SINCLAIR hille architects

Addendum #3

Project Name:	New Residential Housing Facility for the Bridges Project. Southern Hills Drive / NE State Spur 1C @ US Highway 6 & 34 Hastings NE.
Project No.:	10087
Issued:	February 3, 2012
Bid Date:	3:00pm, Thursday, February **9th**, 2012
Bid Opening:	State Building Division – Suite 400
Location:	521 South 14th Street, Lincoln, NE 68508-2707

This Addendum is issued to all known bidders before receipt of proposals. This Addendum is to authorize the use of the following information in preparing proposals for the above named project. The bidder **must** enter the number of this Addendum on the **Proposal Sheet.**

GENERAL CLARIFICATIONS

ADD 1-1. A list of plan holders as of this date can be found at A & D Technical Supply, http://www.adtechplans.com

MODIFICATIONS TO THE DRAWINGS

ADD 1-2. DRAWINGS C402, C403 and C404

a. Add Drawings C402, C403 and C404 included with this addendum.

ADD 1-3. DRAWING A001

a. On sheet A001 add the attached detail of galvanized steel handrails to be located adjacent to each of the concrete stairs as noted on Sheet A001, with keynote 055213.A.

MODIFICATIONS TO THE SPECIFICATIONS

ADD 1-4. 085200-WOOD WINDOWS

a. Refer to Article 2.1 MANUFACTURERS. Under Alternate Number 1, the following is an approved manufacturer: Lincoln Window and Patio Doors, www.lincolnwindows.com . This manufacturer cannot provide integral window blinds under the base bid but is acceptable as a manufacturer under Alternate Number 1.

ADD 1-5. 085200-WOOD WINDOWS

a. Refer to Article 2.4 ACCESSORIES. Delete paragraph A. Horizontal Louver blinds. Integral louver blinds are specified with the insulated glass system.
b. Refer to Article 2.4 ACCESSORIES. Add the following paragraph: Grille Patterns: The grille pattern specified, “Prairie”, is to be applied to the exterior side of the glass only.

ADD 1-6. 323223-SEGMENTAL RETAINING WALLS

c. Refer to the attached FINAL REPORT from Olsson Associates for the design of the segmental retaining walls.

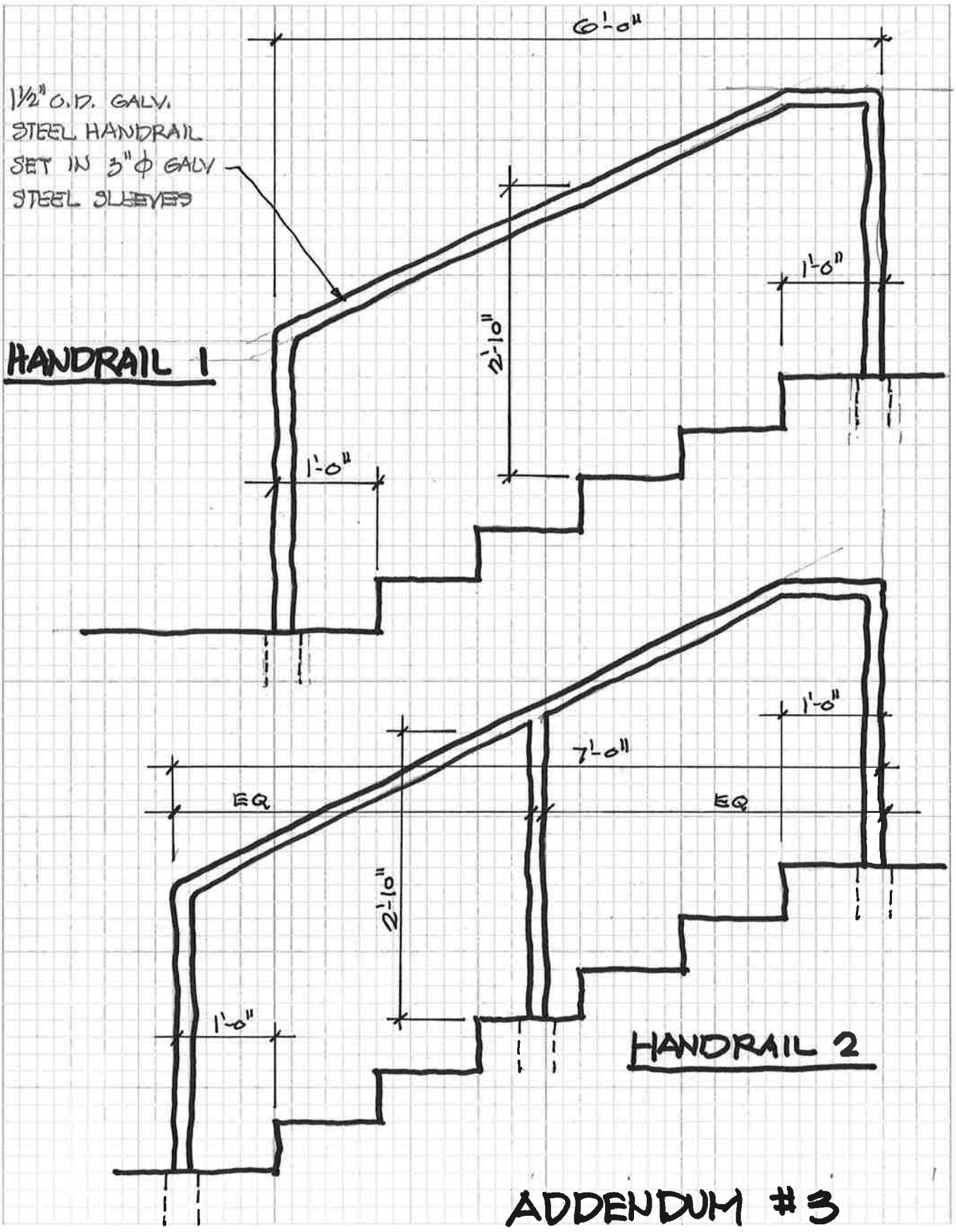
End of Addendum #3

2/3/2012
Date

10087/05
Project # / Phase

BRIDGES PROGRAM HOUSING
Project Name

SINCLAIR hille architects
700 Q Street
Lincoln, NE 68508
T: 402.476.7331
F: 402.476.8341
sinclairhille.com



ADDENDUM #3

OLSSON ASSOCIATES
1802 EAST 123RD STREET
OLATHE, KANSAS 64080
Phone: 913-829-0078 Fax: 913-829-0258

Date:	February 3, 2012
Project:	Sinclair Hille Bridges Project
Project Number:	011-2771
Client:	Sinclair Hille Architect
Structure:	Retaining Walls
Structure Type:	Reinforced Soil – Segmental Block
Designed By:	Ian Dillon, EI Kellen Petersen, PE

2/3/12

Design References:	*Design Manual for Segmental Retaining Walls*, Third Edition, National Concrete Masonry Association, 2010. *Mechanically Stabilized Earth Walls and Reinforced Slopes Design & Construction Guidelines*, FHWA-NHI-00-043, National Highway Institute Office of Bridge Technology, March 2001.

CONTENTS

SECTION – 1

ANCHOR BLOCK – DIAMOND PRO® RETAINING BLOCK AND MIRAFI 3XT GEOGRID DESIGN PARAMETERS

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

November 14, 2002

Mr. Don Armstrong
Anchor Wall Systems
5959 Baker Road, Suite 390
Minnetonka, MN 55345

Fax: 952-979-8454 E-mail: darmstrong@anchorwall.com

Subject: Test Results for Connection Block-to-Block Shear Testing of
Anchor Diamond Pro HC Blocks

Dear Don:

This report presents the final results for large-scale segmental concrete block connection shear tests. Included are data developed for a range of normal compressive loads representing increasing wall heights. All testing work was performed in general accordance with NCMA Test Method SRWU-2 for Connection Shear Strength. Generated results were used to develop general connection shear strength versus normal load design curves.

TRI is pleased to present this final report. The data presented herein appears to be consistent with commonly reported values. Please feel free to call if we can answer any questions or provide any additional information.

Sincerely,

C. Joel Sprague, P.E.
Senior Engineer
Geosynthetics Division

Cc: Mark Sebesta, James Wilson

CONNECTION SHEAR STRENGTH REPORT

ANCHOR DIAMOND PRO HC BLOCK-TO-BLOCK

Overview

The testing reported herein provides the connection shear properties between Anchor Diamond Pro HC segmental concrete block units used in construction of mechanically stabilized earth (MSE) walls. The results of a series of tests were used to define a relationship between connection shear strength and normal load, representing the height of stacked units above the connection elevation.

Terminology

Peak Connection Shear Strength - the maximum shear capacity of the connection between segmental concrete units.

Service State Connection Shear Strength - the connection shear capacity between segmental concrete units at a service state displacement criterion of 2% of the block height *or other service state criteria*.

Displacement Criteria – a user prescribed maximum horizontal movement, in (mm), of the overlying segmental concrete unit over the underlying segmental concrete unit.

Segmental Concrete Unit Width – the segmental concrete unit dimension parallel to the wall face.

Summary of Testing

Dry stacked segmental concrete block units are assembled as specified by the user. The top course of segmental concrete block units is then loaded vertically to a constant normal load and simultaneously loaded horizontally under a constant rate of displacement until a sustained loss of shear capacity and/or an excessive horizontal movement (greater than 25± mm) of the block is recorded.

Peak connection shear capacity, and shear capacity after a user prescribed displacement criteria has occurred, are used to define connection shear strength based on *peak and service state* criteria, respectively. Using horizontal block displacement measurements, both of these values have been obtained from each test. Shear loads and strengths are reported per unit width of block, lbs/ft (kN/m). A series of tests has been performed to establish a mathematical relationship between connection shear strength and normal load on the connection.

Since this connection shear strength test is meant to be a performance test, it has been conducted using full-scale system components. As a performance test on full-scale system components it accounts for some of the variabilities in construction procedures and materials tolerance normally present for these types of retaining wall systems.

Apparatus

The TRI connection shear testing apparatus' principal components include:

- loading frame
- normal load piston/actuator
- vertical loading platen with stiff rubber mat to apply uniform vertical pressure to top of concrete blocks.
- vertical load cell to measure normal load.
- loading platen capable of applying a uniform horizontal force to the test block.
- horizontal piston/actuator to apply a horizontal shearing load.
- horizontal load cell to measure block shear force.
- two (2) Linear Variable Displacement Transducers (LVDT) horizontal displacement measurement devices to record displacement of the segmental concrete block.

Concrete Units

Full-size segmental concrete units as received from the manufacturer were used. Table 1 presents information on the tested segmental concrete units.

Table 1. Segmental Concrete Units Tested

	As-Received	Specification
Segmental concrete unit style	Anchor Diamond Pro HC	Anchor Diamond Pro HC
segmental concrete units dimensions (W x D* x H)	18 in x 12 in x 8 in	18 in x 12 in x 8 in
segmental concrete unit weight with infill material	69 lb/ft	varies with infill
mechanical connectors	Rear "lip"	Rear "lip"
joint configuration	running bond	running bond

*front-to-back distance

In-fill Material

Aggregate infill material as described in Table 2 was placed within the open cell area of the blocks.

Table 2. In fill material

	As-Received	Specification
fill: number 57 stone	See Appendix	ASTM D448

Testing Outline

Three tests were conducted to adequately define a relationship between connection shear strength and normal load applied to the connection. The tests were conducted at three unique normal loads within the range of loads typical of wall design, as directed by the user. No multiple tests were performed at one normal load to verify repeatability.

The general range for repeatability of peak connection shear strength of three nominally identical tests is commonly +/- 10% from the mean of the three tests.

Specific Test Procedure

The segmental concrete units were placed such that an "as manufactured" running bond joint was coincident with the center of horizontal load application. The test setup was constructed using the granular infill, full-scale segmental concrete block units and connectors (if applicable) specified by the user.

Crushed stone granular infill conforming to size number 57 gradations in ASTM D 448 was placed and compacted within the segmental concrete units to the density specified by the user.

Underlying courses of segmental concrete units were rigidly braced to prevent lateral movement of the units during horizontal shearing of the overlying course. A loading platten was then attached to the block overlying the geosynthetic. A displacement recording device was also attached to the overlying block. This device calculates the average displacement of the block during the test.

The predetermined normal (vertical) load was applied to the top of the concrete units and maintained by measuring the normal load using a load cell and adjusting to maintain this constant value for the duration of testing. The range of normal loads chosen for testing and the equivalent stacked height of concrete units is shown in Table 3.

A constant rate of displacement of 0.03 in/min was maintained using the horizontal actuator/piston. During the entire test, normal load, tensile load, and horizontal block displacement were recorded at regular time intervals. The test was continued until there was a sustained loss of shear resistance recorded at the loading platten.

For each test, the shear load versus average block displacement recorded at the back of the top concrete unit was recorded and used to calculate *Peak Connection Shear Strength* and *Service State Connection Shear Strength*.

Results

The tests of the facing connection shear strength between the segmental concrete units detailed herein were in accordance with generally accepted testing protocol. A summary of results is presented in Table 3 and Figure 1.

Table 3. Summary of Connection Shear Test Results
Block Type: Anchor Diamond Pro HC

Test #	Normal Load (lb/ft)	Wall Height (ft)	Number of Blocks	0.16-inch Shear Capacity (lbs/ft)	Peak Shear Capacity (lbs/ft)
1	500	4.8	7.3	837	1658
2	1000	9.7	14.5	1231	2232
3	1500	14.5	21.8	1259	2661

Service State Displacement Criteria = 2% of block height = 0.16 in

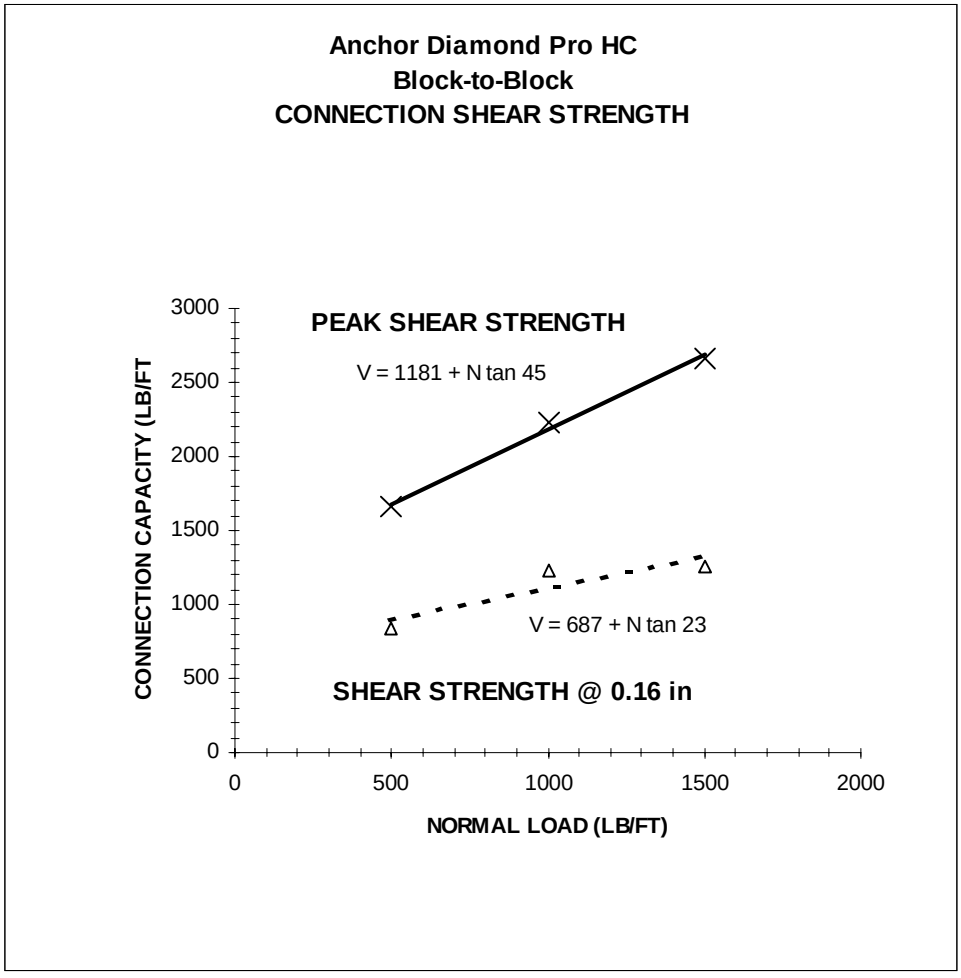


Figure 1. Connection Shear Strength Versus Normal Load

APPENDIX A – RECORDED DATA

Table A-1. Summary of Connection Shear Strength Data
Anchor Diamond Pro HC

Test #	Wall Section Width (ft)	Average Normal Load (lb/ft)	0.16-inch Shear Capacity (lbs/ft)	Peak Shear Capacity (lbs/ft)
1	1.5	500	837	1658
2	1.5	1000	1231	2232
3	1.5	1500	1259	2661

Infilled Block + Loading plate weight above shear plane = 233 lbs

Figures A-1 thru A-3. Normal Load / Shear Force vs. Shear Displacement Curves

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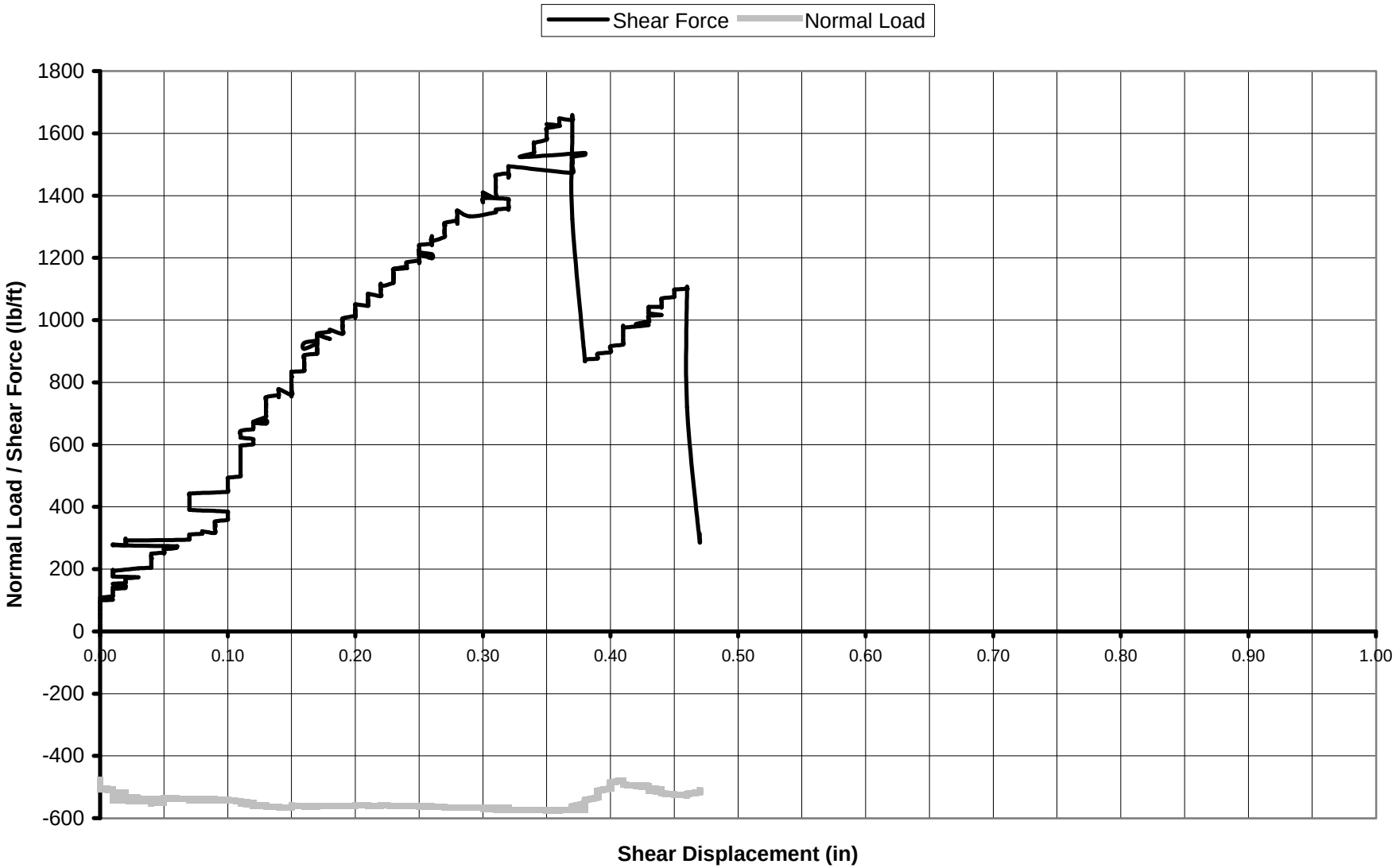
A Texas Research International Company

11/08/2002

Anchor Diamond Pro Block-to-Block Shear (500 plf)



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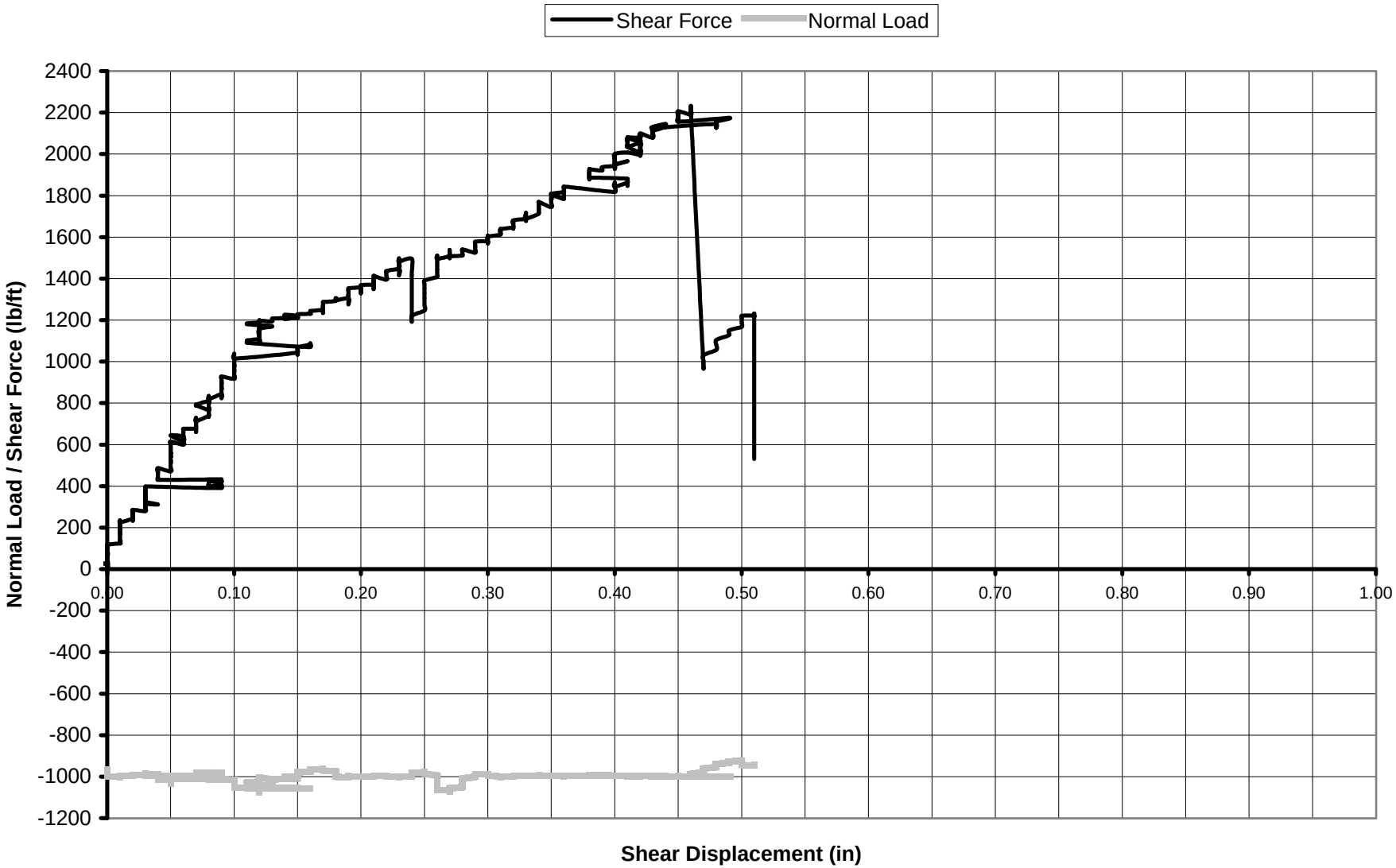
Anchor Diamond Pro Block-to-Block Shear (1000 plf)



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11/08/2002

Anchor Diamond Pro Block-to-Block Shear (1500 plf)

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APPENDIX B - GRANULAR INFILL

The grain size distribution curve of the granular infill placed in and between segmental concrete units is shown in Figure B-1.

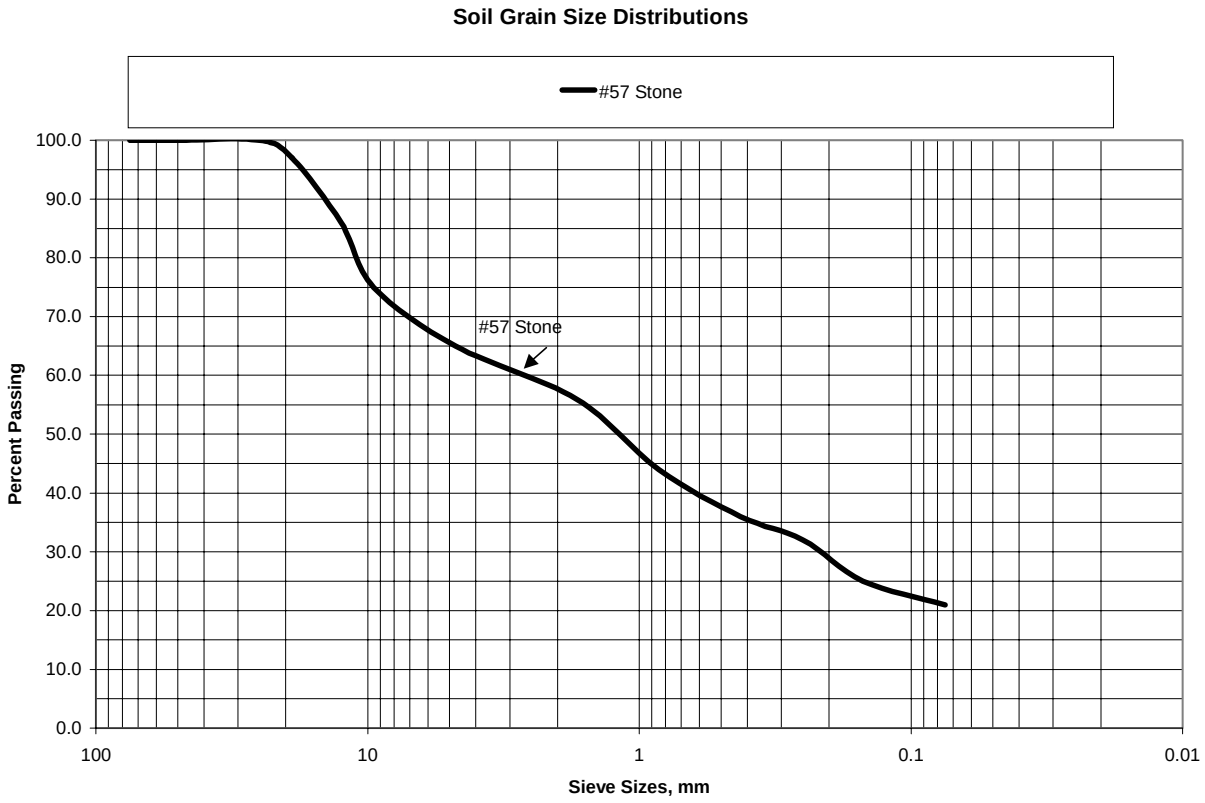

Figure B-1. Infill grain size distribution curve

Granular infill was hand tamped in-place. Density was not measured.

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

July 8, 2002

Mr. John Henderson
TC Nicolon.
365 South Holland Drive
Pendergrass, Georgia 30567

Fax: 706-693-4400 E-mail: John_Henderson@RTCUSA.net

RE: Connection Testing of **Anchor Diamond Pro HC & Miragrid 3XT**
(Log #2161-08-06)

Dear John:

This report presents the final results for large scale geogrid/segmental concrete block connection tests. Included are data developed for a range of normal compressive loads representing increasing wall heights. All testing work was performed in general accordance with NCMA Test Method SRWU-1, GRI Test Method GS8, and ASTM D 6638 Standard Test Method for Connection Strength. Generated results were used to develop general connection strength versus normal load design curves.

TRI is pleased to present this final report. The data presented herein appears to be consistent with commonly reported values. Please feel free to call if we can answer any questions or provide any additional information.

Sincerely,

C. Joel Sprague, P.E.
Senior Engineer
Geosynthetics Division

Cc: Mark Sebesta

CONNECTION STRENGTH REPORT

ANCHOR DIAMOND PRO HC & MIRAGRID 3XT

Overview
The testing reported herein provides the connection properties between a layer of TC Mirafi's Miragrid 3XT geogrid & Anchor Diamond Pro HC segmental concrete block units used in construction of mechanically stabilized earth (MSE) walls. The results of a series of tests were used to define a relationship between connection strength and normal load, representing the height of stacked units above the connection elevation.

Terminology
Peak Connection Strength - the maximum tensile capacity of the connection between geosynthetic reinforcement and segmental concrete units.

Service State Connection Strength - the connection tensile capacity between geosynthetic reinforcement and segmental concrete units at a service state displacement criterion of 19 mm (0.75 in) *or other service state criteria*.

Displacement Criteria – a user prescribed maximum movement, in (mm), of the geosynthetic reinforcement out from the back of segmental concrete units.

Segmental Concrete Unit Width – the segmental concrete unit dimension parallel to the wall face and coincident with the geosynthetic reinforcement test specimen.

Summary of Testing
One end of a wide geosynthetic reinforcement test specimen was attached to dry stacked segmental concrete block units assembled as specified by the user. The other end of the test specimen was attached to a clamp which is part of a constant rate of extension tensile loading machine. The top course of segmental concrete block units is then loaded vertically to a constant normal load, and the geosynthetic is then tensioned under constant rate of displacement until a sustained loss of connection capacity and/or an excessive movement (greater than 150 mm) of the reinforcement out from the connection is recorded.

Peak connection capacity, and tensile capacity after a user prescribed displacement criteria has occurred, are used to define connection strength based on *peak and service state* criteria, respectively. Using geosynthetic displacement measurements, both of these values have been obtained from each test. Tensile loads and strengths are reported per unit width of geosynthetic sample, lbs/ft (kN/m). A series of tests has been performed to establish a mathematical relationship between connection strength and normal load on the connection.

Since this connection strength test is meant to be a performance test, it has been conducted using full-scale system components. As a performance test on full scale system components it accounts for some of the variabilities in construction procedures and materials tolerance normally present for these types of retaining wall systems.

Apparatus

The TRI connection testing apparatus principal components include:

- loading frame
- normal load piston/actuator
- vertical loading platen with stiff rubber mat to apply uniform vertical pressure to top of concrete blocks.
- vertical load cell to measure normal load.
- geosynthetic loading clamp (roller grip) extending the full width of the specimen, capable of applying a uniform force across the full width of the test specimen.
- horizontal piston/actuator to load geosynthetic reinforcement in tension.
- horizontal load cell to measure geosynthetic tensile force.
- two (2) Linear Variable Displacement Transducers (LVDT) horizontal displacement measurement devices to record displacement of the geosynthetic at the back of the segmental concrete blocks.

Concrete Units

Full-size segmental concrete units as received from the manufacturer were used. Table 1 presents information on the tested segmental concrete units.

Table 1. Segmental Concrete Units Tested

	As-Received	Specification
segmental concrete unit style	Anchor Diamond Pro HC	Anchor Diamond Pro HC
segmental concrete units dimensions (W x D* x H)	18 x 12 x 8 in.	18 x 12 x 8 in.
segmental concrete unit weight	76.67 lb/ft	76.67 lb/ft
mechanical connectors	None	None
joint configuration	running bond	running bond

*front-to-back distance

Geosynthetic

Geosynthetic reinforcement samples were manufactured at the Cornelia, Georgia, facility and were used as-received. Table 2 presents information on the tested geosynthetics.

Table 2. Geosynthetic Reinforcement Tested

	As-Received	Specification
geosynthetic style	Miragrid 3XT	Miragrid 3XT
wide-width tensile strength – ASTM D4595	-	2800 lb/ft

In-fill Material

Aggregate as described in Table 3 was placed within the open cell area of the blocks.

Table 3. In fill material

	As-Received	Specification
Fill: number 57 stone	See Appendix	ASTM D448

Testing Outline

Five tests were conducted to adequately define a relationship between connection strength and normal load applied to the connection. The tests were conducted at five unique normal loads within the range of loads typical of wall design, as directed by the user. Additionally, two more tests at one normal load were performed to verify repeatability.

The general range for repeatability of peak connection strength of these three nominally identical tests is +/- 10% from the mean of the three tests.

Specific Test Procedure

The segmental concrete units were placed such that an "as manufactured" running bond joint was coincident with the center of pull for the geosynthetic reinforcement test specimen. The connection was constructed using the geosynthetic reinforcement, granular infill, full-scale segmental concrete block units and connectors (if applicable) specified by the user.

Crushed stone granular infill conforming to size number 57 gradations in ASTM D 448 was placed and compacted within the segmental concrete units to the density specified by the user.

Both underlying and overlying courses of segmental concrete units were rigidly braced to prevent lateral movement of the units during geosynthetic tension testing.

The tensile loading roller grip was then attached to the free end of the geosynthetic. Displacement recording devices were then attached to the geosynthetic reinforcement immediately adjacent to the back of the concrete units. These devices calculate the average displacement of the geosynthetic during the test.

The predetermined normal (vertical) load was applied to the top of the concrete units and maintained by measuring the normal load using a load cell and adjusting to maintain this constant value for the duration of testing. The range of normal loads chosen for testing and the equivalent stacked height of concrete units are shown in Table 4.

A constant rate of displacement of 1 in/min was maintained using the horizontal actuator/piston. During the entire test, normal load, tensile load, and geosynthetic displacement at the back of the concrete units were recorded at regular time intervals.

The test was continued until there was a sustained loss of tensile resistance recorded at the loading clamp due to failure of the reinforcement at or within the connection system and/or failure of the blocks. The type of connection failure, slippage at the block geosynthetic interface, or rupture of the geosynthetic at the connection, rupture of the geosynthetic outside the connection (between the unit and the clamp) or partial geosynthetic rupture/slippage was identified and recorded.

For each test, the tensile load versus average geosynthetic reinforcement displacement recorded at the back of the concrete units was recorded and used to calculate *Peak Connection Strength* and *Service State Connection Strength*.

Peak Connection Strength - The peak connection strength, T_{CP}, was calculated for each test using Eq. 1. This is the maximum force per unit width generated by the connection. Values are to be expressed in lb/ft (kN/m) using Eq. 1 as follows:

$$T_{CP} = (F_p - T_o) / W_s \qquad \textbf{[Eq. 1]}$$

where: T_{CP} = Peak connection strength per width of geosynthetic test specimen, lb/ft (kN/m),
F_p = Peak tensile connection load, lbs (kN),
T_o = Slack tensile load, lbs (kN), and
W_s = Width of geosynthetic test specimen, ft (m)

Service State Connection Strength - The service state connection strength, T_{SC}, was calculated for each test using Eq. 2:

$$T_{SC} = (F_{SC} - T_o) / W_s \qquad \textbf{[Eq. 2]}$$

where: T_{SC} = Service State connection strength based upon a prescribed displacement criterion, lb/ft (kN/m),
F_{SC} = Measured tensile connection load at *measured displacement, d_m,* lbs (kN),
T_o = Slack tensile load, lbs (kN), and
W_s = Width of geosynthetic test specimen, ft (m)

Measured displacement (d_m) - Calculate the *measured displacement, d_m,* corresponding to the user prescribed *displacement criteria, d_c.*

$$d_m = d_c + d_o \qquad \textbf{[Eq. 3]}$$

where: d_m = *Measured displacement, d_m*; mm (ins)
d_c = *Displacement criteria, d_c*; mm (ins)
d_o = *Slack displacement, d_o* ; mm (ins)

If the prescribed displacement criterion was not achieved before the peak connection load was reached the service state connection load was taken as the peak load, (i.e., $F_{SC} = F_{PC}$).

Results

The tests of the facing connection strength between the segmental concrete units and geosynthetic reinforcement detailed herein was in accordance with generally accepted geosynthetic testing protocol. A summary of results is presented in Table 4 and Figure 1.

Table 4. Summary of Connection Test Results
Block Type: Anchor Diamond Pro HC
Geosynthetic Type: Miragrid 3XT

Test #	Normal Load (lb/ft)	Wall Height (ft)	Number of Blocks	¾-inch Tensile Capacity (lbs/ft)	Peak Tensile Capacity (lbs/ft)
1	500	4.4	6.5	918	1672
2	1000	8.7	13.0	1427	1521
3	1500	13.0	19.5	1628*	1628
4	1500	13.0	19.5	1569*	1569
5	1500	13.0	19.5	1411	1605
6	2250	19.6	29.2	1766*	1766
7	3000	26.1	39.0	1711*	1711

Geosynthetic Tensile Strength (ASTM D 4595 / GRI GG1) = 2800 lb/ft
Service State Displacement Criteria = ¾ inch
* peak occurred before ¾-in displacement

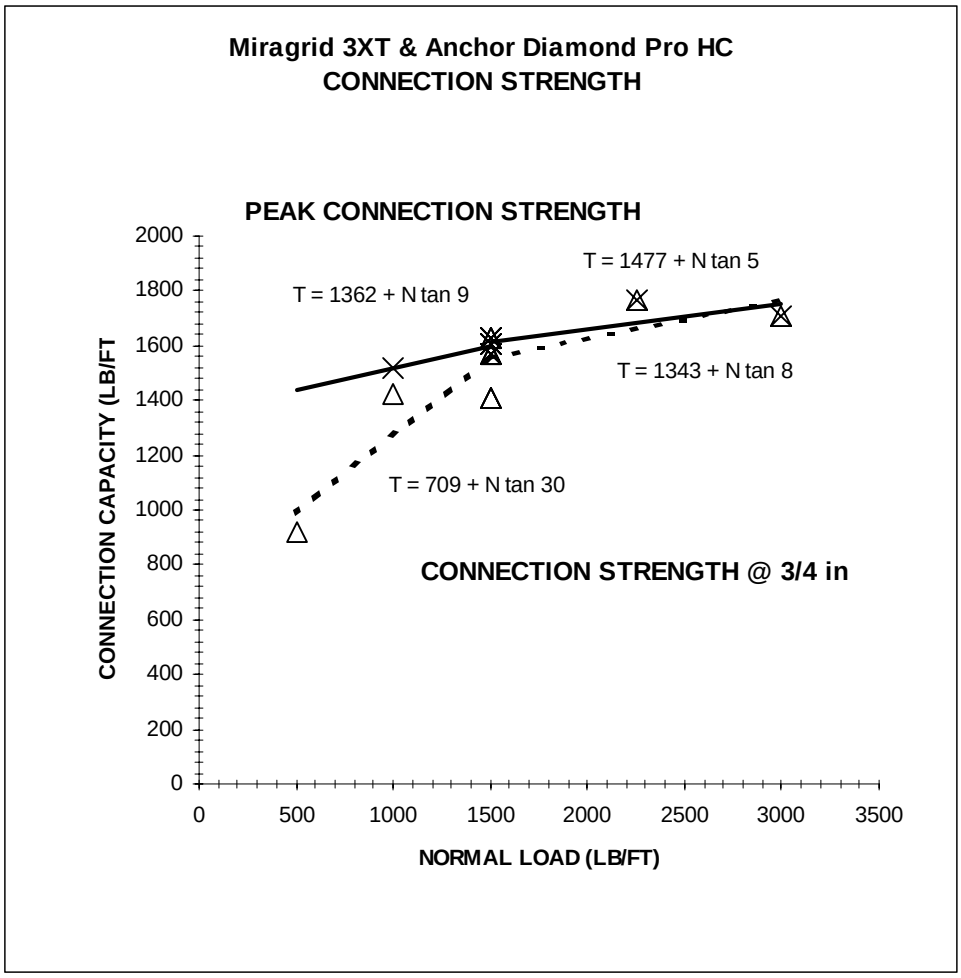

Figure 1. Connection Strength Versus Normal Load

APPENDIX A – RECORDED DATA

Table A-1. Summary of Connection Strength Data

Anchor Diamond Pro HC & Mirafi 3XT

Test #	Wall Section Width (ft)	Geogrid Specimen Width (ft)	Average Normal Load (lb/ft)	¾-inch Tensile Force (lbs/ft)	Peak Tensile Force (lbs/ft)	Type of Failure
1	4.5	3.0	500	918	1672	Tear
2	4.5	3.0	1000	1427	1521	Tear
3	4.5	3.0	1500	1628*	1628	Tear
4	4.5	3.0	1500	1569*	1569	Tear
5	4.5	3.0	1500	1411	1605	Tear
6	4.5	3.0	2250	1766*	1766	Tear
7	4.5	3.0	3000	1711*	1711	Tear

Loading plate weight = 185 lb

* peak occurred before ¾-in displacement

Figures A-1 thru A-7. Normal Load / Pullout Force vs. Pullout Displacement Curves

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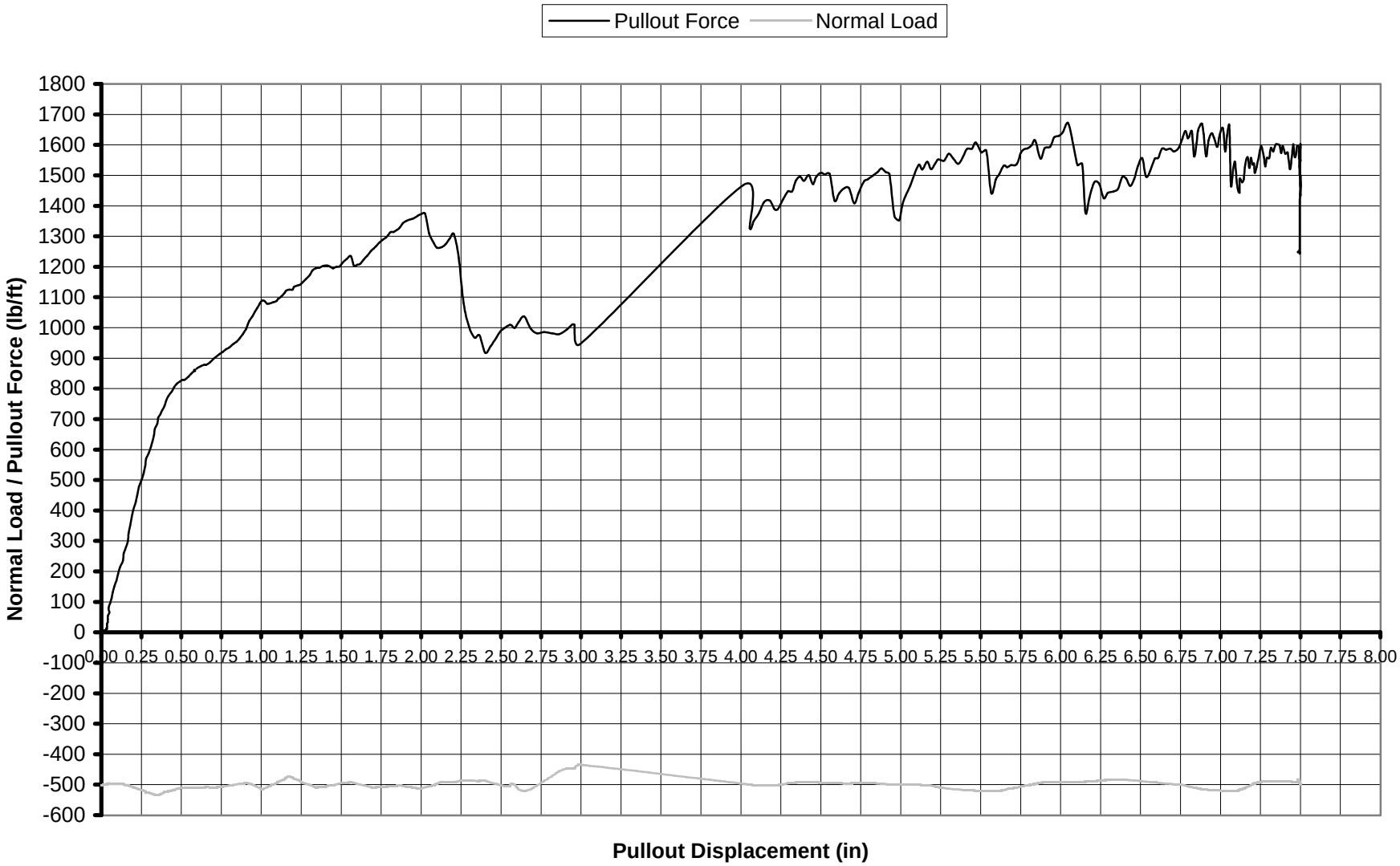
A Texas Research International Company

7/2/2002

Anchor Diamond Pro HC & Miragrid 3XT - 500 plf



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7/2/2002

Anchor Diamond Pro HC & Miragrid 3XT - 1000 plf

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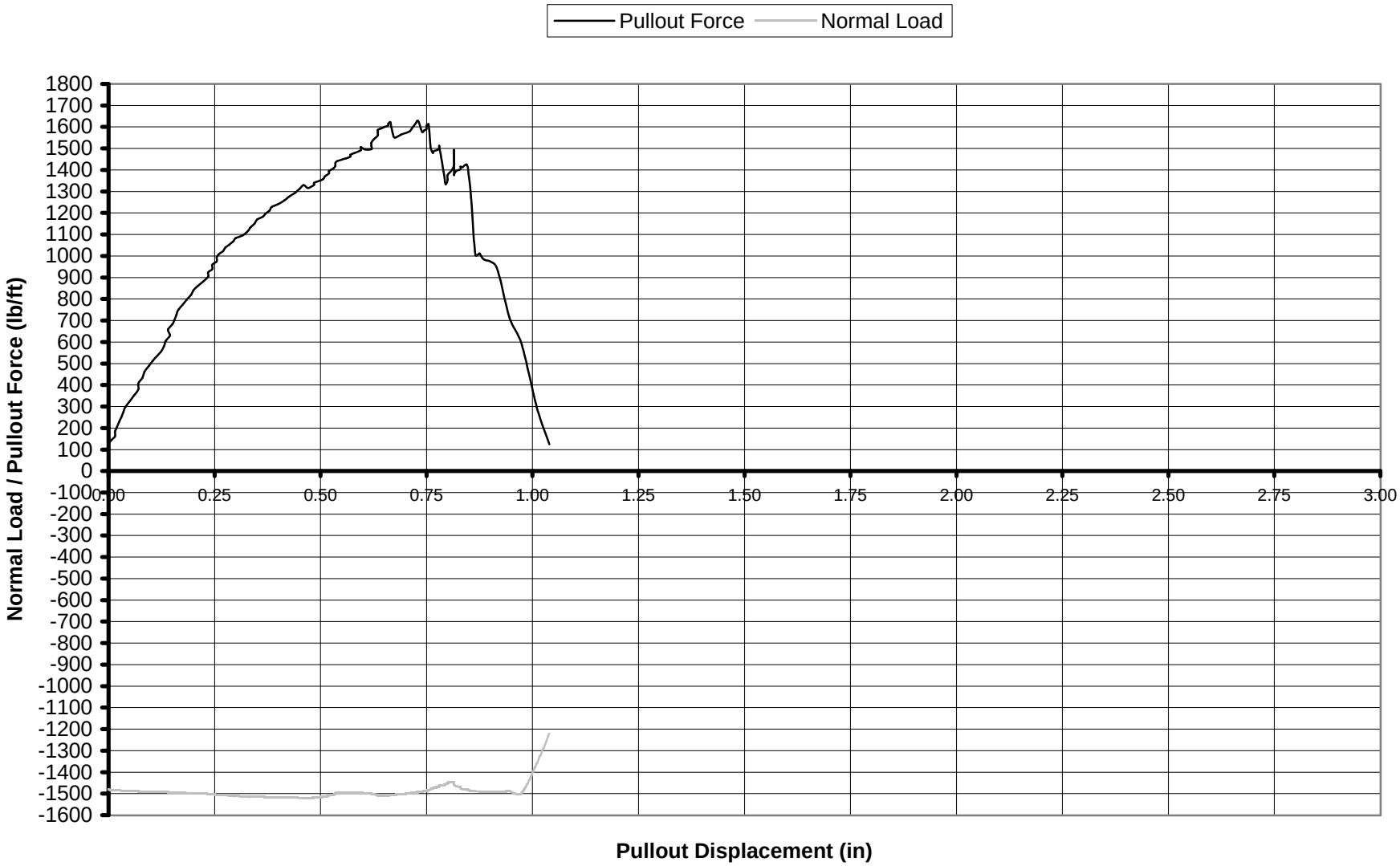
TRI/Environmental, Inc.
A Texas Research International Company

7/2/2002

Anchor Diamond Pro HC & Miragrid 3XT - 1500 plf - a



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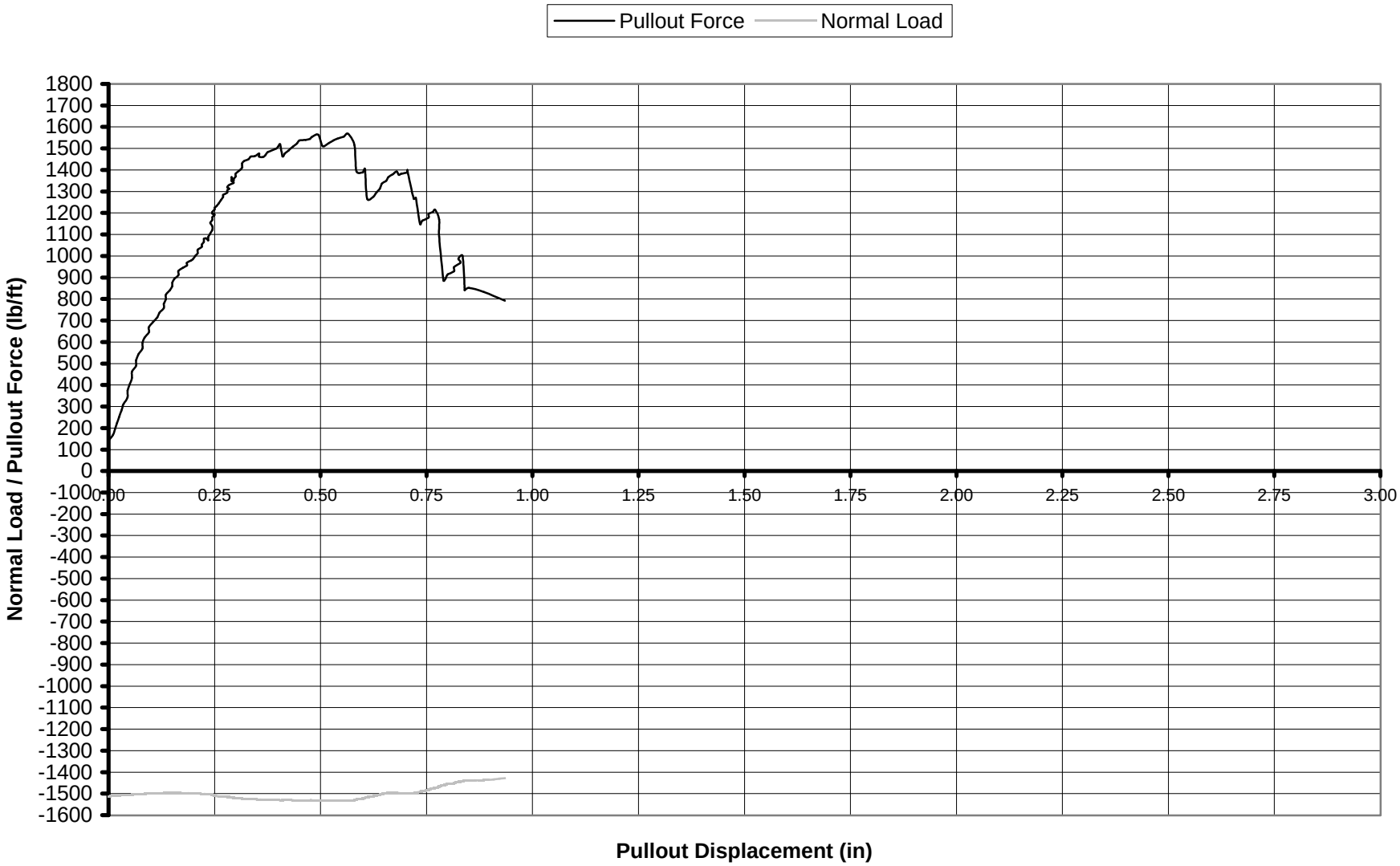
Anchor Diamond Pro HC & Miragrid 3XT - 1500 plf - b



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Anchor Diamond Pro HC & Miragrid 3XT - 1500 plf - c

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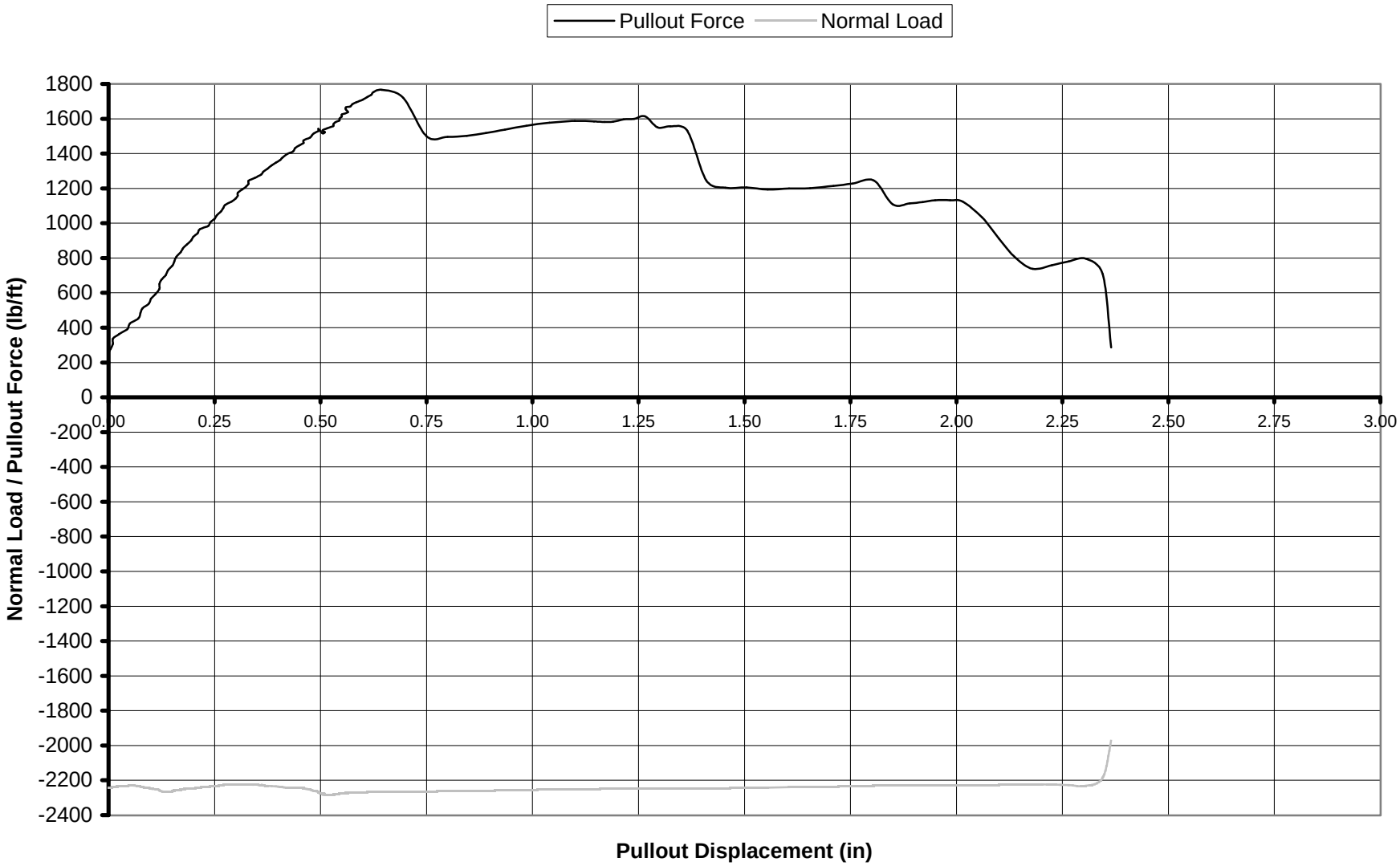
7/2/2002

Anchor Diamond Pro HC & Miragrid 3XT - 2250 plf



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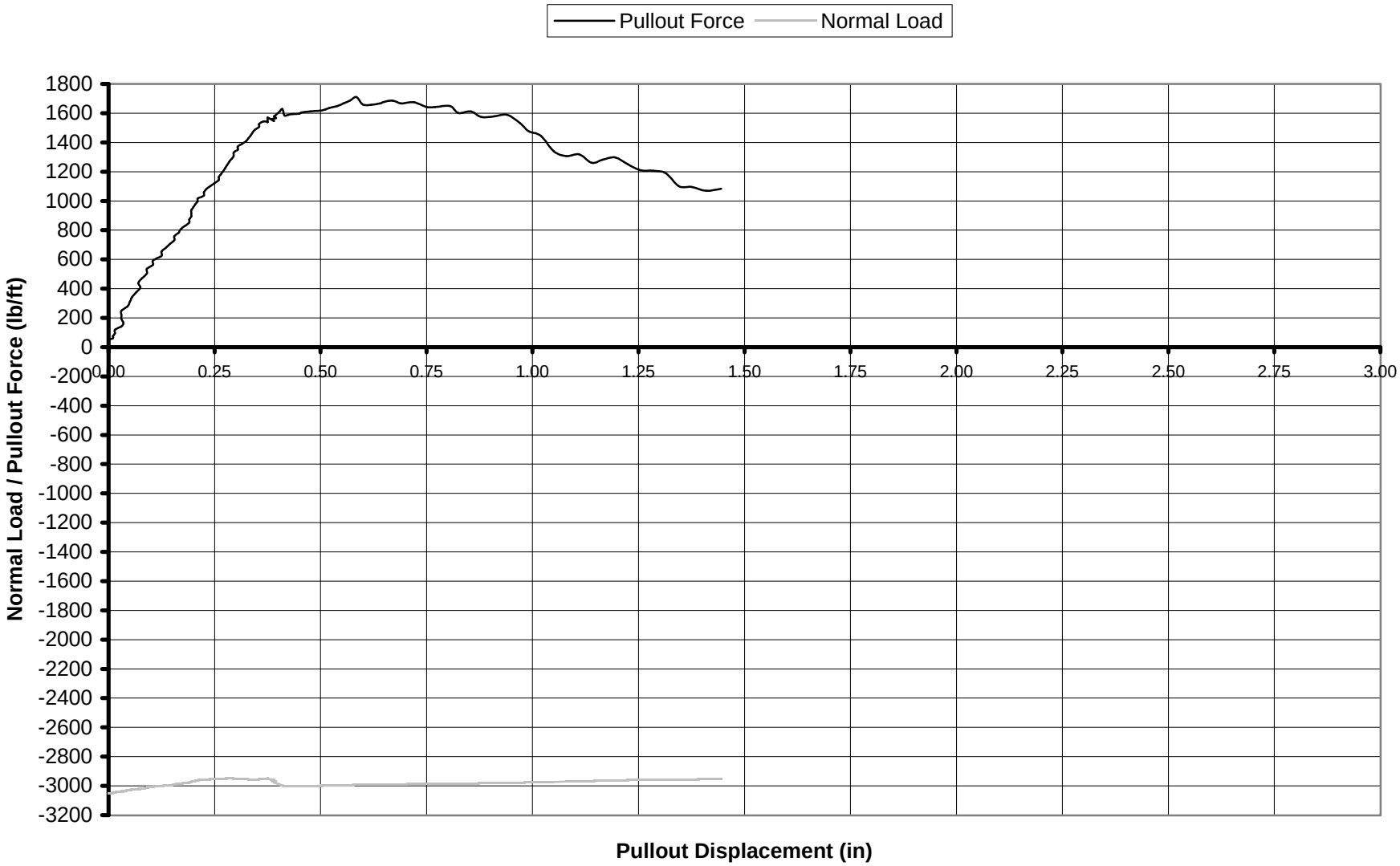
7/2/2002

Anchor Diamond Pro HC & Miragrid 3XT - 3000 plf



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APPENDIX B - GRANULAR INFILL

The grain size distribution curve of the granular infill placed in and between segmental concrete units is shown in Figure B-1.

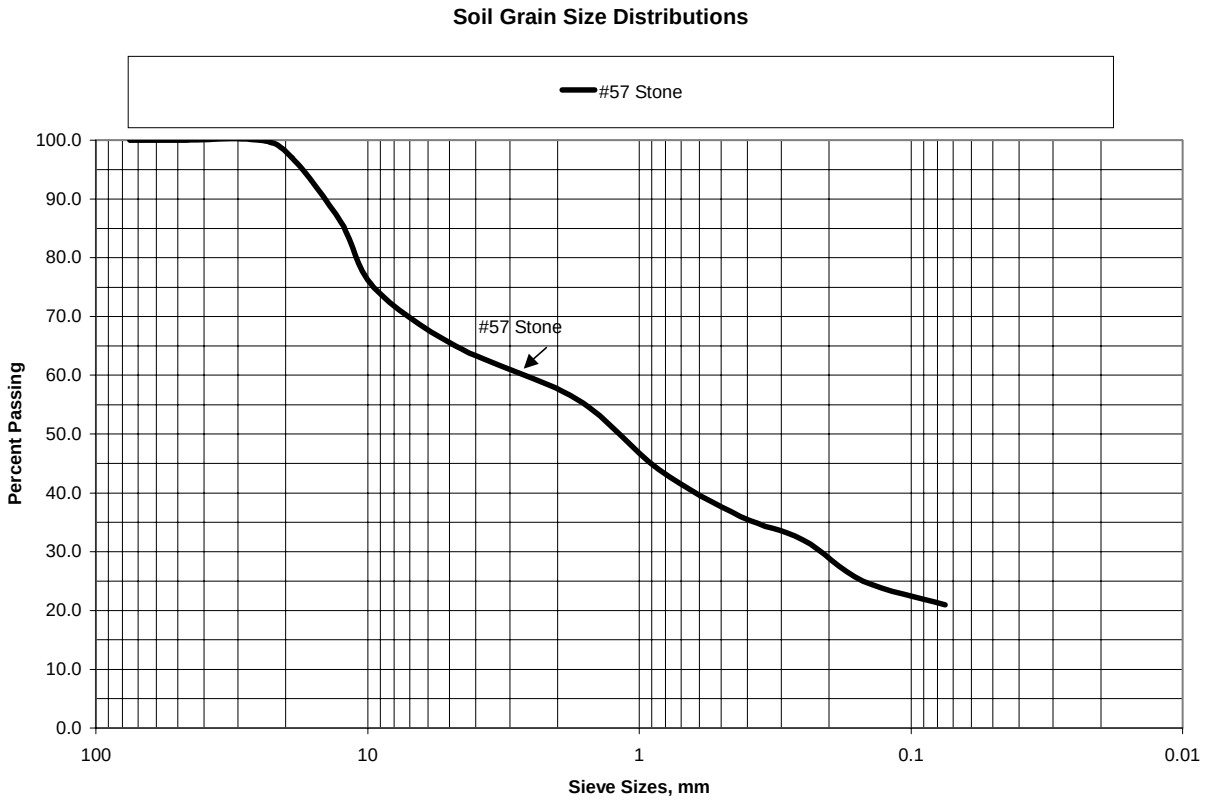
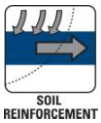


Figure B-1. Infill grain size distribution curve

Granular infill was hand tamped in-place. Density was not measured.

TENCATE Mirafi®



Miragrid® 3XT

Miragrid® 3XT geogrid is composed of high molecular weight, high tenacity polyester multifilament yarns which are woven in tension and finished with a PVC coating. Miragrid® 3XT geogrid is inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value
			Machine Direction
Tensile Strength (at ultimate)	ASTM D6637	lbs/ft (kN/m)	3500 (51.1)
Tensile Strength (at 5% strain)	ASTM D6637	lbs/ft (kN/m)	1056 (15.4)
Creep Reduced Strength	ASTM D5262	lbs/ft (kN/m)	2215 (32.3)
Long Term Allowable Design Load[1]	GRI GG-4(b)	lbs/ft (kN/m)	1918 (28.0)

[1] NOTE: Long Term Allowable Design values are for sand, silt and clay

Physical Properties	Unit	Typical Value
Grid Aperture Size (machine direction)	in (mm)	0.875 (22.2)
Grid Aperture Size (cross machine direction)	in (mm)	1.0 (25.4)
Mass/Unit Area (ASTM D5261)	oz/yd^2 (g/m^2)	8.2 (278)
Roll Dimensions (width x length)	ft (m)	12 x 150 (3.6 x 46)
Roll Area	yd^2 (m^2)	200 (165)
Estimated Roll Weight	lbs (kg)	130 (59)

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SECTION – 2

NCMA DESIGN MANUAL FACTORS OF SAFTEY

SUPPORTING DOCUMENATION

inadequate reinforcement lengths, however, this does not replace the need to carry out a full global stability analysis. In addition, it is recommended that the absolute minimum value for L be 4 ft (1.2 m).

5.10.3: Maximum Wall Height

The design and construction of retaining walls in excess of 50 ft (15.24 m) have become more common. Terraced and single-height retaining walls in excess of this height have also been constructed.

While there is no theoretical maximum height for a properly designed geosynthetic-reinforced SRW there are some practical concerns with taller walls as discussed in Sections 4.4 and 5.9.1 that should be addressed.

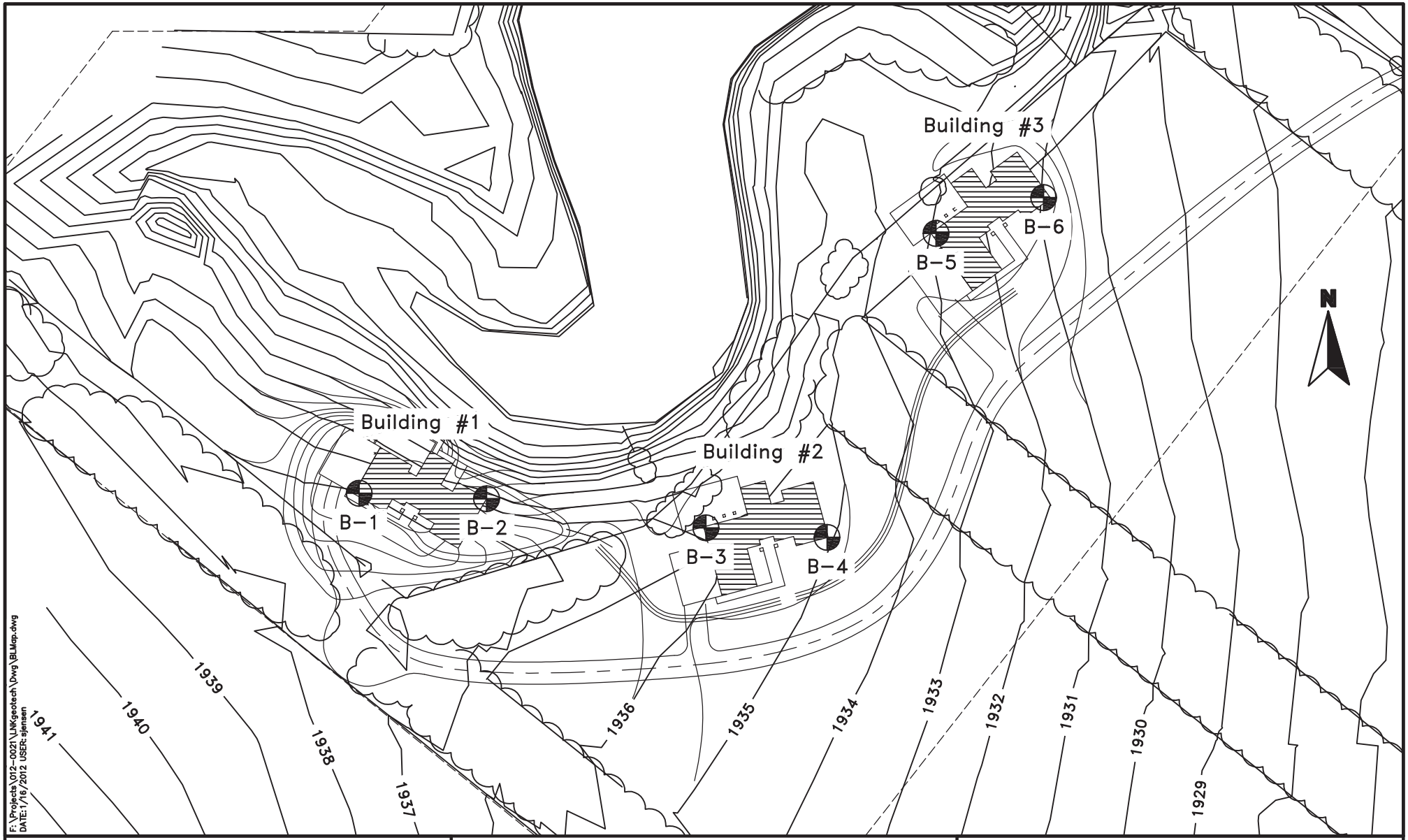
5.10.4: Factors of Safety and Design Criteria Summary

Table 5-2: Recommended Minimum Factors of Safety and Design Criteria for Conventional/ Reinforced SRWs [1, 2, 3, and 4]

Failure Modes		Static	Seismic
Wall Design			
Base Sliding	FS_{sl}	1.5	1.1
Overturning	FS_{ot}	1.5/2.0	1.1
Internal Sliding	$FS_{sc}/FS_{sl(i)}$	1.5	1.1
Tensile Overstress	FS_{to}	1.5	1.1
Pullout	FS_{po}	1.5	1.1
Connection	FS_{cn}	1.5	1.1
Internal Compound Stability	F_{com}	1.3	1.1
Geotechnical Concerns			
Bearing Capacity	FS_{bc}	2.0	1.5
Global Stability	FS_{gl}	1.3-1.5	1.1
Other Wall Design Criteria			
Minimum Reinforced Zone Width	L	$0.6H$ [5]	
Minimum Wall Embedment	H_{emb}	0.5 ft (152 mm) [6]	
Minimum Anchorage Length	L_a	1.0 ft (305 mm)	
Maximum Wall Batter	w	20 degrees	

NOTES:

1. The minimum factors of safety given in this table assume that stability calculations are based on measured site-specific soil/wall data. Measured data are defined as the results of tests carried out on actual samples of soils and geosynthetic products at the proposed structure and actual samples of masonry concrete units (i.e., the same molds, forms, mix design and infill material or same broad soil classification type (e.g. G, S, if applicable).
2. When estimated data is used, the designer may need to use larger factors of safety than those shown in this table or conservative estimates of parameter values. Estimated data includes bulk unit weight and shear strength properties taken from the results of ASTM methods of testing (or similar protocols) carried out on samples of soil having the same USCS classification as the project soil and the same geosynthetic product.
3. Estimated data for facing shear capacity and connection capacity analyses shall be based on laboratory tests carried out on the same masonry concrete unit type under representative surcharge pressures for the project structure (and the same broad soil classification type, e.g. G, S, if applicable).
4. To determine maximum unreinforced wall height, determine height to which factors of safety for conventional SRWs are satisfied.
5. Minimum reinforcement length is $0.6H$ and must meet minimum requirements above.
6. Wall embedment to be determined as per Table 5-1 and must meet minimum requirements above.



LEGEND

SOIL BORING LOCATION

PROJECT: 012-0021

DRAWN BY: SVJ

REVISIONS: XXX

DATE: 1/13/12

0 50 100 200

SCALE IN FEET

BORING LOCATION MAP

HASTINGS, NEBRASKA

OLSSON ASSOCIATES

1111 Lincoln Mall, Suite 111
P.O. Box 84608
Lincoln, NE 68501-4608

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FAX 402.474.5160
www.oaconsulting.com

OLSSON ASSOCIATES

SOIL TEST BORING REPORT

PAGE 1 OF 2 **BORING NO. B-1**

PROJECT: BRIDGES HOUSING - HASTINGS, NEBRASKA
CLIENT: SINCLAIR HILLE ARCHITECTS

LOCATION: SEE BORING LOCATION PLAN
LAT/LONG: N--°--'--", W--°--'--"
JOB NO.: 012-0021
DATE START: 12/28/2011
DATE FINISH: 12/28/2011
DRILL COMPANY: OLSSON ASSOCIATES
EQUIPMENT USED: CME 75
DRILLED BY: A. SNOOK
PREPARED BY: S. JENSEN

DEPTH TO GROUNDWATER
NE WHILE DRILLING
NE 0 HOURS AFTER COMP. ▼
NP 24 HOURS AFTER COMP. ▼

BASE OF BORING AT 25.0 FEET

ELEV (ft)	SOIL PROFILE	DEPTH (ft)	SAMPLE	CLASSIFICATION (USCS)	SPT BLOW COUNTS	LL/PL (%)	MOISTURE (%)	DRY DENSITY (pcf)	Qu (UNCONF. STR.) (tsf)	PASSING #200 SIEVE (%)
	APPROX. SURFACE ELEV. (ft): 1937.00									
	DEVELOPED ZONE 0.5'									
1936.0	***PEORIA LOESS***	1								
	Lean clay (CL)									
1935.0	Stiff, light brown, moist, mostly lean clay, trace fine sand	2	SS-1	CL	4 7 6	--	--	--	--	--
1934.0		3								
1933.0	Lean clay (CL)	4								
	Stiff, light yellowish brown, moist, mostly lean clay,		U-2	CL	--	36/21	14.9	91.3	1.8 (UU)	--
1932.0	trace fine sand	5								
1931.0		6								
1930.0		7								
1929.0		8								
1928.0	Lean clay (CL)	9								
	Firm, light yellowish brown, moist, mostly lean clay,		SS-3	CL	4 4 4	--	--	--	--	--
1927.0	trace fine sand and silt	10								
1926.0		11								
1925.0		12								
1924.0		13								
1923.0	Lean clay (CL)	14								
	Stiff, light yellowish brown, moist, mostly silty lean		U-4	CL	--	35/23	17.9	90.8	--	--
1922.0	clay, trace fine sand	15								
1921.0		16								
1920.0		17								
1919.0		18								
1918.0	Lean clay (CL)	19								
	Stiff, light yellowish brown, moist, mostly silty lean		SS-5	CL	5 4 5	--	--	--	--	--
1917.0	clay, trace fine sand	20								

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE ID.		COMPONENT %		GROUNDWATER
0-3	Very Loose	0-1	Very Soft	SS	SPLIT SPOON	MOSTLY	50-100%	NE - Not Encountered
4-9	Loose	2-4	Soft	U	TUBE	SOME	30-45%	NP - Not Performed
10-29	Med. Dense	5-8	Firm	CA	CALIFORNIA	LITTLE	15-25%	
30-49	Dense	9-15	Stiff	G	GRAB SAMPLE	FEW	5-10%	
>49	Very Dense	16-30	Very Stiff	X	OTHER	TRACE	<5%	**BORING NO. B-1**
		>30	Hard	NR	NO RECOVERY			

OLSSON ASSOCIATES

SOIL TEST BORING REPORT

PAGE 2 OF 2 **BORING NO. B-1**

PROJECT: BRIDGES HOUSING - HASTINGS, NEBRASKA
CLIENT: SINCLAIR HILLE ARCHITECTS

LOCATION: SEE BORING LOCATION PLAN
LAT/LONG: N--°--'--", W--°--'--"
JOB NO.: 012-0021
DATE START: 12/28/2011
DATE FINISH: 12/28/2011
DRILL COMPANY: OLSSON ASSOCIATES
EQUIPMENT USED: CME 75
DRILLED BY: A. SNOOK
PREPARED BY: S. JENSEN

DEPTH TO GROUNDWATER

NE WHILE DRILLING
NE 0 HOURS AFTER COMP. ▼
NP 24 HOURS AFTER COMP. ▼

BASE OF BORING AT 25.0 FEET

ELEV (ft)	SOIL PROFILE	DEPTH (ft)	TEST DATA							
			SAMPLE	CLASSIFICATION (USCS)	SPT BLOW COUNTS	LL/PL (%)	MOISTURE (%)	DRY DENSITY (pcf)	Qu (UNCONF. STR.) (tsf)	PASSING #200 SIEVE (%)
	APPROX. SURFACE ELEV. (ft): 1937.00									
1916.0	***PEORIA LOESS***	21								
1915.0		22								
	22.5'									
1914.0	***LOVELAND FORMATION***	23								
1913.0	Sandy lean clay (CL)	24	U-6	CL	--	--	12.5	100.5	--	--
1912.0	Stiff, dark reddish brown, moist, mostly lean clay, some fine to coarse sand	25								
	BASE OF BORING @ 25.0 FEET									
1911.0		26								
1910.0		27								
1909.0		28								
1908.0		29								
1907.0		30								
1906.0		31								
1905.0		32								
1904.0		33								
1903.0		34								
1902.0		35								
1901.0		36								
1900.0		37								
1899.0		38								
1898.0		39								
1897.0		40								

BLOWS/FT	DENSITY
0-3	Very Loose
4-9	Loose
10-29	Med. Dense
30-49	Dense
>49	Very Dense

BLOWS/FT	CONSISTENCY
0-1	Very Soft
2-4	Soft
5-8	Firm
9-15	Stiff
16-30	Very Stiff
>30	Hard

SAMPLE ID.	
SS	SPLIT SPOON
U	TUBE
CA	CALIFORNIA
G	GRAB SAMPLE
X	OTHER
NR	NO RECOVERY

COMPONENT %	
MOSTLY	50-100%
SOME	30-45%
LITTLE	15-25%
FEW	5-10%
TRACE	<5%

GROUNDWATER
NE - Not Encountered
NP - Not Performed

BORING NO. B-1

OLSSON ASSOCIATES

SOIL TEST BORING REPORT

PAGE 1 OF 2 **BORING NO. B-2**

PROJECT: BRIDGES HOUSING - HASTINGS, NEBRASKA
CLIENT: SINCLAIR HILLE ARCHITECTS

LOCATION: SEE BORING LOCATION PLAN
LAT/LONG: N--°--'--", W--°--'--"
JOB NO.: 012-0021
DATE START: 12/28/2011
DATE FINISH: 12/28/2011
DRILL COMPANY: OLSSON ASSOCIATES
EQUIPMENT USED: CME 75
DRILLED BY: A. SNOOK
PREPARED BY: S. JENSEN

DEPTH TO GROUNDWATER
NE WHILE DRILLING
NE 0 HOURS AFTER COMP. ▼
NP 24 HOURS AFTER COMP. ▼

BASE OF BORING AT 26.5 FEET

ELEV (ft)	SOIL PROFILE	DEPTH (ft)	SAMPLE	CLASSIFICATION (USCS)	SPT BLOW COUNTS	LL/PL (%)	MOISTURE (%)	DRY DENSITY (pcf)	Qu (UNCONF. STR.) (tsf)	PASSING #200 SIEVE (%)
	APPROX. SURFACE ELEV. (ft): 1936.00									
	DEVELOPED ZONE 0.5'									
1935.0	***PEORIA LOESS***	1								
	Silty lean clay (CL/ML)									
1934.0	Very stiff, light yellowish brown mottled with brown, dry to moist, mostly silty lean clay, trace fine sand	2	U-1	CL/ML	--	--	11.5	87.2	--	--
1933.0		3								
1932.0	Silty lean clay (CL/ML)	4								
	Stiff, light yellowish brown mottled with brown, dry to moist, mostly silty lean clay, trace fine sand	5	SS-2	CL/ML	5 5 5	--	11.0	--	--	--
1931.0										
1930.0		6								
1929.0		7								
1928.0		8								
1927.0	Silty lean clay (CL/ML)	9								
	Stiff, light yellowish brown, dry to moist, mostly silty lean clay, trace fine sand	10	SS-3	CL/ML	6 5 6	--	12.7	--	--	--
1926.0										
1925.0		11								
1924.0		12								
1923.0		13								
1922.0	Silty lean clay (CL/ML)	14								
	Stiff, light yellowish brown, dry to moist, mostly silty lean clay, trace fine sand, iron	15	SS-4	CL/ML	7 7 8	--	--	--	--	--
1921.0										
1920.0		16								
1919.0		17								
	17.5'									
1918.0	***LOVELAND FORMATION***	18								
1917.0	Silty sand (SM)	19								
	Medium dense, light reddish brown, moist, mostly fine to coarse sand, little silty clay	20	SS-5	SM	7 8 5	--	4.8	--	--	21.1
1916.0										

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE ID.		COMPONENT %		GROUNDWATER
0-3	Very Loose	0-1	Very Soft	SS	SPLIT SPOON	MOSTLY	50-100%	NE - Not Encountered
4-9	Loose	2-4	Soft	U	TUBE	SOME	30-45%	NP - Not Performed
10-29	Med. Dense	5-8	Firm	CA	CALIFORNIA	LITTLE	15-25%	
30-49	Dense	9-15	Stiff	G	GRAB SAMPLE	FEW	5-10%	
>49	Very Dense	16-30	Very Stiff	X	OTHER	TRACE	<5%	**BORING NO. B-2**
		>30	Hard	NR	NO RECOVERY			

OLSSON ASSOCIATES

SOIL TEST BORING REPORT

PAGE 2 OF 2 **BORING NO. B-2**

PROJECT: BRIDGES HOUSING - HASTINGS, NEBRASKA
CLIENT: SINCLAIR HILLE ARCHITECTS

LOCATION: SEE BORING LOCATION PLAN
LAT/LONG: N--°--'--", W--°--'--"
JOB NO.: 012-0021
DATE START: 12/28/2011
DATE FINISH: 12/28/2011
DRILL COMPANY: OLSSON ASSOCIATES
EQUIPMENT USED: CME 75
DRILLED BY: A. SNOOK
PREPARED BY: S. JENSEN

DEPTH TO GROUNDWATER

NE WHILE DRILLING
NE 0 HOURS AFTER COMP. ▼
NP 24 HOURS AFTER COMP. ▼

BASE OF BORING AT 26.5 FEET

ELEV (ft)	SOIL PROFILE	DEPTH (ft)	TEST DATA: SAMPLE	CLASSIFICATION (USCS)	SPT BLOW COUNTS	LL/PL (%)	MOISTURE (%)	DRY DENSITY (pcf)	Qu (UNCONF. STR.) (tsf)	PASSING #200 SIEVE (%)
	APPROX. SURFACE ELEV. (ft): 1936.00									
	LOVELAND FORMATION									
1915.0		21								
1914.0		22								
1913.0		23								
1912.0	Sandy silt (ML)	24								
	Stiff, dark reddish brown, dry to moist, mostly silt,		U-6	ML	--	--	12.7	--	--	74.7
1911.0	some fine to coarse sand **25.0'**	25								
	Fat clay (CH)				8					
1910.0	Hard, dark brown mottled with dark greyish brown,	26	SS-7	CH	15	--	--	--	--	--
	moist, mostly fat clay, trace fine sand and silt, iron				17					
1909.0	***BASE OF BORING @ 26.5 FEET***	27								
1908.0		28								
1907.0		29								
1906.0		30								
1905.0		31								
1904.0		32								
1903.0		33								
1902.0		34								
1901.0		35								
1900.0		36								
1899.0		37								
1898.0		38								
1897.0		39								
1896.0		40								

BLOWS/FT	DENSITY
0-3	Very Loose
4-9	Loose
10-29	Med. Dense
30-49	Dense
>49	Very Dense

BLOWS/FT	CONSISTENCY
0-1	Very Soft
2-4	Soft
5-8	Firm
9-15	Stiff
16-30	Very Stiff
>30	Hard

SAMPLE ID.	
SS	SPLIT SPOON
U	TUBE
CA	CALIFORNIA
G	GRAB SAMPLE
X	OTHER
NR	NO RECOVERY

COMPONENT %	
MOSTLY	50-100%
SOME	30-45%
LITTLE	15-25%
FEW	5-10%
TRACE	<5%

GROUNDWATER
NE - Not Encountered
NP - Not Performed

BORING NO. B-2

SECTION – 3

SRWall WALL DESIGN CALCULATIONS

SRWall (Version 4) Report

Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Hill Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 1 - Station 10+00**
Project File	**: Wall 1 - Station 10+00.prj**
Vendor Data File	**:**
Date and Time	**: 01/25/2012 16:32:26**

Type of Structure	**: Reinforced Wall**

Wall Geometry

Design Wall Height(ft)	**: 4.00**
Embedment Wall Height(ft)	**: 0.50**
Exposed Wall Design Height(ft)	**: 3.50**
Number of Segmental Wall Units	**: 6**
Wall Inclination(degrees)	**: 7.13**

Grades

Top Slope(degrees)	**: 0.00**

Uniform Distributed Surcharge

Live Load Surcharge(Psf)	**: 50.00**
Dead Load Surcharge(Psf)	**: 0.00**

Soil Data

Soil Zone	Description	Cohesion (c) (psf)	Friction Angle(Φ) (degrees)	Unit Weight (γ)(pcf)
Reinforced Soil	Structural Fill	N/A	26.00	120.00
Retained Soil	Peoria Loess	N/A	23.00	110.00
Leveling Pad Soil	6 inch Granular Base	N/A	32.00	125.00
Foundation Soil	Peoria Loess	0.00	23.00	110.00

Segmental Unit Data

Segmental Unit Name	**: Diamond Pro**
Cap Height (Inches)	**: 4.00**
Unit Height (Hu)(Inches)	**: 8.00**
Unit Width (Wu)(Inches)	**: 12.00**
Unit Length (Inches)	**: 18.00**
Setback (Inches)	**: 1.00**
Weight (Infilled)(lb)	**: 130.00**
Unit Weight (Infilled)(pcf)	**: 130.00**
Center of Gravity(Inches)	**: 6.00**

Geosynthetic Reinforcement Type and Number

Supplier	Product Name	Number
	Miragrid 10XT	0
	Miragrid 2XT	0
	Miragrid 3XT	2
	Miragrid 5XT	0
	Miragrid 8XT	0

Geosynthetic Properties

Geosynthetic Product	Tult (lb/ft)	RFcr	RFd	RFid	LTDS (lb/ft)	Ci	Cds
Miragrid 10XT	9500.00	1.60	1.15	1.15	4489.60	0.70	0.70
Miragrid 2XT	2000.00	1.60	1.15	1.15	945.18	0.70	0.70
Miragrid 3XT	3500.00	1.60	1.15	1.15	1654.06	0.70	0.70
Miragrid 5XT	4700.00	1.60	1.15	1.15	2221.17	0.70	0.70
Miragrid 8XT	7400.00	1.60	1.15	1.15	3497.16	0.70	0.70

Unit-Unit Interface Properties

Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
962.00	26.00	1950.00

Geosynthetic-SRW Unit Connection Strength properties

Geosynthetic Product	Minimum Conn. Capacity (lb/ft)	1st Inflection Point (lb/ft)		2nd Inflection Point (lb/ft)	
		Normal Load (lb/ft)	Connection Capacity (lb/ft)	Normal Load (lb/ft)	Max Connection Capacity(lb/ft)
Miragrid 10XT	937.00	1930.00	2690.00	3863.00	3619.00
Miragrid 2XT	686.00	1750.00	963.00	2002.00	1038.00
Miragrid 3XT	1362.00	1500.00	1628.00	3000.00	1711.00
Miragrid 5XT	1161.00	1923.00	1782.00	3856.00	2105.00
Miragrid 8XT	1313.00	1500.00	1826.00	3000.00	2420.00

Geosynthetic-SRW Unit Shear Strength properties

Geosynthetic Product	Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
Miragrid 10XT	962.00	26.00	1950.00
Miragrid 2XT	962.00	26.00	1950.00
Miragrid 3XT	962.00	26.00	1950.00
Miragrid 5XT	962.00	26.00	1950.00
Miragrid 8XT	962.00	26.00	1950.00

Vertical Components

Vertical Components of Earth Pressures Used **: No**

Cofficients of Earth Pressure and Failure Plane Orientation

Reinforcement Soil(Static)(Ka)	**: 0.299**
Reinforcement Soil(Static)(Kah Horizontal Component)	**: 0.294**
Internal Modified Back Slope(Bint)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for Internal Stability	**: 50.901**
Retained Soil(Static)(Ka)	**: 0.332**
Retained Soil(Static)(Kah Horizontal Component)	**: 0.319**
External Modified Back Slope(Bext)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for External Stability	**: 47.704**

Result of External Stability Static Analysis

	Calculated	Design Criteria
FOS Sliding	2.95	> 1.50
FOS Overturning	12.94	> 2.00
FOS Bearing Capacity	5.25	> 2.50
Base Reinforcement Length (L)(ft)	5.00	
Base Reinforcement Ratio (L/H)	1.25	> 0.60

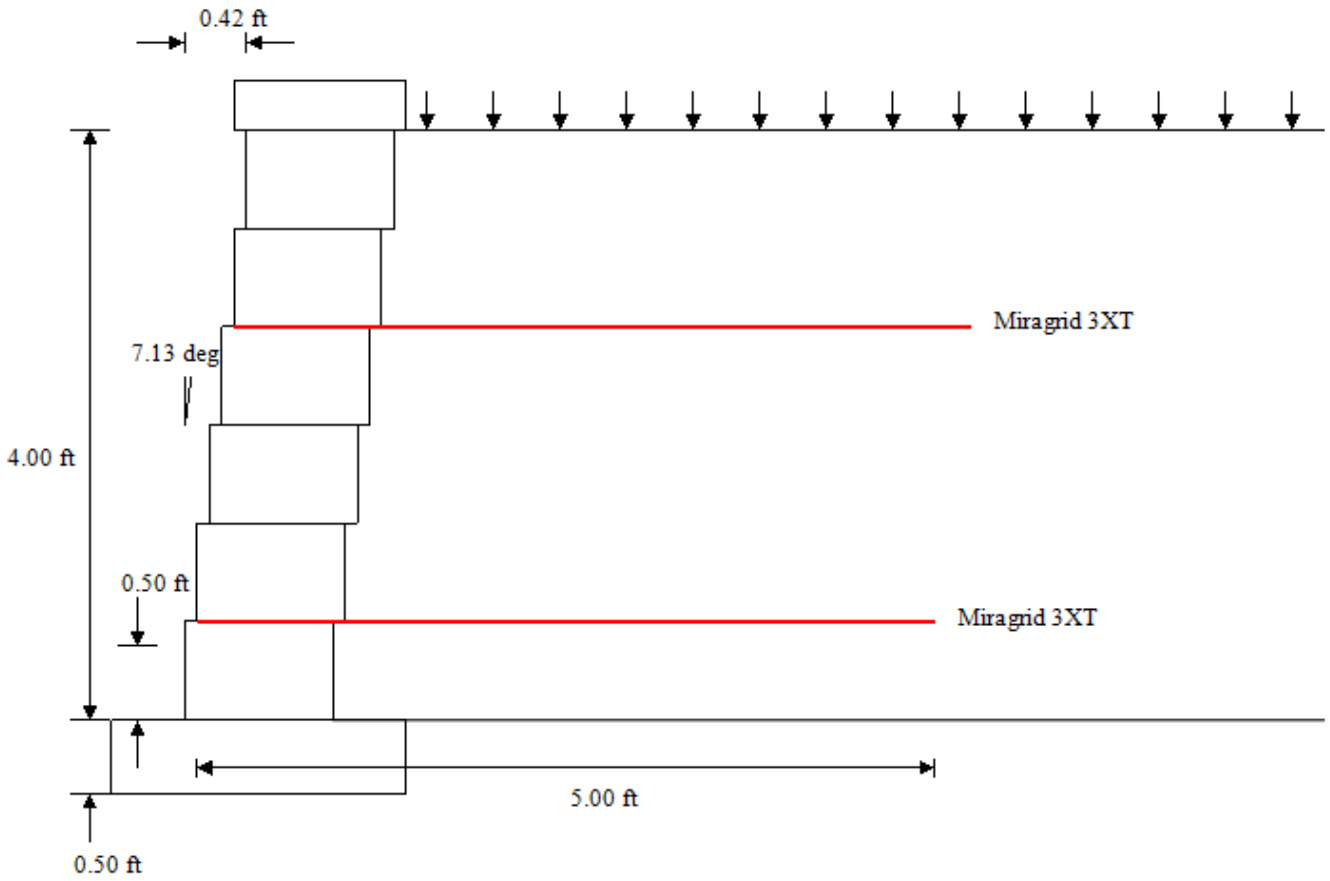
Results of Internal Stability Static Analysis

SRW Unit #	Geosynthetic Product	Elevation (ft)	Length (ft)	Anchor Length (ft)	FOS Overstress >=1.50	FOS Pullout >=1.50	FOS Slide >=1.50	Layer Spacing (ft) >=2.00
5	Miragrid 3XT	2.67	5.00	2.16	12.71	1.81	24.18	OK
2	Miragrid 3XT	0.67	5.00	3.54	7.83	4.57	6.93	OK

Results of Facing Stability Static Analysis

SRW Unit #	Heel Elev (ft)	Geosynthetic Product	FOS Crest Toppling >=1.50	FOS Connection >=1.50
5	2.67	Miragrid 3XT	3.48	10.70
2	0.67	Miragrid 3XT		6.81

Wall Reinforcement Layout



Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Hill Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 1 - Station 10+00**
Vendor Data File	**:**
Project File	**: Wall 1 - Station 10+00.prj**
Date and Time	**: 01/25/2012 16:32:26**

SRWall (Version 4) Report

Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Hill Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 1 - Station 15+00**
Project File	**: Wall 1 - Station 15+00.prj**
Vendor Data File	**:**
Date and Time	**: 01/26/2012 09:40:19**

Type of Structure	**: Reinforced Wall**

Wall Geometry

Design Wall Height(ft)	**: 4.67**
Embedment Wall Height(ft)	**: 0.50**
Exposed Wall Design Height(ft)	**: 4.17**
Number of Segmental Wall Units	**: 7**
Wall Inclination(degrees)	**: 7.13**

Grades

Top Slope(degrees)	**: 0.00**

Uniform Distributed Surcharge

Live Load Surcharge(Psf)	**: 50.00**
Dead Load Surcharge(Psf)	**: 0.00**

Soil Data

Soil Zone	Description	Cohesion (c) (psf)	Friction Angle(Φ) (degrees)	Unit Weight (γ)(pcf)
Reinforced Soil	Structural Fill	N/A	26.00	120.00
Retained Soil	Peoria Loess	N/A	23.00	110.00
Leveling Pad Soil	6 inch Granular Base	N/A	32.00	125.00
Foundation Soil	Peoria Loess	0.00	23.00	110.00

Segmental Unit Data

Segmental Unit Name	**: Diamond Pro**
Cap Height (Inches)	**: 4.00**
Unit Height (Hu)(Inches)	**: 8.00**
Unit Width (Wu)(Inches)	**: 12.00**
Unit Length (Inches)	**: 18.00**
Setback (Inches)	**: 1.00**
Weight (Infilled)(lb)	**: 130.00**
Unit Weight (Infilled)(pcf)	**: 130.00**
Center of Gravity(Inches)	**: 6.00**

Geosynthetic Reinforcement Type and Number

Supplier	Product Name	Number
	Miragrid 10XT	0
	Miragrid 2XT	0
	Miragrid 3XT	2
	Miragrid 5XT	0
	Miragrid 8XT	0

Geosynthetic Properties

Geosynthetic Product	Tult (lb/ft)	RFcr	RFd	RFid	LTDS (lb/ft)	Ci	Cds
Miragrid 10XT	9500.00	1.60	1.15	1.15	4489.60	0.70	0.70
Miragrid 2XT	2000.00	1.60	1.15	1.15	945.18	0.70	0.70
Miragrid 3XT	3500.00	1.60	1.15	1.15	1654.06	0.70	0.70
Miragrid 5XT	4700.00	1.60	1.15	1.15	2221.17	0.70	0.70
Miragrid 8XT	7400.00	1.60	1.15	1.15	3497.16	0.70	0.70

Unit-Unit Interface Properties

Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
962.00	26.00	1950.00

Geosynthetic-SRW Unit Connection Strength properties

Geosynthetic Product	Minimum Conn. Capacity (lb/ft)	1st Inflection Point (lb/ft)		2nd Inflection Point (lb/ft)	
		Normal Load (lb/ft)	Connection Capacity (lb/ft)	Normal Load (lb/ft)	Max Connection Capacity(lb/ft)
Miragrid 10XT	937.00	1930.00	2690.00	3863.00	3619.00
Miragrid 2XT	686.00	1750.00	963.00	2002.00	1038.00
Miragrid 3XT	1362.00	1500.00	1628.00	3000.00	1711.00
Miragrid 5XT	1161.00	1923.00	1782.00	3856.00	2105.00
Miragrid 8XT	1313.00	1500.00	1826.00	3000.00	2420.00

Geosynthetic-SRW Unit Shear Strength properties

Geosynthetic Product	Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
Miragrid 10XT	962.00	26.00	1950.00
Miragrid 2XT	962.00	26.00	1950.00
Miragrid 3XT	962.00	26.00	1950.00
Miragrid 5XT	962.00	26.00	1950.00
Miragrid 8XT	962.00	26.00	1950.00

Vertical Components

Vertical Components of Earth Pressures Used **: No**

Cofficients of Earth Pressure and Failure Plane Orientation

Reinforcement Soil(Static)(Ka)	**: 0.299**
Reinforcement Soil(Static)(Kah Horizontal Component)	**: 0.294**
Internal Modified Back Slope(Bint)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for Internal Stability	**: 50.901**
Retained Soil(Static)(Ka)	**: 0.332**
Retained Soil(Static)(Kah Horizontal Component)	**: 0.319**
External Modified Back Slope(Bext)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for External Stability	**: 47.704**

Result of External Stability Static Analysis

	Calculated	Design Criteria
FOS Sliding	2.60	> 1.50
FOS Overturning	10.02	> 2.00
FOS Bearing Capacity	4.47	> 2.50
Base Reinforcement Length (L)(ft)	5.00	
Base Reinforcement Ratio (L/H)	1.07	> 0.60

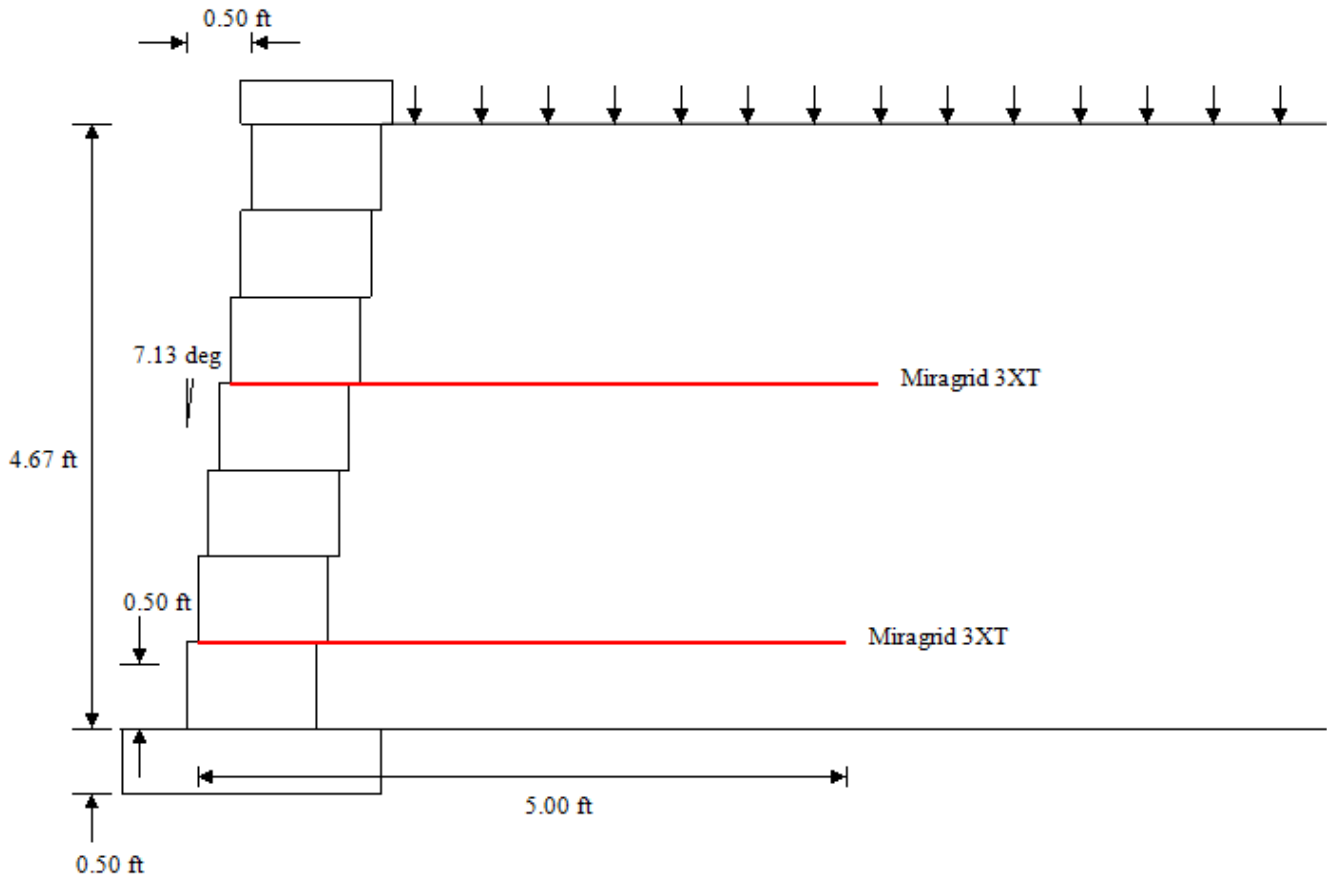
Results of Internal Stability Static Analysis

SRW Unit #	Geosynthetic Product	Elevation (ft)	Length (ft)	Anchor Length (ft)	FOS Overstress >=1.50	FOS Pullout >=1.50	FOS Slide >=1.50	Layer Spacing (ft) >=2.00
5	Miragrid 3XT	2.67	5.00	2.16	8.16	1.75	13.90	OK
2	Miragrid 3XT	0.67	5.00	3.54	6.60	4.62	5.43	OK

Results of Facing Stability Static Analysis

SRW Unit #	Heel Elev (ft)	Geosynthetic Product	FOS Crest Toppling >=1.50	FOS Connection >=1.50
5	2.67	Miragrid 3XT	1.99	6.95
2	0.67	Miragrid 3XT		5.80

Wall Reinforcement Layout



Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Hill Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 1 - Station 15+00**
Vendor Data File	**:**
Project File	**: Wall 1 - Station 15+00.prj**
Date and Time	**: 01/26/2012 09:40:19**

SRWall (Version 4) Report

Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Hill Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 1 - Station 23+00**
Project File	**: Wall 1 - Station 23+00.prj**
Vendor Data File	**:**
Date and Time	**: 01/26/2012 09:44:35**

Type of Structure	**: Reinforced Wall**

Wall Geometry

Design Wall Height(ft)	**: 3.33**
Embedment Wall Height(ft)	**: 0.50**
Exposed Wall Design Height(ft)	**: 2.83**
Number of Segmental Wall Units	**: 5**
Wall Inclination(degrees)	**: 7.13**

Grades

Top Slope(degrees)	**: 0.00**

Uniform Distributed Surcharge

Live Load Surcharge(Psf)	**: 50.00**
Dead Load Surcharge(Psf)	**: 0.00**

Soil Data

Soil Zone	Description	Cohesion (c) (psf)	Friction Angle(Φ) (degrees)	Unit Weight (γ)(pcf)
Reinforced Soil	Structural Fill	N/A	26.00	120.00
Retained Soil	Peoria Loess	N/A	23.00	110.00
Leveling Pad Soil	6 inch Granular Base	N/A	32.00	125.00
Foundation Soil	Peoria Loess	0.00	23.00	110.00

Segmental Unit Data

Segmental Unit Name	**: Diamond Pro**
Cap Height (Inches)	**: 4.00**
Unit Height (Hu)(Inches)	**: 8.00**
Unit Width (Wu)(Inches)	**: 12.00**
Unit Length (Inches)	**: 18.00**
Setback (Inches)	**: 1.00**
Weight (Infilled)(lb)	**: 130.00**
Unit Weight (Infilled)(pcf)	**: 130.00**
Center of Gravity(Inches)	**: 6.00**

Geosynthetic Reinforcement Type and Number

Supplier	Product Name	Number
	Miragrid 10XT	0
	Miragrid 2XT	0
	Miragrid 3XT	2
	Miragrid 5XT	0
	Miragrid 8XT	0

Geosynthetic Properties

Geosynthetic Product	Tult (lb/ft)	RFcr	RFd	RFid	LTDS (lb/ft)	Ci	Cds
Miragrid 10XT	9500.00	1.60	1.15	1.15	4489.60	0.70	0.70
Miragrid 2XT	2000.00	1.60	1.15	1.15	945.18	0.70	0.70
Miragrid 3XT	3500.00	1.60	1.15	1.15	1654.06	0.70	0.70
Miragrid 5XT	4700.00	1.60	1.15	1.15	2221.17	0.70	0.70
Miragrid 8XT	7400.00	1.60	1.15	1.15	3497.16	0.70	0.70

Unit-Unit Interface Properties

Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
962.00	26.00	1950.00

Geosynthetic-SRW Unit Connection Strength properties

Geosynthetic Product	Minimum Conn. Capacity (lb/ft)	1st Inflection Point (lb/ft)		2nd Inflection Point (lb/ft)	
		Normal Load (lb/ft)	Connection Capacity (lb/ft)	Normal Load (lb/ft)	Max Connection Capacity(lb/ft)
Miragrid 10XT	937.00	1930.00	2690.00	3863.00	3619.00
Miragrid 2XT	686.00	1750.00	963.00	2002.00	1038.00
Miragrid 3XT	1362.00	1500.00	1628.00	3000.00	1711.00
Miragrid 5XT	1161.00	1923.00	1782.00	3856.00	2105.00
Miragrid 8XT	1313.00	1500.00	1826.00	3000.00	2420.00

Geosynthetic-SRW Unit Shear Strength properties

Geosynthetic Product	Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
Miragrid 10XT	962.00	26.00	1950.00
Miragrid 2XT	962.00	26.00	1950.00
Miragrid 3XT	962.00	26.00	1950.00
Miragrid 5XT	962.00	26.00	1950.00
Miragrid 8XT	962.00	26.00	1950.00

Vertical Components

Vertical Components of Earth Pressures Used **: No**

Cofficients of Earth Pressure and Failure Plane Orientation

Reinforcement Soil(Static)(Ka)	**: 0.299**
Reinforcement Soil(Static)(Kah Horizontal Component)	**: 0.294**
Internal Modified Back Slope(Bint)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for Internal Stability	**: 50.901**
Retained Soil(Static)(Ka)	**: 0.332**
Retained Soil(Static)(Kah Horizontal Component)	**: 0.319**
External Modified Back Slope(Bext)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for External Stability	**: 47.704**

Result of External Stability Static Analysis

	Calculated	Design Criteria
FOS Sliding	3.42	> 1.50
FOS Overturning	17.46	> 2.00
FOS Bearing Capacity	6.21	> 2.00
Base Reinforcement Length (L)(ft)	5.00	
Base Reinforcement Ratio (L/H)	1.50	> 0.60

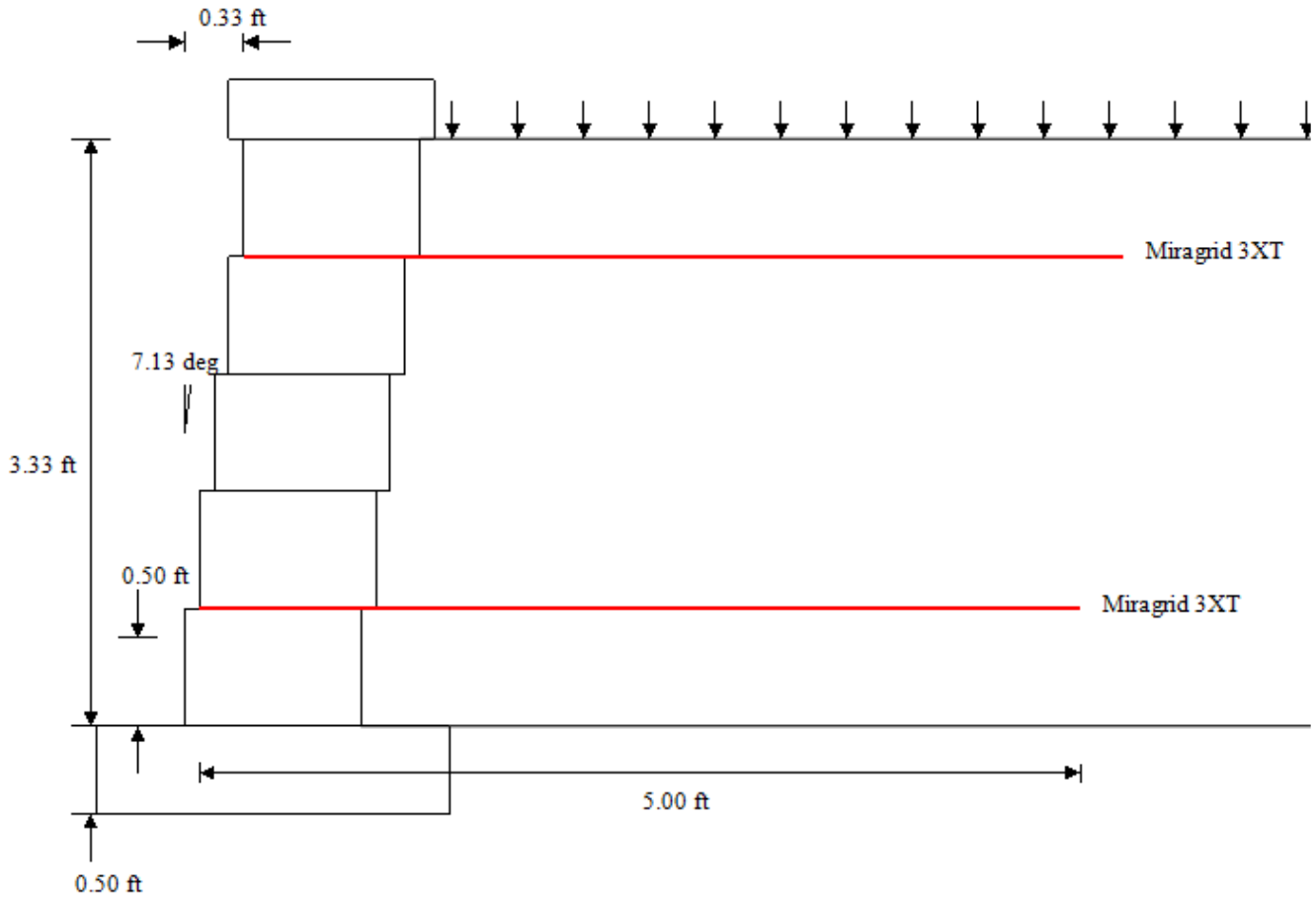
Results of Internal Stability Static Analysis

SRW Unit #	Geosynthetic Product	Elevation (ft)	Length (ft)	Anchor Length (ft)	FOS Overstress >=1.50	FOS Pullout >=1.50	FOS Slide >=1.50	Layer Spacing (ft) >=2.00
5	Miragrid 3XT	2.67	5.00	2.16	22.55	1.60	60.76	OK
2	Miragrid 3XT	0.67	5.00	3.54	9.62	4.49	9.38	OK

Results of Facing Stability Static Analysis

SRW Unit #	Heel Elev (ft)	Geosynthetic Product	FOS Crest Toppling >=1.50	FOS Connection >=1.50
5	2.67	Miragrid 3XT	8.69	18.78
2	0.67	Miragrid 3XT		8.28

Wall Reinforcement Layout



Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Hill Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 1 - Station 23+00**
Vendor Data File	**:**
Project File	**: Wall 1 - Station 23+00.prj**
Date and Time	**: 01/26/2012 09:44:35**

SRWall (Version 4) Report

Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 2 - East Elevation - Station 16+00**
Project File	**: Wall 2 - East Elevation - Station 16+00.prj**
Vendor Data File	**:**
Date and Time	**: 01/26/2012 09:56:49**

Type of Structure	**: Reinforced Wall**

Wall Geometry

Design Wall Height(ft)	**: 8.00**
Embedment Wall Height(ft)	**: 0.50**
Exposed Wall Design Height(ft)	**: 7.50**
Number of Segmental Wall Units	**: 12**
Wall Inclination(degrees)	**: 7.13**

Grades

Top Slope(degrees)	**: 0.00**

Uniform Distributed Surcharge

Live Load Surcharge(Psf)	**: 50.00**
Dead Load Surcharge(Psf)	**: 0.00**

Soil Data

Soil Zone	Description	Cohesion (c) (psf)	Friction Angle(Φ) (degrees)	Unit Weight (γ)(pcf)
Reinforced Soil	Structural Fill	N/A	26.00	120.00
Retained Soil	Peoria Loess	N/A	23.00	110.00
Leveling Pad Soil	6 inch Granular Base	N/A	32.00	125.00
Foundation Soil	Peoria Loess	0.00	23.00	110.00

Segmental Unit Data

Segmental Unit Name	**: Diamond Pro**
Cap Height (Inches)	**: 4.00**
Unit Height (Hu)(Inches)	**: 8.00**
Unit Width (Wu)(Inches)	**: 12.00**
Unit Length (Inches)	**: 18.00**
Setback (Inches)	**: 1.00**
Weight (Infilled)(lb)	**: 130.00**
Unit Weight (Infilled)(pcf)	**: 130.00**
Center of Gravity(Inches)	**: 6.00**

Geosynthetic Reinforcement Type and Number

Supplier	Product Name	Number
	Miragrid 10XT	0
	Miragrid 2XT	0
	Miragrid 3XT	4
	Miragrid 5XT	0
	Miragrid 8XT	0

Geosynthetic Properties

Geosynthetic Product	Tult (lb/ft)	RFcr	RFd	RFid	LTDS (lb/ft)	Ci	Cds
Miragrid 10XT	9500.00	1.60	1.15	1.15	4489.60	0.70	0.70
Miragrid 2XT	2000.00	1.60	1.15	1.15	945.18	0.70	0.70
Miragrid 3XT	3500.00	1.60	1.15	1.15	1654.06	0.70	0.70
Miragrid 5XT	4700.00	1.60	1.15	1.15	2221.17	0.70	0.70
Miragrid 8XT	7400.00	1.60	1.15	1.15	3497.16	0.70	0.70

Unit-Unit Interface Properties

Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
962.00	26.00	1950.00

Geosynthetic-SRW Unit Connection Strength properties

Geosynthetic Product	Minimum Conn. Capacity (lb/ft)	1st Inflection Point (lb/ft)		2nd Inflection Point (lb/ft)	
		Normal Load (lb/ft)	Connection Capacity (lb/ft)	Normal Load (lb/ft)	Max Connection Capacity(lb/ft)
Miragrid 10XT	937.00	1930.00	2690.00	3863.00	3619.00
Miragrid 2XT	686.00	1750.00	963.00	2002.00	1038.00
Miragrid 3XT	1362.00	1500.00	1628.00	3000.00	1711.00
Miragrid 5XT	1161.00	1923.00	1782.00	3856.00	2105.00
Miragrid 8XT	1313.00	1500.00	1826.00	3000.00	2420.00

Geosynthetic-SRW Unit Shear Strength properties

Geosynthetic Product	Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
Miragrid 10XT	962.00	26.00	1950.00
Miragrid 2XT	962.00	26.00	1950.00
Miragrid 3XT	962.00	26.00	1950.00
Miragrid 5XT	962.00	26.00	1950.00
Miragrid 8XT	962.00	26.00	1950.00

Vertical Components

Vertical Components of Earth Pressures Used **: No**

Cofficients of Earth Pressure and Failure Plane Orientation

Reinforcement Soil(Static)(Ka)	**: 0.299**
Reinforcement Soil(Static)(Kah Horizontal Component)	**: 0.294**
Internal Modified Back Slope(Bint)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for Internal Stability	**: 50.901**
Retained Soil(Static)(Ka)	**: 0.332**
Retained Soil(Static)(Kah Horizontal Component)	**: 0.319**
External Modified Back Slope(Bext)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for External Stability	**: 47.704**

Result of External Stability Static Analysis

	Calculated	Design Criteria
FOS Sliding	2.28	> 1.50
FOS Overturning	7.58	> 2.00
FOS Bearing Capacity	3.50	> 2.50
Base Reinforcement Length (L)(ft)	7.00	
Base Reinforcement Ratio (L/H)	0.88	> 0.60

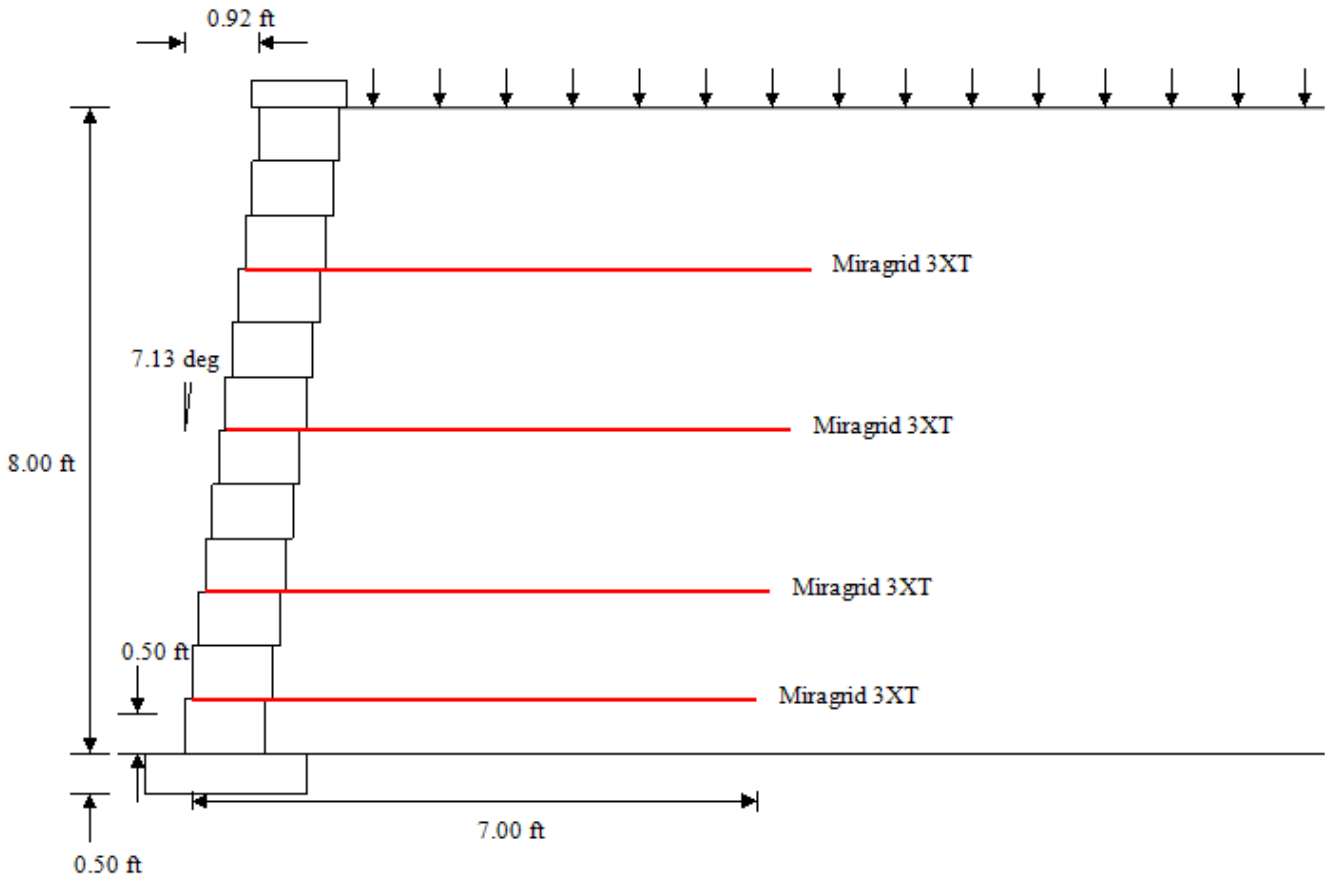
Results of Internal Stability Static Analysis

SRW Unit #	Geosynthetic Product	Elevation (ft)	Length (ft)	Anchor Length (ft)	FOS Overstress >=1.50	FOS Pullout >=1.50	FOS Slide >=1.50	Layer Spacing (ft) >=2.00
10	Miragrid 3XT	6.00	7.00	1.87	8.14	1.51	15.47	OK
7	Miragrid 3XT	4.00	7.00	3.25	5.30	3.41	6.38	OK
4	Miragrid 3XT	2.00	7.00	4.62	4.50	6.19	3.87	OK
2	Miragrid 3XT	0.67	7.00	5.54	4.53	9.10	3.04	OK

Results of Facing Stability Static Analysis

SRW Unit #	Heel Elev (ft)	Geosynthetic Product	FOS Crest Toppling >=1.50	FOS Connection >=1.50
10	6.00	Miragrid 3XT	1.98	6.93
7	4.00	Miragrid 3XT		4.66
4	2.00	Miragrid 3XT		4.08
2	0.67	Miragrid 3XT		4.19

Wall Reinforcement Layout



Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 2 - East Elevation - Station 16+00**
Vendor Data File	**:**
Project File	**: Wall 2 - East Elevation - Station 16+00.prj**
Date and Time	**: 01/26/2012 09:56:49**

SRWall (Version 4) Report

Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 2 - North Elevation - Station 10+00**
Project File	**: Wall 2 - North Elevation - Station 10+00.prj**
Vendor Data File	**:**
Date and Time	**: 01/26/2012 09:57:43**

Type of Structure	**: Reinforced Wall**

Wall Geometry

Design Wall Height(ft)	**: 6.67**
Embedment Wall Height(ft)	**: 0.50**
Exposed Wall Design Height(ft)	**: 6.17**
Number of Segmental Wall Units	**: 10**
Wall Inclination(degrees)	**: 7.13**

Grades

Top Slope(degrees)	**: 0.00**

Uniform Distributed Surcharge

Live Load Surcharge(Psf)	**: 50.00**
Dead Load Surcharge(Psf)	**: 0.00**

Soil Data

Soil Zone	Description	Cohesion (c) (psf)	Friction Angle(Φ) (degrees)	Unit Weight (γ)(pcf)
Reinforced Soil	Structural Fill	N/A	26.00	120.00
Retained Soil	Peoria Loess	N/A	23.00	110.00
Leveling Pad Soil	6 inch Granular Base	N/A	32.00	125.00
Foundation Soil	Peoria Loess	0.00	23.00	110.00

Segmental Unit Data

Segmental Unit Name	**: Diamond Pro**
Cap Height (Inches)	**: 4.00**
Unit Height (Hu)(Inches)	**: 8.00**
Unit Width (Wu)(Inches)	**: 12.00**
Unit Length (Inches)	**: 18.00**
Setback (Inches)	**: 1.00**
Weight (Infilled)(lb)	**: 130.00**
Unit Weight (Infilled)(pcf)	**: 130.00**
Center of Gravity(Inches)	**: 6.00**

Geosynthetic Reinforcement Type and Number

Supplier	Product Name	Number
	Miragrid 10XT	0
	Miragrid 2XT	0
	Miragrid 3XT	3
	Miragrid 5XT	0
	Miragrid 8XT	0

Geosynthetic Properties

Geosynthetic Product	Tult (lb/ft)	RFcr	RFd	RFid	LTDS (lb/ft)	Ci	Cds
Miragrid 10XT	9500.00	1.60	1.15	1.15	4489.60	0.70	0.70
Miragrid 2XT	2000.00	1.60	1.15	1.15	945.18	0.70	0.70
Miragrid 3XT	3500.00	1.60	1.15	1.15	1654.06	0.70	0.70
Miragrid 5XT	4700.00	1.60	1.15	1.15	2221.17	0.70	0.70
Miragrid 8XT	7400.00	1.60	1.15	1.15	3497.16	0.70	0.70

Unit-Unit Interface Properties

Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
962.00	26.00	1950.00

Geosynthetic-SRW Unit Connection Strength properties

Geosynthetic Product	Minimum Conn. Capacity (lb/ft)	1st Inflection Point (lb/ft)		2nd Inflection Point (lb/ft)	
		Normal Load (lb/ft)	Connection Capacity (lb/ft)	Normal Load (lb/ft)	Max Connection Capacity(lb/ft)
Miragrid 10XT	937.00	1930.00	2690.00	3863.00	3619.00
Miragrid 2XT	686.00	1750.00	963.00	2002.00	1038.00
Miragrid 3XT	1362.00	1500.00	1628.00	3000.00	1711.00
Miragrid 5XT	1161.00	1923.00	1782.00	3856.00	2105.00
Miragrid 8XT	1313.00	1500.00	1826.00	3000.00	2420.00

Geosynthetic-SRW Unit Shear Strength properties

Geosynthetic Product	Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
Miragrid 10XT	962.00	26.00	1950.00
Miragrid 2XT	962.00	26.00	1950.00
Miragrid 3XT	962.00	26.00	1950.00
Miragrid 5XT	962.00	26.00	1950.00
Miragrid 8XT	962.00	26.00	1950.00

Vertical Components

Vertical Components of Earth Pressures Used **: No**

Cofficients of Earth Pressure and Failure Plane Orientation

Reinforcement Soil(Static)(Ka)	**: 0.299**
Reinforcement Soil(Static)(Kah Horizontal Component)	**: 0.294**
Internal Modified Back Slope(Bint)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for Internal Stability	**: 50.901**
Retained Soil(Static)(Ka)	**: 0.332**
Retained Soil(Static)(Kah Horizontal Component)	**: 0.319**
External Modified Back Slope(Bext)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for External Stability	**: 47.704**

Result of External Stability Static Analysis

	Calculated	Design Criteria
FOS Sliding	2.68	> 1.50
FOS Overturning	10.39	> 2.00
FOS Bearing Capacity	4.31	> 2.50
Base Reinforcement Length (L)(ft)	7.00	
Base Reinforcement Ratio (L/H)	1.05	> 0.60

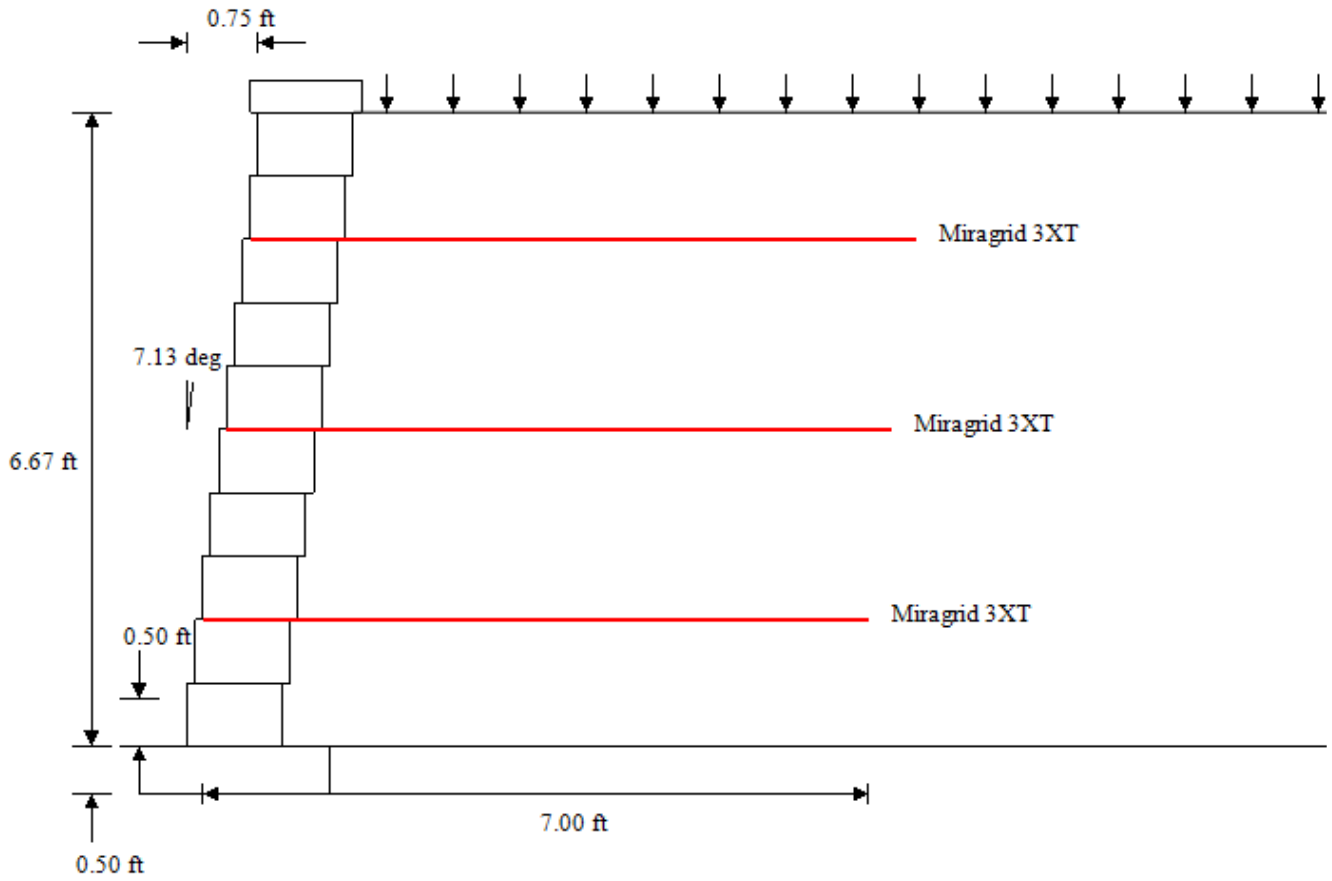
Results of Internal Stability Static Analysis

SRW Unit #	Geosynthetic Product	Elevation (ft)	Length (ft)	Anchor Length (ft)	FOS Overstress >=1.50	FOS Pullout >=1.50	FOS Slide >=1.50	Layer Spacing (ft) >=2.00
9	Miragrid 3XT	5.33	7.00	2.34	12.64	1.95	26.09	OK
6	Miragrid 3XT	3.33	7.00	3.71	6.24	3.83	8.01	OK
3	Miragrid 3XT	1.33	7.00	5.09	3.40	4.56	4.46	OK

Results of Facing Stability Static Analysis

SRW Unit #	Heel Elev (ft)	Geosynthetic Product	FOS Crest Toppling >=1.50	FOS Connection >=1.50
9	5.33	Miragrid 3XT	3.46	10.65
6	3.33	Miragrid 3XT		5.43
3	1.33	Miragrid 3XT		3.05

Wall Reinforcement Layout



Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 2 - North Elevation - Station 10+00**
Vendor Data File	**:**
Project File	**: Wall 2 - North Elevation - Station 10+00.prj**
Date and Time	**: 01/26/2012 09:57:43**

SRWall (Version 4) Report

Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 2 - North Elevation - Station 28+00**
Project File	**: Wall 2 - North Elevation - Station 28+00.prj**
Vendor Data File	**:**
Date and Time	**: 01/26/2012 10:12:53**

Type of Structure	**: Reinforced Wall**

Wall Geometry

Design Wall Height(ft)	**: 5.33**
Embedment Wall Height(ft)	**: 0.50**
Exposed Wall Design Height(ft)	**: 4.83**
Number of Segmental Wall Units	**: 8**
Wall Inclination(degrees)	**: 7.13**

Grades

Top Slope(degrees)	**: 0.00**

Uniform Distributed Surcharge

Live Load Surcharge(Psf)	**: 50.00**
Dead Load Surcharge(Psf)	**: 0.00**

Soil Data

Soil Zone	Description	Cohesion (c) (psf)	Friction Angle(Φ) (degrees)	Unit Weight (γ)(pcf)
Reinforced Soil	Structural Fill	N/A	26.00	120.00
Retained Soil	Peoria Loess	N/A	23.00	110.00
Leveling Pad Soil	6 inch Granular Base	N/A	32.00	125.00
Foundation Soil	Peoria Loess	0.00	23.00	110.00

Segmental Unit Data

Segmental Unit Name	**: Diamond Pro**
Cap Height (Inches)	**: 4.00**
Unit Height (Hu)(Inches)	**: 8.00**
Unit Width (Wu)(Inches)	**: 12.00**
Unit Length (Inches)	**: 18.00**
Setback (Inches)	**: 1.00**
Weight (Infilled)(lb)	**: 130.00**
Unit Weight (Infilled)(pcf)	**: 130.00**
Center of Gravity(Inches)	**: 6.00**

Geosynthetic Reinforcement Type and Number

Supplier	Product Name	Number
	Miragrid 10XT	0
	Miragrid 2XT	0
	Miragrid 3XT	3
	Miragrid 5XT	0
	Miragrid 8XT	0

Geosynthetic Properties

Geosynthetic Product	Tult (lb/ft)	RFcr	RFd	RFid	LTDS (lb/ft)	Ci	Cds
Miragrid 10XT	9500.00	1.60	1.15	1.15	4489.60	0.70	0.70
Miragrid 2XT	2000.00	1.60	1.15	1.15	945.18	0.70	0.70
Miragrid 3XT	3500.00	1.60	1.15	1.15	1654.06	0.70	0.70
Miragrid 5XT	4700.00	1.60	1.15	1.15	2221.17	0.70	0.70
Miragrid 8XT	7400.00	1.60	1.15	1.15	3497.16	0.70	0.70

Unit-Unit Interface Properties

Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
962.00	26.00	1950.00

Geosynthetic-SRW Unit Connection Strength properties

Geosynthetic Product	Minimum Conn. Capacity (lb/ft)	1st Inflection Point (lb/ft)		2nd Inflection Point (lb/ft)	
		Normal Load (lb/ft)	Connection Capacity (lb/ft)	Normal Load (lb/ft)	Max Connection Capacity(lb/ft)
Miragrid 10XT	937.00	1930.00	2690.00	3863.00	3619.00
Miragrid 2XT	686.00	1750.00	963.00	2002.00	1038.00
Miragrid 3XT	1362.00	1500.00	1628.00	3000.00	1711.00
Miragrid 5XT	1161.00	1923.00	1782.00	3856.00	2105.00
Miragrid 8XT	1313.00	1500.00	1826.00	3000.00	2420.00

Geosynthetic-SRW Unit Shear Strength properties

Geosynthetic Product	Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
Miragrid 10XT	962.00	26.00	1950.00
Miragrid 2XT	962.00	26.00	1950.00
Miragrid 3XT	962.00	26.00	1950.00
Miragrid 5XT	962.00	26.00	1950.00
Miragrid 8XT	962.00	26.00	1950.00

Vertical Components

Vertical Components of Earth Pressures Used **: No**

Cofficients of Earth Pressure and Failure Plane Orientation

Reinforcement Soil(Static)(Ka)	**: 0.299**
Reinforcement Soil(Static)(Kah Horizontal Component)	**: 0.294**
Internal Modified Back Slope(Bint)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for Internal Stability	**: 50.901**
Retained Soil(Static)(Ka)	**: 0.332**
Retained Soil(Static)(Kah Horizontal Component)	**: 0.319**
External Modified Back Slope(Bext)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for External Stability	**: 47.704**

Result of External Stability Static Analysis

	Calculated	Design Criteria
FOS Sliding	2.79	> 1.50
FOS Overturning	11.34	> 2.00
FOS Bearing Capacity	4.67	> 2.50
Base Reinforcement Length (L)(ft)	6.00	
Base Reinforcement Ratio (L/H)	1.12	> 0.60

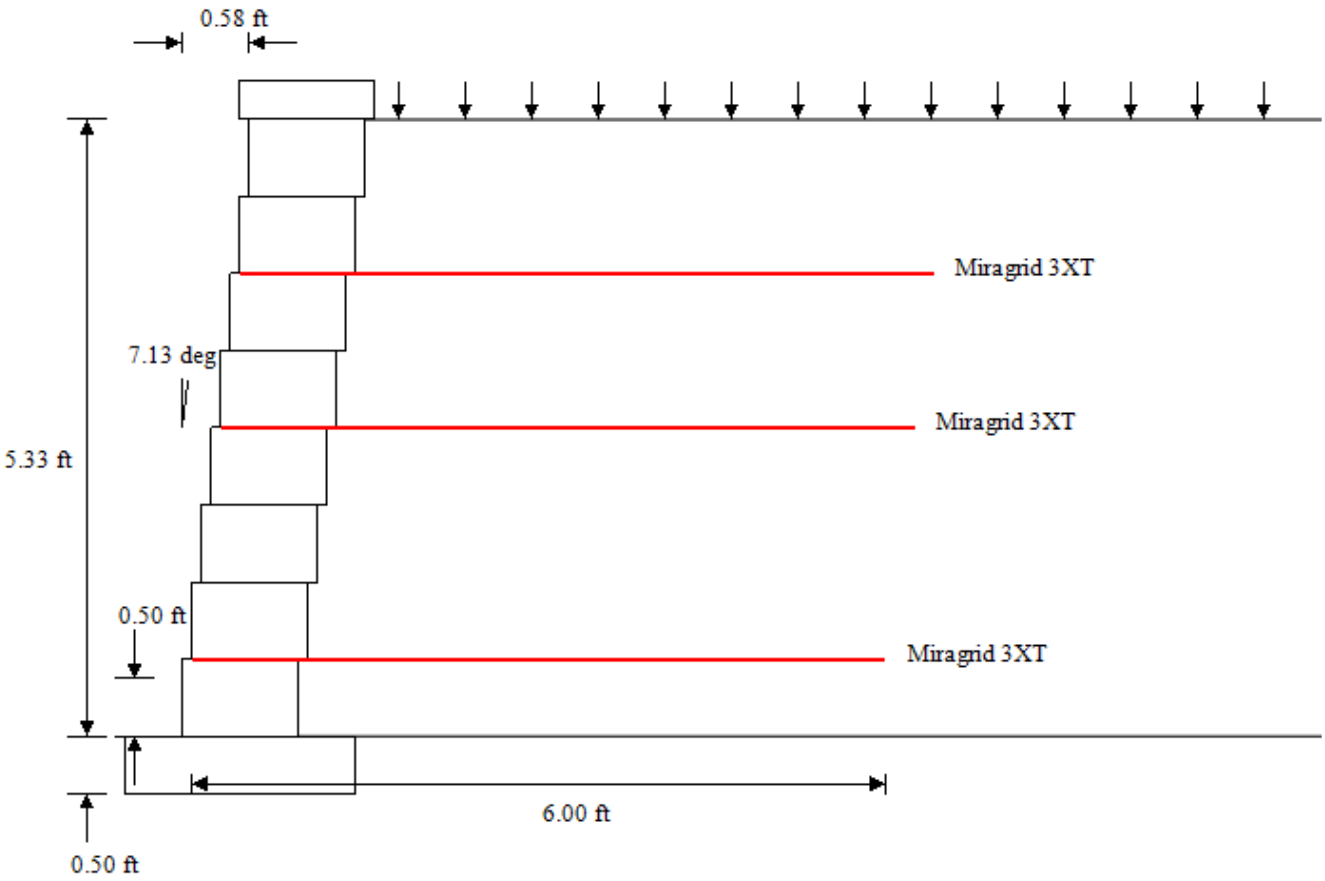
Results of Internal Stability Static Analysis

SRW Unit #	Geosynthetic Product	Elevation (ft)	Length (ft)	Anchor Length (ft)	FOS Overstress >=1.50	FOS Pullout >=1.50	FOS Slide >=1.50	Layer Spacing (ft) >=2.00
7	Miragrid 3XT	4.00	6.00	2.25	16.55	2.46	25.14	OK
5	Miragrid 3XT	2.67	6.00	3.16	8.66	3.61	10.03	OK
2	Miragrid 3XT	0.67	6.00	4.54	5.70	5.98	4.85	OK

Results of Facing Stability Static Analysis

SRW Unit #	Heel Elev (ft)	Geosynthetic Product	FOS Crest Toppling >=1.50	FOS Connection >=1.50
7	4.00	Miragrid 3XT	3.47	13.93
5	2.67	Miragrid 3XT		7.45
2	0.67	Miragrid 3XT		5.07

Wall Reinforcement Layout



Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 2 - North Elevation - Station 28+00**
Vendor Data File	**:**
Project File	**: Wall 2 - North Elevation - Station 28+00.prj**
Date and Time	**: 01/26/2012 10:12:53**

SRWall (Version 4) Report

Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 2 - North Elevation - Station 40+00**
Project File	**: Wall 2 - North Elevation - Station 40+00.prj**
Vendor Data File	**:**
Date and Time	**: 01/26/2012 10:30:35**

Type of Structure	**: Reinforced Wall**

Wall Geometry

Design Wall Height(ft)	**: 4.00**
Embedment Wall Height(ft)	**: 0.50**
Exposed Wall Design Height(ft)	**: 3.50**
Number of Segmental Wall Units	**: 6**
Wall Inclination(degrees)	**: 7.13**

Grades

Top Slope(degrees)	**: 0.00**

Uniform Distributed Surcharge

Live Load Surcharge(Psf)	**: 50.00**
Dead Load Surcharge(Psf)	**: 0.00**

Soil Data

Soil Zone	Description	Cohesion (c) (psf)	Friction Angle(Φ) (degrees)	Unit Weight (γ)(pcf)
Reinforced Soil	Structural Fill	N/A	26.00	120.00
Retained Soil	Peoria Loess	N/A	23.00	110.00
Leveling Pad Soil	6 inch Granular Base	N/A	32.00	125.00
Foundation Soil	Peoria Loess	0.00	23.00	110.00

Segmental Unit Data

Segmental Unit Name	**: Diamond Pro**
Cap Height (Inches)	**: 4.00**
Unit Height (Hu)(Inches)	**: 8.00**
Unit Width (Wu)(Inches)	**: 12.00**
Unit Length (Inches)	**: 18.00**
Setback (Inches)	**: 1.00**
Weight (Infilled)(lb)	**: 130.00**
Unit Weight (Infilled)(pcf)	**: 130.00**
Center of Gravity(Inches)	**: 6.00**

Geosynthetic Reinforcement Type and Number

Supplier	Product Name	Number
	Miragrid 10XT	0
	Miragrid 2XT	0
	Miragrid 3XT	2
	Miragrid 5XT	0
	Miragrid 8XT	0

Geosynthetic Properties

Geosynthetic Product	Tult (lb/ft)	RFcr	RFd	RFid	LTDS (lb/ft)	Ci	Cds
Miragrid 10XT	9500.00	1.60	1.15	1.15	4489.60	0.70	0.70
Miragrid 2XT	2000.00	1.60	1.15	1.15	945.18	0.70	0.70
Miragrid 3XT	3500.00	1.60	1.15	1.15	1654.06	0.70	0.70
Miragrid 5XT	4700.00	1.60	1.15	1.15	2221.17	0.70	0.70
Miragrid 8XT	7400.00	1.60	1.15	1.15	3497.16	0.70	0.70

Unit-Unit Interface Properties

Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
962.00	26.00	1950.00

Geosynthetic-SRW Unit Connection Strength properties

Geosynthetic Product	Minimum Conn. Capacity (lb/ft)	1st Inflection Point (lb/ft)		2nd Inflection Point (lb/ft)	
		Normal Load (lb/ft)	Connection Capacity (lb/ft)	Normal Load (lb/ft)	Max Connection Capacity(lb/ft)
Miragrid 10XT	937.00	1930.00	2690.00	3863.00	3619.00
Miragrid 2XT	686.00	1750.00	963.00	2002.00	1038.00
Miragrid 3XT	1362.00	1500.00	1628.00	3000.00	1711.00
Miragrid 5XT	1161.00	1923.00	1782.00	3856.00	2105.00
Miragrid 8XT	1313.00	1500.00	1826.00	3000.00	2420.00

Geosynthetic-SRW Unit Shear Strength properties

Geosynthetic Product	Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
Miragrid 10XT	962.00	26.00	1950.00
Miragrid 2XT	962.00	26.00	1950.00
Miragrid 3XT	962.00	26.00	1950.00
Miragrid 5XT	962.00	26.00	1950.00
Miragrid 8XT	962.00	26.00	1950.00

Vertical Components

Vertical Components of Earth Pressures Used **: No**

Cofficients of Earth Pressure and Failure Plane Orientation

Reinforcement Soil(Static)(Ka)	**: 0.299**
Reinforcement Soil(Static)(Kah Horizontal Component)	**: 0.294**
Internal Modified Back Slope(Bint)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for Internal Stability	**: 50.901**
Retained Soil(Static)(Ka)	**: 0.332**
Retained Soil(Static)(Kah Horizontal Component)	**: 0.319**
External Modified Back Slope(Bext)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for External Stability	**: 47.704**

Result of External Stability Static Analysis

	Calculated	Design Criteria
FOS Sliding	2.95	> 1.50
FOS Overturning	12.94	> 2.00
FOS Bearing Capacity	5.25	> 2.50
Base Reinforcement Length (L)(ft)	5.00	
Base Reinforcement Ratio (L/H)	1.25	> 0.60

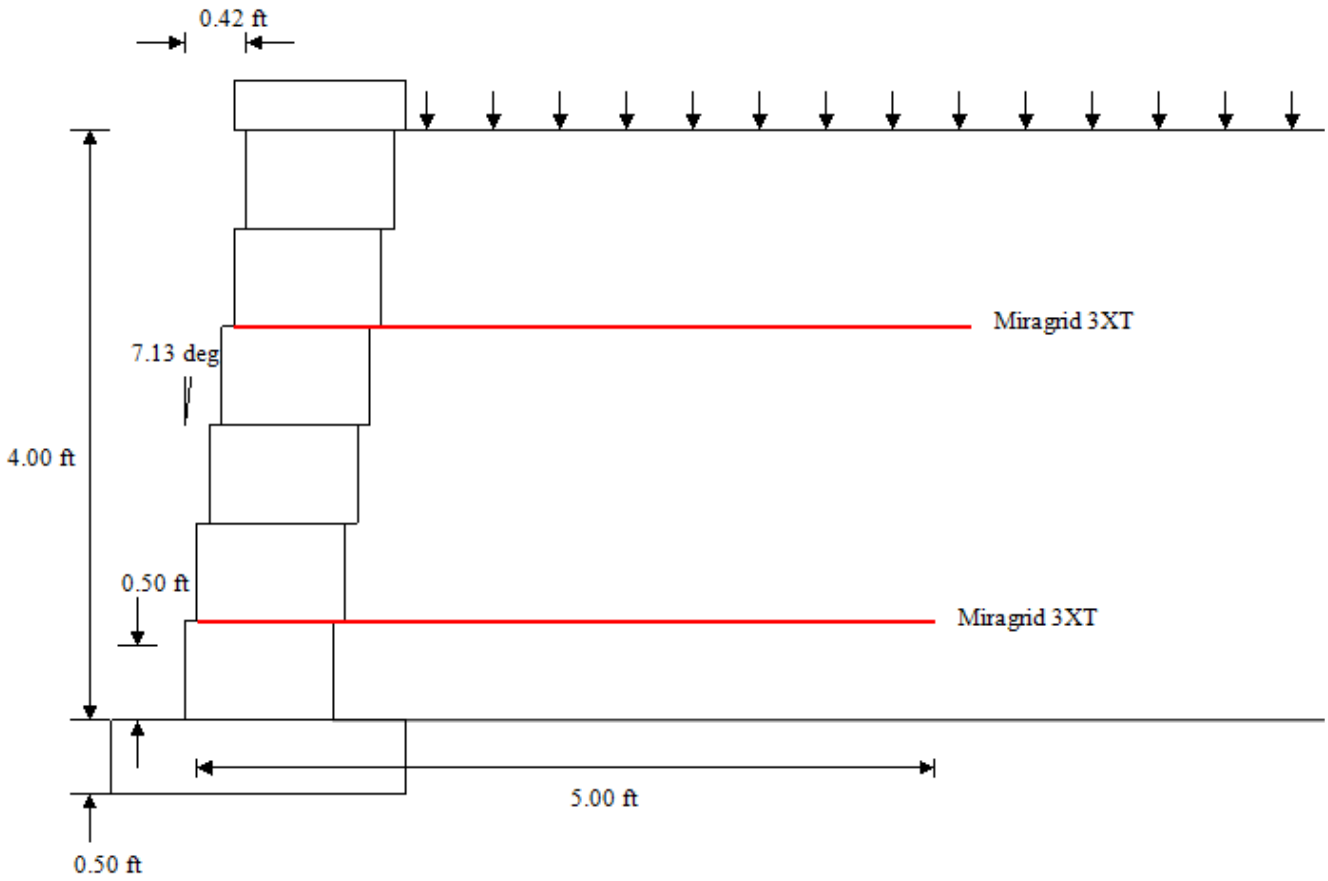
Results of Internal Stability Static Analysis

SRW Unit #	Geosynthetic Product	Elevation (ft)	Length (ft)	Anchor Length (ft)	FOS Overstress >=1.50	FOS Pullout >=1.50	FOS Slide >=1.50	Layer Spacing (ft) >=2.00
5	Miragrid 3XT	2.67	5.00	2.16	12.71	1.81	24.18	OK
2	Miragrid 3XT	0.67	5.00	3.54	7.83	4.57	6.93	OK

Results of Facing Stability Static Analysis

SRW Unit #	Heel Elev (ft)	Geosynthetic Product	FOS Crest Toppling >=1.50	FOS Connection >=1.50
5	2.67	Miragrid 3XT	3.48	10.70
2	0.67	Miragrid 3XT		6.81

Wall Reinforcement Layout



Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 2 - North Elevation - Station 40+00**
Vendor Data File	**:**
Project File	**: Wall 2 - North Elevation - Station 40+00.prj**
Date and Time	**: 01/26/2012 10:30:35**

SRWall (Version 4) Report

Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 2 - North Elevation - Station 52+00**
Project File	**: Wall 2 - North Elevation - Station 52+00.prj**
Vendor Data File	**:**
Date and Time	**: 01/26/2012 10:32:07**

Type of Structure	**: Reinforced Wall**

Wall Geometry

Design Wall Height(ft)	**: 3.33**
Embedment Wall Height(ft)	**: 0.50**
Exposed Wall Design Height(ft)	**: 2.83**
Number of Segmental Wall Units	**: 5**
Wall Inclination(degrees)	**: 7.13**

Grades

Top Slope(degrees)	**: 0.00**

Uniform Distributed Surcharge

Live Load Surcharge(Psf)	**: 50.00**
Dead Load Surcharge(Psf)	**: 0.00**

Soil Data

Soil Zone	Description	Cohesion (c) (psf)	Friction Angle(Φ) (degrees)	Unit Weight (γ)(pcf)
Reinforced Soil	Structural Fill	N/A	26.00	120.00
Retained Soil	Peoria Loess	N/A	23.00	110.00
Leveling Pad Soil	6 inch Granular Base	N/A	32.00	125.00
Foundation Soil	Peoria Loess	0.00	23.00	110.00

Segmental Unit Data

Segmental Unit Name	**: Diamond Pro**
Cap Height (Inches)	**: 4.00**
Unit Height (Hu)(Inches)	**: 8.00**
Unit Width (Wu)(Inches)	**: 12.00**
Unit Length (Inches)	**: 18.00**
Setback (Inches)	**: 1.00**
Weight (Infilled)(lb)	**: 130.00**
Unit Weight (Infilled)(pcf)	**: 130.00**
Center of Gravity(Inches)	**: 6.00**

Geosynthetic Reinforcement Type and Number

Supplier	Product Name	Number
	Miragrid 10XT	0
	Miragrid 2XT	0
	Miragrid 3XT	2
	Miragrid 5XT	0
	Miragrid 8XT	0

Geosynthetic Properties

Geosynthetic Product	Tult (lb/ft)	RFcr	RFd	RFid	LTDS (lb/ft)	Ci	Cds
Miragrid 10XT	9500.00	1.60	1.15	1.15	4489.60	0.70	0.70
Miragrid 2XT	2000.00	1.60	1.15	1.15	945.18	0.70	0.70
Miragrid 3XT	3500.00	1.60	1.15	1.15	1654.06	0.70	0.70
Miragrid 5XT	4700.00	1.60	1.15	1.15	2221.17	0.70	0.70
Miragrid 8XT	7400.00	1.60	1.15	1.15	3497.16	0.70	0.70

Unit-Unit Interface Properties

Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
962.00	26.00	1950.00

Geosynthetic-SRW Unit Connection Strength properties

Geosynthetic Product	Minimum Conn. Capacity (lb/ft)	1st Inflection Point (lb/ft)		2nd Inflection Point (lb/ft)	
		Normal Load (lb/ft)	Connection Capacity (lb/ft)	Normal Load (lb/ft)	Max Connection Capacity(lb/ft)
Miragrid 10XT	937.00	1930.00	2690.00	3863.00	3619.00
Miragrid 2XT	686.00	1750.00	963.00	2002.00	1038.00
Miragrid 3XT	1362.00	1500.00	1628.00	3000.00	1711.00
Miragrid 5XT	1161.00	1923.00	1782.00	3856.00	2105.00
Miragrid 8XT	1313.00	1500.00	1826.00	3000.00	2420.00

Geosynthetic-SRW Unit Shear Strength properties

Geosynthetic Product	Minimum Shear Capacity(lb/ft)	Shear Friction Angle	Maximum Shear Capacity (lb/ft)
Miragrid 10XT	962.00	26.00	1950.00
Miragrid 2XT	962.00	26.00	1950.00
Miragrid 3XT	962.00	26.00	1950.00
Miragrid 5XT	962.00	26.00	1950.00
Miragrid 8XT	962.00	26.00	1950.00

Vertical Components

Vertical Components of Earth Pressures Used **: No**

Cofficients of Earth Pressure and Failure Plane Orientation

Reinforcement Soil(Static)(Ka)	**: 0.299**
Reinforcement Soil(Static)(Kah Horizontal Component)	**: 0.294**
Internal Modified Back Slope(Bint)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for Internal Stability	**: 50.901**
Retained Soil(Static)(Ka)	**: 0.332**
Retained Soil(Static)(Kah Horizontal Component)	**: 0.319**
External Modified Back Slope(Bext)	**: 0.000**
Orientation of failure plane from horizontal(degrees) for External Stability	**: 47.704**

Result of External Stability Static Analysis

	Calculated	Design Criteria
FOS Sliding	2.74	> 1.50
FOS Overturning	11.35	> 2.00
FOS Bearing Capacity	5.10	> 2.50
Base Reinforcement Length (L)(ft)	4.00	
Base Reinforcement Ratio (L/H)	1.20	> 0.60

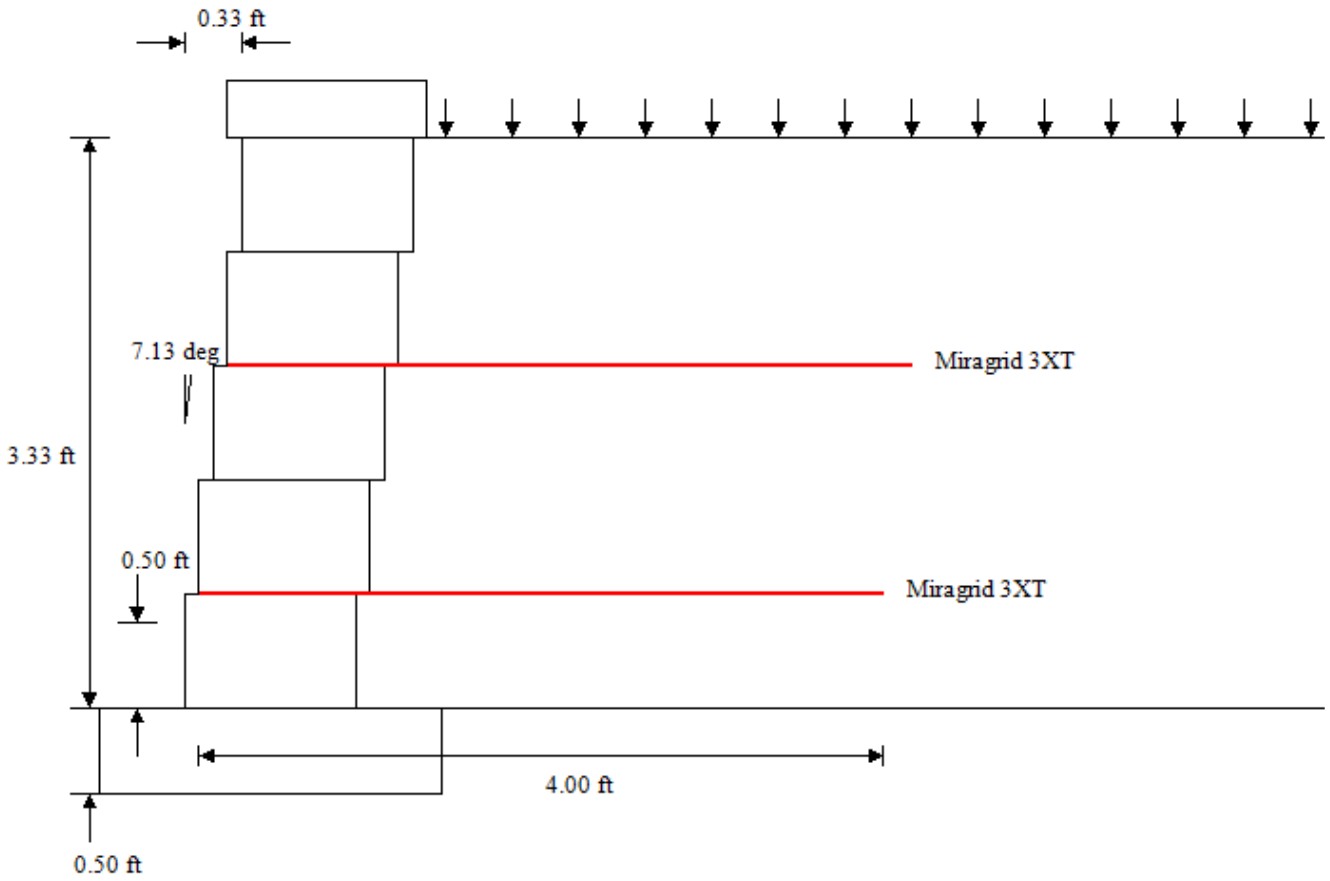
Results of Internal Stability Static Analysis

SRW Unit #	Geosynthetic Product	Elevation (ft)	Length (ft)	Anchor Length (ft)	FOS Overstress >=1.50	FOS Pullout >=1.50	FOS Slide >=1.50	Layer Spacing (ft) >=2.00
4	Miragrid 3XT	2.00	4.00	1.62	16.55	1.78	23.05	OK
2	Miragrid 3XT	0.67	4.00	2.54	11.38	3.81	8.73	OK

Results of Facing Stability Static Analysis

SRW Unit #	Heel Elev (ft)	Geosynthetic Product	FOS Crest Toppling >=1.50	FOS Connection >=1.50
4	2.00	Miragrid 3XT	3.47	13.93
2	0.67	Miragrid 3XT		9.79

Wall Reinforcement Layout



Project Identification

Project ID	**: 012-0021**
Project Name	**: Bridges Housing**
Owner	**: State of Nebraska**
Client	**: Sinclair Architects**
Prepared By	**: Ian Dillon, E.I. Kellen Petersen, P.E.**
Company	**: Olsson Associates**
Address	**: 1802 E. 123rd Street**
Telephone	**: 913-829-0078**
Section	**: Wall 2 - North Elevation - Station 52+00**
Vendor Data File	**:**
Project File	**: Wall 2 - North Elevation - Station 52+00.prj**
Date and Time	**: 01/26/2012 10:32:07**

SECTION – 4

ReSSA GLOBAL AND TRANSLATIONAL STABILITY ANALYSIS

Bridges Housing

PROJECT IDENTIFICATION

Title:	Bridges Housing
Project Number:	012 - 0021
Client:	State of Nebraska
Designer:	Ian Dillon, E.I.
Station Number:	Station 15+00

Description:
Wall 1 - Station 15+00

Company's information:

Name:	Olsson Associates
Street:	1802 East 123rd Street Olathe, KS 66061
Telephone #:	913-829-0078
Fax #:	913-829-0258
E-Mail:	olsson@oaconsulting.com

Original file path and name: C:\Users\i ..... all Design\REESA\Wall 1\Wall 1 - Station 15+00.MSE
Original date and time of creating this file: Thu Jan 26 12:49:15 2012

PROGRAM MODE: Analysis of a General Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ³]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ²]
....1.......Reinforced Zone (Cohessive Soils).......	120.0	26.0	0.0
....2.......Peoria Loess (Retained and Bearing Soils)	110.0	23.0	100.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	Miragrid 3XT	3500.00	1.15	1.15	1.60	1.00	1.00

Interaction Parameters		== Direct Sliding ==		==== Pullout ====	
Type #	Geosynthetic Designated Name	Cds-phi	Cds-c	Ci	Alpha
1	Miragrid 3XT	0.70	0.70	0.70	0.70

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Water is not present

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - COMPLEX - Quick Input

-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.

GEOMETRY

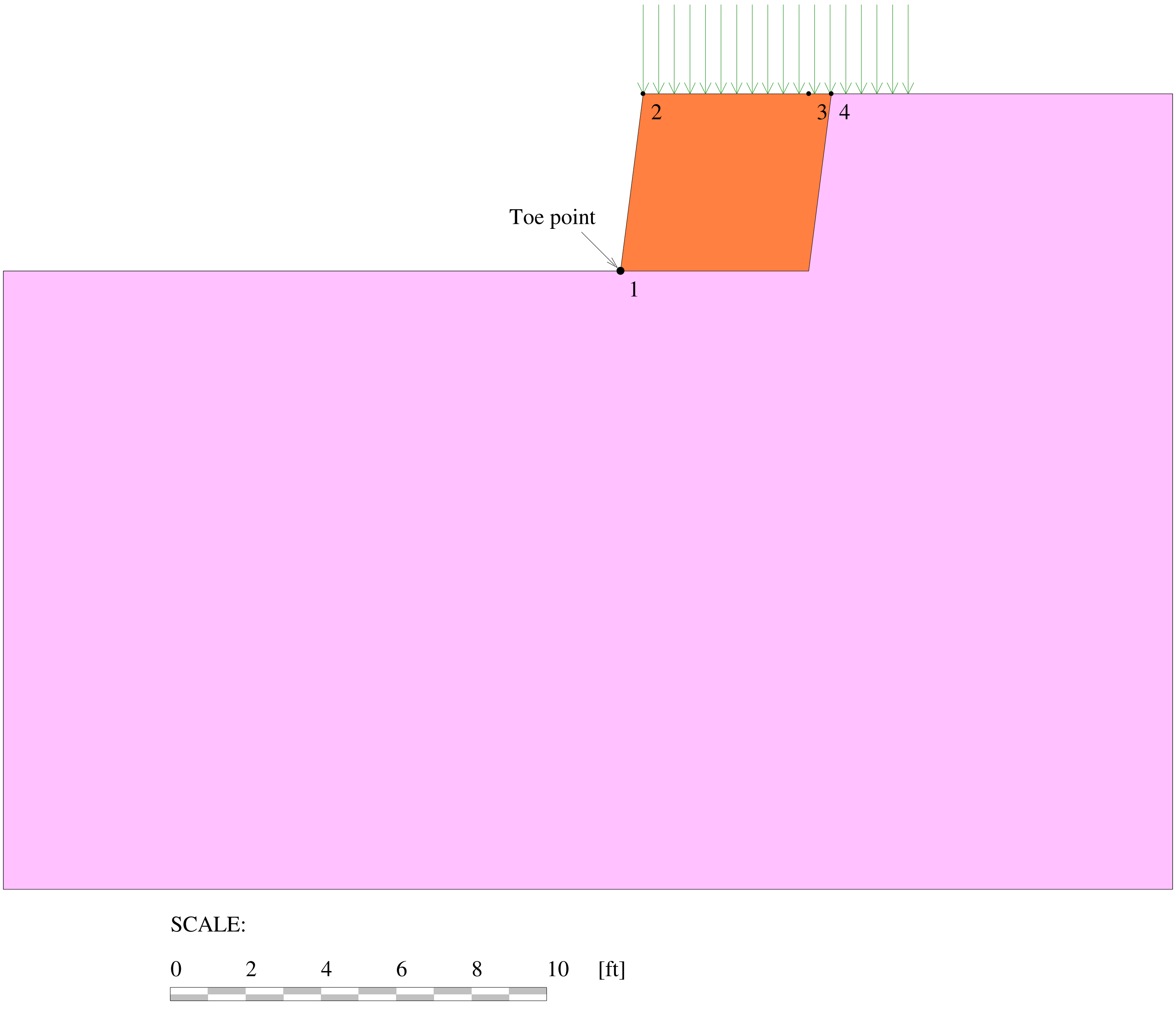
Soil profile contains 2 layers (see details in next page)

UNIFORM SURCHARGE

Load Q1 = 50.00 [lb/ft²] inclined from verical at 0.00 degrees, starts at X1s = 0.60 and ends at X1e = 8.00 [ft].
Surcharge load, Q2.................................... None
Surcharge load, Q3.................................... None

STRIP LOAD

............................None...................................



TABULATED DETAILS OF QUICK SPECIFIED GEOMETRY

Soil profile contains 2 layers. Coordinates in [ft.]

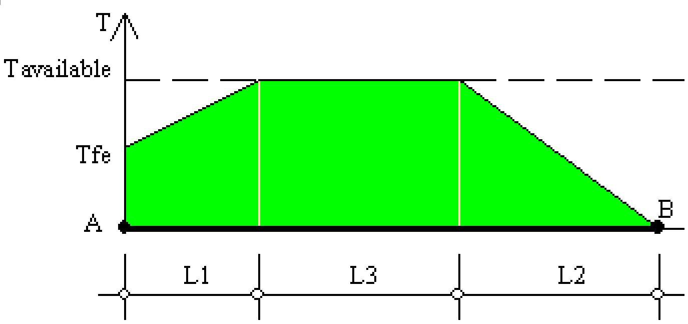
	#	Xi	Yi
Top of Layer 1	1	0.00	0.00
	2	0.60	4.70
	3	5.60	4.70
Top of Layer 2	4	0.00	0.00
	5	5.00	0.00
	6	5.60	4.70

TABULATED DETAILS OF SPECIFIED GEOMETRY

Soil profile contains 2 layers. Coordinates in [ft.]

#	X	Y1	Y2
1	0.00	0.00	0.00
2	0.60	4.70	0.00
3	5.00	4.70	0.00
4	5.60	4.70	4.70

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tavailable [lb/ft]
1	Miragrid 3XT	0.60	5.00	0.00	5.00	0.00	740.38	740.38 (*)
2	Miragrid 3XT	2.60	5.00	0.00	5.00	0.00	389.53	389.53 (*)

(*) This Tavailable is dictated by the pullout resistance capacity, which is smaller than the long-term strength of the reinforcement that is related to its specified ultimate strength

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	3.60	4.70	-4.50	0.01	-1.84	4.76	5.44	2.87	
2	5.61	4.70	-0.01	0.00	0.09	5.59	5.59	1.75	OK
3	7.62	4.70	-0.01	0.00	0.14	8.30	8.30	1.98	
4	9.63	4.70	-4.47	0.00	-0.38	11.24	11.96	2.24	
5	11.64	4.70	-0.01	0.00	0.28	16.08	16.08	2.49	
6	13.65	4.70	-0.01	0.00	0.37	21.11	21.12	2.78	
7	15.66	4.70	-1.65	0.01	-0.45	29.85	29.87	3.20	
8	17.67	4.70	-10.64	0.11	0.56	20.67	23.40	3.55	
9	19.68	4.70	-11.97	0.03	0.70	23.73	26.88	3.82	
10	21.69	4.70	-13.58	0.09	0.86	26.84	30.40	4.09	
11	23.70	4.70	-15.19	0.15	1.04	29.97	33.95	4.35	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

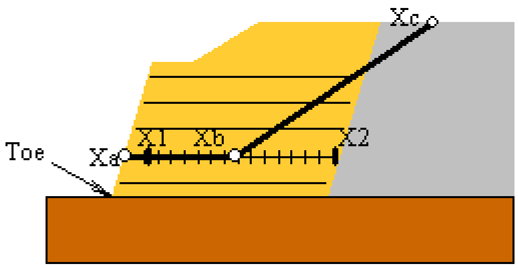
Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points)

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-14.99	0.05	9.63	4.70	-5.35	16.54	19.10	2.98	
2	-13.61	0.11	9.63	4.70	-4.64	15.83	18.09	2.83	
3	-12.02	0.08	7.62	4.70	-3.95	9.84	12.66	2.65	
4	-10.44	0.01	7.62	4.70	-3.20	9.25	11.74	2.47	
5	-9.00	0.04	7.62	4.70	-2.51	8.86	10.95	2.32	
6	-7.56	0.08	7.62	4.70	-1.73	8.17	9.98	2.18	
7	-6.06	0.08	5.61	4.70	-1.53	5.68	7.21	2.03	
8	-4.50	0.02	5.61	4.70	-0.90	5.50	6.56	1.91	
9	-3.00	0.01	5.61	4.70	-0.29	5.28	5.93	1.86	
10	-1.56	0.02	5.61	4.70	-0.02	5.50	5.69	1.88	
11	-0.01	0.00	5.61	4.70	0.09	5.59	5.59	1.75	On extreme X-exit

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

RESULTS OF TRANSLATIONAL ANALYSIS



Results in the table below represent critical two-part wedges identified between specified starting (X1) and ending (X2) search points. Wedges along all reinforcement layers and at elevation zero are reported. The critical two-part wedge, one for each predetermined elevation, is defined by Xa, Xb and Xc where Xa is the front end of the passive wedge (slope face), Xb is where the passive wedge ends and the active one starts, and Xc is the X-ordinate at which the active wedge starts.

Critical two-part wedge along each interface:

Interface	Height Relative to Toe [ft]	(Xa, Ya) [ft]		(Xb, Yb) [ft]		(Xc, Yc) [ft]		Fs	STATUS
. At toe elevation	0.00	0.00	0.00	0.20	0.00	5.80	4.70	1.31	Minimum on Edge
Reinf. Layer #1	0.60	0.08	0.60	0.40	0.60	4.50	4.70	1.55	Minimum on Edge
Reinf. Layer #2	2.60	0.33	2.60	0.70	2.60	2.73	4.70	1.86	Minimum on Edge

Note: In the 'Status' column, OK means the critical two part-wedge was identified within the specified search domain. 'Minimum on Edge' means the critical result corresponds to a minimum on the edge of the search domain; i.e., either on X1 or X2 or the internally preset limits on Xc.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.75
Critical Circle: Xc = 0.09[ft], Yc = 5.59[ft], R = 5.59[ft]. (Number of slices used = 54)

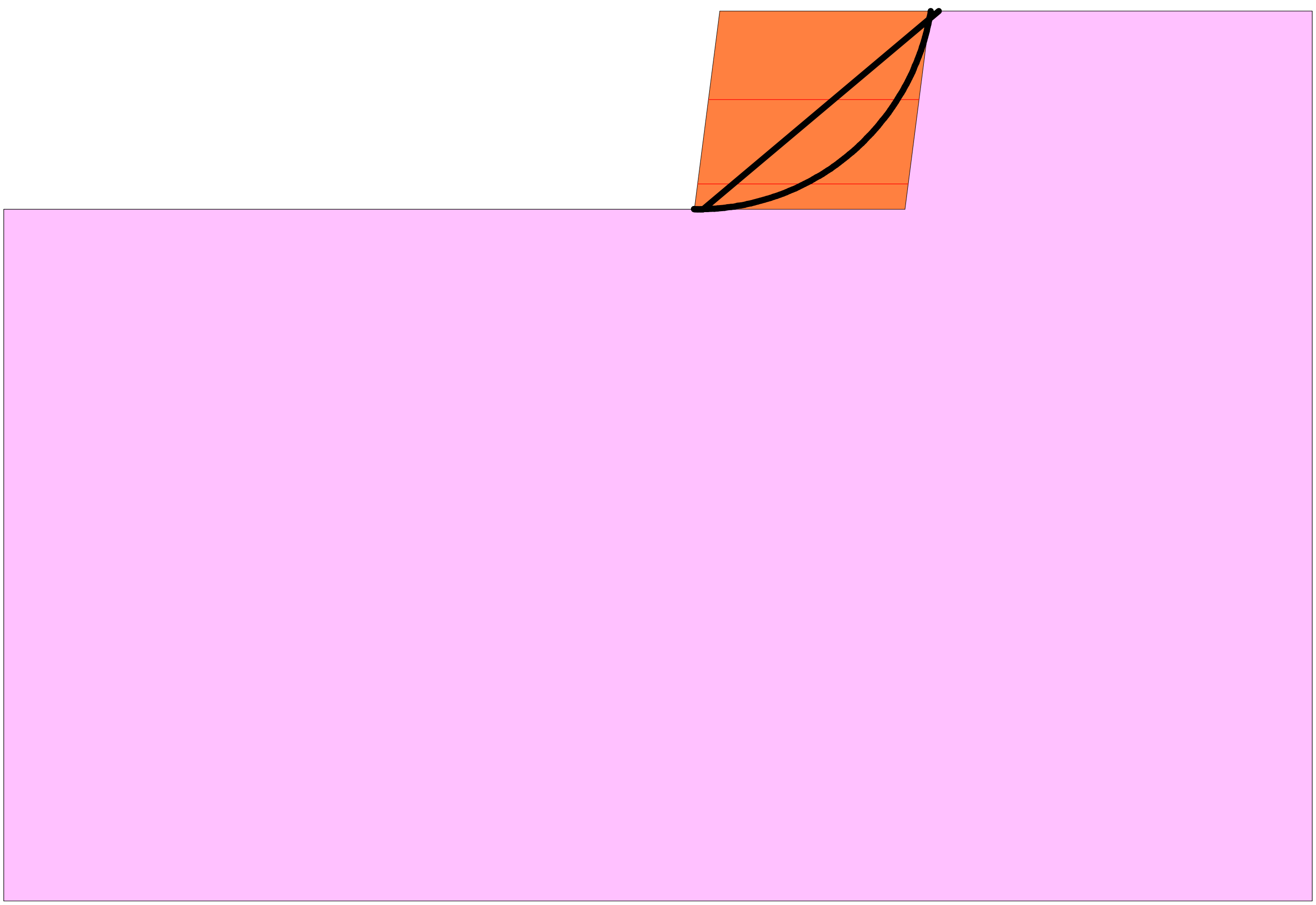
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

Minimum Factor of Safety = 1.31
Critical Two-Part Wedge: (Xa = 0.00, Ya = 0.00) [ft]
(Xb = 0.20, Yb = 0.00) [ft]
(Xc = 5.80, Yc = 4.70) [ft]
(Number of slices used = 30)
Interslice resultant force inclination = 39.86 [degrees]

Three-Part Wedge Stability Analysis

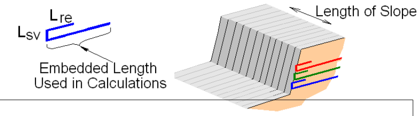
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 2 4 6 8 10 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	Miragrid 3XT	0.60	5.00	1.00	0.08	0.60	5.08	0.60	0.00	0.00
2	1	Miragrid 3XT	2.60	5.00	1.00	0.33	2.60	5.33	2.60	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	Miragrid 3XT	1.00	10.00

Bridges Housing

PROJECT IDENTIFICATION

Title:	Bridges Housing
Project Number:	012 - 0021
Client:	State of Nebraska
Designer:	Ian Dillon, E.I.
Station Number:	Station 16+00

Description:
Wall 2 - East Elevation - Station 16+00

Company's information:

Name:	Olsson Associates
Street:	1802 East 123rd Street Olathe, KS 66061
Telephone #:	913-829-0078
Fax #:	913-829-0258
E-Mail:	olsson@oaconsulting.com

Original file path and name: C:\Users\i ..... Wall 2\Wall 2 - East Elevation - Station 16+00.MSE
Original date and time of creating this file: Thu Jan 26 12:49:15 2012

PROGRAM MODE: Analysis of a General Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ³]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ²]
....1.......Reinforced Zone (Cohessive Soils).......	120.0	26.0	0.0
....2.......Peoria Loess (Retained and Bearing Soils)	110.0	23.0	100.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	Miragrid 3XT	3500.00	1.15	1.15	1.60	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	Miragrid 3XT	0.70	0.70	0.70	0.70

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ³]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - COMPLEX - Quick Input

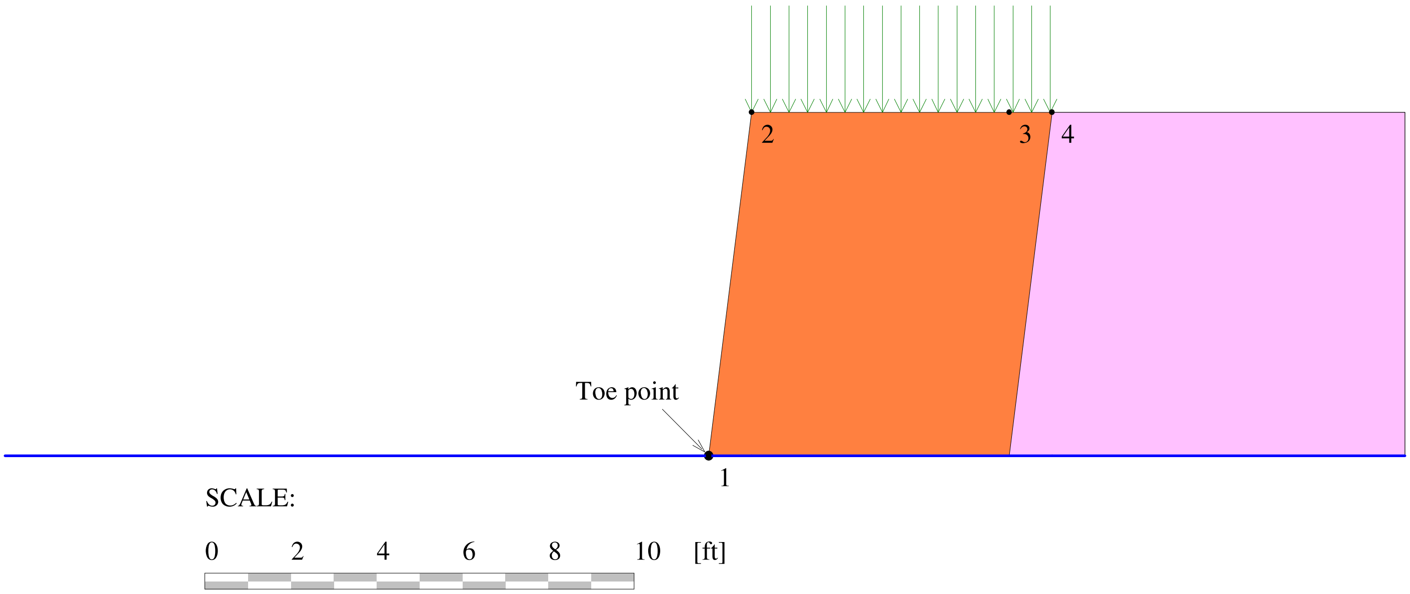
-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.
-- Xw,Yw represents the coordinates of phreatic surface.

GEOMETRY
Soil profile contains 2 layers (see details in next page)

WATER GEOMETRY
Phreatic line was specified.

UNIFORM SURCHARGE
Load Q1 = 50.00 [lb/ft²] inclined from verical at 0.00 degrees, starts at X1s = 1.00 and ends at X1e = 8.00 [ft].
Surcharge load, Q2.................................... None
Surcharge load, Q3.................................... None

STRIP LOAD
............................None...................................



TABULATED DETAILS OF QUICK SPECIFIED GEOMETRY

Soil profile contains 2 layers. Coordinates in [ft.]
Water was described by phreatic line.

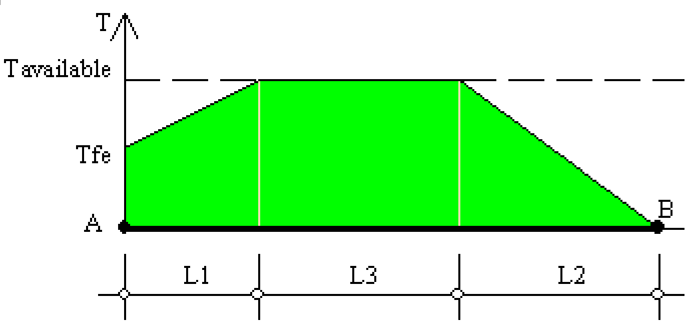
	#	Xi	Yi
Top of Layer 1	1	0.00	0.00
	2	1.00	8.00
	3	8.00	8.00
Top of Layer 2	4	0.00	0.00
	5	7.00	0.00
	6	8.00	8.00
Top of Phreatic Line	8	0.00	0.00

TABULATED DETAILS OF SPECIFIED GEOMETRY

Soil profile contains 2 layers. Coordinates in [ft.]
Water was described by phreatic line. Y values are tabulated in the right most column.

#	X	Y1	Y2	Yw (phreatic)
1	0.00	0.00	0.00	0.00
2	1.00	8.00	0.00	0.00
3	7.00	8.00	0.00	0.00
4	8.00	8.00	8.00	0.00

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tavailable [lb/ft]
1	Miragrid 3XT	0.67	7.00	1.05	5.91	0.04	1488.66	1654.06
2	Miragrid 3XT	2.00	7.00	0.06	6.94	0.00	1488.66	1498.24 (*)
3	Miragrid 3XT	4.00	7.00	0.00	7.00	0.00	1030.05	1030.05 (*)
4	Miragrid 3XT	6.00	7.00	0.00	7.00	0.00	524.64	524.64 (*)

(*) This Tavailable is dictated by the pullout resistance capacity, which is smaller than the long-term strength of the reinforcement that is related to its specified ultimate strength

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point X [ft]	Entry Point Y [ft]	Exit Point X [ft]	Exit Point Y [ft]	Critical Circle Xc [ft]	Critical Circle Yc [ft]	Critical Circle R [ft]	Fs	STATUS
1	5.40	8.00	0.09	0.80	-2.27	8.10	7.68	2.10	
2	7.47	8.00	0.09	0.80	-0.61	8.90	8.13	1.57	
. 3	9.54	8.00	-8.04	0.08	-1.11	8.16	10.65	1.51 .	OK
4	11.61	8.00	-9.72	0.11	-1.70	11.22	13.70	1.55	
5	13.68	8.00	-9.73	0.09	-1.80	15.22	17.09	1.65	
6	15.75	8.00	-13.00	0.14	-2.16	17.00	20.04	1.79	
7	17.82	8.00	-14.62	0.16	-1.89	18.53	22.35	1.90	
8	19.89	8.00	-16.13	0.09	-1.71	20.41	24.91	2.00	
9	21.96	8.00	-16.24	0.17	-0.76	21.76	26.57	2.10	
10	24.03	8.00	-16.26	0.18	0.19	23.13	28.23	2.21	
11	26.10	8.00	-16.36	0.26	1.15	24.50	29.91	2.33	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

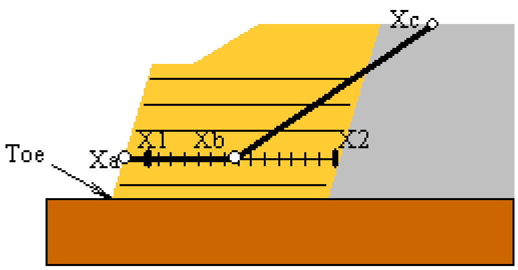
Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points)

Exit Point #	Exit Point X [ft]	Exit Point Y [ft]	Entry Point X [ft]	Entry Point Y [ft]	Critical Circle Xc [ft]	Critical Circle Yc [ft]	Critical Circle R [ft]	Fs	STATUS
1	-16.21	0.18	11.61	8.00	-4.88	13.26	17.31	1.68	
2	-14.49	0.08	11.61	8.00	-4.08	12.74	16.39	1.63	
3	-13.00	0.18	11.61	8.00	-3.27	12.18	15.45	1.60	
4	-11.35	0.18	9.54	8.00	-2.67	8.80	12.24	1.56	
5	-9.60	0.04	9.54	8.00	-1.90	8.51	11.45	1.53	
. 6	-8.04	0.08	9.54	8.00	-1.11	8.16	10.65	1.51 .	OK
7	-6.40	0.05	9.54	8.00	-0.46	8.09	10.00	1.53	
8	-4.82	0.06	9.54	8.00	0.12	8.08	9.42	1.58	
9	-3.14	0.01	9.54	8.00	0.64	8.07	8.90	1.69	
10	-1.64	0.04	9.54	8.00	1.10	8.03	8.44	1.88	
11	0.09	0.80	7.47	8.00	-0.61	8.90	8.13	1.57	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

RESULTS OF TRANSLATIONAL ANALYSIS



Results in the table below represent critical two-part wedges identified between specified starting (X1) and ending (X2) search points. Wedges along all reinforcement layers and at elevation zero are reported. The critical two-part wedge, one for each predetermined elevation, is defined by Xa, Xb and Xc where Xa is the front end of the passive wedge (slope face), Xb is where the passive wedge ends and the active one starts, and Xc is the X-ordinate at which the active wedge starts.

Critical two-part wedge along each interface:

Interface	Height Relative to Toe [ft]	(Xa, Ya) [ft]		(Xb, Yb) [ft]		(Xc, Yc) [ft]		Fs	STATUS
. At toe elevation	0.00	0.00	0.00	0.20	0.00	8.48	8.00	1.62	Minimum on Edge
Reinf. Layer #1	0.67	0.08	0.67	1.78	0.67	8.38	8.00	1.74	OK
Reinf. Layer #2	2.00	0.25	2.00	1.98	2.00	8.19	8.00	1.74	OK
Reinf. Layer #3	4.00	0.50	4.00	0.80	4.00	4.94	8.00	2.02	Minimum on Edge
Reinf. Layer #4	6.00	0.75	6.00	1.10	6.00	3.03	8.00	2.39	Minimum on Edge

Note: In the 'Status' column, OK means the critical two part-wedge was identified within the specified search domain. 'Minimum on Edge' means the critical result corresponds to a minimum on the edge of the search domain; i.e., either on X1 or X2 or the internally preset limits on Xc.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.51
Critical Circle: Xc = -1.11[ft], Yc = 8.16[ft], R = 10.65[ft]. (Number of slices used = 54)

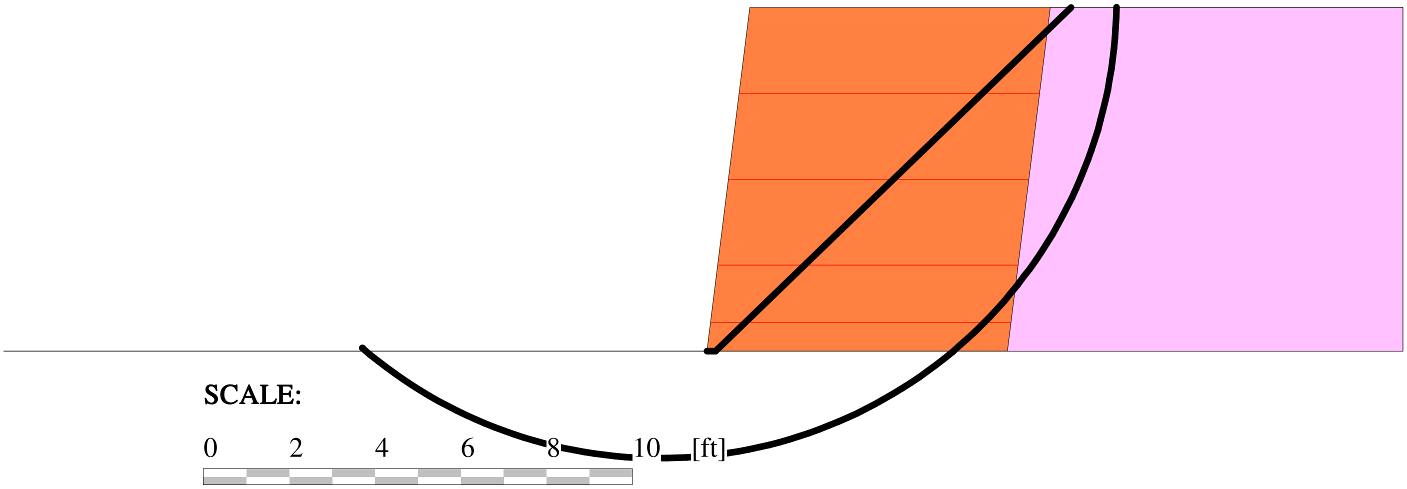
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

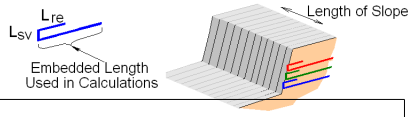
Minimum Factor of Safety = 1.62
Critical Two-Part Wedge: (Xa = 0.00, Ya = 0.00) [ft]
(Xb = 0.20, Yb = 0.00) [ft]
(Xc = 8.48, Yc = 8.00) [ft]
(Number of slices used = 30)
Interslice resultant force inclination = 43.97 [degrees]

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING





REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	Miragrid 3XT	0.67	7.00	1.00	0.08	0.67	7.08	0.67	0.00	0.00
2	1	Miragrid 3XT	2.00	7.00	1.00	0.25	2.00	7.25	2.00	0.00	0.00
3	1	Miragrid 3XT	4.00	7.00	1.00	0.50	4.00	7.50	4.00	0.00	0.00
4	1	Miragrid 3XT	6.00	7.00	1.00	0.75	6.00	7.75	6.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	Miragrid 3XT	1.00	28.00

Bridges Housing

PROJECT IDENTIFICATION

Title:	Bridges Housing
Project Number:	012 - 0021
Client:	State of Nebraska
Designer:	Ian Dillon, E.I.
Station Number:	Station 10+00

Description:
Wall 2 - North Elevation - Station 10+00

Company's information:

Name:	Olsson Associates
Street:	1802 East 123rd Street Olathe, KS 66061
Telephone #:	913-829-0078
Fax #:	913-829-0258
E-Mail:	olsson@oaconsulting.com

Original file path and name: C:\Users\i ..... all 2\Wall 2 - North Elevation - Station 10+00.MSE
Original date and time of creating this file: Thu Jan 26 12:49:15 2012

PROGRAM MODE: Analysis of a General Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
....1.....Reinforced Zone (Cohessive Soils).....	120.0	26.0	0.0
....2.....Peoria Loess (Retained and Bearing Soils)	110.0	23.0	100.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	Miragrid 3XT	3500.00	1.15	1.15	1.60	1.00	1.00

Interaction Parameters		== Direct Sliding ==		==== Pullout ====	
Type #	Geosynthetic Designated Name	Cds-phi	Cds-c	Ci	Alpha
1	Miragrid 3XT	0.70	0.70	0.70	0.70

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - COMPLEX - Quick Input

-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.
-- Xw,Yw represents the coordinates of phreatic surface.

GEOMETRY

Soil profile contains 2 layers (see details in next page)

WATER GEOMETRY

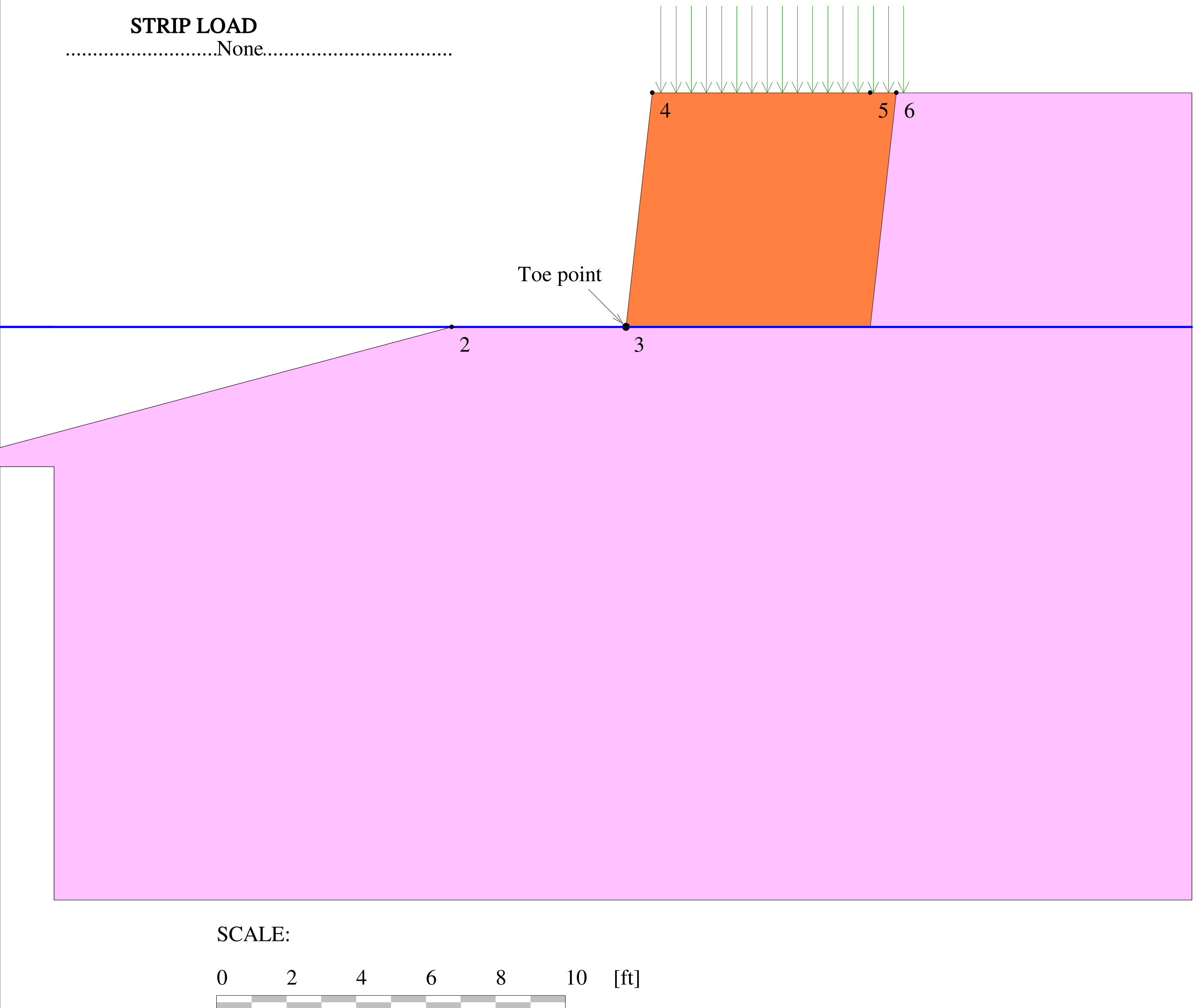
Phreatic line was specified.

UNIFORM SURCHARGE

Load Q1 = 50.00 [lb/ft²] inclined from verical at 0.00 degrees, starts at X1s = 1.00 and ends at X1e = 8.00 [ft].
Surcharge load, Q2....................................None
Surcharge load, Q3....................................None

STRIP LOAD

............................None...................................



TABULATED DETAILS OF QUICK SPECIFIED GEOMETRY

Soil profile contains 2 layers. Coordinates in [ft.]
Water was described by phreatic line.

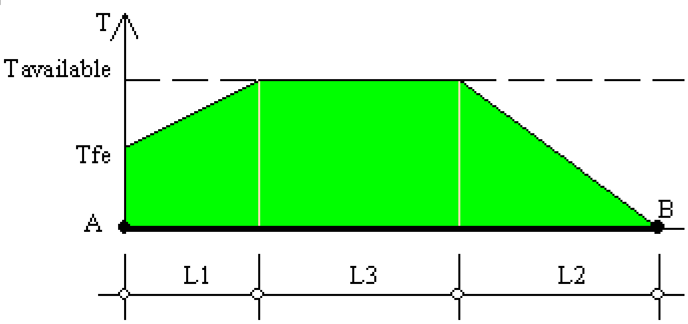
	#	Xi	Yi
Top of Layer 1	1	-20.00	-4.00
	2	-5.00	0.00
	3	0.00	0.00
	4	0.75	6.70
	5	7.00	6.70
Top of Layer 2	6	-20.00	-4.00
	7	-5.00	0.00
	8	0.00	0.00
	9	7.00	0.00
	10	7.75	6.70
Top of Phreatic Line	12	0.00	0.00

TABULATED DETAILS OF SPECIFIED GEOMETRY

Soil profile contains 2 layers. Coordinates in [ft.]
Water was described by phreatic line. Y values are tabulated in the right most column.

#	X	Y1	Y2	(phreatic) Yw
1	-20.00	-4.00	-4.00	0.00
2	-5.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.75	6.70	0.00	0.00
5	7.00	6.70	0.00	0.00
6	7.75	6.70	6.70	0.00

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tavailable [lb/ft]
1	Miragrid 3XT	1.33	7.00	0.00	7.00	0.00	1372.45	1372.45 (*)
2	Miragrid 3XT	3.33	7.00	0.00	7.00	0.00	875.76	875.76 (*)
3	Miragrid 3XT	5.33	7.00	0.00	7.00	0.00	361.95	361.95 (*)

(*) This Tavailable is dictated by the pullout resistance capacity, which is smaller than the long-term strength of the reinforcement that is related to its specified ultimate strength

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	3.60	6.70	-16.14	-2.83	-8.63	6.84	12.24	2.98	
2	5.85	6.70	-7.88	-0.74	-3.10	6.84	8.96	1.69	
. 3	8.10	6.70	-7.93	-0.71	-2.20	7.94	10.38	1.50 .	OK
4	10.35	6.70	-11.17	-1.60	-3.97	11.79	15.20	1.55	
5	12.60	6.70	-12.77	-2.05	-5.28	17.38	20.82	1.67	
6	14.85	6.70	-16.07	-2.90	-5.50	17.67	23.12	1.76	
7	17.10	6.70	-16.02	-2.92	-4.57	19.49	25.17	1.84	
8	19.35	6.70	-16.10	-2.88	-3.63	21.35	27.25	1.94	
9	21.60	6.70	-16.21	-2.82	-2.67	23.23	29.36	2.05	
10	23.85	6.70	-16.37	-2.75	-1.90	25.98	32.17	2.17	
11	26.10	6.70	-16.14	-2.86	-0.71	27.07	33.67	2.28	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

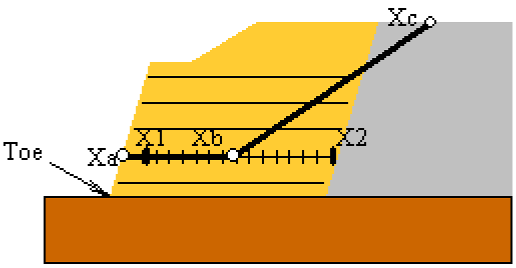
Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points)

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-16.03	-2.92	10.35	6.70	-7.46	14.57	19.48	1.61	
2	-14.49	-2.43	10.35	6.70	-6.09	13.07	17.63	1.59	
3	-12.77	-2.04	8.10	6.70	-5.08	8.88	13.36	1.56	
4	-11.13	-1.61	8.10	6.70	-4.06	8.44	12.29	1.53	
5	-9.59	-1.12	8.10	6.70	-3.14	8.21	11.34	1.50	
. 6	-7.93	-0.71	8.10	6.70	-2.20	7.94	10.38	1.50 .	OK
7	-6.32	-0.26	8.10	6.70	-1.24	7.64	9.39	1.51	
8	-4.74	0.09	8.10	6.70	-0.35	7.34	8.48	1.56	
9	-2.98	0.01	8.10	6.70	0.07	7.49	8.08	1.60	
10	-1.34	0.00	8.10	6.70	-0.55	8.89	8.93	1.62	
11	0.26	2.69	8.10	6.70	1.46	10.01	7.42	2.65	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

RESULTS OF TRANSLATIONAL ANALYSIS



Results in the table below represent critical two-part wedges identified between specified starting (X1) and ending (X2) search points. Wedges along all reinforcement layers and at elevation zero are reported. The critical two-part wedge, one for each predetermined elevation, is defined by Xa, Xb and Xc where Xa is the front end of the passive wedge (slope face), Xb is where the passive wedge ends and the active one starts, and Xc is the X-ordinate at which the active wedge starts.

Critical two-part wedge along each interface:

Interface	Height Relative to Toe [ft]	(Xa, Ya) [ft]		(Xb, Yb) [ft]		(Xc, Yc) [ft]		Fs	STATUS
. At toe elevation	0.00	0.00	0.00	0.20	0.00	8.18	6.70	1.30	Minimum on Edge
Reinf. Layer #1	1.33	0.15	1.33	1.88	1.33	8.06	6.70	1.82	OK
Reinf. Layer #2	3.33	0.37	3.33	0.70	3.33	4.31	6.70	2.15	Minimum on Edge
Reinf. Layer #3	5.33	0.60	5.33	3.66	5.33	4.24	6.70	2.91	OK

Note: In the 'Status' column, OK means the critical two part-wedge was identified within the specified search domain. 'Minimum on Edge' means the critical result corresponds to a minimum on the edge of the search domain; i.e., either on X1 or X2 or the internally preset limits on Xc.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.50

Critical Circle: Xc = -2.20[ft], Yc = 7.94[ft], R = 10.38[ft]. (Number of slices used = 55)

Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

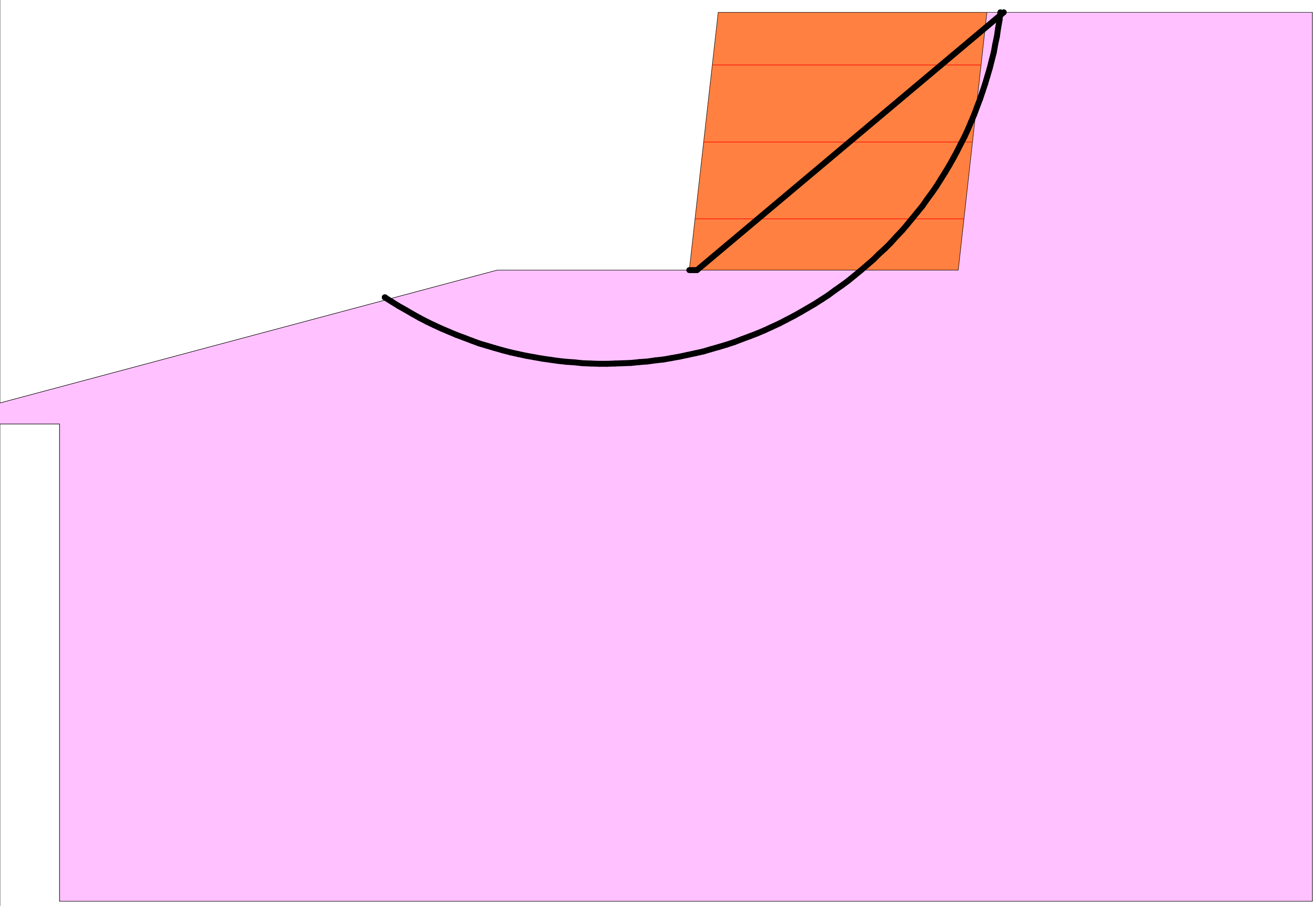
Minimum Factor of Safety = 1.30

Critical Two-Part Wedge: (Xa = 0.00, Ya = 0.00) [ft]
(Xb = 0.20, Yb = 0.00) [ft]
(Xc = 8.18, Yc = 6.70) [ft]
(Number of slices used = 30)
Interslice resultant force inclination = 39.77 [degrees]

Three-Part Wedge Stability Analysis

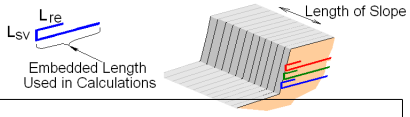
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 2 4 6 8 10 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	Miragrid 3XT	1.33	7.00	1.00	0.15	1.33	7.15	1.33	0.00	0.00
2	1	Miragrid 3XT	3.33	7.00	1.00	0.37	3.33	7.37	3.33	0.00	0.00
3	1	Miragrid 3XT	5.33	7.00	1.00	0.60	5.33	7.60	5.33	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	Miragrid 3XT	1.00	21.00