

IGES®

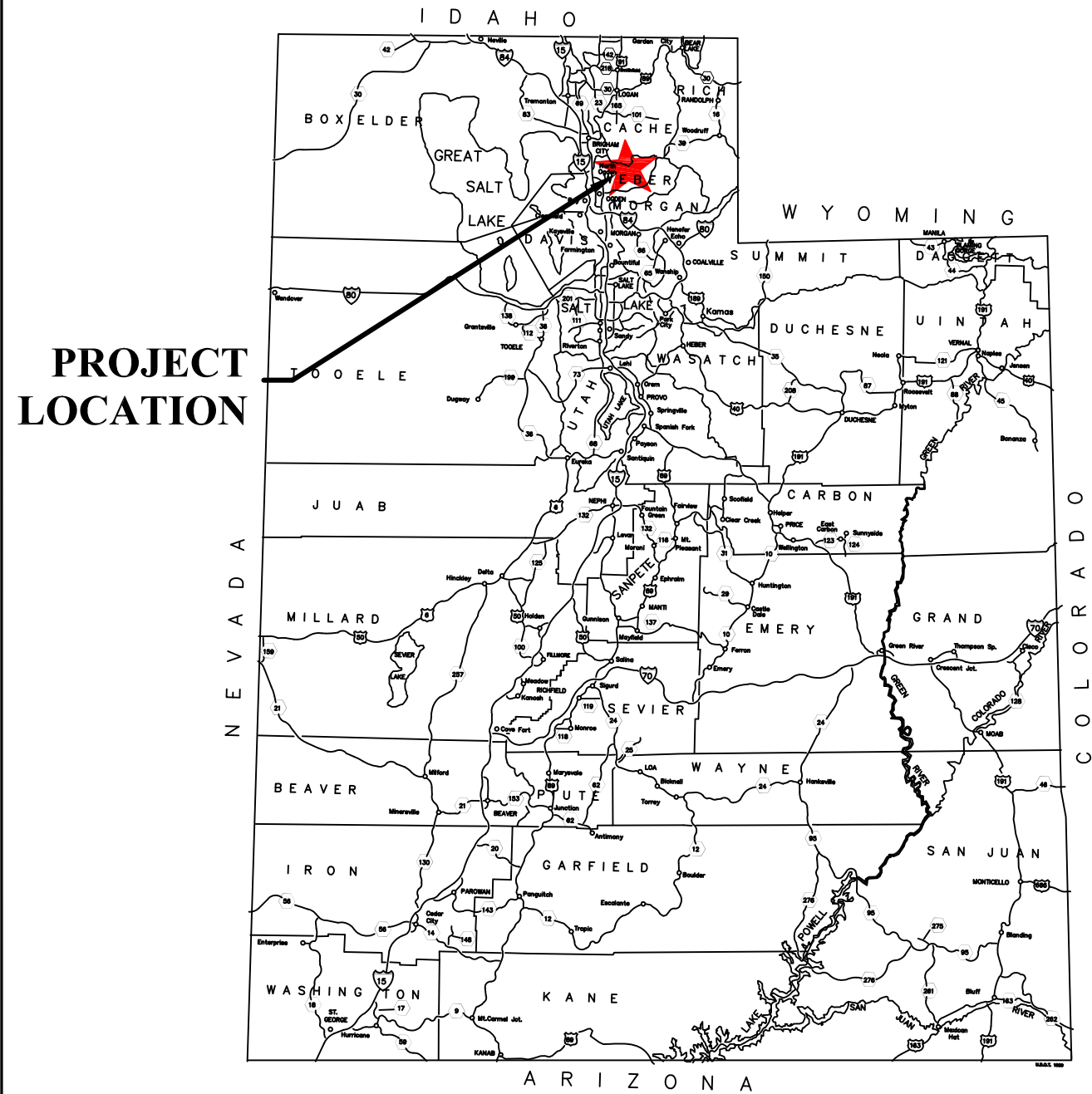
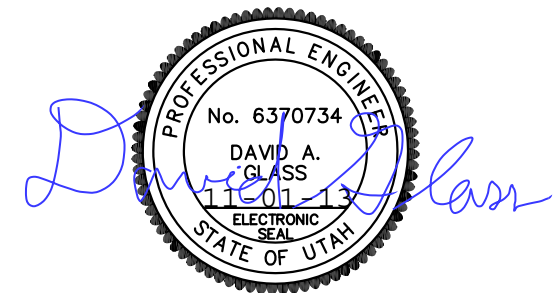
DESIGN PACKAGE ROCKERY DESIGN - HORIZON RUN POWDER MOUNTAIN RESORT WEBER COUNTY, UTAH

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PREPARED BY:
JUSTIN W. WHITMER, P.E.I.

REVIEWED BY:
DAVID A. GLASS, P.E.



**PROJECT
LOCATION**

PROJECT LOCATION MAP

PLOT DATE: OCT 30, 2013

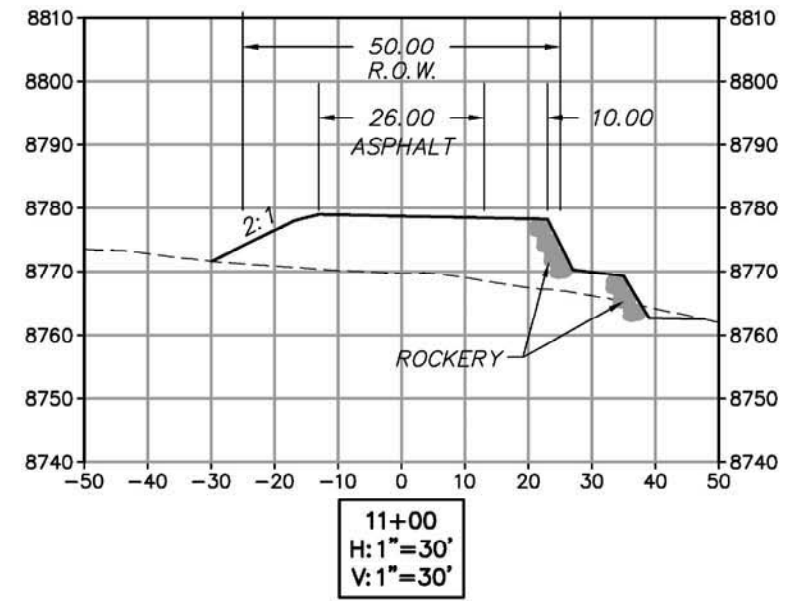
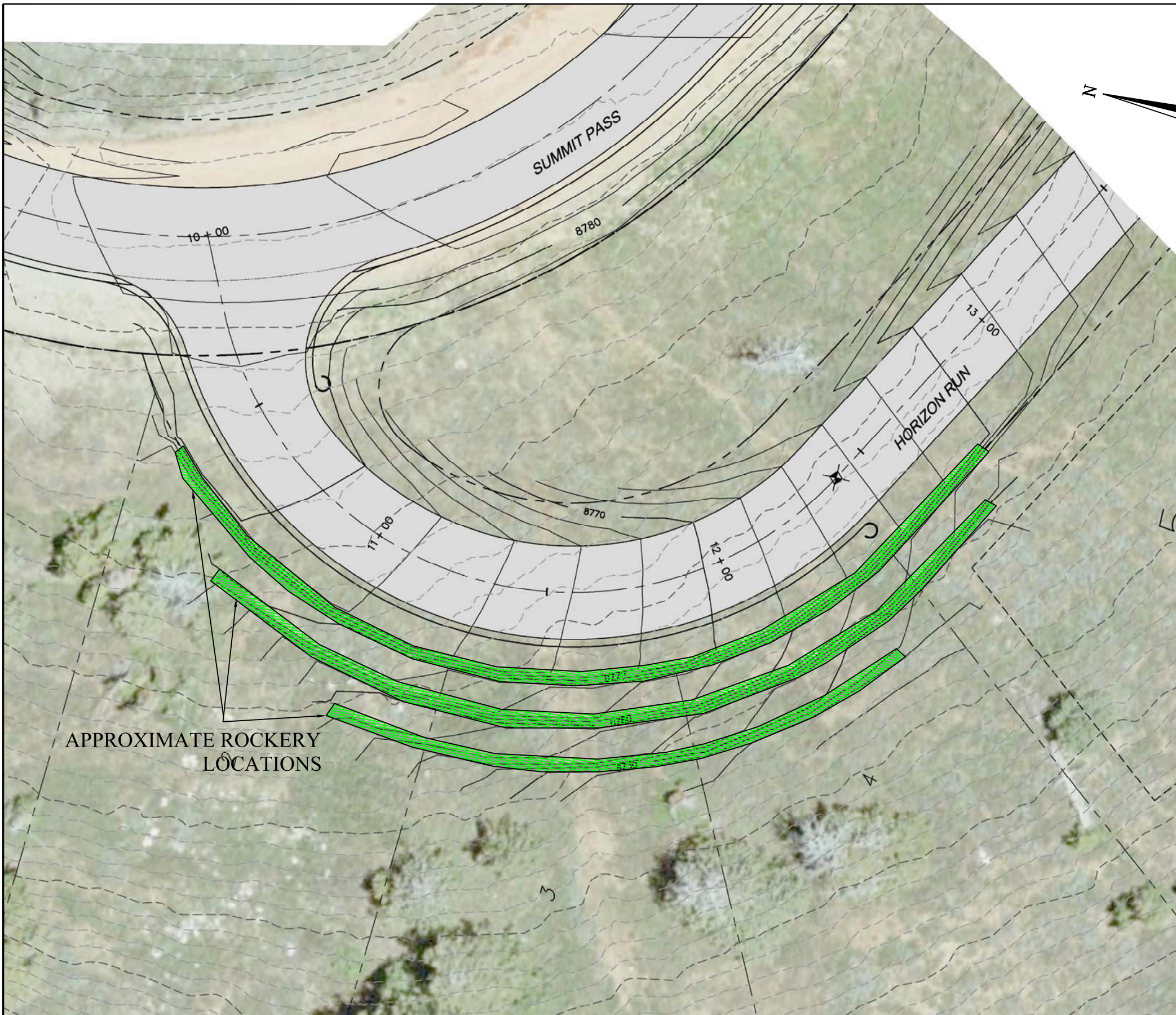
MARK	REVISIONS	DATE	BY	CHK



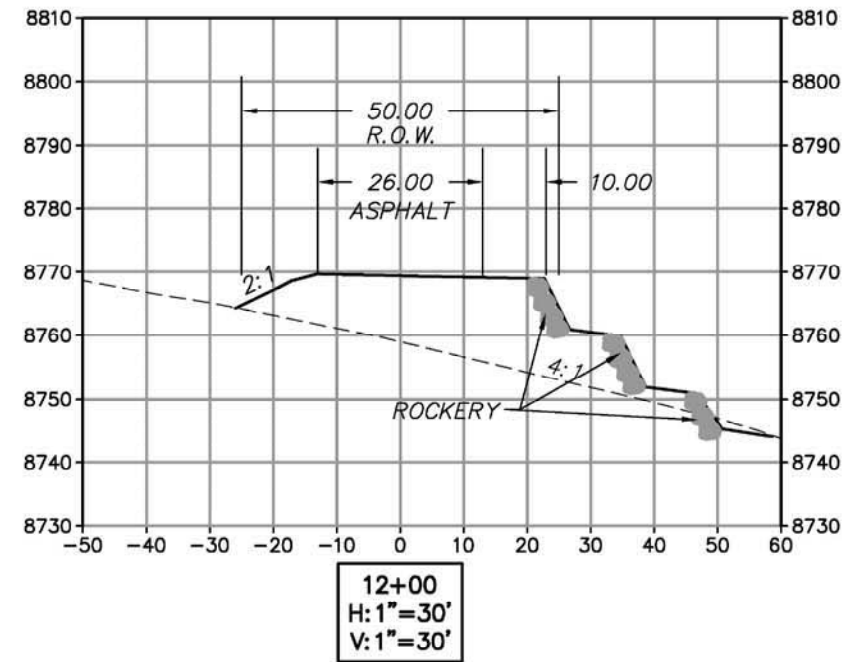
12429 SOUTH 300 EAST, STE. 100
DRAPER, UTAH 84020
(801) 748-4044 FAX: (801) 748-4045

ROCKERY DESIGN - HORIZON RUN
POWDER MOUNTAIN RESORT
WEBER COUNTY, UTAH
COVER SHEET

DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE
DRAWN BY: JWW OCT 30, 2013	1=1
CHECKED BY: KAH OCT 30, 2013	DWG SCALE
APPROVED BY: DAG OCT 30, 2013	NTS
IGES PROJECT NO. 01855-001	SHEET NO. 1.1
	REV. N/A

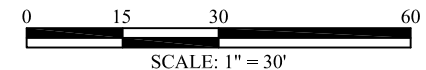


APPROXIMATE ROCKERY LOCATIONS



BASE MAP: UNDATED SITE PLAN PROVIDED BY NV5

POWDER MOUNTAIN HORIZON RUN SITE LAYOUT



PLOT DATE: OCT 30, 2013

MARK	REVISIONS	DATE	BY	CHK



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ROCKERY DESIGN - HORIZON RUN
POWDER MOUNTAIN RESORT
WEBER COUNTY, UTAH
PLAN VIEW

DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE: 1=1
DRAWN BY: JWW OCT 30, 2013	DWG SCALE: 1"=30'
CHECKED BY: DAG OCT 30, 2013	IGES PROJECT NO. 01855-001
APPROVED BY: DAG OCT 30, 2013	SHEET NO. 1.2
	REV. N/A

ROCKERY STABILITY ANALYSES	
ANALYSIS	DESIGN REFERENCES/SOFTWARE
EXTERNAL STABILITY	FHWA 2006 CFL/TD-06-006 DESIGN METHODOLOGY
INTERNAL STABILITY	FHWA 2006 CFL/TD-06-006 DESIGN METHODOLOGY
GLOBAL STABILITY	SLIDE: ROCSCIENCE INC., 1998-2010, VERSION 5.044, BUILD DATE FEBRUARY 2, 2010.

SOIL CONDITIONS			
SOIL AREA	FRICTION ANGLE	COHESION	UNIT WEIGHT
NATIVE CLAYEY GRAVEL SOILS	36°	100 PSF*	125 PCF
ENGINEERED FILL	34°	50 PSF*	125 PCF

* COHESION USED ONLY IN GLOBAL STABILITY ANALYSIS

ROCKERY GEOMETRY AND LOADING CONDITIONS				
TIER	LENGTH (FT)	MAXIMUM HEIGHT (FT)	BACKSLOPE CONDITIONS	SURCHARGE LOADING
UPPER	~225	8	FLAT	250 PSF (TRAFFIC)
MIDDLE	~185	8	8:1	150 PSF (SNOW)
LOWER	~140	6	8:1	150 PSF (SNOW)

2012 IBC HORIZONTAL GROUND ACCELERATION		
SITE CLASS	PGA	SEISMIC COEFFICIENT
C: VERY DENSE SOIL	0.35g	0.15g

SOURCES:

1. INTERNATIONAL CODE COUNCIL, 2012, INTERNATIONAL BUILDING CODE.

REFERENCE: IGES, INC., 2013, ROCKERY CONSTRUCTION GUIDELINES, POWDER MOUNTAIN RESORT, WEBER COUNTY, UTAH, PROJECT NO. 01628-005, DATED MAY 8, 2013

PLOT DATE: OCT 30, 2013

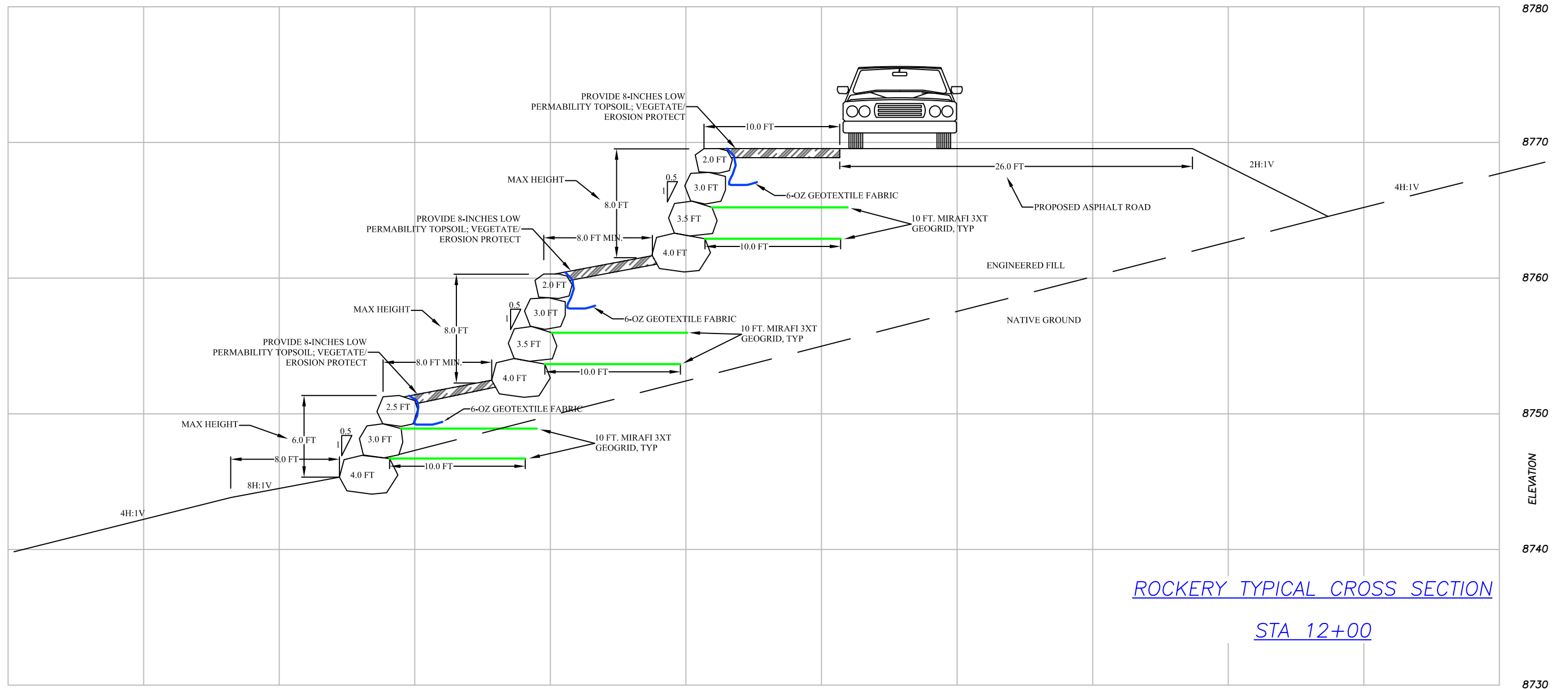
MARK	REVISIONS	DATE	BY	CHK



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ROCKERY DESIGN - HORIZON RUN
 POWDER MOUNTAIN RESORT
 WEBER COUNTY, UTAH
 DESIGN CRITERIA

DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE
DRAWN BY: JWW OCT 30, 2013	1=1
CHECKED BY: DAG OCT 30, 2013	DWG SCALE
APPROVED BY: DAG OCT 30, 2013	NA
IGES PROJECT NO. 01855-001	SHEET NO. 1.3
	REV. N/A



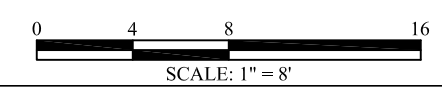
ROCKERY TYPICAL CROSS SECTION
STA 12+00

SECTION BASED ON UNDATED CROSS-SECTION DRAWN BY NV-5

EXPOSED ROCKERY HEIGHT - ASSUMES 1-FOOT MINIMUM EMBEDMENT DEPTH FOR ALL ROCKERY SECTIONS AND TIERS

CONSTRUCTION CRITERIA

1. MAINTAIN MINIMUM OF 10 FEET FROM FACE OF TOP BOULDER TO ASPHALT PAVEMENT
2. MAXIMUM BATTER OF 0.5H:1V
3. BOULDER SIZES SHOWN IS MINIMUM DIMENSION INTO THE SLOPE



PLOT DATE: OCT 30, 2013

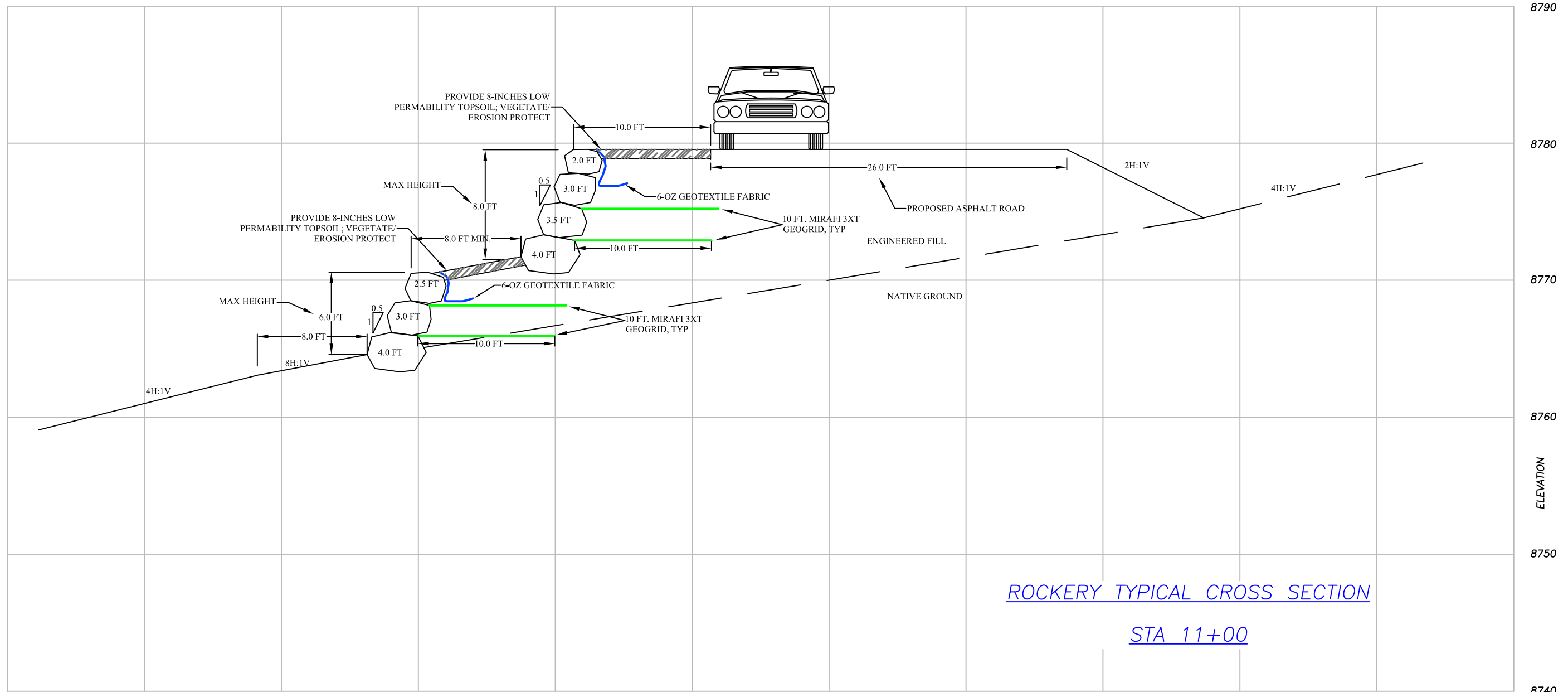
MARK	REVISIONS	DATE	BY	CHK



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DRAPER, UTAH 84020
(801) 748-4044 FAX: (801) 748-4045

ROCKERY DESIGN - HORIZON RUN
POWDER MOUNTAIN RESORT
WEBER COUNTY, UTAH
SECTION VIEW

DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE
DRAWN BY: JWW OCT 30, 2013	1=1
CHECKED BY: DAG OCT 30, 2013	DWG SCALE
APPROVED BY: DAG OCT 30, 2013	1"=8'
IGES PROJECT NO. 01855-001	SHEET NO. 1.4a
	REV. N/A

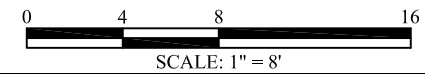


SECTION BASED ON UNDATED CROSS-SECTION DRAWN BY NV-5

* EXPOSED ROCKERY HEIGHT - ASSUMES 1-FOOT MINIMUM EMBEDMENT DEPTH FOR ALL ROCKERY SECTIONS AND TIERS

CONSTRUCTION CRITERIA

1. MAINTAIN MINIMUM OF 10 FEET FROM FACE OF TOP BOULDER TO ASPHALT PAVEMENT
2. MAXIMUM BATTER OF 0.5H:1V
3. BOULDER SIZES SHOWN IS MINIMUM DIMENSION INTO THE SLOPE



PLOT DATE: OCT 30, 2013

MARK	REVISIONS	DATE	BY	CHK



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DRAPER, UTAH 84020
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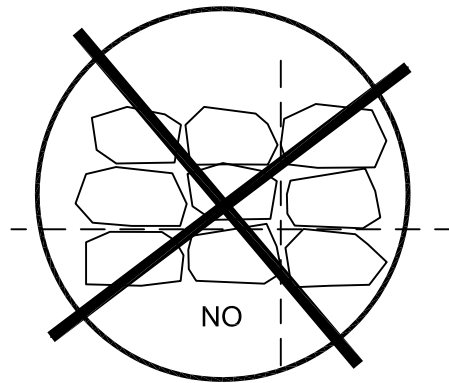
ROCKERY DESIGN - HORIZON RUN
POWDER MOUNTAIN RESORT
WEBER COUNTY, UTAH
SECTION VIEW

DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE
DRAWN BY: JWW OCT 30, 2013	1=1
CHECKED BY: DAG OCT 30, 2013	DWG SCALE
APPROVED BY: DAG OCT 30, 2013	1"=8'
IGES PROJECT NO. 01855-001	SHEET NO. 1.4b
	REV. N/A

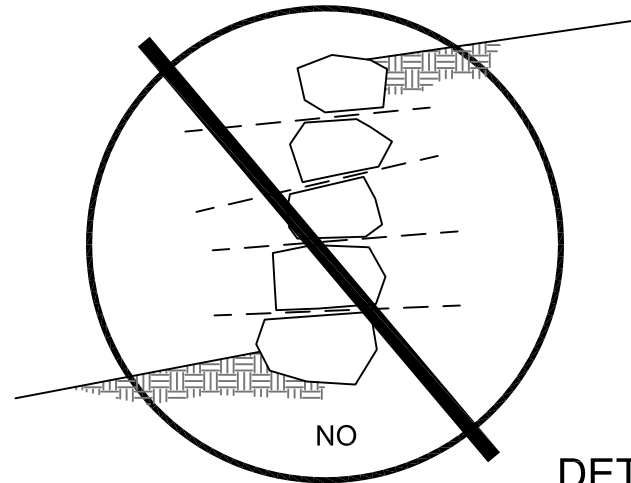
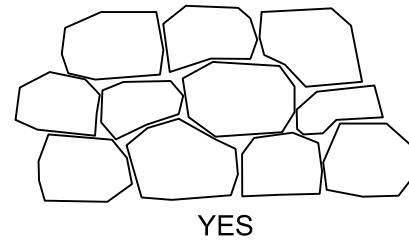
Rock Stacking Construction Guidelines:

Rocks should be stacked in general accordance with the Associated Rockery Contractors (ARC) Rockery Construction Guidelines, summarized as follows:

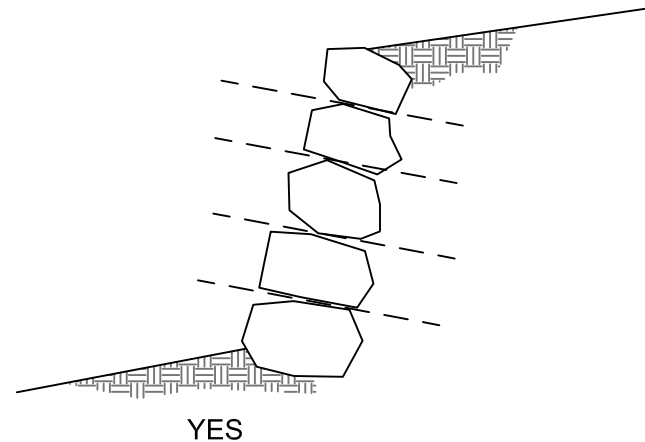
- Rocks should be placed so that there are no continuous joint planes in either the vertical or lateral direction (see detail A)
- Wherever possible, each rock should bear on at least two rocks below it.
- The upper plane of each rock between courses (the top surface of rock), should slope back towards the slope face and away from the face of the rock wall (see detail B)



DETAIL A



DETAIL B



1. INTRODUCTION

- 1.1. DESIGN AND CONSTRUCTION INFORMATION IS BASED ON INFORMATION OBTAINED FROM SITE TOPOGRAPHY, SOIL DESCRIPTIONS, SITE OBSERVATIONS, SITE GEOMETRY, PROJECT PLANS, AND THE ENGINEERING ANALYSIS PERFORMED AS PART OF THE SCOPE OF WORK FOR THIS PROJECT BY IGES, INC.
- 1.2. CONTRACTOR SHALL LOCATE ALL EXISTING UTILITIES PRIOR TO ROCKERY CONSTRUCTION.
- 1.3. THE DESIGN INCLUDES MEASURES TO REDUCE THE POTENTIAL FOR SATURATION OF THE SLOPES ABOVE THE ROCKERIES.
 - 1.3.1. VEGETATION OR EROSION CONTROL MEASURES SHALL BE ESTABLISHED ABOVE AND BELOW THE ROCKERIES IMMEDIATELY FOLLOWING CONSTRUCTION.
- 1.4. CONDITIONS SUCH AS LEAKY OR BROKEN IRRIGATION LINES AND/OR RUNOFF FROM PRECIPITATION CAN LEAD TO UNDERMINING OR SATURATION OF THE SOIL BEHIND THE ROCKERY, WHICH CAN LEAD TO SLOPE MOVEMENT.
 - 1.4.1. THE OWNER SHALL BE AWARE OF THE RISKS IF THESE OR OTHER CONDITIONS OCCUR THAT COULD SATURATE OR ERODE THE SOIL BEHIND THE ROCKERIES.

2. MATERIALS

- 2.1. RETAINED SOILS ARE TO CONSIST OF NATIVE CUT SOILS OR GRANULAR IMPORT APPROVED BY IGES, INC. IF NATIVE FILL IS USED, THE FILL SHOULD CONSIST OF 4-INCH MINUS GRANULAR SOILS COMPACTED TO A MINIMUM OF 90 PERCENT ASTM D-1557 FOR LANDSCAPE AREAS AND 95 PERCENT UNDERNEATH OR IMMEDIATELY ADJACENT TO STRUCTURES. ANY BACKFILL MATERIAL THAT IS IMPORTED SHOULD BE APPROVED BY IGES INC. PRIOR TO IMPORTING.
- 2.2. ROCKERY BOULDERS TO BE USED AS FACING SHALL BE DURABLE ANGULAR PARTICLES WITH A MINIMUM NOMINAL DIAMETER OF 1½ -FEET. ROCK SIZES SHALL BE IN ACCORDANCE WITH DESIGN DRAWINGS.

3. ROCKERY INSTALLATION

- 3.1. ROCKS SHOULD BE STACKED IN GENERAL ACCORDANCE WITH THE ASSOCIATED ROCKERY CONTRACTORS (ARC) ROCKERY CONSTRUCTION GUIDELINES (SEE ADJACENT DETAILS).
- 3.2. ROCK FACING SHOULD BE STACKED AT A MAXIMUM STEEPNESS OF ½ HORIZONTAL TO 1 VERTICAL.
- 3.3. BOTTOM ROW OF ROCKS SHOULD BE BURIED (KEYED IN) A MINIMUM DEPTH OF 1 FOOT.

4. CONSTRUCTION OBSERVATION

- 4.1. TO FULFILL ANY APPLICABLE CITY, COUNTY AND/OR STATE AGENCY REQUIREMENTS, AND TO PROTECT THE CONTRACTOR AND DESIGN ENGINEER, IGES MUST PERFORM PERIODIC CONSTRUCTION OBSERVATIONS.
 - 4.1.1. INSPECTIONS SHALL PROCEED AS FOLLOWS:
 - 4.1.1.1. OBSERVE THE ROCKERY BASE EXCAVATION TO ASSESS THE SUITABILITY OF THE FOUNDATION SOILS.
 - 4.1.1.2. INSPECT THE FIRST COURSE OF ROCKS FOR SIZE AND EMBEDMENT INSTALLATION.
 - 4.1.1.3. INSPECT THE SECOND OR THIRD COURSE OF ROCKS FOR SIZE, POSITION AND PLACEMENT.
 - 4.1.1.4. INSPECT THE FINISHED ROCKERIES FOR CONFORMANCE TO DESIGN REQUIREMENTS SUCH AS MAXIMUM HEIGHTS, BATTER, FRONT AND BACK SLOPE GEOMETRIES, ROCK SIZING, POSITIONING AND PLACEMENT.

PLOT DATE: OCT 30, 2013

MARK	REVISIONS	DATE	BY	CHK



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ROCKERY DESIGN - HORIZON RUN
 POWDER MOUNTAIN RESORT
 WEBER COUNTY, UTAH
ARC DETAILS AND SPECIFICATIONS

DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE
DRAWN BY: JWW OCT 30, 2013	1=1
CHECKED BY: DAG OCT 30, 2013	DWG SCALE
APPROVED BY: DAG OCT 30, 2013	N/A
IGES PROJECT NO. 01855-001	SHEET NO. 1.5
	REV. N/A

ROCKERY EXTERNAL AND INTERNAL STABILITY CALCULATIONS FROM FHWA 2006 CFL/TD-06-006

<i>MINIMUM ALLOWABLE FACTORS OF SAFETY</i>		
<i>FAILURE MECHANISM</i>	<i>UNDER STATIC CONDITIONS</i>	<i>UNDER SEISMIC CONDITIONS</i>
<i>EXTERNAL SLIDING</i>	<i>1.5</i>	<i>1.13</i>
<i>EXTERNAL OVERTURNING</i>	<i>1.5</i>	<i>1.13</i>
<i>BEARING CAPACITY</i>	<i>2.0</i>	<i>1.50</i>
<i>INDIVIDUAL ROCK OVERTURNING</i>	<i>1.5</i>	<i>1.13</i>



ROCKERY DESIGN
POWDER MOUNTAIN RESORT
WEBER COUNTY, UTAH

DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE
DRAWN BY: JWW OCT 30, 2013	1=1
CHECKED BY: DAG OCT 30, 2013	DWG SCALE
APPROVED BY: DAG OCT 30, 2013	N/A
IGES PROJECT NO. 01855-001	SHEET NO. 2.1
	REV. N/A

Interactive Rockery Minimum Rock Size Stability Calculations

Project: Powder Mountain Resort
 Rockery Analysis and Design
 Location: Weber County, UT
 IGES, Inc. Project No:
 Engineer: JWW
 Date: October 28, 2013

	Minimum Factors of Safety:		Allowable		Actual	
	Static	Seismic	Static	Seismic	Static	Seismic
Overturning:	1.5	1.1	2.16	1.46		
Sliding:	1.5	1.1	1.78	1.30		
Bearing Capacity:	2.0	1.5	2.56	1.83		
Internal Sliding:	1.5	1.1	1.87	1.34		
Internal Overturning:	1.5	1.1	2.76	1.86		

Rockery Section Description: 8-ft Rockery Section Top Tier

1. Enter Geometric Parameters:

Backslope (for flat backslope V=0): 10 H. : 1 V. $\beta = 5.71$ degrees surcharge, $q_B = 250$ psf	Toeslope (for flat toeslope V=0): 4 H. : 0 V. $\beta_T = 0.00$ degrees surcharge, $q_T = 0$ psf	Rockery Batter (for vertical stacking H = 0): 1 H. : 2 V. $\Psi_{front} = -26.57$ degrees Number of Rocks (8 max): 4 Appr. Rockery Length, L = 80 ft
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2. Enter Soil, Foundation, Rock and Seismic Properties

Will geotextile fabric be used along the back soil? YES NO

Retained Soil Properties: $\gamma_{retained} = 125$ pcf $\phi_{retained} = 30$ degrees $C_{retained} = 0$ psf $\delta_{retained} = 30.00$ degrees $K_a = 0.195$ $K_{ah} = 0.190$	Foundation Properties: $\gamma_{foundation} = 125$ pcf $\phi_{foundation} = 30.0$ degrees $C_{foundation} = 0$ psf $I_{foundation} = 0.6$ Depth to Groundwater, z = 50.0 ft	Foundation Soil Type: Sand Silt or Clay Gravel Bedrock Structural Fill	Rock Properties: $\gamma_{Rock\ Boulder} = 150$ pcf $\phi_{Boulder\ Interface} = 0.55$ degrees Rockery Embedment, D = 1.0 ft Rock Stacking Red. Factor* = 0.70 *Height to Width Ratio
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Seismic Properties: 2 % Exceedance Prob. 50 years Exposure Time 2 PE 50 PGA: 0.150 g 2475 -yr Recurrence Interval	$k_v = 0.000$ g $K_{AE} = 0.247$ $k_h = 0.075$ g $F_{AE} = 1,348.0$ lb/ft $\theta = 4.29$ degrees $\Delta F_{AE} = 282.5$ lb/ft
--	---

3. Enter Rock Diameters in Table Below

Actual Back of Rock Batter, $\psi = 17.2$ degrees from vertical (CW)

4. Calculate Hinge Height do not use

Avg. rock diameter: 3.1 ft Hinge Ht., $H_h = 10.1$ ft

5. Calculate the Factor of Safety against Overturning (Min. FS = 1.5)

Wall Weight, $W_1 = 4,208$ lb/ft

Acting At: x = 2.48 y = 4.16

Resisting Moment, $M_{res} = 11,623.0$ lb $M_{res-E} = 11,981.0$ lb-dyn

Driving Moment, $M_{drv} = 5,369.9$ lb $M_{drv-E} = 8,226.8$ lb-dyn

$FS_{ovt} = M_{res}/M_{drv} = 2.16$ static 1.46 seismic

6. Calculate the Factor of Safety against Base Sliding (Min. FS = 1.5)

Resisting Force, $P_{res} = 2,665.6$ lb/ft $P_{res-E} = 2,703.0$ lb/ft-dyn

Driving Force, $P_{ah1} = 1,495.0$ lb/ft $P_{ah1-E} = 2,086.1$ lb/ft-dyn

$FS_{slid} = P_{res}/P_{ah1} = 1.78$ static 1.30 seismic

7. Calculate the Factor of Safety for Bearing Capacity (Min. FS = 2.0)

Eccentricity, e = 0.593 ft OK $e_E = 1.17$ ft

Bearing Stress, $\sigma_{vb} = 2,098$ psf $\sigma_{vb-E} = 2,936$ psf-dyn

Max. Allow., $q_{ULT} = 5,368$ psf $q_{ULT-E} = 5,368$ psf-dyn

$FS_{bearing} = q_{ULT}/\sigma_{vb} = 2.56$ static 1.83 seismic

8. Calculate the Factors of Safety for Internal Bulding (Min. FS = 1.5)

Values tabulated below

Approximate Maximum Exposed Rockery Height: **8.4** ft

Row, i	Min. Rock Dia. (ft)	$H_{1,i}$ (ft)	Accm. Weigh t (lb/ft)	F_{AEi} (lb/ft)	ΔF_{AEi} (lb/ft)	P_{ahi}		P_{resi}		F.S. Internal Sliding		M_{drv}		M_{res}		F.S. Internal Overturning	
						Static	Seismic	Static	Seismic	Static	Seismic	Static	Seismic	Static	Seismic	Static	Seismic
						(lb/ft)	(lb/ft)	(lb/ft)	(lb/ft)	1.5 Min.	1.13 Min.	lb	lb	lb	lb	1.5 Min.	1.1 Min.
1	4.0	9.4	4,208	1,348	282	1,495	2,086	2,666	2,703	See Base Sliding	5,370	8,227	11,623	11,981	See Ext. OT		
2	3.5	6.6	2,702	662	139	829	1,167	1,550	1,568	1.87	1.34	2,159	3,294	5,968	6,113	2.76	1.86
3	3.0	4.1	1,538	259	54	400	568	870	878	2.18	1.55	683	1,034	2,666	2,711	3.90	2.62
4	2.0	2.0	600	62	13	145	203	336	338	2.32	1.67	129	189	713	720	5.52	3.80

Calculations Based on Rockery Design and Construction Guidelines, FHWA Publication No. FHWA-CFL/TD-06-006



Interactive Rockery Minimum Rock Size Stability Calculations

Project: Powder Mountain Resort
Rockery Analysis and Design
Location: Weber County, UT
IGES, Inc. Project No:
Engineer: JWW
Date: October 28, 2013

	Minimum Factors of Safety:		Allowable		Actual	
	Static	Seismic	Static	Seismic	Static	Seismic
Overturning:	1.5	1.1	2.53	1.60		
Sliding:	1.5	1.1	2.00	1.40		
Bearing Capacity:	2.0	1.5	3.16	2.13		
Internal Sliding:	1.5	1.1	2.17	1.49		
Internal Overturning:	1.5	1.1	3.37	2.09		

Rockery Section Description: 8-ft Rockery Section Middle Tier

1. Enter Geometric Parameters:

Backslope (for flat backslope V=0): 8 H. : 1 V. $\beta = 7.13$ degrees surcharge, $q_B = 150$ psf	Toeslope (for flat toeslope V=0): 4 H. : 0 V. $\beta_T = 0.00$ degrees surcharge, $q_T = 0$ psf	Rockery Batter (for vertical stacking H = 0): 1 H. : 2 V. $\Psi_{front} = -26.57$ degrees Number of Rocks (8 max): 4 Appr. Rockery Length, L = 80 ft
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2. Enter Soil, Foundation, Rock and Seismic Properties

Will geotextile fabric be used along the back soil? YES NO

Retained Soil Properties: $\gamma_{retained} = 125$ pcf $\phi_{retained} = 30$ degrees $C_{retained} = 0$ psf $\delta_{retained} = 30.00$ degrees $K_a = 0.198$ $K_{ah} = 0.194$	Foundation Properties: $\gamma_{foundation} = 125$ pcf $\phi_{foundation} = 30.0$ degrees $C_{foundation} = 0$ psf $I_{foundation} = 0.6$ Depth to Groundwater, z = 50.0 ft	Rock Properties: $\gamma_{Rock\ Boulder} = 150$ pcf $\phi_{Boulder\ Interface} = 0.55$ degrees Rockery Embedment, D = 1.0 ft Rock Stacking Red. Factor* = 0.70 *Height to Width Ratio
--	---	--

Seismic Properties: 2 % Exceedance Prob. 50 years Exposure Time 2475 -yr Recurrence Interval	2 PE 50 PGA: 0.150 g $k_v = 0.000$ g $k_h = 0.075$ g $\theta = 4.29$ degrees	$K_{AE} = 0.252$ $F_{AE} = 1,377.6$ lb/ft $\Delta F_{AE} = 293.2$ lb/ft
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3. Enter Rock Diameters in Table Below

Actual Back of Rock Batter, $\psi = 17.2$ degrees from vertical (CW)

4. Calculate Hinge Height do not use

Avg. rock diameter: 3.1 ft Hinge Ht., $H_h = 10.1$ ft

5. Calculate the Factor of Safety against Overturning (Min. FS = 1.5)

Wall Weight, $W_1 = 4,208$ lb/ft

Acting At: x = 2.48 y = 4.16

Resisting Moment, $M_{res} = 11,643.7$ lb $M_{res-E} = 12,015.3$ lb-dyn

Driving Moment, $M_{drv} = 4,597.5$ lb $M_{drv-E} = 7,513.1$ lb-dyn

$FS_{ovt} = M_{res}/M_{drv} = 2.53$ static 1.60 seismic

6. Calculate the Factor of Safety against Base Sliding (Min. FS = 1.5)

Resisting Force, $P_{res} = 2,668.1$ lb/ft $P_{res-E} = 2,706.9$ lb/ft-dyn

Driving Force, $P_{ah1} = 1,336.0$ lb/ft $P_{ah1-E} = 1,937.5$ lb/ft-dyn

$FS_{slid} = P_{res}/P_{ah1} = 2.00$ static 1.40 seismic

7. Calculate the Factor of Safety for Bearing Capacity (Min. FS = 2.0)

Eccentricity, e = 0.415 ft OK $e_E = 1.00$ ft

Bearing Stress, $\sigma_{vb} = 1,805$ psf $\sigma_{vb-E} = 2,673$ psf-dyn

Max. Allow., $q_{ULT} = 5,699$ psf $q_{ULT-E} = 5,699$ psf-dyn

$FS_{bearing} = q_{ULT}/\sigma_{vb} = 3.16$ static 2.13 seismic

8. Calculate the Factors of Safety for Internal Bulldging (Min. FS = 1.5)

Values tabulated below

Approximate Maximum Exposed Rockery Height: 8.4 ft

Row, i	Min. Rock Dia. (ft)	$H_{1,i}$ (ft)	Accm. Weigh t (lb/ft)	F_{AEi} (lb/ft)	ΔF_{AEi} (lb/ft)	P_{ahi}		P_{resi}		F.S. Internal Sliding		M_{drv}		M_{res}		F.S. Internal Overturning	
						Static	Seismic	Static	Seismic	Static	Seismic	Static	Seismic	Static	Seismic	Static	Seismic
						(lb/ft)	(lb/ft)	(lb/ft)	(lb/ft)	1.5 Min.	1.13 Min.	Lb	Lb	Lb	Lb	1.5 Min.	1.1 Min.
1	4.0	9.4	4,208	1,378	293	1,336	1,937	2,668	2,707	See Base Sliding		4,598	7,513	11,644	12,015	See Ext. OT	
2	3.5	6.6	2,702	676	144	714	1,057	1,551	1,570	2.17	1.49	1,772	2,927	5,977	6,127	3.37	2.09
3	3.0	4.1	1,538	265	56	325	496	871	878	2.68	1.77	528	884	2,669	2,716	5.05	3.07
4	2.0	2.0	600	63	13	108	166	336	338	3.11	2.03	92	153	714	721	7.77	4.73

Calculations Based on Rockery Design and Construction Guidelines, FHWA Publication No. FHWA-CFL/TD-06-006



Interactive Rockery Minimum Rock Size Stability Calculations

Project: Powder Mountain Resort
Rockery Analysis and Design
Location: Weber County, UT
IGES, Inc. Project No:
Engineer: JWW
Date: October 28, 2013

	Minimum Factors of Safety:		Allowable		Actual	
	Static	Seismic	Static	Seismic	Static	Seismic
Overturning:	1.5	1.1	3.71	2.24		
Sliding:	1.5	1.1	2.54	1.70		
Bearing Capacity:	2.0	1.5	4.83	3.40		
Internal Sliding:	1.5	1.1	2.72	1.79		
Internal Overturning:	1.5	1.1	4.96	2.94		

Rockery Section Description: 6-ft Rockery Section Lower Tier

1. Enter Geometric Parameters:

Backslope (for flat backslope V=0): 8 H. : 1 V. $\beta = 7.13$ degrees surcharge, $q_B = 150$ psf	Toeslope (for flat toeslope V=0): 4 H. : 0 V. $\beta_T = 0.00$ degrees surcharge, $q_T = 0$ psf	Rockery Batter (for vertical stacking H = 0): 1 H. : 2 V. $\psi_{front} = -26.57$ degrees Number of Rocks (8 max): 3 Appr. Rockery Length, L = 80 ft
---	---	---

2. Enter Soil, Foundation, Rock and Seismic Properties

Will geotextile fabric be used along the back soil? YES NO

Retained Soil Properties: $\gamma_{retained} = 125$ pcf $\phi_{retained} = 30$ degrees $C_{retained} = 0$ psf $\delta_{retained} = 30.00$ degrees $K_a = 0.200$ $K_{ah} = 0.195$	Foundation Properties: $\gamma_{foundation} = 125$ pcf $\phi_{foundation} = 30.0$ degrees $C_{foundation} = 0$ psf $I_{foundation} = 0.6$ Depth to Groundwater, z = 50.0 ft	Rock Properties: $\gamma_{Rock\ Boulder} = 150$ pcf $\phi_{Boulder\ Interface} = 0.55$ degrees Rockery Embedment, D = 1.0 ft Rock Stacking Red. Factor* = 0.70 *Height to Width Ratio
--	---	--

Seismic Properties: 2 % Exceedance Prob. 50 years Exposure Time 2475 -yr Recurrence Interval	2 PE 50 PGA: 0.150 g $k_v = 0.000$ g $k_h = 0.075$ g $\theta = 4.29$ degrees	$K_{AE} = 0.254$ $F_{AE} = 868.2$ lb/ft $\Delta F_{AE} = 184.1$ lb/ft
--	---	---

3. Enter Rock Diameters in Table Below

Actual Back of Rock Batter, $\psi = 17.0$ degrees from vertical (CW)

4. Calculate Hinge Height do not use

Avg. rock diameter: 3.2 ft Hinge Ht., $H_h = 10.3$ ft

5. Calculate the Factor of Safety against Overturning (Min. FS = 1.5)

Wall Weight, $W_1 = 3,608$ lb/ft

Acting At: x = 2.33 y = 3.42

Resisting Moment, $M_{res} = 9,145.6$ lb $M_{res-E} = 9,367.1$ lb-dyn

Driving Moment, $M_{drv} = 2,465.4$ lb $M_{drv-E} = 4,186.1$ lb-dyn

$FS_{ovt} = M_{res}/M_{drv} = 3.71$ static 2.24 seismic

6. Calculate the Factor of Safety against Base Sliding (Min. FS = 1.5)

Resisting Force, $P_{res} = 2,256.7$ lb/ft $P_{res-E} = 2,281.5$ lb/ft-dyn

Driving Force, $P_{ah1} = 888.5$ lb/ft $P_{ah1-E} = 1,338.5$ lb/ft-dyn

$FS_{slid} = P_{res}/P_{ah1} = 2.54$ static 1.70 seismic

7. Calculate the Factor of Safety for Bearing Capacity (Min. FS = 2.0)

Eccentricity, e = 0.224 ft OK $e_E = 0.64$ ft OK

Bearing Stress, $\sigma_{vb} = 1,256$ psf $\sigma_{vb-E} = 1,784$ psf-dyn

Max. Allow., $q_{ULT} = 6,060$ psf $q_{ULT-E} = 6,060$ psf-dyn

$FS_{bearing} = q_{ULT}/\sigma_{vb} = 4.83$ static 3.40 seismic

8. Calculate the Factors of Safety for Internal Bulding (Min. FS = 1.5)

Values tabulated below

Approximate Maximum Exposed Rockery Height: 6.4 ft

Row, i	Min. Rock Dia. (ft)	$H_{1,i}$ (ft)	Accm. Weigh t (lb/ft)	F_{AEi} (lb/ft)	ΔF_{AEi} (lb/ft)	P_{ahi}		P_{resi}		F.S. Internal Sliding		M_{drv}		M_{res}		F.S. Internal Overturning	
						Static	Seismic	Static	Seismic	Static	Seismic	Static	Seismic	Static	Seismic	Static	Seismic
						(lb/ft)	(lb/ft)	(lb/ft)	(lb/ft)	1.5 Min.	1.13 Min.	Lb	Lb	Lb	Lb	1.5 Min.	1.1 Min.
1	4.0	7.4	3,608	868	184	889	1,339	2,257	2,281	See Base Sliding	2,465	4,186	9,146	9,367	See Ext. OT		
2	3.0	4.6	1,898	336	71	396	607	1,076	1,086	2.72	1.79	712	1,221	3,532	3,593	4.96	2.94
3	2.5	2.5	938	99	21	151	242	525	528	3.48	2.18	157	276	1,395	1,409	8.88	5.11

Calculations Based on Rockery Design and Construction Guidelines, FHWA Publication No. FHWA-CFL/TD-06-006



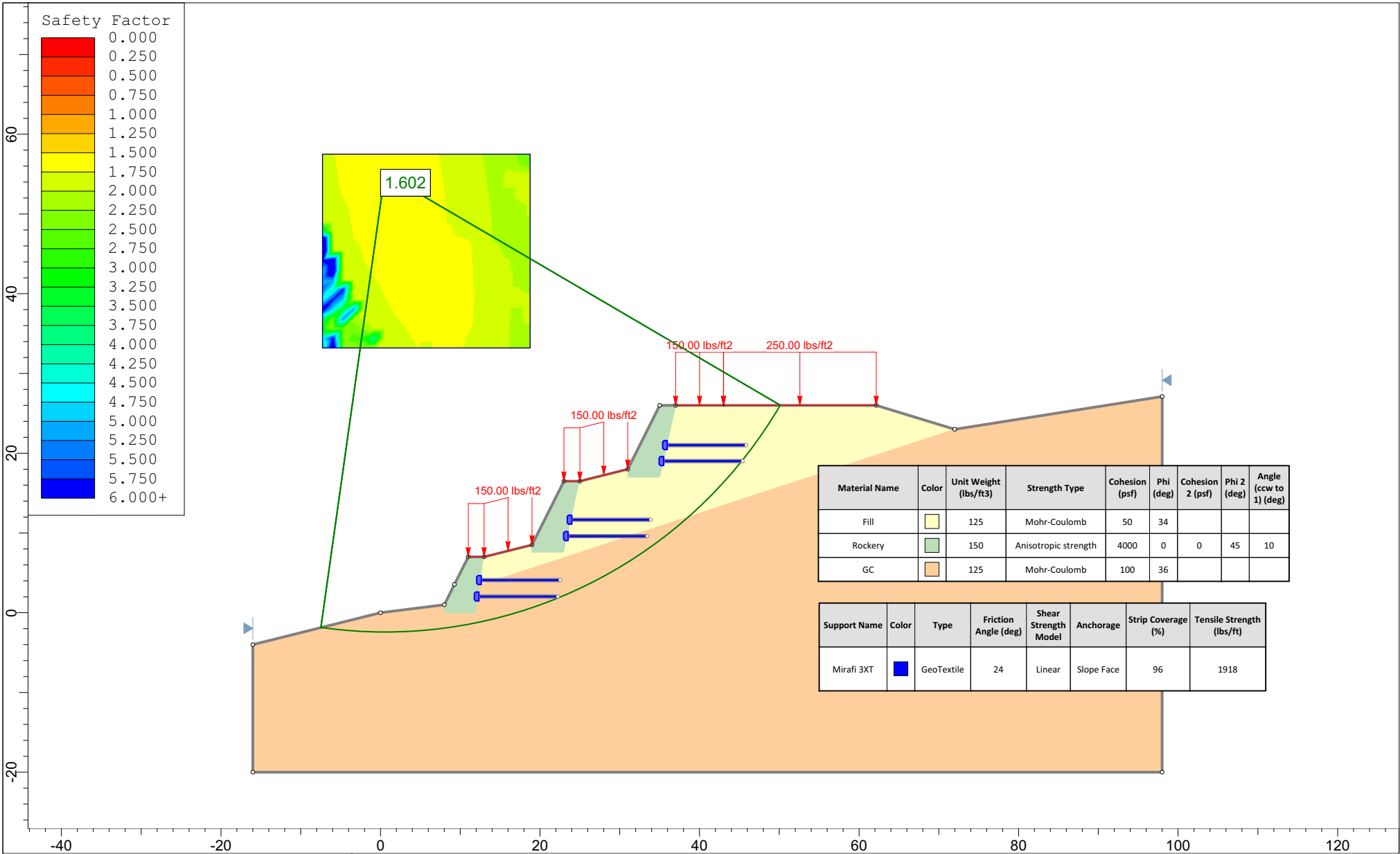
ROCKERY RETAINING WALL GLOBAL STABILITY CALCULATIONS FROM SLIDE

<i>MINIMUM ALLOWABLE FACTORS OF SAFETY</i>	
<i>UNDER STATIC CONDITIONS</i>	<i>UNDER SEISMIC CONDITIONS</i>
1.5	1.1




ROCKERY DESIGN
POWDER MOUNTAIN RESORT
WEBER COUNTY, UTAH

DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE
DRAWN BY: JWW OCT 30, 2013	1=1
CHECKED BY: DAG OCT 30, 2013	DWG SCALE
APPROVED BY: DAG OCT 30, 2013	N/A
IGES PROJECT NO. 01855-001	SHEET NO. 2.2
	REV. N/A



Material Name	Color	Unit Weight (lbs/ft ³)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)	Angle (ccw to 1) (deg)
Fill		125	Mohr-Coulomb	50	34			
Rockery		150	Anisotropic strength	4000	0	0	45	10
GC		125	Mohr-Coulomb	100	36			

Support Name	Color	Type	Friction Angle (deg)	Shear Strength Model	Anchorage	Strip Coverage (%)	Tensile Strength (lbs/ft)
Mirafi 3XT		GeoTextile	24	Linear	Slope Face	96	1918



Project
Powder Mountain - Max Section - Static

Analysis Description
Spencer's

Drawn By Justin W *Scale* 1:200 *Company* IGES, Inc

Date 10/28/13 *File Name* 25H Static.slim

Slide Analysis Information
Powder Mountain - Max Section - Static

Project Summary

- File Name: 25H Static
- Slide Modeler Version: 6.025
- Project Title: Powder Mountain - Max Section - Static
- Analysis: Spencer's
- Author: Justin W
- Company: IGES, Inc
- Date Created: 10/28/13

General Settings

- Units of Measurement: Imperial Units
- Time Units: seconds
- Permeability Units: feet/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 62.4 lbs/ft3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Grid Search
- Radius Increment: 10
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: Not Defined

Loading

- 4 Distributed Loads present




Distributed Load 1
Distribution: Constant
Magnitude [psf]: 250
Orientation: Normal to boundary

Distributed Load 2
Distribution: Constant
Magnitude [psf]: 150
Orientation: Normal to boundary

Distributed Load 3
Distribution: Constant
Magnitude [psf]: 150
Orientation: Vertical

Distributed Load 4
Distribution: Constant
Magnitude [psf]: 150
Orientation: Vertical

Material Properties

Property	Fill	Rockery	GC
Color			
Strength Type	Mohr-Coulomb	Anisotropic strength	Mohr-Coulomb
Unit Weight [lbs/ft3]	125	150	125
Cohesion [psf]	50		100
Friction Angle [deg]	34		36
Cohesion 1 [psf]		4000	
Cohesion 2 [psf]		0	
Friction Angle 1 [deg]		0	
Friction Angle 2 [deg]		45	
Angle from 1 [deg]		10	
Water Surface	None	None	None
Ru Value	0	0	0

Support Properties

Mirafi 3XT
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Bisector of Parallel and Tangent
Anchorage: Slope Face
Shear Strength Model: Linear
Strip Coverage: 96 percent

Tensile Strength: 1918 lb/ft
 Pullout Strength Adhesion: 0 psf
 Pullout Strength Friction Angle: 24 degrees

Global Minimums

Method: spencer
 FS: 1.601890
 Center: 0.539, 55.069
 Radius: 57.498
 Left Slip Surface Endpoint: -7.472, -1.868
 Right Slip Surface Endpoint: 50.148, 26.000
 Resisting Moment=2.8359e+006 lb-ft
 Driving Moment=1.77035e+006 lb-ft
 Resisting Horizontal Force=42723.4 lb
 Driving Horizontal Force=26670.6 lb
 Total Slice Area=464.539 ft2

Valid / Invalid Surfaces

Method: spencer
 Number of Valid Surfaces: 3889
 Number of Invalid Surfaces: 962

Error Codes:

Error Code -106 reported for 11 surfaces
 Error Code -108 reported for 298 surfaces
 Error Code -111 reported for 653 surfaces

Error Codes

The following errors were encountered during the computation:
 -106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
 -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
 -111 = safety factor equation did not converge

Slice Data

• Global Minimum Query (spencer) - Safety Factor: 1.60189

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.3088	123.317	GC	100	36	123.03	197.081	133.621	0	133.621
2	2.3088	356.367	GC	100	36	182.947	293.061	265.725	0	265.725
3	2.3088	562.38	GC	100	36	230.058	368.528	369.598	0	369.598
4	2.3088	717.262	GC	100	36	259.973	416.448	435.555	0	435.555
5	2.3088	788.684	GC	100	36	267.103	427.869	451.272	0	451.272
6	2.3088	830.927	GC	100	36	266.759	427.319	450.518	0	450.518
7	2.3088	930.955	GC	100	36	278.967	446.874	477.432	0	477.432
8	2.3088	2102.29	GC	100	36	515.966	826.521	999.97	0	999.97

9	2.3088	2639.9	GC	100	36	675.46	1082.01	1351.62	0	1351.62
10	2.3088	2329.2	GC	100	36	591.046	946.791	1165.51	0	1165.51
11	2.3088	2314.56	GC	100	36	565.903	906.515	1110.07	0	1110.07
12	2.3088	2504.86	GC	100	36	544.406	872.078	1062.67	0	1062.67
13	2.3088	3732.37	GC	100	36	705.935	1130.83	1418.81	0	1418.81
14	2.3088	4348.5	GC	100	36	825.594	1322.51	1682.64	0	1682.64
15	2.3088	3816.06	GC	100	36	720.998	1154.96	1452.03	0	1452.03
16	2.3088	3632.54	GC	100	36	664.072	1063.77	1326.52	0	1326.52
17	2.3088	3511.3	GC	100	36	601.489	963.52	1188.53	0	1188.53
18	2.3088	4401.77	GC	100	36	665.751	1066.46	1330.22	0	1330.22
19	2.3088	5119.93	GC	100	36	729.913	1169.24	1471.69	0	1471.69
20	2.3088	4323.05	GC	100	36	627.237	1004.77	1245.3	0	1245.3
21	2.28877	3680.27	Fill	50	34	476.91	763.957	1058.49	0	1058.49
22	2.28877	3029.94	Fill	50	34	385.942	618.236	842.446	0	842.446
23	2.28877	2299.3	Fill	50	34	310.38	497.194	662.992	0	662.992
24	2.28877	1470.11	Fill	50	34	213.52	342.036	432.962	0	432.962
25	2.28877	514.079	Fill	50	34	114.386	183.234	197.528	0	197.528

Interslice Data

• Global Minimum Query (spencer) - Safety Factor: 1.60189

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	-7.47209	-1.86802	0	0	0
2	-5.16329	-2.14541	320.583	159.375	26.4339
3	-2.85449	-2.32866	790.87	393.174	26.4339
4	-0.545689	-2.41868	1354.3	673.279	26.4339
5	1.76311	-2.4159	1952.18	970.512	26.4339
6	4.07191	-2.32031	2524.57	1255.07	26.4339
7	6.38071	-2.13144	3054.22	1518.38	26.4339
8	8.68952	-1.84837	3561.94	1770.79	26.4339
9	10.9983	-1.46969	4372.29	2173.65	26.4339
10	13.3071	-0.993442	5285.15	2627.47	26.4339
11	15.6159	-0.41713	5975.49	2970.67	26.4339
12	17.9247	0.262407	6525.26	3243.98	26.4339
13	20.2335	1.04906	6943.86	3452.08	26.4339
14	22.5423	1.9476	7295.79	3627.04	26.4339
15	24.8511	2.96381	7488.43	3722.81	26.4339
16	27.1599	4.10471	7493.31	3725.24	26.4339
17	29.4687	5.37892	7333.38	3645.73	26.4339
18	31.7775	6.79697	7034.09	3496.94	26.4339
19	34.0863	8.37197	6473.18	3218.09	26.4339
20	36.3951	10.1204	5582.06	2775.08	26.4339
21	38.7039	12.0635	4607.82	2290.74	26.4339

22	40.9927	14.209	3426.25	1703.33	26.4339
23	43.2815	16.6097	2285.52	1136.23	26.4339
24	45.5702	19.3167	1277.45	635.074	26.4339
25	47.859	22.4063	427.58	212.568	26.4339
26	50.1478	26	0	0	0

List Of Coordinates

Line Load

X	Y
62.156	26
43	26

Line Load

X	Y
43.0223	26
37	26

Line Load

X	Y
31	18
25	16.5
23	16.5

Line Load

X	Y
19	8.5
13	7
11	7

External Boundary

X	Y
-16	-20
98	-20
98.005	27.116
72	23
62.156	26
37	26
35	26
31	18
25	16.5
23	16.5

19	8.5
13	7
11	7
9.27164	3.54328
8	1
0	0
-16	-4

Material Boundary

X	Y
8	1
8	0
12	0
12.4935	3.45431
13	7

Material Boundary

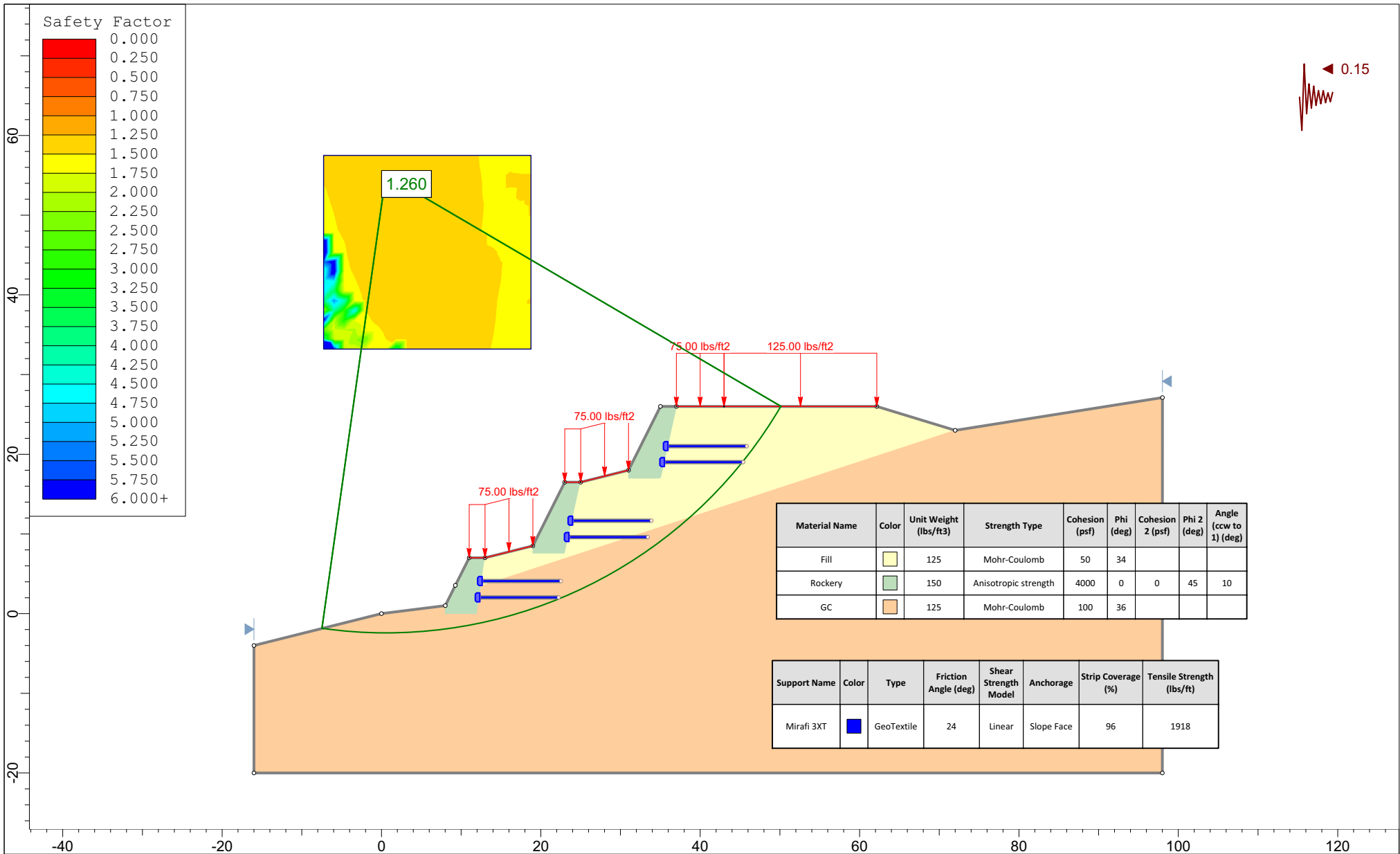
X	Y
19	8.5
19	7.5
23	7.5
25	16.5


Material Boundary

X	Y
31	18
31	17
35	17
37	26

Material Boundary

X	Y
12.4935	3.45431
72	23



	Project			Powder Mountain - Max Section - Pseudo Static		
	Analysis Description			Spencer's		
	Drawn By	Justin W	Scale	1:200	Company	IGES, Inc
	Date	10/28/13	File Name	25H P-Static.slim		

Slide Analysis Information
Powder Mountain - Max Section - Pseudo Static

Project Summary

- File Name: 25H P-Static
- Slide Modeler Version: 6.025
- Project Title: Powder Mountain - Max Section - Pseudo Static
- Analysis: Spencer's
- Author: Justin W
- Company: IGES, Inc
- Date Created: 10/28/13

General Settings

- Units of Measurement: Imperial Units
- Time Units: seconds
- Permeability Units: feet/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check $m\alpha < 0.2$: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 62.4 lbs/ft3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Grid Search
- Radius Increment: 10
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined

- Minimum Depth: Not Defined

Loading

- Seismic Load Coefficient (Horizontal): 0.15
- 4 Distributed Loads present

Distributed Load 1

Distribution: Constant
Magnitude [psf]: 125
Orientation: Normal to boundary

Distributed Load 2

Distribution: Constant
Magnitude [psf]: 75
Orientation: Normal to boundary




Distributed Load 3

Distribution: Constant
Magnitude [psf]: 75
Orientation: Vertical

Distributed Load 4

Distribution: Constant
Magnitude [psf]: 75
Orientation: Vertical

Material Properties

Property	Fill	Rockery	GC
Color			
Strength Type	Mohr-Coulomb	Anisotropic strength	Mohr-Coulomb
Unit Weight [lbs/ft3]	125	150	125
Cohesion [psf]	50		100
Friction Angle [deg]	34		36
Cohesion 1 [psf]		4000	
Cohesion 2 [psf]		0	
Friction Angle 1 [deg]		0	
Friction Angle 2 [deg]		45	
Angle from 1 [deg]		10	
Water Surface	None	None	None
Ru Value	0	0	0

Support Properties

Mirafi 3XT

Support Type: GeoTextile
Force Application: Passive
Force Orientation: Bisector of Parallel and Tangent
Anchorage: Slope Face

Shear Strength Model: Linear
 Strip Coverage: 96 percent
 Tensile Strength: 1918 lb/ft
 Pullout Strength Adhesion: 0 psf
 Pullout Strength Friction Angle: 24 degrees

Global Minimums

Method: spencer
 FS: 1.259510
 Center: 0.539, 55.069
 Radius: 57.498
 Left Slip Surface Endpoint: -7.472, -1.868
 Right Slip Surface Endpoint: 50.148, 26.000
 Resisting Moment=2.61663e+006 lb-ft
 Driving Moment=2.0775e+006 lb-ft
 Resisting Horizontal Force=39926.5 lb
 Driving Horizontal Force=31700 lb
 Total Slice Area=464.539 ft2

Valid / Invalid Surfaces

Method: spencer
 Number of Valid Surfaces: 3585
 Number of Invalid Surfaces: 1266

Error Codes:

Error Code -106 reported for 11 surfaces
 Error Code -108 reported for 383 surfaces
 Error Code -111 reported for 872 surfaces

Error Codes

The following errors were encountered during the computation:
 -106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
 -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
 -111 = safety factor equation did not converge

Slice Data

• Global Minimum Query (spencer) - Safety Factor: 1.25951

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.3088	123.317	GC	100	36	205.17	258.414	218.038	0	218.038
2	2.3088	356.367	GC	100	36	288.819	363.771	363.049	0	363.049
3	2.3088	562.38	GC	100	36	348.511	438.953	466.529	0	466.529
4	2.3088	717.262	GC	100	36	380.856	479.692	522.6	0	522.6
5	2.3088	788.684	GC	100	36	380.752	479.561	522.421	0	522.421
6	2.3088	830.927	GC	100	36	371.338	467.704	506.101	0	506.101
7	2.3088	930.955	GC	100	36	379.517	478.005	520.281	0	520.281

8	2.3088	2102.29	GC	100	36	677.934	853.865	1037.61	0	1037.61
9	2.3088	2639.9	GC	100	36	827.916	1042.77	1297.61	0	1297.61
10	2.3088	2329.2	GC	100	36	709.62	893.774	1092.54	0	1092.54
11	2.3088	2314.56	GC	100	36	669.456	843.187	1022.91	0	1022.91
12	2.3088	2504.86	GC	100	36	653.804	823.473	995.774	0	995.774
13	2.3088	3732.37	GC	100	36	853.33	1074.78	1341.67	0	1341.67
14	2.3088	4348.5	GC	100	36	959.143	1208.05	1525.1	0	1525.1
15	2.3088	3816.06	GC	100	36	820.483	1033.41	1284.72	0	1284.72
16	2.3088	3632.54	GC	100	36	746.648	940.411	1156.73	0	1156.73
17	2.3088	3511.3	GC	100	36	677.05	852.751	1036.07	0	1036.07
18	2.3088	4401.77	GC	100	36	758.411	955.226	1177.12	0	1177.12
19	2.3088	5119.93	GC	100	36	820.595	1033.55	1284.92	0	1284.92
20	2.3088	4323.05	GC	100	36	682.838	860.041	1046.11	0	1046.11
21	2.28877	3680.27	Fill	50	34	501.185	631.247	861.734	0	861.734
22	2.28877	3029.94	Fill	50	34	396.818	499.796	666.849	0	666.849
23	2.28877	2299.3	Fill	50	34	305.62	384.931	496.557	0	496.557
24	2.28877	1470.11	Fill	50	34	201.495	253.785	302.125	0	302.125
25	2.28877	514.079	Fill	50	34	102.123	128.625	116.567	0	116.567

Interslice Data

• Global Minimum Query (spencer) - Safety Factor: 1.25951

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	-7.47209	-1.86802	0	0	0
2	-5.16329	-2.14541	515.949	330.547	32.646
3	-2.85449	-2.32866	1196.23	766.373	32.6459
4	-0.545689	-2.41868	1958.96	1255.03	32.6461
5	1.76311	-2.4159	2729.74	1748.83	32.646
6	4.07191	-2.32031	3441.08	2204.56	32.646
7	6.38071	-2.13144	4078.69	2613.05	32.646
8	8.68952	-1.84837	4668.49	2990.91	32.646
9	10.9983	-1.46969	5526.32	3540.49	32.646
10	13.3071	-0.993442	6424.94	4116.19	32.646
11	15.6159	-0.41713	7085.22	4539.2	32.646
12	17.9247	0.262407	7589.44	4862.24	32.646
13	20.2335	1.04906	7940.74	5087.3	32.646
14	22.5423	1.9476	8146.63	5219.21	32.646
15	24.8511	2.96381	8160.27	5227.95	32.646
16	27.1599	4.10471	8017.52	5136.49	32.646
17	29.4687	5.37892	7723.57	4948.17	32.646
18	31.7775	6.79697	7291.73	4671.51	32.646
19	34.0863	8.37197	6529.51	4183.19	32.646
20	36.3951	10.1204	5410.57	3466.33	32.646

21	38.7039	12.0635	4306.9	2759.25	32.646
22	40.9927	14.209	3053.7	1956.38	32.646
23	43.2815	16.6097	1907.08	1221.79	32.6461
24	45.5702	19.3167	986.881	632.253	32.646
25	47.859	22.4063	294.377	188.595	32.646
26	50.1478	26	0	0	0

List Of Coordinates

Line Load

X	Y
62.156	26
43	26

Line Load

X	Y
42.9819	26
37	26

Line Load

X	Y
31	18
25	16.5
23	16.5

Line Load

X	Y
19	8.5
13	7
11	7

External Boundary

X	Y
-16	-20
98	-20
98.005	27.116
72	23
62.156	26
37	26
35	26
31	18
25	16.5

23	16.5
19	8.5
13	7
11	7
9.27164	3.54328
8	1
0	0
-16	-4

Material Boundary

X	Y
8	1
8	0
12	0
12.4935	3.45431
13	7

Material Boundary

X	Y
19	8.5
19	7.5
23	7.5
25	16.5

Material Boundary

X	Y
31	18
31	17
35	17
37	26

Material Boundary

X	Y
12.4935	3.45431
72	23