X	Y
338.805	283.627
338.452	283.693
336.164	283.577
332.706	281.825
330.396	281.742
326.395	283.741
303.057	284
298.535	275
288.545	255.121
287.934	255.121
283.141	255.464
271.516	253.25
267.921	252.566
263.085	252.893
257.823	252.384
245.177	254.596
231.415	256.663
214.366	258.632
205.363	259.636
190.193	260.85
171.476	262.294
149.371	263.956
131.973	264.299
115.73	264.375
93.3949	264.373
63.3936	264.373
39.1526	264.403
21.634	264.404
0	264.404
0	160
684.38	160
684.38	172.23
684.38	176.23
684.38	290
684.38	308.847
684.38	312.847
509.3	304.105
455.845	298.606
439.873	296.639
433.123	295.808
418.604	293.886
383.449	289.233
345.484	284.177
341.396	283.633

Material Boundary

X	Y
350.751	282.423
358.504	279.862
405.071	264.481
684.38	172.23

Material Boundary

X	Y
365.835	281.44
409.442	267.038
684.38	176.23

Material Boundary

X	Y
358.504	279.862
365.835	281.44
383.449	285.233
387.014	286
418.604	293.886

Material Boundary

X	Y
287.514	253.183
303.412	255.284
317.441	255.742
327.532	256.071
331.114	256.204
394.947	258.56
405.071	264.481
409.442	267.038
423.315	275.152
447.48	288.459
456.447	286.407
466.701	291.266
495.498	289.061
500.784	286.547
537.312	286.363
552.089	294.063
584.318	294.638
588.434	293.38
593.115	290.081
597.227	287.154
605.644	285.815
621.904	294.92
636.67	295.489
647.141	300.993
684.38	290

Material Boundary

X	Y
287.514	253.183
314.068	253.183
317.441	255.742

Material Boundary

X	Y
314.068	253.183
325.655	253.183
327.532	256.071

Material Boundary

X	Y
325.655	253.183
328.748	253.183
331.114	256.204

Material Boundary

X	Y
271.516	253.25
273.485	253.232
277.371	253.148
280.907	253.072
281.897	252.998
284.425	252.81
285.256	252.88
286.65	253.033
287.514	253.183
287.981	254
288.545	255.121

Material Boundary

X	Y
338.805	283.627
347.395	282
349.898	282
350.751	282.423
351.623	282.855
352.272	282.724
352.962	282.934
353.586	282.812
356.795	283.494
383.449	289.233

Material Boundary

X	Y
439.873	296.639
509.3	300.105
684.38	308.847

Material Boundary

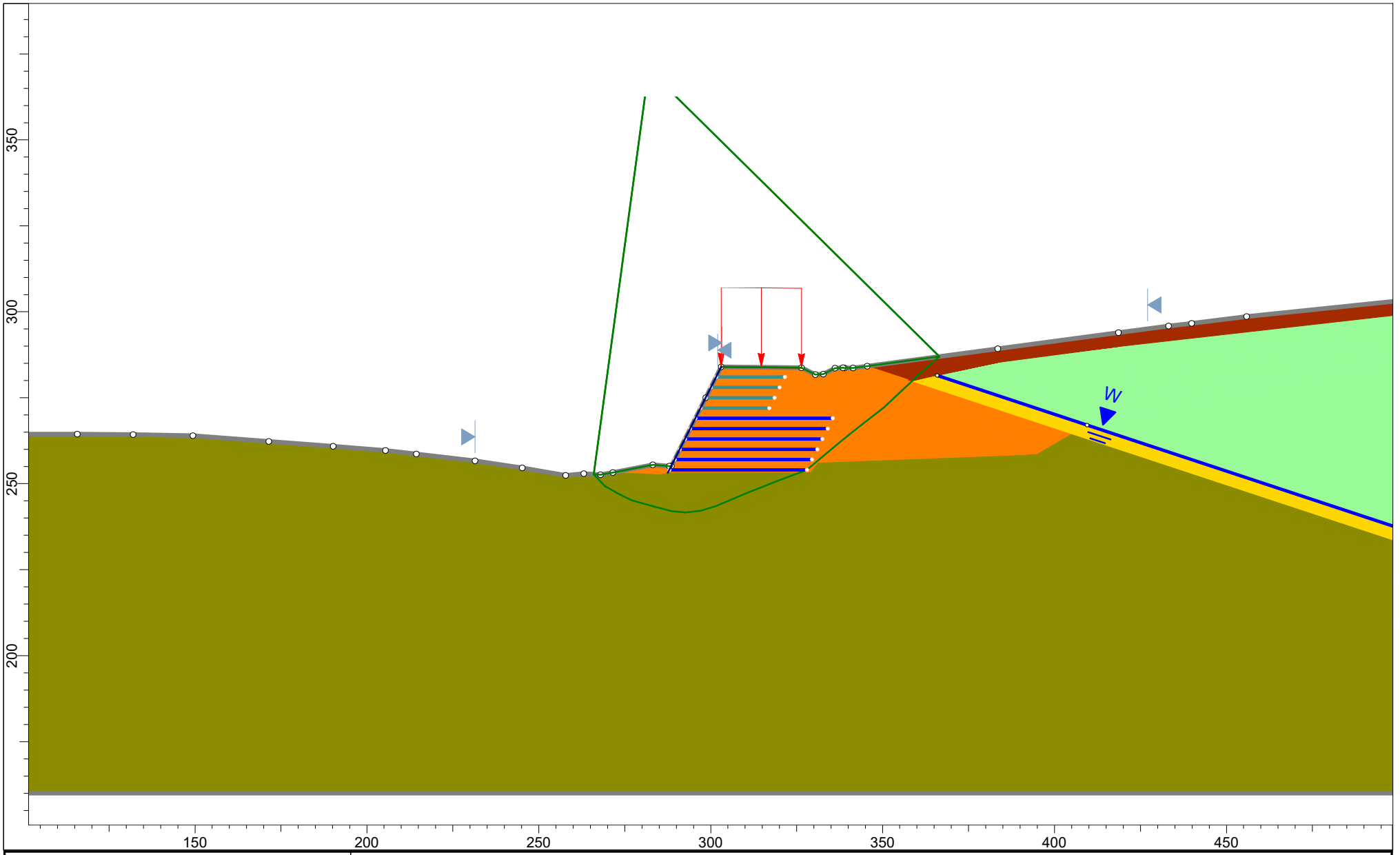
X	Y
357.552	280.177
383.449	285.233
418.604	289.886
509.3	300.105

Material Boundary

X	Y
365.391	281.44
365.835	281.44

Material Boundary

X	Y
345.484	284.177
350.751	282.423



Dunn Mine and C&D Facility S.A. Dunn & Company, LLC Rensselaer, New York		
Station 03+30 Static		
	Scale: 1:462	PREPARED BY: Civil & Environmental Consultants, Inc.
Date: 5/17/2021		File Name: Station 03+30 Static.slim

SLIDEINTERPRET 9.009

Slide Analysis Information

Project Summary

Slide Modeler Version:	9.009
Compute Time:	00h:00m:09.323s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	GLE/Morgenstern-Price with interslice force function (Half Sine)
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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

Surface Options

Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Number of vertices per surface:	12
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.075

Loading

1 Distributed Load present

Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	250
Orientation:	Vertical

Materials

C&D Waste	
Color	
Strength Type	Shear Normal function
Unit Weight [lbs/ft3]	60
Water Surface	None
Ru Value	0
Bottom Liner	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	118.5
Cohesion [psf]	67
Friction Angle [deg]	17.4
Water Surface	Water Table
Hu Value	Automatically Calculated
Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Final Cover System	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	119.9
Cohesion [psf]	0
Friction Angle [deg]	27
Water Surface	None
Ru Value	0
New Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	100
Friction Angle [deg]	30
Water Surface	None
Ru Value	0

Shear Normal Functions

Name: C&D

Normal (psf)	Shear (psf)
0	0
2000	1400
10000	6169

Support

Type 1	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	1900
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Type 2	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	3900
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Global Minimums

Method: gle/morgenstern-price

FS	1.540800
Axis Location:	285.278, 382.680
Left Slip Surface Endpoint:	264.809, 252.776
Right Slip Surface Endpoint:	376.920, 288.363
Resisting Moment:	2.02102e+07 lb-ft
Driving Moment:	1.31166e+07 lb-ft
Resisting Horizontal Force:	138095 lb
Driving Horizontal Force:	89625.1 lb
Total Slice Area:	2129.74 ft2
Surface Horizontal Width:	112.111 ft
Surface Average Height:	18.9968 ft

Global Minimum Coordinates

Method: gle/morgenstern-price

X	Y
264.809	252.776
269.717	248.822
273.559	246.896
277.083	245.741
280.607	244.761
285.15	243.717
289.491	242.762
294.18	242.577
298.869	243.685
303.706	245.531
308.583	247.523
313.46	249.345
318.307	251
323.153	252.485
327.976	253.996
332.797	256.736
337.618	259.845
341.134	262.41
344.604	264.958
348.075	267.385
351.096	269.392
354.458	271.668
358.95	274.553
363.442	277.331
367.935	281.07
372.427	284.718
376.92	288.363

Global Minimum Support Data

Method: gle/morgenstern-price

Number of Supports: 10

Type 1

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
297.027, 272	20	Not Effective	Not Effective	Not Effective	Not Effective	0
298.535, 275	20	Not Effective	Not Effective	Not Effective	Not Effective	0

Type 2

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
295.519, 269	40	Not Effective	Not Effective	Not Effective	Not Effective	0
294.012, 266	40	Not Effective	Not Effective	Not Effective	Not Effective	0
292.504, 263	40	Not Effective	Not Effective	Not Effective	Not Effective	0
290.997, 260	40	Not Effective	Not Effective	Not Effective	Not Effective	0
289.489, 257	40	Not Effective	Not Effective	Not Effective	Not Effective	0
287.981, 254	40	Not Effective	Not Effective	Not Effective	Not Effective	0

Type 1

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
300.042, 278	20	Not Effective	Not Effective	Not Effective	Not Effective	0
301.55, 281	20	Not Effective	Not Effective	Not Effective	Not Effective	0

Valid and Invalid Surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	3086
Number of Invalid Surfaces:	15925

Error Codes

Error Code -105 reported for 2128 surfaces
Error Code -108 reported for 3 surfaces
Error Code -109 reported for 2 surfaces
Error Code -110 reported for 754 surfaces
Error Code -111 reported for 101 surfaces
Error Code -113 reported for 12931 surfaces
Error Code -123 reported for 6 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.

-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).

-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

-113 = Surface intersects outside slope limits.

-123 = Surface radius equal or less than the internal cutoff of 0.01.

Slice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.5408

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.45419	266.726	-38.8594	Subgrade	0	30	62.3049	95.9994	166.276	0	166.276	116.075	116.075
2	2.45419	850.15	-38.8594	Subgrade	0	30	217.654	335.362	580.864	0	580.864	405.494	405.494
3	1.9206	1094.87	-26.6256	Subgrade	0	30	312.74	481.87	834.623	0	834.623	677.84	677.84
4	1.9206	1401.06	-26.6256	Subgrade	0	30	420.607	648.071	1122.49	0	1122.49	911.635	911.635
5	1.76204	1522.37	-18.1486	Subgrade	0	30	459.838	708.518	1227.19	0	1227.19	1076.46	1076.46
6	1.76204	1715.44	-18.1486	Subgrade	0	30	535.385	824.921	1428.81	0	1428.81	1253.31	1253.31
7	3.52409	3973.09	-15.5449	Subgrade	0	30	625.589	963.907	1669.54	0	1669.54	1495.52	1495.52
8	2.27179	2916.4	-12.937	Subgrade	0	30	715.421	1102.32	1909.27	0	1909.27	1744.94	1744.94
9	2.27179	3113.14	-12.937	Subgrade	0	30	790.057	1217.32	2108.46	0	2108.46	1926.98	1926.98
10	2.17031	3063.88	-12.4061	Subgrade	0	30	835.475	1287.3	2229.67	0	2229.67	2045.88	2045.88
11	2.17031	3265.13	-12.4061	Subgrade	0	30	914.337	1408.81	2440.14	0	2440.14	2239	2239
12	2.34461	4676.4	-2.25668	Subgrade	0	30	1004.23	1547.32	2680.03	0	2680.03	2640.46	2640.46
13	2.34461	6015.06	-2.25668	Subgrade	0	30	1275.51	1965.31	3404.01	0	3404.01	3353.75	3353.75
14	2.34435	7261.89	13.2957	Subgrade	0	30	1197.81	1845.58	3196.65	0	3196.65	3479.7	3479.7
15	2.34435	8418.41	13.2957	Subgrade	0	30	1367.29	2106.72	3648.94	0	3648.94	3972.04	3972.04
16	2.41862	9846.18	20.8881	Subgrade	0	30	1364.19	2101.94	3640.66	0	3640.66	4161.27	4161.27
17	2.41862	10924.6	20.8881	Subgrade	0	30	1513.52	2332.03	4039.19	0	4039.19	4616.79	4616.79
18	2.43855	11105.2	22.2175	Subgrade	0	30	1539.81	2372.54	4109.38	0	4109.38	4738.31	4738.31
19	2.43855	10805.8	22.2175	Subgrade	0	30	1489.06	2294.35	3973.92	0	3973.92	4582.13	4582.13
20	2.43853	10518.8	20.4872	Subgrade	0	30	1481.7	2283	3954.28	0	3954.28	4507.88	4507.88
21	2.43853	10244.2	20.4872	Subgrade	0	30	1435.76	2212.22	3831.67	0	3831.67	4368.12	4368.12
22	2.42329	9919.58	18.848	Subgrade	0	30	1430.29	2203.79	3817.08	0	3817.08	4305.32	4305.32
23	2.42329	9671.2	18.848	Subgrade	0	30	1388.27	2139.04	3704.92	0	3704.92	4178.82	4178.82
24	2.42327	9435.05	17.0373	Subgrade	0	30	1389.73	2141.3	3708.85	0	3708.85	4134.72	4134.72
25	2.42327	9211.29	17.0373	Subgrade	0	30	1350.59	2080.99	3604.38	0	3604.38	4018.26	4018.26
26	2.22623	8263.04	17.3996	Subgrade	0	30	1304.93	2010.63	3482.52	0	3482.52	3891.45	3891.45
27	2.59609	9318.84	17.3996	New Fill	100	30	1274.35	1963.52	3227.71	0	3227.71	3627.06	3627.06
28	2.53982	8411.82	29.6119	New Fill	100	30	943.03	1453.02	2343.5	0	2343.5	2879.48	2879.48
29	1.39589	4344.2	29.6119	Subgrade	0	30	822.066	1266.64	2193.88	0	2193.88	2661.11	2661.11
30	0.885618	2691.85	29.6119	New Fill	100	30	865.992	1334.32	2137.91	0	2137.91	2630.1	2630.1
31	2.41071	7222.86	32.8086	New Fill	100	30	812.902	1252.52	1996.23	0	1996.23	2520.28	2520.28
32	2.41071	7068.86	32.8086	New Fill	100	30	797.326	1228.52	1954.66	0	1954.66	2468.67	2468.67
33	1.75768	4886.88	36.1182	New Fill	100	30	722.553	1113.31	1755.1	0	1755.1	2282.35	2282.35
34	1.75768	4611.08	36.1182	New Fill	100	30	686.373	1057.56	1658.55	0	1658.55	2159.39	2159.39
35	3.47068	8390.68	36.2855	New Fill	100	30	638.346	983.564	1530.38	0	1530.38	1999.04	1999.04
36	1.73533	3875.54	34.9637	New Fill	100	30	609.102	938.504	1452.33	0	1452.33	1878.25	1878.25
37	1.73533	3670.84	34.9637	New Fill	100	30	582.534	897.568	1381.43	0	1381.43	1788.77	1788.77
38	3.02089	5921.04	33.5978	New Fill	100	30	557.77	859.412	1315.34	0	1315.34	1685.89	1685.89
39	3.36194	5896.41	34.1031	New Fill	100	30	506.656	780.655	1178.93	0	1178.93	1522	1522
40	2.24608	3538.5	32.7089	New Fill	100	30	473.235	729.161	1089.74	0	1089.74	1393.65	1393.65
41	2.24608	3230.02	32.7089	New Fill	100	30	440.095	678.098	1001.3	0	1001.3	1283.93	1283.93
42	2.24612	2926.28	31.7275	New Fill	100	30	411.394	633.876	924.702	0	924.702	1179.06	1179.06
43	2.24612	2628.5	31.7275	New Fill	100	30	377.729	582.005	834.856	0	834.856	1068.4	1068.4
44	0.774189	829.279	39.7731	New Fill	100	30	323.029	497.723	688.877	0	688.877	957.757	957.757
45	3.44039	3028.38	39.7731	Bottom Liner	67	17.4	151.483	233.405	643.518	112.519	530.999	769.608	657.089
46	0.277827	191.215	39.7731	C&D Waste	0	34.992	209.278	322.456	460.652	0	460.652	634.85	634.85
47	1.37824	896.244	39.0776	C&D Waste	0	34.992	200.744	309.307	441.867	0	441.867	604.878	604.878
48	3.11415	1532.41	39.0776	Final Cover System	0	27	120.108	185.063	363.207	0	363.207	460.739	460.739
49	2.24619	615.465	39.0565	Final Cover System	0	27	68.8019	106.01	208.056	0	208.056	263.883	263.883
50	2.24619	205.155	39.0565	Final Cover System	0	27	23.4303	36.1014	70.8531	0	70.8531	89.8648	89.8648

Interslice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.5408

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	264.809	252.776	0	0	0
2	267.263	250.799	461.7	18.1444	2.25052
3	269.717	248.822	2080.71	163.154	4.48354
4	271.638	247.859	3402.85	370.137	6.20781
5	273.559	246.896	5186.37	719.959	7.90315
6	275.321	246.318	6591.24	1094.35	9.42688
7	277.083	245.741	8231.2	1587.3	10.9149
8	280.607	244.761	11774.5	2884.53	13.7653
9	282.879	244.239	14177.4	3932.25	15.5019
10	285.15	243.717	16839.1	5196.81	17.151
11	287.321	243.239	19487	6573.14	18.6397
12	289.491	242.762	22391.5	8167.41	20.0397
13	291.836	242.67	24642.9	9681.87	21.4492
14	294.18	242.577	27496.8	11530.1	22.7495
15	296.524	243.131	27989.4	12425.8	23.9387
16	298.869	243.685	28541.9	13319.3	25.0165
17	301.287	244.608	27742.5	13537.6	26.0111
18	303.706	245.531	26855.6	13617.2	26.8874
19	306.145	246.527	25684.6	13456.9	27.6513
20	308.583	247.523	24547.2	13215.2	28.2962
21	311.022	248.434	23768.7	13079.4	28.823
22	313.46	249.345	23010.5	12877.3	29.2326
23	315.884	250.173	22574.9	12784.9	29.5243
24	318.307	251	22149	12634.3	29.7014
25	320.73	251.742	22054.9	12612.9	29.7647
26	323.153	252.485	21960.3	12533.1	29.7141
27	325.38	253.183	21816.1	12376.7	29.5671
28	327.976	253.996	21799.6	12220.3	29.2739
29	330.516	255.44	20181	11121.8	28.8593
30	331.911	256.233	19262.1	10492.2	28.5774
31	332.797	256.736	18751.1	10129.6	28.3785
32	335.208	258.291	17066.7	8982.45	27.7585
33	337.618	259.845	15420.9	7864.85	27.0221
34	339.376	261.127	14073.3	6989.59	26.4116
35	341.134	262.41	12806.7	6174.02	25.7384
36	344.604	264.958	10493.3	4721.38	24.225
37	346.34	266.171	9497.32	4105.22	23.3764
38	348.075	267.385	8556.59	3538.47	22.4669
39	351.096	269.392	7157.72	2710.31	20.7394
40	354.458	271.668	5735.04	1930.76	18.6063
41	356.704	273.111	4960.68	1522.51	17.0621
42	358.95	274.553	4262.6	1176.29	15.4272
43	361.196	275.942	3683.01	898.298	13.707
44	363.442	277.331	3174.92	669.538	11.9082
45	364.217	277.975	2918.89	581.741	11.2715
46	367.657	280.839	1370.08	201.099	8.35019
47	367.935	281.07	1307.36	186.26	8.10838
48	369.313	282.189	1022.29	123.675	6.89803
49	372.427	284.718	362.92	26.059	4.107
50	374.673	286.54	92.0997	3.31311	2.06022
51	376.92	288.363	0	0	0

Entity Information

Water Table

X	Y
365.835	281.44
409.442	267.038
684.38	176.23

Distributed Load

X	Y
303.057	284
326.395	283.741

External Boundary

X	Y
338.805	283.627
338.452	283.693
336.164	283.577
332.706	281.825
330.396	281.742
326.395	283.741
303.057	284
298.535	275
288.545	255.121
287.934	255.121
283.141	255.464
271.516	253.25
267.921	252.566
263.085	252.893
257.823	252.384
245.177	254.596
231.415	256.663
214.366	258.632
205.363	259.636
190.193	260.85
171.476	262.294
149.371	263.956
131.973	264.299
115.73	264.375
93.3949	264.373
63.3936	264.373
39.1526	264.403
21.634	264.404
0	264.404
0	160
684.38	160
684.38	172.23
684.38	176.23
684.38	290
684.38	308.847
684.38	312.847
509.3	304.105
455.845	298.606
439.873	296.639
433.123	295.808
418.604	293.886
383.449	289.233
345.484	284.177
341.396	283.633

Material Boundary

X	Y
350.751	282.423
358.504	279.862
405.071	264.481
684.38	172.23

Material Boundary

X	Y
365.835	281.44
409.442	267.038
684.38	176.23

Material Boundary

X	Y
358.504	279.862
365.835	281.44
383.449	285.233
387.014	286
418.604	293.886

Material Boundary

X	Y
287.514	253.183
303.412	255.284
317.441	255.742
327.532	256.071
331.114	256.204
394.947	258.56
405.071	264.481
409.442	267.038
423.315	275.152
447.48	288.459
456.447	286.407
466.701	291.266
495.498	289.061
500.784	286.547
537.312	286.363
552.089	294.063
584.318	294.638
588.434	293.38
593.115	290.081
597.227	287.154
605.644	285.815
621.904	294.92
636.67	295.489
647.141	300.993
684.38	290

Material Boundary

X	Y
287.514	253.183
314.068	253.183
317.441	255.742

Material Boundary

X	Y
314.068	253.183
325.655	253.183
327.532	256.071

Material Boundary

X	Y
325.655	253.183
328.748	253.183
331.114	256.204

Material Boundary

X	Y
271.516	253.25
273.485	253.232
277.371	253.148
280.907	253.072
281.897	252.998
284.425	252.81
285.256	252.88
286.65	253.033
287.514	253.183
287.981	254
288.545	255.121

Material Boundary

X	Y
338.805	283.627
347.395	282
349.898	282
350.751	282.423
351.623	282.855
352.272	282.724
352.962	282.934
353.586	282.812
356.795	283.494
383.449	289.233

Material Boundary

X	Y
439.873	296.639
509.3	300.105
684.38	308.847

Material Boundary

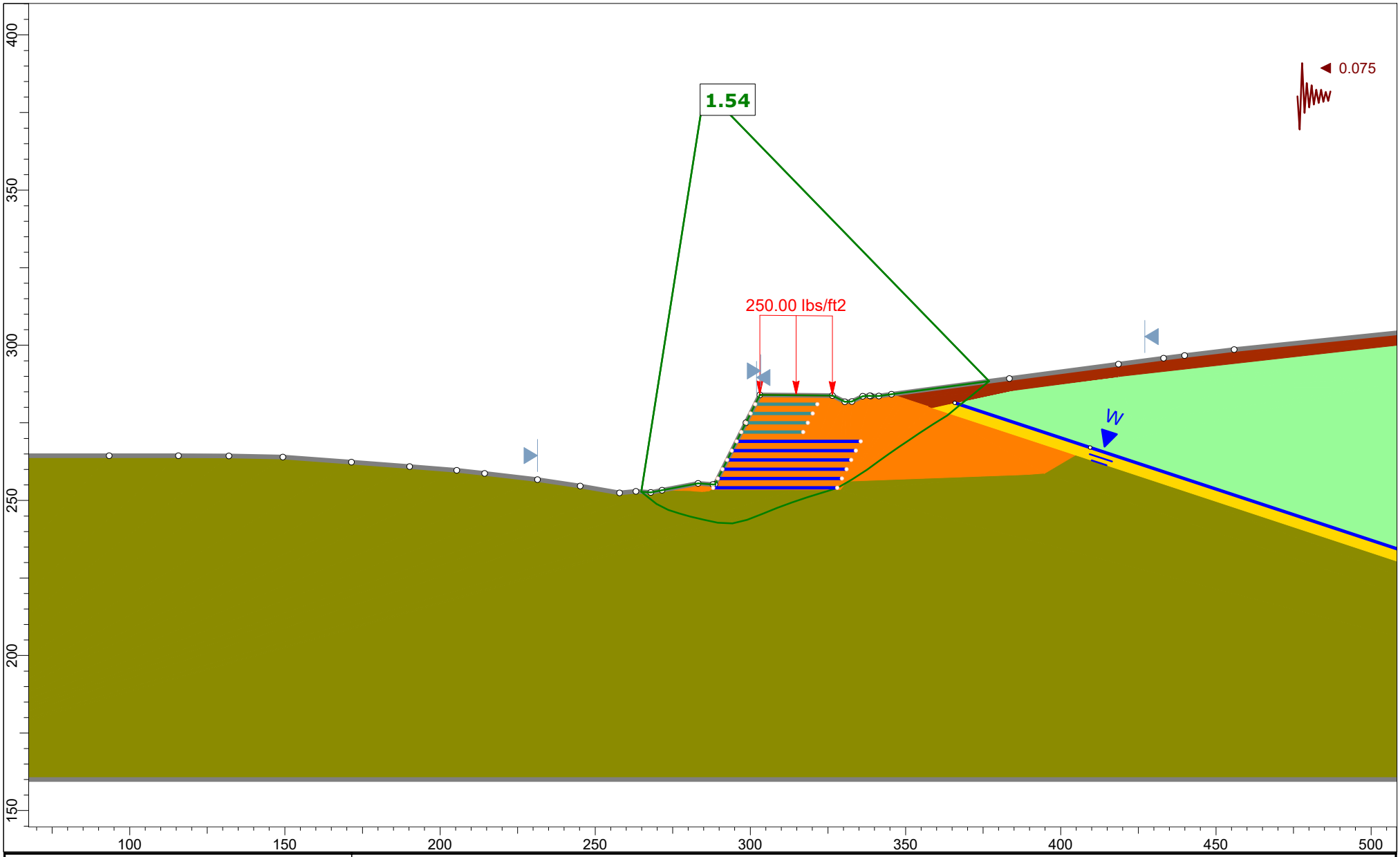
X	Y
357.552	280.177
383.449	285.233
418.604	289.886
509.3	300.105

Material Boundary

X	Y
365.391	281.44
365.835	281.44

Material Boundary

X	Y
345.484	284.177
350.751	282.423



Dunn Mine and C&D Facility
S.A. Dunn & Company, LLC
Rensselaer, New York

Station 03+30 Seismic

Scale: 1:513

PREPARED BY: Civil & Environmental Consultants, Inc.

Date: 5/17/2021

File Name: Station 03+30 Seismic.slim

SLIDEINTERPRET 9.009

Slide Analysis Information

Project Summary

Slide Modeler Version:	9.009
Compute Time:	00h:00m:30.445s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	GLE/Morgenstern-Price with interslice force function (Half Sine)
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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

Surface Options

Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Number of vertices per surface:	12
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Loading

1 Distributed Load present

Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	250
Orientation:	Vertical

Materials

C&D Waste	
Color	
Strength Type	Shear Normal function
Unit Weight [lbs/ft3]	60
Water Surface	None
Ru Value	0
Bottom Liner	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	118.5
Cohesion [psf]	67
Friction Angle [deg]	17.4
Water Surface	Water Table
Hu Value	Automatically Calculated
Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Final Cover System	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.4
Cohesion [psf]	0
Friction Angle [deg]	27
Water Surface	None
Ru Value	0
New Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	100
Friction Angle [deg]	30
Water Surface	None
Ru Value	0

Shear Normal Functions

Name: C&D

Normal (psf)	Shear (psf)
0	0
2000	1400
10000	6169

Support

Type 1	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	1900
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Type 2	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	3900
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Type 3	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	8400
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Global Minimums

Method: gle/morgenstern-price

FS	1.522870
Axis Location:	98.021, 295.066
Left Slip Surface Endpoint:	116.762, 226.615
Right Slip Surface Endpoint:	164.026, 268.988
Resisting Moment:	3.79577e+06 lb-ft
Driving Moment:	2.49251e+06 lb-ft
Resisting Horizontal Force:	40606.6 lb
Driving Horizontal Force:	26664.5 lb
Active Support Moment:	-2.09187e+06 lb-ft
Active Horizontal Support Force:	-28791.7 lb
Maximum Single Support Force:	3900 lb
Total Support Force:	31384.9 lb
Total Slice Area:	776.53 ft2
Surface Horizontal Width:	47.2641 ft
Surface Average Height:	16.4296 ft

Global Minimum Coordinates

Method: gle/morgenstern-price

X	Y
116.762	226.615
118.158	226.956
119.553	227.253
120.949	227.501
122.301	227.724
125.252	228.815
127.419	229.93
128.73	230.824
129.916	231.591
131.107	232.32
132.297	233.007
134.005	234.481
135.71	236.003
137.415	238.048
139.208	240.137
141.001	242.163
142.673	243.994
144.345	246.01
146.017	248.021
147.381	249.656
148.745	251.288
149.838	252.557
150.934	253.792
152.031	254.989
153.244	256.272
155.279	258.35
156.406	259.462
157.665	260.979
158.729	262.335
159.788	263.648
160.848	264.925
161.907	266.164
162.966	267.449
164.026	268.988

Global Minimum Support Data

Method: gle/morgenstern-price

Number of Supports: 20

Type 2

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
119.957, 233.01	40	12.3437	27.6563	12.3437	27.6563	3900
121.456, 236.01	40	14.2596	25.7404	14.2596	25.7404	3900
122.955, 239.01	40	15.285	24.715	15.285	24.715	3900
124.454, 242.01	40	16.411	23.589	16.411	23.589	3900
125.953, 245.01	40	17.5624	22.4376	17.5624	22.4376	3900
127.452, 248.01	40	18.5562	21.4438	18.5562	21.4438	3900
128.951, 251.01	40	19.5615	20.4385	19.5615	20.4385	3900
118.458, 230.01	40	9.07784	30.9222	9.07784	30.9222	3900

Type 1

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
130.45, 254.01	20	Not Effective	Not Effective	Not Effective	Not Effective	0
131.949, 257.01	20	Not Effective	Not Effective	Not Effective	Not Effective	0
133.448, 260.01	20	Not Effective	Not Effective	Not Effective	Not Effective	0
134.947, 263.01	20	Not Effective	Not Effective	Not Effective	Not Effective	0
136.446, 266.01	20	Not Effective	Not Effective	Not Effective	Not Effective	0
137.945, 269.01	20	Not Effective	Not Effective	Not Effective	Not Effective	0

Type 3

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
110.958, 215	70	Not Effective	Not Effective	Not Effective	Not Effective	0
109.459, 212	70	Not Effective	Not Effective	Not Effective	Not Effective	0
112.457, 218	70	Not Effective	Not Effective	Not Effective	Not Effective	0
113.956, 221	70	Not Effective	Not Effective	Not Effective	Not Effective	0
115.455, 224	70	Not Effective	Not Effective	Not Effective	Not Effective	0
116.954, 227	70	1.41096	68.589	1.41096	68.589	184.933

Valid and Invalid Surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	8617
Number of Invalid Surfaces:	10403

Error Codes

Error Code -105 reported for 1475 surfaces
Error Code -108 reported for 7 surfaces
Error Code -110 reported for 76 surfaces
Error Code -111 reported for 98 surfaces
Error Code -113 reported for 8747 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

-113 = Surface intersects outside slope limits.

Slice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.52287

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	0.697927	51.358	13.7144	New Fill	100	30	87.0603	132.582	56.4329	0	56.4329	77.6791	77.6791
2	0.697927	154.074	13.7144	New Fill	100	30	141.72	215.821	200.607	0	200.607	235.192	235.192
3	0.697929	257.707	12.0073	New Fill	100	30	206.739	314.836	372.108	0	372.108	416.079	416.079
4	0.697929	362.256	12.0073	New Fill	100	30	265.597	404.469	527.355	0	527.355	583.845	583.845
5	0.697929	467.826	10.0801	New Fill	100	30	333.852	508.413	707.392	0	707.392	766.741	766.741
6	0.697929	574.417	10.0801	New Fill	100	30	400.069	609.253	882.051	0	882.051	953.171	953.171
7	0.675633	657.945	9.38671	New Fill	100	30	471.525	718.071	1070.53	0	1070.53	1148.48	1148.48
8	0.675633	758.516	9.38671	New Fill	100	30	541.055	823.957	1253.93	0	1253.93	1343.37	1343.37
9	1.47549	1979.44	20.2928	New Fill	100	30	547.671	834.031	1271.38	0	1271.38	1473.89	1473.89
10	1.47549	2405.68	20.2928	New Fill	100	30	648.105	986.979	1536.3	0	1536.3	1775.94	1775.94
11	1.08355	2027.9	27.2155	New Fill	100	30	647.305	985.762	1534.18	0	1534.18	1867.07	1867.07
12	1.08355	2237.41	27.2155	New Fill	100	30	696.588	1060.81	1664.18	0	1664.18	2022.41	2022.41
13	0.655603	1451.16	34.2867	New Fill	100	30	1376.68	2096.5	3458.03	0	3458.03	4396.67	4396.67
14	0.655603	1519.22	34.2867	New Fill	100	30	707.391	1077.26	1692.68	0	1692.68	2174.99	2174.99
15	1.18631	2924.96	32.8986	New Fill	100	30	750.182	1142.43	1805.54	0	1805.54	2290.83	2290.83
16	1.19065	3168.6	31.4655	New Fill	100	30	806.293	1227.88	1953.54	0	1953.54	2446.97	2446.97
17	1.19064	3407.89	29.9872	New Fill	100	30	870.6	1325.81	2123.16	0	2123.16	2625.54	2625.54
18	0.853764	2580.32	40.8019	New Fill	100	30	1322.42	2013.88	3314.93	0	3314.93	4456.49	4456.49
19	0.853764	2679.87	40.8019	New Fill	100	30	744.075	1133.13	1789.44	0	1789.44	2431.75	2431.75
20	0.852389	2773.58	41.7536	New Fill	100	30	738.441	1124.55	1774.57	0	1774.57	2433.74	2433.74
21	0.852389	2870.24	41.7536	New Fill	100	30	749.683	1141.67	1804.23	0	1804.23	2473.44	2473.44
22	0.85239	2953.51	50.1899	New Fill	100	30	1075.03	1637.13	2662.39	0	2662.39	3952.22	3952.22
23	0.85239	3023.39	50.1899	New Fill	100	30	632.381	963.034	1494.82	0	1494.82	2253.56	2253.56
24	0.896544	3257.09	49.3555	New Fill	100	30	1115.3	1698.45	2768.59	0	2768.59	4067.79	4067.79
25	0.896544	3249.81	49.3555	New Fill	100	30	687.782	1047.4	1640.95	0	1640.95	2442.14	2442.14
26	0.896544	3142.9	48.4917	New Fill	100	30	679.161	1034.27	1618.21	0	1618.21	2385.64	2385.64
27	0.896544	3032.25	48.4917	New Fill	100	30	1142.65	1740.1	2840.73	0	2840.73	4131.88	4131.88
28	0.836108	2729.58	47.5975	New Fill	100	30	648.403	987.434	1537.08	0	1537.08	2247.11	2247.11
29	0.836108	2636.26	47.5975	New Fill	100	30	629.108	958.049	1486.18	0	1486.18	2175.08	2175.08
30	0.836106	2538.31	50.3214	New Fill	100	30	570.231	868.388	1330.89	0	1330.89	2018.26	2018.26
31	0.836106	2435.73	50.3214	New Fill	100	30	1015	1545.72	2504.05	0	2504.05	3727.56	3727.56
32	0.836108	2333.28	50.252	New Fill	100	30	530.587	808.015	1226.32	0	1226.32	1864.33	1864.33
33	0.836108	2230.94	50.252	New Fill	100	30	955.347	1454.87	2346.71	0	2346.71	3495.47	3495.47
34	0.681972	1743.99	50.1759	New Fill	100	30	489.845	745.97	1118.85	0	1118.85	1706.28	1706.28
35	0.681972	1676.09	50.1759	New Fill	100	30	477.555	727.254	1086.43	0	1086.43	1659.12	1659.12
36	1.36395	3148.81	50.1086	New Fill	100	30	699.607	1065.41	1672.14	0	1672.14	2509.12	2509.12
37	1.09258	2329.39	49.2713	New Fill	100	30	428.853	653.087	957.975	0	957.975	1456.06	1456.06
38	1.09655	2170.58	48.4046	New Fill	100	30	418.126	636.752	929.679	0	929.679	1400.7	1400.7
39	1.09655	2008.05	47.5073	New Fill	100	30	408.058	621.419	903.126	0	903.126	1348.56	1348.56
40	1.21341	2038.62	46.5783	New Fill	100	30	397.598	605.49	875.537	0	875.537	1295.67	1295.67
41	1.01716	1564.88	45.6163	New Fill	100	30	387.988	590.856	850.185	0	850.185	1246.61	1246.61
42	1.01716	1435.87	45.6163	New Fill	100	30	372.71	567.589	809.888	0	809.888	1190.7	1190.7
43	1.12692	1442.82	44.6201	New Fill	100	30	363.254	553.188	784.947	0	784.947	1143.41	1143.41
44	1.25923	1410.35	50.2967	New Fill	100	30	310.392	472.686	645.513	0	645.513	1019.34	1019.34
45	1.06421	1001.18	51.8823	New Fill	100	30	281.114	428.1	568.286	0	568.286	926.577	926.577
46	1.05936	817.656	51.1068	New Fill	100	30	218.639	332.959	403.497	0	403.497	674.525	674.525
47	1.05936	643.808	50.3044	New Fill	100	30	184.142	280.425	312.506	0	312.506	534.341	534.341
48	1.05936	473.748	49.474	New Fill	100	30	155.17	236.303	236.083	0	236.083	417.597	417.597
49	1.05936	299.198	50.4935	New Fill	100	30	117.516	178.962	136.766	0	136.766	279.291	279.291
50	1.05935	105.124	55.4638	New Fill	100	30	67.8351	103.304	5.72277	0	5.72277	104.29	104.29

Interslice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.52287

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	116.762	226.615	0	0	0
2	117.46	226.786	51.1501	2.85636	3.19623
3	118.158	226.956	115.893	12.9296	6.36588
4	118.855	227.104	388.863	64.9587	9.48357
5	119.553	227.253	495.949	110.185	12.526
6	120.251	227.377	641.188	177.491	15.4729
7	120.949	227.501	810.972	268.323	18.3076
8	121.625	227.613	1009.98	386.33	20.9325
9	122.301	227.724	1235.49	535.443	23.4312
10	123.776	228.27	1349.92	730.731	28.4273
11	125.252	228.815	1468.02	945.457	32.783
12	126.335	229.373	1314.5	940.635	35.5869
13	127.419	229.93	1141.94	894.625	38.0761
14	128.074	230.377	4225.48	3475.54	39.438
15	128.73	230.824	3932.62	3382.26	40.6973
16	129.916	231.591	3436.97	3174.98	42.7309
17	131.107	232.32	2973.55	2919.88	44.4782
18	132.297	233.007	2551.38	2638.08	45.9571
19	133.151	233.744	4892.7	5222.09	46.8652
20	134.005	234.481	4209.16	4618.41	47.6544
21	134.857	235.242	3488.35	3919.39	48.3302
22	135.71	236.003	2754.57	3157.54	48.8993
23	136.562	237.026	4479.94	5220.66	49.3665
24	137.415	238.048	3490.22	4120.74	49.7358
25	138.311	239.093	5142.51	6133.29	50.0216
26	139.208	240.137	4045.37	4856.24	50.2049
27	140.104	241.15	3014.92	3629.85	50.2873
28	141.001	242.163	4717.5	5676.12	50.2696
29	141.837	243.079	3852.32	4617.58	50.1627
30	142.673	243.994	3017.61	3592.14	49.9678
31	143.509	245.002	2153.03	2537.26	49.6832
32	144.345	246.01	4007.91	4660.76	49.3069
33	145.181	247.015	3218.62	3681.23	48.8357
34	146.017	248.021	5189.03	5817.08	48.266
35	146.699	248.839	4608.06	5068.67	47.7252
36	147.381	249.656	4045.22	4355.17	47.1131
37	148.745	251.288	5803.96	5939.57	45.6616
38	149.838	252.557	5056.89	4928.54	44.2636
39	150.934	253.792	4366.98	4019.93	42.6305
40	152.031	254.989	3733.41	3216.52	40.7465
41	153.244	256.272	3093.28	2446.69	38.3429
42	154.261	257.311	2604.34	1895.49	36.0479
43	155.279	258.35	2141.74	1416.43	33.4785
44	156.406	259.462	1678.19	980.369	30.2927
45	157.665	260.979	1090.08	538.614	26.2942
46	158.729	262.335	618.433	256.808	22.551
47	159.788	263.648	320.179	107.164	18.5054
48	160.848	264.925	116.43	29.3973	14.1704
49	161.907	266.164	-11.7471	-1.98554	9.59368
50	162.966	267.449	-62.973	-5.33516	4.84261
51	164.026	268.988	0	0	0

Entity Information

Water Table

X	Y
188.955	268.129
189.345	268
195.14	266.085
209.113	261.467
237.757	252
243.808	250
249.86	248
252.025	247.284
253.803	246.696
255.906	246
268.009	242
269.613	241.472
274.09	240
279.281	238.284
279.679	238.281
284.074	238.253
319.355	238
340.951	237.846
348.732	237.634
354.978	237.421
362.922	236.992
414.823	233.843
415.732	233.787
430.633	232.883
436.252	232.542
465.537	230.765
484.568	229.61
493.294	229.08
558.588	230.158
561.535	230.207
585.166	230.597
600	230.842

Distributed Load

X	Y
138.333	269.786
139.254	269.864
157.461	269.547
158.915	269.447

External Boundary

X	Y
599.009	304.329
551.257	304.247
306.301	302.471
297.878	302.14
291.298	302.111
282.616	302
276.502	300
248.013	290
187.037	270
183.831	269.067
180.644	268.615
177.82	268
175.551	267.909
173.156	268
169	268.728
165.258	268.855
161.285	269.284
158.915	269.447
157.461	269.547
139.254	269.864
138.333	269.786
109.209	211.5
106.917	211.479
0	210.5
0	60
600	60
600	226.842
600	230.842
600	287.321
600	300.331
600	304.331

Material Boundary

X	Y
183.831	269.067
184.819	266.855
185.531	265.261
186.278	265.014
186.323	264.999
189.345	264
195.14	262.085
234.104	249.207
243.808	246
249.86	244
252.025	243.284
255.906	242
268.009	238
269.613	237.472
274.09	236
279.281	234.284
279.679	234.281
284.074	234.253
340.951	233.846
348.732	233.634
354.978	233.421
362.922	232.992
414.823	229.843
415.732	229.787
430.633	228.883
436.252	228.542
465.537	226.765
484.568	225.61
493.294	225.08
558.588	226.158
561.535	226.207
585.166	226.597
600	226.842

Material Boundary

X	Y
188.955	268.129
189.345	268
195.14	266.085
209.113	261.467
237.757	252
243.808	250
249.86	248
252.025	247.284
253.803	246.696
255.906	246
268.009	242
269.613	241.472
274.09	240
279.281	238.284
279.679	238.281
284.074	238.253
319.355	238
340.951	237.846
348.732	237.634
354.978	237.421
362.922	236.992
414.823	233.843
415.732	233.787
430.633	232.883
436.252	232.542
465.537	230.765
484.568	229.61
493.294	229.08
558.588	230.158
561.535	230.207
585.166	230.597
600	230.842

Material Boundary

X	Y
282.616	298
285.662	298.039
288.091	298.058
291.298	298.111
293.364	298.102
296.474	298.137
297.878	298.14
306.301	298.471
435.34	299.406
454.564	299.546
483.219	299.753
511.453	299.958
551.257	300.247
600	300.331

Material Boundary

X	Y
184.819	266.855
187.037	267.5
188.955	268.129
210.575	275.223
210.615	275.236
214.538	276.523
217.516	277.5
238.207	284.285
248.013	287.5
262.752	292.693
276.502	297.5
278.611	298.19
282.616	299.5

Material Boundary

X	Y
282.616	298
282.616	299.5

Material Boundary

X	Y
109.209	211.5
179.7	211.5
184.7	221.5
185.7	223.5
186.7	225.5
187.644	227.467
158.044	227.467
162.061	235.5
166.756	244.89
167.061	245.5
170.038	251.454
149.839	251.454
156.941	265.5
158.915	269.447

Material Boundary

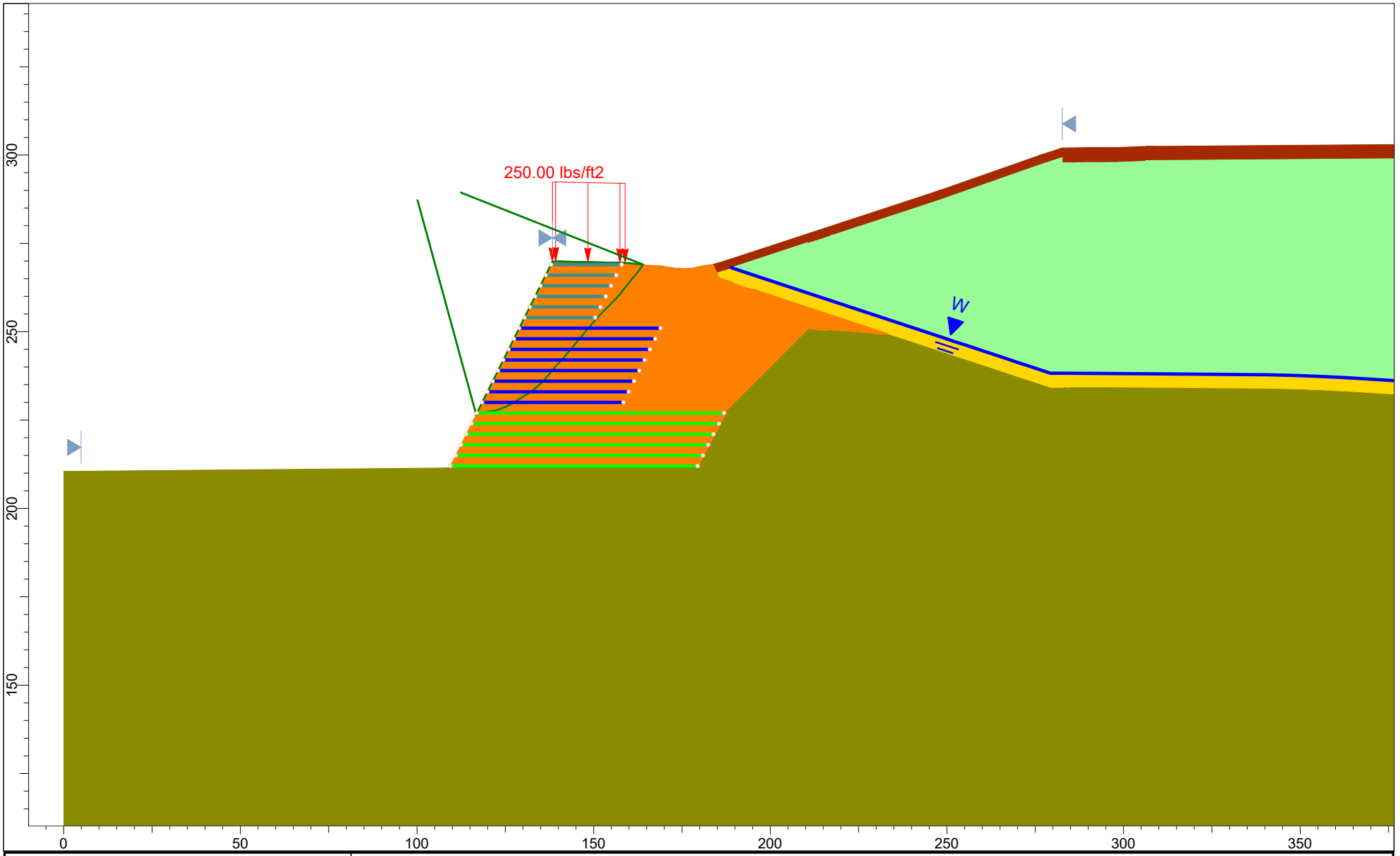
X	Y
109.209	211.5
113.346	212
116.035	212.75
135.237	226.567
149.539	236.387
161.902	245.909
163.014	246.327
166.756	244.89
168.535	244.206
176.707	247.452
181.679	251.408
182.921	251.089
187.481	250.571

189.706	252.514
194.169	252.453
197.058	253.055
201.693	252.344
206.514	251.604
207.801	251.15
209.376	251.298
210.956	250.779
211.871	250.479
215.827	250.229
217.746	250.488
225.195	249.965
231.101	249.35
234.104	249.207
238.077	249.018
242.567	248.314
251.498	246.602
252.795	246.633
253.803	246.696
254.544	246.742
266.618	247.183
276.942	248.011
289.568	248.577
302.908	249.224
308.197	249.096
310.691	249.197
322.981	249.052
324.829	249.851
326.794	250.102
329.818	249.858
333.021	248.984
341.672	254.103
345.536	255.454
351.933	259.414
359.864	262.304
368.33	267.503
380.893	276.434
385.018	278.926
387.297	280.67
399.095	279.63
400.557	279.221
403.836	279.374
426.32	281.672
434.374	282.672
458.823	285.199
469.446	286.25
497.853	288.827
506.714	289.507
524.117	290.667
525.982	290.956
532.284	291.807
533.489	291.386
537.367	290.755

538.857	289.665
542.424	287.723
549.701	285.77
567.168	285.834
572.29	286.14
576.13	286.145
591.361	286.377
591.689	286.452
600	287.321

Material Boundary

X	Y
187.644	227.467
210.956	250.779
212.644	252.467



Dunn MIne and C&D Facility S.A. Dunn & Company, LLC Rensselaer, New York		
Station 10+27 Static		
	Scale: 1:450	PREPARED BY: Civil & Environmental Consultants, Inc.
Date: 5/17/2021		File Name: Station 10+27 Static.slim

SLIDEINTERPRET 9.009

Slide Analysis Information

Project Summary

Slide Modeler Version:	9.009
Compute Time:	00h:01m:11.303s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	GLE/Morgenstern-Price with interslice force function (Half Sine)
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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

Surface Options

Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Number of vertices per surface:	12
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.075

Loading

1 Distributed Load present

Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	250
Orientation:	Vertical

Materials

C&D Waste	
Color	
Strength Type	Shear Normal function
Unit Weight [lbs/ft3]	60
Water Surface	None
Ru Value	0
Bottom Liner	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	118.5
Cohesion [psf]	67
Friction Angle [deg]	17.4
Water Surface	Water Table
Hu Value	Automatically Calculated
Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Final Cover System	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.4
Cohesion [psf]	0
Friction Angle [deg]	27
Water Surface	None
Ru Value	0
New Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	100
Friction Angle [deg]	30
Water Surface	None
Ru Value	0

Shear Normal Functions

Name: C&D

Normal (psf)	Shear (psf)
0	0
2000	1400
10000	6169

Support

Type 1	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	1900
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Type 2	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	3900
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Type 3	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	8400
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Global Minimums

Method: gle/morgenstern-price

FS	1.303140
Axis Location:	94.076, 296.230
Left Slip Surface Endpoint:	114.885, 222.859
Right Slip Surface Endpoint:	165.258, 268.855
Resisting Moment:	3.83772e+06 lb-ft
Driving Moment:	2.94498e+06 lb-ft
Resisting Horizontal Force:	39311.8 lb
Driving Horizontal Force:	30166.9 lb
Active Support Moment:	-2.31302e+06 lb-ft
Active Horizontal Support Force:	-31070.3 lb
Maximum Single Support Force:	3900 lb
Total Support Force:	33501.9 lb
Total Slice Area:	784.735 ft2
Surface Horizontal Width:	50.3727 ft
Surface Average Height:	15.5786 ft

Global Minimum Coordinates

Method: gle/morgenstern-price

X	Y
114.885	222.859
116.953	224.177
119.021	225.448
121.089	226.647
123.157	227.791
124.978	228.79
127.026	230.201
129.088	231.613
131.146	233.01
132.44	234.176
133.733	235.342
135.029	236.583
136.325	237.824
138.044	239.618
139.762	241.352
141.481	243.183
143.2	244.956
144.919	246.849
146.638	248.764
147.873	250.099
148.856	251.182
150.823	253.284
152.106	254.642
153.388	256.001
154.672	257.319
155.956	258.637
157.159	259.954
158.361	261.271
160.526	263.681
161.7	264.948
162.874	266.174
164.048	267.359
165.258	268.855

Global Minimum Support Data

Method: gle/morgenstern-price

Number of Supports: 20

Type 2

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
119.957, 233.01	40	11.1897	28.8103	11.1897	28.8103	3900
121.456, 236.01	40	12.9747	27.0253	12.9747	27.0253	3900
122.955, 239.01	40	14.5064	25.4936	14.5064	25.4936	3900
124.454, 242.01	40	15.9261	24.0739	15.9261	24.0739	3900
125.953, 245.01	40	17.296	22.704	17.296	22.704	3900
127.452, 248.01	40	18.5089	21.4911	18.5089	21.4911	3900
128.951, 251.01	40	19.7484	20.2516	19.7484	20.2516	3900
118.458, 230.01	40	8.28965	31.7104	8.28965	31.7104	3900

Type 1

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
130.45, 254.01	20	Not Effective	Not Effective	Not Effective	Not Effective	0
131.949, 257.01	20	Not Effective	Not Effective	Not Effective	Not Effective	0
133.448, 260.01	20	Not Effective	Not Effective	Not Effective	Not Effective	0
134.947, 263.01	20	Not Effective	Not Effective	Not Effective	Not Effective	0
136.446, 266.01	20	Not Effective	Not Effective	Not Effective	Not Effective	0
137.945, 269.01	20	Not Effective	Not Effective	Not Effective	Not Effective	0

Type 3

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
110.958, 215	70	Not Effective	Not Effective	Not Effective	Not Effective	0
109.459, 212	70	Not Effective	Not Effective	Not Effective	Not Effective	0
112.457, 218	70	Not Effective	Not Effective	Not Effective	Not Effective	0
113.956, 221	70	Not Effective	Not Effective	Not Effective	Not Effective	0
115.455, 224	70	1.22054	68.7795	1.22054	68.7795	157.526
116.954, 227	70	4.77361	65.2264	4.77361	65.2264	2144.41

Valid and Invalid Surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4097
Number of Invalid Surfaces:	14925

Error Codes
Error Code -105 reported for 1190 surfaces
Error Code -108 reported for 9 surfaces
Error Code -110 reported for 84 surfaces
Error Code -111 reported for 4598 surfaces
Error Code -113 reported for 9044 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

-113 = Surface intersects outside slope limits.

Slice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.30314

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.03407	87.5252	32.5004	New Fill	100	30	91.915	119.778	34.2567	0	34.2567	92.8139	92.8139
2	1.03407	262.576	32.5004	New Fill	100	30	150.827	196.548	167.227	0	167.227	263.315	263.315
3	1.03407	439.066	31.5767	New Fill	100	30	217.269	283.132	317.195	0	317.195	450.737	450.737
4	1.03407	616.996	31.5767	New Fill	100	30	270.316	352.259	436.925	0	436.925	603.072	603.072
5	0.68938	511.178	30.1018	New Fill	100	30	319.226	415.996	547.32	0	547.32	732.383	732.383
6	0.68938	592.25	30.1018	New Fill	100	30	352.96	459.956	623.462	0	623.462	828.08	828.08
7	0.68938	673.322	30.1018	New Fill	100	30	385.244	502.027	696.331	0	696.331	919.666	919.666
8	1.03407	1163.7	28.9496	New Fill	100	30	838.413	1092.57	1719.19	0	1719.19	2182.96	2182.96
9	1.03407	1349.52	28.9496	New Fill	100	30	552.064	719.417	1072.86	0	1072.86	1378.24	1378.24
10	0.910358	1342.1	28.7501	New Fill	100	30	593.688	773.659	1166.81	0	1166.81	1492.52	1492.52
11	0.910358	1486.57	28.7501	New Fill	100	30	628.948	819.607	1246.4	0	1246.4	1591.45	1591.45
12	1.02367	1835.31	34.586	New Fill	100	30	572.053	745.465	1117.98	0	1117.98	1512.4	1512.4
13	1.02367	2000.27	34.586	New Fill	100	30	1627.35	2120.66	3499.89	0	3499.89	4621.93	4621.93
14	1.03142	2182.59	34.3783	New Fill	100	30	688.479	897.184	1380.76	0	1380.76	1851.79	1851.79
15	1.03142	2350.74	34.3783	New Fill	100	30	702.156	915.007	1411.63	0	1411.63	1892.02	1892.02
16	1.02901	2513.15	34.1657	New Fill	100	30	720.794	939.296	1453.7	0	1453.7	1942.92	1942.92
17	1.02901	2681.2	34.1657	New Fill	100	30	736.302	959.505	1488.7	0	1488.7	1988.45	1988.45
18	1.29341	3586.11	42.039	New Fill	100	30	1378.31	1796.13	2937.78	0	2937.78	4180.51	4180.51
19	1.29341	3806.87	42.039	New Fill	100	30	631.913	823.471	1253.09	0	1253.09	1822.84	1822.84
20	1.29583	4029.74	43.7584	New Fill	100	30	1375.03	1791.86	2930.39	0	2930.39	4247.09	4247.09
21	1.29583	4240.06	43.7584	New Fill	100	30	629.248	819.998	1247.07	0	1247.07	1849.62	1849.62
22	0.859395	2924.18	46.2235	New Fill	100	30	590.843	769.951	1160.39	0	1160.39	1777.02	1777.02
23	0.859395	3009.05	46.2235	New Fill	100	30	1674.36	2181.92	3606	0	3606	5353.43	5353.43
24	0.859397	3058.1	45.2563	New Fill	100	30	649.425	846.292	1292.61	0	1292.61	1947.87	1947.87
25	0.859397	2984.2	45.2563	New Fill	100	30	645.161	840.735	1282.99	0	1282.99	1933.95	1933.95
26	0.859394	2891.47	46.815	New Fill	100	30	1650.43	2150.74	3551.97	0	3551.97	5310.42	5310.42
27	0.859394	2795.5	46.815	New Fill	100	30	580.984	757.103	1138.14	0	1138.14	1757.15	1757.15
28	0.859396	2701.04	45.8879	New Fill	100	30	577.949	753.148	1131.28	0	1131.28	1727.43	1727.43
29	0.859396	2608.09	45.8879	New Fill	100	30	563.362	734.139	1098.36	0	1098.36	1679.46	1679.46
30	0.859392	2512.03	47.7581	New Fill	100	30	1502.85	1958.43	3218.9	0	3218.9	4873.88	4873.88
31	0.859392	2412.89	47.7581	New Fill	100	30	503.704	656.397	963.706	0	963.706	1518.4	1518.4
32	0.859392	2313.17	48.0932	New Fill	100	30	485.72	632.961	923.114	0	923.114	1464.33	1464.33
33	0.859392	2212.88	48.0932	New Fill	100	30	1400.37	1824.88	2987.57	0	2987.57	4547.94	4547.94
34	1.23576	3009.3	47.2172	New Fill	100	30	453.009	590.334	849.284	0	849.284	1338.78	1338.78
35	0.982575	2247.89	47.7895	New Fill	100	30	1206.99	1572.88	2551.1	0	2551.1	3881.74	3881.74
36	0.98342	2121.9	46.8912	New Fill	100	30	405.425	528.325	741.883	0	741.883	1175	1175
37	0.98342	1995.91	46.8912	New Fill	100	30	393.703	513.05	715.421	0	715.421	1136.01	1136.01
38	1.28269	2414.86	46.6433	New Fill	100	30	383.894	500.267	693.285	0	693.285	1099.86	1099.86
39	1.28269	2202.33	46.6433	New Fill	100	30	371.073	483.56	664.345	0	664.345	1057.34	1057.34
40	1.28382	1994.64	45.7591	New Fill	100	30	366.963	478.204	655.067	0	655.067	1031.88	1031.88
41	1.28382	1788.11	45.7591	New Fill	100	30	355.357	463.08	628.873	0	628.873	993.773	993.773
42	1.20281	1481.99	47.5898	New Fill	100	30	329.879	429.878	571.368	0	571.368	932.502	932.502
43	1.20281	1286.41	47.5898	New Fill	100	30	317.589	413.863	543.626	0	543.626	891.307	891.307
44	0.721414	674.218	48.0847	New Fill	100	30	289.849	377.714	481.015	0	481.015	803.884	803.884
45	0.721414	600.356	48.0847	New Fill	100	30	235.422	306.788	358.168	0	358.168	620.409	620.409
46	0.721414	526.495	48.0847	New Fill	100	30	221.175	288.222	326.01	0	326.01	572.382	572.382
47	1.17416	701.455	47.1761	New Fill	100	30	203.168	264.756	285.366	0	285.366	504.583	504.583
48	1.17416	509.304	46.2353	New Fill	100	30	174.082	226.853	219.716	0	219.716	401.471	401.471
49	1.17416	321.564	45.2612	New Fill	100	30	137.786	179.555	137.792	0	137.792	276.84	276.84
50	1.20949	118.016	51.0337	New Fill	100	30	80.2164	104.533	7.85164	0	7.85164	107.03	107.03

Interslice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.30314

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	114.885	222.859	0	0	0
2	115.919	223.518	65.9136	8.44999	7.30536
3	116.953	224.177	243.251	62.239	14.352
4	117.987	224.812	233.388	89.2627	20.9301
5	119.021	225.448	188.935	95.8799	26.9067
6	119.711	225.848	151.927	89.5879	30.5269
7	120.4	226.247	101.665	68.1956	33.8532
8	121.089	226.647	38.4563	28.8675	36.894
9	122.123	227.219	1911.11	1658.49	40.9519
10	123.157	227.791	1767.08	1734.16	44.4613
11	124.068	228.29	1624.13	1750.77	47.149
12	124.978	228.79	1462.7	1712.98	49.5063
13	126.002	229.496	1121.56	1425.85	51.8117
14	127.026	230.201	3890.85	5316.16	53.7999
15	128.057	230.907	3462.92	5043.5	55.5261
16	129.088	231.613	3014.7	4644.19	57.011
17	130.117	232.311	2552.63	4130.29	58.2828
18	131.146	233.01	2069.46	3495.17	59.3706
19	132.44	234.176	3797.71	6714.8	60.5087
20	133.733	235.342	2868.18	5265.44	61.4221
21	135.029	236.583	4330.65	8192.11	62.1374
22	136.325	237.824	3280.61	6348.48	62.6721
23	137.184	238.721	2528.3	4948.01	62.9342
24	138.044	239.618	4094.31	8079.39	63.1259
25	138.903	240.485	3302.21	6551.35	63.2496
26	139.762	241.352	2520.34	5012.54	63.3064
27	140.622	242.267	4048.54	8048.64	63.2972
28	141.481	243.183	3296.05	6531.18	63.2216
29	142.341	244.07	2587.32	5095.25	63.079
30	143.2	244.956	1902.22	3712.09	62.8676
31	144.059	245.902	3525.21	6796.56	62.5853
32	144.919	246.849	2865.08	5440.75	62.2289
33	145.778	247.806	2225.06	4148.69	61.7941
34	146.638	248.764	3963.25	7231.83	61.276
35	147.873	250.099	3163.31	5562.12	60.3721
36	148.856	251.182	4982.98	8461.37	59.5058
37	149.839	252.233	4443.13	7248.31	58.4922
38	150.823	253.284	3929	6123.41	57.3143
39	152.106	254.642	3298.5	4798.5	55.4953
40	153.388	256.001	2706.8	3631.67	53.3017
41	154.672	257.319	2164.74	2640.82	50.6578
42	155.956	258.637	1657.81	1807.58	47.4747
43	157.159	259.954	1191.08	1146.51	43.9077
44	158.361	261.271	760.76	630.985	39.6728
45	159.083	262.074	532.751	398.1	36.769
46	159.804	262.878	369.738	245.351	33.5675
47	160.526	263.681	227.828	131.814	30.0523
48	161.7	264.948	52.2352	22.8671	23.6424
49	162.874	266.174	-50.9169	-15.0016	16.4165
50	164.048	267.359	-76.5239	-11.4715	8.52558
51	165.258	268.855	0	0	0

Entity Information

Water Table

X	Y
188.955	268.129
189.345	268
195.14	266.085
209.113	261.467
237.757	252
243.808	250
249.86	248
252.025	247.284
253.803	246.696
255.906	246
268.009	242
269.613	241.472
274.09	240
279.281	238.284
279.679	238.281
284.074	238.253
319.355	238
340.951	237.846
348.732	237.634
354.978	237.421
362.922	236.992
414.823	233.843
415.732	233.787
430.633	232.883
436.252	232.542
465.537	230.765
484.568	229.61
493.294	229.08
558.588	230.158
561.535	230.207
585.166	230.597
600	230.842

Distributed Load

X	Y
138.333	269.786
139.254	269.864
157.461	269.547
158.915	269.447

External Boundary

X	Y
599.009	304.329
551.257	304.247
306.301	302.471
297.878	302.14
291.298	302.111
282.616	302
276.502	300
248.013	290
187.037	270
183.831	269.067
180.644	268.615
177.82	268
175.551	267.909
173.156	268
169	268.728
165.258	268.855
161.285	269.284
158.915	269.447
157.461	269.547
139.254	269.864
138.333	269.786
109.209	211.5
106.917	211.479
0	210.5
0	60
600	60
600	226.842
600	230.842
600	287.321
600	300.331
600	304.331

Material Boundary

X	Y
183.831	269.067
184.819	266.855
185.531	265.261
186.278	265.014
186.323	264.999
189.345	264
195.14	262.085
234.104	249.207
243.808	246
249.86	244
252.025	243.284
255.906	242
268.009	238
269.613	237.472
274.09	236
279.281	234.284
279.679	234.281
284.074	234.253
340.951	233.846
348.732	233.634
354.978	233.421
362.922	232.992
414.823	229.843
415.732	229.787
430.633	228.883
436.252	228.542
465.537	226.765
484.568	225.61
493.294	225.08
558.588	226.158
561.535	226.207
585.166	226.597
600	226.842

Material Boundary

X	Y
188.955	268.129
189.345	268
195.14	266.085
209.113	261.467
237.757	252
243.808	250
249.86	248
252.025	247.284
253.803	246.696
255.906	246
268.009	242
269.613	241.472
274.09	240
279.281	238.284
279.679	238.281
284.074	238.253
319.355	238
340.951	237.846
348.732	237.634
354.978	237.421
362.922	236.992
414.823	233.843
415.732	233.787
430.633	232.883
436.252	232.542
465.537	230.765
484.568	229.61
493.294	229.08
558.588	230.158
561.535	230.207
585.166	230.597
600	230.842

Material Boundary

X	Y
282.616	298
285.662	298.039
288.091	298.058
291.298	298.111
293.364	298.102
296.474	298.137
297.878	298.14
306.301	298.471
435.34	299.406
454.564	299.546
483.219	299.753
511.453	299.958
551.257	300.247
600	300.331

Material Boundary

X	Y
184.819	266.855
187.037	267.5
188.955	268.129
210.575	275.223
210.615	275.236
214.538	276.523
217.516	277.5
238.207	284.285
248.013	287.5
262.752	292.693
276.502	297.5
278.611	298.19
282.616	299.5

Material Boundary

X	Y
282.616	298
282.616	299.5

Material Boundary

X	Y
109.209	211.5
179.7	211.5
184.7	221.5
185.7	223.5
186.7	225.5
187.644	227.467
158.044	227.467
162.061	235.5
166.756	244.89
167.061	245.5
170.038	251.454
149.839	251.454
156.941	265.5
158.915	269.447

Material Boundary

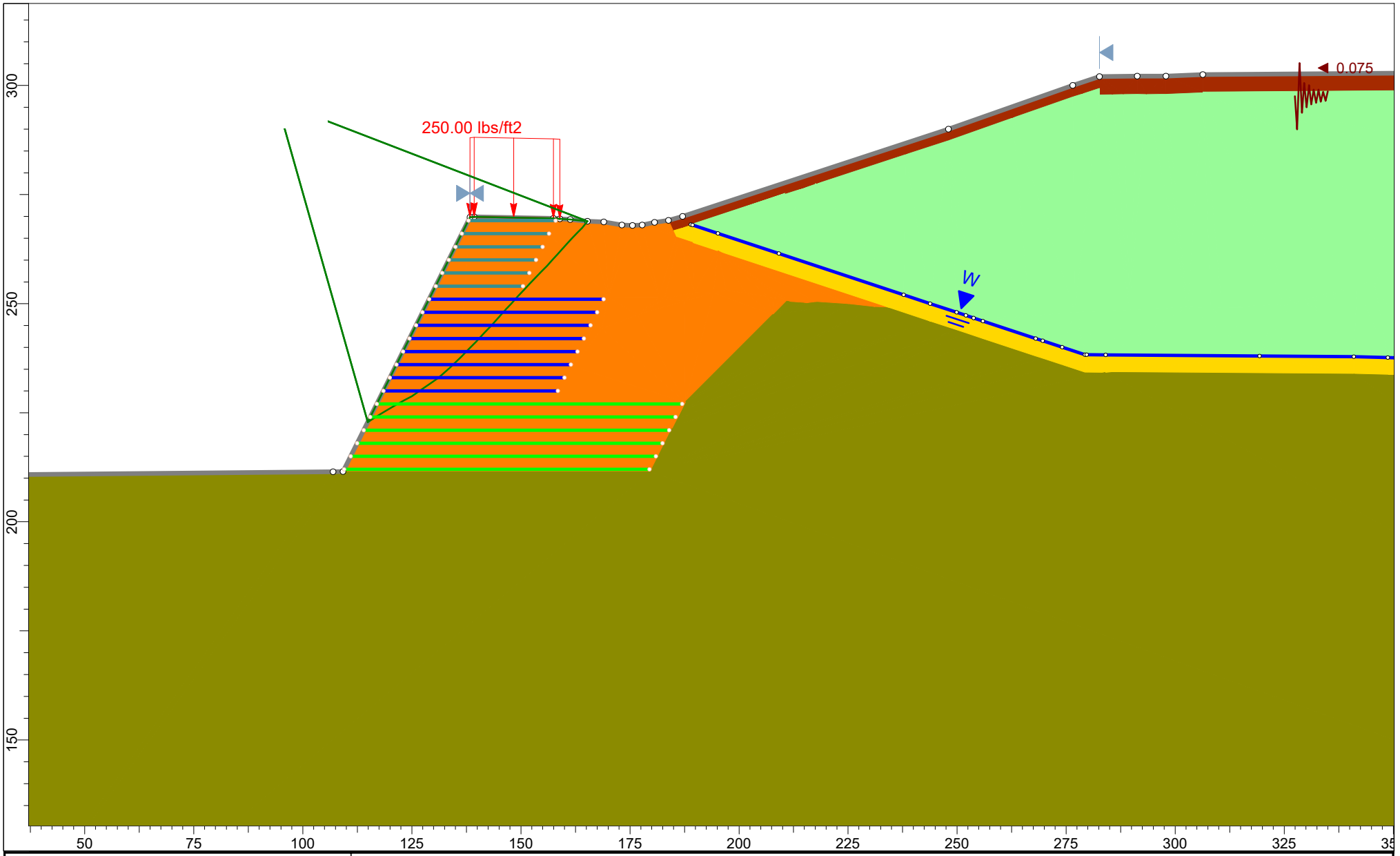
X	Y
109.209	211.5
113.346	212
116.035	212.75
135.237	226.567
149.539	236.387
161.902	245.909
163.014	246.327
166.756	244.89
168.535	244.206
176.707	247.452
181.679	251.408
182.921	251.089
187.481	250.571

189.706	252.514
194.169	252.453
197.058	253.055
201.693	252.344
206.514	251.604
207.801	251.15
209.376	251.298
210.956	250.779
211.871	250.479
215.827	250.229
217.746	250.488
225.195	249.965
231.101	249.35
234.104	249.207
238.077	249.018
242.567	248.314
251.498	246.602
252.795	246.633
253.803	246.696
254.544	246.742
266.618	247.183
276.942	248.011
289.568	248.577
302.908	249.224
308.197	249.096
310.691	249.197
322.981	249.052
324.829	249.851
326.794	250.102
329.818	249.858
333.021	248.984
341.672	254.103
345.536	255.454
351.933	259.414
359.864	262.304
368.33	267.503
380.893	276.434
385.018	278.926
387.297	280.67
399.095	279.63
400.557	279.221
403.836	279.374
426.32	281.672
434.374	282.672
458.823	285.199
469.446	286.25
497.853	288.827
506.714	289.507
524.117	290.667
525.982	290.956
532.284	291.807
533.489	291.386
537.367	290.755

538.857	289.665
542.424	287.723
549.701	285.77
567.168	285.834
572.29	286.14
576.13	286.145
591.361	286.377
591.689	286.452
600	287.321

Material Boundary

X	Y
187.644	227.467
207.644	247.467
210.956	250.779



Dunn Mine and C&D Facility S.A. Dunn & Company, LLC Rensselaer, New York		
Station 10+27 Seismic		
	Scale: 1:364	PREPARED BY: Civil & Environmental Consultants, Inc.
Date: 5/17/2021		File Name: Station 10+27 Seismic.slim

SLIDEINTERPRET 9.009

Slide Analysis Information

Project Summary

Slide Modeler Version:	9.009
Compute Time:	00h:00m:09.228s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	GLE/Morgenstern-Price with interslice force function (Half Sine)
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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

Surface Options

Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Number of vertices per surface:	12
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Loading

1 Distributed Load present

Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	250
Orientation:	Vertical

Materials

C&D Waste	
Color	
Strength Type	Shear Normal function
Unit Weight [lbs/ft3]	60
Water Surface	None
Ru Value	0
Bottom Liner	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	118.5
Cohesion [psf]	67
Friction Angle [deg]	17.4
Water Surface	Water Table
Hu Value	Automatically Calculated
Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Final Cover System	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	119.9
Cohesion [psf]	0
Friction Angle [deg]	27
Water Surface	None
Ru Value	0
New Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	100
Friction Angle [deg]	30
Water Surface	None
Ru Value	0

Shear Normal Functions

Name: C&D

Normal (psf)	Shear (psf)
0	0
2000	1400
10000	6169

Support

Type 1	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	1900
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Type 2	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	3900
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Global Minimums

Method: gle/morgenstern-price

FS	1.713230
Axis Location:	163.935, 299.723
Left Slip Surface Endpoint:	153.928, 204.589
Right Slip Surface Endpoint:	234.038, 234.637
Resisting Moment:	1.29195e+07 lb-ft
Driving Moment:	7.541e+06 lb-ft
Resisting Horizontal Force:	111851 lb
Driving Horizontal Force:	65286.4 lb
Total Slice Area:	1713.5 ft2
Surface Horizontal Width:	80.1107 ft
Surface Average Height:	21.3892 ft

Global Minimum Coordinates

Method: gle/morgenstern-price

X	Y
153.928	204.589
156.106	202.272
158.284	200.453
160.462	199.222
162.64	197.918
165.143	196.676
168.029	195.351
170.701	194.439
173.341	194.072
177.778	194.439
181.835	195.372
185.928	196.812
190.272	198.484
194.617	200.057
198.962	201.841
203.195	203.435
207.428	204.979
210.25	206.089
212.278	208.237
214.307	210.386
216.346	212.773
218.384	215.16
220.692	218.064
223.017	221.013
224.815	223.23
226.647	225.425
228.494	227.574
230.342	229.66
232.19	231.813
234.038	234.637

Global Minimum Support Data

Method: gle/morgenstern-price

Number of Supports: 10

Type 1

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
179.341, 224	20	Not Effective	Not Effective	Not Effective	Not Effective	0
180.864, 227	20	Not Effective	Not Effective	Not Effective	Not Effective	0
182.387, 230	20	Not Effective	Not Effective	Not Effective	Not Effective	0
183.91, 233	20	Not Effective	Not Effective	Not Effective	Not Effective	0

Type 2

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
171.726, 209	40	Not Effective	Not Effective	Not Effective	Not Effective	0
173.249, 212	40	Not Effective	Not Effective	Not Effective	Not Effective	0
174.772, 215	40	Not Effective	Not Effective	Not Effective	Not Effective	0
176.295, 218	40	Not Effective	Not Effective	Not Effective	Not Effective	0
177.818, 221	40	Not Effective	Not Effective	Not Effective	Not Effective	0
170.248, 206.089	40	Not Effective	Not Effective	Not Effective	Not Effective	0

Valid and Invalid Surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	3907
Number of Invalid Surfaces:	15104

Error Codes

Error Code -105 reported for 2135 surfaces
Error Code -108 reported for 3 surfaces
Error Code -110 reported for 247 surfaces
Error Code -111 reported for 128 surfaces
Error Code -113 reported for 12543 surfaces
Error Code -123 reported for 48 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

-113 = Surface intersects outside slope limits.

-123 = Surface radius equal or less than the internal cutoff of 0.01.

Slice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.71323

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.17801	302.684	-46.7613	Subgrade	0	30	79.2783	135.822	235.251	0	235.251	150.942	150.942
2	2.1781	843.167	-39.8728	Subgrade	0	30	212.204	363.555	629.697	0	629.697	452.438	452.438
3	2.17824	1241.91	-29.4744	Subgrade	0	30	287.748	492.978	853.865	0	853.865	691.235	691.235
4	2.17823	1573.15	-30.897	Subgrade	0	30	398.443	682.624	1182.34	0	1182.34	943.907	943.907
5	1.25118	1048.13	-26.4097	Subgrade	0	30	453.086	776.241	1344.49	0	1344.49	1119.48	1119.48
6	1.25118	1141.42	-26.4097	Subgrade	0	30	510.158	874.018	1513.85	0	1513.85	1260.5	1260.5
7	1.44348	1428.04	-24.6535	Subgrade	0	30	556.472	953.364	1651.28	0	1651.28	1395.87	1395.87
8	1.44348	1542.8	-24.6535	Subgrade	0	30	622.176	1065.93	1846.25	0	1846.25	1560.69	1560.69
9	1.33592	1517.48	-18.8424	Subgrade	0	30	618.854	1060.24	1836.39	0	1836.39	1625.2	1625.2
10	1.33592	1763.27	-18.8424	Subgrade	0	30	724.538	1241.3	2149.98	0	2149.98	1902.73	1902.73
11	1.32009	2207.41	-7.9178	Subgrade	0	30	776.79	1330.82	2305.06	0	2305.06	2197.02	2197.02
12	1.32009	2648.43	-7.9178	Subgrade	0	30	926.116	1586.65	2748.16	0	2748.16	2619.36	2619.36
13	1.4787	3461.2	4.72635	Subgrade	0	30	915.738	1568.87	2717.37	0	2717.37	2793.08	2793.08
14	1.4787	3956.36	4.72635	Subgrade	0	30	1038.16	1778.61	3080.65	0	3080.65	3166.48	3166.48
15	1.4787	4451.52	4.72635	Subgrade	0	30	1161.01	1989.08	3445.18	0	3445.18	3541.17	3541.17
16	2.02876	6876.8	12.9545	Subgrade	0	30	1171.55	2007.14	3476.47	0	3476.47	3745.96	3745.96
17	2.02876	7736.1	12.9545	Subgrade	0	30	1304.55	2235	3871.13	0	3871.13	4171.22	4171.22
18	1.36415	5671.35	19.3844	Subgrade	0	30	1301.06	2229.02	3860.77	0	3860.77	4318.55	4318.55
19	1.36415	6032.66	19.3844	Subgrade	0	30	1373.97	2353.92	4077.11	0	4077.11	4560.54	4560.54
20	1.36415	6342.98	19.3844	Subgrade	0	30	1435.57	2459.46	4259.91	0	4259.91	4765.02	4765.02
21	1.44828	6702.74	21.0497	Subgrade	0	30	1391.65	2384.21	4129.58	0	4129.58	4665.17	4665.17
22	1.44828	6600.28	21.0497	Subgrade	0	30	1363.55	2336.07	4046.19	0	4046.19	4570.97	4570.97
23	1.44828	6497.81	21.0497	Subgrade	0	30	1335.61	2288.2	3963.27	0	3963.27	4477.3	4477.3
24	2.17241	9561.33	19.8981	Subgrade	0	30	1321.91	2264.73	3922.63	0	3922.63	4401.11	4401.11
25	2.17241	9394.58	19.8981	Subgrade	0	30	1288.82	2208.05	3824.44	0	3824.44	4290.94	4290.94
26	2.17243	9225.69	22.3246	Subgrade	0	30	1274.17	2182.95	3780.99	0	3780.99	4304.2	4304.2
27	2.17243	8992.18	22.3246	Subgrade	0	30	1248.2	2138.46	3703.93	0	3703.93	4216.48	4216.48
28	1.41092	5718.35	20.6329	Subgrade	0	30	1243.87	2131.03	3691.05	0	3691.05	4159.41	4159.41
29	1.41092	5627.4	20.6329	Subgrade	0	30	1219.46	2089.22	3618.63	0	3618.63	4077.8	4077.8
30	1.41092	5536.45	20.6329	Subgrade	0	30	1195.29	2047.81	3546.92	0	3546.92	3996.98	3996.98
31	1.5818	6100.59	20.0432	Subgrade	0	30	1179.02	2019.93	3498.63	0	3498.63	3928.76	3928.76
32	1.5818	5989.79	20.0432	Subgrade	0	30	1152.7	1974.84	3420.53	0	3420.53	3841.06	3841.06
33	1.06915	3985.77	20.0432	New Fill	100	30	1189.28	2037.51	3355.87	0	3355.87	3789.75	3789.75
34	1.41095	5179.11	21.4769	New Fill	100	30	1148.37	1967.43	3234.49	0	3234.49	3686.31	3686.31
35	1.41095	5084.12	21.4769	New Fill	100	30	1124.78	1927.01	3164.47	0	3164.47	3607.01	3607.01
36	2.02883	6977.41	46.6387	New Fill	100	30	784.647	1344.28	2155.15	0	2155.15	2986.02	2986.02
37	2.02883	6441.32	46.6387	New Fill	100	30	738.377	1265.01	2017.85	0	2017.85	2799.72	2799.72
38	2.03847	5903.2	49.5034	New Fill	100	30	661.534	1133.36	1789.83	0	1789.83	2564.48	2564.48
39	2.03847	5305.26	49.5034	New Fill	100	30	613.283	1050.69	1646.65	0	1646.65	2364.8	2364.8
40	1.1537	2730.61	51.5354	New Fill	100	30	557.207	954.623	1480.25	0	1480.25	2181.64	2181.64
41	1.1537	2525.06	51.5354	New Fill	100	30	528.269	905.047	1394.38	0	1394.38	2059.35	2059.35
42	1.16256	2335.76	51.7405	New Fill	100	30	497.19	851.8	1302.15	0	1302.15	1932.62	1932.62
43	1.16256	2125.54	51.7405	New Fill	100	30	466.949	799.991	1212.42	0	1212.42	1804.54	1804.54
44	1.79795	2862.92	50.9602	New Fill	100	30	394.629	676.09	997.817	0	997.817	1484.45	1484.45
45	1.83192	2353.85	50.1527	New Fill	100	30	321.528	550.852	780.897	0	780.897	1166.16	1166.16
46	1.84792	1868.13	49.317	New Fill	100	30	269.95	462.486	627.844	0	627.844	941.878	941.878
47	1.84792	1265.97	48.452	New Fill	100	30	202.13	346.296	426.597	0	426.597	654.678	654.678
48	1.84795	722.323	49.3645	New Fill	100	30	134.374	230.214	225.538	0	225.538	382.118	382.118
49	0.955677	171.068	56.7979	New Fill	100	30	78.1176	133.834	58.6014	0	58.6014	177.968	177.968
50	0.892302	49.015	56.7979	Final Cover System	0	27	11.0929	19.0047	37.2987	0	37.2987	54.2491	54.2491

Interslice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.71323

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	153.928	204.589	0	0	0
2	156.106	202.272	717.561	26.0688	2.08063
3	158.284	200.453	2325.45	168.353	4.14075
4	160.462	199.222	4003.43	432.117	6.16047
5	162.64	197.918	6412.5	914.999	8.12071
6	163.891	197.297	7814.8	1267.54	9.21299
7	165.143	196.676	9393.74	1703.23	10.277
8	166.586	196.013	11291	2290.11	11.4655
9	168.029	195.351	13412.3	3000.15	12.6087
10	169.365	194.895	15076.2	3653.81	13.6233
11	170.701	194.439	17024.3	4432.45	14.5935
12	172.021	194.255	18472.9	5125.31	15.5067
13	173.341	194.072	20200	5934.7	16.3726
14	174.82	194.194	21221.9	6603.62	17.2846
15	176.299	194.316	22380.4	7329.52	18.1335
16	177.778	194.439	23676	8114.32	18.9178
17	179.806	194.905	24430.4	8837.2	19.8866
18	181.835	195.372	25270.5	9563.54	20.729
19	183.199	195.852	25192.2	9783.36	21.2236
20	184.563	196.332	25109.6	9971.98	21.6599
21	185.928	196.812	25023.3	10129.2	22.0376
22	187.376	197.369	24737.1	10183	22.3745
23	188.824	197.927	24456.6	10202.7	22.6447
24	190.272	198.484	24181.8	10189.3	22.8487
25	192.445	199.27	23969.1	10189	23.0298
26	194.617	200.057	23761.7	10116.1	23.061
27	196.79	200.949	23156.9	9802	22.9423
28	198.962	201.841	22564.4	9426.74	22.6737
29	200.373	202.372	22358.5	9224.26	22.4192
30	201.784	202.903	22156.7	8997.6	22.1015
31	203.195	203.435	21958.8	8747.86	21.7212
32	204.777	204.012	21804.8	8466.34	21.2201
33	206.358	204.589	21654.2	8156.88	20.6408
34	207.428	204.979	21616.8	7955.62	20.2051
35	208.839	205.534	21441.5	7624.97	19.5763
36	210.25	206.089	21271.8	7277.42	18.8866
37	212.278	208.237	18233.8	5850.79	17.7902
38	214.307	210.386	15396.8	4582.21	16.5734
39	216.346	212.773	12473	3396.8	15.234
40	218.384	215.16	9792.51	2402.28	13.7835
41	219.538	216.612	8285.68	1900.1	12.9159
42	220.692	218.064	6870.17	1462.38	12.0166
43	221.854	219.538	5528.55	1082.64	11.0799
44	223.017	221.013	4284.07	764.23	10.1145
45	224.815	223.23	2781.31	419.152	8.57016
46	226.647	225.425	1656.22	201.602	6.94014
47	228.494	227.574	805.39	73.9811	5.24832
48	230.342	229.66	289.386	17.7995	3.5197
49	232.19	231.813	52.0449	1.60481	1.76616
50	233.146	233.273	41.1243	0.612704	0.853577
51	234.038	234.637	0	0	0

Entity Information

Water Table

X	Y
239.379	233.369
241.729	231.905
267.762	223.824
305.856	212
325.184	206
536.167	142
539.199	141.882
550.798	141.429
563.541	141.037
570.958	140.885
586.49	140.52
604.544	140.153
777.197	137.439
780.819	137.382
800	137.08

Distributed Load

X	Y
195.034	235.9
211.017	235.833
223.621	235.478

External Boundary

X	Y
169.506	204.589
141.85	204.589
131.978	203.905
122.258	203.825
93.9061	202.931
81.4642	202.76
70.8931	202.018
65.2022	200.967
60.3118	200.341
46.9303	197.781
38.5618	196.748
27.2664	196.163
0	196.201
0	0
800	0
800	133.08
800	137.08
800	244.379
800	318
800	322
499.734	322
373.088	280
343.734	270
241.729	235.905
240.595	235.711
238.871	235.734
238.038	235.498
235.871	235.555
232.768	234
231.963	233.989
230.095	234
228.116	234.931
225.827	234.974
223.621	235.478
211.017	235.833
195.034	235.9
192.264	235.533
185.274	235.688
183.91	233
177.819	221.002
176.295	218
170.248	206.089
170.242	206.076

Material Boundary

X	Y
235.871	235.555
239.379	233.369
241.729	231.905
267.762	223.824
305.856	212
312.3	210
325.184	206
463.642	164
496.608	154
536.167	142
539.199	141.882
550.798	141.429
563.541	141.037
570.958	140.885
586.49	140.52
604.544	140.153
777.197	137.439
780.819	137.382
800	137.08

Material Boundary

X	Y
170.248	206.089
173.722	206.227
181.132	208.641
183.568	209.25
187.68	208.231
188.785	207.948
188.96	207.953
194.097	208.265
198.511	207.987
200.965	207.891
207.125	208.092
214.877	208.345
224.162	208.519
224.748	208.719
227.761	209.66
236.954	213.307
246.468	218.629
253.908	224.125
254.798	224.782
257.288	224.172
258.624	223.62
267.762	223.824
268.559	223.842
276.801	223.733
277.35	223.976
279.904	224.663
294.867	219.426
310.669	213.858
318.14	211.333

339.89	204.51
348.744	201.745
367.473	195.761
373.011	194.062
391.919	187.721
396.291	185.896
399.922	186.085
403.587	185.694
414.635	186.642
425.909	188.05
434.864	189.152
451.032	191.196
456.908	191.736
458.199	191.872
473.223	187.443
473.306	187.356
474.037	187.216
474.785	186.894
485.213	181.934
486.479	182.695
496.339	176.403
510.112	174.888
511.921	174.511
514.356	174.73
519.993	173.831
533.581	172.533
536.872	172.738
545.906	173.493
549.494	173.039
557.418	171.993
562.439	171.657
574.666	173.419
591.182	178.015
599.36	180.603
604.858	180.265
609.812	179.164
616.71	178.254
620.105	178.44
623.466	179.291
631.375	180.78
636.949	180.91
641.901	182.165
646.344	182.052
652.94	184.267
657.255	185.358
664.689	185.819
669.057	188.878
673.746	191.858
691.992	196.743
692.936	196.933
707.079	203.199
708.949	203.904
724.311	207.678

730.025	209.155
730.553	209.447
743.892	218.45
762.748	228.283
769.069	231.713
777.207	235.77
793.455	241.864
799.817	244.305
800	244.379

Material Boundary

X	Y
231.963	233.989
233.114	233.273
241.729	227.905
253.908	224.125
305.856	208
312.3	206
325.184	202
463.642	160
496.608	150
536.167	138
539.199	137.882
550.798	137.429
563.541	137.037
570.958	136.885
586.49	136.52
604.544	136.153
777.197	133.439
780.819	133.382
800	133.08

Material Boundary

X	Y
499.734	322
499.734	319.5
499.734	318
504.934	318
800	318

Material Boundary

X	Y
233.114	233.273
239.379	233.369
241.73	233.405
253.734	237.5
343.734	267.5
373.088	277.5
403.632	287.5
499.734	319.5

Material Boundary

X	Y
170.242	206.076
196.136	206.076
200.965	207.891

Material Boundary

X	Y
196.136	206.076
204.37	206.076
207.125	208.092

Material Boundary

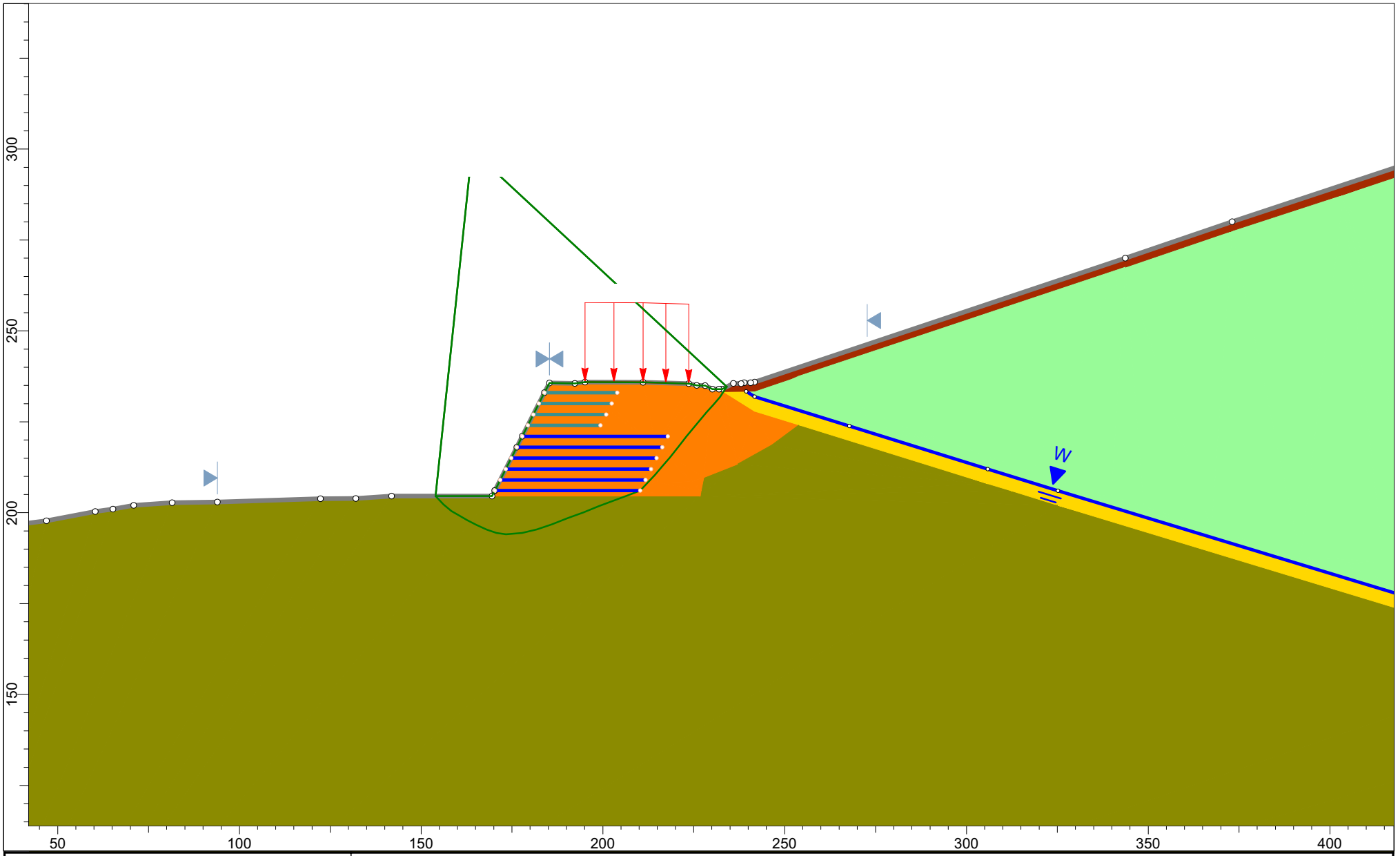
X	Y
204.37	206.076
227.035	206.076
227.761	209.66

Material Boundary

X	Y
176.295	218
214.643	218

Material Boundary

X	Y
169.506	204.589
226.741	204.589
227.035	206.076



Dunn Mine and C&D Facility S.A.Dunn & Company, LLC Rensselaer, New York		
Station 15+01 Static		
	Scale: 1:437	PREPARED BY: Civil & Environmental Consultants, Inc.
Date: 5/17/2021		File Name: Station 15+01 Static.slim

SLIDEINTERPRET 9.009

Slide Analysis Information

Project Summary

Slide Modeler Version:	9.009
Compute Time:	00h:01m:14.678s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	GLE/Morgenstern-Price with interslice force function (Half Sine)
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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

Surface Options

Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Number of vertices per surface:	12
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.075

Loading

1 Distributed Load present

Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	250
Orientation:	Vertical

Materials

C&D Waste	
Color	
Strength Type	Shear Normal function
Unit Weight [lbs/ft3]	60
Water Surface	None
Ru Value	0
Bottom Liner	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	118.5
Cohesion [psf]	67
Friction Angle [deg]	17.4
Water Surface	Water Table
Hu Value	Automatically Calculated
Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Final Cover System	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	119.9
Cohesion [psf]	0
Friction Angle [deg]	27
Water Surface	None
Ru Value	0
New Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	100
Friction Angle [deg]	30
Water Surface	None
Ru Value	0

Shear Normal Functions

Name: C&D

Normal (psf)	Shear (psf)
0	0
2000	1400
10000	6169

Support

Type 1	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	1900
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Type 2	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	3900
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Global Minimums

Method: gle/morgenstern-price

FS	1.468380
Axis Location:	205.828, 577.706
Left Slip Surface Endpoint:	155.391, 204.589
Right Slip Surface Endpoint:	474.060, 313.486
Resisting Moment:	6.70595e+07 lb-ft
Driving Moment:	4.56692e+07 lb-ft
Resisting Horizontal Force:	179832 lb
Driving Horizontal Force:	122470 lb
Active Support Moment:	-1.4184e+06 lb-ft
Active Horizontal Support Force:	-3818.02 lb
Maximum Single Support Force:	3900 lb
Total Support Force:	3906.23 lb
Total Slice Area:	3092.94 ft2
Surface Horizontal Width:	318.669 ft
Surface Average Height:	9.7058 ft

Global Minimum Coordinates

Method: gle/morgenstern-price

X	Y
155.391	204.589
163.741	198.373
171.498	194.534
181.489	195.856
191.592	200.268
200.601	203.955
211.913	209.086
220.285	213.162
233.822	219.28
243.925	223.493
256.183	228.177
267.77	233.487
277.18	237.584
284.523	240.525
291.865	243.209
299.526	246.516
309.241	250.53
316.032	253.339
322.822	256.115
332.936	260.44
343.173	265.657
349.411	268.618
356.061	271.542
362.712	274.234
369.363	276.694
381.721	280.834
394.079	284.542
407.335	288.998
423.098	294.198
438.863	300.226
450.595	304.643
462.327	308.65
474.06	313.486

Global Minimum Support Data

Method: gle/morgenstern-price

Number of Supports: 10

Type 1

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
179.341, 224	20	Not Effective	Not Effective	Not Effective	Not Effective	0
180.864, 227	20	Not Effective	Not Effective	Not Effective	Not Effective	0
182.387, 230	20	Not Effective	Not Effective	Not Effective	Not Effective	0
183.91, 233	20	Not Effective	Not Effective	Not Effective	Not Effective	0

Type 2

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
171.726, 209	40	39.9977	0.0023409	39.9977	0.0023409	6.2344
173.249, 212	40	Not Effective	Not Effective	Not Effective	Not Effective	0
174.772, 215	40	Not Effective	Not Effective	Not Effective	Not Effective	0
176.295, 218	40	Not Effective	Not Effective	Not Effective	Not Effective	0
177.818, 221	40	Not Effective	Not Effective	Not Effective	Not Effective	0
170.248, 206.089	40	35.0577	4.94231	35.0577	4.94231	3900

Valid and Invalid Surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	5263
Number of Invalid Surfaces:	13795

Error Codes

Error Code -105 reported for 2164 surfaces
Error Code -108 reported for 1 surface
Error Code -110 reported for 315 surfaces
Error Code -111 reported for 71 surfaces
Error Code -113 reported for 11244 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

-113 = Surface intersects outside slope limits.

Slice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.46838

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	8.35077	3114.53	-36.6628	Subgrade	0	30	234.778	344.743	597.113	0	597.113	422.351	422.351
2	7.75627	8048.39	-26.3316	Subgrade	0	30	625.574	918.581	1591.03	0	1591.03	1281.42	1281.42
3	9.99146	27811.6	7.53783	Subgrade	0	30	1140.89	1675.26	2901.64	0	2901.64	3052.6	3052.6
4	5.05136	21780.7	23.5902	Subgrade	0	30	1463.85	2149.49	3723.03	0	3723.03	4362.27	4362.27
5	5.05136	22088.1	23.5902	Subgrade	0	30	1468.6	2156.47	3735.13	0	3735.13	4376.45	4376.45
6	9.00956	36432.9	22.2558	Subgrade	0	30	1419.61	2084.52	3610.5	0	3610.5	4191.44	4191.44
7	1.39755	5299.87	24.4001	Subgrade	0	30	1318.04	1935.39	3352.2	0	3352.2	3950.09	3950.09
8	4.95677	17932.1	24.4001	New Fill	100	30	1380.71	2027.4	3338.36	0	3338.36	3964.67	3964.67
9	4.95677	16581.2	24.4001	New Fill	100	30	1235.72	1814.5	2969.6	0	2969.6	3530.15	3530.15
10	8.3723	24681.1	25.9598	New Fill	100	30	1072.09	1574.24	2553.46	0	2553.46	3075.42	3075.42
11	6.76867	16760.2	24.3202	New Fill	100	30	899.032	1320.12	2113.31	0	2113.31	2519.62	2519.62
12	6.76867	13460.5	24.3202	New Fill	100	30	700.819	1029.07	1609.19	0	1609.19	1925.92	1925.92
13	5.05165	9083.2	22.6372	New Fill	100	30	656.046	963.325	1495.32	0	1495.32	1768.91	1768.91
14	5.05165	7779.26	22.6372	New Fill	100	30	571.881	839.738	1281.26	0	1281.26	1519.75	1519.75
15	5.38617	6865.63	20.9119	New Fill	100	30	501.53	736.437	1102.34	0	1102.34	1293.98	1293.98
16	5.77615	5935.16	20.9119	Bottom Liner	67	17.4	198.38	291.297	829.559	113.826	715.733	905.36	791.534
17	1.09524	985.779	20.9119	C&D Waste	1.13687e-13	34.992	373.476	548.404	783.434	0	783.434	926.14	926.14
18	5.79358	5081.66	24.6215	C&D Waste	5.68434e-14	34.992	334.4	491.027	701.468	0	701.468	854.72	854.72
19	5.79358	4833.68	24.6215	C&D Waste	5.68434e-14	34.992	316.703	465.04	664.343	0	664.343	809.484	809.484
20	9.40984	7383.12	23.5285	C&D Waste	0	34.992	303.941	446.301	637.573	0	637.573	769.91	769.91
21	7.34288	5447.89	21.8253	C&D Waste	0	34.992	298.104	437.73	625.328	0	625.328	744.714	744.714
22	7.3424	5292.7	20.0805	C&D Waste	5.68434e-14	34.992	301.665	442.959	632.799	0	632.799	743.076	743.076
23	7.66038	5300.63	23.3507	C&D Waste	5.68434e-14	34.992	266.161	390.826	558.323	0	558.323	673.23	673.23
24	4.8577	3198.29	22.4488	C&D Waste	0	34.992	258.186	379.115	541.593	0	541.593	648.267	648.267
25	4.8577	3087.84	22.4488	C&D Waste	0	34.992	248.708	365.198	521.711	0	521.711	624.469	624.469
26	6.79064	4130.83	22.4696	C&D Waste	5.68434e-14	34.992	237.239	348.357	497.653	0	497.653	595.774	595.774
27	6.7906	3920.41	22.2356	C&D Waste	5.68434e-14	34.992	225.756	331.495	473.564	0	473.564	565.857	565.857
28	10.1136	5403.19	23.1552	C&D Waste	5.68434e-14	34.992	203.356	298.604	426.576	0	426.576	513.547	513.547
29	5.11875	2453.93	27.0022	C&D Waste	2.84217e-14	34.992	165.684	243.287	347.553	0	347.553	431.981	431.981
30	5.11875	2179.73	27.0022	C&D Waste	0	34.992	146.918	215.731	308.187	0	308.187	383.052	383.052
31	6.23733	2331.52	25.3915	C&D Waste	2.84217e-14	34.992	133.68	196.293	280.418	0	280.418	343.87	343.87
32	6.65074	2187.82	23.7366	C&D Waste	-2.84217e-14	34.992	121.929	179.038	255.768	0	255.768	309.384	309.384
33	2.45451	747.331	22.0386	C&D Waste	2.84217e-14	34.992	117.108	171.959	245.656	0	245.656	293.062	293.062
34	4.19629	1190.13	22.0386	Final Cover System	0	27	75.5411	110.923	217.699	0	217.699	248.278	248.278
35	6.65075	1701.48	20.2989	Final Cover System	0	27	70.4933	103.511	203.151	0	203.151	229.225	229.225
36	6.179	1518.61	18.5193	Final Cover System	0	27	70.1814	103.053	202.251	0	202.251	225.76	225.76

37	6.179	1510.85	18.5193	Final Cover System	0	27	69.9124	102.658	201.476	0	201.476	224.895	224.895
38	6.179	1575.5	16.7018	Final Cover System	0	27	75.6487	111.081	218.009	0	218.009	240.707	240.707
39	6.179	1720.08	16.7018	Final Cover System	0	27	82.8743	121.691	238.832	0	238.832	263.698	263.698
40	6.62806	1910.81	18.5785	Final Cover System	0	27	83.3388	122.373	240.172	0	240.172	268.184	268.184
41	6.62806	1887.17	18.5785	Final Cover System	0	27	82.6653	121.384	238.23	0	238.23	266.015	266.015
42	15.7634	4485.83	18.2579	Final Cover System	0	27	83.7733	123.011	241.423	0	241.423	269.06	269.06
43	7.88205	2066.92	20.9252	Final Cover System	0	27	75.2489	110.494	216.856	0	216.856	245.629	245.629
44	7.88205	1688.99	20.9252	Final Cover System	0	27	62.0776	91.1535	178.898	0	178.898	202.635	202.635
45	5.8662	1023.91	20.6292	Final Cover System	0	27	51.1748	75.144	147.479	0	147.479	166.744	166.744
46	5.8662	838.963	20.6292	Final Cover System	0	27	42.2356	62.0179	121.717	0	121.717	137.617	137.617
47	5.86621	726.055	18.8569	Final Cover System	0	27	37.4532	54.9956	107.935	0	107.935	120.727	120.727
48	5.86621	685.189	18.8569	Final Cover System	0	27	35.5877	52.2563	102.559	0	102.559	114.713	114.713
49	5.86623	498.569	22.4008	Final Cover System	0	27	25.381	37.269	73.1445	0	73.1445	83.6062	83.6062
50	5.86623	166.19	22.4008	Final Cover System	0	27	8.54016	12.5402	24.6114	0	24.6114	28.1316	28.1316

Interslice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.46838

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	155.391	204.589	0	0	0
2	163.741	198.373	5438.67	412.422	4.33652
3	171.498	194.534	15794.7	2303.1	8.2961
4	181.489	195.856	21271.7	4991.48	13.2057
5	186.54	198.062	18820.2	5246.2	15.576
6	191.592	200.268	16342.9	5265.1	17.8571
7	200.601	203.955	13088.7	5203.28	21.6798
8	201.999	204.589	12408.1	5074.48	22.2428
9	206.956	206.837	14212.7	6379.35	24.1729
10	211.913	209.086	12423.2	6058.34	25.9968
11	220.285	213.162	9139.77	5031.69	28.834
12	227.053	216.221	7503.31	4491.71	30.906
13	233.822	219.28	6314.79	4067.16	32.7843
14	238.874	221.387	5797.56	3919.87	34.0636
15	243.925	223.493	5403.89	3817.86	35.2413
16	249.312	225.551	5321.62	3921.83	36.3888
17	255.088	227.758	4191.47	3216.17	37.4995
18	256.183	228.177	4198.72	3244.73	37.6965
19	261.977	230.832	3892.49	3114.97	38.6686
20	267.77	233.487	3600.89	2971.11	39.5262
21	277.18	237.584	3295.02	2832.74	40.6858
22	284.523	240.525	3236.47	2853.21	41.3988
23	291.865	243.209	3355.98	3016.47	41.9503
24	299.526	246.516	3150.89	2873.05	42.3592
25	304.383	248.523	3078.22	2823.85	42.5322
26	309.241	250.53	3007.69	2769.5	42.6391
27	316.032	253.339	2911.2	2684.35	42.6784
28	322.822	256.115	2835.52	2606.46	42.5898
29	332.936	260.44	2641.87	2397.05	42.2184
30	338.055	263.049	2399.37	2154.33	41.9198
31	343.173	265.657	2184.06	1935.35	41.545
32	349.411	268.618	2012.81	1748.66	40.983
33	356.061	271.542	1911.64	1618.47	40.2526
34	358.516	272.536	1898.94	1590.46	39.9479
35	362.712	274.234	1756.87	1442.17	39.3817
36	369.363	276.694	1598.33	1265.21	38.3645
37	375.542	278.764	1499.47	1141.57	37.2826
38	381.721	280.834	1401.13	1020.34	36.0631
39	387.9	282.688	1346.22	932.167	34.7
40	394.079	284.542	1286.5	841.466	33.1876
41	400.707	286.77	1160.51	708.18	31.3929
42	407.335	288.998	1036.15	584.167	29.4137
43	423.098	294.198	764.772	339.594	23.9434
44	430.981	297.212	549.299	208.716	20.8052
45	438.863	300.226	372.753	116.894	17.4112
46	444.729	302.434	270.475	71.1211	14.7324
47	450.595	304.643	186.52	39.4344	11.9378
48	456.461	306.646	135.525	21.574	9.04493
49	462.327	308.65	87.4227	9.30373	6.07469
50	468.194	311.068	22.0591	1.17576	3.051
51	474.06	313.486	0	0	0

Entity Information

Water Table

X	Y
239.379	233.369
241.729	231.905
267.762	223.824
305.856	212
325.184	206
536.167	142
539.199	141.882
550.798	141.429
563.541	141.037
570.958	140.885
586.49	140.52
604.544	140.153
777.197	137.439
780.819	137.382
800	137.08

Distributed Load

X	Y
195.034	235.9
211.017	235.833
223.621	235.478

External Boundary

X	Y
169.506	204.589
141.85	204.589
131.978	203.905
122.258	203.825
93.9061	202.931
81.4642	202.76
70.8931	202.018
65.2022	200.967
60.3118	200.341
46.9303	197.781
38.5618	196.748
27.2664	196.163
0	196.201
0	0
800	0
800	133.08
800	137.08
800	244.379
800	318
800	322
499.734	322
373.088	280
343.734	270
241.729	235.905
240.595	235.711
238.871	235.734
238.038	235.498
235.871	235.555
232.768	234
231.963	233.989
230.095	234
228.116	234.931
225.827	234.974
223.621	235.478
211.017	235.833
195.034	235.9
192.264	235.533
185.274	235.688
183.91	233
177.819	221.002
176.295	218
170.248	206.089
170.242	206.076

Material Boundary

X	Y
235.871	235.555
239.379	233.369
241.729	231.905
267.762	223.824
305.856	212
312.3	210
325.184	206
463.642	164
496.608	154
536.167	142
539.199	141.882
550.798	141.429
563.541	141.037
570.958	140.885
586.49	140.52
604.544	140.153
777.197	137.439
780.819	137.382
800	137.08

Material Boundary

X	Y
170.248	206.089
173.722	206.227
181.132	208.641
183.568	209.25
187.68	208.231
188.785	207.948
188.96	207.953
194.097	208.265
198.511	207.987
200.965	207.891
207.125	208.092
214.877	208.345
224.162	208.519
224.748	208.719
227.761	209.66
236.954	213.307
246.468	218.629
253.908	224.125
254.798	224.782
257.288	224.172
258.624	223.62
267.762	223.824
268.559	223.842
276.801	223.733
277.35	223.976
279.904	224.663
294.867	219.426
310.669	213.858
318.14	211.333

339.89	204.51
348.744	201.745
367.473	195.761
373.011	194.062
391.919	187.721
396.291	185.896
399.922	186.085
403.587	185.694
414.635	186.642
425.909	188.05
434.864	189.152
451.032	191.196
456.908	191.736
458.199	191.872
473.223	187.443
473.306	187.356
474.037	187.216
474.785	186.894
485.213	181.934
486.479	182.695
496.339	176.403
510.112	174.888
511.921	174.511
514.356	174.73
519.993	173.831
533.581	172.533
536.872	172.738
545.906	173.493
549.494	173.039
557.418	171.993
562.439	171.657
574.666	173.419
591.182	178.015
599.36	180.603
604.858	180.265
609.812	179.164
616.71	178.254
620.105	178.44
623.466	179.291
631.375	180.78
636.949	180.91
641.901	182.165
646.344	182.052
652.94	184.267
657.255	185.358
664.689	185.819
669.057	188.878
673.746	191.858
691.992	196.743
692.936	196.933
707.079	203.199
708.949	203.904
724.311	207.678

730.025	209.155
730.553	209.447
743.892	218.45
762.748	228.283
769.069	231.713
777.207	235.77
793.455	241.864
799.817	244.305
800	244.379

Material Boundary

X	Y
231.963	233.989
233.114	233.273
241.729	227.905
253.908	224.125
305.856	208
312.3	206
325.184	202
463.642	160
496.608	150
536.167	138
539.199	137.882
550.798	137.429
563.541	137.037
570.958	136.885
586.49	136.52
604.544	136.153
777.197	133.439
780.819	133.382
800	133.08

Material Boundary

X	Y
499.734	322
499.734	319.5
499.734	318
504.934	318
800	318

Material Boundary

X	Y
233.114	233.273
239.379	233.369
241.73	233.405
253.734	237.5
343.734	267.5
373.088	277.5
403.632	287.5
499.734	319.5

Material Boundary

X	Y
170.242	206.076
196.136	206.076
200.965	207.891

Material Boundary

X	Y
196.136	206.076
204.37	206.076
207.125	208.092

Material Boundary

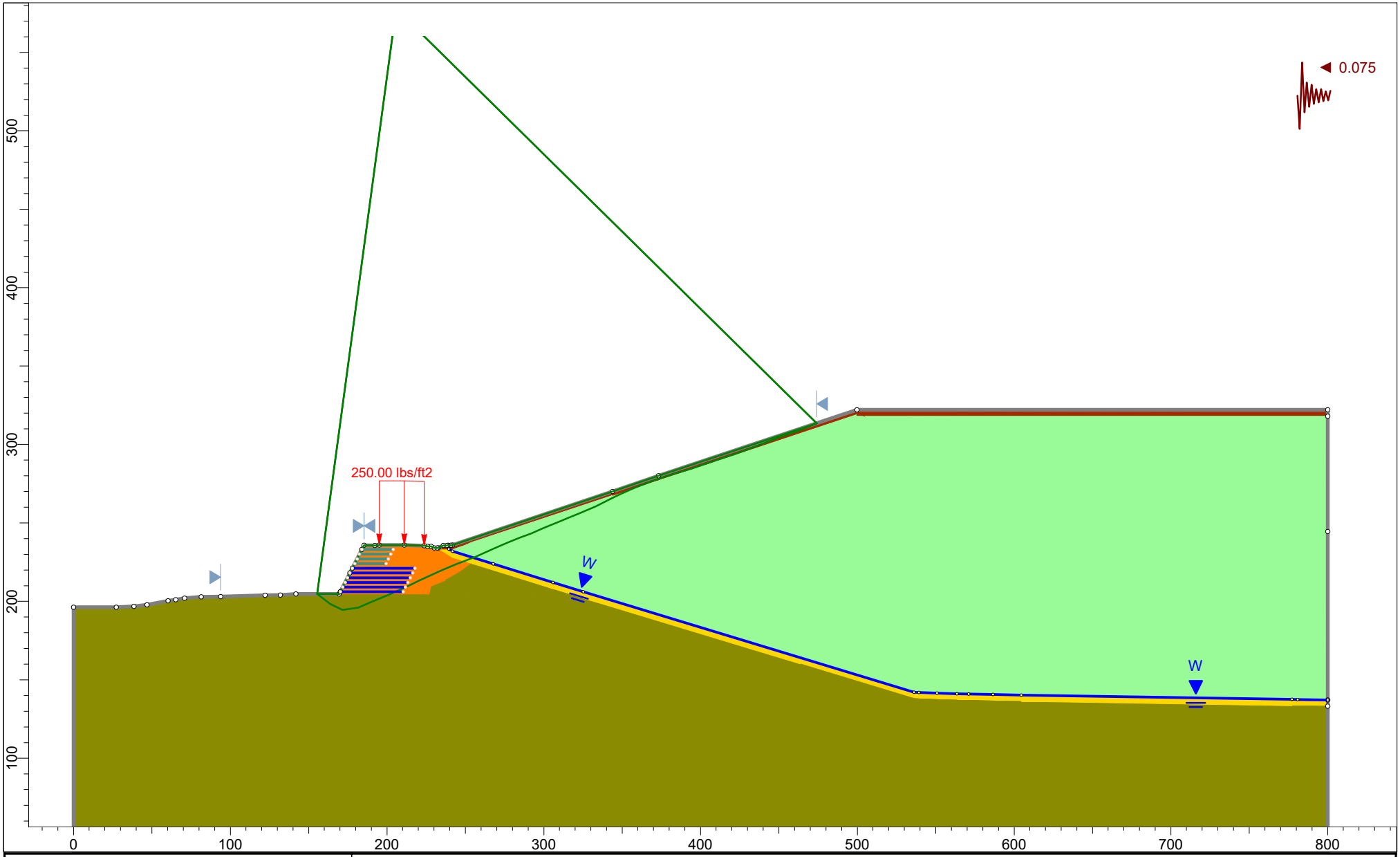
X	Y
204.37	206.076
227.035	206.076
227.761	209.66

Material Boundary

X	Y
176.295	218
214.643	218

Material Boundary

X	Y
169.506	204.589
226.741	204.589
227.035	206.076



Dunn Mine and C&D Facility S.A.Dunn & Company, LLC Rensselaer, New York		
Station 15+01 Seismic		
	Scale: 1:1016	PREPARED BY: Civil & Environmental Consultants, Inc.
Date: 5/17/2021		File Name: Station 15+01 Seismic.slim

SLIDEINTERPRET 9.009

Slide Analysis Information

Station 19+47 Static.Rev1

Project Summary

File Name:	Station 19+47 Static.Rev1.slmd
Slide Modeler Version:	9.009
Compute Time:	00h:00m:07.47s
Analysis:	Station 19+47 Static
Company:	Civil & Environmental Consultants, Inc.

Comments

Dunn Mine and C&D Facility
S.A. Dunn & Company, LLC
Rensselaer, New York

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	GLE/Morgenstern-Price with interslice force function (Half Sine)
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Discard data for surfaces with FS above:	2
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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

Surface Options

Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Number of vertices per surface:	12
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Loading

1 Distributed Load present

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

Materials

C&D Waste	
Color	
Strength Type	Shear Normal function
Unit Weight [lbs/ft3]	60
Water Surface	None
Ru Value	0
Bottom Liner	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	118.5
Cohesion [psf]	67
Friction Angle [deg]	17.4
Water Surface	Piezometric Line 1
Hu Value	Automatically Calculated
Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Final Cover System	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	119.9
Cohesion [psf]	0
Friction Angle [deg]	27
Water Surface	None
Ru Value	0
New Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	100
Friction Angle [deg]	30
Water Surface	None
Ru Value	0

Shear Normal Functions

Name: C&D

Normal (psf)	Shear (psf)
0	0
2000	1400
10000	6169

Support

Type 1	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	1900
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Type 2	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	3900
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Type 3	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	8400
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Global Minimums

Method: gle/morgenstern-price

FS	1.555360
Axis Location:	319.538, 358.188
Left Slip Surface Endpoint:	312.081, 140.000
Right Slip Surface Endpoint:	489.614, 221.309
Resisting Moment:	8.4536e+07 lb-ft
Driving Moment:	5.43514e+07 lb-ft
Resisting Horizontal Force:	326357 lb
Driving Horizontal Force:	209828 lb
Active Support Moment:	-1.25099e+07 lb-ft
Active Horizontal Support Force:	-55568.9 lb
Maximum Single Support Force:	8400 lb
Total Support Force:	58810.7 lb
Total Slice Area:	5547.42 ft2
Surface Horizontal Width:	177.533 ft
Surface Average Height:	31.2472 ft

Global Minimum Coordinates

Method: gle/morgenstern-price

X	Y
312.081	140
316.065	137.093
322.805	134.627
329.544	133.502
336.59	132.793
343.635	132.391
351.115	132.629
358.523	133.5
366.199	134.787
374.152	136.548
382.105	138.511
390.058	140.196
398.01	142.318
405.962	146.294
413.913	151.608
417.888	155.078
421.862	158.549
429.812	165.211
437.763	171.597
443.283	175.838
450.538	181.594
457.344	187.611
463.759	194.347
470.553	201.49
477.346	208.635
483.48	214.972
489.614	221.309

Global Minimum Support Data

Method: gle/morgenstern-price

Number of Supports: 20

Type 2

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
402, 194	55	Not Effective	Not Effective	Not Effective	Not Effective	0
403.5, 197	55	Not Effective	Not Effective	Not Effective	Not Effective	0
405, 200	55	Not Effective	Not Effective	Not Effective	Not Effective	0

Type 1

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
414, 218	20	Not Effective	Not Effective	Not Effective	Not Effective	0
412.5, 215	20	Not Effective	Not Effective	Not Effective	Not Effective	0
411, 212	20	Not Effective	Not Effective	Not Effective	Not Effective	0
409.5, 209	20	Not Effective	Not Effective	Not Effective	Not Effective	0
408, 206	20	Not Effective	Not Effective	Not Effective	Not Effective	0

Type 2

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
400.5, 191	55	Not Effective	Not Effective	Not Effective	Not Effective	0
399, 188	55	Not Effective	Not Effective	Not Effective	Not Effective	0
397.5, 185	55	Not Effective	Not Effective	Not Effective	Not Effective	0
396, 182	55	54.9971	0.00289802	54.9971	0.00289802	10.7017
406.5, 203	55	Not Effective	Not Effective	Not Effective	Not Effective	0

Type 3

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
393, 176	90	50.4873	39.5127	50.4873	39.5127	8400
393.75, 177.5	90	51.6279	38.3721	51.6279	38.3721	8400
394.5, 179	90	52.7685	37.2315	52.7685	37.2315	8400
395.25, 180.5	90	53.909	36.091	53.909	36.091	8400
391.5, 173	100	48.089	51.911	48.089	51.911	8400
392.25, 174.5	100	49.2915	50.7085	49.2915	50.7085	8400
390.75, 171.5	100	46.892	53.108	46.892	53.108	8400

Valid and Invalid Surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	1276
Number of Invalid Surfaces:	17733

Error Codes

Error Code -97 reported for 1249 surfaces
Error Code -105 reported for 3633 surfaces
Error Code -108 reported for 10 surfaces
Error Code -110 reported for 419 surfaces
Error Code -111 reported for 161 surfaces
Error Code -113 reported for 12261 surfaces

Error Code Descriptions

The following errors were encountered during the computation:
-97 = Factor of safety is out of valid range set by user.
-105 = More than two surface / slope intersections with no valid slip surface.
-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).
-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.
-111 = safety factor equation did not converge
-113 = Surface intersects outside slope limits.

Slice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.55536

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	3.9842	694.922	-36.1156	Subgrade	0	30	93.7661	145.84	252.602	0	252.602	184.188	184.188
2	3.36999	1561.63	-20.0942	Subgrade	0	30	215.09	334.542	579.444	0	579.444	500.757	500.757
3	3.36999	2695.85	-20.0942	Subgrade	0	30	383.94	597.165	1034.32	0	1034.32	893.862	893.862
4	3.36961	3739.86	-9.47973	Subgrade	0	30	491.346	764.22	1323.67	0	1323.67	1241.62	1241.62
5	3.36961	4648.63	-9.47973	Subgrade	0	30	625.604	973.04	1685.35	0	1685.35	1580.89	1580.89
6	3.52273	5782.16	-5.74979	Subgrade	0	30	731.766	1138.16	1971.35	0	1971.35	1897.67	1897.67
7	3.52273	6676.69	-5.74979	Subgrade	0	30	862.848	1342.04	2324.49	0	2324.49	2237.6	2237.6
8	3.52269	7538.61	-3.26535	Subgrade	0	30	964.716	1500.48	2598.9	0	2598.9	2543.86	2543.86
9	3.52269	8368.13	-3.26535	Subgrade	0	30	1089.32	1694.29	2934.6	0	2934.6	2872.46	2872.46
10	3.73976	9716.9	1.8282	Subgrade	0	30	1134.08	1763.9	3055.16	0	3055.16	3091.36	3091.36
11	3.73976	10502.5	1.8282	Subgrade	0	30	1238.9	1926.93	3337.52	0	3337.52	3377.07	3377.07
12	3.70418	11106.5	6.70229	Subgrade	0	30	1250.89	1945.59	3369.87	0	3369.87	3516.87	3516.87
13	3.70418	11736.3	6.70229	Subgrade	0	30	1327.33	2064.48	3575.78	0	3575.78	3731.76	3731.76
14	3.83813	12780.7	9.51608	Subgrade	0	30	1345.86	2093.29	3625.68	0	3625.68	3851.29	3851.29
15	3.83813	13368.2	9.51608	Subgrade	0	30	1408.13	2190.15	3793.45	0	3793.45	4029.5	4029.5
16	3.97636	14418.3	12.4875	Subgrade	0	30	1403.52	2182.98	3781.02	0	3781.02	4091.85	4091.85
17	3.97636	14946.8	12.4875	Subgrade	0	30	1450.12	2255.46	3906.57	0	3906.57	4227.72	4227.72
18	3.97636	15451.2	13.8657	Subgrade	0	30	1462.68	2274.99	3940.41	0	3940.41	4301.46	4301.46
19	3.97636	15931.5	13.8657	Subgrade	0	30	1500.04	2333.1	4041.05	0	4041.05	4411.32	4411.32
20	3.97644	16213.3	11.9651	Subgrade	0	30	1563.15	2431.26	4211.06	0	4211.06	4542.32	4542.32
21	3.97644	15854	11.9651	Subgrade	0	30	1521.31	2366.19	4098.36	0	4098.36	4420.75	4420.75
22	3.97626	16169.7	14.9349	Subgrade	0	30	1470.6	2287.31	3961.73	0	3961.73	4353.98	4353.98
23	3.97626	19208.6	14.9349	Subgrade	0	30	1729.27	2689.64	4658.59	0	4658.59	5119.85	5119.85
24	3.97577	22272.8	26.5692	Subgrade	0	30	1666.26	2591.63	4488.84	0	4488.84	5322.12	5322.12
25	3.97577	25117.9	26.5692	Subgrade	0	30	1867.72	2904.98	5031.56	0	5031.56	5965.59	5965.59
26	2.50494	17223.2	33.7582	Subgrade	0	30	1814.04	2821.49	4886.97	0	4886.97	6099.45	6099.45
27	5.44585	40903.5	33.7582	New Fill	100	30	2039.85	3172.7	5322.07	0	5322.07	6685.48	6685.48
28	3.97493	31652.8	41.1214	New Fill	100	30	1966.73	3058.97	5125.09	0	5125.09	6842.07	6842.07
29	3.97493	30139.4	41.1214	New Fill	100	30	1899.43	2954.29	4943.78	0	4943.78	6602	6602
30	3.97501	28517.9	39.9661	New Fill	100	30	1846.07	2871.31	4800.04	0	4800.04	6347.22	6347.22
31	3.97501	26928.8	39.9661	New Fill	100	30	1761.44	2739.68	4572.06	0	4572.06	6048.31	6048.31
32	3.97509	25373.2	38.7705	New Fill	100	30	1711.66	2662.25	4437.94	0	4437.94	5812.7	5812.7
33	3.97509	23850.3	38.7705	New Fill	100	30	1654.67	2573.6	4284.41	0	4284.41	5613.39	5613.39
34	2.76014	15680.8	37.5333	New Fill	100	30	1615.24	2512.28	4178.17	0	4178.17	5419.08	5419.08
35	2.76014	14978.4	37.5333	New Fill	100	30	1538.05	2392.22	3970.22	0	3970.22	5151.83	5151.83
36	3.62729	18596.4	38.4288	New Fill	100	30	1418.12	2205.68	3647.15	0	3647.15	4772.29	4772.29
37	3.62729	17343.7	38.4288	New Fill	100	30	1291.16	2008.22	3305.14	0	3305.14	4329.56	4329.56
38	3.40305	15048.6	41.4792	New Fill	100	30	1151.62	1791.18	2929.19	0	2929.19	3947.31	3947.31
39	3.40305	13456.9	41.4792	New Fill	100	30	1003.57	1560.91	2530.36	0	2530.36	3417.6	3417.6
40	3.20777	11113.9	46.3966	New Fill	100	30	835.324	1299.23	2077.13	0	2077.13	2954.21	2954.21
41	3.20777	9906.14	46.3966	New Fill	100	30	759.342	1181.05	1872.43	0	1872.43	2669.72	2669.72
42	3.3968	9427.42	46.4373	New Fill	100	30	697.143	1084.31	1704.87	0	1704.87	2437.9	2437.9
43	3.3968	8094.17	46.4373	New Fill	100	30	614.519	955.798	1482.29	0	1482.29	2128.44	2128.44
44	3.3968	6816.75	46.4422	New Fill	100	30	533.34	829.535	1263.59	0	1263.59	1824.48	1824.48
45	3.3968	5462.85	46.4422	New Fill	100	30	443.647	690.031	1021.96	0	1021.96	1488.53	1488.53
46	3.59915	4318.12	45.9336	New Fill	100	30	350.137	544.589	770.049	0	770.049	1131.79	1131.79
47	2.53484	2107.99	45.9336	Bottom Liner	67	17.4	145.094	225.674	633.862	127.533	506.329	783.764	656.231
48	0.394889	249.624	45.9341	Bottom Liner	67	17.4	134.109	208.588	466.944	15.1371	451.807	605.499	590.362
49	0.962054	555.228	45.9341	C&D Waste	5.68434e-14	34.992	172.012	267.54	382.201	0	382.201	559.914	559.914
50	4.77704	1311.95	45.9341	Final Cover System	0	27	65.7591	102.279	200.734	0	200.734	268.673	268.673

Interslice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.55536

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	312.081	140	0	0	0
2	316.065	137.093	1107.9	38.9213	2.01201
3	319.435	135.86	2547.13	164.841	3.70281
4	322.805	134.627	5116.17	481.288	5.37411
5	326.175	134.065	7516.59	925.214	7.01722
6	329.544	133.502	10572.9	1603.59	8.62431
7	333.067	133.147	13850	2506.45	10.2579
8	336.59	132.793	17714.1	3712.33	11.8361
9	340.113	132.592	21634.8	5135.08	13.3522
10	343.635	132.391	26062	6885.94	14.8001
11	347.375	132.51	29938.5	8730.21	16.2569
12	351.115	132.629	34173.2	10857.5	17.6261
13	354.819	133.065	37339.9	12778.3	18.8918
14	358.523	133.5	40700.1	14865.3	20.0642
15	362.361	134.143	43532.9	16866.5	21.1785
16	366.199	134.787	46496.9	18964.2	22.1886
17	370.176	135.667	48748.1	20816.7	23.1237
18	374.152	136.548	51074.1	22680.9	23.945
19	378.128	137.529	53022.6	24333.8	24.6519
20	382.105	138.511	55020.9	25943.3	25.2447
21	386.081	139.354	57688.1	27792.2	25.7232
22	390.058	140.196	60283.9	29516.9	26.0878
23	394.034	141.257	61929.6	30659.8	26.3389
24	398.01	142.318	63864.7	31808.9	26.4764
25	401.986	144.306	61564.5	30695.7	26.5006
26	405.962	146.294	58986.2	29295.7	26.4115
27	408.467	147.968	55348.2	27351.4	26.2972
28	413.913	151.608	47085	22856.3	25.8932
29	417.888	155.078	37117.7	17675.3	25.4636
30	421.862	158.549	27512	12782.3	24.92
31	425.837	161.88	18859.2	8500.28	24.2622
32	429.812	165.211	10629.5	4619.67	23.4902
33	433.788	168.404	3264.53	1359.18	22.6043
34	437.763	171.597	4087.04	1618.56	21.6047
35	440.523	173.717	7638.99	2908.57	20.8445
36	443.283	175.838	11418.8	4163.02	20.0306
37	446.91	178.716	21930.7	7500.26	18.8806
38	450.538	181.594	32966.4	10483.7	17.6413
39	453.941	184.602	28082.7	8265.22	16.4001
40	457.344	187.611	23885.1	6438.35	15.0858
41	460.551	190.979	19568.7	4800.53	13.7834
42	463.759	194.347	15698	3458.09	12.4232
43	467.156	197.919	11976.8	2311.7	10.9246
44	470.553	201.49	8770.03	1447.43	9.37177
45	473.95	205.063	6067.8	828.102	7.77142
46	477.346	208.635	3924.06	421.499	6.13086
47	480.946	212.353	2320.91	176.856	4.35758
48	483.48	214.972	1028.73	55.5771	3.0924
49	483.875	215.38	891.185	45.0577	2.89437
50	484.837	216.374	676.783	28.4968	2.41109
51	489.614	221.309	0	0	0

Entity Information

Group 1

Shared Entities

Type	Coordinates (x,y)
External Boundary	380.3, 171.5 317.3, 140 300.623, 140 186.076, 175.814 180.749, 175.21 177.103, 174.502 173.919, 174.049 168.077, 173.629 162.334, 173.167 158.792, 172.962 149.383, 171.734 142.209, 171.055 139.841, 170.852 131.095, 169.848 122.464, 168.846 113.506, 168.081 108.58, 167.62 106.167, 166.548 102.779, 165.424 100.704, 164.746 97.1202, 163.317 90.4984, 155.011 82.4686, 139.273 77.1292, 137.905 57.573, 121.275 52.7049, 117.102 49.4852, 113.688 47.3428, 112.076 29.7971, 100.128 20.7316, 96.425 0, 96.425 0, -60 1500, -60 1500, 177.713 1500, 181.713 1500, 292.83 1500, 309.839 1500, 313.839 1373.34, 317.661 1238.22, 322 1113.67, 322 882.738, 314.583 829.159, 313.1 816.405, 308.747 579.825, 228 480.195, 220.611 471.961, 220 469.01, 219.63 466.666, 219.122

	465.856, 219.318 465.361, 219.168 464.478, 219.484 462.482, 218.492 461.493, 218 460.364, 217.999 459.302, 218 455.627, 219.028 452.962, 220 415, 220 408, 206 406.5, 203 398.85, 187.7 397.821, 185.641 396, 182 395.25, 180.5 394.5, 179 391.5, 173 383.3, 173
Material Boundary	679.556, 146.222 679.659, 146.188
Material Boundary	462.482, 218.492 467.538, 216.811 471.961, 215.34 480.624, 212.46 490.154, 209.291 498.125, 206.641 504.977, 204.363 530.19, 196 543.024, 191.723 580.953, 179.083 596.205, 174 611.982, 168.742 644.215, 158 674.04, 148.061 679.556, 146.222
	341.65, 149.043 345.946, 147.446 354.918, 148.674 358.59, 148.539 359.264, 148.32 365.545, 147.003 368.082, 146.83 370.259, 146.867 381.654, 147.418 388.679, 147.474 399.065, 147.741 412.618, 148.069 415.536, 147.958 426.261, 148.275 439.874, 148.457 444.572, 149.513 456.024, 152.177 457.378, 152.578 471.97, 160.321 474.665, 161.616 476.041, 162.472 478.887, 164.244 485.361, 168.626

491.216, 172.59
494.285, 173.024
496.898, 173.394
497.818, 173.493
502.123, 175.191
517.079, 182.966
519.812, 184.269
520.992, 184.921
530.944, 191.258
534.194, 193.463
534.918, 193.095
538.276, 191.619
543.024, 191.723
543.714, 191.738
550.585, 192.032
552.604, 192.53
553.154, 192.666
554.551, 193.036
568.396, 187.268
571.04, 186.166
571.641, 185.926
573.356, 185.335
594.033, 178.422
600.282, 176.36
627.672, 166.757
632.565, 164.896
640.148, 163.138
641.774, 162.814
647.025, 161.764
660.11, 161.695
666.193, 161.705
673.288, 159.415
674.211, 159.193
675.404, 158.902
676.983, 158.511
679.14, 157.974
682.084, 157.233
686.308, 157.233
689.377, 157.233
691.596, 157.233
691.732, 157.233
693.401, 157.233
707.907, 157.233
710.128, 157.233
728.345, 157.233
728.415, 157.233
728.796, 157.233
728.865, 157.233
728.931, 157.233
728.995, 157.233
729.615, 157.233
729.673, 157.233
729.726, 157.233
730.384, 157.233
732.31, 157.233
733.014, 157.233
746.705, 157.233
746.877, 157.233
746.955, 157.233

Material Boundary	747.046, 157.233 747.717, 157.233 747.815, 157.233 747.923, 157.233 748.656, 157.233 748.769, 157.233 748.889, 157.233 749.654, 157.233 749.777, 157.233 750.551, 157.233 750.675, 157.233 751.434, 157.233 751.559, 157.233 752.282, 157.233 752.407, 157.233 753.076, 157.233 753.678, 157.233 753.8, 157.233 754.057, 157.233 754.739, 157.233 766.42, 157.233 766.549, 157.233 766.904, 157.233 767.08, 157.233 767.216, 157.233 767.384, 157.233 767.533, 157.233 767.691, 157.233 767.85, 157.233 768.069, 157.233 768.232, 157.233 768.403, 157.233 768.639, 157.233 768.807, 157.233 769.061, 157.233 769.379, 157.233 769.527, 157.233 770.042, 157.233 770.21, 157.233 770.408, 157.233 770.663, 157.233 770.922, 157.233 771.126, 157.233 771.373, 157.233 771.614, 157.233 772.039, 157.233 774.386, 157.233 774.452, 157.233 774.512, 157.233 774.559, 157.233 774.931, 157.233 774.961, 157.233 775.367, 157.233 775.401, 157.233 776.247, 157.286 777.028, 157.337 777.671, 157.38 778.186, 157.417 778.581, 157.449

778.862, 157.475
783.551, 157.969
790.108, 158.186
798.6, 158.519
809.535, 158.849
843.835, 160.001
846.293, 160.089
847.159, 160.152
849.637, 160.268
866.743, 161.218
873.476, 161.278
877.576, 161.355
888.228, 161.812
889.815, 161.89
895.696, 164.994
896.357, 165.231
898.087, 164.714
902.669, 167.126
906.077, 167.939
907.788, 167.521
909.116, 168.298
912.794, 170.282
921.58, 171.527
926.416, 172.161
927.334, 172.197
934.394, 172.502
939.995, 172.711
940.314, 172.75
941.031, 172.768
948.74, 175.986
953.918, 177.83
958.843, 179.444
968.83, 181.685
971.257, 181.784
972.949, 182.025
984.3, 185.078
990.206, 186.968
991.891, 188.102
1000.51, 194.523
1000.89, 194.307
1003.12, 193.411
1015.58, 188.515
1024.56, 186.575
1028.32, 183.743
1034.83, 183.741
1035.33, 183.59
1041.38, 179.685
1043.37, 178.556
1043.55, 178.456
1048.32, 181.858
1053.87, 184.714
1063.46, 185.442
1072.52, 186.42
1076.18, 191.404
1091.57, 213.32
1107.86, 213.235
1108.83, 213.181
1110.31, 213.165
1125.68, 212.596

	1134.55, 212.296 1135.26, 212.258 1149.65, 211.949 1174.52, 211.423 1176.11, 211.377 1176.72, 211.332 1190.89, 210.189 1197.61, 212.782 1215.78, 218.32 1240.39, 226.167 1244.64, 227.429 1251.66, 229.668 1275.26, 237.111 1285.49, 240.306 1317.11, 250.108 1348.93, 260.257 1368.04, 266.247 1396.06, 275.448 1406.31, 279.816 1427.31, 285.78 1434.09, 288.541 1439.03, 290.725 1457.49, 295.321 1459.12, 294.83 1468.45, 293.335 1476.04, 293.238 1489.53, 293.023 1493.41, 292.968 1494.79, 292.97 1500, 292.83

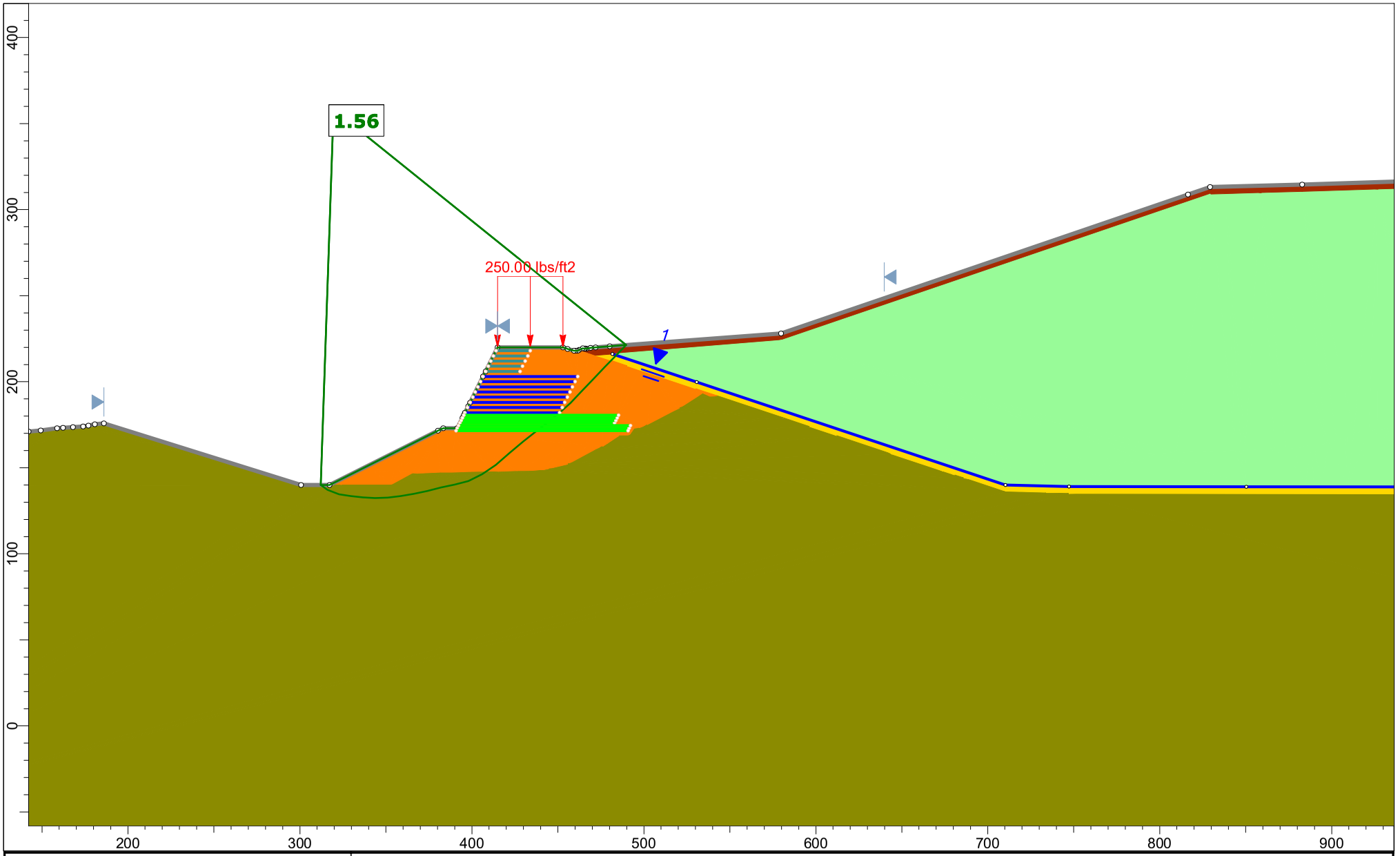
Material Boundary	474.174, 218.604 481.652, 216.118 504.977, 208.363 530.19, 200 552.604, 192.53 568.396, 187.268 638.214, 164 641.774, 162.814 679.556, 150.222 680.589, 149.878 686.101, 148.041 710.23, 140 717.128, 139.963 733.673, 139.409 747.226, 139.068 850.321, 138.949 884.358, 138.909 889.686, 138.903 894.14, 138.898 909.357, 138.88 993.915, 138.782 1007.61, 138.766 1013.66, 138.759 1027.23, 138.743 1057.38, 138.708 1070.71, 138.919 1098.28, 139.464 1117.33, 140 1155.78, 141.555 1167.24, 142 1209.53, 144 1230.37, 144.7 1269.07, 146 1269.84, 146.004 1270.03, 146.004 1311.13, 147.025 1325.73, 147.317 1335.19, 147.531 1337.55, 147.527 1345.58, 147.733 1346.8, 147.731 1355.95, 148 1443.5, 168.509 1467.16, 174.051 1467.96, 174.234 1475.53, 176 1500, 181.713
Material Boundary	467.538, 216.811 470.86, 217.5 474.174, 218.604 480.195, 220.611

Material Boundary	816.405, 308.747 829.159, 309.1 838.386, 309.356 858.579, 309.915 882.738, 310.583 926.849, 312 956.644, 312.957 981.404, 313.752 1031.11, 315.349 1093.6, 317.355 1113.67, 318 1238.22, 318 1285.71, 316.475 1310.67, 315.673 1328.89, 315.088 1335.69, 314.87 1360.27, 314.08 1373.34, 313.661 1449.02, 311.377 1474.32, 310.614 1494.67, 310 1500, 309.839
Material Boundary	390, 170 456.486, 164.183 467.135, 163.252 476.041, 162.472
Material Boundary	476.041, 162.472 485.055, 180.5 498.125, 206.641
Material Boundary	456.486, 164.183 464.644, 180.5 480.624, 212.46
Material Boundary	467.135, 163.252 475.759, 180.5 490.154, 209.291

Material Boundary	679.659, 146.188 680.589, 145.878 686.101, 144.041 710.23, 136 717.128, 135.963 733.673, 135.409 747.226, 135.068 1007.61, 134.766 1013.66, 134.759 1027.23, 134.743 1057.38, 134.708 1070.71, 134.919 1098.28, 135.464 1117.33, 136 1155.78, 137.555 1167.24, 138 1209.53, 140 1230.37, 140.7 1269.07, 142 1269.84, 142.004 1270.03, 142.004 1311.13, 143.025 1325.73, 143.317 1335.19, 143.531 1337.55, 143.527 1345.58, 143.733 1346.8, 143.731 1355.95, 144 1467.16, 170.051 1467.96, 170.234 1475.53, 172 1500, 177.713
Material Boundary	323.563, 140 352.549, 140 365.545, 147.003
Material Boundary	396, 182 402.783, 182
Material Boundary	485.361, 168.626 491.288, 168.626 494.285, 173.024
Material Boundary	317.3, 140 323.563, 140 341.65, 149.043 379.564, 168 390, 170 390.75, 171.5
Material Boundary	390.75, 171.5 391.5, 173
Material Boundary	471.961, 215.34 481.652, 216.118 579.825, 224 829.159, 309.1

Scenario-based Entities

Type	Coordinates (x,y)	Master Scenario
Piezoline	481.652, 216.118 530.705, 199.829 710.23, 140 747.226, 139.068 850.321, 138.949 1013.66, 138.759 1027.23, 138.743 1057.38, 138.708 1070.71, 138.919 1098.28, 139.464 1117.33, 140 1155.78, 141.555 1167.24, 142 1209.53, 144 1230.37, 144.7 1270.03, 146.004 1355.95, 148 1500, 181.713	Assigned to: Bottom Liner
Distributed Load	452.962, 220 415, 220	Constant DistributionOrientation: Normal to boundaryMagnitude: 250 lbs/ft2Creates Excess Pore Pressure: No



Dunn Mine and C&D Facility S.A. Dunn & Company, LLC Rensselaer, New York		
Station 19+47 Static		
	Scale: 1:924	PREPARED BY: Civil & Environmental Consultants, Inc.
Date: 5/17/2021		File Name: Station 19+47 Static.Rev1.slmd

SLIDEINTERPRET 9.009

Slide Analysis Information

Station 19+47 Seismic

Project Summary

File Name:	Station 19+47 Seismic.slmd
Slide Modeler Version:	9.009
Compute Time:	00h:00m:09.795s
Analysis:	Station 19+47 Seismic
Company:	Civil & Environmental Consultants, Inc.
Comments	
	Dunn Mine and C&D Facility S.A. Dunn & Company, LLC Rensselaer, New York

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	GLE/Morgenstern-Price with interslice force function (Half Sine)
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Discard data for surfaces with FS above:	2
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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

Surface Options

Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Number of vertices per surface:	12
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.075

Loading

1 Distributed Load present

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

Materials

C&D Waste	
Color	
Strength Type	Shear Normal function
Unit Weight [lbs/ft3]	60
Water Surface	None
Ru Value	0
Bottom Liner	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	118.5
Cohesion [psf]	67
Friction Angle [deg]	17.4
Water Surface	Piezometric Line 1
Hu Value	Automatically Calculated
Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Final Cover System	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	119.9
Cohesion [psf]	0
Friction Angle [deg]	27
Water Surface	None
Ru Value	0
New Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	100
Friction Angle [deg]	30
Water Surface	None
Ru Value	0

Shear Normal Functions

Name: C&D

Normal (psf)	Shear (psf)
0	0
2000	1400
10000	6169

Support

Type 1	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	1900
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Type 2	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	3900
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Type 3	
Color	
Support Type	Geosynthetic
Force Application	Active
Force Orientation	Bisector of Parallel and Tangent
Anchorage	None
Shear Strength Model	Linear
Use External Loads for Strength	yes
Strip Coverage [percent]	100
Tensile Strength [lb/ft]	8400
Pullout Strength Adhesion [psf]	0
Pullout Strength Friction Angle [degrees]	21
Material Dependent	No

Global Minimums

Method: gle/morgenstern-price

FS	1.320650
Axis Location:	320.967, 361.111
Left Slip Surface Endpoint:	312.331, 140.000
Right Slip Surface Endpoint:	492.674, 221.536
Resisting Moment:	7.82195e+07 lb-ft
Driving Moment:	5.92283e+07 lb-ft
Resisting Horizontal Force:	305714 lb
Driving Horizontal Force:	231488 lb
Active Support Moment:	-1.27197e+07 lb-ft
Active Horizontal Support Force:	-55143.7 lb
Maximum Single Support Force:	8400 lb
Total Support Force:	58800 lb
Total Slice Area:	5300.86 ft2
Surface Horizontal Width:	180.343 ft
Surface Average Height:	29.3932 ft

Global Minimum Coordinates

Method: gle/morgenstern-price

X	Y
312.331	140
317.768	136.654
324.726	134.782
331.684	134.243
338.4	134.108
345.117	134.626
352.258	135.354
360.064	136.775
367.641	138.297
375.218	140.175
383.036	142.293
390.277	144.553
397.518	146.813
404.76	150.149
409.897	152.986
415.034	156.151
420.171	159.316
425.308	162.482
433.154	167.316
437.077	170.054
441	173.399
446.297	177.948
451.595	182.511
456.892	187.477
461.184	191.5
466.412	196.401
471.637	201.3
476.863	206.199
482.133	211.139
487.404	216.08
492.674	221.536

Global Minimum Support Data

Method: gle/morgenstern-price

Number of Supports: 20

Type 2

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
402, 194	55	Not Effective	Not Effective	Not Effective	Not Effective	0
403.5, 197	55	Not Effective	Not Effective	Not Effective	Not Effective	0
405, 200	55	Not Effective	Not Effective	Not Effective	Not Effective	0

Type 1

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
414, 218	20	Not Effective	Not Effective	Not Effective	Not Effective	0
412.5, 215	20	Not Effective	Not Effective	Not Effective	Not Effective	0
411, 212	20	Not Effective	Not Effective	Not Effective	Not Effective	0
409.5, 209	20	Not Effective	Not Effective	Not Effective	Not Effective	0
408, 206	20	Not Effective	Not Effective	Not Effective	Not Effective	0

Type 2

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
400.5, 191	55	Not Effective	Not Effective	Not Effective	Not Effective	0
399, 188	55	Not Effective	Not Effective	Not Effective	Not Effective	0
397.5, 185	55	Not Effective	Not Effective	Not Effective	Not Effective	0
396, 182	55	Not Effective	Not Effective	Not Effective	Not Effective	0
406.5, 203	55	Not Effective	Not Effective	Not Effective	Not Effective	0

Type 3

Support Type: Geosynthetic

Start (x, y)	Length (ft)	L Inside SS (ft)	L Outside SS (ft)	Li (ft)	Lo (ft)	Force (lb)
393, 176	90	51.0289	38.9711	51.0289	38.9711	8400
393.75, 177.5	90	52.0253	37.9747	52.0253	37.9747	8400
394.5, 179	90	53.0183	36.9817	53.0183	36.9817	8400
395.25, 180.5	90	54.0098	35.9902	54.0098	35.9902	8400
391.5, 173	100	49.0326	50.9674	49.0326	50.9674	8400
392.25, 174.5	100	50.0325	49.9675	50.0325	49.9675	8400
390.75, 171.5	100	48.0234	51.9766	48.0234	51.9766	8400

Valid and Invalid Surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	2698
Number of Invalid Surfaces:	16310

Error Codes

Error Code -97 reported for 1032 surfaces
Error Code -105 reported for 3284 surfaces
Error Code -108 reported for 6 surfaces
Error Code -110 reported for 320 surfaces
Error Code -111 reported for 121 surfaces
Error Code -113 reported for 11547 surfaces

Error Code Descriptions

The following errors were encountered during the computation:
-97 = Factor of safety is out of valid range set by user.
-105 = More than two surface / slope intersections with no valid slip surface.
-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).
-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.
-111 = safety factor equation did not converge
-113 = Surface intersects outside slope limits.

Slice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.32065

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.71828	272.894	-31.6138	Subgrade	0	30	63.3805	83.7035	144.979	0	144.979	105.966	105.966
2	2.71828	825.248	-31.6138	Subgrade	0	30	206.715	272.998	472.846	0	472.846	345.606	345.606
3	3.47881	2053.07	-15.0597	Subgrade	0	30	335.016	442.439	766.327	0	766.327	676.186	676.186
4	3.47881	3169.95	-15.0597	Subgrade	0	30	544.9	719.622	1246.42	0	1246.42	1099.81	1099.81
5	3.47932	4148.34	-4.42682	Subgrade	0	30	645.382	852.324	1476.27	0	1476.27	1426.31	1426.31
6	3.47932	4987.14	-4.42682	Subgrade	0	30	802.514	1059.84	1835.7	0	1835.7	1773.57	1773.57
7	3.35799	5569.84	-1.14708	Subgrade	0	30	912.891	1205.61	2088.18	0	2088.18	2069.9	2069.9
8	3.35799	6273.5	-1.14708	Subgrade	0	30	1056.47	1395.23	2416.61	0	2416.61	2395.46	2395.46
9	3.35815	6911.84	4.40508	Subgrade	0	30	1088.07	1436.96	2488.89	0	2488.89	2572.71	2572.71
10	3.35815	7484.22	4.40508	Subgrade	0	30	1196.94	1580.74	2737.93	0	2737.93	2830.13	2830.13
11	3.57056	8566.34	5.8238	Subgrade	0	30	1275.36	1684.3	2917.29	0	2917.29	3047.37	3047.37
12	3.57056	9175.23	5.8238	Subgrade	0	30	1383.58	1827.22	3164.85	0	3164.85	3305.97	3305.97
13	3.90308	10653.1	10.3171	Subgrade	0	30	1361.8	1798.46	3115.02	0	3115.02	3362.93	3362.93
14	3.90308	11234.4	10.3171	Subgrade	0	30	1441.36	1903.53	3297.02	0	3297.02	3559.4	3559.4
15	3.78862	11444.7	11.3561	Subgrade	0	30	1484.11	1959.99	3394.79	0	3394.79	3692.86	3692.86
16	3.78862	11960	11.3561	Subgrade	0	30	1550.68	2047.91	3547.08	0	3547.08	3858.52	3858.52
17	3.78871	12435.1	13.9204	Subgrade	0	30	1522.76	2011.03	3483.21	0	3483.21	3860.63	3860.63
18	3.78871	12869.4	13.9204	Subgrade	0	30	1567.6	2070.25	3585.77	0	3585.77	3974.3	3974.3
19	3.90865	13710.8	15.1626	Subgrade	0	30	1564.59	2066.28	3578.89	0	3578.89	4002.89	4002.89
20	3.90865	14130.6	15.1626	Subgrade	0	30	1599.13	2111.89	3657.91	0	3657.91	4091.27	4091.27
21	3.62058	13093.5	17.33	Subgrade	0	30	1511.63	1996.33	3457.75	0	3457.75	3929.44	3929.44
22	3.62058	12604.8	17.33	Subgrade	0	30	1444.01	1907.03	3303.06	0	3303.06	3753.65	3753.65
23	3.62058	12803.6	17.33	Subgrade	0	30	1450.69	1915.86	3318.38	0	3318.38	3771.06	3771.06
24	3.62058	15279.3	17.33	Subgrade	0	30	1706.02	2253.06	3902.42	0	3902.42	4434.76	4434.76
25	2.04025	9742.71	24.7376	Subgrade	0	30	1622.51	2142.77	3711.39	0	3711.39	4458.95	4458.95
26	5.20119	28315.5	24.7376	New Fill	100	30	1917.93	2532.92	4213.94	0	4213.94	5097.62	5097.62
27	5.13712	32726.9	28.9085	New Fill	100	30	2027.06	2677.04	4463.57	0	4463.57	5582.96	5582.96
28	5.13705	37209.9	31.6393	New Fill	100	30	2162.18	2855.48	4772.63	0	4772.63	6104.86	6104.86
29	5.13712	38384.4	31.6393	New Fill	100	30	2307.03	3046.78	5103.97	0	5103.97	6525.45	6525.45
30	5.13712	36433.1	31.6393	New Fill	100	30	2205.41	2912.58	4871.54	0	4871.54	6230.41	6230.41
31	3.92298	26508.3	31.6393	New Fill	100	30	2120.89	2800.95	4678.18	0	4678.18	5984.97	5984.97
32	3.92298	25370.4	31.6393	New Fill	100	30	2051.16	2708.86	4518.69	0	4518.69	5782.51	5782.51
33	3.92335	24159.4	34.9084	New Fill	100	30	1860.34	2456.86	4082.2	0	4082.2	5380.4	5380.4
34	3.92316	22726.3	40.4528	New Fill	100	30	1894.04	2501.36	4159.27	0	4159.27	5774.23	5774.23
35	2.64854	14449.5	40.6596	New Fill	100	30	1699.86	2244.92	3715.12	0	3715.12	5175.14	5175.14
36	2.64854	13726.5	40.6596	New Fill	100	30	1786.81	2359.75	3914.01	0	3914.01	5448.71	5448.71
37	5.29708	25280	40.7388	New Fill	100	30	1454.12	1920.38	3152.99	0	3152.99	4405.45	4405.45
38	2.64851	11484.4	43.1505	New Fill	100	30	1112.76	1469.56	2372.15	0	2372.15	3415.29	3415.29
39	2.64851	10437.4	43.1505	New Fill	100	30	996.827	1316.46	2106.97	0	2106.97	3041.43	3041.43
40	4.2924	14783.4	43.1505	New Fill	100	30	891.728	1177.66	1866.56	0	1866.56	2702.5	2702.5
41	5.22788	15650.2	43.1505	New Fill	100	30	803.519	1061.17	1664.8	0	1664.8	2418.04	2418.04
42	5.22534	12993.9	43.1505	New Fill	100	30	698.61	922.619	1424.82	0	1424.82	2079.72	2079.72
43	5.22592	10287.4	43.1505	New Fill	100	30	583.543	770.656	1161.61	0	1161.61	1708.64	1708.64
44	2.63519	4108.23	43.1505	New Fill	100	30	485.761	641.52	937.939	0	937.939	1393.31	1393.31
45	2.63519	3381.77	43.1505	New Fill	100	30	416.186	549.636	778.793	0	778.793	1168.94	1168.94
46	0.644866	705.522	43.1505	New Fill	100	30	366.288	483.738	664.655	0	664.655	1008.03	1008.03
47	3.15114	2689.3	43.1505	Bottom Liner	67	17.4	169.682	224.091	613.684	112.404	501.28	772.75	660.346
48	1.4745	908.064	43.1505	C&D Waste	0	34.992	207.206	273.646	390.922	0	390.922	585.164	585.164
49	0.52352	294.321	45.9922	C&D Waste	2.84217e-14	34.992	183.609	242.483	346.406	0	346.406	536.486	536.486
50	4.74694	1298.31	45.9922	Final Cover System	0	27	72.7634	96.095	188.596	0	188.596	263.924	263.924

Interslice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 1.32065

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	312.331	140	0	0	0
2	315.05	138.327	394.399	15.1503	2.19986
3	317.768	136.654	1685.58	129.353	4.38833
4	321.247	135.718	3414.37	428.603	7.15487
5	324.726	134.782	6238.92	1084.68	9.86269
6	328.205	134.512	8570.94	1898.91	12.4922
7	331.684	134.243	11483.6	3082.59	15.0259
8	335.042	134.176	14271.8	4463.48	17.367
9	338.4	134.108	17511.4	6233.94	19.5954
10	341.758	134.367	20003	7961.67	21.7037
11	345.117	134.626	22753	9981.5	23.6866
12	348.687	134.99	25601.8	12296	25.654
13	352.258	135.354	28701.3	14925	27.4749
14	356.161	136.065	31004.2	17397.7	29.2985
15	360.064	136.775	33444.9	20056	30.95
16	363.852	137.536	35626.1	22602.2	32.3922
17	367.641	138.297	37905.1	25260.7	33.6803
18	371.43	139.236	39470.9	27452.4	34.819
19	375.218	140.175	41077.7	29640.6	35.8132
20	379.127	141.234	42374	31575.7	36.6923
21	383.036	142.293	43690.2	33436.4	37.4271
22	386.656	143.423	44274.7	34569.7	37.9827
23	390.277	144.553	44825.8	35555.4	38.4211
24	393.897	145.683	45369	36405.1	38.7443
25	397.518	146.813	45991	37182.2	38.9544
26	399.558	147.753	45081.8	36536.9	39.0233
27	404.76	150.149	42835.4	34735.1	39.0385
28	409.897	152.986	38131.8	30688.6	38.8272
29	415.034	156.151	31342	24831.2	38.3886
30	420.171	159.316	24159.4	18684.7	37.7181
31	425.308	162.482	17336.9	12973.6	36.8084
32	429.231	164.899	12361.1	8963.52	35.9473
33	433.154	167.316	7582.68	5297.01	34.9369
34	437.077	170.054	1893.19	1266.03	33.7718
35	441	173.399	9470.12	6020.86	32.4472
36	443.649	175.674	12314	7534.14	31.4598
37	446.297	177.948	22866.6	13413.5	30.3958
38	451.595	182.511	30037.3	15992.7	28.0321
39	454.243	184.994	26233.6	13211.6	26.7305
40	456.892	187.477	22859.7	10829.3	25.3483
41	461.184	191.5	18067.8	7645.97	22.9372
42	466.412	196.401	12935.9	4636.93	19.7204
43	471.637	201.3	8632.49	2510.23	16.2138
44	476.863	206.199	5219.8	1152.05	12.4461
45	479.498	208.669	3874.74	715.424	10.4612
46	482.133	211.139	2793.97	414.01	8.42875
47	482.778	211.744	2575.46	358.524	7.92509
48	485.929	214.698	1095.64	104.232	5.43439
49	487.404	216.08	792.711	58.9802	4.25515
50	487.928	216.622	679.018	45.5148	3.83482
51	492.674	221.536	0	0	0

Entity Information

Group 1

Shared Entities

Type	Coordinates (x,y)
External Boundary	380.3, 171.5 317.3, 140 300.623, 140 186.076, 175.814 180.749, 175.21 177.103, 174.502 173.919, 174.049 168.077, 173.629 162.334, 173.167 158.792, 172.962 149.383, 171.734 142.209, 171.055 139.841, 170.852 131.095, 169.848 122.464, 168.846 113.506, 168.081 108.58, 167.62 106.167, 166.548 102.779, 165.424 100.704, 164.746 97.1202, 163.317 90.4984, 155.011 82.4686, 139.273 77.1292, 137.905 57.573, 121.275 52.7049, 117.102 49.4852, 113.688 47.3428, 112.076 29.7971, 100.128 20.7316, 96.425 0, 96.425 0, -60 1500, -60 1500, 177.713 1500, 181.713 1500, 292.83 1500, 309.839 1500, 313.839 1373.34, 317.661 1238.22, 322 1113.67, 322 882.738, 314.583 829.159, 313.1 816.405, 308.747 579.825, 228 480.195, 220.611 471.961, 220 469.01, 219.63 466.666, 219.122

	465.856, 219.318 465.361, 219.168 464.478, 219.484 462.482, 218.492 461.493, 218 460.364, 217.999 459.302, 218 455.627, 219.028 452.962, 220 415, 220 408, 206 406.5, 203 398.85, 187.7 397.821, 185.641 396, 182 395.25, 180.5 394.5, 179 391.5, 173 383.3, 173
Material Boundary	679.556, 146.222 679.659, 146.188
Material Boundary	462.482, 218.492 467.538, 216.811 471.961, 215.34 480.624, 212.46 490.154, 209.291 498.125, 206.641 504.977, 204.363 530.19, 196 543.024, 191.723 580.953, 179.083 596.205, 174 611.982, 168.742 644.215, 158 674.04, 148.061 679.556, 146.222
	341.65, 149.043 345.946, 147.446 354.918, 148.674 358.59, 148.539 359.264, 148.32 365.545, 147.003 368.082, 146.83 370.259, 146.867 381.654, 147.418 388.679, 147.474 399.065, 147.741 412.618, 148.069 415.536, 147.958 426.261, 148.275 439.874, 148.457 444.572, 149.513 456.024, 152.177 457.378, 152.578 471.97, 160.321 474.665, 161.616 476.041, 162.472 478.887, 164.244 485.361, 168.626

491.216, 172.59
494.285, 173.024
496.898, 173.394
497.818, 173.493
502.123, 175.191
517.079, 182.966
519.812, 184.269
520.992, 184.921
530.944, 191.258
534.194, 193.463
534.918, 193.095
538.276, 191.619
543.024, 191.723
543.714, 191.738
550.585, 192.032
552.604, 192.53
553.154, 192.666
554.551, 193.036
568.396, 187.268
571.04, 186.166
571.641, 185.926
573.356, 185.335
594.033, 178.422
600.282, 176.36
627.672, 166.757
632.565, 164.896
640.148, 163.138
641.774, 162.814
647.025, 161.764
660.11, 161.695
666.193, 161.705
673.288, 159.415
674.211, 159.193
675.404, 158.902
676.983, 158.511
679.14, 157.974
682.084, 157.233
686.308, 157.233
689.377, 157.233
691.596, 157.233
691.732, 157.233
693.401, 157.233
707.907, 157.233
710.128, 157.233
728.345, 157.233
728.415, 157.233
728.796, 157.233
728.865, 157.233
728.931, 157.233
728.995, 157.233
729.615, 157.233
729.673, 157.233
729.726, 157.233
730.384, 157.233
732.31, 157.233
733.014, 157.233
746.705, 157.233
746.877, 157.233
746.955, 157.233

Material Boundary	747.046, 157.233 747.717, 157.233 747.815, 157.233 747.923, 157.233 748.656, 157.233 748.769, 157.233 748.889, 157.233 749.654, 157.233 749.777, 157.233 750.551, 157.233 750.675, 157.233 751.434, 157.233 751.559, 157.233 752.282, 157.233 752.407, 157.233 753.076, 157.233 753.678, 157.233 753.8, 157.233 754.057, 157.233 754.739, 157.233 766.42, 157.233 766.549, 157.233 766.904, 157.233 767.08, 157.233 767.216, 157.233 767.384, 157.233 767.533, 157.233 767.691, 157.233 767.85, 157.233 768.069, 157.233 768.232, 157.233 768.403, 157.233 768.639, 157.233 768.807, 157.233 769.061, 157.233 769.379, 157.233 769.527, 157.233 770.042, 157.233 770.21, 157.233 770.408, 157.233 770.663, 157.233 770.922, 157.233 771.126, 157.233 771.373, 157.233 771.614, 157.233 772.039, 157.233 774.386, 157.233 774.452, 157.233 774.512, 157.233 774.559, 157.233 774.931, 157.233 774.961, 157.233 775.367, 157.233 775.401, 157.233 776.247, 157.286 777.028, 157.337 777.671, 157.38 778.186, 157.417 778.581, 157.449

778.862, 157.475
783.551, 157.969
790.108, 158.186
798.6, 158.519
809.535, 158.849
843.835, 160.001
846.293, 160.089
847.159, 160.152
849.637, 160.268
866.743, 161.218
873.476, 161.278
877.576, 161.355
888.228, 161.812
889.815, 161.89
895.696, 164.994
896.357, 165.231
898.087, 164.714
902.669, 167.126
906.077, 167.939
907.788, 167.521
909.116, 168.298
912.794, 170.282
921.58, 171.527
926.416, 172.161
927.334, 172.197
934.394, 172.502
939.995, 172.711
940.314, 172.75
941.031, 172.768
948.74, 175.986
953.918, 177.83
958.843, 179.444
968.83, 181.685
971.257, 181.784
972.949, 182.025
984.3, 185.078
990.206, 186.968
991.891, 188.102
1000.51, 194.523
1000.89, 194.307
1003.12, 193.411
1015.58, 188.515
1024.56, 186.575
1028.32, 183.743
1034.83, 183.741
1035.33, 183.59
1041.38, 179.685
1043.37, 178.556
1043.55, 178.456
1048.32, 181.858
1053.87, 184.714
1063.46, 185.442
1072.52, 186.42
1076.18, 191.404
1091.57, 213.32
1107.86, 213.235
1108.83, 213.181
1110.31, 213.165
1125.68, 212.596

	1134.55, 212.296 1135.26, 212.258 1149.65, 211.949 1174.52, 211.423 1176.11, 211.377 1176.72, 211.332 1190.89, 210.189 1197.61, 212.782 1215.78, 218.32 1240.39, 226.167 1244.64, 227.429 1251.66, 229.668 1275.26, 237.111 1285.49, 240.306 1317.11, 250.108 1348.93, 260.257 1368.04, 266.247 1396.06, 275.448 1406.31, 279.816 1427.31, 285.78 1434.09, 288.541 1439.03, 290.725 1457.49, 295.321 1459.12, 294.83 1468.45, 293.335 1476.04, 293.238 1489.53, 293.023 1493.41, 292.968 1494.79, 292.97 1500, 292.83

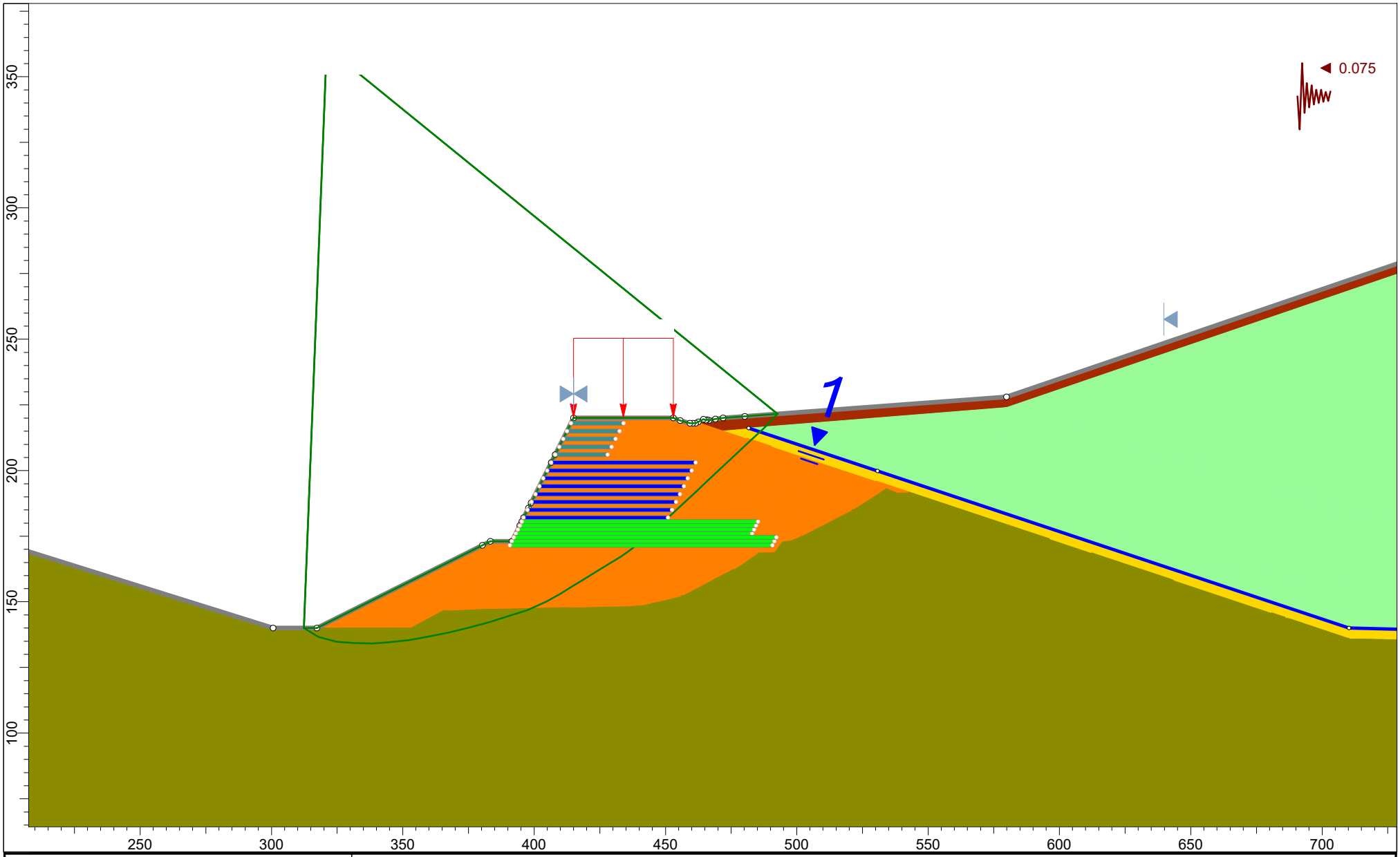
Material Boundary	474.174, 218.604 481.652, 216.118 504.977, 208.363 530.19, 200 552.604, 192.53 568.396, 187.268 638.214, 164 641.774, 162.814 679.556, 150.222 680.589, 149.878 686.101, 148.041 710.23, 140 717.128, 139.963 733.673, 139.409 747.226, 139.068 850.321, 138.949 884.358, 138.909 889.686, 138.903 894.14, 138.898 909.357, 138.88 993.915, 138.782 1007.61, 138.766 1013.66, 138.759 1027.23, 138.743 1057.38, 138.708 1070.71, 138.919 1098.28, 139.464 1117.33, 140 1155.78, 141.555 1167.24, 142 1209.53, 144 1230.37, 144.7 1269.07, 146 1269.84, 146.004 1270.03, 146.004 1311.13, 147.025 1325.73, 147.317 1335.19, 147.531 1337.55, 147.527 1345.58, 147.733 1346.8, 147.731 1355.95, 148 1443.5, 168.509 1467.16, 174.051 1467.96, 174.234 1475.53, 176 1500, 181.713
Material Boundary	467.538, 216.811 470.86, 217.5 474.174, 218.604 480.195, 220.611

Material Boundary	816.405, 308.747 829.159, 309.1 838.386, 309.356 858.579, 309.915 882.738, 310.583 926.849, 312 956.644, 312.957 981.404, 313.752 1031.11, 315.349 1093.6, 317.355 1113.67, 318 1238.22, 318 1285.71, 316.475 1310.67, 315.673 1328.89, 315.088 1335.69, 314.87 1360.27, 314.08 1373.34, 313.661 1449.02, 311.377 1474.32, 310.614 1494.67, 310 1500, 309.839
Material Boundary	390, 170 456.486, 164.183 467.135, 163.252 476.041, 162.472
Material Boundary	476.041, 162.472 485.055, 180.5 498.125, 206.641
Material Boundary	456.486, 164.183 464.644, 180.5 480.624, 212.46
Material Boundary	467.135, 163.252 475.759, 180.5 490.154, 209.291

Material Boundary	679.659, 146.188 680.589, 145.878 686.101, 144.041 710.23, 136 717.128, 135.963 733.673, 135.409 747.226, 135.068 1007.61, 134.766 1013.66, 134.759 1027.23, 134.743 1057.38, 134.708 1070.71, 134.919 1098.28, 135.464 1117.33, 136 1155.78, 137.555 1167.24, 138 1209.53, 140 1230.37, 140.7 1269.07, 142 1269.84, 142.004 1270.03, 142.004 1311.13, 143.025 1325.73, 143.317 1335.19, 143.531 1337.55, 143.527 1345.58, 143.733 1346.8, 143.731 1355.95, 144 1467.16, 170.051 1467.96, 170.234 1475.53, 172 1500, 177.713
Material Boundary	323.563, 140 352.549, 140 365.545, 147.003
Material Boundary	396, 182 402.783, 182
Material Boundary	485.361, 168.626 491.288, 168.626 494.285, 173.024
Material Boundary	317.3, 140 323.563, 140 341.65, 149.043 379.564, 168 390, 170 390.75, 171.5
Material Boundary	390.75, 171.5 391.5, 173
Material Boundary	471.961, 215.34 481.652, 216.118 579.825, 224 829.159, 309.1

Scenario-based Entities

Type	Coordinates (x,y)	Master Scenario
Piezoline	481.652, 216.118 530.705, 199.829 710.23, 140 747.226, 139.068 850.321, 138.949 1013.66, 138.759 1027.23, 138.743 1057.38, 138.708 1070.71, 138.919 1098.28, 139.464 1117.33, 140 1155.78, 141.555 1167.24, 142 1209.53, 144 1230.37, 144.7 1270.03, 146.004 1355.95, 148 1500, 181.713	Assigned to: Bottom Liner
Distributed Load	452.962, 220 415, 220	Constant DistributionOrientation: Normal to boundaryMagnitude: 250 lbs/ft2Creates Excess Pore Pressure: No



Dunn Mine and C&D Facility S.A. Dunn & Company, LLC Rensselaer, New York		
Station 19+47 Seismic		
	Scale: 1:606	PREPARED BY: Civil & Environmental Consultants, Inc.
Date: 5/17/2021		File Name: Station 19+47 Seismic.slmd

SLIDEINTERPRET 9.009

Attachment B.2

ReSlope Output

Dunn MSE Berm Station 19+47

PROJECT IDENTIFICATION

Title: Dunn MSE Berm Station 19+47
Project Number: 182-442.0002
Designer: JMN

Description:

File path and name: \\svr-boston\projects\2018\182-442\-Calculations\MSE Be.....
.....(Seismic) - Rev1.NAT
Date and time of creating the input data file: Mon Jun 10 17:40:24 2019

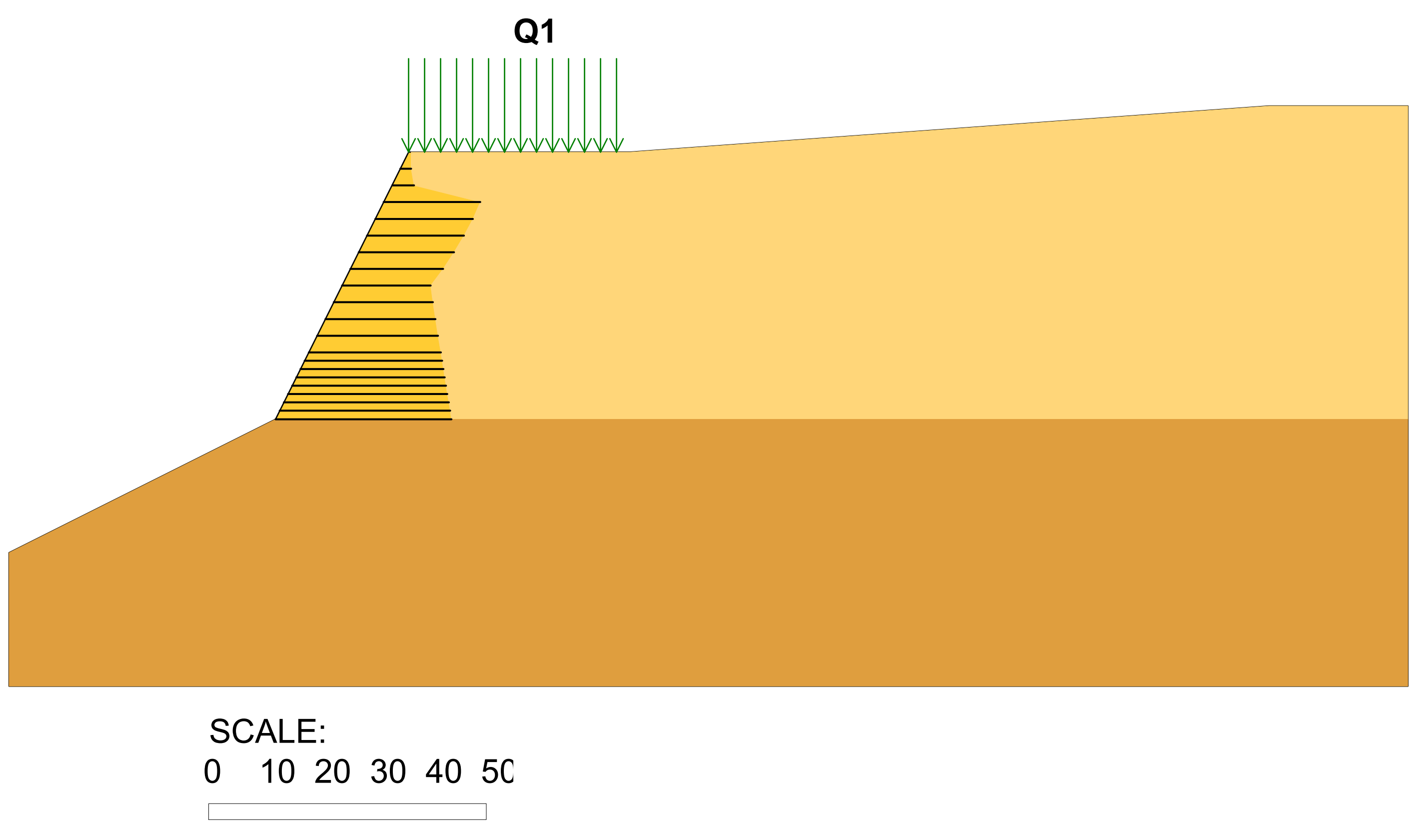
D e s i g n P h i l o s o p h y a n d P r o g r a m D e v e l o p e d b y :

Dov Leshchinsky, Ph.D.
33 The Horseshoe
Newark, Delaware 19711, USA

GEOMETRY AND LOADING DATA

Height of slope, H [ft]	48.00
Slope angle, i °	63.43
Horizontal length, A [ft]	40.00
Horizontal length, B [ft]	115.00
Backslope angle, β °	4.10
Slope at bottom of wall, α °	26.57
Surcharge load over A, Q1 [lb/ft ²]	250.00
Surcharge load over backslope B, Q2 [lb/ft ²]	0.00
Surcharge load away from backslope, Q3 [lb/ft ²]	0.00

Water is not present.



SOIL DATA

REINFORCED SOIL:	Internal angle of friction, $\phi°$	30.0
	Cohesion, c [lb/ft ²]	100.00
	Moist unit weight, γ [lb/ft ³]	120.00
BACKFILL SOIL:	Internal angle of friction, $\phi°$	30.0
	Cohesion, c [lb/ft ²]	100.00
	Moist unit weight, γ [lb/ft ³]	120.00
FOUNDATION SOIL:	Internal angle of friction, $\phi°$	30.0
	Cohesion, c [lb/ft ²]	0.00
	Moist unit weight, γ [lb/ft ³]	120.00

GENERAL DATA

Assumed angle of interwedge force (direct sliding analysis), δ °	20.00
Pullout interaction coefficient (reinforced soil), Ci	0.80
Pullout interaction coefficient (foundation soil), Ci	0.80
Direct sliding coefficient (along reinforced soil), Cds	0.80
Direct sliding coefficient (along foundation soil), Cds	0.80

Minimum required length at each elevation was specified.

SEISMIC PARAMETERS

Horizontal seismic coefficient, Kh (100% used)	0.00
Vertical seismic coefficient, Kv	0.00

Kh and Kv ARE being applied to the reinforced mass and surcharge in direct sliding analysis.

FOUNDATION EFFECTS

Slip surfaces in tieback and compound analyses are allowed to penetrate the foundation soil.
Bishop's deepseated analysis was invoked and circles may penetrate the foundation to a maximum depth of [ft] 28.00

GEOSYNTHETIC DESIGN PARAMETERS

(-------- Manual input data --------)

Reduction factor for installation damage, RFid	1.00
Reduction factor for durability, RFd	1.00
Reduction factor for creep, RFc	1.00
Coverage ratio, Rc	1.00

SPECIFIED FORCE ORIENTATION

Relative orientation of reinforcement is prescribed, ROR 0.00

GENERAL SAFETY FACTORS

Factor of safety on soil shear strength	1.00
Factor of safety on geosynthetic strength	1.00
Factor of safety on pullout resistance	1.50
Factor of safety on direct sliding resistance	1.50

SUMMARY OF TIEBACK AND COMPOUND RESULTS

#	Elevation [ft]	Length [ft]	Mode of Failure	Strength: Required, Tr [lb/ft]	Strength: Ultimate, T-ult [lb/ft]	Strength: Long-term (design) T-ltds [lb/ft]	Actual Overall Fs	Status
1	0.00	31.73	Compound	8400.00	8400.00	8400.00	> 1.00	OK
2	1.50	30.74	Compound	8400.00	8400.00	8400.00	> 1.00	OK
3	3.00	29.74	Compound	8400.00	8400.00	8400.00	> 1.00	OK
4	4.50	28.75	Tieback	1102.30	8400.00	8400.00	7.62	OK
5	6.00	27.76	Tieback	1058.88	8400.00	8400.00	7.93	OK
6	7.50	26.77	Tieback	1015.46	8400.00	8400.00	8.27	OK
7	9.00	25.78	Tieback	972.05	8400.00	8400.00	8.64	OK
8	10.50	24.79	Tieback	928.65	8400.00	8400.00	9.05	OK
9	12.00	23.80	Tieback	1708.23	3900.00	3900.00	2.28	OK
10	15.00	21.81	Tieback	1534.27	3900.00	3900.00	2.54	OK
11	18.00	19.83	Tieback	1360.30	3900.00	3900.00	2.87	OK
12	21.00	17.85	Tieback	1186.39	3900.00	3900.00	3.29	OK
13	24.00	16.00	Tieback	1012.49	3900.00	3900.00	3.85	OK
14	27.00	16.71	Tieback	838.64	3900.00	3900.00	4.65	OK
15	30.00	17.19	Tieback	664.82	3900.00	3900.00	5.87	OK
16	33.00	17.50	Tieback	492.16	3900.00	3900.00	7.92	OK
17	36.00	17.60	Tieback	317.83	1900.00	1900.00	5.98	OK
18	39.00	17.41	Tieback	61.23	1900.00	1900.00	31.03	OK
19	42.00	3.97	Tieback	0.00	1900.00	1900.00	2772953485.39	OK
20	45.00	1.98	Tieback	0.00	1900.00	1900.00	2772953485.39	OK

DETAILED RESULTS OF TIEBACK AND COMPOUND ANALYSES

#	Elevation [ft]	Total Length [ft]	Embedded Length to resist pullout, Le [ft]	Length to slip surface, La [ft]	Strength for: Compound stability (available) T-compound [lb/ft]	Strength for: Tieback (required) T-tieback [lb/ft]	Controlling Mode of Failure
1	0.00	10.32	10.32	0.00	8400.00	1232.61	Compound
2	1.50	11.60	7.01	4.59	8400.00	1189.17	Compound
3	3.00	11.52	7.20	4.32	8400.00	1145.73	Compound
4	4.50	6.17	1.39	4.78	8400.00	1102.30	Tieback
5	6.00	7.45	1.06	6.39	8400.00	1058.88	Tieback
6	7.50	8.74	0.86	7.87	8400.00	1015.46	Tieback
7	9.00	9.46	0.77	8.69	8400.00	972.05	Tieback
8	10.50	10.14	0.67	9.47	8400.00	928.65	Tieback
9	12.00	11.47	1.06	10.41	3900.00	1708.23	Tieback
10	15.00	12.93	0.86	12.06	3900.00	1534.27	Tieback
11	18.00	14.11	0.67	13.44	3900.00	1360.30	Tieback
12	21.00	15.14	0.58	14.57	3900.00	1186.39	Tieback
13	24.00	16.00	0.53	15.47	3900.00	1012.49	Tieback
14	27.00	16.71	0.53	16.18	3900.00	838.64	Tieback
15	30.00	17.19	0.48	16.71	3900.00	664.82	Tieback
16	33.00	17.50	0.43	17.07	3900.00	492.16	Tieback
17	36.00	17.60	0.34	17.27	1900.00	317.83	Tieback
18	39.00	17.41	0.10	17.32	1900.00	61.23	Tieback
19	42.00	0.00	0.00	0.00	1900.00	0.00	Tieback
20	45.00	0.00	0.00	0.00	1900.00	0.00	Tieback

RESULTS OF DIRECT SLIDING AND DEEPSEATED ANALYSES

DIRECT SLIDING

Required length of bottom layer to produce the
specified Fs-direct sliding = 1.50 is 31.73 ft.
Maximum length based on compound and tieback analyses to insure
Fs-uncertainties = 1.00 and Fs-pullout = 1.50, is 17.60 ft.
Theta-critical = 57.0 degrees

DEEPSEATED

Global deepseated factor of safety, Fs-deepseated, based on Bishop's analysis, is 1.01.
NOTE: Target Fs was smaller than initially computed. Hence, length of reinforcement was increased to meet or exceed the target value, resulting in possibly excessive Fs for direct sliding.

The critical circle is forced to pass outside the reinforced zone defined by the bottom geosynthetic layer; its maximum potential depth is restricted to 28.00 ft.
The critical circle is at: Xc = -20.14, Yc = 60.00, Radius = 79.31 feet. Number of slices = 50.
In case the crest elevation is above H, ReSlope assumes a tension crack between the crest and H (see graphic screen).

NOTE: To obtain satisfactory Fs-deepseated, re-run ReSlope with a larger specified value of Fs-direct sliding. This will force deeper circles that should yield larger deepseated safety factor.

TIEBACK & COMPOUND

Tieback/compound slip surfaces are not restricted from penetrating the foundation soil.

Dunn MSE Berm Station 19+47

PROJECT IDENTIFICATION

Title: Dunn MSE Berm Station 19+47
Project Number: 182-442.0002
Designer: JMN

Description:

File path and name: \\svr-boston\projects\2018\182-442\-Calculations\MSE Be.....
.....(Seismic) - Rev1.NAT
Date and time of creating the input data file: Mon Jun 10 17:40:24 2019

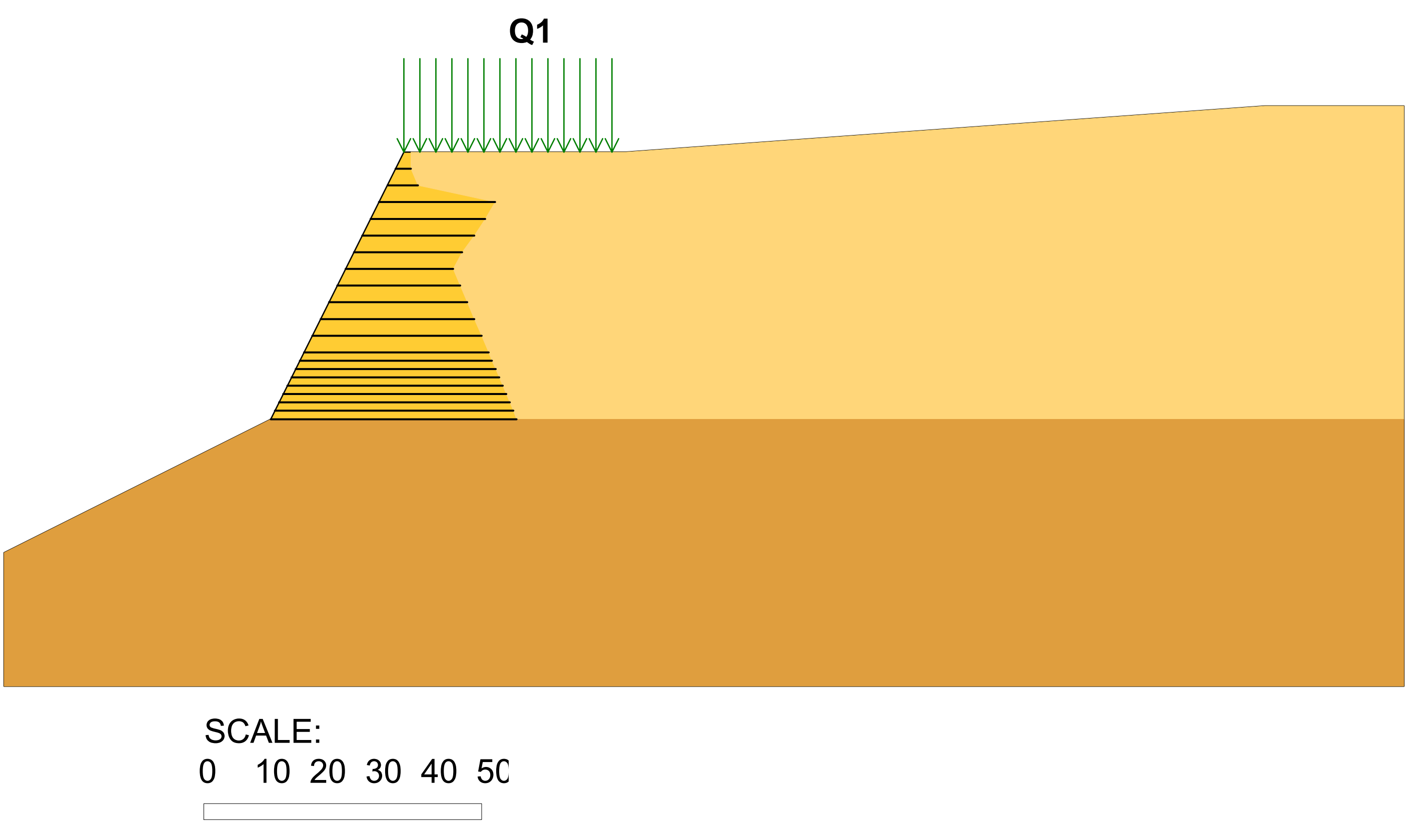
D e s i g n P h i l o s o p h y a n d P r o g r a m D e v e l o p e d b y :

Dov Leshchinsky, Ph.D.
33 The Horseshoe
Newark, Delaware 19711, USA

GEOMETRY AND LOADING DATA

Height of slope, H [ft]	48.00
Slope angle, i °	63.43
Horizontal length, A [ft]	40.00
Horizontal length, B [ft]	115.00
Backslope angle, β °	4.10
Slope at bottom of wall, α °	26.57
Surcharge load over A, Q1 [lb/ft ²]	250.00
Surcharge load over backslope B, Q2 [lb/ft ²]	0.00
Surcharge load away from backslope, Q3 [lb/ft ²]	0.00

Water is not present.



SOIL DATA

REINFORCED SOIL:	Internal angle of friction, $\phi°$	30.0
	Cohesion, c [lb/ft ²]	100.00
	Moist unit weight, γ [lb/ft ³]	120.00
BACKFILL SOIL:	Internal angle of friction, $\phi°$	30.0
	Cohesion, c [lb/ft ²]	100.00
	Moist unit weight, γ [lb/ft ³]	120.00
FOUNDATION SOIL:	Internal angle of friction, $\phi°$	30.0
	Cohesion, c [lb/ft ²]	0.00
	Moist unit weight, γ [lb/ft ³]	120.00

GENERAL DATA

Assumed angle of interwedge force (direct sliding analysis), δ °	20.00
Pullout interaction coefficient (reinforced soil), Ci	0.80
Pullout interaction coefficient (foundation soil), Ci	0.80
Direct sliding coefficient (along reinforced soil), Cds	0.80
Direct sliding coefficient (along foundation soil), Cds	0.80

Minimum required length at each elevation was specified.

SEISMIC PARAMETERS

Horizontal seismic coefficient, Kh (100% used)	0.07
Vertical seismic coefficient, Kv	0.00

Kh and Kv ARE being applied to the reinforced mass and surcharge in direct sliding analysis.

FOUNDATION EFFECTS

Slip surfaces in tieback and compound analyses are allowed to penetrate the foundation soil.
Bishop's deepseated analysis was invoked and circles may penetrate the foundation to a maximum depth of [ft] 28.00

GEOSYNTHETIC DESIGN PARAMETERS

(-------- Manual input data --------)

Reduction factor for installation damage, RFid	1.00
Reduction factor for durability, RFd	1.00
Reduction factor for creep, RFc	1.00
Coverage ratio, Rc	1.00

SPECIFIED FORCE ORIENTATION

Relative orientation of reinforcement is prescribed, ROR 0.00

GENERAL SAFETY FACTORS

Factor of safety on soil shear strength	1.00
Factor of safety on geosynthetic strength	1.00
Factor of safety on pullout resistance	1.50
Factor of safety on direct sliding resistance	1.50

SUMMARY OF TIEBACK AND COMPOUND RESULTS

#	Elevation [ft]	Length [ft]	Mode of Failure	Strength: Required, Tr [lb/ft]	Ultimate, T-ult [lb/ft]	Long-term (design) T-ltds [lb/ft]	Actual Overall Fs	Status
1	0.00	44.33	Compound	8400.00	8400.00	8400.00	> 1.00	OK
2	1.50	42.94	Compound	8400.00	8400.00	8400.00	> 1.00	OK
3	3.00	41.56	Compound	8400.00	8400.00	8400.00	> 1.00	OK
4	4.50	40.17	Tieback	1402.46	8400.00	8400.00	5.99	OK
5	6.00	38.79	Tieback	1348.99	8400.00	8400.00	6.23	OK
6	7.50	37.40	Tieback	1295.51	8400.00	8400.00	6.48	OK
7	9.00	36.02	Tieback	1242.03	8400.00	8400.00	6.76	OK
8	10.50	34.63	Tieback	1188.59	8400.00	8400.00	7.07	OK
9	12.00	33.25	Tieback	2197.02	3900.00	3900.00	1.78	OK
10	15.00	30.48	Tieback	1982.66	3900.00	3900.00	1.97	OK
11	18.00	27.70	Tieback	1768.32	3900.00	3900.00	2.21	OK
12	21.00	24.93	Tieback	1553.99	3900.00	3900.00	2.51	OK
13	24.00	22.16	Tieback	1339.68	3900.00	3900.00	2.91	OK
14	27.00	19.39	Tieback	1127.03	3900.00	3900.00	3.46	OK
15	30.00	19.48	Tieback	912.10	3900.00	3900.00	4.28	OK
16	33.00	20.15	Tieback	697.01	3900.00	3900.00	5.60	OK
17	36.00	20.62	Tieback	482.51	1900.00	1900.00	3.94	OK
18	39.00	20.91	Tieback	257.48	1900.00	1900.00	7.38	OK
19	42.00	5.54	Tieback	0.00	1900.00	1900.00	2772953485.39	OK
20	45.00	2.77	Tieback	0.00	1900.00	1900.00	2772953485.39	OK

DETAILED RESULTS OF TIEBACK AND COMPOUND ANALYSES

#	Elevation [ft]	Total Length [ft]	Embedded Length to resist pullout, Le [ft]	Length to slip surface, La [ft]	Strength for: Compound stability (available) T-compound [lb/ft]	Strength for: Tieback (required) T-tieback [lb/ft]	Controlling Mode of Failure
1	0.00	10.32	10.32	0.00	8400.00	1562.96	Compound
2	1.50	12.62	5.86	6.76	8400.00	1509.45	Compound
3	3.00	12.44	6.05	6.40	8400.00	1455.95	Compound
4	4.50	7.42	1.44	5.98	8400.00	1402.46	Tieback
5	6.00	10.07	0.96	9.11	8400.00	1348.99	Tieback
6	7.50	12.03	0.77	11.26	8400.00	1295.51	Tieback
7	9.00	13.25	0.67	12.57	8400.00	1242.03	Tieback
8	10.50	14.11	0.62	13.48	8400.00	1188.59	Tieback
9	12.00	14.94	1.06	13.89	3900.00	2197.02	Tieback
10	15.00	14.47	0.96	13.51	3900.00	1982.66	Tieback
11	18.00	15.17	0.82	14.36	3900.00	1768.32	Tieback
12	21.00	16.53	0.77	15.76	3900.00	1553.99	Tieback
13	24.00	17.69	0.72	16.97	3900.00	1339.68	Tieback
14	27.00	18.67	0.67	18.00	3900.00	1127.03	Tieback
15	30.00	19.48	0.62	18.86	3900.00	912.10	Tieback
16	33.00	20.15	0.58	19.57	3900.00	697.01	Tieback
17	36.00	20.62	0.48	20.14	1900.00	482.51	Tieback
18	39.00	20.91	0.34	20.58	1900.00	257.48	Tieback
19	42.00	0.00	0.00	0.00	1900.00	0.00	Tieback
20	45.00	0.00	0.00	0.00	1900.00	0.00	Tieback

RESULTS OF DIRECT SLIDING AND DEEPSEATED ANALYSES

DIRECT SLIDING

Required length of bottom layer to produce the
specified Fs-direct sliding = 1.50 is 44.33 ft.
Maximum length based on compound and tieback analyses to insure
Fs-uncertainties = 1.00 and Fs-pullout = 1.50, is 20.91 ft.
Theta-critical = 54.0 degrees

DEEPSEATED

Global deepseated factor of safety, Fs-deepseated, based on Bishop's analysis, is 1.03.
NOTE: Target Fs was smaller than initially computed. Hence, length of reinforcement was increased to meet or exceed the target value, resulting in possibly excessive Fs for direct sliding.

The critical circle is forced to pass outside the reinforced zone defined by the bottom geosynthetic layer; its maximum potential depth is restricted to 28.00 ft.
The critical circle is at: Xc = -19.84, Yc = 72.00, Radius = 96.44 feet. Number of slices = 50.
In case the crest elevation is above H, ReSlope assumes a tension crack between the crest and H (see graphic screen).

NOTE: To obtain satisfactory Fs-deepseated, re-run ReSlope with a larger specified value of Fs-direct sliding. This will force deeper circles that should yield larger deepseated safety factor.

TIEBACK & COMPOUND

Tieback/compound slip surfaces are not restricted from penetrating the foundation soil.

ATTACHMENT C

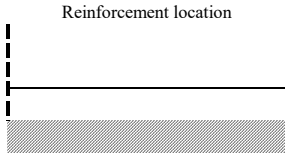
GEOGRID STRENGTH WORKSHEETS

Civil & Environmental Consultants, Inc.
333 Baldwin Road · Pittsburgh, PA 15205

PROJECT	Dunn C&D Landfill	NUMBER	182-442
CALCULATED BY	NAB	DATE	May-19
CHECKED BY		DATE	
DESCRIPTION	North Perimeter Berm		

Geosynthetic Reinforcement Parameters

Geosynthetic Reinforcement Type:	Miragrid® XT Geogrids
Start of Geosynthetic Reinforcement:	Does not start at base of wall
Reinforced Soil Friction Angle (°):	30
Foundation Soil Friction Angle (°):	30



Miragrid® XT Geogrids — **Selected Product**

Products	2XT	3XT	5XT	7XT	8XT	10XT	20XT	22XT	24XT	5XT
	lbs/ft	lbs/ft	lbs/ft	lbs/ft	lbs/ft	lbs/ft	lbs/ft	lbs/ft	lbs/ft	T_{ult} (lbs/ft)
Ultimate Tensile Strength, T_{ult} (1)	2000	3500	4700	5900	7400	9500	13705	20559	27415	**4,700**
Creep Reduction Factor, RF_{CR}										RF_{CR}
114-year design life	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	**1.58**
Creep Limited Strength, T_{CLS}										RF_{ID}
114-year design life	1266	2215	2975	3734	4684	6013	8674	13012	17351	**1.05**
Installation Damage Reduction Factor, RF_{ID}										RF_D
Type 3 Backfill (Sand, Silt, Clay)	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	**1.10**
Type 2 Backfill (Sandy Gravel)	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	
Type 1 Backfill (Gravel)	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	T_{ALL} (lbs/ft) (3)
User Specified RF_{ID} (Table 3-9) (2)										**2,575**
1.80										
										p (°) (4)
Durability Reduction Factor, RF_D	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	**21**

(1) - Ultimate Tensile Strength (MARV) in Machine Direction as measured per ASTM D6637 guidelines

(2) - Table 3-9 "Installation Damage Reduction Factors", FHWA NHI-10-024, MSE Walls and RSS - Vol I, Nov. 2009, p 3-32

(3) - Allowable tensile strength, per Equation (3-12), FHWA NHI-10-024, MSE Walls and RSS - Vol I, Nov. 2009, p 3-28

(4) - Interface Shear, per Equation (3-9), FHWA NHI-10-024, MSE Walls and RSS - Vol I, Nov. 2009, p 3-21

Coefficient of Shear Stress Interaction, C_i, and Coefficient of Direct Sliding, C_{ds} — **Selected Values**

Soil Type	U.S.C.S.	C_i	C_{ds}	C_i
Silty clay, sandy clay, clayey silt	(ML, CL)	0.7 - 0.8	0.70	**0.8 - 0.9**
Silty sands, fine to medium sands	(SM, SP, SW)	0.8 - 0.9	0.80	C_{ds}
Dense well- graded sand, sand and gravel	(SW, GP, GW)	0.9 - 1.0	0.90	**0.8**

C_i and C_{ds} values from Tencate's Determination of the Long Term Propoerties for Miragrid and Mirafi PET Geosynthetics.

Equation 3-9, Interface Shear

$$p = \tan^{-1}\left(\frac{2}{3}\tan\right)$$

Where: ϕ = 30 °

p = tan-1(2/3 tan (30 °)) = **21.1 °**

Equation 3-12, Allowable Tensile Strength (for Global Stability Analysis and Passive Force Application Method)

$$T_{ALL} = \frac{T_{ULT}}{RF_{ID} \times RF_{CR} \times RD_D}$$

Where: T_{ULT} = 4700 LBS/FT

RF_{ID} = 1.05

RF_{CR} = 1.58

RF_D = 1.10

T_{ALL} = (4700 LBS/FT / (1.05 X 1.58 X 1.1) = **2575 LBS/FT**

Equation 9-17, Reinforcement Strength (for Global Stability Analysis and Active Force Application Method)

Geotechnical Parameters are: Well-Defined and Reinforced/Active Zone Does not Contrain a Structural Element

$$T_R = \phi \times T_{ALL}$$

Where: T_{ALL} = 2575 LBS/FT

ϕ = 0.75

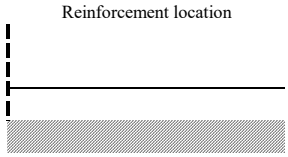
T_R = (0.75) X (2575 LBS/FT) = **1932 LBS/FT**

Civil & Environmental Consultants, Inc.
333 Baldwin Road · Pittsburgh, PA 15205

PROJECT	Dunn C&D Landfill	NUMBER	182-442
CALCULATED BY	NAB	DATE	May-19
CHECKED BY		DATE	
DESCRIPTION	North Perimeter Berm		

Geosynthetic Reinforcement Parameters

Geosynthetic Reinforcement Type:	Miragrid® XT Geogrids
Start of Geosynthetic Reinforcement:	Does not start at base of wall
Reinforced Soil Friction Angle (°):	30
Foundation Soil Friction Angle (°):	30



Miragrid® XT Geogrids — **Selected Product**

Products	2XT	3XT	5XT	7XT	8XT	10XT	20XT	22XT	24XT	10XT
	lbs/ft	lbs/ft	lbs/ft	lbs/ft	lbs/ft	lbs/ft	lbs/ft	lbs/ft	lbs/ft	T_{ult} (lbs/ft)
Ultimate Tensile Strength, T_{ult} (1)	2000	3500	4700	5900	7400	9500	13705	20559	27415	**9,500**
Creep Reduction Factor, RF_{CR}										RF_{CR}
114-year design life	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	**1.58**
Creep Limited Strength, T_{CLS}										RF_{ID}
114-year design life	1266	2215	2975	3734	4684	6013	8674	13012	17351	**1.05**
Installation Damage Reduction Factor, RF_{ID}										RF_D
Type 3 Backfill (Sand, Silt, Clay)	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	**1.10**
Type 2 Backfill (Sandy Gravel)	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	
Type 1 Backfill (Gravel)	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	T_{ALL} (lbs/ft) (3)
User Specified RF_{ID} (Table 3-9) (2)										**5,206**
1.80										
										p (°) (4)
Durability Reduction Factor, RF_D	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	**21**

(1) - Ultimate Tensile Strength (MARV) in Machine Direction as measured per ASTM D6637 guidelines

(2) - Table 3-9 "Installation Damage Reduction Factors", FHWA NHI-10-024, MSE Walls and RSS - Vol I, Nov. 2009, p 3-32

(3) - Allowable tensile strength, per Equation (3-12), FHWA NHI-10-024, MSE Walls and RSS - Vol I, Nov. 2009, p 3-28

(4) - Interface Shear, per Equation (3-9), FHWA NHI-10-024, MSE Walls and RSS - Vol I, Nov. 2009, p 3-21

Coefficient of Shear Stress Interaction, C_i, and Coefficient of Direct Sliding, C_{ds} — **Selected Values**

Soil Type	U.S.C.S.	C_i	C_{ds}	C_i
Silty clay, sandy clay, clayey silt	(ML, CL)	0.7 - 0.8	0.70	**0.8 - 0.9**
Silty sands, fine to medium sands	(SM, SP, SW)	0.8 - 0.9	0.80	C_{ds}
Dense well- graded sand, sand and gravel	(SW, GP, GW)	0.9 - 1.0	0.90	**0.8**

C_i and C_{ds} values from Tencate's Determination of the Long Term Propoerties for Miragrid and Mirafi PET Geosynthetics.

Equation 3-9, Interface Shear

$$p = \tan^{-1}\left(\frac{2}{3}\tan\right)$$

Where: ϕ = 30 ° p = tan-1(2/3 tan (30 °)) = **21.1 °**

Equation 3-12, Allowable Tensile Strength (for Global Stability Analysis and Passive Force Application Method)

$$T_{ALL} = \frac{T_{ULT}}{RF_{ID} \times RF_{CR} \times RD_D}$$

Where: T_{ULT} = 9500 LBS/FT
RF_{ID} = 1.05
RF_{CR} = 1.58
RF_D = 1.10

T_{ALL} = (9500 LBS/FT / (1.05 X 1.58 X 1.1) = **5206 LBS/FT**

Equation 9-17, Reinforcement Strength (for Global Stability Analysis and Active Force Application Method)

Geotechnical Parameters are: Well-Defined and Reinforced/Active Zone Does not Contrain a Structural Element

$$T_R = \phi \times T_{ALL}$$

Where: T_{ALL} = 5206 LBS/FT
ϕ = 0.75

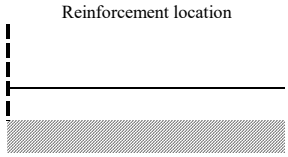
T_R = (0.75) X (5206 LBS/FT) = **3904 LBS/FT**

Civil & Environmental Consultants, Inc.
333 Baldwin Road · Pittsburgh, PA 15205

PROJECT	Dunn C&D Landfill	NUMBER	182-442
CALCULATED BY	NAB	DATE	May-19
CHECKED BY		DATE	
DESCRIPTION	North Perimeter Berm		

Geosynthetic Reinforcement Parameters

Geosynthetic Reinforcement Type:	Miragrid® XT Geogrids
Start of Geosynthetic Reinforcement:	Does not start at base of wall
Reinforced Soil Friction Angle (°):	30
Foundation Soil Friction Angle (°):	30



Miragrid® XT Geogrids — **Selected Product**

Products	2XT	3XT	5XT	7XT	8XT	10XT	20XT	22XT	24XT	22XT
	lbs/ft	lbs/ft	lbs/ft	lbs/ft	lbs/ft	lbs/ft	lbs/ft	lbs/ft	lbs/ft	T_{ult} (lbs/ft)
Ultimate Tensile Strength, T_{ult} (1)	2000	3500	4700	5900	7400	9500	13705	20559	27415	**20,559**
Creep Reduction Factor, RF_{CR}										RF_{CR}
114-year design life	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	**1.58**
Creep Limited Strength, T_{CLS}										RF_{ID}
114-year design life	1266	2215	2975	3734	4684	6013	8674	13012	17351	**1.05**
Installation Damage Reduction Factor, RF_{ID}										RF_D
Type 3 Backfill (Sand, Silt, Clay)	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	**1.10**
Type 2 Backfill (Sandy Gravel)	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	
Type 1 Backfill (Gravel)	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	T_{ALL} (lbs/ft) (3)
User Specified RF_{ID} (Table 3-9) (2)										**11,266**
1.80										
										p (°) (4)
Durability Reduction Factor, RF_D	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	**21**

(1) - Ultimate Tensile Strength (MARV) in Machine Direction as measured per ASTM D6637 guidelines

(2) - Table 3-9 "Installation Damage Reduction Factors", FHWA NHI-10-024, MSE Walls and RSS - Vol I, Nov. 2009, p 3-32

(3) - Allowable tensile strength, per Equation (3-12), FHWA NHI-10-024, MSE Walls and RSS - Vol I, Nov. 2009, p 3-28

(4) - Interface Shear, per Equation (3-9), FHWA NHI-10-024, MSE Walls and RSS - Vol I, Nov. 2009, p 3-21

Coefficient of Shear Stress Interaction, C_i, and Coefficient of Direct Sliding, C_{ds} — **Selected Values**

Soil Type	U.S.C.S.	C_i	C_{ds}	C_i
Silty clay, sandy clay, clayey silt	(ML, CL)	0.7 - 0.8	0.70	**0.8 - 0.9**
Silty sands, fine to medium sands	(SM, SP, SW)	0.8 - 0.9	0.80	C_{ds}
Dense well- graded sand, sand and gravel	(SW, GP, GW)	0.9 - 1.0	0.90	**0.8**

C_i and C_{ds} values from Tencate's Determination of the Long Term Propoerties for Miragrid and Mirafi PET Geosynthetics.

Equation 3-9, Interface Shear

$$p = \tan^{-1}\left(\frac{2}{3}\tan\phi\right)$$

Where: ϕ = 30 °

p = tan-1(2/3 tan (30 °)) = **21.1 °**

Equation 3-12, Allowable Tensile Strength (for Global Stability Analysis and Passive Force Application Method)

$$T_{ALL} = \frac{T_{ULT}}{RF_{ID} \times RF_{CR} \times RD_D}$$

Where: T_{ULT} = 20559 LBS/FT

RF_{ID} = 1.05

RF_{CR} = 1.58

RF_D = 1.10

T_{ALL} = (20559 LBS/FT / (1.05 X 1.58 X 1.1) = **11266 LBS/FT**

Equation 9-17, Reinforcement Strength (for Global Stability Analysis and Active Force Application Method)

Geotechnical Parameters are: Well-Defined and Reinforced/Active Zone Does not Contrain a Structural Element

$$T_R = \phi \times T_{ALL}$$

Where: T_{ALL} = 11266 LBS/FT

ϕ = 0.75

T_R = (0.75) X (11266 LBS/FT) = **8449 LBS/FT**

ATTACHMENT D

REFERENCES

October 5, 2010
Revised May 13, 2011
Revised June 14, 2011

Hydrogeologic Report
Dunn Sand & Gravel Mined Land Use Plan Modification/C&D Landfill
Rensselaer County, New York

Prepared for:

Mr. Michael Dunn, President
S.A. Dunn & Company, LLC
209 Partition Street Ext.
Rensselaer, New York 12144

Prepared by:

C.T. MALE ASSOCIATES, P.C.
50 Century Hill Drive
Latham, New York 12110
(518) 786-7400
FAX (518) 786-7299

C.T. Male Project No: 09.9520

170 feet below grade (above the mine floor). Maps EM2, EM3, and EM4 in Appendix A contain geologic cross sections that depict the site geology. As shown, several distinct unconsolidated deposits exist within the site, several of which are discontinuous across the site. A major deposit of sand, sand and gravel, and silt lie beneath the floor of the mine, and are underlain by a deposit of sand, gravel and silt which represents a glacial till deposit that lacks the typical coarse sediment load embedment within a silt and clay matrix. The standard penetration values within this deposit were generally in the range of 80 to 90 blows per 12 inch sampling increment. The soils above the glacial till deposits represent a sequence characteristic of ice contact and lacustrine depositional environments. Shale bedrock was encountered at one boring location (MW-6D) at a depth of approximately 198 feet below grade, this being approximately nine (9) feet below mean sea level.

3.3 Water Well Survey

Based on the water well survey, no private water wells were observed. Based on a response to the FOIL request (Appendix F) Rensselaer County indicated that they do not possess any records regarding private water wells in the vicinity to the project site. It is possible that some private water supply wells exist out of view of our survey; however, based on the observation of fire hydrants on or near every street within the surveyed area and the County's FOIL response; it appears that the entire area is serviced by municipal water.

The likelihood that private water wells are being used as a potable water source within a one (1) mile radius of the site is very low. Figure 4 Water Well Survey Area, in Appendix A shows the area in which the water well survey was performed.

3.4 Water Level Measurements and Groundwater Movement

Monthly water levels were recorded at MW-1, MW-2, MW-3 and MW-4 between November 2009 and June 2010. Each month it was observed that the end of the electronic water level indicator probe was covered in silt while taking water level measurements of MW-2 and MW-4. Based on the subsurface information developed as function of the 2010/11 test borings, it has been determined that monitoring wells MW-2 and MW-4 were not installed at depths that intercept the aquifer beneath the site. The limited water noted in these well are likely water condensation that has settled in the

3.0 RESULTS OF INVESTIGATION

The following sections provide the results and interpretation of the data prepared by others (boring logs) and the investigative work conducted by C.T. Male since 2009.

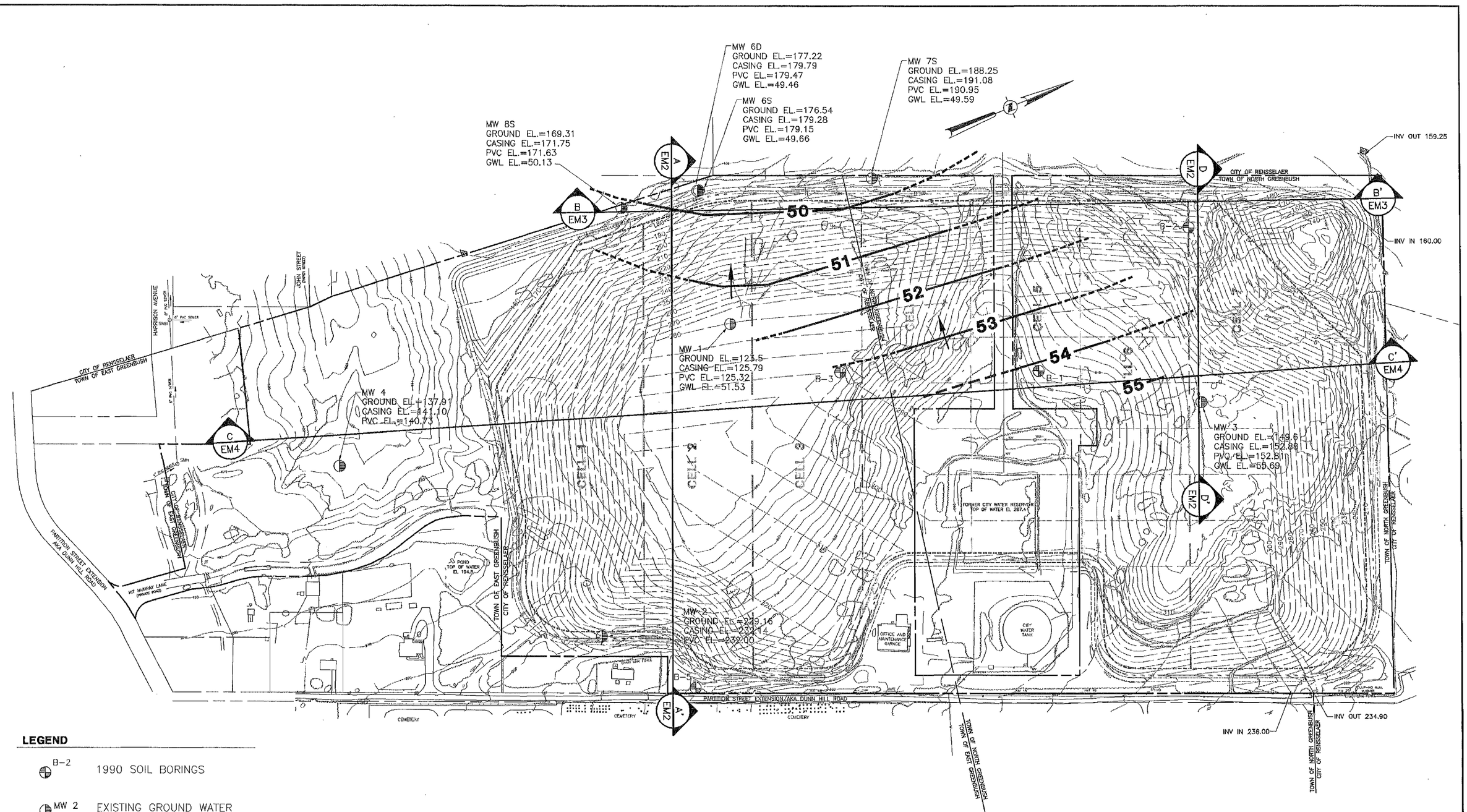
3.1 Regional Geology

The Taconic Mountains are located to the east of the site, and the Helderberg Escarpment associated with the Catskill Mountains is located to the west of the site. Bedrock underlying the site is mapped as the Upper to Middle Ordovician Canajoharie/Normanskill Shale Formation (Appendix A, Figure 2, Bedrock Geology Map). Glacial sediments deposited during the waning stages of deglaciation in the vicinity of the site are dominated by glaciolacustrine sand and silt sediments and kame deposits (Appendix A, Figure 3, Surficial Geology Map). The kame deposits consist of a thick sequence of ice-contact sand and gravel sediments that have historically been mined at the site, resulting in the excavated north and south pits. Glaciolacustrine sand and clay deposits are mapped around the kame deposits.

3.2 Site Geology

The site is located within the Hudson-Mohawk Lowlands physiographic province of New York. This province is characterized by a general low-lying topography surrounding the Mohawk and Hudson Rivers that resulted from erosion of weak underlying bedrock formations and the subsequent deposition of glacial sediments. The topography in the vicinity of the site ranges from approximately 200 to 300 feet above mean sea level and generally decreases to the west towards the Hudson River.

Based on review of the test boring and monitoring well data, the stratigraphy beneath the proposed C&D landfill (and the current mine floors) consists of glaciolacustrine silts and glaciolacustrine sands, interbedded with deposits of finer and coarser materials, underlain by shale bedrock. The glaciolacustrine clay unit is present at the MW-4, MW-6S/6D, and MW-8S locations and extends to the boundary of the south pit, whereas the glaciolacustrine sand is present in the other three (3) locations. The thickness of unconsolidated sediments ranges from approximately 130 feet (below the mine floor) to



LEGEND

B-2 — 1990 SOIL BORINGS

MW 2 — EXISTING GROUND WATER MONITORING WELL

GROUND WATER CONTOUR, INFERRED WHERE DASHED. ARROW DEPICTS INFERRED DIRECTION OF GROUNDWATER MOVEMENT

NOTE:
GROUNDWATER CONTOURS DEVELOPED USING WATER LEVEL DATA COLLECTED ON 3/31/11

BAR SCALE
250 0 125 250 500
1 inch = 250 ft.

C.T. MALE ASSOCIATES, P.C.
50 CENTURY HILL DRIVE, LATHAM, NY 12110
518.786.7400 * FAX 518.786.7299
ARCHITECTURE & BUILDING SYSTEMS ENGINEERING * CIVIL ENGINEERING
ENVIRONMENTAL SERVICES * SURVEY & LAND INFORMATION SERVICES

PROJ. NO.: 09.9520	DRAFTED: NGK	SCALE: AS SHOWN	DATE: MAY 2011

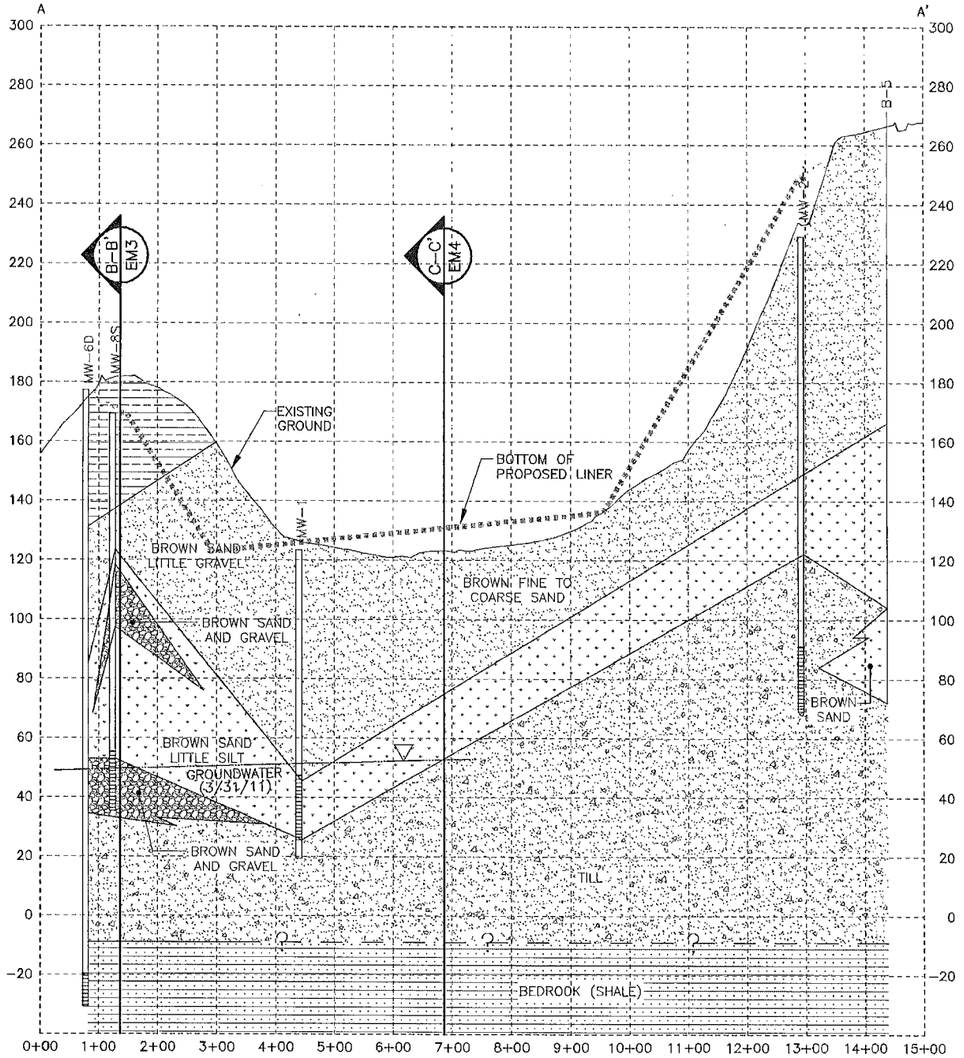
EM1a
GROUNDWATER CONTOUR MAP

DUNN SAND AND GRAVEL MINED LAND USE PLAN MODIFICATION/C&D LANDFILL

CITY OF RENSSELAER & TOWN OF N. GREENBUSH RENSSELAER COUNTY, NEW YORK

CAD DWG. FILE NAME: DLF-EM1A ENVIRON MON PLAN.DWG

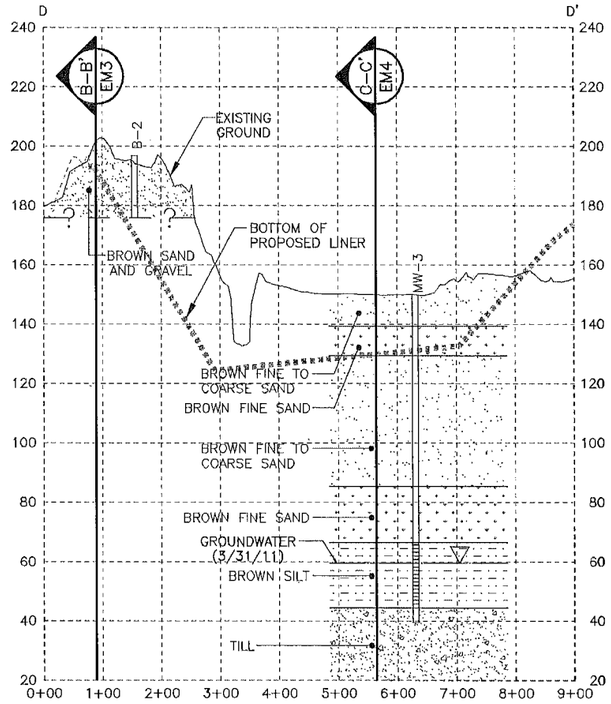
DLF-BASE 125 SCALE.DWG :XREFS



A–A' EM2

GEOLOGIC CROSS SECTION

SCALE: HORZ. 1"=250'
VERT. 1"=50'
CROSS REFERENCE: NONE



D–D' EM2

GEOLOGIC CROSS SECTION

SCALE: HORZ. 1"=250'
VERT. 1"=50'
CROSS REFERENCE: NONE

NOTE:
GROUNDWATER CONTOURS DEVELOPED USING WATER LEVEL DATA COLLECTED ON 3/31/11

BAR SCALE
250 0 125 250
1 inch = 250 ft.

50
1 inch = 50 ft.

C.T. MALE ASSOCIATES, P.C.
50 CENTURY HILL DRIVE, LATHAM, NY 12110
518.786.7400 * FAX 518.786.7299
ARCHITECTURE & BUILDING SYSTEMS ENGINEERING * CIVIL ENGINEERING
ENVIRONMENTAL SERVICES * SURVEY & LAND INFORMATION SERVICES

EM2
ENVIRONMENTAL MONITORING SECTION

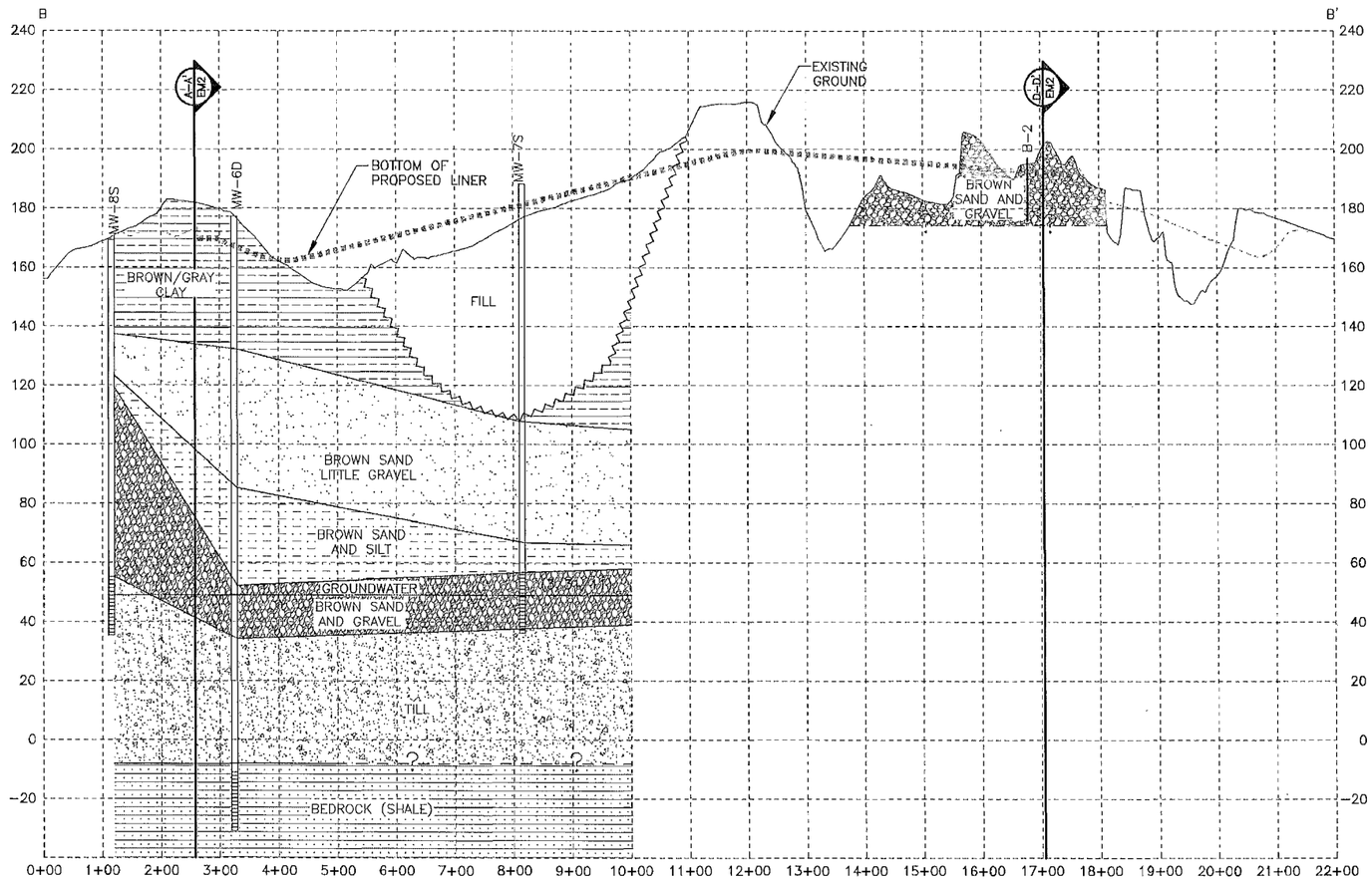
DUNN SAND AND GRAVEL MINED LAND USE PLAN MODIFICATION/C&D LANDFILL

PROJ. NO.: 09.9520	DRAFTED: NGK	SCALE: AS SHOWN	DATE: MAY 2011

CITY OF RENSSELAER & TOWN OF N. GREENBUSH RENSSELAER COUNTY, NEW YORK

CAD DWG. FILE NAME: DLF-EM2 ENVIRON MON SECT.DWG

GEOXSECTS2.DWG -XREFS

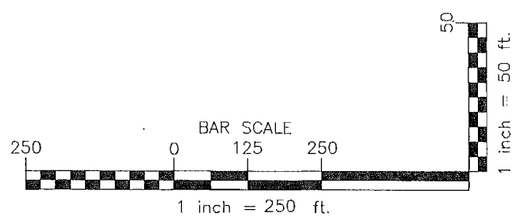


B-B' / EM3

GEOLOGIC CROSS SECTION

SCALE: HORZ. 1"=250'
VERT. 1"=50'
CROSS REFERENCE: NONE

NOTE:
GROUNDWATER CONTOURS DEVELOPED USING WATER LEVEL DATA COLLECTED ON 3/31/11



C.T. MALE ASSOCIATES, P.C.
50 CENTURY HILL DRIVE, LATHAM, NY 12110
518.786.7400 * FAX 518.786.7299
ARCHITECTURE & BUILDING SYSTEMS ENGINEERING * CIVIL ENGINEERING
ENVIRONMENTAL SERVICES * SURVEY & LAND INFORMATION SERVICES

PROJ. NO.: 09.9520	DRAFTED: NGK	SCALE: AS SHOWN	DATE: MAY 2011

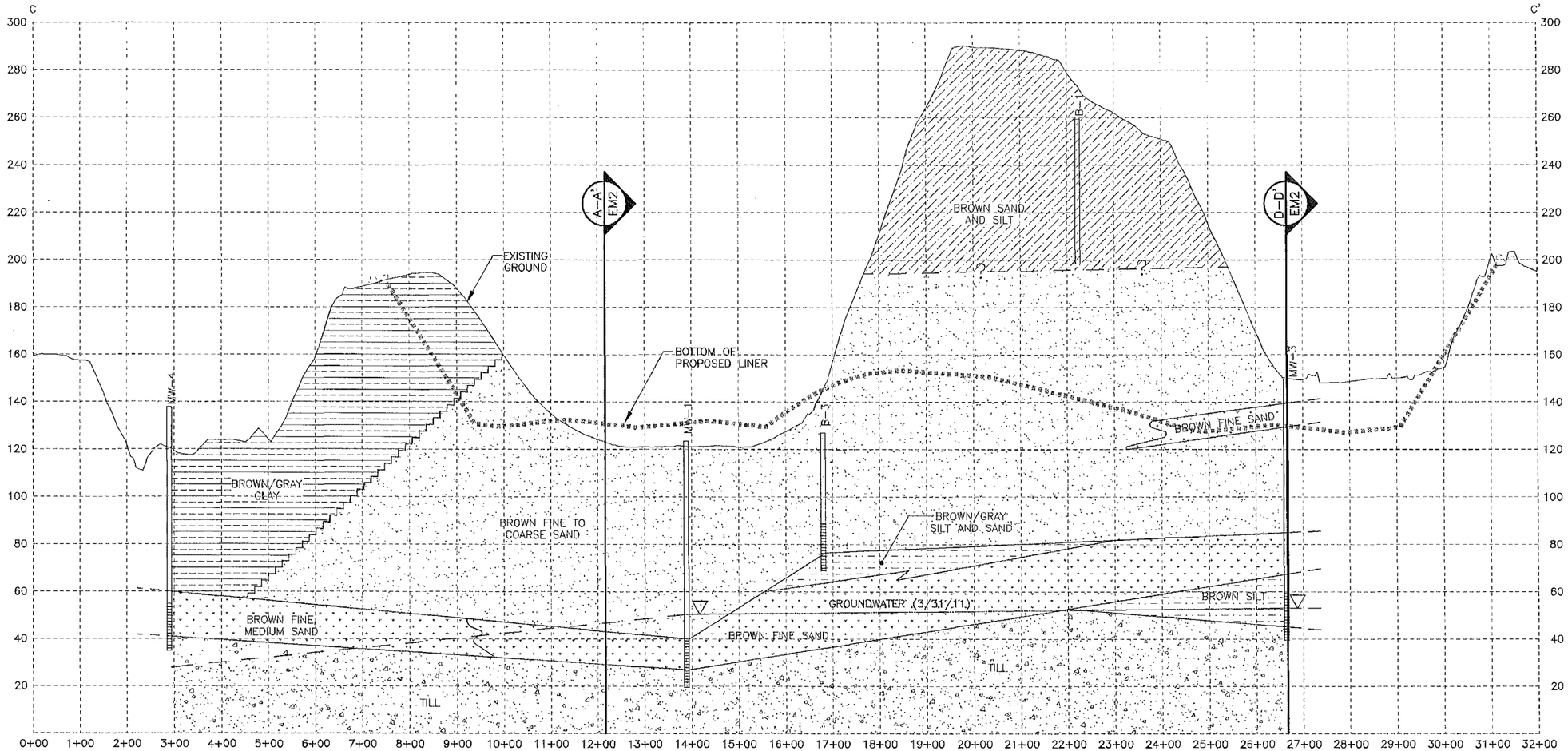
EM3
ENVIRONMENTAL MONITORING SECTION

DUNN SAND AND GRAVEL MINED LAND USE PLAN MODIFICATION/C&D LANDFILL

CITY OF RENSSELAER & TOWN OF N. GREENBUSH RENSSELAER COUNTY, NEW YORK

CAD DWG. FILE NAME: DLF-EM3 ENVIRON MON SECT.DWG

GEOXSECTS2.DWG :XREFS



C-C' / EM4

GEOLOGIC CROSS SECTION

SCALE: HORZ. 1"=250'
VERT. 1"=50'
CROSS REFERENCE: NONE

NOTE:
GROUNDWATER CONTOURS DEVELOPED USING WATER LEVEL DATA COLLECTED ON 3/31/11

C.T. MALE ASSOCIATES, P.C.
50 CENTURY HILL DRIVE, LATHAM, NY 12110
518.786.7400 * FAX 518.786.7299
ARCHITECTURE & BUILDING SYSTEMS ENGINEERING * CIVIL ENGINEERING
ENVIRONMENTAL SERVICES * SURVEY & LAND INFORMATION SERVICES

PROJ. NO.: 09.9520	DRAFTED: NGK	SCALE: AS SHOWN	DATE: MAY 2011

EM4
ENVIRONMENTAL MONITORING SECTION

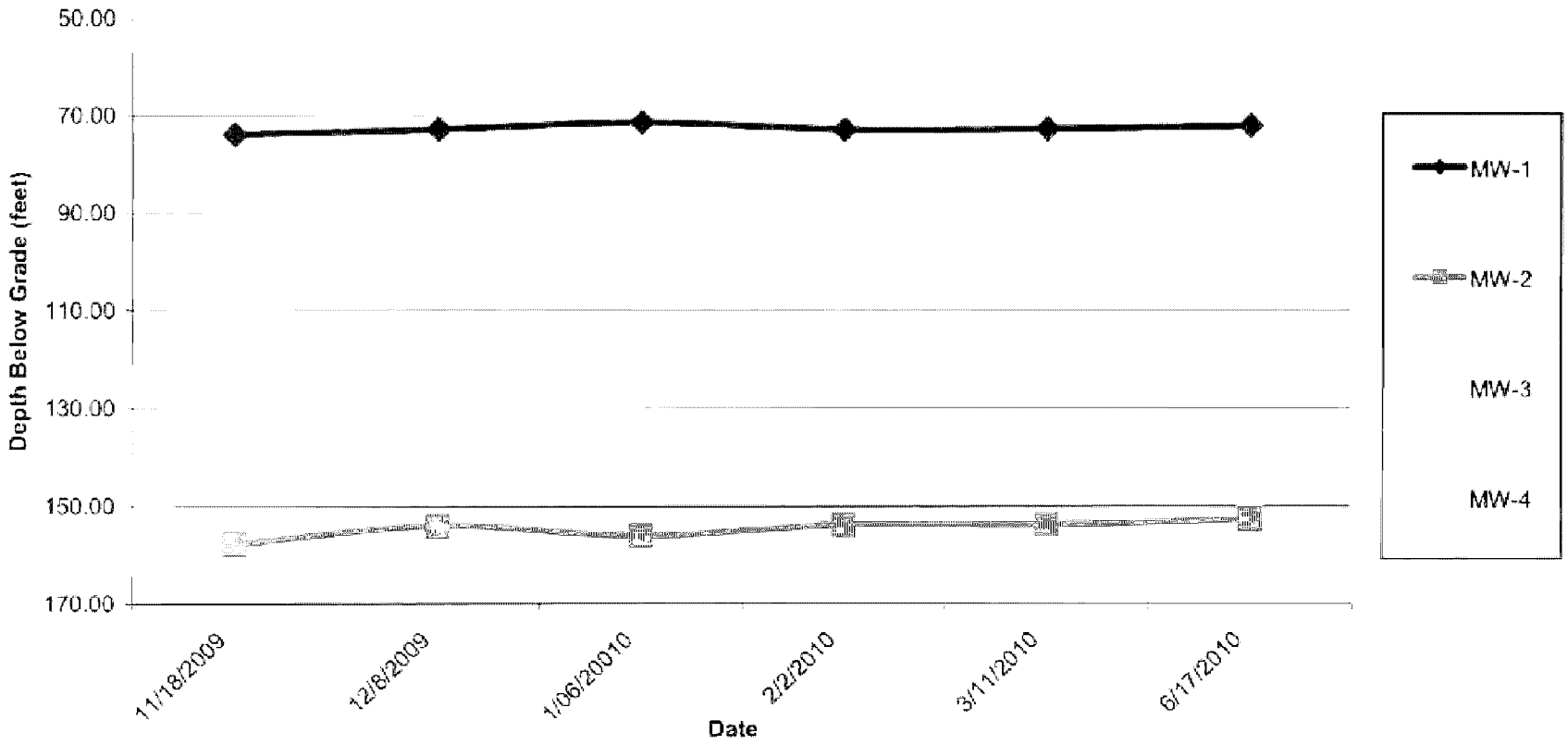
DUNN SAND AND GRAVEL MINED LAND USE PLAN MODIFICATION/C&D LANDFILL

CITY OF RENSSELAER & TOWN OF N. GREENBUSH RENSSELAER COUNTY, NEW YORK

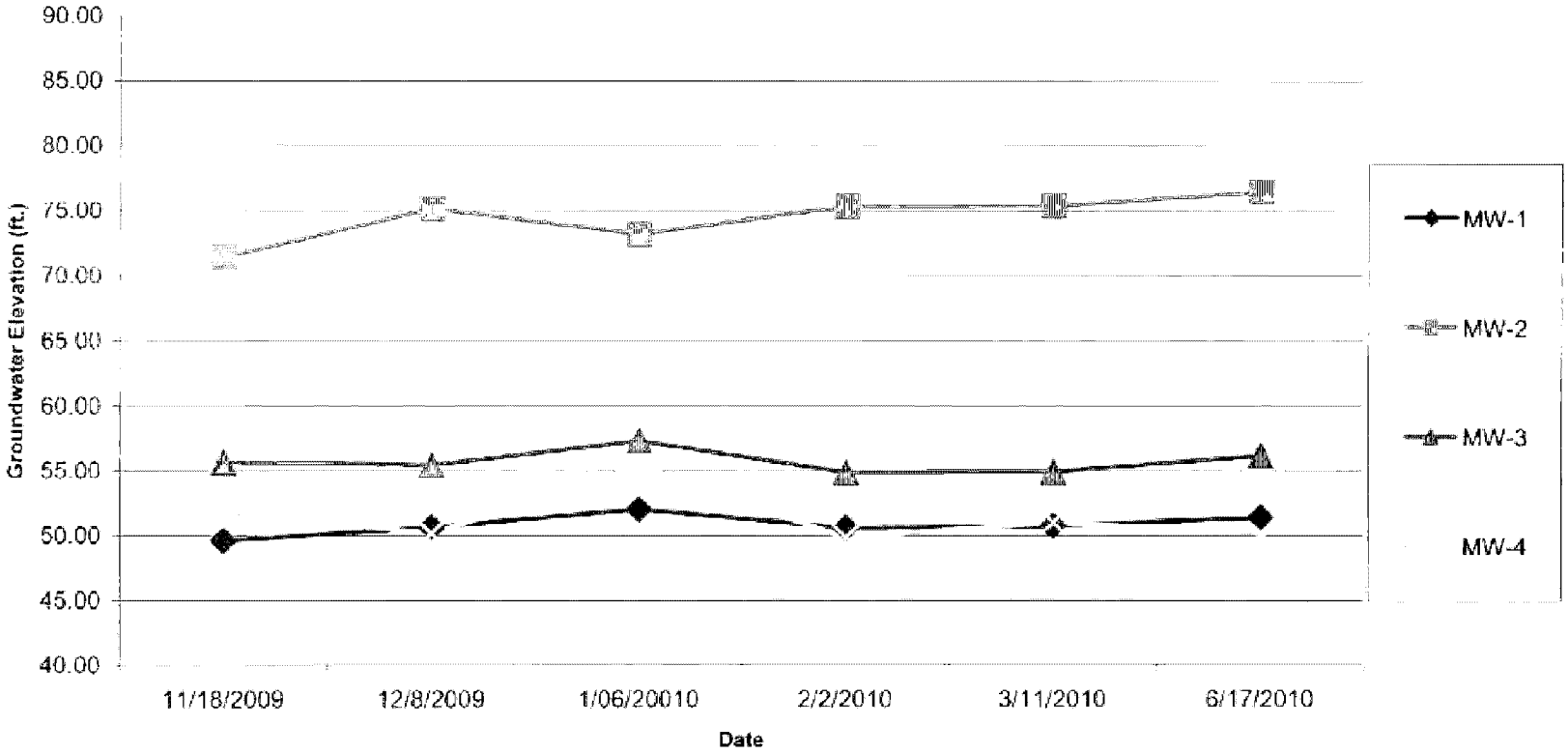
CAD DWG. FILE NAME: DLF-EM4 ENVIRON MON SECT.DWG

GEOXSECTS2.DWG :XREFS

S.A. Dunn Sand & Gravel Quarry
Depth to Groundwater from Existing Grade
(Measured with Water Level Meter)
Project # 09.9520



S.A. Dunn Sand & Gravel Quarry
Groundwater Elevation
(Measured with Water Level Meter)
C.T. Male Associates, P.C. Proj. No. 09.9520



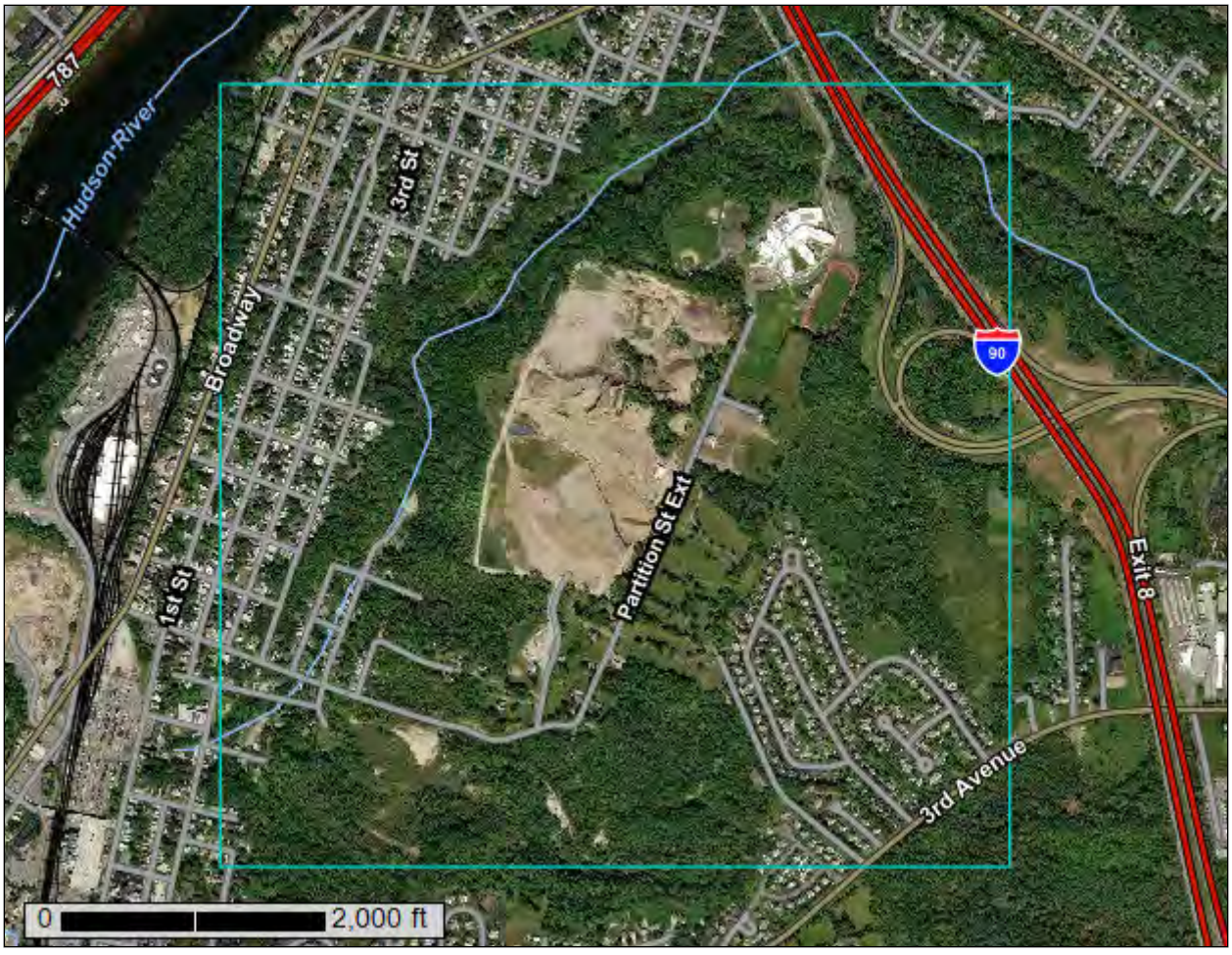
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Rensselaer County, New York



May 14, 2019

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface.....2
How Soil Surveys Are Made.....5
Soil Map.....8
Soil Map.....9
Legend.....10
Map Unit Legend.....11
Map Unit Descriptions.....12
Rensselaer County, New York.....14
ChA—Chenango very gravelly loam, 0 to 3 percent slopes.....14
ChB—Chenango very gravelly loam, 3 to 8 percent slopes.....15
FlA—Fluvaquents-Udifluvents complex, 0 to 3 percent slopes.....17
FrA—Fredon silt loam, 0 to 4 percent slopes.....19
HbB—Haven silt loam, 3 to 8 percent slopes.....20
HoA—Hoosic gravelly sandy loam, 0 to 3 percent slopes.....22
HoB—Hoosic gravelly sandy loam, 3 to 8 percent slopes.....23
HoC—Hoosic gravelly sandy loam, rolling.....24
HoD—Hoosic gravelly sandy loam, hilly.....25
HoE—Hoosic gravelly sandy loam, steep.....27
HuB—Hudson silt loam, 3 to 8 percent slopes.....28
HuC—Hudson silt loam, 8 to 15 percent slopes.....29
HuD—Hudson silt loam, hilly.....31
HuE—Hudson silt loam, steep.....32
LmA—Limerick silt loam, 0 to 3 percent slopes.....33
Pg—Pits, gravel.....35
RhA—Rhinebeck silt loam, 0 to 3 percent slopes.....35
RhB—Rhinebeck silt loam, 3 to 8 percent slopes.....37
SwA—Shaker very fine sandy loam, sandy substratum, 0 to 4 percent slopes.....38
Ud—Udorthents, loamy.....40
Ue—Udorthents, sandy.....41
W—Water.....42
WnB—Windsor loamy sand, 3 to 8 percent slopes.....42
References.....44

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rensselaer County, New York
Survey Area Data: Version 15, Sep 3, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 1, 2014—Sep 22, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
ChA	Chenango very gravelly loam, 0 to 3 percent slopes	3.7	0.5%
ChB	Chenango very gravelly loam, 3 to 8 percent slopes	24.1	3.0%
FlA	Fluvaquents-Udifluvents complex, 0 to 3 percent slopes	22.8	2.8%
FrA	Fredon silt loam, 0 to 4 percent slopes	4.9	0.6%
HbB	Haven silt loam, 3 to 8 percent slopes	4.8	0.6%
HoA	Hoosic gravelly sandy loam, 0 to 3 percent slopes	2.0	0.2%
HoB	Hoosic gravelly sandy loam, 3 to 8 percent slopes	58.5	7.2%
HoC	Hoosic gravelly sandy loam, rolling	115.2	14.2%
HoD	Hoosic gravelly sandy loam, hilly	19.4	2.4%
HoE	Hoosic gravelly sandy loam, steep	104.6	12.9%
HuB	Hudson silt loam, 3 to 8 percent slopes	109.2	13.5%
HuC	Hudson silt loam, 8 to 15 percent slopes	0.7	0.1%
HuD	Hudson silt loam, hilly	21.9	2.7%
HuE	Hudson silt loam, steep	118.1	14.6%
LmA	Limerick silt loam, 0 to 3 percent slopes	18.1	2.2%
Pg	Pits, gravel	78.7	9.7%
RhA	Rhinebeck silt loam, 0 to 3 percent slopes	18.2	2.3%
RhB	Rhinebeck silt loam, 3 to 8 percent slopes	55.0	6.8%
SwA	Shaker very fine sandy loam, sandy substratum, 0 to 4 percent slopes	2.6	0.3%
Ud	Udorthents, loamy	12.4	1.5%
Ue	Udorthents, sandy	4.1	0.5%
W	Water	2.4	0.3%
WnB	Windsor loamy sand, 3 to 8 percent slopes	9.0	1.1%
Totals for Area of Interest		**810.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas

shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Rensselaer County, New York

ChA—Chenango very gravelly loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9v1n
Elevation: 600 to 1,800 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Chenango and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chenango

Setting

Landform: Valley trains, terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Gravelly loamy glaciofluvial deposits over sandy and gravelly glaciofluvial deposits, derived mainly from sandstone, shale, and siltstone

Typical profile

H1 - 0 to 7 inches: very gravelly loam
H2 - 7 to 43 inches: very gravelly loam
H3 - 43 to 78 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Riverhead

Percent of map unit: 3 percent
Hydric soil rating: No

Unadilla
Percent of map unit: 3 percent
Hydric soil rating: No

Hoosic
Percent of map unit: 3 percent
Hydric soil rating: No

Castile
Percent of map unit: 3 percent
Hydric soil rating: No

Palms
Percent of map unit: 1 percent
Landform: Swamps, marshes
Hydric soil rating: Yes

Carlisle
Percent of map unit: 1 percent
Landform: Swamps, marshes
Hydric soil rating: Yes

Fredon
Percent of map unit: 1 percent
Hydric soil rating: No

ChB—Chenango very gravelly loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9v1p
Elevation: 600 to 1,800 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Chenango and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chenango

Setting

Landform: Terraces, valley trains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Gravelly loamy glaciofluvial deposits over sandy and gravelly glaciofluvial deposits, derived mainly from sandstone, shale, and siltstone

Typical profile

H1 - 0 to 7 inches: very gravelly loam
H2 - 7 to 43 inches: very gravelly loam
H3 - 43 to 78 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Unadilla

Percent of map unit: 3 percent
Hydric soil rating: No

Riverhead

Percent of map unit: 3 percent
Hydric soil rating: No

Hoosic

Percent of map unit: 3 percent
Hydric soil rating: No

Castile

Percent of map unit: 3 percent
Hydric soil rating: No

Carlisle

Percent of map unit: 1 percent
Landform: Marshes, swamps
Hydric soil rating: Yes

Fredon

Percent of map unit: 1 percent
Hydric soil rating: No

Palms

Percent of map unit: 1 percent
Landform: Swamps, marshes
Hydric soil rating: Yes

FlA—Fluvaquents-Udifluvents complex, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9v1t
Elevation: 100 to 3,000 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition

Fluvaquents and similar soils: 45 percent
Udifluvents and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fluvaquents

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium with highly variable texture

Typical profile

H1 - 0 to 6 inches: silt loam
H2 - 6 to 60 inches: gravelly silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Description of Udifluvents

Setting

Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium with a wide range of texture

Typical profile

H1 - 0 to 9 inches: gravelly fine sandy loam
H2 - 9 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 19.98 in/hr)
Depth to water table: About 36 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Teel

Percent of map unit: 5 percent
Hydric soil rating: No

Limerick

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Saprists

Percent of map unit: 5 percent
Landform: Swamps, marshes
Hydric soil rating: Yes

Fredon

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed soils, moderately deep

Percent of map unit: 2 percent
Hydric soil rating: Unranked

FrA—Fredon silt loam, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: 9v1v
Elevation: 250 to 1,200 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Fredon, poorly drained, and similar soils: 50 percent
Fredon, somewhat poorly drained, and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fredon, Poorly Drained

Setting

Landform: Terraces, valley trains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy over sandy and gravelly glaciofluvial deposits

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 23 inches: gravelly silt loam
H3 - 23 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Description of Fredon, Somewhat Poorly Drained

Setting

Landform: Terraces, valley trains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy over sandy and gravelly glaciofluvial deposits

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 23 inches: gravelly silt loam
H3 - 23 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Castile

Percent of map unit: 10 percent
Hydric soil rating: No

Unnamed soils, mucky surface

Percent of map unit: 5 percent
Hydric soil rating: Yes

HbB—Haven silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9v21
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Haven and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Haven

Setting

Landform: Outwash plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits over sandy and gravelly glaciofluvial deposits

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 30 inches: silt loam
H3 - 30 to 60 inches: stratified gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Riverhead

Percent of map unit: 10 percent
Hydric soil rating: No

Chenango

Percent of map unit: 5 percent
Hydric soil rating: No

Hoosic

Percent of map unit: 5 percent
Hydric soil rating: No

HoA—Hoosic gravelly sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9v22
Elevation: 100 to 1,100 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hoosic and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hoosic

Setting

Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits

Typical profile

H1 - 0 to 9 inches: gravelly sandy loam
H2 - 9 to 23 inches: very gravelly sandy loam
H3 - 23 to 60 inches: very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Castile
Percent of map unit: 5 percent
Hydric soil rating: No

Chenango
Percent of map unit: 5 percent
Hydric soil rating: No

Fredon
Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed soils, sandy surface
Percent of map unit: 2 percent
Hydric soil rating: No

HoB—Hoosic gravelly sandy loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 9v23
Elevation: 100 to 1,100 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Hoosic and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hoosic

Setting
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits

Typical profile
H1 - 0 to 9 inches: gravelly sandy loam
H2 - 9 to 23 inches: very gravelly sandy loam
H3 - 23 to 60 inches: very gravelly sand

Properties and qualities
Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Castile
Percent of map unit: 5 percent
Hydric soil rating: No

Chenango
Percent of map unit: 5 percent
Hydric soil rating: No

Fredon
Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed soils, sandy surface
Percent of map unit: 2 percent
Hydric soil rating: No

HoC—Hoosic gravelly sandy loam, rolling

Map Unit Setting
National map unit symbol: 9v24
Elevation: 100 to 1,100 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Hoosic and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hoosic

Setting
Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits

Typical profile

H1 - 0 to 9 inches: gravelly sandy loam
H2 - 9 to 23 inches: very gravelly sandy loam
H3 - 23 to 60 inches: very gravelly sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Riverhead

Percent of map unit: 5 percent
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed soils, silty surface

Percent of map unit: 5 percent
Hydric soil rating: No

HoD—Hoosic gravelly sandy loam, hilly

Map Unit Setting

National map unit symbol: 9v25
Elevation: 100 to 1,100 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition

Hoosic and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hoosic

Setting

Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits

Typical profile

H1 - 0 to 9 inches: gravelly sandy loam
H2 - 9 to 23 inches: very gravelly sandy loam
H3 - 23 to 60 inches: very gravelly sand

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 5 percent
Hydric soil rating: No

Riverhead

Percent of map unit: 5 percent
Hydric soil rating: No

Hoosic, severely eroded

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed soils, sandy surface

Percent of map unit: 2 percent
Hydric soil rating: No

HoE—Hoosic gravelly sandy loam, steep

Map Unit Setting

National map unit symbol: 9v26
Elevation: 100 to 1,100 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition

Hoosic and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hoosic

Setting

Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits

Typical profile

H1 - 0 to 9 inches: gravelly sandy loam
H2 - 9 to 23 inches: very gravelly sandy loam
H3 - 23 to 60 inches: very gravelly sand

Properties and qualities

Slope: 25 to 35 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Riverhead
Percent of map unit: 5 percent
Hydric soil rating: No

Windsor
Percent of map unit: 5 percent
Hydric soil rating: No

Hoosic, very steep
Percent of map unit: 5 percent
Hydric soil rating: No

Hoosic, severely eroded
Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed soils, sandy surface
Percent of map unit: 5 percent
Hydric soil rating: No

HuB—Hudson silt loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 9v27
Elevation: 300 to 1,800 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Hudson and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hudson

Setting
Landform: Lake plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Clayey and silty glaciolacustrine deposits

Typical profile
H1 - 0 to 8 inches: silt loam
H2 - 8 to 16 inches: silty clay
H3 - 16 to 28 inches: silty clay

H4 - 28 to 60 inches: silty clay

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Rhinebeck

Percent of map unit: 10 percent
Hydric soil rating: No

Nassau

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed soils, gravelly or sandy surface

Percent of map unit: 2 percent
Hydric soil rating: No

HuC—Hudson silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9v28
Elevation: 300 to 1,800 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hudson and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hudson

Setting

Landform: Lake plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Clayey and silty glaciolacustrine deposits

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 16 inches: silty clay
H3 - 16 to 28 inches: silty clay
H4 - 28 to 60 inches: silty clay

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Rhinebeck

Percent of map unit: 10 percent
Hydric soil rating: No

Scio

Percent of map unit: 5 percent
Hydric soil rating: No

Nassau

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed soils, gravelly or lfs surface

Percent of map unit: 2 percent
Hydric soil rating: No

HuD—Hudson silt loam, hilly

Map Unit Setting

National map unit symbol: 9v29
Elevation: 300 to 1,800 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition

Hudson and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hudson

Setting

Landform: Lake plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Clayey and silty glaciolacustrine deposits

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 16 inches: silty clay
H3 - 16 to 28 inches: silty clay
H4 - 28 to 60 inches: silty clay

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Unnamed soils, gravelly or lfs surface
Percent of map unit: 10 percent
Hydric soil rating: No

Nassau
Percent of map unit: 5 percent
Hydric soil rating: No

Hudson, severely eroded
Percent of map unit: 5 percent
Hydric soil rating: No

HuE—Hudson silt loam, steep

Map Unit Setting
National map unit symbol: 9v2b
Elevation: 300 to 1,800 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition
Hudson and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hudson

Setting
Landform: Lake plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Clayey and silty glaciolacustrine deposits

Typical profile
H1 - 0 to 8 inches: silt loam
H2 - 8 to 16 inches: silty clay
H3 - 16 to 28 inches: silty clay
H4 - 28 to 60 inches: silty clay

Properties and qualities
Slope: 25 to 35 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Unadilla

Percent of map unit: 5 percent
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Hydric soil rating: No

Hudson, severely eroded

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed soils, gravelly surface

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed soils, alluvial

Percent of map unit: 1 percent
Hydric soil rating: Unranked

LmA—Limerick silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9v2c
Elevation: 50 to 500 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition

Limerick and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Limerick

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium that is dominantly silt and very fine sand

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: Very high (about 13.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Teel

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed soils, gravelly or sandy surface

Percent of map unit: 5 percent
Hydric soil rating: Yes

Hamlin

Percent of map unit: 3 percent
Hydric soil rating: No

Saprists

Percent of map unit: 2 percent
Landform: Swamps, marshes
Hydric soil rating: Yes

Pg—Pits, gravel

Map Unit Setting

National map unit symbol: 9v2r
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition

Pits, gravel: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pits, Gravel

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Udorthents, loamy and clayey

Percent of map unit: 10 percent
Hydric soil rating: No

RhA—Rhinebeck silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9v2x
Elevation: 80 to 1,000 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Rhinebeck and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rhinebeck

Setting

Landform: Lake plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Clayey and silty glaciolacustrine deposits

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 36 inches: silty clay
H3 - 36 to 62 inches: silty clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Madalin

Percent of map unit: 8 percent
Landform: Depressions
Hydric soil rating: Yes

Hudson

Percent of map unit: 5 percent
Hydric soil rating: No

Nassau

Percent of map unit: 2 percent
Hydric soil rating: No

RhB—Rhinebeck silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9v2y
Elevation: 80 to 1,000 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Rhinebeck and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rhinebeck

Setting

Landform: Lake plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Clayey and silty glaciolacustrine deposits

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 36 inches: silty clay
H3 - 36 to 62 inches: silty clay loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Madalin
Percent of map unit: 8 percent
Landform: Depressions
Hydric soil rating: Yes

Hudson
Percent of map unit: 5 percent
Hydric soil rating: No

Nassau
Percent of map unit: 2 percent
Hydric soil rating: No

SwA—Shaker very fine sandy loam, sandy substratum, 0 to 4 percent slopes

Map Unit Setting
National map unit symbol: 9v39
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Prime farmland if drained

Map Unit Composition
Shaker, poorly drained, and similar soils: 50 percent
Shaker, somewhat poorly drained, and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Shaker, Poorly Drained

Setting
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy over clayey glaciolacustrine or glaciomarine deposits

Typical profile
H1 - 0 to 9 inches: very fine sandy loam
H2 - 9 to 23 inches: fine sandy loam
H3 - 23 to 48 inches: silty clay
H4 - 48 to 60 inches: loamy fine sand

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: 18 to 40 inches to strongly contrasting textural stratification

Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Description of Shaker, Somewhat Poorly Drained

Setting
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy over clayey glaciolacustrine or glaciomarine deposits

Typical profile
H1 - 0 to 9 inches: very fine sandy loam
H2 - 9 to 23 inches: fine sandy loam
H3 - 23 to 48 inches: silty clay
H4 - 48 to 60 inches: loamy fine sand

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: 18 to 40 inches to strongly contrasting textural stratification
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Madalin, loamy surface
Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Elmridge
Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed soils, sandy surface
Percent of map unit: 5 percent
Hydric soil rating: Yes

Ud—Udorthents, loamy

Map Unit Setting
National map unit symbol: 9v3c
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition
Udorthents, loamy, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Loamy

Typical profile
H1 - 0 to 60 inches: loam

Properties and qualities
Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 36 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 9.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Unnamed soils, fragmental
Percent of map unit: 3 percent
Hydric soil rating: No

Udorthents, intermittently ponded
Percent of map unit: 2 percent
Hydric soil rating: No

Udorthents, sandy
Percent of map unit: 2 percent
Hydric soil rating: No

Udorthents, clayey
Percent of map unit: 2 percent
Hydric soil rating: No

Urban land
Percent of map unit: 1 percent
Hydric soil rating: Unranked

Ue—Udorthents, sandy

Map Unit Setting

National map unit symbol: 9v3d
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, sandy, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Sandy

Typical profile

H1 - 0 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 3.0 inches)

Minor Components

Teel

Percent of map unit: 4 percent
Hydric soil rating: No

Limerick
Percent of map unit: 3 percent
Landform: Flood plains
Hydric soil rating: Yes

Hamlin
Percent of map unit: 3 percent
Hydric soil rating: No

W—Water

Map Unit Setting
National map unit symbol: 9v3k
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 115 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition
Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

WnB—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2svkf
Elevation: 0 to 1,210 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Windsor, loamy sand, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor, Loamy Sand

Setting
Landform: Outwash plains, dunes, outwash terraces, deltas
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

O - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Hinckley, loamy sand

Percent of map unit: 10 percent
Landform: Outwash plains, eskers, kames, deltas
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Deerfield, loamy sand

Percent of map unit: 5 percent
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

RSA GEOLAB, LLC

1017 Greeley Avenue North
Union, New Jersey 07083
908-964-0786 (P)
www.RSAgeolab.com

Letter of Transmittal

Date: 5-16-18 Job No.: 848 Lab Log: 18-115

Attention: Amy Knight
Civil Environmental Consultants, Inc.
31 Bellows Rd.
Raynham, MA 02767

CC:

Re: Dunn C&D Facility – Phase 6

Sample(s) ID: **SG-1 (Subgrade)**

Dear Ms. Knight,

Please find attached results for the samples referenced above. The following lab testing was performed:

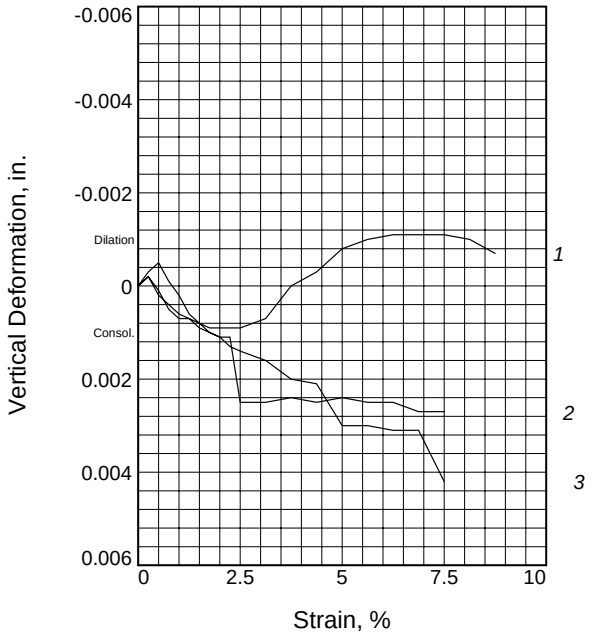
- ASTM D3080 Direct Shear (500, 7500, 15000 psf)

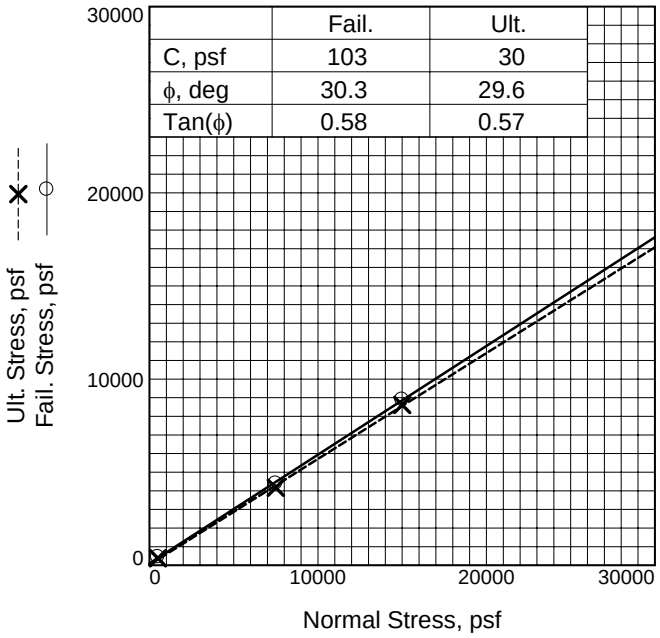
Regards,
RSA Geolab, LLC

Remarks: If you have any questions, please call 908-964-0786.

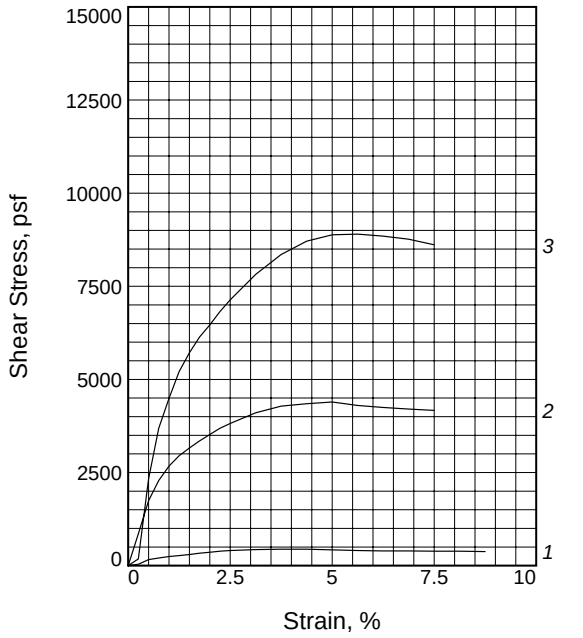
Signed: _____

Dr. Raza S. Ahmed
President RSA Geolab, LLC





	Fail.	Ult.
C, psf	103	30
ϕ, deg	30.3	29.6
Tan(ϕ)	0.58	0.57



Sample No.		1	2	3
Initial	Water Content, %	17.7	19.0	17.3
	Dry Density, pcf	109.3	108.0	109.7
	Saturation, %	86.8	90.6	85.7
	Void Ratio	0.5534	0.5715	0.5480
	Side Length, in.	4.00	4.00	4.00
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	15.6	15.1	14.4
	Dry Density, pcf	111.0	109.6	111.4
	Saturation, %	80.0	75.0	74.7
	Void Ratio	0.5293	0.5489	0.5240
	Side Length, in.	4.00	4.00	4.00
	Height, in.	0.98	0.99	0.98
Normal Stress, psf		500	7500	15000
Fail. Stress, psf		441	4392	8901
Strain, %		3.8	5.0	5.6
Ult. Stress, psf		378	4167	8613
Strain, %		8.8	7.5	7.5
Strain rate, in./min.		0.008	0.008	0.008

Sample Type: ASTM D3080

Description: Dark Grayish Brown, Pale Yellow poorly graded sand

LL= NV **PI=** NP

Assumed Specific Gravity= 2.72

Remarks: Recompacted sample. -3/8" material tested. Tested with water in box. Consolidate/Saturate 1 hr.

Figure _____

Client: Civil Environmental Consultants, Inc.

Project: Dunn C & D Facility - Phase 6

Sample Number: SG-1 (Subgrade)

Proj. No.: 848 **Date Sampled:** 5-16-18

DIRECT SHEAR TEST REPORT
RSA Geolab
Union, New Jersey

Tested By: RP **Checked By:** KP

U.S. Geolog cal Survey - Earthquake Hazards Program

n fied aza d Too

Please do not use th s tool to obta n ground mot on parameter values for the des gn code reference documents covered by the U.S. Se sm c Des gn Maps web tools (e.g., the Internat onal Bu ld ng Code and the ASCE 7 or 41 Standard). The values returned by the two appl cat ons are not dent cal.

Input

Ed t on

Conterm nous U.S. 2 14 (v4. .x)

Spectral Per od

Peak ground accelerat on

at tude

Dec mal degrees

42.65261

T me Hor zon

Return per od n years

2475

ong tude

Dec mal degrees, negat ve values for western long tudes

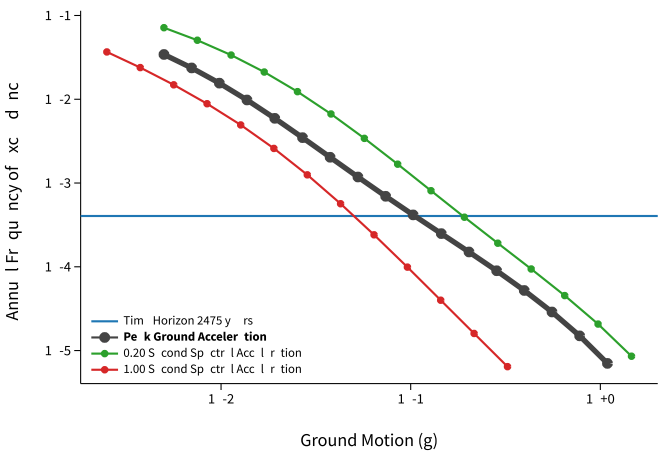
-73.72475

S te Class

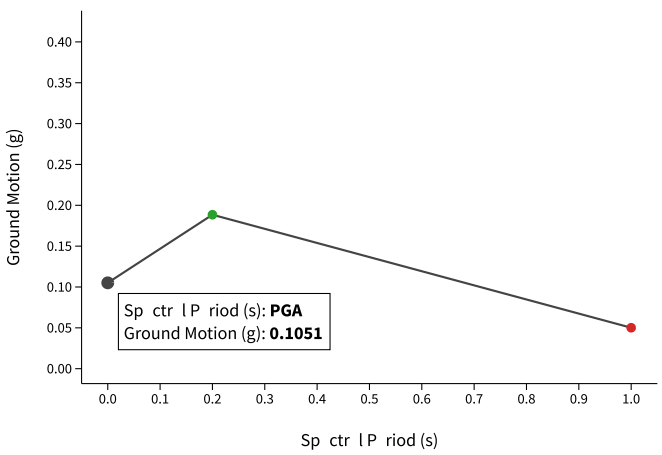
76 m/s (B/C boundary)

H z rd urv

H z rd urv s



niform H z rd R spons Sp ctrum



Vi R D t

Transactions on the Built Environment vol 14, © 1995 WIT Press, www.witpress.com, ISSN 1743-3509

Seismic response of municipal solid waste landfills

S. Singh
Department of Civil Engineering, Santa Clara University, Santa Clara CA 95053, USA

ABSTRACT

A brief but critical evaluation of the seismic response of Municipal solid Waste Landfills (MSWL) have been presented.

Parametric studies on the dynamic response using range of values for shear modulus and damping characteristics of the refuse material were carried out. Results of seismic response analyses (for different levels of base motion) performed by the authors and other investigators are examined to evaluate the impact of stiffness and height of the refuse fill on the overall response. A strong influence by a moderate increase in dynamic strength (stiffness) properties on the response has been noted. Based on these analyses the influence of shear wave velocity is discussed. The importance of low and high frequency contents of the base motions is also addressed. Simplified procedures to estimate amplification of seismic ground motions by MSWL have been developed and are presented in this paper.

INTRODUCTION

The seismic response of Municipal Solid Waste Landfills are typically carried out using procedures developed for soil slopes or earth dams. Accordingly assessment of landfill stability under earthquake loading is carried out using deformational analysis. Typical deformation analyses employ a combination of one dimensional seismic response analyses, e.g. (SHAKE 1972) and Newmark [10] sliding block deformation procedures to evaluate permanent deformations which are assumed to take place along a sliding surface. An accurate estimation of the material properties, especially the dynamic strength properties are essential for use in the above analyses. The refuse is a highly heterogeneous material and its dynamic strength properties are yet to established through a reasonable set of data measured or observed. There are other aspects of the MSWL which differ from a well compacted homogeneous earth dam. For example the light weight of refuse and existence of layers of soils and liner systems. All these have raised concerns regarding the applicability of the conventional geotechnical earthquake engineering procedures to refuse slope.

This paper attempts to address the unique concerns related to the seismic response of MSWL and presents simplified procedures for preliminary assessment of the amplification effects of the refuse fill to base motions.

SEISMIC RESPONSE OF MUNICIPAL SOLID WASTE LANDFILLS (MSWL)

Factors that could influence seismic response of landfills include: (1) height of refuse, (2) stiffness (or shear wave velocity) of refuse, (3) dynamic properties of refuse, (4) presence of clay liner, (5) refuse geometry, and (6) characteristics of base motions.

Height and stiffness of the refuse influence the basic vibrating characteristics of the landfills. In a preliminary assessment of landfill response, these are the two most significant factors that should be considered. Shear wave velocity measurements in landfills are not that uncommon nowadays. Conventional methods of downhole and crosshole measurements have been successfully used at landfill sites. Although, all the aforementioned methods require drilling or puncturing a probe into the refuse, more recently, a new method of using surface wave measurements was successfully used to determine the shear wave velocity of refuse Kavazanjian et al. [6]. The benefit of this new technology is that this non-destructive method does not require puncturing any hole into the refuse, and more importantly the surface wave measurement uses a much larger volume of materials in determining the average stiffness of the extremely heterogeneous materials, as compared to crosshole and downhole methods.

Measurements made in landfills typically show that the shear wave velocity ranges between 500 to 1000 feet per second (fps). Although shear wave velocity in excess of 1000 fps have also been reported. The velocity profiles at some landfill sites show that the stiffness increases with depths. It should be noted that unlike conventional soil fills, the refuse fill compacts under its own weight with time, thus the stiffness and in turn the shear wave velocity also increase with time. Thus the velocity of a newly closed landfill may be significantly different when the measurements were made 10 or 20 years later. In the following section, the authors present simplified charts using the refuse height and the average shear wave velocity to assess the response of landfills.

SIMPLIFIED METHOD OF LANDFILL RESPONSE EVALUATION

The relationships shown in Figures 1 and 2 are derived from the authors' experience, publised results, and field instrumentation records on landfill response during earthquakes.

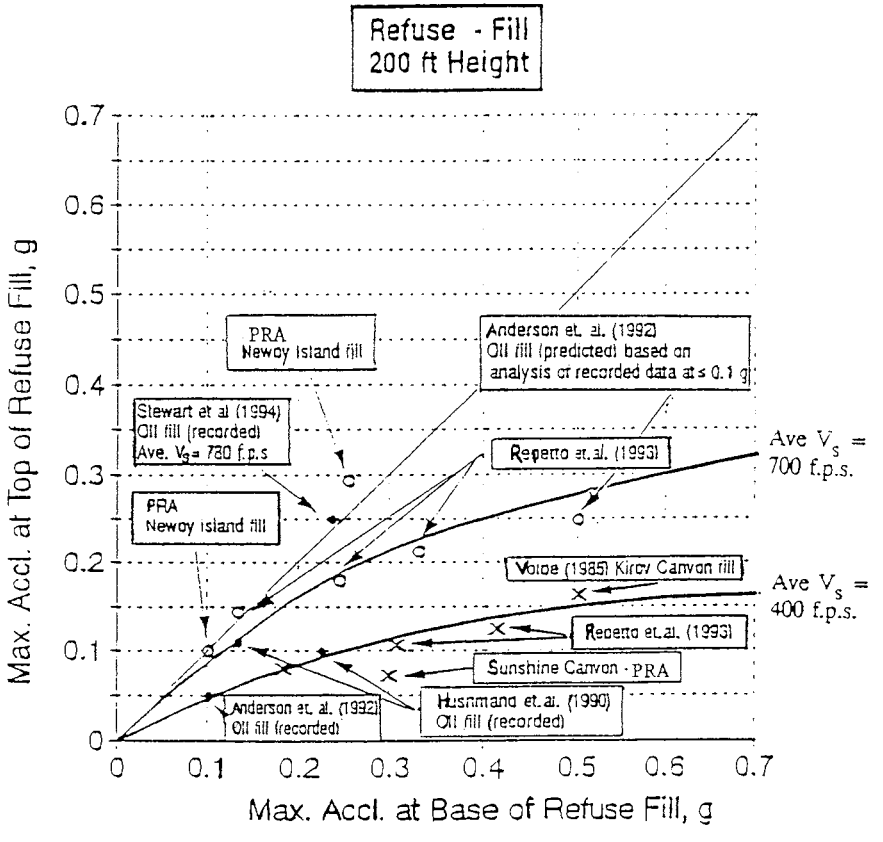


Fig. 1 Approximate Relationship Between Maximum Accelerations at the Base and Crest

The horizontal axis represents the anticipated ground motion at the toe or base of the landfill. In using these charts for preliminary design purposes, this can be determined either from conventional deterministic or probabilistic seismic hazard evaluation. The vertical axis represents the anticipated ground acceleration at the top or crest of the landfill.

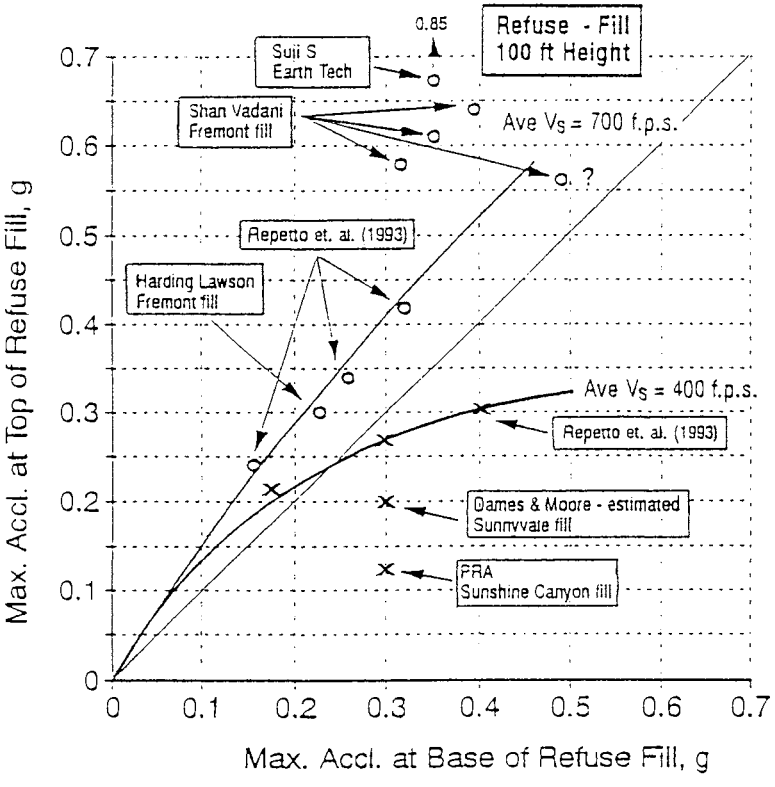


Fig. 2 Approximate Relationship Between Maximum Accelerations at the Base and Crest

As stated in the previous paragraph, the two key parameters used in these two charts and refuse height and refuse average shear wave velocity. Fig. 1 shows the response of 200-ft high landfill and Fig. 2 shows the response of a 100 ft. high landfill. In each plot, the authors developed two curves; they correspond to average refuse shear wave velocity of 400 fps and 700 fps (ft/sec).

It should be noted that due to the limited instrumentation on landfills, Figs 1 and 2 also incorporate some of the authors' analytical work as well as simulations presented by others.

Harder [3] presented a similar chart for earth dams, where he compared the acceleration recorded at the base (or abutment) of the dam with those recorded at the crest of the dam. The authors believe that he proposed upper bound correlation by Harder can be also viewed as an upper bound for response of landfills. The basis of this assessment are (1) the two dimensional geometry of a typical earth dam will respond more than that of a landfill which responds more in a one-dimensional manner, (2) the refuse will have a higher damping than that of an earth fill dam.

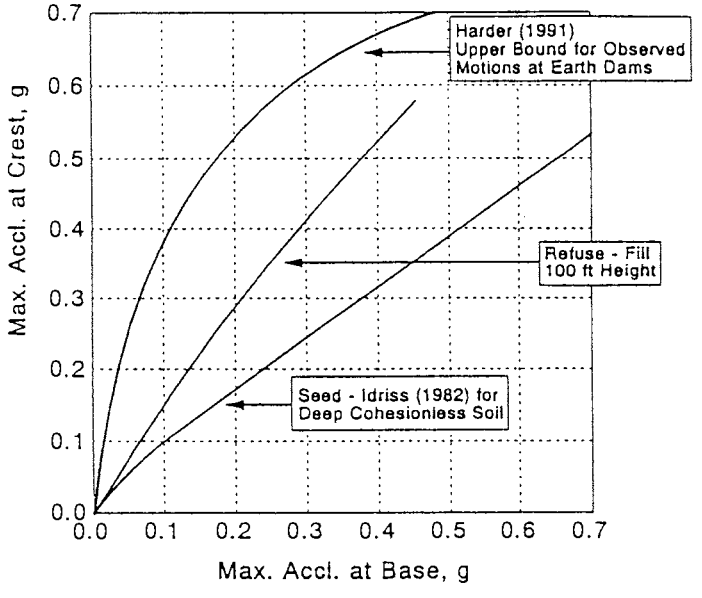


Fig. 3 Approximate Relationships Between Maximum Accelerations at the Base and Crest

Fig. 3 shows the comparison of Harder's proposed relationship with the 700 fps curve shown in Fig. 2. Also shown on Fig. 3 is the correlation proposed by Seed and Idriss [14] for deep cohesionless sites. It can be seen that all three curves are reasonably similar. It is the authors' opinion that on a preliminary basis the upper bound for the response of the MSWL should be between the Harder curve and the authors' 100 ft. curve in Fig. 3.

It should be pointed out that if one compares Figs. 1 and 2, it could easily be seen that the acceleration for 100 ft. landfill is much higher than the 200 ft. high landfill. However, one important aspect that these two charts do not show is the effect of straining. The reason that lower acceleration is anticipated for 200 ft. high landfill is that much of the motion is anticipated to be damped out before the motions can reach to the top with the accompanying strain. Thus the strain developed in the 200 ft. landfill is higher than the 100 ft. landfill.

Frequency dependence aspects of the response is also very important. It is now well known that the maximum response depends primarily on the fundamental period of

the landfill and the frequency characteristics of the base motions, and typically high acceleration levels are associated with higher frequency motions. On the basis of several analyses made by the authors using SHAKE program and the Singh and Murphy [15] modules degradation and damping curves; and more recently analyses made by Hushmand Associates [5] and Stewart et al. [16], it appears that a MSWL with height over 200 ft. will have fundamental periods on the order of one second or more. Accordingly, it is likely that as the fill height increases, the high frequency high motion will be attenuated. This trend is evident from Figs. 1 and 2. It may be noted that on the basis of the evaluation of the recorded data at the base and the top of the OII Landfill in Monterey Park, in the Los Angeles area, during the Northridge earthquake, Stewart et al. [16] pointed out that "there was attenuation in the high frequency range, but at periods beyond approximately 0.6 seconds, there was amplification of the motions from the base to the top." The OII Landfill is located 48 km from the epicenter. Accordingly, if significant energy from a seismic shaking at an MSWL site is dominant in relatively low frequency, an amplification can be expected. In this context it appears that for a given peak acceleration at the base, the distinction between a near field and a far field seismic event is a significant consideration in evaluating the response of MSWL.

LANDFILL PERFORMANCE DURING RECENT EARTHQUAKES

An evaluation of the performance of solid waste landfills during the Loma Prieta Earthquake was reported by Orr and Finch, [11]. They examined ten solid waste landfills located in the area impacted by the earthquake. The landfill sites accelerations ranged from 0.10 to 0.45g. However, none of these landfills were equipped with liners, nor were any one of them instrumented. According to Orr and Finch [11], "The limited surface damage, given the peak horizontal accelerations estimated for the 10 solid waste landfills, suggests that the properties of the solid waste may tend to dampen or attenuate the effects of earthquakes." It also suggests that landfills behave more elastically than what we normally conceive and that damping may also play a significant role in the seismic response of MSWL. It is important to note, however, that the Buena Vista Landfill suffered minor slope cracking and minor cracking to a buried landfill gas header line. The two-foot gunit-lined drainage ditch at the Newby Island site was also damaged.

The solid waste landfills located in the Los Angeles area that were shaken during the Northridge earthquake have performed much better than expected (Kavanzanjian,[6] and Stewart et al., [16]. Compared to the very high levels of accelerations, the damage was relatively insignificant. Unfortunately, because of the lack of instrumentation, recorded data on the seismic response is available only for one landfill, the OII fill. Preliminary information, however, indicates that the MSWL has inherently moderate to strong energy absorption characteristics; especially for the high frequency motions. The existence of interlocking, large-strain capacity and the light-weight, appear to contribute to this response.

CONCLUSIONS

On the basis of the studies reported in this paper, the following conclusions may be drawn:

1. The height and stiffness (or shear wave velocity) of the refuse material in a MSWL are the significant factors which influence the basic vibrating characteristics of the landfills.
2. Results of seismic response analyses (for different levels of base motion) indicate a strong influence by a moderate increase in dynamic strength (stiffness) properties of refuse on the seismic response of MSWL.
3. Preliminary evaluation of landfill response which includes the influence of height and stiffness of refuse can be made from figures 1 and 2.

REFERENCES

1. Anderson, D. G., Hushmand, B., and Martin, G. R., (1992), "Seismic Response of Landfill Slopes," Proc. ASCE Specialty Conference on Stability and Performance of Slopes and Embankments - II, Berkeley, California, June 28 - July 1, pp. 973-989.

2. Dames & Moore, (1988) "Landfill Slope Stability Analysis, Sunnyvale Sanitary Landfill, Sunnyvale, California," Report to City of Sunnyvale, California, 94086, February.

3. Harder, Jr. L. S., (1991) "Performance of Earth Dams During the Loma Prieta Earthquake," Proceedings Second International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, St. Louis, Missouri, Paper No. LPO5, pp. 1673, March 11-15.

4. Hushmand, B., et al., (1990) "Seismic Monitoring and Evaluation of a Solid Waste Landfill," Proceedings 4th U.S. National Conference on Earthquake Engineering, Vol. 3, pp. 855-869.

5. Hushmand Associates (1994) "Landfill Response to Seismic Events," Technical Report to CDM Federal Programs, Hushmand Associates, Laguna Niguel, California.

6. Kavazanjian, E., "Personal Communications," April, 1994.

7. Kavazanjian, E., Jr., Snow, M.S., Matasovic, N., Poran, C., and Satoh, T., (1994) "Non-Intrusive Rayleigh Wave Investigations at Solid Waste Landfills." *Proceedings of the 1st International Conference on Environmental Geotechnics*, Edmonton, Alberta, July.

8. Makdisi, F. I. and Seed, H. B., (1978) "Simplified Procedure for Estimating Dam and Embankment Earthquake-Induced Deformations," Journal of the Geotechnical Engineering Division of ASCE, July.

9. Mitchell, R. A., and Mitchell, J. K., (1992) "Stability Evaluation of Waste Landfills," Proceedings of ASCE Specialty Conference on Stability and Performance of Slopes and Embankments - II, Berkeley, California, June 28 - July 1.

10. Newmark, N. M.,(1965) "Effects of Earthquakes on Dams and Embankments," The Rankin Lecture, Geotechnique, Vol. 29, No. 3, pp. 215-263.

11. Orr, W. R., and Finch, M.A., (1990) "Solid Waste Landfill Performance During the Loma Prieta Earthquake," ASTM STP 1070, Geotechnics of Waste Fills - Theory and Practice, American Society for Testing Materials, pp. 22-30.

12. PRA, "Seismic Response, Newby Island Sanitary Landfill," 1987, Letter from Bill Schreeder to Dr. S. Singh, Aug. 24, 1993.

13. PRA, "Sunshine Canyon," (1990), Letter from Bill Schreeder to Dr. S. Singh, Aug. 24, 1993.

14. Seed, H. Bolton, and Idriss, I. M., (1982) "Ground Motions and Soil Liquefaction During Earthquakes," Earthquake Engineering Research Institute, Berkeley, California, Volume 5, Engineering Monograph on Earthquake Criteria Structural Design and Strong Motion Records, p. 37.

15. Singh, S. and Murphy, B., "Evaluation of the Stability of Sanitary Landfills," Geotechnics of Wastefills - Theory and Practice, ASTM STP 1070, American Society for Testing and Materials, pp. 240-258, 1990.

16. Stewart, J. P., Bray, J. D., Seed, R. B. and Sitar, N., (1994) editors, "Preliminary Report on the Principal Geotechnical Aspects of the January 17, 1994 Northridge Earthquake," Report No. UCB/EERC-94/08 Earthquake Engineering Research Center, College of Engineering, University of California at Berkeley, June, pp. 199-225.

17. Somasundaram, S., "Earth-Tech.," Communication to Dr. S. Singh, Aug. 18, 1992.

TENCATE Mirafi®

SOIL REINFORCEMENT

Miragrid® Geogrids
for Soil Reinforcement

Miragrid® 5XT

TenCate develops and produces materials that function to increase performance, reduce costs and deliver measurable results by working with our customers to provide advanced solutions.

The Difference Miragrid® Geogrids Make:

- High long-term design strengths (LTDS). Miragrid® geogrids have more than 100,000 hours of tension creep testing performed at an independent test laboratory. Credible, dependable long term strength assured.
- Cost effective. Creep resistant polyester fibers provide higher allowable tensile strength, minimizing the required number of geogrid layers. Wide rolls significantly reducing placement time, lowering cost.
- Light weight, easy to handle. No sharp edges.
- Flexible, tough. Minimizes movement of soil structure.
- Custom fabrication. Rolls fabricated to meet your specific project requirements.
- Miragrid® geogrids provide the widest strength range, and are the highest strength geogrid material in the market today.

APPLICATIONS

Miragrid® geogrids can be used in most MSE applications for soil reinforcement including internally reinforced soil walls, segmental retaining wall reinforcement, steep reinforced slopes, and reinforcement in a variety of landfill applications including potential voids bridging and veneer stability. When a project specifies for long-term design strength for structure stability use Miragrid® geogrids.

INSTALLATION GUIDELINES

Before placing Miragrid® geogrids, the surface should be cleared of all debris and the foundation base proofrolled. The grids should be rolled out, cut to length, thus eliminating field connections and laid at the proper elevation, location and orientation. Since geogrids vary in strength with roll direction, Miragrid® geogrids should be laid in the direction of main reinforcement.

After rolling out, the geogrid should be tensioned by hand until it is taut, free of wrinkles, and lying flat. Adjacent geogrid rolls may be butted together side-by-side without overlap. Splices in the main reinforcement direction should be avoided.

Certain fill placement procedures may require the reinforcement to be held in place by stakes, sandbags, or fills, as directed by an engineer. A razor blade, sharp knife or scissors may be used to cut the geogrid. Fill placement should follow the standard practice, or as defined in the project specifications or directed by the Engineer. Care should be taken to prevent wrinkles and/or slippage of reinforcement during fill placement and spreading.

These guidelines serve as a general basis for installation. Detailed instructions are available from your TenCate representative.

TENCATE Mirafi®

Miragrid® Geogrids

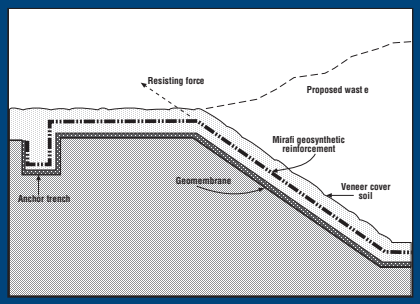
for Soil Reinforcement

Property	Test Method	Units	2XT[4]	3XT	5XT	7XT	8XT	10XT	20XT	22XT	24XT
Polymer (coating)	–	–	PET (PVC)	PET (PVC)	PET (PVC)	PET (PVC)	PET (PVC)	PET (PVC)	PET (PVC)	PET (PVC)	PET (PVC)
Tensile Strength @ Ultimate (MARV)[1]	ASTM D6637 (Method B)	lbs/ft (kN/m)	2000 (29.0)	3500 (51.1)	4700 (68.6)	5900 (86.1)	7400 (108.0)	9500 (138.6)	13705 (200.0)	20559 (300.0)	27415 (400.0)
Creep Reduced Strength[2]	ASTM D5262/ D6992	lbs/ft (kN/m)	1379 (20.0)	2414 (35.2)	3241 (47.3)	4069 (59.4)	5103 (74.5)	6552 (95.6)	9452 (137.9)	14179 (206.9)	18907 (275.9)
Long Term Design Strength[3]		lbs/ft (kN/m)	1142 (17.0)	1999 (29.2)	2684 (39.2)	3370 (49.2)	3927 (57.3)	5042 (73.6)	7540 (110.0)	11311 (165.0)	15083 (220.1)

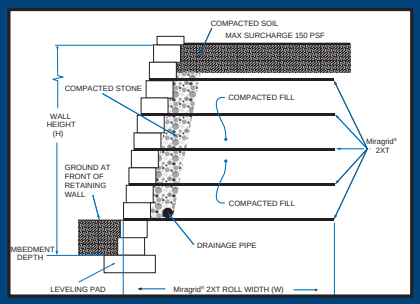
Packaging	Units	2XT[5]	3XT[5]	5XT[5]	7XT[5]	8XT[5]	10XT[5]	20XT[5]	22XT[5]	24XT[5]
Roll Width	ft (m)	4 6 12 (1.2) (1.8) (3.6)	6 12 (1.8) (3.6)	6 12 (1.8) (3.6)	6 12 (1.8) (3.6)	6 12 (1.8) (3.6)	12 (3.6)	12 (3.6)	12 (3.6)	12 (3.6)
Roll Length	ft (m)	50 150 1000 (15) (46) (305)	150 300 1000 (46) (91) (305)	150 300 1000 (46) (91) (305)	200 300 1000 (61) (91) (305)	200 300 1000 (61) (91) (305)	200 1000 (61) (305)	200 1000 (61) (305)	200 (61)	200 1000 (61) (305)
Estimate Roll Weight	lbs (kg)	25 50 109 (11) (23) (49)	115 115 670 (52) (52) (304)	135 135 831 (61) (61) (376)	130 179 846 (58) (81) (383)	140 205 975 (64 (93) (442)	255 1235 (116) (559)	360 1725 (163) (781)	470 (213)	595 2840 (270) (1287)
Area	yd^2 (m^2)	22 100 109 (18) (84) (167)	200 200 1333 (167) (167) (1114)	200 200 1333 (167) (167) (1114)	200 267 1333 (168) (220) (1114)	200 267 1333 (168) (220) (1114)	267 1333 (220) (1114)	267 1333 (220) (1114)	267 (220)	267 1333 (220) (1114)

[1]Minimum Average Roll Values (MARV) shown above are based on QC Testing per a defined lot not to exceed 12 months. Testing Frequency follows ASTM D4354, Table 1.
[2]75-year design life based on NTPEP Report REGEO-2011-01-001 and REGEO-2015-01-002.
[3]Long Term Design Strength for Type 3 Backfill (Sifty Sand), 6-inch lift / 25,000-lb roller.
[4]Note: Values shown for Miragrid 2XT® are both machine and cross-machine direction. Values for other Mirafi® products are machine direction only.
[5]Available in various roll widths and roll lengths.

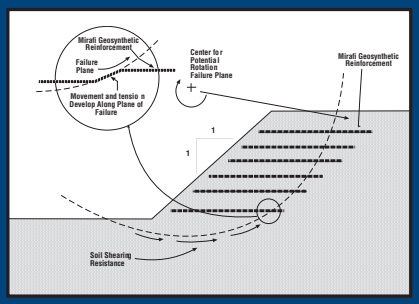
Miragrid® Geogrids Typical Applications



Veneer Reinforcement



Retaining Wall



Steepened Slope

PDS.GRID(M)0218

365 South Holland Drive
Pendergrass, GA 30567
Tel 800 685 9990
Tel 706 693 2226
Fax 706 693 4400
www.tencategeo.us

ISO 9001 FM 61026

TENCATE materials that make a difference