ATTACHMENT 7-III

STABILITY ANALYSES

1 - PURPOSE OF ANALYSIS

The purpose of this analysis is to evaluate slope stability of the proposed landfill expansion at various locations, stages of development, and for applicable failure modes. Calculated factors of safety against slope stability failure are compared against minimum acceptable factors of safety.

2 - APPROACH

Cross-sections are cut and analyzed at potentially critical alignments representing stages of construction, intermediate filling, and final configuration. In addition, for each configuration and location, multiple failure modes are evaluated including circular failure and block-sliding along the composite liner interfaces, as applicable. Slope stability analyses for the final configuration include both static and seismic loading conditions.

3 – EXISTING SUBSURFACE CONDITIONS

Subsurface soil and bedrock stratigraphy are inferred from logs for nearby borings performed for the expansion application and from previous subsurface explorations and geologic cross-sections compiled for the 1995 permit application (Dell 1995), (EES 2016).

Soil stratigraphy (Dell 1995) generally consists of four soil units overlying bedrock, namely: (1) soft to stiff silty clay; (2) dense upper sand; (3) hard sandy clay to dense clayey sand and silt; and (4) dense lower sand. In some areas, the hard sandy clay and the lower dense sand strata are absent. Top of bedrock is typically encountered between elevations 450 feet to 475 feet at borings located at the landfill.

For the purpose of these analyses, the foundation soils are modeled as a single soil unit with geotechnical properties consistent with the soft to stiff upper silty clay unit. This approach is conservative since it ignores the presence of the higher strength sand and hard sandy clay units underlying the upper silty clay.

4 – RELEVANT LANDFILL DESIGN FEATURES

The currently permitted landfill includes both pre-Subtitle D and Subtitle D disposal areas. Cells A through E on the north side of the existing landfill footprint are pre-Subtitle D disposal areas and have a natural soil buffer lining the disposal cells with granular leachate collection layer. Where it has been constructed, the final cover for the pre-subtitle D area consists of 3-foot thick soil cover (1-foot vegetative layer over 2-foot infiltration layer).

Phase 1 through Phase 8 of the currently permitted landfill (Phase 8 is not yet constructed) are Subtitle D disposal areas with a composite liner. Permitted liner configurations for the Subtitle D areas consist of 60-mil HDPE geomembrane overlying a 2-foot thick compacted clay liner or a geosynthetic clay liner (Dell 2001). Based on available information, a smooth geomembrane was used for all areas except Phase 7, where a textured geomembrane was used. The permitted leachate collection layer design consists of 1-foot of granular drainage layer overlying a non-woven geotextile or a geocomposite drainage layer. A 1-foot thick intermediate cover soil layer currently covers inactive areas.

The proposed expansion area will have a liner consist of a 60-mil textured geomembrane overlying a 2-foot compacted clay liner or a geosynthetic clay liner. The leachate collection layer will consist of 1-foot of granular drainage layer overlying a non-woven geotextile or a geocomposite drainage layer. Above the footprint of the pre-Subtitle D disposal cells, an overliner system will be constructed above currently permitted waste grades. The overliner will have a nominal 5% slope to the north and south. The overliner will have the same design as the base liner for the expansion area. Final cover for the proposed expansion will be 4-feet thick and will include a 40-mil textured LLDPE geomembrane.

Two potentiometric surfaces were modeled for the slope stability analyses. A 1-foot leachate head was modeled

above the base liner. The leachate surface was used for calculation of stresses in the leachate collection layer and on the base liner interface. A groundwater potentiometric surface was modeled from 2015 water levels measured in facility monitoring wells (Keck 2015) and others. The groundwater potentiometric surface was used for calculation of stresses within the foundation soils.

5 - SELECTION OF CROSS-SECTIONS FOR SLOPE STABILITY ANALYSIS

Figure 1 depicts the location and alignment of seven cross-sections used for slope stability analysis. The cross-sections are discussed below.

5. 1 – Intermediate Configurations

Five cross-sections (Figure 1) were selected to model intermediate configurations during key stages of the landfill expansion construction and filling:

- **Section AA' – Excavation at Proposed Phase 11**: This east-west cross-section (Figure 2) models the situation that will exist at the conclusion of the foundation excavation for Phase 11 (Expansion Area). A 3H:1V excavation slope on the west side of the phase area will begin near the toe of the existing landfill waste slope and will extend down approximately 50-foot below original ground surface to approximately elevation 600 feet. Immediately west of Phase 11 excavation slope, the existing landfill waste slope rises at 4H:1V to approximately elevation 745 feet.
- **Section BB' – Intermediate Waste Grades at End of Phase 11 Filling**: This east-west cross-section (Figure 3) models the situation that will exist near the conclusion of filling of Phase 11. The Phase 11 bottom liner is at approximately elevation 600 feet. The toe of the interim waste slope will be near the east edge of Phase 11 and the waste slope will rise back and to the west at 3H:1V up to approximately elevation 700 feet. To be conservative, the herringbone base grading is ignored and replaced by a horizontal base liner.
- **Section CC' – Intermediate Waste Grades at End of Phase 12 Filling**: This east-west cross-section (Figure 4) is at same approximate location as Section BB' but models the situation that will exist near the conclusion of filling of Phase 12. The Phase 12 bottom liner is at approximately elevation 600 feet. The toe of the interim waste slope will be near the east edge of Phase 12 and the waste slope will rise back and to the west at 3H:1V up to approximately elevation 730 feet. To be conservative, the herringbone base grading is ignored and replaced by a horizontal base liner.
- **Section DD' – Excavation at Phase 8**: This north-south cross-section (Figure 5) models the situation that will exist at the conclusion of foundation excavation for the north end of Phase 8. A 3H:1V excavation slope on the north edge Phase 8 will extend down approximately 45 feet below original ground surface to approximately elevation 630 feet. At the top of the excavation slope, the interim waste slope will rise up to the north at 3H:1V to approximately elevation 750 feet.
- **Section EE' – Intermediate Waste Grades during Phase 8 Filling**: This north-south cross-section (Figure 6) models the situation that will exist near the conclusion of filling of the north end of Phase 8. The Phase 8 bottom liner is at approximately elevation 630 feet. The toe of the interim waste slope will be near middle of Phase 8 (approximately 5100N coordinate line) and the interim waste slope will rise up to the north at 3H:1V to approximately elevation 835 feet. The waste cross-section also includes the overliner that will be constructed above the pre-Subtitle D disposal cells. To be conservative, the herringbone base grading in Phase 8 disposal cell is ignored and replaced by a horizontal base liner.

5.2 – Final Configuration

Two cross-sections (Figure 1) were selected to model the final configuration of the landfill at the conclusion of filling:

- **Section FF' – South Side of Landfill**: This north-south cross-section (Figure 7) models the final configuration through the south side of the landfill (Phase 4 area). This is considered a potentially

critical section due to the maximum fill height, relatively low sideslope berm at the south edge of the Phase 4 disposal cell, and the smooth HDPE geomembrane and the geosynthetic clay liner used for the liner construction.

- **Section GG' – North Side of Landfill**: This north-south cross-section (Figure 8) models the final configuration through the north side of the landfill. The section includes the proposed overliner system that will be constructed above the existing waste over the pre-subtitle D disposal cell footprint.

6 – MATERIAL GEOTECHNICAL PROPERTIES

Table 1, below, summarizes the individual soil units and their respective geotechnical properties used in the slope stability models. Additional information concerning the assignment of the geotechnical properties follows the table.

Table 1 - XSTABL Slope Stability Model Soil Units and Properties

Soil Unit	Description	γ_{MOIST} (pcf)	$\gamma_{SATURATED}$ (pcf)	Cohesion, c (psf)	Friction, ϕ (degrees)
1	Grading Layer Fill/ Intermediate & Final Cover	128	130	0	24
2	Waste	80	85	210	25
3	Leachate Collection Layer	125	130	0	32
4	Existing Interface with Smooth HDPE – Peak	65	65	0	11
5	Existing Interface with Smooth HDPE – Residual	65	65	0	8
6	Existing Interface with Textured HDPE – Peak	65	65	0	18
7	Existing Interface with Textured HDPE –Residual	65	65	0	8
8	Proposed Critical Interface – Peak	65	65	0	18
9	Proposed Critical Interface – Residual	65	65	0	8
10	Compacted Clay Liner	128	130	180	24
11	Foundation Soil – Silty Clay	128	130	180	24

Grading Layer Fill / Intermediate and Final Cover Soil: The unit weight and strength values assigned to this soil unit are presumptive values based the assumption that the majority of the soils used in these soil layers will come from on-site borrow excavations in the native silty clay stratum.

Waste: The moist unit weight is derived from historical site operation data. The unit weight value is consistent with typical values reported by Zekkos et al (2006). Shear strength of the waste is based on typical back-calculated strength values for municipal solid waste based on Koerner & Wong (2011).

Leachate Collection Layer Sand: The unit weight and shear strength are presumptive values for a medium dense to dense uniform sand.

Existing Interface with Smooth HDPE – Peak and Residual: These layers are intended to model the critical geosynthetic interface for a composite liner system that includes a smooth HDPE geomembrane, such as exists in the liner of Phases 1 through 6 of the existing Subtitle D landfill. In the absence of site-specific interface friction test data, presumed interface friction values of 11 degrees for peak and 8 degrees for residual were assigned to the interface. The peak value is used for the base liner and the residual value is used for sideslope liner. The peak value is consistent with typical values reported for nonwoven geotextile-to-smooth HDPE geomembrane under high normal loads (Koerner & Narejo 2005) and slightly lower than typical values for cohesive soil-to-smooth HDPE geomembrane. The residual value is a conservative lower bound strength for the residual strength of a geosynthetic clay liner under high normal loads. These values are considered conservative but appropriate presumptive values for modeling the existing composite liner system.

Existing Interface with Textured HDPE – Peak and Residual: These layers are intended to model the critical geosynthetic interface for a composite liner system that includes a textured HDPE geomembrane, such as exists in the liner of Phase 7 of the existing Subtitle D landfill. In the absence of site-specific interface friction test data, presumed interface friction values of 18 degrees for peak and 8 degrees for residual were assigned. The peak value is consistent with typical values for compacted cohesive soil-to-textured HDPE geomembrane under high normal loads (Koerner & Narejo 2005) and slightly lower than typical values for nonwoven geotextile-to-textured HDPE geomembrane or granular soil-to textured HDPE geomembrane interfaces. The residual value is a conservative lower bound strength for the residual strength of a geosynthetic clay liner and high normal loads. Note that no slope stability cross-sections were ultimately cut through the Phase 7 disposal cell and, consequently, these XSTABL soil units were not assigned in the models analyzed.

Proposed Critical Interface with Textured HDPE- Peak and Residual: These layers are intended to model the critical geosynthetic interface for a proposed composite liner system that includes a textured HDPE geomembrane, such as will be used in the proposed expansion area liner, overliner area, and future Phase 8 liner. The peak friction angle, used for base liner areas, is the back-calculated minimum allowable interface friction required to achieve the acceptable factor of safety against block sliding failure for intermediate filling configurations in the expansion area. The residual value is a conservative lower bound strength for the residual strength of a geosynthetic clay liner and high normal loads.

Compacted Clay Liner: The unit weight and shear strength values are assumed to be equivalent to those of the native silty clay soil stratum from which the soil is derived.

Foundation Soil - Silty Clay: The unit weight value represents an average of laboratory bulk density measurements made on six undisturbed soil samples collected from borings DB-24, DB-27, SB-32, and SB-36. The shear strength values represent the lower of two total stress shear strength parameters from consolidated-undrained shear strength tests performed on undisturbed soil samples collected from two depths in boring DB-24. Note that the effective shear strength parameters for the same soil samples are higher (c' = 288 psf, ϕ' = 29.2°), but were not used in the analyses.

7 –SLOPE STABILITY ANALYSIS METHODOLOGY

Slope stability calculations will be performed using XSTABL two-dimensional limit equilibrium slope stability software (Sharma 2011).

The earthquake loading scenario for slope stability analyses of the final configuration models consists of a pseudo-static analysis performed using a horizontal acceleration of a_h = 0.031g, which is equal to the peak ground acceleration at the site associated with an earthquake hazard with a 2% probability of exceedance in 50 years (return period = 2,475 years) based on the USGS 2008 probabilistic seismic hazard mapping (USGS 2008), as shown on Figure 9.

For each cross-section, slope stability will be evaluated using circular failure surface search and block failure surface search. The circular failure surface search will calculate factor of safety against shallow and deep circular failure surfaces within any portion of the cross-section. Block failure surface searches will be constrained to the composite liner in order to evaluate the potential for sliding on a geosynthetic-geosynthetic or soil-geosynthetic interface.

The following minimum allowable factors of safety will be used for evaluation of slope stability results:

- Intermediate (Temporary) Configurations
  - Static: FS ≥ 1.4
- Final Configuration
  - Static: FS ≥ 1.5
  - Seismic: FS ≥ 1.1

8 –SLOPE STABILITY RESULTS

Table 2, below, summarizes the results of the slope stability analyses. Copies of the XSTABL output files are attached to this calculation.

Table 2 - Summary of Slope Stability Results

Configuration	Section	Description	Failure Mode	Minimum Calculated Factor of Safety			
				Static	Criteria	Seismic	Criteria
Intermediate	AA'	Phase 11 Excavation	Circular	1.5	≥1.4	-	-
			Block	-	≥1.4	-	-
	BB'	Phase 11 Interim Waste Grades	Circular	1.8	≥1.4	-	-
			Block	1.4	≥1.4	-	-
	CC'	Phase 12 Interim Waste Grades	Circular	1.7	≥1.4	-	-
			Block	1.8	≥1.4	-	-
	DD'	Phase 8 Excavation	Circular	1.9	≥1.4	-	-
			Block	2.2	≥1.4	-	-
	EE'	Phase 8 Interim Waste Grades	Circular	1.9	≥1.4	-	-
			Block	1.7	≥1.4	-	-
Final	FF'	Final South Side	Circular	2.2	≥1.5	1.9	≥1.1
			Block	1.5	≥1.5	1.3	≥1.1
	GG'	Final North Side	Circular	2.2	≥1.5	1.9	≥1.1
			Block	2.1	≥1.5	1.8	≥1.1

9 – ADDITIONAL SLOPE STABILITY CONSIDERATIONS

WCG was provided anecdotal information concerning disposal of sludge type wastes in the existing landfill. The information included the reported existence of an approximate 10-foot thick layer of sludge that may have been disposed at the base of Cell E. The significance of this reported sludge layer on the stability of the interim and final waste slopes was considered.

The possible existence of 10-foot thick sludge layer at the base of Cell E does not present a significant stability concern for the area east of the 2000E coordinate line. In this area, the sludge is at the bottom of a significant thickness of overlying waste and has had a significant amount of time to consolidate under that overburden weight and gain strength. Also, in this area, the potential sludge layer is laterally confined by a cell separation berm on the north and by in-place waste disposed in the Phase 4 through 7 disposal cells to the south of Cell E.

In the area west of the 2000E coordinate line (i.e., north of Phase 8), Cell E waste is not currently confined by waste to the south, since Phase 8 is not yet constructed. Therefore, an additional slope stability evaluation was performed to evaluate the potential significance of the reported sludge layer on the stability of the planned interim waste grades in that area. In the absence of information on the nature or strength of the reported sludge material, a slope stability model along cross-section DD' that includes a 10-ft thick sludge zone at base of Cell E was prepared and used to back-calculate the lowest allowable sludge strength possible while still achieving an acceptable factor of safety for the interim slope. Cross-section DD' models a condition corresponding to excavation of Phase 8 subgrade and 3H:1V interim waste slopes rising up from the south edge of Cell E to

currently permitted final waste grades (approximately equivalent to base of proposed overliner). For block-sliding failure through the Cell E sludge layer, the analysis indicates that a factor of safety of 1.4 is achieved for assumed sludge strengths of $\phi \geq 13.3$ degrees. A similar analysis indicates that the assumed sludge strength must drop to a value of $\phi = 7.4$ degrees before the calculated factor of safety for block sliding through the sludge is equal to one. The XSTABL model plots for these analyses are attached. As noted, the in-situ strength of the reported sludge layer is not known. However, typical wastewater treatment sludge would be expected to have a drained friction angle greater than 13.3 degrees. In addition, there is apparently no information to suggest that slope instability was experienced during filling at Cell E. Based on this analysis and evidence, the reported sludge layer at the base of Cell E is not expected to present a significant stability concern. The anticipated construction sequence and operational fill plan of Phase 8A however should be considered and waste placement in Phase 8A should be brought up to a level above the presumed elevation of sludge in Cell E prior to filling over the west portion of Cell E.

In WCG's judgement, the reported historical sludge disposal does not present a concern to the stability of the final configuration of the landfill since the reported contiguous sludge zones will be isolated well inside the final landform and beneath significant overburden stresses that will serve to consolidate and strengthen the sludge. In addition, these zones will not be situated at locations near the toe of final landfill slopes.

10 - REFERENCES

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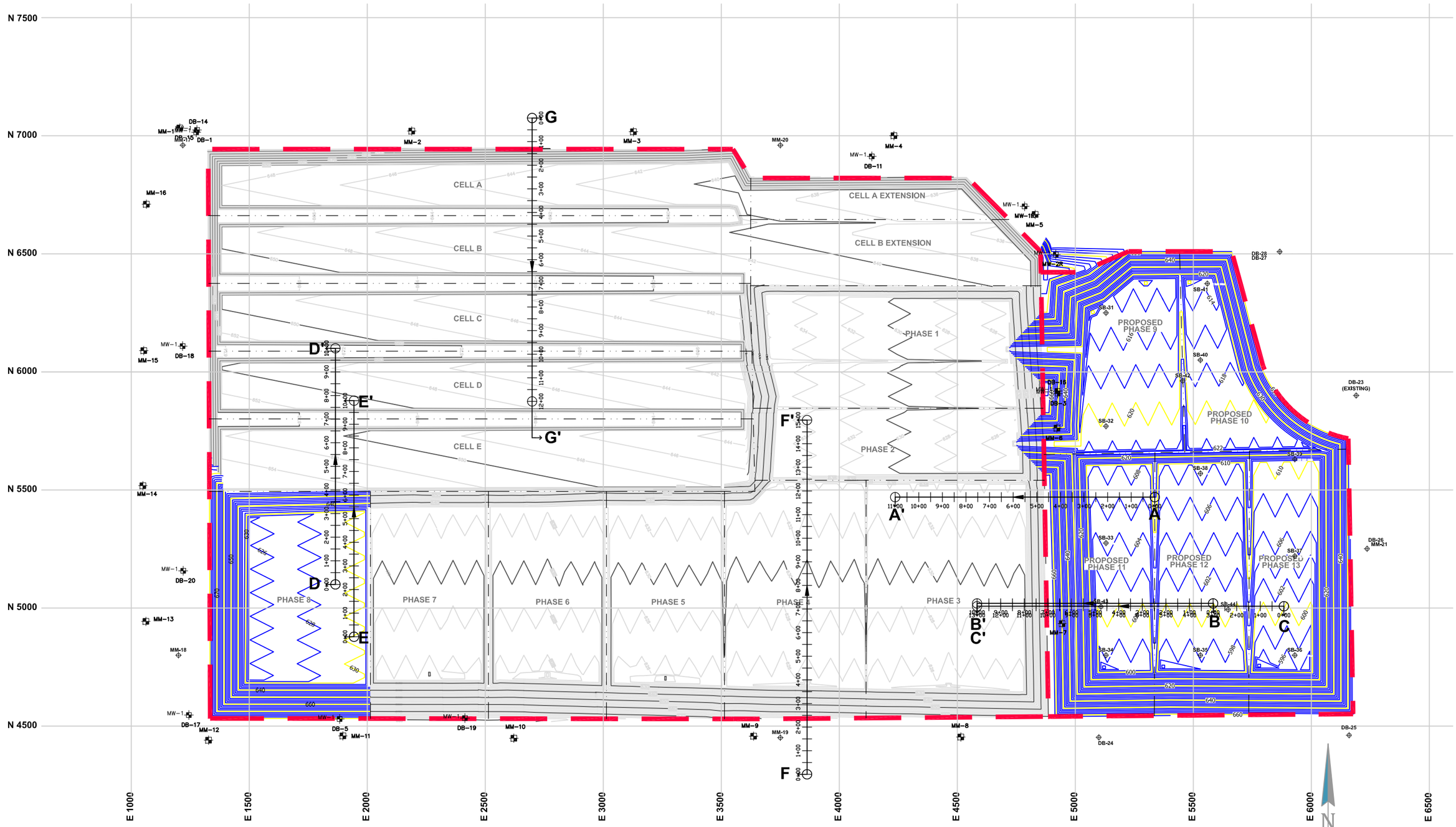
FIGURES AND ATTACHMENTS

Figure 1 – Plan View Slope Stability Cross-Sections
Figure 2 – Section AA' (Intermediate Configuration)
Figure 3 – Section BB' (Intermediate Configuration)
Figure 4 – Section CC' (Intermediate Configuration)
Figure 5 – Section DD' (Intermediate Configuration)
Figure 6 – Section EE' (Intermediate Configuration)
Figure 7 – Section FF' (Final Configuration)
Figure 8 – Section GG' (Final Configuration)
Figure 9 – USGS Probabilistic Seismic Hazard

Attachment A – XSTABL Output files

FIGURES



NOTE:

1. FOR CLARITY, ONLY BASE GRADES ARE SHOWN. REFER TO DESIGN DRAWINGS FOR PROPOSED INTERMEDIATE WASTE GRADES, OVERLINER GRADES, AND FINAL COVER GRADES.

SCALE: 1" = 400'

0 200' 400' 800'

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PLAN VIEW SLOPE STABILITY CROSS-SECTIONS SLOPE STABILITY ANALYSES

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FIGURE 1

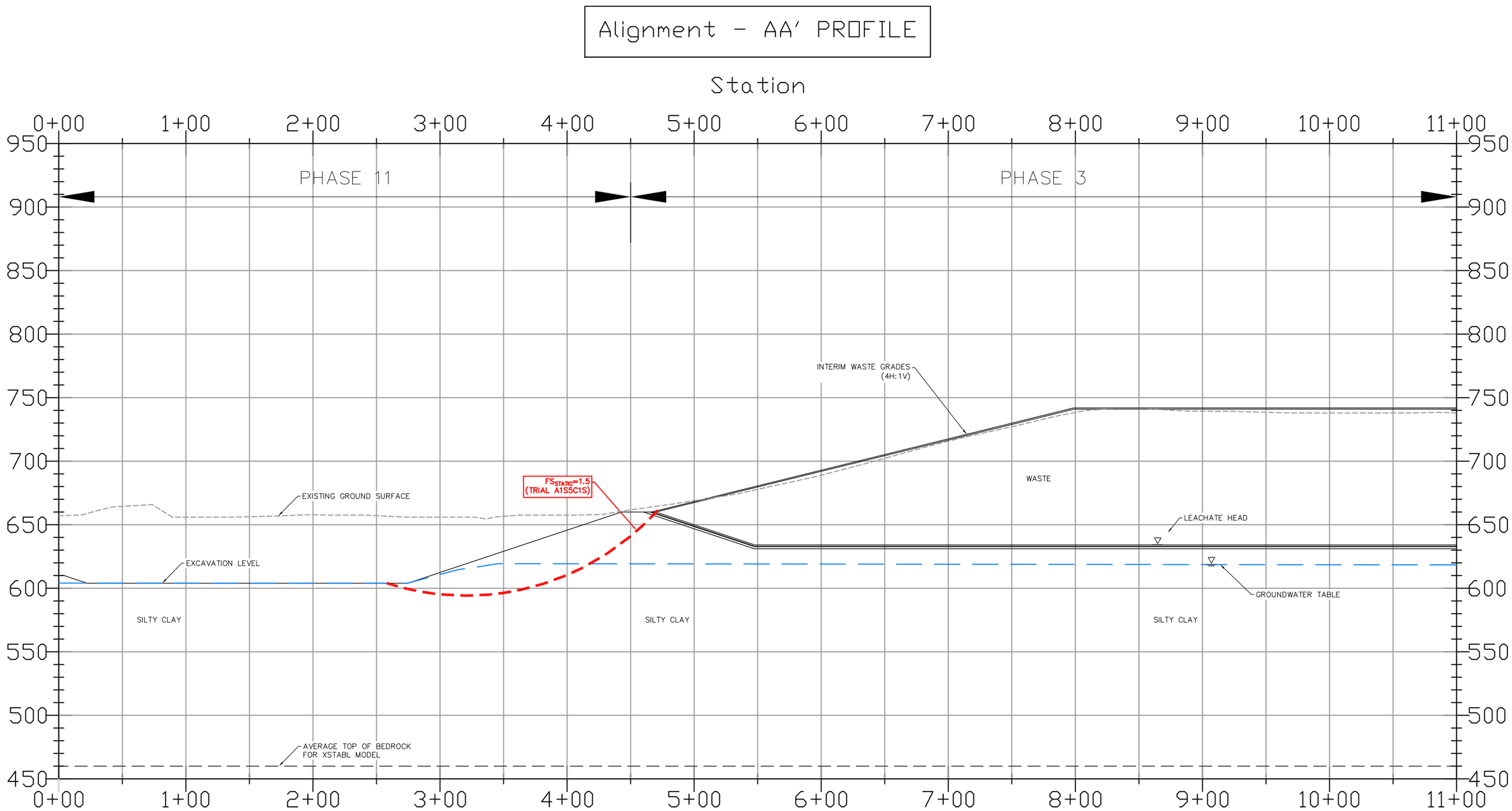

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FIGURE 2

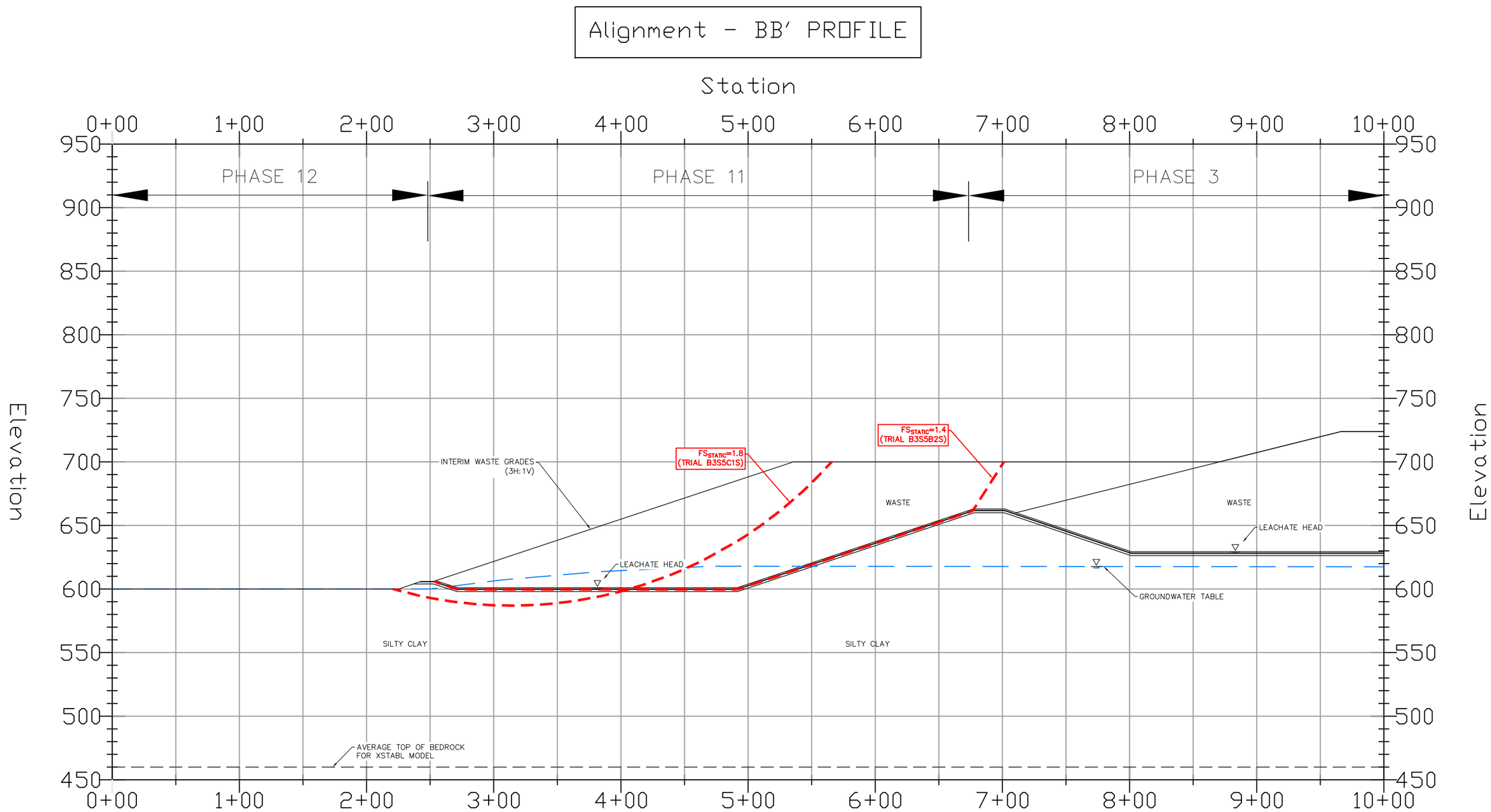

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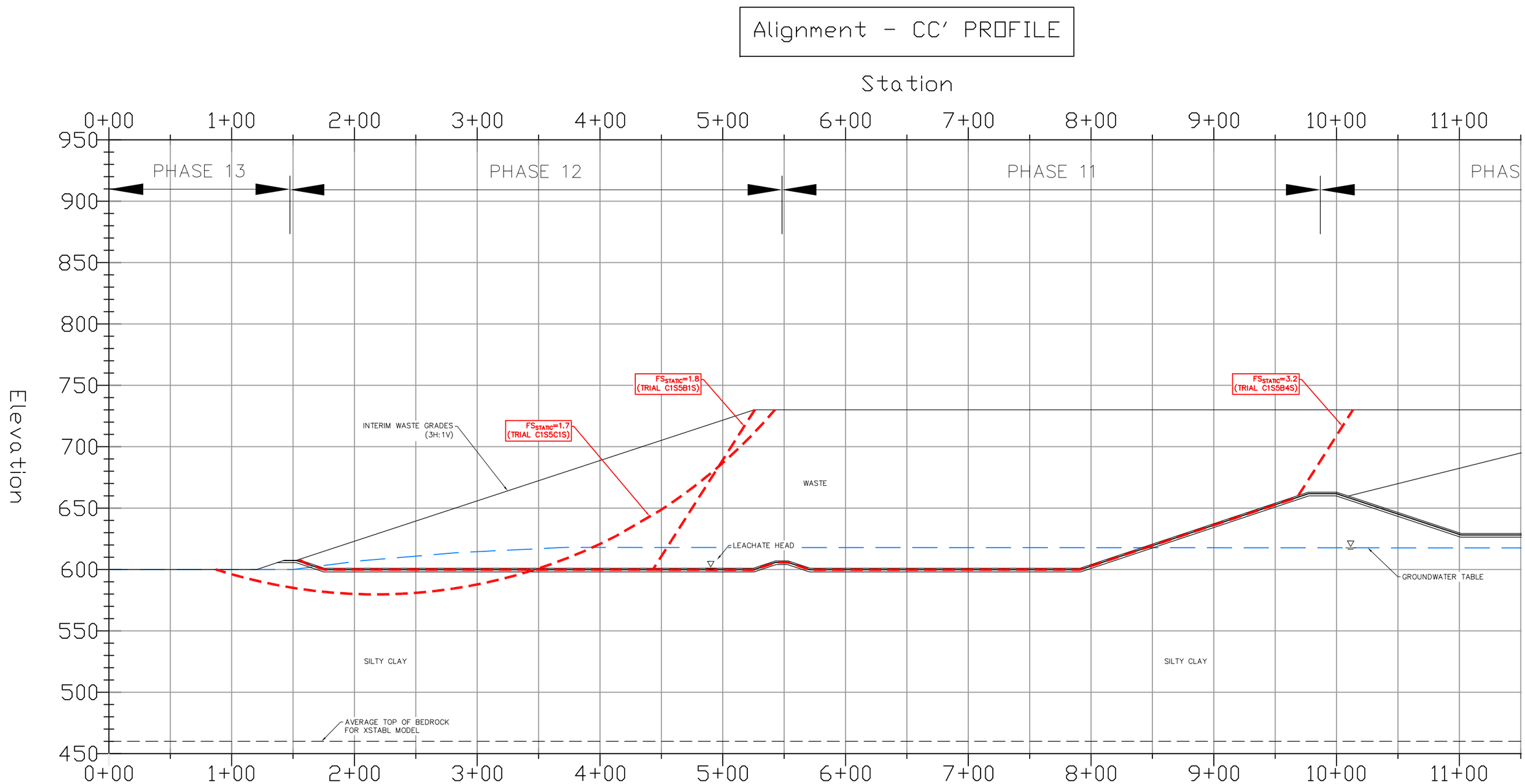
FIGURE 3



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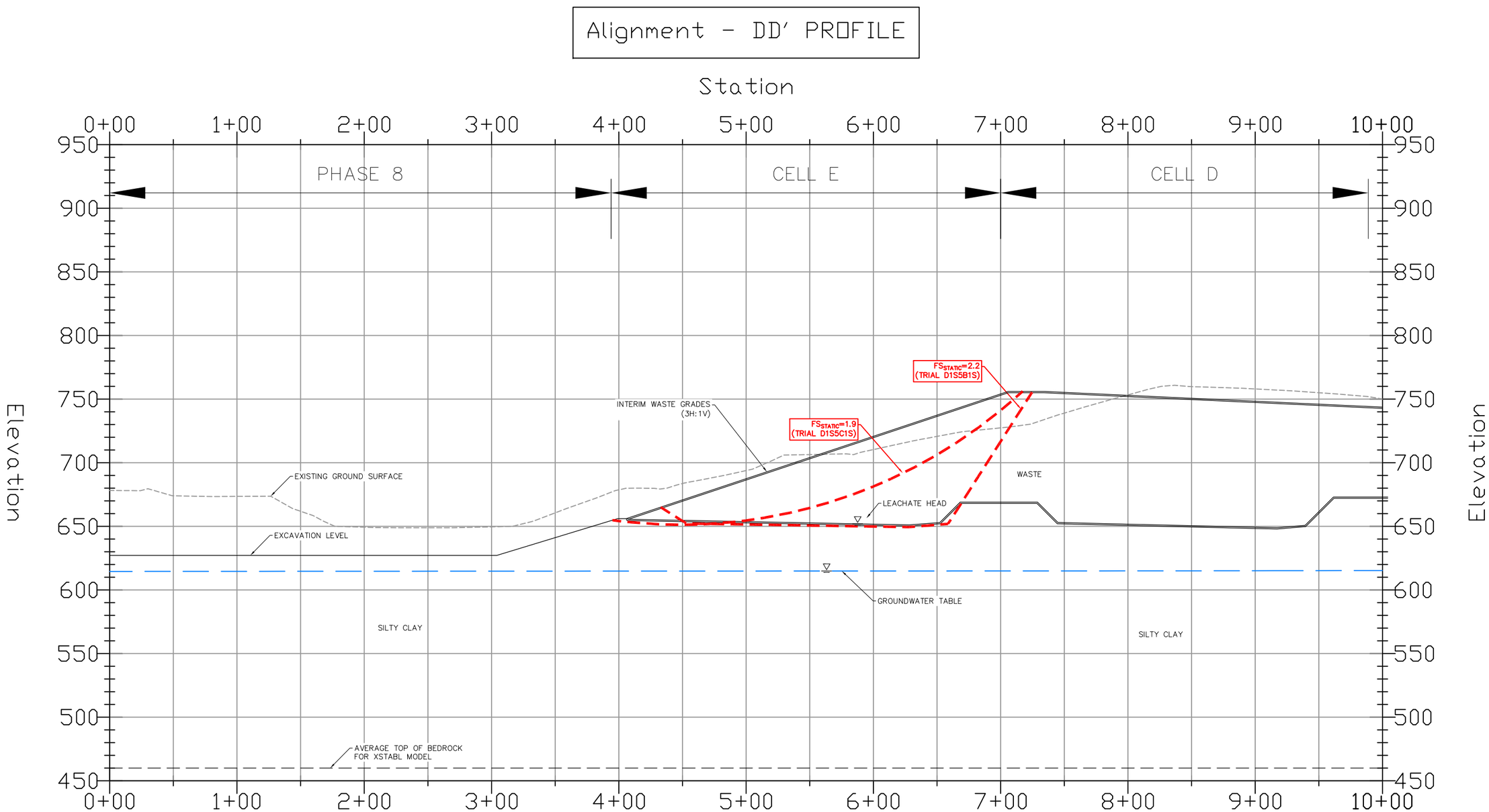

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FIGURE 5

Alignment - EE' PROFILE

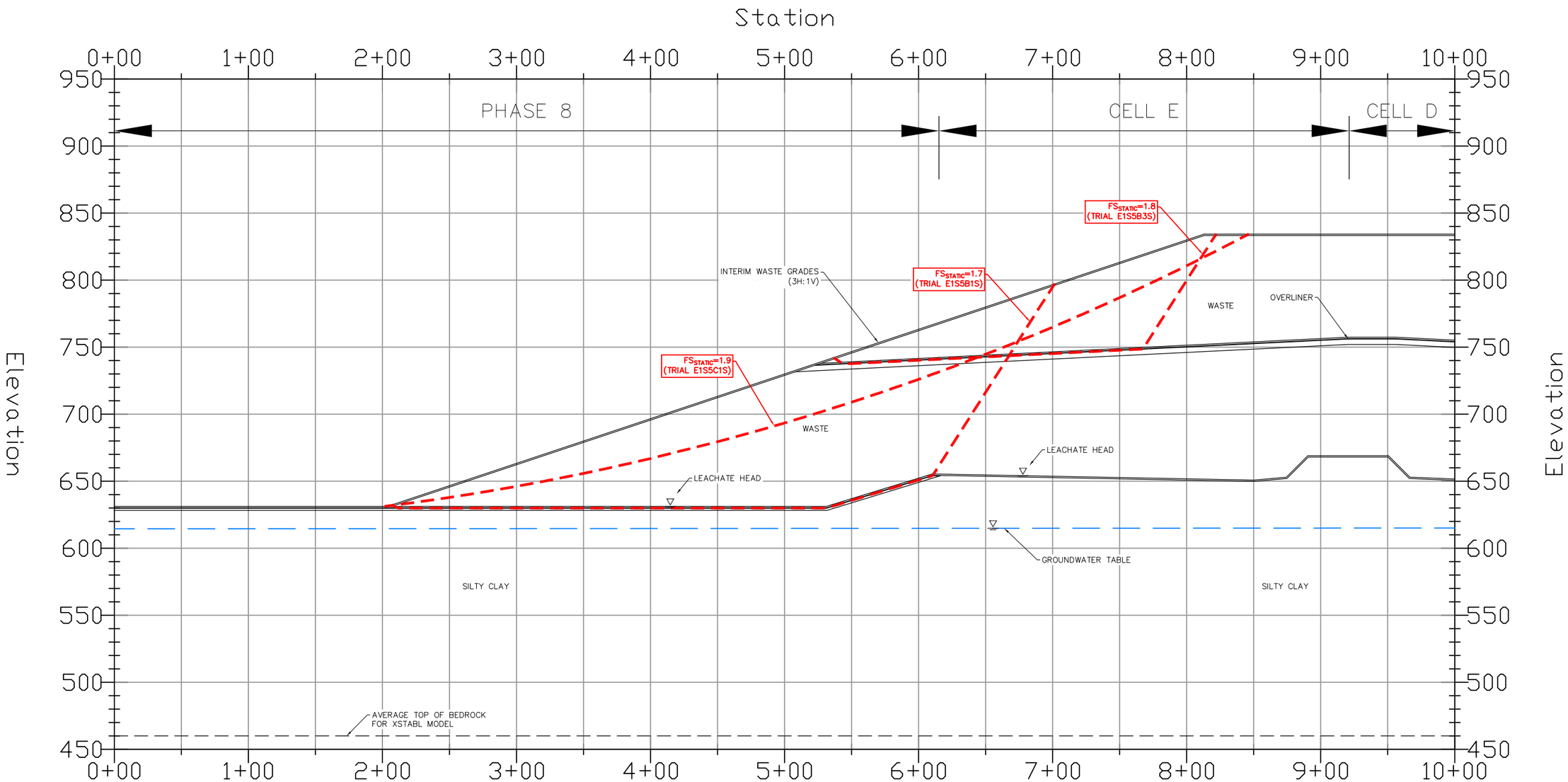

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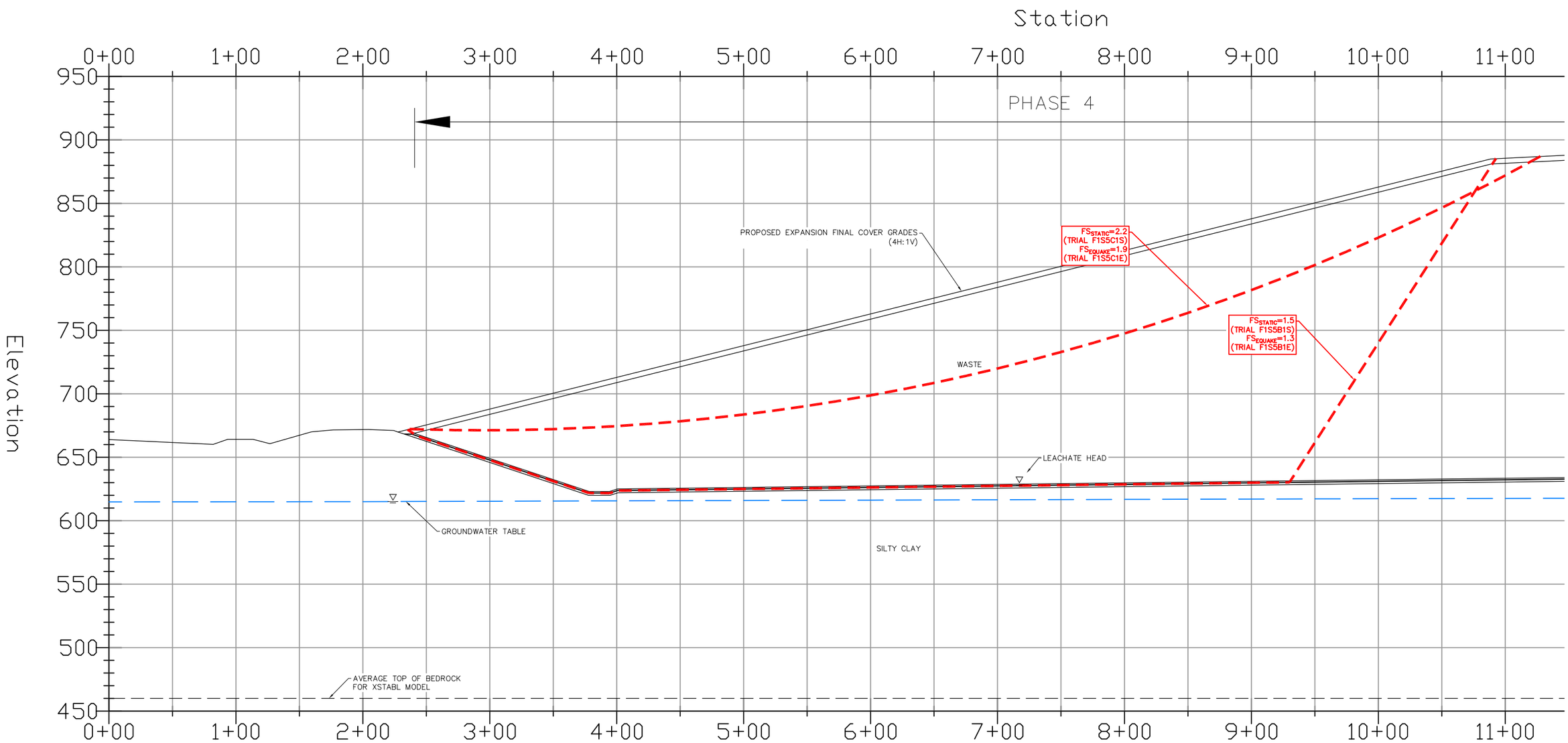
FIGURE 6

Alignment - FF' PROFILE



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COOPERSVILLE, MI

SECTION FF' (FINAL CONFIGURATION)

SLOPE STABILITY ANALYSES

OTTAWA COUNTY FARMS LANDFILL
OTTAWA COUNTY, MICHIGAN

No.	DATE	REVISION DESCRIPTION

Weaver Consultants Group

WEAVER CONSULTANTS GROUP
1316 BOND STREET
SUITE 108
NAPERVILLE, ILLINOIS 60563
(630)-717-4848
www.wcgrp.com

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DRAWN BY: JSE
REVIEWED BY: PEB
DATE: 04/11/2016
FILE: 0120-685-11-03
CAD: OCF00006.dwg

FIGURE 7

F:\PROJECTS\0120\685 - OCFL\DWG\OCF00006.dwg;javink;May 18, 2016

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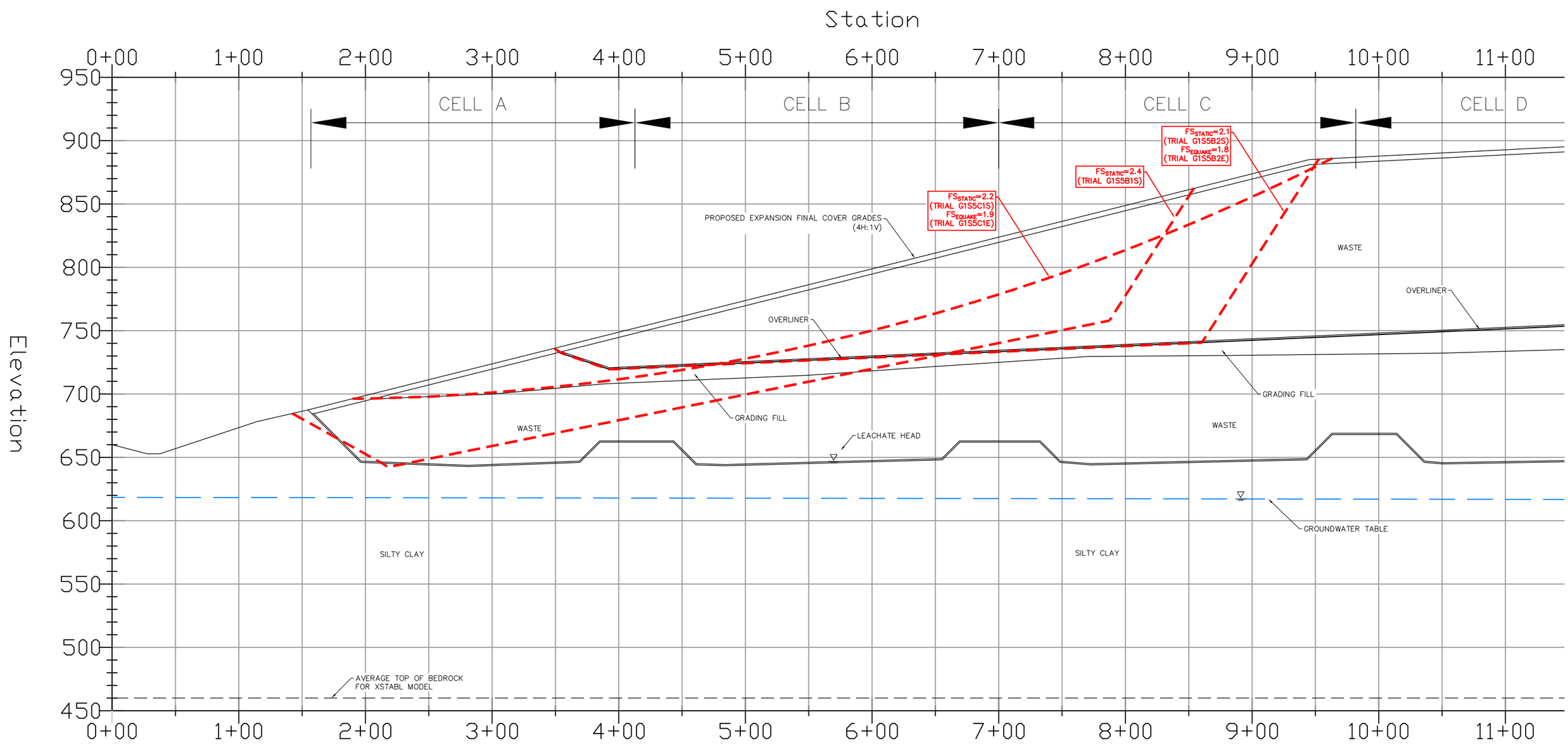
Alignment - GG' PROFILE



PREPARED FOR:
REPUBLIC SERVICES
OTTAWA COUNTY LANDFILL, INC.
15550 68TH AVE.
COOPERSVILLE, MI

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CAD: OCF00006.dwg

FIGURE 8

F:\PROJECTS\0120\685 - OCFL\DWG\OCF00006.dwg;javink;May 18, 2016

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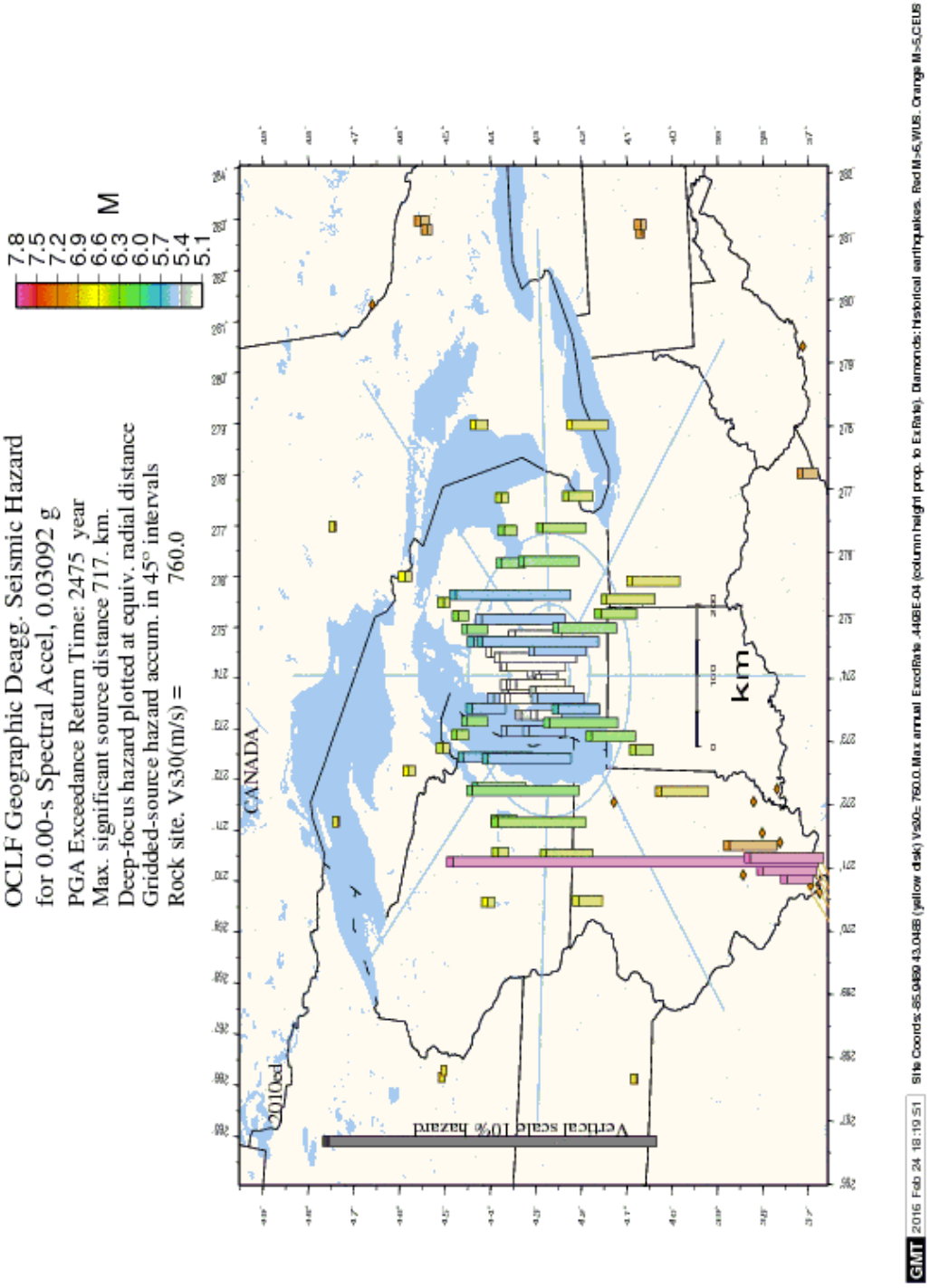

SOURCE: USGS NATIONAL SEISMIC HAZARD MAP 2008 INTERACTIVE DEAGGREGATION.

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REPUBLIC SERVICES
OTTAWA COUNTY LANDFILL, INC.
15550 68TH AVE.
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PROBABILISTIC SEISMIC HAZARD

OTTAWA COUNTY FARMS LANDFILL
OTTAWA COUNTY, MICHIGAN

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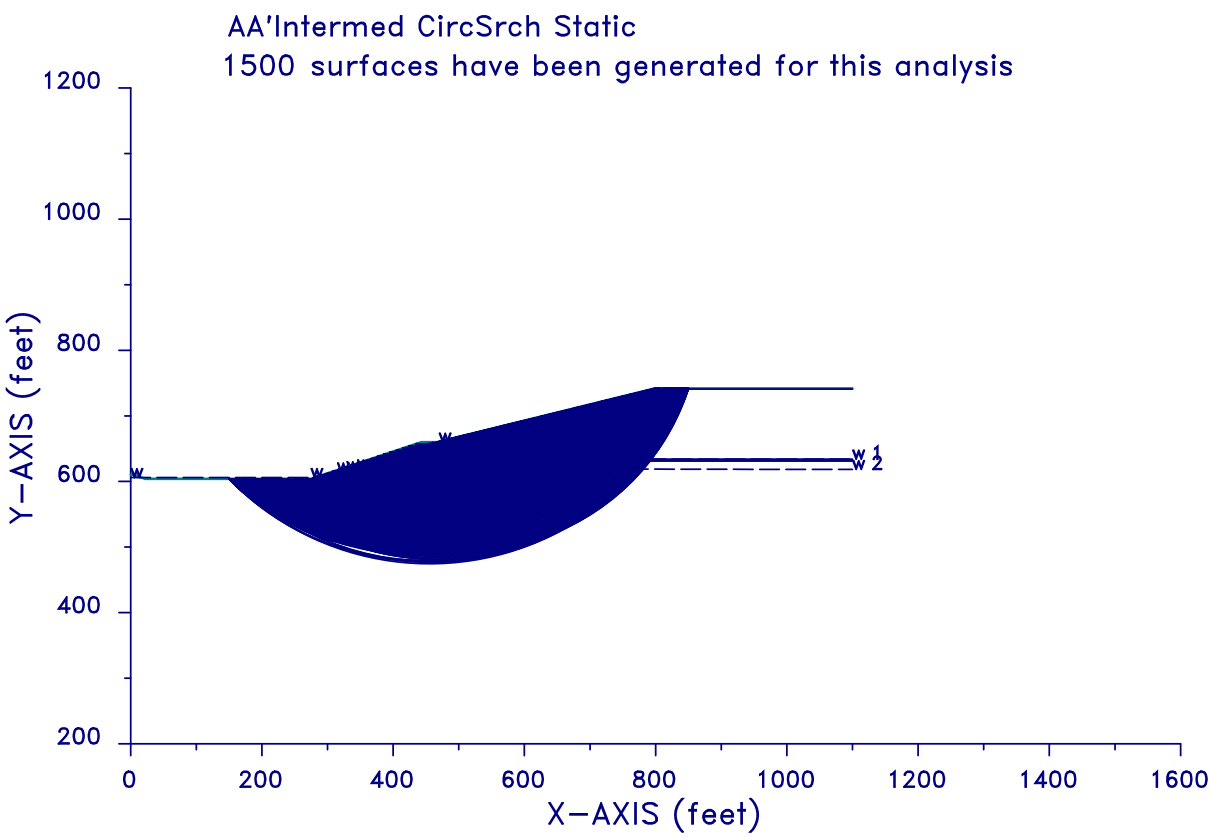
DATE: 04/11/2016
FILE: 0120-685-11-03
CAD: OCF00006.dwg
FIGURE 9

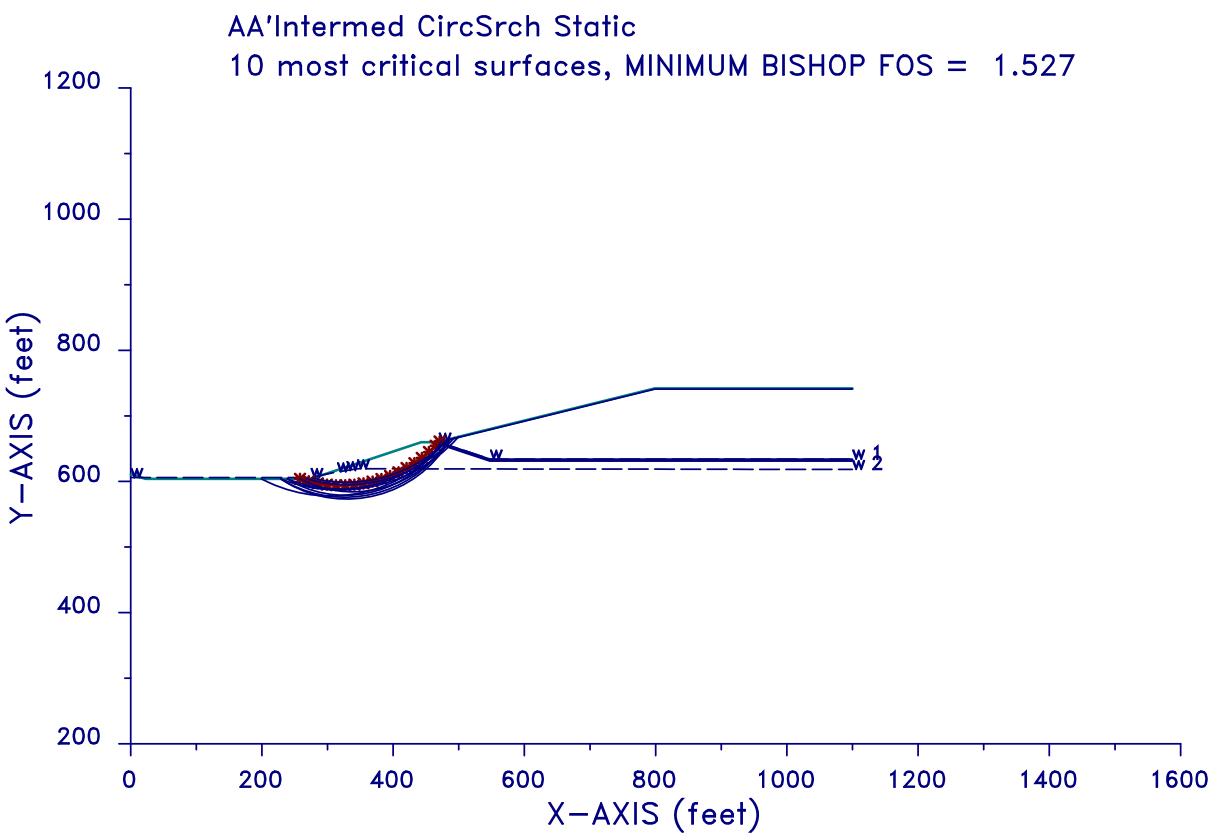
F:\PROJECTS\0120\685 - OCFL\DWG\OCF00006.dwg;javink;April 26, 2016

APPENDIX A

A1S5C1S 4-12-16 18:22



A1S5C1S 4-12-16 18:22



XSTABL File: A1S5C1S 4-12-16 18:22

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*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
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*                                       *
*  Ver. 5.208                 96 - 2046 *
*****************************************
```

Problem Description : AA'Intermed CircSrch Static

SEGMENT BOUNDARY COORDINATES
---

9 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	610.0	4.2	610.0	11
2	4.2	610.0	22.1	604.0	11
3	22.1	604.0	274.7	604.0	11
4	274.7	604.0	442.8	660.0	11
5	442.8	660.0	460.3	660.0	11
6	460.3	660.0	465.4	660.0	10
7	465.4	660.0	466.6	660.0	5
8	466.6	660.0	798.7	741.9	1
9	798.7	741.9	1100.0	741.9	1

12 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	466.6	660.0	469.8	660.0	3
2	469.8	660.0	798.8	740.9	2
3	798.8	740.9	1100.0	740.9	2
4	469.8	660.0	547.7	634.1	3
5	547.7	634.1	1100.0	634.1	3
6	466.6	660.0	547.5	633.1	5
7	547.4	632.7	547.5	633.1	4
8	547.5	633.1	1100.0	633.1	4
9	465.4	660.0	547.4	632.7	10
10	547.4	632.7	1100.0	632.7	10

11	460.3	660.0	547.2	631.1	11
12	547.2	631.1	1100.0	631.1	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 3 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	469.80	660.00
2	547.70	634.10
3	1100.00	634.10

Water Surface No. 2 specified by 6 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	606.00
2	274.40	606.00

```
    3         314.60      614.70
    4         329.00      616.70
    5         345.20      619.40
    6        1100.00      618.40


A critical failure surface searching method, using a random
technique for generating CIRCULAR surfaces has been specified.


 1500 trial surfaces will be generated and analyzed.


  50 Surfaces initiate from each of  30 points equally spaced
along the ground surface between  x =    150.0 ft
                             and  x =    435.0 ft


Each surface terminates between   x =    470.0 ft
                            and   x =    850.0 ft


Unless further limitations were imposed, the minimum elevation
at which a surface extends is  y =    460.0 ft



* * * * *  DEFAULT SEGMENT LENGTH SELECTED BY XSTABL  * * * * *

   14.0 ft line segments define each trial failure surface.



---------------------
ANGULAR RESTRICTIONS
---------------------

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees



************************************************************************
    --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)
************************************************************************
Negative effective stresses were calculated at the base of a slice.
This warning is usually reported for cases where slices have low self
weight and a relatively high "c" shear strength parameter.  In such
cases, this effect can only be eliminated by reducing the "c" value.
************************************************************************

    ------------------------------------------------------------
    USER SELECTED option to maintain strength greater than zero
    ------------------------------------------------------------
```

```
*************************************************************
**     Factor of safety calculation for surface #  1473    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  21.0064    **
**    This will be ignored for final summary of results    **
*************************************************************


Circular surface (FOS= 21.0064) is defined by: xcenter =    456.19
ycenter =    671.24   Init. Pt. =    435.00   Seg. Length =  14.00
-------------------------------------------------------------------


*************************************************************
**     Factor of safety calculation for surface #  1494    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  22.2554    **
**    This will be ignored for final summary of results    **
*************************************************************


Circular surface (FOS= 22.2554) is defined by: xcenter =    453.17
ycenter =    672.11   Init. Pt. =    435.00   Seg. Length =  14.00
-------------------------------------------------------------------


    Factors of safety have been calculated by the :

    * * * * *   SIMPLIFIED BISHOP METHOD   * * * * *


      The most critical circular failure surface
      is specified by 18 coordinate points
```

Point No.	x-surf (ft)	y-surf (ft)
1	258.10	604.00
2	271.57	600.16
3	285.26	597.25
4	299.12	595.30
5	313.09	594.31
6	327.09	594.28
7	341.06	595.22
8	354.93	597.12
9	368.63	599.97
10	382.11	603.76
11	395.29	608.48
12	408.12	614.09
13	420.53	620.57
14	432.46	627.89
15	443.86	636.02
16	454.68	644.91

17	464.85	654.53
18	470.85	661.05

**** Simplified BISHOP FOS = 1.527 ****

```
*******************************************************************
**                                                               **
**  Out of the   1500 surfaces generated and analyzed by XSTABL,  **
**        2 surfaces were found to have MISLEADING FOS values.    **
**                                                               **
*******************************************************************
```

The following is a summary of the TEN most critical surfaces

Problem Description : AA'Intermed CircSrch Static

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.527	320.48	797.03	202.86	258.10	470.85	5.348E+07
2.	1.559	318.72	804.39	215.87	238.45	482.56	7.057E+07
3.	1.567	327.48	749.85	170.88	238.45	473.79	6.525E+07
4.	1.592	338.62	758.14	173.91	258.10	485.03	6.455E+07
5.	1.608	326.88	762.88	186.81	228.62	485.81	8.123E+07
6.	1.615	328.99	813.26	214.45	277.76	483.00	5.599E+07
7.	1.615	318.07	831.09	244.07	228.62	499.71	9.161E+07
8.	1.616	329.77	818.22	222.97	267.93	493.02	6.776E+07
9.	1.630	329.61	754.70	181.41	228.62	487.20	8.388E+07
10.	1.631	304.58	804.23	226.29	199.14	481.87	9.286E+07

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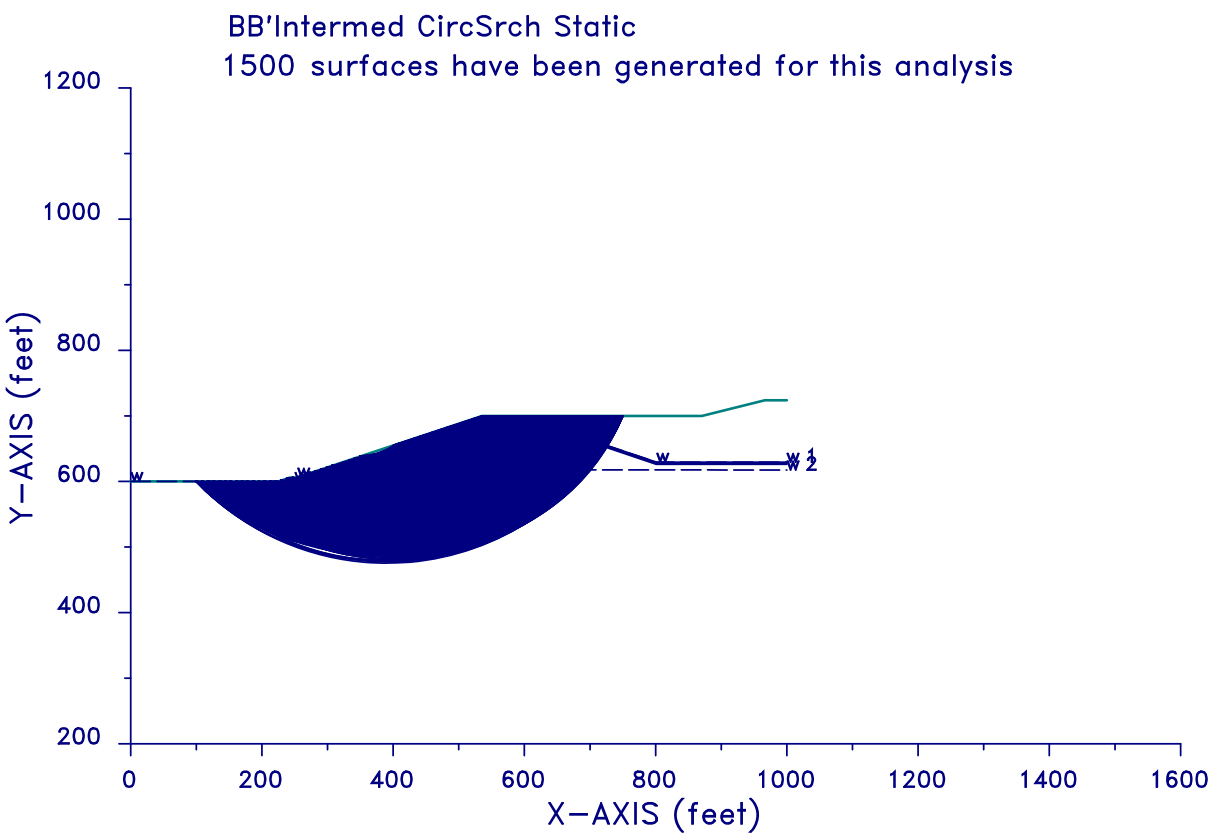
B3S5C1S 4-12-16 16:44



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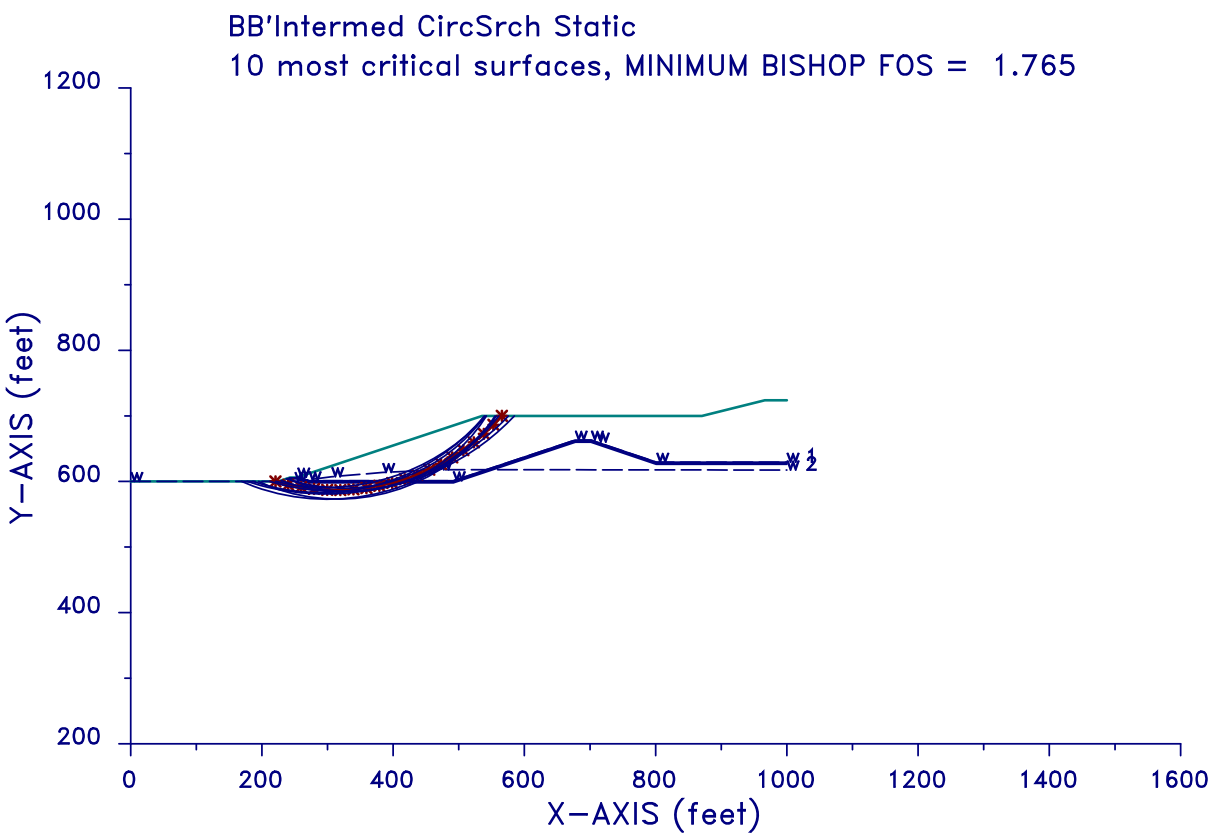

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*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
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*        Moscow, ID 83843, U.S.A.       *
*                                       *
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*                                       *
*  Ver. 5.208                 96 - 2046 *
*****************************************
```

Problem Description : BB'Intermed CircSrch Static

SEGMENT BOUNDARY COORDINATES
---

10 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	600.0	225.4	600.0	11
2	225.4	600.0	236.9	604.0	11
3	236.9	604.0	241.5	605.6	10
4	241.5	605.6	242.7	606.0	9
5	242.7	606.0	252.7	606.0	9
6	252.7	606.0	254.3	606.5	3
7	254.3	606.5	535.6	700.0	2
8	535.6	700.0	870.6	700.0	2
9	870.6	700.0	966.3	723.9	2
10	966.3	723.9	1000.0	723.9	2

34 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	254.3	606.5	271.7	601.0	3
2	271.7	601.0	491.3	601.0	3
3	491.3	601.0	677.2	663.0	3
4	677.2	663.0	701.8	663.0	3
5	701.8	663.0	710.7	660.0	3
6	710.7	660.0	801.4	629.3	3
7	801.4	629.3	1000.0	629.3	3
8	252.7	606.0	271.6	600.0	9
9	491.5	600.0	677.4	662.0	9

10	677.4	662.0	701.7	662.0	9
11	701.7	662.0	702.9	661.6	9
12	702.9	661.6	801.3	628.3	5
13	800.0	628.3	1000.0	628.3	4
14	270.3	600.0	271.6	600.0	8
15	271.6	600.0	491.5	600.0	8
16	491.5	600.0	492.8	600.0	8
17	241.5	605.6	252.6	605.6	10
18	252.6	605.6	270.3	600.0	10
19	270.3	600.0	271.5	599.6	10
20	271.5	599.6	491.6	599.6	10
21	491.6	599.6	492.8	600.0	10
22	492.8	600.0	677.4	661.6	10
23	677.4	661.6	701.6	661.6	10
24	701.6	661.6	702.9	661.6	5
25	701.6	661.6	800.0	628.3	10
26	800.0	628.3	801.2	627.9	10
27	801.2	627.9	1000.0	627.9	10
28	236.9	604.0	252.4	604.0	11
29	252.4	604.0	271.3	598.0	11
30	271.3	598.0	491.8	598.0	11
31	491.8	598.0	677.7	660.0	11
32	677.7	660.0	701.4	660.0	11
33	701.4	660.0	800.9	626.3	11
34	800.9	626.3	1000.0	626.3	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 8 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	254.30	606.50
2	271.70	601.00
3	491.30	601.00
4	677.20	663.00
5	701.80	663.00
6	710.70	660.00
7	801.40	629.30
8	1000.00	629.30

Water Surface No. 2 specified by 6 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	600.00
2	250.00	600.00
3	306.10	607.20
4	383.70	613.70
5	471.30	618.00
6	1000.00	617.50

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

1500 trial surfaces will be generated and analyzed.

50 Surfaces initiate from each of 30 points equally spaced along the ground surface between x = 100.0 ft
and x = 350.0 ft

Each surface terminates between x = 400.0 ft
and x = 750.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 460.0 ft

20.0 ft line segments define each trial failure surface.

```
---------------------
ANGULAR RESTRICTIONS
---------------------

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees




Factors of safety have been calculated by the :

* * * * *   SIMPLIFIED BISHOP METHOD   * * * * *



  The most critical circular failure surface
  is specified by 20 coordinate points

       Point      x-surf      y-surf
        No.        (ft)        (ft)

         1        220.69      600.00
         2        240.07      595.06
         3        259.71      591.28
         4        279.54      588.67
         5        299.49      587.23
         6        319.49      586.99
         7        339.46      587.92
         8        359.35      590.04
         9        379.08      593.33
        10        398.58      597.79
        11        417.77      603.39
        12        436.61      610.12
        13        455.01      617.95
        14        472.92      626.86
        15        490.26      636.82
        16        506.99      647.78
        17        523.04      659.72
        18        538.35      672.59
        19        552.87      686.34
        20        565.68      700.00


****  Simplified BISHOP FOS =   1.765  ****




The following is a summary of the TEN most critical surfaces

Problem Description : BB'Intermed CircSrch Static

       FOS      Circle Center    Radius  Initial Terminal  Resisting
```

	(BISHOP)	x-coord (ft)	y-coord (ft)	(ft)	x-coord (ft)	x-coord (ft)	Moment (ft-lb)
1.	1.765	313.68	924.41	337.47	220.69	565.68	1.753E+08
2.	1.769	326.79	872.64	288.26	229.31	557.43	1.517E+08
3.	1.776	316.51	861.87	288.76	194.83	555.45	1.786E+08
4.	1.781	289.65	907.93	324.84	186.21	539.02	1.518E+08
5.	1.781	324.65	855.13	265.35	237.93	539.88	1.149E+08
6.	1.783	297.18	920.57	329.57	220.69	541.86	1.360E+08
7.	1.787	297.26	966.92	385.94	177.59	575.86	2.303E+08
8.	1.788	334.11	830.40	245.65	237.93	542.07	1.190E+08
9.	1.790	317.24	952.92	368.25	212.07	584.76	2.191E+08
10.	1.791	300.12	905.26	332.25	168.97	561.25	2.108E+08

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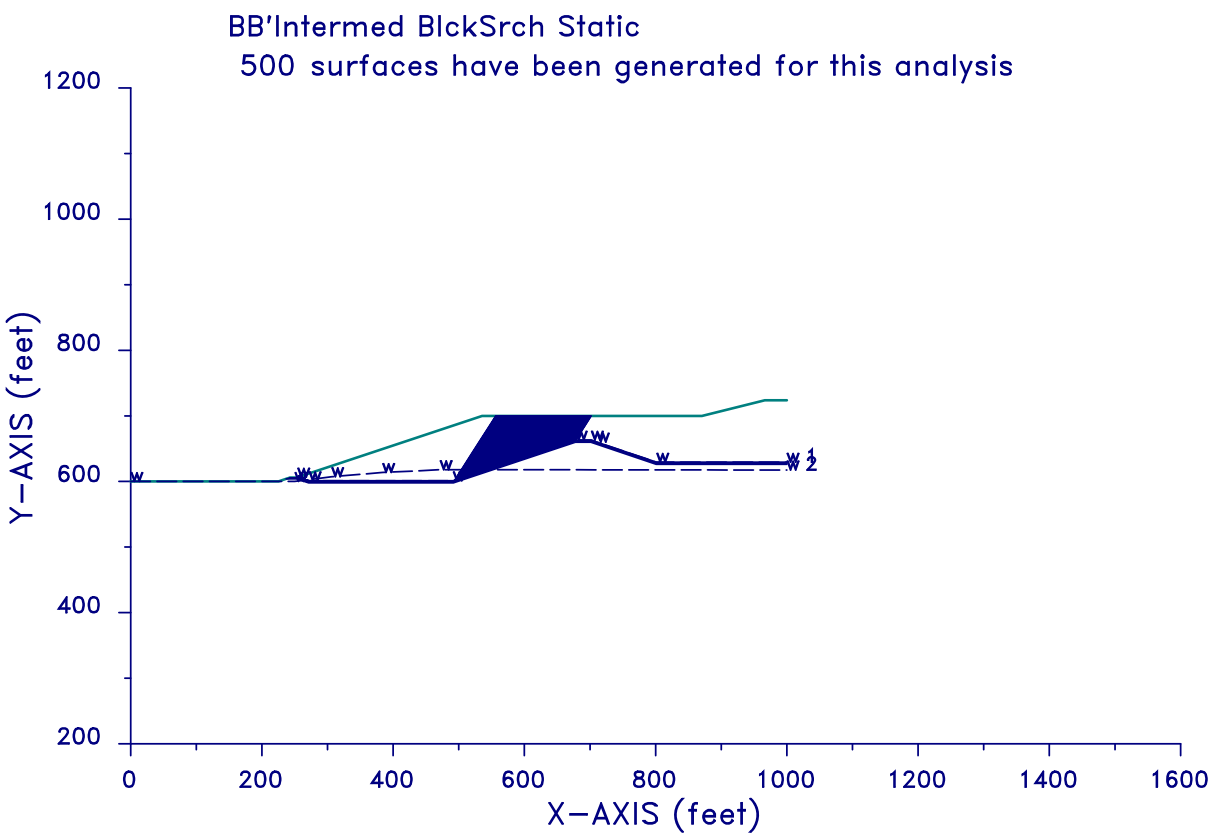
B3S5B2S 4-12-16 16:42



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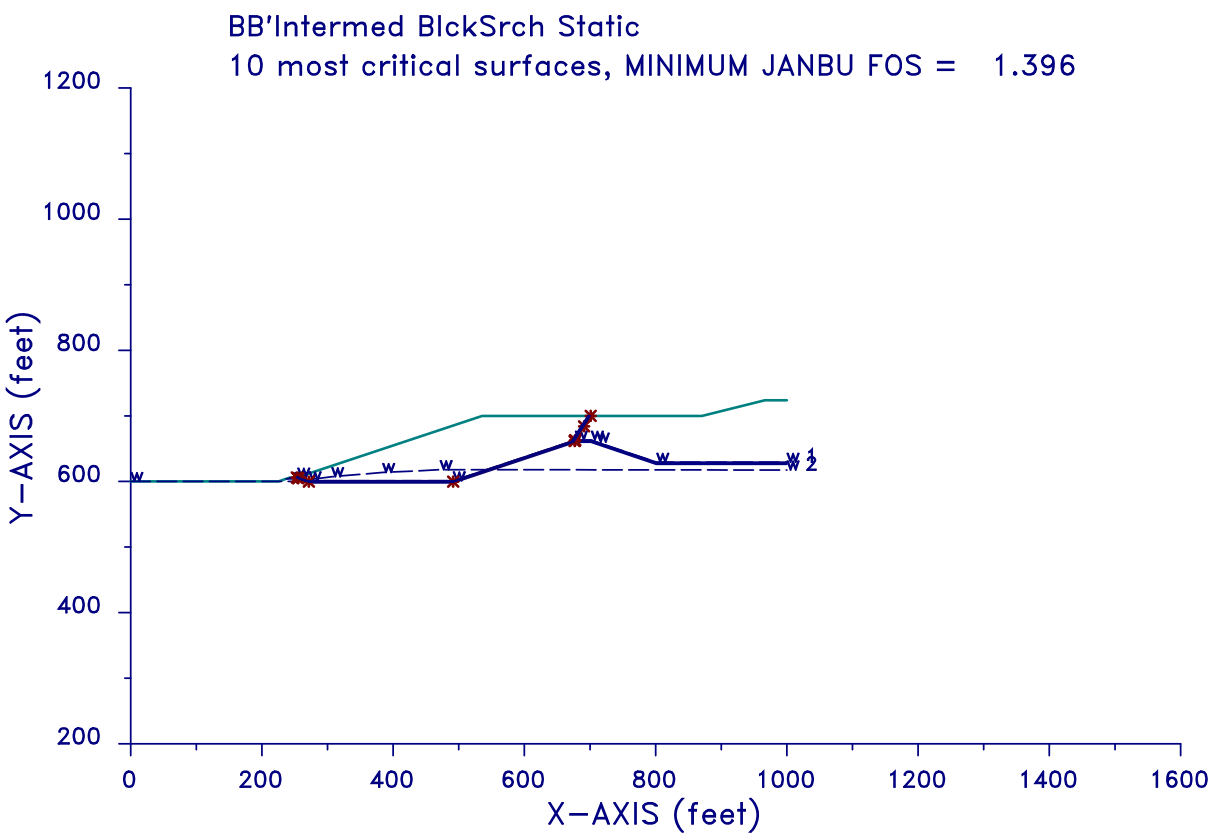

XSTABL File: B3S5B2S 4-12-16 16:42

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*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
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*        Moscow, ID 83843, U.S.A.       *
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*                                       *
*  Ver. 5.208                 96 - 2046 *
*****************************************
```

Problem Description : BB'Intermed BlckSrch Static

SEGMENT BOUNDARY COORDINATES
---

10 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	600.0	225.4	600.0	11
2	225.4	600.0	236.9	604.0	11
3	236.9	604.0	241.5	605.6	10
4	241.5	605.6	242.7	606.0	9
5	242.7	606.0	252.7	606.0	9
6	252.7	606.0	254.3	606.5	3
7	254.3	606.5	535.6	700.0	2
8	535.6	700.0	870.6	700.0	2
9	870.6	700.0	966.3	723.9	2
10	966.3	723.9	1000.0	723.9	2

34 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	254.3	606.5	271.7	601.0	3
2	271.7	601.0	491.3	601.0	3
3	491.3	601.0	677.2	663.0	3
4	677.2	663.0	701.8	663.0	3
5	701.8	663.0	710.7	660.0	3
6	710.7	660.0	801.4	629.3	3
7	801.4	629.3	1000.0	629.3	3
8	252.7	606.0	271.6	600.0	9
9	491.5	600.0	677.4	662.0	9

10	677.4	662.0	701.7	662.0	9
11	701.7	662.0	702.9	661.6	9
12	702.9	661.6	801.3	628.3	5
13	800.0	628.3	1000.0	628.3	4
14	270.3	600.0	271.6	600.0	8
15	271.6	600.0	491.5	600.0	8
16	491.5	600.0	492.8	600.0	8
17	241.5	605.6	252.6	605.6	10
18	252.6	605.6	270.3	600.0	10
19	270.3	600.0	271.5	599.6	10
20	271.5	599.6	491.6	599.6	10
21	491.6	599.6	492.8	600.0	10
22	492.8	600.0	677.4	661.6	10
23	677.4	661.6	701.6	661.6	10
24	701.6	661.6	702.9	661.6	5
25	701.6	661.6	800.0	628.3	10
26	800.0	628.3	801.2	627.9	10
27	801.2	627.9	1000.0	627.9	10
28	236.9	604.0	252.4	604.0	11
29	252.4	604.0	271.3	598.0	11
30	271.3	598.0	491.8	598.0	11
31	491.8	598.0	677.7	660.0	11
32	677.7	660.0	701.4	660.0	11
33	701.4	660.0	800.9	626.3	11
34	800.9	626.3	1000.0	626.3	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 8 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	254.30	606.50
2	271.70	601.00
3	491.30	601.00
4	677.20	663.00
5	701.80	663.00
6	710.70	660.00
7	801.40	629.30
8	1000.00	629.30

Water Surface No. 2 specified by 6 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	600.00
2	250.00	600.00
3	306.10	607.20
4	383.70	613.70
5	471.30	618.00
6	1000.00	617.50

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

500 trial surfaces will be generated and analyzed.

4 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 25.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)

1	254.9	605.1	271.2	599.9	.3
2	271.6	599.8	271.6	599.8	.3
3	491.5	599.8	491.5	599.8	.3
4	492.0	600.0	677.4	661.8	.3

```
************************************************************************
ERROR # 38
************************************************************************
The program calculated a point for the PASSIVE wedge that is outside
the defined slope geometry.  The analysis will continue, but the user
should adjust the search box or slope geometry to allow a passive
wedge to be formed from all points within first box.
************************************************************************
```


```
************************************************************************
ERROR # 38
************************************************************************
The program calculated a point for the PASSIVE wedge that is outside
the defined slope geometry.  The analysis will continue, but the user
should adjust the search box or slope geometry to allow a passive
wedge to be formed from all points within first box.
************************************************************************
```

```
************************************************************************
ERROR # 38
************************************************************************
The program calculated a point for the PASSIVE wedge that is outside
the defined slope geometry.  The analysis will continue, but the user
should adjust the search box or slope geometry to allow a passive
wedge to be formed from all points within first box.
************************************************************************
```

```
************************************************************************
ERROR # 38
************************************************************************
The program calculated a point for the PASSIVE wedge that is outside
the defined slope geometry.  The analysis will continue, but the user
should adjust the search box or slope geometry to allow a passive
wedge to be formed from all points within first box.
************************************************************************
```


Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined

are displayed below - the most critical first

Failure surface No. 1 specified by 10 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	253.37	606.21
2	255.16	605.22
3	255.35	605.05
4	271.60	599.73
5	491.50	599.67
6	676.71	661.57
7	676.94	661.85
8	677.58	663.00
9	691.01	684.08
10	701.15	700.00

** Corrected JANBU FOS = 1.396 ** (Fo factor = 1.050)

Failure surface No. 2 specified by 10 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	253.40	606.22
2	255.26	605.19
3	255.62	604.87
4	271.60	599.73
5	491.50	599.87
6	673.63	660.44
7	674.00	660.87
8	674.72	662.17
9	688.16	683.26
10	698.82	700.00

** Corrected JANBU FOS = 1.399 ** (Fo factor = 1.050)

Failure surface No. 3 specified by 10 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	254.10	606.44
2	257.82	604.38
3	258.15	604.09
4	271.60	599.90
5	491.50	599.73
6	675.60	661.28
7	675.75	661.45
8	676.47	662.76
9	689.90	683.84
10	700.20	700.00

** Corrected JANBU FOS = 1.400 ** (Fo factor = 1.050)

Failure surface No. 4 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	254.53	606.58
2	255.00	606.28
3	259.26	603.92
4	259.77	603.48
5	271.60	599.76
6	491.50	599.88
7	673.42	660.33
8	673.84	660.81
9	674.57	662.12
10	688.00	683.21
11	698.70	700.00

** Corrected JANBU FOS = 1.402 ** (Fo factor = 1.051)

Failure surface No. 5 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	254.81	606.67
2	255.83	606.02
3	260.10	603.65
4	260.41	603.39
5	271.60	599.77
6	491.50	599.89
7	674.47	660.77
8	674.77	661.12
9	675.50	662.43
10	688.93	683.52
11	699.43	700.00

** Corrected JANBU FOS = 1.402 ** (Fo factor = 1.050)

Failure surface No. 6 specified by 10 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	253.97	606.40
2	257.35	604.52
3	257.76	604.17
4	271.60	599.90
5	491.50	599.73
6	673.19	660.54
7	673.26	660.62
8	673.98	661.93
9	687.42	683.01
10	698.24	700.00

** Corrected JANBU FOS = 1.402 ** (Fo factor = 1.051)

Failure surface No. 7 specified by 10 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	254.15	606.45
2	258.01	604.31
3	258.64	603.77
4	271.60	599.90
5	491.50	599.73
6	672.87	660.39
7	672.99	660.53
8	673.71	661.84
9	687.15	682.92
10	698.03	700.00

** Corrected JANBU FOS = 1.403 ** (Fo factor = 1.051)

Failure surface No. 8 specified by 10 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	253.41	606.22
2	255.31	605.17
3	255.94	604.62
4	271.60	599.88
5	491.50	599.82
6	671.08	659.73
7	671.27	659.95
8	671.99	661.26
9	685.42	682.35
10	696.67	700.00

** Corrected JANBU FOS = 1.403 ** (Fo factor = 1.051)

Failure surface No. 9 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	254.58	606.59
2	255.14	606.23
3	259.40	603.87
4	259.94	603.41
5	271.60	599.92
6	491.50	599.93
7	673.26	660.45
8	673.46	660.68
9	674.18	661.99
10	687.61	683.08
11	698.40	700.00

** Corrected JANBU FOS = 1.404 ** (Fo factor = 1.051)

Failure surface No.10 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	254.39	606.53
2	254.58	606.41
3	258.84	604.05
4	258.97	603.94
5	271.60	599.91
6	491.50	599.83
7	672.54	660.05
8	672.94	660.51
9	673.67	661.82
10	687.10	682.91
11	697.99	700.00

** Corrected JANBU FOS = 1.404 ** (Fo factor = 1.051)

The following is a summary of the TEN most critical surfaces

Problem Description : BB'Intermed BlckSrch Static

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	1.396	1.050	253.37	701.15	4.913E+05
2.	1.399	1.050	253.40	698.82	4.903E+05
3.	1.400	1.050	254.10	700.20	4.912E+05
4.	1.402	1.051	254.53	698.70	4.909E+05
5.	1.402	1.050	254.81	699.43	4.912E+05
6.	1.402	1.051	253.97	698.24	4.911E+05
7.	1.403	1.051	254.15	698.03	4.912E+05
8.	1.403	1.051	253.41	696.67	4.904E+05
9.	1.404	1.051	254.58	698.40	4.906E+05
10.	1.404	1.051	254.39	697.99	4.909E+05

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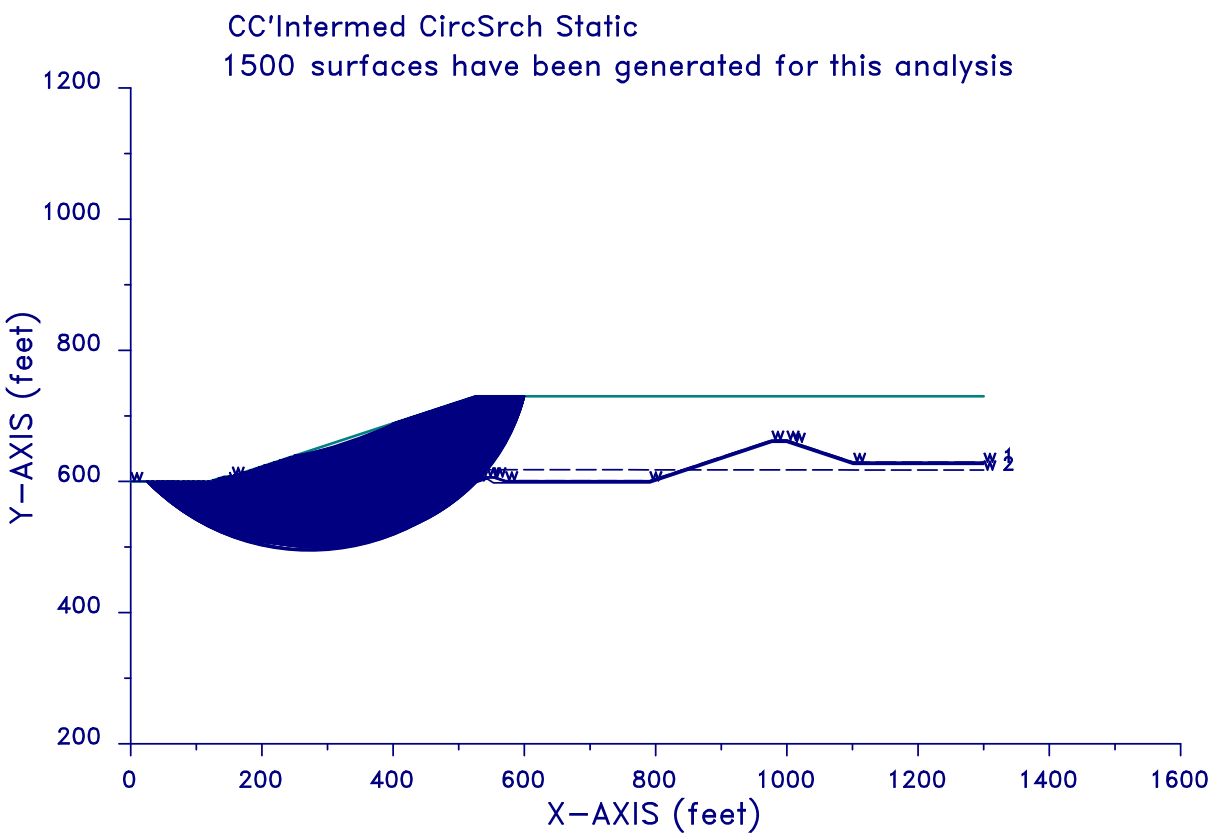

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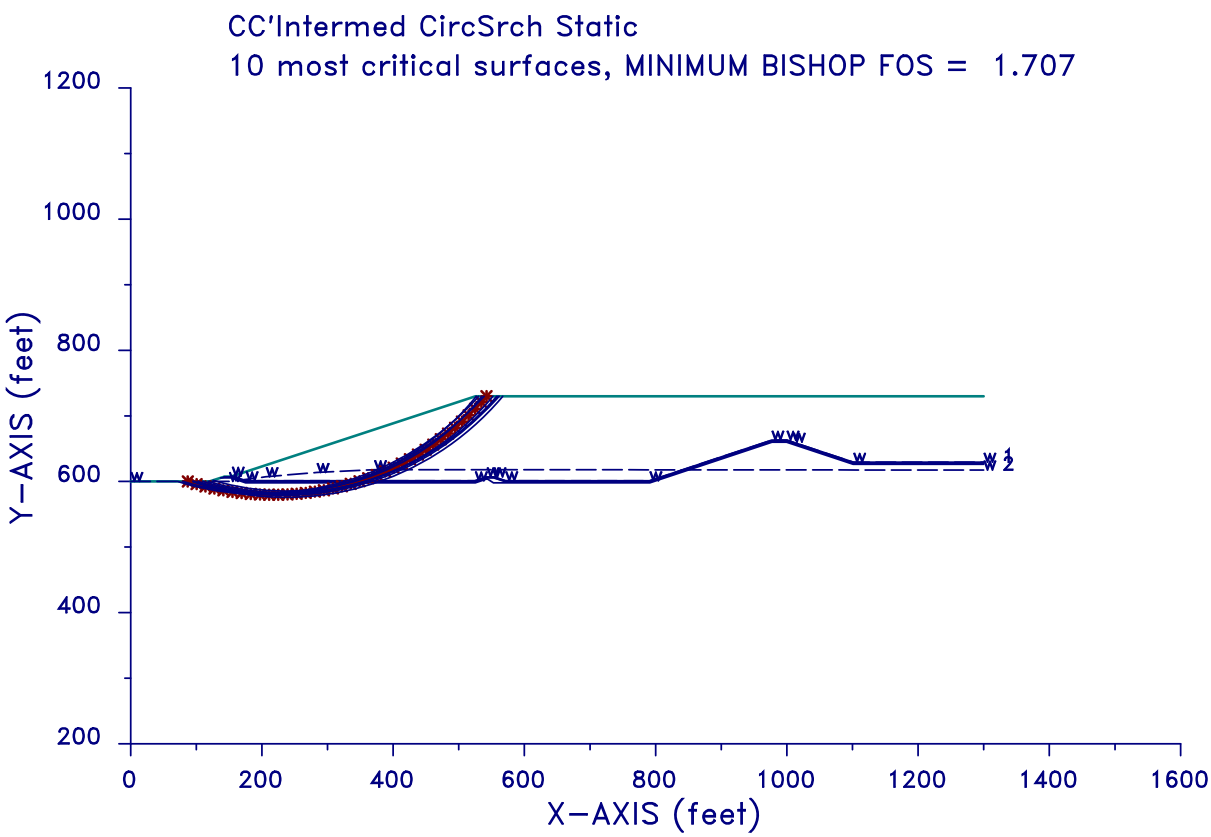

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```

Problem Description : CC'Intermed CircSrch Static

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	600.0	120.4	600.0	11
2	120.4	600.0	136.9	605.5	11
3	136.9	605.5	141.7	607.1	10
4	141.7	607.1	142.9	607.5	9
5	142.9	607.5	152.9	607.5	9
6	152.9	607.5	154.5	608.0	3
7	154.5	608.0	525.5	730.0	2
8	525.5	730.0	1300.0	730.0	2

55 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	154.5	608.0	175.6	601.0	3
2	175.6	601.0	524.9	601.0	3
3	524.9	601.0	542.9	607.0	3
4	542.9	607.0	553.3	607.0	3
5	553.3	607.0	571.3	601.0	3
6	571.3	601.0	790.9	601.0	3
7	790.9	601.0	976.9	663.0	3
8	976.9	663.0	1000.0	663.0	3
9	1000.0	663.0	1009.6	659.8	3
10	1009.6	659.8	1101.5	629.3	3
11	1101.5	629.3	1300.0	629.3	3

12	152.9	607.5	175.4	600.0	9
13	525.1	600.0	543.1	606.0	9
14	543.1	606.0	553.1	606.0	9
15	553.1	606.0	571.1	600.0	9
16	791.1	600.0	977.1	662.0	9
17	977.1	662.0	999.8	662.0	9
18	999.8	662.0	1001.0	661.6	9
19	1001.0	661.6	1101.4	628.3	5
20	141.7	607.1	152.9	607.1	10
21	152.9	607.1	174.2	600.0	10
22	526.4	600.0	543.2	605.6	10
23	543.2	605.6	553.0	605.6	10
24	553.0	605.6	569.8	600.0	10
25	792.3	600.0	977.2	661.6	10
26	977.2	661.6	999.8	661.6	10
27	999.8	661.6	1001.0	661.6	5
28	999.8	661.6	1100.1	628.3	10
29	174.2	600.0	175.4	600.0	8
30	175.4	600.0	525.1	600.0	8
31	525.1	600.0	526.4	600.0	8
32	569.8	600.0	571.1	600.0	8
33	571.1	600.0	791.1	600.0	8
34	791.1	600.0	792.3	600.0	8
35	1100.1	628.3	1101.4	628.3	4
36	1101.4	628.3	1300.0	628.3	4
37	174.2	600.0	175.4	599.6	10
38	175.4	599.6	525.2	599.6	10
39	525.2	599.6	526.4	600.0	10
40	569.8	600.0	571.0	599.6	10
41	571.0	599.6	791.2	599.6	10
42	791.2	599.6	792.3	600.0	10
43	1100.1	628.3	1101.3	627.9	10
44	1101.3	627.9	1300.0	627.9	10
45	136.9	605.5	152.6	605.5	11
46	152.6	605.5	175.1	598.0	11
47	175.1	598.0	525.4	598.0	11
48	525.4	598.0	543.4	604.0	11
49	543.4	604.0	552.8	598.0	11
50	552.8	598.0	570.8	598.0	11
51	570.8	598.0	791.4	598.0	11
52	791.4	598.0	977.4	660.0	11
53	977.4	660.0	999.5	660.0	11
54	999.5	660.0	1101.1	626.3	11
55	1101.1	626.3	1300.0	626.3	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1

4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 12 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	154.50	608.00
2	175.60	601.00
3	524.90	601.00
4	542.90	607.00
5	553.30	607.00
6	571.30	601.00
7	790.90	601.00
8	976.90	663.00
9	1000.00	663.00
10	1009.60	659.80
11	1101.50	629.30
12	1300.00	629.30

Water Surface No. 2 specified by 6 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	600.00
2	150.00	600.00
3	206.10	607.20
4	283.70	613.70
5	371.30	618.00
6	1300.00	617.50

A critical failure surface searching method, using a random

technique for generating CIRCULAR surfaces has been specified.

1500 trial surfaces will be generated and analyzed.

50 Surfaces initiate from each of 30 points equally spaced
along the ground surface between x = 25.0 ft
and x = 250.0 ft

Each surface terminates between x = 400.0 ft
and x = 600.0 ft

Unless further limitations were imposed, the minimum elevation
at which a surface extends is y = 460.0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

14.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined
within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 37 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	87.07	600.00
2	100.47	595.95
3	114.00	592.34
4	127.64	589.18
5	141.37	586.46
6	155.19	584.20
7	169.07	582.39

8	183.00	581.04
9	196.97	580.15
10	210.97	579.71
11	224.97	579.74
12	238.96	580.22
13	252.93	581.16
14	266.86	582.56
15	280.73	584.42
16	294.54	586.72
17	308.27	589.49
18	321.90	592.69
19	335.41	596.35
20	348.80	600.44
21	362.04	604.98
22	375.13	609.94
23	388.05	615.33
24	400.79	621.14
25	413.33	627.37
26	425.66	634.00
27	437.76	641.04
28	449.63	648.47
29	461.25	656.28
30	472.60	664.47
31	483.68	673.03
32	494.48	681.94
33	504.97	691.21
34	515.16	700.81
35	525.02	710.74
36	534.56	721.00
37	542.40	730.00

**** Simplified BISHOP FOS = 1.707 ****

The following is a summary of the TEN most critical surfaces

Problem Description : CC'Intermed CircSrch Static

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.707	217.24	1006.53	426.87	87.07	542.40	3.431E+08
2.	1.708	234.36	994.16	413.21	110.34	552.08	3.456E+08
3.	1.712	234.94	1003.65	424.80	102.59	559.85	3.774E+08
4.	1.713	225.71	1032.91	452.26	94.83	561.46	3.922E+08
5.	1.714	215.66	981.33	400.02	94.83	526.80	2.913E+08
6.	1.715	237.82	1003.80	421.17	118.10	557.74	3.543E+08
7.	1.717	203.69	1029.46	449.33	71.55	538.62	3.485E+08
8.	1.720	236.95	1006.33	430.47	94.83	567.00	4.095E+08
9.	1.720	202.70	1019.24	437.02	79.31	530.23	3.150E+08
10.	1.721	236.47	965.89	380.50	125.86	534.95	2.789E+08

* * * END OF FILE * * *

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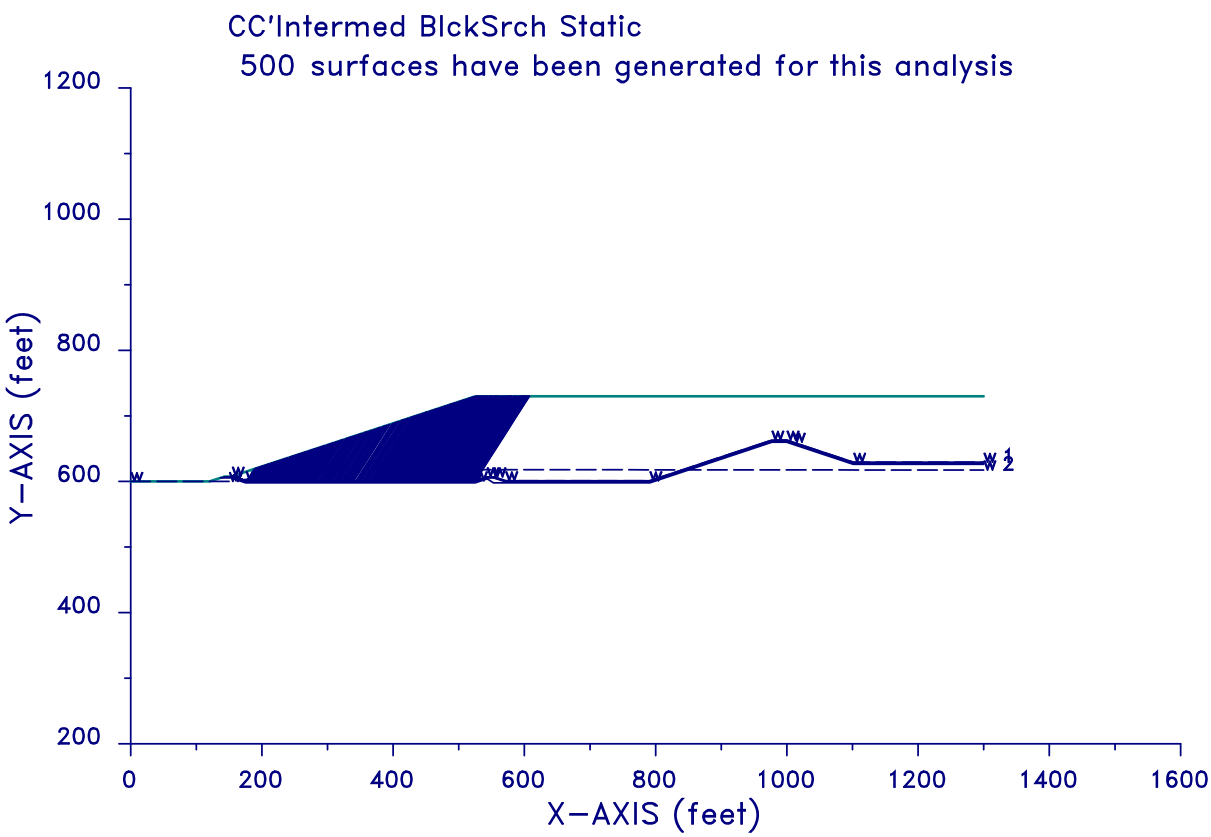

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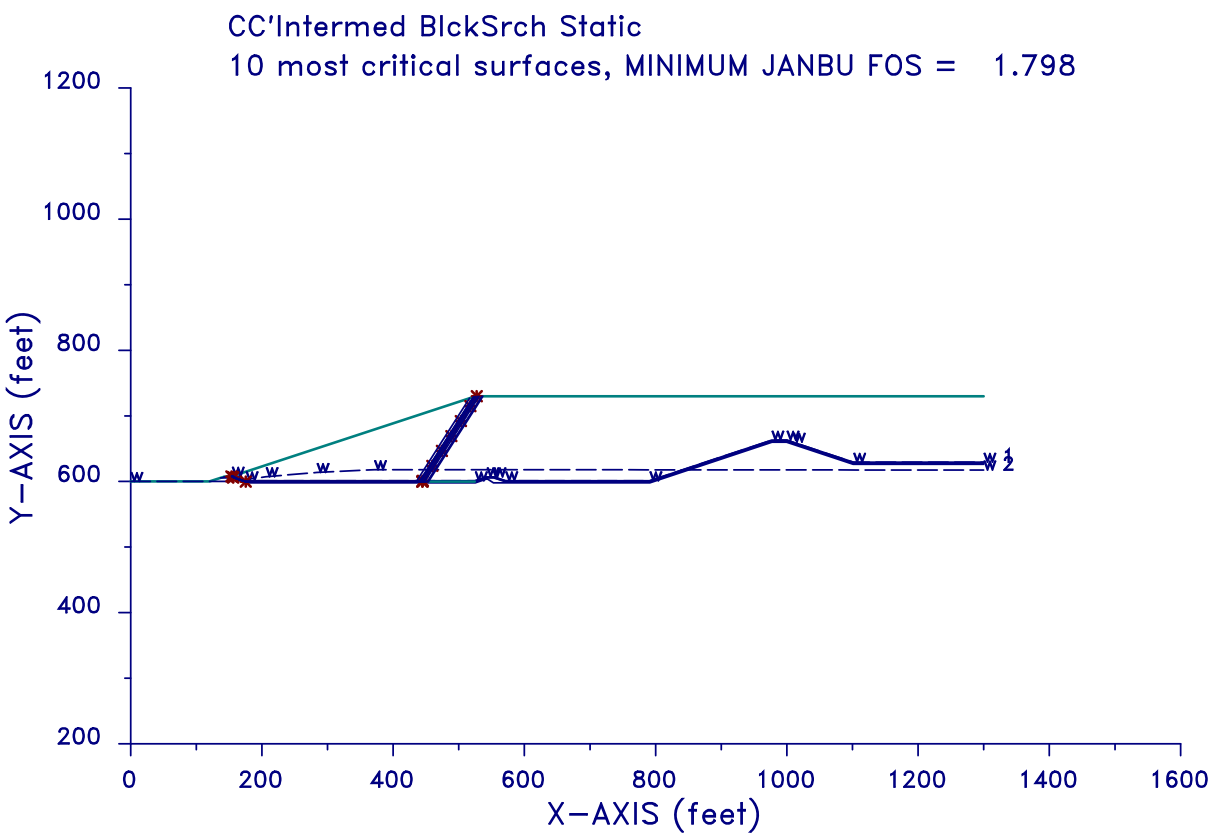

XSTABL File: C1S5B1S 4-12-16 16:50

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
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*                                       *
*  Ver. 5.208                 96 - 2046 *
*****************************************
```

Problem Description : CC'Intermed BlckSrch Static

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	600.0	120.4	600.0	11
2	120.4	600.0	136.9	605.5	11
3	136.9	605.5	141.7	607.1	10
4	141.7	607.1	142.9	607.5	9
5	142.9	607.5	152.9	607.5	9
6	152.9	607.5	154.5	608.0	3
7	154.5	608.0	525.5	730.0	2
8	525.5	730.0	1300.0	730.0	2

55 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	154.5	608.0	175.6	601.0	3
2	175.6	601.0	524.9	601.0	3
3	524.9	601.0	542.9	607.0	3
4	542.9	607.0	553.3	607.0	3
5	553.3	607.0	571.3	601.0	3
6	571.3	601.0	790.9	601.0	3
7	790.9	601.0	976.9	663.0	3
8	976.9	663.0	1000.0	663.0	3
9	1000.0	663.0	1009.6	659.8	3
10	1009.6	659.8	1101.5	629.3	3
11	1101.5	629.3	1300.0	629.3	3

12	152.9	607.5	175.4	600.0	9
13	525.1	600.0	543.1	606.0	9
14	543.1	606.0	553.1	606.0	9
15	553.1	606.0	571.1	600.0	9
16	791.1	600.0	977.1	662.0	9
17	977.1	662.0	999.8	662.0	9
18	999.8	662.0	1001.0	661.6	9
19	1001.0	661.6	1101.4	628.3	5
20	141.7	607.1	152.9	607.1	10
21	152.9	607.1	174.2	600.0	10
22	526.4	600.0	543.2	605.6	10
23	543.2	605.6	553.0	605.6	10
24	553.0	605.6	569.8	600.0	10
25	792.3	600.0	977.2	661.6	10
26	977.2	661.6	999.8	661.6	10
27	999.8	661.6	1001.0	661.6	5
28	999.8	661.6	1100.1	628.3	10
29	174.2	600.0	175.4	600.0	8
30	175.4	600.0	525.1	600.0	8
31	525.1	600.0	526.4	600.0	8
32	569.8	600.0	571.1	600.0	8
33	571.1	600.0	791.1	600.0	8
34	791.1	600.0	792.3	600.0	8
35	1100.1	628.3	1101.4	628.3	4
36	1101.4	628.3	1300.0	628.3	4
37	174.2	600.0	175.4	599.6	10
38	175.4	599.6	525.2	599.6	10
39	525.2	599.6	526.4	600.0	10
40	569.8	600.0	571.0	599.6	10
41	571.0	599.6	791.2	599.6	10
42	791.2	599.6	792.3	600.0	10
43	1100.1	628.3	1101.3	627.9	10
44	1101.3	627.9	1300.0	627.9	10
45	136.9	605.5	152.6	605.5	11
46	152.6	605.5	175.1	598.0	11
47	175.1	598.0	525.4	598.0	11
48	525.4	598.0	543.4	604.0	11
49	543.4	604.0	552.8	598.0	11
50	552.8	598.0	570.8	598.0	11
51	570.8	598.0	791.4	598.0	11
52	791.4	598.0	977.4	660.0	11
53	977.4	660.0	999.5	660.0	11
54	999.5	660.0	1101.1	626.3	11
55	1101.1	626.3	1300.0	626.3	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1

4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 12 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	154.50	608.00
2	175.60	601.00
3	524.90	601.00
4	542.90	607.00
5	553.30	607.00
6	571.30	601.00
7	790.90	601.00
8	976.90	663.00
9	1000.00	663.00
10	1009.60	659.80
11	1101.50	629.30
12	1300.00	629.30

Water Surface No. 2 specified by 6 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	600.00
2	150.00	600.00
3	206.10	607.20
4	283.70	613.70
5	371.30	618.00
6	1300.00	617.50

A critical failure surface searching method, using a random

technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

500 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 27.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	155.5	606.4	174.1	600.3	.3
2	175.4	599.8	175.4	599.8	.3
3	176.2	599.8	524.8	599.8	.3

```
************************************************************
**     Factor of safety calculation for surface #     6    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was -24.3113    **
**    This will be ignored for final summary of results    **
************************************************************
```

The trial failure surface in question is defined by the following 9 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	158.91	609.45
2	168.44	603.37
3	173.22	600.73
4	173.23	600.72
5	175.40	599.69
6	179.42	599.71
7	179.63	600.00
8	180.18	601.00
9	192.63	620.54

```
**********************************************************************
ERROR # 38
**********************************************************************
```

The program calculated a point for the PASSIVE wedge that is outside the defined slope geometry. The analysis will continue, but the user

should adjust the search box or slope geometry to allow a passive
wedge to be formed from all points within first box.
****

****
ERROR # 38
****
The program calculated a point for the PASSIVE wedge that is outside
the defined slope geometry. The analysis will continue, but the user
should adjust the search box or slope geometry to allow a passive
wedge to be formed from all points within first box.
****

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined
are displayed below - the most critical first

Failure surface No. 1 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	153.66	607.74
2	155.88	606.51
3	156.27	606.17
4	175.40	599.68
5	444.49	599.70
6	444.70	600.00
7	445.26	601.00
8	459.77	623.77
9	474.27	646.54
10	488.78	669.31
11	503.29	692.09
12	517.79	714.86
13	527.44	730.00

** Corrected JANBU FOS = 1.798 ** (Fo factor = 1.081)

Failure surface No. 2 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	153.69	607.75
2	156.01	606.46
3	156.46	606.07
4	175.40	599.80
5	453.91	599.67

6	454.14	600.00
7	454.70	601.00
8	469.20	623.77
9	483.71	646.54
10	498.22	669.31
11	512.72	692.09
12	527.23	714.86
13	536.88	730.00

** Corrected JANBU FOS = 1.800 ** (Fo factor = 1.081)

Failure surface No. 3 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	153.97	607.83
2	157.10	606.10
3	157.59	605.67
4	175.40	599.77
5	446.04	599.92
6	446.10	600.00
7	446.65	601.00
8	461.16	623.77
9	475.67	646.54
10	490.17	669.31
11	504.68	692.09
12	519.19	714.86
13	528.84	730.00

** Corrected JANBU FOS = 1.800 ** (Fo factor = 1.081)

Failure surface No. 4 specified by 14 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	154.83	608.11
2	155.53	607.66
3	160.21	605.06
4	160.60	604.73
5	175.40	599.78
6	448.21	599.71
7	448.41	600.00
8	448.96	601.00
9	463.47	623.77
10	477.98	646.54
11	492.48	669.31
12	506.99	692.09
13	521.50	714.86
14	531.15	730.00

** Corrected JANBU FOS = 1.801 ** (Fo factor = 1.081)

Failure surface No. 5 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	154.23	607.92
2	158.11	605.76
3	158.71	605.25
4	175.40	599.69
5	439.86	599.73
6	440.05	600.00
7	440.60	601.00
8	455.11	623.77
9	469.62	646.54
10	484.12	669.31
11	498.63	692.09
12	513.14	714.86
13	522.07	728.87

** Corrected JANBU FOS = 1.801 ** (Fo factor = 1.081)

Failure surface No. 6 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	154.37	607.96
2	158.66	605.58
3	158.97	605.31
4	175.40	599.69
5	440.85	599.78
6	441.00	600.00
7	441.55	601.00
8	456.06	623.77
9	470.57	646.54
10	485.07	669.31
11	499.58	692.09
12	514.09	714.86
13	523.27	729.27

** Corrected JANBU FOS = 1.802 ** (Fo factor = 1.081)

Failure surface No. 7 specified by 14 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	154.55	608.02
2	154.65	607.95
3	159.33	605.36
4	159.68	605.05
5	175.40	599.66
6	440.66	599.84
7	440.77	600.00
8	441.32	601.00
9	455.83	623.77
10	470.34	646.54
11	484.85	669.31
12	499.35	692.09

13	513.86	714.86
14	522.98	729.17

** Corrected JANBU FOS = 1.802 ** (Fo factor = 1.081)

Failure surface No. 8 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	153.95	607.83
2	157.01	606.13
3	157.23	605.94
4	175.40	599.76
5	435.41	599.66
6	435.65	600.00
7	436.20	601.00
8	450.71	623.77
9	465.21	646.54
10	479.72	669.31
11	494.23	692.09
12	508.74	714.86
13	516.50	727.04

** Corrected JANBU FOS = 1.803 ** (Fo factor = 1.081)

Failure surface No. 9 specified by 14 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	155.77	608.42
2	158.53	606.66
3	163.24	604.05
4	163.60	603.74
5	175.40	599.76
6	452.06	599.67
7	452.29	600.00
8	452.84	601.00
9	467.35	623.77
10	481.86	646.54
11	496.37	669.31
12	510.87	692.09
13	525.38	714.86
14	535.03	730.00

** Corrected JANBU FOS = 1.805 ** (Fo factor = 1.081)

Failure surface No.10 specified by 14 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	154.90	608.13
2	155.78	607.58
3	160.46	604.98

4	160.64	604.82
5	175.40	599.89
6	443.15	599.82
7	443.27	600.00
8	443.83	601.00
9	458.34	623.77
10	472.84	646.54
11	487.35	669.31
12	501.86	692.09
13	516.36	714.86
14	526.01	730.00

** Corrected JANBU FOS = 1.806 ** (Fo factor = 1.081)

```
*******************************************************************
**                                                               **
**  Out of the    500 surfaces generated and analyzed by XSTABL,  **
**        1 surfaces were found to have MISLEADING FOS values.    **
**                                                               **
*******************************************************************
```

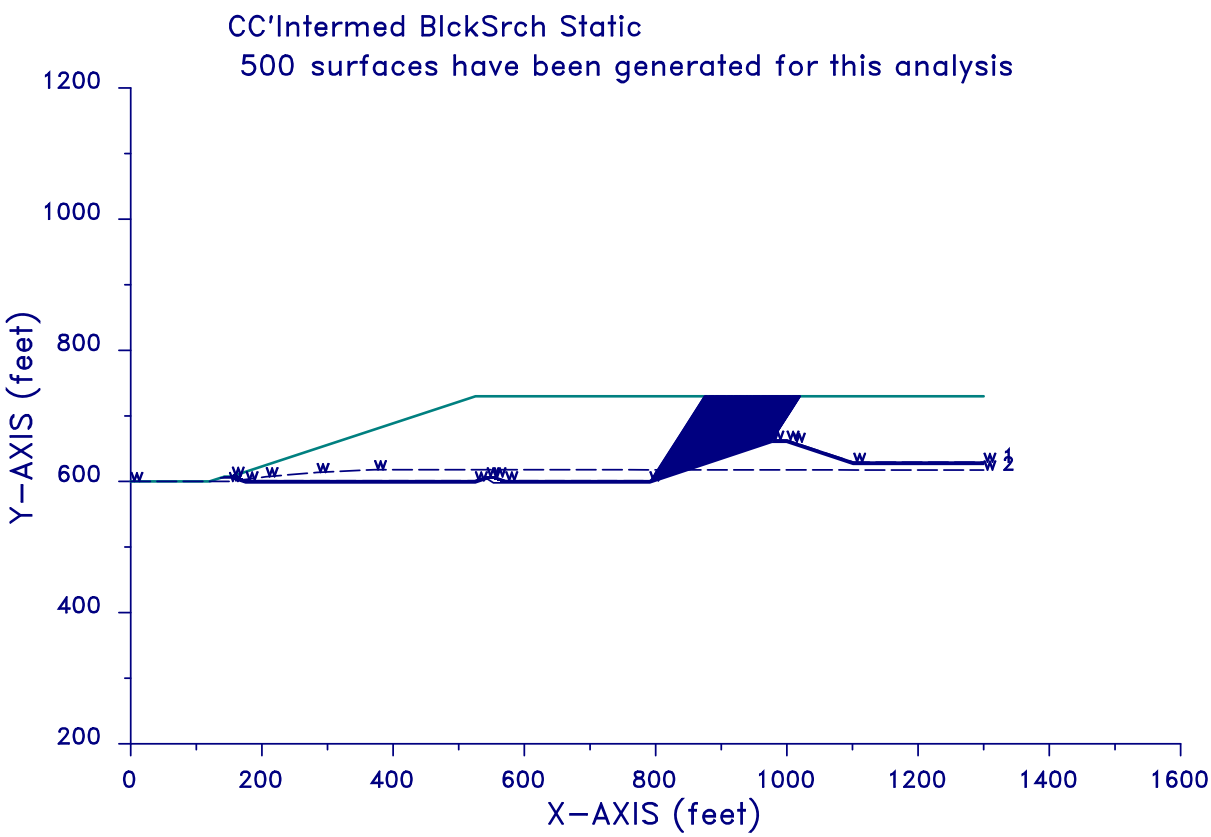
The following is a summary of the TEN most critical surfaces

Problem Description : CC'Intermed BlckSrch Static

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	1.798	1.081	153.66	527.44	6.958E+05
2.	1.800	1.081	153.69	536.88	7.361E+05
3.	1.800	1.081	153.97	528.84	7.017E+05
4.	1.801	1.081	154.83	531.15	7.125E+05
5.	1.801	1.081	154.23	522.07	6.759E+05
6.	1.802	1.081	154.37	523.27	6.801E+05
7.	1.802	1.081	154.55	522.98	6.792E+05
8.	1.803	1.081	153.95	516.50	6.569E+05
9.	1.805	1.081	155.77	535.03	7.305E+05
10.	1.806	1.081	154.90	526.01	6.906E+05

* * * END OF FILE * * *

C1S5B4S 4-12-16 17:02



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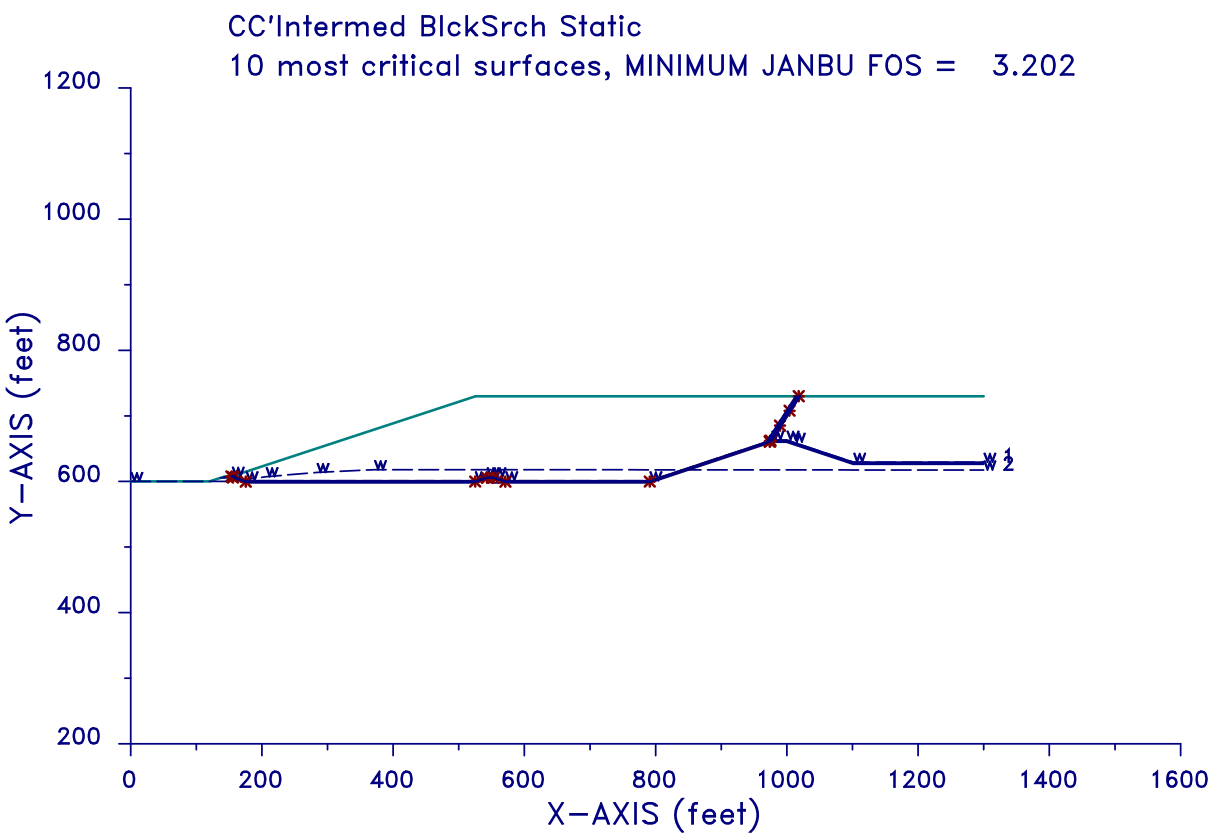

XSTABL File: C1S5B4S 4-12-16 17:02

```
*****************************************
*              X S T A B L              *
*                                       *
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*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                 96 - 2046 *
*****************************************
```

Problem Description : CC'Intermed BlckSrch Static

SEGMENT BOUNDARY COORDINATES
---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	600.0	120.4	600.0	11
2	120.4	600.0	136.9	605.5	11
3	136.9	605.5	141.7	607.1	10
4	141.7	607.1	142.9	607.5	9
5	142.9	607.5	152.9	607.5	9
6	152.9	607.5	154.5	608.0	3
7	154.5	608.0	525.5	730.0	2
8	525.5	730.0	1300.0	730.0	2

55 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	154.5	608.0	175.6	601.0	3
2	175.6	601.0	524.9	601.0	3
3	524.9	601.0	542.9	607.0	3
4	542.9	607.0	553.3	607.0	3
5	553.3	607.0	571.3	601.0	3
6	571.3	601.0	790.9	601.0	3
7	790.9	601.0	976.9	663.0	3
8	976.9	663.0	1000.0	663.0	3
9	1000.0	663.0	1009.6	659.8	3
10	1009.6	659.8	1101.5	629.3	3
11	1101.5	629.3	1300.0	629.3	3

12	152.9	607.5	175.4	600.0	9
13	525.1	600.0	543.1	606.0	9
14	543.1	606.0	553.1	606.0	9
15	553.1	606.0	571.1	600.0	9
16	791.1	600.0	977.1	662.0	9
17	977.1	662.0	999.8	662.0	9
18	999.8	662.0	1001.0	661.6	9
19	1001.0	661.6	1101.4	628.3	5
20	141.7	607.1	152.9	607.1	10
21	152.9	607.1	174.2	600.0	10
22	526.4	600.0	543.2	605.6	10
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24	553.0	605.6	569.8	600.0	10
25	792.3	600.0	977.2	661.6	10
26	977.2	661.6	999.8	661.6	10
27	999.8	661.6	1001.0	661.6	5
28	999.8	661.6	1100.1	628.3	10
29	174.2	600.0	175.4	600.0	8
30	175.4	600.0	525.1	600.0	8
31	525.1	600.0	526.4	600.0	8
32	569.8	600.0	571.1	600.0	8
33	571.1	600.0	791.1	600.0	8
34	791.1	600.0	792.3	600.0	8
35	1100.1	628.3	1101.4	628.3	4
36	1101.4	628.3	1300.0	628.3	4
37	174.2	600.0	175.4	599.6	10
38	175.4	599.6	525.2	599.6	10
39	525.2	599.6	526.4	600.0	10
40	569.8	600.0	571.0	599.6	10
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48	525.4	598.0	543.4	604.0	11
49	543.4	604.0	552.8	598.0	11
50	552.8	598.0	570.8	598.0	11
51	570.8	598.0	791.4	598.0	11
52	791.4	598.0	977.4	660.0	11
53	977.4	660.0	999.5	660.0	11
54	999.5	660.0	1101.1	626.3	11
55	1101.1	626.3	1300.0	626.3	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1

4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 12 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	154.50	608.00
2	175.60	601.00
3	524.90	601.00
4	542.90	607.00
5	553.30	607.00
6	571.30	601.00
7	790.90	601.00
8	976.90	663.00
9	1000.00	663.00
10	1009.60	659.80
11	1101.50	629.30
12	1300.00	629.30

Water Surface No. 2 specified by 6 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	600.00
2	150.00	600.00
3	206.10	607.20
4	283.70	613.70
5	371.30	618.00
6	1300.00	617.50

A critical failure surface searching method, using a random

technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

500 trial surfaces will be generated and analyzed.

8 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 27.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	155.5	606.4	174.1	600.3	.3
2	175.4	599.8	175.4	599.8	.3
3	525.1	599.8	525.1	599.8	.3
4	543.1	605.8	543.1	605.8	.3
5	553.1	605.8	553.1	605.8	.3
6	571.1	599.8	571.1	599.8	.3
7	791.1	599.8	791.1	599.8	.3
8	791.7	600.0	977.1	661.8	.3

****
ERROR # 38
****
The program calculated a point for the PASSIVE wedge that is outside the defined slope geometry. The analysis will continue, but the user should adjust the search box or slope geometry to allow a passive wedge to be formed from all points within first box.
****

****
ERROR # 38
****
The program calculated a point for the PASSIVE wedge that is outside the defined slope geometry. The analysis will continue, but the user should adjust the search box or slope geometry to allow a passive wedge to be formed from all points within first box.
****

****
ERROR # 38
****

The program calculated a point for the PASSIVE wedge that is outside
the defined slope geometry. The analysis will continue, but the user
should adjust the search box or slope geometry to allow a passive
wedge to be formed from all points within first box.
****

****
ERROR # 38
****
The program calculated a point for the PASSIVE wedge that is outside
the defined slope geometry. The analysis will continue, but the user
should adjust the search box or slope geometry to allow a passive
wedge to be formed from all points within first box.
****

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined
are displayed below - the most critical first

Failure surface No. 1 specified by 15 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	153.61	607.72
2	155.68	606.57
3	155.97	606.32
4	175.40	599.76
5	525.10	599.93
6	543.10	605.66
7	553.10	605.80
8	571.10	599.82
9	791.10	599.90
10	974.01	660.67
11	974.37	661.09
12	975.10	662.40
13	989.61	685.17
14	1004.11	707.94
15	1018.16	730.00

** Corrected JANBU FOS = 3.202 ** (Fo factor = 1.047)

Failure surface No. 2 specified by 15 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	153.97	607.84

2	157.11	606.10
3	157.66	605.62
4	175.40	599.76
5	525.10	599.72
6	543.10	605.65
7	553.10	605.74
8	571.10	599.65
9	791.10	599.75
10	975.82	661.47
11	975.95	661.62
12	976.67	662.92
13	991.18	685.70
14	1005.69	708.47
15	1019.40	730.00

** Corrected JANBU FOS = 3.202 ** (Fo factor = 1.047)

Failure surface No. 3 specified by 15 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	154.42	607.97
2	158.85	605.52
3	159.29	605.14
4	175.40	599.87
5	525.10	599.78
6	543.10	605.87
7	553.10	605.71
8	571.10	599.87
9	791.10	599.82
10	975.54	661.20
11	975.88	661.59
12	976.61	662.90
13	991.11	685.67
14	1005.62	708.45
15	1019.35	730.00

** Corrected JANBU FOS = 3.202 ** (Fo factor = 1.047)

Failure surface No. 4 specified by 16 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	153.63	607.73
2	155.78	606.54
3	156.32	606.08
4	175.40	599.66
5	525.10	599.66
6	543.10	605.90
7	553.10	605.77
8	571.10	599.93
9	791.10	599.93
10	969.24	659.13
11	969.53	659.48
12	970.26	660.79

13	984.77	683.56
14	999.27	706.33
15	1013.78	729.10
16	1014.35	730.00

** Corrected JANBU FOS = 3.202 ** (Fo factor = 1.047)

Failure surface No. 5 specified by 16 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	155.45	608.31
2	157.52	607.00
3	162.22	604.39
4	162.70	603.98
5	175.40	599.93
6	525.10	599.75
7	543.10	605.85
8	553.10	605.80
9	571.10	599.86
10	791.10	599.82
11	976.54	661.64
12	976.75	661.88
13	977.37	663.00
14	991.88	685.77
15	1006.38	708.54
16	1020.05	730.00

** Corrected JANBU FOS = 3.204 ** (Fo factor = 1.047)

Failure surface No. 6 specified by 15 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	153.73	607.76
2	156.17	606.41
3	156.86	605.81
4	175.40	599.77
5	525.10	599.94
6	543.10	605.83
7	553.10	605.80
8	571.10	599.73
9	791.10	599.87
10	973.33	660.44
11	973.70	660.87
12	974.43	662.18
13	988.93	684.95
14	1003.44	707.72
15	1017.63	730.00

** Corrected JANBU FOS = 3.205 ** (Fo factor = 1.047)

Failure surface No. 7 specified by 16 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	155.51	608.33
2	157.70	606.94
3	162.40	604.33
4	162.78	604.01
5	175.40	599.89
6	525.10	599.88
7	543.10	605.91
8	553.10	605.67
9	571.10	599.81
10	791.10	599.90
11	976.00	661.54
12	976.11	661.67
13	976.83	662.98
14	991.34	685.75
15	1005.85	708.52
16	1019.53	730.00

** Corrected JANBU FOS = 3.205 ** (Fo factor = 1.047)

Failure surface No. 8 specified by 16 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	156.84	608.77
2	161.91	605.54
3	166.63	602.92
4	167.00	602.61
5	175.40	599.71
6	525.10	599.73
7	543.10	605.70
8	553.10	605.89
9	571.10	599.76
10	791.10	599.78
11	976.86	661.85
12	976.95	661.95
13	977.53	663.00
14	992.04	685.77
15	1006.54	708.54
16	1020.21	730.00

** Corrected JANBU FOS = 3.205 ** (Fo factor = 1.047)

Failure surface No. 9 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	155.31	608.27
2	157.07	607.15
3	161.77	604.54
4	161.91	604.42
5	175.40	599.71
6	525.10	599.78

7	543.10	605.70
8	553.10	605.74
9	571.10	599.67
10	791.10	599.95
11	971.43	660.06
12	971.50	660.13
13	972.23	661.44
14	986.73	684.21
15	1001.24	706.98
16	1015.75	729.76
17	1015.90	730.00

** Corrected JANBU FOS = 3.208 ** (Fo factor = 1.047)

Failure surface No.10 specified by 16 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	154.17	607.90
2	157.89	605.84
3	158.11	605.65
4	175.40	599.68
5	525.10	599.67
6	543.10	605.65
7	553.10	605.78
8	571.10	599.73
9	791.10	599.87
10	967.89	658.68
11	968.19	659.03
12	968.91	660.34
13	983.42	683.11
14	997.93	705.88
15	1012.43	728.65
16	1013.29	730.00

** Corrected JANBU FOS = 3.210 ** (Fo factor = 1.047)

The following is a summary of the TEN most critical surfaces

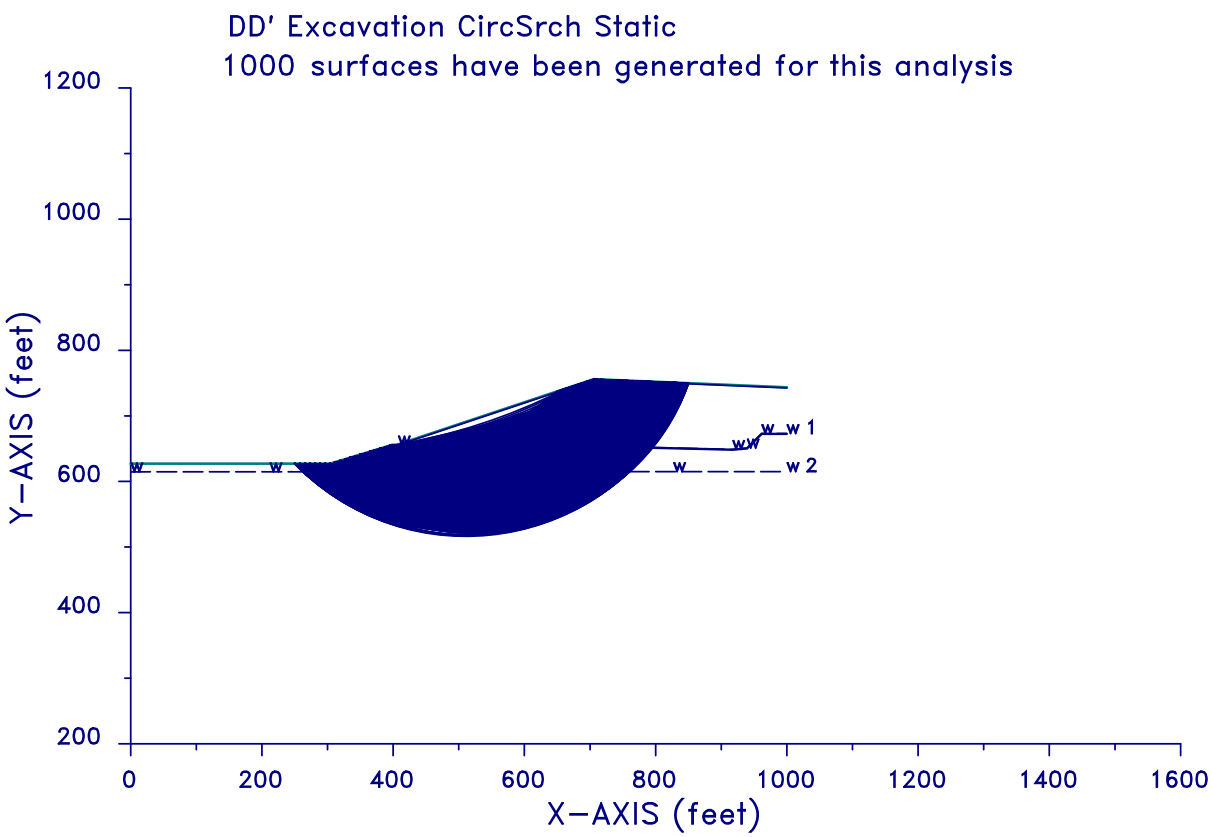
Problem Description : CC'Intermed BlckSrch Static

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	3.202	1.047	153.61	1018.16	1.966E+06
2.	3.202	1.047	153.97	1019.40	1.970E+06
3.	3.202	1.047	154.42	1019.35	1.967E+06
4.	3.202	1.047	153.63	1014.35	1.967E+06
5.	3.204	1.047	155.45	1020.05	1.968E+06
6.	3.205	1.047	153.73	1017.63	1.967E+06
7.	3.205	1.047	155.51	1019.53	1.967E+06
8.	3.205	1.047	156.84	1020.21	1.972E+06

9.	3.208	1.047	155.31	1015.90	1.969E+06
10.	3.210	1.047	154.17	1013.29	1.969E+06

* * * END OF FILE * * *

D1S5C1S 4-12-16 17:07



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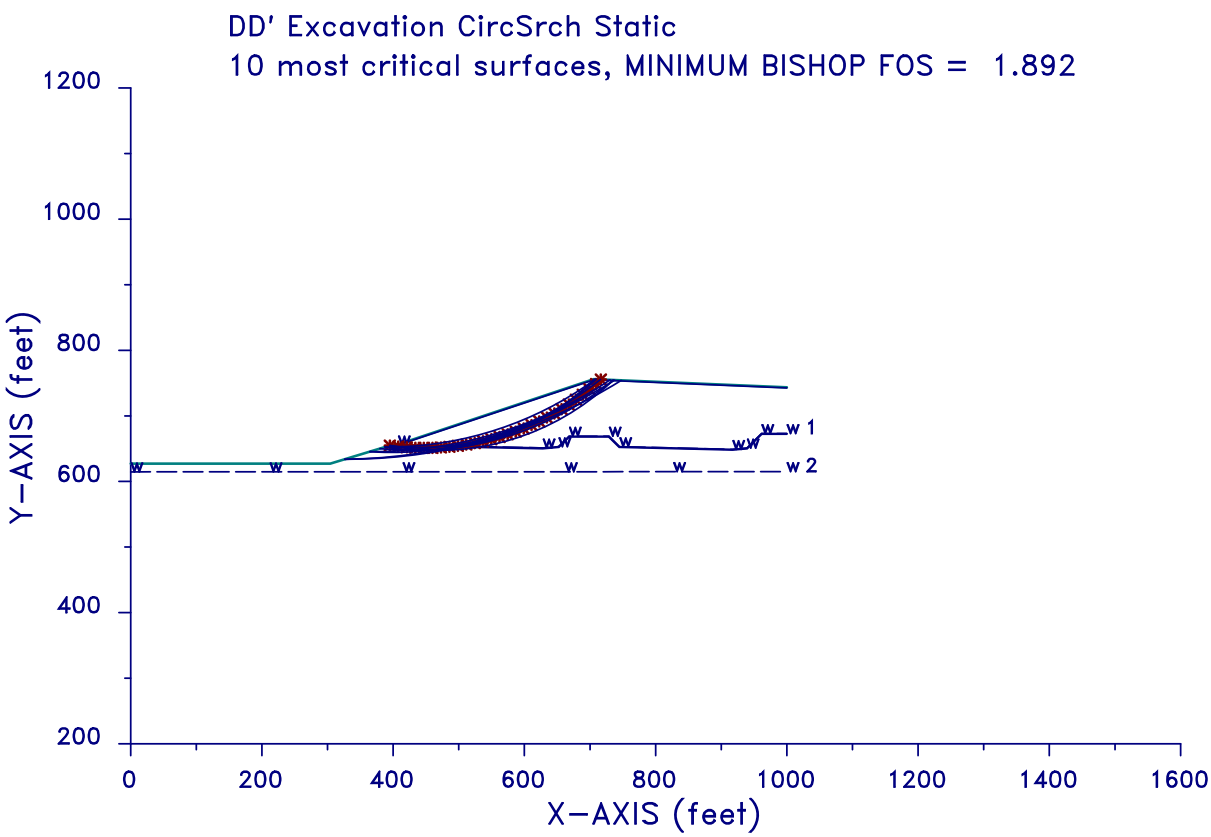

XSTABL File: D1S5C1S 4-12-16 17:07

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                 96 - 2046 *
*****************************************
```

Problem Description : DD' Excavation CircSrch Static

SEGMENT BOUNDARY COORDINATES
---

6 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	627.2	304.2	627.2	11
2	304.2	627.2	399.0	656.0	11
3	399.0	656.0	405.8	656.0	11
4	405.8	656.0	406.8	656.3	3
5	406.8	656.3	705.8	756.0	1
6	705.8	756.0	1000.0	743.7	1

23 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	406.8	656.3	407.1	655.5	3
2	407.1	655.5	407.6	655.5	3
3	407.6	655.5	706.0	755.0	2
4	706.0	755.0	1000.0	742.7	2
5	407.6	655.5	628.2	651.1	3
6	628.2	651.1	652.2	653.0	3
7	652.2	653.0	668.2	669.0	3
8	668.2	669.0	729.0	669.0	3
9	729.0	669.0	745.0	653.0	3
10	745.0	653.0	917.1	648.9	3
11	917.1	648.9	939.2	650.8	3
12	939.2	650.8	961.5	673.0	3
13	961.5	673.0	1000.0	673.0	3

14	405.8	656.0	406.4	654.6	11
15	406.4	654.6	628.2	650.1	11
16	628.2	650.1	652.6	652.0	11
17	652.6	652.0	668.6	668.0	11
18	668.6	668.0	728.5	668.0	11
19	728.5	668.0	744.5	652.0	11
20	744.5	652.0	917.1	647.9	11
21	917.1	647.9	939.6	649.8	11
22	939.6	649.8	961.9	672.0	11
23	961.9	672.0	1000.0	672.0	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 10 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	407.60	655.50
2	628.20	651.10
3	652.20	653.00
4	668.20	669.00
5	729.00	669.00
6	745.00	653.00
7	917.10	648.90
8	939.20	650.80

9	961.50	673.00
10	1000.00	673.00

Water Surface No. 2 specified by 6 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	614.60
2	212.00	614.70
3	414.60	614.80
4	662.00	614.90
5	827.10	615.00
6	1000.00	615.10

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

1000 trial surfaces will be generated and analyzed.

50 Surfaces initiate from each of 20 points equally spaced along the ground surface between x = 250.0 ft
and x = 395.0 ft

Each surface terminates between x = 650.0 ft
and x = 850.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 460.0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

13.0 ft line segments define each trial failure surface.

```
---------------------
ANGULAR RESTRICTIONS
---------------------
```

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

```
************************************************************************
    --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)
************************************************************************
Negative effective stresses were calculated at the base of a slice.
This warning is usually reported for cases where slices have low self
weight and a relatively high "c" shear strength parameter.  In such
cases, this effect can only be eliminated by reducing the "c" value.
************************************************************************

    ------------------------------------------------------------
    USER SELECTED option to maintain strength greater than zero
    ------------------------------------------------------------



    Factors of safety have been calculated by the :

    * * * * *   SIMPLIFIED BISHOP METHOD   * * * * *


      The most critical circular failure surface
      is specified by 28 coordinate points

           Point      x-surf      y-surf
            No.        (ft)        (ft)

             1        395.00      654.78
             2        407.91      653.25
             3        420.86      652.14
             4        433.84      651.45
             5        446.84      651.19
             6        459.84      651.35
             7        472.83      651.94
             8        485.79      652.96
             9        498.71      654.39
            10        511.57      656.25
            11        524.37      658.53
            12        537.09      661.23
            13        549.71      664.34
            14        562.22      667.87
            15        574.62      671.80
            16        586.87      676.14
            17        598.98      680.87
            18        610.92      686.00
            19        622.70      691.51
            20        634.28      697.41
            21        645.67      703.69
            22        656.84      710.33
            23        667.79      717.34
            24        678.51      724.70
            25        688.97      732.40
            26        699.19      740.45
            27        709.13      748.83
            28        716.60      755.55
```

**** Simplified BISHOP FOS = 1.892 ****

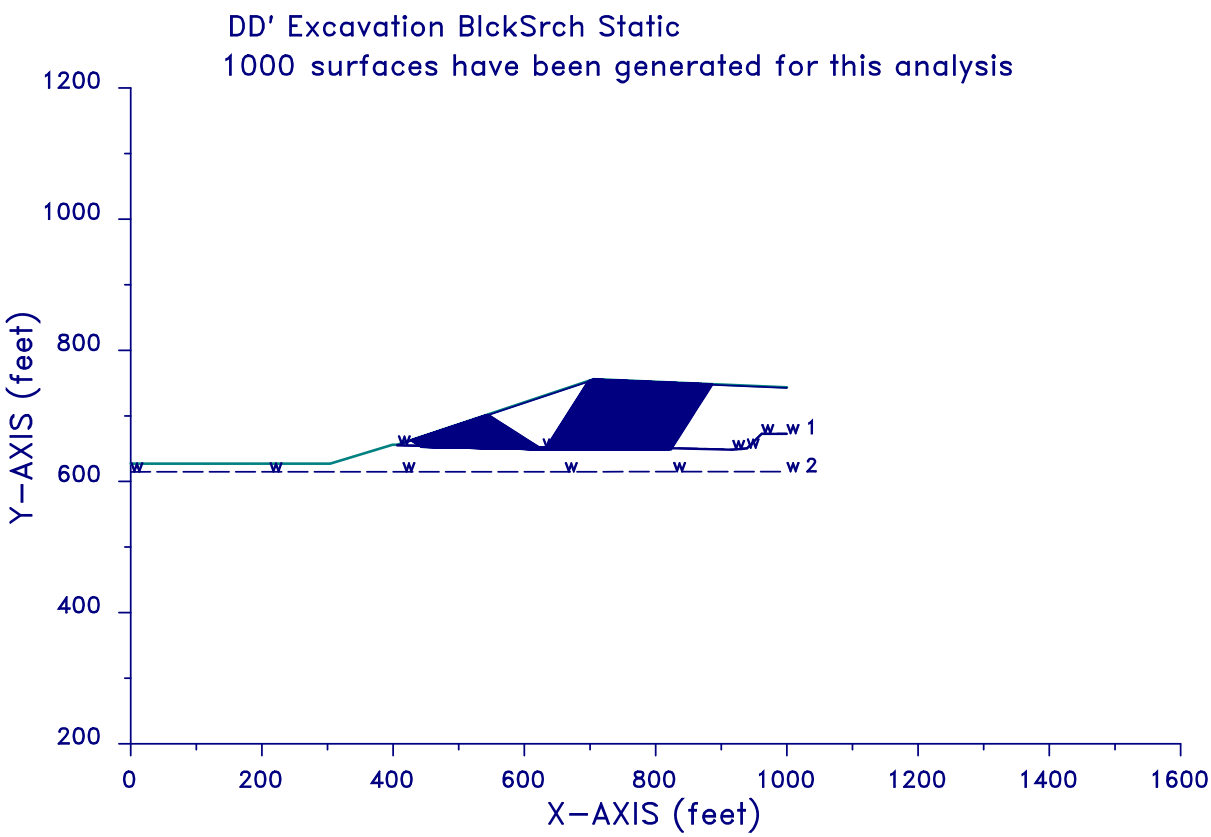
The following is a summary of the TEN most critical surfaces

Problem Description : DD' Excavation CircSrch Static

	FOS (BISHOP)	Circle Center x-coord (ft)	y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.892	448.33	1048.26	397.07	395.00	716.60	1.591E+08
2.	1.899	442.41	1046.74	394.82	395.00	709.31	1.442E+08
3.	1.922	430.74	1135.18	487.71	379.74	735.82	2.335E+08
4.	1.924	398.01	1155.05	510.64	364.47	716.09	2.107E+08
5.	1.927	445.20	1017.92	370.00	387.37	706.46	1.501E+08
6.	1.930	369.21	1296.79	651.29	364.47	730.58	2.601E+08
7.	1.934	469.22	1031.87	384.32	395.00	735.44	2.005E+08
8.	1.940	319.79	1416.93	783.04	326.32	737.53	3.844E+08
9.	1.949	390.38	1192.63	540.17	387.37	708.20	1.557E+08
10.	1.951	330.52	1416.04	782.13	326.32	747.37	4.249E+08

* * * END OF FILE * * *

D1S5B1S 4-12-16 17:04



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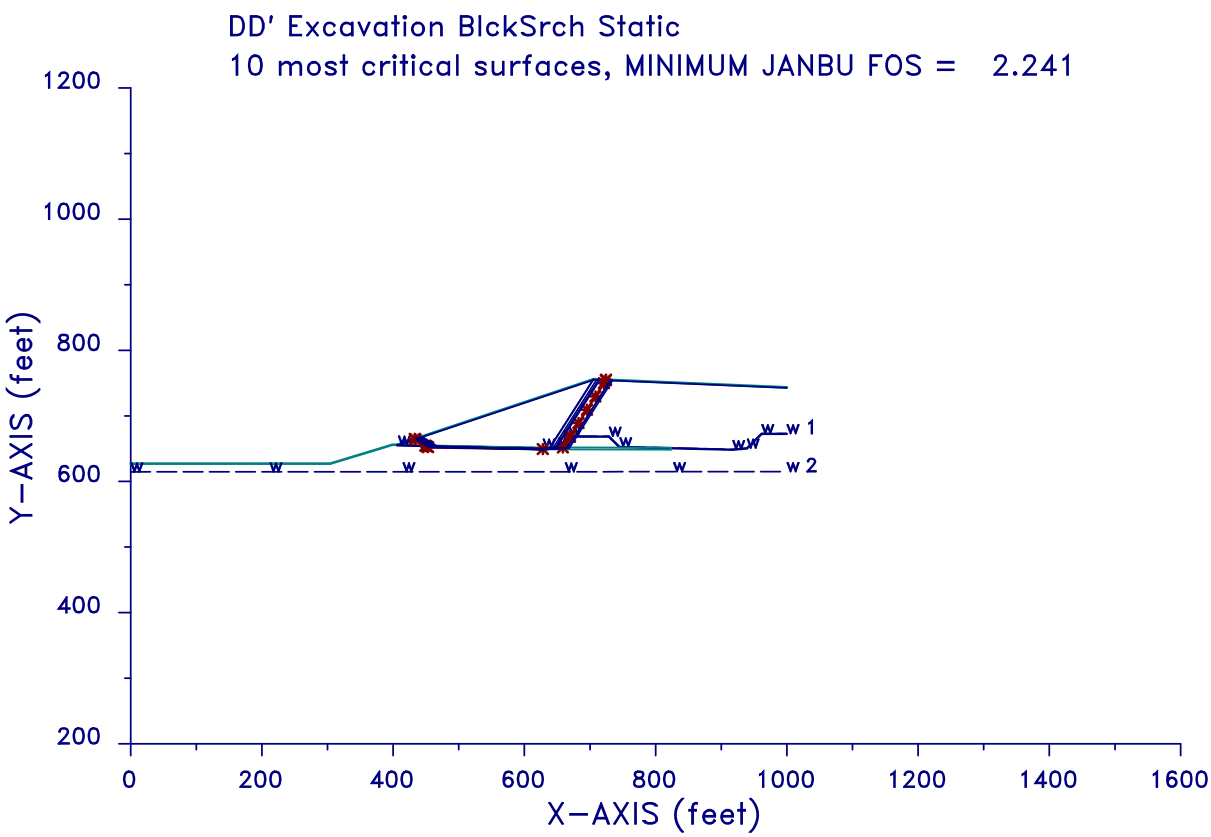

XSTABL File: D1S5B1S 4-12-16 17:04

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                 96 - 2046 *
*****************************************
```

Problem Description : DD' Excavation BlckSrch Static

SEGMENT BOUNDARY COORDINATES
---

6 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	627.2	304.2	627.2	11
2	304.2	627.2	399.0	656.0	11
3	399.0	656.0	405.8	656.0	11
4	405.8	656.0	406.8	656.3	3
5	406.8	656.3	705.8	756.0	1
6	705.8	756.0	1000.0	743.7	1

23 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	406.8	656.3	407.1	655.5	3
2	407.1	655.5	407.6	655.5	3
3	407.6	655.5	706.0	755.0	2
4	706.0	755.0	1000.0	742.7	2
5	407.6	655.5	628.2	651.1	3
6	628.2	651.1	652.2	653.0	3
7	652.2	653.0	668.2	669.0	3
8	668.2	669.0	729.0	669.0	3
9	729.0	669.0	745.0	653.0	3
10	745.0	653.0	917.1	648.9	3
11	917.1	648.9	939.2	650.8	3
12	939.2	650.8	961.5	673.0	3
13	961.5	673.0	1000.0	673.0	3

14	405.8	656.0	406.4	654.6	11
15	406.4	654.6	628.2	650.1	11
16	628.2	650.1	652.6	652.0	11
17	652.6	652.0	668.6	668.0	11
18	668.6	668.0	728.5	668.0	11
19	728.5	668.0	744.5	652.0	11
20	744.5	652.0	917.1	647.9	11
21	917.1	647.9	939.6	649.8	11
22	939.6	649.8	961.9	672.0	11
23	961.9	672.0	1000.0	672.0	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 10 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	407.60	655.50
2	628.20	651.10
3	652.20	653.00
4	668.20	669.00
5	729.00	669.00
6	745.00	653.00
7	917.10	648.90
8	939.20	650.80

9	961.50	673.00
10	1000.00	673.00

Water Surface No. 2 specified by 6 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	614.60
2	212.00	614.70
3	414.60	614.80
4	662.00	614.90
5	827.10	615.00
6	1000.00	615.10

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

1000 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 24.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	442.5	653.8	624.2	650.2	3.0
2	628.2	650.1	628.2	650.1	3.0
3	632.4	650.5	823.9	650.1	3.0

```
************************************************************************
    --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)
************************************************************************
```

Negative effective stresses were calculated at the base of a slice. This warning is usually reported for cases where slices have low self weight and a relatively high "c" shear strength parameter. In such cases, this effect can only be eliminated by reducing the "c" value.

```
*************************************************************************

    ------------------------------------------------------------
    USER SELECTED option to maintain strength greater than zero
    ------------------------------------------------------------


    Factors of safety have been calculated by the :

    * * * * *   SIMPLIFIED JANBU METHOD   * * * * *


    The 10 most critical of all the failure surfaces examined
    are displayed below - the most critical first

    Failure surface No. 1 specified by 15 coordinate points

           Point      x-surf      y-surf
            No.        (ft)        (ft)

             1        432.95      665.02
             2        434.03      664.31
             3        449.17      654.67
             4        450.93      653.70
             5        453.18      652.23
             6        628.20      649.40
             7        658.62      651.93
             8        669.06      668.00
             9        669.61      669.00
            10        682.51      689.24
            11        695.40      709.48
            12        708.30      729.72
            13        721.19      749.97
            14        723.92      754.25
            15        724.55      755.22

     **  Corrected JANBU FOS =   2.241  **    (Fo factor = 1.083)


    Failure surface No. 2 specified by 16 coordinate points

           Point      x-surf      y-surf
            No.        (ft)        (ft)

             1        435.63      665.91
             2        436.72      665.21
             3        453.39      654.59
             4        455.15      653.61
             5        455.63      653.30
             6        628.20      648.91
             7        647.38      650.84
             8        647.89      651.63
             9        648.48      652.71
            10        661.38      672.95
            11        674.27      693.19
            12        687.17      713.43
            13        700.06      733.67
```

14	712.96	753.91
15	713.45	754.69
16	714.08	755.65

** Corrected JANBU FOS = 2.273 ** (Fo factor = 1.084)

Failure surface No. 3 specified by 15 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	440.65	667.59
2	441.73	666.88
3	461.28	654.43
4	463.05	653.45
5	464.43	652.55
6	628.20	649.90
7	665.16	651.37
8	675.96	668.00
9	676.51	669.00
10	689.41	689.24
11	702.30	709.48
12	715.20	729.72
13	728.09	749.97
14	730.65	753.97
15	731.27	754.94

** Corrected JANBU FOS = 2.274 ** (Fo factor = 1.083)

Failure surface No. 4 specified by 15 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	434.54	665.55
2	435.63	664.85
3	451.68	654.62
4	453.43	653.65
5	454.41	653.01
6	628.20	648.77
7	668.43	650.84
8	679.57	668.00
9	680.12	669.00
10	693.02	689.24
11	705.91	709.48
12	718.81	729.72
13	731.70	749.97
14	734.16	753.82
15	734.79	754.79

** Corrected JANBU FOS = 2.282 ** (Fo factor = 1.082)

Failure surface No. 5 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)

1	443.71	668.61
2	444.80	667.90
3	445.86	667.23
4	466.10	654.33
5	467.87	653.35
6	468.69	652.82
7	628.20	650.08
8	647.30	651.41
9	647.42	651.60
10	648.01	652.67
11	660.91	672.91
12	673.80	693.15
13	686.70	713.39
14	699.59	733.63
15	712.49	753.88
16	713.02	754.71
17	713.64	755.67

** Corrected JANBU FOS = 2.284 ** (Fo factor = 1.085)

Failure surface No. 6 specified by 15 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	433.85	665.32
2	434.94	664.61
3	450.59	654.64
4	452.35	653.67
5	453.49	652.92
6	628.20	649.98
7	644.05	651.42
8	644.60	652.40
9	657.49	672.64
10	670.39	692.88
11	683.28	713.12
12	696.18	733.36
13	709.07	753.61
14	709.86	754.84
15	710.49	755.80

** Corrected JANBU FOS = 2.284 ** (Fo factor = 1.084)

Failure surface No. 7 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	443.25	668.46
2	444.34	667.75
3	445.14	667.24
4	465.38	654.35
5	467.15	653.37
6	468.56	652.45
7	628.20	649.72
8	648.23	650.06

9	649.32	651.74
10	649.92	652.82
11	662.81	673.06
12	675.71	693.30
13	688.60	713.54
14	701.50	733.78
15	714.39	754.03
16	714.78	754.63
17	715.41	755.60

** Corrected JANBU FOS = 2.302 ** (Fo factor = 1.085)

Failure surface No. 8 specified by 16 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	441.47	667.86
2	442.55	667.15
3	462.57	654.40
4	464.33	653.42
5	466.44	652.06
6	628.20	649.22
7	638.55	650.52
8	638.81	650.93
9	639.40	651.99
10	652.30	672.23
11	665.19	692.47
12	678.09	712.71
13	690.98	732.95
14	703.88	753.19
15	704.76	754.59
16	705.65	755.95

** Corrected JANBU FOS = 2.304 ** (Fo factor = 1.085)

Failure surface No. 9 specified by 16 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	438.18	666.76
2	439.26	666.06
3	457.39	654.51
4	459.16	653.53
5	461.38	652.09
6	628.20	649.19
7	637.47	649.52
8	638.36	650.89
9	638.94	651.95
10	651.84	672.19
11	664.73	692.43
12	677.63	712.67
13	690.52	732.92
14	703.42	753.16
15	704.21	754.40
16	705.10	755.77

** Corrected JANBU FOS = 2.309 ** (Fo factor = 1.085)

Failure surface No.10 specified by 14 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	435.88	666.00
2	436.97	665.29
3	453.78	654.58
4	453.91	654.51
5	628.20	648.74
6	665.78	651.30
7	676.62	668.00
8	677.18	669.00
9	690.07	689.24
10	702.97	709.48
11	715.86	729.72
12	728.76	749.97
13	731.29	753.94
14	731.92	754.91

** Corrected JANBU FOS = 2.314 ** (Fo factor = 1.083)

The following is a summary of the TEN most critical surfaces

Problem Description : DD' Excavation BlckSrch Static

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	2.241	1.083	432.95	724.55	6.500E+05
2.	2.273	1.084	435.63	714.08	6.026E+05
3.	2.274	1.083	440.65	731.27	6.722E+05
4.	2.282	1.082	434.54	734.79	6.998E+05
5.	2.284	1.085	443.71	713.64	5.885E+05
6.	2.284	1.084	433.85	710.49	5.897E+05
7.	2.302	1.085	443.25	715.41	6.031E+05
8.	2.304	1.085	441.47	705.65	5.650E+05
9.	2.309	1.085	438.18	705.10	5.678E+05
10.	2.314	1.083	435.88	731.92	6.946E+05

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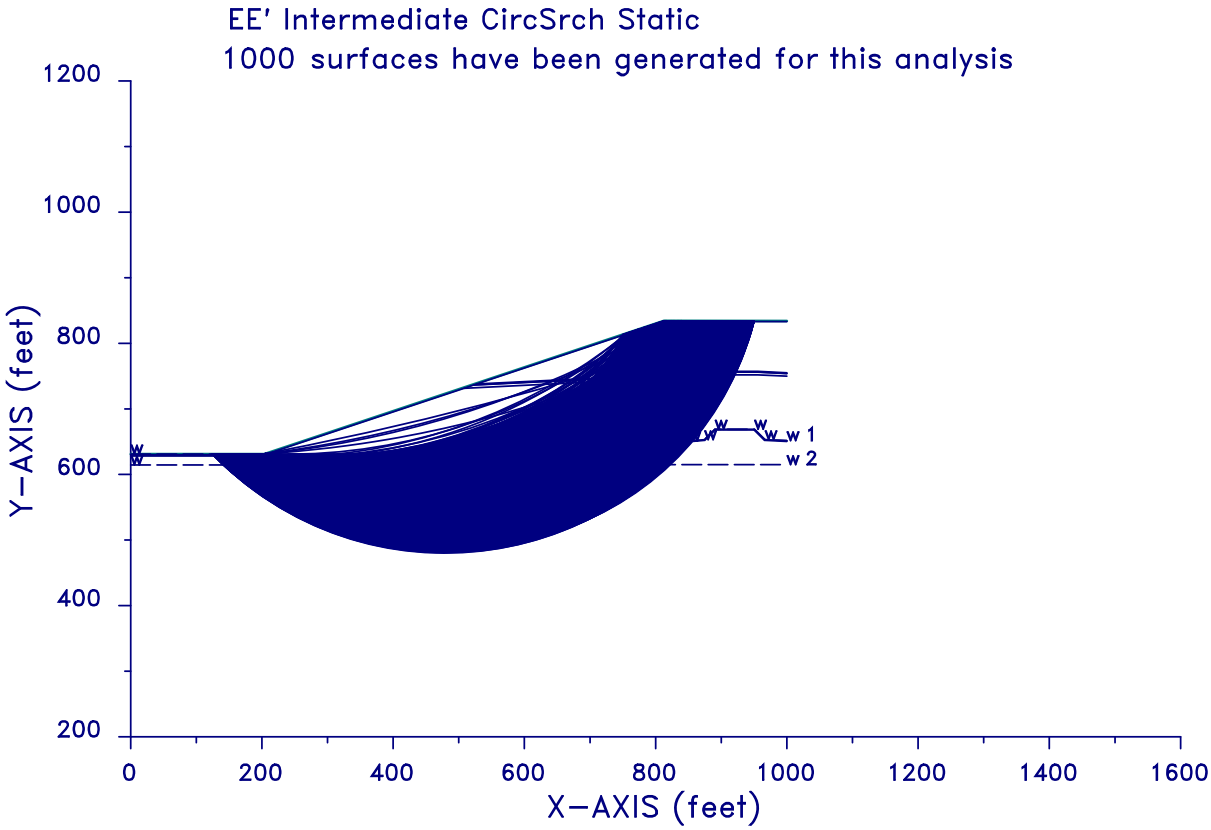

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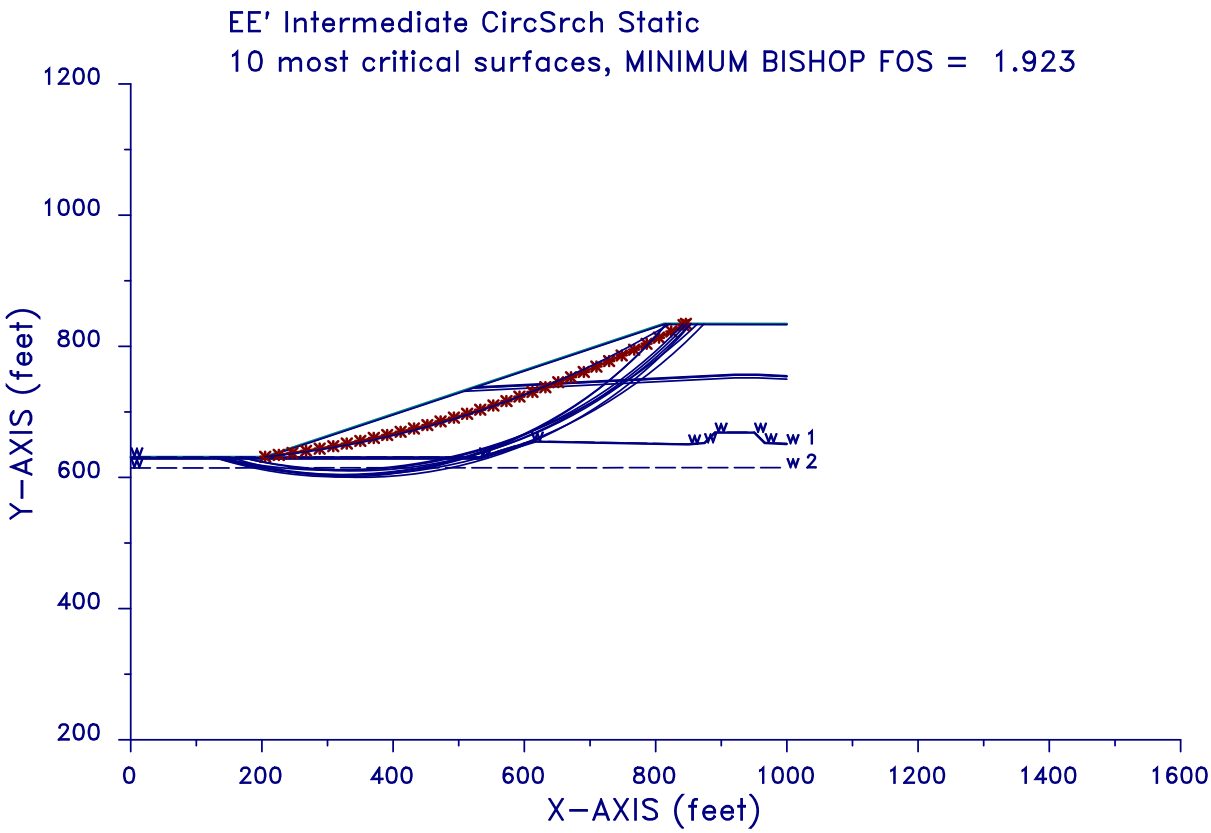

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*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
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*        Moscow, ID 83843, U.S.A.       *
*                                       *
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*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
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Problem Description : EE' Intermediate CircSrch Static

SEGMENT BOUNDARY COORDINATES
---

3 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	631.2	203.7	631.2	3
2	203.7	631.2	812.9	834.3	1
3	812.9	834.3	1000.0	834.2	1

44 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	203.7	631.2	206.8	631.2	3
2	206.8	631.2	508.1	731.6	3
3	508.1	731.6	522.2	736.3	1
4	522.2	736.3	523.6	736.8	8
5	523.6	736.8	527.1	738.0	3
6	527.1	738.0	813.0	833.3	2
7	813.0	833.3	1000.0	833.2	2
8	527.1	738.0	920.5	757.4	3
9	920.5	757.4	955.8	757.4	3
10	955.8	757.4	1000.0	755.2	3
11	523.6	736.8	920.5	756.4	8
12	920.5	756.4	955.8	756.4	8
13	955.8	756.4	1000.0	754.2	8
14	522.2	736.3	920.5	756.0	1
15	920.5	756.0	955.8	756.0	1
16	955.8	756.0	1000.0	753.8	1

17	508.1	731.6	920.6	752.0	2
18	920.6	752.0	955.7	752.0	2
19	955.7	752.0	1000.0	749.8	2
20	206.8	631.2	531.1	631.2	3
21	531.1	631.2	610.3	655.4	3
22	610.3	655.4	850.0	650.8	3
23	850.0	650.8	874.3	653.0	3
24	874.3	653.0	890.4	669.0	3
25	890.4	669.0	950.5	669.0	3
26	950.5	669.0	966.5	653.0	3
27	966.5	653.0	1000.0	651.6	3
28	.0	630.2	531.3	630.2	8
29	531.3	630.2	610.4	654.4	9
30	610.4	654.4	616.9	654.3	9
31	616.9	654.3	850.1	649.8	11
32	850.1	649.8	874.8	652.0	11
33	874.8	652.0	890.8	668.0	11
34	890.8	668.0	950.1	668.0	11
35	950.1	668.0	966.1	652.0	11
36	966.1	652.0	1000.0	650.6	11
37	531.3	630.2	532.7	630.2	8
38	.0	629.8	531.3	629.8	10
39	531.3	629.8	532.7	630.2	10
40	532.7	630.2	610.5	654.0	10
41	610.5	654.0	615.7	653.9	10
42	.0	628.2	531.6	628.2	11
43	531.6	628.2	615.7	653.9	11
44	615.7	653.9	616.9	654.3	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 9 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	631.20
2	531.10	631.20
3	610.30	655.40
4	850.00	650.80
5	874.30	653.00
6	890.40	669.00
7	950.50	669.00
8	966.50	653.00
9	1000.00	651.60

Water Surface No. 2 specified by 2 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	614.50
2	1000.00	615.10

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

1000 trial surfaces will be generated and analyzed.

50 Surfaces initiate from each of 20 points equally spaced along the ground surface between x = 125.0 ft
and x = 205.0 ft

Each surface terminates between x = 750.0 ft
and x = 950.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 460.0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

21.0 ft line segments define each trial failure surface.

```
---------------------
ANGULAR RESTRICTIONS
---------------------

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees




Factors of safety have been calculated by the :

* * * * *   SIMPLIFIED BISHOP METHOD   * * * * *



  The most critical circular failure surface
  is specified by 34 coordinate points
```

Point No.	x-surf (ft)	y-surf (ft)
1	205.00	631.63
2	225.82	634.39
3	246.60	637.38
4	267.36	640.61
5	288.07	644.06
6	308.74	647.75
7	329.37	651.66
8	349.96	655.81
9	370.50	660.19
10	390.99	664.79
11	411.42	669.63
12	431.80	674.69
13	452.13	679.98
14	472.39	685.50
15	492.59	691.25
16	512.72	697.22
17	532.79	703.41
18	552.78	709.83
19	572.70	716.47
20	592.55	723.34
21	612.32	730.42
22	632.01	737.73
23	651.61	745.25
24	671.13	753.00
25	690.56	760.96
26	709.91	769.14
27	729.16	777.53
28	748.31	786.14
29	767.37	794.96
30	786.32	804.00

31	805.18	813.25
32	823.93	822.70
33	842.57	832.37
34	846.16	834.28

**** Simplified BISHOP FOS = 1.923 ****

The following is a summary of the TEN most critical surfaces

Problem Description : EE' Intermediate CircSrch Static

	FOS (BISHOP)	Circle Center x-coord (ft)	y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.923	-31.32	2495.27	1878.56	205.00	846.16	1.826E+09
2.	1.940	319.56	1326.29	721.80	125.00	847.57	1.716E+09
3.	1.940	55.46	2125.99	1501.82	205.00	821.59	1.449E+09
4.	1.944	321.15	1251.42	648.01	133.42	817.01	1.439E+09
5.	1.947	337.00	1344.42	740.56	137.63	873.71	1.892E+09
6.	1.948	320.19	1243.47	642.63	125.00	815.61	1.458E+09
7.	1.950	338.43	1313.18	703.17	167.11	853.25	1.629E+09
8.	1.956	330.88	1310.46	698.73	167.11	842.17	1.551E+09
9.	1.959	308.11	1414.33	803.30	129.21	863.78	1.872E+09
10.	1.962	349.86	1259.93	659.65	150.26	853.79	1.683E+09

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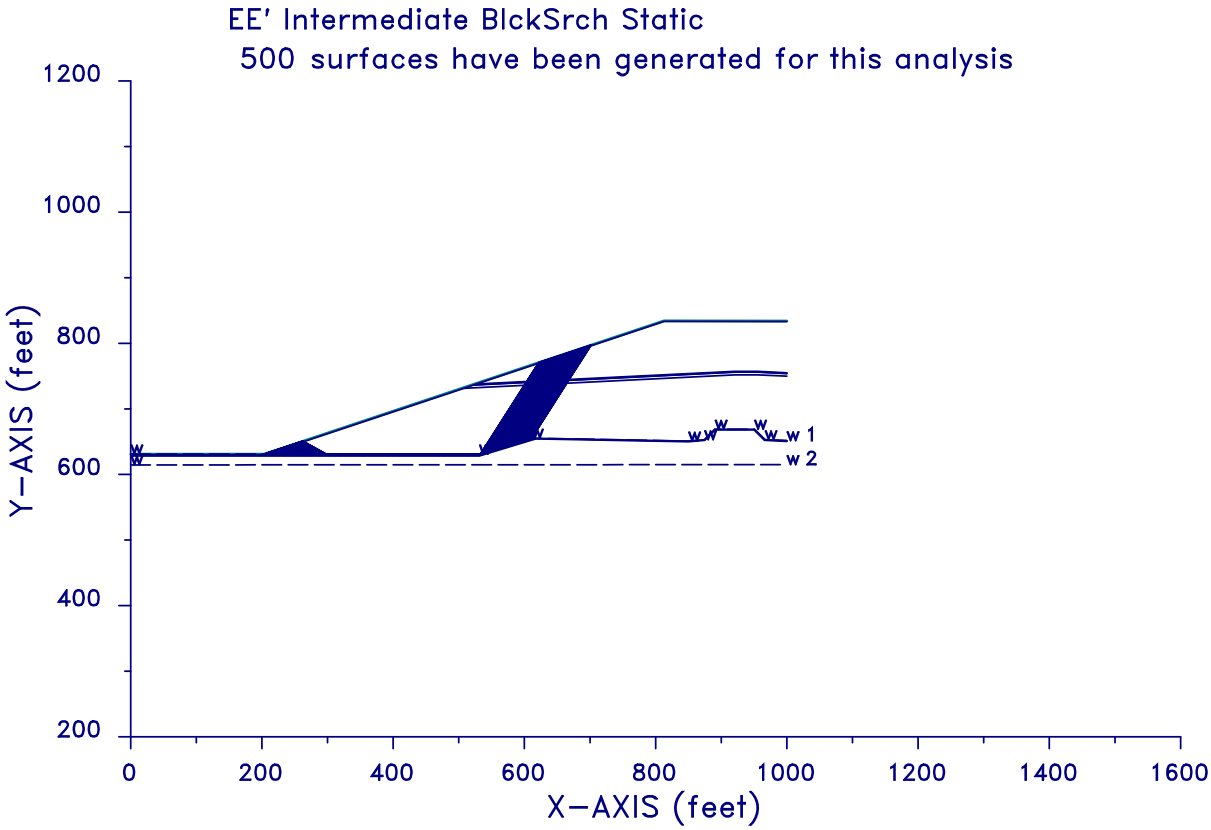

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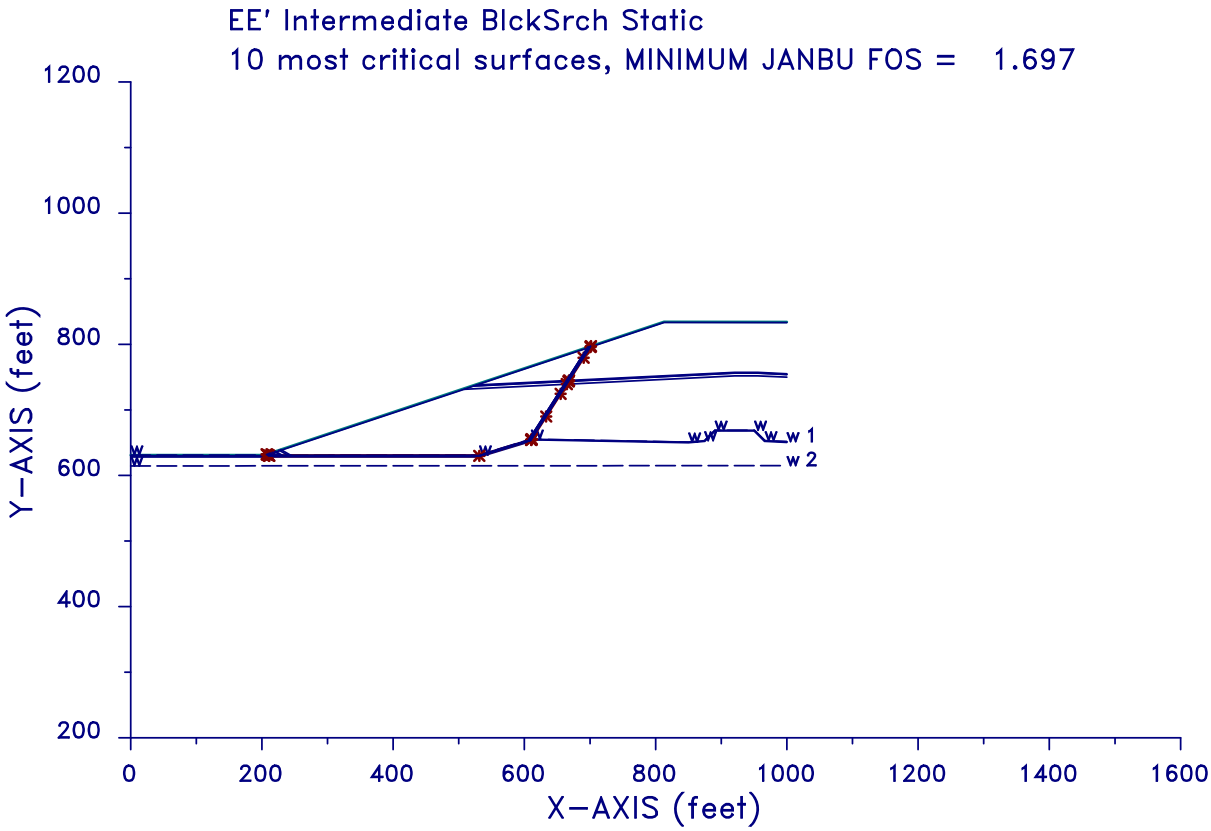

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*                using the              *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 2046  *
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Problem Description : EE' Intermediate BlckSrch Static

SEGMENT BOUNDARY COORDINATES
---

3 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	631.2	203.7	631.2	3
2	203.7	631.2	812.9	834.3	1
3	812.9	834.3	1000.0	834.2	1

44 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	203.7	631.2	206.8	631.2	3
2	206.8	631.2	508.1	731.6	3
3	508.1	731.6	522.2	736.3	1
4	522.2	736.3	523.6	736.8	8
5	523.6	736.8	527.1	738.0	3
6	527.1	738.0	813.0	833.3	2
7	813.0	833.3	1000.0	833.2	2
8	527.1	738.0	920.5	757.4	3
9	920.5	757.4	955.8	757.4	3
10	955.8	757.4	1000.0	755.2	3
11	523.6	736.8	920.5	756.4	8
12	920.5	756.4	955.8	756.4	8
13	955.8	756.4	1000.0	754.2	8
14	522.2	736.3	920.5	756.0	1
15	920.5	756.0	955.8	756.0	1
16	955.8	756.0	1000.0	753.8	1

17	508.1	731.6	920.6	752.0	2
18	920.6	752.0	955.7	752.0	2
19	955.7	752.0	1000.0	749.8	2
20	206.8	631.2	531.1	631.2	3
21	531.1	631.2	610.3	655.4	3
22	610.3	655.4	850.0	650.8	3
23	850.0	650.8	874.3	653.0	3
24	874.3	653.0	890.4	669.0	3
25	890.4	669.0	950.5	669.0	3
26	950.5	669.0	966.5	653.0	3
27	966.5	653.0	1000.0	651.6	3
28	.0	630.2	531.3	630.2	8
29	531.3	630.2	610.4	654.4	9
30	610.4	654.4	616.9	654.3	9
31	616.9	654.3	850.1	649.8	11
32	850.1	649.8	874.8	652.0	11
33	874.8	652.0	890.8	668.0	11
34	890.8	668.0	950.1	668.0	11
35	950.1	668.0	966.1	652.0	11
36	966.1	652.0	1000.0	650.6	11
37	531.3	630.2	532.7	630.2	8
38	.0	629.8	531.3	629.8	10
39	531.3	629.8	532.7	630.2	10
40	532.7	630.2	610.5	654.0	10
41	610.5	654.0	615.7	653.9	10
42	.0	628.2	531.6	628.2	11
43	531.6	628.2	615.7	653.9	11
44	615.7	653.9	616.9	654.3	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 9 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	631.20
2	531.10	631.20
3	610.30	655.40
4	850.00	650.80
5	874.30	653.00
6	890.40	669.00
7	950.50	669.00
8	966.50	653.00
9	1000.00	651.60

Water Surface No. 2 specified by 2 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	614.50
2	1000.00	615.10

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

500 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 41.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)

1	209.3	630.0	300.0	630.0	.3
2	531.3	630.0	531.3	630.0	.3
3	532.7	630.4	610.4	654.2	.3

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined
are displayed below - the most critical first

Failure surface No. 1 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	207.16	632.35
2	208.22	631.67
3	209.07	631.20
4	210.87	630.20
5	211.27	629.92
6	531.30	629.97
7	610.39	654.07
8	610.67	654.40
9	611.22	655.38
10	633.24	689.96
11	655.27	724.54
12	664.71	739.34
13	667.39	743.48
14	667.70	743.92
15	668.28	744.96
16	690.30	779.54
17	700.71	795.87
18	701.56	797.18

** Corrected JANBU FOS = 1.697 ** (Fo factor = 1.073)

Failure surface No. 2 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	206.90	632.27
2	207.95	631.58
3	208.64	631.20
4	210.44	630.20
5	210.58	630.11
6	531.30	629.86
7	609.36	653.74
8	609.77	654.21
9	610.43	655.40
10	632.46	689.98
11	654.49	724.56

12	663.88	739.30
13	666.57	743.44
14	666.87	743.88
15	667.45	744.92
16	689.48	779.50
17	699.69	795.53
18	700.55	796.84

** Corrected JANBU FOS = 1.703 ** (Fo factor = 1.073)

Failure surface No. 3 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	208.80	632.90
2	209.85	632.22
3	211.69	631.20
4	213.49	630.20
5	213.61	630.11
6	531.30	630.01
7	609.38	653.74
8	609.78	654.21
9	610.44	655.40
10	632.47	689.98
11	654.50	724.56
12	663.89	739.30
13	666.58	743.44
14	666.88	743.88
15	667.46	744.92
16	689.49	779.50
17	699.71	795.54
18	700.56	796.85

** Corrected JANBU FOS = 1.704 ** (Fo factor = 1.073)

Failure surface No. 4 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	215.73	635.21
2	216.78	634.53
3	222.78	631.20
4	224.58	630.20
5	224.94	629.95
6	531.30	630.13
7	609.15	653.67
8	609.55	654.14
9	610.24	655.38
10	632.27	689.96
11	654.30	724.54
12	663.70	739.29
13	666.38	743.43
14	666.69	743.87
15	667.27	744.91
16	689.30	779.49

17	699.47	795.46
18	700.32	796.77

** Corrected JANBU FOS = 1.708 ** (Fo factor = 1.074)

Failure surface No. 5 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	210.59	633.50
2	211.64	632.81
3	214.55	631.20
4	216.35	630.20
5	216.79	629.89
6	531.30	630.08
7	606.05	652.98
8	606.16	653.10
9	606.85	654.35
10	628.88	688.92
11	650.91	723.50
12	660.88	739.16
13	663.57	743.29
14	663.87	743.73
15	664.45	744.77
16	686.48	779.35
17	696.00	794.30
18	696.85	795.61

** Corrected JANBU FOS = 1.719 ** (Fo factor = 1.074)

Failure surface No. 6 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	212.49	634.13
2	213.54	633.45
3	217.60	631.20
4	219.40	630.20
5	219.83	629.90
6	531.30	629.93
7	606.07	652.98
8	606.17	653.11
9	606.86	654.35
10	628.89	688.93
11	650.92	723.51
12	660.89	739.16
13	663.58	743.29
14	663.88	743.73
15	664.46	744.77
16	686.49	779.35
17	696.02	794.31
18	696.87	795.62

** Corrected JANBU FOS = 1.721 ** (Fo factor = 1.074)

Failure surface No. 7 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	219.15	636.35
2	220.20	635.67
3	228.26	631.20
4	230.06	630.20
5	230.45	629.93
6	531.30	630.09
7	607.39	653.39
8	607.50	653.51
9	608.19	654.76
10	630.22	689.34
11	652.25	723.91
12	662.00	739.21
13	664.68	743.35
14	664.99	743.78
15	665.57	744.83
16	687.60	779.41
17	697.38	794.76
18	698.23	796.07

** Corrected JANBU FOS = 1.721 ** (Fo factor = 1.074)

Failure surface No. 8 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	225.97	638.63
2	227.03	637.94
3	239.19	631.20
4	240.99	630.20
5	241.45	629.88
6	531.30	630.03
7	609.04	653.82
8	609.24	654.05
9	609.93	655.29
10	631.96	689.87
11	653.99	724.45
12	663.44	739.28
13	666.13	743.42
14	666.43	743.85
15	667.01	744.90
16	689.04	779.48
17	699.15	795.35
18	700.01	796.66

** Corrected JANBU FOS = 1.722 ** (Fo factor = 1.075)

Failure surface No. 9 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)

1	228.65	639.52
2	229.71	638.83
3	243.48	631.20
4	245.28	630.20
5	245.62	629.97
6	531.30	630.11
7	610.03	654.19
8	610.14	654.32
9	610.73	655.39
10	632.76	689.97
11	654.79	724.55
12	664.20	739.32
13	666.88	743.46
14	667.19	743.89
15	667.77	744.94
16	689.80	779.52
17	700.08	795.66
18	700.94	796.97

** Corrected JANBU FOS = 1.723 ** (Fo factor = 1.075)

Failure surface No.10 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	220.59	636.83
2	221.64	636.15
3	230.57	631.20
4	232.37	630.20
5	232.86	629.86
6	531.30	629.86
7	606.00	652.78
8	606.33	653.16
9	607.02	654.40
10	629.05	688.98
11	651.08	723.56
12	661.02	739.16
13	663.71	743.30
14	664.01	743.73
15	664.59	744.78
16	686.62	779.36
17	696.18	794.36
18	697.03	795.67

** Corrected JANBU FOS = 1.729 ** (Fo factor = 1.075)

The following is a summary of the TEN most critical surfaces

Problem Description : EE' Intermediate BlckSrch Static

Modified JANBU FOS	Correction Factor	Initial x-coord	Terminal x-coord	Available Strength

			(ft)	(ft)	(lb)
1.	1.697	1.073	207.16	701.56	1.171E+06
2.	1.703	1.073	206.90	700.55	1.171E+06
3.	1.704	1.073	208.80	700.56	1.170E+06
4.	1.708	1.074	215.73	700.32	1.169E+06
5.	1.719	1.074	210.59	696.85	1.165E+06
6.	1.721	1.074	212.49	696.87	1.166E+06
7.	1.721	1.074	219.15	698.23	1.167E+06
8.	1.722	1.075	225.97	700.01	1.170E+06
9.	1.723	1.075	228.65	700.94	1.170E+06
10.	1.729	1.075	220.59	697.03	1.167E+06

* * * END OF FILE * * *

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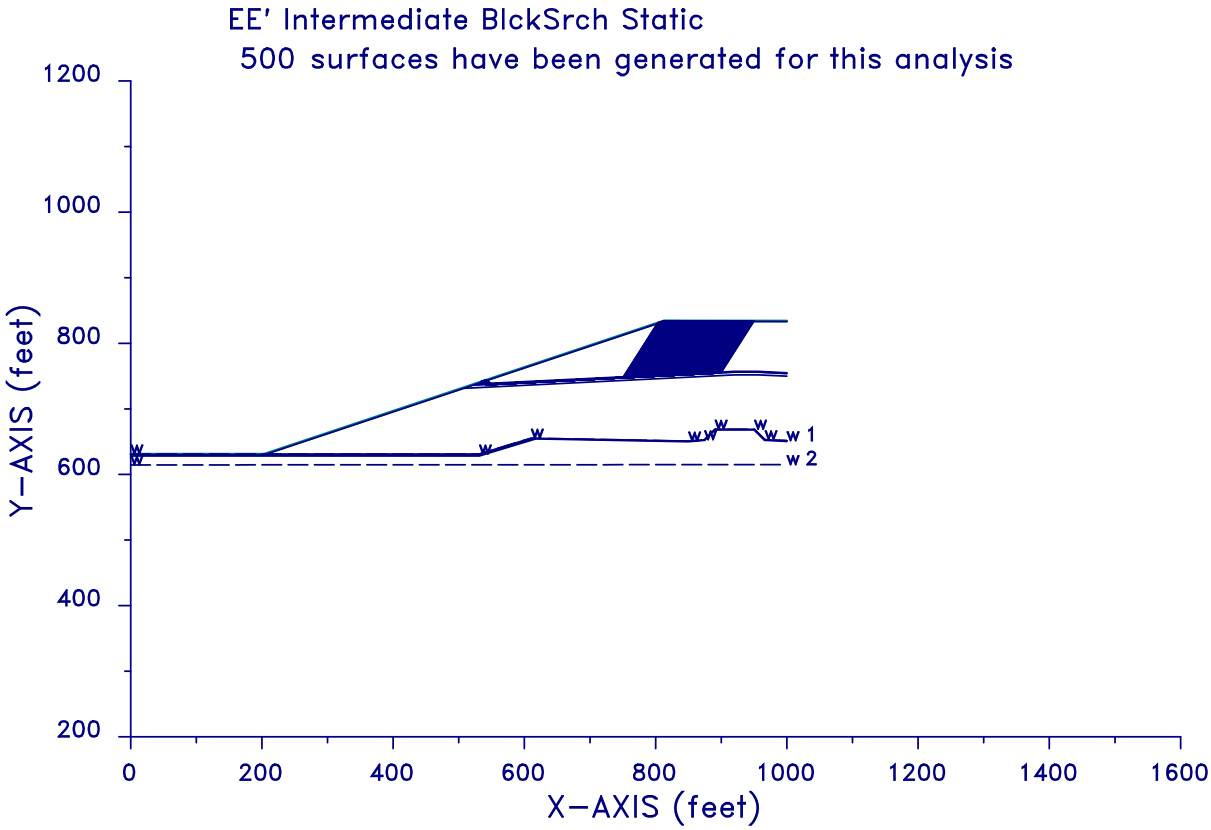

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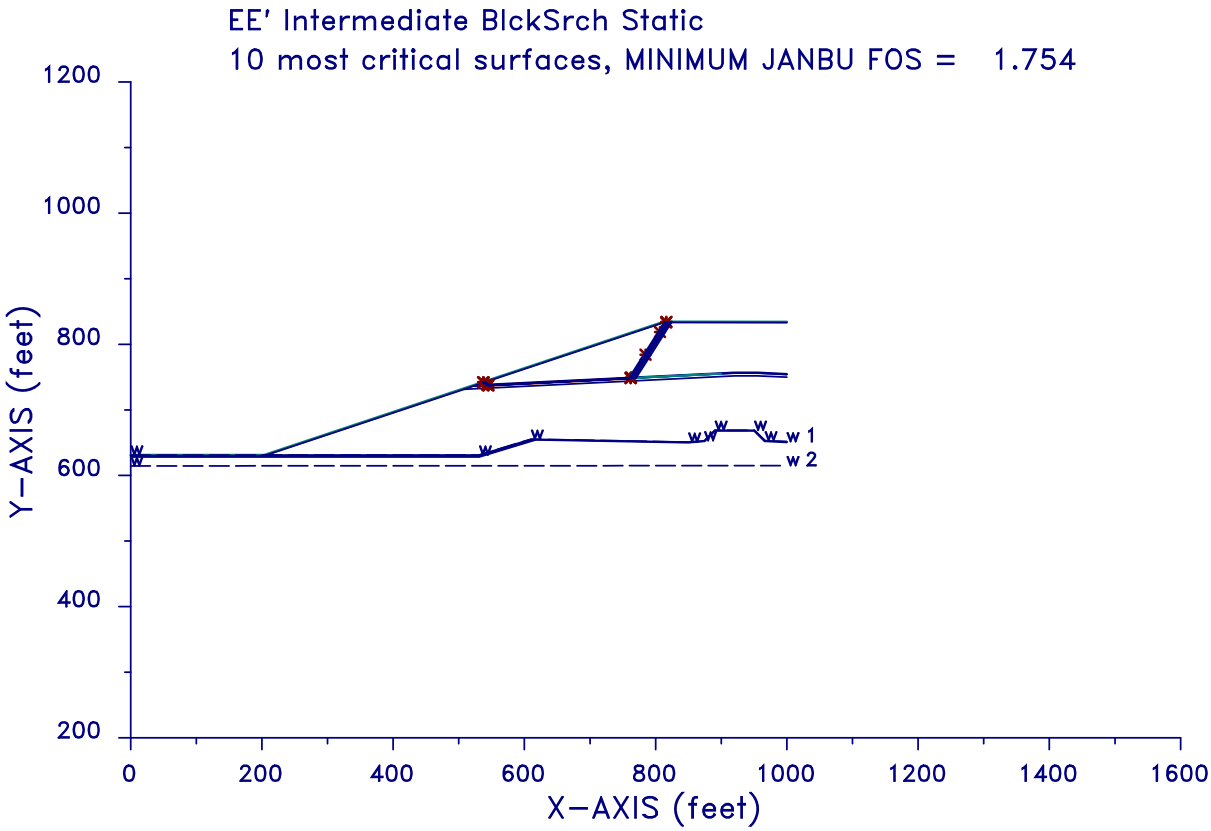

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
*                                       *
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*****************************************
```

Problem Description : EE' Intermediate BlckSrch Static

SEGMENT BOUNDARY COORDINATES
---

3 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	631.2	203.7	631.2	3
2	203.7	631.2	812.9	834.3	1
3	812.9	834.3	1000.0	834.2	1

44 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	203.7	631.2	206.8	631.2	3
2	206.8	631.2	508.1	731.6	3
3	508.1	731.6	522.2	736.3	1
4	522.2	736.3	523.6	736.8	8
5	523.6	736.8	527.1	738.0	3
6	527.1	738.0	813.0	833.3	2
7	813.0	833.3	1000.0	833.2	2
8	527.1	738.0	920.5	757.4	3
9	920.5	757.4	955.8	757.4	3
10	955.8	757.4	1000.0	755.2	3
11	523.6	736.8	920.5	756.4	8
12	920.5	756.4	955.8	756.4	8
13	955.8	756.4	1000.0	754.2	8
14	522.2	736.3	920.5	756.0	1
15	920.5	756.0	955.8	756.0	1
16	955.8	756.0	1000.0	753.8	1

17	508.1	731.6	920.6	752.0	2
18	920.6	752.0	955.7	752.0	2
19	955.7	752.0	1000.0	749.8	2
20	206.8	631.2	531.1	631.2	3
21	531.1	631.2	610.3	655.4	3
22	610.3	655.4	850.0	650.8	3
23	850.0	650.8	874.3	653.0	3
24	874.3	653.0	890.4	669.0	3
25	890.4	669.0	950.5	669.0	3
26	950.5	669.0	966.5	653.0	3
27	966.5	653.0	1000.0	651.6	3
28	.0	630.2	531.3	630.2	8
29	531.3	630.2	610.4	654.4	9
30	610.4	654.4	616.9	654.3	9
31	616.9	654.3	850.1	649.8	11
32	850.1	649.8	874.8	652.0	11
33	874.8	652.0	890.8	668.0	11
34	890.8	668.0	950.1	668.0	11
35	950.1	668.0	966.1	652.0	11
36	966.1	652.0	1000.0	650.6	11
37	531.3	630.2	532.7	630.2	8
38	.0	629.8	531.3	629.8	10
39	531.3	629.8	532.7	630.2	10
40	532.7	630.2	610.5	654.0	10
41	610.5	654.0	615.7	653.9	10
42	.0	628.2	531.6	628.2	11
43	531.6	628.2	615.7	653.9	11
44	615.7	653.9	616.9	654.3	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 9 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	631.20
2	531.10	631.20
3	610.30	655.40
4	850.00	650.80
5	874.30	653.00
6	890.40	669.00
7	950.50	669.00
8	966.50	653.00
9	1000.00	651.60

Water Surface No. 2 specified by 2 coordinate points

```
**********************************
         PHREATIC SURFACE,
**********************************
```

Point No.	x-water (ft)	y-water (ft)
1	.00	614.50
2	1000.00	615.10

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

500 trial surfaces will be generated and analyzed.

2 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 41.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)

1	541.6	737.0	550.0	737.9	.3
2	750.0	747.8	900.0	755.2	.3

```
************************************************************************
    --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)
************************************************************************
Negative effective stresses were calculated at the base of a slice.
This warning is usually reported for cases where slices have low self
weight and a relatively high "c" shear strength parameter.  In such
cases, this effect can only be eliminated by reducing the "c" value.
************************************************************************
```

```
    ------------------------------------------------------------
    USER SELECTED option to maintain strength greater than zero
    ------------------------------------------------------------
```

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined
are displayed below - the most critical first

Failure surface No. 1 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	537.19	742.38
2	538.22	741.71
3	542.83	738.78
4	544.53	737.83
5	545.10	737.43
6	545.12	737.42
7	761.92	748.42
8	762.03	748.57
9	762.60	749.61
10	784.63	784.19
11	806.66	818.77
12	815.92	833.30
13	816.56	834.30

** Corrected JANBU FOS = 1.754 ** (Fo factor = 1.076)

Failure surface No. 2 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	537.47	742.48
2	538.51	741.80
3	543.23	738.80

4	544.93	737.85
5	545.42	737.51
6	759.07	748.12
7	759.30	748.44
8	759.87	749.48
9	781.90	784.06
10	803.93	818.64
11	813.27	833.30
12	813.92	834.30

** Corrected JANBU FOS = 1.755 ** (Fo factor = 1.076)

Failure surface No. 3 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	538.83	742.93
2	539.87	742.26
3	545.15	738.89
4	546.85	737.95
5	547.26	737.66
6	764.16	748.50
7	764.29	748.69
8	764.87	749.73
9	786.90	784.30
10	808.93	818.88
11	818.11	833.30
12	818.76	834.30

** Corrected JANBU FOS = 1.755 ** (Fo factor = 1.076)

Failure surface No. 4 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	538.34	742.77
2	539.38	742.09
3	544.46	738.86
4	546.16	737.91
5	546.61	737.60
6	768.06	748.56
7	768.28	748.88
8	768.86	749.92
9	790.89	784.50
10	812.92	819.08
11	821.98	833.30
12	822.62	834.29

** Corrected JANBU FOS = 1.755 ** (Fo factor = 1.076)

Failure surface No. 5 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)

1	536.00	741.99
2	537.04	741.31
3	541.15	738.69
4	542.85	737.75
5	543.42	737.35
6	543.47	737.32
7	765.81	748.65
8	765.89	748.76
9	766.46	749.80
10	788.49	784.38
11	810.52	818.96
12	819.65	833.30
13	820.30	834.30

** Corrected JANBU FOS = 1.755 ** (Fo factor = 1.075)

Failure surface No. 6 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	539.38	743.11
2	540.41	742.44
3	545.92	738.93
4	547.62	737.99
5	548.15	737.61
6	764.78	748.59
7	764.86	748.71
8	765.44	749.75
9	787.47	784.33
10	809.50	818.91
11	818.66	833.30
12	819.31	834.30

** Corrected JANBU FOS = 1.755 ** (Fo factor = 1.076)

Failure surface No. 7 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	537.76	742.57
2	538.79	741.90
3	543.63	738.82
4	545.33	737.87
5	545.76	737.58
6	770.55	748.86
7	770.65	749.00
8	771.23	750.04
9	793.26	784.62
10	815.28	819.20
11	824.27	833.29
12	824.91	834.29

** Corrected JANBU FOS = 1.756 ** (Fo factor = 1.075)

Failure surface No. 8 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	538.70	742.88
2	539.74	742.21
3	544.96	738.88
4	546.66	737.94
5	547.07	737.66
6	761.45	748.29
7	761.64	748.55
8	762.21	749.59
9	784.24	784.17
10	806.27	818.75
11	815.54	833.30
12	816.19	834.30

** Corrected JANBU FOS = 1.756 ** (Fo factor = 1.076)

Failure surface No. 9 specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	539.16	743.04
2	540.20	742.37
3	545.62	738.91
4	547.32	737.97
5	547.69	737.71
6	766.71	748.62
7	766.84	748.81
8	767.41	749.85
9	789.44	784.43
10	811.47	819.01
11	820.57	833.30
12	821.22	834.30

** Corrected JANBU FOS = 1.756 ** (Fo factor = 1.076)

Failure surface No.10 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	537.64	742.53
2	538.68	741.86
3	543.47	738.81
4	545.17	737.87
5	545.74	737.46
6	545.77	737.45
7	761.67	748.47
8	761.73	748.56
9	762.31	749.60
10	784.34	784.18
11	806.37	818.76

12	815.63	833.30
13	816.28	834.30

** Corrected JANBU FOS = 1.756 ** (Fo factor = 1.076)

The following is a summary of the TEN most critical surfaces

Problem Description : EE' Intermediate BlckSrch Static

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	1.754	1.076	537.19	816.56	3.581E+05
2.	1.755	1.076	537.47	813.92	3.505E+05
3.	1.755	1.076	538.83	818.76	3.634E+05
4.	1.755	1.076	538.34	822.62	3.745E+05
5.	1.755	1.075	536.00	820.30	3.694E+05
6.	1.755	1.076	539.38	819.31	3.649E+05
7.	1.756	1.075	537.76	824.91	3.802E+05
8.	1.756	1.076	538.70	816.19	3.565E+05
9.	1.756	1.076	539.16	821.22	3.701E+05
10.	1.756	1.076	537.64	816.28	3.575E+05

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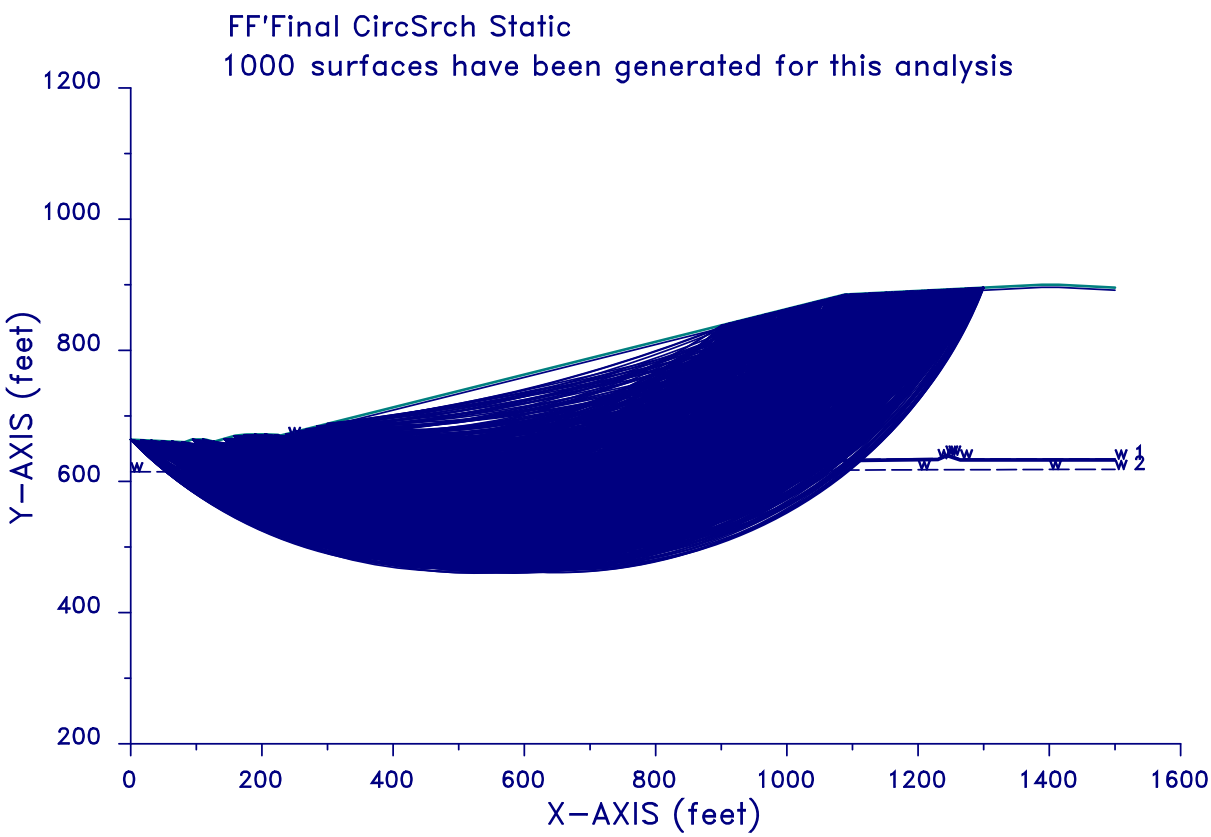

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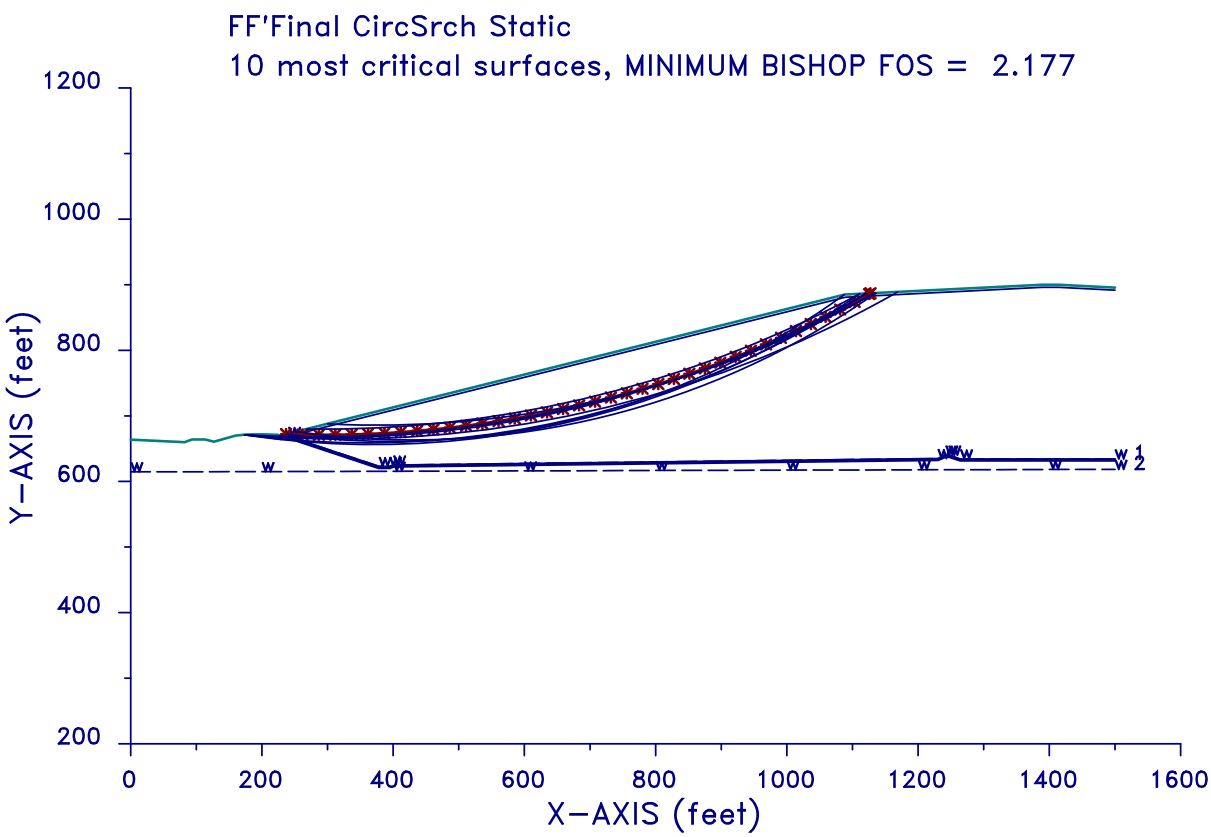

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*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
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Problem Description : FF'Final CircSrch Static

SEGMENT BOUNDARY COORDINATES
---

13 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	663.9	82.1	660.1	11
2	82.1	660.1	93.5	664.1	11
3	93.5	664.1	113.5	664.1	11
4	113.5	664.1	126.8	660.7	11
5	126.8	660.7	159.5	670.0	11
6	159.5	670.0	176.7	671.5	11
7	176.7	671.5	204.4	671.9	11
8	204.4	671.9	224.3	671.0	11
9	224.3	671.0	227.7	669.9	11
10	227.7	669.9	1088.4	885.0	1
11	1088.4	885.0	1388.7	900.0	1
12	1388.7	900.0	1414.4	900.0	1
13	1414.4	900.0	1500.0	895.7	1

43 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	227.7	669.9	232.2	668.4	11
2	232.2	668.4	238.6	668.4	5
3	238.6	668.4	240.4	668.8	3
4	240.4	668.8	1089.0	881.0	2
5	1089.0	881.0	1388.8	896.0	2
6	1388.8	896.0	1414.3	896.0	2

7	1414.3	896.0	1500.0	891.7	2
8	240.4	668.8	378.6	623.0	3
9	378.6	623.0	394.4	623.0	3
10	394.4	623.0	400.5	625.0	3
11	400.5	625.0	1229.9	635.0	3
12	1229.9	635.0	1242.0	640.2	3
13	1242.0	640.2	1246.6	640.2	3
14	1246.6	640.2	1264.5	634.4	3
15	1264.5	634.4	1500.0	634.4	3
16	238.6	668.4	378.1	622.0	5
17	376.9	622.0	378.1	622.0	4
18	378.1	622.0	394.5	622.0	4
19	394.5	622.0	400.7	624.0	4
20	400.7	624.0	1230.1	634.0	4
21	1230.1	634.0	1242.2	639.2	4
22	1242.2	639.2	1246.5	639.2	4
23	1246.5	639.2	1264.4	633.4	4
24	1264.4	633.4	1500.0	633.4	4
25	232.2	668.4	233.4	668.0	10
26	233.4	668.0	238.5	668.0	10
27	238.5	668.0	376.9	622.0	10
28	376.9	622.0	378.1	621.6	10
29	378.1	621.6	394.6	621.6	10
30	394.6	621.6	400.7	623.6	10
31	400.7	623.6	1230.2	633.6	10
32	1230.2	633.6	1242.3	638.8	10
33	1242.3	638.8	1246.4	638.8	10
34	1246.4	638.8	1264.3	633.0	10
35	1264.3	633.0	1500.0	633.0	10
36	233.4	668.0	377.8	620.0	11
37	377.8	620.0	394.8	620.0	11
38	394.8	620.0	401.0	622.0	11
39	401.0	622.0	1230.5	632.0	11
40	1230.5	632.0	1242.6	637.2	11
41	1242.6	637.2	1246.2	637.2	11
42	1246.2	637.2	1264.0	631.4	11
43	1264.0	631.4	1500.0	631.4	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2

11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 9 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	240.40	668.80
2	378.30	623.00
3	394.40	623.00
4	400.50	625.00
5	1229.90	635.00
6	1242.00	640.20
7	1246.60	640.20
8	1264.50	634.40
9	1500.00	634.40

Water Surface No. 2 specified by 9 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	614.80
2	200.00	615.00
3	400.00	615.60
4	600.00	616.20
5	800.00	616.80
6	1000.00	617.30
7	1200.00	617.80
8	1400.00	618.30
9	1500.00	618.60

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

1000 trial surfaces will be generated and analyzed.

50 Surfaces initiate from each of 20 points equally spaced

```
along the ground surface between  x =       .0 ft
                             and  x =    300.0 ft


Each surface terminates between   x =    900.0 ft
                            and   x =   1300.0 ft


Unless further limitations were imposed, the minimum elevation
at which a surface extends is  y =    460.0 ft


   25.0 ft line segments define each trial failure surface.



----------------------
ANGULAR RESTRICTIONS
----------------------

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees




Factors of safety have been calculated by the :

* * * * *   SIMPLIFIED BISHOP METHOD   * * * * *



  The most critical circular failure surface
  is specified by 39 coordinate points
```

Point No.	x-surf (ft)	y-surf (ft)
1	236.84	672.18
2	261.83	671.54
3	286.83	671.25
4	311.83	671.33
5	336.83	671.77
6	361.82	672.58
7	386.79	673.75
8	411.74	675.28
9	436.67	677.18
10	461.57	679.44
11	486.43	682.06
12	511.25	685.04
13	536.03	688.38
14	560.75	692.09
15	585.42	696.15
16	610.02	700.57
17	634.56	705.35

18	659.03	710.48
19	683.42	715.97
20	707.73	721.82
21	731.95	728.01
22	756.07	734.56
23	780.10	741.46
24	804.03	748.71
25	827.85	756.31
26	851.55	764.25
27	875.14	772.53
28	898.60	781.16
29	921.94	790.13
30	945.14	799.44
31	968.21	809.08
32	991.13	819.06
33	1013.91	829.37
34	1036.53	840.01
35	1058.99	850.98
36	1081.30	862.27
37	1103.43	873.89
38	1125.40	885.83
39	1127.39	886.95

**** Simplified BISHOP FOS = 2.177 ****

The following is a summary of the TEN most critical surfaces

Problem Description : FF'Final CircSrch Static

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.177	293.90	2389.64	1718.41	236.84	1127.39	3.066E+09
2.	2.180	397.55	1837.60	1176.44	236.84	1087.62	2.472E+09
3.	2.189	428.81	1890.23	1226.82	252.63	1135.41	2.912E+09
4.	2.190	294.33	2398.58	1718.70	268.42	1110.57	2.573E+09
5.	2.191	357.81	2047.89	1388.91	173.68	1119.57	3.121E+09
6.	2.191	294.63	2332.09	1665.25	173.68	1121.39	3.135E+09
7.	2.192	377.29	2205.07	1519.07	300.00	1132.77	2.541E+09
8.	2.194	370.34	1965.90	1309.52	173.68	1111.12	3.015E+09
9.	2.195	280.28	2439.91	1771.89	173.68	1134.01	3.325E+09
10.	2.207	321.70	2377.07	1712.24	173.68	1168.66	3.860E+09

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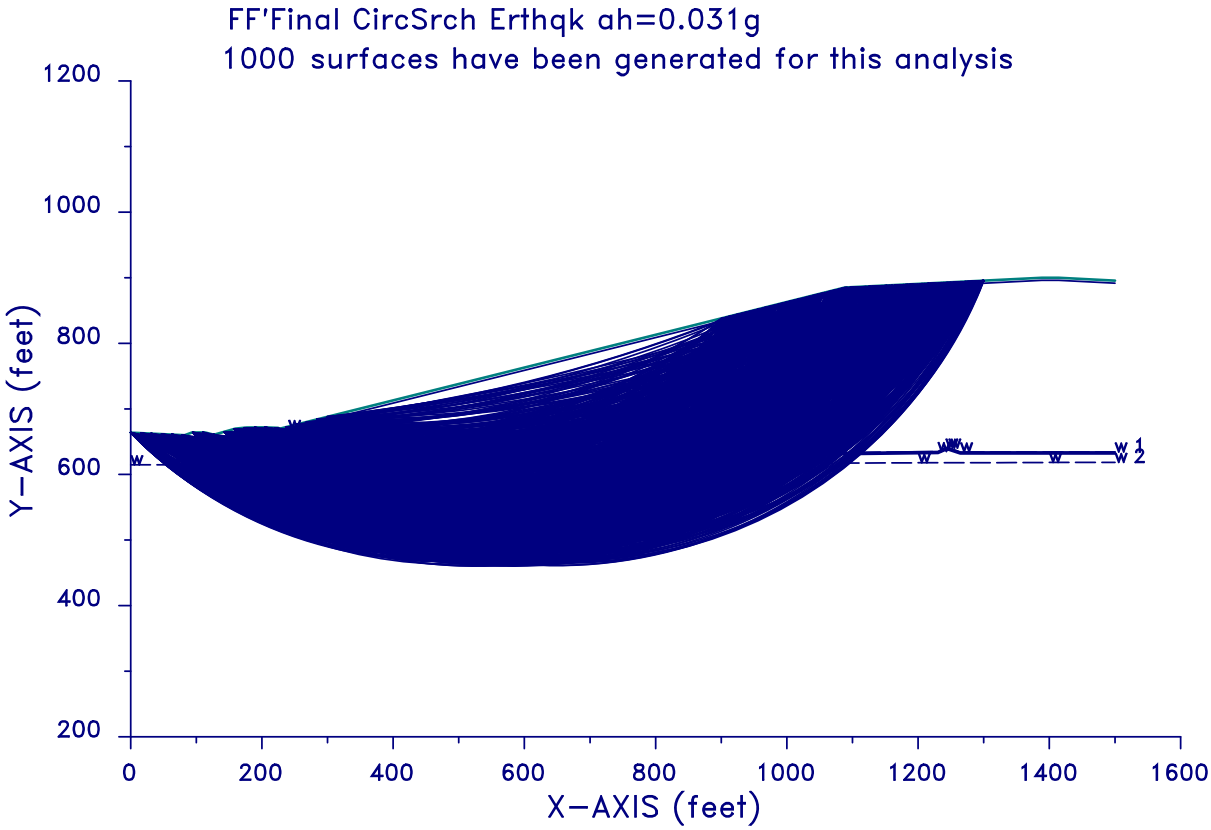

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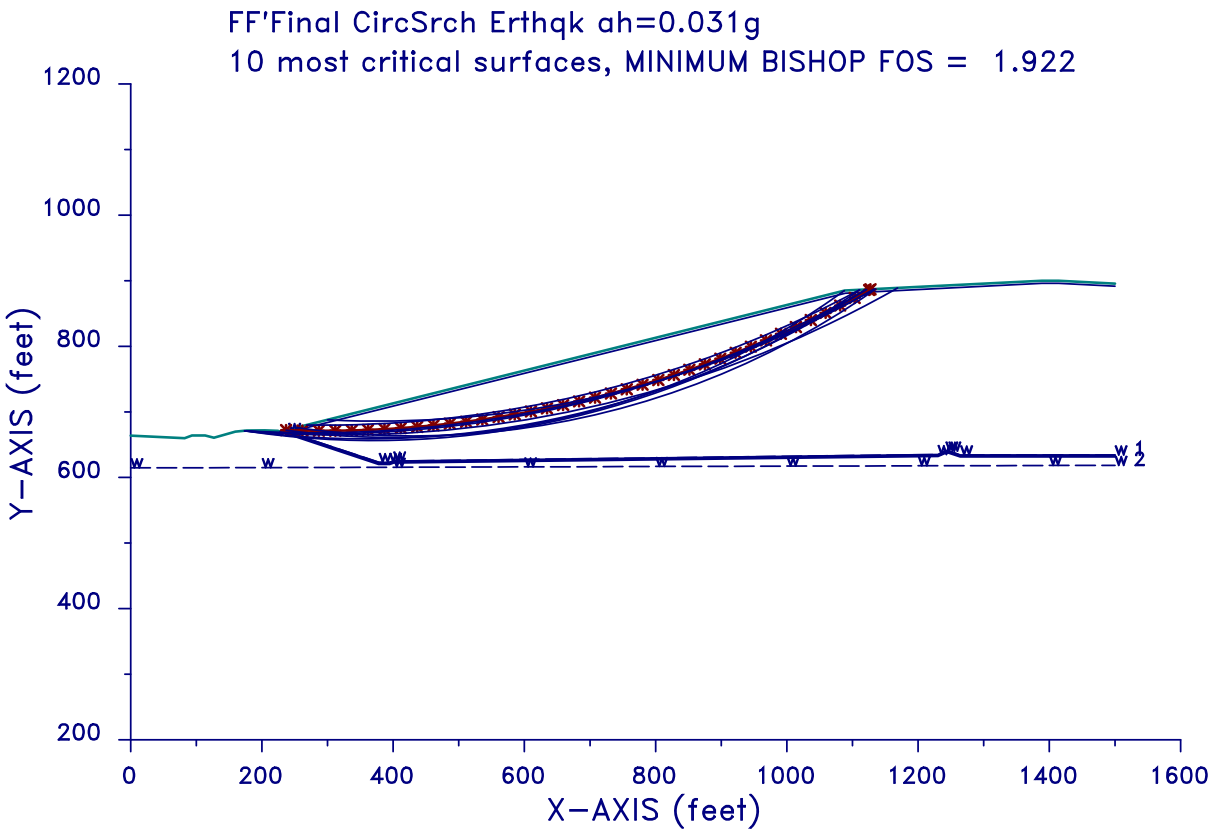

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*                using the              *
*            Method of Slices           *
*                                       *
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*        Moscow, ID 83843, U.S.A.       *
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*  Ver. 5.208                96 - 2046  *
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Problem Description : FF'Final CircSrch Erthqk ah=0.031g

SEGMENT BOUNDARY COORDINATES
---

13 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	663.9	82.1	660.1	11
2	82.1	660.1	93.5	664.1	11
3	93.5	664.1	113.5	664.1	11
4	113.5	664.1	126.8	660.7	11
5	126.8	660.7	159.5	670.0	11
6	159.5	670.0	176.7	671.5	11
7	176.7	671.5	204.4	671.9	11
8	204.4	671.9	224.3	671.0	11
9	224.3	671.0	227.7	669.9	11
10	227.7	669.9	1088.4	885.0	1
11	1088.4	885.0	1388.7	900.0	1
12	1388.7	900.0	1414.4	900.0	1
13	1414.4	900.0	1500.0	895.7	1

43 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	227.7	669.9	232.2	668.4	11
2	232.2	668.4	238.6	668.4	5
3	238.6	668.4	240.4	668.8	3
4	240.4	668.8	1089.0	881.0	2
5	1089.0	881.0	1388.8	896.0	2
6	1388.8	896.0	1414.3	896.0	2

7	1414.3	896.0	1500.0	891.7	2
8	240.4	668.8	378.6	623.0	3
9	378.6	623.0	394.4	623.0	3
10	394.4	623.0	400.5	625.0	3
11	400.5	625.0	1229.9	635.0	3
12	1229.9	635.0	1242.0	640.2	3
13	1242.0	640.2	1246.6	640.2	3
14	1246.6	640.2	1264.5	634.4	3
15	1264.5	634.4	1500.0	634.4	3
16	238.6	668.4	378.1	622.0	5
17	376.9	622.0	378.1	622.0	4
18	378.1	622.0	394.5	622.0	4
19	394.5	622.0	400.7	624.0	4
20	400.7	624.0	1230.1	634.0	4
21	1230.1	634.0	1242.2	639.2	4
22	1242.2	639.2	1246.5	639.2	4
23	1246.5	639.2	1264.4	633.4	4
24	1264.4	633.4	1500.0	633.4	4
25	232.2	668.4	233.4	668.0	10
26	233.4	668.0	238.5	668.0	10
27	238.5	668.0	376.9	622.0	10
28	376.9	622.0	378.1	621.6	10
29	378.1	621.6	394.6	621.6	10
30	394.6	621.6	400.7	623.6	10
31	400.7	623.6	1230.2	633.6	10
32	1230.2	633.6	1242.3	638.8	10
33	1242.3	638.8	1246.4	638.8	10
34	1246.4	638.8	1264.3	633.0	10
35	1264.3	633.0	1500.0	633.0	10
36	233.4	668.0	377.8	620.0	11
37	377.8	620.0	394.8	620.0	11
38	394.8	620.0	401.0	622.0	11
39	401.0	622.0	1230.5	632.0	11
40	1230.5	632.0	1242.6	637.2	11
41	1242.6	637.2	1246.2	637.2	11
42	1246.2	637.2	1264.0	631.4	11
43	1264.0	631.4	1500.0	631.4	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2

11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 9 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	240.40	668.80
2	378.30	623.00
3	394.40	623.00
4	400.50	625.00
5	1229.90	635.00
6	1242.00	640.20
7	1246.60	640.20
8	1264.50	634.40
9	1500.00	634.40

Water Surface No. 2 specified by 9 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	614.80
2	200.00	615.00
3	400.00	615.60
4	600.00	616.20
5	800.00	616.80
6	1000.00	617.30
7	1200.00	617.80
8	1400.00	618.30
9	1500.00	618.60

A horizontal earthquake loading coefficient
of .031 has been assigned

A vertical earthquake loading coefficient
of .000 has been assigned

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

1000 trial surfaces will be generated and analyzed.

50 Surfaces initiate from each of 20 points equally spaced along the ground surface between x = .0 ft
and x = 300.0 ft

Each surface terminates between x = 900.0 ft
and x = 1300.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 460.0 ft

25.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 39 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	236.84	672.18
2	261.83	671.54
3	286.83	671.25
4	311.83	671.33
5	336.83	671.77
6	361.82	672.58
7	386.79	673.75
8	411.74	675.28
9	436.67	677.18

10	461.57	679.44
11	486.43	682.06
12	511.25	685.04
13	536.03	688.38
14	560.75	692.09
15	585.42	696.15
16	610.02	700.57
17	634.56	705.35
18	659.03	710.48
19	683.42	715.97
20	707.73	721.82
21	731.95	728.01
22	756.07	734.56
23	780.10	741.46
24	804.03	748.71
25	827.85	756.31
26	851.55	764.25
27	875.14	772.53
28	898.60	781.16
29	921.94	790.13
30	945.14	799.44
31	968.21	809.08
32	991.13	819.06
33	1013.91	829.37
34	1036.53	840.01
35	1058.99	850.98
36	1081.30	862.27
37	1103.43	873.89
38	1125.40	885.83
39	1127.39	886.95

**** Simplified BISHOP FOS = 1.922 ****

The following is a summary of the TEN most critical surfaces

Problem Description : FF'Final CircSrch Erthqk ah=0.031g

	FOS (BISHOP)	Circle Center x-coord (ft)	y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.922	293.90	2389.64	1718.41	236.84	1127.39	3.046E+09
2.	1.927	397.55	1837.60	1176.44	236.84	1087.62	2.456E+09
3.	1.932	428.81	1890.23	1226.82	252.63	1135.41	2.894E+09
4.	1.934	357.81	2047.89	1388.91	173.68	1119.57	3.101E+09
5.	1.934	294.63	2332.09	1665.25	173.68	1121.39	3.115E+09
6.	1.935	294.33	2398.58	1718.70	268.42	1110.57	2.556E+09
7.	1.935	377.29	2205.07	1519.07	300.00	1132.77	2.525E+09
8.	1.937	370.34	1965.90	1309.52	173.68	1111.12	2.996E+09
9.	1.937	280.28	2439.91	1771.89	173.68	1134.01	3.304E+09
10.	1.944	321.70	2377.07	1712.24	173.68	1168.66	3.835E+09

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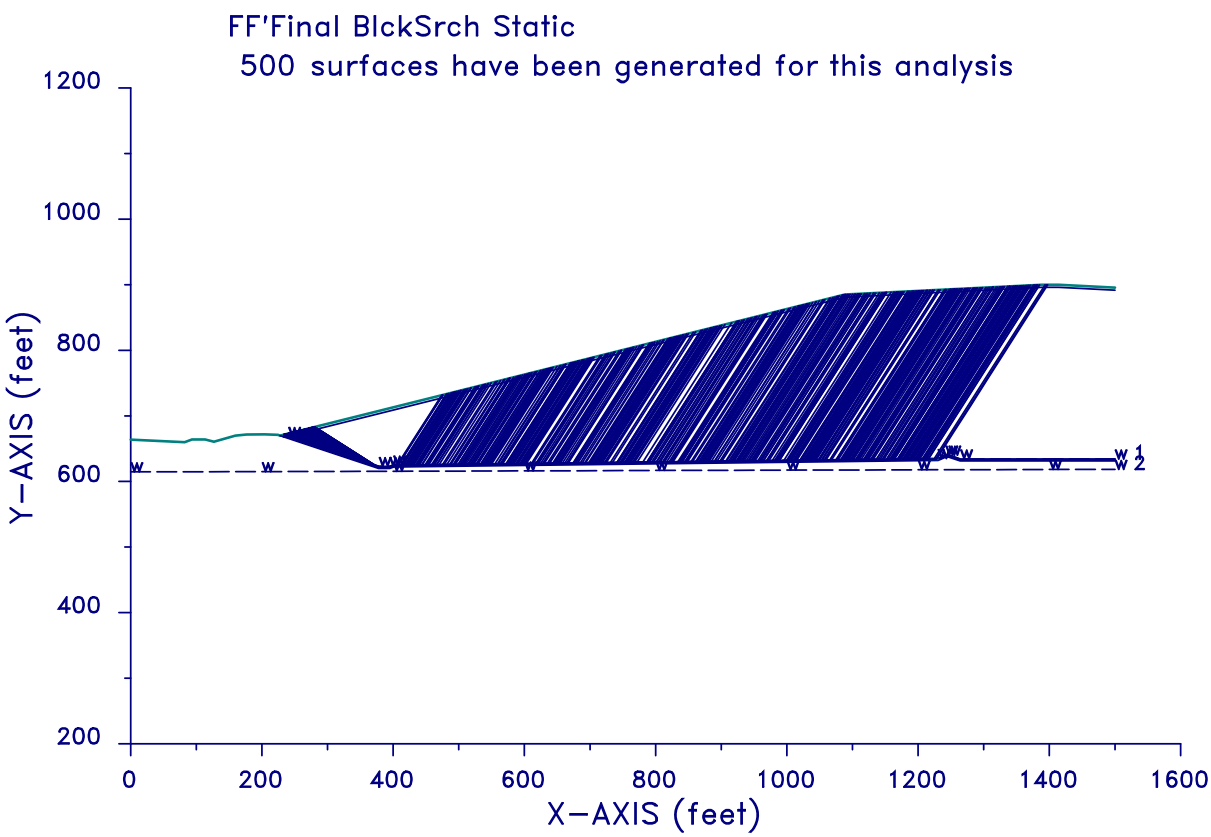

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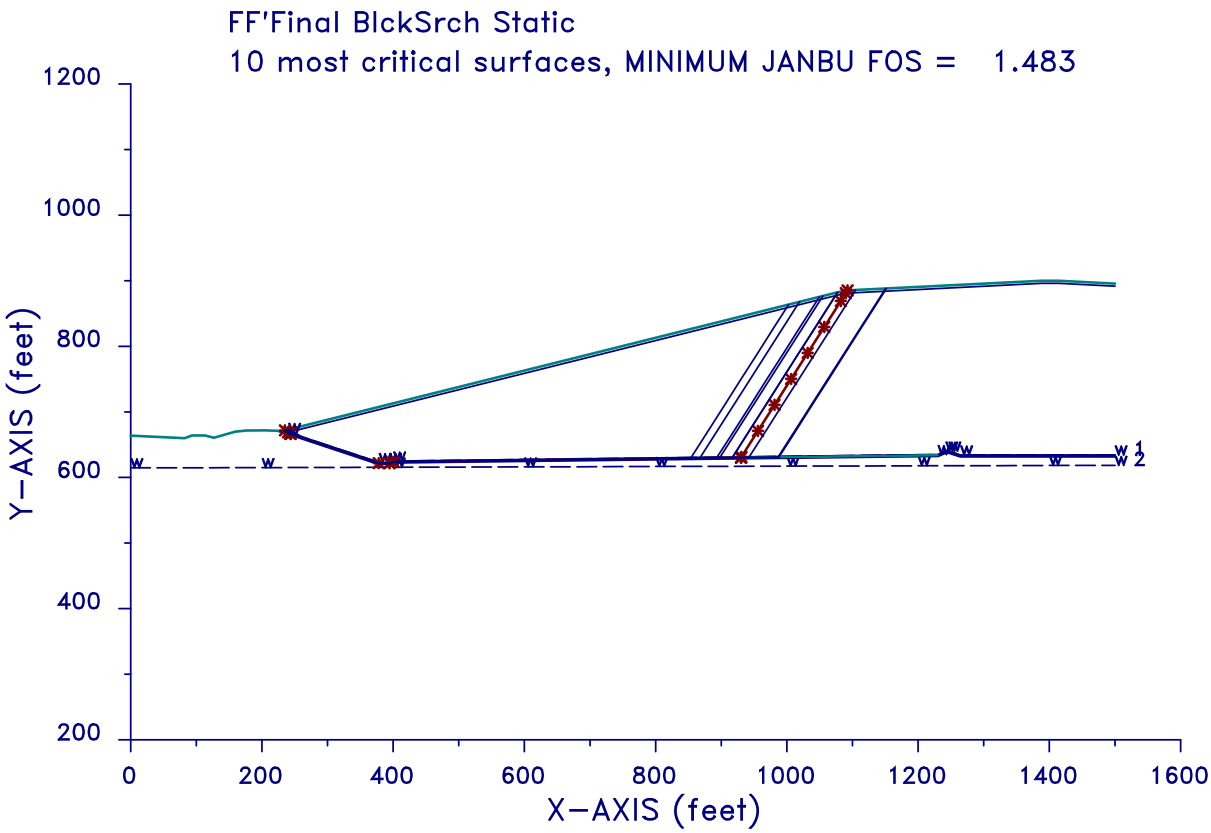

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*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
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```

Problem Description : FF'Final BlckSrch Static

SEGMENT BOUNDARY COORDINATES
---

13 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	663.9	82.1	660.1	11
2	82.1	660.1	93.5	664.1	11
3	93.5	664.1	113.5	664.1	11
4	113.5	664.1	126.8	660.7	11
5	126.8	660.7	159.5	670.0	11
6	159.5	670.0	176.7	671.5	11
7	176.7	671.5	204.4	671.9	11
8	204.4	671.9	224.3	671.0	11
9	224.3	671.0	227.7	669.9	11
10	227.7	669.9	1088.4	885.0	1
11	1088.4	885.0	1388.7	900.0	1
12	1388.7	900.0	1414.4	900.0	1
13	1414.4	900.0	1500.0	895.7	1

43 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	227.7	669.9	232.2	668.4	11
2	232.2	668.4	238.6	668.4	5
3	238.6	668.4	240.4	668.8	3
4	240.4	668.8	1089.0	881.0	2
5	1089.0	881.0	1388.8	896.0	2
6	1388.8	896.0	1414.3	896.0	2

7	1414.3	896.0	1500.0	891.7	2
8	240.4	668.8	378.6	623.0	3
9	378.6	623.0	394.4	623.0	3
10	394.4	623.0	400.5	625.0	3
11	400.5	625.0	1229.9	635.0	3
12	1229.9	635.0	1242.0	640.2	3
13	1242.0	640.2	1246.6	640.2	3
14	1246.6	640.2	1264.5	634.4	3
15	1264.5	634.4	1500.0	634.4	3
16	238.6	668.4	378.1	622.0	5
17	376.9	622.0	378.1	622.0	4
18	378.1	622.0	394.5	622.0	4
19	394.5	622.0	400.7	624.0	4
20	400.7	624.0	1230.1	634.0	4
21	1230.1	634.0	1242.2	639.2	4
22	1242.2	639.2	1246.5	639.2	4
23	1246.5	639.2	1264.4	633.4	4
24	1264.4	633.4	1500.0	633.4	4
25	232.2	668.4	233.4	668.0	10
26	233.4	668.0	238.5	668.0	10
27	238.5	668.0	376.9	622.0	10
28	376.9	622.0	378.1	621.6	10
29	378.1	621.6	394.6	621.6	10
30	394.6	621.6	400.7	623.6	10
31	400.7	623.6	1230.2	633.6	10
32	1230.2	633.6	1242.3	638.8	10
33	1242.3	638.8	1246.4	638.8	10
34	1246.4	638.8	1264.3	633.0	10
35	1264.3	633.0	1500.0	633.0	10
36	233.4	668.0	377.8	620.0	11
37	377.8	620.0	394.8	620.0	11
38	394.8	620.0	401.0	622.0	11
39	401.0	622.0	1230.5	632.0	11
40	1230.5	632.0	1242.6	637.2	11
41	1242.6	637.2	1246.2	637.2	11
42	1246.2	637.2	1264.0	631.4	11
43	1264.0	631.4	1500.0	631.4	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2

11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 9 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	240.40	668.80
2	378.30	623.00
3	394.40	623.00
4	400.50	625.00
5	1229.90	635.00
6	1242.00	640.20
7	1246.60	640.20
8	1264.50	634.40
9	1500.00	634.40

Water Surface No. 2 specified by 9 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	614.80
2	200.00	615.00
3	400.00	615.60
4	600.00	616.20
5	800.00	616.80
6	1000.00	617.30
7	1200.00	617.80
8	1400.00	618.30
9	1500.00	618.60

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

500 trial surfaces will be generated and analyzed.

5 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 47.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	238.6	668.2	376.8	622.2	.3
2	378.1	621.8	378.1	621.8	.3
3	394.5	621.8	394.5	621.8	.3
4	400.7	623.8	400.7	623.8	.3
5	401.0	623.8	1229.7	633.8	.3

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	235.17	671.77
2	239.91	668.69
3	243.17	666.88
4	243.82	666.32
5	378.10	621.83
6	394.50	621.70
7	400.70	623.72
8	930.12	630.24
9	930.24	630.38
10	930.80	631.39
11	956.05	671.03
12	981.30	710.67
13	1006.56	750.31
14	1031.81	789.95
15	1057.06	829.59
16	1082.32	869.23
17	1089.84	881.04
18	1092.55	885.21

** Corrected JANBU FOS = 1.483 ** (Fo factor = 1.079)

Failure surface No. 2 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	233.82	671.43
2	238.48	668.40
3	238.99	667.96
4	378.10	621.79
5	394.50	621.90
6	400.70	623.81
7	916.47	629.88
8	916.75	630.22
9	917.31	631.23
10	942.56	670.87
11	967.81	710.51
12	993.06	750.15
13	1018.32	789.79
14	1043.57	829.43
15	1068.82	869.07
16	1074.04	877.26
17	1077.26	882.22

** Corrected JANBU FOS = 1.484 ** (Fo factor = 1.079)

Failure surface No. 3 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	237.65	672.39
2	242.40	669.30
3	246.20	666.88
4	250.73	664.36
5	250.90	664.22
6	378.10	621.88
7	394.50	621.77
8	400.70	623.94
9	941.88	630.20
10	942.16	630.53
11	942.72	631.54
12	967.97	671.18
13	993.22	710.82
14	1018.48	750.46
15	1043.73	790.10
16	1068.98	829.73
17	1094.23	869.37
18	1102.06	881.65
19	1104.76	885.82

** Corrected JANBU FOS = 1.486 ** (Fo factor = 1.079)

Failure surface No. 4 specified by 18 coordinate points

Point	x-surf	y-surf

No.	(ft)	(ft)
1	234.51	671.60
2	239.22	668.54
3	240.36	667.81
4	240.66	667.56
5	378.10	621.69
6	394.50	621.68
7	400.70	623.80
8	987.89	630.89
9	988.05	631.08
10	988.61	632.09
11	1013.86	671.73
12	1039.12	711.37
13	1064.37	751.01
14	1089.62	790.65
15	1114.88	830.29
16	1140.13	869.93
17	1149.10	884.01
18	1151.80	888.17

** Corrected JANBU FOS = 1.492 ** (Fo factor = 1.077)

Failure surface No. 5 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	237.49	672.35
2	242.24	669.26
3	245.75	667.03
4	250.29	664.51
5	250.44	664.38
6	378.10	621.84
7	394.50	621.87
8	400.70	623.79
9	893.06	629.70
10	893.26	629.94
11	893.82	630.95
12	919.07	670.59
13	944.33	710.23
14	969.58	749.87
15	994.83	789.51
16	1020.08	829.14
17	1045.34	868.78
18	1046.32	870.33
19	1049.54	875.29

** Corrected JANBU FOS = 1.495 ** (Fo factor = 1.080)

Failure surface No. 6 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	234.41	671.58
2	239.12	668.52

3	240.41	667.80
4	241.05	667.24
5	378.10	621.78
6	394.50	621.80
7	400.70	623.86
8	867.49	629.57
9	867.53	629.63
10	868.09	630.64
11	893.35	670.28
12	918.60	709.92
13	943.85	749.56
14	969.11	789.20
15	994.36	828.83
16	1015.95	862.73
17	1019.18	867.70

** Corrected JANBU FOS = 1.497 ** (Fo factor = 1.080)

Failure surface No. 7 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	242.29	673.55
2	247.04	670.46
3	259.68	662.41
4	264.29	659.85
5	264.60	659.59
6	378.10	621.93
7	394.50	621.71
8	400.70	623.94
9	916.59	629.91
10	916.85	630.22
11	917.41	631.23
12	942.66	670.87
13	967.91	710.51
14	993.17	750.15
15	1018.42	789.79
16	1043.67	829.43
17	1068.93	869.07
18	1074.16	877.29
19	1077.38	882.25

** Corrected JANBU FOS = 1.499 ** (Fo factor = 1.080)

Failure surface No. 8 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	240.24	673.03
2	244.99	669.95
3	253.73	664.38
4	258.31	661.84
5	258.90	661.33
6	378.10	621.77
7	394.50	621.88

8	400.70	623.77
9	897.76	629.91
10	897.84	629.99
11	898.39	631.00
12	923.65	670.64
13	948.90	710.28
14	974.15	749.92
15	999.41	789.56
16	1024.66	829.20
17	1049.91	868.84
18	1051.72	871.68
19	1054.94	876.64

** Corrected JANBU FOS = 1.500 ** (Fo factor = 1.080)

Failure surface No. 9 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	235.28	671.79
2	240.02	668.72
3	243.57	666.75
4	243.82	666.53
5	378.10	621.86
6	394.50	621.67
7	400.70	623.66
8	853.35	629.17
9	853.60	629.46
10	854.15	630.47
11	879.41	670.11
12	904.66	709.75
13	929.91	749.39
14	955.17	789.03
15	980.42	828.67
16	999.50	858.62
17	1002.73	863.59

** Corrected JANBU FOS = 1.500 ** (Fo factor = 1.080)

Failure surface No.10 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	241.01	673.23
2	245.77	670.14
3	255.97	663.64
4	260.56	661.10
5	260.92	660.78
6	378.10	621.71
7	394.50	621.80
8	400.70	623.94
9	986.61	630.86
10	986.78	631.07
11	987.34	632.08
12	1012.59	671.71

13	1037.84	711.35
14	1063.10	750.99
15	1088.35	790.63
16	1113.60	830.27
17	1138.86	869.91
18	1147.79	883.94
19	1150.50	888.10

** Corrected JANBU FOS = 1.501 ** (Fo factor = 1.078)

The following is a summary of the TEN most critical surfaces

Problem Description : FF'Final BlckSrch Static

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	1.483	1.079	235.17	1092.55	2.239E+06
2.	1.484	1.079	233.82	1077.26	2.168E+06
3.	1.486	1.079	237.65	1104.76	2.304E+06
4.	1.492	1.077	234.51	1151.80	2.526E+06
5.	1.495	1.080	237.49	1049.54	2.057E+06
6.	1.497	1.080	234.41	1019.18	1.925E+06
7.	1.499	1.080	242.29	1077.38	2.187E+06
8.	1.500	1.080	240.24	1054.94	2.086E+06
9.	1.500	1.080	235.28	1002.73	1.860E+06
10.	1.501	1.078	241.01	1150.50	2.534E+06

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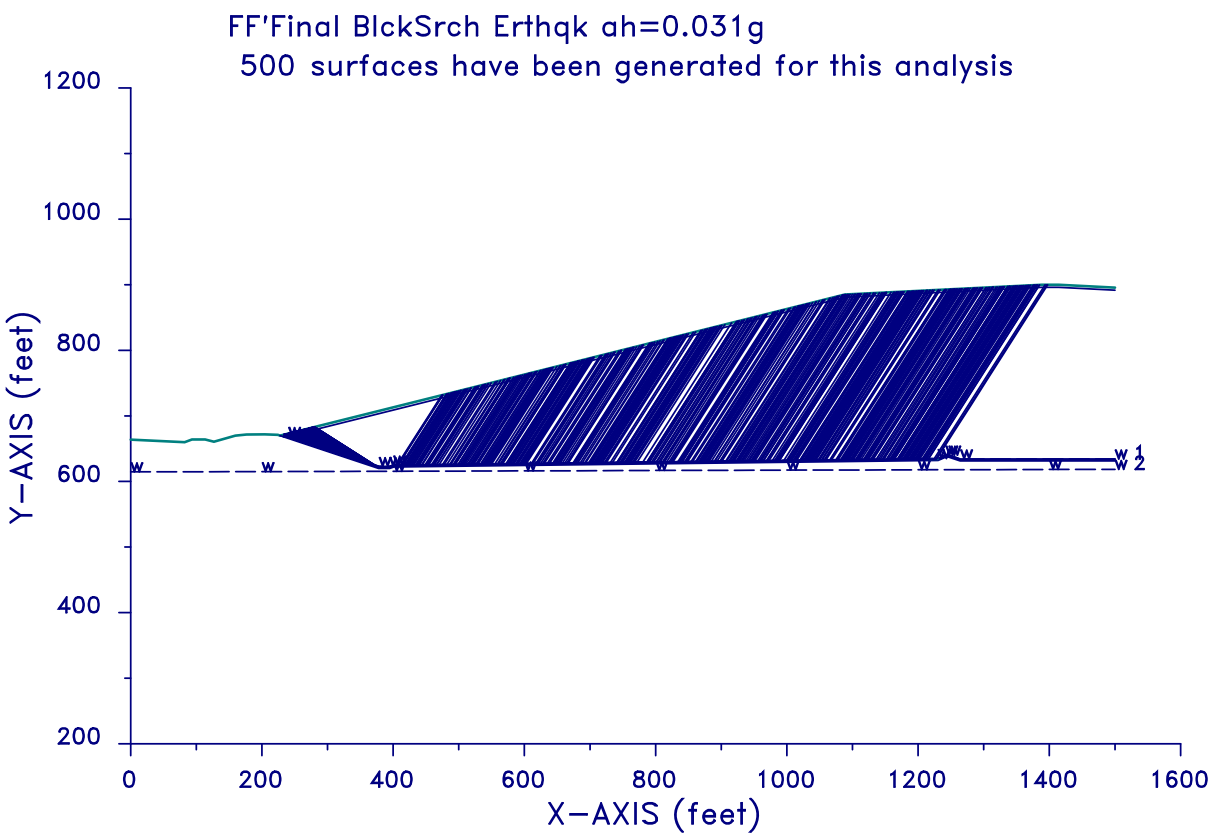

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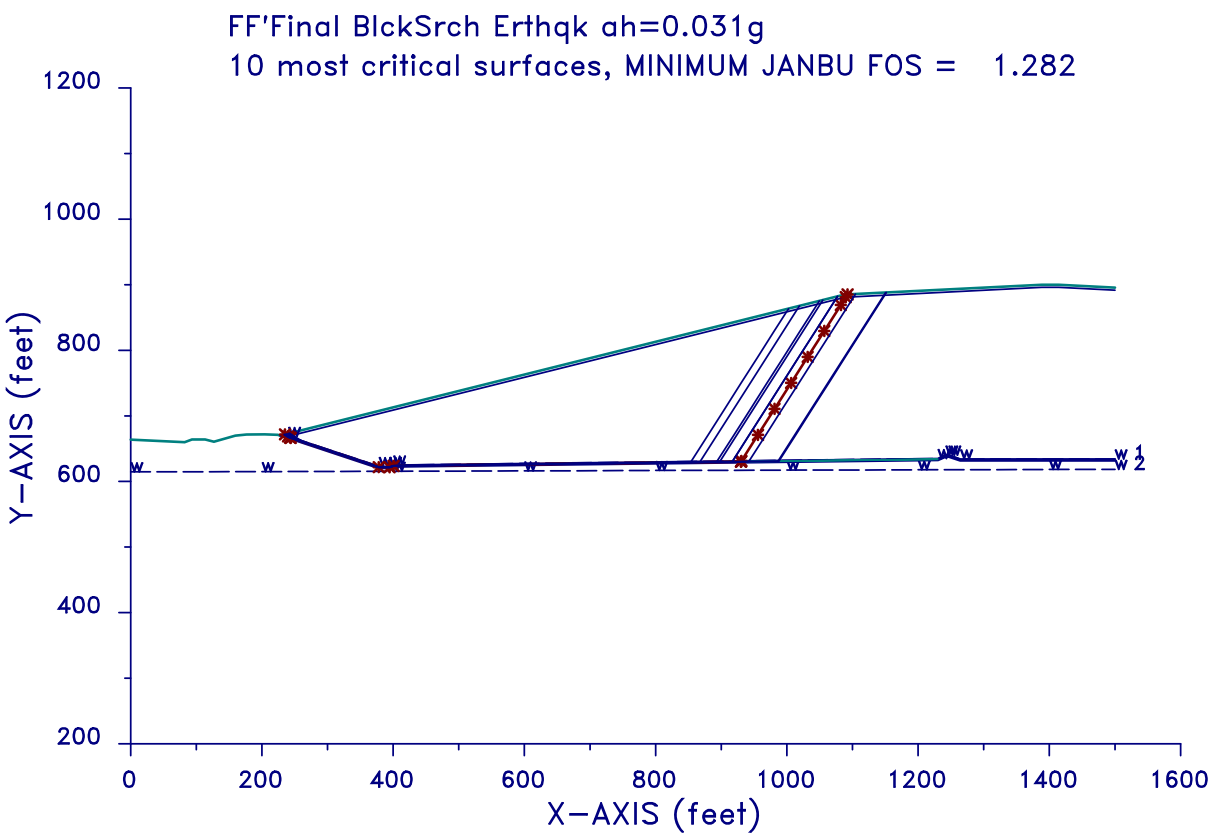

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Problem Description : FF'Final BlckSrch Erthqk ah=0.031g

SEGMENT BOUNDARY COORDINATES
---

13 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	663.9	82.1	660.1	11
2	82.1	660.1	93.5	664.1	11
3	93.5	664.1	113.5	664.1	11
4	113.5	664.1	126.8	660.7	11
5	126.8	660.7	159.5	670.0	11
6	159.5	670.0	176.7	671.5	11
7	176.7	671.5	204.4	671.9	11
8	204.4	671.9	224.3	671.0	11
9	224.3	671.0	227.7	669.9	11
10	227.7	669.9	1088.4	885.0	1
11	1088.4	885.0	1388.7	900.0	1
12	1388.7	900.0	1414.4	900.0	1
13	1414.4	900.0	1500.0	895.7	1

43 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	227.7	669.9	232.2	668.4	11
2	232.2	668.4	238.6	668.4	5
3	238.6	668.4	240.4	668.8	3
4	240.4	668.8	1089.0	881.0	2
5	1089.0	881.0	1388.8	896.0	2
6	1388.8	896.0	1414.3	896.0	2

7	1414.3	896.0	1500.0	891.7	2
8	240.4	668.8	378.6	623.0	3
9	378.6	623.0	394.4	623.0	3
10	394.4	623.0	400.5	625.0	3
11	400.5	625.0	1229.9	635.0	3
12	1229.9	635.0	1242.0	640.2	3
13	1242.0	640.2	1246.6	640.2	3
14	1246.6	640.2	1264.5	634.4	3
15	1264.5	634.4	1500.0	634.4	3
16	238.6	668.4	378.1	622.0	5
17	376.9	622.0	378.1	622.0	4
18	378.1	622.0	394.5	622.0	4
19	394.5	622.0	400.7	624.0	4
20	400.7	624.0	1230.1	634.0	4
21	1230.1	634.0	1242.2	639.2	4
22	1242.2	639.2	1246.5	639.2	4
23	1246.5	639.2	1264.4	633.4	4
24	1264.4	633.4	1500.0	633.4	4
25	232.2	668.4	233.4	668.0	10
26	233.4	668.0	238.5	668.0	10
27	238.5	668.0	376.9	622.0	10
28	376.9	622.0	378.1	621.6	10
29	378.1	621.6	394.6	621.6	10
30	394.6	621.6	400.7	623.6	10
31	400.7	623.6	1230.2	633.6	10
32	1230.2	633.6	1242.3	638.8	10
33	1242.3	638.8	1246.4	638.8	10
34	1246.4	638.8	1264.3	633.0	10
35	1264.3	633.0	1500.0	633.0	10
36	233.4	668.0	377.8	620.0	11
37	377.8	620.0	394.8	620.0	11
38	394.8	620.0	401.0	622.0	11
39	401.0	622.0	1230.5	632.0	11
40	1230.5	632.0	1242.6	637.2	11
41	1242.6	637.2	1246.2	637.2	11
42	1246.2	637.2	1264.0	631.4	11
43	1264.0	631.4	1500.0	631.4	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2

11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 9 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	240.40	668.80
2	378.30	623.00
3	394.40	623.00
4	400.50	625.00
5	1229.90	635.00
6	1242.00	640.20
7	1246.60	640.20
8	1264.50	634.40
9	1500.00	634.40

Water Surface No. 2 specified by 9 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	614.80
2	200.00	615.00
3	400.00	615.60
4	600.00	616.20
5	800.00	616.80
6	1000.00	617.30
7	1200.00	617.80
8	1400.00	618.30
9	1500.00	618.60

A horizontal earthquake loading coefficient
of .031 has been assigned

A vertical earthquake loading coefficient
of .000 has been assigned

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

500 trial surfaces will be generated and analyzed.

5 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 47.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	238.6	668.2	376.8	622.2	.3
2	378.1	621.8	378.1	621.8	.3
3	394.5	621.8	394.5	621.8	.3
4	400.7	623.8	400.7	623.8	.3
5	401.0	623.8	1229.7	633.8	.3

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	235.17	671.77
2	239.91	668.69
3	243.17	666.88
4	243.82	666.32
5	378.10	621.83
6	394.50	621.70
7	400.70	623.72
8	930.12	630.24
9	930.24	630.38
10	930.80	631.39
11	956.05	671.03
12	981.30	710.67

13	1006.56	750.31
14	1031.81	789.95
15	1057.06	829.59
16	1082.32	869.23
17	1089.84	881.04
18	1092.55	885.21

** Corrected JANBU FOS = 1.282 ** (Fo factor = 1.079)

Failure surface No. 2 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	233.82	671.43
2	238.48	668.40
3	238.99	667.96
4	378.10	621.79
5	394.50	621.90
6	400.70	623.81
7	916.47	629.88
8	916.75	630.22
9	917.31	631.23
10	942.56	670.87
11	967.81	710.51
12	993.06	750.15
13	1018.32	789.79
14	1043.57	829.43
15	1068.82	869.07
16	1074.04	877.26
17	1077.26	882.22

** Corrected JANBU FOS = 1.283 ** (Fo factor = 1.079)

Failure surface No. 3 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	237.65	672.39
2	242.40	669.30
3	246.20	666.88
4	250.73	664.36
5	250.90	664.22
6	378.10	621.88
7	394.50	621.77
8	400.70	623.94
9	941.88	630.20
10	942.16	630.53
11	942.72	631.54
12	967.97	671.18
13	993.22	710.82
14	1018.48	750.46
15	1043.73	790.10
16	1068.98	829.73
17	1094.23	869.37
18	1102.06	881.65

19	1104.76	885.82

** Corrected JANBU FOS = 1.285 ** (Fo factor = 1.079)

Failure surface No. 4 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	234.51	671.60
2	239.22	668.54
3	240.36	667.81
4	240.66	667.56
5	378.10	621.69
6	394.50	621.68
7	400.70	623.80
8	987.89	630.89
9	988.05	631.08
10	988.61	632.09
11	1013.86	671.73
12	1039.12	711.37
13	1064.37	751.01
14	1089.62	790.65
15	1114.88	830.29
16	1140.13	869.93
17	1149.10	884.01
18	1151.80	888.17

** Corrected JANBU FOS = 1.287 ** (Fo factor = 1.077)

Failure surface No. 5 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	237.49	672.35
2	242.24	669.26
3	245.75	667.03
4	250.29	664.51
5	250.44	664.38
6	378.10	621.84
7	394.50	621.87
8	400.70	623.79
9	893.06	629.70
10	893.26	629.94
11	893.82	630.95
12	919.07	670.59
13	944.33	710.23
14	969.58	749.87
15	994.83	789.51
16	1020.08	829.14
17	1045.34	868.78
18	1046.32	870.33
19	1049.54	875.29

** Corrected JANBU FOS = 1.293 ** (Fo factor = 1.080)

Failure surface No. 6 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	234.41	671.58
2	239.12	668.52
3	240.41	667.80
4	241.05	667.24
5	378.10	621.78
6	394.50	621.80
7	400.70	623.86
8	867.49	629.57
9	867.53	629.63
10	868.09	630.64
11	893.35	670.28
12	918.60	709.92
13	943.85	749.56
14	969.11	789.20
15	994.36	828.83
16	1015.95	862.73
17	1019.18	867.70

** Corrected JANBU FOS = 1.294 ** (Fo factor = 1.080)

Failure surface No. 7 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	241.01	673.23
2	245.77	670.14
3	255.97	663.64
4	260.56	661.10
5	260.92	660.78
6	378.10	621.71
7	394.50	621.80
8	400.70	623.94
9	986.61	630.86
10	986.78	631.07
11	987.34	632.08
12	1012.59	671.71
13	1037.84	711.35
14	1063.10	750.99
15	1088.35	790.63
16	1113.60	830.27
17	1138.86	869.91
18	1147.79	883.94
19	1150.50	888.10

** Corrected JANBU FOS = 1.296 ** (Fo factor = 1.078)

Failure surface No. 8 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)

1	235.28	671.79
2	240.02	668.72
3	243.57	666.75
4	243.82	666.53
5	378.10	621.86
6	394.50	621.67
7	400.70	623.66
8	853.35	629.17
9	853.60	629.46
10	854.15	630.47
11	879.41	670.11
12	904.66	709.75
13	929.91	749.39
14	955.17	789.03
15	980.42	828.67
16	999.50	858.62
17	1002.73	863.59

** Corrected JANBU FOS = 1.297 ** (Fo factor = 1.080)

Failure surface No. 9 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	240.24	673.03
2	244.99	669.95
3	253.73	664.38
4	258.31	661.84
5	258.90	661.33
6	378.10	621.77
7	394.50	621.88
8	400.70	623.77
9	897.76	629.91
10	897.84	629.99
11	898.39	631.00
12	923.65	670.64
13	948.90	710.28
14	974.15	749.92
15	999.41	789.56
16	1024.66	829.20
17	1049.91	868.84
18	1051.72	871.68
19	1054.94	876.64

** Corrected JANBU FOS = 1.297 ** (Fo factor = 1.080)

Failure surface No.10 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	242.29	673.55
2	247.04	670.46
3	259.68	662.41
4	264.29	659.85

5	264.60	659.59
6	378.10	621.93
7	394.50	621.71
8	400.70	623.94
9	916.59	629.91
10	916.85	630.22
11	917.41	631.23
12	942.66	670.87
13	967.91	710.51
14	993.17	750.15
15	1018.42	789.79
16	1043.67	829.43
17	1068.93	869.07
18	1074.16	877.29
19	1077.38	882.25

** Corrected JANBU FOS = 1.297 ** (Fo factor = 1.080)

The following is a summary of the TEN most critical surfaces

Problem Description : FF'Final BlckSrch Erthqk ah=0.031g

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	1.282	1.079	235.17	1092.55	2.195E+06
2.	1.283	1.079	233.82	1077.26	2.126E+06
3.	1.285	1.079	237.65	1104.76	2.260E+06
4.	1.287	1.077	234.51	1151.80	2.477E+06
5.	1.293	1.080	237.49	1049.54	2.016E+06
6.	1.294	1.080	234.41	1019.18	1.887E+06
7.	1.296	1.078	241.01	1150.50	2.486E+06
8.	1.297	1.080	235.28	1002.73	1.823E+06
9.	1.297	1.080	240.24	1054.94	2.045E+06
10.	1.297	1.080	242.29	1077.38	2.145E+06

* * * END OF FILE * * *

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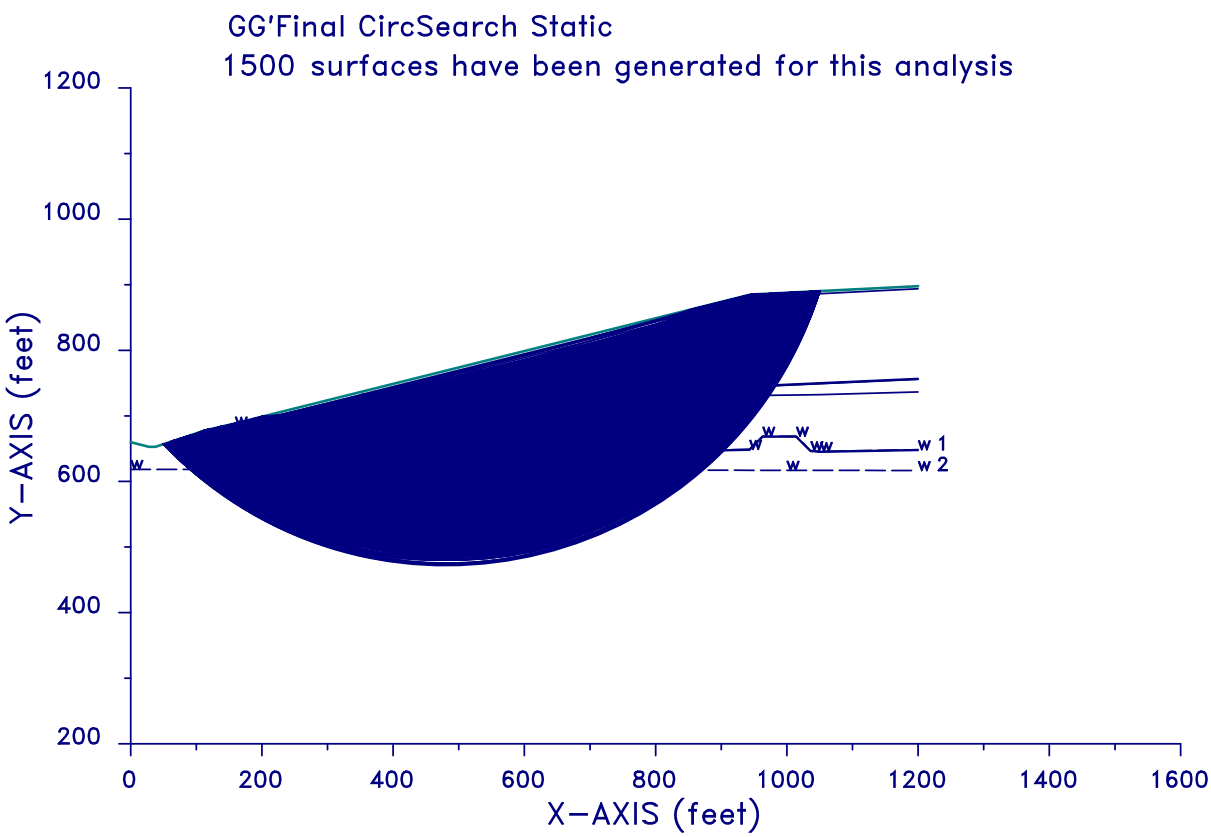

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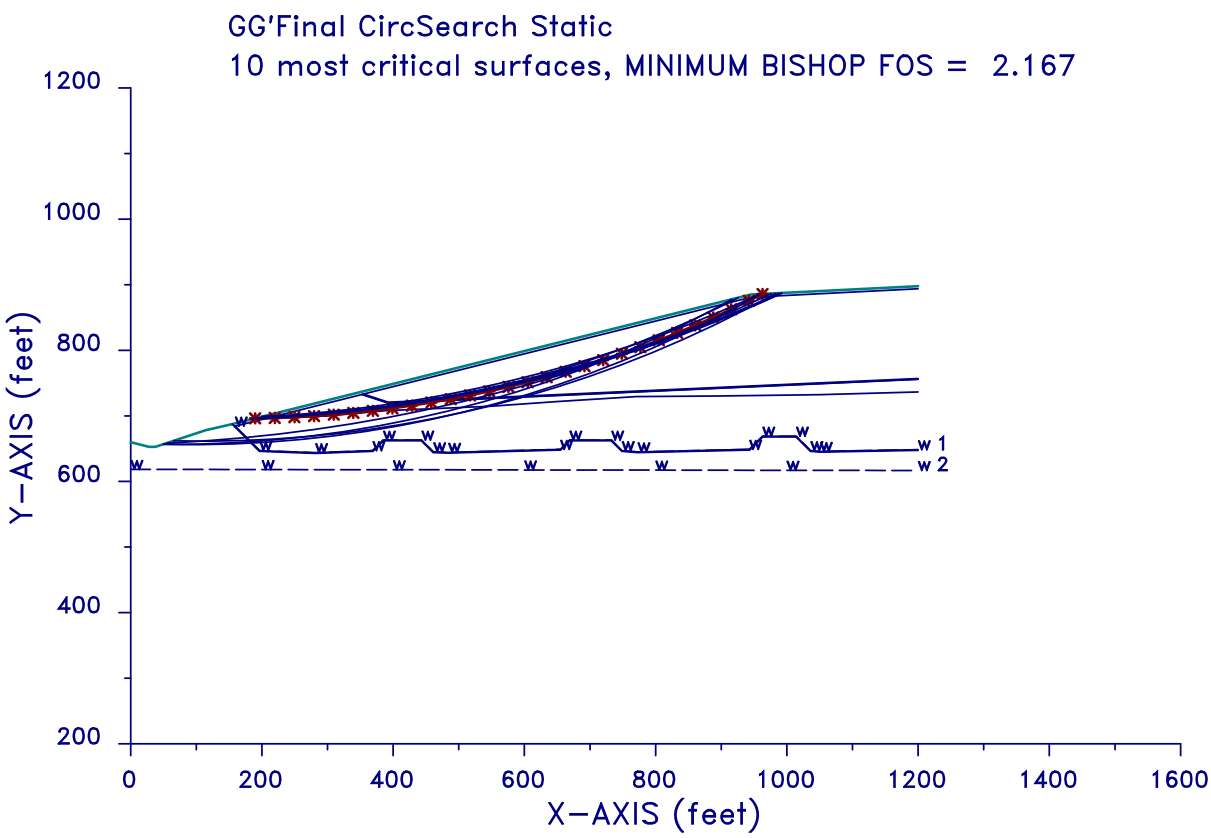

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*****************************************
*              X S T A B L              *
*                                       *
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*                using the              *
*            Method of Slices           *
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Problem Description : GG'Final CircSearch Static

SEGMENT BOUNDARY COORDINATES
---

6 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	660.0	27.8	652.8	11
2	27.8	652.8	37.7	652.8	11
3	37.7	652.8	114.3	678.2	11
4	114.3	678.2	154.7	687.5	11
5	154.7	687.5	944.9	885.0	1
6	944.9	885.0	1200.0	897.8	1

60 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	154.7	687.5	158.0	684.2	11
2	158.0	684.2	159.1	684.4	3
3	159.1	684.4	205.8	696.1	2
4	205.8	696.1	352.4	732.7	1
5	352.4	732.7	353.1	732.9	9
6	353.1	732.9	354.9	733.4	3
7	354.9	733.4	945.5	881.0	2
8	945.5	881.0	1200.0	893.8	2
9	354.9	733.4	392.5	720.8	3
10	392.5	720.8	1200.0	757.1	3
11	353.1	732.9	392.4	719.8	9
12	392.4	719.8	1200.0	756.1	8
13	352.4	732.7	391.3	719.8	1

14	391.3	719.8	392.4	719.8	8
15	391.3	719.8	392.3	719.4	1
16	392.3	719.4	1200.0	755.7	1
17	205.8	696.1	300.0	699.9	2
18	300.0	699.9	388.4	708.0	2
19	388.4	708.0	550.0	714.8	2
20	550.0	714.8	650.0	721.8	2
21	650.0	721.8	770.6	729.6	2
22	770.6	729.6	900.3	730.6	2
23	900.3	730.6	1050.0	732.3	2
24	1050.0	732.3	1200.0	736.6	2
25	159.1	684.4	196.6	647.0	3
26	196.6	647.0	281.4	643.8	3
27	281.4	643.8	368.8	647.0	3
28	368.8	647.0	384.9	663.0	3
29	384.9	663.0	443.4	663.0	3
30	443.4	663.0	461.4	645.0	3
31	461.4	645.0	484.2	644.3	3
32	484.2	644.3	655.0	649.0	3
33	655.0	649.0	669.0	663.0	3
34	669.0	663.0	732.7	663.0	3
35	732.7	663.0	748.7	647.0	3
36	748.7	647.0	772.7	645.0	3
37	772.7	645.0	943.0	649.0	3
38	943.0	649.0	963.0	669.0	3
39	963.0	669.0	1014.3	669.0	3
40	1014.3	669.0	1036.3	647.0	3
41	1036.3	647.0	1050.8	645.8	3
42	1050.8	645.8	1200.0	648.4	3
43	158.0	684.2	196.2	646.0	11
44	196.2	646.0	281.4	642.8	11
45	281.4	642.8	369.3	646.0	11
46	369.3	646.0	385.3	662.0	11
47	385.3	662.0	443.0	662.0	11
48	443.0	662.0	461.0	644.0	11
49	461.0	644.0	484.2	643.3	11
50	484.2	643.3	655.4	648.0	11
51	655.4	648.0	669.4	662.0	11
52	669.4	662.0	732.3	662.0	11
53	732.3	662.0	748.3	646.0	11
54	748.3	646.0	772.6	644.0	11
55	772.6	644.0	943.4	648.0	11
56	943.4	648.0	963.4	668.0	11
57	963.4	668.0	1013.9	668.0	11
58	1013.9	668.0	1035.9	646.0	11
59	1035.9	646.0	1050.8	644.8	11
60	1050.8	644.8	1200.0	647.4	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.

1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 19 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	159.10	684.40
2	196.60	647.00
3	281.40	643.80
4	368.80	647.00
5	384.90	663.00
6	443.40	663.00
7	461.40	645.00
8	484.20	644.30
9	655.00	649.00
10	669.00	663.00
11	732.70	663.00
12	748.70	647.00
13	772.70	645.00
14	943.00	649.00
15	963.00	669.00
16	1014.30	669.00
17	1036.30	647.00
18	1050.80	645.80
19	1200.00	648.40

Water Surface No. 2 specified by 7 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)

```
    1            .00      618.40
    2         200.00      618.20
    3         400.00      617.90
    4         600.00      617.60
    5         800.00      617.30
    6        1000.00      617.00
    7        1200.00      616.70


A critical failure surface searching method, using a random
technique for generating CIRCULAR surfaces has been specified.


 1500 trial surfaces will be generated and analyzed.


  50 Surfaces initiate from each of  30 points equally spaced
along the ground surface between  x =     50.0 ft
                             and  x =    200.0 ft


Each surface terminates between   x =    850.0 ft
                            and   x =   1050.0 ft


Unless further limitations were imposed, the minimum elevation
at which a surface extends is  y =    460.0 ft


   30.0 ft line segments define each trial failure surface.



---------------------
ANGULAR RESTRICTIONS
---------------------

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees



************************************************************************
    --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)
************************************************************************
Negative effective stresses were calculated at the base of a slice.
This warning is usually reported for cases where slices have low self
weight and a relatively high "c" shear strength parameter.  In such
cases, this effect can only be eliminated by reducing the "c" value.
************************************************************************

    ------------------------------------------------------------
    USER SELECTED option to maintain strength greater than zero
    ------------------------------------------------------------
```

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 28 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	189.66	696.24
2	219.65	696.89
3	249.63	698.05
4	279.58	699.72
5	309.50	701.90
6	339.38	704.58
7	369.21	707.78
8	398.98	711.48
9	428.68	715.68
10	458.31	720.38
11	487.86	725.59
12	517.31	731.30
13	546.66	737.51
14	575.90	744.22
15	605.02	751.42
16	634.02	759.11
17	662.88	767.30
18	691.60	775.97
19	720.17	785.13
20	748.58	794.77
21	776.82	804.90
22	804.88	815.50
23	832.76	826.58
24	860.45	838.12
25	887.94	850.14
26	915.22	862.62
27	942.28	875.56
28	963.00	885.91

**** Simplified BISHOP FOS = 2.167 ****

The following is a summary of the TEN most critical surfaces

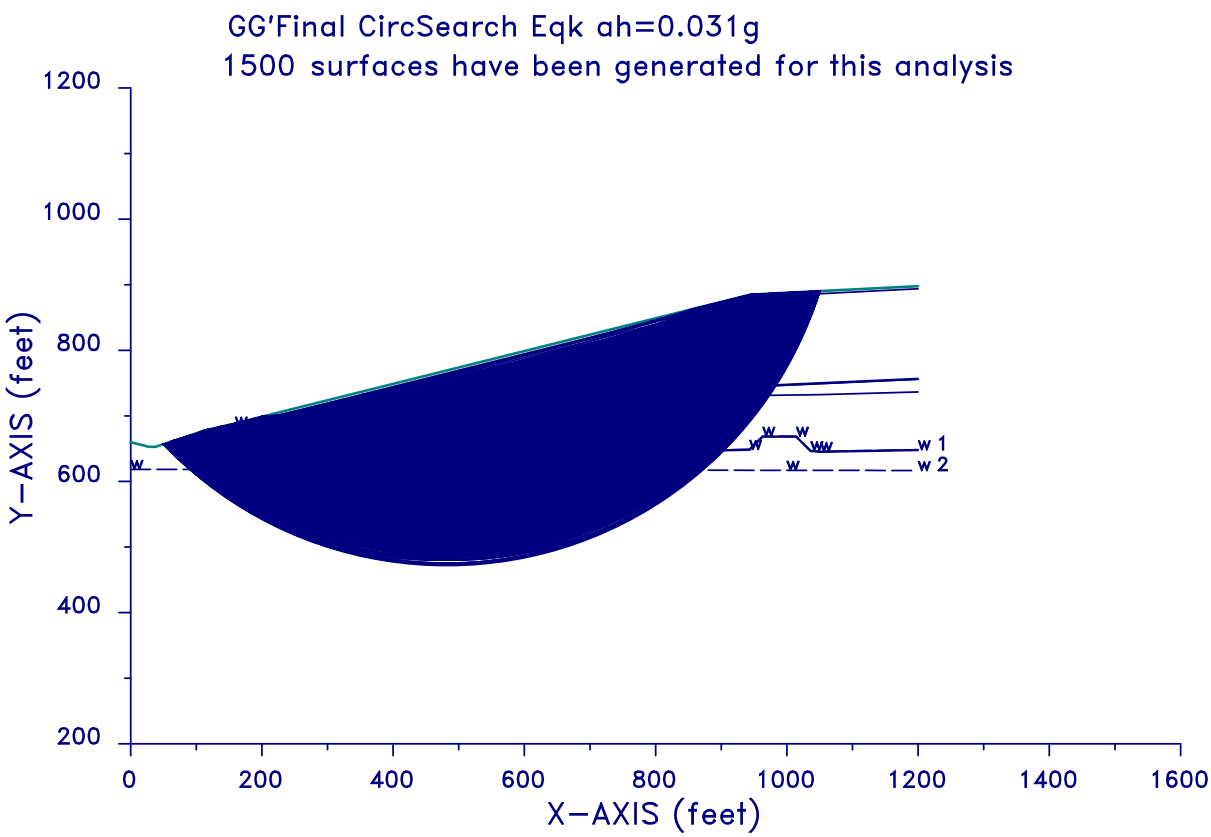
Problem Description : GG'Final CircSearch Static

FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)

1.	2.167	166.21	2463.54	1767.46	189.66	963.00	2.054E+09
2.	2.183	171.59	2356.04	1657.46	200.00	926.02	1.642E+09
3.	2.188	101.46	2830.04	2135.63	189.66	987.99	2.448E+09
4.	2.190	135.37	2731.44	2033.64	200.00	992.71	2.394E+09
5.	2.192	94.08	2401.93	1745.61	50.00	958.93	3.480E+09
6.	2.194	68.88	2972.43	2280.41	184.48	992.33	2.590E+09
7.	2.197	66.20	2402.00	1745.19	50.00	916.22	2.997E+09
8.	2.200	-55.04	3079.68	2423.59	55.17	976.42	3.928E+09
9.	2.200	110.57	2462.23	1800.77	65.52	982.98	3.657E+09
10.	2.204	97.48	2746.82	2050.56	200.00	958.19	1.982E+09

* * * END OF FILE * * *

G1S5C1E 4-12-16 17:58



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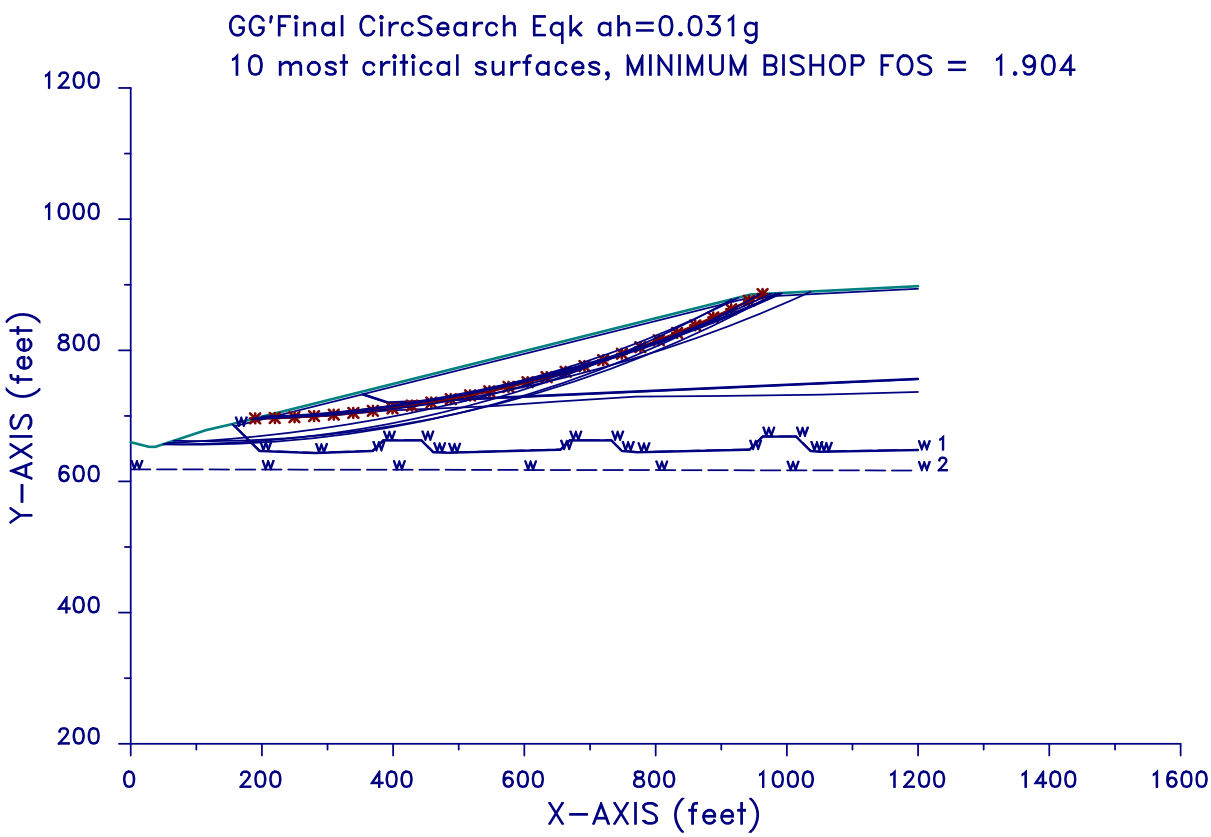

XSTABL File: G1S5C1E 4-12-16 17:58

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*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
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*        Moscow, ID 83843, U.S.A.       *
*                                       *
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*  Ver. 5.208                 96 - 2046 *
*****************************************
```

Problem Description : GG'Final CircSearch Eqk ah=0.031g

SEGMENT BOUNDARY COORDINATES
---

6 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	660.0	27.8	652.8	11
2	27.8	652.8	37.7	652.8	11
3	37.7	652.8	114.3	678.2	11
4	114.3	678.2	154.7	687.5	11
5	154.7	687.5	944.9	885.0	1
6	944.9	885.0	1200.0	897.8	1

60 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	154.7	687.5	158.0	684.2	11
2	158.0	684.2	159.1	684.4	3
3	159.1	684.4	205.8	696.1	2
4	205.8	696.1	352.4	732.7	1
5	352.4	732.7	353.1	732.9	9
6	353.1	732.9	354.9	733.4	3
7	354.9	733.4	945.5	881.0	2
8	945.5	881.0	1200.0	893.8	2
9	354.9	733.4	392.5	720.8	3
10	392.5	720.8	1200.0	757.1	3
11	353.1	732.9	392.4	719.8	9
12	392.4	719.8	1200.0	756.1	8
13	352.4	732.7	391.3	719.8	1

14	391.3	719.8	392.4	719.8	8
15	391.3	719.8	392.3	719.4	1
16	392.3	719.4	1200.0	755.7	1
17	205.8	696.1	300.0	699.9	2
18	300.0	699.9	388.4	708.0	2
19	388.4	708.0	550.0	714.8	2
20	550.0	714.8	650.0	721.8	2
21	650.0	721.8	770.6	729.6	2
22	770.6	729.6	900.3	730.6	2
23	900.3	730.6	1050.0	732.3	2
24	1050.0	732.3	1200.0	736.6	2
25	159.1	684.4	196.6	647.0	3
26	196.6	647.0	281.4	643.8	3
27	281.4	643.8	368.8	647.0	3
28	368.8	647.0	384.9	663.0	3
29	384.9	663.0	443.4	663.0	3
30	443.4	663.0	461.4	645.0	3
31	461.4	645.0	484.2	644.3	3
32	484.2	644.3	655.0	649.0	3
33	655.0	649.0	669.0	663.0	3
34	669.0	663.0	732.7	663.0	3
35	732.7	663.0	748.7	647.0	3
36	748.7	647.0	772.7	645.0	3
37	772.7	645.0	943.0	649.0	3
38	943.0	649.0	963.0	669.0	3
39	963.0	669.0	1014.3	669.0	3
40	1014.3	669.0	1036.3	647.0	3
41	1036.3	647.0	1050.8	645.8	3
42	1050.8	645.8	1200.0	648.4	3
43	158.0	684.2	196.2	646.0	11
44	196.2	646.0	281.4	642.8	11
45	281.4	642.8	369.3	646.0	11
46	369.3	646.0	385.3	662.0	11
47	385.3	662.0	443.0	662.0	11
48	443.0	662.0	461.0	644.0	11
49	461.0	644.0	484.2	643.3	11
50	484.2	643.3	655.4	648.0	11
51	655.4	648.0	669.4	662.0	11
52	669.4	662.0	732.3	662.0	11
53	732.3	662.0	748.3	646.0	11
54	748.3	646.0	772.6	644.0	11
55	772.6	644.0	943.4	648.0	11
56	943.4	648.0	963.4	668.0	11
57	963.4	668.0	1013.9	668.0	11
58	1013.9	668.0	1035.9	646.0	11
59	1035.9	646.0	1050.8	644.8	11
60	1050.8	644.8	1200.0	647.4	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.

1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 19 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	159.10	684.40
2	196.60	647.00
3	281.40	643.80
4	368.80	647.00
5	384.90	663.00
6	443.40	663.00
7	461.40	645.00
8	484.20	644.30
9	655.00	649.00
10	669.00	663.00
11	732.70	663.00
12	748.70	647.00
13	772.70	645.00
14	943.00	649.00
15	963.00	669.00
16	1014.30	669.00
17	1036.30	647.00
18	1050.80	645.80
19	1200.00	648.40

Water Surface No. 2 specified by 7 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)

```
    1            .00      618.40
    2         200.00      618.20
    3         400.00      617.90
    4         600.00      617.60
    5         800.00      617.30
    6        1000.00      617.00
    7        1200.00      616.70


A horizontal earthquake loading coefficient
of   .031 has been assigned

A vertical earthquake loading coefficient
of   .000 has been assigned



A critical failure surface searching method, using a random
technique for generating CIRCULAR surfaces has been specified.


 1500 trial surfaces will be generated and analyzed.


  50 Surfaces initiate from each of  30 points equally spaced
along the ground surface between  x =     50.0 ft
                             and  x =    200.0 ft


Each surface terminates between   x =    850.0 ft
                            and   x =   1050.0 ft


Unless further limitations were imposed, the minimum elevation
at which a surface extends is  y =    460.0 ft


   30.0 ft line segments define each trial failure surface.



---------------------
ANGULAR RESTRICTIONS
---------------------

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees


**********************************************************************
    --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 48)
**********************************************************************
Negative effective stresses were calculated at the base of a slice.
```

This warning is usually reported for cases where slices have low self weight and a relatively high "c" shear strength parameter. In such cases, this effect can only be eliminated by reducing the "c" value.
****

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 28 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	189.66	696.24
2	219.65	696.89
3	249.63	698.05
4	279.58	699.72
5	309.50	701.90
6	339.38	704.58
7	369.21	707.78
8	398.98	711.48
9	428.68	715.68
10	458.31	720.38
11	487.86	725.59
12	517.31	731.30
13	546.66	737.51
14	575.90	744.22
15	605.02	751.42
16	634.02	759.11
17	662.88	767.30
18	691.60	775.97
19	720.17	785.13
20	748.58	794.77
21	776.82	804.90
22	804.88	815.50
23	832.76	826.58
24	860.45	838.12
25	887.94	850.14
26	915.22	862.62
27	942.28	875.56
28	963.00	885.91

**** Simplified BISHOP FOS = 1.904 ****

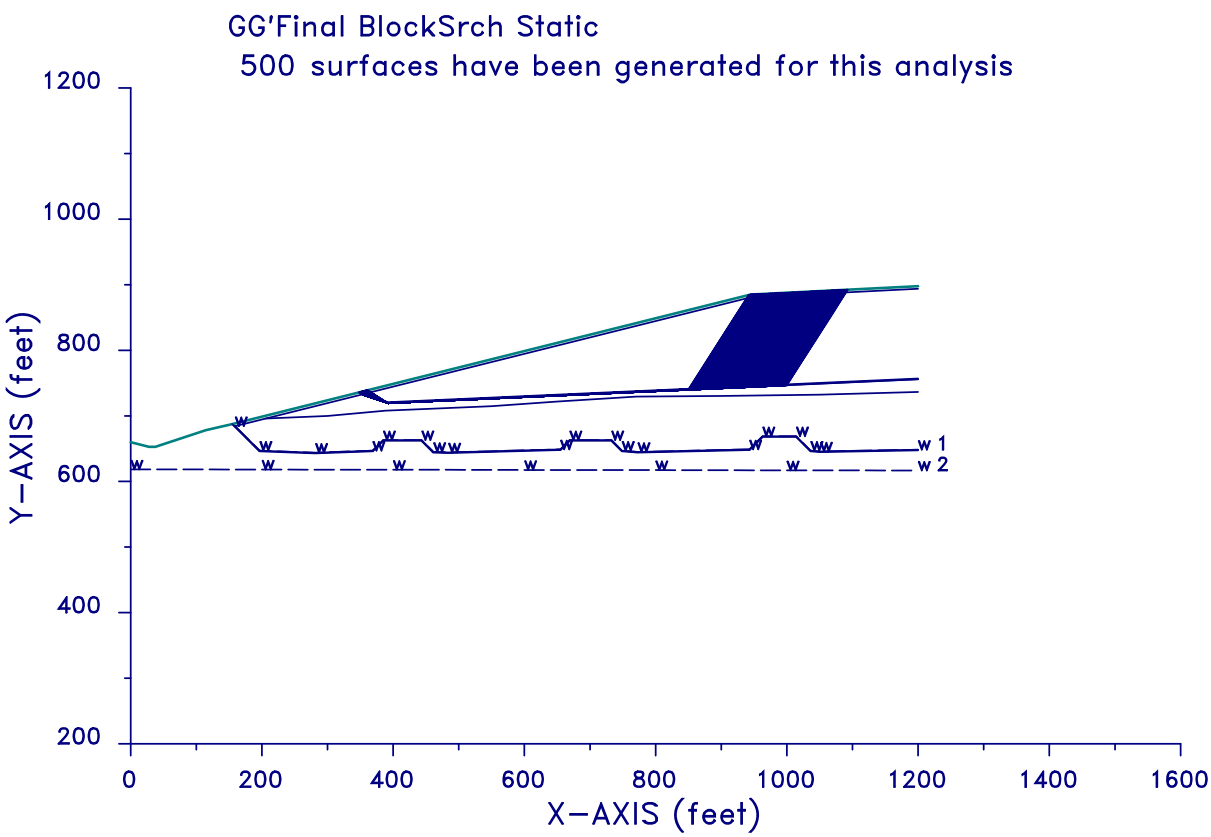
The following is a summary of the TEN most critical surfaces

Problem Description : GG'Final CircSearch Eqk ah=0.031g

	FOS (BISHOP)	Circle Center x-coord (ft)	y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.904	166.21	2463.54	1767.46	189.66	963.00	2.040E+09
2.	1.920	171.59	2356.04	1657.46	200.00	926.02	1.631E+09
3.	1.923	101.46	2830.04	2135.63	189.66	987.99	2.431E+09
4.	1.925	135.37	2731.44	2033.64	200.00	992.71	2.378E+09
5.	1.929	68.88	2972.43	2280.41	184.48	992.33	2.573E+09
6.	1.929	94.08	2401.93	1745.61	50.00	958.93	3.457E+09
7.	1.934	66.20	2402.00	1745.19	50.00	916.22	2.977E+09
8.	1.935	110.57	2462.23	1800.77	65.52	982.98	3.633E+09
9.	1.936	148.59	2827.68	2131.84	189.66	1036.52	3.070E+09
10.	1.937	-55.04	3079.68	2423.59	55.17	976.42	3.903E+09

* * * END OF FILE * * *

G1S5B2S 4-12-16 17:56



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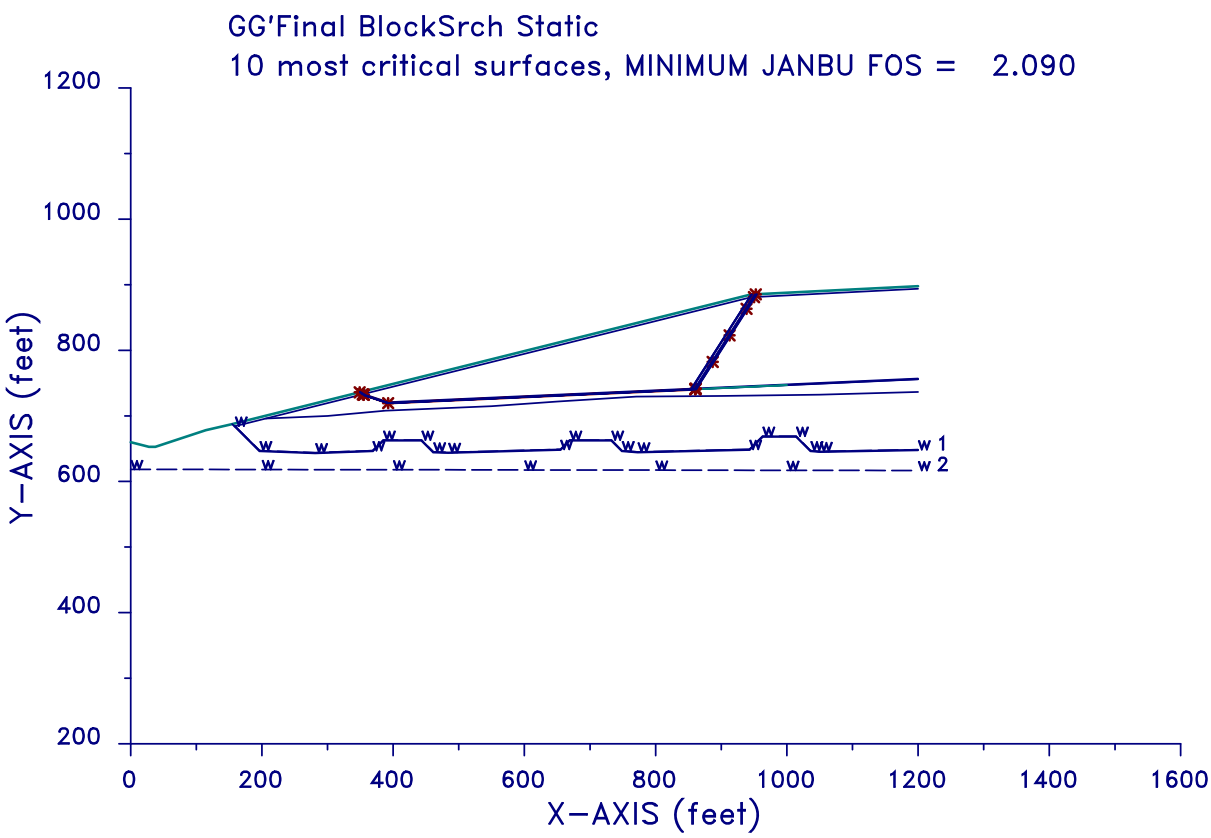

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*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
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*        Moscow, ID 83843, U.S.A.       *
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*                                       *
*  Ver. 5.208                96 - 2046  *
*****************************************
```

Problem Description : GG'Final BlockSrch Static

SEGMENT BOUNDARY COORDINATES
---

6 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	660.0	27.8	652.8	11
2	27.8	652.8	37.7	652.8	11
3	37.7	652.8	114.3	678.2	11
4	114.3	678.2	154.7	687.5	11
5	154.7	687.5	944.9	885.0	1
6	944.9	885.0	1200.0	897.8	1

60 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	154.7	687.5	158.0	684.2	11
2	158.0	684.2	159.1	684.4	3
3	159.1	684.4	205.8	696.1	2
4	205.8	696.1	352.4	732.7	1
5	352.4	732.7	353.1	732.9	9
6	353.1	732.9	354.9	733.4	3
7	354.9	733.4	945.5	881.0	2
8	945.5	881.0	1200.0	893.8	2
9	354.9	733.4	392.5	720.8	3
10	392.5	720.8	1200.0	757.1	3
11	353.1	732.9	392.4	719.8	9
12	392.4	719.8	1200.0	756.1	8
13	352.4	732.7	391.3	719.8	1

14	391.3	719.8	392.4	719.8	8
15	391.3	719.8	392.3	719.4	1
16	392.3	719.4	1200.0	755.7	1
17	205.8	696.1	300.0	699.9	2
18	300.0	699.9	388.4	708.0	2
19	388.4	708.0	550.0	714.8	2
20	550.0	714.8	650.0	721.8	2
21	650.0	721.8	770.6	729.6	2
22	770.6	729.6	900.3	730.6	2
23	900.3	730.6	1050.0	732.3	2
24	1050.0	732.3	1200.0	736.6	2
25	159.1	684.4	196.6	647.0	3
26	196.6	647.0	281.4	643.8	3
27	281.4	643.8	368.8	647.0	3
28	368.8	647.0	384.9	663.0	3
29	384.9	663.0	443.4	663.0	3
30	443.4	663.0	461.4	645.0	3
31	461.4	645.0	484.2	644.3	3
32	484.2	644.3	655.0	649.0	3
33	655.0	649.0	669.0	663.0	3
34	669.0	663.0	732.7	663.0	3
35	732.7	663.0	748.7	647.0	3
36	748.7	647.0	772.7	645.0	3
37	772.7	645.0	943.0	649.0	3
38	943.0	649.0	963.0	669.0	3
39	963.0	669.0	1014.3	669.0	3
40	1014.3	669.0	1036.3	647.0	3
41	1036.3	647.0	1050.8	645.8	3
42	1050.8	645.8	1200.0	648.4	3
43	158.0	684.2	196.2	646.0	11
44	196.2	646.0	281.4	642.8	11
45	281.4	642.8	369.3	646.0	11
46	369.3	646.0	385.3	662.0	11
47	385.3	662.0	443.0	662.0	11
48	443.0	662.0	461.0	644.0	11
49	461.0	644.0	484.2	643.3	11
50	484.2	643.3	655.4	648.0	11
51	655.4	648.0	669.4	662.0	11
52	669.4	662.0	732.3	662.0	11
53	732.3	662.0	748.3	646.0	11
54	748.3	646.0	772.6	644.0	11
55	772.6	644.0	943.4	648.0	11
56	943.4	648.0	963.4	668.0	11
57	963.4	668.0	1013.9	668.0	11
58	1013.9	668.0	1035.9	646.0	11
59	1035.9	646.0	1050.8	644.8	11
60	1050.8	644.8	1200.0	647.4	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.

1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 19 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	159.10	684.40
2	196.60	647.00
3	281.40	643.80
4	368.80	647.00
5	384.90	663.00
6	443.40	663.00
7	461.40	645.00
8	484.20	644.30
9	655.00	649.00
10	669.00	663.00
11	732.70	663.00
12	748.70	647.00
13	772.70	645.00
14	943.00	649.00
15	963.00	669.00
16	1014.30	669.00
17	1036.30	647.00
18	1050.80	645.80
19	1200.00	648.40

Water Surface No. 2 specified by 7 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)

1	.00	618.40
2	200.00	618.20
3	400.00	617.90
4	600.00	617.60
5	800.00	617.30
6	1000.00	617.00
7	1200.00	616.70

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

500 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 48.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	354.1	732.4	391.0	720.1	.3
2	392.4	719.6	392.4	719.6	.3
3	850.0	740.2	1000.0	746.9	.3

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.00	736.06
2	353.64	733.05
3	355.13	732.22
4	355.22	732.14

5	392.40	719.48
6	860.46	740.55
7	860.66	740.85
8	861.23	741.87
9	887.02	782.35
10	912.81	822.84
11	938.60	863.32
12	950.01	881.23
13	952.72	885.39

** Corrected JANBU FOS = 2.090 ** (Fo factor = 1.070)

Failure surface No. 2 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.35	736.15
2	353.98	733.14
3	356.41	731.80
4	356.77	731.49
5	392.40	719.48
6	861.73	740.76
7	861.83	740.90
8	862.39	741.92
9	888.18	782.41
10	913.97	822.89
11	939.77	863.37
12	951.18	881.29
13	953.88	885.45

** Corrected JANBU FOS = 2.091 ** (Fo factor = 1.070)

Failure surface No. 3 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.20	736.11
2	353.84	733.11
3	355.88	731.97
4	356.18	731.71
5	392.40	719.65
6	853.52	740.21
7	853.75	740.54
8	854.32	741.56
9	880.11	782.04
10	905.90	822.53
11	931.69	863.01
12	942.71	880.30
13	945.79	885.04

** Corrected JANBU FOS = 2.091 ** (Fo factor = 1.070)

Failure surface No. 4 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.61	736.22
2	354.23	733.21
3	357.37	731.48
4	357.93	730.99
5	392.40	719.51
6	853.97	740.28
7	854.16	740.56
8	854.73	741.58
9	880.52	782.06
10	906.31	822.54
11	932.10	863.03
12	943.18	880.42
13	946.20	885.07

** Corrected JANBU FOS = 2.092 ** (Fo factor = 1.070)

Failure surface No. 5 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.21	736.11
2	353.84	733.11
3	355.89	731.97
4	356.33	731.59
5	392.40	719.59
6	859.13	740.70
7	859.18	740.78
8	859.75	741.80
9	885.54	782.29
10	911.33	822.77
11	937.12	863.25
12	948.53	881.15
13	951.23	885.32

** Corrected JANBU FOS = 2.092 ** (Fo factor = 1.070)

Failure surface No. 6 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.90	736.29
2	354.51	733.29
3	358.41	731.13
4	358.96	730.65
5	392.40	719.51
6	854.82	740.42
7	854.94	740.59
8	855.50	741.61
9	881.29	782.10
10	907.08	822.58
11	932.88	863.06
12	944.08	880.64

13	946.97	885.10

** Corrected JANBU FOS = 2.092 ** (Fo factor = 1.070)

Failure surface No. 7 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.58	736.21
2	354.20	733.21
3	357.26	731.52
4	357.75	731.09
5	392.40	719.70
6	854.07	740.52
7	854.09	740.55
8	854.66	741.58
9	880.45	782.06
10	906.24	822.54
11	932.03	863.02
12	943.10	880.40
13	946.13	885.06

** Corrected JANBU FOS = 2.093 ** (Fo factor = 1.070)

Failure surface No. 8 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.70	736.24
2	354.31	733.24
3	357.67	731.38
4	358.16	730.96
5	392.40	719.71
6	862.38	740.71
7	862.53	740.93
8	863.09	741.95
9	888.89	782.44
10	914.68	822.92
11	940.47	863.40
12	951.88	881.32
13	954.59	885.49

** Corrected JANBU FOS = 2.093 ** (Fo factor = 1.070)

Failure surface No. 9 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.78	736.26
2	354.40	733.26
3	357.99	731.27
4	358.54	730.79
5	392.40	719.67

6	861.45	740.63
7	861.63	740.89
8	862.20	741.91
9	887.99	782.40
10	913.78	822.88
11	939.57	863.36
12	950.98	881.28
13	953.68	885.44

** Corrected JANBU FOS = 2.093 ** (Fo factor = 1.070)

Failure surface No.10 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.13	736.09
2	353.76	733.08
3	355.59	732.07
4	356.10	731.63
5	392.40	719.70
6	860.68	740.74
7	860.76	740.85
8	861.33	741.88
9	887.12	782.36
10	912.91	822.84
11	938.70	863.32
12	950.11	881.23
13	952.81	885.40

** Corrected JANBU FOS = 2.093 ** (Fo factor = 1.070)

The following is a summary of the TEN most critical surfaces

Problem Description : GG'Final BlockSrch Static

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	2.090	1.070	349.00	952.72	1.400E+06
2.	2.091	1.070	349.35	953.88	1.404E+06
3.	2.091	1.070	349.20	945.79	1.367E+06
4.	2.092	1.070	349.61	946.20	1.370E+06
5.	2.092	1.070	349.21	951.23	1.391E+06
6.	2.092	1.070	349.90	946.97	1.374E+06
7.	2.093	1.070	349.58	946.13	1.367E+06
8.	2.093	1.070	349.70	954.59	1.407E+06
9.	2.093	1.070	349.78	953.68	1.403E+06
10.	2.093	1.070	349.13	952.81	1.397E+06

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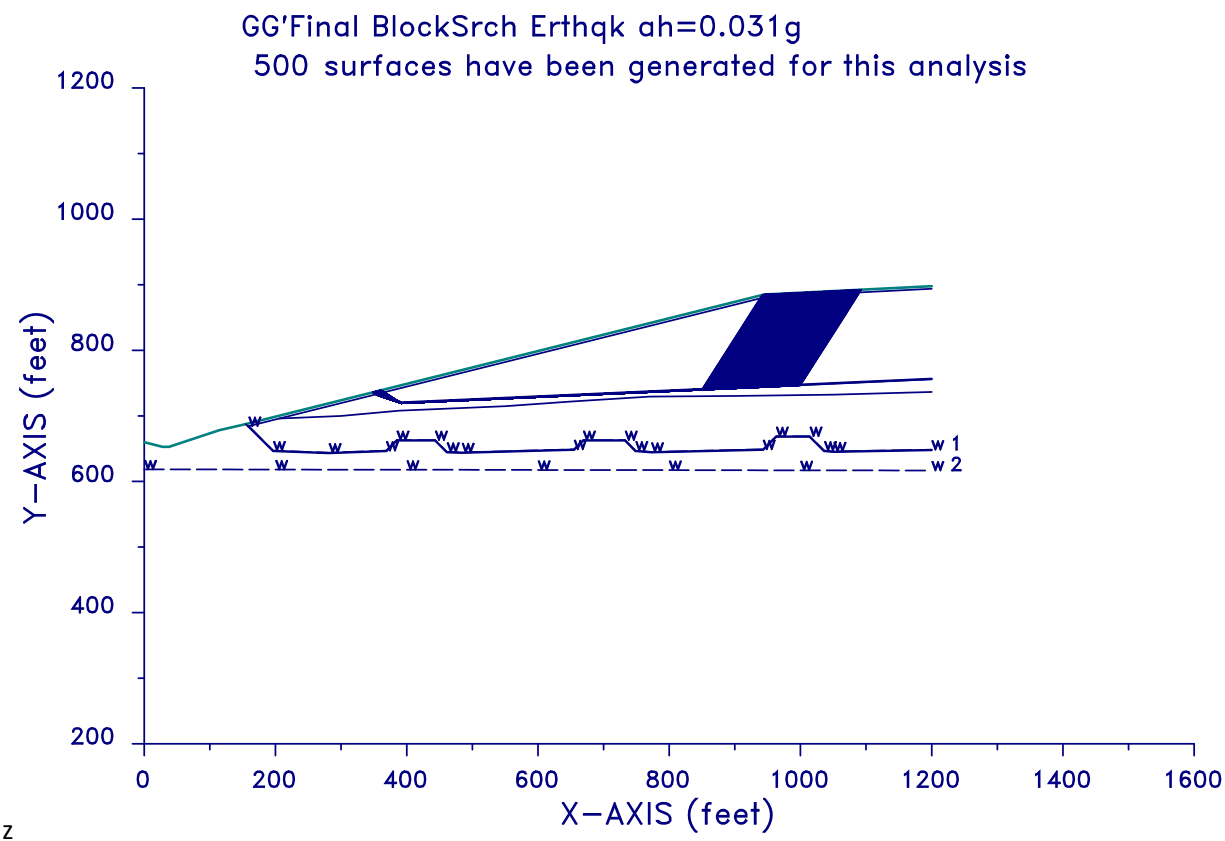

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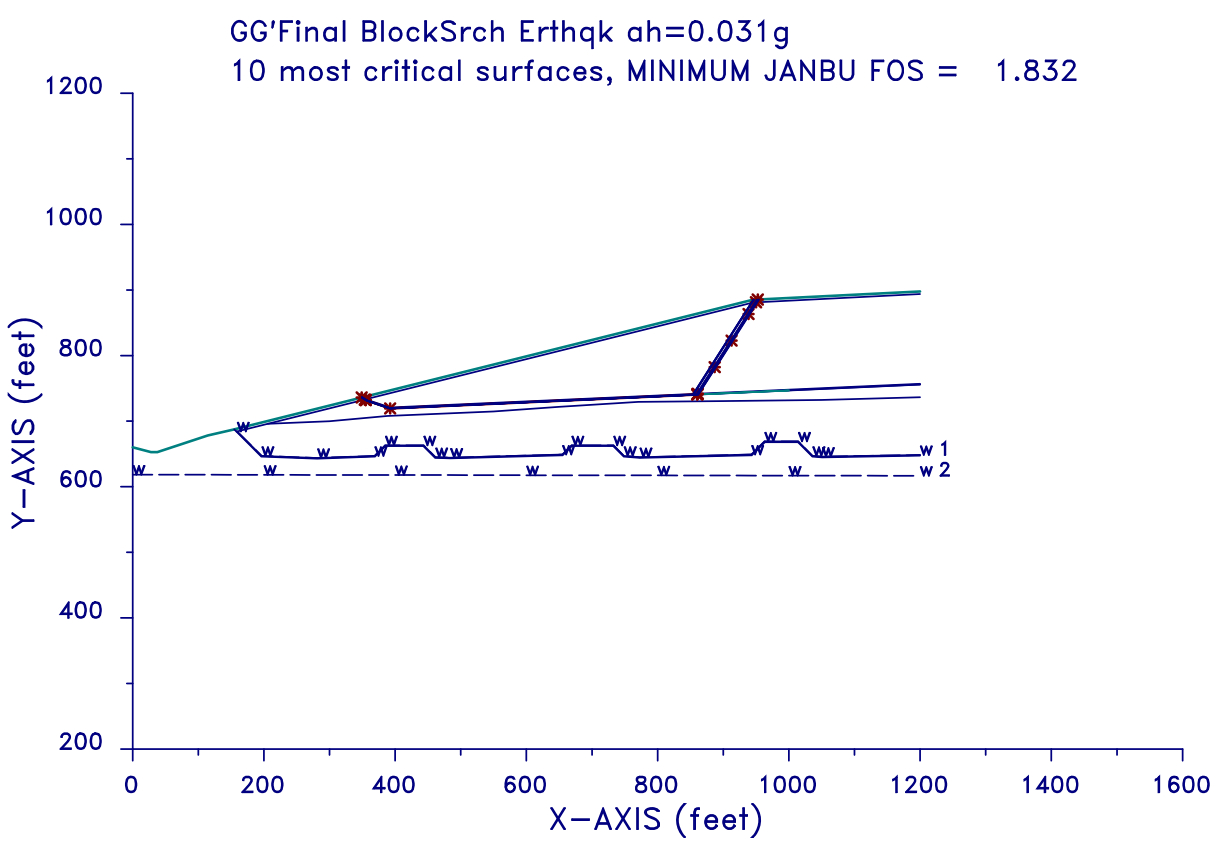

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*                using the              *
*            Method of Slices           *
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Problem Description : GG'Final BlockSrch Erthqk ah=0.031g

SEGMENT BOUNDARY COORDINATES
---

6 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	660.0	27.8	652.8	11
2	27.8	652.8	37.7	652.8	11
3	37.7	652.8	114.3	678.2	11
4	114.3	678.2	154.7	687.5	11
5	154.7	687.5	944.9	885.0	1
6	944.9	885.0	1200.0	897.8	1

60 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	154.7	687.5	158.0	684.2	11
2	158.0	684.2	159.1	684.4	3
3	159.1	684.4	205.8	696.1	2
4	205.8	696.1	352.4	732.7	1
5	352.4	732.7	353.1	732.9	9
6	353.1	732.9	354.9	733.4	3
7	354.9	733.4	945.5	881.0	2
8	945.5	881.0	1200.0	893.8	2
9	354.9	733.4	392.5	720.8	3
10	392.5	720.8	1200.0	757.1	3
11	353.1	732.9	392.4	719.8	9
12	392.4	719.8	1200.0	756.1	8
13	352.4	732.7	391.3	719.8	1

14	391.3	719.8	392.4	719.8	8
15	391.3	719.8	392.3	719.4	1
16	392.3	719.4	1200.0	755.7	1
17	205.8	696.1	300.0	699.9	2
18	300.0	699.9	388.4	708.0	2
19	388.4	708.0	550.0	714.8	2
20	550.0	714.8	650.0	721.8	2
21	650.0	721.8	770.6	729.6	2
22	770.6	729.6	900.3	730.6	2
23	900.3	730.6	1050.0	732.3	2
24	1050.0	732.3	1200.0	736.6	2
25	159.1	684.4	196.6	647.0	3
26	196.6	647.0	281.4	643.8	3
27	281.4	643.8	368.8	647.0	3
28	368.8	647.0	384.9	663.0	3
29	384.9	663.0	443.4	663.0	3
30	443.4	663.0	461.4	645.0	3
31	461.4	645.0	484.2	644.3	3
32	484.2	644.3	655.0	649.0	3
33	655.0	649.0	669.0	663.0	3
34	669.0	663.0	732.7	663.0	3
35	732.7	663.0	748.7	647.0	3
36	748.7	647.0	772.7	645.0	3
37	772.7	645.0	943.0	649.0	3
38	943.0	649.0	963.0	669.0	3
39	963.0	669.0	1014.3	669.0	3
40	1014.3	669.0	1036.3	647.0	3
41	1036.3	647.0	1050.8	645.8	3
42	1050.8	645.8	1200.0	648.4	3
43	158.0	684.2	196.2	646.0	11
44	196.2	646.0	281.4	642.8	11
45	281.4	642.8	369.3	646.0	11
46	369.3	646.0	385.3	662.0	11
47	385.3	662.0	443.0	662.0	11
48	443.0	662.0	461.0	644.0	11
49	461.0	644.0	484.2	643.3	11
50	484.2	643.3	655.4	648.0	11
51	655.4	648.0	669.4	662.0	11
52	669.4	662.0	732.3	662.0	11
53	732.3	662.0	748.3	646.0	11
54	748.3	646.0	772.6	644.0	11
55	772.6	644.0	943.4	648.0	11
56	943.4	648.0	963.4	668.0	11
57	963.4	668.0	1013.9	668.0	11
58	1013.9	668.0	1035.9	646.0	11
59	1035.9	646.0	1050.8	644.8	11
60	1050.8	644.8	1200.0	647.4	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.

1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 19 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	159.10	684.40
2	196.60	647.00
3	281.40	643.80
4	368.80	647.00
5	384.90	663.00
6	443.40	663.00
7	461.40	645.00
8	484.20	644.30
9	655.00	649.00
10	669.00	663.00
11	732.70	663.00
12	748.70	647.00
13	772.70	645.00
14	943.00	649.00
15	963.00	669.00
16	1014.30	669.00
17	1036.30	647.00
18	1050.80	645.80
19	1200.00	648.40

Water Surface No. 2 specified by 7 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)

1	.00	618.40
2	200.00	618.20
3	400.00	617.90
4	600.00	617.60
5	800.00	617.30
6	1000.00	617.00
7	1200.00	616.70

A horizontal earthquake loading coefficient
of .031 has been assigned

A vertical earthquake loading coefficient
of .000 has been assigned

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

500 trial surfaces will be generated and analyzed.

3 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 48.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	354.1	732.4	391.0	720.1	.3
2	392.4	719.6	392.4	719.6	.3
3	850.0	740.2	1000.0	746.9	.3

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.00	736.06
2	353.64	733.05
3	355.13	732.22
4	355.22	732.14
5	392.40	719.48
6	860.46	740.55
7	860.66	740.85
8	861.23	741.87
9	887.02	782.35
10	912.81	822.84
11	938.60	863.32
12	950.01	881.23
13	952.72	885.39

** Corrected JANBU FOS = 1.832 ** (Fo factor = 1.070)

Failure surface No. 2 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.35	736.15
2	353.98	733.14
3	356.41	731.80
4	356.77	731.49
5	392.40	719.48
6	861.73	740.76
7	861.83	740.90
8	862.39	741.92
9	888.18	782.41
10	913.97	822.89
11	939.77	863.37
12	951.18	881.29
13	953.88	885.45

** Corrected JANBU FOS = 1.832 ** (Fo factor = 1.070)

Failure surface No. 3 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.20	736.11
2	353.84	733.11
3	355.88	731.97
4	356.18	731.71
5	392.40	719.65
6	853.52	740.21
7	853.75	740.54
8	854.32	741.56
9	880.11	782.04
10	905.90	822.53
11	931.69	863.01

12	942.71	880.30
13	945.79	885.04

** Corrected JANBU FOS = 1.833 ** (Fo factor = 1.070)

Failure surface No. 4 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.21	736.11
2	353.84	733.11
3	355.89	731.97
4	356.33	731.59
5	392.40	719.59
6	859.13	740.70
7	859.18	740.78
8	859.75	741.80
9	885.54	782.29
10	911.33	822.77
11	937.12	863.25
12	948.53	881.15
13	951.23	885.32

** Corrected JANBU FOS = 1.833 ** (Fo factor = 1.070)

Failure surface No. 5 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.61	736.22
2	354.23	733.21
3	357.37	731.48
4	357.93	730.99
5	392.40	719.51
6	853.97	740.28
7	854.16	740.56
8	854.73	741.58
9	880.52	782.06
10	906.31	822.54
11	932.10	863.03
12	943.18	880.42
13	946.20	885.07

** Corrected JANBU FOS = 1.833 ** (Fo factor = 1.070)

Failure surface No. 6 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.70	736.24
2	354.31	733.24
3	357.67	731.38
4	358.16	730.96

5	392.40	719.71
6	862.38	740.71
7	862.53	740.93
8	863.09	741.95
9	888.89	782.44
10	914.68	822.92
11	940.47	863.40
12	951.88	881.32
13	954.59	885.49

** Corrected JANBU FOS = 1.834 ** (Fo factor = 1.070)

Failure surface No. 7 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.58	736.21
2	354.20	733.21
3	357.26	731.52
4	357.75	731.09
5	392.40	719.70
6	854.07	740.52
7	854.09	740.55
8	854.66	741.58
9	880.45	782.06
10	906.24	822.54
11	932.03	863.02
12	943.10	880.40
13	946.13	885.06

** Corrected JANBU FOS = 1.834 ** (Fo factor = 1.070)

Failure surface No. 8 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.78	736.26
2	354.40	733.26
3	357.99	731.27
4	358.54	730.79
5	392.40	719.67
6	861.45	740.63
7	861.63	740.89
8	862.20	741.91
9	887.99	782.40
10	913.78	822.88
11	939.57	863.36
12	950.98	881.28
13	953.68	885.44

** Corrected JANBU FOS = 1.834 ** (Fo factor = 1.070)

Failure surface No. 9 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.90	736.29
2	354.51	733.29
3	358.41	731.13
4	358.96	730.65
5	392.40	719.51
6	854.82	740.42
7	854.94	740.59
8	855.50	741.61
9	881.29	782.10
10	907.08	822.58
11	932.88	863.06
12	944.08	880.64
13	946.97	885.10

** Corrected JANBU FOS = 1.834 ** (Fo factor = 1.070)

Failure surface No.10 specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	349.13	736.09
2	353.76	733.08
3	355.59	732.07
4	356.10	731.63
5	392.40	719.70
6	860.68	740.74
7	860.76	740.85
8	861.33	741.88
9	887.12	782.36
10	912.91	822.84
11	938.70	863.32
12	950.11	881.23
13	952.81	885.40

** Corrected JANBU FOS = 1.834 ** (Fo factor = 1.070)

The following is a summary of the TEN most critical surfaces

Problem Description : GG'Final BlockSrch Erthqk ah=0.031g

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	1.832	1.070	349.00	952.72	1.386E+06
2.	1.832	1.070	349.35	953.88	1.391E+06
3.	1.833	1.070	349.20	945.79	1.354E+06
4.	1.833	1.070	349.21	951.23	1.378E+06
5.	1.833	1.070	349.61	946.20	1.357E+06
6.	1.834	1.070	349.70	954.59	1.393E+06

7.	1.834	1.070	349.58	946.13	1.354E+06
8.	1.834	1.070	349.78	953.68	1.390E+06
9.	1.834	1.070	349.90	946.97	1.361E+06
10.	1.834	1.070	349.13	952.81	1.384E+06

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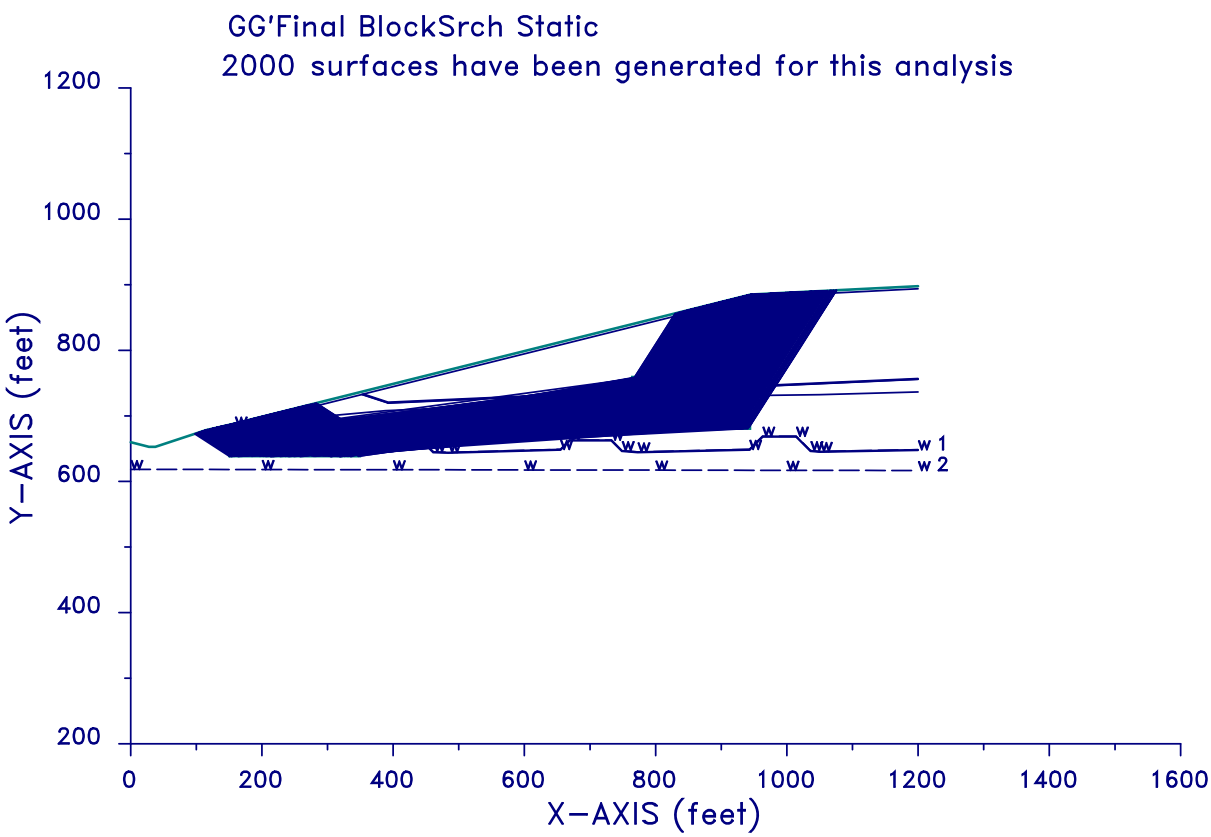

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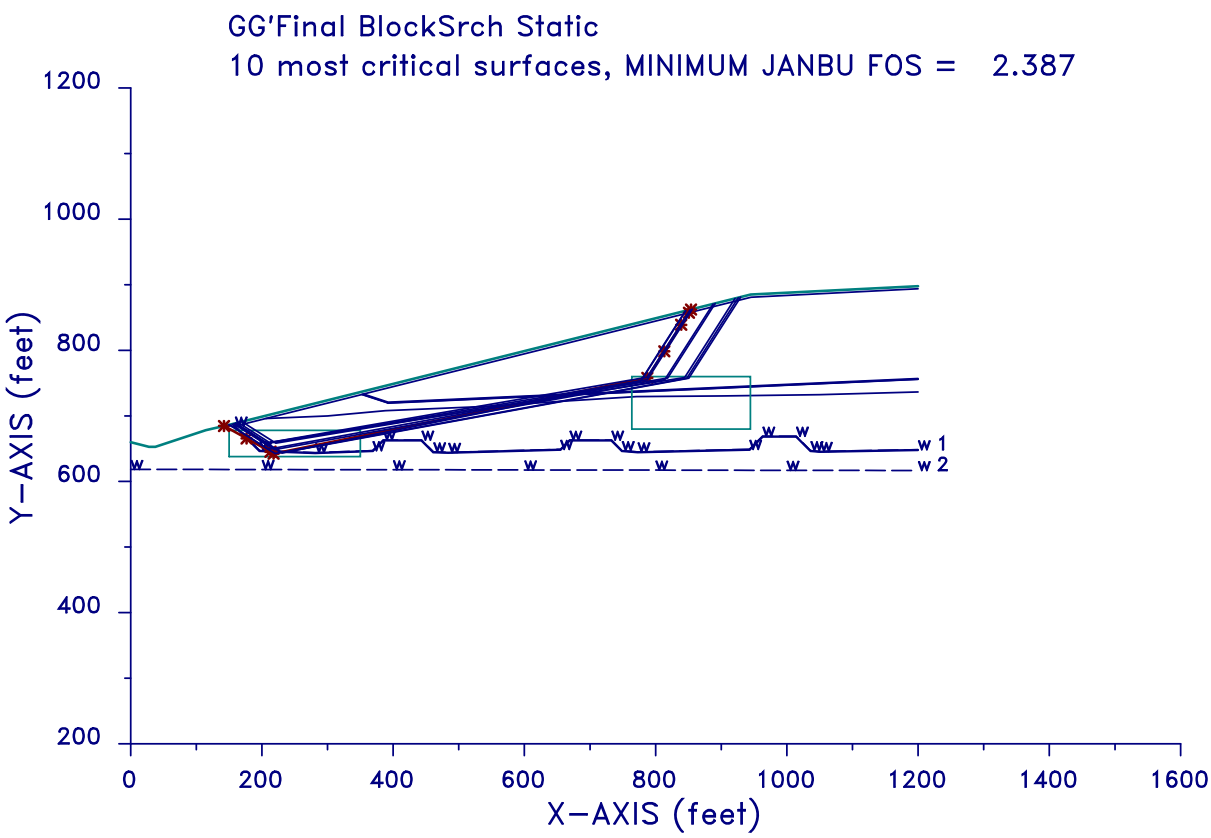

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*  Ver. 5.208                 96 - 2046 *
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Problem Description : GG'Final BlockSrch Static

SEGMENT BOUNDARY COORDINATES
---

6 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	660.0	27.8	652.8	11
2	27.8	652.8	37.7	652.8	11
3	37.7	652.8	114.3	678.2	11
4	114.3	678.2	154.7	687.5	11
5	154.7	687.5	944.9	885.0	1
6	944.9	885.0	1200.0	897.8	1

60 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	154.7	687.5	158.0	684.2	11
2	158.0	684.2	159.1	684.4	3
3	159.1	684.4	205.8	696.1	2
4	205.8	696.1	352.4	732.7	1
5	352.4	732.7	353.1	732.9	9
6	353.1	732.9	354.9	733.4	3
7	354.9	733.4	945.5	881.0	2
8	945.5	881.0	1200.0	893.8	2
9	354.9	733.4	392.5	720.8	3
10	392.5	720.8	1200.0	757.1	3
11	353.1	732.9	392.4	719.8	9
12	392.4	719.8	1200.0	756.1	8
13	352.4	732.7	391.3	719.8	1

14	391.3	719.8	392.4	719.8	8
15	391.3	719.8	392.3	719.4	1
16	392.3	719.4	1200.0	755.7	1
17	205.8	696.1	300.0	699.9	2
18	300.0	699.9	388.4	708.0	2
19	388.4	708.0	550.0	714.8	2
20	550.0	714.8	650.0	721.8	2
21	650.0	721.8	770.6	729.6	2
22	770.6	729.6	900.3	730.6	2
23	900.3	730.6	1050.0	732.3	2
24	1050.0	732.3	1200.0	736.6	2
25	159.1	684.4	196.6	647.0	3
26	196.6	647.0	281.4	643.8	3
27	281.4	643.8	368.8	647.0	3
28	368.8	647.0	384.9	663.0	3
29	384.9	663.0	443.4	663.0	3
30	443.4	663.0	461.4	645.0	3
31	461.4	645.0	484.2	644.3	3
32	484.2	644.3	655.0	649.0	3
33	655.0	649.0	669.0	663.0	3
34	669.0	663.0	732.7	663.0	3
35	732.7	663.0	748.7	647.0	3
36	748.7	647.0	772.7	645.0	3
37	772.7	645.0	943.0	649.0	3
38	943.0	649.0	963.0	669.0	3
39	963.0	669.0	1014.3	669.0	3
40	1014.3	669.0	1036.3	647.0	3
41	1036.3	647.0	1050.8	645.8	3
42	1050.8	645.8	1200.0	648.4	3
43	158.0	684.2	196.2	646.0	11
44	196.2	646.0	281.4	642.8	11
45	281.4	642.8	369.3	646.0	11
46	369.3	646.0	385.3	662.0	11
47	385.3	662.0	443.0	662.0	11
48	443.0	662.0	461.0	644.0	11
49	461.0	644.0	484.2	643.3	11
50	484.2	643.3	655.4	648.0	11
51	655.4	648.0	669.4	662.0	11
52	669.4	662.0	732.3	662.0	11
53	732.3	662.0	748.3	646.0	11
54	748.3	646.0	772.6	644.0	11
55	772.6	644.0	943.4	648.0	11
56	943.4	648.0	963.4	668.0	11
57	963.4	668.0	1013.9	668.0	11
58	1013.9	668.0	1035.9	646.0	11
59	1035.9	646.0	1050.8	644.8	11
60	1050.8	644.8	1200.0	647.4	11

ISOTROPIC Soil Parameters
---

12 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.

1	128.0	130.0	.0	24.00	.000	.0	1
2	80.0	85.0	210.0	25.00	.000	.0	1
3	125.0	130.0	.0	32.00	.000	.0	1
4	65.0	65.0	.0	11.00	.000	.0	1
5	65.0	65.0	.0	8.00	.000	.0	1
6	65.0	65.0	.0	18.00	.000	.0	1
7	65.0	65.0	.0	8.00	.000	.0	1
8	65.0	65.0	.0	20.00	.000	.0	1
9	65.0	65.0	.0	8.40	.000	.0	1
10	128.0	130.0	180.0	24.00	.000	.0	2
11	128.0	130.0	180.0	24.00	.000	.0	2
12	125.0	130.0	.0	34.00	.000	.0	2

2 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 19 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	159.10	684.40
2	196.60	647.00
3	281.40	643.80
4	368.80	647.00
5	384.90	663.00
6	443.40	663.00
7	461.40	645.00
8	484.20	644.30
9	655.00	649.00
10	669.00	663.00
11	732.70	663.00
12	748.70	647.00
13	772.70	645.00
14	943.00	649.00
15	963.00	669.00
16	1014.30	669.00
17	1036.30	647.00
18	1050.80	645.80
19	1200.00	648.40

Water Surface No. 2 specified by 7 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)

1	.00	618.40
2	200.00	618.20
3	400.00	617.90
4	600.00	617.60
5	800.00	617.30
6	1000.00	617.00
7	1200.00	616.70

A critical failure surface searching method, using a random technique for generating sliding BLOCK surfaces, has been specified.

The active and passive portions of the sliding surfaces are generated according to the Rankine theory.

2000 trial surfaces will be generated and analyzed.

2 boxes specified for generation of central block base

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

Length of line segments for active and passive portions of sliding block is 48.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	150.0	657.9	350.0	657.9	40.0
2	763.7	720.0	944.3	720.0	80.0

****
ERROR # 38
****
The program calculated a point for the PASSIVE wedge that is outside the defined slope geometry. The analysis will continue, but the user should adjust the search box or slope geometry to allow a passive wedge to be formed from all points within first box.
****

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first

Failure surface No. 1 specified by 9 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	142.27	684.64
2	176.59	665.61
3	213.12	645.36
4	217.86	642.29
5	787.47	757.97
6	813.26	798.45
7	839.05	838.94
8	850.76	857.32
9	853.98	862.28

** Corrected JANBU FOS = 2.387 ** (Fo factor = 1.049)

Failure surface No. 2 specified by 9 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	163.88	689.79
2	168.54	686.76
3	171.03	685.18
4	211.51	659.39
5	787.09	758.99
6	812.88	799.47
7	838.67	839.95
8	849.54	857.02
9	852.76	861.97

** Corrected JANBU FOS = 2.400 ** (Fo factor = 1.049)

Failure surface No. 3 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	150.74	686.59
2	167.81	675.71
3	173.42	672.14
4	213.91	646.35
5	215.87	645.26
6	220.10	642.51
7	847.68	757.53
8	873.47	798.02
9	899.26	838.50
10	922.71	875.31
11	925.93	880.26

** Corrected JANBU FOS = 2.401 ** (Fo factor = 1.052)

Failure surface No. 4 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	160.18	688.87
2	164.84	685.84
3	187.17	671.62
4	227.65	645.83
5	229.60	644.75
6	231.30	643.64
7	787.57	755.35
8	813.36	795.83
9	839.15	836.31
10	852.87	857.85
11	856.08	862.80

** Corrected JANBU FOS = 2.404 ** (Fo factor = 1.051)

Failure surface No. 5 specified by 9 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	157.66	688.24
2	162.33	685.21
3	179.09	674.53
4	219.57	648.74
5	814.10	755.32
6	839.89	795.80
7	865.68	836.29
8	884.44	865.74
9	887.66	870.69

** Corrected JANBU FOS = 2.404 ** (Fo factor = 1.052)

Failure surface No. 6 specified by 9 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	149.61	686.33
2	163.67	678.53
3	169.26	674.97
4	209.74	649.18
5	776.79	752.50
6	802.58	792.98
7	828.37	833.47
8	842.21	855.19
9	845.43	860.14

** Corrected JANBU FOS = 2.404 ** (Fo factor = 1.051)

Failure surface No. 7 specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)

1	159.59	688.72
2	164.26	685.69
3	186.30	671.65
4	226.78	645.86
5	228.74	644.78
6	230.16	643.86
7	850.74	757.56
8	876.53	798.04
9	902.32	838.52
10	926.34	876.21
11	929.55	881.16

** Corrected JANBU FOS = 2.408 ** (Fo factor = 1.052)

Failure surface No. 8 specified by 9 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	157.00	688.08
2	161.67	685.04
3	163.22	684.06
4	203.70	658.27
5	844.24	758.53
6	870.04	799.01
7	895.83	839.49
8	917.87	874.09
9	921.09	879.05

** Corrected JANBU FOS = 2.410 ** (Fo factor = 1.051)

Failure surface No. 9 specified by 9 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	169.74	691.26
2	174.40	688.23
3	180.92	684.08
4	221.40	658.29
5	818.42	757.83
6	844.21	798.31
7	870.00	838.80
8	887.69	866.55
9	890.90	871.50

** Corrected JANBU FOS = 2.412 ** (Fo factor = 1.051)

Failure surface No.10 specified by 9 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	160.03	688.83
2	164.70	685.80
3	167.75	683.85

4	208.24	658.06
5	778.11	753.68
6	803.90	794.16
7	829.69	834.64
8	842.88	855.35
9	846.10	860.31

** Corrected JANBU FOS = 2.413 ** (Fo factor = 1.051)

The following is a summary of the TEN most critical surfaces

Problem Description : GG'Final BlockSrch Static

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	2.387	1.049	142.27	853.98	2.149E+06
2.	2.400	1.049	163.88	852.76	1.861E+06
3.	2.401	1.052	150.74	925.93	2.579E+06
4.	2.404	1.051	160.18	856.08	2.172E+06
5.	2.404	1.052	157.66	887.66	2.268E+06
6.	2.404	1.051	149.61	845.43	2.043E+06
7.	2.408	1.052	159.59	929.55	2.587E+06
8.	2.410	1.051	157.00	921.09	2.267E+06
9.	2.412	1.051	169.74	890.90	2.112E+06
10.	2.413	1.051	160.03	846.10	1.901E+06

* * * END OF FILE * * *

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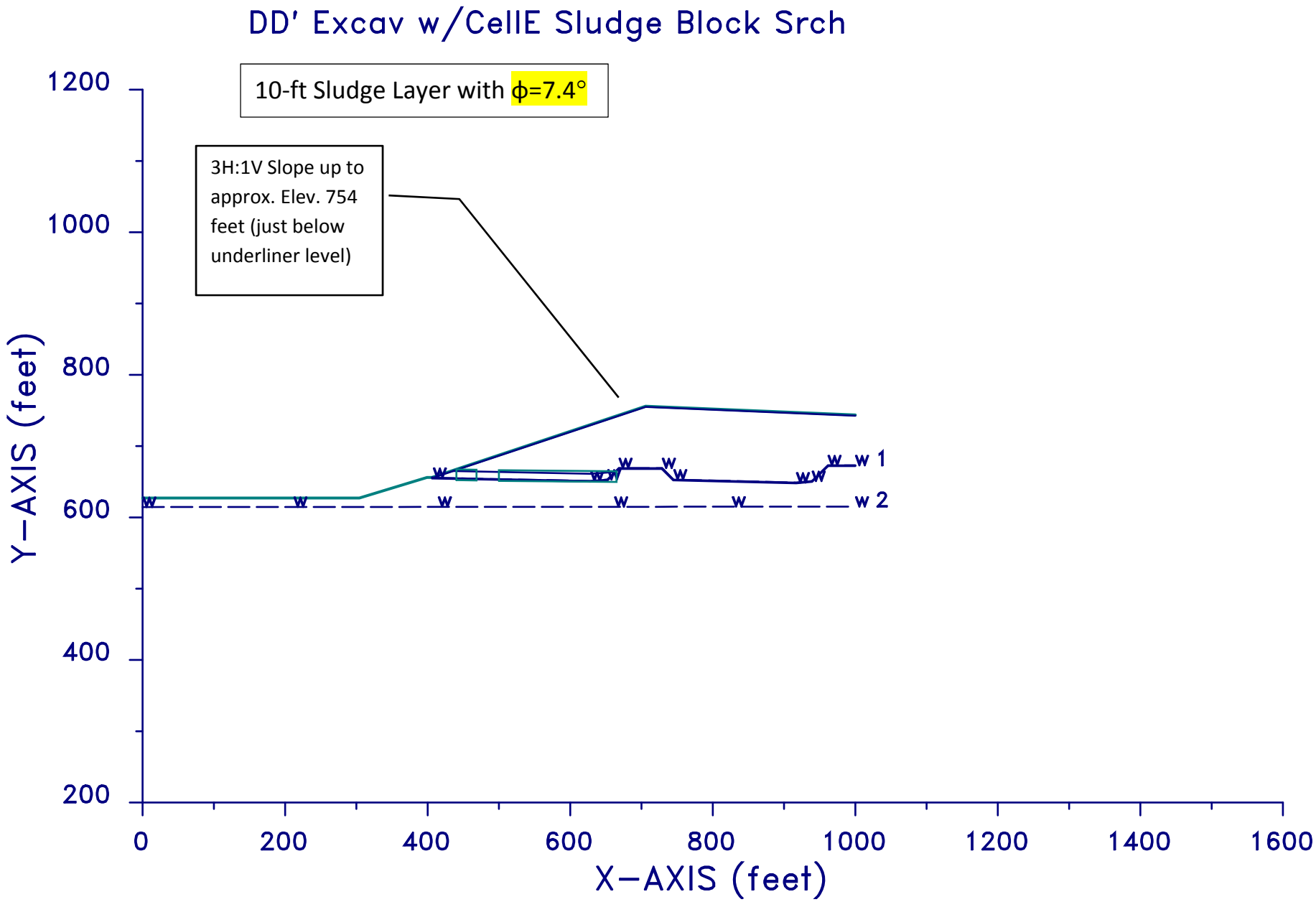

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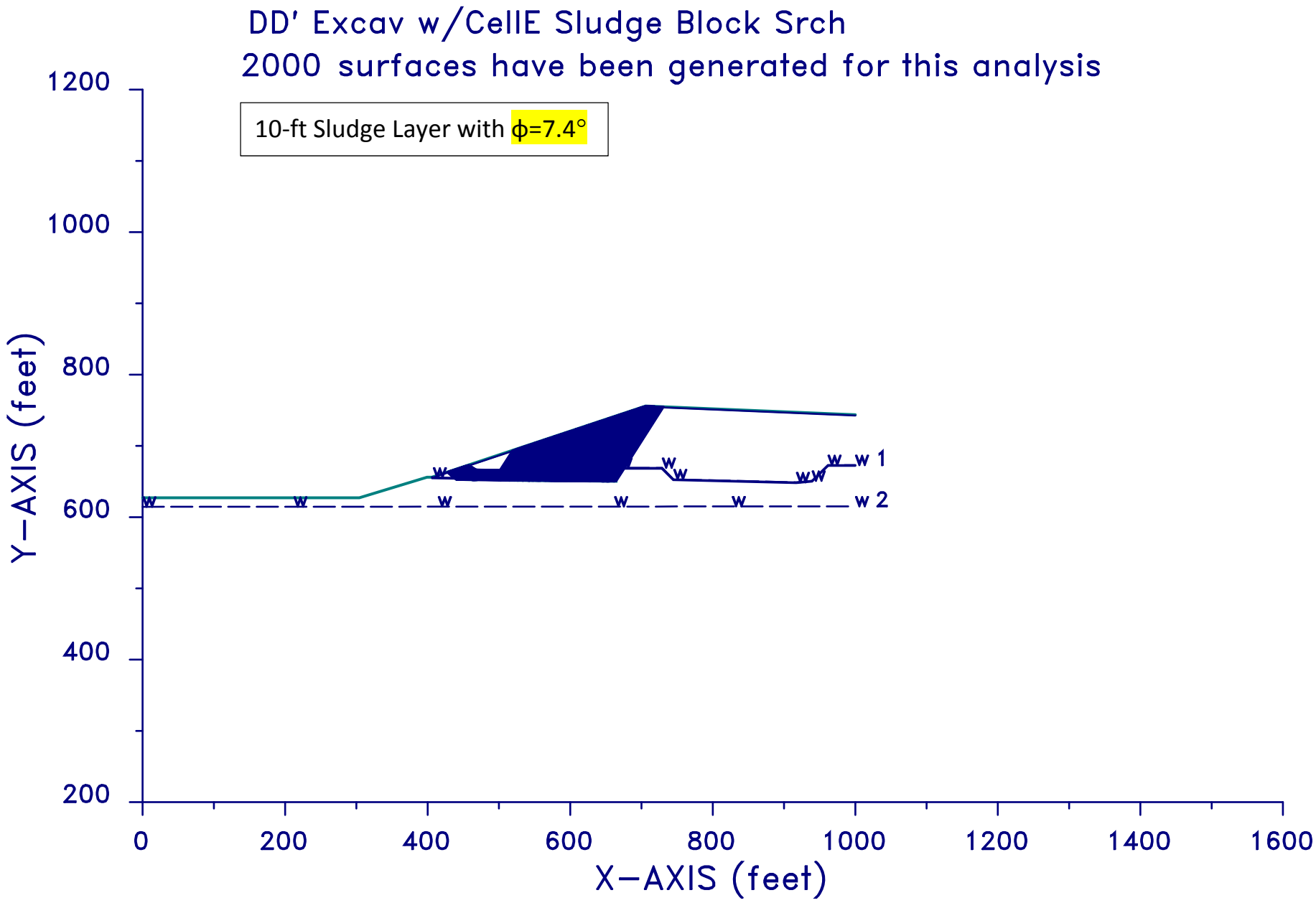

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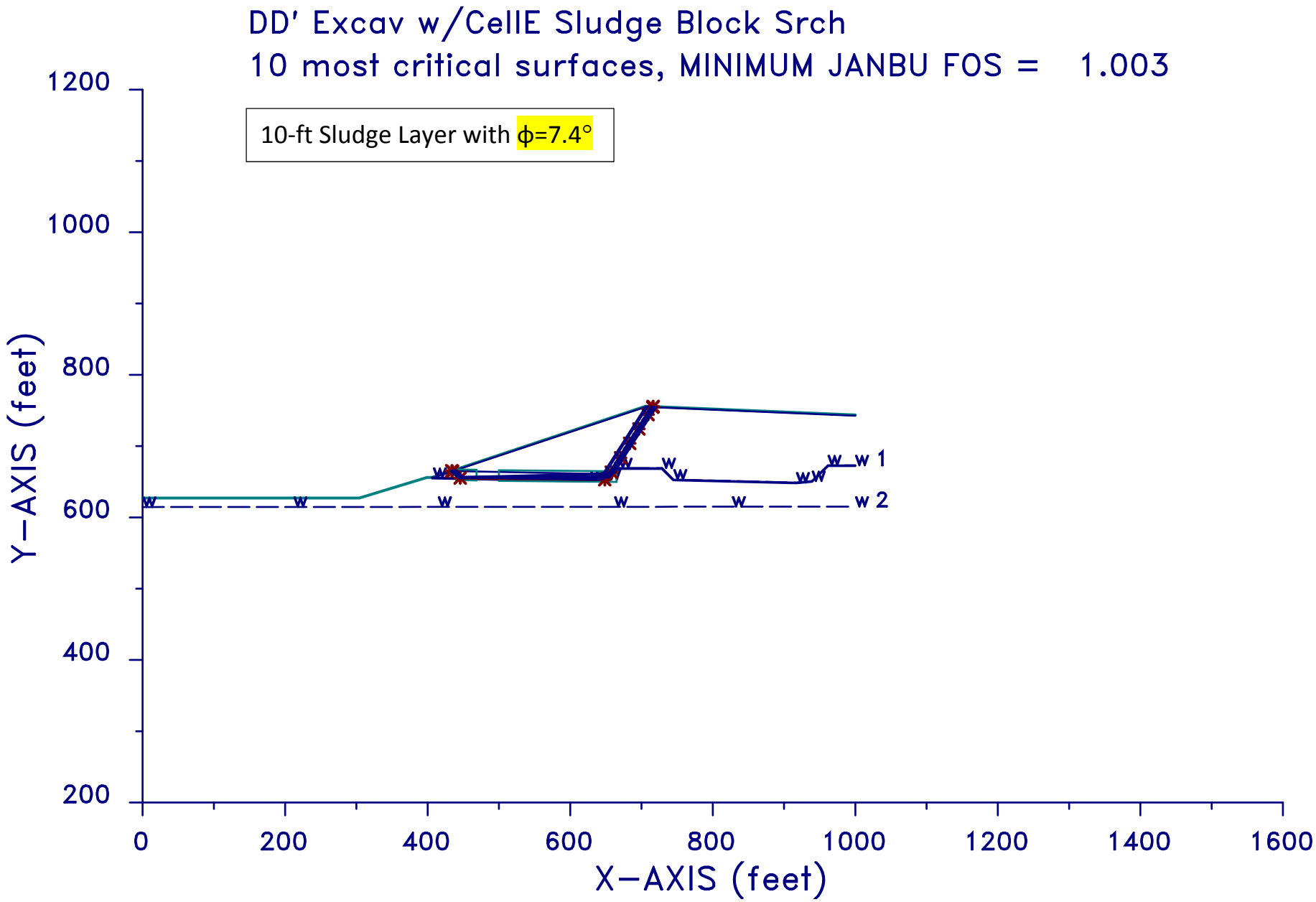

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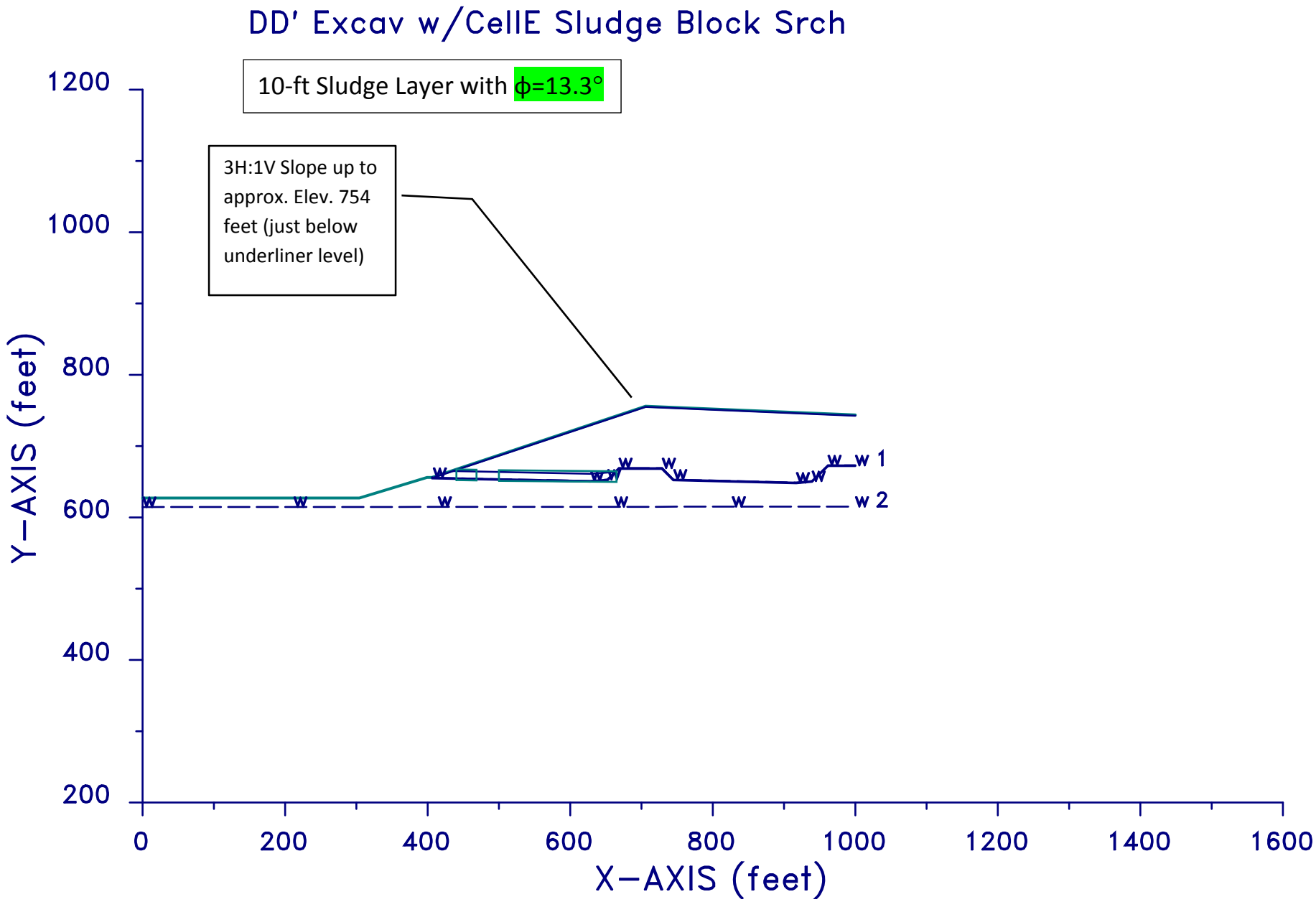

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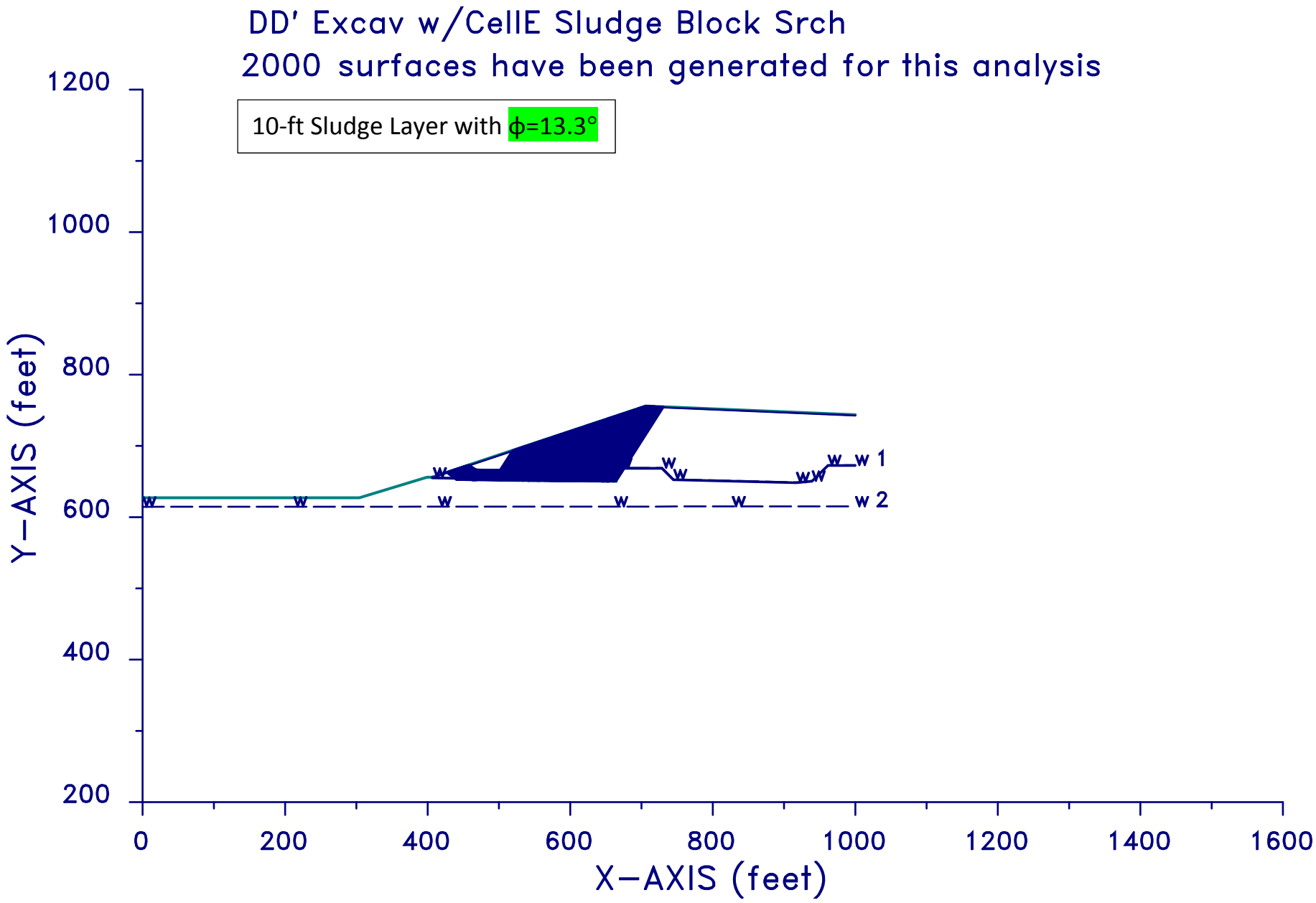
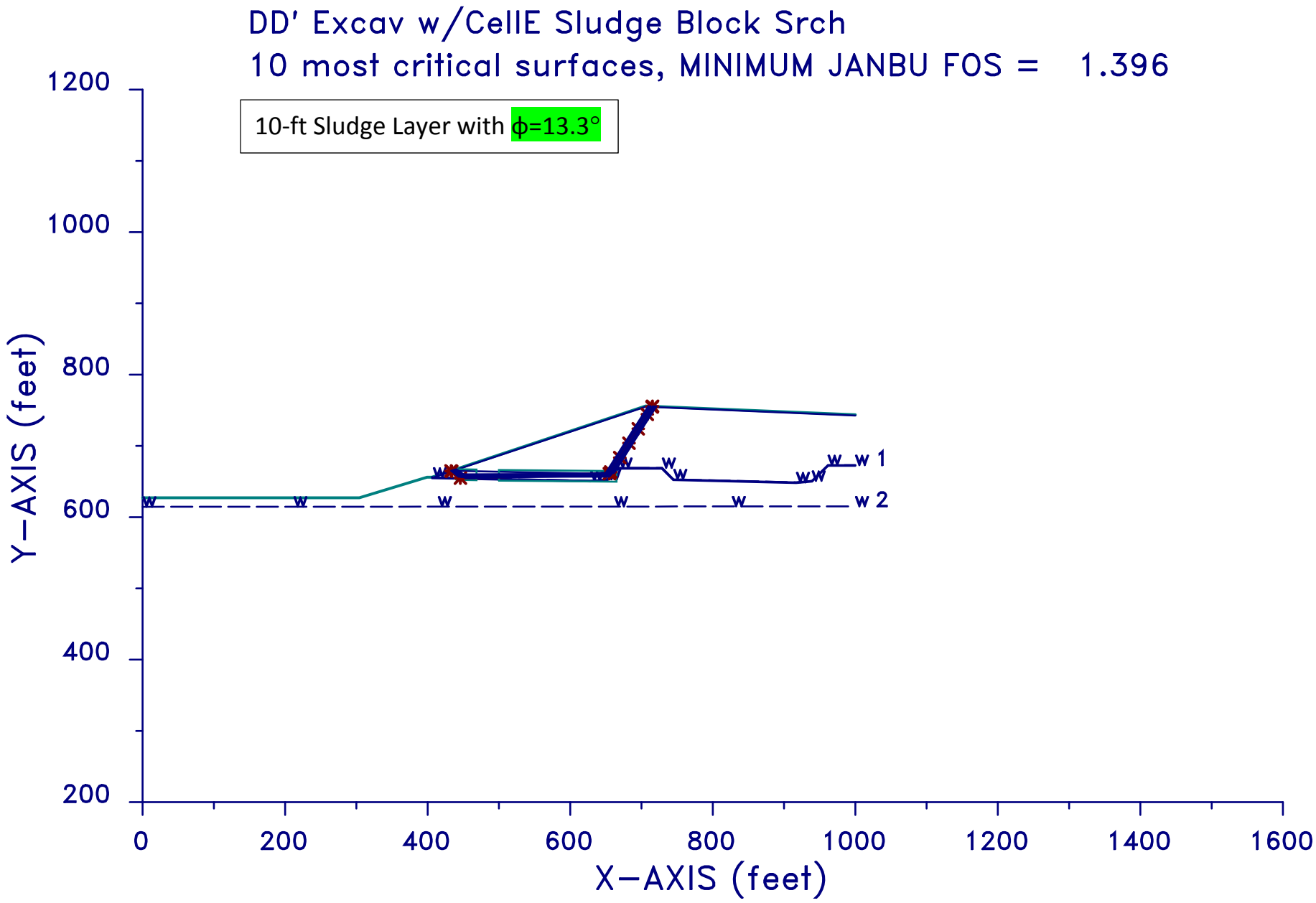
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