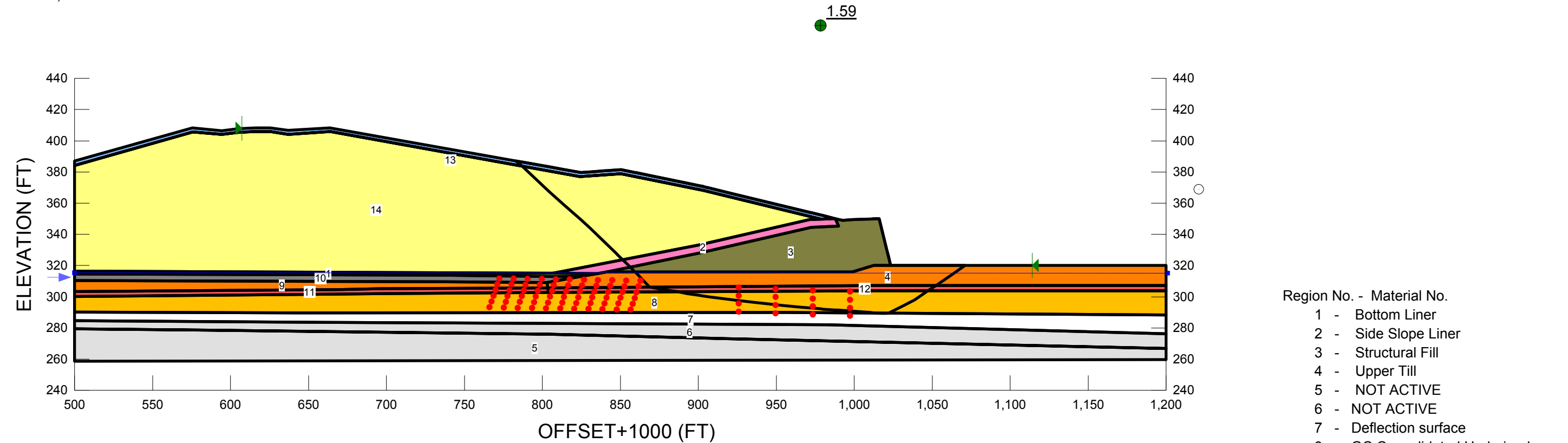
Name: GC-Overconsolidated Undrained Model: Shear/Normal Fn. Unit Weight: 125 pcf Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

Title: Model City - RMU-2 XS 3950
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Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.59

PURPOSE:
To determine the critical static deep-seated (going into the subgrade) failure for the final configuration of RMU-2 located at cross-section 39+50.

Slip Surface Option: Block
Surface Limits
Left Coordinate: (607.28187, 407.93415) ft
Right Coordinate: (1,114.195, 320.05144) ft

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft



Material Properties:

Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °

Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline

Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1

Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1

Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °

Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1

Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1

Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1

Name: NOT ACTIVE Model: (None) Piezometric Line: 1

Name: GC Consolidated Undrained Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED static 0.34 Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

Name: GC-Overconsolidated Undrained Model: Shear/Normal Fn. Unit Weight: 125 pcf Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

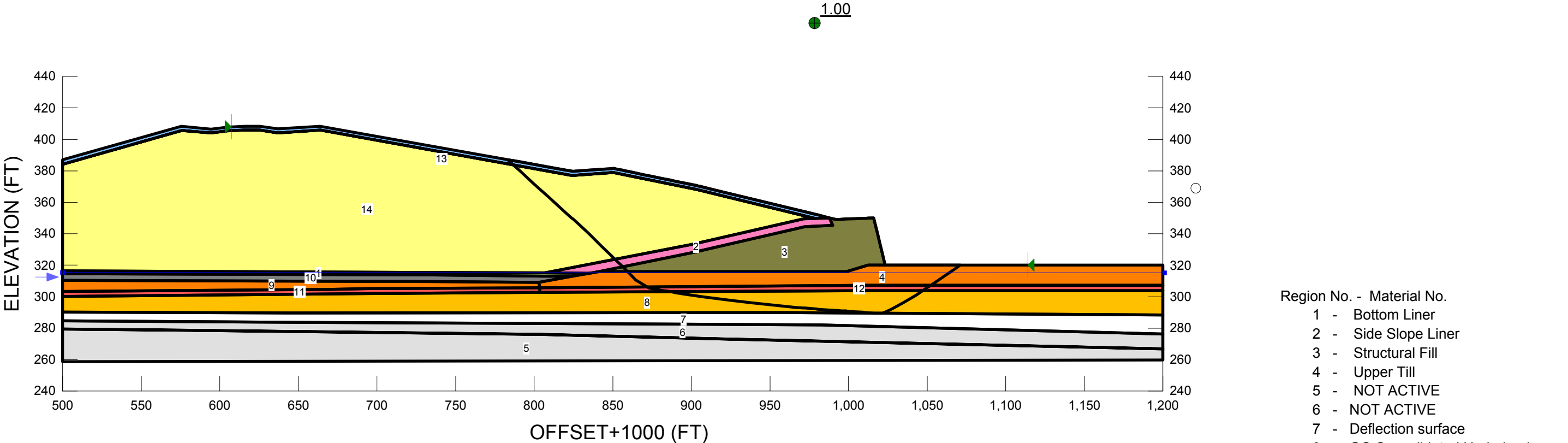
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Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: No
Slip Surface Factor of Safety: 1.00

PURPOSE:
To determine the seismic ky value for the deep-seated global failure for the final configuration of RMU-2 located at cross-section 39+50.

Seismic Analysis
Horz Seismic Coef. (ky): 0.135 g

Slip Surface Option: Fully-Specified
Surface Limits
Left Coordinate: (607.28187, 407.93415) ft
Right Coordinate: (1,114.195, 320.05144) ft

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft



Material Properties:

Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °

Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline

Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1

Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1

Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °

Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1

Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1

Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1

Name: NOT ACTIVE Model: (None) Piezometric Line: 1

Name: GC Consolidated Undrained Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED static 0.34 Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

Name: GC-Overconsolidated Undrained Model: Shear/Normal Fn. Unit Weight: 125 pcf Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

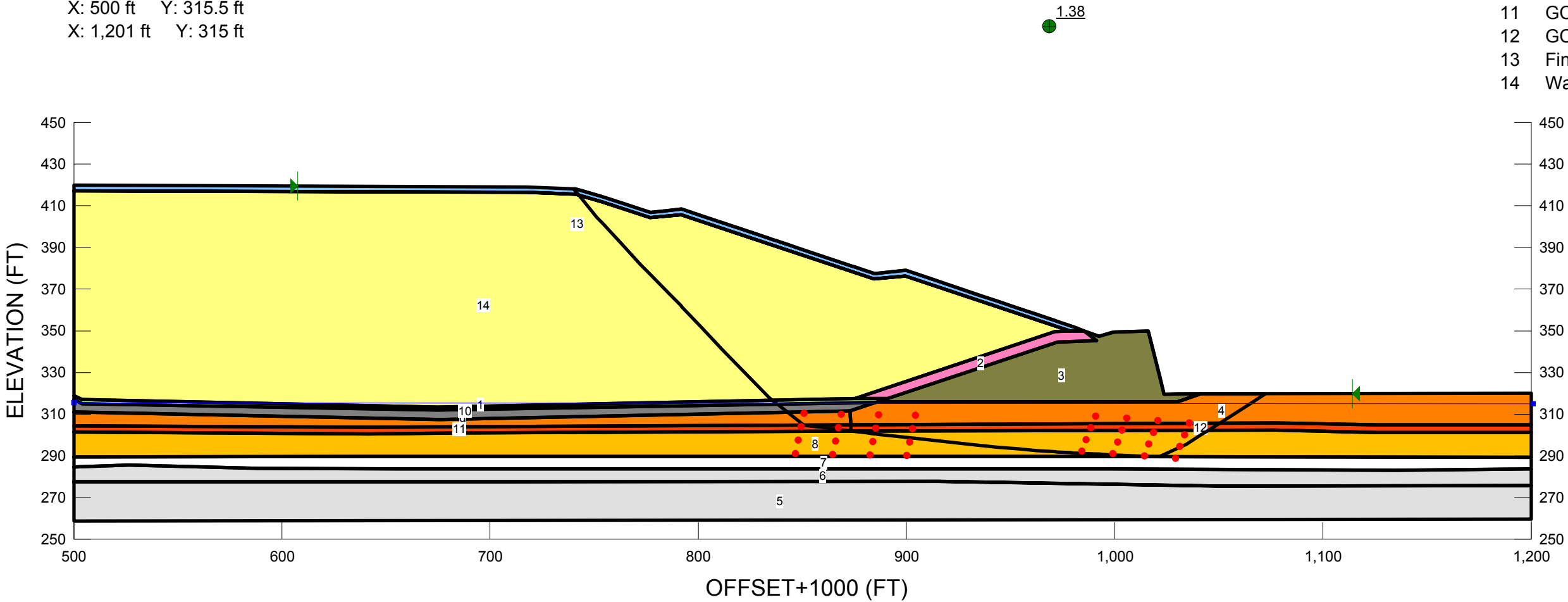
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Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.38

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft

PURPOSE:
To determine the critical static deep-seated (going into the subgrade) failure for the final configuration of RMU-2 located at cross-section 42+50.

Slip Surface Option: Block
Surface Limits
Left Coordinate: (607.55022, 419.45476) ft
Right Coordinate: (1,114.1953, 319.9052) ft

Region No.	-	Material No.
1		Bottom Liner
2		Side Slope Liner
3		Structural Fill
4		Upper Till
5		NOT ACTIVE
6		NOT ACTIVE
7		Deflection surface
8		GC Consolidated Undrained
9		Upper Till
10		CCL
11		GC-Overconsolidated Undrained
12		GC-Overconsolidated Undrained
13		Final Cover
14		Waste Material



Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1
Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: NOT ACTIVE Model: (None) Piezometric Line: 1
Name: GC Consolidated Undrained Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED static 0.34 Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: GC-Overconsolidated Undrained Model: Shear/Normal Fn. Unit Weight: 125 pcf Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

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Name: CONSOLIDATED UNDRAINED-Yield Acc
File Name: RMU2X4250r1.gsz
Date: 2/16/2013Time: 7:32:55 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: No
Slip Surface Factor of Safety: 1.00

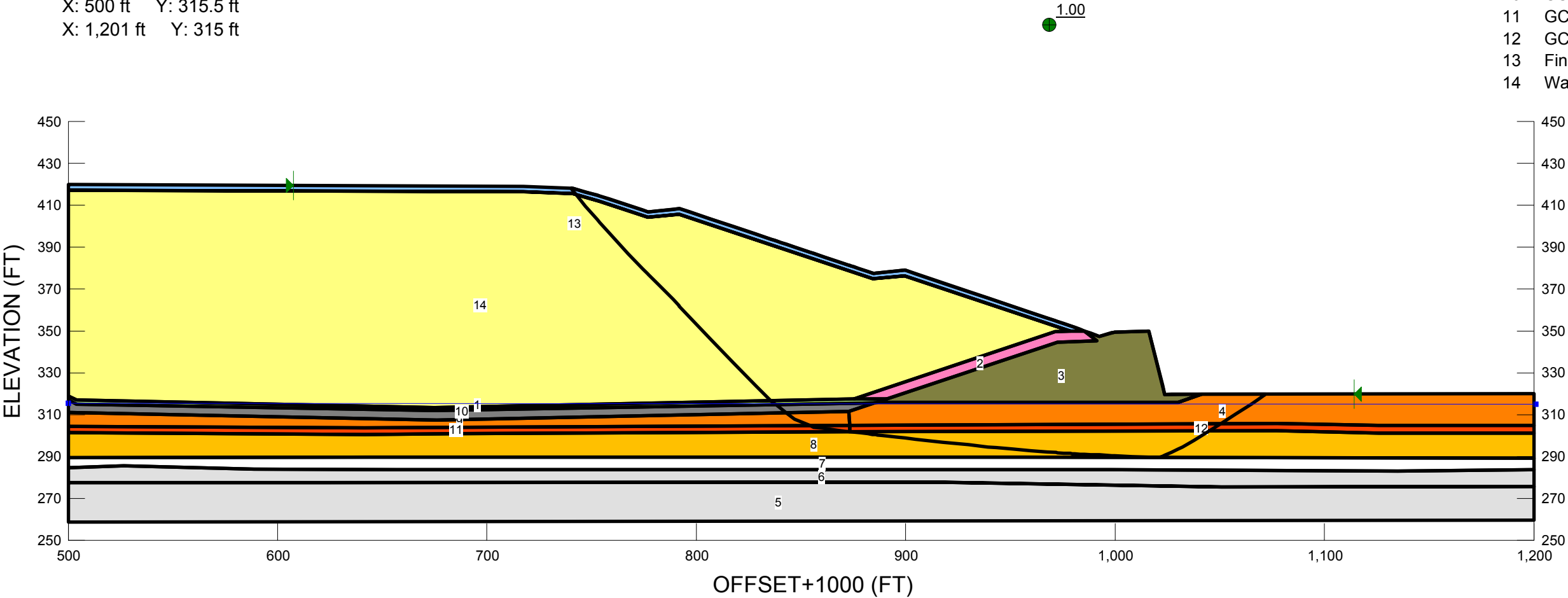
PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft

PURPOSE:
To determine the seismic ky value for the deep-seated global failure for the final configuration of RMU-2 located at cross-section 42+50.

Slip Surface Option: Fully-Specified
Surface Limits
Left Coordinate: (607.55022, 419.45476) ft
Right Coordinate: (1,114.1953, 319.9052) ft

Seismic Analysis
Horz Seismic Coef. (ky): 0.104 g

Region No.	-	Material No.
1		Bottom Liner
2		Side Slope Liner
3		Structural Fill
4		Upper Till
5		NOT ACTIVE
6		NOT ACTIVE
7		Deflection surface
8		GC Consolidated Undrained
9		Upper Till
10		CCL
11		GC-Overconsolidated Undrained
12		GC-Overconsolidated Undrained
13		Final Cover
14		Waste Material



Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 195 psf Phi': 28.7 ° Piezometric Line: 1
Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: NOT ACTIVE Model: (None) Piezometric Line: 1
Name: GC Consolidated Undrained Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED static 0.34 Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: GC-Overconsolidated Undrained Model: Shear/Normal Fn. Unit Weight: 125 pcf Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

Title: Model City - RMU-2 XS 2600
Name: Baseline Failures - Yield Acceleration
File Name: RMU2X2600r1.gsz
Date: 2/17/2013Time: 4:22:49 PM
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Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: No
Slip Surface Factor of Safety: 1.002

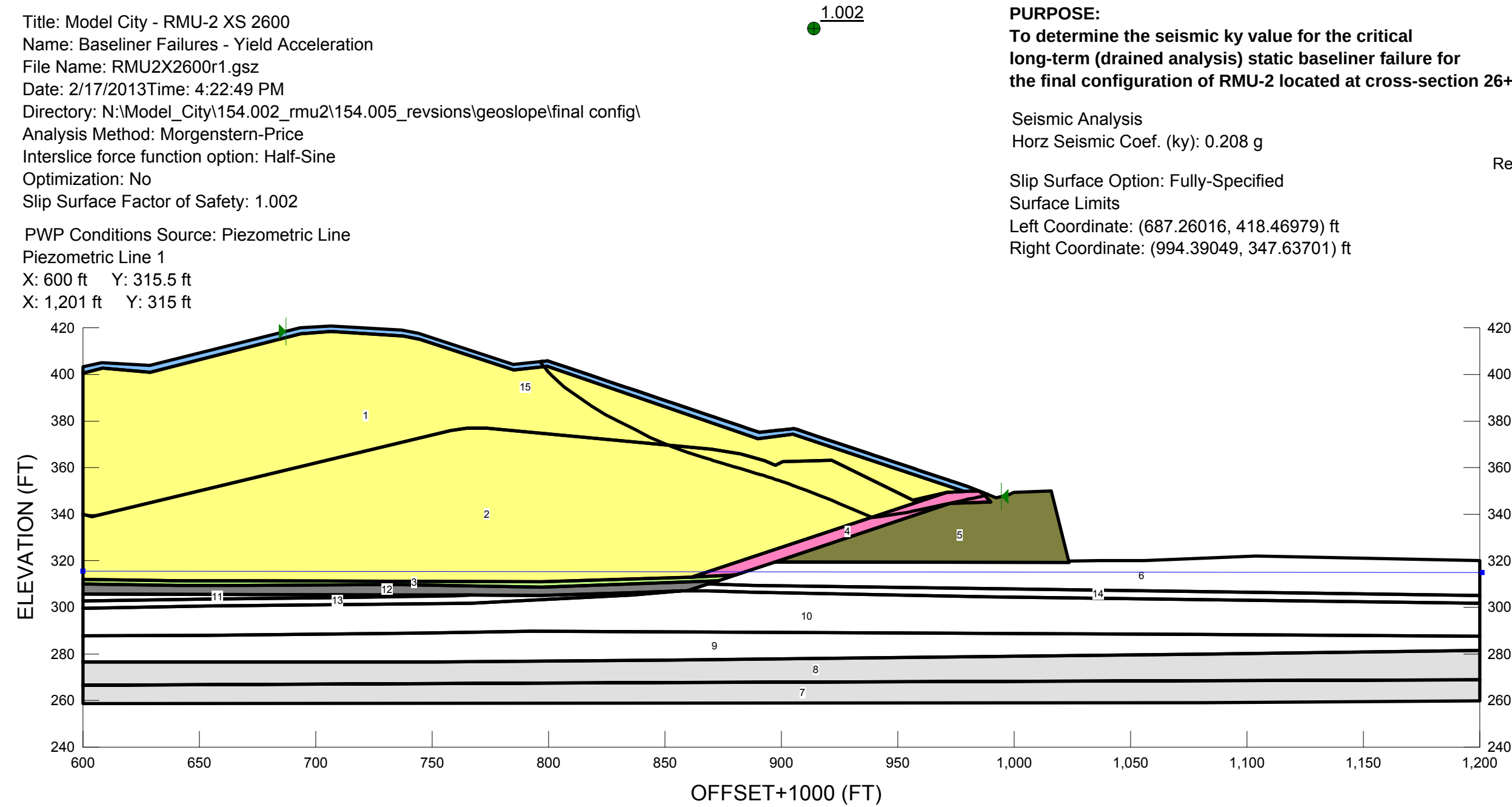
PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 600 ft Y: 315.5 ft
X: 1,201 ft Y: 315 ft

PURPOSE:
To determine the seismic ky value for the critical long-term (drained analysis) static baseliner failure for the final configuration of RMU-2 located at cross-section 26+00.

Seismic Analysis
Horz Seismic Coef. (ky): 0.208 g

Slip Surface Option: Fully-Specified
Surface Limits
Left Coordinate: (687.26016, 418.46979) ft
Right Coordinate: (994.39049, 347.63701) ft

- Region No. - Material No.
- 1 - Waste Material
 - 2 - Waste Material
 - 3 - Bottom Liner
 - 4 - Side Slope Liner
 - 5 - Structural Fill
 - 6 - Deflection surface
 - 7 - NOT ACTIVE
 - 8 - NOT ACTIVE
 - 9 - Deflection surface
 - 10 - Deflection surface
 - 11 - Deflection surface
 - 12 - CCL
 - 13 - Deflection surface
 - 14 - Deflection surface
 - 15 - Final Cover



Material Properties:

Name: Waste Material	Model: Mohr-Coulomb	Unit Weight: 111 pcf	Cohesion': 0 psf	Phi': 30 °
Name: Bottom Liner	Model: Shear/Normal Fn.	Unit Weight: 120 pcf	Strength Function: Baseline	
Name: CCL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 1,000 psf	Phi': 10 ° Piezometric Line: 1
Name: Side Slope Liner	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 0 psf	Phi': 13 °
Name: Deflection surface	Model: Bedrock (Impenetrable)	Piezometric Line: 1		
Name: Structural Fill	Model: Mohr-Coulomb	Unit Weight: 128 pcf	Cohesion': 195 psf	Phi': 28.7 ° Piezometric Line: 1
Name: Final Cover	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 0 psf	Phi': 30 ° Piezometric Line: 1
Name: NOT ACTIVE	Model: (None)	Piezometric Line: 1		

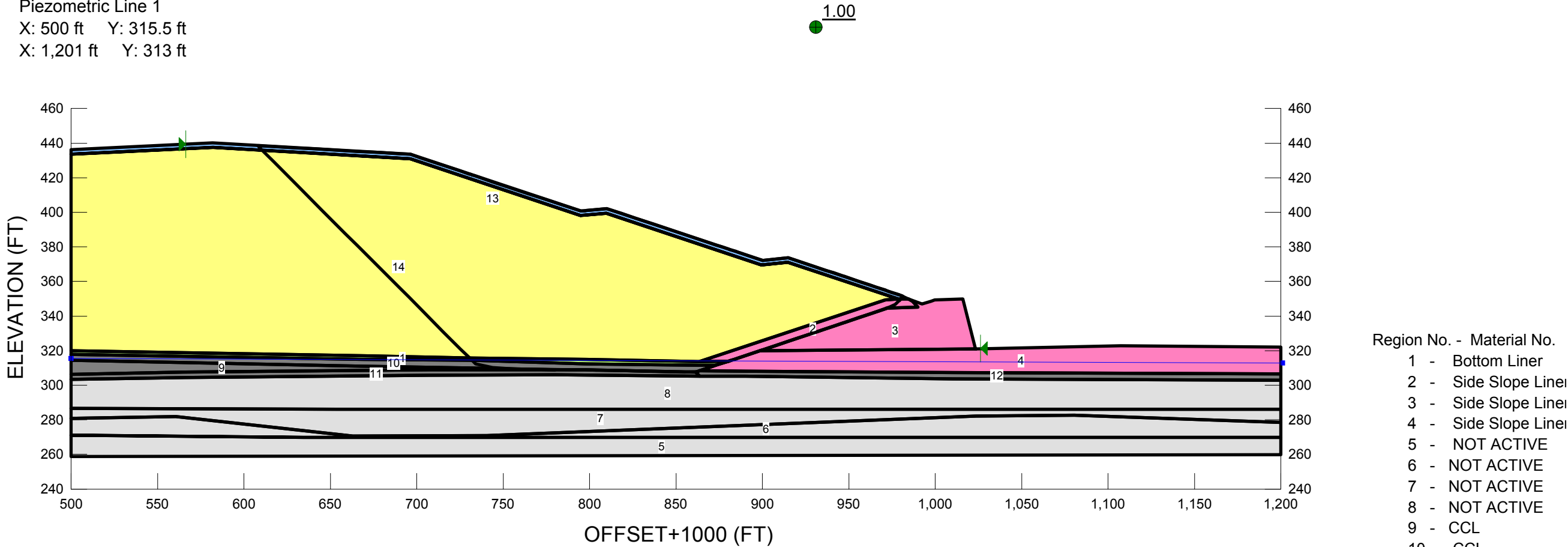
Title: Model City - RMU-2 XS 3050
Name: Drained Final Grade -Baseliner Yield Accel
File Name: RMU2X3050r1.gsz
Date: 2/15/2013Time: 10:30:39 AM
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Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: No
Slip Surface Factor of Safety: 1.00

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 500 ft Y: 315.5 ft
X: 1,201 ft Y: 313 ft

PURPOSE:
To determine the seismic ky value for the critical long-term (drained analysis) static baseliner failure for the final configuration of RMU-2 located at cross-section 30+50.

Seismic Analysis
Horz Seismic Coef. (ky): 0.216 g

Slip Surface Option: Fully-Specified
Surface Limits
Left Coordinate: (566.46829, 439.38777) ft
Right Coordinate: (1,026.2009, 321.16002) ft



Material Properties:
Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseliner
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Side Slope Liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 13 °
Name: Final Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: NOT ACTIVE Model: (None) Piezometric Line: 1

Title: Model City - RMU-2 Excavation Section Sta. 845
Name: EXCAVATION 1 ESA
Description: EXCAVATION TO MSE AND BASELINER SUBGRADE
File Name: RMU2_ST845EXC.gsz
Date: 2/17/2013 Time: 9:24:45 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\Excavation\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 2.077

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 0 ft Y: 315.5 ft
X: 651 ft Y: 315 ft

PURPOSE:

To determine the critical failure surface during excavtion phase.

The limits of search include from top of RMU-1 with exits under MSE berm.

Slip Surface Option: Entry and Exit

Surface Limits

Left Coordinate: (0.44206872, 303.37492) ft

Right Coordinate: (549.31281, 394) ft

Left-Zone Left Coordinate: (137.74673, 318.76652) ft

Left-Zone Right Coordinate: (190, 316.21561) ft

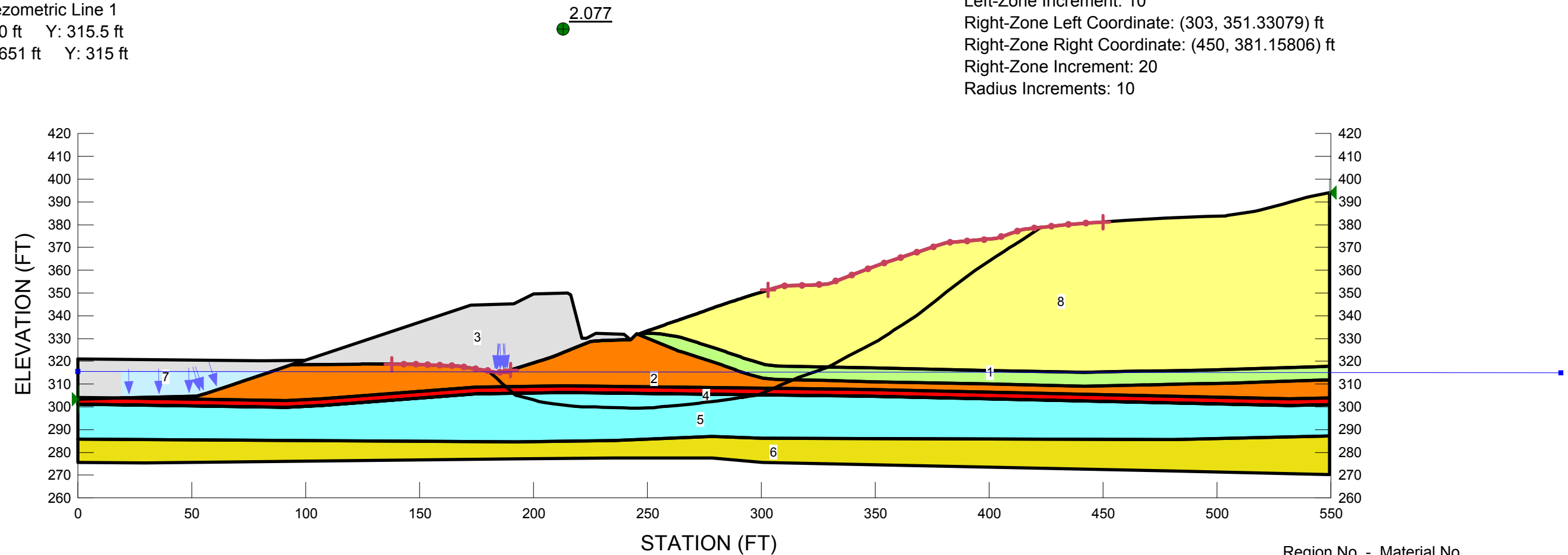
Left-Zone Increment: 10

Right-Zone Left Coordinate: (303, 351.33079) ft

Right-Zone Right Coordinate: (450, 381.15806) ft

Right-Zone Increment: 20

Radius Increments: 10



Material Properties:

Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °

Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline

Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1

Name: GC-Drained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: normalized N^m Anisotropic Strength Fn: clay ellipse staticshear

Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 °

Name: Sand/Silt Model: Mohr-Coulomb Unit Weight: 135 pcf Cohesion': 0 psf Phi': 34 ° Piezometric Line: 1

Name: NOT ACTIVE Model: (None) Piezometric Line: 1

Region No. - Material No.

1 - Bottom Liner

2 - Upper Till

3 - NOT ACTIVE

4 - GC OverConsolidated

5 - GC-Drained

6 - Sand/Silt

7 - NOT ACTIVE

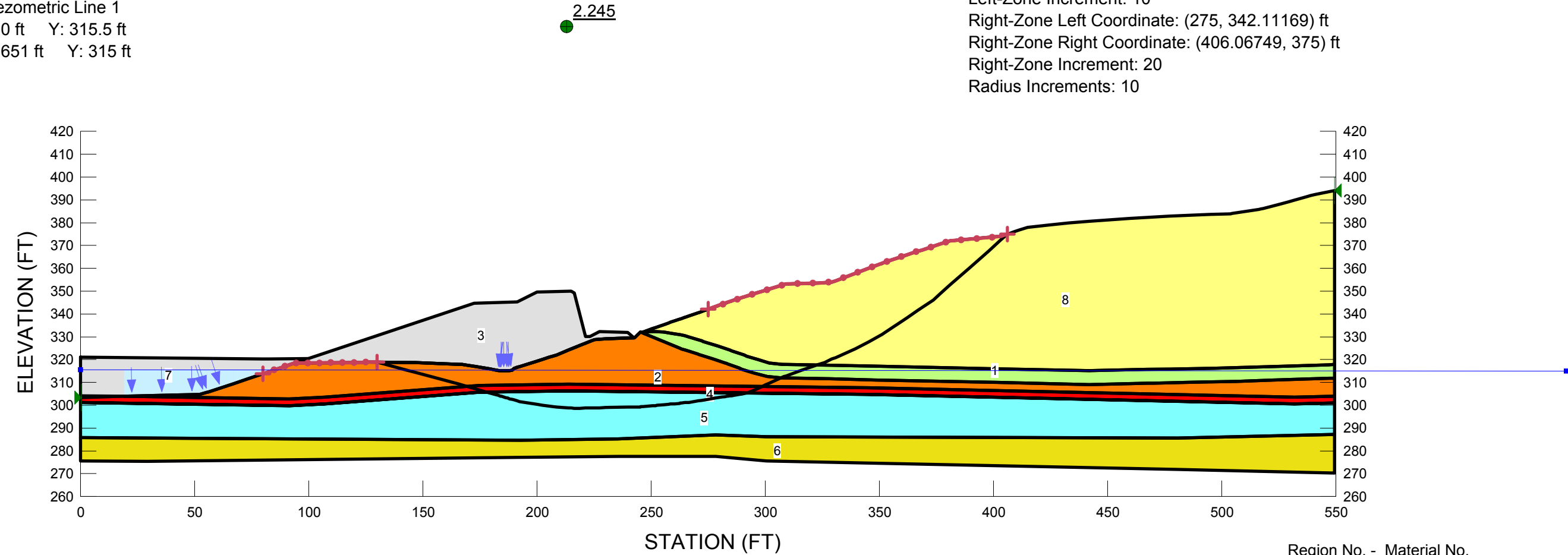
8 - Waste Material

Title: Model City - RMU-2 Excavation Section Sta. 845
Name: EXCAVATION 1 ESA (2)-W
Description: EXCAVATION TO MSE AND BASELINER SUBGRADE
File Name: RMU2_ST845EXC.gsz
Date: 2/17/2013Time: 9:24:45 AM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\Excavation\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 2.245

PWP Conditions Source: Piezometric Line
Piezometric Line 1
X: 0 ft Y: 315.5 ft
X: 651 ft Y: 315 ft

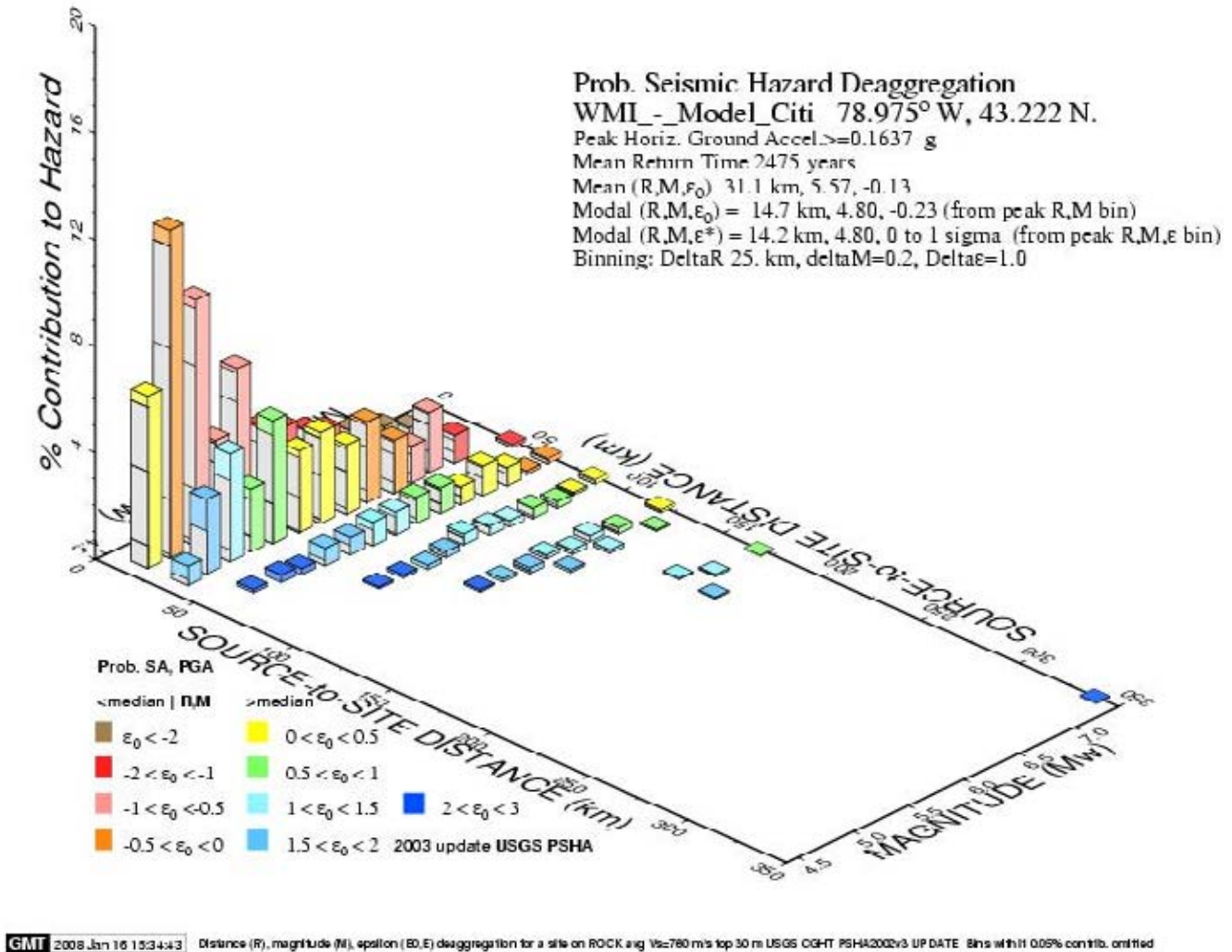
PURPOSE:
To determine the critical failure surface during excavtion phase.
The limits of search include from mid slope of RMU-1 with exits past MSE Berm.

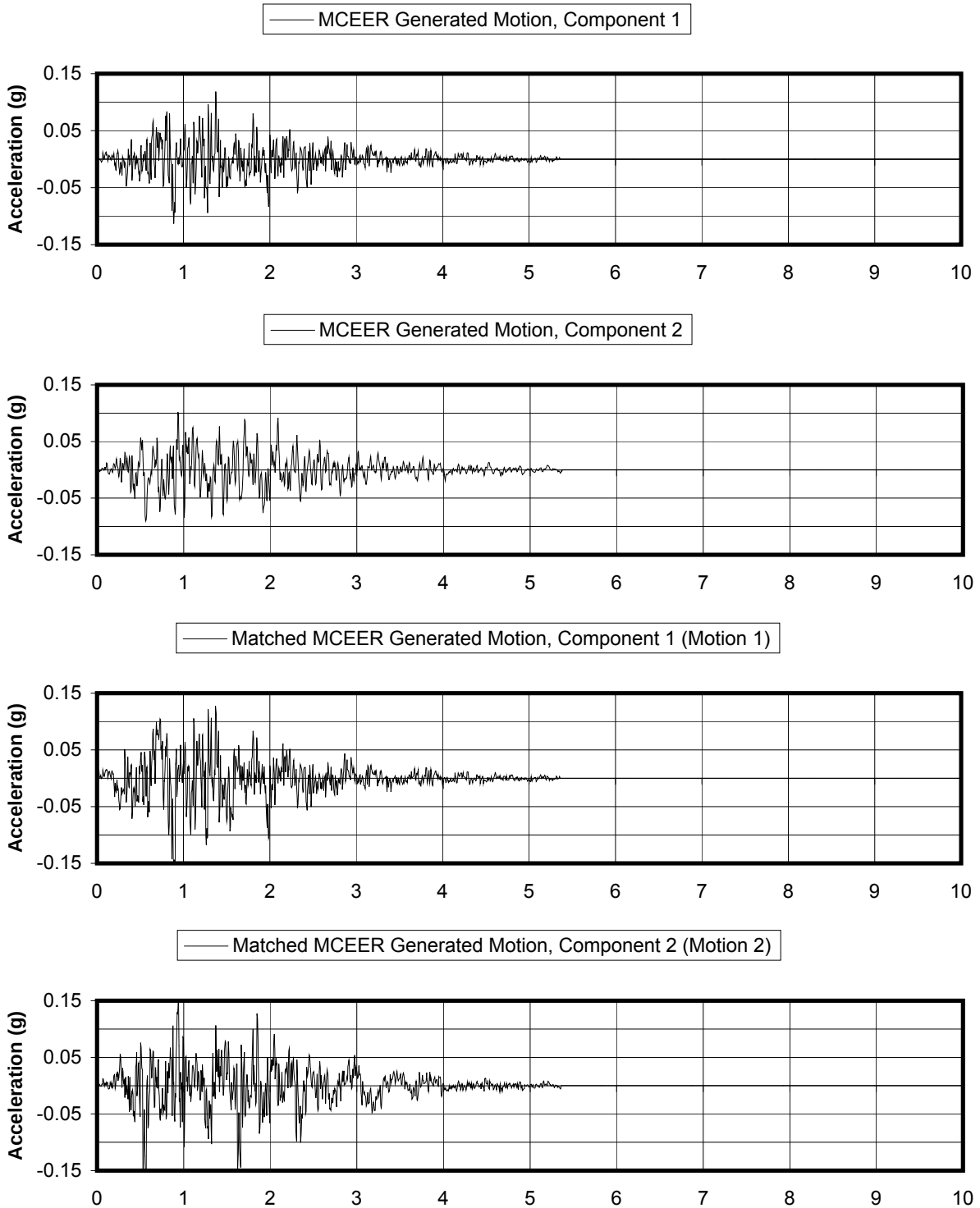
Slip Surface Option: Entry and Exit
Surface Limits
Left Coordinate: (0.44206872, 303.37492) ft
Right Coordinate: (549.31281, 394) ft
Left-Zone Left Coordinate: (80, 313.86961) ft
Left-Zone Right Coordinate: (130, 318.81517) ft
Left-Zone Increment: 10
Right-Zone Left Coordinate: (275, 342.11169) ft
Right-Zone Right Coordinate: (406.06749, 375) ft
Right-Zone Increment: 20
Radius Increments: 10

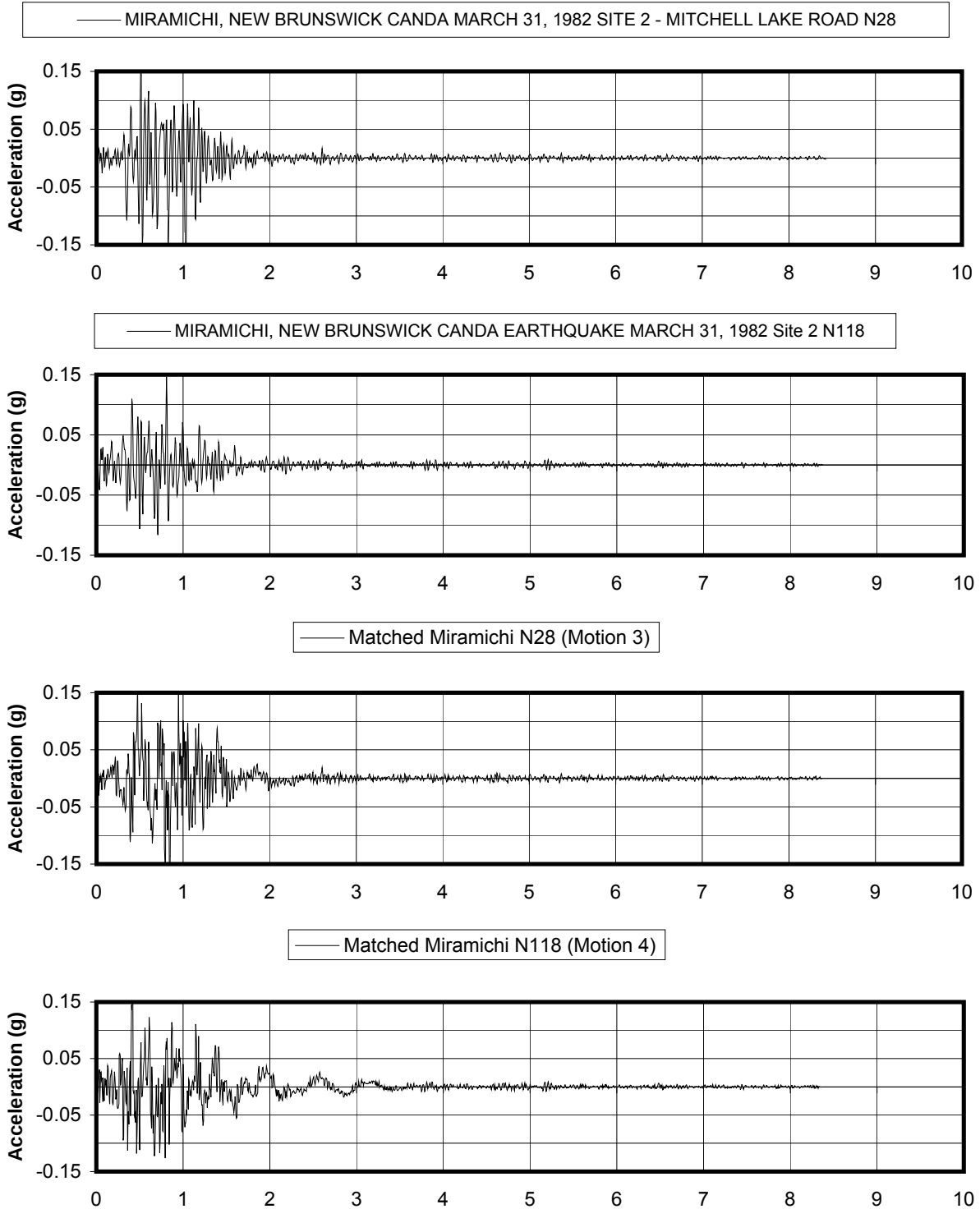


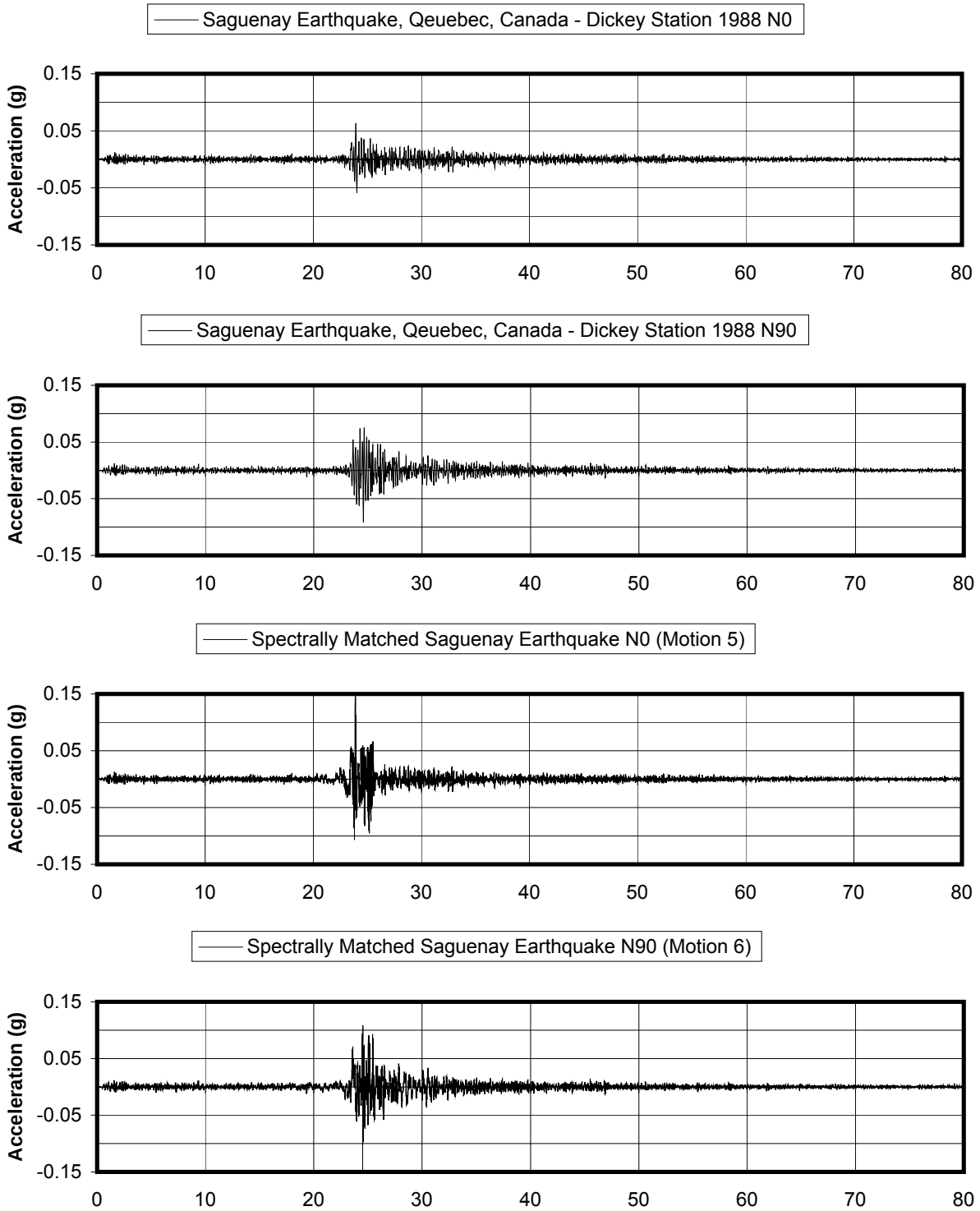
Material Properties:
Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: GC-Drained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: normalized N^m Anisotropic Strength Fn: clay ellipse staticshear
Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 °
Name: Sand/Silt Model: Mohr-Coulomb Unit Weight: 135 pcf Cohesion': 0 psf Phi': 34 ° Piezometric Line: 1
Name: NOT ACTIVE Model: (None) Piezometric Line: 1

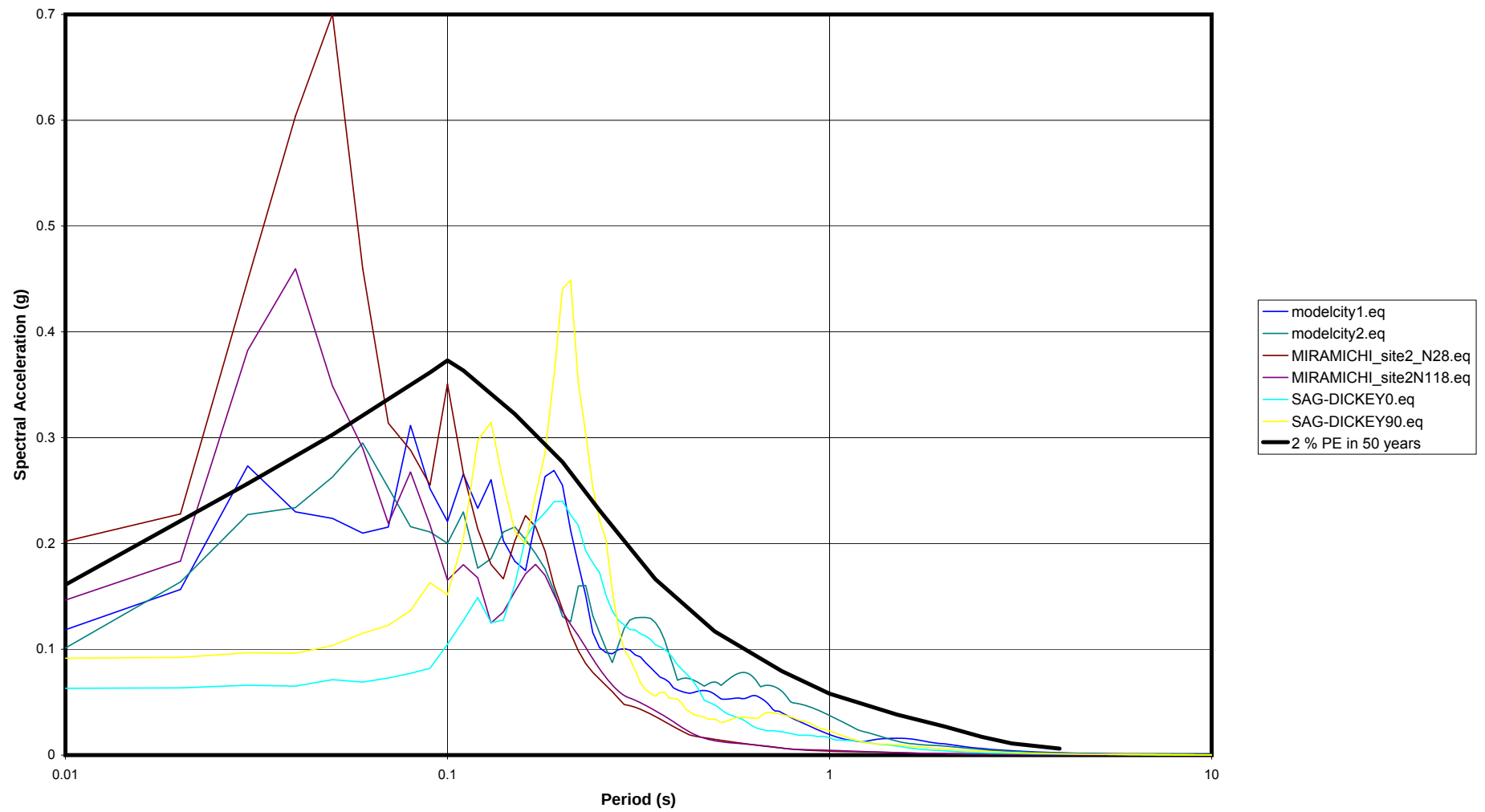
Region No. - Material No.
1 - Bottom Liner
2 - Upper Till
3 - NOT ACTIVE
4 - GC OverConsolidated
5 - GC-Drained
6 - Sand/Silt
7 - NOT ACTIVE
8 - Waste Material

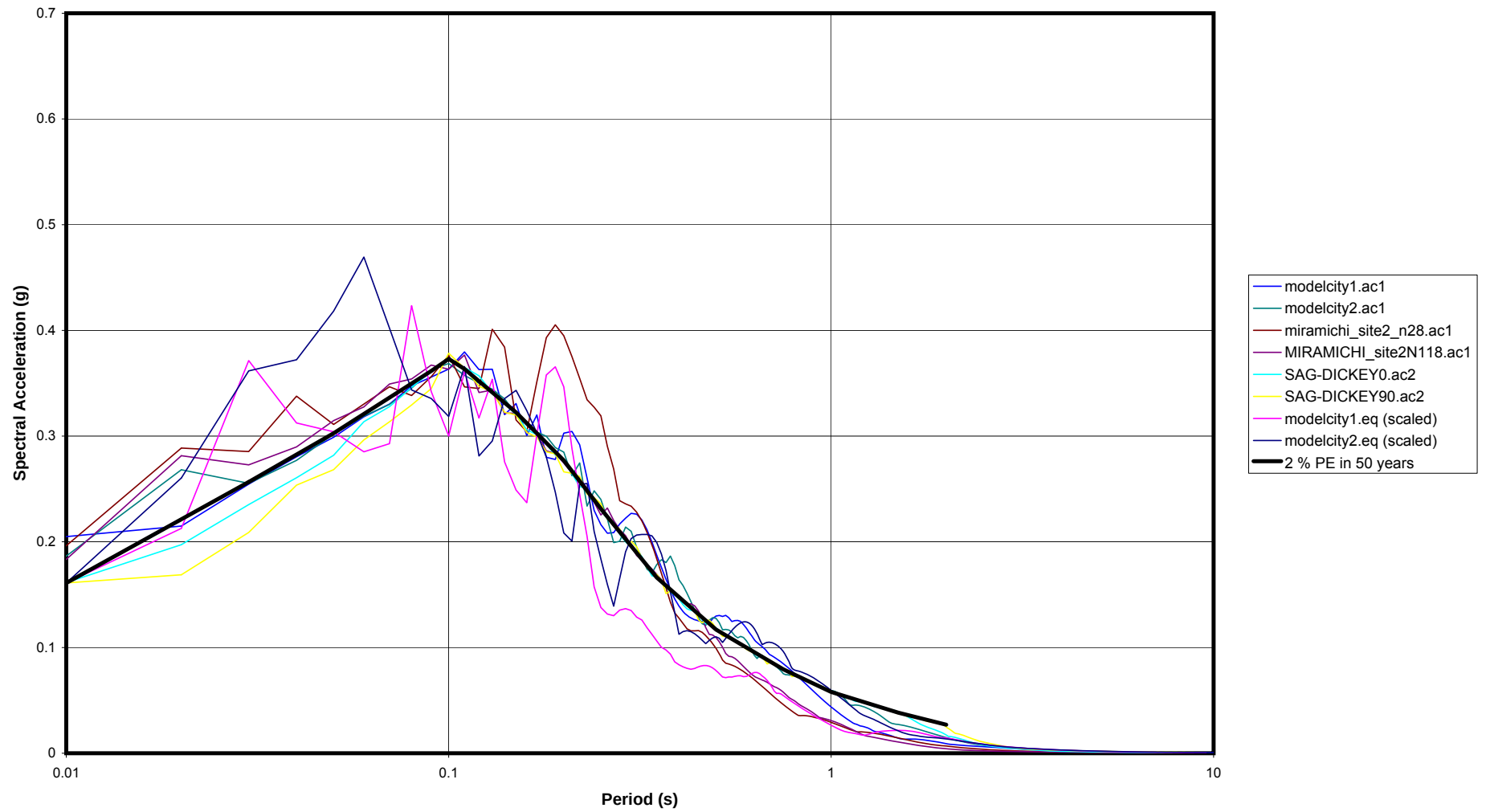












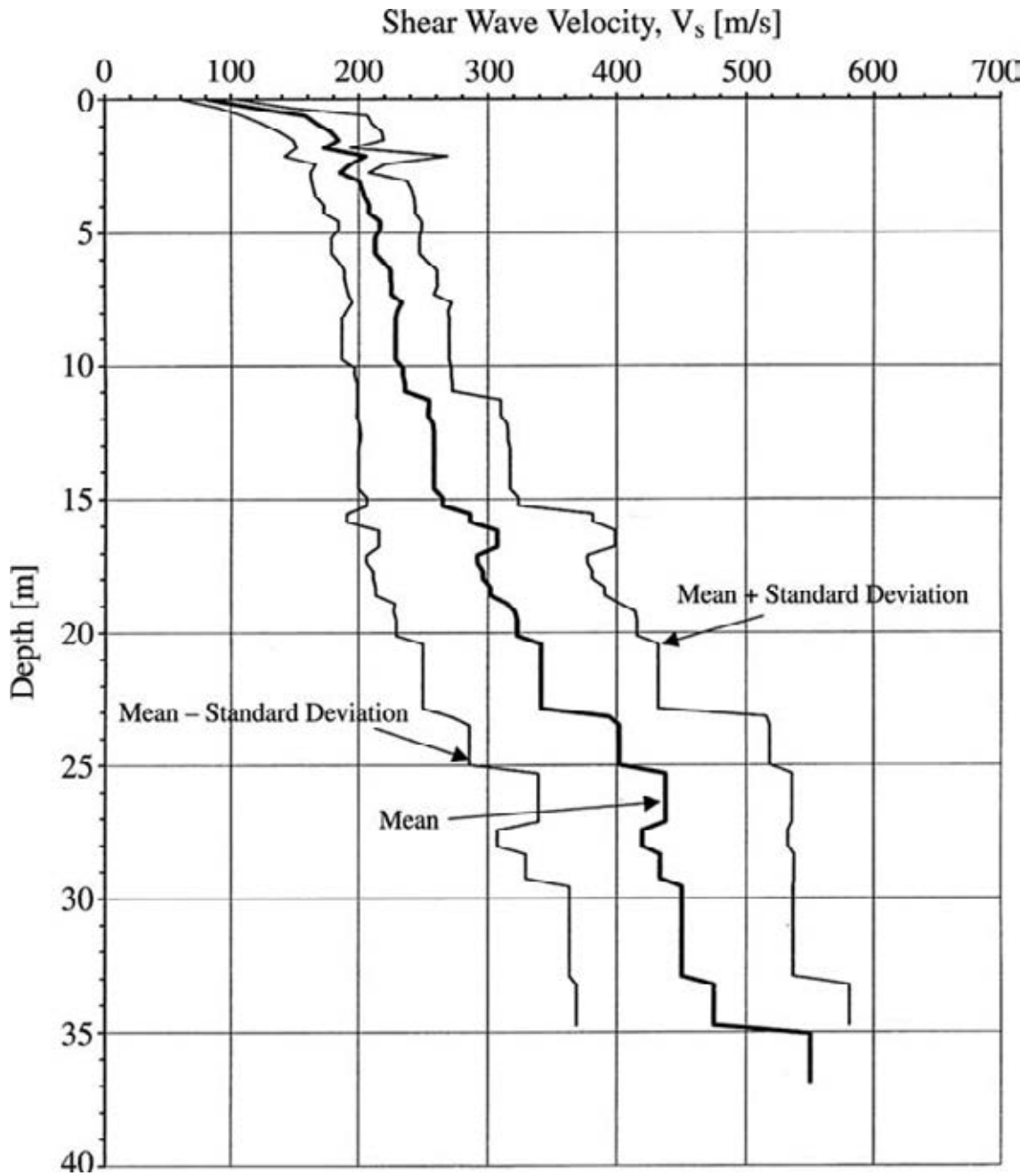
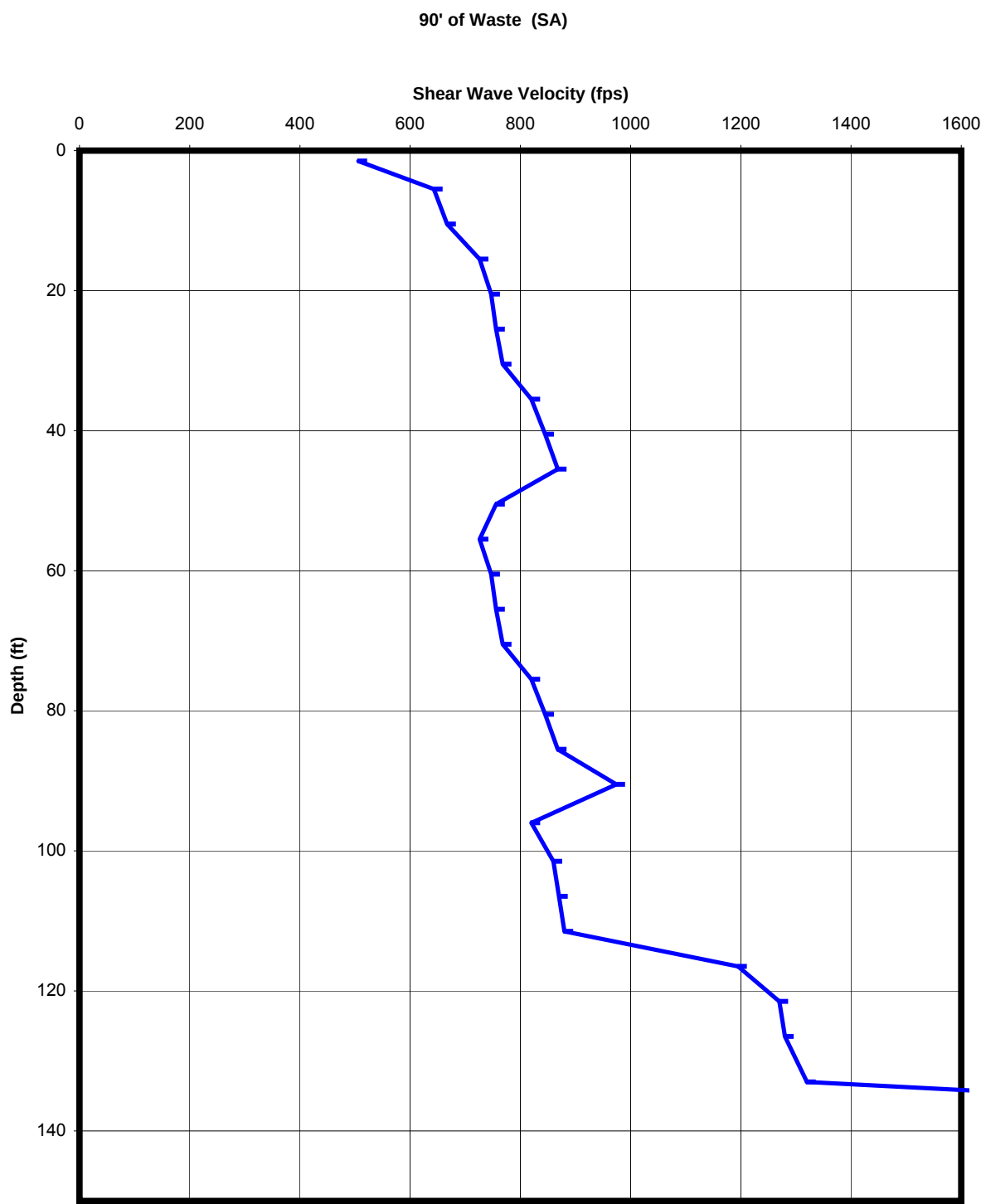
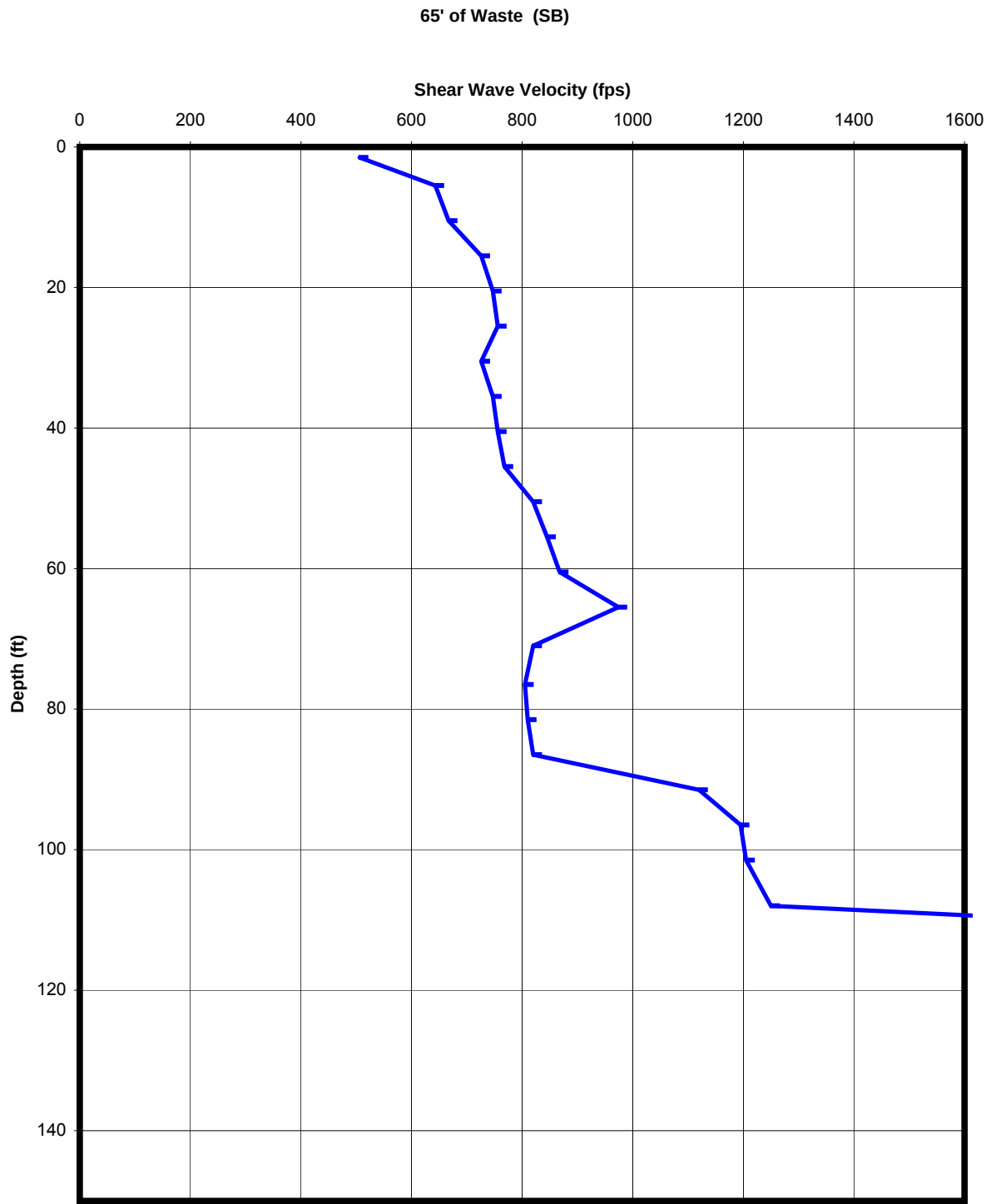
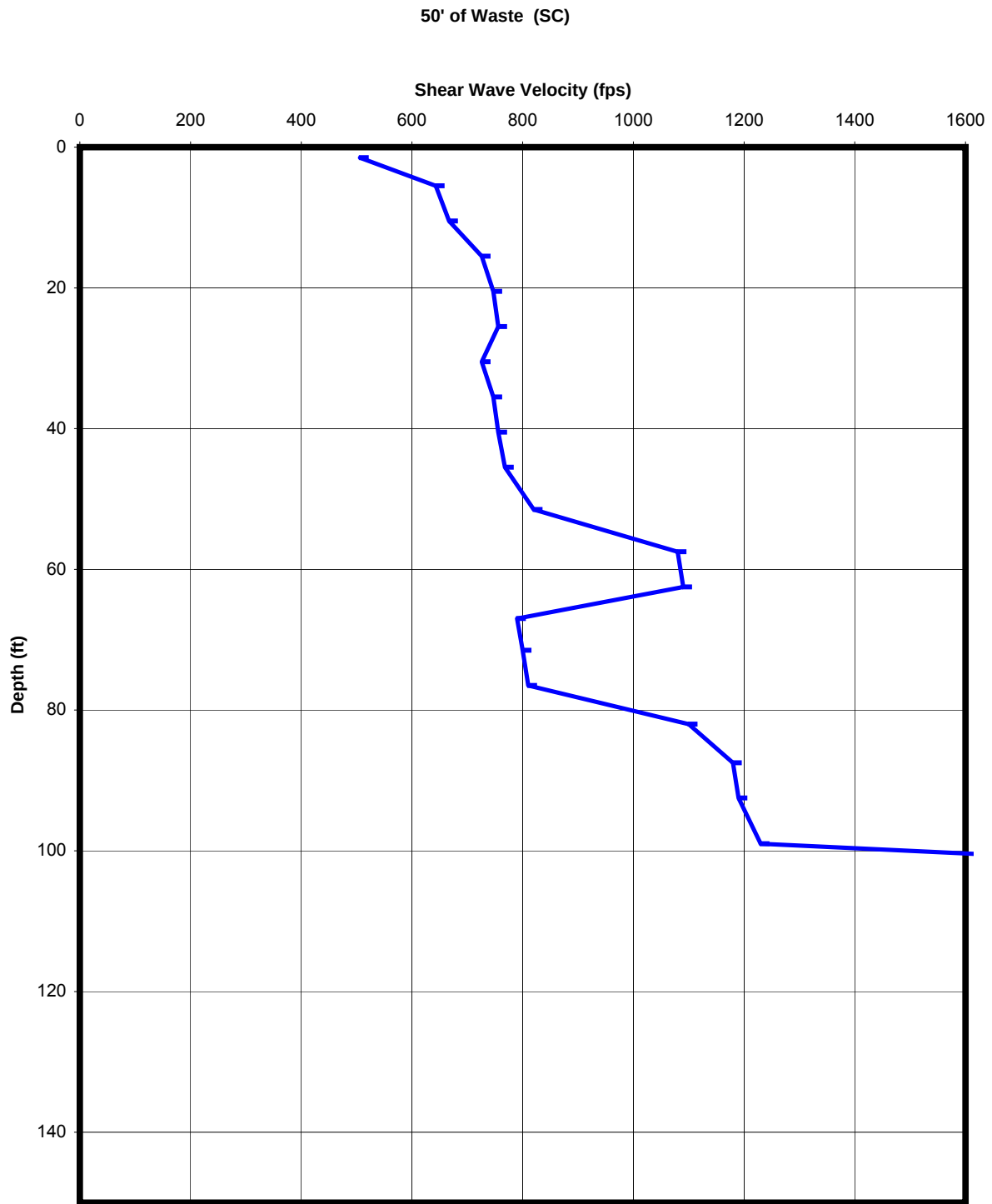
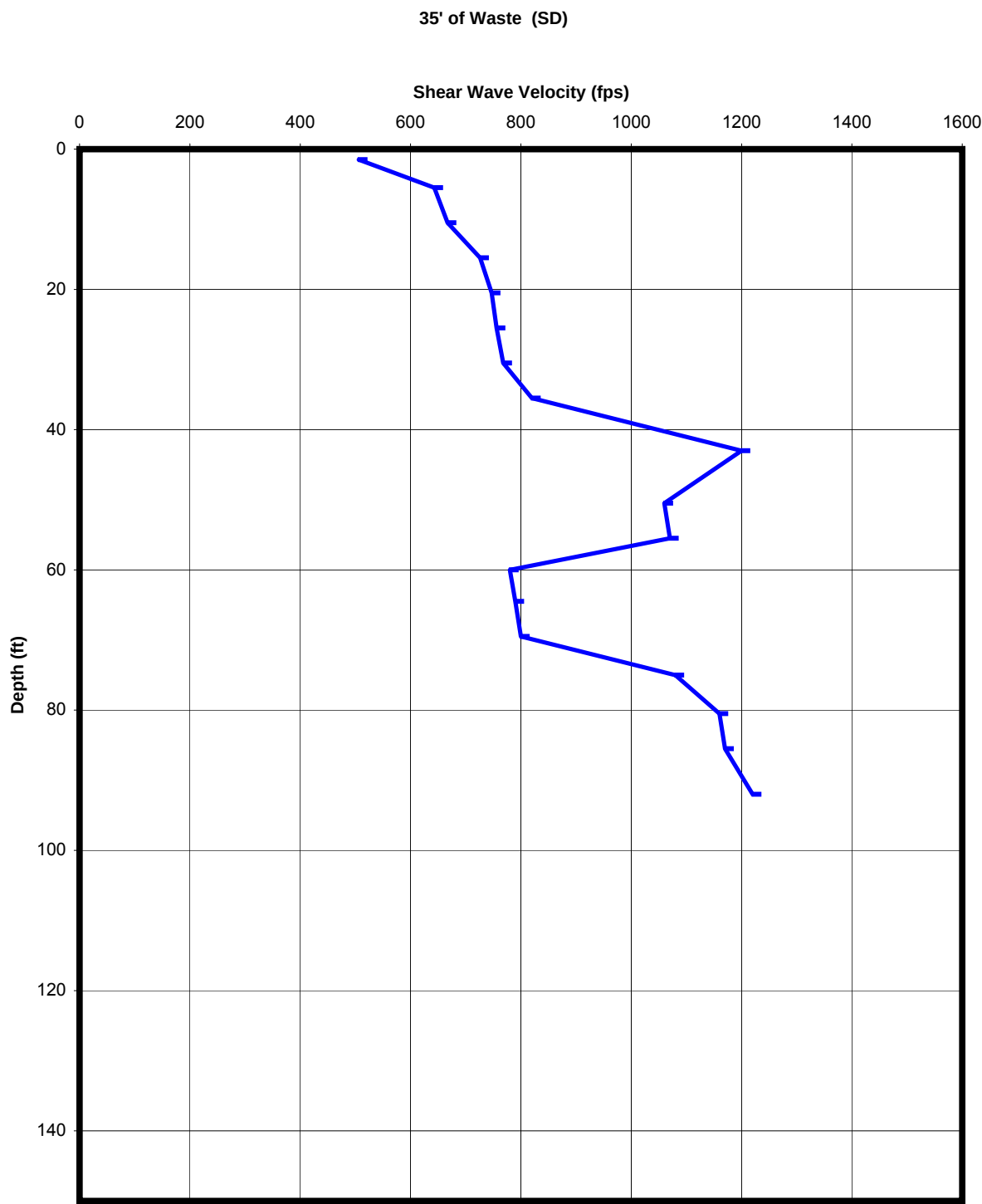


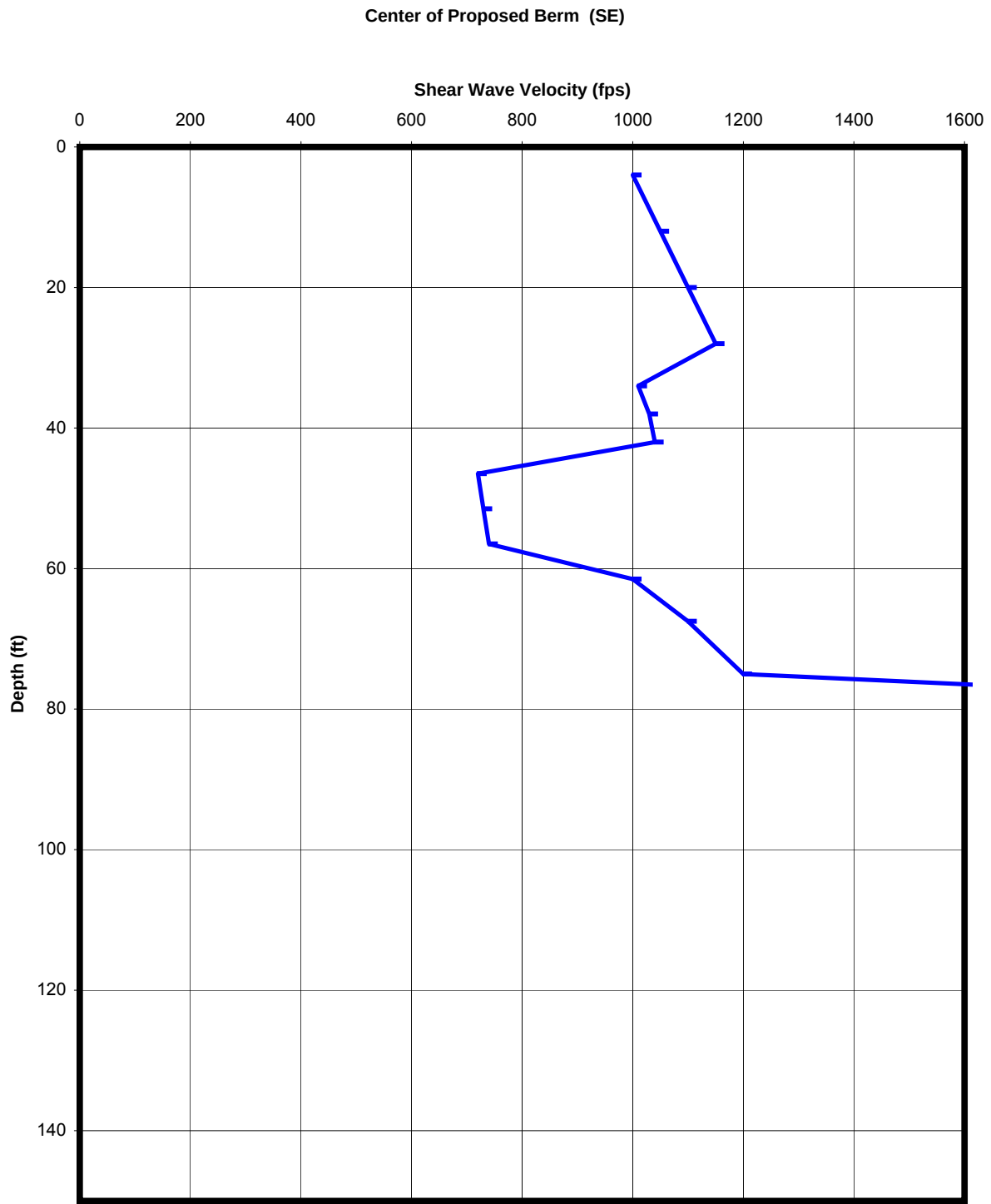
Fig. 5. Mean and mean G one standard deviation shear wave velocity in waste mass.

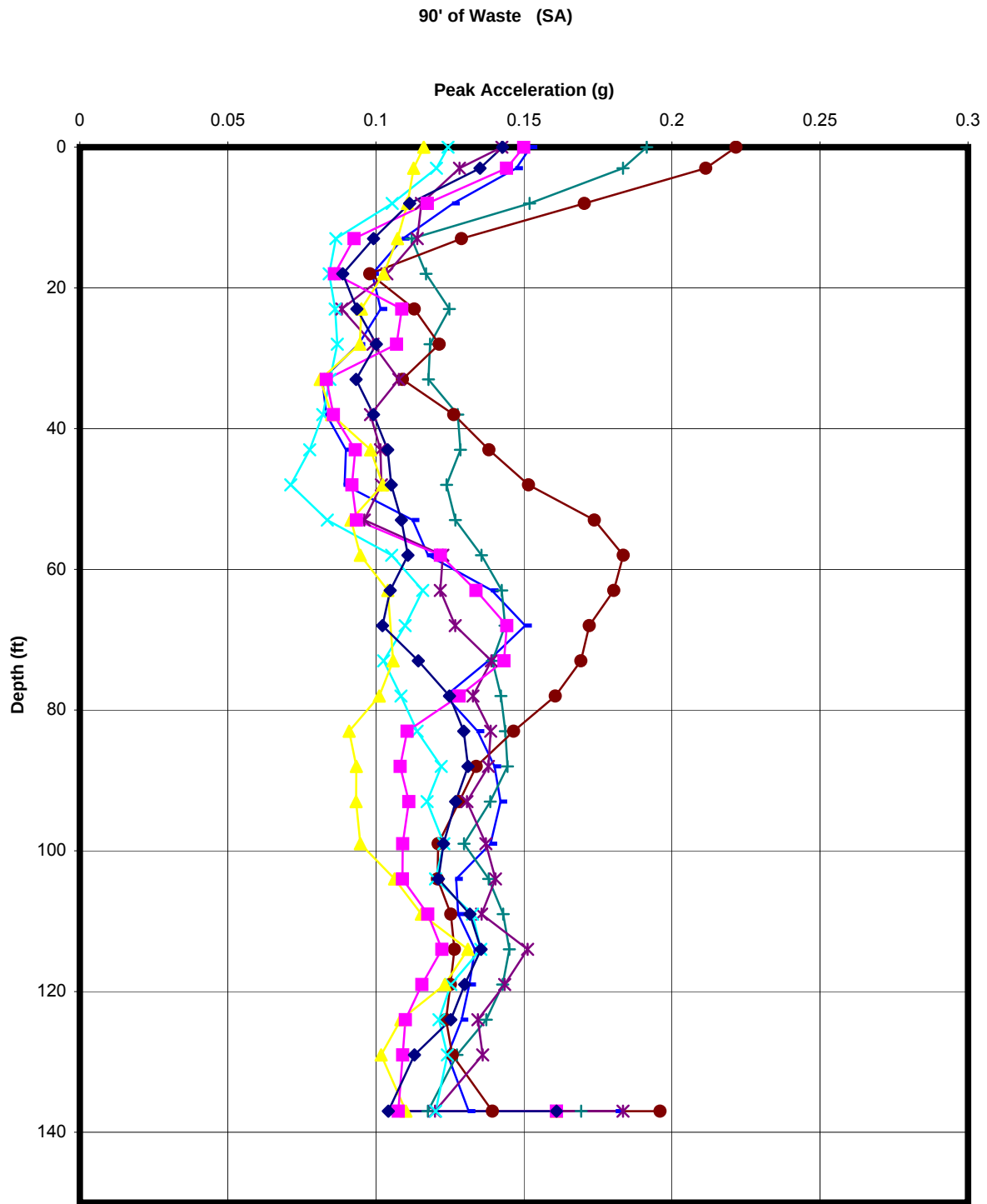


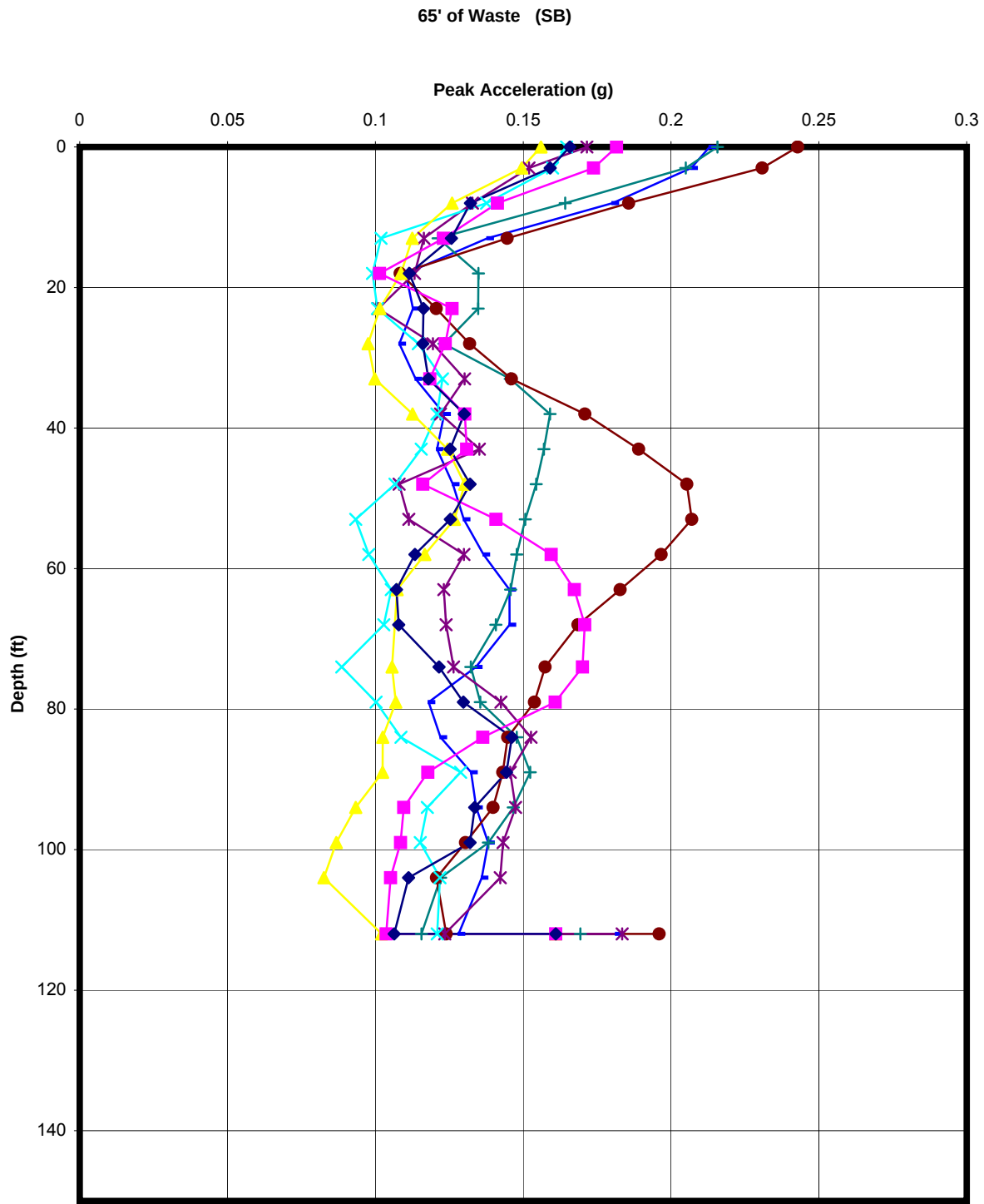


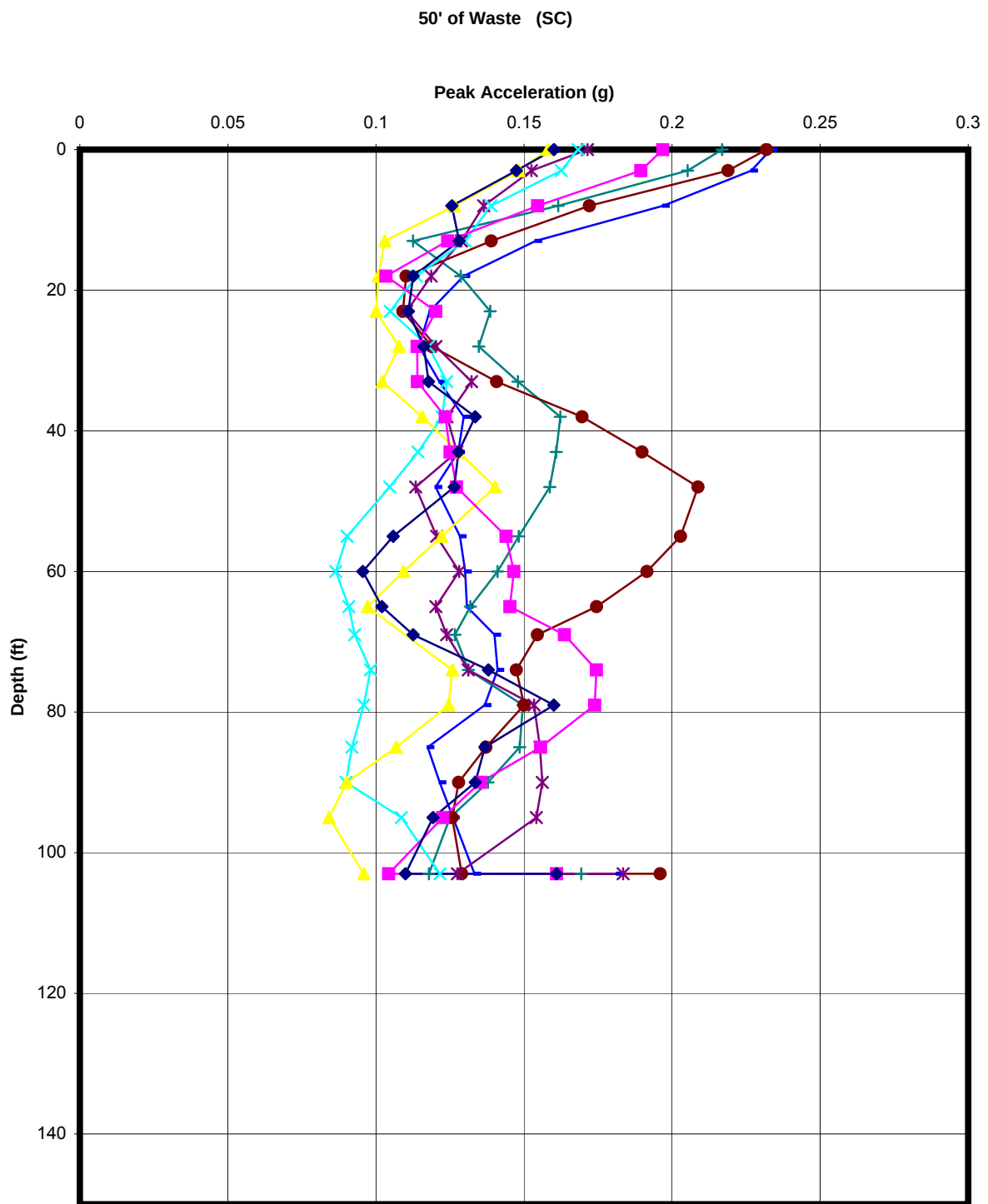


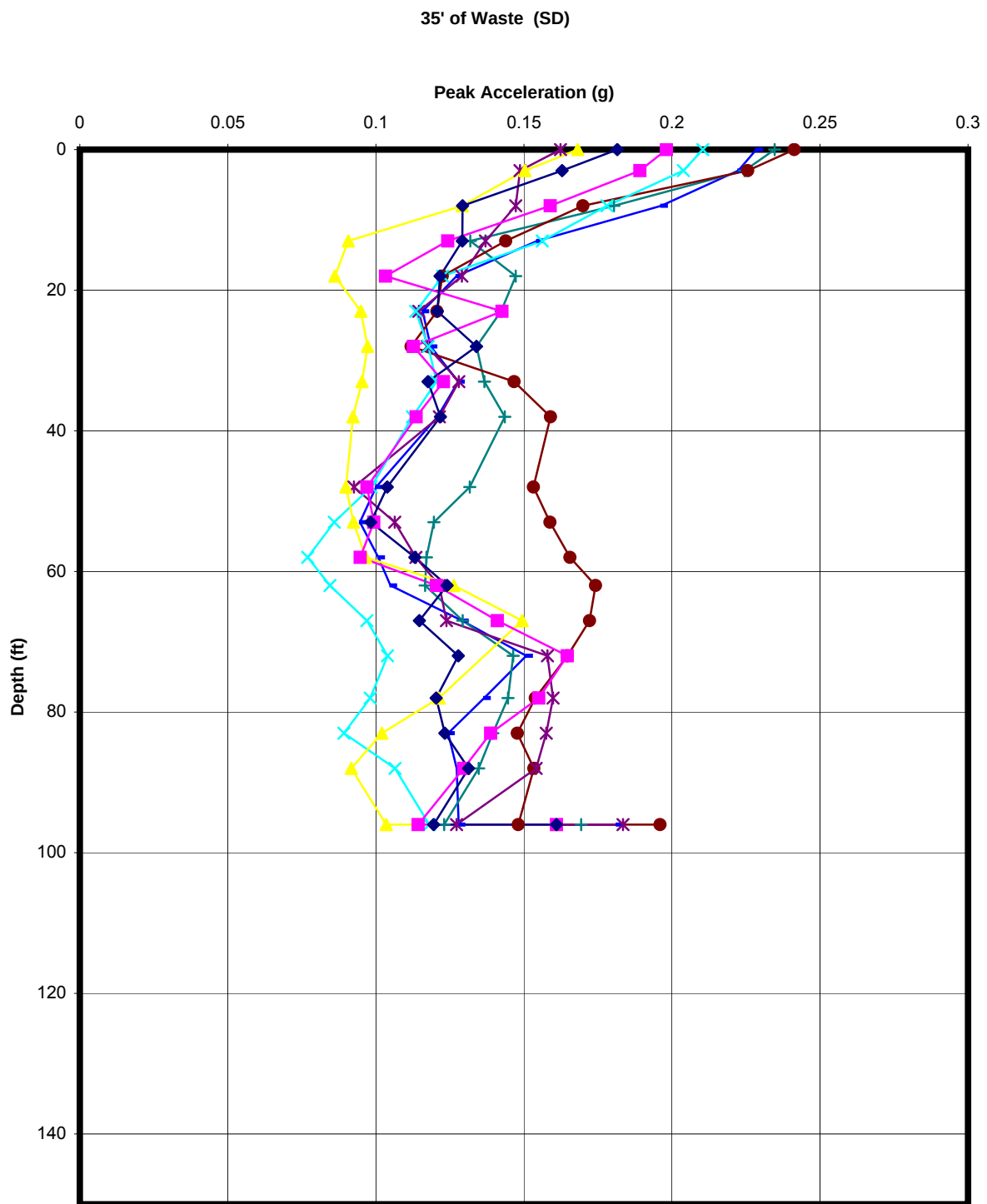


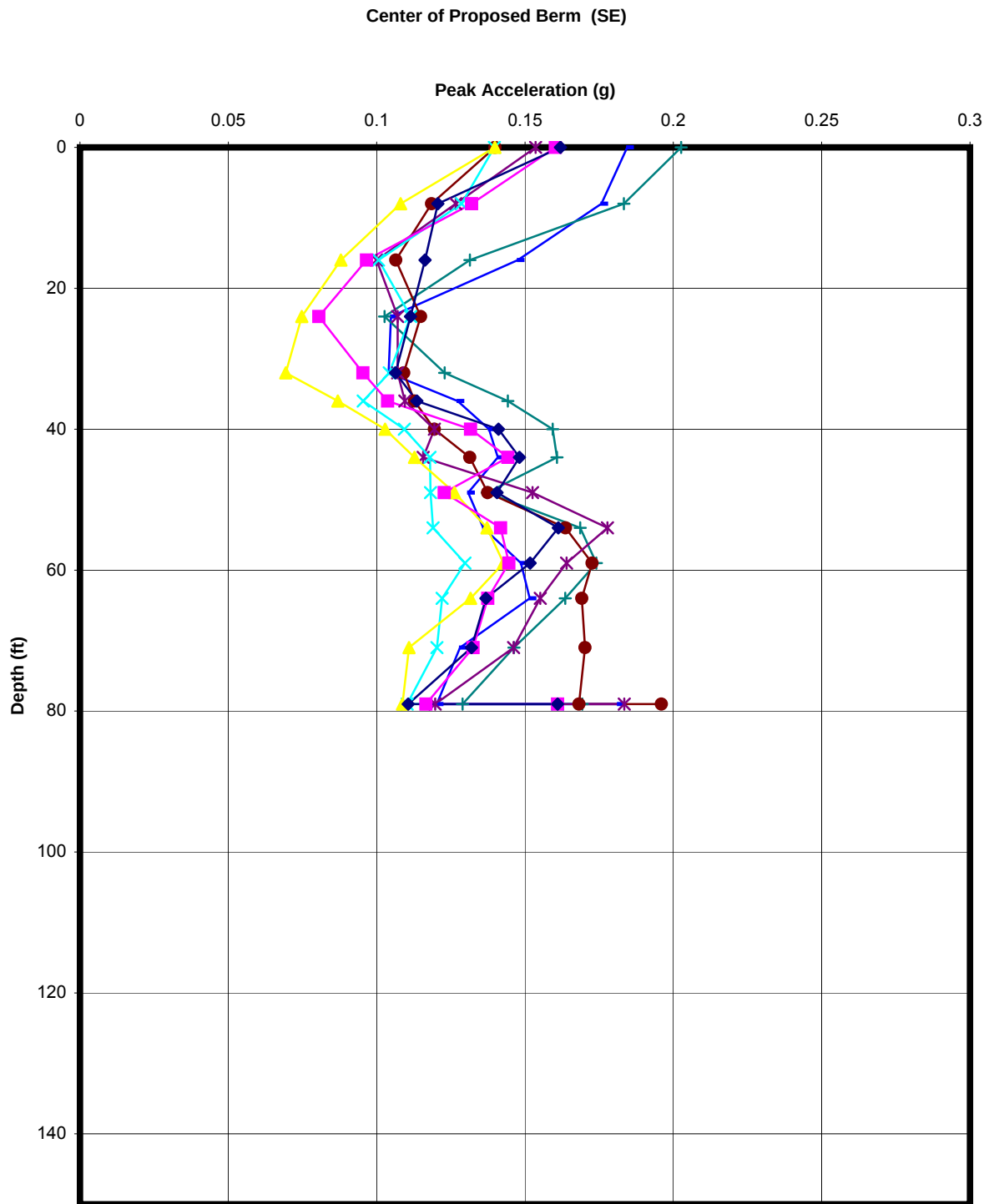


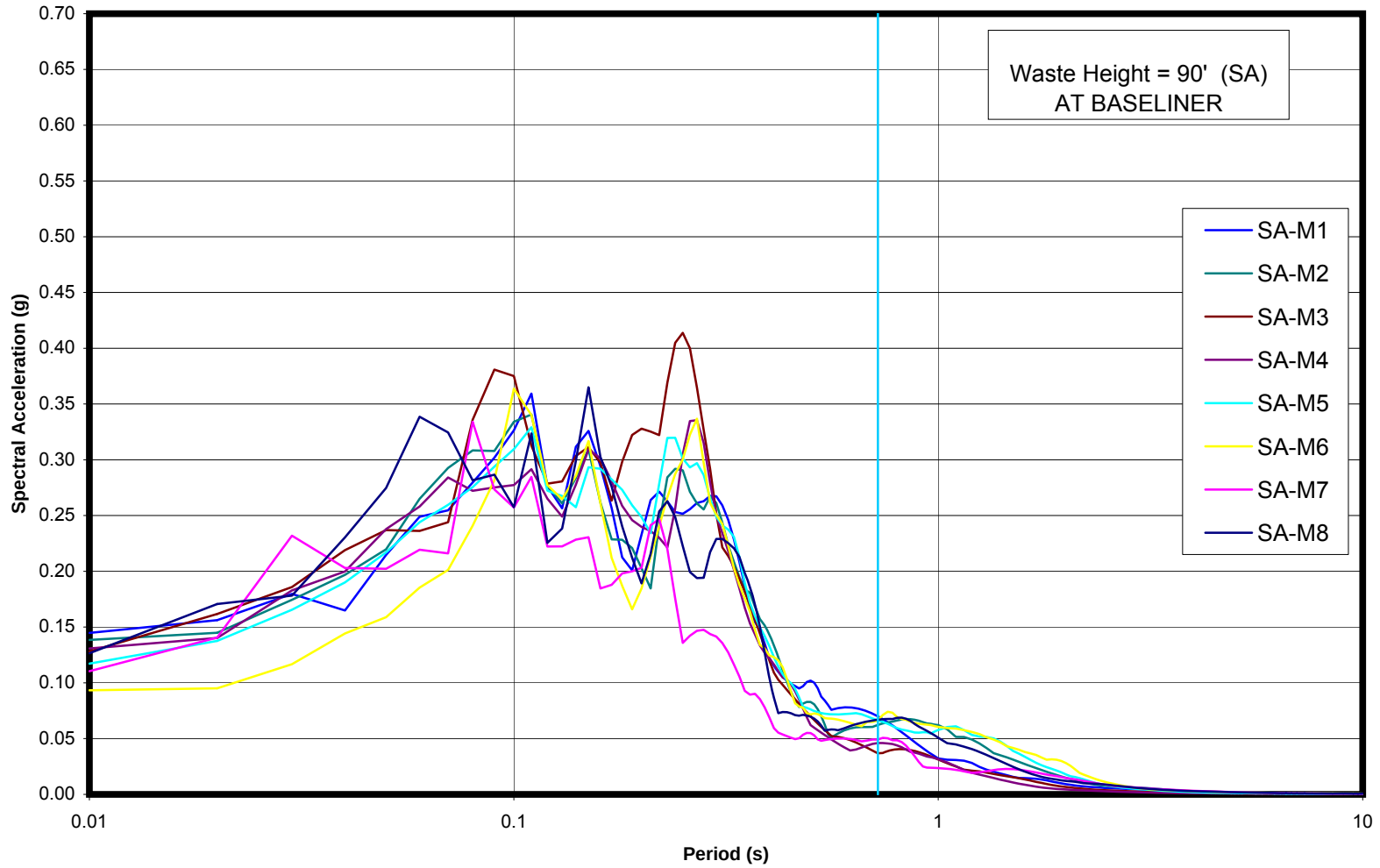


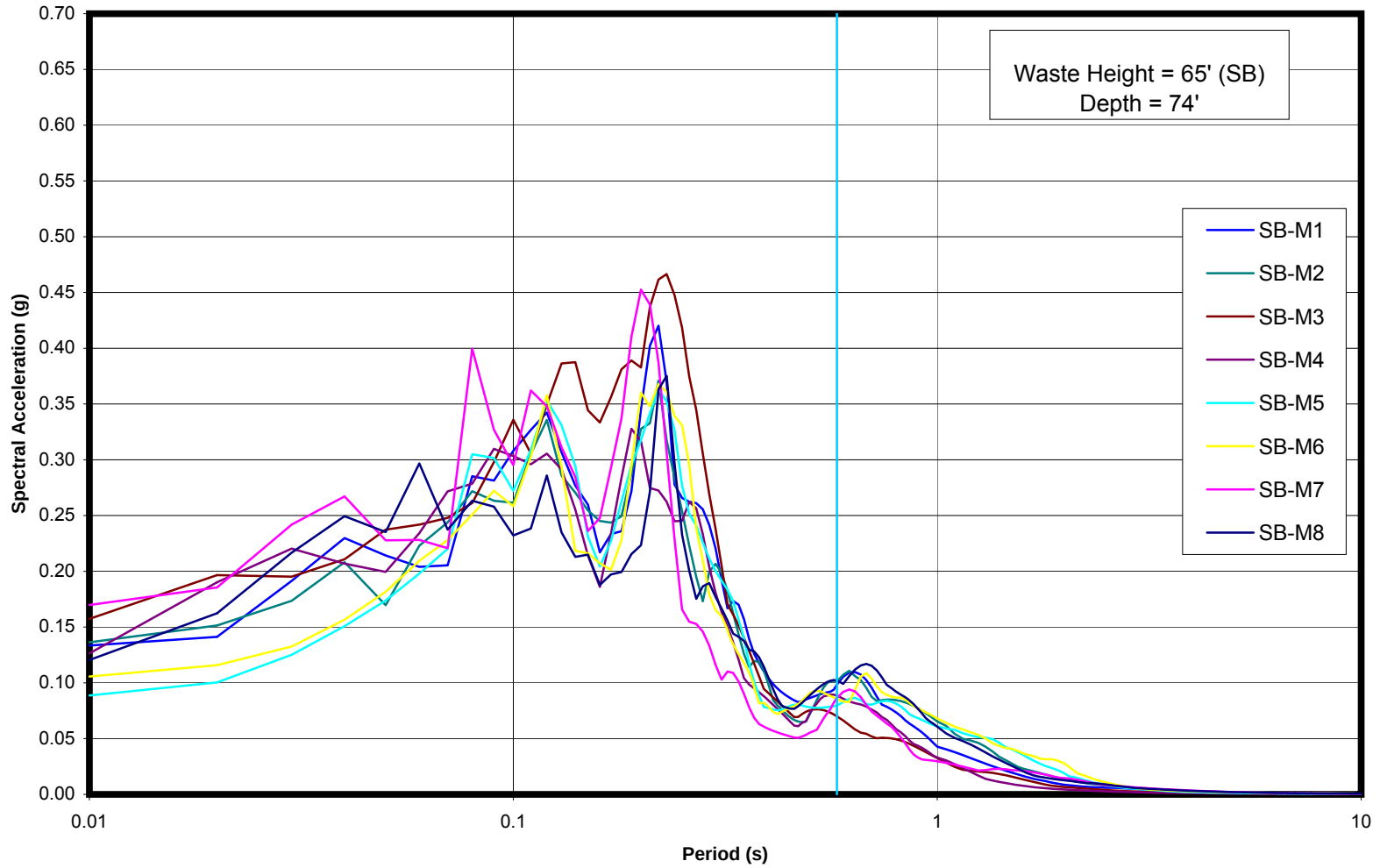


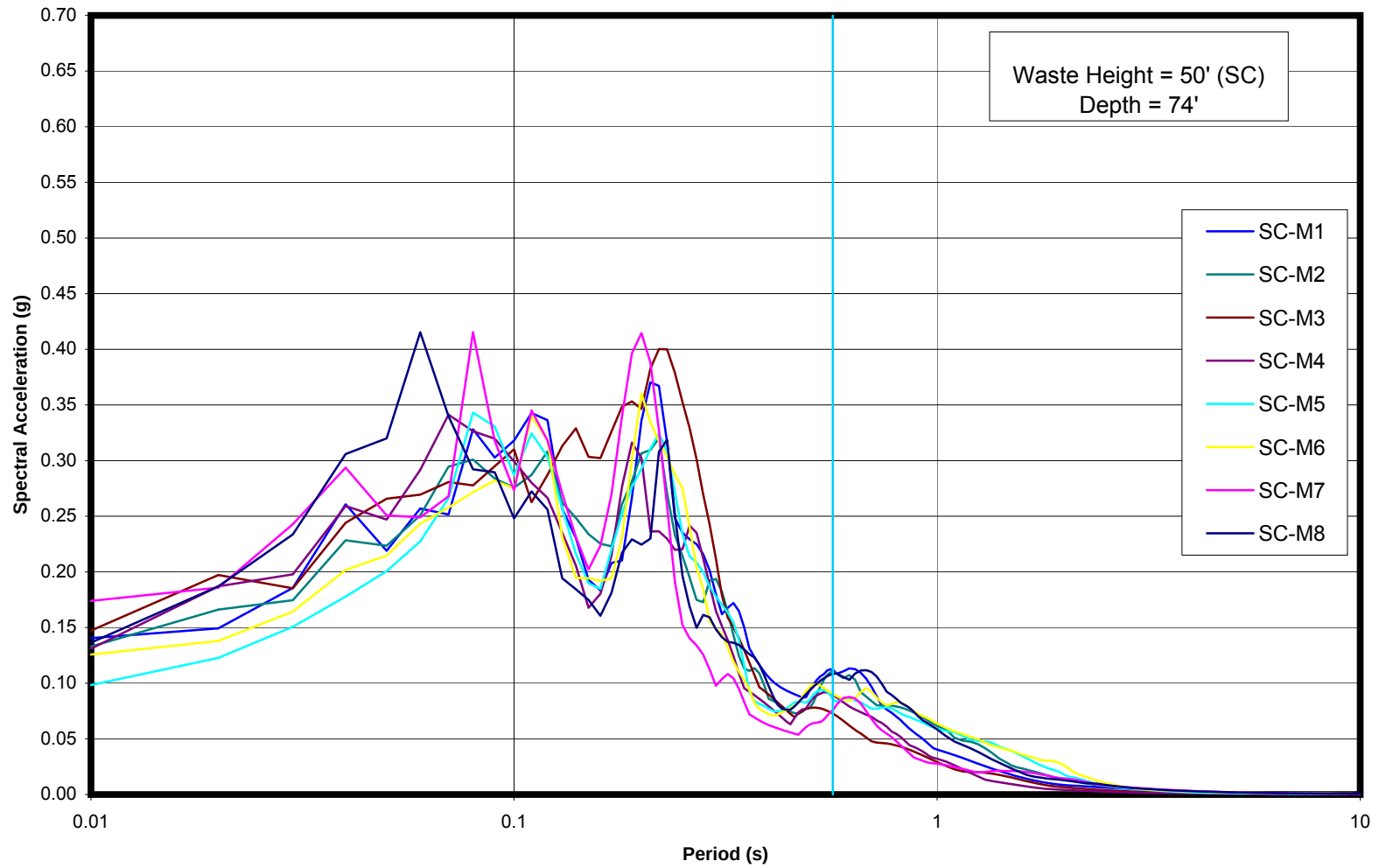


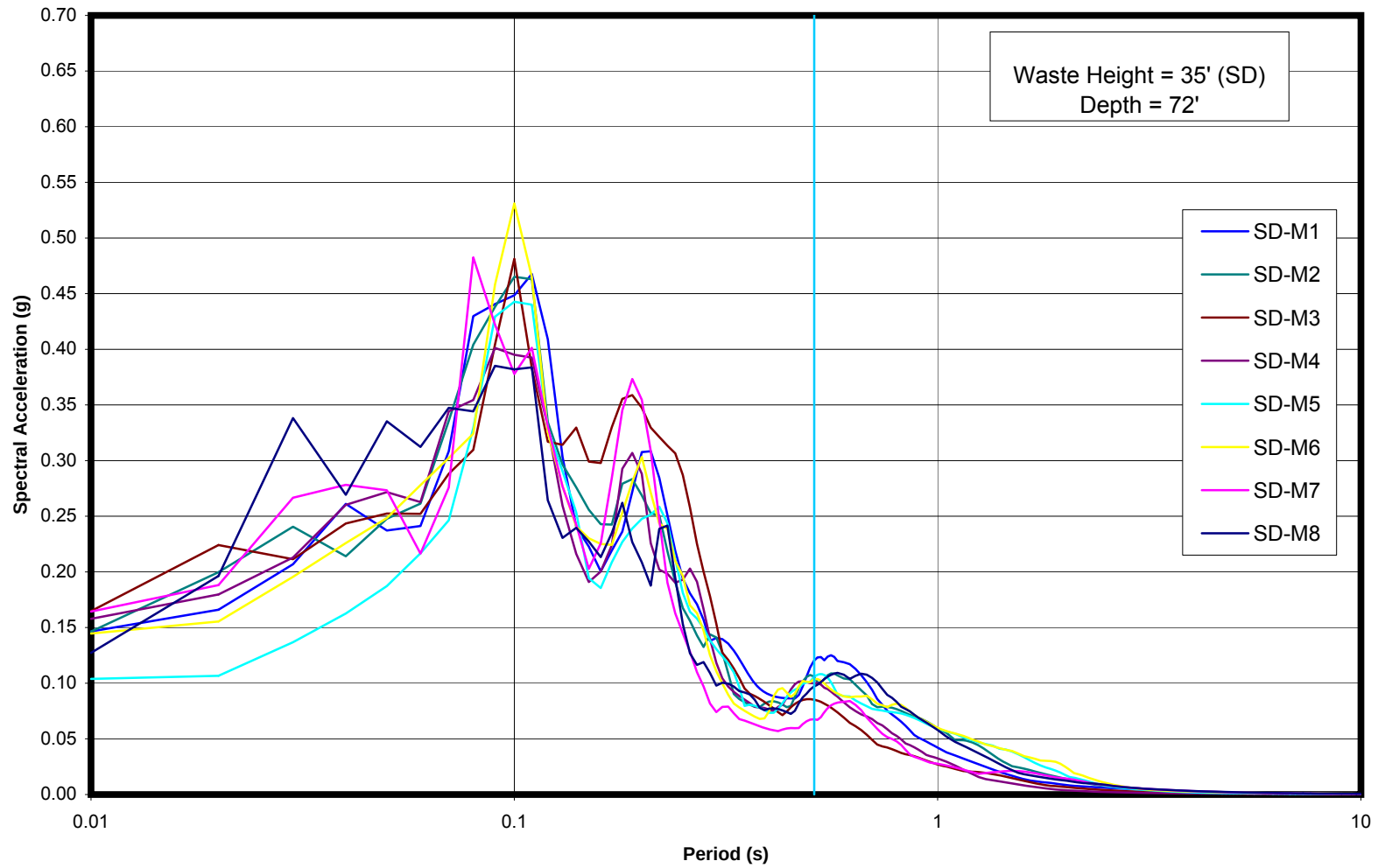


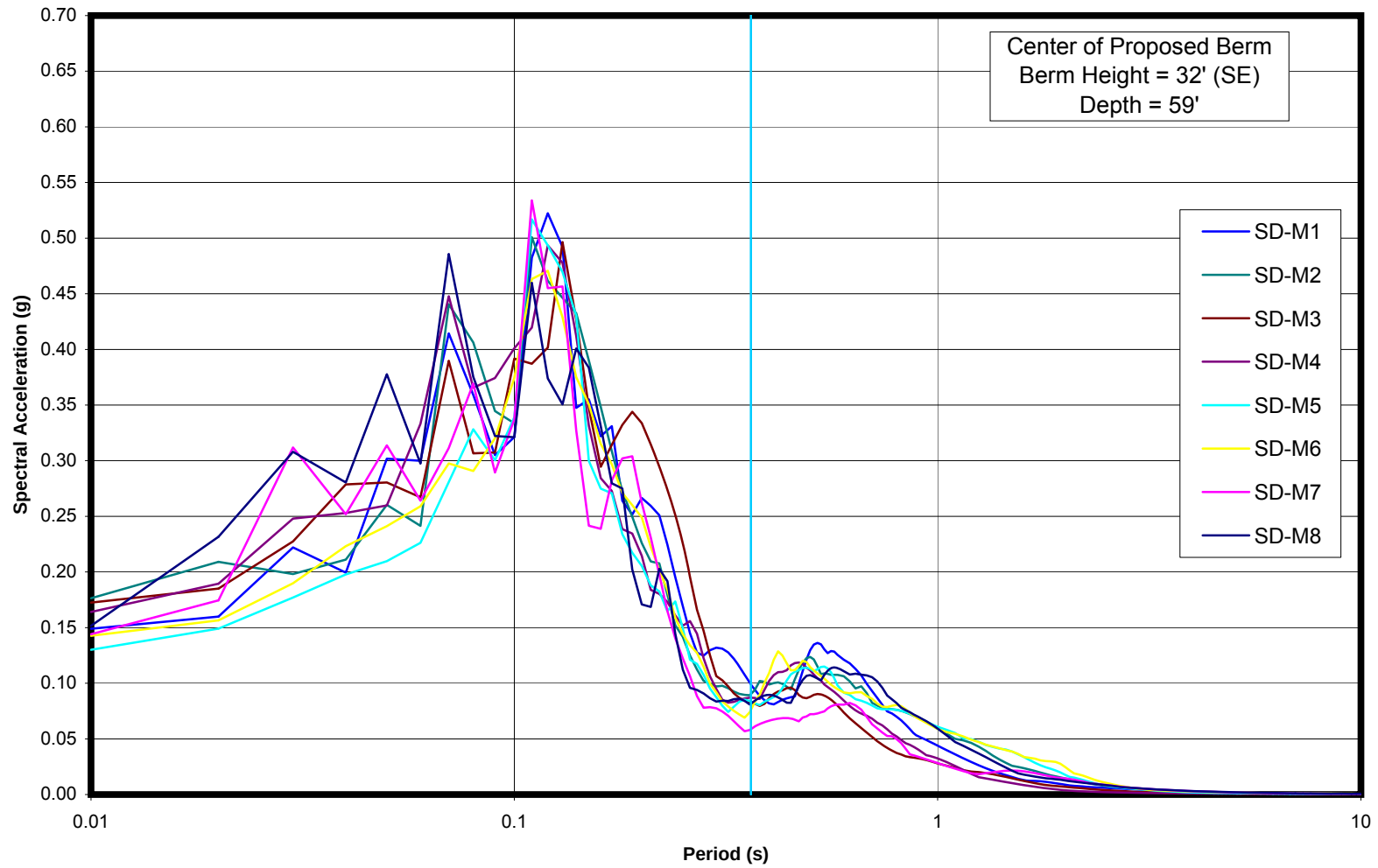












Simplified Procedure for Estimating Earthquake Induced Deviatoric Slope Displacements

by Jonathan D. Bray and Thaleia Travarasrou

Journal of Geotechnical and Geonvironmental Engineering, ASCE, V. 133(4), pp. 381-392, April 2007

SEE NOTES BELOW FOR GUIDANCE IN THE USE OF SPREADSHEET

Input Parameters

Yield Coefficient (ky)	0.208	Based on pseudostatic analysis
Initial Fundamental Period (Ts)	0.48 seconds	1D: Ts=4H/Vs 2D: Ts=2.6H/Vs
Degraded Period (1.5Ts)	0.72 seconds	
Moment Magnitude (Mw)	5.6	
Spectral Acceleration (Sa(1.5Ts))	0.075 g	

Additional Input Parameters

Probability of Exceedance #1 (P1)	15 %	
Probability of Exceedance #2 (P2)	5 %	
Probability of Exceedance #3 (P3)	1 %	
Displacement Threshold (d_threshold)	15.24 cm	6 in

Intermediate Calculated Parameters

Non-Zero Seismic Displacement Est (D)	0.01 cm	eq. (5) or (6)
Standard Deviation of Non-Zero Seismic D	0.66	

Results

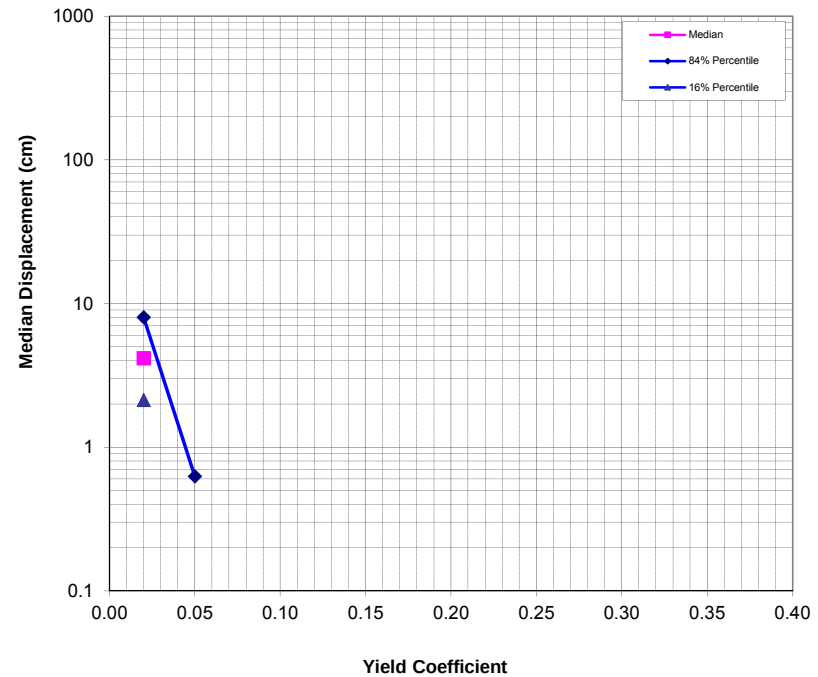
Probability of Negligible Displ. (P(D=0))	1.000	eq. (3)
D1	<1 cm	calc. using eq. (7)
D2	<1 cm	calc. using eq. (7)
D3	<1 cm	calc. using eq. (7)
P(D>d_threshold)	0.000	eq. (7)

Notes

- Values highlighted in blue are input parameters
- Probability of Exceedance is the desired probability of exceeding a particular displacement value.
- Displacements D1, D2, and D3 correspond to P1, P2, and P3, respectively.
(e.g., the probability of exceeding displacement D1 is P1)
- Calculated seismic displacements are due to deviatoric deformation only (add in volumetrically induced movement).
- ky may range between 0.01 and 0.5, Ts between 0 and 2 s, Sa between 0.002 and 2.7 g, M between 4.5 and 9
- Rigid slope is assumed for Ts < 0.05 s
- When a value for D is not calculated, D is < 1cm
- ky may be estimated using the simplified equations shown below.
- Examples of how Ts is estimated are shown below.
- Vs = weighted avg. shear wave velocity for the sliding mass, e.g., for 2 layers, Vs = [(h1)(Vs1) + (h2)(Vs2)]/(h1 + h2)

Dependence on ky

ky	P(D="0")	D (cm)	Dmedian (cm)	D1 (cm)	D3 (cm)
0.020	0.00	4.2	4.2	8.0	2.1
0.05	0.70	0.7	<1	0.6	<1
0.07	0.96	0.3	<1	<1	<1
0.1	1.00	0.1	<1	<1	<1
0.11	1.00	0.1	<1	<1	<1
0.12	1.00	0.1	<1	<1	<1
0.14	1.00	0.0	<1	<1	<1
0.4	1.00	0.0	<1	<1	<1



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Journal of Geotechnical and Geonvironmental Engineering, ASCE, V. 133(4), pp. 381-392, April 2007

SEE NOTES BELOW FOR GUIDANCE IN THE USE OF SPREADSHEET

Input Parameters

Yield Coefficient (ky)	0.09	Based on pseudostatic analysis	
Initial Fundamental Period (Ts)	0.39 seconds	1D: Ts=4H/Vs	2D: Ts=2.6H/Vs
Degraded Period (1.5Ts)	0.59 seconds		
Moment Magnitude (Mw)	5.6		
Spectral Acceleration (Sa(1.5Ts))	0.125 g		

Additional Input Parameters

Probability of Exceedance #1 (P1)	15 %	
Probability of Exceedance #2 (P2)	5 %	
Probability of Exceedance #3 (P3)	1 %	
Displacement Threshold (d_threshold)	15.24 cm	6 in

Intermediate Calculated Parameters

Non-Zero Seismic Displacement Est (D)	0.57 cm	eq. (5) or (6)
Standard Deviation of Non-Zero Seismic D	0.66	

Results

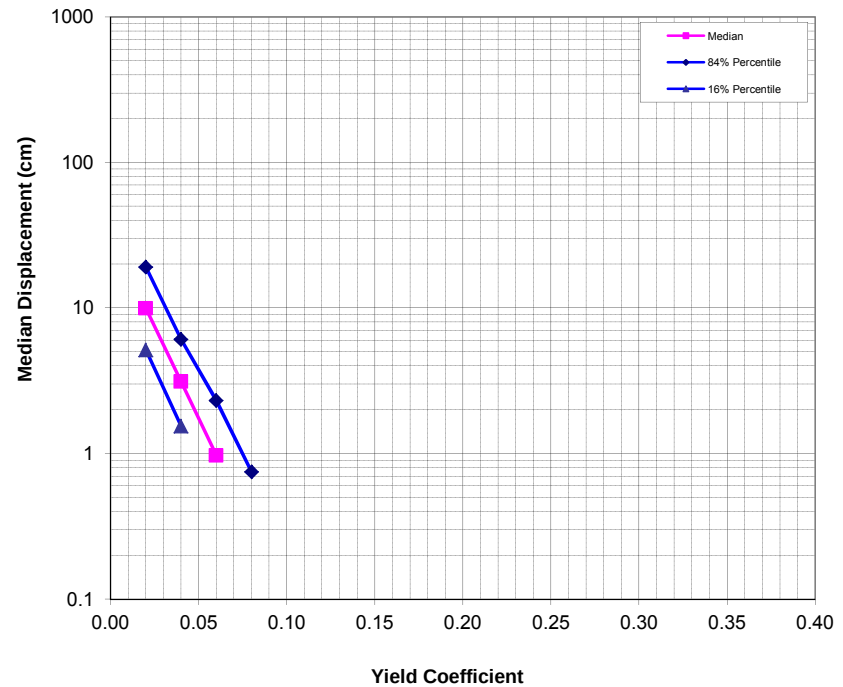
Probability of Negligible Displ. (P(D=0))	0.808	eq. (3)
D1	0.34 cm	calc. using eq. (7)
D2	0.87 cm	calc. using eq. (7)
D3	1.66 cm	calc. using eq. (7)
P(D>d_threshold)	0.000	eq. (7)

Notes

1. Values highlighted in blue are input parameters
2. Probability of Exceedance is the desired probability of exceeding a particular displacement value.
3. Displacements D1, D2, and D3 correspond to P1, P2, and P3, respectively.
(e.g., the probability of exceeding displacement D1 is P1)
4. Calculated seismic displacements are due to deviatoric deformation only (add in volumetrically induced movement).
5. ky may range between 0.01 and 0.5, Ts between 0 and 2 s, Sa between 0.002 and 2.7 g, M between 4.5 and 9
6. Rigid slope is assumed for Ts < 0.05 s
7. When a value for D is not calculated, D is < 1cm
8. ky may be estimated using the simplified equations shown below.
9. Examples of how Ts is estimated are shown below.
10. Vs = weighted avg. shear wave velocity for the sliding mass, e.g., for 2 layers, Vs = [(h1)(Vs1) + (h2)(Vs2)]/(h1 + h2)

Dependence on ky

ky	P(D="0")	D (cm)	Dmedian (cm)	D1 (cm)	D3 (cm)
0.020	0.00	10.0	10.0	19.2	5.2
0.04	0.03	3.2	3.1	6.1	1.5
0.06	0.30	1.4	1.0	2.3	<1
0.08	0.68	0.8	<1	0.8	<1
0.1	0.89	0.4	<1	<1	<1
0.12	0.97	0.3	<1	<1	<1
0.15	1.00	0.2	<1	<1	<1
0.2	1.00	0.1	<1	<1	<1



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SEE NOTES BELOW FOR GUIDANCE IN THE USE OF SPREADSHEET

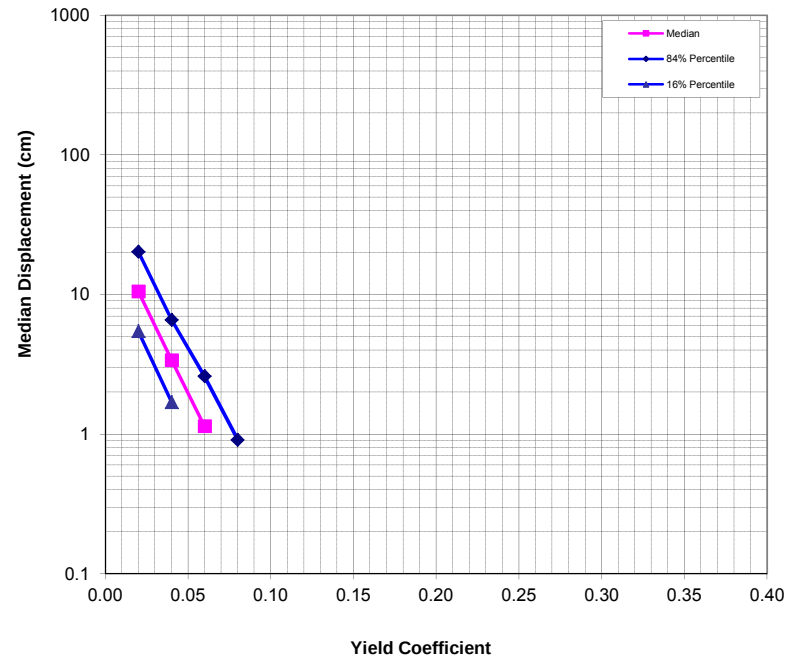
Input Parameters		
Yield Coefficient (ky)	0.09	Based on pseudostatic analysis
Initial Fundamental Period (Ts)	0.38 seconds	1D: Ts=4H/Vs 2D: Ts=2.6H/Vs
Degraded Period (1.5Ts)	0.57 seconds	
Moment Magnitude (Mw)	5.6	
Spectral Acceleration (Sa(1.5Ts))	0.13 g	
Additional Input Parameters		
Probability of Exceedance #1 (P1)	15 %	
Probability of Exceedance #2 (P2)	5 %	
Probability of Exceedance #3 (P3)	1 %	
Displacement Threshold (d_threshold)	15.24 cm	6 in
Intermediate Calculated Parameters		
Non-Zero Seismic Displacement Est (D)	0.62 cm	eq. (5) or (6)
Standard Deviation of Non-Zero Seismic D	0.66	
Results		
Probability of Negligible Displ. (P(D=0))	0.772	eq. (3)
D1	0.48 cm	calc. using eq. (7)
D2	1.04 cm	calc. using eq. (7)
D3	1.92 cm	calc. using eq. (7)
P(D>d_threshold)	0.000	eq. (7)

Notes

- Values highlighted in blue are input parameters
- Probability of Exceedance is the desired probability of exceeding a particular displacement value.
- Displacements D1, D2, and D3 correspond to P1, P2, and P3, respectively.
(e.g., the probability of exceeding displacement D1 is P1)
- Calculated seismic displacements are due to deviatoric deformation only (add in volumetrically induced movement).
- ky may range between 0.01 and 0.5, Ts between 0 and 2 s, Sa between 0.002 and 2.7 g, M between 4.5 and 9
- Rigid slope is assumed for Ts < 0.05 s
- When a value for D is not calculated, D is < 1cm
- ky may be estimated using the simplified equations shown below.
- Examples of how Ts is estimated are shown below.
- Vs = weighted avg. shear wave velocity for the sliding mass, e.g., for 2 layers, Vs = [(h1)(Vs1) + (h2)(Vs2)]/(h1 + h2)

Dependence on ky

ky	P(D="0")	D (cm)	Dmedian (cm)	D1 (cm)	D3 (cm)
0.020	0.00	10.5	10.5	20.3	5.5
0.04	0.02	3.5	3.4	6.6	1.7
0.06	0.26	1.5	1.1	2.6	<1
0.08	0.63	0.8	<1	0.9	<1
0.1	0.87	0.5	<1	<1	<1
0.12	0.96	0.3	<1	<1	<1
0.14	0.99	0.2	<1	<1	<1
0.16	1.00	0.1	<1	<1	<1



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SEE NOTES BELOW FOR GUIDANCE IN THE USE OF SPREADSHEET

Input Parameters

Yield Coefficient (ky)	0.09	Based on pseudostatic analysis
Initial Fundamental Period (Ts)	0.34 seconds	1D: Ts=4H/Vs 2D: Ts=2.6H/Vs
Degraded Period (1.5Ts)	0.51 seconds	
Moment Magnitude (Mw)	5.6	
Spectral Acceleration (Sa(1.5Ts))	0.125 g	

Additional Input Parameters

Probability of Exceedance #1 (P1)	15 %	
Probability of Exceedance #2 (P2)	5 %	
Probability of Exceedance #3 (P3)	1 %	
Displacement Threshold (d_threshold)	15.24 cm	6 in

Intermediate Calculated Parameters

Non-Zero Seismic Displacement Est (D)	0.53 cm	eq. (5) or (6)
Standard Deviation of Non-Zero Seismic D	0.66	

Results

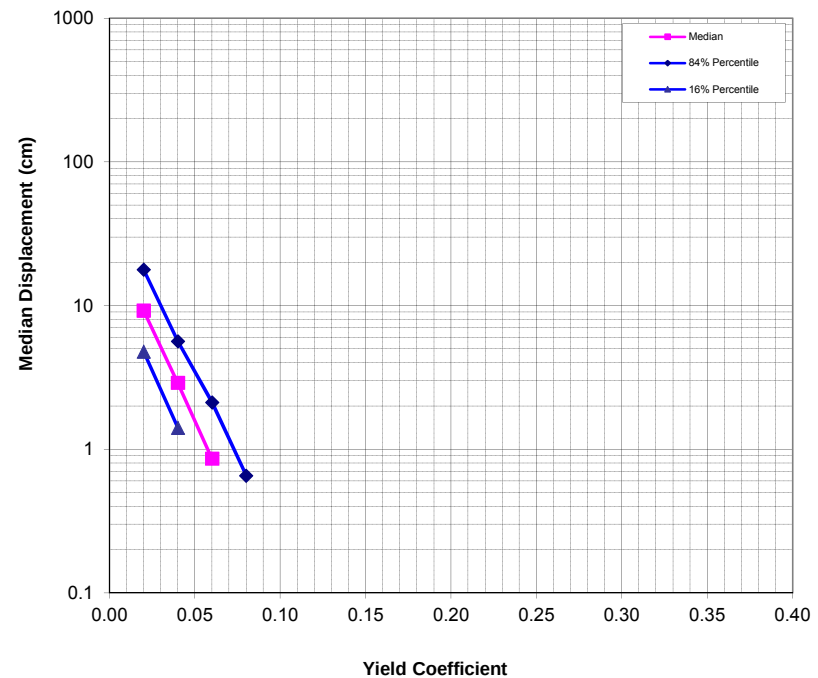
Probability of Negligible Displ. (P(D=0))	0.824	eq. (3)
D1	0.27 cm	calc. using eq. (7)
D2	0.77 cm	calc. using eq. (7)
D3	1.50 cm	calc. using eq. (7)
P(D>d_threshold)	0.000	eq. (7)

Notes

- Values highlighted in blue are input parameters
- Probability of Exceedance is the desired probability of exceeding a particular displacement value.
- Displacements D1, D2, and D3 correspond to P1, P2, and P3, respectively.
(e.g., the probability of exceeding displacement D1 is P1)
- Calculated seismic displacements are due to deviatoric deformation only (add in volumetrically induced movement).
- ky may range between 0.01 and 0.5, Ts between 0 and 2 s, Sa between 0.002 and 2.7 g, M between 4.5 and 9
- Rigid slope is assumed for Ts < 0.05 s
- When a value for D is not calculated, D is < 1cm
- ky may be estimated using the simplified equations shown below.
- Examples of how Ts is estimated are shown below.
- Vs = weighted avg. shear wave velocity for the sliding mass, e.g., for 2 layers, Vs = [(h1)(Vs1) + (h2)(Vs2)]/(h1 + h2)

Dependence on ky

ky	P(D="0")	D (cm)	Dmedian (cm)	D1 (cm)	D3 (cm)
0.020	0.00	9.2	9.2	17.8	4.8
0.04	0.03	3.0	2.9	5.7	1.4
0.06	0.33	1.3	0.9	2.1	<1
0.08	0.70	0.7	<1	0.7	<1
0.1	0.90	0.4	<1	<1	<1
0.12	0.97	0.3	<1	<1	<1
0.14	0.99	0.2	<1	<1	<1
0.16	1.00	0.1	<1	<1	<1



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Input Parameters

Yield Coefficient (ky)	0.09	Based on pseudostatic analysis	
Initial Fundamental Period (Ts)	0.24 seconds	1D: Ts=4H/Vs	2D: Ts=2.6H/Vs
Degraded Period (1.5Ts)	0.36 seconds		
Moment Magnitude (Mw)	5.6		
Spectral Acceleration (Sa(1.5Ts))	0.16 g		

Additional Input Parameters

Probability of Exceedance #1 (P1)	15 %
Probability of Exceedance #2 (P2)	5 %
Probability of Exceedance #3 (P3)	1 %
Displacement Threshold (d_threshold)	15.24 cm

Intermediate Calculated Parameters

Non-Zero Seismic Displacement Est (D)	0.87 cm	eq. (5) or (6)
Standard Deviation of Non-Zero Seismic D	0.66	

Results

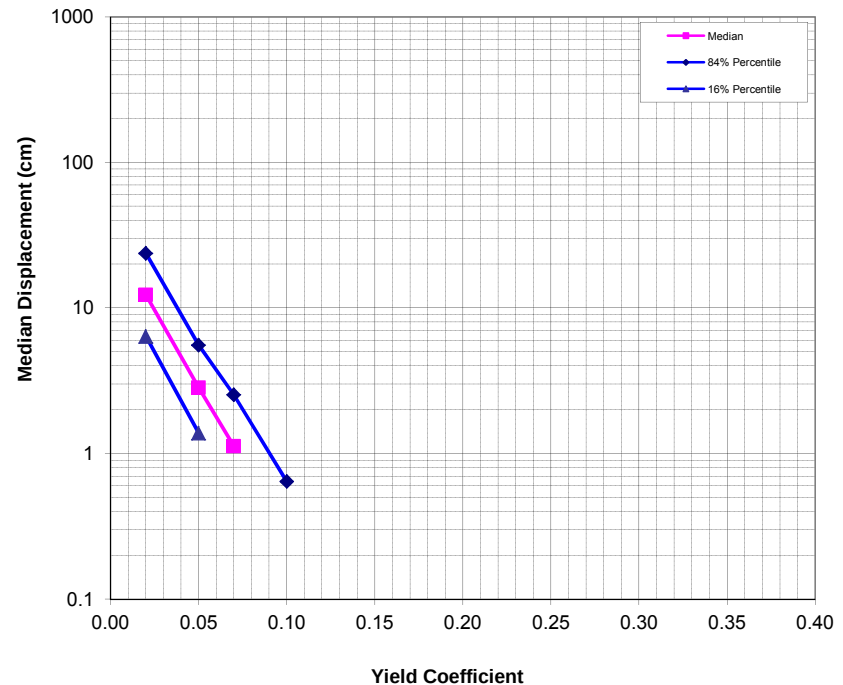
Probability of Negligible Displ. (P(D=0))	0.570	eq. (3)
D1	1.12 cm	calc. using eq. (7)
D2	1.91 cm	calc. using eq. (7)
D3	3.24 cm	calc. using eq. (7)
P(D>d_threshold)	0.000	eq. (7)

Notes

1. Values highlighted in blue are input parameters
2. Probability of Exceedance is the desired probability of exceeding a particular displacement value.
3. Displacements D1, D2, and D3 correspond to P1, P2, and P3, respectively.
(e.g., the probability of exceeding displacement D1 is P1)
4. Calculated seismic displacements are due to deviatoric deformation only (add in volumetrically induced movement).
5. ky may range between 0.01 and 0.5, Ts between 0 and 2 s, Sa between 0.002 and 2.7 g, M between 4.5 and 9
6. Rigid slope is assumed for Ts < 0.05 s
7. When a value for D is not calculated, D is < 1cm
8. ky may be estimated using the simplified equations shown below.
9. Examples of how Ts is estimated are shown below.
10. Vs = weighted avg. shear wave velocity for the sliding mass, e.g., for 2 layers, Vs = [(h1)(Vs1) + (h2)(Vs2)]/(h1 + h2)

Dependence on ky

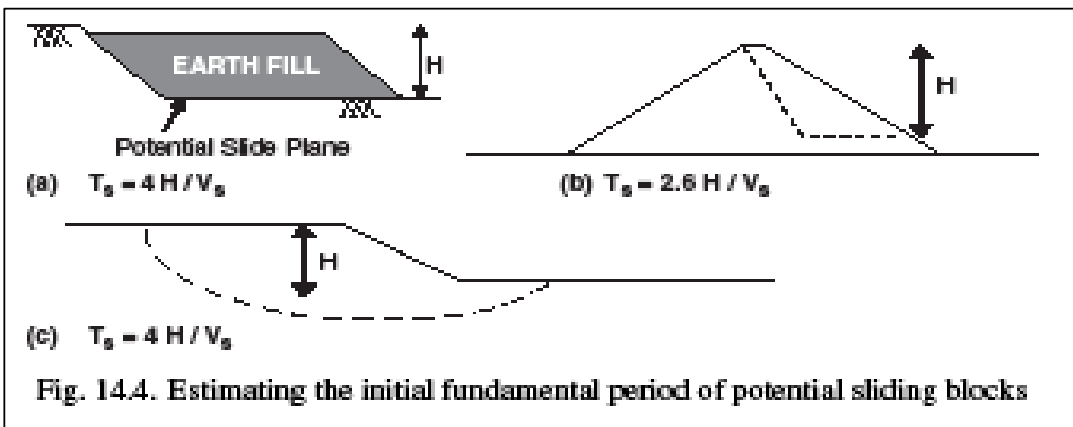
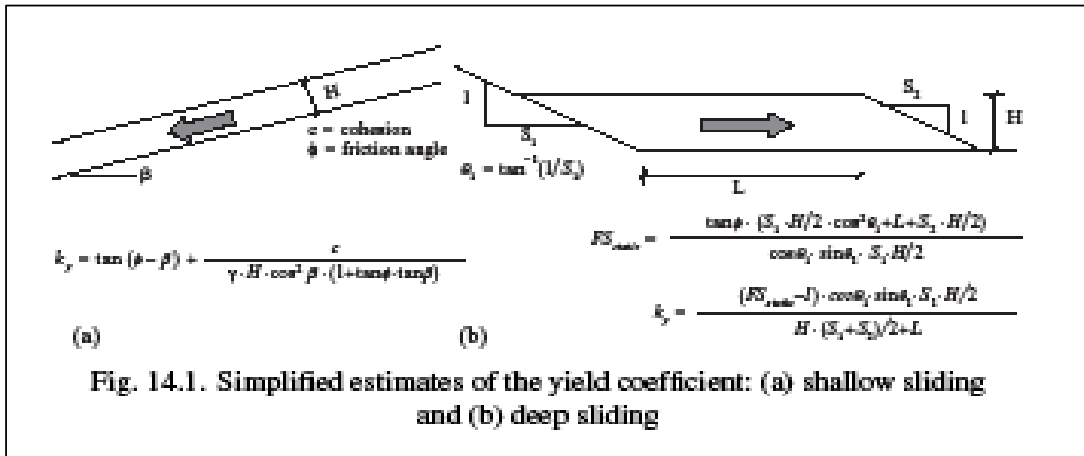
ky	P(D="0")	D (cm)	Dmedian (cm)	D1 (cm)	D3 (cm)
0.020	0.00	12.3	12.3	23.8	6.4
0.05	0.04	2.9	2.8	5.6	1.4
0.07	0.25	1.5	1.1	2.5	<1
0.1	0.70	0.7	<1	0.6	<1
0.15	0.97	0.3	<1	<1	<1
0.2	1.00	0.1	<1	<1	<1
0.3	1.00	0.0	<1	<1	<1
0.4	1.00	0.0	<1	<1	<1



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Figures from Bray, J.D. (2007) "Chapter 14: Simplified Seismic Slope Displacement Procedures," Earthquake Geotechnical Engineering, 4th Inter. Conf. on Earthquake Geotechnical Engineering - Invited Lectures, in Geotechnical, Geological, and Earthquake Engineering Series, Vol. 6, Pitolakis, Kyriazis D., Ed., Springer, Vol. 6, pp. 327-353.

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Bray&Travararou2007-Seismic Displ Est_modelcitySC.xls

ATTACHEMENT 1

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Figure 3 - Stability Analysis of Long Term Drained Conditions – Subgrade Failures

Final Configuration Drain

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File Information

Title: [Model City - RMU-2 Sta 1350](#)
 Created By: [Peter J. Carey](#)
 Revision Number: [366](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/19/2013](#)
 Time: [9:32:07 PM](#)
 File Name: [RMU2X1350.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/19/2013](#)
 Last Solved Time: [9:53:36 PM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Final Configuration Drain

Description: [WITH GRIDS in Berm](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

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: **Yes**
 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: **0.01**
 Minimum Slip Surface Depth: **15 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

Waste Material

Model: **Mohr-Coulomb**
 Unit Weight: **111 pcf**
 Cohesion': **0 psf**
 Phi': **30 °**
 Phi-B: **0 °**

Bottom Liner

Model: **Shear/Normal Fn.**
 Unit Weight: **120 pcf**
 Strength Function: **Baseliner**
 Phi-B: **0 °**

CCL

Model: **Mohr-Coulomb**
 Unit Weight: **120 pcf**
 Cohesion': **1,000 psf**
 Phi': **10 °**
 Phi-B: **0 °**

Upper Till

Model: **Mohr-Coulomb**
 Unit Weight: **125 pcf**
 Cohesion': **150 psf**
 Phi': **31 °**
 Phi-B: **0 °**

GC-Drained

Model: **Shear/Normal Fn.**
 Unit Weight: **118 pcf**
 Strength Function: **normalized N^m**
 Phi-B: **0 °**
 Anisotropic Strength Fn: **clay ellipse staticshear**
 Pore Water Pressure
 Piezometric Line: **1**

GC OverConsolidated

Model: **Shear/Normal Fn.**
 Unit Weight: **125 pcf**

Strength Function: [GC-hyper](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

side slope liner

Model: [Mohr-Coulomb](#)
 Unit Weight: [115 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [13 °](#)
 Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

STRUCTURAL FILL

Model: [Mohr-Coulomb](#)
 Unit Weight: [130 pcf](#)
 Cohesion': [195 psf](#)
 Phi': [28.7 °](#)
 Phi-B: [0 °](#)

final cover

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
 Left-Zone Left Coordinate: [\(605.8643, 435.59451\) ft](#)
 Left-Zone Right Coordinate: [\(781, 404.7847\) ft](#)
 Left-Zone Increment: [10](#)
 Right Projection: [Range](#)
 Right-Zone Left Coordinate: [\(1,027.4437, 320\) ft](#)
 Right-Zone Right Coordinate: [\(1,110, 318.98701\) ft](#)
 Right-Zone Increment: [10](#)
 Radius Increments: [4](#)

Slip Surface Limits

Left Coordinate: [\(567.80061, 436.48593\) ft](#)
 Right Coordinate: [\(1,178.0754, 315.45063\) ft](#)

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	200	314.5
Coordinate 2	1,202	313

Maximum Suction: 0 psf

Reinforcements

Reinforcement 1

Type: [Geosynthetic](#)
 Outside Point: (1,024.4865, 320) ft
 Inside Point: (929, 320) ft
 Slip Surface Intersection: () ft
 Total Length: 95.4865 ft
 Reinforcement Direction: 0 °
 F of S Dependent: [Yes](#)
 Interface Adhesion: 0 psf
 Interface Shear Angle: 35 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: [Concentrated](#)
 Tensile Capacity: 5,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 5,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 2

Type: [Geosynthetic](#)
 Outside Point: (1,022.5, 322.5) ft
 Inside Point: (929, 323) ft
 Slip Surface Intersection: () ft
 Total Length: 93.501337 ft
 Reinforcement Direction: 359.69 °
 F of S Dependent: [Yes](#)
 Interface Adhesion: 0 psf
 Interface Shear Angle: 35 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: [Concentrated](#)
 Tensile Capacity: 5,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 5,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 3

Type: [Geosynthetic](#)
 Outside Point: (1,022, 325.5) ft
 Inside Point: (929, 326) ft
 Slip Surface Intersection: () ft
 Total Length: [93.001344](#) ft
 Reinforcement Direction: [359.69](#) °
 F of S Dependent: [Yes](#)
 Interface Adhesion: [0](#) psf
 Interface Shear Angle: [35](#) °
 Surface Area Factor: [1](#)
 Resistance Reduction Factor: [1](#)
 Force Distribution: [Concentrated](#)
 Tensile Capacity: [5,000](#) lbs
 Reduction Factor: [1](#)
 Force Orientation: [0](#)
 Max. Pullout Force: [5,000](#) lbs
 Pullout Force: [0](#) lbs
 Pullout Force per Length: [0](#) lbs/ft
 Available Length: [0](#) ft
 Required Length: [0](#) ft
 Governing Component: (none)

Reinforcement 4

Type: [Geosynthetic](#)
 Outside Point: (1,020.5, 331) ft
 Inside Point: (950.4865, 331) ft
 Slip Surface Intersection: () ft
 Total Length: [70.0135](#) ft
 Reinforcement Direction: [0](#) °
 F of S Dependent: [Yes](#)
 Interface Adhesion: [0](#) psf
 Interface Shear Angle: [35](#) °
 Surface Area Factor: [1](#)
 Resistance Reduction Factor: [1](#)
 Force Distribution: [Concentrated](#)
 Tensile Capacity: [5,000](#) lbs
 Reduction Factor: [1](#)
 Force Orientation: [0](#)
 Max. Pullout Force: [5,000](#) lbs
 Pullout Force: [0](#) lbs
 Pullout Force per Length: [0](#) lbs/ft
 Available Length: [0](#) ft
 Required Length: [0](#) ft
 Governing Component: (none)

Reinforcement 5

Type: [Geosynthetic](#)
 Outside Point: (1,020, 337) ft
 Inside Point: (960.4865, 337) ft
 Slip Surface Intersection: () ft
 Total Length: [59.5135](#) ft
 Reinforcement Direction: [0](#) °
 F of S Dependent: [Yes](#)
 Interface Adhesion: [0](#) psf
 Interface Shear Angle: [35](#) °
 Surface Area Factor: [1](#)
 Resistance Reduction Factor: [1](#)
 Force Distribution: [Concentrated](#)
 Tensile Capacity: [5,000](#) lbs
 Reduction Factor: [1](#)
 Force Orientation: [0](#)
 Max. Pullout Force: [5,000](#) lbs

Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 6

Type: Geosynthetic
 Outside Point: (1,017.4865, 342) ft
 Inside Point: (967, 342) ft
 Slip Surface Intersection: () ft
 Total Length: 50.4865 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 35 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 5,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 5,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 7

Type: Geosynthetic
 Outside Point: (1,016, 348) ft
 Inside Point: (997, 347.5) ft
 Slip Surface Intersection: () ft
 Total Length: 19.006578 ft
 Reinforcement Direction: 1.5074 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 35 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 5,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 5,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 8

Type: Geosynthetic
 Outside Point: (1,022, 328) ft
 Inside Point: (950.4865, 328) ft
 Slip Surface Intersection: () ft
 Total Length: 71.5135 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 35 °
 Surface Area Factor: 1

Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 5,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 5,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 9

Type: Geosynthetic
 Outside Point: (1,019.5, 334) ft
 Inside Point: (960.4865, 334) ft
 Slip Surface Intersection: () ft
 Total Length: 59.0135 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 35 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 5,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 5,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 10

Type: Geosynthetic
 Outside Point: (1,016.5676, 345) ft
 Inside Point: (984.5, 344.5) ft
 Slip Surface Intersection: () ft
 Total Length: 32.071498 ft
 Reinforcement Direction: 0.89329 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 35 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 5,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 5,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Anisotropic Strength Functions

clay ellipse staticshear

Model: [Spline Data Point Function](#)

Function: [Modifier Factor vs. Inclination](#)

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: [Inclination \(°\)](#), [Modifier Factor](#)

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

GC-hyper

Model: [Shear/Normal Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (200, 155.07701)

Data Point: (1,200, 715.00724)

Data Point: (2,200, 1,199.0999)

Data Point: (3,200, 1,650.6757)

Data Point: (4,200, 2,081.6153)

Data Point: (5,200, 2,497.5816)

Data Point: (6,200, 2,901.8766)

Data Point: (7,200, 3,296.6546)

Data Point: (8,200, 3,683.4269)

Data Point: (9,200, 4,063.309)
 Data Point: (10,200, 4,437.1568)
 Data Point: (11,200, 4,805.6463)
 Data Point: (12,200, 5,169.3242)
 Data Point: (13,200, 5,528.6411)
 Data Point: (14,200, 5,883.9746)
 Data Point: (15,200, 6,235.6455)

Estimation Properties

Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600,000 psf
 SigmaC: 300,000 psf
 Num. Points: 20

normalized N^m

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: Mesri1

Field

tan_Phi_100kPa: .548982

power: .147

pa: 2089

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	350.5	318.75
Point 2	362.75	324.75
Point 3	367.75	324.75
Point 4	386.25	315.5
Point 5	386.75	309.25
Point 6	386.75	307.75
Point 7	369.25	309.75
Point 8	352.75	312.75
Point 9	338	312.5
Point 10	200	309
Point 11	200	315
Point 12	386.75	287.25
Point 13	200	286.5
Point 14	200	271.75
Point 15	200	269.75
Point 16	470	274.5
Point 17	469.75	268.5
Point 18	493.25	268.5
Point 19	524	266.5
Point 20	602	275.25
Point 21	602.5	267
Point 22	851	276.5
Point 23	851.5	268.5
Point 24	1,200	269.75

Point 25	1,200	276
Point 26	1,195	269.75
Point 27	1,195	276
Point 28	1,200	259.75
Point 29	1,195	259.75
Point 30	1,195	284.25
Point 31	1,200	284.25
Point 32	1,195	301.5
Point 33	1,200	301.5
Point 34	1,200	315.5
Point 35	1,195	315.5
Point 36	1,186.75	315
Point 37	1,102.5	319.25
Point 38	1,109.75	319
Point 39	1,085.25	319.5
Point 40	1,066	319.75
Point 41	1,036.75	320
Point 42	1,023.75	320
Point 43	1,023.75	319.25
Point 44	897.25	319.5
Point 45	991.25	345.25
Point 46	1,000	349.5
Point 47	1,016.25	350
Point 48	997.75	348.5
Point 49	992.5	347
Point 50	978.5	349.75
Point 51	985.75	350
Point 52	972.5	344.75
Point 53	971.5	349.5
Point 54	910.4	372.6
Point 55	910.6	375.1
Point 56	895.4	371.1
Point 57	895.7	373.6
Point 58	806.4	402.8
Point 59	806.2	400.3
Point 60	791.2	398.8
Point 61	791.4	401.3
Point 62	694.8	431
Point 63	695.3	433.5
Point 64	687.8	431.4
Point 65	438.6	436.6
Point 66	439.1	439.5
Point 67	200	436
Point 68	200	433.5
Point 69	467	350
Point 70	844.5	307.25

Point 71	842.25	301.25
Point 72	812.5	305.5
Point 73	812.25	301.75
Point 74	732	309.25
Point 75	732	307.25
Point 76	732	303.25
Point 77	670.5	304.25
Point 78	670.5	310.25
Point 79	670.5	308
Point 80	606.5	303.5
Point 81	606.5	305.5
Point 82	606.5	311.5
Point 83	606.5	309.5
Point 84	520.75	307
Point 85	520.75	313
Point 86	520.75	311
Point 87	520.75	305.5
Point 88	463.5	306.75
Point 89	413.5	306.25
Point 90	405.5	307.75
Point 91	411.25	309
Point 92	411	315
Point 93	411	312.75
Point 94	386.25	313.75
Point 95	350.5	316.75
Point 96	200	313
Point 97	542.25	375
Point 98	883	375
Point 99	616.25	399.75
Point 100	200	350
Point 101	200	375
Point 102	200	400
Point 103	200	259
Point 104	363	269
Point 105	373	274
Point 106	415	269
Point 107	415	258
Point 108	560	275
Point 109	563	258
Point 110	751	276
Point 111	751	268
Point 112	854.5	305.25
Point 113	872.5	287.25
Point 114	981.25	300.5
Point 115	1,081.25	276
Point 116	1,080.75	285.5

Point 117	1,080	300.75
Point 118	1,081.25	269.75
Point 119	1,081.25	259
Point 120	812.25	308
Point 121	362.75	323.25
Point 122	367.75	323.25
Point 123	844.5	304.75
Point 124	851.75	304.5
Point 125	990	345.25
Point 126	987	348.5
Point 127	637	303.8574
Point 128	637	304.9043
Point 129	379	319.25
Point 130	200	308
Point 131	261.25	308
Point 132	343.5	307.75
Point 133	387	305
Point 134	344	305
Point 135	261	305
Point 136	200	305
Point 137	413	303
Point 138	464	304
Point 139	521	302
Point 140	607	300
Point 141	637	301
Point 142	670	301
Point 143	732	300
Point 144	854	301
Point 145	981	297
Point 146	1,080	298
Point 147	1,195	298
Point 148	1,200	298

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	99,62,60	2,770.9
Region 2	Waste Material	97,99,60,59,98	6,502.4
Region 3	Waste Material	69,97,98,56,54,50,53	10,963
Region 4	Waste Material	129,69,53,70,120,74,78,82,85,92,4	19,218
Region 5	Bottom Liner	2,121,122,94,93,86,83,79,75,72,123,124,112,70,120,74,78,82,85,92,4,129,3	1,036.1
Region	side slope liner	112,44,52,125,126,51,50,53,70	718.34

6			
Region 7	STRUCTURAL FILL	44,52,125,126,51,49,48,46,47,42,43	2,311
Region 8	Upper Till	112,44,43,42,41,40,39,37,38,36,35,32,117,114	5,551.3
Region 9	NOT ACTIVE	15,104,106,17,18,19,21,111,23,118,26,29,119,109,107,103	10,051
Region 10	NOT ACTIVE	15,14,105,16,108,20,110,22,115,27,26,118,23,111,21,19,18,17,106,104	6,503.2
Region 11	Deflection surface	14,13,12,113,116,30,27,115,22,110,20,108,16,105	11,503
Region 12	GC-Drained	13,136,135,134,133,137,138,139,140,141,142,143,73,71,144,145,146,147,30,116,113,12	14,287
Region 13	Upper Till	10,9,8,7,5,91,84,81,128,127,80,87,88,89,90,6,132,131	937.18
Region 14	CCL	95,121,122,94,93,86,83,79,75,72,123,124,71,73,76,77,127,128,81,84,91,5,7,8,9	2,164.5
Region 15	Upper Till	10,96,95,9	572.38
Region 16		96,11,1,2,121,95	322.44
Region 17	Waste Material	100,69,129,3,2,1,11	7,125.6
Region 18	Waste Material	100,101,97,69	7,615.6
Region 19	Waste Material	101,102,99,97	9,438.5
Region 20	Waste Material	102,68,65,64,62,99	15,898
Region 21	final cover	68,67,66,63,62,64,65	1,307.1
Region 22	final cover	62,60,59,98,56,54,50,51,55,57,58,61,63	751.41
Region 23		35,34,33,32	70
Region 24		148,31,30,147	68.75
Region 25		30,31,25,27	41.25
Region 26		27,25,24,26	31.25
Region 27		26,24,28,29	50
Region 28	GC OverConsolidated	136,130,10,131,132,6,90,89,88,87,80,127,77,76,73,143,142,141,140,139,138,137,133,134,135	1,821.9
Region 29	GC OverConsolidated	71,124,112,114,117,32,147,146,145,144	1,187.5
Region 30		32,33,148,147	17.5

Current Slip Surface

Slip Surface: 606
 F of S: 1.62
 Volume: 25,879.183 ft³
 Weight: 3,005,989.5 lbs
 Resisting Moment: 3.6758667e+008 lbs-ft
 Activating Moment: 2.2733253e+008 lbs-ft
 Resisting Force: 971,514.21 lbs
 Activating Force: 601,298.66 lbs
 F of S Rank: 1
 Exit: (1,092.138, 319.40017) ft
 Entry: (672.85985, 434.02553) ft
 Radius: 213.16805 ft
 Center: (948.02253, 623.02642) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	673.76928	432.84966	0	98.521545	56.88144	0
Slice 2	677.24518	428.35545	0	440.39086	254.25978	0
Slice 3	683.80582	419.87276	0	1,051.7062	607.20283	0
Slice 4	691.3	410.18305	0	1,731.9319	999.93136	0
Slice 5	695.05	405.33443	0	2,066.5023	1,193.0957	0
Slice 6	697.6087	402.02612	0	2,237.6617	1,291.9146	0
Slice 7	704.9884	393.30169	0	2,773.3765	1,601.2097	0
Slice 8	716.55262	381.28116	0	3,491.0646	2,015.5671	0
Slice 9	732.58657	365.77087	0	4,182.8694	2,414.9808	0
Slice 10	746.17307	353.13052	0	4,939.5506	2,851.8509	0
Slice 11	757.38832	343.67433	0	5,333.7988	3,079.4702	0
Slice 12	773.11885	330.68754	0	5,944.2732	3,431.9277	0
Slice 13	786.53995	320.00439	0	6,493.9352	3,749.2752	0
Slice 14	793.12352	314.93629	0	6,764.2317	3,905.331	0
Slice 15	798.38602	310.88517	0	7,118.6423	4,109.9501	0
Slice 16	803.55615	306.90515	0	7,839.5525	2,228.3662	732.33248
Slice 17	805.69365	305.53783	0	9,977.8867	1,759.3706	1,000
Slice 18	806.3	305.40415	0	10,001.801	1,763.5873	1,000
Slice 19	809.45	304.70966	0	9,986.0808	1,760.8155	1,000
Slice 20	818.36945	302.74316	0	9,929.9907	1,750.9253	1,000
Slice 21	833.24445	300.28125	828.09663	10,168.746	2,584.1233	445.33501
Slice 22	843.04545	299.01024	906.4918	10,017.903	2,529.9308	435.99237
Slice 23	844.17045	298.86914	915.19168	10,065.557	2,506.219	431.90384
Slice 24	848.125	298.41374	943.23919	10,006.001	2,485.7366	428.3753
Slice 25	852.875	297.86674	976.92841	9,933.8744	2,460.9593	424.10445
Slice 26	854.25	297.7084	986.68055	9,912.5311	2,453.6714	422.84655
Slice 27	858.90405	297.17244	1,019.6892	9,853.1155	2,431.9825	419.10915
Slice 28	868.03455	296.12099	1,084.447	9,736.4412	2,389.3076	411.75684
Slice 29	875.98035	295.25575	1,137.6957	9,694.3116	2,339.2056	403.12184
Slice 30	881.09985	294.74537	1,169.0653	9,617.0137	2,313.8404	398.75166
Slice 31	889.35	293.92288	1,219.6179	9,487.4236	2,271.6883	391.48576
Slice 32	896.475	293.21256	1,263.2761	9,411.5288	2,243.638	386.65225
Slice 33	903.925	292.46985	1,308.9258	9,658.5043	2,290.8375	394.78844

Slice 34	916.7628	291.19	1,387.5891	9,785.9046	2,302.2396	396.75239
Slice 35	929.0884	289.96121	1,463.1139	9,590.2296	2,238.6717	385.7973
Slice 36	943.7164	288.68893	1,541.1379	9,413.6599	2,152.8711	371.01298
Slice 37	961.8408	287.4362	1,617.615	9,087.0927	2,049.2066	353.14749
Slice 38	972	286.81057	1,655.7052	8,851.3766	1,984.9587	342.07287
Slice 39	975.5	286.59503	1,668.8279	8,750.9102	1,958.1984	337.46259
Slice 40	978.97992	286.38073	1,681.8753	8,645.8474	1,930.308	332.65516
Slice 41	980.22992	286.34471	1,684.0066	8,778.1493	1,959.2683	337.64774
Slice 42	981.125	286.33718	1,684.3923	8,739.1647	1,949.9898	336.04847
Slice 43	983.5	286.31723	1,685.4158	8,634.9287	1,925.146	331.76571
Slice 44	986.375	286.29307	1,686.6548	8,510.0458	1,895.3024	326.62418
Slice 45	988.5608	286.2747	1,687.5968	8,415.12	1,872.5656	322.70461
Slice 46	991.3108	286.25159	1,688.7819	8,273.8594	1,838.6914	316.86766
Slice 47	995.125	286.21954	1,690.4257	8,298.8593	1,844.2533	317.82557
Slice 48	998.875	286.18803	1,692.0418	8,460.9195	1,882.3797	324.39612
Slice 49	1,008.125	286.11029	1,696.0281	8,542.4721	1,900.764	327.56441
Slice 50	1,016.5013	286.03991	1,699.6379	8,421.7487	1,871.2797	322.48389
Slice 51	1,019.4431	286.01518	1,700.9057	6,847.2186	1,489.9879	256.77407
Slice 52	1,022.9418	286.27608	1,684.2993	5,654.2236	1,437.3105	247.69625
Slice 53	1,030.25	288.83974	1,523.6438	4,726.0662	1,196.6377	206.22013
Slice 54	1,046.206	294.43703	1,172.8822	3,817.9893	1,016.5611	175.18707
Slice 55	1,059.5333	299.11218	879.90816	3,066.7951	878.64812	134.92898
Slice 56	1,063.5858	300.58955	787.34168	3,230.1701	1,103.089	185.0982
Slice 57	1,064.8835	301.4445	0	3,561.894	2,140.2018	150
Slice 58	1,074.3472	307.67934	0	2,266.8973	1,362.0893	150
Slice 59	1,083.9722	314.02044	0	1,034.3132	621.47806	150
Slice 60	1,088.694	317.13123	0	476.32407	286.20437	150

Figure 4 - Stability Analysis of Long Term Drained Conditions – Subgrade Failures

Long Term -Static Drained

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File Information

Title: [Model City - RMU-2 XS 2600](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [370](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/13/2013](#)
 Time: [4:52:57 PM](#)
 File Name: [RMU2X2600r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revisions\geoslope\final config\](#)
 Last Solved Date: [2/13/2013](#)
 Last Solved Time: [5:26:40 PM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Long Term -Static Drained

Description: [drained conditions final grade](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 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: [Block](#)
 Critical slip surfaces saved: [1](#)
 Restrict Block Crossing: [No](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 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: [25 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [150 psf](#)
 Phi': [31 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Drained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [118 pcf](#)
 Strength Function: [normalized phi](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure

Piezometric Line: 1

GC OverConsolidated

Model: [Mohr-Coulomb](#)

Unit Weight: 125 pcf

Cohesion': 100 psf

Phi': 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Side Slope Liner

Model: [Mohr-Coulomb](#)

Unit Weight: 115 pcf

Cohesion': 0 psf

Phi': 13 °

Phi-B: 0 °

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)

Pore Water Pressure

Piezometric Line: 1

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: 128 pcf

Cohesion': 195 psf

Phi': 28.7 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Final Cover

Model: [Mohr-Coulomb](#)

Unit Weight: 125 pcf

Cohesion': 0 psf

Phi': 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

NOT ACTIVE

Model: [\(None\)](#)

Pore Water Pressure

Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (605.06438, 404.48794) ft

Right Coordinate: (1,125.3782, 321.55462) ft

Slip Surface Block

Left Grid

Upper Left: (847.6, 309.8) ft

Lower Left: (843.5, 290.6) ft

Lower Right: (915.6, 290.2) ft

X Increments: 5

Y Increments: 3

Starting Angle: 115 °

Ending Angle: 135 °

Angle Increments: 2

Right Grid

Upper Left: (959.8, 308.2) ft

Lower Left: (959.8, 292.7) ft

Lower Right: (1,031.2, 290) ft

X Increments: 3

Y Increments: 3

Starting Angle: 15 °

Ending Angle: 45 °

Angle Increments: 2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	600	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

normalized phi

Model: [Add-In Function](#)Function: [Shear Stress vs. Normal Stress](#)Assembly: [GeoStudio AddIns1](#)Function: [Mesri1](#)

Field

tan_Phi_100kPa: 0.549

power: 0.147

pa: 2089

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	600	302.8
Point 2	600	287.85
Point 3	600	276.5
Point 4	600	266.5
Point 5	851.25	277.4
Point 6	851.5	267.65
Point 7	1,200	268.85
Point 8	1,199.9987	281.4
Point 9	1,200	259.75
Point 10	1,200	287.55
Point 11	1,200	305.2
Point 12	1,200	320
Point 13	1,104	322
Point 14	1,056	320
Point 15	1,036.75	320
Point 16	1,023.5	319.9
Point 17	1,023.6	319.2
Point 18	897.25	319.5
Point 19	991.25	345.25
Point 20	999.8	349.5
Point 21	1,016	350
Point 22	997.75	348.5
Point 23	992.3	347.1

Point 24	978.5	349.75
Point 25	984.9	350
Point 26	972.5	344.75
Point 27	971	349.5
Point 28	905	374.5
Point 29	861.5	313
Point 30	797	308.6
Point 31	766.5	305.22
Point 32	732	311.25
Point 33	732	309.75
Point 34	737	305.35
Point 35	670.5	311.45
Point 36	670.5	309.45
Point 37	600	305.7
Point 38	600	312
Point 39	600	310
Point 40	600	400.6
Point 41	890	372.5
Point 42	600	258.75
Point 43	751	276.6
Point 44	759	267.4
Point 45	880.5	314
Point 46	793	289.8
Point 47	990	308
Point 48	1,082	280
Point 49	1,079.5	288.3
Point 50	1,082.5	268.5
Point 51	1,081.25	259
Point 52	797	311.1
Point 53	873	311.5
Point 54	990	345.25
Point 55	987	348.5
Point 56	653	303.5
Point 57	670.5	305.5
Point 58	600	299.7
Point 59	653	300.5
Point 60	689.75	301
Point 61	766.5	301.75
Point 62	868.5	307
Point 63	989.75	304.5
Point 64	1,199.9987	301.7
Point 65	651.5	288
Point 66	746.5	289
Point 67	705.5	304.19
Point 68	640.5	311.5
Point 69	640.5	309.5

Point 70	836	305.3
Point 71	836	306.3
Point 72	887.5	309.5
Point 73	868.5	310
Point 74	887.5	306.5
Point 75	600	340
Point 76	785	402
Point 77	608.5	402.7
Point 78	629	401
Point 79	693.5	417.5
Point 80	706.5	418.5
Point 81	737.5	416.5
Point 82	799.5	403.5
Point 83	604	339
Point 84	758.0046	376
Point 85	870	368
Point 86	882.5	366
Point 87	893	363
Point 88	897.5	361
Point 89	956.5	346
Point 90	765	377
Point 91	773.5	377
Point 92	900.5	362.5
Point 93	921.75	363.25
Point 94	759.6649	304.9246
Point 95	859.5	307
Point 96	796	305.1
Point 97	857	307
Point 98	861.5	311
Point 99	600	403.3
Point 100	608.1	405.2
Point 101	628.8	403.9
Point 102	693.4	420
Point 103	706.4	420.9
Point 104	737.1	419.1
Point 105	744.6	415.1
Point 106	744	417.8
Point 107	784.8	404.4
Point 108	799.7	405.9
Point 109	980	351.9
Point 110	905.5	376.8
Point 111	890.6	375.2

Regions

	Material	Points	Area (ft²)

Region 1	Waste Material	40,77,78,79,80,81,105,76,82,41,28,24,27,89,93,92,88,87,86,85,91,90,84,83,75	12,028
Region 2	Waste Material	75,83,84,90,91,85,86,87,88,92,93,89,27,29,52,32,35,68,38	16,661
Region 3	Bottom Liner	39,69,36,33,30,98,53,45,29,52,32,35,68,38	555.25
Region 4	Side Slope Liner	45,18,26,54,55,25,24,27,29	615.34
Region 5	Structural Fill	18,26,54,55,25,23,22,20,21,16,17	2,306.2
Region 6	Upper Till	45,18,17,16,15,14,13,12,11,47,72,73,53	4,072.7
Region 7	NOT ACTIVE	4,44,6,50,7,9,51,42	5,301.4
Region 8	NOT ACTIVE	4,3,43,5,48,8,7,50,6,44	6,275.2
Region 9	Deflection surface	3,2,65,66,46,49,10,8,48,5,43	6,239.6
Region 10	GC-Drained	2,58,59,60,61,70,97,95,62,74,63,64,10,49,46,66,65	8,734.9
Region 11	Upper Till	37,57,34,31,67,56,1	255.65
Region 12	CCL	39,69,36,33,30,98,53,73,95,97,71,96,31,34,57,37	1,053.7
Region 13	GC OverConsolidated	58,1,56,67,94,31,96,71,97,70,61,60,59	657.67
Region 14	GC OverConsolidated	73,72,47,11,64,63,74,62,95	1,139.2
Region 15	Final Cover	40,77,78,79,80,81,105,76,82,41,28,24,25,109,110,111,108,107,106,104,103,102,101,100,99	990.04

Current Slip Surface

Slip Surface: 3,457

F of S: 1.570

Volume: 17,663.307 ft³

Weight: 2,060,689.7 lbs

Resisting Moment: 1.1323858e+008 lbs-ft

Activating Moment: 72,165,341 lbs-ft

Resisting Force: 681,734 lbs

Activating Force: 434,648.02 lbs

F of S Rank: 1

Exit: (1,072.8802, 320.70334) ft

Entry: (729.82944, 419.52629) ft

Radius: 177.86717 ft

Center: (911.8, 443.5) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	731.09629	418.17885	-0	113.99294	65.813856	0
Slice 2	734.73157	414.31232	0	414.22753	239.15437	0
Slice 3	737.3	411.58051	0	612.8889	353.85157	0
Slice 4	740.75	407.91104	0	843.38555	486.92887	0
Slice 5	744.3	404.13522	0	1,074.7357	620.49895	0
Slice 6	747.1662	401.08669	0	1,229.5726	709.89405	0
Slice 7	755.15145	393.27013	0	1,666.1779	961.96826	0
Slice 8	767.00514	382.5915	0	2,210.2428	1,276.0843	0
Slice 9	779.11989	372.06416	0	2,684.5997	1,549.9544	0
Slice 10	784.9	367.04142	0	2,911.1971	1,680.7804	0
Slice 11	786.8627	365.3359	0	3,053.5708	1,762.9799	0

Slice 12	794.2127	358.69911	0	3,537.2911	2,042.256	0
Slice 13	805.0019	348.83234	0	4,143.2585	2,392.1114	0
Slice 14	815.90153	339.20262	0	4,653.4898	2,686.6936	0
Slice 15	827.09699	329.64041	0	5,054.192	2,918.0391	0
Slice 16	838.29245	320.0782	0	5,461.4945	3,153.1953	0
Slice 17	845.42434	313.98675	0	5,725.3611	3,305.5388	0
Slice 18	847.05586	312.62689	0	6,823.6781	3,939.6524	0
Slice 19	849.08762	311.59375	0	7,028.3158	2,137.4335	584.56958
Slice 20	854.57181	308.80506	404.54851	7,209.117	1,199.829	1,000
Slice 21	858.32595	306.89609	523.47339	7,179.3417	2,606.7821	449.23519
Slice 22	859.01515	306.72491	534.11925	8,560.5436	2,291.1337	394.84031
Slice 23	860.5	306.5189	546.89749	8,540.535	2,283.1507	393.46156
Slice 24	865	305.89455	585.62331	8,485.8557	2,260.3743	389.53652
Slice 25	869.25	305.30488	622.1977	8,436.5106	2,239.3865	385.9217
Slice 26	871.5	304.99271	641.56062	8,410.13	2,228.2022	383.99138
Slice 27	876.0625	304.35968	680.8243	8,356.1745	2,205.3745	380.05799
Slice 28	879.8125	303.84769	712.57792	8,356.7478	2,171.9046	374.29067
Slice 29	881.5	303.63393	725.82889	8,335.4613	2,163.5307	372.84835
Slice 30	883.42387	303.39023	740.93594	8,312.1233	2,154.2034	371.24104
Slice 31	885.92387	303.07355	760.567	8,281.5778	2,142.0217	369.13919
Slice 32	888.75	302.71556	782.75897	8,246.7207	2,128.1523	366.75169
Slice 33	890.3	302.51922	794.93022	8,225.4523	2,120.0178	365.34859
Slice 34	891.8	302.32921	806.70886	8,263.1132	2,126.3146	366.4344
Slice 35	895.125	301.90803	832.81817	8,383.0628	2,149.1206	370.36389
Slice 36	897.375	301.62301	850.48613	8,464.1643	2,164.512	373.01725
Slice 37	899	301.41717	863.24632	8,524.2304	2,175.9797	374.99211
Slice 38	902.6094	300.95996	891.58886	8,657.2715	2,201.3199	379.36015
Slice 39	904.8594	300.6749	909.25993	8,738.5409	2,217.4267	382.13376
Slice 40	905.25	300.62528	912.33573	8,754.5166	2,220.5416	382.67195
Slice 41	913.625	299.56143	978.28519	8,669.1028	2,183.9297	376.36348
Slice 42	925.9956	297.99004	1,075.6982	8,518.1435	2,123.6245	365.96997
Slice 43	934.64345	296.92046	1,141.9911	8,429.5533	2,073.4193	357.31934
Slice 44	943.44795	295.85991	1,207.7124	8,306.5932	2,027.5403	349.41244
Slice 45	952.1751	294.91382	1,266.2948	8,254.0746	1,963.5304	338.38081
Slice 46	963.75	293.80098	1,335.1352	8,041.3955	1,895.8488	326.71901
Slice 47	971.75	293.03184	1,382.7143	7,890.1246	1,847.7926	318.43658
Slice 48	974.18985	292.79727	1,397.2251	7,833.807	1,830.6237	315.4775
Slice 49	977.18985	292.53472	1,413.4524	7,818.4218	1,804.6042	310.99381
Slice 50	979.25	292.37734	1,423.1656	7,757.5852	1,787.6354	308.069
Slice 51	982.45	292.1329	1,438.253	7,635.3466	1,754.5254	302.36193
Slice 52	985.95	291.86553	1,454.7549	7,504.1837	1,718.8015	296.20499
Slice 53	988.375	291.68028	1,466.1883	7,433.3377	1,698.8387	292.76657
Slice 54	989.875	291.5657	1,473.2606	7,392.5513	1,687.2101	290.76186
Slice 55	991.15	291.4683	1,479.2719	7,340.9879	1,673.2005	288.34881
Slice 56	995.025	291.17229	1,497.5419	7,406.2651	1,684.6413	290.31814
Slice 57	998.775	290.88583	1,515.2224	7,592.1005	1,725.451	297.35199

Slice 58	1,007.9	290.18877	1,558.2452	7,759.5981	1,755.5532	302.53995
Slice 59	1,017.4436	289.45974	1,603.2415	7,119.3366	1,588.6757	273.78011
Slice 60	1,020.9479	289.69856	1,588.157	5,713.3793	1,290.1475	222.33517
Slice 61	1,023.2543	290.1733	1,558.4132	5,062.5607	1,420.0208	244.71634
Slice 62	1,030.125	293.68611	1,338.8577	4,273.3783	1,220.6051	210.35031
Slice 63	1,043.2321	300.38734	920.02007	3,132.8183	959.40354	165.3368
Slice 64	1,050.5454	304.12643	686.32127	2,615.831	1,114.0029	100
Slice 65	1,053.097	305.8436	579.03722	2,623.1891	1,180.1916	100
Slice 66	1,055.4086	307.57995	470.56903	2,366.1537	1,138.9822	150
Slice 67	1,060.7187	311.56846	221.41061	1,673.7873	872.67594	150
Slice 68	1,069.1587	317.90806	-0	586.20981	352.23039	150

Figure 5 - Stability Analysis of Long Term Drained Conditions – Subgrade Failures

Long Term -Static Drained (2)

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File Information

Title: [Model City - RMU-2 XS 2600](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [373](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/14/2013](#)
 Time: [9:48:33 AM](#)
 File Name: [RMU2X2600r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revisions\geoslope\final config\](#)
 Last Solved Date: [2/14/2013](#)
 Last Solved Time: [10:04:46 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Long Term -Static Drained (2)

Description: [drained conditions final grade E&E search](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

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: [Yes](#)
 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: [25 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [150 psf](#)
 Phi': [31 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Drained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [118 pcf](#)
 Strength Function: [normalized phi](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC OverConsolidated

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [100 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)
 Unit Weight: [115 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [13 °](#)
 Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Structural Fill

Model: [Mohr-Coulomb](#)
 Unit Weight: [128 pcf](#)
 Cohesion': [195 psf](#)
 Phi': [28.7 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
 Left-Zone Left Coordinate: [\(690, 419.15263\) ft](#)
 Left-Zone Right Coordinate: [\(820, 399.044\) ft](#)
 Left-Zone Increment: [12](#)
 Right Projection: [Range](#)
 Right-Zone Left Coordinate: [\(1,031.0268, 319.95681\) ft](#)
 Right-Zone Right Coordinate: [\(1,130, 321.45833\) ft](#)
 Right-Zone Increment: [10](#)
 Radius Increments: [10](#)

Slip Surface Limits

Left Coordinate: [\(605.06438, 404.48794\) ft](#)

Right Coordinate: (1,170.1984, 320.62087) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	600	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

normalized phi

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: Mesri1

Field

tan_Phi_100kPa: 0.549

power: 0.147

pa: 2089

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	600	302.8
Point 2	600	287.85
Point 3	600	276.5
Point 4	600	266.5
Point 5	851.25	277.4
Point 6	851.5	267.65
Point 7	1,200	268.85
Point 8	1,199.9987	281.4
Point 9	1,200	259.75
Point 10	1,200	287.55
Point 11	1,200	305.2
Point 12	1,200	320
Point 13	1,104	322
Point 14	1,056	320
Point 15	1,036.75	320
Point 16	1,023.5	319.9
Point 17	1,023.6	319.2
Point 18	897.25	319.5
Point 19	991.25	345.25
Point 20	999.8	349.5
Point 21	1,016	350
Point 22	997.75	348.5
Point 23	992.3	347.1
Point 24	978.5	349.75
Point 25	984.9	350
Point 26	972.5	344.75
Point 27	971	349.5
Point 28	905	374.5
Point 29	861.5	313
Point 30	797	308.6
Point 31	766.5	305.22

Point 32	732	311.25
Point 33	732	309.75
Point 34	737	305.35
Point 35	670.5	311.45
Point 36	670.5	309.45
Point 37	600	305.7
Point 38	600	312
Point 39	600	310
Point 40	600	400.6
Point 41	890	372.5
Point 42	600	258.75
Point 43	751	276.6
Point 44	759	267.4
Point 45	880.5	314
Point 46	793	289.8
Point 47	990	308
Point 48	1,082	280
Point 49	1,079.5	288.3
Point 50	1,082.5	268.5
Point 51	1,081.25	259
Point 52	797	311.1
Point 53	873	311.5
Point 54	990	345.25
Point 55	987	348.5
Point 56	653	303.5
Point 57	670.5	305.5
Point 58	600	299.7
Point 59	653	300.5
Point 60	689.75	301
Point 61	766.5	301.75
Point 62	868.5	307
Point 63	989.75	304.5
Point 64	1,199.9987	301.7
Point 65	651.5	288
Point 66	746.5	289
Point 67	705.5	304.19
Point 68	640.5	311.5
Point 69	640.5	309.5
Point 70	836	305.3
Point 71	836	306.3
Point 72	887.5	309.5
Point 73	868.5	310
Point 74	887.5	306.5
Point 75	600	340
Point 76	785	402
Point 77	608.5	402.7

Point 78	629	401
Point 79	693.5	417.5
Point 80	706.5	418.5
Point 81	737.5	416.5
Point 82	799.5	403.5
Point 83	604	339
Point 84	758.0046	376
Point 85	870	368
Point 86	882.5	366
Point 87	893	363
Point 88	897.5	361
Point 89	956.5	346
Point 90	765	377
Point 91	773.5	377
Point 92	900.5	362.5
Point 93	921.75	363.25
Point 94	759.6649	304.9246
Point 95	859.5	307
Point 96	796	305.1
Point 97	857	307
Point 98	861.5	311
Point 99	600	403.3
Point 100	608.1	405.2
Point 101	628.8	403.9
Point 102	693.4	420
Point 103	706.4	420.9
Point 104	737.1	419.1
Point 105	744.6	415.1
Point 106	744	417.8
Point 107	784.8	404.4
Point 108	799.7	405.9
Point 109	980	351.9
Point 110	905.5	376.8
Point 111	890.6	375.2

Regions

	Material	Points	Area (ft ²)
Region 1	Waste Material	40,77,78,79,80,81,105,76,82,41,28,24,27,89,93,92,88,87,86,85,91,90,84,83,75	12,028
Region 2	Waste Material	75,83,84,90,91,85,86,87,88,92,93,89,27,29,52,32,35,68,38	16,661
Region 3	Bottom Liner	39,69,36,33,30,98,53,45,29,52,32,35,68,38	555.25
Region 4	Side Slope Liner	45,18,26,54,55,25,24,27,29	615.34
Region 5	Structural Fill	18,26,54,55,25,23,22,20,21,16,17	2,306.2
Region 6	Upper Till	45,18,17,16,15,14,13,12,11,47,72,73,53	4,072.7
Region 7	NOT ACTIVE	4,44,6,50,7,9,51,42	5,301.4
Region 8	NOT ACTIVE	4,3,43,5,48,8,7,50,6,44	6,275.2

Region 9	Deflection surface	3,2,65,66,46,49,10,8,48,5,43	6,239.6
Region 10	GC-Drained	2,58,59,60,61,70,97,95,62,74,63,64,10,49,46,66,65	8,734.9
Region 11	Upper Till	37,57,34,31,67,56,1	255.65
Region 12	CCL	39,69,36,33,30,98,53,73,95,97,71,96,31,34,57,37	1,053.7
Region 13	GC OverConsolidated	58,1,56,67,94,31,96,71,97,70,61,60,59	657.67
Region 14	GC OverConsolidated	73,72,47,11,64,63,74,62,95	1,139.2
Region 15	Final Cover	40,77,78,79,80,81,105,76,82,41,28,24,25,109,110,111,108,107,106,104,103,102,101,100,99	990.04

Current Slip Surface

Slip Surface: 1,574

F of S: 1.583

Volume: 15,565.774 ft³

Weight: 1,826,242.6 lbs

Resisting Moment: 1.4710509e+008 lbs-ft

Activating Moment: 92,921,314 lbs-ft

Resisting Force: 620,876.87 lbs

Activating Force: 392,609.95 lbs

F of S Rank: 1

Exit: (1,074.7597, 320.78165) ft

Entry: (734.66674, 419.24267) ft

Radius: 176.42178 ft

Center: (980.26186, 499.9127) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	735.88337	418.5043	-0	68.175478	39.36113	0
Slice 2	738.54865	416.88675	-0	197.90838	114.26246	0
Slice 3	741.99865	414.79296	0	334.8241	193.31078	0
Slice 4	744.3	413.39628	0	416.99452	240.7519	0
Slice 5	744.79945	413.09317	0	428.87896	247.61338	0
Slice 6	749.7916	409.45918	0	580.76294	335.30364	0
Slice 7	759.377	402.43329	0	903.67131	521.73487	0
Slice 8	769.32727	395.12929	0	1,231.8822	711.22752	0
Slice 9	779.64243	387.54718	0	1,567.0666	904.74633	0
Slice 10	788.2283	381.23618	0	1,966.0023	1,135.0719	0
Slice 11	793.85908	376.80602	0	2,251.9573	1,300.1682	0
Slice 12	797.78078	373.40474	0	2,538.7034	1,465.7211	0
Slice 13	799.6	371.82693	0	2,671.4714	1,542.3747	0
Slice 14	807.55505	364.92754	0	2,975.4033	1,717.8499	0
Slice 15	820.08407	353.9368	0	3,417.4834	1,973.085	0
Slice 16	829.43202	345.58065	0	3,780.6043	2,182.7329	0
Slice 17	838.9787	337.31217	0	4,230.2483	2,442.335	0
Slice 18	848.7241	329.13138	0	4,585.2991	2,647.3237	0
Slice 19	858.4695	320.95059	0	4,946.1775	2,855.6769	0

Slice 20	864.45705	316.06962	0	5,480.5637	3,164.2049	0
Slice 21	866.01401	314.96555	0	5,528.0172	3,191.6022	0
Slice 22	867.36926	314.0045	0	5,982.7559	1,381.228	0
Slice 23	869.14121	312.74798	0	5,835.5122	1,938.1922	404.2058
Slice 24	870.51117	311.7765	0	5,887.0792	1,948.3608	411.1341
Slice 25	871.29729	311.21905	253.0475	5,995.6525	1,012.5762	1,000
Slice 26	872.28612	310.51785	296.75103	5,729.3423	3,264.2302	150
Slice 27	875.2971	308.38269	429.82865	5,903.3344	3,160.13	100
Slice 28	879.0471	306.50982	546.50099	7,910.6626	2,198.0858	378.80323
Slice 29	881.5	306.09798	572.07249	7,889.5485	2,186.1945	376.75308
Slice 30	883.42387	305.77496	592.12887	7,874.4214	2,177.2239	375.20837
Slice 31	885.92387	305.35521	618.19139	7,854.6666	2,165.5344	373.19338
Slice 32	888.75	304.88071	647.6538	7,832.1569	2,152.2607	370.90603
Slice 33	890.3	304.62046	663.81257	7,817.7664	2,144.4515	369.56071
Slice 34	891.8	304.36861	679.45008	7,861.051	2,151.5194	370.77793
Slice 35	895.125	303.81035	714.11323	7,992.9465	2,176.3428	375.05525
Slice 36	897.375	303.43258	737.5695	8,082.2396	2,193.1236	377.94641
Slice 37	899	303.15974	754.51014	8,148.28	2,205.6216	380.10244
Slice 38	902.75	302.53012	793.60392	8,300.4968	2,234.376	385.05577
Slice 39	905.25	302.11037	819.66644	8,403.4489	2,253.8816	388.41869
Slice 40	908.7178	301.52813	855.81828	8,392.8102	2,242.0141	386.3738
Slice 41	916.8428	300.22516	936.7015	8,375.4783	2,185.8713	376.69696
Slice 42	929.672	298.23119	1,060.4592	8,261.7226	2,126.1953	366.4142
Slice 43	942.3205	296.38549	1,174.9746	8,221.3876	2,032.5679	350.27922
Slice 44	951.7735	295.15662	1,251.1652	8,098.8728	1,983.5745	341.8351
Slice 45	960.6399	294.00401	1,322.6279	7,980.9262	1,936.677	333.75365
Slice 46	967.8899	293.12828	1,376.8968	7,942.6455	1,878.2598	323.68655
Slice 47	971.75	292.70933	1,402.8387	7,876.5178	1,855.7708	319.80999
Slice 48	973.08795	292.56412	1,411.8305	7,849.7958	1,847.0332	318.30552
Slice 49	976.08795	292.28974	1,428.7962	7,841.7693	1,815.5175	312.87274
Slice 50	979.25	292.0137	1,445.8572	7,756.7448	1,790.8359	308.61981
Slice 51	982.45	291.73434	1,463.1229	7,640.855	1,758.5548	303.05642
Slice 52	985.95	291.42879	1,482.0073	7,516.6359	1,723.7467	297.05873
Slice 53	988.375	291.21709	1,495.0916	7,450.5216	1,704.4314	293.72954
Slice 54	989.875	291.08614	1,503.1849	7,412.6517	1,693.2045	291.79443
Slice 55	991.15	290.97484	1,510.0642	7,363.6411	1,679.5356	289.4383
Slice 56	995.025	290.63655	1,530.972	7,435.7761	1,692.0641	291.59873
Slice 57	998.775	290.30918	1,551.2053	7,627.8193	1,733.9718	298.82026
Slice 58	1,007.9	289.51258	1,600.4396	7,811.9347	1,766.748	304.47037
Slice 59	1,017.054	288.71344	1,649.8307	7,388.2239	1,651.3028	284.57398
Slice 60	1,018.7332	288.61815	1,655.6895	6,705.6308	1,466.1989	252.67383
Slice 61	1,019.6531	288.61333	1,655.9423	6,218.23	1,344.5361	231.7074
Slice 62	1,021.3139	288.84246	1,641.5586	5,621.2265	1,250.7525	215.54538
Slice 63	1,023.09	289.27226	1,614.6468	5,247.0304	1,446.6985	249.31411
Slice 64	1,030.125	292.68908	1,401.0723	4,375.2784	1,219.8882	210.22715
Slice 65	1,042.1684	298.53843	1,035.4472	3,383.6557	997.17877	171.84656

Slice 66	1,049.328	302.42674	792.44498	3,079.9903	1,049.6699	180.8927
Slice 67	1,053.5346	305.46276	602.77942	2,651.4663	1,182.8099	100
Slice 68	1,061.4517	311.17685	245.80911	1,716.3604	883.59635	150
Slice 69	1,070.8316	317.94661	-0	576.0261	346.1114	150

Figure 6 - Stability Analysis of Long Term Drained Conditions – Subgrade Failures

Drained Final Grade

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File Information

Title: [Model City - RMU-2 XS 3050](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [390](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/16/2013](#)
 Time: [9:26:39 AM](#)
 File Name: [RMU2X3050r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/16/2013](#)
 Last Solved Time: [9:49:22 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Drained Final Grade

Description: [Assuming Full Consolidation has Occured](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 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: [Block](#)
 Critical slip surfaces saved: [1](#)
 Restrict Block Crossing: [No](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 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: [25 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [150 psf](#)
 Phi': [31 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Drained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [118 pcf](#)
 Strength Function: [normalized phi](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure

Piezometric Line: 1

GC OverConsolidated

Model: [Mohr-Coulomb](#)Unit Weight: [125 pcf](#)Cohesion': [100 psf](#)Phi': [30 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: 1

Side Slope Liner

Model: [Mohr-Coulomb](#)Unit Weight: [115 pcf](#)Cohesion': [0 psf](#)Phi': [13 °](#)Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)

Pore Water Pressure

Piezometric Line: 1

Structural Fill

Model: [Mohr-Coulomb](#)Unit Weight: [128 pcf](#)Cohesion': [195 psf](#)Phi': [28.7 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: 1

Final Cover

Model: [Mohr-Coulomb](#)Unit Weight: [125 pcf](#)Cohesion': [0 psf](#)Phi': [30 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: 1

NOT ACTIVE

Model: [\(None\)](#)

Pore Water Pressure

Piezometric Line: 1

Slip Surface Limits

Left Coordinate: [\(606.47519, 438.67767\) ft](#)Right Coordinate: [\(1,114.1689, 322.83421\) ft](#)

Slip Surface Block

Left Grid

Upper Left: [\(772.4, 311.8\) ft](#)Lower Left: [\(766.2, 293.2\) ft](#)Lower Right: [\(856.7, 291.7\) ft](#)X Increments: [10](#)Y Increments: [5](#)

Starting Angle: 135 °

Ending Angle: 160 °

Angle Increments: 2

Right Grid

Upper Left: (925.8, 305.9) ft

Lower Left: (925.8, 290.4) ft

Lower Right: (997.2, 287.7) ft

X Increments: 3

Y Increments: 3

Starting Angle: 15 °

Ending Angle: 45 °

Angle Increments: 2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	313

Maximum Suction: 0 psf

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

normalized phi

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: Mesri1

Field

tan_Phi_100kPa: 0.549

power: 0.147

pa: 2089

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	500	306.45
Point 2	500	286.75
Point 3	500	280.9
Point 4	500	271.2
Point 5	740.7	270.8
Point 6	634.5	269.8
Point 7	1,200	269.95
Point 8	1,199.9987	278.5
Point 9	1,200	259.75
Point 10	1,200	286.05
Point 11	1,200	306.5
Point 12	1,200	322
Point 13	1,107.4	322.9
Point 14	1,023.4	321.1
Point 15	1,023.5	320.9
Point 16	898.8	320
Point 17	991.25	345.25
Point 18	999.8	349.5
Point 19	1,016	350
Point 20	997.75	348.5
Point 21	992.3	347.1
Point 22	978.7	349.8
Point 23	984.4	350
Point 24	972.5	344.75
Point 25	971	349.5
Point 26	914.8	371.1
Point 27	863.6	313.6

Point 28	798.1	312.4
Point 29	780.3	309.03
Point 30	732.5	315.9
Point 31	732.5	314.4
Point 32	732.6	309.9
Point 33	669.1	317
Point 34	669.1	315
Point 35	500	314.5
Point 36	500	320
Point 37	500	318
Point 38	500	433.6
Point 39	899.6	369.5
Point 40	500	258.75
Point 41	560.6	281.9
Point 42	880.5	314
Point 43	1,010.6	307.3
Point 44	1,023.5	282.3
Point 45	983.2	286.1
Point 46	1,026.6	269.9
Point 47	798.1	314.9
Point 48	873	311.5
Point 49	990	345.25
Point 50	987	348.5
Point 51	707.7	308.9
Point 52	669.1	311.05
Point 53	500	303.35
Point 54	707.7	305.9
Point 55	780.3	306
Point 56	863.7	305.4
Point 57	1,010.35	303.8
Point 58	1,199.9987	303
Point 59	653.3	286.1
Point 60	836.6	308.1
Point 61	890.3	308.2
Point 62	863.7	308.4
Point 63	890.3	305.2
Point 64	794.8	398.1
Point 65	582.2	437.6
Point 66	696.4	431
Point 67	809.8	399.6
Point 68	861.4	307.6
Point 69	797.1	308.9
Point 70	863.6	311.6
Point 71	500	436.3
Point 72	581.8	440.1
Point 73	696.3	433.5

Point 74	795	400.7
Point 75	810.1	402.1
Point 76	980.1	352
Point 77	915	373.7
Point 78	900.2	372.2
Point 79	1,080.5	282.7
Point 80	663.1	270.7
Point 81	565.2	307.6
Point 82	565.2	304.53077

Regions

	Material	Points	Area (ft ²)
Region 1	Bottom Liner	37,34,31,28,70,48,42,27,47,30,33,36	756.75
Region 2	Side Slope Liner	42,16,24,49,50,23,22,25,27	606.02
Region 3	Structural Fill	16,24,49,50,23,21,20,18,19,14,15	2,170.4
Region 4	Upper Till	42,16,15,14,13,12,11,43,61,62,48	4,514.2
Region 5	NOT ACTIVE	4,6,46,7,9,40	7,520.4
Region 6	NOT ACTIVE	4,3,41,80,5,44,79,8,7,46,6	5,230.9
Region 7	Deflection surface	3,2,59,45,10,8,79,44,5,80,41	6,088.1
Region 8	GC-Drained	2,53,82,54,55,56,63,57,58,10,45,59	12,919
Region 9	Upper Till	35,52,32,29,51,81,1	992.38
Region 10	CCL	37,34,31,28,70,48,62,68,60,69,29,32,52,35	1,426.9
Region 11	GC OverConsolidated	53,1,81,51,29,69,60,68,56,55,54,82	1,073.1
Region 12	GC OverConsolidated	62,61,43,11,58,57,63,56,68	1,137.4
Region 13	Final Cover	38,65,66,64,67,39,26,22,23,76,77,78,75,74,73,72,71	1,253.8
Region 14	Waste Material	38,65,66,64,67,39,26,22,25,27,47,30,33,36	41,876

Current Slip Surface

Slip Surface: 9,505

F of S: 1.62

Volume: 20,714.519 ft³

Weight: 2,404,890.6 lbs

Resisting Moment: 1.9913919e+008 lbs-ft

Activating Moment: 1.2285724e+008 lbs-ft

Resisting Force: 828,727.2 lbs

Activating Force: 511,623.21 lbs

F of S Rank: 1

Exit: (1,073.2064, 322.16728) ft

Entry: (683.20218, 434.25498) ft

Radius: 201.35463 ft

Center: (931.1, 507) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	684.48875	432.93451	-0	113.73208	65.663246	0
Slice 2	691.03766	426.21303	0	632.21352	365.00865	0
Slice 3	702.2501	414.70512	0	1,344.0165	775.96826	0
Slice 4	713.0979	404.4069	0	1,936.1175	1,117.818	0

Slice 5	722.8933	396.02423	0	2,323.3202	1,341.3695	0
Slice 6	734.6126	386.56563	0	2,814.7681	1,625.1071	0
Slice 7	748.2558	376.03112	0	3,263.1411	1,883.9754	0
Slice 8	760.00973	367.198	0	3,698.3026	2,135.216	0
Slice 9	769.87437	360.06627	0	3,987.9501	2,302.4441	0
Slice 10	779.7779	352.86391	0	4,266.9332	2,463.515	0
Slice 11	789.7203	345.59092	0	4,565.9818	2,636.1708	0
Slice 12	794.74575	341.91245	0	4,631.5417	2,674.0219	0
Slice 13	794.9	341.79307	0	4,636.1637	2,676.6904	0
Slice 14	802.55	335.87286	0	5,144.9456	2,970.4357	0
Slice 15	815.17451	326.10294	0	5,820.9563	3,360.7307	0
Slice 16	825.32352	318.24877	0	6,163.7474	3,558.6412	0
Slice 17	830.43962	314.28951	0	6,339.1589	3,659.9151	0
Slice 18	830.57915	314.18152	0	6,609.3434	2,076.1372	516.34725
Slice 19	833.02123	313.02529	0	7,587.6	2,204.11	684.18442
Slice 20	839.69885	309.9475	270.87952	7,755.5087	1,319.7421	1,000
Slice 21	846.62632	306.75456	468.57736	7,708.5459	4,179.9977	100
Slice 22	855.31015	304.79367	589.00446	9,112.8926	2,381.1547	410.35433
Slice 23	862.55	303.88385	644.16588	8,990.0731	2,338.6809	403.03209
Slice 24	864.54287	303.63341	659.34986	8,961.0997	2,328.1224	401.212
Slice 25	869.19287	303.04906	694.77886	8,896.0018	2,304.0538	397.06388
Slice 26	876.75	302.09937	752.35764	8,788.8871	2,264.5266	390.25322
Slice 27	880.71574	301.601	782.57318	8,732.3492	2,243.659	386.65608
Slice 28	882.58219	301.36645	796.79392	8,708.1362	2,234.4032	385.06085
Slice 29	887.26645	300.83341	829.01354	8,713.1902	2,193.5483	378.02007
Slice 30	894.55	300.05163	876.17554	8,599.5861	2,155.336	371.4362
Slice 31	899.2	299.55252	906.28493	8,526.5745	2,130.7637	367.20264
Slice 32	899.9	299.47739	910.81753	8,514.3206	2,126.7602	366.51157
Slice 33	907.6	298.65091	960.6761	8,751.2459	2,171.3131	374.18896
Slice 34	919.89435	297.3313	1,040.2837	8,917.1038	2,191.8005	377.72093
Slice 35	927.33385	296.53897	1,088.0694	8,805.9522	2,150.114	370.5358
Slice 36	935.04418	295.76908	1,134.3952	8,699.8772	2,102.8346	362.38755
Slice 37	945.37452	294.76327	1,194.8585	8,511.87	2,043.781	352.20962
Slice 38	955.65477	293.85204	1,249.4319	8,368.5649	1,977.6383	340.81376
Slice 39	965.88492	293.03537	1,298.1154	8,147.2291	1,913.4771	329.7536
Slice 40	971.75	292.56716	1,326.0263	8,017.7559	1,875.906	323.28049
Slice 41	973.50225	292.42728	1,334.365	7,972.9348	1,863.1871	321.08827
Slice 42	976.60225	292.22823	1,346.0956	7,951.2095	1,844.1424	317.8061
Slice 43	979.4	292.06947	1,355.3795	7,860.5011	1,820.3016	313.69791
Slice 44	982.25	291.90775	1,364.8368	7,720.6853	1,784.6118	307.54611
Slice 45	985.7	291.71198	1,376.2851	7,562.1282	1,743.8126	300.51598
Slice 46	988.5	291.5531	1,385.5764	7,476.8407	1,721.0444	296.59188
Slice 47	991.15	291.40272	1,394.3701	7,387.3054	1,697.3169	292.50408
Slice 48	995.025	291.18283	1,407.2287	7,444.0175	1,707.9066	294.32794
Slice 49	998.775	290.97004	1,419.6725	7,618.6257	1,746.9645	301.05926
Slice 50	1,005.075	290.61255	1,440.5781	7,734.4898	1,769.7661	304.98858

Slice 51	1,013.175	290.15291	1,467.4567	7,803.0273	1,779.7538	306.70908
Slice 52	1,018.5817	289.84611	1,485.3981	6,539.6816	1,467.7703	252.94522
Slice 53	1,022.2817	290.24482	1,459.6952	5,662.413	1,639.8233	282.59566
Slice 54	1,032.3094	295.13364	1,152.401	4,149.4755	1,228.9913	211.7957
Slice 55	1,044.1566	301.56113	748.68929	3,487.8962	1,221.8455	210.56421
Slice 56	1,049.5474	305.38507	508.87608	2,977.9958	1,425.547	100
Slice 57	1,056.4936	310.31223	199.87506	2,175.0604	1,186.8111	150
Slice 58	1,067.0965	317.83331	-0	842.72284	506.35897	150

Figure 7 - Stability Analysis of Long Term Drained Conditions – Subgrade Failures

Drained With no Grids

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File Information

Title: [Model City - RMU-2 XS3200](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [387](#)
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 Last Solved Date: [2/14/2013](#)
 Last Solved Time: [2:58:26 PM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Drained With no Grids

Description: [Final Grade - Static Drained](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 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: [Block](#)
 Critical slip surfaces saved: [1](#)
 Restrict Block Crossing: [No](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 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: [25 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [150 psf](#)
 Phi': [31 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Drained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [118 pcf](#)
 Strength Function: [normalized phi](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure

Piezometric Line: 1

GC OverConsolidated

Model: [Mohr-Coulomb](#)

Unit Weight: 125 pcf

Cohesion': 100 psf

Phi': 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Side Slope Liner

Model: [Mohr-Coulomb](#)

Unit Weight: 115 pcf

Cohesion': 0 psf

Phi': 13 °

Phi-B: 0 °

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)

Pore Water Pressure

Piezometric Line: 1

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: 130 pcf

Cohesion': 195 psf

Phi': 28.7 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Final Cover

Model: [Mohr-Coulomb](#)

Unit Weight: 125 pcf

Cohesion': 0 psf

Phi': 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

NOT ACTIVE

Model: [\(None\)](#)

Pore Water Pressure

Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (606.35749, 436.40883) ft

Right Coordinate: (1,114.195, 320.05133) ft

Slip Surface Block

Left Grid

Upper Left: (772.4, 311.8) ft

Lower Left: (766.2, 293.2) ft

Lower Right: (856.7, 291.7) ft

X Increments: 10

Y Increments: 5

Starting Angle: 135 °

Ending Angle: 160 °

Angle Increments: 2

Right Grid

Upper Left: (925.8, 305.9) ft

Lower Left: (925.8, 290.4) ft

Lower Right: (997.2, 287.7) ft

X Increments: 3

Y Increments: 3

Starting Angle: 15 °

Ending Angle: 45 °

Angle Increments: 2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

normalized phi

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: Mesri1

Field

tan_Phi_100kPa: 0.549

power: 0.147

pa: 2089

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	500	305.75
Point 2	500	288.15
Point 3	500	283.4
Point 4	500	273.4
Point 5	609.5	272.3
Point 6	1,200	269.95
Point 7	1,199.9987	280.3
Point 8	1,200	259.75
Point 9	1,200	286.7
Point 10	1,200	304.9
Point 11	1,200	320.1
Point 12	1,023.7	320
Point 13	1,012.5	320
Point 14	898.8	320
Point 15	991.25	345.25
Point 16	999.8	349.5
Point 17	1,016	350
Point 18	992.5	346.7
Point 19	978.7	349.8
Point 20	984.8	350
Point 21	972.4	344.6
Point 22	971.4	349.6
Point 23	910.3	372.6
Point 24	860.8	312.7
Point 25	800.5	311.2
Point 26	780.3	308.1
Point 27	735.4	314.9

Point 28	735.4	313.4
Point 29	735.5	308.9
Point 30	500	313.3
Point 31	500	319.3
Point 32	500	317.3
Point 33	500	426.2
Point 34	895.2	371.1
Point 35	500	258.75
Point 36	520.6	283.6
Point 37	876	312.5
Point 38	1,010.6	307.3
Point 39	854.9	273.7
Point 40	984.6	286.8
Point 41	1,026.6	269.9
Point 42	800.5	313.7
Point 43	870	310.5
Point 44	990	345.2
Point 45	987	348.5
Point 46	714.8	307.9
Point 47	500	302.65
Point 48	714.8	304.9
Point 49	780.3	305.07
Point 50	863	305.15
Point 51	1,010.35	303.8
Point 52	1,199.9987	301.4
Point 53	719.7	287.1
Point 54	890.3	308.2
Point 55	863	308.15
Point 56	890.3	305.2
Point 57	790.2	399.6
Point 58	528.3	431
Point 59	696.4	431
Point 60	805.3	401.1
Point 61	858.4	306.6
Point 62	799.9	307.7
Point 63	860.8	310.7
Point 64	500	428.9
Point 65	527.9	433.5
Point 66	696.3	433.5
Point 67	790.5	402.1
Point 68	805.5	403.7
Point 69	980.1	352
Point 70	910.5	375.1
Point 71	895.5	373.7
Point 72	1,092.6	283.3
Point 73	630.8	274.6

Point 74	651.5	307.4
Point 75	651.5	304.33077
Point 76	625	437.1
Point 77	624.9	434.6
Point 78	1,004	316
Point 79	825.1	269.8

Regions

	Material	Points	Area (ft²)
Region 1	Bottom Liner	32,28,25,63,43,37,24,42,27,31	702.82
Region 2	Side Slope Liner	37,14,21,44,45,20,19,22,24	631.75
Region 3	Structural Fill	14,21,44,45,20,18,16,17,12,13,78	2,446.9
Region 4	Upper Till	37,14,78,13,12,11,10,38,54,55,43	3,999.3
Region 5	NOT ACTIVE	4,5,79,41,6,8,35	8,020.2
Region 6	NOT ACTIVE	4,3,36,73,39,72,7,6,41,79,5	5,003.5
Region 7	Deflection surface	3,2,53,40,9,7,72,39,73,36	6,471.5
Region 8	GC-Drained	2,47,75,48,49,50,56,51,52,9,40,53	11,774
Region 9	Upper Till	30,29,26,46,74,1	990.49
Region 10	CCL	32,28,25,63,43,55,61,62,26,29,30	1,504.8
Region 11	GC OverConsolidated	47,1,74,46,26,62,61,50,49,48,75	1,034.4
Region 12	GC OverConsolidated	55,54,38,10,52,51,56,50,61	1,143.1
Region 13	Final Cover	33,58,77,59,57,60,34,23,19,20,69,70,71,68,67,66,76,65,64	1,237.8
Region 14	Waste Material	33,58,77,59,57,60,34,23,19,22,24,42,27,31	41,745

Current Slip Surface

Slip Surface: 9,505

F of S: 1.56

Volume: 20,940.635 ft³

Weight: 2,437,383 lbs

Resisting Moment: 1.406089e+008 lbs-ft

Activating Moment: 90,027,592 lbs-ft

Resisting Force: 824,912.93 lbs

Activating Force: 528,066.96 lbs

F of S Rank: 1

Exit: (1,078.4403, 320.03105) ft

Entry: (685.35216, 434.05277) ft

Radius: 203.14049 ft

Center: (911.8, 443.5) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	686.58864	432.74225	-0	111.75451	64.521494	0
Slice 2	692.06256	426.94058	0	557.41285	321.82246	0
Slice 3	700.98155	417.48756	0	1,142.8186	659.80665	0
Slice 4	710.95232	407.70192	0	1,689.8963	975.66211	0
Slice 5	721.53077	398.05435	0	2,145.0248	1,238.4307	0
Slice 6	734.775	386.92872	0	2,741.796	1,582.9766	0
Slice 7	750.685	374.32501	0	3,280.095	1,893.7637	0

Slice 8	762.58755	365.11753	0	3,745.2401	2,162.3154	0
Slice 9	772.45133	358.1602	0	4,105.8146	2,370.4932	0
Slice 10	784.43377	349.95405	0	4,427.0636	2,555.9664	0
Slice 11	791.47845	345.12952	0	4,652.5572	2,686.1551	0
Slice 12	798.97845	339.42409	0	4,975.3827	2,872.5386	0
Slice 13	811.69224	329.60767	0	5,617.8671	3,243.4771	0
Slice 14	824.07673	320.04551	0	6,026.2657	3,479.2661	0
Slice 15	831.63101	314.21279	0	6,280.0559	3,625.792	0
Slice 16	833.06398	313.10638	0	6,597.3396	2,074.2416	514.4704
Slice 17	835.80157	311.9684	0	7,777.867	2,222.7643	720.35315
Slice 18	843.51514	308.83508	400.6019	7,908.3976	1,323.8269	1,000
Slice 19	850.62857	305.94554	580.59235	7,883.1552	4,216.1367	100
Slice 20	855.54755	304.73995	655.60253	9,085.1755	2,364.6334	407.50298
Slice 21	859.6	304.21976	687.88186	9,018.2185	2,340.8656	403.40914
Slice 22	861.9	303.92453	706.20225	8,984.3731	2,328.3566	401.25255
Slice 23	865.70241	303.43643	736.48988	8,930.7731	2,308.2159	397.78094
Slice 24	869.20241	302.98716	764.36873	8,881.0761	2,289.563	394.56661
Slice 25	873	302.49969	794.61804	8,826.5823	2,269.1559	391.05097
Slice 26	878.1081	301.84399	835.30603	8,756.1448	2,242.3486	386.43143
Slice 27	882.25147	301.35033	865.92623	8,775.1041	2,203.3188	379.70529
Slice 28	887.29337	300.79775	900.18277	8,697.1473	2,176.6261	375.10505
Slice 29	892.75	300.19972	937.25713	8,611.8654	2,147.4561	370.07804
Slice 30	895.35	299.91476	954.92249	8,570.0471	2,133.2495	367.63075
Slice 31	897.15	299.71749	967.15236	8,618.7567	2,141.9643	369.13157
Slice 32	900.72885	299.32526	991.46839	8,734.8385	2,163.8578	372.90422
Slice 33	906.57885	298.60403	1,036.2124	8,853.6187	2,220.8549	382.72593
Slice 34	918.8756	297.00521	1,135.4314	8,893.7461	2,206.5278	380.25635
Slice 35	932.97395	295.27115	1,243.0094	8,776.5645	2,119.015	365.17677
Slice 36	944.41945	293.98102	1,323.0045	8,604.5116	2,058.3906	354.72925
Slice 37	955.86495	292.69088	1,402.9996	8,427.7148	1,996.3072	344.03001
Slice 38	966.49385	291.63515	1,468.404	8,338.3637	1,921.8219	331.19374
Slice 39	971.9	291.18264	1,496.4001	8,227.4618	1,888.6289	325.47281
Slice 40	975.55	290.87712	1,515.3018	8,133.4567	1,861.5711	320.81141
Slice 41	979.4	290.55487	1,535.2393	8,027.9503	1,831.4313	315.61647
Slice 42	982.45	290.29957	1,551.0339	7,903.5201	1,797.6387	309.7919
Slice 43	985.6913	290.02826	1,567.8192	7,769.544	1,761.1825	303.51021
Slice 44	986.7913	289.93908	1,573.3351	7,770.1926	1,750.6494	301.69511
Slice 45	988.5	289.81975	1,580.7056	7,715.125	1,735.5919	299.10038
Slice 46	991.25	289.62769	1,592.5678	7,607.0225	1,706.599	294.10282
Slice 47	996.15	289.28547	1,613.704	7,756.6337	1,737.6466	299.4532
Slice 48	1,001.9	288.88389	1,638.5068	7,989.4851	1,787.7227	308.08304
Slice 49	1,007.3	288.50675	1,661.7998	8,039.7571	1,794.1978	309.19978
Slice 50	1,011.55	288.20993	1,680.1322	8,073.7674	1,797.9586	309.84859
Slice 51	1,014.25	288.02136	1,691.7787	8,099.2285	1,801.2734	310.41799
Slice 52	1,018.6795	287.71201	1,710.8855	6,772.1962	1,473.037	253.85152
Slice 53	1,022.5295	288.05954	1,689.0281	5,825.9302	1,592.7497	274.48227

Slice 54	1,030.938	291.90042	1,448.9828	4,410.2222	1,197.5409	206.37542
Slice 55	1,045.4139	298.51285	1,035.7231	3,313.6626	957.42953	164.99663
Slice 56	1,053.6574	302.52914	784.73951	3,005.6219	1,021.162	175.98001
Slice 57	1,057.0989	304.95957	632.92762	2,692.5796	1,189.1406	100
Slice 58	1,065.491	310.88616	262.73476	1,699.1345	863.07601	150
Slice 59	1,074.9437	317.56173	-0	532.81201	320.14575	150

Figure 8 - Stability Analysis of Long Term Drained Conditions – Subgrade Failures

Drained Final Grade

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File Information

Title: [Model City - RMU-2 XS 3050](#)
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 Last Edited By: [Peter J. Carey](#)
 Revision Number: [390](#)
 File Version: [8.0](#)
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 File Name: [RMU2X3050r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revisions\geoslope\final config\](#)
 Last Solved Date: [2/16/2013](#)
 Last Solved Time: [9:49:22 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Drained Final Grade

Description: [Assuming Full Consolidation has Occured](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 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: [Block](#)
 Critical slip surfaces saved: [1](#)
 Restrict Block Crossing: [No](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 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: [25 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [150 psf](#)
 Phi': [31 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Drained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [118 pcf](#)
 Strength Function: [normalized phi](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure

Piezometric Line: 1

GC OverConsolidated

Model: [Mohr-Coulomb](#)Unit Weight: [125 pcf](#)Cohesion': [100 psf](#)Phi': [30 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: 1

Side Slope Liner

Model: [Mohr-Coulomb](#)Unit Weight: [115 pcf](#)Cohesion': [0 psf](#)Phi': [13 °](#)Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)

Pore Water Pressure

Piezometric Line: 1

Structural Fill

Model: [Mohr-Coulomb](#)Unit Weight: [128 pcf](#)Cohesion': [195 psf](#)Phi': [28.7 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: 1

Final Cover

Model: [Mohr-Coulomb](#)Unit Weight: [125 pcf](#)Cohesion': [0 psf](#)Phi': [30 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: 1

NOT ACTIVE

Model: [\(None\)](#)

Pore Water Pressure

Piezometric Line: 1

Slip Surface Limits

Left Coordinate: [\(606.47519, 438.67767\) ft](#)Right Coordinate: [\(1,114.1689, 322.83421\) ft](#)

Slip Surface Block

Left Grid

Upper Left: [\(772.4, 311.8\) ft](#)Lower Left: [\(766.2, 293.2\) ft](#)Lower Right: [\(856.7, 291.7\) ft](#)X Increments: [10](#)Y Increments: [5](#)

Starting Angle: 135 °

Ending Angle: 160 °

Angle Increments: 2

Right Grid

Upper Left: (925.8, 305.9) ft

Lower Left: (925.8, 290.4) ft

Lower Right: (997.2, 287.7) ft

X Increments: 3

Y Increments: 3

Starting Angle: 15 °

Ending Angle: 45 °

Angle Increments: 2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	313

Maximum Suction: 0 psf

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

normalized phi

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: Mesri1

Field

tan_Phi_100kPa: 0.549

power: 0.147

pa: 2089

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	500	306.45
Point 2	500	286.75
Point 3	500	280.9
Point 4	500	271.2
Point 5	740.7	270.8
Point 6	634.5	269.8
Point 7	1,200	269.95
Point 8	1,199.9987	278.5
Point 9	1,200	259.75
Point 10	1,200	286.05
Point 11	1,200	306.5
Point 12	1,200	322
Point 13	1,107.4	322.9
Point 14	1,023.4	321.1
Point 15	1,023.5	320.9
Point 16	898.8	320
Point 17	991.25	345.25
Point 18	999.8	349.5
Point 19	1,016	350
Point 20	997.75	348.5
Point 21	992.3	347.1
Point 22	978.7	349.8
Point 23	984.4	350
Point 24	972.5	344.75
Point 25	971	349.5
Point 26	914.8	371.1
Point 27	863.6	313.6

Point 28	798.1	312.4
Point 29	780.3	309.03
Point 30	732.5	315.9
Point 31	732.5	314.4
Point 32	732.6	309.9
Point 33	669.1	317
Point 34	669.1	315
Point 35	500	314.5
Point 36	500	320
Point 37	500	318
Point 38	500	433.6
Point 39	899.6	369.5
Point 40	500	258.75
Point 41	560.6	281.9
Point 42	880.5	314
Point 43	1,010.6	307.3
Point 44	1,023.5	282.3
Point 45	983.2	286.1
Point 46	1,026.6	269.9
Point 47	798.1	314.9
Point 48	873	311.5
Point 49	990	345.25
Point 50	987	348.5
Point 51	707.7	308.9
Point 52	669.1	311.05
Point 53	500	303.35
Point 54	707.7	305.9
Point 55	780.3	306
Point 56	863.7	305.4
Point 57	1,010.35	303.8
Point 58	1,199.9987	303
Point 59	653.3	286.1
Point 60	836.6	308.1
Point 61	890.3	308.2
Point 62	863.7	308.4
Point 63	890.3	305.2
Point 64	794.8	398.1
Point 65	582.2	437.6
Point 66	696.4	431
Point 67	809.8	399.6
Point 68	861.4	307.6
Point 69	797.1	308.9
Point 70	863.6	311.6
Point 71	500	436.3
Point 72	581.8	440.1
Point 73	696.3	433.5

Point 74	795	400.7
Point 75	810.1	402.1
Point 76	980.1	352
Point 77	915	373.7
Point 78	900.2	372.2
Point 79	1,080.5	282.7
Point 80	663.1	270.7
Point 81	565.2	307.6
Point 82	565.2	304.53077

Regions

	Material	Points	Area (ft ²)
Region 1	Bottom Liner	37,34,31,28,70,48,42,27,47,30,33,36	756.75
Region 2	Side Slope Liner	42,16,24,49,50,23,22,25,27	606.02
Region 3	Structural Fill	16,24,49,50,23,21,20,18,19,14,15	2,170.4
Region 4	Upper Till	42,16,15,14,13,12,11,43,61,62,48	4,514.2
Region 5	NOT ACTIVE	4,6,46,7,9,40	7,520.4
Region 6	NOT ACTIVE	4,3,41,80,5,44,79,8,7,46,6	5,230.9
Region 7	Deflection surface	3,2,59,45,10,8,79,44,5,80,41	6,088.1
Region 8	GC-Drained	2,53,82,54,55,56,63,57,58,10,45,59	12,919
Region 9	Upper Till	35,52,32,29,51,81,1	992.38
Region 10	CCL	37,34,31,28,70,48,62,68,60,69,29,32,52,35	1,426.9
Region 11	GC OverConsolidated	53,1,81,51,29,69,60,68,56,55,54,82	1,073.1
Region 12	GC OverConsolidated	62,61,43,11,58,57,63,56,68	1,137.4
Region 13	Final Cover	38,65,66,64,67,39,26,22,23,76,77,78,75,74,73,72,71	1,253.8
Region 14	Waste Material	38,65,66,64,67,39,26,22,25,27,47,30,33,36	41,876

Current Slip Surface

Slip Surface: 9,505

F of S: 1.62

Volume: 20,714.519 ft³

Weight: 2,404,890.6 lbs

Resisting Moment: 1.9913919e+008 lbs-ft

Activating Moment: 1.2285724e+008 lbs-ft

Resisting Force: 828,727.2 lbs

Activating Force: 511,623.21 lbs

F of S Rank: 1

Exit: (1,073.2064, 322.16728) ft

Entry: (683.20218, 434.25498) ft

Radius: 201.35463 ft

Center: (931.1, 507) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	684.48875	432.93451	-0	113.73208	65.663246	0
Slice 2	691.03766	426.21303	0	632.21352	365.00865	0
Slice 3	702.2501	414.70512	0	1,344.0165	775.96826	0
Slice 4	713.0979	404.4069	0	1,936.1175	1,117.818	0

Slice 5	722.8933	396.02423	0	2,323.3202	1,341.3695	0
Slice 6	734.6126	386.56563	0	2,814.7681	1,625.1071	0
Slice 7	748.2558	376.03112	0	3,263.1411	1,883.9754	0
Slice 8	760.00973	367.198	0	3,698.3026	2,135.216	0
Slice 9	769.87437	360.06627	0	3,987.9501	2,302.4441	0
Slice 10	779.7779	352.86391	0	4,266.9332	2,463.515	0
Slice 11	789.7203	345.59092	0	4,565.9818	2,636.1708	0
Slice 12	794.74575	341.91245	0	4,631.5417	2,674.0219	0
Slice 13	794.9	341.79307	0	4,636.1637	2,676.6904	0
Slice 14	802.55	335.87286	0	5,144.9456	2,970.4357	0
Slice 15	815.17451	326.10294	0	5,820.9563	3,360.7307	0
Slice 16	825.32352	318.24877	0	6,163.7474	3,558.6412	0
Slice 17	830.43962	314.28951	0	6,339.1589	3,659.9151	0
Slice 18	830.57915	314.18152	0	6,609.3434	2,076.1372	516.34725
Slice 19	833.02123	313.02529	0	7,587.6	2,204.11	684.18442
Slice 20	839.69885	309.9475	270.87952	7,755.5087	1,319.7421	1,000
Slice 21	846.62632	306.75456	468.57736	7,708.5459	4,179.9977	100
Slice 22	855.31015	304.79367	589.00446	9,112.8926	2,381.1547	410.35433
Slice 23	862.55	303.88385	644.16588	8,990.0731	2,338.6809	403.03209
Slice 24	864.54287	303.63341	659.34986	8,961.0997	2,328.1224	401.212
Slice 25	869.19287	303.04906	694.77886	8,896.0018	2,304.0538	397.06388
Slice 26	876.75	302.09937	752.35764	8,788.8871	2,264.5266	390.25322
Slice 27	880.71574	301.601	782.57318	8,732.3492	2,243.659	386.65608
Slice 28	882.58219	301.36645	796.79392	8,708.1362	2,234.4032	385.06085
Slice 29	887.26645	300.83341	829.01354	8,713.1902	2,193.5483	378.02007
Slice 30	894.55	300.05163	876.17554	8,599.5861	2,155.336	371.4362
Slice 31	899.2	299.55252	906.28493	8,526.5745	2,130.7637	367.20264
Slice 32	899.9	299.47739	910.81753	8,514.3206	2,126.7602	366.51157
Slice 33	907.6	298.65091	960.6761	8,751.2459	2,171.3131	374.18896
Slice 34	919.89435	297.3313	1,040.2837	8,917.1038	2,191.8005	377.72093
Slice 35	927.33385	296.53897	1,088.0694	8,805.9522	2,150.114	370.5358
Slice 36	935.04418	295.76908	1,134.3952	8,699.8772	2,102.8346	362.38755
Slice 37	945.37452	294.76327	1,194.8585	8,511.87	2,043.781	352.20962
Slice 38	955.65477	293.85204	1,249.4319	8,368.5649	1,977.6383	340.81376
Slice 39	965.88492	293.03537	1,298.1154	8,147.2291	1,913.4771	329.7536
Slice 40	971.75	292.56716	1,326.0263	8,017.7559	1,875.906	323.28049
Slice 41	973.50225	292.42728	1,334.365	7,972.9348	1,863.1871	321.08827
Slice 42	976.60225	292.22823	1,346.0956	7,951.2095	1,844.1424	317.8061
Slice 43	979.4	292.06947	1,355.3795	7,860.5011	1,820.3016	313.69791
Slice 44	982.25	291.90775	1,364.8368	7,720.6853	1,784.6118	307.54611
Slice 45	985.7	291.71198	1,376.2851	7,562.1282	1,743.8126	300.51598
Slice 46	988.5	291.5531	1,385.5764	7,476.8407	1,721.0444	296.59188
Slice 47	991.15	291.40272	1,394.3701	7,387.3054	1,697.3169	292.50408
Slice 48	995.025	291.18283	1,407.2287	7,444.0175	1,707.9066	294.32794
Slice 49	998.775	290.97004	1,419.6725	7,618.6257	1,746.9645	301.05926
Slice 50	1,005.075	290.61255	1,440.5781	7,734.4898	1,769.7661	304.98858

Slice 51	1,013.175	290.15291	1,467.4567	7,803.0273	1,779.7538	306.70908
Slice 52	1,018.5817	289.84611	1,485.3981	6,539.6816	1,467.7703	252.94522
Slice 53	1,022.2817	290.24482	1,459.6952	5,662.413	1,639.8233	282.59566
Slice 54	1,032.3094	295.13364	1,152.401	4,149.4755	1,228.9913	211.7957
Slice 55	1,044.1566	301.56113	748.68929	3,487.8962	1,221.8455	210.56421
Slice 56	1,049.5474	305.38507	508.87608	2,977.9958	1,425.547	100
Slice 57	1,056.4936	310.31223	199.87506	2,175.0604	1,186.8111	150
Slice 58	1,067.0965	317.83331	-0	842.72284	506.35897	150

Figure 9 - Stability Analysis of Long Term Drained Conditions – Subgrade Failures

Drained Final Grade -Grid Failures

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File Information

Title: [Model City - RMU-2 XS3200](#)
 Created By: [Peter J. Carey](#)
 Revision Number: [418](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/18/2013](#)
 Time: [10:02:11 AM](#)
 File Name: [RMU2X3200r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/18/2013](#)
 Last Solved Time: [11:20:54 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Drained Final Grade -Grid Failures

Description: [Final Grade - Static Drained](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 Lambda
 Lambda 1: [0](#)
 Lambda 2: [0.1](#)
 Lambda 3: [0.2](#)
 Lambda 4: [0.3](#)
 Lambda 5: [0.4](#)
 Lambda 6: [0.5](#)
 Lambda 7: [0.6](#)
 Lambda 8: [0.7](#)
 Lambda 9: [0.8](#)
 Lambda 10: [0.9](#)
 Lambda 11: [1](#)
 Lambda 12: [1.1](#)
 Lambda 13: [1.2](#)
 Lambda 14: [1.3](#)
 Lambda 15: [1.4](#)
 Lambda 16: [1.5](#)
 Lambda 17: [1.6](#)
 Lambda 18: [1.7](#)

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: [Block](#)

Critical slip surfaces saved: [1](#)

Restrict Block Crossing: [No](#)

Optimize Critical Slip Surface Location: [Yes](#)

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: [25 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

Waste Material

Model: [Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion': [0 psf](#)

Phi': [30 °](#)

Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)

Unit Weight: [120 pcf](#)

Strength Function: [Baseliner](#)

Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)

Unit Weight: [120 pcf](#)

Cohesion': [1,000 psf](#)

Phi': [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [125 pcf](#)

Cohesion': [150 psf](#)

Phi': [31 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

GC-Drained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [118 pcf](#)
 Strength Function: [normalized phi](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC OverConsolidated

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [100 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)
 Unit Weight: [115 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [13 °](#)
 Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Structural Fill

Model: [Mohr-Coulomb](#)
 Unit Weight: [130 pcf](#)
 Cohesion': [195 psf](#)
 Phi': [28.7 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Slip Surface Limits

Left Coordinate: [\(931.73033, 368.05373\) ft](#)
 Right Coordinate: [\(1,088.3996, 320.0367\) ft](#)

Slip Surface Block

Left Grid

Upper Left: (991.6, 317.3) ft
 Lower Left: (991.1, 308.7) ft
 Lower Right: (1,002.4, 306.8) ft
 X Increments: 3
 Y Increments: 3
 Starting Angle: 115 °
 Ending Angle: 135 °
 Angle Increments: 2

Right Grid

Upper Left: (1,010.5, 313.7) ft
 Lower Left: (1,012.4, 307.7) ft
 Lower Right: (1,030.2, 310.2) ft
 X Increments: 3
 Y Increments: 3
 Starting Angle: 0 °
 Ending Angle: 45 °
 Angle Increments: 2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Reinforcements

Reinforcement 1

Type: Geosynthetic
 Outside Point: (1,024.5, 319.5) ft
 Inside Point: (993, 319.3918) ft
 Slip Surface Intersection: (993.07645, 319.39206) ft
 Total Length: 31.500186 ft
 Reinforcement Direction: 0.19681 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 6,800 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 6,800 lbs
 Pullout Force: 101.74931 lbs
 Pullout Force per Length: 1,330.9517 lbs/ft
 Available Length: 0.076448539 ft
 Required Length: 0.076448539 ft
 Governing Component: Pullout Resistance

Reinforcement 2

Type: [Geosynthetic](#)
 Outside Point: (1,023.5, 321) ft
 Inside Point: (993, 321) ft
 Slip Surface Intersection: () ft
 Total Length: [30.5 ft](#)
 Reinforcement Direction: 0 °
 F of S Dependent: [Yes](#)
 Interface Adhesion: [0 psf](#)
 Interface Shear Angle: 30 °
 Surface Area Factor: [1](#)
 Resistance Reduction Factor: [1](#)
 Force Distribution: [Concentrated](#)
 Tensile Capacity: [6,800 lbs](#)
 Reduction Factor: [1](#)
 Force Orientation: [0](#)
 Max. Pullout Force: [6,800 lbs](#)
 Pullout Force: [0 lbs](#)
 Pullout Force per Length: [0 lbs/ft](#)
 Available Length: [0 ft](#)
 Required Length: [0 ft](#)
 Governing Component: (none)

Reinforcement 3

Type: [Geosynthetic](#)
 Outside Point: (1,023.125, 322.5) ft
 Inside Point: (993, 322.5) ft
 Slip Surface Intersection: () ft
 Total Length: [30.125 ft](#)
 Reinforcement Direction: 0 °
 F of S Dependent: [Yes](#)
 Interface Adhesion: [0 psf](#)
 Interface Shear Angle: 30 °
 Surface Area Factor: [1](#)
 Resistance Reduction Factor: [1](#)
 Force Distribution: [Concentrated](#)
 Tensile Capacity: [5,900 lbs](#)
 Reduction Factor: [1](#)
 Force Orientation: [0](#)
 Max. Pullout Force: [5,900 lbs](#)
 Pullout Force: [0 lbs](#)
 Pullout Force per Length: [0 lbs/ft](#)
 Available Length: [0 ft](#)
 Required Length: [0 ft](#)
 Governing Component: (none)

Reinforcement 4

Type: [Geosynthetic](#)
 Outside Point: (1,022.75, 324) ft
 Inside Point: (991, 324) ft
 Slip Surface Intersection: () ft
 Total Length: [31.75 ft](#)
 Reinforcement Direction: 0 °
 F of S Dependent: [Yes](#)
 Interface Adhesion: [0 psf](#)
 Interface Shear Angle: 30 °
 Surface Area Factor: [1](#)
 Resistance Reduction Factor: [1](#)
 Force Distribution: [Concentrated](#)
 Tensile Capacity: [5,900 lbs](#)
 Reduction Factor: [1](#)
 Force Orientation: [0](#)
 Max. Pullout Force: [5,900 lbs](#)

Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 5

Type: Geosynthetic
 Outside Point: (1,022.375, 325.5) ft
 Inside Point: (991, 325.5) ft
 Slip Surface Intersection: () ft
 Total Length: 31.375 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 5,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 5,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 6

Type: Geosynthetic
 Outside Point: (1,022, 327) ft
 Inside Point: (990.5, 327) ft
 Slip Surface Intersection: () ft
 Total Length: 31.5 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 4,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 4,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 7

Type: Geosynthetic
 Outside Point: (1,021.5, 328.5) ft
 Inside Point: (990, 328.5) ft
 Slip Surface Intersection: () ft
 Total Length: 31.5 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1

Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 4,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 4,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 8

Type: Geosynthetic
 Outside Point: (1,021.25, 330) ft
 Inside Point: (1,011.25, 330) ft
 Slip Surface Intersection: () ft
 Total Length: 10 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 1,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 1,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 9

Type: Geosynthetic
 Outside Point: (1,020.875, 331.5) ft
 Inside Point: (985.9975, 331.5) ft
 Slip Surface Intersection: () ft
 Total Length: 34.8775 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 4,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 4,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 10

Type: Geosynthetic
 Outside Point: (1,020.5, 333) ft
 Inside Point: (1,010.5, 333) ft
 Slip Surface Intersection: () ft

Total Length: 10 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 1,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 1,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 11

Type: Geosynthetic
 Outside Point: (1,020.125, 334.5) ft
 Inside Point: (984, 334.5) ft
 Slip Surface Intersection: () ft
 Total Length: 36.125 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 4,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 4,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 12

Type: Geosynthetic
 Outside Point: (1,019.75, 336) ft
 Inside Point: (1,009.75, 336) ft
 Slip Surface Intersection: () ft
 Total Length: 10 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 1,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 1,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 13

Type: [Geosynthetic](#)
 Outside Point: (1,019.375, 337.5) ft
 Inside Point: (982, 337.5) ft
 Slip Surface Intersection: () ft
 Total Length: 37.375 ft
 Reinforcement Direction: 0 °
 F of S Dependent: [Yes](#)
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: [Concentrated](#)
 Tensile Capacity: 4,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 4,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 14

Type: [Geosynthetic](#)
 Outside Point: (1,019, 339) ft
 Inside Point: (1,009, 339) ft
 Slip Surface Intersection: () ft
 Total Length: 10 ft
 Reinforcement Direction: 0 °
 F of S Dependent: [Yes](#)
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: [Concentrated](#)
 Tensile Capacity: 1,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 1,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 15

Type: [Geosynthetic](#)
 Outside Point: (1,018.625, 340.5) ft
 Inside Point: (982, 340.5) ft
 Slip Surface Intersection: () ft
 Total Length: 36.625 ft
 Reinforcement Direction: 0 °
 F of S Dependent: [Yes](#)
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: [Concentrated](#)
 Tensile Capacity: 3,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 3,000 lbs

Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 16

Type: Geosynthetic
 Outside Point: (1,018.25, 342) ft
 Inside Point: (1,008.25, 342) ft
 Slip Surface Intersection: () ft
 Total Length: 10 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 1,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 1,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 17

Type: Geosynthetic
 Outside Point: (1,017.875, 343.5) ft
 Inside Point: (981.5, 343.5) ft
 Slip Surface Intersection: () ft
 Total Length: 36.375 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 2,300 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 2,300 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 18

Type: Geosynthetic
 Outside Point: (1,017.5, 345) ft
 Inside Point: (993.5, 345) ft
 Slip Surface Intersection: () ft
 Total Length: 24 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1

Resistance Reduction Factor: 1
 Force Distribution: [Concentrated](#)
 Tensile Capacity: [2,300 lbs](#)
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: [2,300 lbs](#)
 Pullout Force: [0 lbs](#)
 Pullout Force per Length: [0 lbs/ft](#)
 Available Length: [0 ft](#)
 Required Length: [0 ft](#)
 Governing Component: [\(none\)](#)

Reinforcement 19

Type: [Geosynthetic](#)
 Outside Point: [\(1,017.125, 346.5\) ft](#)
 Inside Point: [\(996.5, 346.5\) ft](#)
 Slip Surface Intersection: [\(\)](#) ft
 Total Length: [20.625 ft](#)
 Reinforcement Direction: [0 °](#)
 F of S Dependent: [Yes](#)
 Interface Adhesion: [0 psf](#)
 Interface Shear Angle: [30 °](#)
 Surface Area Factor: [1](#)
 Resistance Reduction Factor: [1](#)
 Force Distribution: [Concentrated](#)
 Tensile Capacity: [3,000 lbs](#)
 Reduction Factor: [1](#)
 Force Orientation: [0](#)
 Max. Pullout Force: [3,000 lbs](#)
 Pullout Force: [0 lbs](#)
 Pullout Force per Length: [0 lbs/ft](#)
 Available Length: [0 ft](#)
 Required Length: [0 ft](#)
 Governing Component: [\(none\)](#)

Reinforcement 20

Type: [Geosynthetic](#)
 Outside Point: [\(1,016.75, 348\) ft](#)
 Inside Point: [\(998.5, 348\) ft](#)
 Slip Surface Intersection: [\(\)](#) ft
 Total Length: [18.25 ft](#)
 Reinforcement Direction: [0 °](#)
 F of S Dependent: [Yes](#)
 Interface Adhesion: [0 psf](#)
 Interface Shear Angle: [30 °](#)
 Surface Area Factor: [1](#)
 Resistance Reduction Factor: [1](#)
 Force Distribution: [Concentrated](#)
 Tensile Capacity: [3,000 lbs](#)
 Reduction Factor: [1](#)
 Force Orientation: [0](#)
 Max. Pullout Force: [3,000 lbs](#)
 Pullout Force: [0 lbs](#)
 Pullout Force per Length: [0 lbs/ft](#)
 Available Length: [0 ft](#)
 Required Length: [0 ft](#)
 Governing Component: [\(none\)](#)

Anisotropic Strength Functions

clay ellipse staticshear

Model: [Spline Data Point Function](#)

Function: [Modifier Factor vs. Inclination](#)

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: [Inclination \(°\)](#), [Modifier Factor](#)

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

normalized phi

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: [Mesri1](#)

Field

tan_Phi_100kPa: 0.549

power: 0.147

pa: 2089

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	500	305.75

Point 2	500	288.15
Point 3	500	283.4
Point 4	500	273.4
Point 5	609.5	272.3
Point 6	1,200	269.95
Point 7	1,199.9987	280.3
Point 8	1,200	259.75
Point 9	1,200	286.7
Point 10	1,200	304.9
Point 11	1,200	320.1
Point 12	1,023.7	320
Point 13	1,012.5	320
Point 14	898.8	320
Point 15	991.25	345.25
Point 16	999.8	349.5
Point 17	1,016	350
Point 18	992.5	346.7
Point 19	978.7	349.8
Point 20	984.8	350
Point 21	972.4	344.6
Point 22	971.4	349.6
Point 23	910.3	372.6
Point 24	860.8	312.7
Point 25	800.5	311.2
Point 26	780.3	308.1
Point 27	735.4	314.9
Point 28	735.4	313.4
Point 29	735.5	308.9
Point 30	500	313.3
Point 31	500	319.3
Point 32	500	317.3
Point 33	500	426.2
Point 34	895.2	371.1
Point 35	500	258.75
Point 36	520.6	283.6
Point 37	876	312.5
Point 38	1,010.6	307.3
Point 39	854.9	273.7
Point 40	984.6	286.8
Point 41	1,026.6	269.9
Point 42	800.5	313.7
Point 43	870	310.5
Point 44	990	345.2
Point 45	987	348.5
Point 46	714.8	307.9
Point 47	500	302.65

Point 48	714.8	304.9
Point 49	780.3	305.07
Point 50	863	305.15
Point 51	1,010.35	303.8
Point 52	1,199.9987	301.4
Point 53	719.7	287.1
Point 54	890.3	308.2
Point 55	863	308.15
Point 56	890.3	305.2
Point 57	790.2	399.6
Point 58	528.3	431
Point 59	696.4	431
Point 60	805.3	401.1
Point 61	858.4	306.6
Point 62	799.9	307.7
Point 63	860.8	310.7
Point 64	500	428.9
Point 65	527.9	433.5
Point 66	696.3	433.5
Point 67	790.5	402.1
Point 68	805.5	403.7
Point 69	980.1	352
Point 70	910.5	375.1
Point 71	895.5	373.7
Point 72	1,092.6	283.3
Point 73	630.8	274.6
Point 74	651.5	307.4
Point 75	651.5	304.33077
Point 76	625	437.1
Point 77	624.9	434.6
Point 78	1,004	316
Point 79	825.1	269.8

Regions

	Material	Points	Area (ft²)
Region 1	Bottom Liner	32,28,25,63,43,37,24,42,27,31	702.82
Region 2	Side Slope Liner	37,14,21,44,45,20,19,22,24	631.75
Region 3	Structural Fill	14,21,44,45,20,18,16,17,12,13,78	2,446.9
Region 4	Upper Till	37,14,78,13,12,11,10,38,54,55,43	3,999.3
Region 5	NOT ACTIVE	4,5,79,41,6,8,35	8,020.2
Region 6	NOT ACTIVE	4,3,36,73,39,72,7,6,41,79,5	5,003.5
Region 7	Deflection surface	3,2,53,40,9,7,72,39,73,36	6,471.5
Region 8	GC-Drained	2,47,75,48,49,50,56,51,52,9,40,53	11,774
Region 9	Upper Till	30,29,26,46,74,1	990.49
Region 10	CCL	32,28,25,63,43,55,61,62,26,29,30	1,504.8

Region 11	GC OverConsolidated	47,1,74,46,26,62,61,50,49,48,75	1,034.4
Region 12	GC OverConsolidated	55,54,38,10,52,51,56,50,61	1,143.1
Region 13	Final Cover	33,58,77,59,57,60,34,23,19,20,69,70,71,68,67,66,76,65,64	1,237.8
Region 14	Waste Material	33,58,77,59,57,60,34,23,19,22,24,42,27,31	41,745

Current Slip Surface

Slip Surface: 2,305

F of S: 1.62

Volume: 1,839.2907 ft³

Weight: 232,556.78 lbs

Resisting Moment: 19,554,491 lbs-ft

Activating Moment: 12,083,851 lbs-ft

Resisting Force: 125,391.29 lbs

Activating Force: 77,493.88 lbs

F of S Rank: 1

Exit: (1,042.8664, 320.01087) ft

Entry: (931.73033, 368.05373) ft

Radius: 67.405815 ft

Center: (1,033.5, 456.7) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	933.46892	366.8249	0	64.141175	37.031925	0
Slice 2	936.94611	364.36726	0	188.86371	109.04052	0
Slice 3	939.84285	362.31986	0	284.39304	164.1944	0
Slice 4	942.14115	360.73091	0	353.87799	204.31155	0
Slice 5	945.15955	358.73757	0	435.57288	251.47812	0
Slice 6	948.91605	356.29165	0	527.86705	304.76418	0
Slice 7	952.67255	353.84573	0	618.2852	356.96713	0
Slice 8	956.5798	351.26012	0	706.76859	408.05304	0
Slice 9	960.65635	348.29808	0	778.78952	449.63434	0
Slice 10	965.09752	344.82897	0	970.68313	224.09986	0
Slice 11	967.78851	342.72697	-0	988.92789	541.4222	195
Slice 12	969.74295	340.95188	-0	1,007.5497	551.61734	195
Slice 13	971.9	338.94358	-0	1,125.3025	616.08514	195
Slice 14	973.59435	337.36606	-0	1,213.5693	664.40981	195
Slice 15	976.74435	334.26736	-0	1,324.6565	725.22827	195
Slice 16	979.34025	331.63024	-0	1,469.1035	804.31065	195
Slice 17	980.04025	330.92278	-0	1,559.0567	853.55862	195
Slice 18	981.3696	329.65383	-0	1,618.8417	886.28993	195
Slice	983.7196	327.47751	-0	1,782.9533	976.13844	195

19						
Slice 20	985.9	325.53123	-0	1,883.6779	1,031.2835	195
Slice 21	987.31385	324.26918	-0	1,955.3863	1,070.5427	195
Slice 22	988.81385	322.98682	-0	2,090.9693	1,144.7723	195
Slice 23	991.25	320.92845	-0	2,208.7939	1,209.2794	195
Slice 24	992.78175	319.63423	-0	2,296.2495	1,257.1599	195
Slice 25	994.74762	318.86193	-0	3,515.8912	1,924.8942	195
Slice 26	998.11587	317.79345	-0	3,810.4243	2,086.1464	195
Slice 27	1,001.1043	316.84545	-0	4,026.9457	2,204.6884	195
Slice 28	1,002.9008	316.22739	-0	3,831.4052	2,097.6331	195
Slice 29	1,003.6965	315.89709	-0	3,882.7882	2,333.0145	150
Slice 30	1,004.7608	315.45526	-0	3,941.7533	2,368.4443	150
Slice 31	1,007.2662	314.41523	45.112412	4,078.764	2,423.6624	150
Slice 32	1,010.7554	312.96683	135.33724	4,271.0996	2,485.0168	150
Slice 33	1,014.25	311.51618	225.70209	4,470.1391	2,550.3151	150
Slice 34	1,017.1148	310.32699	299.78034	4,151.7114	2,314.4737	150
Slice 35	1,020.194	309.6065	344.602	3,477.1471	1,882.223	150
Slice 36	1,022.9293	309.62706	343.19675	2,963.7213	1,574.57	150
Slice 37	1,025.8745	310.69059	276.70173	2,035.2877	1,056.6651	150
Slice 38	1,030.2236	312.26101	178.5139	1,584.2447	844.64829	150
Slice 39	1,033.9551	314.08213	64.70999	1,466.381	842.2089	150
Slice 40	1,037.3507	316.34125	-0	862.90561	518.486	150
Slice 41	1,041.0279	318.78766	-0	315.17359	189.3754	150

Figure 10 - Stability Analysis of Long Term Drained Conditions – Subgrade Failures

DRAINED FINAL GRADE

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File Information

Title: [Model City - RMU-2 XS3728](#)
 Created By: [Peter J. Carey](#)
 Revision Number: [383](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/17/2013](#)
 Time: [2:19:35 PM](#)
 File Name: [RMU2X3728r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/17/2013](#)
 Last Solved Time: [3:02:00 PM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

DRAINED FINAL GRADE

Description: [DRAINED CONDITIONS FINAL GRADE](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 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: [Block](#)

Critical slip surfaces saved: **1**
 Restrict Block Crossing: **No**
 Optimize Critical Slip Surface Location: **Yes**
 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: **25 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

Waste Material

Model: **Mohr-Coulomb**
 Unit Weight: **111 pcf**
 Cohesion': **0 psf**
 Phi': **30 °**
 Phi-B: **0 °**

Bottom Liner

Model: **Shear/Normal Fn.**
 Unit Weight: **120 pcf**
 Strength Function: **Baseliner**
 Phi-B: **0 °**

CCL

Model: **Mohr-Coulomb**
 Unit Weight: **120 pcf**
 Cohesion': **1,000 psf**
 Phi': **10 °**
 Phi-B: **0 °**
 Pore Water Pressure
 Piezometric Line: **1**

Upper Till

Model: **Mohr-Coulomb**
 Unit Weight: **125 pcf**
 Cohesion': **150 psf**
 Phi': **31 °**
 Phi-B: **0 °**
 Pore Water Pressure
 Piezometric Line: **1**

GC-Drained

Model: **Shear/Normal Fn.**
 Unit Weight: **118 pcf**
 Strength Function: **normalized phi**
 Phi-B: **0 °**
 Anisotropic Strength Fn: **clay ellipse staticshear**
 Pore Water Pressure
 Piezometric Line: **1**

GC OverConsolidated

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [100 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)
 Unit Weight: [115 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [13 °](#)
 Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Structural Fill

Model: [Mohr-Coulomb](#)
 Unit Weight: [135 pcf](#)
 Cohesion': [195 psf](#)
 Phi': [28.7 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Slip Surface Limits

Left Coordinate: [\(252.03542, 336.05185\) ft](#)
 Right Coordinate: [\(770.84263, 407.9993\) ft](#)

Slip Surface Block

Left Grid
 Upper Left: [\(399, 315\) ft](#)
 Lower Left: [\(390, 290\) ft](#)
 Lower Right: [\(458, 290\) ft](#)
 X Increments: [3](#)
 Y Increments: [3](#)
 Starting Angle: [135 °](#)
 Ending Angle: [180 °](#)

Angle Increments: 2

Right Grid

Upper Left: (540, 309) ft

Lower Left: (541, 288) ft

Lower Right: (634, 295) ft

X Increments: 3

Y Increments: 3

Starting Angle: 45 °

Ending Angle: 65 °

Angle Increments: 2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	200	315
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

normalized phi

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: Mesri1

Field

tan_Phi_100kPa: 0.549

power: 0.147

pa: 2089

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	486.6	305.1
Point 2	500.1	290.5
Point 3	484	285.1
Point 4	500.3	280.2
Point 5	646	278.3
Point 6	1,200	270.4
Point 7	1,200	281.2
Point 8	1,200	259.75
Point 9	1,200	289.7
Point 10	1,200	303.8
Point 11	1,200	345.8
Point 12	1,023.3	321.9
Point 13	1,008.8	322
Point 14	999.8	349.5
Point 15	1,016.2	350
Point 16	992.5	347.4
Point 17	978.7	349.8
Point 18	985.3	350
Point 19	972.4	344.6
Point 20	971.4	349.6
Point 21	859.1	310.1
Point 22	690.6	315.1
Point 23	690.6	313.6
Point 24	690.9	309.1
Point 25	548.3	311.8
Point 26	443.7	349.9
Point 27	225	258.75
Point 28	874.6	312.1

Point 29	1,077.5	305.8
Point 30	1,058	281.5
Point 31	956.5	289.8
Point 32	859.1	312.1
Point 33	869	310.2
Point 34	991.3	345.2
Point 35	678.1	304.3
Point 36	486.6	302
Point 37	678.1	301.3
Point 38	856.8	305.3
Point 39	1,077.25	302.3
Point 40	1,199.9987	300.3
Point 41	643.8	289.7
Point 42	856.8	302.3
Point 43	879	376.4
Point 44	772.7	404.9
Point 45	893.8	378
Point 46	856.6	306.1
Point 47	437.1	350
Point 48	773	407.5
Point 49	879.2	378.9
Point 50	894.1	380.5
Point 51	980.1	352
Point 52	668.3	284
Point 53	633.7	303.9
Point 54	633.7	300.8308
Point 55	993.8	316
Point 56	1,030.2	273.5
Point 57	518.7	375.2
Point 58	518.6	377.8
Point 59	628.9	405.4
Point 60	628.6	408
Point 61	721.1	415.5
Point 62	721.1	412.8
Point 63	788.1	406.4
Point 64	788.4	409
Point 65	594.1	284.4
Point 66	546.4	317.6
Point 67	546.6	315.6055
Point 68	1,125.9	301.2989
Point 69	1,125.9	304.8
Point 70	533.9	373.8
Point 71	533.6	376.3
Point 72	644.3	403.9
Point 73	644	406.5
Point 74	654.1	406.60174

Point 75	654.1	409.2
Point 76	680.3	413.9
Point 77	680.4	411.31703
Point 78	697.1	415.3
Point 79	697.7	412.72407
Point 80	734	414.8
Point 81	734.3	412.07212
Point 82	750.1	412.8
Point 83	750.1	410.14334
Point 84	450.7	349.6
Point 85	437	344.9
Point 86	450.3	344.6
Point 87	535.5	316.08408
Point 88	448.5	316.4
Point 89	436.3	320
Point 90	385.2	319.9
Point 91	390.7	322.9
Point 92	394	322.9
Point 93	397	321.4
Point 94	398.9	321.4
Point 95	406	350.1
Point 96	422.3	349.5
Point 97	430.8	345.2
Point 98	429.7	347.3
Point 99	225	306.2
Point 100	225	344.2
Point 101	330.3	320.2
Point 102	320.4	321
Point 103	267.5	332
Point 104	282.8	330
Point 105	236.8	338
Point 106	244.6	338
Point 107	338.3	301.4
Point 108	360.3	304.5
Point 109	225	303.2
Point 110	338.3	298.4
Point 111	360.4	301.5
Point 112	225	284.7
Point 113	225	283.7
Point 114	225	281.4
Point 115	356.2	276
Point 116	355.4	280.2
Point 117	353.4	283
Point 118	333	282.6
Point 119	333.3	281.2
Point 120	412.8	290.2

Point 121	412.8	283.9
Point 122	566.6	303.5
Point 123	566.6	300.41591
Point 124	1,077.9	322.1
Point 125	1,131.2	342.3
Point 126	891.9	317.84898
Point 127	800	259.33974
Point 128	800	276.376
Point 129	800	283.15512
Point 130	800	289.74995
Point 131	800	301.98215
Point 132	800	304.98215
Point 133	800	307.12474
Point 134	800	311.3276
Point 135	800	313.15223
Point 136	800	402.47261
Point 137	800	405.15463

Regions

	Material	Points	Area
Region 1	Bottom Liner	67,23,134,21,33,28,32,135,22,66	57
Region 2	Side Slope Liner	32,28,126,19,34,18,17,20	63
Region 3	Structural Fill	126,19,34,18,16,14,15,12,13,55	2,52
Region 4	Upper Till	55,13,12,124,125,11,10,69,29,38,46,33,28,126	6,89
Region 5	NOT ACTIVE	4,5,128,56,6,8,127,27,114,115	16,73
Region 6	NOT ACTIVE	4,115,114,113,119,116,121,3,65,52,129,30,7,6,56,128,5	6,31
Region 7	Deflection surface	3,121,116,119,113,112,118,117,120,2,41,130,31,9,7,30,129,52,65	5,80
Region 8	GC-Drained	2,120,117,118,112,109,110,111,36,123,54,37,131,42,39,68,40,9,31,130,41	12,35
Region 9	Upper Till	99,100,105,106,103,104,102,101,90,89,88,87,25,24,133,46,38,132,35,53,122,1,108,107	7,17
Region 10	CCL	67,23,134,21,33,46,133,24,25	1,32
Region 11	GC OverConsolidated	36,111,110,109,99,107,108,1,122,53,35,132,38,42,131,37,54,123	1,91
Region 12	GC OverConsolidated	38,29,69,10,40,68,39,42	1,14
Region 13	Final Cover	26,57,70,59,72,74,77,79,62,81,83,44,63,136,43,45,17,18,51,50,49,137,64,48,82,80,61,78,76,75,73,60,71,58,47	1,41
Region	Waste Material	26,57,70,59,72,74,77,79,62,81,83,44,63,136,43,45,17,20,32,135,22,66,84	34,55

14			
Region 15	Side Slope Liner	25,67,66,84,26,47,85,86,87	56
Region 16	Structural Fill	87,88,89,90,91,92,93,94,95,96,97,85,86	2,57
Region 17	Structural Fill	96,98,47,85,97	3

Current Slip Surface

Slip Surface: 2,305

F of S: 1.64

Volume: 17,635.524 ft³

Weight: 2,088,094 lbs

Resisting Moment: 1.465471e+008 lbs-ft

Activating Moment: 89,221,972 lbs-ft

Resisting Force: 695,171.52 lbs

Activating Force: 423,627.1 lbs

F of S Rank: 1

Exit: (337.38708, 320.16127) ft

Entry: (681.3227, 413.98522) ft

Radius: 175.9579 ft

Center: (430, 462) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	341.39922	317.58064	-0	512.09352	307.69683	150
Slice 2	353.56832	309.75339	327.38875	1,832.6058	904.42563	150
Slice 3	364.04423	303.0152	747.85162	2,963.4888	1,279.1988	100
Slice 4	368.67615	300.03592	933.75872	3,380.5027	1,120.6434	193.12402
Slice 5	378.09455	295.59137	1,211.0984	3,776.3905	1,117.9837	192.66554
Slice 6	385.31325	292.58741	1,398.5458	4,283.8841	1,235.918	212.98933
Slice 7	388.06325	291.93744	1,439.1036	4,270.2847	1,045.7239	180.21268
Slice 8	392.35	290.95736	1,500.2604	4,648.4852	1,144.8241	197.29074
Slice 9	395.5	290.23718	1,545.1998	4,651.8864	1,131.9273	195.06786
Slice 10	397.95	289.67704	1,580.1527	4,628.1089	1,113.6483	191.9183
Slice 11	399.62815	289.29337	1,604.0939	5,142.4118	1,264.772	217.96222
Slice 12	401.51712	289.04999	1,619.2808	5,945.6199	1,287.3203	221.84762
Slice 13	404.33897	289.17442	1,611.5161	7,106.8251	1,603.1539	276.27573
Slice 14	409.4	289.78788	1,573.2364	7,911.9765	1,810.7987	312.061
Slice 15	414.58525	290.20613	1,547.1372	8,169.6391	1,847.6518	318.41319
Slice 16	419.33525	290.22246	1,546.1186	8,157.486	1,845.0037	317.95444
Slice 17	426	290.24536	1,544.6895	8,002.0422	1,808.2775	311.62623
Slice 18	430.25	290.25997	1,543.7781	7,882.6099	1,779.9281	306.74067
Slice 19	433.0414	290.26956	1,543.1796	8,028.3964	1,814.9317	312.77241
Slice 20	435.7914	290.27901	1,542.5899	8,171.7004	1,849.2264	318.68223
Slice 21	436.65	290.28196	1,542.4058	8,217.4254	1,860.1446	320.56413
Slice 22	437.05	290.28333	1,542.32	8,186.4269	1,852.794	319.2973
Slice 23	440.4	290.29485	1,541.6016	8,293.4016	1,878.3813	323.70603
Slice 24	446.1	290.45263	1,531.7561	8,329.779	1,890.2867	325.75852

Slice 25	449.4	290.65628	1,519.0483	8,425.5602	1,916.3898	330.25836
Slice 26	456.0829	291.08109	1,492.5397	8,572.5588	1,957.3825	337.32168
Slice 27	466.80548	291.85919	1,443.9864	8,711.7773	2,007.9407	346.03347
Slice 28	476.68482	292.68018	1,392.7569	8,883.039	2,060.2574	355.04973
Slice 29	484.11225	293.33698	1,351.7724	8,940.032	2,092.6133	360.62674
Slice 30	491.60325	294.07866	1,305.4916	9,047.6183	2,128.7535	366.85574
Slice 31	502.10487	295.21481	1,234.596	9,111.3764	2,174.9086	374.80956
Slice 32	513.10163	296.49636	1,154.6268	9,236.0846	2,223.0239	383.10221
Slice 33	526.1	298.01119	1,060.1017	9,010.2465	2,192.178	377.78351
Slice 34	533.75	298.90272	1,004.4704	8,726.0163	2,138.2937	368.49914
Slice 35	534.7	299.01343	997.56195	8,736.0485	2,142.2958	369.18755
Slice 36	537.11951	299.2954	979.9671	8,764.5582	2,153.1777	371.06352
Slice 37	542.80476	299.95796	938.6236	8,839.2308	2,180.521	375.7747
Slice 38	547.27149	300.47851	906.14116	8,911.9983	2,205.2775	380.03832
Slice 39	547.87226	300.65401	895.18962	7,068.533	2,411.9489	415.65833
Slice 40	548.18601	300.85627	882.56885	6,914.2769	3,482.4083	100
Slice 41	550.5089	302.3537	789.12924	6,826.1075	3,485.4511	100
Slice 42	558.69957	307.63374	459.65468	6,480.7012	3,617.8097	150
Slice 43	567.40392	313.24492	109.51717	6,504.4535	1,127.5998	1,000
Slice 44	570.33744	315.13598	-0	6,411.4824	1,130.5173	1,000
Slice 45	571.99056	316.20165	0	6,283.9193	2,021.9844	467.02967
Slice 46	574.16271	317.60191	0	6,009.5992	3,469.6437	0
Slice 47	581.6511	323.26392	0	5,453.6172	3,148.6473	0
Slice 48	594.7116	333.75225	0	4,859.4062	2,805.5795	0
Slice 49	607.3158	344.34605	0	4,413.7467	2,548.2778	0
Slice 50	621.10895	357.20914	0	3,605.0765	2,081.3919	0
Slice 51	632.40385	368.61734	0	2,966.4201	1,712.6634	0
Slice 52	640.10385	376.20849	0	2,399.7918	1,385.5204	0
Slice 53	649.05	384.8171	0	1,832.989	1,058.2767	0
Slice 54	657.00935	392.47615	0	1,397.8143	807.02847	0
Slice 55	664.36919	399.16596	0	1,008.2407	582.10806	0
Slice 56	673.27018	406.94643	0	504.00373	290.98669	0
Slice 57	679.01034	411.96397	-0	162.32666	93.719341	0
Slice 58	680.81135	413.53825	-0	38.620213	22.29739	0

Figure 11 - Stability Analysis of Long Term Drained Conditions – Subgrade Failures

DRAINED FINAL GRADE

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File Information

Title: [Model City - RMU-2 XS 3950](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [363](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/16/2013](#)
 Time: [7:54:03 AM](#)
 File Name: [RMU2X3950r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/16/2013](#)
 Last Solved Time: [8:10:10 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

DRAINED FINAL GRADE

Description: [FINAL GRADE WITH DRAINED CONDITIONS](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

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: [Block](#)
 Critical slip surfaces saved: [1](#)
 Restrict Block Crossing: [No](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 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: [25 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [150 psf](#)
 Phi': [31 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Drained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [118 pcf](#)
 Strength Function: [normalized phi](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure

Piezometric Line: 1

GC OverConsolidated

Model: Mohr-Coulomb

Unit Weight: 125 pcf

Cohesion': 100 psf

Phi': 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Side Slope Liner

Model: Mohr-Coulomb

Unit Weight: 115 pcf

Cohesion': 0 psf

Phi': 13 °

Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Pore Water Pressure

Piezometric Line: 1

Structural Fill

Model: Mohr-Coulomb

Unit Weight: 125 pcf

Cohesion': 195 psf

Phi': 28.7 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Final Cover

Model: Mohr-Coulomb

Unit Weight: 125 pcf

Cohesion': 0 psf

Phi': 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

NOT ACTIVE

Model: (None)

Pore Water Pressure

Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (607.28187, 407.93415) ft

Right Coordinate: (1,114.195, 320.05144) ft

Slip Surface Block

Left Grid

Upper Left: (919.5, 304.2) ft

Lower Left: (918.5, 290.9) ft

Lower Right: (947.2, 290.5) ft

X Increments: 3

Y Increments: 3

Starting Angle: 115 °

Ending Angle: 135 °

Angle Increments: 2

Right Grid

Upper Left: (987.5, 302) ft

Lower Left: (986.1, 291.7) ft

Lower Right: (1,026.7, 289.8) ft

X Increments: 3

Y Increments: 3

Starting Angle: 5 °

Ending Angle: 45 °

Angle Increments: 3

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

normalized phi

Model: [Add-In Function](#)Function: [Shear Stress vs. Normal Stress](#)Assembly: [GeoStudio AddIns1](#)Function: [Mesri1](#)

Field

tan_Phi_100kPa: 0.549

power: 0.147

pa: 2089

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	499.9	303.3
Point 2	500	290.1
Point 3	500	284.6
Point 4	500	279.3
Point 5	579.9	278.5
Point 6	1,200	266.7
Point 7	1,200	276.3
Point 8	1,200	259.75
Point 9	1,200	288.4
Point 10	1,200	307.2
Point 11	1,200	320.1
Point 12	1,023.3	320
Point 13	1,012.5	320
Point 14	841.1	316
Point 15	991.25	345.25
Point 16	999.8	349.5
Point 17	1,016	350
Point 18	992.6	349
Point 19	978.7	349.8
Point 20	987.9	350.1
Point 21	972.4	344.6
Point 22	971.4	349.6
Point 23	903.3	368.1

Point 24	806.7	313.1
Point 25	736.2	315.4
Point 26	736.2	313.9
Point 27	737.4	309.5
Point 28	500	310.5
Point 29	500	316.5
Point 30	500	314.5
Point 31	500	384.2
Point 32	500	258.75
Point 33	835	314.9
Point 34	1,010.6	307.3
Point 35	884	282.5
Point 36	956.5	289.8
Point 37	919.2	273.2
Point 38	806.7	315.1
Point 39	824.4	313
Point 40	990	345.2
Point 41	695.1	305.1
Point 42	499.9	300.2
Point 43	695.1	302.1
Point 44	803.5	305.74
Point 45	1,010.35	303.8
Point 46	1,199.9987	303.7
Point 47	643.8	289.7
Point 48	803.5	302.74
Point 49	824.2	377.1
Point 50	575.9	405.7
Point 51	663.9	405.9
Point 52	850.4	378.9
Point 53	802.8	309.16
Point 54	500	386.9
Point 55	575.5	408.2
Point 56	663.8	408.4
Point 57	824.5	379.6
Point 58	850.6	381.5
Point 59	980.1	352
Point 60	903.5	370.6
Point 61	982.8	282.1
Point 62	657.1	283.7
Point 63	670	304.7
Point 64	670	301.63077
Point 65	594.5	406.5
Point 66	594.4	404
Point 67	998.5	315.9
Point 68	803.8	276.1
Point 69	604.8	405.31597

Point 70	604.8	407.8
Point 71	615.8	405.88502
Point 72	615.9	408.4
Point 73	625.4	405.81253
Point 74	625.4	408.3
Point 75	636.9687	404.2
Point 76	637	406.7
Point 77	900.5	333.2
Point 78	900.5	327.9

Regions

	Material	Points	Area (ft²)
Region 1	Bottom Liner	30,26,24,39,33,38,25,29	582.37
Region 2	Side Slope Liner	38,33,14,78,21,40,20,19,22,77	903.76
Region 3	Structural Fill	14,78,21,40,20,18,16,17,12,13,67	3,271.5
Region 4	Upper Till	33,14,67,13,12,11,10,34,44,53,39	4,273.5
Region 5	NOT ACTIVE	4,5,68,37,6,8,32	10,393
Region 6	NOT ACTIVE	4,3,62,35,61,7,6,37,68,5	5,540.7
Region 7	Deflection surface	3,2,47,36,9,7,61,35,62	5,279.5
Region 8	GC-Drained	2,42,64,43,48,45,46,9,36,47	9,164.6
Region 9	Upper Till	28,27,53,44,41,63,1	1,599.2
Region 10	CCL	30,26,24,39,53,27,28	1,313.3
Region 11	GC OverConsolidated	42,1,63,41,44,48,43,64	926.06
Region 12	GC OverConsolidated	44,34,10,46,45,48	1,335.9
Region 13	Final Cover	31,50,66,69,71,73,75,51,49,52,23,19,20,59,60,58,57,56,76,74,72,70,65,55,54	1,231.7
Region 14	Waste Material	31,50,66,69,71,73,75,51,49,52,23,19,22,77,38,25,29	31,095

Current Slip Surface

Slip Surface: 3,073

F of S: 1.68

Volume: 6,990.2078 ft³

Weight: 844,108.12 lbs

Resisting Moment: 56,982,757 lbs-ft

Activating Moment: 33,844,078 lbs-ft

Resisting Force: 308,599.3 lbs

Activating Force: 183,587.7 lbs

F of S Rank: 1

Exit: (1,082.9657, 320.03377) ft

Entry: (859.87369, 379.58916) ft

Radius: 114.31393 ft

Center: (978.4, 473.8) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	862.70293	377.6999	-0	132.13371	76.287434	0
Slice 2	868.88523	373.57157	0	399.93991	230.90542	0
Slice 3	875.25283	368.91834	0	662.58554	382.54394	0

Slice 4	881.28188	364.09001	0	955.32026	551.55441	0
Slice 5	887.46367	359.01582	0	1,243.1604	717.73897	0
Slice 6	893.7982	353.69578	0	1,553.8685	897.1264	0
Slice 7	900.23273	348.29176	0	1,863.9389	1,076.1456	0
Slice 8	906.40105	343.11132	0	2,149.2842	1,240.8898	0
Slice 9	911.35875	338.98486	0	2,382.2614	1,375.3992	0
Slice 10	914.01874	336.88072	0	2,627.089	1,516.7506	0
Slice 11	917.49941	334.49166	0	2,987.3911	689.69358	0
Slice 12	924.50572	329.68267	-0	3,024.0639	1,655.6266	195
Slice 13	932.12104	324.12035	-0	3,264.2219	1,787.1093	195
Slice 14	939.09371	318.6638	-0	3,631.4934	1,988.1846	195
Slice 15	943.06045	315.55958	-0	3,804.972	2,286.2578	150
Slice 16	948.04142	311.66166	219.57115	4,100.0194	2,331.6085	150
Slice 17	953.41193	307.50773	478.53731	4,527.6078	2,432.927	150
Slice 18	956.58044	305.20601	622.02369	4,736.1864	2,375.3129	100
Slice 19	959.07486	303.39397	734.98391	4,968.2322	1,790.2705	308.52247
Slice 20	964.27555	302.30804	802.51471	6,297.5484	1,754.6716	302.38691
Slice 21	970.3402	301.19506	871.69412	6,391.9303	1,703.0577	293.49221
Slice 22	971.9	300.94588	887.1736	6,391.7393	1,698.9316	292.78277
Slice 23	975.55	300.36279	923.39626	6,382.9154	1,687.067	290.73576
Slice 24	979.4	299.74774	961.60373	6,369.6607	1,673.4925	288.3967
Slice 25	984	299.01288	1,007.2542	6,338.6757	1,653.2428	284.90712
Slice 26	988.95	298.22211	1,056.3781	6,330.2106	1,637.9968	282.28089
Slice 27	991.3	297.8467	1,079.6995	6,340.7803	1,634.6174	281.69901
Slice 28	994.83865	297.28139	1,114.8171	6,402.7521	1,641.7325	282.92447
Slice 29	997.78865	296.80867	1,144.1836	6,489.2103	1,660.6757	286.18973
Slice 30	999.15	296.58841	1,157.867	6,531.6603	1,668.2966	287.50297
Slice 31	1,005.2	295.60957	1,218.6777	6,693.8761	1,695.1127	292.12479

Slice 32	1,011.55	294.58218	1,282.5038	6,859.8153	1,722.044	296.7645
Slice 33	1,014.25	294.14534	1,309.6424	6,929.8733	1,733.3418	298.71101
Slice 34	1,018.0556	293.52963	1,347.8934	5,990.3109	1,472.5722	253.77233
Slice 35	1,021.3802	293.29107	1,362.6314	4,744.5746	1,043.6883	179.86185
Slice 36	1,022.9746	293.47449	1,351.1151	4,196.5655	1,019.0348	175.61297
Slice 37	1,027.6991	294.77257	1,269.9048	3,796.4671	920.78082	158.68068
Slice 38	1,036.4974	297.18992	1,118.6708	3,415.0172	848.71733	146.26178
Slice 39	1,045.0796	299.74271	958.99457	3,074.4181	821.46331	141.56524
Slice 40	1,053.5051	302.45002	789.68374	2,640.1485	732.84942	126.29424
Slice 41	1,060.6529	305.54262	596.38709	2,529.2189	1,115.921	100
Slice 42	1,068.5965	310.2709	300.98856	1,716.455	850.498	150
Slice 43	1,074.8895	314.17941	56.817556	1,136.6862	648.85054	150
Slice 44	1,079.555	317.56141	-0	526.17308	316.15668	150

Figure 12 - Stability Analysis of Long Term Drained Conditions – Subgrade Failures

DRAINED FINAL GRADE

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File Information

Title: [Model City - RMU-2 XS 4250](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [369](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/16/2013](#)
 Time: [7:39:51 AM](#)
 File Name: [RMU2X4250r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/16/2013](#)
 Last Solved Time: [7:50:04 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

DRAINED FINAL GRADE

Description: [FINAL CONFIGURATION WITH DRAINED CONDITIONS](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

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: [Block](#)
 Critical slip surfaces saved: [1](#)
 Restrict Block Crossing: [No](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 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: [0.01](#)
 Minimum Slip Surface Depth: [25 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [150 psf](#)
 Phi': [31 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Drained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [118 pcf](#)
 Strength Function: [normalized phi](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure

Piezometric Line: 1

GC OverConsolidated

Model: [Mohr-Coulomb](#)Unit Weight: [125 pcf](#)Cohesion': [100 psf](#)Phi': [30 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: 1

Side Slope Liner

Model: [Mohr-Coulomb](#)Unit Weight: [115 pcf](#)Cohesion': [0 psf](#)Phi': [13 °](#)Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)

Pore Water Pressure

Piezometric Line: 1

Structural Fill

Model: [Mohr-Coulomb](#)Unit Weight: [128 pcf](#)Cohesion': [195 psf](#)Phi': [28.7 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: 1

Final Cover

Model: [Mohr-Coulomb](#)Unit Weight: [125 pcf](#)Cohesion': [0 psf](#)Phi': [30 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: 1

NOT ACTIVE

Model: [\(None\)](#)

Pore Water Pressure

Piezometric Line: 1

Slip Surface Limits

Left Coordinate: [\(607.55022, 419.45476\) ft](#)Right Coordinate: [\(1,114.1953, 319.9052\) ft](#)

Slip Surface Block

Left Grid

Upper Left: [\(852.4, 311.8\) ft](#)Lower Left: [\(846.2, 293.2\) ft](#)Lower Right: [\(936.7, 291.7\) ft](#)X Increments: [10](#)Y Increments: [5](#)

Starting Angle: 135 °

Ending Angle: 160 °

Angle Increments: 2

Right Grid

Upper Left: (975.8, 305.9) ft

Lower Left: (975.8, 290.4) ft

Lower Right: (1,047.2, 287.7) ft

X Increments: 3

Y Increments: 3

Starting Angle: 15 °

Ending Angle: 45 °

Angle Increments: 2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

normalized phi

Model: [Add-In Function](#)Function: [Shear Stress vs. Normal Stress](#)Assembly: [GeoStudio AddIns1](#)Function: [Mesri1](#)

Field

tan_Phi_100kPa: 0.549

power: 0.147

pa: 2089

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	500	304.5
Point 2	500	289.6
Point 3	500	284.6
Point 4	500	277.5
Point 5	621.9	277.6
Point 6	1,200.1	275.8
Point 7	1,200	283.7
Point 8	1,200	259.75
Point 9	1,200	289.3
Point 10	1,200	304.8
Point 11	1,200	320.1
Point 12	1,023.8	319.7
Point 13	1,030.2	316
Point 14	886.4	316
Point 15	999.8	349.5
Point 16	1,016.2	350
Point 17	992.5	347.4
Point 18	978.7	349.8
Point 19	985.3	350
Point 20	972.4	344.6
Point 21	971.4	349.6
Point 22	875.4	315.5
Point 23	674.8	313.4

Point 24	674.8	311.9
Point 25	676	307.5
Point 26	500	311
Point 27	500	319
Point 28	500	317
Point 29	500	417.2
Point 30	500	258.75
Point 31	890.9	317.5
Point 32	1,077.5	305.8
Point 33	998.3	283.7
Point 34	956.5	289.8
Point 35	1,050.9	275.6
Point 36	875.4	317.5
Point 37	885.3	315.6
Point 38	991.3	345.2
Point 39	686.9	304
Point 40	500	301.4
Point 41	686.9	301
Point 42	873.2	304.9
Point 43	1,077.25	302.3
Point 44	1,199.9987	301.3
Point 45	643.8	289.7
Point 46	873.2	301.9
Point 47	884.3	375
Point 48	776.8	404.3
Point 49	899.4	376.4
Point 50	872.9	311.5
Point 51	500	419.9
Point 52	777	406.9
Point 53	884.6	377.5
Point 54	899.6	379
Point 55	980.1	352
Point 56	1,135	283
Point 57	657.1	283.7
Point 58	641.5	303.7
Point 59	641.5	300.6308
Point 60	998.5	315.9
Point 61	915.4	277.8
Point 62	717.4	416.5125
Point 63	717.4	419
Point 64	740.9687	415.5
Point 65	741	418
Point 66	753.9	414.5
Point 67	753.9	411.9321
Point 68	791.7	405.8
Point 69	792	408.4

Point 70	1,041.3	319.7397
Point 71	526.4	285.5
Point 72	588.8	283.9
Point 73	503.9	317
Point 74	504.1	315.0055
Point 75	1,125.9	301.2989
Point 76	1,125.9	304.8

Regions

	Material	Points	Area (ft²)
Region 1	Bottom Liner	28,74,24,22,37,14,31,36,23,73,27	681.48
Region 2	Side Slope Liner	36,31,20,38,19,18,21	548.11
Region 3	Structural Fill	14,31,20,38,19,17,15,16,12,70,13,60	2,807.2
Region 4	Upper Till	14,60,13,70,11,10,76,32,42,50,37	4,131
Region 5	NOT ACTIVE	4,5,61,35,6,8,30	12,464
Region 6	NOT ACTIVE	4,3,71,72,57,33,56,7,6,35,61,5	4,686.7
Region 7	Deflection surface	3,2,45,34,9,7,56,33,57,72,71	4,137.6
Region 8	GC-Drained	2,40,59,41,46,43,75,44,9,34,45	8,301.2
Region 9	Upper Till	26,25,50,42,39,58,1	1,917
Region 10	CCL	28,74,24,22,37,50,25,26	1,597.6
Region 11	GC OverConsolidated	40,1,58,39,42,46,41,59	1,133.1
Region 12	GC OverConsolidated	42,32,76,10,44,75,43,46	1,092.9
Region 13	Final Cover	29,62,64,67,48,68,47,49,18,19,55,54,53,69,52,66,65,63,51	1,257.9
Region 14	Waste Material	29,62,64,67,48,68,47,49,18,21,36,23,73,27	38,817

Current Slip Surface

Slip Surface: 9,505

F of S: 1.58

Volume: 11,127.171 ft³

Weight: 1,323,572.6 lbs

Resisting Moment: 1.0117235e+008 lbs-ft

Activating Moment: 64,056,214 lbs-ft

Resisting Force: 482,947.7 lbs

Activating Force: 308,746.82 lbs

F of S Rank: 1

Exit: (1,075.9737, 319.81842) ft

Entry: (785.69562, 407.76956) ft

Radius: 153.47234 ft

Center: (988.8, 485) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	787.21837	406.63584	-0	126.02634	72.761343	0
Slice 2	789.23591	405.13374	0	287.85641	166.19397	0
Slice 3	790.71535	403.91382	0	391.97356	226.30604	0
Slice 4	791.85	402.93256	0	483.53194	279.1673	0
Slice 5	796.14063	399.22196	0	674.98198	389.70103	0
Slice 6	804.42188	392.06021	0	1,026.8006	592.82362	0

Slice 7	813.53183	384.86145	0	1,409.865	813.98592	0
Slice 8	823.47047	377.62567	0	1,720.9918	993.61509	0
Slice 9	833.40913	370.38988	0	2,026.8007	1,170.1739	0
Slice 10	843.34777	363.1541	0	2,328.7114	1,344.4821	0
Slice 11	853.11185	356.24581	0	2,650.3528	1,530.1819	0
Slice 12	861.9481	350.27443	0	2,912.499	1,681.5321	0
Slice 13	870.5672	344.6663	0	3,160.7943	1,824.8854	0
Slice 14	879.8724	338.71608	0	3,390.4628	1,957.4846	0
Slice 15	885.17845	335.32312	0	3,543.8667	2,046.0524	0
Slice 16	890.3443	331.84254	0	3,812.7697	2,201.3036	0
Slice 17	897.26585	327.26386	0	4,346.6664	2,509.549	0
Slice 18	902.40987	324.0287	0	4,882.9767	1,127.324	0
Slice 19	906.97082	321.16025	-0	4,706.2836	2,576.615	195
Slice 20	911.5486	318.017	-0	4,701.5277	2,574.0112	195
Slice 21	914.9092	315.58936	-0	4,808.7719	2,889.4017	150
Slice 22	922.40359	310.17555	313.4455	5,174.6394	2,920.9	150
Slice 23	931.57913	303.54729	726.64017	5,667.1501	2,852.4047	100
Slice 24	938.58177	301.16289	875.11502	7,618.961	2,029.5691	349.76183
Slice 25	948.15693	299.59434	972.56637	7,543.6721	1,985.1406	342.10503
Slice 26	957.04305	298.26209	1,055.3033	7,557.7496	1,904.7942	328.2601
Slice 27	965.24015	297.16614	1,123.3257	7,455.2414	1,862.0997	320.90284
Slice 28	970.36935	296.49885	1,164.7367	7,444.4378	1,818.8282	313.44495
Slice 29	971.9	296.32164	1,175.7263	7,420.0864	1,810.0943	311.93857
Slice 30	975.55	295.89907	1,201.9321	7,346.0775	1,785.2852	307.66327
Slice 31	979.4	295.45335	1,229.5739	7,261.7853	1,757.5047	302.87558
Slice 32	982.7	295.0713	1,253.2669	7,159.0997	1,726.0482	297.45417
Slice 33	985.7496	294.71824	1,275.1621	7,065.5104	1,697.2152	292.48659
Slice 34	988.7496	294.41837	1,293.7403	7,051.1405	1,665.617	287.04071
Slice 35	991.9	294.11226	1,312.7017	6,971.8255	1,641.3354	282.85507
Slice 36	995.5	293.76246	1,334.3692	7,098.6898	1,667.3254	287.33426
Slice 37	999.15	293.40779	1,356.3376	7,277.0728	1,705.8412	293.97197
Slice 38	1,003.9	292.94625	1,384.9266	7,371.7933	1,722.0797	296.77122
Slice 39	1,012.1	292.14948	1,434.2802	7,494.7788	1,740.1304	299.88117
Slice 40	1,019.0739	291.47184	1,476.254	6,121.2789	1,386.8923	239.00754
Slice 41	1,022.8738	291.54956	1,471.2353	4,921.2422	1,306.9907	225.23824
Slice 42	1,027	293.13989	1,371.8153	4,098.0643	1,069.177	184.25449
Slice 43	1,035.75	296.51237	1,160.9832	3,565.7304	960.64871	165.55114
Slice 44	1,045.5206	300.27823	925.55843	2,981.2715	840.36749	144.82311
Slice 45	1,049.9918	302.07602	813.17751	3,036.884	1,018.0753	175.44788
Slice 46	1,052.7721	303.97463	694.58015	2,824.3785	1,229.6396	100
Slice 47	1,062.1787	310.39816	293.33336	1,805.3107	908.48762	150
Slice 48	1,072.5146	317.45627	-0	632.97566	380.33015	150

Baseliner Failures

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File Information

Title: [Model City - RMU-2 XS 2600](#)
 Created By: [Peter J. Carey](#)
 Revision Number: [393](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/17/2013](#)
 Time: [4:22:49 PM](#)
 File Name: [RMU2X2600r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/17/2013](#)
 Last Solved Time: [4:22:58 PM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Baseliner Failures

Description: [Baseliner Static Entry and Exit Search](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 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: Yes
 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: 0.01
 Minimum Slip Surface Depth: 25 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

Waste Material

Model: Mohr-Coulomb
 Unit Weight: 111 pcf
 Cohesion': 0 psf
 Phi': 30 °
 Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
 Unit Weight: 120 pcf
 Strength Function: Baseline
 Phi-B: 0 °

CCL

Model: Mohr-Coulomb
 Unit Weight: 120 pcf
 Cohesion': 1,000 psf
 Phi': 10 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

Side Slope Liner

Model: Mohr-Coulomb
 Unit Weight: 115 pcf
 Cohesion': 0 psf
 Phi': 13 °
 Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)
 Pore Water Pressure
 Piezometric Line: 1

Structural Fill

Model: Mohr-Coulomb
 Unit Weight: 128 pcf
 Cohesion': 195 psf
 Phi': 28.7 °

Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
 Left-Zone Left Coordinate: [\(698.0096, 420.31913\) ft](#)
 Left-Zone Right Coordinate: [\(820, 399.044\) ft](#)
 Left-Zone Increment: [20](#)
 Right Projection: [Range](#)
 Right-Zone Left Coordinate: [\(969.9906, 355.24542\) ft](#)
 Right-Zone Right Coordinate: [\(989, 348.39324\) ft](#)
 Right-Zone Increment: [5](#)
 Radius Increments: [10](#)

Slip Surface Limits

Left Coordinate: [\(687.26016, 418.46979\) ft](#)
 Right Coordinate: [\(994.39049, 347.63701\) ft](#)

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	600	315.5
Coordinate 2	1,201	315

Maximum Suction: [0 psf](#)

Seismic Coefficients

Horz Seismic Coef.: [0](#)

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [100 %](#)

Y-Intercept: [0](#)

Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)

Data Point: [\(0, 0\)](#)

Data Point: [\(500, 235\)](#)

Data Point: [\(1,000, 463\)](#)

Data Point: [\(2,000, 899\)](#)

Data Point: [\(5,000, 2,057\)](#)

Data Point: [\(10,000, 3,515\)](#)

Data Point: [\(15,000, 4,430\)](#)

Estimation Properties

Intact Rock Param.: [10](#)

Geological Strength: [100](#)

Disturbance Factor: [0](#)

SigmaC: [600,000 psf](#)

SigmaC: [300,000 psf](#)

Num. Points: [20](#)

Points

	X (ft)	Y (ft)
Point 1	600	302.8
Point 2	600	287.85
Point 3	600	276.5
Point 4	600	266.5
Point 5	851.25	277.4
Point 6	851.5	267.65
Point 7	1,200	268.85
Point 8	1,199.9987	281.4
Point 9	1,200	259.75
Point 10	1,200	287.55
Point 11	1,200	305.2
Point 12	1,200	320
Point 13	1,104	322
Point 14	1,056	320
Point 15	1,036.75	320
Point 16	1,023.5	319.9
Point 17	1,023.6	319.2
Point 18	897.25	319.5
Point 19	991.25	345.25
Point 20	999.8	349.5
Point 21	1,016	350
Point 22	997.75	348.5
Point 23	992.3	347.1
Point 24	978.5	349.75

Point 25	984.9	350
Point 26	972.5	344.75
Point 27	971	349.5
Point 28	905	374.5
Point 29	861.5	313
Point 30	797	308.6
Point 31	766.5	305.22
Point 32	732	311.25
Point 33	732	309.75
Point 34	737	305.35
Point 35	670.5	311.45
Point 36	670.5	309.45
Point 37	600	305.7
Point 38	600	312
Point 39	600	310
Point 40	600	400.6
Point 41	890	372.5
Point 42	600	258.75
Point 43	751	276.6
Point 44	759	267.4
Point 45	880.5	314
Point 46	793	289.8
Point 47	990	308
Point 48	1,082	280
Point 49	1,079.5	288.3
Point 50	1,082.5	268.5
Point 51	1,081.25	259
Point 52	797	311.1
Point 53	873	311.5
Point 54	990	345.25
Point 55	987	348.5
Point 56	653	303.5
Point 57	670.5	305.5
Point 58	600	299.7
Point 59	653	300.5
Point 60	689.75	301
Point 61	766.5	301.75
Point 62	868.5	307
Point 63	989.75	304.5
Point 64	1,199.9987	301.7
Point 65	651.5	288
Point 66	746.5	289
Point 67	705.5	304.19
Point 68	640.5	311.5
Point 69	640.5	309.5
Point 70	836	305.3

Point 71	836	306.3
Point 72	887.5	309.5
Point 73	868.5	310
Point 74	887.5	306.5
Point 75	600	340
Point 76	785	402
Point 77	608.5	402.7
Point 78	629	401
Point 79	693.5	417.5
Point 80	706.5	418.5
Point 81	737.5	416.5
Point 82	799.5	403.5
Point 83	604	339
Point 84	758.0046	376
Point 85	870	368
Point 86	882.5	366
Point 87	893	363
Point 88	897.5	361
Point 89	956.5	346
Point 90	765	377
Point 91	773.5	377
Point 92	900.5	362.5
Point 93	921.75	363.25
Point 94	759.6649	304.9246
Point 95	859.5	307
Point 96	796	305.1
Point 97	857	307
Point 98	861.5	311
Point 99	600	403.3
Point 100	608.1	405.2
Point 101	628.8	403.9
Point 102	693.4	420
Point 103	706.4	420.9
Point 104	737.1	419.1
Point 105	744.6	415.1
Point 106	744	417.8
Point 107	784.8	404.4
Point 108	799.7	405.9
Point 109	980	351.9
Point 110	905.5	376.8
Point 111	890.6	375.2

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	40,77,78,79,80,81,105,76,82,41,28,24,27,89,93,92,88,87,86,85,91,90,84,83,75	12,028

Region 2	Waste Material	75,83,84,90,91,85,86,87,88,92,93,89,27,29,52,32,35,68,38	16,661
Region 3	Bottom Liner	39,69,36,33,30,98,53,45,29,52,32,35,68,38	555.25
Region 4	Side Slope Liner	45,18,26,54,55,25,24,27,29	615.34
Region 5	Structural Fill	18,26,54,55,25,23,22,20,21,16,17	2,306.2
Region 6	Deflection surface	45,18,17,16,15,14,13,12,11,47,72,73,53	4,072.7
Region 7	NOT ACTIVE	4,44,6,50,7,9,51,42	5,301.4
Region 8	NOT ACTIVE	4,3,43,5,48,8,7,50,6,44	6,275.2
Region 9	Deflection surface	3,2,65,66,46,49,10,8,48,5,43	6,239.6
Region 10	Deflection surface	2,58,59,60,61,70,97,95,62,74,63,64,10,49,46,66,65	8,734.9
Region 11	Deflection surface	37,57,34,31,67,56,1	255.65
Region 12	CCL	39,69,36,33,30,98,53,73,95,97,71,96,31,34,57,37	1,053.7
Region 13	Deflection surface	58,1,56,67,94,31,96,71,97,70,61,60,59	657.67
Region 14	Deflection surface	73,72,47,11,64,63,74,62,95	1,139.2
Region 15	Final Cover	40,77,78,79,80,81,105,76,82,41,28,24,25,109,110,111,108,107,106,104,103,102,101,100,99	990.04

Current Slip Surface

Slip Surface: 1,387

F of S: 1.875

Volume: 3,342.526 ft³

Weight: 378,409.59 lbs

Resisting Moment: 40,024,185 lbs-ft

Activating Moment: 21,350,213 lbs-ft

Resisting Force: 169,546.62 lbs

Activating Force: 90,453.572 lbs

F of S Rank: 1

Exit: (989, 348.39324) ft

Entry: (796.03778, 405.53132) ft

Radius: 94.89657 ft

Center: (948.87911, 567.29429) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	797.01091	404.43725	-0	109.89492	63.447863	0
Slice 2	798.74202	402.49099	0	293.32879	169.35346	0
Slice 3	799.6	401.52637	0	377.38947	217.88591	0
Slice 4	801.72585	399.13631	0	509.56627	294.19822	0
Slice 5	806.68428	394.75136	0	794.06608	458.45427	0
Slice 6	812.54945	390.53673	0	972.02836	561.20083	0
Slice 7	818.41462	386.3221	0	1,145.1213	661.13612	0
Slice 8	824.52221	382.62949	0	1,377.2466	795.15367	0
Slice 9	830.87224	379.4589	0	1,461.0875	843.55924	0
Slice 10	837.22226	376.28832	0	1,545.7226	892.42335	0
Slice 11	843.57229	373.11773	0	1,631.5906	941.99928	0
Slice 12	849.03029	370.63762	0	1,778.817	1,027.0005	0
Slice 13	853.36544	368.93846	0	1,802.7268	1,040.8048	0
Slice 14	859.32025	366.74393	0	1,860.2793	1,074.0327	0
Slice 15	866.61145	364.36566	0	1,932.0477	1,115.4682	0
Slice 16	870.3452	363.27692	0	1,920.9721	1,109.0738	0
Slice 17	873.6428	362.28531	0	1,902.4428	1,098.3759	0

Slice 18	879.5476	360.5034	0	1,890.9136	1,091.7194	0
Slice 19	886.25	358.4808	0	1,877.9267	1,084.2215	0
Slice 20	890.3	357.25862	0	1,868.2489	1,078.634	0
Slice 21	891.8	356.80596	0	1,917.3953	1,107.0087	0
Slice 22	893.8363	356.19146	0	2,004.882	1,157.5191	0
Slice 23	896.0863	355.45463	0	2,055.3649	1,186.6655	0
Slice 24	899	354.45613	0	2,189.5019	1,264.1095	0
Slice 25	901.3221	353.66037	0	2,296.515	1,325.8936	0
Slice 26	903.5721	352.86552	0	2,378.945	1,373.4845	0
Slice 27	905.25	352.26257	0	2,459.9939	1,420.2781	0
Slice 28	907.0065	351.63136	0	2,480.0122	1,431.8357	0
Slice 29	911.01765	350.15446	0	2,481.1441	1,432.4892	0
Slice 30	916.02695	348.28338	0	2,511.6776	1,450.1178	0
Slice 31	920.1408	346.66114	0	2,471.7769	1,427.081	0
Slice 32	924.57674	344.76816	0	2,524.5029	1,457.5225	0
Slice 33	930.23021	342.35562	0	2,593.3613	1,497.2778	0
Slice 34	935.88368	339.94308	0	2,664.0608	1,538.0962	0
Slice 35	938.89221	338.65923	0	2,770.6613	639.65757	0
Slice 36	942.24717	339.01855	0	3,248.4587	749.96578	0
Slice 37	948.59353	339.89236	0	2,854.269	658.95992	0
Slice 38	954.13335	340.81765	0	2,549.4159	588.57904	0
Slice 39	959.49755	341.92461	0	2,158.2363	498.2681	0
Slice 40	966.74755	343.47987	0	1,640.7473	378.79637	0
Slice 41	971.75794	344.5835	0	1,280.714	295.67613	0
Slice 42	973.93879	345.06388	0	1,125.3515	259.80786	0
Slice 43	976.93085	345.7243	0	915.05785	211.25775	0
Slice 44	979.25	346.23715	0	750.02709	173.1574	0
Slice 45	982.45	346.94479	0	497.91278	114.95222	0
Slice 46	985.95	347.71877	0	229.97714	53.094407	0
Slice 47	987.21044	347.9975	0	143.28711	33.080436	0
Slice 48	988.21044	348.21864	-0	92.637022	50.717288	195

Baseline Failures (2) Block

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File Information

Title: [Model City - RMU-2 XS 2600](#)
 Created By: [Peter J. Carey](#)
 Revision Number: [393](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/17/2013](#)
 Time: [4:22:49 PM](#)
 File Name: [RMU2X2600r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revisions\geoslope\final config\](#)
 Last Solved Date: [2/17/2013](#)
 Last Solved Time: [4:23:16 PM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Baseline Failures (2) Block

Description: [Baseline Static Block Search](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 Lambda
 Lambda 1: [0](#)
 Lambda 2: [0.2](#)
 Lambda 3: [0.3](#)
 Lambda 4: [0.4](#)
 Lambda 5: [0.5](#)
 Lambda 6: [0.6](#)
 Lambda 7: [0.7](#)
 Lambda 8: [0.8](#)
 Lambda 9: [0.9](#)
 Lambda 10: [1](#)
 Lambda 11: [1.1](#)
 Lambda 12: [1.2](#)
 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: [Block](#)
 Critical slip surfaces saved: [1](#)
 Restrict Block Crossing: [No](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 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: [25 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)
 Unit Weight: [115 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [13 °](#)
 Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)

Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

NOT ACTIVE

Model: (None)
Pore Water Pressure
Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (647.31746, 408.51503) ft
Right Coordinate: (994.39049, 347.63701) ft

Slip Surface Block

Left Grid
Upper Left: (763, 302.9) ft
Lower Left: (761.3, 289.7) ft
Lower Right: (795.9, 290.8) ft
X Increments: 3
Y Increments: 3
Starting Angle: 115 °
Ending Angle: 135 °
Angle Increments: 2

Right Grid
Upper Left: (849.4, 307.9) ft
Lower Left: (850.6, 300.1) ft
Lower Right: (863.2, 302.9) ft
X Increments: 3
Y Increments: 3
Starting Angle: 0 °
Ending Angle: 45 °
Angle Increments: 2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	600	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [100 %](#)

Y-Intercept: [0](#)

Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)

Data Point: [\(0, 0\)](#)

Data Point: [\(500, 235\)](#)

Data Point: [\(1,000, 463\)](#)

Data Point: [\(2,000, 899\)](#)

Data Point: [\(5,000, 2,057\)](#)

Data Point: [\(10,000, 3,515\)](#)

Data Point: [\(15,000, 4,430\)](#)

Estimation Properties

Intact Rock Param.: [10](#)

Geological Strength: [100](#)

Disturbance Factor: [0](#)

SigmaC: [600,000 psf](#)

SigmaC: [300,000 psf](#)

Num. Points: [20](#)

Points

	X (ft)	Y (ft)
Point 1	600	302.8
Point 2	600	287.85
Point 3	600	276.5
Point 4	600	266.5
Point 5	851.25	277.4
Point 6	851.5	267.65
Point 7	1,200	268.85
Point 8	1,199.9987	281.4
Point 9	1,200	259.75
Point 10	1,200	287.55
Point 11	1,200	305.2
Point 12	1,200	320
Point 13	1,104	322
Point 14	1,056	320
Point 15	1,036.75	320
Point 16	1,023.5	319.9
Point 17	1,023.6	319.2
Point 18	897.25	319.5
Point 19	991.25	345.25
Point 20	999.8	349.5
Point 21	1,016	350
Point 22	997.75	348.5
Point 23	992.3	347.1
Point 24	978.5	349.75

Point 25	984.9	350
Point 26	972.5	344.75
Point 27	971	349.5
Point 28	905	374.5
Point 29	861.5	313
Point 30	797	308.6
Point 31	766.5	305.22
Point 32	732	311.25
Point 33	732	309.75
Point 34	737	305.35
Point 35	670.5	311.45
Point 36	670.5	309.45
Point 37	600	305.7
Point 38	600	312
Point 39	600	310
Point 40	600	400.6
Point 41	890	372.5
Point 42	600	258.75
Point 43	751	276.6
Point 44	759	267.4
Point 45	880.5	314
Point 46	793	289.8
Point 47	990	308
Point 48	1,082	280
Point 49	1,079.5	288.3
Point 50	1,082.5	268.5
Point 51	1,081.25	259
Point 52	797	311.1
Point 53	873	311.5
Point 54	990	345.25
Point 55	987	348.5
Point 56	653	303.5
Point 57	670.5	305.5
Point 58	600	299.7
Point 59	653	300.5
Point 60	689.75	301
Point 61	766.5	301.75
Point 62	868.5	307
Point 63	989.75	304.5
Point 64	1,199.9987	301.7
Point 65	651.5	288
Point 66	746.5	289
Point 67	705.5	304.19
Point 68	640.5	311.5
Point 69	640.5	309.5
Point 70	836	305.3

Point 71	836	306.3
Point 72	887.5	309.5
Point 73	868.5	310
Point 74	887.5	306.5
Point 75	600	340
Point 76	785	402
Point 77	608.5	402.7
Point 78	629	401
Point 79	693.5	417.5
Point 80	706.5	418.5
Point 81	737.5	416.5
Point 82	799.5	403.5
Point 83	604	339
Point 84	758.0046	376
Point 85	870	368
Point 86	882.5	366
Point 87	893	363
Point 88	897.5	361
Point 89	956.5	346
Point 90	765	377
Point 91	773.5	377
Point 92	900.5	362.5
Point 93	921.75	363.25
Point 94	759.6649	304.9246
Point 95	859.5	307
Point 96	796	305.1
Point 97	857	307
Point 98	861.5	311
Point 99	600	403.3
Point 100	608.1	405.2
Point 101	628.8	403.9
Point 102	693.4	420
Point 103	706.4	420.9
Point 104	737.1	419.1
Point 105	744.6	415.1
Point 106	744	417.8
Point 107	784.8	404.4
Point 108	799.7	405.9
Point 109	980	351.9
Point 110	905.5	376.8
Point 111	890.6	375.2

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	40,77,78,79,80,81,105,76,82,41,28,24,27,89,93,92,88,87,86,85,91,90,84,83,75	12,028

Region 2	Waste Material	75,83,84,90,91,85,86,87,88,92,93,89,27,29,52,32,35,68,38	16,661
Region 3	Bottom Liner	39,69,36,33,30,98,53,45,29,52,32,35,68,38	555.25
Region 4	Side Slope Liner	45,18,26,54,55,25,24,27,29	615.34
Region 5	Deflection surface	18,26,54,55,25,23,22,20,21,16,17	2,306.2
Region 6	Deflection surface	45,18,17,16,15,14,13,12,11,47,72,73,53	4,072.7
Region 7	NOT ACTIVE	4,44,6,50,7,9,51,42	5,301.4
Region 8	NOT ACTIVE	4,3,43,5,48,8,7,50,6,44	6,275.2
Region 9	Deflection surface	3,2,65,66,46,49,10,8,48,5,43	6,239.6
Region 10	Deflection surface	2,58,59,60,61,70,97,95,62,74,63,64,10,49,46,66,65	8,734.9
Region 11	Deflection surface	37,57,34,31,67,56,1	255.65
Region 12	CCL	39,69,36,33,30,98,53,73,95,97,71,96,31,34,57,37	1,053.7
Region 13	Deflection surface	58,1,56,67,94,31,96,71,97,70,61,60,59	657.67
Region 14	Deflection surface	73,72,47,11,64,63,74,62,95	1,139.2
Region 15	Final Cover	40,77,78,79,80,81,105,76,82,41,28,24,25,109,110,111,108,107,106,104,103,102,101,100,99	990.04

Current Slip Surface

Slip Surface: 2,305

F of S: 2.413

Volume: 18,263.136 ft³

Weight: 2,043,948.9 lbs

Resisting Moment: 1.2579588e+008 lbs-ft

Activating Moment: 52,132,343 lbs-ft

Resisting Force: 670,478.35 lbs

Activating Force: 278,357.21 lbs

F of S Rank: 1

Exit: (984.88334, 350.00646) ft

Entry: (681.2665, 416.97602) ft

Radius: 151.88544 ft

Center: (911.8, 443.5) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	682.01947	415.86588	-0	119.51627	69.002751	0
Slice 2	688.08622	406.9214	0	964.77385	557.01244	0
Slice 3	696.60255	394.36539	0	2,041.4469	1,178.6299	0
Slice 4	703.10255	385.37104	0	2,827.7733	1,632.6157	0
Slice 5	709.47845	377.10943	0	3,429.1951	1,979.8467	0
Slice 6	715.6274	369.83849	0	4,124.3357	2,381.1863	0
Slice 7	723.29843	361.63903	0	4,682.5184	2,703.4533	0
Slice 8	732.49948	351.80416	0	5,338.6655	3,082.2799	0
Slice 9	737.1667	346.81542	0	5,666.7432	3,271.6957	0
Slice 10	740.6167	343.7093	0	6,116.1876	3,531.1825	0
Slice 11	744.3	340.40537	0	6,297.188	3,635.6832	0
Slice 12	749.0424	336.15143	0	6,479.681	3,741.0456	0
Slice 13	755.7447	330.43679	0	6,998.2067	4,040.4165	0
Slice 14	761.5023	326.02974	0	7,181.7633	4,146.393	0
Slice 15	767.49915	321.43957	0	7,377.4329	4,259.3629	0
Slice 16	771.74915	318.40611	0	7,829.4151	4,520.3149	0
Slice 17	775.00974	316.31937	0	7,914.312	4,569.3302	0

Slice 18	779.81727	313.24259	0	8,042.9136	4,643.5783	0
Slice 19	783.95753	310.59287	0	8,413.6098	2,269.8754	849.86229
Slice 20	784.9	309.9897	0	8,448.7272	2,271.7881	857.40808
Slice 21	785.85655	309.37751	0	8,519.1157	2,275.396	872.66384
Slice 22	791.85655	308.23902	443.1251	10,315.991	1,740.8526	1,000
Slice 23	798.25	307.50525	488.58039	10,523.691	1,769.4608	1,000
Slice 24	799.6	307.35031	498.17844	10,568.583	1,775.6841	1,000
Slice 25	803.8854	306.85848	528.64621	10,510.54	1,760.0773	1,000
Slice 26	812.67835	306.18137	570.44164	10,597.152	1,767.9795	1,000
Slice 27	821.84742	305.99844	581.38053	10,526.669	1,753.6228	1,000
Slice 28	831.20447	306.15613	571.05461	10,335.102	1,721.665	1,000
Slice 29	840.75705	306.45857	551.6868	10,023.3	1,670.1009	1,000
Slice 30	847.1751	306.6725	538.00408	9,798.832	1,632.9338	1,000
Slice 31	849.52347	306.75078	532.99756	9,715.4063	1,619.1064	1,000
Slice 32	850.89604	306.79653	530.07136	9,666.3226	1,610.9676	1,000
Slice 33	856.54062	308.15466	445.03106	10,140.512	1,709.5748	1,000
Slice 34	864.91515	310.40946	303.89677	9,519.7663	1,625.0064	1,000
Slice 35	869.16515	311.55376	0	9,370.4968	2,295.2993	1,070.7836
Slice 36	873.8521	312.81569	0	9,001.6131	2,292.1093	981.82558
Slice 37	880.1021	314.49848	0	8,247.5933	1,904.1069	0
Slice 38	882.72378	315.20435	0	8,044.5399	1,857.2284	0
Slice 39	883.28288	315.35489	0	8,001.0896	1,847.1971	0
Slice 40	886.8091	316.30496	0	7,726.4496	1,783.7914	0
Slice 41	890.3	317.24558	0	7,450.8614	1,720.1669	0
Slice 42	890.6849	317.3493	0	7,423.0236	1,713.74	0
Slice 43	891.8849	317.73832	0	7,525.3748	1,737.3697	0
Slice 44	895.125	318.80224	0	7,413.5311	1,711.5485	0
Slice 45	897.375	319.54194	0	7,351.4728	1,697.2212	0
Slice 46	898.07717	319.77755	0	7,325.9047	1,691.3184	0
Slice 47	899.57717	320.28088	0	7,271.0366	1,678.6511	0
Slice 48	901.28955	320.85546	0	7,208.014	1,664.1012	0
Slice 49	903.53955	321.61045	0	7,124.5426	1,644.8303	0
Slice 50	905.25	322.18439	0	7,062.553	1,630.5188	0
Slice 51	913.02	324.79159	0	6,365.451	1,469.5802	0
Slice 52	921.145	327.51792	0	5,623.0356	1,298.1801	0
Slice 53	927.9783	329.81082	0	5,005.3727	1,155.5813	0
Slice 54	940.4349	333.99061	0	3,896.3361	899.54006	0
Slice 55	951.5816	337.73087	0	2,928.7904	676.16453	0
Slice 56	963.75	341.81395	0	1,906.7364	440.20478	0
Slice 57	971.75	344.49834	0	1,250.8449	288.7803	0
Slice 58	975.5	344.83571	0	1,020.1175	235.51269	0
Slice 59	979.05539	344.9373	0	871.42603	201.18455	0
Slice 60	979.80539	345.02883	0	862.23758	199.06323	0
Slice 61	981.3998	345.64879	0	704.88686	162.73595	0
Slice 62	983.84147	348.09976	0	331.48411	76.529138	0

Drained Final Grade -Baseliner static

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File Information

Title: [Model City - RMU-2 XS 3050](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [359](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/15/2013](#)
 Time: [8:32:07 AM](#)
 File Name: [RMU2X3050r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revisions\geoslope\final config\](#)
 Last Solved Date: [2/15/2013](#)
 Last Solved Time: [8:32:14 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Drained Final Grade -Baseliner static

Description: [auto search](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 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: [Yes](#)
 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: [40 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)
 Unit Weight: [115 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [13 °](#)
 Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [0 psf](#)

Phi': 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

NOT ACTIVE

Model: (None)

Pore Water Pressure

Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range

Left-Zone Left Coordinate: (575, 439.78411) ft

Left-Zone Right Coordinate: (675, 434.72777) ft

Left-Zone Increment: 10

Right Projection: Range

Right-Zone Left Coordinate: (970.5983, 355.16723) ft

Right-Zone Right Coordinate: (999.8, 349.5) ft

Right-Zone Increment: 5

Radius Increments: 10

Slip Surface Limits

Left Coordinate: (566.46829, 439.38777) ft

Right Coordinate: (1,026.2009, 321.16002) ft

Piezometric Lines**Piezometric Line 1****Coordinates**

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	313

Maximum Suction: 0 psf

Shear/Normal Strength Functions**Baseliner**

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600,000 psf
 SigmaC: 300,000 psf
 Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	500	306.45
Point 2	500	286.75
Point 3	500	280.9
Point 4	500	271.2
Point 5	740.7	270.8
Point 6	634.5	269.8
Point 7	1,200	269.95
Point 8	1,199.9987	278.5
Point 9	1,200	259.75
Point 10	1,200	286.05
Point 11	1,200	306.5
Point 12	1,200	322
Point 13	1,107.4	322.9
Point 14	1,023.4	321.1
Point 15	1,023.5	320.9
Point 16	898.8	320
Point 17	991.25	345.25
Point 18	999.8	349.5
Point 19	1,016	350
Point 20	997.75	348.5
Point 21	992.3	347.1
Point 22	978.7	349.8
Point 23	984.4	350
Point 24	972.5	344.75
Point 25	971	349.5
Point 26	914.8	371.1
Point 27	863.6	313.6
Point 28	798.1	312.4
Point 29	780.3	309.03
Point 30	732.5	315.9
Point 31	732.5	314.4
Point 32	732.6	309.9
Point 33	669.1	317
Point 34	669.1	315
Point 35	500	314.5
Point 36	500	320
Point 37	500	318
Point 38	500	433.6

Point 39	899.6	369.5
Point 40	500	258.75
Point 41	560.6	281.9
Point 42	880.5	314
Point 43	1,010.6	307.3
Point 44	1,023.5	282.3
Point 45	983.2	286.1
Point 46	1,026.6	269.9
Point 47	798.1	314.9
Point 48	873	311.5
Point 49	990	345.25
Point 50	987	348.5
Point 51	707.7	308.9
Point 52	669.1	311.05
Point 53	500	303.35
Point 54	707.7	305.9
Point 55	780.3	306
Point 56	863.7	305.4
Point 57	1,010.35	303.8
Point 58	1,199.9987	303
Point 59	653.3	286.1
Point 60	836.6	308.1
Point 61	890.3	308.2
Point 62	863.7	308.4
Point 63	890.3	305.2
Point 64	794.8	398.1
Point 65	582.2	437.6
Point 66	696.4	431
Point 67	809.8	399.6
Point 68	861.4	307.6
Point 69	797.1	308.9
Point 70	863.6	311.6
Point 71	500	436.3
Point 72	581.8	440.1
Point 73	696.3	433.5
Point 74	795	400.7
Point 75	810.1	402.1
Point 76	980.1	352
Point 77	915	373.7
Point 78	900.2	372.2
Point 79	1,080.5	282.7
Point 80	663.1	270.7
Point 81	565.2	307.6
Point 82	565.2	304.53077

Regions

	Material	Points	Area (ft²)
Region 1	Bottom Liner	37,34,31,28,70,48,42,27,47,30,33,36	756.75
Region 2	Side Slope Liner	42,16,24,49,50,23,22,25,27	606.02
Region 3	Deflection surface	16,24,49,50,23,21,20,18,19,14,15	2,170.4
Region 4	Deflection surface	42,16,15,14,13,12,11,43,61,62,48	4,514.2
Region 5	NOT ACTIVE	4,6,46,7,9,40	7,520.4
Region 6	NOT ACTIVE	4,3,41,80,5,44,79,8,7,46,6	5,230.9
Region 7	NOT ACTIVE	3,2,59,45,10,8,79,44,5,80,41	6,088.1
Region 8	NOT ACTIVE	2,53,82,54,55,56,63,57,58,10,45,59	12,919
Region 9	Deflection surface	35,52,32,29,51,81,1	992.38
Region 10	CCL	37,34,31,28,70,48,62,68,60,69,29,32,52,35	1,426.9
Region 11	Deflection surface	53,1,81,51,29,69,60,68,56,55,54,82	1,073.1
Region 12	Deflection surface	62,61,43,11,58,57,63,56,68	1,137.4
Region 13	Final Cover	38,65,66,64,67,39,26,22,23,76,77,78,75,74,73,72,71	1,253.8
Region 14	Waste Material	38,65,66,64,67,39,26,22,25,27,47,30,33,36	41,876

Current Slip Surface

Slip Surface: 727

F of S: 2.03

Volume: 23,202.998 ft³

Weight: 2,596,081.1 lbs

Resisting Moment: 1.978196e+008 lbs-ft

Activating Moment: 97,643,123 lbs-ft

Resisting Force: 823,208.7 lbs

Activating Force: 407,539.52 lbs

F of S Rank: 1

Exit: (984.33269, 350.03131) ft

Entry: (617.21542, 438.05859) ft

Radius: 184.47454 ft

Center: (837.63282, 510.98957) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	618.3782	436.75026	-0	117.11526	67.616525	0
Slice 2	624.89444	429.41837	0	702.69626	405.70187	0
Slice 3	635.8087	417.36621	0	1,629.8054	940.96858	0
Slice 4	646.9303	405.30906	0	2,513.7153	1,451.2942	0
Slice 5	658.0519	393.25191	0	3,366.0115	1,943.3676	0
Slice 6	668.90898	381.91949	0	4,237.6623	2,446.6155	0
Slice 7	679.50153	371.31183	0	4,961.4422	2,864.49	0
Slice 8	690.5489	360.52675	0	5,768.9644	3,330.7131	0
Slice 9	700.3799	351.15704	0	6,309.7291	3,642.9238	0
Slice 10	709.31872	342.86226	0	6,773.6128	3,910.7472	0
Slice 11	719.03657	334.04963	0	7,163.6468	4,135.9334	0
Slice	732.65444	322.70372	0	7,972.2848	4,602.8008	0

12						
Slice 13	742.12661	315.19904	0	8,702.525	2,283.4029	913.2129
Slice 14	743.20212	314.34693	0	8,748.6601	2,285.0994	923.59407
Slice 15	749.34407	313.17756	89.431574	10,841.622	1,895.9012	1,000
Slice 16	760.90342	311.41287	196.97551	10,699.934	1,851.955	1,000
Slice 17	771.60663	310.17271	271.97977	10,839.116	1,863.2711	1,000
Slice 18	781.45367	309.45707	314.44435	10,632.991	1,819.4383	1,000
Slice 19	788.98381	309.02094	339.983	10,630.518	1,814.499	1,000
Slice 20	793.19521	308.93022	344.70711	10,604.156	1,809.0177	1,000
Slice 21	794.9	308.91702	345.1509	10,553.039	1,799.9261	1,000
Slice 22	796.05	308.90812	345.45026	10,568.559	1,802.6099	1,000
Slice 23	797.6	308.88987	346.24422	10,546.735	1,798.6217	1,000
Slice 24	804.1	308.75823	353.0124	10,671.639	1,819.4523	1,000
Slice 25	814.2561	308.55253	363.58753	10,665.013	1,816.4192	1,000
Slice 26	822.47894	308.386	372.14963	10,421.366	1,771.9478	1,000
Slice 27	830.16004	308.23043	380.14764	10,189.544	1,729.6612	1,000
Slice 28	835.1872	308.12861	385.38221	10,035.684	1,701.6086	1,000
Slice 29	845.62312	309.90468	272.2333	10,281.649	1,764.93	1,000
Slice 30	859.12312	312.6531	0	9,570.5983	2,293.4953	1,121.0718
Slice 31	864.49287	313.78506	0	8,905.5045	2,055.9977	0
Slice 32	865.90734	314.08324	0	8,807.8712	2,033.4573	0
Slice 33	867.40342	314.39862	0	8,704.47	2,009.5853	0
Slice 34	875.80453	316.03729	0	8,089.7284	1,867.661	0
Slice 35	890.65778	318.90378	0	7,096.4749	1,638.3503	0
Slice 36	898.8422	320.56596	0	6,757.239	1,560.0315	0
Slice	899.9	320.88553	0	6,664.0674	1,538.5212	0

37						
Slice 38	907.6	323.21173	0	6,392.9493	1,475.9287	0
Slice 39	922.9333	328.10797	0	5,482.2801	1,265.6841	0
Slice 40	937.5555	333.01491	0	4,169.2238	962.54116	0
Slice 41	950.9333	337.50745	0	3,005.261	693.81916	0
Slice 42	964.3111	342	0	1,881.219	434.31364	0
Slice 43	971.75	344.49813	0	1,271.5659	293.56412	0
Slice 44	975.6	344.83857	0	1,030.9959	238.02415	0
Slice 45	979.27731	344.94364	0	877.47117	202.58018	0
Slice 46	979.97731	344.997	0	870.61646	200.99765	0
Slice 47	980.9609	345.29253	0	776.18678	179.19684	0
Slice 48	983.07725	347.79126	0	421.0759	97.213031	0

Drained Final Grade -Baseliner static (2)

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File Information

Title: [Model City - RMU-2 XS 3050](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [357](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/14/2013](#)
 Time: [6:20:31 PM](#)
 File Name: [RMU2X3050r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revisions\geoslope\final config\](#)
 Last Solved Date: [2/14/2013](#)
 Last Solved Time: [6:42:04 PM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Drained Final Grade -Baseliner static (2)

Description: [Block search](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 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: [Block](#)
 Critical slip surfaces saved: [1](#)
 Restrict Block Crossing: [No](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 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: [40 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)
 Unit Weight: [115 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [13 °](#)
 Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)

Cohesion': 0 psf
 Phi': 30 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

NOT ACTIVE

Model: (None)
 Pore Water Pressure
 Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (578.98724, 439.96933) ft
 Right Coordinate: (1,026.2009, 321.16002) ft

Slip Surface Block

Left Grid

Upper Left: (713.5, 314.7) ft
 Lower Left: (712.4, 293.4) ft
 Lower Right: (843.3, 291.5) ft
 X Increments: 8
 Y Increments: 1
 Starting Angle: 115 °
 Ending Angle: 135 °
 Angle Increments: 2

Right Grid

Upper Left: (856.1, 306.2) ft
 Lower Left: (863.8, 294.3) ft
 Lower Right: (873.5, 296.2) ft
 X Increments: 3
 Y Increments: 1
 Starting Angle: 15 °
 Ending Angle: 45 °
 Angle Increments: 2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	313

Maximum Suction: 0 psf

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
 Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 100 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	500	306.45
Point 2	500	286.75
Point 3	500	280.9
Point 4	500	271.2
Point 5	740.7	270.8
Point 6	634.5	269.8
Point 7	1,200	269.95
Point 8	1,199.9987	278.5
Point 9	1,200	259.75
Point 10	1,200	286.05
Point 11	1,200	306.5
Point 12	1,200	322
Point 13	1,107.4	322.9
Point 14	1,023.4	321.1
Point 15	1,023.5	320.9
Point 16	898.8	320
Point 17	991.25	345.25
Point 18	999.8	349.5
Point 19	1,016	350
Point 20	997.75	348.5
Point 21	992.3	347.1
Point 22	978.7	349.8
Point 23	984.4	350
Point 24	972.5	344.75
Point 25	971	349.5
Point 26	914.8	371.1
Point 27	863.6	313.6
Point 28	798.1	312.4
Point 29	780.3	309.03
Point 30	732.5	315.9
Point 31	732.5	314.4

Point 32	732.6	309.9
Point 33	669.1	317
Point 34	669.1	315
Point 35	500	314.5
Point 36	500	320
Point 37	500	318
Point 38	500	433.6
Point 39	899.6	369.5
Point 40	500	258.75
Point 41	560.6	281.9
Point 42	880.5	314
Point 43	1,010.6	307.3
Point 44	1,023.5	282.3
Point 45	983.2	286.1
Point 46	1,026.6	269.9
Point 47	798.1	314.9
Point 48	873	311.5
Point 49	990	345.25
Point 50	987	348.5
Point 51	707.7	308.9
Point 52	669.1	311.05
Point 53	500	303.35
Point 54	707.7	305.9
Point 55	780.3	306
Point 56	863.7	305.4
Point 57	1,010.35	303.8
Point 58	1,199.9987	303
Point 59	653.3	286.1
Point 60	836.6	308.1
Point 61	890.3	308.2
Point 62	863.7	308.4
Point 63	890.3	305.2
Point 64	794.8	398.1
Point 65	582.2	437.6
Point 66	696.4	431
Point 67	809.8	399.6
Point 68	861.4	307.6
Point 69	797.1	308.9
Point 70	863.6	311.6
Point 71	500	436.3
Point 72	581.8	440.1
Point 73	696.3	433.5
Point 74	795	400.7
Point 75	810.1	402.1
Point 76	980.1	352
Point 77	915	373.7

Point 78	900.2	372.2
Point 79	1,080.5	282.7
Point 80	663.1	270.7
Point 81	565.2	307.6
Point 82	565.2	304.53077

Regions

	Material	Points	Area (ft ²)
Region 1	Bottom Liner	37,34,31,28,70,48,42,27,47,30,33,36	756.75
Region 2	Side Slope Liner	42,16,24,49,50,23,22,25,27	606.02
Region 3	Deflection surface	16,24,49,50,23,21,20,18,19,14,15	2,170.4
Region 4	Deflection surface	42,16,15,14,13,12,11,43,61,62,48	4,514.2
Region 5	NOT ACTIVE	4,6,46,7,9,40	7,520.4
Region 6	NOT ACTIVE	4,3,41,80,5,44,79,8,7,46,6	5,230.9
Region 7	NOT ACTIVE	3,2,59,45,10,8,79,44,5,80,41	6,088.1
Region 8	NOT ACTIVE	2,53,82,54,55,56,63,57,58,10,45,59	12,919
Region 9	Deflection surface	35,52,32,29,51,81,1	992.38
Region 10	CCL	37,34,31,28,70,48,62,68,60,69,29,32,52,35	1,426.9
Region 11	Deflection surface	53,1,81,51,29,69,60,68,56,55,54,82	1,073.1
Region 12	Deflection surface	62,61,43,11,58,57,63,56,68	1,137.4
Region 13	Final Cover	38,65,66,64,67,39,26,22,23,76,77,78,75,74,73,72,71	1,253.8
Region 14	Waste Material	38,65,66,64,67,39,26,22,25,27,47,30,33,36	41,876

Current Slip Surface

Slip Surface: 1,297

F of S: 2.03

Volume: 24,263.904 ft³

Weight: 2,715,547 lbs

Resisting Moment: 2.3249588e+008 lbs-ft

Activating Moment: 1.1445132e+008 lbs-ft

Resisting Force: 859,968.26 lbs

Activating Force: 424,454.46 lbs

F of S Rank: 1

Exit: (984.20713, 350.08971) ft

Entry: (609.72116, 438.49057) ft

Radius: 187.30349 ft

Center: (931.1, 507) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	610.88895	437.18253	-0	117.29057	67.717742	0
Slice 2	616.78577	430.57744	0	648.30411	374.29856	0
Slice 3	626.24386	419.98335	0	1,457.3693	841.41258	0
Slice 4	636.32523	409.09299	0	2,301.0407	1,328.5065	0
Slice 5	647.0299	397.90635	0	3,111.7364	1,796.5619	0
Slice 6	657.73457	386.71971	0	3,898.7506	2,250.9447	0
Slice 7	668.62242	375.66595	0	4,734.2669	2,733.3303	0

Slice 8	679.69345	364.74506	0	5,479.5713	3,163.6319	0
Slice 9	690.76448	353.82418	0	6,215.1465	3,588.3165	0
Slice 10	698.90595	345.79313	0	6,695.6987	3,865.7635	0
Slice 11	706.70915	338.53687	0	7,208.5663	4,161.8677	0
Slice 12	717.009	329.4627	0	7,716.6019	4,455.1822	0
Slice 13	727.2142	320.68565	0	8,111.9871	4,683.4579	0
Slice 14	732.74666	316.09341	0	9,655.5474	5,574.6329	0
Slice 15	734.47476	315.27442	0	9,935.3644	2,283.7164	1,216.4831
Slice 16	736.17773	314.46734	0	9,965.0436	2,282.5467	1,224.4629
Slice 17	736.66543	314.23621	26.193002	10,061.355	1,769.4698	1,000
Slice 18	744.96815	312.76815	115.9521	10,980.53	1,915.7183	1,000
Slice 19	758.67804	310.78555	236.61537	11,073.298	1,910.7996	1,000
Slice 20	769.65832	309.67782	303.29422	10,876.233	1,864.2944	1,000
Slice 21	775.65094	309.11479	337.0937	11,092.686	1,896.5011	1,000
Slice 22	778.22671	309.06781	339.45201	11,020.803	1,883.4104	1,000
Slice 23	784.42705	308.99806	342.4246	10,883.576	1,858.6893	1,000
Slice 24	791.77705	308.94119	344.33794	10,663.62	1,819.5679	1,000
Slice 25	796.05	308.90812	345.45026	10,584.006	1,805.3336	1,000
Slice 26	797.6	308.88987	346.24422	10,562.208	1,801.3502	1,000
Slice 27	804.1	308.75823	353.0124	10,683.17	1,821.4856	1,000
Slice 28	814.79685	308.54158	364.15059	10,654.523	1,814.4702	1,000
Slice 29	823.01969	308.37504	372.71269	10,406.442	1,769.2172	1,000
Slice 30	831.57284	308.20182	381.61873	10,143.473	1,721.2783	1,000
Slice 31	837.58272	308.08019	387.87093	9,956.5265	1,687.2121	1,000
Slice 32	844.69957	308.27698	374.00745	9,882.9784	1,676.6881	1,000
Slice 33	857.21685	309.24621	310.74146	9,583.8629	1,635.1015	1,000

Slice 34	864.49287	310.10413	255.5885	9,188.2538	1,575.0699	1,000
Slice 35	868.28118	310.5508	226.87279	8,985.5979	1,544.3995	1,000
Slice 36	872.08831	311.1961	185.75901	9,460.9543	1,635.4672	1,000
Slice 37	875.73685	312.41228	0	9,335.0273	2,295.3542	1,062.0239
Slice 38	879.48685	313.66228	0	8,973.9042	2,291.5284	975.34081
Slice 39	890.35	317.23507	0	7,619.2483	1,759.0421	0
Slice 40	900.38211	320.5313	0	6,733.3028	1,554.5054	0
Slice 41	907.44236	322.90228	0	6,464.9303	1,492.5468	0
Slice 42	914.56025	325.29262	0	6,193.6277	1,429.9116	0
Slice 43	914.9	325.40672	0	6,181.3385	1,427.0744	0
Slice 44	924.0229	328.47038	0	5,360.092	1,237.4747	0
Slice 45	936.53818	332.67327	0	4,242.4168	979.4391	0
Slice 46	947.77291	336.44613	0	3,267.5716	754.37834	0
Slice 47	963.25764	341.64622	0	1,965.212	453.70494	0
Slice 48	971.63995	344.46118	0	1,279.1996	295.3265	0
Slice 49	975.48995	344.80161	0	1,041.1471	240.36775	0
Slice 50	979.4	344.94714	0	871.63777	201.23344	0
Slice 51	980.60029	344.98144	0	808.16352	186.57925	0
Slice 52	982.65385	347.54272	0	478.66546	110.50863	0

Figure 17 - Stability Analyses For Seismic Response

Consolidated Undrained Final Grade

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File Information

Title: [Model City - RMU-2 Sta 1350](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [354](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/18/2013](#)
 Time: [9:07:57 AM](#)
 File Name: [RMU2X1350.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revisions\geoslope\final config\](#)
 Last Solved Date: [2/18/2013](#)
 Last Solved Time: [9:26:24 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Consolidated Undrained Final Grade

Description: [determination of critical f surface for use in yield acc. analysis - fully consolidated](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

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: [Yes](#)
 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: [25 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [150 psf](#)
 Phi': [31 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

side slope liner

Model: [Mohr-Coulomb](#)
 Unit Weight: [115 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [13 °](#)
 Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: 1

STRUCTURAL FILL

Model: [Mohr-Coulomb](#)
 Unit Weight: 130 pcf
 Cohesion': 195 psf
 Phi': 28.7 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

final cover

Model: [Mohr-Coulomb](#)
 Unit Weight: 125 pcf
 Cohesion': 0 psf
 Phi': 30 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: 1

GC Consolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: 120 pcf
 Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static 0.34](#)
 Phi-B: 0 °
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: 1

GC Overconsolidated

Model: [Shear/Normal Fn.](#)
 Unit Weight: 125 pcf
 Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
 Phi-B: 0 °
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: [Range](#)
 Left-Zone Left Coordinate: (644.2295, 434.69603) ft
 Left-Zone Right Coordinate: (789.3109, 401.99999) ft
 Left-Zone Increment: 10
 Right Projection: [Range](#)
 Right-Zone Left Coordinate: (1,026.9725, 320) ft
 Right-Zone Right Coordinate: (1,142, 317.32468) ft
 Right-Zone Increment: 10
 Radius Increments: 6

Slip Surface Limits

Left Coordinate: (599.83553, 435.7357) ft

Right Coordinate: (1,155.0854, 316.64491) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	200	314.5
Coordinate 2	1,200	313

Maximum Suction: 0 psf

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf
 Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static 0.34

Model: Add-In Function
 Function: Shear Stress vs. Normal Stress
 Assembly: GeoStudio AddIns1
 Function: SHANSEPP
 Field
 MPP: 5000
 m: 0.7
 S: 0.34
 Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
 Function: Shear Stress vs. Normal Stress
 Assembly: GeoStudio AddIns1
 Function: SHANSEPP
 Field
 MPP: 8000
 m: 0.7
 S: .34
 Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	350.5	318.75
Point 2	362.75	324.75
Point 3	367.75	324.75
Point 4	386.25	315.5
Point 5	386.75	309.25
Point 6	386.75	307.75
Point 7	369.25	309.75
Point 8	352.75	312.75
Point 9	338	312.5
Point 10	200	309
Point 11	200	315
Point 12	386.75	287.25
Point 13	200	286.5
Point 14	200	271.75
Point 15	200	269.75
Point 16	470	274.5
Point 17	469.75	268.5
Point 18	493.25	268.5
Point 19	524	266.5
Point 20	602	275.25
Point 21	602.5	267
Point 22	851	276.5
Point 23	851.5	268.5
Point 24	1,200	269.75

Point 25	1,200	276
Point 26	1,195	269.75
Point 27	1,195	276
Point 28	1,200	259.75
Point 29	1,195	259.75
Point 30	1,195	284.25
Point 31	1,200	284.25
Point 32	1,195	301.5
Point 33	1,200	301.5
Point 34	1,200	315.5
Point 35	1,195	315.5
Point 36	1,186.75	315
Point 37	1,102.5	319.25
Point 38	1,109.75	319
Point 39	1,085.25	319.5
Point 40	1,066	319.75
Point 41	1,036.75	320
Point 42	1,023.75	320
Point 43	1,023.75	319.25
Point 44	897.25	319.5
Point 45	991.25	345.25
Point 46	1,000	349.5
Point 47	1,016.25	350
Point 48	997.75	348.5
Point 49	992.5	347
Point 50	978.5	349.75
Point 51	985.75	350
Point 52	972.5	344.75
Point 53	971.5	349.5
Point 54	910.4	372.6
Point 55	910.6	375.1
Point 56	895.4	371.1
Point 57	895.7	373.6
Point 58	806.4	402.8
Point 59	806.2	400.3
Point 60	791.2	398.8
Point 61	791.4	401.3
Point 62	694.8	431
Point 63	695.3	433.5
Point 64	687.8	431.4
Point 65	438.6	436.6
Point 66	439.1	439.5
Point 67	200	436
Point 68	200	433.5
Point 69	467	350
Point 70	844.5	307.25

Point 71	842.25	301.25
Point 72	812.5	305.5
Point 73	812.25	301.75
Point 74	732	309.25
Point 75	732	307.25
Point 76	732	303.25
Point 77	670.5	304.25
Point 78	670.5	310.25
Point 79	670.5	308
Point 80	606.5	303.5
Point 81	606.5	305.5
Point 82	606.5	311.5
Point 83	606.5	309.5
Point 84	520.75	307
Point 85	520.75	313
Point 86	520.75	311
Point 87	520.75	305.5
Point 88	463.5	306.75
Point 89	413.5	306.25
Point 90	405.5	307.75
Point 91	411.25	309
Point 92	411	315
Point 93	411	312.75
Point 94	386.25	313.75
Point 95	350.5	316.75
Point 96	200	313
Point 97	542.25	375
Point 98	883	375
Point 99	616.25	399.75
Point 100	200	350
Point 101	200	375
Point 102	200	400
Point 103	200	259
Point 104	363	269
Point 105	373	274
Point 106	415	269
Point 107	415	258
Point 108	560	275
Point 109	563	258
Point 110	751	276
Point 111	751	268
Point 112	854.5	305.25
Point 113	872.5	287.25
Point 114	981.25	300.5
Point 115	1,081.25	276
Point 116	1,080.75	285.5

Point 117	1,080	300.75
Point 118	1,081.25	269.75
Point 119	1,081.25	259
Point 120	812.25	308
Point 121	362.75	323.25
Point 122	367.75	323.25
Point 123	844.5	304.75
Point 124	851.75	304.5
Point 125	990	345.25
Point 126	987	348.5
Point 127	637	303.8574
Point 128	637	304.9043
Point 129	379	319.25
Point 130	200	308
Point 131	261.25	308
Point 132	343.5	307.75
Point 133	387	305
Point 134	344	305
Point 135	261	305
Point 136	200	305
Point 137	413	303
Point 138	464	304
Point 139	521	302
Point 140	607	300
Point 141	637	301
Point 142	670	301
Point 143	732	300
Point 144	854	301
Point 145	981	297
Point 146	1,080	298
Point 147	1,195	298
Point 148	1,200	298

Regions

	Material	Points	Area (ft ²)
Region 1	Waste Material	99,62,60	2,770.9
Region 2	Waste Material	97,99,60,59,98	6,502.4
Region 3	Waste Material	69,97,98,56,54,50,53	10,963
Region 4	Waste Material	129,69,53,70,120,74,78,82,85,92,4	19,218
Region 5	Bottom Liner	2,121,122,94,93,86,83,79,75,72,123,124,112,70,120,74,78,82,85,92,4,129,3	1,036.1
Region	side slope liner	112,44,52,125,126,51,50,53,70	718.34

6			
Region 7	STRUCTURAL FILL	44,52,125,126,51,49,48,46,47,42,43	2,311
Region 8	Upper Till	112,44,43,42,41,40,39,37,38,36,35,32,117,114	5,551.3
Region 9	NOT ACTIVE	15,104,106,17,18,19,21,111,23,118,26,29,119,109,107,103	10,051
Region 10	NOT ACTIVE	15,14,105,16,108,20,110,22,115,27,26,118,23,111,21,19,18,17,106,104	6,503.2
Region 11	Deflection surface	14,13,12,113,116,30,27,115,22,110,20,108,16,105	11,503
Region 12	GC Consolidated Undrained	13,136,135,134,133,137,138,139,140,141,142,143,73,71,144,145,146,147,30,116,113,12	14,287
Region 13	Upper Till	10,9,8,7,5,91,84,81,128,127,80,87,88,89,90,6,132,131	937.18
Region 14	CCL	95,121,122,94,93,86,83,79,75,72,123,124,71,73,76,77,127,128,81,84,91,5,7,8,9	2,164.5
Region 15	Upper Till	10,96,95,9	572.38
Region 16		96,11,1,2,121,95	322.44
Region 17	Waste Material	100,69,129,3,2,1,11	7,125.6
Region 18	Waste Material	100,101,97,69	7,615.6
Region 19	Waste Material	101,102,99,97	9,438.5
Region 20	Waste Material	102,68,65,64,62,99	15,898
Region 21	final cover	68,67,66,63,62,64,65	1,307.1
Region 22	final cover	62,60,59,98,56,54,50,51,55,57,58,61,63	751.41
Region 23		35,34,33,32	70
Region 24		148,31,30,147	68.75
Region 25		30,31,25,27	41.25
Region 26		27,25,24,26	31.25
Region 27		26,24,28,29	50
Region 28	GC Overconsolidated	136,130,10,131,132,6,90,89,88,87,80,127,77,76,73,143,142,141,140,139,138,137,133,134,135	1,821.9
Region 29	GC Overconsolidated	71,124,112,114,117,32,147,146,145,144	1,187.5
Region 30		32,33,148,147	17.5

Current Slip Surface

Slip Surface: 848
 F of S: 1.40
 Volume: 26,968.26 ft³
 Weight: 3,131,222.7 lbs
 Resisting Moment: 2.4140409e+008 lbs-ft
 Activating Moment: 1.7223273e+008 lbs-ft
 Resisting Force: 826,405.97 lbs
 Activating Force: 572,919.44 lbs
 F of S Rank: 1
 Exit: (1,082.3837, 319.53722) ft
 Entry: (670.4099, 434.08291) ft
 Radius: 211.94971 ft
 Center: (931.31653, 530.39025) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	671.47723	432.90062	-0	99.073744	57.200253	0
Slice 2	675.72362	428.1969	0	456.0057	263.27501	0
Slice 3	679.17589	424.37284	0	733.80341	423.6616	0
Slice 4	683.62455	418.70026	0	1,080.8456	624.02649	0
Slice 5	691.3	408.82906	0	1,734.3002	1,001.2987	0
Slice 6	695.05	404.00628	0	2,047.3916	1,182.0621	0
Slice 7	697.00383	401.4935	0	2,170.8445	1,253.3377	0
Slice 8	702.80783	394.02912	0	2,513.656	1,451.26	0
Slice 9	712.86833	381.878	0	3,175.1538	1,833.1759	0
Slice 10	724.30355	368.68218	0	3,744.2405	2,161.7382	0
Slice 11	735.25333	356.04654	0	4,274.0185	2,467.6057	0
Slice 12	742.10721	348.13741	0	4,600.1417	2,655.8931	0
Slice 13	752.83115	337.2028	0	5,325.7717	3,074.8357	0
Slice 14	770.19756	320.74609	0	6,265.63	3,617.4632	0
Slice 15	781.14744	311.03576	0	6,655.6547	3,842.644	0
Slice 16	785.41735	307.24922	0	7,225.785	2,162.9766	618.60937
Slice 17	787.71762	305.20935	524.72649	7,526.4421	1,234.5914	1,000
Slice 18	789.9382	304.12381	592.25619	10,051.311	1,667.8866	1,000
Slice 19	791.3	303.86987	607.97457	10,037.353	1,662.6538	1,000
Slice 20	796.50037	302.90014	667.99908	10,222.565	1,684.7278	1,000
Slice 21	802.63607	301.75599	738.81951	10,439.521	2,586.1173	0.0010573445
Slice 22	804.9357	301.32717	765.36266	10,524.438	2,601.6803	-3.6679555e-005
Slice 23	806.3	301.07276	781.10988	10,574.829	2,610.9158	0.0003312879
Slice 24	809.45	300.48537	817.4683	10,550.68	2,594.7858	-0.00058531754
Slice 25	818.28598	298.8377	919.45625	10,472.442	2,546.7379	0.00086171923
Slice 26	829.85793	296.67983	1,053.0238	10,372.354	2,484.448	0.00031524094
Slice 27	838.94695	295.28238	1,139.3743	10,702.645	2,330.3956	0.00095279171
Slice 28	843.375	294.85536	1,165.6054	10,623.432	2,304.7008	0.00094228627
Slice 29	848.125	294.39731	1,193.7436	10,546.232	2,279.0336	-0.00099605281
Slice 30	852.875	293.93925	1,221.8819	10,468.733	2,253.2904	0.00028591034
Slice 31	854.25	293.80665	1,230.0271	10,445.814	2,245.7216	-0.00050657755
Slice 32	858.90108	293.35813	1,257.5794	10,381.153	2,223.2496	0.00075226307
Slice 33	866.73988	292.60221	1,304.0152	10,272.188	2,185.382	-3.0810411e-005

Slice 34	874.68561	291.9524	1,343.8195	10,276.014	2,150.0995	-0.00078813732
Slice 35	881.09681	291.49973	1,371.4664	10,162.45	2,116.1059	0.0014618537
Slice 36	889.35	290.91699	1,407.0564	10,010.105	2,070.8687	-2.9195956e-005
Slice 37	896.475	290.41392	1,437.7814	9,914.7702	2,040.5246	-2.8768151e-005
Slice 38	903.925	289.8879	1,469.9079	10,146.406	2,088.5493	-0.00017667133
Slice 39	916.00985	289.03462	1,522.0212	10,254.569	2,102.0413	-0.0003259898
Slice 40	926.82955	288.27067	1,568.6787	10,048.86	2,041.2921	0.00097848556
Slice 41	941.81315	287.3394	1,625.3877	9,796.3848	1,961.8278	0.0004093479
Slice 42	954.18656	286.66507	1,666.308	9,569.3617	1,896.9705	-0.00040651256
Slice 43	964.59061	286.47613	1,677.1238	9,412.8495	1,856.6003	-5.235019e-006
Slice 44	972.3475	286.41095	1,680.4653	9,170.8298	1,797.713	-0.00025851775
Slice 45	975.5	286.38445	1,681.8233	9,051.8077	1,768.8208	0.00036907576
Slice 46	979.75	286.34874	1,683.6541	8,883.1179	1,727.896	-0.00037028062
Slice 47	981.125	286.33718	1,684.2464	8,823.1362	1,713.3579	-0.00024638717
Slice 48	983.46485	286.31752	1,685.2543	8,720.4357	1,688.468	-0.00071890165
Slice 49	985.71485	286.29861	1,686.2235	8,621.5778	1,664.5093	-0.00082603521
Slice 50	986.375	286.29307	1,686.5079	8,594.0407	1,657.8319	-0.00070585768
Slice 51	988.5	286.27521	1,687.4233	8,502.8694	1,635.73	0.00011069366
Slice 52	991.25	286.2521	1,688.6079	8,361.6867	1,601.5613	0.00010838139
Slice 53	995.125	286.21954	1,690.2771	8,383.6107	1,606.4227	-4.5295984e-006
Slice 54	998.875	286.18803	1,691.8925	8,546.4761	1,645.123	0.00022729736
Slice 55	1,008.125	286.11029	1,695.8771	8,628.938	1,663.9584	-0.00035657907
Slice 56	1,016.6753	286.03844	1,699.5604	8,415.341	1,611.8098	0.00022269467
Slice 57	1,019.5531	286.01426	1,700.8	6,875.5206	1,241.9505	-4.7275694e-005
Slice 58	1,022.8778	286.3446	1,679.8759	5,905.9385	427.0597	996.4746
Slice 59	1,024.734	287.09147	1,633.0972	5,268.5084	408.20106	952.47023
Slice 60	1,031.234	290.49183	1,420.3061	5,027.7375	437.9644	1,021.918
Slice 61	1,040.5539	295.56812	1,102.6733	4,165.1602	416.96755	972.92334
Slice 62	1,047.1428	299.15692	878.11547	3,830.2351	573.06536	1,337.1512
Slice 63	1,052.5208	302.08618	694.82617	3,238.3926	1,528.3289	150
Slice 64	1,060.5569	306.69984	406.18159	2,426.3223	1,213.823	150
Slice 65	1,068.7981	311.5469	102.95412	1,537.1667	861.76187	150
Slice 66	1,076.99	316.36492	-0	655.26033	393.72013	150

Figure 18 - Stability Analyses For Seismic Response

Consolidated Undrained-Seismic Yield

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File Information

Title: [Model City - RMU-2 Sta 1350](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [359](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/18/2013](#)
 Time: [9:44:44 AM](#)
 File Name: [RMU2X1350.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revisions\geoslope\final config\](#)
 Last Solved Date: [2/18/2013](#)
 Last Solved Time: [9:44:52 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Consolidated Undrained-Seismic Yield

Description: [yield acceleration determination on critical failure surface](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

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: [Fully-Specified](#)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: [Sensitivity](#)

Modifiers

	Property	Offset
	Analyses[3].Applied.SeismicX	Range(Mean=0,Delta=0.001)

Advanced

Number of Slices: [30](#)F of S Tolerance: [0.01](#)Minimum Slip Surface Depth: [25 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

Waste Material

Model: [Mohr-Coulomb](#)Unit Weight: [111 pcf](#)Cohesion': [0 psf](#)Phi': [30 °](#)Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)Unit Weight: [120 pcf](#)Strength Function: [Baseliner](#)Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)Unit Weight: [120 pcf](#)Cohesion': [1,000 psf](#)Phi': [10 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)Unit Weight: [125 pcf](#)Cohesion': [150 psf](#)Phi': [31 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

side slope liner

Model: [Mohr-Coulomb](#)Unit Weight: [115 pcf](#)Cohesion': [0 psf](#)

Phi': 13 °
Phi-B: 0 °

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
Pore Water Pressure
Piezometric Line: 1

STRUCTURAL FILL

Model: [Mohr-Coulomb](#)
Unit Weight: 130 pcf
Cohesion': 195 psf
Phi': 28.7 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

final cover

Model: [Mohr-Coulomb](#)
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

NOT ACTIVE

Model: [\(None\)](#)
Pore Water Pressure
Piezometric Line: 1

GC Consolidated Undrained

Model: [Shear/Normal Fn.](#)
Unit Weight: 120 pcf
Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static 0.34](#)
Phi-B: 0 °
Anisotropic Strength Fn: [clay ellipse staticshear](#)
Pore Water Pressure
Piezometric Line: 1

GC Overconsolidated

Model: [Shear/Normal Fn.](#)
Unit Weight: 125 pcf
Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
Phi-B: 0 °
Anisotropic Strength Fn: [clay ellipse staticshear](#)
Pore Water Pressure
Piezometric Line: 1

Slip Surface Limits

Left Coordinate: [\(599.83553, 435.7357\) ft](#)
Right Coordinate: [\(1,155.0854, 316.64491\) ft](#)

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

	X (ft)	Y (ft)
	666	441
	671.4772	432.9006
	675.7236	428.1969
	679.1759	424.3728
	683.6246	418.7003
	691.3	408.8291
	695.05	404.0063
	697.0038	401.4935
	702.8078	394.0291
	712.8683	381.878
	724.3035	368.6822
	735.2533	356.0465
	742.1072	348.1374
	752.8311	337.2028
	770.1976	320.7461
	781.1474	311.0358
	785.4174	307.2492
	787.7176	305.2093
	789.9382	304.1238
	791.3	303.8699
	796.5004	302.9001
	802.6361	301.756
	804.9357	301.3272
	806.3	301.0728
	809.45	300.4854
	818.286	298.8377
	829.8579	296.6798
	838.947	295.2824
	843.375	294.8554
	848.125	294.3973
	852.875	293.9393
	854.25	293.8066
	858.9011	293.3581
	866.7399	292.6022
	874.6856	291.9524
	881.0968	291.4997
	889.35	290.917
	896.475	290.4139
	903.925	289.8879
	916.0099	289.0346
	926.8296	288.2707
	941.8131	287.3394

	954.1866	286.6651
	964.5906	286.4761
	972.3475	286.411
	975.5	286.3845
	979.75	286.3487
	981.125	286.3372
	983.4648	286.3175
	985.7148	286.2986
	986.375	286.2931
	988.5	286.2752
	991.25	286.2521
	995.125	286.2195
	998.875	286.188
	1,008.13	286.1103
	1,016.68	286.0384
	1,019.55	286.0143
	1,022.88	286.3446
	1,024.73	287.0915
	1,031.23	290.4918
	1,040.55	295.5681
	1,047.14	299.1569
	1,052.52	302.0862
	1,060.56	306.6998
	1,068.8	311.5469
	1,076.99	316.3649
	1,094	327

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	200	314.5
Coordinate 2	1,200	313

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0.099

Ignore seismic load in strength: Yes

Anisotropic Strength Functions

clay ellipse staticshear

Model: [Spline Data Point Function](#)

Function: [Modifier Factor vs. Inclination](#)

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: [Inclination \(°\)](#), [Modifier Factor](#)

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static 0.34

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: SHANSEPP

Field

MPP: 5000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: SHANSEPP

Field

MPP: 8000

m: 0.7

S: .34

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	350.5	318.75
Point 2	362.75	324.75
Point 3	367.75	324.75
Point 4	386.25	315.5
Point 5	386.75	309.25
Point 6	386.75	307.75
Point 7	369.25	309.75
Point 8	352.75	312.75
Point 9	338	312.5
Point 10	200	309
Point 11	200	315
Point 12	386.75	287.25
Point 13	200	286.5
Point 14	200	271.75
Point 15	200	269.75
Point 16	470	274.5
Point 17	469.75	268.5
Point 18	493.25	268.5
Point 19	524	266.5
Point 20	602	275.25
Point 21	602.5	267
Point 22	851	276.5
Point 23	851.5	268.5
Point 24	1,200	269.75
Point 25	1,200	276
Point 26	1,195	269.75
Point 27	1,195	276
Point 28	1,200	259.75
Point 29	1,195	259.75
Point 30	1,195	284.25
Point 31	1,200	284.25
Point 32	1,195	301.5
Point 33	1,200	301.5
Point 34	1,200	315.5
Point 35	1,195	315.5
Point 36	1,186.75	315
Point 37	1,102.5	319.25
Point 38	1,109.75	319
Point 39	1,085.25	319.5

Point 40	1,066	319.75
Point 41	1,036.75	320
Point 42	1,023.75	320
Point 43	1,023.75	319.25
Point 44	897.25	319.5
Point 45	991.25	345.25
Point 46	1,000	349.5
Point 47	1,016.25	350
Point 48	997.75	348.5
Point 49	992.5	347
Point 50	978.5	349.75
Point 51	985.75	350
Point 52	972.5	344.75
Point 53	971.5	349.5
Point 54	910.4	372.6
Point 55	910.6	375.1
Point 56	895.4	371.1
Point 57	895.7	373.6
Point 58	806.4	402.8
Point 59	806.2	400.3
Point 60	791.2	398.8
Point 61	791.4	401.3
Point 62	694.8	431
Point 63	695.3	433.5
Point 64	687.8	431.4
Point 65	438.6	436.6
Point 66	439.1	439.5
Point 67	200	436
Point 68	200	433.5
Point 69	467	350
Point 70	844.5	307.25
Point 71	842.25	301.25
Point 72	812.5	305.5
Point 73	812.25	301.75
Point 74	732	309.25
Point 75	732	307.25
Point 76	732	303.25
Point 77	670.5	304.25
Point 78	670.5	310.25
Point 79	670.5	308
Point 80	606.5	303.5
Point 81	606.5	305.5
Point 82	606.5	311.5
Point 83	606.5	309.5
Point 84	520.75	307
Point 85	520.75	313

Point 86	520.75	311
Point 87	520.75	305.5
Point 88	463.5	306.75
Point 89	413.5	306.25
Point 90	405.5	307.75
Point 91	411.25	309
Point 92	411	315
Point 93	411	312.75
Point 94	386.25	313.75
Point 95	350.5	316.75
Point 96	200	313
Point 97	542.25	375
Point 98	883	375
Point 99	616.25	399.75
Point 100	200	350
Point 101	200	375
Point 102	200	400
Point 103	200	259
Point 104	363	269
Point 105	373	274
Point 106	415	269
Point 107	415	258
Point 108	560	275
Point 109	563	258
Point 110	751	276
Point 111	751	268
Point 112	854.5	305.25
Point 113	872.5	287.25
Point 114	981.25	300.5
Point 115	1,081.25	276
Point 116	1,080.75	285.5
Point 117	1,080	300.75
Point 118	1,081.25	269.75
Point 119	1,081.25	259
Point 120	812.25	308
Point 121	362.75	323.25
Point 122	367.75	323.25
Point 123	844.5	304.75
Point 124	851.75	304.5
Point 125	990	345.25
Point 126	987	348.5
Point 127	637	303.8574
Point 128	637	304.9043
Point 129	379	319.25
Point 130	200	308
Point 131	261.25	308

Point 132	343.5	307.75
Point 133	387	305
Point 134	344	305
Point 135	261	305
Point 136	200	305
Point 137	413	303
Point 138	464	304
Point 139	521	302
Point 140	607	300
Point 141	637	301
Point 142	670	301
Point 143	732	300
Point 144	854	301
Point 145	981	297
Point 146	1,080	298
Point 147	1,195	298
Point 148	1,200	298

Regions

	Material	Points	Area (ft ²)
Region 1	Waste Material	99,62,60	2,770.9
Region 2	Waste Material	97,99,60,59,98	6,502.4
Region 3	Waste Material	69,97,98,56,54,50,53	10,963
Region 4	Waste Material	129,69,53,70,120,74,78,82,85,92,4	19,218
Region 5	Bottom Liner	2,121,122,94,93,86,83,79,75,72,123,124,112,70,120,74,78,82,85,92,4,129,3	1,036.1
Region 6	side slope liner	112,44,52,125,126,51,50,53,70	718.34
Region 7	STRUCTURAL FILL	44,52,125,126,51,49,48,46,47,42,43	2,311
Region 8	Upper Till	112,44,43,42,41,40,39,37,38,36,35,32,117,114	5,551.3
Region 9	NOT ACTIVE	15,104,106,17,18,19,21,111,23,118,26,29,119,109,107,103	10,051
Region 10	NOT ACTIVE	15,14,105,16,108,20,110,22,115,27,26,118,23,111,21,19,18,17,106,104	6,503.2
Region 11	Deflection surface	14,13,12,113,116,30,27,115,22,110,20,108,16,105	11,503
Region 12	GC Consolidated Undrained	13,136,135,134,133,137,138,139,140,141,142,143,73,71,144,145,146,147,30,116,113,12	14,287
Region 13	Upper Till	10,9,8,7,5,91,84,81,128,127,80,87,88,89,90,6,132,131	937.18
Region 14	CCL	95,121,122,94,93,86,83,79,75,72,123,124,71,73,76,77,127,128,81,84,91,5,7,8,9	2,164.5
Region 15	Upper Till	10,96,95,9	572.38
Region 16		96,11,1,2,121,95	322.44
Region 17	Waste Material	100,69,129,3,2,1,11	7,125.6
Region 18	Waste Material	100,101,97,69	7,615.6
Region 19	Waste Material	101,102,99,97	9,438.5
Region 20	Waste Material	102,68,65,64,62,99	15,898
Region 21	final cover	68,67,66,63,62,64,65	1,307.1
Region 22	final cover	62,60,59,98,56,54,50,51,55,57,58,61,63	751.41
Region 23		35,34,33,32	70
Region 24		148,31,30,147	68.75

Region 25		30,31,25,27	41.25
Region 26		27,25,24,26	31.25
Region 27		26,24,28,29	50
Region 28	GC Overconsolidated	136,130,10,131,132,6,90,89,88,87,80,127,77,76,73,143,142,141,140,139,138,137,133,134,135	1,821.9
Region 29	GC Overconsolidated	71,124,112,114,117,32,147,146,145,144	1,187.5
Region 30		32,33,148,147	17.5

Current Slip Surface

Slip Surface: 1

F of S: 1.00

Volume: 26,957.31 ft³

Weight: 3,130,042.2 lbs

Resisting Moment: 2.1891373e+008 lbs-ft

Activating Moment: 2.1895045e+008 lbs-ft

Resisting Force: 819,566.59 lbs

Activating Force: 820,572.17 lbs

F of S Rank: 1

Exit: (1,082.0704, 319.54129) ft

Entry: (670.68198, 434.07653) ft

Radius: 211.77339 ft

Center: (964, 503) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	671.07959	433.48857	-0	43.297188	24.997643	0
Slice 2	672.01086	432.30947	-0	143.94745	83.108097	0
Slice 3	674.13406	429.95762	0	315.92387	182.39873	0
Slice 4	677.31313	426.43618	0	560.51922	323.61592	0
Slice 5	679.03928	424.52413	0	691.04184	398.97319	0
Slice 6	681.40025	421.53655	0	844.07526	487.32708	0
Slice 7	685.7123	416.01534	0	1,179.8969	681.21377	0
Slice 8	689.55	411.07974	0	1,472.2365	849.99614	0
Slice 9	693.05	406.57846	0	1,730.5448	999.13052	0
Slice 10	694.925	404.16706	0	1,866.24	1,077.4742	0
Slice 11	695.175	403.84554	0	1,884.6311	1,088.0923	0
Slice 12	696.1519	402.58914	0	1,936.7407	1,118.1777	0
Slice 13	697.85571	400.39787	0	2,021.7611	1,167.2643	0
Slice 14	700.75771	396.66567	0	2,163.4875	1,249.0901	0
Slice 15	707.83805	387.95355	0	2,550.4112	1,472.4806	0
Slice 16	715.84846	378.439	0	2,945.3972	1,700.5259	0
Slice 17	721.56606	371.8411	0	3,165.7995	1,827.7752	0
Slice 18	729.7784	362.36435	0	3,470.0887	2,003.4567	0
Slice 19	737.99075	352.88761	0	3,764.4327	2,173.3962	0
Slice 20	741.4177	348.93306	0	3,884.443	2,242.6842	0
Slice 21	747.46915	342.6701	0	4,349.7857	2,511.3499	0
Slice 22	761.51435	328.97445	0	4,949.0918	2,857.3595	0
Slice 23	774.20832	317.18939	0	5,510.5383	3,181.5108	0

Slice 24	779.68322	312.33424	0	5,664.1255	3,270.1844	0
Slice 25	782.61164	309.73732	0	5,747.5506	3,318.3499	0
Slice 26	784.74664	307.84402	0	5,865.7145	1,944.1648	408.25404
Slice 27	786.0881	306.6544	0	5,903.5488	1,951.5793	413.36317
Slice 28	787.2382	305.63445	498.2451	5,940.3823	959.59563	1,000
Slice 29	788.8279	304.66655	558.49299	7,606.9928	1,242.8407	1,000
Slice 30	790.5691	304.00617	599.53759	9,441.473	1,559.0718	1,000
Slice 31	791.25	303.87922	607.39553	9,436.1737	1,556.7518	1,000
Slice 32	791.35	303.86058	608.54972	9,434.5849	1,556.2681	1,000
Slice 33	793.9502	303.37568	638.5641	9,527.9547	1,567.4394	1,000
Slice 34	799.05059	302.42458	697.43536	9,716.5979	1,590.3217	1,000
Slice 35	802.11844	301.85253	732.84413	9,753.8595	2,404.8988	-0.00020343148
Slice 36	803.1538	301.65947	744.79418	9,793.3364	2,412.2402	-3.4008751e-005
Slice 37	804.3036	301.44507	758.06512	9,836.6558	2,420.2489	0.0018425711
Slice 38	805.56785	301.20932	772.65707	9,883.8243	2,428.9421	-0.00089034945
Slice 39	806.25	301.08212	780.5305	9,909.6136	2,433.7171	0.00030880391
Slice 40	806.35	301.06348	781.68473	9,913.8796	2,434.5678	-0.00054917643
Slice 41	807.925	300.76978	799.86419	9,904.6734	2,427.2668	-0.00037642657
Slice 42	810.85	300.22433	833.626	9,883.3735	2,412.587	-0.00071428624
Slice 43	815.268	299.40048	884.62072	9,853.6243	2,391.0596	0.00097759444
Slice 44	824.07195	297.75875	986.24087	9,798.4012	2,349.2525	0.00013248291
Slice 45	834.40245	295.9811	1,096.1993	9,970.4299	2,277.6312	-0.00083488515
Slice 46	840.5985	295.12314	1,149.1559	10,385.772	2,250.7953	-0.00082504823
Slice 47	842.8125	294.90964	1,162.271	10,359.387	2,241.1698	-0.00066353534
Slice 48	843.9375	294.80115	1,168.9356	10,347.428	2,236.6438	0.001545124
Slice 49	846.3125	294.5721	1,183.006	10,323.335	2,227.3465	-0.00081645286
Slice 50	849.9375	294.22254	1,204.4796	10,287.125	2,213.2598	-0.00034323783
Slice 51	852.3125	293.99354	1,218.5469	10,263.005	2,203.954	-0.00018643347
Slice 52	853.4375	293.88501	1,225.2134	10,250.463	2,199.3959	0.0012093121
Slice 53	854.125	293.81866	1,229.2893	10,243.284	2,196.6527	0.0015174973
Slice 54	854.375	293.79455	1,230.7708	10,241.401	2,195.7222	-0.00049529895
Slice 55	856.70055	293.5703	1,244.5463	10,223.781	2,188.0708	0.00043187655
Slice 56	861.10163	293.1459	1,270.6166	10,190.925	2,173.7147	-0.00049033464
Slice 57	865.02103	292.76795	1,293.8338	10,161.391	2,160.8593	0.00057882908
Slice 58	870.71275	292.2773	1,323.9178	10,246.176	2,156.7623	-0.00063854511
Slice 59	876.93961	291.79324	1,353.5401	10,290.962	2,151.3594	-0.00018198447
Slice 60	880.14521	291.56689	1,367.3643	10,254.93	2,139.3591	-0.00078420032
Slice 61	882.0484	291.43251	1,375.5714	10,233.249	2,132.1591	-0.0001803603
Slice 62	886.175	291.14116	1,393.3654	10,184.387	2,116.1124	0.0014618582
Slice 63	892.525	290.69281	1,420.7482	10,105.119	2,090.4465	-0.00017683182
Slice 64	896.0875	290.44126	1,436.1115	10,079.21	2,080.5122	-0.00061597002
Slice 65	896.8625	290.38654	1,439.4535	10,107.901	2,086.6093	0.0001176715
Slice 66	900.5875	290.12354	1,455.5161	10,250.542	2,117.0786	-0.00017908463
Slice 67	907.2625	289.65224	1,484.3003	10,503.829	2,171.1225	-0.00033670308
Slice 68	913.30495	289.22559	1,510.3576	10,595.788	2,186.986	-0.00033916323
Slice 69	921.41975	288.65265	1,545.3498	10,486.107	2,152.1556	0.0014867577

Slice 70	934.32135	287.80505	1,597.0324	10,366.907	2,106.8994	-2.9703931e-005
Slice 71	947.99985	287.00225	1,645.8468	10,190.168	2,051.079	-2.8916953e-005
Slice 72	959.3886	286.5706	1,671.7158	10,234.939	2,055.2359	-0.00075336424
Slice 73	965.94806	286.46471	1,677.7095	10,121.393	2,026.5112	0.0012571066
Slice 74	969.40276	286.43571	1,679.1954	10,010.181	1,999.4645	0.00011275709
Slice 75	971.92375	286.41456	1,680.2796	9,927.742	1,979.4187	0.00011162663
Slice 76	972.42375	286.41036	1,680.4947	9,910.6589	1,975.2671	0.00011139251
Slice 77	974	286.39711	1,681.174	9,849.476	1,960.4197	0.00040905409
Slice 78	977	286.37186	1,682.4684	9,731.6269	1,931.8253	-5.4471297e-006
Slice 79	979.125	286.35396	1,683.3865	9,644.3201	1,910.6506	0.00039866946
Slice 80	980.375	286.34347	1,683.9242	9,588.2858	1,897.0734	-5.3491404e-006
Slice 81	981.0625	286.33772	1,684.2187	9,557.1712	1,889.5352	-0.00013852501
Slice 82	981.1875	286.33667	1,684.2724	9,551.0921	1,888.0628	0.00052704978
Slice 83	982.3574	286.32682	1,684.7775	9,497.8234	1,875.1571	0.00039126351
Slice 84	984.5898	286.30805	1,685.7401	9,396.0944	1,850.5115	-0.00039655658
Slice 85	985.7324	286.29845	1,686.232	9,344.3144	1,837.9662	-0.00065299189
Slice 86	986.0625	286.2957	1,686.3727	9,329.9738	1,834.4897	0.00025346109
Slice 87	986.6875	286.29047	1,686.6409	9,302.2847	1,827.78	0.00025253405
Slice 88	987.75	286.28152	1,687.0999	9,254.8055	1,816.2747	0.00025094443
Slice 89	989.25	286.2689	1,687.7468	9,187.0026	1,799.8462	0.00050242425
Slice 90	990.625	286.25735	1,688.3389	9,113.4858	1,782.0598	0.00049745921
Slice 91	991.875	286.24684	1,688.8776	9,034.3972	1,762.9489	0.00061639832
Slice 92	993.8125	286.23054	1,689.7133	9,044.5474	1,765.1844	0.00061717995
Slice 93	996.4375	286.20848	1,690.8446	9,142.9862	1,788.5388	0.00037319005
Slice 94	998.3125	286.19273	1,691.6519	9,224.7479	1,807.9687	-0.00025999256
Slice 95	999.4375	286.18328	1,692.1361	9,290.6759	1,823.6755	-0.00026225124
Slice 96	1,004.065	286.14443	1,694.1272	9,327.1502	1,831.9512	0.00012397241
Slice 97	1,012.19	286.07616	1,697.6268	9,329.0303	1,831.5626	-5.1644213e-006
Slice 98	1,016.465	286.04021	1,699.4699	9,209.218	1,802.3644	0.00050312721
Slice 99	1,018.115	286.02635	1,700.1802	8,303.534	1,584.827	0.0002189666
Slice 100	1,021.215	286.17945	1,690.3366	6,955.4231	1,274.3416	0.00026589951
Slice 101	1,023.315	286.52022	1,668.8758	6,940.9962	1,580.0364	-0.00033859496
Slice 102	1,024.24	286.89367	1,645.486	6,559.7155	447.2175	1,043.5068
Slice 103	1,027.98	288.79165	1,526.7021	6,650.1948	1,635.0783	-0.00029276023
Slice 104	1,033.99	291.99508	1,326.2454	5,945.2703	471.67747	1,100.5771
Slice 105	1,038.65	294.53323	1,167.4287	5,343.9203	457.6376	1,067.8239
Slice 106	1,042.4522	296.60402	1,037.8555	4,867.234	445.86466	1,040.3499
Slice 107	1,045.7472	298.39842	925.57652	4,879.5768	625.54554	1,459.6079
Slice 108	1,048.533	299.91538	830.65749	4,505.9036	611.95049	1,427.8841
Slice 109	1,051.223	301.38003	739.01154	4,293.8033	2,135.9344	150
Slice 110	1,056.54	304.393	550.50466	3,519.3175	1,783.8427	150
Slice 111	1,063.28	308.29981	306.08862	2,521.5864	1,331.2054	150
Slice 112	1,067.4	310.72336	154.47347	1,947.3826	1,077.2885	150
Slice 113	1,070.1987	312.36975	51.47688	1,585.5321	921.75335	150
Slice 114	1,074.2937	314.77875	-0	1,053.1749	632.81132	150
Slice 115	1,079.5302	317.9531	-0	412.64673	247.94317	150

Figure 19 - Stability Analyses For Seismic Response

Consolidated Undrained-Static

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File Information

Title: [Model City - RMU-2 XS 2600](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [378](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/14/2013](#)
 Time: [10:45:04 AM](#)
 File Name: [RMU2X2600r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/14/2013](#)
 Last Solved Time: [11:05:04 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Consolidated Undrained-Static

Description: [Find Critical Surface for Yield Acceleration Calculation](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

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: [Yes](#)
 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: [25 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [150 psf](#)
 Phi': [31 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)
 Unit Weight: [115 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [13 °](#)
 Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: 1

Structural Fill

Model: [Mohr-Coulomb](#)
 Unit Weight: 128 pcf
 Cohesion': 195 psf
 Phi': 28.7 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: 125 pcf
 Cohesion': 0 psf
 Phi': 30 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: 1

GC-Consolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: 118 pcf
 Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static 0.34](#)
 Phi-B: 0 °
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: 1

GC-Overconsolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: 125 pcf
 Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
 Phi-B: 0 °
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: [Range](#)
 Left-Zone Left Coordinate: (728.3435, 419.61341) ft
 Left-Zone Right Coordinate: (800, 405.79868) ft
 Left-Zone Increment: 10
 Right Projection: [Range](#)
 Right-Zone Left Coordinate: (1,029.6167, 319.94616) ft
 Right-Zone Right Coordinate: (1,130, 321.45833) ft
 Right-Zone Increment: 10
 Radius Increments: 6

Slip Surface Limits

Left Coordinate: (605.06438, 404.48794) ft

Right Coordinate: (1,161.1814, 320.80872) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	600	315.5
Coordinate 2	1,200	313

Maximum Suction: 0 psf

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf
 Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static 0.34

Model: Add-In Function
 Function: Shear Stress vs. Normal Stress
 Assembly: GeoStudio AddIns1
 Function: SHANSEPP
 Field
 MPP: 5000
 m: 0.7
 S: 0.34
 Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
 Function: Shear Stress vs. Normal Stress
 Assembly: GeoStudio AddIns1
 Function: SHANSEPP
 Field
 MPP: 8000
 m: 0.7
 S: .34
 Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	600	302.8
Point 2	600	287.85
Point 3	600	276.5
Point 4	600	266.5
Point 5	851.25	277.4
Point 6	851.5	267.65
Point 7	1,200	268.85
Point 8	1,199.9987	281.4
Point 9	1,200	259.75
Point 10	1,200	287.55
Point 11	1,200	305.2
Point 12	1,200	320
Point 13	1,104	322
Point 14	1,056	320
Point 15	1,036.75	320
Point 16	1,023.5	319.9
Point 17	1,023.6	319.2
Point 18	897.25	319.5
Point 19	991.25	345.25
Point 20	999.8	349.5
Point 21	1,016	350
Point 22	997.75	348.5
Point 23	992.3	347.1
Point 24	978.5	349.75

Point 25	984.9	350
Point 26	972.5	344.75
Point 27	971	349.5
Point 28	905	374.5
Point 29	861.5	313
Point 30	797	308.6
Point 31	766.5	305.22
Point 32	732	311.25
Point 33	732	309.75
Point 34	737	305.35
Point 35	670.5	311.45
Point 36	670.5	309.45
Point 37	600	305.7
Point 38	600	312
Point 39	600	310
Point 40	600	400.6
Point 41	890	372.5
Point 42	600	258.75
Point 43	751	276.6
Point 44	759	267.4
Point 45	880.5	314
Point 46	793	289.8
Point 47	990	308
Point 48	1,082	280
Point 49	1,079.5	288.3
Point 50	1,082.5	268.5
Point 51	1,081.25	259
Point 52	797	311.1
Point 53	873	311.5
Point 54	990	345.25
Point 55	987	348.5
Point 56	653	303.5
Point 57	670.5	305.5
Point 58	600	299.7
Point 59	653	300.5
Point 60	689.75	301
Point 61	766.5	301.75
Point 62	868.5	307
Point 63	989.75	304.5
Point 64	1,199.9987	301.7
Point 65	651.5	288
Point 66	746.5	289
Point 67	705.5	304.19
Point 68	640.5	311.5
Point 69	640.5	309.5
Point 70	836	305.3

Point 71	836	306.3
Point 72	887.5	309.5
Point 73	868.5	310
Point 74	887.5	306.5
Point 75	600	340
Point 76	785	402
Point 77	608.5	402.7
Point 78	629	401
Point 79	693.5	417.5
Point 80	706.5	418.5
Point 81	737.5	416.5
Point 82	799.5	403.5
Point 83	604	339
Point 84	758.0046	376
Point 85	870	368
Point 86	882.5	366
Point 87	893	363
Point 88	897.5	361
Point 89	956.5	346
Point 90	765	377
Point 91	773.5	377
Point 92	900.5	362.5
Point 93	921.75	363.25
Point 94	759.6649	304.9246
Point 95	859.5	307
Point 96	796	305.1
Point 97	857	307
Point 98	861.5	311
Point 99	600	403.3
Point 100	608.1	405.2
Point 101	628.8	403.9
Point 102	693.4	420
Point 103	706.4	420.9
Point 104	737.1	419.1
Point 105	744.6	415.1
Point 106	744	417.8
Point 107	784.8	404.4
Point 108	799.7	405.9
Point 109	980	351.9
Point 110	905.5	376.8
Point 111	890.6	375.2

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	40,77,78,79,80,81,105,76,82,41,28,24,27,89,93,92,88,87,86,85,91,90,84,83,75	12,028

Region 2	Waste Material	75,83,84,90,91,85,86,87,88,92,93,89,27,29,52,32,35,68,38	16,661
Region 3	Bottom Liner	39,69,36,33,30,98,53,45,29,52,32,35,68,38	555.25
Region 4	Side Slope Liner	45,18,26,54,55,25,24,27,29	615.34
Region 5	Structural Fill	18,26,54,55,25,23,22,20,21,16,17	2,306.2
Region 6	Upper Till	45,18,17,16,15,14,13,12,11,47,72,73,53	4,072.7
Region 7	NOT ACTIVE	4,44,6,50,7,9,51,42	5,301.4
Region 8	NOT ACTIVE	4,3,43,5,48,8,7,50,6,44	6,275.2
Region 9	Deflection surface	3,2,65,66,46,49,10,8,48,5,43	6,239.6
Region 10	GC-Consolidated Undrained	2,58,59,60,61,70,97,95,62,74,63,64,10,49,46,66,65	8,734.9
Region 11	Upper Till	37,57,34,31,67,56,1	255.65
Region 12	CCL	39,69,36,33,30,98,53,73,95,97,71,96,31,34,57,37	1,053.7
Region 13	GC-Overconsolidated Undrained	58,1,56,67,94,31,96,71,97,70,61,60,59	657.67
Region 14	GC-Overconsolidated Undrained	73,72,47,11,64,63,74,62,95	1,139.2
Region 15	Final Cover	40,77,78,79,80,81,105,76,82,41,28,24,25,109,110,111,108,107,106,104,103,102,101,100,99	990.04

Current Slip Surface

Slip Surface: 848
 F of S: 1.374
 Volume: 15,691.022 ft³
 Weight: 1,839,273.7 lbs
 Resisting Moment: 1.122673e+008 lbs-ft
 Activating Moment: 81,723,281 lbs-ft
 Resisting Force: 503,857.92 lbs
 Activating Force: 367,193.31 lbs
 F of S Rank: 1
 Exit: (1,068.9878, 320.54116) ft
 Entry: (752.25104, 415.0901) ft
 Radius: 167.3326 ft
 Center: (973.50318, 477.72217) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	754.74034	413.04742	-0	113.3908	65.466211	0
Slice 2	762.93585	406.32232	0	452.70433	261.36897	0
Slice 3	774.34828	396.95748	0	897.47661	518.15836	0
Slice 4	782.42725	389.95579	0	1,168.3256	674.53312	0
Slice 5	789.1364	383.39787	0	1,622.3782	936.68051	0
Slice 6	795.37294	376.97102	0	2,005.812	1,158.0561	0
Slice 7	798.38654	373.50056	0	2,258.0913	1,303.7096	0
Slice 8	799.6	372.10314	0	2,359.4431	1,362.2251	0
Slice 9	804.48985	366.472	0	2,616.155	1,510.4378	0
Slice 10	814.06955	355.44004	0	3,105.5966	1,793.017	0
Slice	823.46245	345.07284	0	3,682.7035	2,126.2099	0

11						
Slice 12	832.66855	335.37039	0	4,102.8131	2,368.7602	0
Slice 13	841.27017	326.50055	0	4,572.4116	2,639.883	0
Slice 14	849.26732	318.46333	0	4,922.0537	2,841.749	0
Slice 15	854.0964	313.61006	0	5,134.7312	2,964.5385	0
Slice 16	856.49467	311.82375	0	6,500.9688	2,058.7327	499.57006
Slice 17	859.78122	309.82878	286.34114	6,696.3042	1,130.2494	1,000
Slice 18	862.08025	308.43325	372.8245	6,764.3393	1,126.9965	1,000
Slice 19	864.16976	307.839	409.36241	8,148.4839	614.41181	1,433.624
Slice 20	867.08951	307.37077	437.82062	8,121.9924	613.09921	1,430.5632
Slice 21	869.03927	307.0581	456.82453	8,104.4949	612.22365	1,428.5216
Slice 22	869.78927	306.93782	464.13463	8,093.1141	1,972.5743	0.00055064103
Slice 23	871.5	306.66348	480.80881	8,075.6557	1,963.7502	-0.000836109
Slice 24	876.75	305.82156	531.9795	8,022.0976	1,936.6707	-0.00027850037
Slice 25	880.99808	305.14032	573.3847	7,979.4282	1,914.9329	-0.0010852986
Slice 26	881.99808	304.97995	583.1315	7,970.5524	1,910.1167	-5.3859183e-006
Slice 27	884.42405	304.59091	606.7769	7,949.0179	1,898.4341	0.00066376944
Slice 28	886.92405	304.19237	630.99572	7,940.0474	1,881.12	0.0005251117
Slice 29	888.75	303.90708	648.32311	7,922.93	1,872.2557	-0.00013725822
Slice 30	890.3	303.66491	663.03187	7,906.4114	1,864.2186	-5.2565003e-006
Slice 31	891.8	303.43054	677.26615	7,947.9309	1,871.2409	-5.2763013e-006
Slice 32	895.125	302.91104	708.81881	8,076.1955	1,896.1321	-0.00053999498
Slice 33	897.375	302.55949	730.17024	8,163.1092	1,913.005	0.0002643091
Slice 34	899	302.3056	745.59071	8,227.4972	1,925.6081	-0.00014116957
Slice 35	902.55365	301.75037	779.31315	8,368.2621	1,953.1571	0.0001321747
Slice	904.80365	301.39954	800.61979	8,470.1228	1,965.923	0.00054878433

36						
Slice 37	905.25	301.33143	804.75364	8,489.2489	1,969.7661	0.00041100429
Slice 38	909.5625	300.6734	844.69366	8,466.0919	1,953.5924	0.00040762955
Slice 39	917.6875	299.43363	919.94297	8,396.4704	1,916.4585	-0.00041068875
Slice 40	928.59565	297.76918	1,020.9683	8,301.7543	1,866.284	-0.0002683785
Slice 41	940.70597	296.09602	1,122.225	8,282.7401	1,775.7127	0.00012016663
Slice 42	951.23532	294.83881	1,197.9372	8,140.6063	1,721.69	-4.8546152e-006
Slice 43	960.1413	293.77543	1,261.9763	8,017.7089	1,675.3328	-0.00059521156
Slice 44	967.3913	293.02795	1,306.734	7,997.0371	1,621.0792	0.00045252172
Slice 45	971.75	292.65025	1,329.1692	7,913.1477	1,595.3168	0.00010795881
Slice 46	975.5	292.3253	1,348.4712	7,824.391	1,569.1336	0.00032740976
Slice 47	979.25	292.00035	1,367.7732	7,728.222	1,541.1547	0.00032157177
Slice 48	982.45	291.72306	1,384.2442	7,615.7456	1,509.9103	0.00031505244
Slice 49	985.95	291.41977	1,402.2594	7,495.3036	1,476.3619	0.00020398059
Slice 50	988.375	291.20963	1,414.7414	7,431.8024	1,457.9511	-4.1109561e-006
Slice 51	989.875	291.07965	1,422.4622	7,395.5528	1,447.2972	-0.0002591381
Slice 52	991.15	290.96917	1,429.0249	7,347.9558	1,434.174	-0.00010514171
Slice 53	995.025	290.63339	1,448.9703	7,424.0254	1,447.773	-4.0822569e-006
Slice 54	998.775	290.30843	1,468.2723	7,619.7136	1,490.5117	0.00020593559
Slice 55	1,002.8075	289.959	1,489.0284	7,739.5159	1,514.5108	0.00020925142
Slice 56	1,010.9075	289.22489	1,532.731	7,846.9354	1,535.3717	0.00021213365
Slice 57	1,016.6777	288.68838	1,564.7092	7,585.0983	1,463.9278	-0.00041690853
Slice 58	1,018.1765	288.62107	1,568.5196	6,990.2735	1,301.2358	-0.00032471254
Slice 59	1,019.4132	288.61459	1,568.6021	6,342.4113	355.03825	828.42461
Slice 60	1,021.0506	288.81795	1,555.4866	5,748.4808	356.7782	832.48275
Slice	1,022.8863	289.38253	1,519.7799	5,537.2843	459.15214	1,071.3539

61						
Slice 62	1,030.125	293.61743	1,253.64	4,474.5013	429.69565	1,002.6234
Slice 63	1,037.8	298.10758	971.45889	3,748.5038	411.00217	959.00557
Slice 64	1,042.325	301.23771	774.96237	3,485.314	421.57846	983.68165
Slice 65	1,048.1751	305.47311	509.15258	3,153.1977	581.48017	1,356.7872
Slice 66	1,053.2751	309.16543	277.4254	2,223.9825	1,169.6095	150
Slice 67	1,057.6904	312.36206	76.808028	1,631.4885	934.14628	150
Slice 68	1,064.1843	317.06354	-0	753.57896	452.79592	150

Figure 20 - Stability Analyses For Seismic Response

Consolidated Undrained-Seismic

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File Information

Title: [Model City - RMU-2 XS 2600](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [382](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/14/2013](#)
 Time: [11:10:24 AM](#)
 File Name: [RMU2X2600r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/14/2013](#)
 Last Solved Time: [11:10:30 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Consolidated Undrained-Seismic

Description: [Yield Acceleration Determination](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 Lambda
 Lambda 1: [-1.5](#)
 Lambda 2: [-1.4](#)
 Lambda 3: [-1.3](#)
 Lambda 4: [-1.2](#)
 Lambda 5: [-1](#)
 Lambda 6: [-0.8](#)
 Lambda 7: [-0.6](#)
 Lambda 8: [-0.5](#)
 Lambda 9: [-0.4](#)
 Lambda 10: [-0.2](#)
 Lambda 11: [0](#)
 Lambda 12: [0.2](#)
 Lambda 13: [0.4](#)
 Lambda 14: [0.6](#)
 Lambda 15: [0.8](#)
 Lambda 16: [1](#)
 Lambda 17: [1.1](#)

Lambda 18: 1.2
 Lambda 19: 1.3
 Lambda 20: 1.4
 Lambda 21: 1.6
 Lambda 22: 1.8
 Lambda 23: 2

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: Fully-Specified

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: 25 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

Waste Material

Model: Mohr-Coulomb

Unit Weight: 111 pcf

Cohesion': 0 psf

Phi': 30 °

Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.

Unit Weight: 120 pcf

Strength Function: Baseline

Phi-B: 0 °

CCL

Model: Mohr-Coulomb

Unit Weight: 120 pcf

Cohesion': 1,000 psf

Phi': 10 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Upper Till

Model: Mohr-Coulomb

Unit Weight: 125 pcf

Cohesion': 150 psf

Phi': 31 °

Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

Side Slope Liner

Model: [Mohr-Coulomb](#)
 Unit Weight: 115 pcf
 Cohesion': 0 psf
 Phi': 13 °
 Phi-B: 0 °

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: 1

Structural Fill

Model: [Mohr-Coulomb](#)
 Unit Weight: 128 pcf
 Cohesion': 195 psf
 Phi': 28.7 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: 125 pcf
 Cohesion': 0 psf
 Phi': 30 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: 1

GC-Consolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: 118 pcf
 Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static 0.34](#)
 Phi-B: 0 °
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: 1

GC-Overconsolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: 125 pcf
 Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
 Phi-B: 0 °
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: 1

Slip Surface Limits

Left Coordinate: [\(605.06438, 404.48794\) ft](#)

Right Coordinate: (1,125.3782, 321.55462) ft

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

	X (ft)	Y (ft)
	749.1	417.5
	754.7403	413.04742
	762.9358	406.32232
	774.3483	396.95748
	782.4272	389.95579
	789.1364	383.39787
	795.3729	376.97102
	798.3865	373.50056
	799.6	372.10314
	804.4899	366.472
	814.0696	355.44004
	823.4624	345.07284
	832.6685	335.37039
	841.2702	326.50055
	849.2673	318.46333
	854.0964	313.61006
	856.4947	311.82375
	859.7812	309.82878
	862.0802	308.43325
	864.1698	307.839
	867.0895	307.37077
	869.0393	307.0581
	869.7893	306.93782
	871.5	306.66348
	876.75	305.82156
	880.9981	305.14032
	881.9981	304.97995
	884.424	304.59091
	886.924	304.19237
	888.75	303.90708
	890.3	303.66491
	891.8	303.43054
	895.125	302.91104
	897.375	302.55949
	899	302.3056
	902.5536	301.75037
	904.8036	301.39954
	905.25	301.33143
	909.5625	300.6734
	917.6875	299.43363

	928.5956	297.76918
	940.706	296.09602
	951.2353	294.83881
	960.1413	293.77543
	967.3913	293.02795
	971.75	292.65025
	975.5	292.3253
	979.25	292.00035
	982.45	291.72306
	985.95	291.41977
	988.375	291.20963
	989.875	291.07965
	991.15	290.96917
	995.025	290.63339
	998.775	290.30843
	1,002.81	289.959
	1,010.91	289.22489
	1,016.68	288.68838
	1,018.18	288.62107
	1,019.41	288.61459
	1,021.05	288.81795
	1,022.89	289.38253
	1,030.13	293.61743
	1,037.8	298.10758
	1,042.33	301.23771
	1,048.18	305.47311
	1,053.28	309.16543
	1,057.69	312.36206
	1,064.18	317.06354
	1,073.5	326.7

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	600	315.5
Coordinate 2	1,201	313

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0.095

Ignore seismic load in strength: Yes

Anisotropic Strength Functions

clay ellipse staticshear

Model: [Spline Data Point Function](#)

Function: [Modifier Factor vs. Inclination](#)

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: [Inclination \(°\)](#), [Modifier Factor](#)

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static 0.34

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: SHANSEPP

Field

MPP: 5000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: SHANSEPP

Field

MPP: 8000

m: 0.7

S: .34

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	600	302.8
Point 2	600	287.85
Point 3	600	276.5
Point 4	600	266.5
Point 5	851.25	277.4
Point 6	851.5	267.65
Point 7	1,200	268.85
Point 8	1,199.9987	281.4
Point 9	1,200	259.75
Point 10	1,200	287.55
Point 11	1,200	305.2
Point 12	1,200	320
Point 13	1,104	322
Point 14	1,056	320
Point 15	1,036.75	320
Point 16	1,023.5	319.9
Point 17	1,023.6	319.2
Point 18	897.25	319.5
Point 19	991.25	345.25
Point 20	999.8	349.5
Point 21	1,016	350
Point 22	997.75	348.5
Point 23	992.3	347.1
Point 24	978.5	349.75
Point 25	984.9	350
Point 26	972.5	344.75
Point 27	971	349.5
Point 28	905	374.5
Point 29	861.5	313
Point 30	797	308.6
Point 31	766.5	305.22
Point 32	732	311.25
Point 33	732	309.75
Point 34	737	305.35
Point 35	670.5	311.45
Point 36	670.5	309.45
Point 37	600	305.7
Point 38	600	312
Point 39	600	310

Point 40	600	400.6
Point 41	890	372.5
Point 42	600	258.75
Point 43	751	276.6
Point 44	759	267.4
Point 45	880.5	314
Point 46	793	289.8
Point 47	990	308
Point 48	1,082	280
Point 49	1,079.5	288.3
Point 50	1,082.5	268.5
Point 51	1,081.25	259
Point 52	797	311.1
Point 53	873	311.5
Point 54	990	345.25
Point 55	987	348.5
Point 56	653	303.5
Point 57	670.5	305.5
Point 58	600	299.7
Point 59	653	300.5
Point 60	689.75	301
Point 61	766.5	301.75
Point 62	868.5	307
Point 63	989.75	304.5
Point 64	1,199.9987	301.7
Point 65	651.5	288
Point 66	746.5	289
Point 67	705.5	304.19
Point 68	640.5	311.5
Point 69	640.5	309.5
Point 70	836	305.3
Point 71	836	306.3
Point 72	887.5	309.5
Point 73	868.5	310
Point 74	887.5	306.5
Point 75	600	340
Point 76	785	402
Point 77	608.5	402.7
Point 78	629	401
Point 79	693.5	417.5
Point 80	706.5	418.5
Point 81	737.5	416.5
Point 82	799.5	403.5
Point 83	604	339
Point 84	758.0046	376
Point 85	870	368

Point 86	882.5	366
Point 87	893	363
Point 88	897.5	361
Point 89	956.5	346
Point 90	765	377
Point 91	773.5	377
Point 92	900.5	362.5
Point 93	921.75	363.25
Point 94	759.6649	304.9246
Point 95	859.5	307
Point 96	796	305.1
Point 97	857	307
Point 98	861.5	311
Point 99	600	403.3
Point 100	608.1	405.2
Point 101	628.8	403.9
Point 102	693.4	420
Point 103	706.4	420.9
Point 104	737.1	419.1
Point 105	744.6	415.1
Point 106	744	417.8
Point 107	784.8	404.4
Point 108	799.7	405.9
Point 109	980	351.9
Point 110	905.5	376.8
Point 111	890.6	375.2

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	40,77,78,79,80,81,105,76,82,41,28,24,27,89,93,92,88,87,86,85,91,90,84,83,75	12,028
Region 2	Waste Material	75,83,84,90,91,85,86,87,88,92,93,89,27,29,52,32,35,68,38	16,661
Region 3	Bottom Liner	39,69,36,33,30,98,53,45,29,52,32,35,68,38	555.25
Region 4	Side Slope Liner	45,18,26,54,55,25,24,27,29	615.34
Region 5	Structural Fill	18,26,54,55,25,23,22,20,21,16,17	2,306.2
Region 6	Upper Till	45,18,17,16,15,14,13,12,11,47,72,73,53	4,072.7
Region 7	NOT ACTIVE	4,44,6,50,7,9,51,42	5,301.4
Region 8	NOT ACTIVE	4,3,43,5,48,8,7,50,6,44	6,275.2
Region 9	Deflection surface	3,2,65,66,46,49,10,8,48,5,43	6,239.6

Region 10	GC-Consolidated Undrained	2,58,59,60,61,70,97,95,62,74,63,64,10,49,46,66,65	8,734.9
Region 11	Upper Till	37,57,34,31,67,56,1	255.65
Region 12	CCL	39,69,36,33,30,98,53,73,95,97,71,96,31,34,57,37	1,053.7
Region 13	GC-Overconsolidated Undrained	58,1,56,67,94,31,96,71,97,70,61,60,59	657.67
Region 14	GC-Overconsolidated Undrained	73,72,47,11,64,63,74,62,95	1,139.2
Region 15	Final Cover	40,77,78,79,80,81,105,76,82,41,28,24,25,109,110,111,108,107,106,104,103,102,101,100,99	990.04

Current Slip Surface

Slip Surface: 1

F of S: 1.000

Volume: 15,687.274 ft³

Weight: 1,838,812.7 lbs

Resisting Moment: 83,266,425 lbs-ft

Activating Moment: 83,322,991 lbs-ft

Resisting Force: 499,802.12 lbs

Activating Force: 500,137.86 lbs

F of S Rank: 1

Exit: (1,067.4828, 320.47845) ft

Entry: (752.0827, 415.14539) ft

Radius: 166.98092 ft

Center: (911.8, 443.5) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	753.4115	414.0964	-0	56.181321	32.436301	0
Slice 2	755.98493	412.0261	-0	165.76597	95.705027	0
Slice 3	760.08268	408.66355	0	329.535	190.25712	0
Slice 4	768.64205	401.6399	0	647.41837	373.78717	0
Slice 5	778.38775	393.45664	0	987.6071	570.19523	0
Slice 6	783.6136	388.79614	0	1,131.3961	653.21184	0
Slice 7	786.9682	385.51718	0	1,334.81	770.65293	0
Slice 8	792.25465	380.18444	0	1,671.3963	964.98112	0
Slice 9	796.32297	375.87692	0	1,854.4838	1,070.6867	0
Slice 10	797.82977	374.14169	0	1,960.6647	1,131.9903	0
Slice 11	798.94325	372.85943	0	2,038.4228	1,176.8839	0
Slice 12	799.55	372.16072	0	2,080.7323	1,201.3114	0
Slice 13	799.65	372.04556	0	2,087.9902	1,205.5017	0
Slice 14	802.09495	369.22999	0	2,189.8213	1,264.2939	0
Slice 15	809.27975	360.95602	0	2,477.1449	1,430.1803	0
Slice 16	818.766	350.25644	0	2,901.381	1,675.1131	0
Slice 17	828.06545	340.22161	0	3,315.472	1,914.1886	0
Slice 18	836.96935	330.93547	0	3,667.4346	2,117.3944	0
Slice 19	845.26875	322.48194	0	4,010.5124	2,315.4704	0

Slice 20	851.26572	316.45491	0	4,217.6344	2,435.0524	0
Slice 21	853.68027	314.02827	0	4,302.3098	2,483.9397	0
Slice 22	854.63119	313.21174	0	5,138.9596	2,966.9797	0
Slice 23	855.83034	312.31858	0	5,173.1641	1,795.5036	321.93078
Slice 24	857.27858	311.34792	0	5,701.1519	1,911.0507	386.51499
Slice 25	858.92183	310.35044	254.12515	5,697.705	959.85	1,000
Slice 26	860.6406	309.30711	318.78251	5,732.2811	954.54586	1,000
Slice 27	861.7901	308.60935	362.02468	5,755.9789	951.09966	1,000
Slice 28	862.54415	308.30131	381.05041	7,212.3563	1,204.5435	1,000
Slice 29	863.58895	308.00418	399.31982	7,236.0544	682.05869	1,591.4782
Slice 30	864.92714	307.71755	416.85864	7,811.7703	606.08472	1,414.1966
Slice 31	866.38698	307.48343	431.08848	7,805.5997	605.58344	1,413.0242
Slice 32	867.79475	307.25768	444.81023	7,799.8078	605.09397	1,411.8888
Slice 33	868.76965	307.10134	454.31248	7,795.8255	604.76391	1,411.1088
Slice 34	869.30893	307.01486	459.56902	7,793.5821	604.5859	1,410.6991
Slice 35	869.68393	306.95472	463.22442	7,744.5694	1,882.7073	-0.0009343189
Slice 36	869.89465	306.92093	465.27841	7,743.2218	1,881.8135	-5.3061124e-006
Slice 37	870.75	306.78376	473.6158	7,737.6495	1,878.2172	-0.00027009455
Slice 38	872.25	306.54321	488.23674	7,727.9735	1,871.9318	-5.2782492e-006
Slice 39	874.875	306.12225	513.82328	7,711.3525	1,861.0196	-0.0011859298
Slice 40	878.625	305.52088	550.37522	7,688.2309	1,845.5842	0.00012489499
Slice 41	880.74905	305.18026	571.07857	7,675.7584	1,837.0057	0.00051279727
Slice 42	881.25007	305.09991	575.96215	7,673.4041	1,835.1493	-0.00091071761
Slice 43	881.75007	305.01973	580.83591	7,671.1027	1,833.2934	-0.00026363434
Slice 44	882.24905	304.93971	585.69974	7,668.8226	1,831.4444	0.00025304034
Slice 45	883.462	304.74519	597.52295	7,663.3335	1,826.9684	-0.00013393813
Slice 46	885.674	304.39164	619.01001	7,658.5199	1,818.2084	-0.00013329592
Slice 47	887.212	304.14737	633.85302	7,668.7707	1,810.5579	-0.00026036489
Slice 48	888.125	304.00473	642.51708	7,664.4846	1,807.2246	0.0001222991
Slice 49	889.375	303.80943	654.3792	7,658.6516	1,802.6724	0.00024906507
Slice 50	890.15	303.68835	661.73374	7,654.1	1,799.6079	0.00050235772
Slice 51	890.45	303.64147	664.58074	7,650.7364	1,798.0255	0.00037516952
Slice 52	891.2	303.52429	671.69841	7,674.9104	1,802.4157	-5.0822361e-006
Slice 53	892.4	303.3368	683.08645	7,726.6523	1,812.7901	-0.00077183446
Slice 54	894.0625	303.07705	698.86332	7,798.4025	1,827.1945	0.0005100585
Slice 55	896.1875	302.74503	719.0295	7,890.2617	1,845.6541	0.00038510752
Slice 56	897.3125	302.56926	729.70584	7,939.0413	1,855.4608	0.00025635855
Slice 57	897.4375	302.54973	730.89209	7,944.6153	1,856.5817	-0.00052873151
Slice 58	898.25	302.42278	738.60255	7,980.7021	1,863.8838	0.00052030024
Slice 59	899.75	302.18842	752.83747	8,047.3641	1,877.387	-0.00053465661
Slice 60	901.5268	301.9108	769.69945	8,126.4798	1,893.4083	0.00039507174
Slice 61	903.6786	301.57495	790.09775	8,224.3123	1,912.6561	-5.3930789e-006
Slice 62	904.9018	301.38456	801.66108	8,298.8762	1,921.7373	-5.4186846e-006
Slice 63	905.125	301.3505	803.72817	8,309.5966	1,923.9555	-0.00014104842
Slice 64	905.375	301.31236	806.04355	8,322.2488	1,926.6273	-0.0001412443
Slice 65	907.53125	300.98334	826.0144	8,322.7239	1,921.6293	0.00053641981

Slice 66	913.625	300.05352	882.45384	8,305.8218	1,902.8308	0.0002629034
Slice 67	919.71875	299.12368	938.89351	8,289.8382	1,884.2695	0.00012751292
Slice 68	925.1728	298.29146	989.40866	8,276.3898	1,867.8733	0.00052141392
Slice 69	934.6508	296.9326	1,071.7413	8,328.7782	1,831.9795	-0.0010382843
Slice 70	945.97065	295.46742	1,160.2306	8,378.0385	1,789.9221	-0.0001312222
Slice 71	953.86765	294.52451	1,217.0183	8,320.2533	1,761.5081	0.00024337763
Slice 72	958.32065	293.99282	1,249.0399	8,286.4099	1,745.1742	0.00048716264
Slice 73	963.7663	293.40169	1,284.5127	8,326.6905	1,723.8216	-0.00073395421
Slice 74	969.19565	292.8716	1,316.1813	8,355.5123	1,705.6505	-4.8093889e-006
Slice 75	971.375	292.68275	1,327.3999	8,323.9004	1,695.2724	0.00011472304
Slice 76	972.125	292.61775	1,331.2606	8,312.1523	1,691.4903	-0.00072018847
Slice 77	974	292.45528	1,340.9123	8,276.4328	1,680.4962	-0.0001232
Slice 78	977	292.19532	1,356.3551	8,216.2647	1,662.1752	0.00011248327
Slice 79	978.875	292.03285	1,366.0069	8,176.3057	1,650.1541	0.00034431521
Slice 80	979.625	291.96786	1,369.8676	8,157.0395	1,644.5502	0.00034314592
Slice 81	981.225	291.82921	1,378.1037	8,107.4569	1,630.5407	0.00022528261
Slice 82	983.675	291.61691	1,390.7154	8,027.2941	1,608.0622	0.00022217688
Slice 83	985.425	291.46526	1,399.7238	7,974.0385	1,592.9754	0.00022009243
Slice 84	986.475	291.37428	1,405.1289	7,947.9065	1,585.3353	-4.4701386e-006
Slice 85	987.6875	291.26921	1,411.3705	7,920.9702	1,577.2962	-4.4474709e-006
Slice 86	989.0625	291.15006	1,418.4486	7,893.1894	1,568.8477	0.00010616759
Slice 87	989.8125	291.08507	1,422.3093	7,877.97	1,564.2244	0.00021612007
Slice 88	989.9375	291.07423	1,422.9527	7,875.434	1,563.4528	-0.00044525204
Slice 89	990.575	291.01899	1,426.2342	7,854.0135	1,557.467	-4.3915589e-006
Slice 90	991.725	290.91934	1,432.1539	7,813.6549	1,546.2558	-0.00054935313
Slice 91	993.6625	290.75145	1,442.1273	7,859.7763	1,555.014	-4.3846423e-006
Slice 92	996.3875	290.51532	1,456.1547	7,991.7035	1,583.5839	0.00010716482
Slice 93	998.2625	290.35284	1,465.8068	8,097.1933	1,606.8056	0.00010873629
Slice 94	999.2875	290.26405	1,471.0814	8,177.0681	1,624.8342	-4.581513e-006
Slice 95	1,001.305	290.08933	1,481.46	8,244.4799	1,638.6529	0.00022640342
Slice 96	1,006.86	289.59195	1,511.055	8,329.7724	1,655.7765	0.00011205026
Slice 97	1,013.455	288.98825	1,547.0138	8,441.0363	1,676.3639	-4.7268102e-006
Slice 98	1,016.34	288.71999	1,563.0041	8,317.3	1,642.3876	0.0001111442
Slice 99	1,017.43	288.65472	1,566.7939	7,941.5336	1,530.1305	-4.3144787e-006
Slice 100	1,018.5299	288.61923	1,568.7235	7,505.511	1,424.8454	-0.00035555827
Slice 101	1,019.1449	288.616	1,568.7656	7,173.7566	1,345.2132	-0.00028827336
Slice 102	1,020.23	288.71628	1,562.2262	6,999.9683	1,329.4408	0.00023053883
Slice 103	1,021.97	289.10024	1,537.8154	6,602.1922	1,414.1735	-3.9875171e-006
Slice 104	1,023.195	289.56093	1,508.7501	6,984.1778	1,789.6644	0.00024726784
Slice 105	1,026.815	291.67838	1,375.6816	6,173.3343	484.24168	1,129.8986
Slice 106	1,033.44	295.55516	1,132.0511	5,224.3409	461.75899	1,077.4378
Slice 107	1,037.275	297.80024	990.96295	4,697.4357	448.24262	1,045.9015
Slice 108	1,040.065	299.67264	873.40043	4,560.9253	459.96911	1,073.2613
Slice 109	1,044.0674	302.4956	696.20925	4,001.9998	447.45954	1,044.0723
Slice 110	1,046.9924	304.6133	563.30554	4,016.164	629.954	1,469.8925
Slice 111	1,049.3675	306.33285	455.38871	3,600.1108	612.53231	1,429.2418

Slice 112	1,051.9175	308.17901	339.52643	2,987.8058	1,591.2468	150
Slice 113	1,054.64	310.15124	215.75298	2,445.7706	1,339.9298	150
Slice 114	1,056.845	311.74955	115.44578	2,045.1337	1,159.4735	150
Slice 115	1,058.5369	312.97557	38.503029	1,765.4661	1,037.6641	150
Slice 116	1,061.7819	315.32631	-0	1,212.9009	728.7844	150
Slice 117	1,065.8314	318.77099	-0	677.50508	407.08612	150

Figure 21 - Stability Analyses For Seismic Response

Consolidated Undrained -Static CS

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File Information

Title: [Model City - RMU-2 XS 3050](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [357](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/14/2013](#)
 Time: [6:20:31 PM](#)
 File Name: [RMU2X3050r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/14/2013](#)
 Last Solved Time: [7:01:18 PM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Consolidated Undrained -Static CS

Description: [find critical failure surface with no acceleration](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

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: [Block](#)
 Critical slip surfaces saved: [1](#)
 Restrict Block Crossing: [No](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 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: [0.002](#)
 Minimum Slip Surface Depth: [25 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [150 psf](#)
 Phi': [31 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)
 Unit Weight: [115 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [13 °](#)
 Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Structural Fill

Model: [Mohr-Coulomb](#)
 Unit Weight: [128 pcf](#)
 Cohesion': [195 psf](#)
 Phi': [28.7 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Consolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Overconsolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [125 pcf](#)
 Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Slip Surface Limits

Left Coordinate: [\(606.47519, 438.67767\) ft](#)
 Right Coordinate: [\(1,114.1689, 322.83421\) ft](#)

Slip Surface Block

Left Grid
 Upper Left: [\(772.4, 311.8\) ft](#)
 Lower Left: [\(766.2, 293.2\) ft](#)
 Lower Right: [\(856.7, 291.7\) ft](#)
 X Increments: [10](#)
 Y Increments: [5](#)

Starting Angle: 135 °

Ending Angle: 160 °

Angle Increments: 2

Right Grid

Upper Left: (925.8, 305.9) ft

Lower Left: (925.8, 290.4) ft

Lower Right: (997.2, 287.7) ft

X Increments: 3

Y Increments: 3

Starting Angle: 15 °

Ending Angle: 45 °

Angle Increments: 2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	313

Maximum Suction: 0 psf

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: SHANSEPP

Field

MPP: 5000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: SHANSEPP

Field

MPP: 8000

m: 0.7

S: .32

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	500	306.45
Point 2	500	286.75
Point 3	500	280.9
Point 4	500	271.2
Point 5	740.7	270.8
Point 6	634.5	269.8
Point 7	1,200	269.95
Point 8	1,199.9987	278.5
Point 9	1,200	259.75
Point 10	1,200	286.05
Point 11	1,200	306.5
Point 12	1,200	322
Point 13	1,107.4	322.9
Point 14	1,023.4	321.1
Point 15	1,023.5	320.9
Point 16	898.8	320
Point 17	991.25	345.25
Point 18	999.8	349.5

Point 19	1,016	350
Point 20	997.75	348.5
Point 21	992.3	347.1
Point 22	978.7	349.8
Point 23	984.4	350
Point 24	972.5	344.75
Point 25	971	349.5
Point 26	914.8	371.1
Point 27	863.6	313.6
Point 28	798.1	312.4
Point 29	780.3	309.03
Point 30	732.5	315.9
Point 31	732.5	314.4
Point 32	732.6	309.9
Point 33	669.1	317
Point 34	669.1	315
Point 35	500	314.5
Point 36	500	320
Point 37	500	318
Point 38	500	433.6
Point 39	899.6	369.5
Point 40	500	258.75
Point 41	560.6	281.9
Point 42	880.5	314
Point 43	1,010.6	307.3
Point 44	1,023.5	282.3
Point 45	983.2	286.1
Point 46	1,026.6	269.9
Point 47	798.1	314.9
Point 48	873	311.5
Point 49	990	345.25
Point 50	987	348.5
Point 51	707.7	308.9
Point 52	669.1	311.05
Point 53	500	303.35
Point 54	707.7	305.9
Point 55	780.3	306
Point 56	863.7	305.4
Point 57	1,010.35	303.8
Point 58	1,199.9987	303
Point 59	653.3	286.1
Point 60	836.6	308.1
Point 61	890.3	308.2
Point 62	863.7	308.4
Point 63	890.3	305.2
Point 64	794.8	398.1

Point 65	582.2	437.6
Point 66	696.4	431
Point 67	809.8	399.6
Point 68	861.4	307.6
Point 69	797.1	308.9
Point 70	863.6	311.6
Point 71	500	436.3
Point 72	581.8	440.1
Point 73	696.3	433.5
Point 74	795	400.7
Point 75	810.1	402.1
Point 76	980.1	352
Point 77	915	373.7
Point 78	900.2	372.2
Point 79	1,080.5	282.7
Point 80	663.1	270.7
Point 81	565.2	307.6
Point 82	565.2	304.53077

Regions

	Material	Points	Area (ft²)
Region 1	Bottom Liner	37,34,31,28,70,48,42,27,47,30,33,36	756.75
Region 2	Side Slope Liner	42,16,24,49,50,23,22,25,27	606.02
Region 3	Structural Fill	16,24,49,50,23,21,20,18,19,14,15	2,170.4
Region 4	Upper Till	42,16,15,14,13,12,11,43,61,62,48	4,514.2
Region 5	NOT ACTIVE	4,6,46,7,9,40	7,520.4
Region 6	NOT ACTIVE	4,3,41,80,5,44,79,8,7,46,6	5,230.9
Region 7	Deflection surface	3,2,59,45,10,8,79,44,5,80,41	6,088.1
Region 8	GC-Consolidated Undrained	2,53,82,54,55,56,63,57,58,10,45,59	12,919
Region 9	Upper Till	35,52,32,29,51,81,1	992.38
Region 10	CCL	37,34,31,28,70,48,62,68,60,69,29,32,52,35	1,426.9
Region 11	GC-Overconsolidated Undrained	53,1,81,51,29,69,60,68,56,55,54,82	1,073.1
Region 12	GC-Overconsolidated Undrained	62,61,43,11,58,57,63,56,68	1,137.4
Region 13	Final Cover	38,65,66,64,67,39,26,22,23,76,77,78,75,74,73,72,71	1,253.8
Region 14	Waste Material	38,65,66,64,67,39,26,22,25,27,47,30,33,36	41,876

Current Slip Surface

Slip Surface: 9,505

F of S: 1.39

Volume: 25,504.249 ft³

Weight: 2,944,428.2 lbs

Resisting Moment: 2.0588707e+008 lbs-ft

Activating Moment: 1.4835298e+008 lbs-ft

Resisting Force: 774,226.79 lbs

Activating Force: 557,958.67 lbs

F of S Rank: 1

Exit: (1,063.351, 321.95609) ft

Entry: (668.54235, 435.1) ft

Radius: 203.96819 ft

Center: (931.1, 507) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	669.44991	433.80254	-0	97.29951	56.175898	0
Slice 2	676.8431	423.23309	0	796.33811	459.76602	0
Slice 3	689.81437	404.68911	0	1,955.9638	1,129.2762	0
Slice 4	696.35	395.34564	0	2,518.0462	1,453.7947	0
Slice 5	697.0487	394.34676	0	2,564.183	1,480.4317	0
Slice 6	704.90415	384.88124	0	3,197.4972	1,846.0759	0
Slice 7	718.369	369.75934	0	4,034.7333	2,329.4543	0
Slice 8	730.8852	356.59181	0	4,603.7845	2,657.9962	0
Slice 9	743.4014	343.42428	0	5,164.2564	2,981.5848	0
Slice 10	755.31727	331.45374	0	5,885.4221	3,397.95	0
Slice 11	766.63281	320.6802	0	6,338.127	3,659.3193	0
Slice 12	772.69358	314.90974	0	7,051.5802	2,140.5528	588.51884
Slice 13	773.17494	314.45144	0	7,074.6616	2,143.6218	592.44995
Slice 14	774.78735	313.72041	0	8,727.5923	2,284.3405	918.84442
Slice 15	781.1716	310.98857	218.94178	8,891.2561	1,529.163	1,000
Slice 16	790.5109	308.46359	374.42221	10,107.208	2,237.6759	-0.0001005582
Slice 17	796.05	307.90887	407.80394	10,052.567	2,217.4385	-9.964876e-005
Slice 18	797.6	307.75364	417.14512	10,096.497	2,225.3905	0.00040002453
Slice 19	804.1	307.10269	456.31777	10,280.28	2,258.6377	0.00074433505
Slice 20	814.1377	306.09746	516.8106	10,373.861	2,266.2445	0.0010863156
Slice 21	822.36054	305.19878	571.05826	10,164.887	2,376.4839	-3.3504643e-005
Slice 22	831.57284	304.11069	636.90513	10,003.247	2,320.1337	-0.00052336303
Slice 23	843.3268	302.72239	720.91902	9,794.4267	2,247.5962	-0.0009823131
Slice 24	855.7268	301.35553	803.45201	9,631.5802	2,157.635	0.0001216769
Slice 25	862.55	300.66716	844.88739	9,494.1682	2,113.9237	0.0002682267
Slice 26	864.54287	300.46611	856.98956	9,458.6709	2,102.2908	-0.00032602848
Slice 27	869.19287	299.99699	885.2277	9,378.368	2,075.763	-0.00046823922
Slice 28	874.13465	299.49844	915.23772	9,292.421	2,047.4226	-0.00046184634
Slice 29	877.88465	299.15552	935.80122	9,277.1085	2,021.8566	0.0015392692
Slice 30	880.71574	298.90823	950.60222	9,222.4154	2,005.0125	0.00081975751
Slice 31	883.07534	298.70212	962.93824	9,179.8213	1,991.6991	-0.00030887765
Slice 32	887.7596	298.30609	986.60844	9,113.6428	1,964.8937	0.00027147828
Slice 33	894.55	297.74804	1,019.9192	8,983.9433	1,925.4824	0.00013030189
Slice 34	899.2	297.3659	1,042.73	8,894.7062	1,898.392	0.00039611164
Slice 35	899.9	297.30838	1,046.1639	8,879.9991	1,894.0067	-0.00027236513
Slice 36	907.6	296.67558	1,083.9367	9,093.9543	1,936.6022	0.00026756941
Slice 37	923.65875	295.35586	1,162.7139	9,146.7828	1,930.3286	0.00026670261
Slice 38	939.59943	294.11224	1,236.7681	8,852.5723	1,834.6392	0.00025348175
Slice 39	954.16328	293.04818	1,299.9244	8,534.6505	1,742.8384	-0.00025062658
Slice 40	966.2226	292.20067	1,350.1255	8,282.2177	1,666.6542	0.00046524392
Slice 41	971.75	291.83566	1,371.6719	8,150.8411	1,629.8877	0.00034008649

Slice 42	975.45355	291.59109	1,386.1088	8,046.5339	1,601.3396	-0.00068180484
Slice 43	978.55355	291.39672	1,397.548	8,145.6399	1,619.5575	0.00010959924
Slice 44	979.4	291.40056	1,397.1197	8,107.3695	1,610.4752	0.00022251028
Slice 45	982.25	291.41351	1,395.6777	7,939.1988	1,570.461	-0.00077936246
Slice 46	985.7	291.42918	1,393.932	7,746.7077	1,524.6806	0.00021065652
Slice 47	988.5	291.4419	1,392.5153	7,634.8374	1,498.1718	-0.0001098335
Slice 48	991.15	291.45393	1,391.1744	7,520.0805	1,470.9513	0.0003069234
Slice 49	995.025	291.47153	1,389.2137	7,543.2873	1,476.9927	-0.00083709365
Slice 50	998.775	291.48857	1,387.3163	7,687.4171	1,512.0387	0.00010232319
Slice 51	1,005.075	291.51719	1,384.1286	7,748.7632	1,527.5268	0.00021104976
Slice 52	1,013.175	291.55398	1,380.0301	7,745.9011	1,527.8237	0.00010339139
Slice 53	1,018.1849	291.57674	1,377.4952	6,620.8874	1,258.4263	-4.7902857e-005
Slice 54	1,021.2569	291.85169	1,359.6544	5,476.8302	392.58702	916.03724
Slice 55	1,022.7721	292.57144	1,314.4048	5,393.7802	476.60426	1,112.074
Slice 56	1,030.7582	298.35452	951.76362	4,103.8365	441.12122	1,029.2829
Slice 57	1,040.5197	305.42317	508.50722	3,277.3774	554.91303	1,294.7971
Slice 58	1,047.3206	310.34793	199.68884	2,309.3401	1,267.6064	150
Slice 59	1,057.5346	317.74424	-0	904.8884	543.71181	150

Figure 22 - Stability Analyses For Seismic Response

Consolidated Undrained -Yield Acc

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File Information

Title: [Model City - RMU-2 XS 3050](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [363](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/15/2013](#)
 Time: [9:00:02 AM](#)
 File Name: [RMU2X3050r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/15/2013](#)
 Last Solved Time: [9:00:14 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Consolidated Undrained -Yield Acc

Description: [determine yield acceleration under seismic conditions](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

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: [Fully-Specified](#)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: [Sensitivity](#)

Modifiers

	Property	Offset
	Analyses[3].Applied.SeismicX	Range(Mean=0,Delta=0.0005)

Advanced

Number of Slices: [30](#)F of S Tolerance: [0.002](#)Minimum Slip Surface Depth: [25 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

Waste Material

Model: [Mohr-Coulomb](#)Unit Weight: [111 pcf](#)Cohesion': [0 psf](#)Phi': [30 °](#)Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)Unit Weight: [120 pcf](#)Strength Function: [Baseliner](#)Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)Unit Weight: [120 pcf](#)Cohesion': [1,000 psf](#)Phi': [10 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)Unit Weight: [125 pcf](#)Cohesion': [150 psf](#)Phi': [31 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)Unit Weight: [115 pcf](#)Cohesion': [0 psf](#)

Phi': 13 °
 Phi-B: 0 °

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: 1

Structural Fill

Model: [Mohr-Coulomb](#)
 Unit Weight: 128 pcf
 Cohesion': 195 psf
 Phi': 28.7 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: 125 pcf
 Cohesion': 0 psf
 Phi': 30 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: 1

GC-Consolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: 120 pcf
 Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static](#)
 Phi-B: 0 °
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: 1

GC-Overconsolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: 125 pcf
 Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
 Phi-B: 0 °
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (606.47519, 438.67767) ft
 Right Coordinate: (1,114.1689, 322.83421) ft

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

	X (ft)	Y (ft)
	666.7	440.9
	669.4499	433.80254
	676.8431	423.23309
	689.8144	404.68911
	696.35	395.34564
	697.0487	394.34676
	704.9041	384.88124
	718.369	369.75934
	730.8852	356.59181
	743.4014	343.42428
	755.3173	331.45374
	766.6328	320.6802
	772.6936	314.90974
	773.1749	314.45144
	774.7873	313.72041
	781.1716	310.98857
	790.5109	308.46359
	796.05	307.90887
	797.6	307.75364
	804.1	307.10269
	814.1377	306.09746
	822.3605	305.19878
	831.5728	304.11069
	843.3268	302.72239
	855.7268	301.35553
	862.55	300.66716
	864.5429	300.46611
	869.1929	299.99699
	874.1346	299.49844
	877.8846	299.15552
	880.7157	298.90823
	883.0753	298.70212
	887.7596	298.30609
	894.55	297.74804
	899.2	297.3659
	899.9	297.30838
	907.6	296.67558
	923.6588	295.35586
	939.5994	294.11224
	954.1633	293.04818
	966.2226	292.20067
	971.75	291.83566

	975.4535	291.59109
	978.5535	291.39672
	979.4	291.40056
	982.25	291.41351
	985.7	291.42918
	988.5	291.4419
	991.15	291.45393
	995.025	291.47153
	998.775	291.48857
	1,005.08	291.51719
	1,013.18	291.55398
	1,018.18	291.57674
	1,021.26	291.85169
	1,022.77	292.57144
	1,030.76	298.35452
	1,040.52	305.42317
	1,047.32	310.34793
	1,057.53	317.74424
	1,063	323.5

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0.09

Ignore seismic load in strength: Yes

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)
 Data Point: (23.685228, 0.90009497)
 Data Point: (39.261389, 1)
 Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: [SHANSEPP](#)

Field

MPP: 5000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: [SHANSEPP](#)

Field

MPP: 8000

m: 0.7

S: .32

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	500	306.45
Point 2	500	286.75
Point 3	500	280.9

Point 4	500	271.2
Point 5	740.7	270.8
Point 6	634.5	269.8
Point 7	1,200	269.95
Point 8	1,199.9987	278.5
Point 9	1,200	259.75
Point 10	1,200	286.05
Point 11	1,200	306.5
Point 12	1,200	322
Point 13	1,107.4	322.9
Point 14	1,023.4	321.1
Point 15	1,023.5	320.9
Point 16	898.8	320
Point 17	991.25	345.25
Point 18	999.8	349.5
Point 19	1,016	350
Point 20	997.75	348.5
Point 21	992.3	347.1
Point 22	978.7	349.8
Point 23	984.4	350
Point 24	972.5	344.75
Point 25	971	349.5
Point 26	914.8	371.1
Point 27	863.6	313.6
Point 28	798.1	312.4
Point 29	780.3	309.03
Point 30	732.5	315.9
Point 31	732.5	314.4
Point 32	732.6	309.9
Point 33	669.1	317
Point 34	669.1	315
Point 35	500	314.5
Point 36	500	320
Point 37	500	318
Point 38	500	433.6
Point 39	899.6	369.5
Point 40	500	258.75
Point 41	560.6	281.9
Point 42	880.5	314
Point 43	1,010.6	307.3
Point 44	1,023.5	282.3
Point 45	983.2	286.1
Point 46	1,026.6	269.9
Point 47	798.1	314.9
Point 48	873	311.5
Point 49	990	345.25

Point 50	987	348.5
Point 51	707.7	308.9
Point 52	669.1	311.05
Point 53	500	303.35
Point 54	707.7	305.9
Point 55	780.3	306
Point 56	863.7	305.4
Point 57	1,010.35	303.8
Point 58	1,199.9987	303
Point 59	653.3	286.1
Point 60	836.6	308.1
Point 61	890.3	308.2
Point 62	863.7	308.4
Point 63	890.3	305.2
Point 64	794.8	398.1
Point 65	582.2	437.6
Point 66	696.4	431
Point 67	809.8	399.6
Point 68	861.4	307.6
Point 69	797.1	308.9
Point 70	863.6	311.6
Point 71	500	436.3
Point 72	581.8	440.1
Point 73	696.3	433.5
Point 74	795	400.7
Point 75	810.1	402.1
Point 76	980.1	352
Point 77	915	373.7
Point 78	900.2	372.2
Point 79	1,080.5	282.7
Point 80	663.1	270.7
Point 81	565.2	307.6
Point 82	565.2	304.53077

Regions

	Material	Points	Area (ft²)
Region 1	Bottom Liner	37,34,31,28,70,48,42,27,47,30,33,36	756.75
Region 2	Side Slope Liner	42,16,24,49,50,23,22,25,27	606.02
Region 3	Structural Fill	16,24,49,50,23,21,20,18,19,14,15	2,170.4
Region 4	Upper Till	42,16,15,14,13,12,11,43,61,62,48	4,514.2
Region 5	NOT ACTIVE	4,6,46,7,9,40	7,520.4
Region 6	NOT ACTIVE	4,3,41,80,5,44,79,8,7,46,6	5,230.9
Region 7	Deflection surface	3,2,59,45,10,8,79,44,5,80,41	6,088.1
Region 8	GC-Consolidated Undrained	2,53,82,54,55,56,63,57,58,10,45,59	12,919
Region 9	Upper Till	35,52,32,29,51,81,1	992.38

Region 10	CCL	37,34,31,28,70,48,62,68,60,69,29,32,52,35	1,426.9
Region 11	GC-Overconsolidated Undrained	53,1,81,51,29,69,60,68,56,55,54,82	1,073.1
Region 12	GC-Overconsolidated Undrained	62,61,43,11,58,57,63,56,68	1,137.4
Region 13	Final Cover	38,65,66,64,67,39,26,22,23,76,77,78,75,74,73,72,71	1,253.8
Region 14	Waste Material	38,65,66,64,67,39,26,22,25,27,47,30,33,36	41,876

Current Slip Surface

Slip Surface: 1

F of S: 1.00

Volume: 25,490.202 ft³

Weight: 2,942,779.9 lbs

Resisting Moment: 1.9704214e+008 lbs-ft

Activating Moment: 1.9696047e+008 lbs-ft

Resisting Force: 763,796.36 lbs

Activating Force: 763,624.7 lbs

F of S Rank: 1

Exit: (1,061.4949, 321.91632) ft

Entry: (668.95645, 435.07613) ft

Radius: 203.29221 ft

Center: (931.1, 507) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	669.20317	434.43934	-0	35.701672	20.61237	0
Slice 2	669.90368	433.15381	-0	140.63187	81.193846	0
Slice 3	673.60028	427.86909	0	473.34592	273.28639	0
Slice 4	683.32875	413.9611	0	1,273.5762	735.29956	0
Slice 5	693.0572	400.05312	0	2,003.0466	1,156.4595	0
Slice 6	696.325	395.38138	0	2,231.5353	1,288.3775	0
Slice 7	696.375	395.3099	0	2,234.0199	1,289.812	0
Slice 8	696.72435	394.81046	0	2,252.0234	1,300.2063	0
Slice 9	700.9764	389.614	0	2,632.8029	1,520.0495	0
Slice 10	711.63655	377.32029	0	3,148.6515	1,817.8748	0
Slice 11	724.6271	363.17557	0	3,717.3124	2,146.1913	0
Slice 12	737.1433	350.00804	0	4,122.5514	2,380.1561	0
Slice 13	749.35935	337.43901	0	4,613.221	2,663.4444	0
Slice 14	760.97505	326.06697	0	5,106.793	2,948.4083	0
Slice 15	769.45521	317.993	0	5,357.2626	3,093.017	0
Slice 16	772.48561	315.10777	0	5,543.0586	1,877.9294	366.35899
Slice 17	772.93425	314.68059	0	5,556.1271	1,880.7156	367.99832
Slice 18	773.9811	314.08592	0	7,647.3384	2,210.1882	695.4156
Slice 19	775.55433	313.3922	0	7,806.1856	2,225.3575	725.84297
Slice 20	778.74648	312.02628	204.35395	7,705.6987	1,322.6895	1,000
Slice 21	784.91331	309.97696	331.95688	8,628.4849	1,462.9017	1,000
Slice 22	789.58296	308.71447	410.52842	8,562.8383	2,253.9854	0.0010264167
Slice 23	792.75545	308.23881	440.06854	9,585.845	2,102.717	-0.00056695983
Slice 24	795.525	307.96145	457.25254	9,573.6485	2,095.9627	-0.0011930701
Slice 25	796.575	307.85629	463.76746	9,609.7033	2,102.7564	-0.00025198691

Slice 26	797.35	307.77868	468.57614	9,636.3351	2,107.7744	-0.0008840586
Slice 27	797.85	307.7286	471.67848	9,653.524	2,111.0086	0.00037946384
Slice 28	801.1	307.40313	491.84347	9,765.265	2,132.0636	-0.00025549898
Slice 29	806.95	306.81728	528.14033	9,967.0669	2,170.1137	6.5014701e-005
Slice 30	809.95	306.51684	546.75403	10,071.773	2,189.9066	0.0007216847
Slice 31	812.11885	306.29964	560.21081	10,052.083	2,182.2863	0.00022882785
Slice 32	815.80717	305.915	584.04804	9,932.5152	2,163.7429	0.00022688345
Slice 33	819.91857	305.46566	611.90386	9,967.2275	2,300.6639	-0.00068114955
Slice 34	826.96665	304.65474	662.19195	9,813.9327	2,266.9742	-0.00035156799
Slice 35	834.0864	303.8138	714.34934	9,732.6727	2,233.926	-0.00050391677
Slice 36	839.9634	303.11965	757.40273	9,665.2232	2,206.5521	0.00074661329
Slice 37	849.5268	302.03896	824.41221	9,613.6337	2,163.0386	0.0008843671
Slice 38	858.5634	301.06935	884.51337	9,574.3682	2,123.8423	-0.00017965678
Slice 39	861.975	300.72517	905.83867	9,527.8119	2,107.25	0.0014557359
Slice 40	863.075	300.6142	912.71446	9,514.4176	2,102.2924	-0.00017783387
Slice 41	863.65	300.55619	916.30856	9,507.4632	2,099.7127	0.0014505289
Slice 42	864.12145	300.50863	919.2554	9,502.4348	2,097.7649	0.0001183006
Slice 43	866.52035	300.26661	934.25034	9,476.62	2,087.7955	-0.00047095346
Slice 44	868.84535	300.03205	948.78341	9,451.4187	2,078.0837	0.00011719071
Slice 45	871.09645	299.80495	962.85455	9,426.7038	2,068.6056	-0.00090408517
Slice 46	873.5673	299.55567	978.29934	9,399.3464	2,058.1437	-2.9016554e-005
Slice 47	876.0096	299.32698	992.46107	9,449.0022	2,054.4471	0.00055032446
Slice 48	879.1923	299.0413	1,010.1461	9,443.048	2,044.0596	-0.00074926746
Slice 49	880.60785	298.91765	1,017.7986	9,424.2829	2,037.6557	-0.00031600472
Slice 50	881.8955	298.80518	1,024.7597	9,408.872	2,032.2351	-0.00045842044
Slice 51	883.6572	298.65292	1,034.1818	9,411.4268	2,027.6677	-0.00060032453
Slice 52	885.99935	298.45491	1,046.4337	9,381.838	2,017.5391	0.00068265848
Slice 53	889.0298	298.2017	1,062.0989	9,362.6899	2,006.8566	-0.0004526957
Slice 54	892.425	297.92268	1,079.359	9,317.0393	1,991.6459	0.00025271139
Slice 55	896.675	297.57341	1,100.9643	9,258.6456	1,972.3027	0.00041153357
Slice 56	899	297.38234	1,112.7836	9,226.3423	1,961.6357	-0.00014381081
Slice 57	899.4	297.34947	1,114.8169	9,221.2088	1,959.8954	-0.00097262457
Slice 58	899.75	297.32071	1,116.596	9,215.6799	1,958.129	-0.0013858448
Slice 59	900.05	297.29605	1,118.1209	9,209.7506	1,956.335	-0.00028132817
Slice 60	903.9	296.97965	1,137.693	9,341.5502	1,983.4691	-0.00086687621
Slice 61	911.3	296.37151	1,175.3116	9,606.6182	2,038.4587	-0.00060351937
Slice 62	919.3294	295.71165	1,216.1295	9,673.7353	2,044.8172	-0.00074954519
Slice 63	931.6291	294.73405	1,276.5844	9,506.7632	1,986.257	-0.00016801838
Slice 64	946.88135	293.58021	1,347.9052	9,266.2288	1,907.5168	-0.00081216638
Slice 65	960.19295	292.62442	1,406.9537	9,016.9092	1,831.6412	0.00025306753
Slice 66	968.6113	292.04293	1,442.8644	8,861.8063	1,783.7057	0.0003721816
Slice 67	971.375	291.86042	1,454.1297	8,798.9226	1,765.8783	0.00049294215
Slice 68	972.125	291.8109	1,457.1868	8,780.9588	1,760.8251	0.00011915914
Slice 69	973.97675	291.68861	1,464.735	8,730.3806	1,746.8502	-0.00012806453
Slice 70	977.0035	291.4939	1,476.7499	8,662.4217	1,726.4658	0.00023853603
Slice 71	978.62675	291.39705	1,482.7213	9,005.2447	1,805.4243	-0.0012777697

Slice 72	979.05	291.39897	1,482.5826	8,983.9235	1,800.3385	0.00062947124
Slice 73	979.75	291.40215	1,482.3532	8,948.0159	1,791.7776	-0.0012681114
Slice 74	981.175	291.40863	1,481.8857	8,855.7127	1,769.7355	-4.9900882e-006
Slice 75	983.325	291.41839	1,481.1805	8,707.1076	1,734.2391	0.00011736001
Slice 76	985.05	291.42623	1,480.6149	8,601.1993	1,708.9563	0.00035658466
Slice 77	986.35	291.43213	1,480.1885	8,537.8953	1,693.8662	-0.00024358419
Slice 78	987.75	291.43849	1,479.7293	8,474.9562	1,678.8706	-4.7338785e-006
Slice 79	989.25	291.4453	1,479.2375	8,412.3426	1,663.9608	0.00046449205
Slice 80	990.575	291.45132	1,478.8032	8,348.1128	1,648.6511	-0.00093438199
Slice 81	991.725	291.45654	1,478.4262	8,282.3225	1,632.9506	0.00022561557
Slice 82	993.6625	291.46534	1,477.7908	8,287.2951	1,634.2968	-4.6081943e-006
Slice 83	996.3875	291.47772	1,476.8971	8,362.0198	1,652.445	0.00034479321
Slice 84	998.2625	291.48624	1,476.282	8,428.6698	1,668.59	-0.0008280603
Slice 85	999.2875	291.4909	1,475.9459	8,488.0455	1,682.9202	-0.00012337772
Slice 86	1,002.44	291.50521	1,474.9126	8,505.7515	1,687.4174	0.00023314094
Slice 87	1,007.84	291.52973	1,473.1422	8,479.3711	1,681.5105	0.00058792417
Slice 88	1,011.89	291.54812	1,471.8141	8,457.7423	1,676.6392	-0.00024110688
Slice 89	1,014.59	291.5604	1,470.9279	8,442.4064	1,673.171	-4.717807e-006
Slice 90	1,017.09	291.57178	1,470.1065	7,855.4718	1,532.502	0.00042779554
Slice 91	1,019.72	291.71422	1,461.1014	6,676.6457	1,258.5599	-9.2267146e-005
Slice 92	1,022.015	292.21157	1,429.9646	6,597.2557	1,613.5292	-0.00040264273
Slice 93	1,023.085	292.79943	1,393.2339	6,763.6085	1,813.6903	0.00031451272
Slice 94	1,027.08	295.69097	1,212.624	5,786.4187	493.22116	1,150.8501
Slice 95	1,034.4385	301.01869	879.84674	4,547.3278	461.63221	1,077.1413
Slice 96	1,039.3185	304.55302	659.08766	4,161.311	595.44785	1,389.3786
Slice 97	1,041.7215	306.29332	550.38591	3,763.922	580.27578	1,353.9774
Slice 98	1,045.1215	308.7557	396.58207	3,180.5227	1,672.7602	150
Slice 99	1,050.6033	312.72643	148.56457	2,167.9245	1,213.3538	150
Slice 100	1,055.7083	316.42459	-0	1,302.9784	782.90842	150
Slice 101	1,059.5125	319.83028	-0	811.37212	487.52155	150

Figure 23 - Stability Analyses For Seismic Response

Consolidated Undrained for Critical Surface

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File Information

Title: [Model City - RMU-2 XS3200](#)
 Created By: [Peter J. Carey](#)
 Revision Number: [418](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/18/2013](#)
 Time: [10:02:11 AM](#)
 File Name: [RMU2X3200r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/18/2013](#)
 Last Solved Time: [11:52:26 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Consolidated Undrained for Critical Surface

Description: [determination of critical surface](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 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: [Block](#)

Critical slip surfaces saved: **1**
 Restrict Block Crossing: **No**
 Optimize Critical Slip Surface Location: **Yes**
 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: **25 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

Waste Material

Model: **Mohr-Coulomb**
 Unit Weight: **111 pcf**
 Cohesion': **0 psf**
 Phi': **30 °**
 Phi-B: **0 °**

Bottom Liner

Model: **Shear/Normal Fn.**
 Unit Weight: **120 pcf**
 Strength Function: **Baseliner**
 Phi-B: **0 °**

CCL

Model: **Mohr-Coulomb**
 Unit Weight: **120 pcf**
 Cohesion': **1,000 psf**
 Phi': **10 °**
 Phi-B: **0 °**
 Pore Water Pressure
 Piezometric Line: **1**

Upper Till

Model: **Mohr-Coulomb**
 Unit Weight: **125 pcf**
 Cohesion': **150 psf**
 Phi': **31 °**
 Phi-B: **0 °**
 Pore Water Pressure
 Piezometric Line: **1**

Side Slope Liner

Model: **Mohr-Coulomb**
 Unit Weight: **115 pcf**
 Cohesion': **0 psf**
 Phi': **13 °**
 Phi-B: **0 °**

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: 1

Structural Fill

Model: [Mohr-Coulomb](#)
 Unit Weight: 130 pcf
 Cohesion': 195 psf
 Phi': 28.7 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: 125 pcf
 Cohesion': 0 psf
 Phi': 30 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: 1

GC-Consolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: 120 pcf
 Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static 0.34](#)
 Phi-B: 0 °
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: 1

GC Overconsolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: 125 pcf
 Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
 Phi-B: 0 °
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (606.35749, 436.40883) ft
 Right Coordinate: (1,140.3, 320.06614) ft

Slip Surface Block

Left Grid
 Upper Left: (799.3, 308.2) ft
 Lower Left: (793.1, 289.6) ft
 Lower Right: (883.6, 288.1) ft
 X Increments: 10
 Y Increments: 5

Starting Angle: 135 °

Ending Angle: 160 °

Angle Increments: 2

Right Grid

Upper Left: (950.6, 305.9) ft

Lower Left: (950.6, 290.4) ft

Lower Right: (1,022, 287.7) ft

X Increments: 3

Y Increments: 3

Starting Angle: 15 °

Ending Angle: 45 °

Angle Increments: 2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static 0.34

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: SHANSEPP

Field

MPP: 5000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: SHANSEPP

Field

MPP: 8000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	500	305.75
Point 2	500	288.15
Point 3	500	283.4
Point 4	500	273.4
Point 5	609.5	272.3
Point 6	1,200	269.95
Point 7	1,199.9987	280.3
Point 8	1,200	259.75
Point 9	1,200	286.7
Point 10	1,200	304.9
Point 11	1,200	320.1
Point 12	1,023.7	320
Point 13	1,012.5	320
Point 14	898.8	320
Point 15	991.25	345.25
Point 16	999.8	349.5
Point 17	1,016	350
Point 18	992.5	346.7

Point 19	978.7	349.8
Point 20	984.8	350
Point 21	972.4	344.6
Point 22	971.4	349.6
Point 23	910.3	372.6
Point 24	860.8	312.7
Point 25	800.5	311.2
Point 26	780.3	308.1
Point 27	735.4	314.9
Point 28	735.4	313.4
Point 29	735.5	308.9
Point 30	500	313.3
Point 31	500	319.3
Point 32	500	317.3
Point 33	500	426.2
Point 34	895.2	371.1
Point 35	500	258.75
Point 36	520.6	283.6
Point 37	876	312.5
Point 38	1,010.6	307.3
Point 39	854.9	273.7
Point 40	984.6	286.8
Point 41	1,026.6	269.9
Point 42	800.5	313.7
Point 43	870	310.5
Point 44	990	345.2
Point 45	987	348.5
Point 46	714.8	307.9
Point 47	500	302.65
Point 48	714.8	304.9
Point 49	780.3	305.07
Point 50	863	305.15
Point 51	1,010.35	303.8
Point 52	1,199.9987	301.4
Point 53	719.7	287.1
Point 54	890.3	308.2
Point 55	863	308.15
Point 56	890.3	305.2
Point 57	790.2	399.6
Point 58	528.3	431
Point 59	696.4	431
Point 60	805.3	401.1
Point 61	858.4	306.6
Point 62	799.9	307.7
Point 63	860.8	310.7
Point 64	500	428.9

Point 65	527.9	433.5
Point 66	696.3	433.5
Point 67	790.5	402.1
Point 68	805.5	403.7
Point 69	980.1	352
Point 70	910.5	375.1
Point 71	895.5	373.7
Point 72	1,092.6	283.3
Point 73	630.8	274.6
Point 74	651.5	307.4
Point 75	651.5	304.33077
Point 76	625	437.1
Point 77	624.9	434.6
Point 78	1,004	316
Point 79	825.1	269.8

Regions

	Material	Points	Area (ft ²)
Region 1	Bottom Liner	32,28,25,63,43,37,24,42,27,31	702.82
Region 2	Side Slope Liner	37,14,21,44,45,20,19,22,24	631.75
Region 3	Structural Fill	14,21,44,45,20,18,16,17,12,13,78	2,446.9
Region 4	Upper Till	37,14,78,13,12,11,10,38,54,55,43	3,999.3
Region 5	NOT ACTIVE	4,5,79,41,6,8,35	8,020.2
Region 6	NOT ACTIVE	4,3,36,73,39,72,7,6,41,79,5	5,003.5
Region 7	Deflection surface	3,2,53,40,9,7,72,39,73,36	6,471.5
Region 8	GC-Consolidated Undrained	2,47,75,48,49,50,56,51,52,9,40,53	11,774
Region 9	Upper Till	30,29,26,46,74,1	990.49
Region 10	CCL	32,28,25,63,43,55,61,62,26,29,30	1,504.8
Region 11	GC Overconsolidated Undrained	47,1,74,46,26,62,61,50,49,48,75	1,034.4
Region 12	GC Overconsolidated Undrained	55,54,38,10,52,51,56,50,61	1,143.1
Region 13	Final Cover	33,58,77,59,57,60,34,23,19,20,69,70,71,68,67,66,76,65,64	1,237.8
Region 14	Waste Material	33,58,77,59,57,60,34,23,19,22,24,42,27,31	41,745

Current Slip Surface

Slip Surface: 9,505

F of S: 1.35

Volume: 21,434.286 ft³

Weight: 2,498,668.9 lbs

Resisting Moment: 1.689771e+008 lbs-ft

Activating Moment: 1.2475442e+008 lbs-ft

Resisting Force: 675,922.67 lbs

Activating Force: 499,343.31 lbs

F of S Rank: 1

Exit: (1,075.6195, 320.02945) ft

Entry: (692.81159, 433.67613) ft

Radius: 200.65901 ft

Center: (977.8, 489.9) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	693.8721	432.37501	-0	102.11952	58.958731	0
Slice 2	695.6163	430.23506	0	261.99719	151.26415	0
Slice 3	698.4223	426.79241	0	455.10061	262.75246	0
Slice 4	705.8156	418.94357	0	893.19901	515.68869	0
Slice 5	716.3576	408.45356	0	1,406.2017	811.87092	0
Slice 6	727.35668	397.78351	0	1,939.0313	1,119.5003	0
Slice 7	738.81282	386.93343	0	2,438.5416	1,407.8926	0
Slice 8	749.60695	376.84702	0	2,919.707	1,685.6936	0
Slice 9	759.73905	367.52429	0	3,331.7957	1,923.6131	0
Slice 10	769.73973	358.1677	0	3,698.6387	2,135.4101	0
Slice 11	779.60897	348.77726	0	4,108.7138	2,372.167	0
Slice 12	787.3718	341.4276	0	4,451.4759	2,570.0608	0
Slice 13	790.35	338.63239	0	4,572.2458	2,639.7873	0
Slice 14	798	331.4524	0	5,125.9991	2,959.4969	0
Slice 15	810.36812	319.84418	0	5,872.209	3,390.3215	0
Slice 16	816.223	314.34902	0	6,111.9165	3,528.7166	0
Slice 17	818.47899	312.23164	0	6,622.7974	2,078.2544	518.45401
Slice 18	820.01221	310.79262	279.49726	6,886.5744	1,165.006	1,000
Slice 19	824.2057	308.84481	400.85385	8,430.3155	1,415.8107	1,000
Slice 20	834.80622	306.13698	569.35095	9,452.0639	2,273.1321	-0.00019228527
Slice 21	849.93862	303.85091	711.32844	9,236.0709	2,181.5247	0.00073814496
Slice 22	859.6	302.39135	801.97495	9,096.4173	2,122.5906	-0.0001795509
Slice 23	861.9	302.04388	823.55435	9,068.1102	2,109.8244	-0.000178471
Slice 24	865.38865	301.51685	856.28609	9,027.6076	2,091.0836	-0.00044811015
Slice 25	868.09106	301.11846	881.02494	9,114.934	2,042.2652	-0.00060464635
Slice 26	869.20241	300.98554	889.26981	9,097.7971	2,035.969	0.00011481571
Slice 27	873	300.53133	917.44335	9,038.9791	2,014.3919	0.00056231436
Slice 28	880.14337	299.67696	970.4385	8,934.4756	1,975.3281	-0.00014481463
Slice 29	885.29947	299.06027	1,008.6905	8,862.0778	1,947.8829	0.00040643823
Slice 30	888.3061	298.70344	1,030.8226	8,824.3977	1,930.7049	0.00013065531
Slice 31	892.75	298.17813	1,063.4043	8,760.5565	1,906.8183	-0.00013979206
Slice 32	895.35	297.87078	1,082.467	8,722.1974	1,892.594	-0.00093922532
Slice 33	897.15	297.65801	1,095.6642	8,772.9863	1,901.9053	0.00039684469
Slice 34	904.65	296.77143	1,150.6526	9,027.4785	1,951.3281	0.00068226332
Slice 35	915.474	295.49193	1,230.0119	9,165.9241	1,965.9663	-5.5433964e-006
Slice 36	925.422	294.31598	1,302.9485	9,036.6166	1,915.8648	-0.00054561461
Slice 37	935.6307	293.17541	1,373.6653	8,937.5564	1,854.8485	0.00012552193
Slice 38	946.1001	292.07024	1,442.1622	8,777.4519	1,798.7903	-0.00025867267
Slice 39	956.3511	291.10929	1,501.6694	8,680.0502	1,734.9242	0.00060659976
Slice 40	966.3837	290.29256	1,552.1867	8,484.8478	1,675.5376	-0.00012283648
Slice 41	971.9	289.84349	1,579.963	8,375.705	1,642.4459	-4.6311723e-006
Slice 42	975.27275	289.56892	1,596.9458	8,291.6503	1,618.026	0.00033761147
Slice 43	978.42275	289.31634	1,612.5671	8,249.4673	1,596.2528	0.00010802216
Slice 44	979.4	289.25034	1,616.642	8,218.5975	1,587.8484	-4.4772247e-006

Slice 45	982.45	289.04435	1,629.3598	8,089.8748	1,553.8302	-4.3813047e-006
Slice 46	985.9	288.81135	1,643.7455	7,943.6799	1,515.2087	-4.2724042e-006
Slice 47	988.5	288.63575	1,654.587	7,857.2105	1,491.8049	-0.0006351681
Slice 48	991.25	288.45003	1,666.0538	7,751.5478	1,463.6333	-4.1269779e-006
Slice 49	996.15	288.1191	1,686.4857	7,905.0305	1,495.6344	-0.00084765893
Slice 50	1,001.9	287.73076	1,710.4619	8,142.5368	1,546.9897	0.0003227893
Slice 51	1,007.3	287.36606	1,732.9787	8,197.6301	1,554.8249	0.00021482138
Slice 52	1,011.55	287.07903	1,750.7003	8,235.5152	1,559.6748	-0.00011434239
Slice 53	1,014.25	286.90015	1,761.7426	8,267.5039	1,563.9868	0.00010583864
Slice 54	1,018.7935	286.78413	1,768.7802	6,981.2539	1,251.0049	0.00017284428
Slice 55	1,021.9665	286.78265	1,768.7309	5,351.7447	325.75405	760.09318
Slice 56	1,023.023	287.12265	1,747.4677	5,689.8775	441.63648	1,030.4832
Slice 57	1,029.2689	290.26092	1,551.3622	4,792.1115	416.41825	971.64166
Slice 58	1,042.5762	298.17663	1,056.8297	3,825.7879	419.55921	978.97081
Slice 59	1,052.9127	305.01258	629.80614	3,055.5474	560.31909	1,307.4114
Slice 60	1,061.8344	310.91283	261.23342	1,752.2059	895.86665	150
Slice 61	1,071.8886	317.5621	-0	557.76027	335.13618	150

Figure 24 - Stability Analyses For Seismic Response

Consolidated Undrained-Seismic Yield acc

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File Information

Title: [Model City - RMU-2 XS3200](#)
 Created By: [Peter J. Carey](#)
 Revision Number: [418](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/18/2013](#)
 Time: [10:02:11 AM](#)
 File Name: [RMU2X3200r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/18/2013](#)
 Last Solved Time: [11:20:16 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Consolidated Undrained-Seismic Yield acc

Description: [yield on critical surface only](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

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: [Fully-Specified](#)

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: **Sensitivity**

Modifiers

	Property	Offset
	Analyses[3].Applied.SeismicX	Range(Mean=0,Delta=0.001)

Advanced

Number of Slices: **30**
 F of S Tolerance: **0.001**
 Minimum Slip Surface Depth: **25 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

Waste Material

Model: **Mohr-Coulomb**
 Unit Weight: **111 pcf**
 Cohesion': **0 psf**
 Phi': **30 °**
 Phi-B: **0 °**

Bottom Liner

Model: **Shear/Normal Fn.**
 Unit Weight: **120 pcf**
 Strength Function: **Baseliner**
 Phi-B: **0 °**

CCL

Model: **Mohr-Coulomb**
 Unit Weight: **120 pcf**
 Cohesion': **1,000 psf**
 Phi': **10 °**
 Phi-B: **0 °**
 Pore Water Pressure
 Piezometric Line: **1**

Upper Till

Model: **Mohr-Coulomb**
 Unit Weight: **125 pcf**
 Cohesion': **150 psf**
 Phi': **31 °**
 Phi-B: **0 °**
 Pore Water Pressure
 Piezometric Line: **1**

Side Slope Liner

Model: **Mohr-Coulomb**
 Unit Weight: **115 pcf**
 Cohesion': **0 psf**
 Phi': **13 °**

Phi-B: 0 °

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
Pore Water Pressure
Piezometric Line: [1](#)

Structural Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [130 pcf](#)
Cohesion': [195 psf](#)
Phi': [28.7 °](#)
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: [1](#)

Final Cover

Model: [Mohr-Coulomb](#)
Unit Weight: [125 pcf](#)
Cohesion': [0 psf](#)
Phi': [30 °](#)
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: [1](#)

NOT ACTIVE

Model: [\(None\)](#)
Pore Water Pressure
Piezometric Line: [1](#)

GC-Consolidated Undrained

Model: [Shear/Normal Fn.](#)
Unit Weight: [120 pcf](#)
Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static 0.34](#)
Phi-B: 0 °
Anisotropic Strength Fn: [clay ellipse staticshear](#)
Pore Water Pressure
Piezometric Line: [1](#)

GC Overconsolidated Undrained

Model: [Shear/Normal Fn.](#)
Unit Weight: [125 pcf](#)
Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
Phi-B: 0 °
Anisotropic Strength Fn: [clay ellipse staticshear](#)
Pore Water Pressure
Piezometric Line: [1](#)

Slip Surface Limits

Left Coordinate: [\(606.35749, 436.40883\) ft](#)
Right Coordinate: [\(1,140.3, 320.06614\) ft](#)

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

	X (ft)	Y (ft)

	688.5	439
	693.8721	432.37501
	695.6163	430.23506
	698.4223	426.79241
	705.8156	418.94357
	716.3576	408.45356
	727.3567	397.78351
	738.8128	386.93343
	749.6069	376.84702
	759.7391	367.52429
	769.7397	358.1677
	779.609	348.77726
	787.3718	341.4276
	790.35	338.63239
	798	331.4524
	810.3681	319.84418
	816.223	314.34902
	818.479	312.23164
	820.0122	310.79262
	824.2057	308.84481
	834.8062	306.13698
	849.9386	303.85091
	859.6	302.39135
	861.9	302.04388
	865.3886	301.51685
	868.0911	301.11846
	869.2024	300.98554
	873	300.53133
	880.1434	299.67696
	885.2995	299.06027
	888.3061	298.70344
	892.75	298.17813
	895.35	297.87078
	897.15	297.65801
	904.65	296.77143
	915.474	295.49193
	925.422	294.31598
	935.6307	293.17541
	946.1001	292.07024
	956.3511	291.10929
	966.3837	290.29256
	971.9	289.84349
	975.2727	289.56892
	978.4227	289.31634
	979.4	289.25034
	982.45	289.04435

	985.9	288.81135
	988.5	288.63575
	991.25	288.45003
	996.15	288.1191
	1,001.9	287.73076
	1,007.3	287.36606
	1,011.55	287.07903
	1,014.25	286.90015
	1,018.79	286.78413
	1,021.97	286.78265
	1,023.02	287.12265
	1,029.27	290.26092
	1,042.58	298.17663
	1,052.91	305.01258
	1,061.83	310.91283
	1,071.89	317.5621
	1,078.1	324.9

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0.091

Ignore seismic load in strength: Yes

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static 0.34

Model: [Add-In Function](#)Function: [Shear Stress vs. Normal Stress](#)Assembly: [GeoStudio AddIns1](#)

Function: SHANSEPP

Field

MPP: 5000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: [Add-In Function](#)Function: [Shear Stress vs. Normal Stress](#)Assembly: [GeoStudio AddIns1](#)

Function: SHANSEPP

Field

MPP: 8000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	500	305.75
Point 2	500	288.15
Point 3	500	283.4
Point 4	500	273.4
Point 5	609.5	272.3
Point 6	1,200	269.95

Point 7	1,199.9987	280.3
Point 8	1,200	259.75
Point 9	1,200	286.7
Point 10	1,200	304.9
Point 11	1,200	320.1
Point 12	1,023.7	320
Point 13	1,012.5	320
Point 14	898.8	320
Point 15	991.25	345.25
Point 16	999.8	349.5
Point 17	1,016	350
Point 18	992.5	346.7
Point 19	978.7	349.8
Point 20	984.8	350
Point 21	972.4	344.6
Point 22	971.4	349.6
Point 23	910.3	372.6
Point 24	860.8	312.7
Point 25	800.5	311.2
Point 26	780.3	308.1
Point 27	735.4	314.9
Point 28	735.4	313.4
Point 29	735.5	308.9
Point 30	500	313.3
Point 31	500	319.3
Point 32	500	317.3
Point 33	500	426.2
Point 34	895.2	371.1
Point 35	500	258.75
Point 36	520.6	283.6
Point 37	876	312.5
Point 38	1,010.6	307.3
Point 39	854.9	273.7
Point 40	984.6	286.8
Point 41	1,026.6	269.9
Point 42	800.5	313.7
Point 43	870	310.5
Point 44	990	345.2
Point 45	987	348.5
Point 46	714.8	307.9
Point 47	500	302.65
Point 48	714.8	304.9
Point 49	780.3	305.07
Point 50	863	305.15
Point 51	1,010.35	303.8
Point 52	1,199.9987	301.4

Point 53	719.7	287.1
Point 54	890.3	308.2
Point 55	863	308.15
Point 56	890.3	305.2
Point 57	790.2	399.6
Point 58	528.3	431
Point 59	696.4	431
Point 60	805.3	401.1
Point 61	858.4	306.6
Point 62	799.9	307.7
Point 63	860.8	310.7
Point 64	500	428.9
Point 65	527.9	433.5
Point 66	696.3	433.5
Point 67	790.5	402.1
Point 68	805.5	403.7
Point 69	980.1	352
Point 70	910.5	375.1
Point 71	895.5	373.7
Point 72	1,092.6	283.3
Point 73	630.8	274.6
Point 74	651.5	307.4
Point 75	651.5	304.33077
Point 76	625	437.1
Point 77	624.9	434.6
Point 78	1,004	316
Point 79	825.1	269.8

Regions

	Material	Points	Area (ft ²)
Region 1	Bottom Liner	32,28,25,63,43,37,24,42,27,31	702.82
Region 2	Side Slope Liner	37,14,21,44,45,20,19,22,24	631.75
Region 3	Structural Fill	14,21,44,45,20,18,16,17,12,13,78	2,446.9
Region 4	Upper Till	37,14,78,13,12,11,10,38,54,55,43	3,999.3
Region 5	NOT ACTIVE	4,5,79,41,6,8,35	8,020.2
Region 6	NOT ACTIVE	4,3,36,73,39,72,7,6,41,79,5	5,003.5
Region 7	Deflection surface	3,2,53,40,9,7,72,39,73,36	6,471.5
Region 8	GC-Consolidated Undrained	2,47,75,48,49,50,56,51,52,9,40,53	11,774
Region 9	Upper Till	30,29,26,46,74,1	990.49
Region 10	CCL	32,28,25,63,43,55,61,62,26,29,30	1,504.8
Region 11	GC Overconsolidated Undrained	47,1,74,46,26,62,61,50,49,48,75	1,034.4
Region 12	GC Overconsolidated Undrained	55,54,38,10,52,51,56,50,61	1,143.1
Region 13	Final Cover	33,58,77,59,57,60,34,23,19,20,69,70,71,68,67,66,76,65,64	1,237.8
Region 14	Waste Material	33,58,77,59,57,60,34,23,19,22,24,42,27,31	41,745

Current Slip Surface

Slip Surface: 1
 F of S: 1.00
 Volume: 21,422.036 ft³
 Weight: 2,497,201.5 lbs
 Resisting Moment: 1.6210451e+008 lbs-ft
 Activating Moment: 1.6210981e+008 lbs-ft
 Resisting Force: 669,290.37 lbs
 Activating Force: 669,478.51 lbs
 F of S Rank: 1
 Exit: (1,073.9773, 320.02852) ft
 Entry: (692.81727, 433.67585) ft
 Radius: 200.16027 ft
 Center: (977.8, 489.9) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	693.34469	433.02543	-0	49.605677	28.639851	0
Slice 2	694.40235	431.72445	-0	148.43263	85.69762	0
Slice 3	695.27445	430.65447	0	225.34015	130.1002	0
Slice 4	695.95815	429.81565	0	280.84237	162.14442	0
Slice 5	697.36115	428.09432	0	372.47238	215.04703	0
Slice 6	702.11895	422.86799	0	645.54555	372.70589	0
Slice 7	711.0866	413.69856	0	1,080.0156	623.54729	0
Slice 8	721.85715	403.11854	0	1,539.8535	889.03482	0
Slice 9	733.08475	392.35847	0	1,982.6909	1,144.7071	0
Slice 10	744.20985	381.89022	0	2,386.594	1,377.9007	0
Slice 11	754.673	372.18566	0	2,751.9991	1,588.8674	0
Slice 12	764.7394	362.846	0	3,050.0135	1,760.9261	0
Slice 13	774.67435	353.47248	0	3,337.8806	1,927.1263	0
Slice 14	783.4904	345.10243	0	3,627.237	2,094.1863	0
Slice 15	788.7859	340.10039	0	3,812.8892	2,201.3726	0
Slice 16	790.275	338.70278	0	3,859.2617	2,228.1458	0
Slice 17	790.425	338.562	0	3,863.4188	2,230.5459	0
Slice 18	794.25	334.972	0	4,089.7757	2,361.2331	0
Slice 19	801.75	327.9328	0	4,536.0806	2,618.9074	0
Slice 20	807.93405	322.12869	0	4,835.143	2,791.5711	0
Slice 21	812.80217	317.55967	0	4,988.9401	2,880.3659	0
Slice 22	815.72962	314.81209	0	5,082.5987	2,934.4397	0
Slice 23	816.71638	313.88595	0	5,114.4539	2,952.8313	0
Slice 24	817.84438	312.82726	0	5,187.1771	1,798.7513	323.54454
Slice 25	819.1136	311.63602	0	5,229.7157	1,808.5508	328.47593
Slice 26	819.8802	310.91651	271.77271	5,242.2809	876.43471	1,000
Slice 27	822.10895	309.81872	340.17581	7,180.5287	1,206.1388	1,000
Slice 28	827.59025	307.98025	454.65214	8,441.1773	1,408.2399	1,000
Slice 29	832.8905	306.62633	538.90053	8,391.7365	690.06253	1,610.1438
Slice 30	838.14171	305.63308	600.64585	9,018.1253	2,154.0763	-0.00063774988
Slice 31	845.70791	304.49005	671.63448	8,942.6412	2,116.5911	0.0014621889
Slice 32	854.1693	303.21177	751.02207	8,857.4842	2,074.4843	0.00057908905

Slice 33	859	302.48199	796.34533	8,810.7727	2,050.933	-0.00029493172
Slice 34	860.2	302.30071	807.60424	8,801.1053	2,045.5832	0.00028262669
Slice 35	861.35	302.12697	818.39412	8,792.6595	2,040.6624	-0.0014442569
Slice 36	862.45	301.96079	828.71481	8,785.4249	2,036.1641	0.0002813253
Slice 37	864.1943	301.69728	845.08051	8,773.9941	2,029.0522	-0.0011499764
Slice 38	866.73985	301.31766	868.65553	8,782.3446	2,017.1652	-0.0010010455
Slice 39	868.24796	301.0997	882.18887	8,972.2836	2,006.6008	-0.00043000586
Slice 40	868.80361	301.03324	886.31124	8,966.8933	2,004.2413	-0.00028821727
Slice 41	869.6012	300.93784	892.22852	8,959.1742	2,000.8531	-5.641766e-006
Slice 42	871.5	300.71074	906.31536	8,940.6894	1,992.7739	0.00041580502
Slice 43	874.5	300.35193	928.57163	8,911.4073	1,979.9879	0.00027356376
Slice 44	878.0717	299.92474	955.06901	8,879.8842	1,965.5966	0.00068725216
Slice 45	882.21507	299.42918	985.80759	8,846.0337	1,949.5795	-0.00014292696
Slice 46	884.79312	299.12084	1,004.9336	8,824.8537	1,939.5825	-0.0002789191
Slice 47	886.8028	298.88185	1,019.7565	8,814.9163	1,931.8873	0.00026691797
Slice 48	889.30305	298.58559	1,038.1321	8,797.3333	1,922.1883	0.00026557791
Slice 49	891.525	298.32294	1,054.4228	8,778.4935	1,913.4854	0.00026437548
Slice 50	893.975	298.03332	1,072.3858	8,757.6614	1,903.8781	0.00066567286
Slice 51	895.275	297.87965	1,081.9173	8,746.113	1,898.657	-0.00040687396
Slice 52	895.425	297.86191	1,083.017	8,743.9596	1,897.8408	0.00012843131
Slice 53	896.325	297.75553	1,089.6154	8,775.004	1,903.8973	-0.00040799693
Slice 54	897.975	297.56049	1,101.7127	8,839.2047	1,916.8126	0.00026483519
Slice 55	901.725	297.1172	1,129.207	8,990.5013	1,947.4824	0.00013179068
Slice 56	907.575	296.42567	1,172.0981	9,227.6471	1,995.6026	0.00069774349
Slice 57	912.987	295.78592	1,211.7776	9,330.5008	2,011.2544	-0.00085633491
Slice 58	920.448	294.90396	1,266.48	9,277.3687	1,984.5399	-5.5957681e-006
Slice 59	930.52635	293.7457	1,338.3068	9,245.6366	1,948.3209	0.0002691885
Slice 60	940.8654	292.62282	1,407.9138	9,193.3772	1,909.1822	0.00066752739
Slice 61	951.2256	291.58977	1,471.9156	9,158.2191	1,869.8726	-5.2724429e-006
Slice 62	961.3674	290.70092	1,526.9278	9,097.6634	1,829.7516	0.00063975525
Slice 63	968.89185	290.08838	1,564.8159	8,975.8275	1,791.1489	0.00024747294
Slice 64	971.65	289.86384	1,578.7041	8,929.8501	1,776.6806	-0.00025549321
Slice 65	972.15	289.82314	1,581.2218	8,920.8663	1,773.9022	-0.00025509367
Slice 66	973.83635	289.68585	1,589.7134	8,883.8471	1,762.9027	-0.00012924137
Slice 67	976.8477	289.44263	1,604.7564	8,822.3503	1,743.4608	-0.00012781605
Slice 68	978.56135	289.30698	1,613.1449	8,858.78	1,742.6594	-4.9137421e-006
Slice 69	979.05	289.27398	1,615.1824	8,844.2359	1,738.6717	-0.0003725898
Slice 70	979.75	289.2267	1,618.1012	8,822.3036	1,732.6957	0.00060582059
Slice 71	981.275	289.12371	1,624.4602	8,760.3068	1,716.2563	-0.00036778629
Slice 72	983.625	288.96499	1,634.2592	8,658.0907	1,689.3139	0.00047156933
Slice 73	985.35	288.84849	1,641.452	8,587.4654	1,670.5981	0.00011305327
Slice 74	986.45	288.7742	1,646.0388	8,548.5374	1,660.1335	-0.00023873331
Slice 75	987.75	288.6864	1,651.4597	8,507.3077	1,648.9139	-0.00058582546
Slice 76	989.25	288.5851	1,657.7144	8,463.7429	1,636.9291	0.00034155573
Slice 77	990.625	288.49224	1,663.4476	8,412.774	1,623.292	-4.5771644e-006
Slice 78	991.875	288.40782	1,668.6598	8,354.4611	1,608.0141	0.00022217024

Slice 79	994.325	288.24235	1,678.8757	8,437.4344	1,625.5132	0.00011000227
Slice 80	997.975	287.99584	1,694.0955	8,660.2497	1,675.4428	-4.724213e-006
Slice 81	1,000.85	287.80167	1,706.0838	8,785.088	1,702.5843	0.00023523647
Slice 82	1,002.95	287.65985	1,714.8404	8,813.1077	1,707.217	0.00035622175
Slice 83	1,005.65	287.4775	1,726.0989	8,844.1791	1,711.9828	-0.00012550834
Slice 84	1,008.825	287.26307	1,739.3379	8,876.6641	1,716.6109	0.00035818184
Slice 85	1,010.475	287.15163	1,746.218	8,893.2068	1,718.9353	-4.846848e-006
Slice 86	1,011.075	287.11111	1,748.7199	8,899.1472	1,719.7625	-0.00024730817
Slice 87	1,012.025	287.04756	1,752.6431	8,914.2851	1,721.9285	0.00060205594
Slice 88	1,013.375	286.95812	1,758.1641	8,929.1359	1,724.1725	-0.00012640199
Slice 89	1,015.125	286.87779	1,763.0988	9,132.4616	1,768.7333	0.00036905751
Slice 90	1,017.395	286.81978	1,766.6176	8,399.4402	1,591.9558	-0.00045336933
Slice 91	1,020.38	286.78339	1,768.7555	6,908.4566	1,233.5393	0.00012695383
Slice 92	1,022.495	286.95265	1,758.0995	6,913.8172	1,459.0973	-5.5541538e-005
Slice 93	1,023.36	287.29337	1,736.8	7,162.3699	1,715.2062	-0.00054892366
Slice 94	1,026.485	288.86251	1,638.7469	6,495.944	470.09755	1,096.8901
Slice 95	1,035.925	294.21877	1,304.0956	5,538.8287	467.96409	1,091.9179
Slice 96	1,046.4467	300.73545	896.98694	4,207.5613	442.70027	1,032.9673
Slice 97	1,051.6117	304.15342	683.47542	3,897.9655	609.75593	1,422.7656
Slice 98	1,054.2089	305.87176	576.13534	3,494.4568	592.28983	1,382.0089
Slice 99	1,058.6689	308.82189	391.84903	2,569.4067	1,308.4087	150
Slice 100	1,064.9935	313.00379	130.61678	1,581.6419	871.86384	150
Slice 101	1,070.0235	316.32843	-0	865.7295	520.18276	150
Slice 102	1,072.9337	318.79531	-0	709.41315	426.25843	150

Figure 25 - Stability Analyses For Seismic Response

Consolidated Undrained w Grids

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File Information

Title: [Model City - RMU-2 XS3200](#)
 Created By: [Peter J. Carey](#)
 Revision Number: [418](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/18/2013](#)
 Time: [10:02:11 AM](#)
 File Name: [RMU2X3200r1_grids.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/18/2013](#)
 Last Solved Time: [11:21:10 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Consolidated Undrained w Grids

Description: [Critical Surface Determination forYield Acceleration](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

Lambda

Lambda 1: [0.2](#)

Lambda 2: [0.4](#)

Lambda 3: [0.5](#)

Lambda 4: [0.6](#)

Lambda 5: [0.7](#)

Lambda 6: [0.8](#)

Lambda 7: [0.9](#)

Lambda 8: [1](#)

Lambda 9: [1.1](#)

Lambda 10: [1.2](#)

Lambda 11: [1.3](#)

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: [Block](#)

Critical slip surfaces saved: **1**
 Restrict Block Crossing: **No**
 Optimize Critical Slip Surface Location: **Yes**
 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: **25 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

Waste Material

Model: **Mohr-Coulomb**
 Unit Weight: **111 pcf**
 Cohesion': **0 psf**
 Phi': **30 °**
 Phi-B: **0 °**

Bottom Liner

Model: **Shear/Normal Fn.**
 Unit Weight: **120 pcf**
 Strength Function: **Baseliner**
 Phi-B: **0 °**

CCL

Model: **Mohr-Coulomb**
 Unit Weight: **120 pcf**
 Cohesion': **1,000 psf**
 Phi': **10 °**
 Phi-B: **0 °**
 Pore Water Pressure
 Piezometric Line: **1**

Upper Till

Model: **Mohr-Coulomb**
 Unit Weight: **125 pcf**
 Cohesion': **150 psf**
 Phi': **31 °**
 Phi-B: **0 °**
 Pore Water Pressure
 Piezometric Line: **1**

Side Slope Liner

Model: **Mohr-Coulomb**
 Unit Weight: **115 pcf**
 Cohesion': **0 psf**
 Phi': **13 °**
 Phi-B: **0 °**

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Consolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static 0.34](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

STRUCTUAL FILL UNDRAINED

Model: [Bilinear](#)
 Unit Weight: [128 pcf](#)
 Cohesion': [2,000 psf](#)
 Phi 1: [5 °](#)
 Phi 2: [2 °](#)
 Bilinear Normal: [2,000 psf](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC Overconsolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [125 pcf](#)
 Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Slip Surface Limits

Left Coordinate: [\(909.97127, 375.05065\) ft](#)
 Right Coordinate: [\(1,088.3996, 320.0367\) ft](#)

Slip Surface Block

Left Grid
 Upper Left: [\(991.6, 317.3\) ft](#)
 Lower Left: [\(991.1, 308.7\) ft](#)
 Lower Right: [\(1,002.4, 306.8\) ft](#)
 X Increments: [3](#)
 Y Increments: [3](#)

Starting Angle: 115 °

Ending Angle: 135 °

Angle Increments: 2

Right Grid

Upper Left: (1,010.5, 313.7) ft

Lower Left: (1,012.4, 307.7) ft

Lower Right: (1,030.2, 310.2) ft

X Increments: 3

Y Increments: 3

Starting Angle: 0 °

Ending Angle: 45 °

Angle Increments: 2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Reinforcements

Reinforcement 1

Type: Geosynthetic

Outside Point: (1,024.5, 319.5) ft

Inside Point: (993, 319.3918) ft

Slip Surface Intersection: (993.23207, 319.3926) ft

Total Length: 31.500186 ft

Reinforcement Direction: 0.19681 °

F of S Dependent: Yes

Interface Adhesion: 0 psf

Interface Shear Angle: 30 °

Surface Area Factor: 1

Resistance Reduction Factor: 1

Force Distribution: Concentrated

Tensile Capacity: 6,800 lbs

Reduction Factor: 1

Force Orientation: 0

Max. Pullout Force: 6,800 lbs

Pullout Force: 251.5521 lbs

Pullout Force per Length: 1,083.9412 lbs/ft

Available Length: 0.23207172 ft

Required Length: 0.23207172 ft

Governing Component: Pullout Resistance

Reinforcement 2

Type: Geosynthetic

Outside Point: (1,023.5, 321) ft

Inside Point: (993, 321) ft

Slip Surface Intersection: () ft

Total Length: 30.5 ft

Reinforcement Direction: 0 °

F of S Dependent: Yes

Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 6,800 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 6,800 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 3

Type: Geosynthetic
 Outside Point: (1,023.125, 322.5) ft
 Inside Point: (993, 322.5) ft
 Slip Surface Intersection: () ft
 Total Length: 30.125 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 5,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 5,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 4

Type: Geosynthetic
 Outside Point: (1,022.75, 324) ft
 Inside Point: (991, 324) ft
 Slip Surface Intersection: () ft
 Total Length: 31.75 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 5,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 5,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 5

Type: Geosynthetic

Outside Point: (1,022.375, 325.5) ft
 Inside Point: (991, 325.5) ft
 Slip Surface Intersection: () ft
 Total Length: 31.375 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 5,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 5,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 6

Type: Geosynthetic
 Outside Point: (1,022, 327) ft
 Inside Point: (990.5, 327) ft
 Slip Surface Intersection: () ft
 Total Length: 31.5 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 4,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 4,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 7

Type: Geosynthetic
 Outside Point: (1,021.5, 328.5) ft
 Inside Point: (990, 328.5) ft
 Slip Surface Intersection: () ft
 Total Length: 31.5 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 4,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 4,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft

Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 8

Type: Geosynthetic
 Outside Point: (1,021.25, 330) ft
 Inside Point: (1,011.25, 330) ft
 Slip Surface Intersection: () ft
 Total Length: 10 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 1,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 1,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 9

Type: Geosynthetic
 Outside Point: (1,020.875, 331.5) ft
 Inside Point: (985.9975, 331.5) ft
 Slip Surface Intersection: () ft
 Total Length: 34.8775 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 4,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 4,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 10

Type: Geosynthetic
 Outside Point: (1,020.5, 333) ft
 Inside Point: (1,010.5, 333) ft
 Slip Surface Intersection: () ft
 Total Length: 10 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated

Tensile Capacity: 1,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 1,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 11

Type: Geosynthetic
 Outside Point: (1,020.125, 334.5) ft
 Inside Point: (984, 334.5) ft
 Slip Surface Intersection: () ft
 Total Length: 36.125 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 4,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 4,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 12

Type: Geosynthetic
 Outside Point: (1,019.75, 336) ft
 Inside Point: (1,009.75, 336) ft
 Slip Surface Intersection: () ft
 Total Length: 10 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 1,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 1,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 13

Type: Geosynthetic
 Outside Point: (1,019.375, 337.5) ft
 Inside Point: (982, 337.5) ft
 Slip Surface Intersection: () ft
 Total Length: 37.375 ft
 Reinforcement Direction: 0 °

F of S Dependent: [Yes](#)
 Interface Adhesion: [0 psf](#)
 Interface Shear Angle: [30 °](#)
 Surface Area Factor: [1](#)
 Resistance Reduction Factor: [1](#)
 Force Distribution: [Concentrated](#)
 Tensile Capacity: [4,900 lbs](#)
 Reduction Factor: [1](#)
 Force Orientation: [0](#)
 Max. Pullout Force: [4,900 lbs](#)
 Pullout Force: [0 lbs](#)
 Pullout Force per Length: [0 lbs/ft](#)
 Available Length: [0 ft](#)
 Required Length: [0 ft](#)
 Governing Component: [\(none\)](#)

Reinforcement 14

Type: [Geosynthetic](#)
 Outside Point: [\(1,019, 339\) ft](#)
 Inside Point: [\(1,009, 339\) ft](#)
 Slip Surface Intersection: [\(\) ft](#)
 Total Length: [10 ft](#)
 Reinforcement Direction: [0 °](#)
 F of S Dependent: [Yes](#)
 Interface Adhesion: [0 psf](#)
 Interface Shear Angle: [30 °](#)
 Surface Area Factor: [1](#)
 Resistance Reduction Factor: [1](#)
 Force Distribution: [Concentrated](#)
 Tensile Capacity: [1,000 lbs](#)
 Reduction Factor: [1](#)
 Force Orientation: [0](#)
 Max. Pullout Force: [1,000 lbs](#)
 Pullout Force: [0 lbs](#)
 Pullout Force per Length: [0 lbs/ft](#)
 Available Length: [0 ft](#)
 Required Length: [0 ft](#)
 Governing Component: [\(none\)](#)

Reinforcement 15

Type: [Geosynthetic](#)
 Outside Point: [\(1,018.625, 340.5\) ft](#)
 Inside Point: [\(982, 340.5\) ft](#)
 Slip Surface Intersection: [\(\) ft](#)
 Total Length: [36.625 ft](#)
 Reinforcement Direction: [0 °](#)
 F of S Dependent: [Yes](#)
 Interface Adhesion: [0 psf](#)
 Interface Shear Angle: [30 °](#)
 Surface Area Factor: [1](#)
 Resistance Reduction Factor: [1](#)
 Force Distribution: [Concentrated](#)
 Tensile Capacity: [3,000 lbs](#)
 Reduction Factor: [1](#)
 Force Orientation: [0](#)
 Max. Pullout Force: [3,000 lbs](#)
 Pullout Force: [0 lbs](#)
 Pullout Force per Length: [0 lbs/ft](#)
 Available Length: [0 ft](#)
 Required Length: [0 ft](#)
 Governing Component: [\(none\)](#)

Reinforcement 16

Type: [Geosynthetic](#)
 Outside Point: (1,018.25, 342) ft
 Inside Point: (1,008.25, 342) ft
 Slip Surface Intersection: () ft
 Total Length: 10 ft
 Reinforcement Direction: 0 °
 F of S Dependent: [Yes](#)
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: [Concentrated](#)
 Tensile Capacity: 1,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 1,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 17

Type: [Geosynthetic](#)
 Outside Point: (1,017.875, 343.5) ft
 Inside Point: (981.5, 343.5) ft
 Slip Surface Intersection: () ft
 Total Length: 36.375 ft
 Reinforcement Direction: 0 °
 F of S Dependent: [Yes](#)
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: [Concentrated](#)
 Tensile Capacity: 2,300 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 2,300 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 18

Type: [Geosynthetic](#)
 Outside Point: (1,017.5, 345) ft
 Inside Point: (993.5, 345) ft
 Slip Surface Intersection: () ft
 Total Length: 24 ft
 Reinforcement Direction: 0 °
 F of S Dependent: [Yes](#)
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: [Concentrated](#)
 Tensile Capacity: 2,300 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 2,300 lbs

Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 19

Type: Geosynthetic
 Outside Point: (1,017.125, 346.5) ft
 Inside Point: (996.5, 346.5) ft
 Slip Surface Intersection: () ft
 Total Length: 20.625 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 3,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 3,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 20

Type: Geosynthetic
 Outside Point: (1,016.75, 348) ft
 Inside Point: (998.5, 348) ft
 Slip Surface Intersection: () ft
 Total Length: 18.25 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 3,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 3,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
 Function: Modifier Factor vs. Inclination
 Curve Fit to Data: 100 %
 Segment Curvature: 50 %
 Y-Intercept: 0.7058887

Data Points: [Inclination \(°\)](#), [Modifier Factor](#)
 Data Point: (-60, 1)
 Data Point: (-30, 1)
 Data Point: (-17.838428, 0.90468204)
 Data Point: (-3, 0.706)
 Data Point: (3, 0.706)
 Data Point: (23.685228, 0.90009497)
 Data Point: (39.261389, 1)
 Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)
 Function: [Shear Stress vs. Normal Stress](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 100 %
 Y-Intercept: 0
 Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)
 Data Point: (0, 0)
 Data Point: (500, 235)
 Data Point: (1,000, 463)
 Data Point: (2,000, 899)
 Data Point: (5,000, 2,057)
 Data Point: (10,000, 3,515)
 Data Point: (15,000, 4,430)
 Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600,000 psf
 SigmaC: 300,000 psf
 Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static 0.34

Model: [Add-In Function](#)
 Function: [Shear Stress vs. Normal Stress](#)
 Assembly: [GeoStudio AddIns1](#)
 Function: [SHANSEPP](#)
 Field
 MPP: 5000
 m: 0.7
 S: 0.34
 Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: [Add-In Function](#)
 Function: [Shear Stress vs. Normal Stress](#)
 Assembly: [GeoStudio AddIns1](#)
 Function: [SHANSEPP](#)
 Field
 MPP: 8000
 m: 0.7
 S: 0.34
 Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)

Point 1	500	305.75
Point 2	500	288.15
Point 3	500	283.4
Point 4	500	273.4
Point 5	609.5	272.3
Point 6	1,200	269.95
Point 7	1,199.9987	280.3
Point 8	1,200	259.75
Point 9	1,200	286.7
Point 10	1,200	304.9
Point 11	1,200	320.1
Point 12	1,023.7	320
Point 13	1,012.5	320
Point 14	898.8	320
Point 15	991.25	345.25
Point 16	999.8	349.5
Point 17	1,016	350
Point 18	992.5	346.7
Point 19	978.7	349.8
Point 20	984.8	350
Point 21	972.4	344.6
Point 22	971.4	349.6
Point 23	910.3	372.6
Point 24	860.8	312.7
Point 25	800.5	311.2
Point 26	780.3	308.1
Point 27	735.4	314.9
Point 28	735.4	313.4
Point 29	735.5	308.9
Point 30	500	313.3
Point 31	500	319.3
Point 32	500	317.3
Point 33	500	426.2
Point 34	895.2	371.1
Point 35	500	258.75
Point 36	520.6	283.6
Point 37	876	312.5
Point 38	1,010.6	307.3
Point 39	854.9	273.7
Point 40	984.6	286.8
Point 41	1,026.6	269.9
Point 42	800.5	313.7
Point 43	870	310.5
Point 44	990	345.2
Point 45	987	348.5
Point 46	714.8	307.9

Point 47	500	302.65
Point 48	714.8	304.9
Point 49	780.3	305.07
Point 50	863	305.15
Point 51	1,010.35	303.8
Point 52	1,199.9987	301.4
Point 53	719.7	287.1
Point 54	890.3	308.2
Point 55	863	308.15
Point 56	890.3	305.2
Point 57	790.2	399.6
Point 58	528.3	431
Point 59	696.4	431
Point 60	805.3	401.1
Point 61	858.4	306.6
Point 62	799.9	307.7
Point 63	860.8	310.7
Point 64	500	428.9
Point 65	527.9	433.5
Point 66	696.3	433.5
Point 67	790.5	402.1
Point 68	805.5	403.7
Point 69	980.1	352
Point 70	910.5	375.1
Point 71	895.5	373.7
Point 72	1,092.6	283.3
Point 73	630.8	274.6
Point 74	651.5	307.4
Point 75	651.5	304.33077
Point 76	625	437.1
Point 77	624.9	434.6
Point 78	1,004	316
Point 79	825.1	269.8

Regions

	Material	Points	Area (ft ²)
Region 1	Bottom Liner	32,28,25,63,43,37,24,42,27,31	702.82
Region 2	Side Slope Liner	37,14,21,44,45,20,19,22,24	631.75
Region 3	STRUCTUAL FILL UNDRAINED	14,21,44,45,20,18,16,17,12,13,78	2,446.9
Region 4	Upper Till	37,14,78,13,12,11,10,38,54,55,43	3,999.3
Region 5	NOT ACTIVE	4,5,79,41,6,8,35	8,020.2
Region 6	NOT ACTIVE	4,3,36,73,39,72,7,6,41,79,5	5,003.5
Region 7	Deflection surface	3,2,53,40,9,7,72,39,73,36	6,471.5
Region 8	GC-Consolidated Undrained	2,47,75,48,49,50,56,51,52,9,40,53	11,774
Region 9	Upper Till	30,29,26,46,74,1	990.49

Region 10	CCL	32,28,25,63,43,55,61,62,26,29,30	1,504.8
Region 11	GC Overconsolidated Undrained	47,1,74,46,26,62,61,50,49,48,75	1,034.4
Region 12	GC Overconsolidated Undrained	55,54,38,10,52,51,56,50,61	1,143.1
Region 13	Final Cover	33,58,77,59,57,60,34,23,19,20,69,70,71,68,67,66,76,65,64	1,237.8
Region 14	Waste Material	33,58,77,59,57,60,34,23,19,22,24,42,27,31	41,745

Current Slip Surface

Slip Surface: 2,305
 F of S: 1.93
 Volume: 1,950.8856 ft³
 Weight: 244,080.05 lbs
 Resisting Moment: 24,794,714 lbs-ft
 Activating Moment: 12,824,792 lbs-ft
 Resisting Force: 155,140.23 lbs
 Activating Force: 80,251.097 lbs
 F of S Rank: 1
 Exit: (1,038.6278, 320.00847) ft
 Entry: (933.52367, 367.45852) ft
 Radius: 65.929071 ft
 Center: (1,033.5, 456.7) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	935.42354	366.1753	0	66.636139	38.472393	0
Slice 2	939.22328	363.60884	0	195.14157	112.66504	0
Slice 3	942.89753	361.12715	0	306.52422	176.97184	0
Slice 4	945.99793	358.88436	0	386.34358	223.05557	0
Slice 5	948.64998	356.79568	0	475.00454	274.244	0
Slice 6	952.07685	353.78704	0	573.39838	331.05171	0
Slice 7	955.56471	350.29332	0	678.07481	391.48667	0
Slice 8	958.33873	347.23448	0	803.9054	464.135	0
Slice 9	960.30947	345.0614	0	969.51449	223.83006	0
Slice 10	962.14494	343.00424	0	1,050.5278	242.53346	0
Slice 11	964.16599	340.72201	-0	718.60362	62.86967	2,000
Slice 12	966.55147	338.354	-0	1,086.0996	95.021405	2,000
Slice 13	969.78382	335.35545	-0	1,290.9122	112.94018	2,000
Slice 14	971.9	333.39234	-0	1,420.5734	124.28406	2,000
Slice 15	973.96865	331.47332	-0	1,539.4607	134.68536	2,000
Slice 16	977.11865	328.82753	-0	1,941.7904	169.88465	2,000
Slice 17	979.4	327.10989	-0	2,042.2747	71.317805	2,105.1358
Slice 18	980.7826	326.06893	-0	2,094.673	73.147591	2,105.1358

Slice 19	983.1326	324.65087	-0	2,513.669	87.779256	2,105.1358
Slice 20	985.9	323.15027	-0	2,569.073	89.714005	2,105.1358
Slice 21	988.5	321.74044	-0	2,638.7166	92.146013	2,105.1358
Slice 22	991.11635	320.32175	-0	2,702.9144	94.38785	2,105.1358
Slice 23	992.36635	319.67311	-0	3,201.5041	111.79899	2,105.1358
Slice 24	994.325	319.03845	-0	3,384.1527	118.17722	2,105.1358
Slice 25	997.975	317.85575	-0	3,660.7891	127.83757	2,105.1358
Slice 26	1,001.7313	316.63861	-0	3,905.9738	136.39961	2,105.1358
Slice 27	1,003.8313	315.95815	-0	4,023.726	2,417.6985	150
Slice 28	1,004.1168	315.86563	-0	4,036.7129	2,425.5018	150
Slice 29	1,005.0585	315.48348	-0	3,838.0208	2,306.1155	150
Slice 30	1,007.9911	314.25941	54.803218	4,007.2012	2,374.8403	150
Slice 31	1,011.2995	312.81334	144.89102	4,079.0804	2,363.8995	150
Slice 32	1,014.25	311.42152	231.60873	4,286.8612	2,436.6415	150
Slice 33	1,017.5377	309.8707	328.23391	3,881.8015	2,135.1989	150
Slice 34	1,020.9064	309.19806	370.05664	3,377.4	1,806.9942	150
Slice 35	1,023.2187	309.47546	352.64414	2,694.5074	1,407.1334	150
Slice 36	1,025.9982	310.77314	271.5452	1,949.1713	1,008.0195	150
Slice 37	1,030.7341	313.48291	102.2447	1,455.785	813.28908	150
Slice 38	1,033.8258	315.55887	-0	939.55053	564.53892	150
Slice 39	1,036.5538	318.00325	-0	536.78236	322.53138	150

Figure 26 - Stability Analyses For Seismic Response

Undrained Seismic w Grids - Yield Acc

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File Information

Title: [Model City - RMU-2 XS3200](#)
 Created By: [Peter J. Carey](#)
 Revision Number: [418](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/18/2013](#)
 Time: [10:02:11 AM](#)
 File Name: [RMU2X3200r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/18/2013](#)
 Last Solved Time: [11:20:58 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Undrained Seismic w Grids - Yield Acc

Description: [yield acceleration determination on critical surface](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

Lambda

Lambda 1: [0](#)
 Lambda 2: [0.2](#)
 Lambda 3: [0.4](#)
 Lambda 4: [0.6](#)
 Lambda 5: [0.8](#)
 Lambda 6: [1](#)
 Lambda 7: [1.1](#)
 Lambda 8: [1.2](#)
 Lambda 9: [1.3](#)
 Lambda 10: [1.4](#)
 Lambda 11: [1.5](#)
 Lambda 12: [1.6](#)
 Lambda 13: [1.7](#)
 Lambda 14: [1.8](#)
 Lambda 15: [2](#)

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: [Fully-Specified](#)
 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [150 psf](#)
 Phi': [31 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)
 Unit Weight: [115 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [13 °](#)

Phi-B: 0 °

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
Pore Water Pressure
Piezometric Line: 1

Final Cover

Model: [Mohr-Coulomb](#)
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

NOT ACTIVE

Model: [\(None\)](#)
Pore Water Pressure
Piezometric Line: 1

GC-Consolidated Undrained

Model: [Shear/Normal Fn.](#)
Unit Weight: 120 pcf
Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static 0.34](#)
Phi-B: 0 °
Anisotropic Strength Fn: [clay ellipse staticshear](#)
Pore Water Pressure
Piezometric Line: 1

STRUCTUAL FILL UNDRAINED

Model: [Bilinear](#)
Unit Weight: 128 pcf
Cohesion': 2,000 psf
Phi 1: 5 °
Phi 2: 2 °
Bilinear Normal: 2,000 psf
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

GC Overconsolidated Undrained

Model: [Shear/Normal Fn.](#)
Unit Weight: 125 pcf
Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
Phi-B: 0 °
Anisotropic Strength Fn: [clay ellipse staticshear](#)
Pore Water Pressure
Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (931.73033, 368.05373) ft
Right Coordinate: (1,088.3996, 320.0367) ft

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

	X (ft)	Y (ft)

	932.1	370.8
	935.4235	366.1753
	939.2233	363.60884
	942.8975	361.12715
	945.9979	358.88436
	948.65	356.79568
	952.0769	353.78704
	955.5647	350.29332
	958.3387	347.23448
	960.3095	345.0614
	962.1449	343.00424
	964.166	340.72201
	966.5515	338.354
	969.7838	335.35545
	971.9	333.39234
	973.9687	331.47332
	977.1187	328.82753
	979.4	327.10989
	980.7826	326.06893
	983.1326	324.65087
	985.9	323.15027
	988.5	321.74044
	991.1164	320.32175
	992.3664	319.67311
	994.325	319.03845
	997.975	317.85575
	1,001.73	316.63861
	1,003.83	315.95815
	1,004.12	315.86563
	1,005.06	315.48348
	1,007.99	314.25941
	1,011.3	312.81334
	1,014.25	311.42152
	1,017.54	309.8707
	1,020.91	309.19806
	1,023.22	309.47546
	1,026	310.77314
	1,030.73	313.48291
	1,033.83	315.55887
	1,036.55	318.00325
	1,041.6	324.2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0.3

Ignore seismic load in strength: No

Reinforcements

Reinforcement 1

Type: Geosynthetic

Outside Point: (1,024.5, 319.5) ft

Inside Point: (993, 319.3918) ft

Slip Surface Intersection: (993.23208, 319.3926) ft

Total Length: 31.500186 ft

Reinforcement Direction: 0.19681 °

F of S Dependent: Yes

Interface Adhesion: 0 psf

Interface Shear Angle: 30 °

Surface Area Factor: 1

Resistance Reduction Factor: 1

Force Distribution: Concentrated

Tensile Capacity: 6,800 lbs

Reduction Factor: 1

Force Orientation: 0

Max. Pullout Force: 6,800 lbs

Pullout Force: 326.95749 lbs

Pullout Force per Length: 1,408.7901 lbs/ft

Available Length: 0.23208388 ft

Required Length: 0.23208388 ft

Governing Component: Pullout Resistance

Reinforcement 2

Type: Geosynthetic

Outside Point: (1,023.5, 321) ft

Inside Point: (993, 321) ft

Slip Surface Intersection: () ft

Total Length: 30.5 ft

Reinforcement Direction: 0 °

F of S Dependent: Yes

Interface Adhesion: 0 psf

Interface Shear Angle: 30 °

Surface Area Factor: 1

Resistance Reduction Factor: 1

Force Distribution: Concentrated

Tensile Capacity: 6,800 lbs

Reduction Factor: 1

Force Orientation: 0

Max. Pullout Force: 6,800 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 3

Type: Geosynthetic
 Outside Point: (1,023.125, 322.5) ft
 Inside Point: (993, 322.5) ft
 Slip Surface Intersection: () ft
 Total Length: 30.125 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 5,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 5,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 4

Type: Geosynthetic
 Outside Point: (1,022.75, 324) ft
 Inside Point: (991, 324) ft
 Slip Surface Intersection: () ft
 Total Length: 31.75 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 5,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 5,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 5

Type: Geosynthetic
 Outside Point: (1,022.375, 325.5) ft
 Inside Point: (991, 325.5) ft
 Slip Surface Intersection: () ft
 Total Length: 31.375 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °

Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 5,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 5,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 6

Type: Geosynthetic
 Outside Point: (1,022, 327) ft
 Inside Point: (990.5, 327) ft
 Slip Surface Intersection: () ft
 Total Length: 31.5 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 4,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 4,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 7

Type: Geosynthetic
 Outside Point: (1,021.5, 328.5) ft
 Inside Point: (990, 328.5) ft
 Slip Surface Intersection: () ft
 Total Length: 31.5 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 4,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 4,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 8

Type: Geosynthetic
 Outside Point: (1,021.25, 330) ft
 Inside Point: (1,011.25, 330) ft

Slip Surface Intersection: () ft
 Total Length: 10 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 1,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 1,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 9

Type: Geosynthetic
 Outside Point: (1,020.875, 331.5) ft
 Inside Point: (985.9975, 331.5) ft
 Slip Surface Intersection: () ft
 Total Length: 34.8775 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 4,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 4,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 10

Type: Geosynthetic
 Outside Point: (1,020.5, 333) ft
 Inside Point: (1,010.5, 333) ft
 Slip Surface Intersection: () ft
 Total Length: 10 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 1,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 1,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft

Governing Component: (none)

Reinforcement 11

Type: [Geosynthetic](#)
 Outside Point: (1,020.125, 334.5) ft
 Inside Point: (984, 334.5) ft
 Slip Surface Intersection: () ft
 Total Length: 36.125 ft
 Reinforcement Direction: 0 °
 F of S Dependent: [Yes](#)
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: [Concentrated](#)
 Tensile Capacity: 4,900 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 4,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 12

Type: [Geosynthetic](#)
 Outside Point: (1,019.75, 336) ft
 Inside Point: (1,009.75, 336) ft
 Slip Surface Intersection: () ft
 Total Length: 10 ft
 Reinforcement Direction: 0 °
 F of S Dependent: [Yes](#)
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: [Concentrated](#)
 Tensile Capacity: 1,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 1,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 13

Type: [Geosynthetic](#)
 Outside Point: (1,019.375, 337.5) ft
 Inside Point: (982, 337.5) ft
 Slip Surface Intersection: () ft
 Total Length: 37.375 ft
 Reinforcement Direction: 0 °
 F of S Dependent: [Yes](#)
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: [Concentrated](#)
 Tensile Capacity: 4,900 lbs
 Reduction Factor: 1

Force Orientation: 0
 Max. Pullout Force: 4,900 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 14

Type: Geosynthetic
 Outside Point: (1,019, 339) ft
 Inside Point: (1,009, 339) ft
 Slip Surface Intersection: () ft
 Total Length: 10 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 1,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 1,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 15

Type: Geosynthetic
 Outside Point: (1,018.625, 340.5) ft
 Inside Point: (982, 340.5) ft
 Slip Surface Intersection: () ft
 Total Length: 36.625 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 3,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 3,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 16

Type: Geosynthetic
 Outside Point: (1,018.25, 342) ft
 Inside Point: (1,008.25, 342) ft
 Slip Surface Intersection: () ft
 Total Length: 10 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf

Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 1,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 1,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 17

Type: Geosynthetic
 Outside Point: (1,017.875, 343.5) ft
 Inside Point: (981.5, 343.5) ft
 Slip Surface Intersection: () ft
 Total Length: 36.375 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 2,300 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 2,300 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 18

Type: Geosynthetic
 Outside Point: (1,017.5, 345) ft
 Inside Point: (1,007.5, 345) ft
 Slip Surface Intersection: () ft
 Total Length: 10 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 1,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 1,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 19

Type: Geosynthetic
 Outside Point: (1,017.125, 346.5) ft

Inside Point: (996.5, 346.5) ft
 Slip Surface Intersection: () ft
 Total Length: 20.625 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 3,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 3,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Reinforcement 20

Type: Geosynthetic
 Outside Point: (1,016.75, 348) ft
 Inside Point: (998.5, 348) ft
 Slip Surface Intersection: () ft
 Total Length: 18.25 ft
 Reinforcement Direction: 0 °
 F of S Dependent: Yes
 Interface Adhesion: 0 psf
 Interface Shear Angle: 30 °
 Surface Area Factor: 1
 Resistance Reduction Factor: 1
 Force Distribution: Concentrated
 Tensile Capacity: 3,000 lbs
 Reduction Factor: 1
 Force Orientation: 0
 Max. Pullout Force: 3,000 lbs
 Pullout Force: 0 lbs
 Pullout Force per Length: 0 lbs/ft
 Available Length: 0 ft
 Required Length: 0 ft
 Governing Component: (none)

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
 Function: Modifier Factor vs. Inclination
 Curve Fit to Data: 100 %
 Segment Curvature: 50 %
 Y-Intercept: 0.7058887
 Data Points: Inclination (°), Modifier Factor
 Data Point: (-60, 1)
 Data Point: (-30, 1)
 Data Point: (-17.838428, 0.90468204)
 Data Point: (-3, 0.706)
 Data Point: (3, 0.706)
 Data Point: (23.685228, 0.90009497)
 Data Point: (39.261389, 1)
 Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static 0.34

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: [SHANSEPP](#)

Field

MPP: 5000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: [SHANSEPP](#)

Field

MPP: 8000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	500	305.75
Point 2	500	288.15
Point 3	500	283.4
Point 4	500	273.4
Point 5	609.5	272.3
Point 6	1,200	269.95
Point 7	1,199.9987	280.3
Point 8	1,200	259.75

Point 9	1,200	286.7
Point 10	1,200	304.9
Point 11	1,200	320.1
Point 12	1,023.7	320
Point 13	1,012.5	320
Point 14	898.8	320
Point 15	991.25	345.25
Point 16	999.8	349.5
Point 17	1,016	350
Point 18	992.5	346.7
Point 19	978.7	349.8
Point 20	984.8	350
Point 21	972.4	344.6
Point 22	971.4	349.6
Point 23	910.3	372.6
Point 24	860.8	312.7
Point 25	800.5	311.2
Point 26	780.3	308.1
Point 27	735.4	314.9
Point 28	735.4	313.4
Point 29	735.5	308.9
Point 30	500	313.3
Point 31	500	319.3
Point 32	500	317.3
Point 33	500	426.2
Point 34	895.2	371.1
Point 35	500	258.75
Point 36	520.6	283.6
Point 37	876	312.5
Point 38	1,010.6	307.3
Point 39	854.9	273.7
Point 40	984.6	286.8
Point 41	1,026.6	269.9
Point 42	800.5	313.7
Point 43	870	310.5
Point 44	990	345.2
Point 45	987	348.5
Point 46	714.8	307.9
Point 47	500	302.65
Point 48	714.8	304.9
Point 49	780.3	305.07
Point 50	863	305.15
Point 51	1,010.35	303.8
Point 52	1,199.9987	301.4
Point 53	719.7	287.1
Point 54	890.3	308.2

Point 55	863	308.15
Point 56	890.3	305.2
Point 57	790.2	399.6
Point 58	528.3	431
Point 59	696.4	431
Point 60	805.3	401.1
Point 61	858.4	306.6
Point 62	799.9	307.7
Point 63	860.8	310.7
Point 64	500	428.9
Point 65	527.9	433.5
Point 66	696.3	433.5
Point 67	790.5	402.1
Point 68	805.5	403.7
Point 69	980.1	352
Point 70	910.5	375.1
Point 71	895.5	373.7
Point 72	1,092.6	283.3
Point 73	630.8	274.6
Point 74	651.5	307.4
Point 75	651.5	304.33077
Point 76	625	437.1
Point 77	624.9	434.6
Point 78	1,004	316
Point 79	825.1	269.8

Regions

	Material	Points	Area (ft ²)
Region 1	Bottom Liner	32,28,25,63,43,37,24,42,27,31	702.82
Region 2	Side Slope Liner	37,14,21,44,45,20,19,22,24	631.75
Region 3	STRUCTUAL FILL UNDRAINED	14,21,44,45,20,18,16,17,12,13,78	2,446.9
Region 4	Upper Till	37,14,78,13,12,11,10,38,54,55,43	3,999.3
Region 5	NOT ACTIVE	4,5,79,41,6,8,35	8,020.2
Region 6	NOT ACTIVE	4,3,36,73,39,72,7,6,41,79,5	5,003.5
Region 7	Deflection surface	3,2,53,40,9,7,72,39,73,36	6,471.5
Region 8	GC-Consolidated Undrained	2,47,75,48,49,50,56,51,52,9,40,53	11,774
Region 9	Upper Till	30,29,26,46,74,1	990.49
Region 10	CCL	32,28,25,63,43,55,61,62,26,29,30	1,504.8
Region 11	GC Overconsolidated Undrained	47,1,74,46,26,62,61,50,49,48,75	1,034.4
Region 12	GC Overconsolidated Undrained	55,54,38,10,52,51,56,50,61	1,143.1
Region 13	Final Cover	33,58,77,59,57,60,34,23,19,20,69,70,71,68,67,66,76,65,64	1,237.8
Region 14	Waste Material	33,58,77,59,57,60,34,23,19,22,24,42,27,31	41,745

Current Slip Surface

Slip Surface: 1
 F of S: 1.45
 Volume: 1,948.5301 ft³
 Weight: 243,775.95 lbs
 Resisting Moment: 26,361,628 lbs-ft
 Activating Moment: 18,138,214 lbs-ft
 Resisting Force: 167,378.03 lbs
 Activating Force: 115,184.96 lbs
 F of S Rank: 1
 Exit: (1,038.1839, 320.00822) ft
 Entry: (934.80755, 367.03241) ft
 Radius: 65.234307 ft
 Center: (1,033.5, 456.7) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	935.11552	366.60385	0	25.73086	14.855719	0
Slice 2	937.3234	364.89207	0	117.87585	68.055651	0
Slice 3	940.17322	362.96723	0	191.37785	110.49205	0
Slice 4	942.01032	361.72639	0	228.95752	132.18868	0
Slice 5	944.4477	360.00576	0	266.13616	153.65378	0
Slice 6	947.32395	357.84002	0	305.05104	176.1213	0
Slice 7	950.36345	355.29136	0	340.98442	196.86745	0
Slice 8	953.8208	352.04018	0	375.51882	216.80589	0
Slice 9	956.9517	348.7639	0	407.36748	235.19372	0
Slice 10	959.03223	346.46977	0	442.66965	255.57544	0
Slice 11	960.01763	345.38323	0	479.95307	110.8059	0
Slice 12	961.2272	344.03282	0	495.04475	114.29009	0
Slice 13	962.77079	342.29749	0	515.39997	118.98946	0
Slice 14	963.78134	341.15637	-0	262.95093	23.005225	2,000
Slice 15	965.35875	339.53801	-0	536.7596	46.96038	2,000
Slice 16	968.16765	336.85472	-0	744.64988	65.148423	2,000
Slice 17	970.5919	334.60581	-0	836.8595	73.215719	2,000
Slice 18	971.65	333.62425	-0	874.43755	76.503373	2,000
Slice 19	972.15	333.16043	-0	891.50294	77.996401	2,000
Slice 20	973.18435	332.20092	-0	924.75991	80.906009	2,000
Slice 21	975.5437	330.15042	-0	1,118.4339	97.850285	2,000
Slice 22	977.90935	328.23223	-0	1,318.6148	115.36385	2,000
Slice 23	979.05	327.37341	-0	1,346.3268	117.78833	2,000
Slice 24	979.75	326.84637	-0	1,362.7228	119.22279	2,000
Slice 25	980.4413	326.32589	-0	1,377.792	120.54118	2,000
Slice 26	981.9576	325.3599	-0	1,687.1204	147.60391	2,000
Slice 27	983.9663	324.1988	-0	1,854.7411	162.26882	2,000
Slice 28	985.35	323.4485	-0	1,880.3865	164.5125	2,000
Slice 29	986.45	322.85204	-0	1,904.0823	166.58561	2,000
Slice 30	987.75	322.14712	-0	1,935.3418	169.32047	2,000
Slice 31	989.25	321.33377	-0	1,975.4579	172.83017	2,000
Slice 32	990.5582	320.62442	-0	2,009.3168	70.166888	2,105.1358

Slice 33	991.7414	319.99743	-0	2,094.4753	73.14069	2,105.1358
Slice 34	992.4332	319.65146	-0	2,671.9602	93.306906	2,105.1358
Slice 35	993.4125	319.33413	-0	2,885.7916	100.77406	2,105.1358
Slice 36	996.15	318.4471	-0	2,918.0951	101.90213	2,105.1358
Slice 37	998.8875	317.55997	-0	3,119.635	108.94006	2,105.1358
Slice 38	1,000.765	316.9514	-0	3,248.2823	113.43252	2,105.1358
Slice 39	1,002.6955	316.32575	-0	3,368.9953	117.64791	2,105.1358
Slice 40	1,003.7455	315.98552	-0	3,428.3299	2,059.9484	150
Slice 41	1,003.915	315.93103	-0	3,466.8777	2,083.1103	150
Slice 42	1,004.06	315.88477	-0	3,479.2395	2,090.538	150
Slice 43	1,004.59	315.67456	-0	3,147.8725	1,891.4326	150
Slice 44	1,005.4721	315.31132	-0	3,188.0938	1,915.6	150
Slice 45	1,006.9371	314.69929	27.401638	3,329.0566	1,983.8344	150
Slice 46	1,009.645	313.53638	99.846999	3,535.2838	2,064.2187	150
Slice 47	1,011.9	312.53026	162.52834	3,658.8734	2,100.8161	150
Slice 48	1,013.375	311.83435	205.88747	3,844.7699	2,186.4611	150
Slice 49	1,015.125	311.00907	257.30706	4,080.0879	2,296.9584	150
Slice 50	1,016.77	310.23366	305.61943	4,063.539	2,257.9859	150
Slice 51	1,019.225	309.53438	349.1451	4,555.2525	2,527.2843	150
Slice 52	1,022.065	309.33676	361.35019	4,930.4393	2,745.3857	150
Slice 53	1,023.46	309.58749	345.64255	6,809.9878	3,884.1705	150
Slice 54	1,024.85	310.23633	305.09307	5,518.5692	3,132.5725	150
Slice 55	1,028.365	312.12802	186.89485	4,045.664	2,318.5824	150
Slice 56	1,031.9521	314.30131	51.122383	2,383.0233	1,401.1474	150
Slice 57	1,033.5021	315.33929	-0	1,683.3393	1,011.4523	150
Slice 58	1,035.19	316.78106	-0	1,336.5492	803.0798	150
Slice 59	1,037.367	319.00573	-0	643.03294	386.37317	150

Figure 27 - Stability Analyses For Seismic Response

CONSOLIDATED UNDRAINED-STATIC

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File Information

Title: [Model City - RMU-2 XS3728](#)
 Created By: [Peter J. Carey](#)
 Revision Number: [384](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/17/2013](#)
 Time: [3:09:39 PM](#)
 File Name: [RMU2X3728r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/17/2013](#)
 Last Solved Time: [3:42:54 PM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

CONSOLIDATED UNDRAINED-STATIC

Description: [DETERMINATION OF YIELD ACCELERATION](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

Lambda

Lambda 1: [0](#)
 Lambda 2: [0.1](#)
 Lambda 3: [0.3](#)
 Lambda 4: [0.5](#)
 Lambda 5: [0.7](#)
 Lambda 6: [0.9](#)
 Lambda 7: [1](#)
 Lambda 8: [1.1](#)
 Lambda 9: [1.2](#)

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: [Block](#)

Critical slip surfaces saved: [1](#)

Restrict Block Crossing: [No](#)

Optimize Critical Slip Surface Location: [Yes](#)

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: [25 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

Waste Material

Model: [Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion': [0 psf](#)

Phi': [30 °](#)

Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)

Unit Weight: [120 pcf](#)

Strength Function: [Baseliner](#)

Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)

Unit Weight: [120 pcf](#)

Cohesion': [1,000 psf](#)

Phi': [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [125 pcf](#)

Cohesion': [150 psf](#)

Phi': [31 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)

Unit Weight: [115 pcf](#)

Cohesion': [0 psf](#)

Phi': [13 °](#)

Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)

Pore Water Pressure
Piezometric Line: 1

Structural Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [135 pcf](#)
Cohesion': [195 psf](#)
Phi': [28.7 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: 1

Final Cover

Model: [Mohr-Coulomb](#)
Unit Weight: [125 pcf](#)
Cohesion': [0 psf](#)
Phi': [30 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: 1

NOT ACTIVE

Model: [\(None\)](#)
Pore Water Pressure
Piezometric Line: 1

GC-Consolidated Undrained

Model: [Shear/Normal Fn.](#)
Unit Weight: [120 pcf](#)
Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static 0.34](#)
Phi-B: [0 °](#)
Anisotropic Strength Fn: [clay ellipse staticshear](#)
Pore Water Pressure
Piezometric Line: 1

GC-Overconsolidated Undrained

Model: [Shear/Normal Fn.](#)
Unit Weight: [125 pcf](#)
Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
Phi-B: [0 °](#)
Anisotropic Strength Fn: [clay ellipse staticshear](#)
Pore Water Pressure
Piezometric Line: 1

Slip Surface Limits

Left Coordinate: [\(296.77888, 326.65399\) ft](#)
Right Coordinate: [\(685.88621, 414.36552\) ft](#)

Slip Surface Block

Left Grid
Upper Left: [\(399, 315\) ft](#)
Lower Left: [\(390, 290\) ft](#)
Lower Right: [\(458, 290\) ft](#)
X Increments: [3](#)
Y Increments: [3](#)
Starting Angle: [135 °](#)
Ending Angle: [180 °](#)

Angle Increments: 2

Right Grid

Upper Left: (540, 309) ft

Lower Left: (541, 288) ft

Lower Right: (634, 295) ft

X Increments: 3

Y Increments: 3

Starting Angle: 45 °

Ending Angle: 65 °

Angle Increments: 2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	200	315
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static 0.34

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: SHANSEPP

Field

MPP: 5000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: SHANSEPP

Field

MPP: 8000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	486.6	305.1
Point 2	500.1	290.5
Point 3	484	285.1
Point 4	500.3	280.2
Point 5	646	278.3
Point 6	1,200	270.4
Point 7	1,200	281.2
Point 8	1,200	259.75
Point 9	1,200	289.7
Point 10	1,200	303.8
Point 11	1,200	345.8
Point 12	1,023.3	321.9
Point 13	1,008.8	322
Point 14	999.8	349.5
Point 15	1,016.2	350
Point 16	992.5	347.4
Point 17	978.7	349.8
Point 18	985.3	350
Point 19	972.4	344.6
Point 20	971.4	349.6

Point 21	859.1	310.1
Point 22	690.6	315.1
Point 23	690.6	313.6
Point 24	690.9	309.1
Point 25	548.3	311.8
Point 26	443.7	349.9
Point 27	225	258.75
Point 28	874.6	312.1
Point 29	1,077.5	305.8
Point 30	1,058	281.5
Point 31	956.5	289.8
Point 32	859.1	312.1
Point 33	869	310.2
Point 34	991.3	345.2
Point 35	678.1	304.3
Point 36	486.6	302
Point 37	678.1	301.3
Point 38	856.8	305.3
Point 39	1,077.25	302.3
Point 40	1,199.9987	300.3
Point 41	643.8	289.7
Point 42	856.8	302.3
Point 43	879	376.4
Point 44	772.7	404.9
Point 45	893.8	378
Point 46	856.6	306.1
Point 47	437.1	350
Point 48	773	407.5
Point 49	879.2	378.9
Point 50	894.1	380.5
Point 51	980.1	352
Point 52	668.3	284
Point 53	633.7	303.9
Point 54	633.7	300.8308
Point 55	993.8	316
Point 56	1,030.2	273.5
Point 57	518.7	375.2
Point 58	518.6	377.8
Point 59	628.9	405.4
Point 60	628.6	408
Point 61	721.1	415.5
Point 62	721.1	412.8
Point 63	788.1	406.4
Point 64	788.4	409
Point 65	594.1	284.4
Point 66	546.4	317.6

Point 67	546.6	315.6055
Point 68	1,125.9	301.2989
Point 69	1,125.9	304.8
Point 70	533.9	373.8
Point 71	533.6	376.3
Point 72	644.3	403.9
Point 73	644	406.5
Point 74	654.1	406.60174
Point 75	654.1	409.2
Point 76	680.3	413.9
Point 77	680.4	411.31703
Point 78	697.1	415.3
Point 79	697.7	412.72407
Point 80	734	414.8
Point 81	734.3	412.07212
Point 82	750.1	412.8
Point 83	750.1	410.14334
Point 84	450.7	349.6
Point 85	437	344.9
Point 86	450.3	344.6
Point 87	535.5	316.08408
Point 88	448.5	316.4
Point 89	436.3	320
Point 90	385.2	319.9
Point 91	390.7	322.9
Point 92	394	322.9
Point 93	397	321.4
Point 94	398.9	321.4
Point 95	406	350.1
Point 96	422.3	349.5
Point 97	430.8	345.2
Point 98	429.7	347.3
Point 99	225	306.2
Point 100	225	344.2
Point 101	330.3	320.2
Point 102	320.4	321
Point 103	267.5	332
Point 104	282.8	330
Point 105	236.8	338
Point 106	244.6	338
Point 107	338.3	301.4
Point 108	360.3	304.5
Point 109	225	303.2
Point 110	338.3	298.4
Point 111	360.4	301.5
Point 112	225	284.7

Point 113	225	283.7
Point 114	225	281.4
Point 115	356.2	276
Point 116	355.4	280.2
Point 117	353.4	283
Point 118	333	282.6
Point 119	333.3	281.2
Point 120	412.8	290.2
Point 121	412.8	283.9
Point 122	566.6	303.5
Point 123	566.6	300.41591
Point 124	1,077.9	322.1
Point 125	1,131.2	342.3
Point 126	891.9	317.84898
Point 127	800	259.33974
Point 128	800	276.376
Point 129	800	283.15512
Point 130	800	289.74995
Point 131	800	301.98215
Point 132	800	304.98215
Point 133	800	307.12474
Point 134	800	311.3276
Point 135	800	313.15223
Point 136	800	402.47261
Point 137	800	405.15463

Regions

	Material	Points	Area (ft²)
Region 1	Bottom Liner	67,23,134,21,33,28,32,135,22,66	571.05
Region 2	Side Slope Liner	32,28,126,19,34,18,17,20	633.41
Region 3	Structural Fill	126,19,34,18,16,14,15,12,13,55	2,524.2
Region 4	Upper Till	55,13,12,124,125,11,10,69,29,38,46,33,28,126	6,897.4
Region 5	NOT ACTIVE	4,5,128,56,6,8,127,27,114,115	16,736
Region 6	NOT ACTIVE	4,115,114,113,119,116,121,3,65,52,129,30,7,6,56,128,5	6,312.6
Region 7	Deflection surface	3,121,116,119,113,112,118,117,120,2,41,130,31,9,7,30,129,5 2,65	5,804.4
Region 8	GC-Consolidated Undrained	2,120,117,118,112,109,110,111,36,123,54,37,131,42,39,68,4 0,9,31,130,41	12,350
Region 9	Upper Till	99,100,105,106,103,104,102,101,90,89,88,87,25,24,133,46,3 8,132,35,53,122,1,108,107	7,170.5
Region 10	CCL	67,23,134,21,33,46,133,24,25	1,326.2
Region 11	GC-Overconsolidated Undrained	36,111,110,109,99,107,108,1,122,53,35,132,38,42,131,37,54, 123	1,915.9
Region 12	GC-Overconsolidated Undrained	38,29,69,10,40,68,39,42	1,146.2
Region 13	Final Cover	26,57,70,59,72,74,77,79,62,81,83,44,63,136,43,45,17,18,51,5	1,411.7

		0,49,137,64,48,82,80,61,78,76,75,73,60,71,58,47	
Region 14	Waste Material	26,57,70,59,72,74,77,79,62,81,83,44,63,136,43,45,17,20,32,135,22,66,84	34,553
Region 15	Side Slope Liner	25,67,66,84,26,47,85,86,87	566.03
Region 16	Structural Fill	87,88,89,90,91,92,93,94,95,96,97,85,86	2,573.5
Region 17	Structural Fill	96,98,47,85,97	31.64

Current Slip Surface

Slip Surface: 2,305

F of S: 1.41

Volume: 14,742.407 ft³

Weight: 1,759,000.9 lbs

Resisting Moment: 84,784,565 lbs-ft

Activating Moment: 59,991,058 lbs-ft

Resisting Force: 485,212.57 lbs

Activating Force: 343,356.18 lbs

F of S Rank: 1

Exit: (354.07097, 320.0701) ft

Entry: (640.91834, 406.80016) ft

Radius: 153.87748 ft

Center: (514, 452) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	357.30903	317.53505	-0	623.15878	374.43157	150
Slice 2	362.44734	313.51231	92.832168	1,413.4965	793.53518	150
Slice 3	369.44415	308.29613	418.32143	2,354.7117	1,163.5007	150
Slice 4	376.58794	303.06995	744.43515	3,584.1466	599.20519	1,398.1446
Slice 5	381.9176	299.17094	987.73332	3,884.343	433.7865	1,012.1688
Slice 6	387.4288	295.13911	1,239.3194	4,782.8181	460.82782	1,075.2654
Slice 7	390.1788	293.296	1,354.3295	4,709.5086	432.1859	1,008.4347
Slice 8	392.35	292.4104	1,409.5908	4,905.4705	437.54519	1,020.9394
Slice 9	395.5	291.12557	1,489.7644	5,016.4881	438.69996	1,023.6332
Slice 10	397.95	290.12626	1,552.1216	5,077.3133	438.64296	1,023.4996
Slice 11	399.80995	289.36761	1,599.4609	5,763.5542	461.11767	1,075.9431
Slice 12	403.06228	289.15003	1,613.0383	6,643.6811	1,208.4604	-0.00034415459
Slice 13	405.70233	289.33968	1,601.2042	7,938.6127	1,547.3908	0.00032287299
Slice 14	409.4	289.78788	1,573.2364	8,022.0341	1,574.5889	-0.00011543577
Slice 15	416.11242	290.21138	1,546.8097	8,241.3942	1,606.7152	-4.530423e-006
Slice 16	420.86242	290.31701	1,540.2183	8,039.9793	1,561.3712	0.00021572584
Slice 17	422.7308	290.43951	1,532.5748	7,999.1027	1,553.3886	-0.00044238587
Slice	426.4308	290.58172	1,523.701	7,914.7918	1,533.9796	-0.00054499165

18						
Slice 19	430.25	290.71485	1,515.3931	7,790.7461	1,506.1996	0.0002081031
Slice 20	433.55	290.82989	1,508.2147	7,940.7325	1,543.9221	0.000213315
Slice 21	436.65	290.93796	1,501.4713	8,082.1939	1,579.4941	-4.4536684e-006
Slice 22	437.05	290.9519	1,500.6012	8,049.1086	1,571.7626	-0.0006692118
Slice 23	438.3357	290.99672	1,497.8045	8,049.7582	1,572.5888	0.00021727573
Slice 24	441.6357	291.21285	1,484.318	8,017.7612	1,574.4078	-0.00067033808
Slice 25	446.1	291.5871	1,460.9651	8,150.0006	1,611.9019	-0.00057267585
Slice 26	449.4	291.86374	1,443.7027	8,236.6659	1,636.9453	0.00011077591
Slice 27	454.7698	292.31389	1,415.6131	8,328.9844	1,665.9604	0.00058248721
Slice 28	463.74852	293.18712	1,361.124	8,366.0551	1,702.5584	-0.00012481743
Slice 29	472.76635	294.18415	1,298.9094	8,470.2609	1,743.0064	0.00060942562
Slice 30	481.78418	295.18118	1,236.6947	8,570.9193	1,782.5933	0.00024629086
Slice 31	491.77988	296.50743	1,153.9364	8,502.7459	1,822.7628	0.00025184086
Slice 32	502.6	298.13976	1,052.0792	8,566.216	1,863.7705	-0.00039939793
Slice 33	513.26667	299.74894	951.6664	8,626.9183	1,903.7318	0.00053142374
Slice 34	520.1426	300.78624	886.93846	8,590.987	1,910.875	-0.00014008946
Slice 35	522.5993	301.14402	864.61337	8,538.9762	1,888.4363	-5.3247864e-006
Slice 36	528.5567	301.95904	813.7561	8,297.9964	578.88021	1,350.7199
Slice 37	533.75	302.66952	769.42184	8,089.9832	575.05198	1,341.79
Slice 38	534.7	302.79949	761.31186	8,095.8442	575.38328	1,342.5554
Slice 39	537.11951	303.1305	740.65693	8,113.7908	576.28847	1,344.6729
Slice 40	540.33571	303.5705	713.2008	8,141.1242	577.5707	1,347.662
Slice 41	542.06131	303.88857	693.35336	6,150.0349	726.23913	1,694.559
Slice 42	544.39511	305.6923	580.80018	5,772.8335	3,119.6883	150
Slice	546.73524	307.50094	467.94125	5,659.3066	3,119.287	150

43						
Slice 44	547.58524	308.15789	426.94793	5,622.7424	3,121.9483	150
Slice 45	550.25104	310.21821	298.38369	5,497.2246	3,123.7788	150
Slice 46	554.32006	313.36306	102.14512	5,718.3545	990.28925	1,000
Slice 47	556.73576	315.2301	-0	5,618.5683	990.70518	1,000
Slice 48	558.27077	316.41647	0	5,479.9303	1,864.3511	358.50509
Slice 49	560.42623	318.08237	0	5,148.8351	2,972.6814	0
Slice 50	567.8806	324.92102	0	4,502.3673	2,599.443	0
Slice 51	578.89815	335.5039	0	3,959.6645	2,286.1133	0
Slice 52	587.86085	344.41163	0	3,581.7833	2,067.9435	0
Slice 53	597.74272	354.70036	0	3,032.6549	1,750.9041	0
Slice 54	608.54377	366.37009	0	2,517.6699	1,453.5774	0
Slice 55	617.01865	375.76724	0	2,033.6639	1,174.1364	0
Slice 56	624.3465	384.9403	0	1,510.9501	872.34744	0
Slice 57	633.85173	397.47862	0	728.05983	420.34554	0
Slice 58	640.0109	405.60316	-0	104.05032	60.073483	0

Figure 28 - Stability Analyses For Seismic Response

CONSOLIDATED UNDRAINED-SEISMIC (2)

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File Information

Title: [Model City - RMU-2 XS3728](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [376](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/15/2013](#)
 Time: [1:18:47 PM](#)
 File Name: [RMU2X3728r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/15/2013](#)
 Last Solved Time: [1:18:48 PM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

CONSOLIDATED UNDRAINED-SEISMIC (2)

Description: [DETERMINATION YIELD ACCELERATION ON CRITICAL SURFACE](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

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: [Fully-Specified](#)

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: [25 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

Waste Material

Model: [Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion': [0 psf](#)

Phi': [30 °](#)

Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)

Unit Weight: [120 pcf](#)

Strength Function: [Baseliner](#)

Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)

Unit Weight: [120 pcf](#)

Cohesion': [1,000 psf](#)

Phi': [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [125 pcf](#)

Cohesion': [150 psf](#)

Phi': [31 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)

Unit Weight: [115 pcf](#)

Cohesion': [0 psf](#)

Phi': [13 °](#)

Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Structural Fill

Model: [Mohr-Coulomb](#)
 Unit Weight: [135 pcf](#)
 Cohesion': [195 psf](#)
 Phi': [28.7 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Consolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static 0.34](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Overconsolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [125 pcf](#)
 Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Slip Surface Limits

Left Coordinate: [\(296.77888, 326.65399\) ft](#)
 Right Coordinate: [\(685.88621, 414.36552\) ft](#)

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

	X (ft)	Y (ft)
	348	324

	357.309	317.53505
	362.4473	313.51231
	369.4441	308.29613
	376.5879	303.06995
	381.9176	299.17094
	387.4288	295.13911
	390.1788	293.296
	392.35	292.4104
	395.5	291.12557
	397.95	290.12626
	399.81	289.36761
	403.0623	289.15003
	405.7023	289.43968
	409.4	290.08788
	416.1124	290.51138
	420.8624	290.31701
	422.7308	290.43951
	426.4308	290.58172
	430.25	290.71485
	433.55	290.82989
	436.65	290.93796
	437.05	290.9519
	438.3357	290.99672
	441.6357	291.21285
	446.1	291.5871
	449.4	291.86374
	454.7698	292.31389
	463.7485	293.18712
	472.7663	294.18415
	481.7842	295.18118
	491.7799	296.50743
	502.6	298.13976
	513.2667	299.74894
	520.1426	300.78624
	522.5993	301.14402
	528.5567	301.95904
	533.75	302.66952
	534.7	302.79949
	537.1195	303.1305
	540.3357	303.5705
	542.0613	303.88857
	544.3951	305.6923
	546.7352	307.50094
	547.5852	308.15789
	550.251	310.21821
	554.3201	313.36306

	556.7358	315.2301
	558.2708	316.41647
	560.4262	318.08237
	567.8806	324.92102
	578.8981	335.5039
	587.8609	344.41163
	597.7427	354.70036
	608.5438	366.37009
	617.0186	375.76724
	624.3465	384.9403
	633.8517	397.47862
	640.0109	405.60316
	646	418

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	200	315
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0.106

Ignore seismic load in strength: Yes

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static 0.34

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: [SHANSEPP](#)

Field

MPP: 5000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: [SHANSEPP](#)

Field

MPP: 8000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	486.6	305.1
Point 2	500.1	290.5
Point 3	484	285.1
Point 4	500.3	280.2
Point 5	646	278.3
Point 6	1,200	270.4
Point 7	1,200	281.2
Point 8	1,200	259.75

Point 9	1,200	289.7
Point 10	1,200	303.8
Point 11	1,200	345.8
Point 12	1,023.3	321.9
Point 13	1,008.8	322
Point 14	999.8	349.5
Point 15	1,016.2	350
Point 16	992.5	347.4
Point 17	978.7	349.8
Point 18	985.3	350
Point 19	972.4	344.6
Point 20	971.4	349.6
Point 21	859.1	310.1
Point 22	690.6	315.1
Point 23	690.6	313.6
Point 24	690.9	309.1
Point 25	548.3	311.8
Point 26	443.7	349.9
Point 27	225	258.75
Point 28	874.6	312.1
Point 29	1,077.5	305.8
Point 30	1,058	281.5
Point 31	956.5	289.8
Point 32	859.1	312.1
Point 33	869	310.2
Point 34	991.3	345.2
Point 35	678.1	304.3
Point 36	486.6	302
Point 37	678.1	301.3
Point 38	856.8	305.3
Point 39	1,077.25	302.3
Point 40	1,199.9987	300.3
Point 41	643.8	289.7
Point 42	856.8	302.3
Point 43	879	376.4
Point 44	772.7	404.9
Point 45	893.8	378
Point 46	856.6	306.1
Point 47	437.1	350
Point 48	773	407.5
Point 49	879.2	378.9
Point 50	894.1	380.5
Point 51	980.1	352
Point 52	668.3	284
Point 53	633.7	303.9
Point 54	633.7	300.8308

Point 55	993.8	316
Point 56	1,030.2	273.5
Point 57	518.7	375.2
Point 58	518.6	377.8
Point 59	628.9	405.4
Point 60	628.6	408
Point 61	721.1	415.5
Point 62	721.1	412.8
Point 63	788.1	406.4
Point 64	788.4	409
Point 65	594.1	284.4
Point 66	546.4	317.6
Point 67	546.6	315.6055
Point 68	1,125.9	301.2989
Point 69	1,125.9	304.8
Point 70	533.9	373.8
Point 71	533.6	376.3
Point 72	644.3	403.9
Point 73	644	406.5
Point 74	654.1	406.60174
Point 75	654.1	409.2
Point 76	680.3	413.9
Point 77	680.4	411.31703
Point 78	697.1	415.3
Point 79	697.7	412.72407
Point 80	734	414.8
Point 81	734.3	412.07212
Point 82	750.1	412.8
Point 83	750.1	410.14334
Point 84	450.7	349.6
Point 85	437	344.9
Point 86	450.3	344.6
Point 87	535.5	316.08408
Point 88	448.5	316.4
Point 89	436.3	320
Point 90	385.2	319.9
Point 91	390.7	322.9
Point 92	394	322.9
Point 93	397	321.4
Point 94	398.9	321.4
Point 95	406	350.1
Point 96	422.3	349.5
Point 97	430.8	345.2
Point 98	429.7	347.3
Point 99	225	306.2
Point 100	225	344.2

Point 101	330.3	320.2
Point 102	320.4	321
Point 103	267.5	332
Point 104	282.8	330
Point 105	236.8	338
Point 106	244.6	338
Point 107	338.3	301.4
Point 108	360.3	304.5
Point 109	225	303.2
Point 110	338.3	298.4
Point 111	360.4	301.5
Point 112	225	284.7
Point 113	225	283.7
Point 114	225	281.4
Point 115	356.2	276
Point 116	355.4	280.2
Point 117	353.4	283
Point 118	333	282.6
Point 119	333.3	281.2
Point 120	412.8	290.2
Point 121	412.8	283.9
Point 122	566.6	303.5
Point 123	566.6	300.41591
Point 124	1,077.9	322.1
Point 125	1,131.2	342.3
Point 126	891.9	317.84898
Point 127	800	259.33974
Point 128	800	276.376
Point 129	800	283.15512
Point 130	800	289.74995
Point 131	800	301.98215
Point 132	800	304.98215
Point 133	800	307.12474
Point 134	800	311.3276
Point 135	800	313.15223
Point 136	800	402.47261
Point 137	800	405.15463

Regions

	Material	Points	Area (ft²)
Region 1	Bottom Liner	67,23,134,21,33,28,32,135,22,66	571.05
Region 2	Side Slope Liner	32,28,126,19,34,18,17,20	633.41
Region 3	Structural Fill	126,19,34,18,16,14,15,12,13,55	2,524.2
Region 4	Upper Till	55,13,12,124,125,11,10,69,29,38,46,33,28,126	6,897.4
Region 5	NOT ACTIVE	4,5,128,56,6,8,127,27,114,115	16,736

Region 6	NOT ACTIVE	4,115,114,113,119,116,121,3,65,52,129,30,7,6,56,128,5	6,312.6
Region 7	Deflection surface	3,121,116,119,113,112,118,117,120,2,41,130,31,9,7,30,129,52,65	5,804.4
Region 8	GC-Consolidated Undrained	2,120,117,118,112,109,110,111,36,123,54,37,131,42,39,68,40,9,31,130,41	12,350
Region 9	Upper Till	99,100,105,106,103,104,102,101,90,89,88,87,25,24,133,46,38,132,35,53,122,1,108,107	7,170.5
Region 10	CCL	67,23,134,21,33,46,133,24,25	1,326.2
Region 11	GC-Overconsolidated Undrained	36,111,110,109,99,107,108,1,122,53,35,132,38,42,131,37,54,123	1,915.9
Region 12	GC-Overconsolidated Undrained	38,29,69,10,40,68,39,42	1,146.2
Region 13	Final Cover	26,57,70,59,72,74,77,79,62,81,83,44,63,136,43,45,17,18,51,50,49,137,64,48,82,80,61,78,76,75,73,60,71,58,47	1,411.7
Region 14	Waste Material	26,57,70,59,72,74,77,79,62,81,83,44,63,136,43,45,17,20,32,135,22,66,84	34,553
Region 15	Side Slope Liner	25,67,66,84,26,47,85,86,87	566.03
Region 16	Structural Fill	87,88,89,90,91,92,93,94,95,96,97,85,86	2,573.5
Region 17	Structural Fill	96,98,47,85,97	31.64

Current Slip Surface

Slip Surface: 1

F of S: 1.00

Volume: 14,733.757 ft³

Weight: 1,758,039.5 lbs

Resisting Moment: 83,597,324 lbs-ft

Activating Moment: 83,713,262 lbs-ft

Resisting Force: 480,674.65 lbs

Activating Force: 481,427.42 lbs

F of S Rank: 1

Exit: (353.65546, 320.07237) ft

Entry: (640.60398, 406.83078) ft

Radius: 153.94631 ft

Center: (514, 452) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	355.48223	318.80371	-0	363.20575	218.23603	150
Slice 2	358.92803	316.26752	-0	989.34079	594.45592	150
Slice 3	361.49718	314.25615	46.415928	1,482.3023	862.76758	150
Slice 4	365.9457	310.90422	255.57667	2,277.8732	1,215.1184	150
Slice 5	371.99238	306.43189	534.65002	3,592.5097	1,837.3475	150
Slice 6	375.56428	303.8188	697.70683	4,363.8063	646.92532	1,509.4936
Slice 7	377.61153	302.3211	791.16345	4,781.1843	663.56765	1,548.3268
Slice 8	380.27638	300.37159	912.81256	4,737.5023	471.50671	1,100.1827
Slice 9	383.5588	297.97029	1,062.6541	5,373.3064	488.73414	1,140.3773
Slice 10	386.3144	295.95437	1,188.4472	6,043.0011	506.47055	1,181.7636
Slice 11	388.8038	294.21756	1,296.8246	6,603.0483	1,806.5667	0.00012225459

Slice 12	390.4394	293.18971	1,360.9624	6,005.6859	476.47949	1,111.7863
Slice 13	391.525	292.74691	1,388.5931	6,147.1484	479.95292	1,119.8916
Slice 14	393.175	292.0739	1,430.5888	6,329.1289	484.14479	1,129.6737
Slice 15	394.75	291.43148	1,470.6755	6,443.9384	486.34936	1,134.8152
Slice 16	396.25	290.81966	1,508.8533	6,490.1541	486.58525	1,135.3641
Slice 17	397.475	290.32	1,540.0318	6,567.8443	1,632.8056	0.00028314542
Slice 18	398.425	289.93252	1,564.2108	6,680.0506	1,661.3882	0.00034665927
Slice 19	399.355	289.55319	1,587.8807	7,140.3222	1,803.1764	0.00024913471
Slice 20	401.43615	289.25882	1,606.2496	6,885.5294	1,269.5315	-3.579673e-006
Slice 21	404.3823	289.29485	1,604.001	7,869.9896	1,522.4437	-4.2928047e-006
Slice 22	405.85115	289.46577	1,593.3358	8,353.5368	1,703.2031	0.00023532196
Slice 23	407.7	289.78987	1,573.1119	8,360.0266	1,709.9337	-4.8214664e-006
Slice 24	412.7562	290.29963	1,541.3031	8,751.0488	1,731.5071	0.00011717513
Slice 25	418.4874	290.4142	1,534.1542	9,315.1884	1,867.6485	-0.00013692046
Slice 26	421.5812	290.36414	1,537.2778	8,672.9636	1,714.1332	0.00059933037
Slice 27	422.5154	290.42539	1,533.4558	8,647.5062	1,708.9369	-0.00036621777
Slice 28	424.5808	290.51061	1,528.1376	8,700.8076	1,721.598	0.00060194038
Slice 29	428.0654	290.6387	1,520.1452	8,546.2154	1,686.3858	-0.00012363179
Slice 30	429.975	290.70526	1,515.9915	8,474.6133	1,670.1971	-0.00024018049
Slice 31	430.525	290.72444	1,514.7952	8,497.9507	1,676.0851	0.00034972586
Slice 32	432.175	290.78196	1,511.2059	8,567.6616	1,693.6788	-4.7756327e-006
Slice 33	434.925	290.87782	1,505.2238	8,682.9052	1,722.7748	0.00035946798
Slice 34	436.475	290.93186	1,501.852	8,747.8864	1,739.1809	0.00024029282
Slice 35	436.825	290.94406	1,501.0907	8,763.5371	1,743.1203	-4.9150417e-006
Slice 36	437.025	290.95103	1,500.6558	8,745.5277	1,738.9018	0.00024025426

Slice 37	437.075	290.95277	1,500.5471	8,693.8752	1,726.5305	0.00023854497
Slice 38	437.71785	290.97518	1,499.1487	8,690.8986	1,726.1515	0.00036017255
Slice 39	439.9857	291.10478	1,491.0614	8,559.3793	1,697.9382	-0.00024416977
Slice 40	442.66785	291.29938	1,478.9189	8,513.9986	1,695.2907	-0.00048279784
Slice 41	444.9	291.4865	1,467.2423	8,562.5301	1,709.7989	0.00011570608
Slice 42	447.3	291.6877	1,454.6877	8,608.3714	1,723.87	0.00048121561
Slice 43	448.95	291.82602	1,446.0566	8,638.1708	1,733.1311	0.00023945694
Slice 44	449.85	291.90146	1,441.3487	8,652.3342	1,737.6797	-0.00098483942
Slice 45	450.5	291.95595	1,437.9485	8,661.2326	1,740.6426	-0.00025031081
Slice 46	452.7349	292.1433	1,426.2578	8,679.0803	1,747.7608	-0.00037453757
Slice 47	459.25915	292.7505	1,388.3685	8,623.125	1,749.9623	0.00011842404
Slice 48	468.2574	293.68563	1,330.0164	8,558.1619	1,756.8112	-4.9536459e-006
Slice 49	477.27525	294.68266	1,267.8017	8,572.6169	1,775.4451	-0.00013016087
Slice 50	484.1921	295.50067	1,216.7585	8,417.462	1,768.0457	-0.0010020495
Slice 51	489.18995	296.16379	1,175.3795	8,410.3927	1,776.4686	0.00037067153
Slice 52	497.18995	297.3236	1,103.0077	8,266.0905	1,776.6963	0.00049596199
Slice 53	507.93335	298.94435	1,001.8726	8,242.2197	1,795.8598	0.00050131144
Slice 54	515.93335	300.15123	926.56316	8,231.958	1,811.9941	0.00037808415
Slice 55	518.65	300.56107	900.98948	8,227.456	1,817.2211	-0.00013322354
Slice 56	519.4213	300.67742	893.72871	8,190.2496	1,809.7937	-0.00026025499
Slice 57	521.37095	300.96513	875.77589	8,131.7352	1,794.2428	-0.00013153896
Slice 58	523.05634	301.20655	860.71148	8,109.6149	1,783.7431	-5.0295855e-006
Slice 59	526.03504	301.61406	835.28286	8,029.7401	572.06338	1,334.8124
Slice 60	531.07835	302.30402	792.22918	7,806.8226	567.73308	1,324.713
Slice 61	533.675	302.65926	770.06221	7,695.7703	565.56677	1,319.6532

Slice 62	533.825	302.67978	768.78168	7,696.3814	565.61343	1,319.7645
Slice 63	534.3	302.74477	764.72661	7,696.2711	565.7103	1,319.9896
Slice 64	535.1	302.85421	757.89706	7,695.4594	565.85749	1,320.3321
Slice 65	536.30975	303.01972	747.56955	7,696.72	566.14031	1,320.9939
Slice 66	537.92926	303.24128	733.74405	7,700.1894	566.56172	1,321.9784
Slice 67	539.53736	303.46128	720.01605	7,703.8564	566.98558	1,322.968
Slice 68	541.1985	303.72954	703.27702	7,455.6963	578.29862	1,349.3553
Slice 69	542.12575	303.93838	690.2449	5,023.2531	677.70052	1,581.3022
Slice 70	543.29265	304.84025	633.96853	5,031.1871	2,642.1155	150
Slice 71	545.39755	306.46708	532.45398	4,949.0783	2,653.7756	150
Slice 72	546.5	307.31916	479.28465	4,909.4003	2,661.8821	150
Slice 73	546.6676	307.44869	471.20158	4,906.7072	2,665.1206	150
Slice 74	546.80285	307.55322	464.67897	4,902.5434	2,666.5379	150
Slice 75	547.22785	307.8817	444.18213	4,889.372	2,670.9396	150
Slice 76	547.9426	308.43411	409.71128	4,867.2542	2,678.362	150
Slice 77	549.2755	309.46427	345.42929	4,820.8671	2,689.1143	150
Slice 78	551.22654	310.97216	251.33697	4,750.1317	2,703.1486	150
Slice 79	553.26109	312.54459	153.21765	4,648.7112	792.67682	1,000
Slice 80	555.37909	314.18153	51.072528	4,594.3311	801.09908	1,000
Slice 81	556.58694	315.11505	-0	4,563.5552	804.67791	1,000
Slice 82	556.88465	315.34515	-0	4,555.995	803.34485	1,000
Slice 83	557.65215	315.93833	0	4,551.6221	1,642.8567	254.56361
Slice 84	558.88943	316.89461	0	4,519.1154	1,634.455	251.22037
Slice 85	559.96713	317.72756	0	4,487.7511	2,591.0043	0
Slice 86	564.1534	321.50169	0	3,959.4367	2,285.9818	0

Slice 87	573.38935	330.21246	0	3,583.2707	2,068.8023	0
Slice 88	583.3795	339.95776	0	3,216.5662	1,857.0853	0
Slice 89	592.8018	349.556	0	2,841.6112	1,640.605	0
Slice 90	603.14325	360.53523	0	2,436.4224	1,406.6691	0
Slice 91	612.7812	371.06867	0	2,046.9891	1,181.8297	0
Slice 92	620.68255	380.35377	0	1,602.5778	925.2487	0
Slice 93	626.47325	387.7457	0	1,276.3231	736.88547	0
Slice 94	628.75	390.74896	0	1,146.4022	661.87564	0
Slice 95	631.37585	394.21272	0	917.71394	529.84239	0
Slice 96	636.47758	400.94239	0	453.01439	261.54798	0
Slice 97	639.55718	405.00466	-0	152.35653	87.963086	0
Slice 98	640.30744	406.21697	-0	42.267953	24.403414	0

Figure 29 - Stability Analyses For Seismic Response

CONSOLIDATED UNDRAINED-Static

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File Information

Title: [Model City - RMU-2 XS 3950](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [356](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/15/2013](#)
 Time: [5:03:00 PM](#)
 File Name: [RMU2X3950r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revisions\geoslope\final config\](#)
 Last Solved Date: [2/15/2013](#)
 Last Solved Time: [5:31:02 PM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

CONSOLIDATED UNDRAINED-Static

Description: [CRITICAL SURFACE DETERMINATION](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 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: [Block](#)
 Critical slip surfaces saved: [1](#)
 Restrict Block Crossing: [No](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 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: [25 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [150 psf](#)
 Phi': [31 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)
 Unit Weight: [115 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [13 °](#)
 Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Structural Fill

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [195 psf](#)
 Phi': [28.7 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC Consolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static 0.34](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Overconsolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [125 pcf](#)
 Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Slip Surface Limits

Left Coordinate: [\(607.28187, 407.93415\) ft](#)
 Right Coordinate: [\(1,114.195, 320.05144\) ft](#)

Slip Surface Block

Left Grid
 Upper Left: [\(772.4, 311.8\) ft](#)
 Lower Left: [\(766.2, 293.2\) ft](#)
 Lower Right: [\(856.7, 291.7\) ft](#)
 X Increments: [10](#)
 Y Increments: [5](#)

Starting Angle: 135 °

Ending Angle: 160 °

Angle Increments: 2

Right Grid

Upper Left: (925.8, 305.9) ft

Lower Left: (925.8, 290.4) ft

Lower Right: (997.2, 287.7) ft

X Increments: 3

Y Increments: 3

Starting Angle: 15 °

Ending Angle: 45 °

Angle Increments: 2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static 0.34

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: SHANSEPP

Field

MPP: 5000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: SHANSEPP

Field

MPP: 8000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	499.9	303.3
Point 2	500	290.1
Point 3	500	284.6
Point 4	500	279.3
Point 5	579.9	278.5
Point 6	1,200	266.7
Point 7	1,200	276.3
Point 8	1,200	259.75
Point 9	1,200	288.4
Point 10	1,200	307.2
Point 11	1,200	320.1
Point 12	1,023.3	320
Point 13	1,012.5	320
Point 14	841.1	316
Point 15	991.25	345.25

Point 16	999.8	349.5
Point 17	1,016	350
Point 18	992.6	349
Point 19	978.7	349.8
Point 20	987.9	350.1
Point 21	972.4	344.6
Point 22	971.4	349.6
Point 23	903.3	368.1
Point 24	806.7	313.1
Point 25	736.2	315.4
Point 26	736.2	313.9
Point 27	737.4	309.5
Point 28	500	310.5
Point 29	500	316.5
Point 30	500	314.5
Point 31	500	384.2
Point 32	500	258.75
Point 33	835	314.9
Point 34	1,010.6	307.3
Point 35	884	282.5
Point 36	956.5	289.8
Point 37	919.2	273.2
Point 38	806.7	315.1
Point 39	824.4	313
Point 40	990	345.2
Point 41	695.1	305.1
Point 42	499.9	300.2
Point 43	695.1	302.1
Point 44	803.5	305.74
Point 45	1,010.35	303.8
Point 46	1,199.9987	303.7
Point 47	643.8	289.7
Point 48	803.5	302.74
Point 49	824.2	377.1
Point 50	575.9	405.7
Point 51	663.9	405.9
Point 52	850.4	378.9
Point 53	802.8	309.16
Point 54	500	386.9
Point 55	575.5	408.2
Point 56	663.8	408.4
Point 57	824.5	379.6
Point 58	850.6	381.5
Point 59	980.1	352
Point 60	903.5	370.6
Point 61	982.8	282.1

Point 62	657.1	283.7
Point 63	670	304.7
Point 64	670	301.63077
Point 65	594.5	406.5
Point 66	594.4	404
Point 67	998.5	315.9
Point 68	803.8	276.1
Point 69	604.8	405.31597
Point 70	604.8	407.8
Point 71	615.8	405.88502
Point 72	615.9	408.4
Point 73	625.4	405.81253
Point 74	625.4	408.3
Point 75	636.9687	404.2
Point 76	637	406.7
Point 77	900.5	333.2
Point 78	900.5	327.9

Regions

	Material	Points	Area (ft²)
Region 1	Bottom Liner	30,26,24,39,33,38,25,29	582.37
Region 2	Side Slope Liner	38,33,14,78,21,40,20,19,22,77	903.76
Region 3	Structural Fill	14,78,21,40,20,18,16,17,12,13,67	3,271.5
Region 4	Upper Till	33,14,67,13,12,11,10,34,44,53,39	4,273.5
Region 5	NOT ACTIVE	4,5,68,37,6,8,32	10,393
Region 6	NOT ACTIVE	4,3,62,35,61,7,6,37,68,5	5,540.7
Region 7	Deflection surface	3,2,47,36,9,7,61,35,62	5,279.5
Region 8	GC Consolidated Undrained	2,42,64,43,48,45,46,9,36,47	9,164.6
Region 9	Upper Till	28,27,53,44,41,63,1	1,599.2
Region 10	CCL	30,26,24,39,53,27,28	1,313.3
Region 11	GC-Overconsolidated Undrained	42,1,63,41,44,48,43,64	926.06
Region 12	GC-Overconsolidated Undrained	44,34,10,46,45,48	1,335.9
Region 13	Final Cover	31,50,66,69,71,73,75,51,49,52,23,19,20,59,60,58,57,56,76,74,72,70,65,55,54	1,231.7
Region 14	Waste Material	31,50,66,69,71,73,75,51,49,52,23,19,22,77,38,25,29	31,095

Current Slip Surface

Slip Surface: 9,505

F of S: 1.59

Volume: 13,609.176 ft³

Weight: 1,614,481.1 lbs

Resisting Moment: 91,859,983 lbs-ft

Activating Moment: 57,922,475 lbs-ft

Resisting Force: 432,793.41 lbs

Activating Force: 269,245.15 lbs

F of S Rank: 1

Exit: (1,071.1423, 320.02708) ft

Entry: (782.87924, 387.0591) ft

Radius: 140.18247 ft
Center: (978.4, 473.8) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	784.65412	385.59731	-0	109.60308	63.279369	0
Slice 2	790.97705	379.88341	0	491.61331	283.83308	0
Slice 3	799.908	371.53358	0	1,028.3548	593.72094	0
Slice 4	809.26818	363.01818	0	1,578.2293	911.19114	0
Slice 5	819.37272	354.04968	0	2,123.0178	1,225.7249	0
Slice 6	827.54745	346.79403	0	2,616.0785	1,510.3936	0
Slice 7	834.72738	340.03905	0	3,060.3071	1,766.8691	0
Slice 8	842.99233	331.93875	0	3,680.2154	2,124.7734	0
Slice 9	848.7624	326.30708	0	4,128.3066	2,383.4789	0
Slice 10	850.5	324.62898	0	4,255.9416	2,457.1691	0
Slice 11	851.01481	324.1318	0	4,285.0428	2,473.9706	0
Slice 12	853.97816	321.26993	0	5,041.3107	1,163.8783	0
Slice 13	857.90201	317.39856	-0	4,549.9479	2,491.0237	195
Slice 14	859.64074	315.61584	-0	4,594.7534	2,760.8064	150
Slice 15	864.41213	310.72373	281.82002	4,968.4564	2,816.0152	150
Slice 16	873.25477	305.44459	610.84492	7,771.8036	607.86685	1,418.3542
Slice 17	882.12411	303.92529	705.25468	7,812.0725	606.48336	1,415.1297
Slice 18	889.67639	302.63159	785.64502	7,839.128	1,846.8689	0.00012498193
Slice 19	896.647	301.51613	854.93954	7,915.0569	1,806.3836	-0.00013242903
Slice 20	901.9	300.72345	904.16897	7,925.0684	1,796.3497	-0.00038494995
Slice 21	903.4	300.4971	918.22649	7,928.5757	1,793.6496	0.00037425645
Slice 22	905.3991	300.19543	936.96142	7,925.7668	1,788.1376	0.00024705688
Slice 23	911.529	299.35988	988.82722	7,967.214	1,747.0695	0.00011822827
Slice 24	919.9906	298.26192	1,056.9633	7,933.9269	1,721.6774	0.00048060355
Slice 25	928.4522	297.16396	1,125.0994	7,900.5749	1,696.2707	-0.00084179724
Slice 26	937.56232	296.10332	1,190.8779	7,921.1765	1,649.5806	0.00022791324
Slice 27	947.32097	295.08	1,254.2987	7,850.4973	1,616.7132	-4.5586145e-006
Slice 28	957.00023	294.11344	1,314.1813	7,799.8216	1,578.7811	0.00032942277
Slice 29	966.76977	293.18755	1,371.5217	7,709.6282	1,542.8674	0.00032192914
Slice 30	972.0697	292.69355	1,402.1117	7,724.9889	1,521.5996	0.00021023084
Slice 31	975.55	292.45099	1,417.0925	7,670.133	1,504.7937	-4.2430371e-006
Slice 32	979.4	292.18267	1,433.6646	7,605.5347	1,485.26	-4.1879581e-006
Slice 33	984	291.86207	1,453.4651	7,512.4199	1,458.0868	9.867214e-005
Slice 34	988.95	291.51708	1,474.7722	7,437.5886	1,434.9512	9.7106494e-005
Slice 35	991.3	291.3533	1,484.8876	7,416.9471	1,427.5494	0.00024755187
Slice 36	995.55	291.05709	1,503.1815	7,446.1404	1,430.1725	9.6783108e-005
Slice 37	999.15	290.80619	1,518.6776	7,512.1779	1,442.3353	4.6769633e-005
Slice 38	1,003.701	290.48901	1,538.2671	7,575.5017	1,452.8599	9.831842e-005
Slice 39	1,008.976	290.08919	1,562.9812	7,599.5841	1,467.9892	9.9342258e-005
Slice 40	1,010.475	289.94961	1,571.6243	7,623.9534	1,471.8137	-4.1500439e-006
Slice 41	1,011.55	289.84951	1,577.8227	7,641.3825	1,474.5446	0.0002037295
Slice 42	1,014.1197	289.61023	1,592.6396	7,682.8482	1,481.025	0.00020462487

Slice 43	1,015.8697	289.45865	1,602.0197	7,888.5518	1,508.785	0.00020846031
Slice 44	1,018.5013	289.44352	1,602.8467	6,577.4095	359.45407	838.72508
Slice 45	1,021.4484	289.42658	1,603.7729	5,053.0714	322.05934	751.47148
Slice 46	1,022.5971	289.78246	1,581.5149	5,253.7407	433.82456	1,012.2568
Slice 47	1,027.186	292.12261	1,435.2851	4,466.5905	409.56602	955.65456
Slice 48	1,034.9581	296.08604	1,187.6214	3,831.7864	393.11694	917.27279
Slice 49	1,043.0453	300.92415	885.36342	3,321.6973	405.33855	945.79019
Slice 50	1,049.8186	305.52924	597.70418	2,860.5502	550.90602	1,285.447
Slice 51	1,058.1414	311.18786	244.23556	1,622.2305	827.98288	150
Slice 52	1,067.5173	317.56243	-0	518.18654	311.35789	150

Figure 30 - Stability Analyses For Seismic Response

CONSOLIDATED UNDRAINED-SEISMIC

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File Information

Title: [Model City - RMU-2 XS 3950](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [359](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/15/2013](#)
 Time: [5:36:27 PM](#)
 File Name: [RMU2X3950r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revisions\geoslope\final config\](#)
 Last Solved Date: [2/15/2013](#)
 Last Solved Time: [5:36:34 PM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

CONSOLIDATED UNDRAINED-SEISMIC

Description: [YIELD ACCELERATION DETERMINATION](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 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: [Fully-Specified](#)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: [Sensitivity](#)

Modifiers

	Property	Offset
	Analyses[3].Applied.SeismicX	Range(Mean=0,Delta=0.002)

Advanced

Number of Slices: [30](#)F of S Tolerance: [0.001](#)Minimum Slip Surface Depth: [25 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

Waste Material

Model: [Mohr-Coulomb](#)Unit Weight: [111 pcf](#)Cohesion': [0 psf](#)Phi': [30 °](#)Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)Unit Weight: [120 pcf](#)Strength Function: [Baseliner](#)Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)Unit Weight: [120 pcf](#)Cohesion': [1,000 psf](#)Phi': [10 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)Unit Weight: [125 pcf](#)Cohesion': [150 psf](#)Phi': [31 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)Unit Weight: [115 pcf](#)Cohesion': [0 psf](#)

Phi': 13 °
 Phi-B: 0 °

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: 1

Structural Fill

Model: [Mohr-Coulomb](#)
 Unit Weight: 125 pcf
 Cohesion': 195 psf
 Phi': 28.7 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: 125 pcf
 Cohesion': 0 psf
 Phi': 30 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: 1

GC Consolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: 120 pcf
 Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static 0.34](#)
 Phi-B: 0 °
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: 1

GC-Overconsolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: 125 pcf
 Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
 Phi-B: 0 °
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (607.28187, 407.93415) ft
 Right Coordinate: (1,114.195, 320.05144) ft

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

	X (ft)	Y (ft)
	778	391.6
	784.6541	385.59731
	790.977	379.88341
	799.908	371.53358
	809.2682	363.01818
	819.3727	354.04968
	827.5475	346.79403
	834.7274	340.03905
	842.9923	331.93875
	848.7624	326.30708
	850.5	324.62898
	851.0148	324.1318
	853.9782	321.26993
	857.902	317.39856
	859.6407	315.61584
	864.4121	310.72373
	873.2548	305.44459
	882.1241	303.92529
	889.6764	302.63159
	896.647	301.51613
	901.9	300.72345
	903.4	300.4971
	905.3991	300.19543
	911.529	299.35988
	919.9906	298.26192
	928.4522	297.16396
	937.5623	296.10332
	947.321	295.08
	957.0002	294.11344
	966.7698	293.18755
	972.0697	292.69355
	975.55	292.45099
	979.4	292.18267
	984	291.86207
	988.95	291.51708
	991.3	291.3533
	995.55	291.05709
	999.15	290.80619
	1,003.7	290.48901
	1,008.98	290.08919
	1,010.48	289.94961
	1,011.55	289.84951

	1,014.12	289.61023
	1,015.87	289.45865
	1,018.5	289.44352
	1,021.45	289.42658
	1,022.6	289.78246
	1,027.19	292.12261
	1,034.96	296.08604
	1,043.05	300.92415
	1,049.82	305.52924
	1,058.14	311.18786
	1,067.52	317.56243
	1,077.2	324.5

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0.135

Ignore seismic load in strength: Yes

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static 0.34

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: [SHANSEPP](#)

Field

MPP: 5000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: [SHANSEPP](#)

Field

MPP: 8000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	499.9	303.3
Point 2	500	290.1
Point 3	500	284.6
Point 4	500	279.3
Point 5	579.9	278.5
Point 6	1,200	266.7
Point 7	1,200	276.3
Point 8	1,200	259.75

Point 9	1,200	288.4
Point 10	1,200	307.2
Point 11	1,200	320.1
Point 12	1,023.3	320
Point 13	1,012.5	320
Point 14	841.1	316
Point 15	991.25	345.25
Point 16	999.8	349.5
Point 17	1,016	350
Point 18	992.6	349
Point 19	978.7	349.8
Point 20	987.9	350.1
Point 21	972.4	344.6
Point 22	971.4	349.6
Point 23	903.3	368.1
Point 24	806.7	313.1
Point 25	736.2	315.4
Point 26	736.2	313.9
Point 27	737.4	309.5
Point 28	500	310.5
Point 29	500	316.5
Point 30	500	314.5
Point 31	500	384.2
Point 32	500	258.75
Point 33	835	314.9
Point 34	1,010.6	307.3
Point 35	884	282.5
Point 36	956.5	289.8
Point 37	919.2	273.2
Point 38	806.7	315.1
Point 39	824.4	313
Point 40	990	345.2
Point 41	695.1	305.1
Point 42	499.9	300.2
Point 43	695.1	302.1
Point 44	803.5	305.74
Point 45	1,010.35	303.8
Point 46	1,199.9987	303.7
Point 47	643.8	289.7
Point 48	803.5	302.74
Point 49	824.2	377.1
Point 50	575.9	405.7
Point 51	663.9	405.9
Point 52	850.4	378.9
Point 53	802.8	309.16
Point 54	500	386.9

Point 55	575.5	408.2
Point 56	663.8	408.4
Point 57	824.5	379.6
Point 58	850.6	381.5
Point 59	980.1	352
Point 60	903.5	370.6
Point 61	982.8	282.1
Point 62	657.1	283.7
Point 63	670	304.7
Point 64	670	301.63077
Point 65	594.5	406.5
Point 66	594.4	404
Point 67	998.5	315.9
Point 68	803.8	276.1
Point 69	604.8	405.31597
Point 70	604.8	407.8
Point 71	615.8	405.88502
Point 72	615.9	408.4
Point 73	625.4	405.81253
Point 74	625.4	408.3
Point 75	636.9687	404.2
Point 76	637	406.7
Point 77	900.5	333.2
Point 78	900.5	327.9

Regions

	Material	Points	Area (ft²)
Region 1	Bottom Liner	30,26,24,39,33,38,25,29	582.37
Region 2	Side Slope Liner	38,33,14,78,21,40,20,19,22,77	903.76
Region 3	Structural Fill	14,78,21,40,20,18,16,17,12,13,67	3,271.5
Region 4	Upper Till	33,14,67,13,12,11,10,34,44,53,39	4,273.5
Region 5	NOT ACTIVE	4,5,68,37,6,8,32	10,393
Region 6	NOT ACTIVE	4,3,62,35,61,7,6,37,68,5	5,540.7
Region 7	Deflection surface	3,2,47,36,9,7,61,35,62	5,279.5
Region 8	GC Consolidated Undrained	2,42,64,43,48,45,46,9,36,47	9,164.6
Region 9	Upper Till	28,27,53,44,41,63,1	1,599.2
Region 10	CCL	30,26,24,39,53,27,28	1,313.3
Region 11	GC-Overconsolidated Undrained	42,1,63,41,44,48,43,64	926.06
Region 12	GC-Overconsolidated Undrained	44,34,10,46,45,48	1,335.9
Region 13	Final Cover	31,50,66,69,71,73,75,51,49,52,23,19,20,59,60,58,57,56,76,74,72,70,65,55,54	1,231.7
Region 14	Waste Material	31,50,66,69,71,73,75,51,49,52,23,19,22,77,38,25,29	31,095

Current Slip Surface

Slip Surface: 1

F of S: 1.00

Volume: 13,599.103 ft³

Weight: 1,613,260.4 lbs

Resisting Moment: 90,035,943 lbs-ft

Activating Moment: 89,769,232 lbs-ft

Resisting Force: 434,235.89 lbs

Activating Force: 433,079.64 lbs

F of S Rank: 1

Exit: (1,070.9588, 320.02697) ft

Entry: (783.07196, 387.02456) ft

Radius: 140.04533 ft

Center: (978.4, 473.8) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	783.86303	386.31094	-0	52.946777	30.568836	0
Slice 2	785.61565	384.72837	-0	168.84606	97.483316	0
Slice 3	788.7771	381.87142	0	356.18641	205.64432	0
Slice 4	795.4425	375.7085	0	718.2065	414.65672	0
Slice 5	804.5881	367.27588	0	1,191.3867	687.84742	0
Slice 6	814.32045	358.53393	0	1,645.539	950.05239	0
Slice 7	821.78635	351.90741	0	1,957.2973	1,130.0461	0
Slice 8	824.35	349.63201	0	2,059.8495	1,189.2547	0
Slice 9	826.02375	348.14645	0	2,153.0738	1,243.0777	0
Slice 10	831.13745	343.41654	0	2,380.5136	1,374.3902	0
Slice 11	838.85985	335.9889	0	2,749.3272	1,587.3248	0
Slice 12	845.87735	329.12291	0	3,127.6935	1,805.7747	0
Slice 13	849.5812	325.51632	0	3,339.2166	1,927.8976	0
Slice 14	850.45	324.67727	0	3,383.6489	1,953.5506	0
Slice 15	850.55	324.58069	0	3,388.9291	1,956.5991	0
Slice 16	850.8074	324.3321	0	3,398.4097	1,962.0727	0
Slice 17	851.22221	323.9315	0	3,412.1313	1,969.9949	0
Slice 18	852.70391	322.50056	0	3,441.928	794.63168	0
Slice 19	855.11131	320.15196	0	3,459.084	798.59247	0
Slice 20	857.07321	318.21627	-0	3,550.1123	1,943.6297	195
Slice 21	858.58964	316.69351	-0	3,528.5632	1,931.8319	195
Slice 22	859.45899	315.80215	-0	3,568.6855	2,144.2826	150
Slice 23	859.82241	315.42953	-0	3,585.3358	2,154.2871	150
Slice 24	862.20811	312.98348	140.91003	3,694.2653	2,135.0713	150
Slice 25	868.15455	308.48947	421.07141	5,323.2715	2,945.539	150
Slice 26	872.5759	305.8499	585.58379	5,277.8149	695.54946	1,622.9504
Slice 27	877.68945	304.68494	658.0496	7,154.3068	590.35944	1,377.5025
Slice 28	884.34144	303.54546	728.85697	7,203.408	589.76549	1,376.1217
Slice 29	888.11759	302.89861	769.05235	7,069.7239	1,649.7551	0.00022793736
Slice 30	893.1617	302.07386	820.29236	7,162.8565	1,639.3209	0.00011093667
Slice 31	898.5735	301.22542	872.99412	7,252.1132	1,632.1457	-0.00069492123
Slice 32	901.2	300.82908	897.60884	7,270.6164	1,630.5811	0.0002252882
Slice 33	902.6	300.61782	910.72917	7,281.5503	1,630.0208	0.00034011426
Slice 34	903.35	300.50464	917.75791	7,287.5736	1,629.7636	0.00034006059
Slice 35	903.45	300.48955	918.69509	7,288.417	1,629.7448	0.00022517265
Slice 36	904.44955	300.33872	928.0627	7,293.0259	1,628.5272	0.00033980261

Slice 37	908.46405	299.77765	962.89447	7,402.2066	1,622.5106	0.00033854721
Slice 38	915.7598	298.8109	1,022.8953	7,478.3964	1,616.1626	0.00033722265
Slice 39	924.2214	297.71294	1,091.0314	7,524.1342	1,610.5553	0.00010899003
Slice 40	933.00725	296.63364	1,157.9886	7,668.8441	1,610.4743	0.00010898456
Slice 41	942.44165	295.59166	1,222.5883	7,802.7752	1,612.7882	-0.00011823622
Slice 42	952.1606	294.59672	1,284.24	7,884.8766	1,612.093	0.0002227338
Slice 43	961.885	293.65049	1,342.8516	7,960.4899	1,610.9133	0.00010901426
Slice 44	969.0849	292.97176	1,384.8841	7,995.0228	1,607.5528	-0.0001178524
Slice 45	971.73485	292.72476	1,400.179	8,002.2871	1,605.5996	0.00010865467
Slice 46	972.23485	292.68204	1,402.8226	8,174.0586	1,629.4972	0.00022513844
Slice 47	973.975	292.56076	1,410.313	8,166.0382	1,625.7645	0.00033922615
Slice 48	977.125	292.34122	1,423.8719	8,150.1242	1,618.6714	-4.5641357e-006
Slice 49	979.05	292.20706	1,432.1578	8,138.4992	1,613.8796	0.00022298064
Slice 50	979.75	292.15828	1,435.1709	8,131.898	1,611.567	0.0001090585
Slice 51	982.05	291.99798	1,445.0713	8,109.5867	1,603.8154	-4.5222467e-006
Slice 52	985.95	291.72616	1,461.8587	8,070.3688	1,590.3373	0.00010762184
Slice 53	988.425	291.55367	1,472.5123	8,057.8218	1,584.7549	-0.00067474355
Slice 54	989.475	291.48049	1,477.0319	8,073.0921	1,587.3409	-0.00011637063
Slice 55	990.65	291.3986	1,482.0895	8,074.3753	1,586.4321	0.0003310192
Slice 56	991.95	291.308	1,487.6853	8,061.6249	1,582.0185	0.00021857857
Slice 57	994.075	291.15989	1,496.8325	8,096.9829	1,588.326	0.00033141437
Slice 58	997.025	290.95429	1,509.5307	8,179.6557	1,605.1647	0.00010862524
Slice 59	998.825	290.82884	1,517.2787	8,229.4561	1,615.2847	-4.5545864e-006
Slice 60	999.475	290.78353	1,520.0769	8,247.1948	1,618.8877	-0.00046103919
Slice 61	1,001.75	290.62494	1,529.8717	8,299.466	1,629.1092	-4.5935669e-006
Slice 62	1,006.34	290.2891	1,550.6241	8,367.464	1,643.7062	-4.6347261e-006
Slice 63	1,009.665	290.02545	1,566.9279	8,351.2038	1,649.7474	0.00011164226
Slice 64	1,010.415	289.95566	1,571.2494	8,370.8432	1,653.4724	-4.6622635e-006
Slice 65	1,010.54	289.944	1,571.9716	8,371.5206	1,653.9572	0.00034510875
Slice 66	1,011.075	289.89395	1,575.0709	8,385.5442	1,656.6146	0.0002288851
Slice 67	1,012.025	289.80529	1,580.5611	8,412.6289	1,661.4206	0.00011243221
Slice 68	1,013.31	289.68565	1,587.9694	8,445.9039	1,667.7107	0.00023041818
Slice 69	1,014.995	289.53444	1,597.3296	8,520.9395	1,677.5788	-0.000241242
Slice 70	1,015.935	289.45828	1,602.0404	8,993.8598	1,774.057	0.00024511145
Slice 71	1,017.25	289.45072	1,602.4536	8,318.3189	1,611.8263	0.00010907604
Slice 72	1,019.3313	289.43875	1,603.1075	7,196.6776	1,342.4723	0.00013816502
Slice 73	1,020.8063	289.43028	1,603.5708	6,426.3526	356.12757	830.96494
Slice 74	1,022.025	289.60452	1,592.6437	7,172.8411	1,561.4703	5.0632745e-005
Slice 75	1,022.95	289.9609	1,570.3643	7,782.8073	1,970.9404	-0.0011170412
Slice 76	1,025.245	291.13098	1,497.2495	7,027.9983	1,754.6673	-6.679261e-005
Slice 77	1,031.075	294.10433	1,311.4531	6,054.6794	468.47253	1,093.1019
Slice 78	1,039.005	298.50509	1,036.4921	5,103.2209	462.80961	1,079.8898
Slice 79	1,045.1496	302.35235	796.15013	4,267.8613	450.80453	1,051.8764
Slice 80	1,048.5346	304.65489	652.32066	4,099.0305	625.07265	1,458.5022
Slice 81	1,051.1056	306.40359	543.08762	3,599.5719	602.9308	1,406.8376
Slice 82	1,055.2656	309.2329	366.35352	2,589.4684	1,335.7822	150

Slice 83	1,061.0167	313.14283	122.11796	1,557.8037	862.64698	150
Slice 84	1,065.7067	316.33011	-0	832.41031	500.16257	150
Slice 85	1,069.2394	318.7947	-0	334.88409	201.21866	150

Figure 31 - Stability Analyses For Seismic Response

CONSOLIDATED UNDRAINED - Static

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File Information

Title: [Model City - RMU-2 XS 4250](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [362](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/15/2013](#)
 Time: [6:32:45 PM](#)
 File Name: [RMU2X4250r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revisions\geoslope\final config\](#)
 Last Solved Date: [2/15/2013](#)
 Last Solved Time: [6:58:40 PM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

CONSOLIDATED UNDRAINED - Static

Description: [CRITICAL SURFACE DETERMINATION](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 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: [Block](#)
 Critical slip surfaces saved: [1](#)
 Restrict Block Crossing: [No](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 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: [25 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)
 Unit Weight: [120 pcf](#)
 Cohesion': [1,000 psf](#)
 Phi': [10 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [150 psf](#)
 Phi': [31 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)
 Unit Weight: [115 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [13 °](#)
 Phi-B: [0 °](#)

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Structural Fill

Model: [Mohr-Coulomb](#)
 Unit Weight: [128 pcf](#)
 Cohesion': [195 psf](#)
 Phi': [28.7 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC Consolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static 0.34](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Overconsolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [125 pcf](#)
 Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Slip Surface Limits

Left Coordinate: [\(607.55022, 419.45476\) ft](#)
 Right Coordinate: [\(1,114.1953, 319.9052\) ft](#)

Slip Surface Block

Left Grid
 Upper Left: [\(850.9, 310.3\) ft](#)
 Lower Left: [\(846.7, 291\) ft](#)
 Lower Right: [\(900.2, 290.1\) ft](#)
 X Increments: [3](#)
 Y Increments: [3](#)

Starting Angle: 115 °

Ending Angle: 135 °

Angle Increments: 2

Right Grid

Upper Left: (990.8, 309.1) ft

Lower Left: (984.2, 292.2) ft

Lower Right: (1,029.2, 288.9) ft

X Increments: 3

Y Increments: 3

Starting Angle: 5 °

Ending Angle: 45 °

Angle Increments: 2

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static 0.34

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: SHANSEPP

Field

MPP: 5000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: SHANSEPP

Field

MPP: 8000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	500	304.5
Point 2	500	289.6
Point 3	500	284.6
Point 4	500	277.5
Point 5	621.9	277.6
Point 6	1,200.1	275.8
Point 7	1,200	283.7
Point 8	1,200	259.75
Point 9	1,200	289.3
Point 10	1,200	304.8
Point 11	1,200	320.1
Point 12	1,023.8	319.7
Point 13	1,030.2	316
Point 14	886.4	316
Point 15	999.8	349.5
Point 16	1,016.2	350
Point 17	992.5	347.4
Point 18	978.7	349.8

Point 19	985.3	350
Point 20	972.4	344.6
Point 21	971.4	349.6
Point 22	875.4	315.5
Point 23	674.8	313.4
Point 24	674.8	311.9
Point 25	676	307.5
Point 26	500	311
Point 27	500	319
Point 28	500	317
Point 29	500	417.2
Point 30	500	258.75
Point 31	890.9	317.5
Point 32	1,077.5	305.8
Point 33	998.3	283.7
Point 34	956.5	289.8
Point 35	1,050.9	275.6
Point 36	875.4	317.5
Point 37	885.3	315.6
Point 38	991.3	345.2
Point 39	686.9	304
Point 40	500	301.4
Point 41	686.9	301
Point 42	873.2	304.9
Point 43	1,077.25	302.3
Point 44	1,199.9987	301.3
Point 45	643.8	289.7
Point 46	873.2	301.9
Point 47	884.3	375
Point 48	776.8	404.3
Point 49	899.4	376.4
Point 50	872.9	311.5
Point 51	500	419.9
Point 52	777	406.9
Point 53	884.6	377.5
Point 54	899.6	379
Point 55	980.1	352
Point 56	1,135	283
Point 57	657.1	283.7
Point 58	641.5	303.7
Point 59	641.5	300.6308
Point 60	998.5	315.9
Point 61	915.4	277.8
Point 62	717.4	416.5125
Point 63	717.4	419
Point 64	740.9687	415.5

Point 65	741	418
Point 66	753.9	414.5
Point 67	753.9	411.9321
Point 68	791.7	405.8
Point 69	792	408.4
Point 70	1,041.3	319.7397
Point 71	526.4	285.5
Point 72	588.8	283.9
Point 73	503.9	317
Point 74	504.1	315.0055
Point 75	1,125.9	301.2989
Point 76	1,125.9	304.8

Regions

	Material	Points	Area (ft ²)
Region 1	Bottom Liner	28,74,24,22,37,14,31,36,23,73,27	681.48
Region 2	Side Slope Liner	36,31,20,38,19,18,21	548.11
Region 3	Structural Fill	14,31,20,38,19,17,15,16,12,70,13,60	2,807.2
Region 4	Upper Till	14,60,13,70,11,10,76,32,42,50,37	4,131
Region 5	NOT ACTIVE	4,5,61,35,6,8,30	12,464
Region 6	NOT ACTIVE	4,3,71,72,57,33,56,7,6,35,61,5	4,686.7
Region 7	Deflection surface	3,2,45,34,9,7,56,33,57,72,71	4,137.6
Region 8	GC Consolidated Undrained	2,40,59,41,46,43,75,44,9,34,45	8,301.2
Region 9	Upper Till	26,25,50,42,39,58,1	1,917
Region 10	CCL	28,74,24,22,37,50,25,26	1,597.6
Region 11	GC-Overconsolidated Undrained	40,1,58,39,42,46,41,59	1,133.1
Region 12	GC-Overconsolidated Undrained	42,32,76,10,44,75,43,46	1,092.9
Region 13	Final Cover	29,62,64,67,48,68,47,49,18,19,55,54,53,69,52,66,65,63,51	1,257.9
Region 14	Waste Material	29,62,64,67,48,68,47,49,18,21,36,23,73,27	38,817

Current Slip Surface

Slip Surface: 2,305
 F of S: 1.38
 Volume: 17,903.919 ft³
 Weight: 2,099,482.3 lbs
 Resisting Moment: 1.4000055e+008 lbs-ft
 Activating Moment: 1.0130035e+008 lbs-ft
 Resisting Force: 567,141.98 lbs
 Activating Force: 410,759.07 lbs
 F of S Rank: 1
 Exit: (1,072.434, 319.81038) ft
 Entry: (740.18658, 418.03447) ft
 Radius: 175.03174 ft
 Center: (968.7, 496.3) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	740.59329	417.54241	-0	39.375399	22.733397	0

Slice 2	741.83464	416.04057	-0	143.32327	82.74773	0
Slice 3	747.05684	409.72255	0	504.2113	291.10653	0
Slice 4	752.6722	403.07582	0	898.94343	519.00523	0
Slice 5	758.42797	396.80109	0	1,216.9589	702.61153	0
Slice 6	767.48393	386.92864	0	1,697.5846	980.10095	0
Slice 7	774.50595	379.50429	0	2,110.2168	1,218.3342	0
Slice 8	781.5691	372.4579	0	2,580.5062	1,489.856	0
Slice 9	788.9191	364.95563	0	3,088.294	1,783.0274	0
Slice 10	791.85	361.85282	0	3,318.1938	1,915.7601	0
Slice 11	796.95997	356.44313	0	3,559.2507	2,054.9344	0
Slice 12	806.87992	345.94134	0	4,012.9141	2,316.857	0
Slice 13	817.3962	335.01266	0	4,541.4226	2,621.9916	0
Slice 14	828.5088	323.65709	0	5,027.1108	2,902.4038	0
Slice 15	834.88065	317.3339	0	5,848.2847	3,376.5088	0
Slice 16	836.59923	315.97389	0	6,234.0052	2,013.1781	459.74606
Slice 17	837.77372	315.04445	0	6,279.875	2,021.2734	466.43917
Slice 18	840.53244	312.8613	149.49821	6,523.0253	1,123.8248	1,000
Slice 19	846.94495	307.7867	465.86798	6,307.0392	3,509.7297	150
Slice 20	855.96017	304.05654	698.22866	9,055.4631	2,078.3244	-0.0001758064
Slice 21	867.29956	302.66668	784.45172	8,874.9971	2,012.0016	0.00084530738
Slice 22	874.47449	301.78724	839.00886	8,764.4216	1,970.9359	0.00041124838
Slice 23	877.65225	301.39775	863.17204	8,719.1158	1,953.6599	0.0005453611
Slice 24	882.10225	300.87256	895.74554	8,687.3598	1,922.3494	0.00053662083
Slice 25	884.45	300.60643	912.2476	8,651.4849	1,909.4286	-0.001082179
Slice 26	884.95	300.54975	915.76204	8,659.8735	1,910.6296	0.00039866509
Slice 27	885.85	300.44773	922.08804	8,689.6608	1,916.4191	-0.00068086462
Slice 28	888.65	300.13034	941.76891	8,784.3047	1,934.9136	-0.00027824769
Slice 29	895.25	299.38219	988.15954	9,014.5411	1,980.2723	-0.00042436376
Slice 30	904.78225	298.30166	1,055.1606	9,102.1073	1,985.3452	0.00041425498
Slice 31	917.7052	296.89288	1,142.4931	8,949.2541	1,915.1813	-5.4001989e-006
Slice 32	930.0651	295.59098	1,223.1814	8,773.2054	1,849.3776	-0.00078741238
Slice 33	939.3035	294.62987	1,282.7438	8,630.3991	1,799.8065	0.00012179711
Slice 34	948.60402	293.75358	1,337.0102	8,538.0647	1,742.9679	-0.0002506452
Slice 35	957.96668	292.96212	1,385.9806	8,360.0189	1,688.0193	0.00059019989
Slice 36	967.024	292.26658	1,428.979	8,224.8217	1,634.8901	-4.6098675e-006
Slice 37	971.9	291.93252	1,449.6075	8,116.1194	1,603.7766	0.00010853131
Slice 38	975.55	291.68245	1,465.0492	8,017.3054	1,576.2898	0.00021778707
Slice 39	979.4	291.41868	1,481.3371	7,906.9034	1,545.8118	0.0001046087
Slice 40	980.78795	291.32359	1,487.209	7,856.7892	1,532.3432	0.00010369724
Slice 41	983.38795	291.18864	1,495.5145	7,811.6316	1,516.0675	-0.00011114546
Slice 42	988.3	290.96302	1,509.3745	7,637.7854	1,471.012	-4.1477833e-006
Slice 43	991.9	290.79766	1,519.5324	7,521.185	1,440.5861	-0.00015638669
Slice 44	995.5	290.63231	1,529.6902	7,624.1478	1,462.862	9.8995288e-005
Slice 45	999.15	290.46466	1,539.9892	7,778.9763	1,497.5538	-4.222623e-006
Slice 46	1,008	290.05816	1,564.9606	7,874.8469	1,514.5716	0.00020925981
Slice 47	1,018.6913	289.67435	1,588.4345	6,731.4766	1,234.3422	4.0025182e-005

Slice 48	1,021.4151	289.6667	1,588.7906	5,324.3159	329.85376	769.65798
Slice 49	1,022.7239	290.16022	1,557.937	5,420.739	429.57577	1,002.344
Slice 50	1,027	292.12315	1,435.2599	4,479.369	399.9515	933.21994
Slice 51	1,032.2034	294.51171	1,285.9822	4,087.5341	390.11124	910.26056
Slice 52	1,037.7534	297.69317	1,087.2122	3,895.1311	418.92295	977.48669
Slice 53	1,043.0888	301.09577	874.65216	3,336.7698	402.72761	939.69762
Slice 54	1,047.5773	303.95831	695.8301	3,173.9285	560.7099	1,308.3233
Slice 55	1,057.6602	310.38852	294.13582	1,781.6531	893.79056	150
Slice 56	1,068.7386	317.45368	-0	520.55123	312.77874	150

Figure 32 - Stability Analyses For Seismic Response

CONSOLIDATED UNDRAINED-Yield Acc

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File Information

Title: [Model City - RMU-2 XS 4250](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [366](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/16/2013](#)
 Time: [7:32:55 AM](#)
 File Name: [RMU2X4250r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revisions\geoslope\final config\](#)
 Last Solved Date: [2/16/2013](#)
 Last Solved Time: [7:33:02 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

CONSOLIDATED UNDRAINED-Yield Acc

Description: [YIELD ACCELERATION DETERMINATION](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 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: [Fully-Specified](#)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: [Sensitivity](#)

Modifiers

	Property	Offset
	Analyses[3].Applied.SeismicX	Range(Mean=0,Delta=0.002)

Advanced

Number of Slices: [30](#)F of S Tolerance: [0.001](#)Minimum Slip Surface Depth: [25 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

Waste Material

Model: [Mohr-Coulomb](#)Unit Weight: [111 pcf](#)Cohesion': [0 psf](#)Phi': [30 °](#)Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)Unit Weight: [120 pcf](#)Strength Function: [Baseliner](#)Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)Unit Weight: [120 pcf](#)Cohesion': [1,000 psf](#)Phi': [10 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Upper Till

Model: [Mohr-Coulomb](#)Unit Weight: [125 pcf](#)Cohesion': [150 psf](#)Phi': [31 °](#)Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)Unit Weight: [115 pcf](#)Cohesion': [0 psf](#)

Phi': 13 °
 Phi-B: 0 °

Deflection surface

Model: [Bedrock \(Impenetrable\)](#)
 Pore Water Pressure
 Piezometric Line: 1

Structural Fill

Model: [Mohr-Coulomb](#)
 Unit Weight: 128 pcf
 Cohesion': 195 psf
 Phi': 28.7 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

Final Cover

Model: [Mohr-Coulomb](#)
 Unit Weight: 125 pcf
 Cohesion': 0 psf
 Phi': 30 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: 1

GC Consolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: 120 pcf
 Strength Function: [SHANSEP CONSOLIDATED UNDRAINED static 0.34](#)
 Phi-B: 0 °
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: 1

GC-Overconsolidated Undrained

Model: [Shear/Normal Fn.](#)
 Unit Weight: 125 pcf
 Strength Function: [SHANSEP Over CONSOLIDATED UNDRAINED STATIC](#)
 Phi-B: 0 °
 Anisotropic Strength Fn: [clay ellipse staticshear](#)
 Pore Water Pressure
 Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (607.55022, 419.45476) ft
 Right Coordinate: (1,114.1953, 319.9052) ft

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

	X (ft)	Y (ft)
	735.5	429.4
	740.5933	417.54241
	741.8346	416.04057
	747.0568	409.72255
	752.6722	403.07582
	758.428	396.80109
	767.4839	386.92864
	774.5059	379.50429
	781.5691	372.4579
	788.9191	364.95563
	791.85	361.85282
	796.96	356.44313
	806.8799	345.94134
	817.3962	335.01266
	828.5088	323.65709
	834.8806	317.3339
	836.5992	315.97389
	837.7737	315.04445
	840.5324	312.8613
	846.9449	307.7867
	855.9602	304.05654
	867.2996	302.66668
	874.4745	301.78724
	877.6522	301.39775
	882.1023	300.87256
	884.45	300.60643
	884.95	300.54975
	885.85	300.44773
	888.65	300.13034
	895.25	299.38219
	904.7822	298.30166
	917.7052	296.89288
	930.0651	295.59098
	939.3035	294.62987
	948.604	293.75358
	957.9667	292.96212
	967.024	292.26658
	971.9	291.93252
	975.55	291.68245
	979.4	291.41868
	980.788	291.32359
	983.388	291.18864

	988.3	290.96302
	991.9	290.79766
	995.5	290.63231
	999.15	290.46466
	1,008	290.05816
	1,018.69	289.69435
	1,021.42	289.6867
	1,022.72	290.16022
	1,027	292.12315
	1,032.2	294.51171
	1,037.75	297.69317
	1,043.09	301.09577
	1,047.58	303.95831
	1,057.66	310.38852
	1,068.74	317.45368
	1,084.4	329.1

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0.104

Ignore seismic load in strength: Yes

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function

Function: Modifier Factor vs. Inclination

Curve Fit to Data: 100 %

Segment Curvature: 50 %

Y-Intercept: 0.7058887

Data Points: Inclination (°), Modifier Factor

Data Point: (-60, 1)

Data Point: (-30, 1)

Data Point: (-17.838428, 0.90468204)

Data Point: (-3, 0.706)

Data Point: (3, 0.706)

Data Point: (23.685228, 0.90009497)

Data Point: (39.261389, 1)

Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED static 0.34

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: [SHANSEPP](#)

Field

MPP: 5000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: [SHANSEPP](#)

Field

MPP: 8000

m: 0.7

S: 0.34

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	500	304.5
Point 2	500	289.6
Point 3	500	284.6
Point 4	500	277.5
Point 5	621.9	277.6
Point 6	1,200.1	275.8
Point 7	1,200	283.7
Point 8	1,200	259.75

Point 9	1,200	289.3
Point 10	1,200	304.8
Point 11	1,200	320.1
Point 12	1,023.8	319.7
Point 13	1,030.2	316
Point 14	886.4	316
Point 15	999.8	349.5
Point 16	1,016.2	350
Point 17	992.5	347.4
Point 18	978.7	349.8
Point 19	985.3	350
Point 20	972.4	344.6
Point 21	971.4	349.6
Point 22	875.4	315.5
Point 23	674.8	313.4
Point 24	674.8	311.9
Point 25	676	307.5
Point 26	500	311
Point 27	500	319
Point 28	500	317
Point 29	500	417.2
Point 30	500	258.75
Point 31	890.9	317.5
Point 32	1,077.5	305.8
Point 33	998.3	283.7
Point 34	956.5	289.8
Point 35	1,050.9	275.6
Point 36	875.4	317.5
Point 37	885.3	315.6
Point 38	991.3	345.2
Point 39	686.9	304
Point 40	500	301.4
Point 41	686.9	301
Point 42	873.2	304.9
Point 43	1,077.25	302.3
Point 44	1,199.9987	301.3
Point 45	643.8	289.7
Point 46	873.2	301.9
Point 47	884.3	375
Point 48	776.8	404.3
Point 49	899.4	376.4
Point 50	872.9	311.5
Point 51	500	419.9
Point 52	777	406.9
Point 53	884.6	377.5
Point 54	899.6	379

Point 55	980.1	352
Point 56	1,135	283
Point 57	657.1	283.7
Point 58	641.5	303.7
Point 59	641.5	300.6308
Point 60	998.5	315.9
Point 61	915.4	277.8
Point 62	717.4	416.5125
Point 63	717.4	419
Point 64	740.9687	415.5
Point 65	741	418
Point 66	753.9	414.5
Point 67	753.9	411.9321
Point 68	791.7	405.8
Point 69	792	408.4
Point 70	1,041.3	319.7397
Point 71	526.4	285.5
Point 72	588.8	283.9
Point 73	503.9	317
Point 74	504.1	315.0055
Point 75	1,125.9	301.2989
Point 76	1,125.9	304.8

Regions

	Material	Points	Area (ft²)
Region 1	Bottom Liner	28,74,24,22,37,14,31,36,23,73,27	681.48
Region 2	Side Slope Liner	36,31,20,38,19,18,21	548.11
Region 3	Structural Fill	14,31,20,38,19,17,15,16,12,70,13,60	2,807.2
Region 4	Upper Till	14,60,13,70,11,10,76,32,42,50,37	4,131
Region 5	NOT ACTIVE	4,5,61,35,6,8,30	12,464
Region 6	NOT ACTIVE	4,3,71,72,57,33,56,7,6,35,61,5	4,686.7
Region 7	Deflection surface	3,2,45,34,9,7,56,33,57,72,71	4,137.6
Region 8	GC Consolidated Undrained	2,40,59,41,46,43,75,44,9,34,45	8,301.2
Region 9	Upper Till	26,25,50,42,39,58,1	1,917
Region 10	CCL	28,74,24,22,37,50,25,26	1,597.6
Region 11	GC-Overconsolidated Undrained	40,1,58,39,42,46,41,59	1,133.1
Region 12	GC-Overconsolidated Undrained	42,32,76,10,44,75,43,46	1,092.9
Region 13	Final Cover	29,62,64,67,48,68,47,49,18,19,55,54,53,69,52,66,65,63,51	1,257.9
Region 14	Waste Material	29,62,64,67,48,68,47,49,18,21,36,23,73,27	38,817

Current Slip Surface

Slip Surface: 1

F of S: 1.00

Volume: 17,893.183 ft³

Weight: 2,098,200.1 lbs

Resisting Moment: 1.3693996e+008 lbs-ft

Activating Moment: 1.367707e+008 lbs-ft

Resisting Force: 572,056.11 lbs

Activating Force: 571,422.56 lbs

F of S Rank: 1

Exit: (1,071.9073, 319.80919) ft

Entry: (740.38556, 418.02604) ft

Radius: 174.81187 ft

Center: (968.7, 496.3) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	740.48943	417.78422	-0	14.737237	8.5085475	0
Slice 2	740.79665	417.29638	-0	58.198393	33.600858	0
Slice 3	741.4173	416.54546	-0	109.16227	63.024867	0
Slice 4	742.25191	415.53569	-0	172.03583	99.324935	0
Slice 5	744.86301	412.37668	0	345.66157	199.5678	0
Slice 6	749.8645	406.39918	0	658.30836	380.07451	0
Slice 7	753.2861	402.40657	0	882.99678	509.79843	0
Slice 8	756.164	399.26921	0	1,023.7311	591.0514	0
Slice 9	762.95595	391.86487	0	1,334.4297	770.43333	0
Slice 10	770.9949	383.21647	0	1,695.7536	979.04381	0
Slice 11	775.65295	378.35997	0	1,926.7144	1,112.3891	0
Slice 12	776.9	377.11589	0	1,971.5619	1,138.2818	0
Slice 13	779.28455	374.73701	0	2,123.55	1,226.0322	0
Slice 14	785.2441	368.70677	0	2,477.4724	1,430.3694	0
Slice 15	790.30955	363.48362	0	2,739.7959	1,581.8219	0
Slice 16	791.775	361.93222	0	2,829.2419	1,633.4636	0
Slice 17	791.925	361.77342	0	2,838.8494	1,639.0105	0
Slice 18	794.48	359.06858	0	2,923.031	1,687.6127	0
Slice 19	801.91995	351.19223	0	3,156.5072	1,822.4103	0
Slice 20	812.13805	340.477	0	3,503.2952	2,022.6284	0
Slice 21	822.9525	329.33488	0	3,863.0483	2,230.332	0
Slice 22	831.6947	320.4955	0	4,198.5629	2,424.0414	0
Slice 23	835.28838	317.0112	0	4,939.1511	2,851.6202	0
Slice 24	836.14768	316.3312	0	4,919.4905	1,735.0807	293.59574
Slice 25	837.05072	315.61658	0	4,941.445	1,740.4211	295.99317
Slice 26	837.63797	315.15186	0	4,955.8057	1,743.9044	297.56557
Slice 27	837.90943	314.93704	0	4,962.4061	1,745.5024	298.28971
Slice 28	839.28878	313.84546	88.142158	4,962.6264	859.50308	1,000
Slice 29	841.77603	311.87714	210.85461	5,018.3305	847.68771	1,000
Slice 30	844.98228	309.33984	369.03943	5,225.0841	2,917.806	150
Slice 31	850.54453	306.29732	558.64516	7,423.7277	4,124.9577	150
Slice 32	855.05218	304.43224	674.82553	6,958.5159	727.11557	1,696.6026
Slice 33	858.50517	303.74461	717.5803	8,515.891	592.29085	1,382.0111
Slice 34	864.17487	303.04968	760.69159	8,470.5217	590.26583	1,377.289
Slice 35	870.0998	302.32345	805.74409	8,425.4935	588.19103	1,372.4435
Slice 36	873.05	301.96184	828.17732	8,404.0489	587.17166	1,370.069
Slice 37	873.37448	301.92207	830.64468	8,402.1515	587.07016	1,369.8321

Slice 38	874.01173	301.84396	835.49031	8,366.9588	1,872.9707	0.00052283685
Slice 39	874.93725	301.73052	842.52785	8,359.3895	1,869.3357	-0.00026881735
Slice 40	876.5261	301.53578	854.60922	8,347.7627	1,863.4389	0.00065153369
Slice 41	879.87725	301.13516	879.45881	8,356.984	1,852.1022	0.00038645296
Slice 42	883.13557	300.75543	903.00855	8,367.8355	1,841.7278	0.00025446114
Slice 43	884.23442	300.63087	910.73239	8,359.6043	1,837.7912	0.00038346689
Slice 44	884.375	300.61493	911.72055	8,358.106	1,837.1785	-0.00039369939
Slice 45	884.525	300.59793	912.77491	8,356.073	1,836.4201	-0.00026408397
Slice 46	884.775	300.56959	914.5322	8,362.2271	1,837.5044	0.00025387761
Slice 47	885.125	300.52991	916.99236	8,376.5867	1,840.4339	-0.00013492531
Slice 48	885.575	300.4789	920.15535	8,395.0569	1,844.2101	0.0002548041
Slice 49	886.125	300.41656	924.0212	8,417.6893	1,848.8374	-5.2131303e-006
Slice 50	887.525	300.25786	933.86146	8,476.2623	1,860.8604	0.00038828042
Slice 51	889.775	300.00281	949.67633	8,570.8464	1,880.2983	0.00025979021
Slice 52	893.075	299.62874	972.87174	8,713.4048	1,909.7473	0.00053310298
Slice 53	897.425	299.13564	1,003.4475	8,903.5778	1,949.1237	-0.00041768877
Slice 54	902.1911	298.59538	1,036.9479	8,988.3139	1,961.7641	0.00013275715
Slice 55	911.2437	297.59727	1,098.8268	8,977.608	1,937.1325	0.00040419507
Slice 56	923.88515	296.24193	1,182.8374	8,935.3755	1,900.786	0.00026262088
Slice 57	934.6843	295.11043	1,252.9626	8,875.7422	1,867.1981	-0.00053175493
Slice 58	943.95375	294.19173	1,309.8769	8,880.4492	1,842.2548	0.00051426254
Slice 59	953.28535	293.35785	1,361.4954	8,860.8464	1,815.1678	0.00012283664
Slice 60	962.49535	292.61435	1,407.4799	8,802.5697	1,783.8579	-0.00013077763
Slice 61	969.212	292.11668	1,438.2357	8,763.7593	1,762.3163	-4.9691686e-006
Slice 62	971.65	291.94965	1,448.5499	8,722.5603	1,749.9236	0.00011842141
Slice 63	972.15	291.91539	1,450.6652	8,713.4239	1,747.2175	-0.00012809146
Slice 64	973.975	291.79036	1,458.3861	8,673.4464	1,735.7419	0.00060688565
Slice 65	977.125	291.57454	1,471.7126	8,601.9071	1,715.3262	-0.00036758697
Slice 66	979.05	291.44266	1,479.8566	8,555.8473	1,702.2857	0.00023519521
Slice 67	979.75	291.3947	1,482.818	8,535.9854	1,696.7939	-4.7844164e-006
Slice 68	980.444	291.34716	1,485.7539	8,514.0408	1,690.8083	0.00011442094
Slice 69	982.088	291.25612	1,491.3617	8,566.1665	1,698.232	-0.00072305887
Slice 70	984.344	291.14473	1,498.2118	8,517.5264	1,684.8568	0.00023278715
Slice 71	986.8	291.03192	1,505.1419	8,436.3077	1,663.6997	-0.0011774656
Slice 72	989.8	290.89412	1,513.607	8,351.5431	1,641.3214	-0.00093022782
Slice 73	991.6	290.81144	1,518.6861	8,296.8361	1,626.9696	0.0003394776
Slice 74	992.2	290.78388	1,520.3791	8,272.8755	1,620.8119	0.00033819276
Slice 75	994	290.70121	1,525.4579	8,330.6667	1,633.4644	0.00045597903
Slice 76	997	290.56341	1,533.9226	8,468.8039	1,664.5906	-0.00023937425
Slice 77	998.825	290.47959	1,539.0721	8,551.8691	1,683.2921	0.00046988835
Slice 78	999.475	290.44973	1,540.9062	8,581.2209	1,689.8978	-0.00012388926
Slice 79	1,003.9	290.24648	1,553.392	8,638.0255	1,700.5354	0.00023495338
Slice 80	1,012.1	289.91863	1,573.4853	8,769.6862	1,727.2227	0.00023864061
Slice 81	1,017.445	289.73672	1,584.5983	8,135.6068	1,572.3647	-4.4335655e-006
Slice 82	1,020.055	289.69052	1,587.3647	6,872.6348	1,268.4773	-9.299421e-005
Slice 83	1,022.07	289.92346	1,572.7399	7,368.1193	1,690.7698	-0.00018354606

Slice 84	1,023.26	290.40788	1,542.4592	6,923.7055	1,664.7799	-0.00012204782
Slice 85	1,025.4	291.38934	1,481.1205	6,267.2033	458.00273	1,068.6737
Slice 86	1,028.6	292.85809	1,389.3282	5,868.7621	449.16266	1,048.0475
Slice 87	1,031.2	294.05237	1,314.6894	5,547.8438	441.60748	1,030.4171
Slice 88	1,034.975	296.10244	1,186.5972	5,437.547	465.0824	1,085.1928
Slice 89	1,039.525	298.82418	1,016.5578	4,924.9946	462.54892	1,079.2814
Slice 90	1,042.195	300.52548	910.27786	4,482.076	450.21771	1,050.5094
Slice 91	1,043.9847	301.66616	839.02023	4,197.6132	442.02167	1,031.3825
Slice 92	1,046.2297	303.09743	749.60906	4,304.922	624.80386	1,457.8737
Slice 93	1,048.9295	304.8192	642.05044	3,841.995	605.4319	1,412.6758
Slice 94	1,053.9695	308.0343	441.20357	2,819.4346	1,428.9854	150
Slice 95	1,061.352	312.74275	147.06805	1,595.0872	870.05766	150
Slice 96	1,066.892	316.27533	-0	809.72359	486.53102	150
Slice 97	1,070.3236	318.63143	-0	367.03417	220.53638	150

Figure 33 - Stability Analyses For Seismic Response

Baseliner Failures - Yield Acceleration

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File Information

Title: [Model City - RMU-2 XS 2600](#)
 Created By: [Peter J. Carey](#)
 Revision Number: [393](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/17/2013](#)
 Time: [4:22:49 PM](#)
 File Name: [RMU2X2600r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\final config\](#)
 Last Solved Date: [2/17/2013](#)
 Last Solved Time: [4:22:52 PM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Baseliner Failures - Yield Acceleration

Description: [Yield acceleration for critical static failure surface](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

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: [Fully-Specified](#)

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: 25 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

Waste Material

Model: Mohr-Coulomb
 Unit Weight: 111 pcf
 Cohesion': 0 psf
 Phi': 30 °
 Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
 Unit Weight: 120 pcf
 Strength Function: Baseline
 Phi-B: 0 °

CCL

Model: Mohr-Coulomb
 Unit Weight: 120 pcf
 Cohesion': 1,000 psf
 Phi': 10 °
 Phi-B: 0 °
 Pore Water Pressure
 Piezometric Line: 1

Side Slope Liner

Model: Mohr-Coulomb
 Unit Weight: 115 pcf
 Cohesion': 0 psf
 Phi': 13 °
 Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)
 Pore Water Pressure
 Piezometric Line: 1

Structural Fill

Model: Mohr-Coulomb
 Unit Weight: 128 pcf
 Cohesion': 195 psf
 Phi': 28.7 °

Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Final Cover

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

NOT ACTIVE

Model: (None)
Pore Water Pressure
Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (687.26016, 418.46979) ft
Right Coordinate: (994.39049, 347.63701) ft

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

	X (ft)	Y (ft)
	795.3	408.5
	797.0109	404.43725
	798.742	402.49099
	799.6	401.52637
	801.7259	399.13631
	806.6843	394.75136
	812.5494	390.53673
	818.4146	386.3221
	824.5222	382.62949
	830.8722	379.4589
	837.2223	376.28832
	843.5723	373.11773
	849.0303	370.63762
	853.3654	368.93846
	859.3202	366.74393
	866.6114	364.36566
	870.3452	363.27692
	873.6428	362.28531
	879.5476	360.5034
	886.25	358.4808
	890.3	357.25862
	891.8	356.80596
	893.8363	356.19146

	896.0863	355.45463
	899	354.45613
	901.3221	353.66037
	903.5721	352.86552
	905.25	352.26257
	907.0065	351.63136
	911.0177	350.15446
	916.027	348.28338
	920.1408	346.66114
	924.5767	344.76816
	930.2302	342.35562
	935.8837	339.94308
	938.8922	338.65923
	942.2472	339.01855
	948.5935	339.89236
	954.1333	340.81765
	959.4976	341.92461
	966.7476	343.47987
	971.7579	344.5835
	973.9388	345.06388
	976.9308	345.7243
	979.25	346.23715
	982.45	346.94479
	985.95	347.71877
	987.2104	347.9975
	988.2104	348.21864
	996.4	353.9

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	600	315.5
Coordinate 2	1,201	315

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0.208

Ignore seismic load in strength: No

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [100 %](#)

Y-Intercept: [0](#)

Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)

Data Point: [\(0, 0\)](#)

Data Point: [\(500, 235\)](#)

Data Point: [\(1,000, 463\)](#)

Data Point: [\(2,000, 899\)](#)

Data Point: [\(5,000, 2,057\)](#)

Data Point: [\(10,000, 3,515\)](#)

Data Point: [\(15,000, 4,430\)](#)

Estimation Properties

Intact Rock Param.: [10](#)

Geological Strength: [100](#)

Disturbance Factor: [0](#)

SigmaC: [600,000 psf](#)

SigmaC: [300,000 psf](#)

Num. Points: [20](#)

Points

	X (ft)	Y (ft)
Point 1	600	302.8
Point 2	600	287.85
Point 3	600	276.5
Point 4	600	266.5
Point 5	851.25	277.4
Point 6	851.5	267.65
Point 7	1,200	268.85
Point 8	1,199.9987	281.4
Point 9	1,200	259.75
Point 10	1,200	287.55
Point 11	1,200	305.2
Point 12	1,200	320
Point 13	1,104	322
Point 14	1,056	320
Point 15	1,036.75	320
Point 16	1,023.5	319.9
Point 17	1,023.6	319.2
Point 18	897.25	319.5
Point 19	991.25	345.25
Point 20	999.8	349.5
Point 21	1,016	350
Point 22	997.75	348.5
Point 23	992.3	347.1
Point 24	978.5	349.75

Point 25	984.9	350
Point 26	972.5	344.75
Point 27	971	349.5
Point 28	905	374.5
Point 29	861.5	313
Point 30	797	308.6
Point 31	766.5	305.22
Point 32	732	311.25
Point 33	732	309.75
Point 34	737	305.35
Point 35	670.5	311.45
Point 36	670.5	309.45
Point 37	600	305.7
Point 38	600	312
Point 39	600	310
Point 40	600	400.6
Point 41	890	372.5
Point 42	600	258.75
Point 43	751	276.6
Point 44	759	267.4
Point 45	880.5	314
Point 46	793	289.8
Point 47	990	308
Point 48	1,082	280
Point 49	1,079.5	288.3
Point 50	1,082.5	268.5
Point 51	1,081.25	259
Point 52	797	311.1
Point 53	873	311.5
Point 54	990	345.25
Point 55	987	348.5
Point 56	653	303.5
Point 57	670.5	305.5
Point 58	600	299.7
Point 59	653	300.5
Point 60	689.75	301
Point 61	766.5	301.75
Point 62	868.5	307
Point 63	989.75	304.5
Point 64	1,199.9987	301.7
Point 65	651.5	288
Point 66	746.5	289
Point 67	705.5	304.19
Point 68	640.5	311.5
Point 69	640.5	309.5
Point 70	836	305.3

Point 71	836	306.3
Point 72	887.5	309.5
Point 73	868.5	310
Point 74	887.5	306.5
Point 75	600	340
Point 76	785	402
Point 77	608.5	402.7
Point 78	629	401
Point 79	693.5	417.5
Point 80	706.5	418.5
Point 81	737.5	416.5
Point 82	799.5	403.5
Point 83	604	339
Point 84	758.0046	376
Point 85	870	368
Point 86	882.5	366
Point 87	893	363
Point 88	897.5	361
Point 89	956.5	346
Point 90	765	377
Point 91	773.5	377
Point 92	900.5	362.5
Point 93	921.75	363.25
Point 94	759.6649	304.9246
Point 95	859.5	307
Point 96	796	305.1
Point 97	857	307
Point 98	861.5	311
Point 99	600	403.3
Point 100	608.1	405.2
Point 101	628.8	403.9
Point 102	693.4	420
Point 103	706.4	420.9
Point 104	737.1	419.1
Point 105	744.6	415.1
Point 106	744	417.8
Point 107	784.8	404.4
Point 108	799.7	405.9
Point 109	980	351.9
Point 110	905.5	376.8
Point 111	890.6	375.2

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	40,77,78,79,80,81,105,76,82,41,28,24,27,89,93,92,88,87,86,85,91,90,84,83,75	12,028

Region 2	Waste Material	75,83,84,90,91,85,86,87,88,92,93,89,27,29,52,32,35,68,38	16,661
Region 3	Bottom Liner	39,69,36,33,30,98,53,45,29,52,32,35,68,38	555.25
Region 4	Side Slope Liner	45,18,26,54,55,25,24,27,29	615.34
Region 5	Structural Fill	18,26,54,55,25,23,22,20,21,16,17	2,306.2
Region 6	Deflection surface	45,18,17,16,15,14,13,12,11,47,72,73,53	4,072.7
Region 7	NOT ACTIVE	4,44,6,50,7,9,51,42	5,301.4
Region 8	NOT ACTIVE	4,3,43,5,48,8,7,50,6,44	6,275.2
Region 9	Deflection surface	3,2,65,66,46,49,10,8,48,5,43	6,239.6
Region 10	Deflection surface	2,58,59,60,61,70,97,95,62,74,63,64,10,49,46,66,65	8,734.9
Region 11	Deflection surface	37,57,34,31,67,56,1	255.65
Region 12	CCL	39,69,36,33,30,98,53,73,95,97,71,96,31,34,57,37	1,053.7
Region 13	Deflection surface	58,1,56,67,94,31,96,71,97,70,61,60,59	657.67
Region 14	Deflection surface	73,72,47,11,64,63,74,62,95	1,139.2
Region 15	Final Cover	40,77,78,79,80,81,105,76,82,41,28,24,25,109,110,111,108,107,106,104,103,102,101,100,99	990.04

Current Slip Surface

Slip Surface: 1

F of S: 1.002

Volume: 3,338.6274 ft³

Weight: 377,969.36 lbs

Resisting Moment: 31,928,687 lbs-ft

Activating Moment: 31,870,334 lbs-ft

Resisting Force: 155,432.19 lbs

Activating Force: 155,163.8 lbs

F of S Rank: 1

Exit: (988.65627, 348.52795) ft

Entry: (796.52933, 405.5808) ft

Radius: 94.647638 ft

Center: (913.9, 548.6) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	796.77011	405.00903	-0	31.287574	18.063889	0
Slice 2	797.49746	403.89021	-0	134.07084	77.405835	0
Slice 3	798.36301	402.91708	0	207.83905	119.99593	0
Slice 4	799.121	402.06489	0	266.98359	154.14305	0
Slice 5	799.55	401.58258	0	300.26915	173.36048	0
Slice 6	799.65	401.47016	0	308.3052	178.00009	0
Slice 7	800.71295	400.27513	0	359.8878	207.78132	0
Slice 8	804.2051	396.94383	0	530.92823	306.53156	0
Slice 9	809.61685	392.64405	0	729.19761	421.00244	0
Slice 10	815.482	388.42942	0	858.0549	495.39823	0
Slice 11	821.4684	384.4758	0	1,030.6846	595.06602	0
Slice 12	827.6972	381.0442	0	1,187.3239	685.50177	0
Slice 13	834.04725	377.87361	0	1,246.3441	719.57709	0
Slice 14	840.3973	374.70303	0	1,306.7593	754.45785	0
Slice 15	846.3013	371.87768	0	1,414.8727	816.87714	0
Slice 16	850.17178	370.19021	0	1,535.222	886.36086	0
Slice 17	852.33933	369.34063	0	1,545.9979	892.5823	0

Slice 18	856.3428	367.8412	0	1,603.2308	925.62573	0
Slice 19	862.9658	365.5548	0	1,705.2374	984.51925	0
Slice 20	868.3057	363.87162	0	1,790.2892	1,033.6239	0
Slice 21	870.1726	363.32725	0	1,789.7588	1,033.3177	0
Slice 22	871.994	362.78112	0	1,768.694	1,021.156	0
Slice 23	876.5952	361.39436	0	1,768.317	1,020.9383	0
Slice 24	881.0238	360.05792	0	1,770.4882	1,022.1918	0
Slice 25	884.375	359.04662	0	1,771.9693	1,023.0469	0
Slice 26	888.125	357.91498	0	1,773.3536	1,023.8462	0
Slice 27	890.15	357.30389	0	1,773.0878	1,023.6927	0
Slice 28	890.45	357.21335	0	1,771.4194	1,022.7294	0
Slice 29	891.2	356.98702	0	1,796.3541	1,037.1255	0
Slice 30	892.4	356.6249	0	1,847.8596	1,066.8622	0
Slice 31	893.41815	356.31765	0	1,891.5154	1,092.0669	0
Slice 32	894.9613	355.82304	0	1,892.3678	1,092.5591	0
Slice 33	896.79315	355.2124	0	1,933.8732	1,116.5222	0
Slice 34	898.25	354.71315	0	1,998.4971	1,153.8328	0
Slice 35	899.75	354.19911	0	2,065.0746	1,192.2714	0
Slice 36	900.91105	353.80123	0	2,116.6261	1,222.0347	0
Slice 37	902.4471	353.26295	0	2,156.0757	1,244.8109	0
Slice 38	904.28605	352.60896	0	2,221.6778	1,282.6863	0
Slice 39	905.125	352.30749	0	2,260.3018	1,304.9859	0
Slice 40	905.375	352.21765	0	2,272.9243	1,312.2735	0
Slice 41	906.25325	351.90205	0	2,283.7916	1,318.5477	0
Slice 42	909.0121	350.89291	0	2,276.8948	1,314.5658	0
Slice 43	913.52235	349.21892	0	2,295.1295	1,325.0936	0
Slice 44	918.0839	347.47226	0	2,278.1566	1,315.2943	0
Slice 45	920.9454	346.31778	0	2,226.5152	1,285.4792	0
Slice 46	923.16335	345.37129	0	2,256.4704	1,302.7738	0
Slice 47	927.40345	343.56189	0	2,315.1016	1,336.6245	0
Slice 48	933.05695	341.14935	0	2,395.4877	1,383.0355	0
Slice 49	937.29706	339.33994	0	2,457.1915	1,418.6602	0
Slice 50	938.80131	338.69802	0	2,382.2239	549.97972	0
Slice 51	940.5697	338.83889	0	3,566.5365	823.39982	0
Slice 52	945.42035	339.45545	0	3,337.0742	770.42429	0
Slice 53	951.3634	340.35501	0	2,971.9962	686.13938	0
Slice 54	955.31665	341.06184	0	2,738.4409	632.21891	0
Slice 55	957.9988	341.61532	0	2,502.0998	577.65525	0
Slice 56	963.1226	342.70224	0	2,073.7487	478.7626	0
Slice 57	968.8738	343.94821	0	1,600.2472	369.44618	0
Slice 58	971.37895	344.50003	0	1,397.7714	322.70095	0
Slice 59	972.13688	344.66698	0	1,336.8581	308.63801	0
Slice 60	973.22733	344.90717	0	1,250.4774	288.69545	0
Slice 61	975.4348	345.39409	0	1,078.9166	249.08752	0
Slice 62	977.7154	345.8978	0	905.44343	209.03809	0
Slice 63	978.875	346.15423	0	816.72704	188.55629	0

Slice 64	979.625	346.32008	0	757.12463	174.79599	0
Slice 65	981.225	346.6739	0	623.00932	143.83303	0
Slice 66	983.675	347.21568	0	417.77691	96.451399	0
Slice 67	985.425	347.60267	0	278.77745	64.360846	0
Slice 68	986.475	347.83487	0	202.93912	46.852187	0
Slice 69	987.1052	347.97424	0	158.32424	36.552032	0
Slice 70	987.31564	348.02077	0	144.39231	33.335592	0
Slice 71	987.81564	348.13134	-0	163.31183	89.410616	195
Slice 72	988.43333	348.37329	-0	271.77608	148.79306	195

Figure 34 - Stability Analyses For Seismic Response

Drained Final Grade -Baseliner Yield Accel

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File Information

Title: [Model City - RMU-2 XS 3050](#)
 Created By: [Peter J. Carey](#)
 Last Edited By: [Peter J. Carey](#)
 Revision Number: [388](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/15/2013](#)
 Time: [10:30:39 AM](#)
 File Name: [RMU2X3050r1.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revisions\geoslope\final config\](#)
 Last Solved Date: [2/15/2013](#)
 Last Solved Time: [10:30:40 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

Drained Final Grade -Baseliner Yield Accel

Description: [yield acceleration](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings
 Side Function
 Interslice force function option: [Half-Sine](#)
 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: [Fully-Specified](#)

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: [40 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

Waste Material

Model: [Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion': [0 psf](#)

Phi': [30 °](#)

Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)

Unit Weight: [120 pcf](#)

Strength Function: [Baseliner](#)

Phi-B: [0 °](#)

CCL

Model: [Mohr-Coulomb](#)

Unit Weight: [120 pcf](#)

Cohesion': [1,000 psf](#)

Phi': [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Side Slope Liner

Model: [Mohr-Coulomb](#)

Unit Weight: [115 pcf](#)

Cohesion': [0 psf](#)

Phi': [13 °](#)

Phi-B: [0 °](#)

Final Cover

Model: [Mohr-Coulomb](#)

Unit Weight: [125 pcf](#)

Cohesion': [0 psf](#)

Phi': [30 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

NOT ACTIVE

Model: (None)

Pore Water Pressure

Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (566.46829, 439.38777) ft

Right Coordinate: (1,026.2009, 321.16002) ft

Fully Specified Slip Surfaces**Fully Specified Slip Surface 1**

	X (ft)	Y (ft)
	603.699	445.441
	609.0806	437.2869
	616.533	429.8345
	628.8049	417.5626
	641.0767	405.2908
	653.3486	393.019
	665.6204	380.7471
	677.8922	368.4753
	690.1641	356.2034
	702.0219	344.3456
	713.4158	332.9517
	724.7597	321.6078
	731.0627	315.3048
	731.8281	314.5394
	732.2312	314.1363
	733.9913	312.3763
	743.8165	310.2142
	755.5768	309.4809
	764.3273	309.3213
	774.9758	309.1271
	787.65	308.9731
	796.05	308.9081
	797.4164	308.8936
	803.9164	308.772
	818.323	308.481
	831.5728	308.2188
	842.8	307.996
	855.2	307.725
	862.55	308.01
	864.5429	308.691
	869.1929	310.231
	876.75	312.77
	885.4	315.6066

	894.55	318.6066
	899.2	320.1443
	899.9	320.3794
	907.6	322.9652
	920.4	327.2537
	930.3565	330.5973
	936.4945	332.6586
	941.1126	334.2095
	947.3783	336.3136
	955.7054	339.11
	965.9018	342.5342
	971.67	344.606
	973.569	345.059
	976.8782	346.6449
	979.4	349.1667
	980.828	350.5947
	983.1	353.361

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	500	315.5
Coordinate 2	1,201	313

Maximum Suction: 0 psf

Seismic Coefficients

Horz Seismic Coef.: 0.216

Ignore seismic load in strength: No

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	500	306.45
Point 2	500	286.75
Point 3	500	280.9
Point 4	500	271.2
Point 5	740.7	270.8
Point 6	634.5	269.8
Point 7	1,200	269.95
Point 8	1,199.9987	278.5
Point 9	1,200	259.75
Point 10	1,200	286.05
Point 11	1,200	306.5
Point 12	1,200	322
Point 13	1,107.4	322.9
Point 14	1,023.4	321.1
Point 15	1,023.5	320.9
Point 16	898.8	320
Point 17	991.25	345.25
Point 18	999.8	349.5
Point 19	1,016	350
Point 20	997.75	348.5
Point 21	992.3	347.1
Point 22	978.7	349.8
Point 23	984.4	350
Point 24	972.5	344.75
Point 25	971	349.5
Point 26	914.8	371.1
Point 27	863.6	313.6
Point 28	798.1	312.4
Point 29	780.3	309.03
Point 30	732.5	315.9
Point 31	732.5	314.4
Point 32	732.6	309.9
Point 33	669.1	317
Point 34	669.1	315
Point 35	500	314.5
Point 36	500	320
Point 37	500	318

Point 38	500	433.6
Point 39	899.6	369.5
Point 40	500	258.75
Point 41	560.6	281.9
Point 42	880.5	314
Point 43	1,010.6	307.3
Point 44	1,023.5	282.3
Point 45	983.2	286.1
Point 46	1,026.6	269.9
Point 47	798.1	314.9
Point 48	873	311.5
Point 49	990	345.25
Point 50	987	348.5
Point 51	707.7	308.9
Point 52	669.1	311.05
Point 53	500	303.35
Point 54	707.7	305.9
Point 55	780.3	306
Point 56	863.7	305.4
Point 57	1,010.35	303.8
Point 58	1,199.9987	303
Point 59	653.3	286.1
Point 60	836.6	308.1
Point 61	890.3	308.2
Point 62	863.7	308.4
Point 63	890.3	305.2
Point 64	794.8	398.1
Point 65	582.2	437.6
Point 66	696.4	431
Point 67	809.8	399.6
Point 68	861.4	307.6
Point 69	797.1	308.9
Point 70	863.6	311.6
Point 71	500	436.3
Point 72	581.8	440.1
Point 73	696.3	433.5
Point 74	795	400.7
Point 75	810.1	402.1
Point 76	980.1	352
Point 77	915	373.7
Point 78	900.2	372.2
Point 79	1,080.5	282.7
Point 80	663.1	270.7
Point 81	565.2	307.6
Point 82	565.2	304.53077

Regions

	Material	Points	Area (ft²)
Region 1	Bottom Liner	37,34,31,28,70,48,42,27,47,30,33,36	756.75
Region 2	Side Slope Liner	42,16,24,49,50,23,22,25,27	606.02
Region 3	Side Slope Liner	16,24,49,50,23,21,20,18,19,14,15	2,170.4
Region 4	Side Slope Liner	42,16,15,14,13,12,11,43,61,62,48	4,514.2
Region 5	NOT ACTIVE	4,6,46,7,9,40	7,520.4
Region 6	NOT ACTIVE	4,3,41,80,5,44,79,8,7,46,6	5,230.9
Region 7	NOT ACTIVE	3,2,59,45,10,8,79,44,5,80,41	6,088.1
Region 8	NOT ACTIVE	2,53,82,54,55,56,63,57,58,10,45,59	12,919
Region 9	CCL	35,52,32,29,51,81,1	992.38
Region 10	CCL	37,34,31,28,70,48,62,68,60,69,29,32,52,35	1,426.9
Region 11	CCL	53,1,81,51,29,69,60,68,56,55,54,82	1,073.1
Region 12	CCL	62,61,43,11,58,57,63,56,68	1,137.4
Region 13	Final Cover	38,65,66,64,67,39,26,22,23,76,77,78,75,74,73,72,71	1,253.8
Region 14	Waste Material	38,65,66,64,67,39,26,22,25,27,47,30,33,36	41,876

Current Slip Surface

Slip Surface: 1

F of S: 1.00

Volume: 24,231.481 ft³

Weight: 2,712,802.8 lbs

Resisting Moment: 1.9737763e+008 lbs-ft

Activating Moment: 1.9717441e+008 lbs-ft

Resisting Force: 780,312.44 lbs

Activating Force: 780,208.84 lbs

F of S Rank: 1

Exit: (981.46193, 351.36655) ft

Entry: (608.22944, 438.57656) ft

Radius: 186.12574 ft

Center: (931.1, 507) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	608.65502	437.93173	-0	41.252472	23.817126	0
Slice 2	609.73885	436.62865	-0	146.63122	84.657573	0
Slice 3	613.46505	432.90245	0	391.99537	226.31863	0
Slice 4	622.66895	423.69855	0	957.97278	553.08584	0
Slice 5	634.9408	411.4267	0	1,661.1035	959.03858	0
Slice 6	647.21265	399.1549	0	2,308.9833	1,333.0921	0
Slice 7	659.4845	386.88305	0	2,910.1744	1,680.19	0
Slice 8	671.7563	374.6112	0	3,474.2669	2,005.8689	0
Slice 9	684.02815	362.33935	0	4,011.4163	2,315.9923	0
Slice 10	693.23205	353.13545	0	4,403.254	2,542.2199	0
Slice 11	699.16095	347.20655	0	4,607.0377	2,659.8745	0
Slice	707.71885	338.64865	0	4,833.5709	2,790.6635	0

12						
Slice 13	719.08775	327.27975	0	5,145.7414	2,970.8952	0
Slice 14	727.59566	318.77184	0	5,390.6457	3,112.2907	0
Slice 15	730.74716	315.62034	0	5,776.1277	1,926.3095	396.32434
Slice 16	731.37825	314.98925	0	5,797.565	1,930.6193	399.15858
Slice 17	731.76095	314.60655	0	5,810.6083	1,933.2296	400.88978
Slice 18	731.89526	314.47224	0	5,815.1956	1,934.1466	401.49875
Slice 19	732.09681	314.27069	25.058063	5,928.0917	1,040.8641	1,000
Slice 20	732.3656	314.00191	41.770502	5,938.578	1,039.7663	1,000
Slice 21	733.24565	313.12191	96.486656	5,972.4535	1,036.0915	1,000
Slice 22	738.9039	311.29525	209.21091	9,646.066	1,663.9722	1,000
Slice 23	749.69665	309.84755	297.14558	10,797.461	1,851.4889	1,000
Slice 24	759.95205	309.4011	322.72183	11,052.418	1,891.935	1,000
Slice 25	769.65155	309.2242	331.60187	10,888.059	1,861.3881	1,000
Slice 26	781.3129	309.0501	339.8706	10,747.108	1,835.0767	1,000
Slice 27	791.325	308.94466	344.22182	10,610.623	1,810.2436	1,000
Slice 28	795.525	308.91216	345.31515	10,555.846	1,800.3921	1,000
Slice 29	796.575	308.90253	345.68263	10,556.197	1,800.389	1,000
Slice 30	797.2582	308.89528	345.98299	10,574.652	1,803.5904	1,000
Slice 31	797.7582	308.88721	346.37548	10,510.16	1,792.1495	1,000
Slice 32	801.0082	308.82641	349.44615	10,599.645	1,807.3866	1,000
Slice 33	806.8582	308.71258	355.24712	10,745.207	1,832.0303	1,000
Slice 34	809.95	308.65013	358.45605	10,830.119	1,846.4368	1,000
Slice 35	814.2115	308.56405	362.87899	10,760.06	1,833.3035	1,000
Slice 36	822.43434	308.39964	371.30813	10,609.809	1,805.3239	1,000
Slice	829.05924	308.26854	378.01447	10,480.701	1,781.3762	1,000

37						
Slice 38	837.1864	308.1074	386.26104	10,314.283	1,750.5781	1,000
Slice 39	849	307.8605	399.03861	10,043.205	1,700.5267	1,000
Slice 40	858.875	307.8675	396.40423	10,294.722	1,745.3405	1,000
Slice 41	863.075	308.1894	375.38305	13,418.965	2,299.9355	1,000
Slice 42	864.07145	308.5299	353.9141	13,294.456	2,281.7667	1,000
Slice 43	864.96432	308.83057	334.95364	13,042.482	2,240.6801	1,000
Slice 44	867.28932	309.60057	286.38824	12,761.483	2,199.6958	1,000
Slice 45	871.08189	310.86565	206.60286	12,356.141	2,142.2914	1,000
Slice 46	874.86044	312.13515	0	12,785.995	2,221.0836	1,843.899
Slice 47	878.625	313.38487	0	12,154.131	2,216.4956	1,736.1044
Slice 48	880.7161	314.0706	0	10,586.292	2,444.0382	0
Slice 49	882.82116	314.76092	0	10,319.009	2,382.3309	0
Slice 50	885.05506	315.49348	0	10,035.906	2,316.9715	0
Slice 51	889.975	317.1066	0	9,416.5927	2,173.9917	0
Slice 52	896.875	319.37545	0	8,577.0319	1,980.1638	0
Slice 53	899.4	320.21147	0	8,299.2371	1,916.0298	0
Slice 54	899.75	320.32902	0	8,254.2491	1,905.6436	0
Slice 55	900.05	320.42977	0	8,214.1141	1,896.3777	0
Slice 56	903.9	321.72267	0	7,960.7701	1,837.8886	0
Slice 57	911.3	324.20484	0	7,493.9555	1,730.116	0
Slice 58	917.7	326.34909	0	6,942.5729	1,602.8193	0
Slice 59	925.37825	328.9255	0	6,045.2214	1,395.6493	0
Slice 60	933.4255	331.62795	0	5,135.5151	1,185.6271	0
Slice 61	938.80355	333.43405	0	4,551.0572	1,050.6943	0
Slice	943.76008	335.09856	0	4,028.541	930.06197	0

62						
Slice 63	946.89293	336.15061	0	3,705.5979	855.50469	0
Slice 64	951.54185	337.7118	0	3,240.3515	748.09408	0
Slice 65	958.89178	340.18006	0	2,527.9787	583.62987	0
Slice 66	963.98997	341.89216	0	2,052.3523	473.82287	0
Slice 67	968.4509	343.44978	0	1,653.5823	381.75956	0
Slice 68	971.335	344.48568	0	1,385.628	319.89743	0
Slice 69	972.6195	344.8325	0	1,236.6145	285.49494	0
Slice 70	975.2236	345.85195	0	1,070.3092	247.10035	0
Slice 71	977.7891	347.5558	0	847.90245	195.7537	0
Slice 72	979.05	348.8167	0	578.67798	133.59834	0
Slice 73	979.75	349.5167	0	428.92898	99.026057	0
Slice 74	980.464	350.2307	-0	486.75389	281.02749	0
Slice 75	981.14496	350.98062	-0	228.07434	131.67878	0

Figure 35 - Stability Analyses For RMU-2 Excavation Adjacent to RMU-1

EXCAVATION 1 ESA

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File Information

Title: [Model City - RMU-2 Excavation Section Sta. 845](#)
 Comments: [Stability Analysis for Excavation Stability Adjacent to RMU-1 at location with highest waste in RMU-1 and combination of GC thickness and Subgrade Elevation for worst condition.](#)
 Created By: [Peter J. Carey](#)
 Revision Number: [468](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/17/2013](#)
 Time: [9:24:45 AM](#)
 File Name: [RMU2_ST845EXC.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\Excavation\](#)
 Last Solved Date: [2/17/2013](#)
 Last Solved Time: [10:18:24 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

EXCAVATION 1 ESA

Description: [EXCAVATION TO MSE AND BASELINER SUBGRADE](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

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: [Yes](#)
 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: [0.01](#)
 Minimum Slip Surface Depth: [15 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

Upper Till

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [150 psf](#)
 Phi': [31 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Drained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [118 pcf](#)
 Strength Function: [normalized N^m](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)

GC OverConsolidated

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [100 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Sand/Silt

Model: [Mohr-Coulomb](#)
 Unit Weight: [135 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [34 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
 Left-Zone Left Coordinate: [\(137.74673, 318.76652\) ft](#)
 Left-Zone Right Coordinate: [\(190, 316.21561\) ft](#)
 Left-Zone Increment: [10](#)
 Right Projection: [Range](#)
 Right-Zone Left Coordinate: [\(303, 351.33079\) ft](#)
 Right-Zone Right Coordinate: [\(450, 381.15806\) ft](#)
 Right-Zone Increment: [20](#)
 Radius Increments: [10](#)

Slip Surface Limits

Left Coordinate: [\(0.44206872, 303.37492\) ft](#)
 Right Coordinate: [\(549.31281, 394\) ft](#)

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	0	315.5
Coordinate 2	651	315

Maximum Suction: [0 psf](#)

Anisotropic Strength Functions

clay ellipse staticshear

Model: [Spline Data Point Function](#)
 Function: [Modifier Factor vs. Inclination](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [50 %](#)
 Y-Intercept: [0.77991173](#)
 Data Points: [Inclination \(°\)](#), [Modifier Factor](#)
 Data Point: [\(-60, 1\)](#)
 Data Point: [\(-30, 1\)](#)
 Data Point: [\(-17.838428, 0.90468204\)](#)

Data Point: (-3, 0.78)
 Data Point: (3, 0.78)
 Data Point: (23.685228, 0.90009497)
 Data Point: (39.261389, 1)
 Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

normalized N^m

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: [Mesri1](#)

Field

tan_Phi_100kPa: .548982

power: .147

pa: 2089

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	549.31281	311.87158
Point 2	547.12907	311.75855
Point 3	522.50905	311.0231
Point 4	506.97074	310.49979
Point 5	495.45607	310.23767
Point 6	494.65924	310.22851
Point 7	484.98392	310.00142
Point 8	470.11945	309.70136
Point 9	467.45491	309.65247
Point 10	441.92125	309.1371
Point 11	401.21222	310.00129

Point 12	348.67814	311.06147
Point 13	328.13429	311.55134
Point 14	307.02246	312.00559
Point 15	300.72719	312.55207
Point 16	294.95397	314.25767
Point 17	289.84475	315.84463
Point 18	288.51884	316.38979
Point 19	283.3885	318.18538
Point 20	283.05589	318.27678
Point 21	282.42127	318.50593
Point 22	277.22797	320.29612
Point 23	270.81876	322.27733
Point 24	270.53415	322.36874
Point 25	264.96697	324.2305
Point 26	263.29803	324.63798
Point 27	263.29188	324.63975
Point 28	262.52439	324.96117
Point 29	246.30265	331.75462
Point 30	246.45375	332.11544
Point 31	250.61509	332.23577
Point 32	250.61903	332.25719
Point 33	251.89204	332.29539
Point 34	255.60008	332
Point 35	260.33203	331.37688
Point 36	262.89261	331
Point 37	264.84231	330.43718
Point 38	266.63288	330
Point 39	272.403	328.07038
Point 40	272.62213	328
Point 41	279.09212	326
Point 42	284.4179	324.16414
Point 43	284.87249	324
Point 44	285.17661	323.91642
Point 45	290.65219	322
Point 46	291.87945	321.49541
Point 47	296.69392	320
Point 48	301.84786	318.47735
Point 49	307.34679	318
Point 50	328.27034	317.5498
Point 51	348.81018	317.06003
Point 52	401.33642	316
Point 53	441.92438	315.13839
Point 54	467.33934	315.65136
Point 55	470.00387	315.70025
Point 56	484.85298	316
Point 57	494.55435	316.2277

Point 58	495.3533	316.23688
Point 59	506.80148	316.49749
Point 60	522.31849	317.02009
Point 61	546.8844	317.75392
Point 62	549.31281	317.87961
Point 63	19.05926	303.84078
Point 64	91.39992	302.81994
Point 65	106.9114	303.59406
Point 66	174.52199	308.61198
Point 67	213.77903	309.33289
Point 68	345.49491	307.75164
Point 69	531.87118	303.58874
Point 70	549.31281	303.99991
Point 71	245.50648	332.08805
Point 72	245.27612	332.05126
Point 73	242.67621	329.49541
Point 74	242.53965	329.61859
Point 75	230.17355	329.05509
Point 76	225.18791	328.79196
Point 77	223.60066	328.14689
Point 78	218.66812	326.14644
Point 79	214.68089	324.53163
Point 80	208.73648	322.12122
Point 81	205.31788	320.99672
Point 82	202.37836	320.09007
Point 83	189.93993	316.19681
Point 84	189.26656	315.34995
Point 85	188.07429	315.11944
Point 86	187.25664	315.09187
Point 87	186.30688	315.08941
Point 88	184.36429	315.09836
Point 89	183.88453	315.1049
Point 90	183.56529	315.13574
Point 91	183.12394	315.19707
Point 92	182.43094	315.31788
Point 93	181.35328	315.55319
Point 94	179.33866	316.03413
Point 95	167.13146	317.82895
Point 96	165.8904	318.00524
Point 97	146.93305	318.70883
Point 98	126.42903	318.8376
Point 99	124.78806	318.80022
Point 100	123.86084	318.79729
Point 101	93.65158	318.42677
Point 102	81.62939	314.42273
Point 103	73.50478	311.66471

Point 104	67.17082	309.43502
Point 105	55.66799	305.70787
Point 106	55.44742	305.63241
Point 107	52.25485	304.67145
Point 108	239.83953	331.88658
Point 109	227.43435	332.25876
Point 110	223.2147	330.14892
Point 111	221.21463	330.14889
Point 112	216.42919	349.29
Point 113	215.00913	350
Point 114	200.00849	349.55
Point 115	191.33812	345.21
Point 116	172.35732	344.64
Point 117	99.88669	320.50339
Point 118	0	301.10944
Point 119	91.45357	299.81888
Point 120	107.09722	300.5996
Point 121	174.66066	305.61402
Point 122	213.78857	306.33256
Point 123	345.44341	304.75204
Point 124	531.87304	300.58795
Point 125	549.31281	300.99908
Point 126	0	303.36386
Point 127	549.31281	287.21524
Point 128	480.78577	285.71818
Point 129	300.6006	286.21512
Point 130	278.42812	286.93334
Point 131	235.43366	285.23564
Point 132	192.64199	284.55761
Point 133	29.26068	285.66447
Point 134	0	285.9174
Point 135	549.31281	270.21549
Point 136	480.78577	271.80786
Point 137	300.6006	275.52562
Point 138	278.42812	277.57887
Point 139	235.43366	277.62041
Point 140	192.64199	277.22462
Point 141	29.26068	275.48545
Point 142	0	275.63248
Point 143	0	321.04123
Point 144	79.60911	320.31009
Point 145	82.58818	320.29122
Point 146	0	304.10974
Point 147	252.59487	334.27307
Point 148	257.58639	336
Point 149	258.54148	336.33728

Point 150	263.3222	338
Point 151	270.63155	340.58224
Point 152	274.68025	342
Point 153	280.40584	344
Point 154	281.72608	344.45933
Point 155	286.24464	346
Point 156	292.0045	347.86126
Point 157	292.42617	348
Point 158	292.9064	348.15309
Point 159	298.78353	350
Point 160	300.22289	350.45649
Point 161	305.12567	352
Point 162	309.05326	353.15038
Point 163	323.32949	353.51902
Point 164	329.12122	354
Point 165	330.82031	354.62282
Point 166	345.24567	360
Point 167	350.68847	362
Point 168	352.0829	362.5021
Point 169	356.26377	364
Point 170	358.133	364.65248
Point 171	362.21309	366
Point 172	366.80132	367.47657
Point 173	368.41511	368
Point 174	376.56716	370.59219
Point 175	380.98837	372
Point 176	403.19368	374
Point 177	406.29446	375.07898
Point 178	408.91164	376
Point 179	411.22122	376.7935
Point 180	414.87537	378
Point 181	424.11121	379.01527
Point 182	433.15866	380
Point 183	445.73114	380.87399
Point 184	462.65204	382
Point 185	467.77229	382.35549
Point 186	476.46925	382.85574
Point 187	501.8988	383.86939
Point 188	503.23672	383.92577
Point 189	503.73274	383.94351
Point 190	503.9247	383.92943
Point 191	503.92765	383.92445
Point 192	504.39506	384
Point 193	516.40886	385.88819
Point 194	517.14164	386
Point 195	518.06235	386.22547

Point 196	525.07639	388
Point 197	528.68324	389.02607
Point 198	532.06791	390
Point 199	537.03106	391.43108
Point 200	539.05259	392
Point 201	540.79078	392.33755
Point 202	549.31281	394

Regions

	Material	Points	Area (ft²)
Region 1	Bottom Liner	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62	1,790.6
Region 2	Upper Till	63,64,65,66,67,68,69,70,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107	4,237.4
Region 3	NOT ACTIVE	101,100,99,98,97,96,95,94,93,92,91,90,89,88,87,86,85,84,83,82,81,80,79,78,77,76,75,74,108,109,110,111,112,113,114,115,116,117	2,404.9
Region 4	GC OverConsolidated	118,119,120,121,122,123,124,125,70,69,68,67,66,65,64,63,126	1,641.7
Region 5	GC-Drained	118,119,120,121,122,123,124,125,127,128,129,130,131,132,133,134	9,577.2
Region 6	Sand/Silt	134,133,132,131,130,129,128,127,135,136,137,138,139,140,141,142	5,912.2
Region 7	NOT ACTIVE	143,144,145,117,101,102,103,104,105,106,107,63,146	1,245.8
Region 8	Waste Material	30,147,148,149,150,151,152,153,154,155,156,157,158,159,160,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,191,192,193,194,195,196,197,198,199,200,201,202,62,61,60,59,58,57,56,55,54,53,52,51,50,49,48,47,46,45,44,43,42,41,40,39,38,37,36,35,34,33,32,31	15,268

Current Slip Surface

Slip Surface: 2,542

F of S: 2.077

Volume: 6,704.8242 ft³

Weight: 779,446.11 lbs

Resisting Moment: 60,455,652 lbs-ft

Activating Moment: 29,104,840 lbs-ft

Resisting Force: 339,280.09 lbs

Activating Force: 163,396.64 lbs

F of S Rank: 1

Exit: (180.20695, 315.82685) ft

Entry: (422.91695, 378.88399) ft

Radius: 119.38489 ft

Center: (251.65518, 463.4313) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	180.46506	315.59402	-0	117.31448	70.489649	150
Slice 2	181.03822	315.077	17.718785	176.95146	95.676645	150

Slice 3	181.79559	314.39382	60.312853	251.31888	114.768	150
Slice 4	182.33442	313.90777	90.616612	307.28169	130.18551	150
Slice 5	182.77744	313.50814	115.53222	361.8295	147.99034	150
Slice 6	183.34462	312.99652	147.4301	433.31963	171.77976	150
Slice 7	183.72491	312.65348	168.81786	482.94489	188.74656	150
Slice 8	184.12441	312.29311	191.28571	538.03922	208.35053	150
Slice 9	185.33559	311.20057	259.4021	711.89907	271.88761	150
Slice 10	186.78176	309.89605	340.73488	924.0163	350.47083	150
Slice 11	187.59445	309.16296	386.44039	1,046.9515	396.87511	150
Slice 12	188.00327	308.79418	0	1,216.4085	702.29377	100
Slice 13	188.67042	308.19238	0	1,343.2411	775.52058	100
Slice 14	189.60324	307.35093	0	1,592.7966	919.60155	100
Slice 15	190.56607	306.48241	0	1,877.811	1,084.1547	100
Slice 16	191.26517	305.8518	0	1,952.7724	924.71741	159.35909
Slice 17	191.74787	305.41637	0	2,058.0076	967.05996	166.65625
Slice 18	196.08306	304.05275	0	1,981.2163	805.15093	138.75398
Slice 19	201.19342	302.75869	0	2,404.101	949.61394	163.64964
Slice 20	203.42594	302.19337	0	2,591.4573	1,012.3893	174.4678
Slice 21	204.89569	301.87445	0	2,585.6246	932.23686	160.65495
Slice 22	207.02718	301.60359	0	2,723.2486	974.40015	167.92118
Slice 23	211.25776	301.066	0	3,026.1106	1,066.1112	183.72629
Slice 24	214.22996	300.68831	0	3,252.5403	1,133.793	195.39001
Slice 25	214.84501	300.61015	0	3,299.6952	1,147.7995	197.80368
Slice 26	215.71916	300.49907	0	3,366.7814	1,167.6754	201.22914
Slice 27	217.34764	300.29213	0	3,492.0141	1,204.6246	207.59632
Slice 28	218.46711	300.16956	0	3,453.2794	1,171.4159	201.87358
Slice 29	219.94137	300.12661	0	3,542.1079	1,197.0708	206.29461
Slice 30	222.21467	300.06038	0	3,679.2134	1,236.4842	213.08669
Slice 31	223.40768	300.02562	0	3,751.2157	1,257.0954	216.6389
Slice 32	224.39429	299.99688	0	3,810.8742	1,274.1295	219.57417
Slice 33	226.31113	299.94103	0	3,875.3365	1,292.4907	222.73876
Slice 34	228.80395	299.8684	0	3,911.542	1,302.7835	224.5128
Slice 35	235.00654	299.68769	0	3,994.6419	1,326.3559	228.57484
Slice 36	241.18959	299.50755	0	4,073.3571	1,348.6182	232.41115
Slice 37	242.60793	299.46622	0	4,082.3632	1,351.161	232.84961
Slice 38	243.38366	299.44362	0	4,170.1353	1,375.9024	237.11303
Slice 39	244.68362	299.43581	0	4,250.7944	1,398.5448	241.01482
Slice 40	245.3913	299.45109	0	4,327.0494	1,419.9165	244.69875
Slice 41	245.90456	299.46218	0	4,307.345	1,414.3987	243.74835
Slice 42	246.3782	299.47241	0	4,307.3816	1,414.4101	243.74899
Slice 43	248.53442	299.51898	0	4,405.7655	1,441.9211	248.49045
Slice 44	251.2771	299.57821	0	4,506.342	1,469.9526	253.32086
Slice 45	252.26699	299.62205	0	4,409.3074	1,446.5623	249.28998
Slice 46	254.09748	299.78693	0	4,453.8684	1,459.0232	251.43742
Slice 47	256.59323	300.01174	0	4,513.5826	1,475.6921	254.31077
Slice 48	258.06394	300.14422	0	4,548.5415	1,485.4362	255.9899

Slice 49	259.43676	300.26788	0	4,581.2341	1,494.5387	257.5583
Slice 50	261.42821	300.44726	0	4,627.8682	1,507.506	259.79308
Slice 51	262.7085	300.56259	0	4,657.6392	1,515.7744	261.21796
Slice 52	263.09532	300.59743	0	4,666.3626	1,518.1954	261.63549
Slice 53	263.31012	300.61678	0	4,671.0645	1,519.5004	261.86008
Slice 54	264.08225	300.68633	0	4,689.0699	1,524.4951	262.7209
Slice 55	264.90464	300.76041	0	4,708.2474	1,529.8128	263.63629
Slice 56	265.79992	300.84106	0	4,729.01	1,535.5653	264.62782
Slice 57	267.06503	300.95501	0	4,757.8767	1,543.5572	266.00502
Slice 58	269.06437	301.18632	0	4,727.0408	1,543.4768	265.99216
Slice 59	270.72515	301.3902	0	4,755.825	1,551.4897	267.37378
Slice 60	271.61088	301.49892	0	4,771.0283	1,555.7198	268.10226
Slice 61	272.51257	301.60961	0	4,786.4912	1,560.0201	268.84281
Slice 62	273.65119	301.74939	0	4,806.1658	1,565.488	269.78537
Slice 63	275.95411	302.03209	0	4,845.6586	1,576.4544	271.675
Slice 64	278.16005	302.30288	0	4,882.9716	1,586.8031	273.4586
Slice 65	279.74898	302.49793	0	4,909.3145	1,594.1025	274.71637
Slice 66	281.06596	302.6596	0	4,930.6966	1,600.0225	275.73718
Slice 67	282.07367	302.7833	0	4,946.6553	1,604.439	276.49805
Slice 68	282.73858	302.86493	0	4,956.7955	1,607.2448	276.98073
Slice 69	283.10832	302.91031	0	4,962.4316	1,608.8034	277.2495
Slice 70	283.27463	302.93378	0	4,904.801	1,603.327	276.30671
Slice 71	283.9032	303.02777	0	4,912.2079	1,605.3919	276.66272
Slice 72	284.6452	303.13872	0	4,920.8542	1,607.8034	277.07667
Slice 73	285.02455	303.19545	0	4,925.3446	1,609.0541	277.29293
Slice 74	285.71062	303.29804	0	4,933.4099	1,611.3014	277.6802
Slice 75	287.38174	303.54793	0	4,950.5382	1,616.0724	278.50207
Slice 76	289.1818	303.8171	0	4,967.5824	1,620.8165	279.32057
Slice 77	290.24847	303.9766	0	4,977.6286	1,623.6126	279.80177
Slice 78	291.16386	304.11348	0	4,986.2237	1,626.0039	280.21367
Slice 79	291.77749	304.20524	0	4,991.8266	1,627.5621	280.48241
Slice 80	291.94198	304.22984	0	4,993.3816	1,627.9945	280.55703
Slice 81	292.21533	304.27071	0	4,996.2486	1,628.7917	280.69449
Slice 82	292.66629	304.33815	0	5,000.7722	1,630.0498	280.91103
Slice 83	293.93018	304.52714	0	5,012.2516	1,633.2417	281.46028
Slice 84	295.82394	304.81032	0	5,029.2599	1,637.9663	282.27649
Slice 85	297.73872	305.09664	0	5,046.5669	1,642.7736	283.10448
Slice 86	298.78357	305.25288	0	5,056.0376	1,645.4031	283.55746
Slice 87	298.84884	305.28176	0	4,429.6185	1,674.9581	288.65117
Slice 88	299.56848	305.60026	0	4,369.551	2,522.7614	100
Slice 89	300.47504	306.00149	0	4,347.5666	2,510.0688	100
Slice 90	301.28753	306.36108	0	4,328.3	2,498.9452	100
Slice 91	303.48676	307.33444	0	4,279.6836	2,470.8765	100
Slice 92	305.31978	308.1457	0	4,239.7491	2,447.8203	100
Slice 93	306.26818	308.56545	418.03785	4,223.7595	2,286.7083	150
Slice 94	307.18462	308.97105	392.68413	4,201.4299	2,288.5254	150

Slice 95	308.20002	309.42045	364.59286	4,177.4457	2,290.9931	150
Slice 96	311.38445	310.82983	276.49514	4,044.0385	2,263.7685	150
Slice 97	314.79554	312.33953	0	3,927.3793	1,474.1033	193.53564
Slice 98	319.39754	314.03473	0	3,913.7807	1,470.2502	192.28238
Slice 99	323.12456	315.32281	0	3,776.0457	1,430.7807	179.78693
Slice 100	325.79992	316.24743	0	3,692.0286	1,406.3114	172.33749
Slice 101	328.44838	317.16275	0	3,610.3242	1,382.2264	165.22142
Slice 102	328.87382	317.35447	0	3,331.3045	1,297.8002	141.88825
Slice 103	329.16199	317.50611	0	3,319.2573	1,294.0782	140.91522
Slice 104	330.01154	317.95316	0	3,258.2017	1,881.1237	0
Slice 105	334.42665	320.27648	0	3,194.535	1,844.3656	0
Slice 106	341.63933	324.07195	0	3,094.5496	1,786.639	0
Slice 107	347.96707	327.40174	0	3,008.8248	1,737.1458	0
Slice 108	351.00666	329.00123	0	2,967.5713	1,713.3281	0
Slice 109	351.70387	329.41445	0	2,808.4252	1,621.4451	0
Slice 110	354.17334	331.01578	0	2,751.7105	1,588.7008	0
Slice 111	357.19838	332.97738	0	2,681.7929	1,548.3339	0
Slice 112	360.17305	334.9063	0	2,608.4745	1,506.0035	0
Slice 113	364.50721	337.71679	0	2,498.2082	1,442.3412	0
Slice 114	366.92006	339.28141	0	2,436.19	1,406.5349	0
Slice 115	367.72695	339.89053	0	2,300.8935	1,328.4215	0
Slice 116	372.49113	343.57443	0	2,137.2027	1,233.9146	0
Slice 117	378.65107	348.3376	0	1,924.0526	1,110.8523	0
Slice 118	380.86168	350.0468	0	1,847.8916	1,066.8807	0
Slice 119	384.15508	352.58937	0	1,669.907	964.12126	0
Slice 120	390.4885	357.4789	0	1,318.2898	761.11498	0
Slice 121	398.42444	363.01392	0	951.96947	549.61983	0
Slice 122	404.74407	367.10876	0	676.58812	390.62833	0
Slice 123	407.60305	368.96125	0	602.00892	347.57001	0
Slice 124	410.06643	370.55741	0	536.7972	309.92001	0
Slice 125	413.0483	372.48953	0	453.60312	261.88788	0
Slice 126	418.89616	376.27869	0	201.64679	116.42083	0

Figure 36 - Stability Analyses For RMU-2 Excavation Adjacent to RMU-1

EXCAVATION 1 ESA (2)-W

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File Information

Title: [Model City - RMU-2 Excavation Section Sta. 845](#)
 Comments: [Stability Analysis for Excavation Stability Adjacent to RMU-1 at location with highest waste in RMU-1 and combination of GC thickness and Subgrade Elevation for worst condition.](#)
 Created By: [Peter J. Carey](#)
 Revision Number: [468](#)
 File Version: [8.0](#)
 Tool Version: [8.0.10.6504](#)
 Date: [2/17/2013](#)
 Time: [9:24:45 AM](#)
 File Name: [RMU2_ST845EXC.gsz](#)
 Directory: [N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\Excavation\](#)
 Last Solved Date: [2/17/2013](#)
 Last Solved Time: [10:23:24 AM](#)

Project Settings

Length(L) Units: [feet](#)
 Time(t) Units: [Days](#)
 Force(F) Units: [lbf](#)
 Pressure(p) Units: [psf](#)
 Strength Units: [psf](#)
 Unit Weight of Water: [62.4 pcf](#)
 View: [2D](#)

Analysis Settings

EXCAVATION 1 ESA (2)-W

Description: [EXCAVATION TO MSE AND BASELINER SUBGRADE](#)
 Kind: [SLOPE/W](#)
 Method: [Morgenstern-Price](#)
 Settings

Side Function

Interslice force function option: [Half-Sine](#)

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: [Yes](#)
 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: [0.01](#)
 Minimum Slip Surface Depth: [15 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

Waste Material

Model: [Mohr-Coulomb](#)
 Unit Weight: [111 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Bottom Liner

Model: [Shear/Normal Fn.](#)
 Unit Weight: [120 pcf](#)
 Strength Function: [Baseliner](#)
 Phi-B: [0 °](#)

Upper Till

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [150 psf](#)
 Phi': [31 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

GC-Drained

Model: [Shear/Normal Fn.](#)
 Unit Weight: [118 pcf](#)
 Strength Function: [normalized N^m](#)
 Phi-B: [0 °](#)
 Anisotropic Strength Fn: [clay ellipse staticshear](#)

GC OverConsolidated

Model: [Mohr-Coulomb](#)
 Unit Weight: [125 pcf](#)
 Cohesion': [100 psf](#)
 Phi': [30 °](#)
 Phi-B: [0 °](#)

Sand/Silt

Model: [Mohr-Coulomb](#)
 Unit Weight: [135 pcf](#)
 Cohesion': [0 psf](#)
 Phi': [34 °](#)
 Phi-B: [0 °](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

NOT ACTIVE

Model: [\(None\)](#)
 Pore Water Pressure
 Piezometric Line: [1](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
 Left-Zone Left Coordinate: [\(80, 313.86961\) ft](#)
 Left-Zone Right Coordinate: [\(130, 318.81517\) ft](#)
 Left-Zone Increment: [10](#)
 Right Projection: [Range](#)
 Right-Zone Left Coordinate: [\(275, 342.11169\) ft](#)
 Right-Zone Right Coordinate: [\(406.06749, 375\) ft](#)
 Right-Zone Increment: [20](#)
 Radius Increments: [10](#)

Slip Surface Limits

Left Coordinate: [\(0.44206872, 303.37492\) ft](#)
 Right Coordinate: [\(549.31281, 394\) ft](#)

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	0	315.5
Coordinate 2	651	315

Maximum Suction: [0 psf](#)

Anisotropic Strength Functions

clay ellipse staticshear

Model: [Spline Data Point Function](#)
 Function: [Modifier Factor vs. Inclination](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [50 %](#)
 Y-Intercept: [0.77991173](#)
 Data Points: [Inclination \(°\)](#), [Modifier Factor](#)
 Data Point: [\(-60, 1\)](#)
 Data Point: [\(-30, 1\)](#)
 Data Point: [\(-17.838428, 0.90468204\)](#)

Data Point: (-3, 0.78)
 Data Point: (3, 0.78)
 Data Point: (23.685228, 0.90009497)
 Data Point: (39.261389, 1)
 Data Point: (59.397364, 1)

Shear/Normal Strength Functions

Baseliner

Model: [Shear/Normal Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (0, 0)

Data Point: (500, 235)

Data Point: (1,000, 463)

Data Point: (2,000, 899)

Data Point: (5,000, 2,057)

Data Point: (10,000, 3,515)

Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600,000 psf

SigmaC: 300,000 psf

Num. Points: 20

normalized N^m

Model: [Add-In Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Assembly: [GeoStudio AddIns1](#)

Function: [Mesri1](#)

Field

tan_Phi_100kPa: .548982

power: .147

pa: 2089

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	549.31281	311.87158
Point 2	547.12907	311.75855
Point 3	522.50905	311.0231
Point 4	506.97074	310.49979
Point 5	495.45607	310.23767
Point 6	494.65924	310.22851
Point 7	484.98392	310.00142
Point 8	470.11945	309.70136
Point 9	467.45491	309.65247
Point 10	441.92125	309.1371
Point 11	401.21222	310.00129

Point 12	348.67814	311.06147
Point 13	328.13429	311.55134
Point 14	307.02246	312.00559
Point 15	300.72719	312.55207
Point 16	294.95397	314.25767
Point 17	289.84475	315.84463
Point 18	288.51884	316.38979
Point 19	283.3885	318.18538
Point 20	283.05589	318.27678
Point 21	282.42127	318.50593
Point 22	277.22797	320.29612
Point 23	270.81876	322.27733
Point 24	270.53415	322.36874
Point 25	264.96697	324.2305
Point 26	263.29803	324.63798
Point 27	263.29188	324.63975
Point 28	262.52439	324.96117
Point 29	246.30265	331.75462
Point 30	246.45375	332.11544
Point 31	250.61509	332.23577
Point 32	250.61903	332.25719
Point 33	251.89204	332.29539
Point 34	255.60008	332
Point 35	260.33203	331.37688
Point 36	262.89261	331
Point 37	264.84231	330.43718
Point 38	266.63288	330
Point 39	272.403	328.07038
Point 40	272.62213	328
Point 41	279.09212	326
Point 42	284.4179	324.16414
Point 43	284.87249	324
Point 44	285.17661	323.91642
Point 45	290.65219	322
Point 46	291.87945	321.49541
Point 47	296.69392	320
Point 48	301.84786	318.47735
Point 49	307.34679	318
Point 50	328.27034	317.5498
Point 51	348.81018	317.06003
Point 52	401.33642	316
Point 53	441.92438	315.13839
Point 54	467.33934	315.65136
Point 55	470.00387	315.70025
Point 56	484.85298	316
Point 57	494.55435	316.2277

Point 58	495.3533	316.23688
Point 59	506.80148	316.49749
Point 60	522.31849	317.02009
Point 61	546.8844	317.75392
Point 62	549.31281	317.87961
Point 63	19.05926	303.84078
Point 64	91.39992	302.81994
Point 65	106.9114	303.59406
Point 66	174.52199	308.61198
Point 67	213.77903	309.33289
Point 68	345.49491	307.75164
Point 69	531.87118	303.58874
Point 70	549.31281	303.99991
Point 71	245.50648	332.08805
Point 72	245.27612	332.05126
Point 73	242.67621	329.49541
Point 74	242.53965	329.61859
Point 75	230.17355	329.05509
Point 76	225.18791	328.79196
Point 77	223.60066	328.14689
Point 78	218.66812	326.14644
Point 79	214.68089	324.53163
Point 80	208.73648	322.12122
Point 81	205.31788	320.99672
Point 82	202.37836	320.09007
Point 83	189.93993	316.19681
Point 84	189.26656	315.34995
Point 85	188.07429	315.11944
Point 86	187.25664	315.09187
Point 87	186.30688	315.08941
Point 88	184.36429	315.09836
Point 89	183.88453	315.1049
Point 90	183.56529	315.13574
Point 91	183.12394	315.19707
Point 92	182.43094	315.31788
Point 93	181.35328	315.55319
Point 94	179.33866	316.03413
Point 95	167.13146	317.82895
Point 96	165.8904	318.00524
Point 97	146.93305	318.70883
Point 98	126.42903	318.8376
Point 99	124.78806	318.80022
Point 100	123.86084	318.79729
Point 101	93.65158	318.42677
Point 102	81.62939	314.42273
Point 103	73.50478	311.66471

Point 104	67.17082	309.43502
Point 105	55.66799	305.70787
Point 106	55.44742	305.63241
Point 107	52.25485	304.67145
Point 108	239.83953	331.88658
Point 109	227.43435	332.25876
Point 110	223.2147	330.14892
Point 111	221.21463	330.14889
Point 112	216.42919	349.29
Point 113	215.00913	350
Point 114	200.00849	349.55
Point 115	191.33812	345.21
Point 116	172.35732	344.64
Point 117	99.88669	320.50339
Point 118	0	301.10944
Point 119	91.45357	299.81888
Point 120	107.09722	300.5996
Point 121	174.66066	305.61402
Point 122	213.78857	306.33256
Point 123	345.44341	304.75204
Point 124	531.87304	300.58795
Point 125	549.31281	300.99908
Point 126	0	303.36386
Point 127	549.31281	287.21524
Point 128	480.78577	285.71818
Point 129	300.6006	286.21512
Point 130	278.42812	286.93334
Point 131	235.43366	285.23564
Point 132	192.64199	284.55761
Point 133	29.26068	285.66447
Point 134	0	285.9174
Point 135	549.31281	270.21549
Point 136	480.78577	271.80786
Point 137	300.6006	275.52562
Point 138	278.42812	277.57887
Point 139	235.43366	277.62041
Point 140	192.64199	277.22462
Point 141	29.26068	275.48545
Point 142	0	275.63248
Point 143	0	321.04123
Point 144	79.60911	320.31009
Point 145	82.58818	320.29122
Point 146	0	304.10974
Point 147	252.59487	334.27307
Point 148	257.58639	336
Point 149	258.54148	336.33728

Point 150	263.3222	338
Point 151	270.63155	340.58224
Point 152	274.68025	342
Point 153	280.40584	344
Point 154	281.72608	344.45933
Point 155	286.24464	346
Point 156	292.0045	347.86126
Point 157	292.42617	348
Point 158	292.9064	348.15309
Point 159	298.78353	350
Point 160	300.22289	350.45649
Point 161	305.12567	352
Point 162	309.05326	353.15038
Point 163	323.32949	353.51902
Point 164	329.12122	354
Point 165	330.82031	354.62282
Point 166	345.24567	360
Point 167	350.68847	362
Point 168	352.0829	362.5021
Point 169	356.26377	364
Point 170	358.133	364.65248
Point 171	362.21309	366
Point 172	366.80132	367.47657
Point 173	368.41511	368
Point 174	376.56716	370.59219
Point 175	380.98837	372
Point 176	403.19368	374
Point 177	406.29446	375.07898
Point 178	408.91164	376
Point 179	411.22122	376.7935
Point 180	414.87537	378
Point 181	424.11121	379.01527
Point 182	433.15866	380
Point 183	445.73114	380.87399
Point 184	462.65204	382
Point 185	467.77229	382.35549
Point 186	476.46925	382.85574
Point 187	501.8988	383.86939
Point 188	503.23672	383.92577
Point 189	503.73274	383.94351
Point 190	503.9247	383.92943
Point 191	503.92765	383.92445
Point 192	504.39506	384
Point 193	516.40886	385.88819
Point 194	517.14164	386
Point 195	518.06235	386.22547

Point 196	525.07639	388
Point 197	528.68324	389.02607
Point 198	532.06791	390
Point 199	537.03106	391.43108
Point 200	539.05259	392
Point 201	540.79078	392.33755
Point 202	549.31281	394

Regions

	Material	Points	Area (ft ²)
Region 1	Bottom Liner	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62	1,790.6
Region 2	Upper Till	63,64,65,66,67,68,69,70,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107	4,237.4
Region 3	NOT ACTIVE	101,100,99,98,97,96,95,94,93,92,91,90,89,88,87,86,85,84,83,82,81,80,79,78,77,76,75,74,108,109,110,111,112,113,114,115,116,117	2,404.9
Region 4	GC OverConsolidated	118,119,120,121,122,123,124,125,70,69,68,67,66,65,64,63,126	1,641.7
Region 5	GC-Drained	118,119,120,121,122,123,124,125,127,128,129,130,131,132,133,134	9,577.2
Region 6	Sand/Silt	134,133,132,131,130,129,128,127,135,136,137,138,139,140,141,142	5,912.2
Region 7	NOT ACTIVE	143,144,145,117,101,102,103,104,105,106,107,63,146	1,245.8
Region 8	Waste Material	30,147,148,149,150,151,152,153,154,155,156,157,158,159,160,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,191,192,193,194,195,196,197,198,199,200,201,202,62,61,60,59,58,57,56,55,54,53,52,51,50,49,48,47,46,45,44,43,42,41,40,39,38,37,36,35,34,33,32,31	15,268

Current Slip Surface

Slip Surface: 2,542

F of S: 2.245

Volume: 6,765.3838 ft³

Weight: 790,747.13 lbs

Resisting Moment: 88,486,439 lbs-ft

Activating Moment: 39,415,535 lbs-ft

Resisting Force: 356,901 lbs

Activating Force: 159,071.46 lbs

F of S Rank: 1

Exit: (130, 318.81517) ft

Entry: (406.06749, 375) ft

Radius: 127.50857 ft

Center: (230.805, 529.83321) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	136.48399	317.10268	-0	251.36147	151.03321	150
Slice 2	144.95051	314.86659	32.578148	559.97818	316.89391	150
Slice 3	151.33524	313.18031	137.49551	774.41017	382.69694	150

Slice 4	160.81391	310.5951	298.35853	1,105.6917	485.09472	150
Slice 5	166.51093	308.99866	397.70314	1,302.3276	543.55321	150
Slice 6	168.20541	308.52383	427.25155	1,337.944	547.19925	150
Slice 7	170.81834	307.79163	0	1,432.6619	827.14772	100
Slice 8	173.05947	307.16361	0	1,485.2891	857.53208	100
Slice 9	174.14181	306.85672	0	1,518.0085	876.42261	100
Slice 10	176.3644	306.21286	0	1,574.1602	908.84183	100
Slice 11	178.77274	305.5152	0	1,587.3898	684.45088	117.95337
Slice 12	180.34597	305.05946	0	1,608.2758	692.12527	119.27596
Slice 13	181.79559	304.63952	0	1,621.9935	697.1578	120.14319
Slice 14	182.33442	304.48343	0	1,629.6091	699.94891	120.62424
Slice 15	182.77744	304.35509	0	1,642.4784	704.66117	121.4364
Slice 16	183.34462	304.19079	0	1,659.9815	711.06169	122.53927
Slice 17	183.72491	304.08062	0	1,672.8875	715.77457	123.35159
Slice 18	184.12441	303.9649	0	1,688.7282	721.55211	124.34708
Slice 19	185.33559	303.61403	0	1,739.7677	740.1133	127.54589
Slice 20	186.78176	303.1951	0	1,801.2459	762.36487	131.3807
Slice 21	187.66547	302.9391	0	1,840.176	776.39781	133.79869
Slice 22	188.67042	302.64798	0	1,892.6021	795.22638	137.04368
Slice 23	189.60324	302.37775	0	2,000.8468	833.86267	143.70207
Slice 24	190.63903	302.0777	0	2,137.4393	882.18275	152.02917
Slice 25	191.81628	301.73667	0	2,241.2536	918.60338	158.30547
Slice 26	196.15147	301.01444	0	2,390.1973	882.50682	152.08492
Slice 27	201.19342	300.2514	0	2,714.3544	983.6299	169.51155
Slice 28	203.84812	299.84965	0	2,884.5439	1,036.0001	178.53706
Slice 29	206.11689	299.5063	0	3,031.6991	1,080.9166	186.27778
Slice 30	207.82619	299.31708	0	3,038.0069	1,052.2349	181.33479
Slice 31	211.25776	299.0596	0	3,249.6582	1,114.4539	192.05705
Slice 32	214.22996	298.83658	0	3,440.975	1,170.1833	201.66099
Slice 33	214.84501	298.79043	0	3,480.6552	1,181.684	203.64313
Slice 34	215.71916	298.72484	0	3,536.9958	1,197.9804	206.4517
Slice 35	216.64335	298.6555	0	3,596.5455	1,215.1639	209.41294
Slice 36	217.76281	298.66077	0	3,517.5499	1,189.9694	205.07084
Slice 37	219.94137	298.71214	0	3,624.4729	1,220.7554	210.37644
Slice 38	222.21467	298.76573	0	3,735.9587	1,252.7134	215.8839
Slice 39	223.40768	298.79386	0	3,794.3988	1,269.4095	218.76118
Slice 40	224.39429	298.81712	0	3,842.767	1,283.1996	221.13745
Slice 41	226.31113	298.86231	0	3,885.84	1,295.4584	223.25003
Slice 42	228.80395	298.92108	0	3,894.8491	1,298.0197	223.69174
Slice 43	235.00654	299.06731	0	3,910.9964	1,302.6087	224.48244
Slice 44	241.18959	299.21309	0	3,923.9476	1,306.2872	225.11638
Slice 45	242.60793	299.24652	0	3,918.261	1,304.6723	224.83804
Slice 46	243.97617	299.27878	0	4,068.6335	1,347.2633	232.17772
Slice 47	245.3913	299.31215	0	4,228.9981	1,392.4298	239.96184
Slice 48	245.90456	299.32425	0	4,207.8229	1,386.4805	238.9365
Slice 49	246.32743	299.33422	0	4,191.8881	1,382.0004	238.16455

Slice 50	246.40298	299.33964	0	4,091.3587	1,358.038	234.03501
Slice 51	248.53442	299.54296	0	4,155.1594	1,376.0817	237.14447
Slice 52	251.25357	299.80233	0	4,220.5901	1,394.544	240.32617
Slice 53	252.24346	299.89676	0	4,243.9383	1,401.1222	241.45945
Slice 54	254.09748	300.07361	0	4,285.4869	1,412.8141	243.47483
Slice 55	256.59323	300.31168	0	4,340.5123	1,428.2741	246.13822
Slice 56	258.06394	300.45197	0	4,372.8055	1,437.3331	247.69974
Slice 57	259.43676	300.58292	0	4,403.0835	1,445.8179	249.16222
Slice 58	261.42821	300.77288	0	4,446.3339	1,457.9236	251.24823
Slice 59	262.7085	300.89501	0	4,473.9974	1,465.6567	252.58164
Slice 60	263.09532	300.93191	0	4,482.0993	1,467.921	252.97112
Slice 61	263.31012	300.9524	0	4,486.4589	1,469.139	253.18085
Slice 62	264.08225	301.02605	0	4,503.2475	1,473.8267	253.98921
Slice 63	264.90464	301.1045	0	4,521.1461	1,478.8218	254.85027
Slice 64	265.71328	301.18163	0	4,538.6805	1,483.7136	255.6922
Slice 65	268.54557	301.58257	0	4,468.7438	1,484.5341	255.83489
Slice 66	270.72515	301.92712	0	4,497.3659	1,492.6422	257.23075
Slice 67	271.61088	302.06714	0	4,508.7322	1,495.8598	257.78479
Slice 68	272.51257	302.20967	0	4,520.3186	1,499.1373	258.35063
Slice 69	273.65119	302.38967	0	4,535.1677	1,503.3369	259.07437
Slice 70	275.95411	302.75371	0	4,565.0889	1,511.7931	260.53187
Slice 71	278.16005	303.10243	0	4,593.4786	1,519.8089	261.91338
Slice 72	279.74898	303.3536	0	4,613.5546	1,525.4738	262.8888
Slice 73	281.06596	303.56179	0	4,629.8491	1,530.0682	263.68073
Slice 74	282.07367	303.72109	0	4,641.978	1,533.4856	264.27086
Slice 75	282.73858	303.8262	0	4,649.627	1,535.6413	264.64177
Slice 76	283.2222	303.90265	0	4,655.24	1,537.2221	264.91458
Slice 77	283.9032	304.0103	0	4,663.1428	1,539.4484	265.29763
Slice 78	284.6452	304.1276	0	4,671.6539	1,541.8452	265.7102
Slice 79	285.02455	304.18756	0	4,676.0826	1,543.0919	265.92508
Slice 80	285.71062	304.29602	0	4,684.0506	1,545.3336	266.31243
Slice 81	287.38174	304.56019	0	4,701.022	1,550.1084	267.13523
Slice 82	289.1818	304.84474	0	4,717.9973	1,554.8821	267.95752
Slice 83	290.24847	305.01336	0	4,728.0551	1,557.7082	268.44559
Slice 84	291.16386	305.15806	0	4,736.6922	1,560.136	268.86292
Slice 85	291.77749	305.25507	0	4,742.3376	1,561.7214	269.13687
Slice 86	291.94198	305.28107	0	4,743.9062	1,562.1624	269.21235
Slice 87	292.05763	305.29935	0	4,745.1062	1,562.4996	269.27035
Slice 88	292.20214	305.34893	0	4,232.0355	1,617.3043	278.71496
Slice 89	292.35984	305.42	0	4,174.6539	2,410.2376	100
Slice 90	292.66629	305.55809	0	4,167.6813	2,406.2119	100
Slice 91	293.93018	306.12766	0	4,138.2753	2,389.2344	100
Slice 92	295.82394	306.98107	0	4,094.2666	2,363.8259	100
Slice 93	297.73872	307.84396	0	4,050.1755	2,338.3699	100
Slice 94	299.50321	308.63911	413.76521	4,018.9871	2,166.2359	150
Slice 95	300.47504	309.07706	386.39059	3,995.7324	2,168.7113	150

Slice 96	301.28753	309.44321	363.50442	3,976.69	2,171.0209	150
Slice 97	303.48676	310.43428	301.55596	3,928.5307	2,179.3063	150
Slice 98	306.05357	311.591	229.25388	3,871.5987	2,188.5416	150
Slice 99	307.16413	312.09146	0	3,910.2251	1,469.241	191.95576
Slice 100	307.79534	312.37591	0	3,898.2666	1,465.8432	190.8586
Slice 101	308.64857	312.7195	0	4,030.984	1,503.2104	203.18976
Slice 102	312.48121	314.05916	0	3,903.7014	1,467.3889	191.3561
Slice 103	319.35661	316.46239	0	3,656.8845	1,395.9869	169.2608
Slice 104	323.06678	317.75924	0	3,492.7408	2,016.5349	0
Slice 105	324.60798	318.29795	0	3,449.3459	1,991.4808	0
Slice 106	327.50385	319.46604	0	3,231.1203	1,865.4882	0
Slice 107	329.97076	320.56605	0	3,169.342	1,829.8205	0
Slice 108	335.20045	322.89801	0	3,135.8269	1,810.4705	0
Slice 109	342.41314	326.34554	0	2,982.1417	1,721.7403	0
Slice 110	347.96707	329.2757	0	2,910.8641	1,680.5882	0
Slice 111	350.83267	330.78753	0	2,873.5997	1,659.0735	0
Slice 112	351.52988	331.23697	0	2,721.2162	1,571.0949	0
Slice 113	354.17334	333.02165	0	2,654.9622	1,532.8431	0
Slice 114	357.19838	335.06396	0	2,578.2481	1,488.5523	0
Slice 115	360.17305	337.07225	0	2,497.5278	1,441.9484	0
Slice 116	364.50721	339.99839	0	2,375.524	1,371.5094	0
Slice 117	367.60821	342.09199	0	2,287.0048	1,320.4029	0
Slice 118	371.02059	344.39579	0	2,188.2055	1,263.3611	0
Slice 119	375.09661	347.46098	0	1,926.0819	1,112.0239	0
Slice 120	378.77776	350.73059	0	1,760.4524	1,016.3977	0
Slice 121	385.23096	356.46233	0	1,379.4681	796.43627	0
Slice 122	393.71614	363.99889	0	805.70379	465.1733	0
Slice 123	400.57621	370.1019	0	326.83738	188.69965	0
Slice 124	404.63058	373.71831	0	70.332276	40.606359	0



Appendix C-6

RMU-2 Final Cover Stability

APPENDIX C-6

RMU-2 Final Cover Stability

PREPARED FOR

C W M

PREPARED BY

P.J. Carey & Associates, PC

September 14, 2009

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ATTACHMENTS

- Attachment 1 Stability Calculations
- Attachment 2 Newmark Analysis Output from SHAKE 2000

1 FINAL COVER STABILITY

1.1 INTRODUCTION

Evaluate the stability of the final cover under the following conditions:

(1) Long-Term Stability - using peak and residual shear strengths without construction equipment loadings;

(2) Short-Term Stability - using peak and residual shear strengths with construction equipment loadings; and

(3) Seismic Stability – limiting deformations to 12 inches or less based on accelerations predicted for the design seismic event

As indicated above, analyses for peak and residual strengths are provided for long and short-term analyses. However, given the seismic conditions assume a deformation of 12 inches may occur, large strain values under rapid shearing are the conditions under which the seismic shear strength is defined. The yield acceleration associated with specific yield accelerations was determined by performing Newmark analysis using the results of the SHAKE modeling described in Appendix C-5 as the acceleration time history. It was found that accelerations at the final cover level at Section C resulted in the largest displacements for a given yield acceleration. A constant yield acceleration of 0.043g was found to produce a displacement of 10.45 inches. The output from the program is presented in Attachment 2. This yield acceleration (0.043g) was utilized to determine the required minimum shear strength. The calculation for minimum shear strength, under seismic conditions, is presented in Attachment 1.

1.2 RESULTS

The computations are shown on the attached calculation work sheet and are summarized below.

The required shear strengths under the various conditions are presented below

Condition	Duration	Normal Stress Range (psf)	Shear Strength * ϕ (deg)	Factor of Safety
Static - peak	Long term	0-400	26.6	1.5
Static-residual	Long term	0-400	18.43	1.0
Seismic-large strain	Rapid	0-400	20.9	< 12 in. Displ.
Equipment loading- peak	Short term	0-1000	26.2	1.5
Equipment loading - residual	Short term	0-1000	18.2	1.0

* (shear strength equal to or greater than that described by the friction angle stated within the normal stress range)

ATTACHMENT 1

P.J.Carey & Associates, P.C.

CLIENT CMW

CALCULATION BY PJC

PROJECT RMU-2 Final Cover

CHECKED BY KLCH

JOB No

DATE 8/24/09

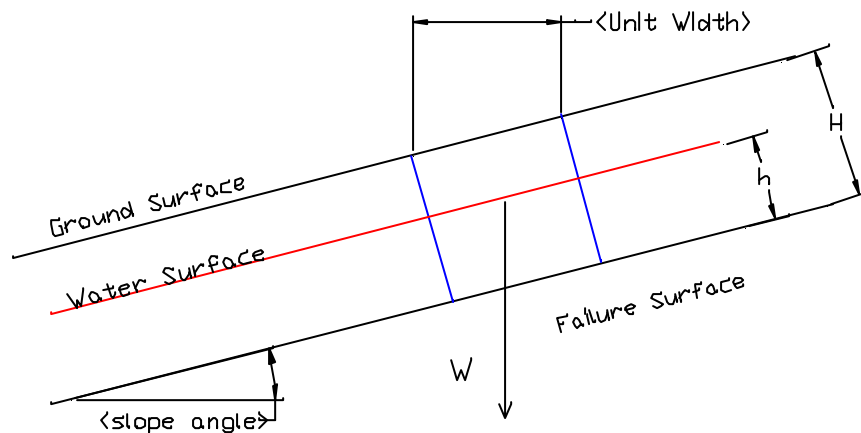
OBJECT : Determine the factor of safety of a landfill slope under static and dynamic conditions using an infinite slope approximation. The following conditions were evaluated.

- (1) Long-Term Stability - using peak and residual shear strengths without construction equipment loadings;
- (2) Seismic Stability - using large displacement rapid shear strength with a horizontal seismic coefficient..
- (3) Short-Term Stability - using peak and residual shear strengths with construction equipment loadings;

General: The stability of a slope where the likely failure plane is nearly parallel to the ground surface and the failure plane is much longer than it is deep can be approximated using an infinite slope analysis. This analysis assumes that an imaginary element with its sides perpendicular to the ground surface is in static equilibrium. The factor of safety against sliding can be expressed as

$$FS = \text{Resisting Forces} / \text{Forces Causing Sliding}$$

In the case of the infinite slope both the resisting forces and the sliding forces are parallel to the ground surface. This is illustrated in the Figure below.



The soils making up the slope have the properties of unit weight and shear strength. The variables are defined as follows

H = the thickness of the soil mass above the failure surface in feet
 h = the height of the water surface (average height) above the failure surface in feet
 β = the angle of inclination between the failure surface and the horizontal in degrees
 γ = the total unit weight of the soil (in the case of H values of less than 5 feet this is equal to the total saturated unit weight) in lbs/ft³
 ϕ = the effective angle of internal friction of the soil or interface at the failure plane in degrees
 c = the effective cohesion of the soil mass or interface at the failure plane in lbs/ft²
 a = the horizontal acceleration (seismic case only) expressed as a multiple of g
 W = weight of the soil and water above the failure surface within the unit width element in lbs
 U = the total water pressure action perpendicular to the failure surface
 N = the total normal stress acting on the failure surface
 c_a = Assumed adhesion in cover system (both peak and residual)
 δ = effective internal friction angle in a residual state (in degrees)

The shear strength of the soil or interface at the failure surface can be expressed as

$$\tau = c + (N-U) \tan \phi, \text{ for drained conditions}$$

For undrained conditions and expression for the undrained shear strength should be developed on a case by case basis.

At the RMU-2 Site the final cover system consists of the following, in ascending order

1. Subbase
2. GCL
3. 40 Mil HDPE textured FML
4. Double sided geocomposite Drain
5. Protective soil layer and topsoil, 24 inches thick

The total thickness of the final cover section is 24.5 inches

The geocomposite drain is designed to eliminate any significant head build up (less than 1/4 inch). Therefore no water head will build up over the FML. The weakest interface within the system will be located between the FML and the materials on either side of it. The analysis below determines the minimum shear strength properties needed.

Static Analysis

Under static conditions the driving forces can be expressed as

$$DF = W \sin \beta.$$

Resisting forces can be expressed as

$$RF = c + (W \cos \beta - U) \tan \phi$$

$$\text{Where } W = 1 \times H \times \gamma \text{ and } U = h \times 62.4$$

Assigning values to the problem

$$\beta := 18.43 \text{ deg} \quad \gamma := 125 \frac{\text{lb}}{\text{ft}^3} \quad H := \frac{24.5}{12} \text{ ft} \quad h := 0 \text{ ft} \quad \phi := 26.6 \text{ deg} \quad c := 0 \text{ psf} \quad c_a := 0 \text{ psf}$$

The Factor of Safety, using peak shear strengths can then be expressed as

$$\frac{c \cdot 1\text{ft}^2 + \left(\gamma \cdot 1\text{ft}^2 \cdot H \cdot \cos(\beta) - 62.4 \frac{\text{lb}}{\text{ft}^3} \cdot 1\text{ft}^2 \cdot h \right) \cdot \tan(\phi)}{\gamma \cdot 1\text{ft}^2 \cdot H \cdot \sin(\beta)} = 1.503$$

for a factor of safety of 1 under residual conditions, assuming no cohesion, using the built in solving routine

$$\text{FS}(\delta) := \frac{c_a \cdot 1\text{ft}^2 + \left(\gamma \cdot 1\text{ft}^2 \cdot H \cdot \cos(\beta) - 62.4 \frac{\text{lb}}{\text{ft}^3} \cdot 1\text{ft}^2 \cdot h \right) \cdot \tan(\delta)}{\gamma \cdot 1\text{ft}^2 \cdot H \cdot \sin(\beta)}$$

Given

$$\text{FS}(\delta) = 1 \quad \delta_r := \text{Find}(\delta)$$

$\delta_r = 18.43 \cdot \text{deg}$ identifies a residual strength for a factor of safety of 1 under static conditions

Seismic Analysis: Under seismic conditions the yield acceleration, defined as that acceleration that results in a pseudo-static factor of safety of 1, can also be determined using an infinite slope analysis. The analysis is modified to include the impact of a horizontal force equal to the mass of the infinite slope multiplied by the horizontal acceleration of gravity. This force increases the driving force while decreasing the resisting force. The modified expression is shown below. The lateral acceleration is expressed as a multiplier of g as the variable a.

$$\text{FS}(\phi_s) := \frac{c \cdot 1\text{ft}^2 + \left[\gamma \cdot 1\text{ft}^2 \cdot H \cdot (\cos(\beta) - a \cdot \sin(\beta)) - 62.4 \frac{\text{lb}}{\text{ft}^3} \cdot 1\text{ft}^2 \cdot h \right] \cdot \tan(\phi_s)}{\gamma \cdot 1\text{ft}^2 \cdot H \cdot (\sin(\beta) + a \cdot \cos(\beta))}$$

The State of NY DEC guidance require that the displacement of the final cover following the design seismic event cannot exceed 12 inches. The program SHAKE 2000 contains a Newmark analysis calculator. The acceleration time histories at the final cover level were examined and section C was found to produce the greatest displacement for a given yield acceleration. The yield acceleration was varied until the displacement approached 12 inches. A yield acceleration of 0.043g was found to produce a displacement of 10.4 inches. The calculated ϕ equivalent to describe the shear strength is presented below. See Attachment 2 for the SHAKE 2000 Newmark Analysis.

Using the solve block for determining the phi of the cap required for yield acceleration of 0.043g, consistent with the SHAKE 2000 analysis

$$a := 0.043$$

and setting the factor of safety to 1.0

$$FS(\phi_s) := \frac{c \cdot 1\text{ft}^2 + \left[\gamma \cdot 1\text{ft}^2 \cdot H \cdot (\cos(\beta) - a \cdot \sin(\beta)) - 62.4 \frac{\text{lb}}{\text{ft}^3} \cdot 1\text{ft}^2 \cdot h \right] \cdot \tan(\phi_s)}{\gamma \cdot 1\text{ft}^2 \cdot H \cdot (\sin(\beta) + a \cdot \cos(\beta))}$$

Given

$$FS(\phi_s) = 1.0$$

Find(ϕ_s) = 20.892·deg the required shear strength to limit displacement to less than 12 inches.

Static Stability with added Equipment Loads

The short-term stability with equipment loads accounts for the weight for the equipment by using an influence factor to the active wedge to the total weight of the active wedge, W_A . It also, adds the weight for the equipment taking into account an influence factor to the effective normal to the failure plane of the active wedge, N_A . This calculation is performed as follows:

Additional Variables:

L = Length of slope measured along the geomembrane

W_b = Equipment weight

w = Length of each equipment track

b = Width of each equipment track

q = Equipment ground pressure (weight of equipment/(2wb))

I = Influence factor at geomembrane interface

a = Acceleration/deceleration of the bulldozer

W_e = Equivalent equipment force per unit width at the geomembrane interface

W_{A1} = Modified total weight of the active wedge

W_p = Total weight of the passive wedge

N_{A1} = Modified effective force normal to the failure plane of the active wedge

The analysis is done for an 18 inch thick lift of soils during construction of the protective layer

$$W_b := 38400\text{lb} \quad w := 10\text{ft} \quad b := 3\text{ft} \quad I := 0.97 \quad a := 0g \quad L := 112\text{ft}$$

$$c_a = 0 \quad c = 0 \quad \delta := 18.2\text{deg} \quad H := 18\text{in} \quad \phi := 26.2\text{deg}$$

$$q := \frac{W_b}{(2 \cdot w \cdot b)} = 640 \frac{\text{lb}}{\text{ft}^2}$$

$$W_e := q \cdot w \cdot I = 6208 \frac{\text{lb}}{\text{ft}}$$

$$W_A := \gamma \cdot H^2 \cdot \left(\frac{L}{H} - \frac{1}{\sin(\beta)} - \frac{\tan(\beta)}{2} \right) = 2.006 \times 10^4 \frac{\text{lb}}{\text{ft}} \quad N_A := W_A \cdot \cos(\beta)$$

$$W_{A1} := W_e + W_A = 2.627 \times 10^4 \frac{\text{lb}}{\text{ft}}$$

$$W_p := \frac{\gamma \cdot H^2}{\sin(2\beta)} = 468.858 \frac{\text{lb}}{\text{ft}}$$

$$N_{A1} := W_e \cdot \cos(\beta) + N_A = 2.492 \times 10^4 \frac{\text{lb}}{\text{ft}}$$

where W_{A1} is the total weight of the modified active wedge, N_{A1} is the effective force nonnal to the failure plane of the active wedge, W_p is the weight of the passive wedge, E_A is the interwedge force acting on the active wedge from the passive wedge, E_p is the interwedge force acting on the passive wedge from the active wedge, and FS is the factor of safety. By setting $E_A = E_p$, the factor of safety can be calculated as follows, for peak strength conditions:

$$E_a(FS_{\text{equip}}) := \frac{FS_{\text{equip}} \cdot (W_{A1} - N_{A1} \cdot \cos(\beta)) - (N_{A1} \cdot \tan(\phi) + c_a) \cdot \sin(\beta)}{\sin(\beta) \cdot FS_{\text{equip}}}$$

$$E_p(FS_{\text{equip}}) := \frac{c_a + W_p \cdot \tan(\phi)}{\cos(\beta) \cdot FS_{\text{equip}} - \sin(\beta) \cdot \tan(\phi)}$$

note that δ can be substituted for ϕ for residual strength conditions. Using the solving routing for the peak and residual conditions

$$FS_{\text{equip}} := 1.5 \quad \text{for static conditions}$$

Given

$$E_a(FS_{\text{equip}}) = E_p(FS_{\text{equip}})$$

$$\text{Find}(FS_{\text{equip}}) = 1.509 \quad \text{requiring a } \phi \text{ of } 26.2 \text{ deg for peak}$$

For residual conditions :

$$E_a(FS_{\text{equip}}) := \frac{FS_{\text{equip}} \cdot (W_{A1} - N_{A1} \cdot \cos(\beta)) - (N_{A1} \cdot \tan(\delta) + c_a) \cdot \sin(\beta)}{\sin(\beta) \cdot FS_{\text{equip}}}$$

$$E_p(FS_{\text{equip}}) := \frac{c_a + W_p \cdot \tan(\delta)}{\cos(\beta) \cdot FS_{\text{equip}} - \sin(\beta) \cdot \tan(\delta)} \quad \delta = 18.2 \cdot \text{deg}$$

$$FS_{\text{equip}} := 1.0 \quad \text{for residual strength conditions}$$

Given

$$E_a(FS_{\text{equip}}) = E_p(FS_{\text{equip}})$$

$\text{Find}(FS_{\text{equip}}) = 1.009$ requiring a δ of 18.2 deg for residual conditions

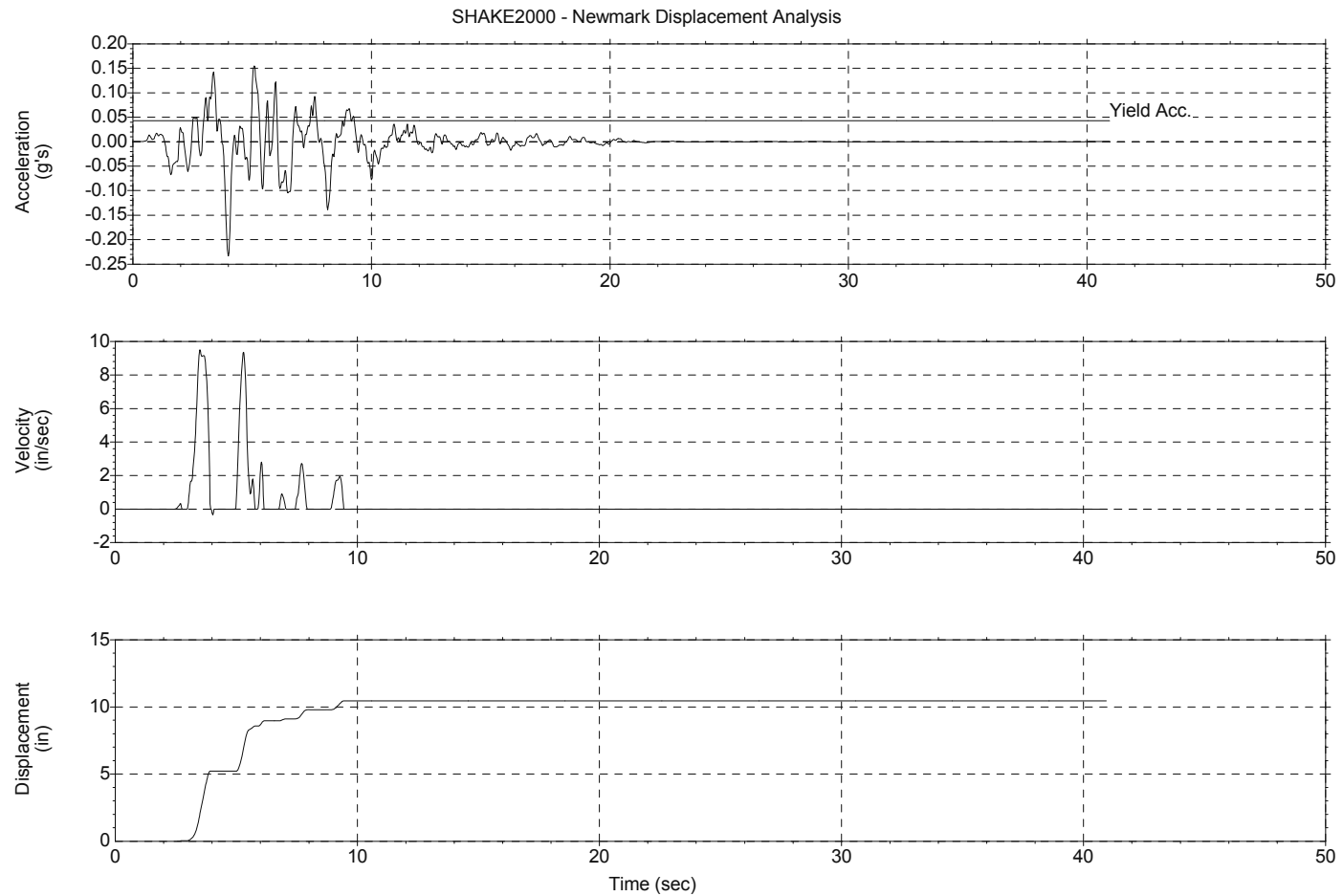
Notes:

- (1) The above calculations are based on "Analysis and Design of Veneer Cover Soils" by R.M. Koerner and Te-Yang Soong, published in Sixth International Conference on Geosynthetics (1998).
- (2) The above calculation does not account for acceleration/deceleration of the bulldozer.
- (3) The Influence Factor, I , is estimated from Figure 7 of the above reference.
- (4) The friction angle of the cover soil, the minimum interface friction angle of the cover soil, and equipment weight are assumed input parameters.

References:

1. Bray, Rathje, Augello and Merry, "Simplified Seismic Design Procedure for Geosynthetic Lined, Solid Waste Landfills", Geosynthetics International, 1998, Volume 5 Nos. 1-2 pg 203.
2. Koerner and Soong "Analysis and Design of Veneer Cover Soils", published in Sixth International Conference on Geosynthetics (1998).

ATTACHMENT 2



Notes:

Displacement Analysis - Newmark Method
Project: SHAKE2000 - Newmark Displacement Analysis

Newmark Method by Houston et.al. (1987)
Constant Yield Acceleration: .043 (g)

Acceleration Time History:
Acceleration Time History File: C:\Program Files\SHAKE2000\RMU2Final\newmark\SC-M1.ahl
Peak Acceleration Value: .23339 (g)
Upslope Movement Included for Static Factor of Safety: 1.5
Acceleration due to gravity: 386.4 (in/sec²)

Displacement computed: 10.44097 in



Appendix C-7

Liquefaction Analysis



Imagine the result

Calculation Sheet

Client: CWM Chemical Services, LLC

Project Location: Model City, New York

Project: RMU-2 Design Calculations

Project No.: B0023725.2009

Subject: Appendix C-7: Liquefaction Analysis

Prepared By: JPT

Date: August 2009

Reviewed By: APC

Date: August 2009

Checked By: BMS

Date: August 2009

OBJECTIVE:

Evaluate the potential for the underlying Glaciolacustrine Clay and Silt/Sand units to liquefy during seismic activity.

REFERENCES:

1. *Seismic Analysis and Design Considerations for Municipal Solid Waste Landfills*, NYASWM, NYSDEC, and USEPA, Saratoga Springs, March 1994 (Attachment 1).
2. *Seismic Hazard Evaluation*, prepared for CWM Chemical Services, LLC, Model City, New York by Geoscience Services, February 22, 1993.
3. *1993 Hydrogeologic Characterization Update, Model City TSDR Facility, Model City, New York*, Golder Associates, Inc., June 1993.
4. *Engineering Report for CWM Chemical Services, LLC Model City Facility, Residuals Management Unit-1*, Earth Tech.
5. *RMU-2 Engineering Report*, ARCADIS, August 2009.
6. Figure entitled "Glaciolacustrine Silt/Sand Unit Potentiometric Contour Map May 15, 2001," prepared by Golder Associates, Inc. (Golder), January 2002 (included as Appendix B in the RMU-2 Engineering Report).
7. Figure entitled "Glaciolacustrine Silt/Sand Unit Potentiometric Surface Contours October 2004," prepared by Golder, January 2005 (included as Appendix B to the RMU-2 Engineering Report).
8. *Letter Report on Geotechnical Investigation for Proposed Residuals Management Unit Number 2 Western Expansion Area Model City TSD Facility, Model City, New York*, prepared by Golder Associates, December 18, 2002 (included as Appendix A-2 to the RMU-2 Engineering Report).
9. United States National Seismic Hazard Maps, USGS, 2008. Available online at: <http://earthquake.usgs.gov/research/hazmaps/>.

Calculation Sheet

ASSUMPTIONS:

- The following parameters are assumed for the analysis provided below in Table 1:

Table 1 - Parameters used in calculation

Parameter	Symbol	Value
Unit Weight of Final Cover (Reference 4 & 5)	γ_{cover}	130 pcf
Unit Weight of Waste (Reference 4)	γ_{waste}	111 pcf
Unit Weight of Base Liner System (Reference 4 & 5)	γ_{base}	130 pcf
Unit Weight of Till (Reference 4)	γ_{till}	130 pcf
Unit Weight of Glaciolacustrine Clay (References 3 & 4)	γ_{Gclay}	125 pcf
Unit Weight of Glaciolacustrine Silt/Sand (Reference 4)	$\gamma_{Gs/s}$	130 pcf
Unit Weight of Water	γ_{water}	62.4 pcf
Thickness of Final Cover (Reference 5)	t_{cover}	2.5 ft
Maximum Waste Thickness (Reference 5)	H_{waste}	124 ft
Thickness of Base Liner System (Reference 5)	t_{base}	6.0 ft
Average Thickness of Upper Till (Reference 8)	t_{till}	15.7 ft
Average Thickness of Glaciolacustrine Clay (Reference 8)	t_{Gclay}	14.5 ft
Average Thickness of Glaciolacustrine Silt/Sand (Reference 8)	$t_{Gs/s}$	7.5 ft

- Based on a maximum potentiometric surface of 316.5 ft (References 6 and 7) for the confined aquifer and an average top of Glaciolacustrine Silt/Sand elevation of 287.8 ft (References 3 and 8), the pressure head is assumed to be 28.7 ft.

CALCULATIONS:

Consistent with Reference 1 (Section 5), the liquefaction analysis is performed using the following procedure:

- Evaluate five screening criteria to determine the potential for liquefaction of underlying soil (i.e., Glaciolacustrine Clay and Silt/Sand):**
 - Geologic age and origin - The underlying Glaciolacustrine soils are deposits from the Late Wisconsin age (Reference 3), which is within the Pleistocene epoch. Based on Table 5.1 (Attachment 1), the likelihood of liquefaction based on the age of the deposit is low for both the Glaciolacustrine Clay and Glaciolacustrine Silt/Sand layers.
 - Fines content and plasticity - Clayey soils having less than 15% (by weight) finer than 0.005 mm, a liquid limit below 35, and an in-situ water content less than 0.9 times the liquid limit generally do not liquefy. Also, if the clay content is greater than 20%, the soil will not liquefy unless it is extremely sensitive. Although the Glaciolacustrine Clay has a clay content ranging from 20 to 70%, the clay does have the potential to liquefy because of its water content, as indicated by the water content data from Reference 8. Since the available grain-size information for the Glaciolacustrine Silt/Sand only consists of physical descriptions, it is conservatively assumed here that potential does exist for liquefaction of the silt/sand layer.
 - Saturation - For liquefaction to occur, complete saturation is required. The Glaciolacustrine Clay lies above a Glaciolacustrine Silt/Sand layer that is a confined aquifer. Therefore, the Glaciolacustrine Silt/Sand layer is saturated. It is assumed herein that due to the pressures existing in the confined

Calculation Sheet

aquifer, the Glaciolacustrine Clay layer may also be saturated.

4. Depth below ground surface - Liquefaction does not generally occur past 50 ft below the ground surface. Both the silt/sand layer and clay layer occur above 50 ft below the ground surface.
5. Soil penetration resistance - Liquefaction does not generally occur in deposits with Standard Penetration Test (SPT) N values larger than 22. The silt/sand layer SPT N-values range from 10 to greater than 50 on borings provided in References 3 and 8, with the majority of the values greater than 30. Therefore, based on SPT N-values, the silt/sand layer is not likely to liquefy. According to this criterion, there is potential for liquefaction of the Glaciolacustrine Clay unit since the N-values are generally all below 22 (References 3 and 8).

If three or more of the above criteria indicate that liquefaction is not likely, the potential for liquefaction can be dismissed. For the Glaciolacustrine Silt/Sand, only Criteria 1 and 5 indicate that the potential for liquefaction is not likely; therefore, the Simplified Procedure detailed in Attachment A is required to further assess the liquefaction potential of the Glaciolacustrine Silt/Sand. Similarly, for the Glaciolacustrine Clay, only Criterion 1 indicates that liquefaction is not likely; therefore, further analysis using the Simplified Procedure is required to assess the liquefaction potential.

- **Apply the Simplified Procedure to the Glaciolacustrine Silt/Sand:**

1. Determine the standardized SPT blowcount, N_{60} . For the silt/sand layer, a typical blowcount (i.e., mean value) of 30 is used for the analysis.
2. Determine the water pressure, u ; total vertical stress, σ_o ; and vertical effective stress, σ_o^1 , in the soil at the time of sampling and for design at the midpoint of the silt/sand layer. Using the parameters provided in the assumptions, the total and effective stresses are calculated as follows:

$$\sigma_o(\text{sampling}) = \gamma_{\text{till}} t_{\text{till}} + \gamma_{\text{Gclay}} t_{\text{Gclay}} + \gamma_{\text{Gs/s}} (0.5 t_{\text{Gs/s}}) = 4,341 \text{ psf} = 2.17 \text{ tsf}$$

$$u = (28.7 + 0.5 t_{\text{Gs/s}}) \gamma_{\text{water}} = 2,025 \text{ psf} = 1.01 \text{ tsf}$$

$$\sigma_o^1(\text{sampling}) = \sigma_o(\text{sampling}) - u = 2,316 \text{ psf} = 1.16 \text{ tsf}$$

$$\sigma_o(\text{design}) = \gamma_{\text{cover}} t_{\text{cover}} + \gamma_{\text{waste}} H_{\text{waste}} + \gamma_{\text{base}} t_{\text{base}} + \gamma_{\text{till}} (t_{\text{till}} - t_{\text{base}}) + \gamma_{\text{Gclay}} t_{\text{Gclay}} + \gamma_{\text{Gs/s}} (0.5 t_{\text{Gs/s}})$$

$$\sigma_o(\text{design}) = 18,420 \text{ psf} = 9.21 \text{ tsf}$$

$$\sigma_o^1(\text{design}) = \sigma_o(\text{design}) - u = 16,400 \text{ psf} = 8.20 \text{ tsf}$$

Calculation Sheet

3. Calculate the normalized standardized SPT blowcount, $(N_1)_{60}$. The normalized standardized blowcount normalizes N to an effective overburden pressure of 1 tsf to eliminate the influence of confining pressure and is calculated as follows:

$$(N_1)_{60} = N_{60} C_N$$

$$C_N = \sqrt{\frac{1}{\sigma_o^1(sampling)}}$$

$$C_N = 0.93$$

$$(N_1)_{60} = 30(0.93) = 27.9$$

4. Determine the critical stress ratio, CSR, at which liquefaction is expected to occur during an earthquake of magnitude 7.5 using Figure 5.4 (Attachment 1). Assuming that the average fines content is less than 5% based on the sandy nature of the material (conservative assumption), the CSR is 0.35.

5. Calculate the corrected critical stress ratio, CSR_L , using the following correction factors:

- K_M : correction factor for earthquake magnitudes other than 7.5 as shown on Figure 5.5 (Attachment 1);
- K_α : correction factor for non-level ground conditions; and
- CSR_L is calculated as: $CSR_L = CSR * K_M * K_\alpha$.

Based on References 2 and 9, the design seismic event has a maximum acceleration of 0.12g. This acceleration is expected for a magnitude 5.6 earthquake. Therefore, a value for K_M of 1.42 was selected from Figure 5.5 (Attachment 1). K_α is assumed to be 1.0. Therefore, the CSR_L is 0.50.

6. Determine the stress reduction factor, r_d , defined as the ratio of the dynamic shear stress in the deformable soil column to that in a rigid body. There are several ways to determine r_d . For depths less than 40 ft, the average values from Figure 5.7 (Attachment 1) can be used. For a depth of 30.2 ft (15.7 ft [average] of Upper Till plus 14.5 ft [average] of Glaciolacustrine Clay), $r_d = 0.91$.
7. Calculate the critical stress ratio induced by the design earthquake, CSR_{EQ} , for the depths of potential liquefaction as follows:

$$CSR_{EQ} = 0.65 \left(\frac{a_{max}}{g} \right) r_d \left(\frac{\sigma_o'(design)}{\sigma_o'(design)} \right)$$

where a_{max} is assumed to be 0.12g based on References 2 and 9, and the other variables are as defined previously. The resulting CSR_{EQ} is 0.080.

8. Compute a factor of safety against liquefaction, FS_{LIQ} .

Calculation Sheet

$$FS_{LIQ} = \frac{CSR_L}{CSR_{EQ}}$$

$$FS_{LIQ} = 6.23$$

The factor of safety is greater than one; therefore, according to Reference 1 (Attachment 1), the silt/sand layer is not likely to liquefy, and an evaluation of the liquefaction-induced displacement is not necessary. A summary of the above calculations is provided in Attachment 2.

- Apply the Simplified Procedure to the Glaciolacustrine Clay:**

- Determine the standardized SPT blowcount, N_{60} . For the Glaciolacustrine Clay layer, a typical blowcount (i.e., mean value) of 8 is used for the analysis.
- Determine the water pressure, u ; total vertical stress, σ_o ; and vertical effective stress, σ_o^1 , in the soil at the time of sampling and for design at the midpoint of the clay layer. Using the parameters provided in the assumptions, the total and effective stresses are calculated as follows:

$$\sigma_o(\text{sampling}) = \gamma_{till} t_{till} + 0.5(\gamma_{Gclay} t_{Gclay}) = 2,947 \text{ sf} = 1.47 \text{ tsf}$$

$$u = (28.7 - 0.5 t_{Gclay}) \gamma_{water} = 1,338 \text{ psf} = 0.67 \text{ tsf}$$

$$\sigma_o^1(\text{sampling}) = \sigma_o(\text{sampling}) - u = 1,609 \text{ psf} = 0.81 \text{ tsf}$$

$$\sigma_o(\text{design}) = \gamma_{cover} t_{cover} + \gamma_{waste} H_{waste} + \gamma_{base} t_{base} + \gamma_{till} (t_{till} - t_{base}) + 0.5(\gamma_{Gclay} t_{Gclay})$$

$$\sigma_o(\text{design}) = 17,020 \text{ psf} = 8.51 \text{ tsf}$$

$$\sigma_o^1(\text{design}) = \sigma_o(\text{design}) - u = 15,680 \text{ psf} = 7.84 \text{ tsf}$$

- Calculate the normalized standardized SPT blowcount, $(N_1)_{60}$. The normalized standardized blowcount normalizes N to an effective overburden pressure of 1 tsf to eliminate the influence of confining pressure and is calculated as follows:

$$(N_1)_{60} = N_{60} C_N$$

$$C_N = \sqrt{\frac{1}{\sigma_o^1(\text{sampling})}}$$

$$C_N = 1.1$$

$$(N_1)_{60} = 8(1.1) = 8.8$$

- Determine the critical stress ratio, CSR , at which liquefaction is expected to occur during an earthquake of magnitude 7.5 using Figure 5.4 (Attachment 1). Assuming that the average fines content is 35%, the CSR is 0.15.
- Calculate the corrected critical stress ratio, CSR_L , using the following correction factors:



Imagine the result

Calculation Sheet

- K_M : correction factor for earthquake magnitudes other than 7.5 as shown on Figure 5.5 (Attachment 1);
- K_α : correction factor for non-level ground conditions; and
- CSR_L is calculated as: $CSR_L = CSR * K_M * K_\alpha$.

Based on References 2 and 9, the design seismic event has a maximum acceleration of 0.12g. This acceleration is expected for a magnitude 5.6 earthquake, and a value for K_M of 1.42 was selected from Figure 5.5 (Attachment 1). K_α is assumed to be 1.0. Therefore, the CSR_L is 0.21.

- Determine the stress reduction factor, r_d , defined as the ratio of the dynamic shear stress in the deformable soil column to that in a rigid body. There are several ways to determine r_d . For depths less than 40 ft, the average values from Figure 5.7 (Attachment 1) can be used. For a depth of 15.7 ft (15.7 ft [average] thickness of Upper Till), $r_d = 0.97$.
- Calculate the critical stress ratio induced by the design earthquake, CSR_{EQ} , for the depths of potential liquefaction as follows:

$$CSR_{EQ} = 0.65 \left(\frac{a_{max}}{g} \right) r_d \left(\frac{\sigma_o'(design)}{\sigma_o'(design)} \right)$$

where a_{max} is assumed to be 0.12g based on References 2 and 9, and the other variables are as defined previously. The resulting CSR_{EQ} is 0.082.

- Compute a factor of safety against liquefaction, FS_{LIQ} .

$$FS_{LIQ} = \frac{CSR_L}{CSR_{EQ}}$$

$$FS_{LIQ} = 2.59$$

The factor of safety is greater than one; therefore, according to Reference 1, the clay layer is not likely to liquefy, and an evaluation of the liquefaction-induced displacement is not necessary. A summary of the above calculations is provided in Attachment 3.

SUMMARY:

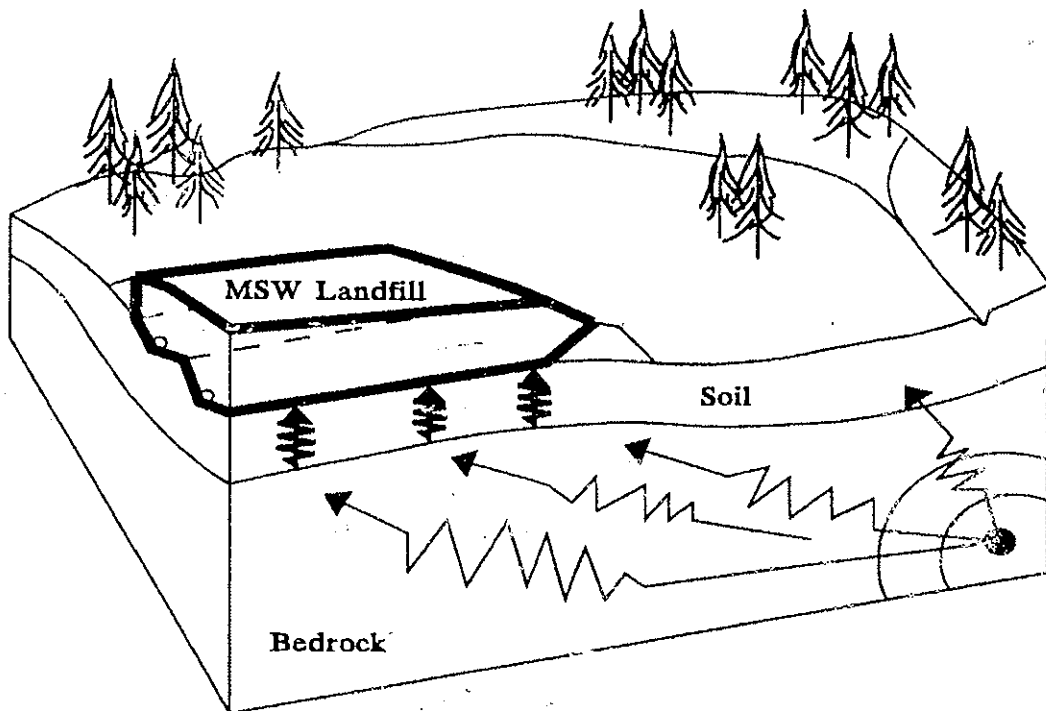
Based on the screening criteria and the simplified method described in Reference 1, neither the Glaciolacustrine Clay nor the Glaciolacustrine Silt/Sand are likely to liquefy.



Attachment 1

Reference 1

Seismic Analysis and Design Considerations For Municipal Solid Waste Landfills



March 2-3, 1994
Sheraton Saratoga Springs
Hotel and Conference Center
Saratoga Springs, New York

Seismic Analysis and Design Considerations For Municipal Solid Waste Landfills

Sponsored by the
New York Association
for Solid Waste Management



In cooperation with the
New York State
Department of Environmental Conservation



and the
United States Environmental Protection
Agency



March 2-3, 1994

Sheraton Saratoga Springs
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Saratoga Springs, New York

from "Seismic Analysis and Design Considerations for
Municipal Solid Waste Landfills," NYASWH, NYSDEC, and
USEPA, Saratoga Springs, March 1994.

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SECTION 5

258.14 SEISMIC IMPACT ZONES: LIQUEFACTION ANALYSIS

During strong earthquakes, the shaking of the ground may cause a loss of strength or stiffness of loose saturated soil deposits that could result in large permanent displacements of a landfill. The process leading to this loss of strength in granular soils is called liquefaction. Liquefaction is the loss of soil strength resulting from the increase in pore water pressure. The increased pore water pressure results from volumetric strains caused by the cyclic stresses applied by the earthquake shaking. Liquefaction beneath and in the vicinity of a MSWLF can produce localized ground failures and excessive settlements that may damage landfill liner and cover systems. Additionally, liquefaction induced lateral spreading or flow failure may reduce the global stability of the landfill. The assessment of liquefaction potential is therefore a key element in the seismic design of landfills.

This section provides a review of criteria used to evaluate the potential for liquefaction and potential displacements at a given site, and provides example evaluations for such considerations. Advanced methods for liquefaction assessments and potential remediation procedures to improve the liquefaction resistance of a site are briefly discussed in this section.

5.1 Liquefaction Screening Criteria

The first step in the liquefaction evaluation is to determine if the potential for liquefaction exists at the site. The following five screening criteria are most commonly used:

- *Geologic age and origin.* The potential for liquefaction decreases with increasing age of the soil deposit. Table 5.1 presents the liquefaction susceptibility of soil deposits as a function of geologic age and origin (Youd and Perkins, 1978).
- *Fines content and plasticity.* The potential for liquefaction decreases with increasing fines content and increasing plasticity of the soil. For cohesionless soils, the grain size distributions having a higher risk of liquefaction are shown in Figure 5.1 (Ishihara et al., 1989). Clayey soils having less than 15% (by weight) finer than 0.005 mm (e.g., clay size), a liquid limit below 35 percent, and an in-situ water content less than 0.9 times the liquid limit generally do not

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liquefy (Seed and Idriss, 1982). If the clay content is greater than 20% the soil will not liquefy unless it is extremely sensitive (Seed and Idriss, 1982).

- *Saturation.* Full saturation is generally deemed to be a necessary condition for soil liquefaction. In performing the liquefaction analysis, the seasonal high water table evaluation should be used.
- *Depth below ground surface.* Liquefaction is generally not likely to occur more than 50 ft (15 m) below the ground surface.
- *Soil penetration resistance.* Seed et al. (1985) indicate that liquefaction has not been observed in soil deposits having a normalized Standard Penetration Test (SPT) blowcount, N , larger than 22 (see Figure 5.4). Marcuson et al. (1990) suggest an SPT value of 30 as the threshold. In a similar manner, it has been shown that no liquefaction will occur if the normalized Cone Penetration Test (CPT) cone resistance, q_c , is larger than 157 tsf (15 MPa) (Shibata and Taparaska, 1988).

Liquefaction susceptibility maps based on some (or all) of the above screening criteria have been developed for many major urban areas (e.g. Kavazanjian et al., 1985; Tinsley et al., 1985; Hadj-Hamou and Elton, 1988; Hwang and Lee, 1992). However, such maps are not likely to be available for many existing or potential MSWLF sites. If three or more of the above criteria indicate that liquefaction is not likely, the potential for liquefaction can be dismissed. Otherwise a more rigorous analysis of the liquefaction potential at the site is required.

5.2 Liquefaction Potential Assessment

Due to the difficulties associated with obtaining an undisturbed sample of the loose cohesionless soils that typify deposits having a high liquefaction potential, the use of in-situ tests to evaluate the liquefaction potential is preferred among practicing engineers. Liquefaction potential assessment procedures involving both SPT and CPT are widely used in practice and will be discussed in this Section.

The most common procedure used in practice for liquefaction potential assessment, the *Simplified Procedure*, was developed by Seed and Idriss (1982) and has been progressively revised and refined. The Simplified Procedure may be used with both CPT and SPT data. Recent summaries of the various revisions are provided by Marcuson et al. (1990) and by Seed

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and Harder (1990). Based on recommendations from these two studies, the Simplified Procedure for evaluating the liquefaction potential at the site of a MSWLF can be carried out in the following steps:

Step 1: Compute the cyclic stress ratio required to liquify the strata

- Step 1.1:** From in-situ testing and laboratory index tests, develop a detailed understanding of site conditions: stratigraphy, layer geometry, material properties and their variability, and the areal extent of potential problem zones. Determine the most critical zones to be analyzed and develop simplified sections amenable to analyses. The data should include the location of water tables, SPT blowcount, N , or tip resistance of a standard CPT cone, q_c , unit weights for all soil strata, and the mean grain size, D_{50} , and percentage of fines for those soil layers having a liquefaction potential.
- Step 1.2:** Determine the *standardized* SPT blowcount, N_{60} , defined as the standard penetration test blowcount for a hammer with an efficiency of 60 percent. The "standardized" equipment corresponding to an efficiency of 60 percent is specified on Table 5.2. If nonstandard equipment is used in the SPT, then N_{60} is determined as $N_{60} = N \cdot C_{60}$, where C_{60} is the product of the correction factors outlined on Table 5.3. Alternatively, if CPT data are used, N_{60} can be determined from the chart relating N_{60} to q_c and D_{50} shown on Figure 5.2 (Seed and De Alba, 1986).
- Step 1.3:** Determine the total vertical stress, σ_o , and vertical effective stress, σ_o' , in the deposit at the time of exploration and for design. The exploration and design values may be the same if the anticipated seasonal high water table existed at the time of the field exploration.
- Step 1.4:** Calculate the normalized standardized SPT blowcount, $(N_1)_{60}$. The normalized standardized blowcount normalizes N to an effective overburden pressure of 1 tsf to eliminate the influence of confining pressure. The normalized-standardized blowcount is calculated as $(N_1)_{60} = N_{60} \cdot C_N$ is the correction factor for effective overburden pressure shown on Figure 5.3 (Seed et al., 1983). C_N may also be calculated using the following closed form expression proposed by Liao and Whitman (1986): $C_N = (1/\sigma_o')^{1/2}$, where σ_o' equals the vertical effective stress during sampling in tsf.

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Step 1.5: Determine the critical stress ratio, CSR, at which liquefaction is expected to occur during an earthquake of magnitude 7.5 using the chart on Figure 5.4.

Step 1.6: Calculate the *corrected* critical stress ratio, CSR_L , using the following correction factors:

- K_M ; correction factor for earthquake magnitudes other than 7.5 as shown on Figure 5.5 as developed from tabular data presented by Seed et al (1983);
- K_α ; correction factor for non-level ground conditions given on Figure 5.6; and
- CSR_L is calculated as: $CSR_L = CSR \cdot K_M \cdot K_\alpha$.

Step 2: Compute the critical stress ratio, CSR_{EQ} , resulting from the earthquake:

Step 2.1: Determine the stress reduction factor, r_d , defined as the ratio of the dynamic shear stress in the deformable soil column to that in a rigid body. There are several ways to determine r_d . For depths less than 40 ft (12 m), the average values from Figure 5.7 can be used. Alternatively, for depths below the surface up to 1,000 ft (300 m), the following equation proposed by Iwasaki et al. (1978) can be used: $r_d = 1 - 0.015 D$, where D is in meters. Additionally, r_d can be calculated using the results of a site response analysis (e.g., a SHAKE analysis as described in Section 4.1.2). Here the value of r_d at any depth D can be calculated as $r_d = [(\tau_{max})_{@depth=D}] / [(\sigma_o)_{depth=D} \cdot (a_{max}/g)]$, where a_{max} is the peak ground surface acceleration and g is the acceleration of gravity.

Step 2.2: Calculate the critical stress ratio induced by the design earthquake, CSR_{EQ} , for the depths of potential liquefaction as follows:

$$CSR_{EQ} = 0.65 (a_{max}/g) \cdot r_d \cdot (\sigma_o / \sigma_o')$$

DRAFT**Step 3: Compute a factor of safety against liquefaction, FS_{LIQ}**

$$FS_{LIQ} = CSR_L / CSR_{EQ}$$

This procedure must be repeated for each suspected strata beneath the proposed MSWLF. Currently there is no general agreement on the appropriate minimum value of FS_{LIQ} . However, when the design ground motion is extreme or conservative (such as the 250 year, 90% no exceedence event), most geotechnical engineers are content with a safety factor of 1.0.

It should be noted that the Simplified Procedure is intended for moderately strong ground motions, $a_{max} < 0.75$ g. If the design peak ground motion acceleration is larger than 0.75 g, then more sophisticated analytical approaches should be considered.

5.3 Liquefaction Induced Displacements

For the soil layers having FS_{LIQ} , less than one, an evaluation of the liquefaction induced displacements should be performed if the site is still to be considered. Depending on the site's geometry and ground surface inclination, the displacement analysis may consist of the following steps:

Step 1: Determine vertical settlements due to liquefaction

The vertical settlements resulting from liquefaction of saturated sands can be estimated by multiplying the thickness of the liquefiable soil layer by the liquefaction induced volumetric strain, ϵ_v . The volumetric strain can be estimated from the chart presented in Figure 5.8 (Tokimatsu and Seed, 1987). The magnitude of liquefaction induced seismic settlements should be calculated at each boring or CPT sounding to evaluate the potential variability in such settlements across the site.

Step 2: Estimate lateral displacements due to liquefaction

The liquefaction induced lateral displacement, Δ_L , can be estimated using an empirical equation proposed by Hamada et al., (1987): $\Delta_L = 0.75 (H)^{1/2} (S)^{1/4}$, where H is the thickness of the layer in meters, and S is the ground slope in percent. This formula is based mainly on Japanese data on displacements in very loose sand and soil deposits having a slope, S, less than 10 percent. Therefore, it should be assumed to provide only a rough estimate of lateral displacements. Since the equation does not reflect the

Table 5.1 Estimated Susceptibility of Sedimentary Deposits to Liquefaction During Strong Seismic Shaking (Youd and Perkins, 1978).

Type of deposit (1)	General distribution of cohesionless sediments in deposits (2)	Likelihood that Cohesionless Sediments, When Saturated, Would Be Susceptible to Liquefaction (by Age of Deposit)			
		<500 yr (3)	Holocene (4)	Pleistocene (5)	Pre-pleistocene (6)
(a) Continental Deposits					
River channel	Locally variable	Very high	High	Low	Very low
Flood plain	Locally variable	High	Moderate	Low	Very low
Alluvial fan and plain	Widespread	Moderate	Low	Low	Very low
Marine terraces and plains	Widespread	—	Low	Very low	Very low
Delta and fan-delta	Widespread	High	Moderate	Low	Very low
Lacustrine and playa	Variable	High	Moderate	Low	Very low
Colluvium	Variable	High	Moderate	Low	Very low
Talus	Widespread	Low	Low	Very low	Very low
Dunes	Widespread	High	Moderate	Low	Very low
Loess	Variable	High	High	High	Unknown
Glacial till	Variable	Low	Low	Very low	Very low
Tuff	Rare	Low	Low	Very low	Very low
Tephra	Widespread	High	High	?	?
Residual soils	Rare	Low	Low	Very low	Very low
Sebka	Locally variable	High	Moderate	Low	Very low
(b) Coastal Zone					
Delta	Widespread	Very high	High	Low	Very low
Estuarine	Locally variable	High	Moderate	Low	Very low
Beach					
High wave energy	Widespread	Moderate	Low	Very low	Very low
Low wave energy	Widespread	High	Moderate	Low	Very low
Lagoonal	Locally variable	High	Moderate	Low	Very low
Fore shore	Locally variable	High	Moderate	Low	Very low
(c) Artificial					
Uncompacted fill	Variable	Very high	—	—	—
Compacted fill	Variable	Low	—	—	—

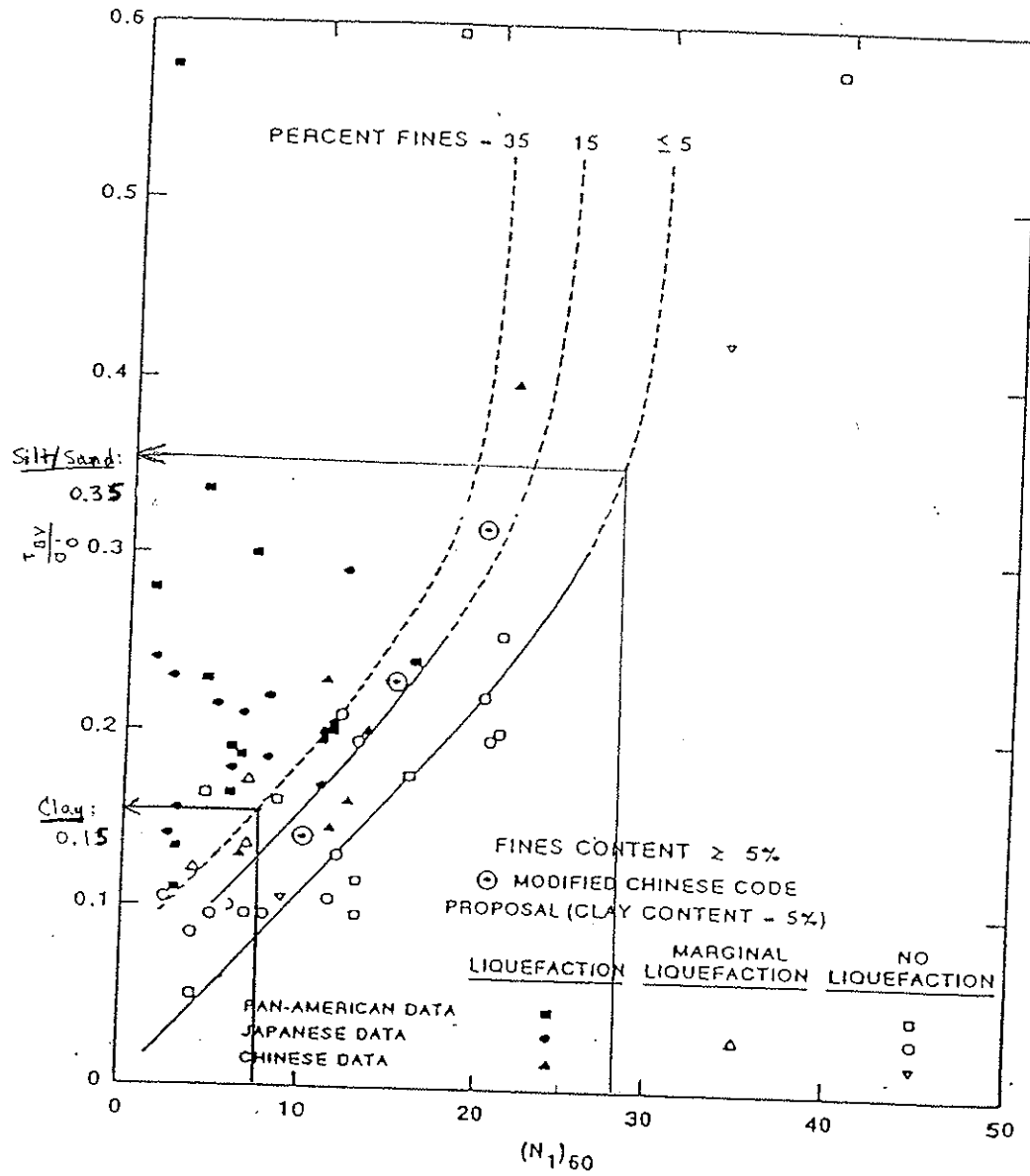


Figure 5.4 Relationships between stress ratio causing liquefaction and $(N_1)_{60}$ values for silty sands for $M = 7.5$ earthquakes (Seed et al., 1985).

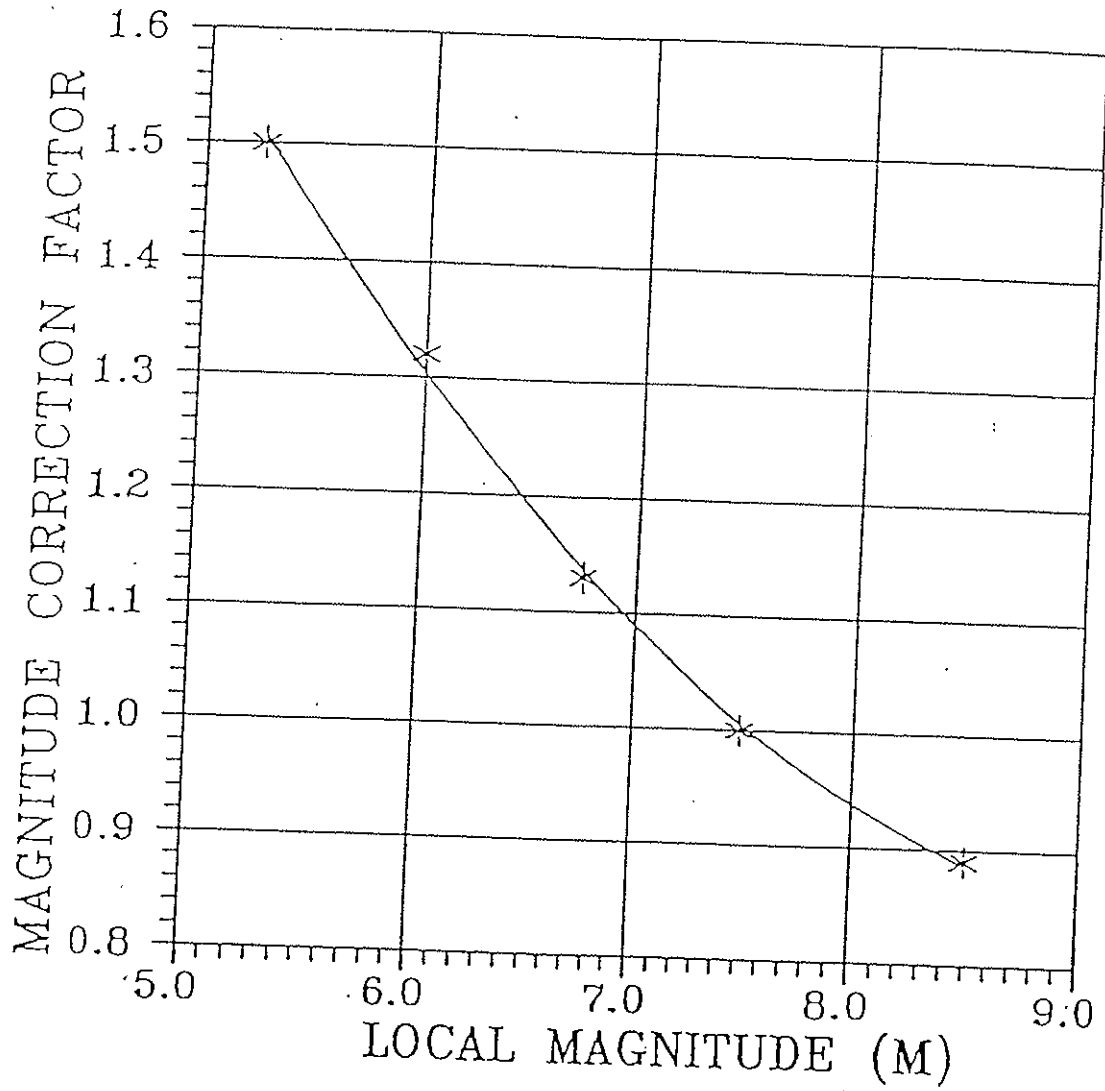


Figure 5.5 Curve for estimation of magnitude correction factor, K_M (after Seed et al., 1983).

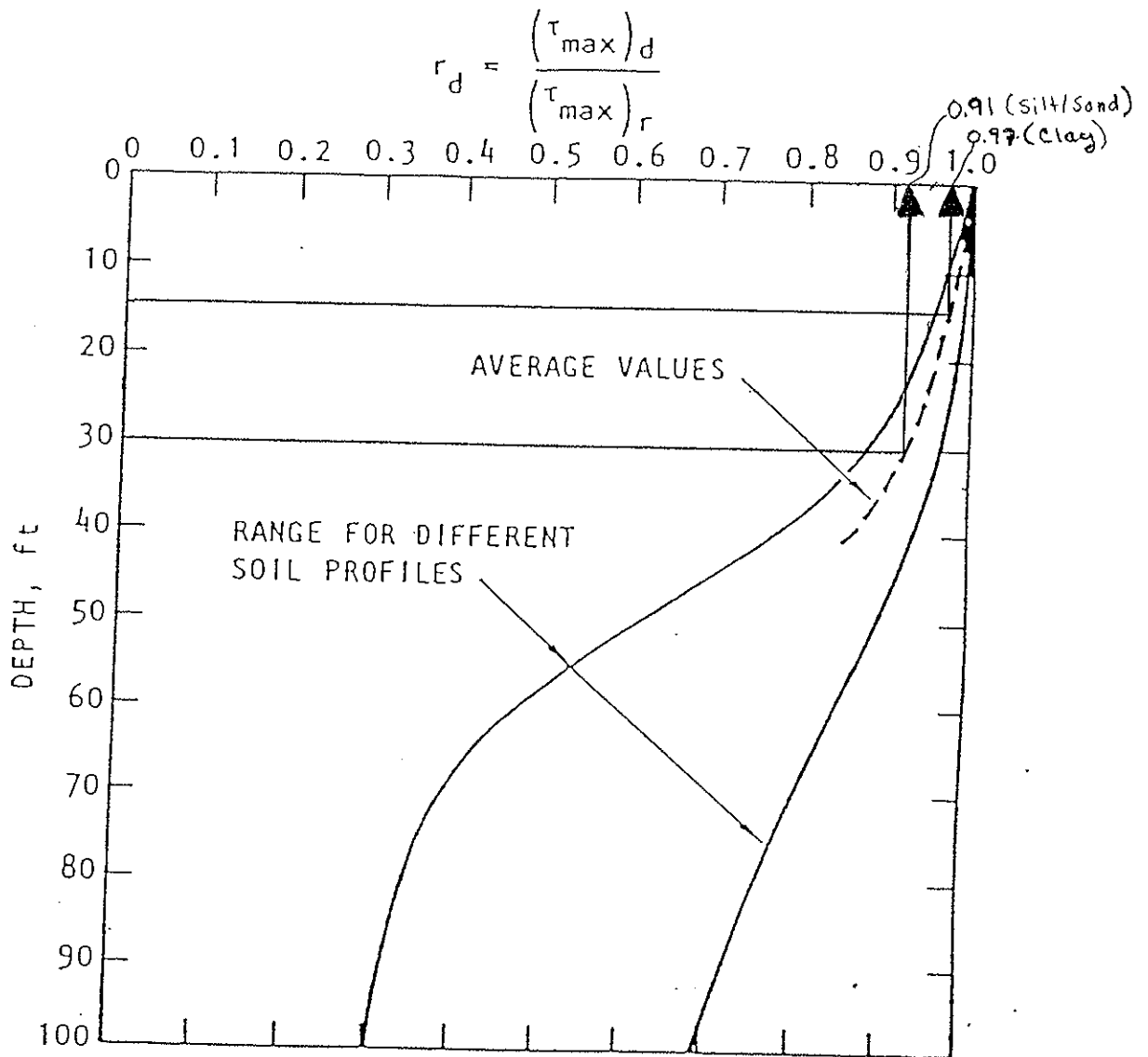


Figure 5.7 Curves for estimation of stress reduction factor r_d (Seed and Idriss, 1982).



Attachment 2

Simplified Procedure –
Glaciolacustrine Silt/Sand

CWM Chemical Services, LLC**Model City Facility****RMU-2****Appendix C-7: Liquefaction - Glaciolacustrine Silt/Sand**

Parameter	Value	Units
Unit Weight of Final Cover	125	pcf
Unit Weight of Waste	111	pcf
Unit Weight of Base Liner System	130	pcf
Unit Weight of Till	130	pcf
Unit Weight of Glaciolacustrine Clay	125	pcf
Unit Weight of Glaciolacustrine Silt/Sand	130	pcf
Unit Weight of Water	62.4	pcf
Thickness of Final Cover	2.5	ft
Maximum Waste Height	124	ft
Thickness of Base Liner System	6.0	ft
Average Thickness of Upper Till	15.7	ft
Average Thickness of Glaciolacustrine Clay	14.5	ft
Average Thickness of Glaciolacustrine Silt/Sand	7.5	ft
Average Elevation of Top of GSS	287.8	ft
Maximum Potentiometric Surface measured in GSS	316.5	ft
Water Pressure at Midpoint of GSS Layer	1.01	tsf
Total Stress at Midpoint of GSS (sampling)	2.17	tsf
Effective Stress at Midpoint of GSS (sampling)	1.16	tsf
Total Stress at Midpoint of GSS (design)	9.21	tsf
Effective Stress at Midpoint of GSS (design)	8.20	tsf
Corrected N Value	27.9	
CSR(L)	0.50	
rd	0.91	
CSR(EQ)	0.080	
Factor of Safety	6.23	



Attachment 3

Simplified Procedure –
Glaciolacustrine Clay

CWM Chemical Services, LLC**Model City Facility****RMU-2****Appendix C-7: Liquefaction - Glaciolacustrine Clay**

Parameter	Value	Units
Unit Weight of Final Cover	125	pcf
Unit Weight of Waste	111	pcf
Unit Weight of Base Liner System	130	pcf
Unit Weight of Till	130	pcf
Unit Weight of Glaciolacustrine Clay	125	pcf
Unit Weight of Glaciolacustrine Silt/Sand	130	pcf
Unit Weight of Water	62.4	pcf
Thickness of Final Cover	2.5	ft
Maximum Waste Height	124	ft
Thickness of Base Liner System	6.0	ft
Average Thickness of Upper Till	15.7	ft
Average Thickness of Glaciolacustrine Clay	14.5	ft
Average Thickness of Glaciolacustrine Silt/Sand	7.5	ft
Average Elevation of Top of GSS	287.8	ft
Maximum Potentiometric Surface measured in GSS	316.5	ft
Water Pressure at Midpoint of GC Layer	0.67	tsf
Total Stress at Midpoint of GC (sampling)	1.47	tsf
Effective Stress at Midpoint of GC (sampling)	0.81	tsf
Total Stress at Midpoint of GC (design)	8.51	tsf
Effective Stress at Midpoint of GC (design)	7.84	tsf
Corrected N Value	8.8	
CSR(L)	0.21	
rd	0.97	
CSR(EQ)	0.082	
Factor of Safety	2.59	



Appendix C-8

RMU-2 MSE Wall Analysis

APPENDIX C-8

RMU-2 MSE WALL ANALYSIS

P R E P A R E D F O R

C W M

P R E P A R E D B Y

P.J. Carey & Associates, PC

September 14, 2009

Revised 2/2013

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1 INTRODUCTION

1.1 SCOPE OF APPENDIX C-8

This appendix addresses the stability of the Mechanically Stabilized Earth (MSE) wall that forms the perimeter berm of RMU-2 under static, seismic, construction and operational conditions. The material properties for the subsurface soils, structural fill, liner materials, final cover and waste materials are those presented in the Summary of Shear Strength Properties for Stability Analysis presented in Appendix A-1. The assignment of material properties used in the analyses is summarized in this Appendix. In addition, the analyses regarding stability during construction rely upon procedures for coupled consolidation stress models fully discussed in Appendix C-9 (Fill Progression Plan 1). The response of the MSE wall during the design seismic event utilizes the seismic response information presented in Appendix C-5. Subsurface conditions upon which the stability evaluation is based were developed as described in Appendix C-5. The cross sections utilized for the detailed design of the MSE berm is Sta 13+50. Some stability analyses for global long term failures were included in C-5 for the berm for Sta 32+00.

2 REINFORCEMENT

2.1 GEOSYNTHETIC REINFORCING MATERIALS

Geosynthetic reinforcing material has been included in the MSE berm to allow the safe creation of a 0.25H:1V face on the exterior of the berm. The reinforcing elements in the stability model were assigned long term tensile strengths on a pound per foot normal to the cross section. Lengths and strengths were determined by trial and error. The actual assigned values for long term design strength can be met by several grid manufacturers. Details of the required strengths and lengths for the geogrid layers needed in the typical MSE wall section are provided in this appendix. The long term design strength (LTDS) refers to the design tensile strength the geo-reinforcement is capable of supplying for the design life, accounting for durability reduction, construction damage, creep impacts, and biodegradation. The design life is provided in the project specifications and does not impact the stability evaluation. In addition, for all analyses performed involving the geo-reinforcement elements, detailed information concerning the location, length, strength, bond development and forces applied from the elements in the analysis is included in the figures depicting each analysis.

The MSE system includes a wire basket facing to create a stable wall face. The baskets will be filled with rock that is incapable of passing through the basket mesh. This eliminates any reliance on geofabric that would be exposed to the elements from retaining materials.

2.1.1 SHORT DURATION LOAD TREATMENT

An increase to the LTDS for the geo-reinforcement was applied under seismic and loadings of short duration. This increase was applied because the short duration loading does not require the adjustment of strength associated with time creep. This is acknowledged in the section 7.1.2a of the FHWA-NHI-10-024 Design of Mechanically Stabilized Earth Walls and Reinforced Slopes – Vol. 1. FHWA-NHI-10-024 states that only the long term loading associated with static conditions needs to be reduced.

The analysis method used allows the ratio loading associated with the static conditions and that associated with the pseudo static conditions to be computed by comparing the tensile load in the static analysis compared to the yield acceleration analysis. Given that the program does not specifically calculate the dynamic portion of the loading a combined value can be determined by considering the portion of the grid capacity is not used for the static condition is available for the dynamic resistance and is only reduced for damage and degradation due to chemical or biological action and not for creep rupture. Alternatively, it should be stated that it has been standard practice in North America to increase the tensile capacity under dynamic loading by 33% to account for the lack of creep rupture effect on the tensile capacity for loads of very short duration (Chapter 14 of Geosynthetics and Their Applications). The calculation performed presented in Attachment 5 results in an allowable increase in grid strength of 18.3% if the factor of safety under static loadings was 1.5. Actual factors of safety passing through the grids are in excess of 2.0 which results in a higher increase allowed (27.5%), as calculated in Attachment 5. Therefore the choice of 17% (1/0.85) improvement in strength for the overall strength for dynamic loading, both equip stresses and earthquake conditions, is conservative.

3 STABILITY ANALYSIS

3.1 GENERAL

This section addresses the

- selection of cross sections for analysis,
- assignment of material properties
- method of limit equilibrium analysis
 - static
 - pseudo static determination of yield acceleration
- assignment of piezometric heads
- treatment of geogrid elements
- analysis results

3.2 SELECTION OF CROSS SECTIONS FOR ANALYSIS

3.2.1 SURFACE AND SUBSURFACE GEOMETRY

The manner in which the geometry of surface and subsurface at RMU-2 was depicted is presented in Appendix C-5.

3.2.2 SELECTION OF SECTIONS FOR ANALYSIS

The method of generating cross sections from the three dimensional geometry models is described in Appendix C-5. The stability analyses performed in section C-5 allowed identification of the sections with the conditions resulting in the lower factors of safety for static conditions and had the lowest yield acceleration. The section at Sta 13+50 was found to have the lower factors of safety for near berm failures. This section was selected to determine the number, length and strength of the geo-reinforcement. The location of this section is shown in Figure 1.

3.3 METHOD OF ANALYSIS

3.3.1 LIMIT EQUILIBRIUM ANALYSIS

The analysis of all sections reported in this appendix was performed using Slope/W as part of the GEOStudio 2012 software package Version 8.0.10.605 under license from GEO-SLOPE International Ltd. This software allows flexibility in the description of shear strength under both drained and undrained conditions and a significant number of analytical methods to be used. Add-ins were utilized to allow the use of the normalized ϕ' and SHANSEP models for which parameters are described in Appendix A-1.

The software also allows the use of anisotropic modifiers, which were applied to soils as described in Appendix A-1 and re-iterated in 3.4 of this Appendix.

All analyses presented in this report utilized the Morgenstern - Price with half sine side forces. This method places the slide mass in both force and moment equilibrium when obtaining the safety factor. The analyses, with the exception of pseudo-static analyses to determine yield acceleration, were performed allowing the software to optimize the shape of the failure surface to obtain the minimum factor of safety. Selection of this option allows the failure surface to conform to the section conditions as opposed to the rigid conformance to a circular or straight line shape block failure. Both block type and circular type failure searches were utilized as the initial search method from which software optimized automatically in the individual analysis.

For pseudo-static analyses, the failure surface possessing the minimum safety factor with no acceleration applied, using the same soil properties that were to be used for the pseudo-static analysis was entered as a fully defined failure surface. This was accomplished by copying the mid points of the slices from the static analysis into the pseudo-static analysis. No optimization was used for pseudo-static analyses.

The search method, limits of search, and type of search are all documented on the presented stability analysis figures and the text output files in Attachment 1

In addition, search zones were further focused into the areas of weaker soils by use of deflection surfaces. The assignment of a deflection surface to the GSS or LGT for analyses including subgrade failures prevents surfaces from running into these stronger layers which would have higher factors of safety and instead deflects the surface along the upper boundary of the deflection surface. In this fashion the number of trial surfaces within the weaker zone is increased. In the case of RMU-2, the difference between the strength of the GSS and the overlying GC is significant resulting in all critical failure surfaces staying above the GSS. This same technique was utilized to analyze baseliner only failures by assigning materials below the baseliner as deflection surfaces.

Directional modifier functions (Anisotropic Strength) have been utilized for the GC soils to allow the strength of the soils to be defined for steeply oriented failures in general and have the strength reduced as a function of the angle of the failure plane relative to the horizontal. The use of these functions allows the lower shear strength associated with near horizontal failures in soft clays to be included in the analysis. The software applies the reduction factor defined based on the orientation of the bottom of the slice.

Analyses were performed to determine the factor of safety and yield accelerations for potential failures passing through the berm, and waste mass and the subgrade below. In this fashion the length and strength of the proposed reinforcement was evaluated for both near face failures and failures involving the waste mass.

3.3.1.1 SlopeW Geo-reinforcement Treatment

The presence of geosynthetic reinforcement in the stability analysis is included in the determination of the critical failure surface and the calculation of the factor of safety by the GeoStudio program. The program inputs for each geosynthetic layer include the geometric information (beginning and end of the layer in x,y space), the bond development characteristics between the layer and the surrounding soils, the

tensile strength of the layer, the factor of safety to be applied to the bond development and tensile (termed reduction factors).

In all analyses presented in this application involving geosynthetics, the allowable maximum pull out force for each layer of geosynthetics is computed by the program using by multiplying the tensile capacity by the reduction factor. This represents the maximum tensile force that can be applied to the layer assuming the bond strength is determined to be sufficient to develop the tensile force. The bond strength available for each layer is calculated based on the length of that geosynthetic layer protruding beyond the failure surface using the interface shear angle times the normal load times the surface area factor (simulating a pull out test). The force applied by a geosynthetic layer in each specific analysis trial is equal to the lesser of the maximum tensile force or the computed maximum pull out force reduced by the factor of safety. In the event that a failure surface does not intersect a geosynthetic layer no force from the layer is included in the analysis of that surface. The computed tensile load is applied to the slice where the reinforcing layer intersects the failure surface.

In this fashion the analysis includes evaluation of the governing control on the geosynthetic layer, i.e. tensile capacity, pullout resistant (bond failure) or non-intersection. This negates the need to perform internal evaluations of each layer.

Searching the MSE berm area with different limitations on lateral bounds allows failures through various portions of the berm to be evaluated. Performing these searches with the same geosynthetic layer configurations and strengths was performed to determine the minimum strengths and lengths of the geosynthetic layers for adequate stability under all conditions and failures representing global, intermediate and near face conditions.

The limit equilibrium method of analysis performed by the program, considering the mechanics of resistance of the layers individually, is consistent with the requirements of internal stability analysis of the geo-reinforcing provided in technical guidelines by the FHWA. The method used allows the consideration of the geometry of the berm to an extent that is not capable in the methods outlined in the FHWA guidance.

The specific loadings applied to every reinforcement layer, the bond development and controlling mechanism (tensile stress limitation or bond pullout) is noted on the graphical outputs of the stability figures, along with other information concerning the geo-reinforcement.

3.3.2 TIME DEPENDENT PORE PRESSURES

The prediction of pore pressures that would be present during the construction phase of the MSE berm was made using the SigmaW and SeepW modules of Geostudio 2012 to perform coupled consolidation analysis. This analysis was chosen to allow prediction pore pressures under the MSE wall that would include both shear and principal stress components. These pore pressures were then imported directly into the stability analysis module in computation of vertical effective stress on the slice used to compute the undrained strength (S_u) of the GC materials. The coupled consolidation analysis utilizes the compressibility, drainage and stress boundary conditions and permeability of the materials to compute pore pressures with time. A fuller discussion of this analysis method is provided in Appendix C-9, where its use was central to the analyses performed.

3.3.3 OPERATIONAL LOADING

The impact of operational equipment on the MSE wall was evaluated by placement of two rectangular strip loads that correspond to a fully loaded articulating dump truck that could be used to deliver soils to the final cover or operations. A Caterpillar model 740 dump truck was used for calculation of the equivalent strip loadings. These were found to be approximately 2641 lbs per foot over a 5.5 foot wide strip on either side of the truck, including a 1.5 multiplier for dynamic loading. A strip load of 2700 psf was used to be conservative. The equivalent strip load was calculated at a depth of 4 feet to account for the surface spreading impacts and still provide a conservative estimate for what is a 3 dimensional loading situation be modeled as a 2 dimensional problem. The distance of the wheel loading was varied from the front face of the wall to determine the required set back distance. The calculation of the equivalent strip loading is presented in Attachment 2.

3.4 MATERIAL ASSIGNMENTS

Three types of analyses were performed in the design:

- Long term conditions,
- Seismic Response,
- Short term loadings,
 - o Traffic loads, and
 - o Construction.

The material assignments and general grid factors assigned to each of these type of analyses is presented below.

3.4.1 LONG TERM CONDITIONS

Analyses of this type were performed to determine the long term stability of RMU-2 MSE berm under static conditions after consolidation of the GC has completed. This is the condition that exists for all but the initial period following filling of a cell or during seismic events. Effective stress parameters are applied to all materials. A listing of the material assignments for these conditions is provided in Table 3-1. The rationale for choosing these parameters is provided in Appendix A-1

In addition to the soil materials the geo-reinforcing elements were all assigned the following properties

Structural Fill Material	Grid Reduction Factor	Interface Shear Angle	Surface Area Factor	Bond Reduction Factor	Factor of Safety Dependent
Cohesive	1	30	1	1	yes
Cohesionless	1	34	1	1	yes

Table3.1: Material Properties Used for Drained Long Term Conditions

Material	Total Unit Weight (pcf)	c' (psf)	ϕ' (deg)	Shear Function (if used)	Directional Modifier (if applied)	Section in Appendix A-1
Waste	111	0	30			5.1
Baseliner	120			Baseliner (Shear Normal Function)		5.2
Side Slope Liner	115	0	13			5.3
Compacted Clay Liner (CCL)	120	1000	10			
Compacted Structural Fill	130	195	28.7			4.3.1
Compacted Structural fill cohesionless	120	0	34			4.2
UGT	125	150	31			4.2
OGC	125	100	30			4.1.2
GC	118			Normalized Phi $q = n' \cdot \tan 28.77^\circ \cdot \frac{100kPa^{1-0.853}}{n'}$	“clay ellipse static shear (0.706 on horizontal)	4.1.2
GSS				Deflection Surface		

**Table 3.2: Material Properties Partially Drained or Consolidated Undrained
(where different from Long Term Drained)**

Material	Total Unit Weight (pcf)	c' (psf)	ϕ' (deg)	Shear Function (if used)	Directional Modifier (if applied)	Section in Appendix A-1
Compacted Structural Fill (cohesive)	130	363	26.3			4.3.1
OGC	125			SHANSEP S=0.34, m = 0.7 max past press. = 8000 psf	"clay ellipse static shear (0.706 on horizontal)	4.1.2
GC	118			SHANSEP S=0.34, m = 0.7 max past press. = 5000 psf	"clay ellipse static shear (0.706 on horizontal)	4.1.2

Long term ground water levels were assigned to the analyzed cross sections using the October 2004 sand and silt groundwater elevations reported by Golder. It should be noted that short term fluctuations in the ground water levels in the sand and silt do not result in changes in shear strength in the critical strength layers at the site, i.e. the GC. This piezometric surface was assigned to all materials below the secondary liner membrane (CCL and below). Piezometric levels are apparent on the stability figures presented in this appendix.

3.4.2 DETERMINATION OF CRITICAL SURFACE FOR PSEUDO-STATIC AND YIELD ACCELERATION ANALYSES (SEISMIC RESPONSE)

These types of analyses were performed to facilitate the prediction of performance of RMU-2 MSE berm under seismic conditions. The application of seismic loads occurs during a relatively short period (seconds or minutes) and the performance of the GC and OCG materials is best described by and undrained strength. The compacted structural fill, if clayey in nature will also respond in a fashion best described by the undrained strength. The remaining materials are best described by their effective stress parameters.

The strength of the GC materials, as described in Appendix A-1, have undrained strengths that are a function of the stress to which they have been consolidated, their maximum past pressure, the amount of shearing stress present during consolidation and the direction in which they are being sheared. Each of these factors has been incorporated in the analysis under the seismic conditions using the SHANSEP formulation with a direction modifier function that reflects the significant static shear present under the consolidated undrained state once the fill has been placed. The directional modifier assigned for this condition is the “clay ellipse static shear”, reflecting the presence of static shear during the consolidation period

The compacted structural fill was assigned a strength envelope based on the undrained envelope from the CIU triaxial compression tests on the Sully materials (R based - envelope). The material assignments that were different for these types of analyses relative to the long term drained parameters identified in Table 3-1 are presented in Table 3-2.

Geo-reinforcement assignments for the seismic response analyses were modified from those assigned during to the long term drained conditions by applying a 0.85 reduction factor (1.17x) times the LTDS of the geogrids to account for the short term nature of the loading as described in 2.1.1.

Structural Fill Material	Grid Reduction Factor	Interface Shear Angle	Surface Area Factor	Bond Reduction Factor	Factor of Safety Dependent
Cohesive	0.85	30	1	1	yes
Cohesionless	0.85	34	1	1	yes

Long term ground water levels were assigned to the analyzed cross sections using the October 2004 sand and silt groundwater elevations reported by Golder. It should be noted that short term fluctuations in the ground water levels in the sand and silt do not result in changes in shear strength in the critical strength

layers at the site, i.e. the GC. This piezometric surface was assigned to all materials below the secondary liner membrane (CCL and below). Piezometric levels are apparent on the stability figures presented in this appendix.

3.4.3 SHORT TERM LOADINGS

3.4.3.1 Traffic Loads

The assignment of material properties for traffic loadings were identical to those used for the Seismic Response analyses. Surface loadings were applied to represent the presence of trucks as described in 3.3.3.

3.4.3.2 Construction Conditions

During construction conditions the GC soils underlying the MSE Berm will, depending on the rate of construction, represent a partially drained condition to an undrained condition. The method of analysis utilized assumed that the GC materials would be undrained and their strengths described by the SHANSEP type formulation as described in Section 4.1.3 of Appendix A-1. In the case of the construction loading, which may occur rapidly and without significant shear stress present during consolidation, the directional modifier function “clay ellipse” was assigned, with its lower 0.63 factor on near horizontal failure planes. In addition, the compacted structural fill, if cohesive, is most easily described by a constant undrained strength, as opposed to the R based CIU triaxial test derived envelope used for the seismic and truck loading conditions. The remaining materials in the analysis were assigned their long term drained parameters as shown in Table 3.1. The materials assigned different properties relative to those presented in Table 3.1 are presented in Table 3.3

Table 3.3: Stability Material Properties for Construction Conditions

Material	Total Unit Weight	Cohesion Intercept	Shear Function	Directional Modifier	Section in A-1
Cohesive Structural Fill	130	2000 psf			4.3.1
OGC	125		SHANSEP S=0.34, $m = 0.7$ max past press. = 8000	“clay ellipse” (0.63 on horizontal)	4.1.2
GC	118		SHANSEP S=0.34, $m = 0.7$ max past press. = 5000 psf	“clay ellipse” (0.63 on horizontal)	4.1.2

Geo-reinforcement assignments for construction conditions were the same as the long term drained conditions.

3.4.4 PORE PRESSURE PREDICTION-CONSTRUCTION LOADING

3.4.4.1 General Modeling Approach

. The cross section at Sta 13+50 was selected for this analysis because of the depth of excavation and the maximum thickness of the GC materials, both potentially detrimental to stability. A construction duration of approximately 6 days was chosen to reflect a faster than possible construction schedule. This was simulated by placing the entire berm geometry instantaneously in the model, and using pore pressure levels three days after the instantaneous loading for stability analysis.

3.4.4.2 Time Rate of Consolidation Properties

The compression and shear characteristics of the GC layers were described using the Modified Cam-clay model developed by Britto and Gunn. The Modified Cam-clay model incorporates the consolidation and shear behaviors into a single model, allowing plastic yielding. Input parameters for the model can be derived from ϕ' , compression ratios (CR and RR), the initial void ratio and OCR. The coupled stress/seepage modeling used to simulate time rate of consolidation also requires the determination of permeability and assignment of drainage boundary conditions. In addition, the model requires the definition of the permeability of the layers that are either contributing to the release of pore water during compression or transmitting the released pore water to the transmissive. At this site the main transmissive layers are the Glacial Sand and Silt and potentially the upper bedrock surface. Layers that are compressive enough to contribute to significant pore water release during compression are the CCL, the overconsolidated GC crust and the lightly overconsolidated GC. The upper till, sand and silt and lower glacial till are too stiff to contribute significant consolidation waters.

The selection of parameters for the use in the finite element modeled time rate of loading sensitive analyses was presented in Appendix A-1 and is not repeated here. All properties assigned are listed on the coupled consolidation figures. All analyses had the same properties assigned except for the compacted structural fill, which when changed to cohesionless was assigned a different unit weight consistent with that used in the stability analysis.

3.4.4.3 Assigned Boundary Conditions

Drainage and stress boundary conditions were assigned in the finite element model to simulate the field conditions.

3.4.4.3.1 Stress Boundary Conditions

The left and right and sides of the model were assigned fixed X and free Y stress boundary conditions. These were assigned to the infinite elements at either side of the model to simulate continuous conditions beyond the limits of the mesh. The base of the model was assigned fixed X and Y boundary conditions to simulate the bedrock. No other stress boundary conditions were assigned.

3.4.4.3.2 Hydraulic Boundary Conditions.

Three kinds of hydraulic boundary conditions were assigned in the finite element model. These were;

- **No flow boundary** – this condition allows no flow to pass the boundary. This boundary condition was not assigned to the modeling done for the MSE.
- **No flow unless pressure** – this condition allows flow to exit the boundary if the pore pressure at the boundary is positive. It represents one way leakage and was subject to review in each time iteration to decide what the head should be set at to meet the boundary condition. This boundary condition simulates a ground surface and was assigned to the top of layers that would be expected to express groundwater, such as the top of the excavation.
- **Constant Head** – Constant total head boundaries maintain the head assigned to them and allow liquid to flow in either direction. Constant head boundaries were assigned to the bottom and edges of bedrock and the edges of the model representing the head levels of the GSS. The various heads assigned were color coded and show in the key. Heads of 315 were used on the south boundary and 313 on the north boundary.

3.4.4.4 Time Rate of Construction

The impact on the time rate of construction on the development and dissipation of pore pressures in the GC was investigated. The most rapid rate of construction envisioned for the MSE wall was 6 days. The wall construction under this time period was divided into three instantaneous lifts, all applied at once. The sequence of filling and cutting is depicted in the Figures representing the results. A depiction of the FEM mesh with hydraulic boundary conditions is presented in Figure 13

3.4.4.5 Initial Piezometric Head Assignments

Long term ground water levels were assigned to the analyzed cross sections using the October 2004 sand and silt groundwater elevations reported by Golder. It should be noted that short term fluctuations in the ground water levels in the sand and silt do not result in changes in shear strength in the critical strength layers at the site, i.e. the GC. This piezometric surface was assigned to all materials below the secondary liner membrane (CCL and below). Piezometric levels are apparent on the stability figures presented in this appendix.

3.5 RESULTS

The results of the analyses are presented in Figures 4 through 24. These figures are graphical representations of the stability analyses direct from the Geostudio Software. The figures depict the following:

- Geometry of the section analyzed,
- Material assignment by region number,
- Material properties by material assignment,

- Analysis method,
- Search method and limits,
- Piezometric surface used and assignment to material, including the parent analysis if pore pressures were assigned from a coupled consolidation analysis,
- Horizontal acceleration applied (pseudo-static analyses only) and,
- Factor of safety.

For the coupled consolidation analyses to determine pore pressure, the material properties and elapsed time is presented, along with excess pore pressure contours present at the elapsed time presented.

An annotated example identifying symbols and call outs is provided in Figure 2 in the form of a key. In addition, an output file for each analysis created by the software that presents the input parameters and the details of the minimum failure surface and forces, etc. is provided in Attachment 1. Attachment 1 contains an index referenced to the figure numbers.

The results are summarized in tabular form below, organized by the condition being analyzed with reference to the figure number it is presented in and the page in Attachment 1 the output file begins on. In addition, for the yield acceleration determination analyses, the Figure presenting the determination of the critical failure surface is referenced.

The results are summarized in Tabular form below for each type of analysis. Analyses are presented for the use of both cohesive and cohesionless structural fill materials.

3.5.1 LONG TERM WITH FINAL WASTE GRADES

It was found that long term stability analyses governed the length and strength of the geo-reinforcement. The geo-reinforcement was lengthened to result in failure surfaces and factors of safety involving the waste were no lower than those presented in Appendix C-5 that did not involve failure surfaces passing through the MSE berm. The minimum long term factor of safety for failures not involving the MSE berm materials was 1.56 at Sta 42+50. As can be seen in Figures 4 and 5 a minimum factor of safety for long term conditions of 1.71 was obtained. The critical failures in both the aforementioned figures do not come near the geo-reinforcement. The results are summarized below.

Structural Fill Condition	Figure #	Factor of Safety	Pages in Attachment 1 with Text Output from Geostudio
Cohesive	4	1.71	
Cohesionless	5	1.73	

3.5.2 LONG TERM BERM ONLY OR NEAR BERM FAILURES

Potential failure surfaces passing through or just behind the geo-reinforcement assuming long term drained conditions were also analyzed. The results are summarized below. The failure surface in depicted in Figure 6 was constrained to the berm itself while the surface in Figure 7 was allowed to go behind the geo-reinforcing, and had a lower factor of safety. Both factors of safety are well above 1.5.

Structural Fill Condition	Figure #	Factor of Safety
Cohesive	6	2.13
Cohesionless	7	1.74

Note that Figure 7 depicts an analysis with the GC materials assigned consolidated undrained strength parameters. However, the critical failure surfaces did not pass below the UGT so all materials involved in the failure are reflective of long term drained conditions.

3.5.3 SEISMIC RESPONSE

The yield acceleration of both global failures and failures proximate to the berm was determined. The yield acceleration for each of the sections analyzed was not specifically determined for failures where the failure surface search was kept proximate to the berm. At Sta 13+50 and the yield acceleration was found to exceed 0.20g. Application of horizontal accelerations higher than this value resulted in non-converging force and moment factors of safety. While it is possible to attain yield accelerations using other analysis methods, the fact that the yield acceleration is significantly higher than the spectral acceleration and site peak ground acceleration indicates that no displacement will occur. For that reason, no further analysis is required. Also, the yield acceleration was only attempted to be determined for the cohesive structural fill. The definition of critical surface using undrained analysis had a lower factor of safety than the cohesionless fill analysis. The results are summarized in tabular form below.

Failure type (global or proximate) to berm	Structural Fill Condition	Figure #	Critical Surface Determination Factor of Safety	Yield Acceleration	Parent Fig # for Yield Acceleration Failure Surface
Global	Cohesive	See C-5- Fig 17	1.4		
Global	Cohesive	See C-5 Fig 18	1	0.099 g	
Global	Cohesionless	8	1.54		
Proximate	Cohesive	9	1.71		
Proximate	Cohesive	10	1.56	>0.2 g	9
Proximate	Cohesionless	7	1.74		

Note that the global cohesionless analysis in Figure 8 had a factor of safety higher than its counterpart for cohesive fill reported in C-5 so it was not analyzed for yield acceleration.

APPENDIX C-8

The global cohesionless analysis in Figure 8, presented for long term conditions has the GC assigned a consolidated undrained envelope, the failures did not pass below the till and is applicable to seismic conditions.

3.5.4 OPERATIONAL LOADING

The application of the strip loads simulating the use of a CAT 740 dual axle articulating dump truck are presented in Figures 13 and 14. The outer edge of the strip load closest to the exterior side of the MSE berm was located 4 feet from the exterior edge. The results of the analyses for both the cohesionless and cohesive structural fill are presented below.

Structural Fill Condition	Figure #	Factor of Safety
Cohesive	11	1.51
Cohesionless	12	1.52

Failure surfaces associated with the above analyses passed through the reinforced section of the berm. The same reinforcement layers and strengths were utilized in both analyses.

3.5.5 RATE OF CONSTRUCTION

The stability of the MSE Berm assuming it was constructed in as little as 6 days, was analyzed using the pore pressures from the coupled consolidation run at 3 days following instantaneous loading of the entire berm section. The finite element mesh with hydraulic boundary conditions is shown in Figure 13. The results of the coupled consolidation analysis are depicted from the start of the filling through the elapsed time of 3 days for both cohesive and cohesionless fills (since they have different unit weights) in Figures 14, 15 and 16. The output depicts the excess pore pressure in psf.

The stability analysis results using the computed pore pressures and the predicted undrained strengths for the GC materials are summarized in tabular form below.

Analysis Type	Elapsed Time (days)	Structural Fill Condition	Figure #	Factor of Safety	Parent Analysis (Fig #)
Initial Stress Determination	0	NA	14	NA	none
Coupled Consolidation	3	Cohesive	15	NA	14
Coupled Consolidation	3	Cohesionless	16	NA	15
Stability	3	Cohesive	17	1.38	15
Stability	3	Cohesionless	18	1.65	16

Given the temporary nature of the condition modeled and the extreme rate of construction assumed a factor of safety of 1.38 is acceptable for temporary construction conditions where no waste or containment structure is involved. Factors of safety quickly approach 2 for berm only failures which is apparent in

Figure 19. Figure 19 depicts the pore pressures that are present 90 days following the onset of construction. There are essentially no excess pore pressures underlying the berm itself or to the exterior side.

3.5.6 INTERIOR EXCAVATION

The stability of the excavated and lined landfill with no waste was evaluated for drained conditions following 90 days after instantaneous berm construction and undrained conditions at 75 days following construction. Pore pressures present at

The results are presented in Figures 20 and 21. For these analyses the piezometric level assigned is equal the head in the sand and silt, resulting in reduced effective stress due to up flow in the GC. As can be seen in Figures 20 and 21 the factor of safety for 1.65 and 1.69 for undrained and drained conditions, respectively. These results indicate that the internal slopes of the landfill are stable following placement of the liner and rebound of pore pressures in the GC and CCL. It should be noted that as no waste is present during these periods the minimum factors of safety would be acceptable if they were as low as 1.3. Further, the geogrids were not factored into the analysis, making them conservative.

No further time rate analysis was considered warranted exploring different possible filling scenarios with varying time intervals of lift placement during construction, given that a construction period of three days resulted in acceptable factors of safety.

3.5.7 POST GEO-REINFORCEMENT SERVICE LIFE

The proposed geogrids have projected long term service lives in excess of 100 years. However at some after 100 years the ability of the reinforcement to sustain tension loads needed to maintain the berm geometry will be insufficient. An analysis was performed to demonstrate what type of soil berm could be constructed in front of the MSE berm to provide a factor of safety in perpetuity. A soil berm constructed of site soils with a 2:1 geometry was placed in front of the berm. The analyses were performed with the MSE berm having been constructed of both cohesive structural fill and assumed the reinforcement was not present. Only cohesive fill was analyzed as it was shown to have lower near face factor of safety results for static conditions. Long term drained conditions were evaluated, with material assignments identical to the long term drained conditions in 3.4.1. Global and near slope face analyses were performed. The results are summarized below.

Structural Fill Condition	Figure #	Factor of Safety
Cohesive	22	1.80
Cohesive	23	1.75

These factors of safety are well in excess of the required 1.5 value.

3.6 ADDITION ANALYSIS

Analysis of factor of safety against sliding, overturning and bearing capacity modes of failures of the MSE wall section at Station 1350 was performed as requested. The analysis was performed using the LFRD design methodology as per the latest FHWA design guidance. The results of the analyses show the proposed MSE wall has significantly higher resistance to failures of these modes than suggested. The analyses are provided in Attachment 4 of this Appendix and are summarized below.

Condition	Calculated LFD Ratio	Acceptable Outcome (FHWA)
Sliding	2.839	1.0
Overturning	Resultant inside Center of Base	Acceptable
Bearing Capacity	4.85	1.0

4 SLOPE DEFORMATION ANALYSIS

4.1 GENERAL PROCEDURE

The response of the MSE wall to the design seismic event (2% probability of being exceeded in 50 yrs) for the site was used to evaluate the seismically induced permanent deformation of the potential failure masses at RMU-2. The details of the procedure used to determine the response of the MSE wall (or berm as it is referred to in Appendix C-5) is presented in Section 3.4 of Appendix C-5. It is not repeated here in.

The centerline of the MSE wall corresponds to Section SE in Section 4 of Appendix C-5.

4.2 PREDICTION OF PERMANENT DEFORMATIONS

The permanent deformations were evaluated using the procedure described in detail in Bray and Travasarou¹. This procedure represents an evolutionary improvement over the original case study based charts presented by Makdisi and Seed² that are contained in the RCRA Subtitle D (258) (USEPA)³. The Bray and Travasarou procedure incorporates the dynamic properties of the embankment (or waste mass), the soil column properties, event magnitude and the frequency content of the earthquake event. This is achieved by utilizing the initial fundamental period of the site and the grounds spectral acceleration (S_a) (as opposed to the peak acceleration) along with yield acceleration to obtain predictions of permanent deformation. The use of more site specific variables than just the ratio of yield acceleration to peak ground acceleration and magnitude, utilized by Makdisi and Seed to develop their displacement chart, results in a better prediction for a given site.

The predicted S_a values at the degraded 1.5Ts ($S_a(1.5Ts)$) values were determined at the base at the layer defining the base of the potential failure mass, e.g. within the Glaciolacustrine clay for failures controlled by the Glaciolacustrine clay and at the baseliner level for baseliner potential failures. They were taken to be the maximum value resulting from the eight (8) input motions for the section representing the center of the perimeter berm (Section E).. The table below summarizes the resulting spectral accelerations at Section SE.

¹ Bray, J.D and Travasarou, T, "Simplified Procedure for Estimating Earthquake-Induced Devatoric Slope Displacements", ASCE Journal of Geotechnical and Geoenvironmental Engineering, Volume 133, No.4, April 2007.

² Makdisi, F.1.,and Seed,H.B., "Simplified Procedure for Estimating Dam and Embankment Earthquake Induced Defonnations," ASCE Journal of Geotechnical Engineering, Vol. 104, No. GT7, July 1978, pp. 849-867.

³ United States Environmental Protection Agency, "RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities," April 1995.

Section	Waste Height (ft)	Average V_s for the Sliding Mass Soil Column (ft/s) V_s	Height Sliding Mass Soil Column (ft) H	Initial Fundamental Period (s) $T_s = 4H/V_s$	Degraded Fundamental Period (s) $1.5 * T_s$	Spectral Acceleration @ Degraded Period ¹ (g)
SE	Berm	977.5	59	0.24	0.36	0.16

These values along with the yield coefficient (yield acceleration (k_y) expressed in g), and the earthquake magnitude were used to predict a seismic displacement. For both sections analyzed k_y was found to be in excess of 0.20g for failures limited to the berm cross section. The Bray and Travarasou procedure adopts a probabilistic approach to displacement prediction. A probability 95% that the actual displacements are less than predicted was adopted to represent the predicted displacement, however predicted di-minimus displacement by the software is 0.12 cm which was calculated to have a 99.8% probability of the displacement being less than that value. In addition, the probability that the permanent displacement would exceed the design standard of less than 6” of movement under the design seismic event requested by the NYDEC was computed by adopting 6 inches as the “threshold” displacement. Figure 24 shows the calculation and methodology used to calculate the displacements. As can be seen in the table below the displacement is negligible.

Section	Waste Height (ft)	Displacement (cm)	Displacement (in)
SE	Berm	.99.8% prob of <0.12cm	99.8% prob <0.05

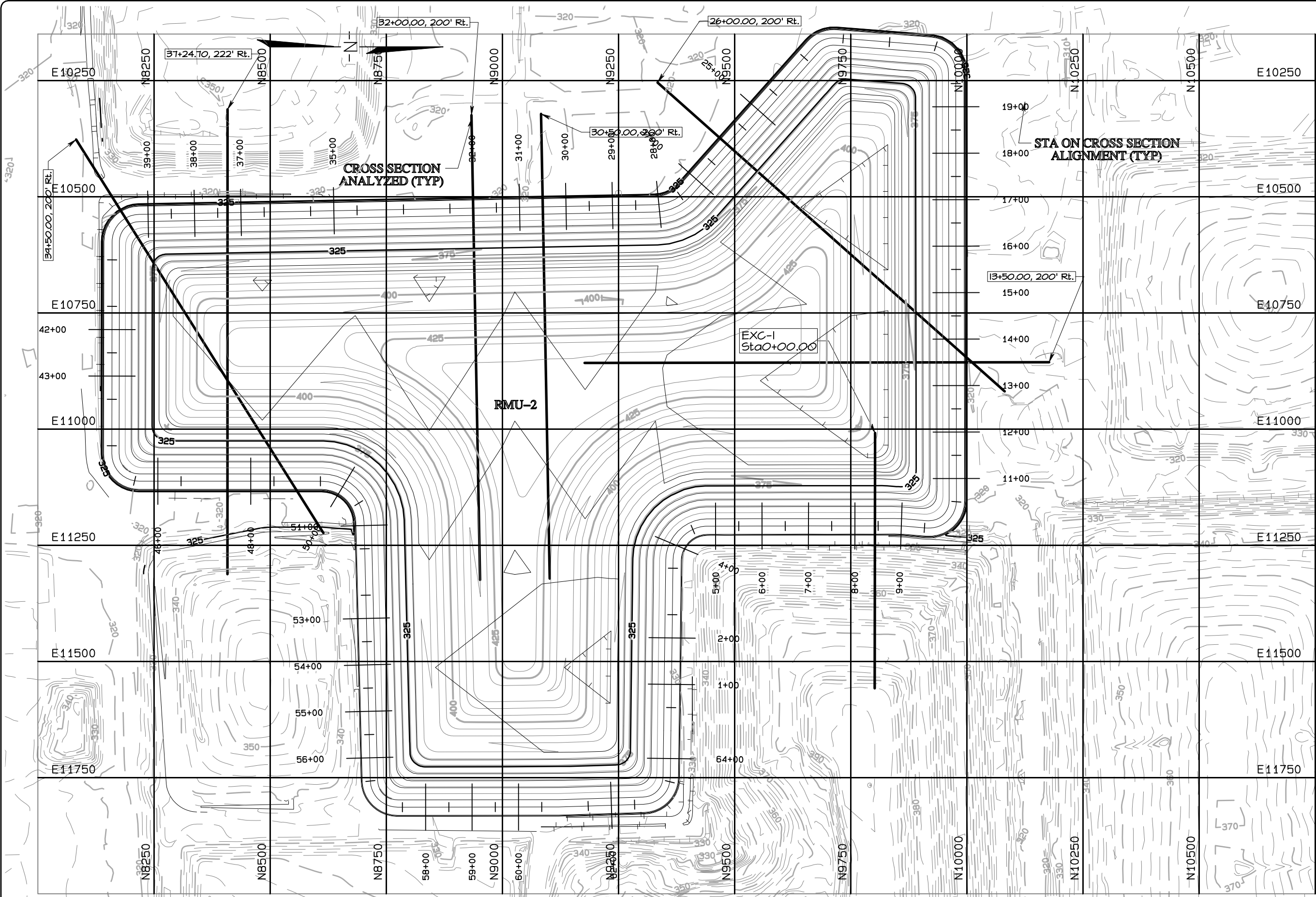
The probability of 6 inches of displacement being exceeded is zero.

5 CONCLUSIONS

Based on the evaluation of the global and baseliner stability under both static and seismic conditions the following conclusions concerning the design of RMU-2 are presented:

- The proposed MSE wall configuration possesses a long term factor of safety under static conditions of greater than 1.5
- The MSE wall and landfill containment systems are predicted to experience deformations less than ¼" during the design seismic event utilized.
- The MSE wall embankment can be safely built to final grade in as little as 6 days without generating pore pressures in the GC that could destabilize the embankment.
- The eventual loss of strength of the geo-reinforcement can be accommodated by placing an earthen wedge of fill with a 2:1 exterior slope against the face of the wall. This does not represent the only possible solution but a viable one that may be implemented when such a strength deficit would occur and require no intrusive work. It should be noted that the design provides a factor of safety of 1.5 against the LTDS as well as the soil strengths. The LTDS is to be predicted at 100 yrs. .

FIGURES



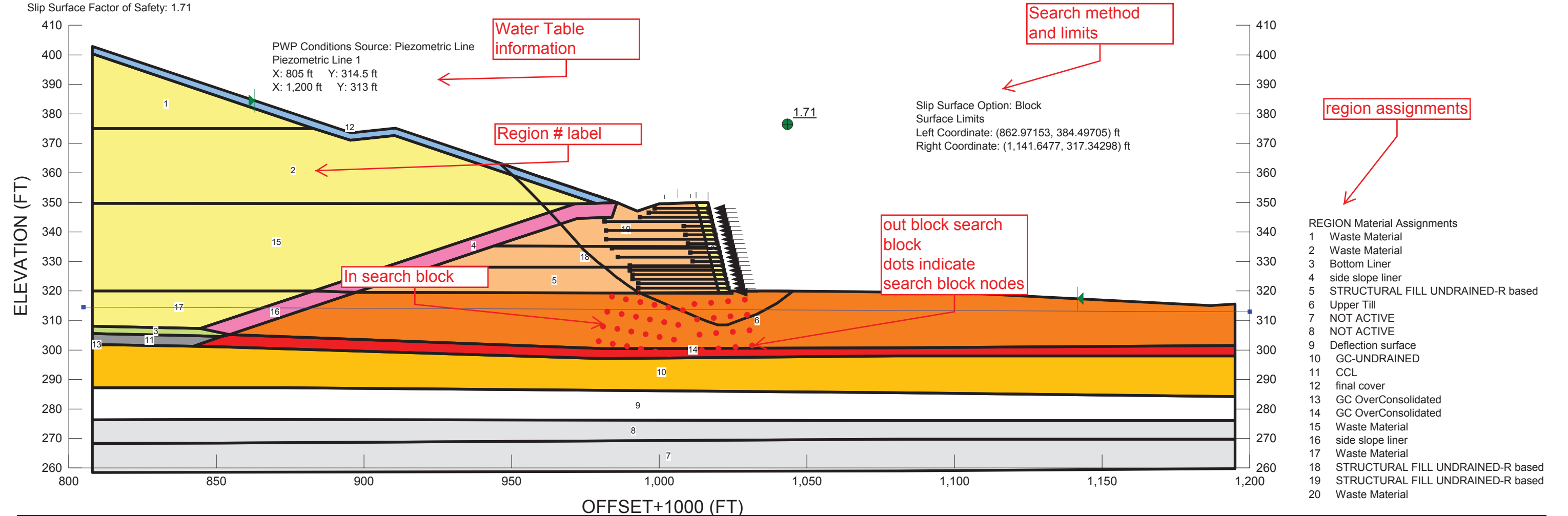
PURPOSE:
To determine the critical failure near the berm for the final configuration of RMU-2 located at cross-section 13+50. Using consolidated undrained GC and assuming undrained (R envelope) berm material properties. To be used in seismic analysis.

Title: Model City - RMU-2 XS 1350 MSE
Name: Undrained - static
File Name: RMU2X1350msseslopewonly.gsz
Date: 2/19/2013Time: 11:34:07 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\MSE-C8\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.71

NYSDEC OHMS Document No. 201469232-00007

Material Properties:

Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 ° Piezometric Line: 1
Name: side slope liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 100 psf Phi': 13 ° Piezometric Line: 1
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: final cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 °
Name: NOT ACTIVE Model: (None) Piezometric Line: 1
Name: STRUCTURAL FILL UNDRAINED-R based Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 363 psf Phi': 26.3 °
Name: GC-UNDRAINED Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED-STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

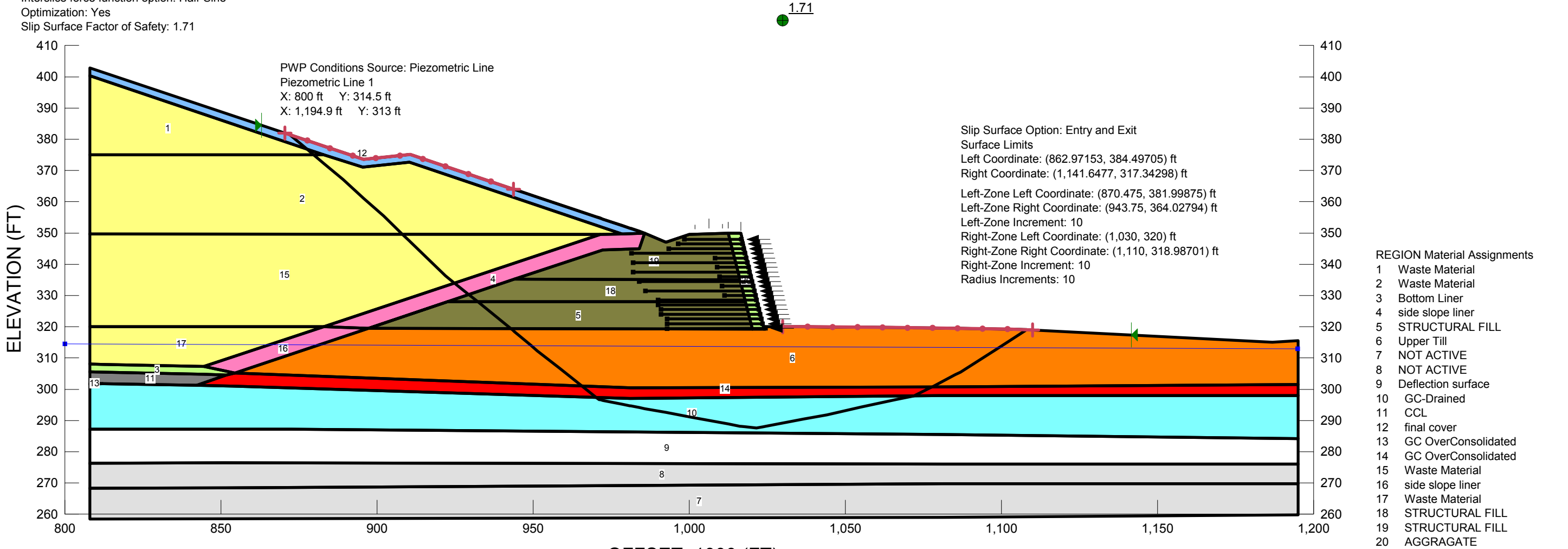


Grid #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Type:	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic
Outside Point:	(1,024.5, 319.5) ft	(1,023.5, 321) ft	(1,023.125, 322.5) ft	(1,022.75, 324) ft	(1,022.375, 325.5) ft	(1,022, 327) ft	(1,021.5, 328.5) ft	(1,021.25, 330) ft	(1,020.875, 331.5) ft	(1,020.5, 333) ft	(1,020.125, 334.5) ft	(1,019.75, 336) ft	(1,019.375, 337.5) ft	(1,019, 339) ft	(1,018.625, 340.5) ft	(1,018.25, 342) ft	(1,017.875, 343.5) ft	(1,017.5, 345) ft	(1,017.125, 346.5) ft	(1,016.75, 348) ft
Inside Point:	(993, 319.3918) ft	(993, 321) ft	(993, 322.5) ft	(991, 324) ft	(990.9978, 325.5) ft	(990, 327) ft	(990, 328.5) ft	(1,011.25, 330) ft	(986, 331.5) ft	(1,010.5, 333) ft	(984, 334.5) ft	(1,009.75, 336) ft	(982, 337.5) ft	(1,009, 339) ft	(982, 340.5) ft	(1,008.25, 342) ft	(981.5, 343.5) ft	(993.5, 345) ft	(996.5, 346.5) ft	(998.5, 348) ft
Slip Surface Intersection:	993.01892, 319.39186) ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft
Total Length:	31.500186 ft	30.5 ft	30.125 ft	31.75 ft	31.3772 ft	32 ft	31.5 ft	10 ft	34.875 ft	10 ft	36.125 ft	10 ft	37.375 ft	10 ft	36.625 ft	10 ft	36.375 ft	24 ft	20.625 ft	18.25 ft
Reinforcement Direction:	0.19681 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °
F of S Dependent:	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interface Adhesion:	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf
Interface Shear Angle:	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °
Surface Area Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Resistance Reduction Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Force Distribution:	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated
Tensile Capacity:	6,800 lbs	6,800 lbs	5,900 lbs	5,900 lbs	5,900 lbs	4,900 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	3,000 lbs	1,000 lbs	2,300 lbs	2,300 lbs	3,000 lbs	3,000 lbs
Reduction Factor:	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Force Orientation:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Max. Pullout Force:	8,000 lbs	8,000 lbs	6,941.1765 lbs	6,941.1765 lbs	6,941.1765 lbs	5,764.7059 lbs	5,764.7059 lbs	1,176.4706 lbs	5,764.7059 lbs	1,176.4706 lbs	5,764.7059 lbs	1,176.4706 lbs	5,764.7059 lbs	1,176.4706 lbs	3,529.4118 lbs	1,176.4706 lbs	2,705.8824 lbs	2,705.8824 lbs	3,529.4118 lbs	3,529.4118 lbs
Pullout Force:	22.717158 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs
Pullout Force per Length:	1,200.8852 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft
Available Length:	0.018917011 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Required Length:	0.018917011 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Governing Component:	Pullout Resistance	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)

PURPOSE:
To determine the critical global failure for long-term (drained analysis) for the final configuration of RMU-2 located at cross-section 13+50. Using berm material with some cohesion.

Title: Model City - RMU-2 XS 1350 MSE
Name: FINAL WALL DRAINED -GLOBAL
File Name: RMU2X1350msseslopewonly.gsz
Date: 2/19/2013Time: 11:34:07 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\MSE-C8\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.71

Material Properties: NYSDEC OHMS Document No. 201469232-00007
Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: GC-Drained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: normalized N*m Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 ° Piezometric Line: 1
Name: side slope liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 100 psf Phi': 13 ° Piezometric Line: 1
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: STRUCTURAL FILL Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 195 psf Phi': 28.7 °
Name: final cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 °
Name: NOT ACTIVE Model: (None) Piezometric Line: 1
Name: AGGRAGATE Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 48 ° Piezometric Line: 1

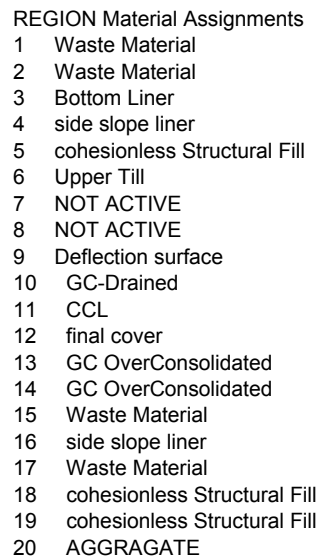


Grid #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Type:	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic
Outside Point:	(1,024.5, 319.5) ft	(1,023.5, 321) ft	(1,023.125, 322.5) ft	(1,022.75, 324) ft	(1,022.375, 325.5) ft	(1,022, 327) ft	(1,021.5, 328.5) ft	(1,021.25, 330) ft	(1,020.875, 331.5) ft	(1,020.5, 333) ft	(1,020.125, 334.5) ft	(1,019.75, 336) ft	(1,019.375, 337.5) ft	(1,019, 339) ft	(1,018.625, 340.5) ft	(1,018.25, 342) ft	(1,017.875, 343.5) ft	(1,017.5, 345) ft	(1,017.125, 346.5) ft	(1,016.75, 348) ft
Inside Point:	(993, 319.3918) ft	(993, 321) ft	(993, 322.5) ft	(991, 324) ft	(991, 325.5) ft	(990, 327) ft	(990, 328.5) ft	(1,011.25, 330) ft	(985.9975, 331.5) ft	(1,010.5, 333) ft	(984, 334.5) ft	(1,009.75, 336) ft	(982, 337.5) ft	(1,009, 339) ft	(982, 340.5) ft	(1,008.25, 342) ft	(981.5, 343.5) ft	(993.5, 345) ft	(996.5, 346.5) ft	(998.5, 348) ft
Slip Surface Intersection:	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Total Length:	31.500186 ft	30.5 ft	30.125 ft	31.75 ft	31.375 ft	32 ft	31.5 ft	10 ft	34.8775 ft	10 ft	36.125 ft	10 ft	37.375 ft	10 ft	36.625 ft	10 ft	36.375 ft	24 ft	20.625 ft	18.25 ft
Reinforcement Direction:	0.19681 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °
F of S Dependent:	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interface Adhesion:	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf
Interface Shear Angle:	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °
Surface Area Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Resistance Reduction Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Force Distribution:	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated
Tensile Capacity:	6,800 lbs	6,800 lbs	5,900 lbs	5,900 lbs	5,900 lbs	4,900 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	3,000 lbs	1,000 lbs	2,300 lbs	2,300 lbs	3,000 lbs	3,000 lbs
Reduction Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Force Orientation:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Max. Pullout Force:	6,800 lbs	6,800 lbs	5,900 lbs	5,900 lbs	5,900 lbs	4,900 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	3,000 lbs	1,000 lbs	2,300 lbs	2,300 lbs	3,000 lbs	3,000 lbs
Pullout Force:	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs
Pullout Force per Length:	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft
Available Length:	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Required Length:	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Governing Component:	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)

To determine the critical global failure for long-term (drained analysis) for the final configuration of RMU-2 located at cross-section 13+50. Using berm material without cohesion.

Material Properties: NYSDEC OHMS Document No. 201469232-00007

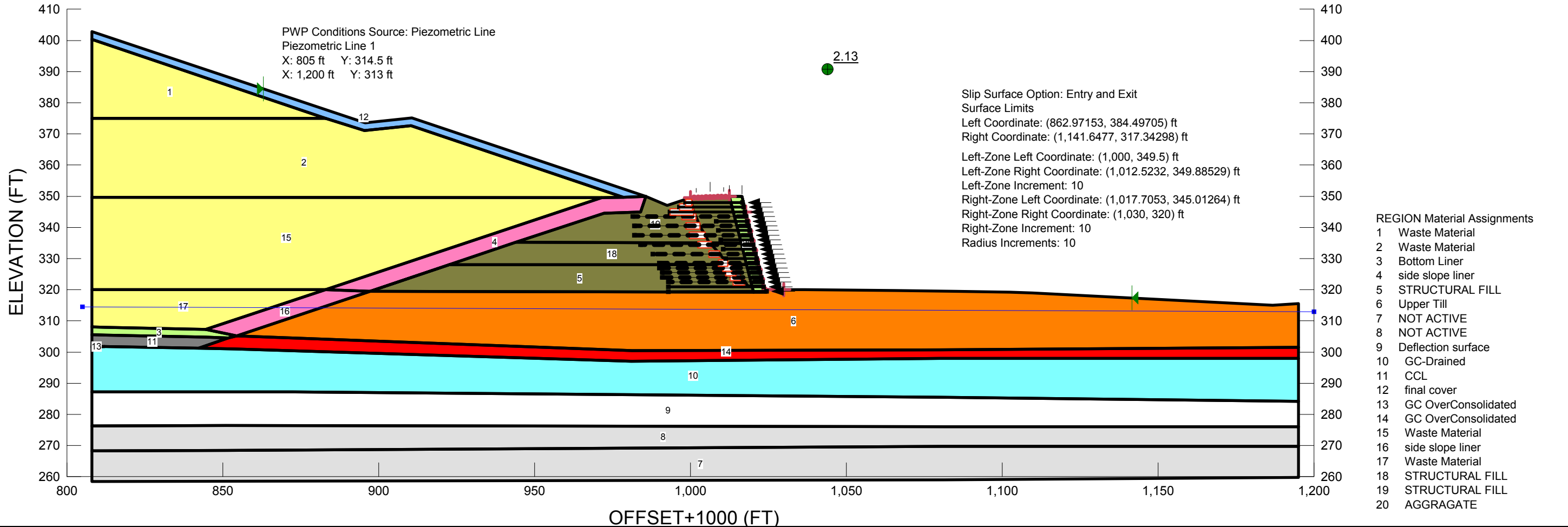
Name: Waste Material	Model: Mohr-Coulomb	Unit Weight: 111 pcf	Cohesion': 0 psf	Phi': 30 °	
Name: Bottom Liner	Model: Shear/Normal Fn.	Unit Weight: 120 pcf	Strength Function: Baseline		
Name: CCL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 1,000 psf	Phi': 10 °	Piezometric Line: 1
Name: Upper Till	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 150 psf	Phi': 31 °	Piezometric Line: 1
Name: GC-Drained	Model: Shear/Normal Fn.	Unit Weight: 118 pcf	Strength Function: normalized N^m	Anisotropic Strength Fn: clay ellipse staticshear	Piezometric Line: 1
Name: GC OverConsolidated	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 100 psf	Phi': 30 °	Piezometric Line: 1
Name: side slope liner	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 100 psf	Phi': 13 °	Piezometric Line: 1
Name: Deflection surface	Model: Bedrock (Impenetrable)				Piezometric Line: 1
Name: final cover	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 0 psf	Phi': 30 °	
Name: NOT ACTIVE	Model: (None)				Piezometric Line: 1
Name: AGGRAGATE	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 0 psf	Phi': 48 °	Piezometric Line: 1
Name: cohesionless Structural Fill	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 34 °	Piezometric Line: 1

[illegible]

PURPOSE:
To determine the critical failure through the berm for long-term (drained analysis) for the final configuration of RMU-2 located at cross-section 13+50. Using berm material with some cohesion.

Title: Model City - RMU-2 XS 1350 MSE
Name: FINAL WALL DRAINED
File Name: RMU2X1350msesslopewonly.gsz
Date: 2/19/2013Time: 11:34:07 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\MSE-C8\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 2.13

Material Properties: NYSDEC OHMS Document No. 201469232-00007
Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: GC-Drained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: normalized N^m Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 ° Piezometric Line: 1
Name: side slope liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 100 psf Phi': 13 ° Piezometric Line: 1
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: STRUCTURAL FILL Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 195 psf Phi': 28.7 °
Name: final cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 °
Name: NOT ACTIVE Model: (None) Piezometric Line: 1
Name: AGGRAGATE Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 48 ° Piezometric Line: 1

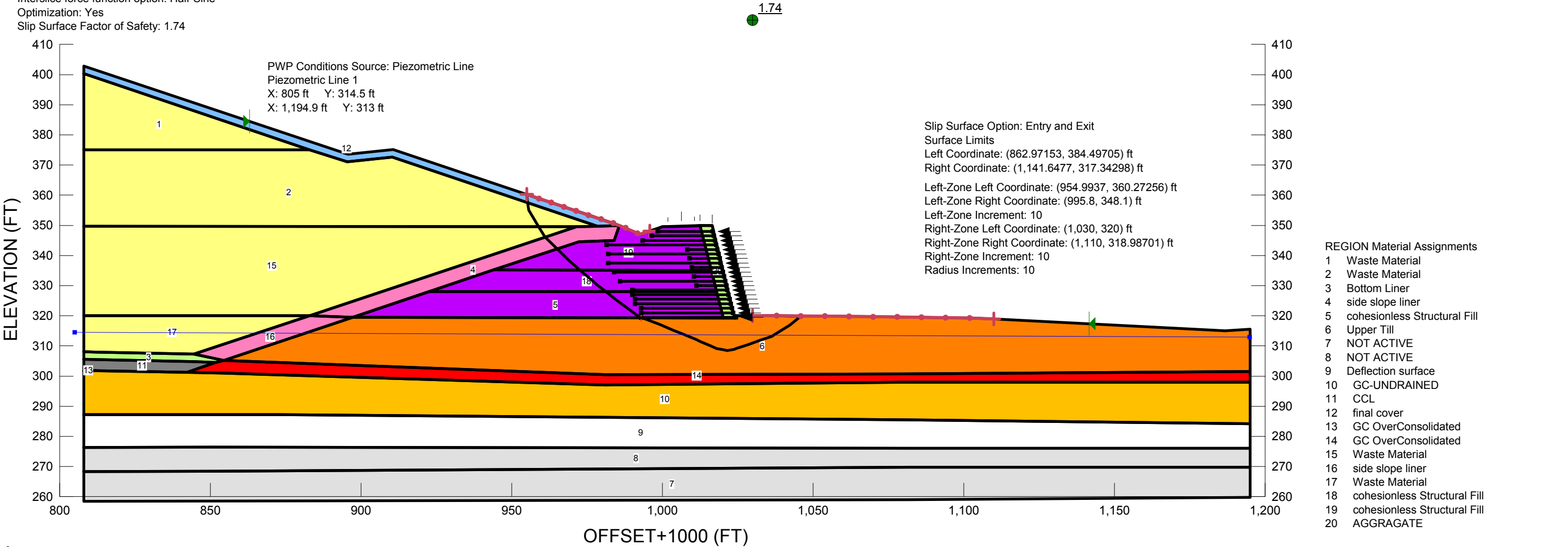


Grid #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Type:	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic
Outside Point:	(1,024.5, 319.5) ft	(1,023.5, 321) ft	(1,023.125, 322.5) ft	(1,022.75, 324) ft	(1,022.375, 325.5) ft	(1,022, 327) ft	(1,021.5, 328.5) ft	(1,021.25, 330) ft	(1,020.875, 331.5) ft	(1,020.5, 333) ft	(1,020.125, 334.5) ft	(1,019.75, 336) ft	(1,019.375, 337.5) ft	(1,019, 339) ft	(1,018.625, 340.5) ft	(1,018.25, 342) ft	(1,017.875, 343.5) ft	(1,017.5, 345) ft	(1,017.125, 346.5) ft	(1,016.75, 348) ft
Inside Point:	(993.0002, 319.37606) ft	(993, 321) ft	(993, 322.5) ft	(991, 324) ft	(990.9978, 325.5) ft	(990, 327) ft	(990, 328.5) ft	(1,011.25, 330) ft	(987.9975, 331.5) ft	(1,010.5, 333) ft	(984, 334.5) ft	(1,009.75, 336) ft	(982, 337.5) ft	(1,009, 339) ft	(982, 340.5) ft	(1,008.25, 342) ft	(981.5, 343.5) ft	(993.5, 345) ft	(996.5, 346.5) ft	(998.5, 348) ft
Slip Surface Intersection:	() ft	() ft	(1,017.3921, 322.5) ft	(1,016.0627, 324) ft	(1,014.6582, 325.5) ft	(1,013.279, 327) ft	(1,011.9065, 328.5) ft	() ft	(1,009.3314, 331.5) ft	() ft	(1,006.7221, 334.5) ft	() ft	(1,004.721, 337.5) ft	() ft	(1,003.0935, 340.5) ft	() ft	(1,001.7266, 343.5) ft	(1,001.106, 345) ft	(1,000.7374, 346.5) ft	(1,000.3687, 348) ft
Total Length:	31.500044 ft	30.5 ft	30.125 ft	31.75 ft	31.3772 ft	32 ft	31.5 ft	10 ft	32.8775 ft	10 ft	36.125 ft	10 ft	37.375 ft	10 ft	36.625 ft	10 ft	36.375 ft	24 ft	20.625 ft	18.25 ft
Reinforcement Direction:	0.22544 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °
F of S Dependent:	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interface Adhesion:	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf
Interface Shear Angle:	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °
Surface Area Factor:	1	0.75	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Resistance Reduction Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Force Distribution:	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated
Tensile Capacity:	6,800 lbs	6,800 lbs	5,900 lbs	5,900 lbs	5,900 lbs	4,900 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	3,000 lbs	1,000 lbs	2,300 lbs	2,300 lbs	3,000 lbs	3,000 lbs
Reduction Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Force Orientation:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Max. Pullout Force:	6,800 lbs	6,800 lbs	5,900 lbs	5,900 lbs	5,900 lbs	4,900 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	3,000 lbs	1,000 lbs	2,300 lbs	2,300 lbs	3,000 lbs	3,000 lbs
Pullout Force:	0 lbs	0 lbs	2,769.1878 lbs	2,769.1878 lbs	2,769.1878 lbs	2,299.834 lbs	2,299.834 lbs	0 lbs	2,299.834 lbs	0 lbs	2,299.834 lbs	0 lbs	2,299.834 lbs	0 lbs	1,408.0616 lbs	0 lbs	1,079.5139 lbs	610.20944 lbs	339.95049 lbs	149.9185 lbs
Pullout Force per Length:	0 lbs/ft	0 lbs/ft	749.75683 lbs/ft	851.21922 lbs/ft	830.04686 lbs/ft	786.99936 lbs/ft	761.26346 lbs/ft	0 lbs/ft	665.40517 lbs/ft	0 lbs/ft	536.35169 lbs/ft	0 lbs/ft	453.34699 lbs/ft	0 lbs/ft	312.81979 lbs/ft	0 lbs/ft	243.43708 lbs/ft	80.226964 lbs/ft	80.226964 lbs/ft	80.226964 lbs/ft
Available Length:	0 ft	0 ft	24.392054 ft	25.062723 ft	23.660408 ft	23.278953 ft	21.906529 ft	0 ft	21.333918 ft	0 ft	22.722114 ft	0 ft	22.721008 ft	0 ft	21.093474 ft	0 ft	20.226614 ft	7.6060393 ft	4.2373595 ft	1.8686798 ft
Required Length:	0 ft	0 ft	3.693448 ft	3.2532017 ft	3.3361825 ft	2.9222819 ft	3.0210749 ft	0 ft	3.4562911 ft	0 ft	4.2879215 ft	0 ft	5.0730103 ft	0 ft	4.5011909 ft	0 ft	4.4344679 ft	7.6060393 ft	4.2373595 ft	1.8686798 ft
Governing Component:	(none)	(none)	Tensile Capacity	Tensile Capacity	Tensile Capacity	Tensile Capacity	Tensile Capacity	(none)	Tensile Capacity	(none)	Tensile Capacity	(none)	Tensile Capacity	(none)	Tensile Capacity	(none)	Tensile Capacity	Pullout Resistance	Pullout Resistance	Pullout Resistance

PURPOSE:
To determine the critical failure through the berm for consolidated undrained for the final configuration of RMU-2 located at cross-section 13+50. Using berm material with no cohesion.

Title: Model City - RMU-2 XS 1350 MSE
Name: FINAL WALL -GLOBAL Cohesionless Undrained GC (2)
File Name: RMU2X1350msseslopewonly.gsz
Date: 2/19/2013Time: 7:54:52 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\MSE-C8\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.74

Material Properties: NYSDEC OHMS Document No. 201469232-00007
Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 ° Piezometric Line: 1
Name: side slope liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 100 psf Phi': 13 ° Piezometric Line: 1
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: final cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 °
Name: NOT ACTIVE Model: (None) Piezometric Line: 1
Name: GC-UNDRAINED Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED-STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: AGGRAGATE Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 48 ° Piezometric Line: 1
Name: cohesionless Structural Fill Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 ° Piezometric Line: 1

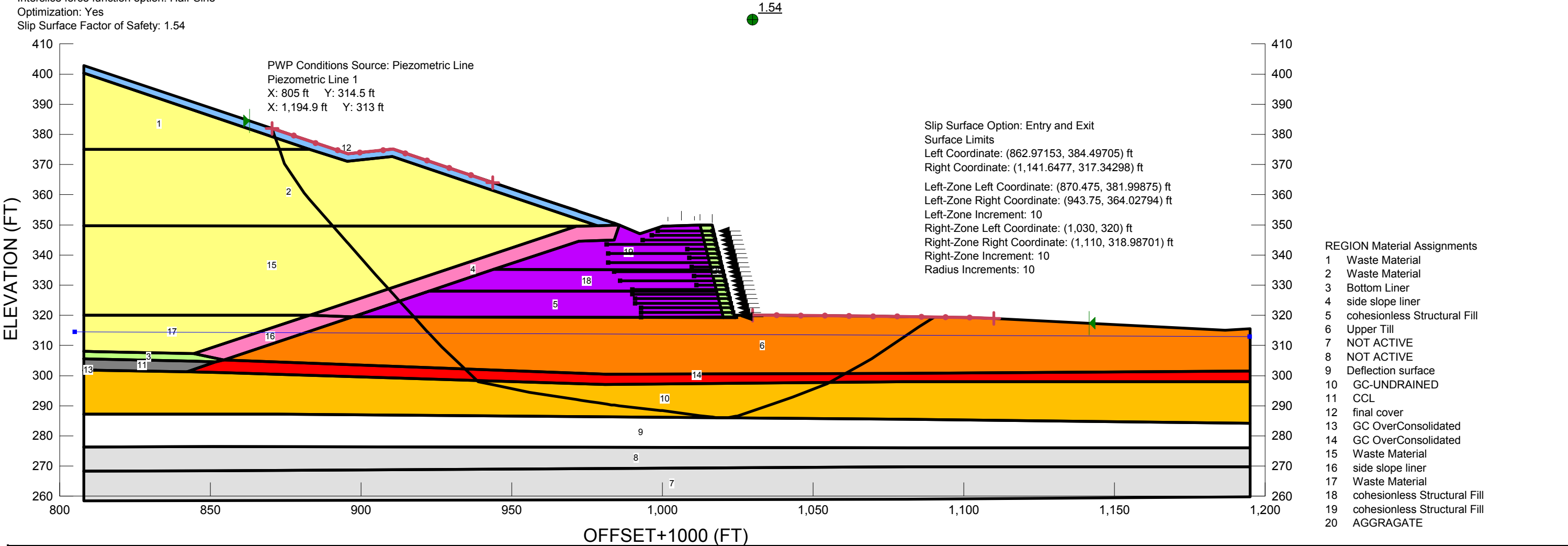


Grid #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Type:	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic
Outside Point:	(1,024.5, 319.5) ft	(1,023.5, 321) ft	(1,023.125, 322.5) ft	(1,022.75, 324) ft	(1,022.375, 325.5) ft	(1,022, 327) ft	(1,021.5, 328.5) ft	(1,021.25, 330) ft	(1,020.875, 331.5) ft	(1,020.5, 333) ft	(1,020.125, 334.5) ft	(1,019.75, 336) ft	(1,019.375, 337.5) ft	(1,019, 339) ft	(1,018.625, 340.5) ft	(1,018.25, 342) ft	(1,017.875, 343.5) ft	(1,017.5, 345) ft	(1,017.125, 346.5) ft	(1,016.75, 348) ft
Inside Point:	(993, 319.3918) ft	(993, 321) ft	(993, 322.5) ft	(991, 324) ft	(991, 325.5) ft	(990, 327) ft	(990, 328.5) ft	(1,011.25, 330) ft	(985.9975, 331.5) ft	(1,010.5, 333) ft	(984, 334.5) ft	(1,009.75, 336) ft	(982, 337.5) ft	(1,009, 339) ft	(982, 340.5) ft	(1,008.25, 342) ft	(981.5, 343.5) ft	(993.5, 345) ft	(996.5, 346.5) ft	(998.5, 348) ft
Slip Surface Intersection:	993.01662, 319.39186) ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Total Length:	31.500186 ft	30.5 ft	30.125 ft	31.75 ft	31.375 ft	32 ft	31.5 ft	10 ft	34.8775 ft	10 ft	36.125 ft	10 ft	37.375 ft	10 ft	36.625 ft	10 ft	36.375 ft	24 ft	20.625 ft	18.25 ft
Reinforcement Direction:	0.19681 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °
F of S Dependent:	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interface Adhesion:	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf
Interface Shear Angle:	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °
Surface Area Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Resistance Reduction Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Force Distribution:	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated
Tensile Capacity:	6,800 lbs	6,800 lbs	5,900 lbs	5,900 lbs	5,900 lbs	4,900 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	3,000 lbs	1,000 lbs	2,300 lbs	2,300 lbs	3,000 lbs	3,000 lbs
Reduction Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Force Orientation:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Max. Pullout Force:	6,800 lbs	6,800 lbs	5,900 lbs	5,900 lbs	5,900 lbs	4,900 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	3,000 lbs	1,000 lbs	2,300 lbs	2,300 lbs	3,000 lbs	3,000 lbs
Pullout Force:	21.408356 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs
Pullout Force per Length:	1,287.8385 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft
Available Length:	0.016623478 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Required Length:	0.016623478 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Governing Component:	Pullout Resistance	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)

PURPOSE:
To determine the critical global failure for the final configuration of RMU-2 located at cross-section 13+50. Using consolidated undrained GC and berm material without cohesion.

Title: Model City - RMU-2 XS 1350 MSE
Name: FINAL WALL -GLOBAL Cohesionless Undrained GC
File Name: RMU2X1350msesslopewonly.gsz
Date: 2/19/2013Time: 7:54:52 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\MSE-C8\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.54

Material Properties: NYSDEC OHMS Document No. 201469232-00007
Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 ° Piezometric Line: 1
Name: side slope liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 100 psf Phi': 13 ° Piezometric Line: 1
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: final cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 °
Name: NOT ACTIVE Model: (None) Piezometric Line: 1
Name: GC-UNDRAINED Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED-STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: AGGRAGATE Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 48 ° Piezometric Line: 1
Name: cohesionless Structural Fill Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 ° Piezometric Line: 1



Grid #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Type:	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic
Outside Point:	(1,024.5, 319.5) ft	(1,023.5, 321) ft	(1,023.125, 322.5) ft	(1,022.75, 324) ft	(1,022.375, 325.5) ft	(1,022, 327) ft	(1,021.5, 328.5) ft	(1,021.25, 330) ft	(1,020.875, 331.5) ft	(1,020.5, 333) ft	(1,020.125, 334.5) ft	(1,019.75, 336) ft	(1,019.375, 337.5) ft	(1,019, 339) ft	(1,018.625, 340.5) ft	(1,018.25, 342) ft	(1,017.875, 343.5) ft	(1,017.5, 345) ft	(1,017.125, 346.5) ft	(1,016.75, 348) ft
Inside Point:	(993, 319.3918) ft	(993, 321) ft	(993, 322.5) ft	(991, 324) ft	(991, 325.5) ft	(990, 327) ft	(990, 328.5) ft	(1,011.25, 330) ft	(985.9975, 331.5) ft	(1,010.5, 333) ft	(984, 334.5) ft	(1,009.75, 336) ft	(982, 337.5) ft	(1,009, 339) ft	(982, 340.5) ft	(1,008.25, 342) ft	(981.5, 343.5) ft	(993.5, 345) ft	(996.5, 346.5) ft	(998.5, 348) ft
Slip Surface Intersection:	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Total Length:	31.500186 ft	30.5 ft	30.125 ft	31.75 ft	31.375 ft	32 ft	31.5 ft	10 ft	34.8775 ft	10 ft	36.125 ft	10 ft	37.375 ft	10 ft	36.625 ft	10 ft	36.375 ft	24 ft	20.625 ft	18.25 ft
Reinforcement Direction:	0.19681 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °
F of S Dependent:	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interface Adhesion:	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf
Interface Shear Angle:	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °	34 °
Surface Area Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Resistance Reduction Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Force Distribution:	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated
Tensile Capacity:	6,800 lbs	6,800 lbs	5,900 lbs	5,900 lbs	5,900 lbs	4,900 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	3,000 lbs	1,000 lbs	2,300 lbs	2,300 lbs	3,000 lbs	3,000 lbs
Reduction Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Force Orientation:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Max. Pullout Force:	6,800 lbs	6,800 lbs	5,900 lbs	5,900 lbs	5,900 lbs	4,900 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	3,000 lbs	1,000 lbs	2,300 lbs	2,300 lbs	3,000 lbs	3,000 lbs
Pullout Force:	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs
Pullout Force per Length:	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft
Available Length:	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Required Length:	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Governing Component:	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)

PURPOSE:
To determine the critical failure near the berm for the final configuration of RMU-2 located at cross-section 13+50. Using consolidated undrained GC and assuming undrained (R envelope) berm material properties. To be used in seismic analysis.

Title: Model City - RMU-2 XS 1350 MSE
Name: Undrained - static
File Name: RMU2X1350msseslopewonly.gsz
Date: 2/19/2013Time: 11:34:07 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\MSE-C8\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.71

NYSDEC OHMS Document No. 201469232-00007

Material Properties:

Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °

Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline

Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1

Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1

Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 ° Piezometric Line: 1

Name: side slope liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 100 psf Phi': 13 ° Piezometric Line: 1

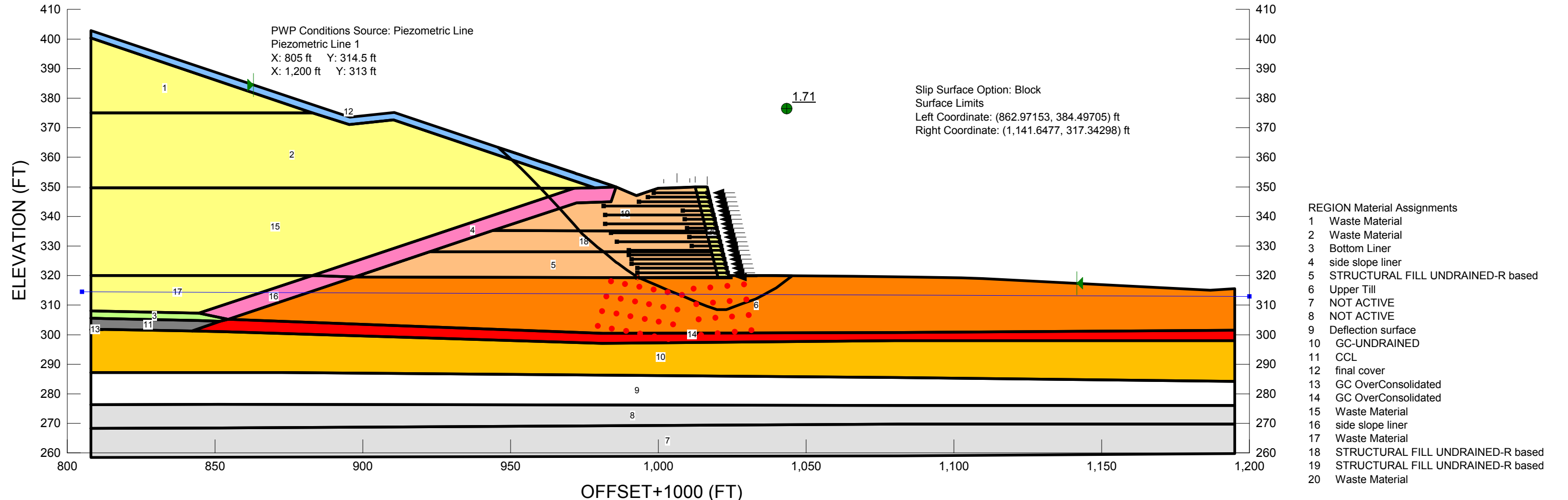
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1

Name: final cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 °

Name: NOT ACTIVE Model: (None) Piezometric Line: 1

Name: STRUCTURAL FILL UNDRAINED-R based Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 363 psf Phi': 26.3 °

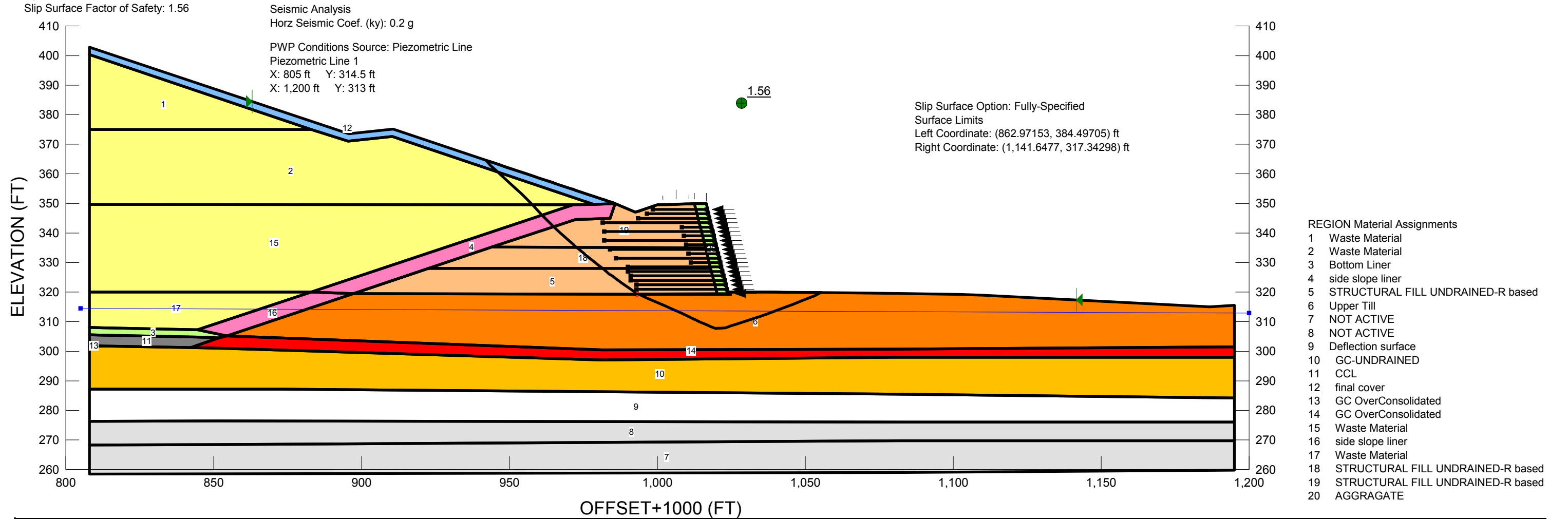
Name: GC-UNDRAINED Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED-STATIC Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1



Grid #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Type:	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic
Outside Point:	(1,024.5, 319.5) ft	(1,023.5, 321) ft	(1,023.125, 322.5) ft	(1,022.75, 324) ft	(1,022.375, 325.5) ft	(1,022, 327) ft	(1,021.5, 328.5) ft	(1,021.25, 330) ft	(1,020.875, 331.5) ft	(1,020.5, 333) ft	(1,020.125, 334.5) ft	(1,019.75, 336) ft	(1,019.375, 337.5) ft	(1,019, 339) ft	(1,018.625, 340.5) ft	(1,018.25, 342) ft	(1,017.875, 343.5) ft	(1,017.5, 345) ft	(1,017.125, 346.5) ft	(1,016.75, 348) ft
Inside Point:	(993, 319.3918) ft	(993, 321) ft	(993, 322.5) ft	(991, 324) ft	(990.9978, 325.5) ft	(990, 327) ft	(990, 328.5) ft	(1,011.25, 330) ft	(986, 331.5) ft	(1,010.5, 333) ft	(984, 334.5) ft	(1,009.75, 336) ft	(982, 337.5) ft	(1,009, 339) ft	(982, 340.5) ft	(1,008.25, 342) ft	(981.5, 343.5) ft	(993.5, 345) ft	(996.5, 346.5) ft	(998.5, 348) ft
Slip Surface Intersection:	993.01892, 319.39186) ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft	() ft
Total Length:	31.500186 ft	30.5 ft	30.125 ft	31.75 ft	31.3772 ft	32 ft	31.5 ft	10 ft	34.875 ft	10 ft	36.125 ft	10 ft	37.375 ft	10 ft	36.625 ft	10 ft	36.375 ft	24 ft	20.625 ft	18.25 ft
Reinforcement Direction:	0.19681 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °
F of S Dependent:	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interface Adhesion:	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf
Interface Shear Angle:	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °
Surface Area Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Resistance Reduction Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Force Distribution:	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated
Tensile Capacity:	6,800 lbs	6,800 lbs	5,900 lbs	5,900 lbs	5,900 lbs	4,900 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	3,000 lbs	1,000 lbs	2,300 lbs	2,300 lbs	3,000 lbs	3,000 lbs
Reduction Factor:	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Force Orientation:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Max. Pullout Force:	8,000 lbs	8,000 lbs	6,941.1765 lbs	6,941.1765 lbs	6,941.1765 lbs	5,764.7059 lbs	5,764.7059 lbs	1,176.4706 lbs	5,764.7059 lbs	1,176.4706 lbs	5,764.7059 lbs	1,176.4706 lbs	5,764.7059 lbs	1,176.4706 lbs	3,529.4118 lbs	1,176.4706 lbs	2,705.8824 lbs	2,705.8824 lbs	3,529.4118 lbs	3,529.4118 lbs
Pullout Force:	22.717158 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs
Pullout Force per Length:	1,200.8852 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft
Available Length:	0.018917011 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Required Length:	0.018917011 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Governing Component:	Pullout Resistance	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)

PURPOSE:
To determine the seismic ky value for the critical failure near the berm for the final configuration of RMU-2 located at cross-section 13+50. Using consolidated undrained GC and assuming undrained (R envelope) berm material properties. To be used in seismic analysis.

Title: Model City - RMU-2 XS 1350 MSE
Name: Undrained - Yield Acc.
File Name: RMU2X1350mssesslopowonly.gsz
Date: 2/19/2013Time: 7:54:52 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\MSE-C8\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: No
Slip Surface Factor of Safety: 1.56



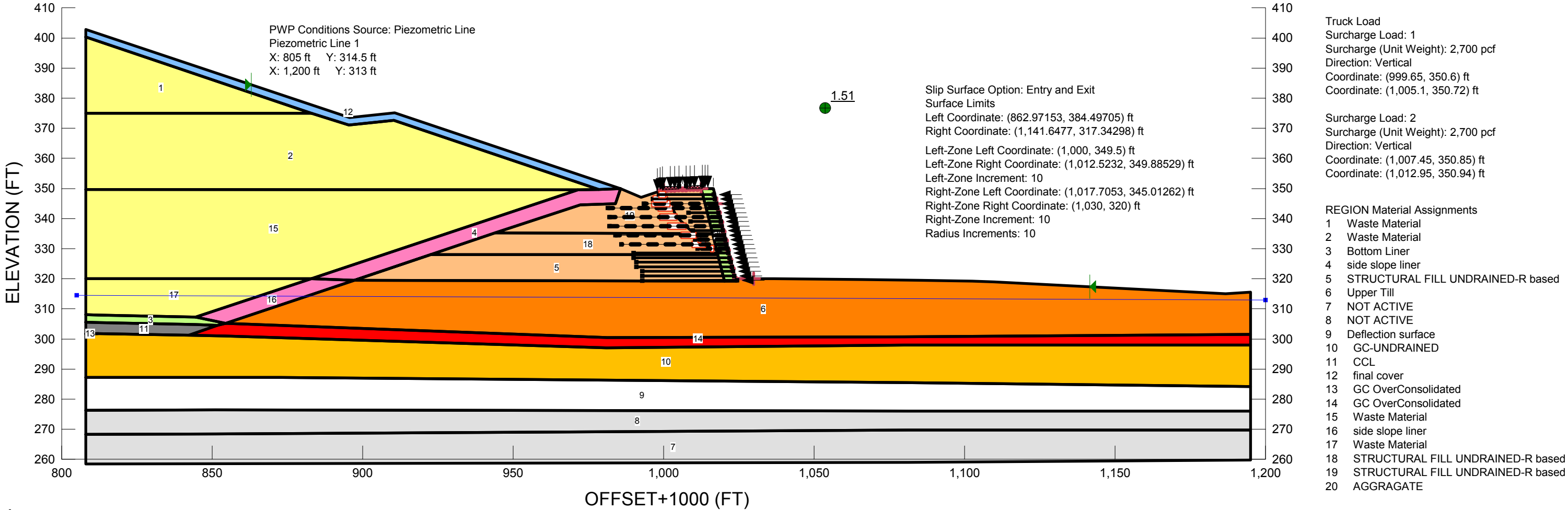
Grid #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Type:	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic
Outside Point:	(1,024.5, 319.5) ft	(1,023.5, 321) ft	(1,023.125, 322.5) ft	(1,022.75, 324) ft	(1,022.375, 325.5) ft	(1,022, 327) ft	(1,021.5, 328.5) ft	(1,021.25, 330) ft	(1,020.875, 331.5) ft	(1,020.5, 333) ft	(1,020.125, 334.5) ft	(1,019.75, 336) ft	(1,019.375, 337.5) ft	(1,019, 339) ft	(1,018.625, 340.5) ft	(1,018.25, 342) ft	(1,017.875, 343.5) ft	(1,017.5, 345) ft	(1,017.125, 346.5) ft	(1,016.75, 348) ft
Inside Point:	(993, 319.3918) ft	(993, 321) ft	(993, 322.5) ft	(991, 324) ft	(990.9978, 325.5) ft	(990, 327) ft	(990, 328.5) ft	(1,011.25, 330) ft	(986, 331.5) ft	(1,010.5, 333) ft	(984, 334.5) ft	(1,009.75, 336) ft	(982, 337.5) ft	(1,009, 339) ft	(982, 340.5) ft	(1,008.25, 342) ft	(981.5, 343.5) ft	(993.5, 345) ft	(996.5, 346.5) ft	(998.5, 348) ft
Slip Surface Intersection:	993.39978, 319.39317) ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Total Length:	31.500186 ft	30.5 ft	30.125 ft	31.75 ft	31.3772 ft	32 ft	31.5 ft	10 ft	34.875 ft	10 ft	36.125 ft	10 ft	37.375 ft	10 ft	36.625 ft	10 ft	36.375 ft	24 ft	20.625 ft	18.25 ft
Reinforcement Direction:	0.19681 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °
F of S Dependent:	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interface Adhesion:	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf
Interface Shear Angle:	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °
Surface Area Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Resistance Reduction Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Force Distribution:	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated
Tensile Capacity:	6,800 lbs	6,800 lbs	5,900 lbs	5,900 lbs	5,900 lbs	4,900 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	3,000 lbs	1,000 lbs	2,300 lbs	2,300 lbs	3,000 lbs	3,000 lbs
Reduction Factor:	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Force Orientation:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Max. Pullout Force:	8,000 lbs	8,000 lbs	6,941.1765 lbs	6,941.1765 lbs	6,941.1765 lbs	5,764.7059 lbs	5,764.7059 lbs	1,176.4706 lbs	5,764.7059 lbs	1,176.4706 lbs	5,764.7059 lbs	1,176.4706 lbs	5,764.7059 lbs	1,176.4706 lbs	3,529.4118 lbs	1,176.4706 lbs	2,705.8824 lbs	2,705.8824 lbs	3,529.4118 lbs	3,529.4118 lbs
Pullout Force:	527.52825 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs
Pullout Force per Length:	1,319.5254 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft
Available Length:	0.39978637 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Required Length:	0.39978637 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft
Governing Component:	Pullout Resistance	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)	(none)

PURPOSE:
To determine the critical failure through the berm for the final configuration of RMU-2 with truck loading located at cross-section 13+50. Using undrained (R envelope) berm material properties.

Title: Model City - RMU-2 XS 1350 MSE
Name: Undrained w Articulating Dump 1
File Name: RMU2X1350msseslopewonly.gsz
Date: 2/19/2013Time: 7:54:52 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\MSE-C8\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.51

Material Properties: NYSDEC OHMS Document No. 201469232-00007
Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 ° Piezometric Line: 1
Name: side slope liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 100 psf Phi': 13 ° Piezometric Line: 1
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: final cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 °
Name: NOT ACTIVE Model: (None) Piezometric Line: 1
Name: STRUCTURAL FILL UNDRAINED-R based Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 363 psf Phi': 26.3 °
Name: GC-UNDRAINED Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED-STATIC
Name: AGGRAGATE Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 48 ° Piezometric Line: 1

Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1

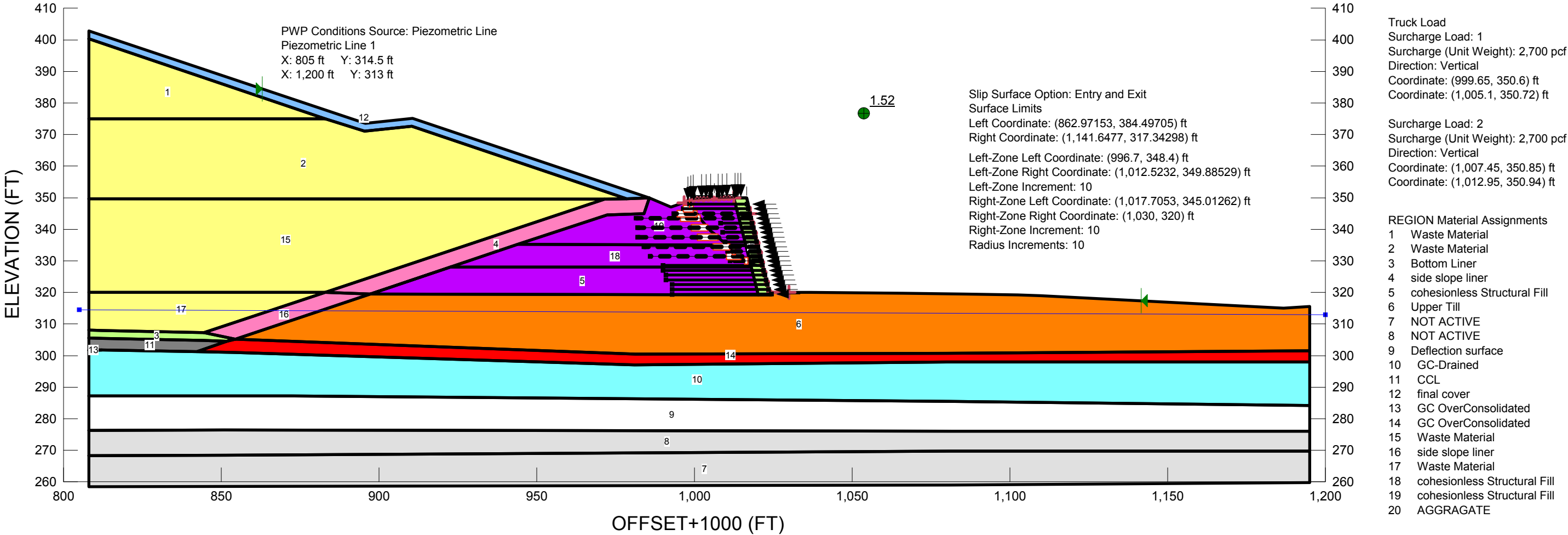


Grid #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Type:	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic
Outside Point:	(1,024.5, 319.5) ft	(1,023.5, 321) ft	(1,023.125, 322.5) ft	(1,022.75, 324) ft	(1,022.375, 325.5) ft	(1,022, 327) ft	(1,021.5, 328.5) ft	(1,021.25, 330) ft	(1,020.875, 331.5) ft	(1,020.5, 333) ft	(1,020.125, 334.5) ft	(1,019.75, 336) ft	(1,019.375, 337.5) ft	(1,019, 339) ft	(1,018.625, 340.5) ft	(1,018.25, 342) ft	(1,017.875, 343.5) ft	(1,017.5, 345) ft	(1,017.125, 346.5) ft	(1,016.75, 348) ft
Inside Point:	(993, 319.3918) ft	(993, 321) ft	(993, 322.5) ft	(991, 324) ft	(990.9978, 325.5) ft	(990, 327) ft	(990, 328.5) ft	(1,011.25, 330) ft	(986, 331.5) ft	(1,010.5, 333) ft	(984, 334.5) ft	(1,009.75, 336) ft	(982, 337.5) ft	(1,009, 339) ft	(982, 340.5) ft	(1,008.25, 342) ft	(981.5, 343.5) ft	(993.5, 345) ft	(996.475, 346.5) ft	(998.5, 348) ft
Slip Surface Intersection:	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	(1,016.6694, 330) ft	(1,013.9691, 331.5) ft	(1,012.4193, 333) ft	(1,010.8214, 334.5) ft	0 ft	(1,007.5188, 337.5) ft	0 ft	(1,004.4839, 340.5) ft	(1,002.902, 343.5) ft	(1,002.0823, 345) ft	(1,001.2456, 346.5) ft	(1,000.6356, 348) ft
Total Length:	31.500186 ft	30.5 ft	30.125 ft	31.75 ft	31.3772 ft	32 ft	31.5 ft	10 ft	34.875 ft	10 ft	36.125 ft	10 ft	37.375 ft	10 ft	36.625 ft	10 ft	36.375 ft	24 ft	20.65 ft	18.25 ft
Reinforcement Direction:	0.19681 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °
F of S Dependent:	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interface Adhesion:	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf
Interface Shear Angle:	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	34 °	34 °	34 °	34 °	34 °
Surface Area Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Resistance Reduction Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Force Distribution:	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated
Tensile Capacity:	6,800 lbs	6,800 lbs	5,900 lbs	5,900 lbs	5,900 lbs	4,900 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	3,000 lbs	1,000 lbs	2,300 lbs	2,300 lbs	3,000 lbs	3,000 lbs
Reduction Factor:	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Force Orientation:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Max. Pullout Force:	8,000 lbs	8,000 lbs	6,941.1765 lbs	6,941.1765 lbs	6,941.1765 lbs	5,764.7059 lbs	5,764.7059 lbs	1,176.4706 lbs	5,764.7059 lbs	1,176.4706 lbs	5,764.7059 lbs	1,176.4706 lbs	5,764.7059 lbs	1,176.4706 lbs	3,529.4118 lbs	1,176.4706 lbs	2,705.8824 lbs	2,705.8824 lbs	3,529.4118 lbs	3,529.4118 lbs
Pullout Force:	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	779.81223 lbs	3,821.0799 lbs	779.81223 lbs	3,821.0799 lbs	0 lbs	3,821.0799 lbs	0 lbs	2,339.4367 lbs	0 lbs	1,793.5681 lbs	1,793.5681 lbs	596.6358 lbs	267.08781 lbs
Pullout Force per Length:	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	780.94185 lbs/ft	860.88644 lbs/ft	826.32765 lbs/ft	758.48706 lbs/ft	0 lbs/ft	617.48388 lbs/ft	0 lbs/ft	407.70358 lbs/ft	0 lbs/ft	384.12152 lbs/ft	301.2076 lbs/ft	125.0663 lbs/ft	125.0663 lbs/ft
Available Length:	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	5.4193885 ft	27.969111 ft	1.9193271 ft	26.821427 ft	0 ft	25.518764 ft	0 ft	22.483948 ft	0 ft	21.401977 ft	8.5823297 ft	4.7705561 ft	2.1355698 ft
Required Length:	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0.99855352 ft	4.4385412 ft	0.94370826 ft	5.0377655 ft	0 ft	6.1881453 ft	0 ft	5.7380823 ft	0 ft	4.6692727 ft	5.9545912 ft	4.7705561 ft	2.1355698 ft
Governing Component:	(none)	(none)	(none)	(none)	(none)	(none)	(none)	Tensile Capacity	Tensile Capacity	Tensile Capacity	Tensile Capacity	(none)	Tensile Capacity	(none)	Tensile Capacity	(none)	Tensile Capacity	Tensile Capacity	Pullout Resistance	Pullout Resistance

PURPOSE:
To determine the critical failure through the berm for the final configuration of RMU-2 with truck loading located at cross-section 13+50. This is to establish use of cohesionless fill material.

Title: Model City - RMU-2 XS 1350 MSE
Name: Drained w Articulating Dump (3)
Description: Strip Load - cat 740 with Cohesionless Fill
File Name: RMU2X1350msesslopewonly.gsz
Date: 2/20/2013Time: 2:56:22 PM
Directory: N:\Model_City\154.002_rmu2\154.005_revnsions\geoslope\MSE-C8\
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Optimization: Yes
Slip Surface Factor of Safety: 1.52

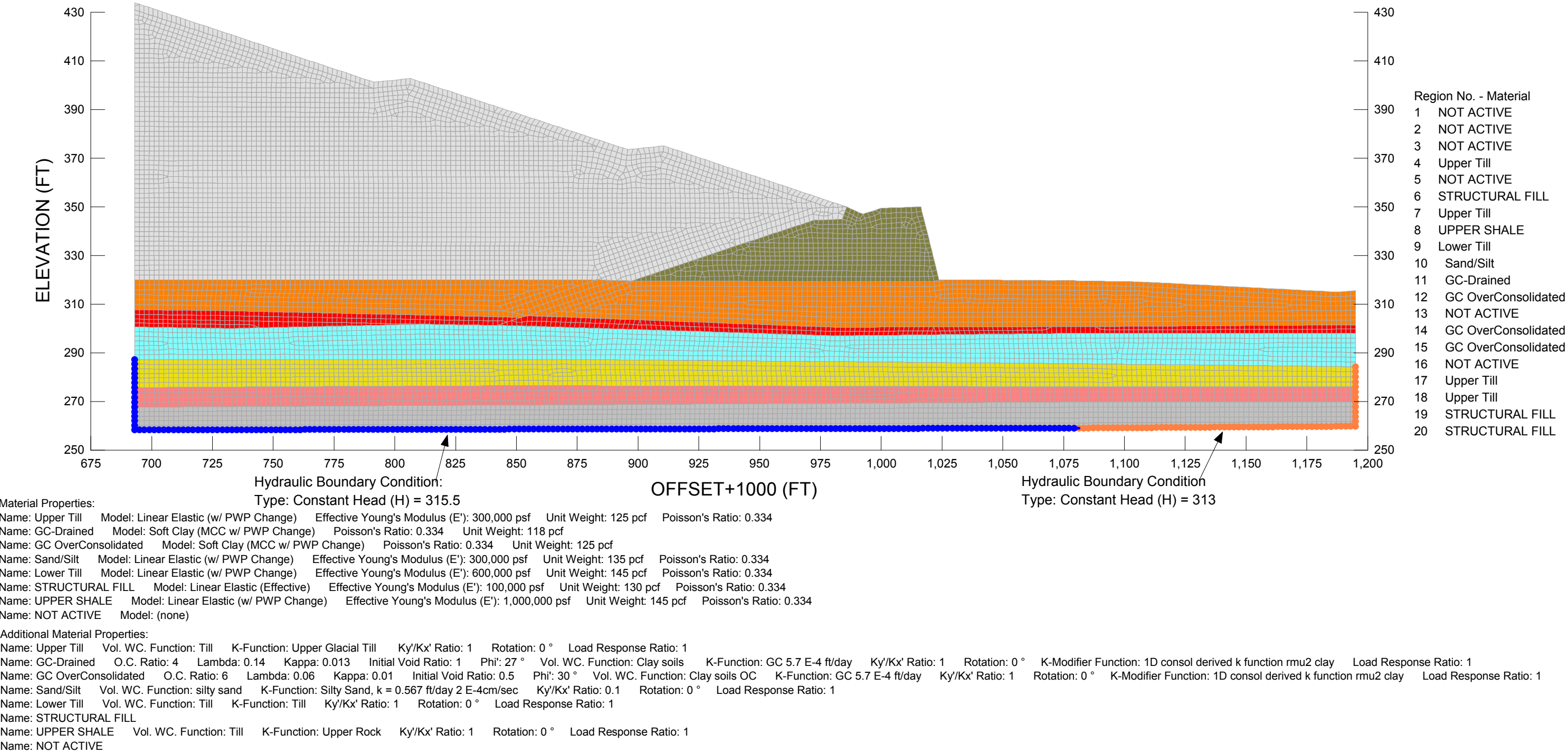
Material Properties:
Name: Waste Material Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 30 °
Name: Bottom Liner Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: Baseline
Name: CCL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 10 ° Piezometric Line: 1
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 ° Piezometric Line: 1
Name: GC-Drained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: normalized N*m Anisotropic Strength Fn: clay ellipse staticshear Piezometric Line: 1
Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 ° Piezometric Line: 1
Name: side slope liner Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 100 psf Phi': 13 ° Piezometric Line: 1
Name: Deflection surface Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: final cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 30 °
Name: NOT ACTIVE Model: (None) Piezometric Line: 1
Name: AGGRAGATE Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 48 ° Piezometric Line: 1
Name: cohesionless Structural Fill Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 ° Piezometric Line: 1



Grid #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Type:	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic	Geosynthetic
Outside Point:	(1,024.5, 319.5) ft	(1,023.5, 321) ft	(1,023.125, 322.5) ft	(1,022.75, 324) ft	(1,022.375, 325.5) ft	(1,022, 327) ft	(1,021.5, 328.5) ft	(1,021.25, 330) ft	(1,020.875, 331.5) ft	(1,020.5, 333) ft	(1,020.125, 334.5) ft	(1,019.75, 336) ft	(1,019.375, 337.5) ft	(1,019, 339) ft	(1,018.625, 340.5) ft	(1,018.25, 342) ft	(1,017.875, 343.5) ft	(1,017.5, 345) ft	(1,017.125, 346.5) ft	(1,016.75, 348) ft
Inside Point:	(993, 319.3918) ft	(993, 321) ft	(993, 322.5) ft	(991, 324) ft	(990.9978, 325.5) ft	(990, 327) ft	(990, 328.5) ft	(1,011.25, 330) ft	(986, 331.5) ft	(1,010.5, 333) ft	(984, 334.5) ft	(1,009.75, 336) ft	(982, 337.5) ft	(1,009, 339) ft	(982, 340.5) ft	(1,008.25, 342) ft	(981.5, 343.5) ft	(993.5, 345) ft	(996.5, 346.5) ft	(998.5, 348) ft
Slip Surface Intersection:	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	(1,016.9577, 330) ft	(1,014.7315, 331.5) ft	(1,013.0191, 333) ft	(1,011.2175, 334.5) ft	0 ft	(1,007.4823, 337.5) ft	0 ft	(1,004.2712, 340.5) ft	0 ft	(1,001.7979, 343.5) ft	(1,000.7518, 345) ft	(999.63849, 346.5) ft	(998.51265, 348) ft
Total Length:	31.500186 ft	30.5 ft	30.125 ft	31.75 ft	31.3772 ft	32 ft	31.5 ft	10 ft	34.875 ft	10 ft	36.125 ft	10 ft	37.375 ft	10 ft	36.625 ft	10 ft	36.375 ft	24 ft	20.625 ft	18.25 ft
Reinforcement Direction:	0.19681 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °
F of S Dependent:	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interface Adhesion:	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf	0 psf
Interface Shear Angle:	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	30 °	34 °	34 °	34 °	34 °	34 °
Surface Area Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Resistance Reduction Factor:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Force Distribution:	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated	Concentrated
Tensile Capacity:	6,800 lbs	6,800 lbs	5,900 lbs	5,900 lbs	5,900 lbs	4,900 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	4,900 lbs	1,000 lbs	3,000 lbs	1,000 lbs	2,300 lbs	2,300 lbs	3,000 lbs	3,000 lbs
Reduction Factor:	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Force Orientation:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Max. Pullout Force:	8,000 lbs	8,000 lbs	6,941.1765 lbs	6,941.1765 lbs	6,941.1765 lbs	5,764.7059 lbs	5,764.7059 lbs	1,176.4706 lbs	5,764.7059 lbs	1,176.4706 lbs	5,764.7059 lbs	1,176.4706 lbs	5,764.7059 lbs	1,176.4706 lbs	3,529.4118 lbs	1,176.4706 lbs	2,705.8824 lbs	2,705.8824 lbs	3,529.4118 lbs	3,529.4118 lbs
Pullout Force:	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	772.33395 lbs	3,784.4364 lbs	772.33395 lbs	3,784.4364 lbs	0 lbs	3,784.4364 lbs	0 lbs	2,317.0019 lbs	0 lbs	1,776.3681 lbs	1,776.3681 lbs	337.77008 lbs	0.38718693 lbs
Pullout Force per Length:	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	0 lbs/ft	778.36674 lbs/ft	816.18548 lbs/ft	780.3191 lbs/ft	722.0195 lbs/ft	0 lbs/ft	584.0185 lbs/ft	0 lbs/ft	434.04023 lbs/ft	0 lbs/ft	287.7896 lbs/ft	287.7896 lbs/ft	107.62191 lbs/ft	30.60723 lbs/ft
Available Length:	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	5.7076934 ft	28.73154 ft	2.5190809 ft	27.217494 ft	0 ft	25.482274 ft	0 ft	22.271229 ft	0 ft	20.297937 ft	7.2517823 ft	3.1384879 ft	0.012650179 ft
Required Length:	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0 ft	0.99224942 ft	4.6367357 ft	0.98976682 ft	5.2414601 ft	0 ft	6.479994 ft	0 ft	5.3382191 ft	0 ft	6.172454 ft	6.172454 ft	3.1384879 ft	0.012650179 ft
Governing Component:	(none)	(none)	(none)	(none)	(none)	(none)	(none)	Tensile Capacity	Tensile Capacity	Tensile Capacity	Tensile Capacity	(none)	Tensile Capacity	(none)	Tensile Capacity	(none)	Tensile Capacity	Tensile Capacity	Pullout Resistance	Pullout Resistance

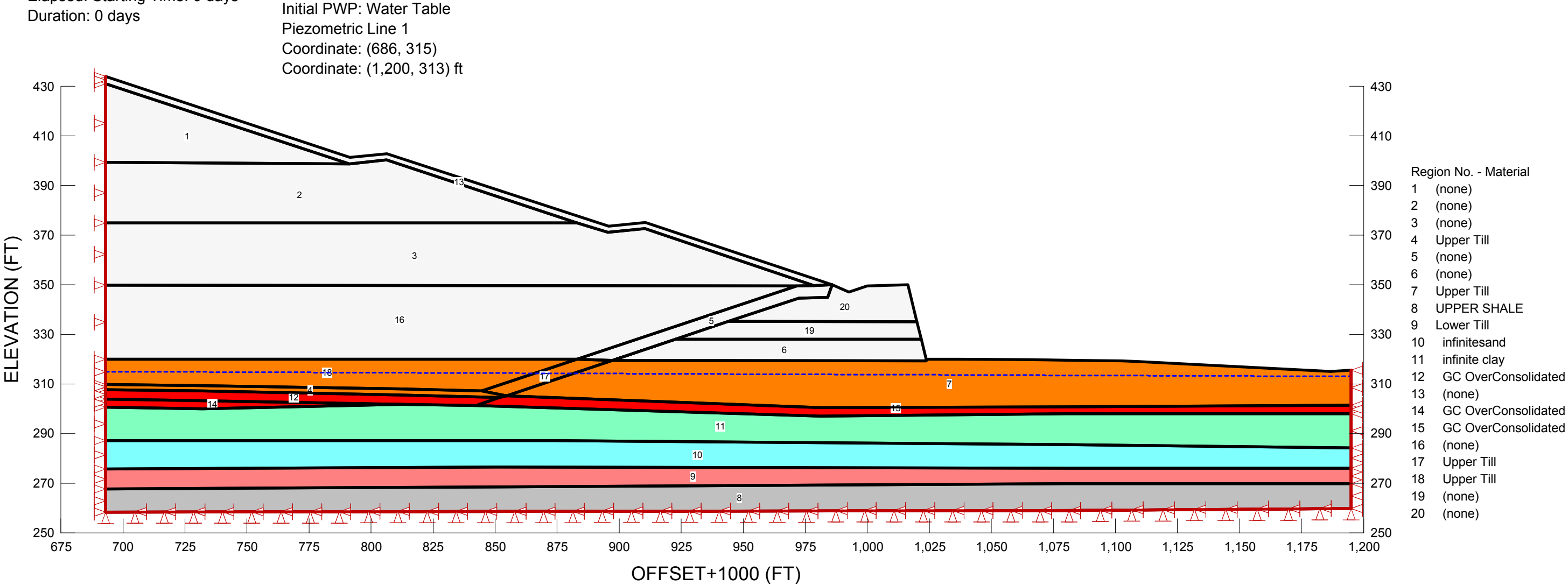
Title: Model City - RMU-2 XS 1350 MSE
Name: MSE step 1 - no solution - key
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\MSE-C8\
File Name: RMU2X1350mse21-key.gsz
Last Saved Date: 2/21/2013
Analysis Kind: SIGMA/W
Analysis Method: Coupled Stress/PWP

PURPOSE:
To present the mesh and hydraulic boundary conditions.



Title: Model City - RMU-2 XS 1350 MSE
Name: Insitu
File Name: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\MSE-C8\RMU2X1350mse21.gsz
Last Saved Date: 2/16/2013
Analysis Kind: SIGMA/W
Analysis Method: Insitu
Elapsed: Starting Time: 0 days
Duration: 0 days

PURPOSE:
To determine the effective stresses /pore pressures prior to
any material placement/construction at cross-section 13+50.



Material Properties:

Name: Upper Till Model: Linear Elastic (w/ PWP Change) Effective Young's Modulus (E'): 300,000 psf Unit Weight: 125 pcf Poisson's Ratio: 0.334 Insitu Ko: 0.5015015
Name: GC OverConsolidated Model: Soft Clay (MCC w/ PWP Change) Poisson's Ratio: 0.334 Insitu Ko: 0.5015015 Unit Weight: 125 pcf
Name: Lower Till Model: Linear Elastic (w/ PWP Change) Effective Young's Modulus (E'): 600,000 psf Unit Weight: 145 pcf Poisson's Ratio: 0.334 Insitu Ko: 0.5015015
Name: UPPER SHALE Model: Linear Elastic (w/ PWP Change) Effective Young's Modulus (E'): 1,000,000 psf Unit Weight: 145 pcf Poisson's Ratio: 0.334 Insitu Ko: 0.5015015
Name: infinite clay Model: Linear Elastic (w/ PWP Change) Effective Young's Modulus (E'): 400,000 psf Unit Weight: 120 pcf Poisson's Ratio: 0.334 Insitu Ko: 0.5015015
Name: infinitesand Model: Linear Elastic (w/ PWP Change) Effective Young's Modulus (E'): 400,000 psf Unit Weight: 120 pcf Poisson's Ratio: 0.334 Insitu Ko: 0.5015015

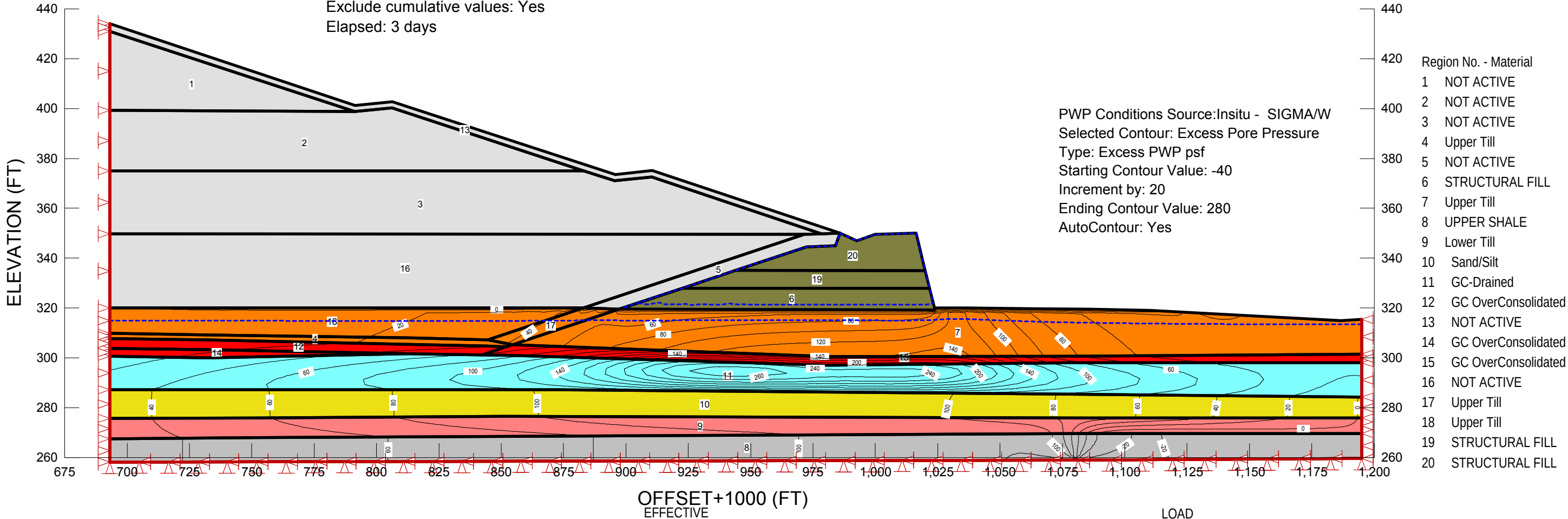
Additional Material Properties:

Name: Upper Till Vol. WC. Function: Till K-Function: Upper Glacial Till Ky'/Kx' Ratio: 1 Rotation: 0 ° Load Response Ratio: 1
Name: GC OverConsolidated O.C. Ratio: 6 Lambda: 0.06 Kappa: 0.01 Initial Void Ratio: 0.5 Phi': 30 ° Vol. WC. Function: Clay soils OC K-Function: GC 5.7 E-4 ft/day Ky'/Kx' Ratio: 1 Rotation: 0 ° K-Modifier Function: 1D consol derived k function rmu2 clay Load Response Ratio: 1
Name: Lower Till Vol. WC. Function: Till K-Function: Till Ky'/Kx' Ratio: 1 Rotation: 0 ° Load Response Ratio: 1
Name: UPPER SHALE Vol. WC. Function: Till K-Function: Upper Rock Ky'/Kx' Ratio: 1 Rotation: 0 ° Load Response Ratio: 1
Name: infinite clay Vol. WC. Function: Clay soils K-Function: GC 5.7 E-4 ft/day Ky'/Kx' Ratio: 1 Rotation: 0 ° Load Response Ratio: 1
Name: infinitesand Vol. WC. Function: silty sand K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec Ky'/Kx' Ratio: 0.1 Rotation: 0 ° Load Response Ratio: 1

Title: Model City - RMU-2 XS 1350 MSE
Name: MSE step 1 (4)
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\MSE-C8\
File Name: RMU2X1350mse21.gsz
Last Saved Date: 2/16/2013
Analysis Kind: SIGMA/W
Analysis Method: Coupled Stress/PWP
Elapsed: Starting Time: 0 days
Step Generation Method: Linear
Duration: 30 days
of Steps: 10

Parent Analysis Name: Insitu
Starting Time: 0 days
Initial Stress: Parent Analysis
Initial PWP: Parent Analysis
Exclude cumulative values: Yes
Elapsed: 3 days

PURPOSE:
To determine the effective stresses /pore pressures from berm placement in 3 days at cross-section 13+50. This analysis runs for 30 days in 10 steps, but the placement of the fill occurs on the first step (3 days) and the effective stress/pore pressure used in the stability anaylsis is taken from the first step (3 days). Using a berm fill material with some cohesive strength.

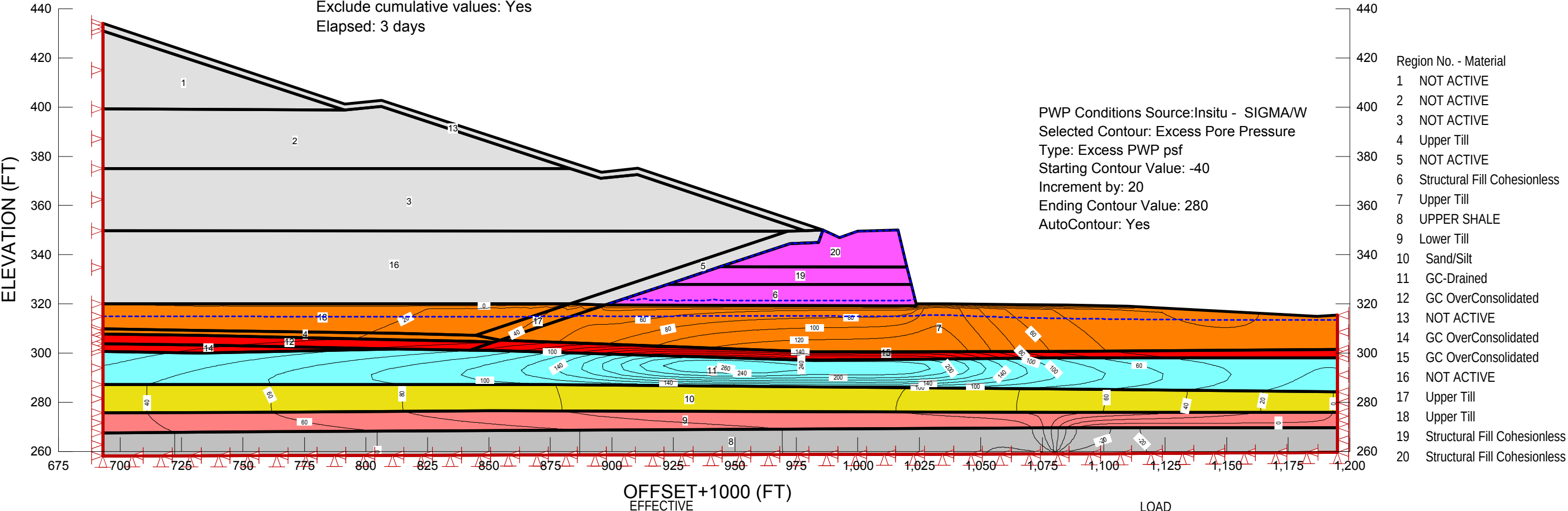


		EFFECTIVE YOUNGS		POISSONS VOL. WC		K-FUNCTION		LOAD RESPONSE		OC		INITIAL VOID	
NAME	MODEL	MODULUS (E)	UNIT WEIGHT	RATIO	FUNCTION	K-FUNCTION	RATIO	RATIO	LAMBDA	KAPPA	RATIO	RATIO	PHI'
Upper Till	Linear Elastic (w/ PWP Change)	300,000 psf	125 pcf	0.334	Till	Upper Glacial Till	1	0 °	1	0	0	1.5	31 °
GC-Drained	Soft Clay (MCC w/ PWP Change)	100 psf	118 pcf	0.334	Clay soils	GC 5.7 E-4 ft/day	1	0 °	1	0.14	0.013	4	27 °
GC OverConsolidated	Soft Clay (MCC w/ PWP Change)	200,000 psf	125 pcf	0.334	Clay soils OC	GC 5.7 E-4 ft/day	1	0 °	1	0.06	0.01	6	30 °
Sand/Silt	Linear Elastic (w/ PWP Change)	300,000 psf	135 pcf	0.334	silty sand	Silty Sand, k = 0.567 ft/day 2 E-4cm/sec	0.1	0 °	1	0	0	0	34 °
Lower Till	Linear Elastic (w/ PWP Change)	600,000 psf	145 pcf	0.334	Till	Till	1	0 °	1	0	0	0	0 °
STRUCTURAL FILL	Linear Elastic (Effective)	100,000 psf	130 pcf	0.334	Till	Till	1	0 °	1	0	0	0	28.7 °
UPPER SHALE	Linear Elastic (w/ PWP Change)	1,000,000 psf	145 pcf	0.334	Till	Upper Rock	1	0 °	1	0	0	0	0 °
NOT ACTIVE	(none)	0 psf	0 pcf	0.334			1	0 °	1	0	0	0	0 °

Title: Model City - RMU-2 XS 1350 MSE
Name: MSE step 1 cohesionless
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\MSE-C8\
File Name: RMU2X1350mse21.gsz
Last Saved Date: 2/16/2013
Analysis Kind: SIGMA/W
Analysis Method: Coupled Stress/PWP
Elapsed: Starting Time: 0 days
Step Generation Method: Linear
Duration: 30 days
of Steps: 10

Parent Analysis Name: Insitu
Starting Time: 0 days
Initial Stress: Parent Analysis
Initial PWP: Parent Analysis
Exclude cumulative values: Yes
Elapsed: 3 days

PURPOSE:
To determine the effective stresses /pore pressures from berm placement in 3 days at cross-section 13+50. This analysis runs for 30 days in 10 steps, but the placement of the fill occurs on the first step (3 days) and the effective stress/pore pressure used in the stability anaylsis is taken from the first step (3 days). Using a berm fill material with no cohesive strength.



PWP Conditions Source:Insitu - SIGMA/W
Selected Contour: Excess Pore Pressure
Type: Excess PWP psf
Starting Contour Value: -40
Increment by: 20
Ending Contour Value: 280
AutoContour: Yes

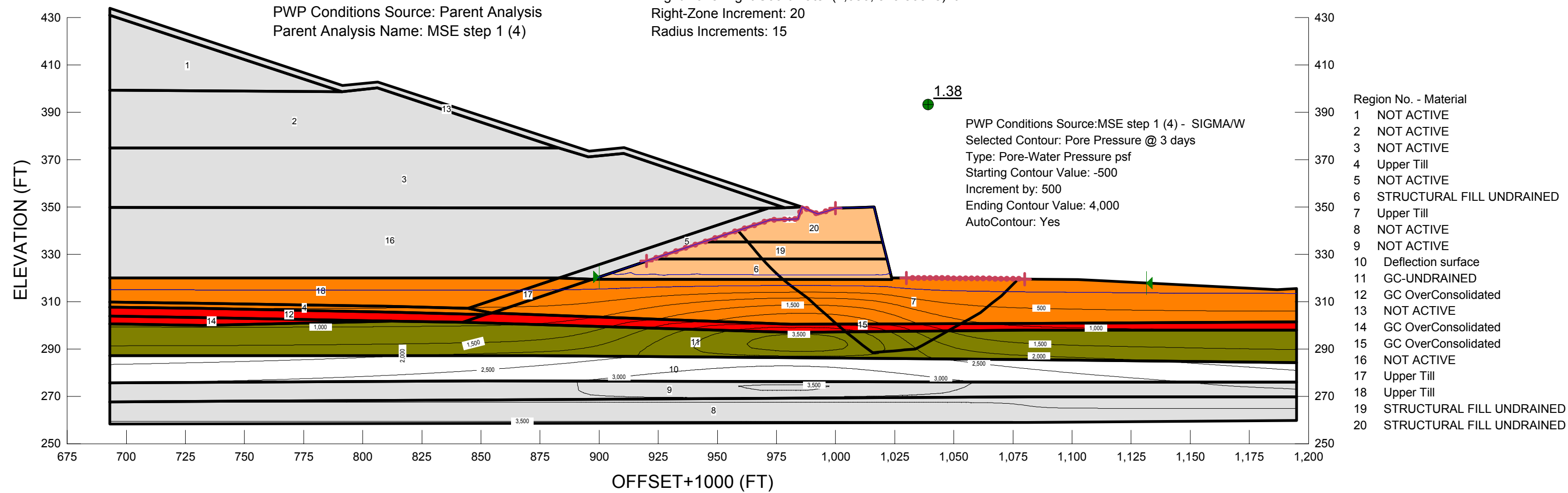
- Region No. - Material
- 1 NOT ACTIVE
 - 2 NOT ACTIVE
 - 3 NOT ACTIVE
 - 4 Upper Till
 - 5 NOT ACTIVE
 - 6 Structural Fill Cohesionless
 - 7 Upper Till
 - 8 UPPER SHALE
 - 9 Lower Till
 - 10 Sand/Silt
 - 11 GC-Drained
 - 12 GC OverConsolidated
 - 13 NOT ACTIVE
 - 14 GC OverConsolidated
 - 15 GC OverConsolidated
 - 16 NOT ACTIVE
 - 17 Upper Till
 - 18 Upper Till
 - 19 Structural Fill Cohesionless
 - 20 Structural Fill Cohesionless

				EFFECTIVE						LOAD				
		EFFECTIVE YOUNGS		POISSONS		VOL. WC	Ky'/Kx'		RESPONSE			OC	INITIAL VOID	
NAME	MODEL	MODULUS (E)	UNIT WEIGHT	RATIO	FUNCTION	K-FUNCTION	RATIO	ROTATION	RATIO	LAMBDA	KAPPA	RATIO	RATIO	PHI'
Upper Till	Linear Elastic (w/ PWP Change)	300,000 psf	125 pcf	0.334	Till	Upper Glacial Till	1	0 °	1	0	0	0	1.5	31 °
GC-Drained	Soft Clay (MCC w/ PWP Change)	100 psf	118 pcf	0.334	Clay soils	GC 5.7 E-4 ft/day	1	0 °	1	0.14	0.013	4	1	27 °
GC OverConsolidated	Soft Clay (MCC w/ PWP Change)	200,000 psf	125 pcf	0.334	Clay soils OC	GC 5.7 E-4 ft/day	1	0 °	1	0.06	0.01	6	0.5	30 °
Sand/Silt	Linear Elastic (w/ PWP Change)	300,000 psf	135 pcf	0.334	silty sand	Silty Sand, k = 0.567 ft/day 2 E-4cm/sec	0.1	0 °	1	0	0	0	1.5	34 °
Lower Till	Linear Elastic (w/ PWP Change)	600,000 psf	145 pcf	0.334	Till	Till	1	0 °	1	0	0	0	1.5	0 °
UPPER SHALE	Linear Elastic (w/ PWP Change)	1,000,000 psf	145 pcf	0.334	Till	Upper Rock	1	0 °	1	0	0	0	1.5	0 °
NOT ACTIVE	(none)	0 psf	0 pcf	0.334			1	0 °	1	0	0	0	1.5	0 °
Structural Fill Cohesionless	Linear Elastic (Effective)	100,000 psf	120 pcf	0.334			1	0 °	1	0	0	0	1.5	34 °

Title: Model City - RMU-2 XS 1350 MSE
Name: Slope Stability MSE - 3 DAYS of Filling (2)
File Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\MSE-C8\
File Name: RMU2X1350mse21.gsz
Date: 2/16/2013Time: 3:55:07 PM
Analysis Kind: SLOPE/W
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Slip Surface Option: Entry and Exit
Optimization: Yes
Slip Surface Factor of Safety: 1.38

NYSDEC OHMS Document No. 201469232-00007
Slip Surface Option: Entry and Exit
Surface Limits
Left Coordinate: (900, 320.42276) ft
Right Coordinate: (1,131.413, 317.87465) ft
Slip Surface Option: Entry and Exit
Surface Limits
Left Coordinate: (900, 320.42276) ft
Right Coordinate: (1,131.413, 317.87465) ft
Left-Zone Left Coordinate: (920, 327.13372) ft
Left-Zone Right Coordinate: (1,000, 349.5) ft
Left-Zone Increment: 20
Right-Zone Left Coordinate: (1,030, 320) ft
Right-Zone Right Coordinate: (1,080, 319.56818) ft
Right-Zone Increment: 20
Radius Increments: 15

PURPOSE:
To determine the critical failure surface and factor of safety from berm placement in 3 days at cross-section 13+50. This analysis uses the calculated pore pressures and assumes fill material with some cohesion.



Material Properties:

Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 °

Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 °

Name: Deflection surface Model: Bedrock (Impenetrable)

Name: NOT ACTIVE Model: (None)

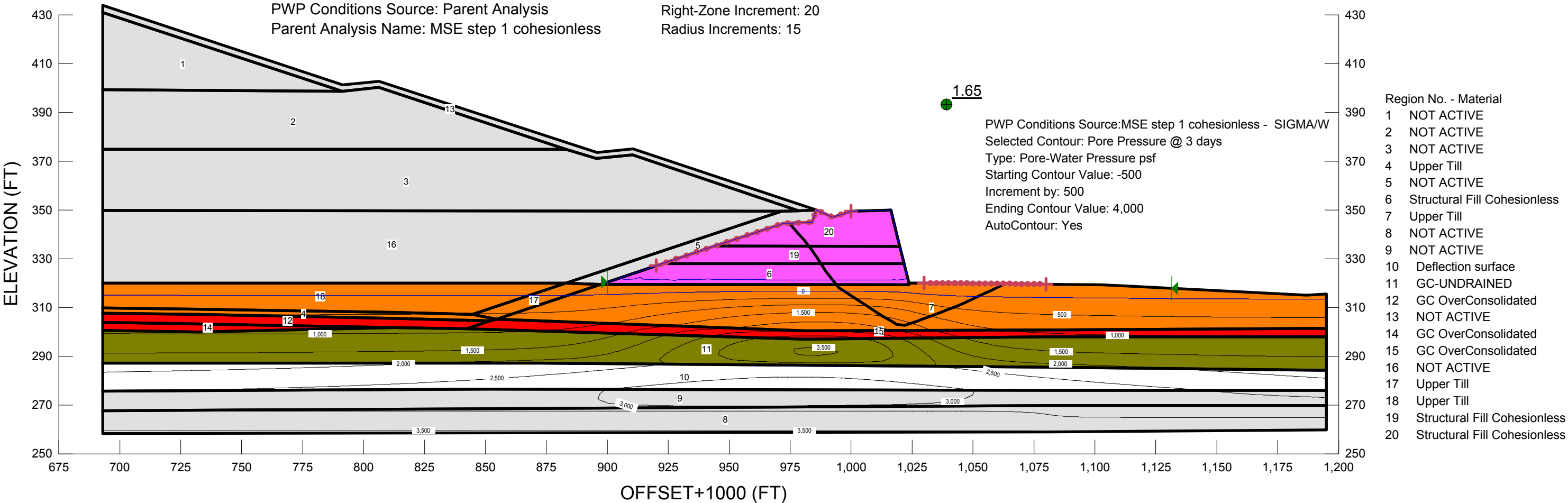
Name: STRUCTURAL FILL UNDRAINED Model: Undrained (Phi=0) Unit Weight: 128 pcf Cohesion': 2,000 psf

Name: GC-UNDRAINED Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED-STATIC Anisotropic Strength Fn: clay ellipse

Title: Model City - RMU-2 XS 1350 MSE
Name: Slope Stability MSE Cohesionless - 3 DAYS of Filling (3)
File Directory: N:\Model_City\154.002_rm2\154.005_revsions\geoslope\MSE-C8\
File Name: RMU2X1350mse21.gsz
Date: 2/16/2013Time: 4:15:03 PM
Analysis Kind: SLOPE/W
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Slip Surface Option: Entry and Exit
Optimization: Yes
Slip Surface Factor of Safety: 1.65

NYSDEC OHMS Document No. 201469232-00007
Slip Surface Option: Entry and Exit
Surface Limits
Left Coordinate: (900, 320.42276) ft
Right Coordinate: (1,131.413, 317.87465) ft
Slip Surface Option: Entry and Exit
Surface Limits
Left Coordinate: (900, 320.42276) ft
Right Coordinate: (1,131.413, 317.87465) ft
Left-Zone Left Coordinate: (920, 327.13372) ft
Left-Zone Right Coordinate: (1,000, 349.5) ft
Left-Zone Increment: 20
Right-Zone Left Coordinate: (1,030, 320) ft
Right-Zone Right Coordinate: (1,080, 319.56818) ft
Right-Zone Increment: 20
Radius Increments: 15

PURPOSE:
To determine the critical failure surface and factor of safety from berm placement in 3 days at cross-section 13+50. This analysis uses the calculated pore pressures and assumes fill material with some cohesion.

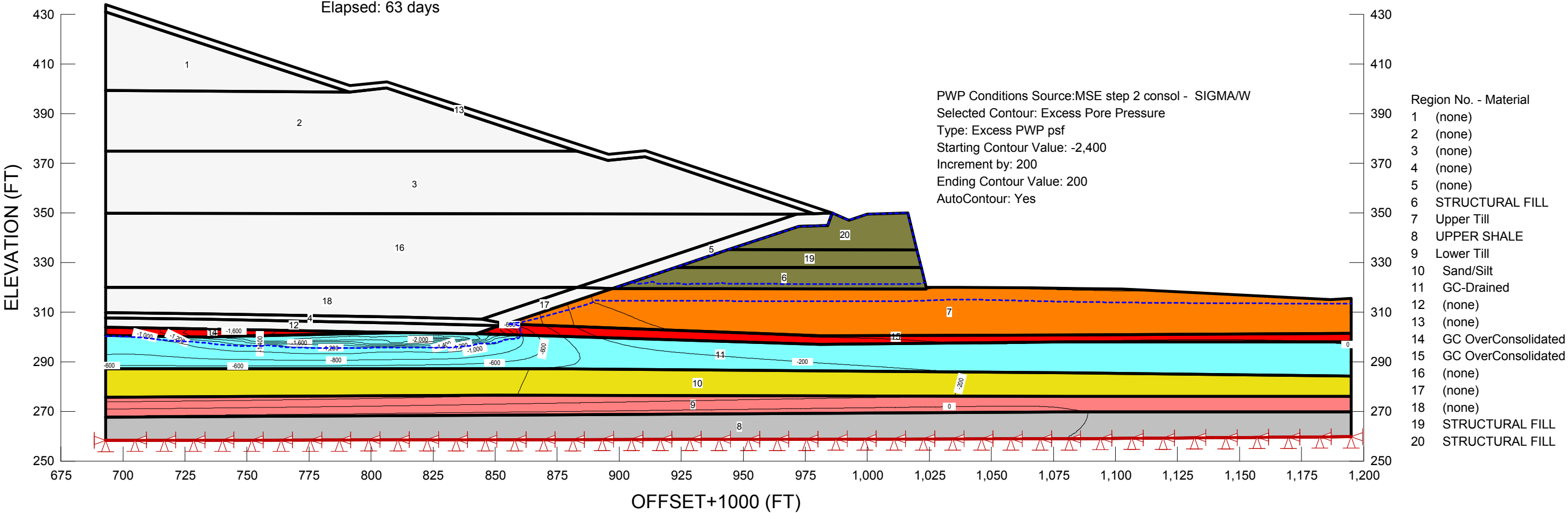


Material Properties:
Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 31 °
Name: GC OverConsolidated Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 100 psf Phi': 30 °
Name: Deflection surface Model: Bedrock (Impenetrable)
Name: NOT ACTIVE Model: (None)
Name: GC-UNDRAINED Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: SHANSEP CONSOLIDATED UNDRAINED-STATIC Anisotropic Strength Fn: clay ellipse
Name: Structural Fill Cohesionless Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °

Title: Model City - RMU-2 XS 1350 MSE
Name: MSE step5 excavation to subgrd
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\MSE-C8\
File Name: RMU2X1350mse21.gsz
Last Saved Date: 2/21/2013
Analysis Kind: SIGMA/W
Analysis Method: Coupled Stress/PWP
Elapsed: Starting Time: 60 days
Step Generation Method: Linear
Duration: 30 days
of Steps: 10

Parent Analysis Name: MSE step 2 consol
Starting Time: 60 days
Initial Stress: Parent Analysis
Initial PWP: Parent Analysis
Exclude cumulative values: Yes
Elapsed: 63 days

PURPOSE:
To determine the effective stresses /pore pressures for the excavation to the subgrade after berm placement at cross-section from berm at cross-section 13+50. Using a berm fill material with some cohesive strength.



Material Properties:

Name	Model	Effective Young's Modulus (E')	Unit Weight	Poisson's Ratio
Upper Till	Linear Elastic (w/ PWP Change)	300,000 psf	125 pcf	0.334
GC-Drained	Soft Clay (MCC w/ PWP Change)	Poisson's Ratio: 0.334	Unit Weight: 118 pcf	
GC OverConsolidated	Soft Clay (MCC w/ PWP Change)	Poisson's Ratio: 0.334	Unit Weight: 125 pcf	
Sand/Silt	Linear Elastic (w/ PWP Change)	300,000 psf	135 pcf	0.334
Lower Till	Linear Elastic (w/ PWP Change)	600,000 psf	145 pcf	0.334
STRUCTURAL FILL	Linear Elastic (Effective)	100,000 psf	130 pcf	0.334
UPPER SHALE	Linear Elastic (w/ PWP Change)	1,000,000 psf	145 pcf	0.334

Additional Material Properties:

Name	Vol. WC. Function	K-Function	Ky/Kx' Ratio	Rotation	Load Response Ratio
Upper Till	Till	Upper Glacial Till	1	0 °	1
GC-Drained	O.C. Ratio: 4	Lambda: 0.14	Kappa: 0.013	Initial Void Ratio: 1	Phi': 27 °
GC OverConsolidated	O.C. Ratio: 6	Lambda: 0.06	Kappa: 0.01	Initial Void Ratio: 0.5	Phi': 30 °
Sand/Silt	Vol. WC. Function: silty sand	K-Function: Silty Sand, k = 0.567 ft/day	2 E-4cm/sec	Ky/Kx' Ratio: 0.1	Rotation: 0 °
Lower Till	Vol. WC. Function: Till	K-Function: Till	Ky/Kx' Ratio: 1	Rotation: 0 °	Load Response Ratio: 1
STRUCTURAL FILL					
UPPER SHALE	Vol. WC. Function: Till	K-Function: Upper Rock	Ky/Kx' Ratio: 1	Rotation: 0 °	Load Response Ratio: 1

Title: Model City - RMU-2 XS 1350 MSE
Name: Inward Failure - Undrained
File Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\MSE-C8\
File Name: RMU2X1350mse21.gsz
Date: 2/21/2013Time: 4:58:25 PM
Analysis Kind: SLOPE/W
Analysis Method: Morgenstern-Price
Interslice force function option: Half-Sine
Slip Surface Option: Block
Optimization: Yes
Slip Surface Factor of Safety: 1.65

NYSDEC OHMS Document No. 201469232-00007
Slip Surface Option: Block
Surface Limits
Left Coordinate: (773.93733, 308.59677) ft
Right Coordinate: (1,012.8109, 349.89418) ft

PURPOSE:
To determine the critical failure surface and factor of safety for the excavation to the subgrade after berm placement at cross-section 13+50. This analysis assumes undrained conditions and uses the effective stresses/pore water pressure for the excavation after 75 days.

