US EPA ARCHIVE DOCUMENT

APPENDIX H.2

SLOPE STABILITY ANALYSIS:
GLOBAL ANALYSIS - SECTION A-A'
CHEMICAL WASTE UNIT- SECTION B-B'

Shaw®

Shaw® Shaw Environmental, Inc.

Client:	Clinton Landfill, Inc.		
Project:	Clinton Landfill No. 3 Chemical Waste Unit		
Proj. #:	128017		
Calculated By:	PCT	Date:	9/25/07
Checked By:	JPV	Date:	9/26/07

TITLE: SLOPE STABILITY ANALYSES

Problem Statement

Determine the factor of safety against slope failure for the final landform, excavation slopes, and west detention basin under static and seismic loading conditions.

Given

- ❑ Hydrogeologic and Design Drawings contained in this application.
- ❑ Appendix H.1 "Summary of Geotechnical Design Parameters" contained in this application.
- ❑ USGS National Seismic Hazard Mapping Project found on the internet/online at *http://earthquake.usgs.gov/research/hazmaps/design/*. (Value of 0.0981 for horizontal acceleration — please refer to attached pages in H.1).
- ❑ Computer model SLIDE - 2D Limit Equilibrium Slope Stability Analysis, version 5.0, developed by Rocscience, Inc. was used for the stability analyses.
- ❑ Figures 1 and 2, showing locations of the critical cross sections. (Please refer to attached pages).

Assumptions

Critical Cross Section

Cross Sections A-A' and B-B', shown on the attached figures, were determined to be the most critical cross sections for the global mass stability for the Clinton Landfill No. 3 Chemical Waste Unit. Specifically, Cross Section A-A' was determined to be the most critical cross section prior to MSW placement; and Cross Section B-B' was determined to be the most critical cross section for the final landform. The liner design calls for the following liner systems on the base and sideslopes:

Base Liner System

- ❑ 60-mil HDPE textured geomembrane
- ❑ Geosynthetic clay liner
- ❑ 60-mil HDPE textured geomembrane
- ❑ Geocomposite
- ❑ 60-mil HDPE textured geomembrane

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TITLE: SLOPE STABILITY ANALYSES

- 3-foot low permeability compacted cohesive earth liner ($k \leq 1\times10^{-7}$ cm/sec).
- Compacted clay fill replacing Roxana Silt / Robein Member beneath compacted cohesive earth liner (thickness varies)

Sideslope Liner System

- 18-inch select fill
- Geocomposite
- 60-mil HDPE textured geomembrane
- Geocomposite
- 60-mil HDPE textured geomembrane
- 3-foot low permeability compacted cohesive earth liner ($k \leq 1\times10^{-7}$ cm/sec).

The cross sections were modeled assuming a maximum excavation depth of approximately 662 ft MSL with the excavation slope of 3H:1V. The final landform was modeled through the peak of the Chemical Waste Unit at a maximum waste height of 812 ft MSL with a final cover slope ranging between 4H:1V and 20H:1V.

Two truck loadings of 250 pounds per square foot (psf) over a length of 20 feet is applied to all final cover failure conditions.

Modes of Failure

Four failure scenarios were analyzed to demonstrate that the final landform meets the required factor of safety against slope failure. Two of the four failure scenarios were analyzed to determine that during operation and filling of the landfill that the required factors of safety were met.

- Bottom Liner System Stability - A failure may occur at the most critical interface along the bottom liner system. The slope stability analysis was performed by assuming a potential failure surface extending through the waste and sliding along the critical interface of the bottom liner system (block failure).

- Waste Stability - Circular failure surfaces extending through the waste were automatically generated and evaluated by SLIDE.

- Foundation Stability - Circular failure surfaces extending through the waste mass and into the bottom liner system and foundation soils were automatically generated and evaluated by SLIDE.

- Waste Active Face Stability - Circular failure surfaces extending through the waste were automatically generated and evaluated by SLIDE to demonstrate that the active face will meet the required factors of safety at a slope of 3H:1V. Two scenarios were evaluated for Cross

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TITLE: SLOPE STABILITY ANALYSES

Section A-A' — short term active face under static conditions, and short term active face under seismic conditions. Both scenarios represent the short term active face with a maximum waste height of 50 feet.

SLIDE generates failure surfaces through the waste, liner, and foundation soils and calculates the factor of safety. For both long and short term, SLIDE located the failure surface of minimum factor of safety.

Failure Conditions

Each scenario listed above, with the exception of the Waste Active Face, was analyzed under the following four failure conditions.

- Short Term (undrained), Static Conditions
- Short Term (undrained), Seismic Conditions
- Long Term (drained) Static Conditions
- Long Term (drained) Seismic Conditions

Material Properties

Appendix H.1 explains all geotechnical parameters used in the slope stability report. Table 1 summarizes the material properties and strength parameters.

Client: Clinton Landfill, Inc.

Project: Clinton Landfill No. 3 Chemical Waste Unit

Proj. #: 128017

Shaw® Shaw Environmental, Inc.

Calculated By: PCT Date: 9/25/07

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TITLE: SLOPE STABILITY ANALYSES

TABLE 1
SUMMARY OF MATERIAL PROPERTIES

Layer No.	Layer	Moist Unit Weight (pcf)	Saturated Unit Weight (pcf)	Short-Term Conditions[1]		Long-Term Conditions[2]	
				Cohesion (psf)	Friction Angle (deg.)	Cohesion (psf)	Friction Angle (deg.)
1	Tiskilwa Formation: Brown and Gray Silty Clay (CL), with localized sand strata	135	140	3,500	0	600	26
2	Roxana Silt / Robein Member: Dark Brown Organic Silt (OL) and Peat (Pt)	100	110	1,400	0	1,500	19
3	Berry Clay and Radnor Till: Gray Clay (CL)	140	148	6,000	0	1,100	18
4	Mahomet Sand Member: Sand and Gravel (SP/GP)	135	140	0	35	0	35
5	Final Cover	128	134	1,350	0	1,300	22
6	MSW	75	75	500	30	500	30
7	Chemical Waste	90	90	900	0	240	45
				840	17.4		
8	Leachate Drainage Layer	126	130	0	30	0	30
9	Critical interface between geosynthetics on sideslopes[3]	135	140	0	24	0	24
10	Critical interface between geosynthetics on bottom liner system[3]	135	140	0	24	0	24
11	Compacted Fill / Sub-base	135	140	3,000	0	700	21
12	Compacted Select Fill on Sideslopes	128	134	1,350	0	1,300	22

Notes:

1. Short Term Shear Strength values for soils reflect the total shear strength values from unconsolidated undrained triaxial shear strength testing performed on representative soil samples. Short Term Shear Strength values for the Chemical Waste:

- cohesion = 900 psf, and friction angle = 0 deg., reflect the total shear strength values from unconsolidated undrained triaxial shear strength testing performed on representative samples of the chemical waste to represent short term active waste fill conditions; and
- cohesion = 840 psf, and friction angle 17.4 = 0 deg., reflect the total shear strength values from consolidated undrained triaxial shear testing performed on representative samples of the chemical waste to represent interim waste fill conditions (i.e., under maximum loading - maximum waste height / consolidated conditions). Refer to Appendix H.1.

2. Long Term Shear Strength values for soils reflect the effective shear strength values from consolidated undrained triaxial shear strength testing performed on representative soil samples. Long Term Shear Strength values for the Chemical Waste reflect the effective shear strength values from consolidated undrained triaxial shear strength testing performed on representative samples of the chemical waste to represent long term waste fill conditions. Refer to Appendix H.1.

3. Both the sideslope and bottom liner system consists of a series of geosynthetics placed on top of each other. The CQA plan will require that the friction angles listed above are achieved between each geosynthetic interface. Refer to Appendix H.1.

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Project: Clinton Landfill No. 3 Chemical Waste Unit
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TITLE: SLOPE STABILITY ANALYSES

Calculations

Refer to attached SLIDE output files.

Results

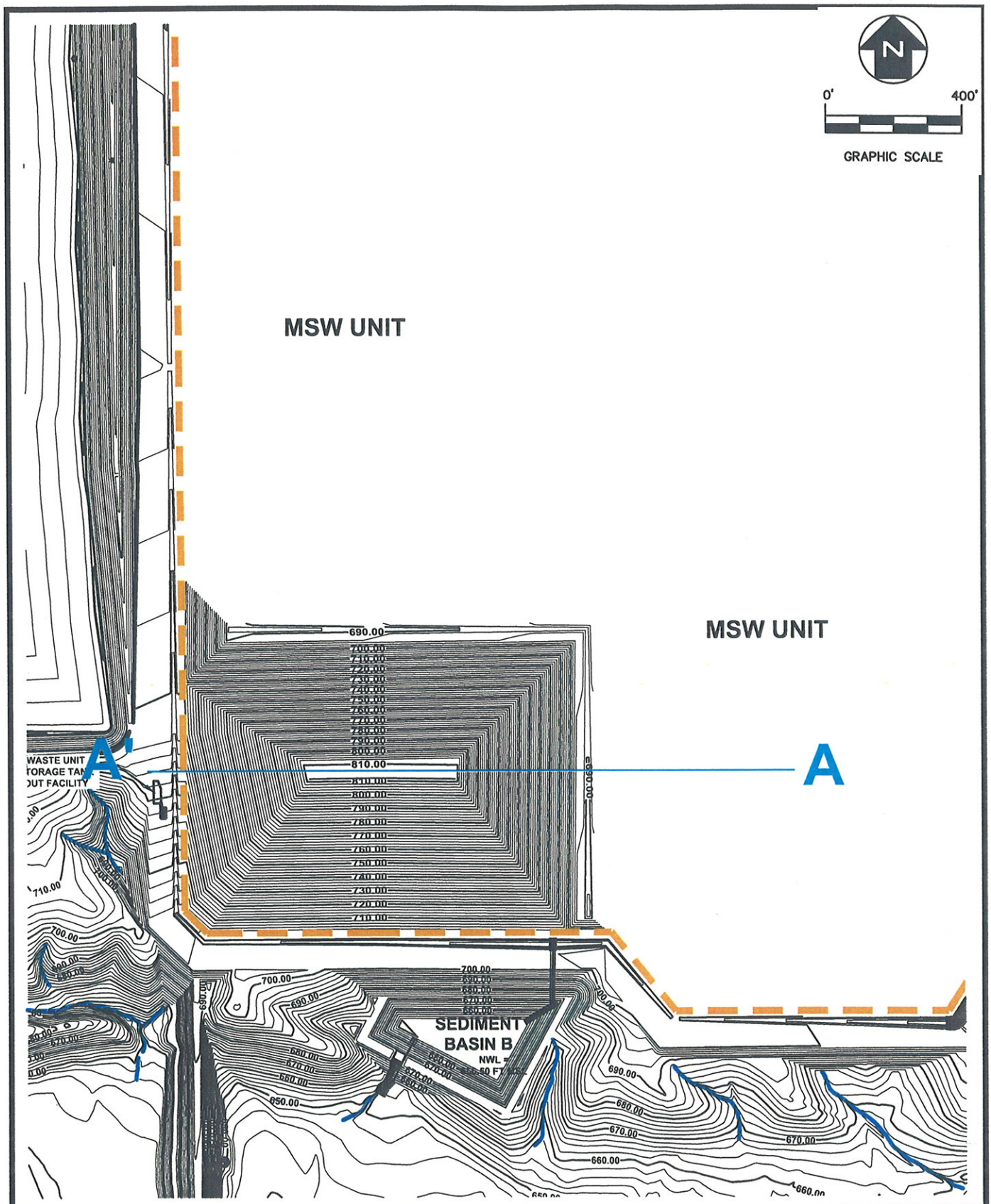
Results of all the scenarios run by SLIDE are summarized in the table below. The following summary table demonstrates that the Clinton Landfill No. 3 Chemical Waste Unit meets and exceeds all the required safety factors as required by 35 Ill. Admin. Code Section 811.304 (d). The active face scenarios demonstrate compliance with 35 Ill. Admin. Code Section 811.107 (a)(1).

TABLE 2
FACTORS OF SAFETY

Scenario	Short Term Conditions		Long Term Conditions	
	Static	Seismic	Static	Seismic
Section A-A'				
Liner Block Failure	1.77	1.32	2.45	1.77
Waste Circular Failure	1.76	1.32	3.41	2.56
Foundation Circular Failure	1.93	1.43	2.72	1.98
Active Face Circular Failure	2.00	1.47	-	-
Section B-B'				
Liner Block Failure	2.07	1.41	3.06	2.05
Waste Circular Failure	2.13	1.49	4.64	3.25
Foundation Circular Failure	2.28	1.57	3.66	2.49

The slope stability under short term conditions of the excavation and active face demonstrates a factor of safety against failure greater than 1.5 under static loading and 1.3 under seismic loading. For long term / final conditions, the stability analyses demonstrate a factor of safety against failure greater than 1.5 under static loading and 1.3 under seismic loading.

During construction of the landfill liner system, on-site testing will be required to demonstrate a friction angle greater than or equal to the required friction angles.



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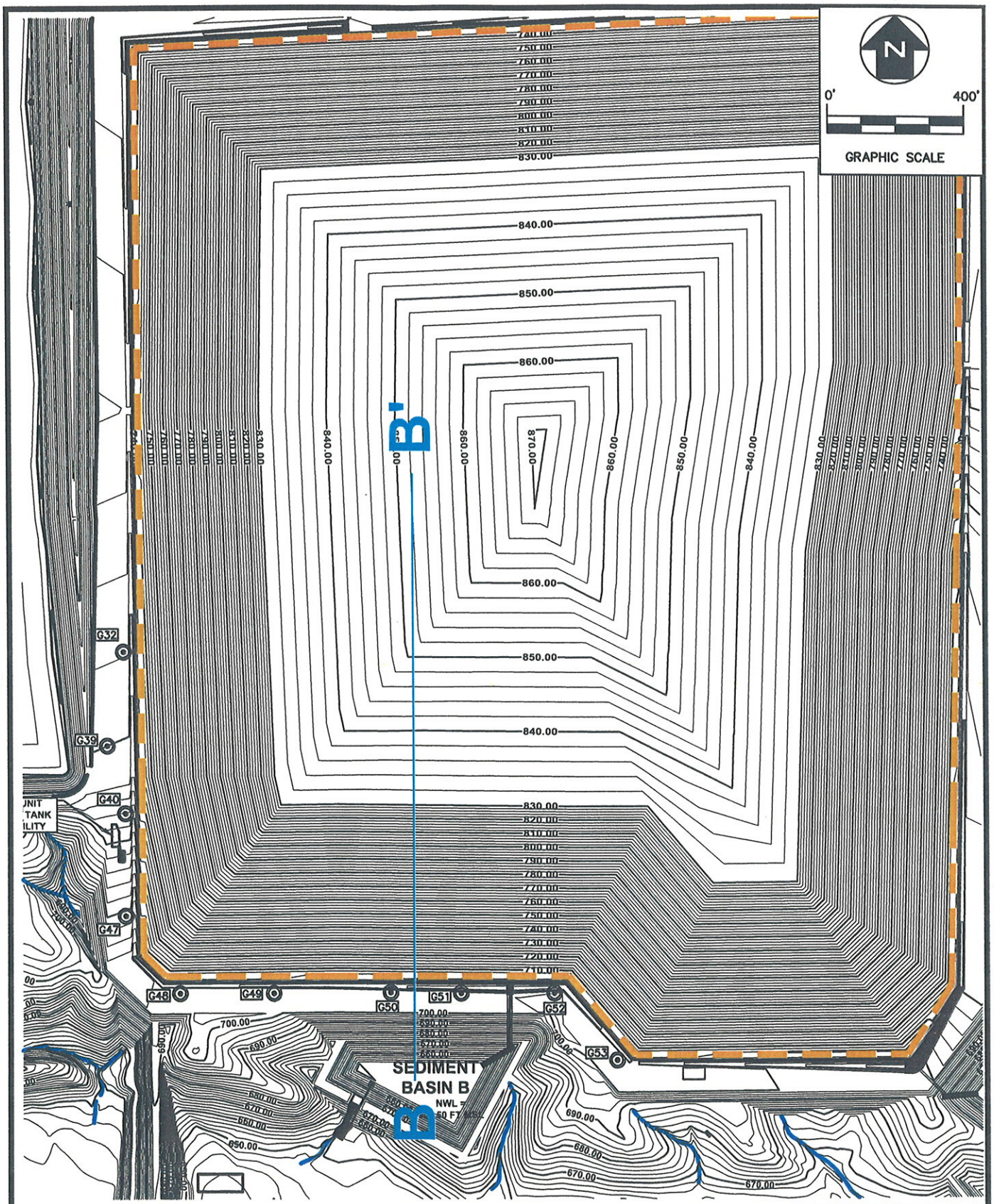
CLINTON LF. NO. 3 CHEMICAL WASTE UNIT
DEWITT COUNTY, ILLINIOS

FIGURE1
SLOPE STABILITY ANALYSIS
SECTION A-A'

APPROVED BY: DAM	PROJ. NO.: 128017	DATE: SEPT. 2007



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CLINTON LF. NO. 3 CHEMICAL WASTE UNIT
DEWITT COUNTY, ILLINOIS

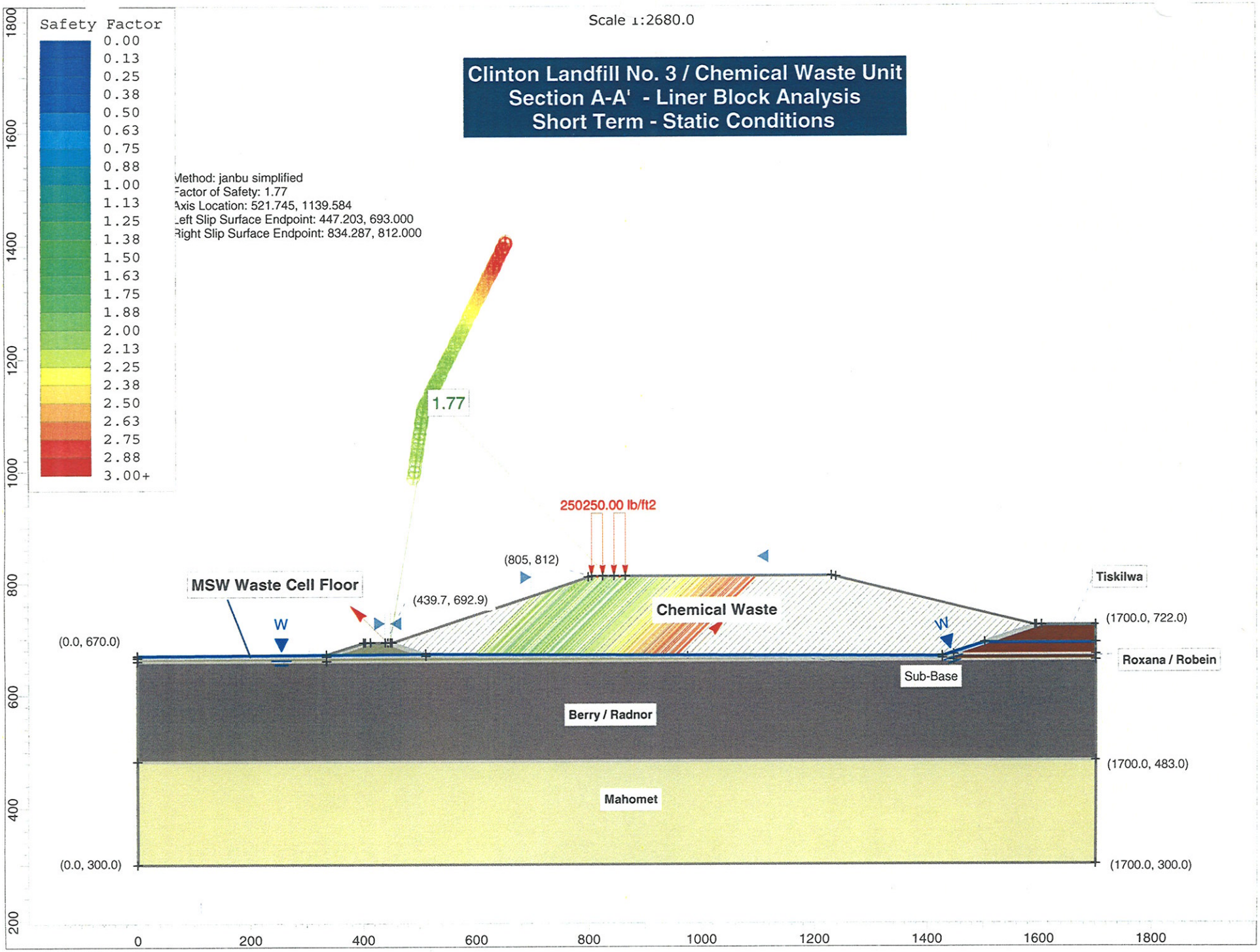
FIGURE2
SLOPE STABILITY ANALYSIS
SECTION B-B'

APPROVED BY: DAM	PROJ. NO.: 128017	DATE: SEPT. 2007

CROSS SECTION A-A'
LINER BLOCK FAILURE
SHORT TERM / STATIC ANALYSIS

Scale 1:2680.0

Clinton Landfill No. 3 / Chemical Waste Unit
Section A-A' - Liner Block Analysis
Short Term - Static Conditions



Slide Analysis Information

Document Name

File Name: A-A'_SSTAT_LB

Project Settings

Project Title: Clinton Landfill No. 3 / Chemical Waste Landfill, A-A', LINER BLOCK, SHORT TERM/STATIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 400
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250

lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3500 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1400 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 6000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 840 psf
Friction Angle: 17.4 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3

Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 1.765590
Axis Location: 521.745, 1139.584
Left Slip Surface Endpoint: 447.203, 693.000
Right Slip Surface Endpoint: 834.287, 812.000
Resisting Horizontal Force=897035 lb
Driving Horizontal Force=508066 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 400
Number of Invalid Surfaces: 0

List of All Coordinates

Block Search Polyline

444	693
511	669
976	668

Material Boundary

0	669
335	671
404	693

Material Boundary

0	666
335	668

Material Boundary

335	668
413	693

Material Boundary

335	668
511	669
439	693

Material Boundary

448	693
511	672
1428	667
1595	722

Material Boundary

511	669
1428	664
1448	670
1604	722

Material Boundary

0	660
335	660
1448	660
1700	660

Material Boundary

451	693
511	673
1428	668
1592	722

Material Boundary

0	483

1700	483

Material Boundary

1448	670
1700	670

Material Boundary

335	660
335	668

Material Boundary

1448	660
1448	670

Material Boundary

1428	664
1428	667

Material Boundary

511	669
511	672

Material Boundary

335	668
335	671

External Boundary

1700	300
1700	483
1700	660
1700	670
1700	722
1604	722
1595	722
1592	722
1239	810
1231	812
805	812
799	810
451	693
448	693
439	693
413	693
404	693
401	693
335	672
0	670
0	669
0	666
0	660

0	483
0	300

Water Table

0	670
335	672
511	673
1428	668
1503	691
1700	691

Distributed Load

825	812
805	812

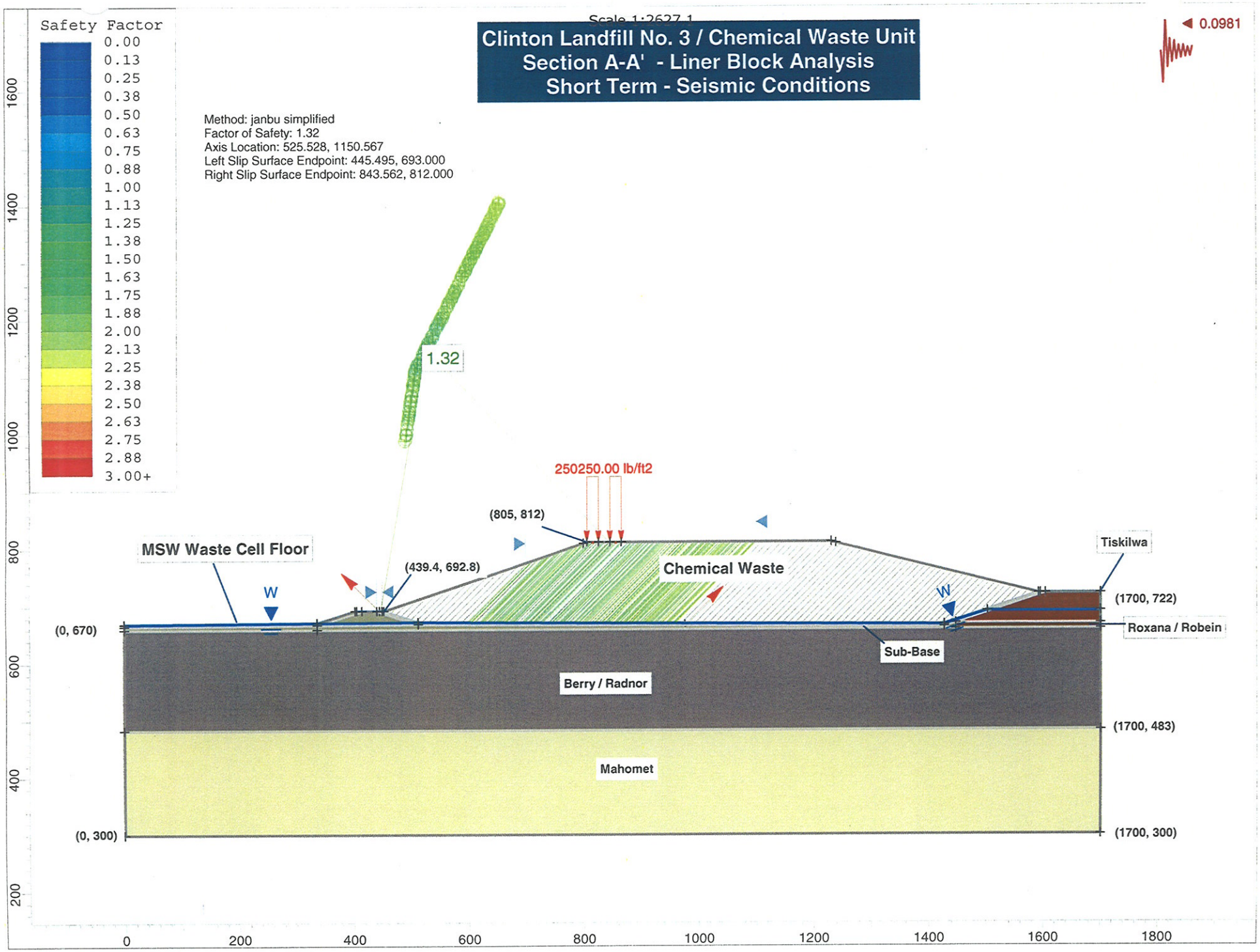
Distributed Load

865	812
845	812

CROSS SECTION A-A'
LINER BLOCK FAILURE
SHORT TERM / SEISMIC ANALYSIS

Scale 1:2627.1

Clinton Landfill No. 3 / Chemical Waste Unit
Section A-A' - Liner Block Analysis
Short Term - Seismic Conditions



Slide Analysis Information

Document Name

File Name: A-A'_SSEIS_LB

Project Settings

Project Title: Clinton Landfill No. 3 / Chemical Waste Landfill, A-A', LINER BLOCK, SHORT TERM/SEISMIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 400
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.0981
2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3500 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1400 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 6000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 840 psf
Friction Angle: 17.4 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb

Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 1.324470
Axis Location: 525.528, 1150.567
Left Slip Surface Endpoint: 445.495, 693.000
Right Slip Surface Endpoint: 843.562, 812.000
Resisting Horizontal Force=932510 lb
Driving Horizontal Force=704061 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 400
Number of Invalid Surfaces: 0

List of All Coordinates

Block Search Polyline

444	693
511	669
976	668

Material Boundary

0	669
335	671
404	693

Material Boundary

0	666
335	668

Material Boundary

335	668
413	693

Material Boundary

335	668
511	669
439	693

Material Boundary

448	693
511	672
1428	667
1595	722

Material Boundary

511	669
1428	664
1448	670
1604	722

Material Boundary

0	660
335	660
1448	660
1700	660

Material Boundary

451	693
511	673
1428	668
1592	722

Material Boundary

0 483
1700 483

Material Boundary
1448 670
1700 670

Material Boundary
335 660
335 668

Material Boundary
1448 660
1448 670

Material Boundary
1428 664
1428 667

Material Boundary
511 669
511 672

Material Boundary
335 668
335 671

External Boundary
1700 300
1700 483
1700 660
1700 670
1700 722
1604 722
1595 722
1592 722
1239 810
1231 812
805 812
799 810
451 693
448 693
439 693
413 693
404 693
401 693
335 672
0 670
0 669
0 666

0	660
0	483
0	300

Water Table

0	670
335	672
511	673
1428	668
1503	691
1700	691

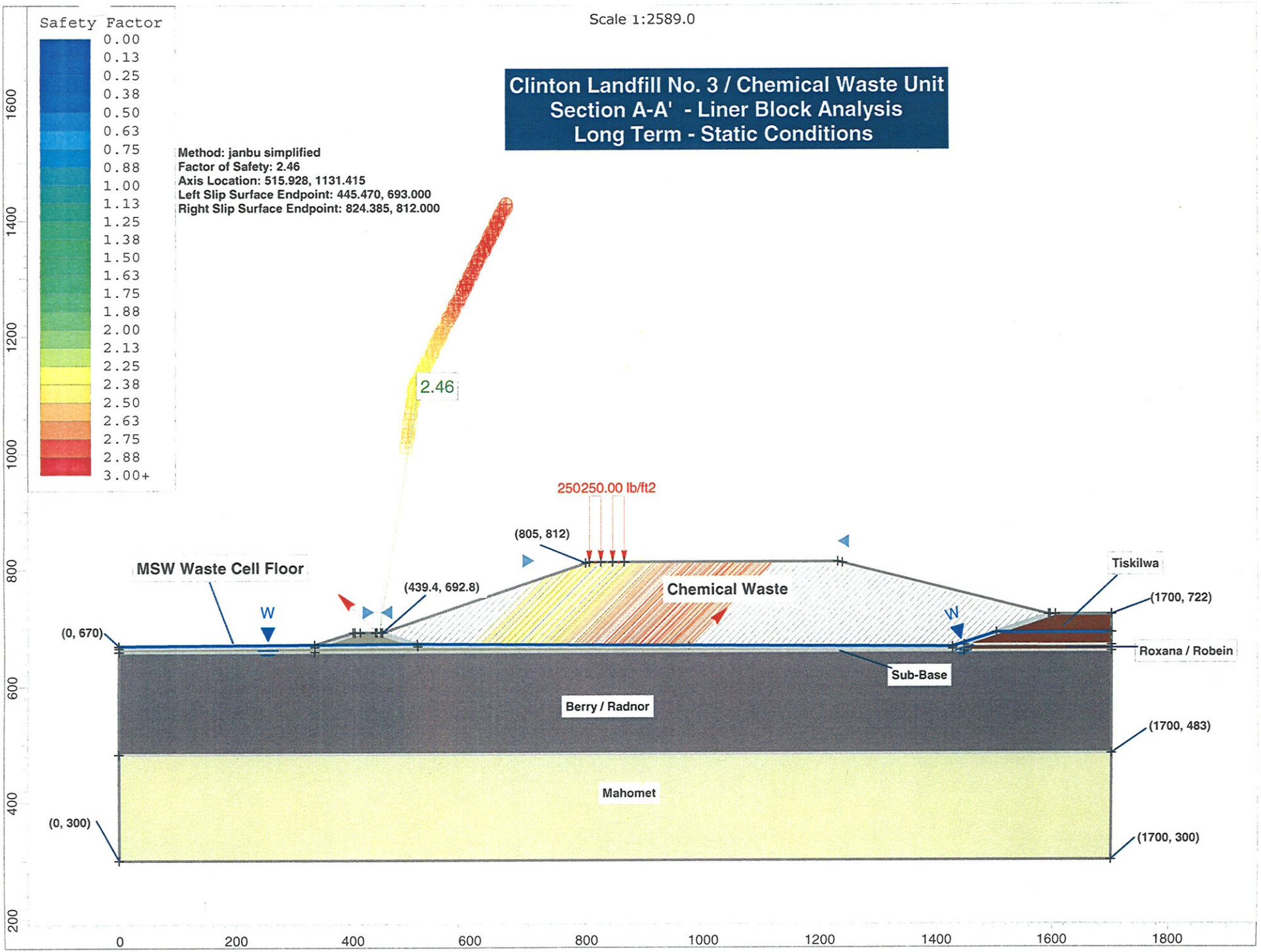
Distributed Load

825	812
805	812

Distributed Load

865	812
845	812

CROSS SECTION A-A'
LINER BLOCK FAILURE
LONG TERM / STATIC ANALYSIS


Scale 1:2589.0
Clinton Landfill No. 3 / Chemical Waste Unit
Section A-A' - Liner Block Analysis
Long Term - Static Conditions
Safety Factor
0.00
0.13
0.25
0.38
0.50
0.63
0.75
0.88
1.00
1.13
1.25
1.38
1.50
1.63
1.75
1.88
2.00
2.13
2.25
2.38
2.50
2.63
2.75
2.88
3.00+
Method: janbu simplified
Factor of Safety: 2.46
Axis Location: 515.928, 1131.415
Left Slip Surface Endpoint: 445.470, 693.000
Right Slip Surface Endpoint: 824.385, 812.000
2.46
250250.00 lb/ft2
(805, 812)
MSW Waste Cell Floor
(439.4, 692.8)
Chemical Waste
Tiskilwa
(1700, 722)
W
W
(0, 670)
Roxana / Robein
Sub-Base
Berry / Radnor
(1700, 483)
Mahomet
(0, 300)
(1700, 300)
1600
1400
1200
1000
800
600
400
200
0
200
400
600
800
1000
1200
1400
1600
1800

Slide Analysis Information

Document Name

File Name: A-A'_LSTA_LB

Project Settings

Project Title: Clinton Landfill No. 3 / Chemical Waste Landfill, **A-A', LINER BLOCK, LONG TERM/STATIC**
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 400
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa

Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 600 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1500 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 1100 psf
Friction Angle: 18 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 240 psf
Friction Angle: 45 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3

Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 700 psf
Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 2.455150
Axis Location: 515.928, 1131.415
Left Slip Surface Endpoint: 445.470, 693.000
Right Slip Surface Endpoint: 824.385, 812.000
Resisting Horizontal Force=1.06352e+006 lb
Driving Horizontal Force=433179 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 400
Number of Invalid Surfaces: 0

List of All Coordinates

Block Search Polyline
442 693
511 670
976 668

Material Boundary
0 669
335 671
404 693

Material Boundary
0 666
335 668

Material Boundary
335 668
413 693

Material Boundary
335 668
511 669
439 693

Material Boundary
448 693
511 672
1428 667
1595 722

Material Boundary
511 669
1428 664
1448 670
1604 722

Material Boundary
0 660
335 660
1448 660
1700 660

Material Boundary
451 693
511 673
1428 668
1592 722

Material Boundary
0 483
1700 483

Material Boundary
1448 670
1700 670

Material Boundary
335 660
335 668

Material Boundary
1448 660
1448 670

Material Boundary
1428 664
1428 667

Material Boundary
511 669

511 672

Material Boundary

335 668
335 671

External Boundary

1700	300
1700	483
1700	660
1700	670
1700	722
1604	722
1595	722
1592	722
1239	810
1231	812
805	812
799	810
451	693
448	693
439	693
413	693
404	693
401	693
335	672
0	670
0	669
0	666
0	660
0	483
0	300

Water Table

0	670
335	672
511	673
1428	668
1503	691
1700	691

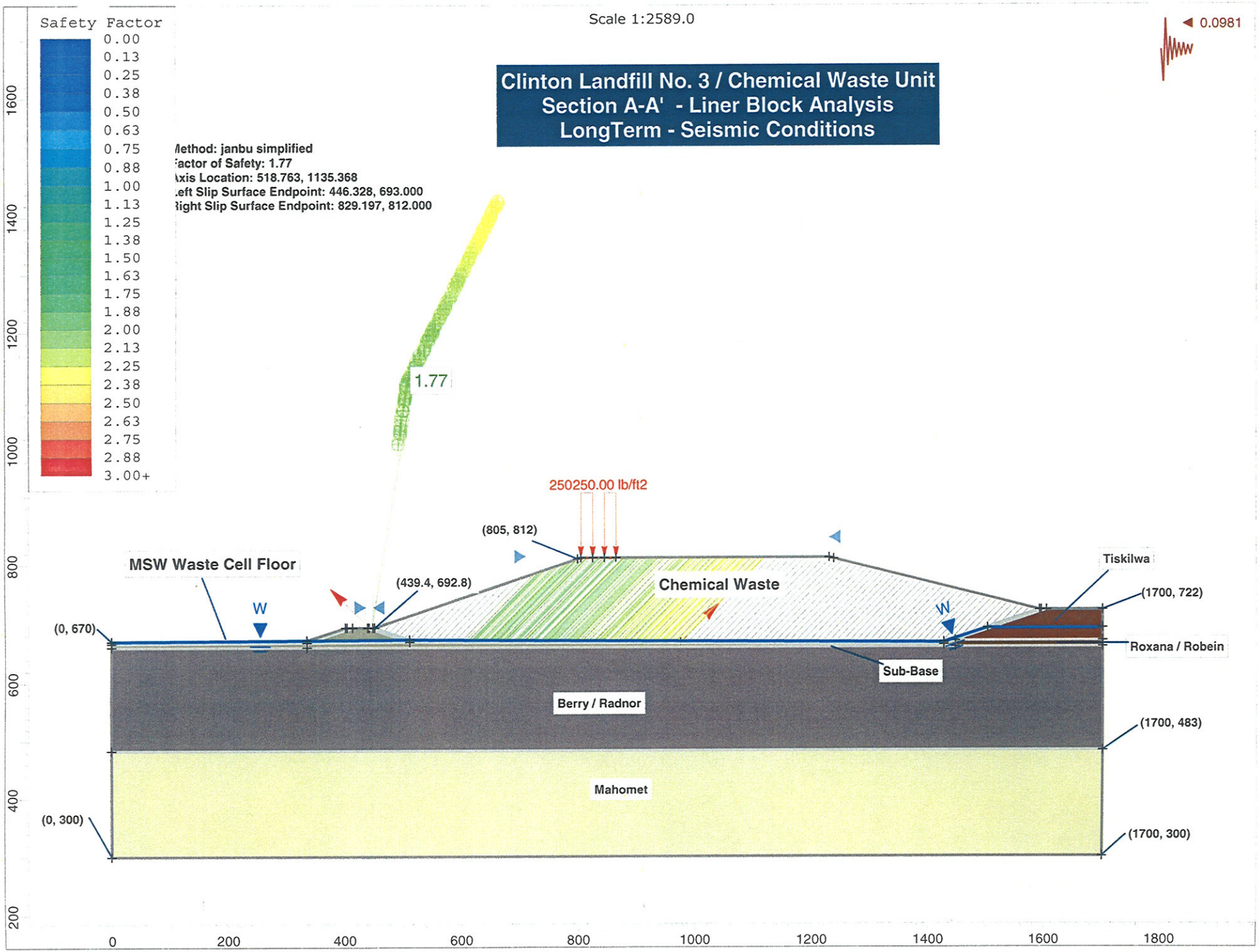
Distributed Load

825 812
805 812

Distributed Load

865 812
845 812

CROSS SECTION A-A'
LINER BLOCK FAILURE
LONG TERM / SEISMIC ANALYSIS


Scale 1:2589.0
0.0981
Clinton Landfill No. 3 / Chemical Waste Unit
Section A-A' - Liner Block Analysis
LongTerm - Seismic Conditions
Safety Factor
0.00
0.13
0.25
0.38
0.50
0.63
0.75
0.88
1.00
1.13
1.25
1.38
1.50
1.63
1.75
1.88
2.00
2.13
2.25
2.38
2.50
2.63
2.75
2.88
3.00+
Method: janbu simplified
Factor of Safety: 1.77
Axis Location: 518.763, 1135.368
Left Slip Surface Endpoint: 446.328, 693.000
Right Slip Surface Endpoint: 829.197, 812.000
1.77
250250.00 lb/ft2
(805, 812)
(439.4, 692.8)
MSW Waste Cell Floor
Chemical Waste
Tiskilwa
(1700, 722)
Roxana / Robein
Sub-Base
Berry / Radnor
Mahomet
(0, 670)
(0, 300)
(1700, 483)
(1700, 300)
W
W
0
200
400
600
800
1000
1200
1400
1600
1800
200
400
600
800
1000
1200
1400
1600

Slide Analysis Information

Document Name

File Name: A-A'_LSEIS_LB

Project Settings

Project Title: Clinton Landfill No. 3 / Chemical Waste Landfill, **A-A', LINER BLOCK, LONG TERM/SEISMIC**
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 400
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.0981
2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 600 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1500 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 1100 psf
Friction Angle: 18 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 240 psf
Friction Angle: 45 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3

Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 700 psf
Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 1.771350
Axis Location: 518.763, 1135.368
Left Slip Surface Endpoint: 446.328, 693.000
Right Slip Surface Endpoint: 829.197, 812.000
Resisting Horizontal Force=1.04571e+006 lb
Driving Horizontal Force=590349 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 400
Number of Invalid Surfaces: 0

List of All Coordinates

Block Search Polyline
442 693
511 670
976 668

Material Boundary
0 669
335 671
404 693

Material Boundary
0 666
335 668

Material Boundary
335 668
413 693

Material Boundary
335 668
511 669
439 693

Material Boundary
448 693
511 672
1428 667
1595 722

Material Boundary
511 669
1428 664
1448 670
1604 722

Material Boundary
0 660
335 660
1448 660
1700 660

Material Boundary
451 693
511 673
1428 668
1592 722

Material Boundary
0 483
1700 483

Material Boundary
1448 670
1700 670

Material Boundary
335 660
335 668

Material Boundary
1448 660
1448 670

Material Boundary
1428 664
1428 667

Material Boundary

511 669
511 672

Material Boundary
335 668
335 671

External Boundary

1700	300
1700	483
1700	660
1700	670
1700	722
1604	722
1595	722
1592	722
1239	810
1231	812
805	812
799	810
451	693
448	693
439	693
413	693
404	693
401	693
335	672
0	670
0	669
0	666
0	660
0	483
0	300

Water Table

0	670
335	672
511	673
1428	668
1503	691
1700	691

Distributed Load
825 812
805 812

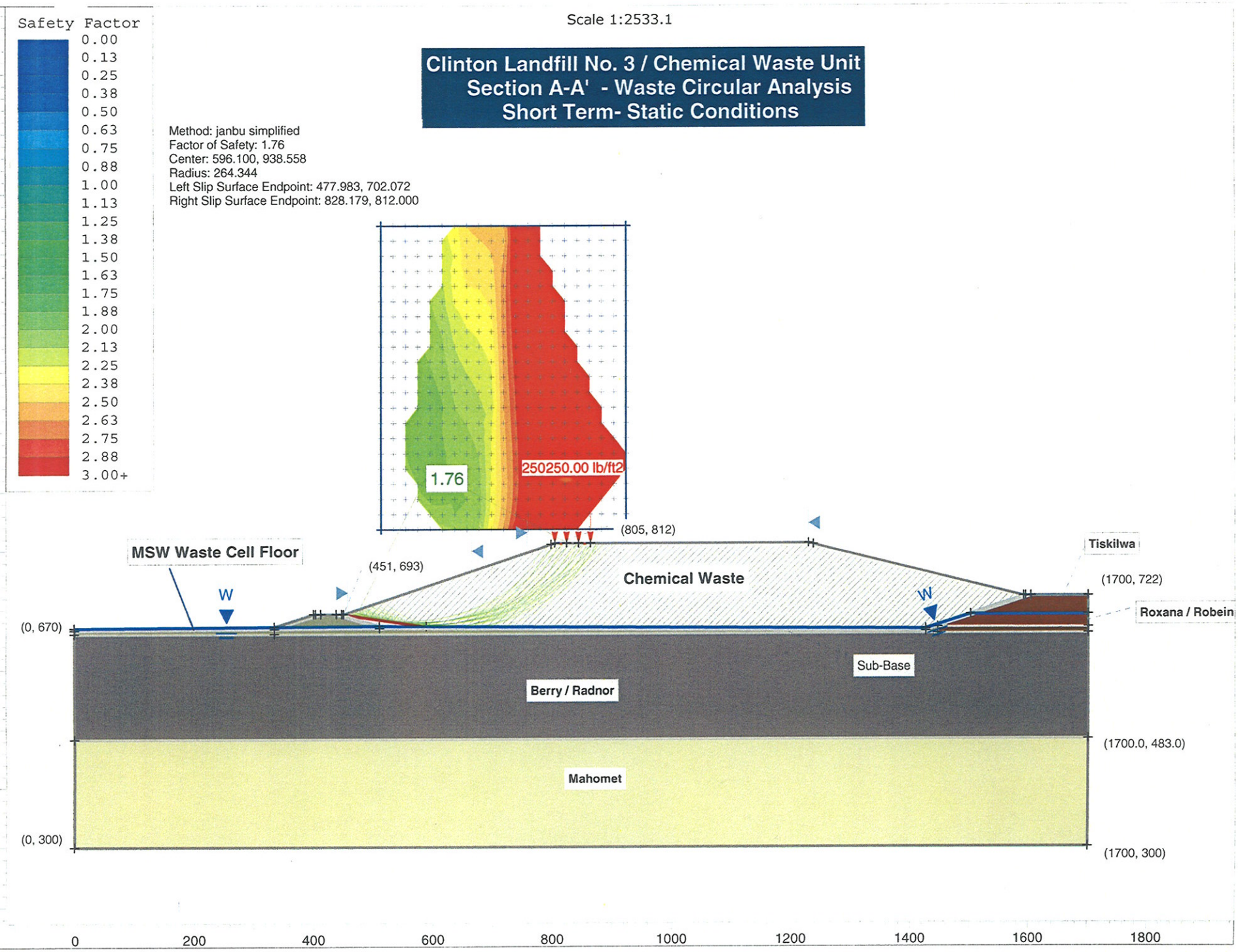
Distributed Load
865 812
845 812

CROSS SECTION A-A'
WASTE CIRCULAR FAILURE
SHORT TERM / STATIC ANALYSIS

Scale 1:2533.1

Clinton Landfill No. 3 / Chemical Waste Unit
Section A-A' - Waste Circular Analysis
Short Term- Static Conditions

Method: janbu simplified
Factor of Safety: 1.76
Center: 596.100, 938.558
Radius: 264.344
Left Slip Surface Endpoint: 477.983, 702.072
Right Slip Surface Endpoint: 828.179, 812.000



Slide Analysis Information

Document Name

File Name: A-A'_SSTAT_WC

Project Settings

Project Title: Clinton Landfill No. 3 / Chemical Waste Landfill, A-A', WASTE CIRCULAR, SHORT TERM/STATIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 5
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: 673
Minimum Depth: 1

Loading

2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3500 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1400 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 6000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 840 psf
Friction Angle: 17.4 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table

Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 1.760180
Center: 596.100, 938.558
Radius: 264.344
Left Slip Surface Endpoint: 477.983, 702.072
Right Slip Surface Endpoint: 828.179, 812.000
Resisting Horizontal Force=815918 lb
Driving Horizontal Force=463543 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 287
Number of Invalid Surfaces: 154
Error Codes:
Error Code -101 reported for 67 surfaces
Error Code -113 reported for 87 surfaces

Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero)
surface / slope intersections.

-113 = Surface intersects outside slope limits.

List of All Coordinates

Search Grid
514 836
925 836
925 1347
514 1347

Focus/Block Search Line
451 693
589 672

Material Boundary
0 669
335 671
404 693

Material Boundary
0 666
335 668

Material Boundary
335 668
413 693

Material Boundary
335 668
511 669
439 693

Material Boundary
448 693
511 672
1428 667
1595 722

Material Boundary
511 669
1428 664
1448 670
1604 722

Material Boundary

0 660
335 660
1448 660
1700 660

Material Boundary
451 693
511 673
1428 668
1592 722

Material Boundary
0 483
1700 483

Material Boundary
1448 670
1700 670

Material Boundary
335 660
335 668

Material Boundary
1448 660
1448 670

Material Boundary
1428 664
1428 667

Material Boundary
511 669
511 672

Material Boundary
335 668
335 671

External Boundary
1700 300
1700 483
1700 660
1700 670
1700 722
1604 722
1595 722
1592 722
1239 810
1231 812
805 812

799	810
451	693
448	693
439	693
413	693
404	693
401	693
335	672
0	670
0	669
0	666
0	660
0	483
0	300

Water Table

0	670
335	672
511	673
1428	668
1503	691
1700	691

Distributed Load

825	812
805	812

Distributed Load

865	812
845	812

Slide Analysis Information

Document Name

File Name: A-A'_SSEIS_WC

Project Settings

Project Title: Clinton Landfill No. 3 / Chemical Waste Landfill, A-A', WASTE CIRCULAR, SHORT TERM/SEISMIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 5
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: 673
Minimum Depth: 1

Loading

Seismic Load Coefficient (Horizontal): 0.0981
2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3500 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1400 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 6000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 840 psf
Friction Angle: 17.4 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf

Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 1.320850
Center: 596.100, 989.650
Radius: 314.872
Left Slip Surface Endpoint: 472.268, 700.151
Right Slip Surface Endpoint: 856.071, 812.000
Resisting Horizontal Force=897944 lb
Driving Horizontal Force=679821 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 287
Number of Invalid Surfaces: 154
Error Codes:
Error Code -101 reported for 67 surfaces
Error Code -113 reported for 87 surfaces

Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero)
surface / slope intersections.

-113 = Surface intersects outside slope limits.

List of All Coordinates

Search Grid
514 836
925 836
925 1347
514 1347

Focus/Block Search Line
451 693
589 672

Material Boundary
0 669
335 671
404 693

Material Boundary
0 666
335 668

Material Boundary
335 668
413 693

Material Boundary
335 668
511 669
439 693

Material Boundary
448 693
511 672
1428 667
1595 722

Material Boundary
511 669
1428 664

1448	670
1604	722

Material Boundary

0	660
335	660
1448	660
1700	660

Material Boundary

451	693
511	673
1428	668
1592	722

Material Boundary

0	483
1700	483

Material Boundary

1448	670
1700	670

Material Boundary

335	660
335	668

Material Boundary

1448	660
1448	670

Material Boundary

1428	664
1428	667

Material Boundary

511	669
511	672

Material Boundary

335	668
335	671

External Boundary

1700	300
1700	483
1700	660
1700	670
1700	722
1604	722

1595	722
1592	722
1239	810
1231	812
805	812
799	810
451	693
448	693
439	693
413	693
404	693
401	693
335	672
0	670
0	669
0	666
0	660
0	483
0	300

Water Table

0	670
335	672
511	673
1428	668
1503	691
1700	691

Distributed Load

825	812
805	812

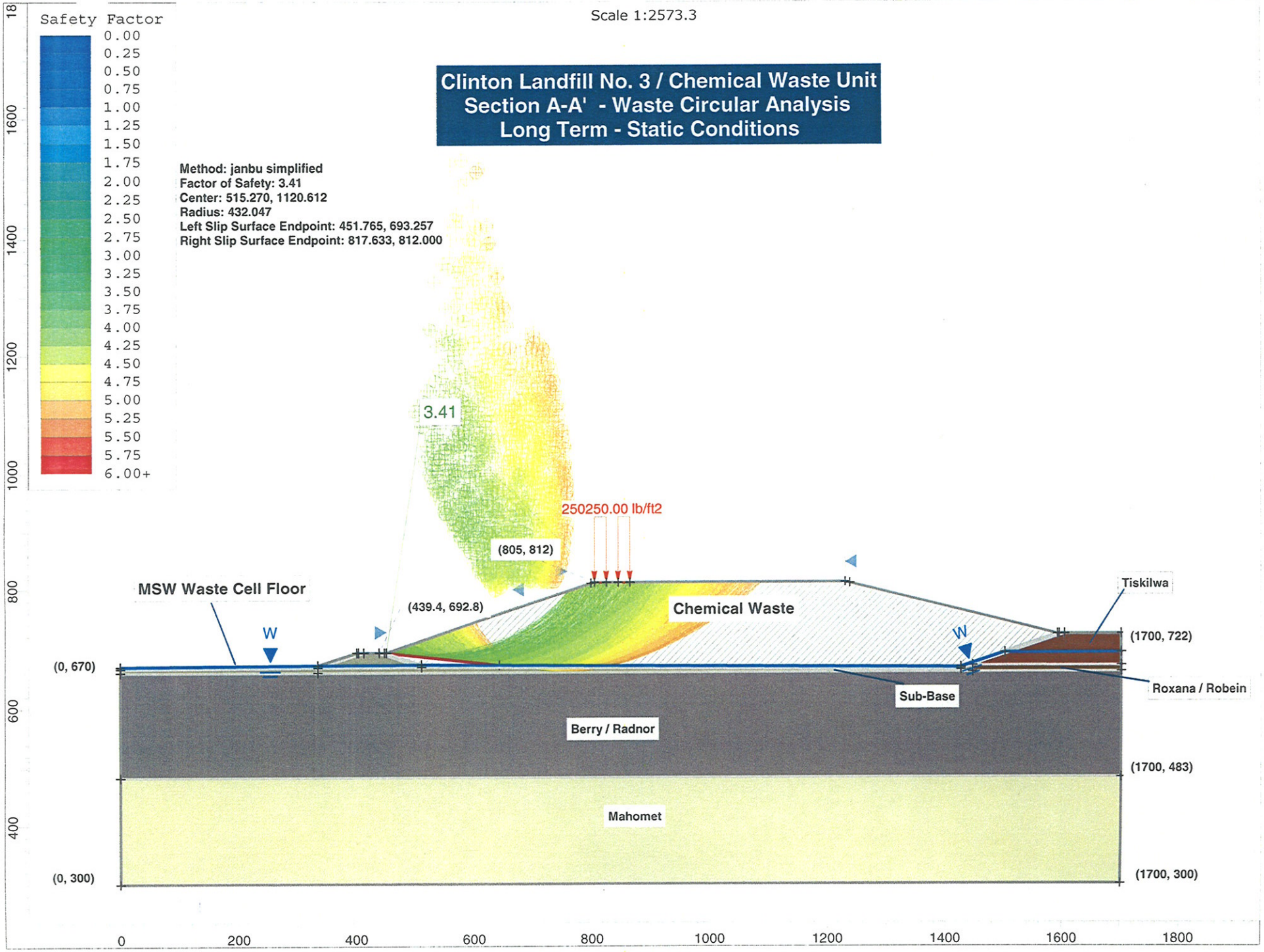
Distributed Load

865	812
845	812

CROSS SECTION A-A'
WASTE CIRCULAR FAILURE
LONG TERM / STATIC ANALYSIS

Scale 1:2573.3

Clinton Landfill No. 3 / Chemical Waste Unit
Section A-A' - Waste Circular Analysis
Long Term - Static Conditions

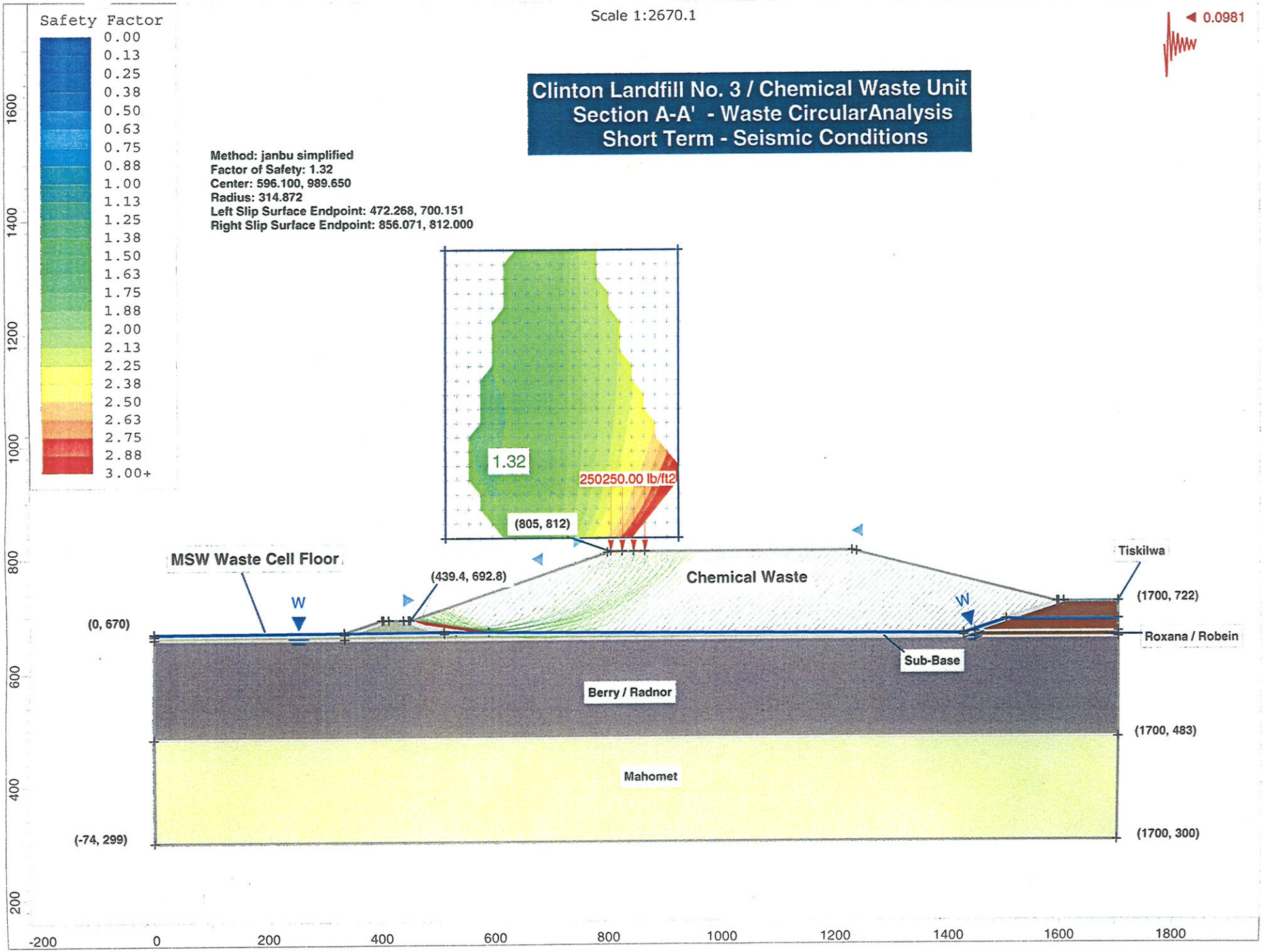


CROSS SECTION A-A'
WASTE CIRCULAR FAILURE
SHORT TERM / SEISMIC ANALYSIS

Scale 1:2670.1

◄ 0.0981

Clinton Landfill No. 3 / Chemical Waste Unit
Section A-A' - Waste CircularAnalysis
Short Term - Seismic Conditions



Slide Analysis Information

Document Name

File Name: A-A'_LSTAT_WC

Project Settings

Project Title: Clinton Landfill No. 3 / Chemical Waste Landfill, **A-A', WASTE CIRCULAR, LONG TERM/STATIC**
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 5000
Upper Angle: Not Defined
Lower Angle: Not Defined
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb

Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 600 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1500 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 1100 psf
Friction Angle: 18 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 240 psf
Friction Angle: 45 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf

Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 700 psf
Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 3.407670
Center: 515.270, 1120.612
Radius: 432.047
Left Slip Surface Endpoint: 451.765, 693.257
Right Slip Surface Endpoint: 817.633, 812.000
Resisting Horizontal Force=1.10713e+006 lb
Driving Horizontal Force=324895 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 4182
Number of Invalid Surfaces: 818
Error Codes:
Error Code -111 reported for 3 surfaces
Error Code -114 reported for 815 surfaces

Error Codes

The following errors were encountered during the computation:

-111 = safety factor equation did not converge

-114 = Surface with Reverse Curvature.

List of All Coordinates

Focus/Block Search Line
451 693

643 672

Material Boundary
0 669
335 671
404 693

Material Boundary
0 666
335 668

Material Boundary
335 668
413 693

Material Boundary
335 668
511 669
439 693

Material Boundary
448 693
511 672
1428 667
1595 722

Material Boundary
511 669
1428 664
1448 670
1604 722

Material Boundary
0 660
335 660
1448 660
1700 660

Material Boundary
451 693
511 673
1428 668
1592 722

Material Boundary
0 483
1700 483

Material Boundary
1448 670
1700 670

Material Boundary
335 660
335 668

Material Boundary

1448	660
1448	670

Material Boundary

1428	664
1428	667

Material Boundary

511	669
511	672

Material Boundary

335	668
335	671

External Boundary

1700	300
1700	483
1700	660
1700	670
1700	722
1604	722
1595	722
1592	722
1239	810
1231	812
805	812
799	810
451	693
448	693
439	693
413	693
404	693
401	693
335	672
0	670
0	669
0	666
0	660
0	483
0	300

Water Table

0	670
335	672
511	673
1428	668
1503	691
1700	691

Distributed Load

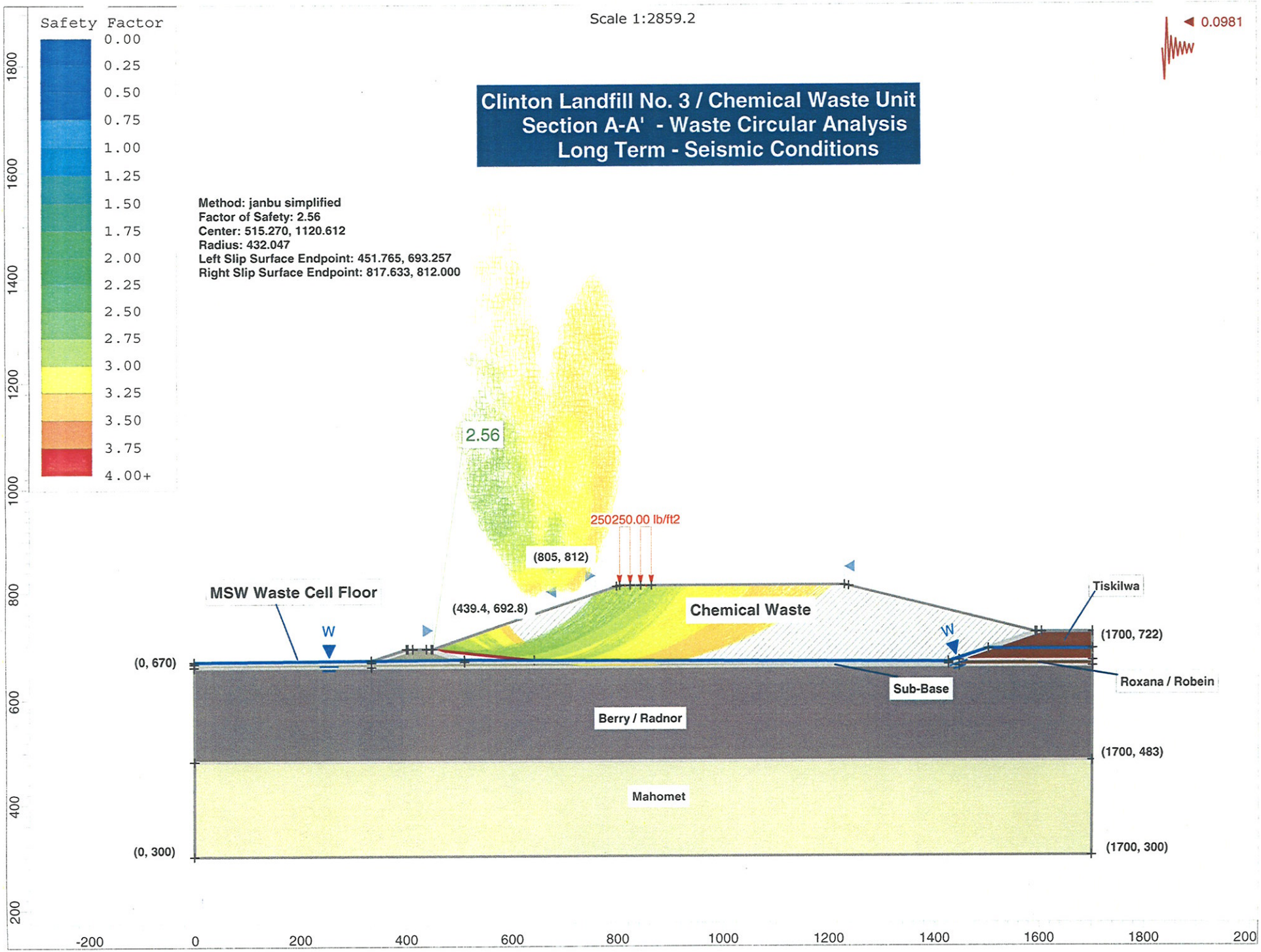
825	812
805	812

Distributed Load

865 812

845 812

CROSS SECTION A-A'
WASTE CIRCULAR FAILURE
LONG TERM / SEISMIC ANALYSIS


Clinton Landfill No. 3 / Chemical Waste Unit
Section A-A' - Waste Circular Analysis
Long Term - Seismic Conditions
Scale 1:2859.2
0.0981
Safety Factor
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00
3.25
3.50
3.75
4.00+
Method: janbu simplified
Factor of Safety: 2.56
Center: 515.270, 1120.612
Radius: 432.047
Left Slip Surface Endpoint: 451.765, 693.257
Right Slip Surface Endpoint: 817.633, 812.000
2.56
250250.00 lb/ft2
(805, 812)
(439.4, 692.8)
MSW Waste Cell Floor
Chemical Waste
Tiskilwa
W
W
(0, 670)
(1700, 722)
Roxana / Robein
Sub-Base
Berry / Radnor
(1700, 483)
Mahomet
(0, 300)
(1700, 300)
1800
1600
1400
1200
1000
800
600
400
200
-200
0
200
400
600
800
1000
1200
1400
1600
1800
200

Slide Analysis Information

Document Name

File Name: A-A'_LSEIS_WC

Project Settings

Project Title: Clinton Landfill No. 3 / Chemical Waste Landfill, **A-A', WASTE CIRCULAR, LONG TERM/SEISMIC**
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 5000
Upper Angle: Not Defined
Lower Angle: Not Defined
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.0981
2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa

Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 600 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1500 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 1100 psf
Friction Angle: 18 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 240 psf
Friction Angle: 45 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3

Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 700 psf
Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 2.563720
Center: 515.270, 1120.612
Radius: 432.047
Left Slip Surface Endpoint: 451.765, 693.257
Right Slip Surface Endpoint: 817.633, 812.000
Resisting Horizontal Force=1.07835e+006 lb
Driving Horizontal Force=420620 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 4182
Number of Invalid Surfaces: 818
Error Codes:
Error Code -111 reported for 3 surfaces
Error Code -114 reported for 815 surfaces

Error Codes

The following errors were encountered during the computation:

-111 = safety factor equation did not converge

-114 = Surface with Reverse Curvature.

List of All Coordinates

Focus/Block Search Line

451 693
643 672

Material Boundary
0 669
335 671
404 693

Material Boundary
0 666
335 668

Material Boundary
335 668
413 693

Material Boundary
335 668
511 669
439 693

Material Boundary
448 693
511 672
1428 667
1595 722

Material Boundary
511 669
1428 664
1448 670
1604 722

Material Boundary
0 660
335 660
1448 660
1700 660

Material Boundary
451 693
511 673
1428 668
1592 722

Material Boundary
0 483
1700 483

Material Boundary
1448 670
1700 670

Material Boundary
335 660

335 668

Material Boundary

1448	660
1448	670

Material Boundary

1428	664
1428	667

Material Boundary

511	669
511	672

Material Boundary

335	668
335	671

External Boundary

1700	300
1700	483
1700	660
1700	670
1700	722
1604	722
1595	722
1592	722
1239	810
1231	812
805	812
799	810
451	693
448	693
439	693
413	693
404	693
401	693
335	672
0	670
0	669
0	666
0	660
0	483
0	300

Water Table

0	670
335	672
511	673
1428	668
1503	691
1700	691

Distributed Load

825 812

805 812

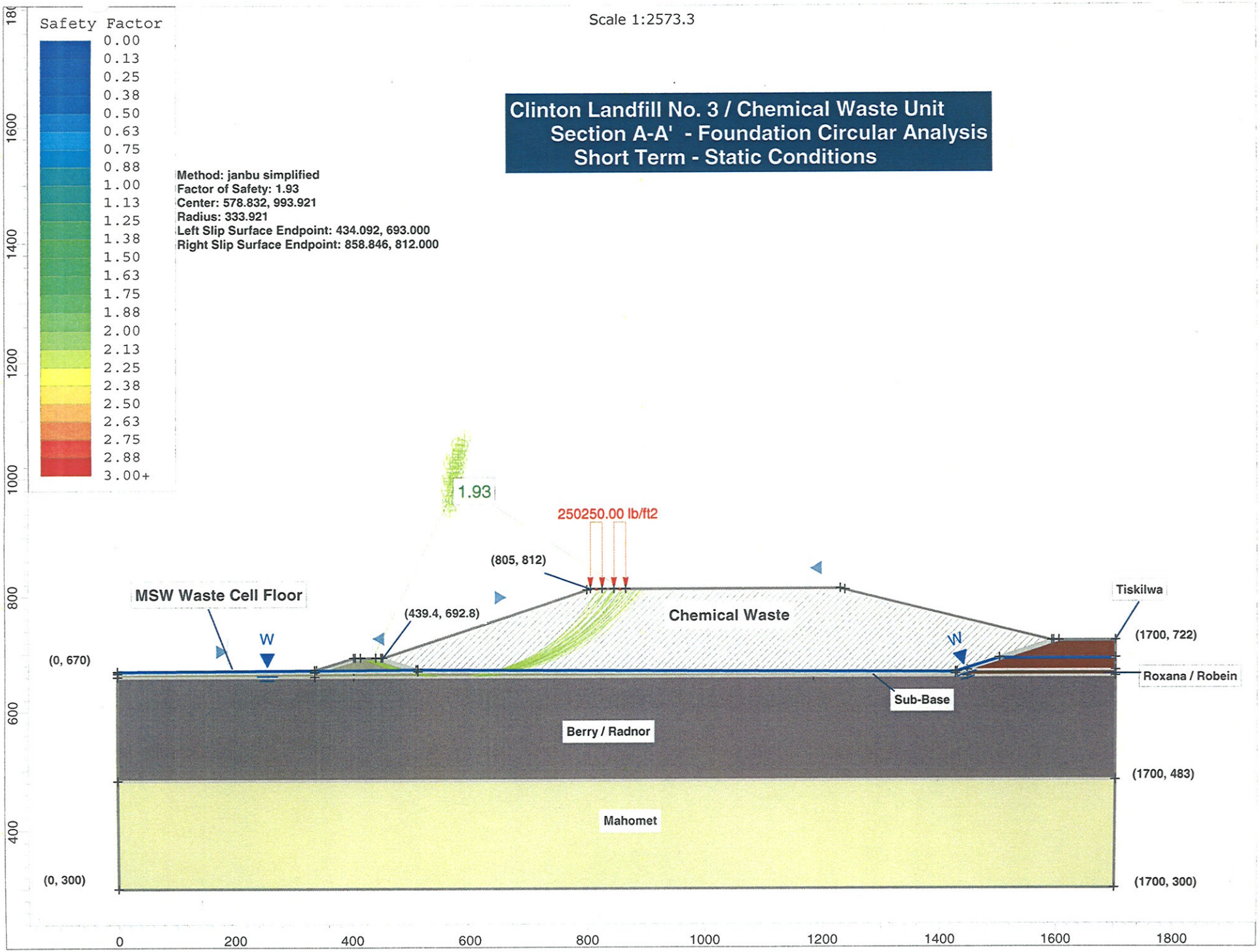
Distributed Load

865 812
845 812

CROSS SECTION A-A'
FOUNDATION CIRCULAR FAILURE
SHORT TERM / STATIC ANALYSIS

Scale 1:2573.3

Clinton Landfill No. 3 / Chemical Waste Unit
Section A-A' - Foundation Circular Analysis
Short Term - Static Conditions



Slide Analysis Information

Document Name

File Name: A-A'_SSTAT_FC

Project Settings

Project Title: Clinton Landfill No. 3 / Chemical Waste Landfill, A-A', FOUNDATION CIRCULAR, SHORT TERM/STATIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 6000
Upper Angle: -45
Lower Angle: -45
Composite Surfaces: Enabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: 660
Minimum Depth: 1

Loading

2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3500 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1400 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 6000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 840 psf
Friction Angle: 17.4 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3

Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 128 lb/ft3
Saturated Unit Weight: 134 lb/ft3
Cohesion: 1350 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 1.932200
Center: 578.832, 993.921
Radius: 333.921
Left Slip Surface Endpoint: 434.092, 693.000
Right Slip Surface Endpoint: 858.846, 812.000
Resisting Horizontal Force=1.20853e+006 lb
Driving Horizontal Force=625470 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 6000
Number of Invalid Surfaces: 0

List of All Coordinates

Focus/Block Search Line
401 660
1185 660

Material Boundary
0 669
335 671

Material Boundary
0 666
335 668

Material Boundary
335 668
413 693

Material Boundary
335 668
511 669
439 693

Material Boundary
448 693
508 673

Material Boundary
511 669
1428 664
1448 670
1604 722

Material Boundary
0 660
335 660
1448 660
1700 660

Material Boundary
451 693
511 673
1428 668

1592 722

Material Boundary
0 483
1700 483

Material Boundary
1448 670
1700 670

Material Boundary
335 660
335 668

Material Boundary
1448 660
1448 670

Material Boundary
1428 664
1428 667

Material Boundary
511 669
511 672

Material Boundary
335 668
335 671

Material Boundary
511 673
508 673
511 672
511 673

Material Boundary
511 672
1428 667

Material Boundary
1428 668
1431 668
1428 667
1428 668

Material Boundary
1431 668
1595 722

Material Boundary

335	672
338	672
335	671
335	672

Material Boundary

338	672
404	693

External Boundary

1700	300
1700	483
1700	660
1700	670
1700	722
1604	722
1595	722
1592	722
1239	810
1231	812
805	812
799	810
451	693
448	693
439	693
413	693
404	693
401	693
335	672
0	670
0	669
0	666
0	660
0	483
0	300

Water Table

0	670
335	672
511	673
1428	668
1503	691
1700	691

Distributed Load

825	812
805	812

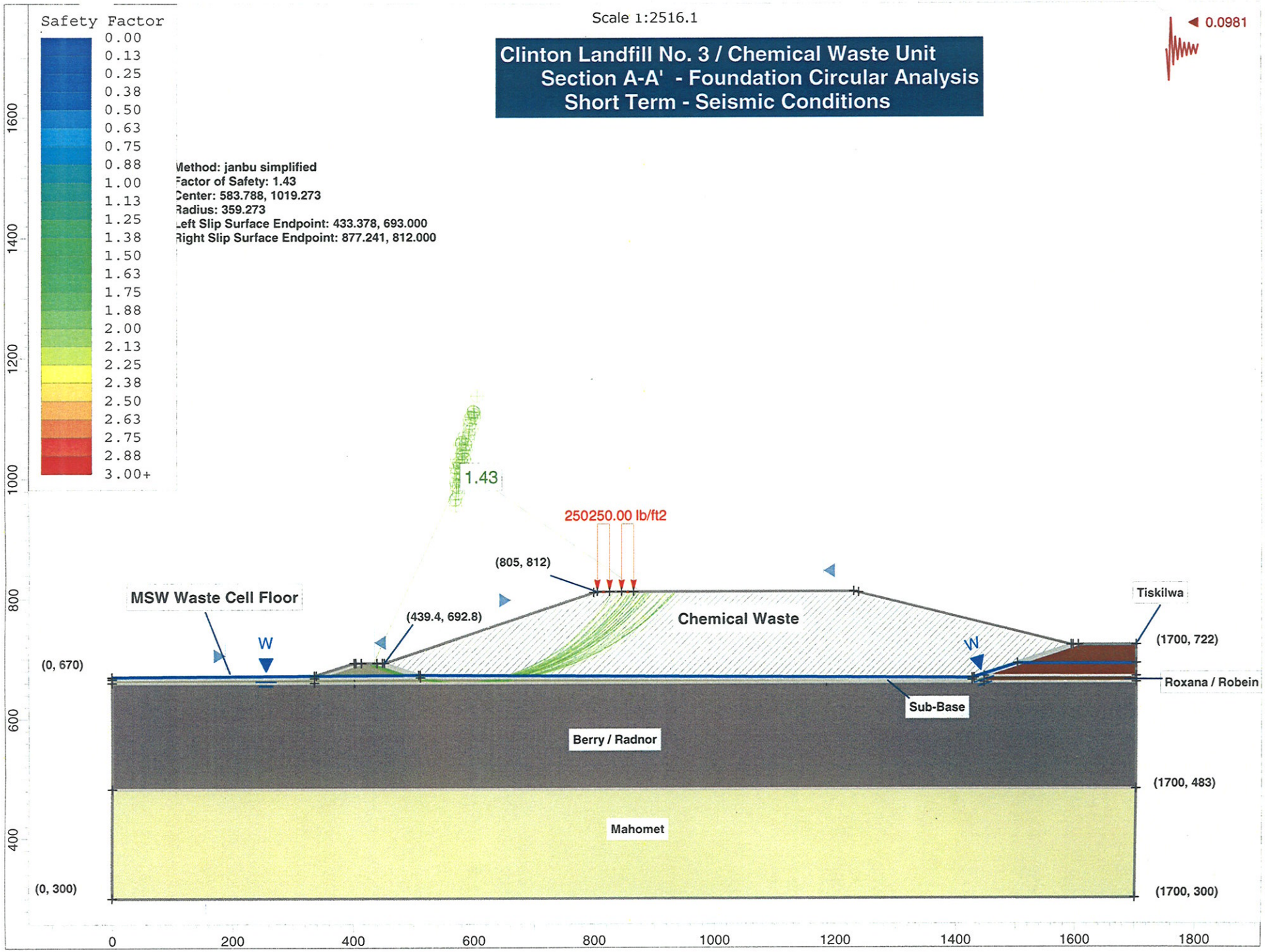
Distributed Load

865 812
845 812

CROSS SECTION A-A'
FOUNDATION CIRCULAR FAILURE
SHORT TERM / SEISMIC ANALYSIS

Scale 1:2516.1

Clinton Landfill No. 3 / Chemical Waste Unit
Section A-A' - Foundation Circular Analysis
Short Term - Seismic Conditions



Slide Analysis Information

Document Name

File Name: A-A'_SSTAT_FC

Project Settings

Project Title: Clinton Landfill No. 3 / Chemical Waste Landfill, A-A', FOUNDATION CIRCULAR, SHORT TERM/SEISMIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 6000
Upper Angle: -45
Lower Angle: -45
Composite Surfaces: Enabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: 660
Minimum Depth: 1

Loading

Seismic Load Coefficient (Horizontal): 0.0981
2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250

lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3500 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1400 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 6000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 840 psf
Friction Angle: 17.4 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3

Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 128 lb/ft3
Saturated Unit Weight: 134 lb/ft3
Cohesion: 1350 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 1.429590
Center: 583.788, 1019.273
Radius: 359.273
Left Slip Surface Endpoint: 433.378, 693.000
Right Slip Surface Endpoint: 877.241, 812.000
Resisting Horizontal Force=1.26123e+006 lb

Driving Horizontal Force=882236 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 6000
Number of Invalid Surfaces: 0

List of All Coordinates

Focus/Block Search Line
401 660
1185 660

Material Boundary
0 669
335 671

Material Boundary
0 666
335 668

Material Boundary
335 668
413 693

Material Boundary
335 668
511 669
439 693

Material Boundary
448 693
508 673

Material Boundary
511 669
1428 664
1448 670
1604 722

Material Boundary
0 660
335 660
1448 660
1700 660

Material Boundary
451 693
511 673

1428 668
1592 722

Material Boundary
0 483
1700 483

Material Boundary
1448 670
1700 670

Material Boundary
335 660
335 668

Material Boundary
1448 660
1448 670

Material Boundary
1428 664
1428 667

Material Boundary
511 669
511 672

Material Boundary
335 668
335 671

Material Boundary
511 673
508 673
511 672
511 673

Material Boundary
511 672
1428 667

Material Boundary
1428 668
1431 668
1428 667
1428 668

Material Boundary
1431 668
1595 722

Material Boundary

335	672
338	672
335	671
335	672

Material Boundary

338	672
404	693

External Boundary

1700	300
1700	483
1700	660
1700	670
1700	722
1604	722
1595	722
1592	722
1239	810
1231	812
805	812
799	810
451	693
448	693
439	693
413	693
404	693
401	693
335	672
0	670
0	669
0	666
0	660
0	483
0	300

Water Table

0	670
335	672
511	673
1428	668
1503	691
1700	691

Distributed Load

825	812
805	812

Distributed Load

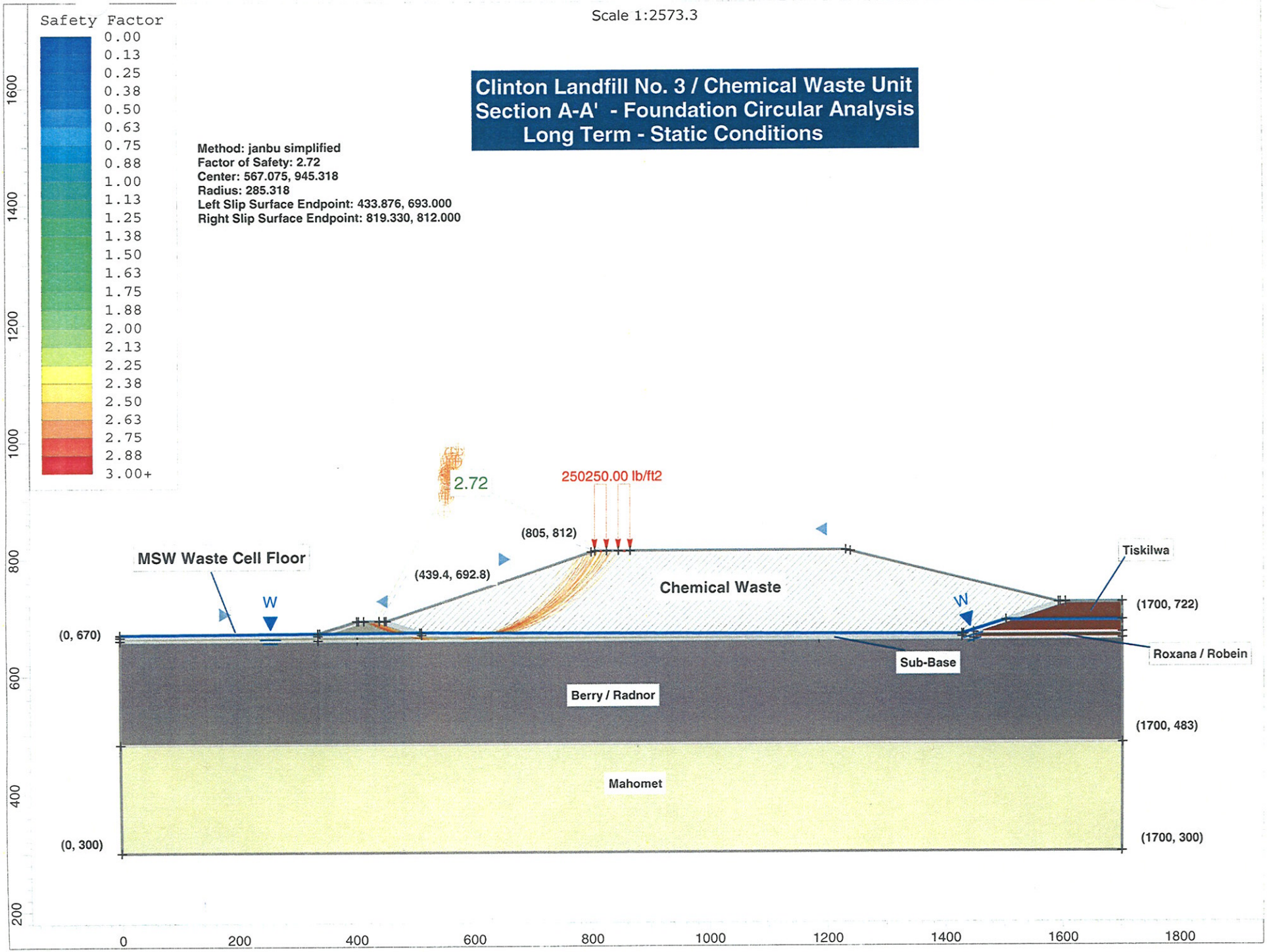
865 812

845 812

CROSS SECTION A-A'
FOUNDATION CIRCULAR FAILURE
LONG TERM / STATIC ANALYSIS

Scale 1:2573.3

Clinton Landfill No. 3 / Chemical Waste Unit
Section A-A' - Foundation Circular Analysis
Long Term - Static Conditions



Slide Analysis Information

Document Name

File Name: A-A'_LSTAT_FC

Project Settings

Project Title: Clinton Landfill No. 3 / Chemical Waste Landfill, **A-A', FOUNDATION CIRCULAR, LONG TERM/STATIC**
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 6000
Upper Angle: -45
Lower Angle: -45
Composite Surfaces: Enabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: 660
Minimum Depth: 1

Loading

2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb

Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 600 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1500 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 1100 psf
Friction Angle: 18 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 240 psf
Friction Angle: 45 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf

Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 700 psf
Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 128 lb/ft3
Saturated Unit Weight: 134 lb/ft3
Cohesion: 1300 psf
Friction Angle: 22 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 2.723640
Center: 567.075, 945.318
Radius: 285.318
Left Slip Surface Endpoint: 433.876, 693.000
Right Slip Surface Endpoint: 819.330, 812.000
Resisting Horizontal Force=1.40262e+006 lb
Driving Horizontal Force=514980 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 6000
Number of Invalid Surfaces: 0

List of All Coordinates

Focus/Block Search Line
401 660
1185 660

Material Boundary

0 669
335 671

Material Boundary
0 666
335 668

Material Boundary
335 668
413 693

Material Boundary
335 668
511 669
439 693

Material Boundary
448 693
508 673

Material Boundary
511 669
1428 664
1448 670
1604 722

Material Boundary
0 660
335 660
1448 660
1700 660

Material Boundary
451 693
511 673
1428 668
1592 722

Material Boundary
0 483
1700 483

Material Boundary
1448 670
1700 670

Material Boundary
335 660
335 668

Material Boundary
1448 660
1448 670

Material Boundary

1428	664
1428	667

Material Boundary

511	669
511	672

Material Boundary

335	668
335	671

Material Boundary

511	673
508	673
511	672
511	673

Material Boundary

511	672
1428	667

Material Boundary

1428	668
1431	668
1428	667
1428	668

Material Boundary

1431	668
1595	722

Material Boundary

335	672
338	672
335	671
335	672

Material Boundary

338	672
404	693

External Boundary

1700	300
1700	483
1700	660
1700	670
1700	722
1604	722
1595	722
1592	722
1239	810
1231	812
805	812
799	810
451	693

448	693
439	693
413	693
404	693
401	693
335	672
0	670
0	669
0	666
0	660
0	483
0	300

Water Table

0	670
335	672
511	673
1428	668
1503	691
1700	691

Distributed Load

825	812
805	812

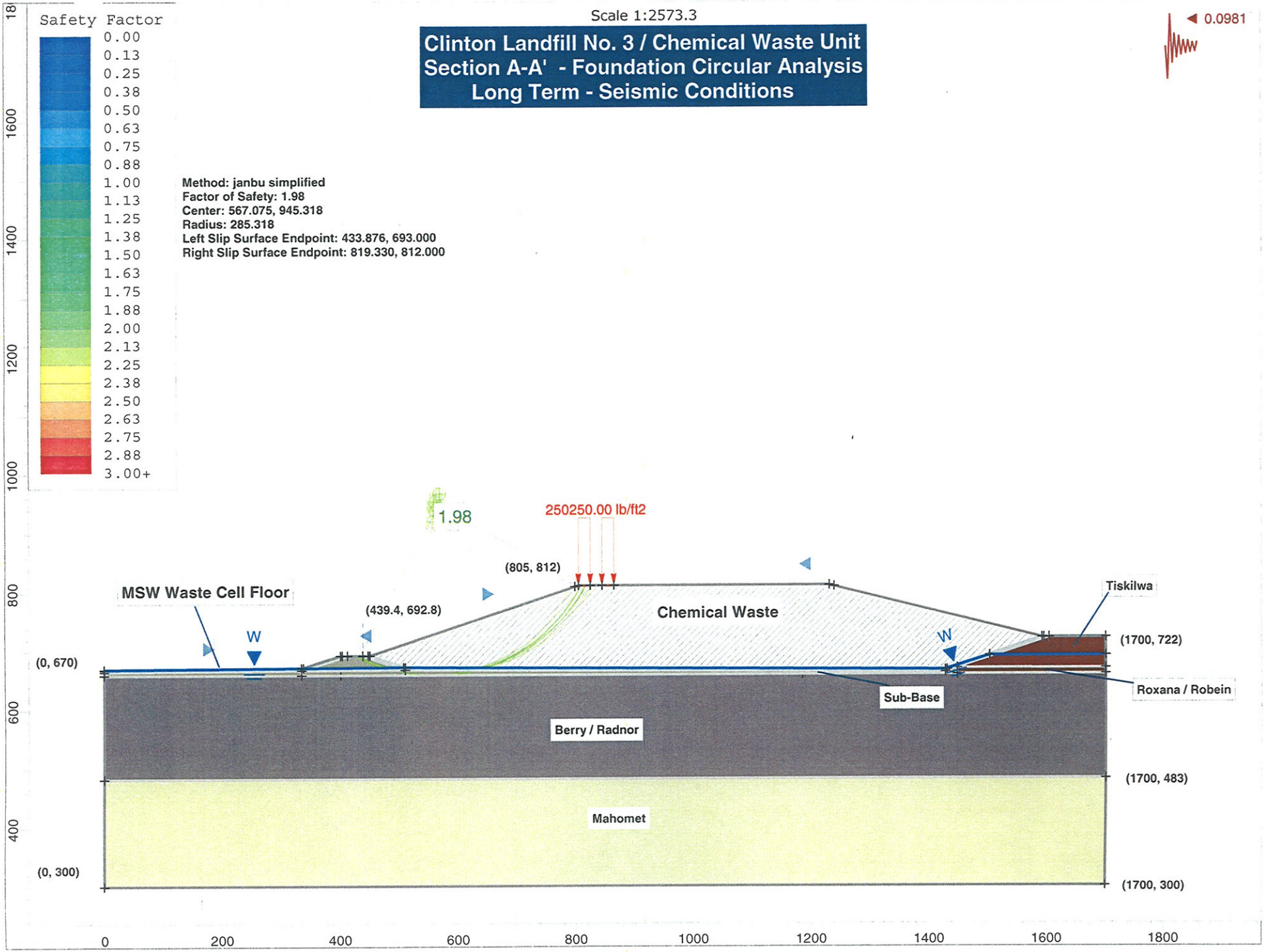
Distributed Load

865	812
845	812

CROSS SECTION A-A'
FOUNDATION CIRCULAR FAILURE
LONG TERM / SEISMIC ANALYSIS

Scale 1:2573.3

Clinton Landfill No. 3 / Chemical Waste Unit
Section A-A' - Foundation Circular Analysis
Long Term - Seismic Conditions



Slide Analysis Information

Document Name

File Name: A-A'_LSEIS_FC

Project Settings

Project Title: Clinton Landfill No. 3 / Chemical Waste Landfill, **A-A', FOUNDATION CIRCULAR, LONG TERM/SEISMIC**
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 6000
Upper Angle: -45
Lower Angle: -45
Composite Surfaces: Enabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: 660
Minimum Depth: 1

Loading

Seismic Load Coefficient (Horizontal): 0.0981
2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa

Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 600 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1500 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 1100 psf
Friction Angle: 18 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 240 psf
Friction Angle: 45 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3

Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 700 psf
Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 128 lb/ft3
Saturated Unit Weight: 134 lb/ft3
Cohesion: 1300 psf
Friction Angle: 22 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 1.978160
Center: 567.075, 945.318
Radius: 285.318
Left Slip Surface Endpoint: 433.876, 693.000
Right Slip Surface Endpoint: 819.330, 812.000
Resisting Horizontal Force=1.34858e+006 lb
Driving Horizontal Force=681735 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 6000
Number of Invalid Surfaces: 0

List of All Coordinates

Focus/Block Search Line
401 660
1185 660

Material Boundary
0 669
335 671

Material Boundary
0 666
335 668

Material Boundary
335 668
413 693

Material Boundary
335 668
511 669
439 693

Material Boundary
448 693
508 673

Material Boundary
511 669
1428 664
1448 670
1604 722

Material Boundary
0 660
335 660
1448 660
1700 660

Material Boundary
451 693
511 673
1428 668
1592 722

Material Boundary
0 483
1700 483

Material Boundary
1448 670
1700 670

Material Boundary
335 660
335 668

Material Boundary
1448 660
1448 670

Material Boundary

1428	664
1428	667

Material Boundary

511	669
511	672

Material Boundary

335	668
335	671

Material Boundary

511	673
508	673
511	672
511	673

Material Boundary

511	672
1428	667

Material Boundary

1428	668
1431	668
1428	667
1428	668

Material Boundary

1431	668
1595	722

Material Boundary

335	672
338	672
335	671
335	672

Material Boundary

338	672
404	693

External Boundary

1700	300
1700	483
1700	660
1700	670
1700	722
1604	722
1595	722
1592	722
1239	810
1231	812
805	812
799	810

451	693
448	693
439	693
413	693
404	693
401	693
335	672
0	670
0	669
0	666
0	660
0	483
0	300

Water Table

0	670
335	672
511	673
1428	668
1503	691
1700	691

Distributed Load

825	812
805	812

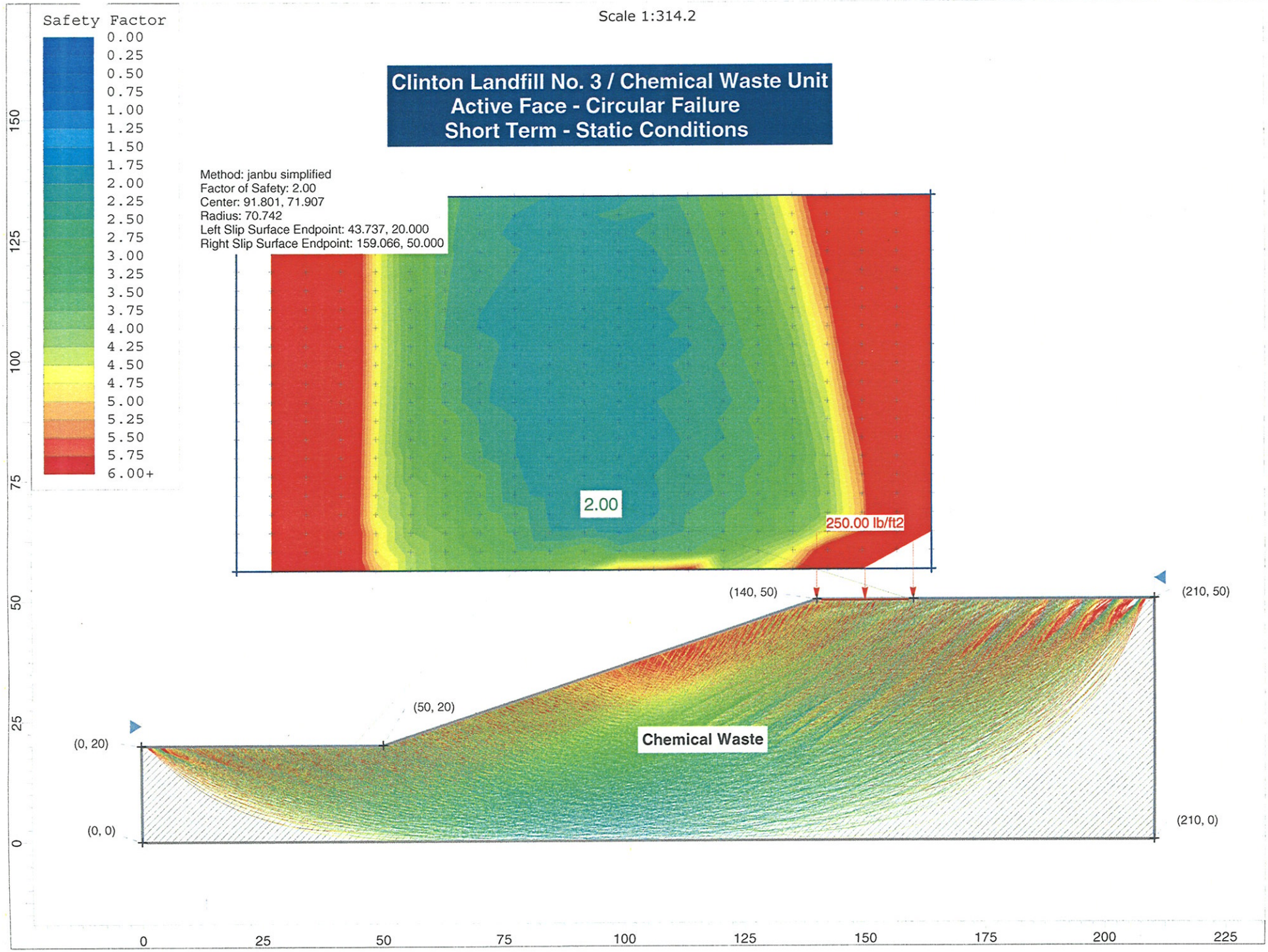
Distributed Load

865	812
845	812

CROSS SECTION A-A'
ACTIVE FACE CIRCULAR FAILURE
SHORT TERM / STATIC ANALYSIS

Scale 1:314.2

Clinton Landfill No. 3 / Chemical Waste Unit
Active Face - Circular Failure
Short Term - Static Conditions



Slide Analysis Information

Document Name

File Name: Active ST-Static

Project Settings

Project Title: Clinton Landfill No. 3 / Chemical Waste Unit, A-A' Active Face Circular, Short Term / Static
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

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

Loading

1 Distributed Load present:
Distributed Load Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Chemical Waste
Strength Type: Mohr-Coulomb

Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 900 psf
Friction Angle: 0 degrees
Water Surface: None

Global Minimums

Method: janbu simplified
FS: 1.998150
Center: 91.801, 71.907
Radius: 70.742
Left Slip Surface Endpoint: 43.737, 20.000
Right Slip Surface Endpoint: 159.066, 50.000
Resisting Horizontal Force=103796 lb
Driving Horizontal Force=51945.8 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 3479
Number of Invalid Surfaces: 1372
Error Codes:
Error Code -103 reported for 601 surfaces
Error Code -107 reported for 254 surfaces
Error Code -108 reported for 480 surfaces
Error Code -111 reported for 37 surfaces

Error Codes

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).

-111 = safety factor equation did not converge

List of All Coordinates

Search Grid

20	56
164	56
164	134
20	134

External Boundary

210	0
210	50
140	50
50	20
0	20
0	0

Distributed Load

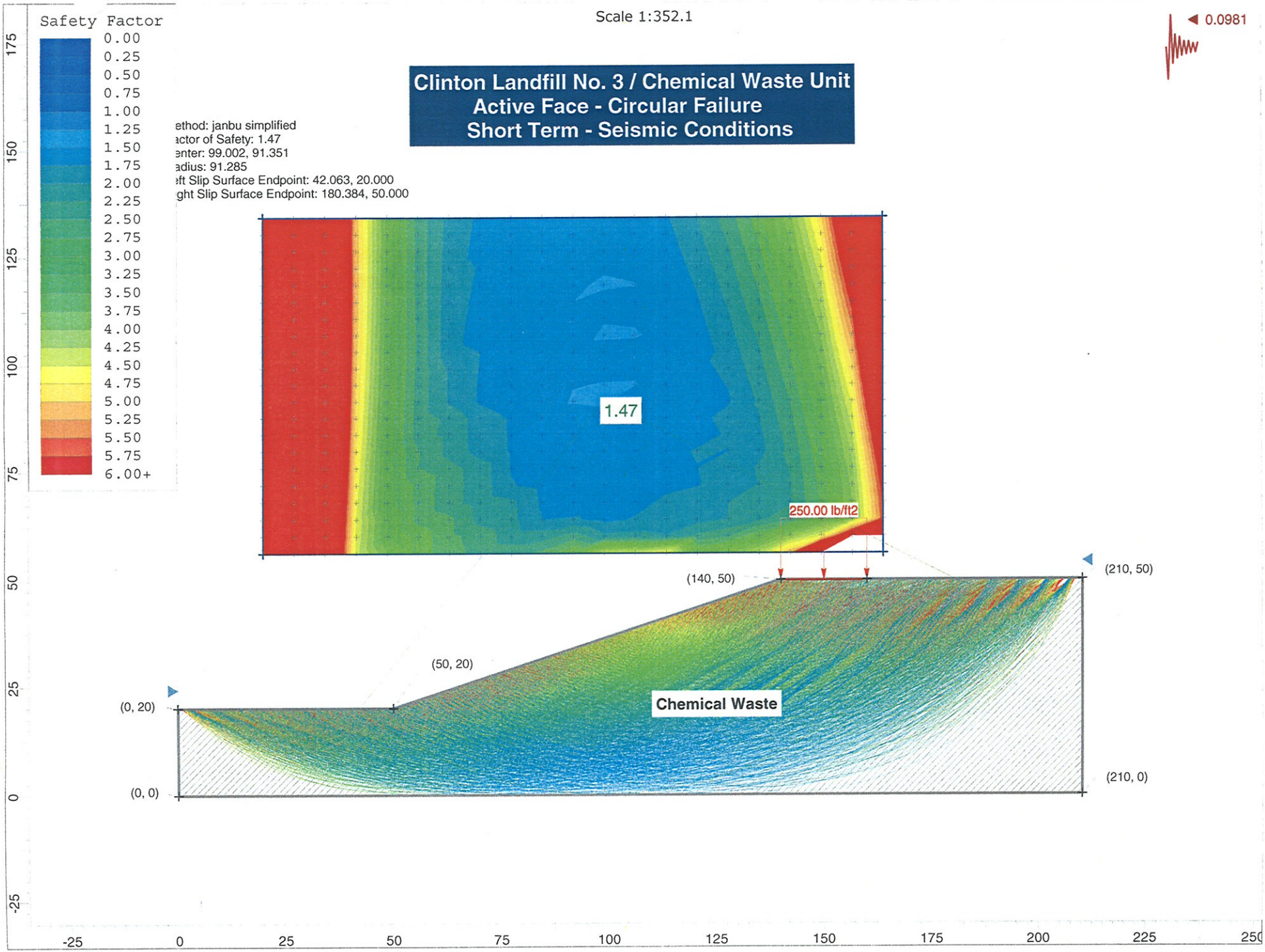
160	50
140	50

CROSS SECTION A-A'
ACTIVE FACE CIRCULAR FAILURE
SHORT TERM / SEISMIC ANALYSIS

Scale 1:352.1

◄ 0.0981

Clinton Landfill No. 3 / Chemical Waste Unit
Active Face - Circular Failure
Short Term - Seismic Conditions



Slide Analysis Information

Document Name

File Name: Active ST-Seismic

Project Settings

Project Title: Clinton Landfill No. 3 / Chemical Waste Unit, A-A' Active Face Circular, Short Term / Seismic
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.0981
1 Distributed Load present:
Distributed Load Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Chemical Waste

Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 900 psf
Friction Angle: 0 degrees
Water Surface: None

Global Minimums

Method: janbu simplified
FS: 1.470790
Center: 99.002, 91.351
Radius: 91.285
Left Slip Surface Endpoint: 42.063, 20.000
Right Slip Surface Endpoint: 180.384, 50.000
Resisting Horizontal Force=124489 lb
Driving Horizontal Force=84641 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 4074
Number of Invalid Surfaces: 777
Error Codes:
Error Code -103 reported for 601 surfaces
Error Code -107 reported for 86 surfaces
Error Code -108 reported for 53 surfaces
Error Code -111 reported for 37 surfaces

Error Codes

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).

-111 = safety factor equation did not converge

List of All Coordinates

Search Grid

20	56
164	56
164	134
20	134

External Boundary

210	0
210	50
140	50
50	20
0	20
0	0

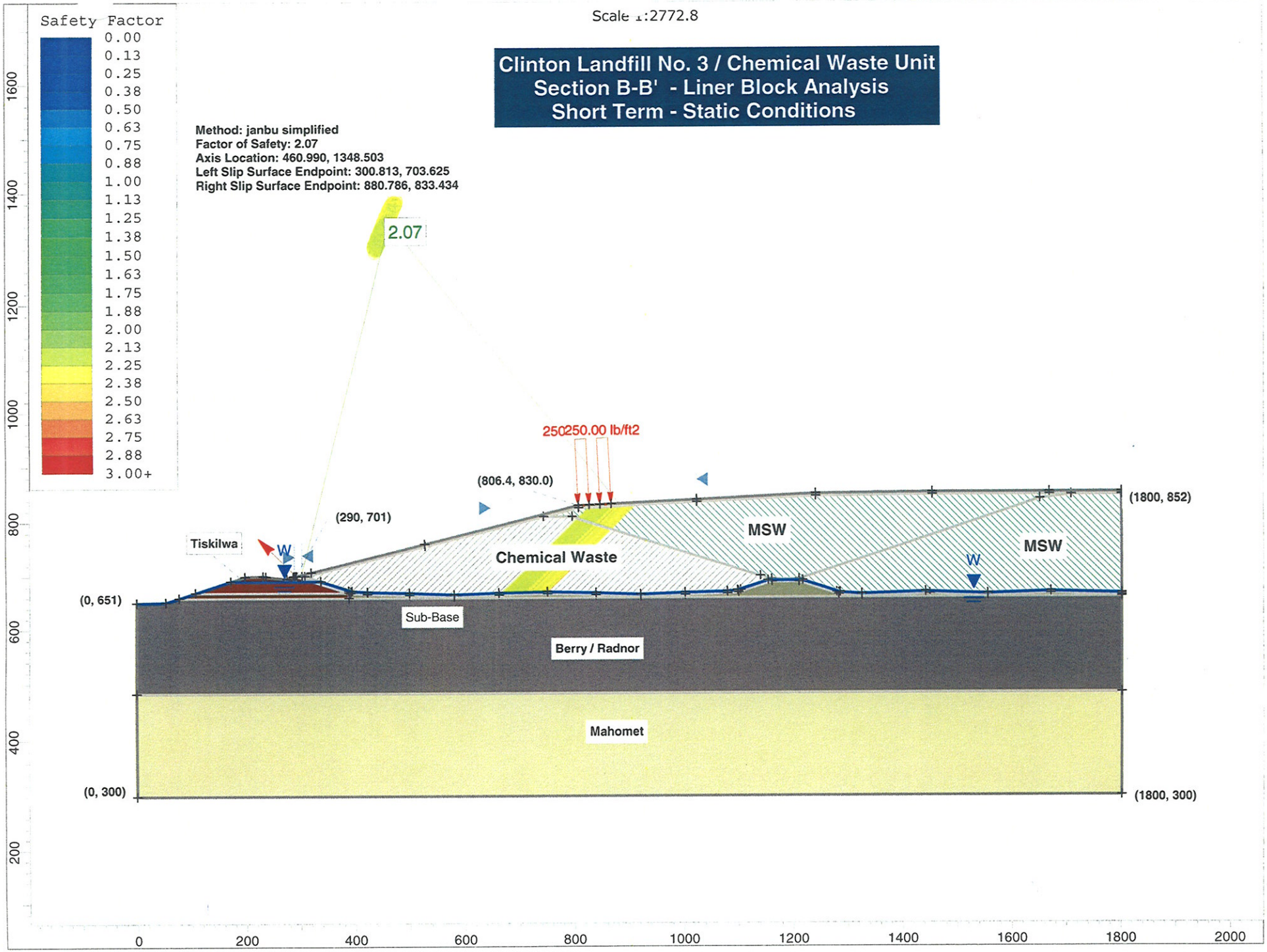
Distributed Load

160	50
140	50

CROSS SECTION B-B'
LINER BLOCK FAILURE
SHORT TERM / STATIC ANALYSIS

Scale 1:2772.8

Clinton Landfill No. 3 / Chemical Waste Unit
Section B-B' - Liner Block Analysis
Short Term - Static Conditions



Slide Analysis Information

Document Name

File Name: B-B'_SSTAT_LB

Project Settings

Project Title: Clinton Landfill No. 3/ Chemical Waste Unit, B-B' LINER BLOCK, SHORT TERM/STATIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 4000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250

lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3500 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1400 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 6000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Final Cover
Strength Type: Mohr-Coulomb
Unit Weight: 128 lb/ft3
Cohesion: 1350 psf
Friction Angle: 0 degrees
Water Surface: None

Material: MSW
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 75 lb/ft3
Saturated Unit Weight: 75 lb/ft3

Cohesion: 500 psf
Friction Angle: 30 degrees
Water Surface: None

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 840 psf
Friction Angle: 17.4 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 128 lb/ft3

Saturated Unit Weight: 134 lb/ft3
Cohesion: 1350 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 2.068200
Axis Location: 460.990, 1348.503
Left Slip Surface Endpoint: 300.813, 703.625
Right Slip Surface Endpoint: 880.786, 833.434
Resisting Horizontal Force=1.65499e+006 lb
Driving Horizontal Force=800208 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 4000
Number of Invalid Surfaces: 0

List of All Coordinates

Focus/Block Search Window
292 701
390 669
391 672
302 701

Focus/Block Search Window
390 669
421 667
421 670
391 672

Focus/Block Search Window
421 667
498 665
498 668
421 670

Focus/Block Search Window
498 665
580 662
580 665
498 668

Focus/Block Search Window
580 662

661 665
661 668
580 665

Focus/Block Search Window
661 665
750 667
750 670
661 668

Material Boundary
108 670
387 670
387 670
387 670
387 660

Material Boundary
290 701
292 701
302 701

Material Boundary
0 483
1800 483

Material Boundary
292 701
387 670
387 670
390 669
421 667
498 665
580 662
661 665
750 667
839 665
920 662
1002 665
1079 667
1100 669
1161 689
1210 689
1282 665
1325 662
1449 666
1555 662
1670 666
1800 663

Material Boundary

78	660
387	660
1800	660

Material Boundary

302	701
391	672
421	670
498	668
580	665
661	668
750	670
839	668
920	665
1002	668
1079	670
1099	672
1103	673

Material Boundary

1160	694
1210	694

Material Boundary

1670	669
1800	666

Material Boundary

307	701
393	673

Material Boundary

307	701
527	756
807	826
1023	836
1241	846
1454	848
1668	848
1800	848

Material Boundary

307	701
743	810
796	810
1140	700
1160	694

Material Boundary

1210	694
1651	840
1708	847
1800	847

Material Boundary

387	673
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673

Material Boundary

307	701
302	701
387	673

Material Boundary

1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

Material Boundary

1210	694
1285	669
1279	669
1210	692
1210	694

Material Boundary

1210	692
1283	668
1325	665
1441	669
1555	665
1670	669

Material Boundary

1282	665
1283	668

Material Boundary

1210	689
1210	692

Material Boundary

1160	692
1161	689

Material Boundary

1099	672
1100	669

Material Boundary

390	669
391	672

Material Boundary

1098	673
1160	694
1160	692
1103	673
1098	673

Material Boundary

1160	694
1160	694

External Boundary

1800	300
1800	483
1800	660
1800	663
1800	666
1800	667
1800	847
1800	848
1800	852
1668	852
1454	852
1240	850
1023	840
806	830
526	760
319	708
290	701
287	701
286	700
275	696
236	700

231	701
198	700
108	670
78	660
53	652
0	651
0	483
0	300

Water Table

0	651
53	652
78	660
108	670
172	691
336	691
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673
1153	691
1217	691
1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

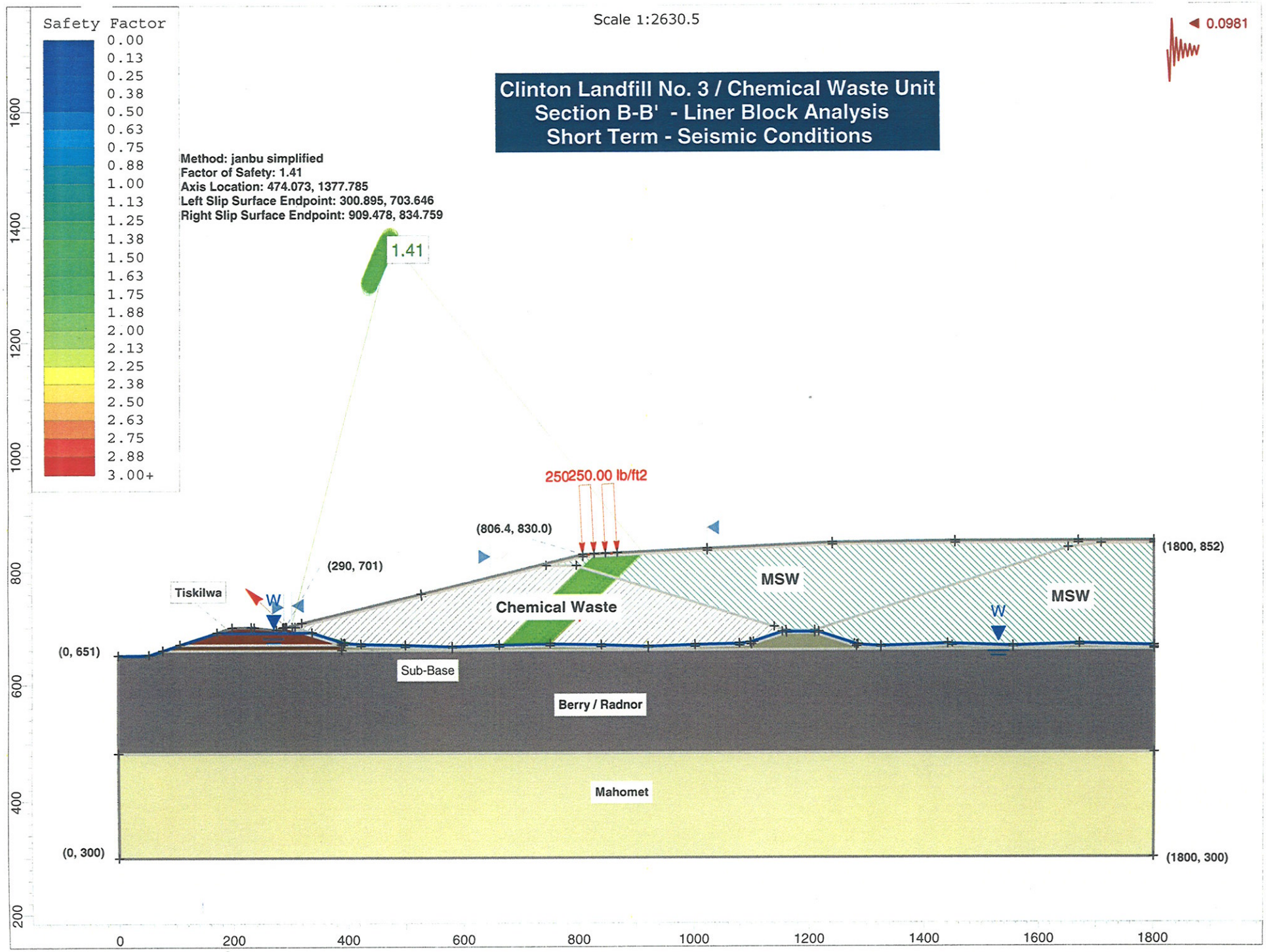
Distributed Load

826	831
806	830

Distributed Load

866	833
846	832

CROSS SECTION B-B'
LINER BLOCK FAILURE
SHORT TERM / SEISMIC ANALYSIS


Scale 1:2630.5
0.0981
Clinton Landfill No. 3 / Chemical Waste Unit
Section B-B' - Liner Block Analysis
Short Term - Seismic Conditions
Safety Factor
0.00
0.13
0.25
0.38
0.50
0.63
0.75
0.88
1.00
1.13
1.25
1.38
1.50
1.63
1.75
1.88
2.00
2.13
2.25
2.38
2.50
2.63
2.75
2.88
3.00+
Method: janbu simplified
Factor of Safety: 1.41
Axis Location: 474.073, 1377.785
Left Slip Surface Endpoint: 300.895, 703.646
Right Slip Surface Endpoint: 909.478, 834.759
1.41
250250.00 lb/ft2
(806.4, 830.0)
(290, 701)
(1800, 852)
Tiskilwa
W
Chemical Waste
MSW
MSW
W
(0, 651)
Sub-Base
Berry / Radnor
Mahomet
(0, 300)
(1800, 300)
1600
1400
1200
1000
800
600
400
200
0
200
400
600
800
1000
1200
1400
1600
1800

Slide Analysis Information

Document Name

File Name: B-B'_SSEIS_LB

Project Settings

Project Title: Clinton Landfill No. 3/ Chemical Waste Unit, B-B' LINER BLOCK, SHORT TERM/SEISMIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 4000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.0981
2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3500 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1400 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 6000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Final Cover
Strength Type: Mohr-Coulomb
Unit Weight: 128 lb/ft3
Cohesion: 1350 psf
Friction Angle: 0 degrees
Water Surface: None

Material: MSW
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 75 lb/ft3

Saturated Unit Weight: 75 lb/ft3
Cohesion: 500 psf
Friction Angle: 30 degrees
Water Surface: None

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 840 psf
Friction Angle: 17.4 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb

Unsaturated Unit Weight: 128 lb/ft3
Saturated Unit Weight: 134 lb/ft3
Cohesion: 1350 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 1.406310
Axis Location: 474.073, 1377.785
Left Slip Surface Endpoint: 300.895, 703.646
Right Slip Surface Endpoint: 909.478, 834.759
Resisting Horizontal Force=1.72089e+006 lb
Driving Horizontal Force=1.22369e+006 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 4000
Number of Invalid Surfaces: 0

List of All Coordinates

Focus/Block Search Window
292 701
390 669
391 672
302 701

Focus/Block Search Window
390 669
421 667
421 670
391 672

Focus/Block Search Window
421 667
498 665
498 668
421 670

Focus/Block Search Window
498 665
580 662
580 665
498 668

Focus/Block Search Window

580 662
661 665
661 668
580 665

Focus/Block Search Window
661 665
750 667
750 670
661 668

Material Boundary
108 670
387 670
387 670
387 670
387 660

Material Boundary
290 701
292 701
302 701

Material Boundary
0 483
1800 483

Material Boundary
292 701
387 670
387 670
390 669
421 667
498 665
580 662
661 665
750 667
839 665
920 662
1002 665
1079 667
1100 669
1161 689
1210 689
1282 665
1325 662
1449 666
1555 662
1670 666
1800 663

Material Boundary

78	660
387	660
1800	660

Material Boundary

302	701
391	672
421	670
498	668
580	665
661	668
750	670
839	668
920	665
1002	668
1079	670
1099	672
1103	673

Material Boundary

1160	694
1210	694

Material Boundary

1670	669
1800	666

Material Boundary

307	701
393	673

Material Boundary

307	701
527	756
807	826
1023	836
1241	846
1454	848
1668	848
1800	848

Material Boundary

307	701
743	810
796	810
1140	700
1160	694

Material Boundary

1210	694
1651	840
1708	847
1800	847

Material Boundary

387	673
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673

Material Boundary

307	701
302	701
387	673

Material Boundary

1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

Material Boundary

1210	694
1285	669
1279	669
1210	692
1210	694

Material Boundary

1210	692
1283	668
1325	665
1441	669
1555	665
1670	669

Material Boundary

1282	665

1283	668

Material Boundary

1210	689
1210	692

Material Boundary

1160	692
1161	689

Material Boundary

1099	672
1100	669

Material Boundary

390	669
391	672

Material Boundary

1098	673
1160	694
1160	692
1103	673
1098	673

Material Boundary

1160	694
1160	694

External Boundary

1800	300
1800	483
1800	660
1800	663
1800	666
1800	667
1800	847
1800	848
1800	852
1668	852
1454	852
1240	850
1023	840
806	830
526	760
319	708
290	701
287	701
286	700
275	696

236	700
231	701
198	700
108	670
78	660
53	652
0	651
0	483
0	300

Water Table

0	651
53	652
78	660
108	670
172	691
336	691
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673
1153	691
1217	691
1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

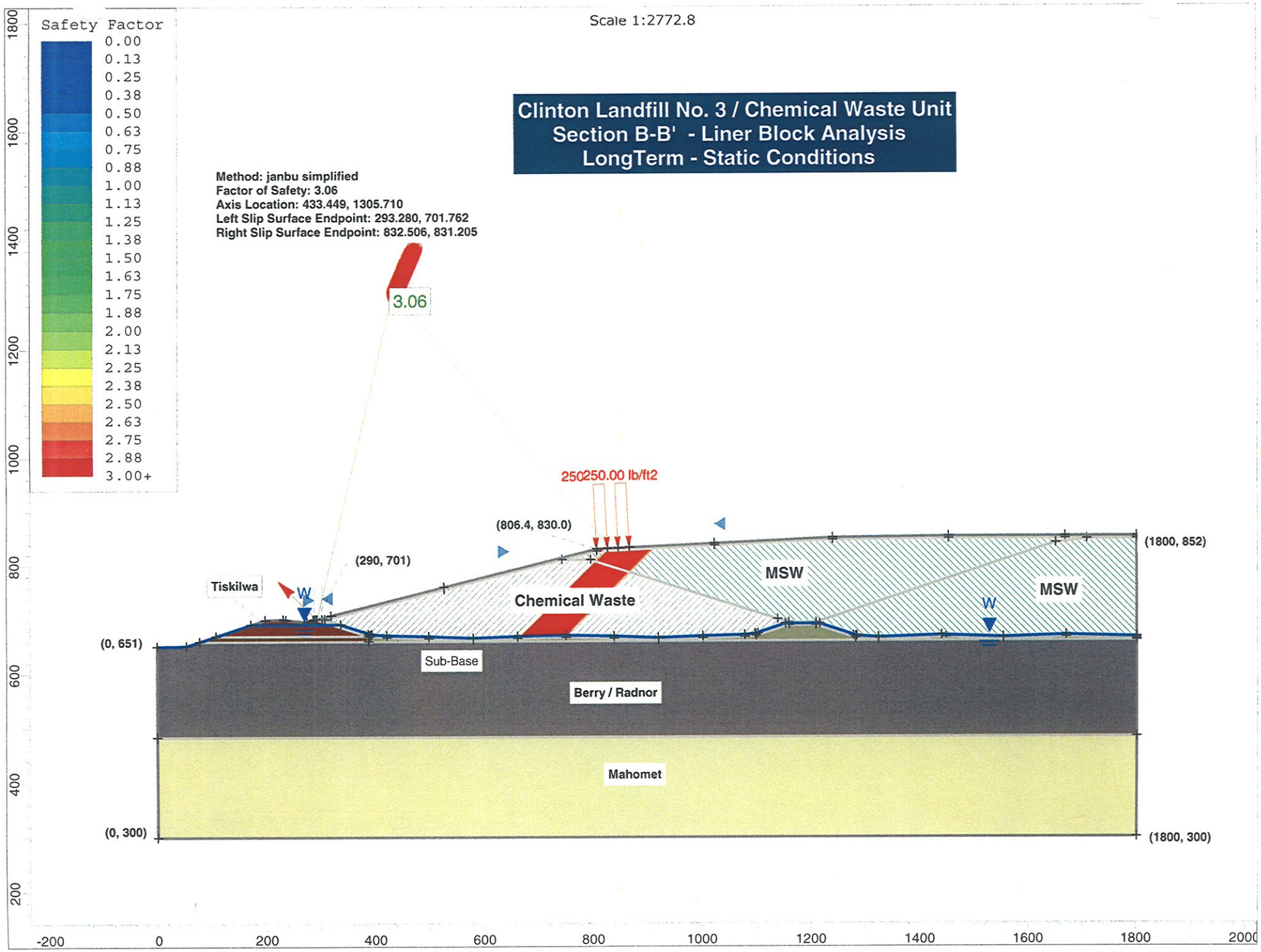
Distributed Load

826	831
806	830

Distributed Load

866	833
846	832

CROSS SECTION B-B'
LINER BLOCK FAILURE
LONG TERM / STATIC ANALYSIS


Scale 1:2772.8
Clinton Landfill No. 3 / Chemical Waste Unit
Section B-B' - Liner Block Analysis
LongTerm - Static Conditions
Safety Factor
0.00
0.13
0.25
0.38
0.50
0.63
0.75
0.88
1.00
1.13
1.25
1.38
1.50
1.63
1.75
1.88
2.00
2.13
2.25
2.38
2.50
2.63
2.75
2.88
3.00+
Method: janbu simplified
Factor of Safety: 3.06
Axis Location: 433.449, 1305.710
Left Slip Surface Endpoint: 293.280, 701.762
Right Slip Surface Endpoint: 832.506, 831.205
3.06
250250.00 lb/ft2
(806.4, 830.0)
(290, 701)
(1800, 852)
Tiskilwa
W
Chemical Waste
MSW
MSW
W
(0, 651)
Sub-Base
Berry / Radnor
Mahomet
(0, 300)
(1800, 300)
1800
1600
1400
1200
1000
800
600
400
200
-200
0
200
400
600
800
1000
1200
1400
1600
1800
2000

Slide Analysis Information

Document Name

File Name: B-B'_LSTAT_LB

Project Settings

Project Title: Clinton Landfill No. 3/ Chemical Waste Unit, B-B' LINER BLOCK, LONG TERM/STATIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 4000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250

lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 600 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1500 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 1100 psf
Friction Angle: 18 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Final Cover
Strength Type: Mohr-Coulomb
Unit Weight: 128 lb/ft3
Cohesion: 1300 psf
Friction Angle: 22 degrees
Water Surface: None

Material: MSW
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 75 lb/ft3
Saturated Unit Weight: 75 lb/ft3

Cohesion: 500 psf
Friction Angle: 30 degrees
Water Surface: None

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 240 psf
Friction Angle: 45 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 700 psf
Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 128 lb/ft3

Saturated Unit Weight: 134 lb/ft3
Cohesion: 1300 psf
Friction Angle: 22 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 3.061790
Axis Location: 433.449, 1305.710
Left Slip Surface Endpoint: 293.280, 701.762
Right Slip Surface Endpoint: 832.506, 831.205
Resisting Horizontal Force=1.96706e+006 lb
Driving Horizontal Force=642453 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 4000
Number of Invalid Surfaces: 0

List of All Coordinates

Focus/Block Search Window
292 701
390 669
391 672
302 701

Focus/Block Search Window
390 669
421 667
421 670
391 672

Focus/Block Search Window
421 667
498 665
498 668
421 670

Focus/Block Search Window
498 665
580 662
580 665
498 668

Focus/Block Search Window
580 662

661 665
661 668
580 665

Focus/Block Search Window
661 665
750 667
750 670
661 668

Material Boundary
108 670
387 670
387 670
387 670
387 660

Material Boundary
290 701
292 701
302 701

Material Boundary
0 483
1800 483

Material Boundary
292 701
387 670
387 670
390 669
421 667
498 665
580 662
661 665
750 667
839 665
920 662
1002 665
1079 667
1100 669
1161 689
1210 689
1282 665
1325 662
1449 666
1555 662
1670 666
1800 663

Material Boundary

78	660
387	660
1800	660

Material Boundary

302	701
391	672
421	670
498	668
580	665
661	668
750	670
839	668
920	665
1002	668
1079	670
1099	672
1103	673

Material Boundary

1160	694
1210	694

Material Boundary

1670	669
1800	666

Material Boundary

307	701
393	673

Material Boundary

307	701
527	756
807	826
1023	836
1241	846
1454	848
1668	848
1800	848

Material Boundary

307	701
743	810
796	810
1140	700
1160	694

Material Boundary

1210	694
1651	840
1708	847
1800	847

Material Boundary

387	673
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673

Material Boundary

307	701
302	701
387	673

Material Boundary

1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

Material Boundary

1210	694
1285	669
1279	669
1210	692
1210	694

Material Boundary

1210	692
1283	668
1325	665
1441	669
1555	665
1670	669

Material Boundary

1282	665
1283	668

Material Boundary

1210	689
1210	692

Material Boundary

1160	692
1161	689

Material Boundary

1099	672
1100	669

Material Boundary

390	669
391	672

Material Boundary

1098	673
1160	694
1160	692
1103	673
1098	673

Material Boundary

1160	694
1160	694

External Boundary

1800	300
1800	483
1800	660
1800	663
1800	666
1800	667
1800	847
1800	848
1800	852
1668	852
1454	852
1240	850
1023	840
806	830
526	760
319	708
290	701
287	701
286	700
275	696
236	700

231	701
198	700
108	670
78	660
53	652
0	651
0	483
0	300

Water Table

0	651
53	652
78	660
108	670
172	691
336	691
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673
1153	691
1217	691
1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

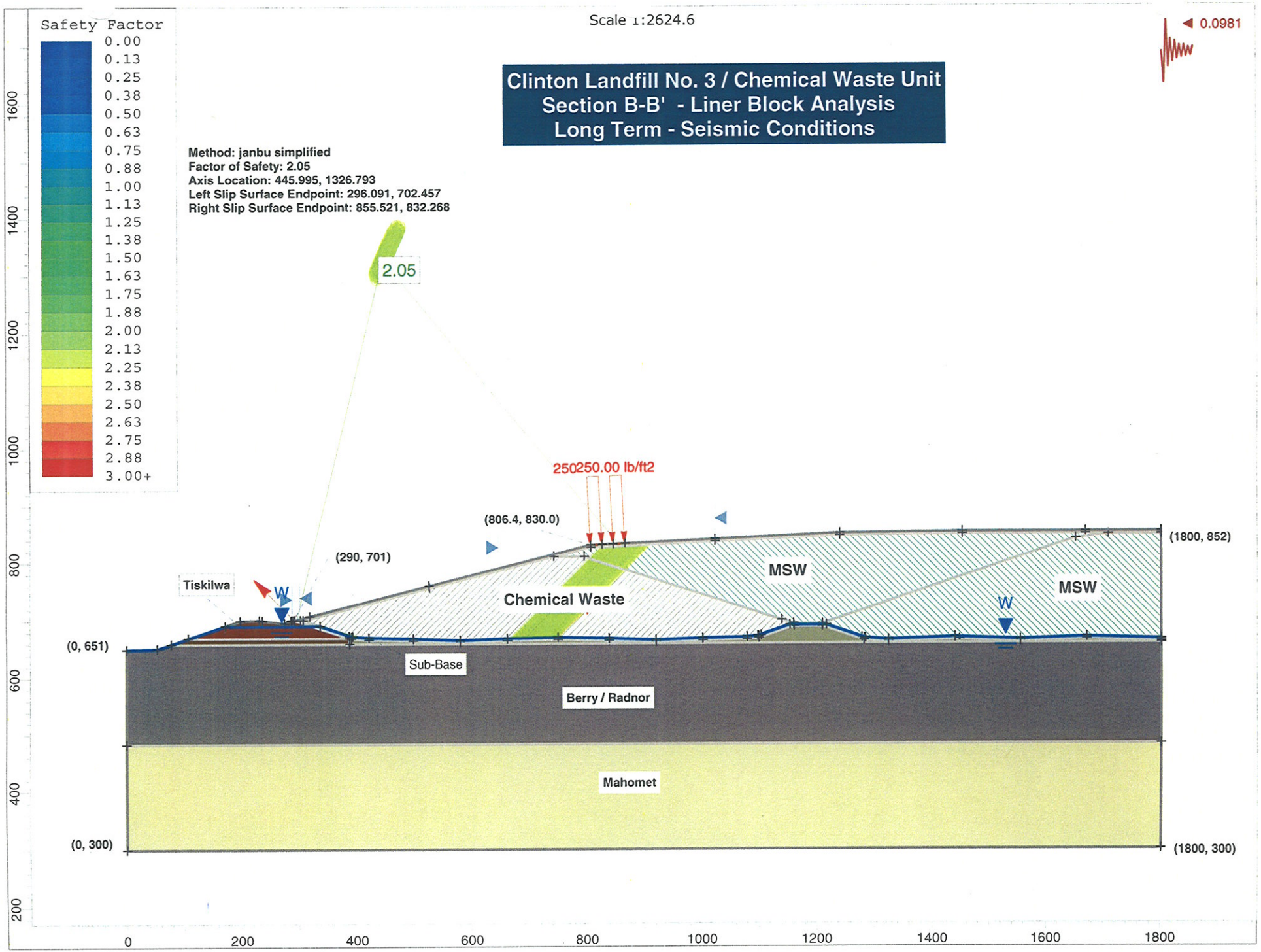
Distributed Load

826	831
806	830

Distributed Load

866	833
846	832

CROSS SECTION B-B'
LINER BLOCK FAILURE
LONG TERM / SEISMIC ANALYSIS


Clinton Landfill No. 3 / Chemical Waste Unit
Section B-B' - Liner Block Analysis
Long Term - Seismic Conditions
Scale 1:2624.6
0.0981
Safety Factor
0.00
0.13
0.25
0.38
0.50
0.63
0.75
0.88
1.00
1.13
1.25
1.38
1.50
1.63
1.75
1.88
2.00
2.13
2.25
2.38
2.50
2.63
2.75
2.88
3.00+
Method: janbu simplified
Factor of Safety: 2.05
Axis Location: 445.995, 1326.793
Left Slip Surface Endpoint: 296.091, 702.457
Right Slip Surface Endpoint: 855.521, 832.268
2.05
250250.00 lb/ft2
(806.4, 830.0)
(290, 701)
(1800, 852)
Tiskilwa
W
Chemical Waste
MSW
MSW
W
(0, 651)
Sub-Base
Berry / Radnor
Mahomet
(0, 300)
(1800, 300)
1600
1400
1200
1000
800
600
400
200
0
200
400
600
800
1000
1200
1400
1600
1800

Slide Analysis Information

Document Name

File Name: B-B'_LSEIS_LB

Project Settings

Project Title: Clinton Landfill No. 3/ Chemical Waste Unit, B-B' LINER BLOCK, LONG TERM/SEISMIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 4000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.0981
2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 600 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1500 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 1100 psf
Friction Angle: 18 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Final Cover
Strength Type: Mohr-Coulomb
Unit Weight: 128 lb/ft3
Cohesion: 1300 psf
Friction Angle: 22 degrees
Water Surface: None

Material: MSW
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 75 lb/ft3

Saturated Unit Weight: 75 lb/ft3
Cohesion: 500 psf
Friction Angle: 30 degrees
Water Surface: None

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 240 psf
Friction Angle: 45 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 700 psf
Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb

Unsaturated Unit Weight: 128 lb/ft3
Saturated Unit Weight: 134 lb/ft3
Cohesion: 1300 psf
Friction Angle: 22 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 2.045770
Axis Location: 445.995, 1326.793
Left Slip Surface Endpoint: 296.091, 702.457
Right Slip Surface Endpoint: 855.521, 832.268
Resisting Horizontal Force=2.05376e+006 lb
Driving Horizontal Force=1.00391e+006 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 4000
Number of Invalid Surfaces: 0

List of All Coordinates

Focus/Block Search Window
292 701
390 669
391 672
302 701

Focus/Block Search Window
390 669
421 667
421 670
391 672

Focus/Block Search Window
421 667
498 665
498 668
421 670

Focus/Block Search Window
498 665
580 662
580 665
498 668

Focus/Block Search Window

580 662
661 665
661 668
580 665

Focus/Block Search Window
661 665
750 667
750 670
661 668

Material Boundary
108 670
387 670
387 670
387 670
387 660

Material Boundary
290 701
292 701
302 701

Material Boundary
0 483
1800 483

Material Boundary
292 701
387 670
387 670
390 669
421 667
498 665
580 662
661 665
750 667
839 665
920 662
1002 665
1079 667
1100 669
1161 689
1210 689
1282 665
1325 662
1449 666
1555 662
1670 666
1800 663

Material Boundary

78	660
387	660
1800	660

Material Boundary

302	701
391	672
421	670
498	668
580	665
661	668
750	670
839	668
920	665
1002	668
1079	670
1099	672
1103	673

Material Boundary

1160	694
1210	694

Material Boundary

1670	669
1800	666

Material Boundary

307	701
393	673

Material Boundary

307	701
527	756
807	826
1023	836
1241	846
1454	848
1668	848
1800	848

Material Boundary

307	701
743	810
796	810
1140	700
1160	694

Material Boundary

1210	694
1651	840
1708	847
1800	847

Material Boundary

387	673
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673

Material Boundary

307	701
302	701
387	673

Material Boundary

1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

Material Boundary

1210	694
1285	669
1279	669
1210	692
1210	694

Material Boundary

1210	692
1283	668
1325	665
1441	669
1555	665
1670	669

Material Boundary

1282	665

1283	668

Material Boundary

1210	689
1210	692

Material Boundary

1160	692
1161	689

Material Boundary

1099	672
1100	669

Material Boundary

390	669
391	672

Material Boundary

1098	673
1160	694
1160	692
1103	673
1098	673

Material Boundary

1160	694
1160	694

External Boundary

1800	300
1800	483
1800	660
1800	663
1800	666
1800	667
1800	847
1800	848
1800	852
1668	852
1454	852
1240	850
1023	840
806	830
526	760
319	708
290	701
287	701
286	700
275	696

236	700
231	701
198	700
108	670
78	660
53	652
0	651
0	483
0	300

Water Table

0	651
53	652
78	660
108	670
172	691
336	691
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673
1153	691
1217	691
1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

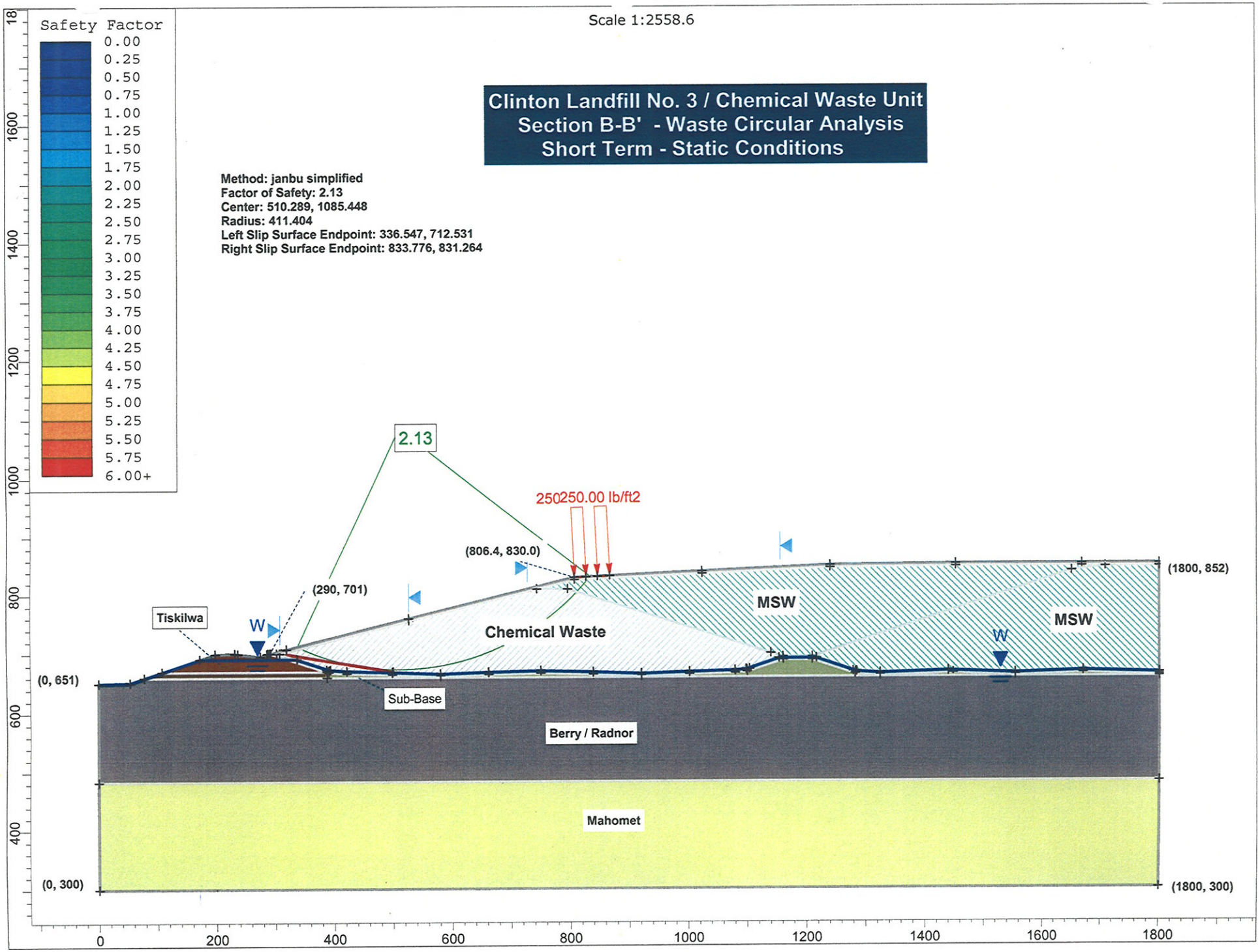
Distributed Load

826	831
806	830

Distributed Load

866	833
846	832

CROSS SECTION B-B'
WASTE CIRCULAR FAILURE
SHORT TERM / STATIC ANALYSIS


Scale 1:2558.6
Clinton Landfill No. 3 / Chemical Waste Unit
Section B-B' - Waste Circular Analysis
Short Term - Static Conditions
Method: janbu simplified
Factor of Safety: 2.13
Center: 510.289, 1085.448
Radius: 411.404
Left Slip Surface Endpoint: 336.547, 712.531
Right Slip Surface Endpoint: 833.776, 831.264
Safety Factor
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00
3.25
3.50
3.75
4.00
4.25
4.50
4.75
5.00
5.25
5.50
5.75
6.00+
2.13
250250.00 lb/ft2
(806.4, 830.0)
(290, 701)
(1800, 852)
Tiskilwa
W
Chemical Waste
MSW
MSW
W
(0, 651)
Sub-Base
Berry / Radnor
Mahomet
(0, 300)
(1800, 300)
0
200
400
600
800
1000
1200
1400
1600
1800
400
600
800
1000
1200
1400
1600
18

Slide Analysis Information

Document Name

File Name: B-B'_SSTAT_WC

Project Settings

Project Title: Clinton Landfill No. 3/ Chemical Waste Unit, B-B' WASTE CIRCULAR, SHORT TERM/STATIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 5000
Upper Angle: -45
Lower Angle: -45
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3500 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1400 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 6000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Final Cover
Strength Type: Mohr-Coulomb
Unit Weight: 128 lb/ft3
Cohesion: 1350 psf
Friction Angle: 0 degrees
Water Surface: None

Material: MSW
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 75 lb/ft3
Saturated Unit Weight: 75 lb/ft3
Cohesion: 500 psf

Friction Angle: 30 degrees
Water Surface: None

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 840 psf
Friction Angle: 17.4 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 128 lb/ft3
Saturated Unit Weight: 134 lb/ft3

Cohesion: 1350 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 2.127230
Center: 510.289, 1085.448
Radius: 411.404
Left Slip Surface Endpoint: 336.547, 712.531
Right Slip Surface Endpoint: 833.776, 831.264
Resisting Horizontal Force=1.31151e+006 lb
Driving Horizontal Force=616534 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 4067
Number of Invalid Surfaces: 933
Error Codes:
Error Code -112 reported for 473 surfaces
Error Code -114 reported for 460 surfaces

Error Codes

The following errors were encountered during the computation:

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-114 = Surface with Reverse Curvature.

List of All Coordinates

Focus/Block Search Line
310 702
499 670

Material Boundary
108 670
387 670
387 670
387 670
387 660

Material Boundary

290	701
292	701
302	701

Material Boundary

0	483
1800	483

Material Boundary

292	701
387	670
387	670
390	669
421	667
498	665
580	662
661	665
750	667
839	665
920	662
1002	665
1079	667
1100	669
1161	689
1210	689
1282	665
1325	662
1449	666
1555	662
1670	666
1800	663

Material Boundary

78	660
387	660
1800	660

Material Boundary

302	701
391	672
421	670
498	668
580	665
661	668
750	670
839	668
920	665
1002	668
1079	670

1099	672
1103	673

Material Boundary

1160	694
1210	694

Material Boundary

1670	669
1800	666

Material Boundary

307	701
393	673

Material Boundary

307	701
527	756
807	826
1023	836
1241	846
1454	848
1668	848
1800	848

Material Boundary

307	701
743	810
796	810
1140	700
1160	694

Material Boundary

1210	694
1651	840
1708	847
1800	847

Material Boundary

387	673
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673

Material Boundary

307	701
302	701
387	673

Material Boundary

1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

Material Boundary

1210	694
1285	669
1279	669
1210	692
1210	694

Material Boundary

1210	692
1283	668
1325	665
1441	669
1555	665
1670	669

Material Boundary

1282	665
1283	668

Material Boundary

1210	689
1210	692

Material Boundary

1160	692
1161	689

Material Boundary

1099	672
1100	669

Material Boundary

390	669
391	672

Material Boundary

1098	673

1160	694
1160	692
1103	673
1098	673

Material Boundary

1160	694
1160	694

External Boundary

1800	300
1800	483
1800	660
1800	663
1800	666
1800	667
1800	847
1800	848
1800	852
1668	852
1454	852
1240	850
1023	840
806	830
526	760
319	708
290	701
287	701
286	700
275	696
236	700
231	701
198	700
108	670
78	660
53	652
0	651
0	483
0	300

Water Table

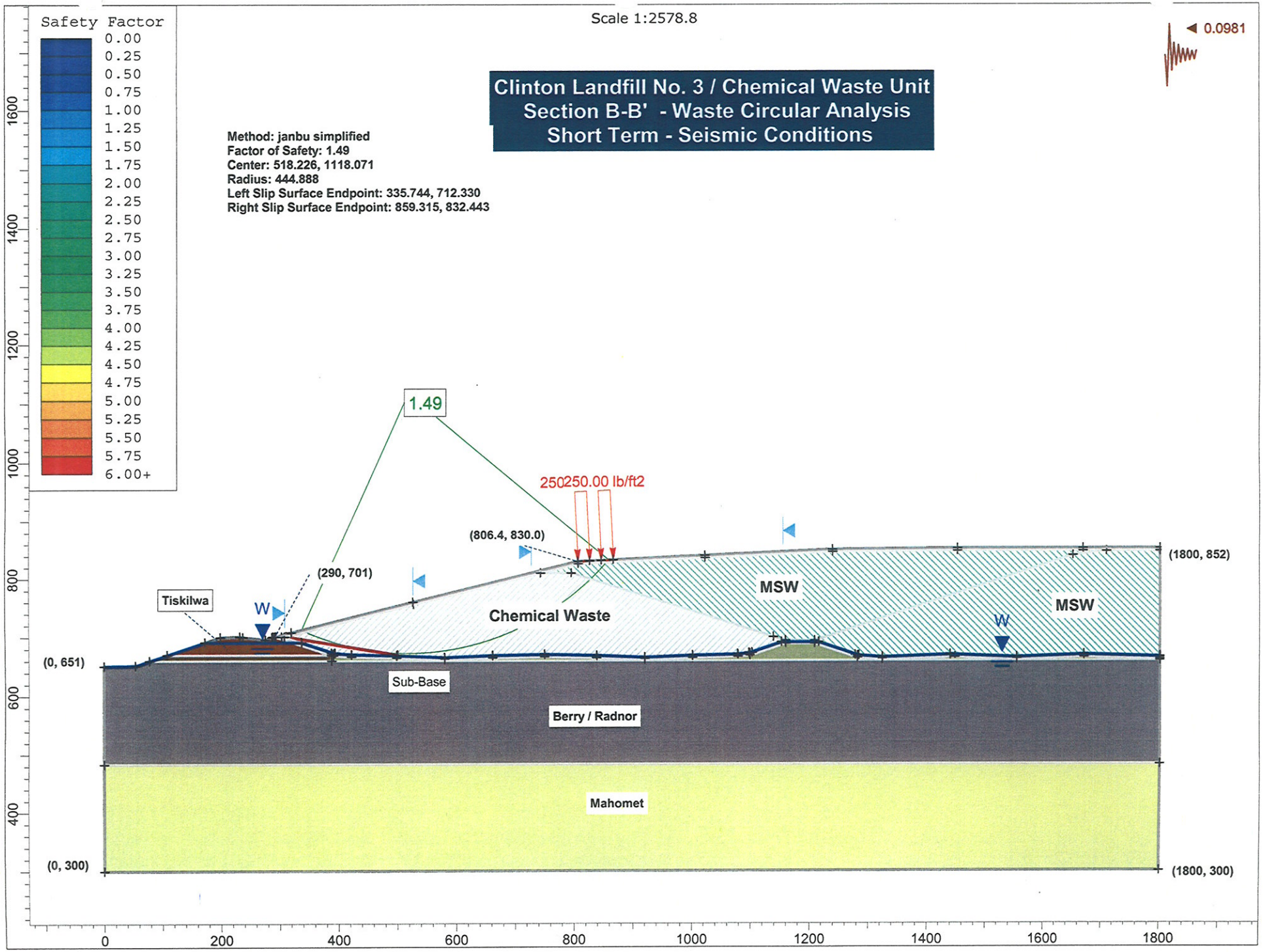
0	651
53	652
78	660
108	670
172	691
336	691
393	673
421	671
498	669
580	666

661 669
750 671
839 669
920 666
1002 669
1079 671
1098 673
1153 691
1217 691
1285 669
1325 666
1441 670
1555 666
1670 670
1800 667

Distributed Load
826 831
806 830

Distributed Load
866 833
846 832

CROSS SECTION B-B'
WASTE CIRCULAR FAILURE
SHORT TERM / SEISMIC ANALYSIS


Safety Factor
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00
3.25
3.50
3.75
4.00
4.25
4.50
4.75
5.00
5.25
5.50
5.75
6.00+
Scale 1:2578.8
0.0981
Clinton Landfill No. 3 / Chemical Waste Unit
Section B-B' - Waste Circular Analysis
Short Term - Seismic Conditions
Method: janbu simplified
Factor of Safety: 1.49
Center: 518.226, 1118.071
Radius: 444.888
Left Slip Surface Endpoint: 335.744, 712.330
Right Slip Surface Endpoint: 859.315, 832.443
1.49
250250.00 lb/ft2
(806.4, 830.0)
(290, 701)
(1800, 852)
Tiskilwa
W
Chemical Waste
MSW
MSW
W
(0, 651)
Sub-Base
Berry / Radnor
Mahomet
(0, 300)
(1800, 300)
0
200
400
600
800
1000
1200
1400
1600
1800
400
600
800
1000
1200
1400
1600

Slide Analysis Information

Document Name

File Name: B-B'_SSEIS_WC

Project Settings

Project Title: Clinton Landfill No. 3/ Chemical Waste Unit, B-B' WASTE CIRCULAR, SHORT TERM/SEISMIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 5000
Upper Angle: -45
Lower Angle: -45
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.0981
2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250

lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3500 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1400 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 6000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Final Cover
Strength Type: Mohr-Coulomb
Unit Weight: 128 lb/ft3
Cohesion: 1350 psf
Friction Angle: 0 degrees
Water Surface: None

Material: MSW
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 75 lb/ft3
Saturated Unit Weight: 75 lb/ft3

Cohesion: 500 psf
Friction Angle: 30 degrees
Water Surface: None

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 840 psf
Friction Angle: 17.4 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 128 lb/ft3

Saturated Unit Weight: 134 lb/ft3
Cohesion: 1350 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 1.489870
Center: 518.226, 1118.071
Radius: 444.888
Left Slip Surface Endpoint: 335.744, 712.330
Right Slip Surface Endpoint: 859.315, 832.443
Resisting Horizontal Force=1.40302e+006 lb
Driving Horizontal Force=941705 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 4067
Number of Invalid Surfaces: 933
Error Codes:
Error Code -112 reported for 473 surfaces
Error Code -114 reported for 460 surfaces

Error Codes

The following errors were encountered during the computation:

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-114 = Surface with Reverse Curvature.

List of All Coordinates

Focus/Block Search Line
310 702
499 670

Material Boundary
108 670
387 670
387 670
387 670

387 660

Material Boundary

290 701
292 701
302 701

Material Boundary

0 483
1800 483

Material Boundary

292 701
387 670
387 670
390 669
421 667
498 665
580 662
661 665
750 667
839 665
920 662
1002 665
1079 667
1100 669
1161 689
1210 689
1282 665
1325 662
1449 666
1555 662
1670 666
1800 663

Material Boundary

78 660
387 660
1800 660

Material Boundary

302 701
391 672
421 670
498 668
580 665
661 668
750 670
839 668
920 665
1002 668

1079	670
1099	672
1103	673

Material Boundary

1160	694
1210	694

Material Boundary

1670	669
1800	666

Material Boundary

307	701
393	673

Material Boundary

307	701
527	756
807	826
1023	836
1241	846
1454	848
1668	848
1800	848

Material Boundary

307	701
743	810
796	810
1140	700
1160	694

Material Boundary

1210	694
1651	840
1708	847
1800	847

Material Boundary

387	673
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671

1098	673

Material Boundary

307	701
302	701
387	673

Material Boundary

1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

Material Boundary

1210	694
1285	669
1279	669
1210	692
1210	694

Material Boundary

1210	692
1283	668
1325	665
1441	669
1555	665
1670	669

Material Boundary

1282	665
1283	668

Material Boundary

1210	689
1210	692

Material Boundary

1160	692
1161	689

Material Boundary

1099	672
1100	669

Material Boundary

390	669
391	672

Material Boundary

1098	673
1160	694
1160	692
1103	673
1098	673

Material Boundary

1160	694
1160	694

External Boundary

1800	300
1800	483
1800	660
1800	663
1800	666
1800	667
1800	847
1800	848
1800	852
1668	852
1454	852
1240	850
1023	840
806	830
526	760
319	708
290	701
287	701
286	700
275	696
236	700
231	701
198	700
108	670
78	660
53	652
0	651
0	483
0	300

Water Table

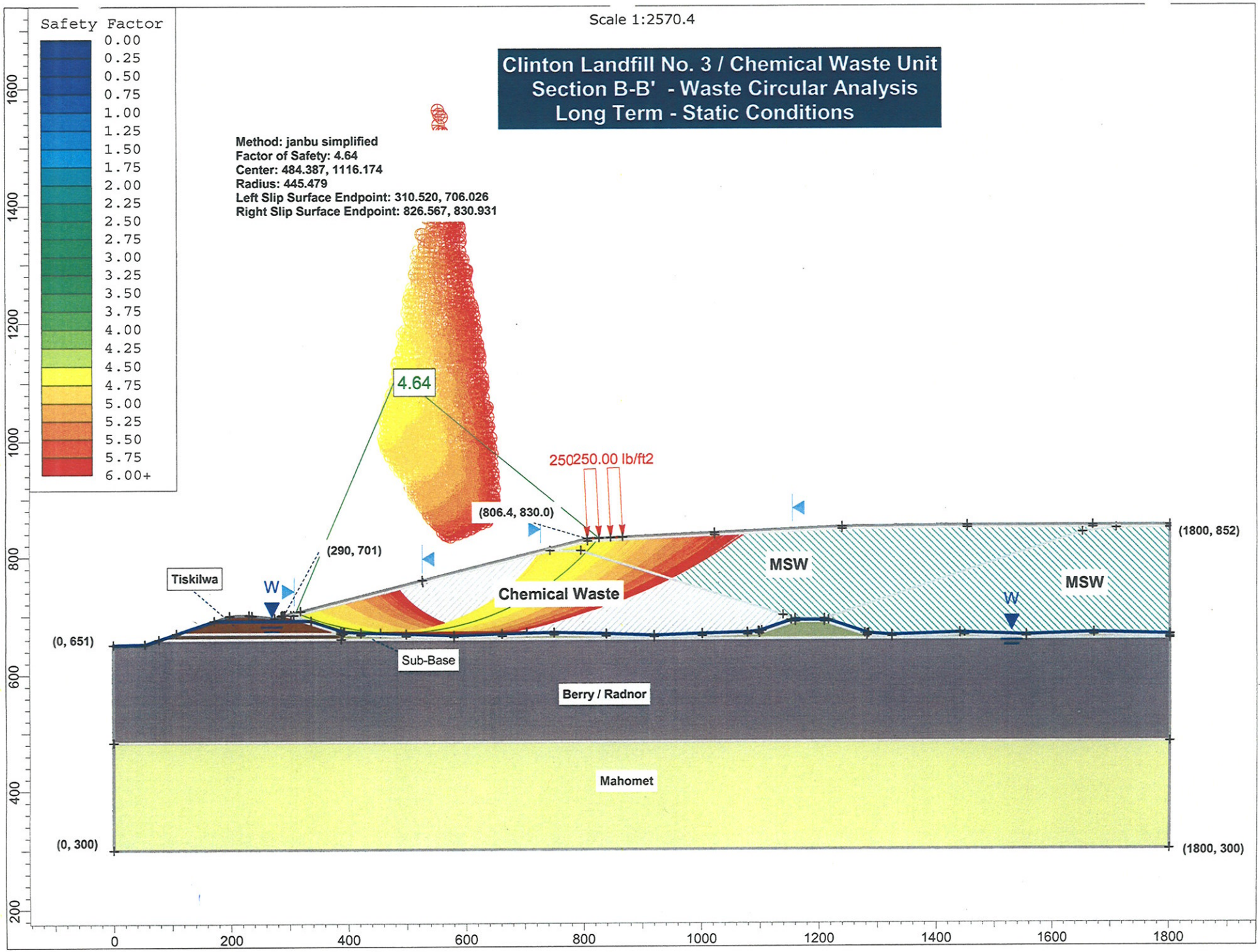
0	651
53	652
78	660
108	670
172	691
336	691
393	673
421	671
498	669

580 666
661 669
750 671
839 669
920 666
1002 669
1079 671
1098 673
1153 691
1217 691
1285 669
1325 666
1441 670
1555 666
1670 670
1800 667

Distributed Load
826 831
806 830

Distributed Load
866 833
846 832

CROSS SECTION B-B'
WASTE CIRCULAR FAILURE
LONG TERM / STATIC ANALYSIS


Scale 1:2570.4
Clinton Landfill No. 3 / Chemical Waste Unit
Section B-B' - Waste Circular Analysis
Long Term - Static Conditions
Safety Factor
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00
3.25
3.50
3.75
4.00
4.25
4.50
4.75
5.00
5.25
5.50
5.75
6.00+
Method: janbu simplified
Factor of Safety: 4.64
Center: 484.387, 1116.174
Radius: 445.479
Left Slip Surface Endpoint: 310.520, 706.026
Right Slip Surface Endpoint: 826.567, 830.931
4.64
250250.00 lb/ft2
(806.4, 830.0)
(290, 701)
(1800, 852)
Tiskilwa
W
Chemical Waste
MSW
MSW
W
(0, 651)
Sub-Base
Berry / Radnor
Mahomet
(0, 300)
(1800, 300)
0
200
400
600
800
1000
1200
1400
1600
1800
200
400
600
800
1000
1200
1400
1600

Slide Analysis Information

Document Name

File Name: B-B'_LSTAT_WC

Project Settings

Project Title: Clinton Landfill No. 3/ Chemical Waste Unit, B-B' WASTE CIRCULAR, LONG TERM/STATIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 5000
Upper Angle: -45
Lower Angle: -45
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 600 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1500 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 1100 psf
Friction Angle: 18 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Final Cover
Strength Type: Mohr-Coulomb
Unit Weight: 128 lb/ft3
Cohesion: 1300 psf
Friction Angle: 22 degrees
Water Surface: None

Material: MSW
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 75 lb/ft3
Saturated Unit Weight: 75 lb/ft3
Cohesion: 500 psf

Friction Angle: 30 degrees
Water Surface: None

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 240 psf
Friction Angle: 45 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 700 psf
Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 128 lb/ft3
Saturated Unit Weight: 134 lb/ft3

Cohesion: 1300 psf
Friction Angle: 22 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 4.637530
Center: 484.387, 1116.174
Radius: 445.479
Left Slip Surface Endpoint: 310.520, 706.026
Right Slip Surface Endpoint: 826.567, 830.931
Resisting Horizontal Force=3.00272e+006 lb
Driving Horizontal Force=647482 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 4624
Number of Invalid Surfaces: 376
Error Codes:
Error Code -112 reported for 200 surfaces
Error Code -114 reported for 176 surfaces

Error Codes

The following errors were encountered during the computation:

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-114 = Surface with Reverse Curvature.

List of All Coordinates

Focus/Block Search Line
455 671
703 671

Material Boundary
108 670
387 670
387 670
387 670
387 660

Material Boundary

290	701
292	701
302	701

Material Boundary

0	483
1800	483

Material Boundary

292	701
387	670
387	670
390	669
421	667
498	665
580	662
661	665
750	667
839	665
920	662
1002	665
1079	667
1100	669
1161	689
1210	689
1282	665
1325	662
1449	666
1555	662
1670	666
1800	663

Material Boundary

78	660
387	660
1800	660

Material Boundary

302	701
391	672
421	670
498	668
580	665
661	668
750	670
839	668
920	665
1002	668
1079	670

1099	672
1103	673

Material Boundary

1160	694
1210	694

Material Boundary

1670	669
1800	666

Material Boundary

307	701
393	673

Material Boundary

307	701
527	756
807	826
1023	836
1241	846
1454	848
1668	848
1800	848

Material Boundary

307	701
743	810
796	810
1140	700
1160	694

Material Boundary

1210	694
1651	840
1708	847
1800	847

Material Boundary

387	673
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673

Material Boundary

307	701
302	701
387	673

Material Boundary

1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

Material Boundary

1210	694
1285	669
1279	669
1210	692
1210	694

Material Boundary

1210	692
1283	668
1325	665
1441	669
1555	665
1670	669

Material Boundary

1282	665
1283	668

Material Boundary

1210	689
1210	692

Material Boundary

1160	692
1161	689

Material Boundary

1099	672
1100	669

Material Boundary

390	669
391	672

Material Boundary

1098	673

1160	694
1160	692
1103	673
1098	673

Material Boundary

1160	694
1160	694

External Boundary

1800	300
1800	483
1800	660
1800	663
1800	666
1800	667
1800	847
1800	848
1800	852
1668	852
1454	852
1240	850
1023	840
806	830
526	760
319	708
290	701
287	701
286	700
275	696
236	700
231	701
198	700
108	670
78	660
53	652
0	651
0	483
0	300

Water Table

0	651
53	652
78	660
108	670
172	691
336	691
393	673
421	671
498	669
580	666

661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673
1153	691
1217	691
1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

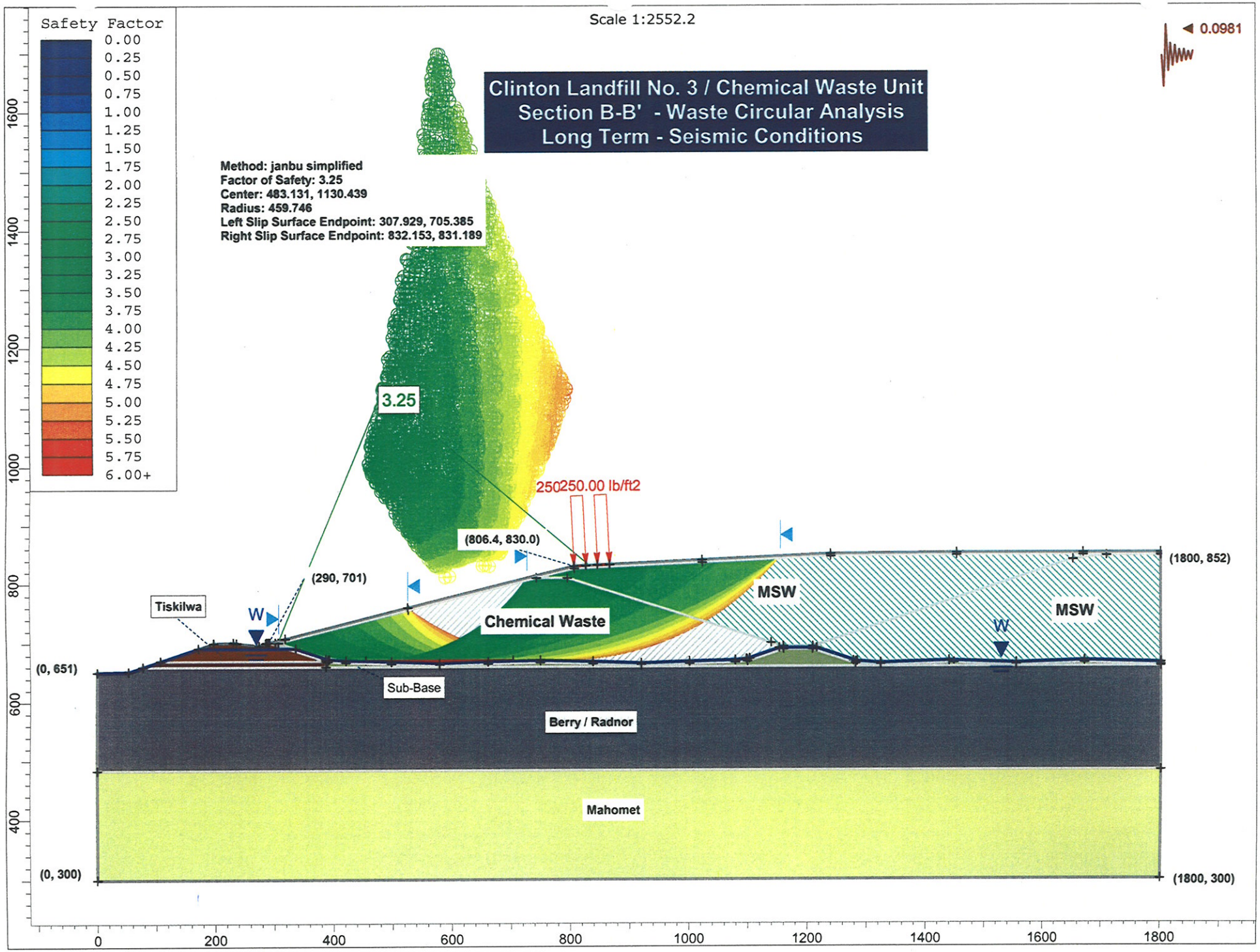
Distributed Load

826 831
806 830

Distributed Load

866 833
846 832

CROSS SECTION B-B'
WASTE CIRCULAR FAILURE
LONG TERM / SEISMIC ANALYSIS


Clinton Landfill No. 3 / Chemical Waste Unit
Section B-B' - Waste Circular Analysis
Long Term - Seismic Conditions
Scale 1:2552.2
0.0981
Safety Factor
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00
3.25
3.50
3.75
4.00
4.25
4.50
4.75
5.00
5.25
5.50
5.75
6.00+
Method: janbu simplified
Factor of Safety: 3.25
Center: 483.131, 1130.439
Radius: 459.746
Left Slip Surface Endpoint: 307.929, 705.385
Right Slip Surface Endpoint: 832.153, 831.189
3.25
250250.00 lb/ft2
(806.4, 830.0)
(290, 701)
(1800, 852)
Tiskilwa
W
Chemical Waste
MSW
MSW
W
(0, 651)
Sub-Base
Berry / Radnor
Mahomet
(0, 300)
(1800, 300)
1600
1400
1200
1000
800
600
400
0
200
400
600
800
1000
1200
1400
1600
1800

Slide Analysis Information

Document Name

File Name: B-B'_LSTAT_WC

Project Settings

Project Title: Clinton Landfill No. 3/ Chemical Waste Unit, B-B' WASTE CIRCULAR, LONG TERM/SEISMIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 5000
Upper Angle: -45
Lower Angle: -45
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.0981
2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250

lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 600 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1500 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 1100 psf
Friction Angle: 18 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Final Cover
Strength Type: Mohr-Coulomb
Unit Weight: 128 lb/ft3
Cohesion: 1300 psf
Friction Angle: 22 degrees
Water Surface: None

Material: MSW
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 75 lb/ft3
Saturated Unit Weight: 75 lb/ft3

Cohesion: 500 psf
Friction Angle: 30 degrees
Water Surface: None

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 240 psf
Friction Angle: 45 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 700 psf
Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 128 lb/ft3

Saturated Unit Weight: 134 lb/ft3
Cohesion: 1300 psf
Friction Angle: 22 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 3.253390
Center: 483.131, 1130.439
Radius: 459.746
Left Slip Surface Endpoint: 307.929, 705.385
Right Slip Surface Endpoint: 832.153, 831.189
Resisting Horizontal Force=3.00382e+006 lb
Driving Horizontal Force=923289 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 4690
Number of Invalid Surfaces: 310
Error Codes:
Error Code -112 reported for 134 surfaces
Error Code -114 reported for 176 surfaces

Error Codes

The following errors were encountered during the computation:

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-114 = Surface with Reverse Curvature.

List of All Coordinates

Focus/Block Search Line
455 671
703 671

Material Boundary
108 670
387 670
387 670
387 670

387 660

Material Boundary

290 701
292 701
302 701

Material Boundary

0 483
1800 483

Material Boundary

292 701
387 670
387 670
390 669
421 667
498 665
580 662
661 665
750 667
839 665
920 662
1002 665
1079 667
1100 669
1161 689
1210 689
1282 665
1325 662
1449 666
1555 662
1670 666
1800 663

Material Boundary

78 660
387 660
1800 660

Material Boundary

302 701
391 672
421 670
498 668
580 665
661 668
750 670
839 668
920 665
1002 668

1079	670
1099	672
1103	673

Material Boundary

1160	694
1210	694

Material Boundary

1670	669
1800	666

Material Boundary

307	701
393	673

Material Boundary

307	701
527	756
807	826
1023	836
1241	846
1454	848
1668	848
1800	848

Material Boundary

307	701
743	810
796	810
1140	700
1160	694

Material Boundary

1210	694
1651	840
1708	847
1800	847

Material Boundary

387	673
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671

1098	673

Material Boundary

307	701
302	701
387	673

Material Boundary

1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

Material Boundary

1210	694
1285	669
1279	669
1210	692
1210	694

Material Boundary

1210	692
1283	668
1325	665
1441	669
1555	665
1670	669

Material Boundary

1282	665
1283	668

Material Boundary

1210	689
1210	692

Material Boundary

1160	692
1161	689

Material Boundary

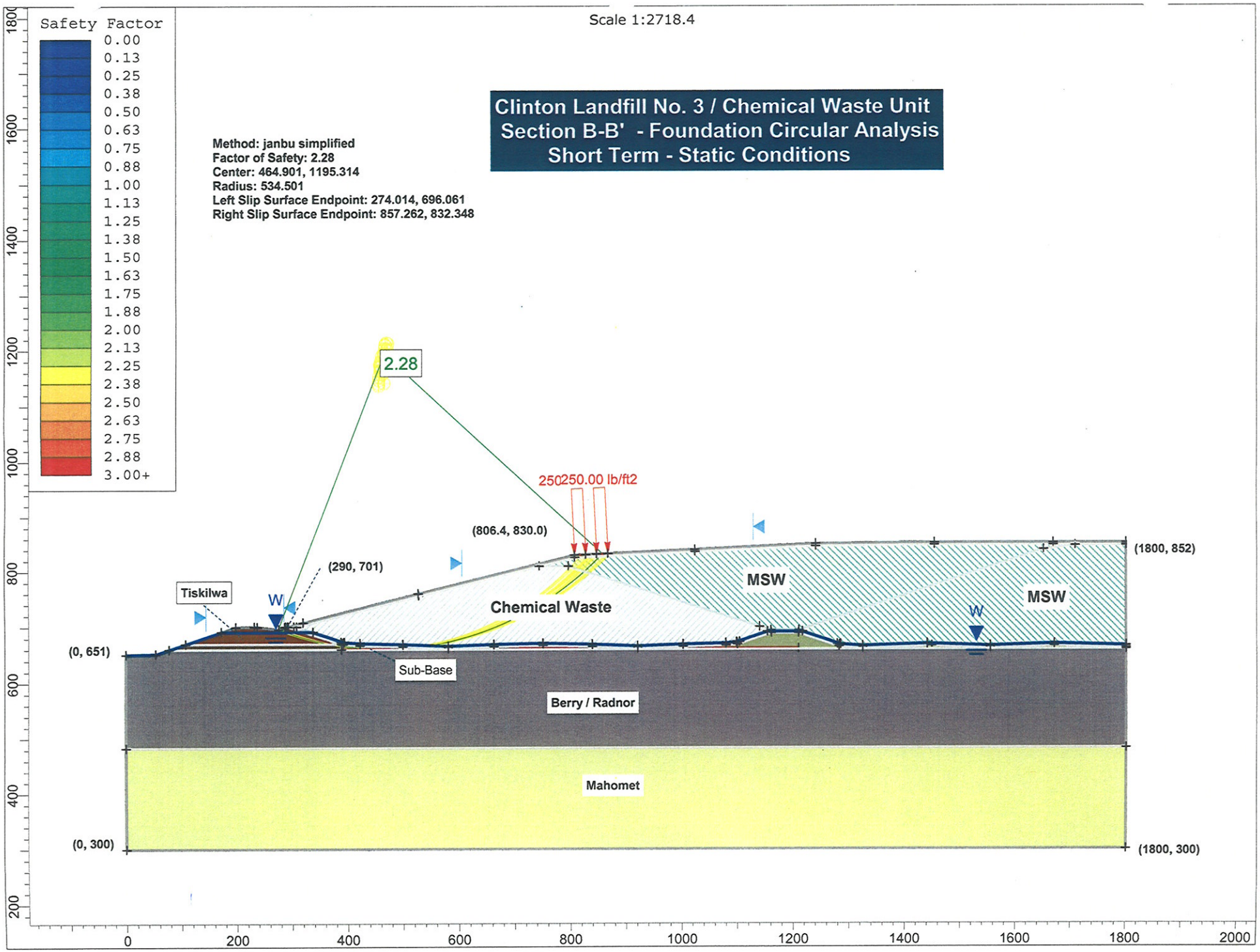
1099	672
1100	669

Material Boundary

390	669
391	672

Material Boundary

CROSS SECTION B-B'
FOUNDATION CIRCULAR FAILURE
SHORT TERM / STATIC ANALYSIS


Safety Factor
0.00
0.13
0.25
0.38
0.50
0.63
0.75
0.88
1.00
1.13
1.25
1.38
1.50
1.63
1.75
1.88
2.00
2.13
2.25
2.38
2.50
2.63
2.75
2.88
3.00+
Scale 1:2718.4
Clinton Landfill No. 3 / Chemical Waste Unit
Section B-B' - Foundation Circular Analysis
Short Term - Static Conditions
Method: janbu simplified
Factor of Safety: 2.28
Center: 464.901, 1195.314
Radius: 534.501
Left Slip Surface Endpoint: 274.014, 696.061
Right Slip Surface Endpoint: 857.262, 832.348
2.28
250250.00 lb/ft2
(806.4, 830.0)
(290, 701)
(1800, 852)
Tiskilwa
W
Chemical Waste
MSW
MSW
W
(0, 651)
Sub-Base
Berry / Radnor
Mahomet
(0, 300)
(1800, 300)
0
200
400
600
800
1000
1200
1400
1600
1800
2000

Slide Analysis Information

Document Name

File Name: B-B'_SSEIS_FC

Project Settings

Project Title: Clinton Landfill No. 3/ Chemical Waste Unit, B-B' FOUNDATION CIRCULAR, SHORT TERM/STATIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 5000
Upper Angle: -45
Lower Angle: -45
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: 668
Minimum Depth: 1

Loading

2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3500 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1400 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 6000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Final Cover
Strength Type: Mohr-Coulomb
Unit Weight: 128 lb/ft3
Cohesion: 1350 psf
Friction Angle: 0 degrees
Water Surface: None

Material: MSW
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 75 lb/ft3
Saturated Unit Weight: 75 lb/ft3
Cohesion: 500 psf

Friction Angle: 30 degrees
Water Surface: None

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 840 psf
Friction Angle: 17.4 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 128 lb/ft3
Saturated Unit Weight: 134 lb/ft3

Cohesion: 1350 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 2.275280
Center: 464.901, 1195.314
Radius: 534.501
Left Slip Surface Endpoint: 274.014, 696.061
Right Slip Surface Endpoint: 857.262, 832.348
Resisting Horizontal Force=1.73697e+006 lb
Driving Horizontal Force=763411 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 5000
Number of Invalid Surfaces: 0

List of All Coordinates

Focus/Block Search Line
387 661
1209 662

Material Boundary
108 670
387 670
387 670
387 670
387 660

Material Boundary
290 701
292 701
302 701

Material Boundary
0 483
1800 483

Material Boundary
292 701
387 670
387 670
390 669
421 667

498 665
580 662
661 665
750 667
839 665
920 662
1002 665
1079 667
1100 669
1161 689
1210 689
1282 665
1325 662
1449 666
1555 662
1670 666
1800 663

Material Boundary
78 660
387 660
1800 660

Material Boundary
302 701
391 672
421 670
498 668
580 665
661 668
750 670
839 668
920 665
1002 668
1079 670
1099 672
1103 673

Material Boundary
1160 694
1210 694

Material Boundary
1670 669
1800 666

Material Boundary
307 701
393 673

Material Boundary

307	701
527	756
807	826
1023	836
1241	846
1454	848
1668	848
1800	848

Material Boundary

307	701
743	810
796	810
1140	700
1160	694

Material Boundary

1210	694
1651	840
1708	847
1800	847

Material Boundary

387	673
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673

Material Boundary

307	701
302	701
387	673

Material Boundary

1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

Material Boundary

1210	694
1285	669
1279	669
1210	692
1210	694

Material Boundary

1210	692
1283	668
1325	665
1441	669
1555	665
1670	669

Material Boundary

1282	665
1283	668

Material Boundary

1210	689
1210	692

Material Boundary

1160	692
1161	689

Material Boundary

1099	672
1100	669

Material Boundary

390	669
391	672

Material Boundary

1098	673
1160	694
1160	692
1103	673
1098	673

Material Boundary

1160	694
1160	694

External Boundary

1800	300
1800	483
1800	660

1800	663
1800	666
1800	667
1800	847
1800	848
1800	852
1668	852
1454	852
1240	850
1023	840
806	830
526	760
319	708
290	701
287	701
286	700
275	696
236	700
231	701
198	700
108	670
78	660
53	652
0	651
0	483
0	300

Water Table

0	651
53	652
78	660
108	670
172	691
336	691
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673
1153	691
1217	691
1285	669
1325	666
1441	670

1555	666
1670	670
1800	667

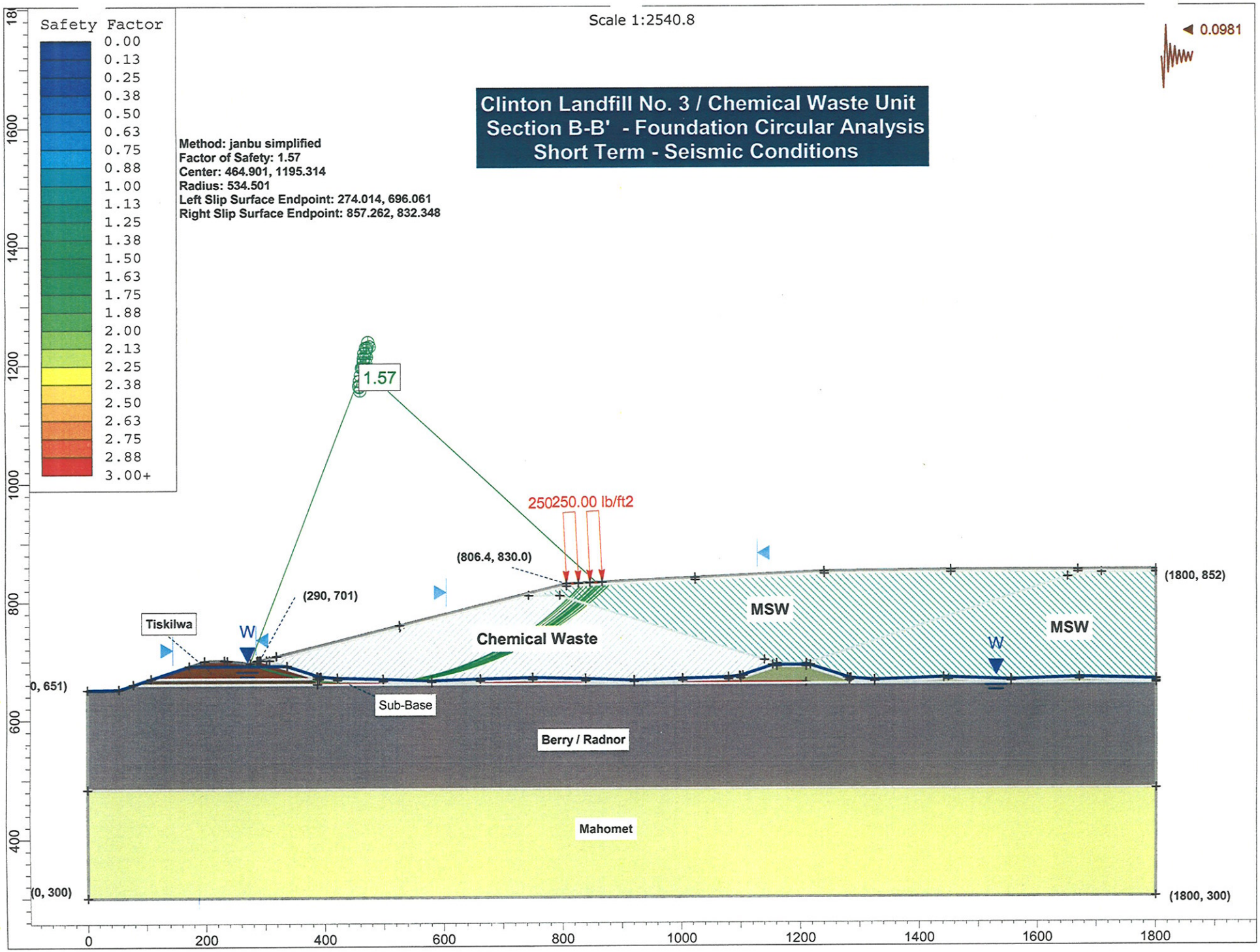
Distributed Load

826 831
806 830

Distributed Load

866 833
846 832

CROSS SECTION B-B'
FOUNDATION CIRCULAR FAILURE
SHORT TERM / SEISMIC ANALYSIS


Clinton Landfill No. 3 / Chemical Waste Unit
Section B-B' - Foundation Circular Analysis
Short Term - Seismic Conditions
Scale 1:2540.8
0.0981
Safety Factor
0.00
0.13
0.25
0.38
0.50
0.63
0.75
0.88
1.00
1.13
1.25
1.38
1.50
1.63
1.75
1.88
2.00
2.13
2.25
2.38
2.50
2.63
2.75
2.88
3.00+
Method: janbu simplified
Factor of Safety: 1.57
Center: 464.901, 1195.314
Radius: 534.501
Left Slip Surface Endpoint: 274.014, 696.061
Right Slip Surface Endpoint: 857.262, 832.348
1.57
250250.00 lb/ft2
(806.4, 830.0)
(290, 701)
(1800, 852)
Tiskilwa
W
Chemical Waste
MSW
MSW
W
(0, 651)
Sub-Base
Berry / Radnor
Mahomet
(0, 300)
(1800, 300)
0
200
400
600
800
1000
1200
1400
1600
1800

Slide Analysis Information

Document Name

File Name: B-B'_SSEIS_FC

Project Settings

Project Title: Clinton Landfill No. 3/ Chemical Waste Unit, B-B' FOUNDATION CIRCULAR, SHORT TERM/SEISMIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 5000
Upper Angle: -45
Lower Angle: -45
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: 668
Minimum Depth: 1

Loading

Seismic Load Coefficient (Horizontal): 0.0981
2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250

lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3500 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1400 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 6000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Final Cover
Strength Type: Mohr-Coulomb
Unit Weight: 128 lb/ft3
Cohesion: 1350 psf
Friction Angle: 0 degrees
Water Surface: None

Material: MSW
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 75 lb/ft3
Saturated Unit Weight: 75 lb/ft3

Cohesion: 500 psf
Friction Angle: 30 degrees
Water Surface: None

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 840 psf
Friction Angle: 17.4 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 3000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 128 lb/ft3

Saturated Unit Weight: 134 lb/ft3
Cohesion: 1350 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 1.569460
Center: 464.901, 1195.314
Radius: 534.501
Left Slip Surface Endpoint: 274.014, 696.061
Right Slip Surface Endpoint: 857.262, 832.348
Resisting Horizontal Force=1.71234e+006 lb
Driving Horizontal Force=1.09104e+006 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 5000
Number of Invalid Surfaces: 0

List of All Coordinates

Focus/Block Search Line
387 661
1209 662

Material Boundary
108 670
387 670
387 670
387 670
387 660

Material Boundary
290 701
292 701
302 701

Material Boundary
0 483
1800 483

Material Boundary
292 701
387 670
387 670
390 669

421	667
498	665
580	662
661	665
750	667
839	665
920	662
1002	665
1079	667
1100	669
1161	689
1210	689
1282	665
1325	662
1449	666
1555	662
1670	666
1800	663

Material Boundary

78	660
387	660
1800	660

Material Boundary

302	701
391	672
421	670
498	668
580	665
661	668
750	670
839	668
920	665
1002	668
1079	670
1099	672
1103	673

Material Boundary

1160	694
1210	694

Material Boundary

1670	669
1800	666

Material Boundary

307	701
393	673

Material Boundary

307	701
527	756
807	826
1023	836
1241	846
1454	848
1668	848
1800	848

Material Boundary

307	701
743	810
796	810
1140	700
1160	694

Material Boundary

1210	694
1651	840
1708	847
1800	847

Material Boundary

387	673
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673

Material Boundary

307	701
302	701
387	673

Material Boundary

1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

Material Boundary

1210	694
1285	669
1279	669
1210	692
1210	694

Material Boundary

1210	692
1283	668
1325	665
1441	669
1555	665
1670	669

Material Boundary

1282	665
1283	668

Material Boundary

1210	689
1210	692

Material Boundary

1160	692
1161	689

Material Boundary

1099	672
1100	669

Material Boundary

390	669
391	672

Material Boundary

1098	673
1160	694
1160	692
1103	673
1098	673

Material Boundary

1160	694
1160	694

External Boundary

1800	300
1800	483

1800	660
1800	663
1800	666
1800	667
1800	847
1800	848
1800	852
1668	852
1454	852
1240	850
1023	840
806	830
526	760
319	708
290	701
287	701
286	700
275	696
236	700
231	701
198	700
108	670
78	660
53	652
0	651
0	483
0	300

Water Table

0	651
53	652
78	660
108	670
172	691
336	691
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673
1153	691
1217	691
1285	669
1325	666

1441	670
1555	666
1670	670
1800	667

Distributed Load

826 831
806 830

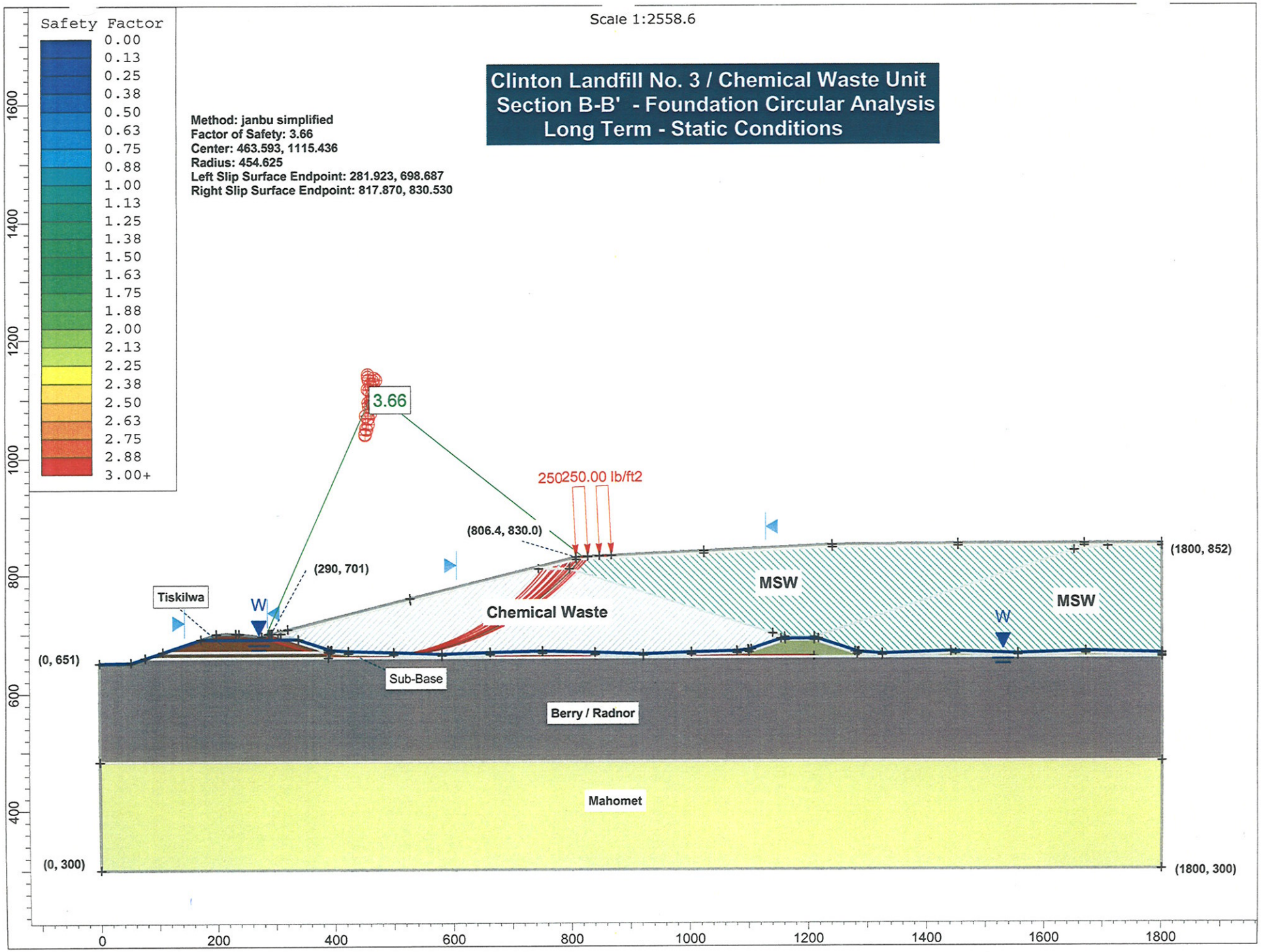
Distributed Load

866 833
846 832

CROSS SECTION B-B'
FOUNDATION CIRCULAR FAILURE
LONG TERM / STATIC ANALYSIS

Scale 1:2558.6

Clinton Landfill No. 3 / Chemical Waste Unit
Section B-B' - Foundation Circular Analysis
Long Term - Static Conditions



Slide Analysis Information

Document Name

File Name: B-B'_LSTAT_FC

Project Settings

Project Title: Clinton Landfill No. 3/ Chemical Waste Unit, B-B' FOUNDATION CIRCULAR, LONG TERM/STATIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 5000
Upper Angle: -45
Lower Angle: -45
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: 668
Minimum Depth: 1

Loading

2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 600 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1500 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 1100 psf
Friction Angle: 18 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Final Cover
Strength Type: Mohr-Coulomb
Unit Weight: 128 lb/ft3
Cohesion: 1300 psf
Friction Angle: 22 degrees
Water Surface: None

Material: MSW
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 75 lb/ft3
Saturated Unit Weight: 75 lb/ft3
Cohesion: 500 psf

Friction Angle: 30 degrees
Water Surface: None

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 240 psf
Friction Angle: 45 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 700 psf
Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 128 lb/ft3
Saturated Unit Weight: 134 lb/ft3

Cohesion: 1300 psf
Friction Angle: 22 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 3.662530
Center: 463.593, 1115.436
Radius: 454.625
Left Slip Surface Endpoint: 281.923, 698.687
Right Slip Surface Endpoint: 817.870, 830.530
Resisting Horizontal Force=2.45443e+006 lb
Driving Horizontal Force=670147 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 5000
Number of Invalid Surfaces: 0

List of All Coordinates

Focus/Block Search Line
387 661
1209 662

Material Boundary
108 670
387 670
387 670
387 670
387 660

Material Boundary
290 701
292 701
302 701

Material Boundary
0 483
1800 483

Material Boundary
292 701
387 670
387 670
390 669
421 667

498	665
580	662
661	665
750	667
839	665
920	662
1002	665
1079	667
1100	669
1161	689
1210	689
1282	665
1325	662
1449	666
1555	662
1670	666
1800	663

Material Boundary

78	660
387	660
1800	660

Material Boundary

302	701
391	672
421	670
498	668
580	665
661	668
750	670
839	668
920	665
1002	668
1079	670
1099	672
1103	673

Material Boundary

1160	694
1210	694

Material Boundary

1670	669
1800	666

Material Boundary

307	701
393	673

Material Boundary

307	701
527	756
807	826
1023	836
1241	846
1454	848
1668	848
1800	848

Material Boundary

307	701
743	810
796	810
1140	700
1160	694

Material Boundary

1210	694
1651	840
1708	847
1800	847

Material Boundary

387	673
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673

Material Boundary

307	701
302	701
387	673

Material Boundary

1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

Material Boundary

1210	694
1285	669
1279	669
1210	692
1210	694

Material Boundary

1210	692
1283	668
1325	665
1441	669
1555	665
1670	669

Material Boundary

1282	665
1283	668

Material Boundary

1210	689
1210	692

Material Boundary

1160	692
1161	689

Material Boundary

1099	672
1100	669

Material Boundary

390	669
391	672

Material Boundary

1098	673
1160	694
1160	692
1103	673
1098	673

Material Boundary

1160	694
1160	694

External Boundary

1800	300
1800	483
1800	660

1800	663
1800	666
1800	667
1800	847
1800	848
1800	852
1668	852
1454	852
1240	850
1023	840
806	830
526	760
319	708
290	701
287	701
286	700
275	696
236	700
231	701
198	700
108	670
78	660
53	652
0	651
0	483
0	300

Water Table

0	651
53	652
78	660
108	670
172	691
336	691
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673
1153	691
1217	691
1285	669
1325	666
1441	670

1555	666
1670	670
1800	667

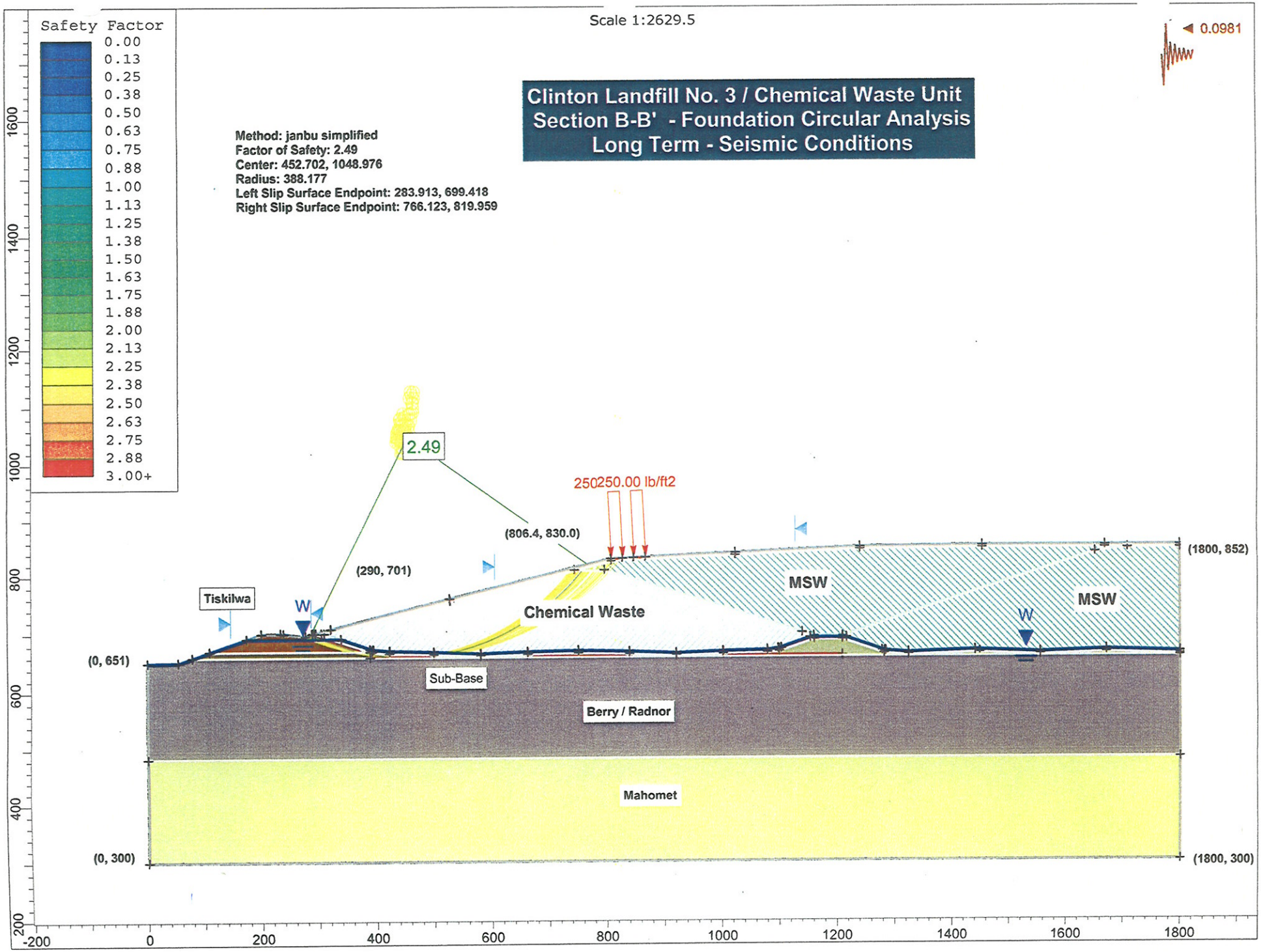
Distributed Load

826 831
806 830

Distributed Load

866 833
846 832

CROSS SECTION B-B'
FOUNDATION CIRCULAR FAILURE
LONG TERM / SEISMIC ANALYSIS


Safety Factor
0.00
0.13
0.25
0.38
0.50
0.63
0.75
0.88
1.00
1.13
1.25
1.38
1.50
1.63
1.75
1.88
2.00
2.13
2.25
2.38
2.50
2.63
2.75
2.88
3.00+
Scale 1:2629.5
0.0981
Clinton Landfill No. 3 / Chemical Waste Unit
Section B-B' - Foundation Circular Analysis
Long Term - Seismic Conditions
Method: janbu simplified
Factor of Safety: 2.49
Center: 452.702, 1048.976
Radius: 388.177
Left Slip Surface Endpoint: 283.913, 699.418
Right Slip Surface Endpoint: 766.123, 819.959
2.49
250250.00 lb/ft2
(806.4, 830.0)
(290, 701)
(1800, 852)
Tiskilwa
W
Chemical Waste
MSW
MSW
W
(0, 651)
Sub-Base
Berry / Radnor
Mahomet
(0, 300)
(1800, 300)
1600
1400
1200
1000
800
600
400
200
-200
0
200
400
600
800
1000
1200
1400
1600
1800

Slide Analysis Information

Document Name

File Name: B-B'_LSEIS_FC

Project Settings

Project Title: Clinton Landfill No. 3/ Chemical Waste Unit, B-B' FOUNDATION CIRCULAR, LONG TERM/SEISMIC
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 5000
Upper Angle: -45
Lower Angle: -45
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: 668
Minimum Depth: 1

Loading

Seismic Load Coefficient (Horizontal): 0.0981
2 Distributed Loads present:
Distributed Load #1 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250 lb/ft2
Distributed Load #2 Constant Distribution, Orientation: Normal to boundary, Magnitude: 250

lb/ft2

Material Properties

Material: Tiskilwa
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 600 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Roxana / Robein
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 100 lb/ft3
Saturated Unit Weight: 110 lb/ft3
Cohesion: 1500 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Berry / Radnor
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 140 lb/ft3
Saturated Unit Weight: 148 lb/ft3
Cohesion: 1100 psf
Friction Angle: 18 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Mahomet
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Final Cover
Strength Type: Mohr-Coulomb
Unit Weight: 128 lb/ft3
Cohesion: 1300 psf
Friction Angle: 22 degrees
Water Surface: None

Material: MSW
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 75 lb/ft3
Saturated Unit Weight: 75 lb/ft3

Cohesion: 500 psf
Friction Angle: 30 degrees
Water Surface: None

Material: Chemical Waste
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 90 lb/ft3
Saturated Unit Weight: 90 lb/ft3
Cohesion: 240 psf
Friction Angle: 45 degrees
Water Surface: None

Material: LCS
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 126 lb/ft3
Saturated Unit Weight: 130 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sideslope Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bottom Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sub-Base
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 135 lb/ft3
Saturated Unit Weight: 140 lb/ft3
Cohesion: 700 psf
Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Select Fill on Sideslopes
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 128 lb/ft3

Saturated Unit Weight: 134 lb/ft3
Cohesion: 1300 psf
Friction Angle: 22 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: janbu simplified
FS: 2.492090
Center: 452.702, 1048.976
Radius: 388.177
Left Slip Surface Endpoint: 283.913, 699.418
Right Slip Surface Endpoint: 766.123, 819.959
Resisting Horizontal Force=2.00371e+006 lb
Driving Horizontal Force=804027 lb

Valid / Invalid Surfaces

Method: janbu simplified
Number of Valid Surfaces: 5000
Number of Invalid Surfaces: 0

List of All Coordinates

Focus/Block Search Line
387 661
1209 662

Material Boundary
108 670
387 670
387 670
387 670
387 660

Material Boundary
290 701
292 701
302 701

Material Boundary
0 483
1800 483

Material Boundary
292 701
387 670
387 670
390 669

421	667
498	665
580	662
661	665
750	667
839	665
920	662
1002	665
1079	667
1100	669
1161	689
1210	689
1282	665
1325	662
1449	666
1555	662
1670	666
1800	663

Material Boundary

78	660
387	660
1800	660

Material Boundary

302	701
391	672
421	670
498	668
580	665
661	668
750	670
839	668
920	665
1002	668
1079	670
1099	672
1103	673

Material Boundary

1160	694
1210	694

Material Boundary

1670	669
1800	666

Material Boundary

307	701
393	673

Material Boundary

307	701
527	756
807	826
1023	836
1241	846
1454	848
1668	848
1800	848

Material Boundary

307	701
743	810
796	810
1140	700
1160	694

Material Boundary

1210	694
1651	840
1708	847
1800	847

Material Boundary

387	673
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673

Material Boundary

307	701
302	701
387	673

Material Boundary

1285	669
1325	666
1441	670
1555	666
1670	670
1800	667

Material Boundary

1210	694
1285	669
1279	669
1210	692
1210	694

Material Boundary

1210	692
1283	668
1325	665
1441	669
1555	665
1670	669

Material Boundary

1282	665
1283	668

Material Boundary

1210	689
1210	692

Material Boundary

1160	692
1161	689

Material Boundary

1099	672
1100	669

Material Boundary

390	669
391	672

Material Boundary

1098	673
1160	694
1160	692
1103	673
1098	673

Material Boundary

1160	694
1160	694

External Boundary

1800	300
1800	483

1800	660
1800	663
1800	666
1800	667
1800	847
1800	848
1800	852
1668	852
1454	852
1240	850
1023	840
806	830
526	760
319	708
290	701
287	701
286	700
275	696
236	700
231	701
198	700
108	670
78	660
53	652
0	651
0	483
0	300

Water Table

0	651
53	652
78	660
108	670
172	691
336	691
393	673
421	671
498	669
580	666
661	669
750	671
839	669
920	666
1002	669
1079	671
1098	673
1153	691
1217	691
1285	669
1325	666

1441	670
1555	666
1670	670
1800	667

Distributed Load

826 831
806 830

Distributed Load

866 833
846 832